GOLDER
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REPORT

Geotechnical and Hydrogeological Investigation

New Ottawa Hospital (Phase 2)

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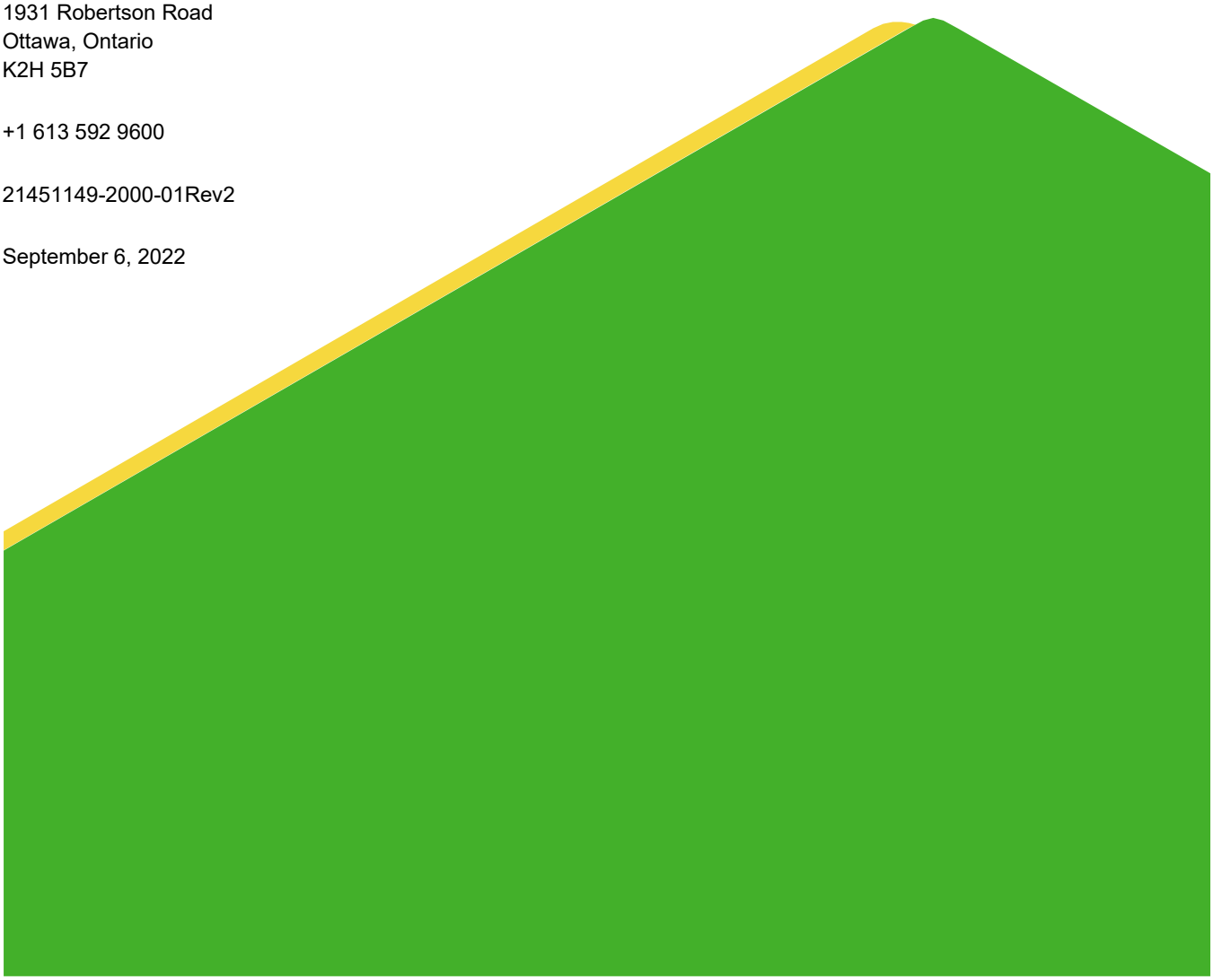

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1.0 INTRODUCTION

This report presents the results of a geotechnical investigation carried out in support of the proposed development of the new campus of The Ottawa Hospital (TOH) on an approximately 50-acre site located in the northeast corner of the Canadian Experimental Farm in the City of Ottawa. The site is located in the southwest quadrant of the intersection of Carling Avenue and Preston Street.

The overall development includes a number of major components including:

- Design and construction of a new main hospital complex located on the west side of the site bounded by Carling Ave. and a new research facility development to the north, and Prince of Wales Dr. to the south.
- Design and construction of a new parkade structure and access roads on the east side of the site.
- A future research facility in the northwest portion of the site along Carling Ave.
- A new University of Ottawa Heart Institute in the southern portion of the site.

This report has been prepared in support of the design and construction of the new Ottawa Hospital structure(s). Concurrent with the investigations completed for this report, additional investigations were completed for the proposed new parkade structure and access roads from Carling Ave. and Prince of Wales Dr., as well as for the future research facility and Heart Institute. These investigations are presented under separate cover. Environmental investigations formed part of this assignment and are also presented under separate cover.

The purpose of this geotechnical investigation is to assess the general subsurface conditions at the location of the proposed new hospital building by drilling boreholes and completing associated field and laboratory testing. This study also uses available subsurface information from previous studies at this site completed by Golder as well as previous investigation data (completed by others) supplied by the client. Based on interpretation of the new factual information obtained combined with existing subsurface information from previous studies, engineering guidelines are provided.

The reader is referred to the “Important Information and Limitations of This Report”, which follows the text but forms an integral part of this document.

2.0 DESCRIPTION OF PROJECT AND SITE

Plans are being prepared for development of the first phase of the new Ottawa Hospital Campus located on the south side of Carling Avenue near Preston Street in a portion of what was the Ottawa Experimental Farm (see Site Plan, Figure 1). The first portion of the development will include the main hospital structure in approximately the center of the site.

The following is a summary of the proposed Hospital Structure and new campus, based on information provided to us:

- The new main Hospital building will be a large multi-storey structure with 12 floors above grade on one side and 7 floors above grade on the other.
- The details of the proposed structure are not known but the preliminary plans provided indicate the main level of the building (Level 01) will have a Finished Floor Elevation (FFE) of 80.36 m. The ambulance and garage level (Level E) will have a FFE of 75.36 and the basement (Level B) is indicated to have a FFE of 70.36 m. The B level is understood to extend across the majority of the footprint of the building.

- Cooling Towers and a Central Utility Plant (CUP) are proposed at the south-west limit of the site in a separate structure with FFE of 73.5 m, It is understood that this may be replaced with, or incorporated into multiple utility levels extending down to the B1 level at the south end of the site.

Golder Associates, and others, have completed several geotechnical and environmental investigations within the vicinity of the new Hospital structure. The results of these investigations were included in the following reports (some of which were obtained from Golder's archive, and some of which were provided to Golder for use as part of this study):

- Stantec Consulting Ltd. "*Phase II Environmental Site Assessment, New Ottawa Hospital Civic Campus, Ottawa, ON*" dated September 2017.
- Golder Report, titled "*Soil Investigation, Proposed Sewer, Ottawa Observatory, Ottawa, ON*", dated 1984 (Report No. 881-2144).
- Stantec Consulting Ltd. Report to Public Services and Procurement Canada "*Geotechnical Data Report, The Proposed Sir John Carling West Annex Building Demolition, 930 Carling Avenue, Ottawa, Ontario"* dated July 2020.
- Paterson Group Consulting Engineers Report titled "*Environmental Investigation of Existing Fault Line, Proposed New Hospital Campus - Carling Avenue, Ottawa, Ontario"* dated 2017.

Based on the results of the current investigation, previous subsurface investigations and published geological mapping, the ground conditions at the site consist of variable deposits of fill overlying silty clay, glacial till, and sand and gravel. Bedrock was proven at depths ranging from 8 to 17 m in previous investigations. The bedrock consists of Bobcaygeon Formation, nodular, limestone and shaley limestone.

3.0 PROCEDURE

The fieldwork for this investigation was carried out between May 5th and June 11th, 2021. At that time, thirty-two boreholes (numbered 21-201 to 21-219, 21-221, 21-222, and 21-224 to 21-226) were advanced at the site at the approximate locations shown on the attached Site Plan, Figure 1. Due to the location of boreholes 21-223 and 21-220 these boreholes were not advanced during the investigation. These areas will be sampled separately following the demolition/remediation of the existing Annex Building (while excavations are open). Eight boreholes (numbered 21-101 to 21-108) were advanced along the south and west sides of the site where parking lots and internal roadways are proposed.

The boreholes were advanced to depths ranging from 1.5 to 21.6 m below the existing ground surface using a track-mounted continuous flight hollow-stem auger drill rig supplied and operated by George Downing Estate Drilling of Hawkesbury, Ontario and a truck-mounted auger drill rig supplied and operated by CCC Geotechnical and Environmental Drilling of Ottawa, Ontario. Wash boring techniques were used to advance boreholes 21-201, 21-202, 21-205, 21-207, 21-219 and 21-221 through cobbles and boulders within the glacial till and/or sand and gravel layers. Standard Penetration Tests (SPTs) were carried out in the boreholes at regular intervals of depth and disturbed samples of the soils encountered were recovered using split spoon sampling equipment.

Portions of boreholes 21-201, 21-203, 21-204, 21-205A, 21-208, 21-209, 21-212 and 21-222 were advanced, without sampling, using dynamic cone penetration testing (DCPT) to depths of 10.9 to 16.9 m below ground surface, where cone refusal was encountered.

Upon encountering refusal, selected boreholes were extended into the bedrock using rotary diamond drilling techniques while retrieving NQ or HQ sized core. Within these boreholes, the drilled lengths in the bedrock ranged between 3.3 and 9.4 m.

Monitoring wells were sealed into boreholes 21-201, 21-202, 21-204, 21-213, 21-215, 21-218, 21-219, 21-221, 21-222, 21-224, 21-225, and 21-226. Multi-level monitoring wells were sealed into boreholes 21-221 and 21-222. These wells were installed to allow subsequent measurement of the groundwater levels and hydraulic conductivity testing. The groundwater levels in the monitoring wells were measured on May 28, June 9, June 18th and 24th, 2021.

The fieldwork was supervised by a member of our engineering staff who located the boreholes, directed the drilling operations and in situ testing, and logged the boreholes and samples.

Upon completion of the drilling operations, samples of the soil and rock core obtained in the boreholes were transported to our laboratory for further examination and for laboratory testing. The laboratory testing included determination of natural water content, Atterberg limits, grain size distribution, and Uniaxial Compressive Strength (UCS) testing.

Groundwater samples from boreholes 21-201, 21-213, 21-215 and 21-221(S) were submitted to AGAT Laboratories for basic chemical analysis related to potential sulphate attack on buried concrete elements and corrosion of buried ferrous elements.

A Vertical Seismic Profile (VSP) casing was installed into borehole 21-207 for the purposes of downhole geophysical testing. Shear wave velocities were measured at the site on May 3, 2022. A summary of the results is included in Appendix F.

The borehole locations were selected, marked in the field, and surveyed in the field by Golder Associates Ltd. Borehole locations and elevations were surveyed using a Trimble R8 Global Positioning System (GPS) unit. The elevations are referenced to Geodetic datum but have been obtained for the purposes of providing geotechnical information. The borehole elevations should not be used in place of a proper topographic survey of the site.

Concurrently, geotechnical investigations were completed at the site for the new parkade structure to the northeast of the Hospital, the future University of Ottawa Heart Institute to the southeast of the Hospital and a future Research Building to the north of the Hospital. The results of these investigations are presented in separate reports. The locations of the various boreholes in these areas are, however, shown on the current borehole location plan for reference. Borehole records for these areas are also included in Appendix A for reference (though the sub-surface conditions in these areas are not discussed in detail in this report).

4.0 SUBSURFACE CONDITIONS

4.1 General

Information on the subsurface conditions is provided as follows:

- Borehole records from the current investigation are provided in Appendix A.
- The results of the natural water content and Atterberg limit tests are provided on the Record of Borehole sheets.
- Photographs of the rock core are provided on Figures B-1 to B-26 in Appendix B.

- Borehole records from the previous boreholes advanced in the area of the site are provided in Appendix C.
- The results of the basic chemical analyses are provided in Appendix D.
- Grain size distribution testing results are provided on Figures 2, 3A, 3B, 5A to 5D and 7A to 7C.
- Plasticity charts for the silty clay (weathered crust) and glacial till are provided on Figures 4A, 4B and 6.
- Results of UCS testing of rock cores are provided in Figure 8.
- The results of shear wave velocity measurements are included in Appendix F.

In general, the subsurface conditions on this site consist of topsoil, variable deposits of fill, overlying localized areas of silty clay, glacial till and silty sand/sand and gravel deposits over bedrock. Refusal to augering, dynamic cone penetration and/or bedrock was encountered at depths of 7.1 to 16.9 m in the current investigation. This corresponds to elevations ranging from 61.2 m to 71.1 m (61.2 m to 68.1 m considering only those holes where bedrock was proven through coring).

The following sections present a more detailed overview of the subsurface conditions on this site. It should be noted that the subsurface conditions encountered in previous investigations have also been used to supplement the current investigations.

4.2 Topsoil and Fill

Topsoil exists at the ground surface at all the boreholes advanced within the hospital footprint as well as in boreholes 21-101 to 21-108 located around the south exterior of the footprint. The topsoil has a thickness ranging from about 150 to 460 mm at the borehole locations. In borehole 21-221 a 460 mm thick layer of topsoil was encountered beneath the fill layer at a depth of about 0.8 m below existing ground surface.

Heterogeneous fill was encountered below the topsoil at all the borehole locations advanced during the current investigation, with the exception of boreholes 21-104, 21-106 and 21-108. The fill extended to depths ranging from 0.7 to 8.4 m below ground surface with thicknesses ranging from 0.2 to 8.2 m. The fill varied in consistency including silty clay, silty sand, gravelly sand, gravel and sand to sandy gravel with various amounts of cobbles, organics, wood, brick, ash, and other debris.

Standard penetration tests carried out within the fill deposit gave SPT ‘N’ values ranging from 1 to greater than 50 blows per 0.3 m of penetration, but more typically in the range of 5 to 30 blows per 0.3 m of penetration, indicating a loose to compact state of packing. The higher SPT ‘N’ values are likely due to the presence of cobbles and boulders in the fill.

The results of gradation testing carried out on one sample of the clay fill and one sample of the granular fill are provided on Figure 2. The measured water content of select samples of the fill ranged from 4 to 36%.

4.3 Upper Silty Sand and Sandy Silt

A discontinuous layer of silty sand to sandy silt was encountered below the fill in boreholes 21-218, 21-222 and 21-108 and previous boreholes 16-2, 16-5 to 16-7, 16-9, 16-14, MW 17-04 to 17-07, MW17-09, MW 20-15, and BH5. The silty sand to sandy silt extends to depths ranging from 1.4 to 9.1 m below the existing ground surface at the locations where it was encountered.

Standard penetration tests carried out within the silty sand to sandy silt deposit gave SPT ‘N’ values ranging from 2 to 4 blows per 0.3 m of penetration, indicating a very loose state of packing.

The results of gradation testing carried out on one sample of this silty sand/sandy silt is provided on Figure 5B. The water content of the sample was measured to be 18%. Portions of these layers may also be coarser layers of glacial till within the overall deposit, as opposed to a separate soil layer.

4.4 Silty Clay

A deposit of silty clay to clay (hereafter referred to as silty clay) was encountered beneath the fill and upper silty sand (where present) in boreholes 21-202, 21-203, 21-205, 21-207, 21-208, 21-210, 21-212, 21-215, 21-221, 21-225, 21-226 as well as previous boreholes MW 16-2, 16-3, 16-9, 16-14, 20-18, BH5 to BH8, AP-4 and AP-5.

The upper portion of the deposit in boreholes 21-202, 21-203, 21-205, 21-207, 21-208, 21-210, 21-212, 21-215, 21-221, 21-225, 21-226, as well as previous boreholes 16-9, BH5 to BH8, and AP-5 is generally grey-brown in colour (i.e., weathered) and extends to depths ranging from about 1.1 to 5.3 m below the existing ground surface. Standard penetration tests carried out within this deposit gave SPT ‘N’ values ranging from 4 to 17 blow per 0.3 m of penetration indicating a generally very stiff to stiff consistency for the weathered deposit.

The silty clay below the upper weathered portion, at 21-221 and 16-9, and the entire silty clay deposit at boreholes MW 16-2, 16-3, 16-14, 20-18, and AP-4 is grey in color. The lower grey silty clay, where fully penetrated, extends to depths of between 6.9 to 9.1 m below the existing ground surface (i.e., elevations 66.7 to 71.9 m). The results of in situ vane shear testing in the unweathered portion of this deposit gave undrained shear strength values generally ranging from 42 to 72 kPa indicating a firm to stiff consistency. The lower, unweathered clay is typically more compressible and sensitive to disturbance.

The results of gradation testing carried out on one sample of the silty clay are provided on Figures 3A and 3B. Atterberg limit testing carried out on samples of the weathered deposit gave plasticity index values of 28 to 62% and liquid limit values of 51 to 88%, indicating a soil of high plasticity. The results of the Atterberg Limits testing are presented on Figures 4A and 4B. The measured water content of selected samples of the weathered silty clay ranges from 29 to 54%.

4.5 Glacial Till

Glacial till was encountered below the fill and/or silty sand/sandy silt or clay (where encountered) at all locations advanced during the current investigation as well as previous boreholes 20-15 to 20-18, BH1 to BH10, and AP-2, AP-3, AP-5 and AP-6. The till was encountered at depths ranging from 0.7 to 8.4 m below existing ground surface. In general, the glacial till consists of a heterogeneous mixture of cobbles, boulders, and gravel in a matrix of silty sand. Localized zones of silty clay may also be present within the till.

The glacial till was not fully penetrated at boreholes 21-209 to 21-212, 21-215, 21-217 to 21-219, 21-222, 21-225, 21-226, 21-101 to 21-108 as well as previous boreholes 20-15 to 20-18, BH1 to BH10, and AP-2, AP-3, AP-5 and AP-6, but proven to extend to depths from 1.5 to up to 14.3 m below existing ground surface at these locations. Where fully penetrated, the glacial till extends to depths ranging from 4.9 to 16.9 m below ground surface.

The results of standard penetration tests carried out within the glacial till gave SPT ‘N’ values ranging from ‘weight of hammer’ to greater than 50 blows, but generally between 2 and 42 blows per 0.3 m of penetration, indicating a very loose to dense state of packing. It should be noted the higher values may be due to the presence of cobbles/ boulders or the bedrock surface rather than the density of the soil matrix, and lower values may be due to soil disturbance induced during drilling and sampling.

The results of gradation testing carried out selected samples of the glacial till are provided on Figures 5A to 5D. Atterberg limit testing carried out on the fine portion of one sample of the glacial till gave a plasticity index value of 4% and liquid limit value of 16%, indicating low plasticity fines. The results of the Atterberg Limits testing are presented on Figure 6. The measured water content of selected samples of the glacial till ranged from 5 to 16%.

4.6 Lower Layered Sandy Gravel, Gravelly Sand, and Sand

A layered deposit of gravelly sand, sand, and sandy gravel with layers of sandy silt was encountered beneath the glacial till in boreholes 21-201 to 21-208 at depths ranging from about 4.9 to 12.2 m below the existing ground surface (i.e., elevations 69.5 to 77.6 m). The sandy deposit was not fully penetrated by boreholes 21-201, 21-203, 21-204, 21-205, 21-206 and 21-208 but was proven/inferred to extend to depths ranging from about 10.9 to 16.9 m below the existing ground surface (i.e., elevations 64.5 to 70.2 m). Where fully penetrated at boreholes 21-202 and 21-207, the sand and gravel deposit extend to depths of 12.2 m and 16.5 m (i.e., elevations 64.7 m and 68.1 m).

Standard penetration tests carried out within the layered deposit gave SPT ‘N’ values ranging from 1 to greater than 50 blows per 0.3 m of penetration, but more typically in the range of 2 to 35 blows per 0.3 m of penetration, indicating a generally very loose to dense state of packing.

The measured natural water content of select samples of the layered sand and gravel ranged between 7 and 24%. The results of gradation testing carried out on select samples of the lower layered sand and gravel are provided on Figures 7A to 7C.

These layers may also be coarser layers or lenses of the glacial till within the overall deposit, as opposed to a unique geological layer.

4.7 Refusal and Bedrock

Refusal to Dynamic Cone Penetration Testing (DCPT) was encountered in boreholes 21-201, 21-203, 21-204, 21-208, 21-209, 21-212, 21-222 as well as previous boreholes BH3, BH4A, BH5 and BH6. Auger refusal was encountered below the glacial till and/or sand and gavel deposits at boreholes 21-202, 21-206, 21-207, 21-210, 21-211, 21-213, 21-214, 21-215, 21-216, 21-217, 21-218, 21-219, 21-221, 21-224, 21-225, 21-226 as well as previous boreholes MW17-04, 17-06, 17-08, 16-5, 16-6, BH1 to 3, BH8, BH 9, BH9A, and BH10.

DCPT refusal or refusal to augering was encountered at depths ranging from 2.7 to 16.9 m below the existing ground surface (i.e., Elevations from 61.2 to 82.4 m) within the hospital footprint during the current investigation. DCPT refusal and auger refusal could indicate the presence of the bedrock surface, or boulders/cobbles within the glacial till/sandy and gravely deposits.

Bedrock was proven at boreholes 21-202, 21-207, 21-213, 21-214, 21-216, 21-219, 21-221 and 21-224 by extending the borehole into the bedrock using rotary diamond drilling techniques while retrieving NQ or HQ sized core. Within these boreholes, the cored lengths in the bedrock ranged from 3.3 to 9.4 m. Where bedrock was proven through coring, the bedrock elevation ranged from 61.2 to 68.6 m elevation.

The cored bedrock generally consists of fresh, thinly to medium bedded, grey to dark grey, fine to medium grained, non-porous, shaley, nodular shaley limestone bedrock. At borehole 21-202 a possible healed fault was noted at a depth of 18.5 to 19.4 m.

The Rock Quality Designation (RQD) values measured on the recovered bedrock core samples ranges from 61% to 100% indicating fair to excellent quality rock. It is common for bedrock in the area to be more weathered and disturbed in the upper 1 m to 2 m and improve in quality below that depth.

Results of UCS testing carried out on five samples of bedrock gave strengths ranging from 59 to 157 MPa, indicative of strong to very strong bedrock.

Photographs of the bedrock core are provided in Appendix B.

The depth and elevations of the bedrock surface, as well as the ground surface elevation, at the borehole locations in the current and previous investigations are summarized in the table below.

Table 1: Summary of Auger Refusal/Bedrock Depths and Elevations

Report no.	BH No.	Ground Surface Elevation (m)	Refusal Depth (m)	Bedrock Elevation (m)
Current	21-201	82.46	12.88[D]	69.58[D]
	21-202	81.20	16.49	64.71
	21-203	81.36	16.90[D]	64.46[D]
	21-204	81.09	10.88[D]	70.21[D]
	21-206	77.09	12.09[R]	65.00[R]
	21-207	80.26	12.17	68.09
	21-208	80.77	14.33[D]	66.44[D]
	21-209	81.03	10.88[D]	70.15[D]
	21-210	80.23	9.15[R]	71.08[R]
	21-211	79.60	10.77[R]	68.83[R]
	21-212	79.89	13.19[D]	66.70[D]
	21-213	76.11	12.20	63.91
	21-214	75.82	8.28	67.55
	21-215	72.79	7.06[R]	65.73[R]
	21-216	74.34	11.13	63.21
	21-217	75.19	8.84[R]	66.35[R]
	21-218	78.54	13.59[R]	64.95[R]
	21-219	79.40	10.84	68.56
	21-221	74.59	13.41	61.18
	21-222	78.83	14.02[D]	64.81[D]
	21-224	78.90	16.92	61.98
	21-225	75.21	12.98[R]	62.23[R]
	21-226	76.25	10.67[R]	65.58[R]
Stantec 2017 and 2020 Investigations	17-04	85.13	2.74[R]	82.39[R]
	17-06	-	4.60[R]	-
	17-08	-	5.49[R]	-
	16-5	-	6.71[R]	-
	16-6	-	7.32[R]	-

Report no.	BH No.	Ground Surface Elevation (m)	Refusal Depth (m)	Bedrock Elevation (m)
Paterson Report PE4096	BH1	-	7.34[R]	-
	BH2	-	8.18[R]	-
	BH3	-	11.20[D]	-
	BH4A	-	11.15[D]	-
	BH5	-	10.26[D]	-
	BH6	-	10.31[D]	-
	BH8	-	8.86[R]	-
	BH9	-	3.43[R]	-
	BH 9A	-	3.25[R]	-
	BH 10	-	7.29[R]	-

Note [R] Denotes auger refusal, bedrock surface not confirmed through coring.

[D] Denotes DCPT refusal, bedrock surface not confirmed through coring

4.8 Groundwater

Monitoring wells were sealed into boreholes 21-201, 21-202, 21-204, 21-213, 21-215, 21-218, 21-219, 21-221, 21-222, 21-224, 21-225, and 21-226. Multi-level monitoring wells were sealed into borehole 21-221 and 21-222. These were installed to allow subsequent measurement of the groundwater levels and hydraulic conductivity testing. The following table summarizes the measured groundwater levels and hydraulic conductivity testing carried out in both the current and previous investigations.

Table 2: Summary of Groundwater Conditions

Report No.	Borehole No.	Ground Surface Elevation (m)	Groundwater Level			Hydraulic Conductivity (cm/s)	Geological Strata Screened
			Date	Depth (m below ground surface)	Elevation (m)		
Current	21-201	82.46	June 18, 2021	6.45	76.01	$2x10^{-2}$	Glacial till/ Sand and Gravel
			June 24, 2021	6.50	75.96		
	21-202	81.20	June 9, 2021	5.15	76.04	$4x10^{-3}$	Limestone bedrock
			June 18, 2021	5.26	75.93		
	21-204	81.09	June 18, 2021	5.16	75.93	$1x10^{-3}$	Glacial till
			June 24, 2021	5.21	75.88		
	21-213	76.11	June 9, 2021	0.70	75.40	$8x10^{-4}$	Glacial till/ gravelly sand
	21-215	72.79	June 9, 2021	2.39	70.40	$3x10^{-4}$	Glacial till
	21-218	78.54	May 27, 2021	5.83	72.71	Not tested	Sandy silt/ glacial till
			June 9, 2021	6.02	72.52		
	21-219	79.40	May 28, 2021	2.80	76.60	Not tested	Fill/ glacial till
			June 9, 2021	2.93	76.47		

Report No.	Borehole No.	Ground Surface Elevation (m)	Groundwater Level			Hydraulic Conductivity (cm/s)	Geological Strata Screened
			Date	Depth (m below ground surface)	Elevation (m)		
	21-221 (Shallow)	74.59	May 28, 2021	1.35	73.23	$1x10^{-2}$	Glacial till/ sand
			June 9, 2021	1.43	73.15		
	21-221 (Deep)		May 28, 2021	2.33	72.26	$1x10^{-4}$	Limestone bedrock
			June 9, 2021	2.41	72.18		
	21-222 (Shallow)	78.83	May 21, 2021	6.42	72.41	Not tested	Fill
			June 9, 2021	6.52	72.31		
	21-222 (Deep)		May 21, 2021	5.65	73.18	Not tested	Glacial till
			June 9, 2021	6.79	72.04		
	21-224	78.90	May 27, 2021	6.31	72.59	Not tested	Fill
			June 9, 2021	6.49	72.41		
	21-225	75.21	May 28, 2021	3.54	71.68	Not tested	Fill/ silty clay
			June 9, 2021	3.63	71.59		
	21-226	76.25	May 28, 2021	2.83	72.48	Not tested	Fill/silty clay/glacial till
			June 9, 2021	3.00	72.31		
Stantec 2017 and 2020 Investigations	MW 20-15	79.71	Feb 12, 2020	5.90	73.81	-	-
	MW 20-16	79.55	Feb 12, 2020	6.10	73.45		
	MW 20-17	78.67	Feb 12, 2020	2.90	75.77		
	MW 20-18	75.04	Feb 12, 2020	6.90	68.14		
	MW 17-04	85.13	Aug 3, 2017	1.61	83.52		
	MW 17-05	-	Aug 3, 2017	3.43	-		
	MW 17-06	-	Aug 3, 2017	Dry	-		
	MW 17-07	-	Aug 3, 2017	4.58	-		
	MW 17-08	-	Aug 3, 2017	5.21	-		
	MW 17-09	-	Aug 3, 2017	2.24	-		
	MW 17-10	-	Aug 3, 2017	2.79	-		
	MW 16-1A	78.05	March 16, 2017	9.25	68.80		
	MW 16-3	77.34	March 16, 2017	5.29	72.05		
	MW 16-5	77.89	March 16, 2017	3.77	74.12		
	MW 16-6	-	March 16, 2017	2.28	-		
	MW 16-7	75.35	March 16, 2017	4.79	70.56		
	MW 16-7A	75.19	Aug 8, 2016	5.07	70.12		
	MW 16-8	74.87	Aug 8, 2016	5.27	69.60		
	MW 16-9	73.79	Aug 8, 2016	5.16	68.63		

Report No.	Borehole No.	Ground Surface Elevation (m)	Groundwater Level			Hydraulic Conductivity (cm/s)	Geological Strata Screened
			Date	Depth (m below ground surface)	Elevation (m)		
	MW 16-14	79.51	Aug 8, 2016	7.23	72.28		
Paterson Report PE4096	BH1	-	Aug. 8, 2017	2.74	-	-	-
	BH2	-	Aug. 9, 2017	1.85	-		
	BH3	-	Aug. 9, 2017	3.98	-		
	BH4A	-	Aug. 8, 2017	2.12	-		
	BH5	-	Aug. 8, 2017	4.40	-		
	BH6	-	Aug. 8, 2017	3.45	-		
	BH8	-	Aug. 8, 2017	4.52	-		
	BH 10	-	Aug. 8, 2017	3.89	-		

It should be noted that groundwater levels are expected to fluctuate seasonally. Higher groundwater levels are expected during wet periods of the year, such as spring.

5.0 DISCUSSION

5.1 General

This section of the report provides engineering guidelines related to the geotechnical design aspects of the proposed hospital building based on our interpretation of the factual information and project requirements. Reference should be made to the “Important Information and Limitations of This Report”, which follows the text but forms an integral part of this document.

5.2 Site Grading

The proposed hospital development has a complex grading scheme, further complicated by the fact that the site is sloping from south to north.

It is currently understood the majority of the new hospital building (the towers and the concourse area between them) will have a basement level (Level B) with a Finished Floor Elevation of 70.36 m. Other areas will have a basement level at the emergency entrance level (Level E) of 75.36 m.

Based on the information provided it is understood the exterior areas to the east of the building will lowered to the B level. The emergency vehicle access road to the south of the building will be lowered to approximately the E level. The parking area to the south of the building will remain approximately at existing grade (with a bridge structure connecting it to the main building over the lowered emergency vehicle access). At the north of the building, between the towers there are connections to the Main (01) level of the building at 80.36 which require raising the grade and the use of new retaining walls and slopes.

Grade Lowering

The development will require lowering the grade by up to 12 m on the south and east sides of the site where the grade will be as low as the B level on the south end of the site. These grade changes may require significant (10 m to 12 m high) slopes and/or retaining walls on the east and south sides of the project.

The design of the various slopes and retaining walls on the east side of the site will require additional geotechnical input based on final grades, locations, etc. during detailed design but they are likely to be significant construction elements. The extensive grade lowering will also mean that the areas south and east of the hospital will be below the existing groundwater table. The roads, parking lots, slopes, walls, etc. in these areas will need to incorporate significant permanent drainage works.

Grade Raising

From a geotechnical perspective, the site is underlain by discontinuous fill overlying localized silty clay (mostly weathered crust) deposits and native glacial till and silt/sand deposits. The majority of these soils would not be expected to be sensitive to typical grade raises which would accompany the development.

The northwest corner of the site (at Borehole BH21-221) encountered unweathered, sensitive silty clay. This sensitive silty clay was not widespread in the current borehole investigation but was also encountered in some of the historical boreholes to the east of Borehole BH21-221. The exact extent of this clay is not known with certainty, but it seems to mainly be present at the north end of the two “wings” of the building as well as potentially below the area between them (where the roundabout is located). The presence of this layer is not a significant concern for moderate changes in grade if needed, but if significant raising of the grade (more than say 1.5 m) is required this area should be reviewed in more detail during detailed design.

As a more general guideline regarding the site grading, preparation for filling of the site should include stripping the topsoil (including buried topsoil) as well as any deleterious fill material (it is possible that portions of the existing fill material can be re-used or left in place, but they should be reviewed at the time of excavation). The excavation can be brought up to grade with compacted engineered fill consisting of Granular B Type I or Type II (S.P. F-3147) where under hard surfaces or structures; where it is below landscaped areas general earth fill may be used.

Engineered fill should be placed in maximum 300 mm thick lifts and should be compacted to at least 95% of the material’s Standard Proctor Maximum Dry Density (SPMDD) under pavements and hard surfaces, or 100% where under foundations and structures. It is possible that portions of the existing granular fill material could be suitable for re-use as engineered fill below non-structural elements (i.e., not below foundations) if needed, but the material would need to be reviewed during construction and suitable portions of the soil set aside for re-use.

5.3 Frost Protection

All perimeter and exterior foundation elements or interior foundation elements in unheated areas should be provided with a minimum of 1.5 m of earth cover for frost protection purposes. Isolated, unheated exterior footings/pile caps should be provided with a minimum of 1.8 m of earth cover.

Insulation of the bearing surface with high density polystyrene rigid foam insulation could be considered as an alternative to earth cover for frost protection. Additional guidance on insulation details can be provided if and when required but require further understanding of the proposed design.

5.4 Seismic Design Considerations

5.4.1 Liquefaction Assessment

Liquefaction is a phenomenon whereby seismically induced shaking generates shear stresses within silty or sandy soils under undrained conditions. In loose soil deposits, these stresses may have the potential to densify the soil (leading to potentially large surface settlements) and may generate excess pore pressures. The excess pore pressures can lead to sudden temporary losses in shear strength.

The site is underlain by deposits of sandy glacial till, as well as deposits of sand and gravel. SPT 'N' values within these deposits are highly variable, ranging from less than 5 to greater than 50. Very low SPT test results in granular soil can often be caused by disturbance due to drilling, or unbalanced porewater pressures during testing. Similarly, very high SPT test results are often a result of cobbles and boulders, and not the density of the soil matrix itself. The average SPT N values for the site are in the in the range of 15 to 20 blows per 300 mm of penetration, with lower and higher values distributed both horizontally and vertically throughout the boreholes.

A preliminary seismic liquefaction assessment was completed for the site. The methodology used to assess liquefaction potential is consistent with the "simplified" approach outlined by Idriss and Boulanger (2008). It involves comparing the cyclic shear stresses applied to the soil by the design earthquake, represented as the cyclic stress ratio (CSR), to the cyclic shear strength, represented as the cyclic resistance ratio (CRR) provided by the soil.

The liquefaction assessment was carried out using the in situ SPT data collected at the various borehole locations. The design groundwater level was based on the measured groundwater levels in the monitoring wells installed in boreholes closest to the building location during the current investigation. The CRR with depth was calculated using the distribution of SPT 'N' values, estimated pore water pressure, and estimated fines content (based on visual observations and laboratory testing of selected samples). The assessment was based on an earthquake with a magnitude of 6.4 and a peak ground acceleration of 0.300 g (corresponding to a seismic event with a 2% probability of exceedance in 50 years).

Based on the typical range of SPT 'N' values, the site is not considered to be at large-scale risk of seismic liquefaction. Although there are low SPT 'N' values recorded throughout the soil strata, they are relatively uniformly distributed throughout the site (i.e., they are not indicative of a particular zone or layer of very loose soil and are more likely indicative of drilling and testing disturbance or random variations in the soil). Similarly, the very high values are not considered representative of the site as they are likely a result of cobbles and boulders (which also affect the test results) distributed more or less randomly through the soil.

In addition, a shear wave velocity measurement was completed in Borehole 21-207 in May 2022. The results of the shear wave velocity measurement are included in Appendix F. The results indicate that the average shear wave velocity, Vs in the overburden is approximately 570 m/s, with no unusually low zones or layers. Shear wave velocities in excess of 200 m/s to 220 m/s are generally indicative of dilatant soil behaviour and soils with Vs values greater than this would not typically be considered liquefiable regardless of the magnitude of earthquake event.

5.4.2 Seismic Site Response Classification

Based on the shear wave velocities measured at the site, a Site Class C may be assumed (Very Dense Soil, with V_s values of 360 m/s to 760 m/s).

5.5 Foundation Design

The subsurface conditions present at the site are variable deposits of fill, localized deposits of silty clay, with glacial till overlying sand and gravel in some locations over shaley limestone bedrock. It is likely that the majority of the main hospital will be supported on deep foundations (piles). Shallow foundations would likely be appropriate for smaller structures such as retaining walls, stand-alone structures, or potentially more lightly loaded areas such as podiums. There are also some areas where it may be feasible to support the main hospital building on shallow foundations on rock.

Discussion related to both foundation types is presented below.

5.5.1 Deep Foundations

Two types of deep foundations would typically be used in the area to support large, relatively heavy, buildings:

- Driven steel piles (typically H sections or pipe piles);
- Drilled, cast-in-place concrete piles with rock sockets.

Driven steel piles (either single piles or in groups) are often the most cost-effective in terms of supporting moderate vertical loads and are commonly used in the area. Driven piles would, however, require relatively large pile groups to carry large column loads. In some areas of the project the bedrock may be relatively close to the underside of the pile cap, limiting the feasibility of installing piled foundations in some areas.

Drilled, cast-in-place piles are less common in the area but are used on a variety of projects. Drilled piles are not as ideally suited to the conditions at this site because the drilling conditions are not ideal (the glacial till contains cobbles and boulders; flowing sands were encountered below the water table in some locations during the investigation) and there is a need to deal with excess soil and groundwater during construction. Drilled piles are, however, feasible if properly designed and constructed and do have some advantages in that they can be designed to carry very large loads. This is particularly relevant if there are large lateral and uplift loads because the presence of a rock socket provides significant resistance compared to driven piles. In addition, with the majority of the building incorporating the basement level, there are large areas that may be relatively close to the bedrock surface. Driven piles will not penetrate the bedrock significantly, potentially leading to very short piles with no lateral or uplift resistance. This is not a concern for drilled piles since the resistance can be developed in the rock socket.

Discussion related to the design of both types of piles is provided below.

5.5.1.1 Driven Steel Piles

The proposed hospital structure may be supported on driven steel piles. Steel H-piles and closed-ended steel pipe piles are both commonly used in the area.

In general, the subsurface conditions in the vicinity of the proposed hospital building consist of variable deposits of fill with some localized areas of silty clay overlying a deposit of glacial till, overlying localized deposits of interlayered sands which in turn overlies shaley limestone bedrock. A piled foundation system could be used to transfer the foundation loads through the overburden soils to the underlying bedrock.

5.5.1.1.1 Axial Resistance

Piles driven to sound rock generate high ultimate geotechnical capacities, generally equal to or in excess of the structural capacity of the steel section (i.e., with increased loading or driving stresses, the steel section will

become damaged and fail before the bedrock yields). For the purposes of design, the ultimate geotechnical resistance of the rock may be assumed to be equal to the ultimate resistance of the steel section.

A resistance factor of 0.4 should be applied to this value to obtain the factored geotechnical resistance of a pile driven to sound rock. The resistance factor may be increased to 0.5 if a program of dynamic (PDA) testing is implemented, or 0.6 if static load testing is performed.

As an example, an HP310x79 has an ultimate resistance of 3,493 kN (based on the cross-sectional area, assuming 350 MPa yield stress and ignoring buckling, bending, lateral loads, sacrificial thicknesses or other more complex conditions which may reduce the structural capacity). The factored geotechnical resistance of an HP310x79 driven to sound rock may therefore be assumed to be 1,397 kN (3,493 kN x 0.4). A similar methodology may be used to estimate the geotechnical resistance of other pile sections.

Settlements for piles driven to sound rock are generally negligible, and the geotechnical resistance mobilized at 25 mm of settlement (a typical SLS condition) would be expected to exceed the factored axial resistance at ULS. Geotechnical SLS considerations therefore do not generally govern the design of pile driven to sound rock.

5.5.1.1.2 Uplift Resistance

The uplift resistance of a driven pile is a result of skin friction acting along the surface area of the embedded pile. The unfactored shaft resistance may be assumed to be equal to:

$$q_s = \beta\sigma_v'$$

Where:

q_s = the unfactored shaft resistance (in kPa);

β = a shaft resistance factor based on soil type and strength (use 0.8);

σ_v' = the vertical effective stress at the adjacent to the pile at depth z, equal to $z\gamma'$;

γ' = the effective unit weight of the soil which may be assumed to be 9 kN/m^3

A resistance factor of 0.3 should be applied to this value, to obtain the factored geotechnical uplift resistance. The dead weight of the pile itself, with an appropriate resistance factor for dead weight, may also be added to the geotechnical resistance in calculating the total uplift resistance.

The total uplift resistance of a pile group is the lesser of the sum of the individual pile resistances as described above, or the resistance of a single “block” of soil with a perimeter equal to the perimeter of the pile group (the mass of the soil inside the “block” may be included in the calculation; use a soil weight of 9 kN/m^3).

It should be noted that the uplift resistance of piles is highly dependent upon the installation of the piles as well as the layout of the pile groups. If the piles are relied upon to resist significant uplift loads, and uplift governs the design, consideration may be given to carrying out a tension test to confirm the uplift capacity.

5.5.1.1.3 Negative Friction

The raising of the grade or lowering of the groundwater table at the site may cause settlement of the existing soils. Localized settlement could also potentially be caused during a seismic event (see Section 5.4.1 above). In any of these cases, the potential will exist to develop negative skin friction (or downdrag) along the piles, and this should be considered in the design.

The magnitude of negative friction depends on the pile loading, pile dimensions and the final configuration of the site as well as the details of the below-grade portions of the building. The location of negative friction forces is also dependent on the location of the neutral axis of the pile which can only be determined once all of the pile

details are known. For preliminary design, however, the negative friction can be assumed to be equal to the shaft friction calculated as described above for uplift resistance (the resistance factor of 0.3 should not be applied).

Negative friction is typically only considered in conjunction with dead and sustained live loads (not transient loads such as wind, earthquake and transient live loads) in evaluating the structural capacity of the pile. Negative friction does not impact the geotechnical resistance of the piles.

5.5.1.1.4 Lateral Resistance

The lateral resistance of a slender pile is typically governed by limiting the deflection which will occur under loading to some acceptable level. The geotechnical parameter most commonly used to determine lateral deflection of piles is the coefficient of horizontal subgrade reaction (k_h). For this site, k_h may be assumed to be:

$$k_h = \eta_h z$$

Where:

k_h = the modulus of subgrade reaction (kN/m^3);

η_h = a coefficient based on soil type (use 4.4 MPa/m); and,

z = the depth under consideration

The value above is for a single pile group. Group interaction must be considered when piles are spaced closely together. Group effects may be accounted for by reducing the coefficient of horizontal reaction (k_h) by an appropriate factor as follows:

Table 3: Coefficient of Horizontal Subgrade Rection Reduction Factors

Pile Spacing in Direction of Loading (d = Pile Diameter)	Reduction Factor
6d	1.0
3d	0.25

Values for other spacings may be interpolated from the values above. No reduction is required for the first row of piles (i.e., the row which bears against undisturbed soil with no piles in front).

It should be noted that the method of applying a linear “spring” to represent the soil reaction to loading is a significant simplification of the soil/pile behaviour. If lateral load resistance governs the pile design, more rigorous, non-linear methods of analysing resistance exist, one common one being the method of p-y curves. These methods, however, require knowledge of the pile size, location, loading, pile cap construction, etc. and are therefore typically more suited to the detailed design phase when these items are known. Golder can provide additional assistance during detailed design, if required.

5.5.1.1.5 Construction Considerations

The piles will be driven to bedrock through a layer of glacial till which is known to contain cobbles and boulders. Piles can deflect or become damaged if they encounter boulders in the glacial till. Piles (both H-piles and pipe piles) should be equipped with pile points (e.g., Titus Standard H Point, or similar) to provide additional protection to the pile tips against damage from boulders during driving. Even with this measure, it should be expected that damage may occur to some piles and replacement piles will be required. For piles driven to refusal on bedrock, and as described in OPSS 903, it is a generally accepted practice to reduce the hammer energy after abrupt peaking is met on the bedrock surface, and then gradually increase the energy over a series of blows to seat the pile.

Provision should be made for restriking all piles at least once to confirm the design set and/or the permanence of the set and to check for upward displacement due to driving adjacent piles. Piles that do not meet the design set criteria on the first restrike should receive additional restriking until the design set is met. All restriking should be performed a minimum of 48 hours after the previous set.

Pile driving criteria depend not only on the details of the pile (size, length, load, etc.) but also on the equipment used for installation. Preliminary pile driving criteria should be established prior to construction using wave equation analysis (WEAP or similar) or other approved means and confirmed through a program of dynamic (PDA) testing carried out at an early stage in the piling program. Additional PDA testing should be used to confirm the pile capacities at regular intervals as the project progresses. As a preliminary guideline, the specification should require that at least 10% of the piles be included in the dynamic testing program. CASE method estimates of the capacities should be provided for all piles tested. These estimates should be provided by means of a field report on the day of testing; CAPWAP analyses should be carried out for at least one half of the piles tested, with the results provided no later than three days following testing. The final report should be stamped by an engineer licensed in the province of Ontario. The PDA testing program will justify an increase in the geotechnical resistance factor to 0.5 as discussed above.

The driving energies required confirm the ultimate geotechnical resistance of the pile (typically the testing is intended to prove a load of twice the design load) may be significantly higher than the energy required to install the pile. Insufficient energy is a common problem in demonstrating the true ultimate capacity of piles during PDA testing, and larger pile driving hammers may be required for the testing. It is also likely that the stresses induced in the piles during driving and testing will be limiting factor in pile testing, not the capacity of the bedrock to resist the loading (i.e., it is common to damage or break a pile during driving and/or testing long before the bedrock yields).

The piling specifications should be reviewed by an experienced geotechnical engineer prior to tender, as should the contractor’s submission (shop drawings, equipment, procedures, preliminary set criteria, etc.) prior to construction. Piling operations should be inspected on a full-time basis by geotechnical personnel to monitor the pile locations and plumbness, initial sets, penetrations on restrike, and to check the integrity of the piles following installation.

Given the large number of piles that will be required for the proposed building(s) (including potentially at future phases), consideration could be given to carrying out a test pile program to optimize the pile design and to better define the ultimate pile capacity. The test program could be completed prior to construction of the hospital building. This would require mobilization of pile driving equipment to the site prior to building construction but would allow for optimization of the pile design for the hospital building (and potentially for future buildings on the site as well).

5.5.1.2 Drilled Cast-in-Place Piles

If drilled piles are used to support the main hospital building (or portions of it) they will be drilled through the overburden (fill, silty clay, glacial till and sandy soils) into the underlying limestone bedrock. Casing will be required to advance the piles through the soil. The casing should be extended so that it is “seated” a minimum of 500 mm into the bedrock.

5.5.1.2.1 Axial Geotechnical Resistance

Rock socketed, drilled piles may be designed on the basis of end bearing and sidewall friction provided that the base of the socket can be adequately cleaned and inspected. If, due to the difficulty in socketing liners into the limestone bedrock to completely cut off the water infiltration, it is not feasible to dewater and clean the base of the socket, or to inspect the base prior to concreting then end-bearing support may not be fully developed (without significant settlement of the pile) and should be neglected in the design.

Where cleaning and inspecting the base in detail is not feasible, the axial geotechnical resistance for rock-socketed caissons is generally assumed to be based on the sidewall (shaft) resistance of the rock socket only (there is a contribution to shaft resistance from the soil overburden, but it is small compared to the rock socket and it typically neglected). This is particularly the case for longer, narrower shafts where it is more difficult to reliably clean the base, and the contribution from end bearing is smaller in any case.

5.5.1.2.1.1 End Bearing ULS Resistance

If the ends of the drilled piles can be adequately cleaned and inspected, then end bearing resistance of the rock socket may be considered. For preliminary design, the end bearing resistance may be assumed as follows.

Table 4: Factored End Bearing Resistance for Rock-Socketed Piles

Depth of Rock Socket	Factored ULS Bearing Resistance
500 mm	5 MPa
Greater of 1.5 m or Pile Diameter	10 MPa

The above values assume the base of the pile has been completely cleaned of loose rock, drilling mud, slough, mud, rock flour, etc. to ensure the concrete is case on clean, undisturbed bedrock. All pile bases should be cleaned, pumped dry, probed, and visually inspected using a down-hole camera under the full-time supervision of a geotechnical engineer to ensure the base is sound and free of soft or deleterious material. Failure to ensure an adequate base could lead to significant settlement of the foundations under load.

5.5.1.2.1.2 Shaft ULS Resistance

For longer, more slender rock sockets (particularly for smaller diameter shafts) it can be difficult to clean and inspect the shaft base, and it is common practice to rely on shaft friction only.

The factored geotechnical shaft resistance at ULS of 1.0 MPa for piles socketed into sound rock. For preliminary design this condition can be assumed to be met at 0.5 m below the bedrock surface (i.e., the first 0.5 m of rock socket capacity can conservatively be ignored). This value assumes that the side wall of the socket will be cleaned of any cuttings or smeared material.

5.5.1.2.1.3 SLS Resistance

Provided the rock socket is carefully cleaned and confirmed to be clean and free of soft material, the SLS resistance for 25 mm of settlement is typically greater than the factored ultimate axial resistance. Note this does not account for settlement of any soft material remaining in the base of the pile which would be significant under large loads, further reinforcing the need to adequately clean and inspect all rock sockets.

Group action for lateral and vertical loading should be considered when the pile spacing in the direction of the loading is less than three to four pile diameters.

5.5.1.2.2 Uplift Resistance

The factored ultimate uplift resistance of a rock-socketed drilled pile is also based on the shaft resistance of the socket which may be assumed to be 750 kPa (the resistance factor for uplift is lower than for compression). The dead weight of the pile itself, with an appropriate resistance factor for dead weight, may also be added to the geotechnical resistance in calculating the total uplift resistance.

Failure within the rock mass or rock cone pull-out should also be considered for the caisson uplift resistance. The same theory applied to rock anchors below should be considered for uplift of piles.

5.5.1.2.3 Negative Friction

The potential for negative friction to develop along any drilled piles should also be considered as per Section 5.5.1.1.3 above for driven piles.

5.5.1.2.4 Lateral Resistance

The contribution to lateral resistance of the soil overburden on the drilled piles may be assumed as for driven piles discussed in Section 5.5.1.1.4 above.

To provide full fixity within the rock sockets for the purposes of lateral resistance, the caissons should be provided with a minimum socket length equal to the greater of twice the caisson diameter below the depth of any broken or highly weathered surficial bedrock (which can be assumed to be 0.5 m).

5.5.1.2.5 Construction Considerations

Drilled piles will need to be advanced through a variety of overburden soils below the groundwater table. Flowing soils were encountered during the ground investigation and should be anticipated during construction. Casing will be required over the full length of the piles. The soils at the site contain cobbles and boulders, the presence of which should also be considered during construction. Temporary casing and liners will be required over the entire length of the drilled shafts in overburden. The shafts will be installed below the water table and may require pumping of groundwater to facilitate cleaning the sockets as well as inspection of the pile. Pile concrete should be placed by tremie.

The capacity of drilled shafts is highly dependent upon the methodology and quality of construction; in particular the rock socket. The piling specifications should be reviewed by an experience geotechnical engineer prior to tender, as should the contractor's submission (shop drawings, equipment, procedures, methods of installing casings, cleaning the rock sockets, etc.) prior to construction. Piling operations should be inspected on a full-time basis by geotechnical personnel to monitor the pile locations and plumbness, casing lengths, socket conditions, concreting procedures, etc. during construction.

Given the large number of piles that will be required for the proposed building(s) (including potentially at future phases), consideration could be given to carrying out a test pile program to optimize pile design and to better define the ultimate capacity of the rock sockets (as well as the required resistance factors). The test program could be completed prior to construction of the hospital building. This would require mobilization of piling equipment to the site prior to building construction but would allow for optimization of the pile design for the hospital building, as well as potentially for future development.

5.5.2 Shallow Footings

5.5.2.1 Shallow Foundations on Rock

The currently proposed building has a basement FFE of 70.36. Where bedrock was cored in the current investigation the top of bedrock elevation ranged from approximately 61.2 m to 68.6 m, or 1.8 m to 9.2 m below the FFE. Allowing for the thickness of the floor, granular base, drainage works, thickness of footings, etc., it is

possible that in some areas it may be feasible to found portions of the building on the bedrock surface. Where the rock surface is relatively close to the FFE two options could be considered:

- Lower the foundation elevation to the as-found rock surface and adjust the column length;
- Construct a concrete pier to fill in the gap between the rock surface and the underside of footing (essentially thickening the concrete).

The following geotechnical bearing resistances may be assumed for shallow foundations on rock:

Prepared Bearing Stratum	Factored ULS Bearing Resistance (kPa)	SLS Bearing Resistance (kPa)
Slightly Weathered to Fresh Bedrock (Footings on Bedrock, or Concrete Piers on Bedrock)	5,000	N/A

The above values are based on the following assumptions:

- The bedrock has not been excessively disturbed, and any loose/broken rock has been removed.
- The water table must be drawn down below the bottom of the excavation and should be maintained at that level throughout the placement of concrete.
- There is no practical limit on the size of footings on rock.

The above values are based on the bearing resistance of the rock (i.e., the geotechnical resistance of the foundation). If the option to place additional concrete between the as-found rock surface and the underside of the footing is adopted, it will have no impact on the bearing resistance of the rock (and the values above may be used). The suitability of the concrete pier should, however, be assessed by the structural engineer to confirm the pier itself has adequate capacity.

Settlement of footings on bedrock is typically negligible under services loads and SLS conditions do not govern the design of foundations on rock for typical building foundation loads.

It must be understood that while it is likely that there are some areas where a shallow foundation on rock may be feasible, there are many areas where it almost certainly is not (for example there are areas within the hospital footprint where the rock is more than 9 m below the FFE). If the option of founding a portion(s) of the building on rock is pursued, then it will be necessary to further delineate the bedrock surface during detailed design to confirm for which portions of the building this option is feasible.

For lateral sliding resistance, an unfactored interface friction coefficient of 0.7 may be used for the design of foundations placed on competent bedrock. A resistance factor of 0.8 should be applied to the sliding resistance.

5.5.2.2 Shallow Foundations on Soil

While unlikely to be appropriate for the majority of the main hospital structure, it may be feasible to support smaller structures (such as retaining walls, canopies, podiums, smaller buildings, etc.) on shallow foundations on soil overburden.

For the purposes of preliminary design, spread footings founded on native soils (weathered silty clay, glacial till or sand and gravel) or engineered fill, may be assumed to have a factored bearing resistance of 200 kPa and an SLS bearing resistance of 150 kPa for pad footings up to 3 m wide and strip footings up to 2 m wide. The SLS

values provided correspond to anticipated total and differential settlement values of 25 and 20 mm, respectively. Where shallow foundations are used any settlement of the footings should be assumed to be entirely differential with respect to portions of the structure founded on piles (i.e., the footing will settle up to 25 mm and the settlement of the pile will be negligible).

There are a variety of soil types (and potentially foundation depths) present at the site. These preliminary bearing resistance values should be reviewed by an experienced geotechnical engineer during the design phase based on the locations and elevations of any proposed shallow foundations. It is also noted that there are a number of locations where relatively deep deposits of fill material were encountered in the recent investigation including boreholes BH21-209, 210, 214, 216, 217, 218, 219, 222, 224, 225 and 226 (and it could be deep in other locations as well). At these boreholes the fill was found to vary in thickness from 3 m to more than 8 m. The fill material is unlikely to be suitable as a bearing sub-grade for building structures (though it may be adequate for other structures which are not settlement sensitive). Again, careful review of any shallow foundation locations and depths should be completed during detailed design.

There is a large portion of the site where the former Sir John A. Carling Building will be removed (including the existing piled foundations). It is understood that there will be a large excavation in this area, which will be backfilled under the supervision of the team completing the remediation. If the excavation is backfilled with engineered fill placed and compacted in accordance with common practice, then it is expected that it will be adequate to support shallow foundations using the design parameters above. The construction records from the backfilling of the area should, however, be reviewed by an experienced geotechnical engineer to confirm this assumption.

For ULS sliding resistance of a cast-in-place footing placed on soil an unfactored friction coefficient of 0.45 may be used. A geotechnical resistance factor of 0.8 should be applied to the sliding resistance.

5.5.3 Ground Anchors

The use of rock anchors to resist uplift forces on the foundations could be considered where additional uplift resistance is required.

In designing grouted rock anchors, consideration should be given to four possible anchor failure modes:

i) Failure of the steel tendon or top anchorage

ii) Failure of the grout/tendon bond

iii) Failure of the rock/grout bond, and

iv) Failure within the rock mass, or rock cone pull-out.

Potential failure modes i) and ii) are structural and are best addressed by a structural engineer.

For potential failure mode iii), the *factored* bond stress at the grout/rock interface may be taken as 1,000 kPa (or 1/30 of the compressive strength of the grout) for ULS design purposes. This value should be used in calculating the resistance under ULS conditions. If the response of the anchor under SLS conditions needs to be evaluated, it may conservatively be taken as the elastic elongation of the unbonded portion of the anchor under the design loading.

For potential failure mode iv), the resistance is calculated based on the weight of the potential mass of rock and soil which could be mobilized by the anchor. This is typically considered as the mass of rock included within a cone (or wedge for a line of closely spaced anchors) having an apex at the tip of the anchor and having an apex

angle of 60 degrees. For each individual anchor, the ULS factored geotechnical resistance can be calculated based on the following equation:

$$Q_r = \varphi \frac{\pi}{3} \gamma' D^3 \tan^{2-}\theta$$

Where: Q_r = Factored uplift resistance of the anchor (kN);

φ = Geotechnical resistance factor (use 0.4);

γ' = Effective unit weight of rock and soil (use 10 kN/m^3 below the groundwater level);

D = Anchor length in metres; and,

θ = one-half of the apex angle of the rock failure cone (use 30°).

For a group of anchors or for a line of closely spaced anchors, the resistance must consider the potential overlap between the rock masses mobilized by individual anchors. In the case of group effects for a series of rock anchors in a rectangle with width “a” and length “b” installed to a depth “D”, the equation for the volume of the truncated trapezoid failure zone would be as follows:

$$V = \frac{4}{3} D^3 sin^2\varphi + aD^2 \sin\varphi + bD^2 \sin\varphi + abD$$

Where: V = Volume of the truncated trapezoid failure zone (m^3);

D = Depth of anchor group (m);

a = Width of anchor group (m);

b = Length of the anchor group (m); and,

φ = ½ of the apex angle of the rock failure cone, use 30°.

The ULS factored geotechnical resistance for the truncated trapezoid failure formed by the group of anchors can then be calculated based on the following equation:

$$Q_r = \varphi \gamma' V$$

Where: Qr = Factored uplift resistance of the anchor (KN);

φ = Geotechnical resistance factor, use 0.4;

γ' = Effective unit weight of rock and soil, use 10 kN/m^3 below the water table; and,

V = Volume of truncated trapezoid (m^3).

It is recommended that proof load tests be carried out on any new anchors to confirm their resistance. The proof load tests should be carried out in accordance with the Post Tensioning Institute (PTI) Recommendations for Prestressed Rock and Soil Anchors (2004).

A geotechnical engineer should be present during the installation and testing of the anchors. Care must be taken during grouting to ensure that the grouting pressure is sufficient to bond the entire length of the grouted area with minimum voids.

Confirmation of sufficient embedment into the rock beneath the foundations should be carried out during construction to make sure that the anchors are being installed in rock of adequate quality. The anchor holes must be thoroughly flushed with water to remove all debris and rock flour. It is essential that rock flour be completely

removed from the holes to be grouted to promote an adequate bond between the grout and the rock. Prestressing of the anchors prior to loading will minimize anchor movement due to service loads.

5.5.4 Lateral Earth Pressures

The lateral earth pressures acting on below-grade portions of the structure will depend on the type and method of placement of the backfill materials, the nature of the soils behind the backfill, the magnitude of surcharge including construction loadings, the freedom of lateral movement of the structure, and the drainage conditions behind the walls.

The following recommendations are made concerning the design of the walls:

- Select, free draining granular fill should be used as backfill behind the walls. Longitudinal drains or weep holes should be installed to provide positive drainage of the granular backfill.
- A minimum compaction surcharge of 12 kPa should be included in the lateral earth pressures for the structural design of the walls. Care must be taken during the compaction operation not to overstress the wall. Heavy construction equipment should be maintained at a distance of at least 1 m away from the walls while the backfill soils are being placed. Hand-operated compaction equipment should be used to compact the backfill soils within a 1 m wide zone adjacent to the walls. Other surcharge loadings should be accounted for in the design, as required.

The following values in the table below provide preliminary guidelines for the lateral earth pressures for static (i.e., not earthquake) loading conditions for planning purposes. These lateral earth pressure coefficients assume that the ground above the wall will be flat, not sloping. If the inclination of the slope above the wall changes, new lateral earth pressures will need to be calculated (or the soil above the wall treated as a surcharge).

Material	Sand and Gravel, Granular A and Granular B Type II	Glacial Till, Granular B Type I, Earth Fill and SSM
Soil Unit Weight:	21 to 22 kN/m^3	20 kN/m3
Coefficients of static lateral earth pressure: Active, K_a At rest, K_o Passive, K_P	 0.27 0.43 3.70	 0.33 0.50 3.00

The following values in the table below provide guidelines for the dynamic lateral earth pressures for earthquake loading conditions for planning purposes. These lateral earth pressure coefficients assume that the ground above the wall will be flat, not sloping. If the inclination of the slope above the wall changes, new lateral earth pressures will need to be calculated.

Material	Sand and Gravel, Granular A and Granular B Type II	Glacial Till, Granular B Type I, Earth Fill and SSM
Soil Unit Weight:	21 to 22 kN/m^3	20 kN/m3

Material	Sand and Gravel, Granular A and Granular B Type II	Glacial Till, Granular B Type I, Earth Fill and SSM
Coefficients of lateral earth pressures during earthquake loading:		
Active, K_{ae} (Non-Yielding)	0.51	0.61
Active, K_{ae} (Yielding)	0.38	0.46
Passive, K_{Pe} (Non-Yielding)	3.62	2.88
Passive, K_{Pe} (Yielding)	3.67	2.95

- If the wall allows lateral yielding, active earth pressures may be used in the geotechnical design of the structure. The movement to allow active pressures to develop within the backfill, and thereby assume an unrestrained structure, may be taken as:
  - Rotation of approximately 0.002 about the base of a vertical wall (where the rotation is calculated as the horizontal displacement divided by the height of the wall);
  - Horizontal translation of 0.001 times the height of the wall; or,
  - A combination of both.
- If the wall does not allow lateral yielding (i.e., restrained structure where the rotational or horizontal movement is not sufficient to mobilize an active earth pressure condition), at-rest earth pressures (plus any compaction surcharge) should be assumed for geotechnical design.

5.6 Slab on Grade

If a slab on grade construction is adopted for the new structure, then the existing topsoil, any fill with organic matter, and any wet or disturbed material should be removed from within the proposed building footprint to provide more predictable performance of the new floor slab.

Provision should be made for at least 200 mm of City of Ottawa SP F-3147 Granular A to form the base for the floor slab. The granular base should be compacted to a minimum of 100% of the material's Standard Proctor Maximum Dry Density (SPMDD).

There are a number of locations where the thickness of the fill may make complete removal and replacement impractical. These areas should be reviewed once the final floor elevations in various portions of the building are fixed. Portions of the existing fill at this site could remain below the new floor slab, provided that the surface of the fill at subgrade level is proof rolled to expose soft or weak areas in the presence of geotechnical personnel. Any soft or weak areas should be excavated and replaced with additional engineered fill.

Any engineered fill required to raise the grade to the underside of the Granular A, including the repair of weak or soft areas, should consist of City of Ottawa SP F-3147 Granular B Type II. The under-slab fill should be placed in maximum 300 mm thick lifts and should be compacted to at least 95 % of the material's Standard Proctor maximum dry density (SPMDD) using suitable vibratory compaction equipment.

5.7 Excavations & Groundwater Control

5.7.1 Temporary Excavations

Based on the preliminary site plan provided, the lowest level of the main hospital building (Level B) has a FFE of 70.36 m. Topographic information has not been provided but based on the borehole elevations the existing grade at the north end of the site is at approximately 73 m to 75 m elevation. This implies relatively shallow excavations

would be required at the north end. At the south end of the site, however, the existing grade raises up to around 82 m to 83 m elevation, which implies excavations on the order of 12 m to reach the B level. Where the grade is lowered to the E level (75.36 m) excavations on the order of 7 m would be required at the south end.

A smaller excavation is also required for the proposed cooling tower and Central Utility Plant located at the south end of the site. The finished floor elevation of the cooling tower is indicated to be 73.5 m with an existing grade of approximately 82.5 m, implying an excavation of 9 to 10 m.

It is noted that the site has relatively complex grading. Unlike a typical building where basement levels are below grade, at this site there is a combination of true, below-grade basement levels, as well as areas where the exterior grade will be lowered to the basement level permanently. This means that a typical large, single excavation over the footprint of the building will not apply, but the excavations will need to be made in a series of permanent and temporary steps, terraces, slopes, etc. some of which may eventually be backfilled and some of which will be permanent.

Excavations for the construction of the foundations, basement levels and site grading will be through the existing fill, and into the underlying silty clay, glacial till and silty sand and sand and gravel deposits. No unusual problems are anticipated with excavating the overburden using conventional hydraulic excavating equipment. Cobbles and boulders should be expected in the fill, glacial till and sand and gravel deposits. Debris (e.g., organics, brick, metal, wood, stone, concrete, etc.) should also be expected in the fill.

It is understood that the foundations for the former Sir John Carling building (which are within the footprint of the proposed hospital building) will be removed prior to development of the hospital, as well as any demolition debris which was left in place during demolition. It is important that the condition of the area around the Sir John Carling Building be confirmed and documented carefully to aid in construction planning for the new building. Given the size and long history of the site it is possible that the remains of other buried structures, debris, etc. may be encountered in other areas as well.

Above the groundwater level and within the fill, silty sand, native silty clay and glacial till side slopes should be stable in the short term at 1 horizontal to 1 vertical; these soils would be classified as Type 3 soils in accordance with the Occupational Health and Safety Act of Ontario (OHSA). Excavations within the silty and sandy soils (both fill and native) *below the water table* would be classified as a Type 4 soil; these excavations would therefore require side slopes at a minimum slope of 3H:1V (i.e., flatter than 3H:1V). Where groundwater levels are lowered and maintained below the depth of excavation, unsupported side slopes may be steepened to 1H:1V.

It is expected that open-cut methods will generally be feasible in most areas provided sufficient space exists to accommodate the excavations, though given the height they will likely require benching, access ramps, etc. to be incorporated into the design. It is also likely that they will need to incorporate permanent drainage works as there will be a significant portion of the slopes that are below the existing water table.

It should be noted that the height of the excavations (up to 12 m) exceeds the height for prescriptive design under the OHSA. Deeper portions of the excavation (even if open cut) will require an engineered design to comply with the relevant regulations.

Where sufficient space does not exist (for example at the south end of the site where the deep excavations extend to the property line) or if it is preferable to limit the size and impact of the excavation as well as associated excavation and backfilling the temporary excavations could be carried out using a shoring system to ensure support for the soil and provide for worker safety. Shoring for this type of project would typically include tied back sheet pile walls or soldier pile and lagging systems (if a soldier pile and lagging system is employed the potential

for flowing sands below the water table must be considered and addressed as part of the shoring/dewatering design).

This type of shoring system is typically designed and constructed by a specialist contractor. In addition to supporting the soils surrounding the excavation, the design of temporary support systems (and in particular the selection of the appropriate design earth pressures; higher design earth pressures are required if it is necessary to limit the deflection of the shoring) will need to consider the support requirements of adjacent structures, roads, utilities, etc.

Temporary excavations for site services (if required) will be through similar soils as discussed above. These excavations can also likely be made with sloping excavations where space permits. Where space does not exist, excavations for temporary services could be carried out with vertical sides and fully braced, steel trench boxes or shoring systems.

5.7.2 Groundwater Control

Significant portions of the proposed excavation(s) will be below the measured groundwater levels, which were found to be at Elevations ranging from 68.1 m to up to 83.5 m (but were typically between 70 m and 77 m in most of the current boreholes). Groundwater levels at the south end of the hospital building were typically found to be 75 m to 76 m elevation (compared with the proposed B elevation of 70.36 m; localized deeper excavations will be required for pile caps, grade beams, utilities, drainage, granular layers, the concrete slab, etc.).

The exterior area to the east of the building will also be permanently lowered to the B level (and therefore below the groundwater level). The emergency access road at the south of the building is at a proposed elevation of 74.75 m, which is also below the groundwater level at the south end of the site.

Further to the north the measured groundwater levels appear to drop and were found to be in the range of approximately 72 m to 73 m in Boreholes 21-221, 222 and 224. At the proposed cooling tower and Central Utility Plant, the groundwater level was found to be at approximately 76 m elevation (compared with a proposed floor elevation of 73.5 m).

Based on our current understanding of the required excavations and the existing sub-surface conditions, it is expected that the excavations will be below the existing groundwater levels in predominantly silty and sandy soils. It will be necessary to temporarily lower the groundwater table below the depth of excavation during construction. Given the size of the excavations it is expected there will be a significant groundwater inflow and careful groundwater management will be required. This groundwater management will need to include active dewatering from wells and well-point systems in the deeper parts of the excavation (including in the floor of the interior of the excavation). Where the excavations are only slightly below the water table (which may be the case at the north end) it may be feasible to manage groundwater inflow by pumping from properly filtered sumps.

The soils at the site are expected to be sensitive to disturbance, including from unbalanced water pressures. Failure to adequately control groundwater will likely result in excessive soil disturbance in the base of the excavation, as well as potentially piping, heave and other safety concerns for temporary excavations.

The contractor is typically responsible for the design of a temporary groundwater control system, including assessing the appropriate type of pump(s) and other equipment as well as their arrangement. Given the extent of dewatering required the contractor should be required to submit a detailed de-watering work plan for review.

For any pumping that exceeds a rate 50,000 l/day, but is less than 400,000 l/day, a Ministry of Environment, Conservation and Parks (MECP) Environmental Activity and Sector Registration (EASR) is required and must be supported by a water taking plan and a discharge plan. For pumping that exceeds 400,000 L/day, an MECP Permit to Take Water (PTTW) is required and must be supported by a hydrogeological report.

Based on the available groundwater information at the site as well as our understanding of the extent and depth of the required excavations, the groundwater control requirements during excavation will be significant. A PTTW will be required for this project.

In addition, the exact excavation extent and depths should be reviewed in order to determine the potential extent of groundwater drawdown. It is possible that due to the sandy nature of the sub-surface soils the groundwater drawdown could extend outside the site boundary. This is particularly relevant at the south end of the site where the depth of groundwater lowering is highest and existing roads and buildings are present near the site.

A hydrogeological study will be required, based on the proposed excavation depths and locations to support the application for a PTTW, refine estimated dewatering volumes and determine the potential extent of groundwater drawdown during construction.

In addition to the temporary dewatering, in exterior areas where the grade is being permanently lowered below the groundwater level, permanent drainage works will be required. Based on the preliminary designs this will include the area to the south and east of the building which is being lowered to the B level as well as the lowered emergency access road on the south side of the building. The majority of the slopes and retaining walls which make up the up to 12 m grade difference will also require permanent drainage.

5.8 Foundation Wall Backfill and Drainage

The fill materials and natural soils at this site are considered frost susceptible and should not be used as backfill against exterior, unheated, or well insulated foundation elements. To avoid problems with frost adhesion and heaving, the foundation and basement walls should be backfilled with non-frost susceptible sand or sand and gravel conforming to the requirements of City of Ottawa SP F-3147.

To avoid ground settlements around the foundations, which could affect site grading and drainage, all of the backfill materials should be placed in 300 mm lifts and be compacted to at least 95% of the materials SPMDD.

In areas where pavements or other hard surfacing will about the building, differential frost heaving could occur between the granular fill and other areas. To reduce this differential heaving, the backfill adjacent to the wall should be placed to form a frost taper. The frost taper should be brought up to pavement subgrade level from 1.5 m below finished exterior grade at a slope of 3 horizontal to 1 vertical, or flatter, away from the wall. The fill should be placed in maximum 300 mm thick lifts and should be compacted to at least 95% of the material's SPMDD using suitable vibratory compaction equipment.

The foundation wall should be wrapped in a drainage board (Miridrain or similar) and be drained by means of a perforated pipe subdrain in a surround of 19 mm clear stone, fully wrapped in a geotextile, which leads by positive drainage to a storm sewer or to a sump pit from which the water is pumped. The basement levels will be below the existing groundwater table and should also be provided with sub-drains below the lowest floor level. For preliminary design these can be assumed to be similar perforated pipe drains as the foundation walls placed on 6 m centres below the floor.

Long-term flow estimates (for sizing permanent drains, pumps, sumps, discharge flows, etc.) can be determined based on the proposed final basement (and excavation) layout and depth as part of the hydrogeological study required for the PTTW discussed above.

5.9 Site Servicing

Excavations for site servicing should be carried out per guidelines in Section 5.7 above.

Bedding for the service pipes, maintenance holes, or valve chamber structures may be placed on undisturbed native inorganic soil or the limestone bedrock. The existing fill may be suitable for support of site services (and in many locations may extend too deep for practical removal. Where existing fill is encountered in the base of service trenches it should be reviewed and approved by a qualified geotechnical engineer. If the existing fill at the base of the excavation is not found to be suitable then it may require re-compaction or sub-excavation and replacement up to the bottom of the bedding layer using engineered fill.

Engineered fill, if required, should consist of either imported Granular B Type II (City of Ottawa SP F-3147) or suitable materials previously excavated at the site (including existing pavement granular, inorganic sandy fill, or compactable glacial till). The suitability of re-using the existing fill and native soil would need to be confirmed at the time of construction by the geotechnical engineer. Engineered fill (either imported or re-used on site) should be placed in maximum 300 mm thick lifts and compacted to at least 95% of the material's SPMDD using suitable vibratory compaction equipment. The engineered fill should extend down and away from the bottom of the bedding to the undisturbed native subgrade at a slope of 1 horizontal to 1 vertical. If this cannot be achieved due to space restrictions, the geotechnical engineer should be consulted to assess potential alternatives.

Re-use of excavated materials would also need to take into account environmental considerations. Further discussion on soil quality and the potential for re-use of the existing fill is provided in the Phase II ESA report, which is provided under separate cover.

At least 150 mm of Granular A (City of Ottawa SP F-3147) should be used as pipe bedding for sewer and water pipes. Where unavoidable disturbance to the subgrade surface occurs during construction, it may be necessary to place a sub-bedding layer consisting of 300 mm of compacted Granular B Type II (S.P. F-3147) beneath the Granular A. The bedding material should in all cases extend to the spring line of the pipe and should be compacted to at least 95% of the material's SPMDD. The use of clear crushed stone as a bedding layer should be discouraged since fine particles from the sandy backfill materials and native soils could potentially migrate into the voids in the clear crushed stone and cause loss of lateral pipe support.

5.10 Trench Backfill

All trench backfill should conform to City of Ottawa specification SP F-2120.

Trench backfill above the pipe cover material may consist of approved excavated material such as the existing fill (provided that it is free of organic matter and other deleterious materials) and non-clayey native soils, where the service pipes will be overlain by pavements or other hard surfacing. Fill that contains organic matter or deleterious materials is not suitable for reuse as trench backfill and should be wasted upon excavation.

Imported backfill, if required, should consist of compactable and inorganic earth borrow (OPSS.MUNI 206/212) or Select Subgrade Material (SP F-3147). Imported materials should be reviewed and accepted by the geotechnical engineer prior to arrival on site.

Where the trench will be covered with hard surfaced areas (e.g., pavements and sidewalks), the type of material placed in the frost zone (down to 1.8 m depth) should match the soil exposed on the trench walls for frost heave compatibility.

All trench backfill should be placed in maximum 300 mm loose lifts and be uniformly compacted to at least 95% of the material's SPMDD. Backfilling operations during cold weather should avoid inclusions of frozen lumps of material, snow, and ice.

If the construction schedule allows, delay between service installation/trench backfilling and final paving should be made to allow for settlement of the trench backfill material, which will reduce the magnitude of differential movement (i.e., sagging) of pavements placed over backfilled trenches.

5.11 Pavement Design

It is understood that new internal access roads and parking lots will be required as part of the new development.

5.11.1 Profile Grade

Because the site is underlain predominantly by granular soils with localized weathered silty clay. No significant post-construction primary consolidation or secondary compression settlements of the subgrade soils are expected. Some settlement above the service trenches should be expected due to settlement of backfill. The magnitude of that settlement, however, should be within tolerable limits, provided that compaction of service trench backfill is carried out in accordance with the guidelines provided above.

5.11.2 Subgrade Preparation

The pavement subgrade will generally consist of the existing heterogenous fill, or native silty sand, silty clay and glacial tills. The subgrade may also include backfill in existing utility trenches and other previous excavations.

Portions of the existing fill may need to be removed to accommodate the full depth of the new pavement structure. As a general guideline, in preparation for pavement construction, all deleterious material (i.e., loose, disturbed or contaminated soil, or soil containing organic material) should be removed from all pavement areas. It should generally be feasible to leave the existing inorganic fill in place beneath the pavement structure. Where this is the case, the subgrade should be proof rolled prior to the placement of new fill. The purpose of the proof rolling is to provide surficial densification of the existing inorganic fill and to locate any isolated areas of soft or loose soil, which would require sub-excavation and replacement with suitable fill.

Sections requiring grade raising to the proposed subgrade level should be filled using acceptable (compactable and inorganic) earth borrow (OPSS.MUNI 206/212), Select Subgrade Material (OPSS.MUNI 1010) or additional granular base if grade changes are minor. All fill should be placed in maximum 300 mm thick lifts and should be compacted to at least 95% of the material's SPMDD using suitable vibratory compaction equipment.

5.11.3 Pavement Drainage

The subgrade surface should be crowned or sloped to promote drainage of the roadway granular structure. Perforated pipe subdrains should be provided along the low sides of the roadway along the entire length. The geotextile should consist of a Class I nonwoven geotextile to OPSS 1860. The geotextile should have a maximum Apparent Opening Size A.O.S. of 212 µm. The subdrains should be connected to the catch basins such that the pavement structure will be positively drained and will intercept flows within the subbase. Subdrains should not be allowed to drain on existing slopes.

Backfilling of catch basin laterals located below subgrade level should be completed using acceptable native soils or fill which match the material types exposed on the lateral trench walls. This will reduce potential problems associated with differential frost heaving.

5.11.4 Granular Pavement Materials

Good drainage significantly improves the freeze-thaw resistance of the asphaltic concrete and decreases the frequency of transverse cracking, thereby extending the life of the pavement. The granular base and sub-base for new construction should consist of Granular A and Granular B Type II, respectively (S.P. F-3147).

Based on the results of the subsurface investigation, the existing fill within the project limits would generally not meet the requirements for Granular A or Granular B Type II. As outlined in Section 5.12 the existing fill material could be re-used as general trench backfill or as subgrade material for pavements.

5.11.5 Pavement Design

The preliminary design for the roadways were subdivided into four categories:

- Parking Areas
- Local Routes (which will not be subjected to Bus Traffic or Heavy Truck Traffic)
- Collector/Bus Routes
- Rigid Concrete Pavements

These pavement designs are preliminary based on our understanding of the project and experience with similar projects/developments. These pavement sections should be confirmed during detailed design based on the location, geometry, loading, drainage, etc. of the various sections)

5.11.5.1 Parking Areas

The pavement structure for parking areas should be:

Pavement Component	Thickness (mm)
Asphaltic Concrete	50
S.P.F-3147 Granular A Base	150
S.P.F-3147 Granular B Type II Subbase	400

The composition of the asphaltic concrete pavement should be as follows:

- Superpave 12.5 mm Surface Course – One lift of 50 mm

The asphaltic concrete should meet the requirements of City of Ottawa specification F-3106. The Performance Graded Asphalt Cement (PGAC) should consist of PG 58-34 for Traffic Category B.

5.11.5.2 Local Routes (No Buses)

The pavement structure for local and access roads, not exposed to bus or heavy truck traffic, should be:

Pavement Component	Thickness (mm)
Asphaltic Concrete	90
S.P.F-3147 Granular A Base	150
S.P.F-3147 Granular B Type II Subbase	400

The composition of the asphaltic concrete pavement should be as follows:

- Superpave 12.5 mm Surface Course – One lift of 40 mm

- Superpave 19.0 mm Binder Course – One lift of 50 mm

The asphaltic concrete should meet the requirements of City of Ottawa specification F-3106. The Performance Graded Asphalt Cement (PGAC) should consist of PG 58-34 for Traffic Category B.

5.11.5.3 Collector Routes

The pavement structure for collector routes should be:

Pavement Component	Thickness (mm)
Asphaltic Concrete	120
S.P.F-3147 Granular A Base	150
S.P.F-3147 Granular B Type II Subbase	400

The composition of the asphaltic concrete pavement should be as follows:

- Superpave 12.5 FC1 mm Surface Course – One lift of 50 mm
- Superpave 19.0 mm Binder Course – One lift of 70 mm

The asphaltic concrete should meet the requirements of City of Ottawa specification F-3106. The Performance Graded Asphalt Cement (PGAC) should consist of PG 64-34 for Traffic Category C.

The above pavement designs assume that the trench backfill has been acceptably prepared (i.e., where the bottom of the excavation is free of organics, has been adequately compacted to the required density, and the subgrade surface is not disturbed by construction operations or precipitation).

5.11.5.4 Rigid Pavements

If required, a preliminary design section for rigid pavements is presented below.

Pavement Component	Thickness (mm)
Portland Cement Concrete	200
S.P.F-3147 Granular A Base	150
S.P.F-3147 Granular B Type II Subbase	400

The Portland cement concrete should meet the requirements of CSA A 23.1 Class C2 exposure. Concrete joint specifications and spacing should be in accordance with OPSD 552.020 and 551.010.

5.11.6 Pavement Structure Compaction

Adequate compaction of the granular roadway materials will be essential to the continued acceptable performance of the roadway. Compaction should be carried out in conformance with procedures outlined in OPSS 501 “Construction Specification for Compacting” with compacted densities of the various materials being in accordance with Subsection 501.08.02 Method A. The granular base and subbase material should be uniformly compacted to at least 100% of the Standard Proctor Maximum Dry Density (SPMDD) using suitable vibratory compaction equipment. Compaction of the asphaltic concrete should be carried out in accordance with OPSS 310, Table 10.

The placement and compaction of any engineered fill, as well as sewer and watermain bedding and backfill, should be inspected to ensure that the materials used conform to the specifications from both a grading and compaction viewpoint. In addition, testing and sampling of the asphaltic and Portland cement concrete used on site should be carried out to make sure that the materials used, and level of compaction achieved, during construction meet the project requirements.

5.11.7 Joints, Tie-ins with Existing Pavements, Pavement Resurfacing

At intersections, the new pavement structure should be continued at least to the limits of construction or the end of the curb “return” (i.e., the start of the constant width portion of the side road). At these streets, the pavement should be milled back beyond the curb return an additional 300 mm to a depth of 40 mm to accept the surface course asphaltic concrete.

The pavement granular and subgrade level should be tapered between the new and existing pavements by using 10H:1V tapers up or down as required.

A tack coat should be provided on all and vertical and milled horizontal surfaces. The tack coat should consist of SS-1 emulsified asphalt diluted with an equal amount of water. The undiluted and emulsified asphalt shall be in conformance with OPSS 1103.

5.12 Reuse of Existing Soils

From a geotechnical perspective, the native glacial till (provided it has suitable water content to be compactable), may be reused on this project as backfill within service trenches, provided the materials are frost compatible. The existing soils are likely be suitable for reuse as pavement structure base or subbase materials, or as engineered fill. The heterogeneous fill and buried topsoil encountered on site contains organic matter and debris, and therefore would also not be considered suitable for reuse as base and subbase material (but portions may be used for trench backfill and site grading if reviewed and approved during excavation).

Reclaimed Asphalt Pavement (RAP) and/or Reclaimed Concrete Material (RCM) may be used on this project as granular material as stated in OPSS.MUNI 1010 “Material Specification for Aggregates – Base, Subbase, Select Subgrade and Backfill Material”.

Reclaimed asphalt pavement may be used in the asphaltic concrete mixes in accordance with OPSS.MUNI 1151.

5.13 Corrosion and Cement Type

Groundwater samples from boreholes 21-201, 21-213, 21-215 and 21-221 (S) were submitted to AGAT Laboratories for basic chemical analyses related to potential sulphate attack on buried concrete elements and potential corrosion of buried ferrous elements. The results of this testing are provided in Appendix D and are summarized in the following table.

Table 5: Results of Basic Chemical Testing

Borehole Number	Sample Type	Chloride (mg/L)	Sulphate (mg/L)	Electrical Conductivity (µS/cm)	pH
21-201	Groundwater	216	130	1500	7.79
21-213	Groundwater	225	74.3	1310	7.87
21-215	Groundwater	267	305	1980	7.66
21-221 (Shallow)	Groundwater	497	169	2420	7.70

The water-soluble sulphate (SO4) content in the tested samples was above 150 mg/L and below 1,500 mg/L. As such, concrete made with Moderate Sulfate Resistance (S-3) type cement should be acceptable for buried concrete elements.

Based on ASTM STP1013 (Chaker and Palmer, 1989), and the results of the corrosivity testing indicate an elevated potential for corrosion of exposed ferrous metal (e.g., steel, iron, etc.), which should be considered in the design of substructures. Corrosion protection systems or steel coatings may be required but should be selected by a structural engineer. The results also indicate a higher chloride content, which should be considered in the design of substructures.

6.0 ADDITIONAL CONSIDERATIONS

At the time of the writing of this report, only preliminary design details for the proposed hospital were available. Golder Associates should be retained to review the final drawings and specifications for this project prior to construction to ensure that the guidelines in this report have been adequately interpreted.

All prepared subgrade surfaces for roadways, parking areas, floor slabs, foundations, etc. should be reviewed by Golder to ensure that they have been adequately prepared. The installation of piled foundations should be reviewed on a full-time basis by Golder. The placing and compaction of any engineered fill should be inspected and tested to ensure that the materials used conform to the specifications from both a grading and compaction viewpoint.

It should also be noted that the soil samples retrieved as part of the geotechnical investigation are generally only maintained for a period of 3 months following issuance of the report.

Ontario Regulation 903 requires abandonment of the monitoring wells installed within the boreholes for this investigation; however, these devices will be useful during construction. It is therefore proposed that decommissioning of these devices be made part of the construction contract. Some of those devices will be useful during dewatering to monitor the progress of groundwater lowering.

7.0 CLOSURE

We trust this report satisfies your current requirements. If you have any questions regarding this report, please contact the undersigned.

Golder Associates Ltd.

Bridgit Bocage, M.Eng., P.Eng.
Geotechnical Engineer

Chris Hendry, P.Eng.
Senior Geotechnical Engineer, Associate

KM/BB/CH/ml

https://golderassociates.sharepoint.com/sites/140130/project files/6 deliverables/geotechnical/2000- hospital/revised_final_august 2022/21451149(2000)-r-rev2_geo-hydro phase 2 hospital-2022sept6.docx

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IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

Standard of Care: Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

Basis and Use of the Report: This report has been prepared for the specific site, design objective, development and purpose described to Golder by the Client **Parsons Corporation.** The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. Golder cannot be responsible for use of this report, or portions thereof, unless Golder is requested to review and, if necessary, revise the report.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without Golder's express written consent. If the report was prepared to be included for a specific permit application process, then the client may authorize the use of this report for such purpose by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process, provided this report is not noted to be a draft or preliminary report, and is specifically relevant to the project for which the application is being made. Any other use of this report by others is prohibited and is without responsibility to Golder. The report, all plans, data, drawings and other documents as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder, who authorizes only the Client and Approved Users to make copies of the report, but only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make available the report or any portion thereof to any other party without the express written permission of Golder. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client cannot rely upon the electronic media versions of Golder's report or other work products.

The report is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other reports prepared by Golder for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. Golder cannot be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Groundwater Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. **The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report.** The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.

LEGEND

- APPROXIMATE BOREHOLE LOCATION
- PREVIOUS BOREHOLE LOCATION (STANTEC 2020)
- PREVIOUS ENVIRONMENTAL BOREHOLE OR MONITORING WELL LOCATION (STANTEC, 2017)
- PREVIOUS ENVIRONMENTAL BOREHOLE OR MONITORING WELL LOCATION (PATERSON, 2017)
- HISTORICAL TESTHOLE LOCATION
- 2.5 DEPTH TO BEDROCK, mbgs
- 99.99 BEDROCK SURFACE ELEVATION, mASL
- PATERSON REMEDIATION AREA
- STUDY AREA

REFERENCE(S)

1. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: MTM ZONE 9, VERTICAL DATUM: CGVD28

CLIENT
PARSONS INC.

PROJECT
GEOTECHNICAL INVESTIGATION
OTTAWA HOSPITAL NEW CIVIC CAMPUS

TITLE
SITE PLAN

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-06-02
DESIGNED	---
PREPARED	JEM
REVIEWED	BB
APPROVED	CH

PROJECT NO.	CONTROL	REV.	FIGURE
21451149	0011	0	**1**

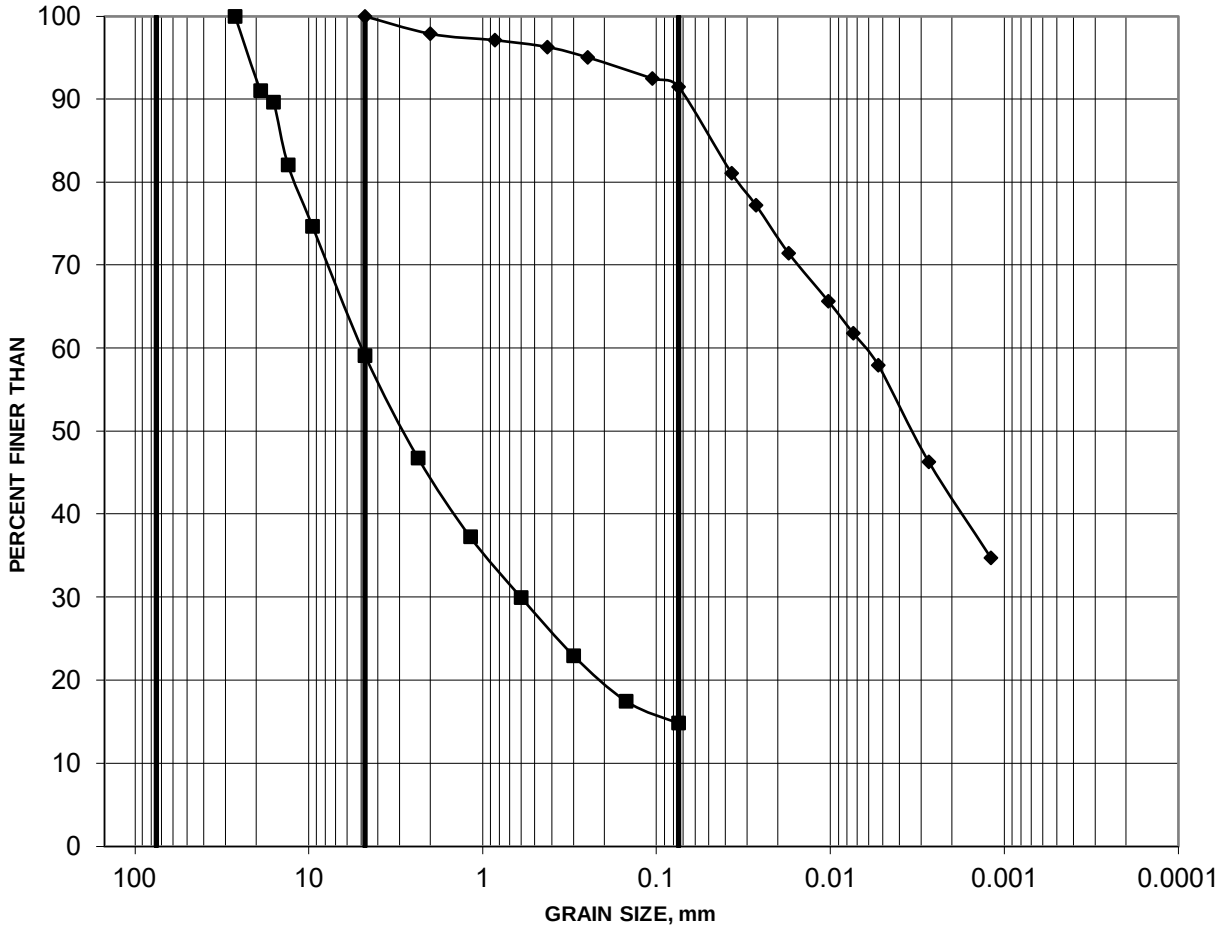
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 25mm

Path: N:\Active\Spatial_IM\Ottawa_Hospital\New_Civic_Campus\99_PRO\21451149_Parsons_Expansion\0011_Geotech_Investigation_MainCampus_SC\21451149-0011-BG-0001.mxd

GRAIN SIZE DISTRIBUTION

FIGURE 2

FILL



COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
	GRAVEL SIZE		SAND SIZE			

	Borehole	Sample	Depth (m)	Constituents (%) Gravel	Sand	Silt	Clay
■	21-213	2	0.76-1.37	41	44		15
◆	21-217	4	2.29-2.90	0	9	49	42

Project: 21451149/2000

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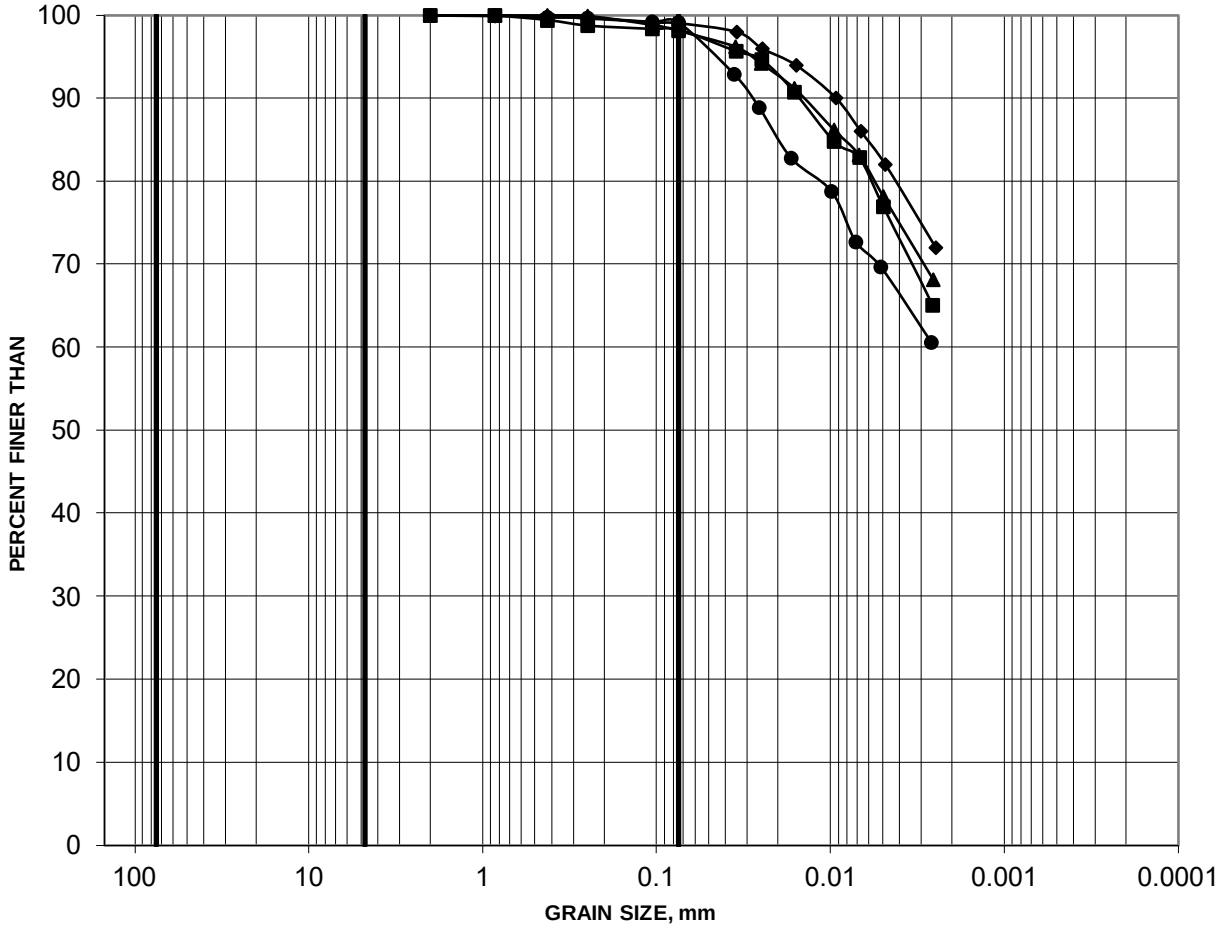
GRAIN SIZE DISTRIBUTION

FIGURE 3A

SILTY CLAY TO CLAY (WEATHERED CRUST)



COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
	GRAVEL SIZE		SAND SIZE			

	Borehole	Sample	Depth (m)	Constituents (%) Gravel	Sand	Silt	Clay
■	21-205	3	1.52-2.13	0	2	39	59
◆	21-212	4	2.29-2.90	0	1	31	68
▲	21-221	5	3.05-3.66	0	2	33	65
●	21-226	5	3.05-3.66	0	1	43	56

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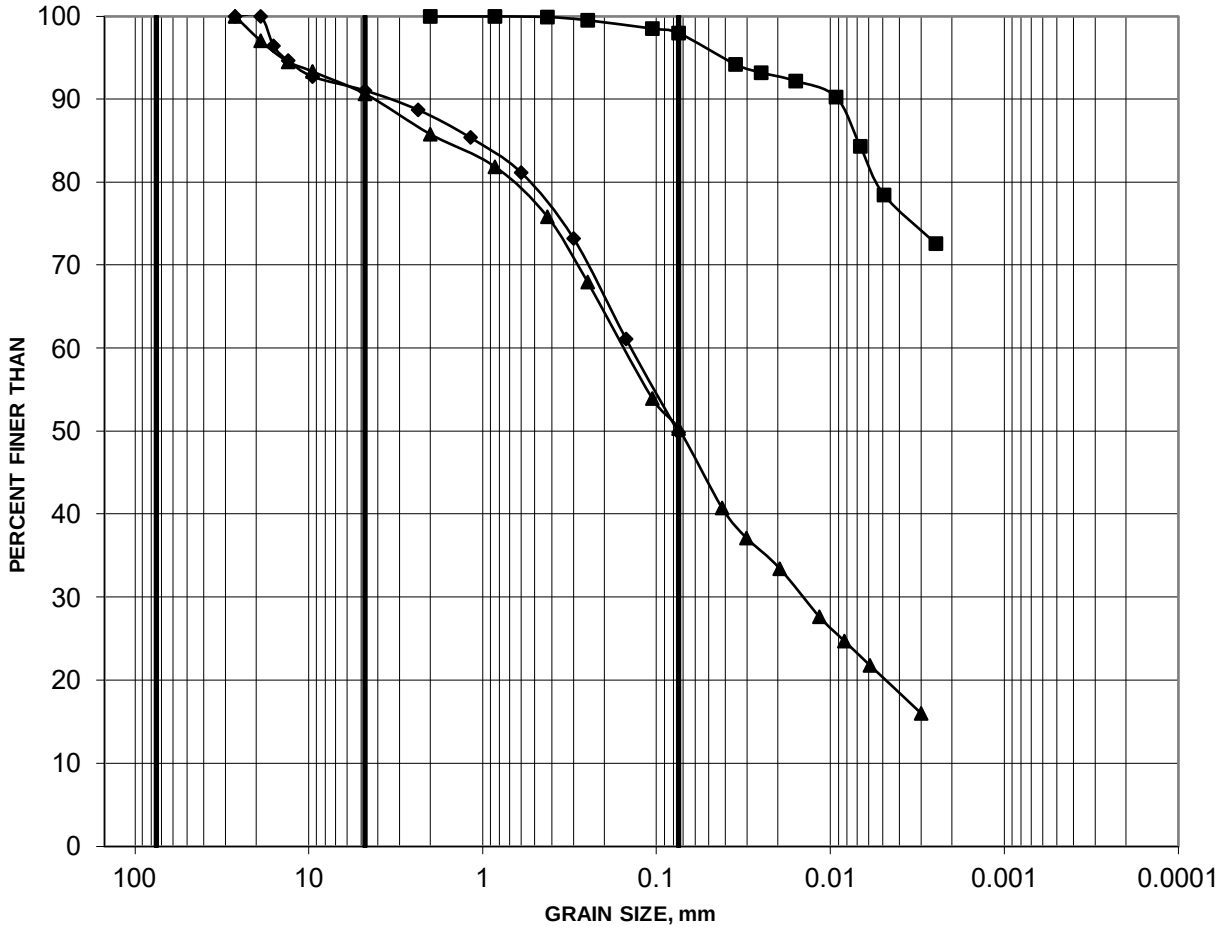
GRAIN SIZE DISTRIBUTION

FIGURE 3B

SILTY CLAY TO CLAY (WEATHERED CRUST)



COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
	GRAVEL SIZE		SAND SIZE			

	Borehole	Sample	Depth (m)	Constituents (%) Gravel	Sand	Silt	Clay
■	22-111	3	1.52-2.13	0	2	30	68
◆	22-111	4	2.29-2.90	9	41		50
▲	22-112	4	2.29-2.90	9	41	37	13

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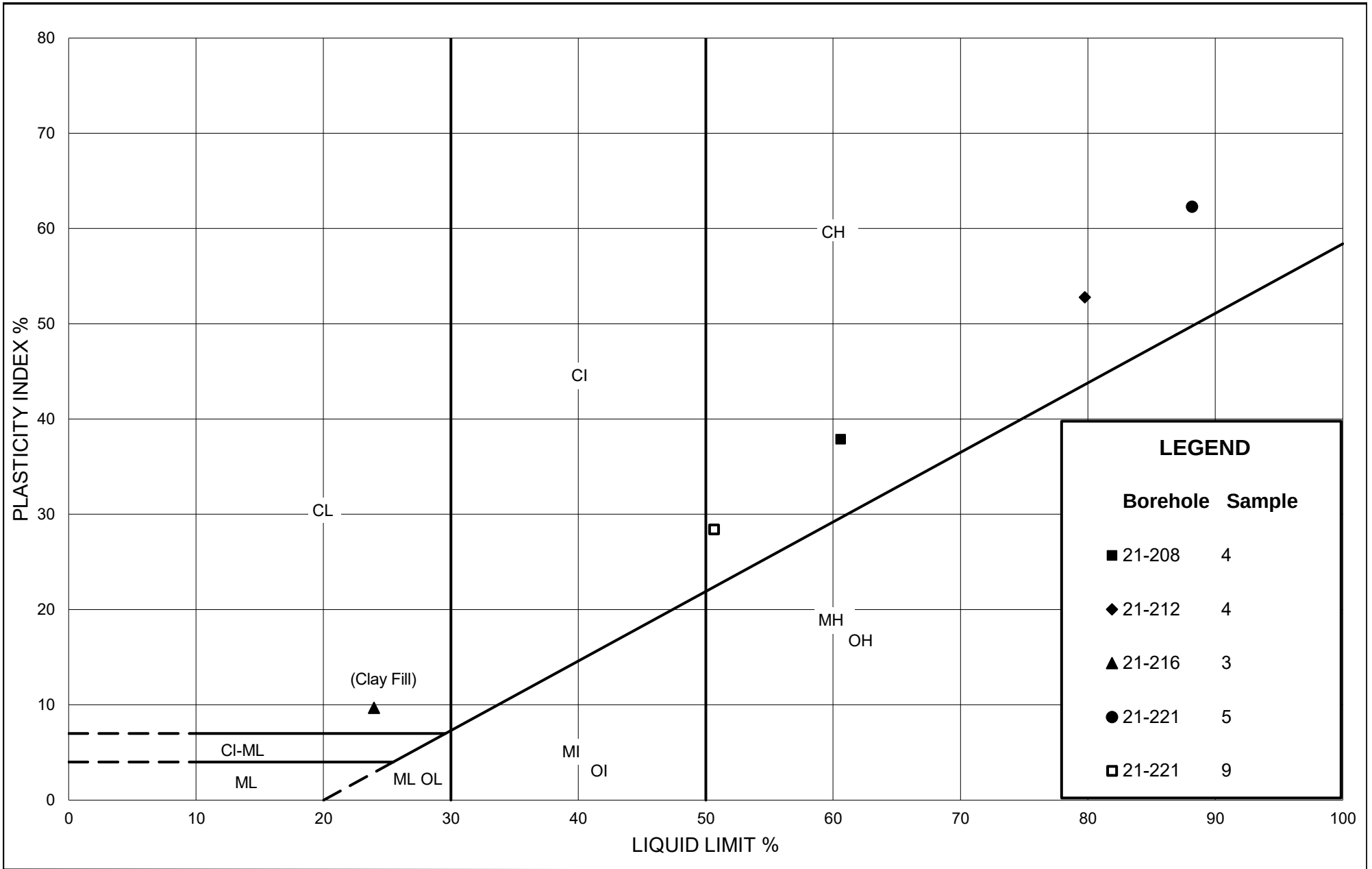

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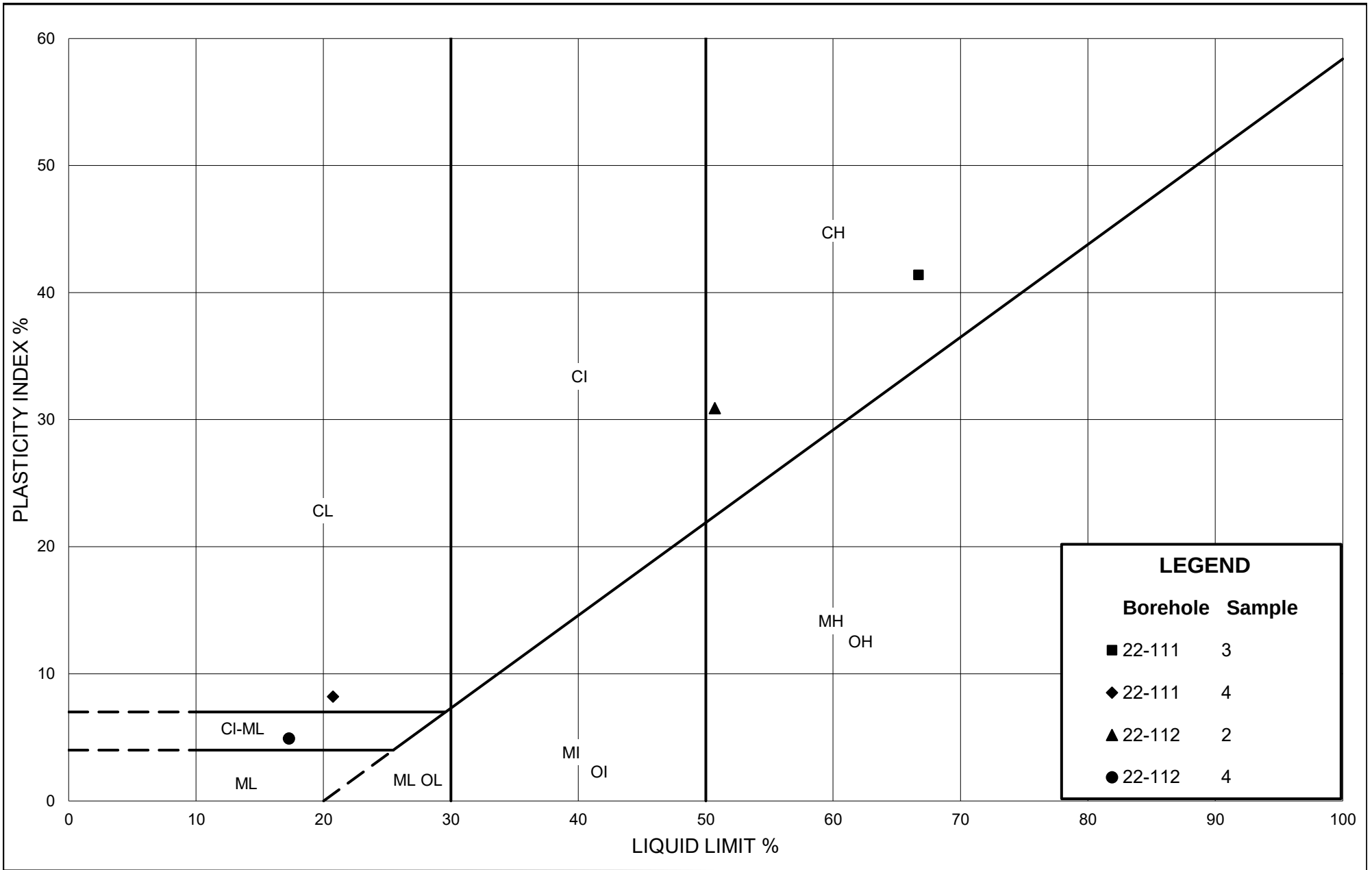
PLASTICITY CHART

SILTY CLAY TO CLAY (WEATHERED CRUST)

Figure:	4A
Project:	21451149/2000
Created By: CW	Checked By: MI



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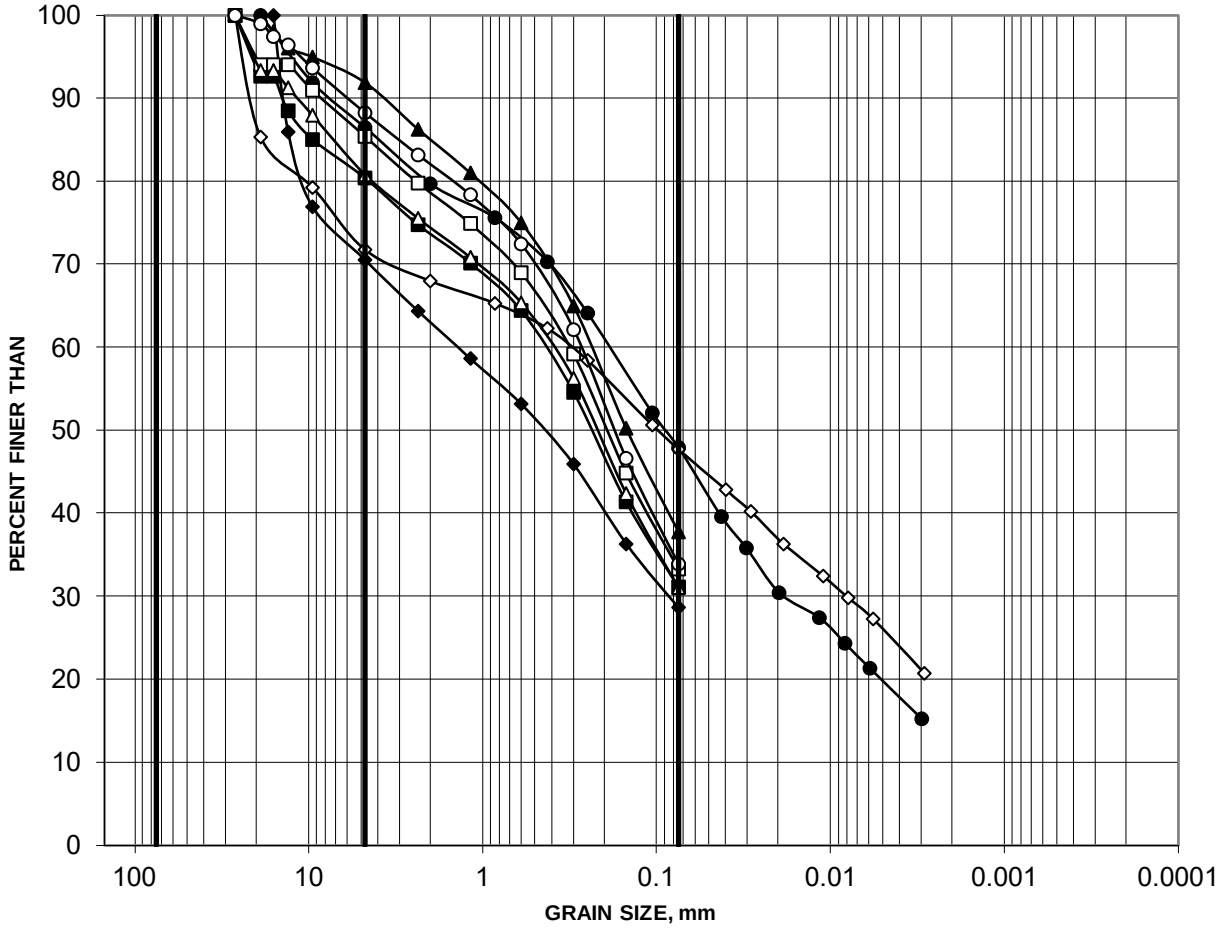
PLASTICITY CHART
WEATHERED CRUST

Figure:	4B
Project:	21451149/2000
Created By: CW	Checked By: MI

GRAIN SIZE DISTRIBUTION

FIGURE 5A

GLACIAL TILL



COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
	GRAVEL SIZE		SAND SIZE			

	Borehole	Sample	Depth (m)	Constituents (%) Gravel	Sand	Silt	Clay
■	21-103	2	0.91-1.52	20	49		31
◆	21-107	2	0.91-1.52	30	41		29
▲	21-201	2	0.76-1.37	8	54		38
●	21-208	5	3.05-3.66	14	38	35	13
□	21-208	9	6.10-6.71	15	52		33
◇	21-210	5	3.05-3.66	28	24	30	18
△	21-210	9	6.10-6.86	19	50		31
○	21-212	10	6.86-7.47	12	54		34

Project: 21451149/2000

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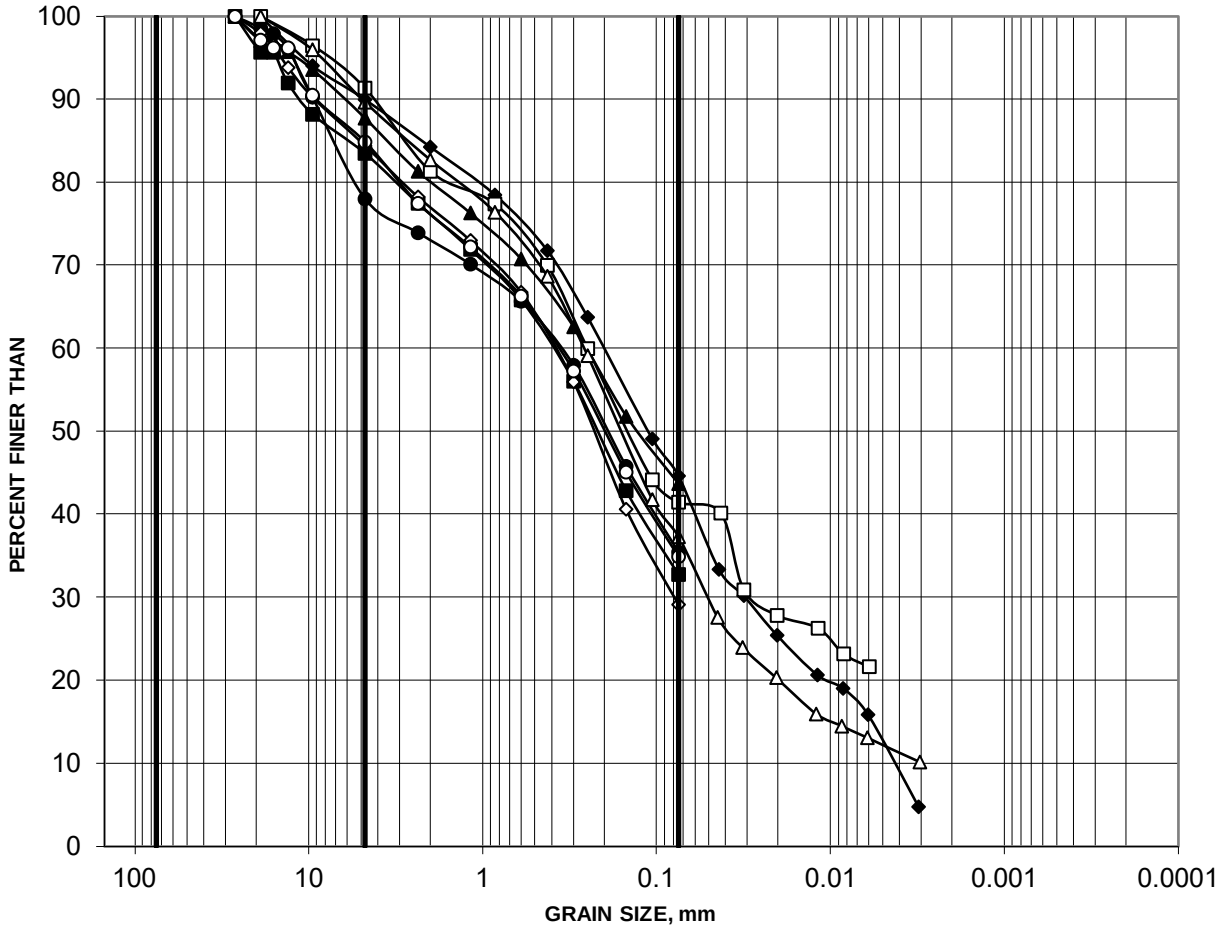
GRAIN SIZE DISTRIBUTION

FIGURE 5B

GLACIAL TILL



COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
	GRAVEL SIZE		SAND SIZE			

Borehole	Sample	Depth (m)	Constituents (%) Gravel	Sand	Silt	Clay
21-216	13	9.14-9.75	17	50		33
21-216	6	3.81-4.42	10	45	41	4
21-216	7	4.57-5.18	12	44		44
21-217	10	6.86-7.47	22	43		35
21-218	10	6.86-7.47	9	50	26	15
21-218	15	10.67-11.28	16	55		29
21-221	11	8.38-8.99	10	53	29	8
21-221	12	9.14-9.75	15	50		35

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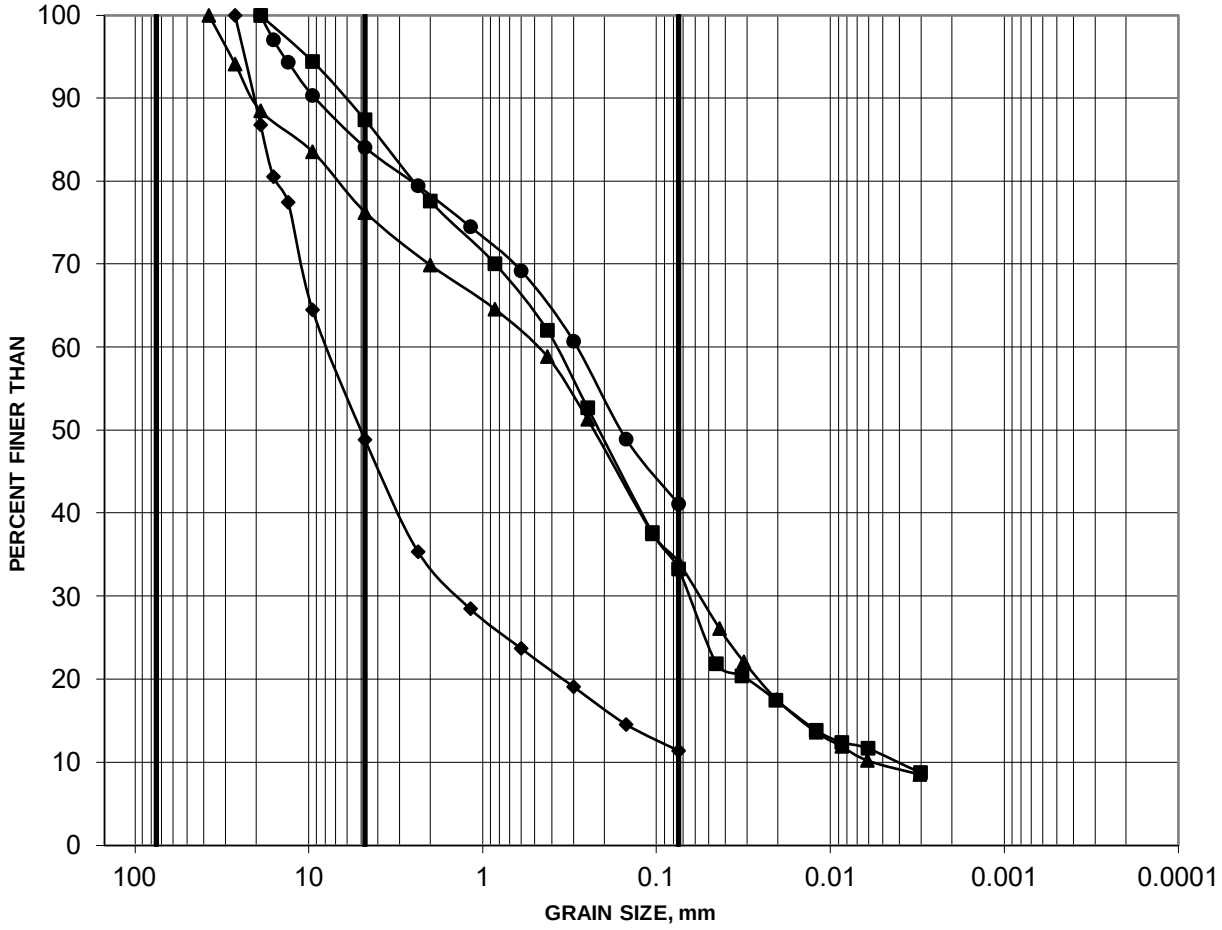
GRAIN SIZE DISTRIBUTION

FIGURE 5C

GLACIAL TILL



COBBLE SIZE	GRAVEL SIZE		SAND SIZE			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

	Borehole	Sample	Depth (m)	Constituents (%) Gravel	Sand	Silt	Clay
■	21-221	14	9.14-9.75	13	54	26	7
◆	21-221	15B	11.73-12.04	51	38	11	
▲	21-222	14	9.91-10.52	24	42	28	6
●	21-226	8	5.33-5.94	16	43	41	

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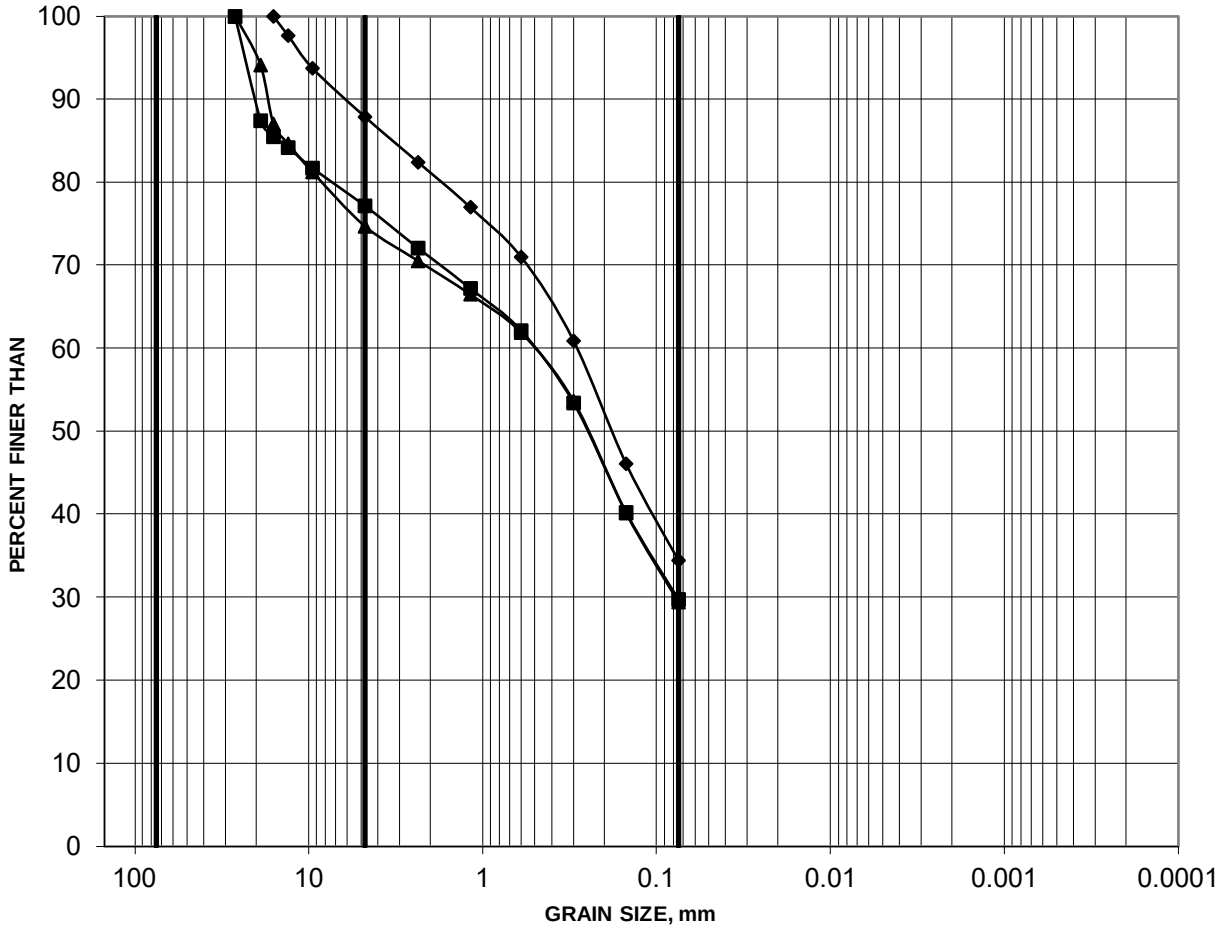
GRAIN SIZE DISTRIBUTION

FIGURE 5D

GLACIAL TILL



COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
	GRAVEL SIZE		SAND SIZE			

	Borehole	Sample	Depth (m)	Constituents (%) Gravel	Sand	Silt	Clay
■	22-109	5	3.05-3.66	23	47	30	
◆	22-110	6	3.81-4.42	12	54	34	
▲	22-113	6	3.81-4.42	25	46	29	

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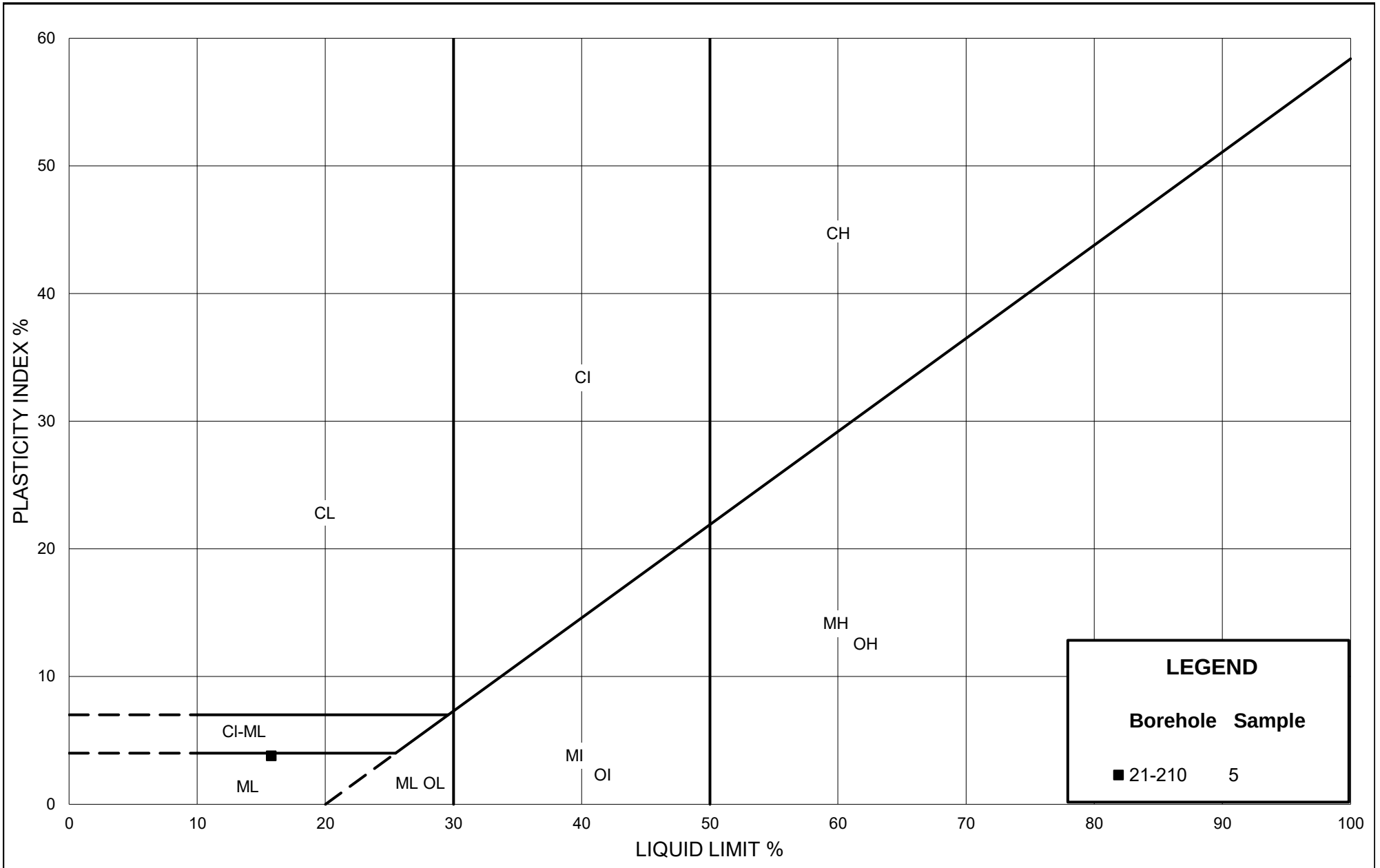

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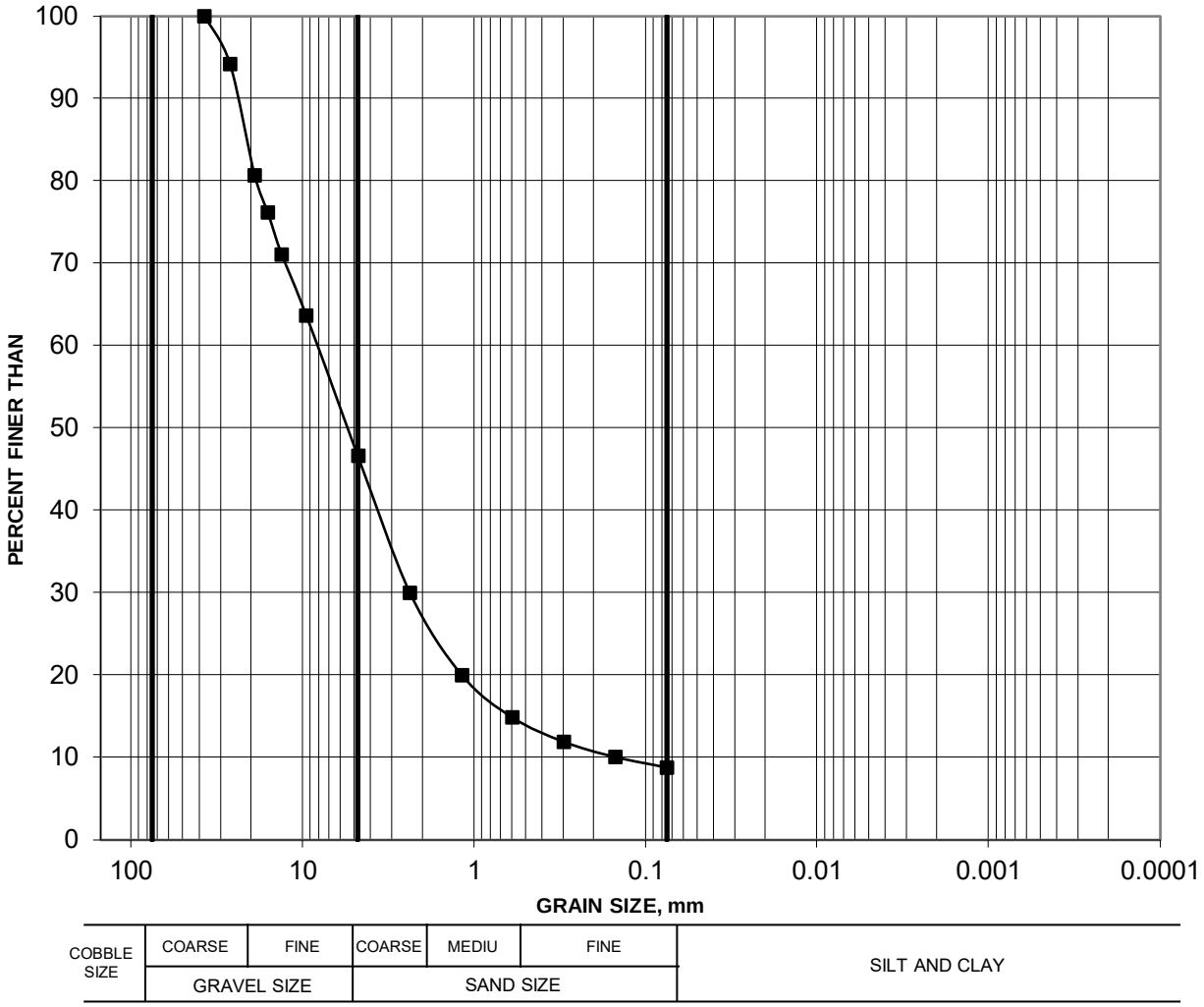
PLASTICITY CHART
GLACIAL TILL

Figure:	6
Project:	21451149/2000
Created By: CW	Checked By: MI

GRAIN SIZE DISTRIBUTION

FIGURE 7A

GRAVEL AND SAND



	Borehole	Sample	Depth (m)	Constituents (%) Gravel	Sand	Silt	Clay
—■—	21-201	13	9.14-9.75	53	38		9

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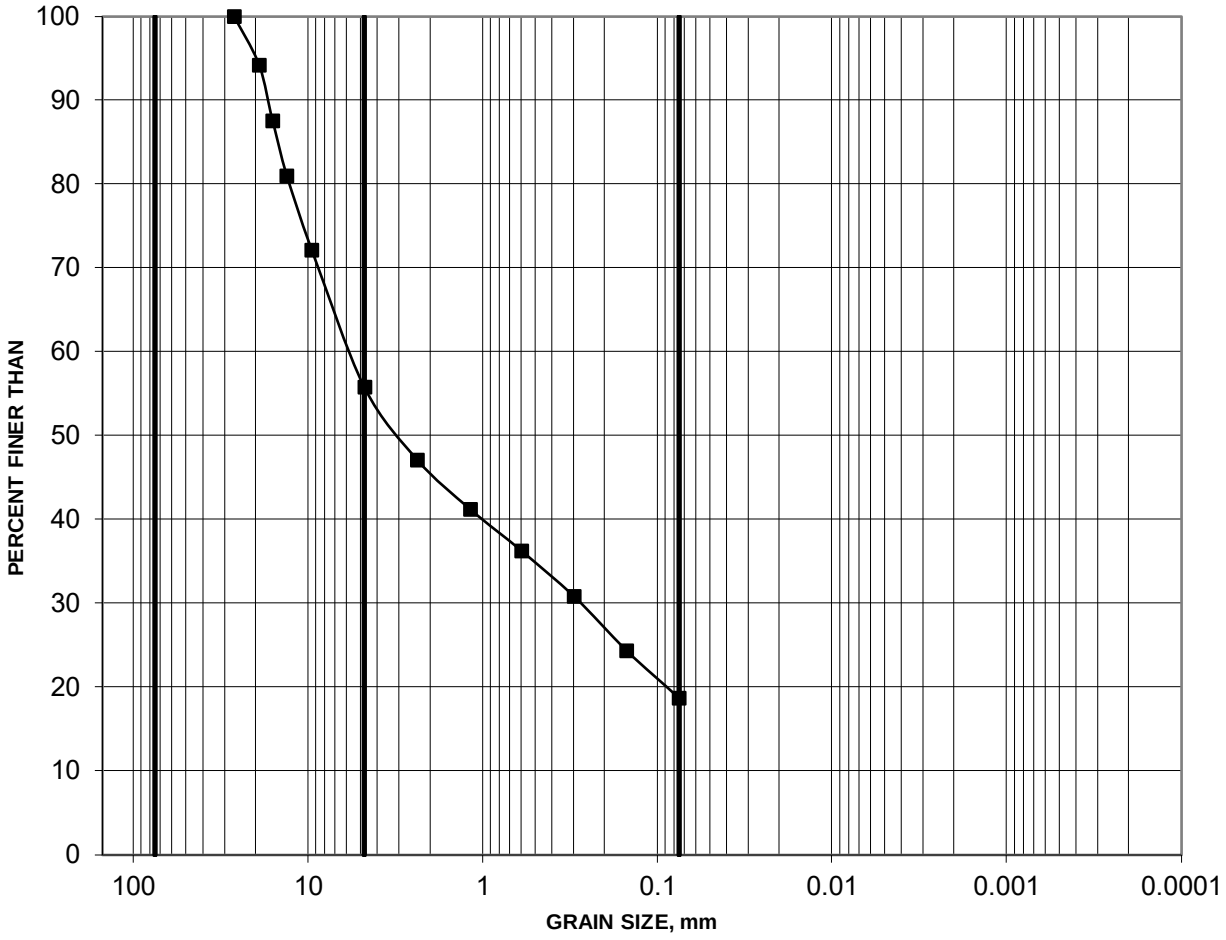
GRAIN SIZE DISTRIBUTION

FIGURE 7B

SILTY GRAVEL AND SAND



Borehole	Sample	Depth (m)	Constituents (%) Gravel	Sand	Silt	Clay
22-110	3	1.52-2.13	44	37	19	

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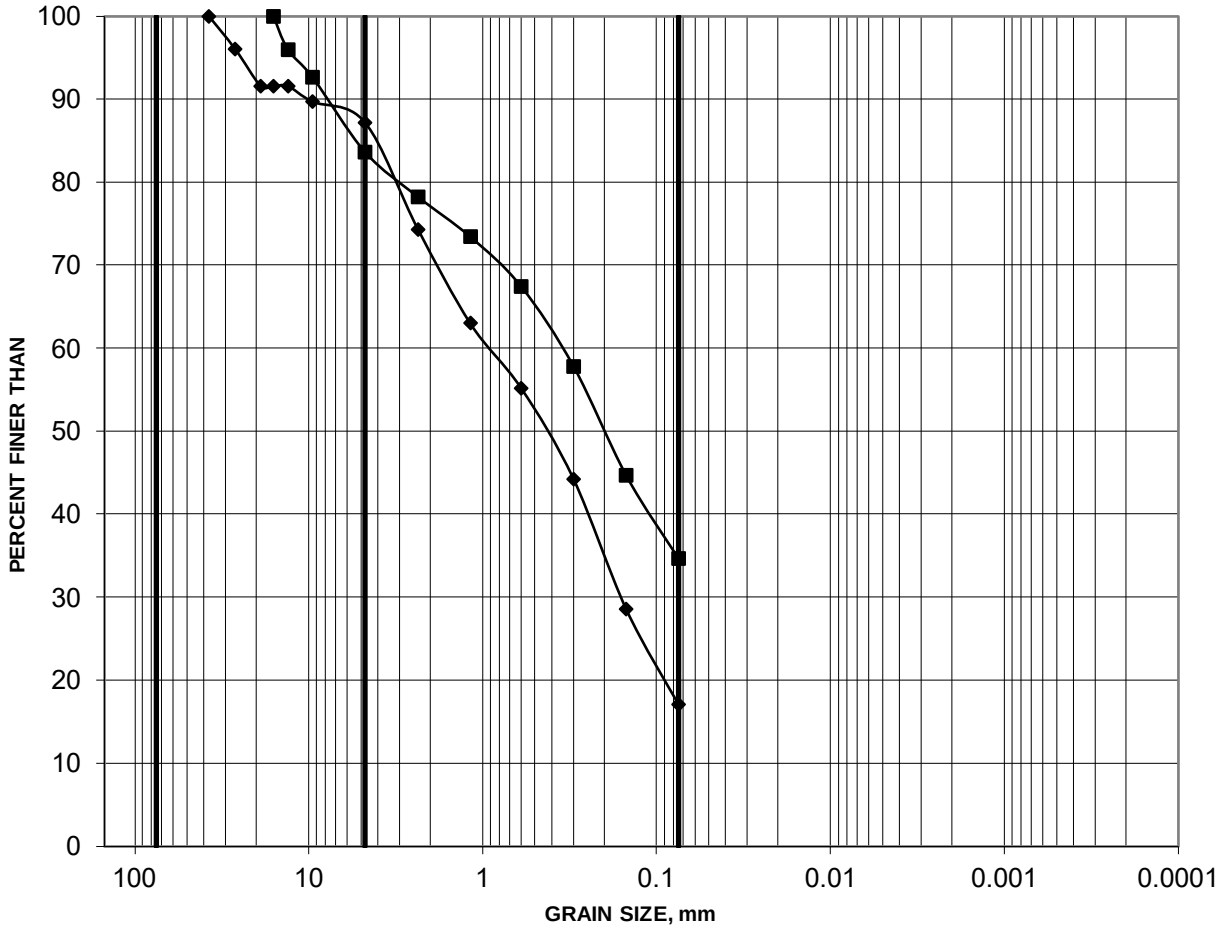
GRAIN SIZE DISTRIBUTION

FIGURE 7C

GRAVELLY SILTY SAND



COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
	GRAVEL SIZE		SAND SIZE			

	Borehole	Sample	Depth (m)	Constituents (%) Gravel	Sand	Silt	Clay
■	21-205	9	6.10-6.71	16	49	35	
◆	21-205	16	11.43-12.04	13	70	17	

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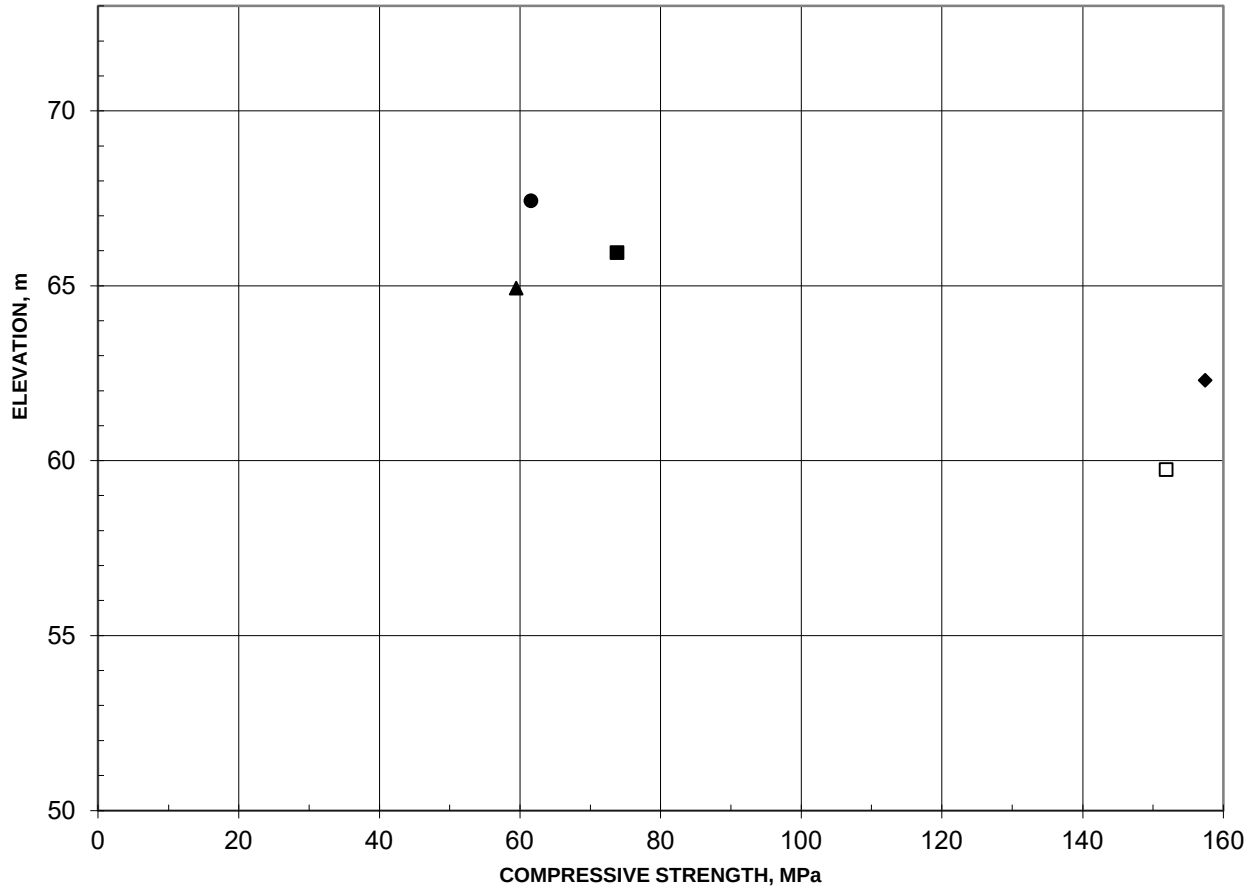
ASTM D7012 - Method C
UNCONFINED COMPRESSIVE STRENGTH OF ROCK CORE
SUMMARY OF LABORATORY TEST RESULTS

FIGURE 8



Borehole	Depth (m)	L/D	Bulk Density (kg/m^3)	Lithology	UCS (MPa)	Failure Type
BH21-207 RC1	14.3	2.4	2690	Limestone	74	1
BH21-213 RC1	13.8	2.4	2693	Limestone	157	1
BH21-214 RC1	10.9	2.2	2661	Limestone	59	1
BH21-219 RC1	12.0	2.4	2685	Limestone	62	1
BH21-221 RC1	14.8	2.5	2681	Limestone	152	1

Notes:

Failure Types

1. Well formed cones on both ends

Remarks

- Cores tested in vertical direction.
- Cores tested in air-dry condition.
- Time to failure > 2 and < 15 minutes.

Project: 21451149/2000

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Checked by:	CW

APPENDIX A

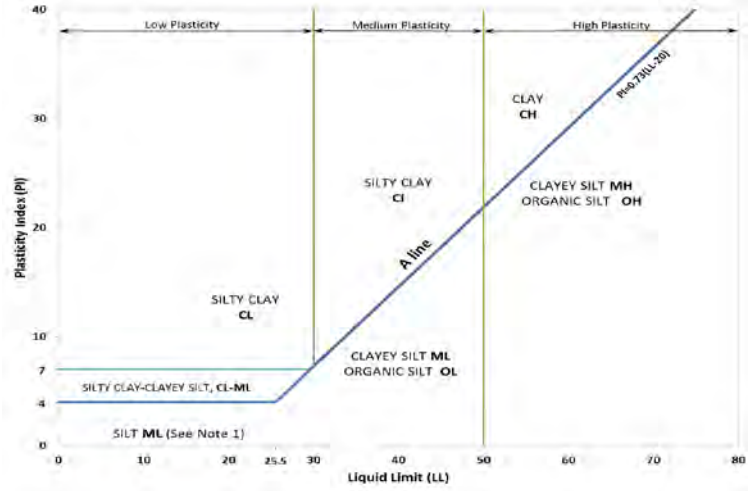
Method of Soil Classification and Terms
Lithological and Geotechnical Rock Description Terminology
Record of Borehole Logs Current Investigation

METHOD OF SOIL CLASSIFICATION

The Golder Associates Ltd. Soil Classification System is based on the Unified Soil Classification System (USCS)

Organic or Inorganic	Soil Group	Type of Soil		Gradation or Plasticity	$Cu = \frac{D_{60}}{D_{10}}$	$Cc = \frac{(D_{30})^2}{D_{10} x D_{60}}$	Organic Content	USCS Group Symbol	Group Name
INORGANIC (Organic Content ≤30% by mass)	COARSE-GRAINED SOILS (>50% by mass is larger than 0.075 mm)	GRAVELS (>50% by mass of coarse fraction is larger than 4.75 mm)	Gravels with ≤12% fines (by mass)	Poorly Graded	<4	≤1 or ≥3	≤30%	GP	GRAVEL
				Well Graded	≥4	1 to 3		GW	GRAVEL
			Gravels with >12% fines (by mass)	Below A Line	n/a			GM	SILTY GRAVEL
				Above A Line	n/a			GC	CLAYEY GRAVEL
		SANDS (≥50% by mass of coarse fraction is smaller than 4.75 mm)	Sands with ≤12% fines (by mass)	Poorly Graded	<6	≤1 or ≥3		SP	SAND
				Well Graded	≥6	1 to 3		SW	SAND
			Sands with >12% fines (by mass)	Below A Line	n/a			SM	SILTY SAND
				Above A Line	n/a			SC	CLAYEY SAND

Organic or Inorganic	Soil Group	Type of Soil	Laboratory Tests	Field Indicators					Organic Content	USCS Group Symbol	Primary Name
				Dilatancy	Dry Strength	Shine Test	Thread Diameter	Toughness (of 3 mm thread)			
INORGANIC (Organic Content ≤30% by mass)	FINE-GRAINED SOILS (≥50% by mass is smaller than 0.075 mm)	SILTS (Non-Plastic or PI and LL plot below A-Line on Plasticity Chart below)	Liquid Limit <50	Rapid	None	None	>6 mm	N/A (can't roll 3 mm thread)	<5%	ML	SILT
				Slow	None to Low	Dull	3mm to 6 mm	None to low	<5%	ML	CLAYEY SILT
				Slow to very slow	Low to medium	Dull to slight	3mm to 6 mm	Low	5% to 30%	OL	ORGANIC SILT
			Liquid Limit ≥50	Slow to very slow	Low to medium	Slight	3mm to 6 mm	Low to medium	<5%	MH	CLAYEY SILT
				None	Medium to high	Dull to slight	1 mm to 3 mm	Medium to high	5% to 30%	OH	ORGANIC SILT
		CLAYS (PI and LL plot above A-Line on Plasticity Chart below)	Liquid Limit <30	None	Low to medium	Slight to shiny	~ 3 mm	Low to medium	0% to 30% **(see Note 2)**	CL	SILTY CLAY
			Liquid Limit 30 to 50	None	Medium to high	Slight to shiny	1 mm to 3 mm	Medium		CI	SILTY CLAY
			Liquid Limit ≥50	None	High	Shiny	<1 mm	High		CH	CLAY
HIGHLY ORGANIC SOILS (Organic Content >30% by mass)		Peat and mineral soil mixtures							30% to 75%	PT	SILTY PEAT, SANDY PEAT
		Predominantly peat, may contain some mineral soil, fibrous or amorphous peat							75% to 100%		PEAT



Note 1 – Fine grained materials with PI and LL that plot in this area are named (ML) SILT with slight plasticity. Fine-grained materials which are non-plastic (i.e. a PL cannot be measured) are named SILT.
Note 2 – For soils with <5% organic content, include the descriptor "trace organics" for soils with between 5% and 30% organic content include the prefix "organic" before the Primary name.

Dual Symbol — A dual symbol is two symbols separated by a hyphen, for example, GP-GM, SW-SC and CL-ML.
For non-cohesive soils, the dual symbols must be used when the soil has between 5% and 12% fines (i.e. to identify transitional material between "clean" and "dirty" sand or gravel.
For cohesive soils, the dual symbol must be used when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart (see Plasticity Chart at left).

Borderline Symbol — A borderline symbol is two symbols separated by a slash, for example, CL/CI, GM/SM, CL/ML.
A borderline symbol should be used to indicate that the soil has been identified as having properties that are on the transition between similar materials. In addition, a borderline symbol may be used to indicate a range of similar soil types within a stratum.

ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES AND TEST PITS

PARTICLE SIZES OF CONSTITUENTS

Soil Constituent	Particle Size Description	Millimetres	Inches (US Std. Sieve Size)
BOULDERS	Not Applicable	>300	>12
COBBLES	Not Applicable	75 to 300	3 to 12
GRAVEL	Coarse Fine	19 to 75 4.75 to 19	0.75 to 3 (4) to 0.75
SAND	Coarse Medium Fine	2.00 to 4.75 0.425 to 2.00 0.075 to 0.425	(10) to (4) (40) to (10) (200) to (40)
SILT/CLAY	Classified by plasticity	<0.075	< (200)

MODIFIERS FOR SECONDARY AND MINOR CONSTITUENTS

Percentage by Mass	Modifier
>35	Use 'and' to combine major constituents (*i.e.,* SAND and GRAVEL)
> 12 to 35	Primary soil name prefixed with "gravelly, sandy, SILTY, CLAYEY" as applicable
> 5 to 12	some
≤ 5	trace

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.) split-spoon sampler for a distance of 300 mm (12 in.). Values reported are as recorded in the field and are uncorrected.

Cone Penetration Test (CPT)

An electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm^2 pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (q_t), porewater pressure (u) and sleeve frictions are recorded electronically at 25 mm penetration intervals.

Dynamic Cone Penetration Resistance (DCPT); 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.).

PH: Sampler advanced by hydraulic pressure
PM: Sampler advanced by manual pressure
WH: Sampler advanced by static weight of hammer
WR: Sampler advanced by weight of sampler and rod

SAMPLES

AS	Auger sample
BS	Block sample
CS	Chunk sample
DD	Diamond Drilling
DO or DP	Seamless open ended, driven or pushed tube sampler – note size
DS	Denison type sample
GS	Grab Sample
MC	Modified California Samples
MS	Modified Shelby (for frozen soil)
RC	Rock core
SC	Soil core
SS	Split spoon sampler – note size
ST	Slotted tube
TO	Thin-walled, open – note size (Shelby tube)
TP	Thin-walled, piston – note size (Shelby tube)
WS	Wash sample

SOIL TESTS

w	water content
PL , w_p	plastic limit
LL , w_L	liquid limit
C	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test[1]
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement[1]
D_R	relative density (specific gravity, Gs)
DS	direct shear test
GS	specific gravity
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
SO_4	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V (FV)	field vane (LV-laboratory vane test)
γ	unit weight

1. Tests anisotropically consolidated prior to shear are shown as CAD, CAU.

NON-COHESIVE (COHESIONLESS) SOILS

Compactness[2]

Term	SPT 'N' (blows/0.3m)[1]
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	>50

1. SPT 'N' in accordance with ASTM D1586, uncorrected for the effects of overburden pressure.
2. Definition of compactness terms are based on SPT 'N' ranges as provided in Terzaghi, Peck and Mesri (1996). Many factors affect the recorded SPT 'N' value, including hammer efficiency (which may be greater than 60% in automatic trip hammers), overburden pressure, groundwater conditions, and grainsize. As such, the recorded SPT 'N' value(s) should be considered only an approximate guide to the soil compactness. These factors need to be considered when evaluating the results, and the stated compactness terms should not be relied upon for design or construction.

Field Moisture Condition

Term	Description
Dry	Soil flows freely through fingers.
Moist	Soils are darker than in the dry condition and may feel cool.
Wet	As moist, but with free water forming on hands when handled.

COHESIVE SOILS

Consistency

Term	Undrained Shear Strength (kPa)	SPT 'N'[1,2] (blows/0.3m)
Very Soft	<12	0 to 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	>200	>30

1. SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects; approximate only.
2. SPT 'N' values should be considered ONLY an approximate guide to consistency; for sensitive clays (e.g., Champlain Sea clays), the N-value approximation for consistency terms does NOT apply. Rely on direct measurement of undrained shear strength or other manual observations.

Water Content

Term	Description
w < PL	Material is estimated to be drier than the Plastic Limit.
w ~ PL	Material is estimated to be close to the Plastic Limit.
w > PL	Material is estimated to be wetter than the Plastic Limit.

Unless otherwise stated, the symbols employed in the report are as follows:

I. GENERAL

π	3.1416
ln x	natural logarithm of x
$\log_{10}$	x or log x, logarithm of x to base 10
g	acceleration due to gravity
t	time

II. STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta\sigma$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
υ	Poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma - u$)
σ'_{vo}	initial effective overburden stress
$\sigma_1, \sigma_2, \sigma_3$	principal stress (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress $= (\sigma_1 + \sigma_2 + \sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III. SOIL PROPERTIES

(a) Index Properties

$\rho(\gamma)$	bulk density (bulk unit weight)*
$\rho_d(\gamma_d)$	dry density (dry unit weight)
$\rho_w(\gamma_w)$	density (unit weight) of water
$\rho_s(\gamma_s)$	density (unit weight) of solid particles
γ'	unit weight of submerged soil ($\gamma' = \gamma - \gamma_w$)
D_R	relative density (specific gravity) of solid particles ($D_R = \rho_s / \rho_w$) (formerly G_s)
e	void ratio
n	porosity
S	degree of saturation

* Density symbol is ρ. Unit weight symbol is γ where $\gamma = \rho g$ (i.e. mass density multiplied by acceleration due to gravity)

(a) Index Properties (continued)

w	water content
w_l or LL	liquid limit
w_p or PL	plastic limit
I_p or PI	plasticity index = $(w_l - w_p)$
NP	non-plastic
w_s	shrinkage limit
I_L	liquidity index = $(w - w_p) / I_p$
I_C	consistency index = $(w_l - w) / I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
I_D	density index = $(e_{max} - e) / (e_{max} - e_{min})$ (formerly relative density)

(b) Hydraulic Properties

h	hydraulic head or potential
q	rate of flow
v	velocity of flow
i	hydraulic gradient
k	hydraulic conductivity (coefficient of permeability)
j	seepage force per unit volume

(c) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (over-consolidated range)
C_s	swelling index
C_α	secondary compression index
m_v	coefficient of volume change
c_v	coefficient of consolidation (vertical direction)
c_h	coefficient of consolidation (horizontal direction)
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation stress
OCR	over-consolidation ratio = σ'_p / σ'_{vo}

(d) Shear Strength

τ_p, τ_r	peak and residual shear strength
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction = tan δ
c′	effective cohesion
c_u, s_u	undrained shear strength ($\phi = 0$ analysis)
p	mean total stress $(\sigma_1 + \sigma_3)/2$
p′	mean effective stress $(\sigma'_1 + \sigma'_3)/2$
q	$(\sigma_1 - \sigma_3)/2$ or $(\sigma'_1 - \sigma'_3)/2$
q_u	compressive strength $(\sigma_1 - \sigma_3)$
S_t	sensitivity

Notes: 1 $\tau = c' + \sigma' \tan \phi'$

2 shear strength = (compressive strength)/2

LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY

WEATHERING CLASSIFICATION

Fresh (W1): no visible sign of rock material weathering.

Slightly Weathered (W2): discoloration indicates weathering of rock mass material on discontinuity surfaces. **Less than 5%** of rock mass is altered or weathered.

Moderately Weathered (W3): less than 50% of the rock mass is decomposed and/or disintegrated to a soil. Fresh or discoloured rock is present either as a discontinuous framework or as corestones.

Highly Weathered (W4): more than 50% of the rock mass is decomposed and/or disintegrated to a soil. Fresh or discoloured rock is present either as a discontinuous framework or as corestones.

Completely Weathered (W5): 100% of the rock mass is decomposed and/or disintegrated to a soil. The original mass structure is still largely intact.

Residual Soil (W6): all rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

BEDDING THICKNESS

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

JOINT OR FOLIATION SPACING

Description	Spacing
Very wide	Greater than 3 m
Wide	1 m to 3 m
Moderately close	0.3 m to 1 m
Close	50 mm to 300 mm
Very close	Less than 50 mm

GRAIN SIZE

Term	Size*
Very Coarse Grained	Greater than 60 mm
Coarse Grained	2 mm to 60 mm
Medium Grained	60 microns to 2 mm
Fine Grained	2 microns to 60 microns
Very Fine Grained	Less than 2 microns

Note: * Grains greater than 60 microns diameter are visible to the naked eye

CORE CONDITION

Total Core Recovery (TCR)

The percentage of solid drill core recovered regardless of quality or length, measured relative to the length of the total core run.

Solid Core Recovery (SCR)

The percentage of solid drill core, regardless of length, recovered at full diameter, measured relative to the length of the total core run.

Rock Quality Designation (RQD)

The percentage of solid drill core, greater than 100 mm length, recovered at full diameter, as measured along the centerline axis of the core, relative to the length of the total core run. RQD varies from 0% for completely broken core to 100% for core in solid segments.

DISCONTINUITY DATA

Fracture Index

A count of the number of discontinuities (physical separations) in the rock core, including both naturally occurring fractures and mechanically induced breaks caused by drilling.

Dip with Respect to Core Axis

The angle of the discontinuity relative to the axis (length) of the core. In a vertical borehole, a discontinuity with a 90° angle is horizontal.

Description and Notes

An abbreviation description of the discontinuities, whether naturally occurring separations such as fractures, bedding planes and foliation planes or mechanically induced features caused by drilling such as ground or shattered core and mechanically separated bedding or foliation surfaces. Additional information concerning the nature of fracture surfaces and infillings are also noted.

Abbreviations

AXJ Axial Joint
BD Bedding
BC Broken Core
CC Continuous Core
CL Closed
CO Contact
CU Curved
CT Coated
FLT Fault
FOL Foliation
FR Fracture
GO Gouge
IN Infilled
IR Irregular
JN Joint
KV Karstic Void
K Slickensided
LC Lost Core
MB Mechanical Break
PL Planar
PO Polished
RO Rough
SA Slightly Altered
SH Shear
SM Smooth
SR Slightly Rough
SY Stylolite
UN Undulating
VN Vein
VR Very Rough

ISRM Intact Rock Material Strength Classification

Grade	Description	Approx. Range of Uniaxial Compressive Strength (MPa)
R0	Extremely weak rock	0.25 – 1.0
R1	Very weak rock	1.0 – 5.0
R2	Weak rock	5.0 – 25
R3	Medium strong rock	25 – 50
R4	Strong rock	50 -100
R5	Very strong rock	100 -250
R6	Extremely strong rock	>250

PROJECT: 21451149

RECORD OF BOREHOLE: 21-01

SHEET 1 OF 1

LOCATION: N 5028807.8 ;E 366831.0

BORING DATE: June 11, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE		65.05							
	Power Auger 200 mm Diam. (Hollow Stem)	ASPHALTIC CONCRETE		0.05							Flush Mount Casing
		FILL - (SW/GW) gravelly SAND to sandy GRAVEL, angular; grey (PAVEMENT STRUCTURE)		64.44	1	SS	14				Backfill; Bentonite Seal
1		FILL - (SW) gravelly SILTY SAND; dark brown to brown; non-cohesive, moist to wet, compact		0.61							Silica Sand
				63.85	2	SS	18				
		FILL - Wood; brown; non-cohesive, moist		1.20							52 mm Diam. PVC #10 Slot Screen
				1.30							
		FILL/WASTE - (SM) gravelly SILTY SAND; dark brown to black, contains asphalt; non-cohesive, moist, compact		1.45							
				63.37	3	SS	>50				
		FILL - (SM) gravelly SILTY SAND; brown, with black staining; non-cohesive, moist to wet, compact		1.68							
2				63.14							Cave
		FILL - (GW) sandy GRAVEL; grey; non-cohesive, moist, very dense		1.91							
		End of Borehole Auger Refusal									
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RI

CHECKED: KM/BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-02

SHEET 1 OF 2

LOCATION: N 5028720.9 ;E 366811.1

BORING DATE: May 18, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		65.67							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; dark brown, contains organic matter (rootlets); non-cohesive, moist		0.00	1	SS	9		○	M	Bentontie Seal
		FILL - (SM) gravelly SILTY SAND; dark brown, contains brick, ash, organic matter and silty clay layers; non-cohesive, moist, loose to compact		0.15	2	SS	>50				
1				64.40							
		Borehole continued on RECORD OF DRILLHOLE 21-02		1.27							
2											
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: KM/CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-02

SHEET 2 OF 2

LOCATION: N 5028720.9 ;E 366811.1

DRILLING DATE: May 18, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.	
		BEDROCK SURFACE		64.40															
2	Rotary Drill / NQ Core	Fresh, thinly to medium bedded, grey to dark grey, fine to medium grained, non-porous, very strong SHALEY NODULAR LIMESTONE - Broken core from 1.44 m to 1.55 m		1.27	1	100													Bentontie Seal Silica Sand UCS = 130 MPa
3					2	100													32 mm Diam. PVC #10 Slot Screen
4																			
5					3	100													
6																			Silica Sand
7				58.38	4	100													
		End of Drillhole Note(s): 1. Water level in screen measured at 2.09 m (Elev. 63.59 m) on May 28, 2021		7.29															

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: KM/CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-03

SHEET 1 OF 2

LOCATION: N 5028765.9 ;E 366781.2

BORING DATE: May 18, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		64.97							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist, loose		0.00 64.72	1	SS	5				
		FILL - (SM) SILTY SAND, trace gravel; dark brown to grey brown, contains organic matter and brick fragments; non-cohesive, moist, compact		0.25							Bentonite Seal
1					2	SS	10				
		(SM) gravelly SILTY SAND; grey brown (GLACIAL TILL); non-cohesive, moist, very dense		63.45 1.52	3	SS	>50				
		Borehole continued on RECORD OF DRILLHOLE 21-03		1.68							
2											
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: KM/CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-03

SHEET 2 OF 2

LOCATION: N 5028765.9 ;E 366781.2

DRILLING DATE: May 18, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.	
		BEDROCK SURFACE		63.29															
2	Rotary Drill / NQ Core	Fresh, thinly to medium bedded, grey to dark grey, fine to medium grained, non-porous, very strong SHALEY NODULAR LIMESTONE - Broken core from 2.05 m to 2.07 m		1.68	1	100													Bentontie Seal UCS = 130 MPa Silica Sand
3					2	100													
4		- Broken core from 3.57 m to 3.58 m																	32 mm Diam. PVC #10 Slot Screen
5		- Broken core from 4.64 m to 4.66 m		59.66	3	100													
6		End of Drillhole Note(s): 1. Water level in screen measured at 2.59 m (Elev. 62.38 m) on May 28, 2021 2. Water level in screen measured at 2.67 m (Elev. 62.30 m) on June 23, 2021		5.31															
7																			
8																			
9																			
10																			
11																			

DEPTH SCALE
1 : 50

LOGGED: RI
CHECKED: KM/CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-04

SHEET 1 OF 1

LOCATION: N 5028747.0 ;E 366692.9

BORING DATE: May 13, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		67.61							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (ML) sandy SILT; dark brown, contains organic matter (rootlets); non-cohesive, moist, very loose		0.00 / 67.31	1	SS	5				
		FILL - (CL/CI) SILTY CLAY, trace to some sand, trace gravel; grey brown, contains concrete fragments and organic matter; cohesive, w>PL, firm		0.30							
1					2	SS	6		○		
2					3	SS	5				
				65.32							
		FILL - (GM/SM) SILTY GRAVEL and SAND; dark brown, contains concrete, brick and wood fragments; non-cohesive, moist to wet, compact to very loose		2.29	4	SS	18		○	M	
3					5	SS	1				
				63.80	6	SS	>50				
		End of Borehole Auger Refusal		3.81							
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: RI
CHECKED: KM/CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-05

SHEET 1 OF 2

LOCATION: N 5028738.6 ;E 366737.3

BORING DATE: May 14, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		65.58							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (ML/SM) SILTY SAND to sandy SILT, trace gravel; dark brown, contains brick fragments and organic matter (rootlets); non-cohesive, moist, loose		0.00 65.35	1	SS	12				
				0.23							Bentonite Seal
1		FILL - (SM) gravelly SILTY SAND, some low-plastisity fines; dark brown, contains concrete, carpet and organic matter (rootlets); non-cohesive, moist, loose			2	SS	50		○	MH	
				64.34							
	Rotary Drill NQ Core	CONCRETE		1.24	1	RC	DD				Bentonite Seal
				63.79							
2		FILL - (SM) gravelly SILTY SAND; brown; non-cohesive, moist to wet		1.79							
		Borehole continued on RECORD OF DRILLHOLE 21-05		1.95							
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RI

CHECKED: KM/CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-05

SHEET 2 OF 2

LOCATION: N 5028738.6 ;E 366737.3

DRILLING DATE: May 14, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		BEDROCK SURFACE		63.63														
2	Rotary Drill / NQ Core	Fresh, thinly to medium bedded, grey to dark brey, fine to medium grained, non-porous, strong SHALEY NODULAR LIMESTONE		1.95														
					2	0												
3																		
4					3	0-25												
5																		
6					4	0-25												
				58.64														
7		End of Drillhole Note(s): 1. Water level in screen measured at 2.72 m (Elev. 62.86 m) on May 28, 2021 2. Water level in screen measured at 2.73 m (Elev. 62.85 m) on June 2, 2021		6.94														
8																		
9																		
10																		
11																		

UCS = 97 MPa

Bentonite Seal

Silica Sand

38 mm Diam. PVC #10 Slot Screen

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: KM/CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-06

SHEET 1 OF 2

LOCATION: N 5028643.3 ;E 366748.4

BORING DATE: May 12, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		67.00							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (ML) sandy SILT, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist, loose		0.00							
				0.15	1	SS	11				Bentonite Seal
		FILL - (SC) SILTY CLAYEY SAND, some low-medium plasticity fines, trace gravel; brown to dark brown, with black staining, contains wood, organic matter (rootlets); cohesive, moist, compact									
1					2	SS	14				Backfill
					3	SS	15		○	MH	Bentonite Seal
2				64.97							
		Borehole continued on RECORD OF DRILLHOLE 21-06		2.03							
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: KM/CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-06

SHEET 2 OF 2

LOCATION: N 5028643.3 ;E 366748.4

DRILLING DATE: May 12, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.	
		BEDROCK SURFACE		64.97															
3	Rotary Drill / NQ Core	Fresh, thinly to medium bedded, grey to dark grey, fine to medium grained, non-porous, very strong SHALEY NODULAR LIMESTONE		2.03	1	100													Bentonite Seal UCS = 109 MPa Silica Sand
					2	100													
4		- Broken core from 4.03 m to 4.04 m			3	100													38 mm Diam. PVC #10 Slot Screen
5				61.60															
		End of Drillhole		5.40															
6		Note(s):																	
		1. Water level in screen measured at 1.19 m (Elev. 65.82 m) on May 27, 2021																	
		2. Water level in screen measured at 2.70 m (Elev. 64.31 m) on June 23, 2021																	
7																			
8																			
9																			
10																			
11																			
12																			

DEPTH SCALE
1 : 50

LOGGED: RI
CHECKED: KM/CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-07

SHEET 1 OF 2

LOCATION: N 5028686.9 ;E 366770.2

BORING DATE: May 17, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		66.70							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM/ML) SILTY SAND to sandy SILT, trace gravel, trace clay; dark brown, contains organic matter (rootlets); non-cohesive, moist, loose		0.00							
		FILL - (SM) SILTY SAND, trace gravel, trace to some clay; dark brown to brown, contains ash, organic matter, brick fragments, concrete fragments, silty clay layers and wood; non-cohesive, moist, loose to very dense		66.47							
				0.23	1	SS	8				Bentonite Seal
1					2	SS	19				
					3	SS	>50				64 mm Diam. VSP Pipe
2											
				64.16	4	SS	>50				
		Borehole continued on RECORD OF DRILLHOLE 21-07		2.54							
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

GOLDER

LOGGED: RI
CHECKED: KM/CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-07

SHEET 2 OF 2

LOCATION: N 5028686.9 ;E 366770.2

DRILLING DATE: May 17, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.	
		BEDROCK SURFACE		64.16															
3	Rotary Drill NQ Core	Fresh, thinly to medium bedded, grey to dark grey, fine to medium grained, non-porous, strong SHALEY NODULAR LIMESTONE - Lost core from 2.54 m to 2.64 m - Broken core from 3.08 m to 3.10 m		2.54	1	100													
4					2	100													UCS = 95 MPa
5					3	100													UCS = 106 MPa
6		- Broken core from 6.21 m to 6.23 m																	
7					4	100													64 mm Diam. VSP Pipe
8					5	100													
9																			
10					6	100													
				55.79															
11		End of Borehole		10.91															
12																			

DEPTH SCALE
1 : 50

LOGGED: RI
CHECKED: KM/CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-08

SHEET 1 OF 1

LOCATION: N 5028762.3 ;E 366650.3

BORING DATE: May 18, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		66.02							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) gravelly SILTY SAND; brown, contains organics; cohesive, moist, dense		0.00							
		FILL - (SM) gravelly SILTY SAND, trace organics andgravel; brown, contains brick fragments; cohesive, moist, dense to very dense		0.15	1	SS	30		○		
1					2	SS	>50		○		
				64.80							
		End of Borehole Auger Refusal		1.22							
2											
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: AKP

CHECKED: KM/CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-09

SHEET 1 OF 2

LOCATION: N 5028717.0 ;E 366649.1

BORING DATE: May 18, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		66.35							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) gravelly SILTY SAND; brown, contains organics; non-cohesive, moist, loose		0.00	1	SS	10				
		FILL - (SM) gravelly SILTY SAND; dark brown to brown, trace organics; non-cohesive, moist, loose to dense		0.15							
1					2	SS	41		○	M	
				64.78	3	SS	>50				
		Borehole continued on RECORD OF DRILLHOLE 21-09		1.57							
2											
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: AKP

CHECKED: KM/CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-09

SHEET 2 OF 2

LOCATION: N 5028717.0 ;E 366649.1

DRILLING DATE: May 18, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		BEDROCK SURFACE		64.78															
2	Rortary Drill / BW Casing	Fresh, thinly bedded, medium to dark brownish grey, fine grained, non-porous, strong SHALEY NODULAR LIMESTONE - veritcal join from 2.04 to 2.09 m depth - vertical joint from 2.38 to 2.43 m depth		1.57	1														
3				63.23															
		End of Drillhole		3.12															
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			

DEPTH SCALE
1 : 50

LOGGED: AKP
CHECKED: KM/CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-10

SHEET 1 OF 2

LOCATION: N 5028684.9 ;E 366642.2

BORING DATE: May 18, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		66.19							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) gravelly SILTY SAND; brown, contains organics; non-cohesive, moist, loose		0.00							
				0.15	1	SS	10				
1		FILL - (SM) gravelly SILTY SAND; dark brown to brown, contains organics, brick fragments and clay pockets; non-cohesive, moist, loose to compact			2	SS	15				Bentonite Seal
					3	SS	>50				
2				64.01							
		Borehole continued on RECORD OF DRILLHOLE 21-10		2.18							
3											
4											
5											
6											
7											
8											
9											
10											

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: AKP

CHECKED: KM/CH

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-10

SHEET 2 OF 2

LOCATION: N 5028684.9 ;E 366642.2

DRILLING DATE: May 18, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.	
		BEDROCK SURFACE		64.01															
3	Rotary Drill / NQ Core	Fresh, thinly to medium bedded, medium grey to brownish grey, fine to medium grained, non-porous, medium strong SHALEY LIMESTONE -broken core from 2.38 to 2.45 m depth - vertical joint from 2.69 to 4.06 m		2.18	1		80 60 40 20	80 60 40 20	80 60 40 20	5 10 15 20	0 30 60 90					10^{-6} 10^{-5} 10^{-4} 10^{-3}	2 4 6		Bentonite Seal Silica Sand
4					2														38 mm Diam. PVC #10 Slot Screen
5		- broken core from 5.1 to 5.22 m depth		60.70															
		End of Drillhole Note(s): 1. Water level in screen measured at 2.66 m (Elev. 63.53 m) on May 28, 2021 2. Water level in screen measured at 2.66 m (Elev. 63.53 m) on June 23, 2021		5.49															

DEPTH SCALE
1 : 50

LOGGED: AKP
CHECKED: KM/CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-11

SHEET 1 OF 1

LOCATION: N 5028623.7 ;E 366685.5

BORING DATE: May 13, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		67.35							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, some clay; dark brown, contains organic matter (rootlets); non-cohesive, moist, very loose		0.00	1	SS	3				
				67.05							
		FILL - (SM) gravelly SILTY SAND, trace to some clay; dark brown, contains organic matter; non-cohesive, moist to wet, very loose to compact		0.30							
1					2	SS	11				
					3	SS	>50				
				65.67							
		End of Borehole Auger Refusal		1.68							
2											
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-12

SHEET 1 OF 2

LOCATION: N 5028586.9 ;E 366762.5

BORING DATE: May 19, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		68.72									
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) gravelly SILTY SAND; brown, contains organics; non-cohesive, moist		0.00									
		FILL - (SM) gravellly SILTY SAND; dark brown to brown with black mottling; non-cohesive, moist, compact		0.15	1	SS	26						
1					2	SS	20						
				67.32									
		Borehole continued on RECORD OF DRILLHOLE 21-12		1.4									
2													
3													
4													
5													
6													
7													
8													
9													
10													

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

DEPTH SCALE

1 : 50

GOLDER

LOGGED: AKP

CHECKED: CH

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-12

SHEET 2 OF 2

LOCATION: N 5028586.9 ;E 366762.5

DRILLING DATE: May 19, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate
BD - Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage
PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular
PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR / % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		BEDROCK SURFACE		67.32														
2	Rotary Drill / NQ Core	Fresh, thinly bedded, medium to dark brownish grey, fine grained, non-porous, strong SHALEY NODULAR LIMESTONE - broken core from 1.61 to 1.70 m depth - broken core from 2.15 to 2.19 m depth		1.40 65.75														
3		End of Drillhole		2.97														
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		

DEPTH SCALE
1 : 50

LOGGED: AKP
CHECKED: CH

PROJECT: 21451149

RECORD OF BOREHOLE: 21-13

SHEET 1 OF 2

LOCATION: N ;E

BORING DATE: May 13, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE									
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (ML) sandy SILT, trace clay; dark brown, contains organic matter (rootlets); non-cohesive, moist		0.00							
		FILL - (CL/CI) SILTY CLAY, trace sand, trace gravel; grey brown, contains organic matter; cohesive, w~PL, firm		0.23	1	SS	6		○		
1		(SM/ML) SILTY SAND to sandy SILT, some gravel to gravelly; grey (GLACIAL TILL); non-cohesive, moist to wet, compact		0.76	2	SS	23		○	M	
2					3	SS	10		○		
3		Borehole continued on RECORD OF DRILLHOLE 21-13		2.97							
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-13

SHEET 2 OF 2

LOCATION: N ;E

DRILLING DATE: May 13, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		BEDROCK SURFACE					80 60 40 20	80 60 40 20	80 60 40 20	5 10 15 20	0 30 60 90					10^{-6} 10^{-5} 10^{-4} 10^{-3}	2 4 6	
3	Rotary Drill / NQ Core	Slightly weathered to fresh, thinly to medium bedded, medium grey to brownish grey, fine to medium grained, non-porous, medium strong SHALEY LIMESTONE - broken core from 2.97 to 3.05 m depth - vertical joint from 2.97 to 3.27 m depth		2.97	1													
4		- lost core from 3.88 to 4.30 m depth																
5		End of Drillhole		4.98														
6																		
7																		
8																		
9																		
10																		
11																		
12																		

DEPTH SCALE
1 : 50

LOGGED: RI
CHECKED: CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-201

SHEET 1 OF 2

LOCATION: N 5028309.4 ;E 366459.5

BORING DATE: June 8, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		82.46							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; dark brown, contains organic matter (rootlets): non-cohesive, moist, loose		0.00 / 82.08	1	SS	5				
		FILL - (SM) SILTY SAND, brown to dark brown, contains organic matter; non-cohesive, moist, loose		0.38 / 81.70							
1		(SM) SILTY SAND, grey brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, loose to compact		0.76	2	SS	9		○	M	Bentonite Seal
2					3	SS	19				
					4	SS	15				
3				79.41							
		(SM/GM) SILTY gravelly SAND to SILTY sandy GRAVEL; grey to red brown, contains cobbles and boulders; non-cohesive, moist to wet, compact to very dense		3.05	5	SS	>50				
4					6	SS	14				Backfill
					7	SS	76				
5	Rotary Drill/Wash Boring NW Casing	(SP/GP) Gravelly SAND to Sandy GRAVEL, some non-plastic fines; brown, contains cobbles and boulders; non-cohesive, wet, very dense		77.48 / 4.98	8	RC	-				
6					9	RC	-				June 18, 2021 June 24, 2021
7					10	RC	-				Bentonite Seal
8						SS	>50				
					12	RC	-				Silica Sand
9					13	SS	102		○	M	32 mm Diam. PVC #10 Slot Screen
					14	RC	-				
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-201

SHEET 2 OF 2

LOCATION: N 5028309.4 ;E 366459.5

BORING DATE: June 8, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Rotary Drill/Wash Boring, NW Casing	(SP/GP) Gravelly SAND to Sandy GRAVEL, some non-plastic fines; brown, contains cobbles and boulders; non-cohesive, wet, very dense			14	RC	-				
					15	SS	>50				
11											32 mm Diam. PVC #10 Slot Screen
					16	RC	-				
12											
					17	SS	89				Cave
				69.78							
	DCPT	Dynamic Cone Penetration Test (DCPT)		12.68 / 69.58					120		
13		End of Borehole DCPT Refusal		12.88							
		1. Water level in screen measured at 6.5 m (Elev. 75.95 m) on June 24, 2021 2. Water level in screen measured at 6.45 m (Elev. 76.01) on June 18, 2021									
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE
1 : 50

GOLDER

LOGGED: RI
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-201

SHEET 1 OF 2

LOCATION: N 5028309.4 ;E 366459.5

BORING DATE: June 8, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		82.46							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; dark brown, contains organic matter (rootlets): non-cohesive, moist, loose		0.00 / 82.08	1	SS	5				
		FILL - (SM) SILTY SAND, brown to dark brown, contains organic matter; non-cohesive, moist, loose		0.38 / 81.70							
1		(SM) SILTY SAND, grey brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, loose to compact		0.76	2	SS	9		○	M	Bentonite Seal
2					3	SS	19				
					4	SS	15				
3				79.41							
		(SM/GM) SILTY gravelly SAND to SILTY sandy GRAVEL; grey to red brown, contains cobbles and boulders; non-cohesive, moist to wet, compact to very dense		3.05	5	SS	>50				
4					6	SS	14				Backfill
					7	SS	76				
5	Rotary Drill/Wash Boring NW Casing			77.48							
		(SP/GP) Gravelly SAND to Sandy GRAVEL, some non-plastic fines; brown, contains cobbles and boulders; non-cohesive, wet, very dense		4.98	8	RC	-				
6					9	RC	-				June 18, 2021 June 24, 2021
7					10	RC	-				Bentonite Seal
8						SS	>50				
					12	RC	-				Silica Sand
9					13	SS	102		○	M	32 mm Diam. PVC #10 Slot Screen
					14	RC	-				
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: RI
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-201

SHEET 2 OF 2

LOCATION: N 5028309.4 ;E 366459.5

BORING DATE: June 8, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
10	Rotary Drill/Wash Boring NW Casing	(SP/GP) Gravelly SAND to Sandy GRAVEL, some non-plastic fines; brown, contains cobbles and boulders; non-cohesive, wet, very dense			14	RC	-				
					15	SS	>50				32 mm Diam. PVC #10 Slot Screen
11					16	RC	-				
12					17	SS	89				Cave
	DCPT			69.78							
		Dynamic Cone Penetration Test (DCPT)		12.68					120		
13		End of Borehole		69.58							
		DCPT Refusal		12.88							
		1. Water level in screen measured at 6.5 m (Elev. 75.95 m) on June 24, 2021									
		2. Water level in screen measured at 6.45 m (Elev. 76.01) on June 18, 2021									
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE
1 : 50

GOLDER

LOGGED: RI
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-202

SHEET 1 OF 3

LOCATION: N 5028386.4 ;E 366468.2

BORING DATE: May 25, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		81.20							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; dark brown, contains organic matter (rootlets); non-cohesive, moist, very loose		0.00 80.95							
		FILL - (SM) SILTY SAND; dark brown to brown, contains organic matter; non-cohesive, moist, very loose		0.25	1	SS	3				Bentonite Seal
1					2	SS	4				
		(CI/CH) SILTY CLAY to CLAY, trace sand; grey brown, highly fissured (WEATHERED CRUST); cohesive, w<PL, very stiff		79.98 1.22							
				79.37	3	SS	14				
2		(SM) gravelly SILTY SAND; grey brown, possible cobbles and boulders (GLACIAL TILL); non-cohesive, moist, loose to dense		1.83							
					4	SS	16				
3					5	SS	10				
4					6	SS	36				
					7	SS	7				June 9, 2021
5				75.86							
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very loose		5.34	8	SS	2				Backfill
6				75.10							
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very loose		6.10	9	SS	WH				
				74.34							
7		(SM/GM) gravelly SILTY SAND to SILTY sandy GRAVEL; brown, contains cobbles and boulders; non-cohesive, wet, dense		6.86	10	SS	45				
8					11	SS	34				
				72.97							
		(SW) gravelly SAND, fine to coarse, trace to some silt; grey brown, possible cobbles and boulders; non-cohesive, wet, compact		8.23	12	SS	16				
9					13	SS	24				
10					14	SS	14				
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-202

SHEET 2 OF 3

LOCATION: N 5028386.4 ;E 366468.2

BORING DATE: May 25, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SW) gravelly SAND, fine to coarse, trace to some silt; grey brown, possible cobbles and boulders; non-cohesive, wet, compact			14	SS	14				
11					15	SS	27				
				69.61							
		(SW) gravelly SAND, fine to coarse, trace to some silt; brown, contains cobbles and boulders; non-cohesive, wet, compact to dense		11.59	16	SS	1				
12					17	SS	12				
13	Rotary Drill/Wash Boring NW Casing				18	SS	>50				Backfill
					19	RC	DD				
					20	SS	43				
14											
15					21	SS	32				
16											Bentonite Seal
				64.71	22	SS	>50				
		Borehole continued on RECORD OF DRILLHOLE 21-202		16.49							
17											
18											
19											
20											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-202

SHEET 3 OF 3

LOCATION: N 5028386.4 ;E 366468.2

DRILLING DATE: May 25, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate
BD - Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage
PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular
PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: Jcon	DISCONTINUITY DATA: Jr	DISCONTINUITY DATA: Ja	ROCK STRENGTH INDEX: R4	ROCK STRENGTH INDEX: R3	ROCK STRENGTH INDEX: R2	ROCK STRENGTH INDEX: R1	WEATHERING INDEX: W1	WEATHERING INDEX: W2	WEATHERING INDEX: W3	WEATHERING INDEX: W4	Q AVG.	
		BEDROCK SURFACE		64.71																					
17	Rotary Drill, NQ core	Slightly weathered to fresh, thickly to massive bedded, medium brownish grey, fine to coarse grained, faintly porous, strong LIMESTONE, with thin shale partings - Broken core from 16.49 m to 16.58 m - Broken core from 16.82 m to 16.85 m - Broken core from 17.56 m to 17.59 m		16.49	1	100																			Bentonite Seal Silica Sand
18					2	25																			
19		- Broken/lost core from 19.25 m to 19.36 m			3	25																			32 mm Diam. PVC #10 Slot Screen
20																									
21					4	25																			Silica Sand
				59.38																					
22		End of Drillhole Note(s): 1. Water level in screen measured at 5.15 m (Elev. 76.04 m) on June 9, 2021		21.82																					
23																									
24																									
25																									
26																									

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-202

SHEET 1 OF 3

LOCATION: N 5028386.4 ;E 366468.2

BORING DATE: May 25, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		81.20							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; dark brown, contains organic matter (rootlets); non-cohesive, moist, very loose		0.00 80.95							
		FILL - (SM) SILTY SAND; dark brown to brown, contains organic matter; non-cohesive, moist, very loose		0.25	1	SS	3				Bentonite Seal
1					2	SS	4				
		(CI/CH) SILTY CLAY to CLAY, trace sand; grey brown, highly fissured (WEATHERED CRUST); cohesive, w<PL, very stiff		79.98 1.22							
				79.37	3	SS	14				
2		(SM) gravelly SILTY SAND; grey brown, possible cobbles and boulders (GLACIAL TILL); non-cohesive, moist, loose to dense		1.83							
					4	SS	16				
3					5	SS	10				
4					6	SS	36				
					7	SS	7				June 9, 2021
5				75.86							
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very loose		5.34	8	SS	2				Backfill
6				75.10							
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very loose		6.10	9	SS	WH				
				74.34							
7		(SM/GM) gravelly SILTY SAND to SILTY sandy GRAVEL; brown, contains cobbles and boulders; non-cohesive, wet, dense		6.86	10	SS	45				
8					11	SS	34				
				72.97							
		(SW) gravelly SAND, fine to coarse, trace to some silt; grey brown, possible cobbles and boulders; non-cohesive, wet, compact		8.23	12	SS	16				
9					13	SS	24				
10					14	SS	14				
		CONTINUED NEXT PAGE									

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: CH

PROJECT: 21451149

RECORD OF BOREHOLE: 21-202

SHEET 2 OF 3

LOCATION: N 5028386.4 ;E 366468.2

BORING DATE: May 25, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10	Power Auger 200 mm Diam. (Hollow Stem)	*--- CONTINUED FROM PREVIOUS PAGE ---*									
		(SW) gravelly SAND, fine to coarse, trace to some silt; grey brown, possible cobbles and boulders; non-cohesive, wet, compact			14	SS	14				
11					15	SS	27				
				69.61							
		(SW) gravelly SAND, fine to coarse, trace to some silt; brown, contains cobbles and boulders; non-cohesive, wet, compact to dense		11.59	16	SS	1				
12	Rotary Drill/Wash Boring NW Casing				17	SS	12				
13					18	SS	>50				Backfill
					19	RC	DD				
					20	SS	43				
14											
15					21	SS	32				
16											Bentonite Seal
				64.71	22	SS	>50				
		Borehole continued on RECORD OF DRILLHOLE 21-202		16.49							
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-202

SHEET 3 OF 3

LOCATION: N 5028386.4 ;E 366468.2

DRILLING DATE: May 25, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	ROCK STRENGTH INDEX: R4	R3	R2	R1	WEATHERING INDEX: W1	W2	W3	W4	Q AVG.	
		BEDROCK SURFACE		64.71																					
17	Rotary Drill / NQ core	Slightly weathered to fresh, thickly to massive bedded, medium brownish grey, fine to coarse grained, faintly porous, strong LIMESTONE, with thin shale partings - Broken core from 16.49 m to 16.58 m - Broken core from 16.82 m to 16.85 m - Broken core from 17.56 m to 17.59 m		16.49	1	100	80	80	80	5	0														Bentonite Seal Silica Sand
18					2	25	80	80	80	5	0														
19		- Broken/lost core from 19.25 m to 19.36 m			3	25	80	80	80	5	0														32 mm Diam. PVC #10 Slot Screen
20																									
21				59.38	4	25	80	80	80	5	0														Silica Sand
22		End of Drillhole Note(s): 1. Water level in screen measured at 5.15 m (Elev. 76.04 m) on June 9, 2021		21.82																					
23																									
24																									
25																									
26																									

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-203

SHEET 1 OF 2

LOCATION: N 5028375.5 ;E 366524.0

BORING DATE: May 19, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		81.36							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist, loose		0.00 81.11	1	SS	31				
		FILL - (SM) SILTY SAND; brown; non-cohesive, moist, compact		0.25 80.45							
1		(CI/CH) SILTY CLAY to CLAY, trace sand; grey brown, highly fissured, contains organic matter (WEATHERED CRUST); cohesive, w>PL, very stiff to stiff		0.91 1.07	2	SS	4				
		(SM) gravelly SILTY SAND; grey brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, loose to compact			3	SS	15				
2					4	SS	20				
3					5	SS	17				
4					6	SS	15				
					7	SS	15				
5				76.02							
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to dense		5.34	8	SS	4				
6					9	SS	12				
7					10	SS	11				
8					11	SS	42				
				72.98							
		(SW) SAND, fine to coarse, trace to some gravel; grey; non-cohesive, wet, loose to compact		8.38	12	SS	5				
9					13	SS	10				
10					14	SS	17				
		CONTINUED NEXT PAGE									

DEPTH SCALE
1 : 50

LOGGED: RI
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-203

SHEET 2 OF 2

LOCATION: N 5028375.5 ;E 366524.0

BORING DATE: May 19, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SW) SAND, fine to coarse, trace to some gravel; grey; non-cohesive, wet, loose to compact			14	SS	17				
11					15	SS	29				
				69.77							
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders; non-cohesive, wet, very dense		11.59	16	SS	100				
12				69.16							
		(GW/SW) gravelly SAND to sandy GRAVEL, some silt; grey, contains cobbles and boulders; non-cohesive, wet, very dense		12.20	17	SS	74				
13											
				67.34							
14		(SM/ML) SILTY SAND to sandy SILT, trace to some gravel; grey; non-cohesive, wet, compact		14.02	18	SS	13				
15				66.12							
		(SW) gravelly SAND, fine to coarse, some silt; grey; non-cohesive, wet, dense		15.24	19	SS	41				
				65.51							
16	DCPT	Dynamic Cone Penetration Test (DCPT)		15.85					162 162		
				64.46							
17		End of Borehole DCPT Refusal		16.90							
18											
19											
20											

DEPTH SCALE
1 : 50

LOGGED: RI
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-203

SHEET 1 OF 2

LOCATION: N 5028375.5 ;E 366524.0

BORING DATE: May 19, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		81.36							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist, loose		0.00 81.11	1	SS	31				
		FILL - (SM) SILTY SAND; brown; non-cohesive, moist, compact		0.25 80.45							
1		(CI/CH) SILTY CLAY to CLAY, trace sand; grey brown, highly fissured, contains organic matter (WEATHERED CRUST); cohesive, w>PL, very stiff to stiff		0.91 1.07	2	SS	4				
		(SM) gravelly SILTY SAND; grey brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, loose to compact			3	SS	15				
2					4	SS	20				
3					5	SS	17				
4					6	SS	15				
					7	SS	15				
5				76.02							▽
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to dense		5.34	8	SS	4				
6					9	SS	12				
7					10	SS	11				
					11	SS	42				
8				72.98							
		(SW) SAND, fine to coarse, trace to some gravel; grey; non-cohesive, wet, loose to compact		8.38	12	SS	5				
9					13	SS	10				
10					14	SS	17				
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-203

SHEET 2 OF 2

LOCATION: N 5028375.5 ;E 366524.0

BORING DATE: May 19, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SW) SAND, fine to coarse, trace to some gravel; grey; non-cohesive, wet, loose to compact			14	SS	17				
11					15	SS	29				
				69.77							
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders; non-cohesive, wet, very dense		11.59	16	SS	100				
12				69.16							
		(GW/SW) gravelly SAND to sandy GRAVEL, some silt; grey, contains cobbles and boulders; non-cohesive, wet, very dense		12.20	17	SS	74				
13											
				67.34							
14		(SM/ML) SILTY SAND to sandy SILT, trace to some gravel; grey; non-cohesive, wet, compact		14.02	18	SS	13				
15				66.12							
		(SW) gravelly SAND, fine to coarse, some silt; grey; non-cohesive, wet, dense		15.24	19	SS	41				
				65.51							
16	DCPT	Dynamic Cone Penetration Test (DCPT)		15.85					162 162		
				64.46							
17		End of Borehole DCPT Refusal		16.90							
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-204

SHEET 1 OF 2

LOCATION: N 5028364.7 ;E 366570.7

BORING DATE: June 9, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		81.09							
0	Power Auger	TOPSOIL -(SM) SILTY SAND; dark brown, contains organic matter (rootlets); non-cohesive, moist, loose		0.00							
				0.15	1	SS	5				Bentonite Seal
		FILL - (SP) SAND, fine to medium, some silt; brown to dark brown, contains organic matter; non-cohesive, moist, loose		80.48							
1				0.61	2	SS	6				
		FILL - (SM) SILTY SAND, trace gravel; brown to dark brown, contains organic matter; non-cohesive, moist, loose		79.57							
		(SM) gravelly SILTY SAND; grey brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, loose to compact		1.52	3	SS	6				
2					4	SS	11				
3					5	SS	19				Backfill
				77.28							
4		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact		3.81	6	SS	15				
					7	SS	25				
5					8	SS	>50				June 18, 2021 June 24, 2021 Bentonite Seal
6					9	SS	18				Silica Sand
7					10	SS	11				
8					11	SS	16				50 mm Diam. PVC #10 Slot Screen
					12	SS	21				
9				71.94							
	DCPT	(SW) gravelly SAND, fine to coarse, some silt; grey; non-cohesive, wet, compact		9.15	13	SS	24				Cave
				71.33							
		Dynamic Cone Penetration Test (DCPT)		9.76							
10											

CONTINUED NEXT PAGE

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: CH

PROJECT: 21451149

RECORD OF BOREHOLE: 21-204

SHEET 2 OF 2

LOCATION: N 5028364.7 ;E 366570.7

BORING DATE: June 9, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	DCPT	Dynamic Cone Penetration Test (DCPT)		70.21							Cave
11		End of Borehole DCPT Refusal		10.88					105		
		Note(s): 1. Water level in screen measured at 5.21 m (Elev. 75.88 m) on June 24, 2021 2. Water level in screen measured at 5.16 m (Elev. 75.93 m) on June 18, 2021									
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-204

SHEET 1 OF 2

LOCATION: N 5028364.7 ;E 366570.7

BORING DATE: June 9, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		81.09							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL -(SM) SILTY SAND; dark brown, contains organic matter (rootlets); non-cohesive, moist, loose		0.00	1	SS	5				Bentonite Seal
		FILL - (SP) SAND, fine to medium, some silt; brown to dark brown, contains organic matter; non-cohesive, moist, loose		0.15 80.48							
1		FILL - (SM) SILTY SAND, trace gravel; brown to dark brown, contains organic matter; non-cohesive, moist, loose		0.61 79.57	2	SS	6				
2		(SM) gravelly SILTY SAND; grey brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, loose to compact		1.52	3	SS	6				
					4	SS	11				
3					5	SS	19				Backfill
				77.28							
4		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact		3.81	6	SS	15				
					7	SS	25				
5					8	SS	>50				June 18, 2021 June 24, 2021 Bentonite Seal
6					9	SS	18				Silica Sand
7					10	SS	11				
8					11	SS	16				50 mm Diam. PVC #10 Slot Screen
					12	SS	21				
9	DCPT			71.94							
		(SW) gravelly SAND, fine to coarse, some silt; grey; non-cohesive, wet, compact		9.15	13	SS	24				Cave
				71.33							
10		Dynamic Cone Penetration Test (DCPT)		9.76							
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-204

SHEET 2 OF 2

LOCATION: N 5028364.7 ;E 366570.7

BORING DATE: June 9, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
	DCPT	Dynamic Cone Penetration Test (DCPT)									Cave
				70.21							
11		End of Borehole DCPT Refusal		10.88					105		
		Note(s): 1. Water level in screen measured at 5.21 m (Elev. 75.88 m) on June 24, 2021 2. Water level in screen measured at 5.16 m (Elev. 75.93 m) on June 18, 2021									
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-205

SHEET 1 OF 2

LOCATION: N 5028354.6 ;E 366633.4

BORING DATE: June 8, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		81.68							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM/ML) SILTY SAND to sandy SILT, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist, loose		0.00							
				81.38	1	SS	1				
		FILL - (SM) SILTY SAND; dark brown to brown, contains organic matter; non-cohesive, moist, compact		0.30							
1					2	SS	10				
				80.46							
		(CI/CH) SILTY CLAY to CLAY, trace sand; grey brown, highly fissured (WEATHERED CRUST); cohesive, w<PL, very stiff		1.22							
2					3	SS	17		○	MH	
					4	SS	12				
				78.94							
		(SM) gravelly SILTY SAND; grey brown, contains cobbles and boulders (GLACIAL TILL); non-cohesve, moist to wet, compact		2.74							
3					5	SS	16				
					6	SS	12				
4											
				76.80	7	SS	16				
		(SM) gravelly SILTY SAND; grey, contains cobles and boulders (GLACIAL TILL); non-cohesive, wet, compact		4.88							
5				76.34							
		(SW) gravelly SAND, fine to coarse; grey; non-cohesive, wet, wet, loose to compact		5.34	8	SS	8				
6					9	SS	4		○	M	
7					10	SS	4				
8					11	SS	14				
					12	SS	24				
9					13	SS	17				
					14	SS	12				
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-205

SHEET 2 OF 2

LOCATION: N 5028354.6 ;E 366633.4

BORING DATE: June 8, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SW) gravelly SAND, fine to coarse; grey; non-cohesive, wet, wet, loose to compact			14	SS	12				
11					15	SS	67				
12					16	SS	4		○	M	
				69.18	17	SS	62				
		(SW) gravelly SAND, fine to coarse, some silt; grey non-cohesive; wet, very dense		12.50							
13					18	SS	51				
				67.96							
	Rotary Drill NW Casing	(SM/GM) SILTY sandy GRAVEL to SILTY gravelly SAND; grey; non-cohesive, wet, very dense		13.72	19	SS	79				
14				67.05							
				14.63							
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-205A

SHEET 1 OF 2

LOCATION: N 5028354.6 ;E 366633.4

BORING DATE: June 8, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		81.68							
0	Power Auger 200 mm Diam. (Hollow Stem)	For soil stratigraphy refer to record of borehole 21-205		0.00							
1				80.16							
	DCPT	Dynamic Cone Penetration Test (DCPT)		1.52							
2											
3											
4											
5											
6											
7											
8											
9											
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-205A

SHEET 2 OF 2

LOCATION: N 5028354.6 ;E 366633.4

BORING DATE: June 8, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	DCPT	Dynamic Cone Penetration Test (DCPT)									
				71.09							
		End of Borehole DCPT Refusal		10.59				114			
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-205A

SHEET 1 OF 2

LOCATION: N 5028354.6 ;E 366633.4

BORING DATE: June 8, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		81.68							
0	Power Auger 200 mm Diam. (Hollow Stem)	For soil stratigraphy refer to record of borehole 21-205		0.00							
1				80.16							
	DCPT	Dynamic Cone Penetration Test (DCPT)		1.52							
2											
3											
4											
5											
6											
7											
8											
9											
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-205A

SHEET 2 OF 2

LOCATION: N 5028354.6 ;E 366633.4

BORING DATE: June 8, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	DCPT	Dynamic Cone Penetration Test (DCPT)									
				71.09							
		End of Borehole DCPT Refusal		10.59				114			
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-205

SHEET 1 OF 2

LOCATION: N 5028354.6 ;E 366633.4

BORING DATE: June 8, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		81.68							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM/ML) SILTY SAND to sandy SILT, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist, loose		0.00							
				81.38	1	SS	1				
		FILL - (SM) SILTY SAND; dark brown to brown, contains organic matter; non-cohesive, moist, compact		0.30							
1					2	SS	10				
				80.46							
		(CI/CH) SILTY CLAY to CLAY, trace sand; grey brown, highly fissured (WEATHERED CRUST); cohesive, w<PL, very stiff		1.22							
2					3	SS	17		○	MH	
					4	SS	12				
				78.94							
		(SM) gravelly SILTY SAND; grey brown, contains cobbles and boulders (GLACIAL TILL); non-cohesve, moist to wet, compact		2.74							
3					5	SS	16				
					6	SS	12				
4											
				76.80	7	SS	16				
		(SM) gravelly SILTY SAND; grey, contains cobles and boulders (GLACIAL TILL); non-cohesive, wet, compact		4.88							
5				76.34							
		(SW) gravelly SAND, fine to coarse; grey; non-cohesive, wet, wet, loose to compact		5.34	8	SS	8				
6					9	SS	4		○	M	
7					10	SS	4				
8					11	SS	14				
					12	SS	24				
9					13	SS	17				
10					14	SS	12				

CONTINUED NEXT PAGE

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

PROJECT: 21451149

RECORD OF BOREHOLE: 21-205

SHEET 2 OF 2

LOCATION: N 5028354.6 ;E 366633.4

BORING DATE: June 8, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SW) gravelly SAND, fine to coarse; grey; non-cohesive, wet, wet, loose to compact			14	SS	12				
11					15	SS	67				
12					16	SS	4		○	M	
				69.18	17	SS	62				
		(SW) gravelly SAND, fine to coarse, some silt; grey non-cohesive; wet, very dense		12.50							
13					18	SS	51				
				67.96							
	Rotary Drill NW Casing	(SM/GM) SILTY sandy GRAVEL to SILTY gravelly SAND; grey; non-cohesive, wet, very dense		13.72	19	SS	79				
14				67.05							
				14.63							
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-206

SHEET 1 OF 2

LOCATION: N 5028404.8 ;E 366638.6

BORING DATE: May 19, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		77.09							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; dark brown, contains organic matter; non-cohesive, moist, loose		0.00							
		FILL -(SM) gravelly SILTY SAND; grey brown, contains cobbles and boulders; non-cohesive, moist, compact to very dense		0.15	1	SS	9				
1					2	SS	>50				
				75.57							
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, loose to compact		1.52	3	SS	7				
2					4	SS	8				
3					5	SS	10				
4					6	SS	13				
					7	SS	9				
5				71.75							
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact		5.34	8	SS	10				
6					9	SS	13				
7					10	SS	13				
				69.47							
		(SP/SM) gravelly SAND to SILTY SAND, some gravel; grey; non-cohesive, moist to wet, loose to very dense		7.62	11	SS	23				
8					12	SS	16				
9					13	SS	3				
10					14	SS	7				
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: BW

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-206

SHEET 2 OF 2

LOCATION: N 5028404.8 ;E 366638.6

BORING DATE: May 19, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SP/SM) gravelly SAND to SILTY SAND, some gravel; grey; non-cohesive, moist to wet, loose to very dense			14	SS	7				
11					15	SS	10				
12				65.00	16	SS	>50				
		End of Borehole Auger Refusal		12.09							
13		Note(s): 1. Methane gas noted at a depth of 9.90 mbgs									
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: BW

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-206

SHEET 1 OF 2

LOCATION: N 5028404.8 ;E 366638.6

BORING DATE: May 19, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		77.09							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; dark brown, contains organic matter; non-cohesive, moist, loose		0.00							
		FILL -(SM) gravelly SILTY SAND; grey brown, contains cobbles and boulders; non-cohesive, moist, compact to very dense		0.15	1	SS	9				
1					2	SS	>50				
				75.57							
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, loose to compact		1.52	3	SS	7				
2					4	SS	8				
3					5	SS	10				
4					6	SS	13				
					7	SS	9				
5				71.75							
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact		5.34	8	SS	10				
6					9	SS	13				
7					10	SS	13				
				69.47							
		(SP/SM) gravelly SAND to SILTY SAND, some gravel; grey; non-cohesive, moist to wet, loose to very dense		7.62	11	SS	23				
8					12	SS	16				
9					13	SS	3				
10					14	SS	7				
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

LOGGED: BW

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-206

SHEET 2 OF 2

LOCATION: N 5028404.8 ;E 366638.6

BORING DATE: May 19, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s; WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SP/SM) gravelly SAND to SILTY SAND, some gravel; grey; non-cohesive, moist to wet, loose to very dense			14	SS	7				
11					15	SS	10				
					16	SS	>50				
12				65.00							
		End of Borehole Auger Refusal Note(s): 1. Methane gas noted at a depth of 9.90 mbgs		12.09							
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE
1 : 50

LOGGED: BW
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-207

SHEET 1 OF 3

LOCATION: N 5028410.7 ;E 366583.4

BORING DATE: June 4, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		80.26							
0	Rotary Drill/ Wash Boring; NW Casing	TOPSOIL - (SM) SILTY SAND, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist, loose		0.00 80.03	1	SS	1				Bentonite Seal
		FILL - (SM) gravelly SILTY SAND, angular; grey; non-cohesive, moist, very loose		0.23 0.38 79.50							
1		FILL - (SP) SAND, fine to medium, trace silt; brown; non-cohesive, moist, very loose		0.76	2	SS	5				
		(CI/CH) SILTY CLAY to CLAY, trace siltl; grey brown, highly fissured (WEATHERED CRUST); cohesive, w~PL to w>PL, very stiff			3	SS	7				
2					4	SS	6				
		(SM) gravelly SILTY SAND; brown to grey brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, loose		77.52 2.74							
3					5	SS	9				
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose		76.45 3.81	6	SS	5				
4											
					7	SS	5				
5											64 mm Diam. VSP Pipe
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to compact		74.92 5.34	8	SS	9				
6					9	SS	7				
7					10	SS	11				
8					11	SS	10				
					12	SS	13				
9					13	SS	15				
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-207

SHEET 2 OF 3

LOCATION: N 5028410.7 ;E 366583.4

BORING DATE: June 4, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s; WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
	Rotary Drill/ Wash Boring / NW Casing	(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to compact		69.59							
11		(SW) gravelly SAND, trace to some silt; grey, contains cobbles and boulders; non-cohesive, wet, loose to very dense		10.67	14	SS	4				64 mm Diam. VSP Pipe
					15	RC	-				
12				68.09	16	SS	>50				
		Borehole continued on RECORD OF DRILLHOLE 21-207		12.17							
13											
14											
15											
16											
17											
18											
19											
20											

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: 20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: 20 40 60 80

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-207

SHEET 3 OF 3

LOCATION: N 5028410.7 ;E 366583.4

DRILLING DATE: June 4, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: Jcon	DISCONTINUITY DATA: Jr	DISCONTINUITY DATA: Ja	ROCK STRENGTH INDEX: R4	ROCK STRENGTH INDEX: R3	ROCK STRENGTH INDEX: R2	ROCK STRENGTH INDEX: R1	WEATHERING INDEX: W1	WEATHERING INDEX: W2	WEATHERING INDEX: W3	WEATHERING INDEX: W4	Q AVG.	
		BEDROCK SURFACE		68.09																					
13	Rotary Drill / HQ Core	Fresh, thinly to medium bedded, medium bedded, medium grey to brownish grey, fine to medium grained, non-porous, strong SHALEY NODULAR LIMESTONE - Broken/lost core from 12.17 m to 12.34 m		12.17	1	100																			64 mm Diam. VSP Pipe
14					2	100																			
15					3	100																			UCS = 74 MPa
16					4	100																			
17		- Mud seam from 16.66 m to 16.69 m																							64 mm Diam. VSP Pipe
18		- Heavy fossilferous/bioturbated from 17.60 m to 21.61 m			5	100																			
19		- Heavy calcite veining from 18.40 m to 21.61 m																							
20					6	100																			
21		- Broken core from 20.54 m to 20.59 m			7	100																			
22		End of Drillhole Note(s): 1. Water level in screen measured at 3.32 m (Elev. 76.94 m) on June 9, 2021		58.65 21.61																					

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-207

SHEET 1 OF 3

LOCATION: N 5028410.7 ;E 366583.4

BORING DATE: June 4, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) WATER CONTENT PERCENT Wp W Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE	80.26							
0	Rotary Drill/ Wash Boring; NW Casing	TOPSOIL - (SM) SILTY SAND, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist, loose	0.00							
		FILL - (SM) gravelly SILTY SAND, angular; grey; non-cohesive, moist, very loose	80.03	1	SS	1				Bentonite Seal
		FILL - (SP) SAND, fine to medium, trace silt; brown; non-cohesive, moist, very loose	0.23							
		(CI/CH) SILTY CLAY to CLAY, trace siltl; grey brown, highly fissured (WEATHERED CRUST); cohesive, w~PL to w>PL, very stiff	0.38							
			79.50							
1			0.76	2	SS	5				
2				3	SS	7				
				4	SS	6				
			77.52							
3		(SM) gravelly SILTY SAND; brown to grey brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, loose	2.74							
				5	SS	9				
			76.45							
4		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose	3.81	6	SS	5				
				7	SS	5				
5			74.92							
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to compact	5.34	8	SS	9				64 mm Diam. VSP Pipe
6				9	SS	7				
7				10	SS	11				
				11	SS	10				
8										
				12	SS	13				
9				13	SS	15				
10		*CONTINUED NEXT PAGE*								

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-207

SHEET 2 OF 3

LOCATION: N 5028410.7 ;E 366583.4

BORING DATE: June 4, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Rotary Drill/ Wash Boring, NW Casing	(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to compact		69.59							
11		(SW) gravelly SAND, trace to some silt; grey, contains cobbles and boulders; non-cohesive, wet, loose to very dense		10.67	14	SS	4				64 mm Diam. VSP Pipe
					15	RC	-				
12				68.09	16	SS	>50				
		Borehole continued on RECORD OF DRILLHOLE 21-207		12.17							
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE
1 : 50

LOGGED: RI
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-207

SHEET 3 OF 3

LOCATION: N 5028410.7 ;E 366583.4

DRILLING DATE: June 4, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: Jcon	DISCONTINUITY DATA: Jr	DISCONTINUITY DATA: Ja	ROCK STRENGTH INDEX: R4	ROCK STRENGTH INDEX: R3	ROCK STRENGTH INDEX: R2	ROCK STRENGTH INDEX: R1	WEATHERING INDEX: W1	WEATHERING INDEX: W2	WEATHERING INDEX: W3	WEATHERING INDEX: W4	Q AVG.	
		BEDROCK SURFACE		68.09																					
13	Rotary Drill / HQ Core	Fresh, thinly to medium bedded, medium bedded, medium grey to brownish grey, fine to medium grained, non-porous, strong SHALEY NODULAR LIMESTONE - Broken/lost core from 12.17 m to 12.34 m		12.17	1	100																			64 mm Diam. VSP Pipe
14					2	100																			
15					3	100																			UCS = 74 MPa
16					4	100																			
17		- Mud seam from 16.66 m to 16.69 m																							64 mm Diam. VSP Pipe
18		- Heavy fossilferous/bioturbated from 17.60 m to 21.61 m			5	100																			
19		- Heavy calcite veining from 18.40 m to 21.61 m																							
20					6	100																			
21		- Broken core from 20.54 m to 20.59 m			7	100																			
22		End of Drillhole Note(s): 1. Water level in screen measured at 3.32 m (Elev. 76.94 m) on June 9, 2021		58.65 21.61																					

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-208

SHEET 1 OF 2

LOCATION: N 5028416.5 ;E 366534.7

BORING DATE: June 1, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		80.77							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; dark brown, contains organic matter (rootlets); non-cohesive, moist, loose		0.00 80.52							
		FILL - (SP) SAND, fine to medium, trace silt; brown; non-cohesive, moist, loose		0.25 79.86	1	SS	6				
1		(CI/CH) SILTY CLAY to CLAY, trace sand; grey brown, highly fissured, contains thin lamination of silty sand and very thin beds of gravelly silty sand (WEATHERED CRUST); cohesive, w~PL to w>PL, very stiff		0.91	2	SS	9				
					3	SS	13				
2					4	SS	8				
3				77.57							
		(SM/ML) SILTY SAND to sandy SILT, some gravel, some low plasticity fines; grey brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, loose to compact		3.20	5	SS	8			MH	
4				76.65	6	SS	13				
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact to loose		4.12	7	SS	7				
5				75.43							
		(SM) SILTY SAND, some gravel to gravelly, some low plasticity fines; grey, contains thin beds of gravelly sand, very thin beds of silty sand, cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to dense		5.34	8	SS	7				
6					9	SS	8			MH	
7					10	SS	9				
8					11	SS	21				
					12	SS	9				
9					13	SS	9				
10					14	SS	24				
		CONTINUED NEXT PAGE									

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: RI
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-208

SHEET 2 OF 2

LOCATION: N 5028416.5 ;E 366534.7

BORING DATE: June 1, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SM) SILTY SAND, some gravel to gravelly, some low plasticity fines; grey, contains thin beds of gravelly sand, very thin beds of silty sand, cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to dense			14	SS	24				
11					15	SS	41				
				69.49							
		(SW) gravelly SAND, fine to coarse, trace to some silt; grey; non-cohesive, wet, compact		11.28							
12					16	SS	29		○		
					17	SS	19				
				67.97							
13	DCPT	Dynamic Cone Penetration Test (DCPT)		12.80					114		
14				66.44							
		End of Borehole DCPT Refusal		14.33					105		
15											
16											
17											
18											
19											
20											

DEPTH SCALE
1 : 50

LOGGED: RI
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-208

SHEET 1 OF 2

LOCATION: N 5028416.5 ;E 366534.7

BORING DATE: June 1, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		80.77							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; dark brown, contains organic matter (rootlets); non-cohesive, moist, loose		0.00 80.52							
		FILL - (SP) SAND, fine to medium, trace silt; brown; non-cohesive, moist, loose		0.25 79.86	1	SS	6				
1		(CI/CH) SILTY CLAY to CLAY, trace sand; grey brown, highly fissured, contains thin lamination of silty sand and very thin beds of gravelly silty sand (WEATHERED CRUST); cohesive, w~PL to w>PL, very stiff		0.91	2	SS	9				
					3	SS	13				
2					4	SS	8				
3				77.57							
		(SM/ML) SILTY SAND to sandy SILT, some gravel, some low plasticity fines; grey brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, loose to compact		3.20	5	SS	8			MH	
4				76.65	6	SS	13				
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact to loose		4.12	7	SS	7				
5				75.43							
		(SM) SILTY SAND, some gravel to gravelly, some low plasticity fines; grey, contains thin beds of gravelly sand, very thin beds of silty sand, cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to dense		5.34	8	SS	7				
6					9	SS	8			MH	
7					10	SS	9				
8					11	SS	21				
					12	SS	9				
9					13	SS	9				
10					14	SS	24				
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-208

SHEET 2 OF 2

LOCATION: N 5028416.5 ;E 366534.7

BORING DATE: June 1, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s; WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SM) SILTY SAND, some gravel to gravelly, some low plasticity fines; grey, contains thin beds of gravelly sand, very thin beds of silty sand, cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to dense			14	SS	24				
11					15	SS	41				
				69.49							
		(SW) gravelly SAND, fine to coarse, trace to some silt; grey; non-cohesive, wet, compact		11.28							
12					16	SS	29				
					17	SS	19				
				67.97							
13	DCPT	Dynamic Cone Penetration Test (DCPT)		12.80					114		
14											
				66.44							
		End of Borehole DCPT Refusal		14.33					105		
15											
16											
17											
18											
19											
20											

DEPTH SCALE
1 : 50

LOGGED: RI
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-209

SHEET 1 OF 2

LOCATION: N 5028422.9 ;E 366480.2

BORING DATE: June 10, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		81.03							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, some gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist, compact		0.00	1	SS	14				
				80.57							
		FILL - (SM) gravelly SILTY SAND, some clay; dark brown to grey brown, contains clay layers and organic matter (rootlets); non-cohesive, moist, compact to loose		0.46							
1					2	SS	13				
					3	SS	5				
2				78.90							
		FILL - (CL/CI) SILTY CLAY, soem sand, trace gravel; grey brown, contains roganic matter; cohesive, w>PL, soft to firm		2.13	4	SS	2				
3					5	SS	4				
				77.37							
		FILL - (SM) gravelly SILTY SAND; grey brown, contains clay layers and nodules; non-cohesive, wet, very loose		3.66	6	SS	3				
4				76.46							
		FILL - (CL/CI) SILTY CLAY, trace sand; grey brown, highly fissured; cohesive, w>PL, soft to firm		4.57	7	SS	4				
5				75.92							
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very loose		5.11							
				75.69							
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very loose to compact		5.34	8	SS	7				
6					9	SS	4				
7					10	SS	5				
8					11	SS	11				
					12	SS	11				
9					13	SS	13				
				71.27							
	DCPT	Dynamic Cone Penetration Test (DCPT)		9.76							
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-209

SHEET 2 OF 2

LOCATION: N 5028422.9 ;E 366480.2

BORING DATE: June 10, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	DCPT	Dynamic Cone Penetration Test (DCPT)		70.15							
11		End of Borehole DCPT Refusal		10.88							
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-209

SHEET 1 OF 2

LOCATION: N 5028422.9 ;E 366480.2

BORING DATE: June 10, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		81.03							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, some gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist, compact		0.00	1	SS	14				
				80.57							
		FILL - (SM) gravelly SILTY SAND, some clay; dark brown to grey brown, contains clay layers and organic matter (rootlets); non-cohesive, moist, compact to loose		0.46							
1					2	SS	13				
					3	SS	5				
2				78.90							
		FILL - (CL/CI) SILTY CLAY, soem sand, trace gravel; grey brown, contains roganic matter; cohesive, w>PL, soft to firm		2.13	4	SS	2				
3					5	SS	4				
				77.37							
		FILL - (SM) gravelly SILTY SAND; grey brown, contains clay layers and nodules; non-cohesive, wet, very loose		3.66	6	SS	3				
4				76.46							
		FILL - (CL/CI) SILTY CLAY, trace sand; grey brown, highly fissured; cohesive, w>PL, soft to firm		4.57	7	SS	4				
5				75.92							
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very loose		5.11							
				75.69							
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very loose to compact		5.34	8	SS	7				
6					9	SS	4				
7					10	SS	5				
8					11	SS	11				
					12	SS	11				
9					13	SS	13				
				71.27							
	DCPT	Dynamic Cone Penetration Test (DCPT)		9.76							
10											

CONTINUED NEXT PAGE

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: RI
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-209

SHEET 2 OF 2

LOCATION: N 5028422.9 ;E 366480.2

BORING DATE: June 10, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*											
	DCPT	Dynamic Cone Penetration Test (DCPT)		70.15									
11		End of Borehole DCPT Refusal		10.88									
12													
13													
14													
15													
16													
17													
18													
19													
20													

DEPTH SCALE
1 : 50

LOGGED: RI
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-210

SHEET 1 OF 1

LOCATION: N 5028466.5 ;E 366489.7

BORING DATE: June 2, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		80.23							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, loose		0.00 80.00							
		FILL -(SM) SILTY SAND, trace gravel, some clay; dark brown, contains organic matter and silty clay layers; non-cohesive, moist, compact		0.23 79.62	1	SS	10				
		FILL - (CI/CH) SILTY CLAY to CLAY, trace to some sand, trace gravel; grey brown, highly fissured, contains silty sand pockets/nodules/layers and organic matter; cohesive, w~PL, firm to stiff		0.61	2	SS	9				
1											
					3	SS	4		○		
2											
				77.79							
		FILL - (SW) SAND, fine to coarse, trace gravel; brown, contains organic matter (wood/rootlets); non-cohesive, moist, loose		2.44	4	SS	5		○		
3				77.18							
		(ML/SM) sandy SILT to SILTY SAND, some gravel to gravelly, some low plastic fines; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to compact		3.05	5	SS	8		⊕	MH	
4					6	SS	12				
					7	SS	25		○		
5				74.89							
		(SM) SILTY SAND, some gravel to gravelly; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact to dense		5.34	8	SS	21				
6											
					9	SS	27		○	MH	
7					10	SS	23				
8					11	SS	13				
					12	SS	46				
9				71.08							
		End of Borehole Auger Refusal		9.15							
10											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-210

SHEET 1 OF 1

LOCATION: N 5028466.5 ;E 366489.7

BORING DATE: June 2, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		80.23							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, loose		0.00 80.00							
		FILL -(SM) SILTY SAND, trace gravel, some clay; dark brown, contains organic matter and silty clay layers; non-cohesive, moist, compact		0.23 79.62	1	SS	10				
1		FILL - (CI/CH) SILTY CLAY to CLAY, trace to some sand, trace gravel; grey brown, highly fissured, contains silty sand pockets/nodules/layers and organic matter; cohesive, w~PL, firm to stiff		0.61	2	SS	9				
					3	SS	4		○		
2				77.79							
		FILL - (SW) SAND, fine to coarse, trace gravel; brown, contains organic matter (wood/rootlets); non-cohesive, moist, loose		2.44	4	SS	5		○		
				77.18							
3		(ML/SM) sandy SILT to SILTY SAND, some gravel to gravelly, some low plastic fines; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to compact		3.05	5	SS	8		⊕	MH	
4					6	SS	12				
					7	SS	25		○		
5				74.89							
		(SM) SILTY SAND, some gravel to gravelly; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact to dense		5.34	8	SS	21				
6					9	SS	27		○	MH	
7					10	SS	23				
8					11	SS	13				
					12	SS	46				
9				71.08							
		End of Borehole Auger Refusal		9.15							
10											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-211

SHEET 1 OF 2

LOCATION: N 5028465.6 ;E 366539.9

BORING DATE: May 20, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diam. (Hollow Stem)	GROUND SURFACE		79.60							
		TOPSOIL - (SM/ML) SILTY SAND to sandy SILT, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist, loose		0.00	1	SS	10				
		FILL - (SM) SILTY SAND, trace gravel; dark brown, contains organic matter; non-cohesive, moist, compact		0.15							
1		FILL - (CL/CI) sandy SILTY CLAY, trace gravel; grey brown to grey, contains organic matter; cohesive, w~PL to w>PL, stiff		0.30	2	SS	5				
					3	SS	3				
2				77.31							
		FILL - (SM) gravelly SILTY SAND, trace to some clay; grey brown, contains organic matter; non-cohesive, moist to wet, very loose		2.29	4	SS	2				
		FILL - (SW) SAND, fine to coarse, trace gravel; brown, contains silty clay to clayey silt lens; non-cohesive, mosit, very loose		76.86 2.74							
3					5	SS	3				
4					6	SS	2				
5					7	SS	2				
				74.26							
		(SM) gravelly SILTY SAND to sandy SILT; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, very loose to dense		5.34	8	SS	3				
6					9	SS	4				
7					10	SS	10				
8					11	SS	12				
					12	SS	3				
9					13	SS	11				
10					14	SS	41				
		CONTINUED NEXT PAGE									

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: RI
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-211

SHEET 2 OF 2

LOCATION: N 5028465.6 ;E 366539.9

BORING DATE: May 20, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger	(SM) gravelly SILTY SAND to sandy SILT; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, very loose to dense			14	SS	41				
				68.83	15	SS	>50				
		End of Borehole Auger Refusal		10.77							
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-211

SHEET 1 OF 2

LOCATION: N 5028465.6 ;E 366539.9

BORING DATE: May 20, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		79.60							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM/ML) SILTY SAND to sandy SILT, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist, loose		0.00	1	SS	10				
		FILL - (SM) SILTY SAND, trace gravel; dark brown, contains organic matter; non-cohesive, moist, compact		0.15							
		FILL - (CL/CI) sandy SILTY CLAY, trace gravel; grey brown to grey, contains organic matter; cohesive, w~PL to w>PL, stiff		0.30							
1					2	SS	5				
					3	SS	3				
2				77.31							
		FILL - (SM) gravelly SILTY SAND, trace to some clay; grey brown, contains organic matter; non-cohesive, moist to wet, very loose		2.29	4	SS	2				
		FILL - (SW) SAND, fine to coarse, trace gravel; brown, contains silty clay to clayey silt lens; non-cohesive, mosit, very loose		76.86 2.74							
3					5	SS	3				
4					6	SS	2				
5					7	SS	2				
				74.26							
		(SM) gravelly SILTY SAND to sandy SILT; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, very loose to dense		5.34	8	SS	3				
6					9	SS	4				
7					10	SS	10				
8					11	SS	12				
					12	SS	3				
9					13	SS	11				
10					14	SS	41				
		CONTINUED NEXT PAGE									

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: RI
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-211

SHEET 2 OF 2

LOCATION: N 5028465.6 ;E 366539.9

BORING DATE: May 20, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger	(SM) gravelly SILTY SAND to sandy SILT; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, very loose to dense			14	SS	41				
				68.83	15	SS	>50				
		End of Borehole Auger Refusal		10.77							
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-212

SHEET 1 OF 2

LOCATION: N 5028459.5 ;E 366591.9

BORING DATE: June 10, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		79.89							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; dark brown, contains organic matter (rootlets); non-cohesive, moist, loose		0.00	1	SS	7				
				79.59 0.30							
		FILL - (SP) SAND, fine to medium, trace silt; brown to dark brown, contains organic matter; non-cohesive, moist, loose		79.13 0.76							
1		(CI/CH) SILTY CLAY to CLAY, trace to some sand; grey brown, highly fissured (WEATHERED CRUST); cohesive, w>PL, very stiff			2	SS	12				
					3	SS	17				
2					4	SS	13			MH	
3					5	SS	8				
				76.38 3.51							
4		(SM) gravelly SILTY SAND; grey brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist, compact			6	SS	12				
					7	SS	13				
5				74.55 5.34							
		(SM) SILTY SAND, some gravel to gravell; contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to compact			8	SS	6				
6					9	SS	6				
7					10	SS	5			MH	
					11	SS	12				
8					12	SS	15				
9					13	SS	11				
				70.13 9.76							
10	DCPT	Dynamic Cone Penetration Test (DCPT)									
		CONTINUED NEXT PAGE									

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: RI
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-212

SHEET 2 OF 2

LOCATION: N 5028459.5 ;E 366591.9

BORING DATE: June 10, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s; WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	DCPT	Dynamic Cone Penetration Test (DCPT)									
11											
12											
13				66.70							
		End of Borehole DCPT Refusal		13.19							
14		Note(s): 1. Water level in open hole at 7.47 m upon completion of drilling									
15											
16											
17											
18											
19											
20											

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20, 40, 60, 80

SHEAR STRENGTH Cu, kPa: 20, 40, 60, 80 (nat V. +, rem V. ⊕, Q - ●, U - ○)

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: Wp, W, Wl; 20, 40, 60, 80

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-212

SHEET 1 OF 2

LOCATION: N 5028459.5 ;E 366591.9

BORING DATE: June 10, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		79.89							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; dark brown, contains organic matter (rootlets); non-cohesive, moist, loose		0.00	1	SS	7				
				79.59							
		FILL - (SP) SAND, fine to medium, trace silt; brown to dark brown, contains organic matter; non-cohesive, moist, loose		0.30							
				79.13							
1		(CI/CH) SILTY CLAY to CLAY, trace to some sand; grey brown, highly fissured (WEATHERED CRUST); cohesive, w>PL, very stiff		0.76	2	SS	12				
					3	SS	17				
2					4	SS	13			MH	
3					5	SS	8				
				76.38							
		(SM) gravelly SILTY SAND; grey brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist, compact		3.51							
4					6	SS	12				
					7	SS	13				
5											
				74.55							
		(SM) SILTY SAND, some gravel to gravell; contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to compact		5.34	8	SS	6				
6											
					9	SS	6				
7					10	SS	5			MH	
					11	SS	12				
8											
					12	SS	15				
9											
					13	SS	11				
				70.13							
	DCPT	Dynamic Cone Penetration Test (DCPT)		9.76							
10											
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-212

SHEET 2 OF 2

LOCATION: N 5028459.5 ;E 366591.9

BORING DATE: June 10, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s; WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	DCPT	Dynamic Cone Penetration Test (DCPT)									
11											
12											
13				66.70							
		End of Borehole DCPT Refusal		13.19							
14		Note(s): 1. Water level in open hole at 7.47 m upon completion of drilling									
15											
16											
17											
18											
19											
20											

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20, 40, 60, 80

SHEAR STRENGTH Cu, kPa: 20, 40, 60, 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: 20, 40, 60, 80

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-213

SHEET 1 OF 3

LOCATION: N 5028443.0 ;E 366650.3

BORING DATE: May 31, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		76.11							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist, compact		0.00 75.91 0.20	1	SS	20				Bentonite Seal
		FILL - (SM) gravelly SILTY SAND; dark brown, contains concrete and organic matter; non-cohesive, moist, compact		75.20							June 9, 2021
1		FILL - (SM/GM) SILTY gravelly SAND to SILTY sandy GRAVEL, angular; dark brown to grey brown; non-cohesive, moist, dense		0.91 74.59	2	SS	33		○	M	
		FILL - (SM) gravelly SILTY SAND, trace to some clay; brown to grey brown, contains silty clay layers and organic matter (rootlets/wood); non-cohesive, moist to wet, very loose to compact		1.52	3	SS	6				
2					4	SS	10				Backfill
3					5	SS	4				
		FILL - (SW) gravelly SAND, fine to coarse; brown; non-cohesive, wet, very loose		72.30 3.81	6	SS	1				
4					7	SS	1				Bentonite Seal
5				70.77							
		(SM) gravelly SILTY SAND; grey, possible sand layer from 8.38 m to 8.99 m, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact to very dense		5.34	8	SS	10				
6					9	SS	10				
7					10	SS	20				Native Sand and Gravel
8					11	SS	24				
					12	SS	13				
9					13	SS	40				
10					14	SS	>50				
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-213

SHEET 2 OF 3

LOCATION: N 5028443.0 ;E 366650.3

BORING DATE: May 31, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s; WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SM) gravelly SILTY SAND; grey, possible sand layer from 8.38 m to 8.99 m, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact to very dense		65.44							
11		(SW) gravelly SAND, fine to coarse, some silt; grey; non-cohesive, wet, dense to very loose		10.67	15	SS	40				50 mm Diam. PVC #10 Slot Screen
				64.52							
12		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose		11.59	16	SS	4				
				63.91							
		Borehole continued on RECORD OF DRILLHOLE 21-213 Note(s): 1. Methane gas noted at a depth of 11.59 mbgs		12.2							
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-213

SHEET 3 OF 3

LOCATION: N 5028443.0 ;E 366650.3

DRILLING DATE: May 31, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	ROCK STRENGTH INDEX: R4	R3	R2	R1	WEATH-ERING INDEX: W1	W2	W3	W4	Q AVG.	
		BEDROCK SURFACE		63.91																					
13	Rotary Drill / NQ Core	Fresh, thinly to medium bedded, medium grey to brownish grey, fine to medium grained, non-porous, very strong SHALEY LIMESTONE - Broken core from 12.38 m to 12.40 m		12.20	1	100																			Silica Sand
14					2	100-0																			UCS = 157 MPa Bentonite Seal
15					3	100																			
				60.31																					
16		End of Drillhole Note(s): 1. Water level in screen measured at 0.71 m (Elev. 75.40 m) on June 9, 2021		15.80																					
17																									
18																									
19																									
20																									
21																									
22																									

DEPTH SCALE
1 : 50

LOGGED: RI
CHECKED: CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-213

SHEET 1 OF 3

LOCATION: N 5028443.0 ;E 366650.3

BORING DATE: May 31, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		76.11							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist, compact		0.00 75.91 0.20	1	SS	20				Bentonite Seal
		FILL - (SM) gravelly SILTY SAND; dark brown, contains concrete and organic matter; non-cohesive, moist, compact		75.20							June 9, 2021
1		FILL - (SM/GM) SILTY gravelly SAND to SILTY sandy GRAVEL, angular; dark brown to grey brown; non-cohesive, moist, dense		0.91 74.59	2	SS	33		○	M	
		FILL - (SM) gravelly SILTY SAND, trace to some clay; brown to grey brown, contains silty clay layers and organic matter (rootlets/wood); non-cohesive, moist to wet, very loose to compact		1.52	3	SS	6				
2					4	SS	10				Backfill
3					5	SS	4				
		FILL - (SW) gravelly SAND, fine to coarse; brown; non-cohesive, wet, very loose		72.30 3.81	6	SS	1				
4											
					7	SS	1				Bentonite Seal
5				70.77							
		(SM) gravelly SILTY SAND; grey, possible sand layer from 8.38 m to 8.99 m, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact to very dense		5.34	8	SS	10				
6					9	SS	10				
					10	SS	20				Native Sand and Gravel
7											
					11	SS	24				
8					12	SS	13				
9					13	SS	40				
					14	SS	>50				
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-213

SHEET 2 OF 3

LOCATION: N 5028443.0 ;E 366650.3

BORING DATE: May 31, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s; WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SM) gravelly SILTY SAND; grey, possible sand layer from 8.38 m to 8.99 m, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact to very dense		65.44							
11		(SW) gravelly SAND, fine to coarse, some silt; grey; non-cohesive, wet, dense to very loose		10.67	15	SS	40				50 mm Diam. PVC #10 Slot Screen
				64.52							
12		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose		11.59	16	SS	4				
				63.91							
		Borehole continued on RECORD OF DRILLHOLE 21-213 Note(s): 1. Methane gas noted at a depth of 11.59 mbgs		12.2							
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-213

SHEET 3 OF 3

LOCATION: N 5028443.0 ;E 366650.3

DRILLING DATE: May 31, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	ROCK STRENGTH INDEX: R4	R3	R2	R1	WEATH-ERING INDEX: W1	W2	W3	W4	Q AVG.	
		BEDROCK SURFACE		63.91																					
13	Rotary Drill / NQ Core	Fresh, thinly to medium bedded, medium grey to brownish grey, fine to medium grained, non-porous, very strong SHALEY LIMESTONE - Broken core from 12.38 m to 12.40 m		12.20	1	100																			Silica Sand
14					2	100-0																			UCS = 157 MPa Bentonite Seal
15					3	100																			
				60.31																					
16		End of Drillhole Note(s): 1. Water level in screen measured at 0.71 m (Elev. 75.40 m) on June 9, 2021		15.80																					
17																									
18																									
19																									
20																									
21																									
22																									

DEPTH SCALE
1 : 50

LOGGED: RI
CHECKED: CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-214

SHEET 1 OF 2

LOCATION: N 5028490.1 ;E 366670.1

BORING DATE: May 22, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		75.83							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist, very loose		0.00							
				0.15	1	SS	21				
		FILL - (SM) gravelly SILTY SAND; dark brown, contains concrete fragments, silty clay layers, organic matter and asphalt fragments; non-cohesive, mosit, compact to very dense			2	SS	>50				
1											
				74.00	3	SS	18				
		FILL -(SW) SAND, fine to coarse, some gravel, some silt; brown, contains silty sand layers and silty clay layers; non-cohesive, mosit to wet, compact to very loose		1.83							
2					4	SS	7				
3					5	SS	2				
				72.02							
		FILL - (CL/CI) sandy SILTY CLAY: grey brown, contains silty sand layers; cohesive, w>PL, soft to firm		3.81	6	SS	4				
4				71.26							
		FILL - (SM) CLAYEY SILTY SAND, some gravel; dark grey brown, with black staining, contains organic matter; non-cohesive, wet, very loose		4.57	7	SS	2				
5				70.46							
		FILL - (SW) SAND, fine to coarse, some gravel, trace to some silt; brown, silty clay layers; non-cohesive, wet, dense		5.37	8	SS	49				
				70.04							
		FILL - (SM) gravelly SILTY SAND; grey, with black staining and oxidation staining, contains silty clay layers, possible organic matter; non-cohesive, wet, loose to very loose		5.79	9	SS	>50				
6					10	SS	5				
				68.97							
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact		6.86	11	SS	10				
7											
					12	SS	14				
8				67.55							
		Borehole continued on RECORD OF DRILLHOLE 21-214		8.28							
9											
10											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-214

SHEET 2 OF 2

LOCATION: N 5028490.1 ;E 366670.1

DRILLING DATE: May 22, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	ROCK STRENGTH INDEX: R4	R3	R2	R1	WEATHERING INDEX: W1	W2	W3	W4	Q AVG.	
		BEDROCK SURFACE		67.55																					
9	Rotary Drill / NQ Core	Fresh to slightly weathered, thinly to medium bedded, medium grey to brownish grey, fine to medium grained, non-porous, strong SHALEY LIMESTONE - Broken core from 8.51 m to 8.58 m - Broken/lost core from 9.08 m to 9.16 m		8.28	1	100																			
10		- Broken/lost core from 9.25 m to 9.35 m			2	100																			
11		- Broken/lost core from 10.57 m to 10.77 m			3	100																			UCS = 59 MPa
12		- Broken core from 12.16 m to 12.27 m		63.56																					
		End of Drillhole		12.27																					

DEPTH SCALE
1 : 50

LOGGED: RI
CHECKED: CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-214

SHEET 1 OF 2

LOCATION: N 5028490.1 ;E 366670.1

BORING DATE: May 22, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		75.83							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist, very loose		0.00 0.15	1	SS	21				
		FILL - (SM) gravelly SILTY SAND; dark brown, contains concrete fragments, silty clay layers, organic matter and asphalt fragments; non-cohesive, mosit, compact to very dense			2	SS	>50				
1											
				74.00	3	SS	18				
		FILL -(SW) SAND, fine to coarse, some gravel, some silt; brown, contains silty sand layers and silty clay layers; non-cohesive, mosit to wet, compact to very loose		1.83							
2					4	SS	7				
3					5	SS	2				
				72.02							
		FILL - (CL/CI) sandy SILTY CLAY: grey brown, contains silty sand layers; cohesive, w>PL, soft to firm		3.81	6	SS	4				
4				71.26							
		FILL - (SM) CLAYEY SILTY SAND, some gravel; dark grey brown, with black staining, contains organic matter; non-cohesive, wet, very loose		4.57	7	SS	2				
5				70.46							
		FILL - (SW) SAND, fine to coarse, some gravel, trace to some silt; brown, silty clay layers; non-cohesive, wet, dense		5.37 70.04	8	SS	49				
		FILL - (SM) gravelly SILTY SAND; grey, with black staining and oxidation staining, contains silty clay layers, possible organic matter; non-cohesive, wet, loose to very loose		5.79	9	SS	>50				
6					10	SS	5				
				68.97							
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact		6.86	11	SS	10				
7											
					12	SS	14				
8				67.55							
		Borehole continued on RECORD OF DRILLHOLE 21-214		8.28							
9											
10											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-214

SHEET 2 OF 2

LOCATION: N 5028490.1 ;E 366670.1

DRILLING DATE: May 22, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	ROCK STRENGTH INDEX: R4	R3	R2	R1	WEATHERING INDEX: W1	W2	W3	W4	Q AVG.	
		BEDROCK SURFACE		67.55																					
9	Rotary Drill / NQ Core	Fresh to slightly weathered, thinly to medium bedded, medium grey to brownish grey, fine to medium grained, non-porous, strong SHALEY LIMESTONE - Broken core from 8.51 m to 8.58 m - Broken/lost core from 9.08 m to 9.16 m		8.28	1	100																			
10		- Broken/lost core from 9.25 m to 9.35 m			2	100																			
11		- Broken/lost core from 10.57 m to 10.77 m			3	100																			UCS = 59 MPa
12		- Broken core from 12.16 m to 12.27 m		63.56																					
		End of Drillhole		12.27																					
13																									
14																									
15																									
16																									
17																									
18																									

DEPTH SCALE
1 : 50

LOGGED: RI
CHECKED: CH

PROJECT: 21451149

RECORD OF BOREHOLE: 21-215

SHEET 1 OF 1

LOCATION: N 5028548.6 ;E 366698.7

BORING DATE: May 28, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		72.79							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; dark brown, contains organic matter (rootlets); non-cohesive, moist, loose		0.00							
				72.41	1	SS	6				Bentonite Seal
		FILL - (SM) SILTY SAND, fine to medium; brown, contains organic matter (rootlets); non-cohesive, moist, loose to compact		0.38							
1					2	SS	10				
				71.57							
		(CI/CH) SILTY CLAY to CLAY, trace sand; grey brown, highly fissured, contains thin to thick laminations of silty sand (WEATHERED CRUST); cohesive, w>PL, very stiff		1.22							
					3	SS	8				Backfill
2				70.73							
		(SM) gravelly SILTY SAND; grey brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, loose		2.06							
					4	SS	8				June 9, 2021
3					5	SS	8				Bentonite Seal
											Silica Sand
4					6	SS	9				
				68.22							
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TIL); non-cohesive, wet, loose to very dense		4.57							
5					7	SS	6				
					8	SS	7				50 mm Diam. PVC #10 Slot Screen
6					9	SS	9				
					10	SS	>50				
7				65.73							
		End of Borehole Auger Refusal		7.06							
8		Note(s): 1. Water level in screen measured at 2.39 m (Elev. 70.40 m) on June 9, 2021									
9											
10											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-215

SHEET 1 OF 1

LOCATION: N 5028548.6 ;E 366698.7

BORING DATE: May 28, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE		72.79							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; dark brown, contains organic matter (rootlets); non-cohesive, moist, loose		0.00	1	SS	6				Bentonite Seal
				72.41							
		FILL - (SM) SILTY SAND, fine to medium; brown, contains organic matter (rootlets); non-cohesive, moist, loose to compact		0.38							
1					2	SS	10				
				71.57							
		(CI/CH) SILTY CLAY to CLAY, trace sand; grey brown, highly fissured, contains thin to thick laminations of silty sand (WEATHERED CRUST); cohesive, w>PL, very stiff		1.22							
					3	SS	8				Backfill
2				70.73							
		(SM) gravelly SILTY SAND; grey brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, loose		2.06							June 9, 2021
					4	SS	8				
3											
					5	SS	8				Bentonite Seal
											Silica Sand
4					6	SS	9				
				68.22							
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TIL); non-cohesive, wet, loose to very dense		4.57							
5					7	SS	6				
											50 mm Diam. PVC #10 Slot Screen
					8	SS	7				
6											
					9	SS	9				
					10	SS	>50				
7				65.73							
		End of Borehole Auger Refusal		7.06							
		Note(s): 1. Water level in screen measured at 2.39 m (Elev. 70.40 m) on June 9, 2021									
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-216

SHEET 1 OF 3

LOCATION: N 5028587.2 ;E 366636.0

BORING DATE: May 5, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		74.34							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM/ML) mixture of SILTY SAND and SILTY CLAY; dark brown; non-cohesive, loose		0.00							
		FILL - (CL/CI) SILTY CLAY, trace gravel; grey brown; cohesive, w~PL, very stiff		0.15	1	SS	7				
1					2	SS	7				
					3	SS	6				
2				72.05							
		FILL - (SM) gravelly SILTY SAND, fine to medium brown, contains clay seams; non-cohesive, moist, compact		2.29	4	SS	16				
3					5	SS	12				
				70.68							
		(SM/ML) SILTY SAND to sandy SILT, some gravel; grey brown to grey (GLACIAL TILL); moist to wet, loose to very dense		3.66	6	SS	12			MH	
4											
					7	SS	10			M	
5											
					8	SS	8				
6											
					9	SS	4				
7											
					10	SS	6				
8					11	SS	4				
					12	SS	4				
9											
					13	SS	6			M	
10					14	SS	4				
		CONTINUED NEXT PAGE									

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: RI/BW
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-216

SHEET 2 OF 3

LOCATION: N 5028587.2 ;E 366636.0

BORING DATE: May 5, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger	(SM/ML) SILTY SAND to sandy SILT, some gravel; grey brown to grey (GLACIAL TILL); moist to wet, loose to very dense			14	SS	4				
11				63.21	15	SS	>50				
		Borehole continued on RECORD OF DRILLHOLE 21-216		11.13							
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RI/BW

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-216

SHEET 3 OF 3

LOCATION: N 5028587.2 ;E 366636.0

DRILLING DATE: May 5, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	ROCK STRENGTH INDEX: R4	R3	R2	R1	WEATHERING INDEX: W1	W2	W3	W4	Q AVG.
		BEDROCK SURFACE		63.21																				
12	Rotary Drill / NQ Core	Fresh, thinly to medium bedded, medium to brownish grey, fine to medium grained, non-porous, strong SHALEY LIMESTONE - Broken core from 11.23 m to 11.25 m - Broken core from 11.5 m to 11.51 m		11.13	1	100																		
13		- Broken/lost core from 12.13 m to 12.37 m - Broken core from 12.54 m to 12.55 m			2	100																		
14		- Broken core from 13.14 m to 13.15 m - Mud seam from 14.03 m to 14.06 m - Mud seam from 14.28 m to 14.3 m - Mud seam from 14.41 m to 14.45 m - Mud seam from 14.55 m to 14.58 m			3	100																		
15				59.10																				
		End of Drillhole		15.24																				
16																								
17																								
18																								
19																								
20																								
21																								

DEPTH SCALE
1 : 50

LOGGED: RI/BW
CHECKED: CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-216

SHEET 1 OF 3

LOCATION: N 5028587.2 ;E 366636.0

BORING DATE: May 5, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		74.34							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM/ML) mixture of SILTY SAND and SILTY CLAY; dark brown; non-cohesive, loose		0.00							
		FILL - (CL/CI) SILTY CLAY, trace gravel; grey brown; cohesive, w~PL, very stiff		0.15	1	SS	7				
1					2	SS	7				
					3	SS	6				
2				72.05							
		FILL - (SM) gravelly SILTY SAND, fine to medium brown, contains clay seams; non-cohesive, moist, compact		2.29	4	SS	16				
3					5	SS	12				
				70.68							
		(SM/ML) SILTY SAND to sandy SILT, some gravel; grey brown to grey (GLACIAL TILL); moist to wet, loose to very dense		3.66	6	SS	12			MH	
4											
					7	SS	10			M	
5											
					8	SS	8				
6											
					9	SS	4				
7											
					10	SS	6				
8					11	SS	4				
					12	SS	4				
9											
					13	SS	6			M	
10					14	SS	4				
		CONTINUED NEXT PAGE									

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: RI/BW
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-216

SHEET 2 OF 3

LOCATION: N 5028587.2 ;E 366636.0

BORING DATE: May 5, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger	(SM/ML) SILTY SAND to sandy SILT, some gravel; grey brown to grey (GLACIAL TILL); moist to wet, loose to very dense			14	SS	4				
11				63.21	15	SS	>50				
		Borehole continued on RECORD OF DRILLHOLE 21-216		11.13							
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RI/BW

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-216

SHEET 3 OF 3

LOCATION: N 5028587.2 ;E 366636.0

DRILLING DATE: May 5, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	ROCK STRENGTH INDEX: R4	R3	R2	R1	WEATHERING INDEX: W1	W2	W3	W4	Q AVG.
		BEDROCK SURFACE		63.21																				
12	Rotary Drill / NQ Core	Fresh, thinly to medium bedded, medium to brownish grey, fine to medium grained, non-porous, strong SHALEY LIMESTONE - Broken core from 11.23 m to 11.25 m - Broken core from 11.5 m to 11.51 m		11.13	1	100																		
13		- Broken/lost core from 12.13 m to 12.37 m - Broken core from 12.54 m to 12.55 m			2	100																		
14		- Broken core from 13.14 m to 13.15 m - Mud seam from 14.03 m to 14.06 m - Mud seam from 14.28 m to 14.3 m - Mud seam from 14.41 m to 14.45 m - Mud seam from 14.55 m to 14.58 m			3	100																		
15				59.10																				
		End of Drillhole		15.24																				
16																								
17																								
18																								
19																								
20																								
21																								

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: RI/BW
CHECKED: CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-217

SHEET 1 OF 1

LOCATION: N 5028539.7 ;E 366660.8

BORING DATE: May 5, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s; WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		75.19							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; dark brown, contains rootlets; moist		0.00 74.98							
		FILL - (SM) gravelly SILTY SAND; grey brown, contains clay seams; non-cohesive, moist, loose to dense		0.21	1	SS	7				
1					2	SS	7		○		
					3	SS	39				
2				72.90							
		FILL - (CI/CH) SILTY CLAY; grey brown; cohesive, w>PL, very stiff		2.29	4	SS	14		○	MH	
3				72.14							
		(SM) gravelly silty sand, grey brown to grey contains cobbles (GLACIAL TILL); non-cohesive, moist to wet, loose to very dense		3.05	5	SS	19				
4					6	SS	27		○		
					7	SS	8				
5					8	SS	8				
6					9	SS	6		○		
7					10	SS	7		○	MH	
					11	SS	12				
8					12	SS	>50		○		
				66.35							
9		End of Borehole Auger Refusal		8.84							
10											

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED:

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-217

SHEET 1 OF 1

LOCATION: N 5028539.7 ;E 366660.8

BORING DATE: May 5, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		75.19							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; dark brown, contains rootlets; moist		0.00 74.98							
		FILL - (SM) gravelly SILTY SAND; grey brown, contains clay seams; non-cohesive, moist, loose to dense		0.21	1	SS	7				
1					2	SS	7		○		
					3	SS	39				
2				72.90							
		FILL - (CI/CH) SILTY CLAY; grey brown; cohesive, w>PL, very stiff		2.29	4	SS	14		○	MH	
3				72.14							
		(SM) gravelly silty sand, grey brown to grey contains cobbles (GLACIAL TILL); non-cohesive, moist to wet, loose to very dense		3.05	5	SS	19				
4					6	SS	27		○		
					7	SS	8				
5					8	SS	8				
6					9	SS	6		○		
7					10	SS	7		○	MH	
					11	SS	12				
8					12	SS	>50		○		
				66.35							
9		End of Borehole Auger Refusal		8.84							
10											

DEPTH SCALE

1 : 50

GOLDER

LOGGED:

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-218

SHEET 1 OF 2

LOCATION: N 5028493.7 ;E 366635.3

BORING DATE: May 7, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		78.54							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, some gravel; dark brown, contains organic matter (rootlets); moist		0.00							
		FILL - (CL/CI) SILTY CLAY, trace gravel; grey brown, contains organic matter (rootlets); cohesive, w~PL, hard		0.15 77.78	1	SS	46				
1		FILL - (SM) gravelly SILTY SAND, fine to coarse; grey to brown, contains brick particles and concrete; non-cohesive, dry to moist, compact to very dense		0.76	2	SS	30				
					3	SS	23				Bentonite Seal
2					4	SS	74				
3					5	SS	29				Backfill
4					6	SS	19				
5					7	SS	22				Bentonite Seal
				73.21							
		(SW) SAND, fine to coarse, trace gravel; brown; non-cohesive, moist, very loose		5.33	8	SS	2				May 28, 2021
6											June 9, 2021
					9	SS	3				Silica Sand
				71.99							
		(ML/SM) Sandy SILT to SILTY SAND, some low-med plasticity fines; brown, contains clay seams; non-cohesive, moist, loose		6.55							
7					10	SS	4		○	MH	
				71.22							
		(SM) gravelly SILTY SAND; grey, contains cobbles (GLACIAL TILL); non-cohesive, moist to wet, loose to compact		7.32							
8					11	SS	9				50 mm Diam. PVC #10 Slot Screen
					12	SS	10				
9					13	SS	23				Silica Sand
10					14	SS	7				
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-218

SHEET 2 OF 2

LOCATION: N 5028493.7 ;E 366635.3

BORING DATE: May 7, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SM) gravelly SILTY SAND; grey, contains cobbles (GLACIAL TILL); non-cohesive, moist to wet, loose to compact			14	SS	7				
11					15	SS	4		○	M	
12					16	SS	5				Bentonite Seal
13					17	SS	9				
					18	SS	11				
				64.95							
		End of Borehole Auger Refusal		13.59							
14		Note(s): 1. Water level in screen measured at 6.02 m (Elev. 72.52 m) on June 9, 2021 2. Water level in screen measured at 5.83 m (Elev. 72.71 m) on May 28, 2021									
15											
16											
17											
18											
19											
20											

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: RI
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-218

SHEET 1 OF 2

LOCATION: N 5028493.7 ;E 366635.3

BORING DATE: May 7, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		78.54							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, some gravel; dark brown, contains organic matter (rootlets); moist		0.00							
		FILL - (CL/CI) SILTY CLAY, trace gravel; grey brown, contains organic matter (rootlets); cohesive, w~PL, hard		0.15	1	SS	46				
				77.78							
1		FILL - (SM) gravelly SILTY SAND, fine to coarse; grey to brown, contains brick particles and concrete; non-cohesive, dry to moist, compact to very dense		0.76	2	SS	30				
					3	SS	23				Bentonite Seal
2					4	SS	74				
3					5	SS	29				Backfill
4					6	SS	19				
5					7	SS	22				Bentonite Seal
				73.21							
		(SW) SAND, fine to coarse, trace gravel; brown; non-cohesive, moist, very loose		5.33	8	SS	2				May 28, 2021
6											June 9, 2021 Silica Sand
					9	SS	3				
				71.99							
		(ML/SM) Sandy SILT to SILTY SAND, some low-med plasticity fines; brown, contains clay seams; non-cohesive, moist, loose		6.55							
7					10	SS	4		○	MH	
				71.22							
		(SM) gravelly SILTY SAND; grey, contains cobbles (GLACIAL TILL); non-cohesive, moist to wet, loose to compact		7.32							
8					11	SS	9				50 mm Diam. PVC #10 Slot Screen
					12	SS	10				
9											
					13	SS	23				Silica Sand
10					14	SS	7				
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-218

SHEET 2 OF 2

LOCATION: N 5028493.7 ;E 366635.3

BORING DATE: May 7, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SM) gravelly SILTY SAND; grey, contains cobbles (GLACIAL TILL); non-cohesive, moist to wet, loose to compact			14	SS	7				
11					15	SS	4		○	M	
12					16	SS	5				Bentonite Seal
13					17	SS	9				
					18	SS	11				
				64.95							
		End of Borehole Auger Refusal		13.59							
14		Note(s): 1. Water level in screen measured at 6.02 m (Elev. 72.52 m) on June 9, 2021 2. Water level in screen measured at 5.83 m (Elev. 72.71 m) on May 28, 2021									
15											
16											
17											
18											
19											
20											

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: RI
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-219

SHEET 1 OF 3

LOCATION: N 5028505.1 ;E 366485.3

BORING DATE: May 6, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		79.40							
0	Power Auger	TOPSOIL - (SM) SILTY SAND, some gravel; dark brown, contains organic matter (rootlets); moist, loose		0.00							
				0.15	1	SS	7				Bentonite Seal
1		FILL - (SM) SILTY SAND, trace gravel; brown; non-cohesive, moist, loose			2	SS	7				
				77.88							Silica Sand
		FILL - (CI/CH) SILTY CLAY, trace sand; grey brown, fissured; cohesive, w~PL, stiff to very stiff		1.52	3	SS	7				
2					4	SS	8				
											May 28, 2021
3					5	SS	16				June 9, 2021
											38 mm Diam. PVC #10 Slot Screen
				75.59							
		(SW) gravelly SILTY SAND; grey, contains cobbles (GLACIAL TILL); non-cohesive, moist to wet, loose to very dense		3.81	6	SS	42				
4											
					7	SS	5				
5	200 mm Diam. (Hollow Stem)										Silica Sand
					8	SS	8				
6					9	SS	7				
7					10	SS	12				
8					11	SS	12				Bentonite Seal
					12	SS	34				
9					13	SS	12				
10					14	SS	18				
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI/BW

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-219

SHEET 2 OF 3

LOCATION: N 5028505.1 ;E 366485.3

BORING DATE: May 6, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
	Rotary Drill / HW Casing	(SW) gravelly SILTY SAND; grey, contains cobbles (GLACIAL TILL); non-cohesive, moist to wet, loose to very dense			14	SS	18				
					15	SS	>50				
				68.56							
11		Borehole continued on RECORD OF DRILLHOLE 21-219		10.84							
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: RI/BW

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-219

SHEET 3 OF 3

LOCATION: N 5028505.1 ;E 366485.3

DRILLING DATE: May 6, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH / COLOUR % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	ROCK STRENGTH INDEX: R4	R3	R2	R1	WEATHERING INDEX: W1	W2	W3	W4	Q AVG.	
		BEDROCK SURFACE		68.56																					
11	Rotary Drill / NQ Core	Fresh to slightly weathered, thickly to massive bedded, medium brownish grey, fine to coarse grained, faintly porous, strong LIMESTONE, with thin partings of shale - vertical joint from 11.11 to 11.27 m - broken core from 11.31 to 11.32 m - vertical joint from 11.45 to 11.59 m - broken core from 11.54 to 11.59 m - lost core from 11.59 to 11.64 m		10.84	1																				
12					2																				UCS = 62 MPa
		- vertical bedding from 12.35 to 12.45 m			3																				Bentonite Seal
13																									
		- vertical joint from 13.23 to 13.45 m and 14.63 to 14.69 m																							
14					4																				
				64.71																					
		End of Drillhole		14.69																					
15																									
16																									
17																									
18																									
19																									
20																									

DEPTH SCALE
1 : 50

LOGGED: RI/BW
CHECKED: CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-219

SHEET 1 OF 3

LOCATION: N 5028505.1 ;E 366485.3

BORING DATE: May 6, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		79.40							
0	Power Auger / 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, some gravel; dark brown, contains organic matter (rootlets); moist, loose		0.00							
				0.15	1	SS	7				Bentonite Seal
1		FILL - (SM) SILTY SAND, trace gravel; brown; non-cohesive, moist, loose			2	SS	7				
				77.88							Silica Sand
		FILL - (CI/CH) SILTY CLAY, trace sand; grey brown, fissured; cohesive, w~PL, stiff to very stiff		1.52	3	SS	7				
2					4	SS	8				
											May 28, 2021
3					5	SS	16				June 9, 2021
											38 mm Diam. PVC #10 Slot Screen
				75.59							
		(SW) gravelly SILTY SAND; grey, contains cobbles (GLACIAL TILL); non-cohesive, moist to wet, loose to very dense		3.81	6	SS	42				
4											
					7	SS	5				
5											Silica Sand
					8	SS	8				
6											
					9	SS	7				
7											
					10	SS	12				
8					11	SS	12				Bentonite Seal
					12	SS	34				
9											
					13	SS	12				
10					14	SS	18				
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI/BW

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-219

SHEET 2 OF 3

LOCATION: N 5028505.1 ;E 366485.3

BORING DATE: May 6, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
	Rotary Drill / HW Casing	(SW) gravelly SILTY SAND; grey, contains cobbles (GLACIAL TILL); non-cohesive, moist to wet, loose to very dense			14	SS	18				
					15	SS	>50				
				68.56							
11		Borehole continued on RECORD OF DRILLHOLE 21-219		10.84							
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: RI/BW

CHECKED: CH

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-219

SHEET 3 OF 3

LOCATION: N 5028505.1 ;E 366485.3

DRILLING DATE: May 6, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH / COLOUR % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	ROCK STRENGTH INDEX: R4	R3	R2	R1	WEATHERING INDEX: W1	W2	W3	W4	Q AVG.	
		BEDROCK SURFACE		68.56																					
11	Rotary Drill / NQ Core	Fresh to slightly weathered, thickly to massive bedded, medium brownish grey, fine to coarse grained, faintly porous, strong LIMESTONE, with thin partings of shale - vertical joint from 11.11 to 11.27 m - broken core from 11.31 to 11.32 m - vertical joint from 11.45 to 11.59 m - broken core from 11.54 to 11.59 m - lost core from 11.59 to 11.64 m		10.84	1																				
12					2																				UCS = 62 MPa
		- vertical bedding from 12.35 to 12.45 m			3																				Bentonite Seal
13		- vertical joint from 13.23 to 13.45 m and 14.63 to 14.69 m																							
14					4																				
				64.71																					
		End of Drillhole		14.69																					
15																									
16																									
17																									
18																									
19																									
20																									

DEPTH SCALE
1 : 50

LOGGED: RI/BW
CHECKED: CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-221

SHEET 1 OF 3

LOCATION: N 5028600.7 ;E 366490.8

BORING DATE: May 21, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s; WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE		74.59							
	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist, compact		0.00 74.39 0.20	1	SS	12				
		FILL - (SM) gravelly SILTY SAND; dark brown to brown, contains organic matter and brick; non-cohesive, moist, compact		73.83 0.76	2	SS	12				Bentonite Seal
1		TOPSOIL - (SM) SILTY SAND, fine; dark brown, contains organic matter; non-cohesive, moist, compact		73.37 1.22							
		(SM) SILTY SAND, fine to medium; brown; on-cohesive, moist, compact			3	SS	12				May 28, 2021 June 9, 2021
2				72.61 1.98							
		(CI/CH) SILTY CLAY to CLAY, trace to some sand; grey brown, highly fissured, contains thin laminations of silty sand (WEATHERED CRUST); cohesive, w>PL, stiff to very stiff			4	SS	11				May 28, 2021 June 9, 2021
3					5	SS	3			MH	
4					6	SS	2				
5					7	SS	2				Backfill
				69.25							
		(CI/CH) SILTY CLAY to CLAY; grey; cohesive, firm to stiff		5.34	8	SS	-				
6					9	SS	1				
7											
				66.66	10	SS	6				
8		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very loose to compact		7.93							
					11	SS	15			MH	
9											Bentonite Seal
					12	SS	17			M	
10					13	SS	20				
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-221

SHEET 2 OF 3

LOCATION: N 5028600.7 ;E 366490.8

BORING DATE: May 21, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very loose to compact			13	SS	20				Native Sand
11				63.31	14	SS	3		○	MH	
		(SW) SAND, fine to coarse, trace gravel; grey; non-cohesive, wet, very dense		11.28							
				62.85	15	SS	83				
12		(SM) SILTY sandy GRAVEL; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very dense		11.74					○	M	32 mm Diam. PVC #10 Slot Screen 'S'
				62.09	16	SS	114				
		(SM/ML) gravelly SILTY SAND to sandy SILT; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very dense		12.50							
13					17	SS	>50				
				61.18							
	Rotary Drill NW Casing	(SM/ML) gravelly SILTY SAND to sandy SILT; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very dense		13.41	1	RC	-				Silica Sand
				60.63							Bentonite Seal
14		Borehole continued on RECORD OF DRILLHOLE 21-221		13.96							
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-221

SHEET 3 OF 3

LOCATION: N 5028600.7 ;E 366490.8

DRILLING DATE: May 21, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: Jcon	DISCONTINUITY DATA: Jr	DISCONTINUITY DATA: Ja	ROCK STRENGTH INDEX: R4	ROCK STRENGTH INDEX: R3	ROCK STRENGTH INDEX: R2	ROCK STRENGTH INDEX: R1	WEATHERING INDEX: W1	WEATHERING INDEX: W2	WEATHERING INDEX: W3	WEATHERING INDEX: W4	Q AVG.	
		BEDROCK SURFACE		60.63																					
14	Rotary Drill / NQ Core	Fresh, thinly to medium bedded, medium grey to brownish grey, fine to medium grained, non-porous, very strong SHALEY LIMESTONE		13.96	2	100																			
15																									
16		- broken core from 15.55 m to 15.56 m depth			3	100																			
17					4	100																			
				56.96																					
18		End of Drillhole		17.63																					
		Note(s):																							
		1. Water level in screen measured at 1.35 m (Elev. 73.23 m) on May 28, 2021 (Shallow)																							
19		2. Water level in screen measured at 1.43 m (Elev. 73.15 m) on June 9, 2021 (Shallow)																							
		3. Water level in screen measured at 2.33 m (Elev. 72.26 m) on May 28, 2021 (Deep)																							
		4. Water level in screen measured at 2.41 m (Elev. 72.18 m) on June 9, 2021 (Deep)																							
20																									
21																									
22																									
23																									

Bentonite Seal

Silica Sand

UCS = 152 MPa

32 mm Diam. PVC #10 Slot Screen 'D'

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-221

SHEET 1 OF 3

LOCATION: N 5028600.7 ;E 366490.8

BORING DATE: May 21, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl, 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		74.59							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist, compact		0.00 74.39 0.20	1	SS	12				
		FILL - (SM) gravelly SILTY SAND; dark brown to brown, contains organic matter and brick; non-cohesive, moist, compact		73.83 0.76							Bentonite Seal
1		TOPSOIL - (SM) SILTY SAND, fine; dark brown, contains organic matter; non-cohesive, moist, compact		73.37 1.22	2	SS	12				
		(SM) SILTY SAND, fine to medium; brown; on-cohesive, moist, compact			3	SS	12				May 28, 2021 June 9, 2021
2		(CI/CH) SILTY CLAY to CLAY, trace to some sand; grey brown, highly fissured, contains thin laminations of silty sand (WEATHERED CRUST); cohesive, w>PL, stiff to very stiff		72.61 1.98	4	SS	11				May 28, 2021 June 9, 2021
3					5	SS	3			MH	
4					6	SS	2				
5					7	SS	2				Backfill
		(CI/CH) SILTY CLAY to CLAY; grey; cohesive, firm to stiff		69.25 5.34	8	SS	-	⊕ +			
6					9	SS	1	⊕ +			
7								⊕ +			
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very loose to compact		66.66 7.93	10	SS	6				
8					11	SS	15		○	MH	
9					12	SS	17		○	M	Bentonite Seal
10					13	SS	20				
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-221

SHEET 2 OF 3

LOCATION: N 5028600.7 ;E 366490.8

BORING DATE: May 21, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very loose to compact			13	SS	20				Native Sand
11				63.31	14	SS	3		○	MH	
		(SW) SAND, fine to coarse, trace gravel; grey; non-cohesive, wet, very dense		11.28							
				62.85	15	SS	83		○	M	32 mm Diam. PVC #10 Slot Screen 'S'
12		(SM) SILTY sandy GRAVEL; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very dense		11.74							
				62.09	16	SS	114				
		(SM/ML) gravelly SILTY SAND to sandy SILT; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very dense		12.50							
13					17	SS	>50				
				61.18							
	Rotary Drill NW Casing	(SM/ML) gravelly SILTY SAND to sandy SILT; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very dense		13.41	1	RC	-				Silica Sand
				60.63							Bentonite Seal
14		Borehole continued on RECORD OF DRILLHOLE 21-221		13.96							
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-221

SHEET 3 OF 3

LOCATION: N 5028600.7 ;E 366490.8

DRILLING DATE: May 21, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: Jcon	DISCONTINUITY DATA: Jr	DISCONTINUITY DATA: Ja	ROCK STRENGTH INDEX: R4	ROCK STRENGTH INDEX: R3	ROCK STRENGTH INDEX: R2	ROCK STRENGTH INDEX: R1	WEATHERING INDEX: W1	WEATHERING INDEX: W2	WEATHERING INDEX: W3	WEATHERING INDEX: W4	Q AVG.	
		BEDROCK SURFACE		60.63																					
14	Rotary Drill NQ Core	Fresh, thinly to medium bedded, medium grey to brownish grey, fine to medium grained, non-porous, very strong SHALEY LIMESTONE		13.96	2	100																			
15																									
16		- broken core from 15.55 m to 15.56 m depth			3	100																			
17					4	100																			
				56.96																					
18		End of Drillhole Note(s): 1. Water level in screen measured at 1.35 m (Elev. 73.23 m) on May 28, 2021 (Shallow) 2. Water level in screen measured at 1.43 m (Elev. 73.15 m) on June 9, 2021 (Shallow) 3. Water level in screen measured at 2.33 m (Elev. 72.26 m) on May 28, 2021 (Deep) 4. Water level in screen measured at 2.41 m (Elev. 72.18 m) on June 9, 2021 (Deep)		17.63																					
19																									
20																									
21																									
22																									
23																									

Bentonite Seal

Silica Sand

UCS = 152 MPa

32 mm Diam. PVC #10 Slot Screen 'D'

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-222

SHEET 1 OF 2

LOCATION: N 5028541.6 ;E 366553.3

BORING DATE: May 12, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s; WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		78.83							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; brown, contains organic matter (rootlets); non-cohesive, moist, loose		0.00							
				0.15	1	SS	14				Bentonite Seal
		FILL - (CL/CI) SILTY CLAY, trace to some sand, some gravel; brown, contains brick fragments; cohesive, w~PL, very stiff		0.30							
				77.92							
1		FILL - (SM) gravelly SILTY SAND; grey brown, possible cobbles and boulders; non-cohesive, moist, compact to loose		0.91	2	SS	5		○		
		FILL - (CL/CI) SILTY CLAY, some sand, some gravel; grey brown; cohesive, w~PL, stiff		77.15							
		FILL - (SM) gravelly SILTY SAND, fine to coarse; brown to grey brown, concrete fragments, brick fragments, organic matter and wood; non-cohesive, moist, loose to very dense		1.68	3	SS	7				
2					4	SS	18		○		
3					5	SS	5				Backfill
4					6	SS	>50				
5					7	SS	65		○		
				73.49							
		FILL -(SM) gravelly SILTY SAND; grey brown, contains concrete and brick fragments; non-cohesive, moist, compact		5.34	8	SS	24				May 28, 2021 ▽
6					9	SS	11				June 9, 2021 ▽
				71.97							
7		FILL - (GP) sandy GRAVEL; grey, contains concrete fragments; non-cohesive, wet, dense		6.86	10	SS	35				
				71.21							Cave
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to dense		7.62	11	SS	35		○		
8					12	SS	17				
9					13	SS	9				Bentonite Seal
10					14	SS	14				
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI/BW

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-222

SHEET 2 OF 2

LOCATION: N 5028541.6 ;E 366553.3

BORING DATE: May 12, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to dense			14	SS	14		○	MH	Bentonite Seal
11					15	SS	39				Silica Sand
12					16	SS	9				38 mm Diam. PVC #10 Slot Screen 'D'
					17	SS	33		○		
				66.03							
13	DCPT	Dynamic Cone Penetration Test (DCPT)		12.80							Silica Sand
14				64.81					109		
		End of Borehole DCPT Refusal 1. Water level in screen measured at 5.65 m (Elev. 73.18 m) on May 28, 2021 (Deep) 2. Water level in screen measured at 6.79 m (Elev. 72.04 m) on June 9, 2021 (Deep)		14.02							
15											
16											
17											
18											
19											
20											

DEPTH SCALE
1 : 50

LOGGED: RI/BW
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-222A

SHEET 1 OF 1

LOCATION: N 5028541.6 ;E 366553.3

BORING DATE: May 12, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		78.83							
0	Power Augger 200 mm Diam. (Hollow Stem)	For soil stratigraphy refer to record of borehole 21-222		0.00							Bentonite Seal
1											
2											Backfill
3											
4											Bentonite Seal
5											Silica Sand
6											50 mm Diam. PVC #10 Slot Screen 'S'
7				71.21							May 28, 2021 June 9, 2021
		End of Borehole		7.62							
8		Note(s): 1. Water level in screen measured at 6.42 m (Elev. 72.41 m) on May 28, 2021 (Shallow) 2. Water level in screen measured at 6.52 m (Elev. 72.31 m) on June 9, 2021 (Shallow)									
9											
10											

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-222A

SHEET 1 OF 1

LOCATION: N 5028541.6 ;E 366553.3

BORING DATE: May 12, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		78.83							
0	Power Augger 200 mm Diam. (Hollow Stem)	For soil stratigraphy refer to record of borehole 21-222		0.00							Bentonite Seal
1											
2											Backfill
3											Bentonite Seal
4											Silica Sand
5											
6											50 mm Diam. PVC #10 Slot Screen 'S'
7				71.21							May 28, 2021 June 9, 2021
		End of Borehole		7.62							
8		Note(s): 1. Water level in screen measured at 6.42 m (Elev. 72.41 m) on May 28, 2021 (Shallow) 2. Water level in screen measured at 6.52 m (Elev. 72.31 m) on June 9, 2021 (Shallow)									
9											
10											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-222

SHEET 1 OF 2

LOCATION: N 5028541.6 ;E 366553.3

BORING DATE: May 12, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		78.83							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; brown, contains organic matter (rootlets); non-cohesive, moist, loose		0.00	1	SS	14				Bentonite Seal
		FILL - (CL/CI) SILTY CLAY, trace to some sand, some gravel; brown, contains brick fragments; cohesive, w~PL, very stiff		0.15 0.30 77.92							
1		FILL - (SM) gravelly SILTY SAND; grey brown, possible cobbles and boulders; non-cohesive, moist, compact to loose		0.91	2	SS	5		○		
		FILL - (CL/CI) SILTY CLAY, some sand, some gravel; grey brown; cohesive, w~PL, stiff		77.15							
2		FILL - (SM) gravelly SILTY SAND, fine to coarse; brown to grey brown, concrete fragments, brick fragments, organic matter and wood; non-cohesive, moist, loose to very dense		1.68	3	SS	7				
					4	SS	18		○		
3					5	SS	5				Backfill
4					6	SS	>50				
					7	SS	65		○		
5				73.49							
		FILL -(SM) gravelly SILTY SAND; grey brown, contains concrete and brick fragments; non-cohesive, moist, compact		5.34	8	SS	24				May 28, 2021
6					9	SS	11				June 9, 2021
				71.97							
7		FILL - (GP) sandy GRAVEL; grey, contains concrete fragments; non-cohesive, wet, dense		6.86	10	SS	35				
				71.21							Cave
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to dense		7.62	11	SS	35		○		
8											
					12	SS	17				
9											
					13	SS	9				Bentonite Seal
10					14	SS	14				
		CONTINUED NEXT PAGE									

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: RI/BW
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-222

SHEET 2 OF 2

LOCATION: N 5028541.6 ;E 366553.3

BORING DATE: May 12, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s; WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to dense			14	SS	14			MH	Bentonite Seal
11					15	SS	39				Silica Sand
12					16	SS	9				38 mm Diam. PVC #10 Slot Screen 'D'
					17	SS	33				
				66.03							
13	DCPT	Dynamic Cone Penetration Test (DCPT)		12.80							Silica Sand
14				64.81					109		
		End of Borehole DCPT Refusal 1. Water level in screen measured at 5.65 m (Elev. 73.18 m) on May 28, 2021 (Deep) 2. Water level in screen measured at 6.79 m (Elev. 72.04 m) on June 9, 2021 (Deep)		14.02							
15											
16											
17											
18											
19											
20											

DEPTH SCALE
1 : 50

LOGGED: RI/BW
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-224

SHEET 1 OF 3

LOCATION: N 5028516.4 ;E 366593.7

BORING DATE: May 10, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		78.90							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, trace organic matter; dark brown; moist		0.00							
		FILL - (SM) gravelly SILTY SAND, fine to coarse; dark brown to brown, contains concrete fragments; non-cohesive, moist, loose to very dense		0.15	1	SS	41				Bentonite Seal
1					2	SS	71				
											Backfill
2					3	SS	61				
					4	SS	22				
3											
					5	SS	16				Bentonite Seal
4					6	SS	22				
											Silica Sand
5					7	SS	29				
					8	SS	43				
6											50 mm Diam. PVC #10 Slot Screen
					9	SS	15				May 28, 2021 ▽ June 9, 2021 ▽
7					10	SS	20				
					11	SS	>50				
8					12	SS	6				Silica Sand
				70.52							
		(SM) gravelly SILTY SAND; grey brown to grey, contains cobbles (GLACIAL TILL); non-cohesive, wet, loose to compact		8.38	13	SS	24				
9					14	SS	11				Bentonite Seal
10					15	SS	9				
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED:

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-224

SHEET 2 OF 3

LOCATION: N 5028516.4 ;E 366593.7

BORING DATE: May 10, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SM) gravelly SILTY SAND; grey brown to grey, contains cobbles (GLACIAL TILL); non-cohesive, wet, loose to compact			15	SS	9				
11					16	SS	8				
				67.47							
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact to very dense		11.43	17	SS	18				
12					18	SS	25				
13					19	SS	50				Bentonite Seal
14					20	SS	57				
				64.42							
		(SW) SAND, fine to coarse, trace gravel; grey, contains thin beds of gravelly silty sand; non-cohesive, wet, compact		14.48	21	SS	23				
15				63.66							
		(SM) gravelly SILTY SAND; gery, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very dense		15.24	22	SS	91				
16					23	SS	>50				
				61.98							
17		Borehole continued on RECORD OF DRILLHOLE 21-224		16.92							
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED:

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-224

SHEET 3 OF 3

LOCATION: N 5028516.4 ;E 366593.7

DRILLING DATE: May 10, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	ROCK STRENGTH INDEX: R4	R3	R2	R1	WEATHERING INDEX: W1	W2	W3	W4	Q AVG.	
		BEDROCK SURFACE		61.98																					
17	Rotary Drill NQ Core	Fresh, thinly to medium bedded, medium grey to brownish grey, fine to medium grained, non-porous, medium strong to weak SHALEY LIMESTONE		16.92	1	100																			
18					2	100																			Bentonite Seal
19					3	100																			
20		- broken core from 19.80 m to 19.82 m depth		58.70																					
		End of Drillhole		20.20																					
21																									
22																									
23																									
24																									
25																									
26																									

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED:
CHECKED: CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-224

SHEET 1 OF 3

LOCATION: N 5028516.4 ;E 366593.7

BORING DATE: May 10, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		78.90							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, trace organic matter; dark brown; moist		0.00							
		FILL - (SM) gravelly SILTY SAND, fine to coarse; dark brown to brown, contains concrete fragments; non-cohesive, moist, loose to very dense		0.15	1	SS	41				Bentonite Seal
1					2	SS	71				
											Backfill
2					3	SS	61				
					4	SS	22				
3											
					5	SS	16				Bentonite Seal
4					6	SS	22				
											Silica Sand
5					7	SS	29				
					8	SS	43				
6											50 mm Diam. PVC #10 Slot Screen
					9	SS	15				May 28, 2021 ▽ June 9, 2021 ▽
7					10	SS	20				
					11	SS	>50				
8					12	SS	6				
				70.52							Silica Sand
		(SM) gravelly SILTY SAND; grey brown to grey, contains cobbles (GLACIAL TILL); non-cohesive, wet, loose to compact		8.38	13	SS	24				
9					14	SS	11				Bentonite Seal
10					15	SS	9				
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED:

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-224

SHEET 2 OF 3

LOCATION: N 5028516.4 ;E 366593.7

BORING DATE: May 10, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SM) gravelly SILTY SAND; grey brown to grey, contains cobbles (GLACIAL TILL); non-cohesive, wet, loose to compact			15	SS	9				
11					16	SS	8				
				67.47							
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact to very dense		11.43	17	SS	18				
12					18	SS	25				
13					19	SS	50				Bentonite Seal
14					20	SS	57				
				64.42							
		(SW) SAND, fine to coarse, trace gravel; grey, contains thin beds of gravelly silty sand; non-cohesive, wet, compact		14.48	21	SS	23				
15				63.66							
		(SM) gravelly SILTY SAND; gery, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very dense		15.24	22	SS	91				
16					23	SS	>50				
				61.98							
17		Borehole continued on RECORD OF DRILLHOLE 21-224		16.92							
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED:

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-224

SHEET 3 OF 3

LOCATION: N 5028516.4 ;E 366593.7

DRILLING DATE: May 10, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	ROCK STRENGTH INDEX: R4	R3	R2	R1	WEATHERING INDEX: W1	W2	W3	W4	Q AVG.	
		BEDROCK SURFACE		61.98																					
17	Rotary Drill NQ Core	Fresh, thinly to medium bedded, medium grey to brownish grey, fine to medium grained, non-porous, medium strong to weak SHALEY LIMESTONE		16.92	1	100																			Bentonite Seal
18					2	100																			
19					3	100																			
20		- broken core from 19.80 m to 19.82 m depth		58.70																					
		End of Drillhole		20.20																					
21																									
22																									
23																									
24																									
25																									
26																									

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED:
CHECKED: CH

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-225

SHEET 1 OF 2

LOCATION: N 5028560.9 ;E 366591.4

BORING DATE: May 3, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		75.21							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; dark brown, contains brick and organic matter (rootlets); moist		0.00 74.98	1	SS	>50				
		FILL - (SM) gravelly SILTY SAND; brown, contains cobbles and boulders; non-cohesive, dry, very dense		0.23							
1					2	SS	78				Bentonite Seal
				73.69							
		FILL - (CI/CH) SILTY CLAY, some sand, trace gravel; grey brown; cohesive, w~PL, very stiff		1.52	3	SS	12				
2					4	SS	10				Silica Sand
3				72.16							50 mm Diam. PVC #10 Slot Screen
		(CI/CH) SILTY CLAY, trace sand; grey brown, slightly fissured (WEATHERED CRUST); cohesive, W~PL, very stiff		3.05	5	SS	13				May 28, 2021 June 9, 2021
				71.40							
4		(SM) gravelly SILTY SAND; grey brown to grey (GLACIAL TILL); non-cohesive, moist to wet, compact		3.81	6	SS	12				
					7	SS	15				
5					8	SS	19				Silica Sand
6					9	SS	10				
7					10	SS	20				
8					11	SS	23				Bentonite Seal
					12	SS	13				
9					13	SS	12				
10					14	SS	11				
		CONTINUED NEXT PAGE									

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: RI
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-225

SHEET 2 OF 2

LOCATION: N 5028560.9 ;E 366591.4

BORING DATE: May 3, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SM) gravelly SILTY SAND; grey brown to grey (GLACIAL TILL); non-cohesive, moist to wet, compact			14	SS	11				Bentonite Seal
11					15	SS	10				
12					16	SS	11				
12					17	SS	13				Cave
13				62.23 / 12.98							
13		End of Borehole Auger Refusal Note(s): 1. Water level in screen measured at 3.63 m (Elev. 71.59 m) on June 9, 2021 2. Water level in screen measured at 3.54 m (Elev. 71.68 m) on May 28, 2021 3. Water level measured at a depth of 2.96 m on May 5, 2021									
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: RI
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-225

SHEET 1 OF 2

LOCATION: N 5028560.9 ;E 366591.4

BORING DATE: May 3, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		75.21							
0	Power Auger	TOPSOIL - (SM) SILTY SAND; dark brown, contains brick and organic matter (rootlets); moist		0.00							
				74.98	1	SS	>50				
		FILL - (SM) gravelly SILTY SAND; brown, contains cobbles and boulders; non-cohesive, dry, very dense		0.23							
1					2	SS	78				Bentonite Seal
				73.69							
		FILL - (CI/CH) SILTY CLAY, some sand, trace gravel; grey brown; cohesive, w~PL, very stiff		1.52							
2					3	SS	12				Silica Sand
					4	SS	10				
				72.16							50 mm Diam. PVC #10 Slot Screen
3		(CI/CH) SILTY CLAY, trace sand; grey brown, slightly fissured (WEATHERED CRUST); cohesive, W~PL, very stiff		3.05	5	SS	13				May 28, 2021 June 9, 2021
				71.40							
		(SM) gravelly SILTY SAND; grey brown to grey (GLACIAL TILL); non-cohesive, moist to wet, compact		3.81							
4					6	SS	12				
					7	SS	15				
5											Silica Sand
					8	SS	19				
6											
					9	SS	10				
7											
					10	SS	20				
					11	SS	23				Bentonite Seal
8											
					12	SS	13				
9											
					13	SS	12				
10					14	SS	11				
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-225

SHEET 2 OF 2

LOCATION: N 5028560.9 ;E 366591.4

BORING DATE: May 3, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SM) gravelly SILTY SAND; grey brown to grey (GLACIAL TILL); non-cohesive, moist to wet, compact			14	SS	11				Bentonite Seal
11					15	SS	10				
12					16	SS	11				
13					17	SS	13				Cave
				62.23 / 12.98							
		End of Borehole Auger Refusal Note(s): 1. Water level in screen measured at 3.63 m (Elev. 71.59 m) on June 9, 2021 2. Water level in screen measured at 3.54 m (Elev. 71.68 m) on May 28, 2021 3. Water level measured at a depth of 2.96 m on May 5, 2021									
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: RI
CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-226

SHEET 1 OF 2

LOCATION: N 5028544.1 ;E 366622.8

BORING DATE: May 4, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		75.31							
0	Power Auger	TOPSOIL - (SM) SILTY SAND; dark brown; moist		0.00 / 75.08							
		FILL - (SM) SILTY SAND, fine to coarse, some gravel, trace clay; brown; non-cohesive, moist, loose to dense		0.23	1	SS	12				
1	200 mm Diam. (Hollow Stem)				2	SS	38				Bentonite Seal
					3	SS	95				
2											Silica Sand
				73.02	4	SS	21				
		FILL - (CL/CH) SILTY CLAY, trace sand; grey brown, with black mottling, contains organic matter; w<PL, very stiff		2.29							
3				72.26							
		(CI/CH) SILTY CLAY, trace sand; grey brown, highly fissured (WEATHERED CRUST); cohesive, w<PL, stiff to very stiff		3.05	5	SS	12		○	MH	
4					6	SS	5				50 mm Diam. PVC #10 Slot Screen May 28, 2021 ▽ June 9, 2021 ▽
				70.74							
		(SM) gravelly SILTY SAND; grey brown to grey, contains cobbles (GLACIAL TILL); non-cohesive, moist to wet, compact to very dense		4.57	7	SS	19				
5					8	SS	11		○	M	Silica Sand
6					9	SS	13				
7					10	SS	9				
					11	SS	15				Bentonite Seal
8											
					12	SS	11				
9					13	SS	10				
10					14	SS	32				
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/16/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-226

SHEET 2 OF 2

LOCATION: N 5028544.1 ;E 366622.8

BORING DATE: May 4, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
	Power Auger	(SM) gravelly SILTY SAND; grey brown to grey, contains cobbles (GLACIAL TILL); non-cohesive, moist to wet, compact to very dense			14	SS	32				Bentonite Seal
					15	SS	87				Cave
				64.36							
11		End of Borehole Auger Refusal		10.95							
		Note(s): 1. Water level in screen measured at 3.77 m (Elev. 72.48 m) on May 28, 2021 2. Water level in screen measured at 3.94 m (Elev. 72.31 m) on June 9, 2021 3. Water level measured at a depth of 2.40 m on May 5, 2021									
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

PROJECT: 21451149

RECORD OF BOREHOLE: 21-226

SHEET 1 OF 2

LOCATION: N 5028544.1 ;E 366622.8

BORING DATE: May 4, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W WI)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		75.31							
0	Power Auger	TOPSOIL - (SM) SILTY SAND; dark brown; moist		0.00 75.08							
		FILL - (SM) SILTY SAND, fine to coarse, some gravel, trace clay; brown; non-cohesive, moist, loose to dense		0.23	1	SS	12				
1					2	SS	38				Bentonite Seal
					3	SS	95				
2											Silica Sand
				73.02	4	SS	21				
		FILL - (CL/CH) SILTY CLAY, trace sand; grey brown, with black mottling, contains organic matter; w<PL, very stiff		2.29							
3				72.26							
		(CI/CH) SILTY CLAY, trace sand; grey brown, highly fissured (WEATHERED CRUST); cohesive, w<PL, stiff to very stiff		3.05	5	SS	12		○	MH	
4					6	SS	5				50 mm Diam. PVC #10 Slot Screen May 28, 2021 June 9, 2021
				70.74							
		(SM) gravelly SILTY SAND; grey brown to grey, contains cobbles (GLACIAL TILL); non-cohesive, moist to wet, compact to very dense		4.57	7	SS	19				
5	200 mm Diam. (Hollow Stem)				8	SS	11		○	M	Silica Sand
6					9	SS	13				
7					10	SS	9				
8					11	SS	15				Bentonite Seal
					12	SS	11				
9					13	SS	10				
10					14	SS	32				
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: RI

CHECKED: CH

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 6/13/22

PROJECT: 21451149

RECORD OF BOREHOLE: 21-226

SHEET 2 OF 2

LOCATION: N 5028544.1 ;E 366622.8

BORING DATE: May 4, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
	Power Auger	(SM) gravelly SILTY SAND; grey brown to grey, contains cobbles (GLACIAL TILL); non-cohesive, moist to wet, compact to very dense			14	SS	32				Bentonite Seal
					15	SS	87				Cave
				64.36							
11		End of Borehole Auger Refusal		10.95							
		Note(s): 1. Water level in screen measured at 3.77 m (Elev. 72.48 m) on May 28, 2021 2. Water level in screen measured at 3.94 m (Elev. 72.31 m) on June 9, 2021 3. Water level measured at a depth of 2.40 m on May 5, 2021									
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: CH

PROJECT: 21451149

RECORD OF BOREHOLE: 22-01

SHEET 1 OF 2

LOCATION: N 5028666.0 ;E 366664.4

BORING DATE: February 23, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s; WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		66.19							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM/ML) gravelly SILTY SAND to sandy SILT, trace clay; brown to dark brown, contains rootlets; non-cohesive, moist, compact		0.00 / 65.58	1	SS	27			M	
1		No Sample Recovery Possible Sand Fill, very loose		0.61 / 64.67	2	SS	WR				
		FILL - (SP) SAND, fine to medium, some silt and clay; brown; non-cohesive, moist, very dense		1.52 / 64.36	2A	SS	>50				
2		Borehole continued on RECORD OF DRILLHOLE 22-01		1.83							
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

LOGGED: BW
CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-01

SHEET 2 OF 2

LOCATION: N 5028666.0 ;E 366664.4

DRILLING DATE: February 23, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	ROCK STRENGTH INDEX: R4	R3	R2	R1	WEATHERING INDEX: W1	W2	W3	W4	Q AVG.
		BEDROCK SURFACE		64.36																				
2	Rotary Drill / NQ Core	Fresh to slightly weathered, thinly to medium bedded, grey to dark grey, fine to medium grained, slighly porous, strong SHALEY LIMESTONE - broken core from 2.48 to 2.50 m depth - broken core from 2.52 to 2.70 m depth		1.83	1																			
3				62.84																				
		End of Drillhole		3.35																				
4																								
5																								
6																								
7																								
8																								
9																								
10																								
11																								

DEPTH SCALE
1 : 50

LOGGED: BW
CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-02

SHEET 1 OF 1

LOCATION: N 5028644.0 ;E 366711.2

BORING DATE: February 22, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		66.60									
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM/ML) gravelly SILTY SAND to sandy SILT, some clay; dark brown, contains rootlets; non-cohesive, moist, compact		0.00	1	SS	25						
				65.99									
1		FILL - (SM/SP) SILTY SAND to SAND, fine to medium, some clay, trace gravel; brown to light brown; non-cohesive, moist, compact		0.61	2	SS	20						
				65.23									
2		FILL - (SP) SAND, fine to medium, some silt; black and reddish brown; non-cohesive, moist, dense to very dense		1.37	3	SS	>50						
					4	SS	35						
				63.71									
3		End of Borehole Auger Refusal		2.89									
4													
5													
6													
7													
8													
9													
10													

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: BW
CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-03

SHEET 1 OF 2

LOCATION: N 5028663.0 ;E 366719.8

BORING DATE: February 23, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		66.71							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM/ML) SILTY SAND to sandy SILT, some clay; brown, contains rootlets; non-cohesive, moist, compact		0.00	1	SS	14				
				66.10							
1		FILL - (SP) SAND, fine to medium, some silt; brown to light brown, mottled reddish orangish black; non-cohesive, moist, loose to very		0.61	2	SS	17				
2					3	SS	6				
				64.40	4	SS	>50				
		Borehole continued on RECORD OF DRILLHOLE 22-03		2.31							
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: BW

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-03

SHEET 2 OF 2

LOCATION: N 5028663.0 ;E 366719.8

DRILLING DATE: February 23, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	ROCK STRENGTH INDEX R4	ROCK STRENGTH INDEX R3	ROCK STRENGTH INDEX R2	ROCK STRENGTH INDEX R1	WEATHERING INDEX W1	WEATHERING INDEX W2	WEATHERING INDEX W3	WEATHERING INDEX W4	Q AVG.	
		BEDROCK SURFACE		64.40																					
3	Rotary Drill / NQ Core	Fresh to slightly weathered, thinly to medium bedded, grey, fine to medium grained, slightly porous, strong LIMESTONE, with laminations of shale - broken core from 2.58 to 2.62 m depth - vertical joint from 2.70 to 3.04 m depth - brocken core from 2.83 to 2.91 m depth		2.31	1																				
4					2																				UCS = 108 MPa
				61.86																					
5		End of Drillhole		4.85																					

DEPTH SCALE
1 : 50

LOGGED: BW
CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-04

SHEET 1 OF 1

LOCATION: N 5028673.4 ;E 366740.3

BORING DATE: February 22, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		66.40							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) gravelly SILTY SAND, some clay; brown to dark brown, contains rootlets; non-cohesive, moist, compact		0.00 / 65.79	1	SS	20				
1		FILL - (SM/SP) SAND to SILTY SAND, trace clay; brown mottled black; non-cohesive, moist, compact		0.61 / 64.88	2	SS	25				
2		FILL - (CL) CLAY, some gravel; brown; cohesive, w>PL, hard		1.52 / 64.27	3	SS	63				
		FILL - (ML) gravelly sandy SILT; brown to black; non-cohesive, wet, dense to very dense		2.13 / 63.93	4	SS	>50				
		End of Borehole Auger Refusal		2.47							
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: BW
CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-05

SHEET 1 OF 1

LOCATION: N 5028687.2 ;E 366714.1

BORING DATE: February 22, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		66.26							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM/ML) gravelly SILTY SAND to sandy SILT, some clay; brown to dark brown, contains rootlets; non-cohesive, moist, compact		0.00	1	SS	18				
				65.65							
1		FILL - (CI) SILTY CLAY, trace sand and gravel; brown; cohesive, w>PL, very stiff		0.61	2	SS	24				
				64.77							
		End of Borehole Auger Refusal		1.49							
2											
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: BW

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-06

SHEET 1 OF 1

LOCATION: N 5028724.0 ;E 366710.8

BORING DATE: February 22, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		65.86							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, trace to some clay; brown to dark brown, contains rootlets; non-cohesive, moist, very dense		0.00	1	SS	76				
				65.25							
1		FILL - (SM) SILTY SAND, some gravel; brown, contains brick fragments, potential cobbles; non-cohesive, moist, compact		0.61	2	SS	17				
					3	SS	>50				
2				63.90							
		End of Borehole Auger Refusal		1.96							
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: BW
CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-07

SHEET 1 OF 1

LOCATION: N 5028758.6 ;E 366723.0

BORING DATE: February 24, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		66.05							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM/ML) SILTY SAND to sandy SILT; brown, contains rootlets and 5 cm clay bed; non-cohesive, moist, compact		0.00	1	SS	12				
				65.44							
		FILL - (CH) CLAY; brown; cohesive, w~PL, hard		0.61							
1				64.99	2	SS	33				
		FILL - (SM) SILTY SAND; brown, contains rock fragments, wood chips, gravel pockets; non-cohesive, moist, loose to very dense		1.06							
2					3	SS	5				
				63.66	4	SS	>50				
		Borehole continued on RECORD OF DRILLHOLE 22-07		2.39							
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: BW

CHECKED: BB

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-07

SHEET 1 OF 1

LOCATION: N 5028758.6 ;E 366723.0

DRILLING DATE: February 24, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	ROCK STRENGTH INDEX: R4	R3	R2	R1	WEATHERING INDEX: W1	W2	W3	W4	Q AVG.
		BEDROCK SURFACE		63.66																				
3	Rotary Drill / NQ Core	Fresh to slightly weathered, thinly to medium bedded, grey, fine to medium grained, slightly porous, LIMESTONE, with thin to thick laminations of shale - vertical joint from 2.87 to 3.3 m depth		2.39	1																			
4		- vertical joint from 3.23 to 3.27 m depth			2																			
5		- vertical joint from 4.75 to 5.4 m depth		60.65	3																			
		End of Drillhole		5.40																				
6																								
7																								
8																								
9																								
10																								
11																								
12																								

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: BW
CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-08

SHEET 1 OF 1

LOCATION: N 5028712.6 ;E 366753.6

BORING DATE: February 25, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		65.77							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM/ML) SILTY SAND to sandy SILT; brown, contains rootlets; non-cohesive, moist, compact		0.00	1	SS	17				
				65.16							
1		FILL - (CH) CLAY, trace silt, sand, and gravel; brown mottled black and red, contains gravel, cobbles, and weathered bedrock; cohesive, w>PL, very stiff to hard		0.61	2	SS	17				
2					3	SS	63				
				63.48							
		End of Borehole Auger Refusal		2.29							
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: BW
CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-09

SHEET 1 OF 1

LOCATION: N 5028659.6 ;E 366771.6

BORING DATE: February 22, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		66.89							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND; brown, contains rootlets; non-cohesive, moist, compact		0.00	1	SS	10				
				66.28							
1		FILL - (CI) SILTY CLAY; brown, contains brick fragments; cohesive, w>PL, firm		0.61	2	SS	6			MH	
				65.37							
2		(SM) SILTY SAND, trace clay, trace gravel; brown; non-cohesive, wet, compact		1.52	3	SS	24				
					4	SS	>50				
				64.40							
		End of Borehole Auger Refusal		2.49							
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

LOGGED: BW
CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-10

SHEET 1 OF 1

LOCATION: N 5028648.4 ;E 366795.1

BORING DATE: February 24, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		67.17							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM/ML) SILTY SAND to sandy SILT, trace to some clay; brown, contains rootlets, small gravel bed; non-cohesive, moist, compact		0.00	1	SS	27				
				66.56							
1		FILL - (SM) SILTY SAND, some clay; brown mottled black; non-cohesive, moist, compact		0.61	2	SS	10				
				65.65							
2		FILL - (SM/ML) gravelly SILTY SAND to sandy SILT; brown with a grey area, contains gravel bed; cohesive, w>PL, hard		1.52	3	SS	20		○	MH	
				64.88							
		FILL - (SP) SAND, some silt, fine to medium; brown to light brown; non-cohesive, moist, compact		2.29	4	SS	11				
3					5	SS	>50				
				63.64							
		Borehole continued on RECORD OF DRILLHOLE 22-10		3.53							
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: BW

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-10

SHEET 1 OF 1

LOCATION: N 5028648.4 ;E 366795.1

DRILLING DATE: February 24, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	ROCK STRENGTH INDEX: R4	R3	R2	R1	WEATHERING INDEX: W1	W2	W3	W4	Q AVG.
		BEDROCK SURFACE		63.64																				
4	Rotary Drill / NQ Core	Fresh to slightly weathered, thinly to medium bedded, grey, fine to medium grained, slightly porous, strong LIMESTONE, with thin to thick laminations of shale		3.53	1																			
5					2																			
6					3																			
				60.26																				
7		End of Drillhole		6.91																				
8																								
9																								
10																								
11																								
12																								
13																								

DEPTH SCALE
1 : 50

LOGGED: BW
CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-11

SHEET 1 OF 2

LOCATION: N 5028697.0 ;E 366812.2

BORING DATE: March 14, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		66.07									
0	Power Auger 200 mm Diam. (Hollow Stem)	ASPHALTIC CONCRETE		0.05									
		FILL - (SW/GW) SAND and GRAVEL; grey, crushed stone (PAVEMENT STRUCTURE); non-cohesive, moist		65.84 0.23	1	AS	-						
		FILL - (SW/SM) SAND and SILTY SAND, some gravel, trace clay; brown; non-cohesive, moist		65.31 0.76	2	SS	>50						
1		Weathered LIMESTONE		64.62									
		Borehole continued on RECORD OF DRILLHOLE 22-11		1.45									
2													
3													
4													
5													
6													
7													
8													
9													
10													

DEPTH SCALE

1 : 50

GOLDER

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-11

SHEET 2 OF 2

LOCATION: N 5028697.0 ;E 366812.2

DRILLING DATE: March 14, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate; BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage; PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular; PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break; BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.	
		BEDROCK SURFACE		64.62															
2	Rotary Drill / NQ Core	Slightly weathered to fresh, medium bedded, medium grey to dark grey, fine to medium grained, slightly porous, strong LIMESTONE, with interbedded shale		1.45	1														UCS = 89 MPa
3					2														
4				61.44															
		End of Drillhole		4.63															
5																			
6																			
7																			
8																			
9																			
10																			
11																			

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-12

SHEET 1 OF 2

LOCATION: N 5028737.1 ;E 366786.1

BORING DATE: March 14, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		65.45							
0	Power Auger 200 mm Diam. (Hollow Stem)	ASPHALTIC CONCRETE		0.05							
		FILL - (SW/GW) SAND and GRAVEL; grey, crushed gravel (PAVEMENT STRUCTURE); non-cohesive, moist		65.17 0.28	1	AS	-				
		FILL - (SW) SAND, some silt and gravel; brown, contains cobbles; non-cohesive, moist			2	SS	>50				
1				64.38							
		FILL - (SM) SILTY SAND, some clay and gravel; brown with mottling; slightly cohesive, moist to wet, compact		1.07							
					3	SS	15				
2				63.37							
		Weathered LIMESTONE		2.08							
		Borehole continued on RECORD OF DRILLHOLE 22-12		2.21							
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-12

SHEET 2 OF 2

LOCATION: N 5028737.1 ;E 366786.1

DRILLING DATE: March 14, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		BEDROCK SURFACE		63.24														
3	Rotary Drill / NQ Core	Slightly weathered to fresh, medium bedded, grey to dark grey, fine to medium grained, slightly porous, NODULAR LIMESTONE, with shale interbedded		2.21	1													
4					2													
5					3													
				59.79														
		End of Drillhole		5.66														
6																		
7																		
8																		
9																		
10																		
11																		
12																		

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

PROJECT: 21451149

RECORD OF BOREHOLE: 22-13

SHEET 1 OF 2

LOCATION: N 5028787.1 ;E 366761.0

BORING DATE: March 8, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		65.04							
0	Power Auger 200 mm Diam. (Hollow Stem)	ASPHALTIC CONCRETE		0.05							
		FILL - (SW/GW) SAND and GRAVEL; grey, crushed stone (PAVEMENT STRUCTURE); non-cohesive, moist, compact		64.63	1	AS	-				
		FILL - (SM) SILTY SAND, some gravel and clay; brown; non-cohesive, moist		0.41 64.28							
1		FILL - (SW) SAND, some gravel, trace to some silt, trace clay; brown; non-cohesive, moist, dense to very dense		0.76	2	SS	>50				
					3	SS	37				
2		possible weathered LIMESTONE		63.01 2.03	4	SS	>50				
				62.32							
		Borehole continued on RECORD OF DRILLHOLE 22-13		2.72							
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-13

SHEET 2 OF 2

LOCATION: N 5028787.1 ;E 366761.0

DRILLING DATE: March 8, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		BEDROCK SURFACE		62.32														
3	Rorary Drill / NQ Core	Fresh, medium to thinly bedded, grey, fine to medium grained, slightly porous, strong NODULAR LIMESTONE, with shale interbedded		2.72	1													
4					2													
5																		
6					3													
				58.44														
		End of Drillhole		6.60														
7																		
8																		
9																		
10																		
11																		
12																		

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-14

SHEET 1 OF 2

LOCATION: N 5028810.9 ;E 366851.2

BORING DATE: March 8, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		65.14							
0	Power Auger 200 mm Diam. (Hollow Stem)	ASPHALTIC CONCRETE FILL - (SW/GW) SAND and GRAVEL; grey, crushed stone (PAVEMENT STRUCTURE); non-cohesive, moist		0.00 64.89							
		FILL - (SW) SAND, some silt and gravel, trace clay; brown; non-cohesive, moist		0.25	1	AS	-				
				64.30	2	SS	>50				
1		Possible weathered LIMESTONE		0.84 63.79							
		Borehole continued on RECORD OF DRILLHOLE 22-14		1.35							
2											
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-14

SHEET 2 OF 2

LOCATION: N 5028810.9 ;E 366851.2

DRILLING DATE: March 8, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		BEDROCK SURFACE		63.79														
2	Rotary Drill / NQ Core	Fresh, medium bedded, grey, fine to medium grained, slightly porous, strong NODULAR LIMESTONE, with thin shaley beds		1.35	1													
3					2													
4					3													
				60.36														
		End of Drillhole		4.78														
5																		
6																		
7																		
8																		
9																		
10																		
11																		

DEPTH SCALE
1 : 50

LOGGED: JS
CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-15

SHEET 1 OF 2

LOCATION: N 5028690.4 ;E 366474.2

BORING DATE: May 16, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		66.93							
0	Power Auger 200 mm Diam. (Hollow Stem)	ASPHALTIC CONCRETE		0.00							
		CEMENTITIOUS CONCRETE		0.15	1	GRAB	-				
				66.32							
1		FILL - (SP) SAND, medium, trace gravel; brown; non-cohesive, moist to wet, compact		0.61							
				65.63							
		FILL - (SM/ML) gravelly SILTY SAND to sandy SILT, some clay; brown grey with black staining, contains organics; slightly cohesive, moist, compact		1.30	2	SS	25				
2					3	SS	36				
				64.95							
		TOPSOIL - (ML) sandy SILT, some clay; dark brown, contains organics; non-cohesive, moist, loose		1.98							
				2.13							
		(SM/ML) SILTY SAND to sandy SILT, some clay and gravel; grey (GLACIAL TILL); non-cohesive, moist, compact			4	SS	22				
3					5	SS	16				
					6	SS	>50				
4				62.79							
		Borehole continued on RECORD OF DRILLHOLE 22-15		4.14							
5											
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-15

SHEET 2 OF 2

LOCATION: N 5028690.4 ;E 366474.2

DRILLING DATE: May 16, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		BEDROCK SURFACE		62.79														
5	Rotary Drill / NQ Core	Fresh to slightly weathered, bedded, grey to dark grey, fine to medium grained, slighly porous, medium strong shaley LIMESTONE		4.14 / 61.14	1													
6		End of Drillhole		5.79														
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		

DEPTH SCALE
1 : 50

LOGGED: JS
CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-16

SHEET 1 OF 1

LOCATION: N 5028730.7 ;E 366508.7

BORING DATE: May 16, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		65.97							
0	Power Auger 200 mm Diam. (Hollow Stem)	ASPHALTIC CONCRETE		0.00							
		CEMENTITIOUS CONCRETE		0.13 65.64							
		FILL - (SP) SAND, medium, trace gravel; brown; non-cohesive, moist, loose		0.33	1	GRAB	-				
1		(PT) fibrous PEAT		64.90 1.07	2	SS	9				
		(SM/ML) SILTY SAND to sandy SILT, some plastic fines and gravel; grey (GLACIAL TILL); cohesive, w>PL, soft		64.60 1.37	3	SS	8				
2					4	SS	7				
3		End of Borehole Auger Refusal		63.00 2.97							
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

LOGGED: JS
CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-17

SHEET 1 OF 2

LOCATION: N 5028822.0 ;E 366648.8

BORING DATE: May 17, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE		64.87									
	Power Auger 200 mm Diam. (Hollow Stem)	ASPHALTIC CONCRETE		0.00									
		CEMENTITIOUS CONCRETE		0.13									
				64.46									
		FILL - (SP) SAND, medium, trace gravel; brown; non-cohesive, moist, compact		0.41	1	GRAB	-						
1				63.70									
		FILL - (SM) SILTY SAND, with gravel, some clay; brown; non-cohesive, moist, compact		1.17									
				63.35									
		FILL - (SW) gravelly SAND, medium to coarse, some silt; brown; non-cohesive, moist, compact		1.52	2	SS	28						
					3	SS	25						
2				62.86									
		Weathered LIMESTONE		2.08									
		Borehole continued on RECORD OF DRILLHOLE 22-17											
3													
4													
5													
6													
7													
8													
9													
10													

DEPTH SCALE
1 : 50

LOGGED: JS
CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-17

SHEET 2 OF 2

LOCATION: N 5028822.0 ;E 366648.8

DRILLING DATE: May 17, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		BEDROCK SURFACE		62.79														
3	Rotary Drill / NQ Core	Slightly weathered to fresh, bedded, nodular, grey to dark grey, fine to medium grained, slightly porous, medium strong LIMESTONE, with thin to thick laminations of shale		2.08	1													
4					2													
				60.63														
		End of Drillhole		4.24														
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		

DEPTH SCALE
1 : 50

LOGGED: JS
CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-18

SHEET 1 OF 1

LOCATION: N 5028897.8 ;E 366806.6

BORING DATE: May 16, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		63.14							
0	Power Auger 200 mm Diam. (Hollow Stem)	ASPHALTIC CONCRETE		0.00							
		CEMENTITIOUS CONCRETE		0.13							
		FILL - (SP) SAND, medium, trace gravel; brown; non-cohesive, moist, compact		62.78							
				0.36	1	GRAB	-				
1					2	SS	>50				
				62.05							
		End of Borehole Auger Refusal		1.09							
2											
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-19

SHEET 1 OF 2

LOCATION: N 5028860.2 ;E 366863.0

BORING DATE: May 17, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		63.81							
0	Power Auger 200 mm Diam. (Hollow Stem)	ASPHALTIC CONCRETE		0.00							
		CEMENTITIOUS CONCRETE		0.15 63.45							
		FILL - (SP) gravelly SAND, medium brown; non-cohesive, moist, compact		0.36	1	GRAB	-				
1				62.82	2	SS	>50				
		Borehole continued on RECORD OF DRILLHOLE 22-19		.99							
2											
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-19

SHEET 2 OF 2

LOCATION: N 5028860.2 ;E 366863.0

DRILLING DATE: May 17, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE % (80 60 40 20)	RECOVERY: SOLID CORE % (80 60 40 20)	R.Q.D. % (80 60 40 20)	FRACT. INDEX PER 0.25 m (5 10 15 20)	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec (10^{-6} 10^{-5} 10^{-4} 10^{-3})	Diametral Point Load Index (MPa) (2 4 6)	RMC -Q' AVG.
		BEDROCK SURFACE		62.82														
1	Rotary Drill / NQ Core	Fresh, bedded, nodular grey to dark grey, slightly porous, fine to medium grained, medium strong LIMESTONE, with thin to thick laminations of shale		0.99	1													
2				61.27														
		End of Drillhole		2.54														
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: JS
CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-20

SHEET 1 OF 1

LOCATION: N ;E

BORING DATE: May 17, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) WATER CONTENT PERCENT Wp W Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE									
0	Power Auger 200 mm Diam. (Hollow Stem)	ASPHALTIC CONCRETE		0.00							
		CEMENTITIOUS CONCRETE		0.15							
		FILL - (SW) gravelly SAND, medium; brown; non-cohesive, moist, looset to compact		0.30	1	GRAB	-				
1		FILL - (CL/SW) SILTY CLAY and SAND, some gravel; dark brown, mottled; cohesive, w<PL, stiff		0.81	2	SS	>50				
		Assumed weathered LIMESTONE		1.01							
		End of Borehole Auger Refusal		1.24							
2											
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-21

SHEET 1 OF 2

LOCATION: N 5028698.9 ;E 366848.5

BORING DATE: June 20, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		66.25							
0	Power Auger 200 mm Diam. (Hollow Stem)	ASPHALTIC CONCRETE		0.00							
		FILL - (SW/GP) SAND and GRAVEL, some silt; grey (PAVEMENT STRUCTURE); non-cohesive, moist, compact		0.15	1	AS	-				
				65.89							Bentonite Seal
				0.36							
		FILL - (SM) SILTY SAND, some clay and gravel; brown; slightly to non-cohesive, w<PLto moist, firm to loose			2	SS	>50				
1				65.18							
		Borehole continued on RECORD OF DRILLHOLE 22-21		1.07							
2											
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-21

SHEET 2 OF 2

LOCATION: N 5028698.9 ;E 366848.5

DRILLING DATE: June 20, 2022

DATUM: NAD 1983

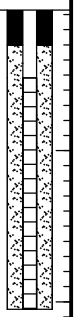
INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.	
		BEDROCK SURFACE		65.18															
2	Rotary Drill / NQ Core	Slightly weatrhered to fresh, bedded, nodular, grey/dark grey, fine to mediuim grained, slightly porous, medium strong SHALEY LIMESTONE		1.07	1	0													Bentonite Seal Silica Sand
3				63.20	1	0													32 mm PVC #10 Slot Screen
		End of Drillhole		3.05															



DEPTH SCALE
1 : 50

GOLDER

LOGGED: JS
CHECKED: BB

PROJECT: 21451149

RECORD OF BOREHOLE: 22-22

SHEET 1 OF 1

LOCATION: N 5028665.1 ;E 366827.6

BORING DATE: June 21, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		66.67							
0	Power Auger 200 mm Diam. (Hollow Stem)	ASPHALTIC CONCRETE (NEW)		0.05							
		ASPHALTIC CONCRETE (OLD)		66.42							
		FILL - (SW) gravelly SAND; brown (PAVEMENT STRUCTURE); non-cohesive, moist		0.25 66.22	1	AS	-				
		FILL -(ML) CLAYEY SILT, some sand, trace gravel; brown; cohesive, w<PL, firm		0.45							
1					2	SS	14				
		End of Borehole Auger Refusal		65.17 1.50							
2											
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-23

SHEET 1 OF 1

LOCATION: N 5028620.8 ;E 366797.6

BORING DATE: June 21, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		67.47							
0	Power Auger 200 mm Diam. (Hollow Stem)	ASPHALTIC CONCRETE		0.00 67.27							
		FILL - (SW) SAND, some gravel; brown (PAVEMENT STRUCTURE); non-cohesive, moist		0.20 66.96	1	AS	-				
		FILL - (ML) CLAYEY SILT, some sand and gravel; grey, contains organic s; cohesive, w<PL, firm		0.51							
1					2	SS	7				
				65.95							
		FILL - (ML/SM) CLAYEY SILT to SILTY CLAY, some gravel; grey, contains organics and debris; slightly cohesive, moist, loose		1.52	3	SS	7				
2											▽
		- Becomes wet at a depth of 2.59 m			4	SS	8				
				64.42							
3		End of Borehole Auger Refusal		3.05							
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-24

SHEET 1 OF 2

LOCATION: N 5028558.6 ;E 366757.3

BORING DATE: June 20, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE		70.64							
0	Power Auger 200 mm Diam. (Hollow Stem)	ASPHALTIC CONCRETE		0.05	1	AS	-				Flush Mount Casing
		FILL - (GP/SW) SAND and GRAVEL; grey (PAVEMENT STRUCTURE); non-cohesive, moist		70.34							
		FILL -(SW) gravelly SAND, some silt, clay; brown; non-cohesive, moist, compact		0.30	2	AS	-				
				69.73	2A						
1		(SM) SILTY SAND, some clay and gravel; brown (GLACIAL TILL); non-cohesive, moist, copmact		0.91	2B	SS	17				Bentonite Seal
					3	SS	>50				
				68.68							
2		Borehole continued on RECORD OF DRILLHOLE 22-24		1.96							
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

GOLDER

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-24

SHEET 2 OF 2

LOCATION: N 5028558.6 ;E 366757.3

DRILLING DATE: June 20, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Downing Drilling

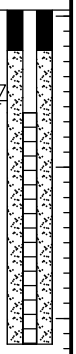
JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE % (80 60 40 20)	RECOVERY: SOLID CORE % (80 60 40 20)	R.Q.D. % (80 60 40 20)	FRACT. INDEX PER 0.25 m (5 10 15 20)	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec (10^{-6} 10^{-5} 10^{-4} 10^{-3})	Diametral Point Load Index (MPa) (2 4 6)	RMC -Q' AVG.	
		BEDROCK SURFACE		68.68															
2	Rotary Drill / NQ Core	Slightly weathered to fresh, bedded/nodular, grey to dark grey, fine to medium grained, slightly porous, medium strong SHALEY LIMESTONE		1.96															
3																			
4				66.47															
		End of Drillhole		4.17															
5		Note(s): 1. Water level in screen measured at a depth of 2.56 m (Elev. 68.08 m) on August 4, 2022.																	
6																			
7																			
8																			
9																			
10																			
11																			

Bentonite Seal

Silica Sand

38 mm Diam. PVC #10 Slot Screen



DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-109

SHEET 1 OF 2

LOCATION: N 5028410.9 ;E 366670.1

BORING DATE: March 30, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		76.78							
0	Power Auger 200 mm Diam. (Hollow Stem)	FILL - (CI/CL) SILTY CLAY; brown, trace organics; cohesive, w~PL, firm		0.00 76.55							
		FILL - (SW) gravelly SAND, some silt; grey to brown, contains debris; non-cohesive, moist, compact		0.23 76.02	1	SS	19		○		
1		FILL - (SM/ML) sandy SILT to SILTY SAND, some clay; grey brown; non-cohesive, moist, dense		0.76 75.26	2	SS	44				
		(SM) gravelly SILTY SAND, some clay; grey (GLACIAL TILL); slightly cohesive, moist to wet, very loose to compact		1.52	3	SS	6				
2					4	SS	8				
3					5	SS	3		○	M	
4					6	SS	3				
					7	SS	2		○		
5					8	SS	7				
6					9	SS	15		○		
7					10	SS	20		○		
					11	SS	1				
8					12	SS	18		○		
9		- Wet below 9.14 m depth			13	SS	12				
	DCPT	Dynamic Cone Penetration Test (DCPT)		67.03 9.75							
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-109

SHEET 2 OF 2

LOCATION: N 5028410.9 ;E 366670.1

BORING DATE: March 30, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	DCPT	Dynamic Cone Penetration Test (DCPT)									
11				65.65							
		End of Borehole DCPT Refusal		11.13							
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE
1 : 50

LOGGED: JS
CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-110

SHEET 1 OF 2

LOCATION: N 5028453.1 ;E 366678.7

BORING DATE: April 1, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		75.74							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (ML) sandy SILT, some clay; black, contains organics; moist		0.00							
		FILL - (SW) gravelly SAND, some silt; dark brown to grey; non-cohesive, moist, very loose to compact		0.08	1	SS	2				
1					2	SS	10				
				74.22							
		(GM/SM) SILTY GRAVEL and SAND; grey; non-cohesive, moist to wet, loose		1.52	3	SS	6		○	M	
2					4	SS	4				
				72.84							
3		(SM) SILTY SAND, some gravel, trace to some low plasticity fines; grey, contains cobbles and boulders (GLACIAL TILL); moist to wet, loose to dense		2.90	5	SS	28		○		
4					6	SS	6		○	M	
5					7	SS	8				
					8	SS	5				
6					9	SS	7				
7					10	SS	13				
8					11	SS	37				
					12	SS	28				
9					13	SS	28				
				65.99							
	DCPT	Dynamic Cone Penetration Test (DCPT)		9.75							
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: KG

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-110

SHEET 2 OF 2

LOCATION: N 5028453.1 ;E 366678.7

BORING DATE: April 1, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
		Dynamic Cone Penetration Test (DCPT)		65.53							
		End of Borehole DCPT Refusal		10.21							
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: KG

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-111

SHEET 1 OF 1

LOCATION: N 5028484.1 ;E 366691.3

BORING DATE: March 29, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		75.13							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (ML) sandy SILT, some clay; black, contains organics; non-cohesive, moist		0.00 / 0.08	1	SS	13				
		FILL - (SW) gravelly SAND, some silt; dark grey, contains bricks; non-cohesive, moist, compact		74.52 / 0.61							
1		FILL - (SP/SM) SAND, fine, some silt to silty, trace to some clay; dark grey; non-cohesive, moist, compact		73.76	2	SS	19				
		(CH) CLAY; brown, mottled, fissured (WEATHERED CRUST); cohesive, w<PL, firm to stiff		1.37	3	SS	8			MH	
2				73.00							
		(CL) SILTY CLAY, trace gravel; brown, mottled (WEATHERED CRUST); cohesive moist to wet, soft		2.13	4	SS	3			M	
				72.23							
3		(ML/SM) sandy SILT to SILTY SAND, some clay, some gravel; brown (GLACIAL TILL); slightly cohesive, moist to wet, compact		2.90	5	SS	14				
4					6	SS	16				
					7	SS	18				
5				69.95							
		End of Borehole		5.18							
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-112

SHEET 1 OF 1

LOCATION: N 5028510.1 ;E 366728.4

BORING DATE: March 29, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		73.59							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, trace clay, trace gravel; dark brown; non-cohesive, moist		0.00 / 73.29	1	SS	17				
		FILL - (SP) SAND, fine; grey to brown; non-cohesive, moist, compact		0.30 / 72.98							
		(CH) CLAY, some to trace sand; brown (WEATHERED CRUST); cohesive, w<PL, soft to stiff		0.61							
1					2	SS	8				
2					3	SS	5				
				71.30							
		(CL-ML) SILTY CLAY to CLAYEY SILT, some sand; brown; cohesive, w>PL, wet, soft		2.29 / 70.69	4	SS	3			MH	
3		(ML) sandy SILT, some clay, some gravel; brown (GLACIAL TILL); slightly cohesive, wet, compact		2.90	5	SS	11				
				69.80							
		End of Borehole		3.79							
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-112A

SHEET 1 OF 2

LOCATION: N 5028510.1 ;E 366728.4

BORING DATE: March 31, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		73.59							
0		For soil stratigraphy refer to Record of Borehole 22-112		0.00							Bentonite Seal
1											
2											Silica Sand
3											50 mm Diam. PVC #10 Slot Screen
4				69.58							
		Borehole continued on RECORD OF DRILLHOLE 22-112A									
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-112A

SHEET 2 OF 2

LOCATION: N 5028510.1 ;E 366728.4

DRILLING DATE: March 31, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.	
		BEDROCK SURFACE		69.58															
5	Rotary Drill / NQ Core	Fresh, thinly bedded, grey to dark grey, fine to medium grained, slightly porous, strong LIMESTONE bedrock with shale interbedded		4.01	1														
6					2														
7					3														UCS = 108 MPa
				65.74															
8		End of Drillhole Note(s): 1. Water level in screen measured at a depth of 2.72 m (Elev. 70.88 m) on May 9, 2022.		7.85															
9																			
10																			
11																			
12																			
13																			
14																			

DEPTH SCALE
1 : 50

LOGGED: JS
CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-113

SHEET 1 OF 2

LOCATION: N 5028442.6 ;E 366704.3

BORING DATE: March 30-31, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W WI) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		76.05							
0	Power Auger 200 mm Diam. (Hollow Stem)	FILL - (CI/CL) SILTY CLAY; brown, contains organics; cohesive, w~PL, firm		0.00							
		FILL - (SW) SAND, some to trace clay and silt, some gravel, some asphalt; brown; non-cohesive, moist, compact		0.13	1	SS	12				
1		FILL - (ML) CLAYEY SILT, some sand, some gravel; grey; cohesive, stiff		74.98 1.07	2	SS	7				
		(SM) gravelly SILTY SAND, some clay; brown (GLACIAL TILL); slightly cohesive, wet, compact to loose		74.53 1.52	3	SS	14				
2					4	SS	5				
		(SM) gravelly SILTY SAND, some clay; grey brown (GLACIAL TILL); slightly cohesive, wet, compact to loose		73.31 2.74							
3					5	SS	7				
4					6	SS	9		○	M	
					7	SS	10				
5		(SM/ML) SILTY SAND to sandy SILT, some clay, some gravel; grey (GLACIAL TILL); slightly cohesive, loose to compact		70.87 5.18							
					8	SS	14				
6					9	SS	14		○		
7					10	SS	9		○		
					11	SS	10				
8				67.69							
		Borehole continued on RECORD OF DRILLHOLE 22-113		8.36							
9											
10											

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-113

SHEET 2 OF 2

LOCATION: N 5028442.6 ;E 366704.3

DRILLING DATE: March 30-31, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.	
		BEDROCK SURFACE		67.69															
9	Rotary Drill / NQ Core	Fresh to Slightly weathered, thinly to medium bedded, grey to dark grey, slightly porous, strong LIMESTONE with shale interbedded		8.36	1		80 60 40 20	80 60 40 20	80 60 40 20	5 10 15 20	0 30 60 90					10^{-6} 10^{-5} 10^{-4} 10^{-3}	2 4 6		
10					2														UCS = 107 MPa
11					3														
12				63.87															
		End of Drillhole		12.18															
13																			
14																			
15																			
16																			
17																			
18																			

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: JS
CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-301

SHEET 1 OF 4

LOCATION: N 5028264.4 ;E 366704.1

BORING DATE: March 3, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		84.60							
0	Wash Bore NW/NQ Casing	TOPSOIL - (SM) SILTY SAND, some plastic fines; brown, contains organic matter (rootlets); non-cohesive, moist, loose		0.00	1	SS	6				
				84.30 0.30							
		FILL - (SM) SILTY SAND, some plastic fines, trace gravel; brown, mottled; white/grey and black; non-cohesive, moist, loose			2	SS	8				
1				83.23							
		FILL - (SM) SILTY SAND; brown, mottled black and grey, contains large gravel seams; non-cohesive, moist, compact to dense		1.37	3	SS	18				Bentonite
2					4	SS	33		○		
				81.55							
3		(SM) gravelly SILTY SAND; brown to grey, possible cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, loose to very dense		3.05	5	SS	16				Silica Sand
					6	SS	15				
4					7	SS	10				32 mm Diam. PVC #10 Slot Screen
5					8	SS	16				
					9	SS	33				
6					10	SS	15		○		Silica Sand
7					11	SS	9				
8					12	SS	9				Bentonite
9					13	SS	20				
					14	SS	26				
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: JS
CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-301

SHEET 2 OF 4

LOCATION: N 5028264.4 ;E 366704.1

BORING DATE: March 3, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Wash Bore NW/NQ Casing	(SM) gravelly SILTY SAND; brown to grey, possible cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, loose to very dense			14	SS	26				
11					15	SS	6		○		
					16	SS	9				
12					17	SS	30				
13					18	SS	60				
14					19	SS	10		○		Bentonite
15					20	SS	17				
					21	SS	17				
16					22	SS	47				
17											
18				66.31							
		(SM) SILTY SAND, some clay and gravel; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very dense		18.29	23	SS	>50				
19					24	SS	>50				Cave
20		*CONTINUED NEXT PAGE*									

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: JS
CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-301

SHEET 3 OF 4

LOCATION: N 5028264.4 ;E 366704.1

BORING DATE: March 3, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
20	Wash Bore NW/NQ Casing	(SM) SILTY SAND, some clay and gravel; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very dense									
21					25	SS	>50				
22					26	SS	>50		○		
				61.89							
		No Recovery Possible (SM) SILTY SAND, with cobbles and boulders (GLACIAL TILL); very dense		22.71							
23											
24					27	SS	>50				Cave
25											
26					28	SS	>50				
				58.39							
		(ML/SM) sandy SILT to SILTY SAND, some clay and gravel; grey, contains cobbles and boulders (GLACIAL TILL); slightly cohesive, moist, very dense		26.21							
27					29	SS	58		○		
28											
29					30	SS	>50				Bentonite
30					31	SS	51				
		CONTINUED NEXT PAGE									

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: JS
CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-301

SHEET 4 OF 4

LOCATION: N 5028264.4 ;E 366704.1

BORING DATE: March 3, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
30		*--- CONTINUED FROM PREVIOUS PAGE ---*									
30	Wash Bore NW/NQ Casing	(ML/SM) sandy SILT to SILTY SAND, some clay and gravel; grey, contains cobbles and boulders (GLACIAL TILL); slightly cohesive, moist, very dense			31	SS	51				Bentonite
31				53.20							
		Borehole continued on RECORD OF DRILLHOLE 22-301		31.4							
32											
33											
34											
35											
36											
37											
38											
39											
40											

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-301

SHEET 4 OF 4

LOCATION: N 5028264.4 ;E 366704.1

DRILLING DATE: March 3, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.	
		BEDROCK SURFACE		53.20																
32	Rotary Drill / NQ Core	Moderately weathered, thinly to medium bedded, grey to dark grey, medium to fine grained, slightly porous, medium strong LIMESTONE with shale interbedded		31.40	1															
33					2															Bentonite
34					3															
35				49.24																
36		End of Drillhole Note(s): 1. Water level in screen measured at a depth of 3.41 m (Elev. 81.19 m) on May 9, 2022.		35.36																
37																				
38																				
39																				
40																				
41																				

DEPTH SCALE
1 : 50

LOGGED: JS
CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-302

SHEET 1 OF 4

LOCATION: N 5028297.1 ;E 366679.0

BORING DATE: May 3 & 4, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		83.23							
0	Wash Bore HW/HQ Casing	TOPSOIL - (SM/ML) SILTY SAND to sandy SILT, some clay; reddish dark brown, contains organics; non-cohesive, moist, loose		0.00 82.98							
		FILL - (SP) SAND, fine to medium; brown, mottled orange; non-cohesive, moist, loose		0.25 82.62	1	SS	5				
1		(SM) Gravelly SILTY SAND to SILTY SAND, some gravel, some clay, brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist, compact		0.61	2	SS	23		O	M	
2											
3					3	SS	21				
4		(SM) Gravelly SILTY SAND to SILTY SAND, some gravel, some clay, grey brown to grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact		79.42 3.81	4	SS	21				
5											
6					5	SS	22		O	M	
7											
8											
9					6	SS	10				
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: JS
CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-302

SHEET 2 OF 4

LOCATION: N 5028297.1 ;E 366679.0

BORING DATE: May 3 & 4, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Wash Bore HW/HQ Casing	(SM) Gravelly SILTY SAND to SILTY SAND, some gravel, some clay, grey brown to grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact									
11				72.26 10.97							
		(SM/SW) SILTY SAND to SAND, some silt and gravel; grey brown to grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very dense									
12					7	SS	>50				
13											
14											
15					8	SS	>50				
16											
17											
18					9	SS	>50				
19											
20		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-302

SHEET 3 OF 4

LOCATION: N 5028297.1 ;E 366679.0

BORING DATE: May 3 & 4, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
20	Wash Bore HW/HQ Casing	*--- CONTINUED FROM PREVIOUS PAGE ---*									
		(SM/SW) SILTY SAND to SAND, some silt and gravel; grey brown to grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very dense									
21					10	SS	>50				
22											
23											
24					11	SS	>50				
25											
26											
27				56.08	12	SS	>50				
		Borehole continued on RECORD OF DRILLHOLE 22-302		27.15							
28											
29											
30											

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-302

SHEET 4 OF 4

LOCATION: N 5028297.1 ;E 366679.0

DRILLING DATE: May 3 & 4, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	ROCK STRENGTH INDEX: R4	R3	R2	R1	WEATHERING INDEX: W1	W2	W3	W4	Q AVG.
		BEDROCK SURFACE		56.08																				
28	Rotary Drill / HQ Core	Slightly to moderately weathered, medium bedded, grey to dark grey, fine to medium grained, slightly to non-porous, weak to medium strong LIMESTONE, with laminations of shale		27.15	1																			
				54.56																				
		End of Drillhole		28.67																				
29																								
30																								
31																								
32																								
33																								
34																								
35																								
36																								
37																								

DEPTH SCALE
1 : 50

LOGGED: JS
CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-303

SHEET 1 OF 3

LOCATION: N 5028341.5 ;E 366652.0

BORING DATE: April 5, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		80.57							
0	Wash Boring / HW Casing	TOPSOIL - (ML/CL) SILTY CLAY to CLAYEY SILT, trace sand; brown, contains organic matter; slightly cohesive		0.00 / 0.10	1	SS	8				
		FILL - (ML/CL) CLAYEY SILT to SILTY CLAY, some sand; brown; cohesive, w<PL, firm to stiff			2	SS	8				
1											
					3	SS	10		○	M	
2											
		(ML/SM) sandy SILT to SILTY SAND, some gravel; brown (GLACIAL TILL); slightly cohesive, wet, loose to dense		78.13 / 2.44	4	SS	8				
3											
					5	SS	28		○	M	Bentonite
		(SM) gravelly SILTY SAND to SITY SAND, some gravel, some clay; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact to very dense		76.76 / 3.81	6	SS	25				▽
4											
					7	SS	51				
5											
					8	SS	30				
6											
					9	SS	12				Silica Sand
7											
					10	SS	23		○	M	
8											
											32 mm Diam. PVC #10 Slot Screen
9					11	SS	20				
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-303

SHEET 2 OF 3

LOCATION: N 5028341.5 ;E 366652.0

BORING DATE: April 5, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Wash Boring / HW Casing	(SM) gravelly SILTY SAND to SITY SAND, some gravel, some clay; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact to very dense									32 mm Diam. PVC #10 Slot Screen
11					12	SS	83				Silica Sand
12					13	SS	>100		○		
13											
14					14	SS	>50				Bentonite
15											
16					15	SS	48				
17				63.55	16	SS	>50				
		Borehole continued on RECORD OF DRILLHOLE 22-303		17.02							
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-303

SHEET 3 OF 3

LOCATION: N 5028341.5 ;E 366652.0

DRILLING DATE: April 5, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.	
		BEDROCK SURFACE		63.55															
18	Rotary Drill / NQ Core	Slightly weathered to fresh, thinly to medium bedded, fine grained, slightly porous, strong LIMESTONE with shale interbedded		17.02	1														
19					2														UCS = 120 MPa Bentonite
20				60.35	3														
		End of Drillhole Note(s): 1. Water level in screen measured at a depth of 4.11 m (Elev. 76.46 m) on May 9, 2022.		20.22															
21																			
22																			
23																			
24																			
25																			
26																			
27																			

DEPTH SCALE
1 : 50

LOGGED: JS
CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-304

SHEET 1 OF 2

LOCATION: N 5028379.9 ;E 366670.3

BORING DATE: May 6, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		77.64							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (ML) CLAYEY SILT, some sand; dark brown, contains organics; cohesive		0.00	1A	SS					
				0.10	1B	SS	4				
		FILL - (ML/CL) CLAYEY SILT to SILTY CLAY, some sand and gravel; brown, fissured; cohesive, w<PL stiff		77.03							
				0.61							
		(ML/CL) CLAYEY SILT to SILTY CLAY; brown; cohesive, w<PL, stiff		76.73	2A	SS					
1				0.91							
		(SM) SILTY SAND, some clay and gravel; brown to brown grey (GLACIAL TILL); non-cohesive, moist, compact			2B	SS	12		○		
				76.12							
		(SW/SM) SAND, some silt to SILTY SAND, some clay and gravel; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist, loose to compact		1.52	3	SS	17				
2					4	SS	20		○	M	
3					5	SS	19				
4					6	SS	19				
		- wet from about 4.7 m depth			7	SS	9		○		
5					8	SS	7		○	M	
6					9	SS	5				
7											
8					10	SS	7				
9					11	SS	15				
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-304

SHEET 2 OF 2

LOCATION: N 5028379.9 ;E 366670.3

BORING DATE: May 6, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s; WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SW/SM) SAND, some silt to SILTY SAND, some clay and gravel; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist, loose to compact		66.87							
		- Becomes dense from 10.70 m depth		10.77							
11		(SW) SAND, some silt; grey; non-cohesive, wet, dense			12	SS	47				
12				65.44							
		Dynamic Cone Penetration Test (DCPT)		12.20							
13				64.61					150		
		End of Borehole DCPT Refusal		13.03							
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-305

SHEET 1 OF 2

LOCATION: N 5028359.6 ;E 366683.8

BORING DATE: May 6, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		78.37							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL/FILL - (SM/ML) SILTY SAND to SAND, some silt and clay; dark brown, mottled, contains organics; moist, loose		0.00	1	SS	9				
				77.76							
1		FILL - (SM/SW) SILTY SAND to SAND, some silt, clay and gravel; brown, mottled; non-cohesive, moist, compact		0.61	2	SS	24				
				76.85							
2		(SW/SM) gravelly SILTY SAND to SAND, some silt and gravel, some clay, grey, contains cobbles and boulders (GLACIAL TILL); moist to wet, loose to compact		1.52	3	SS	9			M	
3					4	SS	13				
4											
5					5	SS	5				
				73.19							
6		(SM/SW) SILTY SAND to SAND, some silt, clay and gravel; grey, contains cobbles and boulders (GLACIAL TILL); wet, compact to very dense		5.18	6	SS	20				
7											
8					7	SS	12				
9					8	SS	52				
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-305

SHEET 2 OF 2

LOCATION: N 5028359.6 ;E 366683.8

BORING DATE: May 6, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SM/SW) SILTY SAND to SAND, some silt, clay and gravel; grey, contains cobbles and boulders (GLACIAL TILL); wet, compact to very dense		67.70							
		Dynamic Cone Penetration Test (DCPT)		10.67							
11											
12									101		
13											
				64.73					120		
		End of Borehole DCPT Refusal		13.64							
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-306

SHEET 1 OF 3

LOCATION: N 5028318.0 ;E 366714.1

BORING DATE: March 24 & 25, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		82.80							
0	Wash Bore HW/HQ Casing	TOPSOIL - (SM) SILTY SAND, some clay; dark brown, contains organics; non-cohesive, wet, loose		0.00	1	SS	4				
				82.34							
		Fill - (SM) SILTY SAND, some gravel and clay; brown, slightly mottled; non-cohesive, wet, very loose		0.46							
1					2	SS	3			M	
				81.28							
		(SM/SW) SILTY SAND to SAND, some clay, slit and gravel; brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, compact to very dense		1.52	3	SS	18				
2					4	SS	54				
3					5	SS	15				
4					6	SS	16				
5					7	SS	18				
					8	SS	>50				
6					9	SS	23				
				76.09							
		(SM/SW) SILTY SAND to SAND, some clay, silt, and gravel; grey (GLACIAL TILL); non-cohesive to slightly cohesive, wet, loose to compact		6.71							
7					10	SS	3				
8											
9					11	SS	10				
10											
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-306

SHEET 2 OF 3

LOCATION: N 5028318.0 ;E 366714.1

BORING DATE: March 24 & 25, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Wash Bore HW/HQ Casing	(SM/SW) SILTY SAND to SAND, some clay, silt, and gravel; grey (GLACIAL TILL); non-cohesive to slightly cohesive, wet, loose to compact									
		- dense			12	SS	32				
				71.83							
11		(SM/SW) SILTY SAND to SAND, some clay and gravel; grey (GLACIAL TILL); non-cohesive, wet, compact to very dense		10.97							
12					13	SS	>50				
13											
14					14	SS	29				
15					15	SS	>50				
16											
					16	SS	27				
17				65.22							
		Borehole continued on RECORD OF DRILLHOLE 22-306		17.58							
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-306

SHEET 3 OF 3

LOCATION: N 5028318.0 ;E 366714.1

DRILLING DATE: March 24 & 25, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.	
		BEDROCK SURFACE		65.22															
18	Rotary Drill / HQ Core	Moderately weathered to fresh, fine to medium bedded, grey to dark grey, fine grained, slightly porous, strong LIMESTONE, with shale bedding, some beds have nodular sections		17.58	1														
19					2														
20					3														
21					4														
22																			63.5 mm Diam. VSP
23					5														UCS = 122 MPa
24					6														
25																			
26					7														
27		End of Drillhole		55.88 / 26.92															

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-307

SHEET 1 OF 4

LOCATION: N 5028283.4 ;E 366737.4

BORING DATE: May 2, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		83.57							
0	Wash Bore HW/HQ Casing	TOPSOIL - (SM) SILTY SAND, fine; dark brown, contains organics; non-cohesive, moist, loose		0.00							
		Fill - (SM) Gravelly SILTY SAND, some clay; brown, contains organics; non-cohesive, moist, loose		0.15	1	SS	4		○	M	
1		(SM) SILTY SAND, some clay and gravel; brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, very loose to compact		82.66 0.91	2	SS	1				
2											
3					3	SS	29		○		
				79.76							
4		(SM) SILTY SAND, some clay and gravel; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact		3.81	4	SS	19				
5											
6					5	SS	12		○		
7											
8											
9					6	SS	11				
					7	SS	15				
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-307

SHEET 2 OF 4

LOCATION: N 5028283.4 ;E 366737.4

BORING DATE: May 2, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Wash Bore HW/HQ Casing	(SM) SILTY SAND, some clay and gravel; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact									
11		(SM) SILTY SAND, some clay and gravel; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet to moist, compact to very dense		72.60 10.97							
12					8	SS	21				
13											
14											
15					9	SS	60				
16											
17											
18					10	SS	>50				
19											
20		*CONTINUED NEXT PAGE*									

DEPTH SCALE
1 : 50

LOGGED: JS
CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-307

SHEET 3 OF 4

LOCATION: N 5028283.4 ;E 366737.4

BORING DATE: May 2, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
20		*--- CONTINUED FROM PREVIOUS PAGE ---*									
				63.22							
		Borehole continued on RECORD OF DRILLHOLE 22-307		20.35							
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-307

SHEET 4 OF 4

LOCATION: N 5028283.4 ;E 366737.4

DRILLING DATE: May 2, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate
BD - Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage
PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular
PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.	
		BEDROCK SURFACE		63.22															
21	Rotary Drill / HQ Core	Slightly weathered, bedded, grey to dark grey, fine to medium grained, slightly porous, strong SHALEY LIMESTONE		20.35	1														UCS = 93 MPa
22					2														
				61.30															
		End of Drillhole		22.27															
23																			
24																			
25																			
26																			
27																			
28																			
29																			
30																			

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: JS
CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-308

SHEET 1 OF 3

LOCATION: N 5028305.1 ;E 366766.9

BORING DATE: April 28 & 29, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		82.93							
0	Wash Bore / HW Casing	TOPSOIL - (SM) SILTY SAND, some plastic fines; brown, contains rootlets, trace to some organics; non-cohesive, moist, very loose		0.00 / 0.10	1	SS	3				Bentonite Seal
		(SM) SILTY SAND, some plastic fines; brown (GLACIAL TILL); non-cohesive, wet, very loose		82.17 / 0.76							
1		(SM) gravelly SILTY SAND, trace plastic fines; brown, mottled black and orange, contains rock fragments, potential cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact to dense			2	SS	16		○	M	
2					3	SS	27		○		
					4	SS	38				
3					5	SS	20				
4					6	SS	17				Silica Sand & Bentonite
5					7	SS	32		○		
					8	SS	19				
6				76.83							
		(SM) gravelly SILTY SAND, trace plastic fines; grey, contains rock fragments, potential cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to very dense		6.10	9	SS	7				
7											
8					10	SS	29				Bentonite Seal
											Silica Sand
9					11	SS	30				32 mm Diam. PVC #10 Slot Screen
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

LOGGED: BW

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-308

SHEET 2 OF 3

LOCATION: N 5028305.1 ;E 366766.9

BORING DATE: April 28 & 29, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
10	Wash Bore HW Casing	(SM) gravelly SILTY SAND, trace plastic fines; grey, contains rock fragments, potential cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to very dense									
11					12	SS	24				32 mm Diam. PVC #10 Slot Screen
12											
13					13	SS	14				
14					14	SS	33				Bentonite Seal
15											
16					15	SS	46				UCS = 125 MPa
17					16	SS	55				
		Borehole continued on RECORD OF DRILLHOLE 22-308		65.66 17.27							Bentonite & Pellets
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: BW

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-308

SHEET 3 OF 3

LOCATION: N 5028305.1 ;E 366766.9

DRILLING DATE: April 28 & 29, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

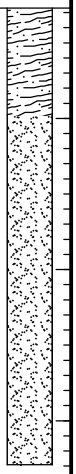
DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	ROCK STRENGTH INDEX: R4	R3	R2	R1	WEATHERING INDEX: W1	W2	W3	W4	Q AVG.	
		BEDROCK SURFACE		65.66																					
18	Rotary Drill / HQ Core	Fresh to slightly weathered, thinly to medium bedded, light to dark grey, fine to medium grained, non to slightly porous, medium strong to strong LIMESTONE, with thin to medium beds of shale		17.27	1																				
19		- vertical joint from 19.20 to 19.27 m depth - vertical joint from 19.41 to 19.47 m depth			2																				
20					3																				
				62.64	4																				
		End of Drillhole Note(s): 1. Water level in screen measured at a depth of 6.01 m (Elev. 76.93 m) on May 9, 2022.		20.29																					

Bentonite & Pellets

Silica Sand



DEPTH SCALE

1 : 50

LOGGED: BW

CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-309

SHEET 1 OF 3

LOCATION: N 5028348.8 ;E 366737.3

BORING DATE: May 5, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		81.69							
0	Wash Bore HW/HQ Casing	TOPSOIL - (ML/CL) CLAYEY SILT to SILTY CLAY, some sand, trace gravel; dark brown, contains organics; cohesive, w<PL, stiff		0.00 81.49							
		(SM) SILTY SAND, some clay and gravel; brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist, compact		0.20	1	SS	9				
1					2	SS	10		○		
2											
3					3	SS	18				
				77.88							
4		(SM) SILTY SAND, some clay and gravel; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact		3.81							
					4	SS	19		○	MM	
5											
				75.90							
		(SM) SILTY SAND, some clay and gravel; brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist, very dense		5.79	5	SS	>50				
6											
7											
8											
				72.85							
		(SM) SILTY SAND, some clay and gravel; brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist, very loose		8.84							
9					6	SS	1				
10											
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-309

SHEET 2 OF 3

LOCATION: N 5028348.8 ;E 366737.3

BORING DATE: May 5, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Wash Bore HW/HQ Casing	(SM) SILTY SAND, some clay and gravel; brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist, very loose									
				70.72 10.97							
11		(SM) SILTY SAND, some clay and gravel; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, compact to very dense									
12					7	SS	19				
13											
14											
15					8	SS	81				
16											
17											
				64.10 17.59							
18		Borehole continued on RECORD OF DRILLHOLE 22-309									
19											
20											

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-309

SHEET 3 OF 3

LOCATION: N 5028348.8 ;E 366737.3

DRILLING DATE: May 5, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE % (80 60 40 20)	RECOVERY: SOLID CORE % (80 60 40 20)	R.Q.D. % (80 60 40 20)	FRACT. INDEX PER 0.25 m (5 10 15 20)	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec (10^{-6} 10^{-5} 10^{-4} 10^{-3})	Diametral Point Load Index (MPa) (2 4 6)	RMC -Q' AVG.
		BEDROCK SURFACE		64.10														
18	Rotary Drill / HQ Core	Slightly weathered, thinly to medium bedded, grey, medium to fine grained, slightly porous, medium strong to strong SHALEY LIMESTONE		17.59	1													
19					2													
				62.39														
		End of Drillhole		19.30														
20																		
21																		
22																		
23																		
24																		
25																		
26																		
27																		

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: JS

CHECKED: BB

PROJECT: 21451149

RECORD OF BOREHOLE: 22-310

SHEET 1 OF 3

LOCATION: N 5028376.9 ;E 366714.5

BORING DATE: April 6-8, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE		80.54							
	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (ML) sandy SILT, some clay; dark brown, contains organic matter; slightly cohesive, w~PL/frozen, compact		0.00							
				80.18	1	SS	14				
		(CL) SILTY CLAY; brown; cohesive, w<PL, stiff to very stiff		0.36							
1					2	SS	12				Bentonite
					3	SS	15			MH	
2					4	SS	12			MH	
				77.49							Silica Sand
3		(SM) gravelly silty sand, some clay; grey brown to brown (GLACIAL TILL); slightly cohesive, compact		3.05	5	SS	21			MH	
				76.88							
		(SM) SILTY SAND, some clay, some gravel; grey brown to grey (GLACIAL TILL); non-cohesive, wet, compact to loose		3.66							
4					6	SS	14				
					7	SS	6				51 mm Diam. PVC #10 Slot Screen
5				75.36							
		(SM) SILTY SAND, some clay, some gravel; grey (GLACIAL TILL); slightly cohesive, wet, loose		5.18							
					8	SS	9				
6					9	SS	9				
				73.83							
	Wash Boring HW Casing	(SM/ML) SILTY SAND to sandy SILT, some clay, some gravel; grey (GLACIAL TILL); slightly cohesive, wet, loose		6.71							
7											
					10	SS	9			M	
8											
9					11	SS	4				
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-310

SHEET 2 OF 3

LOCATION: N 5028376.9 ;E 366714.5

BORING DATE: April 6-8, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Wash Boring / HW Casing	(SM/ML) SILTY SAND to sandy SILT, some clay, some gravel; grey (GLACIAL TILL); slightly cohesive, wet, loose		69.87							
		(SM/ML) SILTY SAND to sandy SILT, some clay, some gravel; grey (GLACIAL TILL); slightly cohesive, wet, loose to compact		10.67	12	SS	11				
11											
12					13	SS	4				
13											
14					14	SS	46				
				66.21							
		(SM/ML) SILTY SAND to sandy SILT, some clay and gravel; grey (GLACIAL TILL); slightly cohesive, wet, very dense		14.33							
15					15	SS	55				
16				64.39							
		Borehole continued on RECORD OF DRILLHOLE 22-310		16.15							
17											
18											
19											
20											

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-310

SHEET 3 OF 3

LOCATION: N 5028376.9 ;E 366714.5

DRILLING DATE: April 6-8, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		BEDROCK SURFACE		64.39														
17	Rotary Drill / HQ Core	Fresh, thinly to medium bedded, grey, medium to fine grained, slightly porous, medium strong to strong LIMESTONE with shale interbedded		16.15	1		80 60 40 20	80 60 40 20	80 60 40 20	5 10 15 20	0 30 60 90					10^{-6} 10^{-5} 10^{-4} 10^{-3}	2 4 6	
18					2													
19				61.36														
		End of Drillhole Note(s): 1. Water level in screen measured at a depth of 1.99 m (Elev. 78.55 m) on May 9, 2022.		19.18														
20																		
21																		
22																		
23																		
24																		
25																		
26																		

DEPTH SCALE
1 : 50

LOGGED: JS
CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-401

SHEET 1 OF 2

LOCATION: N 5028655.7 ;E 366449.5

BORING DATE: March 16-17, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE		68.56							
	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL/FILL - (SP) SAND, fine, some silt; dark brown, contains organics; non-cohesive, moist		0.00 0.08	1	SS	12				
		FILL - (SW) SAND, some low plasticity fines; brown, contains brick, concrete and cinders; non-cohesive, moist, loose to very dense			2	SS	25				
1					3	SS	6				
2					4	SS	>50				Bentonite May 9, 2022
		TOPSOIL - (SP) SAND, fine, some silt; black, contains rootlets; non-cohesive, moist, loose		65.82 2.74							
3		(SW/SM) SAND to SILTY SAND, some low plasticity fines; grey (GLACIAL TILL); slightly cohesive, moist to wet, very loose to loose		65.21 3.35	5	SS	9				
					6	SS	2				
4					7	SS	6				Silica Sand
5		(SW/SM) SAND to SILTY SAND, some low plasticity fines, some gravel; grey (GLACIAL TILL); slightly cohesive, wet, loose to dense		63.38 5.18	8	SS	7		○		
					9	SS	45				32 mm Diam. PVC #10 Slot Screen
6					10	SS	28				
7	Wash Boring NW casing	(SW) SAND, some gravel, some low plasticity fines; grey (GLACIAL TILL); non-cohesive, moist, compact to very dense		60.94 7.62	11	SS	28		○		
8					12	SS	>50				Silica Sand
		(SW/SM) SILTY SAND, some gravel, some low plasticity fines; grey (GLACIAL TILL); non-cohesive, moist, compact		60.03 8.53							
9					13	SS	28				Bentonite
		Borehole continued on RECORD OF DRILLHOLE 22-401		58.83 9.73							
10											

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-401

SHEET 2 OF 2

LOCATION: N 5028655.7 ;E 366449.5

DRILLING DATE: March 16-17, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.	
		BEDROCK SURFACE		58.83															
10	Rotary Drill / NQ Core	Slightly weathered to fresh, thinly to medium bedded, grey to dark grey, fine grained, slightly porous, strong LIMESTONE with shale interbedded - Broken core from 9.73 m to 9.74 m		9.73	1														
11		- Broken core from 10.76 m to 10.88 m																	Bentonite
12					2														UCS = 99 MPa
13					3														
				54.94															
14		End of Drillhole Note(s): 1. Water level in screen measured at a depth of 2.30 m (Elev. 66.26 m) on May 9, 2022.		13.62															
15																			
16																			
17																			
18																			
19																			

DEPTH SCALE
1 : 50

LOGGED: JS
CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-402

SHEET 1 OF 1

LOCATION: N 5028686.9 ;E 366502.4

BORING DATE: March 7, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		66.73							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL/FILL - (SP) SAND, fine, some silt; dark brown, contains organics; non-cohesive, frozen		0.00							
				0.15	1	SS	17				
		FILL - (SW) gravelly SAND to SAND, some gravel, some low plasticity fines; brown; non-cohesive, moist, compact									
1					2	SS	19				
				65.21							
		FILL - (SM) SILTY SAND, some low plasticity fines; brown; non-cohesive, moist, loose		1.52	3	SS	6				
2				64.44							
		(PT) Fibrous PEAT		2.29							
				64.24	4	SS	8				
		(SM) Gravelly SILTY SAND to SILTY SAND, some gravel, some low plasticity fines; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive to slightly cohesive, wet, loose to very dense		2.49					○		
3					5	SS	75			M	
					6	SS	>58				
4				62.51							
		End of Borehole Auger Refusal		4.22							
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-403

SHEET 1 OF 2

LOCATION: N 5028704.0 ;E 366527.3

BORING DATE: February 28, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		65.74							
0	Power Auger 200 mm Diam. (Hollow Stem)	FILL/TOPSOIL - (SM) SILTY SAND, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist/frozen, dense		0.00	1	SS	42				
				65.36							
		FILL - (SM) gravelly SILTY SAND, angular; grey brown; non-cohesive, moist, dense		0.38 65.18							
				0.56							
1		FILL - (SM) gravelly SILTY SAND; dark brown to black, contains ash and coal; non-cohesive, moist, loose		64.52	2	SS	9				
		(PT) Amorphous PEAT; black; non-cohesive, moist, loose		1.22							
				64.06							
		(SM) gravelly SILTY SAND; grey brown, possible cobbles (GLACIAL TILL); non-cohesive, wet, loose		1.68	3	SS	9				
2				63.61							
		(SM) gravelly SILTY SAND; grey, possible cobbles (GLACIAL TILL); non-cohesive, wet, very loose		2.13	4	SS	3		○	M	
				62.69							
3		Borehole continued on RECORD OF DRILLHOLE 22-403		3.05							
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-403

SHEET 2 OF 2

LOCATION: N 5028704.0 ;E 366527.3

DRILLING DATE: February 28, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	ROCK STRENGTH INDEX: R4	R3	R2	R1	WEATHERING INDEX: W1	W2	W3	W4	Q AVG.
		BEDROCK SURFACE		62.69																				
	Rotary Drill / NQ Core	Fresh, thinly to medium bedded, medium grey to brownish grey, fine to medium grained, non-porous, medium strong SHALEY LIMESTONE		3.05	1	100																		
		- Broken core from 3.15 m to 3.17 m																						
4		- Broken/lost core from 3.56 m to 3.62 m			2	100																		
		- Broken core from 3.99 m to 4.08 m																						
		- Broken core from 4.29 m to 4.32 m																						
		- Broken core from 4.45 m to 4.46 m			3	100																		
5																								
		- Broken core from 5.28 m to 5.29 m			4	100																		
6																								
		- Broken core from 6.15 m to 6.19 m																						
		- Broken/lost core from 6.88 m to 7.65 m			5	100																		
7																								
		- Lost core from 7.62 m to 7.97 m																						
8					6	100																		UCS = 132 MPa
		- Broken core from 8.73 m to 8.74 m																						
9																								
		- Broken core from 9.77 m to 9.79 m			7	100																		
10																								
		- Broken core from 10.36 m to 10.38 m																						
				55.02																				
		End of Drillhole		10.72																				
11																								
12																								
13																								

DEPTH SCALE
1 : 50

LOGGED: RI
CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-404

SHEET 1 OF 1

LOCATION: N 5028735.4 ;E 366573.4

BORING DATE: March 1, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		65.53							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL/FILL - (SM) SILTY SAND, trace gravel; brown to dark brown, contains organic matter (rootlets); non-cohesive, moist/frozen, very dense		0.00 / 65.33	1	SS	65				
		FILL - (SM) gravelly SILTY SAND; brown; non-cohesive, moist/frozen, very dense		0.20 / 65.00							
		FILL - (SM) SILTY SAND, trace to some gravel; black, contains ash/slag; non-cohesive, moist, very dense to compact		0.53 / 64.62	2	SS	24				
		FILL - (SM) gravelly SILTY SAND; brown; non-cohesive, moist, compact		0.91 / 64.31							
		(PT) Amorphous PEAT; black; non-cohesive, moist, loose		1.22 / 64.01	3	SS	6				
		(SM) gravelly SILTY SAND; grey, possible cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very loose to dense		1.52	4	SS	3				
					5	SS	6				
					6	SS	44				
				60.96							
		(SM) gravelly SAND, fine to coarse, some silt; grey, possible cobbles and boulders; non-cohesive, wet, very dense		4.57 / 60.65	7	SS	>50				
		End of Borehole		4.88							

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-405

SHEET 1 OF 2

LOCATION: N 5028745.9 ;E 366607.5

BORING DATE: February 25, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		67.19							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM/ML) SILTY SAND to sandy SILT; brown, contains organic matter (rootlets); non-cohesive, moist/frozen, compact		0.00							
		FILL - (CI/CH) SILTY CLAY to CLAY; brown; cohesive, w<PL to w~PL, frozen to thawed, firm to very stiff		0.08	1	SS	21				Bentonite Seal
1					2	SS	3				
				65.67							
2		FILL - (SP) SAND, fine to medium, trace low plasticity fines; brown, mottled reddish black; non-cohesive, moist, compact		1.52	3	SS	12				Backfill
					4	SS	22				
3				64.17							
		Borehole continued on RECORD OF DRILLHOLE 22-405		3.02							
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: BW

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-405

SHEET 2 OF 2

LOCATION: N 5028745.9 ;E 366607.5

DRILLING DATE: February 25, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	ROCK STRENGTH INDEX	WEATHERING INDEX	Q AVG.	
		BEDROCK SURFACE		64.17																
4	Rotary Drill / NQ Core	Fresh to slightly weathered, thinly to medium bedded, pale grey to black, fine to medium grained, non to slightly porous, medium strong SHALEY LIMESTONE		3.02	1															Backfill; Bentonite Seal; Silica Sand; May 9, 2022; UCS = 141 MPa; PVC #10 Slot Screen
5					2															
6				61.10	3															
		End of Drillhole		6.09																
7		Note(s): 1. Water level in screen measured at a depth of 4.00 m (Elev. 63.18 m) on May 9, 2022.																		
8																				
9																				
10																				
11																				
12																				
13																				

DEPTH SCALE
1 : 50

LOGGED: BW
CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-406

SHEET 1 OF 1

LOCATION: N 5028716.8 ;E 366617.5

BORING DATE: March 1, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		66.23									
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (ML/SM) sandy SILT to SILTY SAND, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist/frozen, compact		0.00 66.03 0.20	1	SS	14						
		FILL - (CL) SILTY CLAY, some sand, trace gravel; grey brown, contains brick; cohesive, w~PL, stiff		65.47 0.76									
1		FILL - (SM) gravelly SILTY SAND, angular; brown; non-cohesive, moist, compact		65.16 1.07	2	SS	28						
		FILL - (SM/ML) gravelly SILTY SAND to sandy SILT; dark brown, contains concrete, brick and ash; non-cohesive, moist, compact to loose			3	SS	8						
2				63.94									
		(SM/ML) Gravelly SAND and SILT; grey brown, possible cobbles (GLACIAL TILL); non-cohesive, moist to wet, very dense		2.29 63.59	4	SS	>55					M	
		End of Borehole Auger Refusal		2.64									
3													
4													
5													
6													
7													
8													
9													
10													

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: RI
CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-407

SHEET 1 OF 1

LOCATION: N 5028700.7 ;E 366579.9

BORING DATE: March 7, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		66.96							
0	Power Auger 200 mm Diam. (Hollow Stem)	FILL - (SW) SAND, some silt, some gravel; dark brown, contains brick; non-cohesive, moist/frozen, compact		0.00	1	SS	14				
				66.35							
		FILL - (CI/CH) SILTY CLAY to CLAY, some sand, some gravel; grey; cohesive, w~PL, stiff		0.61	2	SS	6				
				65.44							
2		FILL - (SW) SAND, some silt, some gravel; brown, with layers of black asphalt; non-cohesive, moist to wet, dense to loose		1.52	3	SS	41				
					4	SS	8				
3					5	SS	4				
				63.30							
		(SW) SAND, some low plasticity fines, some gravel; grey, contains cobbles (GLACIAL TILL); non-cohesive, wet, dense		3.66	6	SS	3				
4				62.39	7	SS	>50				
		End of Borehole Auger Refusal		4.57							
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-408

SHEET 1 OF 2

LOCATION: N 5028677.3 ;E 366555.2

BORING DATE: March 3, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) WATER CONTENT PERCENT Wp W Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		66.02							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL/FILL - (SM/ML) SILTY SAND to sandy SILT, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist/frozen, compact		0.00 65.79	1	SS	12				
		FILL - (CL) SILTY CLAY, some sand, trace gravel; grey brown; cohesive, w~PL, stiff		0.23 65.56 0.46							
1		FILL - (SM) gravelly SILTY SAND, sub-rounded to sub-angular; brown; non-cohesive, moist, compact		65.11 0.91 1.07	2	SS	15				
		FILL - (SM) gravelly SILTY SAND; black, contains ash, slag and brick; non-cohesive, moist, compact		64.50 1.52							
2		FILL - (SM) SILTY SAND, trace to some gravel; grey, contains organic matter; non-cohesive, moist, compact to loose		1.68	3	SS	3				
		(SM) gravelly SILTY SAND; grey brown (GLACIAL TILL); non-cohesive, moist to wet, very loose			4	SS	4				
3		(SM) gravelly SILTY SAND; grey, possible cobbles and boulders (GLACIAL TILL); non-cohesive, wet, very loose to loose			5	SS	9				
				62.30							
		Borehole continued on RECORD OF DRILLHOLE 22-408		3.72							
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-408

SHEET 2 OF 2

LOCATION: N 5028677.3 ;E 366555.2

DRILLING DATE: March 3, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: Jcon	DISCONTINUITY DATA: Jr	DISCONTINUITY DATA: Ja	ROCK STRENGTH INDEX: R4	ROCK STRENGTH INDEX: R3	ROCK STRENGTH INDEX: R2	ROCK STRENGTH INDEX: R1	WEATHERING INDEX: W1	WEATHERING INDEX: W2	WEATHERING INDEX: W3	WEATHERING INDEX: W4	Q AVG.
		BEDROCK SURFACE		62.30																				
4	Rotary Drill / NQ Core	(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet		3.72 / 62.12	1	100																		>>
				3.90																				
		Slightly weathered to fresh, thinly to medium bedded, medium grey to brownish grey, fine to medium grained, non-porous, medium strong SHALEY LIMESTONE			2	100																		
5		- Broken core from 3.84 m to 3.90 m																						
		- Broken core from 4.38 m to 4.39 m																						
		- Broken core from 4.75 m to 4.76 m																						
6					3	100																		
		- Broken/lost core from 6.23 m to 6.29 m																						
7					4	100																		
		- Broken/lost core from 7.09 m to 7.11 m																						
8																								
		- Broken core from 8.16 m to 8.18 m																						
9					5	100																		
		- Broken/lost core from 9.55 m to 9.57 m																						UCS = 140 MPa
10					6	100																		
		- Broken/lost core from 10.66 m to 10.67 m																						
11																								
12					7	100																		
				53.04																				
13		End of Drillhole		12.98																				

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-409

SHEET 1 OF 1

LOCATION: N 5028655.4 ;E 366477.0

BORING DATE: March 7, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		67.62							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL/FILL - (SW/SM) SAND, some silt to silty sand, trace low plasticity fines; brown, contains organic matter (rootlets); non-cohesive, moist, compact		0.00 0.10	1	SS	16				
1		FILL - (SW/SM) SAND, some silt to silty sand, some low plastic fines, trace gravel, trace organics; brown to dark brown, mottling present; slightly cohesive, moist, very loose to loose			2	SS	7				
2					3	SS	3				
				65.33							
		(SW/SM) SAND to SILTY SAND, some low plastic fines, some gravel; light brown to grey (GLACIAL TILL); slightly cohesive, wet, loose		2.29	4	SS	5			M	
3					5	SS	7				
4					6	SS	7				
				63.05							
		(SW/SM) SAND to SILTY SAND, some low plastic fines, some gravel; grey (GLACIAL TILL); loose to compact		4.57	7	SS	11		H		
5					8	SS	9				
				61.83							
		End of Borehole Auger Refusal		5.79							
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-410

SHEET 1 OF 1

LOCATION: N 5028654.1 ;E 366523.2

BORING DATE: March 7, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		66.99							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL/FILL		0.00 66.79							
		FILL - (SW) SAND, some silt, some gravel; brown; non-cohesive, moist, compact		0.20	1	SS	29				
				66.23							
1		FILL - (ML-SM) sandy SILT to SILTY SAND, some low plasticity fines, some gravel; brown; non-cohesive, moist to wet, very dense		0.76	2	SS	61				
				65.47							
2		(SM) Gravelly SILTY SAND, some low plasticity fines; grey brown to grey (GLACIAL TILL): non-cohesive, wet, compact		1.52	3	SS	16		○		
					4	SS	22				
3					5	SS	11		○	M	
4					6	SS	13				
				62.29	7	SS	>50				
		End of Borehole Auger Refusal		4.70							
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

WSP GOLDER

LOGGED: JS

CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-411

SHEET 1 OF 2

LOCATION: N 5028653.8 ;E 366567.0

BORING DATE: March 2, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s; WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE		66.72							
	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL - (SM) SILTY SAND, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist/frozen, compact		66.54 / 0.18	1	SS	14				
		FILL - (CL) SILTY CLAY, some sand, trace gravel; grey brown, contains organic matter, ash and slag; cohesive, w~PL, stiff		65.96 / 0.76	2	SS	5				Bentonite Seal
1		(SM) gravelly SILTY SAND; grey brown (GLACIAL TILL); non-cohesive, moist to wet, loose			3	SS	8				Silica Sand
2				64.59 / 2.13	4	SS	5				
		(SM) gravelly SILTY SAND; grey, possible cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to dense			5	SS	30				32 mm Diam. PVC #10 Slot Screen 'B'
3											
4					6	SS	10			M	
				62.15 / 4.57							Silica Sand
		Borehole continued on RECORD OF DRILLHOLE 22-411									
5											
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: RI
CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

PROJECT: 21451149

RECORD OF DRILLHOLE: 22-411

SHEET 2 OF 2

LOCATION: N 5028653.8 ;E 366567.0

DRILLING DATE: March 2, 2022

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD - Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: Jcon	DISCONTINUITY DATA: Jr	DISCONTINUITY DATA: Ja	ROCK STRENGTH INDEX: R4	ROCK STRENGTH INDEX: R3	ROCK STRENGTH INDEX: R2	ROCK STRENGTH INDEX: R1	WEATHERING INDEX: W1	WEATHERING INDEX: W2	WEATHERING INDEX: W3	WEATHERING INDEX: W4	Q AVG.	
		BEDROCK SURFACE		62.15																					
5	Rotary Drill / NQ Core	(SM) gravelly SILTY SAND; grey, possible ccobbles and boulders (GLACIAL TILL); non-cohesive, wet		4.57																					
		Fresh, thinly to medium bedded, medium grey to brownish grey, fine to medium grained, non-porous, medium strong SHALEY LIMESTONE - Lost core from 4.57 m to 4.60 m - Broken/lost core from 4.69 m to 4.73 m - Broken core from 5.02 m to 5.03 m - Broken core from 5.79 m to 5.5 m - Broken/lost core from 6.21 m to 6.24 m - Broken/lost core from 6.57 m to 6.56 m		4.73	1	100																			
6					2	50																			
7					3	50																			
8				58.37																					
		End of Drillhole Note(s): 1. Water level in screen 'A' measured at a depth of 2.41 m (Elev. 64.31 m) on May 9, 2022. 2. Water level in screen 'B' measured at a depth of 0.77 m (Elev. 65.95 m) on May 9, 2022.		8.35																					
9																									
10																									
11																									
12																									
13																									
14																									

Bentonite Seal

Silica Sand

UCS = 89 MPa

32 mm Diam. PVC #10 Slot Screen 'A'

DEPTH SCALE

1 : 50

LOGGED: RI

CHECKED: BB

MIS-RCK 004 21451149.GPJ GAL-MISS.GDT 9/6/22

PROJECT: 21451149

RECORD OF BOREHOLE: 22-412

SHEET 1 OF 1

LOCATION: N 5028677.0 ;E 366602.3

BORING DATE: March 1, 2022

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		66.38							
0	Power Auger 200 mm Diam. (Hollow Stem)	TOPSOIL/FILL - (SM) SILTY SAND, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist/frozen, compact		0.00	1	SS	15				
		FILL - (CL) SILTY CLAY, some sand, trace gravel; grey brown; cohesive, w~PL, stiff		66.02 0.36 65.62							
1		FILL - (SM) gravelly SILTY SAND; grey brown, contains silty clay layers; non-cohesive, moist, dense		0.76 65.24	2	SS	49				
		FILL - (SM) gravelly SILTY SAND; black, contains ash and slag; non-cohesive, moist, dense		1.14 64.86							
		FILL - (SM) gravelly SILTY SAND; grey brown; non-cohesive, moist, compact		1.52 64.40	3	SS	12				
2		(PT) Amorphous PEAT; black; non-cohesive, moist		1.98 64.09							
		(SM) gravelly SILTY SAND; grey, possible cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to very dense		2.29	4	SS	7				
3					5	SS	9		○	M	
				62.47	6	SS	>50				
4		End of Borehole Auger Refusal		3.91							
5											
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

WSP GOLDER

LOGGED: JS

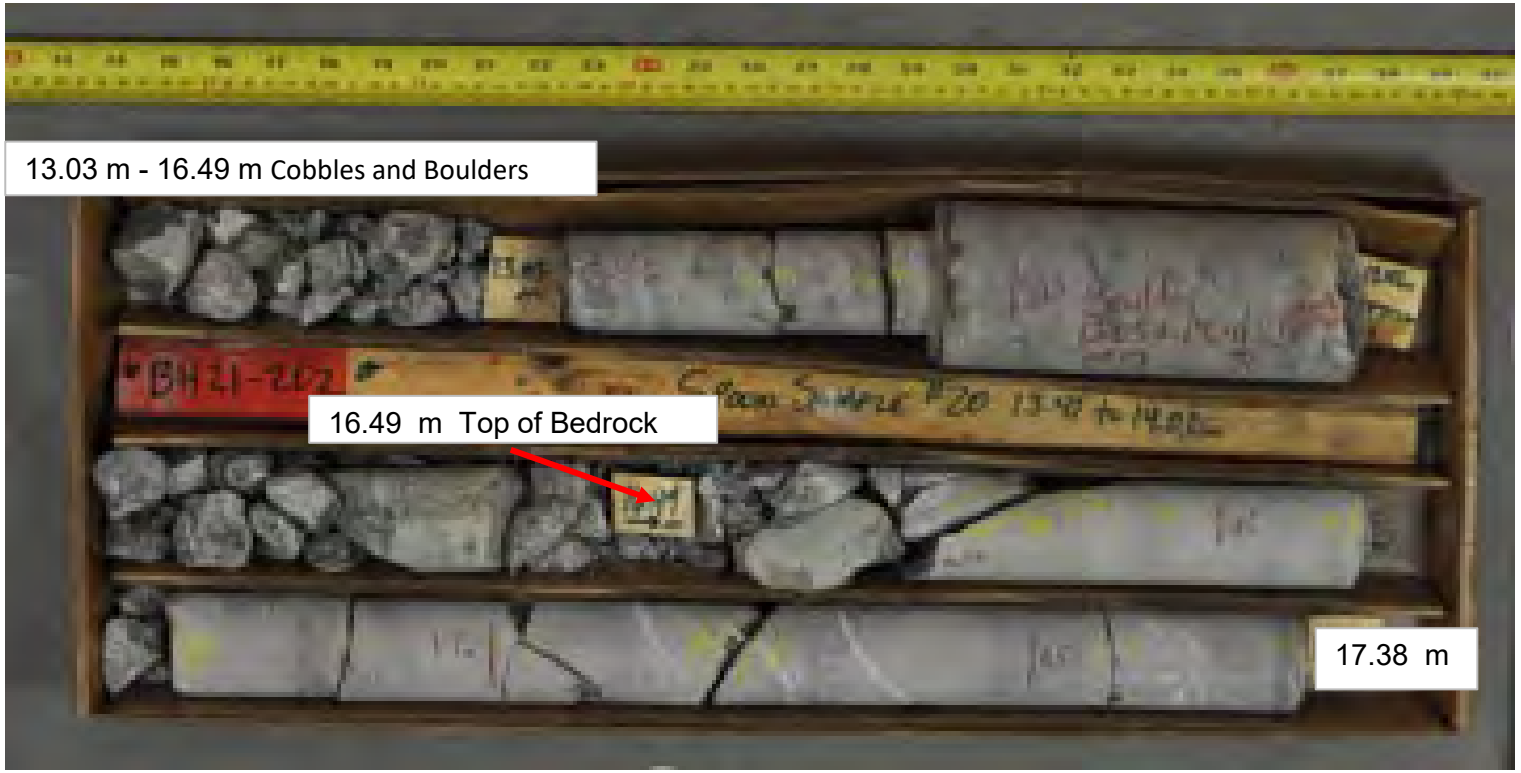
CHECKED: BB

MIS-BHS 001 21451149.GPJ GAL-MIS.GDT 9/6/22

APPENDIX B

Figures B-1 to B-26, Record of Rock Core Photographs

21-202 (Dry)
Cored Length of 13.03 to 17.38 metres
Core Box 1 of 4



CLIENT
Parsons Inc.

PROJECT
PARSONS/ OTTAWA HOSPITAL EXPANSION/ OTTAWA

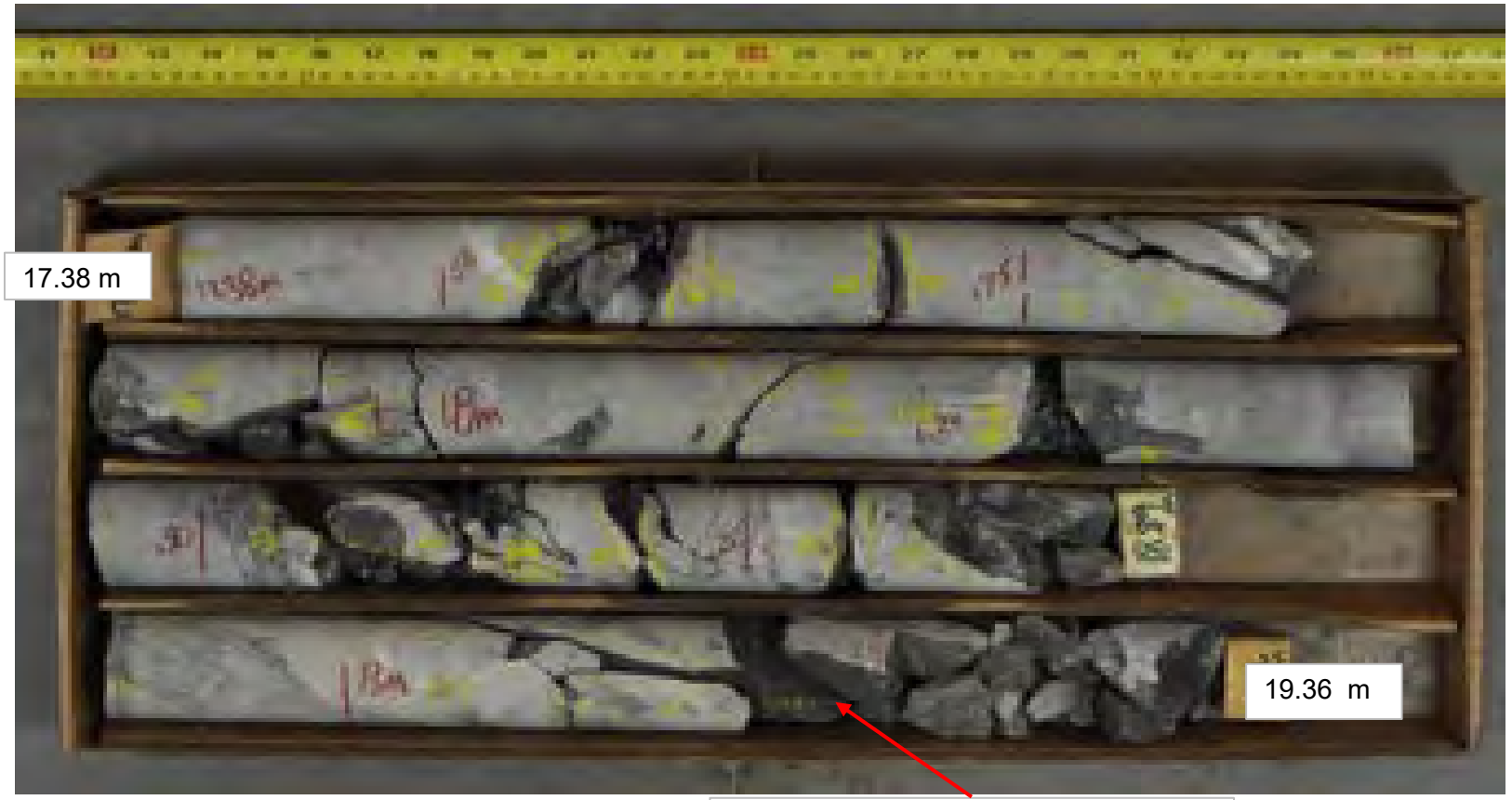
CONSULTANT
GOLDER
MEMBER OF WSP

YYY/MM/DD	2021-08-05
PREPARED	AKP
DESIGN	AKP
REVIEW	
APPROVED	

TITLE
COREHOLE 21-202 (DRY)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-1

21-202 (Dry)
Cored Length of 17.38 to 19.36 metres
Core Box 2 of 4



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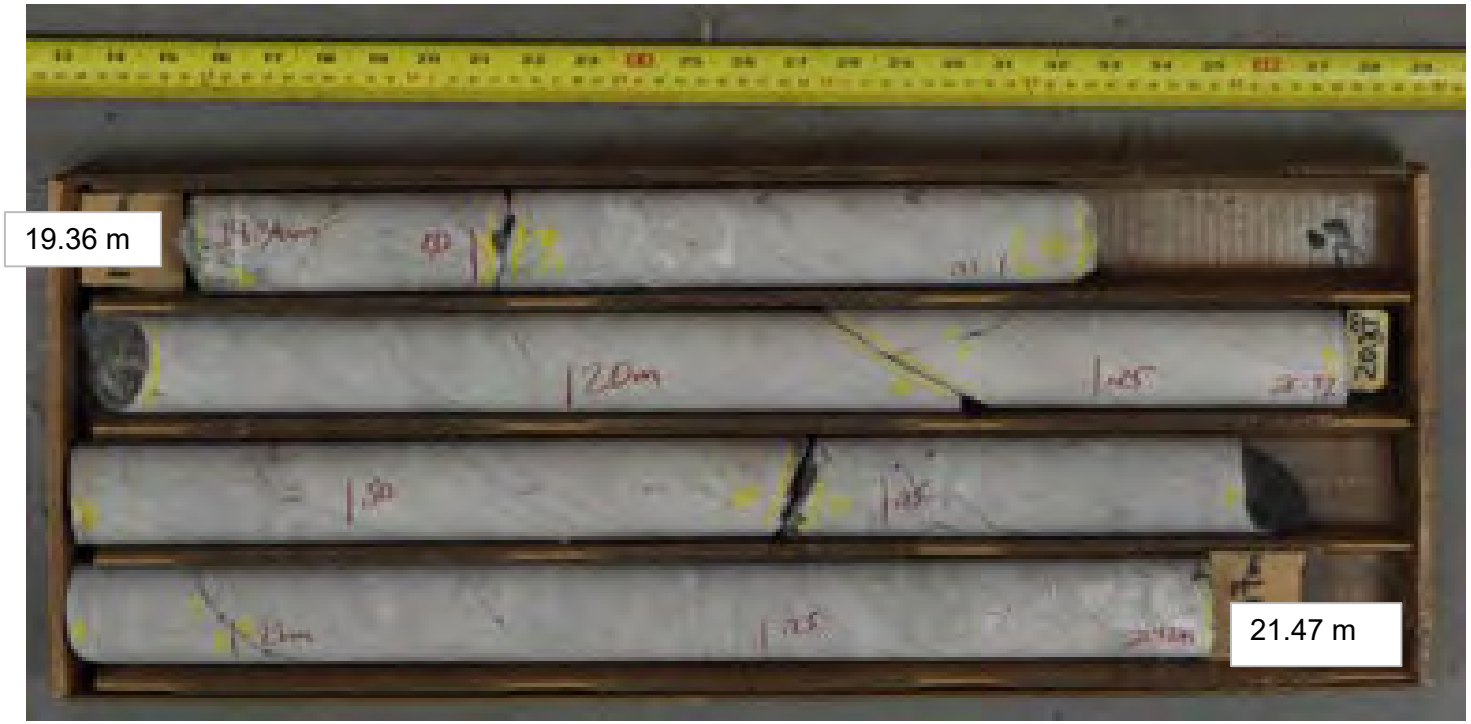
YYY/MM/DD	2021-08-05
PREPARED	AKP
DESIGN	AKP
REVIEW	
APPROVED	

TITLE
COREHOLE 21-202 (DRY)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-2

21-202 (Dry)
Cored Length of 19.36 to 21.47 metres
Core Box 3 of 4



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DESIGN	AKP
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TITLE
COREHOLE 21-202 (DRY)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-3

21-202 (Dry)
Cored Length of 21.47 to 21.82 metres
Core Box 4 of 4

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PREPARED	AKP
DESIGN	AKP
REVIEW	
APPROVED	

TITLE
COREHOLE 21-202 (DRY)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-4

21-202 (Wet)
Cored Length of 13.03 to 17.38 metres
Core Box 1 of 4

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YYY/MM/DD	2021-08-05
PREPARED	AKP
DESIGN	AKP
REVIEW	
APPROVED	

TITLE
COREHOLE 21-202 (WET)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-5

21-202 (Wet)
Cored Length of 17.38 to 19.36 metres
Core Box 2 of 4

CLIENT
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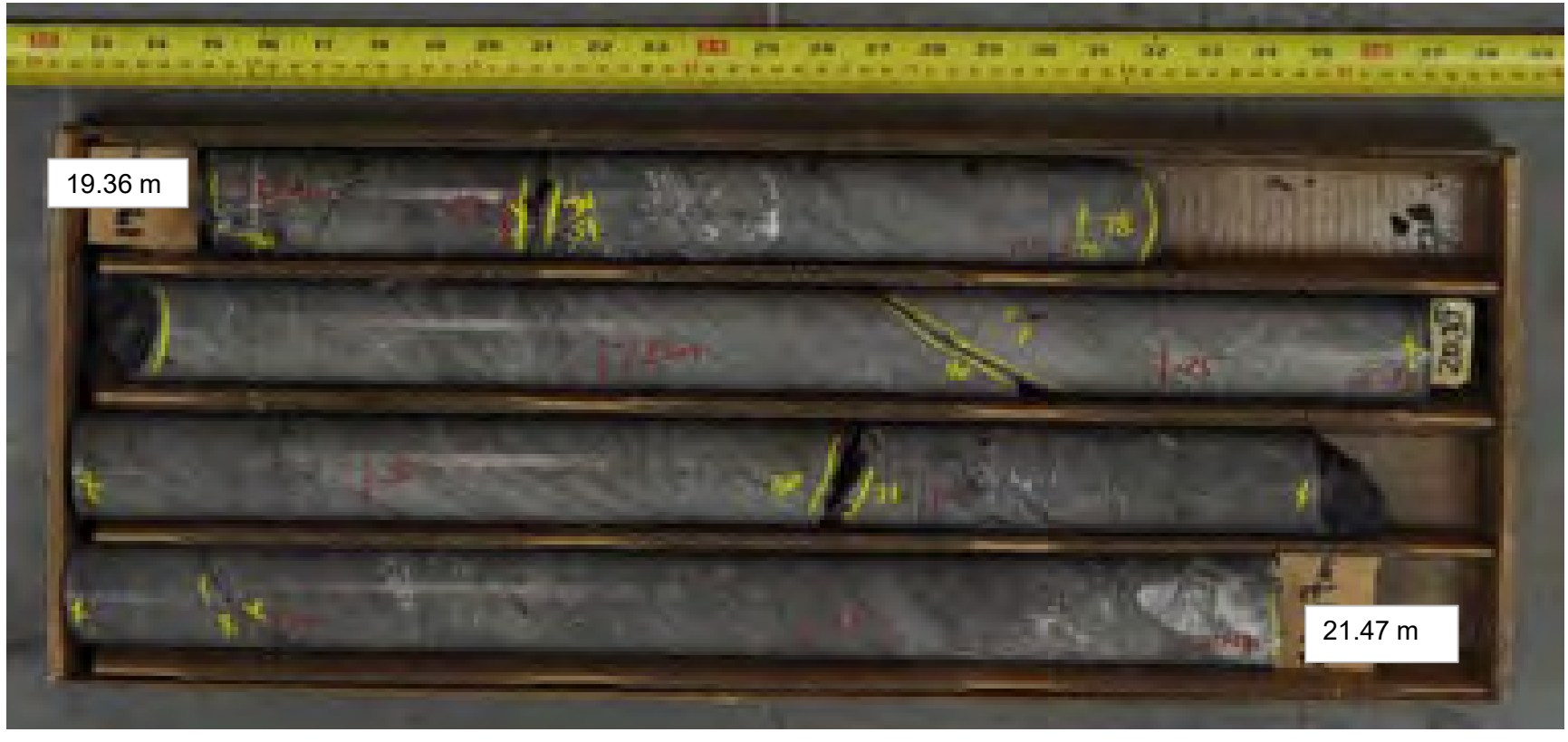
YYY/MM/DD	2021-08-05
PREPARED	AKP
DESIGN	AKP
REVIEW	
APPROVED	

TITLE
COREHOLE 21-202 (WET)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-6

21-202 (Wet)
Cored Length of 19.36 to 21.47 metres
Core Box 3 of 4



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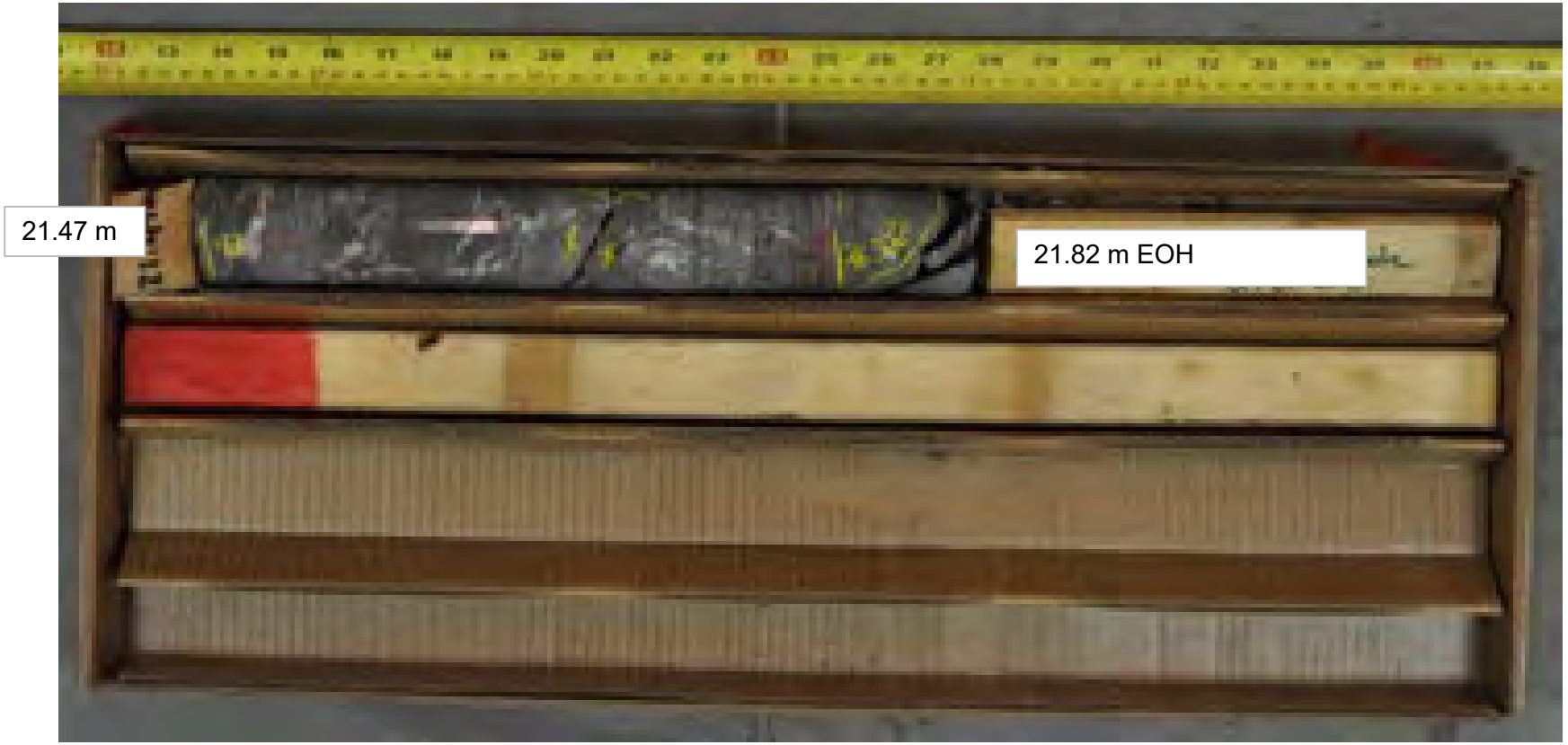
YYY/MM/DD	2021-08-05
PREPARED	AKP
DESIGN	AKP
REVIEW	
APPROVED	

TITLE
COREHOLE 21-202 (WET)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-7

21-202 (Wet)
Cored Length of 21.47 to 21.82 metres
Core Box 4 of 4



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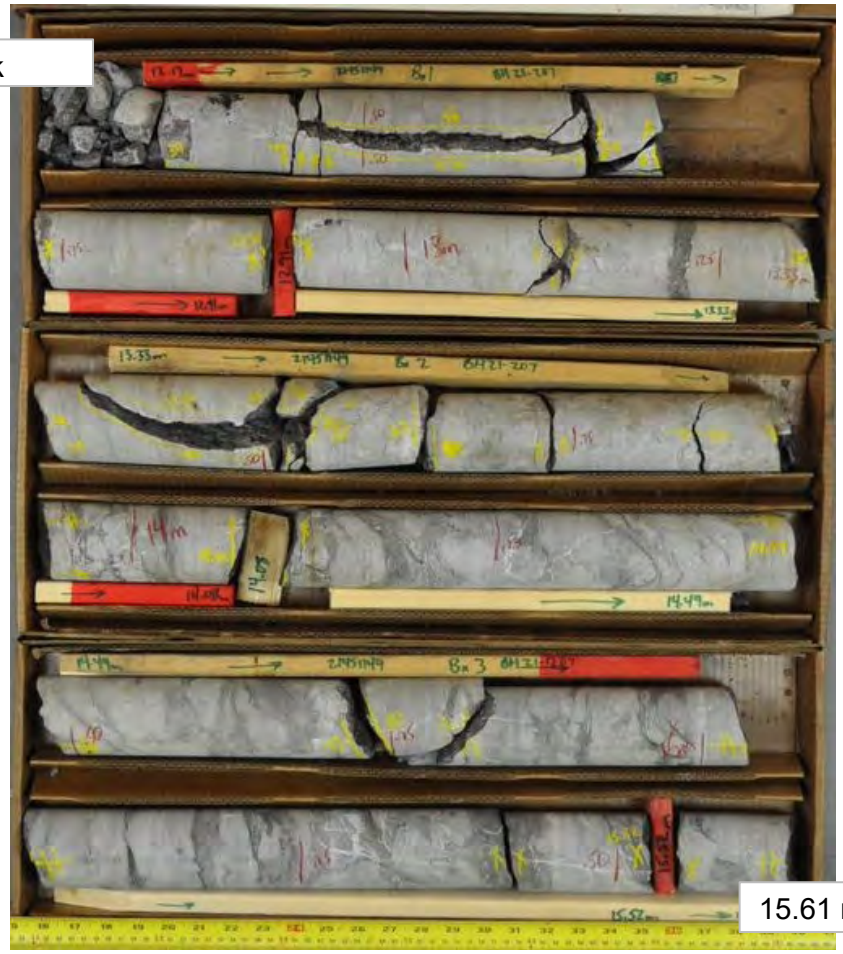
YYY/MM/DD	2021-08-05
PREPARED	AKP
DESIGN	AKP
REVIEW	
APPROVED	

TITLE
COREHOLE 21-202 (WET)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-8

BH 21-207 (Dry)
Cored Length of 12.17 to 15.61 metres
Core Box 1 to 3 of 3

12.17 m Top of bedrock



15.61 m

CLIENT
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YYY/MM/DD	2021-05-20
PREPARED	KM
DESIGN	KM
REVIEW	
APPROVED	

TITLE
BOREHOLE 21-207 (DRY)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-9

BH 21-207 (Dry)
Cored Length of 15.61 to 18.95 metres
Core Box 4 to 6 of 9

15.61 m

18.95 m

CLIENT
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PROJECT
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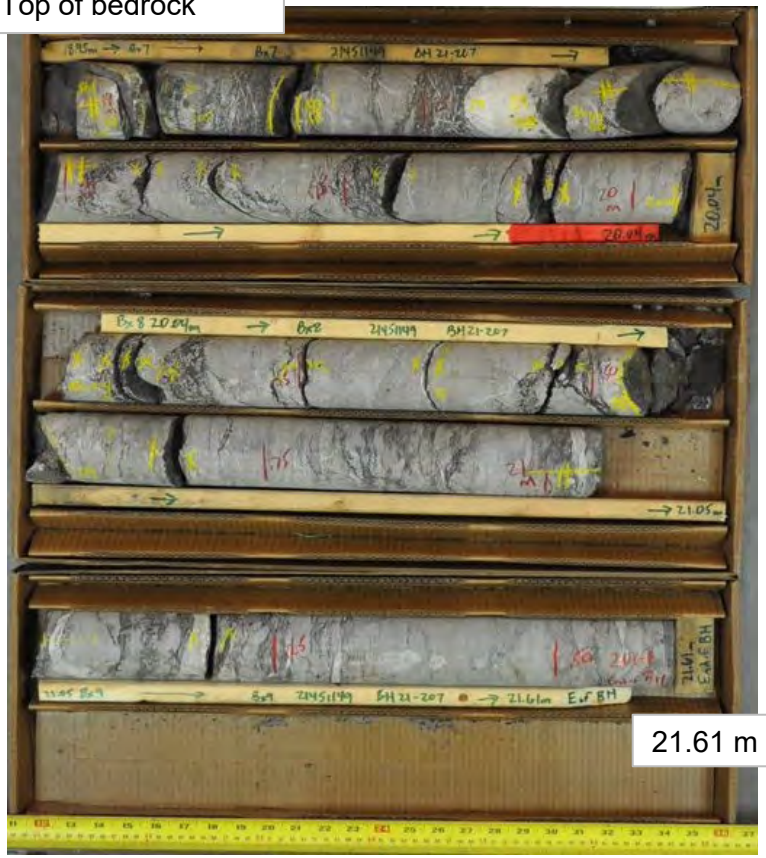
YYY/MM/DD	2021-05-20
PREPARED	KM
DESIGN	KM
REVIEW	
APPROVED	

TITLE
BOREHOLE 21-207 (DRY)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-10

BH 21-207 (Dry)
Cored Length of 18.95 to 21.61 metres
Core Box 7 to 9 of 9

18.95 m Top of bedrock



21.61 m EOH

CLIENT
Parsons Inc.

PROJECT
PARSONS/ OTTAWA HOSPITAL EXPANSION/ OTTAWA

CONSULTANT
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MEMBER OF WSP

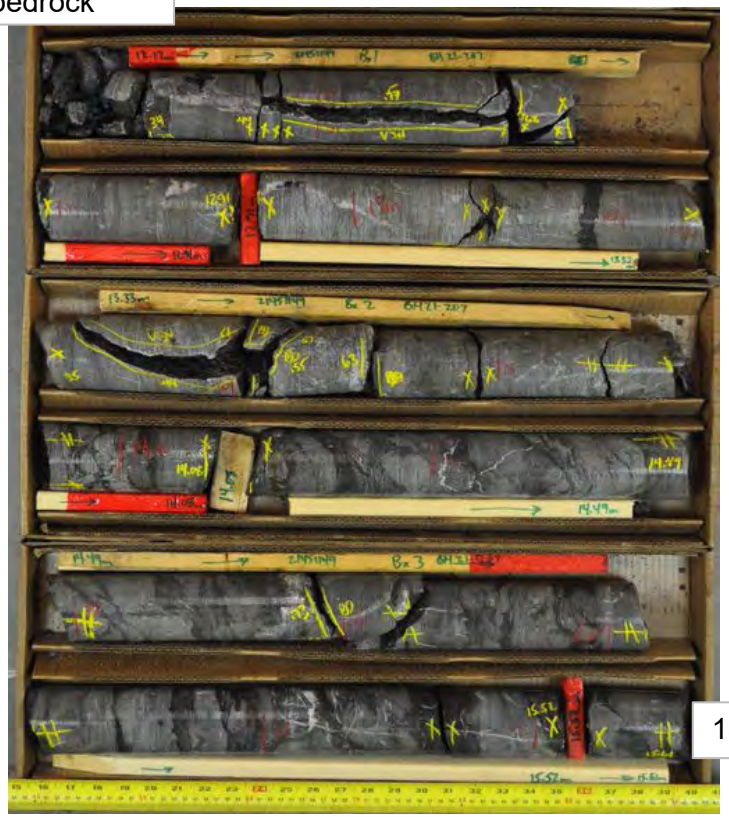
YYY/MM/DD	2021-05-20
PREPARED	KM
DESIGN	KM
REVIEW	
APPROVED	

TITLE
BOREHOLE 21-207 (DRY)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-11

BH 21-207 (Wet)
Cored Length of 12.17 to 15.61 metres
Core Box 1 to 3 of 9

12.17 m Top of bedrock



15.61 m

CLIENT
Parsons Inc.

PROJECT
PARSONS/ OTTAWA HOSPITAL EXPANSION/ OTTAWA

CONSULTANT
GOLDER
MEMBER OF WSP

YYY/MM/DD	2021-05-20
PREPARED	KM
DESIGN	KM
REVIEW	
APPROVED	

TITLE
BOREHOLE 21-207 (WET)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-12

BH 21-207 (Wet)
Cored Length of 15.61 to 18.95 metres
Core Box 4 to 6 of 9

15.61 m

18.95 m

CLIENT
Parsons Inc.

PROJECT
PARSONS/ OTTAWA HOSPITAL EXPANSION/ OTTAWA

CONSULTANT
GOLDER
MEMBER OF WSP

YYY/MM/DD	2021-05-20
PREPARED	KM
DESIGN	KM
REVIEW	
APPROVED	

TITLE
BOREHOLE 21-207 (WET)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-13

BH 21-207 (Wet)
Cored Length of 15.61 to 18.95 metres
Core Box 4 to 6 of 9

15.61

18.95 m EOH

CLIENT
Parsons Inc.

PROJECT
PARSONS/ OTTAWA HOSPITAL EXPANSION/ OTTAWA

CONSULTANT
GOLDER
MEMBER OF WSP

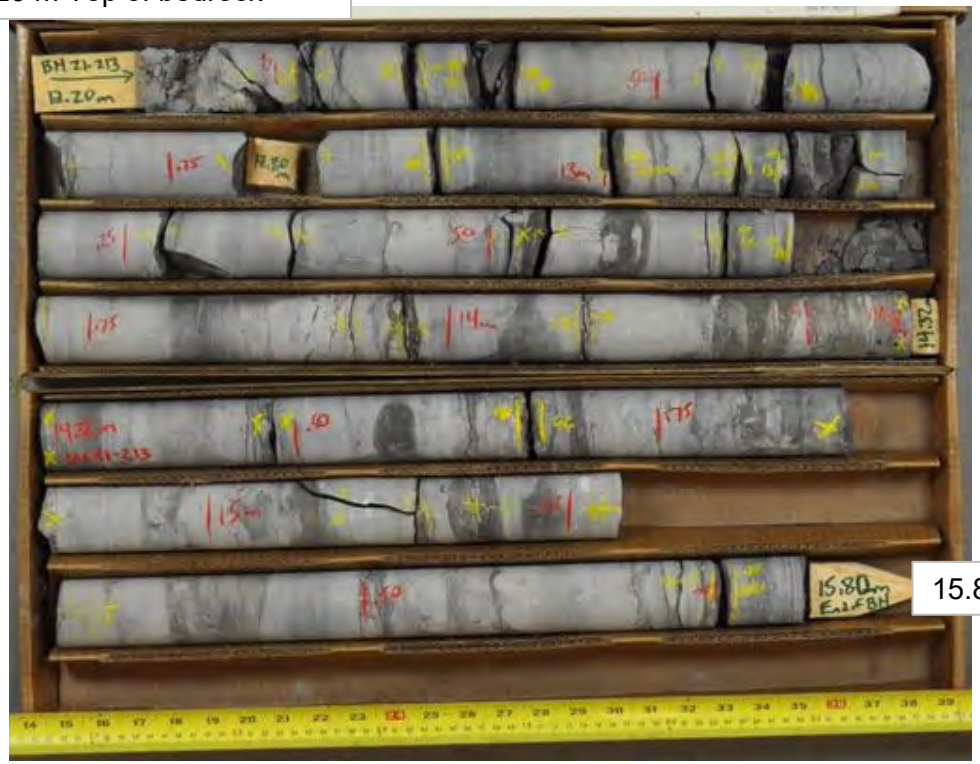
YYY/MM/DD	2021-05-20
PREPARED	KM
DESIGN	KM
REVIEW	
APPROVED	

TITLE
BOREHOLE 21-207 (WET)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-14

BH 21-213 (Dry)
Cored Length of 12.20 to 15.80 metres
Core Box 1 to 2 of 2

12.20 m Top of bedrock



15.80 m EOH

CLIENT
Parsons Inc.

PROJECT
PARSONS/ OTTAWA HOSPITAL EXPANSION/ OTTAWA

CONSULTANT
GOLDER
MEMBER OF WSP

YYY/MM/DD	2021-05-20
PREPARED	KM
DESIGN	KM
REVIEW	
APPROVED	

TITLE
BOREHOLE 21-213 (DRY)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-15

BH 21-213 (Wet)
Cored Length of 12.20 to 15.80 metres
Core Box 1 to 2 of 2

12.20 m Top of bedrock

15.80 m EOH

CLIENT
Parsons Inc.

PROJECT
PARSONS/ OTTAWA HOSPITAL EXPANSION/ OTTAWA

CONSULTANT
GOLDER
MEMBER OF WSP

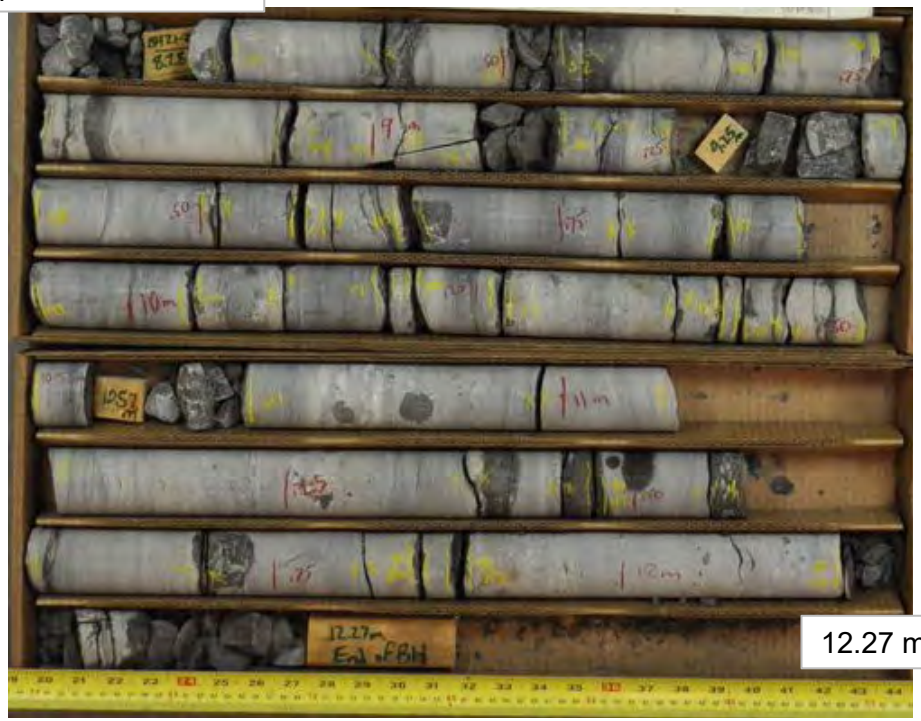
YYY/MM/DD	2021-05-20
PREPARED	KM
DESIGN	KM
REVIEW	
APPROVED	

TITLE
BOREHOLE 21-213 (WET)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-16

BH 21-214 (Dry)
Cored Length of 8.28 to 12.27 metres
Core Box 1 to 2 of 2

8.28 m Top of bedrock



12.27 m EOH

CLIENT
Parsons Inc.

PROJECT
PARSONS/ OTTAWA HOSPITAL EXPANSION/ OTTAWA

CONSULTANT
GOLDER
MEMBER OF WSP

YYY/MM/DD	2021-05-20
PREPARED	KM
DESIGN	KM
REVIEW	
APPROVED	

TITLE
BOREHOLE 21-214 (DRY)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-17

BH 21-214 (Wet)
Cored Length of 8.28 to 12.27 metres
Core Box 1 to 2 of 2

8.28 m Top of bedrock

12.27 m EOH

CLIENT
Parsons Inc.

PROJECT
PARSONS/ OTTAWA HOSPITAL EXPANSION/ OTTAWA

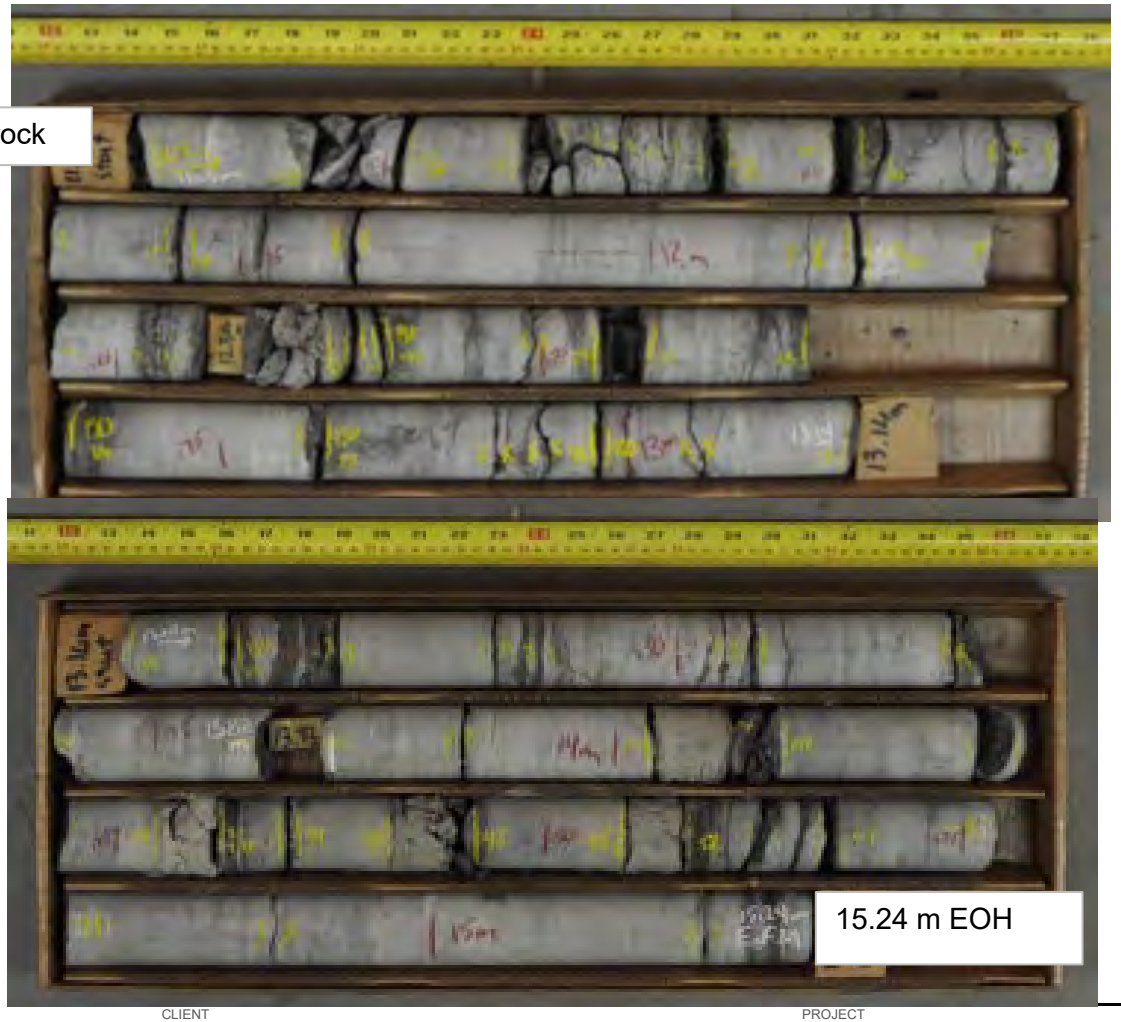
CONSULTANT
GOLDER
MEMBER OF WSP

YYY/MM/DD	2021-05-20
PREPARED	KM
DESIGN	KM
REVIEW	
APPROVED	

TITLE
BOREHOLE 21-214 (WET)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-18

21-216 (Dry)
Cored Length of 11.13 to 15.24 metres
Core Box 1 of 2



CLIENT
Parsons Inc.

PROJECT
PARSONS/ OTTAWA HOSPITAL EXPANSION/ OTTAWA

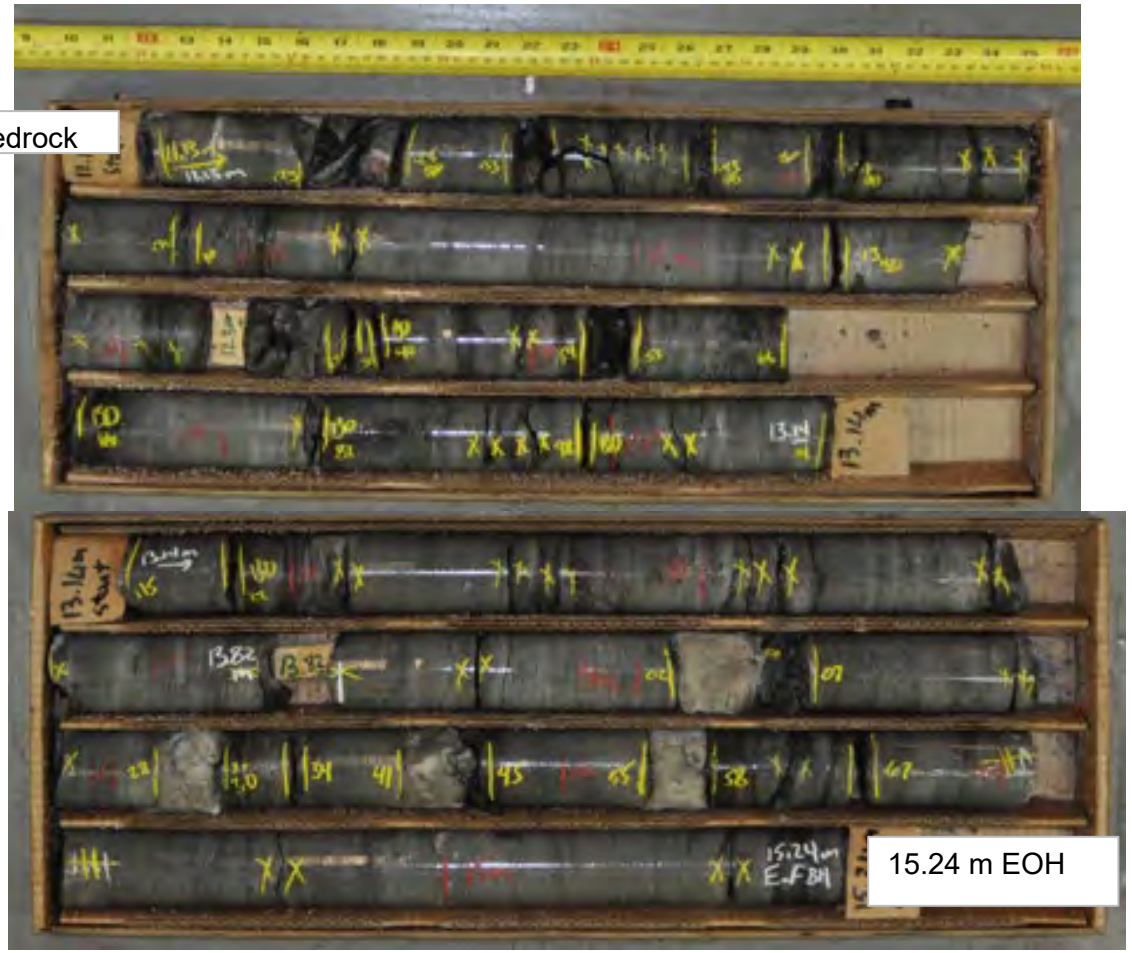
CONSULTANT
GOLDER
MEMBER OF WSP

YYY/MM/DD	2021-08-05
PREPARED	AKP
DESIGN	AKP
REVIEW	
APPROVED	

TITLE
COREHOLE 21-216 (DRY)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B19

21-216 (Wet)
Cored Length of 11.13 to 13.14 metres
Core Box 1 of 2



CLIENT
Parsons Inc.

PROJECT
PARSONS/ OTTAWA HOSPITAL EXPANSION/ OTTAWA

CONSULTANT
GOLDER
MEMBER OF WSP

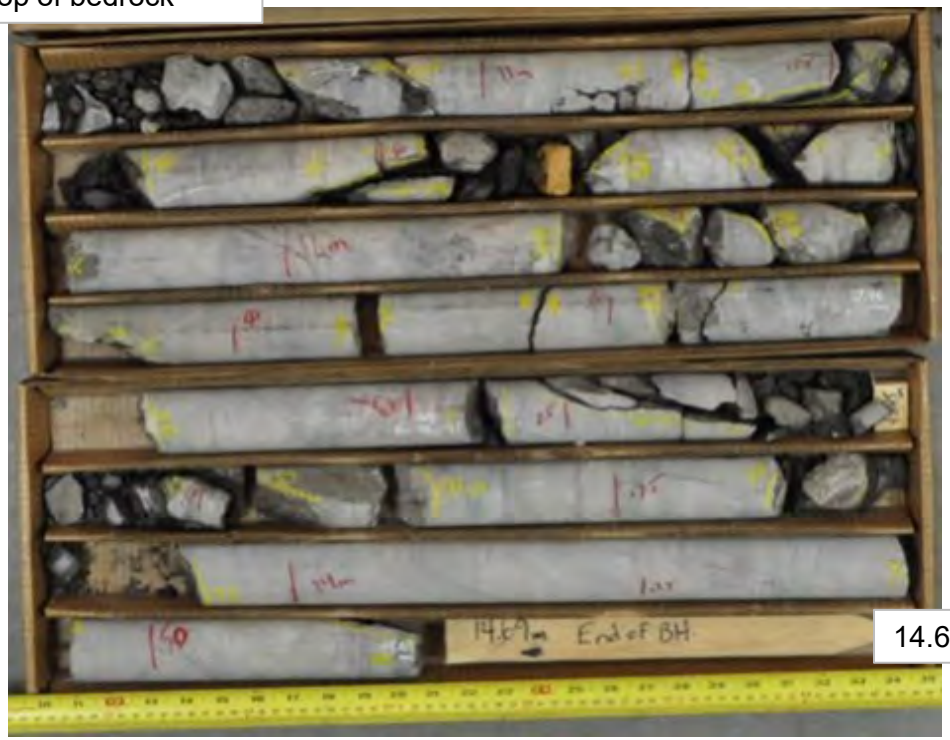
YYY/MM/DD	2021-08-05
PREPARED	AKP
DESIGN	AKP
REVIEW	
APPROVED	

TITLE
COREHOLE 21-216 (WET)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-20

BH 21-219 (Dry)
Cored Length of 10.83 to 14.69 metres
Core Box 1 to 2 of 2

10.84 m Top of bedrock



14.69 m EOH

CLIENT
Parsons Inc.

PROJECT
PARSONS/ OTTAWA HOSPITAL EXPANSION/ OTTAWA

CONSULTANT
GOLDER
MEMBER OF WSP

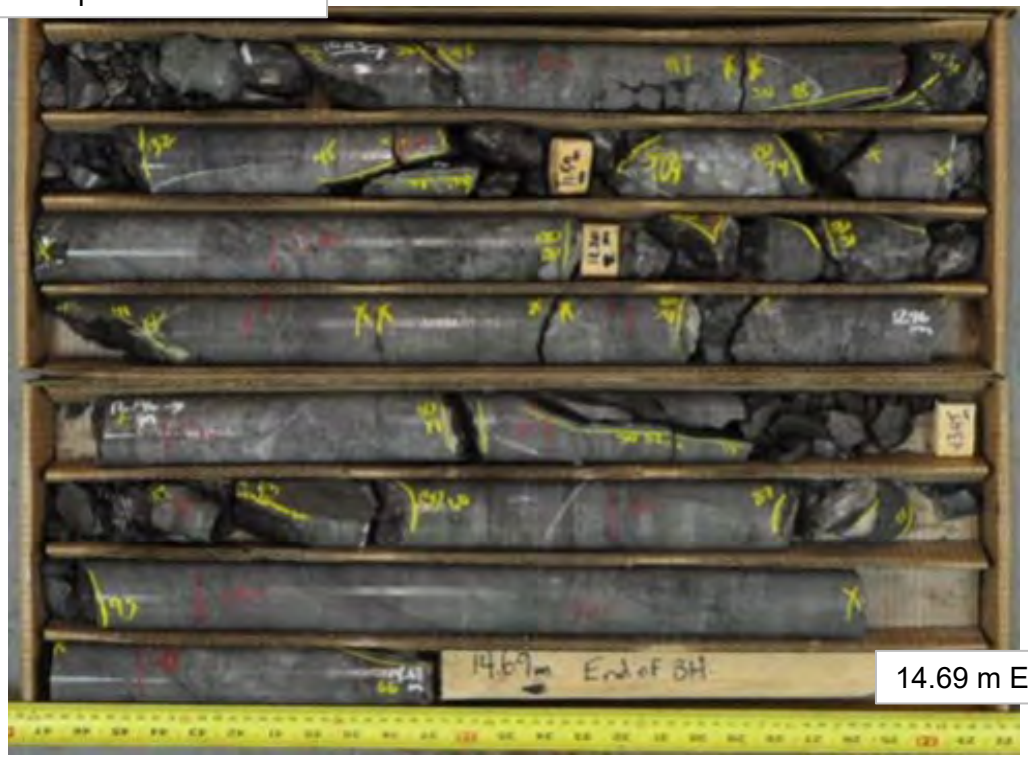
YYY/MM/DD	2021-05-20
PREPARED	KM
DESIGN	KM
REVIEW	
APPROVED	

TITLE
BOREHOLE 21-219 (DRY)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-21

BH 21-219 (Wet)
Cored Length of 10.83 to 14.69 metres
Core Box 1 to 2 of 2

10.84 m Top of bedrock



14.69 m EOH

CLIENT
Parsons Inc.

PROJECT
PARSONS/ OTTAWA HOSPITAL EXPANSION/ OTTAWA

CONSULTANT
GOLDER
MEMBER OF WSP

YYY/MM/DD	2021-05-20
PREPARED	KM
DESIGN	KM
REVIEW	
APPROVED	

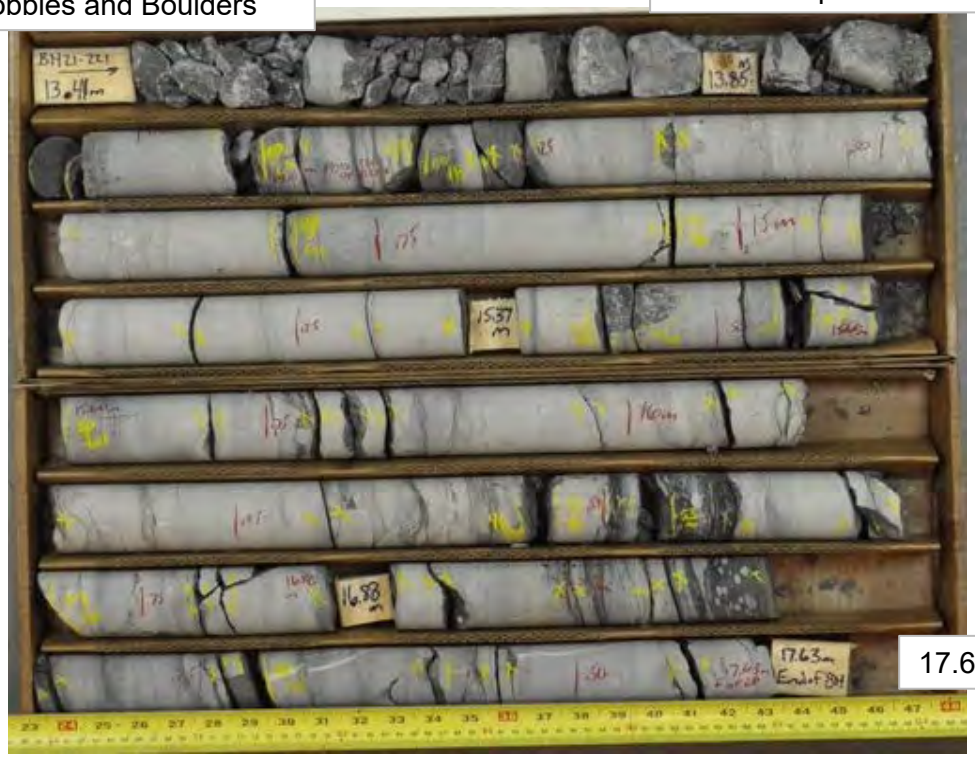
TITLE
BOREHOLE 21-219 (WET)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-22

BH 21-221 (Dry)
Cored Length of 13.41 to 17.63 metres
Core Box 1 to 2 of 2

13.41 m Cobbles and Boulders

13.96 m Top of Bedrock



17.63 m EOH

CLIENT
Parsons Inc.

PROJECT
PARSONS/ OTTAWA HOSPITAL EXPANSION/ OTTAWA

CONSULTANT
GOLDER
MEMBER OF WSP

YYY/MM/DD	2021-05-20
PREPARED	KM
DESIGN	KM
REVIEW	
APPROVED	

TITLE
BOREHOLE 21-221 (DRY)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-23

BH 21-221 (Wet)
Cored Length of 13.41 to 17.63 metres
Core Box 1 to 2 of 2

13.41 m Cobbles and Boulders

13.96 m Top of Bedrock

17.63 m EOH

CLIENT
Parsons Inc.

PROJECT
PARSONS/ OTTAWA HOSPITAL EXPANSION/ OTTAWA

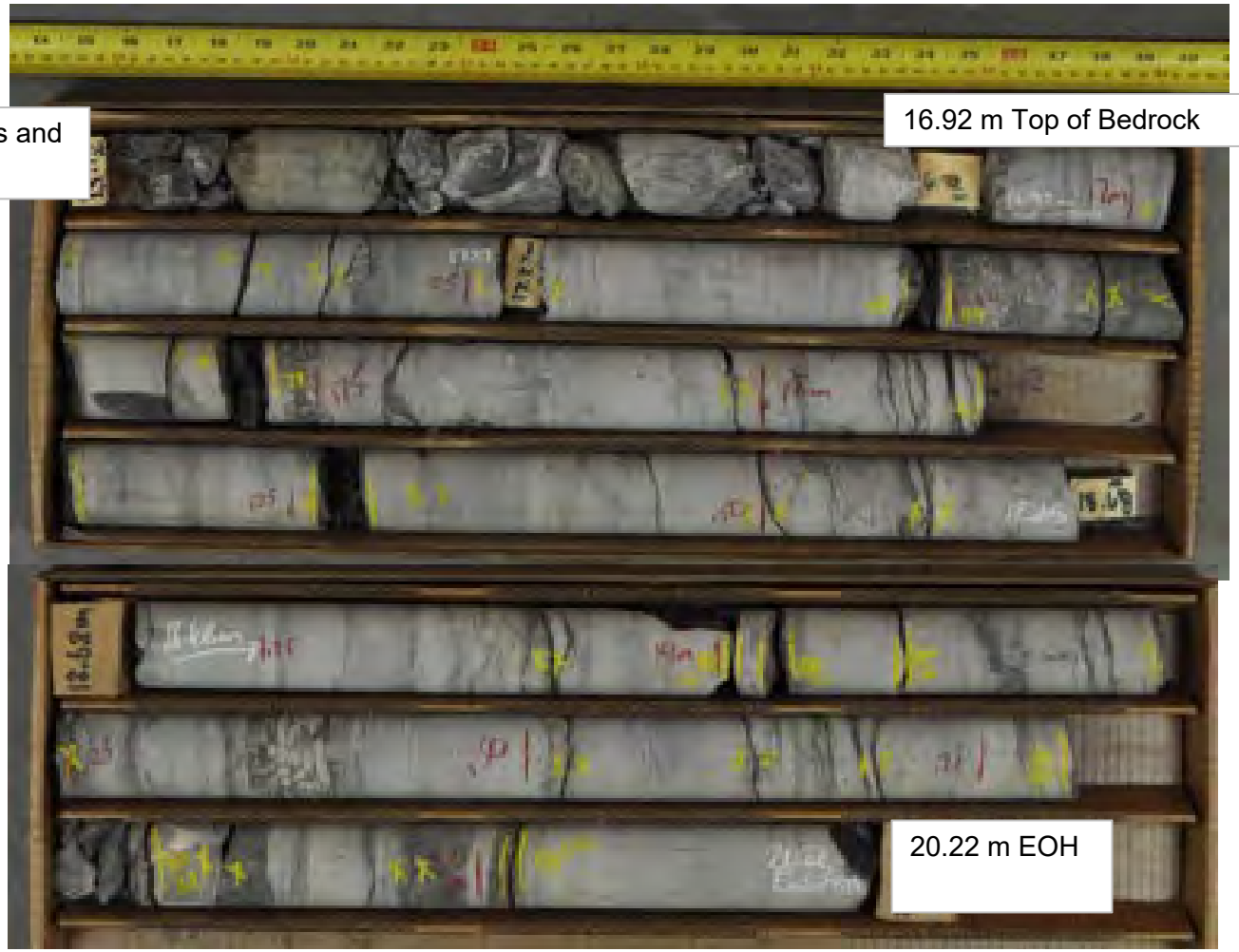
CONSULTANT
GOLDER
MEMBER OF WSP

YYY/MM/DD	2021-05-20
PREPARED	KM
DESIGN	KM
REVIEW	
APPROVED	

TITLE
BOREHOLE 21-221 (WET)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-24

21-224 (Dry)
Cored Length of 15.98 to 20.22 metres
Core Box 1 to 2 of 2



CLIENT
Parsons Inc.

PROJECT
PARSONS/ OTTAWA HOSPITAL EXPANSION/ OTTAWA

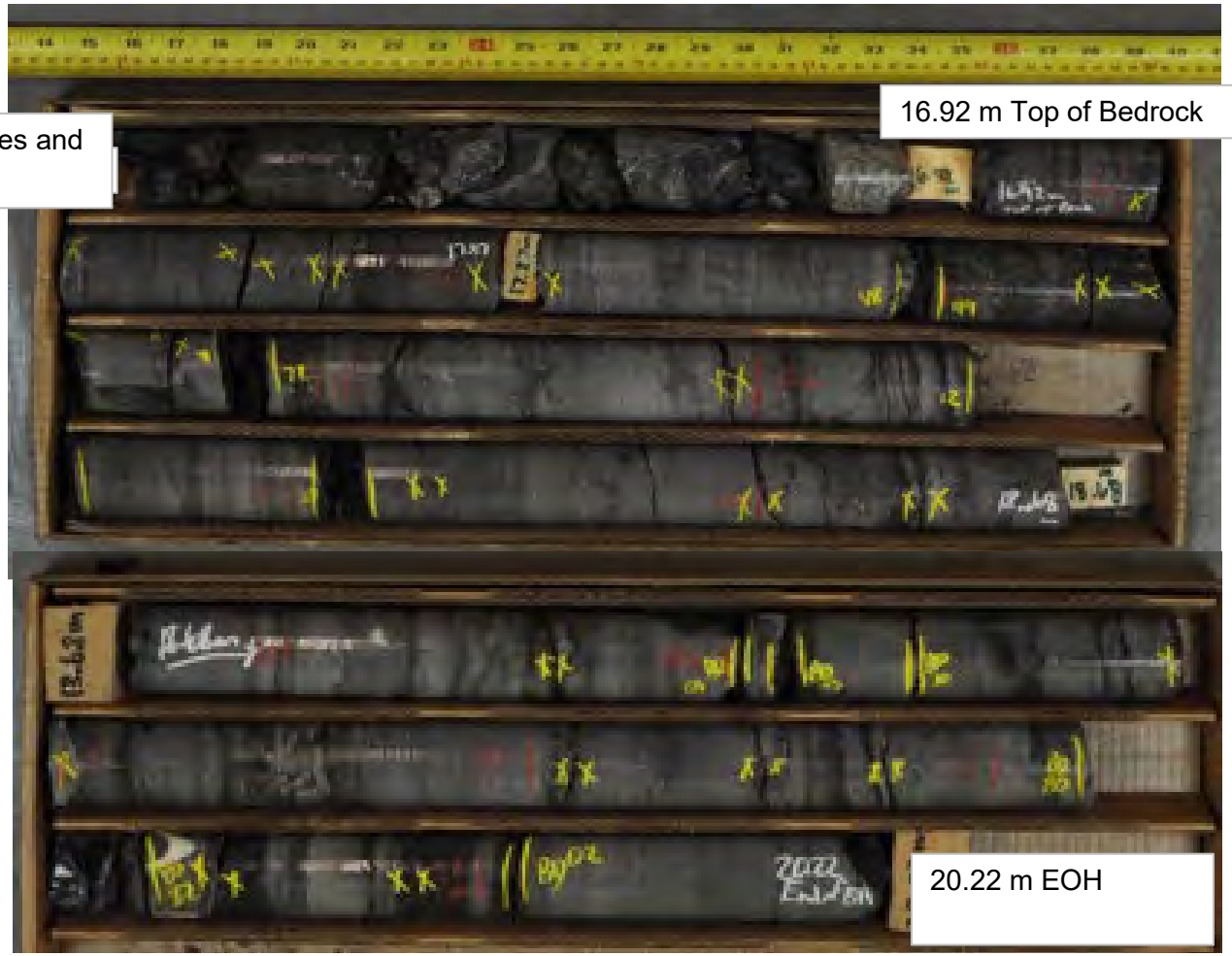
CONSULTANT
GOLDER
MEMBER OF WSP

YYY/MM/DD	2021-08-05
PREPARED	AKP
DESIGN	AKP
REVIEW	
APPROVED	

TITLE
COREHOLE 21-224 (DRY)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-25

21-224 (Wet)
Cored Length of 15.98 to 20.22 metres
Core Box 1 to 2 of 2



CLIENT
Parsons Inc.

PROJECT
PARSONS/ OTTAWA HOSPITAL EXPANSION/ OTTAWA

CONSULTANT
GOLDER
MEMBER OF WSP

YYY/MM/DD	2021-08-05
PREPARED	AKP
DESIGN	AKP
REVIEW	
APPROVED	

TITLE
COREHOLE 21-224 (WET)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
21451149	2000	0a	B-26

APPENDIX C

Record of Borehole Logs, Previous Investigations

RECORD OF AUGER PROBE AP - 2

SHEET 1 of 1

LOCATION See Figure 2

BORING DATE Feb.5,1988

DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

PROJECT 881-2044

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (M)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3M	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH Cu, kPa (nat.V.- + Q.- ● rem.V.- ⊕ U.- O)	HYDRAULIC CONDUCTIVITY, k, CM/SEC / WATER CONTENT, PERCENT (Wp W Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 150mm Diam (Solid Stem)	Ground Surface									
		ASPHALT									
		Grey silty sand, some gravel (FILL)		0.06							
		Brown silty sand (FILL)		0.49							
1		Probably grey brown to grey silty sand, some gravel, trace clay, occasional cobble and boulder (GLACIAL TILL)		0.82							
2											
3											
4											
5											
6											
		End of Hole		6.10							
7											
8											
9											
10											

0 / 16 / 10 PERCENT AXIAL STRAIN AT FAILURE

DEPTH SCALE

1 : 50

Golder Associates

LOGGED S.Leighton

CHECKED CRM

RECORD OF AUGER PROBE AP-3

SHEET 1 of 1

LOCATION See Figure 2

BORING DATE Feb.5,1988

DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

PROJECT 881-2044

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (M)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3M	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH Cu, kPa (nat.V.- + Q.- ● rem.V.- ⊕ U.- O)	HYDRAULIC CONDUCTIVITY, k, CM/SEC; WATER CONTENT, PERCENT (Wp W Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface									
		ASPHALT		0.00							
		Brown silty sand, some gravel (FILL)		0.23							
1				0.98							
2											
3											
4	Power Auger 150mm Diam (Solid Stem)	Probably grey brown to grey silty clay becoming silty sand, some gravel, trace clay, occasional cobble and boulder (GLACIAL TILL)									
5											
6											
7											
8											
9											
		End of Hole		9.14							
10											

0 / 16 / 10 6 PERCENT AXIAL STRAIN AT FAILURE

DEPTH SCALE

1 : 50

Golder Associates

LOGGED S.Leighton

CHECKED CRW

RECORD OF AUGER PROBE AP-4

SHEET 1 of 1

LOCATION See Figure 2

BORING DATE Feb.5,1988

DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

PROJECT 881-2044

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (M)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3M	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m	HYDRAULIC CONDUCTIVITY, k, CM/SEC	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 150mm Diam (Solid Stem)	Ground Surface						SHEAR STRENGTH Cu, kPa nat.V.- + Q.- ● rem.V.- ⊕ U.- O	WATER CONTENT, PERCENT Wp W Wl		
		ASPHALT		0.00							
		Dark grey silty sand, some gravel (FILL)		0.09							
				0.21							
1		Brown silty sand, trace gravel (Probably Fill)									
				1.28							
2											
3		Probably grey brown to grey SILTY CLAY									
4											
5											
6											
		End of Hole		6.10							
7											
8											
9											
10											

16 (0 / 10) 6 PERCENT AXIAL STRAIN AT FAILURE

DEPTH SCALE

1 : 50

Golder Associates

LOGGED S.Leighton

CHECKED CRM

RECORD OF AUGER PROBE AP-5

SHEET 1 of 1

LOCATION See Figure 2

BORING DATE Feb.5,1988

DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

PROJECT 881-2044

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	ELEV. DEPTH (M)	SAMPLES NUMBER	TYPE	BLOWS/0.3M
0	Power Auger	Ground Surface				
		ASPHALT	0.00			
		Grey silty sand and gravel (FILL)	0.09			
		Very stiff grey brown SILTY CLAY, trace sand and gravel (Weathered Crust)	0.37			
1				1	50 DO	16
2				2	50 DO	10
		Grey brown to grey silty sand some gravel, trace clay, occasional cobble and boulder (GLACIAL TILL)	2.16			
				3	50 DO	25
3–8						
		End of Hole	8.63			
9						
10						

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m

SHEAR STRENGTH Cu, kPa — nat.V.- + Q.- ● rem.V.- ⊕ U.- O

HYDRAULIC CONDUCTIVITY, k, CM/SEC

WATER CONTENT, PERCENT — Wp W Wl — 20 40 60 80

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

0 / 15 — 5 / 10 PERCENT AXIAL STRAIN AT FAILURE

DEPTH SCALE 1 : 50

Golder Associates

LOGGED S.Leighton

CHECKED CRM

RECORD OF AUGER PROBE AP-6

SHEET 1 of 1

LOCATION See Figure 2

BORING DATE Feb.5,1988

DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

PROJECT 881-2044

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (M)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3M	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m	SHEAR STRENGTH Cu, kPa (nat.V.- + Q.- ● rem.V.- ⊕ U.- O)	HYDRAULIC CONDUCTIVITY, k, CM/SEC	WATER CONTENT, PERCENT (Wp, W, Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface											
		Medium brown silty sand, trace organic matter (FILL)		0.00									
				0.24									
1		Medium brown silty sand, trace gravel (FILL)											
				1.25									
2													
3													
4	Power Auger 150mm Diam (Hollow Stem)	Probably grey brown to grey silty sand, some gravel, trace clay, occasional cobble and boulder (GLACIAL TILL)											
5													
6													
7													
8													
9													
		End of Hole		9.14									
10													

0 / 15 / 10 PERCENT AXIAL STRAIN AT FAILURE

DEPTH SCALE

1 : 50

Golder Associates

LOGGED S.Leighton

CHECKED CRM

Monitoring Well: MW16-1

Project:	Phase II Environmental Site Assessment	**Drilling method:**	GM100 (Direct Push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	14-Mar-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	97.46 m RTD
Number:	122511246	**Top of casing elevation:**	97.37 m RTD
Field investigator:	J. Urben / B. Chenier	**Easting:**	444332.2
Contractor:	Strata Drilling Group	**Northing:**	5026985.7

Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV / Comb ● 200 400 600 800	Diagram	Description
			Ground Surface	97.46							
			TOPSOIL moist to wet	0.00 97.38							Flushmount protective cover with concrete seal
			CRUSHED CONCRETE (FILL) grey, silt, trace clay, dry	0.08	1	DP	17" 28%	pH, Phenols	<5 <0.02		
5				95.94							
	2		SANDY SILT (FILL) brown, trace gravel, trace concrete dust, dry	1.52	2	DP	47" 78%		<5 1.0		Bentonite backfill 50 mm ID PVC pipe
10				94.41							
	4		SANDY SILT (FILL) grey, gravel, crushed concrete, brick fragments, dry	3.05	3	DP	31" 52%	Explosives	<5 1.0		
15			- becomes grey		4	DP	26" 43%	Metals & Inorganics, Phenols	<5 1.0		Groundwater Level: 5.29 m BGS 17-Mar-16
20	6		- becomes moist to wet		5	DP	30" 50%	PHC, VOC, PAH, Field Duplicate	10 <0.02		Silica sand backfill 50 mm ID slotted PVC pipe
			CLAY grey, moist, black staining at 7.5 m BGS	90.45 7.01							
25	8		- becomes wet		6	DP	30" 50%		<5 1.0		Slough
30			End of Borehole	88.32 9.14							

Screen Interval: 5.64 - 8.69 m BGS
Sand Pack Interval: 5.33 - 8.69 m BGS
Well Seal Interval: 0.23 - 5.33 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Field Duplicate - MW16-1A SS5

Stantec

Drawn By/Checked By: M. Ford

Borehole: BH16-2

Project:	Phase II Environmental Site Assessment	**Drilling method:**	GM100 (Direct Push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	14-Mar-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	99.32 m RTD
Number:	122511246	**Top of casing elevation:**	n/a
Field investigator:	J. Urben / B. Chenier	**Easting:**	444365.8
Contractor:	Strata Drilling Group	**Northing:**	5026932.5

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 ppm OTOV Comb● 200 400 600 800	Diagram	Description
			Ground Surface	99.32							
			TOPSOIL	0.00							
			CLAYEY SILT brown with orange mottling, sand, gravel, dry	99.17 0.15	1	DP	21" 70%	Explosives, PAH, Metals	<5 ● ○ <0.02		
					2a	DP	19" 63%		<5 ● ○ <0.02		
5				97.80							
			SILTY SAND grey-brown, with gravel, moist	1.52	2b	DP	19" 32%		<5 ● ○ <0.02		
	2										
10			- becomes grey, dry		3	DP	24" 40%		<5 ● ○ <0.02		
	4										
15			- with silt, moist		4	DP	12" 20%	VOC, PHC	<5 ● ○ <0.02		Bentonite backfill
	6			93.22							
20			No soil samples recovered	6.10							
				91.70							
25			CLAY grey, gravel, trace silt, wet	7.62	6	DP	12" 20%		<5 ● ○ <0.02		
	8			90.18							
30			End of Borehole	9.14							

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Stantec

Drawn By/Checked By: M. Ford

Monitoring Well: MW16-3

Project:	Phase II Environmental Site Assessment	**Drilling method:**	GM100 (Direct Push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	14-Mar-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	98.02 m RTD
Number:	122511246	**Top of casing elevation:**	97.96 m RTD
Field investigator:	J. Urben / B. Chenier	**Easting:**	444386.4
Contractor:	Strata Drilling Group	**Northing:**	5026952

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV ● Comb 200 400 600 800	Diagram / Description
			Ground Surface	98.02						
			TOPSOIL	0.00 97.76						Flushmount protective cover with concrete seal
			CRUSHED CONCRETE (FILL) with sand, gravel, dry	0.26	1	DP	9" 15%	Phenols	<5 ● ○ <0.02	Bentonite backfill
5	2		- brick fragments		2	DP	14" 23%	PAH, Metals & Inorganics	<5 ● ○ <0.02	50 mm ID PVC pipe
				94.97						
10	4		SAND (FILL) brown, gravel, dry	3.05	3	DP	10" 17%	Phenols, Explosives		Groundwater Level: 3.80 m BGS 17-Mar-16
				93.45						Silica sand backfill
15			GRAVEL (FILL) trace silt, moist	4.57	4	DP	11" 18%	VOC, pH, PHC		50 mm ID slotted PVC pipe
20	6		- with silt, trace clay, wet	91.62						
			CLAY grey, with gravel, wet	6.40	5	DP	31" 52%		<5 ● ○ <0.02	
25	8		- trace sand		6	DP	38" 63%		<5 ● ○ <0.02	Silica sand backfill
				88.88						
30			End of Borehole	9.14						

Screen Interval: 3.05 - 6.10 m BGS
Sand Pack Interval: 2.74 - 9.14 m BGS
Well Seal Interval: 0.23 - 2.74 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Stantec

Drawn By/Checked By: M. Ford

Borehole: BH16-4

Project:	Phase II Environmental Site Assessment	**Drilling method:**	GM100 (Direct Push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	14-Mar-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	94.29 m RTD
Number:	122511246	**Top of casing elevation:**	n/a
Field investigator:	J. Urben / B. Chenier	**Easting:**	444468.1
Contractor:	Strata Drilling Group	**Northing:**	5026816

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV / Comb ● 200 400 600 800	Diagram	Description
			Ground Surface	94.29							
			SILTY SAND grey, trace clay, gravel, moist	0.00	1	DP	24" 40%	PAH, Metals, Explosives, Field Duplicate	<5 ● ○ <0.02		
5				92.51							
	2		SAND coarse to medium grained, with gravel	1.78	2	DP	24" 40%	Glycol, pH	<5 ● ○ <0.02		
				91.24							
10			SILTY SAND grey, with clay, gravel, wet	3.05	3	DP	36" 60%	VOC, PHC	<5 ● ○ <0.02		Bentonite backfill
	4										
15					4	DP	29" 81%		<5 ● ○ <0.02		
					5	DP	29" 121%		<5 ● ○ <0.02		
20	6				6	DP	36" 100%		<5 ● ○ <0.02		
				87.28							
			Refusal on inferred bedrock End of Borehole	7.01							
25											
	8										
30											

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Field Duplicate - BH16-4 SS7 (for Metals Only)

Stantec

Drawn By/Checked By: M. Ford

Monitoring Well: MW16-5

Project:	Phase II Environmental Site Assessment	**Drilling method:**	GM100 (Direct Push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	14-Mar-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	96.18 m RTD
Number:	122511246	**Top of casing elevation:**	96.10 m RTD
Field investigator:	J. Urben / B. Chenier	**Easting:**	444404.1
Contractor:	Strata Drilling Group	**Northing:**	5026972.9

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV / Comb ● 200 400 600 800	Diagram / Description
			Ground Surface	96.18						
			SAND (FILL) brown, clay, gravel, dry	0.00	1	DP	11" 18%	VOC, PHC, PAH, Metals & Inorganics, Explosives	<5 ● ○ <0.02	Flushmount protective cover with concrete seal
5	2		- becomes grey, moist		2	DP	36" 60%	Glycol, Field Duplicate	<5 ● ○ <0.02	Bentonite backfill 50 mm ID PVC pipe
				93.74						Groundwater Level: 2.28 m BGS 17-Mar-16
			SILTY SAND grey, gravel	2.44						
10	4		- trace clay, moist to wet		3	DP	37" 62%		<5 ● ○ <0.02	Silica sand backfill
15					4	DP	27" 45%		<5 ● ○ <0.02	50 mm ID slotted PVC pipe
20	6				5	DP	19" 79%		<5 ● ○ <0.02	
				89.47						
			Refusal on inferred bedrock End of Borehole	6.71						
25	8									
30										

Screen Interval: 3.05 - 6.10 m BGS
Sand Pack Interval: 2.74 - 6.71 m BGS
Well Seal Interval: 0.23 - 2.74 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Field Duplicate - MW16-5 SS7

Stantec

Drawn By/Checked By: M. Ford

Monitoring Well: MW16-6

Project:	Phase II Environmental Site Assessment	**Drilling method:**	GM100 (Direct Push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	11-Mar-2016 / 14-Mar-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	94.85 m RTD
Number:	122511246	**Top of casing elevation:**	94.82 m RTD
Field investigator:	J. Urben / B. Chenier	**Easting:**	444454.1
Contractor:	Strata Drilling Group	**Northing:**	5026972.9

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV ● Comb 200 400 600 800	Diagram / Description
			Ground Surface	94.85						
			SILTY CLAY (FILL) grey, gravel, moist	0.00	1	DP	0" 0%	Phenols, Explosives, PAH, Metals & Inorganics		Flushmount protective cover with concrete seal
5										Groundwater Level: 0.73 m BGS 17-Mar-16
	2				2	DP	12" 50%		<5 ● ○ <0.02	Bentonite backfill
				92.72						50 mm ID PVC pipe
			SILTY SAND brown, trace clay, soft, moist	2.13	3	DP	18" 50%	VOC, pH	<5 ● ○ <0.02	
10			- gravel, wet		4	DP	24" 80%		<5 ● ○ <0.02	
	4									Silica sand backfill
			- seam of coarse brown sand		5	DP	24" 80%		<5 ● ○ <0.02	50 mm ID slotted PVC pipe
15			- becomes grey		6	DP	27" 45%		<5 ● ○ <0.02	
20	6				7	DP	24" 50%	PHC	220 ● ○ <0.02	Slough
				87.54						
			Refusal on inferred bedrock End of Borehole	7.32						
25										
	8									
30										

Screen Interval: 2.59 - 5.64 m BGS
Sand Pack Interval: 2.29 - 5.64 m BGS
Well Seal Interval: 0.23 - 2.29 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Stantec

Drawn By/Checked By: M. Ford

Monitoring Well: MW16-7

Project:	Phase II Environmental Site Assessment	**Drilling method:**	GM100 (Direct Push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	14-Mar-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	95.47 m RTD
Number:	122511246	**Top of casing elevation:**	95.36 m RTD
Field investigator:	J. Urben / B. Chenier	**Easting:**	444336.2
Contractor:	Strata Drilling Group	**Northing:**	5027014.9

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV / Comb ● 200 400 600 800	Diagram	Description
			Ground Surface	95.47							
			TOPSOIL with grass, sand, dry	0.00 95.16							Flushmount protective cover with concrete seal
			SILTY CLAY brown, soft, dry	0.30	1	DP	24" 100%		● <5 ○ <0.02		
					2	DP	24" 67%	Phenols, Metals, Explosives, PAH	● <5 ○ <0.02		Bentonite backfill
5	2				3	DP	36" 60%		● <5 ○ 1.0		50 mm ID PVC pipe
				92.73							
			SILTY SAND brown, coarse grained sand, gravel - becomes wet	2.74	4	DP	24" 80%	PHC, VOC, Field Duplicate	● 60 ○ <0.02		
10	4		- grey		5	DP	30" 100%		● <5 ○ <0.02		
				90.90							
15			SILTY SAND grey, trace clay, gravel, moist	4.57	6	DP	36" 60%		● <5 ○ <0.02		Groundwater Level: 4.79 m BGS 17-Mar-16
											Silica sand backfill
20	6				7	DP	30" 50%		● <5 ○ <0.02		50 mm ID slotted PVC pipe
25	8										Slough
					8	DP	28" 47%		● <5 ○ <0.02		
30				86.33							
			End of Borehole	9.14							

Screen Interval: 3.66 - 6.71 m BGS
Sand Pack Interval: 3.35 - 6.71 m BGS
Well Seal Interval: 0.23 - 3.35 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Field Duplicate - MW16-2A SS4

Stantec

Drawn By/Checked By: M. Ford

Monitoring Well: MW17-05

Project:	Phase II Environmental Site Assessment	**Drilling method:**	Geoprobe (direct push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	26-Jul-2017
Location:	870 and 930 Carling Avenue and 520 Preston Street, Ottawa, Ontario	**Ground surface elevation:**	94.49 m RTD
Number:	122170088	**Top of casing elevation:**	94.39 m RTD
Field investigator:	A. Parrott	**Easting:**	444231.6325
Contractor:	Strata Drilling Group	**Northing:**	5026850.536

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL / ppm (OTOV, Comb)	Diagram / Description
			Ground Surface	94.49						
1	0.5		TOPSOIL black-brown, organics, moist	0.00 93.88	1	DP	100%	H-P, Metals, PAHs, Phenols, VOCs	<5 <0.02	Flushmount protective cover with concrete seal
2			SILT brown-grey, moist	0.61						
3	1.0				2			PHC F1-F4	<5 <0.02	Backfilled with bentonite
4										
5	1.5				3	DP	100%	H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 <0.02	50 mm ID PVC pipe
6										
7	2.0			92.05						
8	2.5		SILTY SAND brown, trace gravel, wet	2.44	4				<5 <0.02	
9										
10	3.0		- brown-grey							
11	3.5				5				<5 <0.02	Groundwater Level: 3.43 m BGS 3-Aug-17
12			- grey			DP	80%			
13	4.0				6				<5 <0.02	
14										
15	4.5									Backfilled with silica sand
16					7				<5 <0.02	
17	5.0					DP	80%			50 mm ID slotted PVC pipe
18	5.5									
19					8				<5 <0.02	
20	6.0			88.39						
21			End of Borehole	6.10						
22	6.5									
23	7.0									
24										
25	7.5									
26	8.0									
27										
28	8.5									
29										
30	9.0									
31	9.5									
32										
33	10.0									
34	10.5									

Screen Interval: 3.05 - 6.10 m BGS
Sand Pack Interval: 2.74 - 6.10 m BGS
Well Seal Interval: 0.23 - 2.74 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

H-P - herbicides and pesticides
PAHs - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOCs - volatile organic compounds
Comb - combustible soil vapour
TOV - total organic vapour

Drawn By/Checked By: T. Pawlick / J. Yaraskavitch

Monitoring Well: MW17-06

Project:	Phase II Environmental Site Assessment	**Drilling method:**	Geoprobe (direct push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	26-Jul-2017
Location:	870 and 930 Carling Avenue and 520 Preston Street, Ottawa, Ontario	**Ground surface elevation:**	95.09 m RTD
Number:	122170088	**Top of casing elevation:**	95.03 m RTD
Field investigator:	A. Parrott	**Easting:**	444175.7424
Contractor:	Strata Drilling Group	**Northing:**	5026815.478

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV / Comb ● 200 400 600 800	Diagram	Description
			Ground Surface	95.09							
1			TOPSOIL black-brown, organics, moist	0.00 94.78							
2	0.5		SANDY SILT brown, trace gravel, moist	0.30	1	DP	75%	H-P, Metals, PAHs, Phenols, VOCs			
3	1.0			93.87					<5		
4			SILTY SAND brown, trace gravel, moist to wet	1.22	2			PHC F1-F4	● 1 ○		Flushmount protective cover with concrete seal Backfilled with bentonite 50 mm ID PVC pipe
5	1.5										
6											
7	2.0										
8	2.5				3	DP	50%	H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 ● <0.02 ○		Backfilled with silica sand
9											
10	3.0		- brown-grey								50 mm ID slotted PVC pipe
11									<5		
12	3.5				4				● <0.02 ○		
13	4.0					DP	n/a		<5		
14				90.82	5				● <0.02 ○		
15	4.5		SAND brown, wet	4.27 90.48							Groundwater Level: dry on 3-Aug-17
16			Refusal at inferred bedrock End of Borehole	4.60	6	DP	n/a		● <0.02 ○		
17	5.0										
18											
19	5.5										
20											
21	6.0										
22											
23	6.5										
24											
25	7.0										
26											
27	7.5										
28											
29	8.0										
30											
31	8.5										
32											
33	9.0										
34											
	9.5										
	10.0										
	10.5										

Screen Interval: 1.55 - 4.60 m BGS
Sand Pack Interval: 1.25 - 4.60 m BGS
Well Seal Interval: 0.23 - 1.25 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

H-P - herbicides and pesticides
PAHs - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOCs - volatile organic compounds
Comb - combustible soil vapour
TOV - total organic vapour

Drawn By/Checked By: T. Pawlick / J. Yaraskavitch

Monitoring Well: MW17-07

Project:	Phase II Environmental Site Assessment	**Drilling method:**	Geoprobe (direct push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	26-Jul-2017
Location:	870 and 930 Carling Avenue and 520 Preston Street, Ottawa, Ontario	**Ground surface elevation:**	94.64 m RTD
Number:	122170088	**Top of casing elevation:**	94.58 m RTD
Field investigator:	A. Parrott	**Easting:**	444240.9625
Contractor:	Strata Drilling Group	**Northing:**	5026754.904

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV / Comb ● 200 400 600 800	Diagram	Description
			Ground Surface	94.64							
			TOPSOIL black, organics, moist	0.00 94.34							
			SILTY SAND brown, trace gravel, moist to wet	0.30	1	DP	40%	H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 ● ○ <0.02		Flushmount protective cover with concrete seal
					2	DP	40%		<5 ● ○ <0.02		Backfilled with bentonite
					3	DP	100%		<5 ● ○ <0.02		50 mm ID PVC pipe
					4				<5 ● ○ <0.02		
			- brown-grey								Backfilled with silica sand
					5	DP	50%	H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 ● ○ <0.02		Groundwater Level: 4.58 m BGS 3-Aug-17
			- wet								50 mm ID slotted PVC pipe
					6	DP	25%		<5 ● ○ <0.02		
				87.02							Slough
			End of Borehole	7.62							

Screen Interval: 3.66 - 6.71 m BGS
Sand Pack Interval: 3.35 - 7.01 m BGS
Well Seal Interval: 0.23 - 3.35 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

H-P - herbicides and pesticides
PAHs - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOCs - volatile organic compounds
Comb - combustible soil vapour
TOV - total organic vapour

Drawn By/Checked By: T. Pawlick / J. Yaraskavitch

Monitoring Well: MW17-08

Project:	Phase II Environmental Site Assessment	**Drilling method:**	Geoprobe (direct push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	26-Jul-2017
Location:	870 and 930 Carling Avenue and 520 Preston Street, Ottawa, Ontario	**Ground surface elevation:**	95.59 m RTD
Number:	122170088	**Top of casing elevation:**	95.52 m RTD
Field investigator:	A. Parrott	**Easting:**	444299.964
Contractor:	Strata Drilling Group	**Northing:**	5026787.713

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV / Comb ● 200 400 600 800	Diagram	Description
			Ground Surface	95.59							
1	0.5		TOPSOIL black, organics, moist	0.00 94.98							Flushmount protective cover with concrete seal
2			SAND brown, trace silt and gravel, moist	0.61	1	DP	40%	H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 ● ○ <0.02		Backfilled with bentonite
3	1.0										50 mm ID PVC pipe
4				94.07							
5	1.5		SILTY SAND brown, trace gravel, moist	1.52							
6					2	DP	50%	H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 ● ○ <0.02		
7	2.0										
8	2.5			93.15							
9			No soil samples recovered - augered through boulders	2.44							
10	3.0				3	DP	20%				Backfilled with silica sand
11											
12	3.5										50 mm ID slotted PVC pipe
13	4.0										
14											
15	4.5				4	RC	n/a				
16											
17	5.0			90.41							
18			SILTY SAND grey, trace gravel, moist	5.18 90.11							Groundwater Level: 5.21 m BGS 3-Aug-17
19	5.5		Refusal at inferred bedrock End of Borehole	5.49							
20	6.0										
21											
22	6.5										
23	7.0										
24											
25	7.5										
26	8.0										
27											
28	8.5										
29											
30	9.0										
31	9.5										
32											
33	10.0										
34	10.5										

Screen Interval: 2.23 - 5.28 m BGS
Sand Pack Interval: 1.93 - 5.49 m BGS
Well Seal Interval: 0.23 - 1.93 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
RC - rock core
ppm - parts per million by volume
n/a - not available

H-P - herbicides and pesticides
PAHs - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOCs - volatile organic compounds
Comb - combustible soil vapour
TOV - total organic vapour

Drawn By/Checked By: T. Pawlick / J. Yaraskavitch

Monitoring Well: MW17-09

Project:	Phase II Environmental Site Assessment	**Drilling method:**	Geoprobe (direct push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	27-Jul-2017
Location:	870 and 930 Carling Avenue and 520 Preston Street, Ottawa, Ontario	**Ground surface elevation:**	99.19 m RTD
Number:	122170088	**Top of casing elevation:**	99.12 m RTD
Field investigator:	A. Parrott	**Easting:**	444493.9007
Contractor:	Strata Drilling Group	**Northing:**	5026676.009

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV / Comb ● 200 400 600 800	Diagram	Description
			Ground Surface	99.19							
			TOPSOIL black, organics, moist	0.00 98.89							
			SAND (FILL) brown, trace gravel, moist	0.30	1	DP	30%	H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 ● ○ <0.02		Flushmount protective cover with concrete seal Backfilled with bentonite 50 mm ID PVC pipe
				97.97							
			SILTY SAND brown, trace gravel, moist	1.22	2 3	DP	70%		<5 ● ○ <0.02 <5 ● ○ <0.02		Groundwater Level: 2.24 m BGS 3-Aug-17
					4	DP	50%	H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 ● ○ <0.02		
					5	DP	25%		<5 ● ○ <0.02		Backfilled with silica sand
			- grey, wet		6 7	DP	80%		<5 ● ○ <0.02 <5 ● ○ <0.02		50 mm ID slotted PVC pipe
					8 9	DP	100%		<5 ● ○ <0.02 <5 ● ○ <0.02		Slough
				91.57							
			End of Borehole	7.62							

Screen Interval: 3.66 - 6.71 m BGS
Sand Pack Interval: 3.35 - 7.01 m BGS
Well Seal Interval: 0.23 - 3.35 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

H-P - herbicides and pesticides
PAHs - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOCs - volatile organic compounds
Comb - combustible soil vapour
TOV - total organic vapour

Drawn By/Checked By: T. Pawlick / J. Yaraskavitch

Monitoring Well: MW17-10

Project:	Phase II Environmental Site Assessment	**Drilling method:**	Geoprobe (direct push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	27-Jul-2017
Location:	870 and 930 Carling Avenue and 520 Preston Street, Ottawa, Ontario	**Ground surface elevation:**	96.57 m RTD
Number:	122170088	**Top of casing elevation:**	96.48 m RTD
Field investigator:	A. Parrott	**Easting:**	444546.5613
Contractor:	Strata Drilling Group	**Northing:**	5026699.988

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV / Comb ● 200 400 600 800	Diagram	Description
			Ground Surface	96.57							
1			TOPSOIL black, organics, moist	0.00 96.26							
2	0.5		SILTY SAND brown, trace gravel, wet	0.30	1	DP	60%	H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 ● ○ <0.02		Flushmount protective cover with concrete seal
3											Backfilled with bentonite
4	1.0				2				<5 ● ○ <0.02		50 mm ID PVC pipe
5	1.5		- moist								
6					3	DP	75%	H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 ● ○ <0.02		
7	2.0										
8	2.5				4				<5 ● ○ <0.02		Groundwater Level: 2.79 m BGS 3-Aug-17
9											
10	3.0				5	DP	75%		<5 ● ○ <0.02		
11											
12	3.5				6				<5 ● ○ <0.02		Backfilled with silica sand
13	4.0										
14					7	DP	50%		<5 ● ○ <0.02		
15	4.5		- grey								
16											
17	5.0										50 mm ID slotted PVC pipe
18											
19	5.5				8				<5 ● ○ <0.02		
20	6.0			90.47							
21			No sample recovered	6.10	9	DP	0%				
22	6.5										
23	7.0			89.25							Slough
24			End of Borehole	7.32							
25	7.5										
26											
27	8.0										
28	8.5										
29											
30	9.0										
31											
32	9.5										
33											
34	10.0										
	10.5										

Screen Interval: 3.05 - 6.10 m BGS
Sand Pack Interval: 2.74 - 6.40 m BGS
Well Seal Interval: 0.23 - 2.74 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

H-P - herbicides and pesticides
PAHs - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOCs - volatile organic compounds
Comb - combustible soil vapour
TOV - total organic vapour

Stantec

Drawn By/Checked By: T. Pawlick / J. Yaraskavitch

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SOIL PROFILE AND TEST DATA

Environmental Investigation of Existing Fault Line
Proposed New Hospital Campus - Carling Avenue
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Geoprobe **DATE** July 27, 2017

FILE NO. PE4096

HOLE NO. BH 1

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
TOPSOIL 0.15		AU	1				
FILL: Loose, brown silty clay, trace sand, gravel and organics 0.61		SS	2	100	4		
		SS	3	54	13	1	
GLACIAL TILL: Compact, brown silty sand, some gravel, trace clay, cobbles and boulders 1.22		SS	4	38	10		
		SS	5	100	10	2	
		SS	6	100	8		
GLACIAL TILL: Stiff to very soft, brown to grey silty clay, some sand and gravel, trace cobbles and boulders		SS	7	83	5	3	
		SS	8	96	2	4	
6.10						5	
GLACIAL TILL: Loose, grey silty sand, trace gravel, cobbles, boulders and clay		SS	9	46	8	6	
7.34						7	
End of Borehole							
Practical refusal to augering at 7.34m depth							
(GWL @ 2.74m - August 8, 2017)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Environmental Investigation of Existing Fault Line
Proposed New Hospital Campus - Carling Avenue
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Geoprobe **DATE** July 27, 2017

FILE NO. PE4096

HOLE NO. BH 2

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
TOPSOIL 0.15		AU	1				
FILL: Grey silty clay, trace sand and gravel 0.30		SS	2	67	13		
0.99		SS	3	62	6	1	
FILL: Compact to loose, brown silty sand, some gravel and cobbles, trace clay and asphalt		SS	4	83	1		
		SS	5	75	8	2	
		SS	6	83	1		
GLACIAL TILL: Very soft to very stiff, brown silty clay, some sand, trace gravel, cobbles and boulders						3	
- grey by 3.4m depth		SS	7	42	17	4	
		SS	8	42	8	5	
		SS	9	83	6	6	
		SS	10	100	14	7	
8.18						8	
End of Borehole							
Practical refusal to augering at 8.18m depth							
(GWL @ 1.85m - August 9, 2017)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Environmental Investigation of Existing Fault Line
Proposed New Hospital Campus - Carling Avenue
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Geoprobe **DATE** July 28, 2017

FILE NO. PE4096

HOLE NO. BH 3

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
TOPSOIL 0.18		AU	1			0	
		SS	2	83	6		
FILL: Loose to compact, brown silty clay, trace sand, gravel, cobbles and boulders		SS	3	33	10	1	
		SS	4	58	3		
		SS	5	92	3	2	
2.69		SS	6	71	11		
		SS	7	50	20	3	
GLACIAL TILL: Very stiff to firm, brown silty clay, trace sand, gravel, cobbles and boulders		SS	8	54	13	4	
- grey by 5.5m depth		SS	9	25	7	5	
		SS	10	46	11	6	
		SS	11	100	10	7	
		SS	12	100	9	8	
9.75						9	
Dynamic Cone Penetration Test commenced at 9.75m depth						10	
Inferred **GLACIAL TILL**							
11.20						11	
End of Borehole							
Practical DCPT refusal at 11.20m depth							
(GWL @ 3.98m - August 9, 2017)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Environmental Investigation of Existing Fault Line
Proposed New Hospital Campus - Carling Avenue
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger **DATE** July 24, 2017

FILE NO. PE4096

HOLE NO. BH 4

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE										
Asphaltic concrete	0.10		AU	1			0			
FILL: Crushed stone with silt and sand	0.69									
GLACIAL TILL: Stiff, brown silty clay, some sand, gravel, cobbles and boulders			SS	2	25	14	1			
			SS	3	100	9				
	2.03						2			
End of Borehole										
Practical refusal to augering at 2.03m depth										
(BH dry upon completion)										

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)
○ Lower Explosive Limit %
20 40 60 80
100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Environmental Investigation of Existing Fault Line
Proposed New Hospital Campus - Carling Avenue
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger **DATE** July 24, 2017

FILE NO. PE4096

HOLE NO. BH 4A

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
Asphaltic concrete 0.10							
FILL: Crushed stone with silt and sand 0.69							
		SS	1	67	22	2	
		SS	2	83	12		
		SS	3	4	11	3	
GLACIAL TILL: Very stiff to firm, brown silty clay, some sand, gravel, cobbles and boulders						4	
- grey by 4.6m depth		SS	4	67	19	5	
		SS	5	58	16	6	
		SS	6	50	5	7	
		SS	7	100	6	8	
9.75						9	
Dynamic Cone Penetration Test commenced at 9.75m depth						10	
Inferred **GLACIAL TILL**							
11.15						11	
End of Borehole							
Practical DCPT refusal at 11.15m depth							
(GWL @ 2.12m - August 8, 2017)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Environmental Investigation of Existing Fault Line
Proposed New Hospital Campus - Carling Avenue
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger **DATE** July 24, 2017

FILE NO. PE4096

HOLE NO. BH 5

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Asphaltic concrete 0.05		AU	1			0	
FILL: Crushed stone with silt and sand 0.71							
FILL: Brown silty clay, some sand, gravel and cobbles		SS	2	33	6	1	
1.83		SS	3	50	4	2	
Loose, brown **SILTY SAND,** trace gravel 1.96							
Hard, brown **SILTY CLAY**		SS	4	100	P	3	
3.45		SS	5	100	P		
		SS	4	100	4	4	
GLACIAL TILL: Soft to very stiff, brown silty clay, some sand, gravel, cobbles and boulders						5	
- grey by 4.6m depth		SS	5	33	19	6	
						7	
		SS	6	88	11	8	
						9	
		SS	7	62	14		
9.75						10	
Dynamic Cone Penetration Test commenced at 9.75m depth 10.26							
Inferred **GLACIAL TILL**							
End of Borehole							
Practical DCPT refusal at 10.26m depth							
(GWL @ 4.40m - August 8, 2017)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Environmental Investigation of Existing Fault Line
Proposed New Hospital Campus - Carling Avenue
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Geoprobe **DATE** July 26, 2017

FILE NO. PE4096

HOLE NO. BH 6

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
TOPSOIL 0.15		AU	1			0	
FILL: Very loose, brown silty sand some clay, trace gravel 0.61		SS	2	50	3		
		SS	3	100	11	1	
Stiff to very stiff, brown **SILTY CLAY,** trace sand		SS	4	100	14		
2.41		SS	5	100	22	2	
		SS	6	100	23		
		SS	7	100	11	3	
GLACIAL TILL: Firm to hard, brown silty clay, some sand, trace gravel, cobbles and boulders		SS	8	75	39	4	
- grey by 3.0m depth		SS	9	33	16	5	
		SS	10	50	5		
		SS	11	100	26	6	
		SS	12	100	57	7	
9.75 Dynamic Cone Penetration Test commenced at 9.75m depth. 10.31						8	
Inferred **GLACIAL TILL** End of Borehole						9	
Practical DCPT refusal at 10.31m depth						10	
(GWL @ 3.45m - August 8, 2017)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Environmental Investigation of Existing Fault Line
Proposed New Hospital Campus - Carling Avenue
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Geoprobe **DATE** July 26, 2017

FILE NO. PE4096

HOLE NO. BH 8

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
TOPSOIL 0.23		AU	1			0	
		SS	2	50	4		
Soft to stiff, brown **SILTY CLAY,** trace sand		SS	3	100	12	1	
1.35		SS	4	62	15		
		SS	5	100	20	2	
		SS	6	100	8		
GLACIAL TILL: Very soft to very stiff, brown silty clay, some sand, trace gravel, cobbles and boulders		SS	7	42	21	3	
		SS	8	42	2	4	
- grey by 4.9m depth		SS	9	100	5	5	
		SS	10	100	3	6	
8.86		SS	11	100	50+	7	
End of Borehole						8	
Practical refusal to augering at 8.86m depth							
(GWL @ 4.52m - August 8, 2017)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Environmental Investigation of Existing Fault Line
Proposed New Hospital Campus - Carling Avenue
Ottawa, Ontario

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REMARKS

BORINGS BY Geoprobe **DATE** July 26, 2017

FILE NO. PE4096

HOLE NO. BH 9

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE								
TOPSOIL	0.23		AU	1			0	
FILL: Brown silty clay, some sand, gravel and topsoil	0.30		SS	2	83	1		
	0.61		SS	3	42	0	1	
FILL: Brown silty sand, trace gravel and topsoil	1.22		SS	4	50	21		
FILL: Brown silty clay, some sand, trace gravel and cobbles			SS	5	100	24	2	
GLACIAL TILL: Compact to dense, brown silty sand, trace clay, gravel, cobbles and boulders			SS	6	83	31		
	3.43						3	
End of Borehole								
Practical refusal to augering at 3.43m depth								
(BH dry upon completion)								

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Environmental Investigation of Existing Fault Line
Proposed New Hospital Campus - Carling Avenue
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Geoprobe **DATE** July 26, 2017

FILE NO. PE4096

HOLE NO. BH 9A

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0		20 40 60 80	
OVERBURDEN						1			
						2			
3.25						3			
End of Borehole Practical refusal to augering at 3.25m depth (BH dry upon completion)									

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Environmental Investigation of Existing Fault Line
Proposed New Hospital Campus - Carling Avenue
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Geoprobe **DATE** July 26, 2017

FILE NO. PE4096

HOLE NO. BH10

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
TOPSOIL		AU	1				
0.56		SS	2	50	1		
		SS	3	92	5	1	
		SS	4	75	3		
GLACIAL TILL: Very soft to stiff, brown silty clay, trace sand, gravel and cobbles		SS	5	100	4	2	
		SS	6	100	2		
- silty clay layer from 2.13 to 2.44m and 2.64 to 3.02m depths						3	
		SS	7	83	6		
- grey by 4.6m depth						4	
		SS	8	50	7	5	
						6	
		SS	9	75	10		
7.29						7	
End of Borehole							
Practical refusal to augering at 7.29m depth							
(GWL @ 3.89m - August 8, 2017)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

APPENDIX D

Basic Chemical Results, AGAT Laboratories Report No. 21Z766508

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: GOLDER ASSOCIATES LTD
1931 ROBERTSON ROAD
OTTAWA, ON K2H5B7
(613) 592-9600
ATTENTION TO: Kim MacDonald
PROJECT: 21451149
AGAT WORK ORDER: 21Z766508
WATER ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Lab Manager
DATE REPORTED: Jun 30, 2021
PAGES (INCLUDING COVER): 5
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

Disclaimer:

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.*
- *AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.*
- *This Certificate shall not be reproduced except in full, without the written approval of the laboratory.*
- *The test results reported herewith relate only to the samples as received by the laboratory.*
- *Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.*
- *All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.*

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 21Z766508

PROJECT: 21451149

CLIENT NAME: GOLDER ASSOCIATES LTD

ATTENTION TO: Kim MacDonald

SAMPLING SITE:

SAMPLED BY:James Sullivan

(Water) Inorganic Chemistry

DATE RECEIVED: 2021-06-25

DATE REPORTED: 2021-06-30

SAMPLE DESCRIPTION:				BH21-10-GW		BH21-215-GW		BH21-213-GW	BH21-201-GW		BH21-2215-GW
SAMPLE TYPE:				Water		Water		Water	Water		Water
DATE SAMPLED:				2021-06-25 09:00		2021-06-25 09:20		2021-06-25 09:35	2021-06-25 10:05		2021-06-25 09:45
Parameter	Unit	G / S	RDL	2662463	RDL	2662465	RDL	2662466	2662467	RDL	2662468
pH	pH Units		NA	7.53	NA	7.66	NA	7.87	7.79	NA	7.70
Electrical Conductivity	µS/cm		2	1460	2	1980	2	1310	1500	2	2420
Chloride	mg/L		0.12	4.73	0.24	267	0.12	225	216	0.49	497
Sulphate	mg/L		0.10	458	0.19	305	0.10	74.3	130	0.38	169

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

2662463 Dilution required, RDL has been increased accordingly.

Analysis perfomed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD

AGAT WORK ORDER: 21Z766508

PROJECT: 21451149

ATTENTION TO: Kim MacDonald

SAMPLING SITE:

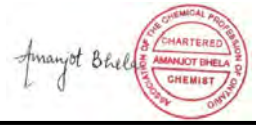
SAMPLED BY:James Sullivan

Water Analysis

RPT Date: Jun 30, 2021			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
(Water) Inorganic Chemistry															
pH	2661074		7.78	7.79	0.1%	NA	101%	98%	103%	NA			NA		
Electrical Conductivity	2661074		1130	1130	0.0%	< 2	108%	90%	110%	NA			NA		
Chloride	2662465	2662465	267	258	3.4%	< 0.10	97%	70%	130%	103%	80%	120%	NA	70%	130%
Sulphate	2662465	2662465	305	295	3.3%	< 0.10	96%	70%	130%	99%	80%	120%	NA	70%	130%

Comments: NA Signifies Not Applicable
Duplicate NA: results are under 5X the RDL and will not be calculated.
Matrix spike NA: Spike level < native concentration. Matrix spike acceptance limits do not apply and are not calculated.

Certified By:



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http://www.agatlabs.com

Method Summary

CLIENT NAME: GOLDER ASSOCIATES LTD

AGAT WORK ORDER: 21Z766508

PROJECT: 21451149

ATTENTION TO: Kim MacDonald

SAMPLING SITE:

SAMPLED BY:James Sullivan

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
pH	INOR-93-6000	modified from SM 4500-H+ B	PC TITRATE
Electrical Conductivity	INOR-93-6000	modified from SM 2510 B	PC TITRATE
Chloride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH

AGAT Laboratories

1 med red

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: GOLDER ASSOCIATES
Contact: KIM MACDONALD
Address: 1931 ROBERTSON RD.
Phone: Fax:
Reports to be sent to:
1. Email: kim_macdonald@golder.com
2. Email:

Project Information:

Project: 21451149
Site Location:
Sampled By: James Sullivan
AGAT ID #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☒ No ☐
Company:
Contact:
Address:
Email:

Regulatory Requirements:

(Please check all applicable boxes)

☐ Regulation 153/04
Table _____ *Indicate One*
☐ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture *(Check One)*
☐ Coarse
☐ Fine

☐ Excess Soils R406
Table _____ *Indicate One*
☐ Regulation 558
☐ CCME

☐ Sewer Use
☐ Sanitary ☐ Storm
_____ *Region*
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
_____ *Indicate One*

Is this submission for a **Record of Site Condition?** ☐ Yes ☐ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Laboratory Use Only

Work Order #: 21776658
Cooler Quantity: one - ice
Arrival Temperatures: 11.0 | 11.1 | 10.8
LT: 6.9 | 7.1 | 7.4
Custody Seal Intact: ☐ Yes ☐ No ☐ N/A
Notes: ON ICE

Turnaround Time (TAT) Required:

Regular TAT (Most Analysis) ☒ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI, DOC (Y/N)	O. Reg 153: Metals & Inorganics	O. Reg 153: Metals - ☐ CrVI, ☐ Hg, ☐ HWSB	O. Reg 153: BTEX, F1-F4 PHCs Analyze F4G if required ☐ Yes ☐ No	O. Reg 153: PAHs	O. Reg 153: Total PCBs ☐ Aroclor	O. Reg 153: VOC	O. Reg 558: Landfill Disposal Characterization TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	O. Reg 406: Excess Soils SPLP Rainwater Leach SPLP: ☐ Metals ☐ VOCs ☐ SVOCs	O. Reg 406: Excess Soils Characterization Package pH, ICPMS Metals, BTEX, F1-F4	Salt - EC/SAR	pH	resistivity conductivity	chlorides	sulphates				Potentially Hazardous or High Concentration (Y/N)
BH 21-10 - GW	21-06-25	900 AM PM	1	GW													✓	✓	✓	✓				
BH 21-215 - GW	"	920 AM PM	1	GW													✓	✓	✓	✓				
BH 21-213 - GW	"	935 AM PM	1	GW													✓	✓	✓	✓				
BH 21-201 - GW	"	10:05 AM PM	1	GW													✓	✓	✓	✓				
BH 21-2215 - GW	"	9:45 AM PM	1	GW													✓	✓	✓	✓				
		AM PM																						
		AM PM																						
		AM PM																						
		AM PM																						
		AM PM																						
		AM PM																						

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
James Sullivan	21-06-25	11:35	[illegible]	21/06/25	14h06
[illegible]	21/06/25	14h00	Avneet Minhas AM	June 26/21	10:50 am
[illegible]	21/06/25	16h00			

Page _____ of _____
N°: T114866

APPENDIX E

Special Provision - Well Abandonment

WELL ABANDONMENT - Item No.

Special Provision

General Requirements

Monitoring wells are located in the work area and shall be properly decommissioned prior to any construction activities being undertaken. The wells are located at boreholes 21-201, 21-202, 21-204, 21-213, 21-215, 21-218, 21-219, 21-221, 21-222, 21-224, 21-225, and 21-226. The construction details of those wells are provided on the Record of Borehole Sheets in the geotechnical investigation report (no. 21451149-2000-01).

The well abandonment method must satisfy the minimum requirements of Ontario Regulation 903. Approval of the proposed abandonment methodology, including plugging material used, depth of plugging material and limit of the casing removal, must be obtained from the Contract Administrator before proceeding. In addition, the Contractor shall provide a copy of the well record (for the abandonment) to the Contract Administrator.

Without superseding the full scope of Ontario Regulation 903, the abandonment of the wells should at least include plugging the wells using an abandonment barrier, starting from the bottom, up to approximately two metres from the ground surface.

Basis of Payment

Payment at the Contract price for the tender item "Well Abandonment" shall be on a per well basis, the price of which shall include full compensation for all labour, equipment and materials required to properly abandon each monitoring well including reporting and documentation.

END OF SECTION

APPENDIX F

GPR and MASW Technical Memorandums

TECHNICAL NOTE

TO: Bridgit Bocage

FROM: Mr. Erwan Pau-Corfa, WSP Canada Inc
Mr. Didier Leynaud, PhD, WSP Canada Inc.

SUBJECT: BH 21-207 DOWNHOLE SEISMIC SHEAR WAVE SURVEY
OTTAWA HOSPITAL, ON

PROJECT No.: 221-03780-0

DATE: May 3, 2022

1 CONTEXT

The Ottawa new Civic Hospital and its parking facilities require a geotechnical study in and around Queen Juliana Park. WSP was mandated to carry a downhole shear wave survey (VSP) in borehole 21-207 located south of 930 Carling Avenue.

1.1 SITE LOCATION

The selected borehole for downhole *in situ* testing is the BH-21-207 (Figure 1) which has a 21.21 m depth. Glacial till was encountered at 2.74 m depth and bedrock surface is at 12.17 m.

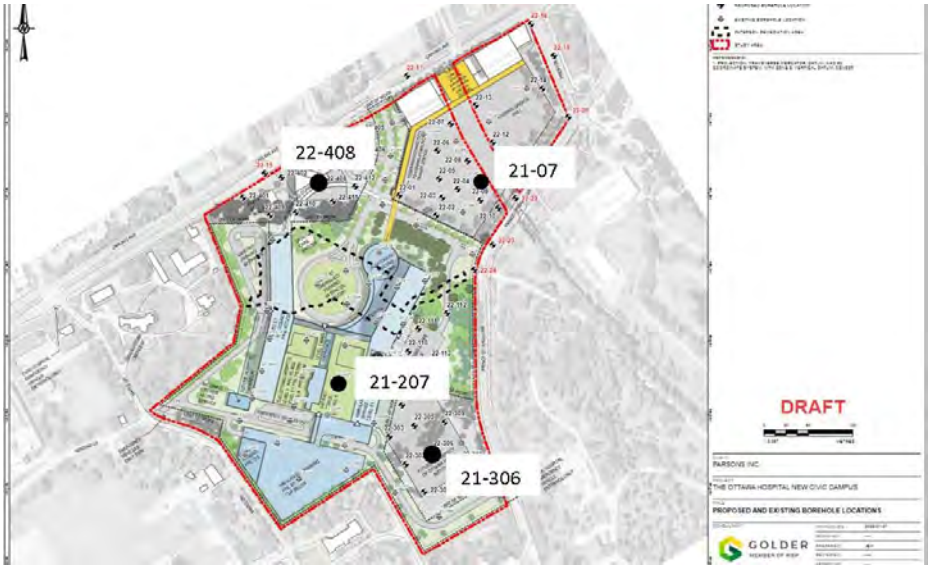


Figure 1: Ottawa Hospital VSP site location

1135, boulevard Lebourgneuf
Québec (Québec)
G2K 0M5 Canada

T +1 418 623-2254
F +1 418 624-1857
www.wsp.com

2 METHODOLOGY

2.1 EQUIPMENT AND DATA ACQUISITION METHOD

The objective of downhole surveys is to get in situ seismic wave velocities for site-specific investigations and material characterization.

The downhole seismic technic determines the compressional (P) and shear (S) wave velocity of sub-surface geological layers (materials) for different depths. The results can be used for soil and rock mechanics, foundation studies and earthquake engineering. Downhole seismic testing is conducted in the near surface for site-specific engineering applications. The *in situ* densities and the P and S wave velocities allow to determine the dynamic elastic moduli of a material.

It shall be mentioned that boreholes shall be completed with casing and grout that closely match the formation density according to the ASTM procedures. Borehole preparation is one of the main parameter controlling the success of downhole seismic testing. If the coupling between casing and geological formation is not good enough, then seismic waves will be attenuated, and arrival times delayed.

DATA ACQUISITION

Borehole verticality was assumed, and no measurements were operated to confirm this parameter.

A geometrics Geode Seismograph was used to record the synchronized seismic data for different depths related to the triggering mechanism. The equipment is composed of a wall-lock 3C borehole geophone allowing shear waves measurements in 3 directions (X-Y-Z orientations) and a BHGC-4 controller (Annex). The geophone diameter is 1.9 inches (48 mm). The clamping mechanism is a steel spring controlled by a DC electric motor.

The S-wave source for side records is an 8-ft weighted beam struck using a sledgehammer on both ends. The P-wave source for the centre record is a polypropylene plate struck with a sledgehammer (Figure 2)

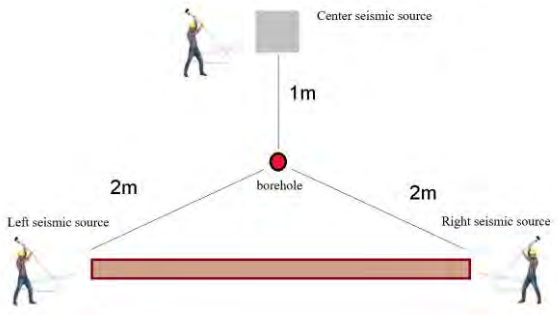


Figure 2: Seismic Source Diagram

A downhole seismic survey consists of measuring the time for seismic wave to propagate between an impulsive source (plate for P-wave, beam for S-wave) and a censor (geophone) moved at different depths in the borehole. The horizontal geophones are used to detect the first arrival for the S-wave while the vertical geophone is used for detecting the compressional P-wave arrival. At each depth, the sensor needs to be locked to the borehole wall using the clamping mechanism for coupling as well as possible the seismic signal propagating in the ground.

The P-wave propagating in the ground faster than the S-wave, its energy appears first on the seismic record. So, the S-wave needs to be amplified to be correctly visualized within the seismic

wave train. To do that we are using a reverse polarity generated by the seismic source (beam struck by a sledgehammer on its right and left side). The S-wave phase reversal allows a clear identification of the first S-wave arrival on the seismic record.

The main parameters controlling data quality for downhole seismic measurements are:

- Correct preparation of the borehole for a good coupling between the geophone and ground (borehole in the ground).
- Amplification of the shear wave using the reverse component for the horizontal censors (H1 and H2 components).
- Polarization of the signal to better visualize the maximum amplitude (in the 2D plane propagation, considering H1 + H2 components).

3 DATA PROCESSING

The data were recorded down to 20 metre depth by 1 metre increments.

The seismic data presents an acceptable signal to noise ratio allowing the picking of first P and S-wave arrivals for all the depths and all the components (Figure 3 & 4).

The processing can be summarized as follows:

- Components H1 and H2 stacked for both sources (right and left side of the beam).
- Picking of the first arrivals time for the P & S waves for each depth.
- Definition of the different layers for the calculation of the average seismic velocity.

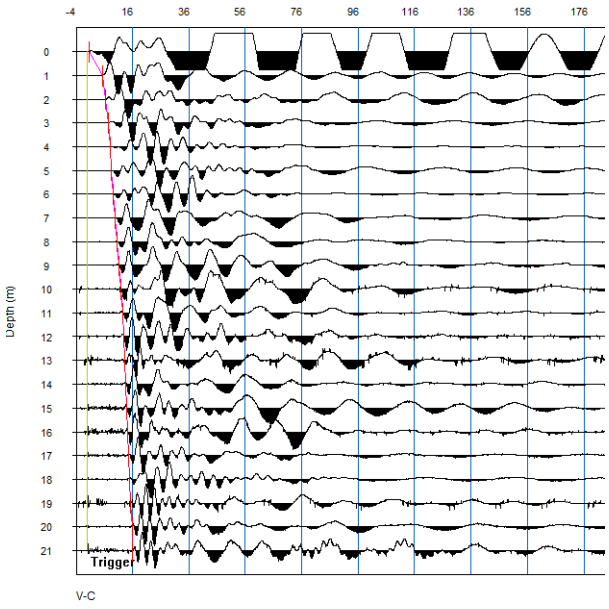


Figure 3: P-wave picking borehole 21-207

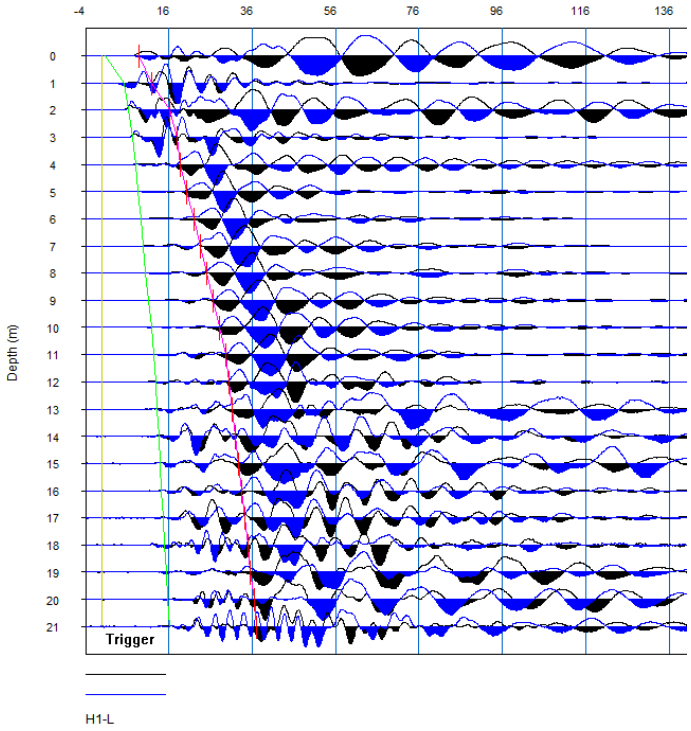


Figure 4: S-wave picking borehole 21-207

4 RESULTS AND DISCUSSION

The P and Shear waves velocity model for the borehole **21-207**:

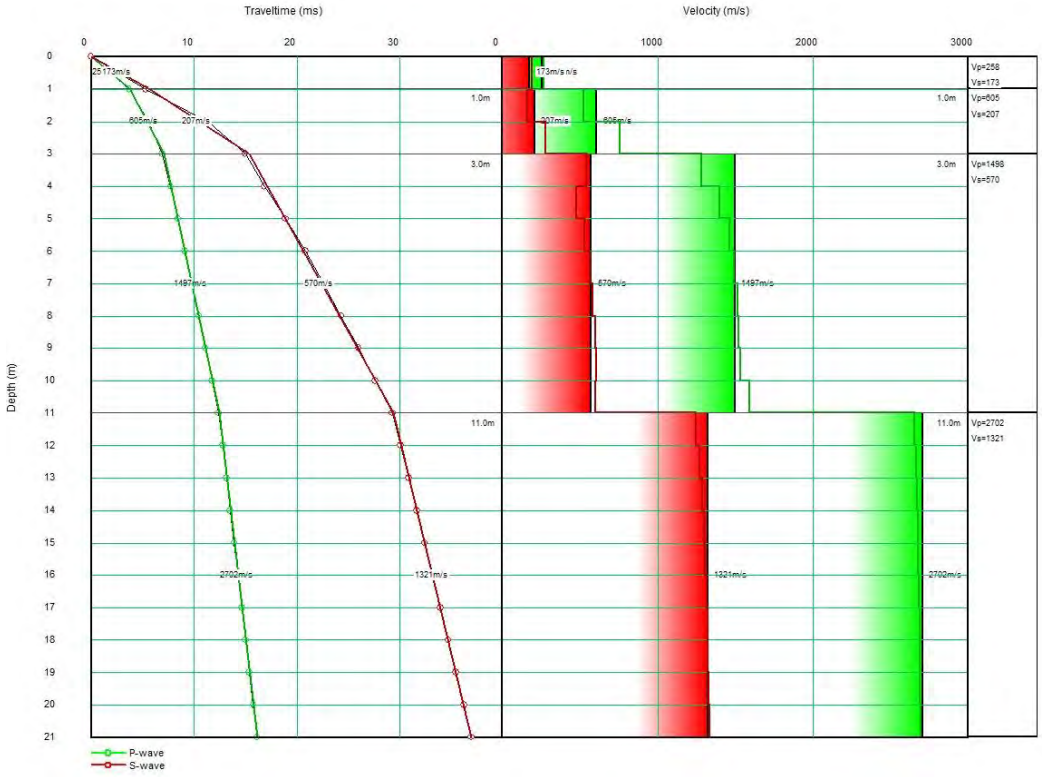


Figure 5: Seismic downhole velocity model, BH 21-207

V_S30 based on the first 20 m is 709.9 m/sec which corresponds to a C class (Figure 6).

Site class	Type of Soil profile	Average properties in top 30 m		
		Soil shear wave average velocity $\overline{V}_s$ (m/s)	Standard penetration resistance $\overline{N}_{60}$	Soil undrained shear strength s_u (kPa)
A	Hard rock	$\overline{V}_s > 1500$	–	–
B	Rock	$760 < \overline{V}_s \leq 1500$	–	–
C	Very dense soil and soft rock	$360 < \overline{V}_s < 760$	$\overline{N}_{60} > 50$	$s_u > 100$
D	Stiff soil	$180 < \overline{V}_s < 360$	$15 \leq \overline{N}_{60} \leq 50$	$50 < s_u \leq 100$
E	(1)Soft soil	$\overline{V}_s < 180$	$\overline{N}_{60} < 15$	$s_u < 50$
F	(2)Others	Site specific evaluation required		

Figure 6: Table 4.1.8.1A from the NBCC 2015 showing ranges of Vs30 values and their corresponding seismic site classification.

Downhole result is provided in Annex A and B with the corresponding borehole log. The seismic data is consistent with the geological information in the borehole log within a ±1 m precision.

Prepared by:

Erwan Pau-Corfa, B. Sc
Geophysicist

Reviewed by:

Didier Leynaud, PhD
Team Leader – Geophysical and Ecomorphological Studies
Solange Momy
Administrative Assistant

EPC/DL/sm

Encl. Appendix 1 – BH 21-207 Seismic model

Appendix 2 – Borehole 21-207 log

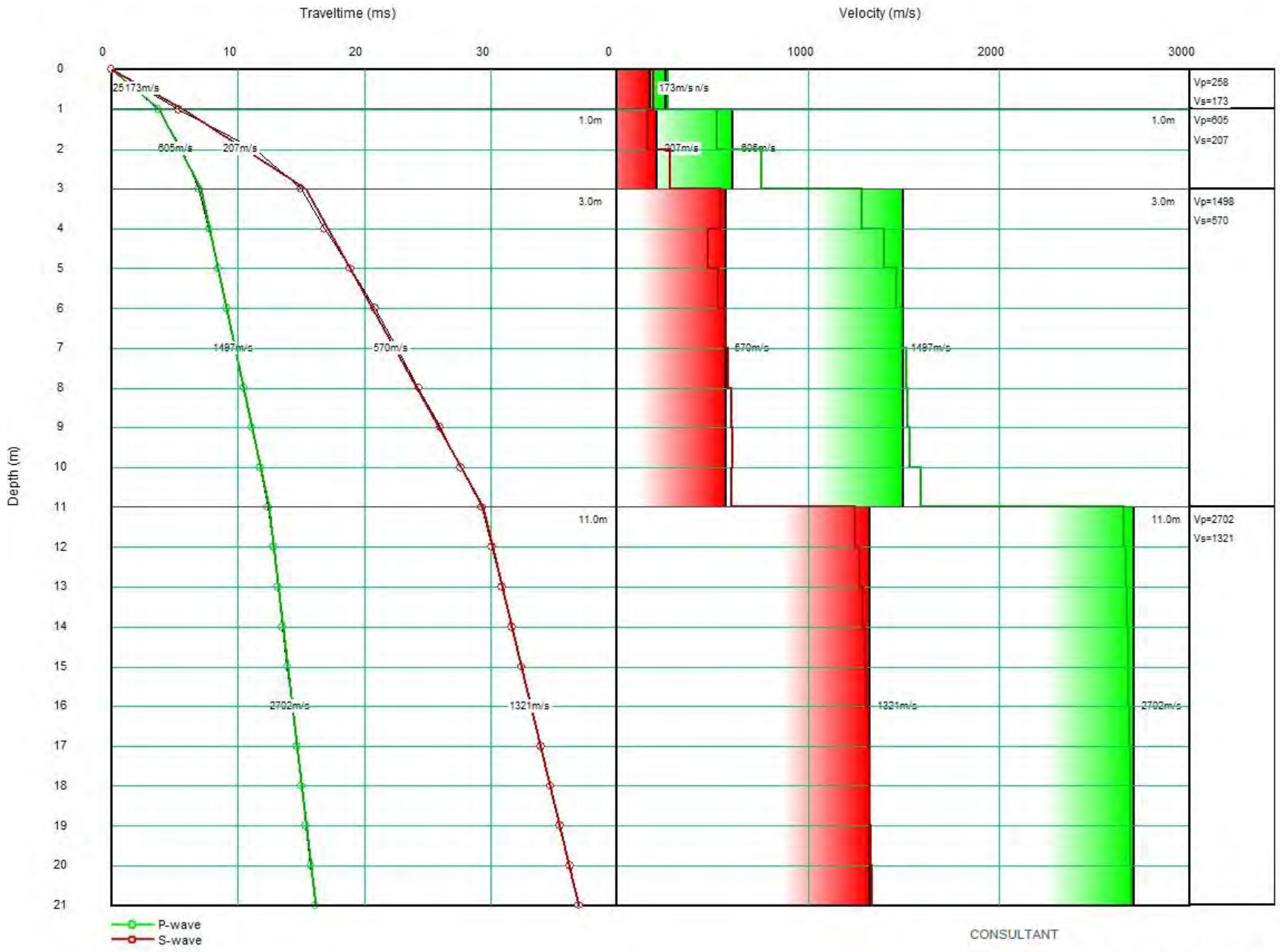
APPENDIX 1

BH 21-207 SEISMIC MODEL

APPENDIX 2

BOREHOLE 21-207 LOG

DOWNHOLE SEISMIC SURVEY MODEL, BH 21-207, Ottawa civic hospital



CONSULTANT

GOLDER
MEMBER OF WSP

PROJECT: 21451149

RECORD OF BOREHOLE: 21-207

SHEET 1 OF 3

LOCATION: N 5028410.7 ;E 366583.4

BORING DATE: June 4, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) 20 40 60 80	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m 20 40 60 80 / WATER CONTENT PERCENT Wp W Wl 20 40 60 80	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		80.26							
0	Rotary Drill/ Wash Boring; NW Casing	TOPSOIL - (SM) SILTY SAND, trace gravel; dark brown, contains organic matter (rootlets); non-cohesive, moist, loose		0.00 80.03							
		FILL - (SM) gravelly SILTY SAND, angular; grey; non-cohesive, moist, compact		0.23 0.38 79.50	1	SS	1				Bentonite Seal
1		FILL -(SP) SAND, fine to medium, trace silt; brown; non-cohesive, moist, compact		0.76	2	SS	5				
		(CI/CH) SILTY CLAY to CLAY, trace siltl; grey brown, highly fissured (WEATHERED CRUST); cohesive, w~PL to w>PL, very stiff			3	SS	7				
2					4	SS	6				
		(SM) gravelly SILTY SAND; brown to grey brown, contains cobbles and boulders (GLACIAL TILL); non-cohesive, moist to wet, loose		77.52 2.74	5	SS	9				
3											
		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose		76.45 3.81	6	SS	5				
4											
					7	SS	5				
5		(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to compact		74.92 5.34	8	SS	9				64 mm Diam. VSP Pipe
					9	SS	7				
6											
					10	SS	11				
7											
					11	SS	10				
8											
					12	SS	13				
9											
					13	SS	15				
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE
1 : 50

GOLDER

LOGGED: RI
CHECKED:

PROJECT: 21451149

RECORD OF BOREHOLE: 21-207

SHEET 2 OF 3

LOCATION: N 5028410.7 ;E 366583.4

BORING DATE: June 4, 2021

DATUM: NAD 1983

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) 20 40 60 80	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m 20 40 60 80 / WATER CONTENT PERCENT Wp W Wl 20 40 60 80	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
	Rotary Drill/ Wash Boring NW Casing	(SM) gravelly SILTY SAND; grey, contains cobbles and boulders (GLACIAL TILL); non-cohesive, wet, loose to compact		69.59							
11		(SW) gravelly SAND, trace to some silt; grey, contains cobbles and boulders; non-cohesive, wet, loose to very dense		10.67	14	SS	4				64 mm Diam. VSP Pipe
					15	RC	-				
12				68.09	16	SS	>50				
		Borehole continued on RECORD OF DRILLHOLE 21-207		12.17							
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE
1 : 50

GOLDER

LOGGED: RI
CHECKED:

PROJECT: 21451149

RECORD OF DRILLHOLE: 21-207

SHEET 3 OF 3

LOCATION: N 5028410.7 ;E 366583.4

DRILLING DATE: June 4, 2021

DATUM: NAD 1983

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: Jcon	DISCONTINUITY DATA: Jr	DISCONTINUITY DATA: Ja	ROCK STRENGTH INDEX: R4	ROCK STRENGTH INDEX: R3	ROCK STRENGTH INDEX: R2	ROCK STRENGTH INDEX: R1	WEATHERING INDEX: W1	WEATHERING INDEX: W2	WEATHERING INDEX: W3	WEATHERING INDEX: W4	Q AVG.	
		BEDROCK SURFACE		68.09																					
13	Rotary Drill / HQ Core	Fresh, thinly to medium bedded, medium bedded, medium grey to brownish grey, fine to medium grained, non-porous, medium strong to weak SHALEY NODULAR LIMESTONE - Broken/lost core from 12.17 m to 12.34 m		12.17	1	100																			64 mm Diam. VSP Pipe
14					2	100																			
15					3	100																			
16					4	100																			
17		- Mud seam from 16.66 m to 16.69 m																							64 mm Diam. VSP Pipe
18		- Heavy fossilferous/bioturbated from 17.60 m to 21.61 m			5	100																			
19		- Heavy calcite veining from 18.40 m to 21.61 m																							
20					6	100																			
21		- Broken core from 20.54 m to 20.59 m			7	100																			
22		End of Drillhole Note(s): 1. Water level in screen measured at 3.32 m (Elev. 76.94 m) on June 9, 2021		58.65 21.61																					

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RI

CHECKED:

golder.com