PRELIMINARY HYDROGEOLOGICAL INVESTIGATION

1026 Cooke Boulevard, Burlington, Ontario

Client

Ms. Kathleen Dryden
Halton Standard Condominium Corporation No. 416
71095 Maplehurst Plaza
Burlington, Ontario L7T 4J8

Project Number

BIGC-ENV-605A

Prepared By:

B.I.G. Consulting Inc.
5500 Tomken Road, Unit 12
Mississauga, ON, L4W 2Z4
T: 416.214.4880
www.bigconsutlinginc.com

Date Submitted

November 10, 2023

Table of Contents

1 Introduction 1
1.1 Project Description 1
1.2 Project Objectives 1
1.3 Scope of Work 1
2 Regional Setting 3
2.1 Regional Physiography 3
2.2 Regional Geology 3
2.3 Regional Hydrogeology 3
3 Site Setting 4
3.1 Site Topography and Drainage 4
3.2 Local Surface Water Features 4
3.3 Ministry of Environment, Conservation and Parks Water Well Review 4
3.4 Permit to Take Water and Environmental Activity and Sector Registry Search 4
4 Field Program 5
4.1 Borehole and Monitoring Well Details 5
4.2 Site Specific Overburden Geology 5
4.3 Water Level Monitoring 6
4.4 Hydraulic Conductivity Testing 6
4.5 Groundwater Sampling 7
5 Temporary Construction Dewatering 9
5.1 Construction Dewatering Requirements 9
5.2 Construction Dewatering Flow Rate Assumptions 9
5.3 Dewatering Flow Rate Equation 10
5.4 Radius of Influence 10
5.5 Results of Construction Dewatering Flow Rate Estimates 11
6 Long Term Discharge Estimate 12
6.1 Long-Term Dewatering Assumptions 12
6.2 Radius of Influence 12
6.3 Long-Term Perimeter Drain Flow Rate Estimate 12
7 Potential Groundwater Impacts 14
7.1 Impacts to Nearby Groundwater Users 14
7.2 Impacts Due to Construction Dewatering 14
8 Water Taking and Discharge Permits 15
8.1 EASR and PTTW 15
9 Conclusions 16
10 Limitations 18
11 References 19

List of Figures

Figure 1 Site Location Map
Figure 2 Physiographic Regions of Southern Ontario
Figure 3 Surficial Geology Map
Figure 4 MECP Water Well Record Locations
Figure 5 PTTW and EASR Record Locations
Figure 6 Borehole/Monitoring Well Location Plan
Figure 7 Geological Cross Section A-A'
Figure 8 Interpreted Groundwater Contour Map

List of Appendices

Appendix A Borehole Logs
Appendix B MECP WWR Summary Table
Appendix C SWRT Results
Appendix D Water Quality Laboratory Certificate of Analysis and Chain of Custody
Appendix E Construction Dewatering Estimate Rate Calculations
Appendix F Long Term Drainage Flow Rate Estimate Calculations

1 Introduction

1.1 Project Description

B.I.G. Consulting Inc. (BIG) was retained by Halton Standard Condominium Corporation No. 416 (the Client) to conduct a Preliminary Hydrogeological Investigation to support the proposed development of the site located at 1026 Cooke Boulevard, Burlington, Ontario (Site).

The Site is located to the west of Cooke Boulevard and north of Plains Road East, in Burlington, Ontario. The Site measures approximately 3,200 m^2 and is currently occupied by a slab-on-grade two (2)-story commercial building (the Site building). The areas surrounding the Site building are covered with landscaping and asphalt. The Site location plan is shown on Figure 1.

It is BIG's understanding that the proposed development consists of a mixed-use high rise building with four (4) levels of underground parking. However, substantive design details of the proposed re-development are not available as of this submission.

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.

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 environmental, geotechnical and hydrogeological investigations were carried out concurrently.

1.2 Project Objectives

The main objectives of the Preliminary 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 the Region of Halton Sanitary and Combined Sewer Use Bylaw and the City of Burlington Storm Sewer Use Bylaw;
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, BIG proposed and initiated the following scope of work:

a) Review available geological and hydrogeological information of for the subject Site;
b) Advancement of five (5) boreholes (BH1 to BH5) to a maximum depth of 24.9 m below ground surface (bgs) and installation of five (5) monitoring wells (MW1 to MW5);
c) Perform Single Well Response Test (SWRT) at all monitoring wells to estimate the hydraulic conductivities of the saturated soils at the Site;
d) Evaluate the information of groundwater level measurements and groundwater quality;
e) Collection of one (1) groundwater sample for laboratory testing and compare it against the Region of Halton Sanitary and Combined Sewer Use Bylaw and the City of Burlington Storm Sewer Use Bylaw parameters ;

f) Assess groundwater discharges during construction phase;
g) Assess foundation sub-drain discharge volumes; and,
h) Prepare a Preliminary Hydrogeological Assessment Report.

2 Regional Setting

2.1 Regional Physiography

The Ontario Geological Survey Map P. 2204, indicates the Site lies in Iroquois Plain physiographic region of Southern Ontario known as the sand 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 were 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 current Lake Ontario water levels. The Iroquois Shoreline that coincided with this elevated lake, terminated north of Highway 403.

2.2 Regional Geology

The surficial geology of the immediate area around the Site is described as coarse-textured glaciolacustrine deposits consisting of sand, gravel, minor silt and clay. The surficial geology for the Site and surrounding areas is shown on Figure 3.

Bedrock of the region corresponds to the Queenston Formation consisting of shale, limestone, dolostone and siltstone. The contact between the bedrock and the overlying overburden is expected to fall at approximately 19.8 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.

Given the regional coarse-grained glaciolacustrine deposits, it forms an overburden aquifer that supplies water to Lake Ontario.

3 Site Setting

3.1 Site Topography and Drainage

The Site is rectangular in shape and has an area of approximately 3,200 m^2. The Site is currently occupied by a slab-on-grade two-story commercial building. The Site is relatively flat-lying and based on the borehole logs, the ground elevation ranges between 101.89 m and 100.64 m above sea level (asl).

3.2 Local Surface Water Features

There are no water bodies located on the Site. A tributary of Grindstone Creek is situated approximately 370 m north of the Site. Lake Ontario is situated approximately 870 m south of the Site. The Site is situated within the West Aldershot watershed.

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 eighty (80) 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 monitoring and observation well purposes within 500 m radius of the Site. One (1) supply water well was identified within 500 m radius of the Site. Given the area is serviced by municipal system, no private well water user for drinking water 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 four (4) expired PTTWs and one (1) expired EASR within 1 km of the Site and are summarized in Table B-2, appendix 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 five (5) boreholes (BH1 to BH5) to a maximum depth of 24.9 m bgs between June 26 and 30, 2023, and instrumented all boreholes with monitoring wells (MW1 to MW5). The boreholes were advanced by using a track mounted hollow 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.

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

4.2 Site Specific Overburden Geology

The borehole locations are shown on Figure 6 and detailed subsurface 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 80 to 100 mm (average 86 mm) thick asphaltic concrete over approximately 150 to 320 mm (average 222 mm) thick granular base.
Fill	Below the asphalt pavement, fill materials were encountered to depths varying between 1.5 and 4.6 m bgs in all boreholes. The fills are heterogeneous and predominantly consisted of sand with a trace of clay, silt and gravel.
Sand and Silty Sand	Below existing fill materials in all boreholes, native sand and silty sand deposits were encountered. The sandy deposits extended to depths varying from 12.2 to 13.7 m bgs. These deposits were brown to reddish brown in color and contained a trace of clay and gravel.
Silty Clay	A stratum of silty clay was encountered below or within the sand, silty sand and sandy silt deposits in all boreholes. This deposit extended to depths ranging from approximately 6.1 to 18.3 m bgs.
Silty Clay Till	A stratum of silty clay till was encountered below sand or silty clay deposits in boreholes BH/MW2, BH/MW3 and BH/MW5. This deposit extended to depths ranging from approximately 15.6 to 18.3 m bgs. Cobbles and boulders were also anticipated in these deposits.
Sandy Silt and Silt	A stratum of sandy silt/silt was encountered below silty clay or silty clay till in boreholes BH/MW2 to BH/MW4. The sandy silt/silt deposits extended to depths varying from 16.8 to 18.3 m bgs.
Sandy Silt Till and Sand and Silt Till	A stratum of sandy silt till and sand and silt till was encountered below silty clay or silt in boreholes BH/MW1, BH/MW2 and BH/MW4. The tills extended to a depth of approximately 19.8 m bgs.

Layer	Description
Silty Clay/Shale Complex	A stratum of silty clay/shale complex was encountered below the native sandy silt, sandy silt till and silty clay till in all boreholes except BH/MW4. The deposits extended to depths ranging from approximately 19.7 to 20.6 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	Below the sand and silt till or silty clay/shale complex in all boreholes, reddish brown to grey, highly weathered to fresh shale bedrock from Queenston/Georgian Bay Formation was encountered/inferred. Boreholes BH/MW2 to BH/MW5 were terminated within the shale bedrock at depths ranging from 19.8 to 24.8 m bgs while the split spoon got refusal within probable shale bedrock in BH/MW1.

4.3 Water Level Monitoring

Water levels at all monitoring well locations were recorded after installation. A summary of all available groundwater level observations is included in Table 4-2. Groundwater was observed in all monitoring wells on July 3, 2023, and depths to the groundwater ranged from 7.92 m to 9.33 m bgs with elevations between 92.72 and 92.63 m asl.

Interpreted groundwater contour map for the water level measurements recorded on July 3, 2023, are 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 south 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)	July 3, 2023	
			Water Level (m bgs)	Elevation (m asl)
BH/MW1	101.98	12.2	9.33	92.65
BH/MW2	101.67	13.7	9.00	92.67
BH/MW3	100.64	12.2	7.92	92.72
BH/MW4	101.71	12.2	9.06	92.65
BH/MW5	101.01	12.2	8.38	92.63

4.4 Hydraulic Conductivity Testing

The hydraulic conductivity test was completed to estimate the saturated hydraulic conductivity (K) of the soil at the well screen depth at selected 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 and Bouwer-Rice solutions 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)	Hydraulic Conductivity (m/s)
BH/MW1	12.2	3.01×10^{-6}
BH/MW2	13.7	1.44×10^{-5}
BH/MW3	12.2	1.29×10^{-5}
BH/MW4	12.2	3.89×10^{-5}
BH/MW5	12.2	4.53×10^{-5}
	Geometric mean K (m/s)	**1.58×10^{-5}**

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.

At the time of conducting slug test, groundwater recovery was observed to be rapid. Given the fast recovery, the hydraulic conductivity test results should be considered as approximate and will require further confirmation. The appropriate method to estimate hydraulic conductivity is by conducting a pump test. Prior to finalizing the dewatering quantity, a properly designed pump test should be conducted. For discussion purposes of this report, a geometric mean hydraulic conductivity value is considered for dewatering calculations.

4.5 Groundwater Sampling

To assess the suitability for discharge of pumped groundwater to the Region of Halton Sanitary and Combined Sewer or the City of Burlington Storm Sewer during dewatering activities, a groundwater sample was collected from BH/MW5 on July 5, 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 Limits for Sanitary and Combined Sewer Discharge (By-Law No. 2-03) of the Regional Municipality of Halton; and Limits for Storm Sewer Discharge (By-Law No. 59-2022) of the Corporation of the City of Burlington.

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 Limits for Sanitary and Combined Sewer Discharge.

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

Table 4-4: Summary of Analytical Results

Parameter	Table 1 - Limits for Sanitary and Combined Sewer Discharge of the Regional Municipality of Halton (mg/L)	Table 2 - Limits for Storm Sewer Discharge of the Corporation of the City of Burlington (mg/L)	Concentration for BH/MW5 (mg/L) (July 5, 2023)
Total Manganese (Mn)	5	0.05	**0.22**
Total Suspended Solids (TSS)	350	15	**45**

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

If groundwater encountered during excavation activities is discharged to the City of Burlington storm sewer, a treatment will be required. No treatment will be required for discharging groundwater to the Region of Halton sanitary and combined sewer.

Although the water quality meets the limits of Region of Halton sanitary and combined sewer, based on BIG experience, the Region typically does not allow groundwater discharge to the Regional sewer system. Alternative discharge method or negotiation with the City of Burlington will be required.

5 Temporary Construction Dewatering

5.1 Construction Dewatering Requirements

It is BIG's understanding that the proposed development will comprise of a mixed-use high rise building with four (4) levels of underground parking structure. However, substantive design details of the proposed re-development are not available as of this submission. Based on the Functional Grading Plan, prepared by Odan Detech Consulting Engineers (ODCE), dated November 9, 2023, the proposed ground elevation is 100.75 m asl. Based on the architectural drawing SPA401 prepared by Turner Fleischer Architects Inc. (TFAI), dated October 26, 2023, the P4 slab will be at an approximate depth of 14.45 m bgs. The footing elevation is assumed approximately 2 m below P4 slab.

Below existing fill materials in all boreholes, native sand and silty sand deposits were encountered. The sand deposits extended to depths varying from 12.2 to 13.7 m bgs. Given the thickness of the sand deposit at the Site, significant amount of groundwater can be produced. Once the finished floor elevation (FFE) and design are finalized, BIG needs to review and re-evaluate the dewatering estimates. If the footing or foundation elevation is deeper than the assumptions in this report, additional investigation will be required.

The stabilized groundwater level measurements in monitoring wells, observed on July 3, 2023 were found to be varying between elevations of 92.72 m and 92.63 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 approximately 1.0 m below the footing elevation.

At the time of conducting slug test, groundwater recovery was observed to be rapid. Given the fast recovery, the hydraulic conductivity test results should be considered as approximate and will require further confirmation. The appropriate method to estimate hydraulic conductivity is by conducting a pump test. Prior to finalizing the dewatering quantity, a properly designed pump test should be conducted. For discussion purposes of this report, a geometric mean hydraulic conductivity value is considered for dewatering calculations. The dewatering estimates below are considered as preliminary. Given the excavation method has not been finalized, continuous caisson shoring system can further reduce groundwater migration into the excavation reducing the ongoing seepage rate.

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
Proposed Ground Elevation (m asl)	100.75	Based on the Functional Grading Plan, prepared by ODCE, dated November 9, 2023
Basement Slab Elevation (m asl)	86.30	P4 is 14.45 m bgs, based on drawing SPA401, Building Sections, prepared by TFAI, dated October 26, 2023
Footing Elevation (m asl)	84.30	Assumed 2.0 m below FFE
Dewatered Elevation Target (m asl)	83.30	Approximate 1 m below footing elevation

Input Parameter	Values	Notes
Groundwater Elevation (m asl)	92.72	Highest groundwater elevation on July 3, 2023
Estimated Excavation Area	69.8 m x 43.3 m	Based on drawing SPA104, Underground Level 01, prepared by TFAI, dated October 26, 2023
Hydraulic Conductivity (m/s)	1.58×10^{-5}	Geometric mean K

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 (m³/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 formation. 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 65.5 m from the edge of the excavation for linear flow. The ROI calculation is provided in Appendix E.

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

Location	Construction Dewatering Flow Rate Without Safety Factor (L/day)	Construction Dewatering Flow Rate Including Safety Factor of 2.5 (L/day)
Excavation area	231,000	577,500

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 2.5 to account for precipitation, 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 400,000 L/day limit, a PTTW for construction dewatering will be required.

Given the predicted large construction dewatering volume, discussion and review with the City of Burlington and Region of Halton should be initiated. This discussion should be conducted in advance of planning stage. If the City of Burlington storm sewer is considered for disposal of construction dewatering discharges, a consultation with the City will be required for the sewer capacity and any other constrains of accepting the water. Based on BIG experience, the Region of Halton does not allow groundwater discharge to their sewer system. Consultation with the Region of Halton or City of Burlington should consider in advance. If the City of Burlington storm sewer is considered, a treatment prior to discharge is 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 basement elevation. Table 6-1 presents the assumptions used to calculate the long-term drainage rate estimates.

Given the thickness of the sand deposit at the Site, significant amount of groundwater can be produced. Once the FFE and design are finalized, BIG needs to review and re-evaluate the dewatering estimates. If the footing or foundation elevation is deeper than the assumptions in this report, additional investigation will be required. The dewatering estimates below are considered as preliminary.

Table 6-1 Dewatering Estimate Assumptions

Input Parameter	Values	Notes
Proposed Ground Elevation (m asl)	100.75	Based on the Functional Grading Plan, prepared by ODCE, dated November 9, 2023
Basement Slab Elevation (m asl)	86.30	P4 is 14.45 m bgs, based on drawing SPA401, Building Sections, prepared by TFAI, dated October 26, 2023
Groundwater Elevation (m asl)	92.72	Highest groundwater elevation on July 3, 2023
Sub-drain/ Foundation Elevation Target (m asl)	85.80	Assumed 0.5 m below the Basement FFE
Drainage Dimensions	69.8 m x 43.3 m	Based on drawing SPA104, Underground Level 01, prepared by TFAI, dated October 26, 2023
Hydraulic Conductivity (m/s)	1.58×10^{-5}	Geometric mean K

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 180.2 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	106,000	Long term sub-drain flow value rounded based on Dupuit's equation including flow from all sides. Safety factor of 2 was used.

The results for the estimate are available in Appendix F, Table F-1. The maximum flow rate estimate represents 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 long-term dewatering volume exceeds the 50,000 L/day limit, a PTTW will be required.

Given the predicted large long-term dewatering volume, discussion and review with the City of Burlington and Region of Halton should be initiated. This discussion should be conducted in advance of planning stage. If the City of Burlington storm sewer is considered for disposal of long-term dewatering discharges, a consultation with the City will be required for the sewer capacity and any other constrains of accepting the water. Based on BIG experience, the Region of Halton does not allow groundwater discharge to their sewer system. Consultation with the Region of Halton or City of Burlington should consider in advance. If the City of Burlington storm sewer is considered, a treatment prior to discharge 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.

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-tight 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 urbanized area of City of Burlington. 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 Due to Construction Dewatering

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 180.2 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.

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 EASR (400,000 L/day) if the excavation is to be undertaken all at once. As cumulative discharge rate for construction is 577,500 L/day and above the EASR limit, a Permit to Take Water as per O.Reg.387/04 would be required.

Given that the predicted long-term dewatering volume is 106,000 L/day and 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 development will comprise of a mixed-use high rise building with four (4) levels of underground parking structure;
b) The Site is located within a physiographic region within the Iroquois Plain known as the sand plains;
c) The surficial geology around the Site is described as coarse-textured glaciolacustrine deposits consisting of sand, gravel, minor silt and clay;
d) The MECP WWR database indicate that there are eighty (80) well records registered with the database within 500 m of the Site. One (1) supply water well was identified within 500 m radius of the Site. Given the area is serviced by municipal system, no private well water user for drinking water is expected;
e) Groundwater was observed in all monitoring wells on July 3, 2023 and depths to the groundwater ranged from 7.92 m to 9.33 m bgs with groundwater elevations varying between 92.72 m and 92.63 m asl;
f) Based on the water level measurements, the inferred direction of groundwater flow across the Site is interpreted to be to the south direction;
g) The estimated hydraulic conductivity of the overburden ranges from 4.53×10^{-5} m/s to 3.01×10^{-6} m/s;
h) Below existing fill materials in all boreholes, native sand and silty sand deposits were encountered. The sand deposits extended to depths varying from 12.2 to 13.7 m bgs. Given the thickness of the sand deposit at the Site, significant amount of groundwater can be produced. Once the finished floor elevation (FFE) and design are finalized, BIG needs to review and re-evaluate the dewatering estimates. If the footing or foundation elevation is deeper than the assumptions in this report, additional investigation will be required;
i) At the time of conducting slug test, groundwater recovery was observed to be rapid. Given the fast recovery, the hydraulic conductivity test results should be considered as approximate and will require further confirmation. The appropriate method to estimate hydraulic conductivity is by conducting a pump test. Prior to finalizing the dewatering quantity, a properly designed pump test should be conducted;
j) Based on the assumptions outlined in this report, the estimated peak construction dewatering flow rate for the proposed construction activity is 577,500 L/day;
k) Based on the assumptions outlined in this report, the cumulative contribution to the foundation drains is 106,000 L/day;
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 Table 2 - Limits for Storm Sewer Discharge of the City of Burlington, the sample indicated exceedances for total suspended solids (TSS) and total manganese (Mn);
n) The construction dewatering rates exceed the EASR (400,000 L/day) limit, a PTTW for construction dewatering as per O.Reg.387/04 will be required;
o) The predicted long-term dewatering volume exceeds the 50,000 L/day limit, a PTTW for long-term discharge as per O.Reg.387/04 will be required;
p) Given the predicted large construction and long-term dewatering volumes, discussion and review with the City of Burlington and Region of Halton should be initiated.

This discussion should be conducted in advance of planning stage. If the City of Burlington storm sewer is considered for disposal of construction and long-term dewatering discharges, a consultation with the City will be required for the sewer capacity and any other constrains of accepting the water. Based on BIG experience, the Region of Halton does not allow groundwater discharge to their sewer system. Consultation with the Region of Halton or City of Burlington should consider in advance. If the City of Burlington storm sewer is considered, a treatment prior to discharge is required; and,

q) 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-tight continuous raft foundation without permanent dewatering (i.e., avoiding permanent perimeter and under-floor drainage system).

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.

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

Peilin (Eileen) Liu, M.Env.Sc., P.Geo.
Manager, Hydrogeology Services



Prem Manicks, P.Geo.
Partner

11 References

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

Chapman, L., & Putnam, D. (2007). Physiography of Southern Ontario. Miscellaneous Release, Data 228 ISBN 978-1-4249-5158-1. Ontario Geological Survey.

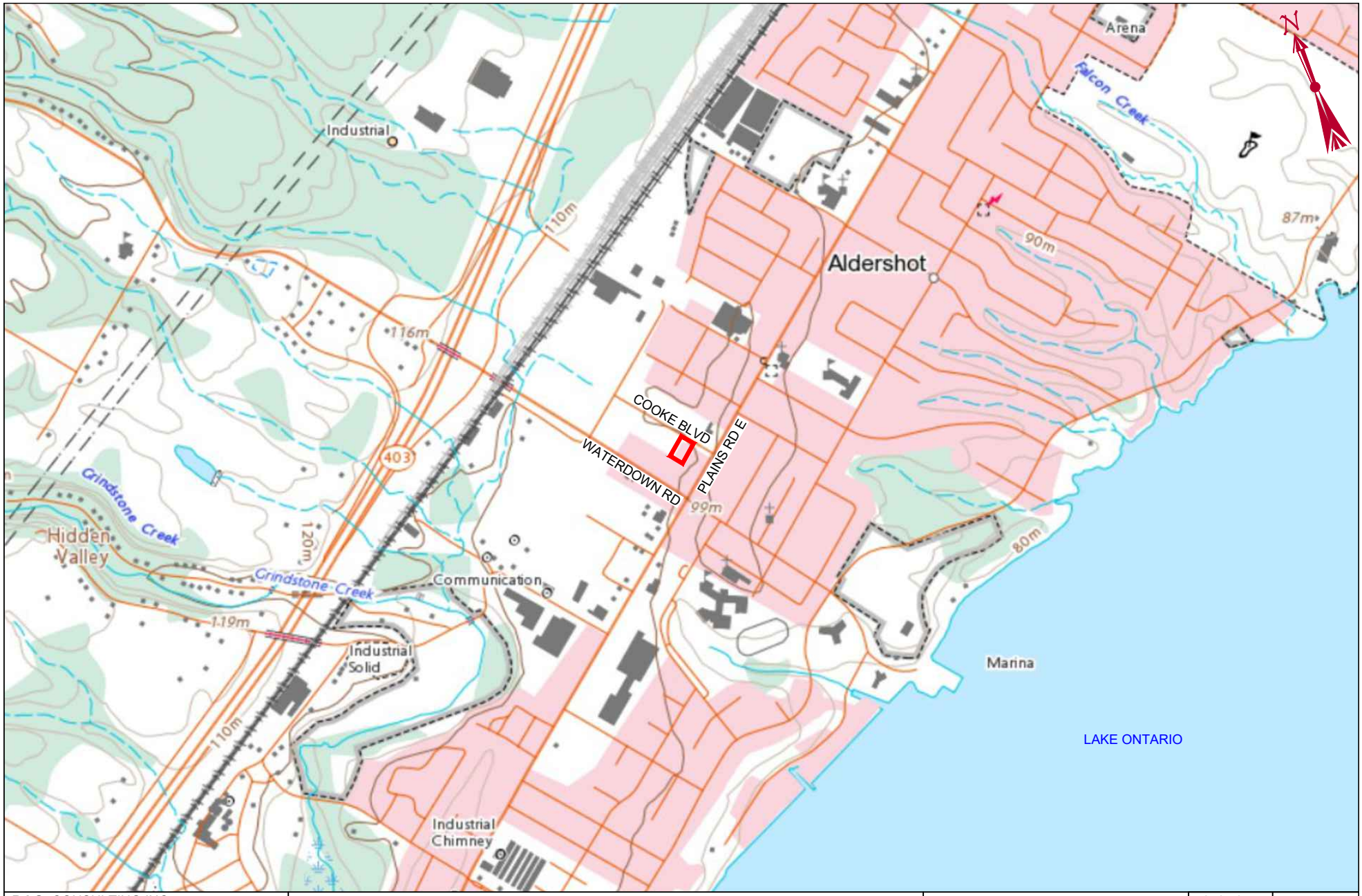
Ministry of Environment, Conservation and Parks. (2017). Ontario Water Resources Act.

Ontario Water Resources Act, Ontario Regulation 387/04, as amended. (2016). *Water Taking and Transfer*.

Ontario Ministry of Environment, Conservation and Parks, Map: Well Records, 2018. Accessed online at https://www.ontario.ca/environment-and-energy/map-well-records

Singer, S.N., Cheng, C.K., and Scafe, M.G. (2003). The Hydrogeology of Southern Ontario, 2nd Edition. Environmental Monitoring and Reporting Branch, Ontario Ministry of Environment.

FIGURES



B.I.G. CONSULTING INC.

t: (416) 214 - 4880 f: (416) 551 - 2633
12-5500 Tomken Rd.
Mississauga, ON L4W 2Z4
Canada

bigconsultinginc.com

LEGEND

SITE BOUNDARY

SCALE

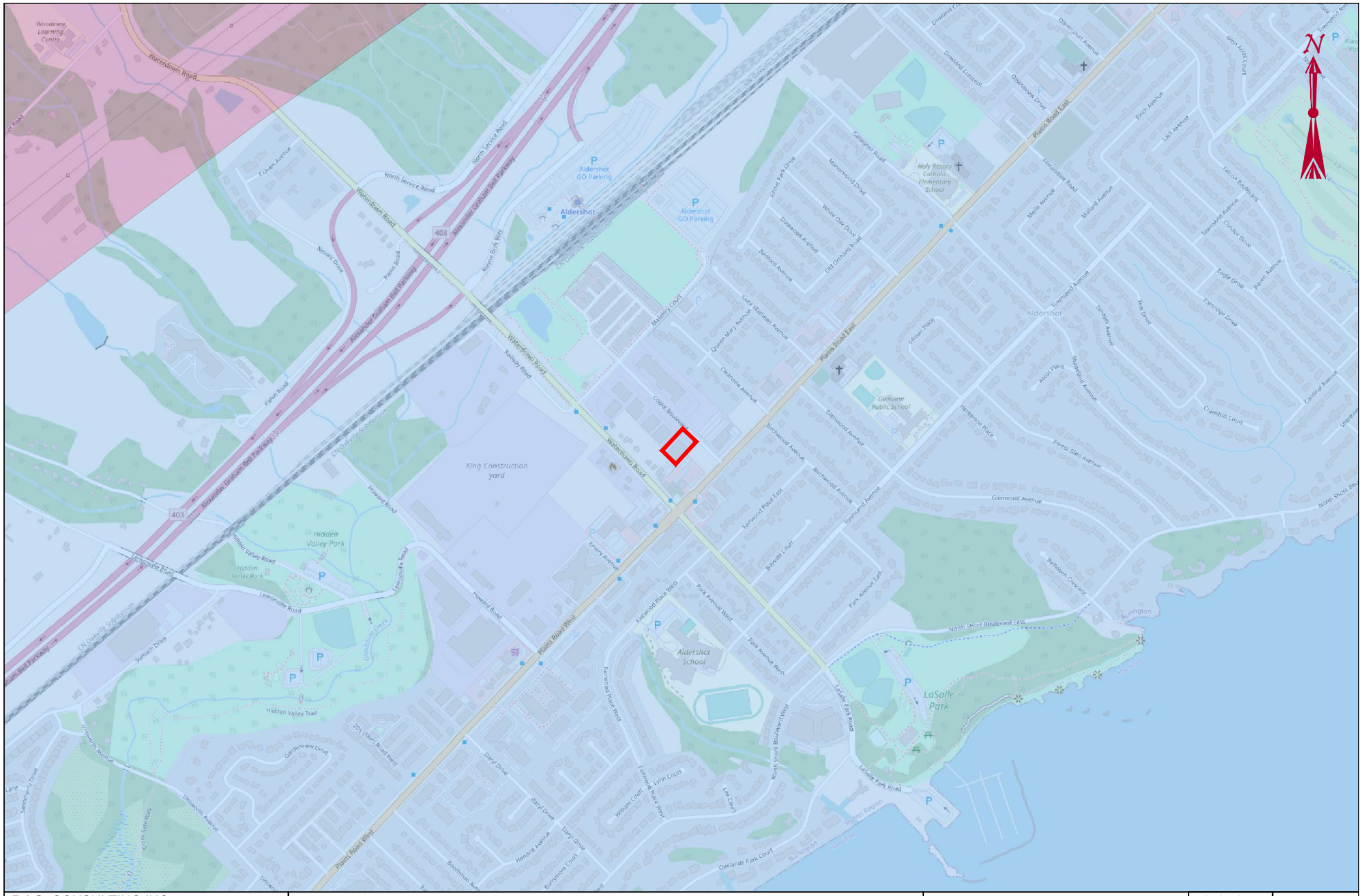
100m 0m 100m 200m 300m 400m 500m

IMAGERY OBTAINED FROM TOPORAMA, NATURAL RESOURCES CANADA, DATE 2022

TITLE AND LOCATION

SITE LOCATION PLAN
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
1026 COOKE BOULEVARD, BURLINGTON, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-605A	T.S.
SCALE	CK.
AS NOTED	W.G.
DATE	FIG NO.
SEPTEMBER 2023	1



B.I.G. CONSULTING INC.

t: (416) 214 - 4880 f: (416) 551 - 2633
12-5500 Tomken Rd.
Mississauga, ON L4W 2Z4
Canada

bigconsultinginc.com

LEGEND

- SITE BOUNDARY
- NIAGARA ESCARPMENT
- IROQUOIS PLAIN

SCALE

50m 0m 100m 200m 300m 400m

NOTES:

1. PHYSIOGRAPHIC REGIONS PRODUCED BY MINISTRY OF ENERGY, NORTHERN DEVELOPMENT AND MINES, DATE 2017
2. IMAGERY OBTAINED FROM OPENSTREETMAP, DATE 2021

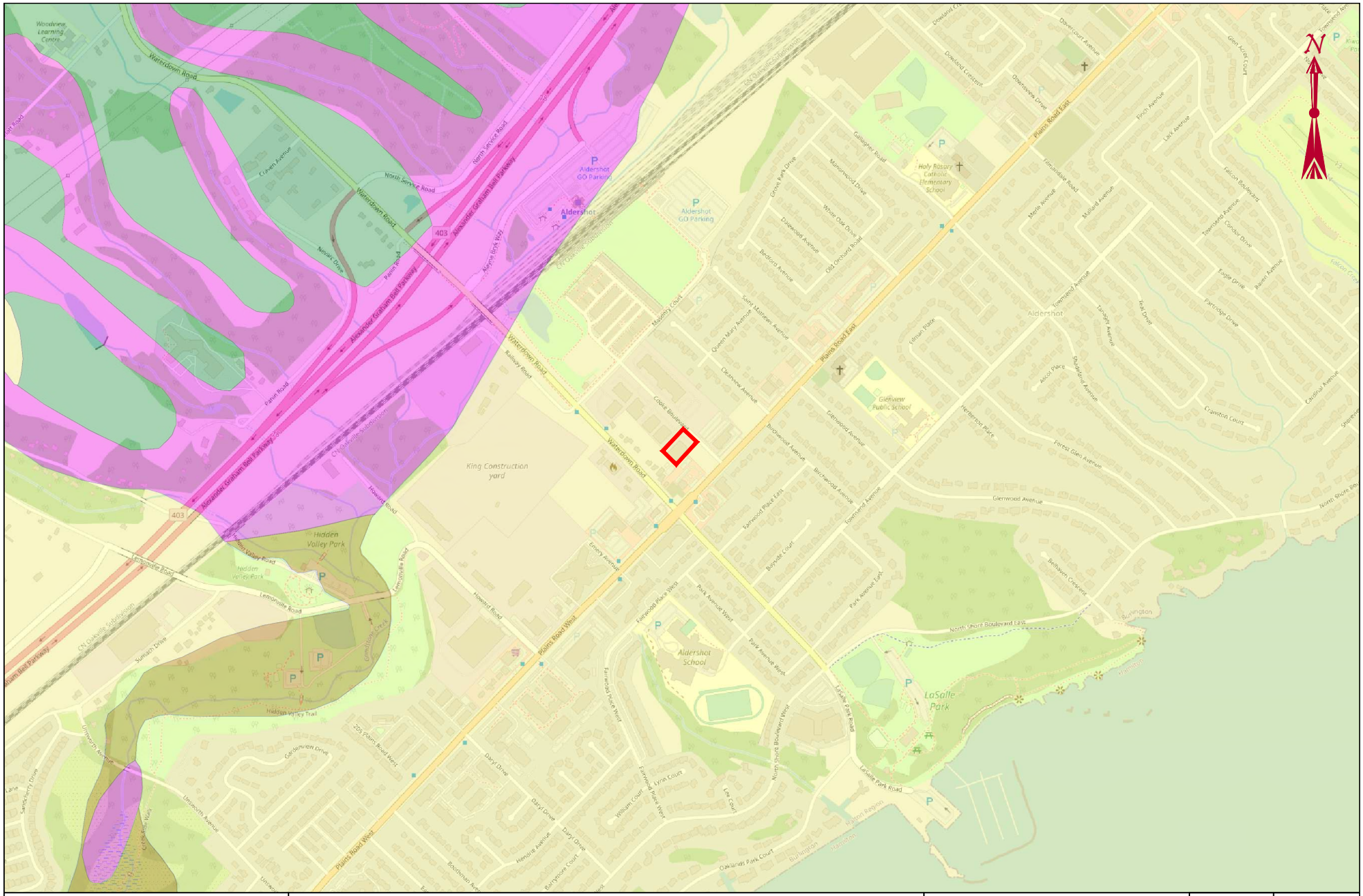
TITLE AND LOCATION

PHYSIOGRAPHIC REGIONS OF SOUTHERN ONTARIO

PRELIMINARY HYDROGEOLOGICAL INVESTIGATION

1026 COOKE BOULEVARD, BURLINGTON, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-605A	T.S.
SCALE	CK.
AS NOTED	W.G.
DATE	FIG NO.
SEPTEMBER 2023	2



B.I.G. CONSULTING INC.

t: (416) 214 - 4880 f: (416) 551 - 2633
12-5500 Tomken Rd.
Mississauga, ON L4W 2Z4
Canada

bigconsultinginc.com

LEGEND

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

SCALE

50m 0m 100m 200m 300m 400m

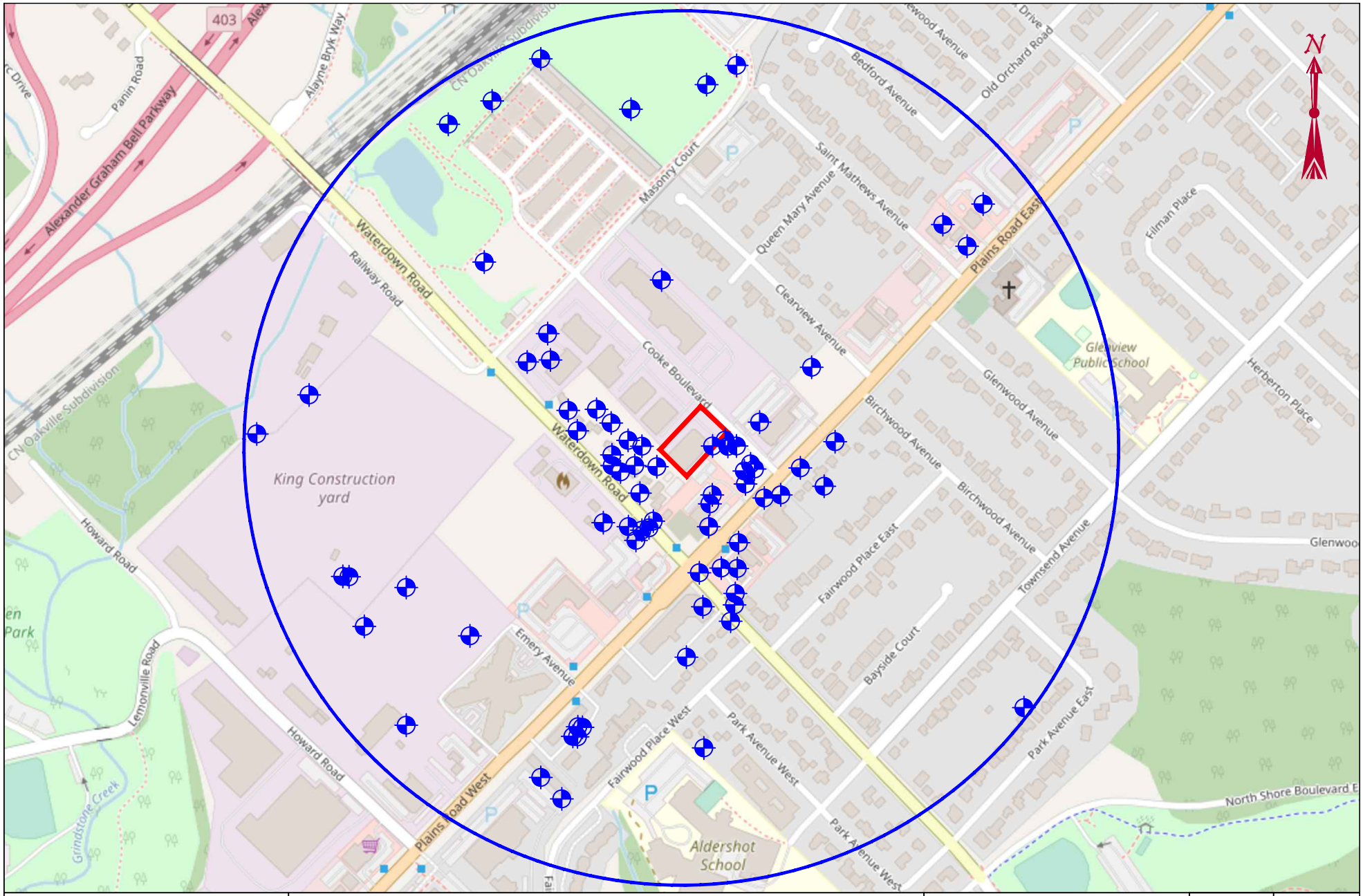
NOTES:

1. SURFICIAL GEOLOGY PRODUCED BY MINISTRY OF ENERGY, NORTHERN DEVELOPMENT AND MINES, DATE 2017
2. IMAGERY OBTAINED FROM OPENSTREETMAP, DATE 2021

TITLE AND LOCATION

SURFICIAL GEOLOGY MAP
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
1026 COOKE BOULEVARD, BURLINGTON, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-605A	T.S.
SCALE	CK.
AS NOTED	W.G.
DATE	FIG NO.
SEPTEMBER 2023	3



B.I.G. CONSULTING INC.

t: (416) 214 - 4880 f: (416) 551 - 2633
12-5500 Tomken Rd.
Mississauga, ON L4W 2Z4
Canada

bigconsultinginc.com

LEGEND

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

SCALE

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

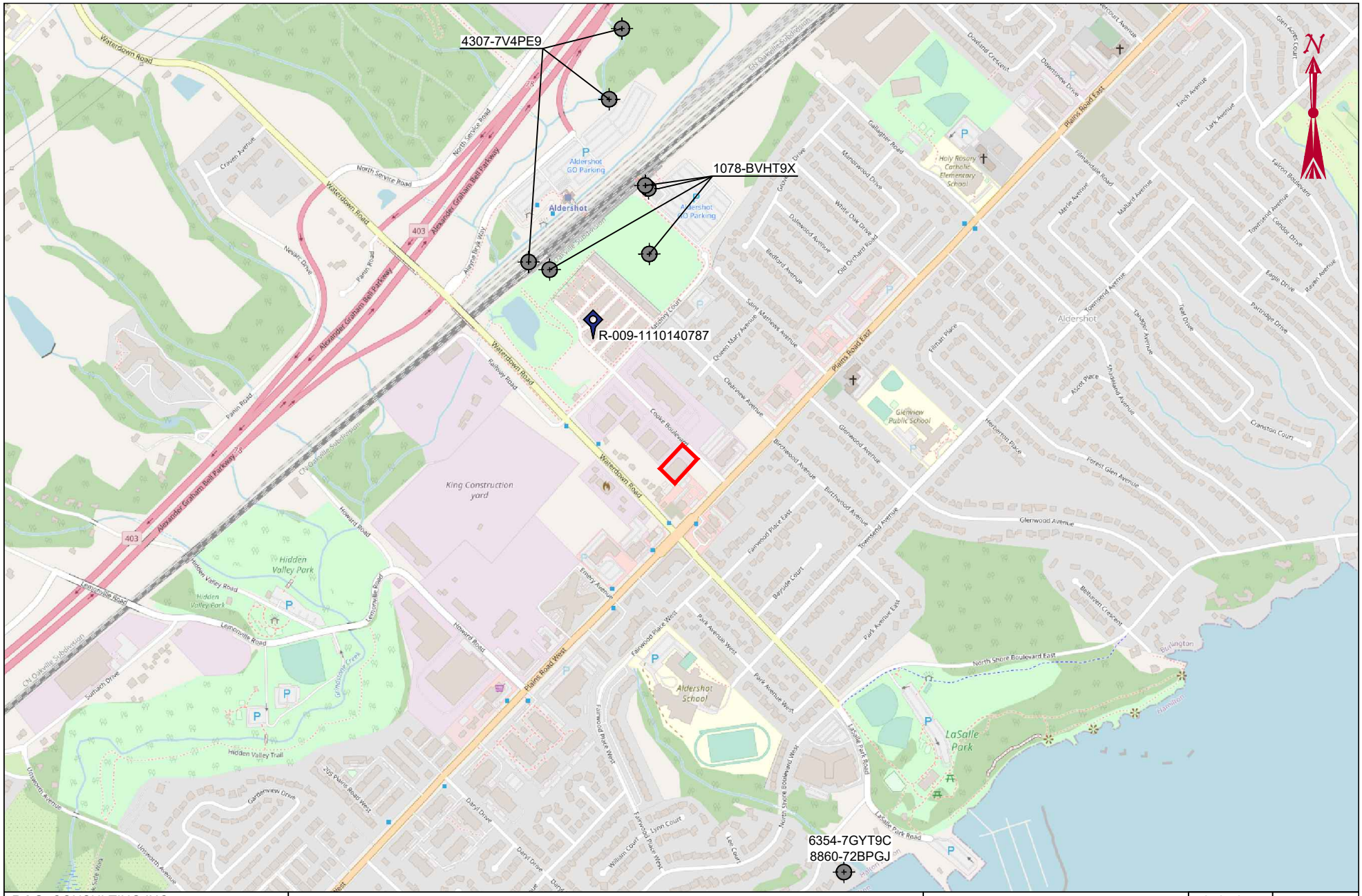
NOTES:

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
1026 COOKE BOULEVARD, BURLINGTON, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-605A	T.S.
SCALE	CK.
AS NOTED	W.G.
DATE	FIG NO.
SEPTEMBER 2023	4



B.I.G. CONSULTING INC.

t: (416) 214 - 4880 f: (416) 551 - 2633
12-5500 Tomken Rd.
Mississauga, ON L4W 2Z4
Canada

bigconsultinginc.com

LEGEND

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

SCALE

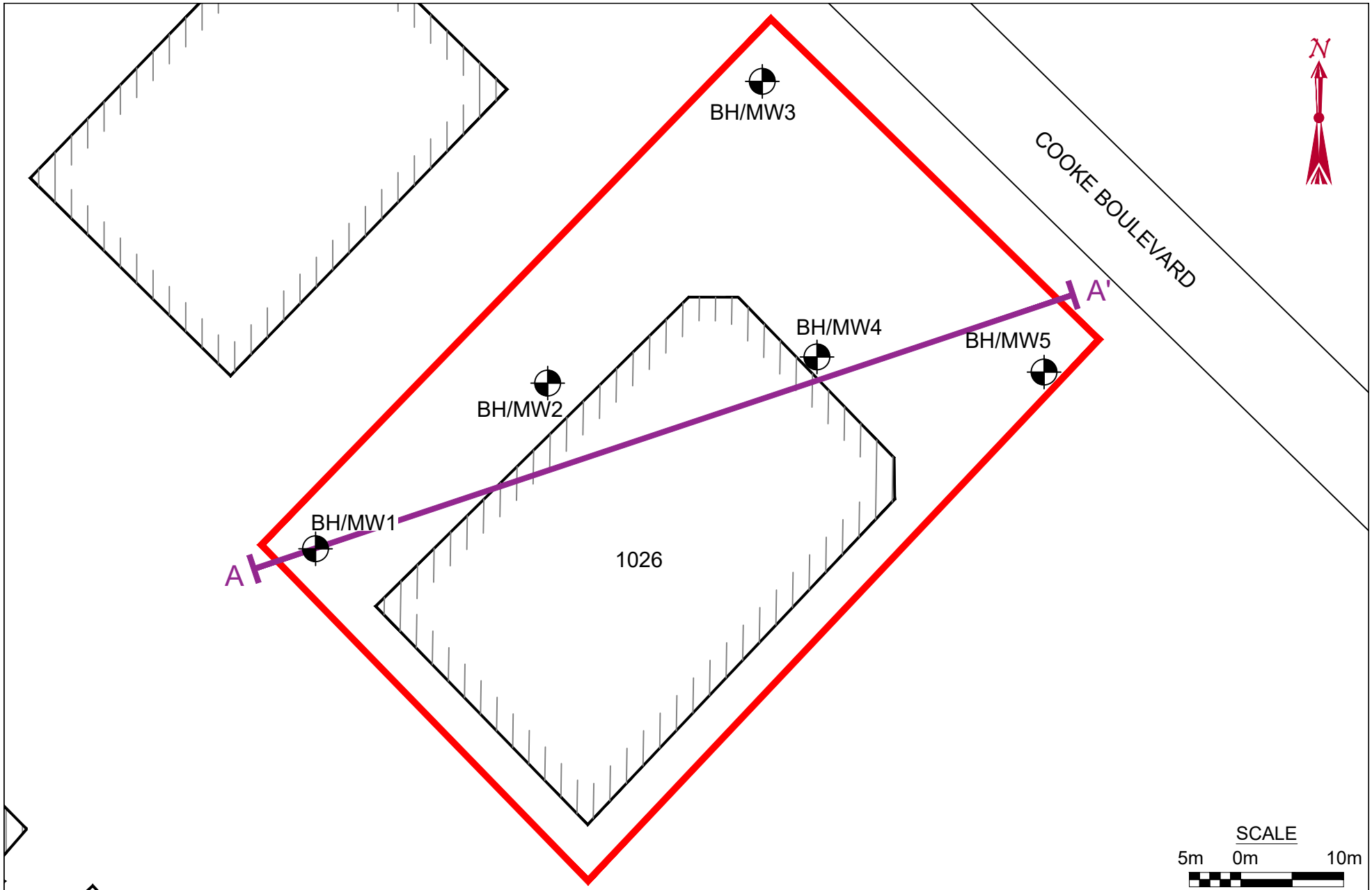
50m 0m 100m 200m 300m 400m

IMAGERY OBTAINED FROM OPENSTREETMAP, DATE 2022

TITLE AND LOCATION

PTTW AND EASR RECORD LOCATIONS
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
1026 COOKE BOULEVARD, BURLINGTON, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-605A	T.S.
SCALE	CK.
AS NOTED	W.G.
DATE	FIG NO.
SEPTEMBER 2023	5



B.I.G. CONSULTING INC.

t: (416) 214 - 4880 f: (416) 551 - 2633
12-5500 Tomken Rd.
Mississauga, ON L4W 2Z4
Canada

bigconsultinginc.com

LEGEND

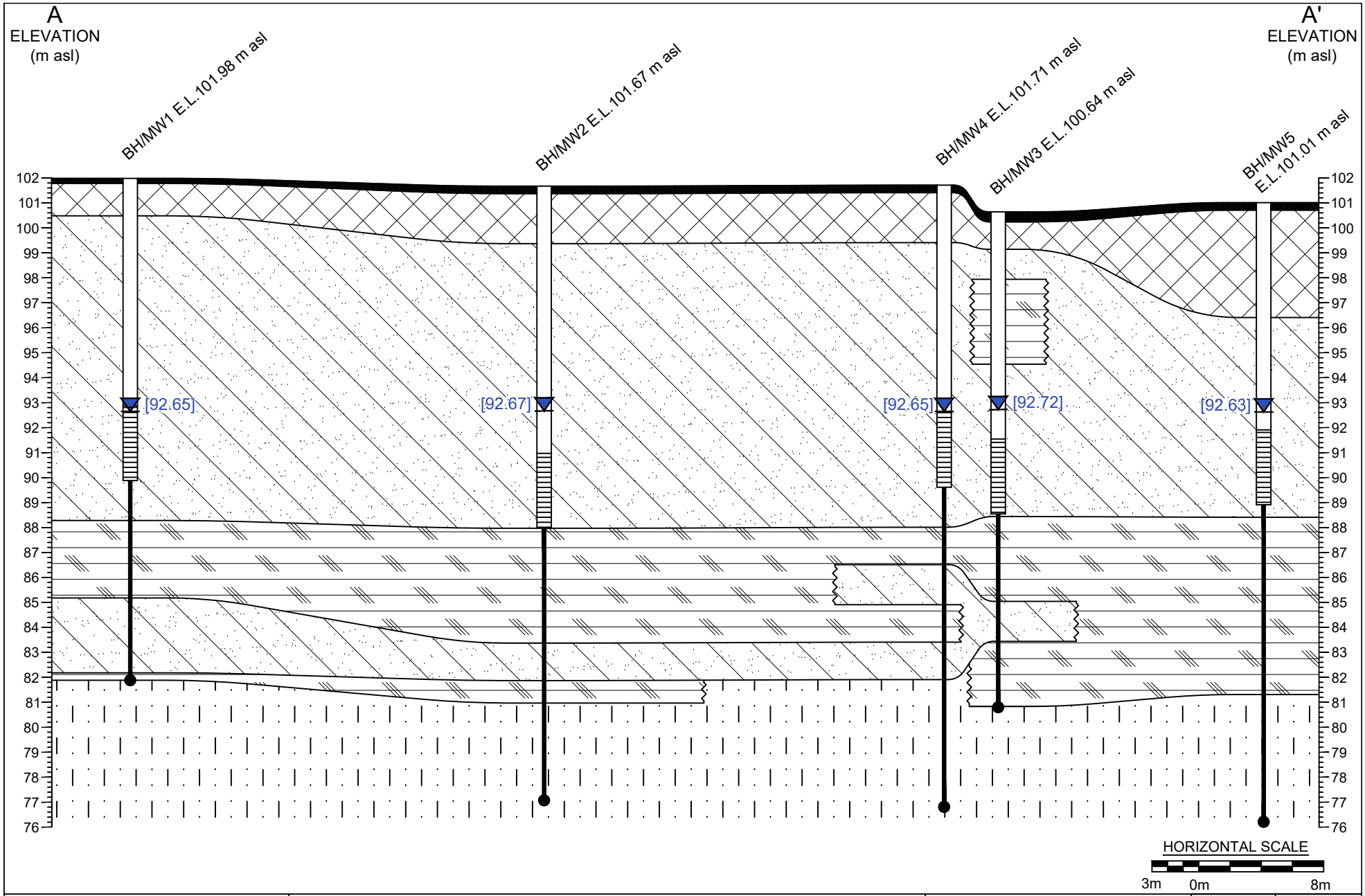
- SITE BOUNDARY
- BUILDING FOOTPRINT
- LOCATION OF THE BOREHOLE / MONITORING WELL (BIG 2023)
- A A' GEOLOGICAL CROSS SECTION

TITLE AND LOCATION

BOREHOLE/MONITORING WELL LOCATION PLAN

PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
1026 COOKE BOULEVARD, BURLINGTON, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-605A	T.S.
SCALE	CK.
AS NOTED	W.G.
DATE	FIG NO.
SEPTEMBER 2023	6



B.I.G. CONSULTING INC.

t: (416) 214 - 4880 f: (416) 551 - 2633
12-5500 Tomken Rd.
Mississauga, ON L4W 2Z4
Canada

bigconsultinginc.com

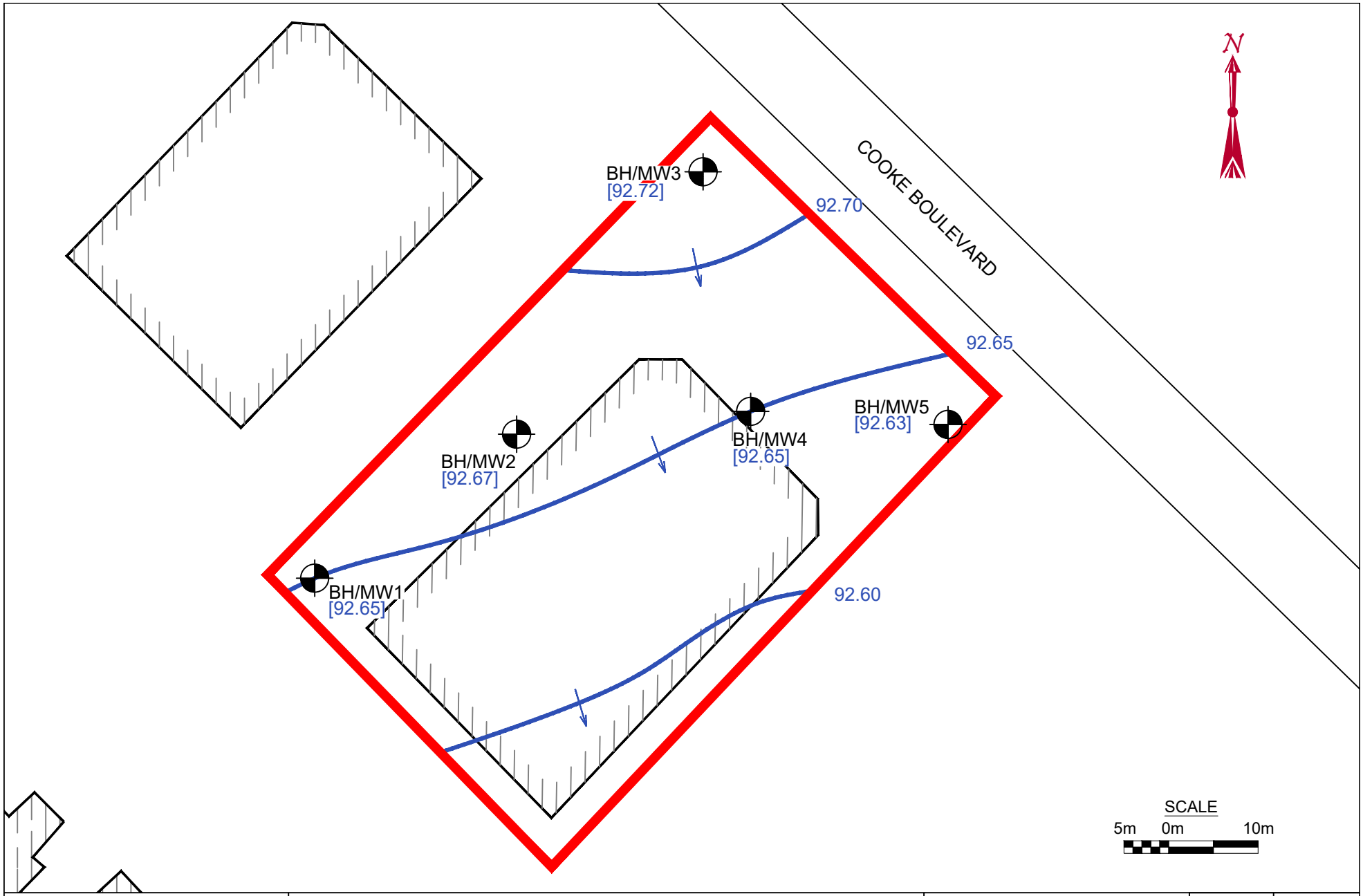
LEGEND

- ASPHALT PAVEMENT
- FILL
- SAND / SILTY SAND / SANDY SILT / SANDY SILT TILL / SAND AND SILT TILL
- SILTY CLAY / SILTY CLAY TILL / SILT / SHALE COMPLEX
- BEDROCK
- WATER LEVEL
- [XX.XX] WATER LEVEL MEASUREMENT (m asl) (JULY 03, 2023)

TITLE AND LOCATION

GEOLOGICAL CROSS SECTION A-A'
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
1026 COOKE BOULEVARD,
BURLINGTON, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-605A	E.P.
SCALE	CK.
AS NOTED	W.G.
DATE	FIG NO.
SEPTEMBER 2023	7



B.I.G. CONSULTING INC.

t: (416) 214 - 4880 f: (416) 551 - 2633
12-5500 Tomken Rd.
Mississauga, ON L4W 2Z4
Canada

bigconsultinginc.com

LEGEND

- SITE BOUNDARY
- BUILDING FOOTPRINT
- LOCATION OF THE BOREHOLE / MONITORING WELL (BIG 2023)
- [XX.XX] WATER ELEVATION (m asl) (JULY 3, 2023)
- INTERPRETED DIRECTION OF GROUNDWATER FLOW
- INTERPRETED GROUNDWATER CONTOUR

TITLE AND LOCATION

INTERPRETED GROUNDWATER CONTOUR PLAN PRELIMINARY HYDROGEOLOGICAL INVESTIGATION

1026 COOKE BOULEVARD, BURLINGTON, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-605A	E.P.
SCALE	CK.
AS NOTED	T.V.H.
DATE	FIG NO.
SEPTEMBER 2023	8

APPENDIX A: BOREHOLE LOGS

RECORD OF BOREHOLE No. BH/MW1

Project Number:	BIGC-ENV-605A	Drilling Location:	See BH Location Plan	Logged by:	AD
Project Client:	Halton Standard Condominium Corporation No. 416	Drilling Method:	190 mm Hollow Stem Augering	Compiled by:	KH
Project Name:	Geotechnical and Hydrogeological Investigations	Drilling Machine:	Track Mounted Drill	Reviewed by:	AC
Project Location:	1026 Cooke Blvd, Burlington, Ontario	Date Started:	30 Jun 23	Date Completed: 30 Jun 23	Revision No.: 0, 14/9/23

Geodetic Ground Surface Elevation: 101.98 m

DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)
ASPHALT PAVEMENT: 80 mm asphalt over 150 mm granular base (101.75 / 0.2)						
FILL: sand, trace clay, trace silt, trace gravel, brown to redish brown, moist, compact to dense	SS	1	84	22		
	SS	2	79	33	1	101
(100.46)						
SAND: trace clay, trace silt, trace gravel, brown to reddish brown, moist to wet, compact 1.5	SS	3	75	15	2	100
	SS	4	84	25	3	99
	SS	5	87	10		
					4	98
	SS	6	87	22	5	97
					6	96
	SS	7	67	18		
(94.36)					7	95
SILTY SAND: trace clay, trace gravel, brown to reddish brown, wet, compact to very dense 7.6	SS	8	75	12	8	94
					9	93
	SS	9	75	15		
					10	92
- layers of gravel	SS	10	100	50/ 130 mm		
					11	91
					12	90
	SS	11	75	19		
					13	89

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 TESTING	
4	
4	
4	
5	
21	
6	
13	
19	
14	
12	
22	

INSTRUMENTATION INSTALLATION

COMMENTS

B.I.G. Consulting Inc.
12-5500 Tomken Rd.
Mississauga, ON L4W 2Z4
Canada
T: 416-214-4880
F: 416-551-2633

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

Groundwater depth observed on July 3, 2023 at a depth of: 9.33 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 : 68

Continued on Next Page

RECORD OF BOREHOLE No. BH/MW1

Project Number: **BIGC-ENV-605A** Drilling Location: **See BH Location Plan** Logged by: **AD**

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
	SILTY SAND: trace clay, trace gravel, brown to reddish brown, wet, compact to very dense										
	88.26										
	SILTY CLAY: trace sand, grey, wet, stiff to hard 13.7	SS	12	100	14	14	88	○	○ 28		
						15	87				
		SS	13	59	35			○	○ 33		
						16	86				
	85.22										
	SANDY SILT TILL: trace to some gravel, trace clay, reddish brown, moist, very dense - layers of silty clay till 16.8	SS	14	100	50/ 80 mm	17	85		○ 15		
						18	84				
		SS	15	89	50/ 130 mm				○ 14		
						19	83				
	82.17										
	SILTY CLAY / SHALE COMPLEX: reddish brown, moist, hard 19.8	SS	16	100	50/ 100 mm	20	82		○ 11		
	81.91 20.1										
	Spoon Refusal on Probable Bedrock 1. Borehole was open upon completion of drilling. 2. Groundwater level was measured at 9.33 m below ground surface on July 3, 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 : 68

RECORD OF BOREHOLE No. BH/MW2

Project Number:	BIGC-ENV-605A	Drilling Location:	See BH Location Plan	Logged by:	CE
Project Client:	Halton Standard Condominium Corporation No. 416	Drilling Method:	190 / 63.5 mm Hollow Stem Augering / HQ Coring	Compiled by:	KH
Project Name:	Geotechnical and Hydrogeological Investigations	Drilling Machine:	Track Mounted Drill	Reviewed by:	AC
Project Location:	1026 Cooke Blvd, Burlington, Ontario	Date Started:	26 Jun 23	Date Completed: 26 Jun 23	Revision No.: 0, 14/9/23

Geodetic Ground Surface Elevation: 101.67 m

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	FIELD TESTING: Undrained Shear Strength (kPa)	LAB TESTING: Soil Vapour Reading (ppm)	INSTRUMENTATION INSTALLATION	COMMENTS
	ASPHALT PAVEMENT: 80 mm asphalt over 210 mm granular base (101.38)										
	FILL: sand, trace clay, trace silt, trace gravel, brown to redish brown, moist, loose to compact (0.3)	SS	1	67	22				11		
		SS	2	62	17	1	101		5		
		SS	3	59	9	2	100		9		
	(99.38)										
	SAND: trace clay, trace silt, trace gravel, brown to reddish brown, moist to wet, compact (2.3)	SS	4	75	10	3	99		7		
		SS	5	70	15	4	98		18		
	- layers of silty clay	SS	6	67	18	5	97		18		
		SS	7	67	28	6	96		8		
		SS	8	70	24	7	95		5		
		SS	9	70	27	8	94		22		
	- layers of gravel	SS	10	75	29	9	93		12		
		SS	11	79	18	10	92		21		
						11	91				
						12	90				
						13	89				

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

B.I.G. Consulting Inc.
12-5500 Tomken Rd.
Mississauga, ON L4W 2Z4
Canada
T: 416-214-4880
F: 416-551-2633

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

▼ Groundwater depth observed on July 3, 2023 at a depth of: 9.00 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 : 68

Continued on Next Page

RECORD OF BOREHOLE No. BH/MW2

Project Number: **BIGC-ENV-605A** Drilling Location: **See BH Location Plan** Logged by: **CE**

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
	SAND: trace clay, trace silt, trace gravel, brown to reddish brown, moist to wet, compact 87.95										
	SILTY CLAY: grey, moist, stiff 13.7	SS	12	95	12	14	88	○	○ 23		
	86.43					15	87				
	SILTY CLAY TILL: some sand to sandy, trace gravel, containing occasional cobbles and boulders, grey to redish grey, moist, hard 15.2	SS	13	100	33	16	86	○	○ 17		
	84.91										
	SILT: trace clay, trace sand, layers of silty clay, seams of silty sand, brown to grey, wet, very dense 16.8	SS	14	100	67	17	85	○	○ 21		
	83.38										
	SANDY SILT TILL: trace clay, trace gravel, brown to reddish brown, moist to wet, very dense 18.3	SS	15	95	64	18	84	○	○ 21		Gr: 9%; Sa: 26%; Si: 58%; Cl: 7%
	81.86										
	SILTY CLAY / SHALE COMPLEX: reddish brown, moist, hard 19.8	SS	16	100	50/ 80 mm	19	83				
	81.02					20	82				
	BEDROCK: Shale, Queenston Formation, highly weathered to slightly weathered, fair to good quality, medium strong to strong, occasional limestone layers, reddish brown to grey 20.7 - Fair Quality	RC	1	100	70	21	81	○			Point Load Test UCS (Axial): 64.73 MPa
	- Fair Quality	RC	2	100	75	22	80	○			UCS: 73.6 MPa
	- Good Quality	RC	3	100	82	23	79	○			Point Load Test UCS (Axial): 63.90 MPa Point Load Test UCS (Axial): 33.46 MPa
	77.06					24	78				
	End of Borehole 24.6 1. Borehole was open upon completion of drilling. 2. Groundwater level was measured at 9.00 m below ground surface on July 3, 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 : 68

RECORD OF BOREHOLE No. BH/MW3

Project Number:	BIGC-ENV-605A	Drilling Location:	See BH Location Plan	Logged by:	CE
Project Client:	Halton Standard Condominium Corporation No. 416	Drilling Method:	190 / 100 mm Hollow Stem Augering / Mud Rotary	Compiled by:	KH
Project Name:	Geotechnical and Hydrogeological Investigations	Drilling Machine:	Track Mounted Drill	Reviewed by:	AC
Project Location:	1026 Cooke Blvd, Burlington, Ontario	Date Started:	27 Jun 23	Date Completed: 27 Jun 23	Revision No.: 0, 14/9/23

Geodetic Ground Surface Elevation: 100.64 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: 100 mm asphalt over 320 mm granular base (100.22)										
	FILL: sand, trace clay, trace silt, trace gravel, brown, moist, compact (0.4 / 99.12)	SS	1	67	16				6		
		SS	2	67	13	1	100		8		
	SAND: trace clay, trace silt, trace gravel, brown, moist to wet, loose to compact (1.5 / 97.95)	SS	3	67	19	2	99		6		
		SS	4	100	6		98		22		
	SILTY CLAY: trace sand, trace gravel, redish brown, moist to wet, firm to very stiff (2.7)					3					
	- seams of sand	SS	5	84	14		97		18		
	(94.54)	SS	6	92	29	4	96		20		
	SAND: trace clay, trace silt, trace gravel, brown to redish brown, moist to wet, compact to very dense (6.1)	SS	7	79	22	5	95		11		
	- layers of sand and gravel					6					
	- cobbles and boulders - layers of silty sand	SS	8	41	67	7	94		10		
						8	93				
		SS	9	92	36	9	92		21		
	- layers of sandy silt					10	91				
	(88.45)	SS	10	95	42	11	90		20		
	SILTY CLAY TILL: trace to some sand, trace gravel, layers of silty clay, grey, moist, very stiff to hard (12.2)	SS	11	87	27	12	89		20		
						13	88				

B.I.G. Consulting Inc.
12-5500 Tomken Rd.
Mississauga, ON L4W 2Z4
Canada
T: 416-214-4880
F: 416-551-2633

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

▼ Groundwater depth observed on July 3, 2023 at a depth of: 7.92 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 : 68

Continued on Next Page

RECORD OF BOREHOLE No. BH/MW3

Project Number: **BIGC-ENV-605A** Drilling Location: **See BH Location Plan** Logged by: **CE**

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	SILTY CLAY TILL: trace to some sand, trace gravel, layers of silty clay, grey, moist, very stiff to hard										
		SS	12	100	38	14	87		15		
							86				
						15					
	85.02	SS	13	100	97		85		16		
	SANDY SILT: trace clay, reddish brown, moist, very dense 15.6					16					
	83.42	SS	14	100	58	17	84		23		
	SILTY CLAY / SHALE COMPLEX: reddish brown, moist, hard 17.2						83				
		SS	15	100	50/ 80 mm	18					
							82				
						19					
	80.83						81				
	BEDROCK: Shale, Queenston Formation 19.8	SS	16	100	50/ 30 mm						
	End of Borehole										

1. Borehole was open upon completion of drilling.
2. Groundwater level was measured at 7.92 m below ground surface on July 3, 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

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 : 68

RECORD OF BOREHOLE No. BH/MW4

Project Number:	BIGC-ENV-605A	Drilling Location:	See BH Location Plan	Logged by:	CE
Project Client:	Halton Standard Condominium Corporation No. 416	Drilling Method:	190 / 63.5 mm Hollow Stem Augering / HQ Coring	Compiled by:	KH
Project Name:	Geotechnical and Hydrogeological Investigations	Drilling Machine:	Track Mounted Drill	Reviewed by:	AC
Project Location:	1026 Cooke Blvd, Burlington, Ontario	Date Started:	29 Jun 23 Date Completed: 29 Jun 23	Revision No.:	0, 14/9/23

Geodetic Ground Surface Elevation: 101.71 m

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)
	ASPHALT PAVEMENT: 90 mm asphalt over 200 mm granular base (101.42)						
	FILL: sand, trace clay, trace silt, trace gravel, brown, moist, loose to compact (0.3)	SS	1	30	10		
	- layers of silty sand	SS	2	79	7	1	101
	(99.42)	SS	3	79	11	2	100
	SAND: trace clay, trace silt, trace gravel, brown to reddish brown, moist to wet, loose to very dense (2.3)	SS	4	75	8		
	- layers of silty sand					3	99
	- cobbles and boulders	SS	5	75	25		
						4	98
		SS	6	75	15	5	97
						6	96
		SS	7	70	20		
						7	95
		SS	8	62	12	8	94
						9	93
	- layers of gravel	SS	9	84	63		
						10	92
	- layers of gravel	SS	10	92	43	11	91
						12	90
	- layers of silty sand	SS	11	75	19		
						13	89

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

○	13
○	5
○	15
○	10
○	7
○	12
○	5
○	11
○	12
○	19

INSTRUMENTATION INSTALLATION

COMMENTS

B.I.G. Consulting Inc.
12-5500 Tomken Rd.
Mississauga, ON L4W 2Z4
Canada
T: 416-214-4880
F: 416-551-2633

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

▼ Groundwater depth observed on July 3, 2023 at a depth of: 9.06 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 : 68

Continued on Next Page

RECORD OF BOREHOLE No. BH/MW4

Project Number: **BIGC-ENV-605A** Drilling Location: **See BH Location Plan** Logged by: **CE**

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
	SAND: trace clay, trace silt, trace gravel, brown to reddish brown, moist to wet, loose to very dense										
	87.99										
	SILTY CLAY: grey, moist, very stiff 13.7	SS	12	100	20	14	88	○	23		
	86.47					15	87				
	SANDY SILT: trace clay, grey, moist, very dense 15.2 - layers of silty clay till	SS	13	100	64			○	16		
	84.95					16	86				
	SILTY CLAY: trace sand, grey, moist, hard 16.8	SS	14	100	55	17	85	○	20		Gr: 0%; Sa: 2%; Si: 70%; Cl: 28% LL: 27%; PL: 14%; PI: 13%
	83.42					18	84				
	SAND AND SILT TILL: trace to some gravel, trace clay, reddish brown, moist, dense 18.3 - layers of silty sand to sandy silt	SS	15	100	31	19	83	○	23		
	81.90										
	BEDROCK: Shale, Queenston Formation, highly weathered to fresh, poor to excellent quality, medium strong to strong, occasional limestone layers, reddish brown to grey 19.8 - Poor Quality	SS	16	100	50/ 100 mm	20	82		8		UCS: 47.5 MPa
		RC	1	100	30	21	81	○			Point Load Test UCS (Axial): 78.13 MPa
	- Good Quality	RC	2	100	78	22	80				
						23	79	○			
	- Excellent Quality	RC	3	100	94	24	78				
	76.84						77	○			Point Load Test UCS (Axial): 43.82 MPa
	End of Borehole 24.9 1. Borehole was open upon completion of drilling. 2. Groundwater level was measured at 9.06 m below ground surface on July 3, 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 : 68

RECORD OF BOREHOLE No. BH/MW5

Project Number:	BIGC-ENV-605A	Drilling Location:	See BH Location Plan	Logged by:	CE
Project Client:	Halton Standard Condominium Corporation No. 416	Drilling Method:	190 / 63.5 mm Hollow Stem Augering / HQ Coring	Compiled by:	KH
Project Name:	Geotechnical and Hydrogeological Investigations	Drilling Machine:	Track Mounted Drill	Reviewed by:	AC
Project Location:	1026 Cooke Blvd, Burlington, Ontario	Date Started:	28 Jun 23	Date Completed: 28 Jun 23	Revision No.: 0, 14/9/23

Geodetic Ground Surface Elevation: 101.01 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: 80 mm asphalt over 230 mm granular base 100.70										
	FILL: sand, trace clay, trace silt, trace gravel, brown to redish brown, moist, loose to compact 0.3	SS	1	67	10			○	12		
	- layers of silty clay	SS	2	79	9	1	100	○	13		
		SS	3	84	14	2	99	○	12		
		SS	4	54	4			○	11		
		SS	5	75	9	3	98	○	8		
	96.44					4	97				
	SAND: trace clay, trace silt, trace gravel, brown to reddish brown, moist to wet, loose to compact 4.6	SS	6	75	6	5	96	○	6		
	- cobbles and boulders	SS	7	79	40	6	95	○	10		
		SS	8	8	16	7	94	○			
		SS	9	59	17	8	93	○	22		
		SS	10	67	10	9	92				
		SS	11	100	14	10	91	○	21		
	88.46					11	90	○	22		
	SILTY CLAY: trace sand, grey, moist, stiff 12.6					12	89				
	- layers of silty clay till					13					

B.I.G. Consulting Inc.
12-5500 Tomken Rd.
Mississauga, ON L4W 2Z4
Canada
T: 416-214-4880
F: 416-551-2633

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

▼ Groundwater depth observed on July 3, 2023 at a depth of: 8.38 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 : 68

Continued on Next Page

RECORD OF BOREHOLE No. BH/MW5

Project Number: **BIGC-ENV-605A** Drilling Location: **See BH Location Plan** Logged by: **CE**

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
	SILTY CLAY: trace sand, grey, moist, stiff										
		SS	12	100	15	14	87	○	○ 24		
	85.77					15	86				
	SILTY CLAY TILL: some sand, trace gravel, redish grey, moist, hard 15.2	SS	13	100	34			○	○ 17		Gr: 2%; Sa: 18%; Si: 48%; Cl: 32% LL: 26%; PL: 15%; PI: 11%
						16	85				
		SS	14	100	41	17	84	○	○ 12		
	- containing shale pieces										
	82.72					18	83				
	SILTY CLAY / SHALE COMPLEX: reddish brown, moist, hard 18.3 - layers of sandy silt till	SS	15	100	63			○	○ 10		
	81.35					19	82				
	BEDROCK: Shale, Queenston Formation, highly weathered to fresh, poor to excellent quality, very weak to medium strong, occasional limestone layers, reddish brown to grey 19.7	SS	16	100	50/ 100 mm						
	- Poor Quality	RC	1	100	29	20	81	○			Point Load Test UCS (Axial): 18.65 MPa
	- Good Quality	RC	2	100	80	21	80	○			
	- Excellent Quality	RC	3	100	98	22	79	○			Point Load Test UCS (Axial): 43.88 MPa
						23	78				
	- Excellent Quality	RC	4	100	94	24	77	○			Point Load Test UCS (Axial): 42.61 MPa
	76.22										
	End of Borehole 24.8 1. Borehole was open upon completion of drilling. 2. Groundwater level was measured at 8.38 m below ground surface on July 3, 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 : 68

APPENDIX B: MECP WWR SUMMARY TABLE

Table B-1: MECP WWR Summary Table

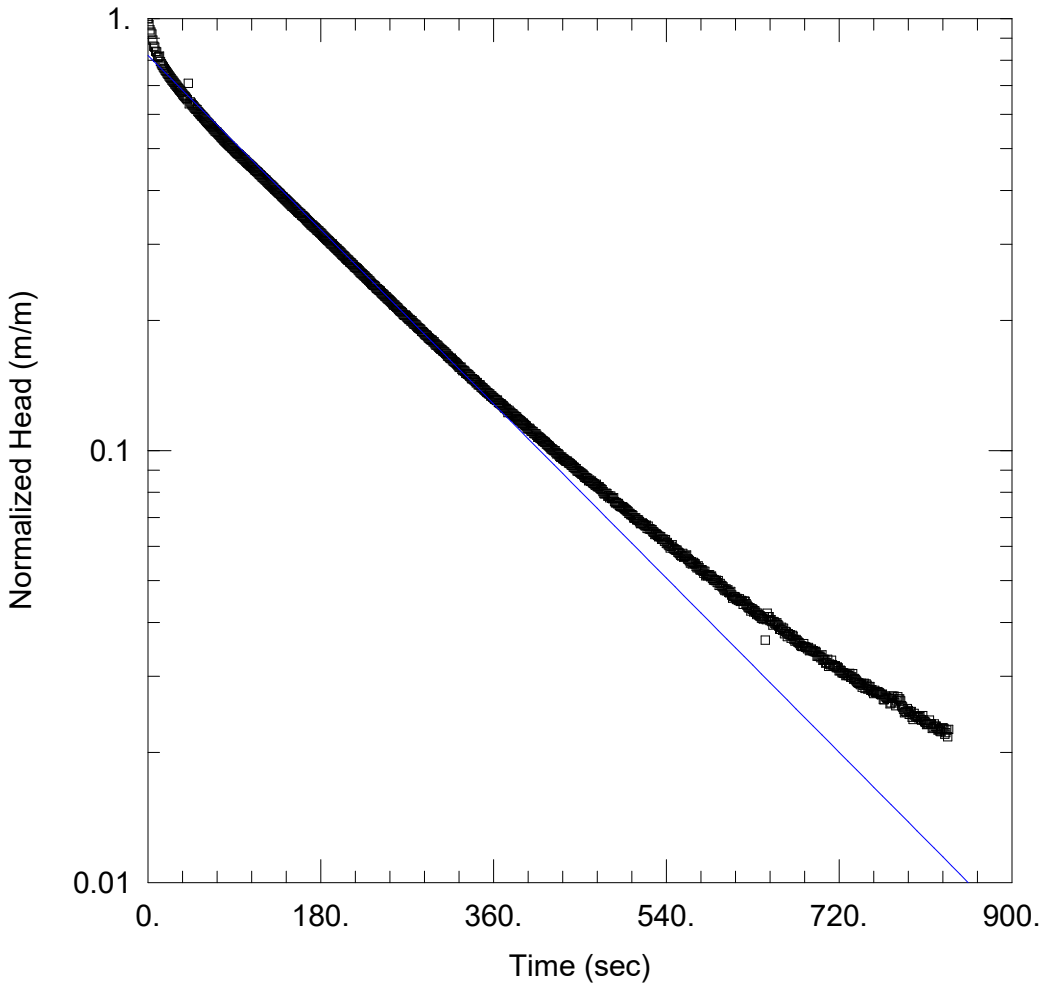
Count	Well ID	Date Completed	Depth (m)	Reported Water Level (m)	Status of Well
1.	2800272	04/09/1949	21.3	7.62	Water Supply (Domestic)
2.	2809957	05/18/2004	10.7	N/A	N/A
3.	2810154	11/22/2004	4.5	2.0	Observation Well
4.	2810377	09/12/2005	9.1	7.6	Observation Well
5.	2810512	02/02/2006	9.1	N/A	Observation Well
6.	7043252	03/26/2007	10.4	N/A	Observation Well
7.	7114369	N/A	11.3	N/A	Observation Well
8.	7114376	04/18/2008	10.7	N/A	Observation Well
9.	7118602	01/10/2008	12.1	6.0	Observation Well
10.	7120225	06/23/2008	N/A	N/A	Abandoned-Other
11.	7123981	06/23/2008	N/A	N/A	Abandoned-Other
12.	7160240	01/12/2011	9.1	N/A	Observation Well
13.	7167017	05/30/2011	N/A	N/A	Abandoned-Other
14.	7176158	10/20/2011	9.1	6.71	Observation Well
15.	7202143	12/04/2012	N/A	N/A	N/A
16.	7203984	07/10/2012	N/A	N/A	N/A
17.	7205652	04/08/2013	12.8	10.2	N/A
18.	7211367	10/08/2013	N/A	N/A	Test Hole
19.	7214775	12/16/2013	7.9	6.1	Observation Well
20.	7220632	04/29/2014	N/A	N/A	N/A
21.	7227608	06/30/2014	N/A	N/A	Abandoned-Other
22.	7229430	08/23/2014	N/A	N/A	Abandoned-Insufficient Supply
23.	7232291	07/18/2014	N/A	6.1	Abandoned-Other
24.	7232366	06/17/2014	12.2	N/A	Observation Well
25.	7236354	12/05/2014	5.2	N/A	Observation Well
26.	7236355	12/05/2014	5.2	N/A	Observation Well
27.	7236356	12/05/2014	5.5	N/A	Observation Well
28.	7236357	12/04/2014	9.1	N/A	Observation Well
29.	7236358	12/04/2014	5.4	N/A	Observation Well
30.	7248588	08/18/2015	9.2	N/A	Observation Well
31.	7248589	08/18/2015	9.2	N/A	Observation Well
32.	7256551	12/11/2015	5.5	N/A	Observation Well
33.	7267367	06/10/2016	10.6	8.0	Observation Well
34.	7271535	10/08/2015	N/A	N/A	N/A
35.	7294096	08/09/2017	2.1	1.22	Observation Well
36.	7294097	08/09/2017	2.1	1.22	Observation Well
37.	7294098	08/08/2017	5.5	3.96	Observation Well
38.	7296543	09/22/2017	5.5	N/A	Observation Well
39.	7296544	09/22/2017	6.1	N/A	Observation Well
40.	7296545	09/22/2017	7	N/A	Observation Well

Count	Well ID	Date Completed	Depth (m)	Reported Water Level (m)	Status of Well
41.	7299235	10/26/2017	10.7	N/A	Observation Well
42.	7301691	10/27/2017	N/A	N/A	N/A
43.	7305852	10/17/2017	N/A	N/A	Abandoned-Other
44.	7314783	03/23/2018	9.1	N/A	Observation Well
45.	7333792	03/19/2019	4.6	N/A	Observation Well
46.	7333793	03/20/2019	5.3	N/A	Observation Well
47.	7333846	03/18/2019	4.9	N/A	Observation Well
48.	7333853	03/20/2019	4.6	N/A	Observation Well
49.	7355583	03/05/2020	N/A	N/A	N/A
50.	7360760	02/10/2020	N/A	N/A	N/A
51.	7361071	N/A	12.8	N/A	Observation Well
52.	7361072	N/A	12.8	N/A	Observation Well
53.	7363235	N/A	13.7	N/A	Observation Well
54.	7372986	05/13/2020	11.6	10.06	Observation Well
55.	7372995	05/08/2020	9.1	3.05	Observation Well
56.	7372996	05/13/2020	9.1	N/A	Observation Well
57.	7374324	07/14/2020	N/A	N/A	N/A
58.	7390906	06/15/2021	N/A	N/A	Observation Well
59.	7390907	06/15/2021	N/A	N/A	Observation Well
60.	7390908	06/16/2021	N/A	N/A	Observation Well
61.	7390909	06/16/2021	N/A	N/A	Observation Well
62.	7390910	06/17/2021	N/A	N/A	Observation Well
63.	7390911	06/17/2021	N/A	N/A	Observation Well
64.	7403383	08/19/2021	10.7	N/A	Observation Well
65.	7403384	08/19/2021	10.7	N/A	Observation Well
66.	7403385	08/19/2021	12.2	N/A	Observation Well
67.	7411053	11/18/2021	N/A	N/A	N/A
68.	7411054	11/19/2021	N/A	N/A	N/A
69.	7411055	11/20/2021	N/A	N/A	N/A
70.	7411056	11/20/2021	N/A	N/A	N/A
71.	7411326	01/10/2022	N/A	N/A	N/A
72.	7416881	04/19/2022	N/A	N/A	N/A
73.	7416882	04/20/2022	N/A	N/A	N/A
74.	7416883	04/19/2022	N/A	N/A	N/A
75.	7416884	04/18/2022	N/A	N/A	N/A
76.	7416885	04/14/2022	N/A	N/A	N/A
77.	7418550	05/05/2022	N/A	N/A	N/A
78.	7418551	05/05/2022	N/A	N/A	N/A
79.	7418552	05/05/2022	N/A	N/A	N/A
80.	7418553	05/05/2022	N/A	N/A	N/A

Table B-2: MECP PTTW and EASR Summary Table

Permit Number	Purpose	Address	Municipality	Water Source	Max L/Day	Active
1078-BVHT9X	Dewatering Construction	Lot 5 & 6, Concession 1	Burlington	Groundwater	2,250,800	No
4307-7V4PE9	Other – Construction	Waterdown Road and North Service Road, Lot 5, Concession 1	Burlington	Surface Water	518,400	No
6354-7GYT9C	Dewatering Construction	Lot Part of 7, Concession Broken Front	Burlington	Surface Water	1,700,000	No
8860-72BPGJ	Other – Dewatering	59 Oaklands Park Crecent, Part of Lot 7	Burlington	Surface Water	1,700,000	No
R-009-1110140787	Construction Dewatering	101 Masonry Court	Burlington	Groundwater	50,000-400000	No

APPENDIX C: SWRT RESULTS



WELL TEST ANALYSIS

Data Set: C:\...\BHMW1.aqt
Date: 09/15/23 Time: 15:12:47

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Halton Standard Condominium
Project: BIGC-ENV-605A
Location: 1026 Cooke Blvd, Burlington
Test Well: BH/MW1
Test Date: July 3, 2023

AQUIFER DATA

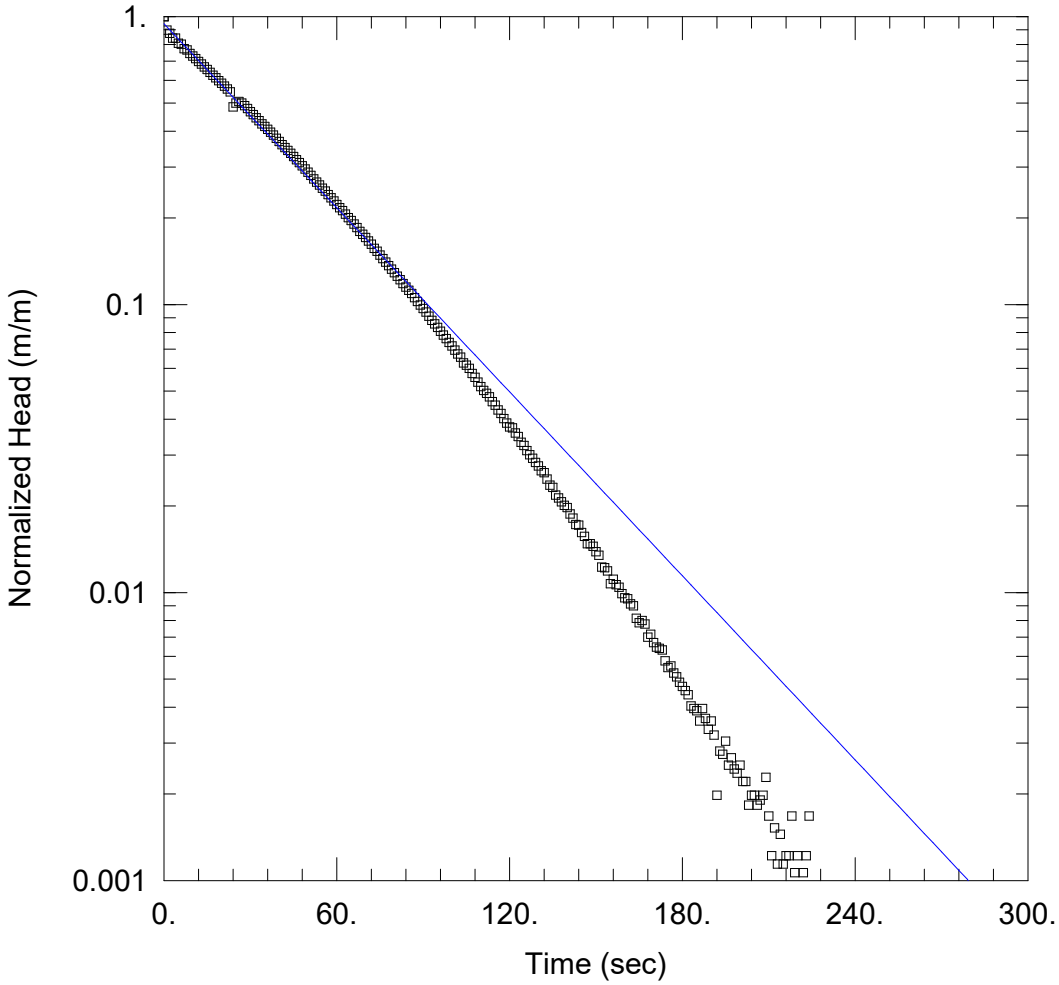
Saturated Thickness: 2.93 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW1)

Initial Displacement: 1.052 m
Total Well Penetration Depth: 2.93 m
Casing Radius: 0.0254 m
Static Water Column Height: 2.93 m
Screen Length: 2.93 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 3.01E-6 m/sec
y0 = 0.8646 m



WELL TEST ANALYSIS

Data Set: C:\...\BHMW2.aqt
Date: 09/15/23 Time: 15:12:40

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Halton Standard Condominium
Project: BIGC-ENV-605A
Location: 1026 Cooke Blvd, Burlington
Test Well: BH/MW2
Test Date: July 3, 2023

AQUIFER DATA

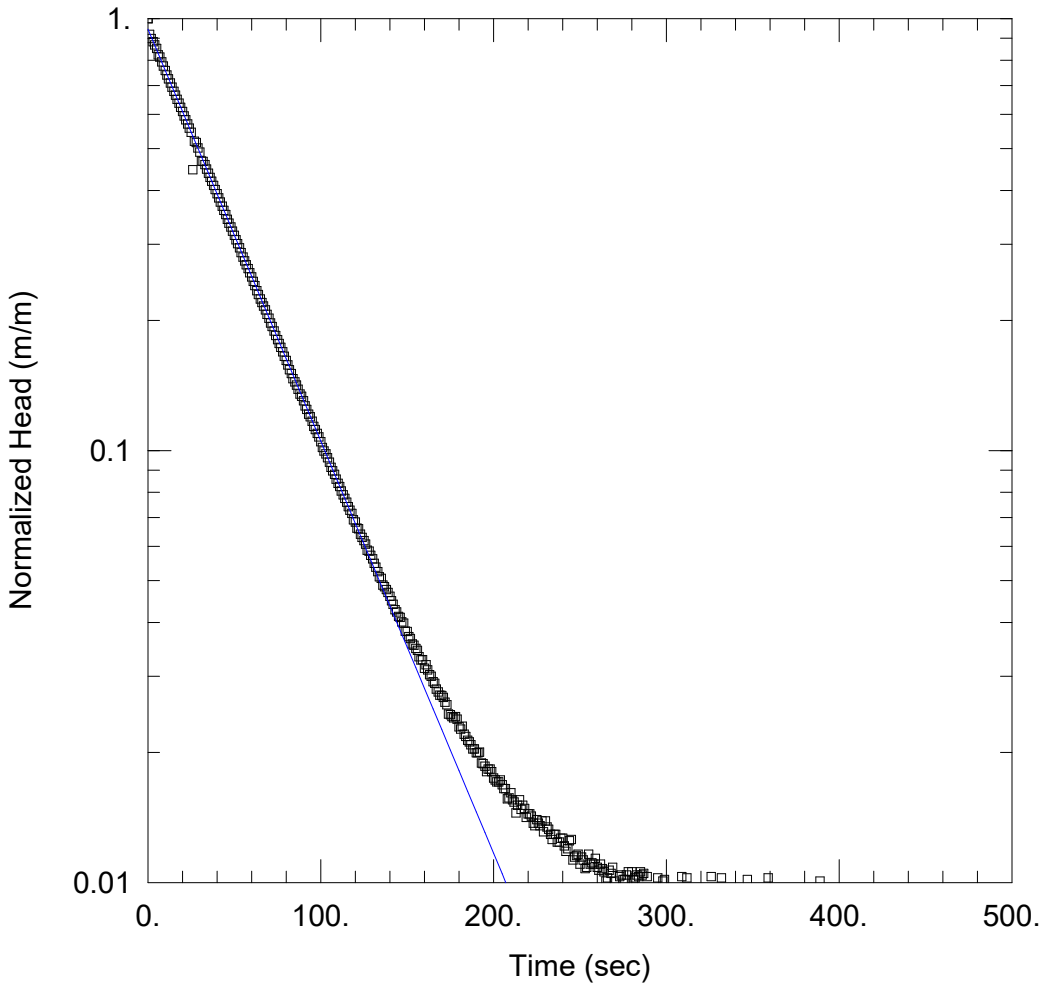
Saturated Thickness: 4.82 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW2)

Initial Displacement: 1.313 m
Total Well Penetration Depth: 4.82 m
Casing Radius: 0.0254 m
Static Water Column Height: 4.82 m
Screen Length: 3. m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.441E-5 m/sec
y0 = 1.239 m



WELL TEST ANALYSIS

Data Set: C:\...\BHMW3.aqt
Date: 09/15/23 Time: 15:12:32

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Halton Standard Condominium
Project: BIGC-ENV-605A
Location: 1026 Cooke Blvd, Burlington
Test Well: BH/MW3
Test Date: July 3, 2023

AQUIFER DATA

Saturated Thickness: 4.3 m Anisotropy Ratio (Kz/Kr): 1.

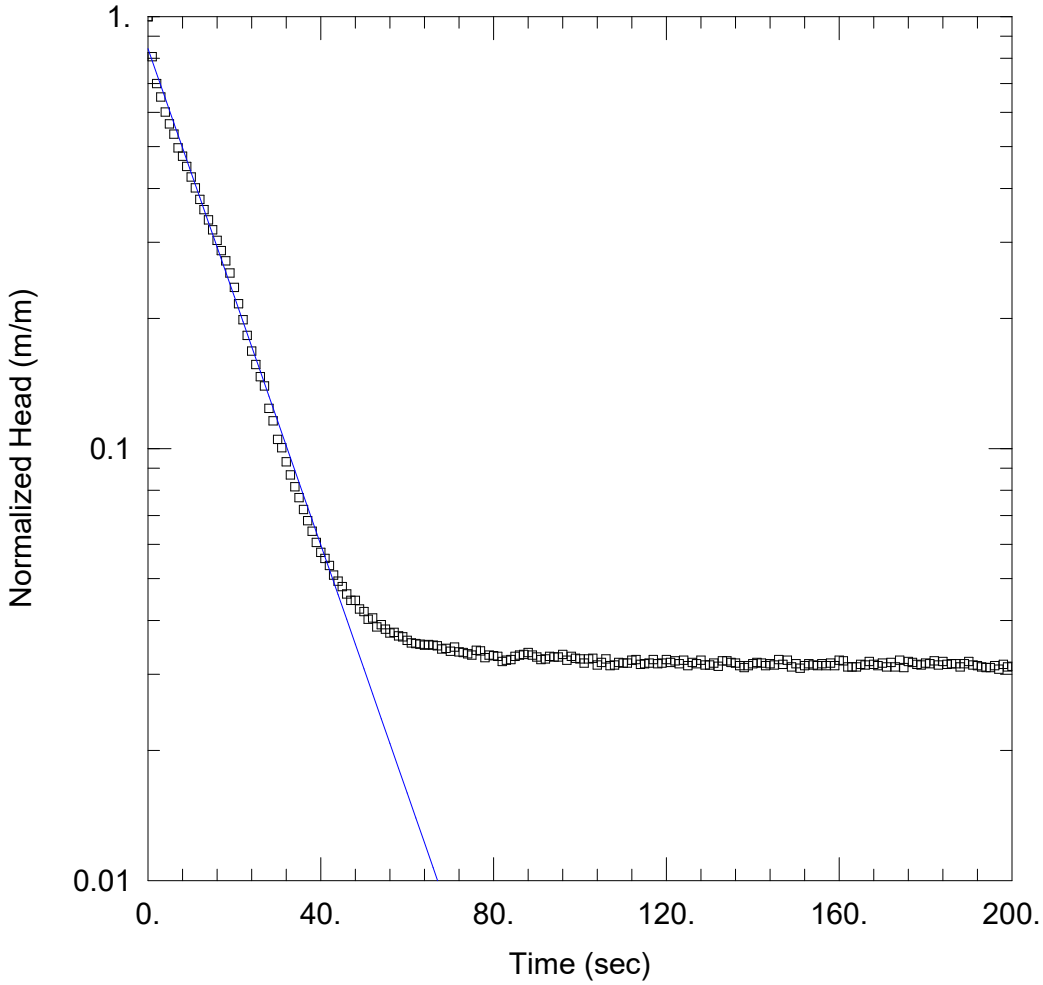
WELL DATA (BH/MW3)

Initial Displacement: 1.152 m
Total Well Penetration Depth: 4.3 m
Casing Radius: 0.0254 m
Static Water Column Height: 4.3 m
Screen Length: 3. m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.29E-5 m/sec y0 = 1.088 m



WELL TEST ANALYSIS

Data Set: C:\...\BHMW4.aqt
Date: 09/15/23 Time: 15:12:22

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Halton Standard Condominium
Project: BIGC-ENV-605A
Location: 1026 Cooke Blvd, Burlington
Test Well: BH/MW4
Test Date: July 3, 2023

AQUIFER DATA

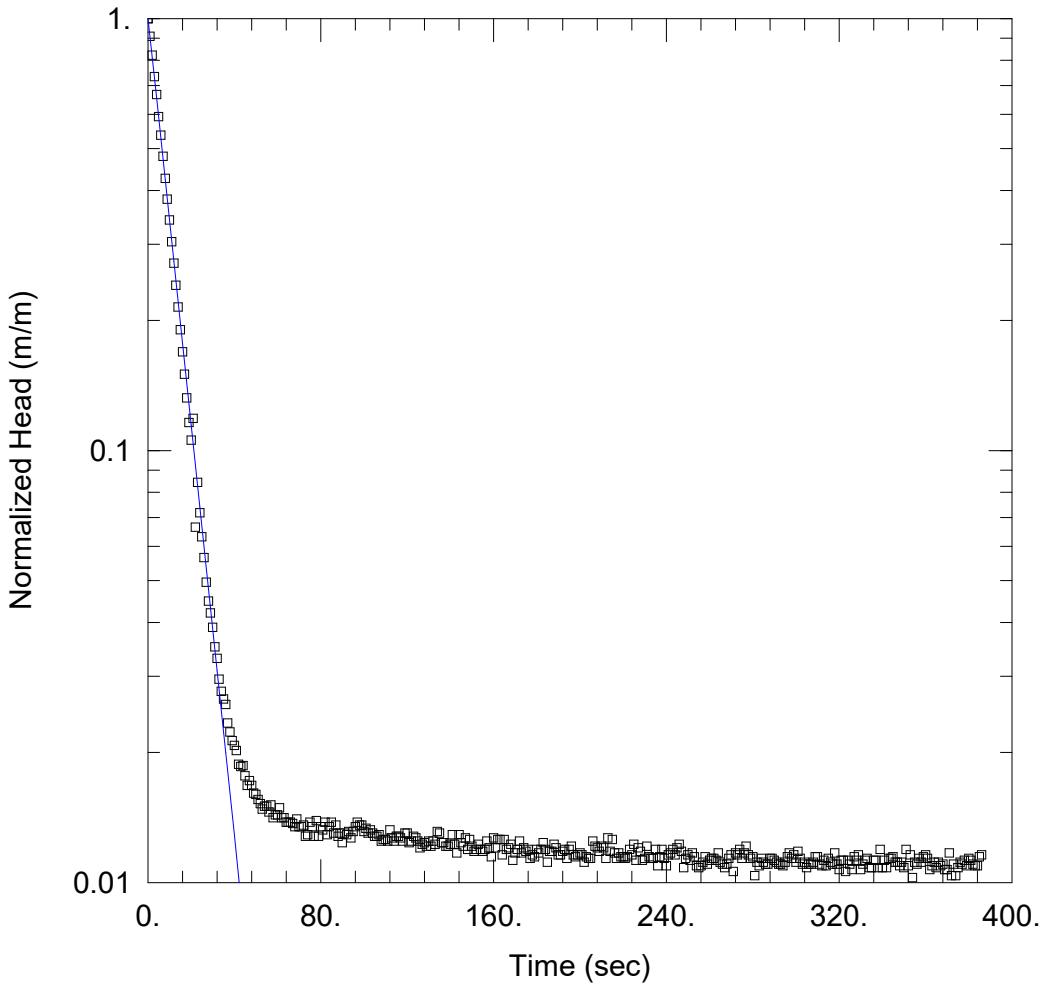
Saturated Thickness: 3.1 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW4)

Initial Displacement: 0.8875 m
Total Well Penetration Depth: 3.1 m
Casing Radius: 0.0254 m
Static Water Column Height: 3.1 m
Screen Length: 3. m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 3.885E-5 m/sec
y0 = 0.7475 m



WELL TEST ANALYSIS

Data Set: C:\...\BHMW5-EL.aqt
Date: 09/15/23 Time: 15:12:12

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Halton Standard Condominium
Project: BIGC-ENV-605A
Location: 1026 Cooke Blvd, Burlington
Test Well: BH/MW5
Test Date: July 3, 2023

AQUIFER DATA

Saturated Thickness: 3.99 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW5)

Initial Displacement: 0.9059 m
Total Well Penetration Depth: 3.99 m
Casing Radius: 0.0254 m
Static Water Column Height: 3.99 m
Screen Length: 3. m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 4.534E-5 m/sec
y0 = 0.9198 m

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

Your Project #: BIGC-ENV-605A
Site Location: 1026 LOOKE BLVD
Your C.O.C. #: 942356-01-01

Attention: Travis Van Holst

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

Report Date: 2023/09/18
Report #: R7818799
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C3J7211
Received: 2023/07/05, 13:31

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Carbonaceous BOD	1	2023/07/07	2023/07/12	CAM SOP-00427	SM 23 5210B m
Total Cyanide	1	2023/07/07	2023/07/07	CAM SOP-00457	OMOE E3015 5 m
Fluoride	1	2023/07/08	2023/07/11	CAM SOP-00449	SM 23 4500-F C m
Mercury in Water by CVAA	1	2023/07/07	2023/07/07	CAM SOP-00453	EPA 7470A m
Total Metals Analysis by Axial ICP	1	2023/07/07	2023/07/07	CAM SOP-00408	EPA 6010D m
E.coli, (CFU/100mL)	1	N/A	2023/07/05	CAM SOP-00552	MECP E3371
Animal and Vegetable Oil and Grease	1	N/A	2023/07/10	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	1	2023/07/10	2023/07/10	CAM SOP-00326	EPA1664B m,SM5520B m
PAH Compounds in Water by GC/MS (SIM)	1	2023/07/06	2023/07/07	CAM SOP-00318	EPA 8270E
pH	1	2023/07/08	2023/07/11	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	1	N/A	2023/07/10	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Turbidimetry	1	N/A	2023/07/10	CAM SOP-00464	SM 23 4500-SO42- E m
Total Kjeldahl Nitrogen in Water	1	2023/07/07	2023/07/10	CAM SOP-00938	OMOE E3516 m
Mineral/Synthetic O & G (TPH Heavy Oil) (1)	1	2023/07/10	2023/07/10	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	1	2023/07/07	2023/07/10	CAM SOP-00428	SM 23 2540D m
Volatile Organic Compounds in Water	1	N/A	2023/07/11	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 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.

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

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Your Project #: BIGC-ENV-605A
Site Location: 1026 LOOKE BLVD
Your C.O.C. #: 942356-01-01

Attention: Travis Van Holst

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

Report Date: 2023/09/18
Report #: R7818799
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C3J7211
Received: 2023/07/05, 13:31

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.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
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) 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 #: C3J7211
Report Date: 2023/09/18

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-605A
Site Location: 1026 LOOKE BLVD
Sampler Initials: ST

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID				WHI302		
Sampling Date				2023/07/05 12:00		
COC Number				942356-01-01		
	UNITS	Criteria	Criteria-2	BH/MW 5	RDL	QC Batch
Calculated Parameters						
Total Animal/Vegetable Oil and Grease	mg/L	150	-	1.2	0.50	8770864
Inorganics						
Total Carbonaceous BOD	mg/L	300	-	ND	2	8773887
Fluoride (F-)	mg/L	10	-	0.15	0.10	8777179
Total Kjeldahl Nitrogen (TKN)	mg/L	100	-	0.37	0.10	8776394
pH	pH	6.0:10.0	6.5:8.5	7.91		8777181
Phenols-4AAP	mg/L	1	0.008	0.0010	0.0010	8773093
Total Suspended Solids	mg/L	350	15	**45**	10	8774166
Dissolved Sulphate (SO4)	mg/L	1500	-	90	1.0	8776561
Total Cyanide (CN)	mg/L	2	0.02	ND	0.0050	8774299
Petroleum Hydrocarbons						
Total Oil & Grease	mg/L	-	-	1.2	0.50	8777984
Total Oil & Grease Mineral/Synthetic	mg/L	-	-	ND	0.50	8777987

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: Halton Sanitary & Combined Sewer Bylaw (2-03)
Criteria-2: The City of Burlington Storm Sewer Discharge By-Law 59-2022
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

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C3J7211
Report Date: 2023/09/18

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-605A
Site Location: 1026 LOOKE BLVD
Sampler Initials: ST

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID				WHI302			WHI302		
Sampling Date				2023/07/05 12:00			2023/07/05 12:00		
COC Number				942356-01-01			942356-01-01		
	UNITS	Criteria	Criteria-2	BH/MW 5	RDL	QC Batch	BH/MW 5 Lab-Dup	RDL	QC Batch
Metals									
Total Aluminum (Al)	mg/L	50	-	1.0	0.1	8774209	1.0	0.1	8774209
Total Antimony (Sb)	mg/L	5	-	ND	0.02	8774209	ND	0.02	8774209
Total Arsenic (As)	mg/L	1	0.02	ND	0.01	8774209	ND	0.01	8774209
Total Beryllium (Be)	mg/L	5	-	ND	0.0005	8774209	ND	0.0005	8774209
Total Cadmium (Cd)	mg/L	1	0.008	ND	0.002	8774209	ND	0.002	8774209
Total Chromium (Cr)	mg/L	3	0.08	ND	0.01	8774209	ND	0.01	8774209
Total Cobalt (Co)	mg/L	5	-	0.002	0.002	8774209	0.002	0.002	8774209
Total Copper (Cu)	mg/L	3	0.04	ND	0.01	8774209	ND	0.01	8774209
Total Iron (Fe)	mg/L	50	-	1.7	0.02	8774209	1.7	0.02	8774209
Total Lead (Pb)	mg/L	3	0.12	ND	0.01	8774209	ND	0.01	8774209
Total Manganese (Mn)	mg/L	5	0.05	**0.22**	0.001	8774209	**0.22**	0.001	8774209
Mercury (Hg)	mg/L	0.05	0.0004	ND	0.00010	8774466			
Total Molybdenum (Mo)	mg/L	5	-	ND	0.005	8774209	ND	0.005	8774209
Total Nickel (Ni)	mg/L	3	0.08	0.005	0.005	8774209	0.005	0.005	8774209
Total Phosphorus (P)	mg/L	10	0.4	ND	0.05	8774209	0.05	0.05	8774209
Total Selenium (Se)	mg/L	5	0.02	ND	0.02	8774209	ND	0.02	8774209
Total Silver (Ag)	mg/L	5	0.12	ND	0.01	8774209	ND	0.01	8774209
Total Tin (Sn)	mg/L	5	-	ND	0.02	8774209	ND	0.02	8774209
Total Titanium (Ti)	mg/L	5	-	0.020	0.005	8774209	0.020	0.005	8774209
Total Zinc (Zn)	mg/L	3	0.04	0.011	0.005	8774209	0.011	0.005	8774209

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

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: Halton Sanitary & Combined Sewer Bylaw (2-03)
Criteria-2: The City of Burlington Storm Sewer Discharge By-Law 59-2022
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

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C3J7211
Report Date: 2023/09/18

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-605A
Site Location: 1026 LOOKE BLVD
Sampler Initials: ST

SEMI-VOLATILE ORGANICS BY GC-MS (WATER)

Bureau Veritas ID			WHI302		
Sampling Date			2023/07/05 12:00		
COC Number			942356-01-01		
	UNITS	Criteria	BH/MW 5	RDL	QC Batch
Polyaromatic Hydrocarbons					
Naphthalene	ug/L	140	ND	0.050	8772144
Surrogate Recovery (%)					
D10-Anthracene	%	-	118		8772144
D14-Terphenyl (FS)	%	-	117		8772144
D8-Acenaphthylene	%	-	92		8772144

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: 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

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

VOLATILE ORGANICS BY GC/MS (WATER)

Bureau Veritas ID				WHI302		
Sampling Date				2023/07/05 12:00		
COC Number				942356-01-01		
	UNITS	Criteria	Criteria-2	BH/MW 5	RDL	QC Batch
Volatile Organics						
Benzene	ug/L	10	2	ND	0.20	8778133
Chloroform	ug/L	40	2	0.96	0.20	8778133
1,4-Dichlorobenzene	ug/L	80	6.8	ND	0.40	8778133
Ethylbenzene	ug/L	160	2	ND	0.20	8778133
Methylene Chloride(Dichloromethane)	ug/L	2000	5.2	ND	2.0	8778133
Tetrachloroethylene	ug/L	1000	4.4	ND	0.20	8778133
Toluene	ug/L	16	2	ND	0.20	8778133
Trichloroethylene	ug/L	400	7.6	ND	0.20	8778133
Surrogate Recovery (%)						
4-Bromofluorobenzene	%	-	-	101		8778133
D4-1,2-Dichloroethane	%	-	-	107		8778133
D8-Toluene	%	-	-	86		8778133

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: Halton Sanitary & Combined Sewer Bylaw (2-03)
Criteria-2: The City of Burlington Storm Sewer Discharge By-Law 59-2022
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

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C3J7211
Report Date: 2023/09/18

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-605A
Site Location: 1026 LOOKE BLVD
Sampler Initials: ST

MICROBIOLOGY (WATER)

Bureau Veritas ID			WHI302		
Sampling Date			2023/07/05 12:00		
COC Number			942356-01-01		
	UNITS	Criteria	BH/MW 5	RDL	QC Batch
Microbiological					
Escherichia coli	CFU/100mL	200	<10	10	8770869

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 City of Burlington Storm Sewer Discharge By-Law 59-2022

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

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

GENERAL COMMENTS

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

Package 1	27.0°C

Revised report[2023/09/18] - Criteria revised as per client request.

Results relate only to the items tested.

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

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

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
8772144	D10-Anthracene	2023/07/07	120	50 - 130	109	50 - 130	115	%				
8772144	D14-Terphenyl (FS)	2023/07/07	136 (1)	50 - 130	122	50 - 130	126	%				
8772144	D8-Acenaphthylene	2023/07/07	104	50 - 130	93	50 - 130	99	%				
8778133	4-Bromofluorobenzene	2023/07/11	104	70 - 130	107	70 - 130	107	%				
8778133	D4-1,2-Dichloroethane	2023/07/11	102	70 - 130	97	70 - 130	104	%				
8778133	D8-Toluene	2023/07/11	104	70 - 130	102	70 - 130	85	%				
8772144	Naphthalene	2023/07/07	143 (2)	50 - 130	133 (2)	50 - 130	ND, RDL=0.050	ug/L	NC	30		
8773093	Phenols-4AAP	2023/07/10	100	80 - 120	101	80 - 120	ND, RDL=0.0010	mg/L	6.5	20		
8773887	Total Carbonaceous BOD	2023/07/12					ND,RDL=2	mg/L	3.8	30	99	85 - 115
8774166	Total Suspended Solids	2023/07/10			95	85 - 115	ND, RDL=10	mg/L	NC	20		
8774209	Total Aluminum (Al)	2023/07/07	NC	80 - 120	109	80 - 120	ND, RDL=0.1	mg/L	1.3	20		
8774209	Total Antimony (Sb)	2023/07/07	105	80 - 120	101	80 - 120	ND, RDL=0.02	mg/L	NC	20		
8774209	Total Arsenic (As)	2023/07/07	110	80 - 120	104	80 - 120	ND, RDL=0.01	mg/L	NC	20		
8774209	Total Beryllium (Be)	2023/07/07	105	80 - 120	107	80 - 120	ND, RDL=0.0005	mg/L	NC	20		
8774209	Total Cadmium (Cd)	2023/07/07	108	80 - 120	104	80 - 120	ND, RDL=0.002	mg/L	NC	20		
8774209	Total Chromium (Cr)	2023/07/07	106	80 - 120	102	80 - 120	ND, RDL=0.01	mg/L	NC	20		
8774209	Total Cobalt (Co)	2023/07/07	99	80 - 120	102	80 - 120	ND, RDL=0.002	mg/L	4.7	20		
8774209	Total Copper (Cu)	2023/07/07	104	80 - 120	104	80 - 120	ND, RDL=0.01	mg/L	NC	20		
8774209	Total Iron (Fe)	2023/07/07	NC	80 - 120	106	80 - 120	ND, RDL=0.02	mg/L	1.1	20		
8774209	Total Lead (Pb)	2023/07/07	98	80 - 120	102	80 - 120	ND, RDL=0.01	mg/L	NC	20		
8774209	Total Manganese (Mn)	2023/07/07	100	80 - 120	106	80 - 120	ND, RDL=0.001	mg/L	0.14	20		
8774209	Total Molybdenum (Mo)	2023/07/07	103	80 - 120	103	80 - 120	ND, RDL=0.005	mg/L	NC	20		
8774209	Total Nickel (Ni)	2023/07/07	99	80 - 120	103	80 - 120	ND, RDL=0.005	mg/L	0	20		
8774209	Total Phosphorus (P)	2023/07/07	110	80 - 120	101	80 - 120	ND, RDL=0.05	mg/L	0.80	20		

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

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

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
8774209	Total Selenium (Se)	2023/07/07	110	80 - 120	104	80 - 120	ND, RDL=0.02	mg/L	NC	20		
8774209	Total Silver (Ag)	2023/07/07	101	80 - 120	104	80 - 120	ND, RDL=0.01	mg/L	NC	20		
8774209	Total Tin (Sn)	2023/07/07	101	80 - 120	104	80 - 120	ND, RDL=0.02	mg/L	NC	20		
8774209	Total Titanium (Ti)	2023/07/07	103	80 - 120	104	80 - 120	ND, RDL=0.005	mg/L	1.5	20		
8774209	Total Zinc (Zn)	2023/07/07	101	80 - 120	104	80 - 120	ND, RDL=0.005	mg/L	3.6	20		
8774299	Total Cyanide (CN)	2023/07/07	94	80 - 120	98	80 - 120	ND, RDL=0.0050	mg/L	NC	20		
8774466	Mercury (Hg)	2023/07/07	100	75 - 125	103	80 - 120	ND, RDL=0.00010	mg/L	NC	20		
8776394	Total Kjeldahl Nitrogen (TKN)	2023/07/10	NC	80 - 120	104	80 - 120	ND, RDL=0.10	mg/L	20	20	100	80 - 120
8776561	Dissolved Sulphate (SO4)	2023/07/10	NC	75 - 125	93	80 - 120	ND, RDL=1.0	mg/L	2.2	20		
8777179	Fluoride (F-)	2023/07/11	92	80 - 120	97	80 - 120	ND, RDL=0.10	mg/L	0.92	20		
8777181	pH	2023/07/11			102	98 - 103			0.65	N/A		
8777984	Total Oil & Grease	2023/07/10			99	85 - 115	ND, RDL=0.50	mg/L	0.25	25		
8777987	Total Oil & Grease Mineral/Synthetic	2023/07/10			97	85 - 115	ND, RDL=0.50	mg/L	0.52	25		
8778133	1,4-Dichlorobenzene	2023/07/11	108	70 - 130	105	70 - 130	ND, RDL=0.40	ug/L	NC	30		
8778133	Benzene	2023/07/11	96	70 - 130	92	70 - 130	ND, RDL=0.20	ug/L	NC	30		
8778133	Chloroform	2023/07/11	101	70 - 130	95	70 - 130	ND, RDL=0.20	ug/L				
8778133	Ethylbenzene	2023/07/11	88	70 - 130	87	70 - 130	ND, RDL=0.20	ug/L				
8778133	Methylene Chloride(Dichloromethane)	2023/07/11	107	70 - 130	100	70 - 130	ND, RDL=2.0	ug/L	NC	30		
8778133	Tetrachloroethylene	2023/07/11	94	70 - 130	89	70 - 130	ND, RDL=0.20	ug/L				
8778133	Toluene	2023/07/11	100	70 - 130	96	70 - 130	ND, RDL=0.20	ug/L	NC	30		

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

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

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
8778133	Trichloroethylene	2023/07/11	105	70 - 130	103	70 - 130	ND, RDL=0.20	ug/L				

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) Surrogate recovery was above the upper control limit due to matrix interference. This may represent a high bias in some results.

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

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

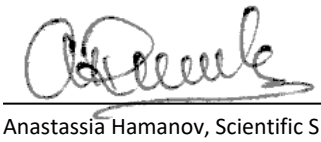
Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C3J7211
Report Date: 2023/09/18

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-605A
Site Location: 1026 LOOKE BLVD
Sampler Initials: ST

VALIDATION SIGNATURE PAGE

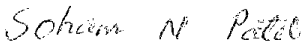
The analytical data and all QC contained in this report were reviewed and validated by:



Anastassia Hamanov, Scientific Specialist



Cristina Carriere, Senior Scientific Specialist



Soham Patel, 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.

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

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C3J7211
Report Date: 2023/09/18

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-605A
Site Location: 1026 LOOKE BLVD
Sampler Initials: ST

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.

Exceedance Summary Table – Burlington Storm Sewer

Result Exceedances

Sample ID	Bureau Veritas ID	Parameter	Criteria	Result	DL	UNITS
BH/MW 5	WHI302-06-Lab Dup	Total Manganese (Mn)	0.05	0.22	0.001	mg/L
BH/MW 5	WHI302-06	Total Manganese (Mn)	0.05	0.22	0.001	mg/L
BH/MW 5	WHI302-04	Total Suspended Solids	15	45	10	mg/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.

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

05-Jul-23 13:31
Deepthi Shaji
C3J7211

Page 1 of 1

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Bureau Veritas Use Only:	
Company Name:	#31796 B.I.G Consulting Inc.	Company Name:		Quotation #:	C25341		Bottle Order #:
Attention:	Accounts Payable	Attention:	Travis Van Holst	P.O. #:			942356
Address:	12-5500 Tomken Road Mississauga ON L4W 2Z4	Address:		Project:	BIGC-ENV-605A	COC #:	Project Manager:
Tel:	(416) 214-4880 Fax:	Tel:	Fax:	Project Name:		C#942356-01-01	Deepthi Shaji
Email:	AP_BIG@brownfieldigi.com	Email:	tvanholst@brownfieldigi.com	Site #:	1026 Cooke Blvd		
				Sampled By:	ST, CD		

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 ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agri/Other ☐ For RSC ☐ Table ___	☐ CCME ☒ Sanitary Sewer Bylaw ☐ Reg 558 ☒ Storm Sewer Bylaw ☐ MISA Municipality Halton ☐ PWQO ☐ Reg 406 Table ☐ Other	

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

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	O Reg 153 VOCs by HS & F1-F4	O Reg 153 PHCs, BTEX/F1-F4	O Reg 153 Metals & Inorganics Pkg	Halton Sanitary & Combined Bylaw (2-03)	Halton sanitary and Burlington storm	O Reg 153 PAHs					# of Bottles	Comments
1		BH/MW5	July 5, 2023	12 pm	GW	N				X	X						14	
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

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

Regular (Standard) TAT: X
(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 #)*

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Cameron Dookhie	23/07/05	1:30	AKSUDEEP KAUR	2023/07/05	12:31	
				2023/07/05		

Laboratory Use Only

Time Sensitive	Temperature (°C) on Recei	Custody Seal	Yes	No
	28/26/27 AKSUDEEP KAUR	Present 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

on ice 28/26/27

Bureau Veritas Canada (2019) Inc.

APPENDIX E: CONSTRUCTION DEWATERING ESTIMATE RATE CALCULATIONS

Construction Dewatering Rate Estimate

1026 Cooke Boulevard, Burlington, Ontario
Four (4) levels of underground parking, unconfined aquifer, groundwater seepage to rectangular excavation (line source)

Table E-1: Construction Dewatering Rate Estimates

Description	Symbol	Total Site	Unit	Explanation
Input Data				
Proposed Ground Elevation		100.75	m asl	Based on Functional Grading Plan, prepared by ODCE, dated November 9, 2023
Highest Groundwater Elevation		92.72	m asl	Highest water level measured on July 3, 2023
Footing elevation		84.30	m asl	assumed 2m below P4, P4 is 14.45 m bgs, based on drawing SPA401, Building Sections, prepared by TFAI, dated October 26, 2023
Aquifer Bottom		82.80	m asl	Assumed 1.5 m below lowest excavation depth
Hydraulic Conductivity	K	1.58E-05	m/s	Geometric mean K
Length of Excavation	x	69.8	m	Based on drawing SPA104, Underground Level 01, prepared by TFAI, dated October 26, 2023
Width of Excavation	a	43.3	m	
Output				
Top of Aquifer		92.72	m asl	water table for unconfined aquifer
Target Water Level		83.30	m asl	assumed 1 m below footing elevation
Water Level above aquifer bottom before dewatering	H	9.9	m	
target water level above aquifer bottom	h	0.5	m	
Radius of Influence	L (R_0)	65.5	m	Sichardt's Formula C=1750
Construction Dewatering Flow Rate - Steady State	Q	231.3	m^3/day	Construction Dewatering Flow - Dupuit Equation
Maximum Construction Flow Rate (safety factor of 2.5)	2.5Q	578.2	m^3/day	during the initial period and after rains
Construction Dewatering Flow Rate - Steady State	Q	**231,000**	L/day	
Maximum Construction Flow Rate (safety factor of 2.5)	2.5Q	**577,500**	L/day	

APPENDIX F: LONG TERM DRAINAGE FLOW RATE ESTIMATE CALCULATIONS

Foundation Drain Flow Rate Estimate

1026 Cooke Boulevard, Burlington, Ontario
Four (4) levels of underground parking, unconfined aquifer, groundwater seepage to rectangular excavation (line source)

Table F-1: Foundation Drain Flow Rate Estimate

Description	Symbol	Values	Unit	Explanation
Input Data				
Proposed Ground Elevation		100.75	m asl	Based on Functional Grading Plan, prepared by ODCE, dated November 9, 2023
Highest Groundwater Elevation		92.72	m asl	Highest water level measured on July 3, 2023
FFE elevation		86.30	m asl	P4 is 14.45 m bgs, based on drawing SPA401, Building Sections, prepared by TFAI, dated October 26, 2023
Aquifer Bottom		84.80	m asl	Assumed 1.5 m below lowest excavation depth
Hydraulic Conductivity	K	1.58E-05	m/s	Geometric mean K
Length of Excavation	x	69.8	m	Based on drawing SPA104, Underground Level 01, prepared by TFAI, dated October 26, 2023
Width of Excavation	a	43.3	m	
Output				
Top of Aquifer		92.72	m asl	Water table for unconfined aquifer
Target Water Level		85.80	m asl	Assumed 0.5 m below basement floor level
Water Level above aquifer bottom before dewatering	H	7.9	m	
Target water level above above aquifer bottom	h	1.0	m	
Radius of Influence	L (R_0)	180.15	m	Weber's Equation - R_0 after 75 days
Long-Term Flow Rate - Steady State	Q	52.9	m^3/day	Long-term flow rate - Dupuit Equation
Maximum Foundation Drain Flow Rate (safety factor of 2)	2Q	105.8	m^3/day	During the initial period and after rains
Estimated Long-term Foundation Drain Flow Rate	Q	**53,000**	L/day	
Estimated Maximum Foundation Drain Flow Rate	2Q	**106,000**	L/day	