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A REPORT TO
2868577 ONTARIO INC.

HYDROGEOLOGICAL ASSESSMENT FOR PROPOSED RESIDENTIAL DEVELOPMENT

15544 MCLAUGHLIN ROAD

TOWN OF CALEDON

REFERENCE NO. 2301-W042

APRIL 9, 2024
(REVISION OF REPORT DATED AUGUST 2023)

DISTRIBUTION

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1.0 EXECUTIVE SUMMARY

Soil Engineers Ltd. has conducted a hydrogeological assessment for a proposed residential development site, located at 15544 McLaughlin Road in the Town of Caledon. The subject site is currently a farmland, where the surrounding land use includes; a water course flowing south of the site, wooded areas, situated immediate to the south-west, and existing residential properties to the north, north-east and north-west of the subject site.

This study has disclosed that beneath layer of topsoil veneer, and a layer of earth fill or weathered soil, the site is underlain by native subsoil strata, comprised of silt, silty sand, sandy silt, silty sand till, sandy silt till and silty clay till, extending to the maximum depth of investigation.

The findings of this study confirm that the measured groundwater level elevations ranged from 272.32 to 284.68 masl, and that shallow groundwater is interpreted to flow in north-westerly directions, beneath the site towards the low relief portion of the Subject Site.

The single well response tests yielded estimated hydraulic conductivity (K) values that range from 6.0×10^{-7} to 4.0×10^{-6} m/sec for the sandy silt till/silty sand till, silt, sandy silt, sand and gravel, and silty clay till subsoils at the depths of the monitoring well screen intervals. These results suggest that low to moderate groundwater seepage rates can be anticipated into open excavations below the shallow groundwater table.

Based on the test pit investigations at the anticipated depths for the housing basement foundations structures and proposed underground services indicate that the minor groundwater seepages within test pits excavations occurred at depths of 1.6 mbgs and <5.0 mbgs or at elevations, ranging between 273.6 to 282.5 masl. Limited seepage was observed within test pit excavations, after the test pits remained opened for up to 6.0 hours.

The maximum anticipated construction (short-term) dewatering for construction of the proposed houses could reach 24,200.0 L/day considering a safety factor of 1.5 and storm event.

The Maximum anticipated construction (short-term) dewatering from groundwater source for the proposed underground services could reach 23,500.0 L/day considering a safety factor of 1.5 for active trench with a length of 25.0 m.

Since the excavation and construction for the SWM Pond, will be completed above shallow groundwater level, groundwater seepage is not anticipated.

Long-term foundation drainage flow from groundwater source considering a safety factor of 1.5 will reach 9,800.0 L/day for the proposed building. The total anticipated flow including infiltration reaches 10,872.0 L/day.

The estimated dewatering flow rates for each proposed single detached dwelling remains below the MECP threshold of 50,000 L/day. As such, filing EASR or apply for PTTW with MECP is not required.

Obtaining discharge agreement from the Town of Caledon/Region of Peel for both the short-term (pertaining to the construction period) and long-term (post construction) if the anticipated dewatering effluent is intended to be discharges into the Town of Caledon/Region of Peel sanitary or storm systems.

Given that only limited un-sustained groundwater seepage rates are anticipated during excavations for the proposed underground housing basement structures, and for the installation of the underground service. It is not anticipated that the groundwater seepage will be sustained within the open excavations, where occasional sump pit pumping should be adequate to remove any occasional limited groundwater seepage that may accumulate within the open excavations. Pumping rates for the anticipated occasional sump pit pumping are expected to be below the 50,000 L/day threshold limit for requiring an approval for any proposed construction related groundwater takings, which will not require any registration or filing with the MECP.

The shallow groundwater levels were measured at depths ranging from 0.66 to 3.42 m below the prevailing ground surface. As such, low impact development (LID) infrastructure may be considered for implementation beneath certain portions of the site. If the shallow soils remain unsaturated, proposed Low Impact Development (LID) infrastructure should be considered for implementation in areas where the shallow groundwater is deeper than 1.0 m below the ground surface, and where it is possible to maintain a minimum 1.0 m separation between the bases for any proposed LID stormwater management infiltration infrastructure and the high groundwater table to address future stormwater management planning.

The anticipated ZOI for construction could reach to 48.7 m away from the dewatering area. There are existing roads and residential properties within a conceptual ZOI for construction. It is recommended a professional geotechnical engineer is consulted in advance of excavation and construction.

34 water supply wells are listed within the 500 m radius of the Subject Site. As such, a door-to-door well survey will be required in advance of, during and after construction.

2.0 INTRODUCTION

2.1 Project Description

In accordance with authorization from Mr. Manoj Sharma of 2868577 Ontario Inc., Soil Engineers Ltd. (SEL) has conducted a hydrogeological assessment for a proposed residential development, for a site, located at 15544 McLaughlin Road in the Town of Caledon. The location of the subject site is shown on Drawing No. 1.

The subject site is currently a vacant land, located approximately 200 m west of McLaughlin Road and approximately 470 m north of Old Base Line Road, at the terminus of Kaufman Road. The subject site is surrounded by existing residential developments. The site slopes with its southwest portion being at higher elevations compared to its northeast portion. As per Drawing No. 1, a water course flows 70 m to the south, 50 m east and 325 m north of the site where it further contributes to the Credit River.

Based on the preliminary development plan, prepared by Candevcon Limited, the Subject Site will be developed into 13 single detached dwelling lots, a parkette and a SWM Pond.

This report summarizes the findings of the field study and the associated groundwater monitoring and testing programs and provides a description and characterization of the interpreted hydro-geo-stratigraphy for the subject site and the local surrounding area. The current study provides preliminary recommendations for any dewatering needs for construction, including an estimation for the construction dewatering flow rates and the associated zones of influence, prior to the detailed design. Furthermore, the report provides a recommendation for any need to acquire an Environmental Activity and Sector Registry (EASR), or to acquire aa Permit-To-Take Water (PTTW) as approvals to facilitate temporary groundwater taking for construction dewatering program, if required.

2.2 Project Objectives

The major objectives of this Hydrogeological Study Report are as follows:

1. Establish the local hydrogeological setting for the subject site, and the local surrounding area;
2. Interpretation of the shallow groundwater flow and runoff patterns;
3. Characterizing the hydraulic conductivity (K) for the groundwater-bearing shallow subsoil strata;

4. Estimate the anticipated, dewatering flows that may be required to lower the groundwater table to facilitate earthworks for the construction and for installation of underground services for proposed residential development, and assessment for any long-term foundation drainage needs following the site development, if required;
5. Identify zones of higher groundwater yield as potential sources for any ongoing shallow groundwater seepage;
6. Prepare an interpreted hydro-geo-stratigraphic cross-section across the subject site;
7. Evaluate potential impacts to nearby groundwater receptors within the anticipated zone of influence for construction dewatering;
8. Determine the groundwater function of the subject site, and assessment of potential impacts to nearby groundwater receptors relative to the proposed development;
9. Assess the shallow groundwater quality in advance of any construction dewatering, or for any anticipated long-term foundation drainage needs, after development, to assess disposal management options for use of the Region of Peel sewer system for any generated dewatering or drainage effluent;
10. Providing comments regarding any need to file for an Environmental Activity and Sector Registry (EASR) approval, or to acquire a Permit-To-Take Water (PTTW) approval to facilitate a temporary construction dewatering program.
11. Determine the feasibility of the subject site for the implementation of any Low Impact Development (LID) infrastructure to address future stormwater management planning and design for the proposed development.

2.3 **Scope of Work**

The scope of work for the Hydrogeological Study is summarized below:

1. Clearance of underground services, borehole drilling and installation of five (5) monitoring wells within the site's development footprint.
2. Monitoring well development and groundwater level measurements at the five (5) installed monitoring wells.
3. Performance of Single Well Response Tests (SWRTs) at the installed monitoring wells to estimate the hydraulic conductivity (K) for the groundwater-bearing subsoil strata at the depths of the monitoring well screens.
4. Describing the geological and hydrogeological setting for the subject site, and the local surround area.
5. Review of the Ministry of the Environment, Conservation, and Parks (MECP) water well records within 500 m of the proposed development site.

6. Assessing the shallow groundwater quality to evaluate, disposal management options in advance of any dewatering effluent disposal management to the Region of Peel Storm and Sanitary system.
7. Review of available engineering development plans and profiles for the proposed development; assessing preliminary dewatering needs, and estimation of any anticipated dewatering flows to lower the groundwater levels to facilitate construction and earth works, or for any anticipated long-term foundation drainage needs following site development.
8. Providing comments, regarding any need to register any proposed groundwater-taking through an Environmental Activity and Sector Registry (EASR), or to apply for a Permit-To-Take Water (PTTW) as groundwater taking approvals.
9. Commenting on the suitability of the subsurface condition for implementing a LID infrastructure at the proposed developed site to address future stormwater management planning and design for the developed site.

3.0 METHODOLOGY

3.1 Borehole Advancement and Monitoring Well Installation

Borehole drilling and monitoring well construction were conducted on January 24, 2023. The program consisted of the drilling of five (5) boreholes (BHs) and the installation of five (5) monitoring wells (MW), one within each of five (5) boreholes drilled for the soil investigation report. The locations of the boreholes/monitoring wells are shown on Drawing No. 2.

The borehole drilling and monitoring well construction were completed by licensed water well contractor, DBW Drilling, under the full-time supervision of a field technician from SEL, who also logged the subsoil strata, encountered during borehole advancement, collected representative subsoil samples for textural classification, and supervised the monitoring well installations. The boreholes were drilled, using a continuous-flight, power auger machine, equipped with solid-stem augers. Selected subsoil samples, retrieved during the drilling program underwent laboratory grain size analysis to confirm the subsoil textures. Detailed descriptions of the encountered subsurface soil and groundwater conditions are presented on the borehole and monitoring well logs, Figures 1 to 5, inclusive.

The monitoring wells were constructed, using 50-mm diameter PVC riser pipes and screens, which were installed in each of the boreholes in accordance with Ontario Regulation (O. Reg.) 903. All of the monitoring wells were provided with steel, monument protective casings at the ground surface. Details for the monitoring well construction are provided on the enclosed Borehole Logs (Figures 1 to 5).

The ground surface elevations and horizontal coordinates at the monitoring well locations were determined at the time of the investigation, using a handheld Global Navigation Satellite System survey equipment (Trimble Geoexplorer unit TSC3) which has an accuracy of ±0.05 m. The UTM coordinates and ground surface elevations at the borehole/monitoring well locations, together with the summary of the monitoring well installation details, are provided in Table 3-1.

Table 3-1 - Monitoring Well Installation Details

Well ID	Installation Date	UTM Coordinates		Ground El. (masl)	Borehole Depth (mbgs)	Well Screen Interval (mbgs)	Well Casing Dia. (mm)
		East (m)	North (m)				
BH/MW 1	January 24, 2023	585730.94	4849365.40	285.81	6.3	3.1-6.1	50
BH/MW 2	January 24, 2023	585793.89	4849351.95	281.75	6.4	3.1-6.1	50
BH/MW 3	January 24, 2023	585781.60	4849417.52	282.83	6.2	3.2-6.2	50
BH/MW 4	January 24, 2023	585862.87	4849395.19	277.25	6.6	3.1-6.1	50
BH/MW 5	January 24, 2023	585827.02	4849464.92	278.64	6.2	3.2-6.2	50

Notes: mbgs -- metres below ground surface masl -- metres above sea level

3.2 Groundwater Monitoring

The groundwater levels within the monitoring wells were manually measured, on January 31, March 2 and on April 3, 2023 to record the fluctuation of the shallow groundwater table beneath the subject site, with the details discussed in the section 6.3 of this report.

3.3 Mapping of Ontario Water Well Records

SEL reviewed the Ministry of the Environment, Conservation and Parks (MECP) Water Well Records (WWRs) for the registered wells, located on the subject site and within 500 m of the subject site boundaries (study area). The water well records indicate that seventy-four (74) wells are located within the 500 m zone of influence study area relative to the subject site. The well record locations are marked, and presented in Drawing No. 3, and related WWRs review information is summarized in Section 6.2, with details of the reviewed records being provided in Appendix 'A'.

3.4 Monitoring Well Development and Single Well Response Tests

The monitoring wells underwent development in preparation for single well response tests (SWRT) to estimate the hydraulic conductivity (K) for saturated subsoil strata at the depths of the monitoring well screens. Well development involved the purging and removal of several well casing volumes of groundwater from each monitoring well to remove remnants of clay, silt and other debris introduced into the monitoring wells during construction, and to induce the flow of formation groundwater through the monitoring well screens, thereby improving the transmissivity of the subsoil strata formation at the monitoring well screen depths.

The test results from SWRT's are used to estimate the hydraulic conductivity (K) for groundwater-bearing subsoil strata at the depths of the monitoring well screens. The K values,

estimated from the SWRTs provide an indication of the yield capacity for the groundwater-bearing subsoil strata, and can be used to estimate the flow of groundwater through the groundwater-bearing subsoil strata.

The SWRT involves the placement of a slug of known volume into the well, below the groundwater table, to displace the groundwater level upward. The rate at which the groundwater level recovers to static conditions (falling head) was tracked using a data logger/pressure transducer that was set to record water level data at 5 second recording intervals. An electronic water level tape was also used to manually record the groundwater levels to verify the data logger measurements.

The rate at which the groundwater table recovers to static conditions is used to estimate the K values for the groundwater-bearing subsoil strata formation at the monitoring well screen depths. The Bower Rice formula was used to interpret the SWRTs. The BH/MWs 1, 2 and 3 underwent SWRTs on March 2, 2023, whereas SWRTs on BH/MWs 4 and 5 were performed on April 3, 2023. The detailed test results are provided in Appendix 'B', with a summary of the findings, being provided in Table 6-2.

3.5 Review Summary of Concurrent Report

The following, concurrent geotechnical report, prepared by SEL was reviewed in preparation of this hydrogeological study:

"A Report to 2868577 Ontario Inc., a Geotechnical Investigation for Proposed Residential Development, 15544 McLaughlin Road, Town of Caledon", Reference No. 2301-S042 dated March 2023.

3.6 Groundwater Quality Assessment

The monitoring well location at the BH/MW 1 underwent sampling for analysis to characterize the shallow groundwater quality for comparison evaluation of the testing results against the Region of Peel Storm and Sanitary Sewer Use By-Law standards. This was performed to assess whether any anticipated dewatering effluent, generated from any construction dewatering, or from any long-term foundation drainage needs can be disposed of into the Region of Peel sewer system. Based on the results, recommendations for any pre-treatment of the dewatering effluent can be developed, if required.

BH/MW 1 was developed and purged in accordance with best management practices with a minimum of 3 well casing volumes of groundwater purged, prior to sample collection. In

accordance with Region of Peel Storm and Sanitary Sewer Use By-Law sampling protocol, one set of groundwater samples was not filtered prior to placement in the laboratory sample bottles. Upon sampling, all of the bottles were placed in ice and packed in a cooler for shipment to the analytical laboratory. Sample analysis was performed by SGS Laboratories, which is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA). Results of the analysis are provided in Appendix 'C', with a discussion of the findings, provided in Section 7.6.

4.0 REGIONAL AND LOCAL SETTING

4.1 Regional Geology

The subject site lies within the Physiographic Region of Southern Ontario, known as the Niagara Escarpment. The Niagara Escarpment extends from the Niagara River to the northern tip of the Bruce Peninsula and continues through the Manitoulin Islands. It consists of an association of landforms, not found anywhere else in Ontario. Vertical cliffs along the brow of the escarpment often outlines the edge of the dolostone of the Lockport and Amabel Formations while the slopes below are carved in red shale. For some distance back from the brow, the dip-slope of the cuesta in many places has been stripped of soil and over-burden. Flanked by landscapes of glacial origin, this rock-hewn topography stands in striking contrast, and its steep-sided valleys are strongly suggestive of non-glaciated regions. While the escarpment stands out boldly in the Niagara Peninsula, and along the shore of Georgian Bay, there is an intervening area in which the slopes are mantled by morainic posits, particularly in Mono and Mulmur Townships, and the Town of Caledon, with long stretches of area being almost completely hidden.

The Dundas Valley is the most notable break in the southern part of the escarpment, extending inland eight miles from the west end of Lake Ontario. The rim is sharply outlined by rock bluffs but within the valley there is deep drift, the surface of which is deeply cut by many gullies. Worthy of note is the occurrence of beds of sand and silty clay in alternate layers (Chapman and Putnam, 1984).

Under the Niagara Escarpment, the physiographic description for the project site is Spillways. These are usually occupied by streams, and are basically a broad trough, floored wholly or in part by gravel beds at one or more levels. It sometimes shows a peculiar disregard for existing grades, since it flowed along an ice front. It is common to find a spillway that now is unoccupied by any stream. On the upland west of the Niagara Escarpment the spillways mostly, but not always, run along the front of the moraines (Chapman and Putnam, 1984).

Review of the surface geological map of Ontario shows that the subject site is located, partially on the Halton Till Unit deposits, consisting predominantly of silt to silty clay matrix which is high in calcium carbonate content, and is clast poor, which was deposited, partially on the bedrock deposits, consisting of undifferentiated igneous and metamorphic rocks, or carbonate and classic sedimentary rocks, being exposed at the surface or covered by a discontinuous, thin layer of drift. Drawing No. 4, as reproduced from Ontario Geological Survey (OGS) mapping, illustrates the Quaternary surface soil geology for the site and surrounding area.

The underlying bedrock is comprised, mainly of shale, limestone, dolostone and siltstone of the Georgian Bay formation, Blue Mountain Formation, Billings Formation, and both the Collingwood and Eastview Member, which were deposited during the Upper Ordovician Epoch (Bedrock Geology of Ontario, 1993). The approximate elevations for the top of the bedrock beneath the site approximately ranges between 267 to 278 masl (metres above sea level).

4.2 Physical Topography

A review of the topography shows that the subject site and surrounding area is sloping in nature, exhibiting a decline in elevation relief towards the east from west, towards the Credit River. Based on review of the topographic map, and from the review of the ground surface elevations at borehole and monitoring well locations, the total elevation relief across the subject site is about 9.0 m. Drawing No. 5 shows the mapped topographical contours for the subject site, and the surrounding area.

4.3 Watershed Setting

The subject site is located within the Credit Valley Watershed, and Credit River-Forks of the Credit to Churchville Sub-watershed as shown, mapped on Drawing No. 6. The Credit River watershed is comprised of twenty-three (23) sub-watersheds and covers an area of about 1,000 km^2. The Credit River is approximately 90 km long and meanders through nine (9) municipalities. Its headwaters, or upper reaches, are located in Orangeville, Erin and in the Town of Mono. It flows south where it empties into Lake Ontario at Port Credit, Mississauga (Credit Valley Conservation Authority, 2009).

4.4 Local Surface Water and Natural Features

Records review show that a tributary of Credit River, and its associated wooded areas and a watercourse are located, immediately south and south-west of the site. This tributary is shown to flow south-easterly, before bending east where it then joins the Credit River, located approximately 50 m south of the subject site. Another small tributary, flowing north joins the Credit River, approximately 300 m north of the site.

Immediately south-west of the site lies a wooded area, and a further 30 m southwest of the site lies an area of natural and scientific interest (ANSI). Apart from these, there are a lot of wooded areas present around the site. The locations of the site and the noted natural features are shown on Drawing No. 7.

5.0 SOIL LITHOLOGY

The investigation revealed that beneath a layer of topsoil veneer, and a layer of earth fill or weathered soil, the site is underlain by native strata of silt, silty sand, sandy silt, silty sand till, sandy silt till and silty clay till. Weathered shale was also observed in some of the BH/MWs at deeper elevations.

Detailed descriptions of the encountered subsurface conditions from the BH/MWs are presented on the BH/MW Logs, comprising Figures 1 to 5, inclusive. A Key Plan and the interpreted geological cross-sections, along the delineated southwest to northeast and southwest to southeast transects across the site are presented on Drawing Nos. 8-1 and 8-2.

5.1 **Topsoil** (All BH/MWs)

All BH/MWs were completed on the vacant field where the ground surface is covered with a layer of topsoil, approximately 15 to 30 cm in thickness. Thicker topsoil deposits may be encountered beyond the BH/MW locations.

5.2 **Earth Fill** (BH/MWs 3, 4 and 5)

Earth fill, approximately 0.2 to 2.2 m thickness, was observed beneath the topsoil layer at BH/MWs 3, 4 and 5 locations. The fill unit consists of mixture of sand, silt, clay and contains organic inclusions.

5.3 **Silt, Sandy Silt and Silty Sand** (BH/MWs 1, 2, 3 and 5)

The silt, sandy silt and silty sand deposits were encountered in BH/MWs 1, 2, 3 and 5. It has trace of clay and occasional gravel. It is brown in colour, is very loose to compact in consistency. The moisture contents for the retrieved subsoil samples ranges from 7% to 33%, indicating moist to wet conditions. The estimated permeability of this layers at the depth of 3.3 mbgs, 4.8 mbgs and 1.8 mbgs ranges from 10^{-4} to 10^{-3} cm/sec. Grain size analyses were performed on three (3) subsoil samples, and the gradation are plotted on Figures 6, 7 and 8.

5.4 **Sandy Silt Till/Silty Sand Till** (BH/MWs 1, 2 and 4)

The sandy silt till and/or silty sand till were contacted in the upper stratigraphy in BH/MWs 1 and 2 at depths of 0.3 to 2.2 m below the prevailing ground surface. With an approximate thickness ranging from 1.4 to 1.9 m. While at BH/MW 4, sandy silt till layer was encountered at a depth of 4.8 m below the prevailing ground surface. It is brown in colour, is

very loose to very dense in consistency, having trace of clay and gravel. The moisture contents for the retrieved subsoil samples ranges from 10 to 36%, indicating moist to saturated conditions.

5.5 **Sand and Gravel** (BH/MWs 4 and 5)

The sand and gravel deposits were encountered in BH/MWs 4 and 5 beneath the eastern portion of the investigated area, at the approximate depth of 2.2 m below the prevailing ground surface. Having an approximate thickness of 1.7 to 2.6 m. This subsoil unit is brown in colour, is dense in consistency, having a trace to some silt. The moisture contents for the retrieved subsoil samples ranges from 3% to 18%, indicating moist condition. The estimated permeability of this layer at the depth of 3.3 mbgs is 10^{-3} cm/sec. Grain size analysis was performed on one representative subsoil sample of the sand and gravel, and the soil gradation is plotted on Figure 9.

5.6 **Silty Clay Till** (BH/MWs 3, 4 and 5)

The silty clay till deposit was encountered at the lower stratigraphy in BH/MWs 3, 4 and 5, at depths, ranging from 4.0 to 6.3 m below prevailing ground surface. It has a trace of gravel and occasional shale fragments. It is brown in colour, hard in consistency, where it extends to the maximum investigation depth at BH/MWs 3 and 4. The moisture contents for the retrieved subsoil samples ranges from 9 to 16% indicating moist conditions.

5.7 **Shale** (BH/MW 5)

Shale bedrock was encountered at the depth of 5.7 m below the prevailing ground surface, at the BH/MW 5 location. It is grey in colour, it is weathered. It extends to the termination depth of investigation of 6.2 mbgs. The permeability of the underlying upper shale unit is anticipated to vary depending on the extent of fracturing, and presence of bedding planes.

6.0 GROUNDWATER STUDY

6.1 Review Summary of Concurrent Report

A review of the findings from the concurrent geotechnical soil investigation report (SEL Reference No. 2301-S042) has disclosed that beneath the topsoil horizon, and a layer of earth fill or weathered subsoil, the subject site is underlain by native strata of silt, silty sand, sandy silt, silty sand till, sandy silt till and silty clay till. Weathered shale was observed in one of the boreholes at deeper elevation.

6.2 Review of Ontario Water Well Records

The Ministry of the Environment, Conservation and Parks (MECP) water well records for the subject site and for the properties within a 500 m radius of the boundaries of the subject site (study area) were reviewed.

The records indicate that seventy-four (74) well records are located within the study area relative to the subject site. The locations of these well records, based on the UTM coordinates provided by the records, are shown on Drawing No. 3. Details for the MECP water well records that were reviewed are provided in Appendix 'A'.

A review of the final status of the well records within the study area reveals that thirty-four (34) are registered as water supply wells, twenty-four (24) are abandoned – other wells, seven (7) are observation wells, five (5) wells have an unidentified status, two (2) are test hole wells, one (1) is an abandoned-supply well, and one (1) dewatering well.

A review of the first usage of the well records reveals that thirty-one (31) are domestic wells, twenty-three (23) wells have an unidentified status, five (5) are monitoring wells, five (5) are dewatering wells, three (3) wells are not being used, two (2) wells are used for livestock, one (1) of each is registered as a test hole well, public, municipal, industrial, and other use well, respectively.

Should there be any water supply wells discovered during the future site grading operations, we recommend that they be properly decommissioned in accordance with the Ontario Water resources Act, Regulation 903.

6.3 Groundwater Monitoring

The groundwater levels within the monitoring wells were measured, manually on three occasions over the study period, on the following dates; January 31, March 2, and on April 3, 2023, to record the fluctuation of the shallow groundwater table beneath the subject site. The groundwater levels and their corresponding elevations are given below in Table 6-1.

Table 6-1 - Groundwater Level Measurements

Well ID		January 31, 2023	March 02, 2023	April 03, 2023	Average (m)	Fluctuation (m)
BH/MW 1	mbgs	3.04	2.14	1.13	2.10	1.91
	masl	282.77	283.67	284.68	283.71	
BH/MW 2	mbgs	3.52	2.20	0.66	2.13	2.86
	masl	278.23	279.55	281.09	279.62	
BH/MW 3	mbgs	3.56	2.78	2.11	2.82	1.45
	masl	279.27	280.05	280.72	280.01	
BH/MW 4	mbgs	4.93	4.17	3.42	4.17	1.51
	masl	272.32	273.08	273.83	273.08	
BH/MW 5	mbgs	2.07	1.39	0.93	1.46	1.14
	masl	276.57	277.25	277.71	277.18	

Notes: mbgs -- metres below ground surface masl -- metres above sea level

As shown above, the groundwater levels within all of the BH/MW locations generally increased over the monitoring period. As shown above the groundwater levels at the BH/MWs range from the depths of between 0.66 to 3.56 m below ground surface. The greatest fluctuation was recorded at BH/MW 2, where a 2.86 m difference in groundwater elevation level was documented during the monitoring period.

6.4 Shallow Groundwater Flow Pattern

The shallow groundwater flow pattern beneath the subject site was interpreted, based on the highest shallow groundwater levels measured at all the BH/MWs, suggesting that it flows in an eastern direction, beneath the site, towards the low relief portions of the property. The flow pattern interpretation was completed within the proposed development footprint area. The interpreted shallow groundwater flow pattern beneath the subject site is illustrated on Drawing No. 9.

6.5 Single Well Response Test Analysis

All of the BH/MWs underwent a single well response test (SWRT) to assess the hydraulic conductivity (K) for saturated aquifer subsoils at the depths of the monitoring well screens. The results for the SWRTs are presented in Appendix 'B', with a summary of the findings shown in Table 6-2.

Table 6-2 - Summary of SWRT Results

Well ID	Ground El. (masl)	Monitoring Well Depth (mbgs)	Borehole Depth (mbgs)	Well Screen Interval (mbgs)	Screened Sub Soil Strata	Hydraulic Conductivity (K) (m/sec)
BH/MW 1	285.81	6.1	6.3	3.1-6.1	Sandy Silt Till/ Silty Sand Till	4.0×10^{-6}
BH/MW 2	281.75	6.1	6.4	3.1-6.1	Silt	1.7×10^{-6}
BH/MW 3	282.83	6.2	6.2	3.2-6.2	Sandy Silt/ Silty Clay Till	1.1×10^{-6}
BH/MW 4	277.25	6.0	6.0	3.1-6.1	Sandy Silt/ Silty Clay Till	6.0×10^{-7}
BH/MW 5	278.64	6.2	6.2	3.2-6.2	Sand and Gravel/ Silty Clay Till	3.5×10^{-6}

Notes: mbgs -- metres below ground surface masl -- metres above sea level

As shown above, the K estimates for the silt, silty sand till, silty clay unit ranges from 6.0×10^{-7} to 4.0×10^{-6} m/sec. The results of the SWRT's provide an indication of the yield capacity for the groundwater-bearing subsoil strata at the depths of the monitoring well screens. The above results suggest that the hydraulic conductivity (K) for the groundwater-bearing subsoils at the depths for the monitoring well screens ranges from low to moderate, with correspondingly low to moderate anticipated groundwater seepage rates being anticipated into open excavations, below the groundwater table.

6.6 Follow Up Test Pit Investigation

On May 30, 2023, a Soil Engineers Ltd. representative performed a site visit to witness a test pit investigation program. Test pit excavations were completed for the subject, at the locations, shown on Drawing No. 2. For the test pit investigation, a backhoe sub-contractor excavated to the target depths, at the indicated test pit locations that were provided in advance by Candevcon Limited. Detailed findings of the test pit investigation are provided in Appendix 'D'.

Based on the test pit observations, no groundwater seepage was observed in one (1) of the test pits, while minimal seepage was observed within three (3) open test pits excavations, with only low to moderate groundwater seepage being observed within one (1) of the open test pit excavations, along with only minimal accumulation of groundwater within the open test pits after about the test pits remained open for about ±4 to 6 hours. This indicates that there is likely to be only limited, low to minor, un-stained groundwater seepage within open excavations at the anticipated depths for the proposed underground services and proposed housing basement structures, with only minimal, occasional groundwater control being anticipated, if that. Any groundwater control can likely be accomplished with occasional pumping from sump pits if required with no approval for any temporary groundwater taking being anticipated in advance of construction.

7.0 GROUNDWATER CONTROL DURING CONSTRUCTION

The estimated hydraulic conductivity (K) for the sandy silt till, silty clay and silty clay till units suggest that groundwater seepage rates into open excavations below the groundwater table will range from moderate to low. To provide safe, dry and stable conditions for earthworks excavations for construction of the proposed underground housing foundation structures and associated underground services, the groundwater table should be lowered in advance of, or, during construction. Preliminary estimates for construction dewatering flows required to locally lower the shallow groundwater table, based on the SWRT, K test estimates, are discussed in the following sections.

7.1 Groundwater Construction Dewatering Flow Rates

A proposed preliminary development plan, prepared by Candevcon Limited, Project No. W22002, dated August 15, 2023 was reviewed for this preliminary dewatering needs assessment. Since the finished floor elevations (FFE) were not available for review at the time of preparation of this report, the BH/MW location elevations, and existing ground elevation contours were considered as the grade elevations and were used to prepare the dewatering needs assessment. Based on review of the plan, the proposed development will comprise 13 single detached dwelling lots, a parkette, and SWM Pond, along with associated roads and municipal services and infrastructure, meeting urban standards. It is assumed that all of the proposed residential units are anticipated to have basement structures.

7.2 Mythology

Short-Term Dewatering Calculation: The pumping rate calculation for the construction for the proposed development was performed based on the assumption with each excavation acting as trench and single well considering the dimensions of the proposed excavation boxes. The calculation was based on the equations provided by Powers et al. (2007). For the purposes of this analysis, steady state flow into an open excavation is assumed. Additionally, the equations of radial flow have the following assumptions:

- Ideal aquifer conditions (homogeneous, isotropic, uniform thickness and has infinite areal extent)
- Fully penetrating pumping well
- Only lateral flow to the pumping well

The following equations were used for open trenches and is based on unconfined aquifer conditions (Powers et. al., 2007):

Where: $$Q = \frac{\pi K (H^2 - h^2)}{\ln(R_0 / r_s)} + 2\left[\frac{xK(H^2 - h^2)}{2L}\right]$$ $$Q = \frac{\pi K (H^2 - h^2)}{\ln(R_0/r_s)}$$

- Q = Anticipated pumping Rate (m3/day)
- K = Hydraulic Conductivity (m/day)
- H = Distance from the static water level to the bottom of the saturated aquifer (m)
- h = Depth of water in the well while pumping (m)
- R_o = Distance from a point of greatest drawdown to a point where there is zero drawdown (radius of influence) (m)
- r_s = Distance to the wellpoints from the centre of the trench, assumed to be half of the trench width (m) for Trench base calculation and Radius of Excavation for Single Well Equation.
- X = Trench Length (m)
- L = Distance from a line source to the trench, Ro (m)/2

The calculated pumping rate was multiplied by a factor of safety of 1.5 to account for uncertainties and natural variability in the range of hydraulic conductivity. Details are presented in Appendix E and following sections.

Zone of Influence for Dewatering: An estimate of the Zone of Influence (ZOI) for dewatering in unconfined aquifers can be calculated using the following equation (Bear, 1979):

$$R_0 = 2.45\sqrt{\frac{HK}{S_y}}t$$

where,

- R_o = Zone of Influence (m), beyond which there is negligible drawdown
- H = Distance from initial static water level to bottom of saturated aquifer (m)
- Sy = Specific yield of the aquifer formation
- t = Time, in seconds, required to draw the static groundwater level to the desired level (assumed to be equivalent to 14 days)
- K = Hydraulic Conductivity (m/s)

7.3 **Anticipated Storm Event**

The amount of runoff that could accumulate in the excavation box was also considered for any construction dewatering needs assessment.

Additional dewatering may be required to maintain the dry condition of the excavation during and following significant precipitation events. Therefore, the dewatering flow rates at the Subject Site should also include removing stormwater from the excavation.

A review of intensity duration frequency curve (IDF curve) for the year 2010 for the coordinates 43° 47' 45" N, 79° 56' 15" W, the rainfall depth considering 2-year storm event over a 3-hour period per day is approximately 30.80 mm, and a 100-year storm event over a 12-hour period per day is 102.0 mm. The data was taken from the Ministry of Transportation's (MTO) website. The accumulated runoff associated with rainfall events within the anticipated excavations for the proposed underground basements was calculated using the estimated rainfall depth multiplied by the estimated area of the proposed excavation footprint of the building.

7.3.1 Groundwater Construction Dewatering Rates for the Construction of Proposed Detached Dwellings with Basement Structures

Based on the provided Preliminary Grading Plan, dated August 15, 2023 and Draft Plan of Subdivision February 7, 2024, the Subject Site will be developed into 13 single-family residential units. Additionally, Stormwater Management (SWM) pond is proposed for the future development. It is also understood the proposed dwellings will be provided with services. Due to early stage of the project, dimensions of the proposed dwellings are not available for review. However, plan review indicates that the frontage of majority of lots is 18.30 m, assuming 50% of each lot will be excavated for construction of basement, an excavation box with dimensions of 15.3 x 19.5 m, with total anticipated excavated area of 298.4 m^2 and perimeter of 69.6 m were considered for the current assessment. The reviewed plans are partially presented in Appendix E and Drawing No. 2.

The summary of dewatering flow rate estimates, estimated zone of influence, and anticipated maximum drawdown are presented in Tables 7-1 and 7-2, and Appendix E (page 1).

Table 7-1 - Groundwater Seepage Flow Rate Estimates for the Proposed Houses (Lots1-5)

Parameters	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5
	Vicinity of BH/MW 1		Vicinity of BH/MW 2		
Excavation Box Dimensions (m)	~15.3 x 19.5	~15.3 x 19.5	~15.3 x 19.5	~15.3 x 19.5	~15.3 x 19.5
Excavation Area (m²)	298.4	298.4	298.4	298.4	298.4
Proposed ground Floor Elevation (masl)	286.5	285.5	284.5	283.5	282.5
Proposed Basement Floor Elevation (masl)	284.0	283.0	282.0	281.0	280.0
Assumed Base of Bulk Excavation (masl)	283.5	282.5	281.5	280.5	279.5
Highest Measured Shallow Groundwater Elevation (masl)	284.7	284.7	280.7	280.7	280.7
Estimated Zone of Influence (m)	36.2	42.3	NE	15.1	19.0
Anticipated Maximum Drawdown (m)	2.2	3.2	NE	1.2	2.2
Dewatering Flow Estimate without safety factor (L/Day)	5,900.0	10,000.0	NE	1,850.0	3,200.0
Estimated Dewatering flow rates with safety factor of 1.5 (L/day)	8,800.0	15,000.0	NE	2,800.0	4,800.0

Table 7-2 - Groundwater Seepage Flow Rate Estimates for the Proposed Houses (Lots 6-13)

Parameters	Lot 6	Lot7	Lot 8	Lot 9	Lot 10	Lot 11	Lot 12	Lot 13
	Vicinity of BH/MW 5		Vicinity of BH/MW 4				Vicinity of BH /MW 2	
Excavation Box Dimensions (m)	~15.3 x 19.5	~15.3 x 19.5	~15.3 x 19.5	~15.3 x 19.5	~15.3 x 19.5	~15.3 x 19.5	~15.3 x 19.5	~15.3 x 19.5
Excavation Area (m²)	298.4	298.4	298.4	298.4	298.4	298.4	298.4	298.4
Proposed ground Floor Elevation (masl)	281.7	280.5	280.5	280.5	281.7	282.5	283.5	284.5
Proposed Basement Floor Elevation (masl)	279.2	278.0	278.0	278.0	279.2	280.0	281.0	282.0
Assumed Base of Bulk Excavation (masl)	278.7	277.5	277.5	277.5	278.7	279.5	280.5	281.5
Highest Measured Shallow Groundwater Elevation (masl)	277.7	277.7	273.8	273.8	273.8	273.8	281.1	281.1
Estimated Zone of Influence (m)	NE	26.8	NE	NE	NE	NE	20.8	NE*
Anticipated Maximum Drawdown (m)	NE	1.2	NE	NE	NE	NE	1.6	NE
Dewatering Flow Estimate without safety factor (L/Day)	NE	2,500.0	NE	NE	NE	NE	2,600.0	NE
Estimated Dewatering flow rates with safety factor of 1.5 (L/day)	NE	3,800.0	NE	NE	NE	NE	3,900.0	NE

*Negligible seepage is expected for excavation and construction of the footings.

The runoff accumulation in excavation areas was also considered in the estimation of the dewatering flow rate, with the summary presented in Tables 8-3 and 7-4.

Table 7-3 - Dewatering Flow Rate Estimates for the Houses (Including Precipitation, Lots1-7)

Parameters	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6	Lot 7
	Vicinity of BH/MW 1		Vicinity of BH/MW 3			Vicinity of BH/MW 5	
Excavation Area (m²)	298.4	298.4	298.4	298.4	298.4	298.4	298.4
Estimated Dewatering flow rates with safety factor of 1.5 (L/day)	8,800.0	15,000.0	NE	2,800.0	4,800.0	NE	2,500.0
Anticipated Storm Flow (2- year storm event with duration of 3 hr/day) (L/day)	9,200.0	9,200.0	9,200.0	9,200.0	9,200.0	9,200.0	9,200.0
Total Anticipated Flow considering 2-year Storm Event (L/day)	18,000.0	24,200.0	9,200.0	12,000.0	14,00.0	9,200.0	11,700.0

Table 7-4 - Dewatering Flow Rate Estimates for the Houses (Including Precipitation, Lots 8-13)

Parameters	Lot 8	Lot 9	Lot 10	Lot 11	Lot 12	Lot 13
	Vicinity of BH/MW 4				Vicinity of BH/MW 2	
Excavation Area (m²)	298.4	298.4	298.4	298.4	298.4	298.4
Estimated Dewatering flow rates with safety factor of 1.5 (L/day)	NE	NE	NE	NE	3,900.0	Negligible for footing construction
Anticipated Storm Flow (2- year storm event with duration of 3 hr/day) (L/day)	9,200.0	9,200.0	9,200.0	9,200.0	9,200.0	9,200.0
Total Anticipated Flow considering 2-year Storm Event (L/day)	9,200.0	9,200.0	9,200.0	9,200.0	13,100.0	10,800.0

Anticipated storm flow considering 100-year storm event can also reach up to 30,500.0 L/day for underground basement excavation for each excavation box.

7.3.2 Groundwater Construction Dewatering Rates for the Construction of Proposed Underground Services

The proposed excavation depths were not available for review at the time of preparation of this current report. As such, the bases for proposed installation of services have been considered at depths of 4.0± m beneath the existing grade surface elevations as indicated by Candevcon Group Inc. The summary of the construction dewatering flow rates for the underground services is summarized in the Tables 7-5 and Appendix E (Page 2).

Table 7-5 - Groundwater Seepage Flow Rate Estimates for the Underground Services Installation

Parameters	Vicinity of BH/MW 1	Vicinity of BH/MW 3	Vicinity of BH/MW 5
Excavation Box Dimensions (m)	~25 x 2.0	~25 x 2.0	~25 x 2.0
Excavation Area (m²)	50.0	50.0	50.0
Existing Ground Surface Elevations (masl)	285.8	282.8	278.6
Sanitary Plug Invert El. (masl)	281.8	278.8	274.6
Highest Measured Shallow Groundwater Elevation (masl)	284.7	280.7	277.7
Estimated Zone of Influence (m)	48.7	22.8	46.5
Anticipated Maximum Drawdown (m)	3.9	2.9	4.1
Dewatering Flow Estimate without S.F. (L/Day)	14,600.0	4,400.0	14,400.0
Estimated Dewatering flow rates with S.F. 1.5 (L/day)	21,900.0	6,600.0	21,600.0

The summary of the construction dewatering flow rates for the underground service installation, including the 2-year precipitation event data, is summarized in the Tables 7-6.

Table 7-6 - Dewatering Flow Rate Estimates for the Underground Service Installation (Including Precipitation)

Parameters	Vicinity of BH/MW 1	Vicinity of BH/MW 3	Vicinity of BH/MW 5
Excavation Area (m²)	~25 x 2.0	~25 x 2.0	~25 x 2.0
Estimated Dewatering flow rates with S.F. 1.5 (L/day)	21,900	6,600.0	21,600.0
Anticipated Storm Flow (2- year storm event with duration of 3 hr/day) (L/day)	1,600.0	1,600.0	1,600.0
Total Anticipated Flow considering 2-year Storm Event (L/day)	23,500.00	8,200.0	23,200.0

Anticipated storm flow considering 100-year storm event can also reach up to 5,500.0 L/day for excavation and installation of the proposed alignment for an open excavation trench with dimensions of 25.0 x 2.0 m.

7.3.3 Groundwater Construction Dewatering Rates for the Construction of Proposed Stormwater Management Pond

Based on a review of the Preliminary Grading Plan, prepared by Candevcon Limited, Project No. W22002, dated August 15, 2023, it is understood that the proposed bottom elevation of the SWM is proposed at El. 275.25 masl. The total area for the proposed SWM pond is provided as 2,100 m^2 (0.21ha). The highest recorded groundwater level is measured at El. 273.8 masl in BH/MW 4, which is located within the vicinity of the proposed SWM pond.

The construction dewatering assessment details for the SWM pond is summarized in the Tables 7-7.

Table 7-7 - Summary of Groundwater Seepage for SWM Pond

Monitoring Well	Approximate Area	Assumed Grading Elevation (masl)	Assumed Invert Elevation (masl)	Highest Recorded Groundwater Level Elevation (masl)	Difference between Highest Groundwater Level Elevation and Invert Elevation (m)	Groundwater Seepage Rate (L/Day)
BH/MW 4	2,100 m^2	277.2	275.25	273.8	Groundwater is 1.45 m below the bulk excavation elevation	No groundwater seepage is expected.

Since the excavation and construction for the SWM Pond, will be completed above shallow groundwater level, groundwater seepage is not anticipated. However, collected water during storm event should controlled. The total dewatering flow from stormwater source is anticipated to reach 64,700.0 L/day considering 2-year storm event with a duration of 3 hours per day. The maximum anticipated flow considering 100-year with a duration of 12 hours per day reaches up to 214,200.0 L/day.

7.4 Long-Term Foundation Drainage

Groundwater seepage and infiltration flow due to storm event should be collected for the post-construction 1-level basements. As such, a foundation drainage system should be designed to collect the anticipated flow for each basement. The proposed drainage layer elevation for the long-term foundation drainage calculation was considered ranging from El. 283.5 masl to 277.5 masl for the proposed 1-Level basements (assuming 0.5 below the proposed basement floor elevation).

Additionally, anticipated flow considering 30.8 mm during storm event (2-year events for a duration of 3 hours) was considered to estimate the anticipated flow through infiltration. Summary of the estimated flow rates is presented in Table 7-8, with the details are presented in Appendix E (page 3).

Table 7-8 - Summary of Anticipated Long-Term Foundation Drainage Flow Rates

Proposed Development	Groundwater Seepage (L/day)	Groundwater Seepage -S.F.* 1.5 (L/day)	Anticipated Flow through Infiltration (L/day)	Total Foundation Drainage Flow Rates-S.F. 1.5 (L/day)
Lot 1	3,100.0	4,600.0	1,072.0	5,672.0
Lot 2	6,600.0	9,800.0	1,072.0	10,872.0
Lot 3	NE	NE	1,072.0	1,072.0
Lot 4	700.0	1,100.0	1,072.0	2,172.0
Lot 5	2,000.0	3,000.0	1,072.0	4,072.0
Lot 6	NE	NE	1,072.0	1,072.0
Lot 7	450.0	700.0	1,072.0	1,772.0
Lot 8	NE	NE	1,072.0	1,072.0
Lot 9	NE	NE	1,072.0	1,072.0
Lot 10	NE	NE	1,072.0	1,072.0
Lot 11	NE	NE	1,072.0	1,072.0
Lot 12	1,100.0	1,700.0	1,072.0	2,772.0
Lot 13	NE	NE	1,072.0	3,372.0

The above estimated flow rate does not include potential long-term flow for sump pit or any other localized structures that may extend below the drainage layer, assuming the above noted structures will be waterproofed for post-development structure.

7.5 Permit Requirements

- *Short-Term Construction Dewatering: T*he anticipated dewatering flow rate for short-term construction activities associated with the proposed houses and underground services could reach up to maximum rate of 24,200 for excavation and construction of the basements and 23,500 L/day for installation of the underground services considering 25 m length of the active trench, which are below the threshold limit specified by the MECP of 50,000 L/day. As such, filing an EASR with the MECP is not required if the proposed excavation for construction of the proposed basements and installation of underground services are completed over phases.
- *Long-Term Foundation Drainage:* The maximum anticipated continuous flow rate foundation for the estimated long-term, is calculated to be 10,872.0 L/day for the proposed post-construction basements. As such, filing PTTW with MECP is not required, given that the foundation drainage flow rate remains below the regulatory threshold.

7.6 Mitigation of Potential Impacts Associated with Dewatering

There is a record of one domestic water supply well and one abandoned supply well, located on the property. These well are identified as Well ID. Nos. 10 and 34, on MECP Well

Location Plan, Drawing No. 3 and are listed in Appendix 'A'. It is recommended that the two wells that are located within the site be decommissioned in advance of construction should it still exist. Records review indicate that a tributary of Credit River and its associated wooded areas are located, about 50 m south of the subject site.

There should be no anticipated concerns associated with potential ground settlement to any existing nearby structures, infrastructure or natural heritage features. It is recommended that a geotechnical engineer should be consulted to review potential ground settlement concerns to nearby structures prior to construction.

7.7 Groundwater Function for the Subject Site

The proposed development will consist of a residential housing development along with associated underground services and utilities and a park. Any occasional sump pumping will be temporary with no potential impacts to groundwater receptors including any nearby supply wells being used in the area.

The subject site is currently comprised of a vacant land. Surrounding land uses includes residential development, Kaufman Road, Victoria Street and McKenzie Street. Furthermore, there is a tributary of Credit River, located about 50 m south of the site, along with wooded area. As such, the local shallow groundwater flow pattern for the area may be locally impacted on temporary basis from the proposed development.

Any construction dewatering will be temporary with low anticipated dewatering flow rates, and any long-term foundation drainage rates for the completed housing basement structures is anticipated to be only occasional, low and un-sustained.

7.8 Ground Settlement

It is recommended that the potential ground settlement concerns associated with any temporary construction dewatering should be assessed by a geotechnical engineer, prior to earthworks and construction.

7.9 Groundwater Quality

One set of groundwater samples were collected for analysis from the monitoring well at BH/MW 1, on April 3, 2023 using a dedicated sampling bailer. The monitoring well was purged of three (3) well casing volumes of groundwater prior to sample collection. Upon sampling, all of the sample bottles were placed in ice and packed in a cooler at about 4° C for

shipment to the analytical laboratory. The groundwater sample was submitted for analysis for comparison evaluation of the results against the Peel Region storm and sanitary sewer use by-law standards, and the Provincial Water Quality Objectives (PWQO) standards. Sample analysis was performed by SGS Environmental Services, which is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA). Results of the analysis are provided in Appendix 'C', with a discussion of the findings provided below. The submitted samples consisted of unfiltered groundwater, with results presented as totals for various parameters analyzed. The chain of custody number for the submitted samples that underwent analysis is 029455 (SGS Group).

The results of the analysis for the unfiltered groundwater indicate one (1) exceedance when evaluated against the Peel Region Storm and Sanitary Sewer Use By-Law standards. The exceedance, together with the storm and sanitary standards criteria, is presented in Table 7-9.

Table 7-9 - Groundwater Quality Results

Parameter	BH/MW 3 – Groundwater Quality Results (Unfiltered Groundwater) (mg/L)	Peel Region Sanitary Sewer Use Limits (mg/L)	Peel Region Storm Sewer Use Limits (mg/L)
Phosphorus (total)	0.879	10	0.4

As shown above, the concentration for Phosphorous exceeded the Peel Region Storm Sewer Use By-Law standards for the sample obtained from BH/MW 1. However, it meets the limits for the Peel Region Sanitary Sewer Use By-Law standards.

The results suggest that any short-term, construction dewatering effluent, and or any long-term foundation drainage effluent should be acceptable for disposal to the Region of Peel Sanitary Sewer system, and that it should be acceptable for disposal to the Region of Peel Storm Sewer system after minimal pre-treatment has been implemented to lower Phosphorus to meet applicable storm sewer standards prior to its disposal.

The final design for any construction dewatering effluent pre-treatment system is the responsibility of contractors responsible for construction. The final design for any long-term foundation drainage systems effluent pre-treatment system will be the responsibility of the mechanical engineer responsible for the design of the long-term foundation drainage system network.

7.10 Low Impact Development (LIDs)

The shallow groundwater levels were measured at depths, ranging from 0.66 to 3.42 m below the prevailing ground surface. The existing shallow subsoil unit beneath the subject site consists of sandy silt, sandy silt till/silty sand till, silt, silty sand, and sand and gravel layers could facilitate some infiltration of precipitation revived at the developed site to the subsurface to recharge the shallow groundwater table. If the shallow soils remain unsaturated, proposed Low Impact Development (LID) infrastructure should be considered for implementation in areas where the shallow groundwater is deeper than 1.0 m below the ground surface, and where it is possible to maintain a minimum 1.0 m separation between the bases for any proposed LID stormwater management infiltration infrastructure and the high groundwater table to address future stormwater management planning and design. Any proposed LID infrastructure should be designed by the stormwater engineer for the project.

7.11 Water Supply Wells and Zone of Influence

A review of the MECP well records has verified that there are no records for water supply wells located within the conceptual ZOI of the Subject Site. However, 34 water supply wells are listed within the 500 m radius of the Subject Site. As such, a door-to-door well survey will be required in advance of, during and after construction.

8.0 CONCLUSION

1. The subject site lies within the Physiographic Region of Southern Ontario, known as the Niagara Escarpment on the spillways Plain Physiographic Feature.
2. Based on review of the surface geological map of Ontario, the subject site is located on the Halton Till Unit, native mineral soil deposits, consisting predominantly of silt to silty clay being high in matrix calcium carbonate content which is considered as being clast poor, comprised mainly of silt and clay.
3. Based on the review of the local topography map for the area, and from the review of the ground surface elevation based on the borehole and monitoring well locations the total elevation relief across the site is about 9 m.
4. The subject site is located within the Credit Valley Watershed. Records review shows that a tributary of the Credit River its associated wooded area is located about 50 m south of the subject site.
5. This study has disclosed that beneath layer of topsoil veneer, and a layer of earth fill or weathered soil, the site is underlain by native subsoil strata, comprised of silt, silty sand, sandy silt, silty sand till, sandy silt till and silty clay till, extending to the maximum depth of investigation.
6. The findings of this study confirm that the measured groundwater level elevations ranged from 272.32 to 284.68 masl, and that shallow groundwater is interpreted to flow in north -westerly directions, beneath the site towards the low relief portion of the property.
7. The single well response tests yielded estimated hydraulic conductivity (K) values that range from 6.0×10^{-7} to 4.0×10^{-6} m/sec for the sandy silt till/silty sand till, silt, sandy silt, sand and gravel, and silty clay till subsoils at the depths of the monitoring well screen intervals. These results suggest that low to moderate groundwater seepage rates can be anticipated into open excavations below the shallow groundwater table.
8. Based on the test pit investigations at the anticipated depths for the housing basement foundations structures and proposed underground services indicate that the minor groundwater seepages within test pits excavations occurred at depths of 1.6 mbgs and <5.0 mbgs or at elevations, ranging between 273.6 to 282.5 masl. Limited seepage was observed within test pit excavations, after the test pits remained opened for up to 6.0 hours.
9. The maximum anticipated construction (short-term) dewatering for construction of the proposed houses could reach 24,200.0 L/day considering a safety factor of 1.5 and storm event.
10. The Maximum anticipated construction (short-term) dewatering from groundwater source for the proposed underground services could reach 23,500.0 L/day considering a safety factor of 1.5 for active trench with a length of 25.0 m.

11. Since the excavation and construction for the SWM Pond, will be completed above shallow groundwater level, groundwater seepage is not anticipated.
12. Long-term foundation drainage flow from groundwater source considering a safety factor of 1.5 will reach 9,800.0 L/day for the proposed building. The total anticipated flow including infiltration reaches 10,872.0 L/day.
13. The estimated dewatering flow rates for each proposed single detached dwelling remains below the MECP threshold of 50,000 L/day. As such, filing EASR or apply for PTTW with MECP is not required.
14. Obtaining discharge agreement from the Town of Caledon/Region of Peel for both the short-term (pertaining to the construction period) and long-term (post construction) if the anticipated dewatering effluent is intended to be discharges into the Town of Caledon/Region of Peel sanitary or storm systems.
15. Given that only limited un-sustained groundwater seepage rates are anticipated during excavations for the proposed underground housing basement structures, and for the installation of the underground service. It is not anticipated that the groundwater seepage will be sustained within the open excavations, where occasional sump pit pumping should be adequate to remove any occasional limited groundwater seepage that may accumulate within the open excavations. Pumping rates for the anticipated occasional sump pit pumping are expected to be below the 50,000 L/day threshold limit for requiring an approval for any proposed construction related groundwater takings, which will not require any registration or filing with the MECP.
16. The shallow groundwater levels were measured at depths ranging from 0.66 to 3.42 m below the prevailing ground surface. As such, low impact development (LID) infrastructure may be considered for implementation beneath certain portions of the site. If the shallow soils remain unsaturated, proposed Low Impact Development (LID) infrastructure should be considered for implementation in areas where the shallow groundwater is deeper than 1.0 m below the ground surface, and where it is possible to maintain a minimum 1.0 m separation between the bases for any proposed LID stormwater management infiltration infrastructure and the high groundwater table to address future stormwater management planning.
17. The anticipated ZOI for construction could reach to 48.7 m away from the dewatering area. There are existing roads and residential properties within a conceptual ZOI for construction. It is recommended a professional geotechnical engineer is consulted in advance of excavation and construction.

34 water supply wells are listed within the 500 m radius of the Subject Site. As such, a door-to-door well survey will be required in advance of, during and after construction.

SOIL ENGINEERS LTD.

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Narjes Alijani, M.Sc., P.Geo.
BB/NA

9.0 REFERENCES

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2. Bedrock Geology of Ontario, 1993, Data set 6, Ministry of Northern Development

3. D.P. Rogers, R.C. Ostry and P.F. Karrow, 1961, Metropolitan Toronto Bedrock Contours, Ontario Department of Mines, Preliminary Map 102.

4. Credit Valley Conservation Authority, 2009.

5. Oakridges Moraine Groundwater Program (https://www.oakridgeswater.ca/)

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CONSULTING ENGINEERS
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TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

FIGURES 1 to 9

BOREHOLE LOGS/MONITORING WELL LOGS
GRAIN SIZE DISTRIBUTION GRAPHS,
AND
TEST PIT LOGS

REFERENCE NO. 2301-W042

LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

The abbreviations and terms commonly employed on the borehole logs and figures, and in the text of the report, are as follows:

SAMPLE TYPES

AS Auger sample
CS Chunk sample
DO Drive open (split spoon)
DS Denison type sample
FS Foil sample
RC Rock core (with size and percentage recovery)
ST Slotted tube
TO Thin-walled, open
TP Thin-walled, piston
WS Wash sample

PENETRATION RESISTANCE

Dynamic Cone Penetration Resistance:

A continuous profile showing the number of blows for each foot of penetration of a 2-inch diameter, 90° point cone driven by a 140-pound hammer falling 30 inches.

Plotted as '—●—'

Standard Penetration Resistance or 'N' Value:

The number of blows of a 140-pound hammer falling 30 inches required to advance a 2-inch O.D. drive open sampler one foot into undisturbed soil.

Plotted as '○'

WH Sampler advanced by static weight
PH Sampler advanced by hydraulic pressure
PM Sampler advanced by manual pressure
NP No penetration

SOIL DESCRIPTION

Cohesionless Soils:

'N' (blows/ft)	Relative Density
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
over 50	very dense

Cohesive Soils:

Undrained Shear Strength (ksf)	'N' (blows/ft)	Consistency
less than 0.25	0 to 2	very soft
0.25 to 0.50	2 to 4	soft
0.50 to 1.0	4 to 8	firm
1.0 to 2.0	8 to 16	stiff
2.0 to 4.0	16 to 32	very stiff
over 4.0	over 32	hard

Method of Determination of Undrained Shear Strength of Cohesive Soils:

x 0.0 Field vane test in borehole; the number denotes the sensitivity to remoulding

△ Laboratory vane test

☐ Compression test in laboratory

For a saturated cohesive soil, the undrained shear strength is taken as one half of the undrained compressive strength

METRIC CONVERSION FACTORS

1 ft = 0.3048 metres
1lb = 0.454 kg
1 inch = 25.4 mm
1ksf = 47.88 kPa

JOB NO.: 2301-W042

LOG OF BOREHOLE: BH/MW 1

FIGURE NO.: 1

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger (Solid Stem)

PROJECT LOCATION: 15544 McLaughlin Road, Town of Caledon

DRILLING DATE: Janaury 24, 2023

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
285.8	Ground Surface				
0.0 / 285.5	**30 cm Topsoil**	1	DO	4	0
0.3	Brown, loose to compact weathered **SANDY SILT** a trace of clay occ. gravel	2	DO	12	1
		3	DO	11	2
283.6 / 2.2	Brown, compact to very dense **SANDY SILT TILL / SILTY SAND TILL** a trace of clay some gravel to gravelly	4	DO	13	3
		5	DO	22	4
		6	DO	73	5
279.5		7	DO	50/15	6
6.3	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 6.1 m completed with 3 m PVC slotted screen Sand backfill from 2.4 to 6.1 m Bentonite seal from 0.0 m to 2.4 m Provided with a monument casing				7 8 9 10

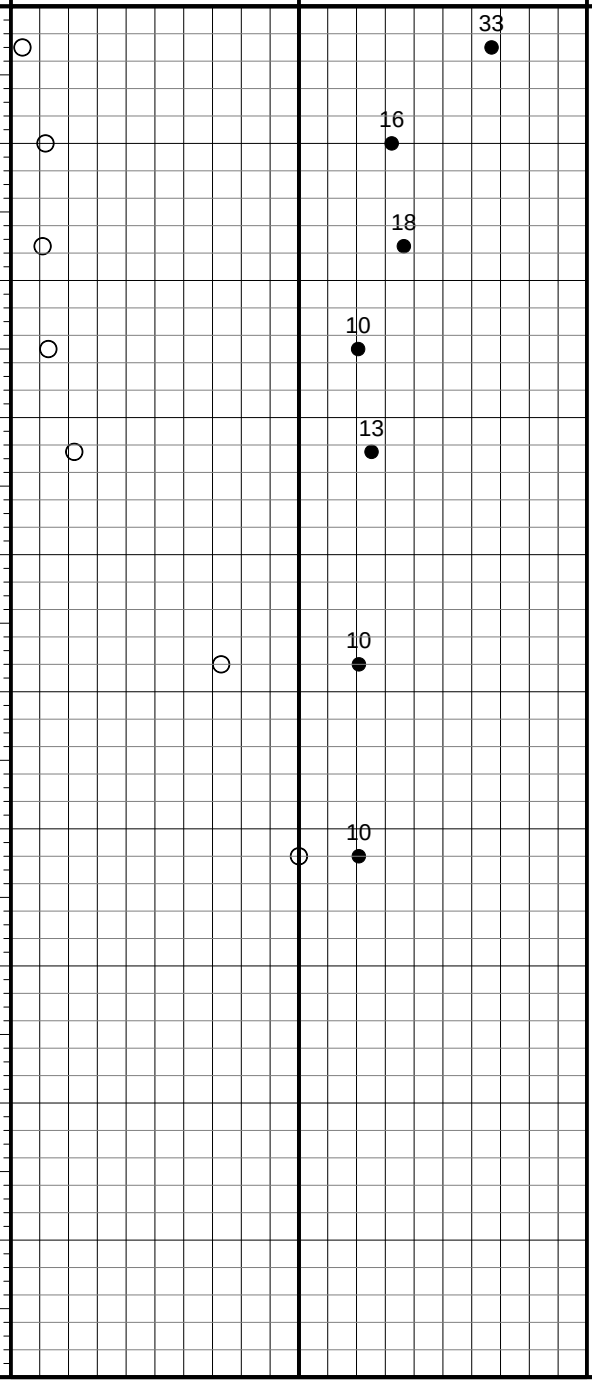
Dynamic Cone (blows/30 cm) 10 30 50 70 90

Shear Strength (kN/m²) 50 100 150 200

Penetration Resistance (blows/30 cm) 10 30 50 70 90

Atterberg Limits PL LL

Moisture Content (%) 10 20 30 40



WATER LEVEL

W.L. @ El. 282.77 m on Jan 31, 2023
W.L. @ El. 283.67 m on Mar 02,2023
W.L. @ El. 284.68 m on Apr 03, 2023

JOB NO.: 2301-W042

LOG OF BOREHOLE: BH/MW 2

FIGURE NO.: 2

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger (Solid Stem)

PROJECT LOCATION: 15544 McLaughlin Road, Town of Caledon

DRILLING DATE: Janaury 24, 2023

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
281.7	Ground Surface							
0.0 281.4	**25 cm Topsoil**	1	DO	3	0		36	
0.3	Brown, very loose to compact weathered **SANDY SILT TILL** traces of clay and gravel	2	DO	15	1		11	
280.1		3	DO	18	2		17	
1.7	Brown, compact to very dense **SILT** very moist to wet a trace to some sand	4	DO	15			22	
		5	DO	21	3		20	
		6	DO	28	4		17	
	occ. cobbles a trace of gravel	7	DO	50/15	5 6		17	
275.4 6.4	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 6.1 m completed with 3 m PVC slotted screen Sand backfill from 2.4 to 6.1 m Bentonite seal from 0.0 m to 2.4 m Provided with a monument casing				7 8 9 10			W.L. @ El. 278.23 m on Jan 31, 2023 W.L. @ El. 279.55 m on Mar 02,2023 W.L. @ El. 281.09 m on Apr 03, 2023

JOB NO.: 2301-W042

LOG OF BOREHOLE: BH/MW 3

FIGURE NO.: 3

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger (Solid Stem)

PROJECT LOCATION: 15544 McLaughlin Road, Town of Caledon

DRILLING DATE: Janaury 24, 2023

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
282.8	Ground Surface				
282.6 / 0.2	**20 cm Topsoil**	1	DO	3	0
	Dark brown **EARTH FILL** sand, some silt occ. topsoil inclusion occ. organics and rootlets	2	DO	5	1
281.3 / 1.5	Brown, compact **SILTY SAND** occ. silty clay layers	3	DO	11	2
280.5 / 2.3	Brown, compact, wet **SILT** traces of clay and gravel	4	DO	19	3
		5	DO	13	
278.8 / 4.0	Brown, compact **SANDY SILT** a trace of clay occ. gravel	6	DO	15	4 5
277.2 / 5.6	Brown, hard **SILTY CLAY TILL** occ. shale fragments	7	DO	50/3	6
276.6 / 6.2	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 6.2 m completed with 3 m PVC slotted screen Sand backfill from 2.6 to 6.2 m Bentonite seal from 0.0 m to 2.6 m Provided with a monument casing				7 8 9 10

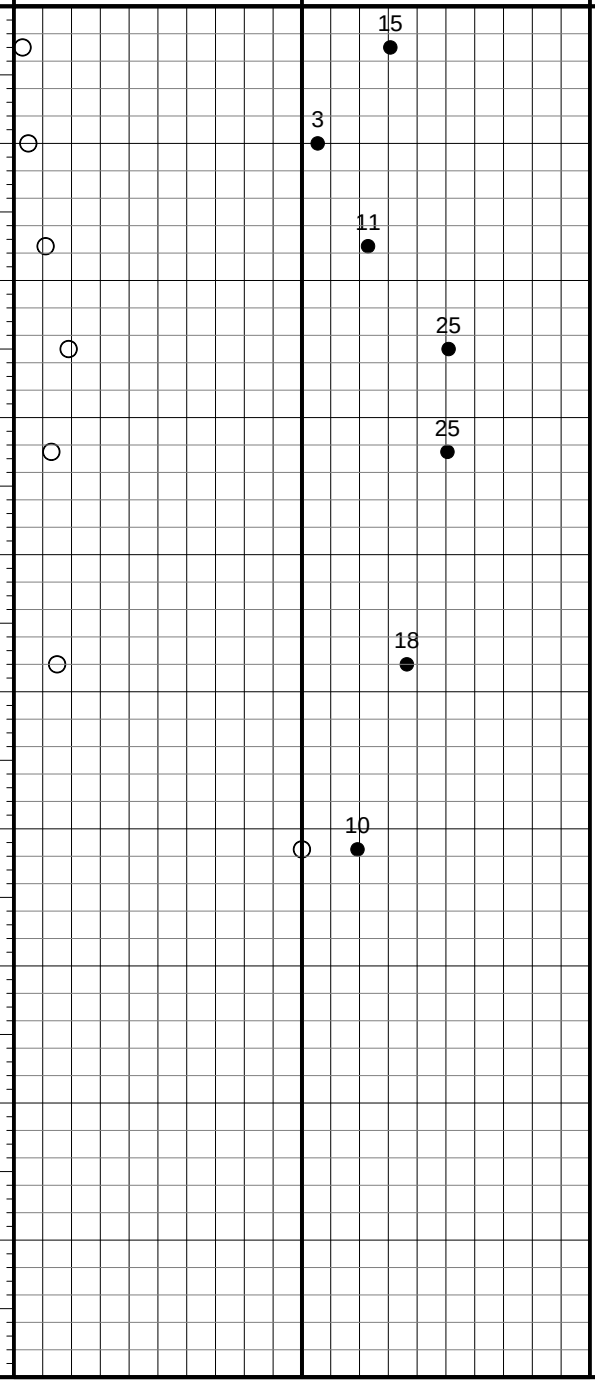
Dynamic Cone (blows/30 cm) 10 30 50 70 90

Shear Strength (kN/m²) 50 100 150 200

Penetration Resistance (blows/30 cm) 10 30 50 70 90

Atterberg Limits PL LL

Moisture Content (%) 10 20 30 40



WATER LEVEL

W.L. @ El. 279.27 m on Jan 31, 2023
W.L. @ El. 280.05 m on Mar 02,2023
W.L. @ El. 280.72 m on Apr 03, 2023

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JOB NO.: 2301-W042

LOG OF BOREHOLE: BH/MW 4

FIGURE NO.: 4

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger (Solid Stem)

PROJECT LOCATION: 15544 McLaughlin Road, Town of Caledon

DRILLING DATE: Janaury 24, 2023

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
277.2	Ground Surface			
277.1 / 0.2	**20 cm Topsoil**	1	DO	5
	Dark brown **EARTH FILL** mixture of sand, silt and clay a trace of gravel occ. topsoil inclusion occ. organics and rootlets	2	DO	6
		3	DO	3
275.1 / 2.2	Brown, dense — — — silty **SAND AND GRAVEL** a trace to some silt	4	DO	37
		5	DO	35
272.4 / 4.8	Brown, dense **SANDY SILT TILL** traces of clay and gravel	6	DO	34
270.9		7A	DO	45
270.6 / 6.6	Brown, hard **SILTY CLAY TILL**	7B		
	END OF BOREHOLE Installed 50 mm Ø monitoring well to 6.1 m completed with 3 m PVC slotted screen Sand backfill from 2.4 to 6.1 m Bentonite seal from 0.0 m to 2.4 m Provided with a monument casing			

Depth Scale (m): 0 1 2 3 4 5 6 7 8 9 10

Dynamic Cone (blows/30 cm): 10 30 50 70 90

Shear Strength (kN/m²): 50 100 150 200

Penetration Resistance (blows/30 cm): 10 30 50 70 90

Atterberg Limits: PL — LL

Moisture Content (%): 10 20 30 40

Moisture Content (%): 17, 18, 24, 18, 3, 18, 10, 9

WATER LEVEL

W.L. @ El. 272.32 m on Jan 31, 2023
W.L. @ El. 273.08 m on Mar 02,2023
W.L. @ El. 273.83 m on Apr 03, 2023

Soil Engineers Ltd.

JOB NO.: 2301-W042

LOG OF BOREHOLE: BH/MW 5

FIGURE NO.: 5

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger (Solid Stem)

PROJECT LOCATION: 15544 McLaughlin Road, Town of Caledon

DRILLING DATE: Janaury 24, 2023

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
278.6	Ground Surface				
278.4 / 0.2	**15 cm Topsoil**	1	DO	5	0
	Dark brown **EARTH FILL** sand, some silt to silty occ. topsoil inclusion occ. organics and rootlets	2	DO	6	1
277.1 / 1.5	Brown, compact **SILTY SAND** a trace of clay	3	DO	16	2
276.3 / 2.3	Brown, dense **SAND AND GRAVEL** a trace to some silt	4	DO	42	3
		5	DO	46	
274.6 / 4.0	Brown, hard **SILTY CLAY TILL** a trace of gravel	6	DO	47	4 5
272.9 / 5.7	Grey, weathered **SHALE** water seepage	7	DO	50/3	6
272.4 / 6.2	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 6.1 m completed with 3 m PVC slotted screen Sand backfill from 2.4 to 6.1 m Bentonite seal from 0.0 m to 2.4 m Provided with a monument casing				7 8 9 10

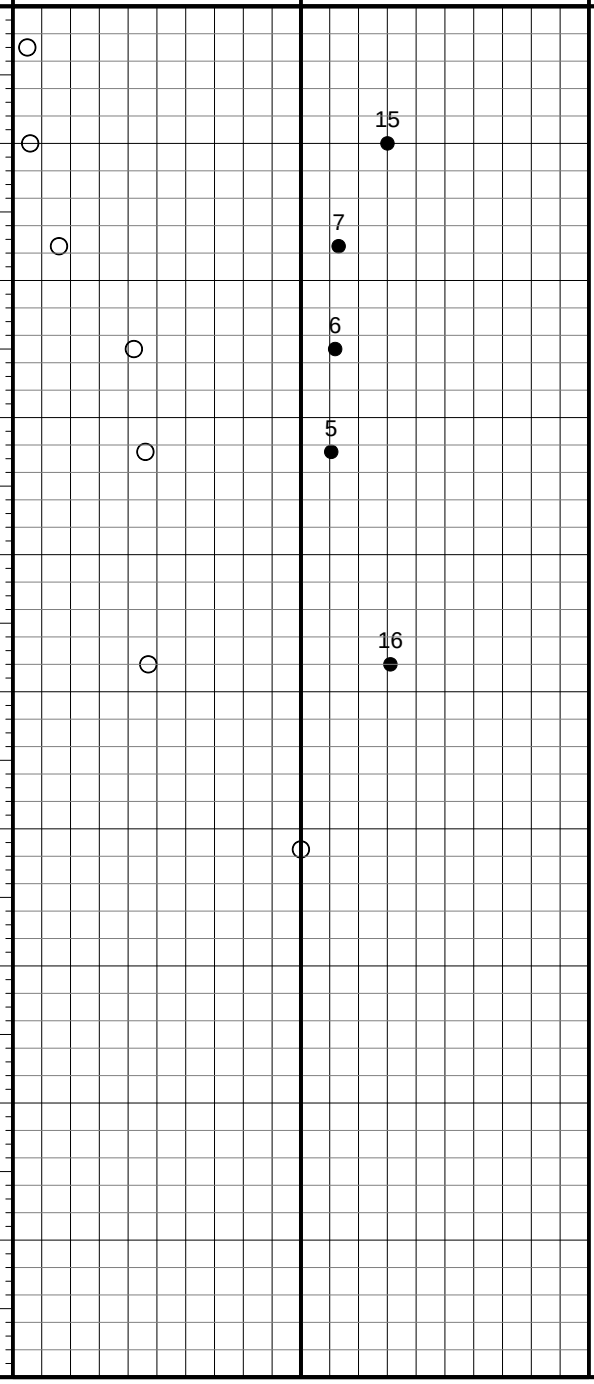
Dynamic Cone (blows/30 cm) 10 30 50 70 90

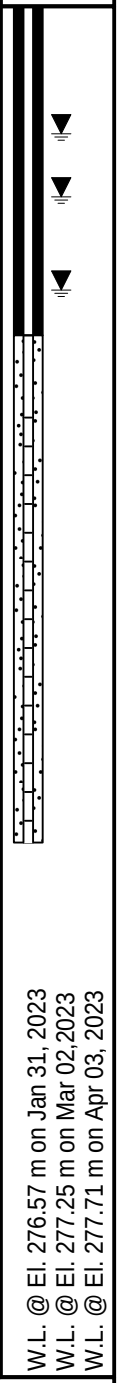
Shear Strength (kN/m²) 50 100 150 200

Penetration Resistance (blows/30 cm) 10 30 50 70 90

Atterberg Limits PL LL

Moisture Content (%) 10 20 30 40





WATER LEVEL

W.L. @ El. 276.57 m on Jan 31, 2023
W.L. @ El. 277.25 m on Mar 02,2023
W.L. @ El. 277.71 m on Apr 03, 2023

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GRAIN SIZE DISTRIBUTION

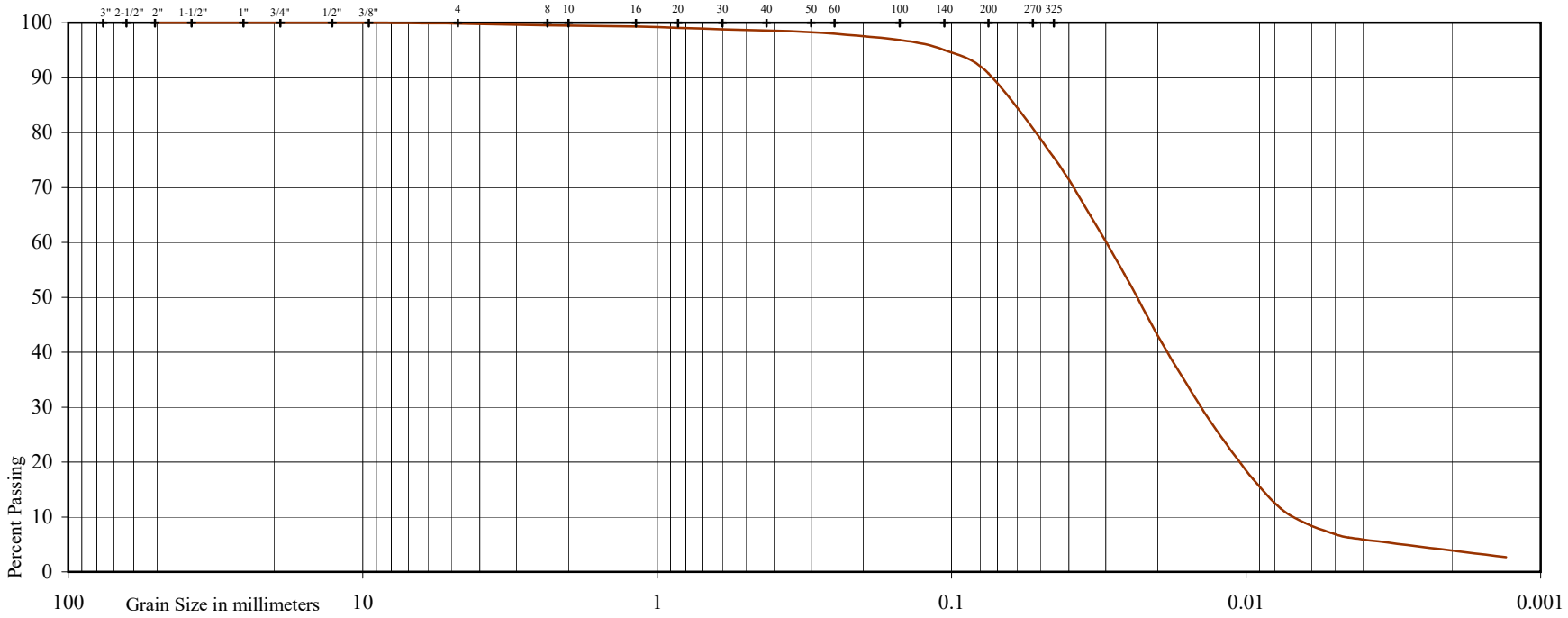
Reference No: 2301-W042

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Residential Development

Location: 15544 McLaughlin Road, Town of Caledon

Borehole No: 2

Sample No: 5

Depth (m): 3.3

Elevation (m): 278.5

Liquid Limit (%) = -

Plastic Limit (%) = -

Plasticity Index (%) = -

Moisture Content (%) = 20

Estimated Permeability (cm./sec.) = 10^{-4}

Classification of Sample [& Group Symbol]: SILT

traces of clay and sand

Figure: 6

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

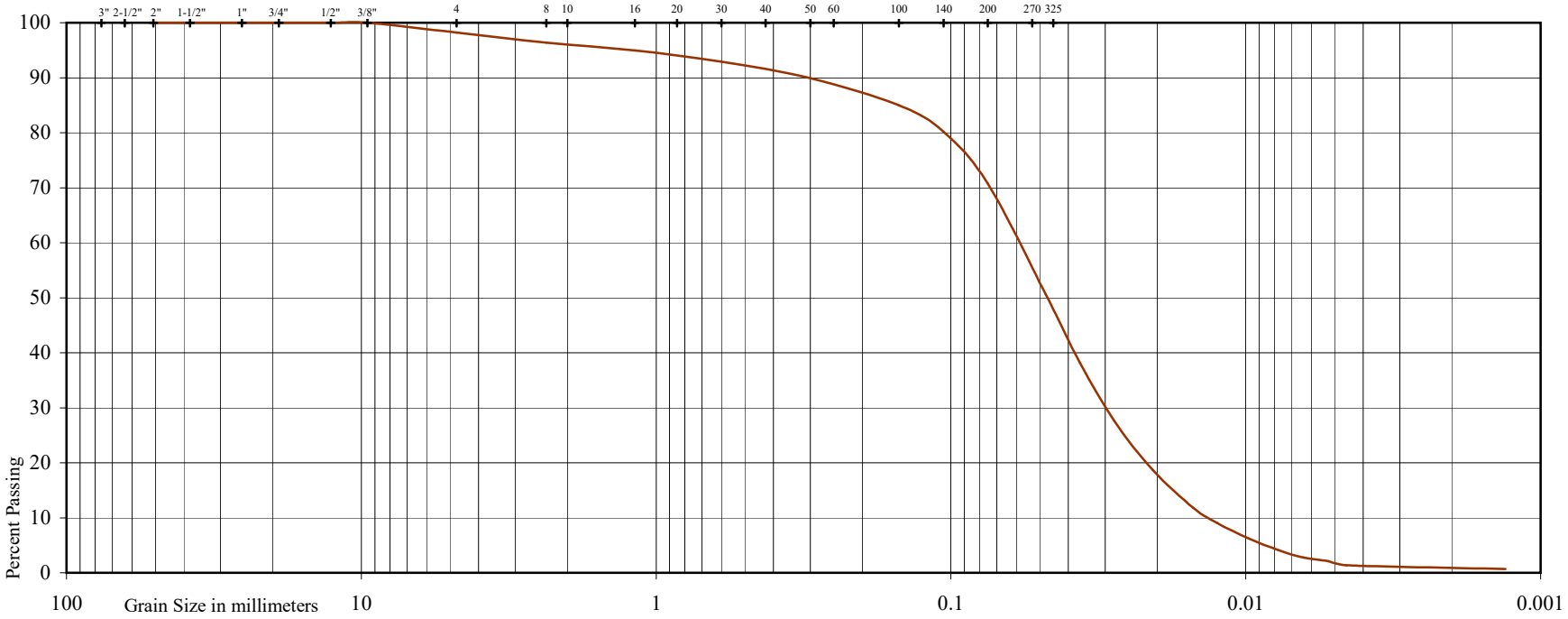
Reference No: 2301-W042

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Residential Development

Location: 15544 McLaughlin Road, Town of Caledon

Borehole No: 3

Sample No: 6

Depth (m): 4.8

Elevation (m): 278.0

Liquid Limit (%) = -

Plastic Limit (%) = -

Plasticity Index (%) = -

Moisture Content (%) = 18

Estimated Permeability (cm./sec.) = 10^{-4}

Classification of Sample [& Group Symbol]: SANDY SILT
a trace of clay and occ. gravel

Figure: 7

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

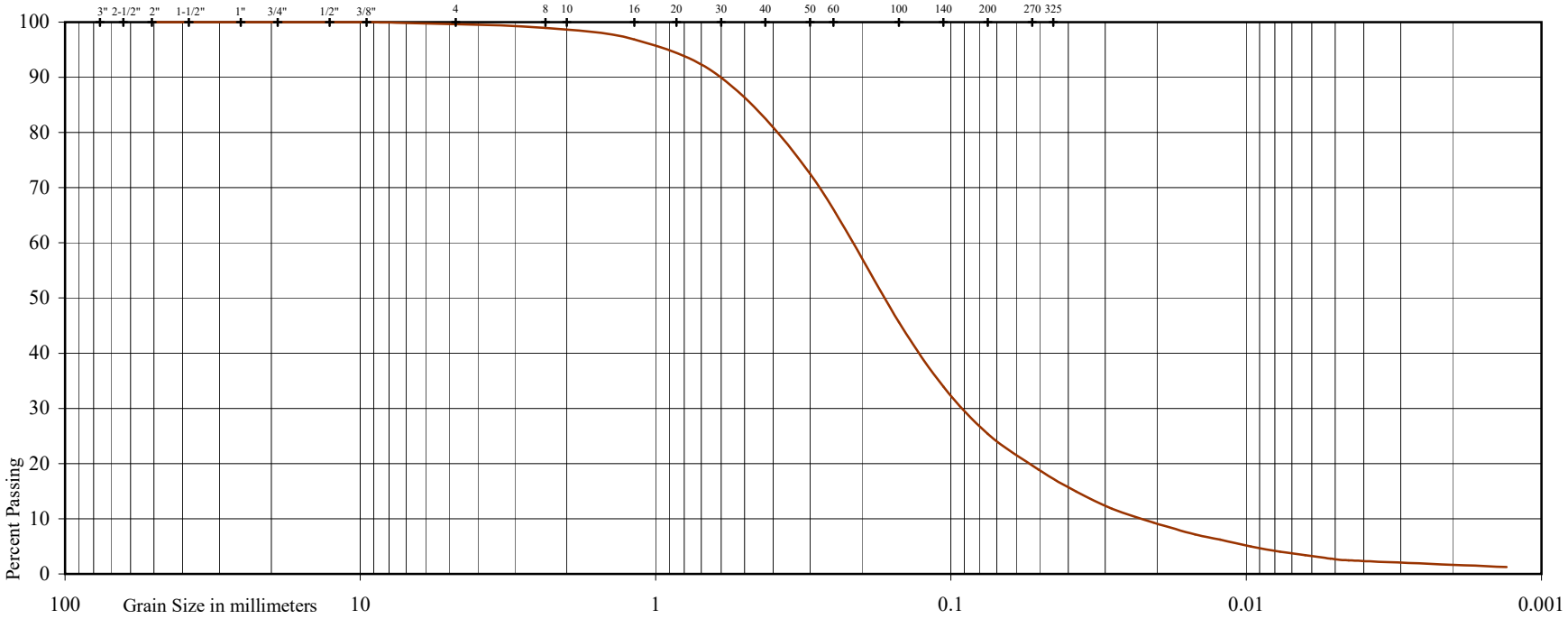
Reference No: 2301-W042

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Residential Development

Location: 15544 McLaughlin Road, Town of Caledon

Borehole No: 5

Sample No: 3

Depth (m): 1.8

Elevation (m): 276.9

Liquid Limit (%) = -

Plastic Limit (%) = -

Plasticity Index (%) = -

Moisture Content (%) = 7

Estimated Permeability (cm./sec.) = 10^{-3}

Classification of Sample [& Group Symbol]: SILTY SAND
a trace of clay

Figure: 8

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

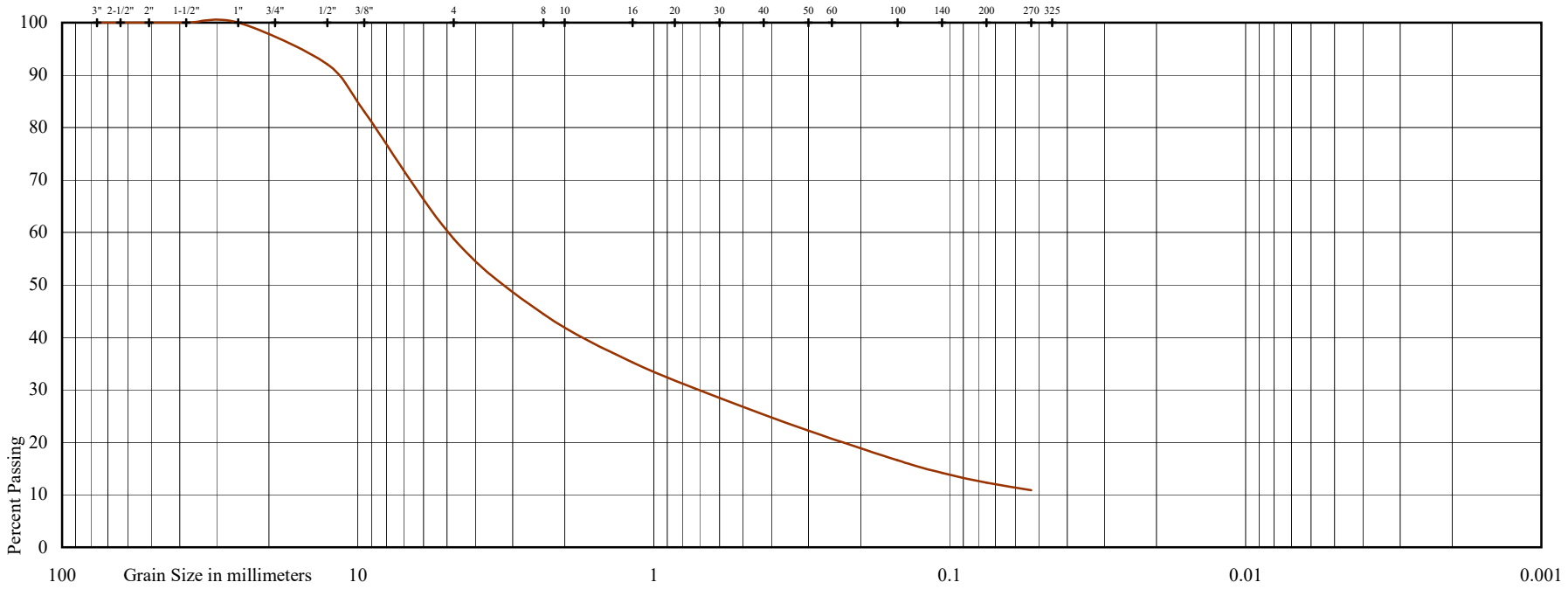
Reference No: 2301-W042

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Residential Development

Location: 15544 McLaughlin Road, Town of Caledon

Borehole No: 4

Sample No: 5

Depth (m): 3.3

Elevation (m): 274.0

Liquid Limit (%) = -

Plastic Limit (%) = -

Plasticity Index (%) = -

Moisture Content (%) = 3

Estimated Permeability (cm./sec.) = 10^{-3}

Classification of Sample [& Group Symbol]: SAND AND GRAVEL
some silt

Figure: 9

JOB NO.: 2301-W042 # LOG OF BOREHOLE: Test Pit 1 **FIGURE NO.:** 10

PROJECT DESCRIPTION: Proposed Residential Development **METHOD** Backhoe

PROJECT LOCATION: 15544 McLaughlin Road, Town of Caledon **TEST PIT DATE:** May 30, 2023

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
285.2	Ground Surface							
0.0 284.9	**30 cm Topsoil**				0			
0.3	Brown, loose to compact **SANDY SILT** a trace of clay occ. gravel				1			
283.6 1.6	Brown, compact to very dense **SANDY SILT TILL / SILTY SAND TILL** a trace of clay some gravel to gravelly				2 3 4			
280.2 5.0	**END OF TEST PIT**				5			
	DETAILED INFORMATION All the measurements are from existing grade **WATER SEEPAGE** Water seepage occured @ 2.7 mbgs Minor seepage rate **Cave-In** Cave-In occured @ 0.8 mbgs **Test Pit Monitoring** Water levels were measured at various time intervals after leaving the test pit open for 6.0 hours **Time Water Level (from bottom of test pit)** 10:00 am 1 cm 10:10 am 2 cm 10:30 am 8 cm 11:45 am 15 cm 12:15 pm 18 cm 01:15 pm 19 cm 02:30 pm 21 cm 03:30 pm 23 cm 04:00 pm 24 cm				6 7 8 9 10			water seepage elevation @ 282.50 masl cave-in occured elevation @ 284.40 masl

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JOB NO.: 2301-W042 **LOG OF BOREHOLE: Test Pit 2** ***FIGURE NO.:*** 11

PROJECT DESCRIPTION: Proposed Residential Development ***METHOD*** Backhoe

PROJECT LOCATION: 15544 McLaughlin Road, Town of Caledon ***TEST PIT DATE:*** May 30, 2023

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
281.7	Ground Surface							
0.0 281.4	**30 cm Topsoil**				0			cave-in occured elevation @ 281.4 masl
0.3	Brown, very loose to compact **SANDY SILT TILL** traces of clay and gravel				1			
280.1 1.6	Brown, compact to very dense **SILT** a trace to some sand				2 3 4			
276.7 5.0	**END OF TEST PIT**				5			

DETAILED INFORMATION

All the measurements are from existing grade

WATER SEEPAGE
No water seepage occured during the time interval

Cave-In
Cave-In occured @ 0.3 mbgs

Test Pit Monitoring
Water levels were measured at various time intervals after leaving the test pit open for 4.0 hours

Time	Water Level (from bottom of test pit)
10:45 am	dry
11:15 am	dry
12:00 pm	dry
12:45 pm	dry
01:15 pm	dry
02:15 pm	dry
02:45 pm	dry

JOB NO.: 2301-W042 # LOG OF BOREHOLE: Test Pit 3 **FIGURE NO.:** 12

PROJECT DESCRIPTION: Proposed Residential Development **METHOD** Backhoe

PROJECT LOCATION: 15544 McLaughlin Road, Town of Caledon **TEST PIT DATE:** May 30, 2023

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
283.0	Ground Surface							
0.0 282.7	**30 cm Topsoil**				0			
0.2	Dark brown **EARTH FILL** sand, some silt occ. topsoil inclusion occ. organics and rootlets				1			
281.3 1.7	Brown, compact **SILTY SAND** occ. silty clay layers				2			
280.5 2.5	Brown, compact **SILT** traces of clay and gravel				3 4			
278.8 4.2	Brown, compact **SANDY SILT** a trace of clay occ. gravel							
278.0 5.0	**END OF TEST PIT**				5			
	DETAILED INFORMATION All the measurements are from existing grade **WATER SEEPAGE** Water seepage occured @ 1.6 mbgs Minimal Seepage rate **Cave-In** No cave-in occured during the time interval **Test Pit Monitoring** Water levels were measured at various time intervals after leaving the test pit open for 6.0 hours **Time Water Level (from bottom of test pit)** 11:20 am 1 cm 11:45 am 3 cm 12:05 pm 7 cm 01:15 pm 9 cm 02:00 pm 11 cm 03:00 pm 13 cm 04:15 pm 15 cm 05:20 pm 18 cm				6 7 8 9 10			▼ water seepage elevation @ 281.40 masl

JOB NO.: 2301-W042 # LOG OF BOREHOLE: Test Pit 4 **FIGURE NO.:** 13

PROJECT DESCRIPTION: Proposed Residential Development **METHOD** Backhoe

PROJECT LOCATION: 15544 McLaughlin Road, Town of Caledon **TEST PIT DATE:** May 30, 2023

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
277.3	Ground Surface							
0.0	**20 cm Topsoil**				0			
0.2	Dark brown **EARTH FILL** mixture of sand, silt and clay a trace of gravel occ. topsoil inclusion occ. organics and rootlets				1			
275.1					2			
2.2	Brown, dense **SAND AND GRAVEL** a trace to some silt				3			▼ water seepage elevation @ 273.80 masl
272.3					4			
5.0	**END OF TEST PIT**				5			
	DETAILED INFORMATION All the measurements are from existing grade **WATER SEEPAGE** Water seepage occured @ 3.5 mbgs Medium to Fast seepage rate **Cave-In** No cave-In occured during the time interval **Test Pit Monitoring** Water levels were measured at various time intervals after leaving the test pit open for 4.0 hours				6			
					7			
					8			
					9			
					10			

Time **Water Level (from bottom of test pit)**

12:00 pm	50 cm
12:20 pm	70 cm
01:15 pm	85 cm
02:00 pm	95 cm
03:10 pm	110 cm
04:00 pm	120 cm

JOB NO.: 2301-W042 # LOG OF BOREHOLE: Test Pit 5 **FIGURE NO.:** 14

PROJECT DESCRIPTION: Proposed Residential Development **METHOD** Backhoe

PROJECT LOCATION: 15544 McLaughlin Road, Town of Caledon **TEST PIT DATE:** May 30, 2023

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
278.4	Ground Surface							
0.0	**20 cm Topsoil**				0			
0.2	Dark brown **EARTH FILL** sand, some silt to silty occ. topsoil inclusion occ. organics and rootlets							
277.1					1			
1.3	Brown, compact **SILTY SAND** a trace of clay							
276.3					2			
2.1	Brown, dense **SAND AND GRAVEL** a trace to some silt							
274.6					3			
3.8	Brown, hard **SILTY CLAY TILL** a trace of gravel				4			
273.4					5			▼ water seepage elevation @ 273.65 masl
5.0	**END OF TEST PIT**							
					6			
					7			
					8			
					9			
					10			

DETAILED INFORMATION

All the measurements are from existing grade

WATER SEEPAGE
Water seepage occured @ 4.75 mbgs

Minor seepage rate

Cave-In
No cave-In occured during the time interval

Test Pit Monitoring
Water levels were measured at various time intervals after leaving the test pit open for 4.0 hours

Time	Water Level (from bottom of test pit)
12:30 pm	3 cm
01:30 pm	9 cm
02:15 pm	12 cm
03:30 pm	14 cm
04:30 pm	16 cm

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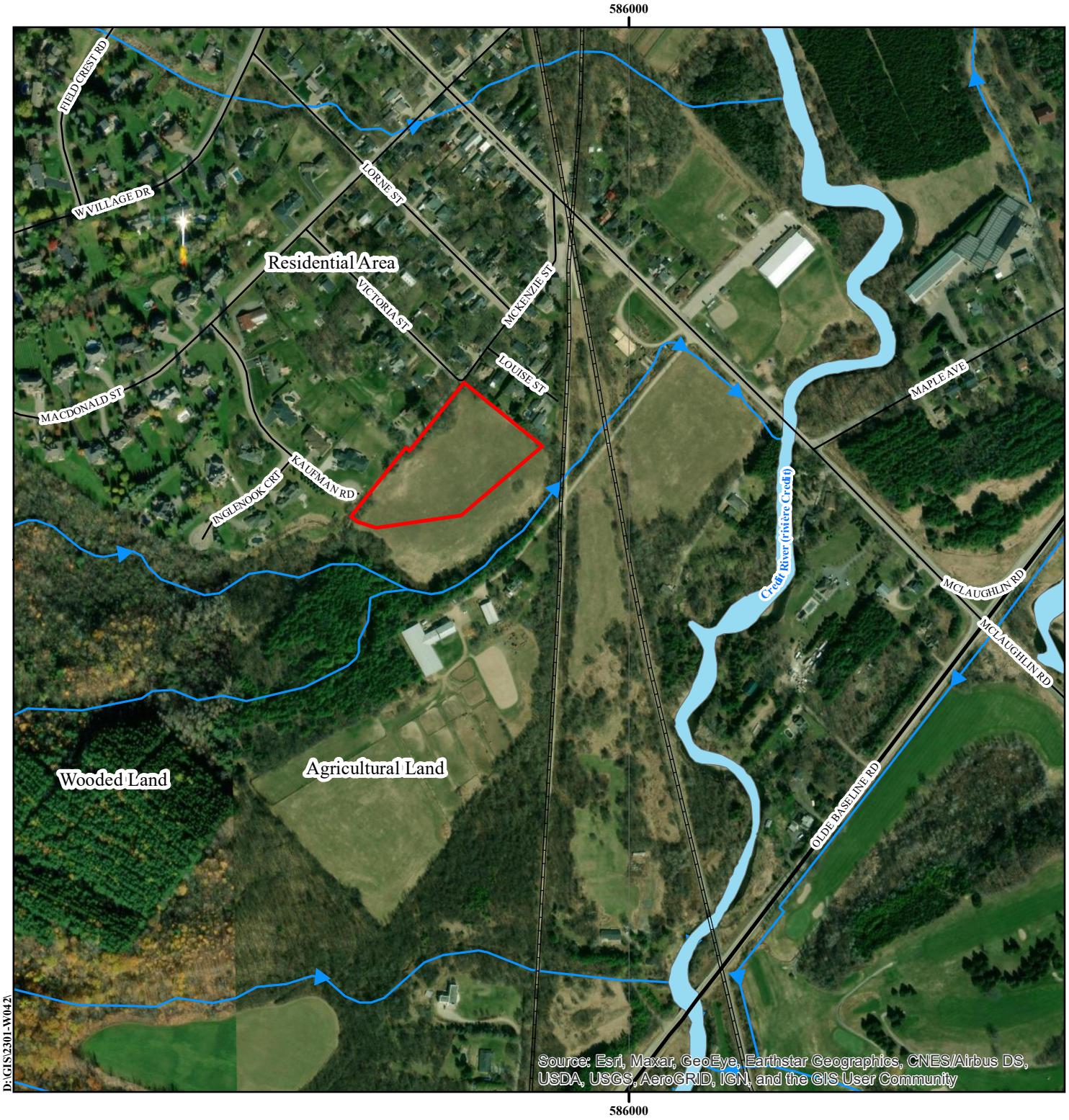
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

DRAWINGS 1 to 9

REFERENCE NO. 2301-W042



N

Legend

- Approximate Boundary of Subject Site
- Waterbody
- Watercourse
- Road
- Railway

Soil Engineers Ltd.

Title: Site Location Plan

Project:

Hydrogeological Assessment
Proposed Residential Development
Address: 15544 McLaughlin Road
Town of Caledon

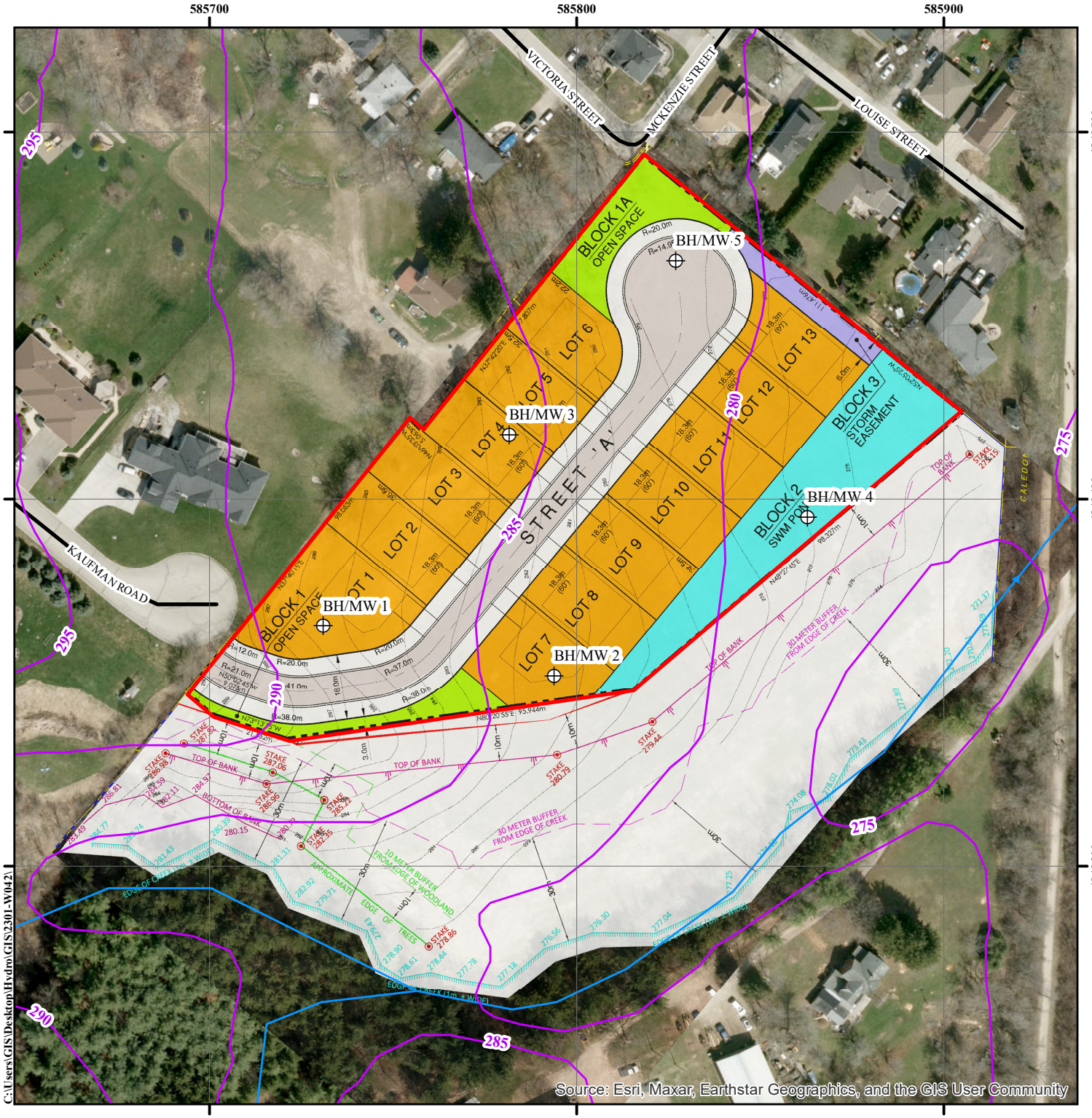
Reference No. 2301-W042

Date: January 20, 2023

Scale:

0 25 50 100 150 200 250
Metres

Drawing No. 1



N

Legend

- Approximate Boundary of Subject Site
- Borehole with Monitoring Well
- Watercourse
- Road

Soil Engineers Ltd.

Title: Borehole and Monitoring Well Location Plan

Project:

Hydrogeological Assessment
Proposed Residential Development
Address: 15544 McLaughlin Road
Town of Caledon

Reference No. 2301-W042

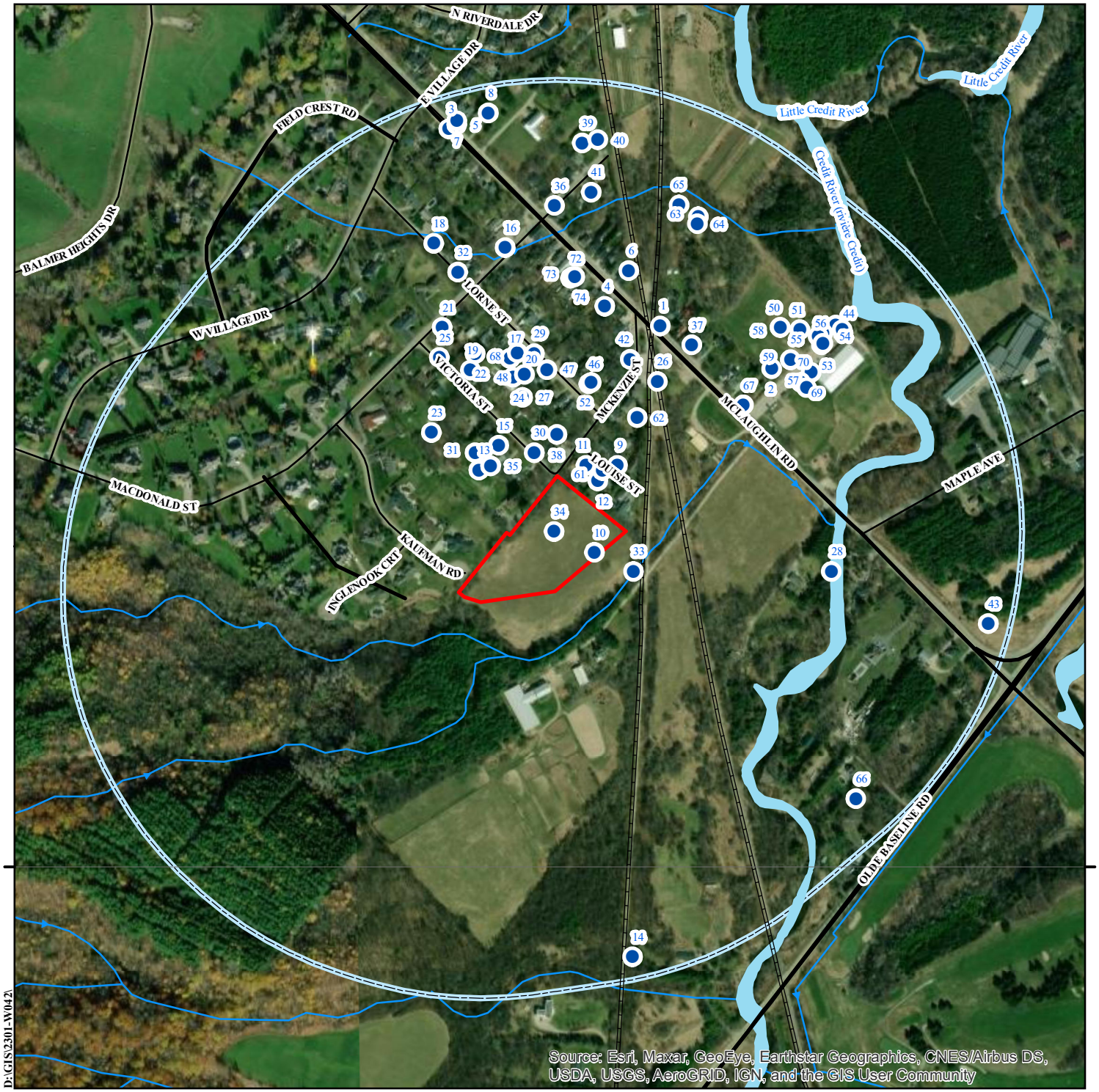
Date: March 14, 2024

Scale:
0 5 10 20 30 40 50
Metres

Drawing No. 2 (e)

C:\Users\GIS\Desktop\Hydro\GIS\2301-W042\

Source: Ontario Ministry of Natural Resources and Forestry



N

Legend

- Approximate Boundary of Subject Site
- 500 metres from Subject Site Boundary
- 1 Well Location from MECP Well Records (see Appendix 'A')
- Major Road
- Local Road
- Waterbody
- Watercourse

Soil Engineers Ltd.

Title: MECP Well Location Plan

Project:

Hydrogeological Assessment
Proposed Residential Development
Address: 15544 McLaughlin Road
Town of Caledon

Reference No. 2301-W042

Date: January 20, 2023

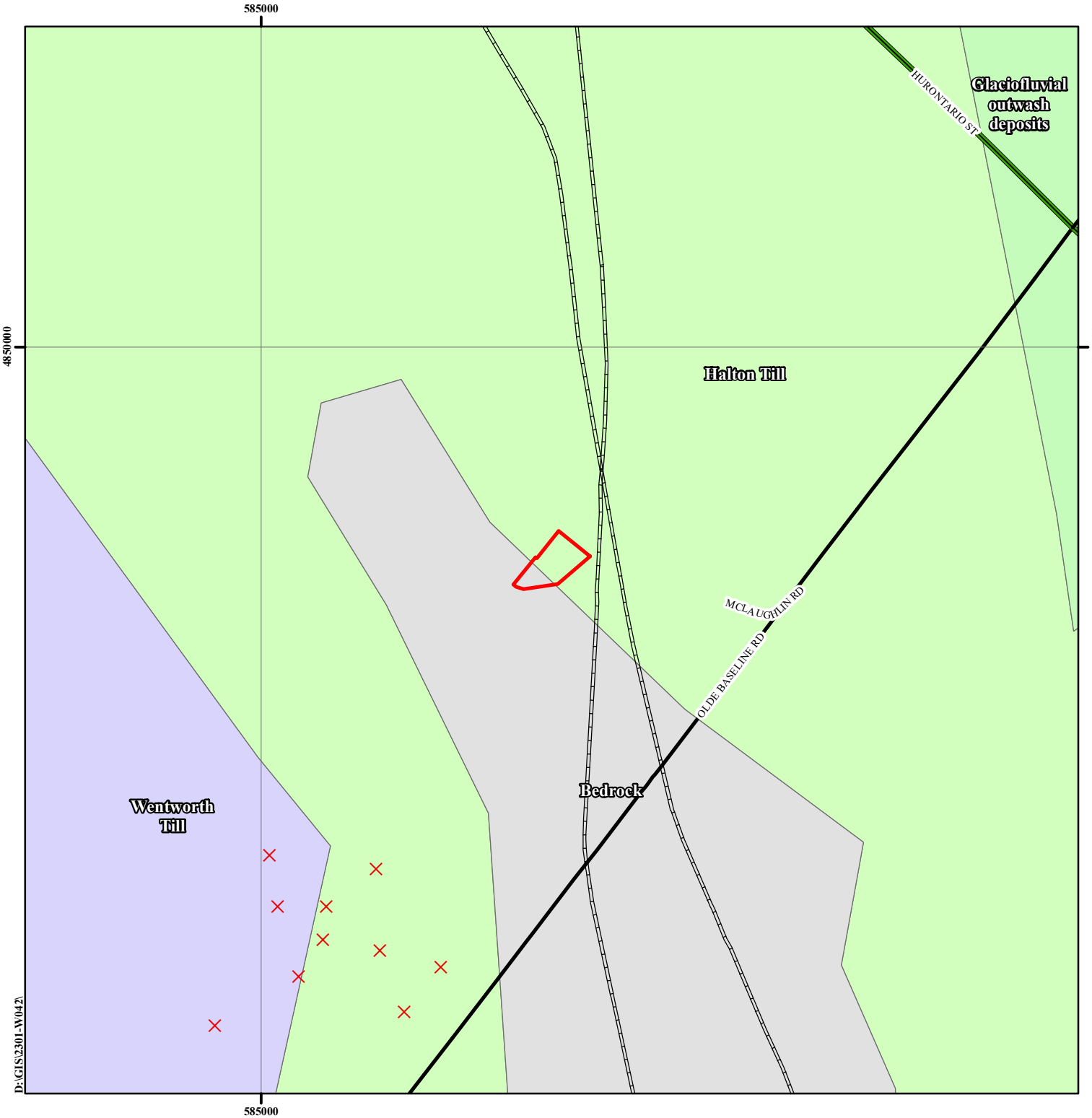
Scale:

0 30 60 120 180 240 300
Metres

Drawing No. 3

D:\GIS\2301-W042\

Source: Ontario Ministry of Natural Resources and Forestry



N

Legend

- Approximate Boundary of Subject Site
- Halton Till
  Material: predominantly silt to silty clay matrix, high in matrix carbonate content and clast poor
- Wentworth Till
  material: sandy silt to silt matrix, becoming finer grained to silty clay near Lake Erie, highly calcareous, clast content moderate to low decreasing southward
- Bedrock, undifferentiated igneous and metamorphic rock, or carbonate and clastic sedimentary rock, exposed at surface or covered by a discontinuous, thin layer of drift
- Bedrock Outcrops
- Expressway/Freeway
- Major Road
- Railway

Soil Engineers Ltd.

Title: Quarternary and Surface Geology Map

Project:

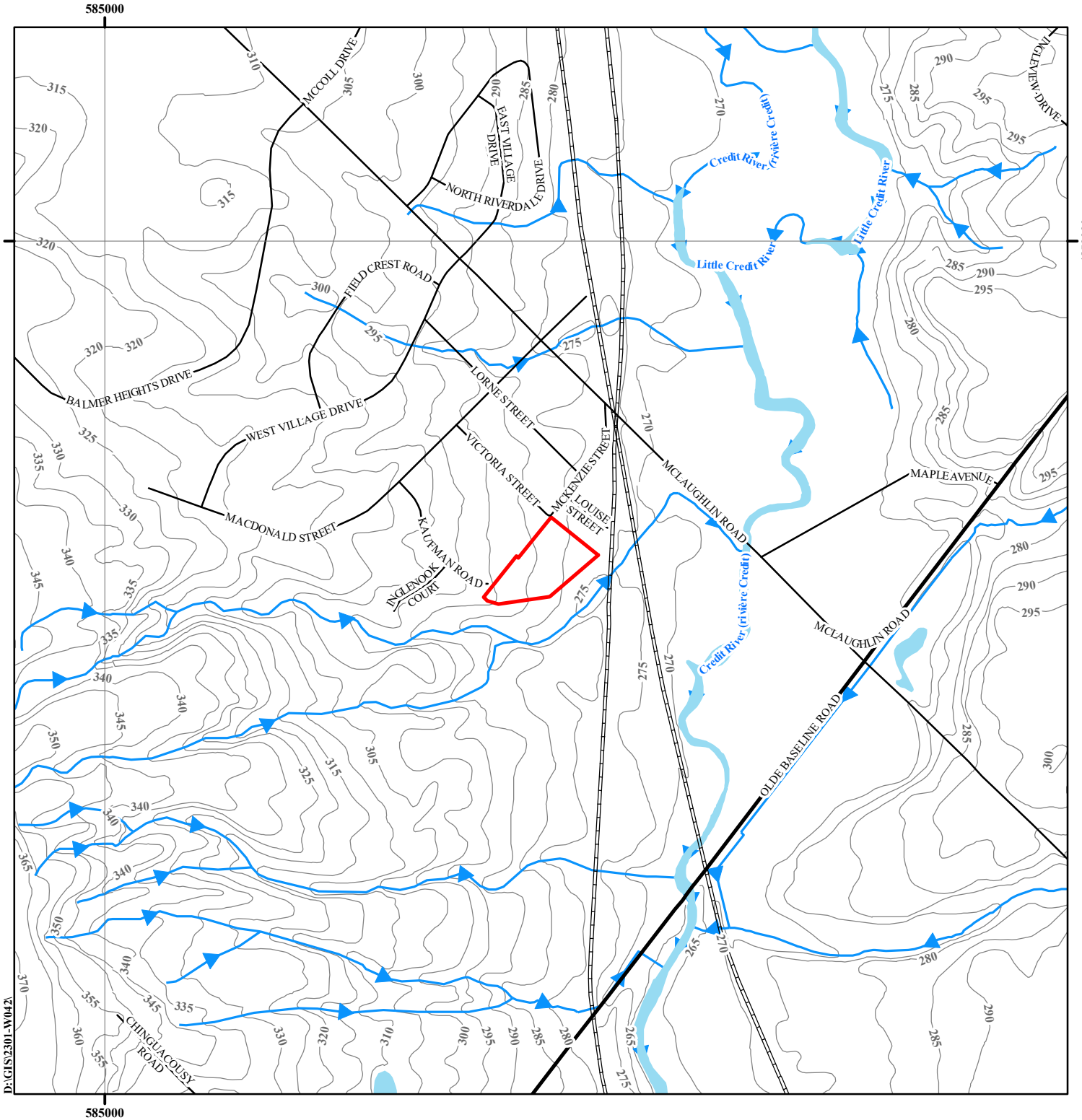
Hydrogeological Assessment
Proposed Residential Development
Address: 15544 McLaughlin Road
Town of Caledon

Reference No. 2301-W042

Date: January 20, 2023

Scale:
0 100 200 300 400 500
Metres

Drawing No. 4



N

Legend

- Approximate Boundary of Subject Site
- Waterbody
- Watercourse
- Road
- Railway
- 100 — Topographic Contour (masl)

Soil Engineers Ltd.

Title: Topographic Map

Project:

Hydrogeological Assessment
Proposed Residential Development
Address: 15544 McLaughlin Road
Town of Caledon

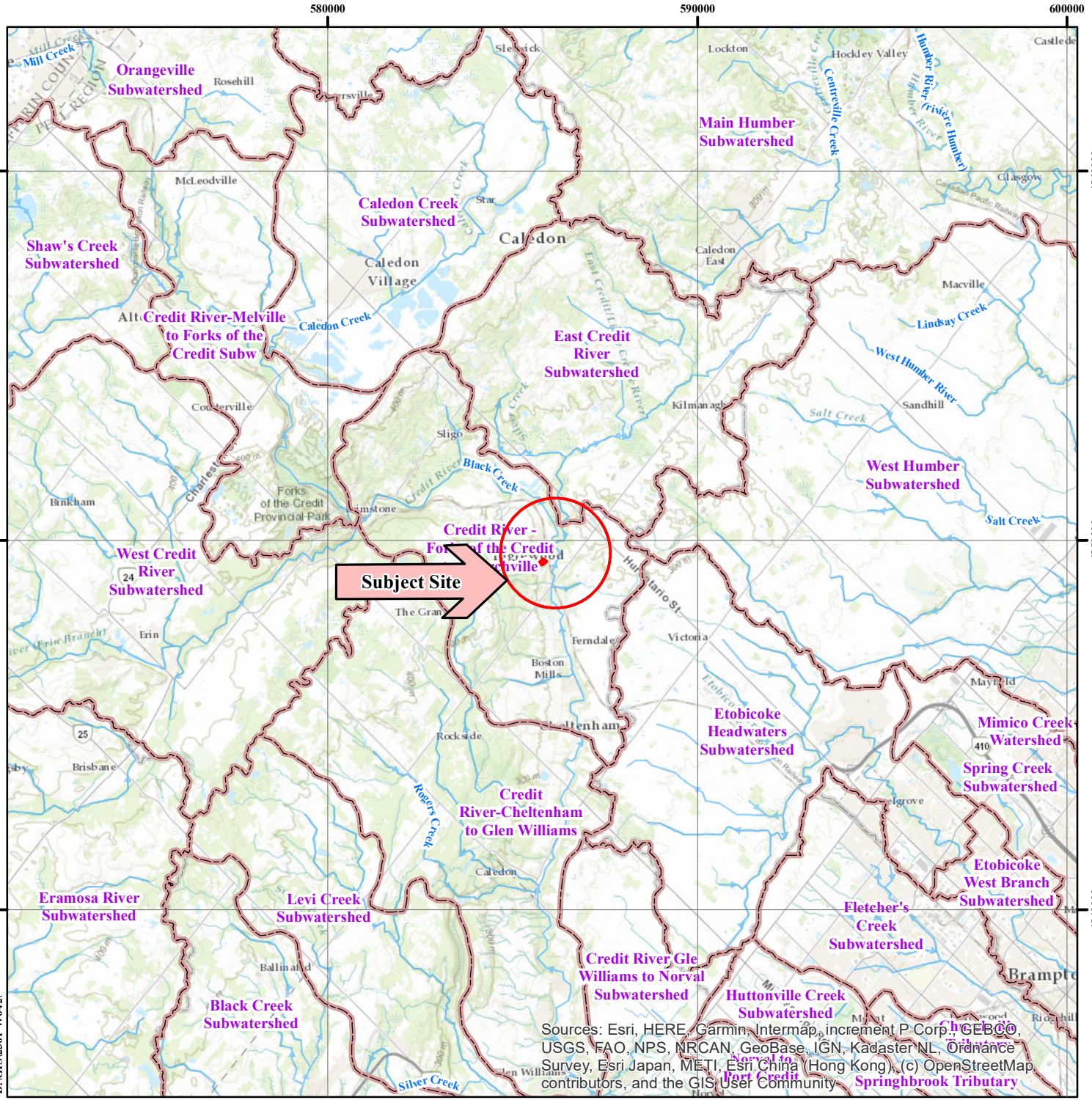
Reference No. 2301-W042

Date: January 20, 2023

Scale:

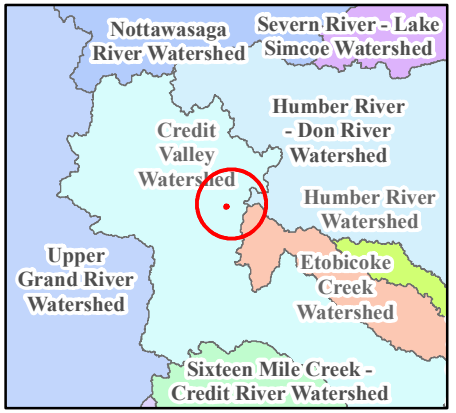
0 50 100 200 300 400 500
Metres

Drawing No. 5



N

Watershed:



Legend

- Approximate Boundary of Subject Site
- Watershed Boundaries
- Waterbody
- Watercourse
- Expressway/Major Road

Soil Engineers Ltd.

Title: Watershed and Subwatershed Map

Project:

Hydrogeological Assessment
Proposed Residential Development
Address: 15544 McLaughlin Road
Town of Caledon

Reference No. 2301-W042

Date: January 20, 2023

Scale:

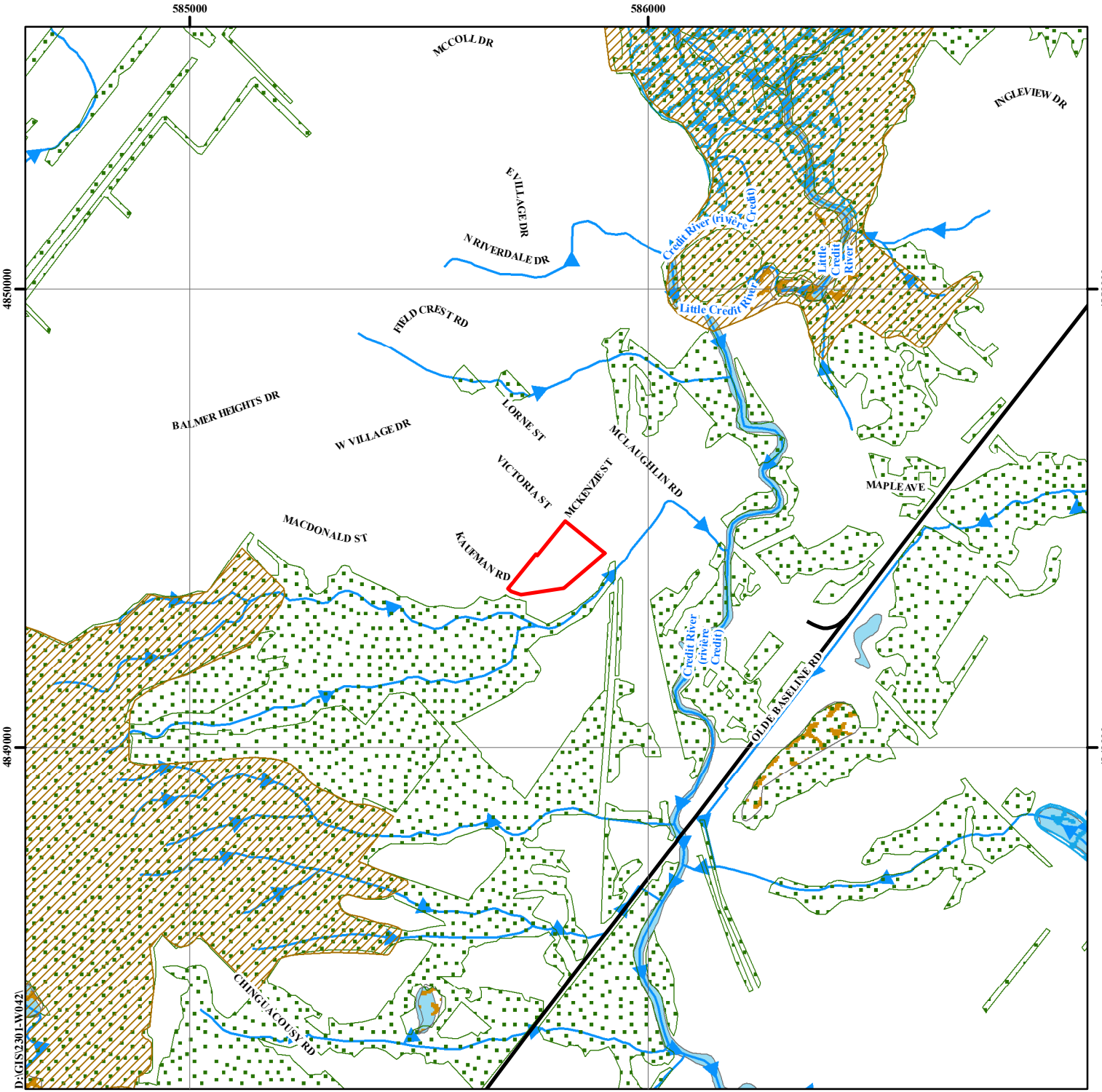
0 1,600 3,200 4,800 6,400 8,000

Metres

Drawing No. 6

D:\GIS\2301-W042\

This mapping was produced by SEL and should be used for information purposes only.
Data sources used in its production are of varying quality and accuracy and all boundaries should be considered approximate.



N

Legend

- Approximate Boundary of Subject Site
- Area of Natural and Scientific Interest (ANSI)
- Wetland (classified as Provincial)
- Wetland (Not evaluated per OWES)
- Wooded Area
- Waterbody
- Watercourse
- Major Road

Soil Engineers Ltd.

Title: Natural Features and Protection Area Plan

Project:

Hydrogeological Assessment
Proposed Residential Development
Address: 15544 McLaughlin Road
Town of Caledon

Reference No. 2301-W042

Date: January 20, 2023

Scale:

0 80 160 240 320 400

Metres

Drawing No. 7

Source: Ontario Ministry of Natural Resources and Forestry

OWES: Ontario Wetland Evaluation System

N

Legend

- Approximate Boundary of Subject Site
- Borehole with Monitoring Well
- Watercourse
- A A' Cross-Section Direction
- 100 Topographic Contour (masl)

Soil Engineers Ltd.

Title: Cross-Section Key Plan

Project:

Hydrogeological Assessment
Proposed Residential Development
Address: 15544 McLaughlin Road
Town of Caledon

Reference No. 2301-W042

Date: January 20, 2023

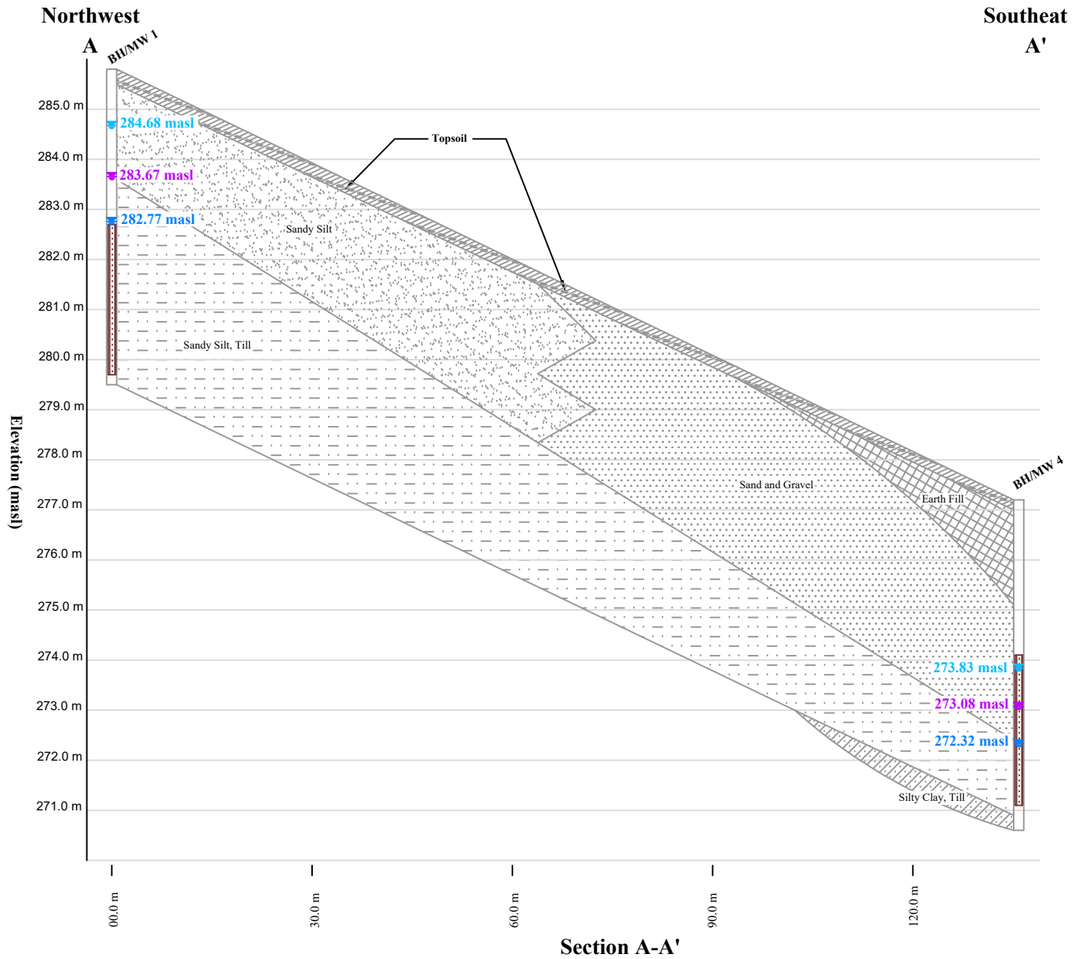
Scale:

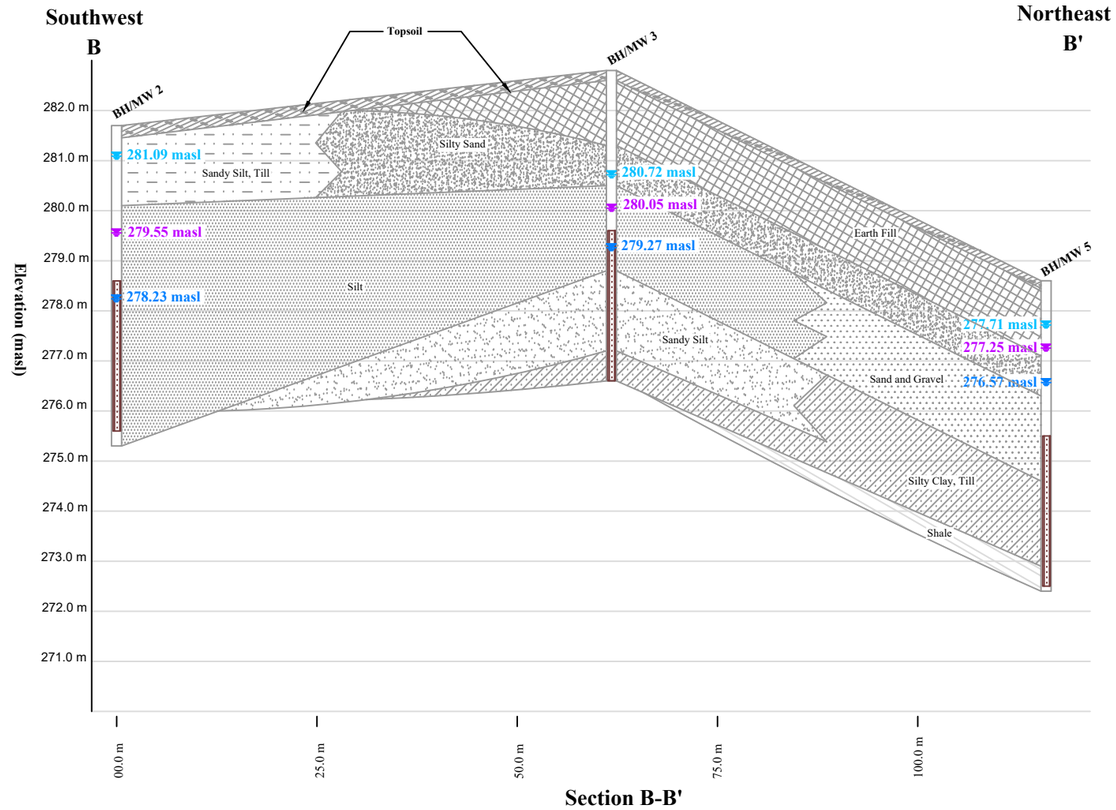
0 5 10 20 30 40 50
Metres

Drawing No. 8-1

D:\GIS\2301-W042\

Source: Ontario Ministry of Natural Resources and Forestry





Topsoil	Silty Clay	Silty Clay, Till
Earth, Fill	Silty Sand	Sandy Silt, Till
Silt	Sand and Gravel	Shale

3.0 m Screen

Water Table on March 16, 2023
Water Table on April 17, 2023
Water Table on May 18, 2023

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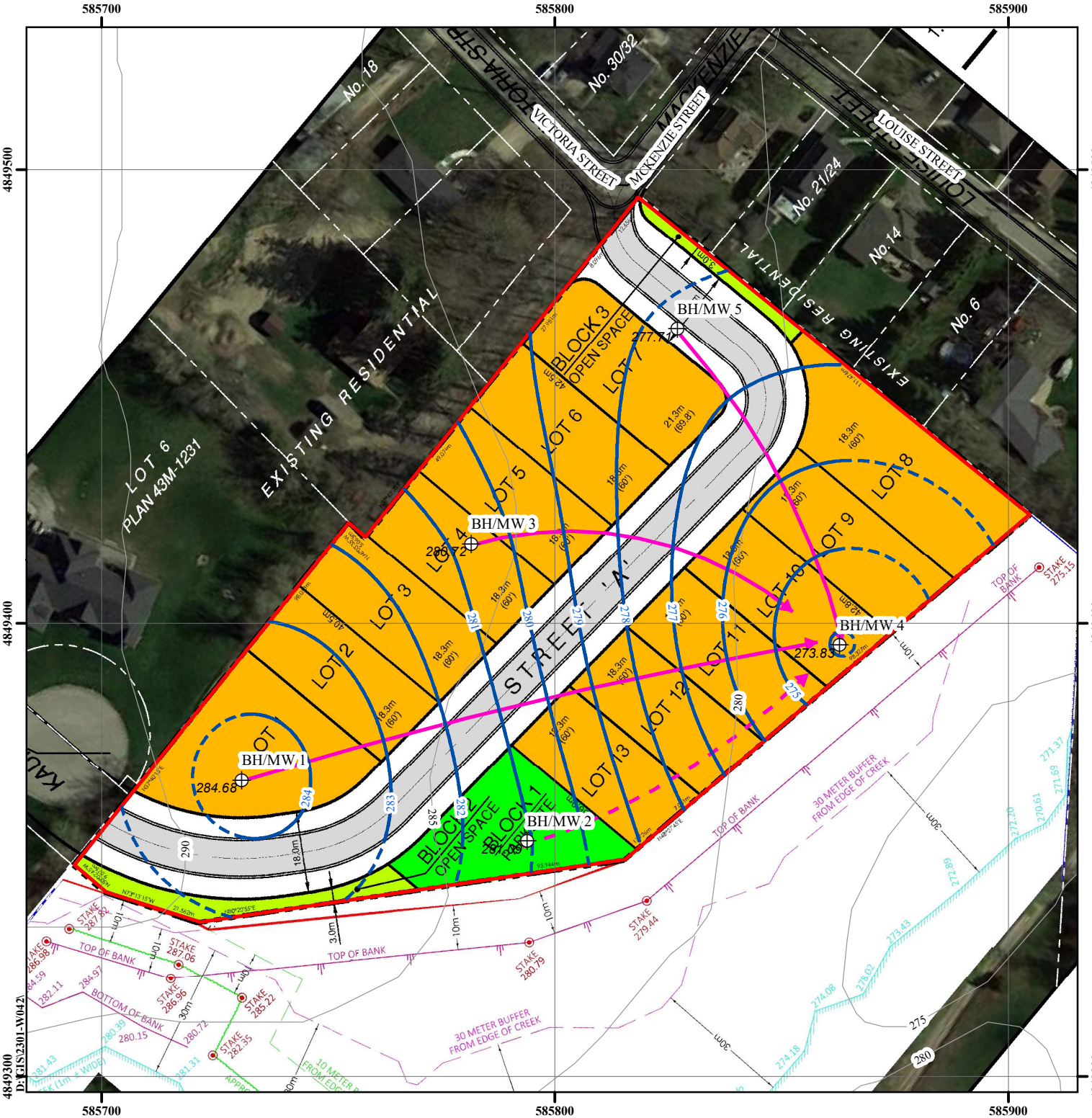
Title: Geological Cross-Section (A-A' and B-B')

Project: Hydrogeological Assessment and Baseline Well Canvassing and Interference Assessment: Proposed Synagogue and Residential Development
3825 Coronation Road, Town of Whitby, Ontario

Reference No:	Date:	Scale: V	Scale: H	Drawing No.
2303-W005	June, 2023	1:100	1:2500	8-2



N

Legend

- Approximate Boundary of Subject Site
- Borehole with Monitoring Well
- Interpreted Shallow Groundwater Flow Direction
- Inferred Shallow Groundwater Flow Direction
- Interpreted Shallow Groundwater Level Elevation (masl)
- Inferred Shallow Groundwater Level Elevation (masl)
- Local Road
- (285.7) Highest Shallow Groundwater Level Elevation (masl)

Soil Engineers Ltd.

Title: Shallow Groundwater Flow Pattern Plan

Project:

Hydrogeological Assessment
Proposed Residential Development
Address: 15544 McLaughlin Road
Town of Caledon

Reference No. 2301-W042

Date: January 20, 2023

Scale:
0 5 10 20 30 40 50
Metres

Drawing No. 9

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APPENDIX 'A'

MECP WATER WELL RECORDS SUMMARY

REFERENCE NO. 2301-W042

Ontario Water Well Records

WELL ID	MECP WWR ID	Construction Method	Well Depth (m)	Well Usage		Water Found (m)	Static Water Level (m)	Top of Screen Depth (m)	Bottom of Screen Depth (m)
				Final Status	First Use				
1	4900713	Boring	3.70	Water Supply	Domestic	3.66	1.80	-	-
2	4900718	Boring	3.00	Water Supply	Industrial	1.22	0.90	-	-
3	4900719	Cable Tool	13.70	Water Supply	Domestic	11.89	3.00	-	-
4	4900720	Cable Tool	16.80	Water Supply	Public	13.72	3.40	-	-
5	4900721	Cable Tool	18.30	Water Supply	Domestic	12.19	4.30	-	-
6	4900722	Boring	6.10	Water Supply	Domestic	2.13	2.10	-	-
7	4900723	Cable Tool	18.30	Water Supply	Livestock	14.33	4.90	-	-
8	4900724	Cable Tool	59.70	Water Supply	Livestock	18.29	5.50	-	-
9	4900813	Cable Tool	18.30	Water Supply	Domestic	18.29	6.10	-	-
10	4900816	Cable Tool	20.40	Water Supply	Domestic	18.29	3.00	-	-
11	4900819	Cable Tool	17.40	Water Supply	Domestic	15.24	4.60	-	-
12	4900820	Cable Tool	18.00	Water Supply	Domestic	15.24	6.10	-	-
13	4900821	Boring	4.30	Water Supply	Domestic	3.35	2.40	-	-
14	4900822	Cable Tool	22.90	Water Supply	Domestic	12.19	9.10	-	-
15	4900823	Cable Tool	18.30	Water Supply	Domestic	18.29	6.10	-	-
16	4900824	Cable Tool	20.70	Water Supply	Domestic	16.76	4.90	-	-
17	4900825	Cable Tool	23.20	Water Supply	Domestic	23.17	8.50	-	-
18	4900826	Cable Tool	24.40	Water Supply	Domestic	24.38	9.80	-	-
19	4900827	Cable Tool	16.50	Water Supply	Domestic	13.72	7.60	-	-
20	4900828	Boring	8.80	Water Supply	Domestic	6.10	6.10	-	-
21	4900829	Cable Tool	15.20	Water Supply	Domestic	12.19	4.60	-	-
22	4900830	Cable Tool	25.90	Water Supply	Domestic	18.29	6.70	-	-
23	4900831	Cable Tool	17.70	Water Supply	Domestic	15.24	4.60	-	-
24	4900832	Cable Tool	20.40	Water Supply	Domestic	19.51	5.50	-	-
25	4900833	Boring	5.50	Water Supply	Domestic	4.27	2.10	-	-
26	4903526	Cable Tool	13.70	Water Supply	Domestic	12.19	0.60	12.50	13.72
27	4903646	Cable Tool	18.30	Water Supply	Domestic	15.24	6.70	-	-

Ontario Water Well Records

WELL ID	MECP WWR ID	Construction Method	Well Depth (m)	Well Usage		Water Found (m)	Static Water Level (m)	Top of Screen Depth (m)	Bottom of Screen Depth (m)
				Final Status	First Use				
28	4903787	Cable Tool	30.80	Water Supply	Domestic	29.26	-0.30	-	-
29	4903965	Cable Tool	17.10	Water Supply	Domestic	16.76	6.40	-	-
30	4903968	Cable Tool	15.80	Water Supply	Domestic	15.85	6.70	-	-
31	4903969	Cable Tool	15.20	Water Supply	Domestic	-	6.40	-	-
32	4904565	Cable Tool	22.90	Water Supply	Domestic	12.19	5.20	-	-
33	4906030	Cable Tool	29.60	Water Supply	Domestic	21.03	6.70	-	-
34	4906031	Rotary (Convent.)	61.60	Abandoned-Supply	Not Used	24.38	9.10	-	-
35	4906257	Rotary (Convent.)	19.80	Water Supply	Domestic	14.33	6.70	-	-
36	4908788	Not Known	-	Abandoned-Other	-	-	-	-	-
37	4908789	Not Known	-	Abandoned-Other	-	-	-	-	-
38	4908790	Not Known	-	Abandoned-Other	-	-	-	-	-
39	4908791	Not Known	-	Abandoned-Other	-	-	-	-	-
40	4908792	Not Known	-	Abandoned-Other	-	-	-	-	-
41	4908793	Not Known	-	Abandoned-Other	-	-	-	-	-
42	4908794	Not Known	-	Abandoned-Other	-	0.00	-	-	-
43	4907595	Rotary (Convent.)	35.70	Test Hole	Municipal	34.75	-	34.75	39.32
44	4907719	Rotary (Air)	14.00	Observation Wells	Not Used	-	2.40	-	-
45	4907720	Rotary (Air)	25.30	Observation Wells	Not Used	-	2.10	-	-
46	4910264	-	-	Abandoned-Other	-	-	2.20	-	-
47	4910275	-	-	-	-	-	7.10	-	-
48	4910276	-	-	Abandoned-Other	-	-	1.40	-	-
49	7112183	Rotary (Convent.)	11.60	Observation Wells	Monitoring	-	-	5.49	8.53
50	7112184	Rotary (Convent.)	11.60	Observation Wells	Monitoring	-	-	5.18	8.23
51	7112185	Rotary (Convent.)	11.60	Test Hole	Test Hole	1.22	1.30	5.49	8.53
52	7118560	-	-	Abandoned-Other	-	-	3.50	-	-
53	7145157	H.S.A.	-	Abandoned-Other	Dewatering	1.30	-	5.00	8.00
54	7145218	H.S.A.	-	Abandoned-Other	Dewatering	1.30	-	6.80	9.80

Ontario Water Well Records

WELL ID	MECP WWR ID	Construction Method	Well Depth (m)	Well Usage		Water Found (m)	Static Water Level (m)	Top of Screen Depth (m)	Bottom of Screen Depth (m)
				Final Status	First Use				
55	7145219	H.S.A.	-	Abandoned-Other	Dewatering	1.30	-	6.80	9.80
56	7145220	H.S.A.	-	Abandoned-Other	Dewatering	1.30	-	5.00	8.00
57	7150899	-	-	Abandoned-Other	-	1.00	-	-	-
58	7156441	-	-	Abandoned-Other	-	3.00	-	-	-
59	7160561	Jetting	7.00	Dewatering	Dewatering	1.00	-	6.00	7.00
60	7161740	-	-	Abandoned-Other	-	3.50	-	-	-
61	7168991	-	-	Abandoned-Other	Other	-	5.10	-	-
62	7180804	-	-	Abandoned-Other	-	-	-	-	-
63	7241495	Boring	6.10	Observation Wells	Monitoring	-	-	4.57	6.10
64	7241496	Boring	4.60	Observation Wells	Monitoring	3.05	-	3.05	4.57
65	7241497	Boring	6.10	Observation Wells	Monitoring	3.05	-	4.57	6.10
66	7255785	Other Method	48.20	-	Domestic	-	-0.30	5.49	8.53
67	7273717	-	-	Abandoned-Other	-	2.40	-	-	-
68	7315045	-	-	Abandoned-Other	-	4.60	-	-	-
69	7340775	-	-	Abandoned-Other	-	1.30	-	0.50	2.00
70	7340776	-	-	Abandoned-Other	-	1.30	-	0.50	2.00
71	7340777	-	-	Abandoned-Other	-	1.30	-	0.50	2.00
72	7381290	-	-	-	-	-	-	-	-
73	7381354	-	-	-	-	-	-	-	-
74	7382661	-	-	-	-	-	-	-	-

Notes:

*MECP WWID: Ministry of the Environment, Conservation and Parks Water Well Records Identification

**metres below ground surface

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FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

APPENDIX 'B'

RESULTS OF SINGLE WELL RESPONSE TEST

REFERENCE NO. 2301-W042

Falling Head Test (Slug Test)

Test Date:		02-Mar-23	
Piezometer/Well No.:		BH/MW 1	
Ground level:		285.81	m
Screen top level:		282.71	m
Screen bottom level:		279.71	m
Test El. (at midpoint of screen):		281.21	m
Test depth (at midpoint of screen):		4.6	m
Screen length	L=	3.0	m
Diameter of undisturbed portion	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.175	m
Initial water depth		2.14	m
Aquifer material:		**Sandy Silt Till/Silty Sand Till**	

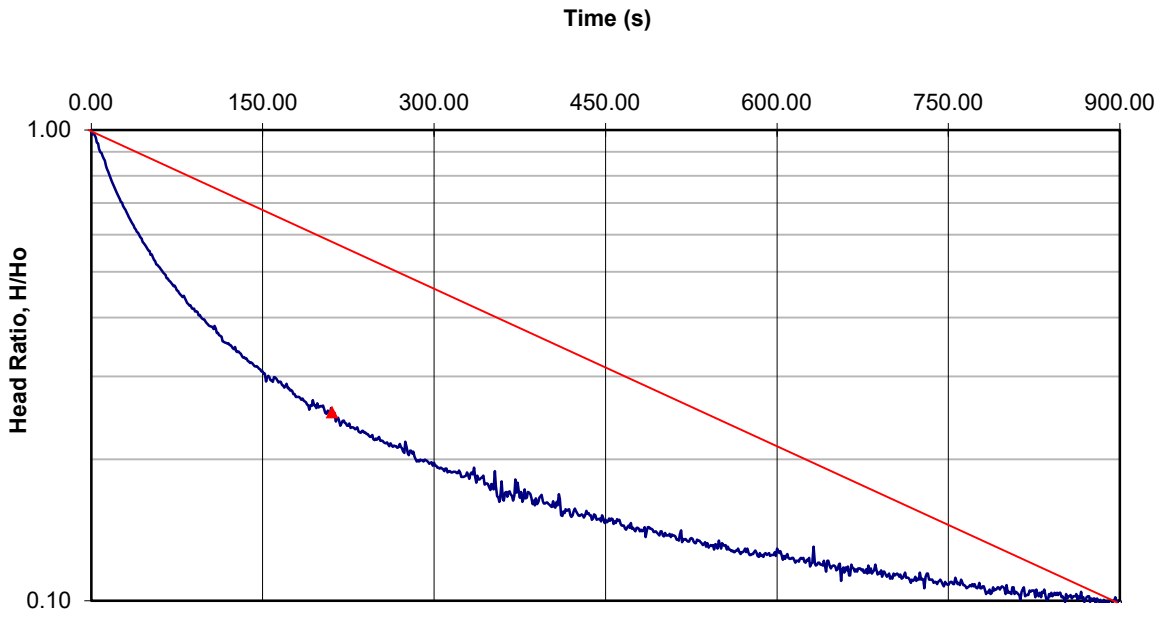
Shape factor $F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.701815$ m

Permeability $K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$\frac{\ln(H1/H2)}{(t2 - t1)} = 0.01176031$

K= **4.0E-04** cm/s

4.0E-06 m/s



Falling Head Test (Slug Test)

Test Date:		02-Mar-23	
Piezometer/Well No.:		BH/MW 2	
Ground level:		281.75	m
Screen top level:		278.65	m
Screen bottom level:		275.65	m
Test El. (at midpoint of screen):		277.15	m
Test depth (at midpoint of screen):		4.6	m
Screen length	L=	3.0	m
Diameter of undisturbed portion	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.2177	m
Initial water depth		2.2	m
Aquifer material:		**Silt**	

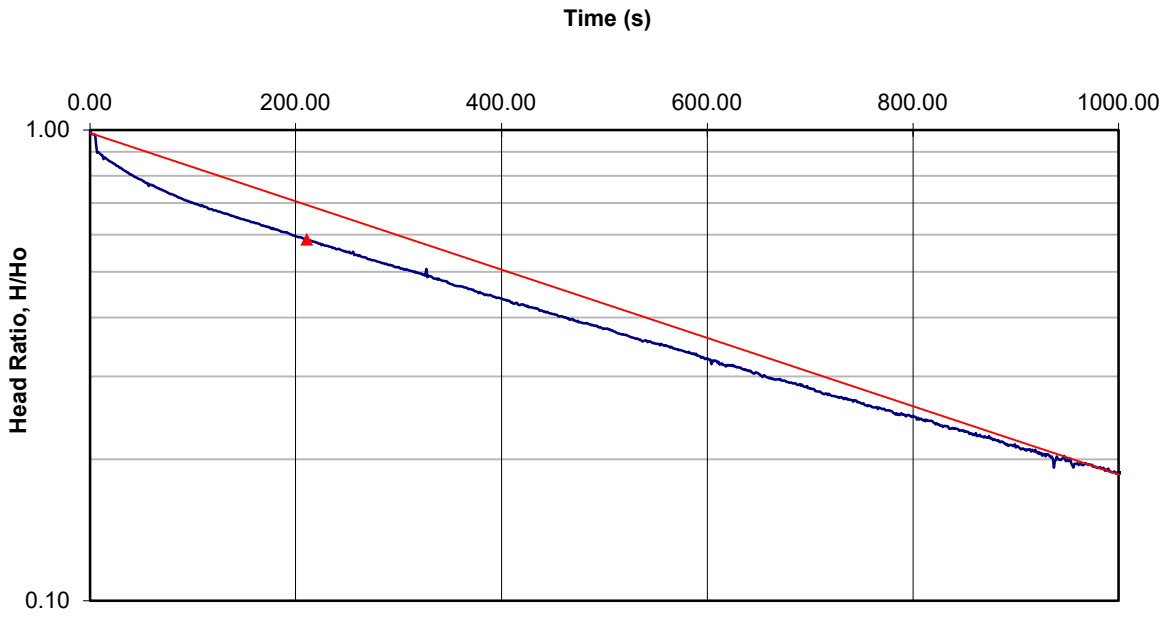
Shape factor $F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.701815$ m

Permeability $K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$\frac{\ln(H1/H2)}{(t2 - t1)} = 0.00484079$

K= **1.7E-04** cm/s

1.7E-06 m/s



Falling Head Test (Slug Test)

Test Date:		02-Mar-23	
Piezometer/Well No.:		BH/MW 3	
Ground level:		282.83	m
Screen top level:		279.63	m
Screen bottom level:		276.63	m
Test El. (at midpoint of screen):		278.13	m
Test depth (at midpoint of screen):		4.7	m
Screen length	L=	3.0	m
Diameter of undisturbed portion	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.2378	m
Initial water depth		2.78	m
Aquifer material:		**Sandy Silt/Silty Clay Till**	

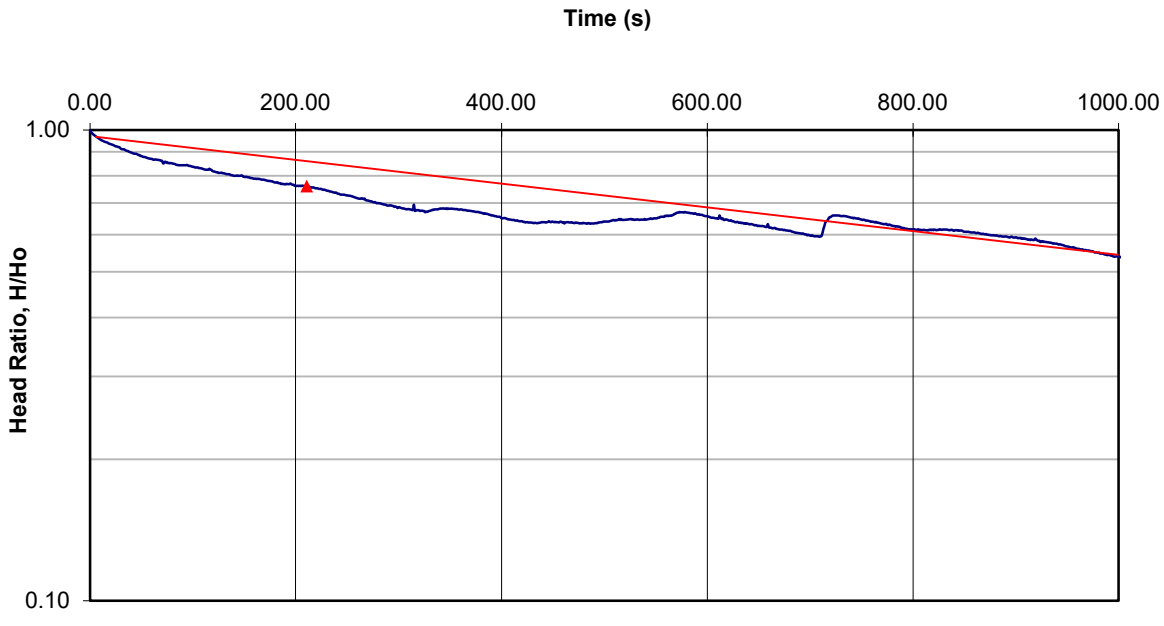
Shape factor $F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.701815$ m

Permeability $K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$\frac{\ln(H1/H2)}{(t2 - t1)} = 0.00314848$

K= **1.1E-04** cm/s

1.1E-06 m/s



Falling Head Test (Slug Test)

Test Date:		03-Apr-23	
Piezometer/Well No.:		BH/MW 4	
Ground level:		277.25	m
Screen top level:		274.15	m
Screen bottom level:		271.15	m
Test El. (at midpoint of screen):		272.65	m
Test depth (at midpoint of screen):		4.6	m
Screen length	L=	3.0	m
Diameter of undisturbed portion	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.0147	m
Initial water depth		3.42	m
Aquifer material:		**Sandy Silt Till / Silty Clay Till**	

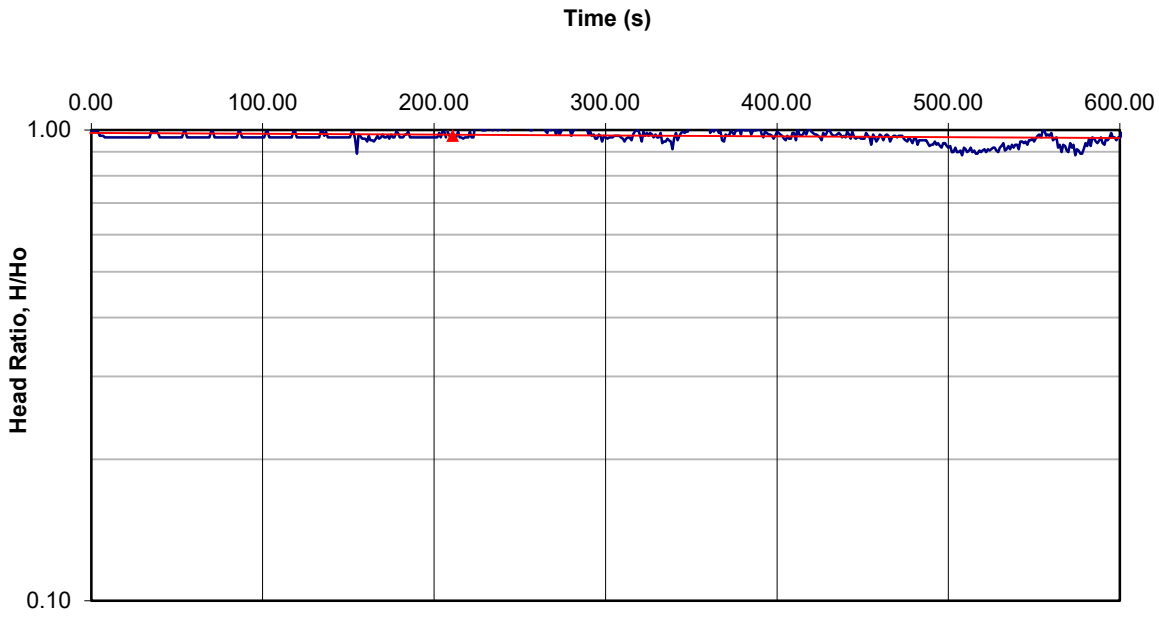
Shape factor $F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.701815$ m

Permeability $K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$\frac{\ln(H1/H2)}{(t2 - t1)} = 0.00173028$

K= **6.0E-05** cm/s

6.0E-07 m/s



Falling Head Test (Slug Test)

Test Date:		03-Apr-23	
Piezometer/Well No.:		BH/MW 5	
Ground level:		278.64	m
Screen top level:		275.54	m
Screen bottom level:		272.54	m
Test El. (at midpoint of screen):		274.04	m
Test depth (at midpoint of screen):		4.6	m
Screen length	L=	3.0	m
Diameter of undisturbed portion	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.1909	m
Initial water depth		0.93	m
Aquifer material:		**Silty Clay Till**	

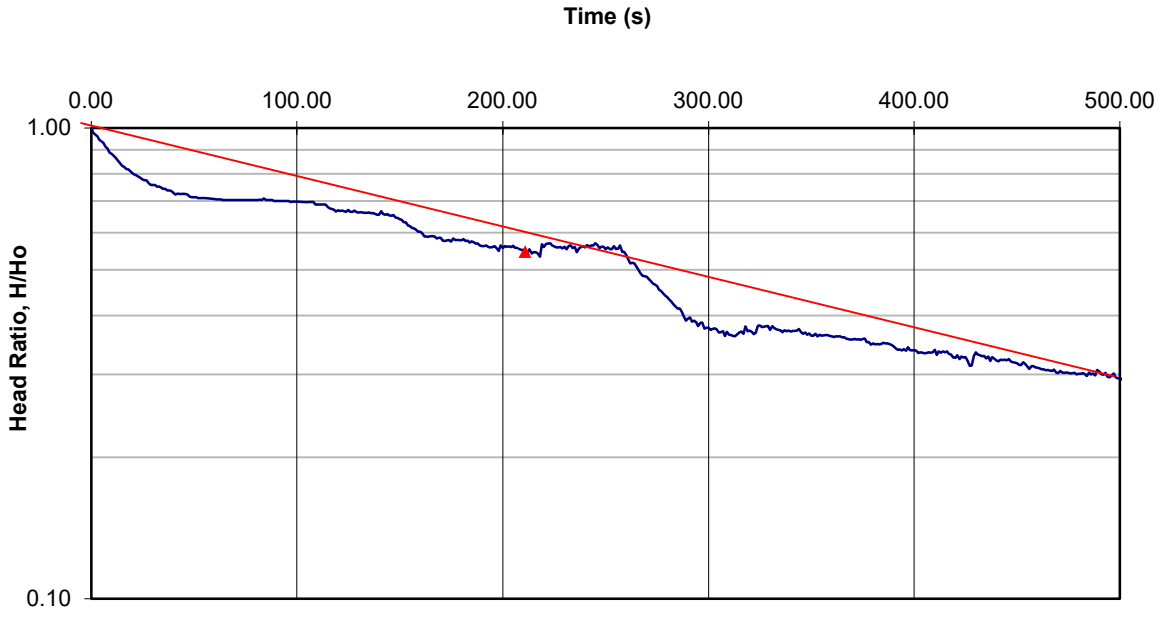
Shape factor $F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.701815$ m

Permeability $K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$\frac{\ln(H1/H2)}{(t2 - t1)} = 0.01007354$

K= **3.5E-04** cm/s

3.5E-06 m/s



Soil Engineers Ltd.
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APPENDIX 'C'

WATER QUALITY TEST RESULTS

REFERENCE NO. 2301-W042

FINAL REPORT

CA40001-APR23 R1

2301-WO42, 15544 McLaughlin Rd, C.aledon

Prepared for

Soil Engineers Ltd.

FINAL REPORT

First Page

CLIENT DETAILS

Client	Soil Engineers Ltd.
Address	90 West Beaver Creek Rd Richmond, ON M1S 3A7. Canada
Contact	Gurkaranbir Singh
Telephone	519-731-6442
Facsimile	
Email	gurkaranbir.singh@soilengineersltd.com
Project	2301-WO42, 15544 McLaughlin Rd, C.aledon
Order Number	
Samples	Ground Water (2)

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	CA40001-APR23
Received	04/03/2023
Approved	04/11/2023
Report Number	CA40001-APR23 R1
Date Reported	04/11/2023

COMMENTS

RL - SGS Reporting Limit

Temperature of Sample upon Receipt: 6 degrees C
Cooling Agent Present: Yes
Custody Seal Present: Yes

Chain of Custody Number: 029455

F-ewl Spike Rep high, all other QC acceptable

SIGNATORIES

Maarit Wolfe, Hon.B.Sc

TABLE OF CONTENTS

Client: Soil Engineers Ltd.
Project: 2301-WO42, 15544 McLaughlin Rd, C.aledon
Project Manager: Gurkaranbir Singh
Samplers: Gurkaranbir Singh

MATRIX: WATER

L1 = SANSEW / WATER / - - Peel Sewer Use ByLaw - Sanitary Sewer Discharge - BL_53_2010

L2 = SANSEW / WATER / - - Peel Sewer Use ByLaw - Storm Sewer Discharge - BL_53_2010

Parameter	Units	RL	L1	L2	Sample Number 8 Sample Name BH/MW1 Sample Matrix Ground Water Sample Date 03/04/2023 Result	Sample Number 9 Sample Name BH/MW1 Dissolved Sample Matrix Ground Water Sample Date 03/04/2023 Result
General Chemistry						
Biochemical Oxygen Demand (BOD5)	mg/L	2	300	15	< 4 ↑	---
Total Suspended Solids	mg/L	2	350	15	12	---
Total Kjeldahl Nitrogen	as N mg/L	0.5	100	1	< 0.5	---
Metals and Inorganics						
Fluoride	mg/L	0.06	10		0.06	---
Cyanide (total)	mg/L	0.01	2	0.02	< 0.01	---
Sulphate	mg/L	2	1500		14	---
Aluminum (total)	mg/L	0.001	50		0.152	0.004
Antimony (total)	mg/L	0.0009	5		< 0.0009	< 0.0009
Arsenic (total)	mg/L	0.0002	1	0.02	< 0.0002	< 0.0002
Cadmium (total)	mg/L	0.000003	0.7	0.008	0.000144	0.000082
Chromium (total)	mg/L	0.00008	5	0.08	0.00133	0.00196
Copper (total)	mg/L	0.0002	3	0.05	0.0035	0.0019
Cobalt (total)	mg/L	0.000004	5		0.000245	0.000143
Lead (total)	mg/L	0.00009	3	0.12	0.00035	< 0.00009
Manganese (total)	mg/L	0.00001	5	0.05	0.0167	0.0139
Molybdenum (total)	mg/L	0.00004	5		0.00033	0.00026
Nickel (total)	mg/L	0.0001	3	0.08	0.0038	0.0068
Phosphorus (total)	mg/L	0.003	10	0.4	< 0.003	0.879
Selenium (total)	mg/L	0.00004	1	0.02	0.0128	0.00493
Silver (total)	mg/L	0.00005	5	0.12	< 0.00005	< 0.00005

Client: Soil Engineers Ltd.
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MATRIX: WATER

L1 = SANSEW / WATER / - - Peel Sewer Use ByLaw - Sanitary Sewer Discharge - BL_53_2010

L2 = SANSEW / WATER / - - Peel Sewer Use ByLaw - Storm Sewer Discharge - BL_53_2010

Parameter	Units	RL	L1	L2	Sample Number 8 Result	Sample Number 9 Result
					Sample Name: BH/MW1	BH/MW1 Dissolved
					Sample Matrix: Ground Water	Ground Water
					Sample Date: 03/04/2023	03/04/2023
Metals and Inorganics (continued)						
Tin (total)	mg/L	0.00006	5		0.00191	0.00047
Titanium (total)	mg/L	0.00005	5		0.00058	0.00110
Zinc (total)	mg/L	0.002	3	0.04	0.012	< 0.002
Microbiology						
E. Coli	cfu/100mL	0		200	< 2↑	---
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	150		< 4	---
Oil & Grease (mineral/synthetic)	mg/L	4	15		< 4	---

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MATRIX: WATER

L1 = SANSEW / WATER / - - Peel Sewer Use ByLaw - Sanitary Sewer Discharge - BL_53_2010

L2 = SANSEW / WATER / - - Peel Sewer Use ByLaw - Storm Sewer Discharge - BL_53_2010

	Sample Number				8	9
	Sample Name				BH/MW1	BH/MW1 Dissolved
	Sample Matrix				Ground Water	Ground Water
	Sample Date				03/04/2023	03/04/2023
Parameter	**Units**	**RL**	**L1**	**L2**	**Result**	**Result**
Other (ORP)						
pH	No unit	0.05	10	9	7.53	---
Mercury (total)	mg/L	0.00001	0.01	0.0004	< 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	---
Methyl ethyl ketone	mg/L	0.02	8		< 0.02	---
Styrene	mg/L	0.0005	0.2		< 0.0005	---
Tetrachloroethylene (perchloroethylene)	mg/L	0.0005	1	0.0044	< 0.0005	---
Trichloroethylene	mg/L	0.0005	0.4	0.008	< 0.0005	---

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Samplers: Gurkaranbir Singh

MATRIX: WATER

L1 = SANSEW / WATER / - - Peel Sewer Use ByLaw - Sanitary Sewer Discharge - BL_53_2010

L2 = SANSEW / WATER / - - Peel Sewer Use ByLaw - Storm Sewer Discharge - BL_53_2010

Sample Number					8	9
Sample Name					BH/MW1	BH/MW1 Dissolved
Sample Matrix					Ground Water	Ground Water
Sample Date					03/04/2023	03/04/2023
Parameter	**Units**	**RL**	**L1**	**L2**	**Result**	**Result**
VOCs (continued)						
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	1.4	0.0044	< 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 / - - Peel Sewer Use ByLaw - Sanitary Sewer Discharge - BL_53_2010 L1	SANSEW / WATER / - - Peel Sewer Use ByLaw - Storm Sewer Discharge - BL_53_2010 L2
BH/MW1 Dissolved					
Phosphorus	SM 3030/EPA 200.8	mg/L	0.879		0.4

QC SUMMARY

Anions by discrete analyzer

Method: US EPA 375.4 | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-026

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	DIO5011-APR23	mg/L	2	<2	1	20	110	80	120	112	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)	BOD0001-APR23	mg/L	2	< 2	4	30	106	70	130	95	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)	SKA0039-APR23	mg/L	0.01	<0.01	ND	10	100	90	110	96	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	EWL0029-APR23	mg/L	0.06	<0.06	ND	10	103	90	110	58	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)	EHG0004-APR23	mg/L	0.00001	< 0.00001	ND	20	105	80	120	117	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)	EMS0010-APR23	mg/L	0.00005	<0.00005	ND	20	102	90	110	85	70	130
Aluminum (total)	EMS0010-APR23	mg/L	0.001	<0.001	2	20	95	90	110	108	70	130
Arsenic (total)	EMS0010-APR23	mg/L	0.0002	<0.0002	ND	20	99	90	110	102	70	130
Cadmium (total)	EMS0010-APR23	mg/L	0.000003	<0.000003	6	20	105	90	110	95	70	130
Cobalt (total)	EMS0010-APR23	mg/L	0.000004	<0.000004	2	20	100	90	110	94	70	130
Chromium (total)	EMS0010-APR23	mg/L	0.00008	<0.00008	ND	20	101	90	110	100	70	130
Copper (total)	EMS0010-APR23	mg/L	0.0002	<0.0002	1	20	102	90	110	85	70	130
Manganese (total)	EMS0010-APR23	mg/L	0.00001	<0.00001	4	20	100	90	110	113	70	130
Molybdenum (total)	EMS0010-APR23	mg/L	0.00004	<0.00004	7	20	103	90	110	102	70	130
Nickel (total)	EMS0010-APR23	mg/L	0.0001	<0.0001	20	20	103	90	110	84	70	130
Lead (total)	EMS0010-APR23	mg/L	0.00009	<0.00009	6	20	106	90	110	91	70	130
Antimony (total)	EMS0010-APR23	mg/L	0.0009	<0.0009	ND	20	107	90	110	111	70	130
Selenium (total)	EMS0010-APR23	mg/L	0.00004	<0.00004	ND	20	94	90	110	NV	70	130
Tin (total)	EMS0010-APR23	mg/L	0.00006	<0.00006	ND	20	102	90	110	NV	70	130
Zinc (total)	EMS0010-APR23	mg/L	0.002	<0.002	3	20	99	90	110	129	70	130
Phosphorus (total)	EMS0034-APR23	mg/L	0.003	0.008	1	20	100	90	110	NV	70	130
Titanium (total)	EMS0034-APR23	mg/L	0.00005	<0.00005	7	20	110	90	110	NV	70	130

QC SUMMARY

Microbiology

Method: SM 9222D | Internal ref.: ME-CA-IENVIMIC-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
E. Coli	BAC9005-APR23	cfu/100mL	-	ACCEPTED	ACCEPTED							

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	GCM0034-APR23	mg/L	0.01	<0.01			86	55	120			
Nonylphenol Ethoxylates	GCM0034-APR23	mg/L	0.01	0								
Nonylphenol monoethoxylate	GCM0034-APR23	mg/L	0.01	<0.01			87	55	120			
Nonylphenol	GCM0034-APR23	mg/L	0.001	<0.001			87	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)	GCM0064-APR23	mg/L	2	<2	NSS	20	107	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)	GCM0064-APR23	mg/L	4	< 4	NSS	20	NA	70	130			
Oil & Grease (mineral/synthetic)	GCM0064-APR23	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	EWL0022-APR23	No unit	0.05	NA	0		100			NA		

QC SUMMARY

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	SKA0015-APR23	mg/L	0.002	<0.002	ND	10	96	80	120	102	75	125

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	GCM0050-APR23	mg/L	0.0001	<0.0001	NSS	30	89	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	GCM0078-APR23	mg/L	0.002	< 0.002	NSS	30	105	50	140	NSS	50	140
di-n-Butyl Phthalate	GCM0078-APR23	mg/L	0.002	< 0.002	NSS	30	110	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	EWL0028-APR23	mg/L	2	< 2	0	10	100	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	SKA0028-APR23	as N mg/L	0.5	<0.5	1	10	99	90	110	98	75	125

QC SUMMARY

Volatile Organics

Method: EPA 5030B/8260C | Internal ref.: ME-CA-[ENVIGC-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	GCM0046-APR23	mg/L	0.0005	<0.0005	ND	30	101	60	130	106	50	140
1,2-Dichlorobenzene	GCM0046-APR23	mg/L	0.0005	<0.0005	ND	30	103	60	130	105	50	140
1,4-Dichlorobenzene	GCM0046-APR23	mg/L	0.0005	<0.0005	ND	30	101	60	130	103	50	140
Benzene	GCM0046-APR23	mg/L	0.0005	<0.0005	ND	30	105	60	130	107	50	140
Chloroform	GCM0046-APR23	mg/L	0.0005	<0.0005	ND	30	102	60	130	106	50	140
cis-1,2-Dichloroethene	GCM0046-APR23	mg/L	0.0005	<0.0005	ND	30	103	60	130	106	50	140
Ethylbenzene	GCM0046-APR23	mg/L	0.0005	<0.0005	ND	30	105	60	130	108	50	140
m-p-xylene	GCM0046-APR23	mg/L	0.0005	<0.0005	9	30	104	60	130	108	50	140
Methyl ethyl ketone	GCM0046-APR23	mg/L	0.02	<0.02	ND	30	103	50	140	111	50	140
Methylene Chloride	GCM0046-APR23	mg/L	0.0005	<0.0005	ND	30	102	60	130	102	50	140
o-xylene	GCM0046-APR23	mg/L	0.0005	<0.0005	13	30	105	60	130	108	50	140
Styrene	GCM0046-APR23	mg/L	0.0005	<0.0005	ND	30	105	60	130	108	50	140
Tetrachloroethylene (perchloroethylene)	GCM0046-APR23	mg/L	0.0005	<0.0005	ND	30	103	60	130	106	50	140
Toluene	GCM0046-APR23	mg/L	0.0005	<0.0005	ND	30	104	60	130	107	50	140
trans-1,3-Dichloropropene	GCM0046-APR23	mg/L	0.0005	<0.0005	ND	30	103	60	130	105	50	140
Trichloroethylene	GCM0046-APR23	mg/L	0.0005	<0.0005	ND	30	103	60	130	104	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

Results relate only to the sample tested.
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 --

SGS — Request for Laboratory Services and CHAIN OF CUSTODY

Industries & Environment - 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: 029455 Page ____ of ____

Laboratory Information Section - Lab use only

Received By: Scott Kan
Received Date: 03 / 03 / 2023 (mm/dd/yy)
Received Time: 17 : 45 (hr : min)
Received By (signature):
Custody Seal Present: Yes ☐ No ☐
Custody Seal Intact: Yes ☑ No ☐
Cooling Agent Present: Yes ☑ No ☐ Type: ice
Temperature Upon Receipt (°C): 6.3
LAB LIMS #: CA400D1-APR23

REPORT INFORMATION	INVOICE INFORMATION
Company: SOIL ENGINEERS LTD	☐ (same as Report Information)
Contact: ~~Gurkaran~~ Gurkaran	Company:
Address: 90 West Beaver Creek Rd, Richmond Hill.	Contact:
Phone: 5197316492	Address:
Fax:	Phone:
Email: gurkaranbir.singh@soilengineersltd.com	Email:

Quotation #: P.O. #:
Project #: 2301-W042 Site Location/ID: 15544 McLaughlin Rd Caledon

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: Region of Peel

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,Se,Ag,Tl,U,V,Zn	SVOC: PAHs only	SVOC: SVOCs all incl PAHs, ABNs, CPs	PCB: PCBs Total ☐ Aroclor ☐	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 (please specify)						SPLP: Specify tests	TCLP: Specify tests	COMMENTS:
																		Metal Dissolved				Sewer Use: ✓ Specify pkg: Region of Peel	Water Characterization Pkg ☐ General ☐ Extended		☐ Metals ☐ VOC ☐ 1,4-Dioxane ☐ OCP ☐ ABN	☐ M&I ☐ VOC ☐ PCB ☐ B(a)P ☐ ABN ☐ Ignit.	
1	BH/MW1	03/04/23	10:00AM	17	GW	N																✓				
2	BH/MW1	03/04/23	10:00AM	1	GW	Y												✓								
3																										
4																										
5																										
6																										
7																										
8																										
9																										
10																										
11																										
12																										

Observations/Comments/Special Instructions

Sampled By (NAME): GURKARANBIR SINGH Signature:
Relinquished by (NAME): Gurkaranbir Singh Signature:
Date: 03 / 04 / 23 (mm/dd/yy)
Date: 03 / 04 / 23 (mm/dd/yy)

Pink Copy - Client
Yellow & White Copy - SGS

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE 100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	MUSKOKA	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

APPENDIX 'D'

TEST PIT INVESTIGATION

REFERENCE NO. 2301-W042

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE 100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	MUSKOKA	HAMILTON
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FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

July 11, 2023 Reference No. 2301-W042

2868577 Ontario Inc.
4510 Eastgate Parkway
Mississauga, Ontario
L4W 3W6

Attention: Mr. Graziano Stefani

Re: Follow-Up Test Pit Investigation - Groundwater Conditions Verification
Proposed Residential Development
15544 Mclaughlin Road
Town of Caledon

Dear Sir:

On May 30, 2023, a Soil Engineers Ltd. representative performed a site visit to witness a test pit investigation program. Test pit excavations were completed at the subject subdivision, located about 200 m west of Mclaughlin Road, and approximately 470 m north of Old Base Line Road, at the Terminus of Kaufman Road, with a municipality address of 15544 McLaughlin Road, in the Town of Caledon, at the location shown on Drawing No. 1. An excavator was used to complete the test pit excavations to the target depth at the indicated test pit locations that were provided in advance by Candevcon Limited.

In total five (5) test pits were excavated on May 30, 2023, to depths, of about ±5.0 m respectively below the existing grade, or to the depth elevations, ranging from 272.3 to 280.2 masl, respectively. The test pit locations are shown on Drawing No. 2. The depths for the test pits were selected based on the anticipated depths for the proposed housing basement structures, and for the proposed underground services. Groundwater conditions were recorded at each of the open test pits, during the field investigation, along with the visual examination of the contacted subsoil strata, to confirm for the presence of ant groundwater seepage, or any caving and unstable subsoil conditions within the open test pits. The test pits were left open and were examined for a period of ±4.0 to 6.0 hours to allow for any groundwater seepage, if present, to accumulate and stabilize within the open excavations.

The ground surface elevations and horizontal coordinates at the test pit locations were determined at the time of the investigation, using a handheld Global Navigation Satellite System survey equipment (Trimble Geoexplorer unit TSC3) which has an accuracy of ±0.05 m. The UTM coordinates and ground surface elevations at the test pit locations, along with the field observations recorded from the test pit investigation are summarized in Table 1, below.

Table 1 - Summary of Test Pit Investigation Findings

Test Pit No.	Existing Ground El. (masl)	Depth of Test Pit Excavation (mbgs/masl)	UTM Coordinates		Sub-Soil Type	Groundwater Seepage Depth (mbgs/masl)	Test Pit Observations
			East (m)	North (m)			
1	±285.2	5.0/280.2	585737	4849365	Topsoil 0 to 0.30 mbgs Brown, loose to compact Sandy Silt, a trace of Clay and occ. Gravel 0.3 to 1.6 mbgs Brown, compact to very dense, Sandy Silt Till/Silty Sand Till, having a trace of clay and some gravel to gravelly 1.6 to 5.0 mbgs	2.7/282.50	Minimal groundwater seepage at depth of 2.7 mbgs (282.50 masl) Minimal accumulation of groundwater within the test pit after leaving the test pit remained open for ±5.0 hours Cave-In occurred at a depth of 0.8 mbgs (El. 284.4 masl)
2	±281.7	5.0/276.7	585794	4849357	Topsoil 0 to 0.30 mbgs Brown, very loose to compact, Sandy Silt Till and traces of clay and gravel 0.3 to 1.6 mbgs Brown, compact to very dense, Silt, and a trace to some Sand 1.6 to 5.0 mbgs	No Groundwater Seepage	No groundwater seepage Test pit left open for ±4.0 hours Cave-In occurred at 0.3 mbgs (El 281.4 masl)

Table 1 - Summary of Test Pit Investigation Findings (Cont'd-1)

Test Pit No.	Existing Ground El. (masl)	Depth of Test Pit Excavation (mbgs/masl)	UTM Coordinates		Sub-Soil Type	Groundwater Seepage Depth (mbgs/masl)	Test Pit Observations
			East (m)	North (m)			
3	±283.0	5.0/278.0	585780	4849412	Topsoil 0 to 0.30 mbgs Dark Brown, Earth Fill, Sand, some Silt, occ. Organics and Rootlets 0.3 to 1.7 mbgs Brown, compact Silty Sand, occ. Silty Clay Layers 1.7 to 2.5 mbgs Brown, compact Silt and traces of Clay and Gravel 2.5 to 4.2 mbgs Brown, compact Sandy Silt and traces of Clay and occ. Gravel 4.2 to 5.0 mbgs	1.6 / 281.4	Minimal water seepage at depth of 1.6 mbgs (281.4 masl) Minimal accumulation of groundwater within the test pit after leaving the test pit remained open for ±6.0 hours
4	±277.3	5.0/272.3	585857	4849398	Topsoil 0 to 0.20 mbgs Dark Brown, Earth Fill, Sand, Silt, Clay, a trace of Gravel, occ. Organics and Rootlets 0.2 to 2.2 mbgs Brown, dense Sand and, Gravel and a trace to some Silt 2.2 to 5.0 mbgs	3.5 / 273.8	Medium to minor ground water seepage at depth of 3.5 mbgs (El. 273.80 masl) Minimal to medium accumulation of groundwater seepage within the test pit after leaving the test pit remained open for ±4.0 hours

Table 1 - Summary of Test Pit Investigation Findings (Cont'd-2)

Test Pit No.	Existing Ground El. (masl)	Depth of Test Pit Excavation (mbgs/masl)	UTM Coordinates		Sub-Soil Type	Groundwater Seepage Depth (mbgs/masl)	Test Pit Observations
			East (m)	North (m)			
5	±278.4	5.0/273.4	585829	4849469	Topsoil 0 to 0.20 mbgs Dark Brown, Earth Fill, Sand, some Silt to Silty, occ. Organics and Rootlets 0.2 to 1.2 mbgs Brown, compact Silty Sand and a trace of Clay 1.3 to 2.1 mbgs Brown, dense Sand, and Gravel and trace to some Silt 2.1 to 3.8 mbgs Brown, hard Silty Clay Till and traces of Gravel 3.8 to 5.0 mbgs	4.75/273.65	Minor groundwater seepage at depth of 4.7 mbgs (El. 273.65 masl) Minimal accumulation of groundwater seepage within the test pit after leaving the test pit left open for ±4.0 hrs

The subsoil at all of the test pits is comprised, primarily of silty sand, sand and gravel and silty clay till, silt and sandy silt, having trace to some gravel. Detailed descriptions are shown on Figures 1 and 5, inclusive.

Comparison of Groundwater Elevations and Observed Groundwater Levels within the Test Pits

Test Pits 1, 2, 3, 4 and 5 are located, adjacent to the BH/MWs 1, 2, 3, 4 and 5 locations. The records for the groundwater level measurements and the comparison between the levels within the monitoring wells and the TPs are summarized in the following Table 6-4 below.

Table 6-4 - Comparison of Previous Groundwater Level Measurements and Groundwater at Test Pit locations

Well ID	Depth Units	Groundwater Level (May 30, 2023)	Test Pit (TP)	Depth Units	Groundwater Seepage Elevations in Test Pits
BH/MW 1	mbgs	1.94	TP 1	mbgs	2.7
	masl	283.87		masl	282.5
BH/MW 2	mbgs	1.61	TP 2	mbgs	<5.0
	masl	280.1		masl	<276.7
BH/MW 3	mbgs	2.82	TP 3	mbgs	1.6
	masl	280.0		masl	281.4
BH/MW 4	mbgs	3.94	TP 4	mbgs	3.5
	masl	273.3		masl	273.8
BH/MW 5	mbgs	2.2	TP 5	mbgs	4.75
	masl	276.4		masl	273.65

Review of the groundwater level elevations recorded from within the test pits when compared to the concurrent groundwater level elevations within the monitoring wells, indicates that that the water levels are higher within the BH/MWs than those observed within the adjacent test pit locations. The groundwater level at the BH/MW1 location is 0.8 m higher than the water level elevation for the groundwater seepage observed at the TP 1. The groundwater level at the BH/MW 2 location is 3.4 m higher than the elevation for the groundwater seepage observed at the TP 2. The groundwater level at the BH/MW 3 location, is about 1.2 m lower than the elevation for the groundwater seepage observed at the TP 3 location. The groundwater level at the BH/MW 4 location, is about 0.4 m lower than the elevation for the groundwater seepage observed at the TP 4 location. The groundwater level at the BH/MW 5 location, is about 2.5 m higher than the elevation for the groundwater seepage observed at the TP 5 location. Based on the overall current observations, only minor groundwater seepage was observed within the test pit excavations, and minor accumulation of groundwater seepage within all the open test pits, with the exception of TP 4 where a more moderate to medium accumulation of water seepage was observed after the pits were left open for four hours following excavation. Based on these findings, it is concluded that there will be only limited, un-sustained groundwater seepage at the anticipated depths for the proposed housing basement structures and associated underground services installation depths. As such only minor, un-sustained occasional groundwater seepage might occur at the depths for conventional foundations drainage networks for the completed housing basements.

We trust that this correspondence addresses your current requirements and ask that you contact us should you have any questions or require additional information.

Yours truly,
SOIL ENGINEERS LTD.

Bhawandeep Singh. Brar, B.Sc.

Gavin O'Brien, M.Sc. P.Geo.
BB/GO

ENCLOSURES

Test Pit Logs……..…….... Figures 1 to 5
Site Location Plan …….. Drawing No.1
Test Pit Location Plan …… Drawing No. 2

JOB NO.: 2301-W042 # LOG OF BOREHOLE: Test Pit 1 **FIGURE NO.:** 10

PROJECT DESCRIPTION: Proposed Residential Development **METHOD** Backhoe

PROJECT LOCATION: 15544 McLaughlin Road, Town of Caledon **TEST PIT DATE:** May 30, 2023

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
285.2	Ground Surface							
0.0 284.9	**30 cm Topsoil**				0			
0.3	Brown, loose to compact **SANDY SILT** a trace of clay occ. gravel				1			
283.6 1.6	Brown, compact to very dense **SANDY SILT TILL / SILTY SAND TILL** a trace of clay some gravel to gravelly				2 3 4			
280.2 5.0	**END OF TEST PIT**				5			
	DETAILED INFORMATION All the measurements are from existing grade **WATER SEEPAGE** Water seepage occured @ 2.7 mbgs Minor seepage rate **Cave-In** Cave-In occured @ 0.8 mbgs **Test Pit Monitoring** Water levels were measured at various time intervals after leaving the test pit open for 6.0 hours **Time Water Level (from bottom of test pit)** 10:00 am 1 cm 10:10 am 2 cm 10:30 am 8 cm 11:45 am 15 cm 12:15 pm 18 cm 01:15 pm 19 cm 02:30 pm 21 cm 03:30 pm 23 cm 04:00 pm 24 cm				6 7 8 9 10			water seepage elevation @ 282.50 masl cave-in occured elevation @ 284.40 masl

Soil Engineers Ltd.

JOB NO.: 2301-W042 **LOG OF BOREHOLE: Test Pit 2** ***FIGURE NO.:*** 11

PROJECT DESCRIPTION: Proposed Residential Development ***METHOD*** Backhoe

PROJECT LOCATION: 15544 McLaughlin Road, Town of Caledon ***TEST PIT DATE:*** May 30, 2023

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
281.7	Ground Surface							
0.0 281.4	**30 cm Topsoil**				0			cave-in occured elevation @ 281.4 masl
0.3	Brown, very loose to compact **SANDY SILT TILL** traces of clay and gravel				1			
280.1 1.6	Brown, compact to very dense **SILT** a trace to some sand				2 3 4			
276.7 5.0	**END OF TEST PIT**				5			

DETAILED INFORMATION

All the measurements are from existing grade

WATER SEEPAGE
No water seepage occured during the time interval

Cave-In
Cave-In occured @ 0.3 mbgs

Test Pit Monitoring
Water levels were measured at various time intervals after leaving the test pit open for 4.0 hours

Time	Water Level (from bottom of test pit)
10:45 am	dry
11:15 am	dry
12:00 pm	dry
12:45 pm	dry
01:15 pm	dry
02:15 pm	dry
02:45 pm	dry

JOB NO.: 2301-W042 # LOG OF BOREHOLE: Test Pit 3 **FIGURE NO.:** 12

PROJECT DESCRIPTION: Proposed Residential Development **METHOD** Backhoe

PROJECT LOCATION: 15544 McLaughlin Road, Town of Caledon **TEST PIT DATE:** May 30, 2023

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
283.0	Ground Surface							
0.0 282.7	**30 cm Topsoil**				0			
0.2	Dark brown **EARTH FILL** sand, some silt occ. topsoil inclusion occ. organics and rootlets				1			
281.3 1.7	Brown, compact **SILTY SAND** occ. silty clay layers				2			
280.5 2.5	Brown, compact **SILT** traces of clay and gravel				3 4			
278.8 4.2	Brown, compact **SANDY SILT** a trace of clay occ. gravel							
278.0 5.0	**END OF TEST PIT**				5			
	DETAILED INFORMATION All the measurements are from existing grade **WATER SEEPAGE** Water seepage occured @ 1.6 mbgs Minimal Seepage rate **Cave-In** No cave-in occured during the time interval **Test Pit Monitoring** Water levels were measured at various time intervals after leaving the test pit open for 6.0 hours **Time Water Level (from bottom of test pit)** 11:20 am 1 cm 11:45 am 3 cm 12:05 pm 7 cm 01:15 pm 9 cm 02:00 pm 11 cm 03:00 pm 13 cm 04:15 pm 15 cm 05:20 pm 18 cm				6 7 8 9 10			▼ water seepage elevation @ 281.40 masl

JOB NO.: 2301-W042 # LOG OF BOREHOLE: Test Pit 4 **FIGURE NO.:** 13

PROJECT DESCRIPTION: Proposed Residential Development **METHOD** Backhoe

PROJECT LOCATION: 15544 McLaughlin Road, Town of Caledon **TEST PIT DATE:** May 30, 2023

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
277.3	Ground Surface							
0.0	**20 cm Topsoil**				0			
0.2	Dark brown **EARTH FILL** mixture of sand, silt and clay a trace of gravel occ. topsoil inclusion occ. organics and rootlets				1			
275.1					2			
2.2	Brown, dense **SAND AND GRAVEL** a trace to some silt				3			▼ water seepage elevation @ 273.80 masl
272.3					4			
5.0	**END OF TEST PIT**				5			
	DETAILED INFORMATION All the measurements are from existing grade **WATER SEEPAGE** Water seepage occured @ 3.5 mbgs Medium to Fast seepage rate **Cave-In** No cave-In occured during the time interval **Test Pit Monitoring** Water levels were measured at various time intervals after leaving the test pit open for 4.0 hours				6			
					7			
					8			
					9			
					10			

Time **Water Level (from bottom of test pit)**

12:00 pm	50 cm
12:20 pm	70 cm
01:15 pm	85 cm
02:00 pm	95 cm
03:10 pm	110 cm
04:00 pm	120 cm

JOB NO.: 2301-W042 # LOG OF BOREHOLE: Test Pit 5 **FIGURE NO.:** 14

PROJECT DESCRIPTION: Proposed Residential Development **METHOD** Backhoe

PROJECT LOCATION: 15544 McLaughlin Road, Town of Caledon **TEST PIT DATE:** May 30, 2023

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
278.4	Ground Surface							
0.0	**20 cm Topsoil**				0			
0.2	Dark brown **EARTH FILL** sand, some silt to silty occ. topsoil inclusion occ. organics and rootlets							
277.1					1			
1.3	Brown, compact **SILTY SAND** a trace of clay							
276.3					2			
2.1	Brown, dense **SAND AND GRAVEL** a trace to some silt							
274.6					3			
3.8	Brown, hard **SILTY CLAY TILL** a trace of gravel				4			
273.4					5			▼ water seepage elevation @ 273.65 masl
5.0	**END OF TEST PIT**							
					6			
					7			
					8			
					9			
					10			

DETAILED INFORMATION

All the measurements are from existing grade

WATER SEEPAGE
Water seepage occured @ 4.75 mbgs

Minor seepage rate

Cave-In
No cave-In occured during the time interval

Test Pit Monitoring
Water levels were measured at various time intervals after leaving the test pit open for 4.0 hours

Time	Water Level (from bottom of test pit)
12:30 pm	3 cm
01:30 pm	9 cm
02:15 pm	12 cm
03:30 pm	14 cm
04:30 pm	16 cm

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BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	MUSKOKA	HAMILTON
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FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

APPENDIX 'E'

SHORT-TERM DEWATERING
AND
LONG-TERM FOUNDATION DRAINAGE FLOW RATE

REFERENCE NO. 2301-W042

DEWATERING CALCULATION- 15544 McLaughin Rd, Caledon-Basements

Dewatering Rate Formula for an Unconfined Aquifer (Powers et al., 2007):

$$Q = \frac{\pi K(H^2 - h^2)}{\ln(R_0/r_s)}$$

Where:

Q = Anticipated pumping rate (m^3/day)
K = Hydraulic conductivity (m/day)
H = Distance from initial static water level to bottom of the saturated aquifer (m)
h = Depth of water in the well while pumping (m)
R_0 = Distance from a point of greatest drawdown to a point where there is no drawdown (Radius of influence) (m)
r_s = Equivalent radius of excavation (m), calculated as follows:

$$r_s = \sqrt{\frac{ab}{\pi}}$$

Where:

a = excavation length (m)
b = excavation width (m)

Radius of Influence Formula (Bear, 1979):

$$R_0 = 2.45\sqrt{\frac{HK}{S_y}}t$$

Where:

R_0 = Radius of influence (m), beyond which there is negligible drawdown
H = Distance from initial static water level to bottom of saturated aquifer (m)
K = Hydraulic conductivity (m/s)
S_y = Specific yield of the aquifer formation
t =Time (s) required to draw the static groundwater level to the desired level (assumed to be equivalent to 14 days)

Parameter	Units	Lot 1	Lot2	Lot3	Lot4	Lot5	Lot6	Lot 7	Lot12	Lot13
Q s.f. 1.5	**m^3/day**	**8.75**	**14.91**	**26.29**	**2.76**	**4.78**	**0.10**	**3.71**	**3.80**	**1.53**
Q	**m^3/day**	**5.8**	**9.9**	**17.5**	**1.8**	**3.2**	**0.1**	**2.5**	**2.5**	**1.0**
K	**m/day**	0.35	0.35	0.10	0.10	0.10	0.30	0.30	0.15	0.15
H	**m**	2.7	3.7	0.7	1.7	2.7	0.5	1.7	2.1	1.1
h	**m**	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
R_0	**m**	36.2	42.3	9.8	15.1	19.0	15.0	26.8	20.8	15.0
r_s	**m**	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7
a	**m**	19.5	19.5	15.3	15.3	15.3	15.3	15.3	15.3	15.3
b	**m**	15.3	15.3	19.5	19.5	19.5	19.5	19.5	19.5	19.5
a/b		1.3	1.3	0.8	0.8	0.8	0.8	0.8	0.8	0.8

a/b>1.5 Trench Dewatering
a/b<1.5 Single Well Dewatering

Parameter	Units	Lot 1	Lot2	Lot3	Lot4	Lot5	Lot6	Lot 7	Lot12	Lot13
R_0	**m**	**36.2**	**42.3**	**9.8**	**15.1**	**19.0**	**15.0**	**26.8**	**20.8**	**15.0**
H	**m**	2.7	3.7	0.7	1.7	2.7	0.5	1.7	2.1	1.1
K	**m/s**	4.0E-06	4.0E-06	1.1E-06	1.1E-06	1.1E-06	3.5E-06	3.5E-06	1.7E-06	1.7E-06
S_y		0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
t	**s**	1209600	1209600	1209600	1209600	1209600	1209600	1209600	1209600	1209600

DEWATERING CALCULATION- 15544 McLaughin Rd, Caledon-Underground Services

Dewatering Rate Formula for an Unconfined Aquifer (Powers et al., 2007):

$$Q = \frac{\pi K (H^2 - h^2)}{\ln(R_0 / r_s)} + 2\left[\frac{xK(H^2 - h^2)}{2L}\right]$$

Where:

- Q = Anticipated pumping rate (m^3/day)
- K = Hydraulic Conductivity (m/day)
- H = Initial Hight of static groundwater level to bottom of the saturated aquifer (m)
- h = Depth of water in the well while pumping (m)
- R_0 = Distance from a point of greatest drawdown to a point where there is no drawdown (Radius of influence) (m)
- r_s = Distance to the wellpoints from the centre of the trench (m), assumed to be half of the trench width
- x = Trench Length (m)
- L = Distance from a line source to the trench, R_o (m)/2

		Serives (BH/MW1)	Serives (BH/MW3)	Services (BH/MW5)
Q s.f. 1.5	**m^3/day**	**21.89**	**6.54**	**21.56**
Q	**m^3/day**	**14.6**	**4.4**	**14.4**
K	**m/day**	0.35	0.10	0.30
H	**m**	4.9	3.9	5.1
h	**m**	1.0	1.0	1.0
R_0	**m**	48.7	22.8	46.5
Trench width (b)	**m**	2	2	2
r_s	**m**	1.0	1.0	1.0
x (a)	**m**	25.0	25.0	25.0
L	**m**	24.4	11.4	23.3
	a/b	12.5	12.5	12.5

a/b>1.5 Trench Dewatering
a/b<1.5 Single Well Dewatering

Radius of Influence Formula (Bear, 1979):

$$R_0 = 2.45\sqrt{\frac{HK}{S_y}}\,t$$

Where:

- R_0 = Radius of Influence (m), beyond which there is negligible drawdown
- H = Distance from initial static water level to bottom of saturated aquifer (m)
- K = Hydraulic conductivity (m/s)
- S_y = Specific yield of the aquifer formation
- t =Time (s) required to draw the static groundwater level to the desired level (assumed to be equivalent to 14 days)

Parameter	Units			
R_0	**m**	**48.7**	**22.8**	**46.5**
H	**m**	4.9	3.9	5.1
K	**m/s**	4.0E-06	1.1E-06	3.5E-06
S_y (Johnson,1967)		0.06	0.06	0.06
t	**s**	1209600	1209600	1209600

DEWATERING CALCULATION- 15544 McLaughin Rd, Caledon-Basements

Dewatering Rate Formula for an Unconfined Aquifer (Powers et al., 2007):

$$Q = \frac{\pi K(H^2 - h^2)}{\ln(R_0/r_s)}$$

Where:

- Q = Anticipated pumping rate (m^3/day)
- K = Hydraulic conductivity (m/day)
- H = Distance from initial static water level to bottom of the saturated aquifer (m)
- h = Depth of water in the well while pumping (m)
- R_0 = Distance from a point of greatest drawdown to a point where there is no drawdown (Radius of influence) (m)
- r_s = Equivalent radius of excavation (m), calculated as follows:

$$r_s = \sqrt{\frac{ab}{\pi}}$$

Where:

- a = excavation length (m)
- b = excavation width (m)

Parameter	Units	Lot 1	Lot2	Lot4	Lot5	Lot 7	Lot12	Lot13
Q s.f. 1.5	m^3/day	4.60	9.78	1.10	2.93	0.67	1.63	2.20
Q	m^3/day	3.1	6.5	0.7	2.0	0.4	1.1	1.5
K	m/day	0.35	0.35	0.10	0.10	0.30	0.15	0.15
H	m	1.9	2.9	1.0	2.0	0.9	1.4	0.4
h	m	0.8	0.8	0.8	0.8	0.8	0.8	0.8
R_0	m	30.7	37.8	11.4	16.2	20.1	16.7	8.5
r_s	m	9.7	9.7	9.7	9.7	9.7	9.7	9.7
a	m	19.5	19.5	15.3	15.3	15.3	15.3	15.3
b	m	15.3	15.3	19.5	19.5	19.5	19.5	19.5
a/b		1.3	1.3	0.8	0.8	0.8	0.8	0.8

a/b>1.5 Trench Dewatering

a/b<1.5 Single Well Dewatering

Radius of Influence Formula (Bear, 1979):

$$R_0 = 2.45\sqrt{\frac{HK}{S_y}}t$$

Where:

- R_0 = Radius of influence (m), beyond which there is negligible drawdown
- H = Distance from initial static water level to bottom of saturated aquifer (m)
- K = Hydraulic conductivity (m/s)
- S_y = Specific yield of the aquifer formation
- t =Time (s) required to draw the static groundwater level to the desired level (assumed to be equivalent to 14 days)

Parameter	Units							
R_0	m	30.7	37.8	11.4	16.2	20.1	16.7	8.5
H	m	1.9	2.9	1.0	2.0	0.9	1.4	0.4
K	m/s	4.0E-06	4.0E-06	1.1E-06	1.1E-06	3.5E-06	1.7E-06	1.7E-06
S_y		0.06	0.06	0.06	0.06	0.06	0.06	0.06
t	s	1209600	1209600	1209600	1209600	1209600	1209600	1209600

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APPENDIX 'F'

REVIEW PLANS

REFERENCE NO. 2301-W042

KAUFMAN ROAD

EXISTING RESIDENTIAL

VICTORIA STREET

EXISTING RESIDENTIAL

MACKENZIE STREET

LOT 2
CONCESSION 2
WEST OF HURONTARIO STREET
EXISTING DRIVEWAY

REAL LOT CATCH BASIN
INFILTRATION GALLERY
RLCB
MH 5A T/G=279.57
MH 4 T/G=279.52
MH 1 T/G=286.50
MH 2 T/G=281.67
DROPMH 3 T/G=280.03
MH 4A T/G=279.58
MH 5
MH 1A T/G=286.50
MH 2A T/G=281.67
MH 3A T/G=280.22
MH 6

LOT 1 LOT 2 LOT 3 LOT 4 LOT 5 LOT 6 LOT 7

STREET 'A'

1.5m SIDEWALK

(KAUFMAN ROAD EXTENSION)

BOTTOM OF BANK

BLOCK 2A
OPEN SPACE

BLOCK 1
PARKETTE

LOT 13 LOT 12 LOT 11 LOT 10 LOT 9 LOT 8

BLOCK 3
SWM POND

BLOCK 2
OPEN SPACE

LOT 45

LOT 46

LOT 47
EXISTING RESIDENTIAL

LOT 48

LOT 49

PLAN REGISTERED

LOUISE STREET

6.0m MUNICIPAL EASEMENT

7.9m
18.0m
3.0m

CALEDON RAILWAY PATH

BAR SCALE
1:500
0 10 20 30 40

SITE
HURONTARIO ST
OLDE BASE LINE RD
MCLAUGHLIN ROAD
HALEWAY
C.P.R.

KEY PLAN (N.T.S.)

LEGEND:

- PROPERTY LINE
- 278.85 EXISTING ELEVATION
- x285.8 PROPOSED ELEVATION
- EXISTING STORM MANHOLE
- EXISTING SANITARY MANHOLE
- STM MH PROPOSED STORM MANHOLE
- SAN MH PROPOSED SANITARY MANHOLE
- EXISTING FIRE HYDRANT
- FLOW DIRECTION
- RLCB □ PROPOSED REAR LOT CATCH BASIN
- INFILTRATION GALLERY

NO.	DESCRIPTION	DATE	BY
6			
5			
4			
3			
2			
1			

REVISIONS

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REGISTERED PROFESSIONAL ENGINEER
S. D. LANG
AUGUST 15, 2023
PROVINCE OF ONTARIO

CONSTRUCTION NORTH

2868577 ONTARIO INC
PROPOSED RESIDENTIAL SUBDIVISION
15544 MCLAUGHLIN ROAD
VILLAGE OF INGLEWOOD
TOWN OF CALEDON

SHEET TITLE:
PRELIMINARY GRADING PLAN

TOWN FILE No. PRE-2029-0197
REGION FILE No.

DRAWN BY: D.R./Y.D.N.	PROJECT No. W22002
DESIGN/CHECK BY: S.D.L./D.K.H.	DRAWING No. PG-1
SCALE: 1:500	
DATE: AUGUST 15th. 2023	