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Category 3 Permit To Take Water
Proposed Residential Development,
1086 Antochi Lane
Ottawa, Ontario

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Submitted to:

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Proposed Residential Development,
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Ottawa, Ontario

February 3, 2023
Project: 100152.004

experience • knowledge • integrity

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1.0 INTRODUCTION

GEMTEC Consulting Engineers and Scientists (GEMTEC) was retained by 1910753 Ontario Inc. to prepare a Category 3 Permit To Take Water (PTTW) application for construction dewatering for a residential development at 1086 Antochi Lane in Ottawa, Ontario. It is understood that groundwater pumping will be required during infrastructure replacement within the property limits of 1086 Antochi Lane.

1.1 Overview of Application Package

The Category 3 PTTW application package includes the following components:

- MECP PTTW application form (online submission);
- Appropriate mapping and figures;
- Completed Schedule 1 - Implementation of Water Conservation in Accordance with Best Management Practices and Standards for the Relevant Sector;
- Description of the proposed water taking activities;
- Calculation of the water taking needs for the project;
- Review of the land use and hydrogeological conditions in the vicinity of the proposed water taking;
- An assessment of the potential adverse impacts on existing groundwater users and/or the natural environment; and
- Recommendations and contingency measures for inclusion within the PTTW.

Site plans are provided in Appendix A of this report. The MECP PTTW application form and the Schedule 1 – Implementation of Water Conservation in Accordance with Best Management Practices and Standards for the Relevant Sector will be completed through the MECP on-line submission portal. Plan and profile drawings for the proposed construction are presented in Appendix B. Borehole records are provided in Appendix C and grain size distribution curves are provided in Appendix D. Hydraulic conductivity testing results and groundwater analytical results are provided in Appendix E and F, respectively. A tabulated summary of MECP Water Well Records is provided in Appendix G. Calculated estimates of groundwater taking needs are provided in Appendix H.

1.2 Project Description

Plans are being prepared for a residential development to be located at 1086 Antochi Lane in Ottawa (Manotick), Ontario. The new development consists of 18 semi detach dwellings and one single detached dwelling. The dwellings are also three storeys with a basement level.

The existing site is currently developed with eight houses on the site. The site is irregular in shape with plan dimensions of approximately 140 metres by 90 metres.

2.0 DESCRIPTION OF WATER TAKING ACTIVITIES

Within the property boundaries of 1086 Antochi Lane, there is a requirement to extend city sanitary sewer, water main and storm drainage sewers throughout to support the proposed development. The preliminary construction drawings for the infrastructure extension can be observed in Appendix B. It is anticipated that the maximum excavation depths should be in the order of 3 meters below ground surface, and the foundations of the residential developments will not reach more than 2.5 meters below ground surface.

2.1 Sources of Water Taking

The requested source of water taking is generalized for the construction along the alignment of the proposed service replacements found in Appendix B, over a total length of approximately 100 meters. The requested source will consist of open trench segments along the alignment of services needing replacement. Up to three (3) trenches will be open simultaneously. The location of the proposed water takings is indicated on Figure 4, following the text of the report. The proposed groundwater taking sources are summarized in Table 2.1.

Table 2.1 – Summary of Proposed Groundwater Taking Sources

Groundwater Source Names	Location of Sources on Subject Site	Description of Groundwater Source
Source 1	Open trenches (up to 3 trenches) on the 1086 Antochi Lane Property	Topsoil, pavement structure, silty clay, silty sand, till, to be dewatered using sump pumps or series of deep wells, wellpoints and/or eductors (to be selected by dewatering contractor)

The maximum estimated dimensions of the excavations for the above noted groundwater sources are provided in Table 2.2. It should be noted that the estimated dimensions are based on available information and our experience working on similar projects. The estimated depth represents the maximum excavation depth based on available information for each source segment as described in Table 2.2. Actual excavation dimensions during construction may differ from those estimated in the report due to varying field conditions, contractor preferences and/or changes in design for the project.

Table 2.2 – Maximum Estimated Excavation Dimensions

Source	Length (m)	Width (m)	Depth (m)	Volume (m^3)
Source 1	180[1]	4.5	4	3,240

Note: 1. Assumes three 30-metre long trenches open simultaneously.

It is expected that the proposed groundwater takings from the above source may be accomplished using one or more methods, which may include direct dewatering of open excavations using pumps, wells, well point dewatering systems, and/or other methods.

As the contractor to carry out the work has yet to be selected, the details of the methods to be used for the proposed water taking are not known. A combination of methods may also be used depending on the contractor's preferences and/or conditions determined in the field at the time of construction. The contractor should verify the assumptions made herein based on their chosen methods and confirm that the water taking volumes presented are accurate prior to transferring the PTTW to their name.

For the purposes of the PTTW application, it is assumed that the dewatering methodology will include sump pumps from within the open excavation.

2.2 Period of Water Taking

It is our understanding that the construction will start in 2023. In order to provide flexibility for the various stages of construction and delays in construction, it is requested that the Permit to Take Water be valid for a period starting May 2023 and ending in January 2026.

2.3 Groundwater Disposal

Groundwater taken from the excavations will be discharged to City of Ottawa sanitary/combined or storm sewers in the vicinity of the site, pending sewer use discharge approval from the City of Ottawa sewer use office. Appropriate erosion and sediment control measures will be implemented.

3.0 METHODOLOGY

3.1 Geotechnical Investigation

The fieldwork for the geotechnical investigation was carried out on November 18, 2021. Two boreholes (numbered 21-01 and 21-02) and one test pit (numbered 21-03) were advanced at the locations shown on the Site Plan, Figure A1.

The boreholes were advanced with a rubber tire track mounted hollow stem auger drill rig supplied and operated by CCC Geotechnical and Environmental Drilling of Ottawa, Ontario. The boreholes

were advanced to depths about 3.9 and 3.8 metres below the existing ground surface in boreholes 21-01 and 21-02, respectively.

Standard penetration tests were carried out in the boreholes at regular intervals of depth and samples of the soils encountered were recovered using a 50 millimetre diameter split barrel sampler.

Well screens were sealed in the overburden in boreholes 21-01 and 21-02 to measure the groundwater levels and for hydraulic conductivity testing.

The test pit was advanced with a vacuum track supplied and operated by Badger Daylighting. The test pit was excavated to a depth of about 1.1 metres below the existing ground surface.

The subsurface conditions in the test pit were determined based on visual and tactile examination of soils exposed on the sides and bottom of the excavation.

The fieldwork was supervised throughout by a member of our engineering staff who directed the drilling and excavating operations, logged the samples and test holes, and carried out the in-situ testing. Following completion of the drilling, the soil samples were returned to our laboratory for examination by a geotechnical engineer and for laboratory testing. Selected soil samples were tested for water content and grain size distribution testing.

One sample of soil obtained from borehole 21-01 was sent to Paracel Laboratories Ltd. for basic chemical testing relating to corrosion of buried concrete and steel.

The test hole locations were selected by GEMTEC and positioned on site relative to existing features. The ground surface elevations at the test hole locations were determined using a Trimble R10 GPS. The elevations are referenced to geodetic datum NAD83 (CSRS) Epoch 2010, vertical network CGVD1928.

Descriptions of the subsurface conditions logged in the test holes are provided on the Record of Test Hole Sheets in Appendix C. The approximate locations of the test holes are shown on the Test Hole Location Plan, Figure A1.

4.0 SUBSURFACE CONDITIONS

4.1 General

The soil conditions logged in the test holes from the current investigation are given on the Record of Test Hole Sheets in Appendix C. The test hole logs indicate the subsurface conditions at the specific test locations only. Boundaries between zones on the logs are often not distinct, but rather are transitional and have been interpreted. Subsurface conditions at locations other than the test hole locations may vary from the conditions encountered in the test holes. In addition to soil

variability, fill of variable physical and chemical composition can be present over portions of the site.

The soil descriptions in this report are based on commonly accepted methods of classification and identification employed in geotechnical practice. Classification and identification of soil involves judgement and GEMTEC does not guarantee descriptions as exact but infers accuracy to the extent that is common in current geotechnical practice.

The following presents an overview of the subsurface conditions encountered in the boreholes and test pits advanced as part of the current investigation.

4.2 Topsoil

Topsoil was encountered at the ground surface in borehole 20-01 and test pit 21-03. The topsoil has a thickness of about 250 and 400 millimetres, respectively.

4.3 Pavement Structure

Borehole 21-02 was advanced through the pavement structure of the drive lanes at 1086 Antochi Lane. The pavement structure consists of about 100 millimetres of asphaltic concrete over > 50 millimetres of sand and gravel base layer. A buried layer of asphaltic concrete with a thickness of about 50 millimetres was encountered below the base layer.

A sand and gravel base layer, with a thickness of about 400 millimetres, was encountered below the buried asphaltic concrete layer.

4.4 Silty Clay

A native deposit of silty clay was encountered below the pavement structure in borehole 21-02. The silty clay has a thickness of about 0.4 metres and extends to a depth of about 1.0 metres below the existing ground surface.

One standard penetration test carried out in the silty clay gave an N value of 16 blows per 0.3 metres of penetration. The results of the in situ testing reflects a stiff consistency.

4.5 Silty Sand

Native deposits of silty sand were encountered below the topsoil in borehole 20-01 and test pit 21-03. The silty sand has a thickness of about 1.0 and 0.4 metres and extends to depths of about 0.3 and 0.4 metres, respectively. Grey brown silty clay layers were observed within the silty sand in borehole 21-01.

Two standard penetration tests carried out in the silty sand gave N values of 3 blows per 0.3 metres of penetration, which indicates a very loose relative density.

One grain size distribution test was carried out on a sample of the silty sand. The results are provided in Appendix D and summarized in Table 4.1.

Table 4.1 – Summary of Grain Size Distribution Test (Silty Sand)

Borehole Number	Sample Number	Sample Depth (metres)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
21-01	2	0.8 – 1.4	0	56	26	18

4.6 Glacial Till

Native deposits of glacial till were encountered below the topsoil pavement structure, silty sand and/or silty clay, where encountered, in the test holes. The glacial till deposit was not fully penetrated but was proven to depths ranging from about 1.1 to 3.9 metres below the ground surface. The glacial till can generally be described as a heterogeneous mix of all grain sizes, which at this site is described as a silty sand with some gravel, cobbles and boulders.

Standard penetration tests carried out in the glacial till gave N values ranging from 4 to greater than 50 blows for less than 0.3 metres of penetration, but more generally between 4 and 16 blows, which indicates a very loose to compact relative density. The high blow counts likely represent the presence of cobbles or boulders within the glacial till deposit or the bedrock surface rather than the relative density of the soil matrix.

One grain size distribution test was carried out on a sample of the glacial till. The results are provided in Appendix B and summarized in Table 4.2.

Table 4.2 – Summary of Grain Size Distribution Test (Glacial Till)

Borehole Number	Sample Number	Sample Depth (metres)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
21-02	4	2.3 – 2.9	19	43	30	8

4.7 Refusal

Auger refusal was encountered in boreholes 21-01 and 21-02 at depths of about 3.9 and 3.8 metres below the existing ground surface, respectively. The auger refusal likely represents the presence of cobbles or boulders within the glacial till deposit or the bedrock surface.

Refusal to hydro-excavation advancement was encountered on cobbles and boulders within the glacial till in test pit 21-03 at a depth of about 1.1 metres below the existing ground surface.

A summary of the refusal depths and elevations are provided in Table 4.3.

Table 4.3 – Summary of Auger Refusal Depth and Elevation

Borehole/Test Pit Number	Ground Surface Elevation (metres)	Depth to Refusal (metres)	Refusal Elevation (metres)
21-01	86.8	3.9	82.9
21-02	86.6	3.8	82.8
21-03	86.7	1.1	85.6

4.8 Groundwater Levels

Well screens were sealed in the overburden at boreholes 21-1 and 21-2 for measurement of the groundwater levels. The groundwater levels in the monitoring wells were measured on December 3, 2021. The groundwater level depth and elevations are summarized in Table 4.4.

Table 4.4 – Summary of Groundwater Levels

Borehole/Test Pit Number	Groundwater Depth (metres)	Groundwater Elevation (metres)	Date
21-1	1.5	82.3	December 3, 2021
21-2	0.8	85.7	December 3, 2021

The groundwater levels may be higher during wet periods of the year such as the early spring or following periods of precipitation.

4.9 Hydraulic Test Results

The results of the hydraulic testing carried out in the well screens are provided in Appendix E. A summary of the recovery measurements made during the hydraulic testing carried out by introducing/removing a slug into the well screens is provided in Table 4.5.

Table 4.5 – Summary of Falling Head Test Results

Borehole	Geological Material Tested	Static Groundwater Depth (metres bgs[1])	Slug Displacement (metres)	Recovery Time (minutes)	Recovery[2] (percent)
21-01	Glacial Till	1.53	1.05	1	100

Borehole	Geological Material Tested	Static Groundwater Depth (metres bgs[1])	Slug Displacement (metres)	Recovery Time (minutes)	Recovery[2] (percent)
21-02	Glacial Till	0.84	0.54	3	87

Notes:
1. Static groundwater level measured from ground surface.
2. Observed displacement greater or less than the slug displacement is often caused by rapid removal of the slug, which is captured by the datalogger, measuring at 0.5-second intervals.

A summary of the recovery measurements made during the rising head test carried out by removing the slug from the well screens is provided in Table 4.6.

Table 4.6 – Summary of Rising Head Test Results

Borehole	Geological Material Tested	Static Groundwater Depth (metres bgs[1])	Slug Displacement (metres)	Recovery Time (minutes)	Recovery[2] (percent)
21-01	Glacial Till	1.53	0.58	1.5	100
21-02	Glacial Till	0.75	0.68	15	98

Notes:
1. Static groundwater level measured from ground surface.
2. Observed displacement greater or less than the slug displacement is often caused by rapid removal of the slug, which is captured by the datalogger, measuring at 0.5-second intervals.

Hydraulic conductivities calculated from the hydraulic test (falling/rising head tests) results are provided in Table 4.7.

Table 4.7 – Calculated Hydraulic Conductivities

Borehole	Geological Material Monitored	Calculated Hydraulic Conductivity, k (m/s)[1,2]	
		Falling Head Test by Introducing a Slug	Rising Head Test by Removing a Slug
21-01	Glacial Till	8×10^{-5}	8×10^{-5}
21-02	Glacial Till	2×10^{-5}	5×10^{-6}

Notes:
1. The hydraulic conductivities were calculated using the Hvorslev analysis.
2. Displacement volume of slug used in analysis for all boreholes.

The hydraulic conductivities calculated from the rising and fall head test completed in the glacial till boreholes ranged from 5×10^{-6} to 8×10^{-5}. The calculated hydraulic conductivity are generally within the literature values (Freeze and Cherry, 1979) for glacial till, which has a hydraulic conductivity ranging from 5×10^{-12} to 5×10^{-6} m/s. The slightly higher in situ hydraulic conductivity likely results from the high gravel and sand content in the glacial till of 19 and 43% respectively, which is displayed in table 4.2.

4.10 Chemistry Relating to Corrosion

One soil sample obtained from borehole 21-01 was sent to Paracel Laboratories for basic chemical testing relating to corrosion of buried concrete and steel. The results of chemical testing are provided in Appendix C and summarized in Table 4.8 below.

Table 4.8 – Summary of Corrosion Testing

Parameter	Borehole 21-1 Sample 3
Chloride Content (µg/g)	27
Resistivity (Ohm.m)	63.9
Conductivity (µs/cm)	157
pH	7.86
Sulphate Content (µg/g)	23

4.11 Groundwater Management Options

To assess groundwater management options, groundwater samples were collected from the monitoring well 21-02. These samples were collected in laboratory supplied bottles using a low-flow peristaltic pump with disposable tubing. Static groundwater levels were measured in all wells prior to sampling on December 13, 2021, using a Heron Instruments oil/water interface meter. Free petroleum product was not detected in the monitoring well. Samples were collected following a period of stabilization, which was monitored using a multi-parameter probe. The samples were submitted to a CALA-accredited laboratory for following parameters: pH, electrical conductivity, total suspended solids (TSS), volatile suspended solids, total phosphorous, Total Kjeldahl Nitrogen (TKN), total PHCs, volatile organic compounds, acid, base-neutrals extractables, organochloride pesticides, polychlorinated biphenyls, and dissolved and total metals.

Water samples were also taken from the Rideau River adjacent to the project site and analyzed for alkalinity, hardness, pH, TSS, and turbidity to gather baseline water quality information.

Groundwater analytical results were compared to the City of Ottawa Sewer Use By-Law, more specifically to the Sanitary and Combined Sewer and Storm Sewer use limits. Water quality

analytical results are presented in Appendix F along with their respective Laboratory certificates of analysis.

The TSS levels in monitoring well 21-02 displayed levels of 402 mg/L, which is above the City of Ottawa Storm Sewer use limit of 15 mg/L, and the City of Ottawa Sanitary and Combined Sewer use limit of 350 mg/L. Removal of suspended solids with filter bags and appropriate sediment control will be necessary before discharging groundwater to local sewers.

Based on the results of the water quality sampling, the groundwater can be discharged to a combined/sanitary sewer after obtaining an approval from the City of Ottawa Sewer Use Office in the form of a City of Ottawa sewer use agreement. Groundwater may be discharged to a storm sewer following the implementation of sedimentation control measures and the removal of TSS. A City of Ottawa sewer use agreement will be required prior to discharging to storm sewers. To note, manganese exceeds the storm sewer criteria; however, elevated manganese concentrations are common in the Ottawa area and a variance should be requested from the City of Ottawa sewer use office. If a variance for manganese cannot be obtained, discharge to sanitary/combined sewer may be required.

5.0 CHARACTERIZATION OF HYDROGEOLOGIC SETTING

The general location of the subject site and details of hydrogeologically relevant features (location of the proposed water takings, identified well records within the study area, provincial geology layers, and watercourses and drainage features) are presented in Figures 1 through 4. A preliminary conceptual site plan is provided in Appendix B, defining the locations of construction and depths of services. The land use in the study area is primarily residential.

5.1 Review of Water Well Records

The purpose of the well survey is to identify existing water wells in the vicinity of the subject site that may be susceptible to adverse impacts due to the proposed water taking.

Drinking Water Well Records were retrieved from the Ontario Ministry of Environment, Conservation and Parks (MECP) online map of well records for an approximate 500 metre radius around the proposed subject sites. It is noted that the well records do not include owner's names or addresses and, therefore, it is not possible to identify the exact locations of the wells provided in the search results. However, the locations of the water wells, based on the UTM coordinates provided in the Water Well Record search results, were plotted on Figure A4.

A total of 169 well records were identified within 500 metres of the site and are classified into the following groups:

- Domestic Wells – 145 wells;
- Commercial Wells – 1 well;

- Livestock Wells – 3 wells;
- Monitoring and Test – 3 wells; and
- Unknown (Not Listed) – 17 wells.

A summary of the 169 MECP Water Well Records is provided in Appendix G. The recorded well depths range from 7.6 to 77.7 metres below ground surface (n = 144), with a median well depth of 21.3 metres and a median recorded depth to bedrock of 9.1 metres (n = 120). Static water level measurements in these wells ranged from 0.6 to 18.3 mbgs, with a median value of 4.6 mbgs (n = 140).

Public well records were examined to assess nearby potential drinking water wells, which are defined here as all commercial, domestic, industrial, irrigation, municipal, public, and livestock well water uses. Well casing lengths for this subset of wells ranged from 1.4 to 28.0 mbgs (n = 138), and their year of installation ranged from 1949 to 2019. Well records indicate that the surrounding overburden is composed mostly of clay, with some deposits of sand and gravel. Bedrock is primarily identified as limestone, with occurrences of sandstone and shale bedrock. Water bearing zones for these wells were noted between 7.6 and 75.9 mbgs. The well records suggest that it is likely that active drinking water well users are present within 500 metres of the project site. Despite the availability of a municipal water supply servicing much of the area, several residences remain on private services.

5.2 Surficial and Bedrock Geology Mapping

Surficial geological and drift thickness maps (Ontario Geologic Survey, 2010) of the area indicate that the site is underlain by 5 to 15 metres of fine-textured glaciomarine deposits consisting of silt and clay, with minor sand and gravel atop bedrock terrain (Figure A2, Appendix A). A small portion of the site to the west (closest to Rideau Valley Dr.) is underlain by a stone-poor, sandy silt, to silty sand-textured till. Bedrock geology maps (Ontario Geologic Survey, 2011) indicates the bedrock is composed of dolostone and sandstone of the Beekmantown Group (Figure A3, Appendix A). Fill material, asphalt and subbase material associated with the roadway should be expected throughout the site.

5.3 Topography and Groundwater Flow Direction

The ground surface elevation across the subject site is generally flat, ranging from approximately 87 to 92 metres above sea level, sloping toward the Rideau River. Groundwater flow often reflects topographic features and typically flows toward nearby lakes, rivers and wetland areas. Localized groundwater flow may also be influenced by local topographical features, subsurface service trenches and other factors. Overall groundwater flow may also be influenced by the regional geology, topography, and recharge/discharge areas on and off the subject site.

5.4 Geological Stratigraphic Framework

A summary of the geological stratigraphic framework in the vicinity of the proposed water taking is provided in Table 5.1

Table 5.1 – Summary of Geological Stratigraphic Framework

Stratigraphic Unit	Generalized Composition	Thickness (m)
Overburden	• Topsoil, pavement structure, silty clay, silty sand, and till	> 3.8
Bedrock	• Limestone/Dolostone and Sandstone	Unknown

5.5 Characterization of Physical Hydrogeology

The groundwater levels measured during the field investigation indicate that the groundwater level within the overburden aquifer can be found at a depth of approximately 0.8 to 1.5 metres below ground surface. The overburden aquifer is unconfined. The groundwater levels may be higher during wet periods of the year such as the early spring or following periods of heavy precipitation.

5.6 Local Surface Water Features

The northeast section of the site boarders the shore of the Rideau River. No other significant surface water features are in close proximity to the site.

5.7 Other Background Information

Based on available mapping, the proposed water taking is not located within provincially significant wetlands. No significant natural features were identified within the study area.

A search of the MECP PTTW database (https://www.ontario.ca/environment-and-energy/map-permits-take-water; accessed on March 14, 2022) identified one (1) active PTTW within 500 m of the proposed excavations. PTTW number 3744-AYCNFY is located approximately 430 metres from the site. The purpose of the permit is construction dewatering for surface water and groundwater sources. Given the distance separating the two projects and the shallow depth of the excavations at the site, dewatering associated with the installation of services described herein is not likely to interfere with dewatering activities covered under permit 3744-AYCNFY.

6.0 CALCULATION OF WATER TAKING NEEDS

6.1 Groundwater Calculations

Based on the water levels measured during the geotechnical investigation, the groundwater is expected to be approximately 0.8 to 1.5 m below ground surface within the site boundaries; for the purpose of the water taking calculation, the water level was assumed to be 0.5 metres. To simplify the groundwater calculations and to provide a conservative estimate of groundwater taking needs, we assumed that the subject site is underlain by a continuous, unconfined overburden aquifer, 8 metres in thickness. Excavations will extend into the ground, up to a maximum excavation depth of 3 metres. Groundwater lowering is expected to be approximately 3 metres, which is 0.5 metre below the proposed maximum excavation depth. The calculations within Appendix H account for a single 30-metre trench.

The measured hydraulic conductivities for the site ranged from 5×10^{-6} to 8×10^{-5} m/s within the overburden formation. A conservative estimate of the hydraulic conductivity of 1×10^{-4} m/s was used for the dewatering calculations.

Although the value used for hydraulic conductivity and the hydraulic head calculations may be conservative, this is not considered to be problematic for the impact assessment as the calculated radius of influence and dewatering volumes will be less for lower hydraulic conductivity conditions encountered during construction.

The parameters used in the groundwater taking needs calculations are summarized in Table 6.1.

Table 6.1 – Summary of Parameters Input for Groundwater Taking Calculations

Dewatering Type	Hydraulic Conductivity (m/s)	Saturated Aquifer Thickness – H (m)	Water Head at Excavation – h_0 (m)
Excavation Dewatering	1×10^{-4}	8.0	4.5

The calculated groundwater taking needs for the various sources and the above noted parameters and the equations used, variable definitions, values used and references are given on the calculation worksheets provided in Appendix H. The calculated radius of influence and maximum calculated groundwater taking volume for each groundwater source are summarized in Table 6.2.

Table 6.2 – Summary of Groundwater Taking Needs

Radius of Influence (m)	Calculated Groundwater Taking Per Source (litres per day)	Calculated Groundwater Taking Per Source (litres per day) Safety Factor (x 2)[2]	Maximum Rate Per Source[1] (litres per minute)
105	417,000	834,000	1,738

Notes: 1. Maximum rate calculated for an 8-hour period.
2. Safety factor of two (2) applied to account for possible variations in hydrogeological conditions, transient (short-term) conditions upon initiation of pumping and dewatering methodology by the contractor as well as stormwater infiltrating into the open excavation.

In order to provide maximum flexibility for times of day for dewatering, we request that the time period of water taking be maximized at 24 hours per day. The maximum flow rate was estimated assuming a worst-case scenario (i.e., maximum daily water taking over an eight-hour period).

The calculated total groundwater taking is 834,000 litres per day per source. A safety factor of two was applied to the dewatering sources to account for possible variations in hydrogeological conditions and dewatering methodology by the contractor as well as storm water infiltrating into the open excavation. The safety factor is also in place to account for rapid initial dewatering to reach steady state conditions. It is assumed that up to three excavations may be open simultaneously, resulting in a total water taking for the purpose of the PTTW application of 2,502,000 litres per day. These water taking calculations are for the purpose of a the PTTW application and are not intended for dewatering design.

7.0 IMPACT ASSESSMENT

The following sections discuss the proposed water taking activities and the potential for water quantity or quality interference for existing groundwater users, natural functioning of ecosystems, and/or physical characteristics of the area (e.g., land stability, subsidence, etc.). The potential ecological receptors, groundwater users and dewatering sources are illustrated on Figure 4.

7.1 Impact to Existing Groundwater Users

Most of the wells identified in the online MECP Water Well Record search were completed in the bedrock aquifer, not the shallow overburden aquifer that will be dewatered during construction. Given that construction dewatering has a radius of influence of dewatering limited to a maximum of 105 m within the overburden, residents relying primarily on well water from the regional bedrock aquifer for their potable water needs are not anticipated to be at risk of adverse impacts.

However, there is uncertainty regarding the presence of public, domestic, agricultural, or commercial well users who may be using wells within the overburden aquifer. Several well records within 500 metres of the site suggest that certain wells are located within the overburden, beneath a layer of clay. Additionally, the details regarding well and casing depths for certain wells are incomplete. Given the radius of influence of approximately 105 metres, approximately 32 residences could theoretically be impacted should they be on wells located within the overburden. Thus, a monitoring and mitigation plan is recommended to manage adverse impacts to well water users in the area during the installation of proposed services (see section 8.2).

7.2 Impact to Surface Water and Natural Functions of the Ecosystem

The Rideau River is located along the boundary of the East section of the site.

Groundwater will be discharged to approved City of Ottawa Sanitary/Combined or Storm sewers following guidelines and water quality restrictions provided from the City of Ottawa Sewer Use Office. Should the groundwater fail to meet City of Ottawa Sewer Use requirements, groundwater will receive additional on-site treatment or otherwise be pumped into tankers and transported to an approved facility for disposal.

7.3 Other Potential Impact Considerations

Based on findings of the geotechnical investigation (GEMTEC, 2021) and anticipated water taking requirements, significant settlement of the overburden is not expected. It is not expected that short term pumping during excavation will have a significant effect on nearby structures given that most of the anticipated drawdown will occur within the till unit. In effect, it is anticipated that the thickness of saturated silty clay that may be dewatered at the site is less than 1 metre. Furthermore, it should be noted that the calculations of radius of influence of dewatering assume steady state conditions are reached. However, the proposed open cut excavations remain open for a short period of time therefore steady state will not likely be reached and the actual radius of influence will likely be less than predicted steady state values. As a result, settlement resulting from construction dewatering from the open trenches is not anticipated to be a concern at the site.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 Summary of Results and Impact Assessment

A total of 169 wells identified in the online MECP Water Well Record are located within 500 metres of the project site. Most of the wells are bedrock supply wells for nearby residential properties. The private residences surrounding the site are not likely to rely on groundwater from the shallow overburden aquifer that may be affected by construction activities; however, uncertainty remains regarding the presence of overburden well users. Overburden wells may be impacted within the area of influence of approximately 105 metres. A monitoring and mitigation plan is recommended to manage adverse impacts to overburden well users.

Groundwater will be discharged to the City of Ottawa Sanitary/Combined or Storm Sewers pending approval from the City of Ottawa Sewer Use Office, and no discharge to the natural environment will occur. If groundwater quality issues are observed or the groundwater quality deteriorates during construction, groundwater will receive additional on-site treatment or otherwise be pumped into tankers and transported to an approved facility for disposal.

The hydrogeological investigation indicates that the proposed construction dewatering is not anticipated to cause significant adverse impacts on or off the subject site with respect to surface water or bedrock groundwater quality. A monitoring plan is recommended to manage adverse impacts to any overburden well users present within the area of influence.

The geotechnical investigation (GEMTEC, 2021) identified no potential soil settlement concerns based on the soil properties at the site. It is also anticipated that the radius of influence of dewatering will be limited and smaller than predicted values due to a combination of the short period of time during which excavations remain open and the fine-grained nature of shallow overburden deposits preventing drawdown from reaching steady state conditions within that timeframe. As a result, a geotechnical risk management program is not required based on our current understanding of site conditions.

8.2 Proposed Monitoring Plan

Daily water taking monitoring is required in order to maintain compliance with the PTTW. A record of water taking volumes, rates and durations should be maintained for the approved water taking source. The flow rates for each pump used should be measured by filling a container of known volume with the discharge from the hose and recording the time required to fill the container. Flow rates should be checked periodically and under different pumping conditions (e.g., deep standing water in the excavation vs. ‘maintenance pumping’ to maintain the water level in an excavation). The total number of hours spent pumping, the number and types of pumps used for dewatering and the estimated flow rates should be recorded daily and be made available for inspection by the Ministry of the Environment immediately upon request.

Due to the identified potential for overburden well users in the area to be impacted, should they exist, it is proposed that a monitoring and mitigation plan to manage possible impacts associated with the proposed construction dewatering be prepared. Based on satellite images and PID delineations provided by the City of Ottawa, there are about 32 residences that are within the approximate 105 metre area of influence of the proposed construction. A water well survey is recommended to inform this planning that will include the following components:

- Collect data to confirm the existence, location, and use of overburden wells;
- Sample overburden wells being used for drinking or commercial purposes within the area of influence for subdivision package parameters and volatile organic compounds (pending approval from the homeowners);

- Compare water quality results for the overburden wells with the Ontario Drinking Water Quality Standards; and
- Provide recommendations regarding the monitoring and mitigation plan.

The well survey results will assist in establishing the background conditions for the wells and in the assessment of potential impacts to identified wells by the proposed construction dewatering.

The contractor is expected to adhere to all other conditions in the Permit To Take Water.

8.3 Proposed PTTW Conditions

It is expected that the MECP will impose typical conditions in the PTTW related to the recording of daily water taking rates, impacts on groundwater and surface water resources, etc. A well survey has been requested to manage potential impacts to local groundwater users and is detailed in Section 8.2. No adverse impacts to the functioning of the natural ecosystem were identified and, therefore, no special conditions for the PTTW are proposed (with the exception of those in the proposed monitoring plan above).

8.4 Proposed Contingency Plan

If daily water taking volumes are found to exceed those authorized in the Permit To Take Water, it is recommended that the MECP staff be notified. The water taking volumes will be restricted to maintain compliance with the allowable limits in the Permit To Take Water until measures can be taken to decrease the volumes of water and/or modify the Permit To Take Water.

If adverse impacts on existing groundwater users are reported, dewatering of excavation(s) will be stopped and measures put in place to reduce and/or eliminate the adverse impacts on existing groundwater users. No adverse impacts due to geotechnical issues are anticipated.

If groundwater quality deteriorates and signs of impacts are observed, groundwater will be discharged directly into groundwater tankers and taken off-site to an appropriate groundwater receiver. No groundwater discharge shall be permitted until groundwater quality meets regulatory limits for discharge.

9.0 REFERENCES

- “Geotechnical Investigation - Proposed Residential Development, 1086 Antochi Lane, prepared by GEMTEC (Project No. 100152.004).
- Ontario Geological Survey. 2010. Surficial geology of Southern Ontario. Ontario Geological Survey, Miscellaneous Release-Data 128-Revision 1.
- Ontario Geological Survey. 2011. 1:250 000 scale bedrock geology of Ontario. Ontario Geological Survey, Miscellaneous Release-Data 126-Revision 1.
- Singer, S.N., Cheng, C.K., and Scafe, M.G. 2003. The Geology of Southern Ontario, Second Edition, April 2003.

10.0 LIMITATION OF LIABILITY

This report was prepared for and the work referred to within it has been undertaken by GEMTEC Consulting Engineers and Scientists (GEMTEC) for 1910753 Ontario Inc. It is intended for the exclusive use of 1910753 Ontario Inc. This report may not be relied upon by any other person or entity without the express written consent of GEMTEC, 1910753 Ontario Inc. Nothing in this report is intended to provide a legal opinion.

The investigation undertaken by GEMTEC with respect to this report and any conclusions or recommendations made in this report reflect the best judgments of GEMTEC based on the site conditions observed during the investigations undertaken at the date(s) identified in the report and on the information available at the time the report was prepared. This report has been prepared for the application noted and it is based, in part, on visual observations made at the site, subsurface investigations at discrete locations and depths during a specific time interval, all as described in the report. Unless otherwise stated, the findings contained in this report cannot be extrapolated or extended to previous or future site conditions, portions of the site that were unavailable for direct investigation, subsurface locations on the site that were not investigated directly, or chemical parameters, materials or analysis which were not addressed.

Should new information become available during future work, including excavations, borings or other studies, GEMTEC should be requested to review the information and, if necessary, re-assess the conclusions presented herein.

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report, please do not hesitate to contact our office.

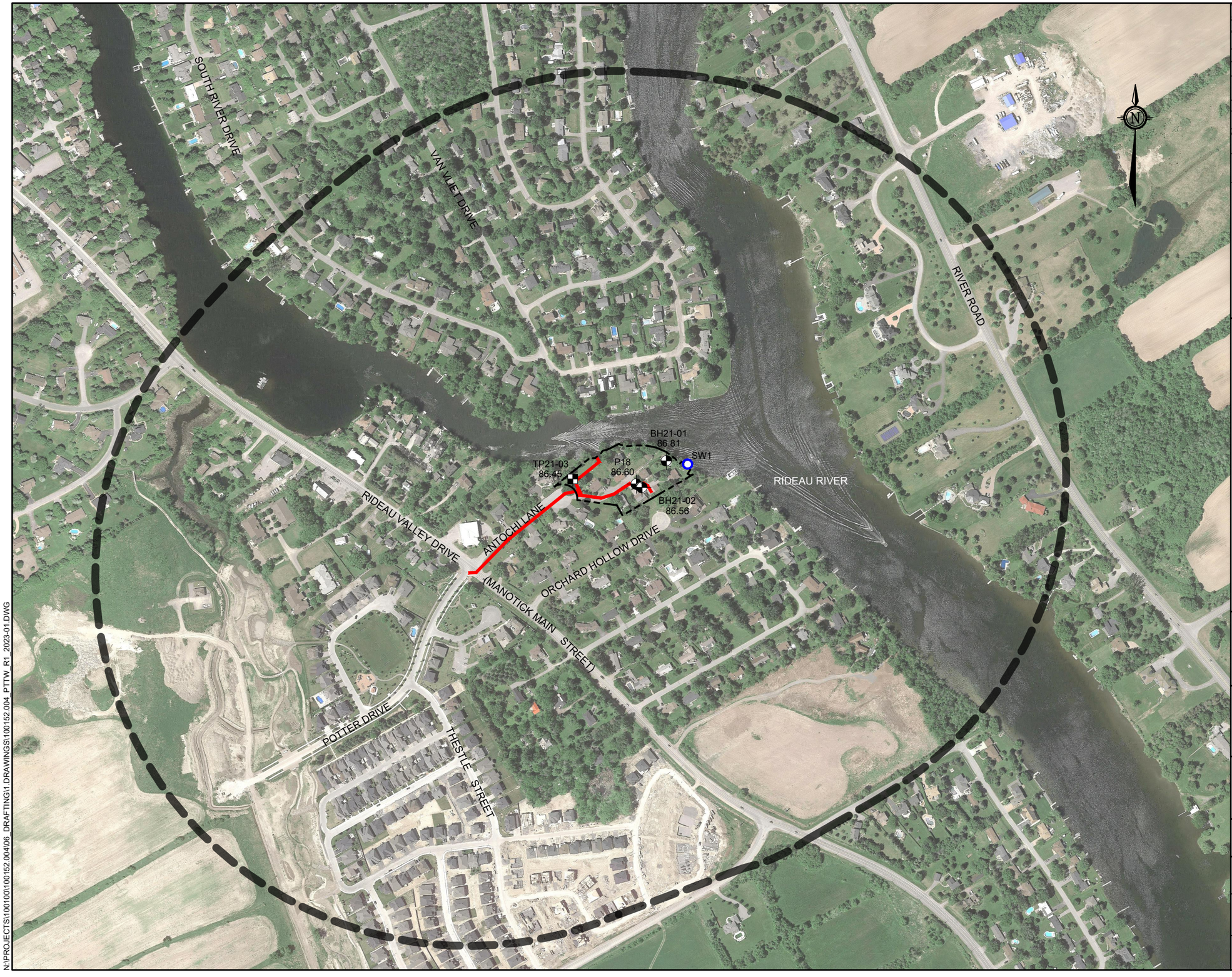
Brent Redmond, M.A.Sc, G.I.T.
Junior Environnemental Scientist

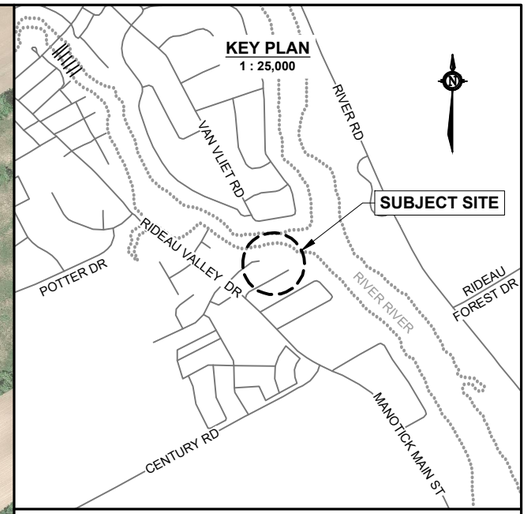
Andrius Paznekas, M.Sc., P.Geo.
Hydrogeologist

BR//JKA/AP

APPENDIX A

Site Plans





LEGEND

BH/ TP # — BOREHOLE/ TEST PIT ID
XX.XX — GROUND SURFACE ELEVATION, IN METRES GEODETIC DATUM

- **BOREHOLE LOCATION** (current investigation by GEMTEC)
- **TEST PIT LOCATION** (current investigation by GEMTEC)
- **SURFACE WATER SAMPLING LOCATION** (current investigation by GEMTEC)
- **APPROXIMATE PROPERTY BOUNDARY**
- **STUDY AREA** (500m RADIUS FROM THE PROPERTY BOUNDARY)
- **AREA OF CONSTRUCTION DEWATERING**

Scale
1:5000
0 100 200 300m

GEMTEC
Consulting Engineers and Scientists
32 Steacie Drive
Ottawa, ON K2K 2A9
Tel: (613) 836-1422
www.gemtec.ca
ottawa@gemtec.ca

Drawing: SITE PLAN

Client: 1910753 ONTARIO INC.

Project: 100152.004

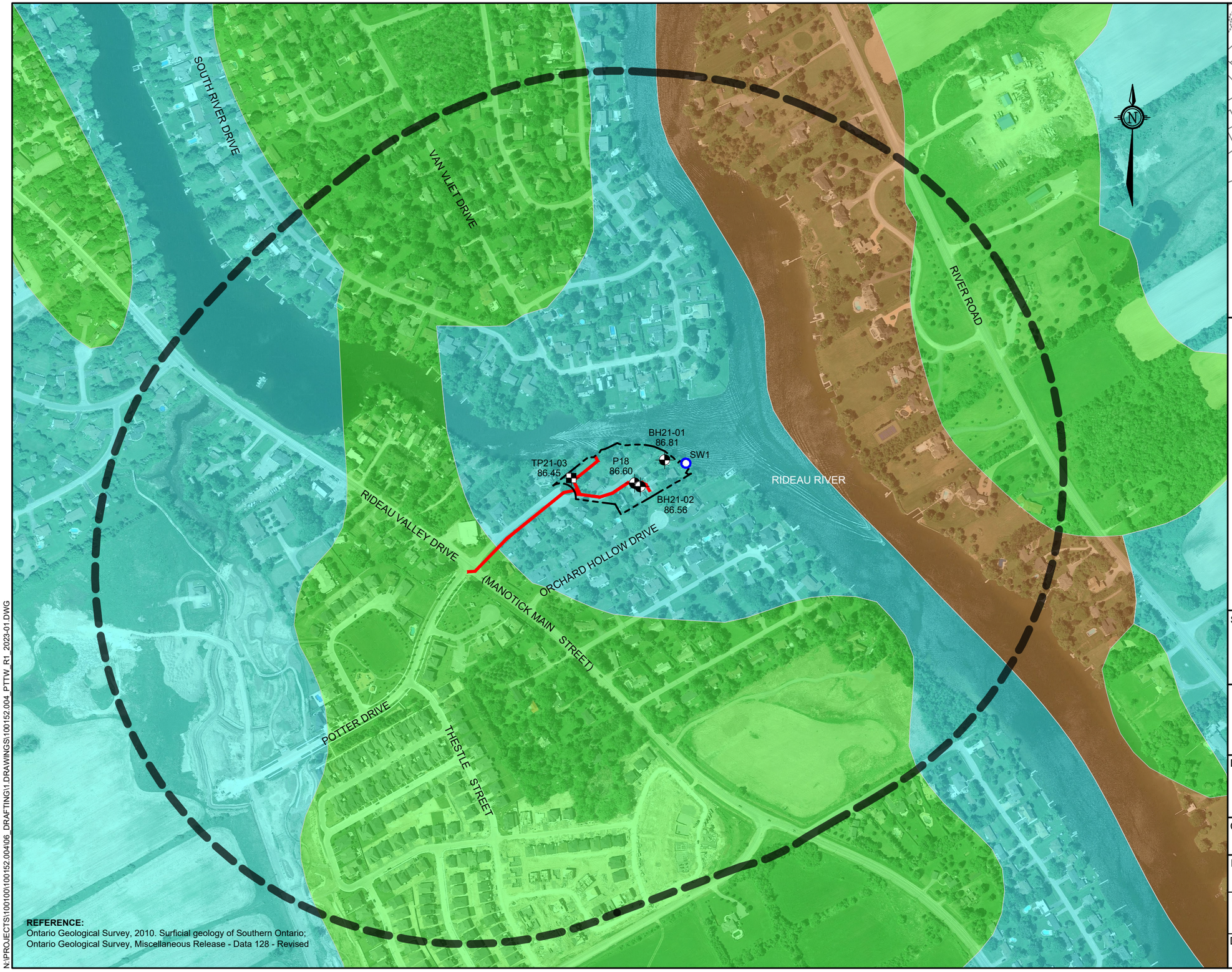
PERMIT TO TAKE WATER
PROPOSED RESIDENTIAL DEVELOPMENT
ANTOCHI LANE
OTTAWA, ONTARIO

Drwn by	Chkd by
S.L.	J.P.

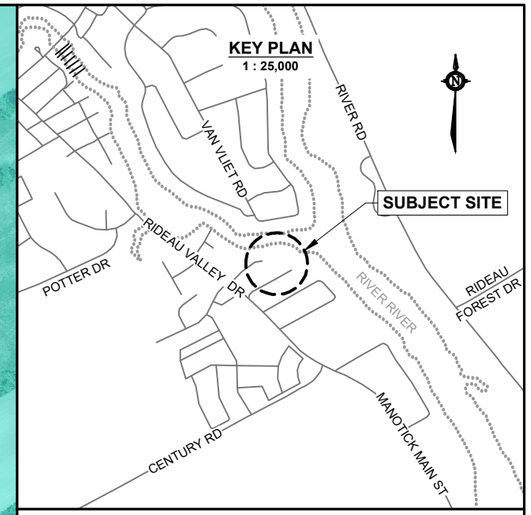
Date: JANUARY, 2023
Rev.: 1

FIGURE A1

N:\PROJECTS\100100\100152.004\06_DRAFTING\1.DRAWINGS\100152.004_PTTW_R1_2023-01.DWG



REFERENCE:
Ontario Geological Survey, 2010. Surficial geology of Southern Ontario;
Ontario Geological Survey, Miscellaneous Release - Data 128 - Revised



LEGEND

- BH/ TP # — BOREHOLE/ TEST PIT ID
- XX.XX — GROUND SURFACE ELEVATION, IN METRES GEODETIC DATUM
- BOREHOLE LOCATION (current investigation by GEMTEC)
- TEST PIT LOCATION (current investigation by GEMTEC)
- SURFACE WATER SAMPLING LOCATION (current investigation by GEMTEC)
- APPROXIMATE PROPERTY BOUNDARY
- STUDY AREA (500m RADIUS FROM THE PROPERTY BOUNDARY)
- AREA OF CONSTRUCTION DEWATERING

SURFICIAL GEOLOGY

- 5B, TILL
- 10A, FINE-TEXTURED GLACIOMARINE DEPOSITS
- 19, MODERN ALLUVIAL DEPOSITS

Scale
1:5000
0 100 200 300m

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Tel: (613) 836-1422
www.gemtec.ca
ottawa@gemtec.ca

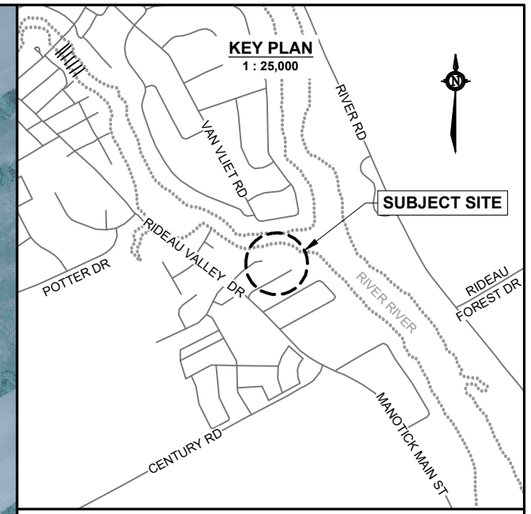
Drawing
SURFICIAL GEOLOGY

Client
1910753 ONTARIO INC.

Project		
100152.004		PERMIT TO TAKE WATER PROPOSED RESIDENTIAL DEVELOPMENT ANTOCHI LANE OTTAWA, ONTARIO
Drwn by: S.L.	Chkd by: J.P.	
Date: JANUARY, 2023	Rev.: 1	**FIGURE A2**

N:\PROJECTS\100100\100152.004\06_DRAFTING\1.DRAWINGS\100152.004_PTTW_R1_2023-01.DWG

REFERENCE:
Armstrong, D.K. and Dodge, J.E.P, 2007.
Paleozoic geology of Southern Ontario;
Ontario Geological Survey, Miscellaneous Release - Data 2019



LEGEND

- BH/ TP # — BOREHOLE/ TEST PIT ID
- XX.XX — GROUND SURFACE ELEVATION, IN METRES GEODETIC DATUM
- BOREHOLE LOCATION (current investigation by GEMTEC)
- TEST PIT LOCATION (current investigation by GEMTEC)
- SURFACE WATER SAMPLING LOCATION (current investigation by GEMTEC)
- APPROXIMATE PROPERTY BOUNDARY
- STUDY AREA (500m RADIUS FROM THE PROPERTY BOUNDARY)
- AREA OF CONSTRUCTION DEWATERING

BEDROCK GEOLOGY

- 53, DOLOSTONE, SANDSTONE

Scale
1:5000
0 100 200 300m

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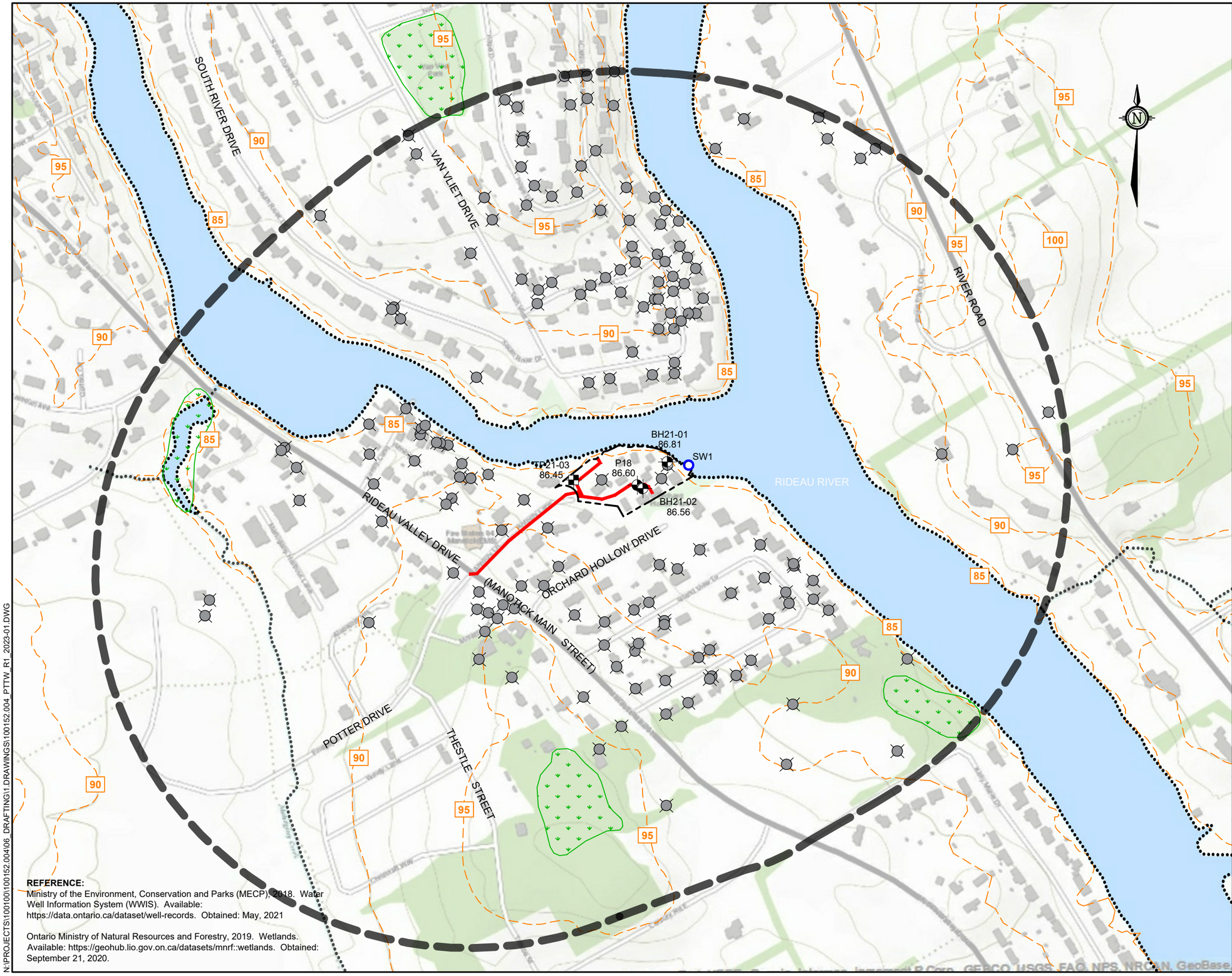
www.gemtec.ca
ottawa@gemtec.ca

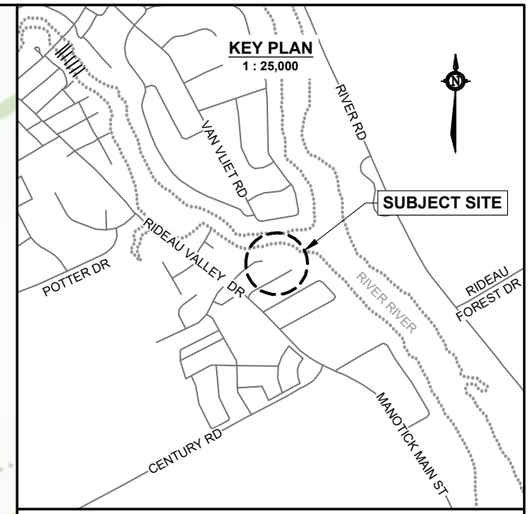
Drawing
BEDROCK GEOLOGY

Client
1910753 ONTARIO INC.

Project		
100152.004		PERMIT TO TAKE WATER PROPOSED RESIDENTIAL DEVELOPMENT ANTOCHI LANE OTTAWA, ONTARIO
Drwn by: S.L.	Chkd by: J.P.	
Date: JANUARY, 2023	Rev.: 1	**FIGURE A3**

N:\PROJECTS\100100\100152.004\06_DRAFTING\1.DRAWINGS\100152.004_PTTW_R1_2023-01.DWG





LEGEND

- BH/ TP # ← BOREHOLE/ TEST PIT ID
- XX.XX ← GROUND SURFACE ELEVATION, IN METRES GEODETIC DATUM
- **BOREHOLE LOCATION** (current investigation by GEMTEC)
- **TEST PIT LOCATION** (current investigation by GEMTEC)
- **SURFACE WATER SAMPLING LOCATION** (current investigation by GEMTEC)
- **APPROXIMATE PROPERTY BOUNDARY**
- **STUDY AREA** (500m RADIUS FROM THE PROPERTY BOUNDARY)
- **AREA OF CONSTRUCTION DEWATERING**
- 100 **CONTOUR INTERVAL, IN METRES** Ontario Basic Mapping (OBM)
- **SURFACE WATER** Ontario Basic Mapping (OBM)
- **WATER WELL INFORMATION SYSTEM** (WWIS, 2021)
- **UNEVALUATED WETLANDS** OMNFR,2019

Scale
1:5000
0 100 200 300m

GEMTEC
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32 Steacie Drive
Ottawa, ON K2K 2A9
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www.gemtec.ca
ottawa@gemtec.ca

Drawing
WATER TAKING IMPACT ASSESSMENT

Client
1910753 ONTARIO INC.

Project
100152.004

PERMIT TO TAKE WATER
PROPOSED RESIDENTIAL DEVELOPMENT
ANTOCHI LANE
OTTAWA, ONTARIO

Drwn by	Chkd by
S.L.	J.P.

Date
JANUARY, 2023

Rev.
1

FIGURE A4

REFERENCE:
Ministry of the Environment, Conservation and Parks (MECP), 2018. Water Well Information System (WWIS). Available: https://data.ontario.ca/dataset/well-records. Obtained: May, 2021

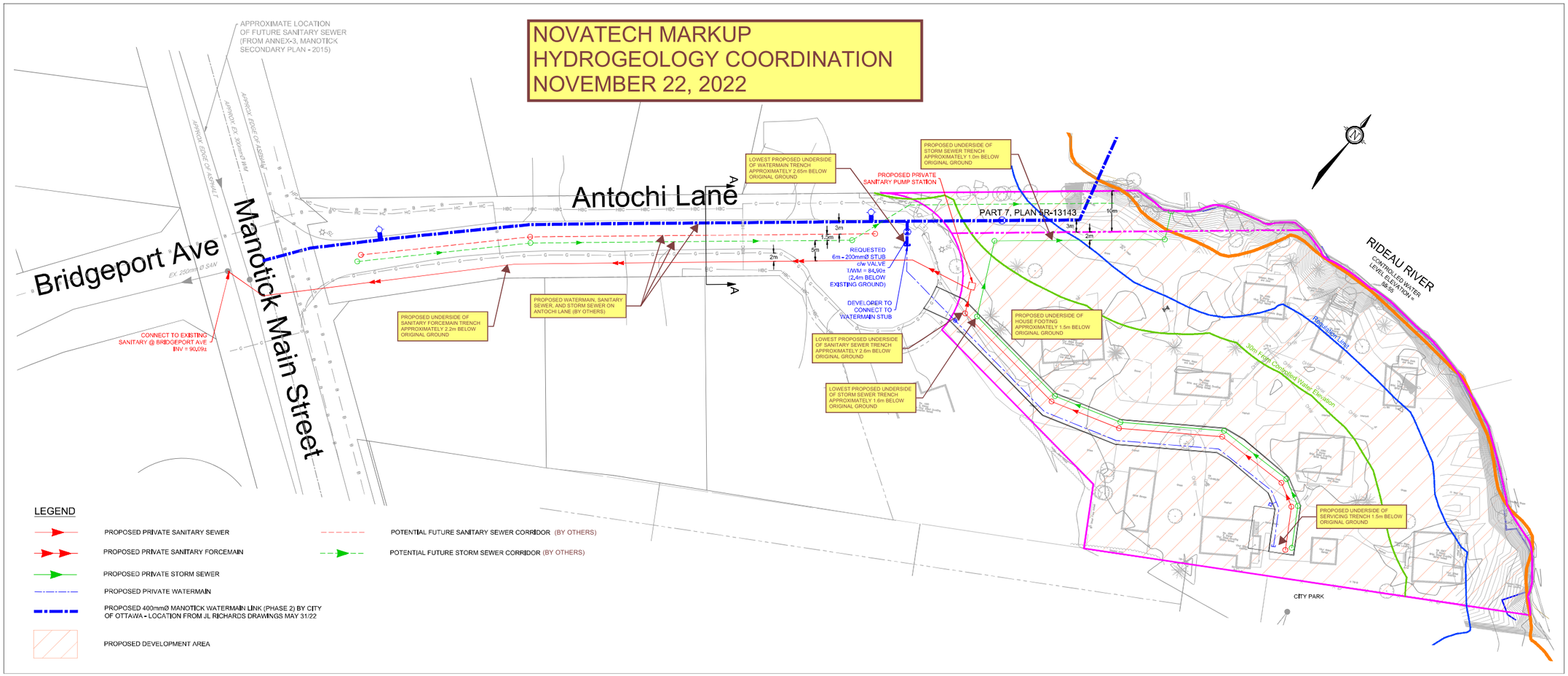
Ontario Ministry of Natural Resources and Forestry, 2019. Wetlands. Available: https://geohub.lio.gov.on.ca/datasets/mnrf::wetlands. Obtained: September 21, 2020.

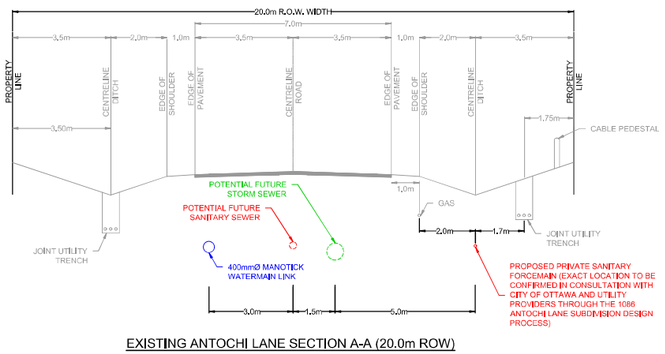
N:\PROJECTS\100100\100152.004\06_DRAFTING\1.DRAWINGS\100152.004_PTTW_R1_2023-01.DWG

APPENDIX B

Construction Drawings

NOVATECH MARKUP
HYDROGEOLOGY COORDINATION
NOVEMBER 22, 2022





EXISTING ANTOCHI LANE SECTION A-A (20.0m ROW)

SCALE 1:100

SOURCE REFERENCE:

Legal Information:

Plan of Survey 5R-13143, Completed by H.A.Ken Shipman Surveying Ltd. October 17, 1989

Topographic Information:

Topographic Plan of Survey, Completed by Annis, O'Sullivan, Vollebekk Ltd. April 29, 2021

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
4.	REVISED CITY WATERMAIN ALIGNMENT	OCT 17/22	AAR
3.	ISSUED FOR DISCUSSION	JUL 20/22	AAR
2.	ISSUED FOR DISCUSSION	JUL 18/22	AAR
1.	ISSUED FOR DISCUSSION		AAR

SCALE 1:500

1:500
0 5 10 15 20

DESIGN: AAR
CHECKED: ARM
DRAWN: AAR
CHECKED: ARM
APPROVED: SMG

FOR REVIEW ONLY

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
MANOTICK, ON
1086 ANTOCHI LANE

DRAWING NAME
CONCEPTUAL SERVICING PLAN

PROJECT No. 120061
REV REV # 4
DRAWING No. 120061-CS

M:\2020\120061\CAD\Design\120061-GSA.dwg - 120061-CS, Oct 17, 2022 - 12:25pm, annajwa

APPENDIX C

Record of Borehole Sheets

Report to: 1910753 Ontario Inc.
Project: 100152.004 (February 3, 2023)

RECORD OF BOREHOLE 21-01

CLIENT: 1384341 Ontario Inc.
PROJECT: Proposed Residential Development, Antochi Lane, Ottawa, Ontario
JOB#: 100152.004
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD2013
BORING DATE: Nov 18 2021

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		86.81							
		TOPSOIL		86.56							
	Power Auger / Hollow Stem Auger (210mm OD)	Very loose, grey brown SILTY SAND, with grey brown silty clay layers		0.25	1	SS	255	3			
1					2	SS	510	3		MH	
		Loose to compact, grey brown SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)		85.49 1.32							
2					3	SS	230	11			
					4	SS	510	5			
3					5	SS	430	14			
				82.92	6	SS	50	>50 for 76 mm			
4		End of Borehole Auger Refusal		3.89							
5											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: NATURAL, REMOULDED
WATER CONTENT, %: W_P, W, W_L
10 20 30 40 50 60 70 80 90

Auger cuttings and bentonite backfill
Bentonite backfill
Filter sand backfill
50 millimetre diameter well screen

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
21/12/03	1.5 ▽	85.3

GEMTEC
Consulting Engineers and Scientists

LOGGED: AN
CHECKED: WAM

GEO - BOREHOLE LOG 100152.004_GINT_BOREHOLE LOGS.GPJ GEMTEC 2018.GDT 10/12/21

RECORD OF BOREHOLE 21-02

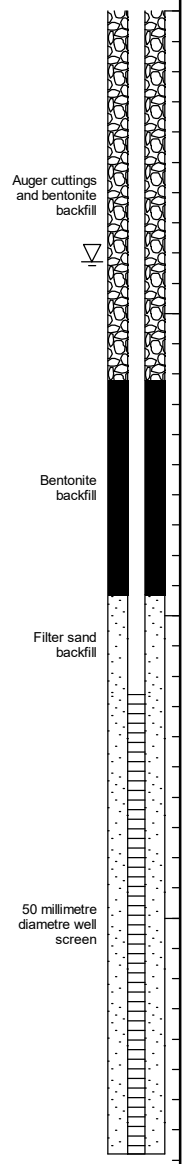
CLIENT: 1384341 Ontario Inc.
PROJECT: Proposed Residential Development, Antochi Lane, Ottawa, Ontario
JOB#: 100152.004
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD2013
BORING DATE: Nov 18 2021

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING
0	Power Auger, Hollow Stem Auger (210mm OD)	Ground Surface		86.56					
		ASPHALTIC CONCRETE		86.46					
		Grey sand and gravel (BASE MATERIAL)		0.13					
		ASPHALTIC CONCRETE		0.18					
		Grey sand and gravel (BASE MATERIAL)			1	GS			
		Stiff, dark grey SILTY CLAY		86.00 0.56					
1		Loose to compact, grey brown SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)		85.57 0.99	2	SS	255	16	
					3	SS	50	10	
2					4	SS	405	4	MH
3					5	SS	430	16	
		End of Borehole Auger Refusal		82.78 3.78					
4									
5									

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P W W_L
10 20 30 40 50 60 70 80 90

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
21/12/03	0.8 ▽	85.7

GEMTEC
Consulting Engineers and Scientists

LOGGED: AN
CHECKED: WAM

GEO - BOREHOLE LOG 100152.004_GINT_BOREHOLE LOGS.GPJ GEMTEC 2018.GDT 10/12/21

RECORD OF TEST PIT 21-03

CLIENT: 1384341 Ontario Inc.
PROJECT: Proposed Residential Development, Antochi Lane, Ottawa, Ontario
JOB#: 100152.004
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD2013
BORING DATE: Nov 18 2021

DEPTH SCALE METRES	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE NUMBER	SAMPLE TYPE	SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION
0	Ground Surface		86.7			10 20 30 40 50 60 70 80 90		
	TOPSOIL		86.3 / 0.4					
	Grey brown SILTY SAND		85.9 / 0.8					
1	Grey brown SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)		85.5 / 1.1					
	End of Test Pit Refusal on cobbles and boulders							
2								
3								
4								
5								

GEMTEC
Consulting Engineers and Scientists

LOGGED: AN
CHECKED: WAM

GEO - TESTPIT LOG 100152.004_GINT_BOREHOLE LOGS.GPJ GEMTEC 2018.GDT 10/12/21

APPENDIX D

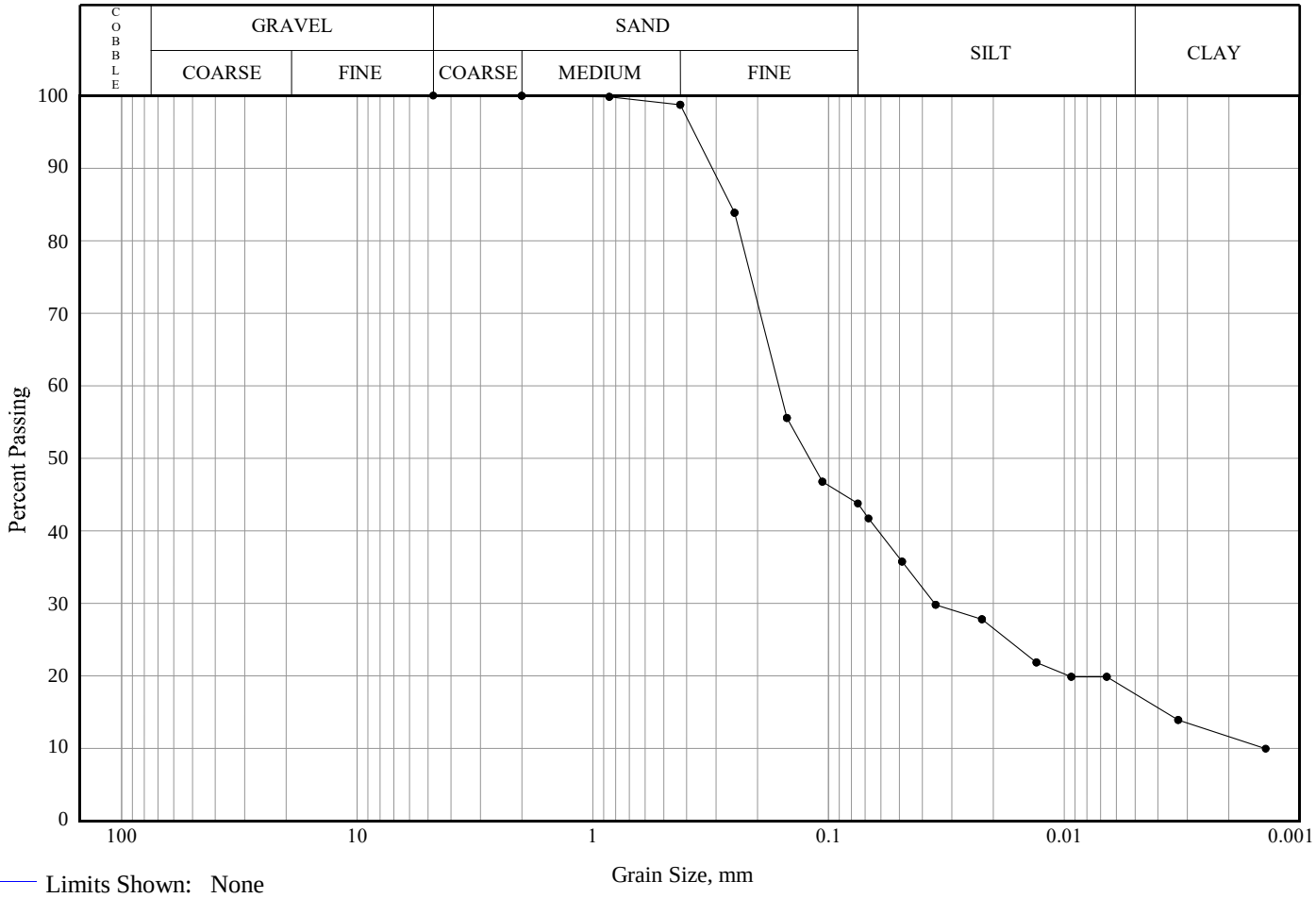
Grain Size Distribution Curves

Report to: 1910753 Ontario Inc.
Project: 100152.004 (February 3, 2023)

GEMTEC
Consulting Engineers and Scientists

Client:	Cavanagh Construction (Developments)
Project:	Geotechnical and Hydrogeological Investigation, Propose
Project #:	100152004

Soils Grading Chart (T88)



Limits Shown: None

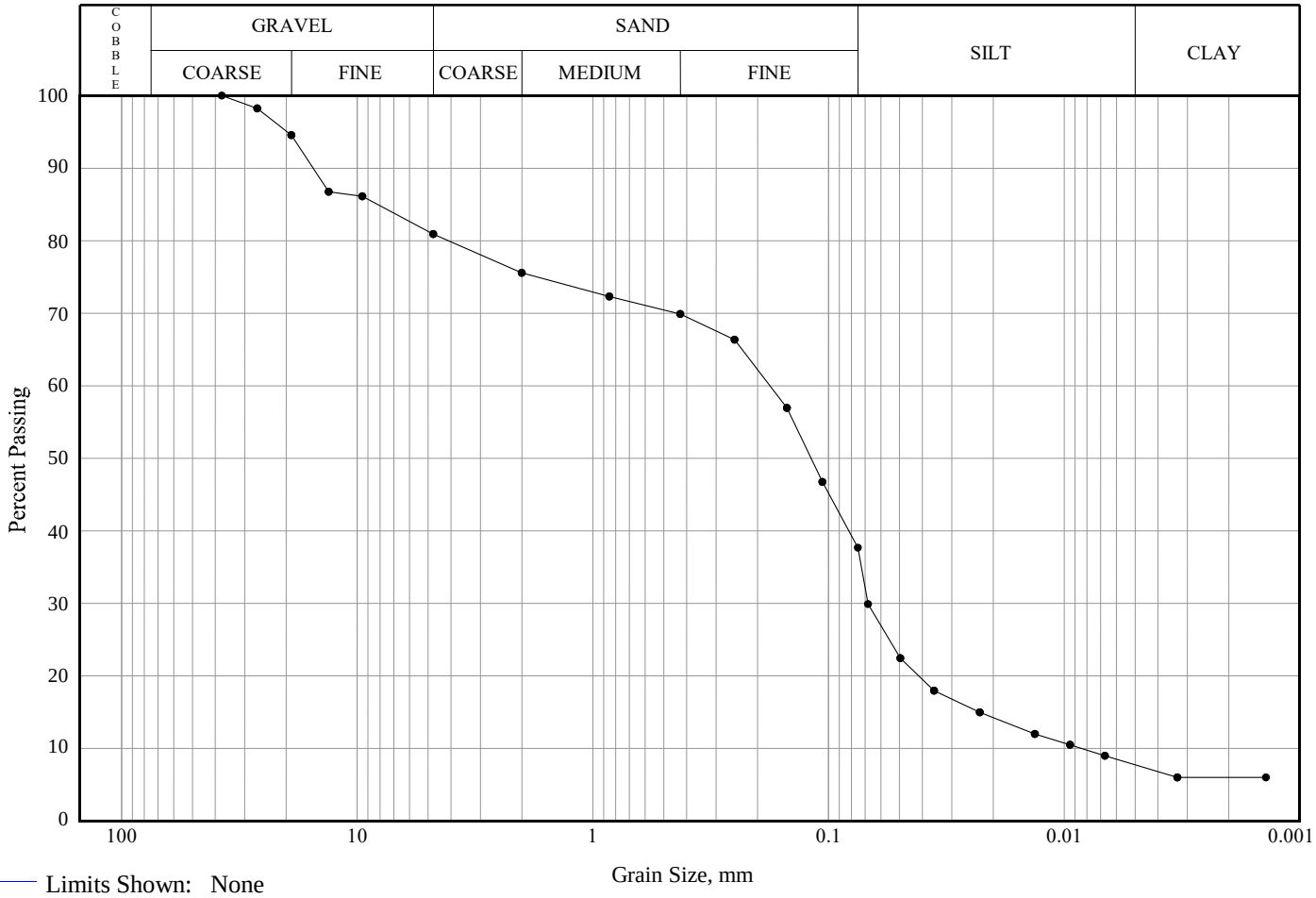
Line Symbol	Sample	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt	% Clay
—●—	SILTY SAND	21-01	SA 2	0.76-1.37	0.0	56.3	26.2	17.5

Line Symbol	CanFEM Classification	USCS Symbol	D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	% 5-75µm
—●—	Silty sand , some clay	N/A	0.00	0.00	0.04	0.12	0.16	0.26	26.2

GEMTEC
Consulting Engineers and Scientists

Client:	Cavanagh Construction (Developments)
Project:	Geotechnical and Hydrogeological Investigation, Propose
Project #:	100152004

Soils Grading Chart (T88)



Limits Shown: None

Line Symbol	Sample	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt	% Clay
—●—	GLACIAL TILL	21-02	SA 4	2.28-2.89	19.1	43.2	29.9	7.7

Line Symbol	CanFEM Classification	USCS Symbol	D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	% 5-75µm
—●—	Silty sand , some gravel , trace clay	N/A	0.01	0.02	0.07	0.12	0.18	8.19	29.9

GEMTEC Consulting Engineers and Scientists	Client	Cavanagh Construction (Developments)	Moisture Content and Density
	Project:	Geotechnical and Hydrogeological Investigation, Proposed Development, Antochi Drive, Ottawa, ON	
	Project #:	100152004	

Borehole / Testpit	Depth	Sample	Description	Date/Time Sampled	Moisture Content, %	Sample Volume, mm^3	Wet Density, kg/m^3	Dry Density, kg/m^3
21-01	0.0-0.61	SA 1		21/11/23 1:07:00 PM	31.88			
21-01	0.76-1.37	SA 2		21/11/25 1:08:33 PM	29.03			
21-01	1.52-2.13	SA 3		21/11/25 1:08:33 PM	7.82			
21-01	2.28-2.89	SA 4		21/11/25 1:08:33 PM	14.00			
21-01	3.05-3.66	SA 5		21/11/25 1:08:33 PM	11.53			
21-01	3.81-3.88	SA 6		21/11/25 1:08:33 PM	12.37			
21-02	0.76-1.37	SA 2A		21/11/25 1:08:33 PM	17.34			
21-02	0.76-1.37	SA 2B		21/11/25 1:08:33 PM	12.61			
21-02	1.52-2.13	SA 3		21/11/25 1:08:33 PM	13.74			
21-02	2.28-2.89	SA 4		21/11/25 1:08:33 PM	24.71			
21-02	3.05-3.66	SA 5		21/11/25 1:08:33 PM	14.22			

APPENDIX E

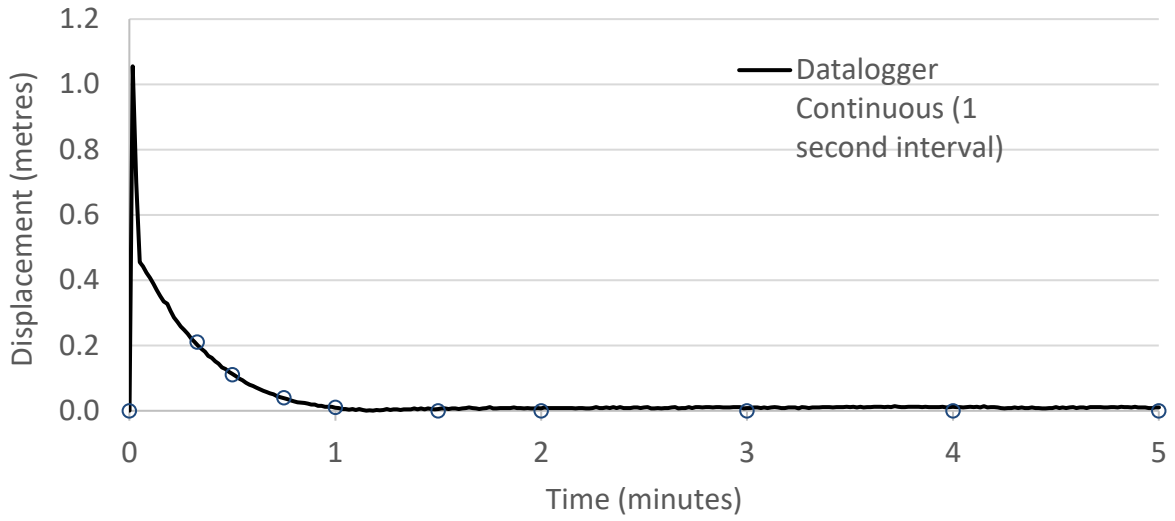
Hydraulic Testing and Analysis

Report to: 1910753 Ontario Inc.
Project: 100152.004 (February 3, 2023)

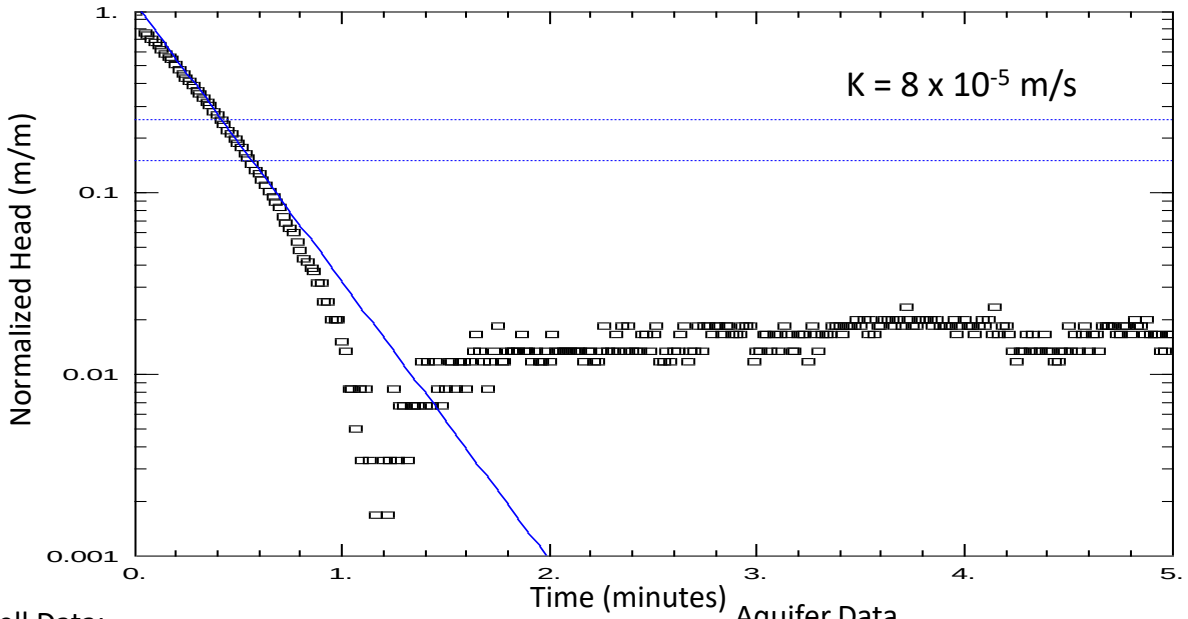
Slug Test Data

FIGURE ___

Borehole 21-01 Falling Head (FH) Test



Borehole 21-01 FH: Hvorslev Analysis



Well Data:

Displacement observed (slug size): 1.05 metres (0.60 m)
Well Depth: 3.83 metres
Screen Length: 1.5 metres
Well Radius: 0.0255 metres

Aquifer Data

Saturated Thickness: 2.3 metres
Anisotropy Ratio (Kz/Kr): 0.1
Aquifer Model: Unconfined, Hvorslev
Static Water Level: 1.53 metres bgs

GEMTEC
Consulting Engineers and Scientists

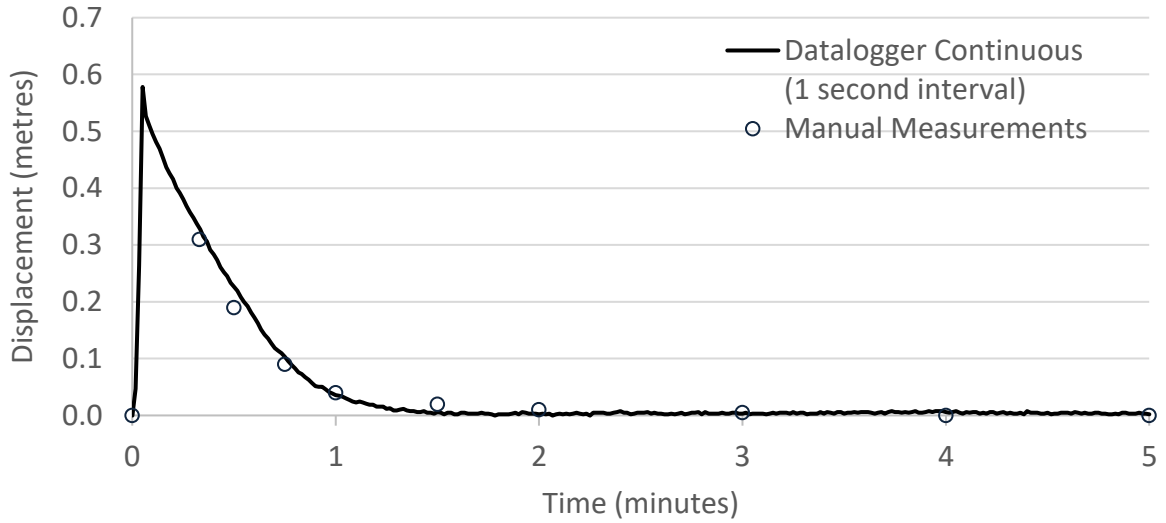
Date: December 2021

Project: 100152.004

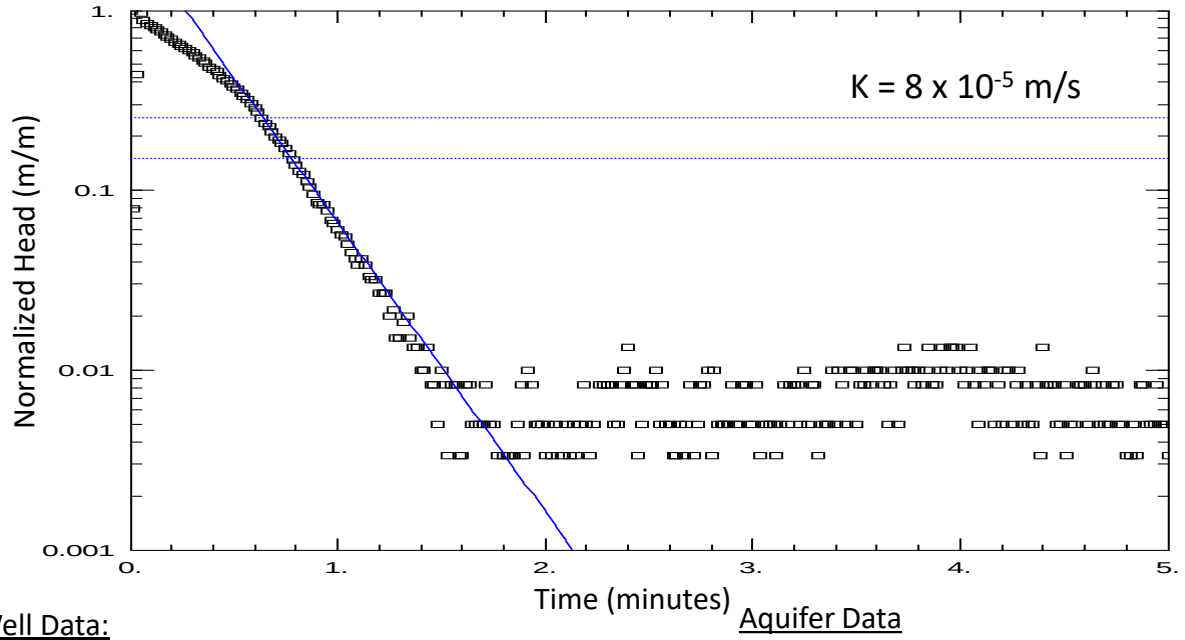
Slug Test Data

FIGURE ___

Borehole 21-01 Rising Head (RH) Test



Borehole 21-01 RH: Hvorslev Analysis



Well Data:

Displacement observed (slug size): 0.58 metres (0.60 m)
Well Depth: 3.83 metres
Screen Length: 1.5 metres
Well Radius: 0.0255 metres

Aquifer Data

Saturated Thickness: 2.3 metres
Anisotropy Ratio (Kz/Kr): 0.1
Aquifer Model: Unconfined, Hvorslev
Static Water Level: 1.53 metres bgs

GEMTEC
Consulting Engineers and Scientists

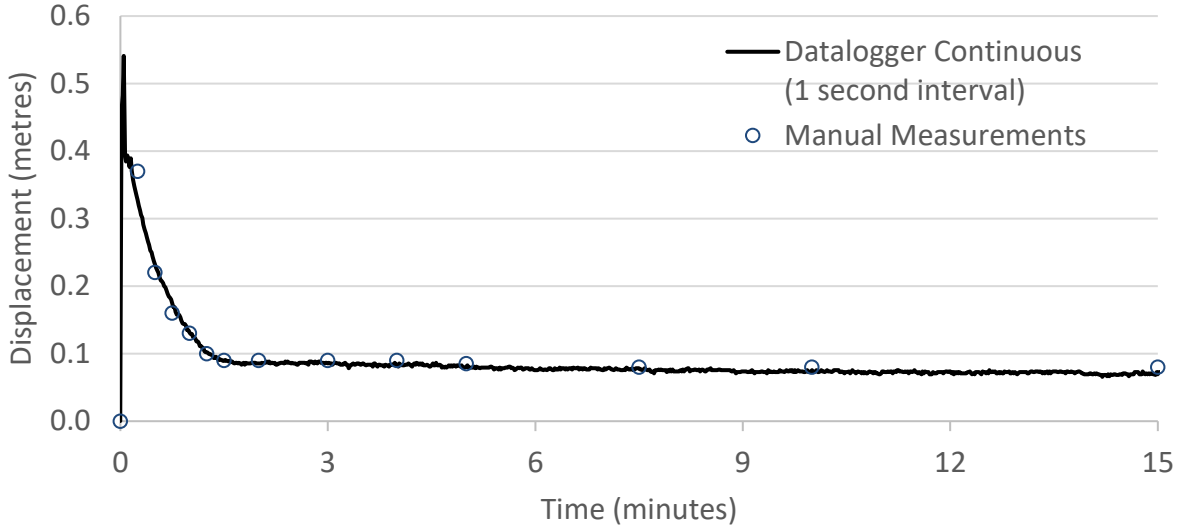
Date: December 2021

Project: 100152.004

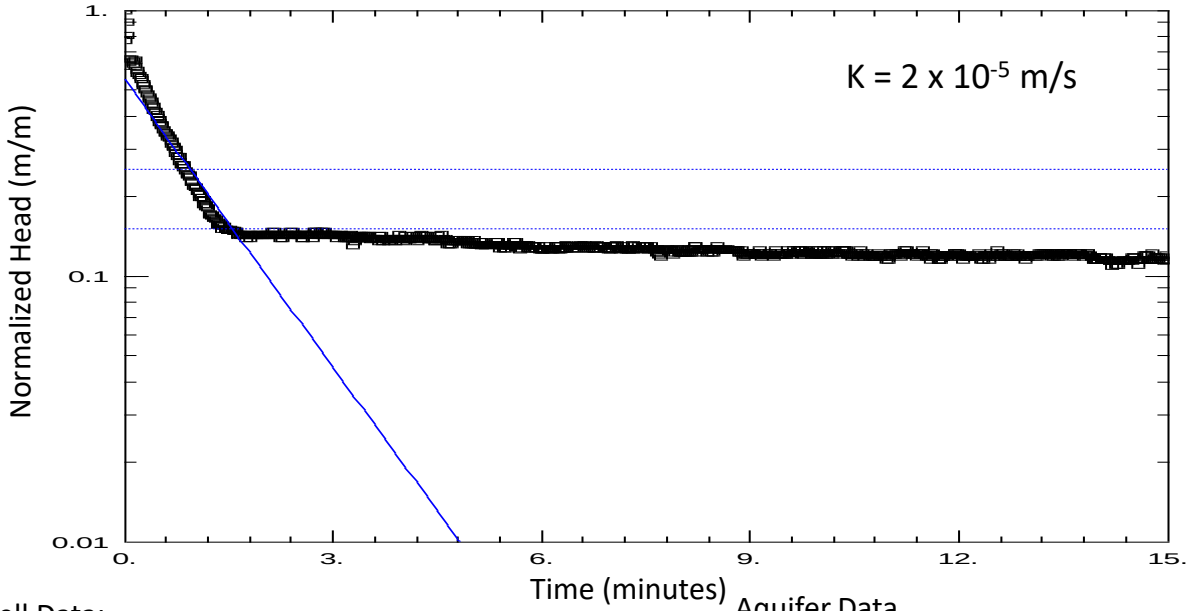
Slug Test Data

FIGURE ___

Borehole 21-02 Falling Head (FH) Test



Borehole 21-02 FH: Hvorslev Analysis



<u>Well Data:</u>
Displacement observed (slug size): 0.54 metres (0.60 m)
Well Depth: 3.70 metres
Screen Length: 1.5 metres
Well Radius: 0.0255 metres

<u>Aquifer Data</u>
Saturated Thickness: 2.9 metres
Anisotropy Ratio (Kz/Kr): 0.1
Aquifer Model: Unconfined, Hvorslev
Static Water Level: 0.83 metres bgs

GEMTEC
Consulting Engineers and Scientists

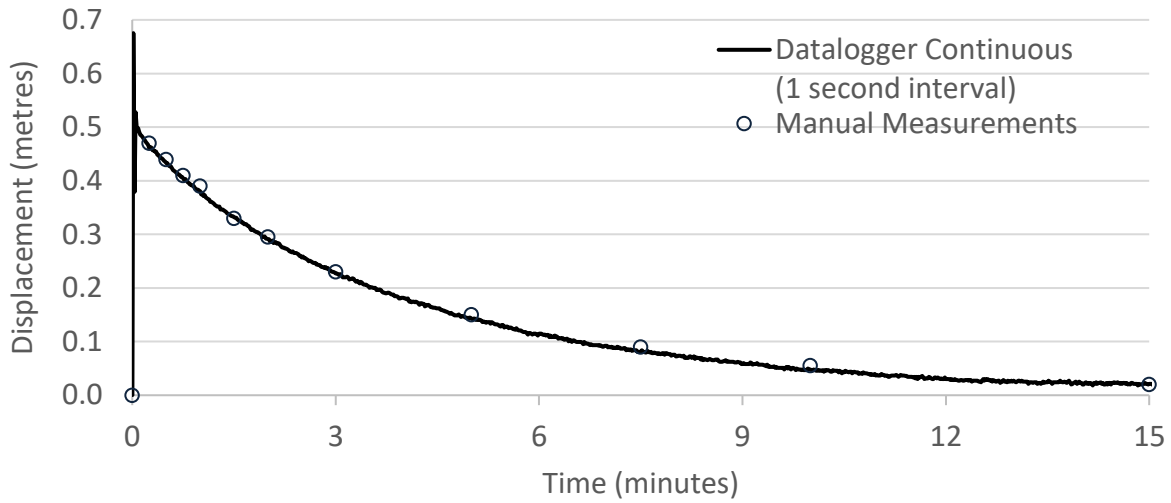
Date: December 2021

Project: 100152.004

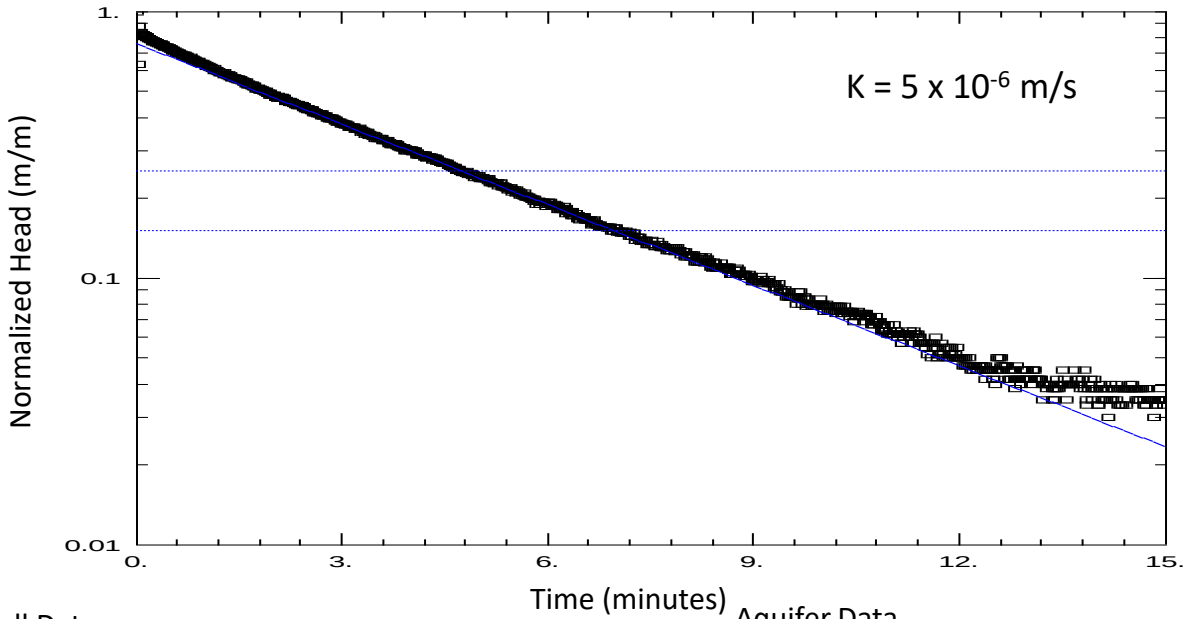
Slug Test Data

FIGURE ___

Borehole 21-02 Rising Head (RH) Test



Borehole 21-02 RH: Hvorslev Analysis



Well Data:

Displacement observed (slug size): 0.68 metres (0.60 m)
Well Depth: 3.70 metres
Screen Length: 1.5 metres
Well Radius: 0.0255 metres

Aquifer Data

Saturated Thickness: 2.9 metres
Anisotropy Ratio (Kz/Kr): 0.1
Aquifer Model: Unconfined, Hvorslev
Static Water Level: 0.75 metres bgs

GEMTEC
Consulting Engineers and Scientists

Date: December 2021

Project: 100152.004

APPENDIX F

Laboratory Analytical Results & Certificates of Analysis

Report to: 1910753 Ontario Inc.
Project: 100152.004 (February 3, 2023)

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Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Jean-Philippe Gobeil

Client PO:
Project: 100152.004
Custody: 63406

Report Date: 17-Dec-2021
Order Date: 13-Dec-2021

Order #: 2151088

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2151088-01	BH21-2
2151088-02	Surface Water
2151088-03	BH21-2 (Filtered)

Approved By:

Dale Robertson, BSc
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	14-Dec-21	14-Dec-21
Hardness	Hardness as CaCO3	15-Dec-21	15-Dec-21
Hexachlorobenzene	EPA 8081B - GC-ECD	15-Dec-21	15-Dec-21
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	15-Dec-21	15-Dec-21
Metals, ICP-MS	EPA 200.8 - ICP-MS	15-Dec-21	15-Dec-21
Ottawa - San/Comn: SVOCs w/o PAHs	EPA 625	15-Dec-21	16-Dec-21
PAHs by GC-MS, SU Addnl	based on EPA 8270 - GC-MS, extraction	14-Dec-21	16-Dec-21
PAHs by GC-MS, Sewer Use	based on EPA 8270 - GC-MS, extraction	14-Dec-21	16-Dec-21
PCBs, total	EPA 608 - GC-ECD	15-Dec-21	15-Dec-21
pH	EPA 150.1 - pH probe @25 °C	14-Dec-21	14-Dec-21
PHC F1	CWS Tier 1 - P&T GC-FID	14-Dec-21	14-Dec-21
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	15-Dec-21	15-Dec-21
Phosphorus, total, water	EPA 365.4 - Auto Colour, digestion	14-Dec-21	14-Dec-21
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	14-Dec-21	14-Dec-21
Total Suspended Solids	SM 2540D - Gravimetric	14-Dec-21	14-Dec-21
Turbidity	SM 2130B - Turbidity meter	15-Dec-21	15-Dec-21
VOCs, Sewer Use	EPA 624 - P&T GC-MS	14-Dec-21	14-Dec-21
Volatile Suspended Solids	SM 2540D - Gravimetric, 550C	14-Dec-21	14-Dec-21

Certificate of Analysis

Report Date: 17-Dec-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 13-Dec-2021

Client PO:

Project Description: 100152.004

	Client ID:	BH21-2	Surface Water	BH21-2 (Filtered)	-
	Sample Date:	13-Dec-21 13:30	13-Dec-21 14:00	13-Dec-21 13:30	-
	Sample ID:	2151088-01	2151088-02	2151088-03	-
	MDL/Units	Water	Water	Water	-
General Inorganics					
Alkalinity, total	5 mg/L	-	158	-	-
Hardness	mg/L	-	142	-	-
pH	0.1 pH Units	7.3	7.9	-	-
Phosphorus, total	0.01 mg/L	0.24	-	-	-
Total Suspended Solids	2 mg/L	402	3	-	-
Volatile Suspended Solids	2 mg/L	20	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	2.0	-	-	-
Turbidity	0.1 NTU	-	2.0	-	-
Metals					
Aluminum	10 ug/L	-	-	13	-
Antimony	1 ug/L	-	-	<1	-
Arsenic	10 ug/L	-	-	<10	-
Bismuth	5 ug/L	-	-	<5	-
Boron	50 ug/L	-	-	<50	-
Cadmium	1 ug/L	-	-	<1	-
Calcium	200 ug/L	-	36200	-	-
Chromium	50 ug/L	-	-	<50	-
Cobalt	1 ug/L	-	-	5	-
Copper	5 ug/L	-	-	<5	-
Lead	1 ug/L	-	-	<1	-
Magnesium	200 ug/L	-	12600	-	-
Manganese	50 ug/L	-	-	1490	-
Molybdenum	5 ug/L	-	-	<5	-
Nickel	5 ug/L	-	-	8	-
Selenium	5 ug/L	-	-	<5	-
Silver	1 ug/L	-	-	<1	-
Tin	10 ug/L	-	-	<10	-
Titanium	10 ug/L	-	-	<10	-
Vanadium	1 ug/L	-	-	<1	-
Zinc	20 ug/L	-	-	<20	-
Metals - Total					
Aluminum	0.01 mg/L	3.66	-	-	-
Antimony	0.001 mg/L	0.002	-	-	-
Arsenic	0.01 mg/L	<0.01	-	-	-
Bismuth	0.005 mg/L	<0.005	-	-	-

Certificate of Analysis

Report Date: 17-Dec-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 13-Dec-2021

Client PO:

Project Description: 100152.004

	Client ID:	BH21-2	Surface Water	BH21-2 (Filtered)	-
	Sample Date:	13-Dec-21 13:30	13-Dec-21 14:00	13-Dec-21 13:30	-
	Sample ID:	2151088-01	2151088-02	2151088-03	-
	MDL/Units	Water	Water	Water	-
Boron	0.05 mg/L	<0.05	-	-	-
Cadmium	0.001 mg/L	<0.001	-	-	-
Chromium	0.05 mg/L	<0.05	-	-	-
Cobalt	0.001 mg/L	0.011	-	-	-
Copper	0.005 mg/L	0.019	-	-	-
Lead	0.001 mg/L	0.009	-	-	-
Manganese	0.05 mg/L	1.80	-	-	-
Mercury	0.0001 mg/L	<0.0001	-	-	-
Molybdenum	0.005 mg/L	<0.005	-	-	-
Nickel	0.005 mg/L	0.021	-	-	-
Selenium	0.005 mg/L	<0.005	-	-	-
Silver	0.001 mg/L	<0.001	-	-	-
Tin	0.01 mg/L	<0.01	-	-	-
Titanium	0.01 mg/L	0.29	-	-	-
Vanadium	0.001 mg/L	0.010	-	-	-
Zinc	0.02 mg/L	0.02	-	-	-
Volatiles					
Benzene	0.0005 mg/L	<0.0005	-	-	-
Bromodichloromethane	0.0005 mg/L	<0.0005	-	-	-
Bromoform	0.0005 mg/L	<0.0005	-	-	-
Bromomethane	0.0005 mg/L	<0.0005	-	-	-
Carbon Tetrachloride	0.0002 mg/L	<0.0002	-	-	-
Chlorobenzene	0.0005 mg/L	<0.0005	-	-	-
Chloroethane	0.0010 mg/L	<0.0010	-	-	-
Chloroform	0.0005 mg/L	<0.0005	-	-	-
Chloromethane	0.0030 mg/L	<0.0030	-	-	-
Dibromochloromethane	0.0005 mg/L	<0.0005	-	-	-
1,2-Dibromoethane	0.0002 mg/L	<0.0002	-	-	-
1,2-Dichlorobenzene	0.0005 mg/L	<0.0005	-	-	-
1,3-Dichlorobenzene	0.0005 mg/L	<0.0005	-	-	-
1,4-Dichlorobenzene	0.0005 mg/L	<0.0005	-	-	-
1,1-Dichloroethane	0.0005 mg/L	<0.0005	-	-	-
1,2-Dichloroethane	0.0005 mg/L	<0.0005	-	-	-
1,1-Dichloroethylene	0.0005 mg/L	<0.0005	-	-	-
cis-1,2-Dichloroethylene	0.0005 mg/L	<0.0005	-	-	-
trans-1,2-Dichloroethylene	0.0005 mg/L	<0.0005	-	-	-

Certificate of Analysis

Report Date: 17-Dec-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 13-Dec-2021

Client PO:

Project Description: 100152.004

	Client ID:	BH21-2	Surface Water	BH21-2 (Filtered)	-
	Sample Date:	13-Dec-21 13:30	13-Dec-21 14:00	13-Dec-21 13:30	-
	Sample ID:	2151088-01	2151088-02	2151088-03	-
	MDL/Units	Water	Water	Water	-
1,2-Dichloropropane	0.0005 mg/L	<0.0005	-	-	-
cis-1,3-Dichloropropylene	0.0005 mg/L	<0.0005	-	-	-
trans-1,3-Dichloropropylene	0.0005 mg/L	<0.0005	-	-	-
Ethylbenzene	0.0005 mg/L	<0.0005	-	-	-
Methylene Chloride	0.0050 mg/L	<0.0050	-	-	-
Styrene	0.0005 mg/L	<0.0005	-	-	-
1,1,2,2-Tetrachloroethane	0.0005 mg/L	<0.0005	-	-	-
Tetrachloroethylene	0.0005 mg/L	<0.0005	-	-	-
Toluene	0.0005 mg/L	<0.0005	-	-	-
1,1,1-Trichloroethane	0.0005 mg/L	<0.0005	-	-	-
1,1,2-Trichloroethane	0.0005 mg/L	<0.0005	-	-	-
Trichloroethylene	0.0005 mg/L	<0.0005	-	-	-
Trichlorofluoromethane	0.0010 mg/L	<0.0010	-	-	-
1,3,5-Trimethylbenzene	0.0005 mg/L	<0.0005	-	-	-
Vinyl chloride	0.0005 mg/L	<0.0005	-	-	-
Xylenes, total	0.0005 mg/L	<0.0005	-	-	-
4-Bromofluorobenzene	Surrogate	90.3%	-	-	-
Dibromofluoromethane	Surrogate	87.6%	-	-	-
Toluene-d8	Surrogate	101%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	0.025 mg/L	<0.025	-	-	-
F2 PHCs (C10-C16)	0.1 mg/L	<0.1	-	-	-
F3 PHCs (C16-C34)	0.1 mg/L	<0.1	-	-	-
F4 PHCs (C34-C50)	0.1 mg/L	<0.1	-	-	-
Semi-Volatiles					
1-Methylnaphthalene	0.00005 mg/L	<0.00005 [2]	-	-	-
2-Methylnaphthalene	0.00005 mg/L	<0.00005 [2]	-	-	-
7H-Dibenzo[c,g]carbazole	0.0005 mg/L	<0.0005	-	-	-
Anthracene	0.00001 mg/L	<0.00001 [2]	-	-	-
Benzo [a] anthracene	0.00001 mg/L	<0.00001 [2]	-	-	-
Benzo [a] pyrene	0.00001 mg/L	<0.00001 [2]	-	-	-
Benzo [b] fluoranthene	0.00005 mg/L	<0.00005 [2]	-	-	-
Benzo [e] pyrene	0.0005 mg/L	<0.0005	-	-	-
Benzo [g,h,i] perylene	0.00005 mg/L	<0.00005 [2]	-	-	-
Benzo [j] fluoranthene	0.0005 mg/L	<0.0005	-	-	-
Benzo [k] fluoranthene	0.00005 mg/L	<0.00005 [2]	-	-	-

Certificate of Analysis

Report Date: 17-Dec-2021

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 13-Dec-2021

Client PO:

Project Description: 100152.004

	Client ID:	BH21-2	Surface Water	BH21-2 (Filtered)	-
	Sample Date:	13-Dec-21 13:30	13-Dec-21 14:00	13-Dec-21 13:30	-
	Sample ID:	2151088-01	2151088-02	2151088-03	-
	MDL/Units	Water	Water	Water	-
Biphenyl	0.00005 mg/L	<0.00005 [2]	-	-	-
Chrysene	0.00005 mg/L	<0.00005 [2]	-	-	-
Dibenzo [a,h] anthracene	0.00005 mg/L	<0.00005 [2]	-	-	-
Dibenzo [a,i] pyrene	0.0005 mg/L	<0.0005	-	-	-
Dibenzo [a,j] acridine	0.0005 mg/L	<0.0005	-	-	-
Fluoranthene	0.00001 mg/L	<0.00001 [2]	-	-	-
Fluorene	0.00005 mg/L	<0.00005 [2]	-	-	-
Indeno [1,2,3-cd] pyrene	0.00005 mg/L	<0.00005 [2]	-	-	-
Naphthalene	0.00005 mg/L	<0.00005 [2]	-	-	-
Perylene	0.0005 mg/L	<0.0005	-	-	-
Phenanthrene	0.00005 mg/L	<0.00005 [2]	-	-	-
Pyrene	0.00001 mg/L	<0.00001 [2]	-	-	-
PAHs, Total	0.00340 mg/L	<0.00340	-	-	-
Benzylbutylphthalate	0.001 mg/L	<0.001 [2]	-	-	-
bis(2-Chloroethoxy)methane	0.001 mg/L	<0.001 [2]	-	-	-
Bis(2-ethylhexyl)phthalate	0.001 mg/L	0.007 [2]	-	-	-
Diethylphthalate	0.001 mg/L	<0.001 [2]	-	-	-
Di-n-butylphthalate	0.001 mg/L	0.001 [2]	-	-	-
Di-n-octylphthalate	0.001 mg/L	<0.001 [2]	-	-	-
Indole	0.001 mg/L	<0.001 [2]	-	-	-
2,4-Dichlorophenol	0.001 mg/L	<0.001 [2]	-	-	-
Pesticides, OC					
Hexachlorobenzene	0.00001 mg/L	<0.00001	-	-	-
Decachlorobiphenyl	Surrogate	54.5%	-	-	-
PCBs					
PCBs, total	0.05 ug/L	<0.05	-	-	-
Decachlorobiphenyl	Surrogate	101%	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Phosphorus, total	ND	0.01	mg/L						
Total Suspended Solids	ND	2	mg/L						
Volatile Suspended Solids	ND	2	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Hydrocarbons									
F1 PHCs (C6-C10)	ND	0.025	mg/L						
F2 PHCs (C10-C16)	ND	0.1	mg/L						
F3 PHCs (C16-C34)	ND	0.1	mg/L						
F4 PHCs (C34-C50)	ND	0.1	mg/L						
Metals									
Aluminum	ND	10	ug/L						
Antimony	ND	1	ug/L						
Arsenic	ND	10	ug/L						
Bismuth	ND	5	ug/L						
Boron	ND	50	ug/L						
Cadmium	ND	1	ug/L						
Calcium	ND	200	ug/L						
Chromium	ND	50	ug/L						
Cobalt	ND	1	ug/L						
Copper	ND	5	ug/L						
Lead	ND	1	ug/L						
Magnesium	ND	200	ug/L						
Manganese	ND	50	ug/L						
Molybdenum	ND	5	ug/L						
Nickel	ND	5	ug/L						
Selenium	ND	5	ug/L						
Silver	ND	1	ug/L						
Tin	ND	10	ug/L						
Titanium	ND	10	ug/L						
Vanadium	ND	1	ug/L						
Zinc	ND	20	ug/L						
Metals - Total									
Aluminum	ND	0.01	mg/L						
Antimony	ND	0.001	mg/L						
Arsenic	ND	0.01	mg/L						
Bismuth	ND	0.005	mg/L						
Boron	ND	0.05	mg/L						
Cadmium	ND	0.001	mg/L						
Chromium	ND	0.05	mg/L						
Cobalt	ND	0.001	mg/L						
Copper	ND	0.005	mg/L						
Lead	ND	0.001	mg/L						
Mercury	ND	0.0001	mg/L						
Manganese	ND	0.05	mg/L						
Molybdenum	ND	0.005	mg/L						
Nickel	ND	0.005	mg/L						
Selenium	ND	0.005	mg/L						
Silver	ND	0.001	mg/L						
Tin	ND	0.01	mg/L						
Titanium	ND	0.01	mg/L						
Vanadium	ND	0.001	mg/L						
Zinc	ND	0.02	mg/L						
PCBs									
PCBs, total	ND	0.05	ug/L						
Surrogate: Decachlorobiphenyl	*0.668*		*ug/L*		*134*	*60-140*			

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Pesticides, OC									
Hexachlorobenzene	ND	0.00001	mg/L						
Surrogate: Decachlorobiphenyl	*).00030⁴*		*mg/L*		*60.8*	*50-140*			
Semi-Volatiles									
1-Methylnaphthalene	ND	0.00005	mg/L						
2-Methylnaphthalene	ND	0.00005	mg/L						
7H-Dibenzo[c,g]carbazole	ND	0.0005	mg/L						
Anthracene	ND	0.00001	mg/L						
Benzo [a] anthracene	ND	0.00001	mg/L						
Benzo [a] pyrene	ND	0.00001	mg/L						
Benzo [b] fluoranthene	ND	0.00005	mg/L						
Benzo [e] pyrene	ND	0.0005	mg/L						
Benzo [g,h,i] perylene	ND	0.00005	mg/L						
Benzo [j] fluoranthene	ND	0.0005	mg/L						
Benzo [k] fluoranthene	ND	0.00005	mg/L						
Biphenyl	ND	0.00005	mg/L						
Chrysene	ND	0.00005	mg/L						
Dibenzo [a,h] anthracene	ND	0.00005	mg/L						
Dibenzo [a,i] pyrene	ND	0.0005	mg/L						
Dibenzo [a,j] acridine	ND	0.0005	mg/L						
Fluoranthene	ND	0.00001	mg/L						
Fluorene	ND	0.00005	mg/L						
Indeno [1,2,3-cd] pyrene	ND	0.00005	mg/L						
Naphthalene	ND	0.00005	mg/L						
Perylene	ND	0.0005	mg/L						
Phenanthrene	ND	0.00005	mg/L						
Pyrene	ND	0.00001	mg/L						
Surrogate: 2-Fluorobiphenyl	*0.0217*		*mg/L*		*109*	*76-125*			
Surrogate: Terphenyl-d14	*0.0219*		*mg/L*		*109*	*70-125*			
Benzylbutylphthalate	ND	0.001	mg/L						
bis(2-Chloroethoxy)methane	ND	0.001	mg/L						
Bis(2-ethylhexyl)phthalate	ND	0.001	mg/L						
Diethylphthalate	ND	0.001	mg/L						
Di-n-butylphthalate	ND	0.001	mg/L						
Di-n-octylphthalate	ND	0.001	mg/L						
Indole	ND	0.001	mg/L						
2,4-Dichlorophenol	ND	0.001	mg/L						
Surrogate: 2-Fluorobiphenyl	*0.0179*		*mg/L*		*89.5*	*76-125*			
Surrogate: Nitrobenzene-d5	*0.0134*		*mg/L*		*66.8*	*68-125*			*S-GC*
Surrogate: Terphenyl-d14	*0.0197*		*mg/L*		*98.6*	*70-125*			
Surrogate: 2,4,6-Tribromophenol	*0.0454*		*mg/L*		*114*	*56-125*			
Surrogate: 2-Fluorophenol	*0.00508*		*mg/L*		*12.7*	*14-125*			*S-GC*
Surrogate: Phenol-d6	*0.00423*		*mg/L*		*10.6*	*5-112*			
Volatiles									
Benzene	ND	0.0005	mg/L						
Bromodichloromethane	ND	0.0005	mg/L						
Bromoform	ND	0.0005	mg/L						
Bromomethane	ND	0.0005	mg/L						
Carbon Tetrachloride	ND	0.0002	mg/L						
Chlorobenzene	ND	0.0005	mg/L						
Chloroethane	ND	0.0010	mg/L						
Chloroform	ND	0.0005	mg/L						
Chloromethane	ND	0.0030	mg/L						
Dibromochloromethane	ND	0.0005	mg/L						
1,2-Dibromoethane	ND	0.0002	mg/L						
1,2-Dichlorobenzene	ND	0.0005	mg/L						
1,3-Dichlorobenzene	ND	0.0005	mg/L						
1,4-Dichlorobenzene	ND	0.0005	mg/L						
1,1-Dichloroethane	ND	0.0005	mg/L						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
1,2-Dichloroethane	ND	0.0005	mg/L						
1,1-Dichloroethylene	ND	0.0005	mg/L						
cis-1,2-Dichloroethylene	ND	0.0005	mg/L						
trans-1,2-Dichloroethylene	ND	0.0005	mg/L						
1,2-Dichloropropane	ND	0.0005	mg/L						
cis-1,3-Dichloropropylene	ND	0.0005	mg/L						
trans-1,3-Dichloropropylene	ND	0.0005	mg/L						
Ethylbenzene	ND	0.0005	mg/L						
Methylene Chloride	ND	0.0050	mg/L						
Styrene	ND	0.0005	mg/L						
1,1,2,2-Tetrachloroethane	ND	0.0005	mg/L						
Tetrachloroethylene	ND	0.0005	mg/L						
Toluene	ND	0.0005	mg/L						
1,1,1-Trichloroethane	ND	0.0005	mg/L						
1,1,2-Trichloroethane	ND	0.0005	mg/L						
Trichloroethylene	ND	0.0005	mg/L						
Trichlorofluoromethane	ND	0.0010	mg/L						
1,3,5-Trimethylbenzene	ND	0.0005	mg/L						
Vinyl chloride	ND	0.0005	mg/L						
Xylenes, total	ND	0.0005	mg/L						
Surrogate: 4-Bromofluorobenzene	*0.0724*		*mg/L*		*90.5*	*50-140*			
Surrogate: Dibromofluoromethane	*0.0650*		*mg/L*		*81.2*	*50-140*			
Surrogate: Toluene-d8	*0.0830*		*mg/L*		*104*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Alkalinity, total	157	5	mg/L	158			1.2	14	
pH	7.9	0.1	pH Units	7.9			0.5	3.3	
Phosphorus, total	0.249	0.01	mg/L	0.242			2.9	15	
Total Suspended Solids	157	2	mg/L	161			2.5	10	
Volatile Suspended Solids	21.0	2	mg/L	20.0			4.9	10	
Total Kjeldahl Nitrogen	2.02	0.1	mg/L	2.05			1.1	16	
Turbidity	2.1	0.1	NTU	2.0			3.4	10	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	0.025	mg/L	ND			NC	30	
Metals									
Aluminum	1670	10	ug/L	1440			14.8	20	
Antimony	11.8	1	ug/L	4.7			NC	20	
Arsenic	ND	10	ug/L	ND			NC	20	
Bismuth	ND	5	ug/L	ND			NC	20	
Boron	77.6	50	ug/L	66.0			16.3	20	
Cadmium	ND	1	ug/L	ND			NC	20	
Calcium	156000	200	ug/L	139000			11.4	20	
Chromium	ND	50	ug/L	ND			NC	20	
Cobalt	1.9	1	ug/L	1.7			14.1	20	
Copper	5.2	5	ug/L	ND			NC	20	
Lead	2.3	1	ug/L	2.0			11.3	20	
Magnesium	26200	200	ug/L	22700			14.2	20	
Manganese	296	50	ug/L	260			13.0	20	
Molybdenum	30.7	5	ug/L	24.2			NC	20	
Nickel	7.7	5	ug/L	6.5			16.2	20	
Selenium	ND	5	ug/L	ND			NC	20	
Silver	ND	1	ug/L	ND			NC	20	
Tin	ND	10	ug/L	ND			NC	20	
Titanium	35.8	10	ug/L	30.7			15.3	20	
Vanadium	3.9	1	ug/L	3.6			9.5	20	
Zinc	21.0	20	ug/L	ND			NC	20	
Metals - Total									
Aluminum	0.81	0.01	mg/L	0.73			10.3	20	
Antimony	0.008	0.001	mg/L	ND			NC	20	
Arsenic	ND	0.01	mg/L	ND			NC	20	
Bismuth	ND	0.005	mg/L	ND			NC	20	
Boron	ND	0.05	mg/L	ND			NC	20	
Cadmium	ND	0.001	mg/L	ND			NC	20	
Chromium	ND	0.05	mg/L	ND			NC	20	
Cobalt	0.002	0.001	mg/L	0.002			17.4	20	
Copper	ND	0.005	mg/L	ND			NC	20	
Lead	0.003	0.001	mg/L	0.002			NC	20	
Mercury	ND	0.0001	mg/L	ND			NC	20	
Manganese	0.237	0.05	mg/L	0.205			14.7	20	
Molybdenum	ND	0.005	mg/L	ND			NC	20	
Nickel	ND	0.005	mg/L	ND			NC	20	
Selenium	ND	0.005	mg/L	ND			NC	20	
Silver	ND	0.001	mg/L	ND			NC	20	
Tin	ND	0.01	mg/L	ND			NC	20	
Titanium	ND	0.01	mg/L	ND			NC	20	
Vanadium	0.002	0.001	mg/L	0.001			NC	20	
Zinc	0.136	0.02	mg/L	0.118			14.3	20	
Volatiles									
Benzene	ND	0.0005	mg/L	ND			NC	30	
Bromodichloromethane	ND	0.0005	mg/L	ND			NC	30	
Bromoform	ND	0.0005	mg/L	ND			NC	30	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Bromomethane	ND	0.0005	mg/L	ND			NC	30	
Carbon Tetrachloride	ND	0.0002	mg/L	ND			NC	30	
Chlorobenzene	ND	0.0005	mg/L	ND			NC	30	
Chloroethane	ND	0.0010	mg/L	ND			NC	30	
Chloroform	0.0023	0.0005	mg/L	0.0024			4.3	30	
Chloromethane	ND	0.0030	mg/L	ND			NC	30	
Dibromochloromethane	ND	0.0005	mg/L	ND			NC	30	
1,2-Dibromoethane	ND	0.0002	mg/L	ND			NC	30	
1,2-Dichlorobenzene	ND	0.0005	mg/L	ND			NC	30	
1,3-Dichlorobenzene	ND	0.0005	mg/L	ND			NC	30	
1,4-Dichlorobenzene	ND	0.0005	mg/L	ND			NC	30	
1,1-Dichloroethane	ND	0.0005	mg/L	ND			NC	30	
1,2-Dichloroethane	ND	0.0005	mg/L	ND			NC	30	
1,1-Dichloroethylene	ND	0.0005	mg/L	ND			NC	30	
cis-1,2-Dichloroethylene	ND	0.0005	mg/L	ND			NC	30	
trans-1,2-Dichloroethylene	ND	0.0005	mg/L	ND			NC	30	
1,2-Dichloropropane	ND	0.0005	mg/L	ND			NC	30	
cis-1,3-Dichloropropylene	ND	0.0005	mg/L	ND			NC	30	
trans-1,3-Dichloropropylene	ND	0.0005	mg/L	ND			NC	30	
Ethylbenzene	ND	0.0005	mg/L	ND			NC	30	
Methylene Chloride	ND	0.0050	mg/L	ND			NC	30	
Styrene	ND	0.0005	mg/L	ND			NC	30	
1,1,2,2-Tetrachloroethane	ND	0.0005	mg/L	ND			NC	30	
Tetrachloroethylene	ND	0.0005	mg/L	ND			NC	30	
Toluene	ND	0.0005	mg/L	ND			NC	30	
1,1,1-Trichloroethane	ND	0.0005	mg/L	ND			NC	30	
1,1,2-Trichloroethane	ND	0.0005	mg/L	ND			NC	30	
Trichloroethylene	ND	0.0005	mg/L	ND			NC	30	
Trichlorofluoromethane	ND	0.0010	mg/L	ND			NC	30	
1,3,5-Trimethylbenzene	ND	0.0005	mg/L	ND			NC	30	
Vinyl chloride	ND	0.0005	mg/L	ND			NC	30	
m,p-Xylenes	ND	0.0005	mg/L	ND			NC	30	
o-Xylene	ND	0.0005	mg/L	ND			NC	30	
Surrogate: 4-Bromofluorobenzene	*0.0725*		*mg/L*		*90.6*	*50-140*			
Surrogate: Dibromofluoromethane	*0.0672*		*mg/L*		*84.1*	*50-140*			
Surrogate: Toluene-d8	*0.0822*		*mg/L*		*103*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Phosphorus, total	0.735	0.01	mg/L	0.242	98.6	80-120			
Total Suspended Solids	22.0	2	mg/L	ND	110	75-125			
Total Kjeldahl Nitrogen	4.25	0.1	mg/L	2.05	110	81-126			
Hydrocarbons									
F1 PHCs (C6-C10)	1.64	0.025	mg/L	ND	81.9	68-117			
F2 PHCs (C10-C16)	1.5	0.1	mg/L	ND	90.8	60-140			
F3 PHCs (C16-C34)	3.9	0.1	mg/L	ND	101	60-140			
F4 PHCs (C34-C50)	2.5	0.1	mg/L	ND	99.3	60-140			
Metals									
Aluminum	57.6	10	ug/L	ND	115	80-120			
Antimony	57.5	1	ug/L	ND	114	80-120			
Arsenic	49.4	10	ug/L	ND	98.9	80-120			
Bismuth	49.5	5	ug/L	ND	99.0	80-120			
Boron	65.7	50	ug/L	ND	118	80-120			
Cadmium	55.9	1	ug/L	ND	112	80-120			
Calcium	11800	200	ug/L	ND	118	80-120			
Chromium	49.4	50	ug/L	ND	98.9	80-120			
Cobalt	49.3	1	ug/L	ND	98.6	80-120			
Copper	61.4	5	ug/L	ND	122	80-120			QM-07
Lead	53.2	1	ug/L	ND	106	80-120			
Magnesium	11500	200	ug/L	ND	115	80-120			
Manganese	48.4	50	ug/L	ND	96.9	80-120			
Molybdenum	45.8	5	ug/L	ND	91.7	80-120			
Nickel	48.0	5	ug/L	ND	96.0	80-120			
Selenium	58.0	5	ug/L	ND	116	80-120			
Silver	51.1	1	ug/L	ND	102	80-120			
Tin	60.8	10	ug/L	ND	121	80-120			QM-07
Titanium	50.0	10	ug/L	ND	99.9	80-120			
Vanadium	49.8	1	ug/L	ND	99.7	80-120			
Zinc	60.0	20	ug/L	ND	116	80-120			
Metals - Total									
Aluminum	140	0.01	mg/L	72.7	112	80-120			
Antimony	60.4	0.001	mg/L	0.094	100	80-120			
Arsenic	69.2	0.01	mg/L	0.073	115	80-120			
Bismuth	53.9	0.005	mg/L	0.025	89.7	80-120			
Boron	62.2	0.05	mg/L	1.85	101	80-120			
Cadmium	61.3	0.001	mg/L	0.002	102	80-120			
Chromium	69.7	0.05	mg/L	0.090	116	80-120			
Cobalt	65.5	0.001	mg/L	0.174	109	80-120			
Copper	64.8	0.005	mg/L	0.300	107	80-120			
Lead	57.3	0.001	mg/L	0.202	95.1	80-120			
Mercury	0.0031	0.0001	mg/L	ND	103	70-130			
Manganese	92.7	0.05	mg/L	20.5	120	80-120			QM-07
Molybdenum	68.0	0.005	mg/L	0.209	113	80-120			
Nickel	65.6	0.005	mg/L	0.453	109	80-120			
Selenium	63.3	0.005	mg/L	0.052	105	80-120			
Silver	49.0	0.001	mg/L	ND	81.7	80-120			
Tin	66.2	0.01	mg/L	0.420	110	80-120			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Titanium	72.5	0.01	mg/L	0.231	120	80-120			QM-07
Vanadium	71.6	0.001	mg/L	0.133	119	80-120			
Zinc	75.1	0.02	mg/L	11.8	106	80-120			
PCBs									
PCBs, total	1.02	0.05	ug/L	ND	102	65-135			
Surrogate: Decachlorobiphenyl	*0.680*		*ug/L*		*136*	*60-140*			
Pesticides, OC									
Hexachlorobenzene	0.00042	0.00001	mg/L	ND	84.2	50-140			
Surrogate: Decachlorobiphenyl	*0.000287*		*mg/L*		*57.4*	*50-140*			
Semi-Volatiles									
1-Methylnaphthalene	0.00566	0.00005	mg/L	ND	113	25-127			
2-Methylnaphthalene	0.00583	0.00005	mg/L	ND	117	21-119			
7H-Dibenzo[c,g]carbazole	0.00597	0.0005	mg/L	ND	119	30-130			
Anthracene	0.00491	0.00001	mg/L	ND	98.2	29-126			
Benzo [a] anthracene	0.00481	0.00001	mg/L	ND	96.2	29-126			
Benzo [a] pyrene	0.00535	0.00001	mg/L	ND	107	29-111			
Benzo [b] fluoranthene	0.00541	0.00005	mg/L	ND	108	26-111			
Benzo [e] pyrene	0.0134	0.0005	mg/L	ND	53.8	30-130			
Benzo [g,h,i] perylene	0.00457	0.00005	mg/L	ND	91.5	23-128			
Benzo [j] fluoranthene	0.00486	0.0005	mg/L	ND	97.2	30-130			
Benzo [k] fluoranthene	0.00510	0.00005	mg/L	ND	102	23-135			
Chrysene	0.00565	0.00005	mg/L	ND	113	29-137			
Dibenzo [a,h] anthracene	0.00462	0.00005	mg/L	ND	92.4	20-131			
Dibenzo [a,i] pyrene	0.00605	0.0005	mg/L	ND	121	30-130			
Dibenzo [a,j] acridine	0.00413	0.0005	mg/L	ND	82.6	30-130			
Fluoranthene	0.00469	0.00001	mg/L	ND	93.7	24-131			
Fluorene	0.00336	0.00005	mg/L	ND	67.1	28-123			
Indeno [1,2,3-cd] pyrene	0.00458	0.00005	mg/L	ND	91.6	20-128			
Naphthalene	0.00521	0.00005	mg/L	ND	104	29-118			
Perylene	0.00357	0.0005	mg/L	ND	71.4	30-130			
Phenanthrene	0.00453	0.00005	mg/L	ND	90.7	34-108			
Pyrene	0.00482	0.00001	mg/L	ND	96.3	29-131			
Surrogate: 2-Fluorobiphenyl	*0.0250*		*mg/L*		*125*	*76-125*			
Surrogate: Terphenyl-d14	*0.0228*		*mg/L*		*114*	*70-125*			
Benzylbutylphthalate	0.01	0.001	mg/L	ND	97.7	50-140			
bis(2-Chloroethoxy)methane	0.01	0.001	mg/L	ND	96.6	50-140			
Bis(2-ethylhexyl)phthalate	0.01	0.001	mg/L	ND	130	50-140			
Diethylphthalate	0.01	0.001	mg/L	ND	106	50-140			
Di-n-butylphthalate	0.01	0.001	mg/L	ND	99.0	50-140			
Di-n-octylphthalate	0.01	0.001	mg/L	ND	102	50-140			
2,4-Dichlorophenol	0.009	0.001	mg/L	ND	94.7	50-140			
Surrogate: 2-Fluorobiphenyl	*0.0145*		*mg/L*		*72.5*	*76-125*			*S-GC*
Surrogate: Nitrobenzene-d5	*0.0134*		*mg/L*		*67.0*	*68-125*			*S-GC*
Surrogate: Terphenyl-d14	*0.0184*		*mg/L*		*92.2*	*70-125*			
Surrogate: 2,4,6-Tribromophenol	*0.0392*		*mg/L*		*98.1*	*56-125*			
Surrogate: 2-Fluorophenol	*0.00707*		*mg/L*		*17.7*	*14-125*			
Surrogate: Phenol-d6	*0.00383*		*mg/L*		*9.58*	*5-112*			
Volatiles									
Benzene	0.0369	0.0005	mg/L	ND	92.2	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Bromodichloromethane	0.0348	0.0005	mg/L	ND	87.1	60-130			
Bromoform	0.0302	0.0005	mg/L	ND	75.5	60-130			
Bromomethane	0.0387	0.0005	mg/L	ND	96.9	50-140			
Carbon Tetrachloride	0.0285	0.0002	mg/L	ND	71.3	60-130			
Chlorobenzene	0.0373	0.0005	mg/L	ND	93.3	60-130			
Chloroethane	0.0419	0.0010	mg/L	ND	105	50-140			
Chloroform	0.0352	0.0005	mg/L	ND	88.0	60-130			
Chloromethane	0.0433	0.0030	mg/L	ND	108	50-140			
Dibromochloromethane	0.0294	0.0005	mg/L	ND	73.4	60-130			
1,2-Dibromoethane	0.0333	0.0002	mg/L	ND	83.3	60-130			
1,2-Dichlorobenzene	0.0365	0.0005	mg/L	ND	91.4	60-130			
1,3-Dichlorobenzene	0.0359	0.0005	mg/L	ND	89.7	60-130			
1,4-Dichlorobenzene	0.0363	0.0005	mg/L	ND	90.8	60-130			
1,1-Dichloroethane	0.0371	0.0005	mg/L	ND	92.7	60-130			
1,2-Dichloroethane	0.0362	0.0005	mg/L	ND	90.6	60-130			
1,1-Dichloroethylene	0.0386	0.0005	mg/L	ND	96.5	60-130			
cis-1,2-Dichloroethylene	0.0361	0.0005	mg/L	ND	90.2	60-130			
trans-1,2-Dichloroethylene	0.0344	0.0005	mg/L	ND	85.9	60-130			
1,2-Dichloropropane	0.0347	0.0005	mg/L	ND	86.8	60-130			
cis-1,3-Dichloropropylene	0.0291	0.0005	mg/L	ND	72.8	60-130			
trans-1,3-Dichloropropylene	0.0295	0.0005	mg/L	ND	73.7	60-130			
Ethylbenzene	0.0371	0.0005	mg/L	ND	92.8	60-130			
Methylene Chloride	0.0404	0.0050	mg/L	ND	101	60-130			
Styrene	0.0343	0.0005	mg/L	ND	85.8	60-130			
1,1,2,2-Tetrachloroethane	0.0321	0.0005	mg/L	ND	80.2	60-130			
Tetrachloroethylene	0.0357	0.0005	mg/L	ND	89.2	60-130			
Toluene	0.0376	0.0005	mg/L	ND	94.1	60-130			
1,1,1-Trichloroethane	0.0312	0.0005	mg/L	ND	78.0	60-130			
1,1,2-Trichloroethane	0.0342	0.0005	mg/L	ND	85.4	60-130			
Trichloroethylene	0.0347	0.0005	mg/L	ND	86.7	60-130			
Trichlorofluoromethane	0.0358	0.0010	mg/L	ND	89.6	60-130			
1,3,5-Trimethylbenzene	0.0365	0.0005	mg/L	ND	91.2	60-130			
Vinyl chloride	0.0380	0.0005	mg/L	ND	95.1	50-140			
m,p-Xylenes	0.0734	0.0005	mg/L	ND	91.8	60-130			
o-Xylene	0.0380	0.0005	mg/L	ND	95.0	60-130			
Surrogate: 4-Bromofluorobenzene	*0.0824*		*mg/L*		*103*	*50-140*			
Surrogate: Dibromofluoromethane	*0.0798*		*mg/L*		*99.7*	*50-140*			
Surrogate: Toluene-d8	*0.0803*		*mg/L*		*100*	*50-140*			

Qualifier Notes:

Login Qualifiers :

Sample - Filtered and preserved by Paracel upon receipt at the laboratory - Metals

Applies to samples: BH21-2 (Filtered)

Sample Qualifiers :

2 : Surrogate recoveries not available.

QC Qualifiers :

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

S-GC : Surrogate recovery outside of control limits. The data was accepted based on valid recovery of the remaining surrogate.

Sample Data Revisions

None

Work Order Revisions / Comments:

Metals bottle subsampled from general bottle (sample -01).

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.

APPENDIX G

MECP Water Well Records Search Results

Report to: 1910753 Ontario Inc.
Project: 100152.004 (February 3, 2023)

MECP Online Well Database Summary (500-m Radius)

ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Stratigraphic Layers (ft)
1500535	OSGOODE TOWNSHIP LI	1963-04-29	DO	20.7	8.2	9.4	5.2	FR 0060 FR 0068	CLAY BLDR 0027 BLUE LMSN 0068
1500538	GLOUCESTER TOWNSHIP LI	1963-06-27	DO	18.3	7.6	8.8	3.0	FR 0047 FR 0059	CLAY 0022 CLAY GRVL BLDR 0025 LMSN 0060
1500540	GLOUCESTER TOWNSHIP LI	1963-07-23	DO	22.6	10.4	11.6	7.0	FR 0060 FR 0073	FILL 0005 HPAN BLDR 0034 LMSN 0074
1500541	GLOUCESTER TOWNSHIP LI	1963-07-25	DO	22.9	11.6	12.5	9.1	FR 0060 FR 0074	HPAN BLDR 0038 LMSN 0075
1500543	GLOUCESTER TOWNSHIP LI	1964-01-10	DO	15.2	10.4	11.9	6.1	FR 0048	GRVL BLDR 0034 GREY LMSN 0050
1500548	GLOUCESTER TOWNSHIP LI	1964-04-06	DO	16.2	7.3	7.6	6.1	FR 0053	BLDR CLAY 0020 GRVL 0024 LMSN 0053
1500562	GLOUCESTER TOWNSHIP LI	1966-05-31	DO	30.5	7.0	8.5	6.1	FR 0097	CLAY 0015 GRVL 0023 LMSN 0100
1506487	NORTH GOWER TOWNSHIP BF 003	1952-12-13	DO	12.8	9.1	9.1	0.9	FR 0025 FR 0035 FR 0040	BLUE CLAY 0030 BLUE LMSN 0042
1506489	NORTH GOWER TOWNSHIP BF 003	1954-11-22	DO	29.6	13.4	13.4	8.5	FR 0096	MSND BLDR 0025 MSND 0044 GREY LMSN 0097
1506494	NORTH GOWER TOWNSHIP BF 004	1949-10-04	DO	8.5		8.5	0.6	FR 0028	CLAY 0024 GRVL 0028
1506495	NORTH GOWER TOWNSHIP BF 004	1951-11-20	DO	19.5	9.1	11.0	3.0	FR 0040	CLAY 0030 LMSN 0064
1506496	NORTH GOWER TOWNSHIP BF 004	1953-01-16	DO	20.4	9.1	9.1	4.9	FR 0044	CLAY 0013 GRVL HPAN 0030 LMSN 0067
1506497	NORTH GOWER TOWNSHIP BF 004	1953-04-08	DO	21.0	9.8	9.8	4.9	FR 0048	BLUE CLAY 0032 BLCK LMSN 0069

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MECP Online Well Database Summary (500-m Radius)

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1506498	NORTH GOWER TOWNSHIP BF 004	1955-11-18	DO	18.3	9.8	9.8	5.5	FR 0060	CLAY 0030 GRVL 0032 LMSN 0060
1506499	NORTH GOWER TOWNSHIP BF 004	1956-07-18	DO	16.2	8.5	8.2	4.0	FR 0053	BLDR CLAY 0024 GRVL 0028 GREY LMSN 0053
1506500	NORTH GOWER TOWNSHIP BF 004	1956-09-14	DO	20.7	11.9	12.2	8.5	FR 0068	STNS GRVL 0030 GREY MSND GRVL 0039 GREY LMSN 0068
1506501	NORTH GOWER TOWNSHIP BF 004	1956-10-01	DO	21.3	6.7	7.9	1.8	FR 0070	CLAY 0022 LMSN 0070
1506502	NORTH GOWER TOWNSHIP BF 004	1956-11-04	DO	13.4		13.4	1.8	FR 0044	CLAY 0040 GRVL 0044
1506503	NORTH GOWER TOWNSHIP BF 004	1956-11-16	DO	21.3	7.3	8.5	5.5	FR 0070	CLAY 0024 LMSN 0070
1506504	NORTH GOWER TOWNSHIP BF 004	1958-07-14	DO	18.3	9.4	9.4	3.7	FR 0058	BLUE CLAY 0031 GREY LMSN 0060
1506505	NORTH GOWER TOWNSHIP BF 004	1960-05-19	CO	34.1	19.2	19.2	5.5	FR 0100	PRDG 0063 LMSN 0100 SNDS 0112
1506506	NORTH GOWER TOWNSHIP BF 004	1960-06-02	DO	31.4	12.2	14.0	6.1	FR 0100	CLAY BLDR 0026 BLDR GRVL CLAY 0040 LMSN 0103
1506507	NORTH GOWER TOWNSHIP BF 004	1963-03-05	DO	21.9	13.7	13.7	9.1	FR 0072	CLAY LOAM 0015 BLUE CLAY 0045 GREY LMSN 0072
1506508	NORTH GOWER TOWNSHIP BF 004	1965-10-12	ST DO	32.9	9.1	9.1	11.6	FR 0100	CLAY LOAM 0020 GRVL 0030 LMSN 0108
1506509	NORTH GOWER TOWNSHIP BF 005	1953-07-04	DO	31.1	9.1	13.4	10.7	FR 0097	CLAY MSND STNS 0030 LMSN 0102
1506510	NORTH GOWER TOWNSHIP BF 005	1956-07-16	DO	21.3	7.9	8.8	5.8	FR 0070	CLAY 0026 GREY LMSN 0070

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MECP Online Well Database Summary (500-m Radius)

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1506511	NORTH GOWER TOWNSHIP BF 005	1956-07-25	DO	20.7	8.5	9.4	3.7	FR 0068	CLAY 0028 GREY LMSN 0068
1506512	NORTH GOWER TOWNSHIP BF 005	1956-08-03	DO	19.2	8.5	9.4	4.0	FR 0063	CLAY 0028 GREY LMSN 0063
1506513	NORTH GOWER TOWNSHIP BF 005	1957-06-18	DO	14.3	11.3	11.3	5.2	FR 0047	BLDR CLAY 0026 GRVL 0037 GREY LMSN 0047
1506514	NORTH GOWER TOWNSHIP BF 005	1958-07-26	DO	18.3	10.4	10.4	4.3	FR 0060	CLAY 0034 LMSN 0060
1506515	NORTH GOWER TOWNSHIP BF 005	1959-08-27	DO	12.2	9.1	9.1	2.4	FR 0040	CLAY 0028 GRVL 0030 LMSN 0040
1506516	NORTH GOWER TOWNSHIP BF 005	1959-09-18	ST DO	10.7	7.6	7.6	2.4	FR 0035	CLAY BLDR 0025 LMSN 0035
1506517	NORTH GOWER TOWNSHIP BF 005	1959-11-03	DO	18.3	5.5	6.4	1.2	FR 0050	CLAY 0008 BLDR GRVL 0018 LMSN 0060
1506518	NORTH GOWER TOWNSHIP BF 005	1960-05-27	DO	27.4	9.1	10.1	2.1	FR 0060	CLAY BLDR 0030 LMSN 0090
1506519	NORTH GOWER TOWNSHIP BF 005	1961-03-20	DO	18.3	10.7	11.6	6.1	FR 0060	CLAY BLDR 0035 GREY LMSN 0060
1506520	NORTH GOWER TOWNSHIP BF 005	1961-07-28	DO	19.5	7.9	9.4	4.3	FR 0064	BLUE CLAY 0010 MSND BLDR 0026 LMSN 0064
1506521	NORTH GOWER TOWNSHIP BF 005	1962-06-20	DO	19.8	10.4	11.0	7.9	FR 0065	CLAY LOAM 0034 LMSN 0065
1506522	NORTH GOWER TOWNSHIP BF 005	1964-10-24	DO	21.3	10.4	11.0	6.1	FR 0070	CLAY 0034 LMSN 0070
1506523	NORTH GOWER TOWNSHIP BF 005	1965-10-02	DO	17.1	7.0	8.8	3.0	FR 0040 FR 0050	MSND 0004 CLAY 0020 GRVL BLDR 0023 LMSN 0056

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1506524	NORTH GOWER TOWNSHIP BF 005	1966-09-14	DO	19.2	8.8	10.4	4.9	FR 0061	CLAY 0008 MSND 0017 MSND BLDR 0029 BLUE LMSN 0063
1506525	NORTH GOWER TOWNSHIP BF 005	1967-08-29	DO	16.5	8.5	9.8	5.2	FR 0052	CLAY 0018 CLAY BLDR 0028 LMSN 0054
1506526	NORTH GOWER TOWNSHIP BF 005	1967-10-21	DO	21.3	7.6	8.5	3.7	FR 0068	CLAY 0010 CLAY MSND BLDR 0020 HPAN 0025 GREY LMSN 0070
1506527	NORTH GOWER TOWNSHIP BF 005	1968-04-29	DO	19.2	9.1	10.1	5.2	FR 0060	CLAY 0020 CLAY BLDR 0025 HPAN 0030 GREY LMSN 0063
1506600	NORTH GOWER TOWNSHIP BF 004	1951-07-16	DO	46.6	27.4	25.6	11.9	FR 0120	CLAY LOAM 0020 CLAY MSND 0079 MSND GRVL SILT 0090 GREY LMSN 0153
1506602	NORTH GOWER TOWNSHIP BF 004	1959-09-19	DO	21.3	11.6	12.2	7.9	FR 0070	CLAY BLDR 0038 LMSN 0070
1506605	NORTH GOWER TOWNSHIP BF 005	1964-02-08	ST DO	40.2	26.5	26.5	10.7	FR 0132	PRDG 0085 PRDR 0087 GREY LMSN 0130 WHIT SNDS 0132
1507741	OSGOODE TOWNSHIP LI	1959-11-03	DO	9.1		9.1	2.4	FR 0030	CLAY 0029 GRVL 0030
1507754	OSGOODE TOWNSHIP LI	1967-10-02	DO	22.9	7.3	7.9	1.8	FR 0073	CLAY 0010 HPAN 0024 LMSN 0075
1510408	OSGOODE TOWNSHIP LI	1969-10-14	DO	29.3	15.5	15.8	13.7	FR 0094	GREY BLDR GRVL 0030 GREY GRVL BLDR 0051 GREY LMSN 0096
1510418	OSGOODE TOWNSHIP LI	1969-10-24	DO	21.9	5.5	6.4	6.1	UK 0070	GREY CLAY BLDR 0018 GREY LMSN 0072
1511017	OSGOODE TOWNSHIP LI	1970-12-08	DO	29.0	14.0	15.5	6.1	FR 0094	BRWN HPAN BLDR 0046 GREY LMSN 0090 BLCK LMSN 0095
1511343	OSGOODE TOWNSHIP LI	1971-07-06	DO	14.9	7.0	7.6	3.7	FR 0048	BRWN SAND CLAY BLDR 0023 GREY LMSN 0049

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1509827	OSGOODE TOWNSHIP LI	1968-12-02	DO	17.7	5.2	6.4	2.1	FR 0055	MSND BLDR 0014 HPAN 0017 LMSN 0058
1509854	NORTH GOWER TOWNSHIP BF 005	1968-11-12	DO	16.8	7.6	8.2	4.6	FR 0050	MSND BLDR 0025 LMSN 0055
1509855	NORTH GOWER TOWNSHIP BF 005	1968-11-14	DO	21.9	11.3	11.3	5.2	FR 0072	MSND BLDR 0037 LMSN 0072
1509856	NORTH GOWER TOWNSHIP BF 005	1968-12-23	DO	21.9	9.4	10.4	6.1	FR 0070	FILL 0009 CLAY BLDR 0031 LMSN 0072
1510363	OSGOODE TOWNSHIP LI	1969-09-23	DO	25.9	5.2	5.5	2.4	FR 0083	GREY HPAN 0017 BLCK LMSN 0085
1511726	OSGOODE TOWNSHIP LI	1972-03-30	DO	18.9	7.0	7.6	3.4	FR 0060	BRWN SAND CLAY 0023 GREY LMSN 0062
1511727	OSGOODE TOWNSHIP LI	1972-03-29	DO	14.6	5.2	6.4	2.7	FR 0046	BRWN SAND CLAY 0017 GREY LMSN 0048
1511729	OSGOODE TOWNSHIP LI	1972-01-10	DO	22.6	9.1	10.1	6.7	FR 0072	BRWN CLAY SAND STNS 0030 GREY LMSN 0074
1512159	NORTH GOWER TOWNSHIP BF 005	1972-09-27	DO	11.3	9.1	8.2	4.6	FR 0034 FR 0036	BRWN CLAY BLDR 0008 BRWN SAND GRVL BLDR 0030 GREY LMSN 0037
1509938	OSGOODE TOWNSHIP CON 01 003	1968-11-29	DO	9.4	4.3	9.4	1.5	FR 0030	BLUE CLAY 0021 BLCK GRVL 0031
1509973	NORTH GOWER TOWNSHIP BF 005	1969-01-04	DO	15.5	12.2	8.5	3.0	FR 0049	CLAY BLDR 0025 LMSN 0051
1510132	NORTH GOWER TOWNSHIP BF 004	1969-06-24	DO	29.9	7.6	9.8	2.1	FR 0092	BRWN GRVL BLDR 0062 GREY LMSN 0098
1510356	OSGOODE TOWNSHIP LI	1969-09-25	DO	19.8	6.4	8.5	6.1	FR 0063	BRWN CLAY 0010 GREY GRVL MSND BLDR 0034 GREY LMSN 0065

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1510424	OSGOODE TOWNSHIP LI	1969-10-31	DO	22.3	6.4	7.3	4.6	FR 0071	GREY CLAY BLDR 0020 GREY MSND GRVL 0021 BLCK LMSN 0073
1510434	NORTH GOWER TOWNSHIP BF 005	1969-12-02	DO	13.1	7.3	11.6	4.6	FR 0042	BLCK LOAM 0002 GREY CLAY 0006 BLUE CLAY MSND 0012 GREY HPAN STNS 0035 BLCK GRVL FSND 0038 GREY LMSN 0043
1510472	NORTH GOWER TOWNSHIP BF 004	1969-12-18	DO	20.4	6.4	7.9	4.6	FR 0067	GREY CLAY MSND GRVL 0011 BLDR GRVL 0026 GREY LMSN SHLE 0067
1510576	OSGOODE TOWNSHIP LI	1970-03-05	DO	26.5	15.2	15.8	14.9	FR 0086	GRVL BLDR 0026 GRVL 0050 BLUE LMSN 0087
1510651	OSGOODE TOWNSHIP CON 01 005	1970-06-18	DO	23.2	5.7	15.2	4.6	FR 0075	BRWN MSND FILL 0012 GREY CLAY SILT 0028 BLCK STNS 0032 GREY MSND GRVL 0046 GREY LMSN 0076
1510655	OSGOODE TOWNSHIP LI	1970-06-26	DO	29.3	11.6	13.1	18.3	FR 0094	HPAN BLDR 0038 BLUE LMSN 0096
1511142	OSGOODE TOWNSHIP LI	1971-04-27	DO	21.3	6.7	9.1	3.7	FR 0068	BRWN CLAY 0012 BLUE CLAY 0026 GREY HPAN 0027 BLUE LMSN 0070
1511047	NORTH GOWER TOWNSHIP BF 005	1970-11-30	DO	19.2	6.7	11.9	6.1	FR 0061	BRWN HPAN BLDR 0035 BLCK LMSN 0063
1511053	OSGOODE TOWNSHIP LI	1971-01-18	DO	20.7	6.7	7.0	4.6	UK 0065	GREY CLAY 0016 GREY SAND BLDR 0022 GREY LMSN 0068
1511202	OSGOODE TOWNSHIP LI	1971-06-07	DO	22.3	10.4	13.7	6.1	FR 0072	BRWN HPAN BLDR 0018 GREY SAND GRVL 0021 BRWN SAND 0028 GREY HPAN 0042 BLCK LMSN 0073
1511216	OSGOODE TOWNSHIP CON 01 003	1971-06-15	DO	19.8	4.9	6.7	0.6	FR 0064	BRWN CLAY 0005 BLUE CLAY BLDR 0016 GREY LMSN 0065
1511218	OSGOODE TOWNSHIP LI	1971-06-15	DO	19.8	6.7	6.7	3.7	FR 0048 FR 0063	BRWN CLAY 0016 GREY LMSN 0065
1511230	OSGOODE TOWNSHIP LI	1971-06-29	DO	36.9	6.4	7.3	2.4	FR 0118	BRWN CLAY 0015 GREY SAND BLDR 0021 BLUE LMSN 0121

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1511347	OSGOODE TOWNSHIP LI	1971-07-28	DO	37.8	7.6	8.2	1.8	FR 0060 FR 0123	BRWN SAND CLAY 0020 GREY HPAN 0025 GREY LMSN 0124
1511722	OSGOODE TOWNSHIP LI	1972-02-10	DO	14.6	7.3	8.2	5.5	FR 0047	BRWN SAND CLAY BLDR 0024 GREY LMSN 0048
1511517	OSGOODE TOWNSHIP LI	1971-10-05	DO	14.6	9.1	6.7	3.0	FR 0026 FR 0044	BRWN CLAY SAND 0016 GREY LMSN 0048
1511518	OSGOODE TOWNSHIP LI	1971-10-05	DO	19.8	0.3	6.7	2.4	FR 0032 FR 0056 FR 0063	BRWN CLAY 0001 GREY LMSN 0065
1511538	OSGOODE TOWNSHIP LI	1971-10-27	DO	29.9	7.0	16.2	14.0	FR 0066 FR 0094	BRWN SAND CLAY GRVL 0015 GREY GRVL CLAY SAND 0045 GREY HPAN BLDR 0051 GREY LMSN 0098
1511539	OSGOODE TOWNSHIP LI	1971-10-28	DO	29.9	16.2	16.8	14.6	UK 0068 UK 0095	BRWN SAND CLAY GRVL 0012 GREY GRVL SAND CLAY 0048 GREY HPAN 0053 GREY LMSN 0098
1511545	OSGOODE TOWNSHIP LI	1971-10-28	DO	29.9	17.4	18.3	14.0	FR 0072 FR 0095	BRWN SAND CLAY GRVL 0014 GREY GRVL SAND BLDR 0052 GREY HPAN 0057 GREY LMSN 0098
1511638	OSGOODE TOWNSHIP LI	1971-11-22	DO	21.3	4.3	6.7	2.4	FR 0040 FR 0068	BRWN SAND CLAY BLDR 0014 GREY LMSN 0070
1511640	OSGOODE TOWNSHIP LI	1971-11-24	DO	30.5	6.1	6.7	5.2	FR 0027 FR 0096	BRWN SAND CLAY BLDR 0020 GREY LMSN 0100
1511908	NORTH GOWER TOWNSHIP BF 005	1972-06-30	DO	10.7	6.7	7.6	2.1	FR 0034	BRWN CLAY 0012 GREY HPAN BLDR 0022 GREY LMSN 0035
1511926	OSGOODE TOWNSHIP LI	1972-05-11	DO	25.6	9.4	10.7	9.1	FR 0080	BRWN CLAY 0018 BRWN GRVL BLDR SAND 0031 BLCK LMSN 0084
1512000	OSGOODE TOWNSHIP LI	1972-08-03	DO	22.9	17.4	18.3	7.6	FR 0073	BRWN HPAN BLDR GRVL 0057 GREY LMSN 0075
1512023	OSGOODE TOWNSHIP LI	1972-08-17	DO	22.9	16.8	17.7	12.2	FR 0074	BRWN HPAN GRVL BLDR 0055 GREY LMSN 0075

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1512024	OSGOODE TOWNSHIP LI	1972-08-16	DO	24.4	12.5	13.7	6.1	FR 0076	BRWN SAND BLDR GRVL 0041 GREY LMSN 0065 GREY SNDS 0080
1512026	OSGOODE TOWNSHIP LI	1972-08-15	DO	14.9	7.6	8.5	3.7	FR 0040	BRWN CLAY 0011 BLUE CLAY 0023 GREY SAND BLDR GRVL 0025 GREY LMSN 0049
1512140	OSGOODE TOWNSHIP LI	1972-10-19	DO	41.1	10.4	11.0	7.3	FR 0070 FR 0107	BRWN CLAY BLDR 0009 GREY SAND 0034 GREY LMSN 0097 GREY SNDS 0135
1512168	OSGOODE TOWNSHIP LI	1972-09-15	DO	38.1	7.3	8.2	5.5	FR 0045 FR 0071	BRWN CLAY BLDR 0021 GREY CLAY GRVL BLDR 0024 GREY LMSN 0085 GREY SNDS 0125
1512169	OSGOODE TOWNSHIP LI	1972-09-14	DO	45.7	7.3	8.2	5.5	FR 0095 FR 0126	BRWN CLAY BLDR 0005 GREY SAND BLDR 0024 GREY LMSN 0082 WHIT SNDS 0150
1512171	OSGOODE TOWNSHIP LI	1972-09-14	DO	32.0	9.1	9.8	6.1	FR 0062 UK 0104	BRWN FILL 0002 GREY SAND BLDR 0030 GREY LMSN 0105
1513747	NORTH GOWER TOWNSHIP BF 004	1973-05-25	DO	19.5	18.3	18.9	2.4	FR 0062	GREY CLAY 0060 GREY LMSN 0064
1512228	OSGOODE TOWNSHIP LI	1972-11-29	DO	41.5	11.6	12.2	5.5	FR 0130	BRWN CLAY BLDR 0015 GREY HPAN BLDR GRVL 0038 GREY LMSN 0076 GREY SNDS 0136
1512310	NORTH GOWER TOWNSHIP BF 005	1973-01-24	DO	39.6	17.4	18.3	9.4	FR 0090	BRWN SAND CLAY BLDR 0012 GREY HPAN GRVL BLDR 0057 GREY LMSN 0126 GREY SNDS 0130
1513374	NORTH GOWER TOWNSHIP BF 004	1973-06-05	DO	11.9		11.3	1.5	FR 0038	BRWN SAND 0002 BRWN CLAY 0010 BLUE CLAY 0030 GREY GRVL 0039
1513555	NORTH GOWER TOWNSHIP BF 005	1973-09-11	DO	44.8	10.4	11.0	7.6	FR 0047 FR 0147	BRWN SAND BLDR 0026 HPAN BLDR 0034 BLCK LMSN 0060 GREY LMSN 0073 BLCK LMSN 0109 WHIT SNDS 0120 BLCK LMSN 0123 WHIT SNDS 0130 GREY SNDS 0147
1513556	NORTH GOWER TOWNSHIP BF 005	1973-09-12	DO	14.6	11.9	12.8	2.4	FR 0045 FR 0047	BRWN CLAY 0020 GREY CLAY STNS 0039 BLCK LMSN 0048
1513558	NORTH GOWER TOWNSHIP BF 005	1973-09-12	DO	45.1	11.3	12.2	7.6	FR 0147	BRWN SAND BLDR 0028 HPAN BLDR 0037 BLCK LMSN 0080 GREY LMSN 0118 GREY SNDS 0148

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1514223	OSGOODE TOWNSHIP LI	1974-08-01	DO	22.3	14.9	15.5	12.2	MN 0055	GREY HPAN BLDR 0049 BLCK LMSN 0073
1514288	OSGOODE TOWNSHIP CON 01 004	1974-08-06	DO	22.3	6.7	7.6	1.5	FR 0070	BRWN SAND 0006 GREY CLAY STNS 0022 BLCK LMSN 0073
1514569	NORTH GOWER TOWNSHIP BF 004	1974-05-17	DO	28.7	28.0	28.0		SU 0094	BRWN SAND 0005 BLUE CLAY 0092 LMSN 0094
1515615	OSGOODE TOWNSHIP LI	1976-09-24	DO	35.1	19.5	20.4	15.2	FR 0112	BRWN SAND BLDR PCKD 0015 BRWN HPAN BLDR PCKD 0064 GREY LMSN 0095 GREY SNDS HARD 0115
1516106	OSGOODE TOWNSHIP LI	1977-06-23	DO	25.3	14.3	14.9	3.7	FR 0080	GREY CLAY STNS 0047 GREY LMSN 0083
1516114	NORTH GOWER TOWNSHIP BF 004	1977-07-11	DO	9.1	4.6	7.6	2.4	FR 0026	GREY CLAY 0015 GREY LMSN 0030
1516271	OSGOODE TOWNSHIP LI	1977-10-20	DO	22.3	14.6	16.2	9.1	FR 0068	BRWN CLAY SAND BLDR 0009 BRWN HPAN BLDR PCKD 0048 GREY LMSN 0073
1516334	NORTH GOWER TOWNSHIP BF 004	1977-09-29	DO	13.4	6.4	7.6	1.5	FR 0038	GREY SAND STNS 0021 GREY LMSN 0044
1517488	OSGOODE TOWNSHIP CON 01 003	1980-07-21	DO	12.2	4.6	6.7	1.2	FR 0025 FR 0038	BRWN CLAY 0008 GREY HPAN 0015 GREY LMSN 0040
1517533	OSGOODE TOWNSHIP LI	1980-10-21	DO	18.3	13.4	13.7	7.6	FR 0056	BRWN CLAY 0016 GREY CLAY 0035 GREY SAND GRVL BLDR 0044 GREY LMSN 0060
1517564	OSGOODE TOWNSHIP LI	1981-04-23	DO	19.2	14.0	14.6	4.6	FR 0059	GREY CLAY BLDR 0028 GREY HPAN GRVL 0046 GREY LMSN 0063
1517589	OSGOODE TOWNSHIP LI	1981-08-06	DO	14.3	12.5	13.1	4.6	FR 0047	GREY SAND 0003 BLUE CLAY 0030 GREY HPAN BLDR 0041 GREY LMSN 0047
1517651	NORTH GOWER TOWNSHIP BF 004	1981-06-29	DO	14.6	7.6	7.9	1.5	FR 0040	BRWN CLAY 0014 GREY CLAY 0020 GREY SAND GRVL 0025 GREY LMSN 0048

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1517652	NORTH GOWER TOWNSHIP CON A 005	1981-06-29	DO	18.3	7.9	9.4	4.6	FR 0055	BRWN CLAY BLDR SNDY 0026 GREY LMSN 0060
1517996	OSGOODE TOWNSHIP CON 01 005	1982-09-14	DO	15.2	3.7	6.7	1.8	FR 0045	BRWN HPAN BLDR 0012 GREY LMSN 0050
1518656	NORTH GOWER TOWNSHIP BF 004	1983-10-19	DO	13.1	9.8	10.4	3.4	FR 0037	GREY CLAY 0005 GREY HPAN STNS 0032 GREY LMSN 0043
1519037	NORTH GOWER TOWNSHIP BF 005	1984-01-17	DO	48.8	13.4	14.0	7.6	FR 0085 FR 0157	GREY CLAY 0004 GREY HPAN STNS 0044 GREY LMSN 0152 WHIT SNDS 0160
1525929	OSGOODE TOWNSHIP CON 01 004	1991-11-20	DO	37.5	8.2	9.1	3.7	FR 0118	GREY CLAY 0027 GREY LMSN 0087 WHIT SNDS 0123
1527503	OSGOODE TOWNSHIP CON 01 006	1993-09-22	DO	31.1	15.5	16.8	3.4	UK 0077 UK 0098	GREY GRVL 0004 GREY CLAY 0045 GREY HPAN GRVL 0051 GREY LMSN 0102
1533319	NORTH GOWER TOWNSHIP CON A 004	2002-11-01	DO	24.4	5.8		3.0	UK 0074	CLAY GRVL 0019 BLCK LMSN 0080
7049988	MARCH TOWNSHIP	2007-09-10							
7052064	NORTH GOWER TOWNSHIP 004	2007-10-18	DO	27.4		6.9	1.9	FR 0072	RED CLAY DNSE 0014 GREY LMSN LYRD 0090
7053560	NORTH GOWER TOWNSHIP CON A 002	2007-11-12	DO	53.3		13.1	10.3	0173	BRWN HPAN BLDR PCKD 0014 GREY HPAN BLDR PCKD 0040 GREY LMSN 0105 GREY SNDS HARD 0175
7105861	NORTH GOWER TOWNSHIP BF	2008-05-15							
7108186	NORTH GOWER TOWNSHIP 009	2008-05-14	DO	43.0			3.2	UT 0132	SAND GRVL 0025 GREY LMSN 0118 GREY LMSN 0141
7108187	NORTH GOWER TOWNSHIP 008	2008-05-14	DO	42.7			3.2	UT 0133 UT 0135	SAND GRVL 0021 GREY LMSN 0116 GREY SNDS 0140

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7109789	NORTH GOWER TOWNSHIP 009	2008-06-24		7.6					0025
7111921	OSGOODE TOWNSHIP	2008-09-09		29.6			3.7		0097
7112930	NORTH GOWER TOWNSHIP 002	2008-08-12	DO	22.9		8.8	2.9	UT 0055	BRWN CLAY STNS 0005 GREY SAND 0010 GREY CLAY 0024 GREY LMSN 0075
7113128	OSGOODE TOWNSHIP 01	2008-09-22	DO	77.7		11.6	1.7	UT 0160 UT 0249	SAND 0032 GREY LMSN 0140 WHIT SNDS LMSN 0200 WHIT SNDS 0255
7154903	OSGOODE TOWNSHIP	2010-11-01	DO					UT	
7161173	OSGOODE TOWNSHIP	2011-03-23	DO			2.1			
7166914	OSGOODE TOWNSHIP	2011-07-28	DO			1.6			
7167126	NORTH GOWER TOWNSHIP CON A 004	2011-07-06	DO	39.6		8.4		UT 0123	CLAY SAND STNS 0021 BLCK LMSN 0090 GREY SNDS 0130
7173519	OSGOODE TOWNSHIP	2011-11-28	DO			2.1			
7173907	NORTH GOWER TOWNSHIP CON A 004	2011-11-07							
7174725	OSGOODE TOWNSHIP	2012-01-05	DO					UT	
7181759	NORTH GOWER TOWNSHIP CON A 004	2012-03-23	TH	38.0		11.3	2.9	UT 0037	GREY CLAY 0025 GREY TILL SAND GRVL 0037 GREY DLMT 0038 0125
7181760	NORTH GOWER TOWNSHIP CON A 004	2012-03-23	MT	14.5		11.4	2.9	UT 0042	GREY CLAY 0025 GREY TILL SAND GRVL 0036 GREY DLMT 0048

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7184704	OSGOODE TOWNSHIP LI	2012-06-20	DO			1.4			
7210675	NORTH GOWER TOWNSHIP CON A 005	2013-09-23	DO	24.4		7.9	1.8	UT 0035 UT 0072	GREY CLAY SNDY 0016 GRVL BLDR 0019 GREY LMSN 0035 BLCK LMSN 0072 GREY LMSN 0080
7211084	OSGOODE TOWNSHIP	2013-10-30	DO			2.3			
7242995	NORTH GOWER TOWNSHIP	2015-04-22							
7243008	NORTH GOWER TOWNSHIP	2015-04-21	DO	42.7		8.5	3.7	UT 0059 UT 0120 UT 0133	CLAY SAND BLDR 0022 GREY LMSN 0059 GREY LMSN 0120 GREY LMSN 0133 GREY LMSN 0140
7243009	NORTH GOWER TOWNSHIP	2015-04-15	DO	42.7		8.5	3.8	UT 0065 UT 0122 UT 0134	CLAY SAND BLDR 0022 GREY LMSN 0065 GREY LMSN 0122 GREY LMSN 0134 GREY LMSN 0140
7251020	NORTH GOWER TOWNSHIP	2015-06-23							
7251023	NORTH GOWER TOWNSHIP	2015-06-18	DO	38.1		11.0	6.2	UT 0113	BRWN LOAM BLDR LOOS 0020 GREY TILL PCKD 0034 GREY LMSN SNDS LYRD 0125
7292170	NORTH GOWER TOWNSHIP CON A 005	2017-06-05							
7296286	NORTH GOWER TOWNSHIP CON 10 010	2017-07-06	DO	19.2		8.5	1.9	UT 0038 UT 0046 UT 0057	SAND CLAY 0010 SAND GRVL 0022 GREY LMSN SHLE 0038 GREY LMSN SHLE 0046 GREY LMSN SHLE 0057 GREY LMSN SHLE 0063
7296897	NORTH GOWER TOWNSHIP CON A 005	2017-08-29	MO	8.2		6.7		UT 0012	LOAM 0003 BLUE CLAY SLTY 0012 GREY SAND SILT 0027
7298148	NORTH GOWER TOWNSHIP	2017-10-03						UT	
7299183	NORTH GOWER TOWNSHIP CON A 004	2017-10-06							

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7321066	NORTH GOWER TOWNSHIP	2018-08-20							
7321150	NORTH GOWER TOWNSHIP CON A 004	2018-08-22	DO	36.6		11.6	7.0	UT 0100 UT 0114	GRVL FILL 0030 GREY LMSN 0120
7324268	OSGOODE TOWNSHIP	2018-10-11							
7324272	OSGOODE TOWNSHIP	2018-10-03	DO	41.1		8.2	4.1	UT 0050 UT 0128	CLAY GRVL SNDY 0021 GREY LMSN 0050 GREY LMSN 0120 GREY SNDS 0128 GREY SNDS 0135
7345394	OSGOODE TOWNSHIP	2019-10-17						UT 0011	
7346274	NORTH GOWER TOWNSHIP CON A 005	2019-10-01	DO	31.4		8.8	4.1	UT 0035 UT 0044 UT 0094	SAND CLAY GRVL 0023 GREY LMSN 0035 GREY LMSN 0044 GREY LMSN 0094 GREY LMSN 0103
7347918	NORTH GOWER TOWNSHIP CON A 005	2019-11-06							
7370182	NORTH GOWER TOWNSHIP	2020-09-02							
7371700	OSGOODE TOWNSHIP	2020-08-18							
7377751	OSGOODE TOWNSHIP	2020-11-13							
7389979	OSGOODE TOWNSHIP	2021-02-25							
7389985	OSGOODE TOWNSHIP	2021-03-01							
7403962		2021-08-30							

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APPENDIX H

Calculated Groundwater Taking Needs

Report to: 1910753 Ontario Inc.
Project: 100152.004 (February 3, 2023)

1086 Antochi Lane - Water Taking Calculations

Groundwater Flow Estimates To Open Excavation - Source 1 Service Replacement Trench

Project: 100152.004

Date: January 2023

Radius of Influence Equation
(Leonards, 1962)

$$R = 100 \cdot C \cdot (H - h_0) \cdot \sqrt{k}$$

Variables and Units

- R = Distance from edge of excavation where drawdown is negligible (m)
- C = Situation Factor (C = 3 for flow to a well; C = 1.5 to 2 for single line of well points)
- H = Water head outside distance R from open slot excavation (m)
- h_0 = Water head inside open slot excavation (m)
- k = Coefficient of permeability (cm/sec)

Gravity flow to Slot/Open Trench Equation, Unconfined
(Driscoll, 1986)

$$Q = \frac{k(H^2 - h_0^2)}{0.733 \log\left({}^{R}/_{0.5w}\right)} + 2\left(\frac{Lk(H^2 - h_0^2)}{2R}\right)$$

Variables and Units

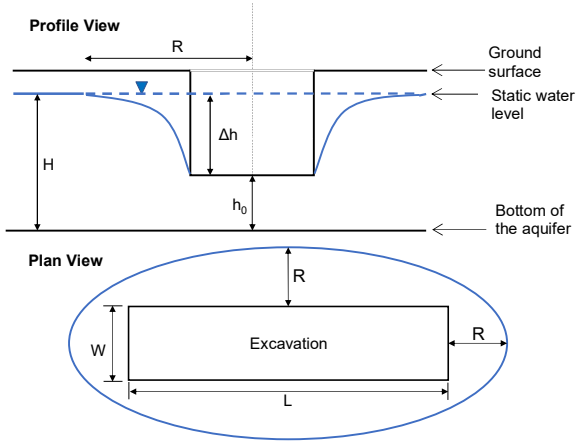
- Q = Flow to one side of the open slot excavation (m^3/day)
- k = Coefficient of permeability (m/day)
- L = Length of open excavation (m)
- R = Radius of influence (m)
- H = Water head outside distance R from open slot excavation (m)
- h_0 = Water head inside open slot excavation (m)
- w = Radius of the well approximation (half of excavation width) (m)

Gravity flow to Slot/Open Trench Equation, Unconfined Aquifer (Powers, 2007)

$$Q = \frac{\pi k(H^2 - h_0^2)}{\ln\left({}^{L}/_{r_s}\right)} + 2\left(\frac{xk(H^2 - h_0^2)}{2L}\right)$$

Variables and Units

- Q = Groundwater flow rate (m^3/day)
- k = hydraulic conductivity m/s
- x = Length of open excavation (m)
- L = Radius of influence (m)
- H = Water table at L (m)
- h_0 = target groundwater level at excavation (m)
- rs = Radius of the well approximation (half of excavation width) (m)



Data Entry

Radius of Influence Equation			Flow to Open Trench Equation		
Variable	Input		Variable	Input	
C	3.0		k	6.9	m/day
H	8.0	m	L	30.0	m
h_0	4.5	m	w	4.5	m
k	0.010	cm/sec			

Results

Radius of Influence ('R)	**105 m**
Flow to Open Trench Equation	**417 (m^3/day)**

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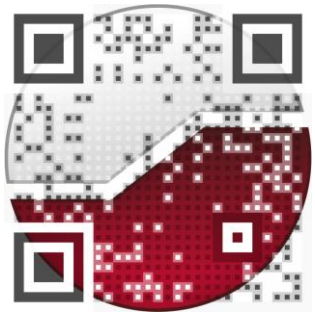

civil	civil
geotechnical	géotechnique
environmental	environnementale
field services	surveillance de chantier
materials testing	service de laboratoire des matériaux

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