HYDROGEOLOGICAL SITE ASSESSMENT
SIMCOE COUNTY AFFORDABLE HOUSING FACILITY
125 SIMCOE ROAD
BRADFORD, WEST GWILLIMBURY, ONTARIO

for

THE CORPORATION OF THE COUNTY OF SIMCOE

PETO MacCALLUM LTD.
165 CARTWRIGHT AVENUE
TORONTO, ONTARIO
M6A 1V5
Phone: (416) 785-5110
Fax: (416) 785-5120
Email: toronto@petomaccallum.com

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1 cc: The Corporation of the County of Simcoe
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ATTACHMENTS:

Peto MacCallum Ltd.
CONSULTING ENGINEERS

April 8, 2022 PML Ref.: 21BF049

Mr. Jesse Marchand
The Corporation of the County Simcoe
1110 Highway 26,
Midhurst, Ontario
L9X 1N6

Dear Mr. Marchand

Hydrogeological Site Assessment
Proposed Simcoe County Affordable Housing Facility
125 Simcoe Road
Bradford, West Gwillimbury, Ontario

1. INTRODUCTION AND OBJECTIVES

1.1 Introduction

Peto MacCallum Ltd. (PML) was retained by The Corporation of the County of Simcoe to conduct a Hydrogeological Site Assessment (HSA) for the proposed Simcoe County Affordable Housing Facility in Bradford, West Gwillimbury, Ontario. The building and parking lot are to be constructed on the southern portion of 125 Simcoe Road, which is located on the northeast corner of the intersection of Simcoe Road and the recently constructed Marshview Boulevard (hereinafter referred to as the site, see Key Plan on Drawing 1 and Figure A-1 in Appendix A). Legally, the site is in Part of Block Y (East of Simcoe Street) Registered plan 457, Town of Bradford West Gwillimbury, County of Simcoe.

It is understood that an approximately 1,700 m^2 building is to be constructed and no basement is to be included. Buried services are anticipated. A site plan design drawing (Sheet A1.1) by MCL Architects was reviewed for this assessment; however, foundation and buried service details were not available.

1.2 Previous Investigations

Prior to this hydrogeological investigation, the following investigations for the site were conducted by PML:

- Geotechnical Investigation, Simcoe County Affordable Housing Facility, 125 Simcoe Road, Bradford, West Gwillimbury, Ontario (PML 21BF049, Report 1 (Revised), January 12, 2022).
- Phase One Environmental Site Assessment, Proposed Simcoe County Affordable Housing Facility, 125 Simcoe Road, Bradford, West Gwillimbury, Ontario (PML 21BF049, Report 2, January 28, 2022).

The reports above were reviewed in preparation for the current investigation.

1.3 Construction Dewatering Water Taking Permitting

Construction dewatering, like other water takings in Ontario, is governed by the Ontario Water Resources Act (OWRA) and the Water Taking and Transfer Regulation 387/04, a regulation under the OWRA. In accordance with these regulatory requirements, if the dewatering discharge during construction is expected to be greater than 50,000 L/d and less than 400,000 L/d, and meets the requirements of Ontario Regulation 63/16, the water taking can be registered with the Ministry of Environment, Conservation and Park's (MECP's) Environmental Activity and Sector Registry (EASR). If the conditions of EASR registration are not met and the dewatering discharge is expected to be greater than 50,000 L/d, or if the dewatering discharge is expected to be greater than 400,000 L/d, an application for a Permit-To-Take-Water (PTTW) must be filed with the MECP. Note that the 400,000 L/d threshold is during normal operations (i.e. extreme weather events are not included).

1.4 Objectives and Scope of Work

The objective of this investigation was to carry out a hydrogeological site assessment to provide observations, assessment findings and recommendations in support of the proposed work at the site and potential permitting for construction dewatering activities. The report has been prepared in accordance with the Ontario Water Resources Act (OWRA), Ontario Regulation 387/04 (Water

Taking and Transfer) and is to be used in accordance with our Statement of Limitations, Appendix G.

Based on the project requirements, as well as the standard practice guidelines, the HSA involved the following tasks:

1. Review available data including Ministry of the Environment, Conservation and Parks (MECP) well records, published geological maps and other data to determine the hydrostratigraphy, hydrogeological conditions, and site vulnerability.

2. Attend the site to visually examine the terrain on and in the vicinity of the site.

3. Utilize the monitoring wells installed as part of geotechnical investigation to perform hydraulic response testing in the monitoring wells to determine soil permeability. Particle size distribution analyses conducted on soil samples retrieved from the boreholes will also be used to estimate hydraulic conductivity.

4. Submit one ground water sample for chemical analysis to assess the ground water chemistry for potential dewatering discharge.

5. Measure ground water levels in order to describe the subsurface ground water conditions and depth to and direction of shallow ground water flow.

6. Conduct private well survey in the vicinity of the site.

7. Develop a hydrogeological conceptual site model of the site and complete a hydrogeological analysis to provide estimates of the potential magnitude of dewatering and zone of influence.

8. Assess the potential impacts of the development on natural ecological features and functions that are supported by ground water resources.

9. Prepare a preliminary pre- and post-construction water balance.

10. Prepare a Hydrogeological Report including field and laboratory data, stratigraphy and ground water conditions, potential dewatering rates, type of water taking approval required, and potential impacts of the dewatering.

11. Assist with applying for water taking approval (EASR or PTTW). MECP permit fees are not included.

The comments and recommendations provided in this report are based on the site conditions at the time of the investigation, and are applicable only to the proposed project as described in the

report. Any changes in the project, including invert depths and layout will require review by PML to assess the validity of the report, and may require modified recommendations, additional investigation and/or analysis.

2. BACKGROUND REVIEW

2.1 Site Physiographic, Geologic and Hydrogeologic Settings

The site is a vacant irregularly shaped property which has a total area of approximately 1.56 ha. A mixture of residential, community, and agricultural properties are located in the vicinity of the site. To the north are the Bradford Curling Club, Community Centre and sports fields, followed primarily by residential properties. To the east is Marshview Boulevard, followed by agricultural properties. To the south is Marshview Boulevard, followed by residential properties, and to the west is Simcoe Road, followed by residential properties. See the aerial photograph of the site and vicinity included in Figure A-1 in Appendix A.

According to Chapman and Putnam (Physiography of Southern Ontario, Ministry of Natural Resources, 1984), the site is located in the physiographic region known as the Schomberg Clay Plains, characterized by clay plains. The prominent physiographic landform in the area is clay plains. The OGSEarth map of Surficial Geology of Southern Ontario (OGS Survey, 2003) indicates that the surficial geology at the site consists of sand and gravel, with minor silt and clay. The bedrock underlying the site is limestone of the Lindsay Formation (Paleozoic Geology of Southern Ontario, OGS, OGSEarth, 2007). The bedrock surface is expected to be at about 120 to 160 m depth according to the map, Bedrock Topography Series Alliston Area.

According to the elevations of the boreholes, the ground surface elevations slopes down from about El. 224 close to Simcoe Road, to about El. 221 on the east side of the proposed parking lot. In the greater vicinity of the site, the topography slopes easterly towards the Holland River, see Figure A-2 in Appendix A.

The site is located within the West Holland Subwatershed of the Lake Simcoe Region

Conservation Area (LSRCA) Watershed. The Holland River flows northerly about 700 m southeast of the site. The site is within LSRCA-regulated limits, see Figure A-3 in Appendix A.

2.2 Site Vulnerability

It was noted in the Phase One ESA that historically the site had been used for agricultural purposes, followed by industrial use for box and crate manufacturing. According to the MECP's Source Protection Information Atlas, the site is within the Lake Simcoe and Couchching / Black River Source Protection Area. The site is not within a Wellhead Protection Area (WHPA), Intake Protection Zone (IPZ), Issue Contributing Area, Significant Ground Water Recharge Area (SGRA) or an area of Highly Vulnerable Aquifers, see Figure A-4 in Appendix A. The site area is not an area of high average annual recharge, although an area of significant recharge is located to the east, see Figure A-5 in Appendix A. According to the Ministry of Natural Resources and Forestry, there are no evaluated or unevaluated wetlands close to the site, see Figure A-1 in Appendix A.

The site is not located in an area under development control as defined by the Niagara Escarpment Planning and Development Act, or in the Oak Ridges Moraine Conservation Area as defined by the Oak Ridges Moraine Conservation Plan.

2.3 MECP Water Well Records Review and Water Well Survey

2.3.1 MECP Water Well Review

The MECP Water Well Records database was searched for water well records in the vicinity of the site (an approximately 1200 m by 1200 m area in UTM coordinates centred on the site) and a summary of the well record information is included in Appendix B. Fifty-seven (57) well records were found. The dominant stratigraphy was clay. Bedrock was encountered between depths of 50 and 112 m below ground surface (bgs), however was typically around 100 m. Static ground water levels at shallow wells (less than 18 m deep) close to the site were in the range of about 1 to 9 m bgs (based on thee wells). The water supply wells were found to have been drilled to depths of 6.5 to 107 m below ground surface (bgs).

Fifty-seven (57) well records were found. Of these, eleven (11) were found to be for municipal or domestic water supply. Of the records without a stated well use, investigation into the individual records found them to be abandonment or test holes (except the top three in the list, which had no recorded information, and thus are expected to be test holes as well).

As stated in Section 2.2, the site is not in a well head protection area (WHPA). The nearest well municipal water supply wells are about 2 km east of the site along Highway 11. The WHPA of the well is depicted on the Figure A-4 attached in Appendix A.

2.3.2 Water Well Assessment/Survey

A door-to-door private well survey was conducted on March 9, 2022. Nine properties where current water supply well use was suspected were surveyed. See Table C-1 in Appendix C for a list of the properties surveyed. Based on the survey, it is expected that only two of the surveyed properties, 221 and 303 Morris Road, have water supply wells, see Table C-2 in Appendix C. The properties are about 290 m and 470 m southeast of the site, respectively. Further discussion is available in Section 7.2.

3. FIELD WORK AND LABORATORY ANALYSES

3.1 Borehole Drilling and Monitoring Well Installation

Borehole drilling and monitoring well installation were part of the geotechnical investigation (see Section 1.2). The fieldwork for the geotechnical investigation was conducted from October 26 to 29, 2021. The geotechnical investigation program comprised twenty (20) boreholes (BH1 to BH20) drilled to depths ranging from 2.0 to 5.0 m. For the borehole locations see Drawing 1.

The number of boreholes and their locations were selected by the Corporation of the County of Simcoe and established in the field and surveyed by PML using a Sokkia GCX3 GNSS Receiver. The elevations provided in this report should not be used or relied upon for any other purposes.

The boreholes were advanced using a Geoprobe track mounted drill rig, fitted with continuous flight solid stem augers, and equipped with an automatic hammer, supplied and operated by a specialist drilling contractor. The work was carried out under full-time supervision of a PML engineering staff member who directed the drilling and sampling operations, documented the soil stratigraphy, monitored ground water conditions and processed the recovered samples.

Representative samples of the overburden were recovered at frequent depth intervals using a conventional split-spoon sampler during drilling. Standard Penetration Tests (SPT) were conducted simultaneously with the sampling operation to assess the strength characteristics of the substrata. The ground water conditions at the borehole locations were assessed during drilling by visual examination of the soil, the sampler and the drill rods as the samples were retrieved and when appropriate by measurement of the water level in the open borehole. Upon completion of drilling, the boreholes without a monitoring well were decommissioned in accordance with O. Reg. 903/90, as amended.

Monitoring wells were installed in eight (8) of the boreholes to allow for water level measurements and potential hydrogeological instrumentation and water sampling. The monitoring wells comprised 50 mm diameter pipe, slotted screens, filter sand packing, bentonite seals and protective casing.

All of the recovered samples were returned to PML's laboratory for detailed visual examination, classification and routine moisture content determinations. The laboratory testing also included six (6) particle size distribution analyses on samples of the major subgrade soil type encountered.

It is recommended that the wells be kept for monitoring purposes throughout the construction period and then decommissioned in accordance with Ontario Regulation (O. Reg.) 903 once they are no longer needed.

3.2 Purging and Ground Water Level Monitoring

The monitoring wells were purged, and after stabilization, the ground water levels were recorded using a Solinst electric water meter tape. Ground water level readings were measured on four (4)

occasions between Nov 2021 and March 2022. The results of the ground water level monitoring are listed on Table 1 and are discussed in Section 4.2.

3.3 Borehole Permeability Testing

To estimate the hydraulic conductivity of the overburden deposits, borehole permeability testing was conducted using slug tests in the monitoring wells of boreholes 1, 5, 7 and 20.

In the test, a volume of water (the 'slug') was rapidly removed from, or added to, the monitoring well, and periodic water level measurements were recorded manually using a Solinst flat tape water level meter and with an electronic transducer (a Solinst Levelogger) as the water level recovered to the hydrostatic level inside the well (a rising or falling head test).

Using the Hvorslev method (Hvorslev, 1951), the data was plotted on a semi-logarithmic scale to estimate the basic time lag T_0, which, combined with the geometric configuration of the well screen, resulted in an estimation of hydraulic conductivity (K-value) for the soils in the vicinity of the well screen. The plots of normalized head versus elapsed time and the estimation of the basic time lags (T_0 values) are included in Appendix D. T_0 was estimated by fitting an exponential trend line to the data typically near the end of the recovery period, as recommended by Butler (1997) to overcome the ambiguity of double straight-line effects or concave results, and calculating T_0 from the inverse of the slope of the fit line. A plot exhibiting concave-upward curvature reflects compressibility of the formation indicating that a storage effect may exist.

The K-values (in cm/s) were estimated using the following equation:

$$K = \frac{r^2}{2LT_0} \ln\left(\frac{L}{R}\right)$$

where: K = hydraulic conductivity (cm/s)

L = the length of the screen (cm)

R = the radius of the borehole (cm)

r = the radius of the well casing (cm)

T_0 = the basic time lag in seconds (-1/slope of line fitted to data, see Appendix D).

Slug tests conducted in monitoring wells with partially submerged well screens are influenced by sand pack drainage and re-saturation. Under this condition, the above procedure was modified using the method outlined by Binkhorst and Robbins (1998) in which an 'effective' well casing radius, re, based on the specific yield of the sand pack, replaces the well casing radius, r. The specific yield of the sand pack was taken to be 0.25.

3.4 Soil Particle Size Distribution Analyses and Hydraulic Conductivity Estimate

Six (6) soil samples obtained from the boreholes were submitted to the PML laboratories for particle size distribution analyses. The particle size distribution curves of these soil samples are shown on Figure GS-1.

In addition to in-situ testing (Section 3.3), the hydraulic conductivity (K) value of selected soil samples was estimated using the grain size distribution and an empirical formula as described below.

The K value of the soil samples were estimated using the following expression (Puckett et. al. 1985) in which the percentage of clay was taken from the particle size distribution charts (Figure GS-1):

$$K = 4.36 \times 10^{-3} \times e^{(-0.1975 \times \% \text{ clay})}$$

where:

- K = hydraulic conductivity (cm/s).
- %clay = percentage of the soil sample finer than 0.002 mm by weight.

The results of field permeability tests as well as the estimated K-values from particle size distribution test results are listed on Table 2.

3.5 Water Sampling

In order to determine the management options for the potential discharge of ground water, a ground water sample was collected from the monitoring well of Borehole 7 on March 9, 2022. The ground water sample was collected using a Waterra Ecobailer. The sample obtained was immediately placed in bottles supplied by SGS Canada Inc. (SGS) and stored at low

temperatures. The ground water sample collected was delivered to SGS Canada Inc for chemical analyses. SGS is accredited by The Standards Council of Canada (SCC) and The Canadian Association for Laboratory Accreditation (CALA).

To assess the baseline ground water quality with respect to future disposal options during potential construction dewatering the ground water sample was analyzed for the following parameters:

- The West Gwillimbury Sewer-Use Bylaw for Sanitary Water,
- The West Gwillimbury Sewer-Use Bylaw for Storm Water,
- A suite of metals (for Provincial Water Quality Objectives, PWQO).

The Chain-of-Custody Record and the laboratory reports are included in Appendix E, and the results are discussed in Section 4.4.

4. SUMMARIZED SUBSURFACE CONDITIONS

The findings of the boreholes drilled and monitoring wells installed as part of the geotechnical investigation are described in detail below. Reference is made to the appended Log of Borehole Sheets, tables, figures, and drawings for details of the field work, including inferred stratigraphy, soil classifications, Standard Penetration Test (SPT) N values, ground water observations and laboratory test results. The borehole locations are depicted in Drawing 1 and hydrogeological findings are depicted in the profiles, see Drawings 3 and 4.

Our summarized findings and interpretation of the site subsurface conditions are presented below. Due to the soil sampling procedures and limited sample size, the depth / elevation demarcations on the borehole logs must be viewed as “transitional” zones between layers, and cannot be construed as exact geologic boundaries between layers.

4.1 Stratigraphy

4.1.1 Topsoil Fill

A 150 to 400 mm thick topsoil fill layer was contacted at the ground surface in all boreholes except for BH3 where no topsoil was present. The topsoil generally consisted of dark brown sand with organics and was judged to be moist.

4.1.2 Fill

A layer of fill was encountered at the ground surface in all the boreholes and it was fully penetrated at depths of 0.7 to 4.0 m at BH1 and BH3 to BH20. The fill layer extended to the borehole termination depth of 2.0 m below grade in BH2. The fill generally comprised very loose to very dense sand to silty sand soils based on SPT "N" values between 1 blow and refusal per 0.3 m penetration of the split spoon sampler. Occasional cobbles and boulders were contacted throughout the fill in BH3 and BH4. The fill soil was judged to be moist with moisture content levels ranging from 9 to 29%.

4.1.3 Sandy Silt Till

Below the fill, sandy silt till was contacted to the borehole termination depths of 3.4 to 5.0 m below grade in all the boreholes, except BH2 where the borehole was terminated in the fill. The upper zone of the till layer, to depths in the range of 1.2 to 2.7 m was generally compact based on SPT "N" values between 11 and 25 blows per 0.3 m penetration of the split spoon sampler. The surface of the till was locally loose at BH6 with an N value of 9. Below 1.2 to 2.7 m the till deposit was dense to very dense with N values in the range of 30 to greater than 50. Based on a review of nearby subsurface information, these dense to very dense soil conditions are expected to continue below the depths investigated. Probable cobbles and/or boulders were occasionally contacted throughout this deposit in BH5, BH7 to BH11 and BH13 to BH20. The sandy silt till was judged to be moist to wet with in-situ moisture content determinations typically ranging from 5.3 to 18%.

Figure GS-1 attached, presents the results of six particle-size distribution analyses conducted on typical samples of the sandy silt till deposit contacted in the boreholes. The results indicate 2 to 12% gravel, 27 to 41% sand and 48 to 67% silt and clay, with the predominant fraction being silt sized particles.

4.2 Ground Water Conditions

The ground water conditions at the site are represented by the ground water level observations made during drilling, upon drilling completion and the ground water levels recorded in the monitoring wells.

Observations During and Upon Completion of Drilling

In general, ground water was contacted during drilling in the fill soils at BH4 and in the native sandy silt till deposit in BH1, BH6, BH7, BH9 to BH17, BH19, and BH20 in the range of 1.4 to 4.6 m bgs. After completion of drilling, free water was observed at BH1, BH4, BH6, BH7, BH9 to BH17, BH19, and BH20 in the range of 1.1 to 4.6 m bgs. Caving of the soil in the boreholes was observed in BH4, BH6, BH11, BH15, BH17, BH19 at 1.1 to 4.3 m bgs.

Hydrostatic Ground Water Level Measurements

Ground water level readings have been measured on four (4) occasions from November 24, 2021 to March 9, 2022. The hydrostatic ground water levels are summarized in Table 1. Over the monitoring period, ground water depths vary from 0.5 m (at BH14 and BH20) to 3.3 m (at BH 5), and ground water elevations vary from 220.0 (at BH16 and BH20) to 222.9 (at BH 8). In the vicinity of the proposed apartment building, ground water level elevations ranged from 220.9 to 222.9.

Based on the readings from March 9, 2022, ground water flow directions are expected to be generally southerly or southeasterly, see the Ground Water Contour Plan in Drawing 2.

Ground water levels at the site are subject to seasonal fluctuations due to weather patterns and variations in precipitation and climate, as well as the water level of the Nith River.

Aquifer and Recharge Findings

The extensive sandy fill and underlying sandy silt deposits encountered at the boreholes indicate the presence of a low permeable aquifer. It is expected that infiltration and recharge through this soil would not be at a high rate, but not completely impeded. The MECP's Source Protection Information Atlas estimates significant recharge rates close to the site.

4.3 Estimated Hydraulic Conductivity and Ground Water Flow Velocities

The hydraulic conductivity K-values of the soils encountered surrounding the monitoring well screens at boreholes 1, 5, 7 and 20 were estimated using in-situ permeability test data (slug tests) as described in Section 3.3. Hydraulic conductivity was also estimated using grain size distribution test results as described in Section 3.4. The results are listed on Table 2.

The estimated hydraulic conductivity at the wells, screened in sandy silt till, were 6×10^{-7} to 4×10^{-5} cm/s based on the slug tests. The estimated hydraulic conductivity of the sandy silt till ranged from 2×10^{-4} to 5×10^{-4} cm/s based on grain size distribution.

Based on the estimated ground water contour map and measured hydraulic conductivities, hydraulic gradients were found to generally be in the range of 0.04 to 0.06 and ground water flow velocities range from 2×10^{-10} to 2×10^{-7} m/s, generally to the south or south east.

4.4 Ground Water Sample Chemical Test Results

The chemical analyses carried out by SGS on a non-filtered ground water sample from monitoring well BH7 in accordance with the chain-of-custody record and the protocols described above (Section 3.5), are included in the laboratory report in Appendix E.

To provide an assessment of how the dewatering discharge water may compare to expected regulatory compliance criteria for discharge to a sanitary sewer or storm sewer, or to a

watercourse, the water quality was compared to the West Gwillimbury sewer-use bylaw criteria for sanitary and storm sewer discharge and metals for comparison to PWQO for discharge to a watercourse.

The non-filtered ground water sample was analyzed and the results complied with the criteria above with the exception of the elevated parameters listed in Table A (discharge to watercourse), and Table B (discharge to storm or sanitary sewer) below:

TABLE A
ELEVATED GROUND WATER SAMPLE CONCENTRATIONS
FOR WATERCOURSE RECEIVERS

PARAMETER	**WATER SAMPLE CONCENTRATION (mg/L)**	**CONCENTRATION LIMIT (mg/L)**
	BH 7	
		PWQO
Copper	0.0021	0.001
Iron	0.628	0.3
Phosphorous	0.079	0.01
		MECP
Total Suspended Solids	226	25

Note: 4AAP-Phenolics were measured at the laboratory detection limit, which is higher than the PWQO limit.

TABLE B
ELEVATED GROUND WATER SAMPLE CONCENTRATIONS
FOR SEWER DISPOSAL

PARAMETER	WATER SAMPLE CONCENTRATION (mg/L)	CONCENTRATION LIMIT (mg/L)	
	BH 7		
		STORM	SANITARY
Total Suspended Solids	226	15	350

The unfiltered ground water sample findings indicate that the discharge water, if untreated, is expected to be:

- Compliant with the West Gwillimbury sewer-use bylaw for discharge to a sanitary sewer.
- Compliant with the West Gwillimbury sewer-use bylaw for discharge to a storm sewer with the exception of total suspended solids (TSS) as listed in Table B.
- Compliant with the PWQO for discharge to a watercourse with the exception of copper, iron, phosphorous and total suspended solids as listed in Table A, above.

The concentrations of many of these parameters will be reduced by treatment with a sedimentation tank and/or filtration bags prior to discharge. Further treatment may be required for the discharge water to meet PWQO needed for discharge to a watercourse. Ground water discharge quality is part of the compliance monitoring plan, see Section 7.4.

4.5 Infiltration

4.5.1 Introduction

Due to wetting and drying cycles of soils, water flow occurs in two zones: the aeration (capillary fringe) zone, and below it, the saturated zone, where the demarcation between the two zones is usually referred to as the ground water phreatic surface or water table. The movement of water in

the aeration zone is infiltration and is governed by negative capillary suction (less than atmospheric pressure) whereas the water flow in the saturated zone is percolation and is controlled by positive hydrostatic pressure (or head).

4.5.2 Test Results

As a preliminary assessment of infiltration at the site, the findings from the grain size distribution assessment of soil samples and borehole permeability testing conducted in the boreholes and corresponding percolation T-value and infiltration rate are summarized in Table C, below.

TABLE C

SUMMARIZED K VALUE, "T" VALUE, AND INFILTRATION RATE

BOREHOLE	SOIL TYPE (SAMPLE DEPTH, m BGS)	K_{fs} [1] (cm/s)	PERC. TIME T-VALUE[4] (mins/cm)	INFILTRATION RATE [4] (mm/hr)
5	Sandy Silt Till (1.5 to 1.9 m)	2×10^{-4} [2]	11	56
9	Sandy Silt Till (1.5 to 1.9 m)	3×10^{-4} [2]	10	62
19	Sandy Silt Till (1.5 to 1.9 m)	5×10^{-4} [2]	8	71
1, 5, 7, 20	Sandy Silt Till (3.0 to 4.5m)	6×10^{-7} to 4×10^{-5} [3]	16 to 50	12 to 38

Notes:

1. Field saturated hydraulic conductivity, K_{fs}.
2. K_{fs} determined from assessment of soil sample.
3. K_{fs} determined from borehole permeability tests.
4. T-value and Infiltration rate based on K_{fs} according to TRCA Stormwater Management Criteria.

4.5.3 Discussion

The near-surface soils at the boreholes were typically sand to sandy silt fill, underlain by sandy silt till encountered to the termination depths of the boreholes (about 5.0 m below ground surface). For this preliminary infiltration assessment, near-surface soil samples were selected that were

taken from a depth of 1.5 to 1.9 m bgs, and the results of the borehole permeability testing, which includes soils screened between 3.0 and 4.5 m bgs were also included. As can be seen in Table C, percolation times ranged from 8 to 11 min/cm based on the soil samples, and 16 to 50 min/cm based on the permeability testing, with corresponding infiltration rates of 56 to 71 mm/hr and 12 to 38 mm/hr. It should be noted that the infiltration rates based on the soil samples may be somewhat overestimated; according to the Ontario Building Code (2003) the typical rate for silt and very fine sands is 12 to 30 mm/hr. Since the minimum guideline value recommended for infiltration gallery design in "Stormwater Management and Planning Design Manual", by MOECC, dated 2003, is 15 mm/hr, the soil at this location would be deemed acceptable. However, please note that some measured ground water levels were shallow (namely at boreholes 8, 9, 14 and 20), and the bottom of any proposed infiltration facilities must be at least 1.0 m above the ground water level.

For final design of infiltration facilities, if any, it is recommended that in-situ percolation testing be conducted in the specific locations and depths required.

5. WATER BALANCE, RECHARGE AND BASEFLOW

5.1 Introduction

The precipitation of the hydrologic cycle partitions into runoff, evapotranspiration and infiltration. The portion of the infiltration that reaches the ground water table is considered the "ground water recharge" and the portion of the ground water flow to wetlands, ponds, and creeks is considered the "baseflow". The main purpose of the water balance (or budget) analysis is to estimate the current infiltration rates to the subsurface to allow comparison with the estimated rates expected after development of the site (which change primarily due to the increase in hard-surfaced area).

The amount of infiltration in an area to be developed is largely dependent not only on precipitation rates, but upon the infiltration capacity of the area and the nature of the proposed development. For example, areas underlain by fine-grained silt and clayey soils and dense till materials, having naturally low infiltration capacity, will likely experience relatively little reduction in infiltration as a result of hard surfacing by a development compared to more permeable soils which may become partially covered with impermeable surfaces.

The method for calculating the infiltration rate involves the use of a site-specific climate water budget and applying it to the area proposed for development. For this assessment, the monthly total precipitation and average temperature, averaged from the years 1981 to 2010, were obtained from the Government of Canada's Canadian Climate Normals website for a nearby weather station (King Smoke Tree). Infiltration factors were estimated using the conservative infiltration factors of the former Ministry of Environment and Energy (MOEE) "Hydrogeological Technical Information, Requirements for Land Development Application" (dated April 1995). The infiltration factors provided are based on a hydrologic analysis of the peak runoff for stormwater management purposes. This provides a worst-case scenario with respect to runoff and is conservative in estimating the amount of ground infiltration.

For pervious surfaces, Thornthwaite monthly water balance software by McCabe and Markstrom (2007, USGS) was used to estimate the monthly and total yearly evapotranspiration, water surplus, and runoff. The total surplus water is that which is available after accounting for losses to evapotranspiration and soil moisture storage recovery each month. The model also includes snow accumulation and melting, and direct runoff. The program input are shown in Table F-1, and model output are shown in Table F-2 in Appendix F.

Model output was incorporated into a water balance in the manner outlined in "Conservation Authority Guidelines for Hydrogeological Assessments", dated June 2013. In the method, the infiltration is calculated by applying the cumulative infiltration factors to the available surplus water.

As a preliminary assessment, the following provides a high-level assessment of pre-development and post-development infiltration and runoff rates.

5.2 Pre-Development Water Balance

Based on the calculations presented in Table F-2 in Appendix F, the yearly surplus water is typically about 190 mm in the project area. The area of the site was assumed to be entirely cultivated. The amount of infiltration at the site is estimated by applying the cumulative infiltration factors to the available surplus water, as shown in Table F-3 in Appendix F. Thus, based on the cumulative

infiltration factor, the infiltration at the existing site is estimated to be about 0.6 x 190 mm/year = 114 mm/year. Based on the estimated grassed area at the site, the pre-development infiltration rate is estimated at about 1,047 m^3/year and the runoff is estimated at 1,928 m^3/year. This infiltration contributes to pre-development ground water recharge and stream baseflow.

5.3 Post-Development Water Balance

Post-development, the area of cultivation, pavement and buildings were assumed as presented in Table F-4 in Appendix F. For the pervious surfaces, the amount of infiltration at the site is estimated by applying the cumulative infiltration factors to the available surplus water, as above. However, for the impervious surfaces, there is no infiltration. On the impervious surfaces, runoff is 80% of precipitation, while 20% is lost to evapotranspiration. Based on the estimated proposed pervious and impervious surface areas at the site, the post-development infiltration rate is estimated at about 475 m^3/year and the runoff is estimated at 4,319 m^3/year.

5.4 Conclusion

Comparing the infiltration rates estimated above results in a deficit of ground water infiltration due to the development changes of 572 m^3/year. Runoff is estimated to increase by 2,391 m^3/year. A ground water infiltration deficit reflects a decrease in contribution to ground water recharge and to baseflow. Low impact development (LID) features may be incorporated at the site to compensate for the infiltration deficit, however consideration must be made to the infiltration rate and potentially high ground water level.

6. CONSTRUCTION DEWATERING REQUIREMENTS

6.1 Introduction

Typically, construction dewatering is required where the proposed excavation will be deeper than the ground water strike level and/or hydrostatic ground water level. The objective is to maintain dry working conditions and a stable excavation bottom and slopes. The magnitude of construction dewatering will depend on the proposed dimensions and depth of the excavations, shoring used, if any, and the site and surrounding ground water conditions (ground water levels, ground water

sources, and hydraulic conductivities). It is prudent to note that ground water control and construction dewatering requirements should be re-evaluated if the design footprint or invert depths are altered from that assumed herein.

Final grading plans and proposed design founding levels for the proposed building were not provided at the time of this report. Once the design details for the proposed development are finalized, the recommendations in this report should be revisited to confirm that they remain applicable.

It is understood that the proposed four (4) storey apartment building is to not have a basement. The following is based on the geotechnical assessment (PML Ref: 21BF049, Report: 1): It is feasible that the building will be constructed using standard construction practices using conventional shallow foundations. The existing in-place fill is not considered suitable to support building foundations or any settlement sensitive structures and will require removal. It is assumed that conventional strip or spread footings are to be at a typical depth of about 1.5 m below finished grade levels, however, footings at these depths will not fully penetrate the existing fill material in all areas and will need to be extended deeper to reach competent native undisturbed soil. Considering the level of competent native soil, the minimum recommended founding elevation for the building was 219.6.

It is expected that site servicing for the development will extend to typical depths in the range of about 2 to 3 m, however, localized subexcavation of unsuitable fill materials may be necessary.

See Drawings 1 to 4 for details.

6.2 Hydrogeological Conceptual Site Models

Since the building is “L” shaped, for ease of assessment the footprint of the excavation will be separated into a west and east part, where the west part extends to the southern extent, and the east part is the remainder of the footprint to the east. The servicing assessment assumes a typical trench for sewer or watermain installation, in the parking lot area. Thus, the construction features included in the assessment of potential dewatering are listed below:

i) Building Excavation (West Part)

ii) Building Excavation (East Part)

iii) Servicing (Typical)

For the assessment, a simplified hydrogeological conceptual site model (HCSM) was developed based on the field and laboratory data compiled to date, and assumed excavation depths and dimensions based on the geotechnical assessment and design drawings.

It is assumed for modelling purposes that the hydrostatic ground water level is at the maximum measured over the monitoring period, an elevation of 222.9 (depth 0.7 m) recorded at borehole 8 for the building, and 222.3 (depth 0.7 m) for the site servicing (which is assumed to be predominantly in the parking area). It is assumed that the ground water level is to be lowered at least 0.5 m below the lowest excavation level to maintain dry working conditions.

Building footprint dimensions take into account sloped excavation sides. Buried sewer servicing is assumed to be dewatered in lengths of 30 m.

Seepage is expected to primarily occur through the sandy silt till. The model hydraulic conductivity was estimated from the maximum measured slug test value (4×10^{-7} m/s).

The relevant assumptions for the HCSM are summarized in Table 3, attached, and are expected to provide a reasonable worst-case estimation of the magnitude of dewatering.

6.3 Construction Dewatering Discharge Rates

The construction dewatering discharge rates are estimated for the proposed construction activities based on the above-noted HCSMs and associated assumptions described below. The relevant assumptions, calculations, and results are summarized on Table 3.

The estimated dewatering discharge rate (with a factor of safety (FOS) of 1.5 applied) and the distance (zone) of influence for each feature are summarized on Table D, below.

TABLE D
APPROXIMATE CONSTRUCTION DEWATERING
DISCHARGE RATES AND ZONES OF INFLUENCE

DEWATERING ACTIVITY	DRAWDOWN (m)	DEWATERING ZONE OF INFLUENCE (DZOI) (m)	DISCHARGE RATE (FOS = 1.5) (L/d)
Building Excavation (West Part)	3.8	8	10,200
Building Excavation (East Part)	3.8	8	8,200
Servicing (Typical)	4.8	5	8,200

The “dewatering zone of influence” (or DZOI) is the maximum radius of the cone-shaped profile of the temporary lowered ground water level if no barriers are used during construction dewatering.

With regards to the above assessment, please note the following:

- Assuming the west and east footprints of the building are excavated simultaneously, the construction dewatering discharge rates are expected to be about 18,400 L/d and 8,200 L/d for typical installation of servicing, thus, according to O. Reg. 387/04 (see Section 1.3), the water taking is not expected to require to be registered on the Environmental Activity and Sector Registry (EASR) or have a Permit to Water (PTTW) since the anticipated rate is not greater than 50,000 L/d.

- The construction dewatering rates are estimated based on features or 'zones' selected for the hydrogeological assessment based on estimated dewatering footprints and depths; the dewatering contractor's dewatering footprints may differ, thus resulting in different dewatering rates.

- The discharge rates and DZOIs are conservatively estimated and have a factor of safety applied to minimize the risk of not being prepared for unanticipated soil or ground water conditions that may require higher pump rates or cause greater dewatering impacts.

- The discharge rates are estimated under steady state conditions. Pumping rates prior to steady state are often increased by the dewatering contractor to achieve the desired drawdown in the shortest period of time but must remain below the 50,000 L/d limit.

- Due to inherent uncertainties in estimation, there is a potential for the dewatering discharge rate to exceed 50,000 L/d, thus necessitating an EASR registration. Daily dewatering volumes will need to be closely monitored and dewatering activities staged to ensure that discharge rates remain below the 50,000 L/d threshold.

- Lower discharge rates are expected during drier periods.

- Surface water, which is to be prevented from entering the excavation area, is not included directly, but should be accounted for by the factor of safety.

7. CONSTRUCTION DEWATERING IMPACT ASSESSMENT AND MONITORING PLAN

Within the construction dewatering zone of influence, impacts such as ground subsidence and reduction in ground water flow to ground water users and watercourses may potentially exist. The impact assessment and the associated monitoring plan are included below.

7.1 Settlement

Ground settlement (soil compression) may be caused by the increase in effective stresses due to the lowering of the ground water level and subsequent reduction (or elimination) of pore water pressure. This settlement can cause damage to buildings and structures close to the dewatering. Typically, subsidence due to dewatering is most likely to occur where the estimated drawdown is significant, structures are located close to the excavation and within the DZOI, and soils within the drawdown depths are compressible. Expected settlement will decrease with distance from the dewatering.

Since the estimated dewatering zone of influence is relatively short at 8 m for the building, and 5 m for a typical servicing trench, it is not expected that settlement will be a significant concern.

Settlement caused by pumping and removing fines (silt and fine sand particles) should be considered. This type of settlement is less common for wellpoints, deep wells, or ejectors, but prevalent for sump pumps. For all pumping methods, it is imperative that the filter packs are sufficiently designed and installed and the discharge is monitored for fines content that may indicate soil erosion.

7.2 Potential Impact on Other Ground Water Users and Water Features

No operating water well is located within the estimated construction dewatering zone of influence which is quite short at 8 m for the building and 5 m for a typical servicing trench. Furthermore, pump rates are expected to be quite low, and dewatering efforts are confined to the shallow ground water system. For these reasons, no water wells are expected to be impacted by the construction dewatering.

Similar to the reasoning above, since no watercourses or waterbodies are located within the dewatering zone of influence and pump rates are expected to be quite low, no impacts are expected on them directly, and the impact on ground water flow to these features is expected to be negligible.

7.3 Discharge Water Quality and Quantity

Ground Water Quality

As discussed in Section 4.4 of the report, the unfiltered ground water sample was compliant with discharge to a sanitary sewer, a storm sewer with the exception of total suspended solids, and compliant with the PWQO for discharge to a watercourse with the exception of copper, iron, phosphorous, and total suspended solids. Therefore, to mitigate impact on the receiving sewer or water feature, it is recommended that the discharge water be treated to remove sediment (total suspended solids) by filtration and/or by using a sedimentation tank at minimum. It is expected that further treatment may be required for the discharge water to meet PWQO needed for discharge to a watercourse. A monitoring plan is described in Section 7.4.

Ground Water Quantity

The estimated construction dewatering pump rate is relatively low, and below the threshold of 50,000 L/d required for a water taking permit with the MECP. Nevertheless, the total daily ground water volume pumped should be metered or measured using a flow measuring device, and a record of the water taking should be maintained by the water-taker. This record will include the dates and duration of water takings, and the total measured volume of water pumped per day for each day that water is taken and will be updated and reported to the Client periodically. Records should be kept up to date and available at or near the site of the water taking in the event of inspection by a Provincial Officer.

7.4 Construction Dewatering Monitoring Program and Treatment Plan

Since no water taking permit is necessary, the MECP is not responsible for discharge water quality compliance. Water quality criteria, if any, will be mandated by the local conservation authority if discharge is to storm sewer or watercourse, and/or municipality if to storm sewer or sanitary sewer.

The monitoring plan for discharge to a storm sewer or watercourse is outlined on Table 4. Due to the relatively low impact of the construction dewatering, the plan is primarily concerned with

discharge water quality. The monitoring will be implemented both during a trial dewatering, if conducted, and during construction. The trial dewatering may be conducted for a short period of time once the dewatering and sediment control facilities (filtration bags, decantation tanks, sedimentation ponds, or the like) are installed to obtain a representative water sample from the outflow of the sediment control facility (the "discharge") for chemical analysis. The results of this water quality analysis will provide guidance in the selection of discharge treatment requirements during construction dewatering.

8. POTENTIAL LONG-TERM IMPACTS

Short term impacts, namely those due to ground water control during construction (construction dewatering), were outlined in Section 7, above. Potential long-term impacts of the development are discussed herein.

As discussed in Section 5.0, the water balance indicates that the development of the site may result in a loss of infiltration of about 572 m^3/year, and an increase in runoff of about 2,391 m^3/year. The loss of infiltration may lead to a decrease in baseflow to nearby watercourses/waterbodies, potentially locally lower the ground water levels, and potentially alter the direction of ground water flow. Increased runoff may lead to a reduction in water quality of water entering watercourses, waterbodies or the soil.

However, due to the high fines content of the existing soils encountered beneath the site, the property was not a significant source of recharge prior to development. In addition, the construction of LID measures may help alleviate these impacts.

9. CONCLUDING REMARKS AND RECOMMENDATIONS

For the proposed construction works, the salient assessment findings are outlined as follows:

- The typical stratigraphy underlying the site consists of surficial topsoil or topsoil fill, underlain by sand to silty sand fill, underlain by a native sandy silt till deposit which extended to the termination depth of the majority of the boreholes.

- Hydrostatic ground water level readings have been measured on four (4) occasions from November 24, 2021 to March 9, 2022. Over the monitoring period, ground water depths ranged from 0.5 m to 3.3 m, and ground water elevations ranged from 220.0 to 222.9. The hydrostatic ground water levels are summarized in Table 1. See Section 4.2 for details.

- The estimated hydraulic conductivity of the sandy silt till ranged from 6×10^{-7} to 4×10^{-5} cm/s based on slug tests and ranged from 2×10^{-4} to 5×10^{-4} cm/s based on grain size distribution. Ground water flow velocities range from 2×10^{-10} to 2×10^{-7} m/s, generally to the south or southeast. See Section 4.3 for details.

- An unfiltered ground water sample collected at the site complied with the criteria corresponding to discharge to a West Gwillimbury sanitary sewer, and West Gwillimbury storm sewer, with the exception of total suspended solids. The ground water sample complied with the criteria corresponding to discharge to watercourse (PWQO) with the exception of copper, iron, phosphorous and total suspended solids. See Section 4.4 for details.

- Infiltration rates of the existing soil encountered at the site are estimated in the range of 12 to 71 mm/hr. See Section 4.5 for details.

- A water balance considering pre- and post-development conditions estimated a deficit of ground water infiltration of 572 m^3/year and an increase in runoff of 2,391 m^3/year. See Section 5 for details.

- Excavation for the building and servicing is expected to be in sandy silt, with worst-case ground water draw down estimates of about 3.8 m and 4.8 m, respectively. An assessment of the potential construction dewatering rates indicates that ground water control is not expected to be excessive; the total dewatering rate for the building excavation was about 20,000 L/d, and for typical buried services was about 8,000 L/d (per 30 m length of trench). Dewatering zones of influence were estimated at 8 m for the building and 5 m for the servicing. See Section 6.

- Assuming the conditions assumed in this report, the construction dewatering rates are not anticipated to exceed 50,000 L/d and thus are not anticipated to require water taking permitting.

- As described in the Section 7, the impact of the construction dewatering (the drawdown of the local ground water table) is expected to be insignificant. Since the dewatering zones of influence are expected to be less than 8 m for the building and 5 m for the servicing, settlement is expected to be negligible, and no private or public water wells or wetlands are expected to be impacted. A construction dewatering monitoring plan is included for discharge water quality compliance, if required by the conservation authority.

We recommend the following:

- Although not mandatory, ground water level uncertainties due to seasonal variability and other factors may be diminished by having the ground water levels monitored for a longer period of time.

- If infiltration facilities are proposed, it is recommended that in-situ percolation testing be conducted in the specific locations and depths required for the final design.

- If final development design details differ from that assumed herein, some assessments should be re-assessed to confirm that the findings and conclusions remain valid.

- Since the construction dewatering rates are less than 50,000 L/d, water taking permitting is not required by the MECP. However, if construction dewatering discharge water is to be directed to a watercourse, the Lake Simcoe Region Conservation Authority should be notified.

- It is recommended that all steps be taken to minimize the dewatering and/or sump pump rates. For example, since the ground water levels may vary, it is best to schedule excavation for periods of low ground water level. Also, excavation footprints and depths should be no more than is needed, and surface water intrusion minimized.

- To reduce the erosion of fines around the sump pumps or wellpoints, it is imperative that the filter packs are sufficiently designed and installed and the discharge is monitored for fines content.

- At minimum, it is recommended that construction dewatering discharge water should be treated using a sedimentation tank and/or filtration. A discharge water quality monitoring plan is included, if required.

- Due to inherent uncertainties in estimation, there is a potential for the dewatering discharge rate to exceed 50,000 L/d, thus necessitating an EASR registration. Daily dewatering volumes will need to be closely monitored and dewatering activities staged to ensure that discharge rates remain below the 50,000 L/d threshold.

We trust you will find this report complete within our terms of reference. Should you have any questions, please do not hesitate to contact this office.

Sincerely

Peto MacCallum Ltd.

Andrew Cooke, PhD, P.Eng.
Manager and Senior Engineer
Geoenvironmental and
Hydrogeological Services

Shamsul A. Tarafder, MSc., PhD, P.Geo
Associate and Senior Geoscientist
Geoenvironmental and
Hydrogeological Services

TABLE 1

GROUND WATER LEVEL READINGS IN MONITORING WELLS

BOREHOLE (BH) / MONITORING WELL (MW) No.[1]	GROUND SURFACE ELEVATION[2]	MID-SCREEN ELEVATION[2] (DEPH, m)	HYDROSTATIC GROUND WATER LEVEL ELEVATION (DEPTH, m) [3]			
			NOV. 24, 2021	DEC. 17, 2021	FEB. 11, 2022	MAR. 9, 2022
1	224.13	220.2 (3.9)	222.5 (1.6)	222.6 (1.5)	221.99 (2.14)	222.3 (1.8)
5	224.15	220.3 (3.9)	221.1 (3.1)	221.4 (2.8)	220.93 (3.22)	220.9 (3.3)
7	223.35	219.5 (3.9)	221.6 (1.8)	221.6 (1.8)	221.07 (2.28)	221.4 (2.0)
8	223.62	219.7 (3.9)	222.9 (0.7)	222.1 (1.5)	221.33 (2.29)	221.6 (2.0)
9	222.98	219.1 (3.9)	222.0 (1.0)	222.3 (0.7)	221.58 (1.40)	222.2 (0.8)
14	222.41	218.5 (3.9)	221.7 (0.7)	221.9 (0.5)	221.17 (1.24)	221.7 (0.7)
16	221.58	217.7 (3.9)	220.3 (1.3)	220.4 (1.2)	219.98 (1.60)	220.0 (1.6)
20	220.82	216.9 (3.9)	220.2 (0.6)	220.3 (0.5)	219.96 (0.86)	220.0 (0.8)

Notes:

(1) See Drawing 1 for approximate borehole locations and Log of Borehole sheets for details of monitoring well installation.

(2) Ground surface elevations at the monitoring well locations were surveyed by PML and are geodetic.

(3) Water levels measured using a Solinst flat tape water level reader.

TABLE 2

ESTIMATED HYDRAULIC CONDUCTIVITY (K) VALUES FROM SOIL SAMPLE GRAIN SIZE DISTRIBUTION AND BOREHOLE PERMEABILITY TEST RESULTS

BOREHOLE (BH) / MONITORING WELL (MW) No.(1)	MW MID-SCREEN ELEVATION (DEPTH, m)	SOIL TYPE (SAMPLE NO., DEPTH) OR SOIL TYPE AT MW SCREEN(1)	% CLAY(2)	ESTIMATED K-VALUES FROM GRAIN SIZE DISTRIBUTION TEST RESULTS(3) (cm/sec)	ESTIMATED K-VALUES FROM BOREHOLE PERMEABILITY TESTS(4) (cm/sec)
1	220.2 (3.9)	Sandy Silt Till	-	-	2×10^{-5}
5	-	Sandy Silt Till (SS3, 1.5 to 1.9 m)	16	2×10^{-4} (P)	-
	220.3 (3.9)	Sandy Silt Till (SS6, 4.6 to 5.0 m)	13	3×10^{-4} (P)	6×10^{-7}
7	219.5 (3.9)	Sandy Silt Till	-	-	4×10^{-5}
9	No MW	Sandy Silt Till (SS3, 1.5 to 1.9 m)	13	3×10^{-4} (P)	-
		Sandy Silt Till (SS5, 3.1 to 3.5 m)	11	5×10^{-4} (P)	-
19	No MW	Sandy Silt Till (SS3, 1.5 to 1.9 m)	11	5×10^{-4} (P)	-
20	216.9 (3.9)	Sandy Silt Till	-	-	1×10^{-5}

Notes:

(1) Log of Borehole Sheets for soil sample description.
(2) % Clay is percentage of the total soil sample finer than 0.002 mm by weight.
(3) K-value determination using grain size distribution method by Vukovic and Soro (1992) (V) or Puckett (1985) (P).
(4) K-value estimated using Hvorslev's Method.

TABLE 3

SUMMARIZED CALCULATIONS OF ESTIMATED CONSTRUCTION DISCHARGE RATES AND ZONES OF INFLUENCE

ACTIVITY / FEATURE	PROPOSED EXCAVATION ELEVATION (mASL) (1)	CLOSEST MONITORING WELLS OR BOREHOLES (2)	GROUND WATER STRIKE ELEVATION (mASL) (3)	MODEL GROUND WATER LEVEL ELEVATION (mASL) (4)	LOWERED GROUND WATER LEVEL ELEVATION (mASL) (5)	AVERAGE DRAW-DOWN REQUIRED S_0 (m) (6)	SOIL TYPE (7)	ASSUMED DIMENSIONS OF DEWATERED AREA (m) (8)	K (m/s)	EQUIVALENT RADIUS, re (m) (9)	ESTIMATED DISTANCE OF INFLUENCE R_0 or L_0 (m) (10)	ESTIMATED DEWATERING DISCHARGE RATE, Q (FOS =1.5) (L/day) (11)
Building Excavation (West Part)	219.6	BH3,4,5,7,8	221.6	222.9 (BH8)	219.1	3.8	Sandy Silt Till	55 x 26	4×10^{-7}	21	8	10,200
Building Excavation (East Part)	219.6	BH5,7,8,11	221.6	222.9 (BH8)	219.1	3.8	Sandy Silt Till	34 x 25	4×10^{-7}	16	8	8,200
Servicing (Typical)	218.0	BH6,9,10,12-20	220.9	222.3 (BH9)	217.5	4.8	Sandy Silt Till	Trench Length = 30	4×10^{-7}	-	5	8,200

Notes:

(1) Based on site drawings. Includes 0.3 m for bedding.
(2) See Drawing 1 for approximate borehole locations.
(3) Model value based on highest reported or interpreted depth to ground water strike.
(4) Model value based on highest measured hydrostatic ground water level.
(5) Ground water level lowered during construction dewatering is assumed to be 0.5 m below the general excavation level.
(6) Difference between the hydrostatic ground water level measured in the monitoring wells and the lowered ground water level elevation.
(7) See Log of Borehole Sheets for soil description.
(8) A maximum length of dewatering of 30 m is assumed for trenches.
(9) Equivalent radius, r_e is the radius that approximates a rectangular or square system area. $r_e = \sqrt{(a \times b / \pi)}$. Not applied to trenches.
(10) $R_0 = 3000 S_o K^{1/2}$ or $L_0 = 1750 S_o K^{1/2}$, R_o in m, L_o in m, S_o in m and K in m/s.
(11) Estimated dewatering rate from Dupuit-based formulas (Powers et al, 2007), with a factor of safety (FOS) multiplier.

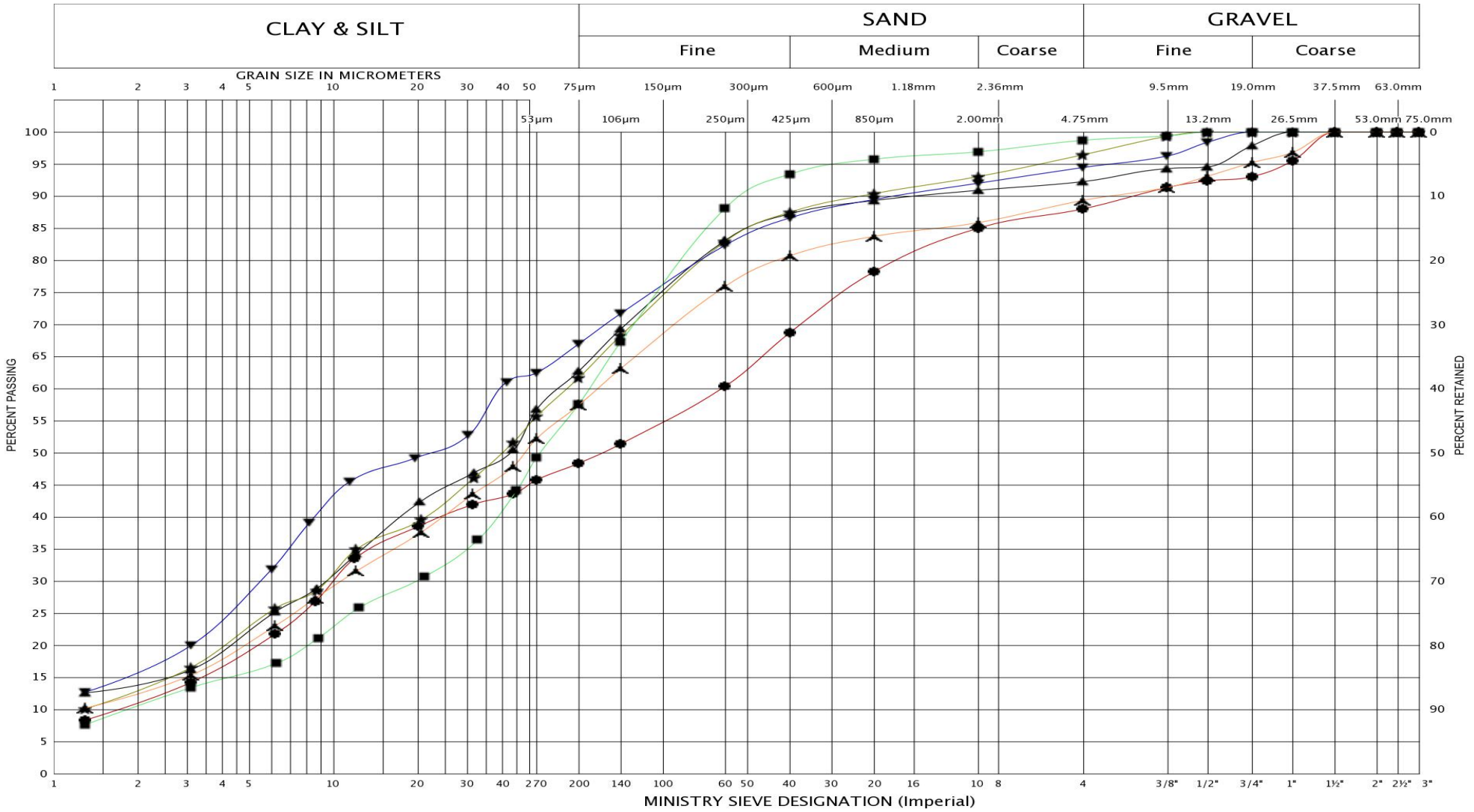
TABLE 4

SUMMARIZED CONSTRUCTION DEWATERING MONITORING AND MITIGATION PLAN

PERIOD	TYPE OF MONITORING	MONITORING LOCATION	PARAMETERS	MONITORING FREQUENCY	TRIGGER FOR MITIGATION	MITIGATION MEASURES / COMMENTS
Trial / Initial Dewatering	Water Quality[1]	Treated dewatering discharge	A suite of metals for PWQO. E-coli, nitrate, nitrite, phosphorus. West Gwillimbury storm sewer bylaw parameters (if via storm sewer). Water clarity by observation, visual or olfactory evidence of petroleum impact.	Once during trial dewatering	Water quality exceeds West Gwillimbury sewer-use bylaw criteria (for storm) or PWQO. Apparent loss of clarity, visual or olfactory evidence of petroleum impact.	Qualified person to review results and advise if treatment is adequate or if additional measures are required.
During Dewatering	Water Quality[1]	Treated dewatering discharge	A suite of metals for PWQO. E-coli, nitrate, nitrite, phosphorus. West Gwillimbury storm sewer bylaw parameters (if via storm sewer). Water clarity by observation, visual or olfactory evidence of petroleum impact.	Once every week, then every two weeks after three consecutive compliant samples. Return to once a week for new dewatering locations.	Water quality exceeds West Gwillimbury sewer-use bylaw criteria (for storm) or PWQO. Apparent loss of clarity, visual or olfactory evidence of petroleum impact	Re-sample. Change treatment method (much preferred) and/or dispose discharge water to sanitary sewer or collect and send off-site (last resort) QP to modify parameter list if evidence of petroleum.

Notes:
1 It is recommended that, at minimum, the discharge water is treated using a sediment control facility such as a decantation tank or filtration bags

UNIFIED SOIL CLASSIFICATION SYSTEM



LEGEND	BH	5	5	9	9	19	19
	SAMPLE	3	6	3	5	3	5
	SYMBOL	▼	✱	⅄	■	●	▲

Peto MacCallum Ltd.
CONSULTING ENGINEERS

GRAIN SIZE DISTRIBUTION

Sandy Silt Till

FIG No.: GS-1

Project No.: 21BF049

SIMCOE ROAD

MARSHVIEW BLVD

BH 6
EL. 223.00

BH 12
EL. 222.40

BH/MW 1
EL. 224.13

BH 3
EL. 223.63

BH/MW 9
EL. 222.98

BH/MW 14
EL. 221.41

BH 19
EL. 221.88

BH 4
EL. 223.89

BH 10
EL. 223.19

BH 15
EL. 221.59

BH 17
EL. 221.62

BH 2
EL. 223.93

BH/MW 7
EL. 223.35

BH 11
EL. 222.70

BH/MW 5
EL. 224.15

BH/MW 16
EL. 221.58

BH/MW 20
EL. 220.82

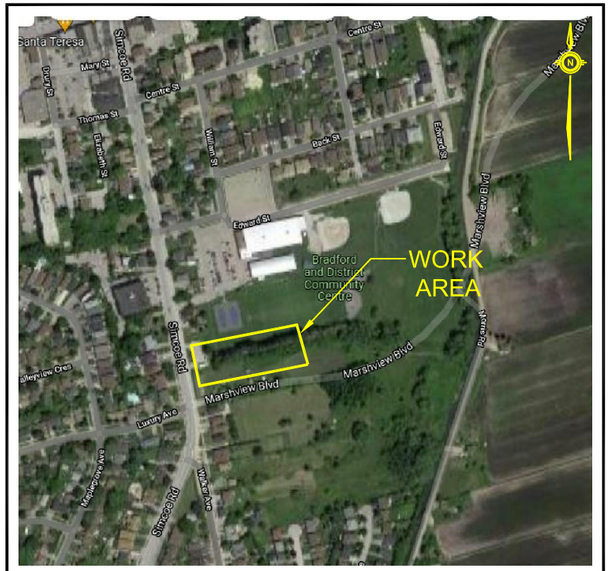
BH/MW 8
EL. 223.62

BH 18
EL. 221.25

BH 13
EL. 221.98

A
A'
B
B'

SCALE
0 m 10 m 20 m 30 m 40 m 50 m



KEY PLAN

LEGEND:

- BOREHOLE WITH MONITORING WELL
- BOREHOLE
- A A' HYDROGEOLOGIC PROFILE

REFERENCE:

BOREHOLE LOCATION PLAN REPRODUCED FROM THE DRAWING SUPPLIED BY THE CLIENT.

NOTES:

THE INFERRED STRATIGRAPHY REFERRED TO IN THE REPORT IS BASED ON THE DATA FROM THESE BOREHOLES SUPPLEMENTED BY GEOLOGICAL EVIDENCE. THE ACTUAL STRATIGRAPHY BETWEEN THE BOREHOLES MAY VARY.

THE BOREHOLE LOCATIONS AND GEODETIC ELEVATIONS WERE SURVEYED WITH A SOKKIA GCX3 REAL TIME KINEMATIC RECEIVER CONNECTED TO THE GLOBAL NAVIGATION SATELLITE SYSTEM.

THE CORPORATION OF THE COUNTY OF SIMCOE

PROPOSED SIMCOE COUNTY AFFORDABLE HOUSING FACILITY

125 SIMCOE ROAD, BRADFORD WEST
GWILLIMBURY, ONTARIO

BOREHOLE LOCATION PLAN

PML Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN	D. SUBBURAJ	DATE	SCALE	PML REF.	DWG. NO.
CHECKED	M. SEGURA	MARCH 2022	AS SHOWN	21BF049	1
APPROVED	A.COOKE				

SIMCOE ROAD

MARSHVIEW BLVD

BH 6
EL. 223.00

BH 12
EL. 222.40

BH/MW 1
EL. 224.13

BH 3
EL. 223.63

BH/MW 9
EL. 222.98

BH/MW 14
EL. 221.41

BH 19
EL. 221.88

BH 4
EL. 223.89

BH 10
EL. 223.19

BH 15
EL. 221.59

BH 17
EL. 221.62

BH 2
EL. 223.93

BH/MW 7
EL. 223.35

BH 11
EL. 222.70

BH/MW 5
EL. 224.15

BH/MW 16
EL. 221.58

BH/MW 20
EL. 220.82

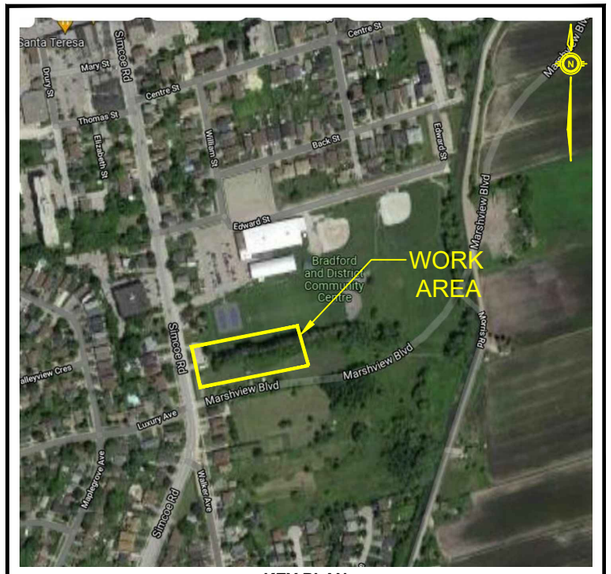
BH/MW 8
EL. 223.62

BH 18
EL. 221.25

BH 13
EL. 221.98

220.0
220.5
221.0
221.5

SCALE
0 m 10 m 20 m 30 m 40 m 50 m



KEY PLAN

LEGEND:

- BOREHOLE WITH MONITORING WELL
- BOREHOLE
- 221.5 INTERPRETED HYDROSTATIC GROUND WATER LEVEL CONTOUR
- INTERPRETED GROUND WATER FLOW DIRECTION

REFERENCE:

BOREHOLE LOCATION PLAN REPRODUCED FROM THE DRAWING SUPPLIED BY THE CLIENT.

NOTES:

THE INFERRED STRATIGRAPHY REFERRED TO IN THE REPORT IS BASED ON THE DATA FROM THESE BOREHOLES SUPPLEMENTED BY GEOLOGICAL EVIDENCE. THE ACTUAL STRATIGRAPHY BETWEEN THE BOREHOLES MAY VARY.

THE BOREHOLE LOCATIONS AND GEODETIC ELEVATIONS WERE SURVEYED WITH A SOKKIA GCX3 REAL TIME KINEMATIC RECEIVER CONNECTED TO THE GLOBAL NAVIGATION SATELLITE SYSTEM.

THE CORPORATION OF THE COUNTY OF SIMCOE

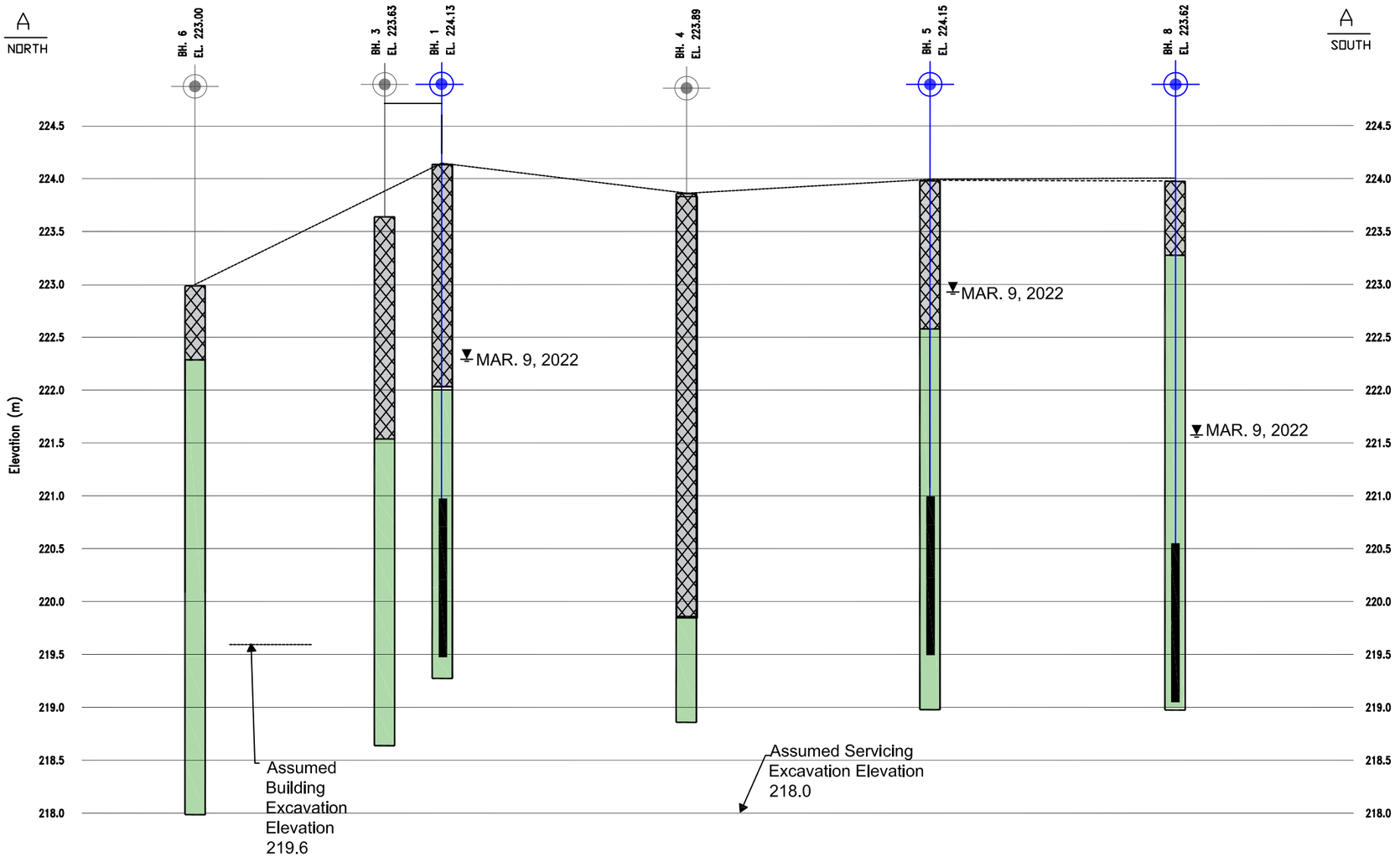
PROPOSED SIMCOE COUNTY AFFORDABLE HOUSING FACILITY

125 SIMCOE ROAD, BRADFORD WEST
GWILLIMBURY, ONTARIO

HYDROSTATIC GROUND WATER LEVEL CONTOUR PLAN

PML Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN	D. SUBBURAJ	DATE	SCALE	PML REF.	DWG. NO.
CHECKED	M. SEGURA	MARCH 2022	AS SHOWN	21BF049	2
APPROVED	A.COOKE				



LEGEND:

- MONITORING WELL
- BOREHOLE
- HYDROSTATIC GROUNDWATER LEVEL AND DATE
- MONITORING WELL SCREEN
- FILL
- SILT

THE CORPORATION OF THE COUNTY OF SIMCOE

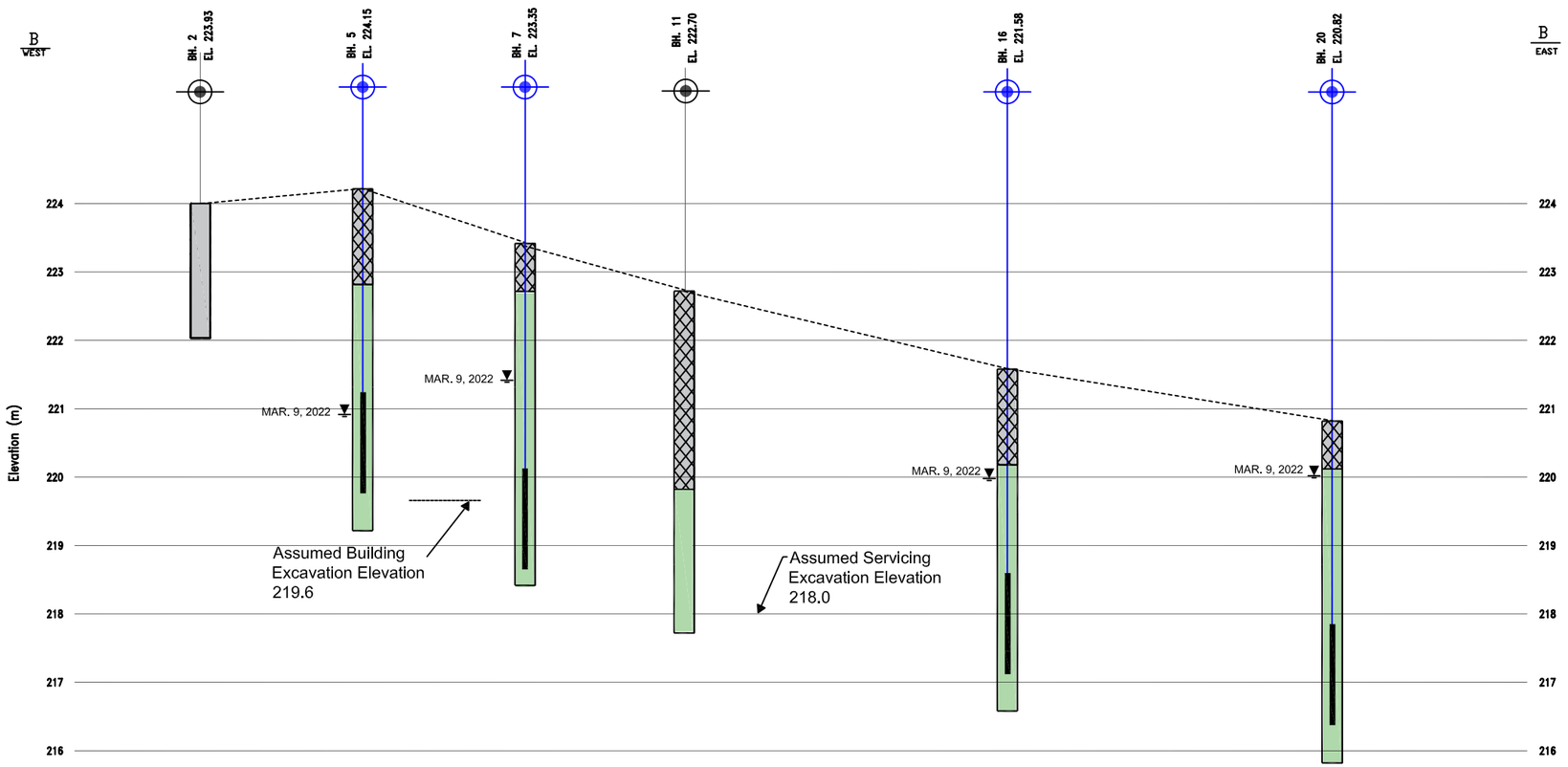
PROPOSED SIMCOE COUNTY AFFORDABLE HOUSING FACILITY

125 SIMCOE ROAD, BRADFORD WEST
GWILLIMBURY, ONTARIO

HYDROGEOLOGIC PROFILE A-A

Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN	M. TOUQAN	DATE	SCALE	PML REF.	DWG. NO.
CHECKED	A.COOKE	APRIL 2022	AS SHOWN	21BF049	3
APPROVED	A.COOKE				



LEGEND:

- MONITORING WELL
- BOREHOLE
- HYDROSTATIC GROUNDWATER LEVEL AND DATE
- MONITORING WELL SCREEN
- FILL
- SILT

THE CORPORATION OF THE COUNTY OF SIMCOE

PROPOSED SIMCOE COUNTY AFFORDABLE HOUSING FACILITY

125 SIMCOE ROAD, BRADFORD WEST
GWILLIMBURY, ONTARIO

HYDROGEOLOGIC PROFILE B-B

Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN	M. TOUQAN	DATE	SCALE	PML REF.	DWG. NO.
CHECKED	A.COOKE	APRIL 2022	AS SHOWN	21BF049	4
APPROVED	A.COOKE				

LIST OF ABBREVIATIONS

PENETRATION RESISTANCE

Standard Penetration Resistance N: - The number of blows required to advance a standard split spoon sampler 0.3 m into the subsoil. Driven by means of a 63.5 kg hammer falling freely a distance of 0.76 m.

Dynamic Penetration Resistance: - The number of blows required to advance a 51 mm, 60 degree cone, fitted to the end of drill rods, 0.3 m into the subsoil. The driving energy being 475 J per blow.

DESCRIPTION OF SOIL

The consistency of cohesive soils and the relative density or denseness of cohesionless soils are described in the following terms:

CONSISTENCY	N (blows/0.3 m)	c (kPa)	DENSENESS	N (blows/0.3 m)
Very Soft	0 - 2	0 - 12	Very Loose	0 - 4
Soft	2 - 4	12 - 25	Loose	4 - 10
Firm	4 - 8	25 - 50	Compact	10 - 30
Stiff	8 - 15	50 - 100	Dense	30 - 50
Very Stiff	15 - 30	100 - 200	Very Dense	> 50
Hard	> 30	> 200		

WTPL	Wetter Than Plastic Limit
APL	About Plastic Limit
DTPL	Drier Than Plastic Limit

TYPE OF SAMPLE

SS	Split Spoon	TW	Thinwall Open
WS	Washed Sample	TP	Thinwall Piston
SB	Scraper Bucket Sample	OS	Oesterberg Sample
AS	Auger Sample	FS	Foil Sample
CS	Chunk Sample	RC	Rock Core
ST	Slotted Tube Sample		

PH	Sample Advanced Hydraulically
PM	Sample Advanced Manually

SOIL TESTS

Qu	Unconfined Compression	LV	Laboratory Vane
Q	Undrained Triaxial	FV	Field Vane
Qcu	Consolidated Undrained Triaxial	C	Consolidation
Qd	Drained Triaxial		

Peto MacCallum Ltd.
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LOG OF BOREHOLE/MONITORING WELL NO. 1

PROJECT Proposed Simcoe County Affordable Housing Facility
PML REF. 21BF049
LOCATION 125 Simcoe Road, Bradford, Onatrio
BORING DATE October 29,2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN FF

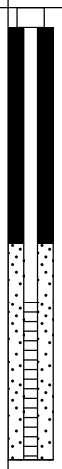
DEPTH (metres) / ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 224.13			
0.23 / 223.90	TOPSOIL: Dark brown sand, trace gravel, trace organics, moist	1	SS	3
	FILL: Very loose to loose, dark brown to brown sand to sandy silt fill, trace gravel, trace organics, moist	2	SS	5
		3	SS	9
2.1 / 222.0	SANDY SILT TILL: Very dense, brown sandy silt till, trace gravel, trace to some clay, moist	4	SS	56
		5	SS	68/290 mm
4.0 / 220.1	becoming grey, wet			
4.9 / 219.2	BOREHOLE TERMINATED AT 4.86 m	6	SS	50/140 mm

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL



Upon completion of augering
Water at 4.5 m
No cave
Water Level Readings:

Date	Depth	Elev.
2021-11-24	1.6	222.5
2021-12-17	1.5	222.6

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 2

PROJECT Proposed Simcoe County Affordable Housing Facility
PML REF. 21BF049
LOCATION 125 Simcoe Road, Bradford, Onatrio
BORING DATE October 28,2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN FF

DEPTH (metres) / ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ● Q; DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L; WATER CONTENT (%)	UNIT WEIGHT kN/m³	GROUND WATER OBSERVATIONS AND REMARKS; GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 223.93						50 100 150 200; 20 40 60 80	10 20 30 40		
0.30 / 223.63	TOPSOIL: Dark brown sand, trace gravel, trace organics, moist		1	SS	15					
	FILL: Compact, dark brown to brown sand to sandy silt fill, some gravel, trace clay, trace organics, moist		2	SS	6	223				
2.0 / 221.9	BOREHOLE TERMINATED AT 2.0 m		3	SS	6	222				Upon completion of augering No water No cave

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 3

PROJECT Proposed Simcoe County Affordable Housing Facility
PML REF. 21BF049
LOCATION 125 Simcoe Road, Bradford, Onatrio
BORING DATE October 29,2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN FF

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 223.63				
0.0		FILL: Compact, brown sand to silt fill, some gravel, probable cobbles and boulders, trace clay, trace organics, moist		1	SS	
				2	SS	13
1.0						
				3	SS	6
2.0	2.1 / 221.5	SANDY SILT TILL: Dense, brown sandy silt till, some gravel, trace to some clay, moist		4	SS	50
3.0	2.9 / 220.7	becoming grey, trace gravel		5	SS	99/290 mm
4.0						
				6	SS	98/295 mm
5.0	5.0 / 218.6	BOREHOLE TERMINATED AT 5.0 m				

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

ELEVATION SCALE: 223, 222, 221, 220, 219

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
No water
No cave

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 4

PROJECT Proposed Simcoe County Affordable Housing Facility
PML REF. 21BF049
LOCATION 125 Simcoe Road, Bradford, Onatrio
BORING DATE October 29,2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN FF

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q; DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L; WATER CONTENT (%)	UNIT WEIGHT kN/m³	GROUND WATER OBSERVATIONS AND REMARKS; GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
		SURFACE ELEVATION 223.89									
0.20	223.69	TOPSOIL: Dark brown sand, some gravel, trace organics, moist		1	SS	18					
		FILL: Very loose to very dense, dark brown sand to silty sand fill, some gravel, probable cobbles and boulders, moist		2	SS	16	223				
				3	SS	2	222				
				4	SS	1					First water strike at 2.3 m
				5	SS	64	221				
4.0	219.9	SANDY SILT TILL: Dense, brown sandy silt till, trace gravel, trace to some clay, wet		6	SS	31	220				
5.0	218.9	BOREHOLE TERMINATED AT 5.0 m					219				Upon completion of augering Water at 1.5 m Cave at 2.6 m

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 5

PROJECT Proposed Simcoe County Affordable Housing Facility
PML REF. 21BF049
LOCATION 125 Simcoe Road, Bradford, Onatrio
BORING DATE October 29,2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN FF

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 224.15				
0.0		TOPSOIL: Dark brown sand, some gravel, trace organics, moist		1	SS	17
0.30	223.85	FILL: Compact to very dense, dark brown sand fill, some gravel, trace organics, moist		2	SS	50/130 mm
1.0						
1.4	222.8	SANDY SILT TILL: Compact to very dense, brown sandy silt till, trace gravel, some clay, probable cobbles and boulders, moist		3	SS	22
2.0				4	SS	37
2.9	221.3	becoming grey		5	SS	47/120 mm
3.0						
4.0						
5.0	219.2	BOREHOLE TERMINATED AT 5.0 m		6	SS	35
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						

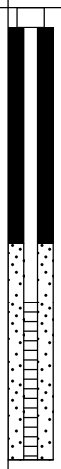
ELEVATION SCALE: 224, 223, 222, 221, 220

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL



Upon completion of augering
No water
No cave
Water Level Readings:

Date	Depth	Elev.
2021-11-24	3.1	221.1
2021-12-17	2.8	221.4

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 6

PROJECT Proposed Simcoe County Affordable Housing Facility
PML REF. 21BF049
LOCATION 125 Simcoe Road, Bradford, Onatrio
BORING DATE October 26,2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN FF

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
		SURFACE ELEVATION 223.00					
0.30	222.70	TOPSOIL: Dark brown sand, trace clay, trace organics, moist		1	SS	4	
0.70	222.30	FILL: Dark brown sand fill, trace silt, trace clay, trace organics, moist					
		SANDY SILT TILL: Loose to compact, brown to grey sandy silt till, trace to some gravel, trace to some clay, moist		2	SS	9	222
				3	SS	12	221
				4	SS	20	
2.9	220.1	becoming dense		5	SS	28	220
							219
5.0	218.0	BOREHOLE TERMINATED AT 5.0 m		6	SS	43	218

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

First water strike at 3.2 m

Upon completion of augering
Water at 3.7 m
Cave at 4.3 m

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 7

PROJECT Proposed Simcoe County Affordable Housing Facility
LOCATION 125 Simcoe Road, Bradford, Onatrio
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE October 26,2021
PML REF. 21BF049
ENGINEER GW
TECHNICIAN FF

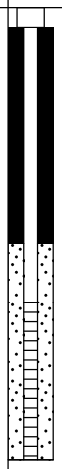
DEPTH (metres) / ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 223.35			
0.20 / 223.15	TOPSOIL: Dark brown sand, trace organics, moist	1	SS	8
0.70 / 222.65	FILL: Dark brown sand fill, trace gravel, trace organics, moist			
	SANDY SILT TILL: Compact, brown sandy silt till, some gravel, trace to some clay, probable cobbles and boulders, moist	2	SS	20
		3	SS	25
2.1 / 221.3	becoming grey, very dense to dense	4	SS	55
		5	SS	57
		6	SS	45
5.0 / 218.4	BOREHOLE TERMINATED AT 5.0 m			

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL



Upon completion of augering
Water at 4.6 m
No cave
Water Level Readings:

Date	Depth	Elev.
2021-11-24	1.8	221.6
2021-12-17	1.8	221.6

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 8

PROJECT Proposed Simcoe County Affordable Housing Facility
PML REF. 21BF049
LOCATION 125 Simcoe Road, Bradford, Onatrio
BORING DATE October 26,2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN FF

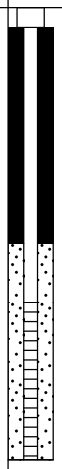
DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	"N" VALUES	ELEVATION SCALE
		SURFACE ELEVATION 223.62					
0.20	223.42	TOPSOIL: Dark brown sand trace gravel, trace organics, moist		1	SS	13	223
0.70	222.92	FILL: Dark brown sand fill, trace gravel, trace organics, moist					
		SANDY SILT TILL: Compact, brown sandy silt till, some gravel, trace to some clay, probable cobbles and boulders, moist		2	SS	20	
				3	SS	20	222
2.1	221.5	becoming very dense		4	SS	54	221
				5	SS	85	
				6	SS	57	220
5.0	218.6	BOREHOLE TERMINATED AT 5.0 m					219

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL



Upon completion of augering
No water
No cave
Water Level Readings:

Date	Depth	Elev.
2021-11-24	0.7	222.9
2021-12-17	1.5	222.1

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 9

PROJECT Proposed Simcoe County Affordable Housing Facility
PML REF. 21BF049
LOCATION 125 Simcoe Road, Bradford, Onatrio
BORING DATE October 29,2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN FF

DEPTH (metres) / ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 222.98			
0.30 / 222.68	TOPSOIL: Dark brown sand, trace silt, some gravel, trace organics, moist	1	SS	4
0.70 / 222.28	FILL: Dark brown sand fill, trace silt, some gravel, trace organics, moist			
	SANDY SILT TILL: Compact to dense, brown sandy silt till, some clay, trace to some gravel, probable cobbles and boulders, moist	2	SS	11
		3	SS	35
2.1 / 220.9	becoming grey, trace gravel	4	SS	30
		5	SS	20
		6	SS	25
5.0 / 218.0	BOREHOLE TERMINATED AT 5.0 m			

STRAT PLOT

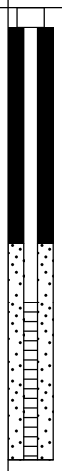
ELEVATION SCALE: 222, 221, 220, 219, 218

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL



Upon completion of augering
Water at 4.5 m
No cave
Water Level Readings:

Date	Depth	Elev.
2021-11-24	1.0	222.0
2021-12-17	0.7	222.3

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 10

PROJECT Proposed Simcoe County Affordable Housing Facility
PML REF. 21BF049
LOCATION 125 Simcoe Road, Bradford, Onatrio
BORING DATE October 26,2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN FF

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
		SURFACE ELEVATION 223.19					
0.0	223.19	TOPSOIL: Dark brown sand, trace clay, trace organics, moist		1	SS	6	223
0.40	222.79	FILL: Dark brown sand to sandy silt fill, trace clay, trace gravel, trace organics, moist		2	SS	8	222
1.4	221.8	SANDY SILT TILL: Compact to very dense brown sandy silt till, some gravel, probable cobbles and boulders, trace to some clay, moist to wet		3	SS	17	221
				4	SS	76	
				5	SS	78	220
4.0	219.2	becoming grey, wet					219
				6	SS	90	
5.0	218.2	BOREHOLE TERMINATED AT 5.0 m					

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

First water strike at 3.0 m

Upon completion of augering
Water at 3.8 m
No cave

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 11

PROJECT Proposed Simcoe County Affordable Housing Facility
PML REF. 21BF049
LOCATION 125 Simcoe Road, Bradford, Onatrio
BORING DATE October 27,2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN FF

DEPTH (metres) / ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 222.70					
0.26 / 222.44	TOPSOIL: Dark brown sand, trace silt, trace gravel, trace organics, moist		1	SS	30	
	FILL: Compact to dense, dark brown sand to silty sand fill, trace gravel, trace organics, moist		2	SS	18	222
			3	SS	16	221
			4	SS	34	
2.9 / 219.8	SANDY SILT TILL: Very dense, grey sandy silt till, trace gravel, probable cobbles and boulders, trace to some clay,wet		5	SS	63	220
						219
			6	SS	83/290 mm	218
5.0 / 217.7	BOREHOLE TERMINATED AT 5.0 m					

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

First water strike at 2.3 m

Upon completion of augering
Water at 2.9 m
Cave at 3.9 m

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 12

PROJECT Proposed Simcoe County Affordable Housing Facility
PML REF. 21BF049
LOCATION 125 Simcoe Road, Bradford, Onatrio
BORING DATE October 29,2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN FF

DEPTH (metres) / ELEV	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 222.40					
0.35 / 222.05	TOPSOIL: Dark brown sand, trace silt, trace gravel, trace organics, moist		1	SS	5	222
0.70 / 221.70	FILL: Loose, dark brown sand fill, trace silt, trace gravel, trace organics, moist					
	SANDY SILT TILL: Compact, brown sandy silt till, trace gravel, trace to some clay, moist		2	SS	11	
			3[1]	SS	23	221
2.1 / 220.3	becoming grey, very dense		4	SS	53	220
3.5			5	SS	76	219
218.9	BOREHOLE TERMINATED AT 3.5 m					

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Water at 3.0 m
No cave

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 13

PROJECT Proposed Simcoe County Affordable Housing Facility
PML REF. 21BF049
LOCATION 125 Simcoe Road, Bradford, Onatrio
BORING DATE October 27,2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN FF

DEPTH (metres) / ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 221.98					
0.20 / 221.78	TOPSOIL: Dark brown sand, some gravel, some organics, moist		1	SS	33	
0.70 / 221.28	FILL: Dark brown sand fill, trace gravel, trace organics, moist					
	SANDY SILT SILT: Compact to dense, brown sandy silt till, some gravel, trace to some clay, moist		2	SS	19	221
1.4 / 220.6	becoming grey, probable cobbles and boulders, very moist		3	SS	30	220
			4	SS	19	
			5	SS	29	219
						218
			6	SS	41	
5.0 / 217.0	BOREHOLE TERMINATED AT 5.0 m					217

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

First water strike at 4.5 m

Upon completion of augering
Water at 4.5 m
No cave

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 14

PROJECT Proposed Simcoe County Affordable Housing Facility
PML REF. 21BF049
LOCATION 125 Simcoe Road, Bradford, Onatrio
BORING DATE October 28,2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN FF

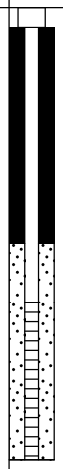
DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 222.41			
0.25	222.16	TOPSOIL: Dark brown sand, trace gravel, trace organics, moist	1	SS	7
0.70	221.71	FILL: Loose, dark brown sand fill, trace gravel, trace organics, moist			
		SANDY SILT TILL: Compact to dense, brown sandy silt till, trace gravel, trace to some clay, moist to wet	2	SS	11
			3	SS	19
			4	SS	38
2.9	219.5	becoming grey, dense to very dense	5	SS	45
4.6	217.8	probable cobbles and boulders	6	SS	50/75 mm
5.0	217.4	BOREHOLE TERMINATED AT 5.0 m			

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL



Upon completion of augering
Water at 1.1 m
No cave
Water Level Readings:

Date	Depth	Elev.
2021-11-24	0.7	221.7
2021-12-17	0.5	221.9

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 15

PROJECT Proposed Simcoe County Affordable Housing Facility — **PML REF.** 21BF049
LOCATION 125 Simcoe Road, Bradford, Onatrio — **BORING DATE** October 28,2021 — **ENGINEER** GW
BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** FF

DEPTH (metres) / ELEV	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 221.59					
0.30 / 221.29	TOPSOIL: Dark brown sand, trace silt, trace gravel, trace organics, moist		1	SS	4	221
0.70 / 220.89	FILL: Loose, dark brown sand fill, trace silt, trace gravel, trace organics, moist					
	SANDY SILT TILL: Compact to very dense, brown to grey sandy silt till, trace gravel, trace to some clay, probable cobbles and boulders, moist to wet		2	SS	15	
			3	SS	37	220
			4	SS	54	
3.4 / 218.2	BOREHOLE TERMINATED AT 3.4 m		5	SS	50/40 mm	219

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q; 50 100 150 200; DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●; 20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

First water strike at 1.5 m

Upon completion of augering Wet cave at 1.1 m

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 16

PROJECT Proposed Simcoe County Affordable Housing Facility
PML REF. 21BF049
LOCATION 125 Simcoe Road, Bradford, Onatrio
BORING DATE October 27,2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN FF

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 221.58				
0.0		TOPSOIL: Dark brown sand, trace gravel, trace organics, moist		1	SS	7
0.34	221.24	FILL: Loose, dark brown sand fill, trace gravel, trace organics, moist		2	SS	5
1.0						
1.4	220.2	SANDY SILT TILL: Compact, brown sandy silt till, trace gravel, some clay, moist to wet		3	SS	20
2.0						
2.1	219.5	becoming grey, probable cobbles and boulders		4	SS	23
3.0						
3.0	218.6	becoming dense to very dense		5	SS	46
4.0						
5.0				6	SS	90/290 mm
5.0	216.6	BOREHOLE TERMINATED AT 5.0 m				

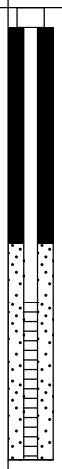
ELEVATION SCALE: 221, 220, 219, 218, 217

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL



Upon completion of augering
Water at 4.3 m
No cave
Water Level Readings:

Date	Depth	Elev.
2021-11-24	1.3	220.3
2021-12-17	1.2	220.4

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 17

PROJECT Proposed Simcoe County Affordable Housing Facility
PML REF. 21BF049
LOCATION 125 Simcoe Road, Bradford, Onatrio
BORING DATE October 27,2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN FF

DEPTH (metres) / ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) / DYNAMIC CONE PENETRATION / STANDARD PENETRATION TEST	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT kN/m³	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 221.62									
0.30 / 221.32	TOPSOIL: Dark brown sandy silt, trace gravel, trace organics, moist		1	SS	8					
	FILL: Loose to very loose, dark brown sand fill, trace silt, trace gravel, trace organics, moist		2	SS	2	221				
1.4 / 220.2	SANDY SILT TILL: Compact to dense, brown sandy silt till, trace gravel, some clay, probable cobbles and boulders, wet		3	SS	18	220				First water strike at 1.5 m
			4	SS	36	219				
3.5 / 218.1	BOREHOLE TERMINATED AT 3.5 m		5	SS	41					Upon completion of augering Water at 2.1 m Cave at 3.0 m

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q; 50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30 40

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 18

PROJECT Proposed Simcoe County Affordable Housing Facility
PML REF. 21BF049
LOCATION 125 Simcoe Road, Bradford, Onatrio
BORING DATE October 27,2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN FF

DEPTH (metres) / ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	"N" VALUES
	SURFACE ELEVATION 221.25				
0.15 / 221.10	TOPSOIL: Dark brown sand, trace gravel, some organics, moist		1	SS	14
0.70 / 220.55	FILL: Compact, dark brown sand fill, some gravel, trace organics, moist				
	SANDY SILT TILL: Compact, brown to dark brown sandy silt till, trace gravel, probable cobbles and boulders, some clay, moist		2	SS	21
			3	SS	17
2.1 / 219.2	becoming grey		4	SS	14
			5	SS	20
3.5 / 217.8	BOREHOLE TERMINATED AT 3.5 m				

ELEVATION SCALE: 221, 220, 219, 218

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
No water
No cave

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 19

PROJECT Proposed Simcoe County Affordable Housing Facility
PML REF. 21BF049
LOCATION 125 Simcoe Road, Bradford, Onatrio
BORING DATE October 27,2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN FF

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
		SURFACE ELEVATION 221.88					
0.0	221.88	TOPSOIL: Dark brown sand, tace gravel, trace organics, moist		1	SS	10	
0.32	221.56	FILL: Loose, dark brown sand fill, trace organics, trace gravel, moist		2	SS	6	221
1.0							
1.4	220.5	SANDY SILT TILL: Compact to very dense, brown sandy silt till, some clay, probable cobbles and boulders, wet		3	SS	19	220
2.0				4	SS	24	
3.0							219
3.5	218.4	BOREHOLE TERMINATED AT 3.5 m		5	SS	63	
4.0							
5.0							
6.0							
7.0							
8.0							
9.0							
10.0							
11.0							
12.0							
13.0							
14.0							
15.0							

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

First water strike at 1.4 m
12, 40, 48
8, 29, 63
Upon completion of augering
Water at 1.5 m
Cave at 2.6 m

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 20

PROJECT Proposed Simcoe County Affordable Housing Facility
PML REF. 21BF049
LOCATION 125 Simcoe Road, Bradford, Onatrio
BORING DATE October 27,2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN FF

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 220.82				
0.32	220.50	TOPSOIL: Dark brown sand, trace gravel, some organics, moist		1	SS	11
0.70	220.12	FILL: Compact, dark brown sand fill, trace gravel, trace organics, moist				
		SANDY SILT TILL: Compact, brown sandy silt till, trace gravel, trace clay, probable cobbles and boulders, moist		2	SS	14
				3	SS	16
2.1	218.7	becoming dense to very dence, some clay		4	SS	45
				5	SS	100/240mm
				6	SS	69
5.0	215.8	BOREHOLE TERMINATED AT 5.0 m				

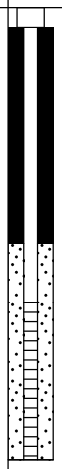
ELEVATION SCALE: 220, 219, 218, 217, 216

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL



Upon completion of augering
Water at 4.1 m
No cave
Water Level Readings:

Date	Depth	Elev.
2021-11-24	0.6	220.2
2021-12-17	0.5	220.3

NOTES

APPENDIX A

Site and Vicinity Maps

Ontario

Ministry of Natural Resources and Forestry

Make-a-Map: Natural Heritage Areas

125 Simcoe Road

Map created:3/27/2022

Notes:

Legend

- Assessment Parcel
- Greenbelt Area Boundary
- ORM Boundary
- NEP Boundary
- ANSI
- Earth Science Provincially Significant/sciences de la terre d'importance provinciale
- Earth Science Regionally Significant/sciences de la terre d'importance régionale
- Life Science Provincially Significant/sciences de la vie d'importance provinciale
- Life Science Regionally Significant/sciences de la vie d'importance régionale
- Evaluated Wetland
- Provincially Significant/considérée d'importance provinciale
- Non-Provincially Significant/non considérée d'importance provinciale
- Unevaluated Wetland

Figure A-1

0.9 0 0.44 0.9 Kilometres

Absence of a feature in the map does not mean they do not exist in this area.

Ontario

Ministry of Natural Resources and Forestry

Make-a-Map: Natural Heritage Areas

125 Simcoe Road

Map created:4/7/2022

Legend

Figure A-2

Notes:

0.6 0 0.32 0.6 Kilometres

Absence of a feature in the map does not mean they do not exist in this area.

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Ontario Ministry of Natural Resources and Forestry(OMNRF) shall not be liable in any way for the use of, or reliance upon, this map or any information on this map.

Lake Simcoe Region conservation authority

125 Simcoe Road, Bradford

Features

- LSRCA Watershed Boundary
- Lake Simcoe
- Watercourse
- Regulated Area Boundary
- Regulated Area
- Road Labels
- Assessment Parcel

Figure A-3

Printed On:
4/6/2022

WGS_1984_Web_Mercator_Auxiliary_Sphere

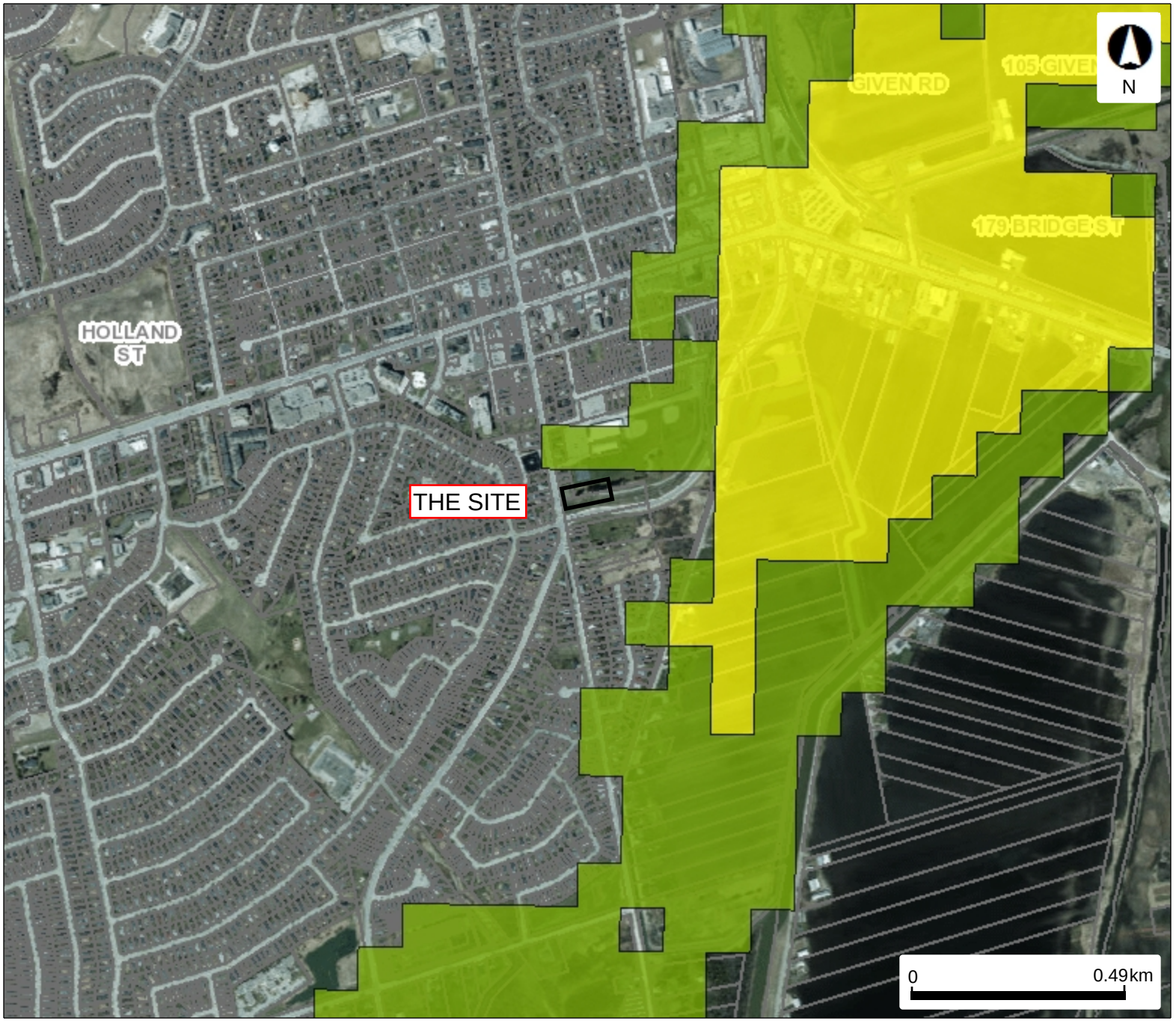
Mapped By:

Scale 1: 6,532

Meters

332 0 166 332

125 Simcoe Road, Bradford



Legend

Significant Groundwater Recharge Area

- 0
- 2
- 4
- 6

Event Based Areas

Assessment Parcel with Addre

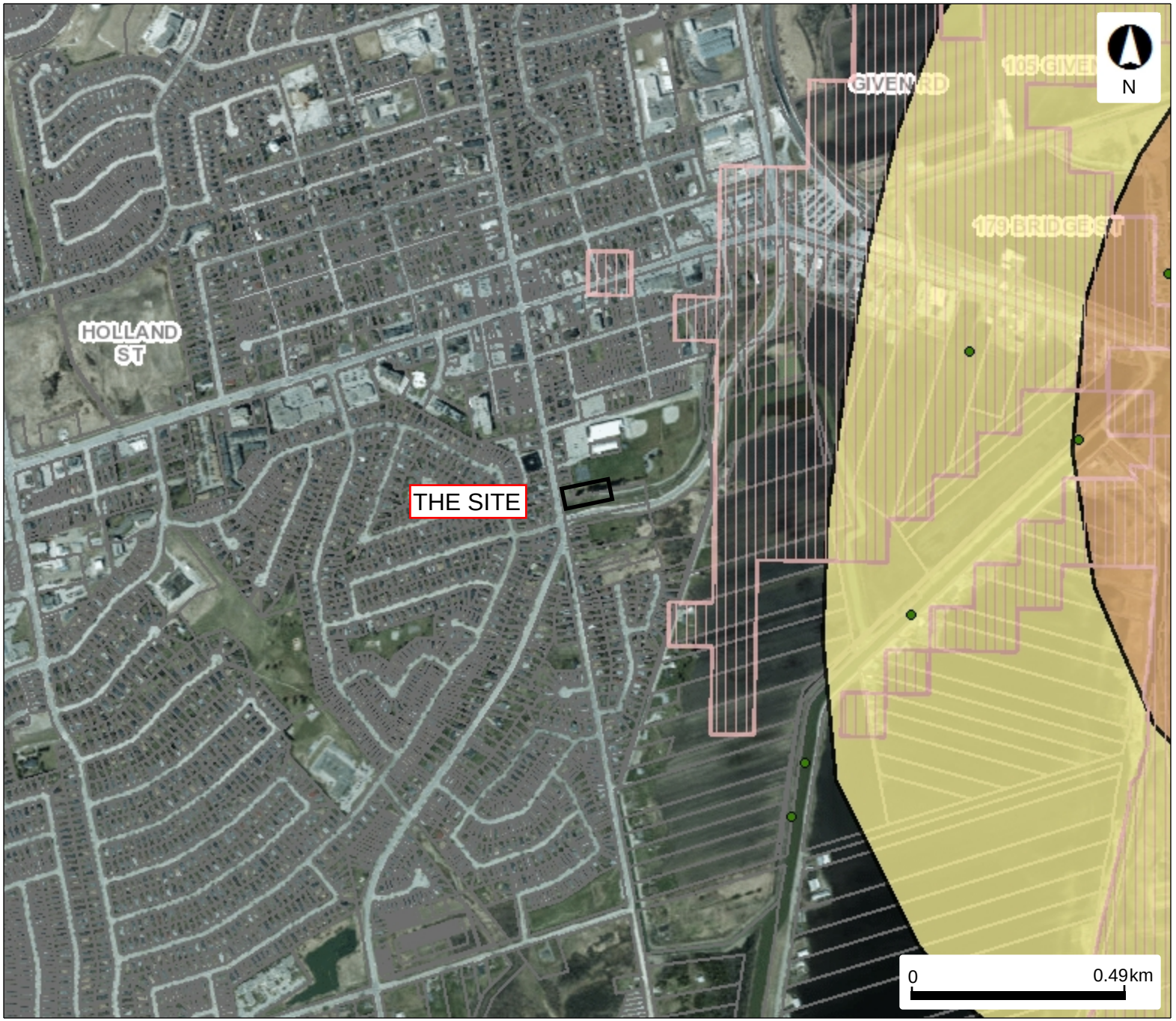
Figure A-4

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Ontario Ministry of Environment, Conservation and Parks (MECP) shall not be liable in any way for the use or any information on this map. of, or reliance upon, this map.

Ontario

Map Created: 3/27/2022
Map Center: 44.11011 N, -79.56287 W

125 Simcoe Road, Bradford



Legend

- Permits To Take Water: Active
- Intake Protection Zone Q
- Wellhead Protection Area Q1
- Wellhead Protection Area Q2
- Issue Contributing Areas
- Highly Vulnerable Aquifers
- WHPA Groundwater Under Direct Influence (WHPA-E)
- Wellhead Protection Area
  - A
  - B
  - C
  - C1
  - D
  - F
- Intake Protection Zone 1
- Event Based Areas
- Intake Protection Zone 2
- Assessment Parcel with Addre

Figure A-5

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Ontario Ministry of Environment, Conservation and Parks (MECP) shall not be liable in any way for the use or any information on this map. of, or reliance upon, this map.

Ontario

Map Created: 3/27/2022
Map Center: 44.11011 N, -79.56287 W

APPENDIX B

Ministry of the Environment, Conservation and Parks
Water Well Records Summary

MECP WELL RECORD SUMMARY

125 Simcoe Road, Bradford

Summarized well records of wells within UTM Easting +/- 600 m and UTM Northing +/- 600 m of site centre

UTM ZONE	EASTING	NORTHING	LOT	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL IDENTIFICATION	FORMATION
17	614449	4885397	W	2020/09 7215						7369196 (Z333657) A295087 P	
17	614475	4885468	W	2020/06 6988						7376554 (C49206) A276705 P	
17	614481	4885471	W	2020/05 7230						7363267 (C47961) A287778 P	
17	614819	4885087	W	2017/08 7230	1.05	UT 0007		TH MO	0010 5	7306614 (Z258039) A229406	BRWN FILL GRVL 0002 BRWN FILL CLAY 0007 BRWN SILT CLAY 0015
17	614647	4885154	W	2017/08 7230	1.05	UT 0014		TH	0010 5	7306611 (Z258036) A229403	BRWN FILL SAND 0002 BRWN FILL SAND 0004 GREY CLAY SILT 0015
17	614622	4885054	W	2017/08 7230	1.05	UT 0010		TH MO	0010 5	7306612 (Z258037) A229407	BRWN FILL SAND 0007 BRWN SILT SAND 0010 GREY CLAY SILT 0015
17	614547	4885194	W	2017/08 7230	1.05	UT 0004		TH MO	0010 5	7306615 (Z258003) A226697	BRWN FILL GRVL 0002 GREY FILL CLAY 0005 GREY CLAY SILT HARD 0015
17	614623	4884559	W	2017/08 7230	1.05	UT 0011		TH MO	0011 5	7306616 (Z258004) A229404	BRWN FILL SAND 0002 BRWN FILL CLAY 0007 BRWN CLAY SILT 0016
17	614918	4884771	W	2017/08 7230	1.05	UT 0014		MO TH	0010 5	7306618 (Z258040) A226696	BRWN FILL SAND 0002 BRWN FILL CLAY HARD 0007 BRWN SILT CLAY DNSE 0015
17	614818	4885087	W	2017/08 7230	1.05	UT 0009		TH MO	0010 5	7306619 (Z258006) A229405	BRWN FILL SAND DNSE 0002 BRWN CLAY SILT HARD 0015
17	614920	4885555	W	2017/03 7383	2	UT 0008		TH MO	0004 5	7287020 (Z241992) A221859	GREY HARD 0000 BRWN SAND SILT GRVL 0009
17	614921	4885564	W	2017/02 7383	2			MO	0010 10	7289356 (Z257561) A222697	FILL SILT SNDY 0020
17	614913	4885559	W	2017/02 7383	2			TH	0010 10	7289355 (Z257562) A222698	FILL SILT SNDY 0020
17	615146	4885424	W	2016/10 6926	2			MO	0010 5	7274768 (Z242767) A	
17	615094	4884860	W	2016/10 6926	5.07	4		MO	0003 2	7274769 (Z242768) A	
17	615159	4884893	W	2016/10 6926	2	5		MO	0010 5	7274770 (Z242769) A	
17	614896	4885568	W	2016/08 7295	1.79			MO	0010 10	7273129 (Z230894) A203461	BRWN SAND CLAY DRY 0010 GREY CLAY SAND DRY 0017 GREY CLAY WBRG 0020
17	614840	4885338	W	2015/12 7241	2			MT	0020 10	7256413 (Z225004) A183582	BRWN SAND GRVL SILT 0024 BRWN SAND GRVL WBRG 0030
17	615137	4885422	W	2015/10 7383	2	10			0010 5	7260855 (Z222026) A182208	
17	615161	4884661	W	2015/10 7383	2			TH	0010 5	7260856 (Z222029) A182210	
17	615161	4884890	W	2015/10 7383	2	10		TH	0010 5	7260853 (Z222027) A182209	
17	615351	4885162	W	2015/10 7088						7251659 (Z218954) A	FILL 0005 0006 GRVL 0010 0010 GRVL 0013
17	614952	4885162	W	2014/12 7437	8	12		OT		7236246 (Z202111) A	
17	614948	4885112	W	2014/12 7437	10	6		OT		7236244 (Z202116) A	
17	615203	4885240	W	2014/12 7437	10	10		OT		7236240 (Z202112) A	
17	614956	4885162	W	2014/12 7437	10	12		OT		7236238 (Z202110) A011217 A	
17	614479	4885431	W	2013/11 7383	2	20		MO	0013 10	7214644 (Z166174) A151182	0000 FILL 0012 SILT SNDY 0023
17	614817	4885502	W	2013/05 7147	19.6	FR 0022			0015 10	7202200 (Z171523) A137276	BRWN 0001 BRWN SILT SAND 0025
17	615051	4884566	W	2009/04 7190	6.5 2.09	UK 0008		MT	0006 10	7124830 (Z91180) A080169	BRWN SAND SILT LOOS 0010 GREY SILT SAND DNSE 0020
17	614884	4885454	W	2008/06 7241	2.04			MO		7107941 (M01594) A072860	BRWN SAND SILT HARD 0025
17	614506	4885613	W	2008/05 3108				NU		7107507 (Z66930) A	16
17	614844	4885422	W	2007/08 7241	2			MO		7101220 (M00187) A061576	BRWN FILL LOOS 0001 BRWN SAND SILT LOOS 0009 GREY SILT SAND 0015 GREY SILT ROCK DNSE 0020
17	615181	4884666	W	2006/06 2513						7039243 (Z15159) A015096 A	
17	615585	4885632	W	2006/02 6607	2	FR 0005			0005 15	5740658 (Z44186) A037810	BRWN LOAM PEAT 0005 GREY CLAY 0020
17	614954	4885159	W	2005/02 2801	10.2		15/69/161/24:0	MN	0092 15	5739595 (Z11281) A011217	BRWN CLAY GRVL 0008 GREY CLAY GRVL 0023 SAND GRVL CLAY 0037 GREY CLAY GRVL 0049 GREY CLAY SLTY 0071 FSND PCKD 0091 FSND LOOS 0098 FSND CLAY LYRD 0112 GREY CLAY SAND LYRD 0119
17	614997	4885096	W	2001/01 2801				NU		5735835 (225716) A	
17	614995	4885281	W	2001/01 2801				NU		5735834 (225717) A	
17	614695	4884783	L	1991/03 4919	30	UK 0050	20/35/10/1:0	DO		5727998 (77222)	BRWN LOAM HARD 0001 BRWN CLAY HARD 0020 GREY CLAY HARD 0050 GREY SAND LOOS 0059
17	614906	4884604	W	1967/09 1621	8	FR 0256	16/60/105/26:0	MN	0257 5 0262 6	5700319 ()	LOAM 0002 CLAY SAND BLDR 0240 FSND CLAY SILT 0256 FSND 0260 MSND 0268 BLUE CLAY SAND GRVL 0269
17	615562	4884871	W	1967/03 3414	4	FR 0327	4/15/5/6:0	DO		5700318 ()	LOAM 0006 CLAY 0141 GRVL 0149 SILT CLAY 0320 GRVL 0322 LMSN 0327
17	615031	4884790	W	1967/01 3109	30	FR 0015	4/11/1/:	DO		5705249 ()	LOAM 0002 BRWN CLAY 0005 BLUE CLAY 0021
17	614751	4884689	W	1962/01 4102	24	FR 0050	30//3/:	DO		5705251 ()	PRDG 0030 CLAY MSND 0050 GRVL 0052
17	614995	4885281	W	1960/12 4823	5 5	FR 0342	11/113/30/4:0	PS DO		5700314 ()	LOAM 0003 MSND CLAY BLDR 0030 HPAN 0052 CLAY MSND 0082 SILT 0087 GRVL CLAY MSND 0096 CLAY MSND 0111 CLAY MSND GRVL 0167 HPAN 0198 BLUE CLAY 0227 BLUE CLAY SILT 0235 BLUE CLAY 0248 CLAY SILT 0269 HPAN 0280 CLAY SILT 0289 BLUE CLAY 0315 GRVL CLAY 0333 BLUE CLAY 0338 BRWN LMSN 0345
17	615009	4885566	W	1960/11 4823						5705250 () A	LOAM 0002 YLLW MSND GRVL 0012 BLUE CLAY GRVL 0030 BLUE CLAY 0085 CLAY MSND 0093 BLUE CLAY GRVL 0130 CLAY MSND 0154 CLAY GRVL MSND 0248 CLAY MSND 0288 MSND SILT 0311 CLAY MSND GRVL 0348 BRWN LMSN 0396
17	614960	4885210	W	1959/07 4823	4	FR 0340	12//84/10:30	MN	0342 8	5700316 ()	LOAM 0001 BRWN MSND BLDR 0012 GREY MSND STNS CLAY 0045 BLUE CLAY 0085 MSND GRVL CLAY 0180 HPAN 0200 CLAY 0224 CLAY SILT 0225 FSND 0260 MSND 0270 MSND GRVL 0280 MSND CLAY 0285 HPAN 0340 GRVL MSND 0345 BRWN LMSN 0350
17	615587	4884621	W	1953/05 4521	2 2 2					5700310 () A	LOAM 0010 CLAY 0042 QSND CLAY 0140 FSND 0155 HPAN MSND 0164 LMSN 0165
17	614960	4885125	W	1952/11 2529	7 7 7	R 0127 FR 0288 FR 034	7/40/80/:	MN		5700308 ()	LOAM 0004 GRVL 0008 CLAY BLDR 0025 CLAY 0130 FSND 0170 CLAY 0270 GRVL 0305 CLAY 0340 GRVL HPAN 0350 BRWN LMSN 0351
17	615230	4885251	W	1948/06 2801	10	UK 0073 UK 0094	/26/115/36:0	MN	0084 10	5700306 ()	LOAM MSND 0004 MSND CLAY 0073 CSND 0094 GRVL MSND 0096
17	614955	4885195	W	1947/06 2801	2 2		//20/2:0			5700307 ()	CLAY LOAM 0008 CLAY BLDR 0017 CLAY MSND GRVL 0055 CLAY GRVL BLDR 0060 MSND GRVL CLAY 0115
17	614964	4885666	W	1947/06 2801	5					5700305 ()	CLAY GRVL BLDR 0012 MSND GRVL BLDR 0030 CLAY GRVL 0160 CLAY BLDR 0170
17	615028	4885229	W	1946/10 2801	6	UK 0073 UK 0094	-2/4/20/50995:51015	NU		5700300 ()	LOAM MSND 0004 MSND CLAY 0073 CSND 0094 GRVL MSND 0123 FSND CLAY GRVL 0166 CLAY SILT 0230 CLAY GRVL 0330 CLAY BLDR 0339
17	615060	4885366	W	1946/09 2801	6					5700296 ()	LOAM 0001 CLAY MSND GRVL 0027 HPAN 0034 CLAY MSND GRVL 0075 CLAY MSND 0114 CLAY MSND GRVL 0190 CLAY 0192 LMSN 0193
17	614804	4885265	W	1946/09 2801	6					5700295 ()	LOAM CLAY 0004 MSND GRVL 0016 HPAN MSND GRVL 0049 CLAY GRVL 0105 CLAY MSND GRVL 0120 FSND CLAY 0193 CLAY 0202
17	615061	4884650	W	1946/09 2801	6					5700297 ()	LOAM MSND 0003 CLAY 0037 CLAY MSND GRVL 0060 CLAY FSND 0087 CLAY GRVL BLDR 0093 CLAY MSND GRVL 0123 CLAY FSND 0159 CLAY GRVL 0210 CLAY SILT 0240 CLAY MSND GRVL 0243 CLAY FSND GRVL 0283 CLAY 0362 CLAY GRVL 0369 LMSN 0370
17	614538	4885560	W	1946/08 2801	6					5700293 ()	LOAM 0001 MSND CLAY 0007 CLAY MSND GRVL 0053 FSND GRVL CLAY 0057 GRVL MSND CLAY 0090 CLAY MSND 0146 CLAY GRVL 0191 CLAY 0202 LMSN 0203
17	614965	4885200	W	1930/10 2801	10	UK 0067	/27/100/:	MN	0091 20	5700292 ()	LOAM 0001 CLAY BLDR GRVL 0067 MSND CLAY 0111
17	615285	4885195	W	7360	2	UT 0010		MO	0030 10	7238143 (Z192061) A177417	SAND WBRG 0025 GREY SAND SILT 0030 GREY SAND SILT 0040

MECP WELL RECORD TABLE ABBREVIATIONS AND DESCRIPTIONS

Header Descriptions

ABBREVIATION	DESCRIPTION
UTM	UTM in Zone, Easting, Northing and Datum is NAD83
LOT	UTM estimated from Centroid of Lot
W	UTM not from Lot Centroid
DATE CNTR	Date Work Completed and Well Contractor Licence Number
CASING DIA	Casing diameter in inches
WATER	Depth of water found, in Feet. See Water Kind, below for meaning of Code
PUMP TEST	Static Water Level in Feet / Water Level After Pumping in Feet / Pump Test Rate in GPM / Pump Test Duration in Hour:Minutes
WELL USE	See below for Meaning of Code
SCREEN	Screen Depth and Length in feet
WELL	Well ID, AUDIT #, Well Tag, A for abandonment; P for Partial Data Entry Only
FORMATION	See below for Meaning of Code

Meaning of Core Material and Descriptive Terms

ABBV	DESCRIPTION	ABBV	DESCRIPTION	ABBV	DESCRIPTION	ABBV	DESCRIPTION
CLN	CLEAN	FILL	FILL	MARL	MARL	SILT	SILT
DRY	DRY	FLDS	FELDSPAR	MGRD	MEDIUM-GRAINED	SLTE	SLATE
QTZ	QUARTZ	FLNT	FLINT	MGVL	MEDIUM GRAVEL	SLTY	SILTY
BLDR	BOULDERS	FOSS	FOSILIFEROUS	MRBL	MARBLE	SNDS	SANDSTONE
BSLT	BASALT	FSND	FINE SAND	MSND	MEDIUM SAND	SNDY	SAN DY
CGRD	COARSE-GRAINED	GNIS	GNEISS	MUCK	MUCK	SOFT	SOFT
CGVL	COARSE GRAVEL	GRNT	GRANITE	OBDN	OVERBURDEN	SPST	SOAPSTONE
CHRT	CHERT	GRSN	GREENSTONE	PCKD	PACKED	STKY	STICKY
CLAY	CLAY	GRVL	GRAVEL	PEAT	PEAT	STNS	STONES
CLYY	CLAYEY	GRWK	GREYWACKE	PGVL	PEA GRAVEL	STNY	STONEY
CMTD	CEMENTED	GVLY	GRAVELLY	PORS	POROUS	THIK	THICK
CONG	CONGLOMERATE	GYPS	GYPSUM	PRDG	PREVIOUSLY DUG	THIN	THIN
CRYS	CRYSTALLINE	HARD	HARD	PRDR	PREV. DRILLED	TILL	TILL
CSND	COARSE SAND	HPAN	HARDPAN	QRTZ	QUARTZITE	UNKN	UNKNOWN TYPE
DKCL	DARK-COLOURED	IRFM	IRON FORMATION	QSND	QUICKSAND	VERY	VERY
DLMT	DOLOMITE	LIMY	LIMY	ROCK	ROCK	WBRG	WATER-BEARING
DNSE	DENSE	LMSN	LIMESTONE	SAND	SAND	WDFR	WOOD FRAGMENTS
DRTY	DIRTY	LOAM	TOPSOIL	SHLE	SHALE	WTHD	WEATHERED
FCRD	FRACTURED	LOOS	LOOSE	SHLY	SHALY		
FGRD	FINE-GRAINED	LTCL	LIGHT-COLOURED	SHRP	SHARP		
FGVL	FINE GRAVEL	LYRD	LAYERED	SHST	SCHIST		

Core Color

ABBV	DESCRIPTION
WHIT	WHITE
GREY	GREY
BLUE	BLUE
GREN	GREEN
YLLW	YELLOW
BRWN	BROWN
RED	RED
BLC K	BLACK
BLGY	BLUE-GREY

Well Use

ABBV	DESCRIPTION
DO	Domestic
ST	Livestock
IR	Irrigation
IN	Industrial
CO	Commercial
MN	Municipal
PS	Public
AC	Cooling And AC
NU	Not Used
OT	Other
TH	Test Hole
DE	Dewatering
MO	Monitoring
MT	Monitoring and Test Hole

Water Kind

ABBV	DESCRIPTION
FR	Fresh
SA	Salty
SU	Sulphur
MN	Minerial
UK	Not Stated
GS	Gas
IR	Iron
UT	Untested
OT	Other

APPENDIX C

Summarized Water Well Survey Responses

WATER WELL SURVEY SUMMARY

125 Simcoe Road, Bradford

Summarized results of door-to-door water well survey

TABLE C-1: Properties Surveyed

Address	Responded to Survey?	Do you have a water supply well?
175 Walker Avenue	No (questionannaire left)	No (*observation)
185 Walker Avenue	No (questionannaire left)	No (*observation)
159 Morris Road	No (questionannaire left)	No (*observation)
201 Morris Road	Yes	No
221 Morris Road	No (questionannaire left)	Yes (*observation)
251 Morris Road	Yes	No
271 Morris Road	No (questionannaire left)	No (*observation)
291 Morris Road	No (questionannaire left)	No (*observation)
303 Morris Road	No (questionannaire left)	Yes (*observation)

Note: * Best estimate based on observation by survey taker from the road.

TABLE C-2: Properties Suspected of Having Wells Based on Survey

Address	Responded to Survey?	Do you have a water supply well?	Well Location	Date of install	Type	Depth	Flow rate	Water Shortages?	Treatment	Drink?	Septic System	Name of Owner or respondant
221 Morris Road	No (questionannaire left)	Yes (*observation)	South side of property (*observation)		Dug							
303 Morris Road	No (questionannaire left)	Yes (*observation)	Backyard (*observation)		Drilled							

Note: * Best estimate based on observation by survey taker from the road.

APPENDIX D

Borehole Permeability Testing Plots

Estimation of K by Slug Test, based on Hvorslev equation

Date:	February 11, 2022		Static water depth, H:	2.14	mbgs
Conducted by:	J. N.		Water depth at time t = 0, Ho:	2.38	mbgs
Project Number:	21BF049		Water depth at time t, h:	see below	mbgs
Well Number:	BH 1		Basic time lag, To:	2,990	sec
Well Screen Bottom:		mbgs	Length of well screen, L:	150	cm
Top of Pipe:		mags	Diameter of the borehole, 2R:	15.2	cm
Well Casing Diameter:		cm	Diameter of the well casing, 2r:	5.1	cm
Well Elevation:	224.13	masl	Estimated Sy of sand pack:	0.00	0 for No
Static Water Level:	2.14	mbgs	Estimated effective $2r_e$:	5.1	cm
Ground Elevation:	224.13	masl	$K^* = r_e 2\ln(L/R)/(2LTo)$ =	**2.2E-05**	cm/s
WATER LEVEL BEFORE TEST = H =	2.14	mbgs	Modified to account for sand pack?	NO	

Time t (sec)	h Water Level (mbgs)	Water Level Elevation (masl)
0	2.38	221.75
1	2.38	221.75
2	2.38	221.75
3	2.38	221.75
4	2.38	221.75
5	2.38	221.75
6	2.38	221.75
7	2.38	221.75
8	2.38	221.75
9	2.38	221.75
10	2.38	221.75
11	2.38	221.75
12	2.37	221.76
13	2.37	221.76
14	2.37	221.76
15	2.37	221.76
16	2.37	221.76
17	2.37	221.76
18	2.38	221.75
19	2.38	221.75
20	2.38	221.75
21	2.38	221.75
22	2.38	221.75
23	2.38	221.75
24	2.38	221.75
25	2.37	221.76
26	2.37	221.76
27	2.37	221.76
28	2.37	221.76
29	2.37	221.76
30	2.37	221.76
31	2.37	221.76
32	2.37	221.76

Time t (sec)	h - H	Ho - H	(h-H)/(Ho-H)
0	0.242	0.242	1.000
1	0.242	0.242	0.999
2	0.240	0.242	0.993
3	0.240	0.242	0.992
4	0.239	0.242	0.990
5	0.239	0.242	0.990
6	0.239	0.242	0.990
7	0.240	0.242	0.991
8	0.239	0.242	0.987
9	0.237	0.242	0.981
10	0.238	0.242	0.982
11	0.237	0.242	0.981
12	0.232	0.242	0.959
13	0.234	0.242	0.966
14	0.235	0.242	0.971
15	0.233	0.242	0.962
16	0.232	0.242	0.958
17	0.234	0.242	0.967
18	0.236	0.242	0.977
19	0.236	0.242	0.974
20	0.236	0.242	0.975
21	0.235	0.242	0.974
22	0.236	0.242	0.974
23	0.235	0.242	0.972
24	0.235	0.242	0.973
25	0.235	0.242	0.971
26	0.235	0.242	0.971
27	0.235	0.242	0.971
28	0.234	0.242	0.969
29	0.235	0.242	0.970
30	0.234	0.242	0.969
31	0.235	0.242	0.970
32	0.234	0.242	0.969

33	2.37	221.76
34	2.37	221.76
35	2.37	221.76
36	2.37	221.76
37	2.37	221.76
38	2.37	221.76
39	2.37	221.76
40	2.37	221.76
41	2.37	221.76
42	2.37	221.76
43	2.37	221.76
44	2.37	221.76
45	2.37	221.76
46	2.37	221.76
47	2.37	221.76
48	2.37	221.76
49	2.37	221.76
50	2.37	221.76
51	2.37	221.76
52	2.37	221.76
53	2.37	221.76
54	2.37	221.76
55	2.37	221.76
56	2.37	221.76
57	2.37	221.76
58	2.37	221.76
59	2.37	221.76
60	2.37	221.76
61	2.37	221.76
62	2.37	221.76
63	2.37	221.76
64	2.37	221.76
65	2.37	221.76
66	2.37	221.76
67	2.37	221.76
68	2.37	221.76
69	2.37	221.76
70	2.37	221.76
71	2.37	221.76
72	2.37	221.76
73	2.37	221.76
74	2.37	221.76
75	2.37	221.76
76	2.37	221.76
77	2.37	221.76
78	2.37	221.76
79	2.37	221.76
80	2.37	221.76
81	2.37	221.76
82	2.37	221.76
83	2.37	221.76
84	2.36	221.77
85	2.36	221.77
86	2.36	221.77
87	2.36	221.77
88	2.36	221.77

33	0.234	0.242	0.967
34	0.234	0.242	0.966
35	0.234	0.242	0.967
36	0.234	0.242	0.969
37	0.234	0.242	0.967
38	0.233	0.242	0.964
39	0.233	0.242	0.964
40	0.233	0.242	0.965
41	0.233	0.242	0.962
42	0.233	0.242	0.964
43	0.233	0.242	0.963
44	0.233	0.242	0.964
45	0.233	0.242	0.963
46	0.232	0.242	0.961
47	0.233	0.242	0.963
48	0.232	0.242	0.961
49	0.232	0.242	0.960
50	0.232	0.242	0.959
51	0.232	0.242	0.958
52	0.232	0.242	0.959
53	0.233	0.242	0.962
54	0.232	0.242	0.958
55	0.232	0.242	0.958
56	0.231	0.242	0.957
57	0.231	0.242	0.956
58	0.232	0.242	0.957
59	0.231	0.242	0.955
60	0.231	0.242	0.954
61	0.231	0.242	0.953
62	0.230	0.242	0.953
63	0.231	0.242	0.954
64	0.231	0.242	0.955
65	0.231	0.242	0.953
66	0.230	0.242	0.952
67	0.230	0.242	0.952
68	0.230	0.242	0.952
69	0.230	0.242	0.952
70	0.230	0.242	0.951
71	0.229	0.242	0.949
72	0.230	0.242	0.952
73	0.230	0.242	0.950
74	0.230	0.242	0.949
75	0.229	0.242	0.949
76	0.229	0.242	0.949
77	0.229	0.242	0.948
78	0.229	0.242	0.947
79	0.228	0.242	0.944
80	0.228	0.242	0.944
81	0.228	0.242	0.941
82	0.226	0.242	0.935
83	0.225	0.242	0.932
84	0.225	0.242	0.930
85	0.224	0.242	0.928
86	0.224	0.242	0.927
87	0.224	0.242	0.927
88	0.222	0.242	0.919

89	2.36	221.77
90	2.36	221.77
91	2.36	221.77
92	2.35	221.78
93	2.36	221.77
94	2.36	221.77
95	2.37	221.76
96	2.36	221.77
97	2.36	221.77
98	2.37	221.76
99	2.37	221.77
100	2.36	221.77
101	2.36	221.77
102	2.37	221.76
103	2.36	221.77
104	2.36	221.77
105	2.37	221.76
106	2.36	221.77
107	2.36	221.77
108	2.36	221.77
109	2.36	221.77
110	2.36	221.77
111	2.36	221.77
112	2.36	221.77
113	2.36	221.77
114	2.36	221.77
115	2.36	221.77
116	2.36	221.77
117	2.36	221.77
118	2.36	221.77
119	2.36	221.77
120	2.36	221.77
121	2.36	221.77
122	2.36	221.77
123	2.36	221.77
124	2.36	221.77
125	2.36	221.77
126	2.36	221.77
127	2.36	221.77
128	2.36	221.77
129	2.36	221.77
130	2.36	221.77
131	2.36	221.77
132	2.36	221.77
133	2.36	221.77
134	2.36	221.77
135	2.36	221.77
136	2.36	221.77
137	2.36	221.77
138	2.36	221.77
139	2.36	221.77
140	2.36	221.77
141	2.36	221.77
142	2.36	221.77
143	2.36	221.77
144	2.36	221.77
145	2.36	221.77
146	2.36	221.77

89	0.223	0.242	0.921
90	0.223	0.242	0.923
91	0.223	0.242	0.922
92	0.212	0.242	0.875
93	0.220	0.242	0.911
94	0.222	0.242	0.919
95	0.226	0.242	0.933
96	0.225	0.242	0.930
97	0.225	0.242	0.930
98	0.225	0.242	0.931
99	0.225	0.242	0.931
100	0.225	0.242	0.930
101	0.225	0.242	0.930
102	0.225	0.242	0.931
103	0.225	0.242	0.930
104	0.224	0.242	0.928
105	0.225	0.242	0.931
106	0.225	0.242	0.929
107	0.225	0.242	0.928
108	0.225	0.242	0.928
109	0.225	0.242	0.928
110	0.224	0.242	0.928
111	0.225	0.242	0.929
112	0.224	0.242	0.926
113	0.224	0.242	0.925
114	0.222	0.242	0.920
115	0.223	0.242	0.924
116	0.224	0.242	0.926
117	0.223	0.242	0.923
118	0.223	0.242	0.921
119	0.224	0.242	0.925
120	0.223	0.242	0.922
121	0.223	0.242	0.923
122	0.224	0.242	0.926
123	0.223	0.242	0.921
124	0.222	0.242	0.920
125	0.222	0.242	0.919
126	0.222	0.242	0.919
127	0.222	0.242	0.919
128	0.222	0.242	0.919
129	0.222	0.242	0.918
130	0.222	0.242	0.919
131	0.222	0.242	0.918
132	0.222	0.242	0.917
133	0.221	0.242	0.916
134	0.222	0.242	0.916
135	0.223	0.242	0.921
136	0.221	0.242	0.914
137	0.221	0.242	0.915
138	0.221	0.242	0.916
139	0.221	0.242	0.912
140	0.221	0.242	0.914
141	0.221	0.242	0.913
142	0.221	0.242	0.912
143	0.220	0.242	0.909
144	0.220	0.242	0.911
145	0.220	0.242	0.911
146	0.221	0.242	0.912

147	2.36	221.77
148	2.36	221.77
149	2.36	221.77
150	2.36	221.77
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158	2.36	221.77
159	2.36	221.77
160	2.36	221.77
161	2.36	221.77
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163	2.35	221.78
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181	2.36	221.77
182	2.36	221.77
183	2.36	221.77
184	2.36	221.77
185	2.35	221.78
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188	2.35	221.78
189	2.36	221.77
190	2.36	221.77
191	2.36	221.77
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193	2.36	221.77
194	2.36	221.77
195	2.36	221.77
196	2.36	221.77
197	2.36	221.77
198	2.36	221.77
199	2.36	221.77
200	2.36	221.77
201	2.36	221.77
202	2.36	221.77
203	2.36	221.77
204	2.36	221.77

147	0.221	0.242	0.912
148	0.220	0.242	0.911
149	0.220	0.242	0.910
150	0.221	0.242	0.915
151	0.219	0.242	0.907
152	0.220	0.242	0.910
153	0.220	0.242	0.908
154	0.220	0.242	0.909
155	0.220	0.242	0.909
156	0.219	0.242	0.906
157	0.219	0.242	0.906
158	0.219	0.242	0.907
159	0.219	0.242	0.906
160	0.219	0.242	0.907
161	0.219	0.242	0.905
162	0.218	0.242	0.903
163	0.212	0.242	0.877
164	0.208	0.242	0.861
165	0.208	0.242	0.862
166	0.207	0.242	0.856
167	0.212	0.242	0.876
168	0.216	0.242	0.895
169	0.217	0.242	0.897
170	0.217	0.242	0.897
171	0.209	0.242	0.864
172	0.213	0.242	0.880
173	0.217	0.242	0.897
174	0.219	0.242	0.905
175	0.219	0.242	0.906
176	0.219	0.242	0.904
177	0.217	0.242	0.897
178	0.219	0.242	0.906
179	0.219	0.242	0.904
180	0.219	0.242	0.904
181	0.219	0.242	0.904
182	0.218	0.242	0.901
183	0.217	0.242	0.897
184	0.215	0.242	0.890
185	0.214	0.242	0.886
186	0.214	0.242	0.884
187	0.214	0.242	0.883
188	0.215	0.242	0.889
189	0.218	0.242	0.903
190	0.218	0.242	0.901
191	0.218	0.242	0.900
192	0.218	0.242	0.900
193	0.218	0.242	0.901
194	0.218	0.242	0.902
195	0.217	0.242	0.898
196	0.217	0.242	0.899
197	0.218	0.242	0.901
198	0.217	0.242	0.899
199	0.217	0.242	0.899
200	0.217	0.242	0.898
201	0.217	0.242	0.898
202	0.217	0.242	0.897
203	0.217	0.242	0.899
204	0.217	0.242	0.898

205	2.36	221.77
206	2.36	221.77
207	2.36	221.77
208	2.36	221.77
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210	2.36	221.77
211	2.36	221.77
212	2.36	221.77
213	2.36	221.77
214	2.36	221.77
215	2.36	221.77
216	2.36	221.77
217	2.36	221.78
218	2.35	221.78
219	2.35	221.78
220	2.35	221.78
221	2.35	221.78
222	2.36	221.77
223	2.35	221.78
224	2.35	221.78
225	2.35	221.78
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227	2.35	221.78
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232	2.35	221.78
233	2.35	221.78
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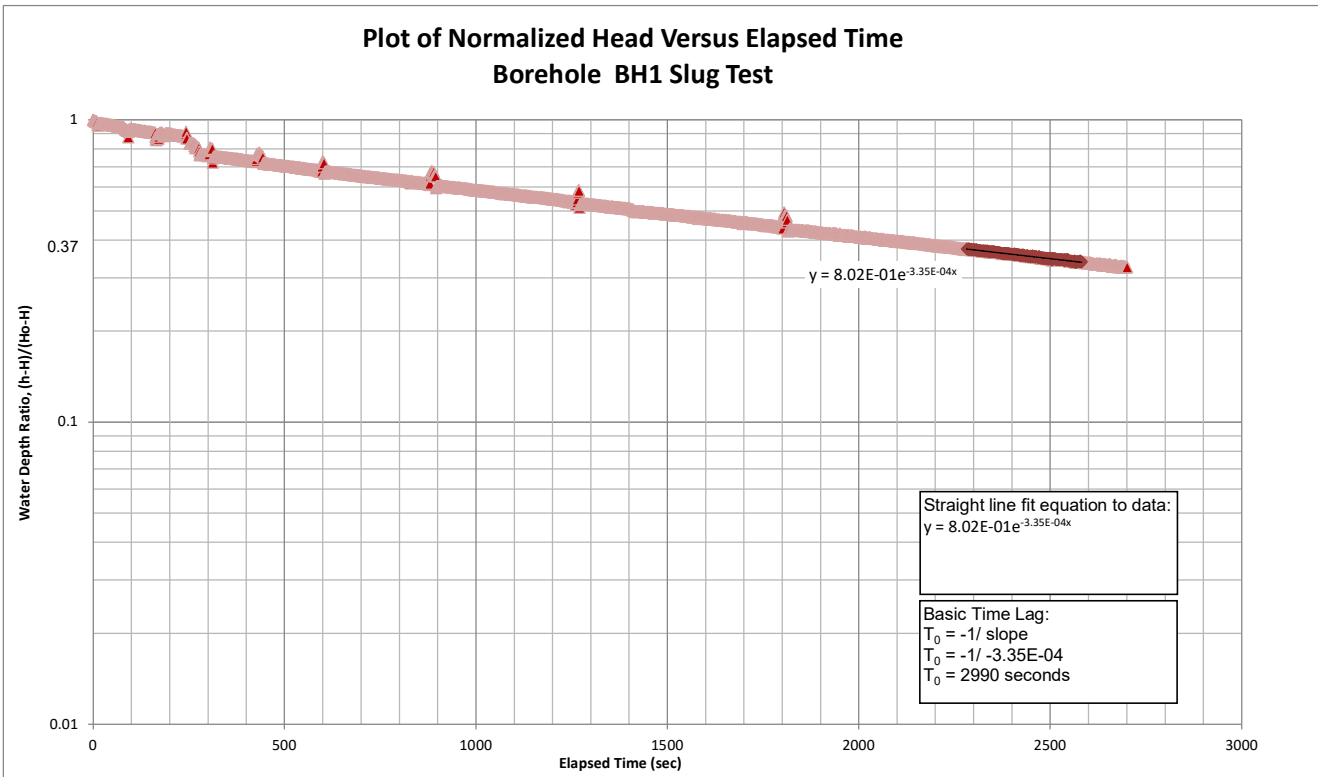
235	2.35	221.78
236	2.35	221.78
237	2.35	221.78
238	2.35	221.78
239	2.36	221.77
240	2.35	221.78
241	2.36	221.78
242	2.36	221.77
243	2.36	221.77
244	2.35	221.78
245	2.35	221.78
246	2.40	221.73
247	2.50	221.63
248	2.51	221.62
249	2.51	221.62
250	2.50	221.63
251	2.44	221.70
252	2.34	221.79
253	2.34	221.79
254	2.34	221.79
255	2.34	221.79
256	2.34	221.79
257	2.34	221.79
258	2.34	221.79
259	2.34	221.79
260	2.34	221.79
261	2.34	221.79
262	2.34	221.79

205	0.217	0.242	0.895
206	0.216	0.242	0.894
207	0.217	0.242	0.896
208	0.216	0.242	0.894
209	0.216	0.242	0.893
210	0.216	0.242	0.893
211	0.215	0.242	0.890
212	0.216	0.242	0.892
213	0.216	0.242	0.891
214	0.216	0.242	0.892
215	0.216	0.242	0.891
216	0.215	0.242	0.891
217	0.215	0.242	0.889
218	0.215	0.242	0.889
219	0.215	0.242	0.889
220	0.215	0.242	0.888
221	0.215	0.242	0.888
222	0.215	0.242	0.890
223	0.215	0.242	0.888
224	0.215	0.242	0.888
225	0.215	0.242	0.889
226	0.215	0.242	0.889
227	0.215	0.242	0.887
228	0.215	0.242	0.887
229	0.214	0.242	0.885
230	0.214	0.242	0.887
231	0.214	0.242	0.885
232	0.214	0.242	0.885
233	0.214	0.242	0.885
234	0.214	0.242	0.884
235	0.213	0.242	0.882
236	0.214	0.242	0.883
237	0.214	0.242	0.883
238	0.214	0.242	0.885
239	0.215	0.242	0.890
240	0.215	0.242	0.888
241	0.215	0.242	0.889
242	0.216	0.242	0.894
243	0.220	0.242	0.911
244	0.211	0.242	0.871
245	0.210	0.242	0.868
246	0.260	0.242	1.074
247	0.359	0.242	1.484
248	0.373	0.242	1.541
249	0.368	0.242	1.520
250	0.357	0.242	1.478
251	0.295	0.242	1.220
252	0.202	0.242	0.834
253	0.202	0.242	0.837
254	0.202	0.242	0.837
255	0.202	0.242	0.836
256	0.202	0.242	0.836
257	0.202	0.242	0.835
258	0.202	0.242	0.836
259	0.202	0.242	0.836
260	0.202	0.242	0.833
261	0.202	0.242	0.836
262	0.201	0.242	0.833


Plot of Normalized Head Versus Elapsed Time
Borehole BH1 Slug Test
Water Depth Ratio, (h-H)/(Ho-H)
1
0.37
0.1
0.01
0
500
1000
1500
2000
2500
3000
Elapsed Time (sec)
y = 8.02E-01e-3.35E-04x
Straight line fit equation to data:
y = 8.02E-01e-3.35E-04x
Basic Time Lag:
T0 = -1/ slope
T0 = -1/ -3.35E-04
T0 = 2990 seconds

Estimation of K by Slug Test, based on Hvorslev equation

Date:	February 11, 2022		Static water depth, H:	3.22	mbgs
Conducted by:	J. N.		Water depth at time t = 0, Ho:	3.45	mbgs
Project Number:	21BF049		Water depth at time t, h:	see below	mbgs
Well Number:	BH 5		Basic time lag, To:	326,000	sec
Well Screen Bottom:		mbgs	Length of well screen, L:	150	cm
Top of Pipe:		mags	Diameter of the borehole, 2R:	15.2	cm
Well Casing Diameter:		cm	Diameter of the well casing, 2r:	5.1	cm
Well Elevation:	224.15	masl	Estimated Sy of sand pack:	0.25	
Static Water Level:	3.22	mbgs	Estimated effective $2r_e$:	8.8	cm
Ground Elevation:	224.15	masl	$K^* = r_e 2\ln(L/R)/(2LTo)$ =	**5.9E-07**	cm/s
WATER LEVEL BEFORE TEST = H =	3.22	mbgs	Modified to account for sand pack?	YES	

Time t (sec)	h Water Level (mbgs)	Water Level Elevation (masl)
0	3.45	220.70
1	3.45	220.70
2	3.45	220.70
3	3.45	220.70
4	3.45	220.70
5	3.45	220.70
6	3.45	220.70
7	3.45	220.70
8	3.44	220.71
9	3.45	220.70
10	3.44	220.71
11	3.45	220.70
12	3.44	220.71
13	3.44	220.71
14	3.44	220.71
15	3.32	220.83
16	3.41	220.74
17	3.42	220.73
18	3.42	220.73
19	3.42	220.73
20	3.42	220.73
21	3.54	220.61
22	3.50	220.65
23	3.49	220.66
24	3.49	220.66
25	3.48	220.67
26	3.48	220.67
27	3.48	220.67
28	3.48	220.67
29	3.48	220.67
30	3.47	220.68
31	3.47	220.68
32	3.47	220.68

Time t (sec)	h - H	Ho - H	(h-H)/(Ho-H)
0	0.234	0.234	1.000
1	0.232	0.234	0.990
2	0.230	0.234	0.983
3	0.229	0.234	0.977
4	0.228	0.234	0.973
5	0.227	0.234	0.968
6	0.226	0.234	0.964
7	0.225	0.234	0.962
8	0.222	0.234	0.948
9	0.226	0.234	0.966
10	0.224	0.234	0.955
11	0.225	0.234	0.961
12	0.221	0.234	0.944
13	0.224	0.234	0.955
14	0.222	0.234	0.949
15	0.104	0.234	0.443
16	0.194	0.234	0.828
17	0.196	0.234	0.835
18	0.196	0.234	0.836
19	0.196	0.234	0.838
20	0.196	0.234	0.838
21	0.318	0.234	1.357
22	0.283	0.234	1.207
23	0.271	0.234	1.155
24	0.266	0.234	1.134
25	0.263	0.234	1.121
26	0.260	0.234	1.109
27	0.258	0.234	1.102
28	0.257	0.234	1.096
29	0.256	0.234	1.093
30	0.255	0.234	1.087
31	0.254	0.234	1.085
32	0.253	0.234	1.079

33	3.47	220.68
34	3.47	220.68
35	3.47	220.68
36	3.47	220.68
37	3.47	220.68
38	3.47	220.68
39	3.47	220.68
40	3.47	220.68
41	3.47	220.68
42	3.47	220.68
43	3.47	220.68
44	3.47	220.68
45	3.47	220.68
46	3.47	220.68
47	3.47	220.68
48	3.47	220.68
49	3.47	220.68
50	3.47	220.68
51	3.47	220.68
52	3.47	220.68
53	3.47	220.68
54	3.47	220.68
55	3.47	220.68
56	3.47	220.68
57	3.47	220.68
58	3.47	220.68
59	3.47	220.68
60	3.47	220.68
61	3.46	220.69
62	3.46	220.69
63	3.46	220.69
64	3.46	220.69
65	3.46	220.69
66	3.46	220.69
67	3.46	220.69
68	3.46	220.69
69	3.46	220.69
70	3.46	220.69
71	3.46	220.69
72	3.46	220.69
73	3.46	220.69
74	3.46	220.69
75	3.46	220.69
76	3.46	220.69
77	3.46	220.69
78	3.46	220.69
79	3.46	220.69
80	3.46	220.69
81	3.46	220.69
82	3.46	220.69
83	3.46	220.69
84	3.46	220.69
85	3.46	220.69
86	3.46	220.69
87	3.46	220.69
88	3.46	220.69

33	0.253	0.234	1.079
34	0.252	0.234	1.076
35	0.252	0.234	1.074
36	0.252	0.234	1.075
37	0.251	0.234	1.071
38	0.251	0.234	1.069
39	0.250	0.234	1.067
40	0.250	0.234	1.066
41	0.250	0.234	1.065
42	0.249	0.234	1.062
43	0.249	0.234	1.063
44	0.247	0.234	1.053
45	0.248	0.234	1.060
46	0.248	0.234	1.059
47	0.247	0.234	1.054
48	0.248	0.234	1.058
49	0.247	0.234	1.053
50	0.246	0.234	1.052
51	0.245	0.234	1.046
52	0.247	0.234	1.055
53	0.246	0.234	1.049
54	0.246	0.234	1.050
55	0.246	0.234	1.049
56	0.246	0.234	1.048
57	0.245	0.234	1.046
58	0.246	0.234	1.048
59	0.245	0.234	1.047
60	0.245	0.234	1.046
61	0.245	0.234	1.045
62	0.245	0.234	1.044
63	0.245	0.234	1.044
64	0.245	0.234	1.044
65	0.244	0.234	1.043
66	0.244	0.234	1.043
67	0.244	0.234	1.042
68	0.244	0.234	1.043
69	0.244	0.234	1.042
70	0.244	0.234	1.041
71	0.244	0.234	1.040
72	0.243	0.234	1.038
73	0.243	0.234	1.038
74	0.244	0.234	1.040
75	0.243	0.234	1.038
76	0.243	0.234	1.038
77	0.243	0.234	1.037
78	0.243	0.234	1.038
79	0.242	0.234	1.035
80	0.243	0.234	1.038
81	0.243	0.234	1.038
82	0.243	0.234	1.035
83	0.243	0.234	1.035
84	0.242	0.234	1.033
85	0.242	0.234	1.035
86	0.242	0.234	1.035
87	0.242	0.234	1.034
88	0.242	0.234	1.032

89	3.46	220.69
90	3.46	220.69
91	3.46	220.69
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93	3.46	220.69
94	3.46	220.69
95	3.46	220.69
96	3.46	220.69
97	3.46	220.69
98	3.46	220.69
99	3.46	220.69
100	3.46	220.69
101	3.46	220.69
102	3.46	220.69
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125	3.46	220.69
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134	3.46	220.69
135	3.46	220.69
136	3.46	220.69
137	3.46	220.69
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141	3.46	220.69
142	3.46	220.69
143	3.46	220.69
144	3.46	220.69
145	3.46	220.69
146	3.46	220.69

89	0.242	0.234	1.033
90	0.242	0.234	1.035
91	0.242	0.234	1.032
92	0.242	0.234	1.035
93	0.242	0.234	1.031
94	0.242	0.234	1.031
95	0.242	0.234	1.032
96	0.242	0.234	1.031
97	0.242	0.234	1.032
98	0.242	0.234	1.031
99	0.242	0.234	1.031
100	0.238	0.234	1.014
101	0.241	0.234	1.030
102	0.241	0.234	1.029
103	0.242	0.234	1.031
104	0.241	0.234	1.030
105	0.241	0.234	1.030
106	0.241	0.234	1.029
107	0.241	0.234	1.030
108	0.241	0.234	1.028
109	0.241	0.234	1.029
110	0.241	0.234	1.029
111	0.241	0.234	1.029
112	0.241	0.234	1.026
113	0.241	0.234	1.027
114	0.241	0.234	1.028
115	0.241	0.234	1.026
116	0.240	0.234	1.026
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118	0.240	0.234	1.023
119	0.240	0.234	1.023
120	0.240	0.234	1.024
121	0.240	0.234	1.026
122	0.240	0.234	1.024
123	0.240	0.234	1.023
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130	0.239	0.234	1.022
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132	0.240	0.234	1.022
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134	0.240	0.234	1.022
135	0.239	0.234	1.021
136	0.239	0.234	1.021
137	0.239	0.234	1.020
138	0.240	0.234	1.025
139	0.239	0.234	1.021
140	0.239	0.234	1.021
141	0.240	0.234	1.022
142	0.239	0.234	1.021
143	0.239	0.234	1.022
144	0.239	0.234	1.020
145	0.239	0.234	1.018
146	0.238	0.234	1.015

147	3.46	220.69
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201	3.46	220.69
202	3.46	220.69
203	3.46	220.69
204	3.46	220.69

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148	0.239	0.234	1.020
149	0.239	0.234	1.019
150	0.238	0.234	1.017
151	0.239	0.234	1.019
152	0.239	0.234	1.020
153	0.239	0.234	1.018
154	0.238	0.234	1.015
155	0.239	0.234	1.018
156	0.239	0.234	1.018
157	0.238	0.234	1.016
158	0.238	0.234	1.016
159	0.238	0.234	1.015
160	0.238	0.234	1.017
161	0.238	0.234	1.017
162	0.239	0.234	1.018
163	0.238	0.234	1.017
164	0.238	0.234	1.017
165	0.238	0.234	1.016
166	0.238	0.234	1.017
167	0.238	0.234	1.016
168	0.238	0.234	1.015
169	0.237	0.234	1.013
170	0.238	0.234	1.014
171	0.238	0.234	1.017
172	0.238	0.234	1.015
173	0.238	0.234	1.017
174	0.238	0.234	1.016
175	0.238	0.234	1.017
176	0.238	0.234	1.015
177	0.238	0.234	1.017
178	0.238	0.234	1.015
179	0.238	0.234	1.017
180	0.238	0.234	1.017
181	0.238	0.234	1.016
182	0.238	0.234	1.014
183	0.238	0.234	1.015
184	0.238	0.234	1.015
185	0.238	0.234	1.015
186	0.238	0.234	1.016
187	0.238	0.234	1.015
188	0.238	0.234	1.017
189	0.238	0.234	1.015
190	0.238	0.234	1.015
191	0.238	0.234	1.016
192	0.238	0.234	1.014
193	0.238	0.234	1.015
194	0.238	0.234	1.015
195	0.238	0.234	1.016
196	0.238	0.234	1.015
197	0.238	0.234	1.015
198	0.237	0.234	1.012
199	0.237	0.234	1.013
200	0.238	0.234	1.015
201	0.238	0.234	1.015
202	0.237	0.234	1.012
203	0.237	0.234	1.012
204	0.237	0.234	1.013

205	3.46	220.69
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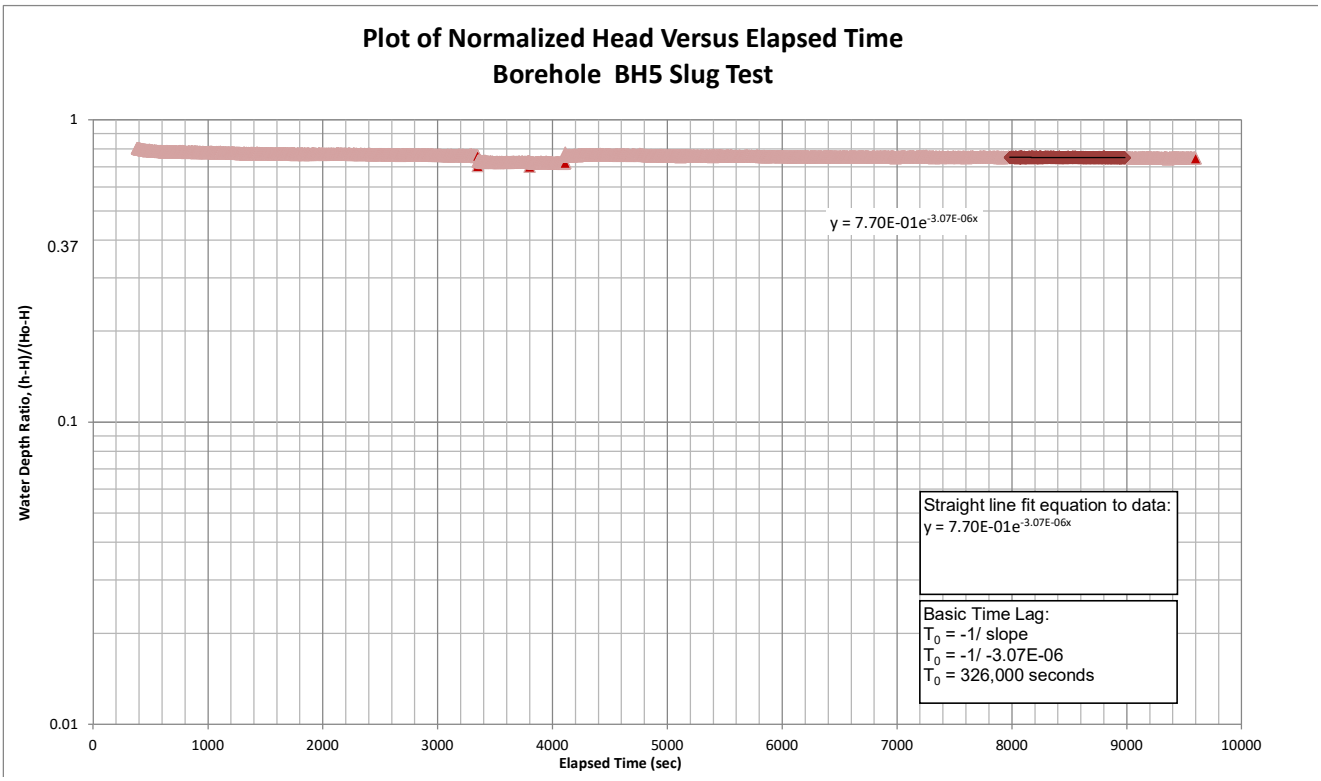
259	3.46	220.69
260	3.46	220.69
261	3.46	220.69
262	3.46	220.69

205	0.238	0.234	1.014
206	0.238	0.234	1.014
207	0.238	0.234	1.014
208	0.237	0.234	1.012
209	0.238	0.234	1.014
210	0.238	0.234	1.014
211	0.237	0.234	1.013
212	0.237	0.234	1.013
213	0.237	0.234	1.013
214	0.238	0.234	1.014
215	0.237	0.234	1.013
216	0.237	0.234	1.012
217	0.237	0.234	1.012
218	0.237	0.234	1.012
219	0.237	0.234	1.013
220	0.237	0.234	1.012
221	0.237	0.234	1.010
222	0.237	0.234	1.012
223	0.237	0.234	1.009
224	0.236	0.234	1.009
225	0.237	0.234	1.012
226	0.236	0.234	1.009
227	0.237	0.234	1.010
228	0.237	0.234	1.012
229	0.238	0.234	1.014
230	0.237	0.234	1.012
231	0.238	0.234	1.014
232	0.237	0.234	1.013
233	0.237	0.234	1.012
234	0.237	0.234	1.011
235	0.237	0.234	1.011
236	0.237	0.234	1.012
237	0.237	0.234	1.011
238	0.236	0.234	1.009
239	0.237	0.234	1.010
240	0.236	0.234	1.009
241	0.236	0.234	1.008
242	0.236	0.234	1.007
243	0.237	0.234	1.009
244	0.236	0.234	1.009
245	0.236	0.234	1.008
246	0.236	0.234	1.007
247	0.236	0.234	1.008
248	0.236	0.234	1.008
249	0.236	0.234	1.009
250	0.237	0.234	1.009
251	0.236	0.234	1.009
252	0.236	0.234	1.009
253	0.237	0.234	1.011
254	0.237	0.234	1.010
255	0.237	0.234	1.009
256	0.237	0.234	1.012
257	0.237	0.234	1.009
258	0.237	0.234	1.010
259	0.237	0.234	1.009
260	0.237	0.234	1.010
261	0.237	0.234	1.011
262	0.237	0.234	1.010


Plot of Normalized Head Versus Elapsed Time
Borehole BH5 Slug Test
Water Depth Ratio, (h-H)/(Ho-H)
1
0.37
0.1
0.01
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Elapsed Time (sec)
y = 7.70E-01e-3.07E-06x
Straight line fit equation to data:
y = 7.70E-01e-3.07E-06x
Basic Time Lag:
T0 = -1/ slope
T0 = -1/ -3.07E-06
T0 = 326,000 seconds

Estimation of K by Slug Test, based on Hvorslev equation

Date:	February 11, 2022		Static water depth, H:	2.28	mbgs
Conducted by:	J. N.		Water depth at time t = 0, Ho:	2.58	mbgs
Project Number:	21BF049		Water depth at time t, h:	see below	mbgs
Well Number:	BH 7		Basic time lag, To:	5,405	sec
Well Screen Bottom:		mbgs	Length of well screen, L:	150	cm
Top of Pipe:		mags	Diameter of the borehole, 2R:	15.2	cm
Well Casing Diameter:		cm	Diameter of the well casing, 2r:	5.1	cm
Well Elevation:	223.25	masl	Estimated Sy of sand pack:	0.25	
Static Water Level:	2.28	mbgs	Estimated effective $2r_e$:	8.8	cm
Ground Elevation:	223.25	masl	$K^* = r_e 2\ln(L/R)/(2LTo)$ =	**3.6E-05**	cm/s
WATER LEVEL BEFORE TEST = H =	2.28	mbgs	Modified to account for sand pack?	YES	

Time t (sec)	h Water Level (mbgs)	Water Level Elevation (masl)
0	2.58	220.67
1	2.58	220.67
2	2.58	220.67
3	2.58	220.67
4	2.58	220.67
5	2.58	220.67
6	2.58	220.67
7	2.58	220.67
8	2.58	220.67
9	2.58	220.67
10	2.58	220.67
11	2.58	220.67
12	2.58	220.67
13	2.58	220.67
14	2.58	220.67
15	2.57	220.68
16	2.57	220.68
17	2.57	220.68
18	2.57	220.68
19	2.57	220.68
20	2.57	220.68
21	2.57	220.68
22	2.57	220.68
23	2.57	220.68
24	2.57	220.68
25	2.57	220.68
26	2.57	220.68
27	2.57	220.68
28	2.57	220.68
29	2.57	220.68
30	2.57	220.68
31	2.57	220.68
32	2.57	220.68

Time t (sec)	h - H	Ho - H	(h-H)/(Ho-H)
0	0.299	0.299	1.000
1	0.298	0.299	0.998
2	0.298	0.299	0.998
3	0.297	0.299	0.996
4	0.298	0.299	0.997
5	0.297	0.299	0.996
6	0.297	0.299	0.995
7	0.297	0.299	0.995
8	0.296	0.299	0.991
9	0.296	0.299	0.990
10	0.296	0.299	0.990
11	0.296	0.299	0.991
12	0.295	0.299	0.989
13	0.295	0.299	0.989
14	0.295	0.299	0.989
15	0.295	0.299	0.987
16	0.295	0.299	0.987
17	0.290	0.299	0.970
18	0.290	0.299	0.970
19	0.290	0.299	0.971
20	0.291	0.299	0.973
21	0.295	0.299	0.987
22	0.295	0.299	0.987
23	0.294	0.299	0.983
24	0.294	0.299	0.983
25	0.293	0.299	0.980
26	0.293	0.299	0.980
27	0.292	0.299	0.979
28	0.292	0.299	0.979
29	0.292	0.299	0.979
30	0.293	0.299	0.981
31	0.292	0.299	0.979
32	0.293	0.299	0.980

33	2.57	220.68
34	2.57	220.68
35	2.57	220.68
36	2.57	220.68
37	2.57	220.68
38	2.57	220.68
39	2.57	220.68
40	2.57	220.68
41	2.57	220.68
42	2.57	220.68
43	2.57	220.68
44	2.57	220.68
45	2.57	220.68
46	2.57	220.68
47	2.57	220.68
48	2.57	220.68
49	2.57	220.68
50	2.57	220.68
51	2.57	220.68
52	2.57	220.68
53	2.57	220.68
54	2.57	220.68
55	2.57	220.68
56	2.57	220.68
57	2.57	220.68
58	2.57	220.68
59	2.57	220.68
60	2.57	220.68
61	2.57	220.68
62	2.57	220.68
63	2.57	220.68
64	2.57	220.68
65	2.57	220.68
66	2.57	220.68
67	2.57	220.68
68	2.57	220.68
69	2.57	220.68
70	2.57	220.68
71	2.57	220.68
72	2.57	220.68
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76	2.57	220.68
77	2.57	220.68
78	2.57	220.68
79	2.57	220.68
80	2.57	220.68
81	2.57	220.68
82	2.56	220.69
83	2.56	220.69
84	2.56	220.69
85	2.56	220.69
86	2.56	220.69
87	2.57	220.68
88	2.57	220.68

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34	0.292	0.299	0.979
35	0.292	0.299	0.978
36	0.292	0.299	0.978
37	0.292	0.299	0.979
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42	0.291	0.299	0.975
43	0.292	0.299	0.978
44	0.291	0.299	0.975
45	0.291	0.299	0.975
46	0.291	0.299	0.974
47	0.291	0.299	0.974
48	0.290	0.299	0.972
49	0.290	0.299	0.972
50	0.291	0.299	0.973
51	0.290	0.299	0.971
52	0.290	0.299	0.970
53	0.290	0.299	0.970
54	0.290	0.299	0.971
55	0.290	0.299	0.971
56	0.290	0.299	0.970
57	0.290	0.299	0.971
58	0.289	0.299	0.968
59	0.290	0.299	0.972
60	0.290	0.299	0.970
61	0.289	0.299	0.968
62	0.289	0.299	0.967
63	0.290	0.299	0.970
64	0.290	0.299	0.970
65	0.291	0.299	0.973
66	0.290	0.299	0.970
67	0.290	0.299	0.973
68	0.290	0.299	0.972
69	0.291	0.299	0.974
70	0.289	0.299	0.969
71	0.289	0.299	0.969
72	0.288	0.299	0.965
73	0.289	0.299	0.968
74	0.289	0.299	0.966
75	0.290	0.299	0.970
76	0.289	0.299	0.969
77	0.288	0.299	0.964
78	0.287	0.299	0.962
79	0.288	0.299	0.964
80	0.288	0.299	0.963
81	0.287	0.299	0.960
82	0.283	0.299	0.947
83	0.283	0.299	0.948
84	0.283	0.299	0.947
85	0.283	0.299	0.948
86	0.283	0.299	0.946
87	0.287	0.299	0.960
88	0.287	0.299	0.962

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146	2.56	220.69

89	0.287	0.299	0.960
90	0.287	0.299	0.961
91	0.286	0.299	0.959
92	0.287	0.299	0.959
93	0.287	0.299	0.960
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97	0.286	0.299	0.959
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99	0.286	0.299	0.958
100	0.286	0.299	0.958
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102	0.286	0.299	0.956
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111	0.285	0.299	0.955
112	0.285	0.299	0.954
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115	0.283	0.299	0.947
116	0.284	0.299	0.952
117	0.283	0.299	0.949
118	0.284	0.299	0.949
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120	0.284	0.299	0.949
121	0.285	0.299	0.953
122	0.284	0.299	0.951
123	0.284	0.299	0.951
124	0.283	0.299	0.947
125	0.285	0.299	0.953
126	0.286	0.299	0.956
127	0.284	0.299	0.951
128	0.284	0.299	0.951
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131	0.283	0.299	0.949
132	0.283	0.299	0.947
133	0.283	0.299	0.946
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135	0.283	0.299	0.948
136	0.284	0.299	0.949
137	0.283	0.299	0.947
138	0.283	0.299	0.947
139	0.282	0.299	0.945
140	0.282	0.299	0.945
141	0.282	0.299	0.944
142	0.279	0.299	0.933
143	0.277	0.299	0.929
144	0.278	0.299	0.930
145	0.278	0.299	0.929
146	0.277	0.299	0.928

147	2.56	220.69
148	2.56	220.69
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198	2.56	220.69
199	2.56	220.69
200	2.56	220.69
201	2.56	220.69
202	2.56	220.69
203	2.56	220.70
204	2.55	220.70

147	0.281	0.299	0.940
148	0.281	0.299	0.942
149	0.282	0.299	0.943
150	0.282	0.299	0.943
151	0.281	0.299	0.940
152	0.281	0.299	0.940
153	0.280	0.299	0.939
154	0.281	0.299	0.941
155	0.281	0.299	0.942
156	0.281	0.299	0.942
157	0.281	0.299	0.940
158	0.281	0.299	0.941
159	0.281	0.299	0.942
160	0.281	0.299	0.940
161	0.281	0.299	0.940
162	0.281	0.299	0.940
163	0.281	0.299	0.939
164	0.280	0.299	0.939
165	0.281	0.299	0.940
166	0.280	0.299	0.939
167	0.281	0.299	0.942
168	0.281	0.299	0.940
169	0.281	0.299	0.940
170	0.280	0.299	0.938
171	0.280	0.299	0.938
172	0.280	0.299	0.939
173	0.280	0.299	0.939
174	0.281	0.299	0.942
175	0.279	0.299	0.935
176	0.280	0.299	0.937
177	0.280	0.299	0.938
178	0.281	0.299	0.940
179	0.280	0.299	0.936
180	0.280	0.299	0.936
181	0.280	0.299	0.938
182	0.280	0.299	0.939
183	0.280	0.299	0.938
184	0.279	0.299	0.934
185	0.279	0.299	0.934
186	0.280	0.299	0.937
187	0.278	0.299	0.931
188	0.278	0.299	0.931
189	0.279	0.299	0.935
190	0.279	0.299	0.936
191	0.279	0.299	0.935
192	0.279	0.299	0.933
193	0.278	0.299	0.930
194	0.278	0.299	0.930
195	0.277	0.299	0.927
196	0.278	0.299	0.931
197	0.278	0.299	0.931
198	0.278	0.299	0.931
199	0.278	0.299	0.931
200	0.278	0.299	0.931
201	0.278	0.299	0.932
202	0.278	0.299	0.930
203	0.275	0.299	0.921
204	0.273	0.299	0.915

205	2.55	220.70
206	2.55	220.70
207	2.55	220.70
208	2.55	220.70
209	2.56	220.69
210	2.56	220.69
211	2.56	220.69
212	2.56	220.69
213	2.56	220.69
214	2.56	220.69
215	2.56	220.69
216	2.56	220.69
217	2.56	220.69
218	2.56	220.69
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224	2.56	220.69
225	2.56	220.69
226	2.56	220.69
227	2.56	220.69
228	2.56	220.69
229	2.56	220.69
230	2.56	220.69
231	2.56	220.69
232	2.56	220.69
233	2.56	220.69
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235	2.55	220.70
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239	2.56	220.70
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243	2.56	220.69
244	2.56	220.69
245	2.56	220.69
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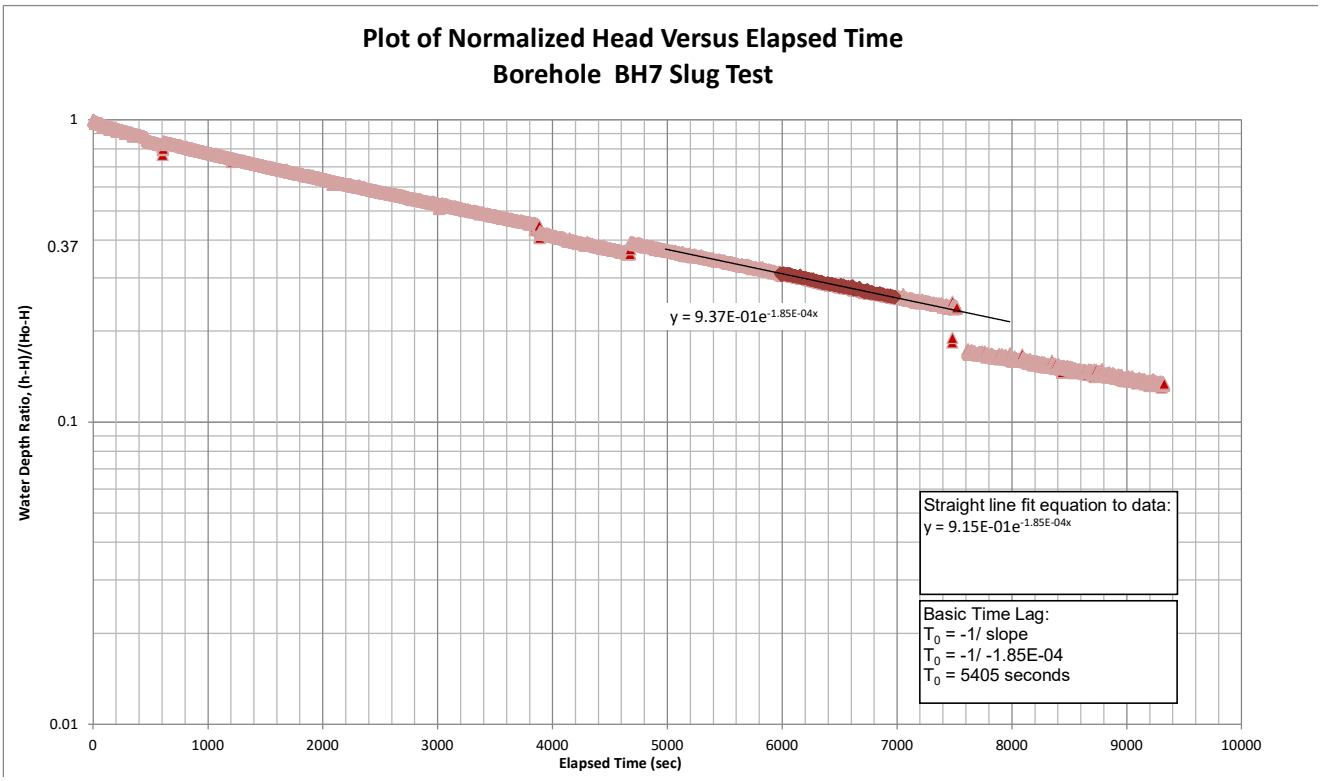
250	2.55	220.70
251	2.55	220.70
252	2.55	220.70
253	2.55	220.70
254	2.55	220.70
255	2.55	220.70
256	2.55	220.70
257	2.55	220.70
258	2.55	220.70
259	2.55	220.70
260	2.55	220.70
261	2.55	220.70
262	2.55	220.70

205	0.274	0.299	0.918
206	0.274	0.299	0.916
207	0.274	0.299	0.916
208	0.273	0.299	0.916
209	0.277	0.299	0.928
210	0.278	0.299	0.931
211	0.278	0.299	0.930
212	0.278	0.299	0.930
213	0.278	0.299	0.929
214	0.277	0.299	0.929
215	0.277	0.299	0.929
216	0.277	0.299	0.929
217	0.277	0.299	0.928
218	0.277	0.299	0.926
219	0.277	0.299	0.926
220	0.277	0.299	0.927
221	0.277	0.299	0.926
222	0.276	0.299	0.925
223	0.277	0.299	0.928
224	0.277	0.299	0.926
225	0.276	0.299	0.925
226	0.276	0.299	0.926
227	0.276	0.299	0.925
228	0.276	0.299	0.924
229	0.276	0.299	0.923
230	0.275	0.299	0.922
231	0.276	0.299	0.923
232	0.276	0.299	0.923
233	0.276	0.299	0.924
234	0.276	0.299	0.923
235	0.275	0.299	0.921
236	0.275	0.299	0.922
237	0.275	0.299	0.921
238	0.275	0.299	0.921
239	0.275	0.299	0.921
240	0.275	0.299	0.922
241	0.275	0.299	0.922
242	0.276	0.299	0.923
243	0.275	0.299	0.922
244	0.276	0.299	0.925
245	0.275	0.299	0.922
246	0.275	0.299	0.920
247	0.275	0.299	0.922
248	0.275	0.299	0.920
249	0.275	0.299	0.921
250	0.275	0.299	0.920
251	0.274	0.299	0.919
252	0.275	0.299	0.920
253	0.274	0.299	0.918
254	0.275	0.299	0.920
255	0.274	0.299	0.918
256	0.274	0.299	0.918
257	0.275	0.299	0.920
258	0.275	0.299	0.919
259	0.274	0.299	0.919
260	0.274	0.299	0.918
261	0.274	0.299	0.917
262	0.274	0.299	0.918


Plot of Normalized Head Versus Elapsed Time
Borehole BH7 Slug Test
Water Depth Ratio, (h-H)/(Ho-H)
1
0.37
0.1
0.01
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Elapsed Time (sec)
y = 9.37E-01e-1.85E-04x
Straight line fit equation to data:
y = 9.15E-01e-1.85E-04x
Basic Time Lag:
T0 = -1/ slope
T0 = -1/ -1.85E-04
T0 = 5405 seconds

Estimation of K by Slug Test, based on Hvorslev equation

Date:	February 11, 2022		Static water depth, H:	0.86	mbgs
Conducted by:	J. N.		Water depth at time t = 0, Ho:	1.24	mbgs
Project Number:	21BF049		Water depth at time t, h:	see below	mbgs
Well Number:	BH 20		Basic time lag, To:	5,556	sec
Well Screen Bottom:		mbgs	Length of well screen, L:	150	cm
Top of Pipe:		mags	Diameter of the borehole, 2R:	15.2	cm
Well Casing Diameter:		cm	Diameter of the well casing, 2r:	5.1	cm
Well Elevation:	220.82	masl	Estimated Sy of sand pack:	0.00	0 for No
Static Water Level:	0.86	mbgs	Estimated effective $2r_e$:	5.1	cm
Ground Elevation:	220.82	masl	$K^* = r_e 2\ln(L/R)/(2LTo)$ =	**1.2E-05**	cm/s
WATER LEVEL BEFORE TEST = H =	0.86	mbgs	Modified to account for sand pack?	NO	

Time t (sec)	h Water Level (mbgs)	Water Level Elevation (masl)
0	1.24	219.58
1	1.24	219.58
2	1.24	219.58
3	1.24	219.58
4	1.24	219.58
5	1.24	219.58
6	1.24	219.58
7	1.24	219.58
8	1.23	219.59
9	1.24	219.58
10	1.23	219.59
11	1.23	219.59
12	1.23	219.59
13	1.24	219.58
14	1.24	219.58
15	1.24	219.58
16	1.24	219.58
17	1.24	219.58
18	1.24	219.58
19	1.23	219.59
20	1.24	219.58
21	1.23	219.59
22	1.23	219.59
23	1.23	219.59
24	1.23	219.59
25	1.23	219.59
26	1.23	219.59
27	1.23	219.59
28	1.23	219.59
29	1.23	219.59
30	1.23	219.59
31	1.23	219.59
32	1.23	219.59

Time t (sec)	h - H	Ho - H	(h-H)/(Ho-H)
0	0.381	0.381	1.000
1	0.380	0.381	0.998
2	0.380	0.381	0.998
3	0.379	0.381	0.997
4	0.379	0.381	0.996
5	0.378	0.381	0.994
6	0.379	0.381	0.996
7	0.378	0.381	0.994
8	0.374	0.381	0.982
9	0.376	0.381	0.987
10	0.375	0.381	0.984
11	0.373	0.381	0.981
12	0.373	0.381	0.981
13	0.376	0.381	0.988
14	0.376	0.381	0.988
15	0.376	0.381	0.988
16	0.376	0.381	0.987
17	0.375	0.381	0.986
18	0.375	0.381	0.986
19	0.375	0.381	0.984
20	0.375	0.381	0.986
21	0.375	0.381	0.984
22	0.375	0.381	0.985
23	0.374	0.381	0.983
24	0.374	0.381	0.984
25	0.375	0.381	0.984
26	0.374	0.381	0.983
27	0.374	0.381	0.982
28	0.374	0.381	0.984
29	0.374	0.381	0.982
30	0.374	0.381	0.983
31	0.374	0.381	0.982
32	0.374	0.381	0.983

33	1.23	219.59
34	1.23	219.59
35	1.23	219.59
36	1.23	219.59
37	1.23	219.59
38	1.23	219.59
39	1.23	219.59
40	1.23	219.59
41	1.23	219.59
42	1.23	219.59
43	1.23	219.59
44	1.23	219.59
45	1.23	219.59
46	1.23	219.59
47	1.23	219.59
48	1.23	219.59
49	1.23	219.59
50	1.23	219.59
51	1.23	219.59
52	1.23	219.59
53	1.23	219.59
54	1.23	219.59
55	1.23	219.59
56	1.23	219.59
57	1.23	219.59
58	1.23	219.59
59	1.23	219.59
60	1.23	219.59
61	1.23	219.59
62	1.23	219.59
63	1.23	219.59
64	1.23	219.59
65	1.23	219.59
66	1.23	219.59
67	1.23	219.59
68	1.23	219.59
69	1.23	219.59
70	1.23	219.59
71	1.23	219.59
72	1.23	219.59
73	1.23	219.59
74	1.23	219.59
75	1.23	219.59
76	1.23	219.59
77	1.23	219.59
78	1.23	219.59
79	1.23	219.59
80	1.23	219.59
81	1.23	219.59
82	1.23	219.59
83	1.23	219.59
84	1.23	219.59
85	1.23	219.59
86	1.23	219.59
87	1.23	219.59
88	1.23	219.59

33	0.374	0.381	0.981
34	0.373	0.381	0.981
35	0.370	0.381	0.972
36	0.370	0.381	0.972
37	0.371	0.381	0.973
38	0.373	0.381	0.981
39	0.373	0.381	0.979
40	0.373	0.381	0.980
41	0.372	0.381	0.978
42	0.373	0.381	0.980
43	0.373	0.381	0.980
44	0.372	0.381	0.978
45	0.372	0.381	0.978
46	0.373	0.381	0.979
47	0.373	0.381	0.979
48	0.372	0.381	0.978
49	0.372	0.381	0.977
50	0.372	0.381	0.977
51	0.372	0.381	0.977
52	0.372	0.381	0.977
53	0.371	0.381	0.976
54	0.372	0.381	0.977
55	0.371	0.381	0.975
56	0.372	0.381	0.977
57	0.372	0.381	0.977
58	0.371	0.381	0.975
59	0.371	0.381	0.974
60	0.371	0.381	0.975
61	0.372	0.381	0.977
62	0.371	0.381	0.975
63	0.371	0.381	0.976
64	0.371	0.381	0.974
65	0.370	0.381	0.973
66	0.370	0.381	0.973
67	0.371	0.381	0.974
68	0.371	0.381	0.973
69	0.371	0.381	0.973
70	0.370	0.381	0.973
71	0.370	0.381	0.973
72	0.370	0.381	0.973
73	0.370	0.381	0.971
74	0.367	0.381	0.964
75	0.367	0.381	0.965
76	0.366	0.381	0.963
77	0.367	0.381	0.965
78	0.368	0.381	0.967
79	0.369	0.381	0.971
80	0.369	0.381	0.970
81	0.369	0.381	0.969
82	0.369	0.381	0.968
83	0.368	0.381	0.968
84	0.368	0.381	0.968
85	0.368	0.381	0.968
86	0.368	0.381	0.967
87	0.368	0.381	0.967
88	0.368	0.381	0.967

89	1.23	219.59
90	1.23	219.59
91	1.23	219.59
92	1.23	219.59
93	1.23	219.59
94	1.23	219.59
95	1.23	219.59
96	1.23	219.59
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119	1.23	219.59
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126	1.23	219.59
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133	1.22	219.60
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135	1.22	219.60
136	1.22	219.60
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139	1.22	219.60
140	1.22	219.60
141	1.22	219.60
142	1.22	219.60
143	1.22	219.60
144	1.22	219.60
145	1.22	219.60
146	1.22	219.60

89	0.368	0.381	0.967
90	0.368	0.381	0.967
91	0.368	0.381	0.967
92	0.367	0.381	0.965
93	0.368	0.381	0.966
94	0.368	0.381	0.968
95	0.368	0.381	0.968
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97	0.368	0.381	0.967
98	0.368	0.381	0.966
99	0.368	0.381	0.967
100	0.368	0.381	0.967
101	0.368	0.381	0.966
102	0.367	0.381	0.965
103	0.367	0.381	0.965
104	0.367	0.381	0.965
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106	0.366	0.381	0.962
107	0.367	0.381	0.963
108	0.367	0.381	0.965
109	0.367	0.381	0.964
110	0.367	0.381	0.964
111	0.367	0.381	0.964
112	0.366	0.381	0.963
113	0.367	0.381	0.963
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121	0.366	0.381	0.962
122	0.366	0.381	0.961
123	0.366	0.381	0.961
124	0.365	0.381	0.960
125	0.366	0.381	0.960
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131	0.365	0.381	0.959
132	0.365	0.381	0.958
133	0.362	0.381	0.952
134	0.362	0.381	0.951
135	0.363	0.381	0.953
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139	0.364	0.381	0.957
140	0.365	0.381	0.958
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142	0.364	0.381	0.955
143	0.363	0.381	0.955
144	0.364	0.381	0.956
145	0.363	0.381	0.953
146	0.364	0.381	0.955

147	1.22	219.60
148	1.22	219.60
149	1.22	219.60
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151	1.22	219.60
152	1.22	219.60
153	1.22	219.60
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156	1.22	219.60
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183	1.22	219.60
184	1.22	219.60
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192	1.22	219.60
193	1.22	219.60
194	1.22	219.60
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197	1.22	219.60
198	1.22	219.60
199	1.22	219.60
200	1.22	219.60
201	1.22	219.60
202	1.22	219.60
203	1.22	219.60
204	1.22	219.60

147	0.363	0.381	0.954
148	0.363	0.381	0.952
149	0.364	0.381	0.955
150	0.363	0.381	0.955
151	0.363	0.381	0.953
152	0.363	0.381	0.953
153	0.363	0.381	0.954
154	0.364	0.381	0.955
155	0.363	0.381	0.954
156	0.363	0.381	0.954
157	0.363	0.381	0.954
158	0.363	0.381	0.953
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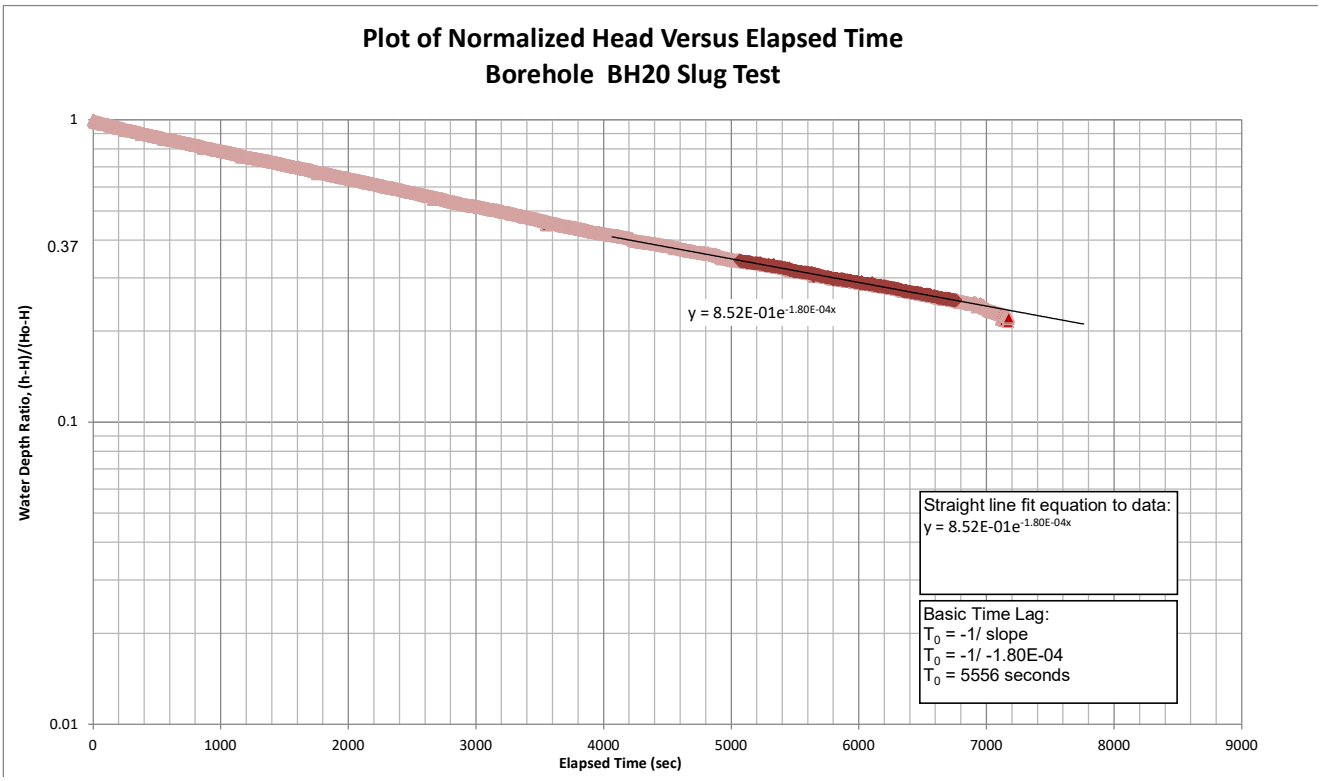
160	0.363	0.381	0.954
161	0.363	0.381	0.953
162	0.363	0.381	0.953
163	0.363	0.381	0.953
164	0.363	0.381	0.952
165	0.362	0.381	0.951
166	0.362	0.381	0.951
167	0.362	0.381	0.951
168	0.362	0.381	0.950
169	0.362	0.381	0.950
170	0.362	0.381	0.950
171	0.361	0.381	0.950
172	0.361	0.381	0.950
173	0.361	0.381	0.948
174	0.361	0.381	0.950
175	0.361	0.381	0.948
176	0.361	0.381	0.948
177	0.361	0.381	0.948
178	0.361	0.381	0.949
179	0.361	0.381	0.948
180	0.360	0.381	0.946
181	0.361	0.381	0.947
182	0.361	0.381	0.947
183	0.361	0.381	0.948
184	0.361	0.381	0.948
185	0.360	0.381	0.947
186	0.360	0.381	0.947
187	0.360	0.381	0.947
188	0.360	0.381	0.946
189	0.360	0.381	0.946
190	0.360	0.381	0.946
191	0.360	0.381	0.946
192	0.360	0.381	0.946
193	0.358	0.381	0.940
194	0.357	0.381	0.937
195	0.357	0.381	0.937
196	0.356	0.381	0.936
197	0.359	0.381	0.944
198	0.359	0.381	0.942
199	0.359	0.381	0.942
200	0.358	0.381	0.942
201	0.358	0.381	0.941
202	0.358	0.381	0.941
203	0.358	0.381	0.941
204	0.358	0.381	0.940

205	1.22	219.60
206	1.22	219.60
207	1.22	219.60
208	1.22	219.60
209	1.22	219.60
210	1.22	219.60
211	1.22	219.60
212	1.22	219.60
213	1.22	219.60
214	1.22	219.60
215	1.22	219.60
216	1.22	219.60
217	1.22	219.60
218	1.22	219.60
219	1.22	219.60
220	1.22	219.60
221	1.22	219.60
222	1.22	219.60
223	1.22	219.60
224	1.22	219.60
225	1.22	219.60
226	1.22	219.60
227	1.22	219.60
228	1.22	219.60
229	1.22	219.60
230	1.22	219.60
231	1.22	219.60
232	1.22	219.60
233	1.22	219.60
234	1.22	219.60
235	1.22	219.60
236	1.21	219.61
237	1.21	219.61
238	1.21	219.61
239	1.21	219.61
240	1.21	219.61
241	1.21	219.61
242	1.21	219.61
243	1.21	219.61
244	1.21	219.61
245	1.21	219.61
246	1.21	219.61
247	1.21	219.61
248	1.21	219.61
249	1.21	219.61
250	1.21	219.61
251	1.21	219.61
252	1.21	219.61
253	1.21	219.61
254	1.21	219.61
255	1.21	219.61
256	1.21	219.61
257	1.21	219.61
258	1.21	219.61
259	1.21	219.61
260	1.21	219.61
261	1.21	219.61
262	1.21	219.61

205	0.358	0.381	0.942
206	0.358	0.381	0.940
207	0.358	0.381	0.941
208	0.358	0.381	0.941
209	0.358	0.381	0.940
210	0.358	0.381	0.939
211	0.357	0.381	0.939
212	0.357	0.381	0.939
213	0.358	0.381	0.939
214	0.357	0.381	0.939
215	0.357	0.381	0.937
216	0.357	0.381	0.937
217	0.357	0.381	0.939
218	0.357	0.381	0.939
219	0.357	0.381	0.938
220	0.357	0.381	0.937
221	0.357	0.381	0.938
222	0.357	0.381	0.937
223	0.357	0.381	0.937
224	0.356	0.381	0.936
225	0.356	0.381	0.936
226	0.356	0.381	0.935
227	0.356	0.381	0.935
228	0.356	0.381	0.935
229	0.356	0.381	0.935
230	0.356	0.381	0.934
231	0.355	0.381	0.933
232	0.356	0.381	0.934
233	0.356	0.381	0.934
234	0.355	0.381	0.934
235	0.355	0.381	0.933
236	0.355	0.381	0.932
237	0.355	0.381	0.932
238	0.355	0.381	0.932
239	0.355	0.381	0.932
240	0.355	0.381	0.932
241	0.354	0.381	0.931
242	0.354	0.381	0.931
243	0.354	0.381	0.930
244	0.355	0.381	0.932
245	0.354	0.381	0.931
246	0.354	0.381	0.930
247	0.353	0.381	0.927
248	0.353	0.381	0.927
249	0.353	0.381	0.926
250	0.353	0.381	0.928
251	0.353	0.381	0.927
252	0.352	0.381	0.926
253	0.353	0.381	0.926
254	0.351	0.381	0.921
255	0.350	0.381	0.919
256	0.350	0.381	0.919
257	0.350	0.381	0.920
258	0.350	0.381	0.919
259	0.352	0.381	0.925
260	0.352	0.381	0.925
261	0.352	0.381	0.924
262	0.352	0.381	0.924


Plot of Normalized Head Versus Elapsed Time
Borehole BH20 Slug Test
Water Depth Ratio, (h-H)/(Ho-H)
1
0.37
0.1
0.01
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Elapsed Time (sec)
y = 8.52E-01e-1.80E-04x
Straight line fit equation to data:
y = 8.52E-01e-1.80E-04x
Basic Time Lag:
T0 = -1/ slope
T0 = -1/ -1.80E-04
T0 = 5556 seconds

APPENDIX E

Ground Water Sample Laboratory Results

FINAL REPORT

CA40149-MAR22 R1

21BF049, Bradford

Prepared for

Peto MacCallum Ltd

FINAL REPORT

First Page

CLIENT DETAILS

Client	Peto MacCallum Ltd
Address	165 Cartwright Ave Toronto, ON M6A 1V5. Canada
Contact	Andrew Cooke
Telephone	416-785-5110
Facsimile	416-785-5120
Email	acooke@petomaccallum.com
Project	21BF049, Bradford
Order Number	
Samples	Ground Water (1)

LABORATORY DETAILS

Project Specialist	Maarit Wolfe, Hon.B.Sc
Laboratory	SGS Canada Inc.
Address	185 Concession St., Lakefield ON, K0L 2H0
Telephone	705-652-2000
Facsimile	705-652-6365
Email	Maarit.Wolfe@sgs.com
SGS Reference	CA40149-MAR22
Received	03/09/2022
Approved	04/01/2022
Report Number	CA40149-MAR22 R1
Date Reported	04/01/2022

COMMENTS

RL - SGS Reporting Limit

Nonylphenol Ethoxylates is the sum of nonylphenol monoethoxylate and nonylphenol diethoxylate.

Temperature of Sample upon Receipt: 8 degrees C
Cooling Agent Present:YES
Custody Seal Present:YES

Chain of Custody Number:022947

SIGNATORIES

Maarit Wolfe, Hon.B.Sc

TABLE OF CONTENTS

Client: Peto MacCallum Ltd
Project: 21BF049, Bradford
Project Manager: Andrew Cooke
Samplers: Jason

MATRIX: WATER

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

Sample Number	8
Sample Name	BH7
Sample Matrix	Ground Water
Sample Date	09/03/2022

Parameter	Units	RL	L1	Result
General Chemistry				
Biochemical Oxygen Demand (BOD5)	mg/L	2		6
Total Suspended Solids	mg/L	2		226
Total Kjeldahl Nitrogen	as N mg/L	0.5		< 0.5
Metals and Inorganics				
Cyanide (total)	mg/L	0.01		< 0.01
Fluoride	mg/L	0.06		0.07
Sulphate	mg/L	0.2		66
Aluminum (0.2µm)	mg/L	0.001	0.075	0.001
Aluminum (total)	mg/L	0.001		0.468
Boron (total)	mg/L	0.002	0.2	0.059
Antimony (total)	mg/L	0.0009	0.02	< 0.0009
Arsenic (total)	mg/L	0.0002	0.005	0.0005
Cadmium (total)	mg/L	0.000003	0.0001	0.000012
Chromium (total)	mg/L	0.00008	0.1	0.00119
Cobalt (total)	mg/L	0.000004	0.0009	0.000596
Copper (total)	mg/L	0.0002	0.001	0.0021
Iron (total)	mg/L	0.007	0.3	0.628
Lead (total)	mg/L	0.00009	0.005	0.00051
Manganese (total)	mg/L	0.00001		0.0646
Molybdenum (total)	mg/L	0.00004	0.04	0.00267
Nickel (total)	mg/L	0.0001	0.025	0.0034
Phosphorus (total)	mg/L	0.003	0.01	0.079

Client: Peto MacCallum Ltd
Project: 21BF049, Bradford
Project Manager: Andrew Cooke
Samplers: Jason

MATRIX: WATER

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

Sample Number	8
Sample Name	BH7
Sample Matrix	Ground Water
Sample Date	09/03/2022

Parameter	Units	RL	L1	Result
Metals and Inorganics (continued)				
Selenium (total)	mg/L	0.00004	0.1	0.00046
Silver (total)	mg/L	0.00005	0.0001	< 0.00005
Tin (total)	mg/L	0.00006		0.00074
Titanium (total)	mg/L	0.00005		0.0283
Vanadium (total)	mg/L	0.00001	0.006	0.00149
Zinc (total)	mg/L	0.002	0.02	0.005
Nonylphenol and Ethoxylates				
Nonylphenol	mg/L	0.001		< 0.001
Nonylphenol Ethoxylates	mg/L	0.01		< 0.01
Nonylphenol diethoxylate	mg/L	0.01		< 0.01
Nonylphenol monoethoxylate	mg/L	0.01		< 0.01
Oil and Grease				
Oil & Grease (total)	mg/L	2		< 2
Oil & Grease (animal/vegetable)	mg/L	4		< 4
Oil & Grease (mineral/synthetic)	mg/L	4		< 4

Client: Peto MacCallum Ltd
Project: 21BF049, Bradford
Project Manager: Andrew Cooke
Samplers: Jason

MATRIX: WATER

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

Sample Number	8
Sample Name	BH7
Sample Matrix	Ground Water
Sample Date	09/03/2022

Parameter	Units	RL	L1	Result
Other (ORP)				
pH	No unit	0.05	8.6	7.48
Mercury (total)	mg/L	0.00001	0.0002	< 0.00001
Mercury (dissolved)	mg/L	0.00001	0.0002	< 0.00001
PCBs				
Polychlorinated Biphenyls (PCBs) - Total	mg/L	0.0001		< 0.0001
Phenols				
4AAP-Phenolics	mg/L	0.002	0.001	< 0.002
SVOCs				
di-n-Butyl Phthalate	mg/L	0.002		< 0.002
Bis(2-ethylhexyl)phthalate	mg/L	0.002		< 0.002
VOCs				
Chloroform	mg/L	0.0005		< 0.0005
1,2-Dichlorobenzene	mg/L	0.0005		< 0.0005
1,4-Dichlorobenzene	mg/L	0.0005		< 0.0005
cis-1,2-Dichloroethene	mg/L	0.0005		< 0.0005
trans-1,3-Dichloropropene	mg/L	0.0005		< 0.0005
Methylene Chloride	mg/L	0.0005	0.1	< 0.0005
1,1,2,2-Tetrachloroethane	mg/L	0.0005	0.07	< 0.0005
Tetrachloroethylene (perchloroethylene)	mg/L	0.0005	0.05	< 0.0005
Trichloroethylene	mg/L	0.0005	0.02	< 0.0005

Client: Peto MacCallum Ltd
Project: 21BF049, Bradford
Project Manager: Andrew Cooke
Samplers: Jason

MATRIX: WATER

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

Sample Number	8
Sample Name	BH7
Sample Matrix	Ground Water
Sample Date	09/03/2022

Parameter	Units	RL	L1	Result
VOCs - BTEX				
Benzene	mg/L	0.0005	0.1	< 0.0005
Ethylbenzene	mg/L	0.0005	0.008	< 0.0005
Toluene	mg/L	0.0005	0.0008	< 0.0005
Xylene (total)	mg/L	0.0005		< 0.0005
m-p-xylene	mg/L	0.0005	0.002	< 0.0005
o-xylene	mg/L	0.0005	0.04	< 0.0005

EXCEEDANCE SUMMARY

Parameter	Method	Units	Result	PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E L1
BH7				
Copper	SM 3030/EPA 200.8	mg/L	0.0021	0.001
Iron	SM 3030/EPA 200.8	mg/L	0.628	0.3
Phosphorus	SM 3030/EPA 200.8	mg/L	0.079	0.01
4AAP-Phenolics	SM 5530B-D	mg/L	< 0.002	0.001

QC SUMMARY

Anions by IC

Method: EPA300/MA300-Ions1.3 | Internal ref.: ME-CA-[ENVIIC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Sulphate	DIO0182-MAR22	mg/L	0.2	<0.2	0	20	108	90	110	96	75	125

Biochemical Oxygen Demand

Method: SM 5210 | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-007

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Biochemical Oxygen Demand (BOD5)	BOD0017-MAR22	mg/L	2	< 2	5	30	92	70	130	80	70	130

Cyanide by SFA

Method: SM 4500 | Internal ref.: ME-CA-[ENVISFA-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Cyanide (total)	SKA0122-MAR22	mg/L	0.01	<0.01	ND	10	96	90	110	NV	75	125

QC SUMMARY

Fluoride by Specific Ion Electrode

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Fluoride	EWL0209-MAR22	mg/L	0.06	<0.06	ND	10	95	90	110	99	75	125

Mercury by CVAAS

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Mercury (total)	EHG0018-MAR22	mg/L	0.00001	< 0.00001	ND	20	87	80	120	80	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Silver (total)	EMS0095-MAR22	mg/L	0.00005	<0.00005	ND	20	107	90	110	114	70	130
Aluminum (total)	EMS0095-MAR22	mg/L	0.001	<0.001	6	20	95	90	110	86	70	130
Aluminum (0.2µm)	EMS0095-MAR22	mg/L	0.001	<0.001	6	20	95	90	110	86	70	130
Arsenic (total)	EMS0095-MAR22	mg/L	0.0002	<0.0002	5	20	104	90	110	101	70	130
Boron (total)	EMS0095-MAR22	mg/L	0.002	<0.002	4	20	95	90	110	86	70	130
Cadmium (total)	EMS0095-MAR22	mg/L	0.000003	<0.000003	ND	20	102	90	110	103	70	130
Cobalt (total)	EMS0095-MAR22	mg/L	0.000004	<0.000004	3	20	103	90	110	103	70	130
Chromium (total)	EMS0095-MAR22	mg/L	0.00008	<0.00008	13	20	106	90	110	105	70	130
Copper (total)	EMS0095-MAR22	mg/L	0.0002	<0.0002	1	20	102	90	110	110	70	130
Iron (total)	EMS0095-MAR22	mg/L	0.007	<0.007	7	20	97	90	110	75	70	130
Manganese (total)	EMS0095-MAR22	mg/L	0.00001	<0.00001	ND	20	104	90	110	100	70	130
Molybdenum (total)	EMS0095-MAR22	mg/L	0.00004	<0.00004	3	20	102	90	110	99	70	130
Nickel (total)	EMS0095-MAR22	mg/L	0.0001	<0.0001	ND	20	108	90	110	107	70	130
Lead (total)	EMS0095-MAR22	mg/L	0.00009	<0.00001	6	20	97	90	110	85	70	130
Phosphorus (total)	EMS0095-MAR22	mg/L	0.003	<0.003	ND	20	98	90	110	NV	70	130
Antimony (total)	EMS0095-MAR22	mg/L	0.0009	<0.0009	ND	20	103	90	110	115	70	130
Selenium (total)	EMS0095-MAR22	mg/L	0.00004	<0.00004	ND	20	97	90	110	81	70	130
Tin (total)	EMS0095-MAR22	mg/L	0.00006	<0.00006	ND	20	106	90	110	NV	70	130
Titanium (total)	EMS0095-MAR22	mg/L	0.00005	<0.00005	12	20	107	90	110	NV	70	130
Vanadium (total)	EMS0095-MAR22	mg/L	0.00001	<0.00001	4	20	105	90	110	96	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS (continued)

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Zinc (total)	EMS0095-MAR22	mg/L	0.002	<0.002	ND	20	102	90	110	85	70	130

Nonylphenol and Ethoxylates

Method: ASTM D7065-06 | Internal ref.: ME-CA-IENVIGC-LAK-AN-015

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Nonylphenol diethoxylate	GCM0218-MAR22	mg/L	0.01	<0.01			91	55	120			
Nonylphenol Ethoxylates	GCM0218-MAR22	mg/L	0.01	< 0.01								
Nonylphenol monoethoxylate	GCM0218-MAR22	mg/L	0.01	<0.01			92	55	120			
Nonylphenol	GCM0218-MAR22	mg/L	0.001	<0.001			65	55	120			

QC SUMMARY

Oil & Grease

Method: MOE E3401 | Internal ref.: ME-CA-[ENV]GC-LAK-AN-019

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Oil & Grease (total)	GCM0227-MAR22	mg/L	2	<2	NSS	20	106	75	125			

Oil & Grease-AV/MS

Method: MOE E3401/SM 5520F | Internal ref.: ME-CA-[ENV]GC-LAK-AN-019

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Oil & Grease (animal/vegetable)	GCM0227-MAR22	mg/L	4	< 4	NSS	20	NA	70	130			
Oil & Grease (mineral/synthetic)	GCM0227-MAR22	mg/L	4	< 4	NSS	20	NA	70	130			

pH

Method: SM 4500 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0189-MAR22	No unit	0.05	NA	1		101			NA		

QC SUMMARY

Phenols by SFA

Method: SM 5530B-D | Internal ref.: ME-CA-[ENVISFA-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
4AAP-Phenolics	SKA0111-MAR22	mg/L	0.002	<0.002	ND	10	107	80	120	89	75	125

Polychlorinated Biphenyls

Method: MOE E3400/EPA 8082A | Internal ref.: ME-CA-[ENVIGC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Polychlorinated Biphenyls (PCBs) - Total	GCM0229-MAR22	mg/L	0.0001	<0.0001	NSS	30	97	60	140	NSS	60	140

QC SUMMARY

Semi-Volatile Organics

Method: EPA 3510C/8270D | Internal ref.: ME-CA-[ENV]GC-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Bis(2-ethylhexyl)phthalate	GCM0201-MAR22	mg/L	0.002	< 0.002	NSS	30	106	50	140	NSS	50	140
di-n-Butyl Phthalate	GCM0201-MAR22	mg/L	0.002	< 0.002	NSS	30	106	50	140	NSS	50	140

Suspended Solids

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Suspended Solids	EWL0197-MAR22	mg/L	2	< 2	5	10	103	90	110	NA		

Total Nitrogen

Method: SM 4500-N C/4500-NO3- F | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-002

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Kjeldahl Nitrogen	SKA0112-MAR22	as N mg/L	0.5	<0.5	1	10	94	90	110	NV	75	125

QC SUMMARY

Volatile Organics

Method: EPA 5030B/8260C | Internal ref.: ME-CA-[ENV]GC-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
1,1,2,2-Tetrachloroethane	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	91	60	130	98	50	140
1,2-Dichlorobenzene	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	92	60	130	99	50	140
1,4-Dichlorobenzene	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	93	60	130	99	50	140
Benzene	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	92	60	130	100	50	140
Chloroform	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	91	60	130	100	50	140
cis-1,2-Dichloroethene	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	92	60	130	101	50	140
Ethylbenzene	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	93	60	130	101	50	140
m-p-xylene	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	93	60	130	102	50	140
Methylene Chloride	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	91	60	130	100	50	140
o-xylene	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	95	60	130	103	50	140
Tetrachloroethylene (perchloroethylene)	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	92	60	130	100	50	140
Toluene	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	91	60	130	100	50	140
trans-1,3-Dichloropropene	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	95	60	130	103	50	140
Trichloroethylene	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	93	60	130	101	50	140

QC SUMMARY

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

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

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS	Insufficient sample for analysis.
RL	Reporting Limit.
↑	Reporting limit raised.
↓	Reporting limit lowered.
NA	The sample was not analysed for this analyte
ND	Non Detect

Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.
"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

This report supersedes all previous versions.

-- End of Analytical Report --

Request for Laboratory Services and CHAIN OF CUSTODY

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

No: 022947
Page ____ of ____

Laboratory Information Section - Lab use only

Received By: Geoff Ken
Received Date: 03/09/2022 (mm/dd/yy)
Received Time: 16:20 (hr : min)
Received By (signature):
Custody Seal Present: Yes ☑ No ☐
Custody Seal Intact: Yes ☑ No ☐
Cooling Agent Present: Yes ☐ No ☐ Type: ice pack
Temperature Upon Receipt (°C): 8 cm
LAB LIMS #: CA40149-MAR22

REPORT INFORMATION	INVOICE INFORMATION
Company: PML	☑ (same as Report Information)
Contact: A. Cooke	Company:
Address: 185 Centennial Ave	Contact:
	Address:
Phone: 416 785 5110	
Fax: 416 785 3120	Phone:
Email: acooke@pmlcallum.com	Email:

Quotation #: PML Rates
Project #: 21BF049
P.O. #:
Site Location/ID: Bradford

TURNAROUND TIME (TAT) REQUIRED

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

RUSH TAT (Additional Charges May Apply): ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 4 Days
PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

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

REGULATIONS

☐ O.Reg 153/04 ☐ O.Reg 406/19
☐ Table 1 ☐ Res/Park ☐ Soil Texture: ☐ Coarse
☐ Table 2 ☐ Ind/Com ☐ Medium/Fine
☐ Table 3 ☐ Agri/Other
☐ Table ____ Appx. ____
Soil Volume ☐ <350m3 ☐ >350m3

Other Regulations:
☐ Reg 347/558 (3 Day min TAT)
☑ PWQO ☐ MMER
☐ CCME ☐ Other:
☐ MISA
☐ ODWS Not Reportable *See note

Sewer By-Law:
☑ Sanitary
☑ Storm
Municipality: W. Gwillimbury

RECORD OF SITE CONDITION (RSC) ☐ YES ☐ NO

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	Field Filtered (Y/N)	M&I: Metals & Inorganics (Incl CrVI, CN,Hg pH,(B(HWS),EC,SAR-soil) (Cl, Na-water)	M&I: Full Metals Suite (ICP metals plus B(HWS-soil only) Hg, CrVI	M&I: ICP Metals only (Sb,As,Ba,Be,B,Cd,Cr,Co,Cu,Pb,Mo,Ni,	SVOC: PAHs only	SVOC: SVOCs (all incl PAHs, ABNs, CPs	PCB: PCBs (Aroclor ☐ Total ☐)	PHC: F1-F4 + BTEX	PHC: F1-F4 only (no BTEX)	VOC: VOCs (all incl BTEX	VOC: BTEX only	Pest: Pesticides (Organochlorine or specify other	Other: ✓ RUSH Metals	Other: Sewer Use: W. Gwillimbury (Specify pkg:)	Other: Water Characterization Pkg (General ☐ Extended ☐)	SPLP: Specify tests (☐ Metals ☐ VOC ☐ 1,4-Dioxane ☐ OCP ☐ ABN)	TCLP: Specify tests (☐ M&I ☐ VOC ☐ PCB ☐ B(a)P ☐ ABN ☐ Ignit.)	COMMENTS:
1	BH7	March 9/22	AM	1B	GW	N												✓	✓				
2																							
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							
11																							
12																							

Observations/Comments/Special Instructions

Sampled By (NAME): Jason	Signature: Jason Norah	Date: 3/9/22 (mm/dd/yy)	Pink Copy - Client
Relinquished by (NAME): Jason	Signature: Jason Norah	Date: 3/9/22 (mm/dd/yy)	Yellow & White Copy - SGS

Revision #: 1.5
Date of Issue: 11 June 2021

FINAL REPORT

CA40149-MAR22 R1

21BF049

Prepared for

Peto MacCallum Ltd

FINAL REPORT

First Page

CLIENT DETAILS

Client	Peto MacCallum Ltd
Address	165 Cartwright Ave Toronto, ON M6A 1V5. Canada
Contact	Andrew Cooke
Telephone	416-785-5110
Facsimile	416-785-5120
Email	acooke@petomaccallum.com
Project	21BF049
Order Number	
Samples	Ground Water (1)

LABORATORY DETAILS

Project Specialist	Brad Moore Hon. B.Sc
Laboratory	SGS Canada Inc.
Address	185 Concession St., Lakefield ON, K0L 2H0
Telephone	705-652-2143
Facsimile	705-652-6365
Email	brad.moore@sgs.com
SGS Reference	CA40149-MAR22
Received	03/09/2022
Approved	03/16/2022
Report Number	CA40149-MAR22 R1
Date Reported	03/16/2022

COMMENTS

RL - SGS Reporting Limit

Nonylphenol Ethoxylates is the sum of nonylphenol monoethoxylate and nonylphenol diethoxylate.

Temperature of Sample upon Receipt: 8 degrees C
Cooling Agent Present:YES
Custody Seal Present:YES

Chain of Custody Number:02294

SIGNATORIES

Brad Moore Hon. B.Sc

TABLE OF CONTENTS

Client: Peto MacCallum Ltd
Project: 21BF049
Project Manager: Andrew Cooke
Samplers: Jason

MATRIX: WATER

Sample Number 8
Sample Name BH7
Sample Matrix Ground Water
Sample Date 09/03/2022

L1 = SANSEW / WATER / - - Bradford West Gwillimbury Sewer Use ByLaw - Sanitary Sewer Discharge - BL_2013_68

L2 = SANSEW / WATER / - - Bradford West Gwillimbury Sewer Use ByLaw - Storm Sewer Discharge - BL_2013_68

Parameter	Units	RL	L1	L2	Result
General Chemistry					
Biochemical Oxygen Demand (BOD5)	mg/L	2	300	15	6
Total Suspended Solids	mg/L	2	350	15	226
Total Kjeldahl Nitrogen	as N mg/L	0.5	100	1	< 0.5
Metals and Inorganics					
Cyanide (total)	mg/L	0.01	2	0.02	< 0.01
Fluoride	mg/L	0.06	10		0.07
Sulphate	mg/L	0.2	1500		66
Aluminum (0.2µm)	mg/L	0.001			0.001
Aluminum (total)	mg/L	0.001	50		0.468
Antimony (total)	mg/L	0.0009	5		< 0.0009
Arsenic (total)	mg/L	0.0002	1	0.02	0.0005
Cadmium (total)	mg/L	0.000003	0.7	0.008	0.000012
Chromium (total)	mg/L	0.00008	2	0.08	0.00119
Cobalt (total)	mg/L	0.000004	5		0.000596
Copper (total)	mg/L	0.0002	3	0.05	0.0021
Lead (total)	mg/L	0.00009	1	0.12	0.00051
Manganese (total)	mg/L	0.00001	5	0.15	0.0646
Molybdenum (total)	mg/L	0.00004	5		0.00267
Nickel (total)	mg/L	0.0001	2	0.08	0.0034
Phosphorus (total)	mg/L	0.003	10	0.4	0.079

Client: Peto MacCallum Ltd
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Project Manager: Andrew Cooke
Samplers: Jason

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L2 = SANSEW / WATER / - - Bradford West Gwillimbury Sewer Use ByLaw - Storm Sewer Discharge - BL_2013_68

Parameter	Units	RL	L1	L2	Result
Metals and Inorganics (continued)					
Selenium (total)	mg/L	0.00004	1	0.02	0.00046
Silver (total)	mg/L	0.00005	5	0.12	< 0.00005
Tin (total)	mg/L	0.00006	5		0.00074
Titanium (total)	mg/L	0.00005	5		0.0283
Zinc (total)	mg/L	0.002	2	0.04	0.005
Nonylphenol and Ethoxylates					
Nonylphenol	mg/L	0.001	0.02		< 0.001
Nonylphenol Ethoxylates	mg/L	0.01	0.2		< 0.01
Nonylphenol diethoxylate	mg/L	0.01			< 0.01
Nonylphenol monoethoxylate	mg/L	0.01			< 0.01
Oil and Grease					
Oil & Grease (total)	mg/L	2			< 2
Oil & Grease (animal/vegetable)	mg/L	4	100		< 4
Oil & Grease (mineral/synthetic)	mg/L	4	15		< 4

Client: Peto MacCallum Ltd
Project: 21BF049
Project Manager: Andrew Cooke
Samplers: Jason

MATRIX: WATER

Sample Number 8
Sample Name BH7
Sample Matrix Ground Water
Sample Date 09/03/2022

L1 = SANSEW / WATER / - - Bradford West Gwillimbury Sewer Use ByLaw - Sanitary Sewer Discharge - BL_2013_68

L2 = SANSEW / WATER / - - Bradford West Gwillimbury Sewer Use ByLaw - Storm Sewer Discharge - BL_2013_68

Parameter	Units	RL	L1	L2	Result
Other (ORP)					
pH	No unit	0.05	9.5	9.5	7.48
Mercury (total)	mg/L	0.00001	0.01	0.4	< 0.00001
Mercury (dissolved)	mg/L	0.00001			< 0.00001
PCBs					
Polychlorinated Biphenyls (PCBs) - Total	mg/L	0.0001	0.001	0.0004	< 0.0001
Phenols					
4AAP-Phenolics	mg/L	0.002	1	0.008	< 0.002
SVOCs					
di-n-Butyl Phthalate	mg/L	0.002	0.08	0.015	< 0.002
Bis(2-ethylhexyl)phthalate	mg/L	0.002	0.012	0.0088	< 0.002
VOCs					
Chloroform	mg/L	0.0005	0.04	0.002	< 0.0005
1,2-Dichlorobenzene	mg/L	0.0005	0.05	0.0056	< 0.0005
1,4-Dichlorobenzene	mg/L	0.0005	0.08	0.0068	< 0.0005
cis-1,2-Dichloroethene	mg/L	0.0005	4	0.0056	< 0.0005
trans-1,3-Dichloropropene	mg/L	0.0005	0.14	0.0056	< 0.0005
Methylene Chloride	mg/L	0.0005	2	0.0052	< 0.0005
1,1,2,2-Tetrachloroethane	mg/L	0.0005	1.4	0.017	< 0.0005
Tetrachloroethylene (perchloroethylene)	mg/L	0.0005	1	0.0044	< 0.0005
Trichloroethylene	mg/L	0.0005	0.4	0.008	< 0.0005

Client: Peto MacCallum Ltd
Project: 21BF049
Project Manager: Andrew Cooke
Samplers: Jason

MATRIX: WATER

Sample Number 8
Sample Name BH7
Sample Matrix Ground Water
Sample Date 09/03/2022

L1 = SANSEW / WATER / - - Bradford West Gwillimbury Sewer Use ByLaw - Sanitary Sewer Discharge - BL_2013_68

L2 = SANSEW / WATER / - - Bradford West Gwillimbury Sewer Use ByLaw - Storm Sewer Discharge - BL_2013_68

Parameter	Units	RL	L1	L2	Result
VOCs - BTEX					
Benzene	mg/L	0.0005	0.01	0.002	< 0.0005
Ethylbenzene	mg/L	0.0005	0.16	0.002	< 0.0005
Toluene	mg/L	0.0005	0.27	0.002	< 0.0005
Xylene (total)	mg/L	0.0005			< 0.0005
m-p-xylene	mg/L	0.0005			< 0.0005
o-xylene	mg/L	0.0005			< 0.0005

EXCEEDANCE SUMMARY

Parameter	Method	Units	Result	SANSEW / WATER / - - Bradford West Gwillimbury Sewer Use ByLaw - Sanitary Sewer Discharge - BL_2013_68 L1	SANSEW / WATER / - - Bradford West Gwillimbury Sewer Use ByLaw - Storm Sewer Discharge - BL_2013_68 L2
BH7					
Total Suspended Solids	SM 2540D	mg/L	226		15

QC SUMMARY

Anions by IC

Method: EPA300/MA300-Ions1.3 | Internal ref.: ME-CA-[ENVIIC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Sulphate	DIO0182-MAR22	mg/L	0.2	<0.2	0	20	108	90	110	96	75	125

Biochemical Oxygen Demand

Method: SM 5210 | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-007

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Biochemical Oxygen Demand (BOD5)	BOD0017-MAR22	mg/L	2	< 2	5	30	92	70	130	80	70	130

Cyanide by SFA

Method: SM 4500 | Internal ref.: ME-CA-[ENVISFA-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Cyanide (total)	SKA0122-MAR22	mg/L	0.01	<0.01	ND	10	96	90	110	NV	75	125

QC SUMMARY

Fluoride by Specific Ion Electrode

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Fluoride	EWL0209-MAR22	mg/L	0.06	<0.06	ND	10	95	90	110	99	75	125

Mercury by CVAAS

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Mercury (total)	EHG0018-MAR22	mg/L	0.00001	< 0.00001	ND	20	87	80	120	80	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Silver (total)	EMS0095-MAR22	mg/L	0.00005	<0.00005	ND	20	107	90	110	114	70	130
Aluminum (total)	EMS0095-MAR22	mg/L	0.001	<0.001	6	20	95	90	110	86	70	130
Aluminum (0.2µm)	EMS0095-MAR22	mg/L	0.001	<0.001	6	20	95	90	110	86	70	130
Arsenic (total)	EMS0095-MAR22	mg/L	0.0002	<0.0002	5	20	104	90	110	101	70	130
Cadmium (total)	EMS0095-MAR22	mg/L	0.000003	<0.000003	ND	20	102	90	110	103	70	130
Cobalt (total)	EMS0095-MAR22	mg/L	0.000004	<0.000004	3	20	103	90	110	103	70	130
Chromium (total)	EMS0095-MAR22	mg/L	0.00008	<0.00008	13	20	106	90	110	105	70	130
Copper (total)	EMS0095-MAR22	mg/L	0.0002	<0.0002	1	20	102	90	110	110	70	130
Manganese (total)	EMS0095-MAR22	mg/L	0.00001	<0.00001	ND	20	104	90	110	100	70	130
Molybdenum (total)	EMS0095-MAR22	mg/L	0.00004	<0.00004	3	20	102	90	110	99	70	130
Nickel (total)	EMS0095-MAR22	mg/L	0.0001	<0.0001	ND	20	108	90	110	107	70	130
Lead (total)	EMS0095-MAR22	mg/L	0.00009	<0.00001	6	20	97	90	110	85	70	130
Phosphorus (total)	EMS0095-MAR22	mg/L	0.003	<0.003	ND	20	98	90	110	NV	70	130
Antimony (total)	EMS0095-MAR22	mg/L	0.0009	<0.0009	ND	20	103	90	110	115	70	130
Selenium (total)	EMS0095-MAR22	mg/L	0.00004	<0.00004	ND	20	97	90	110	81	70	130
Tin (total)	EMS0095-MAR22	mg/L	0.00006	<0.00006	ND	20	106	90	110	NV	70	130
Titanium (total)	EMS0095-MAR22	mg/L	0.00005	<0.00005	12	20	107	90	110	NV	70	130
Zinc (total)	EMS0095-MAR22	mg/L	0.002	<0.002	ND	20	102	90	110	85	70	130

QC SUMMARY

Nonylphenol and Ethoxylates

Method: ASTM D7065-06 | Internal ref.: ME-CA-IENVIGC-LAK-AN-015

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Nonylphenol diethoxylate	GCM0218-MAR22	mg/L	0.01	<0.01			91	55	120			
Nonylphenol Ethoxylates	GCM0218-MAR22	mg/L	0.01	< 0.01								
Nonylphenol monoethoxylate	GCM0218-MAR22	mg/L	0.01	<0.01			92	55	120			
Nonylphenol	GCM0218-MAR22	mg/L	0.001	<0.001			65	55	120			

Oil & Grease

Method: MOE E3401 | Internal ref.: ME-CA-IENVIGC-LAK-AN-019

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Oil & Grease (total)	GCM0227-MAR22	mg/L	2	<2	NSS	20	106	75	125			

QC SUMMARY

Oil & Grease-AV/MS

Method: MOE E3401/SM 5520F | Internal ref.: ME-CA-[ENV]GC-LAK-AN-019

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Oil & Grease (animal/vegetable)	GCM0227-MAR22	mg/L	4	< 4	NSS	20	NA	70	130			
Oil & Grease (mineral/synthetic)	GCM0227-MAR22	mg/L	4	< 4	NSS	20	NA	70	130			

pH

Method: SM 4500 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0189-MAR22	No unit	0.05	NA	1		101			NA		

Phenols by SFA

Method: SM 5530B-D | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
4AAP-Phenolics	SKA0111-MAR22	mg/L	0.002	<0.002	ND	10	107	80	120	89	75	125

QC SUMMARY

Polychlorinated Biphenyls

Method: MOE E3400/EPA 8082A | Internal ref.: ME-CA-[ENV]GC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Polychlorinated Biphenyls (PCBs) - Total	GCM0229-MAR22	mg/L	0.0001	<0.0001	NSS	30	97	60	140	NSS	60	140

Semi-Volatile Organics

Method: EPA 3510C/8270D | Internal ref.: ME-CA-[ENV]GC-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Bis(2-ethylhexyl)phthalate	GCM0201-MAR22	mg/L	0.002	< 0.002	NSS	30	106	50	140	NSS	50	140
di-n-Butyl Phthalate	GCM0201-MAR22	mg/L	0.002	< 0.002	NSS	30	106	50	140	NSS	50	140

QC SUMMARY

Suspended Solids

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Suspended Solids	EWL0197-MAR22	mg/L	2	< 2	5	10	103	90	110	NA		

Total Nitrogen

Method: SM 4500-N C/4500-NO3- F | Internal ref.: ME-CA-[ENVISFA-LAK-AN-002

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Kjeldahl Nitrogen	SKA0112-MAR22	as N mg/L	0.5	<0.5	1	10	94	90	110	NV	75	125

QC SUMMARY

Volatile Organics

Method: EPA 5030B/8260C | Internal ref.: ME-CA-[ENV]GC-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
1,1,2,2-Tetrachloroethane	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	91	60	130	98	50	140
1,2-Dichlorobenzene	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	92	60	130	99	50	140
1,4-Dichlorobenzene	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	93	60	130	99	50	140
Benzene	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	92	60	130	100	50	140
Chloroform	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	91	60	130	100	50	140
cis-1,2-Dichloroethene	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	92	60	130	101	50	140
Ethylbenzene	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	93	60	130	101	50	140
m-p-xylene	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	93	60	130	102	50	140
Methylene Chloride	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	91	60	130	100	50	140
o-xylene	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	95	60	130	103	50	140
Tetrachloroethylene (perchloroethylene)	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	92	60	130	100	50	140
Toluene	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	91	60	130	100	50	140
trans-1,3-Dichloropropene	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	95	60	130	103	50	140
Trichloroethylene	GCM0214-MAR22	mg/L	0.0005	<0.0005	ND	30	93	60	130	101	50	140

QC SUMMARY

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

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

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS	Insufficient sample for analysis.
RL	Reporting Limit.
↑	Reporting limit raised.
↓	Reporting limit lowered.
NA	The sample was not analysed for this analyte
ND	Non Detect

Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.
"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

This report supersedes all previous versions.

-- End of Analytical Report --

Request for Laboratory Services and CHAIN OF CUSTODY

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

No: 022947
Page ____ of ____

Laboratory Information Section - Lab use only

Received By: Geoff Ken
Received Date: 03/09/2022 (mm/dd/yy)
Received Time: 16:20 (hr : min)
Received By (signature):
Custody Seal Present: Yes ☑ No ☐
Custody Seal Intact: Yes ☑ No ☐
Cooling Agent Present: Yes ☐ No ☐ Type: ice pack
Temperature Upon Receipt (°C): 8 cm
LAB LIMS #: CA40149-MAR22

REPORT INFORMATION	INVOICE INFORMATION
Company: PML	☑ (same as Report Information)
Contact: A. Cooke	Company:
Address: 185 Centennial Ave	Contact:
	Address:
Phone: 416 785 5110	
Fax: 416 785 3120	Phone:
Email: acooke@pmlcallum.com	Email:

Quotation #: PML Rates
Project #: 21BF049
P.O. #:
Site Location/ID: Bradford

TURNAROUND TIME (TAT) REQUIRED

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

RUSH TAT (Additional Charges May Apply): ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 4 Days
PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

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

REGULATIONS

☐ O.Reg 153/04 ☐ O.Reg 406/19
☐ Table 1 ☐ Res/Park ☐ Soil Texture: ☐ Coarse
☐ Table 2 ☐ Ind/Com ☐ Medium/Fine
☐ Table 3 ☐ Agri/Other
☐ Table ____ Appx. ____
Soil Volume ☐ <350m3 ☐ >350m3

Other Regulations:
☐ Reg 347/558 (3 Day min TAT)
☑ PWQO ☐ MMER
☐ CCME ☐ Other:
☐ MISA
☐ ODWS Not Reportable *See note

Sewer By-Law:
☑ Sanitary
☑ Storm
Municipality: W. Gwillimbury

RECORD OF SITE CONDITION (RSC) ☐ YES ☐ NO

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	Field Filtered (Y/N)	M&I: Metals & Inorganics (Incl CrVI, CN,Hg pH,(B(HWS),EC,SAR-soil) (Cl, Na-water)	M&I: Full Metals Suite (ICP metals plus B(HWS-soil only) Hg, CrVI	M&I: ICP Metals only (Sb,As,Ba,Be,B,Cd,Cr,Co,Cu,Pb,Mo,Ni,	SVOC: PAHs only	SVOC: SVOCs (all incl PAHs, ABNs, CPs	PCB: PCBs (Aroclor ☐ Total ☐)	PHC: F1-F4 + BTEX	PHC: F1-F4 only (no BTEX)	VOC: VOCs (all incl BTEX	VOC: BTEX only	Pest: Pesticides (Organochlorine or specify other	Other: ✓ RUSH Metals	Other: Sewer Use: W. Gwillimbury (Specify pkg:)	Other: Water Characterization Pkg (General ☐ Extended ☐)	SPLP: Specify tests (☐ Metals ☐ VOC ☐ 1,4-Dioxane ☐ OCP ☐ ABN)	TCLP: Specify tests (☐ M&I ☐ VOC ☐ PCB ☐ B(a)P ☐ ABN ☐ Ignit.)	COMMENTS:
1	BH7	March 9/22	AM	1B	GW	N												✓	✓				
2																							
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							
11																							
12																							

Observations/Comments/Special Instructions

Sampled By (NAME): Jason	Signature: Jason Norah	Date: 3/9/22 (mm/dd/yy)	Pink Copy - Client
Relinquished by (NAME): Jason	Signature: Jason Norah	Date: 3/9/22 (mm/dd/yy)	Yellow & White Copy - SGS

Revision #: 1.5
Date of Issue: 11 June 2021

APPENDIX F

Water Balance

Table F-1: Water Balance Model Input
Project No.: 21BF049
Project: 125 Simcoe Road, Bradford

Program: Thornthwaite Monthly Water Balance
Citation: McCabe and Markstrom, 2007, USGS
Input File:

Year	Month No.	Temperature (^{o}C)	Precipitation (mm)
2010	1	-7.4	51.7
2010	2	-6.1	46
2010	3	-1.5	51.2
2010	4	6	64.9
2010	5	12.5	87.1
2010	6	17.7	84.9
2010	7	20.5	86.4
2010	8	19.6	88.4
2010	9	15.3	84.2
2010	10	8.6	72.9
2010	11	2.2	84.6
2010	12	-3.7	55.5

Additional Input:

Runoff Factor:	40%	(MECP Infiltration Factors)
Direct Runoff Factor:	5%	(Recommended value)
Soil Moisture Storage Capacity:	200	(Moderately Rooted Crops/vegetation, silt loam)
Latitude of Site:	44	(GoogleEarth)
Rain - Temperature Theshold:	3.3 ^{o}C	(Recommended value)
Snow - Temperature Threshold:	-10 ^{o}C	(Recommended value)
Maximum Melt Rate:	50%	(Recommended value)

Weather station is at Latitude 44 deg 01 min
Site is at Latitude 44 deg 06 min
Source: Canadian Climate Normals, 1981 to 2010, "King Smoke Tree" weather station

Table F-2: Water Balance Model Output
Project No.: 21BF049
Project: 125 Simcoe Road, Bradford

Program: Thornthwaite Monthly Water Balance
Citation: McCabe and Markstrom, 2007, USGS
Output File:

Date	PET	P	P-PET	Soil Moisture	AET	PET-AET	Snow Storage	Surplus	ROtotal
Jan-2010	7.8	51.7	5.9	155.9	7.8	0	37.5	0	10.7
Feb-2010	9.7	46	13.4	169.2	9.7	0	59.8	0	6.8
Mar-2010	18.5	51.2	37.5	200	18.5	0	53.2	6.8	8
Apr-2010	36.8	64.9	51.5	200	36.8	0	26.6	51.5	27.7
May-2010	68.6	87.1	27.5	200	68.6	0	13.3	27.5	30
Jun-2010	100.4	84.9	-13.1	186.9	100.4	0	6.7	0	19.6
Jul-2010	118.2	86.4	-29.5	159.3	116.3	1.9	0	0	13.6
Aug-2010	95.1	88.4	-11.1	150.5	92.8	2.3	0	0	10
Sep-2010	55.7	84.2	24.3	174.8	55.7	0	0	0	7.5
Oct-2010	29.1	72.9	40.1	200	29.1	0	0	15	11.6
Nov-2010	14.5	84.6	66.2	200	14.5	0	0	66.2	35.2
Dec-2010	9.1	55.5	22.8	200	9.1	0	22.3	22.8	29.2
Total =	563.5	857.8	235.5		559.3	4.2	219.4	189.8	209.9

Table F-3: Water Balance - Pre-Development
Project No.: 21BF049
Project: 125 Simcoe Road, Bradford

Catchment Designation	Cultivated	Paved	Building	Open Water	Total	
Area (m^2)	9,181	-	-	-	9,181	
Pervious Area (m^2)	9,181	-	-	-	9,181	
Impervious Area (m^2)	-	-	-	-	-	
Infiltration Factors						
Topography Infiltration Factor	0.3	0	0	0		
Soil Infiltration Factor	0.2	0	0	0		
Land Cover Infiltration Factor	0.1	0	0	0		
MECP Infiltration Factor (Total)	**0.6**	**0.0**	**0.0**	**0.0**		
Actual Infiltration Factor (Total)	0.6	0.0	0.0	0.0		
Run-off Coefficient	0.4	1	1	0		
Run-off from Impervious Surfaces	0.0	0.8	0.8	0		
Inputs (per Unit Area)						
Precipitation (mm/yr)	858	-	-	-		
Run-On (mm/yr)	-	-	-	-		
Other Inputs (mm/yr)	22	-	-	-		(snow storage)
Total Inputs (mm/yr)	**880**	**-**	**-**	**-**		
Outputs (per Unit Area)						
Precipitation Surplus (mm/yr)	190	-	-	-		
Net Surplus (mm/yr)	190	-	-	-		
Evapotranspiration (mm/yr)	559	-	-	-		
Infiltration (mm/yr)	114	-	-	-		
Rooftop Infiltration (mm/yr)	-	-	-	-		
Total Infiltration (mm/yr)	**114**	**-**	**-**	**-**		
Run-off Pervious Areas	210	-	-	-		
Run-off Impervious Areas	-	-	-	-		
Total Runoff (mm/yr)	**210**	**-**	**-**	**-**		
Total Outputs (mm/yr)	**883**	**-**	**-**	**-**		
Difference (Inputs - Outputs)	**(3)**	**-**	**-**	**-**		
Inputs (by Volume)						
Precipitation (m^3/yr)	7,877	-	-	-	7,877	
Run-On (m^3/yr)	-	-	-	-	-	
Other Inputs (m^3/yr)	202.0	-	-	-	202	
Total Inputs (m^3/yr)	**8,079**	**-**	**-**	**-**	**8,079**	
Outputs (by Volume)						
Precipitation Surplus (m^3/yr)	1,744	-	-	-	1,744	
Net Surplus (m^3/yr)	**1,744**	**-**	**-**	**-**	**1,744**	
Evapotranspiration (m^3/yr)	5,132	-	-	-	5,132	
Infiltration (m^3/yr)	1,047	-	-	-	1,047	
Rooftop Infiltration (m^3/yr)	-	-	-	-	-	
Total Infiltration (m^3/yr)	**1,047**	**-**	**-**	**-**	**1,047**	
Run-off Pervious Areas	1,928	-	-	-	1,928	
Run-off Impervious Areas	-	-	-	-	-	
Total Runoff (m^3/yr)	**1,928**	**-**	**-**	**-**	**1,928**	
Total Outputs (m^3/yr)	**8,107**	**-**	**-**	**-**	**8,107**	
Difference (Inputs - Outputs)	**(28)**	-	-	-	**(28)**	

Table F-4: Water Balance - Post Development
Project No.: 21BF049
Project: 125 Simcoe Road, Bradford

Catchment Designation	Cultivated	Paved	Building	Open Water	Total	
Area (m^2)	4,163	3,293	1,725	-	9,181	
Pervious Area (m^2)	4,163	-	-	-	4,163	
Impervious Area (m^2)	-	3,293	1,725	-	5,018	
Infiltration Factors						
Topography Infiltration Factor	0.3	0	0	0		
Soil Infiltration Factor	0.2	0	0	0		
Land Cover Infiltration Factor	0.1	0	0	0		
MECP Infiltration Factor (Total)	**0.6**	**0**	**0**	**0**		
Actual Infiltration Factor (Total)	0.6	0	0	0		
Run-off Coefficient	0.4	1	1	1		
Run-off from Impervious Surfaces	0.0	0.8	0.8	0.8		
Inputs (per Unit Area)						
Precipitation (mm/yr)	858	858	858	-		
Run-On (mm/yr)	-	-	-	-		
Other Inputs (mm/yr)	22	22	22	-		snow storage
Total Inputs (mm/yr)	**880**	**880**	**880**	**-**		
Outputs (per Unit Area)						
Precipitation Surplus (mm/yr)	190	686	686	-		
Net Surplus (mm/yr)	190	686	686	-		
Evapotranspiration (mm/yr)	559	194	194	-		
Infiltration (mm/yr)	114	-	-	-		
Rooftop Infiltration (mm/yr)	-	-	-	-		
Total Infiltration (mm/yr)	**114**	**-**	**-**	**-**		
Run-off Pervious Areas	210	-	-	-		
Run-off Impervious Areas	-	686	686	-		
Total Runoff (mm/yr)	**210**	**686**	**686**	**-**		
Total Outputs (mm/yr)	**883**	**880**	**880**	**-**		
Difference (Inputs - Outputs)	**(3)**	**-**	**-**	**-**		
Inputs (by Volume)						
Precipitation (m^3/yr)	3,572	2,825	1,480	-	7,877	
Run-On (m^3/yr)	-	-	-	-	-	
Other Inputs (m^3/yr)	91.6	72.4	38.0	-	202	
Total Inputs (m^3/yr)	**3,663**	**2,898**	**1,518**	**-**	**8,079**	
Outputs (by Volume)						
Precipitation Surplus (m^3/yr)	791	2,260	1,184	-	4,235	
Net Surplus (m^3/yr)	**791**	**2,260**	**1,184**	**-**	**4,235**	
Evapotranspiration (m^3/yr)	2,327	638	334	-	3,299	
Infiltration (m^3/yr)	475	-	-	-	475	
Rooftop Infiltration (m^3/yr)	-	-	-	-	-	
Total Infiltration (m^3/yr)	**475**	**-**	**-**	**-**	**475**	
Run-off Pervious Areas	874	-	-	-	874	
Run-off Impervious Areas	-	2,260	1,184	-	3,444	
Total Runoff (m^3/yr)	**874**	**2,260**	**1,184**	**-**	**4,319**	
Total Outputs (m^3/yr)	**3,676**	**2,898**	**1,518**	**-**	**8,092**	
Difference (Inputs - Outputs)	**(12)**	**-**	**-**	**-**	**(12)**	

APPENDIX G

Statement of Limitations

STATEMENT OF LIMITATIONS

This report is prepared for and made available for the sole use of the client named. Peto MacCallum Ltd. (PML) hereby disclaims any liability or responsibility to any person or entity, other than those for whom this report is specifically issued, for any loss, damage, expenses, or penalties that may arise or result from the use of any information or recommendations contained in this report. The contents of this report may not be used or relied upon by any other person without the express written consent and authorization of PML.

This report shall not be relied upon for any purpose other than as agreed with the client named without the written consent of PML. It shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. A portion of this report may not be used as a separate entity: that is to say the report is to be read in its entirety at all times.

The report is based solely on the scope of services which are specifically referred to in this report. No physical or intrusive testing has been performed, except as specifically referenced in this report. This report is not a certification of compliance with past or present regulations, codes, guidelines and policies.

The scope of services carried out by PML is based on details of the proposed development and land use to address certain issues, purposes and objectives with respect to the specific site as identified by the client. Services not expressly set forth in writing are expressly excluded from the services provided by PML. In other words, PML has not performed any observations, investigations, study analysis, engineering evaluation or testing that is not specifically listed in the scope of services in this report. PML assumes no responsibility or duty to the client for any such services and shall not be liable for failing to discover any condition, whose discovery would require the performance of services not specifically referred to in this report.

STATEMENT OF LIMITATIONS
(continued)

The findings and comments made by PML in this report are based on the conditions observed at the time of PML's site reconnaissance. No assurances can be made and no assurances are given with respect to any potential changes in site conditions following the time of completion of PML's field work. Furthermore, regulations, codes and guidelines may change at any time subsequent to the date of this report and these changes may affect the validity of the findings and recommendations given in this report.

The results and conclusions with respect to site conditions are therefore in no way intended to be taken as a guarantee or representation, expressed or implied, that the site is free from any contaminants from past or current land use activities or that the conditions in all areas of the site and beneath or within structures are the same as those areas specifically sampled.

Any investigation, examination, measurements or sampling explorations at a particular location may not be representative of conditions between sampled locations. Soil, ground water, surface water, or building material conditions between and beyond the sampled locations may differ from those encountered at the sampling locations and conditions may become apparent during construction which could not be detected or anticipated at the time of the intrusive sampling investigation.

Budget estimates contained in this report are to be viewed as an engineering estimate of probable costs and provided solely for the purposes of assisting the client in its budgeting process. It is understood and agreed that PML will not in any way be held liable as a result of any budget figures provided by it.

The Client expressly waives its right to withhold PML's fees, either in whole or in part, or to make any claim or commence an action or bring any other proceedings, whether in contract, tort, or otherwise against PML in anyway connected with advice or information given by PML relating to the cost estimate or Environmental Remediation/Cleanup and Restoration or Soil and Ground Water Management Plan Cost Estimate.