PRELIMINARY HYDROGEOLOGICAL INVESTIGATION

1062 and 1074 Cooke Boulevard, Burlington, Ontario

Client

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Project Number

BIGC-ENV-462A

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Date Submitted

August 10, 2021

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1 Introduction

1.1 Project Description

B.I.G. Consulting Inc. (BIG) was retained by Camarro Developments Inc. (the Client) to conduct a Preliminary Hydrogeological Investigation to support the proposed development of the site located at 1062 and 1074 Cooke Boulevard, Burlington, Ontario (Site).

The Site is located west of Cooke Boulevard and south of Masonry Court, in Burlington, Ontario, as show on Figure 1. For simplicity of this report, Cooke Boulevard is considered running north to south. The Site is irregular in shape and measures approximately 0.71 hectares (1.75 acres) in size. The Site is currently occupied by two (2) single storey slab-on-grade industrial/commercial buildings (the Site buildings). The areas surrounding the Site building are covered with asphalt and landscaped areas. It is BIG's understanding that the proposed re-development at the Site will consist of two (2) high rise towers with three (3) to five (5) levels of undergrounding parking structure.

This report addresses the hydrogeological aspects of the proposed project. Reports for the Preliminary Geotechnical Investigation, Phase One and Phase Two Environmental Site Assessments will be issued under separate covers. The field investigation for the geotechnical, environmental and hydrogeological investigations was carried out concurrently.

It should be noted that the Preliminary Geotechnical and Hydrogeological investigations are for due diligence purpose. No design details were provided to BIG during this investigation. Once the design is available, 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.

1.2 Project Objectives

The main objectives of the Hydrogeological Investigation were to:

a) Establish the local hydrogeological settings of the Site;
b) Provide assessment of anticipated construction dewatering flow rates for a generic construction scenario;
c) Estimate foundation sub-drain discharge volumes, if applicable;
d) Assess groundwater quality and compare the results to Region of Halton Combined/Sanitary Sewer and City of Burlington Storm Sewer Use By-Law parameters;
e) Qualitatively assess the potential impact to the nearby water body and comment on future regulatory agency involvement; 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) Background desktop review of pertinent geological and hydrogeological resources;
b) Review of the Ministry of Environment, Conservation and Parks (MECP) Water Well Records;
c) Advancement of eight (8) boreholes (BH1 to BH8) at the Site up to a maximum depth of 25.3 m bgs and installation of monitoring wells (MW1 to MW8);
d) Perform single well response tests (SWRT) at selected monitoring wells to assess the hydraulic characteristics of the bedrock at the Site;
e) Complete groundwater level measurements at monitoring wells;

f) Evaluate the information of groundwater level measurements and groundwater quality;
g) Collection of one (1) groundwater sample for laboratory testing and compare it against the Region of Halton Combined/Sanitary Sewer and City of Burlington Storm Sewer Use By-Law parameters;
h) Assess groundwater discharges during construction phases;
i) Assess foundation sub-drain discharge volumes, if applicable; and,
j) Prepare a Preliminary Hydrogeological Investigation Report.

2 Regional Setting

2.1 Regional Physiography

The Ontario Geological Survey Map P. 2204, indicates the Site lies in the Iroquois Plain physiographic region of Southern Ontario known as the 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 where much higher due to ice blockage in the St. Lawrence waterway. This created the glacial Lake Iroquois which was up to 60 m higher in elevation in the Toronto area than the current Lake Ontario water levels. The Iroquois Shoreline that coincided with this elevated lake, terminated just above St. Clair Avenue West.

2.2 Regional Geology

The surficial geology of the immediate area around the Site is mostly described as coarse-textured glaciolacustrine deposits, consisting of sand, gravel, minor silt, clay and littoral deposits: and a small section between 1062 and 1074 Cooke Boulevard is described as shore bluff or scarp. 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.

2.3 Regional Hydrogeology

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

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

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

3 Site Setting

3.1 Site Topography and Drainage

The Site is irregular in shape and has an area of approximately 0.71 hectares (1.75 acres). The Site is currently occupied by two (2) single storey slab-on-grade industrial/commercial buildings (Site buildings). The areas surrounding the Site building are covered with asphalt and landscaped areas. The topography of the Site generally slopes to the south/southeast and based on the borehole logs, the ground elevation ranges between 104.41 m and 101.22 m above sea level (asl). Precipitation that falls on the Site is inferred to predominantly be directed to the catch basins that are located in the parking lot.

3.2 Local Surface Water Features

The Site does not feature any surface water bodies on the Site. The closest surface water body to the Site a tributary of Grindstone Creek, located approximately 270 m north of the Site, Lake Ontario is located approximately 1.1 km south/southeast of the Site. The Site is situated within the West Aldershot watershed and is not part of a Conservation Halton regulated area.

3.3 Ministry of Environment, Conservation and Parks Water Well Review

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

The MECP WWR database indicated 59 well records within 500 m radius of the Site. All identified wells are shown on Figure 4. A summary of the Water Well Records is included in Appendix B, Table B-1. A review of the records indicated that the majority of the wells were classified for observation well, monitoring well and test hole purposes within 500 m radius of the Site. Given the area is serviced by municipal system, no private well water user is expected.

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

The MECP also maintains a database of all active and expired Permit to Take Water (PTTW) and Environmental Activity and Sector Registry (EASR) items related to construction dewatering and pumping test. There are three (3) expired PTTW, four (4) active PTTW registrations and one (1) EASR registrations within 1 km of the Site and are summarized in Table B-2, Appendix B. The location for each registration is shown on Figure 5.

4 Field Program

4.1 Borehole and Monitoring Well Details

BIG advanced eight (8) boreholes (BH1 to BH8) to a maximum depth of 25.3 m bgs between May 26 and June 2 and June 25, 2021 and instrumented all boreholes with monitoring wells (BH/MW1 to BH/MW8). The boreholes were advanced by using a truck mounted solid and 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. The borehole records and monitoring well construction detail are included in Appendix A.

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

4.2 Site Specific Overburden Geology

The borehole locations are shown on Figure 6 and detailed subsurface 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 predominately based on BIG's investigation, however, where applicable soil conditions encountered during previous investigation by others are included. 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
Ground Cover	All boreholes were advanced through existing asphalt pavement consisting of approximately 50-100 mm thick asphalt concrete over 200 to 250 mm thick granular bases.
Fill	Below the asphalt pavement in all boreholes, existing fill generally consisting of clayey silt/silty clay, silty sand, and sand with gravel was encountered in all boreholes that extended to depths varying between 0.3 and 6.1 m bgs. Fill also contained occasional cobble and boulders, pieces of concrete and bricks, etc. A 0.6 m thick layer of light weight concrete was also encountered from 4.6 to 5.2 m bgs in BH/MW2.
Silty Sand Till	Below existing fill in boreholes BH/MW1 and BH/MW3, a glacial deposit of native silty sand till was encountered that extended to the depths varying between 6.1 to 7.6 m bgs. Silty sand till also contained trace clay to some clay, and trace gravel.
Upper Clayey Silt/Silty Clay Till	Below existing fill in boreholes BH/MW2, BH/MW4, BH/MW5, BH/MW6, BH/MW7 and BH/MW8; below sandy silt till in borehole BH/MW3; another native deposit of upper clayey silt/silty clay till was encountered that extended to depths varying between 4.6 to 10.7 m bgs. Clayey silt till deposit also contained trace sand and trace gravel.
Sand	Below silty sand till in borehole BH/MW1 and below upper clayey silt/silty clay till in boreholes BH/MW2 to BH/MW8, a cohesionless deposit of sand was encountered that extended to depths varying between 6.7 and 12.5 m bgs. Sand deposit also contained trace silt and trace gravel. Borehole BH/MW1 was terminated within this deposit.

Layer	Description
Lower Clayey Silt/Silty Clay Till	Below sand deposit in BH/MW2 to BH/MW8, another glacial deposit of native clayey silt/silty clay till was encountered that extended to depths varying between 15.5 and 18.3 m bgs. This lower deposit also contained trace to some sand and trace gravel. Occasional fragments of Shale were also encountered within this deposit. Boreholes BH/MW3, BH/MW5, BH/MW6, and BH/MW8 were terminated within this deposit.
Shale Bedrock	Below clayey silt till, a highly weathered reddish brown and/or grey Shale bedrock was encountered in BH/MW2, BH/MW4 and BH/MW7 that extended to the borehole termination depths varying between 19.8 to 25.3 m bgs.

4.3 Water Level Monitoring

Water levels at all monitoring well locations were recorded after installation. A summary of all available water level observations is included in Table 4-2. Groundwater was observed in all monitoring wells on June 10, 2021 and depths to the groundwater ranged from 8.71 m to 11.89 m bgs. The shallow well BH/MW1 was observed as dry, BH/MW2, BH/MW3, BH/MW5, BH/MW6 and BH/MW8 were observed with groundwater elevations of 93.20 m to 92.47 m asl. The deep wells, BH/MW4 and BH/MW7 were observed with groundwater elevations of 93.75 and 92.22 m asl.

An interpreted shallow groundwater contour map for the water level measurements recorded on June 10, 2021 are included as Figure 8. Based on the water level measurements obtained, the inferred direction of shallow groundwater flow across the Site is interpreted to be to the south/southwest 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)	June 10, 2021	
			Water Level (m bgs)	Elevation (m asl)
BH/MW1	103.48	6.10	Dry	Dry
BH/MW2	104.11	12.20	10.91	93.20
BH/MW3	104.41	15.20	11.89	92.52
BH/MW4	103.72	21.30	9.97	93.75
BH/MW5	102.64	13.70	10.13	92.51
BH/MW6	101.22	12.20	8.71	92.51
BH/MW7	101.41	22.90	9.19	92.22
BH/MW8	102.42	13.70	9.95	92.47

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 solution for unconfined conditions. The semi-log plots for normalized drawdown versus time are included in Appendix C.

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

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

Monitoring Well	Well Depth (m bgs)	Hydraulic Conductivity (m/s)
BH/MW2	12.20	1.04×10^{-5}
BH/MW4	21.30	7.67×10^{-8}
BH/MW5	13.70	1.15×10^{-4}
BH/MW7	22.90	6.65×10^{-8}
BH/MW8	13.70	3.16×10^{-5}
Geometric mean K value (except deep wells) (m/s)		**3.35×10^{-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, it was difficult to measure recovery in select wells. 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 or City of Burlington Storm Sewer during dewatering activities, a groundwater sample was collected from BH/MW3 on June 11, 2021.

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

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

For the assessment purposes, the analytical results were compared to Table 1 – Limits for Storm Sewer Discharge (By-Law No. 86-2002) of the Corporation of City of Burlington; and Table 2 – Limits for Sanitary and Combined Sewer Discharge (By-Law No. 2-03) of the Regional Municipality of Halton.

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

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

When compared against the Table 2 – Limits for Sanitary and Combined Sewer Discharge, the sample indicated exceedance for total suspended solids (TSS) and total iron (Fe). A summary of the exceedance is provided in Table 4-4.

Table 4-4: Summary of Analytical Results

Parameter	Limits for Storm Sewer Discharge (mg/L) (Table 1)	Limits for Sanitary and Combined Sewer Discharge (mg/L) (Table 2)	Concentration for BH/MW3 (mg/L) (June 11, 2021)
Total Suspended Solids (TSS)	-	350	**480**
Total Iron (Fe)	-	50	**51**

Notes:
***Bold** indicates concentration exceeds the Sanitary and Combined Sewer Discharge Limit.*

If the groundwater encountered during excavation activities is discharged to the Region of Halton sanitary and combined sewer, a treatment will be required. Given there is no chemical criteria for City of Burlington storm sewer, consultation with the City of Burlington is required prior to discharge any water to the sewer system.

5 Temporary Construction Dewatering

5.1 Dewatering Estimate Consideration

Below silty sand till in borehole BH/MW1 and below upper clayey silt/silty clay till in boreholes BH/MW2 to BH/MW8, a cohesionless deposit of sand/silty sand was encountered that extended to depths varying between 6.7 and 18.7 m bgs. The thickness of the sand deposit in the northern portion of the Site is approximately 1.5 m and the thickness of the sand deposit in the southern portion of the Site is approximately 8.8 m. Given the thickness of the sand deposit at the Site, significant amount of groundwater can be produced.

At the time of conducting slug test, groundwater recovery was observed to be rapid, it was difficult to measure recovery in select wells. 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.

5.2 Construction Dewatering Requirements

It is BIG's understanding that the proposed re-development at the Site will consist of two (2) high rise towers with three (3) to five (5) levels of undergrounding parking structure. It is anticipated that foundation elevation for three (3) to four (4) levels of underground parking structure will be between approximately 88 and 91 m asl and the foundation elevation for five (5) levels of underground parking structure will be approximately below 87 m asl. The foundation for five (5) levels of underground parking is assumed approximately 18 m below ground.

It should be noted that assumptions for construction dewatering calculation in this report are for due diligence purpose, no design details were provided. Once the design is available, 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, both in shallow and deep monitoring wells, observed on June 10, 2021 were found to be varying between elevations of 93.75 m and 92.22 m asl. For conservative purposes, the construction dewatering calculation is based on an open cut excavation at the present time. To excavate under dry conditions, the water level is anticipated to be lowered at least to a minimum of approximately 1.0 m below the foundation elevation.

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

5.3 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	3-4 Levels of Underground Parking	5 Levels of Underground Parking	Notes
Lowest Surface Elevation (m asl)	101.22	101.22	Based on the borehole logs
Foundation Elevation (m asl)	88.0	83.22	3-4 levels is based on the Geotechnical Investigation prepared by BIG dated July 2021 5 levels is assumed 18 m below ground surface
Dewatered Elevation Target (m asl)	87.0	82.22	Approximate 1 m below footing elevation
Groundwater Elevation (m asl)	93.75	93.75	Highest groundwater elevation on June 10, 2021
Estimated Excavation Area	120 m x 55 m	120 m x 55 m	Based on area extent equivalent
Hydraulic Conductivity (m/s)	3.35×10^{-5}	3.35×10^{-5} and 7.67×10^{-8}	Geometric mean K for 3-4 levels and highest K in bedrock for 5 levels

5.4 Dewatering Flow Rate Equation

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

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

Where:

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

It is expected that the initial dewatering rate will be higher in order to remove groundwater from within the overburden 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.

5.5 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. As a result, the distance of influence calculated using Sichardt equation is used to provide a representative flow rate calculation, but it is not precise in determining the actual radius influenced by pumping.

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

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

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 68 m to 74 m from the edge of the excavation for linear flow. The ROI calculation is provided in Appendix E.

5.6 Results of Construction Dewatering Flow Rate Estimates

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

Table 5-2 Summary of Construction Dewatering Flow Rate Estimate

Underground Parking Structure	Construction Dewatering Flow Rate Without Safety Factor (L/day)	Peak Construction Dewatering Flow Rate Including Safety Factor of 2 (L/day)
3-4 Levels	538,000	1,076,000
5 Levels	575,000	1,150,000

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

The peak construction dewatering flow rate includes a factor of safety of two (2) to account for accumulation of rainfall, seasonal fluctuations in the groundwater table, flow from beddings of existing sewers, and variation in hydrogeological properties beyond those encountered during the course of this study. This total dewatering flow rate also provides additional capacity for the dewatering contractors. Given that the predicted dewatering volume exceeds the 400,000 L/day limit, a PTTW for construction dewatering will be required.

Given the predicted large construction 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 dewatering discharges, a consultation with the City will be required for the sewer capacity and any other constrains of accepting the water. If the Region of Halton sanitary and combined sewer is considered, a treatment prior to discharge is required. 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.

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.

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 foundation elevation. Table 6-1 presents the assumptions used to calculate the long-term drainage rate estimates.

It should be noted that assumptions for long-term dewatering calculation in this report are for due diligence purpose, no design details were provided. Once the design is available, 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.

Table 6-1 Dewatering Estimate Assumptions

Input Parameter	3-4 Levels of Underground Parking	5 Levels of Underground Parking	Notes
Surface Elevation (m asl)	101.22	101.22	Based on the borehole logs
Foundation Elevation (m asl)	88.0	83.22	3-4 level is based on the Geotechnical Investigation prepared by BIG dated July 2021 5 level is assumed 18 m below ground surface
Groundwater Elevation (m asl)	93.75	93.75	Highest deep groundwater elevation on June 10, 2021
Sub-drain Elevation Target (m asl)	87.5	82.72	Assumed 0.5 m below the P5 footing elevation
Drainage Dimensions	120 m x 55 m	120 m x 55 m	Based on area extent equivalent
Hydraulic Conductivity (m/s)	1.04×10^{-5}	1.04×10^{-5}	Applicable K value for the overburden

6.2 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

Underground Parking Structure	Long-Term Peak Flow Rate (L/day)	Notes
3-4 Levels	214,000	Long term sub-drain flow value rounded based on Dupuit's equation including flow from all sides. Safety factor of 2 was used.
5 Levels	336,000	

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

As indicated in the Geotechnical Investigation prepared by BIG dated July 2021, the foundation elevation for three (3) to four (4) levels of underground parking is considered at approximately 88 m asl. This

assumption is based on the soil around 88 m asl consists of clayey silt. If sand at deeper elevation is identified in the future investigation, the long-term dewatering estimates should be re-evaluated.

Given the predicted large 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 long-term dewatering discharges, a consultation with the City will be required for the sewer capacity and any other constrains of accepting the water. If the Region of Halton sanitary and combined sewer is considered, a treatment prior to discharge is required. 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.

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 urban area 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 to Nearby Structures

There is a possibility of inducing settlement to neighboring buildings, utilities and underground structures/infrastructure when lowering water levels or depressurizing an aquifer. It is considered a best practice to instigate a pro-active monitoring program in order to identify any potential areas of concern and the need and type of monitoring required. Utilities, and transit owners may have stringent monitoring requirements, which will have to be adhered to. It should be noted that the likelihood for impacts are minimal given that the zone of influence is relatively small.

8 Water Taking and Discharge Permits

8.1 EASR

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 above the EASR limit, a Permit to Take Water as per O.Reg.387/04 would be required.

9 Conclusions

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

a) It is BIG's understanding that the proposed re-development at the Site will consist of two (2) high rise towers with three (3) to five (5) levels of undergrounding parking structure;
b) It should be noted that the Preliminary Geotechnical and Hydrogeological investigations are for due diligence purpose. No design details were provided to BIG during this investigation. Once the design is available, 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;
c) The Site is located within a physiographic region within the Iroquois Plain known as the sand plains;
d) The surficial geology of the immediate area around the Site is described as coarse-textured glaciolacustrine deposits, consisting of sand, gravel, minor silt, clay and littoral deposits: and a small section between 1062 and 1074 Cooke Boulevard is described as shore bluff or scarp;
e) The MECP WWR database indicate that there are 59 well records registered with the database within 500 m of the Site. Given the area is serviced by municipal system, no private well water user is expected;
f) Groundwater was observed in all monitoring wells on June 10, 2021 and depths to the groundwater ranged from 8.71 m to 11.89 m bgs. The shallow well BH/MW1 was observed as dry, the shallow wells BH/MW2, BH/MW3, BH/MW5, BH/MW6 and BH/MW8 were observed with groundwater elevations of 92.47 m to 93.20 m asl. The deep wells, BH/MW4 and BH/MW7 were observed with groundwater elevations of 93.75 and 92.22 m asl;
g) Based on the water level measurements obtained, the inferred direction of shallow groundwater flow across the Site is interpreted to be to the south/southwest direction;
h) The estimated hydraulic conductivity of the soil ranges from 1.15×10^{-4} m/s to 6.65×10^{-8} m/s with a geometric mean of 3.35×10^{-5} m/s;
i) At the time of conducting slug test, groundwater recovery was observed to be rapid, it was difficult to measure recovery in select wells. 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 1,076,000 L/day for three (3) to four (4) levels of underground parking and 1,150,000 L/day for five (5) levels of underground parking;
k) Based on the assumptions outlined in this report, the cumulative contribution to the foundation drains is 214,000 L/day for three (3) to four (4) levels of underground parking and 336,000 L/day for five (5) levels of underground parking;
l) A Permit to Take Water (PTTW) will be required for both short-term and long-term discharges;
m) The laboratory CofA shows that no exceedance under Table 1 – Limits for Storm Sewer Discharge;
n) When compared against Table 2 – Limits for Sanitary and Combined Sewer Discharge, the sample indicated exceedances for total suspended solids (TSS) and total iron (Fe);
o) 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. If the Region of Halton sanitary and combined sewer is considered, a treatment prior to discharge is required. 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; and,

p) 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.

This report was prepared for the exclusive use of Camarro Developments Inc. This report may not be reproduced in whole or in part, without the prior written consent of BIG, or used or relied upon in whole or in part by other parties for any purpose. Any use which a third party makes of this report, or any part thereof, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. BIG accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on 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.

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

Prem Manicks, P.Geo.
Partner



11 References

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

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The Regional Municipality of Halton (2001). By-Law No.2-03

FIGURES



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LEGEND

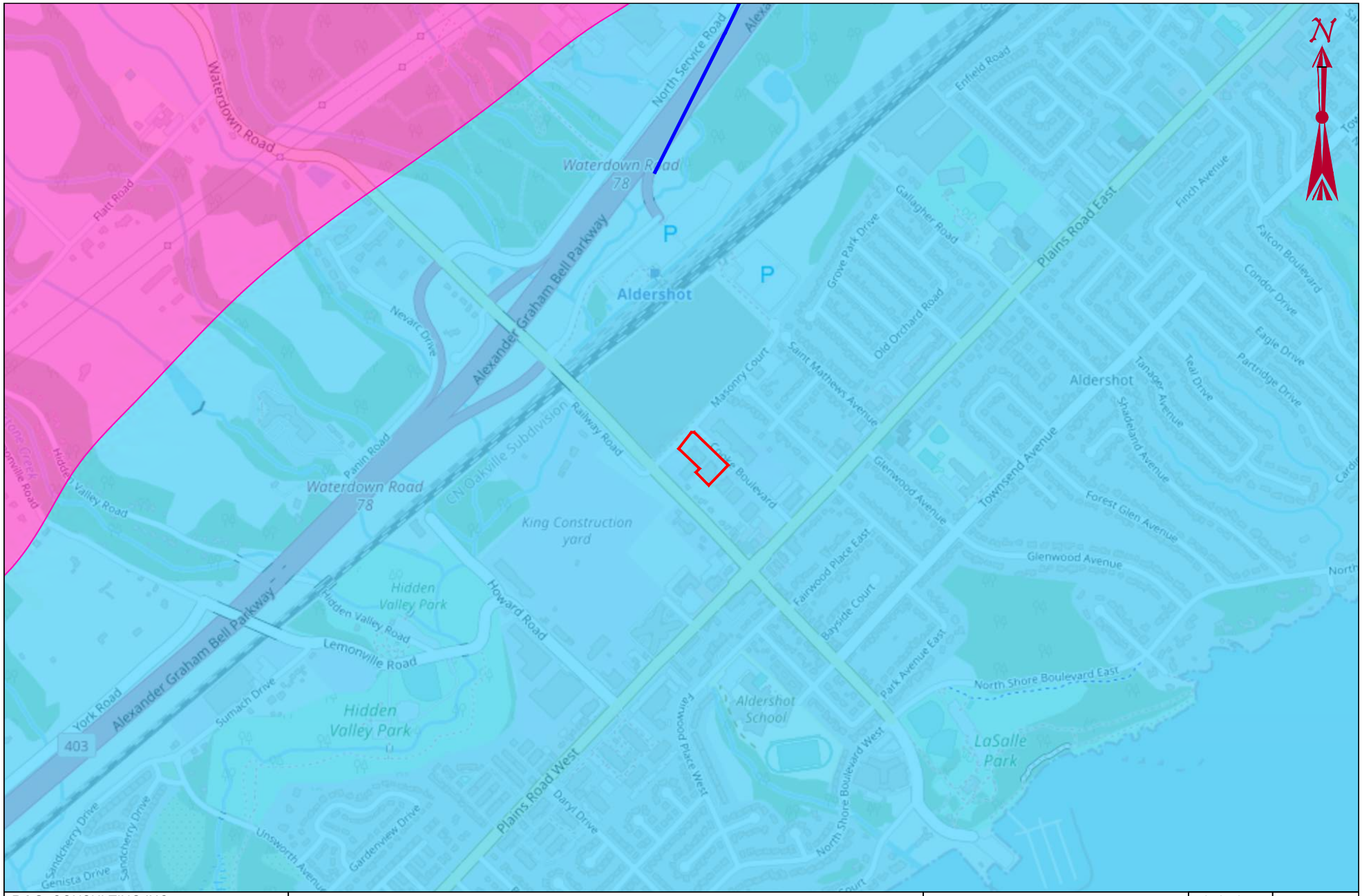
SITE BOUNDARY

IMAGERY OBTAINED FROM TOPORAMA, NATURAL RESOURCES CANADA,2021

TITLE AND LOCATION

SITE LOCATION PLAN
HYDROGEOLOGICAL INVESTIGATION
1062 AND 1074 COOKE BOULEVARD,
BURLINGTON, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-462A	L.C.K.
SCALE	CK.
AS NOTED	E.L.
DATE	FIG NO.
JULY 2021	1



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LEGEND

- SITE BOUNDARY
- IROQUOIS PLAIN
- NIAGARA ESCARPMENT
- SHORECLIFF

SCALE

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

NOTES:

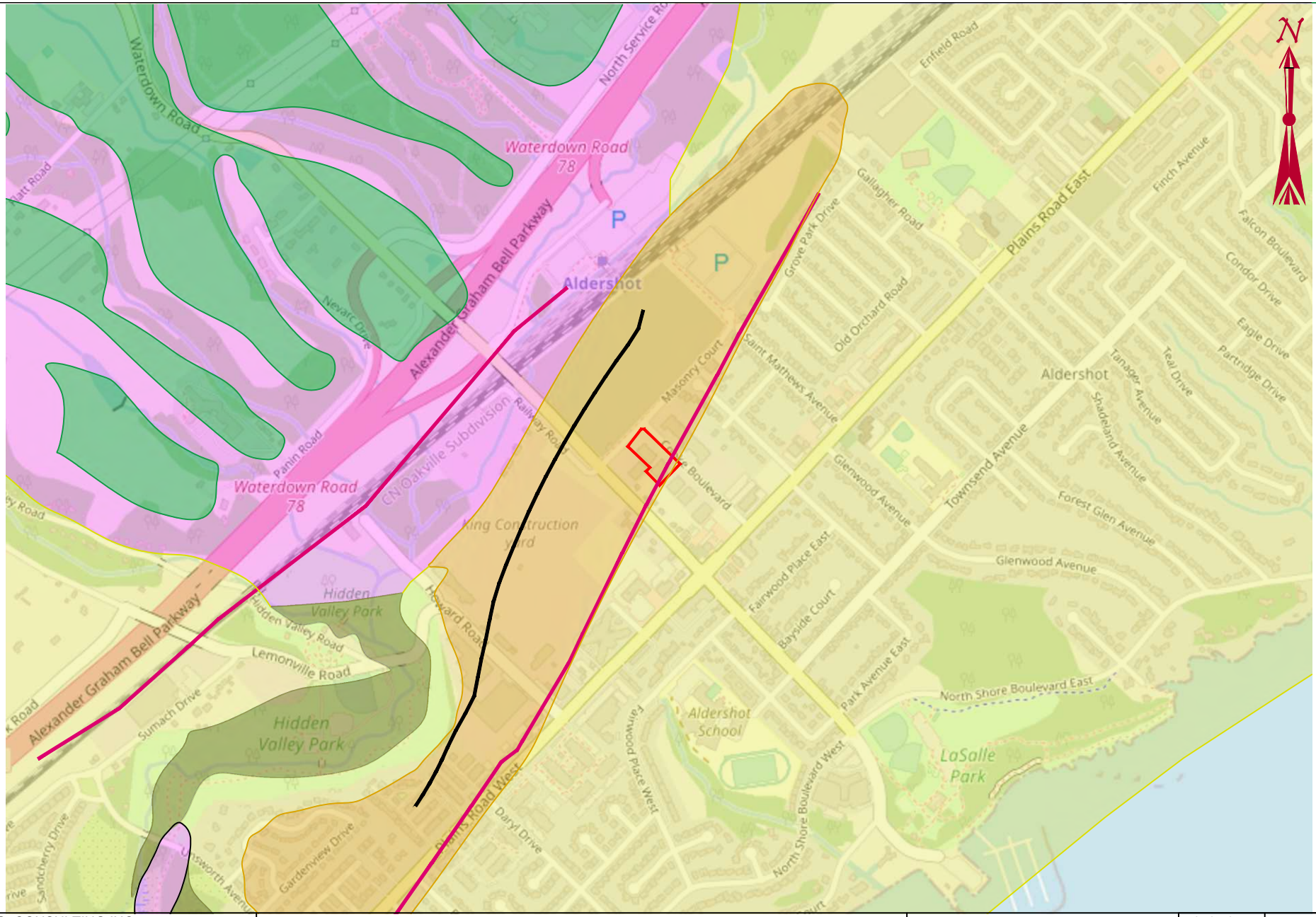
1. PHYISIOGRAPHIC REGIONS PRODUCED BY MINISTRY OF ENERGY, NORTHERN DEVELOPMENT AND MINES, 2021
2. IMAGERY OBTAINED FROM OPENSTREETMAP, 2016

TITLE AND LOCATION

PHYSIOGRAPHIC REGIONS OF SOUTHERN ONTARIO

HYDROGEOLOGICAL INVESTIGATION
1620 AND 1740 COOKE BOULEVARD, BURLINGTON, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-462A	L.C.K.
SCALE	CK.
AS NOTED	E.L.
DATE	FIG NO.
JULY 2021	2



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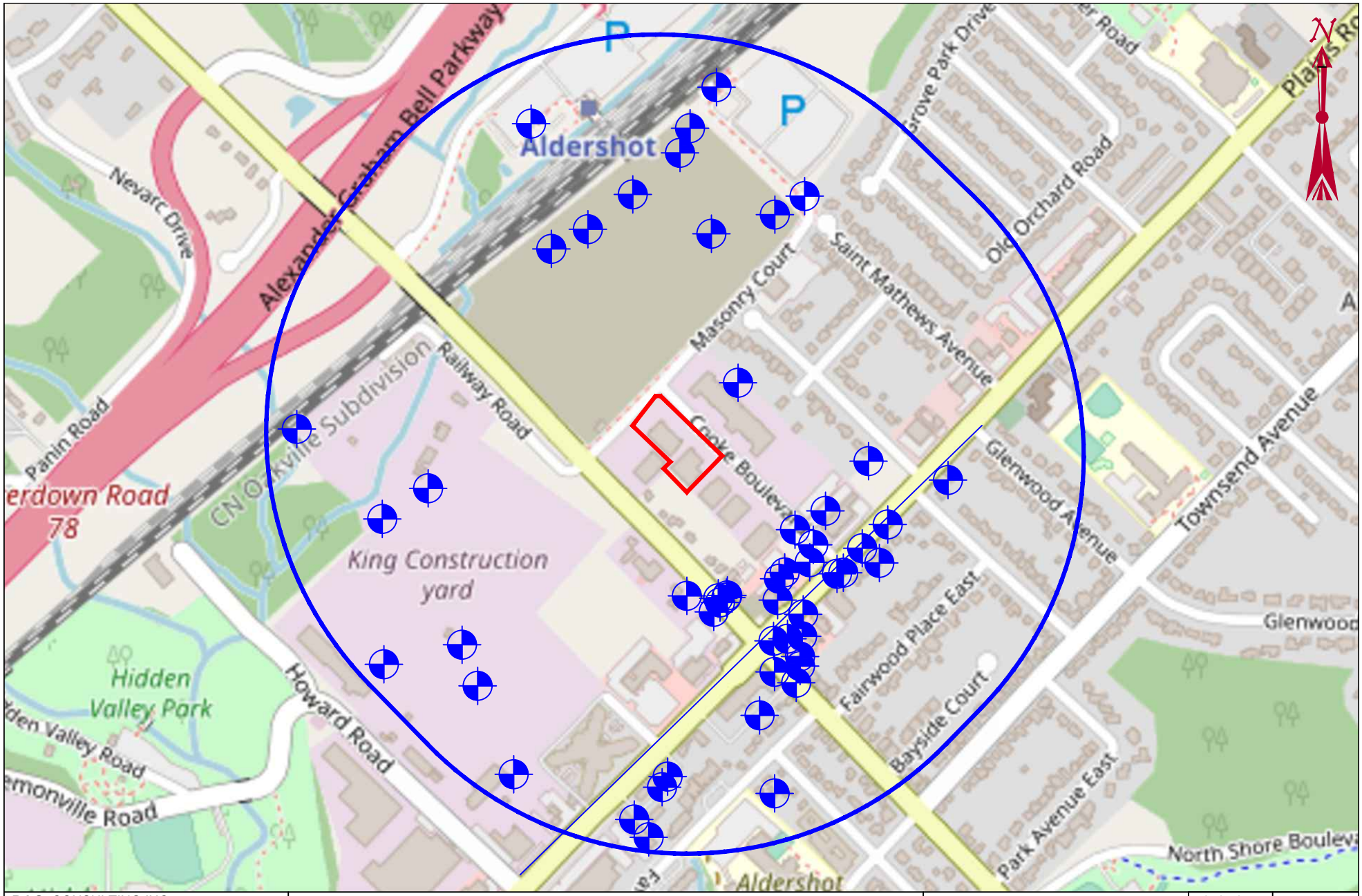
- SITE BOUNDARY
- TILL
- PALEOZOIC BEDROCK
- 9b COARSE-TEXTURED GLACIOLACUSTRINE DEPOSITS
- 9 COARSE-TEXTURED GLACIOLACUSTRINE DEPOSITS
- MODERN ALLUVIAL DEPOSITS
- SHORE BLUFF OR SCARP
- BEACH RIDGES AND NEAR SHORE BARS

NOTES:
1. SURFICIAL GEOLOGY PRODUCED BY MINISTRY OF ENERGY, NORTHERN DEVELOPMENT AND MINES, 2021
2. IMAGERY OBTAINED FROM OPENSTREETMAP, 2016

TITLE AND LOCATION

SURFICIAL GEOLOGY OF SOUTHERN ONTARIO
HYDROGEOLOGICAL INVESTIGATION
1062 AND 1074 COOKE BOULEVARD, BURLINGTON, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-462A	L.C.K.
SCALE	CK.
AS NOTED	E.L.
DATE	FIG NO.
JULY 2021	3



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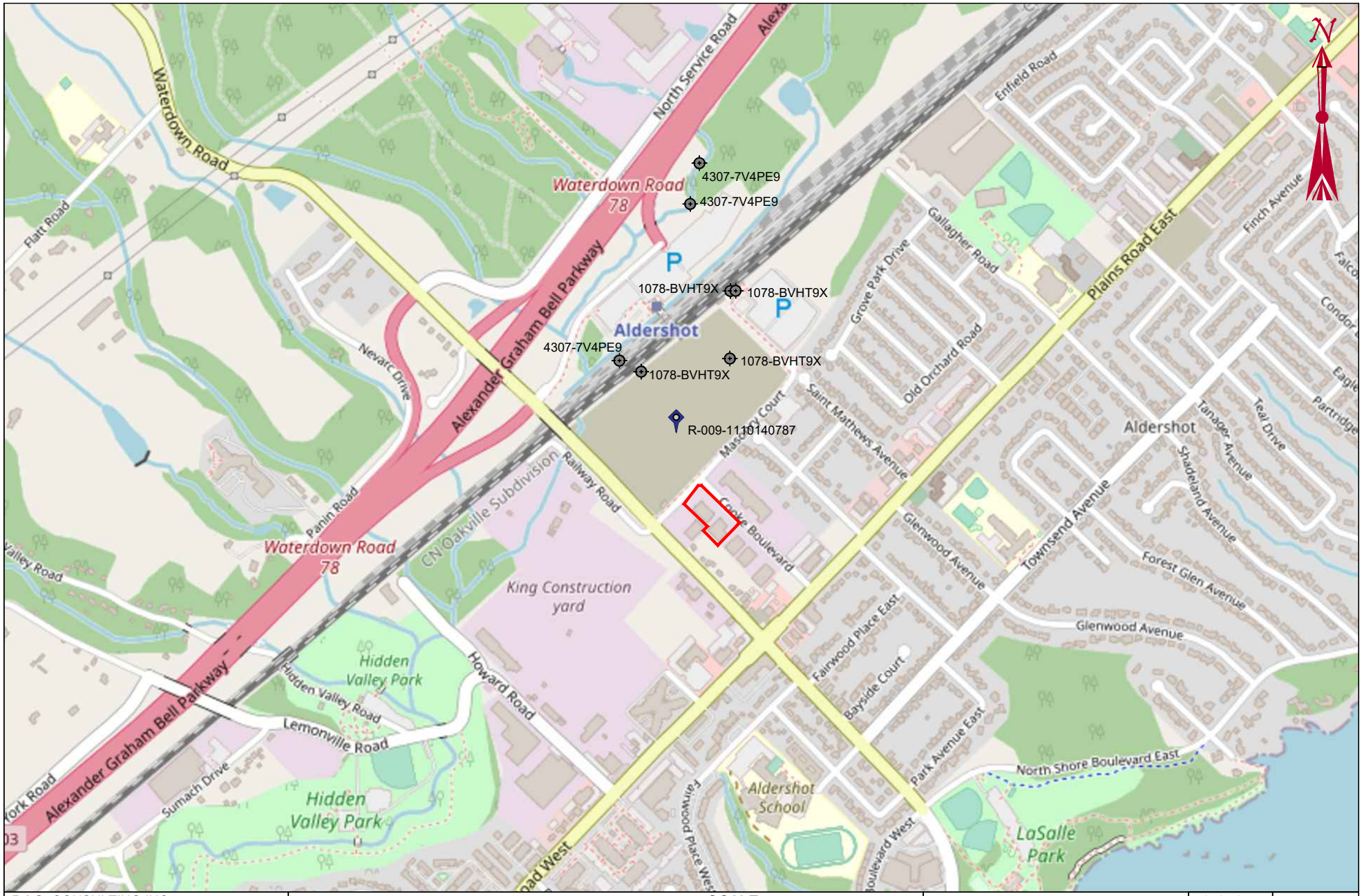
- SITE BOUNDARY
- WELL RECORD STUDY BOUNDARY
- WELL RECORD LOCATION (2021)

IMAGERY OBTAINED FROM OPEN STREET MAP, 2016

TITLE AND LOCATION

MECP WATER WELL RECORD LOCATIONS
HYDROGEOLOGICAL INVESTIGATION
1062 AND 1074 COOKE BOULEVARD, BURLINGTON, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-462A	L.C.K.
SCALE	CK.
AS NOTED	E.L.
DATE	FIG NO.
JULY 2021	4



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LEGEND

- SITE BOUNDARY
- EASR RECORD LOCATION
- PTTW RECORD LOCATION

SCALE

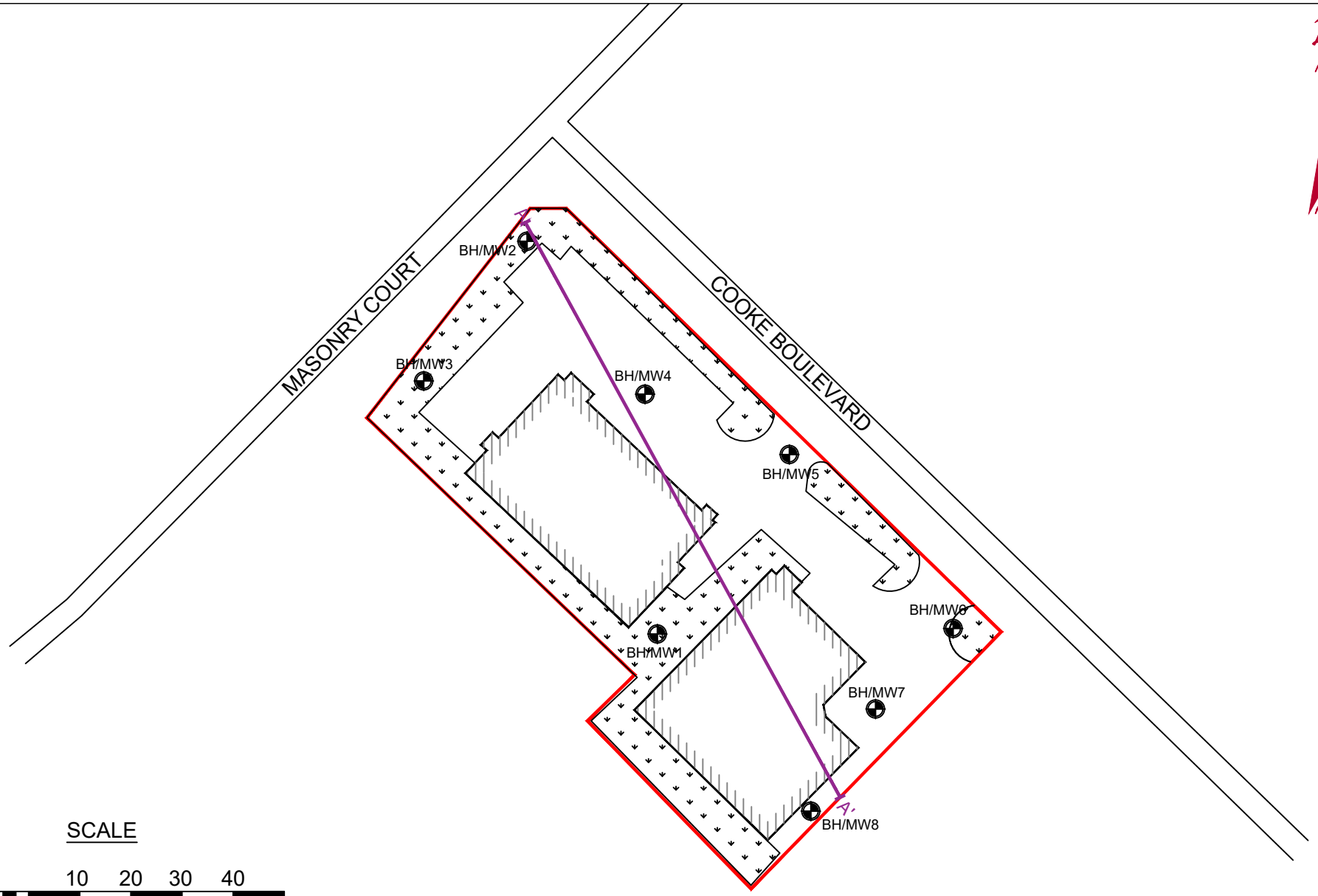
100m 0m 100m 200m 300m 400m 500m

IMAGERY OBTAINED FROM OPEN STREET MAP, 2016

TITLE AND LOCATION

MECP WATER WELL RECORD LOCATIONS
HYDROGEOLOGICAL INVESTIGATION
1062 AND 1074 COOKE BOULEVARD, BURLINGTON, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-462A	L.C.K.
SCALE	CK.
AS NOTED	E.L.
DATE	FIG NO.
JULY 2021	5



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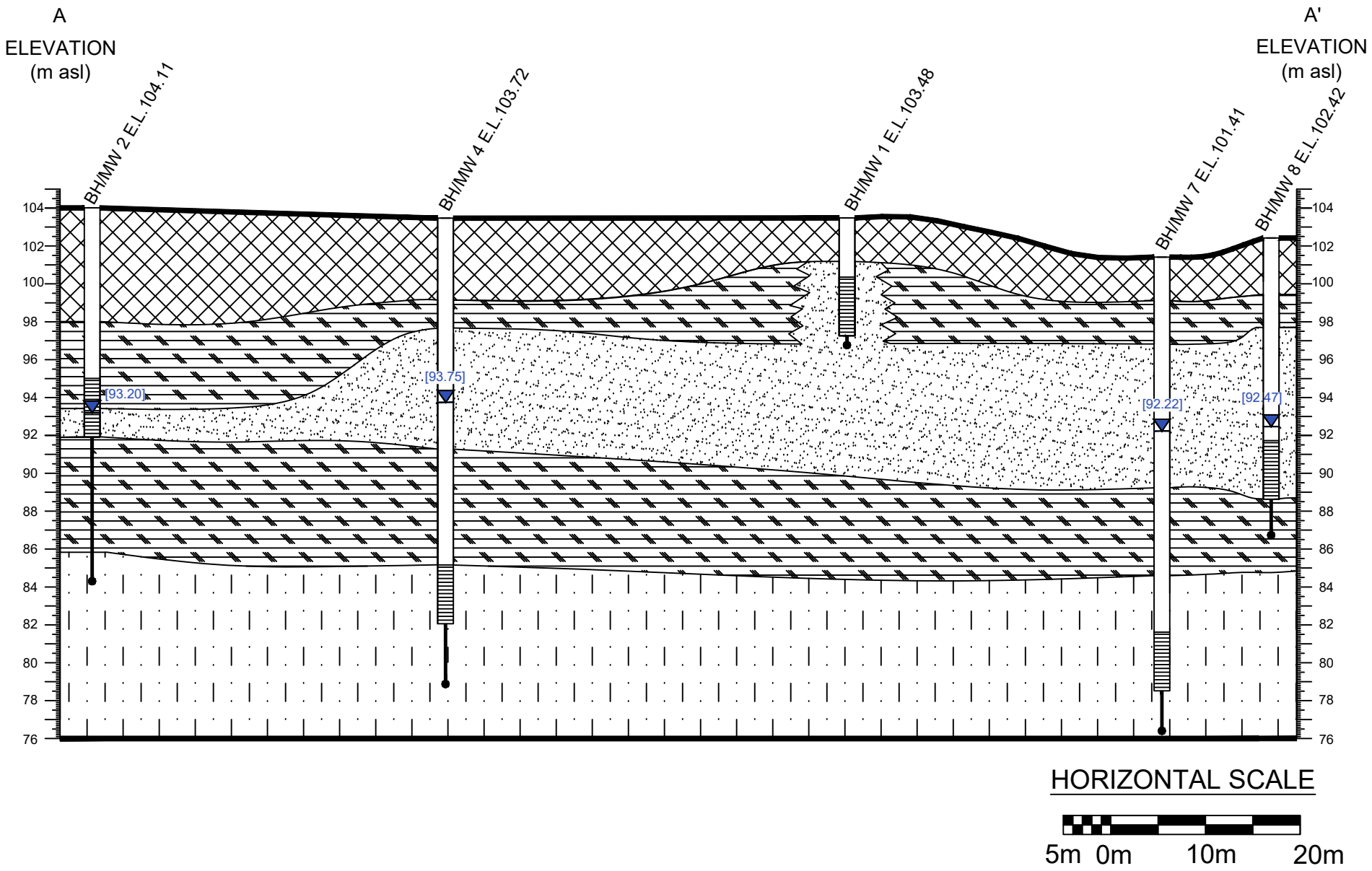
- SITE BOUNDARY
- BUILDING FOOTPRINT
- LOCATION OF BOREHOLE/MONITORING WELL (BIG, 2021)
- A A' GEOLOGICAL CROSS SECTION

TITLE AND LOCATION

BOREHOLE/MONITORING WELL LOCATION PLAN HYDROGEOLOGICAL INVESTIGATION

1062 AND 1074 COOKE BOULEVARD, BURLINGTON, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-462A	L.C.K.
SCALE	CK.
AS NOTED	E.L.
DATE	FIG NO.
JULY 2021	6



HORIZONTAL SCALE

5m 0m 10m 20m

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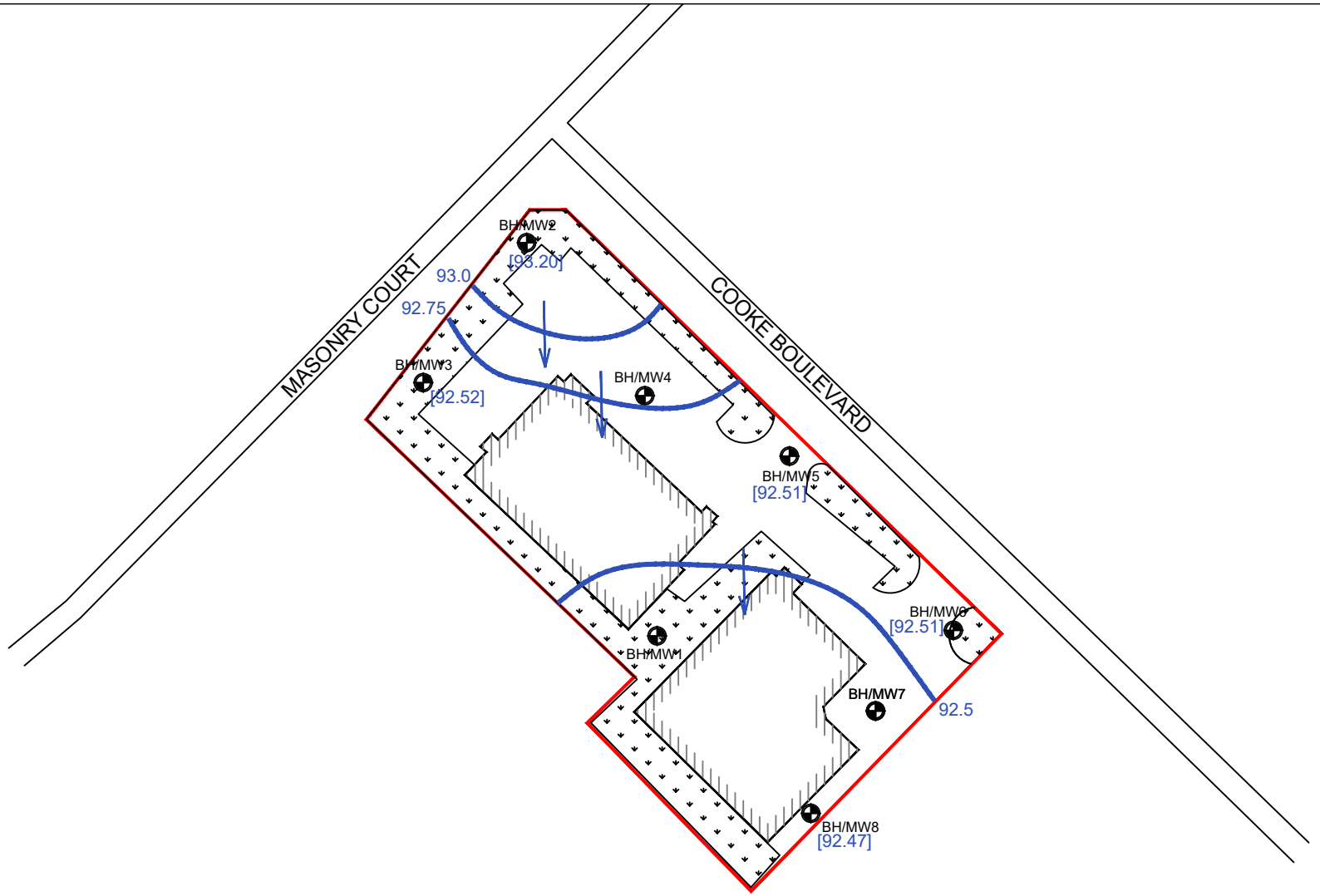
LEGEND

- ASPHALT / GRANULAR
- FILL
- CLAYEY SILT / SILTY CLAY TILL
- SAND / SILTY SAND TILL
- BEDROCK
- WATER LEVEL
- [xx.xx] WATER LEVEL MEASUREMENT (JUNE 10, 2021)

TITLE AND LOCATION

GEOLOGICAL CROSS SECTION A-A'
HYDROGEOLOGICAL INVESTIGATION
1062 AND 1074 COOKE BOULEVARD, BURLINGTON, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-462A	L.C.K.
SCALE	CK.
AS NOTED	E.L.
DATE	FIG NO.
JULY 2021	7



SCALE

10m 10 20 30 40

0m 50m

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LEGEND

- SITE BOUNDARY
- BUILDING FOOTPRINT
- LOCATION OF BOREHOLE/MONITORING WELL (BIG, 2021)
- [152] GROUNDWATER ELEVATION (m asl)
- INTERPRETED DIRECTION OF UNDERWATER GROUND FLOW
- GROUNDWATER CONTOUR
- [151.73] WATERLEVEL MEASUREMENT (JUNE 10, 2021)

TITLE AND LOCATION

SHALLOW GROUNDWATER CONTOUR MAP
HYDROGEOLOGICAL INVESTIGATION
1062 AND 1074 COOKE BOULEVARD, BURLINGTON, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-462A	L.C.K.
SCALE	CK.
AS NOTED	E.L.
DATE	FIG NO.
JULY 2021	8

APPENDIX A: BOREHOLE LOGS

RECORD OF BOREHOLE No. BH/MW1

Project Number:	BIGC-ENV-462A	Drilling Location:	See Borehole Location Plan	Logged by:	KK
Project Client:	Camarro Developments Inc.	Drilling Method:	150 mm SSA+HSA	Compiled by:	KK
Project Name:	Preliminary Geotechnical Investigation	Drilling Machine:	Truck Mounted Drill	Reviewed by:	SS
Project Location:	1062 & 1074 Cooke Boulevard, Burlington, Ontario	Date Started:	26 May 21	Date Completed: 26 May 21	Revision No.: 0, 29/6/21

Geodetic Ground Surface Elevation: 103.48 m

Lithology Plot	DESCRIPTION	Elevation (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	Depth (m)
	ASPHALT PAVEMENT: 50 mm asphalt over 250 mm granular bases	103.18 / 0.3	SS	1	67	19	
	FILL: silty sand, trace clay, trace gravel, trace rootlets, brown, moist, compact - rock		SS	2	70	20	1
	- very moist, loose	101.19	SS	3	67	8	2
	SILTY SAND TILL: trace to some clay, trace gravel, fragments of shale, reddish brown, moist to very moist, dense to very dense	2.3	SS	4	62	34	3
			SS	5	84	53	4
	- compact	97.39	SS	6	84	18	5
	SAND: trace silt, trace gravel, brown, very moist, compact	6.1 / 96.78	SS	7	84	19	6
	End of Borehole	6.7					

Notes:
1. Borehole open and dry upon completion of drilling.
2. Borehole dry on June 10,2021.

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

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

INSTRUMENTATION INSTALLATION

COMMENTS

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Groundwater depth on completion of drilling: Dry m.

Groundwater depth observed on 10/06/2021 at a depth of: Dry 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'.

RECORD OF BOREHOLE No. BH/MW2

Project Number:	BIGC-ENV-462A	Drilling Location:	See Borehole Location Plan	Logged by:	KK
Project Client:	Camarro Developments Inc.	Drilling Method:	150 mm SSA+HSA	Compiled by:	KK
Project Name:	Preliminary Geotechnical Investigation	Drilling Machine:	Truck Mounted Drill	Reviewed by:	SS
Project Location:	1062 & 1074 Cooke Boulevard, Burlington, Ontario	Date Started:	26 May 21	Date Completed: 27 May 21	Revision No.: 0, 29/6/21

Geodetic Ground Surface Elevation: 104.11 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 20 40 60 80 Liquid	INSTRUMENTATION INSTALLATION	COMMENTS
	ASPHALT PAVEMENT: 50 mm asphalt over 250 mm granular bases 103.81 / 0.3	SS	1	46	11	0	104		9		
	FILL: silty clay, trace sand, trace gravel, reddish brown, moist, stiff to hard	SS	2	79	15	1	103		11		
		SS	3	89	79	2	102		11		
		SS	4	0	50/3			50/3			
	- rubble					3	101				
	- silty sand, trace clay, trace gravel, reddish brown, very moist to wet, loose	SS	5	70	9				39		
	- sand and gravel, wet, grey, very dense	SS	6	62	42	4	100		20		
	- light weight concrete	SS	7	87	12	5	99				
	98.02					6	98				
	SILTY CLAY/ CLAYEY SILT TILL: trace sand, trace gravel, fragments of shale, reddish brown, moist, stiff to very stiff 6.1	SS	8	100	14				18		
		SS	9	100	13	7	97		21		
		SS	10	62	22	8	96				
	93.45					9	95		24		
	SAND: trace clay, trace silt, trace gravel, reddish brown, moist, compact 10.7	SS	11	62	23	10	94				
	91.92					11 ▼	93		9		
	SILTY CLAY/ CLAYEY SILT TILL: trace sand, trace gravel, fragments of shale, reddish brown, moist, stiff to hard 12.2	SS	12	95	13	12	92		20		
	----- grey	SS	13	95	47	13	91		15		
		SS	14	95	55	14	90		8		
	----- reddish brown	SS	15	65	50/8	15	89	50/8	12		
	85.83					16	88				
	BEDROCK: Shale, highly weathered, reddish brown, moist, hard 18.3	SS	16	60	50/5	17	87	50/5	10		
	84.27					18	86				
	End of Borehole 19.8	SS	17	100	50/3	19	85	50/3	16		

Notes:
1. Borehole open and dry upon completion of drilling.
3. Groundwater level reading at 10.91 m bgs on June 10, 2021.

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▽ Groundwater depth on completion of drilling: Dry m.

▼ Groundwater depth observed on 10/06/2021 at a depth of: 10.91 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'.

RECORD OF BOREHOLE No. BH/MW3

Project Number:	BIGC-ENV-462A	Drilling Location:	See Borehole Location Plan	Logged by:	KK
Project Client:	Camarro Developments Inc.	Drilling Method:	150 mm SSA+HSA	Compiled by:	KK
Project Name:	Preliminary Geotechnical Investigation	Drilling Machine:	Truck Mounted Drill	Reviewed by:	SS
Project Location:	1062 & 1074 Cooke Boulevard, Burlington, Ontario	Date Started:	31 May 21	Date Completed: 31 May 21	Revision No.: 0, 29/6/21

Lithology Plot	DESCRIPTION (Geodetic Ground Surface Elevation: 104.41 m)		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 20 40 60 80 Liquid	INSTRUMENTATION INSTALLATION	COMMENTS
	ASPHALT PAVEMENT: 100 mm asphalt over 200 mm granular bases	104.11 0.3	SS	1	38	12	0	104	○	10		
	FILL: silty sand, trace clay, trace gravel, occasional fragments of Asphalt, reddish brown, moist, very loose to compact		SS	2	41	4	1	103	○	10		
	- 150 mm thick layer of Asphalt		SS	3	67	16	2	102	○	8		
			SS	4	5	2	3	101	○	32		
	- clayey silt, trace to some sand, trace gravel, fragments of Asphalt, grey, firm		SS	5	8	5	4	100	○	51		
	- possible rock/boulder		SS	6	23	50/13	5	99	50/13 ○	8		
		98.32					6	98	○	22		
	SILTY SAND TILL: trace gravel, reddish brown, wet, compact	6.1 96.79	SS	7	33	12	7	97	○	20		
	SILTY CLAY/ CLAYEY SILT TILL: trace sand, trace gravel, reddish brown, moist, stiff	7.6 95.27	SS	8	87	17	8	96				
	SAND: trace silt, trace gravel, reddish brown, moist, dense	9.1	SS	9	70	31	9	95	○	7		
			SS	10	54	35	10	94	○	4		
		91.91					11	93				
	SILTY CLAY/ CLAYEY SILT TILL: trace sand, trace gravel, reddish brown, very moist, stiff to hard	12.5	SS	11	75	12	12	92	○	19		
	------- grey		SS	12	67	49	13	91	○	13		
		88.57	SS	13	95	50	14	90	○	13		
	End of Borehole	15.8					15	89				

Notes:
1. Borehole open upon completion of drilling.
2. Ground water level reading at 12.19 m bgs upon completion of drilling.
3. Groundwater level reading at 11.89 m bgs on June 10, 2021.

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▽ Groundwater depth on completion of drilling: 12.19 m.

▼ Groundwater depth observed on 10/06/2021 at a depth of: 11.89 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'.

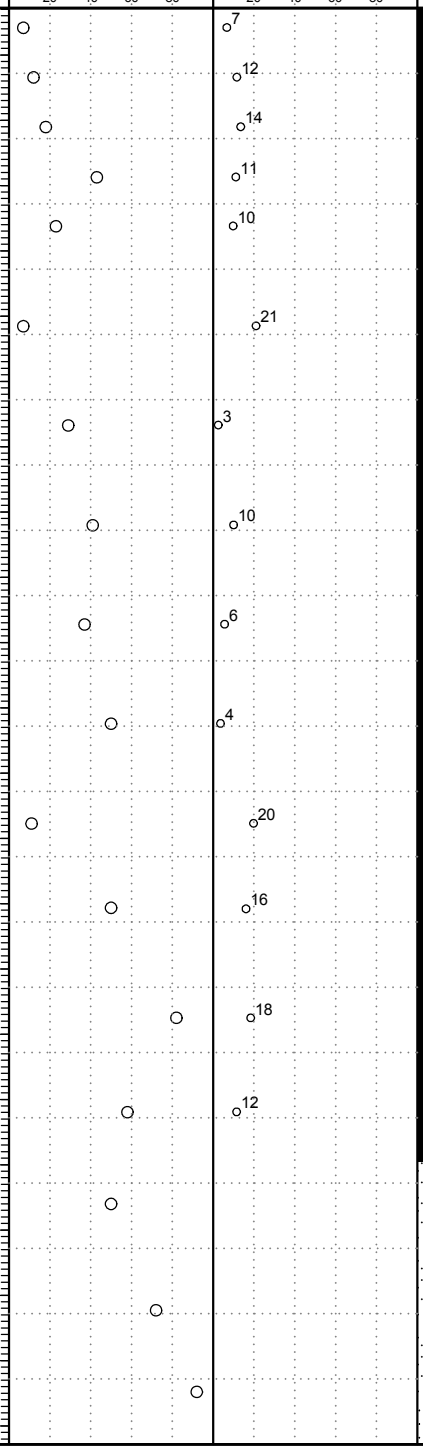
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RECORD OF BOREHOLE No. BH/MW4

Project Number:	BIGC-ENV-462A	Drilling Location:	See Borehole Location Plan	Logged by:	KK
Project Client:	Camarro Developments Inc.	Drilling Method:	150 mm SSA+HSA	Compiled by:	KK
Project Name:	Preliminary Geotechnical Investigation	Drilling Machine:	Truck Mounted Drill	Reviewed by:	SS
Project Location:	1062 & 1074 Cooke Boulevard, Burlington, Ontario	Date Started:	31 May 21	Date Completed: 1 Jun 21	Revision No.: 0, 29/6/21

Geodetic Ground Surface Elevation: 103.72 m

DESCRIPTION	Elev.	Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%
ASPHALT PAVEMENT: 50 mm asphalt over 200 mm granular bases	103.47 / 0.3	0	SS	1	8	7
FILL: sand and gravel, trace clay, brown, moist, loose - silty sand, trace clay, trace gravel, occassional fragments of brick and concrete, reddish brown, compact		1	SS	2	62	12
------- silty clay,trace sand, trace gravel, reddish brown, moist, very stiff to hard occasional pieces of concrete and brick, grey		2	SS	3	75	18
		3	SS	4	87	43
- wood pieces		4	SS	5	79	23
	99.15					
SILTY CLAY/ CLAYEY SILT TILL: trace sand, trace gravel, reddish brown, moist, firm	4.6	5	SS	6	87	7
	97.63					
SAND: some gravel, trace silt, grey, moist, compact to dense	6.1	6	SS	7	51	29
		7				
		8	SS	8	62	41
		9	SS	9	62	37
		10 ▼				
		11	SS	10	62	50
	91.53	12				
SILTY CLAY/ CLAYEY SILT TILL: trace to some sand, trace gravel, reddish brown, moist to wet, stiff to hard	12.2		SS	11	54	11
------- grey		13	SS	12	20	50
		14				
		15	SS	13	100	82
		16				
		17	SS	14	81	58
	85.44	18				
BEDROCK: Shale, highly weathered to excellent quality, occasional limestone layers, reddish brown to grey, damp to moist	18.3		SS	15	63	50
ROCK CORE BEGINS - Fair Quality		19	RC	1	97	72
		20				
- Excellent Quality		21	RC	2	100	92
		22				



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▽ No freestanding groundwater measured in open borehole on completion of drilling.

▼ Groundwater depth observed on 10/06/2021 at a depth of: 9.97 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'.

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Continued on Next Page

RECORD OF BOREHOLE No. BH/MW4

Project Number: **BIGC-ENV-462A** Drilling Location: **See Borehole Location Plan** Logged by: **KK**

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	BEDROCK: Shale, highly weathered to excellent quality, occasional limestone layers, reddish brown to grey, damp to moist - Excellent Quality	RC	3	99	98	23	81				
	- Excellent Quality 78.87	RC	4	94	91	24	80 79				
	End of Borehole 24.9 Notes: 1. Borehole open upon completion of drilling. 2. Ground water level not measured upon completion of drilling due introduced drilling water. 3. Groundwater level reading at 9.97 m bgs on June 10, 2021.										

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'.

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RECORD OF BOREHOLE No. BH/MW5

Project Number:	BIGC-ENV-462A	Drilling Location:	See Borehole Location Plan	Logged by:	KK
Project Client:	Camarro Developments Inc.	Drilling Method:	150 mm SSA+HSA	Compiled by:	KK
Project Name:	Preliminary Geotechnical Investigation	Drilling Machine:	Track Mounted Drill	Reviewed by:	SS
Project Location:	1062 & 1074 Cooke Boulevard, Burlington, Ontario	Date Started:	2 Jun 21	Date Completed: 2 Jun 21	Revision No.: 0, 29/6/21

Lithology Plot	DESCRIPTION (Geodetic Ground Surface Elevation: 102.64 m)		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: 50 mm asphalt over 200 mm granular bases	102.39 / 0.3	SS	1	70	11	0	102		11		
	FILL: silty clay/ clayey silt, trace sand, trace gravel, reddish brown, moist, stiff to hard		SS	2	33	37	1			11		
			SS	3	87	49	2	101		9		
	- sand and gravel, grey, moist, very dense		SS	4	74	50/15	3	100	50 / 15	9		
			SS	5	95	11	4	99		10		
	- NO RECOVERY		SS	6	0	1	5	98				
		96.55					6	97				
	SILTY CLAY/ CLAYEY SILT TILL: trace sand, trace gravel, reddish brown, moist to wet, very soft to soft	6.1	SS	7	95	2	7	96		18		
			SS	8	95	5	8	95		16		
			SS	9	95	4	9	94		15		
		91.98					10 ▼	93				
	SAND: some gravel, trace clay, trace silt, reddish brown, wet, compact	10.7	SS	10	67	16	11	92		17		
		90.45					12 ▽	91				
	SILTY CLAY/ CLAYEY SILT TILL: trace to some sand, trace gravel, grey, very moist to wet, very stiff to hard	12.2	SS	11	95	25	13	90		16		
			SS	12	95	40	14	89		15		
		87.10	SS	13	83	50	15	88		16		Gr-10%; Sa-20%; Si-47%; Cl-22%
	End of Borehole	15.5										

Notes:
1. Borehole open upon completion of drilling.
2. Ground water level reading at 12.19 m bgs upon completion of drilling.
3. Groundwater level reading at 10.13 m bgs on June 10, 2021.

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▽ Groundwater depth on completion of drilling: 12.19 m.

▼ Groundwater depth observed on 10/06/2021 at a depth of: 10.13 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'.

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RECORD OF BOREHOLE No. BH/MW6

Project Number:	BIGC-ENV-462A	Drilling Location:	See Borehole Location Plan	Logged by:	KK
Project Client:	Camarro Developments Inc.	Drilling Method:	150 mm SSA+HSA	Compiled by:	KK
Project Name:	Preliminary Geotechnical Investigation	Drilling Machine:	Track Mounted Drill	Reviewed by:	SS
Project Location:	1062 & 1074 Cooke Boulevard, Burlington, Ontario	Date Started:	3 Jun 21	Date Completed: 3 Jun 21	Revision No.: 0, 29/6/21

Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 101.22 m	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: 50 mm asphalt over 200 mm granular bases 100.97 / 0.3	SS	1	62	35		101		8		
	FILL: silty clay/ clayey silt, trace sand, trace gravel, reddish brown, moist, stiff to hard	SS	2	54	9	1	100		11		
	-------	SS	3	84	30	2			11		
	-silty sand, trace clay, trace gravel, occasional fragments of brick pieces, reddish brown, moist, dense -------	SS	4	84	38	3	99		9		
		SS	5	95	18		98		10		
	- firm	SS	6	41	5	4	97		11		
	95.13					5	96				
	SILTY CLAY/ CLAYEY SILT TILL: trace sand, trace gravel, reddish brown, moist to wet, very soft to soft 6.1	SS	7	67	3	6	95		22		
		SS	8	79	0	7	94		17		
	92.08					8	93				
	SAND: trace to some gravel, trace clay, trace silt, brown, wet, compact 9.1	SS	9	33	15	9	92		11		
		SS	10	51	18	10	91		19		
	89.03					11	90				
	SILTY CLAY/ CLAYEY SILT TILL: trace sand, trace gravel, grey, wet, hard 12.2	SS	11	75	31	12	89		16		
		SS	12	67	46	13	88		12		
	- moist 85.37	SS	13	84	54	14	87		11		
	End of Borehole 15.9					15	86				

Notes:
1. Borehole open upon completion of drilling.
2. Ground water level reading at 12.19 m bgs upon completion of drilling.
3. Groundwater level reading at 8.71 m bgs on June 10, 2021.

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▽ Groundwater depth on completion of drilling: 12.19 m.

▼ Groundwater depth observed on 10/06/2021 at a depth of: 8.71 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'.

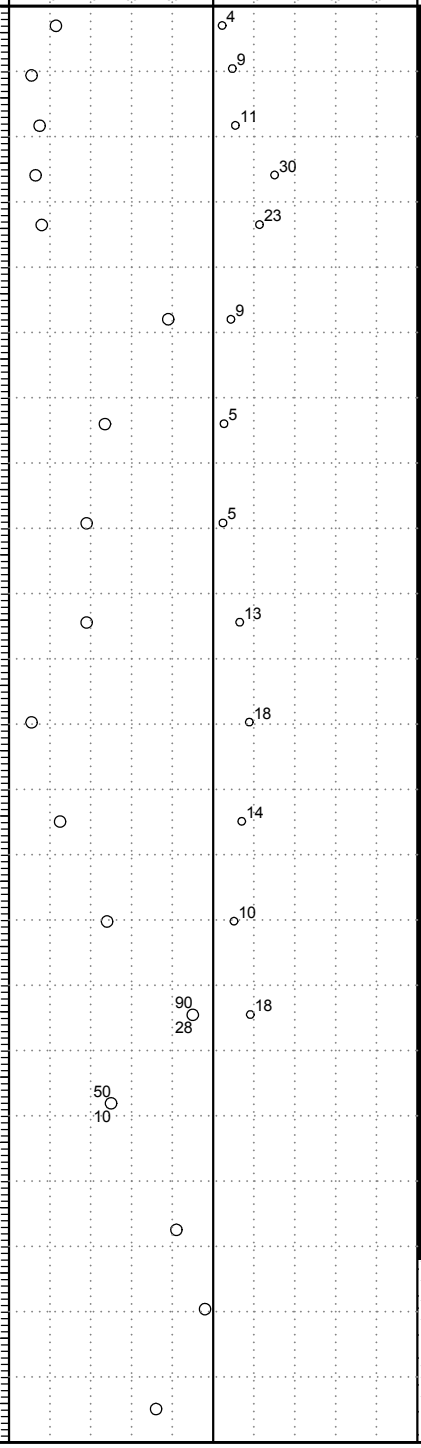
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RECORD OF BOREHOLE No. BH/MW7

Project Number:	BIGC-ENV-462A	Drilling Location:	See Borehole Location Plan	Logged by:	KK
Project Client:	Camarro Developments Inc.	Drilling Method:	150 mm SSA+HSA	Compiled by:	KK
Project Name:	Preliminary Geotechnical Investigation	Drilling Machine:	Track Mounted Drill	Reviewed by:	SS
Project Location:	1062 & 1074 Cooke Boulevard, Burlington, Ontario	Date Started:	8 Jun 21	Date Completed: 9 Jun 21	Revision No.: 0, 29/6/21

Geodetic Ground Surface Elevation: 101.41 m

Depth (m)	Description	Elevation (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%
0	**ASPHALT PAVEMENT:** 100 mm asphalt over 200 mm granular bases	101.11	SS	1	59	23
0.3	**FILL:** silty claey, trace sand, trace gravel, occasional fragments of concrete, reddish brown, damp, very stiff to stiff		SS	2	59	11
1			SS	3	92	15
2		99.12				
2.3	**SILTY CLAY/ CLAYEY SILT TILL:** trace sand, trace gravel, reddish brown, moist, stiff		SS	4	95	13
3			SS	5	75	16
4		96.81				
4.6	**SAND:** trace to some gravel, trace silt, greyish brown, moist, very dense to compact		SS	6	67	78
5						
6			SS	7	67	47
7						
8			SS	8	62	38
9						
9			SS	9	67	38
10						
11			SS	10	95	11
12		89.22				
12.2	**SILTY CLAY/ CLAYEY SILT TILL:** trace to some sand, trace gravel, grey, moist, very stiff to hard		SS	11	70	25
13						
14			SS	12	95	48
15						
16			SS	13	77	90/28
16		84.65				
16.8	**BEDROCK:** Shale, highly weathered to excellent quality, occasional limestone layers, reddish brown to grey, damp to moist		SS	14	30	50/10
17						
18	ROCK CORE BEGINS					
19	- Good Quality		RC	1	83	82
20	- Excellent Quality		RC	2	100	96
21						
22	- Fair Quality		RC	3	100	72



INSTRUMENTATION INSTALLATION

COMMENTS

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No freestanding groundwater measured in open borehole on completion of drilling.

Groundwater depth observed on 10/06/2021 at a depth of: 9.19 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'.

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RECORD OF BOREHOLE No. BH/MW7

Project Number: **BIGC-ENV-462A** Drilling Location: **See Borehole Location Plan** Logged by: **KK**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL) W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS
	BEDROCK: Shale, highly weathered to excellent quality, occasional limestone layers, reddish brown to grey, damp to moist										
	- Excellent Quality	RC	4	100	100	23	79 78				
	- Excellent Quality	RC	5	100	100	24 25	77				
	76.11										
	End of Borehole 25.3										
	Notes: 1. Borehole open upon completion of drilling. 2. Ground water level not measured upon completion of drilling due introduced drilling water. 3. Groundwater level reading at 9.19 m bgs on June 10, 2021.										

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

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RECORD OF BOREHOLE No. BH/MW8

Project Number:	BIGC-ENV-462A	Drilling Location:	See Borehole Location Plan	Logged by:	KK
Project Client:	Camarro Developments Inc.	Drilling Method:	150 mm SSA+HSA	Compiled by:	KK
Project Name:	Preliminary Geotechnical Investigation	Drilling Machine:	Track Mounted Drill	Reviewed by:	SS
Project Location:	1062 & 1074 Cooke Boulevard, Burlington, Ontario	Date Started:	3 Jun 21	Date Completed: 3 Jun 21	Revision No.: 0, 29/6/21

Geodetic Ground Surface Elevation: 102.42 m

Depth (m)	Description	Elevation (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	Field Testing: Penetration Testing (SPT ○ / DCPT ●); MTO Vane* (△ Intact / ▲ Remould); Nilcon Vane* (◇ Intact / ◆ Remould); * Undrained Shear Strength (kPa) 20 40 60 80	Lab Testing: ★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL) W_P W W_L; Plastic 20 40 60 80 Liquid	Instrumentation Installation	Comments
	ASPHALT PAVEMENT: 50 mm asphalt over 200 mm granular bases	102.17 / 0.3								
	FILL: sand and gravel, trace clay, trace silt, occasional fragments of Asphalt, brown, moist, loose		SS	1	8	6		3		
	------- clayey silt, trace sand, trace gravel, brown, moist, stiff		SS	2	54	9		12		
			SS	3	75	9		11		
	- sand, trace to some gravel, trace clay, moist, brown, compact	99.38 / 3.0	SS	4	95	20		10		
	SILTY CLAY/ CLAYEY SILT TILL: trace sand, reddish brown, wet, firm to very stiff		SS	5	79	6		28		
		97.55	SS	6	67	16		10		
	SAND: trace to some gravel, trace silt, brown, moist, compact to very dense	4.9	SS	7	62	29		4		
			SS	8	33	50		3		
	- wet		SS	9	51	75		5		
			SS	10	62	23		13		
		90.23								
	SILTY SAND: trace clay, trace gravel, reddish brown, wet, compact	12.2	SS	11	70	14		21		
		88.71								
	SILTY CLAY/ CLAYEY SILT TILL: trace to some sand, trace gravel, grey, moist, hard	13.7	SS	12	95	45		13		
		86.57	SS	13	95	67		14		Gr-4%; Sa-19%; Si-52%; Cl-25%
	End of Borehole	15.9								

Notes:
1. Borehole open upon completion of drilling.
2. Ground water level reading at 10.66 m bgs upon completion of drilling.
3. Groundwater level reading at 9.95 m bgs on June 10, 2021.

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▽ Groundwater depth on completion of drilling: 10.66 m.

▼ Groundwater depth observed on 10/06/2021 at a depth of: 9.95 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'.

APPENDIX B: MECP WWR, PTTW AND EASR SUMMARY TABLES

Table B-1: MECP WWR Summary Table

Count	Well ID	Date Completed	Depth (m)	Reported Water Level (m)	Status of Well
1.	2800273	03/15/1949	68.6	6.7	Monitoring and test hole
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	7.4	Observation well
5.	2810512	02/02/2006	9.1	N/A	Observation well
6.	7043252	03/26/2007	10.4	N/A	Observation well and test hole
7.	7114369	10/24/2008	11.3	N/A	Observation and monitoring hole
8.	7114376	04/18/2008	10.7	N/A	Observation and monitoring hole
9.	7118602	01/10/2008	12.1	6.0	Observation and monitoring hole
10.	7120225	06/23/2008	N/A	N/A	Decommissioned
11.	7123981	06/23/2008	N/A	N/A	Decommissioned
12.	7141517	10/05/2009	8.2	N/A	Monitoring and test hole
13.	7160240	01/12/2011	9.1	N/A	Observation and monitoring hole
14.	7167017	05/30/2011	N/A	N/A	Decommissioned
15.	7176158	10/20/2011	9.1	6.7	Observation and monitoring hole
16.	7202143	12/04/2012	N/A	N/A	N/A
17.	7203984	07/10/2012	N/A	N/A	N/A
18.	7205652	04/08/2013	12.8	10.1	Monitoring and test hole
19.	7211367	10/08/2013	10.1	N/A	Test hole
20.	7214775	12/16/2013	7.9	N/A	Observation well
21.	7219297	01/31/2014	4.6	N/A	Monitoring
22.	7220632	04/29/2014	N/A	N/A	N/A
23.	7227608	06/30/2014	N/A	N/A	Abandoned
24.	7229430	08/23/2014	N/A	N/A	Decommissioned
25.	7232291	07/18/2014	N/A	N/A	Decommissioned
26.	7232366	06/17/2014	12.2	N/A	Observation and monitoring hole
27.	7236354	12/05/2014	5.2	N/A	Monitoring and test hole
28.	7236355	12/05/2014	5.2	N/A	Monitoring and test hole
29.	7236356	12/05/2014	5.5	N/A	Monitoring and test hole
30.	7236357	12/04/2014	9.1	N/A	Monitoring and test hole
31.	7236358	12/04/2014	5.4	N/A	Monitoring and test hole
32.	7248588	08/18/2015	9.2	N/A	Observation well
33.	7248589	08/18/2015	9.2	N/A	Observation well
34.	7256551	12/11/2015	5.5	N/A	Monitoring and test hole
35.	7267367	06/10/2016	10.6	2.4	Observation and monitoring hole
36.	7271535	10/08/2015	N/A	N/A	N/A
37.	7294096	08/09/2017	2.1	1.2	Observation and monitoring hole
38.	7294097	08/09/2017	2.1	1.2	Observation and monitoring hole
39.	7294098	08/08/2017	5.5	4.0	Observation and monitoring hole
40.	7296543	09/22/2017	5.5	N/A	Monitoring and test hole
41.	7296544	09/22/2017	6.1	N/A	Monitoring and test hole
42.	7296545	09/22/2017	7.0	N/A	Monitoring and test hole

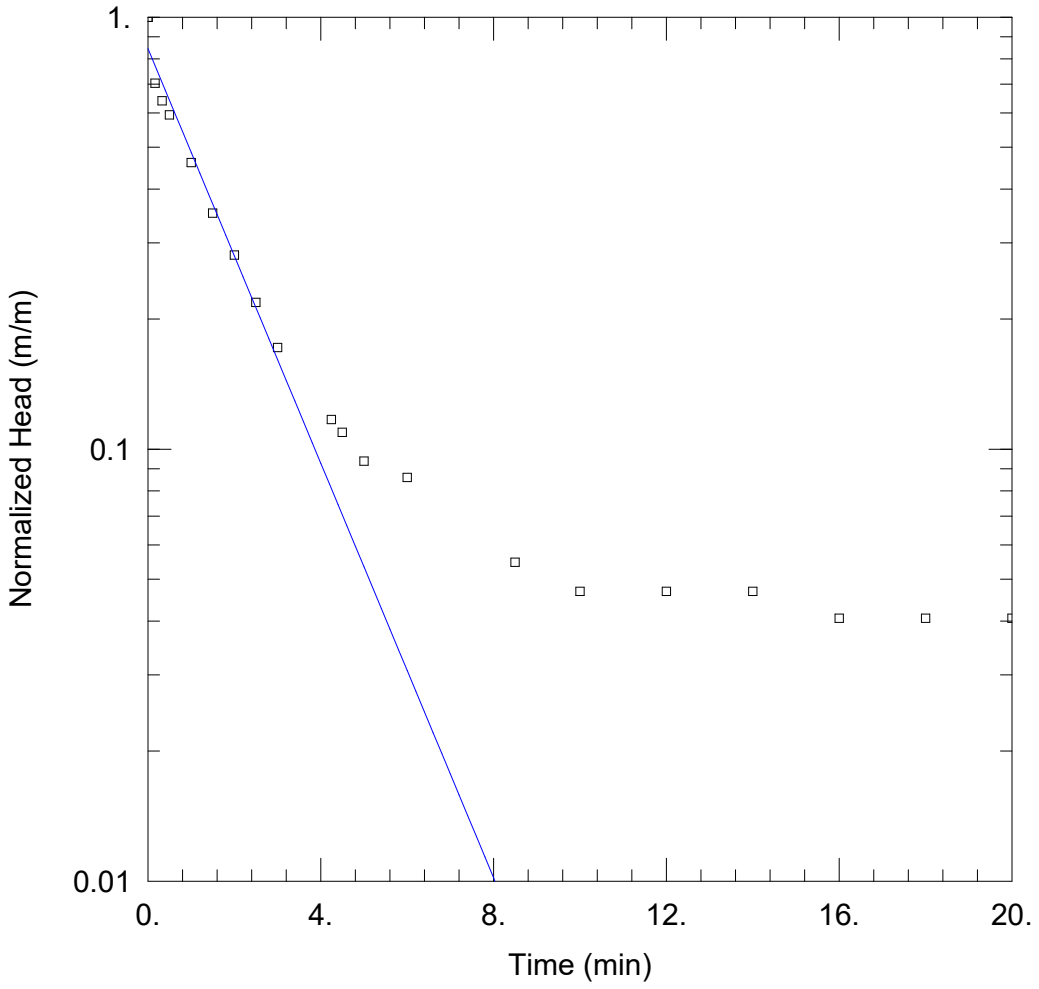
Count	Well ID	Date Completed	Depth (m)	Reported Water Level (m)	Status of Well
43.	7299235	10/26/2017	10.7	N/A	Observation and monitoring hole
44.	7299350	08/28/2017	3.0	N/A	Observation and monitoring hole
45.	7299351	09/23/2017	12.2	9.1	Observation and monitoring hole
46.	7301691	10/27/2017	N/A	N/A	N/A
47.	7305852	10/17/2017	N/A	N/A	Abandoned
48.	7314783	03/23/2018	9.1	N/A	Monitoring
49.	7333791	03/19/2019	4.6	N/A	Monitoring and test hole
50.	7333792	03/19/2019	4.6	N/A	Monitoring and test hole
51.	7333793	03/20/2019	5.3	N/A	Monitoring and test hole
52.	7333846	03/18/2019	4.9	N/A	Monitoring and test hole
53.	7333852	03/20/2019	9.1	N/A	Monitoring and test hole
54.	7333853	03/20/2019	4.6	N/A	Monitoring and test hole
55.	7355583	03/05/2020	N/A	N/A	N/A
56.	7360760	02/10/2020	N/A	N/A	N/A
57.	7361071	N/A	N/A	N/A	N/A
58.	7361072	N/A	N/A	N/A	N/A
59.	7363235	N/A	N/A	N/A	N/A

Table B-2: MECP EASR Summary Table

Permit Number	Purpose	Address	Municipality	Water Source	Max L/Day	Active
R-009-1110140787	Construction Dewatering	101 Masonry Court	Burlington	Groundwater	50,000 to 400,000	No
1078-BVHT9X	Excavation	North of Masonry Court and south of Canadian National Railway	Burlington	Groundwater	97,800	Yes
1078-BVHT9X	Groundwater	South of Canadian National Railway and east of Waterdown Road	Burlington	Groundwater	688,000	Yes
1078-BVHT9X	Excavation	North of Masonry Court and south of Canadian National Railway	Burlington	Groundwater	790,000	Yes
1078-BVHT9X	Excavation	North of Masonry Court and south of Canadian National Railway	Burlington	Groundwater	675,000	Yes
4307-7V4PE9	Well	On Canadian National Railway and east of Waterdown Road	Burlington	Surface Water	172,800	No

Permit Number	Purpose	Address	Municipality	Water Source	Max L/Day	Active
4307-7V4PE9	Unknown	East of Queen Elizabeth Way and north of Aldershot Go Station	Burlington	Surface Water	172,800	No
4307-7V4PE9	Unknown	East of Queen Elizabeth Way and north of Aldershot Go Station	Burlington	Surface Water	172,800	No

APPENDIX C: SWRT RESULTS



WELL TEST ANALYSIS

Data Set: C:\...\MW2.aqt
Date: 06/23/21 Time: 14:01:33

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Camarro Developments Inc.
Project: BIGC-ENV-462A
Location: 1062 and 1074 Cooke Boulevard
Test Well: BH/MW2
Test Date: June 10, 2021

AQUIFER DATA

Saturated Thickness: 1.47 m Anisotropy Ratio (Kz/Kr): 1.

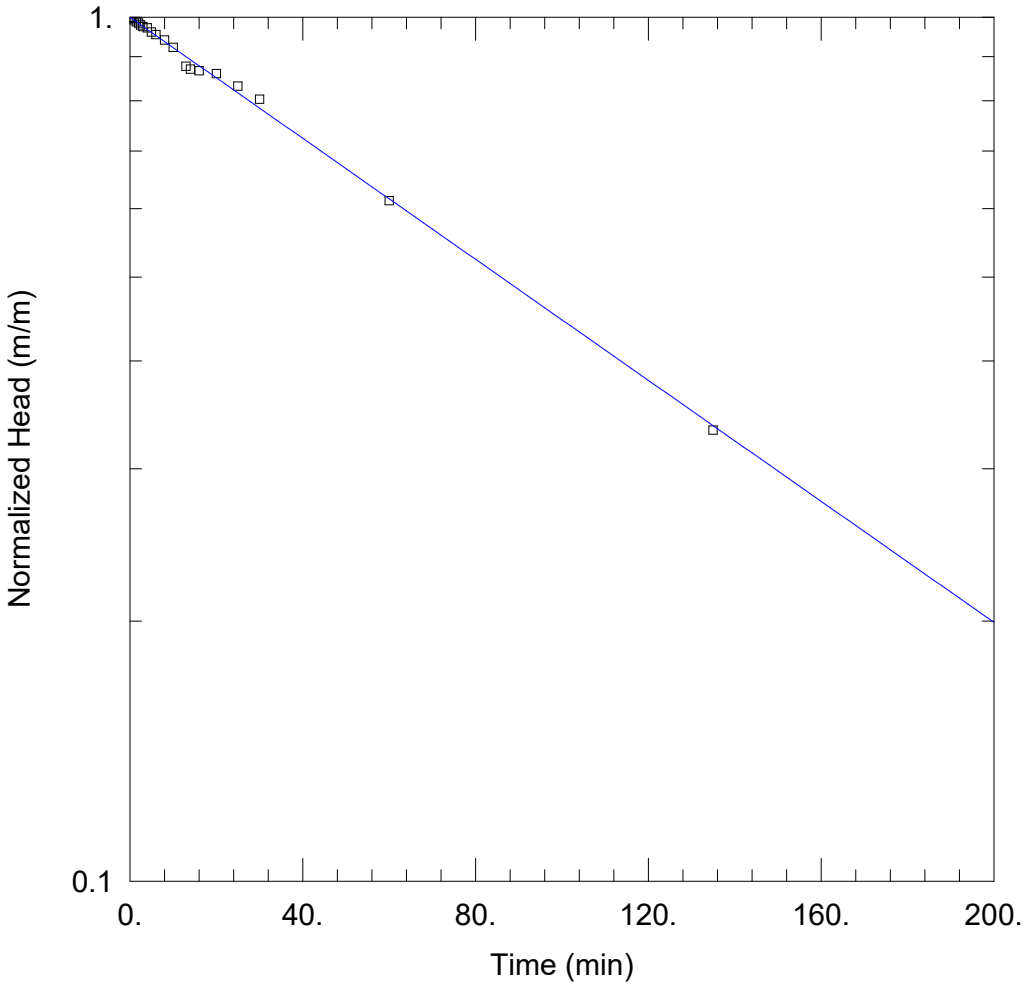
WELL DATA (BH/MW2)

Initial Displacement: 0.64 m
Total Well Penetration Depth: 1.47 m
Casing Radius: 0.025 m
Static Water Column Height: 1.47 m
Screen Length: 1.47 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.037E-5 m/sec y0 = 0.5407 m



WELL TEST ANALYSIS

Data Set: C:\...\MW4.aqt
Date: 06/23/21 Time: 14:03:59

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Camarro Developments Inc.
Project: BIGC-ENV-462A
Location: 1062 and 1074 Cooke Boulevard
Test Well: BH/MW4
Test Date: June 10, 2021

AQUIFER DATA

Saturated Thickness: 12.53 m Anisotropy Ratio (Kz/Kr): 1.

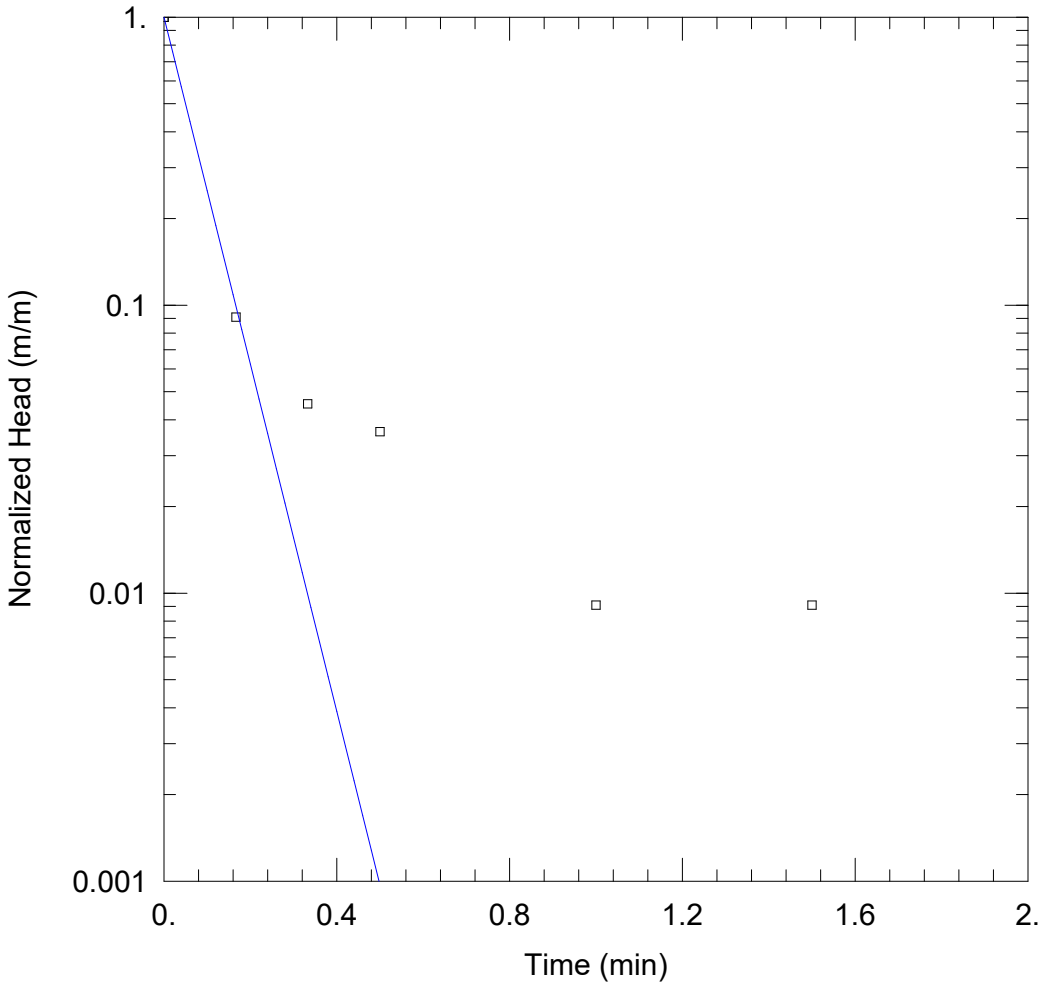
WELL DATA (BH/MW4)

Initial Displacement: 2.855 m
Total Well Penetration Depth: 12.53 m
Casing Radius: 0.025 m
Static Water Column Height: 12.53 m
Screen Length: 3. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 7.671E-8 m/sec y0 = 2.853 m



WELL TEST ANALYSIS

Data Set: C:\...\MW5.aqt
Date: 06/23/21 Time: 14:05:01

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Camarro Developments Inc.
Project: BIGC-ENV-462A
Location: 1062 and 1074 Cooke Boulevard
Test Well: BH/MW5
Test Date: June 11, 2021

AQUIFER DATA

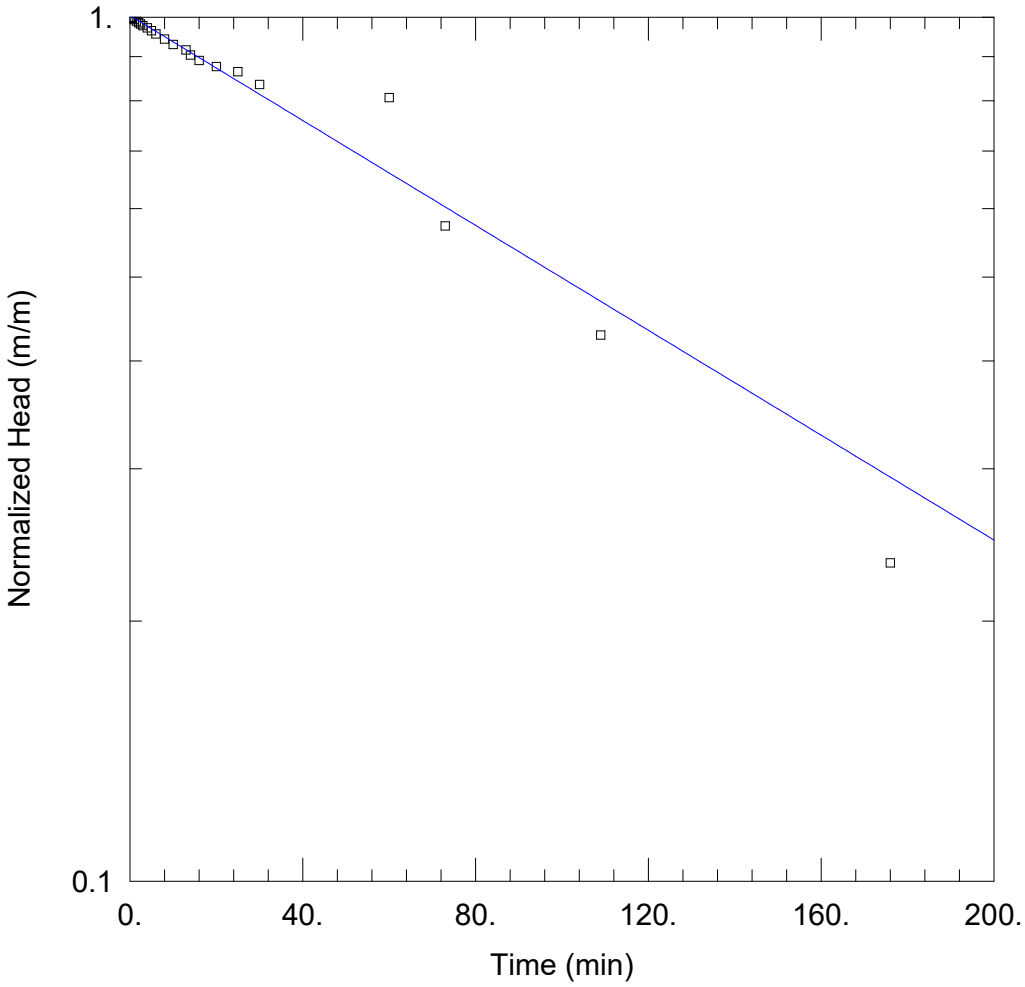
Saturated Thickness: 3.47 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW5)

Initial Displacement: 0.11 m
Total Well Penetration Depth: 3.47 m
Casing Radius: 0.025 m
Static Water Column Height: 3.47 m
Screen Length: 3. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.0001153 m/sec
y0 = 0.11 m



WELL TEST ANALYSIS

Data Set: C:\...\MW7.aqt
Date: 06/23/21 Time: 14:07:24

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Camarro Developments Inc.
Project: BIGC-ENV-462A
Location: 1062 and 1074 Cooke Boulevard
Test Well: BH/MW7
Test Date: June 10, 2021

AQUIFER DATA

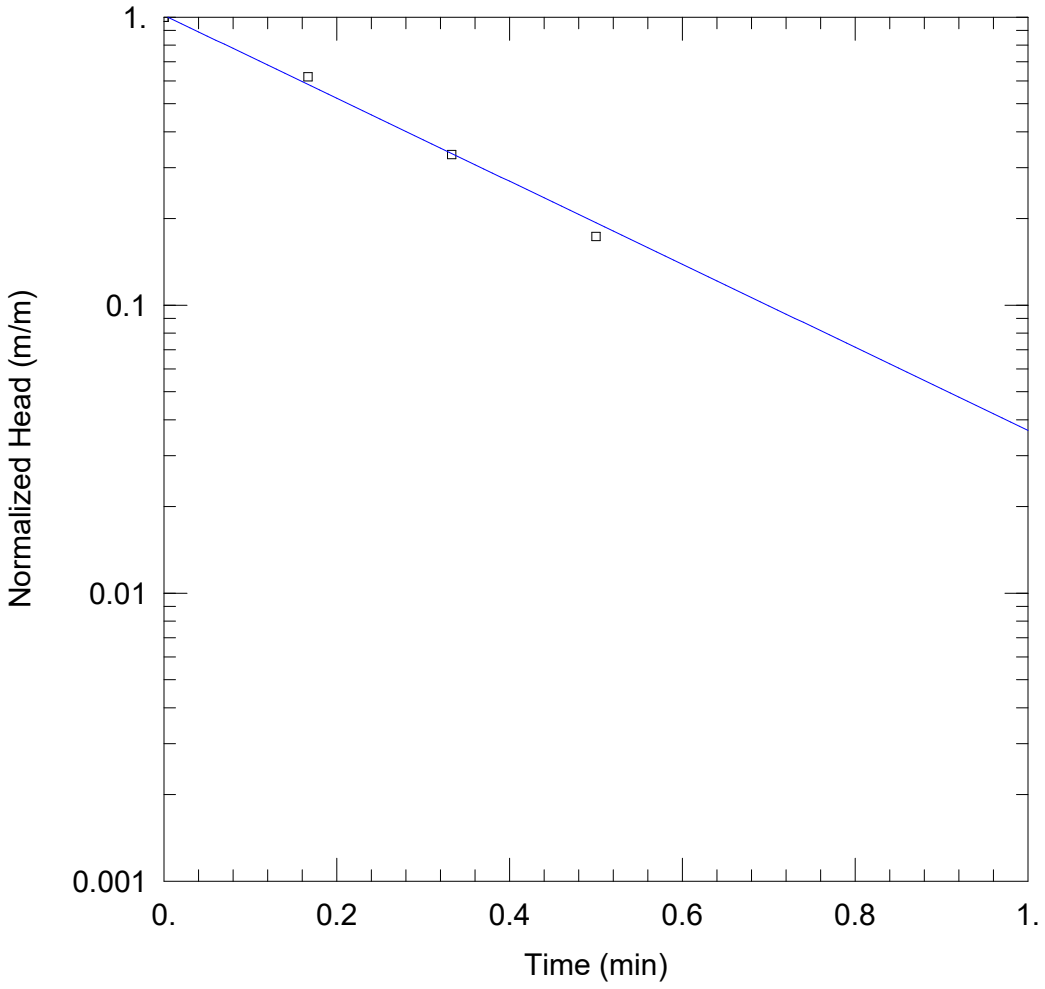
Saturated Thickness: 12.45 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW7)

Initial Displacement: 8.925 m
Total Well Penetration Depth: 12.45 m
Casing Radius: 0.025 m
Static Water Column Height: 12.45 m
Screen Length: 3. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 6.649E-8 m/sec
y0 = 8.96 m



WELL TEST ANALYSIS

Data Set: C:\...\MW8.aqt
Date: 06/23/21 Time: 14:08:30

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Camarro Developments Inc.
Project: BIGC-ENV-462A
Location: 1062 and 1074 Cooke Boulevard
Test Well: BH/MW8
Test Date: June 11, 2021

AQUIFER DATA

Saturated Thickness: 3.965 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW8)

Initial Displacement: 1.185 m
Total Well Penetration Depth: 3.965 m
Casing Radius: 0.025 m
Static Water Column Height: 3.965 m
Screen Length: 3. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 3.157E-5 m/sec y0 = 1.203 m

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

Your Project #: BIGC-ENV-462A
Site Location: 1062 and 1074 Cooke Boulevard
Your C.O.C. #: 830807-01-01

Attention: Eileen Liu

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

Report Date: 2021/06/18
Report #: R6682710
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1G0947
Received: 2021/06/11, 17:35

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Carbonaceous BOD	1	2021/06/12	2021/06/17	CAM SOP-00427	SM 23 5210B m
Total Cyanide	1	2021/06/15	2021/06/15	CAM SOP-00457	OMOE E3015 5 m
Fluoride	1	2021/06/14	2021/06/15	CAM SOP-00449	SM 23 4500-F C m
Mercury in Water by CVAA	1	2021/06/16	2021/06/16	CAM SOP-00453	EPA 7470A m
Total Metals Analysis by Axial ICP	1	2021/06/15	2021/06/15	CAM SOP-00408	EPA 6010D m
E.coli, (CFU/100mL)	1	N/A	2021/06/11	CAM SOP-00552	MOE LSB E3371
Animal and Vegetable Oil and Grease	1	N/A	2021/06/17	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	1	2021/06/16	2021/06/17	CAM SOP-00326	EPA1664B m,SM5520B m
PAH Compounds in Water by GC/MS (SIM)	1	2021/06/16	2021/06/17	CAM SOP-00318	EPA 8270D m
pH	1	2021/06/14	2021/06/15	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	1	N/A	2021/06/14	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	1	N/A	2021/06/15	CAM SOP-00464	EPA 375.4 m
Total Kjeldahl Nitrogen in Water	1	2021/06/14	2021/06/15	CAM SOP-00938	OMOE E3516 m
Mineral/Synthetic O & G (TPH Heavy Oil) (1)	1	2021/06/16	2021/06/17	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	1	2021/06/14	2021/06/15	CAM SOP-00428	SM 23 2540D m
Volatile Organic Compounds in Water	1	N/A	2021/06/16	CAM SOP-00228	EPA 8260C m

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, MELCC, 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.

Your Project #: BIGC-ENV-462A
Site Location: 1062 and 1074 Cooke Boulevard
Your C.O.C. #: 830807-01-01

Attention: Eileen Liu

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

Report Date: 2021/06/18
Report #: R6682710
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1G0947
Received: 2021/06/11, 17:35

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 your Project Manager.
Deepthi Shaji, Project Manager
Email: Deepthi.Shaji@bureauveritas.com
Phone# (905)817-5700 Ext:7065843
==========
BV Labs 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 Signature Page.

BV Labs Job #: C1G0947
Report Date: 2021/06/18

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-462A
Site Location: 1062 and 1074 Cooke Boulevard
Sampler Initials: SL

HALTON SANITARY & COMBINED SEWER (2-03)

BV Labs ID				PUV681		
Sampling Date				2021/06/11 11:00		
COC Number				830807-01-01		
	UNITS	Criteria	Criteria-2	MW3	RDL	QC Batch
Calculated Parameters						
Total Animal/Vegetable Oil and Grease	mg/L	-	150	ND	0.50	7402509
Inorganics						
Total Carbonaceous BOD	mg/L	-	300	ND	2	7404558
Fluoride (F-)	mg/L	-	10	0.11	0.10	7406803
Total Kjeldahl Nitrogen (TKN)	mg/L	-	100	0.45	0.10	7406510
pH	pH	6.5:8.5	6.0:10.0	8.01		7406804
Phenols-4AAP	mg/L	-	1	ND	0.0010	7405670
Total Suspended Solids	mg/L	-	350	**480**	10	7405989
Dissolved Sulphate (SO4)	mg/L	-	1500	110	1.0	7406543
Total Cyanide (CN)	mg/L	-	2	ND	0.0050	7408999
Petroleum Hydrocarbons						
Total Oil & Grease	mg/L	-	-	ND	0.50	7412403
Total Oil & Grease Mineral/Synthetic	mg/L	-	-	ND	0.50	7412425
Metals						
Total Aluminum (Al)	mg/L	-	50	24	0.1	7407986
Total Antimony (Sb)	mg/L	-	5	ND	0.02	7407986
Total Arsenic (As)	mg/L	-	1	0.02	0.01	7407986
Total Beryllium (Be)	mg/L	-	5	0.0013	0.0005	7407986
Total Cadmium (Cd)	mg/L	-	1	ND	0.002	7407986
Total Chromium (Cr)	mg/L	-	3	0.04	0.01	7407986
Total Cobalt (Co)	mg/L	-	5	0.023	0.002	7407986
Total Copper (Cu)	mg/L	-	3	0.10	0.01	7407986
Total Iron (Fe)	mg/L	-	50	**51**	0.02	7407986
Total Lead (Pb)	mg/L	-	3	0.02	0.01	7407986
Total Manganese (Mn)	mg/L	-	5	2.6	0.001	7407986
Mercury (Hg)	mg/L	-	0.05	ND	0.00010	7410545
Total Molybdenum (Mo)	mg/L	-	5	0.006	0.005	7407986
Total Nickel (Ni)	mg/L	-	3	0.050	0.005	7407986

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 86-2002
Criteria-2: Halton Sanitary & Combined Sewer Bylaw (2-03)
ND = Not detected

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

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

HALTON SANITARY & COMBINED SEWER (2-03)

BV Labs ID				PUV681		
Sampling Date				2021/06/11 11:00		
COC Number				830807-01-01		
	UNITS	Criteria	Criteria-2	MW3	RDL	QC Batch
Total Phosphorus (P)	mg/L	-	10	1.8	0.05	7407986
Total Selenium (Se)	mg/L	-	5	ND	0.02	7407986
Total Silver (Ag)	mg/L	-	5	ND	0.01	7407986
Total Tin (Sn)	mg/L	-	5	ND	0.02	7407986
Total Titanium (Ti)	mg/L	-	5	0.36	0.005	7407986
Total Zinc (Zn)	mg/L	-	3	0.12	0.005	7407986
Polyaromatic Hydrocarbons						
Naphthalene	ug/L	-	140	ND	0.050	7411783
Volatile Organics						
Benzene	ug/L	-	10	ND	0.40	7405200
Chloroform	ug/L	-	40	ND	0.40	7405200
1,4-Dichlorobenzene	ug/L	-	80	ND	0.80	7405200
Ethylbenzene	ug/L	-	160	ND	0.40	7405200
Methylene Chloride(Dichloromethane)	ug/L	-	2000	ND	4.0	7405200
Tetrachloroethylene	ug/L	-	1000	ND	0.40	7405200
Toluene	ug/L	-	16	ND	0.40	7405200
Trichloroethylene	ug/L	-	400	ND	0.40	7405200
Surrogate Recovery (%)						
D10-Anthracene	%	-	-	94		7411783
D14-Terphenyl (FS)	%	-	-	84		7411783
D8-Acenaphthylene	%	-	-	93		7411783
4-Bromofluorobenzene	%	-	-	93		7405200
D4-1,2-Dichloroethane	%	-	-	104		7405200
D8-Toluene	%	-	-	93		7405200

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 86-2002
Criteria-2: Halton Sanitary & Combined Sewer Bylaw (2-03)
ND = Not detected

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

BV Labs Job #: C1G0947
Report Date: 2021/06/18

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-462A
Site Location: 1062 and 1074 Cooke Boulevard
Sampler Initials: SL

MICROBIOLOGY (WATER)

BV Labs ID			PUV681		
Sampling Date			2021/06/11 11:00		
COC Number			830807-01-01		
	UNITS	Criteria	MW3	RDL	QC Batch
Microbiological					
Escherichia coli	CFU/100mL	200	<10	10	7404390

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 86-2002

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

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

BV Labs Job #: C1G0947
Report Date: 2021/06/18

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-462A
Site Location: 1062 and 1074 Cooke Boulevard
Sampler Initials: SL

GENERAL COMMENTS

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

Package 1	19.0°C

Sample PUV681 [MW3] : VOC Analysis: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.

Results relate only to the items tested.

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

BV Labs Job #: C1G0947
Report Date: 2021/06/18

QUALITY ASSURANCE REPORT

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-462A
Site Location: 1062 and 1074 Cooke Boulevard
Sampler Initials: SL

			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
7405200	4-Bromofluorobenzene	2021/06/15	104	70 - 130	104	70 - 130	96	%				
7405200	D4-1,2-Dichloroethane	2021/06/15	100	70 - 130	98	70 - 130	106	%				
7405200	D8-Toluene	2021/06/15	105	70 - 130	106	70 - 130	92	%				
7411783	D10-Anthracene	2021/06/17	96	50 - 130	112	50 - 130	101	%				
7411783	D14-Terphenyl (FS)	2021/06/17	89	50 - 130	107	50 - 130	85	%				
7411783	D8-Acenaphthylene	2021/06/17	96	50 - 130	111	50 - 130	99	%				
7404558	Total Carbonaceous BOD	2021/06/17					ND,RDL=2	mg/L	7.7	30	89	85 - 115
7405200	1,4-Dichlorobenzene	2021/06/15	103	70 - 130	102	70 - 130	ND, RDL=0.40	ug/L				
7405200	Benzene	2021/06/15	92	70 - 130	92	70 - 130	ND, RDL=0.20	ug/L	NC	30		
7405200	Chloroform	2021/06/15	94	70 - 130	93	70 - 130	ND, RDL=0.20	ug/L				
7405200	Ethylbenzene	2021/06/15	89	70 - 130	89	70 - 130	ND, RDL=0.20	ug/L	NC	30		
7405200	Methylene Chloride(Dichloromethane)	2021/06/15	108	70 - 130	104	70 - 130	ND, RDL=2.0	ug/L				
7405200	Tetrachloroethylene	2021/06/15	90	70 - 130	90	70 - 130	ND, RDL=0.20	ug/L				
7405200	Toluene	2021/06/15	94	70 - 130	94	70 - 130	ND, RDL=0.20	ug/L	NC	30		
7405200	Trichloroethylene	2021/06/15	101	70 - 130	101	70 - 130	ND, RDL=0.20	ug/L				
7405670	Phenols-4AAP	2021/06/14	94	80 - 120	96	80 - 120	ND, RDL=0.0010	mg/L	8.0	20		
7405989	Total Suspended Solids	2021/06/15					ND, RDL=10	mg/L	0	25	98	85 - 115
7406510	Total Kjeldahl Nitrogen (TKN)	2021/06/15	112	80 - 120	104	80 - 120	ND, RDL=0.10	mg/L	5.0	20	106	80 - 120
7406543	Dissolved Sulphate (SO4)	2021/06/15	112	75 - 125	103	80 - 120	ND, RDL=1.0	mg/L	2.4	20		
7406803	Fluoride (F-)	2021/06/15	107	80 - 120	95	80 - 120	ND, RDL=0.10	mg/L	14	20		
7406804	pH	2021/06/15			102	98 - 103			0.52	N/A		
7407986	Total Aluminum (Al)	2021/06/15	106	80 - 120	98	80 - 120	ND, RDL=0.1	mg/L	NC	20		
7407986	Total Antimony (Sb)	2021/06/15	105	80 - 120	102	80 - 120	ND, RDL=0.02	mg/L	NC	20		
7407986	Total Arsenic (As)	2021/06/15	102	80 - 120	98	80 - 120	ND, RDL=0.01	mg/L	NC	20		
7407986	Total Beryllium (Be)	2021/06/15	98	80 - 120	97	80 - 120	ND, RDL=0.0005	mg/L				
7407986	Total Cadmium (Cd)	2021/06/15	98	80 - 120	95	80 - 120	ND, RDL=0.002	mg/L	NC	20		
7407986	Total Chromium (Cr)	2021/06/15	98	80 - 120	97	80 - 120	ND, RDL=0.01	mg/L	NC	20		

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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
7407986	Total Cobalt (Co)	2021/06/15	98	80 - 120	97	80 - 120	ND, RDL=0.002	mg/L	NC	20		
7407986	Total Copper (Cu)	2021/06/15	97	80 - 120	97	80 - 120	ND, RDL=0.01	mg/L	1.8	20		
7407986	Total Iron (Fe)	2021/06/15	99	80 - 120	102	80 - 120	ND, RDL=0.02	mg/L	NC	20		
7407986	Total Lead (Pb)	2021/06/15	96	80 - 120	96	80 - 120	ND, RDL=0.01	mg/L	NC	20		
7407986	Total Manganese (Mn)	2021/06/15	99	80 - 120	98	80 - 120	ND, RDL=0.001	mg/L	0.57	20		
7407986	Total Molybdenum (Mo)	2021/06/15	101	80 - 120	99	80 - 120	ND, RDL=0.005	mg/L	NC	20		
7407986	Total Nickel (Ni)	2021/06/15	97	80 - 120	96	80 - 120	ND, RDL=0.005	mg/L	NC	20		
7407986	Total Phosphorus (P)	2021/06/15	95	80 - 120	93	80 - 120	ND, RDL=0.05	mg/L				
7407986	Total Selenium (Se)	2021/06/15	100	80 - 120	97	80 - 120	ND, RDL=0.02	mg/L	NC	20		
7407986	Total Silver (Ag)	2021/06/15	100	80 - 120	100	80 - 120	ND, RDL=0.01	mg/L	NC	20		
7407986	Total Tin (Sn)	2021/06/15	101	80 - 120	100	80 - 120	ND, RDL=0.02	mg/L	NC	20		
7407986	Total Titanium (Ti)	2021/06/15	98	80 - 120	96	80 - 120	ND, RDL=0.005	mg/L	NC	20		
7407986	Total Zinc (Zn)	2021/06/15	95	80 - 120	93	80 - 120	ND, RDL=0.005	mg/L	3.3	20		
7408999	Total Cyanide (CN)	2021/06/15	100	80 - 120	104	80 - 120	ND, RDL=0.0050	mg/L	NC	20		
7410545	Mercury (Hg)	2021/06/16	NC	75 - 125	93	80 - 120	ND, RDL=0.00010	mg/L	2.8	20		
7411783	Naphthalene	2021/06/17	100	50 - 130	98	50 - 130	ND, RDL=0.050	ug/L	NC	30		
7412403	Total Oil & Grease	2021/06/17			99	85 - 115	ND, RDL=0.50	mg/L	0.76	25		

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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
7412425	Total Oil & Grease Mineral/Synthetic	2021/06/17			99	85 - 115	ND, RDL=0.50	mg/L	2.6	25		

N/A = Not Applicable

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

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

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

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

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

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

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

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

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

BV Labs Job #: C1G0947
Report Date: 2021/06/18

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-462A
Site Location: 1062 and 1074 Cooke Boulevard
Sampler Initials: SL

VALIDATION SIGNATURE PAGE

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

Brad Newman, B.Sc., C.Chem., Scientific Service Specialist

Soham Patel, Analyst 2

BV Labs 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 Signature Page.

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

BV Labs Job #: C1G0947
Report Date: 2021/06/18

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-462A
Site Location: 1062 and 1074 Cooke Boulevard
Sampler Initials: SL

Exceedance Summary Table – Burlington Storm Sewer

Result Exceedances

Sample ID	BV Labs 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 – Halton Sanitary Sewer

Result Exceedances

Sample ID	BV Labs ID	Parameter	Criteria	Result	DL	UNITS
MW3	PUV681-06	Total Iron (Fe)	50	51	0.02	mg/L
MW3	PUV681-11	Total Suspended Solids	350	480	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.

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MICRO

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11-Jun-21 17:35

Christine Gripton

C1G0947

Bottle Order #: 830807

VBV EMC-003

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:			
Company Name:	#31796 B.I.G Consulting Inc.	Company Name:		Quotation #:	B64476	COC #: C#830807-01-01	Project Manager: Christine Gripton
Attention:	Accounts Payable	Attention:	Eileen Liu	P.O. #:			
Address:	12-5500 Tomken Road Mississauga ON L4W 2Z4	Address:		Project:	BIGC-ENV-462A		
Tel:	(416) 214-4880 Fax:	Tel:	Fax:	Project Name:			
Email:	ldougherty@brownfieldigi.com;admin@brownfieldigi.co	Email:	eliu@brownfieldigi.com	Site #:	1062 and 1074 Cooke Boulevard		
				Sampled By:			

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

Regulation 153 (2011)
- ☐ Table 1 ☐ Res/Park ☐ Medium/Fine
- ☐ Table 2 ☐ Ind/Comm ☐ Coarse
- ☐ Table 3 ☐ Agri/Other ☐ For RSC
- ☐ Table ___

Other Regulations
- ☐ CCME ☑ Sanitary Sewer Bylaw
- ☐ Reg 558 ☑ Storm Sewer Bylaw
- ☐ MISA Municipality: Burlington
- ☐ PWQO ☐ Reg 406 Table ___
- ☐ Other ___

Special Instructions

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

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

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

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

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle) Metals / Hg / Cr VI	ANALYSIS REQUESTED (PLEASE BE SPECIFIC): Burlington storm sewer	Halton Sanitary & Combined Sewer (2-03)	# of Bottles	Comments
1		MW3	21/06/11	1100hrs	GW	N	✓	✓	15	ignore the project code on bottles
2										
3										
4										
5										
6										
7										
8										
9										
10										

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Shirley Li	21/06/11	1733	DILSHANEETHA JAYANTHAN	21/06/11	17:35	

Laboratory Use Only ON ICE

Time Sensitive	Temperature (°C) on Recei	Custody Seal	Yes	No
	18/19/20	Present	✓	
		Intact	✓	

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BV LABS' 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.BVLABS.COM/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.BVLABS.COM/RESOURCES/CHAIN-OF-CUSTODY-FORMS.

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

White: BV Labs Yellow: Client

Bureau Veritas Canada (2019) Inc.

APPENDIX E: CONSTRUCTION DEWATERING ESTIMATE RATE CALCULATIONS

Construction Dewatering Rate Estimate

1062 and 1074 Cooke Boulevard, Burlington, Ontario
Three (3) to Five (5) levels of underground parking, unconfined aquifer, groundwater seepage to square excavation (line source)

Table E-1: Construction Dewatering Rate Estimates for Three (3) to Four (4) Levels of Underground Parking

Description	Symbol	Values	Unit	Explanation
Input				
Lowest Ground Elevation		101.22	m asl	Based on borehole logs
Highest Groundwater Elevation		93.75	m asl	Highest groundwater elevation (June 10, 2021)
Foundation Elevation		88.00	m asl	Based on the Geotechnical Investigation prepared by BIG dated July 2021
Aquifer Bottom		85.00	m asl	Assumed 3 m below foundation elevation
Hydraulic Conductivity	K	3.35E-05	m/s	Geometric mean K
Length of Excavation	x	120.0	m	Based on area extent equivalent
Width of Excavation	a	55.0	m	Based on area extent equivalent
Output				
Top of Aquifer		93.75	m asl	Water table for unconfined aquifer
Target Water Level		87.00	m asl	Assumed 1.0 m below footing elevation
Water Level above aquifer bottom before dewatering	H	8.8	m	
Target water level above aquifer bottom	h	2.0	m	
Radius of Influence	L (R_0)	68.42	m	Sichardt's Formula C=1750
Construction dewatering flow rate - Steady State	Q	537.9	m^3/day	Construction Dewatering flow – Dupuit Equation
Maximum construction dewatering flow rate (safety factor of 2)	2Q	1075.9	m^3/day	During the initial period and after rains
Construction Dewatering Flow Rate - Steady State	Q	**538,000**	L/day	
Maximum Construction Flow Rate (safety factor of 2)	2Q	**1,076,000**	L/day	

Table E-2: Construction Dewatering Rate Estimates for Five (5) Levels of Underground Parking

Description	Symbol	Values	Unit	Explanation
Input				
Lowest Ground Elevation		101.22	m asl	Based on borehole logs
Highest Groundwater Elevation		93.75	m asl	Highest groundwater elevation (June 10, 2021)
Foundation Elevation		83.22	m asl	Assumed 18 m below ground surface
Aquifer Bottom		80.22	m asl	Assumed 3 m below foundation elevation
Hydraulic Conductivity	K	7.67E-08	m/s	Highest K in bedrock
Length of Excavation	x	120.0	m	Based on area extent equivalent
Width of Excavation	a	55.0	m	Based on area extent equivalent
Output				
Top of Aquifer		93.75	m asl	Water table for unconfined aquifer
Target Water Level		82.22	m asl	Assumed 1.0 m below footing elevation
Water Level above aquifer bottom before dewatering	H	13.5	m	
Target water level above aquifer bottom	h	2.0	m	
Radius of Influence	L (R_0)	5.59	m	Sichardt's Formula C=1750
Construction dewatering flow rate - Steady State	Q	37.2	m^3/day	Construction Dewatering flow – Dupuit Equation
Maximum construction dewatering flow rate (safety factor of 2)	2Q	74.3	m^3/day	During the initial period and after rains
Construction Dewatering Flow Rate - Steady State	Q	37,000	L/day	
Maximum Construction Flow Rate (safety factor of 2)	2Q	74,000	L/day	
Total Maximum Construction Flow Rate (safety factor of 2)	2Q	**1,150,000**	L/day	

APPENDIX F: LONG TERM DRAINAGE FLOW RATE ESTIMATE CALCULATIONS

Foundation Drain Flow Rate Estimate

1062 and 1074 Cooke Boulevard, Burlington, Ontario
Three (3) Five (5) levels of underground parking, unconfined aquifer, groundwater seepage to square excavation (line source)

Table F-1: Foundation Drain Flow Rate Estimate for Three (3) to Four (4) Levels of Underground Parking

Description	Symbol	Values	Unit	Explanation
Input				
Lowest Ground Elevation		101.22	m asl	Based on borehole logs
Highest Groundwater Elevation		93.75	m asl	Highest deep groundwater elevation (June 10, 2021)
Foundation elevation		88.00	m asl	Based on the Geotechnical Investigation prepared by BIG dated July 2021
Aquifer Bottom		85.00	m asl	Assumed 3 m below foundation
Hydraulic Conductivity	K	1.04E-05	m/s	Applicable K value for the overburden
Length of Excavation	x	120.0	m	Based on area extent equivalent
Width of Excavation	a	55.0	m	Based on area extent equivalent
Output				
Top of Aquifer		93.8	m asl	Water table for unconfined aquifer
Target Water Level		87.50	m asl	Assumed 0.5 m below foundation elevation
Water Level above aquifer bottom before dewatering	H	8.8	m	
Target water level above aquifer bottom	h	2.5	m	
Radius of Influence	L (R_0)	102.88	m	Jacob's Equation - R_0 after 90 days
Long-Term Flow Rate - Steady State	Q	107.2	m^3/day	Long-term flow rate - Dupuit Equation
Maximum Foundation Drain Flow Rate (safety factor of 2)	2Q	214.33	m^3/day	During the initial period and after rains
Estimated Long-term Foundation Drain Flow Rate	Q	**107,000**	L/day	
Estimated Maximum Foundation Drain Flow Rate	2Q	**214,000**	L/day	

Table F-2: Foundation Drain Flow Rate Estimate for Five (5) Levels of Underground Parking

Description	Symbol	Values	Unit	Explanation
Input				
Lowest Ground Elevation		101.22	m asl	Based on borehole logs
Highest Groundwater Elevation		93.75	m asl	Highest deep groundwater elevation (June 10, 2021)
Foundation elevation		83.22	m asl	Assumed 18 m below ground surface
Aquifer Bottom		80.22	m asl	Assumed 3 m below foundation
Hydraulic Conductivity	K	1.04E-05	m/s	Applicable K value for the overburden
Length of Excavation	x	120.0	m	Based on area extent equivalent
Width of Excavation	a	55.0	m	Based on area extent equivalent
Output				
Top of Aquifer		93.8	m asl	Water table for unconfined aquifer
Target Water Level		82.72	m asl	Assumed 0.5 m below foundation elevation
Water Level above aquifer bottom before dewatering	H	13.5	m	
Target water level above aquifer bottom	h	2.5	m	
Radius of Influence	L (R_0)	165.15	m	Jacob's Equation - R_0 after 150 days
Long-Term Flow Rate - Steady State	Q	167.9	m^3/day	Long-term flow rate - Dupuit Equation
Maximum Foundation Drain Flow Rate (safety factor of 2)	2Q	335.72	m^3/day	During the initial period and after rains
Estimated Long-term Foundation Drain Flow Rate	Q	**168,000**	L/day	
Estimated Maximum Foundation Drain Flow Rate	2Q	**336,000**	L/day	