



## REPORT

# Preliminary Hydrogeological Assessment

*Proposed Residential Subdivision, Bradford Highlands Golf Course, 23 Brownlee Drive, Bradford, Ontario L3Z 2A4*

Submitted to:

### **Bradford Highlands Joint Venture**

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22517668 Rev 1

October 31, 2024



## Distribution List

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# Table of Contents

<b>1.0 INTRODUCTION .....</b>	<b>1</b>
1.1 Scope of Work.....	1
<b>2.0 STUDY AREA CHARACTERIZATION .....</b>	<b>1</b>
2.1 Topography and Drainage .....	1
2.2 Physiography and Geology .....	2
2.3 Groundwater Use .....	2
2.4 Source Water Protection .....	2
2.5 Previous Investigations .....	3
2.5.1 Monitoring Well Installation .....	3
2.5.2 Groundwater Level Monitoring.....	3
2.5.3 Hydraulic Conductivity Testing .....	3
2.5.4 Surface Water Feature Assessment.....	3
2.5.5 Water Balance Assessment.....	3
<b>3.0 2022 FIELD INVESTIGATION .....</b>	<b>4</b>
3.1 Drilling and Well Installations .....	4
3.2 Groundwater Level Measurements .....	4
3.3 Hydraulic Conductivity.....	5
3.4 Groundwater Quality .....	5
<b>4.0 DEWATERING EVALUATION.....</b>	<b>5</b>

## APPENDED TABLES

Table A: Groundwater Levels

Table B: Piezometer Water Level Measurements

## APPENDICES

### APPENDIX A

Important Information and Limitations of This Report

### APPENDIX B

Figures

### APPENDIX C

MECP Water Well Database Search Results

**APPENDIX D**

Borehole Logs and Well Completion Details and Grain Size Analysis Data

**APPENDIX E**

Single Well Response Testing Results

**APPENDIX F**

Groundwater Hydrographs

**APPENDIX G**

Laboratory Analytical Results



## 1.0 INTRODUCTION

WSP Canada Inc (“WSP”), formerly Golder Associates Ltd. (Golder), was retained by Bradford Highlands Joint Venture. (the ‘Client’) to provide geotechnical and hydrogeological consulting services in support of the design for the proposed residential development (the ‘Project’) to be located at 23 Brownlee Drive, Bradford, Ontario (the ‘Site’; Figure 1). The terms of reference for the consulting services are included in Golder’s proposal No. CX22517668, dated February 9, 2022. Authorization to proceed with the investigation was provided in the form of the signed proposal received from the Client on February 16, 2022.

This report provides the results of the hydrogeological assessment and should be read in conjunction with the “Important Information and Limitations of This Report” in Appendix A which forms an integral part of this document. The reader’s attention is specifically drawn to this information, as it is essential for the proper use and interpretation of this report. The data, interpretations and recommendations contained in this report pertain to a specific project as described in the report and are not applicable to any other project or site location. If the project is modified in concept, location, or elevation, or if the project is not initiated within eighteen months of the date of the report, WSP should be given an opportunity to confirm that the recommendations in this report are still valid.

### 1.1 Scope of Work

The scope of work for the current hydrogeological investigation consisted of:

- Reviewing published information sources and data collected at the Site;
- Drilling and installation of monitoring wells;
- Collecting groundwater level measurements from the monitoring wells;
- Conducting hydraulic conductivity measurements at selected monitoring wells;
- Conducting groundwater quality sampling;
- Estimating short-term dewatering requirements;
- Update the previously completed water budget assessment completed previously by Golder in accordance with LSRCA guidelines; and
- Preparing a hydrogeological report compiling the results of both the 2018 investigation and current investigation.

## 2.0 STUDY AREA CHARACTERIZATION

The Site extends from Line 6 in the north to Line 5 in the south, and from Brownlee Drive in the west to Inverness Way in the East, in Bradford, Ontario (Figure 2, Appendix B). Based on the information provided by the Client, the proposed development will consist of a total of 946 residential units consisting of single detached units, semidetached units and townhouses. In addition, two stormwater management ponds are proposed to be constructed. At the time of this proposal preparation only preliminary plans were available for the proposed development.

### 2.1 Topography and Drainage

Based on publicly available topographic and drainage data, the ground surface at the Site slopes north to south, towards the Holland River with a geodetic elevation between approximately 251 metres above sea level (masl) and 219 masl (Figure 2). The closest surface water feature to the Site is the Holland River, bordering the site to the south. It is expected that surface water runoff at the Site would discharge to the Holland River.

## 2.2 Physiography and Geology

Physiographic mapping in the area (Chapman and Putnam, 2007) indicates that the Site lies within the physiographic region of southern Ontario known as the Schomberg Clay Plains. The Schomberg Clay Plains are composed of number of topographic basins located near Schomberg, Newmarket, and north of Lake Scugog. The overburden immediately below ground surface within the Schomberg Clay Plains generally consists of clay deposits underlain by a drumlinized till plain. Surficial mapping provided by the Ontario Geological Survey (OGS) indicates that the surficial geology at the Site consists of stone-poor, sandy silt to silty sand textured till. Bedrock at the Site consists of limestone of the Lindsay Formation.

## 2.3 Groundwater Use

Based on the long-standing development of the area it is expected that all properties in the vicinity of the Site are connected to the municipal water supply system, and no active private groundwater supply wells are present. A review was conducted of the Ministry of the Environment, Conservation and Parks (MECP) water well database for the vicinity of the Site (Figure 3; Appendix B). The MECP database indicates records for 104 water wells located within approximately 200 m of the Site. The results of the MECP database search are provided in Appendix C.

A total of 88 of the records are listed for use as domestic water supply, with the majority of the wells are indicated to be completed between 20 to 45 mbgs. Five of the wells are indicated to be completed at depths shallower than 20 m. Two well records are indicated to be for municipal supply purposes, however based on a review of the MECP Source Protection Information Atlas (<https://www.ontario.ca/page/source-protection>), there are no active municipal groundwater supply wells in the vicinity of the Site. Based on the MECP information it is assumed the designated wells, which were installed in 1962 and 1970, are no longer operational. The remaining well records are listed as abandonment records, unused boreholes, as observation wells, or have no listed completion details.

## 2.4 Source Water Protection

A review of publicly available information (Source Protection Atlas, 2023) indicates that the Site lies outside any mapped groundwater quality wellhead protection areas (WHPA; i.e., WHPA-A through WHPA-D). The Site does lie within groundwater quantity wellhead protection areas WHPA-Q1 and WHPA-Q2, falling within the 'South Georgian Bay Lake Simcoe Source Protection Plan', which encompass the Town of Bradford and the surrounding area. Portions of the Site, specifically along the south property edge, are designated as a significant groundwater recharge area (SGRA; <https://opengis.simcoe.ca/>).

WHPA-Q1 refers to an area where activities that take water without returning it to the same source may be a groundwater quantity threat, and the WHPA-Q2 refers to an area where activities that reduce recharge may be consider a groundwater quantity threat. Table 4 of the South Georgian Bay Lake Simcoe Source Protection Plan identifies 21 activities that have the potential to pose a threat to source protection. Of the 21 actives listed, only Threat #19 ("an Activity that takes water from an aquifer or surface waterbody without returning the water taken to the same aquifer or source water body") is described as applying to Wellhead Protection Area Q1 areas.

As the Site will be fully serviced by the municipal water supply system, it is expected that no long-term groundwater taking will be required related to water supply. The potential for long-term dewatering associated with building foundation drains (or similar structures) will be evaluated as part of the overall project development process.

## 2.5 Previous Investigations

A hydrogeological assessment of the Site was completed at the Site in 2019, which was documented in the report '*Bradford Highlands Golf Course Redevelopment, Bradford, Ontario*', prepared for Diagram Developments Caledon Inc., date March 2018 (Golder, 2018). The following activities were completed as part of the 2018 hydrogeological investigation.

### 2.5.1 Monitoring Well Installation

Ten groundwater monitoring wells (BH2, BH3, BH4, BH5, BH8, BH9, BH11, BH14, BH16, and BH18) were installed across the Site as part of the concurrent geotechnical investigation. The monitoring wells were completed (i.e., screened) at depths between 4.3 to 6.9 m below ground surface (bgs). The location of the historical monitoring wells is presented on Figure 2 (Appendix B). Boreholes logs from the 2018 investigation are provided in Appendix D.

### 2.5.2 Groundwater Level Monitoring

Groundwater level measurements were collected at the 2018 wells using a manual, electric water level tape during six monitoring events spread over 2016 and 2017. The manual groundwater level readings are provided in Table A (attached).

### 2.5.3 Hydraulic Conductivity Testing

Single well response testing (i.e., rising head tests) were carried out at BH5, BH8, BH14, BH16, and BH18 in 2018. The testing was carried out by rapidly purging a known volume of water from each well with a dedicated disposable bailer and monitoring the subsequent water level recovery. The results of the 2018 single well response testing are provided in Appendix E, and summarized in Table A (attached).

### 2.5.4 Surface Water Feature Assessment

Nine shallow piezometers (designated MP-01 through MP-09) were installed in April 2017 adjacent to existing drainage features at the Site (Figure 2; Appendix B). Each piezometer consisted of a short, stainless steel screen, attached to piece of iron black pipe, which was driven into the shallow overburden using a manual hammer. Groundwater level measurements were subsequently collected at each of the piezometers. Water level readings were collected in the spring (April) early summer (May) and early fall (October), and are provided in Table B.

The result of the drainage feature assessment program indicated that recharging groundwater conditions occur at nearly all monitored locations, and throughout the year. The drainage features were found to be dry over much of the year, and groundwater discharge was only at features on the north portion of the Site (MP-02, MP-03, and MP-04) and only during the spring monitoring event.

Piezometers MP-01 through MP-04 were abandoned in June 2017 following confirmation from the LSRCA that the three northern tributaries to the Site are considered ephemeral features and do not meet the definition of a "key natural feature".

### 2.5.5 Water Balance Assessment

A preliminary water balance was completed, based on the available Site development plans, information gathered from the drilling investigation, and climate and water surplus data obtained from Environment Canada. The pre-development annual runoff from the Site was estimated as approximately 87,710 m<sup>3</sup>, and the estimated annual infiltration was approximately 57,060 m<sup>3</sup>. Post-development, the annual estimated runoff was approximately 2566,140 m<sup>3</sup>, and the annual estimated infiltration was 22,560 m<sup>3</sup>. The impact of proposed LID features was estimated as well, and it was found that infiltration would increase approximately 6,925 m<sup>3</sup>, or 12%. An update was conducted to the 2018 water balance assessment, and has been provided under separate cover (Golder, 2022).

## 3.0 2022 FIELD INVESTIGATION

### 3.1 Drilling and Well Installations

The current combined geotechnical and hydrogeological drilling program was carried out from March 14 to 16, 2022, during which time 18 boreholes (designated as BH22-1 to BH22-18) were advanced across the Site. The boreholes were advanced to depths ranging from 6.2 to 11.1 mbgs. The boreholes were advanced using a Geoprobe track mounted rig supplied and operated by Drill Tech Drilling & Shoring Inc. of Newmarket, Ontario, subcontracted to WSP. The approximate borehole locations are shown on Figure 2 (Borehole Location Plan; Appendix B). The results of the drilling program are presented on the Record of Borehole sheets in Appendix D. Grain size sampling results from the drilling program are provided in Appendix D.

Four boreholes were completed as 50-millimetre (mm) diameter monitoring wells, consisting of a PVC riser pipe, with a slotted screen sealed at a selected depth within the borehole. The annular borehole space around each screened interval was backfilled with silica sand, to a height of approximately 0.3 m above the top of the screen. The remaining annular space was backfilled to ground surface with bentonite chips. The well installation details are presented on the Record of Borehole sheets (Appendix D). The depths of the wells ranged from about 9.2 to 10.7 mbgs.

The results of the drilling program indicated that overburden deposits at the Site generally consisted of topsoil overlying native deposits of silty clay and silty clay to clayey silt till. A unit of sand and silty sand was identified at various boreholes across the Site, generally underlying the silty clay and silty clay till. Figure 4A and Figure 4B (Appendix B) provide geological cross-sections across the Site. Bedrock was not encountered at any of the borehole locations.

### 3.2 Groundwater Level Measurements

A groundwater level monitoring program was implemented as part of the current investigation, starting in April 2022. The program consisted of collecting quarterly manual groundwater level readings at each of the monitoring wells at the Site, and installation of pressure transducers at four of the monitoring wells (BH2, BH11, BH22-3, and BH22-09) to collect continuous water level readings. Manual water levels were measured at each location with an electric water level tape, which was cleaned between well locations. Table A attached, provides all available manual water level measurements collected to date at the Site. The groundwater hydrographs from the data logger measurements to date are presented in Appendix F.

The depth to groundwater at the Site was found to range from above grade (i.e., artesian) to approximately 4.51 mbgs, where the ground surface is defined as the existing grade. The water table across the Site was found to be situated within the silty clay unit, at elevations ranging from about 219.4 to 247.5 masl. Groundwater level monitoring over 2022 / 2023 (Appendix F) indicates that the groundwater level at the Site was highest during the spring (i.e., March, April, May) with water levels then declining over the summer months. At monitoring wells BH2, BH11 and BH22-3 the groundwater level was within about 0.2 m of ground surface during the spring period. The pattern of groundwater level fluctuations at well BH22-03 differed somewhat from the other wells. It is surmised that the water level readings before August 2022 are anomalously low due to an incomplete hydrostatic seal at the wellhead. Readings after August 2022 show a pattern of fluctuation consistent with the other wells, with the highest water levels noted during the spring months, and levels then declining in the summer of 2023. The range of fluctuations in the groundwater table over the year was 2.5 to 3 m. For well BH22-09, which is under confined conditions, water levels fluctuated by about 1 m.

Figure 5 (Appendix B) shows the inferred groundwater flow direction at the Site, which essentially mimics the topographic slope. Artesian conditions were noted at monitoring well BH16 in 2018, and at monitoring well BH22-03 during the current investigation. Well BH16 was screened within the silty clay and well BH22-03, although screened in the silty clay, contacted the underlying sand at the bottom of the screen. It is expected

that the artesian conditions are associated with confined (i.e., pressurized) conditions in the deeper sand / silty sand unit.

### 3.3 Hydraulic Conductivity

Single-well response testing was carried in April 2022 as part of the current investigation. The testing was carried out by rapidly purging a known volume of water from each well with a dedicated inertial (i.e., Waterra) pump and monitoring the subsequent water level recovery with manual electric water level tape.

The data was analyzed using the AQTESOLV for Windows version 4.50 Professional software. The Bouwer-Rice (1976) method for unconfined conditions was used to analyse the single well response testing data. Testing was also completed as part of the 2018 investigation. The single-well response testing results from both investigations are provided in Appendix E.

The tested wells were screened within the silty clay (BH5, BH14 and BH16), sandy clay till (BH8 and BH18), and clayey silt till (BH22-05 and BH22-09). The hydraulic conductivity was measured to be between  $2 \times 10^{-6}$  m/s and  $3 \times 10^{-8}$  m/s in the silty clay,  $9 \times 10^{-8}$  m/s in the sandy clay till, and  $2 \times 10^{-7}$  m/s and  $4 \times 10^{-8}$  m/s in the clayey silt till. Geometric mean hydraulic conductivity value based on all the testing results was found to be  $1 \times 10^{-7}$  m/s.

### 3.4 Groundwater Quality

Groundwater quality samples were collected at monitoring well BH22-3 using low-flow sampling techniques, according to standard environmental practices. The samples were stored on ice following collection, and were delivered to Caduceon Laboratories of Barrie, Ontario for analysis of a subset of the Provincial Water Quality Objectives (PWQO). The laboratory analytical data sheets are provided in Appendix G.

The analytical results indicate that the concentrations of the analyzed parameters were below their respective PWQO values, with the exception of total phosphorous [130 ug/L], total cobalt [1 ug/L], total iron [2310 ug/L], and total aluminium [1620 ug/L], each of which were reported at concentrations in excess of the PWQO in the unfiltered sample. The concentration of total suspended solids (TSS) was 206 mg/L. Elevated TSS concentrations are common for groundwater samples collected from relatively new monitoring wells completed in fine grained material, and the presence of elevated phosphorous, iron, cobalt, and aluminium concentrations is assumed to be a consequence of the relatively high TSS concentration.

In order to assess the impact of TSS on the sample, and to provide an indication of water quality following TSS removal (i.e., as part of a construction dewatering setup), an additional filtered sample was collected and submitted for the analysis of metals and total phosphorus. The analytical results from the filtered sample showed that the metals exceedances noted in the filtered sample were no longer present. The phosphorous concentration in the filtered sample was 20 ug/L, which is significantly lower than was noted in the unfiltered sample.

Prior to commencing any temporary construction dewatering activities, the suitability of the water for discharge will need to be confirmed by the contractor. It is recommended that samples be collected from the treatment system and submitted for laboratory analysis prior to commencing the full construction activities. The laboratory results should be provided to a Qualified Professional in order to confirm the discharge water is suitable for release under the applicable guidelines.

## 4.0 DEWATERING EVALUATION

At the time of reporting, no information was available regarding planned excavation depths required for construction. As such, WSP was unable to provide detailed comment on the water taking requirements, or potential concerns related to dewatering, at the Site. Based on the single well response testing results, it is expected the groundwater yield from the various clay-rich units (i.e., silty clay, clayey silt till, sandy clay) will be relatively limited. The occurrence of artesian conditions in the central portion of the Site indicates that the

deeper sand unit (or units) exist under confined (i.e., pressurized) conditions. The possibility of artesian flow, or hydrostatic uplift associated with construction activities, should be considered a possibility and depressurization may be required to permit construction to proceed. When development plans have been finalized, this information should be provided to WSP to complete the dewatering evaluation.

## Signature Page

We trust that this report is sufficient to meet your current requirements. Should any point require additional clarification or should any questions arise, please do not hesitate to contact the undersigned.

Yours truly,

**WSP Canada Inc.**



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PM/DD/rk

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## REFERENCES

Golder Associates Ltd. 2018. Hydrogeological Investigation, Bradford Highlands Golf Course Redevelopment, Bradford, Ontario. Report prepared for Digram Developments Caledon Inc. Dated March 2018.

WSP Golder. 2022. Draft Water Balance Assessment, Bradford Highlands Golf Course Redevelopment. Report prepared for Digram Developments Caledon Inc. Dated October 2022.

## Tables



**Table A**  
**Groundwater Level Measurements**

Well ID	Borehole Depth (mbgs)	Ground Surface (masl)	Measuring Point (masl)	Stick up (m)	Measurement Date	Water Level (mbtoc)	Water Level (mbgs)	Water Level (masl)	Hydraulic Conductivity (m/s)	Primary Unit
BH22-03	10.67	231.5	231.46	-0.04	26-Apr-22	Artesian	-	-	-	CLAYEY SILT TILL
					31-May-22	Artesian	-	-		
					18-Aug-22	Artesian	-	-		
					18-Nov-22	Artesian	-	-		
					14-Aug-23	Artesian	-	-		
					14-May-24	Artesian	- 4.32	235.78		
BH22-05	9.10	224.0	223.91	-0.06	26-Apr-22	0.17	0.23	223.74	4E-08	CLAYEY SILT TILL
					31-May-22	0.29	0.35	223.62		
					18-Aug-22	0.91	0.97	223.00		
					18-Nov-22	0.76	0.82	223.16		
					14-Aug-23	0.43	0.49	223.48		
					14-May-24	0.41	0.47	223.50		
BH22-06	10.70	220.7	220.64	-0.04	26-Apr-22	0.33	0.37	220.31	-	SANDY CLAYEY SILT TILL
					31-May-22	0.49	0.53	220.15		
					18-Aug-22	1.24	1.28	219.41		
					18-Nov-22	0.79	0.83	219.85		
					14-Aug-23	0.26	0.30	220.39		
					14-May-24	-	-	-		
BH22-09	10.70	231.6	231.52	-0.07	26-Apr-22	0.84	0.91	230.68	2E-07	CLAYEY SILT TILL
					31-May-22	1.28	1.35	230.24		
					18-Aug-22	1.99	2.05	229.54		
					18-Nov-22	2.47	2.54	229.05		
					14-Aug-23	1.16	1.52	230.37		
					14-May-24	0.66	1.52	230.86		
BH2	5.20	245.7	245.5	-0.16	23-Mar-16	0.75	0.91	244.75	-	SILTY CLAY
					28-Mar-16	0.01	0.17	245.49		
					21-Oct-16	3.60	3.76	241.90		
					8-Dec-16	3.40	3.56	242.10		
					5-Apr-17	0.58	0.74	244.92		
					26-Apr-22	1.45	1.61	244.05		

**Table A**  
**Groundwater Level Measurements**

Well ID	Borehole Depth (mbgs)	Ground Surface (masl)	Measuring Point (masl)	Stick up (m)	Measurement Date	Water Level (mbtoc)	Water Level (mbgs)	Water Level (masl)	Hydraulic Conductivity (m/s)	Primary Unit
					31-May-22	2.05	2.21	243.45		
					18-Aug-22	3.31	3.47	242.19		
					18-Nov-22	3.32	3.48	242.18		
					14-Aug-23	2.16	2.32	243.34		
					14-May-24	0.79	0.95	244.71		
BH3	5.20	245.4	245.3	-0.09	22-Mar-16	0.77	0.86	244.50	-	SILTY CLAY
					28-Mar-16	0.13	0.22	245.14		
					12-Sep-16	3.31	3.40	241.96		
					21-Oct-16	3.62	3.71	241.65		
					8-Dec-16	3.43	3.52	241.84		
					24-Feb-17	1.55	1.64	243.72		
					26-Apr-22	Buried	-	-		
					31-May-22	Buried	-	-		
					18-Aug-22	3.23	3.32	242.05		
					18-Nov-22	3.36	3.45	241.92		
					14-Aug-23	2.17	2.26	243.11		
					14-May-24	0.85	0.94	244.43		
BH4	5.20	245.2	245.1	-0.15	22-Mar-16	1.05	1.20	244.01		SILTY CLAY
					28-Mar-16	0.26	0.41	244.80		
					21-Oct-16	3.84	3.99	241.22		
					24-Feb-17	1.88	2.03	243.18		
					18-Apr-17	0.59	0.74	244.47		
					26-Apr-22	Buried	-	-		
					31-May-22	Buried	-	-		
					18-Aug-22	Buried	-	-		
					18-Nov-22	Buried	-	-		
					14-Aug-23	Buried	-	-		
					14-May-24	Buried	-	-		

**Table A**  
**Groundwater Level Measurements**

Well ID	Borehole Depth (mbgs)	Ground Surface (masl)	Measuring Point (masl)	Stick up (m)	Measurement Date	Water Level (mbtoc)	Water Level (mbgs)	Water Level (masl)	Hydraulic Conductivity (m/s)	Primary Unit
BH5	6.10	248.2	248.1	-0.09	12-Sep-16	2.99	3.08	245.08	2E-06	SILTY CLAY
					8-Dec-16	3.22	3.31	244.85		
					5-Apr-17	0.59	0.68	247.48		
					26-Apr-22	Buried	-	-		
					31-May-22	Buried	-	-		
					18-Aug-22	Buried	-	-		
					18-Nov-22	3.36	3.45	244.72		
					14-Aug-23	1.16	1.25	246.91		
					14-May-24	0.61	0.70	247.46		
BH8	4.30	236.9	236.9	-0.05	23-Mar-16	0.69	0.74	236.19	9E-08	sandy CLAY
					28-Mar-16	0.34	0.39	236.54		
					21-Oct-16	1.51	1.56	235.37		
					8-Dec-16	1.67	1.72	235.21		
					5-Apr-17	0.45	0.50	236.43		
					26-Apr-22	Buried	-	-		
					31-May-22	Buried	-	-		
					18-Aug-22	1.60	1.65	235.29		
					18-Nov-22	1.43	1.48	235.45		
					14-Aug-23	-	-	-		
					14-May-24	0.59	0.64	236.29		
BH9	5.8	236.2	236.20	-0.04	23-Mar-16	0.70	0.74	235.50	-	SILTY CLAY
					28-Mar-16	0.30	0.34	235.90		
					12-Sep-16	1.54	1.58	234.66		
					5-Apr-17	0.72	0.76	235.48		
					26-Apr-22	Buried	-	-		
					31-May-22	Buried	-	-		
					18-Aug-22	Buried	-	-		
					18-Nov-22	Buried	-	-		
					14-Aug-23	Buried	-	-		
					14-May-24	Buried	-	-		

**Table A**  
**Groundwater Level Measurements**

Well ID	Borehole Depth (mbgs)	Ground Surface (masl)	Measuring Point (masl)	Stick up (m)	Measurement Date	Water Level (mbtoc)	Water Level (mbgs)	Water Level (masl)	Hydraulic Conductivity (m/s)	Primary Unit
BH11	6.9	233.2	233.05	-0.13	23-Sep-16	3.25	3.38	229.80	-	SILTY CLAY
					8-Dec-16	4.38	4.51	228.67		
					5-Apr-17	0.11	0.24	232.94		
					26-Apr-22	0.70	0.83	232.35		
					31-May-22	1.59	1.72	231.46		
					18-Aug-22	2.84	2.97	230.21		
					18-Nov-22	2.89	3.02	230.16		
					14-Aug-23	1.68	1.81	231.38		
					14-May-24	0.79	0.92	232.26		
BH14	6.1	220.3	220.48	-0.16	12-Sep-16	0.67	0.83	219.81	3E-08	SILTY CLAY
					8-Dec-16	0.24	0.40	220.24		
					5-Apr-17	0.05	0.21	220.43		
					26-Apr-22	0.12	0.28	220.36		
					31-May-22	0.25	0.41	220.23		
					18-Aug-22	0.29	0.45	220.19		
					18-Nov-22	0.28	0.44	220.20		
					14-Aug-23	0.28	0.44	220.20		
					14-May-24	0.25	0.41	220.23		
BH16	6.10	231.7	231.5	-0.12	12-Sep-16	2.82	2.94	228.72	1E-07	CLAYEY SILT to SILTY CLAY
					8-Dec-16	4.02	4.14	227.52		
					5-Apr-17	Artesian	-	-		
					26-Apr-22	Buried	-	-		
					31-May-22	Buried	-	-		
					18-Aug-22	Buried	-	-		
					18-Nov-22	4.41	4.53	227.13		
					14-Aug-23	0.89	1.01	230.65		
					14-May-24	0.10	0.22	231.44		

**Table A**  
**Groundwater Level Measurements**

Well ID	Borehole Depth (mbgs)	Ground Surface (masl)	Measuring Point (masl)	Stick up (m)	Measurement Date	Water Level (mbtoc)	Water Level (mbgs)	Water Level (masl)	Hydraulic Conductivity (m/s)	Primary Unit
BH18	3.80	237.0	236.9	-0.1	12-Sep-16	1.73	1.83	235.12	9E-08	sandy CLAY
					8-Dec-16	1.26	1.36	235.59		
					5-Apr-17	0.04	0.14	236.81		
					26-Apr-22	0.37	0.47	236.49		
					31-May-22	0.87	0.97	235.98		
					18-Aug-22	1.44	1.54	235.41		
					18-Nov-22	1.09	1.19	235.77		
					14-Aug-23	0.44	0.54	236.42		
					14-May-24	0.505	0.605	236.345		

**Notes:**

1. m toC meters below top of casing
2. masl meters above sea level
3. m bgs meters below ground surface
4. Table to be read in conjunction with accompanying report
5. Superscript <sup>1</sup> denotes approximate stickups

**Table B**  
**Piezometer Water Level Measurements**

Well ID	Stick-Up (m)	Measurement Date	Water Level (mbtoc)	Water Level (mbgs)	Surface Water Depth (mbtoc)	Comments
MP-01	0.41	12-Apr-17	0.848	0.44	---	
		12-Apr-17	0.824	0.41	---	
		12-May-17	0.539	0.13	0.31	recharging
MP-02	0.36	12-Apr-17	0.624	0.26	---	
		12-Apr-17	0.068	-0.29	---	
		12-May-17	0.178	-0.18	0.33	discharging
MP-03	0.35	12-Apr-17	0.768	0.42	---	
		12-Apr-17	0.768	0.42	---	
		12-May-17	0.344	-0.01	0.36	discharging
MP-04	0.52	12-Apr-17	1.138	0.62	---	
		12-Apr-17	1.105	0.59	---	
		12-May-17	0.388	-0.13	0.43	discharging
MP-05	0.64	12-Apr-17	0.633	-0.01	---	
		12-Apr-17	0.631	-0.01	---	
		12-May-17	0.753	0.11	dry	recharging
		2-Oct-17	1.055	0.42	dry	recharging
MP-06	0.54	12-Apr-17	0.921	0.38	---	
		12-Apr-17	0.734	0.19	---	
		12-May-17	0.521	-0.02	0.53	discharging
		2-Oct-17	1.14	0.60	dry	recharging
MP-07	0.41	12-Apr-17	0.935	0.53	---	
		12-Apr-17	0.92	0.51	---	
		12-May-17	0.565	0.16	0.41	recharging
		2-Oct-17	1.085	0.68	dry	recharging
MP-08	0.57	12-Apr-17	1.045	0.48	---	
		12-Apr-17	1.035	0.47	---	
		12-May-17	0.571	0.00	0.57	
		2-Oct-17	0.59	0.02	dry	recharging

**Table B**  
**Piezometer Water Level Measurements**

Well ID	Stick-Up (m)	Measurement Date	Water Level (mbtoc)	Water Level (mbgs)	Surface Water Depth (mbtoc)	Comments
MP-09	0.51	12-Apr-17	0.618	0.11	---	
		12-Apr-17	0.779	0.27	---	
		12-May-17	0.509	0.00	0.59	
		2-Oct-17	0.53	0.02	dry	recharging

**Notes:**

1. m to c meters below top of casing
2. mbgs meters below ground surface
3. negative values denote water levels above ground surface
4. Initial April 12 reading immediately post installation. Second reading approximately 1 hour post installation.
5. Table to be read in conjunction with accompanying report

**APPENDIX A**

**Important Information and  
Limitations of This Report**





## IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

**Standard of Care:** WSP Canada Inc. (WSP) 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 practising 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 WSP by the Client. 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. WSP cannot be responsible for use of this report, or portions thereof, unless WSP 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 WSP's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, WSP may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process. Any other use of this report by others is prohibited and is without responsibility to WSP. The report, all plans, data, drawings and other documents as well as all electronic media prepared by WSP are considered its professional work product and shall remain the copyright property of WSP, 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 WSP. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client can not rely upon the electronic media versions of WSP'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 WSP by the Client, communications between WSP and the Client, and to any other reports prepared by WSP 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. WSP can not 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 Ground Water 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, WSP 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 WSP 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:** WSP 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.

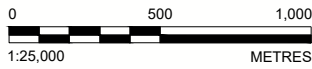
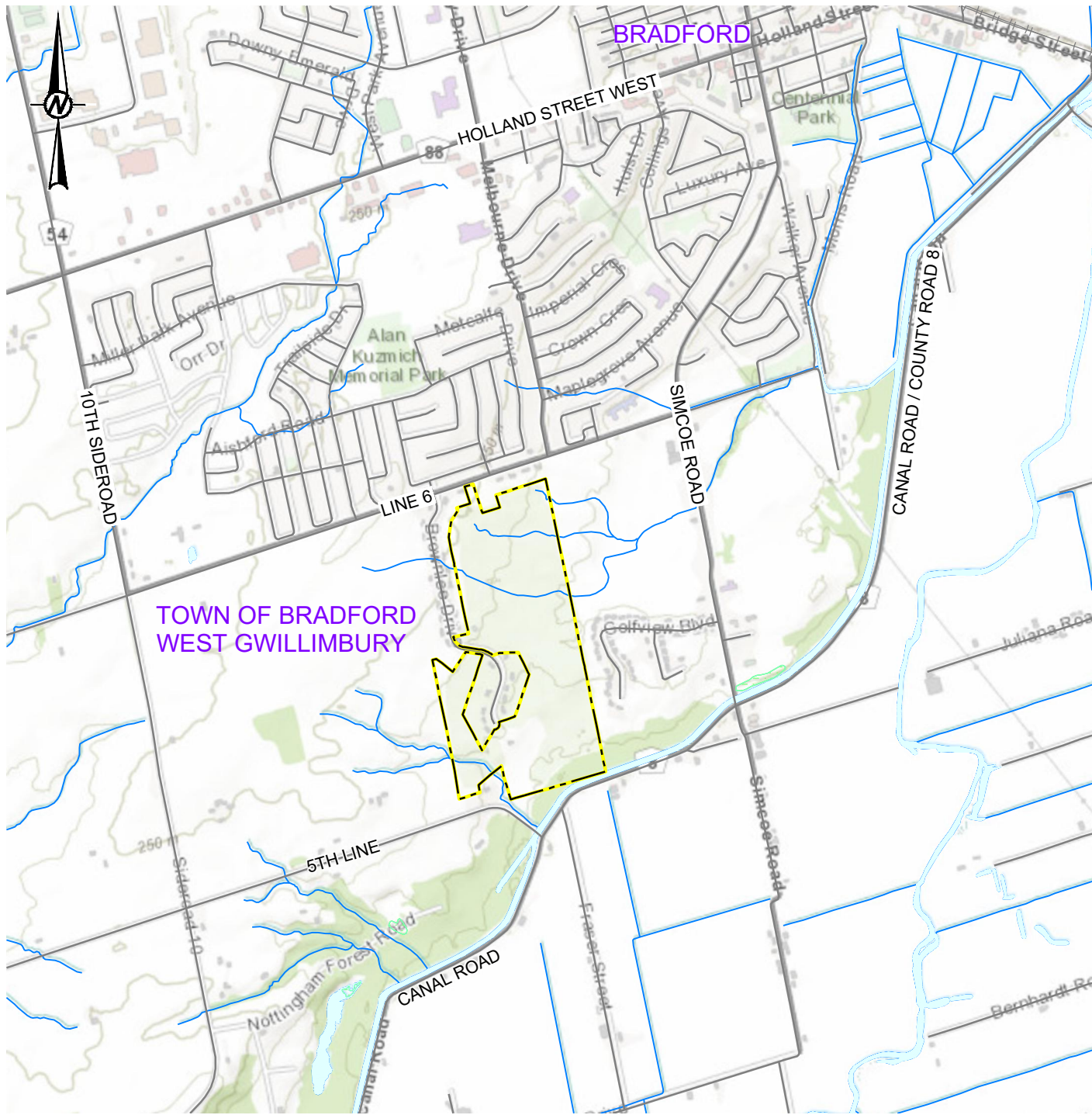
**Follow-Up and Construction Services:** All details of the design were not known at the time of submission of WSP's report. WSP should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of WSP's report.

During construction, WSP 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 WSP's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in WSP's report. Adequate field review, observation and testing during construction are necessary for WSP 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, WSP'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.

## APPENDIX B

# Figures

Path: \\corporate\paw\net\CA\CAMIS\300\CTX\_Data\SIM\Clients\Bradford\_Highlands\_Golcourse\99\_PROJ\2517668\40\_PROJ\0004\_Hydro\2024\_1 File Name: 22517668-0004-CH-0001.dwg



LEGEND

- APPROXIMATE PHASE TWO PROPERTY
- ROAD
- RAILWAY
- WATERCOURSE
- WATER AREA, PERMANENT
- WOODED AREA

REFERENCE(S)

BASE DATA - MNR LIO, OBTAINED 2015  
PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2015  
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT  
BRADFORD HIGHLANDS

PROJECT  
BRADFORD HIGHLANDS GOLF COURSE REDEVELOPMENT  
2789 LINE 6 AND 23 BROWNLEE DRIVE  
TOWN OF BRADFORD WEST GWILLIMBURY, ONTARIO

TITLE  
KEY PLAN

CONSULTANT



YYYY-MM-DD 2024-10-30

PREPARED JPR

DESIGN

REVIEW

APPROVED DPD

PROJECT No.  
22517668

CONTROL  
0004

Rev.  
----

FIGURE  
1

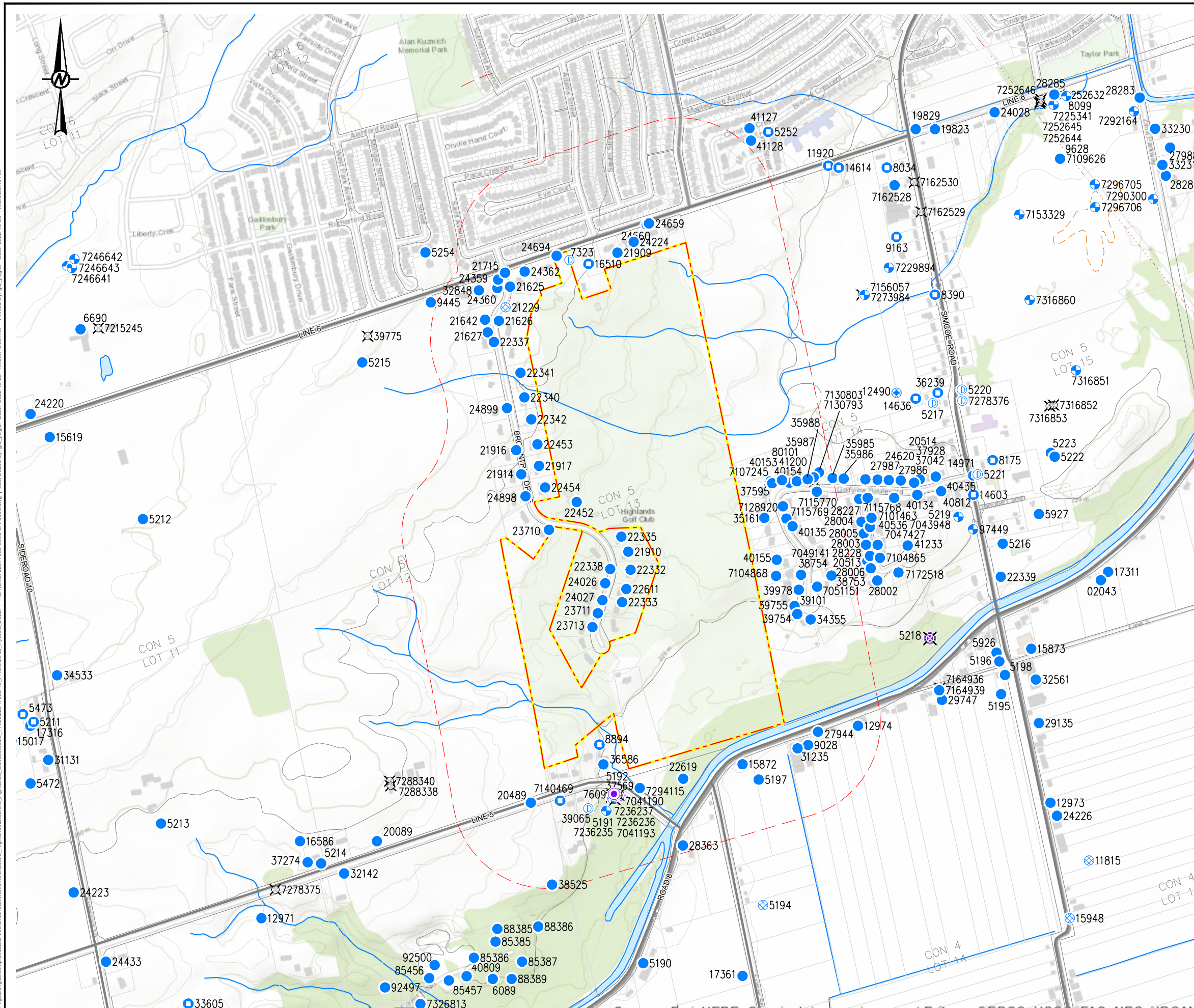
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A

25 mm

















### LEGEND

- |   |                              |
|---|------------------------------|
|  | SHALLOW DUG OR BORED <10 M   |
|  | SANDPOINT                    |
|  | DEEP BORED WELL >10 M        |
|  | DRILLED OVERBURDEN WELL      |
|  | TEST OR OBSERVATION WELL     |
|  | DRILLED BEDROCK WELL         |
|  | MUNICIPAL / PUBLIC SUPPLY    |
|  | MUNICIPAL SUPPLY ABANDONMENT |

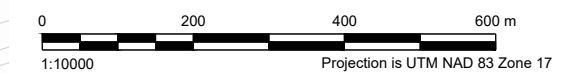
## REFERENCES

MINISTRY OF ENVIRONMENT WATER WELL RECORDS, QUEEN'S PRINTER.

## NOTES

LOCATION AND ELEVATIONS OF FIELD VERIFIED WELLS ARE SUBJECT TO REVISION.

LOCATION OF TEMPORARY DEWATERING RECORDS AND REPAIR RECORDS WITH DETAILS NOT KNOWN ARE NOT ILLUSTRATED.



CLIENT  
Plotted 11x17" Tabloid  
**BRADFORD HIGHLANDS**

PROJECT  
BRADFORD HIGHLANDS GOLF COURSE REDEVELOPMENT  
2789 LINE 6 AND 23 BROWNLEE DRIVE  
TOWN OF BRADFORD WEST GWILLIMBURY, ONTARIO

## TITLE

# MINISTRY RECORDED WELLS

CONSULTANT	YYYY-MM-DD	2022-10-13
	DESIGNED	
	PREPARED	JPR
	REVIEWED	PM
	APPROVED	DPD

PROJECT NO.	CONTROL	REV.	FIGURE
22517668	0002	----	3

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





Path: \\wsp-pblwan-net\CAD\MIS\00CTX\_Data\GISM\Clients\Bradford\_Highlands\_ColCourse\99\_PROD\2251766940\_PROD\0004\_HydroG\_2024 | File Name: 22517668-0004.CH-0002.dwg



- LEGEND**
- BOREHOLE LOCATION 2016
  - BOREHOLE LOCATION 2022
  - MONITORING WELL
  - APPROXIMATE PHASE TWO BOUNDARY
  - CROSS SECTION

- SOIL PATTERN LEGEND AND GENERIC SHADING**
- |                     |                              |
|---------------------|------------------------------|
| ORGANICS / TOPSOIL  | SANDY SILT                   |
| FILL                | Clayey Silt                  |
| SAND                | SILTY CLAY                   |
| SAND TRACE SILT     | CLAYEY SILT TILL             |
| SILTY SAND          | SILTY SAND / SANDY SILT TILL |
| SILTY GRAVELLY SAND | SILTY CLAY TILL              |

- SECTION WELL SYMBOLS**
- FLOWING WELL
  - RECORDED STATIC WATER LEVEL MAY 14, 2024
  - SCREEN
- 0 100 200  
1:5,000 METRES

**REFERENCE(S)**  
ORTOIMAGE ESRI BING  
DRAFT PLAN: MGP OCTOBER, 2024  
BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN DETERMINED ONLY AT WELL AND TEST WELL LOCATIONS. BETWEEN THE WELLS AND TEST WELLS, BOUNDARIES ARE NOT PROVEN BUT ARE ASSUMED FROM GEOLOGICAL EVIDENCE  
BOREHOLE LOCATION SURVEY: RADY-PENTEK & EDWARD SURVEYING LTD., JULY 28, 2016  
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

**CLIENT**  
BRADFORD HIGHLANDS

**PROJECT**  
BRADFORD HIGHLANDS GOLF COURSE REDEVELOPMENT  
2789 LINE 6 AND 23 BROWNLEE DRIVE  
TOWN OF BRADFORD WEST GWILLIMBURY, ONTARIO

**TITLE**  
CROSS-SECTION B - B'

CONSULTANT	YYYY-MM-DD	2024-10-30
	PREPARED	
	DESIGN	JPR
	REVIEW	
	APPROVED	DPD

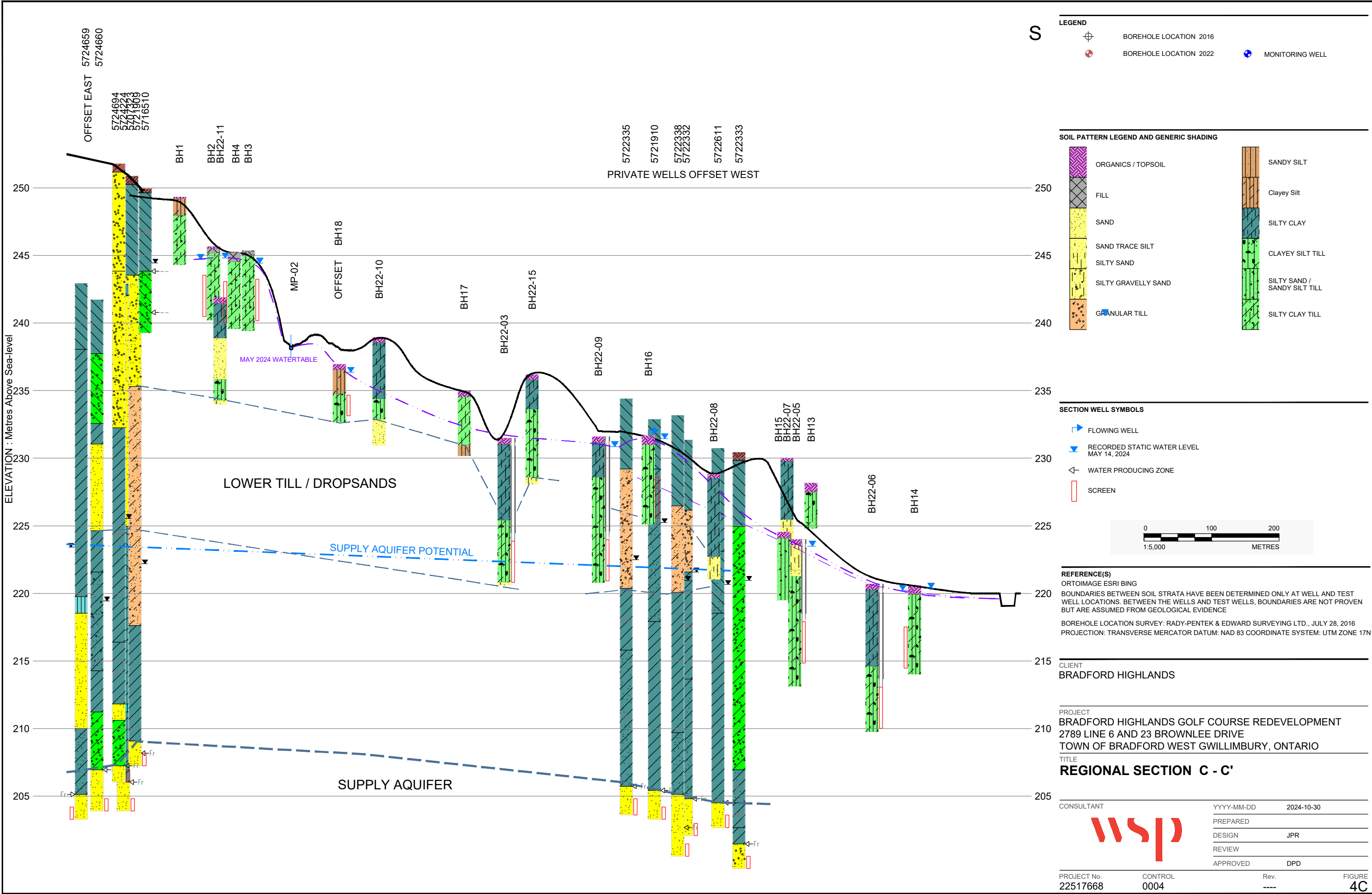
PROJECT No.	CONTROL	Rev.	FIGURE
22517668	0004	----	4B

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3S B

25 mm



Path: \\spp.phw.net\CAMIS\GIS\DOTX\_Data\GIS\Clients\Bradford\_Highlands\_Colcourse\99\_PROD\22517668\40\_PROD\0004\_HydroG\_2024 | File Name: 22517668-0004.CH-0002.dwg



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3S B 25 mm







**APPENDIX C**

**MECP Water Well Database  
Search Results**

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
5191	4 13	Feb-61	613758 4882250	223.7	18.9 Fr	24.1 -2.4 21.6 -2.4	FLW	877	720	2.1	4823 CT	TH NU	<b>MOE# 5705191</b> 0.0 TPSL 0.3 YLLW CLAY 2.4 HPAN GRVL CLAY 18.9 GRVL SAND 26.5
5192	4 13	Mar-62	613789 4882290	223.4	20.4 Fr	24.1 -2.1 21.6 -2.4	-0.3	1864	2880	14.3	4610 CT	WS MU	<b>MOE# 5705192 TAG#ASSMNT</b> 0.0 TPSL 0.3 BRWN SAND 0.9 BRWN SAND CLAY 1.5 CLAY BLDR FSND 7.6 GRVL SAND 8.5 BLUE CLAY GRVL 9.1 BRWN SAND CLAY 20.4 FSND 23.5 SAND GRVL 26.2
5197	4 14	Jan-66	614154 4882331	220.1	32.3 Fr		0.6	91	240	5.5	3414 CT	WS ST	<b>MOE# 5705197</b> 0.0 PEAT 1.5 SILT 19.2 CLAY BLDR 31.7 GRVL 32.3
5252		Apr-65	614179 4884014	232.0	11.6 Fr		8.5	5			3109 BR	WS ST	<b>MOE# 5705252</b> 0.0 TPSL 0.3 CLAY 7.3 BLUE CLAY STNS 11.6 MSND 11.9 BLUE CLAY STNS 15.2
5254	6 12	Dec-65	613288 4883701	260.0	15.8 Fr		6.7	9			3109 BR	WS ST	<b>MOE# 5705254</b> 0.0 TPSL 0.6 CLAY 14.6 CLAY MSND STNS 22.3
7323	5 13	May-70	613662 4883681	250.9	7.3 Fr		1.2				3109 BR	WS DO	<b>MOE# 5707323</b> 0.0 TPSL 0.6 BRWN CLAY 7.3 GRVL 7.9
7609	4 13	Sep-70	613712 4882291	226.8	20.7 Fr	22.3 -4.3	1.5	1918	60	17.7	1621 CT	WS MU	<b>MOE# 5707609</b> 0.0 TPSL 0.3 CLAY MSND GRVL 20.7 FSND CSND GRVL 26.2 CLAY 27.1
8894	5 13	May-72	613740 4882422	226.8	3.0 Fr		2.4				4102 BR	WS DO	<b>MOE# 5708894</b> 0.0 TPSL 0.6 BRWN CLAY 8.2 BLUE CLAY STNS 12.8
9028	4 14	Aug-72	614282 4882421	220.1	32.6 Fr	31.7 -0.9	1.8	23	4320	8.5	3414 CT	WS DO	<b>MOE# 5709028</b> 0.0 CLAY 6.4 CLAY GRVL 31.7 SAND GRVL CLAY 32.6
9445	5 12	Oct-72	613302 4883571	258.8	20.7 Fr		7.3				3109 BR	WS DO	<b>MOE# 5709445</b> 0.0 TPSL 0.6 BRWN CLAY SAND 9.8 BLUE CLAY STNS 20.7 GRVL 21.6
12974	4 14	Nov-75	614412 4882471	220.1	71.6 -	73.8 -1.2	4.0	45		75.0	3903 RC	WS DO	<b>MOE# 5712974</b> 0.0 BLCK WDFR CLAY 3.0 GREY CLAY SAND LYRD 27.4 GREY CLAY STNS HARD 71.6 GREY SAND STNS LOOS 75.0
15872	4 13	Sep-78	614112 4882371	220.1	71.3 -	71.6 -1.2	2.4	36	180	51.8	3903 CT	WS DO	<b>MOE# 5715872</b> 0.0 BLCK WDFR 0.3 GREY CLAY 9.1 GREY CLAY SILT SOFT 29.0 GREY CLAY STNS HARD 62.5 GREY CLAY SILT SOFT 71.3 GREY FSND 72.8
16510	5 13	Oct-79	613712 4883671	249.9	9.1 - 6.1 -		5.5		30	9.1	4919 BR	WS DO	<b>MOE# 5716510</b> 0.0 BRWN TPSL HARD 0.3 BRWN CLAY CMTD 6.1 BRWN CLAY STNS SAND 10.7
20489	4 13	Apr-85	613562 4882271	235.9	15.2 -		15.2		30	18.9	4919 BR	WS DO	<b>MOE# 5720489</b> 0.0 BRWN TPSL HARD 0.3 BRWN CLAY HARD 6.1 BRWN SAND LOOS 19.8

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
20513	5 14	Feb-86	614436 4882899	228.0	10.7 Fr	25.3 -0.9	12.8	36	60	18.3	1413 RR	WS DO	<b>MOE# 5720513</b> 0.0 BRWN SAND CLAY TPSL 0.3 BRWN CLAY SAND SILT 4.6 BRWN SAND CLAY SILT 4.9 BRWN CLAY SAND SILT 10.7 BRWN GRVL SAND LOOS 11.0 BRWN GRVL CLAY SAND 13.1 BRWN GRVL CLAY SAND 24.4 BRWN SAND SILT LOOS 26.2
21229	5 13	Oct-86	613496 4883560	253.9	121.9 Fr		38.1	18	60	121.9	3108 RC	WS DO	<b>MOE# 5721229</b> 0.0 BRWN CLAY 5.5 BRWN CLAY SNDY 10.1 SAND GRVL STNS 11.3 SAND CLAY STNS 15.8 BLUE CLAY SNDY 21.9 BLUE CLAY 41.8 BLUE CLAY SNDY 53.0 BLUE SAND CLAY 71.3 BLUE CLAY 118.9 BLUE CLAY SHLE 120.4 BRWN LMSN 122.5
21625	5 13	Apr-87	613508 4883614	253.9	58.5 Fr	60.0 -0.9	30.5	100	120	42.7	3108 RC	WS DO	<b>MOE# 5721625</b> 0.0 BRWN CLAY SNDY 8.5 BLUE CLAY SNDY 23.5 SAND 24.4 BLUE CLAY 49.4 SAND 50.0 BLUE CLAY 52.7 SAND 54.9 BLUE CLAY 58.5 CSND 61.0
21626	5 13	Apr-87	613479 4883525	253.0	59.4 Fr	61.3 -0.9	30.5	68	120	56.7	3108 RC	WS DO	<b>MOE# 5721626</b> 0.0 BRWN CLAY 3.0 STNS 3.7 BLUE CLAY 14.9 BLUE CLAY SNDY 48.2 SAND 48.8 BLUE CLAY SNDY 58.2 SAND 62.2
21627	5 13	Mar-87	613450 4883495	253.9	49.7 Fr	51.8 -1.8	30.5	91	90	53.3	3108 RC	WS DO	<b>MOE# 5721627</b> 0.0 SAND FILL 2.1 BRWN CLAY SNDY 5.5 BLUE CLAY 49.7 BLUE SAND 53.9
21642	5 13	Apr-87	613443 4883528	253.9	52.7 Fr	53.9 -0.9	30.5	91	120	53.3	3108 RC	WS DO	<b>MOE# 5721642</b> 0.0 BRWN CLAY STNS 8.5 BLUE CLAY SNDY STNS 37.2 BLUE CLAY 52.4 BLUE SAND 54.9
21715	5 13	Jun-87	613495 4883650	254.8	54.9 Fr	55.5 -0.9	30.8	91	120	55.8	3108 RC	WS DO	<b>MOE# 5721715</b> 0.0 BRWN CLAY GRVL STNS 14.6 BLUE CLAY SNDY GRVL 32.0 BLUE CLAY 46.6 BLUE CLAY SNDY 54.3 BLUE SAND 56.4
21909	5 13	Jul-87	613787 4883702	245.7	37.5 Fr	37.5 -0.9	23.5	23	120	36.6	3108 RC	WS CO	<b>MOE# 5721909</b> 0.0 BRWN CLAY 2.4 SAND GRVL STNS 10.4 BLUE SAND CLAY STNS 28.0 BLUE CLAY 36.6 BLUE SAND 38.4
21910	5 13	Jul-87	613815 4882923	232.9	27.4 Fr	28.7 -0.9	7.6	182	60	27.4	3108 RC	WS DO	<b>MOE# 5721910</b> 0.0 BRWN CLAY 3.7 BLUE CLAY SNDY 14.9 BLUE CLAY 27.4 BLUE SAND 29.6
21914	5 13	Jul-87	613537 4883124	246.9	36.6 Fr	37.5 -0.9	24.7	114	60	38.1	3108 RC	WS DO	<b>MOE# 5721914</b> 0.0 BRWN SAND CLAY 3.7 BLUE SAND CLAY STNS 26.8 BLUE SAND CLAY 36.6 BLUE SAND 38.4
21916	5 13	Jul-87	613524 4883187	249.9	36.0 Fr	36.6 -0.9	27.4	82	120	36.0	3108 RC	WS DO	<b>MOE# 5721916</b> 0.0 BRWN CLAY SNDY STNS 2.7 BLUE CLAY SNDY STNS 17.4 BLUE CLAY SNDY 21.6 BLUE CLAY 35.4 BLUE SAND 37.5

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
21917	5 13	Jul-87	613583 4883146	245.1	35.7 Fr	36.9 -0.9	23.8	45	120	36.6	3108 RC	WS DO	<b>MOE# 5721917</b> 0.0 BRWN CLAY SNDY 3.0 BLUE CLAY SNDY STNS 19.5 BLUE CLAY SNDY 28.3 BLUE CLAY 35.7 BLUE SAND 37.8
22332	5 13	Oct-87	613821 4882876	231.3	26.5 Fr	28.3 -0.9	9.8	182	60	27.4	3108 RC	WS DO	<b>MOE# 5722332</b> 0.0 BRWN CLAY 5.2 BLUE GRVL SNDY CLAY 9.8 BLUE CLAY HARD 17.7 BLUE CLAY SNDY 26.5 BLCK SAND 29.3
22333	5 13	Oct-87	613799 4882792	230.4	29.0 Fr	29.9 -0.9	9.4	341	60	29.0	3108 RC	WS DO	<b>MOE# 5722333</b> 0.0 BLCK TPSL 0.6 BRWN CLAY 5.5 BLUE CLAY GVLY 23.5 BLUE CLAY SNDY SOFT 25.9 BLUE CLAY HARD 27.7 BLUE CLAY 29.0 BLCK SAND GRVL 30.8
22335	5 13	Oct-87	613797 4882962	234.4	28.7 Fr	29.6 -1.2	11.9	136	60		3108 RC	WS DO	<b>MOE# 5722335</b> 0.0 BRWN CLAY 5.2 BLUE SAND GRVL CLAY 14.0 BLUE CLAY HARD 18.6 BLUE CLAY SNDY SOFT 28.7 BLCK SAND 30.8
22337	5 13	Oct-87	613466 4883468	253.0	60.0 Fr	61.0 -0.9	30.5	227	120	54.9	3108 RC	WS DO	<b>MOE# 5722337</b> 0.0 BRWN CLAY SNDY STNS 5.5 BLUE CLAY STNS SNDY 20.7 BLUE CLAY 40.5 BLUE CLAY SNDY 54.3 BLUE FSND CLAY LYRD 60.0 BLUE MSND 61.9
22338	5 13	Oct-87	613768 4882878	233.2	30.5 Fr	31.7 -0.9	12.2	136	90	30.5	3108 RC	WS DO	<b>MOE# 5722338</b> 0.0 BRWN CLAY 6.7 BLUE SAND CLAY STNS 13.1 BLUE CLAY 23.5 BLUE CLAY SNDY 28.0 BLUE SAND 32.6
22340	5 13	Oct-87	613545 4883324	250.2	38.1 Fr	39.9 -0.9	29.3	68	90	38.1	3108 RC	WS DO	<b>MOE# 5722340</b> 0.0 BRWN CLAY STNS 7.0 BLUE GRVL SNDY CLAY 21.0 BLUE CLAY 32.6 BLUE CLAY SNDY 38.1 BLUE SAND 40.8
22341	5 13	Oct-87	613535 4883388	250.5	44.2 Fr	45.7 -0.9	28.7	114	120		3108 RC	WS DO	<b>MOE# 5722341</b> 0.0 BRWN CLAY STNS 5.8 BLUE GRVL SNDY CLAY 19.8 BLUE CLAY 36.6 BLUE CLAY SNDY 40.8 BLUE SAND CLAY LYRD 44.2 BLUE SAND 46.6
22342	5 13	Oct-87	613563 4883267	250.2	36.9 Fr	38.1 -0.9	28.3	64	120		3108 RC	WS DO	<b>MOE# 5722342</b> 0.0 BRWN CLAY SNDY STNS 8.2 BLUE CLAY SNDY STNS 18.3 BLUE CLAY 36.9 SAND 39.0
22452	5 13	Oct-87	613681 4883052	235.9	30.5 Fr	31.7 -0.9	20.1	45	120	30.5	3108 RC	WS PU	<b>MOE# 5722452</b> 0.0 BRWN SAND CLAY 4.9 BLUE SAND CLAY STNS 13.4 BLUE CLAY 30.5 BLUE SAND 32.6
22453	5 13	Oct-87	613579 4883202	246.9	33.8 Fr	34.7 -0.9	25.9	45	120	32.6	3108 RC	WS DO	<b>MOE# 5722453</b> 0.0 BRWN CLAY SNDY STNS 5.8 BLUE CLAY SNDY STNS 21.9 BLUE CLAY 33.8 BLUE SAND 35.7

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
22454	5 13	Oct-87	613599 4883090	243.2	32.0 Fr	39.0 -0.9	21.9	91	120	38.7	3108 RC	WS DO	<b>MOE# 5722454</b> 0.0 BRWN CLAY SNDY 3.7 BLUE CLAY SNDY STNS 8.2 SAND GRVL 9.8 BLUE CLAY SNDY STNS 25.3 BLUE CLAY 32.0 BLUE SAND 39.9
22611	5 13	Nov-87	613810 4882826	230.7	26.2 Fr	27.1 -0.9	10.1	227	60	25.9	3108 RC	WS DO	<b>MOE# 5722611</b> 0.0 BRWN CLAY 4.9 BLUE CLAY 7.6 BRWN CLAY SNDY 12.2 BLUE CLAY 26.2 BLUE SAND 28.0
22619	4 13	Nov-87	613958 4882333	220.1	37.5 Fr	36.3 -1.2	10.7	55	90	18.3	1413 RC	WS DO	<b>MOE# 5722619</b> 0.0 BRWN CLAY STNS 9.8 BRWN SAND LOOS 17.4 BRWN SAND PCKD 25.0 BRWN SAND LOOS 34.4 BRWN SAND GRVL CLN 37.5
23710	5 13	Jul-88	613609 4882980	240.8	31.1 Fr	34.4 -0.9	20.7	91	180		3108 RC	WS DO	<b>MOE# 5723710</b> 0.0 BRWN CLAY 4.3 BRWN CLAY GRVL 6.1 BLUE CLAY GRVL 14.0 BLUE CLAY 21.3 BRWN CLAY 24.7 BLUE CLAY 27.4 BLUE CLAY SAND 31.1 BLUE SAND 35.4
23711	5 13	Aug-88	613736 4882763	230.1	32.6 Fr	32.9 -0.9	12.2	205	60	22.9	3108 RC	WS DO	<b>MOE# 5723711</b> 0.0 BRWN CLAY GRVL 7.3 BLUE CLAY 12.5 BLUE CLAY GRVL 22.9 BRWN CLAY GRVL 26.8 BLUE CLAY SAND GRVL 32.6 SAND GRVL 33.8
23713	5 13	Aug-88	613722 4882727	230.4	32.3 Fr	32.3 -0.9	11.9	341	120		3108 RC	WS DO	<b>MOE# 5723713</b> 0.0 BRWN CLAY GRVL 6.7 BRWN SAND 8.5 BLUE CLAY GRVL 26.8 BRWN CLAY 28.7 SAND 31.1 BLUE CLAY 32.3 GRVL 33.2
24026	5 13	Sep-88	613755 4882841	233.2	32.9 Fr	34.4 -0.9	12.8	273	60	21.3	3108 RC	WS DO	<b>MOE# 5724026</b> 0.0 BRWN CLAY 7.0 BLUE CLAY GRVL 9.8 BLUE CLAY 29.9 BLUE CLAY SAND 32.9 BLUE SAND 35.4
24027	5 13	Sep-88	613748 4882797	232.3	32.6 Fr	34.1 -0.9	12.2	341	60		3108 RC	WS DO	<b>MOE# 5724027</b> 0.0 BRWN CLAY GRVL 7.9 BLUE CLAY GRVL 23.2 BLUE CLAY 32.0 BLUE CLAY SAND 32.6 BLUE SAND 35.1
24224	5 13	Oct-88	613829 4883728	243.2	37.2 Fr	38.4 -0.9	10.7	68	60	38.1	3108 RC	WS DO	<b>MOE# 5724224</b> 0.0 BRWN CLAY 1.2 BRWN SAND 18.3 BRWN CLAY SAND LYRD 22.9 BLUE CLAY 31.4 BLUE SILT CLAY 32.0 BLUE CLAY 37.2 BLUE SAND 39.3
24359	5 13	Nov-88	613477 4883632	254.8	25.3 Fr	25.3 -0.9	8.8	36	120		3108 RC	WS DO	<b>MOE# 5724359</b> 0.0 BRWN CLAY 3.0 BRWN CLAY SAND GRVL 12.5 BLUE CLAY GRVL 19.5 BLUE CLAY 23.5 BLUE CLAY SAND 25.3 BLUE SAND 26.2
24360	5 13	Nov-88	613475 4883610	254.8	23.8 Fr	24.7 -0.9	7.6	91	60		3108 RC	WS DO	<b>MOE# 5724360</b> 0.0 BRWN CLAY SAND GRVL 8.2 BLUE CLAY GRVL 19.2 SAND 19.8 BLUE CLAY SAND 23.8 SAND 25.6

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
24362	5 13	Nov-88	613546 4883653	253.9	44.8 Fr	45.7 -0.9	31.7	273	60	45.7	3108 RC	WS DO	<b>MOE# 5724362</b> 0.0 BRWN CLAY 2.1 BRWN CLAY SAND GRVL 14.3 BLUE CLAY GRVL 25.0 BLUE CLAY 35.1 BLUE CLAY SAND 36.9 BLUE CLAY 44.8 SAND 46.6
24659	5 13	Feb-89	613869 4883778	242.9	37.8 Fr	38.7 -0.9	19.5	91	120	38.1	3108 RC	WS DO	<b>MOE# 5724659</b> 0.0 BRWN CLAY 4.9 BLUE CLAY 23.2 SILT 24.4 BLUE SAND 32.9 BLUE CLAY SAND 37.8 BLUE SAND 39.6
24660	5 13	Feb-89	613863 4883775	241.7	34.7 Fr	36.9 -0.9	22.3	32	120	36.6	3108 RC	WS DO	<b>MOE# 5724660</b> 0.0 BRWN CLAY 4.0 BRWN CLAY GRVL 9.1 BLUE CLAY 10.7 SAND 17.1 BLUE CLAY 20.1 BLUE CLAY SAND GRVL 27.4 BLUE CLAY 30.5 GRN CLAY GRVL 34.7 BLUE SAND 37.8
24694	5 13	Mar-89	613629 4883694	251.8	44.5 Fr	44.8 -0.9	26.2	91	60	44.2	3108 RC	WS DO	<b>MOE# 5724694</b> 0.0 FILL 0.6 GRVL 7.9 BRWN GRVL SAND 19.5 BLUE CLAY HARD 35.4 BLUE CLAY SOFT 39.9 BLUE SAND 41.1 BLUE CLAY GRVL 44.5 BLUE SAND 45.7
24898	5 13	May-89	613548 4883067	244.8	30.8 Fr	32.6 -1.8	22.3	45	120	32.0	3108 RC	WS DO	<b>MOE# 5724898</b> 0.0 BRWN CLAY GRVL STNS 7.3 BLUE CLAY SAND GRVL 25.6 BLUE CLAY 30.8 BLUE SAND 34.7
24899	5 13	May-89	613500 4883296	251.8	49.4 Fr	49.4 -1.8	32.6	27	180	50.6	3108 RC	WS DO	<b>MOE# 5724899</b> 0.0 TPSL 0.6 BRWN CLAY SAND GRVL 7.0 BLUE CLAY SAND GRVL 15.8 BLUE CLAY 34.7 BLUE FSND SILT 51.5 BLUE SILT 52.7
27944	4 14	Mar-91	614308 4882455	219.8	25.0 Fr	24.1 -0.9	4.6	23	720	22.9	1350 CT	WS DO	<b>MOE# 5727944</b> 0.0 BRWN SAND GRVL FILL 1.8 BLCK TPSL PEAT 4.3 GREY CLAY 7.9 GREY SILT CLAY 13.7 GREY CLAY 24.4 BRWN SAND GRVL 25.9
28003	5 14	May-91	614433 4882941	233.2	29.6 Fr	28.7 -0.9	10.7	227	90	27.4	4645 RC	WS DO	<b>MOE# 5728003</b> 0.0 BRWN CLAY SILT STNS 9.1 GREY CLAY SILT STNS 11.0 BRWN CLAY SILT STNS 15.2 GREY CLAY SILT STNS 21.3 GREY FSND CSND 30.5
28004	5 14	May-91	614421 4883001	235.0	30.5 Fr	29.6 -0.9	10.7	273	90	27.4	4645 RC	WS DO	<b>MOE# 5728004</b> 0.0 BRWN CLAY SILT STNS 11.0 GREY CLAY SILT STNS 11.3 BRWN CLAY SILT STNS 15.2 GREY CLAY SILT STNS 19.8 GREY CLAY DNSE 21.3 GREY FSND CSND 30.5
28005	5 14	May-91	614427 4882970	233.8	29.3 Fr	28.3 -0.9	10.7	273	90	27.4	4645 RC	WS DO	<b>MOE# 5728005</b> 0.0 BRWN CLAY SILT STNS 9.1 GREY CLAY SILT STNS 11.0 BRWN CLAY SILT STNS 15.2 GREY CLAY SILT STNS 19.8 GREY CLAY SILT STNS 21.3 GREY FSND CSND 30.5



LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
28006	5 14	May-91	614445 4882880	231.3	30.5 Fr	29.6 -0.9	10.7	227	120	27.4	4645 RC	WS DO	<b>MOE# 5728006</b> 0.0 BRWN CLAY SILT STNS 11.0 GREY CLAY SILT STNS 11.6 BRWN CLAY SILT STNS 15.8 GREY CLAY SILT STNS 22.9 GREY FSND CSND 30.5
28227	5 14	Jun-91	614415 4883060	231.3	30.5 Fr	29.6 -0.9	10.7	273	90	27.4	4645 RC	WS DO	<b>MOE# 5728227</b> 0.0 BRWN CLAY SILT STNS 9.1 GREY CLAY SILT STNS 11.3 BRWN CLAY SILT STNS 15.2 GREY CLAY SILT STNS 19.8 GREY CLAY SILT STNS 21.3 30.5
28228	5 14	Jun-91	614443 4882912	232.3	30.5 Fr	29.6 -0.9	10.7	273	90	27.4	4645 RC	WS DO	<b>MOE# 5728228</b> 0.0 BRWN CLAY SILT STNS 9.1 GREY CLAY SILT STNS 11.3 BRWN CLAY SILT STNS 15.2 GREY CLAY SILT STNS 19.8 GREY CLAY DNSE 21.3 GREY FSND CSND 30.5
28363	4 13	Sep-91	614042 4881690	219.8	29.6 Fr	30.5 -1.8	2.4	341	120		3108 RC	WS DO	<b>MOE# 5728363</b> 0.0 TPSL CLAY 3.0 BLUE CLAY 6.1 BLUE CLAY WDFR 12.2 BLUE CLAY 29.6 BRWN SAND 32.3
31235	4 14	Oct-94	614255 4882412	219.8	25.9 Fr	24.7 -1.2	6.1	18	2880	24.4	4645 RC	WS DO	<b>MOE# 5731235</b> 0.0 BRWN SAND 1.5 GREY CLAY 12.2 GREY SAND GRVL LOOS 12.8 GREY SILT CLAY SOFT 16.2 GREY SILT CLAY SOFT 22.9 GREY SILT CSND LOOS 25.9 GREY SILT SAND CLAY 31.1
32848	5 13	Jul-97	613427 4883602	255.7	57.9 Fr	58.5 -1.2 58.5 -1.2	34.1	18	360	57.6	6782 CT	WS DO	<b>MOE# 5732848</b> 0.0 GREY FILL 1.5 TPSL 2.1 GREY CLAY MSND MGVL 31.7 GREY CLAY MSND 50.9 GREY FSND 60.4
34355	5 15	Apr-99	614289 4882747	224.0	25.9 Fr	24.1 -1.2	7.6	496	360	11.0	4645 RC	WS DO	<b>MOE# 5734355</b> 0.0 BRWN CLAY STNS HARD 6.7 GREY CLAY STNS LYRD 19.8 BRWN SAND GRVL LOOS 25.9
35161	5 14	May-00	614169 4883011	228.0	25.9 Fr	24.7 -1.2	12.5	91	180	19.2	4645 RC	WS DO	<b>MOE# 5735161 TAG#ASSMNT</b> 0.0 BRWN FILL SOFT 0.6 BRWN SAND CLAY SOFT 4.3 GREY CLAY STNS HARD 17.1 BRWN CLAY SAND LYRD 19.2 BRWN SAND GRVL LOOS 25.9
35985	5 15	Mar-01	614346 4883115	229.8	25.9 Fr	24.7 -1.2	13.1	45	240	20.7	4645 RC	WS DO	<b>MOE# 5735985</b> 0.0 BRWN FILL CLAY SOFT 4.9 BRWN CLAY HARD 11.6 BRWN SAND SILT SOFT 12.2 GREY CLAY STNS HARD 20.1 GREY SAND SILT LOOS 25.9
35986	5 15	Mar-01	614375 4883113	229.2	25.9 Fr	24.7 -1.2	13.1	227	60	14.9	4645 RC	WS DO	<b>MOE# 5735986</b> 0.0 BRWN CLAY FILL 4.9 BRWN CLAY DNSE 11.6 BRWN SAND SILT LOOS 12.2 GREY CLAY STNS HARD 20.4 GREY SAND LOOS 25.9
35987	5 15	Apr-01	614297 4883116	229.5	29.0 Fr	27.7 -1.2	13.1	45	300	23.2	4645 RC	WS DO	<b>MOE# 5735987</b> 0.0 BRWN FILL SOFT 4.9 BRWN CLAY STNS HARD 11.6 GREY CLAY DNSE 16.5 GREY SILT SAND LOOS 19.8 GREY SAND LOOS 29.0

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
35988	5 15	May-01	614281 4883111	228.9	25.9 Fr	24.7 -1.2	12.8	45	300	18.9	4645 RC	WS DO	<b>MOE# 5735988</b> 0.0 BRWN FILL SOFT 4.9 BRWN CLAY HARD 12.2 GREY CLAY DNSE 19.2 GREY SAND LOOS 25.9
36586	5 13	Oct-01	613751 4882370	224.6	24.4 Fr	23.2 -1.2	17.1	27	180	22.9	4645 RC	WS DO	<b>MOE# 5736586</b> 0.0 BLCK TPSL HARD 0.3 BRWN CLAY STNS HARD 10.7 GREY CLAY DNSE 15.5 BRWN SAND LOOS 22.9 BRWN SAND GRVL LOOS 24.4 GREY CLAY HARD 24.4
37569	4 13	Jan-03	613757 4882270	224.0			NR				2801 -	AB -	<b>MOE# 5737569</b> 0.0
37595	5 15	Aug-02	614185 4883106	228.0	25.9 Fr	24.7 -1.2	13.1	227	120	14.6	4645 RC	WS DO	<b>MOE# 5737595</b> 0.0 BRWN CLAY STNS HARD 4.0 GREY CLAY DNSE 11.3 GREY CLAY STNS HARD 21.3 GREY SAND LOOS 25.9
38525	4 13	Oct-03	613617 4882058	231.3	24.1 -	22.9 -1.5	17.4	205	60	20.1	1663 RC	WS DO	<b>MOE# 5738525 TAG#A001444</b> 0.0 BLCK TPSL 0.3 BRWN CLAY GRVL 14.9 BRWN FSND MGVL 24.7 BRWN FSND 30.5
38753	5 15	Feb-04	614343 4882861	230.7	22.9 Fr	21.6 -1.2	13.7	1046	180	15.8	4645 RC	WS DO	<b>MOE# 5738753 TAG#A003587</b> 0.0 BRWN CLAY STNS HARD 10.4 GREY CLAY STNS HARD 19.2 GREY SAND LOOS 22.9
38754	5 15	Feb-04	614343 4882861	230.7	22.9 Fr	21.6 -1.2	13.7	1046	180	15.8	4645 RC	WS DO	<b>MOE# 5738754 TAG#A003590</b> 0.0 BRWN CLAY STNS HARD 10.4 GREY CLAY STNS HARD 19.2 GREY SAND LOOS 22.9
39065	4 13	Aug-04	613711 4882256	226.8			7.9				1663 OTH	AS NU	<b>MOE# 5739065</b> 0.0 BRWN SAND 0.3 YLLW 1.5 BRWN SAND 1.8 YLLW 7.6 PRDG 7.9
39101	5 14	Aug-04	614258 4882824	227.7	20.1 Un	17.1 -2.1	9.8	27	180	11.0	7178 RC	WS DO	<b>MOE# 5739101 TAG#A006251</b> 0.0 BRWN CLAY STNS 4.0 BRWN CLAY SILT 9.1 BLUE CLAY 18.0 BRWN SAND GRVL 20.1 BLUE CLAY 28.0
39754	5 14	May-05	614254 4882761	224.3			NR				1350 CT	AB DO	<b>MOE# 5739754 TAG#A014296</b> 0.0 BRWN CLAY SILT 4.0 BRWN GRVL BLDR 11.6
39755	5 14	May-05	614247 4882782	224.9	20.1 Un		7.6	86	60	9.4	1350 CT	WS DO	<b>MOE# 5739755 TAG#A014295</b> 0.0 BRWN CLAY SILT 4.0 BRWN GRVL BLDR 11.0 GREY CLAY GRVL SAND 18.3 BRWN SAND MSND 21.9
39978		Jul-05	614258 4882824	227.7		19.5 -1.5	9.4	68	120	13.1	7178 RC	WS DO	<b>MOE# 5739978 TAG#A006251</b> 0.0 BRWN SAND GRVL 21.0 BLUE CLAY 21.6
40135	5 14	Aug-05	614242 4882989	236.8	22.9 Un	21.6 -1.2	13.7	50	180	14.9	4645 RC	WS DO	<b>MOE# 5740135 TAG#A031010</b> 0.0 BRWN CLAY STNS 6.7 GREY CLAY 19.8 GREY SAND 22.9
40153	6 14	Aug-05	614189 4883101	228.9	25.0 Fr	22.9 -3.0	15.2	91	180		1413 RA	WS DO	<b>MOE# 5740153 TAG#A029629</b> 0.0 BRWN CLAY HARD 5.2 GREY CLAY HARD 19.8 GREY FSND 25.9

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
40154	6 14	Aug-05	614234 4883102	229.2	24.1 Fr	23.2 -1.5	14.9	73	60	21.9	1413 RC	WS DO	<b>MOE# 5740154 TAG#A029636</b> 0.0 BRWN CLAY GRVL SOFT 7.0 GREY CLAY DNSE 20.7 GREY SAND GRVL DRTY 22.9 GREY SAND 24.7
40155	6 14	Aug-05	614201 4882902	233.5	25.9 Fr	25.0 -1.5	14.9	132	60	22.9	1413 RC	WS DO	<b>MOE# 5740155 TAG#A029637</b> 0.0 BRWN SAND GRVL SOFT 1.8 BRWN CLAY DNSE 7.0 GREY CLAY DNSE 22.3 GREY SAND GRVL LYRD 24.1 GREY SAND GRVL LYRD 26.5
41127	6 14	Sep-06	614130 4884023	235.0			6.1				7178 -	AS -	<b>MOE# 5741127</b> 0.0 0.6 STNS 5.5 10.1
41128	6 14	Sep-06	614134 4883991	234.1			5.5				7178 -	AS -	<b>MOE# 5741128</b> 0.0 12.5
41200	6 14	Sep-06	614253 4883106	228.6	24.1 Fr	23.2 -0.9	13.7	77	60		1413 RA	WS DO	<b>MOE# 5741200 TAG#A038610</b> 0.0 BRWN CLAY 5.2 GREY CLAY 20.7 BLCK SAND 24.1
7041190	4 13	Oct-06	613771 4882283	223.1	307.8 Un 306.0 Un 303.9 Un		54.9	9	60	55.8	2662 RA	OW -	<b>MOE# 7041190 TAG#A041125</b> 0.0 GREY GRVL 0.3 BLCK TPSL 0.9 BRWN CLAY SNDY 2.4 GREY CLAY SLTY GRVL 5.8 GREY SILT 6.7 GREY CLAY SNDY GRVL 16.5 GREY SAND SLTY GRVL 19.5 GREY SAND GRVL 25.6 GREY SAND GRVL 26.8 GREY CLAY SLTY 30.8 GREY FSND SILT 35.7 GREY CLAY SLTY GRVL 41.5 GREY CLAY SLTY SAND 44.5 GREY CLAY SLTY 46.0 GREY SAND SLTY GRVL 48.8 GREY SILT SNDY CLAY 56.1 GREY SAND SLTY 57.6
7041193	4 13	Oct-06	613774 4882281	223.1		75.9 -10.1	NR				2662 RA	OW -	<b>MOE# 7041193 TAG#A041126</b> 0.0 GREY GRVL FILL 0.6 BLCK TPSL 3.0 BRWN CLAY SNDY GRVL 7.9 GREY CLAY SLTY GRVL 13.1 GREY CLAY SLTY GRVL 22.9 GREY CLAY GRVL SNDY 49.1 GREY SAND 54.9 GREY CLAY 60.0 GREY SAND 65.8 GREY SAND GRVL 82.9 GREY SAND GRVL 88.1 GREY CLAY SNDY GRVL 89.0
7049141	6 14	Jul-07	614264 4882863	229.8	22.9 Fr		10.7	55	60		1413 RA	WS DO	<b>MOE# 7049141 TAG#A060253</b> 0.0 BRWN CLAY HARD 5.2 GREY CLAY STNS HARD 18.3 BLCK SAND MSND 23.8
7051151	6 14	Aug-07	614306 4882832	227.7	22.9 Fr	22.9 -0.9	9.1	150	60		1413 RA	WS DO	<b>MOE# 7051151 TAG#A060272</b> 0.0 BRWN CLAY PCKD 6.4 GREY CLAY STNS HARD 19.8 GREY MSND 23.8
7104868	5 14	Mar-08	614199 4882860	229.8	25.9 Fr		11.6	91	180	13.1	4645 RC	WS DO	<b>MOE# 7104868 TAG#A022296</b> 0.0 BRWN CLAY STNS HARD 7.6 GREY CLAY SILT HARD 15.5 GREY CLAY HARD 22.3 GREY SAND LOOS 25.9
7107245	5 14	May-08	614181 4883101	228.3	25.9 Fr		4.9	27	180	24.1	4645 RC	WS DO	<b>MOE# 7107245 TAG#A062865</b> 0.0 BRWN CLAY HARD 7.9 GREY CLAY STNS HARD 21.6 BRWN SAND LOOS 25.9

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
7115769	5 14	Sep-08	614226 4883009	235.6	25.9 Fr	24.7 -1.2	12.2	23	60	19.8	4645 RC	WS DO	<b>MOE# 7115769 TAG#A071384</b> 0.0 BRWN CLAY STNS HARD 7.0 GREY CLAY HARD 19.5 GREY SAND LOOS 25.9
7115770	5 14	Sep-08	614305 4883079	231.0	25.9 Fr	24.7 -1.2	13.4	23	60	19.8	4645 RC	WS DO	<b>MOE# 7115770 TAG#A071379</b> 0.0 BRWN CLAY STNS HARD 9.1 GREY CLAY HARD 18.6 GREY SAND LOOS 25.9
7128920	5 14	Mar-08	614217 4883041	232.0	22.9 Fr		12.5	41	180	20.4	4645 RC	WS DO	<b>MOE# 7128920 TAG#A022293</b> 0.0 BRWN CLAY STNS HARD 7.9 GREY CLAY HARD 18.9 GREY SAND LOOS 22.9
7130793	5 14	Jul-09	614310 4883129	229.8	21.3 Un	21.3 -1.5	12.8	55	60	14.9	1663 RC	WS DO	<b>MOE# 7130793 TAG#A075139</b> 0.0 BRWN TPSL 0.6 BRWN CLAY GRVL 8.8 GREY CLAY GRVL SILT 18.3 GREY SILT 19.2 GREY SAND GRVL CLAY 20.7 GREY FSND 22.3 GREY FSND 23.2 GREY SAND SLTY 25.3
7130803	5 14	Jul-09	614299 4883106	229.2		27.1 -1.2	NR				1663 OTH	AS NU	<b>MOE# 7130803</b> 0.0
7140469	4 13	Sep-09	613638 4882276	232.6			NR				1663 OTH	AS NU	<b>MOE# 7140469</b> 0.0 BRWN TPSL 0.3 BRWN SAND FILL 1.8 YLLW 2.1 BRWN SAND 6.1 YLLW 13.4 YLLW 13.7
80101	5 14	Feb-12	614214 4883109	226.5	24.4 Fr	23.5 -0.9	11.3	45	60		1413 RC	WS DO	<b>MOE# 7180101 TAG#A124847</b> 0.0 BRWN CLAY HARD 5.2 GREY CLAY STNS HARD 21.3 BLCK SAND FGRD MGRD 24.4
7236235		Dec-14	613773 4882290	223.1	2.7 Un	24.4 -3.0	NR				7437 BR	AB Oth	<b>MOE# 7236235 TAG#A041126</b> 0.0
7236236		Dec-14	613771 4882286	223.1	9.1 Un		NR				7437 DG	AB Oth	<b>MOE# 7236236 TAG#A041125</b> 0.0
7236237		Dec-14	613780 4882279	222.8	4.0 Un		NR				7437 DG	AB Oth	<b>MOE# 7236237</b> 0.0
7294115	4 13	May-17	613845 4882309	220.1		31.4 -1.5	0.9	64	60	11.9	1663 RC	WS DO	<b>MOE# 7294115 TAG#A213043</b> 0.0 BRWN CLAY GRVL 0.6 BLCK TPSL 1.5 BRWN CLAY GRVL 4.3 GREY CLAY GRVL 22.3 GREY CLAY SILT 29.9 GREY CLAY 31.4 GREY FSND 32.9

QUALITY:

Fr Fresh  
Mn Mineral  
Sa Salty  
Su Sulphur  
-- Unrecorded

TYPE:

WS Water Supply  
AQ Abandoned Quality  
AS Abandoned Supply  
AB Abandonment Record  
TH Test Hole or Observation

USE:

CO Comercial  
DO Domestic  
MU Municipal  
PU Public  
ST Stock  
NU Not Used  
IR Irrigation  
AL Alteration  
MO Monitoring  
- Not Recorded

METHOD :

CT Cable Tool  
JT Jetting  
RC Rotary Conventional  
RA Rotary Air  
BR Boring

Easting and Northings UTM NAD 83 Zone 17, Translated from Recorded UTM NAD, subject to Field Verified Location or Improved Location Accuracy.

Records Copyright Ministry of Environment Queen's Printer. Selected information tabulated to metric with changes and corrections subject to Driller's Records.

**APPENDIX D**

**Borehole Logs and Well  
Completion Details and Grain  
Size Analysis Data**

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-29-2022 to Mar-29-2022

COMPILED BY FJ

BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	POCKET PEN. (C <sub>u</sub> ) (kPa)	NATURAL UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)										
	Ground Surface							20	40	60	80	100						GR SA SI CL
0.00	<b>TOPSOIL:</b> (500 mm)																	
0.50	<b>SILTY CLAY:</b> Brown to grey, trace gravel, cobble fragment, cohesive w<PL, stiff to hard.		1	SS	18													
1			2	SS	11													
			3	SS	10													
2																		
			4	SS	18													
			5	SS	34													
4.57	<b>SANDY CLAYEY SILT TILL:</b> Grey, trace gravel, cohesive w>PL, very stiff to hard.		6	SS	27													
5																		

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ s=3% Strain at Failure

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-29-2022 to Mar-29-2022

COMPILED BY FJ

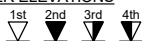
BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

[illegible]

## GROUNDWATER ELEVATIONS

### Measurement



GRAPH  
NOTES

+ 3, × 3: Numbers refer to Sensitivity

○  $\epsilon = 3\%$  Strain at Failure

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM



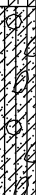
DATUM: UTM NAD , ZONE

Date: Mar-30-2022 to Mar-30-2022

COMPILED BY FJ

BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)		W <sub>p</sub> W W <sub>L</sub>				
0.00	Ground Surface <b>TOPSOIL:</b> (400 mm)													
0.40	<b>SILTY CLAY:</b> Brown, trace gravel, cohesive w<PL, soft to very stiff.		1	SS	7									
			2	SS	3									
			3	SS	17									
2.28	<b>CLAYEY SILT TILL:</b> Brown to grey, trace sand, trace gravel, cohesive w<PL, hard.		4	SS	31									
			5	SS	46									
			6	SS	46									
			7	SS	50/100mm									
6.20	<b>END OF BOREHOLE</b>  Notes: 1). Borehole was terminated due to auger refusal. 2). Upon completion of drilling, borehole had caved at 5.5 meters below ground surface (mbgs) and groundwater level was at approximately at 0.7 meters below ground surface (mbgs).													

## GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

## GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ s=3% Strain at Failure



PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-24-2022 to Mar-24-2022

COMPILED BY FJ

BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT					POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)				
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)											
								○ UNCONFINED	+	FIELD VANE & Sensitivity	×	LAB VANE							
								20	40	60	80	100	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT						
								W <sub>p</sub> W                      W <sub>L</sub>					WATER CONTENT (%)						
0.00	Ground Surface <b>TOPSOIL:</b> (500 mm)															GR	SA	SI	CL
0.50	<b>SILTY CLAY:</b> Brown, cohesive w~PL, firm to very stiff.		1	SS	4														
1			2	SS	15														
			3	SS	13														
2																			
			4	SS	17														
			5	SS	30														
			6	SS	20														
6.10	<b>CLAYEY SILT TILL:</b> Grey, trace gravel, trace sand, cohesive w~PL, very stiff to hard.		7	SS	23														
																			</

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH  
NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ s=3% Strain at Failure

Equipment: Drill Tech Geoprobe 420M

[illegible]

○ **ε**=3% Strain at Failure

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-23-2022 to Mar-23-2022

COMPILED BY FJ

BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

[illegible]

Continued Next Page

## GROUNDWATER ELEVATIONS

## Measurement

1st      2nd      3rd      4th

GRAPH  
NOTES

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

○  **$\epsilon=3\%$**  Strain at Failure

Equipment: Drill Tech Geoprobe 420M

[illegible]

○ **ε**=3% Strain at Failure

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-25-2022 to Mar-25-2022

COMPILED BY FJ

BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT			POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)			
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)					WATER CONTENT (%)					GR	SA	SI	CL
								○ UNCONFINED      + FIELD VANE & Sensitivity ● QUICK TRIAXIAL      × LAB VANE													
0.00	Ground Surface <b>TOPSOIL:</b> (450 mm)							20	40	60	80	100	10	20	30						
0.45	<b>SILTY SAND:</b> Brown, trace gravel, wet, compact.		1	SS	16																
			2	SS	19																
				3	SS	21															
2.28	<b>SAND:</b> Brown, some silt, trace to some gravel, cobble fragment, moist to wet, dense.		4	SS	39																
2.74	<b>CLAYEY SILT TILL:</b> Grey, trace gravel, cohesive w<PL, very stiff to hard.																				
			5	SS	28																
				6	SS	64															
			7	SS	30																
			8	SS50/270mm																	

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH  
NOTES+ 3, × 3: Numbers refer  
to Sensitivity

○ s=3% Strain at Failure

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-25-2022 to Mar-25-2022

COMPILED BY FJ

BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

[illegible]

## GROUNDWATER ELEVATIONS

## Measurement

1st 2nd 3rd 4th

GRAPH  
NOTES

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

○ **ε**=3% Strain at Failure

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-29-2022 to Mar-29-2022

COMPILED BY FJ

BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT		NATURAL MOISTURE CONTENT		LIQUID LIMIT		POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)		W <sub>p</sub>		W		W <sub>L</sub>				
								○ UNCONFINED + FIELD VANE & Sensitivity ● QUICK TRIAXIAL × LAB VANE										
0.00	Ground Surface <b>TOPSOIL:</b> (450 mm)							20 40 60 80 100										GR SA SI CL
0.45	<b>SILTY CLAY:</b> Brown to grey, cohesive w<PL to w>PL, soft to very stiff.		1	SS	10													
1			2	SS	7													
		----- w>PL		3	SS	3												
2				4	SS	15												
		----- no soil sample recovery																
3																		
	----- grey		5	SS	16													
4																		
5			6	SS	7													
6																		
6.10	<b>SANDY CLAYEY SILT TILL:</b> Grey, trace gravel, cobbles fragment, cohesive w<PL, hard.		7	SS	56													
7																		
8			8	SS	89													

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH  
NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ s=3% Strain at Failure

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-29-2022 to Mar-29-2022

COMPILED BY FJ

BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

[illegible]

### GROUNDWATER ELEVATIONS

## Measurement

1st 2nd 3rd 4th

GRAPH  
NOTES

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

○  $\epsilon = 3\%$  Strain at Failure



PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-23-2022 to Mar-23-2022

COMPILED BY FJ

BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	POCKET PEN. (C <sub>u</sub> ) (kPa)	NATURAL UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
	Ground Surface							20 40 60 80 100							GR SA SI CL
0.00	<b>TOPSOIL:</b> (250 mm)														
0.25	<b>SILTY CLAY:</b> Brown, trace sand, trace gravel, cobble fragment, cohesive w~PL, firm to hard.		1	SS	6										
			2	SS	7										
			3	SS	17										
			4	SS	20										
			5	SS	38										
4.57	<b>SILTY SAND:</b> Brown, trace gravel, rock fragments, moist, very dense.		6	SS50/152mm											
			7	SS50/25mm											
7.69	<b>END OF BOREHOLE</b>		8	SS50/25mm											
	Notes:														

Notes:

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

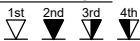
○ s=3% Strain at Failure

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision										REF. NO.: 22517668					
CLIENT: Bradford Highlands Joint Venture										Method: Solid Stem Auger				ENCL NO.:	
PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario										Diameter: 152 mm				ORIGINATED BY PM	
DATUM: UTM NAD , ZONE										Date: Mar-23-2022 to Mar-23-2022				COMPILED BY FJ	
BH LOCATION:										Equipment: Drill Tech Geoprobe 420M					

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)	
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE			"N" BLOWS 0.3 m	20	40	60	80	100	W <sub>p</sub>	W				W <sub>L</sub>
	Continued																	
	1). Upon completion of drilling, borehole had caved at 5.4 meter below ground surface (mbgs).																	

GROUNDWATER ELEVATIONS

Measurement

GRAPH  
NOTES+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

○ s=3% Strain at Failure

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM


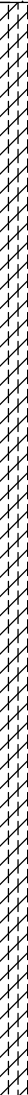

DATUM: UTM NAD , ZONE

Date: Mar-24-2022 to Mar-24-2022

COMPILED BY FJ

BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	*N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)										
								○ UNCONFINED      + FIELD VANE ● QUICK TRIAXIAL      × LAB VANE										
0.00	Ground Surface <b>TOPSOIL:</b> (300 mm)																	
0.30	<b>SILTY CLAY:</b> Brown to grey, trace sand, cohesive w<PL, firm to hard.		1	SS	6													
			2	SS	7													
			3	SS	15													
			4	SS	29													
			5	SS	34													
			6	SS	97													
6.10	<b>SILTY SAND:</b> Grey, trace gravel, moist to wet, very dense.		7	SS	50/101mm													
			8	SS	50													
7.75	<b>END OF BOREHOLE</b>																	

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH  
NOTES+ 3, × 3: Numbers refer  
to Sensitivity

○ s=3% Strain at Failure

Equipment: Drill Tech Geoprobe 420M

[illegible]

○ **ε**=3% Strain at Failure

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-23-2022 to Mar-23-2022

COMPILED BY FJ

BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	POCKET PEN. (C <sub>u</sub> ) (kPa)	NATURAL UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)	
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)								WATER CONTENT (%)
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE & Sensitivity × LAB VANE							
0.00	Ground Surface <b>TOPSOIL:</b> (450 mm)							20 40 60 80 100							GR SA SI CL	
0.45	<b>SILTY CLAY:</b> Brown, trace sand, trace organics, cohesive w<PL, firm.		1	SS	4											
			2	SS	4											
			3	SS	6											
			4	SS	8											
3.04	<b>CLAYEY SILT TILL:</b> Brown to grey, trace sand, trace gravel, cohesive w<PL to w~PL, very stiff to hard.		5	SS	17											
			6	SS	34											
			7	SS	24											
			8	SS	28											

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH  
NOTES+ 3, × 3: Numbers refer  
to Sensitivity

○ s=3% Strain at Failure

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-23-2022 to Mar-23-2022

COMPILED BY FJ

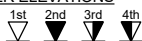
BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT   NATURAL MOISTURE CONTENT   LIQUID LIMIT			POCKET PEN (Cu) (kPa)	NATURAL UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa) ○ UNCONFINED   + FIELD VANE & Sensitivity ● QUICK TRIAXIAL   × LAB VANE					WATER CONTENT (%) w <sub>p</sub> w   w <sub>L</sub>					
	Continued																	
	<b>CLAYEY SILT TILL:</b> Brown to grey, trace sand, trace gravel, cohesive w<PL to w~PL, very stiff to hard.(Continued)																	
			9	SS50/101mm														
			10	SS50/127mm														
10.80	<b>END OF BOREHOLE</b>  Notes: 1). A 50mm diameter monitoring well was installed with screens from 7.62 mbgs to 10.67 mbgs.																	

## GROUNDWATER ELEVATIONS

### Measurement



GRAPH  
NOTES

+ 3, × 3: Numbers refer to Sensitivity

○  $\epsilon = 3\%$  Strain at Failure

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-26-2022 to Mar-26-2022

COMPILED BY      FJ

BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

[illegible]

Continued Next Page

## GROUNDWATER ELEVATIONS

	1st	2nd	3rd	4th
Measurement				

GRAPH  
NOTES

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

○  **$\epsilon = 3\%$**  Strain at Failure

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-26-2022 to Mar-26-2022

COMPILED BY FJ

BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

[illegible]

### GROUNDWATER ELEVATIONS

	1st	2nd	3rd	4th
Measurement				

GRAPH  
NOTES

+ 3, × 3: Numbers refer to Sensitivity

○  $\epsilon = 3\%$  Strain at Failure



PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-29-2022 to Mar-29-2022

COMPILED BY FJ





BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

[illegible]

Continued Next Page

## GROUNDWATER ELEVATIONS

	1st	2nd	3rd	4th
Measurement				

GRAPH  
NOTES

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

○  **$\epsilon=3\%$**  Strain at Failure

Equipment: Drill Tech Geoprobe 420M

[illegible]

○ **ε**=3% Strain at Failure

Equipment: Drill Tech Geoprobe 420M

[illegible]

1st 2nd 3rd 4th

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-28-2022 to Mar-28-2022

COMPILED BY FJ

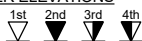
BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

[illegible]

### GROUNDWATER ELEVATIONS

### Measurement



GRAPH  
NOTES

**+<sup>3</sup>, ×<sup>3</sup>:** Numbers refer to Sensitivity

○  $\epsilon = 3\%$  Strain at Failure

Equipment: Drill Tech Geoprobe 420M

[illegible]

○  **$\epsilon=3\%$**  Strain at Failure

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-28-2022 to Mar-28-2022

COMPILED BY FJ

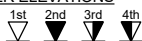
BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

[illegible]

## GROUNDWATER ELEVATIONS

### Measurement



GRAPH  
NOTES

+ 3, × 3: Numbers refer to Sensitivity

○  $\epsilon = 3\%$  Strain at Failure



Equipment: Drill Tech Geoprobe 420M

[illegible]

○ **ε**=3% Strain at Failure



PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-23-2022 to Mar-23-2022

COMPILED BY FJ

BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT   NATURAL MOISTURE CONTENT   LIQUID LIMIT		POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)		W <sub>p</sub> W                      W <sub>L</sub>				
								○ UNCONFINED                      + FIELD VANE & Sensitivity	20   40   60   80   100		WATER CONTENT (%)			
						● QUICK TRIAXIAL                      × LAB VANE	20   40   60   80   100		10   20   30					
0.00	Ground Surface <b>TOPSOIL:</b> (410 mm)													
0.41	<b>SILTY CLAY:</b> Brown, cohesive w<PL, soft to very stiff.  grey, w~PL		1	SS	4									
			2	SS	10									
			3	SS	16									
			4	SS	50									
2.59	<b>CLAYEY SILT TILL:</b> Grey, trace gravel, trace sand, cobble fragments, cohesive w<PL, very stiff to hard.													
			5	SS	51									
			6	SS	24									
			7	SS	83									
7.62	<b>SILTY SAND:</b> Grey, moist to wet, very dense.		8	SS	78									

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ s=3% Strain at Failure

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-23-2022 to Mar-23-2022

COMPILED BY FJ

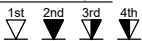
BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	POCKET PEN. (GPa) (MPa)	NATURAL UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)						
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)									WATER CONTENT (%)			GR	SA	SI	CL
								20	40	60	80						100	w <sub>p</sub>	w	w <sub>L</sub>			
	Continued																						
8.10	END OF BOREHOLE																						
<div>Notes:</div> <div>1). Upon completion of drilling, borehole had caved at 5.2 meters below ground surface (mbgs).</div>																							

### GROUNDWATER ELEVATIONS

### Measurement



GRAPH  
NOTES

**+<sup>3</sup>, ×<sup>3</sup>:** Numbers refer to Sensitivity

○  **$\epsilon=3\%$**  Strain at Failure

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-23-2022 to Mar-23-2022

COMPILED BY FJ

BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

[illegible]

Continued Next Page

## GROUNDWATER ELEVATIONS

## Measurement

1st 2nd 3rd 4th

GRAPH  
NOTES

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

○  **$\epsilon=3\%$**  Strain at Failure

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-23-2022 to Mar-23-2022

COMPILED BY FJ

BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

[illegible]

## GROUNDWATER ELEVATIONS

### Measurement

1st 2nd 3rd 4th

GRAPH  
NOTES

+ 3, × 3: Numbers refer to Sensitivity

○  $\epsilon = 3\%$  Strain at Failure

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-25-2022 to Mar-25-2022

COMPILED BY FJ

BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT   NATURAL MOISTURE CONTENT   LIQUID LIMIT			POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)			
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)					WATER CONTENT (%)					GR	SA	SI	CL
								20   40   60   80   100					W <sub>p</sub> W                      W <sub>L</sub>								
0.00	Ground Surface <b>TOPSOIL:</b> (300 mm)																				
0.30	<b>SILTY CLAY:</b> Brown to grey, trace gravel, trace rootlets, cohesive w<PL, soft to very stiff.		1	SS	3																
			2	SS	6																
			3	SS	16																
			4	SS	17																
	<b>grey</b>		5	SS	11																
			6	SS	16																
6.09	<b>SANDY CLAYEY SILT TILL:</b> Grey, trace gravel, cohesive w<PL, hard.		7	SS	55																
			8	SS	60																

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ s=3% Strain at Failure

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-25-2022 to Mar-25-2022

COMPILED BY FJ

BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

SOIL PROFILE				SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			POCKET PEN. (Gs) (kPa)	NATURAL UNIT WT (kNm <sup>-3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)			
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	SHEAR STRENGTH (kPa)				WATER CONTENT (%)			GR	SA	SI			CL			
												20							40	60	80
Continued																					
8.02	END OF BOREHOLE																				
Notes: 1). Upon completion of drilling, borehole had caved at 7.3 meter below ground surface (mbgs) and borehole was dry.																					

### GROUNDWATER ELEVATIONS

## Measurement

1st 2nd 3rd 4th

GRAPH  
NOTES

+ 3, × 3: Numbers refer to Sensitivity

○  $\epsilon = 3\%$  Strain at Failure

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-24-2022 to Mar-24-2022

COMPILED BY FJ

BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

[illegible]

Continued Next Page

## GROUNDWATER ELEVATIONS

## Measurement

1st 2nd 3rd 4th

GRAPH  
NOTES

**+3, ×3:** Numbers refer to Sensitivity

○  $\epsilon = 3\%$  Strain at Failure

PROJECT: GEOTECHNICAL INVESTIGATION For Proposed Residential Subdivision

REF. NO.: 22517668

CLIENT: Bradford Highlands Joint Venture

Method: Solid Stem Auger

ENCL NO.:

PROJECT LOCATION: 23 Brownlee Drive, Bradford, Ontario

Diameter: 152 mm

ORIGINATED BY PM

DATUM: UTM NAD , ZONE

Date: Mar-24-2022 to Mar-24-2022

COMPILED BY FJ

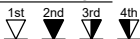
BH LOCATION:

Equipment: Drill Tech Geoprobe 420M

[illegible]

### GROUNDWATER ELEVATIONS

### Measurement



GRAPH  
NOTES

+ 3, × 3: Numbers refer to Sensitivity

○  $\epsilon = 3\%$  Strain at Failure



LOCATION: See Figure 2

## BORING DATE: March 11, 2016

DATUM: Geodetic

DEPTH SCALE  
1 : 50



LOGGED: CL  
CHECKED: NL

PROJECT: 1543120  
LOCATION: See Figure 2




# RECORD OF BOREHOLE: BH10

SHEET 1 OF 1  
DATUM: Geodetic

BORING DATE: March 15, 2016

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

GTA-BHS 001 S:\CLIENTS\GERANIUM\HIGHLAND\_GOLF\COURSE\_BRADFORD\02\_DATA\GINT\1543120-BG-0002.GPJ GAL-MIS.GDT 2-15-17 STB

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION						
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT											
								20		40		60		80				10 <sup>-5</sup>		10 <sup>-4</sup>		10 <sup>-3</sup>	
								nat V. rem V.		+ ⊕		Q - U -		● ○				Wp		W		WI	
0		GROUND SURFACE		237.49				20	40	60	80		10	20	30	40							
	Buggy Mount D-90 4" OD Solid Stem Auger	TOPSOIL		0.00 237.29																			
		(CL/ML) SILTY CLAY to CLAYEY SILT, trace sand; light brown; cohesive, w>PL to w~PL, stiff		0.20	1	DO	8									○							
1																	○						
2																							
3																							
		(CL) SILTY CLAY and SAND to sandy CLAY, trace to some gravel; greyish-brown, (TILL); cohesive, w~PL, very stiff to hard		234.39 3.10	5	DO	16								⊖			MH					
4																							
5		End of Borehole		232.77 4.72	6	DO	50/ 152 mm								○			MH					
		NOTE:  1. Groundwater measured at a depth of 4.5 m below existing grade in open borehole upon completion of drilling March 15, 2016.																					
6																							
7																							
8																							
9																							
10																							

DEPTH SCALE

1 : 50



LOGGED: CL  
CHECKED: NL

PROJECT: 1543120  
LOCATION: See Figure 2

# RECORD OF BOREHOLE: BH11

BORING DATE: March 16, 2016

SHEET 1 OF 1  
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m												
								SHEAR STRENGTH Cu, kPa		nat V. + rem V. ⊕		Q - ● U - ○		WATER CONTENT PERCENT					
								20	40	60	80	10 <sup>-6</sup>	10 <sup>-5</sup>	10 <sup>-4</sup>	10 <sup>-3</sup>			Wp	W
		GROUND SURFACE		233.55															
0	Buggy Mount D-90 8" OD Hollow Stem Auger	TOPSOIL		0.00	1	DO	12									Casing Silica Sand			
		(ML/CL) CLAYEY SILT to SILTY CLAY, trace gravel, trace to some sand; brown to mottled brown to brownish-grey to grey; cohesive, w>PL to w~PL, stiff to very stiff		233.14															
				0.41															
1																			
2																Hole Plug			
3																			
4																			

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DEPTH SCALE  
1 : 50



LOGGED: CL  
CHECKED: NL


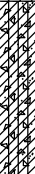

PROJECT: 1543120  
LOCATION: See Figure 2

# RECORD OF BOREHOLE: BH12

SHEET 1 OF 1  
DATUM: Geodetic

BORING DATE: March 15, 2016

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m										
								SHEAR STRENGTH Cu, kPa		nat V. + Q - ● rem V. ⊕ U - ○		WATER CONTENT PERCENT					
								20	40	60	80	10 <sup>-6</sup>	10 <sup>-5</sup>	10 <sup>-4</sup>	10 <sup>-3</sup>		
								20	40	60	80	10	20	30	40		
0		GROUND SURFACE		228.74													
	Buggy Mount D-90 8" OD Solid Stem Auger	TOPSOIL		0.00													
				228.23	1	DO	6										
		(CL) SILTY CLAY, trace to some sand, trace to some gravel, cobble fragments; greyish-brown, oxidation staining, (TILL); cohesive, w~PL to w>PL, very stiff to hard		0.51													
1					2	DO	16										
2		(CL) SILTY CLAY and SAND, trace to some gravel; greyish-brown, (TILL); cohesive, w~PL, hard		1.70	3A	DO	46										
					3B												
					4	DO	50/ 127 mm										
3																	

DEPTH SCALE

1 : 50



LOGGED: CL  
CHECKED: NL

GTA-BHS 001 S:\CLIENTS\GERANIUM\HIGHLAND\_GOLF\COURSE\_BRADFORD\02\_DATA\GINT\1543120-BG-0002.GPJ GAL-MIS.GDT 2-15-17 STB

PROJECT: 1543120  
LOCATION: See Figure 2

# RECORD OF BOREHOLE: BH13

SHEET 1 OF 1  
DATUM: Geodetic

BORING DATE: March 21, 2016

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m										
								SHEAR STRENGTH Cu, kPa		nat V. + rem V. ⊕		Q - U -		WATER CONTENT PERCENT			
								20	40	60	80	10 <sup>-6</sup>	10 <sup>-5</sup>	10 <sup>-4</sup>	10 <sup>-3</sup>		
												Wp ———— W ———— WI					
								20	40	60	80	10	20	30	40		
0		GROUND SURFACE		228.16													
	D-25 RT 4 1/4" OJD Hollow Stem Auger	TOPSOIL		0.00													
					1	DO	8										
					227.47												
					0.69												
1			(CL) sandy CLAY, trace gravel, trace to some sand; brown to greyish-brown, (TILL); cohesive, w~PL to w<PL, stiff to very stiff			2	DO	8									
2		(SM/SP-GW) SILTY SAND to SAND and GRAVEL; greyish-brown, (TILL); non-cohesive, moist to wet, dense		226.03													
				2.13													
3		(CL) SILTY CLAY and SAND, some gravel; greyish-brown, (TILL); cohesive, w~PL, hard		225.26													
				2.90													

DEPTH SCALE

1 : 50



LOGGED: CL

CHECKED: NL

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PROJECT: 1543120  
LOCATION: See Figure 2

# RECORD OF BOREHOLE: BH14

SHEET 1 OF 1  
DATUM: Geodetic

BORING DATE: March 21, 2016

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m											
								SHEAR STRENGTH Cu, kPa		nat V. + Q - rem V. ⊕ U - ⊙		WATER CONTENT PERCENT						
												Wp ⊔ — ⊙ W — ⊔ WI						
		GROUND SURFACE		220.48 0.00				20	40	60	80	10 <sup>-6</sup>	10 <sup>-5</sup>	10 <sup>-4</sup>	10 <sup>-3</sup>			
0	D-25 RT 4 1/4" O/D Hollow Stem Auger	Mixed SILTY CLAY and TOPSOIL			1	DO	7									Casing Silica Sand 8-Dec-2016		
		(CL) SILTY CLAY, trace sand; mottled brown to greyish-brown to brown, oxidation; cohesive, w>PL to w<PL, stiff to hard																
1				2	DO	14												
2				3	DO	21												
3				4	DO	37												
4																		
5					6	DO	17											
6																		
7		End of Borehole		213.93 6.55														
		NOTES:  1. Groundwater measured at a depth of 1.6 m below existing grade in open borehole upon completion of drilling March 21, 2016. 2. Groundwater measured at a depth of 0.7 m below existing grade September 12, 2016. 3. Grounwater measuted at a depth of 0.2 m below existing grade on December 8, 2016.																
8																		
9																		
10																		

DEPTH SCALE  
1 : 50



LOGGED: CL  
CHECKED: NL

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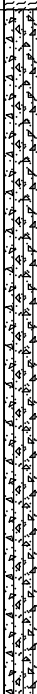
PROJECT: 1543120  
LOCATION: See Figure 2

# RECORD OF BOREHOLE: BH15

SHEET 1 OF 1  
DATUM: Geodetic

BORING DATE: March 22, 2016

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa		nat V. + Q - rem V. ⊕ U - ●		WATER CONTENT PERCENT						
								20	40	60	80	10 <sup>-6</sup>	10 <sup>-5</sup>	10 <sup>-4</sup>	10 <sup>-3</sup>			Wp
0		GROUND SURFACE		224.54				20	40	60	80	10	20	30	40			
	D-25 RT 4 1/4" O/D Hollow Stem Auger	TOPSOIL		0.00	1A	DO	4											
		(CL) SILTY CLAY and SAND, some gravel; brown to mottled brown-grey, (TILL); cohesive, w~PL, very stiff to hard		224.06	1B													
				0.48														
1				2	DO	25												
2				3	DO	50												
					4	DO	50/ 127 mm											
3					5	DO	65											
4																		
					6	DO	82											
5		End of Borehole		219.51 5.03														
		NOTE:  1. Groundwater measured at a depth of 1.5 m below existing grade in open borehole upon completion of drilling March 22, 2016.																
6																		
7																		
8																		
9																		
10																		

DEPTH SCALE

1 : 50



LOGGED: CL

CHECKED: NL

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PROJECT: 1543120  
LOCATION: See Figure 2

# RECORD OF BOREHOLE: BH16

BORING DATE: March 21, 2016

SHEET 1 OF 1  
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m											
								SHEAR STRENGTH Cu, kPa		nat V. + Q - rem V. ⊕ U - ⊙		WATER CONTENT PERCENT						
								20	40	60	80	10 <sup>-6</sup>	10 <sup>-5</sup>	10 <sup>-4</sup>	10 <sup>-3</sup>			Wp
0		GROUND SURFACE		231.66														
	D-25 RT 4 1/4" O/D Hollow Stem Auger	TOPSOIL		0.00	1	DO	10									Casing Silica Sand		
		(ML/CL) CLAYEY SILT to SILTY CLAY, trace sand; mottled greyish-brown to grey; cohesive, w>PL to w<PL, stiff to very stiff																
1				2	DO	11												
				3	DO	21												Hole Plug
2				4	DO	27												
3				5	DO	21												Silica Sand
4																		
					6	DO	20									10 Slot PVC Screen		
5																		
6																		
					7	DO	21											
7		End of Borehole		225.11														
		NOTES: 1. Groundwater measured at a depth of 1.5 m below existing grade in open borehole upon completion of drilling March 21, 2016. 2. Groundwater measured at a depth of 2.8 m below existing grade September 12, 2016. 3. Grounwater measured at a depth of 4.0 m below existing grade December 8, 2016.		6.55														
8																		
9																		
10																		

DEPTH SCALE  
1 : 50



LOGGED: CL  
CHECKED: NL

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PROJECT: 1543120  
LOCATION: See Figure 2

# RECORD OF BOREHOLE: BH17

SHEET 1 OF 1  
DATUM: Geodetic

BORING DATE: March 23, 2016

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								nat V. + Q - rem V. ⊕ U - ●				Wp — W — WI					
								20	40	60	80	10 <sup>-6</sup>	10 <sup>-5</sup>	10 <sup>-4</sup>	10 <sup>-3</sup>		
0		GROUND SURFACE		235.02													
	D-25 RT 4 1/4" O/D Hollow Stem Auger	TOPSOIL		0.00	1A	DO	7										
		(CL/ML) SILTY CLAY to CLAYEY SILT, trace sand, trace gravel; mottled brown to grey, oxidation; cohesive, w~PL to w>PL, firm to very stiff		234.51	1B												
1																	
2		Coarse sand seams at 1.8 and 1.9 mbgs															
3																	
4		(ML) sandy SILT, trace gravel; grey; non-cohesive, wet, very dense		230.98													
				4.04													
5		End of Borehole		230.19	6	DO	50/ 102 mm										
				4.83													
6		NOTE: 1. Groundwater measured at a depth of 1.1 m below existing grade in open borehole upon completion of drilling March 23, 2016.															
7																	
8																	
9																	
10																	

DEPTH SCALE

1 : 50



LOGGED: CL  
CHECKED: NL

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PROJECT: 1543120  
LOCATION: See Figure 2

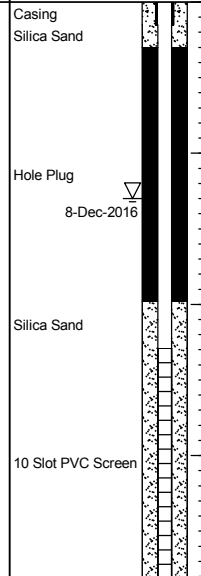
# RECORD OF BOREHOLE: BH18

SHEET 1 OF 1  
DATUM: Geodetic

BORING DATE: March 23, 2016

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m											
								SHEAR STRENGTH Cu, kPa		nat V. + rem V. ⊕		Q - ● U - ○		WATER CONTENT PERCENT				
								20	40	60	80		10 <sup>-6</sup>	10 <sup>-5</sup>	10 <sup>-4</sup>	10 <sup>-3</sup>		
													Wp	W	WI			
								20	40	60	80		10	20	30	40		
0		GROUND SURFACE		236.95														
	D-25 RT 4 1/4" O.D. Hollow Stem Auger	TOPSOIL		0.00														Casing Silica Sand
		(ML) CLAYEY SILT, trace sand, trace gravel; brownish-grey; cohesive, w~PL to w>PL, very stiff		236.52	1A	DO	11											
				0.43	1B													
1																		
						2	DO	23										
2																		
			Coarse sand seam at 1.9 mbgs			3	DO	29										
					234.75													
		(CL) sandy CLAY, trace to some gravel; mottled brown to grey, (TILL); cohesive, w~PL, hard		2.20	4	DO	80											
3																		
					5	DO	80											
4																		
					6	DO	54											
				232.68														
		End of Borehole on Refusal		4.27														
5		NOTES:  1. Groundwater measured at a depth of 0.9 m below existing grade in open borehole upon completion of drilling March 23, 2016. 2. Groundwater measured at a depth of 1.7 m below existing grade September 12, 2016. 3. Groundwater measured at a depth of 1.3 m below existing grade on December 8, 2016.																
6																		
7																		
8																		
9																		
10																		



DEPTH SCALE  
1 : 50



LOGGED: CL  
CHECKED: NL

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

PROJECT: 1543120  
LOCATION: See Figure 2

## RECORD OF BOREHOLE: BH19

BORING DATE: March 23, 2016

SHEET 1 OF 1  
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION							
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT											
								20		40		60		80			10 <sup>-5</sup>		10 <sup>-4</sup>		10 <sup>-3</sup>		
								nat V. + Q - rem V. ⊕ U - ⊙									Wp		W		WI		
0		GROUND SURFACE		241.21				20	40	60	80	10	20	30	40								
	D-25 RT 4" O.D. Solid Stem Auger	TOPSOIL		0.00	1A																		
		(CL) sandy SILTY CLAY, trace to some gravel; mottled brown grey to greyish brown, (TILL); cohesive, w<PL to w>PL, firm to very stiff		240.93	1B	DO	6																
1								2	DO	22													
						3	DO	21															
2		(SM) SILTY SAND, trace to some gravel; greyish brown, (TILL); non-cohesive, moist, very dense		239.08																			
							4	DO	72														
3							5	DO	93/ 279 mm														
4																							
				236.51	6	DO	50/ 127 mm																
5		End of Borehole		4.70																			
		NOTE:  1. Groundwater measured at a depth of 1.6 m below existing grade in open borehole upon completion of drilling March 23, 2016.																					
6																							
7																							
8																							
9																							
10																							

DEPTH SCALE

1 : 50



LOGGED: CL  
CHECKED: NL

PROJECT: 1543120  
LOCATION: See Figure 2

# RECORD OF BOREHOLE: BH2

BORING DATE: March 14, 2016

SHEET 1 OF 1  
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								nat V. + Q - rem V. ⊕ U - ○				Wp — W — WI					
								20	40	60	80	10 <sup>-6</sup>	10 <sup>-5</sup>	10 <sup>-4</sup>	10 <sup>-3</sup>		
		GROUND SURFACE		245.66													
0	Truck Mount CME 55 8" OD Hollow Stem Auger	TOPSOIL		0.00													
		FILL-(CL) SILTY CLAY, trace sand, trace to some gravel; brown; cohesive, w~PL, firm		0.15	1	DO	5										
		(CL) SILTY CLAY and SAND, trace to some gravel, cobble fragments; greyish-brown, (TILL); cohesive, w~PL, very stiff to hard		245.15													
				0.51													
1					2	DO	28										
					3	DO	35										
2																	
					4	DO	75										
3																	
				5	DO	90											
4				6	DO	95/ 279 mm											
				7	DO	50/ 51 mm											
5																	
				8	DO	50/ 102 mm											
		End of Borehole		240.22													
		NOTE:		5.44													
6		1. Groundwater measured at a depth of 3.2 m below existing grade in open borehole upon completion of drilling March 14, 2016.															
		2. Groundwater measured at a depth of 3.4 m below existing grade in monitoring well on December 8, 2016.															
7																	
8																	
9																	
10																	

DEPTH SCALE

1 : 50



LOGGED: CL

CHECKED: NL

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PROJECT: 1543120  
LOCATION: See Figure 2

# RECORD OF BOREHOLE: BH3

BORING DATE: March 11, 2016

SHEET 1 OF 1  
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION			
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m												
								SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT							
												Wp — W — Wi							
								20	40	60	80	10 <sup>-5</sup>	10 <sup>-5</sup>	10 <sup>-4</sup>	10 <sup>-3</sup>				
0		GROUND SURFACE		245.36															
	Buggy Mount D-90 8" OD Hollow Stem Auger	FILL-(SW/GP) SAND and GRAVEL, some silt, asphalt fragments; brown; non-cohesive, moist, compact  FILL-(CL) SILTY CLAY, some sand, some gravel; brown; cohesive, w>PL, stiff  (CL) SILTY CLAY and SAND, some gravel; brown to greyish-brown, (TILL); cohesive, w~PL, very stiff to hard		0.00	1A														
				0.08															
				244.95	1B	DO	14												
				0.41															
1																			
2																			

DEPTH SCALE

1 : 50



LOGGED: CL  
CHECKED: NL

LOCATION: See Figure 2

## BORING DATE: March 14, 2016

DATUM: Geodetic



LOGGED: CL  
CHECKED: NL




PROJECT: 1543120  
LOCATION: See Figure 2

# RECORD OF BOREHOLE: BH5

BORING DATE: March 15, 2016

SHEET 1 OF 1  
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m											
								SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT						
												Wp — W — Wi						
								20	40	60	80	10 <sup>-6</sup>	10 <sup>-5</sup>	10 <sup>-4</sup>	10 <sup>-3</sup>			
0	Truck Mount CME 55 8" OD Hollow Stem Auger	GROUND SURFACE		248.16														
		TOPSOIL		0.00	1	DO	3										Casing Silica Sand	
		FILL-(ML) CLAYEY SILT and SAND; light brown; cohesive, w<PL to w>PL, firm		247.65														
				0.51	2	DO	6											
1																		
						3	DO	6										
2			(CL) SILTY CLAY and SAND, some gravel; greyish-brown, (TILL); cohesive, w~PL to w>PL, hard		246.03													
		2.13			4	DO	46											
			Coarse sand seam at 2.6 mbgs			5	DO	56										
3																		
					6	DO	53											
4																		
5																		
6					7	DO	50/ 76 mm											
		End of Borehole		241.84														
		NOTES:  1. Groundwater measured at a depth of 3.4 m below existing grade in open borehole upon completion of drilling March 15, 2016. 2. Groundwater measured at a depth of 2.9 m below existing grade September 12, 2016. 3. Groundwater measured at a depth of 3.2 m below existing grade December 8, 2016.																
7																		
8																		
9																		
10																		

DEPTH SCALE  
1 : 50



LOGGED: CL  
CHECKED: NL

PROJECT: 1543120  
LOCATION: See Figure 2

# RECORD OF BOREHOLE: BH6

BORING DATE: March 15, 2016

SHEET 1 OF 1  
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m												
								SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT							
												Wp  -----  W  -----  WI							
		GROUND SURFACE		242.51				20	40	60	80	10 <sup>-6</sup>	10 <sup>-5</sup>	10 <sup>-4</sup>	10 <sup>-3</sup>				
0	Buggy Mount D-90 4" O/D Solid Stem Auger	TOPSOIL		0.00	1	DO	4												
		(CL) SILTY CLAY, trace sand; brown to mottled light brown; cohesive, w<PL to w~PL, stiff to very stiff		242.00															
				0.51															
1				2	DO	12													
2			(CL) SILTY CLAY and SAND, trace to some gravel, cobble fragments; greyish-brown to grey, (TILL); cohesive, w~PL, hard		240.38														
		2.13																	
					4	DO	49												
3																			
					5	DO	75/ 279 mm												
4																			
5																			
		End of Borehole		237.48															
				5.03															
6		NOTE:  1. Groundwater measured at a depth of 4.7 m below existing grade in open borehole upon completion of drilling March 15, 2016.																	
7																			
8																			
9																			
10																			

DEPTH SCALE  
1 : 50



LOGGED: CL  
CHECKED: NL

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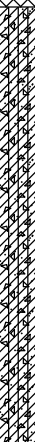
PROJECT: 1543120  
LOCATION: See Figure 2

# RECORD OF BOREHOLE: BH7

BORING DATE: March 15, 2016

SHEET 1 OF 1  
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m											
								SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT						
												Wp ——— W ——— WI						
		GROUND SURFACE		241.08				20	40	60	80	10 <sup>-6</sup>	10 <sup>-5</sup>	10 <sup>-4</sup>	10 <sup>-3</sup>			
0	Buggy Mount D-90 4" OD Solid Stem Auger	TOPSOIL		0.00	1	DO	8											
		FILL-(ML) CLAYEY SILT, trace sand; light brown; cohesive, w>PL, stiff		240.62														
				0.46														
1					2	DO	11											
					3	DO	11											
2			(CL) SILTY CLAY and SAND, trace to some gravel, cobble fragments; greyish-brown, (TILL); cohesive, w~PL, hard		238.95													
		2.13																
					4	DO	40											
3																		
		5			DO	50/ 127 mm												
4																		
5					6	DO	32											
		End of Borehole		236.05														
				5.03														
6		NOTE:  1. Groundwater measured at a depth of 4.2 m below existing grade in open borehole upon completion of drilling March 15, 2016.																
7																		
8																		
9																		
10																		

DEPTH SCALE

1 : 50



LOGGED: CL

CHECKED: NL

GTA-BHS 001 S:\CLIENTS\GERANIUM\HIGHLAND\_GOLF\COURSE\_BRADFORD\02\_DATA\GINT\1543120-BG-0002.GPJ GAL-MIS.GDT 2-15-17 STB

PROJECT: 1543120  
LOCATION: See Figure 2

# RECORD OF BOREHOLE: BH8

BORING DATE: March 10, 2016

SHEET 1 OF 1  
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m											
								SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT						
												Wp — W — Wi						
							20	40	60	80		10 <sup>-5</sup>	10 <sup>-5</sup>	10 <sup>-4</sup>	10 <sup>-3</sup>			
0		GROUND SURFACE		236.62 0.00														
	Buggy Mount D-90 8" OD Hollow Stem Auger	FILL-(CL) SILTY CLAY, trace sand, mixed organics; brown to light brown; cohesive, w<PL, firm to stiff			1	DO	7										Casing	
																		Hole Plug
1		(CL) sandy CLAY, trace to some gravel; mottled brown to brown to brownish-grey to grey, (TILL); cohesive, w>PL to w~PL, stiff to hard			2	DO	10											Silica Sand
2					3	DO	20											
					4	DO	64/ 254 mm											MH, BTEX, PHC
3					5	DO	88										10 Slot PVC Screen	
4					6	DO	50/ 152 mm										BTEX, PHC	
		End of Borehole		232.51 4.11														
		NOTES:  1. Groundwater measured at a depth of 2.2 m below existing grade in open borehole upon completion of drilling March 10, 2016. 2. Groundwater measured at a depth of 1.5 m below existing grade September 12, 2016. 3. Monitoring well unable to be accessed due to damaged well cover.																
5																		
6																		
7																		
8																		
9																		
10																		

DEPTH SCALE  
1 : 50



LOGGED: CL  
CHECKED: NL

LOCATION: See Figure 2

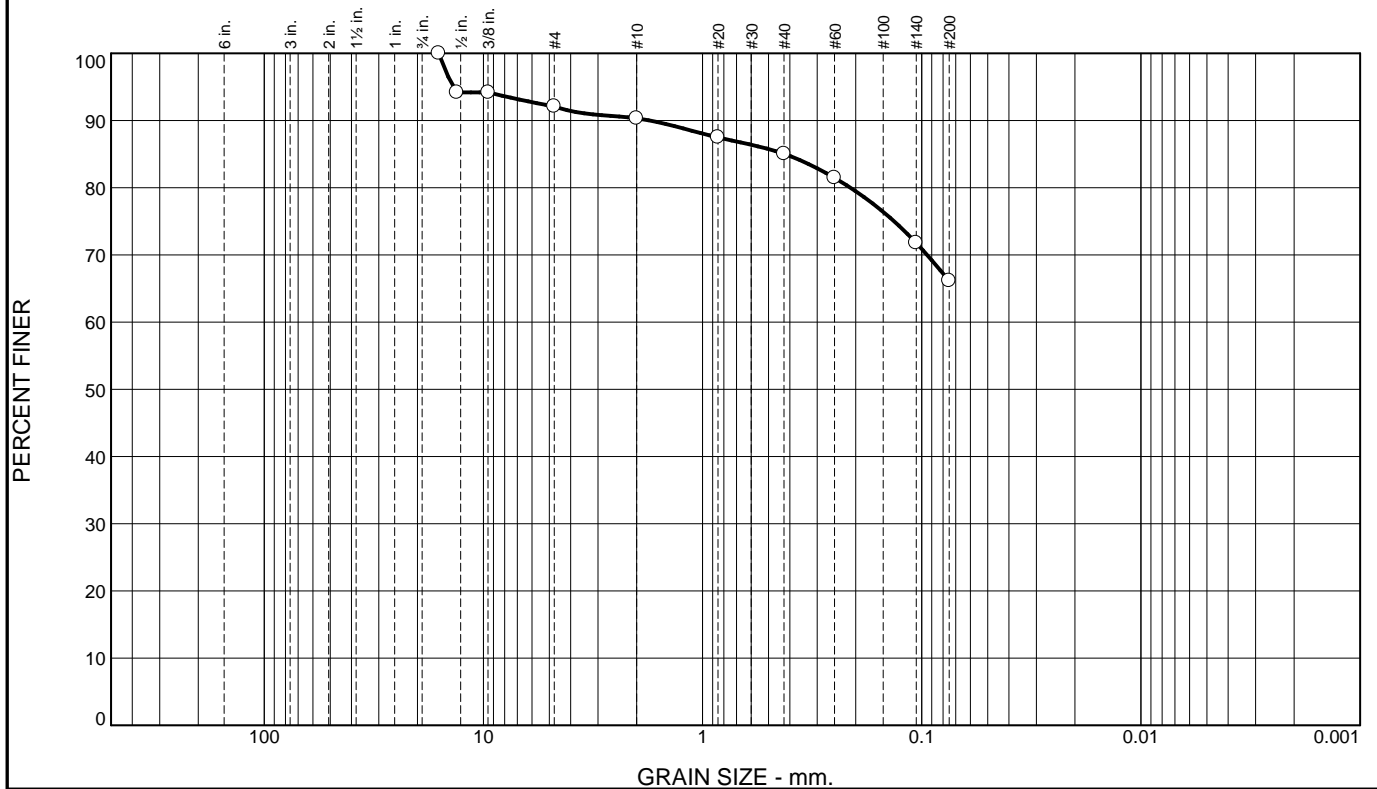
## BORING DATE: March 11, 2016

DATUM: Geodetic



LOGGED: CL  
CHECKED: NL

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.9	1.8	5.3	18.8	66.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
16mm	100.0		
13.2mm	94.2		
9.5mm	94.2		
4.75mm	92.1		
2mm	90.3		
0.850mm	87.5		
0.425mm	85.0		
0.250mm	81.5		
0.106mm	71.8		
0.075mm	66.2		

\* (no specification provided)

**Soil Description**

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>90</sub>= 1.7490      D<sub>85</sub>= 0.4224      D<sub>60</sub>=  
 D<sub>50</sub>=                      D<sub>30</sub>=                      D<sub>15</sub>=  
 D<sub>10</sub>=                      C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**  
 USCS=                      AASHTO=

**Remarks**

Location: BH22-4 SS6  
Sample Number: R1844

Date: 11/04/22



Client: Bradford Highlands Joint Venture  
Project: 221-02423-00 - 23 Brownlee Drive, Bradford, ON

Project No: 221-02423-00

Figure

Tested By: NM                      Checked By: MD

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	6.3	1.5	6.1	66.3	19.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
16mm	100.0		
13.2mm	94.8		
9.5mm	94.8		
4.75mm	93.7		
2mm	92.2		
0.850mm	90.3		
0.425mm	86.1		
0.250mm	70.5		
0.106mm	32.3		
0.075mm	19.8		

\* (no specification provided)

**Soil Description**

**Atterberg Limits**  
 PL=      LL=      PI=

**Coefficients**  
 D<sub>90</sub>= 0.6904      D<sub>85</sub>= 0.4008      D<sub>60</sub>= 0.1959  
 D<sub>50</sub>= 0.1579      D<sub>30</sub>= 0.0998      D<sub>15</sub>=  
 D<sub>10</sub>=      C<sub>u</sub>=      C<sub>c</sub>=

**Classification**  
 USCS=      AASHTO=

**Remarks**

Location: BH22-5 SS3  
Sample Number: R1844

Date: 11/04/22



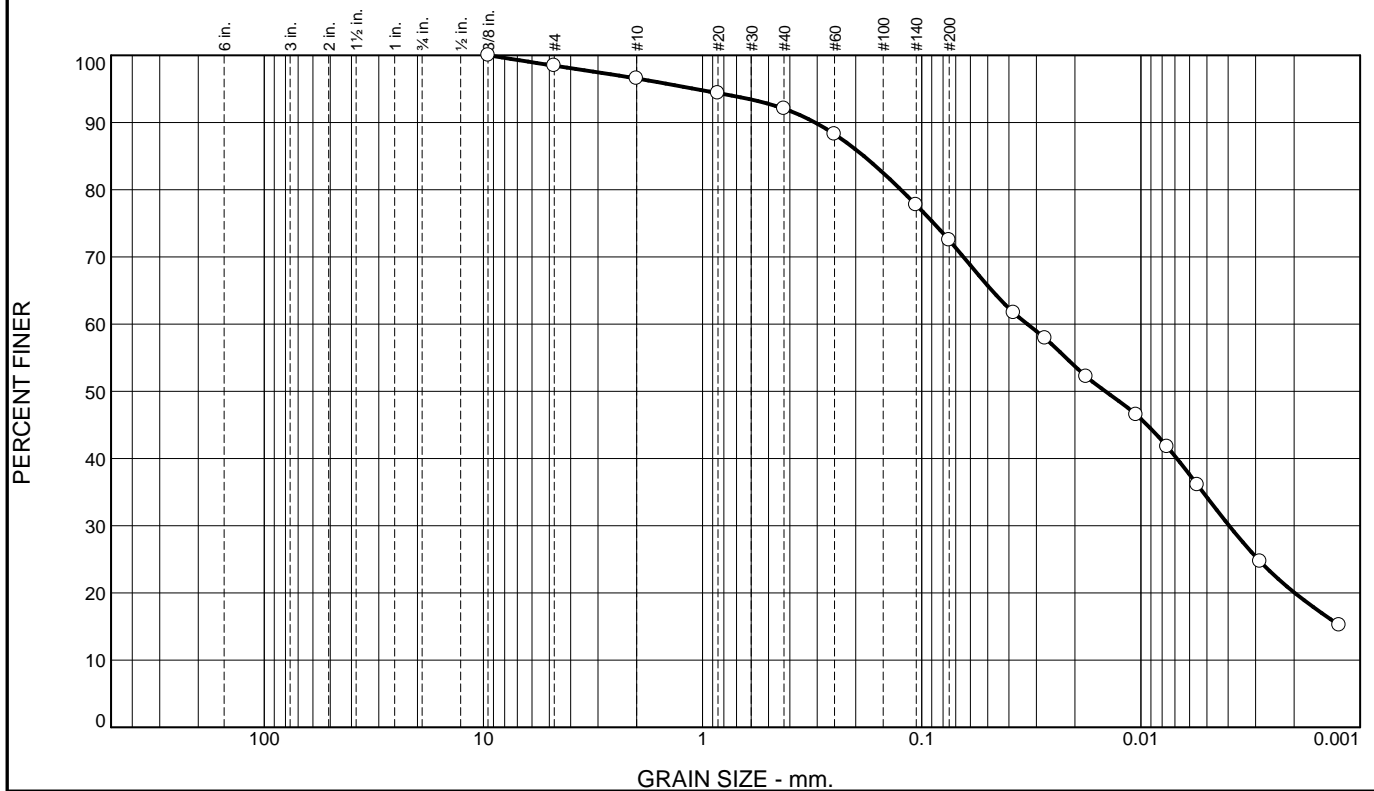
Client: Bradford Highlands Joint Venture  
Project: 221-02423-00 - 23 Brownlee Drive, Bradford, ON

Project No: 221-02423-00

Figure

Tested By: NM      Checked By: MD

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.6	1.9	4.5	19.5	38.3	34.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5mm	100.0		
4.75mm	98.4		
2mm	96.5		
0.850mm	94.4		
0.425mm	92.0		
0.250mm	88.3		
0.106mm	77.7		
0.075mm	72.5		
0.0380 mm.	61.7		
0.0274 mm.	57.9		
0.0178 mm.	52.2		
0.0105 mm.	46.5		
0.0076 mm.	41.8		
0.0055 mm.	36.1		
0.0029 mm.	24.7		
0.0012 mm.	15.2		

\* (no specification provided)

## Soil Description

PL= 12

### Atterberg Limits

LL= 20

PI= 8

D<sub>90</sub>= 0.3069  
D<sub>50</sub>= 0.0145  
D<sub>10</sub>=

### Coefficients

D<sub>85</sub>= 0.1838

D<sub>30</sub>= 0.0040

C<sub>u</sub>=

D<sub>60</sub>= 0.0330  
D<sub>15</sub>=  
C<sub>c</sub>=

USCS= CL

### Classification

AASHTO= A-4(3)

### Remarks

Location: BH22-2 SS4  
Sample Number: R1844

Date: 12/04/22



Client: Bradford Highlands Joint Venture  
Project: 221-02423-00 - 23 Brownlee Drive, Bradford, ON

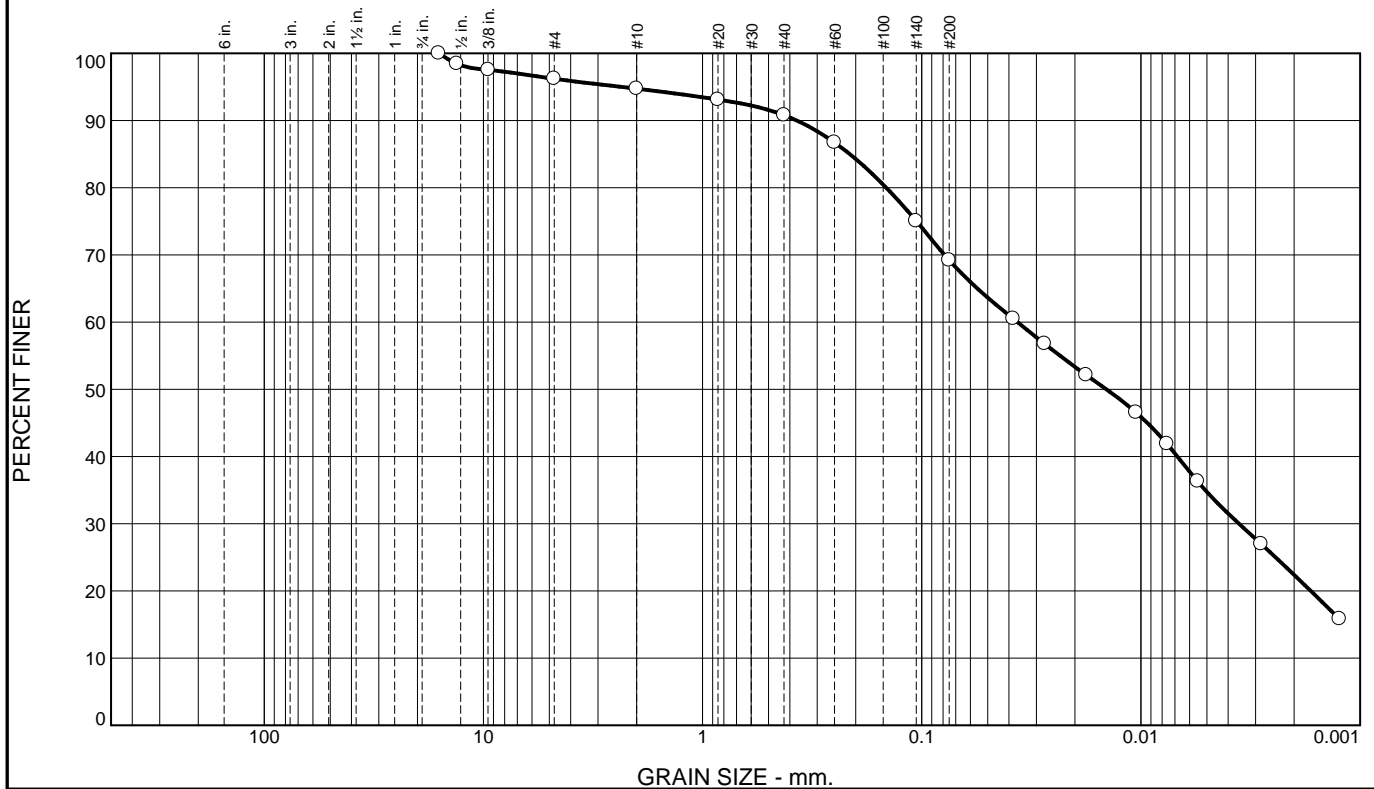
Project No: 221-02423-00

Figure

Tested By: NM

Checked By: MD

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.8	1.5	3.9	21.6	34.5	34.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
16mm	100.0		
13.2mm	98.4		
9.5mm	97.5		
4.75mm	96.2		
2mm	94.7		
0.850mm	93.1		
0.425mm	90.8		
0.250mm	86.7		
0.106mm	75.0		
0.075mm	69.2		
0.0382 mm.	60.5		
0.0275 mm.	56.8		
0.0178 mm.	52.1		
0.0105 mm.	46.5		
0.0076 mm.	41.9		
0.0055 mm.	36.3		
0.0028 mm.	27.0		
0.0012 mm.	15.8		

\* (no specification provided)

## Soil Description

PL= 11

## Atterberg Limits

LL= 18

PI= 7

D<sub>90</sub>= 0.3719  
D<sub>50</sub>= 0.0144  
D<sub>10</sub>=

## Coefficients

D<sub>85</sub>= 0.2131  
D<sub>30</sub>= 0.0036  
C<sub>u</sub>=

D<sub>60</sub>= 0.0366  
D<sub>15</sub>=  
C<sub>c</sub>=

USCS= CL-ML

## Classification

AASHTO= A-4(1)

## Remarks

Location: BH22-3 SS8  
Sample Number: R1844

Date: 12/04/22



Client: Bradford Highlands Joint Venture  
Project: 221-02423-00 - 23 Brownlee Drive, Bradford, ON

Project No: 221-02423-00

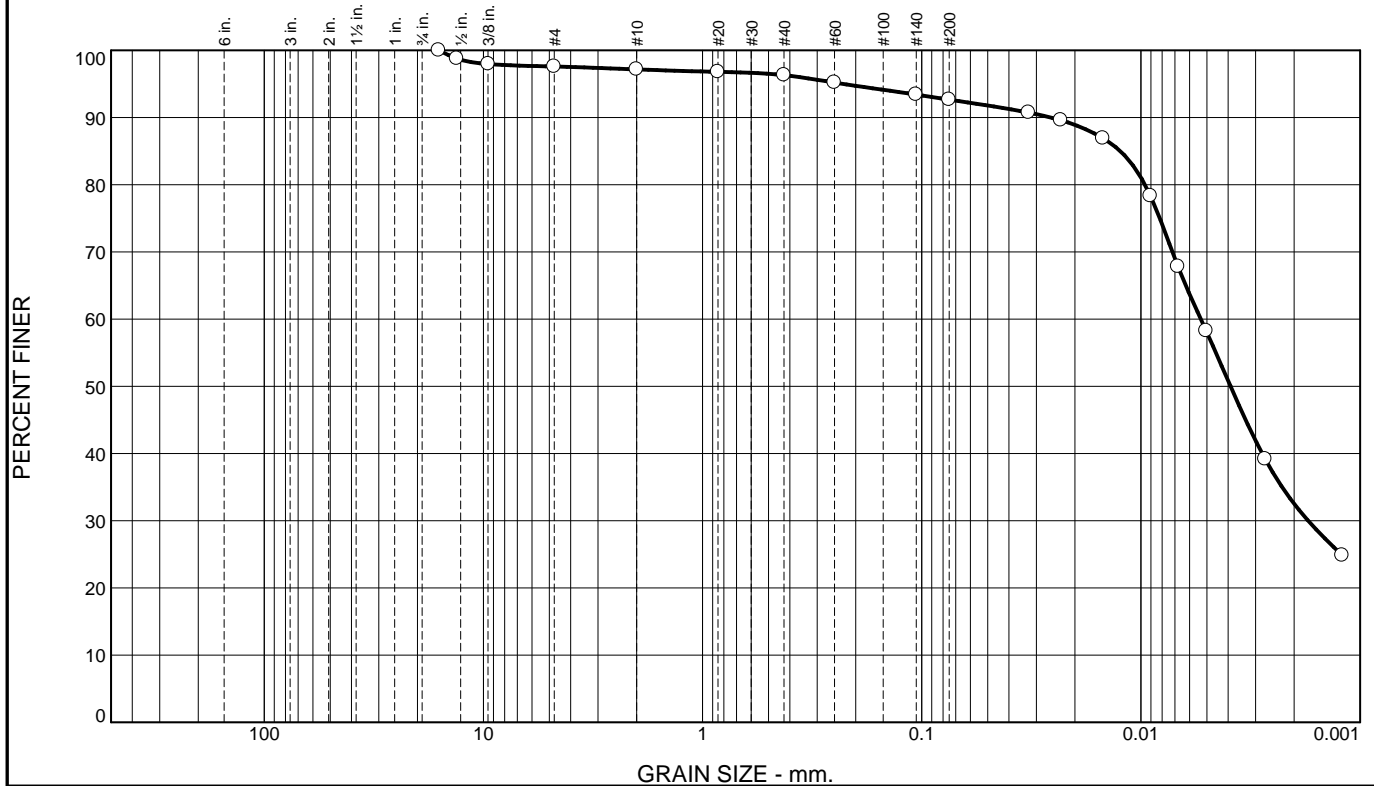
Figure

Tested By: NM

Checked By: MD



# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.4	0.4	0.9	3.7	34.6	58.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
16mm	100.0		
13.2mm	98.8		
9.5mm	98.0		
4.75mm	97.6		
2mm	97.2		
0.850mm	96.8		
0.425mm	96.3		
0.250mm	95.2		
0.106mm	93.4		
0.075mm	92.6		
0.0325 mm.	90.7		
0.0232 mm.	89.6		
0.0149 mm.	86.9		
0.0090 mm.	78.3		
0.0068 mm.	67.8		
0.0050 mm.	58.3		
0.0027 mm.	39.2		
0.0012 mm.	24.8		

\* (no specification provided)

## Soil Description

**Atterberg Limits**  
 PL= 16      LL= 26      PI= 10  
**Coefficients**  
 D<sub>90</sub>= 0.0258      D<sub>85</sub>= 0.0124      D<sub>60</sub>= 0.0053  
 D<sub>50</sub>= 0.0039      D<sub>30</sub>= 0.0017      D<sub>15</sub>=  
 D<sub>10</sub>=      C<sub>u</sub>=      C<sub>c</sub>=  
**Classification**  
 USCS= CL      AASHTO= A-4(8)

## Remarks

Location: BH22-5 SS5  
 Sample Number: R1844

Date: 12/04/22



Client: Bradford Highlands Joint Venture  
 Project: 221-02423-00 - 23 Brownlee Drive, Bradford, ON

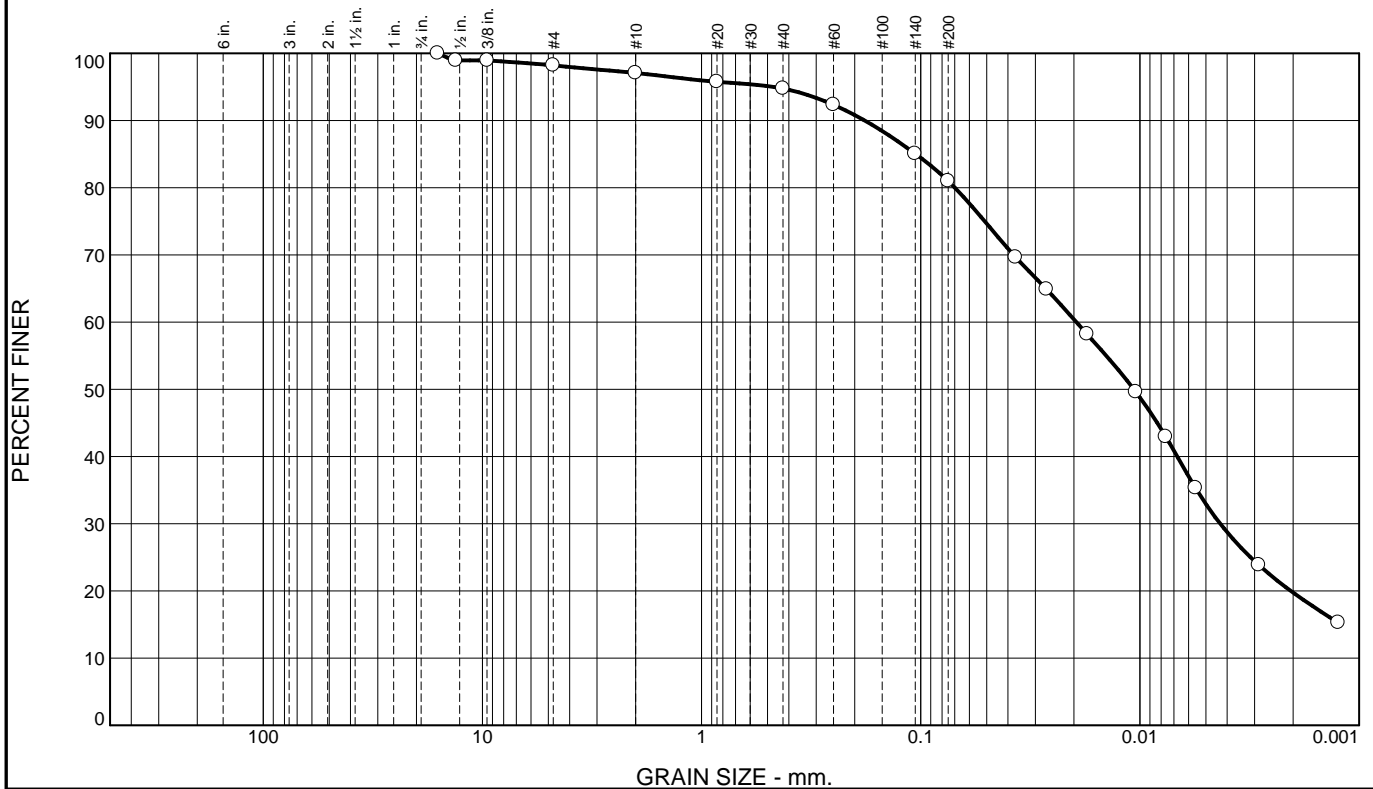
Project No: 221-02423-00

Figure

Tested By: NM

Checked By: MD

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.8	1.1	2.4	13.7	48.1	32.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
16mm	100.0		
13.2mm	98.9		
9.5mm	98.9		
4.75mm	98.2		
2mm	97.1		
0.850mm	95.8		
0.425mm	94.7		
0.250mm	92.3		
0.106mm	85.1		
0.075mm	81.0		
0.0369 mm.	69.6		
0.0267 mm.	64.9		
0.0174 mm.	58.2		
0.0104 mm.	49.6		
0.0076 mm.	42.9		
0.0056 mm.	35.3		
0.0029 mm.	23.9		
0.0012 mm.	15.3		

\* (no specification provided)

## Soil Description

PL= 12

## Atterberg Limits

LL= 19

PI= 7

D<sub>90</sub>= 0.1804

D<sub>50</sub>= 0.0107

D<sub>10</sub>=

## Coefficients

D<sub>85</sub>= 0.1055

D<sub>30</sub>= 0.0043

C<sub>u</sub>=

D<sub>60</sub>= 0.0195

D<sub>15</sub>=

C<sub>c</sub>=

USCS= CL-ML

## Classification

AASHTO= A-4(2)

## Remarks

Location: BH22-6 SS8  
Sample Number: R1844

Date: 12/04/22



Client: Bradford Highlands Joint Venture  
Project: 221-02423-00 - 23 Brownlee Drive, Bradford, ON

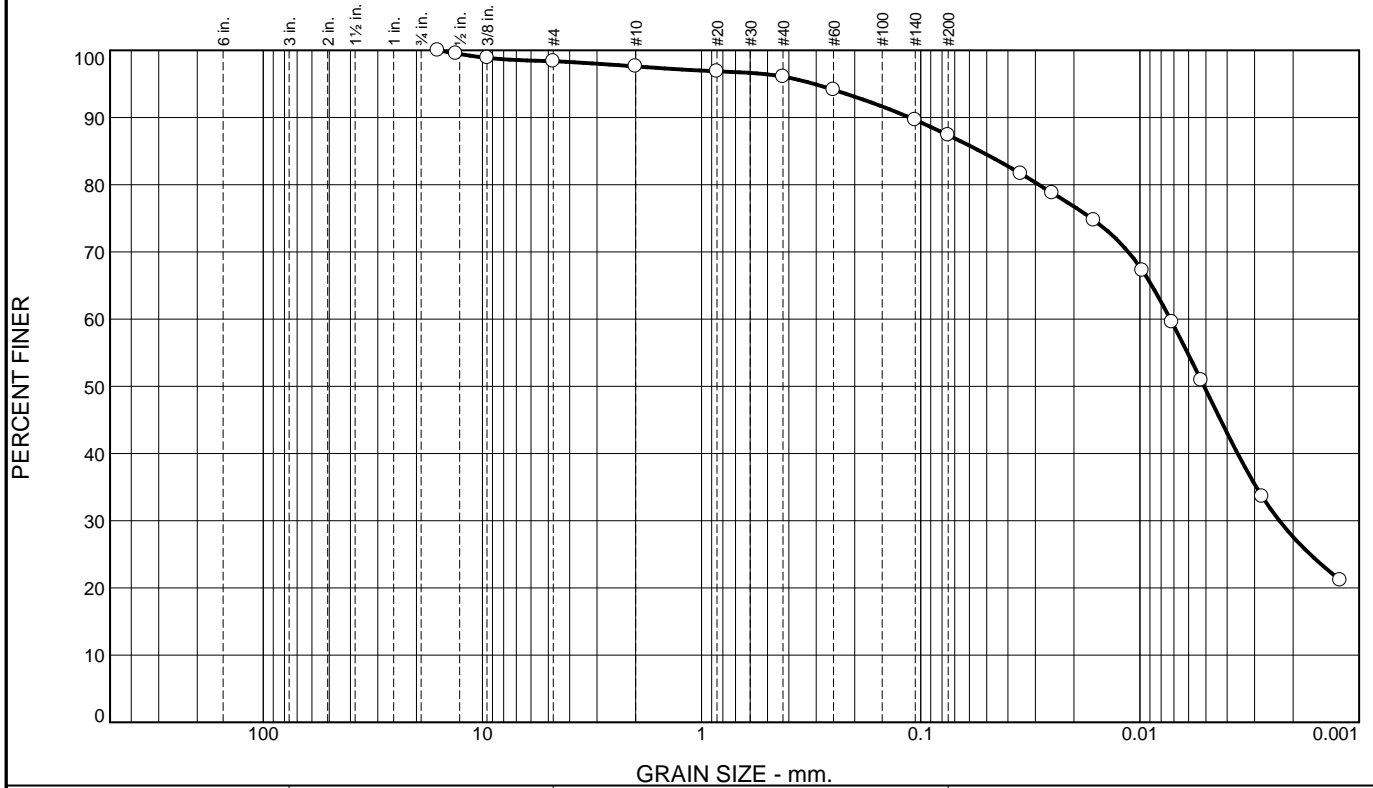
Project No: 221-02423-00

Figure

Tested By: NM

Checked By: MD

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.6	0.8	1.5	8.7	37.9	49.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
16mm	100.0		
13.2mm	99.5		
9.5mm	98.9		
4.75mm	98.4		
2mm	97.6		
0.850mm	96.9		
0.425mm	96.1		
0.250mm	94.1		
0.106mm	89.6		
0.075mm	87.4		
0.0350 mm.	81.6		
0.0251 mm.	78.8		
0.0162 mm.	74.7		
0.0097 mm.	67.2		
0.0071 mm.	59.6		
0.0053 mm.	50.9		
0.0028 mm.	33.6		
0.0012 mm.	21.1		

\* (no specification provided)

Soil Description		
<b>Atterberg Limits</b>		
PL= 16	LL= 26	PI= 10
<b>Coefficients</b>		
D <sub>90</sub> = 0.1126	D <sub>85</sub> = 0.0536	D <sub>60</sub> = 0.0073
D <sub>50</sub> = 0.0051	D <sub>30</sub> = 0.0023	D <sub>15</sub> =
D <sub>10</sub> =	C <sub>u</sub> =	C <sub>c</sub> =
<b>Classification</b>		
USCS= CL	AASHTO=	A-4(7)
<b>Remarks</b>		

Location: BH22-8 SS4  
Sample Number: R1844

Date: 12/04/22



Client: Bradford Highlands Joint Venture  
Project: 221-02423-00 - 23 Brownlee Drive, Bradford, ON

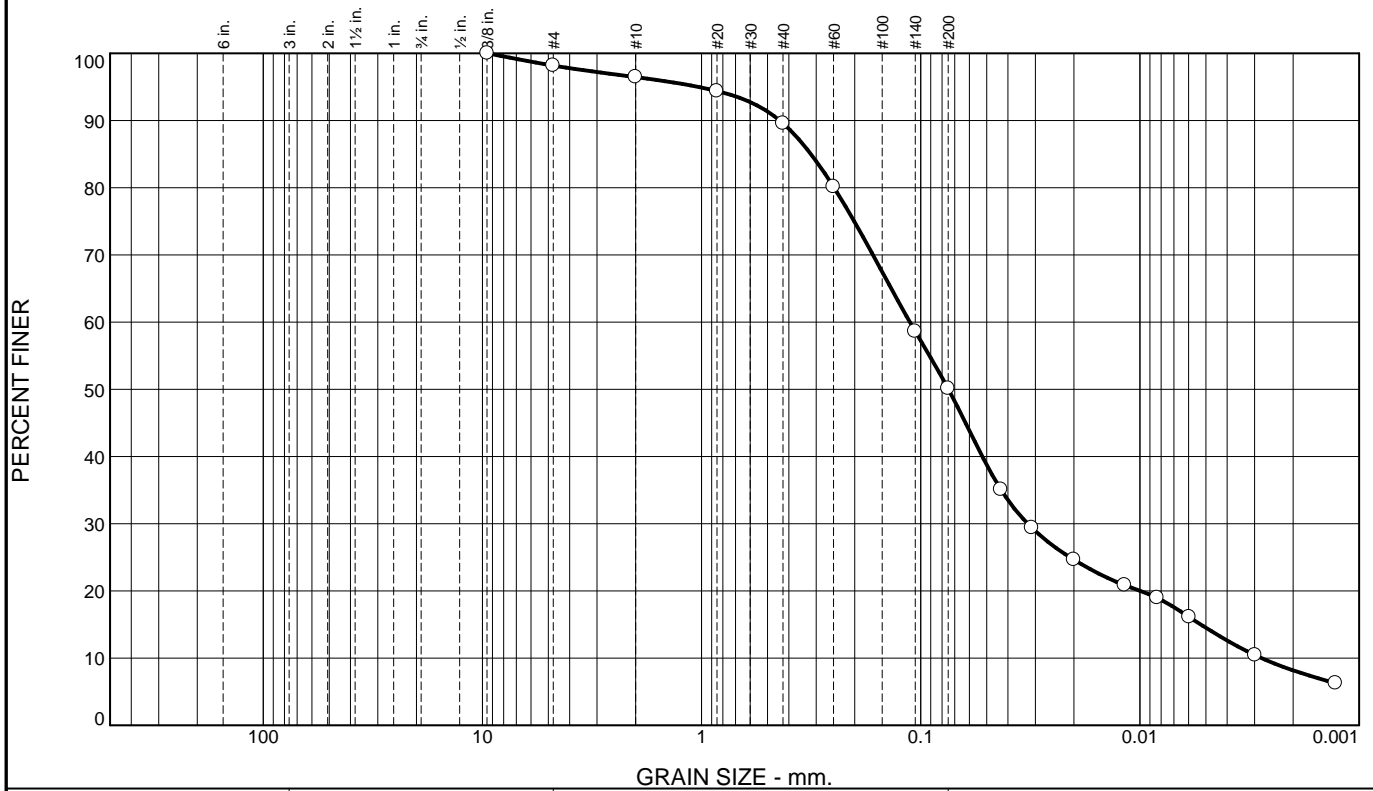
Project No: 221-02423-00

Figure

Tested By: MN

Checked By: MD

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.8	1.7	6.9	39.5	35.6	14.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5mm	100.0		
4.75mm	98.2		
2mm	96.5		
0.850mm	94.4		
0.425mm	89.6		
0.250mm	80.1		
0.106mm	58.6		
0.075mm	50.1		
0.0431 mm.	35.1		
0.0311 mm.	29.4		
0.0200 mm.	24.6		
0.0117 mm.	20.9		
0.0083 mm.	19.0		
0.0060 mm.	16.1		
0.0030 mm.	10.4		
0.0013 mm.	6.3		

\* (no specification provided)

## Soil Description

**Atterberg Limits**  
 PL= NP      LL= NP      PI= NP  
**Coefficients**  
 D<sub>90</sub>= 0.4404      D<sub>85</sub>= 0.3171      D<sub>60</sub>= 0.1122  
 D<sub>50</sub>= 0.0747      D<sub>30</sub>= 0.0325      D<sub>15</sub>= 0.0053  
 D<sub>10</sub>= 0.0028      C<sub>u</sub>= 40.17      C<sub>c</sub>= 3.37  
**Classification**  
 USCS= ML      AASHTO= A-4(0)

## Remarks

Location: BH22-12 SS4  
 Sample Number: R1844

Date: 13/04/22



Client: Bradford Highlands Joint Venture  
 Project: 221-02423-00 - 23 Brownlee Drive, Bradford, ON

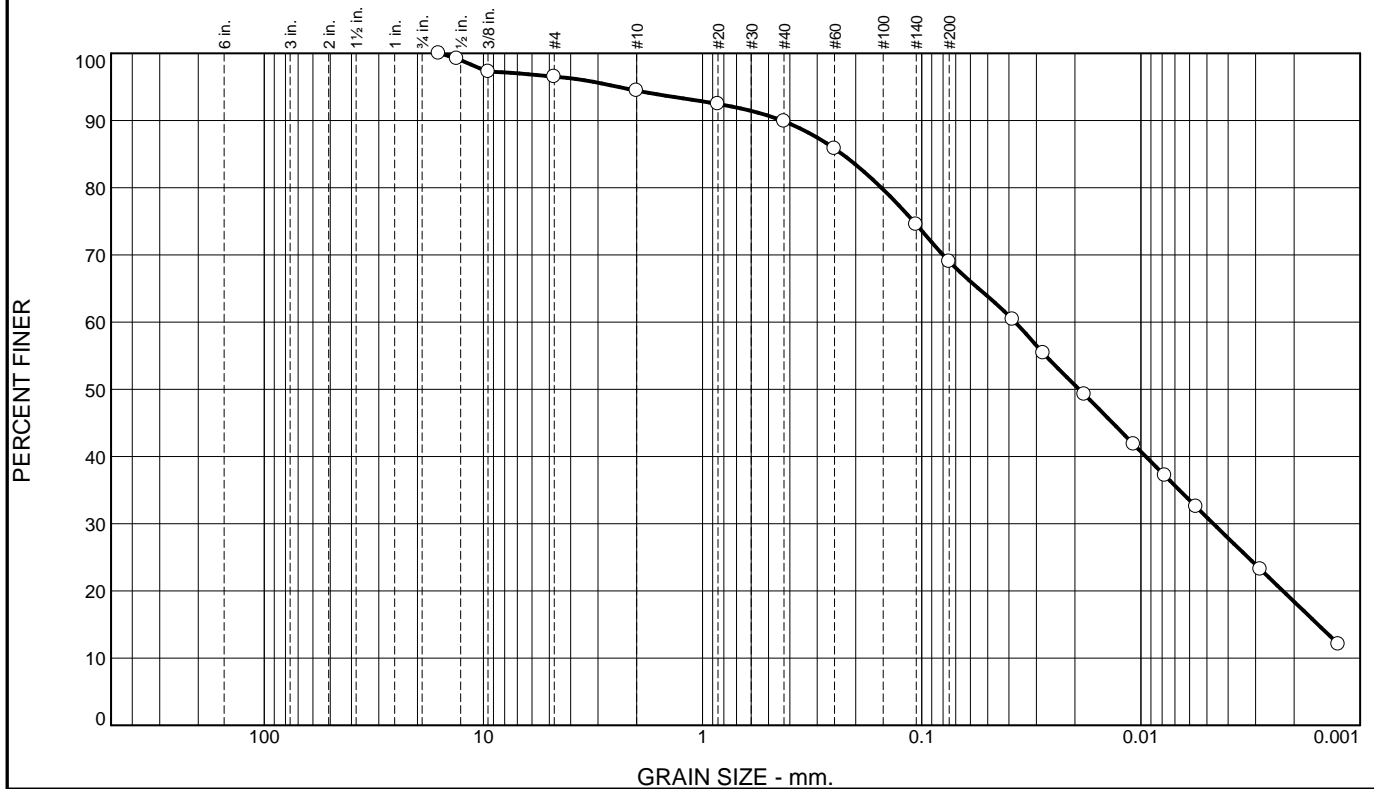
Project No: 221-02423-00

Figure

Tested By: NM

Checked By: MD

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.5	2.1	4.5	20.9	38.1	30.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
16mm	100.0		
13.2mm	99.2		
9.5mm	97.3		
4.75mm	96.5		
2mm	94.4		
0.850mm	92.5		
0.425mm	89.9		
0.250mm	85.8		
0.106mm	74.5		
0.075mm	69.0		
0.0385 mm.	60.4		
0.0279 mm.	55.4		
0.0181 mm.	49.2		
0.0108 mm.	41.8		
0.0078 mm.	37.2		
0.0056 mm.	32.5		
0.0029 mm.	23.2		
0.0013 mm.	12.1		

\* (no specification provided)

## Soil Description

PL= 13

## Atterberg Limits

LL= 20

PI= 7

## Coefficients

D<sub>90</sub>= 0.4352

D<sub>85</sub>= 0.2309

D<sub>60</sub>= 0.0375

D<sub>50</sub>= 0.0191

D<sub>30</sub>= 0.0047

D<sub>15</sub>= 0.0016

D<sub>10</sub>=

C<sub>u</sub>=

C<sub>c</sub>=

## Classification

USCS= CL-ML

AASHTO= A-4(2)

## Remarks

Location: BH22-13 SS3  
Sample Number: R1844

Date: 13/04/22



Client: Bradford Highlands Joint Venture  
Project: 221-02423-00 - 23 Brownlee Drive, Bradford, ON

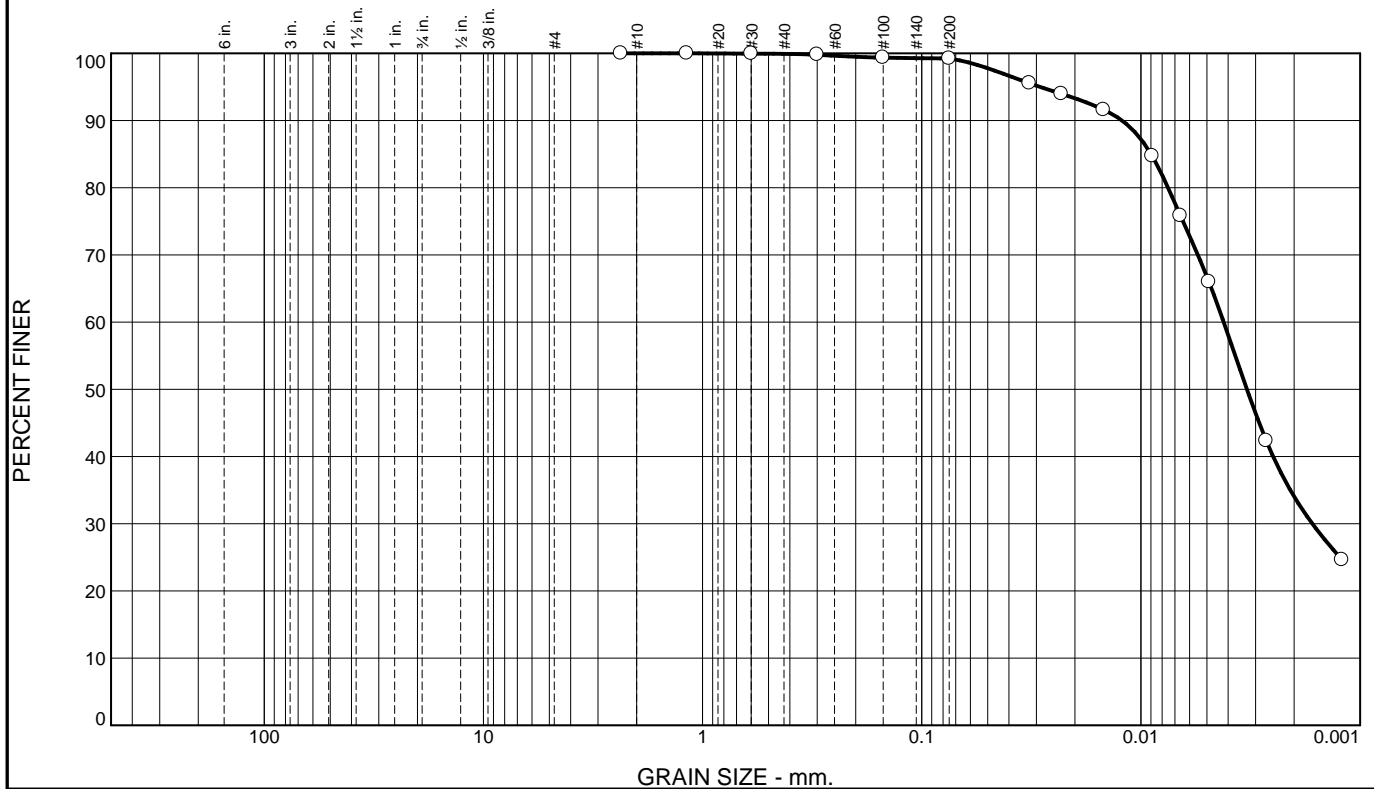
Project No: 221-02423-00

Figure

Tested By: NM

Checked By: MD

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	0.7	32.5	66.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2.36mm	100.0		
1.18mm	100.0		
0.600mm	99.9		
0.300mm	99.8		
0.150mm	99.3		
0.075mm	99.2		
0.0323 mm.	95.5		
0.0230 mm.	94.0		
0.0148 mm.	91.6		
0.0089 mm.	84.7		
0.0066 mm.	75.8		
0.0049 mm.	66.0		
0.0027 mm.	42.3		
0.0012 mm.	24.6		

\* (no specification provided)

## Soil Description

PL= 18

### Atterberg Limits

LL= 30

PI= 12

D<sub>90</sub>= 0.0122  
D<sub>50</sub>= 0.0033  
D<sub>10</sub>=

### Coefficients

D<sub>85</sub>= 0.0090  
D<sub>30</sub>= 0.0017  
C<sub>u</sub>=

D<sub>60</sub>= 0.0042  
D<sub>15</sub>=  
C<sub>c</sub>=

USCS= CL

### Classification

AASHTO= A-6(11)

### Remarks

Location: BH22-17 SS3  
Sample Number: R1844

Date: 13/04/22



Client: Bradford Highlands Joint Venture  
Project: 221-02423-00 - 23 Brownlee Drive, Bradford, ON

Project No: 221-02423-00

Figure

Tested By: NM

Checked By: MD

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.9	1.8	5.8	34.5	34.9	20.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
13.2mm	100.0		
9.5mm	99.7		
4.75mm	97.1		
2mm	95.3		
0.850mm	93.2		
0.425mm	89.5		
0.250mm	82.7		
0.106mm	63.5		
0.075mm	55.0		
0.0418 mm.	42.1		
0.0302 mm.	36.5		
0.0195 mm.	31.8		
0.0114 mm.	27.2		
0.0082 mm.	24.4		
0.0059 mm.	21.5		
0.0029 mm.	15.0		
0.0013 mm.	8.8		

\* (no specification provided)

## Soil Description

**Atterberg Limits**  
 PL= 12      LL= 16      PI= 4  
**Coefficients**  
 D<sub>90</sub>= 0.4520      D<sub>85</sub>= 0.2889      D<sub>60</sub>= 0.0920  
 D<sub>50</sub>= 0.0606      D<sub>30</sub>= 0.0158      D<sub>15</sub>= 0.0029  
 D<sub>10</sub>= 0.0015      C<sub>u</sub>= 60.57      C<sub>c</sub>= 1.79  
**Classification**  
 USCS= CL-ML      AASHTO= A-4(0)  
**Remarks**

Location: BH22-18 SS5  
 Sample Number: R1844

Date: 13/04/22



Client: Bradford Highlands Joint Venture  
 Project: 221-02423-00 - 23 Brownlee Drive, Bradford, ON

Project No: 221-02423-00

Figure

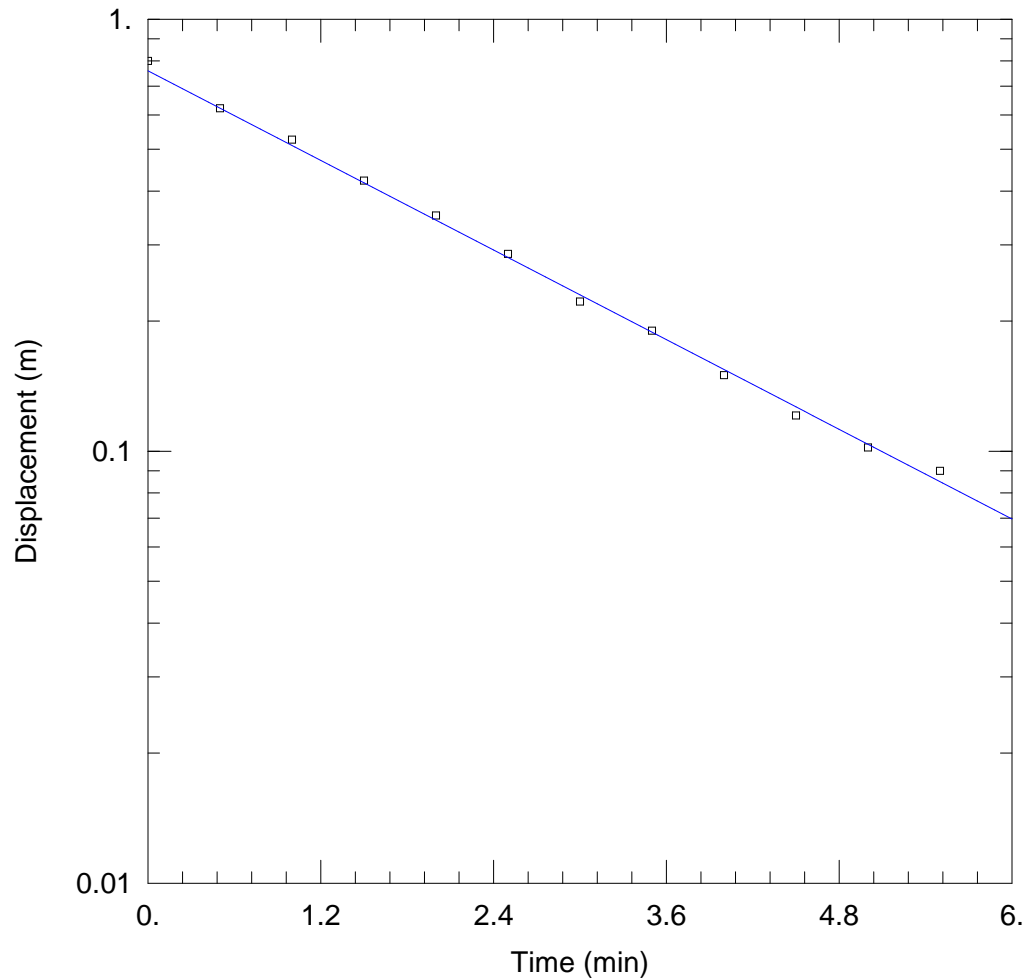
Tested By: NM

Checked By: MD

**APPENDIX E**

**Single Well Response Testing  
Results**





### WELL TEST ANALYSIS

Data Set: \...\BH5.aqt  
Date: 03/06/18

Time: 11:14:39

### PROJECT INFORMATION

Company: Golder

### AQUIFER DATA

Saturated Thickness: 6.2 m

Anisotropy Ratio (Kz/Kr): 1.

### WELL DATA (BH5)

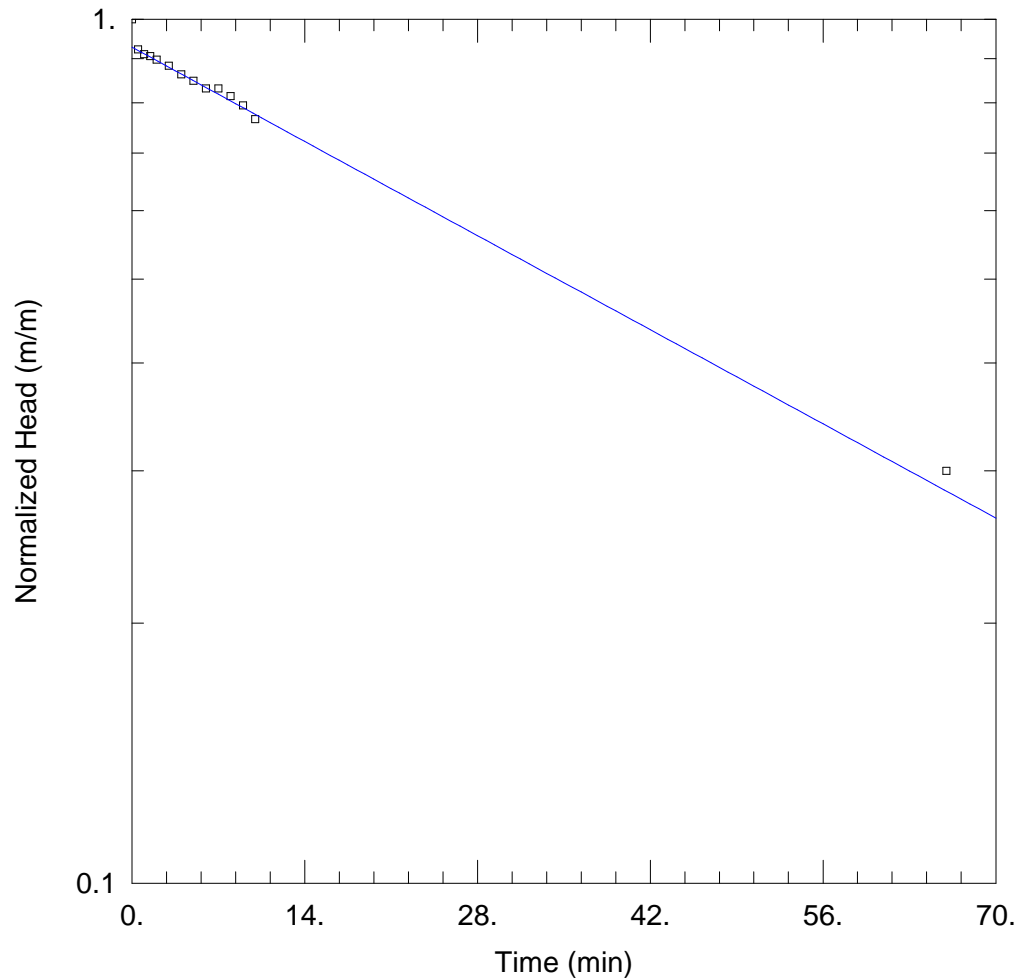
Initial Displacement: 0.8 m  
Total Well Penetration Depth: 6. m  
Casing Radius: 0.025 m

Static Water Column Height: 6.2 m  
Screen Length: 3.05 m  
Well Radius: 0.075 m  
Gravel Pack Porosity: 0.

### SOLUTION

Aquifer Model: Unconfined  
K = 2.058E-6 m/sec

Solution Method: Bouwer-Rice  
y0 = 0.7593 m



### WELL TEST ANALYSIS

Data Set: \...\BH8.aqt  
Date: 03/06/18

Time: 11:15:16

### PROJECT INFORMATION

Company: Golder

### AQUIFER DATA

Saturated Thickness: 3.9 m

Anisotropy Ratio (Kz/Kr): 1.

### WELL DATA (BH8)

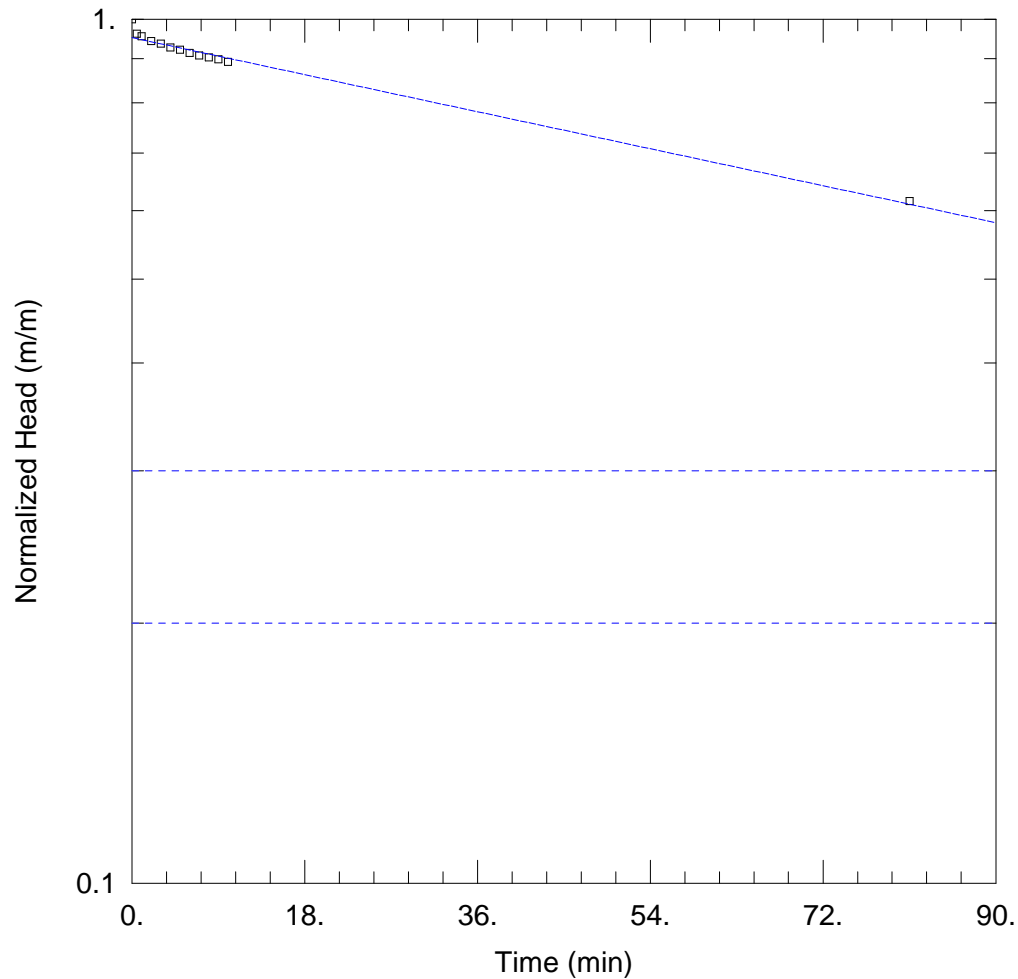
Initial Displacement: 1.36 m  
Total Well Penetration Depth: 4.05 m  
Casing Radius: 0.025 m

Static Water Column Height: 3.9 m  
Screen Length: 3.05 m  
Well Radius: 0.075 m  
Gravel Pack Porosity: 0.

### SOLUTION

Aquifer Model: Unconfined  
K = 9.201E-8 m/sec

Solution Method: Bouwer-Rice  
y0 = 1.262 m



### WELL TEST ANALYSIS

Data Set: \...\BH14.aqt  
Date: 03/06/18

Time: 11:16:05

### PROJECT INFORMATION

Company: Golder

### AQUIFER DATA

Saturated Thickness: 6.35 m

Anisotropy Ratio ( $K_z/K_r$ ): 1.

### WELL DATA (BH8)

Initial Displacement: 1.2 m  
Total Well Penetration Depth: 5. m  
Casing Radius: 0.025 m

Static Water Column Height: 6.35 m  
Screen Length: 3.05 m  
Well Radius: 0.075 m  
Gravel Pack Porosity: 0.

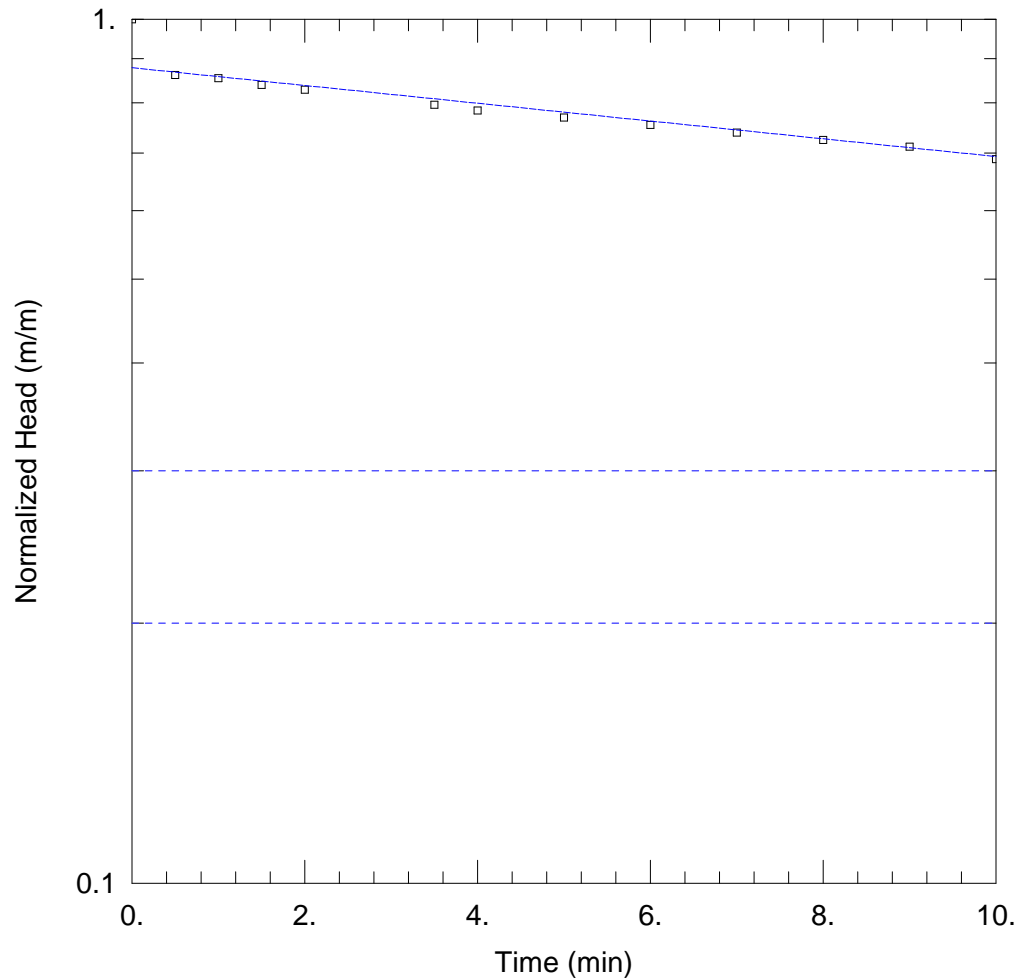
### SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 2.583E-8$  m/sec

$y_0 = 1.142$  m



### WELL TEST ANALYSIS

Data Set: \...\BH16.aqt  
Date: 03/06/18

Time: 11:17:22

### PROJECT INFORMATION

Company: Golder

### AQUIFER DATA

Saturated Thickness: 6.35 m

Anisotropy Ratio ( $K_z/K_r$ ): 1.

### WELL DATA (BH16)

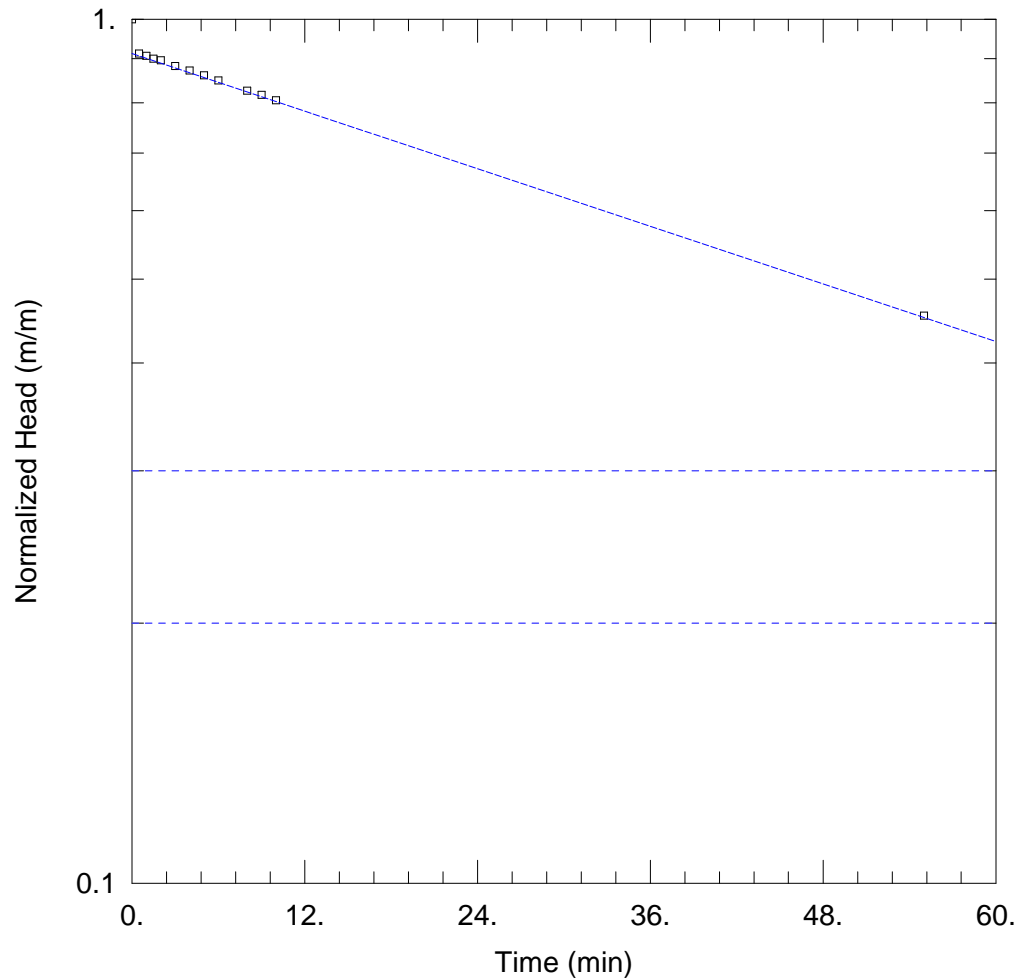
Initial Displacement: 1.2 m  
Total Well Penetration Depth: 4.9 m  
Casing Radius: 0.025 m

Static Water Column Height: 6.35 m  
Screen Length: 3.05 m  
Well Radius: 0.075 m  
Gravel Pack Porosity: 0.

### SOLUTION

Aquifer Model: Unconfined  
 $K = 1.109\text{E-}7$  m/sec

Solution Method: Bouwer-Rice  
 $y_0 = 1.054$  m



### WELL TEST ANALYSIS

Data Set: \...\BH18.aqt  
Date: 03/06/18

Time: 11:20:10

### PROJECT INFORMATION

Company: Golder

### AQUIFER DATA

Saturated Thickness: 4.05 m

Anisotropy Ratio ( $K_z/K_r$ ): 1.

### WELL DATA (BH16)

Initial Displacement: 1.1 m  
Total Well Penetration Depth: 2.52 m  
Casing Radius: 0.025 m

Static Water Column Height: 4.05 m  
Screen Length: 1.5 m  
Well Radius: 0.075 m  
Gravel Pack Porosity: 0.

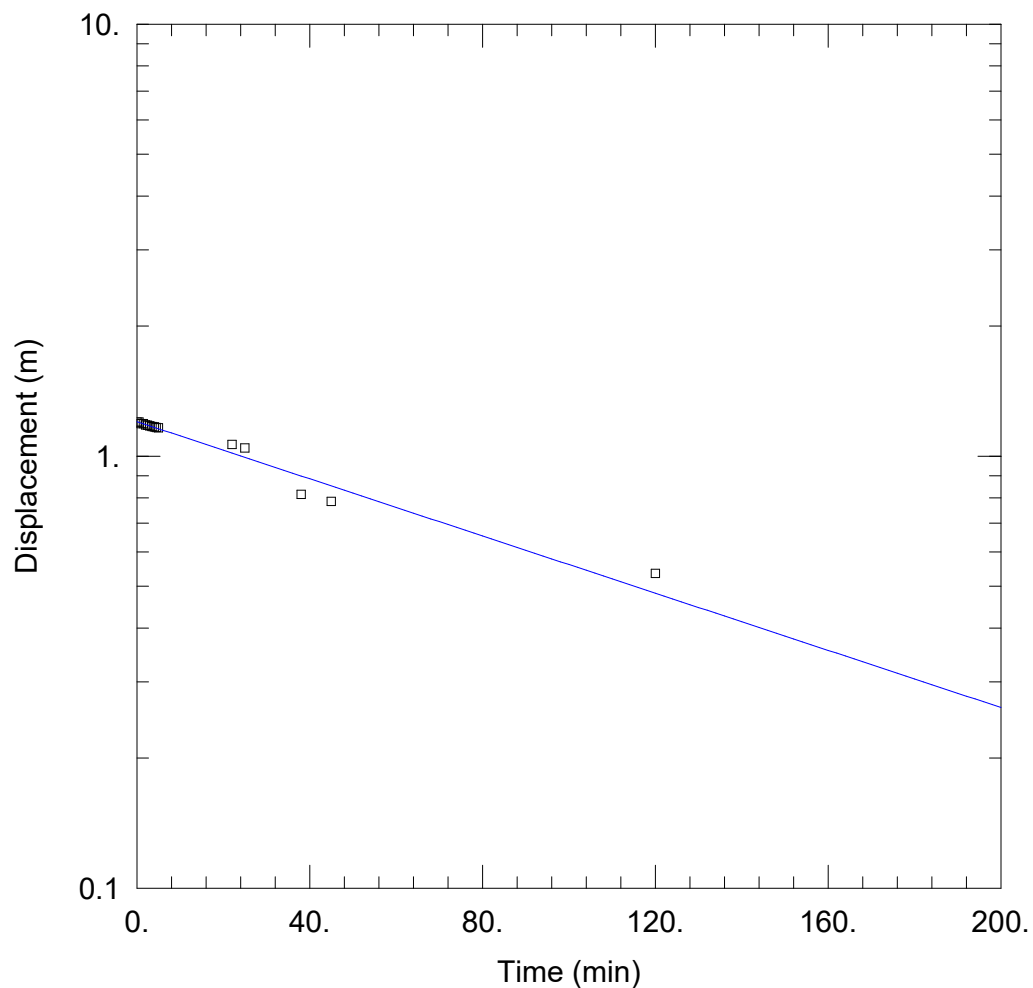
### SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 9.426\text{E-}8$  m/sec

$y_0 = 1.004$  m



### WELL TEST ANALYSIS

Data Set: C:\...\BH22-05.aqt

Date: 10/12/22

Time: 17:45:38

### PROJECT INFORMATION

Company: Golder Associates

Project: 22517668

Test Well: BH22-05

Test Date: 18'Aug'22

### AQUIFER DATA

Saturated Thickness: 10. m

Anisotropy Ratio (Kz/Kr): 1.

### WELL DATA (BH22-05)

Initial Displacement: 1.2 m

Static Water Column Height: 8.25 m

Total Well Penetration Depth: 8.19 m

Screen Length: 3.05 m

Casing Radius: 0.0254 m

Well Radius: 0.076 m

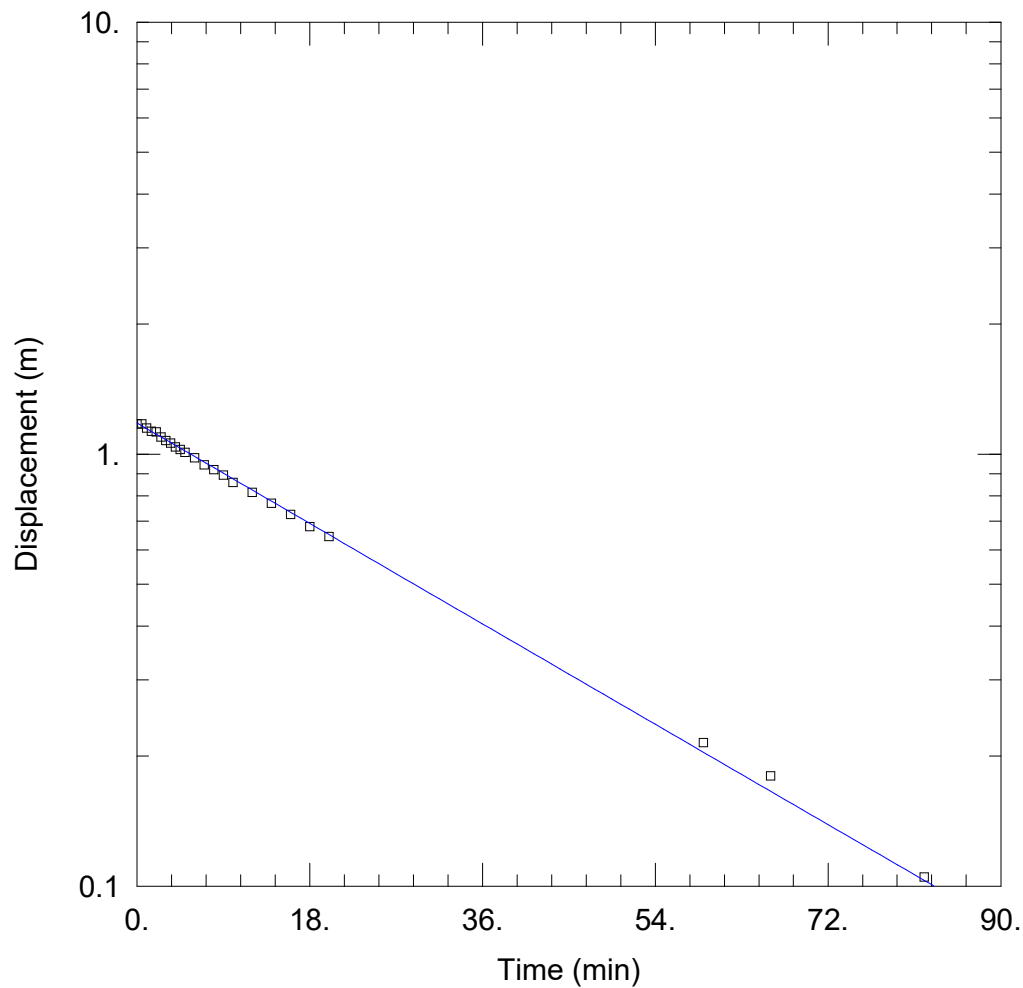
### SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 3.958E-8 m/sec

y0 = 1.202 m



### WELL TEST ANALYSIS

Data Set: C:\...\BH22-09.aqt  
 Date: 10/12/22

Time: 17:46:45

### PROJECT INFORMATION

Company: Golder Associates  
 Project: 22517668  
 Test Well: BH22-09  
 Test Date: 18'Aug'22

### AQUIFER DATA

Saturated Thickness: 10. m

Anisotropy Ratio (Kz/Kr): 1.

### WELL DATA (BH22-9)

Initial Displacement: 1.175 m  
 Total Well Penetration Depth: 8.715 m  
 Casing Radius: 0.0254 m

Static Water Column Height: 8.785 m  
 Screen Length: 3.05 m  
 Well Radius: 0.076 m

### SOLUTION

Aquifer Model: Unconfined  
 K = 1.576E-7 m/sec

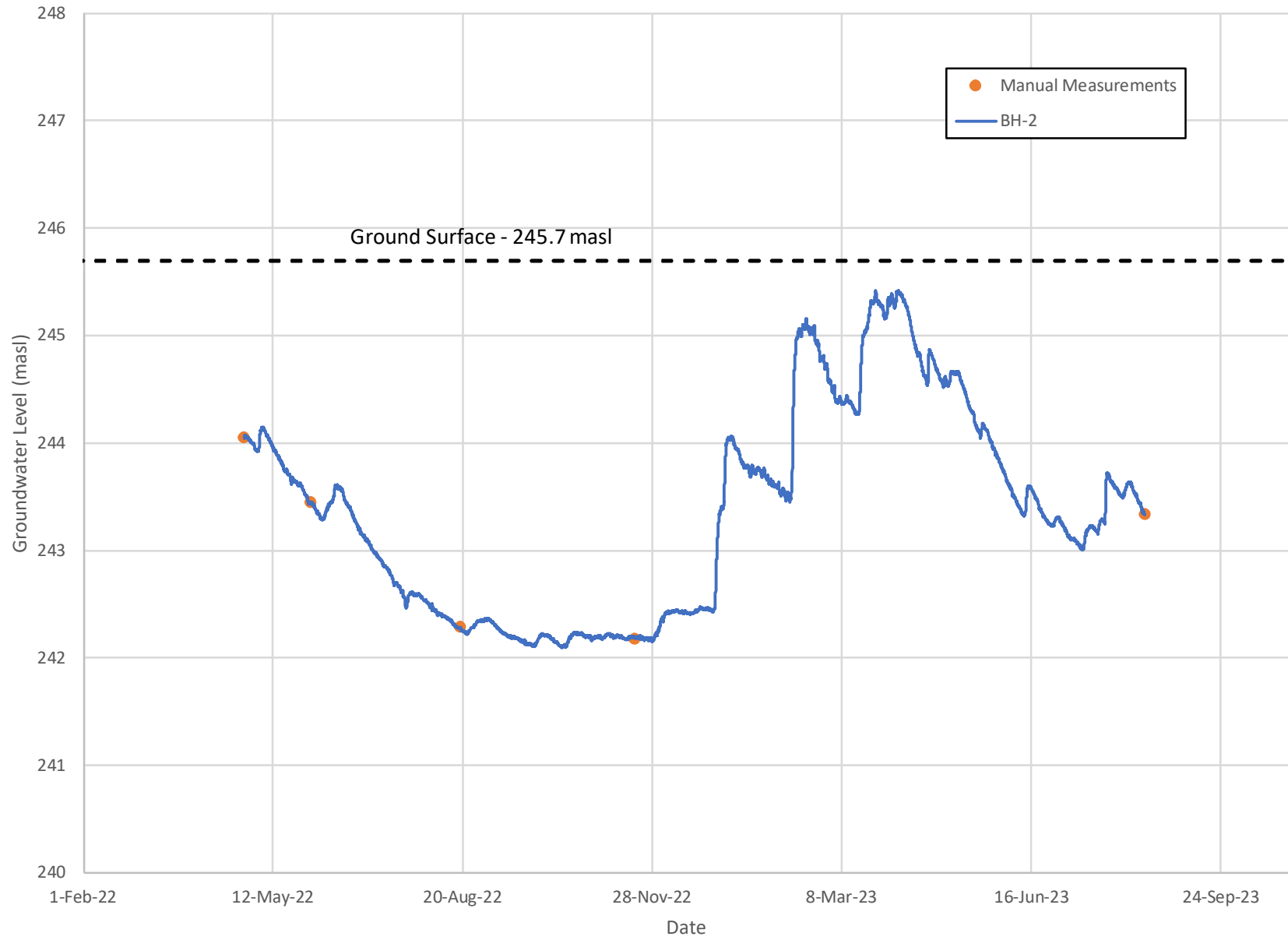
Solution Method: Bouwer-Rice  
 y0 = 1.18 m

**APPENDIX F**

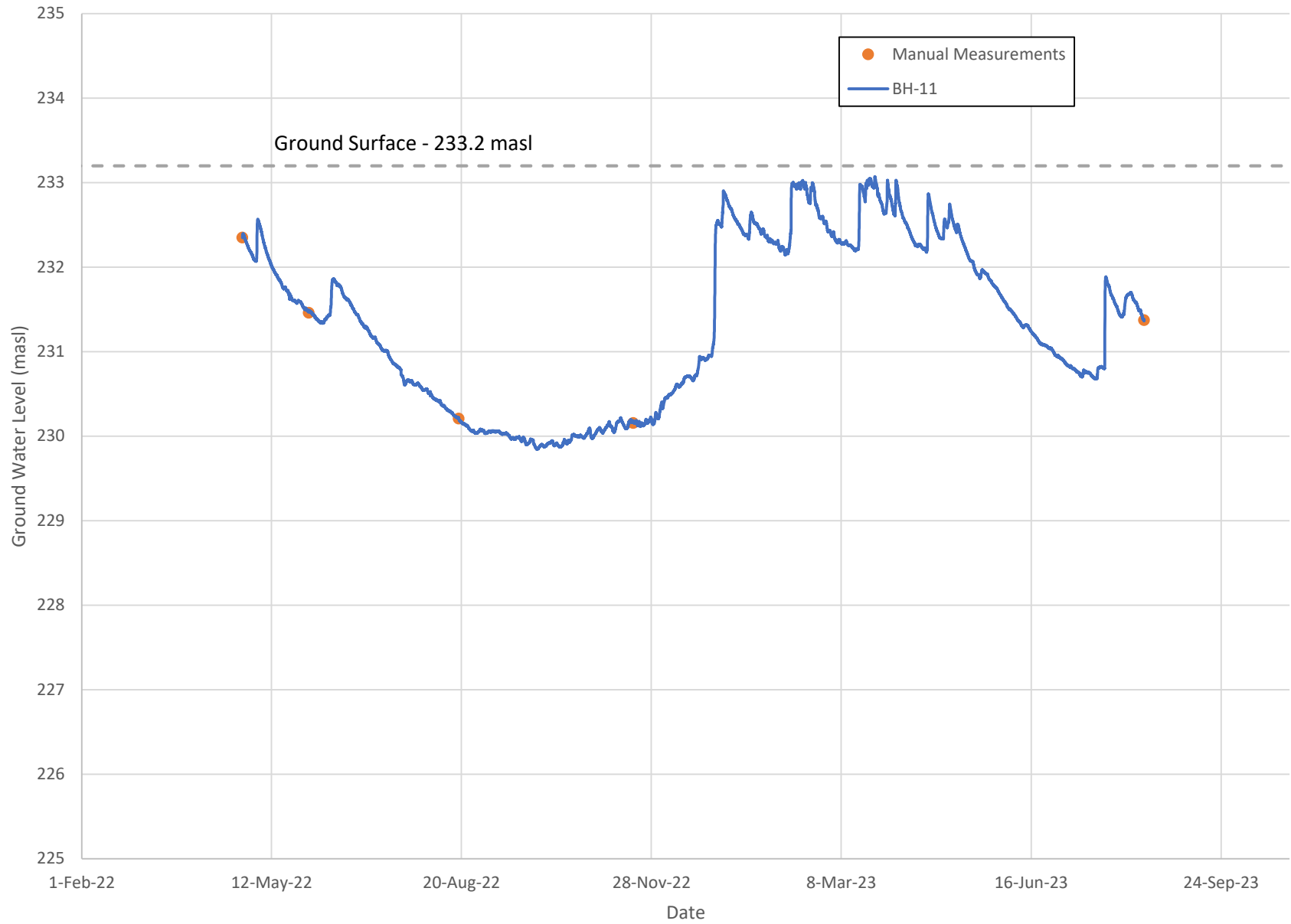
# Groundwater Hydrographs



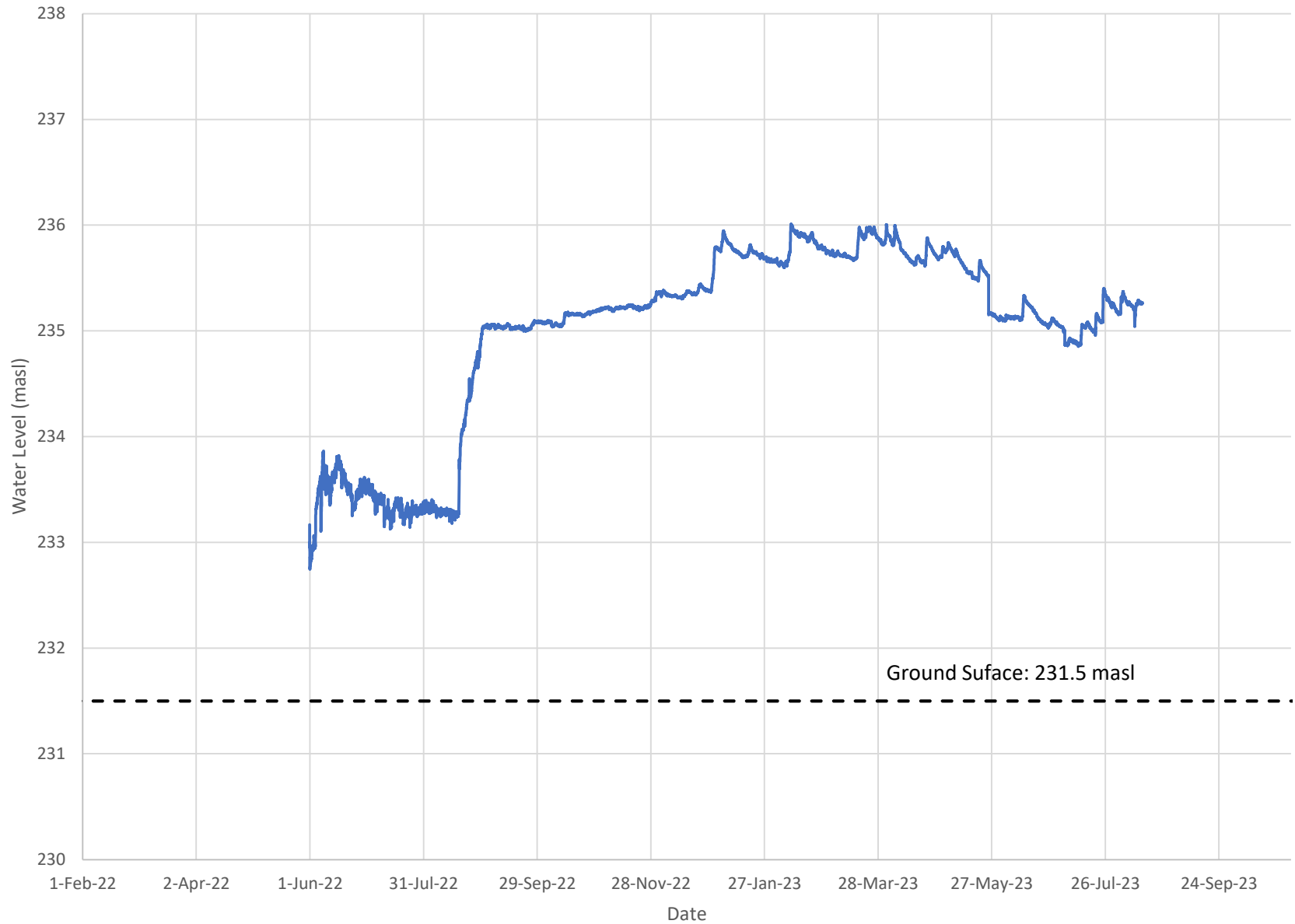
Groundwater Hydrograph BH-2



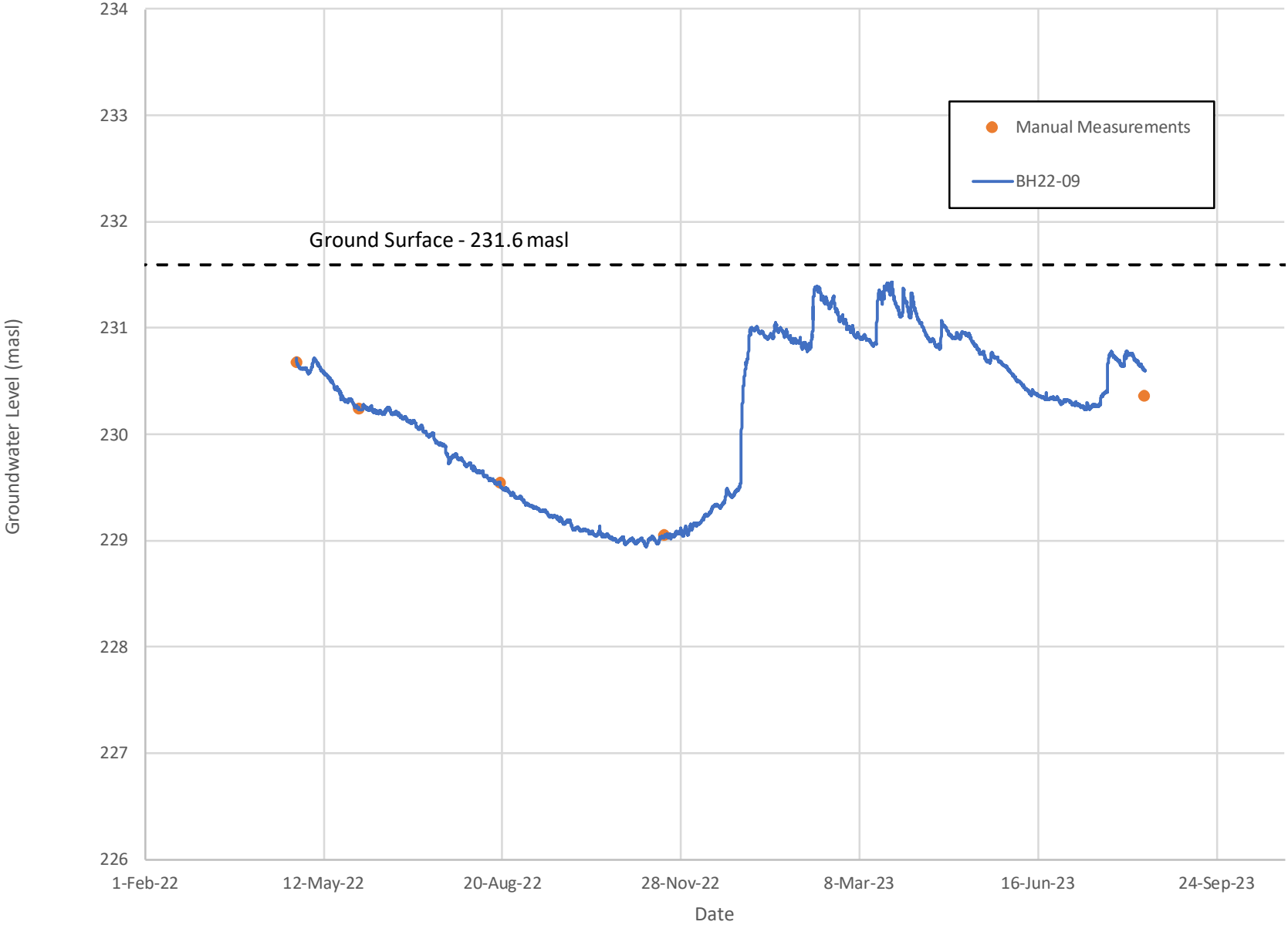
Ground Water Hydrograph BH-11



Ground Water Hydrograph - Well BH22-3



Groundwater Hydrograph BH22-09



**APPENDIX G**

# Laboratory Analytical Results

**C.O.C.: ---**

**REPORT No. B22-26593**

**Report To:**

**Golder Associates Ltd.**  
121 Commerce Park Drive, Unit L,  
Barrie ON. L4N 8X1 Canada

**Attention:** Patrick Merritt

**Caduceon Environmental Laboratories**

112 Commerce Park Drive  
Barrie ON L4N 8W8  
Tel: 705-252-5743  
Fax: 705-252-5746

DATE RECEIVED: 19-Aug-22

JOB/PROJECT NO.:

DATE REPORTED: 30-Aug-22

P.O. NUMBER: 22517668 (2000)

SAMPLE MATRIX: Groundwater

WATERWORKS NO.

Parameter	Qty	Site Analyzed	Analyst Initials	Date Analyzed	Lab Method	Reference Method
Alkalinity (as CaCO <sub>3</sub> )	1	Holly Lane	SYL	22-Aug-22	A-ALK-03 (o)	SM 2320B
Cyanide	1	Kingston	TK	24-Aug-22	A-CN-001 (k)	SM 4500CN
Nitrogen - Ammonia (N)	1	Kingston	KD	25-Aug-22	A-NH3-001 (k)	SM4500-NH3-H
Nitrogen - Ammonia (N)	1	Holly Lane	KD	25-Aug-22	A-NH3-Unionized	Calc.
pH	1	Holly Lane	SYL	22-Aug-22	A-PH-01 (o)	SM 4500H
Sulphide	1	Kingston	TK	23-Aug-22	A-S2	SM4500-S2
A - Wet Chem	2	Kingston	amc	25-Aug-22	A-TPTKN-001 (P)(k)	E3516.2
Total Suspended Solids	2	Kingston	mci	22-Aug-22	A-TSS-001 (k)	SM2540D
Turbidity	1	Holly Lane	ST	23-Aug-22	A-TURB-01 (o)	SM 2130
B - Bacteriological	1	Barrie	EsT	19-Aug-22	B-EC-001 (b)	SM9222D
Glycols	1	Kingston	KPR	22-Aug-22	C-Glycol-01 (k)	EPA 8015
Oil & Grease	1	Kingston	MTY	24-Aug-22	C-O&G-001 (k)	SM 5520
Phenolics (4-aap)	1	Kingston	TK	25-Aug-22	C-PHEN-01 (k)	MOEE 3179
Chromium (VI)	1	Holly Lane	ST	26-Aug-22	D-CRVI-01 (o)	MOE E3056
Mercury	1	Holly Lane	PBK	23-Aug-22	D-HG-02 (o)	SM 3112 B
Metals - ICP-OES	2	Holly Lane	AHM	24-Aug-22	D-ICP-01 (o)	SM 3120
Metals - ICP-MS	2	Holly Lane	TPR	25-Aug-22	D-ICPMS-01 (o)	EPA 200.8

PWQO - Provincial Water Quality Objectives  
Interim PWQO - Interim PWQO  
PWQO - Provincial Water Quality Objectives



R.L. = Reporting Limit

Test methods may be modified from specified reference method unless indicated by an \*

Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Christine Burke  
Lab Manager

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**Attention:** Patrick Merritt

**Caduceon Environmental Laboratories**

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Barrie ON L4N 8W8  
Tel: 705-252-5743  
Fax: 705-252-5746

DATE RECEIVED: 19-Aug-22

JOB/PROJECT NO.:

DATE REPORTED: 30-Aug-22

P.O. NUMBER: 22517668 (2000)

SAMPLE MATRIX: Groundwater

WATERWORKS NO.

	Client I.D. Sample I.D. Date Collected		BH22-3 B22-26593-1 18-Aug-22	BH22-3-F B22-26593-2 18-Aug-22			PWQO Interim PWQO      PWQO	
Parameter	Units	R.L.						
E coli	cfu/100mL	1	< 2					100
pH @25°C	pH Units		7.99					8.5
Alkalinity(CaCO3) to pH4.5	mg/L	5	231					
Hardness (as CaCO3)	mg/L	1	289	231				
Cyanide (Free)	µg/L	5	< 5					5
Ammonia (N)-Total	µg/L	10	170					
Ammonia (N)-unionized	µg/L	10	< 10					20
Phosphorus-Total	µg/L	10	130	20			10	
Phenolics	µg/L	1	< 1					1
Sulphide	µg/L	10	60					
Turbidity	NTU	0.1	299					
Total Suspended Solids	mg/L	3	206	5				
Aluminum	µg/L	10	1620	40			75	
Antimony	µg/L	0.1	0.5	0.5			20	
Arsenic	µg/L	0.1	1.2	1.1			5	5
Beryllium	µg/L	2	< 2	< 2				11
Boron	µg/L	5	19	14			200	
Cadmium	µg/L	0.015	0.015	< 0.015			0.1	0.2
Chromium	µg/L	1	2	< 1				
Chromium (VI)	µg/L	1	< 1					1
Cobalt	µg/L	0.1	1.0	0.2			0.9	
Copper	µg/L	0.1	2.4	0.5			5	
Iron	µg/L	5	2310	31				300
Lead	µg/L	0.02	0.91	< 0.02			1	5

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Interim PWQO - Interim PWQO

PWQO - Provincial Water Quality Objectives



Christine Burke  
Lab Manager

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P.O. NUMBER: 22517668 (2000)

SAMPLE MATRIX: Groundwater

WATERWORKS NO.

Parameter	Units	R.L.	Client I.D. Sample I.D. Date Collected				PWQO	
			BH22-3 B22-26593-1 18-Aug-22	BH22-3-F B22-26593-2 18-Aug-22			Interim PWQO	PWQO
Mercury	µg/L	0.02	< 0.02					0.2
Molybdenum	µg/L	0.1	0.8	1.0			40	
Nickel	µg/L	0.2	2.4	0.3				25
Selenium	µg/L	1	< 1	< 1				100
Silver	µg/L	0.1	< 0.1	< 0.1				0.1
Thallium	µg/L	0.05	< 0.05	< 0.05			0.3	0.3
Tungsten	µg/L	10	< 10	< 10			30	
Uranium	µg/L	0.05	0.13	0.06			5	
Vanadium	µg/L	0.1	2.7	0.4			6	
Zinc	µg/L	5	11	< 5			20	30
Zirconium	µg/L	3	< 3	< 3			4	
Oil and Grease- Anim/Veg. (Calculation)	µg/L	1000	2100					
Oil and Grease-Mineral	µg/L	1000	< 1000					
Oil & Grease-Total	µg/L	1000	2200					
Propylene Glycol	µg/L	3000	< 3000				44000	
Ethylene Glycol	µg/L	2000	< 2000				2000	
Diethylene Glycol	µg/L	3000	< 3000				11000	
Total Glycols	µg/L	3000	< 3000					

PWQO - Provincial Water Quality Objectives

Interim PWQO - Interim PWQO

PWQO - Provincial Water Quality Objectives



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Christine Burke  
Lab Manager

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JOB/PROJECT NO.:

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P.O. NUMBER: 22517668 (2000)

SAMPLE MATRIX: Groundwater

WATERWORKS NO.

**Summary of Exceedances**

Interim PWQO		
BH22-3	Found Value	Limit
Phosphorus-Total (µg/L)	130	10
Cobalt (µg/L)	1.0	0.9
Aluminum (µg/L)	1620	75
BH22-3-F	Found Value	Limit
Phosphorus-Total (µg/L)	20	10

Provincial Water Quality Objectives		
BH22-3	Found Value	Limit
Iron (µg/L)	2310	300

PWQO - Provincial Water Quality Objectives  
Interim PWQO - Interim PWQO  
PWQO - Provincial Water Quality Objectives



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Lab Manager

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