PRELIMINARY HYDROGEOLOGICAL INVESTIGATION

157 and 165 Cross Avenue, Oakville, Ontario

Client

Cross Realty LP.
1-90 Wingold Avenue
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Project Number

BIGC-ENV-623A

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1 Introduction

1.1 Project Description

B.I.G. Consulting Inc. (BIG) was retained by Cross Realty LP.(Client), to conduct a Preliminary Hydrogeological Investigation for the site located at 157 and 165 Cross Avenue, Oakville, Ontario (Site). The earlier field investigations remain valid following design updates.

The Site is located north of Cross Avenue and to the west of Argus Road in Oakville, Ontario, as shown on Figure 1. The Site measures approximately 9,650 m² in size and is currently occupied by a single-storey commercial building at 157 Cross Avenue and a three (3)-storey commercial building at 165 Cross Avenue (Site buildings). The areas surrounding the Site building are covered with asphalt paved parking and landscaping.

Based on the architectural drawings prepared by Teeple Architects Inc. (TAI), dated February 16, 2024, BIG understands that the proposed development will consist of two (2) condominium buildings with eight (8) levels of underground parking structure.

It should be noted that the dewatering estimated provided in this report are based on the conceptual building information available at this time. If design details are changed (including any changes to excavation depth), the dewatering estimates must be revised to include the final layout of the development.

This report addresses the hydrogeological aspects of the proposed project. Reports for the Environmental and Geotechnical Investigations will be issued under separate covers. The field investigations for the geotechnical, environmental and hydrogeological investigations were carried out concurrently.

1.2 Project Objectives

The main objectives of the Hydrogeological Investigation were to:

a) Establish the subsurface geological and hydrogeological conditions at the expected foundation elevation;
b) Provide preliminary assessment of anticipated construction dewatering flow rates for a generic construction scenario;
c) Assess groundwater quality and compare the results to both Combined/Sanitary Sewer Use Bylaw for the Regional of Halton and Storm Sewer Use Bylaw for the Town of Oakville;
d) Assessment of any potential construction dewatering flow rates;
e) Assessment of foundation sub-drain discharge volumes; and
f) Prepare a Preliminary Hydrogeological Investigation Report.

1.3 Scope of Work

To achieve the investigation objectives noted above, BIG proposed and initiated the following scope of work:

a) Review available geological and hydrogeological information of for the subject Site;
b) Review of the Ministry of Environment, Conservation and Parks (MECP) Water Well Records;
c) Advancement of nine (9) boreholes (BH1, BH2D, BH2S, BH3 to BH5, BH6D, BH6S and BH7) to a maximum depth of 32.0 m below ground surface (bgs) and installation of nine (9) monitoring wells (MW1, MW2D, MW2S, MW3 to MW5, MW6D, MW6S and MW7);

d) Perform single well response tests (SWRT) at all monitoring wells to assess the hydraulic characteristics of the saturated soils at the Site;
e) Completion groundwater level measurements at all monitoring wells on-Site;
f) Evaluate the information of groundwater level measurements and groundwater quality;
g) Collection of one (1) groundwater sample for laboratory testing and compare it against both Combined/Sanitary Sewer Use Bylaw for the Regional of Halton and Storm Sewer Use Bylaw for the Town of Oakville parameters;
h) Assessment of groundwater discharges during construction phases;
i) Assessment of foundation sub-drain discharge volumes; and
j) The preparation of a Preliminary Hydrogeological Investigation Report.

2 Regional Setting

2.1 Regional Physiography

The Ontario Geological Survey Map P. 2204, indicates the Site lies in the Iroquois Plain physiographic region of Southern Ontario known as the shale plains. Figure 2 shows the physiographic regions of Southern Ontario around the Site.

During the last retreat of the Laurentide Ice Sheet (12,000 years B.P.) lake levels in what was to become Lake Ontario where much higher due to ice blockage in the St. Lawrence waterway. This created the glacial Lake Iroquois which was up to 60 m higher in elevation in the Toronto area than the current Lake Ontario water levels. The Iroquois Shoreline that coincided with this elevated lake, terminated above St. Clair Avenue West.

2.2 Regional Geology

The surficial geology of the immediate area around the Site is described as Paleozoic bedrock. The surficial geology for the Site and surrounding areas is shown on Figure 3.

Bedrock of the region corresponds to the Georgian Bay Formation, Blue Mountain Formation, Billings Formation, Collingwood Member and Eastview Member consisting of shale, limestone, dolostone and siltstone. The contact between the bedrock and the overlying overburden is expected to be at approximately 2.3 m to 4.6 m bgs.

2.3 Regional Hydrogeology

Groundwater movement through the subsurface is controlled by hydraulic gradients, the physical characteristics of the sediments, and the interconnectedness of lithological formations. Fine grained sediments restrict lateral movement of groundwater and induce vertical infiltration, while coarse grained sediments allow vertical flow with increased transmissivity.

The regional shallow groundwater flow is expected to follow the local topography and discharge to local area creeks and streams. Local deviation from the regional groundwater flow directions may occur in response to changes in topography and/or soil stratigraphy, as well as the presence of surface water features and/or existing subsurface infrastructure.

No local aquifers were identified that could negatively impact the subject Site.

3 Site Setting

3.1 Site Topography and Drainage

The Site is rectangular in shape and has an area of approximately 9,650 m^2. The is currently occupied by a single-storey commercial building located at 157 Cross Avenue and a three (3)-storey commercial building located at 165 Cross Avenue (Site buildings). The areas surrounding the Site building are covered with asphalt paved parking and landscaping. The topography of the Site generally slopes to the south and based on the borehole logs, the ground elevation ranges between 104.24 m and 102.95 m above sea level (asl).

3.2 Local Surface Water Features

The Site does not feature any surface water bodies on the Site. The closest surface water body to the Site is Sixteen Mile Creek, located approximately 330 m southwest of the Site. Lake Ontario is located approximately 2.1 km southeast. The Site is situated within the Lower Morrison Creek watershed and is not port of a Conservation Halton regulated area.

3.3 Ministry of Environment, Conservation and Parks Water Well Review

Well Records from the Ministry of Environment, Conservation and Parks (MECP) Water Well Record Database (WWR) were reviewed to determine the number of water wells and locations present within a 500 m radius of the Site boundaries.

The MECP WWR database indicated sixty-seven (67) well records within 500 m radius of the Site. All identified wells are shown on Figure 4. A summary of the Water Well Records is included in Appendix B, Table B-1. A review of the records indicated that the majority of the wells were classified for observation well, monitoring well and test hole purposes within 500 m radius of the Site. One (1) supply water well was identified at the Queen Elizabeth Way, located approximate 215 m northwest of the Site. The well was installed in 1948 and the well is located in a developed area, the supply well is likely not present. Given the area is serviced by municipal system, no private well water user is expected.

3.4 Permit to Take Water and Environmental Activity and Sector Registry Search

The MECP also maintains a database of all active and expired Permit to Take Water (PTTW) and Environmental Activity and Sector Registry (EASR) items related to construction dewatering and pumping test. There are five (5) expired PTTW registrations, one (1) active EASR registration and two (2) expired EASR registrations within 1 km of the Site and are summarized in Table B-2, Appendix B. The location for each registration is shown on Figure 5.

4 Field Program

4.1 Borehole and Monitoring Well Details

BIG advanced nine (9) boreholes (BH1, BH2D, BH2S, BH3 to BH5, BH6D, BH6S and BH7) to a maximum depth of 32.0 m below ground surface (bgs) between August 28, 2023 and September 11, 2023, and instrumented nine (9) boreholes with monitoring wells (MW1, MW2D, MW2S, MW3 to MW5, MW6D, MW6S and MW7). The boreholes were advanced by using a truck mounted solid stem continuous flight auger equipment under the direction and supervision of BIG field personnel. Soil samples were retrieved at regular intervals with a 50 mm outside diameter split barrel sampler drive and accordance with the Standard Penetration Test Procedure (ASTM D1586). The samples were logged in the field and returned to the BIG laboratory for detailed visual examination. The borehole records and monitoring well construction detail are included in Appendix A.

Figure 6 is a detailed Borehole/Monitoring Well Location Map of the Site. The borehole logs are attached in Appendix A.

4.2 Site Specific Overburden Geology

The borehole locations are shown on Figure 6 and detailed subsurface and bedrock conditions are presented on the borehole logs in Appendix A. The following table is provided in addition to the borehole descriptions to provide a general summary of the soil conditions. The soil descriptions are based on BIG's investigation. The soil boundaries indicated on the borehole logs and discussed herein are inferred from the visual observations and auger resistance and should not be regarded as exact planes of geological change.

The soil conditions encountered at the borehole locations are summarized below. A stratigraphic cross-section across the property as aligned on Figure 6 is included as Figure 7.

Table 4-1: Soil description

Layer	Description
Asphalt Pavement	All boreholes were advanced through the existing asphalt pavement, consisting of approximately 70 to 100 mm (average 83 mm) thick asphaltic concrete over approximately 100 to 230 mm (average 147 mm) thick granular base.
Fill	Below the asphalt pavement, fill materials were encountered to depths varying between 0.8 and 3.1 m bgs in all boreholes. The existing fill is heterogeneous, but it predominantly consisted of silty clay to clayey silt or sandy silt to sand.
Sandy Silt Till	Below existing fill materials, native deposits of sandy silt till were encountered in boreholes BH/MW5 to BH/MW7. The glacial tills extended to depths varying 3.1 to 5.0 m bgs. It should be noted that the presence of occasional cobbles and boulders was anticipated within the tills.
Glacial Till/Shale Complex	A stratum of till/shale complex, consisting of sandy silt till to silty sand till/silty clay till/shale complex, was encountered below the fill or sandy silt till in boreholes BH/MW1 to BH/MW4 and BH/MW7. The deposits extended to depths ranging from approximately 2.3 to 4.6 m bgs in BH/MW1 to BH/MW4. BH/MW7 was terminated in this stratum at the depth of about 6.1 m bgs. This stratum was difficult to penetrate with the drilling augers due to the fragmented shale/limestone content and its hard consistency. Cobbles and boulders were also anticipated in these deposits.
Shale Bedrock	Weathered shale bedrock was encountered below the glacial till or till/shale complex in all boreholes except BH/MW7. Boreholes BH/MW1 to BH/MW6 were terminated within the shale bedrock of Georgian Bay Formation at depths ranging from 6.1 to 32.0 m bgs.

4.3 Water Level Monitoring

Water levels at all monitoring well locations were recorded after installation. A summary of all available water level observations is included in Table 4-2. Groundwater was observed in all monitoring wells on September 12, 2023, and depths to the groundwater ranged from 1.91 m to 21.56 m bgs. The shallow wells BH/MW1, BH/MW2S, BH/MW3, BH/MW5, BH/MW6S, and BH/MW7 were observed with groundwater elevations that ranged from 101.71 m to 98.31 m asl. The deep wells BH/MW2D, BH/MW4 and BH/MW6D, were observed with groundwater elevations that ranged from 91.63 m to 82.28m asl.

An interpreted groundwater contour map for the water level measurements recorded on September 12, 2023, is included as Figure 8. Based on the water level measurements obtained, the inferred direction of groundwater flow across the Site is interpreted to be to the southern direction.

Seasonal variability can produce significant changes to the static water level. It has been observed that groundwater can rise and lower in response to changing weather and climate.

Table 4-2: **Monitoring Well Details and Water Levels Elevations**

Well ID	Ground Elevation (m asl)	Well Depth (m bgs)	September 12, 2023	
			Water Level (m bgs)	Elevation (m asl)
BH/MW1	104.24	6.1	2.53	101.71
BH/MW2D	103.84	22.9	21.56	82.28
BH/MW2S	103.79	4.6	2.13	101.66
BH/MW3	103.45	6.1	3.54	99.91
BH/MW4	103.45	16.8	13.14	90.31
BH/MW5	103.52	6.1	2.40	101.12
BH/MW6D	102.98	21.9	11.35	91.63
BH/MW6S	102.95	7.0	4.64	98.31
BH/MW7	103.20	6.1	2.26	100.94

4.4 Hydraulic Conductivity Testing

The hydraulic conductivity test was completed to estimate the saturated hydraulic conductivity (K) of the soil or bedrock at the well screen depth at all monitoring well locations.

In advance of performing SWRT, the monitoring well was developed to remove the potential presence of fine sediments. The development process involved purging of the monitoring wells to induce the flow of fresh formation water through the screen. The monitoring well water level was permitted to fully recover prior to performing SWRTs.

During the SWRT, a slug of water was instantaneously removed from the well and the response to the water level is recorded. The Hydraulic Conductivity values for each of the tested wells were calculated from the SWRT data using Aqtesolv Software and the Hvorslev solution for unconfined conditions. The semi-log plots for normalized drawdown versus time are included in Appendix C.

The summary of the hydraulic conductivity (K) values estimated from the SWRTs are provided below in Table 4-3:

Table 4-3: Summary of Hydraulic Conductivity (K) Testing Results

Monitoring Well	Well Depth (m bgs)	Material within Well Screen	Hydraulic Conductivity (m/s)
BH/MW1	6.1	Bedrock	5.64×10^{-7}
BH/MW2D	22.9	Bedrock	3.99×10^{-9}
BH/MW2S	4.6	Sandy silt till/bedrock	3.22×10^{-6}
BH/MW3	6.1	Bedrock	7.39×10^{-6}
BH/MW4	16.8	Bedrock	5.17×10^{-8}
BH/MW5	6.1	Bedrock	2.83×10^{-6}
BH/MW6D	21.9	Bedrock	3.55×10^{-6}
BH/MW6S	7.0	Sandy silt till/bedrock	2.49×10^{-6}
BH/MW7	6.1	Sandy silt till/silty clay till/shale complex	2.69×10^{-8}
		Geometric mean K value (m/s)	**4.97×10^{-7}**

The SWRT provides an estimate of K for the geological formation in the immediate media zone surrounding the well screen and may not be representative of bulk formation hydraulic conductivities.

4.5 Groundwater Sampling

To assess the suitability for discharge of pumped groundwater to the Region of Halton Combined/Sanitary Sewer or Town of Oakville Storm Sewer during dewatering activities, a groundwater sample was collected from BH/MW4 on September 13, 2023.

Prior to collection of the samples, approximately three (3) standing well volumes of groundwater were purged from the well. The sample was collected and placed into pre-cleaned laboratory-supplied vials and/or bottles provided with analytical test group specific preservatives, as required.

The sample was not field filtered. Dedicated nitrile gloves were used during sample handling. The groundwater sample was submitted to an independent laboratory, Bureau Veritas Laboratories, of Mississauga, Ontario, for analysis.

For the assessment purposes, the analytical results were compared to Table 1 – Limits for Sanitary and Combined Sewer Discharge (By-Law No. 2-03) of the Regional Municipality of Halton; and Table 2 – Limits for Storm Sewer Discharge (By-Law No 2009-031) of the Corporation of the Town of Oakville.

The laboratory Certificate of Analysis (CofAs) and chain of custody are enclosed in Appendix D.

The laboratory CofAs show that there were no exceedances against the Table 1 – Limits for Sanitary and Combined Sewer Discharge.

When compared against the more stringent Table 2 – Limits for Storm Sewer Discharge, the sample indicated exceedance for total manganese (Mn). A summary of the exceedance is provided in Table 4-4.

Table 4-4: Summary of Analytical Results

Parameter	Limits for Sanitary and Combined Sewer Discharge (mg/L) (Table 1)	Limits for Storm Sewer Discharge (mg/L) (Table 2)	Concentration for BH/MW4 (mg/L) (September 13, 2023)
Total Manganese (Mn)	5	0.05	**0.360**

Notes:
***Bold** indicates concentration exceeds the Storm Sewer Discharge Limit.*

If the groundwater encountered is discharged to the Region of Halton sanitary and combined sewer, no treatment will be required. A treatment is required prior to discharge to the Town of Oakville storm sewer. Although the water quality meets the limits of Region of Halton sanitary and combined sewer, the Region typically does not typically allow groundwater discharge to the Regional sewer system. Alternative discharge method or negotiation with the Town of Oakville will be required.

5 Temporary Construction Dewatering

5.1 Construction Dewatering Requirements

It is BIG's understanding that the proposed re-development at the Site will consist of two (2) condominium buildings with eight (8) levels of underground parking structure. Based on Drawing A501 Building Sections, prepared by TAI, dated February 16, 2024, the finished floor elevation (FFE) of P8 is proposed at 78.93 m asl. The footing elevation is assumed approximately 2 m below FFE. It should be noted that the dewatering estimated provided in this report are based on the conceptual building information available at this time. If design details are changed (including any changes to excavation depth), the dewatering estimates must be revised to include the final layout of the development.

The stabilized groundwater level measurements, observed on September 12, 2023, were found to be varying between elevations of 101.71 m to 82.28 m asl. For conservative purposes, the construction dewatering calculation is based on an open cut excavation at the present time. To excavate under dry conditions, the water level is anticipated to be lowered at least to a minimum of approximately 1.0 m below the footing elevation.

Additional dewatering capacity may be required to maintain dry conditions within the excavation during and following significant precipitation events. It should be noted that the dewatering estimates provided in this report are based on the conceptual building information available at this time. If design details are changed (including any changes to excavation depth), the dewatering estimates must be revised to include the final layout of the development.

5.2 Construction Dewatering Flow Rate Assumptions

The assumptions used for the calculation of the dewatering rate for the proposed development are presented in Table 5-1.

Table 5-1 - Dewatering Estimate Assumptions

Input Parameter	Values	Notes
Established Grade Elevation (m asl)	103.33	Based on drawing A501 Building Sections, prepared by TAI, dated February 16, 2024
P8 FFE (m asl)	78.93	Based on drawing A501 Building Sections, prepared by TAI, dated February 16, 2024
Footing Elevation (m asl)	76.93	Assumed 2 m below FFE
Dewatered Elevation Target (m asl)	75.93	Assumed 1 m below footing
Groundwater Elevation (m asl)	101.71	Highest groundwater elevation (September 12, 2023)
Estimated Excavation Area	98 m x 62 m	Based on drawing A201 Level P8 Plan, prepared by TAI, dated February 16, 2024
Hydraulic Conductivity (m/s)	4.97×10^{-7}	Geometric mean K of overburden and bedrock

5.3 Dewatering Flow Rate Equation

The Dupuit equation for steady flow from a linear source on both sides of a rectangular slot of an excavation through an unconfined aquifer resting on a horizontal impervious surface was used to obtain a flow rate estimate, and is expressed as follows:

$$Q_w = \frac{K(x + a)(H^2 - h^2)}{Lo}$$

Where:

Qw	= Rate of pumping (m^3/s)
x	= Length of excavation (m)
a	= Width of excavation (m)
K	= Hydraulic conductivity (m/s)
H	= Head beyond the influence of pumping (static groundwater elevation) (m)
h	= Head above base of aquifer at the excavation (m)
Lo	= Distance to Line Source (m)

It is expected that the initial dewatering rate will be higher in order to remove groundwater from within the overburden and bedrock formations. The dewatering rates are expected to decrease once the target water level is achieved in the excavation footprint as groundwater will have been removed locally from storage resulting in lower seepage rates into the excavation. Additionally, the use of a continuous caisson shoring system will further reduce groundwater migration into the excavation reducing the ongoing seepage rate.

5.4 Radius of Influence

The Radius of Influence (ROI) for the construction dewatering is based on the empirical Sichardt Equation. This equation is used to predict the distance at which the drawdown resulting from pumping is negligible. This equation is empirical and was developed to provide representative flow rates using the steady state flow dewatering equations, as discussed below.

It is noted that in steady state conditions, the radius of influence of pumping will extend until boundary flow conditions are reached and provide sufficient water inputs to the aquifer, such as recharge and surface water bodies.

The ROI of pumping (dewatering) for linear flow is calculated based on the Sichardt equation, which is described as follows:

$$Lo = 1750\ (H - h)\sqrt{K}$$

Where:

K	= Hydraulic conductivity (m/s)
H	= Static Saturated Head (m)
h	= Dynamic Saturated Head (m)

Based on the Sichardt equation and the geometric mean K value, the ROI is approximately 31.8 m from the edge of the excavation for linear flow. The ROI calculation is provided in Appendix E.

The ROI calculation is a conservative methodology and is calculated based on the assumption of active pumping during the construction dewatering. It should be noted that most of the water will be pumped during the first stage of the construction period or when a rain event occurs. Although the ROI was conservatively predicted as 31.8 m from the edge of the excavation, over a period of time, the drawdown curve will be very close to the bottom of the excavation and thus resulting in negligible ROI.

The likelihood for impacts to the nearby structures are negligible. Additionally, the use of a shoring system will further reduce radius of influence.

5.5 Results of Construction Dewatering Flow Rate Estimates

Based on the assumptions provided in this report, the results of the dewatering rate estimate are as follows:

Table 5-2 Summary of Construction Dewatering Flow Rate Estimate

Underground Levels	Construction Dewatering Flow Rate Without Safety Factor (L/day)	Peak Construction Dewatering Flow Rate Including Safety Factor of 2 (L/day)
P8	155,000	310,000

Construction dewatering flow rate estimates are provided in Table E-1, in Appendix E.

The peak construction dewatering flow rate includes a factor of safety of two (2) to account for accumulation of rainfall, seasonal fluctuations in the groundwater table, flow from beddings of existing sewers, and variation in hydrogeological properties beyond those encountered during the course of this study. This total dewatering flow rate also provides additional capacity for the dewatering contractors. Given that the predicted dewatering volume exceeds the 50,000 L/day limit, an EASR for construction dewatering will be required.

It should be noted that if caisson wall shoring system is considered for the subject Site, reduction in groundwater quantities can be anticipated.

Please note that it is the responsibility of the contractor to ensure dry conditions are maintained within the excavation at all times. The dewatering contractor should ensure that silt removal or replacement from subsoil be eliminated and monitored during construction dewatering at all times.

Additional pumping capacity may be required to maintain dry conditions within the excavation during and following significant precipitation events. Additionally, the presence of near-surface fill material could hold significant groundwater.

The maximum flow calculation is intended to provide a conservative estimate to account for unforeseeable conditions that may arise during construction. It should be noted that the dewatering estimate provided in this report are based on the proposed development information available at this time. If changes to the design are implemented (e.g., increase to planned excavation depths, widening of excavations, etc.), the dewatering estimates must be revised to include and reflect future changes.

6 Long Term Discharge Estimate

6.1 Long-Term Dewatering Assumptions

Given that the groundwater level is above foundation depths for the development, a permanent foundation sub-drain is recommended. It is assumed that the below grade structure will feature a perimeter drain and sub-drain system installed at approximately 0.5 m below the FFE elevation. Table 6-1 presents the assumptions used to calculate the long-term drainage rate estimates.

Once the design is available, BIG needs to review and re-evaluate the dewatering estimates. If the foundation elevation is deeper than the assumptions in this report, additional investigation will be required.

Table 6-1 - Dewatering Estimate Assumptions

Input Parameter	Values	Notes
Established Grade Elevation (m asl)	103.33	Based on drawing A501 Building Sections, prepared by TAI, dated February 16, 2024
P8 FFE (m asl)	78.93	Based on drawing A501 Building Sections, prepared by TAI, dated February 16, 2024
Groundwater Elevation (m asl)	91.63	Highest groundwater elevation in deep aquifer (September 12, 2023)
Sub-drain/ Foundation Elevation Target (m asl)	78.43	Assumed 0.5 m below P8 FFE
Drainage Dimensions	98 m x 62 m	Based on drawing A201 Level P8 Plan, prepared by TAI, dated February 16, 2024
Hydraulic Conductivity (m/s)	1.19×10^{-7}	Geometric mean K of bedrock

6.2 Radius of Influence

The ROI calculation is a conservative methodology and is calculated based on the assumption of active pumping during long-term dewatering. It should be noted that there will be no active pumping during long-term dewatering. The foundation drains will be constructed below the floor slab and/or near the foundation and the groundwater would passively drain into these sub drains and discharged directly to sumps. Due to the nature of overburden material, the groundwater will flow through the natural gradient that exists on the Site and passively flow into the foundation sub-drains and will not be actively pumped. Although, the ROI which was conservatively predicted was at 15.6 m from the edge of the sub-drain, over a period of time, the drawdown curve will be very close to the foundation walls and thus resulting in negligible ROI.

6.3 Long-Term Perimeter Drain Flow Rate Estimate

Based on the assumptions provided in this report (outlined in Section 6.1), the results of the long-term discharge volume estimate are summarized below:

Table 6-2 Summary of Long-Term Discharge Flow Rate

Location	Long-Term Peak Flow Rate (L/day)	Notes
Flow into sub-drain after initial dewatering stages	69,000	Long term sub-drain flow value rounded based on Dupuit's equation including flow from all sides. Safety factor of 3 was used.

The results for the estimate are available in Appendix F, Table F-1. The maximum flow rate estimates represent short term events and are not indicative of long-term continuous contributions to the drainage system. Intermittent cycling of sump pumps and seasonal fluctuation in groundwater regimes should be considered for pump specifications. Given that the predicted dewatering volume exceeds the 50,000 L/day limit, a PTTW is required.

It should be noted that the dewatering estimates provided in this report are based on the proposed building information available at this time.

If the groundwater encountered during long-term dewatering is discharged to the Region of Halton sanitary and combined sewer, no treatment will be required. A treatment is required prior to discharge to the Town of Oakville storm sewer.

In the event that the long-term foundation drainage is not allowed to discharge into the City's sewer system, the proposed building may be designed and supported by "tanked" water-proofed continuous raft foundation without permanent dewatering (i.e., avoiding permanent perimeter and under-floor drainage system).

7 Potential Groundwater Impacts

7.1 Impacts to Nearby Groundwater Users

The Site lies within an urban area of Oakville, based on the MECP WWR database, one (1) supply water well was identified at the Queen Elizabeth Way, located approximate 215 m northwest of the Site. The well was installed in 1948, and the well is located in a developed area, the supply well is likely not present. Given the area is serviced by municipal system, no private well water user is expected. There are no potential impacts to nearby groundwater users due to construction dewatering or long-term dewatering is expected.

7.2 Impacts to Nearby Structures

As discussed in Section 5, given the groundwater table is above the excavation, construction dewatering is required. The ROI calculation is a conservative methodology and is calculated based on the assumption of active pumping during the construction dewatering. It should be noted that most of the water will be pumped during the first stage of the construction period or when a rain event occurs. Although the ROI was conservatively predicted as 31.8 from the edge of the excavation, over a period of time, the drawdown curve will be very close to the bottom of the excavation and thus resulting in negligible ROI. The likelihood for impacts to the nearby structures are negligible. Additionally, the use of a shoring system will further reduce radius of influence.

As discussed in Section 6, given the groundwater level is above foundation depths for the development, a permanent foundation sub-drain is recommended. It is assumed that the below grade structure will feature a perimeter drain and sub-drain system installed at approximately 0.5 m below the basement elevation. If the foundation drains operate on a long-term basis, the radius of influence was conservatively estimated at 15.6 m from the edge of the sub-drain. However, unlike the construction dewatering activities where active dewatering takes places, the long-term dewatering operates passively where water would flow through fractured bedrock primarily via vertical drains. Therefore, the actual radius of influence will be less than the predicted distance and no impacts to the surrounding feature is expected.

8 Water Taking and Discharge Permits

8.1 EASR and PTTW

During the active construction dewatering phase, the volume of water expected to be pumped exceeds the daily limit on groundwater taking under the Ontario Water Resources Act (50,000 L/day) if the excavation is to be undertaken all at once. Therefore, it is necessary to register the construction dewatering under the EASR guidelines, as cumulative discharge rate for construction is 310,000 L/day. The limit for water taking under an EASR is 400,000 L/day. If combined storm and groundwater were to exceed this limit, the dewatering rate would need to be capped to 400,000 L/day of pumped water. If it is necessary to exceed 400,000 L/day of water taking, a PTTW as per O.Reg.387/04 would be required.

Given that the predicted long-term dewatering volume exceeds the 50,000 L/day limit, a PTTW for long-term discharge will be required.

9 Conclusions

Based on the findings of the Preliminary Hydrogeological Investigation, the following summary of conclusions are provided:

a) It is BIG's understanding that the proposed re-development will consist of two (2) condominium buildings with eight (8) levels of underground parking structure;
b) The Site is located within a physiographic region within the Iroquois Plain known as the shale plains;
c) The surficial geology of the immediate area around the Site is described as Paleozoic bedrock;
d) The MECP WWR database indicated one-hundred one (67) well records within 500 m radius of the Site. One (1) supply water well was identified at the Queen Elizabeth Way, located approximate 215 m northwest of the Site. The well was installed in 1948 and the well is located in a developed area, the supply well is likely not present. Given the area is serviced by municipal system, no private well water user is expected;
e) Groundwater was observed in all monitoring wells on September 12, 2023, and depths to the groundwater ranged from 1.91 m to 21.56 m bgs. The shallow wells BH/MW1, BH/MW2S, BH/MW3, BH/MW5, BH/MW6S, and BH/MW7 were observed with groundwater elevations that ranged from 101.71 m to 98.31 m asl. The deep wells BH/MW2D, BH/MW4 and BH/MW6D, were observed with groundwater elevations that ranged from 91.63 m to 82.28m asl;
f) Based on the water level measurements obtained, the inferred direction of groundwater flow across the Site is interpreted to be to the southern direction;
g) The estimated hydraulic conductivity of the soil and bedrock ranges from 7.39×10^{-6} m/s to 3.99×10^{-9} m/s with a geometric mean of 4.97×10^{-7} m/s;
h) Based on the assumptions outlined in this report, the estimated peak construction dewatering flow rate for the proposed construction activity is 310,000 L/day;
i) Based on the assumptions outlined in this report, the cumulative contribution to the foundation drains is 69,000 L/day;
j) Given that the predicted dewatering volume exceeds the 50,000 L/day limit, an EASR for construction dewatering is required ;
k) Given that the predicted long-term dewatering volume exceeds the 50,000 L/day limit, a PTTW for long-term discharge is required;
l) The laboratory CofA shows that no exceedance under Table 1 – Limits for Sanitary and Combined Sewer Discharge of the Regional Municipality of Halton;
m) When compared against the more stringent Table 2 – Limits for Storm Sewer Discharge of the Corporation of the Town of Oakville, the sample indicated exceedances for total manganese (Mn);
n) If the groundwater encountered is discharged to the Region of Halton sanitary and combined sewer, no treatment will be required. A treatment is required prior to discharge to the Town of Oakville storm sewer; and,
o) Although the water quality meets the limits of Region of Halton sanitary and combined sewer, the Region typically does not typically allow groundwater discharge to the Regional sewer system. Alternative discharge method or negotiation with the Town of Oakville will be required.

It should be noted that the comments and recommendations in this report are based on the assumption that the present design concept described throughout the report will proceed to construction. Any changes to the design concept may result in a modification to the recommendations provided in this report. It is noted that these conclusions and recommendations should be read in conjunction with the entirety of the report.

10 Limitations

This report is based on a limited investigation designed to provide information to support an assessment of the current hydrogeological conditions within the study area. The conclusion and recommendations presented within this report reflect Site conditions existing at the time of the assessment. BIG must be contacted immediately if any unforeseen Site conditions are experienced during the dewatering activities. This will allow BIG to review the new findings and provide appropriate recommendations to allow the construction to proceed in a timely and cost-effective manner.

Our undertaking at BIG, therefore, is to perform our work within limits prescribed by our clients, with the usual thoroughness and competence of the geoscience profession. No other warranty or presentation, either expressed or implied, is included or intended in this report.

We trust that this information is satisfactory for your purposes. Should you have any questions or comments, please do not hesitate to contact our office.

Yours truly,

B.I.G. Consulting Inc.

Travis Van Holst, M.Env.Sc., GIT
Environmental Scientist

Wei (Will) Guo, M.Sc., P.Geo.
Senior Hydrogeologist

11 References

Cashman, P. M. (2013). *Groundwater Lowering in Construction: A Practical Guide to Dewatering (Second Ed.).*

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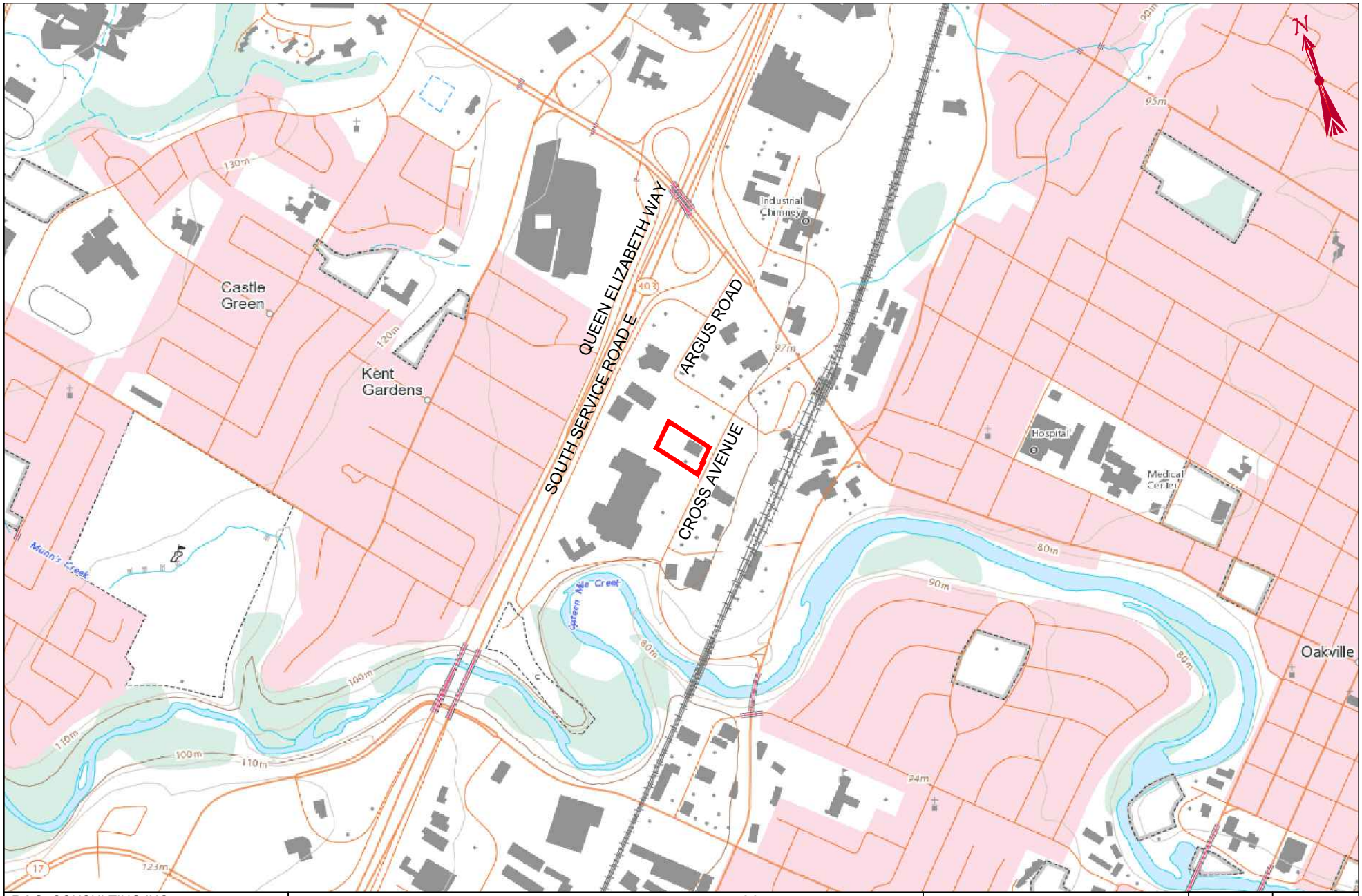
FIGURES



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LEGEND

SITE BOUNDARY

SCALE

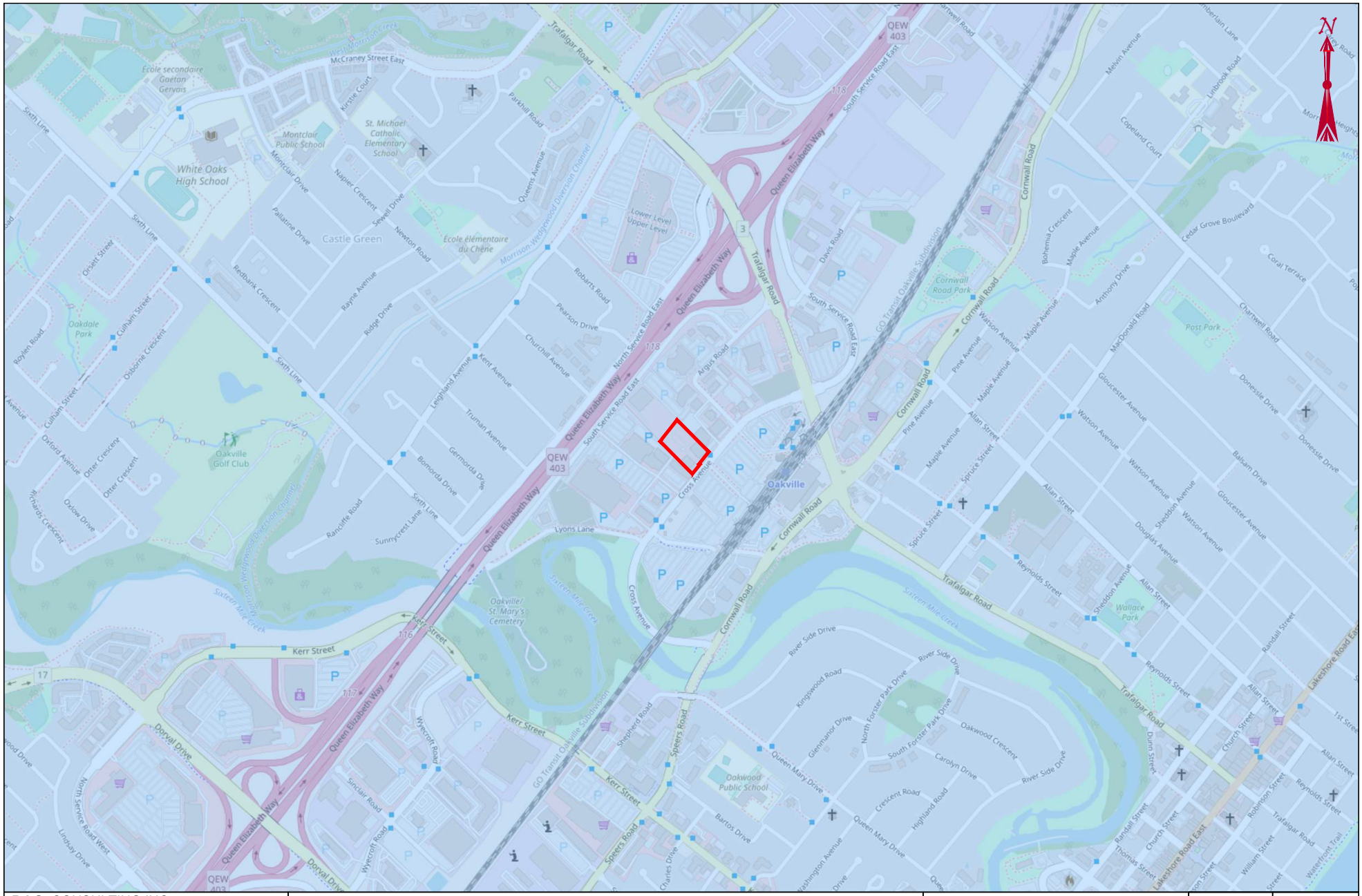
100m 0m 100m 200m 300m 400m 500m

IMAGERY OBTAINED FROM TOPORAMA, NATURAL RESOURCES CANADA, 2021

TITLE AND LOCATION

SITE LOCATION PLAN
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
157 AND 165 CROSS AVENUE, OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-623A	T.S.
SCALE	CK.
AS NOTED	W.G.
DATE	FIG NO.
SEPTEMBER 2023	1



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LEGEND

- SITE BOUNDARY
- IROQUOIS PLAIN

SCALE

100m 0m 100m 200m 300m 400m 500m

NOTES:

1. PHYSIOGRAPHIC REGIONS PRODUCED BY MINISTRY OF ENERGY, NORTHERN DEVELOPMENT AND MINES, DATE 2017
2. IMAGERY OBTAINED FROM OPENSTREETMAP, DATE 2022

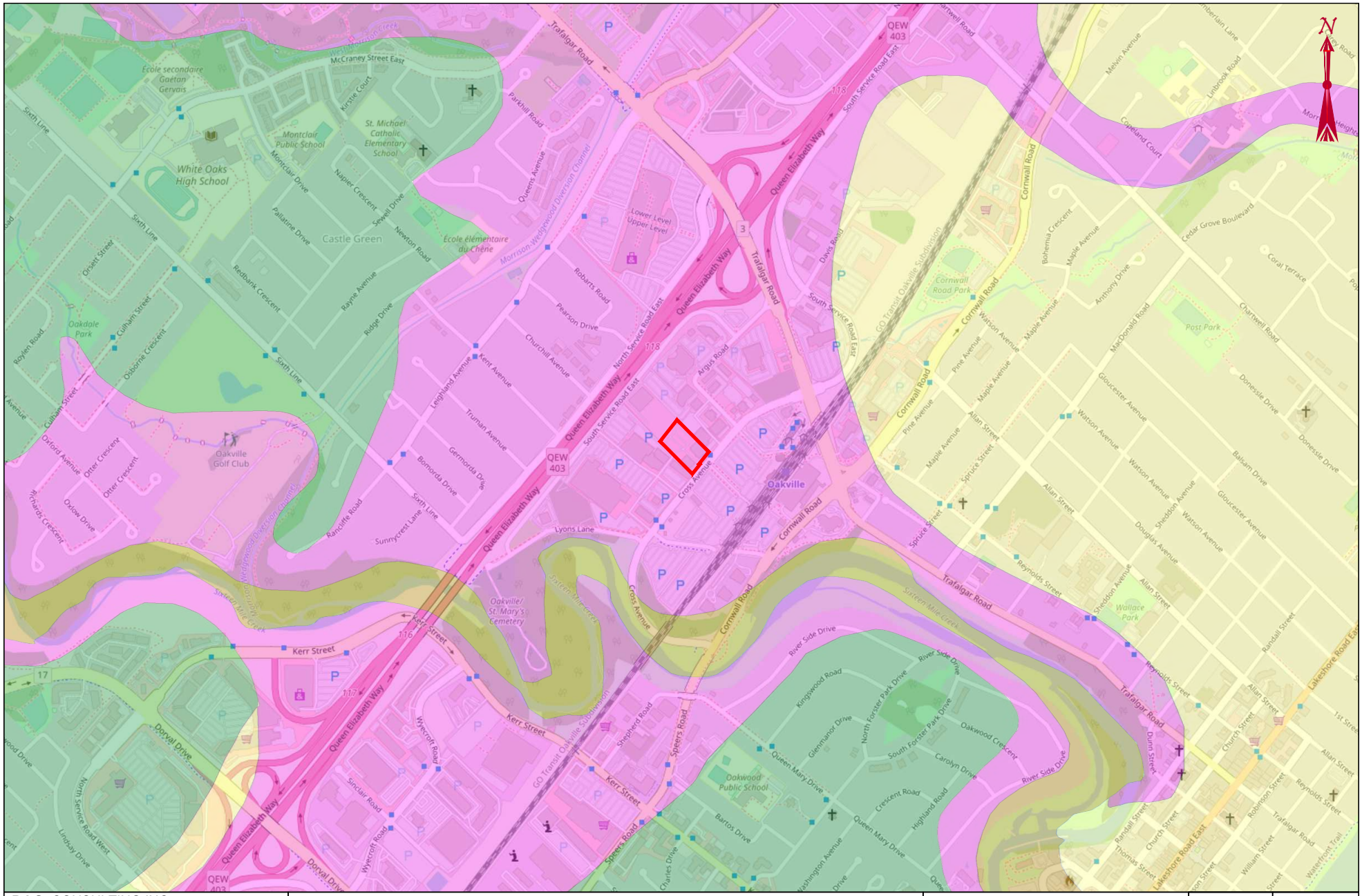
TITLE AND LOCATION

PHYSIOGRAPHIC REGIONS OF SOUTHERN ONTARIO

PRELIMINARY HYDROGEOLOGICAL INVESTIGATION

157 AND 165 CROSS AVENUE, OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-623A	T.S.
SCALE	CK.
AS NOTED	W.G.
DATE	FIG NO.
SEPTEMBER 2023	2



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LEGEND

- SITE BOUNDARY
- COARSE-TEXTURED GLACIOLACUSTRINE DEPOSITS
- TILL
- PALEOZOIC BEDROCK
- MODERN ALLUVIAL DEPOSITS

SCALE

100m 0m 100m 200m 300m 400m 500m

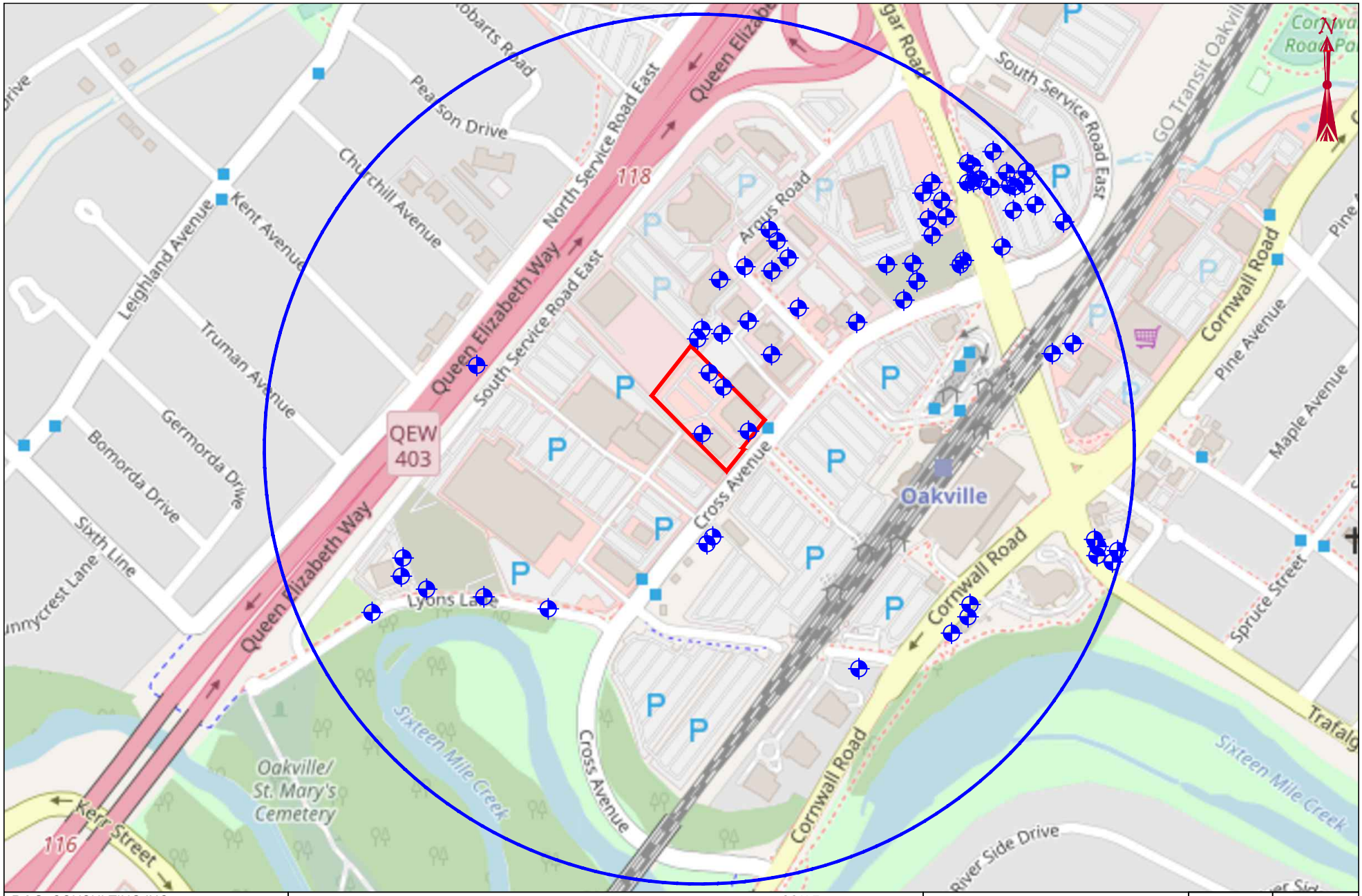
NOTES:

1. SURFICIAL GEOLOGY PRODUCED BY MINISTRY OF ENERGY, NORTHERN DEVELOPMENT AND MINES, DATE 2017
2. IMAGERY OBTAINED FROM OPENSTREETMAP, DATE 2022

TITLE AND LOCATION

SURFICIAL GEOLOGY MAP
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
157 AND 165 CROSS AVENUE, OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-623A	T.S.
SCALE	CK.
AS NOTED	W.G.
DATE	FIG NO.
SEPTEMBER 2023	3



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LEGEND

- SITE BOUNDARY
- WELL RECORD STUDY AREA BOUNDARY
- WELL RECORD LOCATION (2022)

SCALE

40m 0m 50m 100m 150m 200m

NOTES:

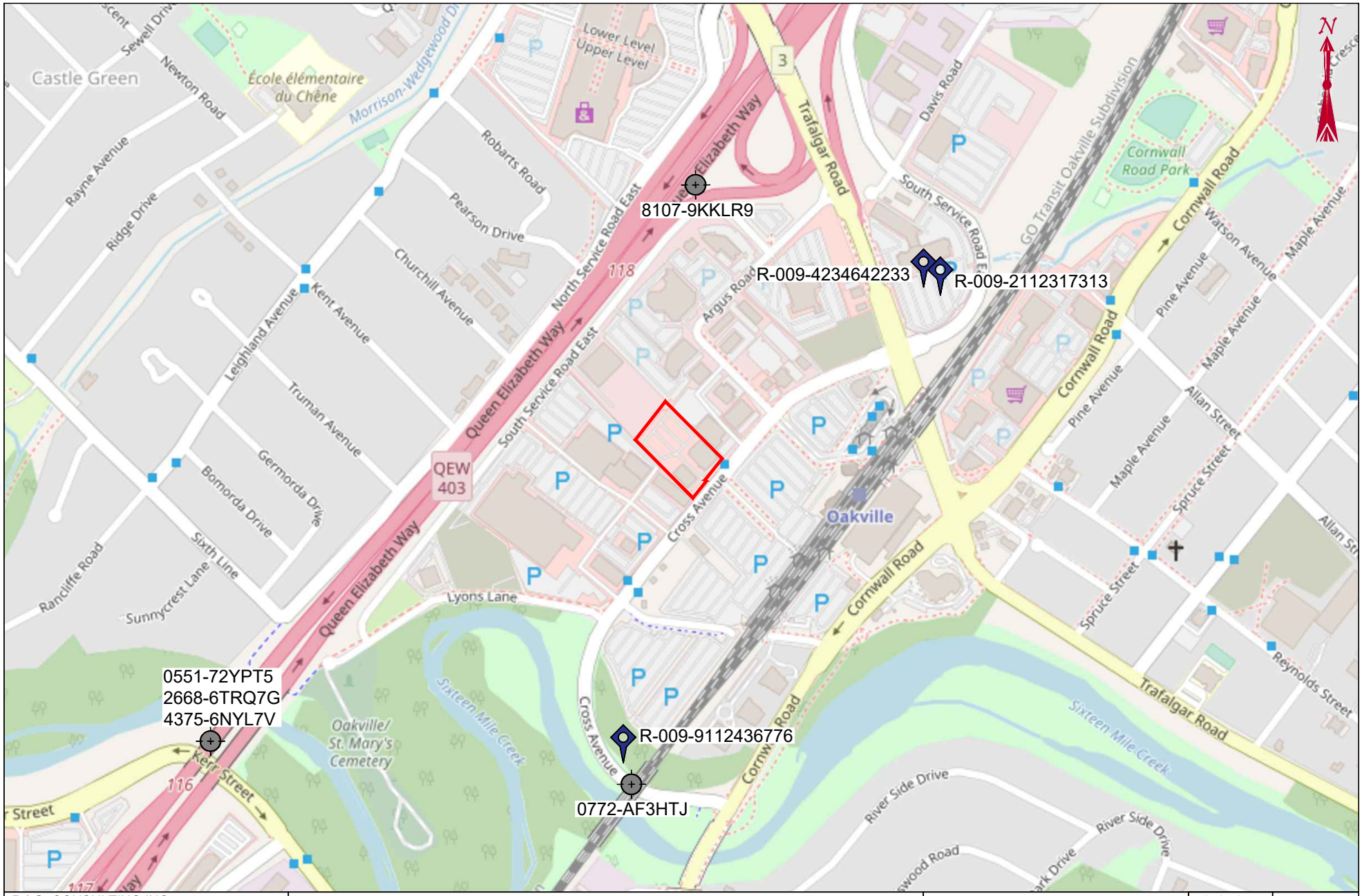
1. WELL RECORDS SOURCED FROM THE MINISTRY OF THE ENVIRONMENT, CONSERVATION PARKS, DATE 2022
2. IMAGERY OBTAINED FROM OPENSTREETMAP, DATE 2022

TITLE AND LOCATION

MECP WATER WELL RECORD LOCATIONS PRELIMINARY HYDROGEOLOGICAL INVESTIGATION

157 AND 165 CROSS AVENUE, OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-623A	T.S.
SCALE	CK.
AS NOTED	W.G.
DATE	FIG NO.
SEPTEMBER 2023	4



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LEGEND

- SITE BOUNDARY
- LOCATION OF PTTW RECORD
- LOCATION OF EASR RECORD

SCALE

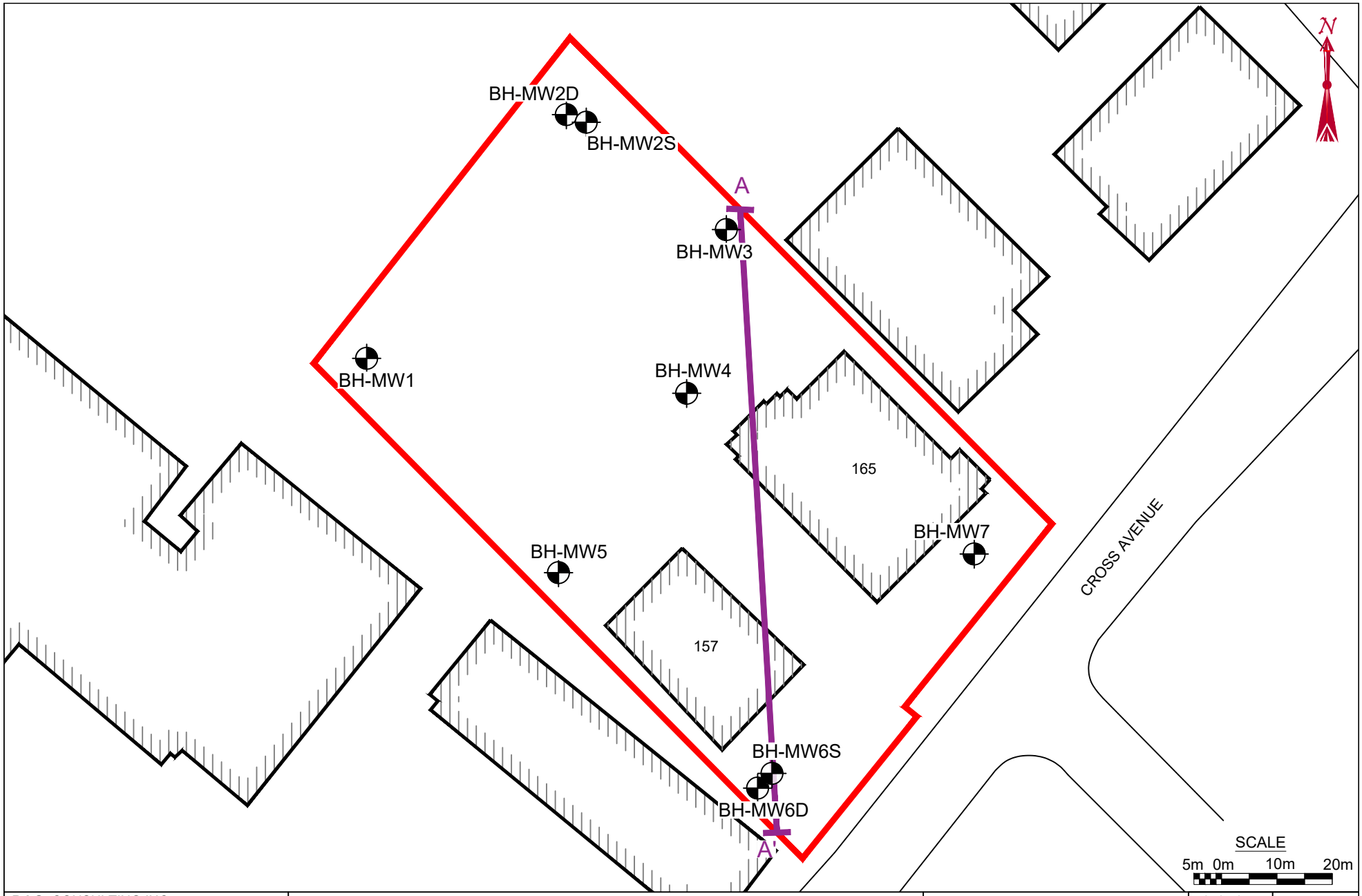
50m 0m 100m 200m 300m

IMAGERY OBTAINED FROM OPENSTREETMAP, DATE 2022

TITLE AND LOCATION

PTTW AND EASR RECORD LOCATIONS
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
157 AND 165 CROSS AVENUE, OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-623A	T.S.
SCALE	CK.
AS NOTED	W.G.
DATE	FIG NO.
SEPTEMBER 2023	5



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LEGEND

SITE BOUNDARY

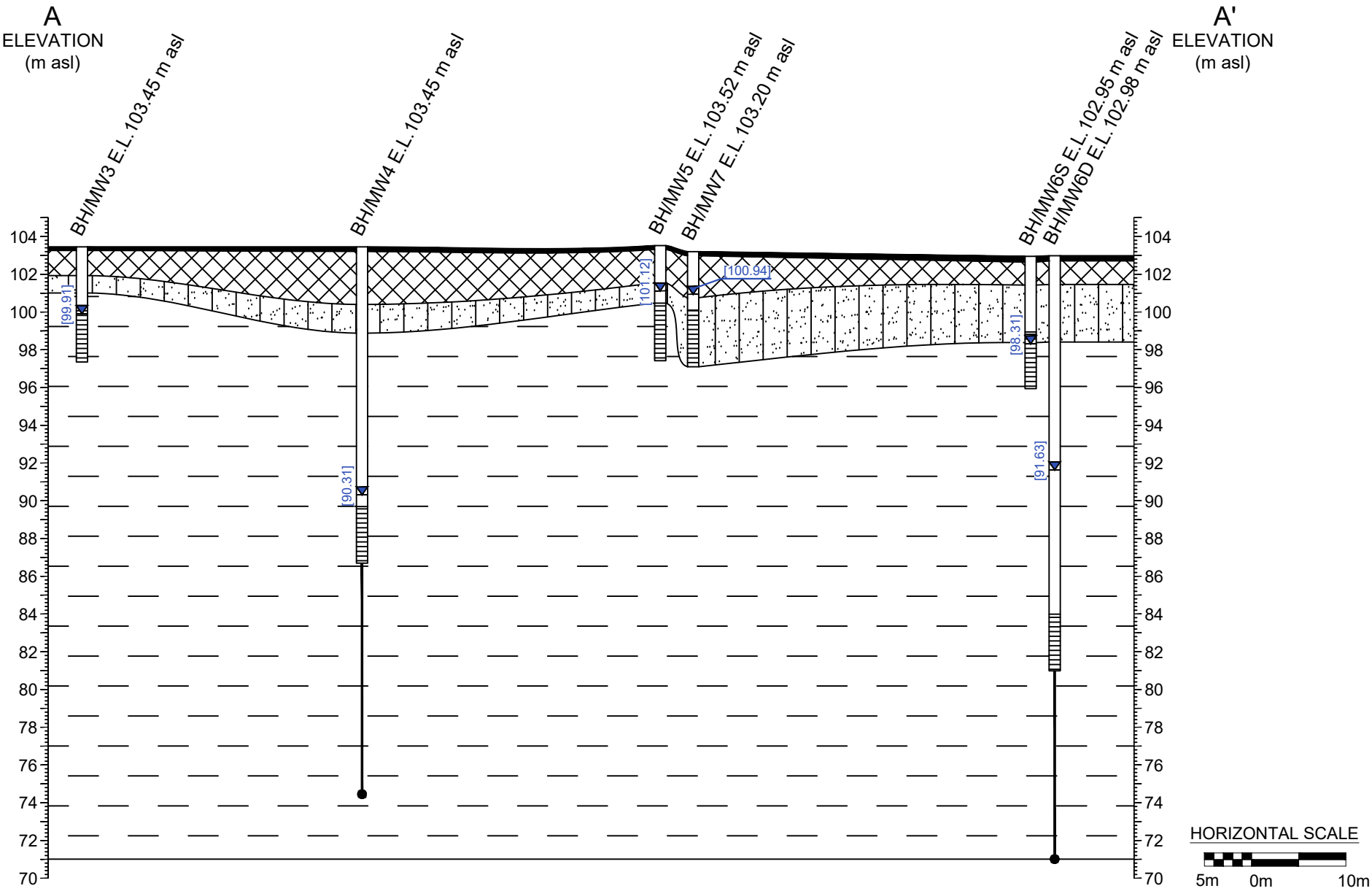
LOCATION OF BOREHOLE/MONITORING WELL (BIG, 2023)

A A' GEOLOGICAL CROSS SECTION

TITLE AND LOCATION

BOREHOLE / MONITORING WELL LOCATION PLAN
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
157 AND 165 CROSS AVENUE, OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-623A	T.S.
SCALE	CK.
AS NOTED	W.G.
DATE	FIG NO.
OCTOBER 2023	6



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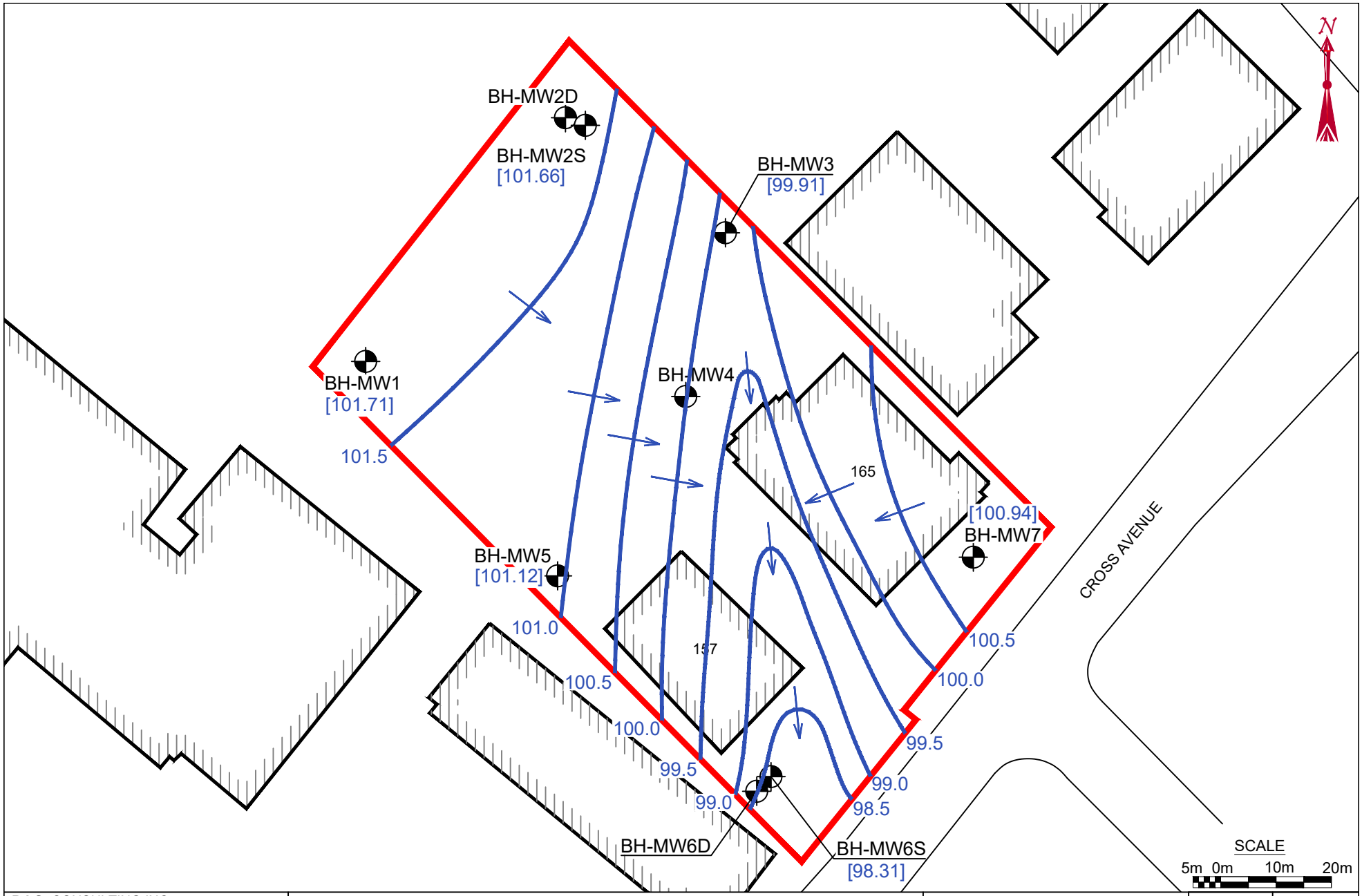
LEGEND

- ASPHALT
- FILL
- SILTY SAND TILL / SILTY CLAY TILL / SHALE COMPLEX
- SHALE
- WATER LEVEL
- [xx.xx] WATER LEVEL MEASUREMENT (SEPTEMBER 12, 2023)

TITLE AND LOCATION

GEOLOGICAL CROSS SECTION A-A'
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
157 AND 165 CROSS AVENUE,
OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-623A	E.P.
SCALE	CK.
AS NOTED	C.D.
DATE	FIG NO.
OCTOBER 2023	7



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LEGEND

- SITE BOUNDARY
- LOCATION OF BOREHOLE/MONITORING WELL (BIG, 2023)
- [XX.XX] WATER LEVEL MEASUREMENT (m asl) (SEPTEMBER 12, 2023)
- INTERPRETED DIRECTION OF GROUNDWATER FLOW
- INTERPRETED GROUNDWATER CONTOUR

TITLE AND LOCATION

INTERPRETED GROUNDWATER CONTOUR MAP PRELIMINARY HYDROGEOLOGICAL INVESTIGATION

157 AND 165 CROSS AVENUE, OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-623A	T.S.
SCALE	CK.
AS NOTED	W.G.
DATE	FIG NO.
SEPTEMBER 2023	8

APPENDIX A: BOREHOLE LOGS

RECORD OF BOREHOLE No. BH/MW1

Project Number:	BIGC-ENV-623A	Drilling Location:	See BH Location Plan	Logged by:	FJ
Project Client:	Cross Realty Incorporated	Drilling Method:	100 mm Solid Stem Augering	Compiled by:	KH
Project Name:	Geotechnical and Hydrogeological Investigations	Drilling Machine:	Truck Mounted Drill	Reviewed by:	AC
Project Location:	157 and 165 Cross Avenue, Oakville, Ontario	Date Started: Aug 28, 23	Date Completed: Aug 28, 23	Revision No.:	0, 10/3/23

LITHOLOGY PROFILE | SOIL SAMPLING | FIELD TESTING | LAB TESTING | INSTRUMENTATION INSTALLATION | COMMENTS

Field Testing legend: PenetrationTesting: ○ SPT ● DCPT; MTO Vane*: △ Intact ▲ Remould; Nilcon Vane*: ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Lab Testing legend: ★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL); W_P W W_L Plastic Liquid 20 40 60 80

Geodetic Ground Surface Elevation: 104.24 m

DESCRIPTION	Elevation (m) / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	W (%)
ASPHALT PAVEMENT: 70 mm asphalt over 230 mm granular base						
FILL: silty sand to sandy silt, trace clay, trace gravel, containing pockets of silty clay, brown to redish brown, moist, loose to compact	103.94 / 0.3	SS	1	59	27	11
		SS	2	100	12	8
		SS	3	62	6	15
SANDY SILT TILL / SHALE COMPLEX: reddish brown to grey, moist, compact to very dense	101.80 / 2.4	SS	4	92	22	11
BEDROCK: Shale, Georgian Bay Formation	101.04 / 3.2	SS	5	80	80/ 250 mm	8
		SS	6	63	50/ 80 mm	7
End of Borehole	98.14 / 6.1					

1. Borehole was open upon completion of drilling.
2. Water level was measured at 4.9 m below ground surface (bgs) upon completion of drilling.
3. Groundwater level was measured at 2.53 m bgs on September 12, 2023.

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▽ Groundwater depth on completion of drilling: 4.9 m.

▼ Groundwater depth observed on September 12, 2023 at a depth of: 2.53 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commisioned and the accompanying'Notes to Record of Boreholes'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH/MW2D

Project Number:	BIGC-ENV-623A	Drilling Location:	See BH Location Plan	Logged by:	FJ
Project Client:	Cross Realty Incorporated	Drilling Method:	150 mm Solid Stem Augering / HQ Coring	Compiled by:	KH
Project Name:	Geotechnical and Hydrogeological Investigations	Drilling Machine:	Truck Mounted Drill	Reviewed by:	AC
Project Location:	157 and 165 Cross Avenue, Oakville, Ontario	Date Started:	Aug 28, 23 Date Completed: Sep 6, 23	Revision No.:	0, 10/3/23

LITHOLOGY PROFILE | SOIL SAMPLING | FIELD TESTING | LAB TESTING

Geodetic Ground Surface Elevation: 103.84 m

Field Testing legend: Penetration Testing: ○ SPT ● DCPT; MTO Vane*: △ Intact ▲ Remould; Nilcon Vane*: ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Lab Testing legend: ★ Rinse pH Values 2 4 6 8 10 12; △ Soil Vapour Reading parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL); W_P W W_L Plastic Liquid 20 40 60 80

Description	Elev. / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	Moisture (%)	Comments
ASPHALT PAVEMENT: 80 mm asphalt over 100 mm granular base	103.66 / 0.2						
FILL: clayey silt, some sand, trace gravel, grey to redish brown, moist, very stiff	103.08 / 0.8	SS	1	59	17	13	
SANDY SILT TILL / SHALE COMPLEX: reddish brown to grey, moist, very dense	101.55 / 2.3	SS	2	100	51	11	
		SS	3	75	59	9	
BEDROCK: Shale, Georgian Bay Formation, highly weathered to fresh, very poor to excellent quality, occasional limestone/siltstone layers (0-50%), grey		SS	4	100	55/ 150 mm	8	
		SS	5	100	50/ 100 mm	7	
		SS	6	100	57/ 150 mm	10	
- very Poor Quality		RC	1	100	0		
- Poor Quality		RC	2	100	48		
- Fair Quality		RC	3	100	61		Inferred UCS From Point Load Test (Axial): 25.2 MPa
- Poor Quality							

Depth scale (m): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10. Elevation scale (m): 103, 102, 101, 100, 99, 98, 97, 96, 95, 94.

INSTRUMENTATION INSTALLATION

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Groundwater depth on completion of drilling: N/A m.

Groundwater depth observed on September 12, 2023 at a depth of: 21.56 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commisioned and the accompanying'Notes to Record of Boreholes'.

Scale: 1 : 53

Continued on Next Page

RECORD OF BOREHOLE No. BH/MW2D

Project Number: **BIGC-ENV-623A** Drilling Location: **See BH Location Plan** Logged by: **FJ**

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	BEDROCK: Shale, Georgian Bay Formation, highly weathered to fresh, very poor to excellent quality, occasional limestone/siltstone layers (0-50%), grey	RC	4	100	30	11	93				
	- Fair Quality	RC	5	96	54	12	92				
	- Good Quality	RC	6	100	83	13	91				Inferred UCS From Point Load Test (Axial): 19.0 MPa
	- Good Quality	RC	7	100	84	14	90				
	- Good Quality	RC	8	100	82	15	89				Inferred UCS From Point Load Test (Axial): 46.8 MPa
	- Good Quality	RC	9	100	85	16	88				
	- Good Quality	RC	10	100	89	17	87				
	- Good Quality	RC	11	100	82	18	86				Inferred UCS From Point Load Test (Axial): 47.8 MPa
						19	85				
						20	84				
						21	83				

FIELD TESTING: Penetration Testing — SPT, DCPT; MTO Vane* (Intact, Remould); Nilcon Vane* (Intact, Remould); * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading parts per million (ppm) 100 200 300 400; Lower Explosive Limit (LEL) W_P W W_L Plastic Liquid 20 40 60 80

Scale: 1 : 53

Continued on Next Page

RECORD OF BOREHOLE No. BH/MW2D

Project Number: **BIGC-ENV-623A** Drilling Location: **See BH Location Plan** Logged by: **FJ**

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	BEDROCK: Shale, Georgian Bay Formation, highly weathered to fresh, very poor to excellent quality, occasional limestone/siltstone layers (0-50%), grey							Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL) W_P W W_L Plastic Liquid 20 40 60 80		
	- Good Quality	RC	12	100	87	22	82	○			
						23	81				
	- Excellent Quality	RC	13	100	94	24	80	○			
	- Fair Quality	RC	14	100	73	25	79	○			Inferred UCS From Point Load Test (Axial): 46.1 MPa
						26	78				
	- Good Quality	RC	15	100	87	27	77	○			UCS: 27.4 MPa Inferred UCS From Point Load Test (Axial): 38.8 MPa
	- Excellent Quality	RC	16	100	99	28	76	○			Inferred UCS From Point Load Test (Axial): 34.6 MPa
	74.43					29	75				
	End of Borehole 29.4 1. Borehole was open upon completion of drilling. 2. Groundwater level was measured at 21.56 m below ground surface on September 12, 2023.										

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commisioned and the accompanying'Notes to Record of Boreholes'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH/MW2S

Project Number:	BIGC-ENV-623A	Drilling Location:	See BH Location Plan	Logged by:	FJ
Project Client:	Cross Realty Incorporated	Drilling Method:	100 mm Solid Stem Augers	Compiled by:	KH
Project Name:	Geotechnical and Hydrogeological Investigations	Drilling Machine:	Truck Mounted Drill	Reviewed by:	AC
Project Location:	157 and 165 Cross Avenue, Oakville, Ontario	Date Started:	Aug 30, 23 Date Completed: Aug 30, 23	Revision No.:	0, 10/3/23

Geodetic Ground Surface Elevation: 103.79 m

DESCRIPTION	Depth (m)	Elevation (m)
ASPHALT PAVEMENT: 80 mm asphalt over 100 mm granular base	0.2	103.61
FILL: clayey silt, some sand, trace gravel, grey to redish brown, moist, very stiff	0.8	103.03
SANDY SILT TILL / SHALE COMPLEX: reddish brown to grey, moist, very dense	2.3	101.50
BEDROCK: Shale, Georgian Bay Formation	4.6	99.22
End of Borehole 1. Borehole was open upon completion of drilling. 2. Water level was measured at 2.4 m below ground surface (bgs) upon completion of drilling. 3. Groundwater level was measured at 2.13 m bgs on September 12, 2023.		

SOIL SAMPLING: Sample Type, Sample Number, Recovery (%), SPT 'N' Value/RQD%

FIELD TESTING: Penetration Testing (SPT, DCPT); MTO Vane* (Intact, Remould); Nilcon Vane* (Intact, Remould); * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading parts per million (ppm) 100 200 300 400; Lower Explosive Limit (LEL); W_P W W_L; Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS

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Groundwater depth on completion of drilling: 2.4 m.

Groundwater depth observed on September 12, 2023 at a depth of: 2.13 m.

RECORD OF BOREHOLE No. BH/MW3

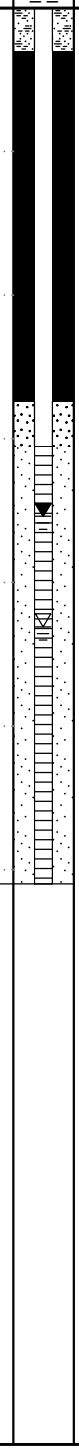
Project Number:	BIGC-ENV-623A	Drilling Location:	See BH Location Plan	Logged by:	FJ
Project Client:	Cross Realty Incorporated	Drilling Method:	100 mm Solid Stem Augering	Compiled by:	KH
Project Name:	Geotechnical and Hydrogeological Investigations	Drilling Machine:	Truck Mounted Drill	Reviewed by:	AC
Project Location:	157 and 165 Cross Avenue, Oakville, Ontario	Date Started:	Aug 28, 23	Date Completed: Aug 28, 23	Revision No.: 0, 10/3/23

Geodetic Ground Surface Elevation: 103.45 m

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)
	ASPHALT PAVEMENT: 90 mm asphalt over 100 mm granular base (103.26) 0.2						
	FILL: sand, trace to some silt, trace clay, trace gravel, containing pockets of silty clay, brown, moist, compact	SS	1	84	11		103
		SS	2	100	13	1	102
	(101.93)						
	SILTY SAND TILL / SHALE COMPLEX: reddish brown to grey, moist, compact to very dense 1.5	SS	3	79	24	2	
	(101.01)	SS	4	92	50/ 100 mm		101
	BEDROCK: Shale, Georgian Bay Formation 2.4					3	
		SS	5	100	50/ 130 mm		100
						4	
		SS	6	100	50/ 100 mm		99
	(97.35)					5	98
	End of Borehole 6.1 1. Borehole was open upon completion of drilling. 2. Water level was measured at 4.3 m below ground surface (bgs) upon completion of drilling. 3. Groundwater level was measured at 3.54 m bgs on September 12, 2023.					6	

FIELD TESTING: Penetration Testing (SPT, DCPT); MTO Vane* (Intact, Remould); Nilcon Vane* (Intact, Remould); * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading parts per million (ppm) 100 200 300 400; Lower Explosive Limit (LEL) W_P W W_L; Plastic Liquid 20 40 60 80



INSTRUMENTATION INSTALLATION

COMMENTS

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Groundwater depth on completion of drilling: 4.3 m.

Groundwater depth observed on September 12, 2023 at a depth of: 3.54 m.

RECORD OF BOREHOLE No. BH/MW4

Project Number:	BIGC-ENV-623A	Drilling Location:	See BH Location Plan	Logged by:	FJ
Project Client:	Cross Realty Incorporated	Drilling Method:	150 mm Solid Stem Augering / HQ Coring	Compiled by:	KH
Project Name:	Geotechnical and Hydrogeological Investigations	Drilling Machine:	Truck Mounted Drill	Reviewed by:	AC
Project Location:	157 and 165 Cross Avenue, Oakville, Ontario	Date Started:	Sep 6, 23 Date Completed: Sep 7, 23	Revision No.:	0, 10/3/23

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	Geodetic Ground Surface Elevation: 103.45 m							Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL) W_P W W_L Plastic Liquid 20 40 60 80		
	ASPHALT PAVEMENT: 90 mm asphalt over 150 mm granular base 103.21										
	FILL: silty sand, trace to some gravel, trace clay, containing layers of sand and gravel, brown to redish brown, moist to wet, compact 0.2	SS	1	62	23		103	○	10		
		SS	2	92	18	1	102	○	17		
		SS	3	67	27	2		○	12		
		SS	4	62	21		101	○	13		
	100.40					3					
	SILTY CLAY TILL / SHALE COMPLEX: reddish brown to grey, moist, hard 3.1	SS	5	100	50/ 80 mm		100		15		
	98.88					4					
	BEDROCK: Shale, Georgian Bay Formation, highly weathered to fresh, very poor to excellent quality, occasional limestone/siltstone layers (0-43%), grey 4.6	SS	6	100	50/ 80 mm		99		7		
						5					
							98				
	- Very Poor Quality	RC	1	100	0	6		○			
	- Fair Quality	RC	2	100	56	7	97				
							96	○			
	- Fair Quality	RC	3	100	66	8					Inferred UCS From Point Load Test (Axial): 34.7 MPa
							95	○			
						9					
	- Poor Quality						94				
						10					

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▽ Groundwater depth on completion of drilling: N/A m.

▼ Groundwater depth observed on September 12, 2023 at a depth of: 13.14 m.

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RECORD OF BOREHOLE No. BH/MW4

Project Number: **BIGC-ENV-623A** Drilling Location: **See BH Location Plan** Logged by: **FJ**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL) W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS
	BEDROCK: Shale, Georgian Bay Formation, highly weathered to fresh, very poor to excellent quality, occasional limestone/siltstone layers (0-43%), grey	RC	4	100	27	10	93	○			
	- Poor Quality	RC	5	100	41	11	92	○			Inferred UCS From Point Load Test (Axial): 23.7 MPa
	- Poor Quality	RC	6	100	32	12	91	○			
	- Fair Quality	RC	7	100	63	13	90	○			
	- Poor Quality	RC	8	100	41	14	89	○			
	- Excellent Quality	RC	9	100	99	15	88	○			Inferred UCS From Point Load Test (Axial): 36.4 MPa
	- Good Quality	RC	10	100	90	16	87	○			
	- Good Quality	RC	11	100	82	17	86	○			
						18	85				
						19	84	○			
						20	83				
						21		○			

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commisioned and the accompanying'Notes to Record of Boreholes'.

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RECORD OF BOREHOLE No. BH/MW4

Project Number: **BIGC-ENV-623A** Drilling Location: **See BH Location Plan** Logged by: **FJ**

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	BEDROCK: Shale, Georgian Bay Formation, highly weathered to fresh, very poor to excellent quality, occasional limestone/siltstone layers (0-43%), grey - Good Quality					22	82	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL) W_P W W_L Plastic Liquid 20 40 60 80		
		RC	12	100	86			○			Inferred UCS From Point Load Test (Axial): 23.8 MPa
	- Excellent Quality					23	81				
		RC	13	100	93	24	80	○			
	- Fair Quality						79				
		RC	14	100	70	25		○			Inferred UCS From Point Load Test (Axial): 24.4 MPa
	- Good Quality					26	78				
		RC	15	100	88	27	77	○			Inferred UCS From Point Load Test (Axial): 30.2 MPa
	- Excellent Quality						76				
		RC	16	100	98	28	75	○			Inferred UCS From Point Load Test (Axial): 39.1 MPa
	74.45										
	End of Borehole 29.0 1. Borehole was open upon completion of drilling. 2. Groundwater level was measured at 13.14 m below ground surface on September 12, 2023.					29					

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commisioned and the accompanying'Notes to Record of Boreholes'.

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RECORD OF BOREHOLE No. BH/MW5

Project Number:	BIGC-ENV-623A	Drilling Location:	See BH Location Plan	Logged by:	FJ
Project Client:	Cross Realty Incorporated	Drilling Method:	100 mm Solid Stem Augering	Compiled by:	KH
Project Name:	Geotechnical and Hydrogeological Investigations	Drilling Machine:	Truck Mounted Drill	Reviewed by:	AC
Project Location:	157 and 165 Cross Avenue, Oakville, Ontario	Date Started:	Aug 28, 23	Date Completed: Aug 28, 23	Revision No.: 0, 10/3/23

Geodetic Ground Surface Elevation: 103.52 m

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	ASPHALT PAVEMENT: 60 mm asphalt over 150 mm granular base 103.31										
	FILL: sand to sandy silt, trace clay, trace gravel, containing pockets of silty clay, brown, moist, compact 0.2	SS	1	95	18						
		SS	2	84	12	1	103				
	101.54	SS	3	79	11		102				
	SANDY SILT TILL: trace clay, trace gravel, greenish brown to grey, moist, compact to very dense 2.0					2					
		SS	4	70	58		101				
	100.47					3					
	BEDROCK: Shale, Georgian Bay Formation 3.1	SS	5	100	56/ 150 mm		100				
		SS	6	100	50/ 80 mm	4	99				
	97.42					5	98				
						6					
	End of Borehole 6.1 1. Borehole was open upon completion of drilling. 2. Water level was measured at 4.3 m below ground surface (bgs) upon completion of drilling. 3. Groundwater level was measured at 2.40 m bgs on September 12, 2023.										

FIELD TESTING: Penetration Testing — SPT, DCPT; MTO Vane* — Intact, Remould; Nilcon Vane* — Intact, Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading parts per million (ppm) 100 200 300 400; Lower Explosive Limit (LEL) W_P W W_L; Plastic Liquid 20 40 60 80

Lab values: 7, 18, 14, 8, 3, 12

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Groundwater depth on completion of drilling: 4.3 m.

Groundwater depth observed on September 12, 2023 at a depth of: 2.40 m.

RECORD OF BOREHOLE No. BH/MW6D

Project Number:	BIGC-ENV-623A	Drilling Location:	See BH Location Plan	Logged by:	FJ
Project Client:	Cross Realty Incorporated	Drilling Method:	150 mm Solid Stem Augering / HQ Coring	Compiled by:	KH
Project Name:	Geotechnical and Hydrogeological Investigations	Drilling Machine:	Truck Mounted Drill	Reviewed by:	AC
Project Location:	157 and 165 Cross Avenue, Oakville, Ontario	Date Started:	Sep 8, 23 Date Completed: Sep 11, 23	Revision No.:	0, 10/3/23

Geodetic Ground Surface Elevation: 102.98 m

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)
	ASPHALT PAVEMENT: 100 mm asphalt over 170 mm granular base (102.71)						
	FILL: sand and gravel, trace clay, trace silt, brown, moist, loose (0.3) (102.22)	SS	1	33	10		
	FILL: silty clay, trace sand, trace gravel, grey to brown, moist, firm (0.8) (101.46)	SS	2	54	6	1	102
	SANDY SILT TILL: trace clay, trace gravel, containing occasional cobbles and boulders, reddish brown to grey, moist, compact to very dense (1.5) (98.41)	SS	3	95	25	2	101
		SS	4	78	87		
		SS	5	100	50/ 130 mm	3	100
	BEDROCK: Shale, Georgian Bay Formation, highly weathered to fresh, very poor to excellent quality, occasional limestone/siltstone layers (3-31%), grey (4.6)	SS	6	100	50/ 80 mm	4	99
	- Poor Quality	RC	1	100	29	5	98
	- Fair Quality	RC	2	100	51	6	97
	- Poor Quality	RC	3	100	45	7	96
						8	95
						9	94
						10	93

FIELD TESTING: Penetration Testing (○ SPT ● DCPT); MTO Vane* (△ Intact ▲ Remould); Nilcon Vane* (◇ Intact ◆ Remould); * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: ★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL) W_P W W_L Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS

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▽ Groundwater depth on completion of drilling: N/A m.

▼ Groundwater depth observed on September 12, 2023 at a depth of: 11.35 m.

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RECORD OF BOREHOLE No. BH/MW6D

Project Number: **BIGC-ENV-623A** Drilling Location: **See BH Location Plan** Logged by: **FJ**

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	FIELD TESTING: Penetration Testing (○ SPT ● DCPT); MTO Vane* (△ Intact ▲ Remould); Nilcon Vane* (◇ Intact ◆ Remould); * Undrained Shear Strength (kPa) 20 40 60 80	LAB TESTING: ★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL) W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS
	BEDROCK: Shale, Georgian Bay Formation, highly weathered to fresh, very poor to excellent quality, occasional limestone/siltstone layers (3-31%), grey										
	- Very Poor Quality	RC	4	90	13	11	92	○			
	- Poor Quality	RC	5	89	45	12	91				
	- Fair Quality	RC	6	100	56	13	90	○			
	- Fair Quality	RC	7	100	54	14	89				Inferred UCS From Point Load Test (Axial): 25.6 MPa
	- Good Quality	RC	8	100	82	15	88	○			
	- Excellent Quality	RC	9	100	95	16	87				
	- Excellent Quality	RC	10	100	93	17	86	○			
						18	85				
						19	84	○			
						20	83				Inferred UCS From Point Load Test (Axial): 42.5 MPa
						21	82	○			

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RECORD OF BOREHOLE No. BH/MW6D

Project Number: **BIGC-ENV-623A** Drilling Location: **See BH Location Plan** Logged by: **FJ**

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	FIELD TESTING: Penetration Testing (SPT ○, DCPT ●); MTO Vane* (Intact △, Remould ▲); Nilcon Vane* (Intact ◇, Remould ◆); * Undrained Shear Strength (kPa) 20 40 60 80	LAB TESTING: ★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL) W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS
	- Excellent Quality **BEDROCK:** Shale, Georgian Bay Formation, highly weathered to fresh, very poor to excellent quality, occasional limestone/siltstone layers (3-31%), grey	RC	11	100	97	22	81	○			
	- Fair Quality	RC	12	100	72	23	80	○			
						24	79				
	- Good Quality	RC	13	100	90	25	78	○			Inferred UCS From Point Load Test (Axial): 37.0 MPa
	- Excellent Quality	RC	14	100	95	26	77	○			Inferred UCS From Point Load Test (Axial): 44.3 MPa
						27	76				UCS: 26.6 MPa
	- Excellent Quality	RC	15	101	99	28	75	○			Inferred UCS From Point Load Test (Axial): 33.7 MPa
	- Excellent Quality	RC	16	100	95	29	74	○			Inferred UCS From Point Load Test (Axial): 24.3 MPa
						30	73				
	- Good Quality	RC	17	100	83	31	72	○			Inferred UCS From Point Load Test (Axial): 40.4 MPa
	71.01 **End of Borehole** 32.0 1. Borehole was open upon completion of drilling. 2. Groundwater level was measured at 11.35 m below ground surface on September 12, 2023.										

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commisioned and the accompanying'Notes to Record of Boreholes'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH/MW6S

Project Number:	BIGC-ENV-623A	Drilling Location:	See BH Location Plan	Logged by:	FJ
Project Client:	Cross Realty Incorporated	Drilling Method:	100 mm Solid Stem Augers	Compiled by:	KH
Project Name:	Geotechnical and Hydrogeological Investigations	Drilling Machine:	Truck Mounted Drill	Reviewed by:	AC
Project Location:	157 and 165 Cross Avenue, Oakville, Ontario	Date Started:	Sep 11, 23	Date Completed: Sep 11, 23	Revision No.: 0, 10/3/23

Geodetic Ground Surface Elevation: 102.95 m

Depth (m)	Description	Elevation (m)
0.0	**ASPHALT PAVEMENT:** 100 mm asphalt over 170 mm granular base	102.68
0.3	**FILL:** sand and gravel, trace clay, trace silt, brown, moist, loose	102.19
0.8	**FILL:** silty clay, trace sand, trace gravel, grey to brown, moist, firm	101.43
1.5	**SANDY SILT TILL:** trace clay, trace gravel, containing occasional cobbles and boulders, reddish brown to grey, moist, compact to very dense	98.38
4.6	**BEDROCK:** Shale, Georgian Bay Formation	95.94
7.0	**End of Borehole** 1. Borehole was open upon completion of drilling. 2. Water level was measured at 4.9 m below ground surface (bgs) upon completion of drilling. 3. Groundwater level was measured at 4.64 m bgs on September 12, 2023.	

Sample Type / Sample Number / Recovery (%) / SPT 'N' Value/RQD%

Field Testing: Penetration Testing (SPT, DCPT); MTO Vane* (Intact, Remould); Nilcon Vane* (Intact, Remould); * Undrained Shear Strength (kPa) 20 40 60 80

Lab Testing: Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading (parts per million (ppm)) 100 200 300 400; Lower Explosive Limit (LEL) W_P W W_L; Plastic Liquid 20 40 60 80

Instrumentation Installation

COMMENTS

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Groundwater depth on completion of drilling: 4.9 m.

Groundwater depth observed on September 12, 2023 at a depth of: 4.64 m.

RECORD OF BOREHOLE No. BH/MW7

Project Number:	BIGC-ENV-623A	Drilling Location:	See BH Location Plan	Logged by:	FJ
Project Client:	Cross Realty Incorporated	Drilling Method:	100 mm Solid Stem Augering	Compiled by:	KH
Project Name:	Geotechnical and Hydrogeological Investigations	Drilling Machine:	Truck Mounted Drill	Reviewed by:	AC
Project Location:	157 and 165 Cross Avenue, Oakville, Ontario	Date Started:	Aug 30, 23 Date Completed: Aug 30, 23	Revision No.:	0, 10/3/23

Geodetic Ground Surface Elevation: 103.20 m

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	FIELD TESTING: Penetration Testing (SPT ○ / DCPT ●); MTO Vane* (Intact △ / Remould ▲); Nilcon Vane* (Intact ◇ / Remould ◆); * Undrained Shear Strength (kPa) 20 40 60 80	LAB TESTING: ★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL) W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS
	ASPHALT PAVEMENT: 90 mm asphalt over 130 mm granular base 102.98										
	0.2										
	FILL: silty sand, trace to some gravel, trace clay, brown, moist, loose	SS	1	62	6		103	○	11		
		SS	2	87	7	1	102	○	17		
		SS	3	54	3	2	101	○	14		
	100.76										
	SANDY SILT TILL: trace clay, trace gravel, containg layers of silty clay till, containing shale pieces, brown to grey, moist, denseto very dense 2.4	SS	4	62	62			○	9		
		SS	5	100	55/ 150 mm	3	100		11		
						4	99				
	98.17	SS	6	58	45	5		○	15		
	SILTY CLAY TILL / SHALE COMPLEX: reddish brown to grey, moist, hard 5.0						98				
	97.10					6					
	End of Borehole 6.1 1. Borehole was open upon completion of drilling. 2. Water level was measured at 3.1 m below ground surface (bgs) upon completion of drilling. 3. Groundwater level was measured at 2.26 m bgs on September 12, 2023.										

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▽ Groundwater depth on completion of drilling: 3.1 m.

▼ Groundwater depth observed on September 12, 2023 at a depth of: 2.26 m.

APPENDIX B: MECP WWR, PTTW AND EASR SUMMARY TABLES

Table B-1: MECP WWR Summary Table

Count	Well ID	Date Completed	Depth (m)	Reported Water Level (m)	Status of Well
1.	2802422	07/21/1948	12.2	4.9	Water supply
2.	2810039	04/06/2004	5.1	N/A	Observation well
3.	2810078	09/03/2004	6.3	3.3	Observation well
4.	2810285	02/01/2005	6	N/A	Observation well
5.	2810392	09/20/2005	4.5	3.9	Observation well
6.	2810649	08/28/2006	7.6	N/A	Observation well
7.	7041205	01/12/2007	2.4	N/A	Observation well
8.	7100453	09/26/2007	4.7	N/A	Observation well
9.	7100453	09/26/2007	N/A	N/A	Observation well
10.	7101141	09/27/2007	N/A	N/A	Test Hole
11.	7101141	09/27/2007	N/A	N/A	Test Hole
12.	7134031	09/16/2009	6.1	N/A	Observation well
13.	7152039	09/03/2010	4	N/A	Test Hole
14.	7152039	09/03/2010	N/A	N/A	Test Hole
15.	7152039	09/03/2010	N/A	N/A	Test Hole
16.	7152039	09/03/2010	N/A	N/A	Test Hole
17.	7152039	09/03/2010	N/A	N/A	Test Hole
18.	7152039	09/07/2010	N/A	N/A	Test Hole
19.	7152039	09/07/2010	N/A	N/A	Test Hole
20.	7152039	09/07/2010	N/A	N/A	Test Hole
21.	7152039	09/07/2010	N/A	N/A	Test Hole
22.	7152039	09/08/2010	N/A	N/A	Test Hole
23.	7152039	09/08/2010	N/A	N/A	Test Hole
24.	7152039	09/08/2010	N/A	N/A	Test Hole
25.	7152039	09/09/2010	N/A	N/A	Test Hole
26.	7152039	09/09/2010	N/A	N/A	Test Hole
27.	7161332	03/29/2011	3.4	N/A	N/A
28.	7161333	03/29/2011	3.4	N/A	N/A
29.	7161334	03/29/2011	3.4	N/A	N/A
30.	7187787	08/28/2012	3.4	N/A	Observation well
31.	7188619	04/13/2012	N/A	N/A	N/A
32.	7192191	05/18/2012	N/A	N/A	N/A
33.	7195037	06/19/2012	9.1	N/A	N/A
34.	7253999	11/20/2015	6.1	N/A	Observation well
35.	7254000	11/20/2015	6.1	N/A	Observation well
36.	7263647	04/23/2016	6.1	N/A	Observation well
37.	7263648	04/23/2016	6.1	N/A	Observation well
38.	7263649	04/23/2016	6.1	N/A	Observation well
39.	7263650	04/23/2016	6.1	N/A	Observation well
40.	7286766	N/A	N/A	N/A	N/A
41.	7322522	05/17/2018	6.1	N/A	Test Hole/Monitoring
42.	7322523	05/17/2018	5.0	N/A	Test Hole/Monitoring
43.	7322524	05/17/2018	6.4	N/A	Test Hole/Monitoring

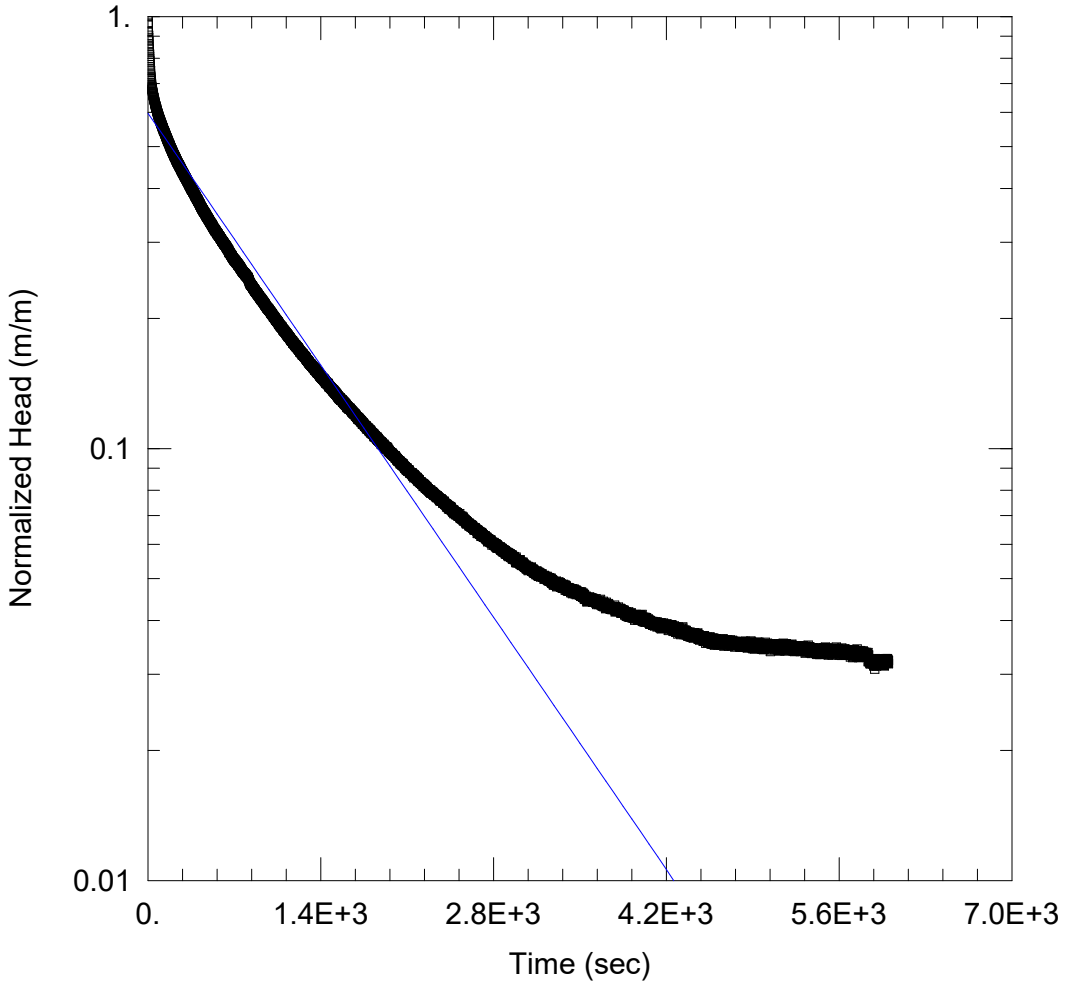
Count	Well ID	Date Completed	Depth (m)	Reported Water Level (m)	Status of Well
44.	7325283	09/11/2018	N/A	N/A	09/11/2018
45.	7327366	08/29/2018	N/A	N/A	N/A
46.	7329556	01/04/2019	16.8	N/A	Monitoring
47.	7343775	09/05/2019	N/A	N/A	N/A
48.	7344253	10/29/2020	N/A	N/A	N/A
49.	7376602	08/13/2020	N/A	N/A	N/A
50.	7384388	01/26/2021	6.1	N/A	Observation/Monitoring
51.	7384399	01/26/2021	7.6	N/A	Observation/Monitoring
52.	7384400	01/26/2021	6.1	N/A	Observation/Monitoring
53.	7384402	01/26/2021	6.1	N/A	Observation/Monitoring
54.	7393298	07/09/2021	3.1	N/A	Abandoned
55.	7393299	06/25/2021	4.0	N/A	Abandoned
56.	7393335	06/25/2021	4.0	2.1	Abandoned
57.	7393339	06/25/2021	4.0	2.9	Abandoned
58.	7393340	06/25/2021	4.0	1.8	Abandoned
59.	7393341	06/25/2021	3.0	1.7	Abandoned
60.	7405067	10/08/2021	22.9	N/A	N/A
61.	7405068	10/08/2021	15.2	N/A	N/A
62.	7405069	10/08/2021	4.9	N/A	N/A
63.	7405070	10/08/2021	7.0	N/A	N/A
64.	7405071	10/08/2021	7.3	N/A	N/A
65.	7412585	02/17/2022	6.1	4.6	Observation/Monitoring
66.	7412588	02/17/2022	8.2	6.1	Observation/Monitoring
67.	7412591	02/17/2022	6.7	4.6	Observation/Monitoring

Table B-2: MECP EASR Summary Table

Permit Number	Purpose	Address	Municipality	Water Source	Max L/Day	Active
0772-AF3HTJ	Dewatering	Canadian National Railway and Cross Avenue	Oakville	Groundwater	20,000 to 428,000	No
2668-6TRQ7G	Dewatering construction	Northeast of Queen Elizabeth Way (Hwy 403) and Kerr Street	Oakville	Groundwater	1,962,744	No
0551-72YPT5	Dewatering construction	Northeast of Queen Elizabeth Way (Hwy 403) and Kerr Street	Oakville	Groundwater	1,962,744	No
4375-6NYL7V	Dewatering construction	Northeast of Queen Elizabeth Way (Hwy 403) and Kerr Street	Oakville	Groundwater	1,962,744	No
8107-9KKLR9	Dewatering construction	Queen Elizabeth Way (Hwy 403), north of South Service Road East, southwest of Chartwell Road	Oakville	Surface water	449,280,000 to 1,168,128,000	No

Permit Number	Purpose	Address	Municipality	Water Source	Max L/Day	Active
R-009-4234642223	Construction dewatering	547 Trafalgar Road	Oakville	Groundwater	380,000 to 400,000	Yes
R-009-2112317313	Construction dewatering	547 Trafalgar Road	Oakville	Groundwater	50,000 to 400,000	No
R-009-9112436776	Construction dewatering	Trans-Northern Pipelines Inc.	Oakville	Groundwater	50,000 to 400,000	No

APPENDIX C: SWRT RESULTS



WELL TEST ANALYSIS

Data Set: C:\...\BHMW1.aqt
Date: 10/23/23 Time: 16:26:10

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Cross Realty Incorporated
Project: BIGC-ENV-623A
Location: 157 and 165 Cross Ave Oakville
Test Well: BH/MW1
Test Date: September 12, 2023

AQUIFER DATA

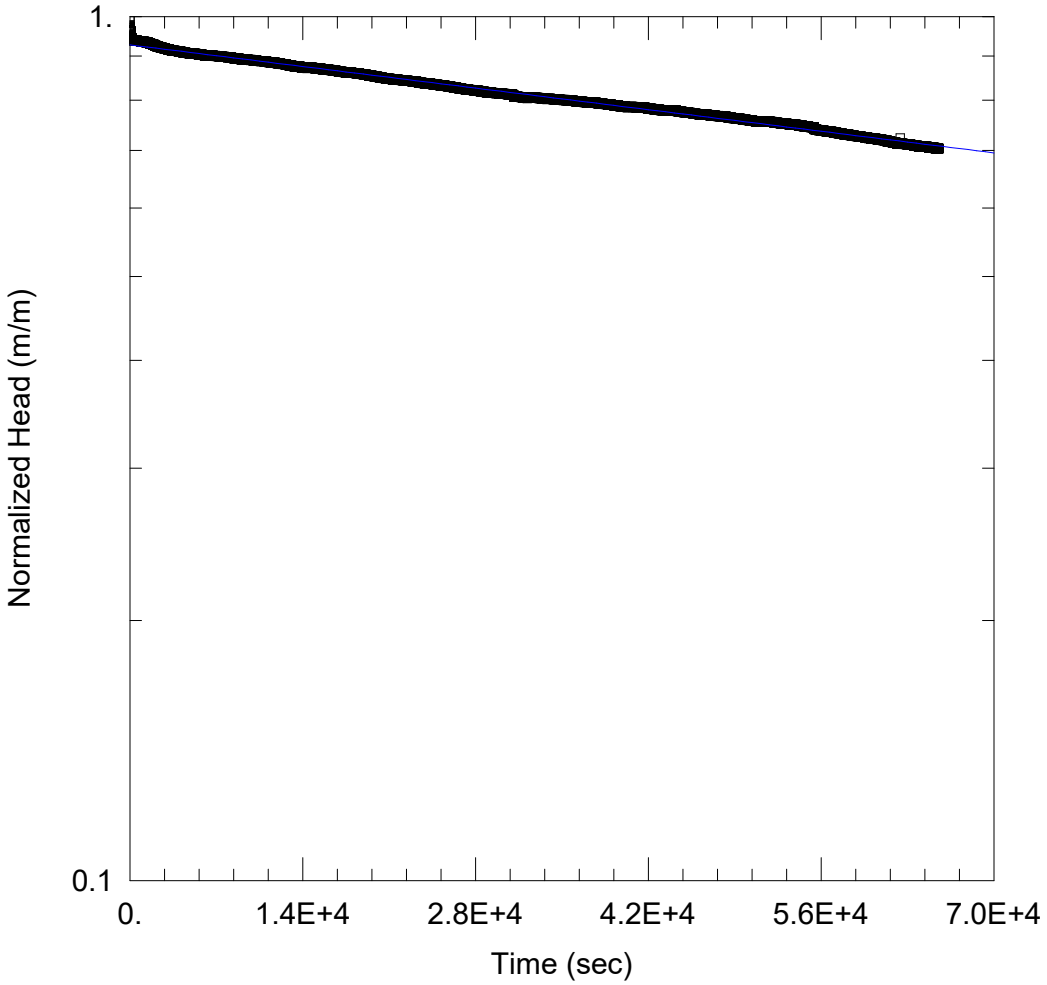
Saturated Thickness: 3.35 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW1)

Initial Displacement: 1.118 m
Total Well Penetration Depth: 3.35 m
Casing Radius: 0.0254 m
Static Water Column Height: 3.35 m
Screen Length: 3. m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 5.639E-7 m/sec
y0 = 0.668 m



WELL TEST ANALYSIS

Data Set: C:\...\BHMW2D.aqt
Date: 10/23/23 Time: 16:29:44

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Cross Realty Incorporated
Project: BIGC-ENV-623A
Location: 157 and 165 Cross Ave Oakville
Test Well: BH/MW2D
Test Date: September 12, 2023

AQUIFER DATA

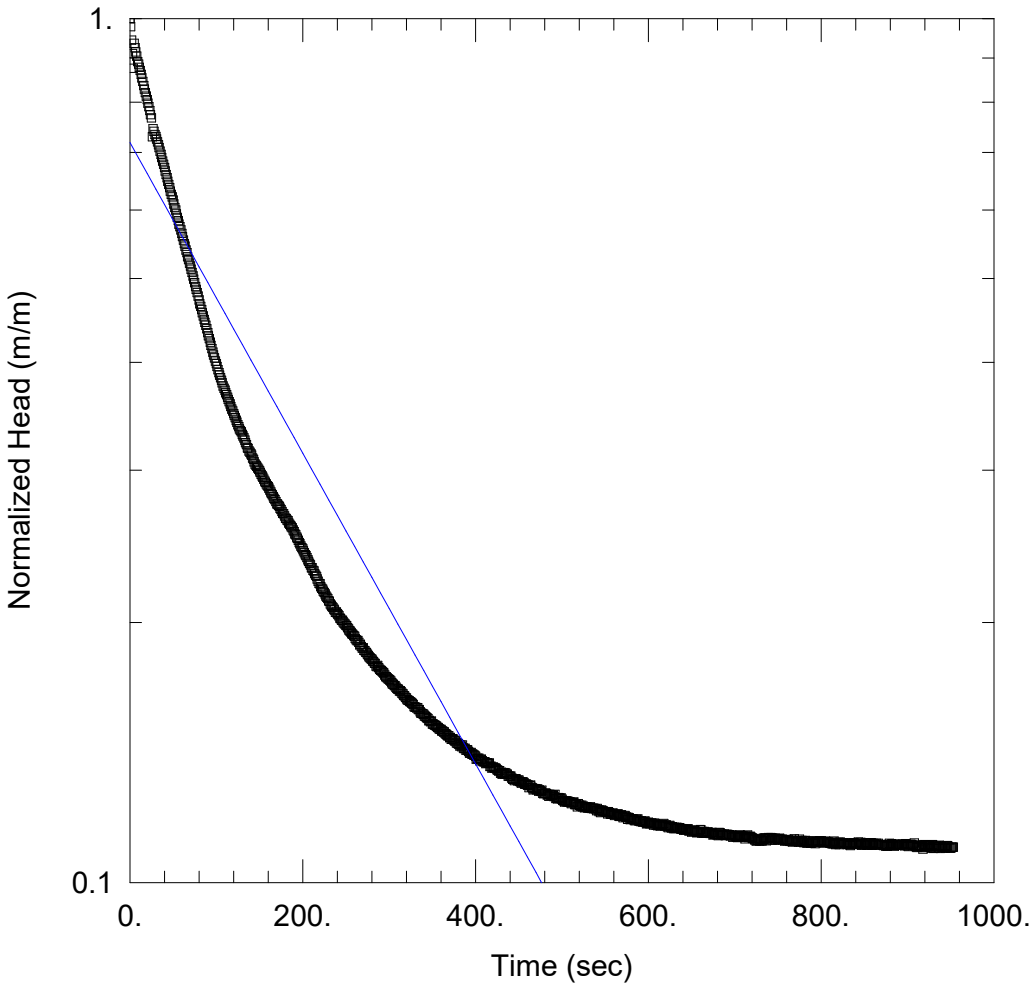
Saturated Thickness: 1.76 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW2D)

Initial Displacement: 1.049 m
Total Well Penetration Depth: 1.76 m
Casing Radius: 0.0254 m
Static Water Column Height: 1.76 m
Screen Length: 1.76 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 3.991E-9 m/sec
y0 = 0.9726 m



WELL TEST ANALYSIS

Data Set: C:\...\BHMW2S.aqt
Date: 10/23/23 Time: 16:35:10

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Cross Realty Incorporated
Project: BIGC-ENV-623A
Location: 157 and 165 Cross Ave Oakville
Test Well: BH/MW2S
Test Date: September 12, 2023

AQUIFER DATA

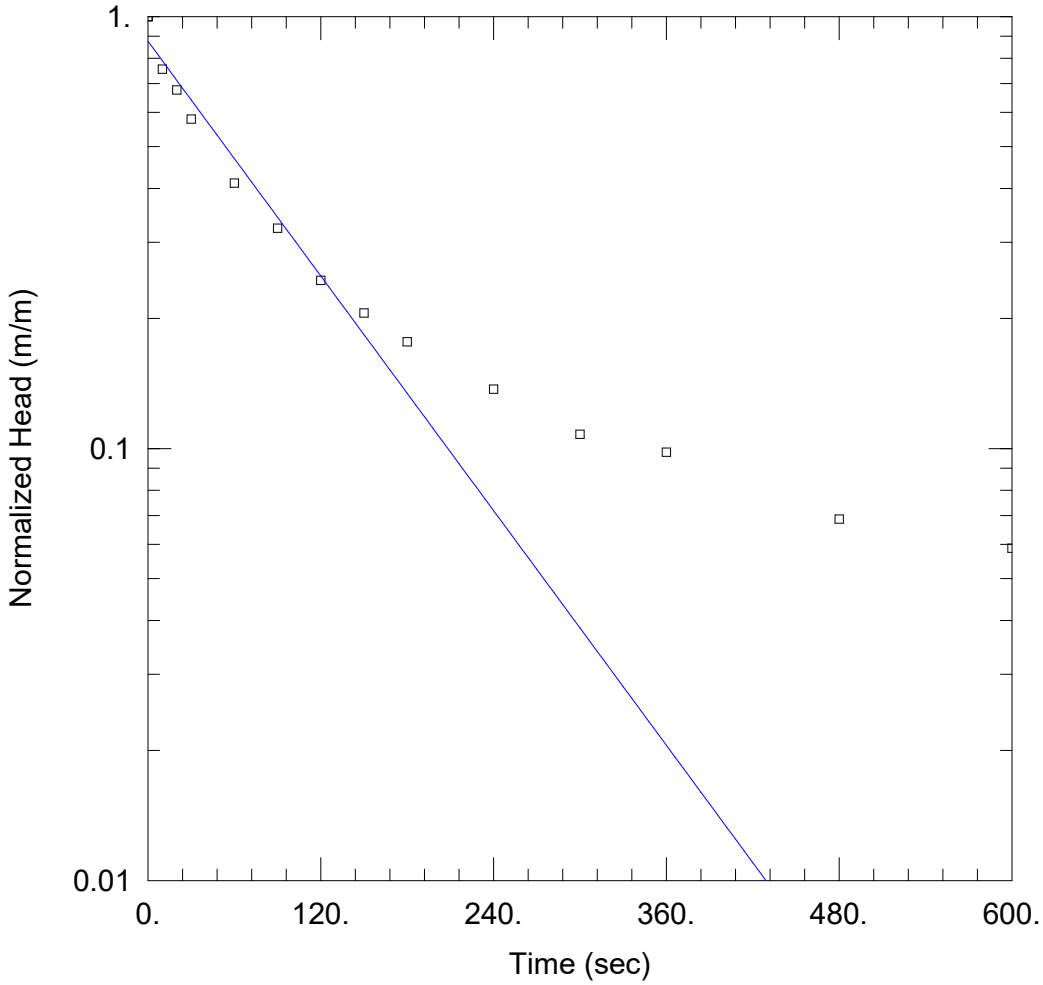
Saturated Thickness: 2.2 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW2S)

Initial Displacement: 1.152 m
Total Well Penetration Depth: 2.2 m
Casing Radius: 0.0254 m
Static Water Column Height: 2.2 m
Screen Length: 2.2 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 3.215E-6 m/sec
y0 = 0.8276 m



WELL TEST ANALYSIS

Data Set: C:\...\BHMW3.aqt
Date: 10/23/23 Time: 16:38:04

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Cross Realty Incorporated
Project: BIGC-ENV-623A
Location: 157 and 165 Cross Ave Oakville
Test Well: BH/MW3
Test Date: September 13, 2023

AQUIFER DATA

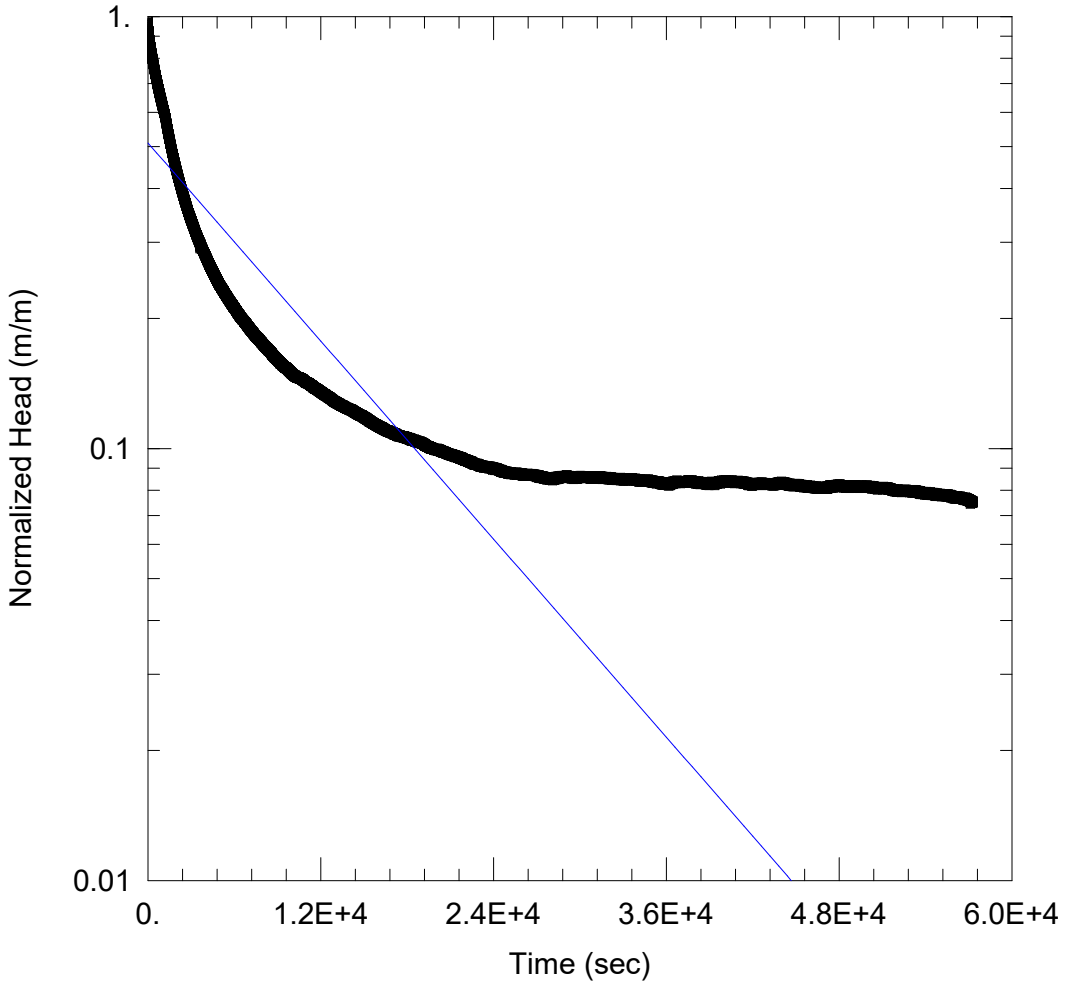
Saturated Thickness: 2.41 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW3)

Initial Displacement: 1.02 m
Total Well Penetration Depth: 2.41 m
Casing Radius: 0.0254 m
Static Water Column Height: 2.41 m
Screen Length: 2.41 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 7.393E-6 m/sec
y0 = 0.894 m



WELL TEST ANALYSIS

Data Set: C:\...\BHMW4.aqt
Date: 10/23/23 Time: 16:40:51

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Cross Realty Incorporated
Project: BIGC-ENV-623A
Location: 157 and 165 Cross Ave Oakville
Test Well: BH/MW4
Test Date: September 12, 2023

AQUIFER DATA

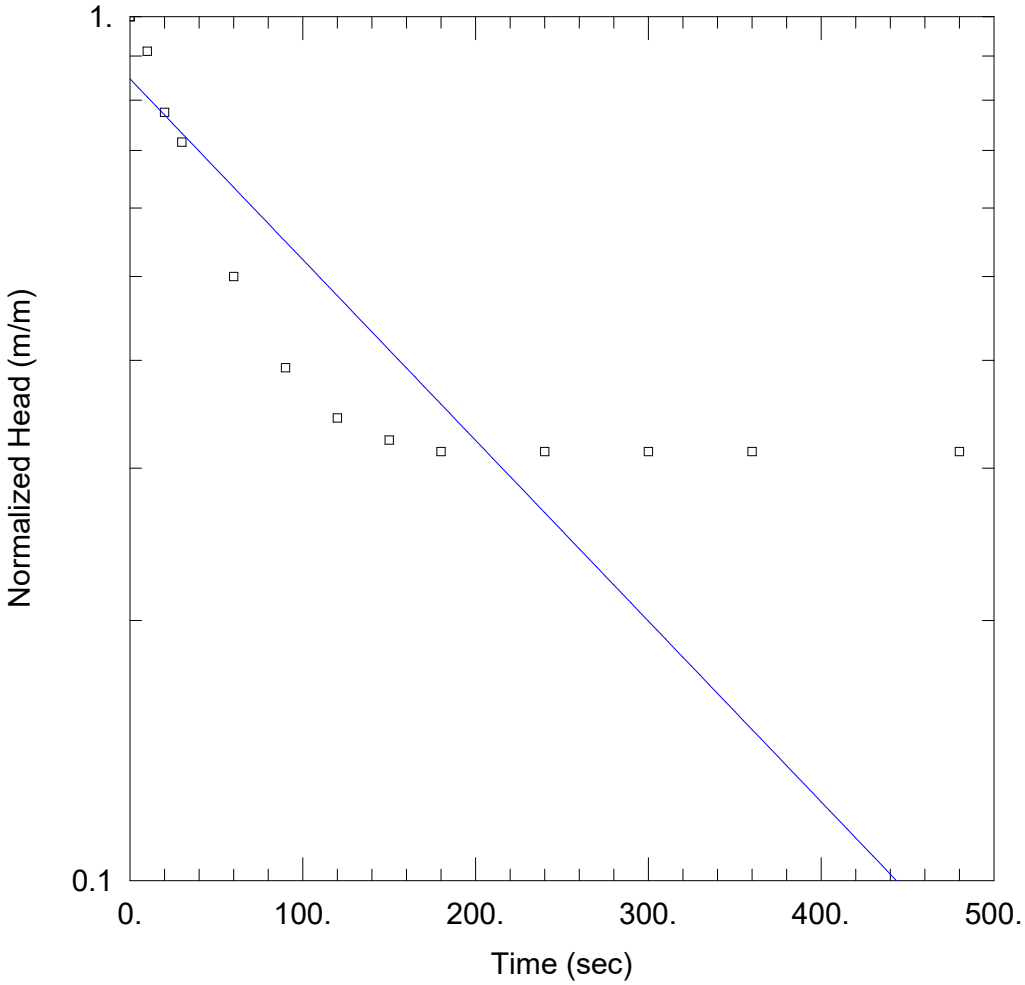
Saturated Thickness: 3.89 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW4)

Initial Displacement: 1.43 m
Total Well Penetration Depth: 3.89 m
Casing Radius: 0.0254 m
Static Water Column Height: 3.89 m
Screen Length: 3. m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 5.17E-8 m/sec
y0 = 0.729 m



WELL TEST ANALYSIS

Data Set: C:\...\BHMW5.aqt
Date: 10/23/23 Time: 16:52:36

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Cross Realty Incorporated
Project: BIGC-ENV-623A
Location: 157 and 165 Cross Ave Oakville
Test Well: BH/MW5
Test Date: September 13, 2023

AQUIFER DATA

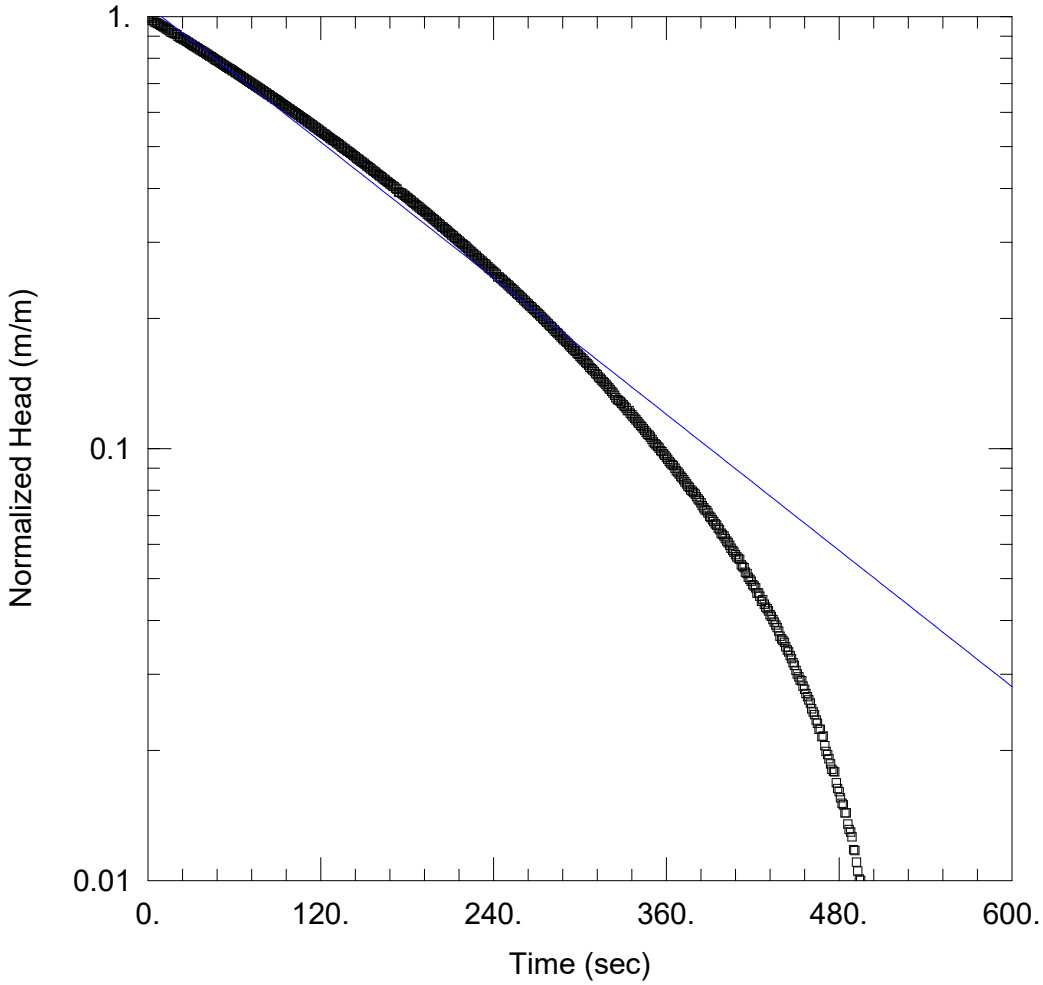
Saturated Thickness: 3.33 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW5)

Initial Displacement: 1.02 m
Total Well Penetration Depth: 3.33 m
Casing Radius: 0.0254 m
Static Water Column Height: 3.33 m
Screen Length: 3. m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 2.83E-6 m/sec
y0 = 0.8638 m



WELL TEST ANALYSIS

Data Set: C:\...\BHMW6D.aqt
Date: 10/23/23 Time: 16:54:29

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Cross Realty Incorporated
Project: BIGC-ENV-623A
Location: 157 and 165 Cross Ave Oakville
Test Well: BH/MW6D
Test Date: September 12, 2023

AQUIFER DATA

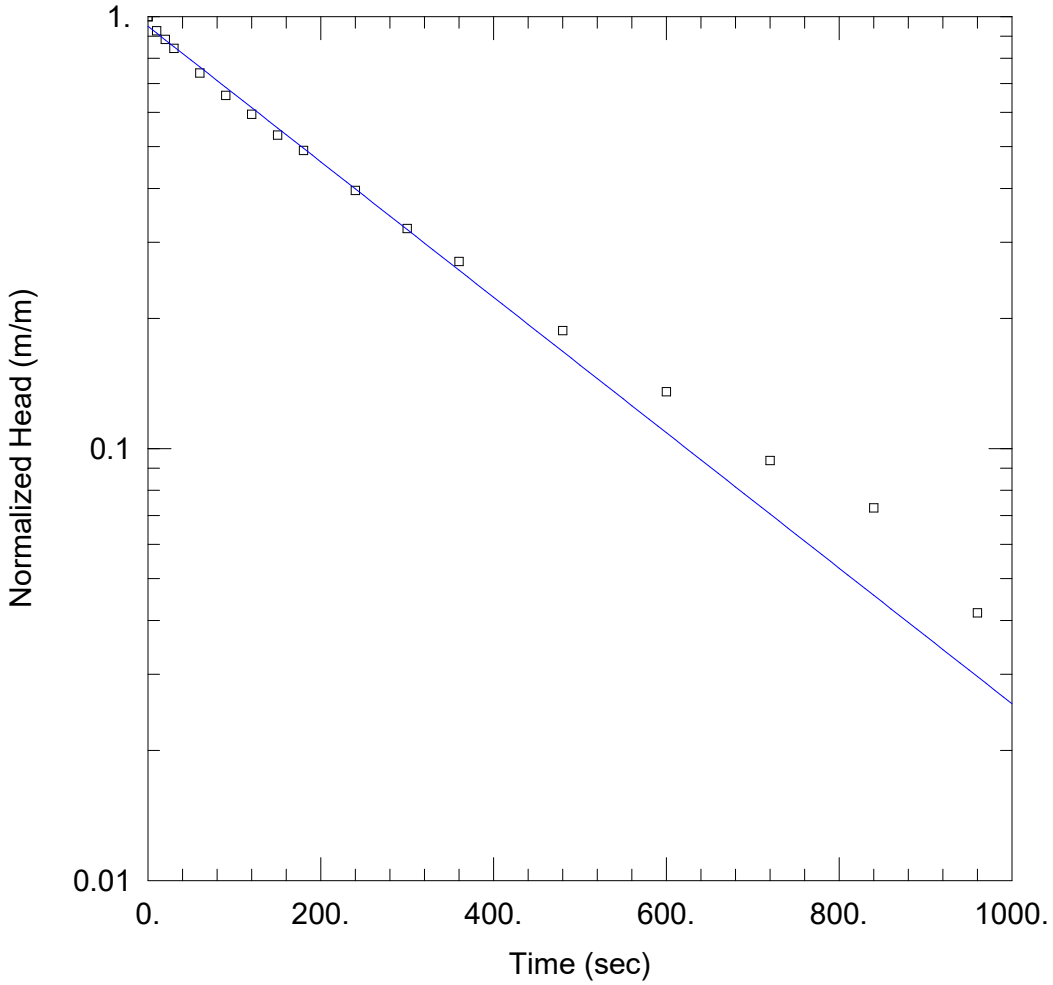
Saturated Thickness: 10.62 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW6D)

Initial Displacement: 1.569 m
Total Well Penetration Depth: 10.62 m
Casing Radius: 0.0254 m
Static Water Column Height: 10.62 m
Screen Length: 3. m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 3.554E-6 m/sec
y0 = 1.66 m



WELL TEST ANALYSIS

Data Set: C:\...\BHMW6S.aqt
Date: 10/23/23 Time: 16:56:14

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Cross Realty Incorporated
Project: BIGC-ENV-623A
Location: 157 and 165 Cross Ave Oakville
Test Well: BH/MW6S
Test Date: September 13, 2023

AQUIFER DATA

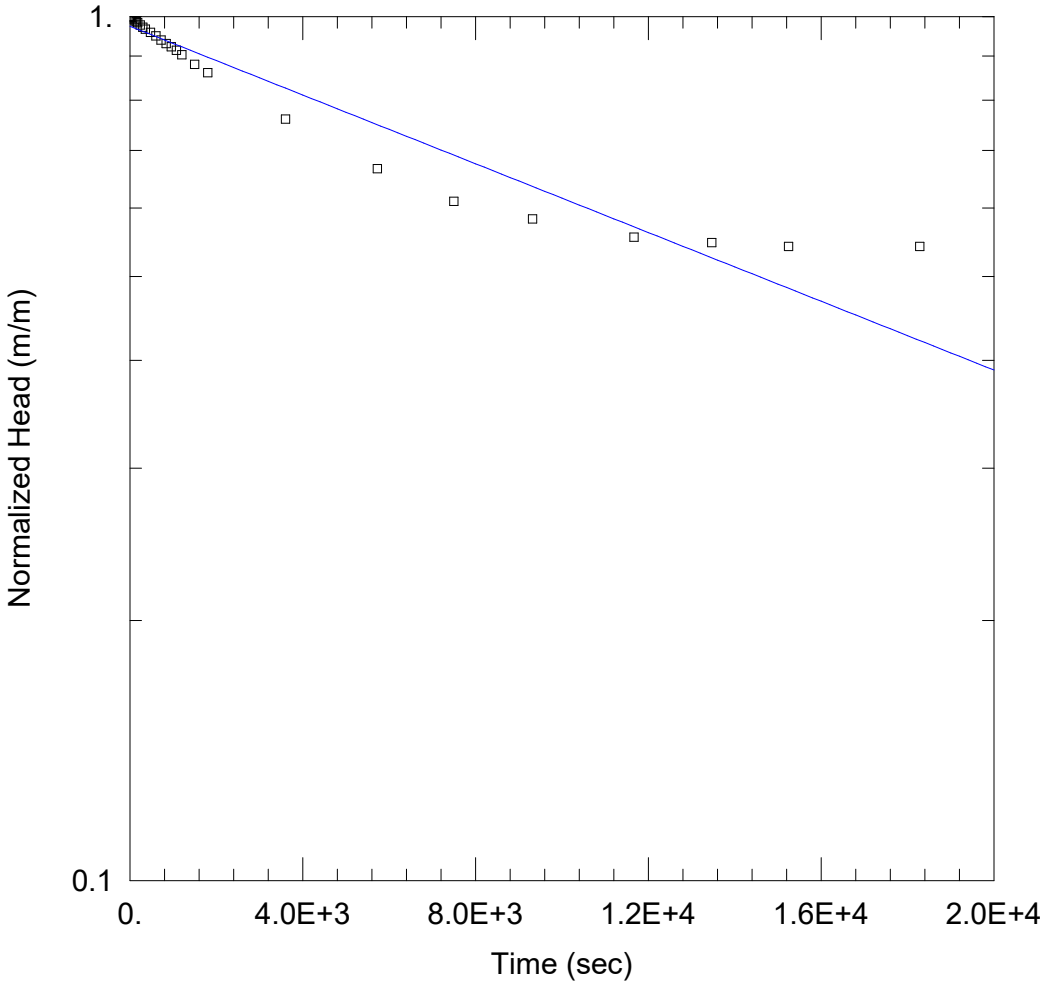
Saturated Thickness: 2.48 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW6S)

Initial Displacement: 0.96 m
Total Well Penetration Depth: 2.48 m
Casing Radius: 0.0254 m
Static Water Column Height: 2.48 m
Screen Length: 2.48 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 2.488E-6 m/sec
y0 = 0.911 m



WELL TEST ANALYSIS

Data Set: C:\...\BHMW7.aqt
Date: 10/23/23 Time: 16:58:33

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Cross Realty Incorporated
Project: BIGC-ENV-623A
Location: 157 and 165 Cross Ave Oakville
Test Well: BH/MW7
Test Date: September 13, 2023

AQUIFER DATA

Saturated Thickness: 3.6 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW7)

Initial Displacement: 3.6 m
Total Well Penetration Depth: 3.6 m
Casing Radius: 0.0254 m
Static Water Column Height: 3.6 m
Screen Length: 3. m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 2.692E-8 m/sec
y0 = 3.508 m

APPENDIX D: WATER QUALITY LABORATORY CERTIFICATE OF ANALYSIS AND CHAIN OF CUSTODY

Your Project #: BIGC-ENV-623A
Site Location: 157-165 Cross Avenue, Oakville
Your C.O.C. #: 953597-01-01

Attention: Eileen Liu

B.I.G Consulting Inc.
12-5500 Tomken Road
Mississauga, ON
CANADA L4W 2Z4

Report Date: 2023/09/27
Report #: R7832940
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C3S1578
Received: 2023/09/13, 19:57

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Sewer Use By-Law Semivolatile Organics	1	2023/09/14	2023/09/15	CAM SOP 00301	EPA 8270 m
Biochemical Oxygen Demand (BOD)	1	2023/09/14	2023/09/19	CAM SOP-00427	SM 23 5210B m
Carbonaceous BOD	1	2023/09/14	2023/09/19	CAM SOP-00427	SM 23 5210B m
Chromium (VI) in Water	1	N/A	2023/09/14	CAM SOP-00436	EPA 7199 m
Total Cyanide	1	2023/09/15	2023/09/15	CAM SOP-00457	OMOE E3015 5 m
Fluoride	1	2023/09/14	2023/09/14	CAM SOP-00449	SM 23 4500-F C m
Mercury in Water by CVAA	1	2023/09/15	2023/09/19	CAM SOP-00453	EPA 7470A m
Total Metals Analysis by ICPMS	1	2023/09/14	2023/09/15	CAM SOP-00447	EPA 6020B m
E.coli, (CFU/100mL)	1	N/A	2023/09/13	CAM SOP-00552	MECP E3371
Total Nonylphenol in Liquids by HPLC	1	2023/09/19	2023/09/19	CAM SOP-00313	In-house Method
Nonylphenol Ethoxylates in Liquids: HPLC	1	2023/09/19	2023/09/19	CAM SOP-00313	In-house Method
Animal and Vegetable Oil and Grease	1	N/A	2023/09/20	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	1	2023/09/20	2023/09/20	CAM SOP-00326	EPA1664B m,SM5520B m
OC Pesticides (Selected) & PCB (1)	1	2023/09/15	2023/09/17	CAM SOP-00307	EPA 8081B/ 8082A
OC Pesticides Summed Parameters	1	N/A	2023/09/14	CAM SOP-00307	EPA 8081B/ 8082A
pH	1	2023/09/14	2023/09/14	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	1	N/A	2023/09/14	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Turbidimetry	1	N/A	2023/09/15	CAM SOP-00464	SM 23 4500-SO42- E m
Total Kjeldahl Nitrogen in Water	1	2023/09/14	2023/09/18	CAM SOP-00938	OMOE E3516 m
Total PAHs (2)	1	N/A	2023/09/15	CAM SOP - 00301	
Mineral/Synthetic O & G (TPH Heavy Oil) (3)	1	2023/09/20	2023/09/20	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	1	2023/09/19	2023/09/20	CAM SOP-00428	SM 23 2540D m
Volatile Organic Compounds in Water	1	N/A	2023/09/15	CAM SOP-00228	EPA 8260D

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCCFP, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement

Your Project #: BIGC-ENV-623A
Site Location: 157-165 Cross Avenue, Oakville
Your C.O.C. #: 953597-01-01

Attention: Eileen Liu

B.I.G Consulting Inc.
12-5500 Tomken Road
Mississauga, ON
CANADA L4W 2Z4

Report Date: 2023/09/27
Report #: R7832940
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C3S1578
Received: 2023/09/13, 19:57

Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Chlordane (Total) = Alpha Chlordane + Gamma Chlordane
(2) Total PAHs include only those PAHs specified in the sewer use by-by-law.
(3) Note: TPH (Heavy Oil) is equivalent to Mineral / Synthetic Oil & Grease

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Deepthi Shaji, Project Manager
Email: Deepthi.Shaji@bureauveritas.com
Phone# (905)817-5700 Ext:7065843

==========

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

Bureau Veritas Job #: C3S1578
Report Date: 2023/09/27

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-623A
Site Location: 157-165 Cross Avenue, Oakville
Sampler Initials: AL

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID				WZC876		
Sampling Date				2023/09/13 13:05		
COC Number				953597-01-01		
	UNITS	Criteria	Criteria-2	BH/MW4	RDL	QC Batch
Calculated Parameters						
Total Animal/Vegetable Oil and Grease	mg/L	-	150	ND	0.50	8913262
Inorganics						
Total BOD	mg/L	15	-	ND	2	8916146
Total Carbonaceous BOD	mg/L	-	300	ND	2	8916151
Fluoride (F-)	mg/L	-	10	0.41	0.10	8916929
Total Kjeldahl Nitrogen (TKN)	mg/L	-	100	8.9	0.50	8917530
pH	pH	6.5:8.5	6.0:10.0	7.66		8916935
Phenols-4AAP	mg/L	0.008	1	ND	0.0010	8917229
Total Suspended Solids	mg/L	15	350	11	10	8925518
Dissolved Sulphate (SO4)	mg/L	-	1500	1000	5.0	8915499
Total Cyanide (CN)	mg/L	0.02	2	ND	0.0050	8918822
Petroleum Hydrocarbons						
Total Oil & Grease	mg/L	-	-	ND	0.50	8928102
Total Oil & Grease Mineral/Synthetic	mg/L	-	-	ND	0.50	8928104

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: The Town of Oakville Storm Sewer Discharge By Law 2009-031
Criteria-2: Halton Sanitary & Combined Sewer Bylaw (2-03)
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Bureau Veritas Job #: C3S1578
Report Date: 2023/09/27

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-623A
Site Location: 157-165 Cross Avenue, Oakville
Sampler Initials: AL

NONYL PHENOL AND NONYL PHENOL ETHOXYLATE (WATER)

Bureau Veritas ID			WZC876		
Sampling Date			2023/09/13 13:05		
COC Number			953597-01-01		
	UNITS	Criteria	BH/MW4	RDL	QC Batch
Miscellaneous Parameters					
Nonylphenol Ethoxylate (Total)	mg/L	0.01	ND	0.005	8925253
Nonylphenol (Total)	mg/L	0.001	ND	0.001	8925248

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: The Town of Oakville Storm Sewer Discharge By Law 2009-031
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Bureau Veritas Job #: C3S1578
Report Date: 2023/09/27

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-623A
Site Location: 157-165 Cross Avenue, Oakville
Sampler Initials: AL

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID				WZC876		
Sampling Date				2023/09/13 13:05		
COC Number				953597-01-01		
	UNITS	Criteria	Criteria-2	BH/MW4	RDL	QC Batch
Metals						
Chromium (VI)	ug/L	40	-	ND (1)	2.5	8916288
Mercury (Hg)	mg/L	0.0004	0.05	ND	0.00010	8926072
Total Aluminum (Al)	ug/L	-	50000	190	4.9	8917140
Total Antimony (Sb)	ug/L	-	5000	1.4	0.50	8917140
Total Arsenic (As)	ug/L	20	1000	1.2	1.0	8917140
Total Cadmium (Cd)	ug/L	8	1000	ND	0.090	8917140
Total Chromium (Cr)	ug/L	80	3000	ND	5.0	8917140
Total Cobalt (Co)	ug/L	-	5000	2.3	0.50	8917140
Total Copper (Cu)	ug/L	40	3000	1.5	0.90	8917140
Total Iron (Fe)	ug/L	-	50000	270	100	8917140
Total Lead (Pb)	ug/L	120	3000	ND	0.50	8917140
Total Manganese (Mn)	ug/L	50	5000	**360**	2.0	8917140
Total Molybdenum (Mo)	ug/L	-	5000	16	0.50	8917140
Total Nickel (Ni)	ug/L	80	3000	13	1.0	8917140
Total Phosphorus (P)	ug/L	400	10000	ND	100	8917140
Total Selenium (Se)	ug/L	20	5000	ND	2.0	8917140
Total Silver (Ag)	ug/L	120	5000	ND	0.090	8917140
Total Tin (Sn)	ug/L	-	5000	2.9	1.0	8917140
Total Titanium (Ti)	ug/L	-	5000	ND	5.0	8917140
Total Zinc (Zn)	ug/L	40	3000	ND	5.0	8917140

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: The Town of Oakville Storm Sewer Discharge By Law 2009-031
Criteria-2: Halton Sanitary & Combined Sewer Bylaw (2-03)
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

(1) Hexavalent Chromium: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.

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SEMI-VOLATILE ORGANICS BY GC-MS (WATER)

Bureau Veritas ID				WZC876		
Sampling Date				2023/09/13 13:05		
COC Number				953597-01-01		
	UNITS	Criteria	Criteria-2	BH/MW4	RDL	QC Batch
Semivolatile Organics						
Naphthalene	ug/L	-	140	ND	0.3	8915862
Di-N-butyl phthalate	ug/L	15	-	ND	2	8915862
Bis(2-ethylhexyl)phthalate	ug/L	8.8	-	ND	2	8915862
3,3'-Dichlorobenzidine	ug/L	0.8	-	ND	0.8	8915862
Pentachlorophenol	ug/L	2	-	ND	1	8915862
Phenanthrene	ug/L	-	-	ND	0.2	8915862
Anthracene	ug/L	-	-	ND	0.2	8915862
Fluoranthene	ug/L	-	-	ND	0.2	8915862
Pyrene	ug/L	-	-	ND	0.2	8915862
Benzo(a)anthracene	ug/L	-	-	ND	0.2	8915862
Chrysene	ug/L	-	-	ND	0.2	8915862
Benzo(b/j)fluoranthene	ug/L	-	-	ND	0.2	8915862
Benzo(k)fluoranthene	ug/L	-	-	ND	0.2	8915862
Benzo(a)pyrene	ug/L	-	-	ND	0.2	8915862
Indeno(1,2,3-cd)pyrene	ug/L	-	-	ND	0.2	8915862
Dibenzo(a,h)anthracene	ug/L	-	-	ND	0.2	8915862
Benzo(g,h,i)perylene	ug/L	-	-	ND	0.2	8915862
Dibenzo(a,i)pyrene	ug/L	-	-	ND	0.2	8915862
Benzo(e)pyrene	ug/L	-	-	ND	0.2	8915862
Perylene	ug/L	-	-	ND	0.2	8915862
Dibenzo(a,j) acridine	ug/L	-	-	ND	0.4	8915862
7H-Dibenzo(c,g) Carbazole	ug/L	-	-	ND	0.4	8915862
1,6-Dinitropyrene	ug/L	-	-	ND	0.4	8915862
1,3-Dinitropyrene	ug/L	-	-	ND	0.4	8915862
1,8-Dinitropyrene	ug/L	-	-	ND	0.4	8915862
Calculated Parameters						
Total PAHs (18 PAHs)	ug/L	2	-	ND	1	8913264

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: The Town of Oakville Storm Sewer Discharge By Law 2009-031
Criteria-2: Halton Sanitary & Combined Sewer Bylaw (2-03)
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

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SEMI-VOLATILE ORGANICS BY GC-MS (WATER)

Bureau Veritas ID				WZC876		
Sampling Date				2023/09/13 13:05		
COC Number				953597-01-01		
	UNITS	Criteria	Criteria-2	BH/MW4	RDL	QC Batch
Surrogate Recovery (%)						
2,4,6-Tribromophenol	%	-	-	72		8915862
2-Fluorobiphenyl	%	-	-	78		8915862
D14-Terphenyl (FS)	%	-	-	97		8915862
D5-Nitrobenzene	%	-	-	92		8915862
D8-Acenaphthylene	%	-	-	77		8915862

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: The Town of Oakville Storm Sewer Discharge By Law 2009-031
Criteria-2: Halton Sanitary & Combined Sewer Bylaw (2-03)

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Bureau Veritas Job #: C3S1578
Report Date: 2023/09/27

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-623A
Site Location: 157-165 Cross Avenue, Oakville
Sampler Initials: AL

VOLATILE ORGANICS BY GC/MS (WATER)

Bureau Veritas ID				WZC876		
Sampling Date				2023/09/13 13:05		
COC Number				953597-01-01		
	UNITS	Criteria	Criteria-2	BH/MW4	RDL	QC Batch
Volatile Organics						
Benzene	ug/L	2	10	0.38	0.20	8916554
Chloroform	ug/L	2	40	0.27	0.20	8916554
1,2-Dichlorobenzene	ug/L	5.6	-	ND	0.40	8916554
1,4-Dichlorobenzene	ug/L	6.8	80	ND	0.40	8916554
cis-1,2-Dichloroethylene	ug/L	5.6	-	ND	0.50	8916554
trans-1,3-Dichloropropene	ug/L	5.6	-	ND	0.40	8916554
Ethylbenzene	ug/L	2	160	ND	0.20	8916554
Methylene Chloride(Dichloromethane)	ug/L	5.2	2000	ND	2.0	8916554
1,1,2,2-Tetrachloroethane	ug/L	17	-	ND	0.40	8916554
Tetrachloroethylene	ug/L	4.4	1000	ND	0.20	8916554
Toluene	ug/L	2	16	ND	0.20	8916554
Trichloroethylene	ug/L	7.6	400	ND	0.20	8916554
Total Xylenes	ug/L	4.4	-	ND	0.20	8916554
Surrogate Recovery (%)						
4-Bromofluorobenzene	%	-	-	101		8916554
D4-1,2-Dichloroethane	%	-	-	106		8916554
D8-Toluene	%	-	-	90		8916554

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: The Town of Oakville Storm Sewer Discharge By Law 2009-031
Criteria-2: Halton Sanitary & Combined Sewer Bylaw (2-03)
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

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Bureau Veritas Job #: C3S1578
Report Date: 2023/09/27

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-623A
Site Location: 157-165 Cross Avenue, Oakville
Sampler Initials: AL

ORGANOCHLORINATED PESTICIDES BY GC-ECD (WATER)

Bureau Veritas ID			WZC876		
Sampling Date			2023/09/13 13:05		
COC Number			953597-01-01		
	UNITS	Criteria	BH/MW4	RDL	QC Batch
Calculated Parameters					
Aldrin + Dieldrin	ug/L	0.08	ND	0.005	8915446
Chlordane (Total)	ug/L	40	ND	0.005	8915446
DDT+ Metabolites	ug/L	-	ND	0.005	8915446
Heptachlor + Heptachlor epoxide	ug/L	-	ND	0.005	8915446
o,p-DDD + p,p-DDD	ug/L	-	ND	0.005	8915446
o,p-DDE + p,p-DDE	ug/L	-	ND	0.005	8915446
o,p-DDT + p,p-DDT	ug/L	-	ND	0.005	8915446
Total Endosulfan	ug/L	-	ND	0.005	8915446
Total PCB	ug/L	0.4	ND	0.05	8915446
Pesticides & Herbicides					
Aldrin	ug/L	-	ND	0.005	8918788
Dieldrin	ug/L	-	ND	0.005	8918788
a-Chlordane	ug/L	-	ND	0.005	8918788
g-Chlordane	ug/L	-	ND	0.005	8918788
o,p-DDT	ug/L	0.04	ND	0.005	8918788
p,p-DDT	ug/L	0.04	ND	0.005	8918788
Lindane	ug/L	40	ND	0.003	8918788
Hexachlorobenzene	ug/L	0.04	ND	0.005	8918788
Mirex	ug/L	40	ND	0.005	8918788
Surrogate Recovery (%)					
2,4,5,6-Tetrachloro-m-xylene	%	-	76		8918788
Decachlorobiphenyl	%	-	122		8918788

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: The Town of Oakville Storm Sewer Discharge By Law 2009-031
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

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MICROBIOLOGY (WATER)

Bureau Veritas ID			WZC876		
Sampling Date			2023/09/13 13:05		
COC Number			953597-01-01		
	UNITS	Criteria	BH/MW4	RDL	QC Batch
Microbiological					
Escherichia coli	CFU/100mL	200	<10	10	8915628

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: The Town of Oakville Storm Sewer Discharge By Law 2009-031

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	7.0°C

Revised report[2023/09/21] - Criteria revised as per client request.
Revised report[2023/09/27] - Criteria revised as per client request.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8915862	2,4,6-Tribromophenol	2023/09/15	105	10 - 130	90	10 - 130	63	%				
8915862	2-Fluorobiphenyl	2023/09/15	79	30 - 130	75	30 - 130	84	%				
8915862	D14-Terphenyl (FS)	2023/09/15	100	30 - 130	99	30 - 130	94	%				
8915862	D5-Nitrobenzene	2023/09/15	86	30 - 130	84	30 - 130	78	%				
8915862	D8-Acenaphthylene	2023/09/15	81	30 - 130	78	30 - 130	76	%				
8916554	4-Bromofluorobenzene	2023/09/15	101	70 - 130	101	70 - 130	101	%				
8916554	D4-1,2-Dichloroethane	2023/09/15	102	70 - 130	100	70 - 130	105	%				
8916554	D8-Toluene	2023/09/15	104	70 - 130	105	70 - 130	91	%				
8918788	2,4,5,6-Tetrachloro-m-xylene	2023/09/17	72	50 - 130	71	50 - 130	74	%				
8918788	Decachlorobiphenyl	2023/09/17	122	50 - 130	105	50 - 130	112	%				
8915499	Dissolved Sulphate (SO4)	2023/09/15	NC	75 - 125	99	80 - 120	ND, RDL=1.0	mg/L	0.54	20		
8915862	1,3-Dinitropyrene	2023/09/15	12 (1)	30 - 130	98	30 - 130	ND, RDL=0.4	ug/L	NC	40		
8915862	1,6-Dinitropyrene	2023/09/15	19 (1)	30 - 130	92	30 - 130	ND, RDL=0.4	ug/L	NC	40		
8915862	1,8-Dinitropyrene	2023/09/15	14 (1)	30 - 130	88	30 - 130	ND, RDL=0.4	ug/L	NC	40		
8915862	3,3'-Dichlorobenzidine	2023/09/15	0.28 (1)	30 - 130	92	30 - 130	ND, RDL=0.8	ug/L	NC	40		
8915862	7H-Dibenzo(c,g) Carbazole	2023/09/15	79	30 - 130	76	30 - 130	ND, RDL=0.4	ug/L	NC	40		
8915862	Anthracene	2023/09/15	81	30 - 130	84	30 - 130	ND, RDL=0.2	ug/L	NC	40		
8915862	Benzo(a)anthracene	2023/09/15	93	30 - 130	94	30 - 130	ND, RDL=0.2	ug/L	NC	40		
8915862	Benzo(a)pyrene	2023/09/15	104	30 - 130	106	30 - 130	ND, RDL=0.2	ug/L	NC	40		
8915862	Benzo(b/j)fluoranthene	2023/09/15	101	30 - 130	99	30 - 130	ND, RDL=0.2	ug/L	NC	40		
8915862	Benzo(e)pyrene	2023/09/15	98	30 - 130	98	30 - 130	ND, RDL=0.2	ug/L	NC	40		
8915862	Benzo(g,h,i)perylene	2023/09/15	103	30 - 130	105	30 - 130	ND, RDL=0.2	ug/L	NC	40		
8915862	Benzo(k)fluoranthene	2023/09/15	96	30 - 130	101	30 - 130	ND, RDL=0.2	ug/L	NC	40		
8915862	Bis(2-ethylhexyl)phthalate	2023/09/15	NC	30 - 130	101	30 - 130	ND,RDL=2	ug/L	NC	40		
8915862	Chrysene	2023/09/15	92	30 - 130	92	30 - 130	ND, RDL=0.2	ug/L	NC	40		
8915862	Dibenzo(a,h)anthracene	2023/09/15	93	30 - 130	93	30 - 130	ND, RDL=0.2	ug/L	NC	40		
8915862	Dibenzo(a,i)pyrene	2023/09/15	53	30 - 130	68	30 - 130	ND, RDL=0.2	ug/L	NC	40		
8915862	Dibenzo(a,j) acridine	2023/09/15	88	30 - 130	87	30 - 130	ND, RDL=0.4	ug/L	NC	40		
8915862	Di-N-butyl phthalate	2023/09/15	88	30 - 130	88	30 - 130	ND,RDL=2	ug/L	NC	40		
8915862	Fluoranthene	2023/09/15	93	30 - 130	94	30 - 130	ND, RDL=0.2	ug/L	NC	40		
8915862	Indeno(1,2,3-cd)pyrene	2023/09/15	108	30 - 130	111	30 - 130	ND, RDL=0.2	ug/L	NC	40		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8915862	Naphthalene	2023/09/15	74	30 - 130	65	30 - 130	ND, RDL=0.3	ug/L				
8915862	Pentachlorophenol	2023/09/15	82	30 - 130	50	30 - 130	ND,RDL=1	ug/L	NC	40		
8915862	Perylene	2023/09/15	91	30 - 130	94	30 - 130	ND, RDL=0.2	ug/L	NC	40		
8915862	Phenanthrene	2023/09/15	83	30 - 130	85	30 - 130	ND, RDL=0.2	ug/L	NC	40		
8915862	Pyrene	2023/09/15	94	30 - 130	94	30 - 130	ND, RDL=0.2	ug/L	NC	40		
8916146	Total BOD	2023/09/19					ND,RDL=2	mg/L	6.1	30	98	80 - 120
8916151	Total Carbonaceous BOD	2023/09/19					ND,RDL=2	mg/L	NC	30	93	85 - 115
8916288	Chromium (VI)	2023/09/14	103	80 - 120	104	80 - 120	ND, RDL=0.50	ug/L	NC	20		
8916554	1,1,2,2-Tetrachloroethane	2023/09/15	107	70 - 130	98	70 - 130	ND, RDL=0.40	ug/L	NC	30		
8916554	1,2-Dichlorobenzene	2023/09/15	101	70 - 130	94	70 - 130	ND, RDL=0.40	ug/L	NC	30		
8916554	1,4-Dichlorobenzene	2023/09/15	110	70 - 130	103	70 - 130	ND, RDL=0.40	ug/L	NC	30		
8916554	Benzene	2023/09/15	96	70 - 130	88	70 - 130	ND, RDL=0.20	ug/L	NC	30		
8916554	Chloroform	2023/09/15	106	70 - 130	97	70 - 130	ND, RDL=0.20	ug/L	NC	30		
8916554	cis-1,2-Dichloroethylene	2023/09/15	104	70 - 130	94	70 - 130	ND, RDL=0.50	ug/L	NC	30		
8916554	Ethylbenzene	2023/09/15	98	70 - 130	92	70 - 130	ND, RDL=0.20	ug/L	NC	30		
8916554	Methylene Chloride(Dichloromethane)	2023/09/15	103	70 - 130	93	70 - 130	ND, RDL=2.0	ug/L	NC	30		
8916554	Tetrachloroethylene	2023/09/15	100	70 - 130	93	70 - 130	ND, RDL=0.20	ug/L	NC	30		
8916554	Toluene	2023/09/15	99	70 - 130	92	70 - 130	ND, RDL=0.20	ug/L	NC	30		
8916554	Total Xylenes	2023/09/15					ND, RDL=0.20	ug/L	NC	30		
8916554	trans-1,3-Dichloropropene	2023/09/15	104	70 - 130	91	70 - 130	ND, RDL=0.40	ug/L	NC	30		
8916554	Trichloroethylene	2023/09/15	102	70 - 130	94	70 - 130	ND, RDL=0.20	ug/L	NC	30		
8916929	Fluoride (F-)	2023/09/14	103	80 - 120	106	80 - 120	ND, RDL=0.10	mg/L	NC	20		
8916935	pH	2023/09/14			101	98 - 103			1.4	N/A		
8917140	Total Aluminum (Al)	2023/09/15	106	80 - 120	100	80 - 120	ND, RDL=4.9	ug/L	0.35	20		
8917140	Total Antimony (Sb)	2023/09/15	108	80 - 120	104	80 - 120	ND, RDL=0.50	ug/L	NC	20		
8917140	Total Arsenic (As)	2023/09/15	100	80 - 120	96	80 - 120	ND, RDL=1.0	ug/L	NC	20		
8917140	Total Cadmium (Cd)	2023/09/15	99	80 - 120	98	80 - 120	ND, RDL=0.090	ug/L	NC	20		
8917140	Total Chromium (Cr)	2023/09/15	101	80 - 120	98	80 - 120	ND, RDL=5.0	ug/L	NC	20		
8917140	Total Cobalt (Co)	2023/09/15	99	80 - 120	97	80 - 120	ND, RDL=0.50	ug/L	NC	20		
8917140	Total Copper (Cu)	2023/09/15	100	80 - 120	98	80 - 120	ND, RDL=0.90	ug/L	0.23	20		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8917140	Total Iron (Fe)	2023/09/15	99	80 - 120	98	80 - 120	ND, RDL=100	ug/L	0.27	20		
8917140	Total Lead (Pb)	2023/09/15	98	80 - 120	97	80 - 120	ND, RDL=0.50	ug/L	1.5	20		
8917140	Total Manganese (Mn)	2023/09/15	98	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L	5.0	20		
8917140	Total Molybdenum (Mo)	2023/09/15	107	80 - 120	101	80 - 120	ND, RDL=0.50	ug/L	9.5	20		
8917140	Total Nickel (Ni)	2023/09/15	98	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L	6.9	20		
8917140	Total Phosphorus (P)	2023/09/15	NC	80 - 120	94	80 - 120	ND, RDL=100	ug/L				
8917140	Total Selenium (Se)	2023/09/15	111	80 - 120	108	80 - 120	ND, RDL=2.0	ug/L	NC	20		
8917140	Total Silver (Ag)	2023/09/15	98	80 - 120	96	80 - 120	ND, RDL=0.090	ug/L				
8917140	Total Tin (Sn)	2023/09/15	99	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L				
8917140	Total Titanium (Ti)	2023/09/15	100	80 - 120	102	80 - 120	ND, RDL=5.0	ug/L				
8917140	Total Zinc (Zn)	2023/09/15	100	80 - 120	102	80 - 120	ND, RDL=5.0	ug/L	2.1	20		
8917229	Phenols-4AAP	2023/09/14	103	80 - 120	104	80 - 120	ND, RDL=0.0010	mg/L	NC	20		
8917530	Total Kjeldahl Nitrogen (TKN)	2023/09/18	NC	80 - 120	98	80 - 120	ND, RDL=0.10	mg/L	9.4	20	100	80 - 120
8918788	a-Chlordane	2023/09/17	80	50 - 130	87	50 - 130	ND, RDL=0.005	ug/L	1.9	30		
8918788	Aldrin	2023/09/17	71	50 - 130	76	50 - 130	ND, RDL=0.005	ug/L	2.5	30		
8918788	Dieldrin	2023/09/17	88	50 - 130	91	50 - 130	ND, RDL=0.005	ug/L	1.3	30		
8918788	g-Chlordane	2023/09/17	85	50 - 130	86	50 - 130	ND, RDL=0.005	ug/L	2.6	30		
8918788	Hexachlorobenzene	2023/09/17	70	50 - 130	78	50 - 130	ND, RDL=0.005	ug/L	2.8	30		
8918788	Lindane	2023/09/17	70	50 - 130	80	50 - 130	ND, RDL=0.003	ug/L	2.6	30		
8918788	Mirex	2023/09/17	77	30 - 130	92	30 - 130	ND, RDL=0.005	ug/L	3.3	40		
8918788	o,p-DDT	2023/09/17	92	50 - 130	90	50 - 130	ND, RDL=0.005	ug/L	5.6	30		
8918788	p,p-DDT	2023/09/17	105	50 - 130	87	50 - 130	ND, RDL=0.005	ug/L	13	30		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8918822	Total Cyanide (CN)	2023/09/15	107	80 - 120	103	80 - 120	ND, RDL=0.0050	mg/L	NC	20		
8925248	Nonylphenol (Total)	2023/09/19	117	50 - 130	112	50 - 130	ND, RDL=0.001	mg/L	NC	40		
8925253	Nonylphenol Ethoxylate (Total)	2023/09/19	92	50 - 130	95	50 - 130	ND, RDL=0.005	mg/L	NC	40		
8925518	Total Suspended Solids	2023/09/20			96	85 - 115	ND, RDL=10	mg/L	NC	20		
8926072	Mercury (Hg)	2023/09/19	103	75 - 125	104	80 - 120	ND, RDL=0.00010	mg/L	NC	20		
8928102	Total Oil & Grease	2023/09/20			99	85 - 115	ND, RDL=0.50	mg/L	0.51	25		
8928104	Total Oil & Grease Mineral/Synthetic	2023/09/20			97	85 - 115	ND, RDL=0.50	mg/L	0.52	25		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Cristina Carriere, Senior Scientific Specialist

Farhana Rahman, Senior Analyst

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

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Exceedance Summary Table – Oakville Storm Sewer

Result Exceedances

Sample ID	Bureau Veritas ID	Parameter	Criteria	Result	DL	UNITS
BH/MW4	WZC876-09	Total Manganese (Mn)	50	360	2.0	ug/L

The exceedance summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.

Exceedance Summary Table – Halton Sanitary Sewer

Result Exceedances

Sample ID	Bureau Veritas ID	Parameter	Criteria	Result	DL	UNITS
No Exceedances						

The exceedance summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.

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Page of

CHAIN OF CUSTODY RECORD

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#31796 B.I.G Consulting Inc.	Company Name:	BIG	Quotation #:	C25341	Bureau Veritas Job #:	Bottle Order #:
Attention:	Accounts Payable	Attention:	Eileen Liu	P.O. #:			953597
Address:	12-5500 Tomken Road Mississauga ON L4W 2Z4	Address:	12-5500 Tomken Rd, Mississauga, ON	Project:	BIGC-ENV-623A	COC #:	Project Manager:
Tel:	(416) 214-4880 Fax:	Tel:	Fax:	Project Name:	157+165 Cross Ave.	C#953597-01-01	Deepthi Shaji
Email:	AP_BIG@brownfieldigi.com	Email:	eliu@brownfieldigi.com, wquc@brownfieldigi.com	Site #:	Oakville, ON		
				Sampled By:	AC		

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)	Other Regulations	Special Instructions
☐ Table 1 ☐ Res/Park ☐ Medium/Fine	☐ CCME ☒ Sanitary Sewer Bylaw	
☐ Table 2 ☐ Ind/Comm ☐ Coarse	☐ Reg 558 ☒ Storm Sewer Bylaw	
☐ Table 3 ☐ Agri/Other ☐ For RSC	☐ MISA Municipality Halton/Oakville	
☐ Table ___	☐ PWQO ☐ Reg 406 Table ___	
	☐ Other ___	

Include Criteria on Certificate of Analysis (Y/N)? Y

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects

Regular (Standard) TAT: ☒
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	Halton Sanitary and Oakville Storm Package									# of Bottles	Comments
1		BH/MW4	23/09/13	1:05 pm	Ground Water	No	X									18	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

13-Sep-23 19:57
Deepthi Shaji
C3S1578
UBE ENV 1467

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Laboratory Use Only				
Andres Cortell	23/09/13	7:52 pm		2023/09/13	19:57		Time Sensitive	Temperature (°C) on Recei	Custody Seal Present	Yes	No
								5.7 X 1.9	Intact	✓	

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/CHAIN-CUSTODY-FORMS-COCS.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

White: Bureau Veritas Yellow: Client

Bureau Veritas Canada (2019) Inc.

APPENDIX E: CONSTRUCTION DEWATERING ESTIMATE RATE CALCULATIONS

Construction Dewatering Rate Estimate

157 and 165 Cross Ave, Oakville, Ontario
Unconfined aquifer, groundwater seepage to rectangular excavation (line source)

Table E-1: Construction Dewatering Rate Estimates

Description	Symbol	Values	Unit	Explanation
Input				
Established Grade Elevation		103.33	m asl	Based on drawing A501 Building Sections, prepared by TAI, dated February 16, 2024
Highest Groundwater Elevation		101.71	m asl	Highest Water level measurement (September 12, 2023)
Footing Elevation		76.93	m asl	Assumed 2m below P8 FFE, P8 FFE is 78.93 masl based on Drawing A501 Building Sections, prepared by TAI, dated February 16, 2024
Aquifer Bottom		74.93	m asl	Assumed 2 m below lowest excavation depth
Hydraulic Conductivity	K	4.97E-07	m/s	Geometric mean K of overburden and bedrock
Length of Excavation	x	98.0	m	Based on drawing A201 Level P8 Plan, prepared by TAI, dated February 16, 2024
Width of Excavation	a	62.0	m	Based on drawing A201 Level P8 Plan, prepared by TAI, dated February 16, 2024
Output				
Top of Aquifer		101.71	m asl	water table for unconfined aquifer
Target Water Level		75.93	m asl	assumed 1 m below footing elevation
Water Level above aquifer bottom before dewatering	H	26.8	m	
target water level above aquifer bottom	h	1.0	m	
Radius of Influence	L (R_0)	31.8	m	Sichardt Equation (C=1750 for line source)
Construction Dewatering Flow Rate - Steady State	Q	154.76	m^3/day	Construction Dewatering Flow - Dupuit Equation
Maximum Construction Flow Rate (safety factor of 2)	2Q	309.53	m^3/day	during the initial period and after rains
Construction Dewatering Flow Rate - Steady State	Q	**155,000**	L/day	
Maximum Construction Flow Rate (safety factor of 2)	2Q	**310,000**	L/day	

APPENDIX F: LONG TERM DRAINAGE FLOW RATE ESTIMATE CALCULATIONS

Foundation Drain Flow Rate Estimate

157 and 165 Cross Ave, Oakville, Ontario
Unconfined Aquifer, Groundwater seepage to rectangular excavation (line source)

Table F-1: Foundation Drain Flow Rate Estimate of Southern Portion

Description	Symbol	Values	Unit	Explanation
Input				
Established Grade Elevation		103.33	m asl	Based on drawing A501 Building Sections, prepared by TAI, dated February 16, 2024
Highest Groundwater Elevation		91.63	m asl	Highest Water level measurement in deep aquifer (September 12, 2023)
Basement elevation		78.93	m asl	P8 FFE is 78.93 masl based on Drawing A501 Building Sections, prepared by TAI, dated February 16, 2024
Aquifer Bottom		76.93	m asl	Assumed 2 m below lowest excavation depth
Hydraulic Conductivity	K	1.19E-07	m/s	Geometric mean K of bedrock
Length of Excavation	x	98.0	m	Based on drawing A201 Level P8 Plan, prepared by TAI, dated February 16, 2024
Width of Excavation	a	62.0	m	Based on drawing A201 Level P8 Plan, prepared by TAI, dated February 16, 2024
Output				
Top of Aquifer		91.63	m asl	Water table for unconfined aquifer
Target Water Level		78.43	m asl	Assumed 0.5 m below basement floor level
Water Level above aquifer bottom before dewatering	H	14.7	m	
Target water level above aquifer bottom	h	1.5	m	
Radius of Influence	L (R_0)	15.56	m	Weber's Equation
Long-Term Flow Rate - Steady State	Q	22.63	m^3/day	Long-term flow rate - Dupuit Equation
Maximum Foundation Drain Flow Rate (safety factor of 3)	3Q	67.88	m^3/day	During the initial period and after rains
Estimated Long-term Foundation Drain Flow Rate	Q	**23,000**	L/day	
Estimated Maximum Foundation Drain Flow Rate	3Q	**69,000**	L/day	