

GEOTECHNICAL DATA REPORT, ROUGE PARK GATEWAY, TORONTO, ONTARIO

ROUGE NATIONAL URBAN PARK FIELD UNIT, PARKS CANADA AGENCY

PROJECT NO.: 201-04948-00 DATE: JULY 27, 2020

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DRAWINGS

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1 INTRODUCTION

WSP Canada Inc. (WSP) was retained by Parks Canada Agency (PCA) to undertake a preliminary geotechnical investigation and slope stability analyses for the new Rouge Gateway Visitor Learning Centre at Zoo Road, Parking Lot No. 4, Toronto, ON. PCA intends to proceed with the Rouge Gateway Project, to provide visitors of Rouge National Urban Park with information and orientation, and to be a destination visitor experience itself.

The site is a land parcel approximately 12 acres in size which is owned by PCA. The site is generally located on the south east corner of Zoo Road and Meadowvale Road, north of Highway 401 and south of Highway 407. The nearest known municipal address is 1749 Meadowvale Road, Toronto, ON.

A water course (Little Rouge Creek) runs through the east side of the site along with a multi-use pathway. The site is located in close proximity to a range of uses – open space and parks, zoo, residential, institutional and industrial.

This geotechnical data report has been requested for providing the factual data retrieved from the site drilling program and does not contain recommendations. WSP will consult with any parties engaged with PCA to provide recommendations and guidance pertaining to the geotechnical aspects of the site.

This report is provided on the basis of the terms of reference presented above and in WSP's proposal for this preliminary geotechnical work, and on the assumption that the design will be in accordance with the applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design. This is a preliminary study and it will be necessary to carry out additional borings and reporting before the recommendations can be prepared.

The site investigation follows generally accepted practices for geotechnical consultants in Ontario. The format and contents are guided by Client specific needs and economics and do not conform to generalized standards for services. Laboratory testing for most part follows ASTM or CSA Standards or modifications of these standards that have become standard practice.

This report has been prepared for PCA. Third party use of this report without WSP Canada Inc. consent is prohibited.

2 REVIEW OF REGIONAL GEOLOGY

The project area is situated within the Iroquois Plain physiographic region of Chapman and Putnam (1984) as represented in the OGS Earth application accessible through the Ministry of Northern Development and Mines Web Page (http://www.geologyontario.mndm.gov.on.ca/). The Iroquois Plain is a strip of land 3 to 5 km wide between the glacial Lake Iroquois shoreline and the present shoreline of Lake Ontario (Karrow, 2005). Over most of the study area, it is represented at ground surface by sand plains.

Surficial geological mapping of the site (Ontario Geological Survey, 2003) indicates that native subsurface materials over most of the area generally consist of sand, gravel, minor silt and clay that are considered to be coarse-textured glaciolacustrine deposits. These materials are expected to behave as unconfined aquifers. To the east and west of the site, there are two areas of modern alluvial deposits associated with the floodplains of the Rouge River to the west and Little Rouge Creek to the east. These deposits may contain varying proportions of gravel, sand, silt and clay and may contain organic remains. They are expected act as local aquifers or aquitards, depending on the composition.

To the north, there is a sandy silt to silty sand-textured till on Paleozoic terrain. This till is expected to behave as an aquitard. In the walls of the river valleys on either side of the site, there are undifferentiated older tills that may include stratified deposits. These are expected to behave as aquitards.

Bedrock geological mapping for southern Ontario indicates that bedrock underlying the site consists of the black shales of the Blue Mountain Formation. The shale is expected to behave as an aquitard, except when fractured or weathered, where it may behave as a weak aquifer.

3 FIELD AND LABORATORY WORK

3.1 GEOTECHNICAL BOREHOLES AND FIELD TESTING

A total of fourteen boreholes (BH20-1 to BH20-11) were drilled at the site as shown on the attached **Drawing 1**. The boreholes BH20-1 to BH20-6 and BH20-11 were drilled across the site for preliminary subsurface investigation for future developments. The remaining boreholes were drilled along the top of valley slope for slope stability assessment.

Borehole elevations and coordinates were recorded upon completion of field work by WSP. Approximate UTM coordinates and existing ground elevations were noted using GPS system and referenced to a local benchmark Toronto Station 12020050046 attached in the drawings section of this report. A summary of the borehole data is presented in **Table 2.1**. Contractors performing any work referenced to the borehole elevations should confirm the borehole elevations for their work.

Table 3.1 Summary of Borehole Information

Borehole/ Park Block	Easting	Northing	Approximate	Depth of	Note
	NAD83, I	UTM Zone 17	Ground Elevation (m)	Borehole (m)	
Toronto Station 12020050046	646976.8	4852441.7	123.4		For reference only
BH 20-1	647052.8	4853370.1	131.3	6.7	Monitoring Well
BH 20-2	647003.9	4853330.6	130.8	6.7	Monitoring Well
BH 20-3	647113.7	4853360.6	131.4	6.7	Monitoring Well
BH 20-4	647066.8	4853257.6	130.1	6.7	Monitoring Well
BH 20-5	647040.5	4853214.9	130.2	9.8	Monitoring Well
BH 20-6	647173.0	4853210.3	130.9	6.7	Monitoring Well
BH 20-7	647113.3	4853409.1	132.2	30.6	Monitoring Well
BH 20-8	647155.6	4853388.6	132.1	30.5	Monitoring Well
BH 20-8A	647154.7	4853390.0	132.1	3.1	Monitoring Well
BH 20-9	647175.9	4853308.2	131.2	36.7	Monitoring Well
BH 20-9A	647175.1	647175.0	131.3	6.1	Monitoring Well
BH 20-10	647211.4	4853247.0	130.7	36.6	Monitoring Well
BH 20-10A	647210.3	4853246.7	130.7	6.1	Monitoring Well
BH 20-11	647172.0	4853264.7	130.8	6.7	Monitoring Well

Prior to drilling operations, underground utilities were cleared at the borehole locations.

The field investigation work was undertaken on June 16 to July 9, 2020 by a drilling sub-contractor under the direction and supervision of WSP personnel. Borehole logging services were provided by the engineering staff of

WSP. All the boreholes were advanced with power auger drilling machines equipped with hollow stem augers and mud rotary. The soil stratigraphy was recorded by observing the quality and changes of augured materials which were retrieved from the boreholes, and by sampling the soils at regular intervals of depth using a 50 mm O.D. split spoon sampler, in accordance with the Standard Penetration Test (ASTM D 1586) method. This sampling method recovers samples from the soil strata, and the number of blows (SPT 'N'-values) required to drive the sampler 300 mm depth into the undisturbed soil gives an indication of the compactness or consistency of the sampled soil material. The SPT 'N' values are indicated on the borehole log sheets (Refer to borehole logs in **Appendix A**). Soil samples were visually classified in the field and later re-evaluated by a geotechnical engineer in our laboratory.

Groundwater conditions in the boreholes were observed during and upon completion of drilling.

As listed in **Table 2-1**, fourteen (14) monitoring wells of 50 mm diameter were installed to enable the longer-term monitoring of groundwater levels.

The installed monitoring wells are comprised of 50 mm diameter, Schedule 40 polyvinyl chloride (PVC) environmental-grade flush threaded pipe and machine slotted No. 10 screen. The bottom of the well screen was covered with a PVC cap to prevent the influx of sediment. The annular space surrounding the screen was backfilled with commercial silica sand to at least 300 mm above the screen. The monitoring wells were constructed in accordance with O. Reg. 903 (as amended) by extending a bentonite seal from above the sand pack to the surface. A lockable protective above ground stick-up casing was provided to protect the riser pipe.

These monitoring wells should not be decommissioned until completion of the hydrogeological investigation or long-term groundwater study. The monitoring wells must then be sealed in accordance with O. Reg. 903 (as amended) prior to construction, such decommissioning is not part of this current scope of work. It is important that the abandoned wells be fully grouted and sealed to reduce/ prevent possible groundwater communication with the proposed excavation areas of the project.

3.2 GEOTECHNICAL LABORATORY TESTING

The soil samples recovered from the boreholes were taken to WSP's laboratory where they were re-examined. Representative soil samples were selected for geotechnical index testing. The testing program consisted of the measurement of the natural water contents of all available soil samples and grain size analyses of six (6) selected samples and consistency (Atterberg) limit tests on five (5) soil samples taken from the boreholes. The results of the particle size distribution tests and consistency (Atterberg) limit tests are enclosed in **Appendix B** of this report and are also summarized on the associated borehole log sheets.

4 SUBSURFACE CONDITIONS

The borehole locations are shown on **Drawing 1**. The subsurface conditions in the boreholes are presented on the individual borehole log sheets in **Appendix A** and summarized in the following subsections.

4.1 SOIL CONDITIONS

4.1.1 TOPSOIL

Topsoil was encountered at the surface of boreholes BH 20-1, 20-2, 20-7, 20-8, 20-9, 20-10 and 20-11 with approximate thicknesses ranging from 50 mm to 230 mm below ground surface (bgs). Topsoil quantities should not be calculated from the borehole information, as large variations in depth may exist between and beyond the boreholes.

4.1.2 GRANULAR FILL

Granular fill was encountered at the surface of boreholes BH20-3 and 20-4, 20-5 and 20-6 with approximate thicknesses ranging from 300 mm to 400 mm bgs.

4.1.3 FILL

Underlying the topsoil and granular fill, soil fill was encountered at all borehole locations, except BH20-9 where native soil was encountered below 150 mm thick topsoil layer. The fill depth ranges from 0.7 m to 1.45 m bgs. The fill generally consisted of sand to sandy material and was observed to also contain silt and trace to some of gravel, and cobbles/boulder (BH20-7, BH20-10).

SPT 'N' values in these fill materials ranged from 4 to 95 blows per 300 mm of penetration, corresponding to a loose very dense state. Higher blow counts may be attributed to cobbles, boulders and other obstructions. Water contents of the fill samples ranged from 1% to 20%.

4.1.4 SANDY SILT

Below the fill and top soil material, deposits of sandy silt were encountered extending to depths ranging from 1.5 m to 2.2 m bgs in boreholes BH20-1, 20-2, 20-4, 20-6, 20-8 and 20-9. This deposit was found to be in a compact to very dense state, with measured SPT 'N' values of 22 to 64 blows per 300 mm of penetration.

This deposit was generally found to be moist to wet with measured water contents ranging from 5% to 19%.

4.1.5 SAND AND SANDY GRAVEL

Below the fill and top soil material, deposits of sand and sandy gravel were encountered extending to depths ranging from 1.45 to 4.1 m bgs in boreholes BH20-5, 20-10 and 20-11. This deposit was found to be in a compact to very dense state, with measured SPT 'N' values of 16 to 64 blows per 300 mm of penetration.

This deposit was generally found to be moist to wet with measured water contents ranging from 6% to 15%.

4.1.6 SILTY CLAY TILL

Below the fill, sand, sandy gravel and sandy silt materials, a native undisturbed deposit of silty clay till was encountered extending to depths ranging from 3.0 m to 32.9 bgs in boreholes BH20-1, 20-2, 20-3, 20-4, 20-6, 20-9, 20-10 and 20-11. This deposit was found to be in a soft to hard consistency, with measured SPT 'N' values of 3 to greater than 90 blows per 300 mm of penetration. This deposit was generally found to be moist with measured water contents ranging from 6% to 17%.

Below the sandy silt till / silty sand till materials, a native undisturbed deposit of silty clay till was encountered extending to depths ranging from 9.8 m to 30 bgs in boreholes BH20-5, 20-7 and 20-8 and found interbedded between a sandy silt till deposit in BH20-10 from 33.1m to 34.6m bgs. This deposit was found to be in a very soft to hard consistency, with measured SPT 'N' values of 1 to greater than 95 blows per 300 mm of penetration. This deposit was generally found to be moist with measured water contents ranging from 7% to 25%.

Three (3) selected samples (BH20-8/SS14, BH20-9/SS7, BH20-10/SS7) were subjected to grain size analyses. The gradation curves for these tests are presented in **Appendix B** and summarized below:

Gravel: 5 to 9 %
Sand: 23 to 40 %
Silt: 35 to 49 %
Clay: 16 to 22 %

Two (2) Atterberg Limit tests were performed on selected samples (BH20-9/SS7, BH20-10/SS7) and the results are provided in **Appendix B** and summarized as follows:

Liquid Limit (W_L): 16 to 18 Plastic Limit (W_P): 12 Plasticity Index (PI): 4 to 6

The soil is classified as CL-ML according to the Unified Soil Classification System with low activity.

4.1.7 SILTY SAND TILL/ SANDY SILT TILL

Below the silty clay till material in Boreholes BH20-1, 20-3, 20-9 and 20-10, native undisturbed deposits of silty sand till / sandy silt till was encountered extending to depths ranging from termination of borehole at 6.7 m to termination of borehole as deep as 36.7m bgs. This deposit was found to be in a compact to very dense state, with measured SPT 'N' values of 15 to greater than 50 blows per 300 mm of penetration. This deposit was generally found to be moist with measured water contents ranging from 7% to 15%.

Below the fill, sandy silt and sandy gravel materials, a native undisturbed deposit of silty sand till / sandy silt till was encountered extending to depths ranging from 3 m to 5.7 bgs in boreholes BH 20-5, BH20-7 and 20-8. This deposit was found to be in a very loose to very dense consistency, with measured SPT 'N' values of 1 to greater than 50 blows per 300 mm of penetration. This deposit was generally found to be moist with measured water contents ranging from 6% to 14%.

Three (3) selected samples (BH20-1/SS6, BH20-5/SS6, BH20-7/SS5) were subjected to grain size analyses. The gradation curves for these tests are presented in **Appendix B** and summarized below:

Gravel: 5 to 11 %
Sand: 36 to 49 %
Silt: 30 to 40 %
Clay: 12 to 15 %

Three (3) Atterberg Limit tests were performed on the above samples (BH20-1/SS6, BH20-5/SS6, BH20-7/SS5) and the results are provided in **Appendix B** and summarized as follows:

Liquid Limit (W_L): NV to 15 Plastic Limit (W_P): NP to 11 Plasticity Index (PI): NP to 4

The soil is classified as ML/SC-SM according to the Unified Soil Classification System.

4.1.8 SILTY SAND

Below the silty clay till material, a deposit of silty sand was encountered extending to the borehole termination at boreholes BH20-7 and 20-8. This non-cohesive deposit was found to be in a very dense state, with measured SPT 'N' values of greater than 50 blows per 300 mm of penetration. This deposit was generally found to be moist to wet with measured water contents ranging from 9% to 19%.

4.2 GROUNDWATER CONDITIONS

Groundwater levels were measured in the monitoring wells and summarized in Table 4.1 below:

Table 4.1 Summary of Groundwater Levels

BOREHOLE NO.	WELL INSTALLATION	EXISTING GROUND ELEVATION	DATE OF WATER	SCREEN (r	l DEPTH n)	GROUNDWATER LEVEL ELEVATION
	DATE	(m) MEASUREMENT		From	То	(m)
BH 20-1	16/06/2020	131.3	July 13, 2020	4.6	6.1	129.7
BH 20-2	16/06/2020	130.8	July 13, 2020	4.6	6.1	129.7
BH 20-3	20/06/2020	131.4	July 13, 2020	4.6	6.1	129.8
BH 20-4	17/06/2020	130.1	July 13, 2020	4.6	6.1	128.3
BH 20-5	17/06/2020	130.2	July 13, 2020	4.6	6.1	124.6
BH 20-6	18/06/2020	130.9	NM	4.6	6.1	NM
BH 20-7	29/06/2020	132.2	NM	27.4	30.5	NM
BH 20-8	25/06/2020	132.1	NM	27.4	30.5	NM
BH 20-8A	25/06/2020	132.1	NM	1.5	3.0	NM
BH 20-9	03/07/2020	131.2	NM	33.5	36.6	NM
BH 20-9A	03/07/2020	131.3	July 13, 2020	4.6	6.1	126.5
BH 20-10	09/07/2020	130.7	July 13, 2020	33.5	36.6	103.0
BH 20-10A	09/07/2020	130.7	July 13, 2020	4.6	6.1	126.8
BH 20-11	18/06/2020	130.8	July 13, 2020	4.6	6.1	129.0

^{*}NM - Not yet Measured

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations in response to major weather events.

5 GENERAL COMMENTS AND LIMITATIONS OF REPORT

This report is intended solely for the Client named. The material in it reflects our best judgment in light of the information available to WSP Canada Inc. at the time of preparation. Unless otherwise agreed in writing by WSP Canada Inc., it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

The data in this report are based on the information determined at the test hole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The number of test holes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. WSP Canada Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

6 CLOSURE

Thank you for the opportunity to be of service to you. Should you have any questions or require further clarification on any aspect of this report, please do not hesitate to contact this office.

SIGNATURES

Amar Persaud, M.Eng., P.Eng.

Lew Gerd

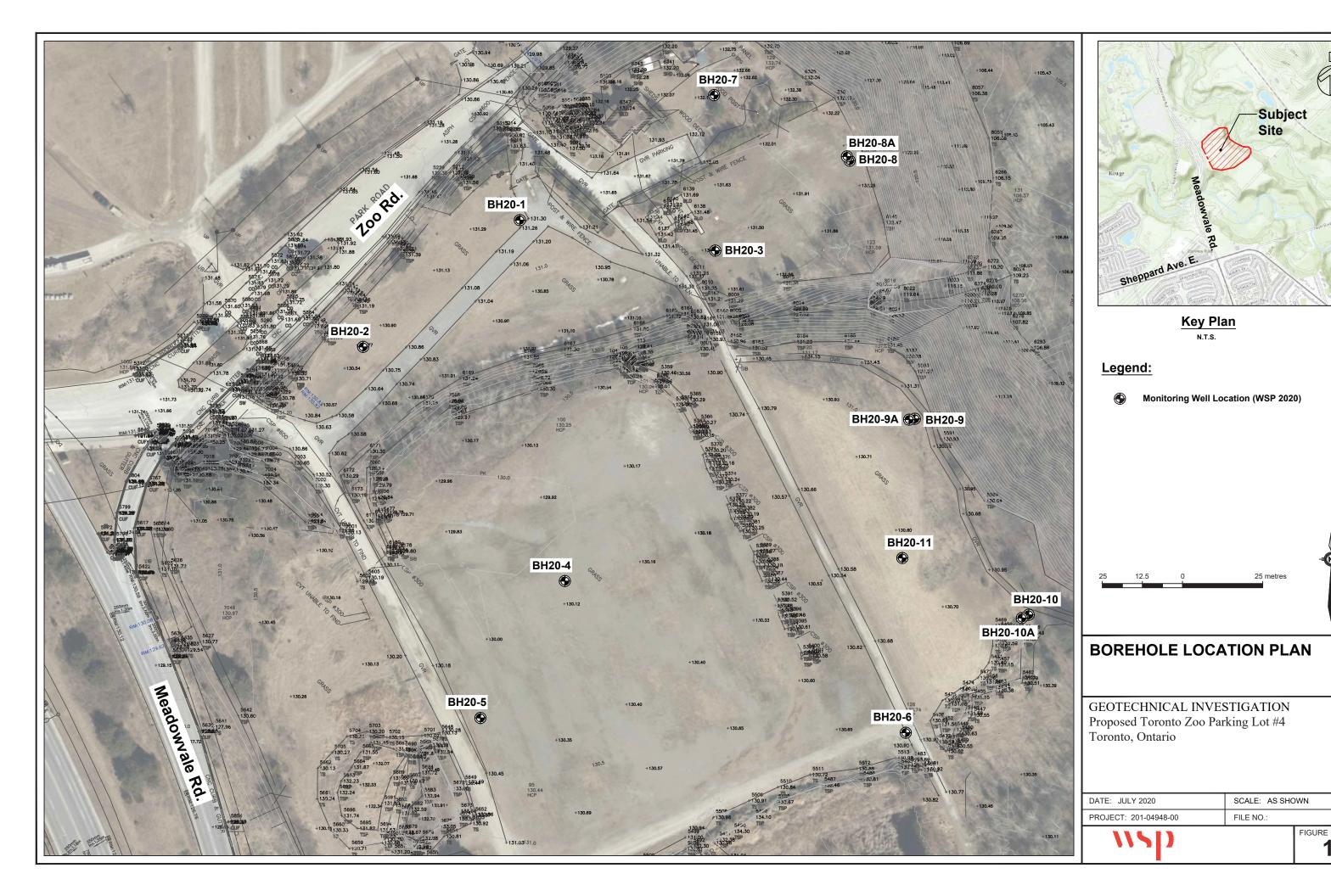
Geotechnical Engineer

Derek Wang, P.Eng.

Senior Geotechnical Engineer

DRAWINGS

BOREHOLE LOCATION PLAN (DRAWING 1)



8/3/2016 COSINE Report

TORONTO In Toronto 12020050046 STATION: Also known as: Monument status: Existing Toronto status: 1 Monument type: ВМ Horizontal datum: TOR H-1974 Horizontal accuracy: UNCLASSIFIED Latitude: N43°48'37.4xxxx" W79°10'22.0xxxx" Longitude: Ellipsoidal elevation: 124.xxx Ellipsoidal elevation order: Unclassified UTM-17 Easting: E646964.xxx UTM-17 Northing: N4852220.xxx UTM-17 Cmbd sc-fact: 0.99984621 UTM-17 Mrdnl convg: 1°15'54.5" MTM-10 Easting: E331124.xxx MTM-10 Northing: N4852105.xxx MTM-10 Cmbd sc-fact: 0.99988907 MTM-10 Mrdnl convq: 0°13'35.4" Vertical datum: CGVD-1928: PRE-1978 Vertical accuracy: Tor third order Orthometric elev: 123.537 Meridional defl: Prime vert defl: Undulation: Created on 2010/10/10. Township: City of Toronto BM IN CONCRETE BASE OF LARGE HYDRO TRANSFORMER ON WEST SIDE OF MEADOWVALE ROAD, 200M NORTH OF SHEPPARD AVENUE EAST, AND 30M SOUTH OF KIRKHAMS ROAD. BM IN EAST FACE OF CONCRETE PAD, 0.4M SOUTH OF THE NORTHEAST Location: CORNER.

Maintenance: Toronto: last maintained: 2005/12/07 (Reference sketch for 12020050046 is not available.)

APPENDIX

A

-EXPLANATION OF TERMS USED IN THE RECORD OF BOREHOLE -LOGS OF BOREHOLES



FIGURE 1A: NOTES ON SAMPLE DESCRIPTIONS

1. All sample descriptions included in this report generally follow the Unified Soil Classification. Laboratory grain size analyses provided by SPL also follow the same system. Different classification systems may be used by others, such as the system by the International Society for Soil Mechanics and Foundation Engineering (ISSMFE). Please note that, with the exception of those samples where a grain size analysis and/or Atterberg Limits testing have been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

CLAY	_	SILT			ISSMFE	SOIL CLAS	SIFICATIO	ON GRA	VEL .		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FIN	E MEDI	UM COARS	SE FINE	MED	UM CO	DARSE		
(0.002	0.006	0.02	0.06	0.2	0.6	2.0	6.0	20	60	2	00

EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)		SAND			GRAVEL

UNIFIED SOIL CLASSIFICATION

- 2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional preliminary geotechnical site investigation.
- 3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.



Auger sample

Figure 1B: Explanation of Terms Used in the Record of Boreholes

Sample Type

BS	Block sample
CS	Chunk sample
DO	Drive open
DS	Dimension type sample
FS	Foil sample
NR	No recovery
RC	Rock core
SC	Soil core
SS	Spoon sample
SH	Shelby tube Sample
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

Penetration Resistance

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) required to drive a 50 mm (2 in) drive open sampler for a distance of 300 mm (12 in).

WH - Samples sinks under "weight of hammer"

Dynamic Cone Penetration Resistance, N_d :

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) to drive uncased a 50 mm (2 in) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in).

Textural Classification of Soils

Classification	Particle Size
Boulders	> 200 mm
Cobbles	75 mm - 200 mm
Gravel	4.75 mm - 75 mm
Sand	0.075 mm – 4.75 mm
Silt	0.002 mm-0.075 mm
Clay	<0.002 mm

Coarse Grain Soil Description (50% greater than 0.075 mm)

Terminology	Proportion
Trace	0-10%
Some	10-20%
Adjective (e.g. silty or sandy)	20-40%
And (e.g. sand and gravel)	> 40%

Soil Description

a) Cohesive Soils(*)

Consistency	Undrained Shear Strength (kPa)	SPT "N" Value
Very soft	<12	0-2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very stiff	100-200	15-30
Hard	>200	>30

(*) Hierarchy of Shear Strength prediction

- 1. Lab triaxial test
- 2. Field vane shear test
- 3. Lab. vane shear test
- 4. SPT "N" value
- 5. Pocket penetrometer

b) Cohesionless Soils

Density Index (Relative Density)	SPT "N" Value
Very loose	<4
Loose	4-10
Compact	10-30
Dense	30-50
Verv dense	>50

Soil Tests

W	Water content
\mathbf{W}_{p}	Plastic limit
Wı	Liquid limit
С	Consolidation (oedometer) test
CID	Consolidated isotropically drained triaxial test
CIU	consolidated isotropically undrained triaxial test with porewater
	pressure measurement
D_R	Relative density (specific gravity, Gs)
DS	Direct shear test
ENV	Environmental/ chemical analysis
M	Sieve analysis for particle size
MH	Combined sieve and hydrometer (H) analysis
MPC	Modified proctor compaction test
SPC	Standard proctor compaction test
OC	Organic content test
U	Unconsolidated Undrained Triaxial Test
V	Field vane (LV-laboratory vane test)
γ	Unit weight



PROJECT: Geotechnical Investigation for Rouge Gateway Project - Site Analysis REF. NO.: 201-04948-00 CLIENT: Parks Canada Agency (PCA) Method: Solid Stem Auger ENCL NO.: 2 ORIGINATED BY JL PROJECT LOCATION: Toronto, ON Diameter: 110 mm DATUM: UTM NAD83 ZONE 17 Date: Jun/16/2020 BH LOCATION: N 4853370.1 E 647052.8 Equipment: Aardvark CME 55 (Track) DYNAMIC CONE PENETRATION RESISTANCE PLOT SOIL PROFILE SAMPLES PLASTIC NATURAL MOISTURE CONTENT REMARKS GROUND WATER CONDITIONS LIMIT POCKET PEN. (Cu) (kPa) AND LIMIT 40 60 80 100 NATURAL UNIT (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m SHEAR STRENGTH (kPa)

O UNCONFINED + FIELD VANE
Sensitivity
UICK TRIAXIAL X LAB VANE ELEVATION ELEV DEPTH DISTRIBUTION **DESCRIPTION** NUMBER (%) WATER CONTENT (%) 60 80 20 131.3 Ground Surface GR SA SI CL TOPSOIL: 170 mm 139.9 0.2 FILL: sand fill, trace silt, trace clay, SS 12 131 1 brown, moist, compact. 130.6 SANDY SILT: trace gravel, trace 0.7 clay, brown, moist, compact. 2 SS 26 130 129.8 SILTY CLAY TILL: trace gravel, 1.5 some sandy, grey, moist, very stiff to W. L. 129.7 m Jul 13, 2020 3 SS 17 0 bentonite 129 4 SS 7 ្ន128.3 SANDY SILT TILL: trace gravel, some clay, brown, moist, dense to 128 compact. 5 SS 38 0 127 sand SS 11 36 40 13 6 15 O Non-pla screen 125 7 SS 15 sand 124.6 END OF BOREHOLE Notes: 1). Borehole was open and dry upon completion of drilling; 2). A 50mm dia. monitoring well was installed upon completion of drilling. Water Level Readings: Date Depth (m.b.g.s.) July 13, 2020 1.56

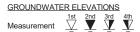




PROJECT: Geotechnical Investigation for Rouge Gateway Project - Site Analysis REF. NO.: 201-04948-00 CLIENT: Parks Canada Agency (PCA) Method: Solid Stem Auger ENCL NO.: 3 ORIGINATED BY JL PROJECT LOCATION: Toronto, ON Diameter: 110 mm DATUM: UTM NAD83 ZONE 17 Date: Jun/16/2020 BH LOCATION: N 4853330.6 E 647003.9 Equipment: Aardvark CME 55 (Track) DYNAMIC CONE PENETRATION RESISTANCE PLOT SOIL PROFILE SAMPLES PLASTIC NATURAL MOISTURE CONTENT REMARKS GROUND WATER CONDITIONS LIMIT POCKET PEN. (Cu) (kPa) AND LIMIT 40 60 80 100 NATURAL UNIT (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m SHEAR STRENGTH (kPa)

O UNCONFINED + FIELD VANE

O QUICK TRIAXIAL × LAB VANE ELEV DEPTH DISTRIBUTION **DESCRIPTION** NUMBER (%) WATER CONTENT (%) TYPE 60 80 10 20 GR SA SI CL 130.8 Ground Surface TOPSOIL: 125 mm 13**0.**Ø FILL: sand fill, trace silt, trace clay, SS 12 brown, moist, compact. 130.1 SANDY SILT: trace gravel, trace 0.7 130 clay, grey, moist, compact. SS 2 24 0 W. L. 129.7 m Jul 13, 2020 129.4 1.5 SILTY CLAY TILL: with sand, trace gravel, grey, moist, soft to very stiff. 129 3 SS 23 bentonite 4 SS 16 128 5 SS 8 127 sand 126 SS 4 6 0 screen 125 SS 15 -sand 124.1 END OF BOREHOLE Notes: 1). Borehole was open and dry upon completion of drilling; 2). A 50mm dia. monitoring well was installed upon completion of drilling. Water Level Readings: Date Depth (m.b.g.s.) July 13, 2020 1.10





PROJECT: Geotechnical Investigation for Rouge Gateway Project - Site Analysis REF. NO.: 201-04948-00 CLIENT: Parks Canada Agency (PCA) Method: Solid Stem Auger ENCL NO.: 4 ORIGINATED BY JL PROJECT LOCATION: Toronto, ON Diameter: 110 mm DATUM: UTM NAD83 ZONE 17 Date: Jun/20/2020 BH LOCATION: N 4853360.6 E 647113.7 Equipment: Aardvark CME 55 (Track) DYNAMIC CONE PENETRATION RESISTANCE PLOT SOIL PROFILE SAMPLES PLASTIC NATURAL MOISTURE CONTENT REMARKS GROUND WATER CONDITIONS LIMIT POCKET PEN. (Cu) (kPa) AND LIMIT NATURAL UNIT (40 60 80 100 (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m SHEAR STRENGTH (kPa)

O UNCONFINED + FIELD VANE

O QUICK TRIAXIAL × LAB VANE ELEVATION ELEV DEPTH DISTRIBUTION **DESCRIPTION** NUMBER (%) WATER CONTENT (%) 60 80 20 GR SA SI CL 131.4 Ground Surface GRANULAR FILL: 400 mm 0.0 SS 20 131 FILL: sandy gravel fill, trace silt, brown, moist, compact. SILTY CLAY TILL: trace sand, 21 2 SS 0 brown to grey, moist, firm to very 130 W. L. 129.8 m Jul 13, 2020 3 SS 11 0 bentonite 129 4 SS 6 5 SS 12 128 ⁻⁻127.3 SANDY SILT TILL: trace gravel, trace clay, grey, moist, compact. -sand⁷ SS 6 33 screen SS 25 7 -sandɔ̄ 124.7 END OF BOREHOLE Notes: 1). Borehole was open and dry upon completion of drilling; 2). A 50mm dia. monitoring well was installed upon completion of drilling. Water Level Readings: Date Depth (m.b.g.s.) July 13, 2020 1.56





PROJECT: Geotechnical Investigation for Rouge Gateway Project - Site Analysis REF. NO.: 201-04948-00 CLIENT: Parks Canada Agency (PCA) Method: Solid Stem Auger ENCL NO.: 5 ORIGINATED BY JL PROJECT LOCATION: Toronto, ON Diameter: 110 mm DATUM: UTM NAD83 ZONE 17 Date: Jun/17/2020 BH LOCATION: N 4853257.6 E 647066.8 Equipment: Aardvark CME 55 (Track) DYNAMIC CONE PENETRATION RESISTANCE PLOT SOIL PROFILE SAMPLES PLASTIC NATURAL MOISTURE CONTENT REMARKS GROUND WATER CONDITIONS LIMIT POCKET PEN. (Cu) (kPa) AND LIMIT 40 60 80 100 NATURAL UNIT (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m SHEAR STRENGTH (kPa)

O UNCONFINED + FIELD VANE
Sensitivity
UICK TRIAXIAL X LAB VANE ELEV DEPTH DISTRIBUTION **DESCRIPTION** NUMBER (%) WATER CONTENT (%) 60 80 20 GR SA SI CL 130.1 Ground Surface GRANULAR FILL: 300 mm 0.0 130 129.8 SS 11 FILL: sandy gravel to sand fill, 0.3 trace silt, trace clay, brown, moist, 129.4 compact. 0.7 SANDY SILT: trace clay, brown to 2 SS 33 129 grey, moist to wet, dense to 3 SS 17 W. L. 128.3 m Jul 13, 2020 pentonite 127.9 SILTY CLAY TILL: trace gravel, 2.2 some sand, grey, moist, soft to stiff. 4 SS 3 auger grinding, cobbles/boulders 127 SS 9 sand SS 6 6 125 screen 124 SS 10 sand 123.4 END OF BOREHOLE Notes: 1). Borehole was open and dry upon completion of drilling; 2). A 50mm dia. monitoring well was installed upon completion of drilling. Water Level Readings: Date Depth (m.b.g.s.) July 13, 2020 1.83





PROJECT: Geotechnical Investigation for Rouge Gateway Project - Site Analysis REF. NO.: 201-04948-00 CLIENT: Parks Canada Agency (PCA) Method: Solid Stem Auger ENCL NO.: 6 ORIGINATED BY JL PROJECT LOCATION: Toronto, ON Diameter: 110 mm DATUM: UTM NAD83 ZONE 17 Date: Jun/17/2020 BH LOCATION: N 4853214.9 E 647040.5 Equipment: Aardvark CME 55 (Track) DYNAMIC CONE PENETRATION RESISTANCE PLOT SOIL PROFILE SAMPLES PLASTIC NATURAL MOISTURE CONTENT REMARKS GROUND WATER CONDITIONS LIMIT POCKET PEN. (Cu) (kPa) AND LIMIT 40 60 80 100 NATURAL UNIT (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m SHEAR STRENGTH (kPa)

O UNCONFINED + FIELD VANE
Sensitivity
UICK TRIAXIAL X LAB VANE ELEVATION ELEV DEPTH DISTRIBUTION **DESCRIPTION** NUMBER (%) WATER CONTENT (%) 60 80 20 GR SA SI CL 130.2 Ground Surface GRANULAR FILL: 360 mm 0.0 130 129.8 SS 44 FILL: sandy gravel to sand fill, trace silt, trace clay, brown, moist, dense to loose. 2 SS 9 129 128.7 SANDY GRAVEL: some silt, trace 1.5 50/ 3 SS 0 clay, brown, moist to wet, very 50mm dense. spoon wet bentonite. 4 SS 85 0 auger grinding, cobbles/boulders 127 5 SS 70 0 [–]126.1 SANDY SILT TILL: trace gravel, some clay, brown, moist, very loose. sand SS 5 41 39 15 6 1 Non-plastic 125 screen W. L. 124.6 m 124.4 Jul 13, 2020 5.7 SILTY CLAY TILL: trace gravel, some sand, containing silty sand layer, grey, moist, soft to very soft. 124 SS 4 123 8 SS -bentonite 0 122 121 9 SS 2 0 END OF BOREHOLE 9.8

Continued Next Page TER ELEVATIONS







LOG OF BOREHOLE BH20-5



PROJECT: Geotechnical Investigation for Rouge Gateway Project - Site Analysis

CLIENT: Parks Canada Agency (PCA)

PROJECT LOCATION: Toronto, ON

DATUM: UTM NAD83 ZONE 17

Method: Solid Stem Auger

Diameter: 110 mm

ENCL NO.: 6
ORIGINATED BY JL

REF. NO.: 201-04948-00

Diameter: 110 mm
Date: Jun/17/2020

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(m)	SOIL PROFILE	<u> </u>	5	AMPL		TER .						30 10	00	PLASTI LIMIT	C NATU MOIS CON	JRAL TURE TENT	LIQUID LIMIT	EN.	TW TIN	REMARKS AND	
ELEV DEPTH	DESCRIPTION Continued	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	○ UI ● QI	AR STI NCONF JICK TF 0 4	RENG INED RIAXIAL	TH (kF + . ×	Pa) FIELD VA & Sensiti LAB VA	ANE vity ANE	W _P ⊢ WA	TER CC	w ⊃——— ONTEN	LIQUID LIMIT W _L T (%)	POCKET F (Cu) (KPs	NATURAL UI (kN/m³)	GRAIN SIZ DISTRIBUTIO (%) GR SA SI	ON
via Pol. (C) pir delectors Octor, surm	Notes: 1). Borehole was open upon completion of drilling; 2). Water was at a depth of 6.1m bgs upon completion of drilling; 3). A 50mm dia. monitoring well was installed upon completion of drilling. Water Level Readings: Date Depth (m.b.g.s.) July 13, 2020 5.53																				



PROJECT: Geotechnical Investigation for Rouge Gateway Project - Site Analysis REF. NO.: 201-04948-00 CLIENT: Parks Canada Agency (PCA) Method: Solid Stem Auger ENCL NO.: 7 ORIGINATED BY JL PROJECT LOCATION: Toronto, ON Diameter: 110 mm DATUM: UTM NAD83 ZONE 17 Date: Jun/18/2020 BH LOCATION: N 4853210.3 E 647173 Equipment: Aardvark CME 55 (Track) DYNAMIC CONE PENETRATION RESISTANCE PLOT SOIL PROFILE SAMPLES PLASTIC NATURAL MOISTURE CONTENT REMARKS GROUND WATER CONDITIONS LIMIT POCKET PEN. (Cu) (kPa) AND LIMIT 40 60 80 100 NATURAL UNIT (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m SHEAR STRENGTH (kPa)

O UNCONFINED + FIELD VANE

O QUICK TRIAXIAL × LAB VANE ELEV DEPTH DISTRIBUTION **DESCRIPTION** NUMBER (%) WATER CONTENT (%) 60 80 10 20 GR SA SI CL 130.9 Ground Surface GRANULAR FILL: 400 mm 0.0 SS 25 130.5 0.4 FILL: sandy gravel to sand fill, 130.2 trace silt, trace clay, brown, moist, compact. 0.7 130 SANDY SILT: trace clay, brown to 2 SS 35 grey, moist, dense to compact. 3 SS 16 129 bentonite 128.7 SILTY CLAY TILL: trace gravel, 2.2 grey, moist, hard to very stiff. 4 SS 55 128 5 SS 27 0 sand SS 6 24 126 screen 125 SS 27 sand 124.2 END OF BOREHOLE Notes: 1). Borehole was open upon completion of drilling; 2). Water was at a depth of 5.5m bgs upon completion of drilling; 3). A 50mm dia. monitoring well was installed upon completion of drilling. Water Level Readings: Date Depth (m.b.g.s.)





CLIENT: Parks Canada Agency (PCA)

PROJECT LOCATION: Toronto, ON DATUM: UTM NAD83 ZONE 17

Method: Hollow Stem Auger/Mud Rotary

Diameter: 203 mm

ORIGINATED BY MH

ENCL NO.: 8

REF. NO.: 201-04948-00

Date: Jun/25/2020 to Jun/29/2020

Equipment: Aardvark CME 55 (Track) BH LOCATION: N 4853409.1 E 647113.3 DYNAMIC CONE PENETRATION RESISTANCE PLOT SOIL PROFILE SAMPLES PLASTIC NATURAL MOISTURE CONTENT REMARKS GROUND WATER CONDITIONS LIMIT POCKET PEN. (Cu) (kPa) AND LIMIT NATURAL UNIT ((kN/m³) 40 60 100 80 (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m SHEAR STRENGTH (kPa)

O UNCONFINED + FIELD VANE

QUICK TRIAXIAL × LAB VANE ELEV DEPTH DISTRIBUTION **DESCRIPTION** NUMBER (%) WATER CONTENT (%) 60 80 10 20 GR SA SI CL 132.2 Ground Surface TOPSOIL: 50mm concrete 132.2 95/ SS 1 132 FILL: gravelly sand, containing 200mr cobbles/boulders, brown, moist, very dense. 2 SS 52 0 131 130.8 SILTY SAND TILL: trace gravel, some clay, brown, moist, very dense -bentonite to compact. 3 SS 51 С 130 4 SS 18 129 9 49 30 12 5 SS 15 фН 128 SS 0 sandy gravel layer 6 24 127 126.5 SILTY CLAY TILL: trace gravel, some sand to sandy containing cobbles/boulders, grey, moist to wet, very stiff to hard. 126 SS 22 125 8 SS 42 0 124 123 66/ SS 230mr

Continued Next Page **GROUNDWATER ELEVATIONS**



<u>GRAPH</u> NOTES

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

 \bigcirc $^{\pmb{\epsilon}=3\%}$ Strain at Failure



CLIENT: Parks Canada Agency (PCA)

 ${\sf PROJECT\ LOCATION:\ Toronto,\ ON}$

DATUM: UTM NAD83 ZONE 17
BH LOCATION: N 4853409.1 E 647113.3

REF. NO.: 201-04948-00

Method: Hollow Stem Auger/Mud Rotary ENCL NO.: 8

Diameter: 203 mm ORIGINATED BY MH

Date: Jun/25/2020 to Jun/29/2020

Equipment: Aardyark CME 55 (Track)

BH L	OCATION: N 4853409.1 E 647113.3							Equip	ment:	Aardv	ark (CME	55 (Tra	ck)						
	SOIL PROFILE		s	SAMPL	.ES			DYNA RESIS	MIC CO TANCE	NE PEI PLOT	NETRA	ATION -			_ NAT	URAL			 -	REMARKS
(m)		-				GROUND WATER CONDITIONS		٠,	n 4	.0 6	30	80	100	PLASTI LIMIT	MOIS CON	TURE	LIQUII LIMI	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	AND
		STRATA PLOT			BLOWS 0.3 m	WA	Z	SHE	AR STI	RENG	TH (k	 (Pa)		W _P	,	W	W_{L}	(KPa	L C	GRAIN SIZE
ELEV DEPTH	DESCRIPTION	ΤĀ	H		3LO 0.3		ΔTIO	0 UI	NCONF	INED	+	FIELD & Sen	VANE sitivity			o—		©Š	동	DISTRIBUTION (%)
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-	some sand to sandy containing cobbles/boulders, grey, moist to wet, very stiff to hard.(Continued)	XX	1				122	-												
-	wet, very stiff to hard.(Continued)	XX	1					-												
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Continued Next Page GROUNDWATER ELEVATIONS





CLIENT: Parks Canada Agency (PCA)
PROJECT LOCATION: Toronto. ON

DATUM: UTM NAD83 ZONE 17

REF. NO.: 201-04948-00

Method: Hollow Stem Auger/Mud Rotary ENCL NO.: 8

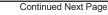
Diameter: 203 mm ORIGINATED BY MH

Date: Jun/25/2020 to Jun/29/2020

BH LOCATION: N 4853409.1 E 647113.3 Equipment: Aardvark CME 55 (Track) DYNAMIC CONE PENETRATION RESISTANCE PLOT SOIL PROFILE SAMPLES PLASTIC NATURAL MOISTURE CONTENT REMARKS GROUND WATER CONDITIONS POCKET PEN. (Cu) (kPa) AND LIMIT 40 60 80 100 NATURAL UNIT (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m SHEAR STRENGTH (kPa)

O UNCONFINED + FIELD VANE

QUICK TRIAXIAL × LAB VANE ELEVATION ELEV DEPTH DISTRIBUTION **DESCRIPTION** (%) WATER CONTENT (%) ż 60 80 20 GR SA SI CL Continued SILTY CLAY TILL: trace gravel, 80mr some sand to sandy containing 112 cobbles/boulders, grey, moist to wet, very stiff to hard.(Continued) 95/ SS | 55. 17 110 50/ 18 SS 130m 109 108 95/ SS 19 230mr 107 SS | 90/ 280mr 20 106 sand 105 88/ 21 SS 0 280mr 104 screen 98/ 22 SS 103.0 230mn 103 SILTY SAND: trace gravel, containing cobbles, grey, wet, very













LOG OF BOREHOLE BH20-7 4 OF 4 REF. NO.: 201-04948-00 PROJECT: Geotechnical Investigation for Rouge Gateway Project - Site Analysis CLIENT: Parks Canada Agency (PCA) Method: Hollow Stem Auger/Mud Rotary ENCL NO.: 8 ORIGINATED BY MH PROJECT LOCATION: Toronto, ON Diameter: 203 mm DATUM: UTM NAD83 ZONE 17 Date: Jun/25/2020 to Jun/29/2020 Equipment: Aardvark CME 55 (Track) BH LOCATION: N 4853409.1 E 647113.3 DYNAMIC CONE PENETRATION RESISTANCE PLOT SOIL PROFILE SAMPLES PLASTIC NATURAL MOISTURE CONTENT REMARKS GROUND WATER CONDITIONS LIMIT NATURAL UNIT V (kN/m³) AND LIMIT 40 60 80 100 (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m SHEAR STRENGTH (kPa)

O UNCONFINED + FIELD VANE

QUICK TRIAXIAL × LAB VANE ELEVATION ELEV DEPTH DISTRIBUTION **DESCRIPTION** NUMBER (%) WATER CONTENT (%) ż 60 80 10 20 30 GR SA SI CL Continued SILTY SAND: trace gravel, containing cobbles, grey, wet, very 102 dense.(Continued) 101.6 END OF BOREHOLE 00mr Notes: 1). A 50mm dia. monitoring well was installed upon completion of drilling. Water Level Readings: Date Depth (m.b.g.s.)







PROJECT: Geotechnical Investigation for Rouge Gateway Project - Site Analysis REF. NO.: 201-04948-00

CLIENT: Parks Canada Agency (PCA)

Method: Hollow Stem Auger/Mud Rotary

ENCL NO.: 9

PROJECT LOCATION: Toronto, ON

Diameter: 203 mm

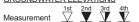
ORIGINATED BY

MH

DATUM: UTM NAD83 ZONE 17 Date: Jun/23/2020 to Jun/25/2020

Common C		JM: UTM NAD83 ZONE 17											Jun/25/								
DESCRIPTION Section	BH LO			_				_						(Trac	ck)						
DESCRIPTION C S S S S S S S S S	L	SOIL PROFILE		S	SAMPL	_ES	· ~		RESIS	TANCE	PLOT	\geq			PLAST	IC NATI	JRAL	LIQUID		₩	
132 Cloude Surface 1 2 2 5 5 1 2 6 7 5 5 1 1 2 6 1 2 6 6 6 6 6 6 6 6 6	(m)		=			١.	ATE		2	20 4	0 6	i0 8	30 1	00	LIMIT	CON	TENT	LIMIT	PEN.	ĮN.	
132 Cloude Surface 1 2 2 5 5 1 2 6 7 5 5 1 1 2 6 1 2 6 6 6 6 6 6 6 6 6	1 ' '	DECODIDATION	P	ا _~		3 m	NO NO	NO NO				TH (kl	Pa)			\ 	<i>N</i> ⊃	W _L	X (2)	SAL L	
132 Cloude Surface 1 2 2 5 5 1 2 6 7 5 5 1 1 2 6 1 2 6 6 6 6 6 6 6 6 6	DEPTH	DESCRIPTION	ATA	BEF	111	BLO 0.3	N E					+	& Sensiti	vity	\Λ/Δ	TER CC	NITEN:	T (%)	P O	ATU.	
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1 130,7 131,7 130,7 131,7				_		-	▼ 1 ▼			<u> </u>	<u> </u>		1	-		<u> </u>		-		\vdash	GR SA SI CL
130	198:1	FILL: sand, trace gravel, containing	X			10		001101	}. }												
2 SS 500 T 131	F	large pieces of obstructions, brown,	\otimes	1	55	10			ļ.												
130.7 SANDY SILT: trace gravel, trace clay, brown, moist, very dense. 3 SS 64 130 122 128.2 129.2 129.3 129 128 129 128 129 128 129 128 129 128 129 128 129 128 129 128 129 128 129 128 129 128 129 128 129 128 129 128 129 128 128 129 128	F	moist, compact to very dense.	X	_					Ė												
130.7 SANDY SILT: trace gravel, trace clay, brown, moist, very dense. 3 SS 64 130 122 128.2 129.2 129.3 129 128 129 128 129 128 129 128 129 128 129 128 129 128 129 128 129 128 129 128 129 128 129 128 129 128 129 128 129 128 128 129 128	-		\times	2	SS	50/			ŀ												
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SANDY SILT TILL: trace gravel, trace clay, brown, moist, very dense. 3 SS 64								131	_												
120 SANDY SILT TILL: trace gravel, treatment day, brown, moist, very dense. 3 SS 64 120 SANDY SILT TILL: trace gravel, treatment day, brown, moist, very dense. 4 SS 50mm 120 SOMM SOM	130.7		X						ŀ												
129 22 SANDY SILT TILL: trace gravel, trace to some clay, brown, moist, very dense. 4 SS 50 130	1.5	SANDY SILT: trace gravel, trace	Ш					-bento	l nite												
129_2 SANDY SILT TILL: trace gravel, trace to some clay, brown, moist, very dense. 4 SS 50 129	<u> </u>	clay, brown, moist, very dense.		3	SS	64		Dente	ŀ						0						
2.2 SANDY SILT TILL trace gravel, trace to some day, brown, moist, very dense. 3.0 SILTY CLAY TILL: trace gravel, grey, moist, hard. 5 SS 84 SO									-												
trace to some clay, brown, moist, very dense. 129.2 3.0 SiLTY CLAY TILL: trace gravel, grey, moist, hard. 5 SS 84/ 200mm 128 6 SS 50/ 100mm 127 7 SS 95/ 770mm 125 8 SS 50/ 127 128	129.9							130							-						
Somm very dense. v	2.2				22	50/			-												
120.2 SILTY CLAY TILL: trace gravel, grey, moist, hard. 5 SS 847 128 6 SS 500 7 SS 957 7 SS 957 7 mm 125 8 SS 40mm 124 9 SS 607 124	F 1	very dense.		H	- 00				ŀ												
3.0 grey, moist, hard. 5 SS 847 5 SS 900mm 128 6 SS 500 127 127 127 125 8 SS 900mm 128 128 6 SS 500 128 128 6 SS 500 128 127 125 8 SS 9500 125 125 9 SS 9500 124	F	,							-												
grey, moist, hard. 5 SS 84 128 128 127 127 127 125 8 SS 770mm 125 125 9 SS 160mm 124			Ш						-												
7 SS 967 125 125 124 124 124 124 124 124 124 124 125 125 125 125 125 125 125 125 125 125	3.0	SILTY CLAY TILL: trace gravel,	131			84/	::: :::	129													
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Continued Next Page GROUNDWATER ELEVATIONS





CLIENT: Parks Canada Agency (PCA)
PROJECT LOCATION: Toronto, ON

DATUM: UTM NAD83 ZONE 17

BH LOCATION: N 4853388.6 E 647155.6

REF. NO.: 201-04948-00

Method: Hollow Stem Auger/Mud Rotary ENCL NO.: 9

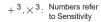
Diameter: 203 mm ORIGINATED BY MH

Date: Jun/23/2020 to Jun/25/2020

Equipment: Aardyark CMF 55 (Track)

BH L	OCATION: N 4853388.6 E 647155.6							Equip	ment:	Aardv	ark (CME 5	5 (Trad	ck)						
	SOIL PROFILE		S	SAMPL	.ES]		DYNA RESIS	MIC CC TANCE	NE PEI	NETRA	TION -		DIAST	n NATI	JRAL	LIOLID		F	REMARKS
(m)		F				GROUND WATER CONDITIONS						80 1	00	LIMIT	IC NATI MOIS CON	TURE	LIQUID LIMIT	a EN	NATURAL UNIT WT (kN/m³)	AND
ELEV	DECODIDATION	P	ا س		3 m	NO NO NO	NO.			RENG	TH (k	Pa)		W _P	\ 	N >	WL	E S	SAL U	GRAIN SIZE DISTRIBUTION
DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	ш	BLOWS 0.3 m	I N I	ELEVATION		NCONF	INED RIAXIAL	+	FIELD \ & Sensi	tivity	l wa	TER CC	NTEN	NT (%)	90	PTUT PTUT	(%)
	Continued	STR	N	TYPE	ž	GR CO	H						00	1			30		_	GR SA SI CL
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CLIENT: Parks Canada Agency (PCA) PROJECT LOCATION: Toronto, ON

DATUM: UTM NAD83 ZONE 17 BH LOCATION: N 4853388.6 E 647155.6 Method: Hollow Stem Auger/Mud Rotary

Diameter: 203 mm

ORIGINATED BY MH

ENCL NO.: 9

REF. NO.: 201-04948-00

Date: Jun/23/2020 to Jun/25/2020

Equipment: Aardvark CME 55 (Track)

2	OCATION: N 4853388.6 E 647155.6			A NADI	ГС								o (Trad) 						
	SOIL PROFILE	\dashv	5/	AMPL	.50	- E		ı	MIC CO STANCE					PLASTI LIMIT	C NATI	JRAL TURE	LIQUID LIMIT	j j	TW.	REMARKS AND
(m)		[b]			ر ا	GROUND WATER CONDITIONS	_		1			1	00	W _P	CON	TENT W	W _L	r PEr kPa)	NATURAL UNIT WT (kN/m³)	GRAIN SIZE
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GRAPH NOTES

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

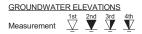
 \bigcirc 8=3% Strain at Failure



LOG OF BOREHOLE BH20-8 4 OF 4 REF. NO.: 201-04948-00 PROJECT: Geotechnical Investigation for Rouge Gateway Project - Site Analysis CLIENT: Parks Canada Agency (PCA) Method: Hollow Stem Auger/Mud Rotary ENCL NO.: 9 ORIGINATED BY MH PROJECT LOCATION: Toronto, ON Diameter: 203 mm DATUM: UTM NAD83 ZONE 17 Date: Jun/23/2020 to Jun/25/2020 BH LOCATION: N 4853388.6 E 647155.6 Equipment: Aardvark CME 55 (Track) DYNAMIC CONE PENETRATION RESISTANCE PLOT SOIL PROFILE SAMPLES PLASTIC NATURAL MOISTURE CONTENT REMARKS GROUND WATER CONDITIONS AND LIMIT NATURAL UNIT ((kN/m³) 40 60 80 100 (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m SHEAR STRENGTH (kPa)

O UNCONFINED + FIELD VANE

QUICK TRIAXIAL × LAB VANE ELEVATION ELEV DEPTH DISTRIBUTION **DESCRIPTION** NUMBER (%) WATER CONTENT (%) ż 60 80 10 20 30 GR SA SI CL Continued SILTY SAND: trace gravel, grey, 30.0 102 wet, very dense. 101.6 sand END OF BOREHOLE 30.5 50mm Note: 1). A 50mm dia. monitoring well was installed upon completion of drilling. Water Level Readings: Depth (m.b.g.s.)





PROJECT: Geotechnical Investigation for Rouge Gateway Project - Site Analysis REF. NO.: 201-04948-00 CLIENT: Parks Canada Agency (PCA) Method: Hollow Stem Auger/Mud Rotary ENCL NO.: 10 ORIGINATED BY JL PROJECT LOCATION: Toronto, ON Diameter: 203 mm DATUM: UTM NAD83 ZONE 17 Date: Jun/25/2020 BH LOCATION: N 4853381 E 647154.7 Equipment: Aardvark CME 55 (Track) DYNAMIC CONE PENETRATION RESISTANCE PLOT SOIL PROFILE SAMPLES PLASTIC NATURAL MOISTURE CONTENT REMARKS GROUND WATER CONDITIONS POCKET PEN. (Cu) (kPa) LIMIT AND LIMIT 40 60 80 100 NATURAL UNIT (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m SHEAR STRENGTH (kPa)

O UNCONFINED + FIELD VANE

QUICK TRIAXIAL × LAB VANE ELEVATION ELEV DEPTH DISTRIBUTION **DESCRIPTION** NUMBER (%) WATER CONTENT (%) TYPE 40 60 80 10 20 GR SA SI CL 132.1 Ground Surface TOPSOIL: 75mm concrete FILL: sand, trace gravel, containing large pieces of obstructions, brown, moist. bentonite 131 130.7 sand SANDY SILT: trace gravel, trace 1.5 clay, brown, moist. 130 129.9 SANDY SILT TILL: trace gravel, 2.2 screen trace to some clay, brown, moist. SILTY CLAY TILL: trace gravel grey, moist. **END OF BOREHOLE** Note: 1). A 50mm dia. monitoring well was installed upon completion of drilling. Water Level Readings: Date Depth (m.b.g.s.) July 13, 2020 Dry





CLIENT: Parks Canada Agency (PCA)

PROJECT LOCATION: Toronto, ON

DATUM: UTM NAD83 ZONE 17

REF. NO.: 201-04948-00

Method: Hollow Stem Auger/Mud Rotary ENCL NO.: 11

Diameter: 203 mm ORIGINATED BY MH

Date: Jun/30/2020 to Jul/03/2020

Equipment: Aardyark CME 55 (Track)

BH L	OCATION: N 4853308.2 E 647175.9							Equip	ment:	Aardv	ark C	OME 55	5 (Trac	k)							
	SOIL PROFILE		S	AMPL	.ES	· ·		RESIS	MIC CO	PLOT	NETRA	TION		PLASTI LIMIT	IC NAT	URAL	LIQUID		¥	REMAR	
(m)		F			(Ol	GROUND WATER CONDITIONS	l _					30 1	00	LIMIT W _P	CON	TENT	LIMIT W _L	PEN.	NATURAL UNIT WT (kN/m³)	AND GRAIN S	
ELEV DEPTH	DESCRIPTION	STRATA PLOT	E.		BLOWS 0.3 m	NOT NOT	ELEVATION		AR ST		TH (k	Pa) FIELD V. & Sensiti	ANE	₩ _P		0		Cu) (k	(kN/n	DISTRIBU	
		RAT	NUMBER	TYPE		SOUN	EVA	• Q	UICK TI	RIAXIAL	_ ×	LAB VA	ANE		TER CO] N	¥	(%)	
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- 13 0.0 - 0.2	TOPSOIL: 150 mm SANDY SILT: trace gravel, trace	H		00			concr	ете 										1			
-	SANDY SILT: trace gravel, trace clay, brown, moist, dense.		1	SS	32			-						0							
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Continued Next Page GROUNDWATER ELEVATIONS





CLIENT: Parks Canada Agency (PCA)
PROJECT LOCATION: Toronto, ON

DATUM: UTM NAD83 ZONE 17

BH LOCATION: N 4853308.2 E 647175.9

lysis REF. NO.: 201-04948-00

Method: Hollow Stem Auger/Mud Rotary ENCL NO.: 11

Diameter: 203 mm ORIGINATED BY MH

Date: Jun/30/2020 to Jul/03/2020 Equipment: Aardvark CME 55 (Track)

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	SOIL PROFILE		S	AMPL	.ES			RESIS	TANCE	NE PEN PLOT		IION		PLASTI	CNAT	URAL	FIOUID		₩	REMARKS
(m)		Ŀ				<u> </u>		2	0 4	0 6	0 8	30 1	00	PLASTI LIMIT	- MOIS	TURE	LIQUID LIMIT	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	AND
ELEV		1 2			BLOWS 0.3 m	W W	Z	SHEA	R STI	RENG	TH (kF	 Ра)		W _P	,	w	W_L	P.S.	AL UI	GRAIN SIZE
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GRAPH NOTES $+\ ^3,\times ^3\colon \ \mathop{\text{Numbers refer}}_{\text{to Sensitivity}}$



REF. NO.: 201-04948-00

ENCL NO.: 11 ORIGINATED BY MH



PROJECT: Geotechnical Investigation for Rouge Gateway Project - Site Analysis

CLIENT: Parks Canada Agency (PCA) PROJECT LOCATION: Toronto, ON

DATUM: UTM NAD83 ZONE 17

Method: Hollow Stem Auger/Mud Rotary

Diameter: 203 mm

Date: Jun/30/2020 to Jul/03/2020

BH LOCATION: N 4853308.2 E 647175.9 Equipment: Aardvark CME 55 (Track)

	SOIL PROFILE		S	AMPL	.ES			DYNA! RESIS		NE PEN PLOT			- (NAT	LIDAL			Ī	REMARKS
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- 1		STRATA PLOT			BLOWS 0.3 m	W C ONS	NO			RENG	TH (k	Pa)		W _P	,	w 0	W _L	KET F	N/m ³)	GRAIN SIZE DISTRIBUTION
ELEV DEPTH	DESCRIPTION	ATA	NUMBER	ш	BLO 0.3	JUNI	ELEVATION	0 UN	NCONF	RENG INED RIAXIAL	+	FIELD \ & Sensi	/ANE tivity	WA	TER CO	ONTEN	T (%)	PO 20	ATUR (x	(%)
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PROJECT: Geotechnical Investigation for Rouge Gateway Project - Site Analysis REF. NO.: 201-04948-00

CLIENT: Parks Canada Agency (PCA)

Method: Hollow Stem Auger/Mud Rotary

ENCL NO.: 11

PROJECT LOCATION: Toronto, ON Diameter: 203 mm ORIGINATED BY MH

DATUM: UTM NAD83 ZONE 17 Date: Jun/30/2020 to Jul/03/2020

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-	SILTY CLAY TILL: trace gravel.	13/					404														
-	some sand to sandy, grey, moist, soft to hard.(Continued)	14					101														
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94.5	END OF BOREHOLE		27	SS	50/ \00mn		sand_	_						0					Н		
	Notes:					ľ															
	A 50mm dia. monitoring well was installed upon completion of drilling.																				
	Water Level Readings:																				
	Date Depth (m.b.g.s.)																				
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REF. NO.: 201-04948-00 PROJECT: Geotechnical Investigation for Rouge Gateway Project - Site Analysis CLIENT: Parks Canada Agency (PCA) Method: Hollow Stem Auger/Mud Rotary ENCL NO.: 12 ORIGINATED BY JL PROJECT LOCATION: Toronto, ON Diameter: 203 mm DATUM: UTM NAD83 ZONE 17 Date: Jul/03/2020 Equipment: Aardvark CME 55 (Track) BH LOCATION: N 4853307.7 E 647175.1 DYNAMIC CONE PENETRATION RESISTANCE PLOT SOIL PROFILE SAMPLES PLASTIC NATURAL MOISTURE CONTENT REMARKS GROUND WATER CONDITIONS LIMIT POCKET PEN. (Cu) (kPa) AND LIMIT 40 60 80 100 NATURAL UNIT (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m SHEAR STRENGTH (kPa)

O UNCONFINED + FIELD VANE

QUICK TRIAXIAL × LAB VANE ELEV DEPTH DISTRIBUTION **DESCRIPTION** NUMBER (%) WATER CONTENT (%) TYPE ż 60 80 20 GR SA SI CL 131.3 Ground Surface TOPSOIL: 150 mm 130.0 concrete SANDY SILT: trace gravel, trace 0.2 131 clay, brown, moist. 130 129.8 SILTY CLAY TILL: trace gravel, 1.5 some sand to sandy, grey, moist. bentonite. 128 127 sand W. L. 126.5 m Jul 13, 2020 screen **END OF BOREHOLE** 1). A 50mm dia. monitoring well was installed upon completion of drilling. Water Level Readings: Date Depth (m.b.g.s.) July 13, 2020 4.78



to Sensitivity



PROJECT: Geotechnical Investigation for Rouge Gateway Project - Site Analysis

CLIENT: Parks Canada Agency (PCA)

PROJECT LOCATION: Toronto, ON

DATUM: UTM NAD83 ZONE 17

Method: Hollow Stem Auger/Mud Rotary

Diameter: 203 mm

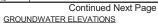
ORIGINATED BY MH

ENCL NO.: 13

REF. NO.: 201-04948-00

Date: Jul/07/2020 to Jul/09/2020

BH L	LOCATION: N 4853247 E 647211.4							Equip	ment:	Aardv	ark C	ME 5	5 (Trad	k)							
	SOIL PROFILE		S	AMPL	ES	~		DYNA RESIS	MIC CO STANCE	NE PEI PLOT	NETRA	TION		PLASTI	NATU	JRAL	LIQUID		Υ	REMAR	KS
(m) ELEV DEPTH	7 Ground Surface	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	SHEA O UI • Q	AR STI NCONF UICK TE	LENG RENG INED RIAXIAL	TH (ki + . ×	Pa) FIELD V & Sensit LAB V	ANE ivity ANE	W _P ⊢ WA	TER CC	w ⊃——— ONTENT	V _L (%)	POCKET PEN. (Cu) (kPa)		AND GRAIN S DISTRIBU (%)	IZE TION
- 13 0.6 - 0.1	TOPSOIL: 130mm	X1 1/2					concr	ete L													
130.0	brown to brown, moist, loose.		1	SS	4		130	- - -													
0.7	7 SAND: trace to some gravel, trace clay, containing cobbles/boulders, brown, moist, dense.		2	SS	33		130	- - - - -						0							
- 129.2 - 1.5 			3	SS	40		-bento 129	t nite L						0							
- - - -			4	SS	22			- - - - -						c							
- - - 3						***	128	 - - - -													
- - -			5	SS	16		127	- - -						С							
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- - - - 5			6	SS	24		126	-							0						
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- - <u>7</u> - - -								-													
- - - <u>8</u> -			8	SS	15		123	- - - -						c	,						
9							122	- - - -													
0 201-048-2018-CO.00-1 307/2			9	SS	18		121	- - - - - -						0							
10	Continued Next Page						121	-													







PROJECT: Geotechnical Investigation for Rouge Gateway Project - Site Analysis

CLIENT: Parks Canada Agency (PCA) PROJECT LOCATION: Toronto, ON

DATUM: UTM NAD83 ZONE 17

Method: Hollow Stem Auger/Mud Rotary

Diameter: 203 mm

ORIGINATED BY MH

ENCL NO.: 13

REF. NO.: 201-04948-00

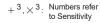
Date: Jul/07/2020 to Jul/09/2020

	JM: UTM NAD83 ZONE 17							Date:												
BHL	OCATION: N 4853247 E 647211.4											ME 55	(Trac	ck)						
	SOIL PROFILE			AMPL	.ES	ec.		RESIS	TANCE	NE PEN PLOT	\geq			PLASTI LIMIT	C NATI	URAL	LIQUID LIMIT		NATURAL UNIT WT (kN/m³)	REMARKS
(m)						GROUND WATER CONDITIONS		2	0 4	0 6	0 8	80 1	00	LIMIT	CON	TENT		PEN.	IN C	AND GRAIN SIZE
	DECODIDATION	STRATA PLOT	_		BLOWS 0.3 m	N NO	O			RENG	TH (kF	Pa)		W _P	\ \	<i>N</i>	WL	X 는	SAL L	DISTRIBUTION
ELEV DEPTH	DESCRIPTION	ATA	NUMBER	111	0.3	JND	ELEVATION		CONF		+	FIELD V. & Sensiti	vity	\ν/Δ-	TER CC	NITEN	T (%)	9 9 9	ATU.	(%)
	O o Posso I	ITR.	₽	TYPE	þ	SRC	E)			RIAXIAL 0 6		LAB VA	ANE 00	1			30			GR SA SI CL
_	SILTY CLAY TILL: trace gravel	13/	_		-								-	 	Ť	<u> </u>	+		\vdash	GR 3A 31 CL
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F	silty sand layers, grey, moist to wet, stiff to hard.(Continued)		1					-												
F	Sun to hard.(Continued)						400	-												
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PROJECT: Geotechnical Investigation for Rouge Gateway Project - Site Analysis

CLIENT: Parks Canada Agency (PCA)
PROJECT LOCATION: Toronto, ON

DATUM: UTM NAD83 ZONE 17
BH LOCATION: N 4853247 E 647211.4

Method: Hollow Stem Auger/Mud Rotary

Diameter: 203 mm

ORIGINATED BY MH

ENCL NO.: 13

REF. NO.: 201-04948-00

Date: Jul/07/2020 to Jul/09/2020

Equipment: Aardvark CME 55 (Track)

BH L	OCATION: N 4853247 E 647211.4		_							Aardv			5 (Trad	ck)						
	SOIL PROFILE		S	AMPL	ES			RESIS	TANCE	NE PEN PLOT	NETRA	TION		DI ACTI	NAT	URAL	LIOLIID		_	REMARKS
(m)		-				GROUND WATER CONDITIONS							00	PLASTI LIMIT	MOIS CON	TURE	LIQUID LIMIT	Ë.	NATURAL UNIT WT (kN/m³)	AND
		STRATA PLOT			BLOWS 0.3 m	WAN	z			1 1	1	1	1	W _P	1	N	W_{L}	(kPa	J &	GRAIN SIZE
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		RA	NUMBER	TYPE		SOU	ELEVATION	• QI	UICK TI	RENG INED RIAXIAL	. ×	LAB V	ANE	1	ER CO		. ,	_	₹	(%)
	Continued		≥	≱	ż	9 2	ᆸ	2	20 4	10 6	0 8	30 1	00	1	0 2	20	30		L	GR SA SI CL
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	Continued Next Page					CDADH	3	3 1	Mumbar			g -30/								

Continued Next Page GROUNDWATER ELEVATIONS

Measurement

GRAPH NOTES $+\ ^3,\times ^3\colon \ \mathop{\text{Numbers refer}}_{\text{to Sensitivity}}$

 \bigcirc $^{\mbox{\boldmath ϵ}=3\%}$ Strain at Failure



LOG OF BOREHOLE BH20-10 4 OF 4 PROJECT: Geotechnical Investigation for Rouge Gateway Project - Site Analysis REF. NO.: 201-04948-00 CLIENT: Parks Canada Agency (PCA) Method: Hollow Stem Auger/Mud Rotary ENCL NO.: 13 ORIGINATED BY MH PROJECT LOCATION: Toronto, ON Diameter: 203 mm DATUM: UTM NAD83 ZONE 17 Date: Jul/07/2020 to Jul/09/2020

	TUM: UTM NAD83 ZONE 17											ul/09/2								
ВН	LOCATION: N 4853247 E 647211.4		_									ME 55	(Trac	k)					_	
	SOIL PROFILE		S	AMPL	.ES	<u>_</u>		RESIS	TANCE	NE PEN PLOT	NE IRA	IION		PI ASTI	C NATI	JRAL	LIQUID		l _⊳ l	REMARKS
(m)		F				GROUND WATER CONDITIONS		2	0 4	0 6	0 8	0 10	00	LIMIT	C NATI MOIS CON	TURE	LIMIT	a) EN	NATURAL UNIT WT (kN/m³)	AND
ELE	,	STRATA PLOT	_		BLOWS 0.3 m	W C	N N	SHEA	AR ST	RENG	TH (kF	Pa)		W _P	\ 	N >	WL	KET (KP)	SAL U	GRAIN SIZE DISTRIBUTION
DEPT	DESCRIPTION	ATA	IBEF	ш	BLC 0.3	JND ITIQ	L ∀		NCONF		+	FIELD V	vity	WA	TER CC	NTEN	T (%)	90 20	ATUR.	(%)
	Continued	STR,	NUMBER	TYPE	þ	GRO	ELEVATION			RIAXIAL 0 6		LAB VA					30		z	GR SA SI CL
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-	some clay, grey, wet, very dense.							-												
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³³ 97	.6	1.						ŀ												
33	1 SILTY CLAY TILL: trace gravel.	191	1				sand	-												
-	some sand, grey, moist, hard.		1				Sand	-												
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-	trace to some clay, grey, wet, very		.				96											1		
35	dense.		00	00	50/	l E.	scree	r 1												
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36	6 END OF BOREHOLE	Ш	27/	33	50/ 50mm		sand-											\vdash	Н	
	Notes:				POLITIN															
	A 50mm dia. monitoring well was installed upon completion of drilling.																			
	Water Level Readings:																			
	Date Depth (m.b.g.s.)																			
	July 13, 2020 27.66																			
8																				
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201-04948																				
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MSW.																			Ш	



PROJECT: Geotechnical Investigation for Rouge Gateway Project - Site Analysis REF. NO.: 201-04948-00 ENCL NO.: 14 CLIENT: Parks Canada Agency (PCA) Method: Hollow Stem Auger/Mud Rotary ORIGINATED BY JL PROJECT LOCATION: Toronto, ON Diameter: 203 mm DATUM: UTM NAD83 ZONE 17 Date: Jul/09/2020 BH LOCATION: N 4853246.7 E 647210.3 Equipment: Aardvark CME 55 (Track) DYNAMIC CONE PENETRATION RESISTANCE PLOT SOIL PROFILE SAMPLES PLASTIC NATURAL MOISTURE CONTENT REMARKS GROUND WATER CONDITIONS LIMIT POCKET PEN. (Cu) (kPa) AND LIMIT 40 60 80 100 NATURAL UNIT (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m SHEAR STRENGTH (kPa)

O UNCONFINED + FIELD VANE

QUICK TRIAXIAL × LAB VANE ELEV DEPTH DISTRIBUTION **DESCRIPTION** NUMBER (%) WATER CONTENT (%) TYPE 60 80 10 20 30 GR SA SI CL 130.7 Ground Surface TOPSOIL: 130mm 13**0.6** 0.1 concrete FILL: sandy silt, trace gravel, dark brown to brown, moist. 130.0 130 SAND: trace to some gravel, trace clay, containing cobbles/boulders, brown, moist. 129.2 1.5 SILTY CLAY TILL: trace gravel, some sand to sandy, containing wet silty sand layers, grey, moist to wet. 129 bentonite 128 W. L. 126.8 m Jul 13, 2020 sand 126 screen 125 <u>124.6</u> **END OF BOREHOLE** 1). A 50mm dia. monitoring well was installed upon completion of drilling. Water Level Readings: Date Depth (m.b.g.s.) July 13, 2020 3.90





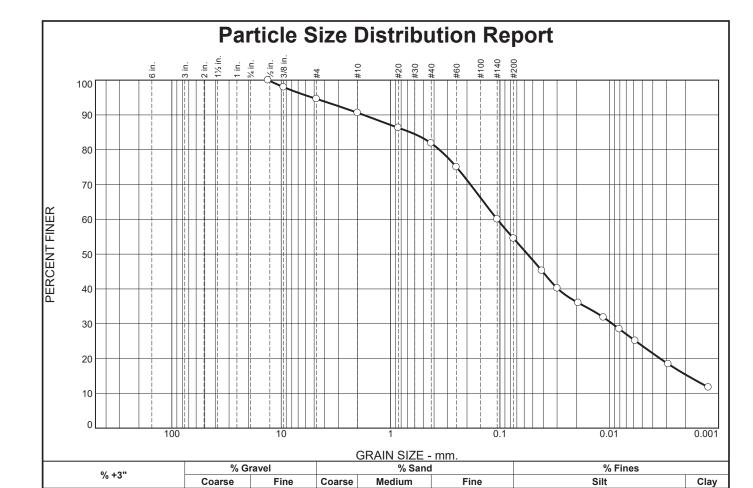
PROJECT: Geotechnical Investigation for Rouge Gateway Project - Site Analysis REF. NO.: 201-04948-00 CLIENT: Parks Canada Agency (PCA) Method: Solid Stem Auger ENCL NO.: 15 ORIGINATED BY JL PROJECT LOCATION: Toronto, ON Diameter: 110 mm DATUM: UTM NAD83 ZONE 17 Date: Jun/18/2020 BH LOCATION: N 4853264.7 E 647172 Equipment: Aardvark CME 55 (Track) DYNAMIC CONE PENETRATION RESISTANCE PLOT SOIL PROFILE SAMPLES PLASTIC NATURAL MOISTURE CONTENT REMARKS GROUND WATER CONDITIONS LIMIT POCKET PEN. (Cu) (kPa) AND LIMIT 40 60 80 100 NATURAL UNIT (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m SHEAR STRENGTH (kPa)

O UNCONFINED + FIELD VANE

O QUICK TRIAXIAL × LAB VANE ELEV DEPTH DISTRIBUTION **DESCRIPTION** NUMBER (%) WATER CONTENT (%) 60 80 10 20 GR SA SI CL 130.8 Ground Surface TOPSOIL: 230 mm 130.5 FILL: sand fill, trace silt, trace clay, SS 0.2 4 1 brown, moist, very loose to 130 129.8 SANDY GRAVEL: trace silt, trace 2 SS 22 0 clay, grey, moist, compact to dense. W. L. 129.0 m 3 SS 33 Jul 13, 2020 bentonite 128.3 SILTY CLAY TILL: trace gravel, 4 SS 31 some sand, grey, moist, hard to very 128 5 SS 11 127 sand 126 SS 10 6 screen 125 SS 20 sand 124.0 END OF BOREHOLE Notes: 1). Borehole was open and dry upon completion of drilling; 2). A 50mm dia. monitoring well was installed upon completion of drilling. Water Level Readings: Date Depth (m.b.g.s.) July 13, 2020 1.71

APPENDIX

-GRAIN SIZE DISTRIBUTION CURVES
-ATTERBERG LIMIT TEST RESULTS



4.0

8.7

5.4

SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
13.2mm	100.0		
9.5mm	98.0		
4.75mm	94.6		
2mm	90.6		
0.850mm	86.3		
0.425mm	81.9		
0.250mm	75.0		
0.106mm	60.0		
0.075mm	54.5		
0.0413 mm.	45.2		
0.0299 mm.	40.2		
0.0192 mm.	36.0		
0.0113 mm.	31.8		
0.0081 mm.	28.5		
0.0058 mm.	25.1		
0.0029 mm.	18.4		
0.0012 mm.	11.7		

0.0

Soil Description											
Sand and silt,	Sandy Silt Till,some										
clay, trace gravel											
PL= NP	Atterberg Limits LL= NV	PI= NP									
D ₉₀ = 1.7676 D ₅₀ = 0.0559 D ₁₀ =	Coefficients D ₈₅ = 0.6569 D ₃₀ = 0.0094 C _u =	D ₆₀ = 0.1058 D ₁₅ = 0.0019 C _c =									
USCS= ML	Classification AASHT	O= A-4(0)									
	Remarks										

39.1

Date: 16/07/20

15.4

(no specification provided)

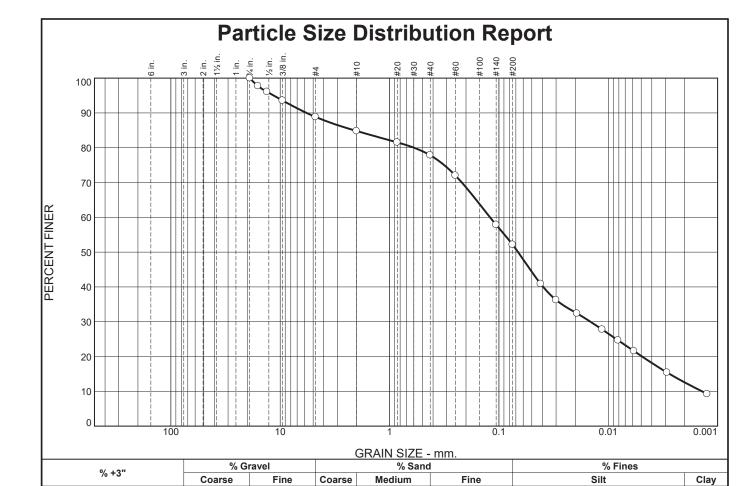
Location: BH20-5 SS6 **Sample Number:** 20MM-850

0.0

Client: Parks Canada Agency **Project:** Rouge Park Gateway

Project No: 201-04948-00 **Figure**

27.4



4.1

11.1

7.0

25.6

SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
19mm	100.0		
16mm	97.7		
13.2mm	96.1		
9.5mm	93.6		
4.75mm	88.9		
2mm	84.8		
0.850mm	81.5		
0.425mm	77.8		
0.250mm	72.0		
0.106mm	57.9		
0.075mm	52.2		
0.0415 mm.	40.9		
0.0300 mm.	36.3		
0.0193 mm.	32.4		
0.0114 mm.	27.8		
0.0081 mm.	24.7		
0.0058 mm.	21.6		
0.0029 mm.	15.4		
0.0012 mm.	9.3		

0.0

Sand and silt,San	Soil Description andy silt till some clay, some gravel										
PL= NP	Atterberg Limits	PI= NP									
D ₉₀ = 5.7330 D ₅₀ = 0.0667 D ₁₀ = 0.0014	Coefficients D ₈₅ = 2.0989 D ₃₀ = 0.0145 C _u = 86.84	$D_{60} = 0.1206$ $D_{15} = 0.0028$ $C_{c} = 1.26$									
USCS= ML	Classification AASHT	O= A-4(0)									
Remarks											

39.6

Date: 16/07/20

12.6

(no specification provided)

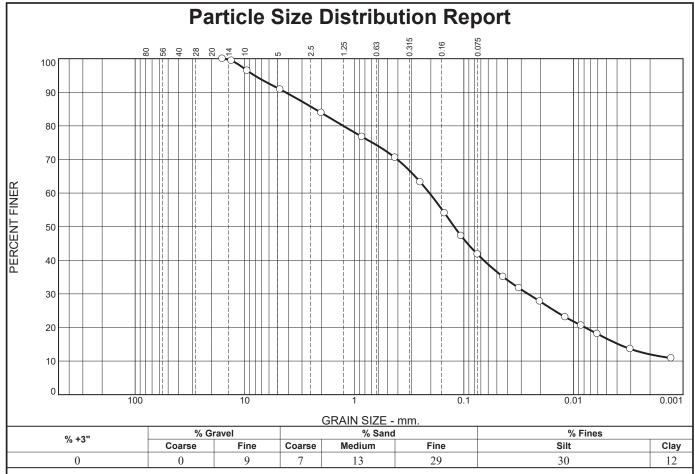
Location: BH20-1 SS6 Sample Number: 20MM-851

0.0

Client: Parks Canada Agency **Project:** Rouge Park Gateway

Project No: 201-04948-00 **Figure**





SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
16.00	100		
13.20	99		
9.50	96		
4.75	91		
2.00	84		
0.85	77		
0.425	71		
0.250	63		
0.150	54		
0.106	47		
0.075	42		
0.0439 mm.	35		
0.0315 mm.	32		
0.0202 mm.	28		
0.0119 mm.	23		
0.0085 mm.	21		
0.0061 mm.	18		
0.0030 mm.	14		
0.0013 mm.	11		

(no specification provided)

Source of Sample: Site Drilling **Sample Number:** 20-7_SS5

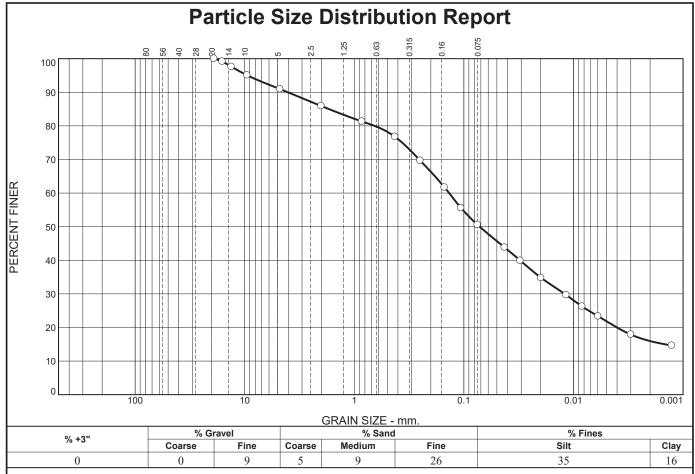
Client: Parks Canada Agency

Project: Chester Station Easier Access Rouge Park Gateway

Project No: 201-04948-00 **Figure** 20-7 SS5

Date: July 24, 2020





SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
19.00	100		
16.00	99		
13.20	98		
9.50	95		
4.75	91		
2.00	86		
0.85	81		
0.425	77		
0.250	70		
0.150	62		
0.106	56		
0.075	51		
0.0425 mm.	44		
0.0305 mm.	40		
0.0197 mm.	35		
0.0116 mm.	30		
0.0083 mm.	26		
0.0060 mm.	23		
0.0030 mm.	18		
0.0013 mm.	15		

	Soil Description			
PL=	Atterberg Limits LL=	PI=		
D ₉₀ = 4.0456 D ₅₀ = 0.0718 D ₁₀ =	$\begin{array}{c} \textbf{Coefficients} \\ \textbf{D}_{85} = 1.7085 \\ \textbf{D}_{30} = 0.0120 \\ \textbf{C}_{u} = \end{array}$	D ₆₀ = 0.1365 D ₁₅ = 0.0015 C _c =		
USCS=	Classification AASHTO	=		
<u>Remarks</u>				

* (no specification provided)

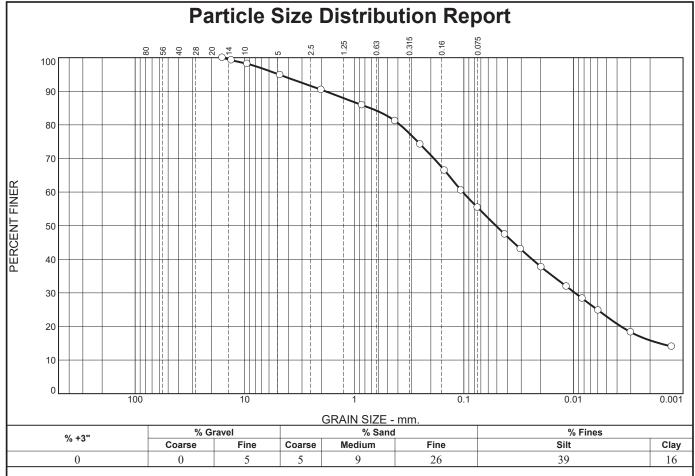
Source of Sample: Site Drilling Sample Number: 20-8_SS14

Client: Parks Canada Agency (PCA)

Project: Chester Station Easier Access Rouge Park Gateway

Date: July 24, 2020





SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
16.00	100		
13.20	99		
9.50	98		
4.75	95		
2.00	90		
0.85	86		
0.425	81		
0.250	74		
0.150	66		
0.106	61		
0.075	55		
0.0422 mm.	47		
0.0304 mm.	43		
0.0196 mm.	38		
0.0116 mm.	32		
0.0083 mm.	28		
0.0059 mm.	25		
0.0030 mm.	18		
0.0013 mm.	14		

Date: July 24, 2020

Figure

20-9 SS7

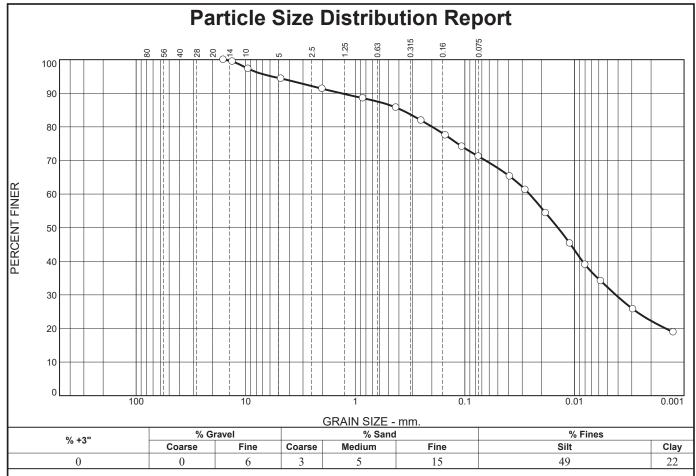
(no specification provided)

Source of Sample: Site Drilling **Sample Number:** 20-9_SS7

Client: Parks Canada Agency (PCA)
Project: Rouge Park Gateway

Project No: 201-04948-00

Tested By: Bruce Shan & LXQ & S.L



SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
16.00	100		
13.20	99		
9.50	97		
4.75	94		
2.00	91		
0.85	89		
0.425	86		
0.250	82		
0.150	77		
0.106	74		
0.075	71		
0.0390 mm.	65		
0.0281 mm.	61		
0.0183 mm.	54		
0.0110 mm.	45		
0.0080 mm.	39		
0.0057 mm.	34		
0.0029 mm.	26		
0.0013 mm.	19		

* (no specification provided)

Source of Sample: Site Drilling Sample Number: 20-10_SS7

Client: Parks Canada Agency (PCA)

Project: Chester Station Easier Access Rouge Park Gateway

Project No: 201-04948-00 **Figure** 20-10 SS7

Date: July 24, 2020

correct City

