PREPARED FOR
BARRIE-BRYNE DEVELOPMENTS LTD.
211-11672-00

PRELIMINARY HYDROGEOLOGICAL INVESTIGATION

HIGHWAY 400 & HARVIE ROAD, BARRIE, ON

MARCH 22, 2022

CONFIDENTIAL

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FINAL REPORT

PROJECT NO.: 211-11672-00
DATE: MARCH 22, 2022

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March 22, 2022

BARRIE-BRYNE DEVELOPMENTS LTD.,
3200 Highway 7
Vaughan, Ontario
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Attention: **Ms. Sandi Chieu, B.Sc.**

Re: Preliminary Hydrogeological Investigation – Highway 400 & Harvie Road, Barrie, ON

Dear Madam:

WSP Canada Inc. is pleased to present the Preliminary Hydrogeological Investigation Report which has been prepared in support of the proposed development of the property located at Highway 400 and Harvie Road, Barrie, Ontario. This report documents relevant background information, the results of our field investigations and analyses, and provides our findings and conclusions.

Please do not hesitate to contact the undersigned should you have any questions or require any further assistance.

Yours sincerely,

WSP Canada Inc.

Melanie Yuen, B.A.T.
Project Manager

Phyllis McCrindle, M.Sc., P.Geo.
Senior Hydrogeologist

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1 INTRODUCTION

WSP Canada Inc. (WSP) was retained by Barrie-Bryne Developments Ltd. to complete a preliminary hydrogeological investigation to provide input into the proposed development located south of Harvie Road and west of Highway 400 in Barrie, Ontario, herein referred to as the "Site". To evaluate regional hydrogeological conditions, a 500 m buffer zone (the "Study Area") was added around the Site. The Site and the Study Area are shown on **Figure 1**.

The Site is located in an area zoned as Light Industrial and General Commercial with Environmental Protection areas in the north and south, and currently consists of agricultural fields. It is understood that the proposed development of the Site consists of a large mix of semi-detached homes, townhomes, mid-rise residential, 2-storey employment blocks, stormwater management facilities, open spaces, and parkland. It is also our understanding that up to one (1) level of basement is proposed for the semi-detached homes, townhomes, and mid-rise residential buildings.

It should be noted that the preliminary dewatering calculations presented in this report are based on estimated construction excavation elevations for the proposed development. Once detailed designs are available, the dewatering calculations should be updated accordingly. It is noted that a desktop geotechnical report has been prepared by WSP and issued under a separate cover.

1.1 OBJECTIVES

This hydrogeological study has been developed considering the Site's location, size, and physical setting. The objectives of this study are to characterize the preliminary hydrogeological conditions on-site, assess groundwater quality, complete a water balance assessment, and identify potential construction dewatering needs.

1.2 SCOPE AND METHODOLOGY

To characterize hydrogeological conditions at the Site and within the Study Area, a combination of existing historical information and field data was used. The scope of work for the preliminary hydrogeological investigation included:

- Background Review:
  - A detailed review and interpretation of existing background information on earth sciences and groundwater resources in the Study Area, including the Ministry of the Environment, Conservation and Parks Water Well Records (MECP WWRs);
  - Review previous reports completed near the Site including a geotechnical report prepared by AMEC (January 2006), a geotechnical report prepared by WSP (January 2019), and a hydrogeological investigation prepared by Terraprobe (November 2005);

- Review Phase One Environmental Site Assessment (ESA) (January 2006) and Environmental Soil Assessment reports (August 2006) prepared by AMEC to evaluate the potential for contaminant migration during dewatering activities;

- Conduct field investigations:
  - Drill seven (7) boreholes and install seven (7) monitoring wells at all borehole locations to understand geological lithology and stratigraphy, current groundwater levels and groundwater quality;
  - Install and geodetically survey two surface water stations and piezometers to evaluate groundwater and surface water interactions at the Site;
  - Monitor groundwater elevations at all available monitoring wells, piezometer and surface water stations for a period of twelve (12) months, using continuous datalogger data and quarterly site visits;
  - Conduct in-situ single well response tests (SWRTs) to calculate the hydraulic conductivity at select well locations;
  - Determine preliminary infiltration rates using the shallow monitoring wells;
  - Collect two (2) groundwater samples from the newly installed monitoring wells and submission of samples for laboratory analysis of select parameters outlined in the Provincial Water Quality Objectives (PWQO);
- Evaluate temporary construction dewatering flow rates for the proposed development;
- Assess potential construction impacts to the local groundwater resources;
- Prepare a pre-development and post-development water balance for the Site; and,
- Document findings of the fieldwork and data analysis in a preliminary hydrogeological report.

1.3 PROJECT WORK BY OTHERS

WSP reviewed background reports provided by Barrie-Bryne Developments Ltd. for the project. Details of these reports are presented below.

Summary of the Results of Preliminary Geotechnical Investigation - Proposed Commercial and Industrial Development, Highway 400 and Harvie Road, Barrie, Ontario

AMEC Earth and Environmental, a division of AMEC Americas Limited (AMEC) was retained by Diamora Developments Limited to conduct a geotechnical investigation at the Site in January 2006. As part of the investigation, seven (7) boreholes BH1 through BH7 were advanced to depths ranging between 3.5 to 5.0 metres below ground surface (mbgs).

The soil profile at the Site generally consisted of 0.2 m to 0.6 m thick topsoil overlying native sandy soil. However, possible fill material was encountered beneath the topsoil at BH5 and BH6 extending 1.0 m and 1.4 m below existing ground surface, respectively. In BH1, a layer of silty clay to clayey silt was encountered within the sand at a depth of 4 m below existing ground surface.

Upon borehole completion, groundwater was only encountered in borehole BH1at 4.3 mbgs, at an elevation of approximately 86.4 metres above mean sea level (masl) on January 11, 2006. Boreholes BH2 through BH7 were dry upon drilling completion.

Summary of the Results of Bryne Drive Extension Geotechnical Investigation, City of Barrie

WSP Canada Inc. was retained by the City of Barrie to conduct a geotechnical investigation for the Bryne Drive Extension lands which pass through the centre of the current Site and in the lands to the north. As part of the investigation, thirty-four (34) boreholes were advanced to depths ranging between 5.0 to 12.7 mbgs.

The soil profile at the Site consisted of topsoil or asphalt pavement structure overlying fill materials, non-cohesive deposits (sand to silty sand to sand and silt), and glacial till (silty sand to sandy silt till and clayey silt till). In several of the borehole locations, the non-cohesive deposits and glacial till was interlayered with cohesive deposits of clayey silt to silt and clay.

Upon borehole completion, groundwater was encountered in 25 of the boreholes at depths ranging between 0.9 mbgs and 7.7 mbgs.

Hydrogeologic Investigation – Proposed Bryne Drive Extension from Veteran's Drive to Commerce Park Drive and North Along Bryne Drive to Essa Road, Barrie, Ontario

Terraprobe was retained by the City of Barrie to complete a hydrogeological investigation for a proposed road extension in November 2005. It is noted that only part of the road extension lands pass through the current Site footprint. The study consisted of detailed site inspection (to assess site conditions, evidence of groundwater discharge features, and surface drainage features), a review of Ministry well records, topographic mapping, previous geotechnical reports, and a review of Lake Simcoe Region Conservation Authority files.

Based on a review of studies provided by the LSRCA, Terraprobe noted the following:

- Three main aquifer units have been identified in the vicinity of Lover's Creek, divided into an Upper, Intermediate, and Deep aquifer. Generally, water supply wells in the area use groundwater from the Upper and Intermediate Aquifers, with only a few wells in the Deep Aquifer.
    - The Upper Aquifer system interacts with local surface water features, characterized by sandy soils, allows for moderate to high infiltration rates, and is typically encountered at an elevations between 250 masl and 310 masl. The Upper Aquifer can be found exposed at surface or covered locally with less permeable silty and clay.
    - The Upper Aquifer is largely unconfined and susceptible to contamination from surface activities.
    - The Intermediate Aquifer is found at elevations ranging between 220 masl and 250 masl.
    - The Deep Aquifer underlies the northeast portion of the Lover's Creek watershed and can be found at elevations between 160 masl and 180 masl.

- The western side of the Lover's Creek watershed is considered an area of groundwater recharge, and groundwater flow in the Upper and Intermediate Aquifer units are important contributors to baseflow.

During the site inspection, Terraprobe noted phreatophytic vegetation (i.e. water cress) along the banks of Whiskey Creek, indicating that there is consistent groundwater discharge or base flow in this area. Tributaries of Lover's Creek towards the Bryne extension were dry with a distinct valley feature, but no continuous channel. It was interpreted that this portion of the creek supports flow during storm events and spring snow melt. A distinct channel feature with minor flow was observed 100m west of Hwy 400, with flow increasing towards Hwy 400. An "oily" sheen was noted on the water surface as a result of iron reducing bacteria, indicating that there is consistent base flow or groundwater discharge in the area. No seeps or points of discharge were directly observed along either the banks of Whiskey Creek or tributaries of Lover's Creek.

Preliminary Environmental Impact Study, Bryne Drive, City of Barrie

Beacon Environmental Limited (Beacon) was retained by Barrie-Bryne Developments Limited to conduct an Environmental Impact Study (EIS) (dated March 2022) as part the proposed development application for the Site, including the future Bryne Drive extension. As part of the study, an investigation of the ecological and physical characteristics of the subject property, their functions, significance and sensitivity, including species at risk (SAR) was completed.

Based on the preliminary field investigations and analysis, key functions and attributes identified on the subject property included fish habitat within the reach of Lover's Creek and Whiskey Creek, amphibian breeding habitat within the upper reach of Lover's Creek, breeding birds observed in the open field areas during Beacon's previous investigations in 2012 and Lover's Creek corridor providing linkage to the downstream reach of Lover's Creek.

Beacon concluded that based on the proposed residential and commercial development at the Site, and with the implementation of appropriate mitigation measures and stormwater quality and quantity controls, no significant negative impacts on the adjacent natural areas (i.e. Whiskey Creek or Lovers Creek) and their associated fish communities and habitats is anticipated. It should be noted the details of the proposed mitigation measures are discussed in detail in the Stormwater Management report prepared by Tatham (dated March 2022) and include measures such as a bioretention cell within the stormwater management pond located in the southwest portion of the Site, and lot-specific controls within the employment blocks located east of the Bryne Drive Extension lands.

2 STUDY AREA SETTING

2.1 PHYSIOGRAPHY, TOPOGRAPHY AND DRAINAGE

The Site and the Study Area are located entirely within the Peterborough Drumlin Field physiographic region of Southern Ontario (Chapman and Putnam, 1984; MNRF, 1984). The region is characterized by drumlins that rise from the relatively flat lying Newmarket Till Plain.

Available mapping indicates that the ground surface elevations across the Site range between 304 masl in the southern portion of the Site and 288 masl in the northern portion of the Site.

Based on watershed mapping provided by the Lake Simcoe Region Conservation Authority (LSRCA, 2012), the Site is present within both the Lovers Creek and Barrie Creeks Subwatersheds of the Lake Simcoe Watershed (see **Figure 1**). Drainage in the southern portion of the Site flows towards tributaries of Lovers Creek, located approximately 2.8 km east of the Site. The northern portion of the Site drains towards Whiskey Creek, located at the northern extent of the Site. Both Lovers Creek and Whiskey Creek flow generally north into Kempenfelt Bay (Lake Simcoe), located approximately 3.2 km northeast of the Site.

It should be noted that the Lovers Creek Wetland Complex, a Provincially Significant Wetland (PSW), is present approximately 2.5 km east of the Site, outside of the Study Area. There are no PSW or unevaluated wetlands within the Study Area (MNRF, January 2022).

2.2 BEDROCK GEOLOGY

The bedrock in the Study Area is mapped as shale and limestone of the Middle Ordovician-aged Lindsay Formation of the Simcoe Group (OGS, 1991). Bedrock was only encountered in one MECP water well record (**Appendix A**) within the Study Area at a depth of 170.7 mbgs. Bedrock was not encountered at the Site during this investigation where boreholes extended to depths up to 12.5 mbgs.

2.3 SURFICIAL GEOLOGY

The occurrence and character of the overburden are a result of the repeated glacial advances and retreats that occurred in Southern Ontario. The native surficial soils in the Study Area are comprised predominantly of Ice-Contact Stratified deposits of sand and gravel with minor inclusions of silt, clay, and till. Fine-textured glaciolacustrine massive to well laminated deposits of silt and clay, minor sand and gravel are present at the northern portion of the Study Area. An organic deposit of peat and muck is located in the southwestern portion of the Study Area. Sandy silt to silty sand textured till (Newmarket Till) is also identified as surficial soils within the western portion of the Study Area (OSG, 1990). The surficial geology at the Site and Study Area is shown on **Figure 2**.

2.4 HYDROSTRATIGRAPHY

The hydrostratigraphic units in the Study Area have been well documented in watershed studies for the Lake Simcoe Watershed and Lovers Creek and Barrie Creeks Subwatersheds as well as source water protection reports applicable to the Barrie area. Based on the information in these reports, overburden hydrostratigraphy in the area of the Site is made up of a sequence of regional aquifer and aquitard units. Aquifers have been identified as units A1, A2, A3, and A4, and aquitards as C1, C2, C3, and C4, extending from shallowest to deepest (LSRCA, 2012).

The following summary describes the characteristics of the A1 and A2 aquifers and C1 aquitard that has the potential to be impacted by the proposed construction at the Site (LSRCA, 2021; Golder, 2010).

- **A1 Aquifer** is generally described to consist of fine to medium grained sand with some gravel. The unit is commonly found above elevations of 250 masl. It has been mapped in some locations reaching elevations of up to 350 masl in upland areas and as low as 220 masl in some lowland areas. Though the aquifer may be confined in some local areas, it is typically an unconfined surficial unit.
- **C1 Aquitard** is identified as varved clay and silt and noted as thin to non-existent in some areas west of Barrie.
- **A2 Aquifer** consists of sand deposits with some clast rich portions. The A2 aquifer ranges in thickness from approximately 10 to 30 m in most areas. It is found at elevations of 175 to 230 masl within the lowland areas but the stratigraphic equivalent extends up to approximately 250 masl to the northeast, under the Oro Moraine.

2.5 SITE STRATIGRAPHY

The stratigraphy at the Site, identified during the drilling program is summarized below. The borehole and monitoring well logs are included in **Appendix B**; the locations of boreholes and monitoring wells advanced on the Site are shown on **Figure 3**. Geological cross-sections for the Site are presented on **Figures 4** and **5**. The general soil profile at the borehole locations consist of topsoil underlain by native sand to silty sand deposits.

TOPSOIL

A 130 mm to 610 mm thick layer of topsoil was encountered at all the borehole locations.

UPPER SILTY SAND/SANDY SILT/SILT AND SAND

Underneath the topsoil, native silty sand to sandy silt to silt and sand material was found in boreholes MW21-02s, MW21-02d, MW21-05s, and MW21-05d, extending to depths ranging from 0.6 to 0.8 mbgs. In borehole MW21-01, silty sand was found from 0.8 mbgs to 1.8 mbgs, underlying a layer of sand found beneath the topsoil. These deposits contained trace organics and was found to be moist to wet in a loose state.

UPPER SAND

A layer of sand was encountered beneath the topsoil in boreholes MW21-01, MW21-03 and MW21-04, underlying the silty sand deposits in boreholes MW21-02s and MW21-02d, and underlying the clayey silt in borehole MW21-05d. In borehole MW21-01, the sand layer is interbedded with a unit of silty sand between 0.8 to 1.8 mbgs and in borehole MW21-04, the sand layer is interbedded with a unit of clayey sandy silt between 1.5 to 2.7 mbgs. This sand layer extends to depths ranging between 3.1 to 9.6 mbgs, with a thickness ranging from 2.5 to 6.9 m. These deposits contained trace silt and were found to be moist and loose to compact.

LOWER SILTY SAND/SILT AND SAND

A lower unit of silty sand to silt and sand was encountered below the sand layer in boreholes MW21-02d, MW21-03, and MW21-04 extending to depths between 7.9 and 9.4 mbgs. This unit contained trace clay and was moist to wet in a very dense state.

CLAYEY SILT/CLAYEY SANDY SILT/CLAY AND SILT

A shallow layer of clayey silt was encountered within the sand deposits in borehole MW21-04, and below the upper silty sand in boreholes MW21-05s and MW21-05d. This shallow layer was found at depths extending from 2.7 mbgs to 3.1 mbgs, contained trace gravel, and was moist in a compact state. A deeper layer was encountered in boreholes MW21-02d and MW21-04 extending to depths between 9.6 mbgs and 10.7 mbgs. The deeper layer contained some sand and was moist to wet with a hard consistency.

LOWER SAND

A lower unit of sand was found in borehole MW21-02d below the clayey silt at 10.7 mbgs and extending to the borehole depth of 12.5 mbgs. This very dense layer contained trace gravel and was moist to wet.

3 HYDROGEOLOGICAL ASSESSMENT

3.1 MINISTRY OF THE ENVIRONMENT, CONSERVATION AND PARKS WATER WELL RECORDS

The MECP WWR database was reviewed to determine the number and locations of water wells present within the Study Area (MECP, 2022a).

The MECP WWR database indicated that there are fifty-eight (58) well records within the Study Area. Locations of identified well records are shown on **Figure 1**. A summary of the WWRs is included in **Appendix A**. Based on the available data, shallower wells were installed at depths ranging between 3.0 mbgs and 66.4 mbgs, and deeper wells were installed at depths ranging between 121.0 mbgs and 174.7 mbgs. Reported static water levels for these wells were recorded to between 1.5 mbgs and 69.2 mbgs.

A review of the records indicates that eight (8) of the records are listed as domestic water supply wells, five (5) are listed as public, industrial, irrigation, or livestock water supply wells, eighteen (18) are listed as monitoring wells, test holes or observation wells, and twenty-seven (27) records are listed as abandoned wells, not in use, or unknown. **Table 1** includes a summary of the water supply wells found within the Study Area. These water supply wells were completed between 1959 and 1979, with the exception of one domestic supply well completed in 2003. It is interpreted that there are no current groundwater users within the Study Area due to the availability of municipal water and sewer services in this area, as indicated by hydrants and storm drains observed around the Site. However, a private water well survey would be needed if a Category 3 Permit to Take Water (PTTW) is required, in order to confirm whether there are current groundwater users within the Study Area.

Table 1: MECP WWR – Water Supply Wells

WELL ID	WELL DEPTH (m)	STATIC WATER LEVEL (mbgs)	DATE COMPLETED	WATER USE	DISTANCE FROM SITE (m)
5701450	44.20	30.48	July 6, 1965	Livestock	398
5701534	33.83	25.91	September 23, 1959	Irrigation	316
5701536	44.50	18.29	June 1, 1960	Public	470
5707449	51.82	42.67	August 14, 1970	Domestic	459
5708906	45.72	28.35	March 28, 1972	Industrial	160
5710048	122.83	63.09	May 5, 1972	Industrial	37
5711172	49.07	40.54	July 1, 1974	Domestic	350
5711221	48.77	40.54	May 10, 1974	Domestic	401
5713455	44.50	32.00	June 17, 1975	Domestic	331
5714107	49.99	42.67	March 16, 1977	Domestic	500
5714186	48.16	36.58	June 14, 1976	Domestic	445
5720702	16.46	10.36	December 10, 1985	Domestic	9
5738555	66.45	1.52	November 18, 2003	Domestic	225

3.2 EXISTING PERMIT TO TAKE WATER AND ENVIRONMENTAL ACTIVITY AND SECTOR REGISTRY SEARCH

The MECP maintains a database of all active PTTW and Environmental Activity and Sector Registry (EASR) items related to construction dewatering. A review of the MECP PTTW database indicated that there are no active PTTW registrations found within 1 km of the Site (MECP, 2022b).

Access environment records were also reviewed for any active construction dewatering EASRs (MECP, 2021c). One construction dewatering record was found for properties within 1 km of the Site. It should be noted that the construction dates for this registration are from November 2018 to November 2020, and dewatering activities may no longer be active. **Table 2** includes the summary and address of the registration.

Table 2: PTTW and EASR Summary

PERMIT #	TYPE	ADDRESS	CLIENT	SOURCE	MAX (L/DAY)
R-009-8110660517	EASR	-	Corporation of the City of Barrie	Construction Dewatering	400,000

Source: MECP, Permits to Take Water, http://www.ontario.ca/environment-and-energy/ map-permits-take-water and Access Environment Web Portal, http://www.accessenvironment.ene.gov.on.ca, Date accessed: January 19, 2022

3.3 SOURCE WATER PROTECTION – IDENTIFICATION OF VULNERABLE AREAS

The Study Area lies within the Lovers Creek and Barrie Creeks Subwatershed of the Lake Simcoe Watershed, and is in the South Georgian Bay Lake Simcoe (SGBLS) Source Protection Region (SPR). The SGBLS SPR is under the jurisdiction of the Lake Simcoe and Region Conservation Authority (LSRCA), Nottawasaga Valley Conservation Authority, and Severn Sound Environmental Association. The Approved Source Protection Plan (2015, amended 2019) is the reference document, which outlines the relevant policies within the jurisdiction boundaries.

The study boundaries were evaluated to identify any potential drinking water vulnerabilities and threats, including the proximity to any vulnerable areas, including the following:

- Wellhead Protection Areas (WHPA)
- Intake Protection Zones (IPZ)
- Highly Vulnerable Aquifers (HVA)
- Significant Groundwater Recharge Areas (SGRA)
- Wellhead Protection Area-Q (WHPA-Q, Water Quantity).

A summary of the information provided in the MECP Source Protection Information Atlas is presented in **Table 3.**

Table 3: Summary of Source Protection Vulnerability

SOURCE PROTECTION DETAILS FOR LOCATION					
Source Protection Area:	Lakes Simcoe and Couchiching/Black River	**Wellhead Protection Area (WHPA):**	NO	**Wellhead Protection Area E (GUDI):**	NO
Intake Protection Zone (IPZ):	NO	**Issue Contributing Area:**	NO	**Significant Groundwater Recharge Area (SGRA):**	YES, score of 4
Highly Vulnerable Aquifer (HVA):	NO	**Event Based Area (EBA):**	NO		
Wellhead Protection Area Q1 (WHPA-Q1):	NO	**Wellhead Protection Area Q2 (WHPA-Q2):**	YES, stress: Low	**Intake Protection Zone Q (IPZ-Q):**	NO

As indicated in **Table 3,** the Site is not located within an HVA, surface water IPZ, or EBA, however it does fall within a SGRA, with a vulnerability score of 4. Vulnerability is measured on a 10-point scale and shows how quickly water (and pollutants) move from the surface to the aquifer. The vulnerability score at the Site is 4, indicating a moderate contamination risk.

Policies 6.36-DP through 6.40-DP of the Lake Simcoe Protection Plan address Significant Groundwater Recharge Areas (SGRA). Identified SGRA's are incorporated into official plans along with policies to protect, improve or restore the function, quality, and quantity of groundwater in these areas. Major developments within a SGRA will require an Environmental Impact Study (EIS) to demonstrate that the SGRA is not impacted by the proposed development. A Preliminary EIS report has been prepared by Beacon Environmental Ltd, and submitted under separate cover. A summary of the main findings is provided in Section 1.3.

The Site is not within a WHPA, but is withing the WHPA-Q2 for the Barrie municipal water supply. The Approved Source Protection Plan (2015, amended 2019) indicates that the WHPA-Q2 is "an area delineated through a Tier 3 Water Budget and Water Quality Risk Assessment as being the area that includes the WHPA-Q1 and any area where a future reduction in recharge would significantly impact that area". Low Impact Development techniques are recommended to be incorporated into the design of the proposed development to mitigate potential reductions in groundwater recharge.

3.4 GROUNDWATER CONDITIONS

3.4.1 WATER LEVEL MONITORING

A 50-mm diameter, Schedule 40 polyvinyl chloride (PVC) monitoring well was installed by a licensed driller under WSP's supervision in all seven (7) boreholes between November 23rd to 26th, 2021, to enable groundwater level monitoring, in-situ hydraulic conductivity testing and groundwater quality sampling. The new wells were predominantly installed in a sand to silty sand unit. In addition, existing monitoring wells at the Site were also used to assess groundwater levels. The results of the manual water level measurements are summarized in **Table 4** below.

Table 4: Groundwater Elevations in Monitoring Wells

MONITORING WELL	WELL DEPTH (mbgs)	GROUND SURFACE ELEVATION (masl)	DATE OF WATER LEVEL MEASUREMENT	DEPTH OF GROUNDWATER LEVEL (mbgs)	GROUNDWATER ELEVATION (masl)
MW21-01	7.3	301.38	December 8, 2021 December 15, 2021 January 19, 2022	2.58 * 3.99 4.06	298.80 * 297.39 297.32
MW21-02s	3.1	292.75	December 8, 2021 December 16, 2021 January 19, 2022	Dry Dry 2.88	Dry Dry 289.87
MW21-02d	12.2	292.83	December 8, 2021 December 16, 2021 January 19, 2022	Dry Dry 12.14	Dry Dry 280.69
MW21-03	9.1	301.68	December 8, 2021 December 16, 2021 January 19, 2022	2.68 2.59 2.66	299.00 299.09 299.02
MW21-04	9.1	298.41	December 8, 2021 December 15, 2021 January 19, 2022	8.17 8.15 7.95	290.24 290.26 290.46
MW21-05s	3.1	303.35	December 8, 2021 January 19, 2022	2.50 2.72	300.84 300.62
MW21-05d	9.1	303.35	December 8, 2021 December 15, 2021 January 19, 2022	4.05 * 3.38 3.66	299.30 299.97 299.69
MW1	7.6	303.02	January 19, 2022	6.52	296.51
BH18-21	11.6	298.96	January 19, 2022	7.38	291.58

*water level measured prior to well development and does not represent static conditions

Based on the monitoring results shown in **Table 4**, the static water level elevations in the wells ranged from 2.50 mbgs (300.84 masl in MW21-05s) to 12.14 mbgs (280.69 masl in MW21-02d). It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations in response to major weather events. The continuous water level monitoring currently being carried out at the Site for a 1 year period (December 2021 to December 2022) will provide more information about the static groundwater levels and any seasonal fluctuations that might occur.

For the dewatering assessment, the overburden will be considered a single hydrostratigraphic unit, using the highest water level (2.50 mbgs in MW21-05s) in the dewatering calculations.

3.4.2 GROUNDWATER FLOW SYSTEM CHARACTERIZATION

Regional groundwater flow in the area is interpreted to be north to northeast towards Kempenfelt Bay of Lake Simcoe. Locally, the Site is within a subwatershed divide with groundwater expected to flow northward and southward towards Whiskey Creek and tributaries of Lovers Creek, respectively. An interpreted sand and silty sand groundwater contour map is included as **Figure 6** and includes water levels measured in the wells on January 19, 2022. Based on the water level measurements, the inferred overburden groundwater flow across the Site is northeastward. As indicated in the previous hydrogeological investigation (Terraprobe, 2005), the portion of Lovers Creek at the Site is interpreted to

support flows during storm events and spring snow melt. The ongoing groundwater monitoring will provide a better understanding of any seasonal changes to groundwater flow patterns at the Site.

3.5 HYDRAULIC CONDUCTIVITY TESTING

Single well response tests (SWRT) were conducted by WSP staff at select monitoring wells on December 15, 2021 to estimate the saturated hydraulic conductivity (K) of the soil at the well screen depths. It should be noted that a SWRT was not conducted at wells MW21-05s, MW21-02s, and MW21-02d due to insufficient water.

The testing was done by performing in-situ rising head or falling head tests using a datalogger placed in the well to accurately measure the change in head versus time. The hydraulic conductivity values for each of the tested wells were calculated from the SWRT data, using Aquifer Test Software and the Bouwer & Rice computation method. The semi-log plots for normalized drawdown versus time are included in **Appendix C** and the test results are summarized in **Table 5** below.

Table 5: Hydraulic Conductivity Test Results

MONITORING WELL	WELL DEPTH (mbgs)	DOMINANT LITHOLOGY ACROSS SCREENED INTERVAL	SCREEN DEPTH RANGE (mbgs)	HYDRAULIC CONDUCTIVITY (m/sec)
MW21-01	7.3	Sand	5.8 – 7.3	Inconclusive
MW21-03	9.1	Silty Sand	7.6 – 9.1	2.9×10^{-6}
MW21-04	9.1	Silty Sand	7.6 – 9.1	7.4×10^{-7}
MW21-05d	9.1	Sand	7.6 – 9.1	2.6×10^{-5}

The SWRT completed at well MW21-01 was inconclusive since recovery happened within 30 seconds. A high conductivity rate can be expected in this are of the Site, but a pumping test will be needed to estimate the value more accurately.

Based on the results of the analysis, the hydraulic conductivity values for the overburden wells ranged between 7.4×10^{-7} m/sec and 2.6×10^{-5} m/sec. These values are consistent with what is expected from the tested sand to silty sand formations.

3.6 GRAIN SIZE ANALYSIS

In addition to the in-situ SWRTs, select soil samples from the screened intervals of the monitoring wells were tested in the laboratory for grain size distribution. The grain size distribution curves are presented in **Appendix D**. The hydraulic conductivity value (K) was estimated from particle size analyses using the Hazen method, an empirical relationship with the following equation:

$$K = C * (d_{10})^2$$

Where:
C = constant, average value of 1.0, when D is in mm and K is in cm/s;
d_{10}=diameter of the 10^{th} percentile grain size (mm).

Table 6 below compares the hydraulic conductivity values between the in-situ testing and the grain size analysis carried out for this project.

Table 6: Comparison of In-Situ Hydraulic Conductivity and Grain Size Analysis Results

MONITORING WELL	GRAIN SIZE ANALYSIS SAMPLE ID	GRAIN SIZE ANALYSIS SAMPLE DEPTH (mbgs)	DOMINANT LITHOLOGY ACROSS SAMPLED INTERVAL	HYDRAULIC CONDUCTIVITY (HAZEN) (m/sec)	HYDRAULIC CONDUCTIVITY (IN-SITU TESTING) (m/sec)
MW21-01	SS8	6.9 – 7.3	Sand	9.1×10^{-5}	Inconclusive
MW21-02s	SS4 *	2.3 – 2.7	Sand	8.5×10^{-6}	-
MW21-02d	SS11	12.2 – 12.5	Sand	8.4×10^{-6}	-
MW21-03	SS8	7.6 – 8.1	Silty Sand	7.2×10^{-6}	2.9×10^{-6}
MW21-04	SS8	7.6 – 8.1	Silty Sand	1.2×10^{-7}	7.4×10^{-7}
MW21-05s	SS4 *	2.3 – 2.8	Clayey Silt	1.0×10^{-8}	-
MW21-05d	SS8	7.6 – 8.1	Sand	4.5×10^{-5}	2.6×10^{-5}

* Grain size analysis sample taken from the deep well (i.e. from MW21-02d and MW21-05d) at the same depth as the screened interval in the shallow well

The results above suggest that based on grain size, the K value for the overburden materials (sand, silty sand, and clayey silt) ranges between 1.0×10^{-8} and 9.5×10^{-5} m/sec. These values are comparable with the values obtained during in-situ hydraulic conductivity testing (see Section 3.5).

For a conservative dewatering assessment, the overburden will be considered to be one continuous unit, using a geometric mean of the hydraulic conductivity values (3.2×10^{-6} m/s) in the calculations based on Hazen estimates and in-situ testing.

3.7 PRELIMINARY INFILTRATION RATES

It is our understanding that the infiltration system design is still being developed at the time of writing this report, but the base elevation of the proposed infiltration system is expected to be approximately 3.0 mbgs.

Preliminary infiltration rates were evaluated at the Site to estimate the infiltration potential of the native soils for consideration of Low Impact Development (LID) techniques for any proposed infiltration systems. This assessment is based on hydraulic conductivity tests and grain size distribution analyses completed at the Site. Calculations for the infiltration assessment are completed in accordance with the Low Impact Development Stormwater Management Planning and Design Guide issued by the Toronto Region Conservation Authority and Credit Valley Conservation (TRCA and CVC, 2010), a guidance document that can be applied to the Lake Simcoe watershed. The infiltration results are compared to the requirements established in the Stormwater Management Planning and Design Manual (MECP, March 2003).

Based on the grain size analysis on soil samples at the target depth, the native soils in the northern portion of the Site around MW21-02s (2.3 – 2.7 mbgs) consist of sandy material containing about 63% sand and gravel, 31% silt, and 6% clay; while the native soils in the southern portion of the Site around MW21-05s

(2.3 – 2.8 mbgs) consist of clayey silt materials containing about 3% sand and gravel, 17% silt, and 80% clay. The grain size distribution curves are presented in **Appendix D**.

Preliminary infiltration rates based on the testing completed at the Site are presented in **Table 7** below.

Table 7: Summary of Preliminary Infiltration Potential Based on In-Situ Hydraulic Conductivity and Grain Size

MONITORING WELL	GRAIN SIZE DEPTH (mbgs)	SCREEN DEPTH (mbgs)	SOIL TYPE	HYDRAULIC CONDUCTIVITY (m/sec)	PRELIMINARY INFILTRATION RATE (mm/hr)	PRELIMINARY PERCOLATION TIME (T) (min/cm)
MW21-02s	2.3 – 2.7	1.6 – 3.1	Sand	8.5×10^{-6} (Hazen)	82	7
				- (In-Situ Testing)	-	-
MW21-05s	2.3 – 2.8	1.6 – 3.1	Clayey Silt	1.0×10^{-8} (Hazen)	13	44
				- (In-Situ Testing)	-	-

* Grain size analysis sample taken from the deep well (i.e. from MW21-02d and MW21-05d) at the same depth as the screened interval in the shallow well

Based on the preliminary infiltration results, the estimated infiltration potential of the native soils range between 13 and 82 mm/hr, with estimated percolation times ranging between 7 and 44 min/cm. Typically, as per the TRCA and CVC LID Guideline, a minimum safety correction factor of 2.5 should be applied to the infiltration rates to calculate the design infiltration rate. This safety factor is required to account for site heterogeneity, potential reduction in soil permeability during construction, and gradual accumulation of fine sediments over time. For consideration of the infiltration system design, applying a minimum safety factor of 2.5 to the preliminary infiltration rates would result in design infiltration rates ranging between **5 and 33 mm/hr**.

For consideration and design of LID stormwater management techniques, Table 4.1 of the MECP Stormwater Management Planning and Design Manual should be adhered to; infiltration rates should be greater or equal to 15 mm/hr, there should be at least 1 m between the base elevation of the infiltration system and seasonal high groundwater levels, and there should be at least 1 m between the base elevation of the infiltration system and bedrock contact depth.

Bedrock was not encountered at the Site during this investigation where boreholes extended to depths up to 12.5 mbgs. Groundwater levels in the shallow wells MW21-02s and MW21-05s were measured to be between 2.50 and 2.88 mbgs between December 2021 and January 2022, and do not represent seasonal high levels.

Once detailed designs are available for any proposed infiltration features, it is recommended that in-situ infiltration testing be completed at the proposed locations and depths to refine the design infiltration rates.

3.8 GROUNDWATER QUALITY

To assess groundwater quality and evaluate the groundwater discharge options during construction activities, two (2) groundwater samples were collected by WSP from wells MW21-01 and MW21-03 on January 25, 2022. Prior to collection of the samples, approximately three (3) standing well volumes of groundwater were purged from the wells by a WSP technician.

Each sample was collected and placed into laboratory-supplied vials and/or bottles containing analytical test group specific preservatives, as required. Dedicated nitrile gloves were used by WSP staff during sample handling. The groundwater samples were submitted to an independent laboratory, AGAT Laboratories (AGAT) in Mississauga, Ontario, for analysis of select parameters of the Provincial Water Quality Objectives (PWQO). AGAT Labs is a laboratory certified by the Canadian Association for Laboratory Accreditation Inc.

The analysis indicates that all tested parameters met PWQO criteria. A summary of the analytical results and the laboratory Certificate of Analysis (CofA) are enclosed in **Appendix E**.

Based on these results, any groundwater pumped from the Site can be discharged to the natural environment "as is" without any pre-treatment. It should be noted that construction works occurring within an LSRCA regulated area will require permission prior to the commencement of construction activities. Permitting requirements should be confirmed during the detail design stage.

Should sanitary or storm sewers become viable discharge options in the future, it is recommended that groundwater be resampled and analyzed against the City of Barrie Sewer Use By-Law.

3.9 SURFACE WATER MONITORING

To evaluate groundwater-surface water interactions at the Site, two (2) surface water monitoring locations will be installed once the weather permits. Their proposed locations are shown on Figure 3. Results of the surface water monitoring will be included in an updated hydrogeological report.

3.10 CONTAMINANT OVERVIEW

AMEC was retained by Diamora Development Limited to complete a Phase I Environmental Site Assessment (ESA) for the Site in January 2006. The Site visit for the Phase I ESA took place on January 13, 2006.

Based on the records' review, Site visit, and interviews, one (1) potentially contaminating activity was identified on the Site related to approximately 450 to 650 m^3 of fill material in six (6) separate stockpiles at the Site with unknown origin and environmental quality. The stockpiles were located in the northeastern and southwestern portions of the Site.

AMEC also completed an Environmental Soil Assessment at the Site in August 2006. It is noted that the Environmental Soil Assessment is not a Phase II ESA, however it was conducted in accordance with the O. Reg. 153/04 Phase II ESA standard. Soil samples were collected from the stockpiles using a rubber tire backhoe on June 16, 2006.

Six (6) selected soil samples were analyzed for general and inorganic parameters (metals, hydrides, pH), two (2) samples were analysed for F1 to F4 petroleum hydrocarbons (PHC), and four (4) samples were analyzed for organochlorine pesticide (OCP). The soil results were compared to the MECP Table 1 Full Depth Background Site Condition Standards (SCSs) as outlined in O. Reg. 153/04.

Results of the soil analysis indicate that all soil samples collected from the Site were non-detect or well below the Table 1 standards for all tested parameters. No further environmental site assessment work was recommended by AMEC to be completed.

4 PRELIMINARY DEWATERING ASSESSMENT

It is understood that the proposed development at the Site will include a large mix of semi-detached homes, townhomes, mid-rise residential buildings, commercial buildings, open spaces, and parkland. It is also understood that up to one (1) level of underground basement are planned for the residential homes and the mid-rise residential buildings. A draft plan of the proposed development is included in **Appendix F**. Although detailed design drawings were not available at the time of preparing this report, it is assumed that P1 for the mid-rise residential buildings will be approximately 4 mbgs and the basement levels for the residential homes will be approximately 2.4 mbgs. To account for building footings/foundations, it is further assumed that an additional 1.5 m will be required for the mid-rise residential buildings and an additional 1 m will be required for the residential homes, based on guidance from the WSP geotechnical team. For the dewatering assessment, the estimated lowest excavation elevation is assumed to be 5.5 mbgs for the mid-rise residential buildings and 3.4 mbgs for the residential homes. It is noted that the current drilling program may not provide adequate coverage and depths over all the areas with a proposed underground level. Additional drilling should be considered once designs are finalized, especially for Mid-Rise Residential Block 58.

Since detailed design drawings were not available, the preliminary dewatering calculations will consider the dewatering requirements for each type of lot in order to provide a general understanding of the dewatering volumes required at the Site. These values can be used to estimate total dewatering volumes for the Site, depending on the construction schedule. It should be noted that the dewatering assessment will need to be updated during the detail design stage to support all proposed works such as proposed buildings, shoring designs, utility and service installations and earthworks within the Site.

4.1 SHORT-TERM DEWATERING REQUIREMENTS

The interpreted static groundwater levels at the Site are higher than the maximum excavation depths and, therefore, groundwater control will be required during excavation. To maintain a stable and relatively dry excavation, water levels should be lowered to at least 1.0 m below the lowest excavation depth. It should be noted that groundwater levels can vary and are subject to seasonal fluctuations and may respond to major weather events.

For a conservative dewatering assessment, the overburden will be considered a single hydrostratigraphic unit, using the highest measured water level and geometric mean hydraulic conductivity estimated for the Site in the calculations.

A complete list of assumptions used in the construction dewatering calculations, based on the draft plan and guidance from the design team, is included in **Table 8** below. It is noted that although there are two different lot sizes for the semi-detached lots (27.5m and 49.6m), the building dimensions for the homes are the same and the dewatering requirements will not be affected by lot size. The dewatering assessment for “Semi-Detached Lot” is applicable to both lot sizes.

Table 8: Construction Dewatering Assumptions

INPUT	ASSUMPTION	NOTES
Groundwater Elevation in Overburden	2.50 mbgs	Highest Water Level (MW21-05s)
Hydraulic Conductivity of the Overburden	3.2 x 10^{-6} m/s	Geometric mean K value based on Hazen and in-situ SWRTs
Mid-Rise Residential Block 58		
Ground Surface Elevation	298.50 masl	Estimated from Topographic Survey
Approximate Excavation Depth	293.00 masl	P1 assumed to be 4 mbgs Footings anticipated to be 1.5 m below P1
Target Pumping Level	291.50 masl	Assumed to be 1.0 m below excavation depth
Dimensions of Excavation for Building 1	21 m x 122 m	Provided by Client with an assumption that P1 will be present in 30% of the block
Dimensions of Excavation for Building 2	24 m x 80 m	Provided by Client with an assumption that P1 will be present in 30% of the block
Mid-Rise Residential Block 59		
Ground Surface Elevation	302.50 masl	Estimated from Topographic Survey
Approximate Excavation Depth	297.00 masl	P1 assumed to be 4 mbgs Footings anticipated to be 1.5 m below P1
Target Pumping Level	295.50 masl	Assumed to be 1.0 m below excavation depth
Dimensions of Excavation for Building 1	21 m x 61.3 m	Provided by Client with an assumption that P1 will be present in 30% of the block
Dimensions of Excavation for Building 2	24 m x 80 m	Provided by Client with an assumption that P1 will be present in 30% of the block
Semi-Detached Lot		
Ground Surface Elevation	300.00 masl	Estimated from Topographic Survey
Approximate Excavation Depth	296.60 masl	Basement assumed to be 2.4 mbgs Foundations anticipated to be 1 m below the basement
Target Pumping Level	295.60 masl	Assumed to be 1.0 m below excavation depth
Dimensions of Excavation	6.1 m x 19 m	Provided by Client with an assumption that basement will be present in 56.6% (27.5 m deep) or 34.4% (49.6 m deep) of the lot
Street Townhouse Lot and Back-to-Back Townhouse Lot		
Ground Surface Elevation	303.00 masl	Estimated from Topographic Survey
Approximate Excavation Depth	299.60 masl	Basement assumed to be 2.4 mbgs Foundations anticipated to be 1 m below the basement
Target Pumping Level	298.60 masl	Assumed to be 1.0 m below excavation depth
Dimensions of Excavation (Street Townhouse Lot)	6 m x 19.5 m	Provided by Client with an assumption that basement will be present in 66% of the lot
Dimensions of Excavation (Back-to-Back Townhouse Lot)	6.4 m x 10.7 m	Provided by Client with an assumption that basement will be present in 71% of the lot

The following general assumptions were also incorporated for dewatering flow estimates, based on the site-specific data collected during the hydrogeological investigation:

- No measures are proposed to be put in place to restrict flow into the excavations (e.g. sheet piling, caissons, etc.)
- The water bearing zones are uniform, continuous, and of infinite extent
- The water bearing zone will not be depleted by initial drainage
- The sand to silty sand units are assumed to be the water bearing zone
- Water seepage across the base of the excavation is assumed to be negligible

The dewatering estimate provided in this report is based on the proposed development information, as outlined in these general assumptions. **As identified in Section 1, detailed design drawings were not available at the time of preparing this report. WSP should be given the opportunity to revise the dewatering calculations once detailed designs are available.**

4.1.1 CONSTRUCTION DEWATERING FLOW EQUATIONS

The dewatering flow estimates were calculated using the Dupuit-Thiem approximation for a single well, which is expressed as follows (Cashman, 2013):

$$Q_w = K \times \frac{(H^2 - h^2)}{0.733 \times \log {}^{R}/_{r_e}}$$

Where:

Q_w = Rate of pumping (m^3/sec)

H = Initial depth of water (water bearing zone/aquifer total head) prior to dewatering

h = Depth of water under the deepest excavation elevation

K = Hydraulic Conductivity

*r_e = Effective radius of excavation = √(a*b)/π*

a = excavation length (estimated)

b = excavation width (estimated)

R = Radius of influence of granular zone = R_0 = C (H-h) √(k)

C = empirical calibration factor of 3000 for rectangular excavation (worst-case scenario)

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 from 'storage' within the overburden soils, resulting in lower seepage rates into the excavation.

4.1.2 ZONE OF INFLUENCE

The zone of influence (ZOI) for construction dewatering is based on the empirical Sichardt's Equation and represents the theoretical distance from the edge of dewatering where the lowering of groundwater becomes insignificant. The equation is empirical and was developed to provide representative flow rates using the steady state flow dewatering equations, as discussed above.

It is noted that in steady state conditions, the radius (or zone) of influence of pumping will extend until boundary flow conditions are reached, and sufficient water inputs are equal to the discharge rate due to

pumping. As a result, the distance of influence calculated using the Sichardt's equation is used to provide a representative flow rate calculation, but it is not accurate in determining the actual radius influenced by pumping. The ZOI from dewatering for linear flow is calculated based on the following empirical relationship:

$$R_0 = C(H - h)\sqrt{K}$$

Where:

K = *Hydraulic conductivity (m/sec) = 4.2 X 10^{-8} m/s;*

H = *Static Saturated Head in m (3 m);*

h = *Dynamic Saturated Head in m (1.4 m);*

C = *Coefficient based on geometry and source of dewatering (3000 assumed).*

The ZOI for the various lot types is presented below in **Table 9**.

4.1.3 PRELIMINARY DEWATERING FLOW ESTIMATES

Based on the assumptions provided in this report, the results of the preliminary dewatering rate estimates can be summarized as follows:

Table 9: Construction Dewatering Flow Estimates

LOT TYPE	ZOI	TOTAL FLOW *	TOTAL FLOW WITH FACTOR OF SAFETY OF 2 *
Mid-Rise Residential Block 58 – Building 1	50.0 m	74,500 L/day	149,000 L/day
Mid-Rise Residential Block 58 – Building 2	46.2 m	67,000 L/day	134,000 L/day
Mid-Rise Residential Block 59 – Building 1	41.7 m	58,000 L/day	116,000 L/day
Mid-Rise Residential Block 59 – Building 2	46.2 m	67,000 L/day	134,000 L/day
Semi-Detached Lot	10.2 m	31,500 L/day	63,000 L/day
Street Townhouse Lot	10.2 m	32,000 L/day	64,000 L/day
Back-to-Back Townhouse Lot	10.2 m	21,000 L/day	42,000 L/day

*The dewatering flow rates are rounded to the nearest thousand for permit considerations

The complete dewatering flow rate estimates are provided in **Appendix F, Tables F-1 to F-5**.

The construction dewatering flow rates includes a factor of safety of 2, to account for seasonal fluctuations in the groundwater table and variation in hydrogeological properties beyond those encountered during the course of this study. This peak dewatering flow rate also provides additional capacity for the dewatering contractors.

Please not 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.

This assessment does not represent an engineering design of a dewatering operation, but a hydrogeological analysis for assessment of dewatering volumes based on the proposed site development information available at this time. Many of the development blocks with a proposed basement level will require excavation and dewatering of the upper sand units. **Once detailed designs are available, the dewatering estimates must be revised to include the final layout of the development, installation of utiltities and services and earthworks and to take into consideration any additional borehole data or hydraulic conductivity data that may be collected.**

4.1.4 STORMWATER CONTRIBUTION

Rain and snow that accumulates in the excavation area will need to be handled during construction. The dewatering flow rate calculations do not include contributions from precipitation events. Based on the historical climate data from the nearest weather station at the Barrie Landfill (located approximately 6km north of the Site), total daily precipitation in 2021 ranged between 0.2mm and 60mm, with an average daily precipitation of 7.3mm. In order to predict the effects of precipitation, a simple estimate was calculated based on the geometry of the planned excavation areas and a 10-mm rain event. The results are included in **Appendix F, Tables F-1 to F-5** and are summarized in **Table 10** below. It is recommended that additional capacity be included for the handling of large precipitation events in order to keep the excavation area relatively dry and stable.

Table 10: Summary of Stormwater Contribution Volumes

LOT TYPE	AREA	ESTIMATED STORMWATER CONTRIBUTION (based on a 10-mm rain event)
Mid-Rise Residential Block 58 – Building 1	2,562 m^2	25,620 L
Mid-Rise Residential Block 58 – Building 2	1,920 m^2	19,200 L
Mid-Rise Residential Block 59 – Building 1	1,287 m^2	12,873 L
Mid-Rise Residential Block 59 – Building 2	1,920 m^2	19,200 L
Semi-Detached Lot	116 m^2	1,159 L
Street Townhouse Lot	117 m^2	1,170 L
Back-to-Back Townhouse Lot	61 m^2	610 L

4.2 LONG-TERM DISCHARGE REQUIREMENTS

Considering the elevation of the proposed underground parking levels, some permanent drainage could be needed along the foundation walls. Groundwater flow under steady-state conditions to the underdrain systems for the buildings will be from the horizontal gradient within the water-bearing zone. Additional components will include the presence of any shoring around the perimeter of the buildings and infiltration from surface runoff during precipitation events. The estimated flow to the underdrain systems for each type of lot is presented below in **Table 11**. However, due to possible heterogeneity of the geology in the

area, a recommended design rate for groundwater seepage is also presented. The complete long-term discharge rate estimates are provided in **Appendix F, Tables F-6 to F-10**.

Table 11: Long-Term Discharge Flow Rates

LOT TYPE	ESTIMATED FLOW RATE *	RECOMMENDED DESIGN RATE WITH A SAFETY FACTOR OF 2 *
Mid-Rise Residential Block 58 – Building 1	16,500 L/day	33,000 L/day
Mid-Rise Residential Block 58 – Building 2	14,500 L/day	29,000 L/day
Mid-Rise Residential Block 59 – Building 1	12,000 L/day	24,000 L/day
Mid-Rise Residential Block 59 – Building 2	14,500 L/day	29,000 L/day
Semi-Detached Lot	1,500 L/day	3,000 L/day
Street Townhouse Lot	1,500 L/day	3,000 L/day
Back-to-Back Townhouse Lot	1,000 L/day	2,000 L/day

*The dewatering flow rates are rounded to the nearest thousand for permit considerations

Once the detailed designs are finalized, the long-term discharge estimates must be revised to include the final layout of the development.

4.3 PERMIT TO TAKE WATER AND ENVIRONMENTAL ACTIVITY SECTOR REGISTRY

The short-term construction dewatering flow rate volumes associated with the proposed development are required to evaluate permitting requirements as follows:

- Temporary groundwater takings at dewatering rates greater than 50,000 L/day, but less than 400,000 L/day at any one time for the project will require a registration with the Environmental Activity and Sector Registry (EASR);
- Temporary groundwater takings at dewatering rates greater than 400,000 L/day at any one time for the project will require a Category 3 Permit to Take Water (PTTW); or,
- Groundwater takings less than 50,000 L/day at any one time do not require an EASR nor a PTTW.

It should be noted that cumulative site-wide daily construction dewatering volumes may be authorized through an EASR, so long as dewatering rates at any given source location do not exceed 400,000 L/day for groundwater control, and the zone of influence (ZOI) of construction dewatering at multiple active dewatering source locations do not overlap.

Construction dewatering to remove accumulated water from precipitation or runoff is not counted towards this total of 400,000 L/day per source location, so long as water takings attributed to stormwater management can be discerned from groundwater takings.

If construction methodologies are used to limit construction dewatering at each individual source location to less than 400,000 L/day with appropriate water quality, then all of the construction dewatering potentially required for the project site could be authorized through an EASR, instead of a PTTW, provided that the calculated ZOI of each of the separate source locations do not overlap one another.

For long-term groundwater, a PTTW would still be required for groundwater control volumes in excess of 50,000 L/day that require pumping for groundwater management.

The expected daily groundwater taking rate will depend largely on the construction plan/schedule and will need to take into consideration the number and size of excavations being dewatered at a given time. Based on the estimated dewatering rates for each type of lot and given that there are several of each lot type in the proposed development, it is anticipated that daily dewatering rates will exceed 400,000 L/day. As a result, it is likely that a Category 3 PTTW will need to be obtained for the proposed development project during short-term construction activities. A PTTW application requires a minimum of 90 days for the MECP to process and appropriate lead time should be factored into the overall project schedule to accommodate the PTTW process.

At this preliminary design stage, the timing for the construction of the proposed buildings within the development is unknown at this time. The cumulative long-term drainage discharge volumes will need to be reassessed at the detail design stage to confirm permitting requirements to support the removal of groundwater from building foundation drains. For long-term discharge consideration, if pumping of groundwater is estimated at volumes greater than 50,000 L/day, a PTTW will need to be obtained.

4.4 POINTS OF DISCHARGE

The following sections discuss discharge options as it relates to short-term construction dewatering activities.

4.4.1 DISCHARGE TO NATURAL ENVIRONMENT

If temporary construction water is to be discharged indirectly to local surface water, approvals will be required from the LSRCA. In addition, a discharge plan would have to be included in a EASR or PTTW. As such, the quality of groundwater will have to conform to the applicable standards. These include the Provincial Water Quality Objectives and the Canadian Water Quality Guidelines for the Protection of Aquatic Life. As discussed in **Section 3.8**, all tested parameters at the Site met PWQO criteria. However, it should be noted that the list of analyzed PWQO parameters in this report is not complete and should be updated to ensure the analysis includes all parameters required by the LSRCA or MECP approvals. It should also be noted that the approval process for an ECA submission can take between 12 and 18 months to process.

4.4.2 DISCHARGE TO SEWER SYSTEM

If temporary construction water is to be discharged to local sewer systems, then a discharge permit will need to be obtained from the City of Barrie by a dewatering contractor prior to any discharge to the storm or sanitary sewer systems. A water sample will need to be collected an analyzed against the City of Barrie Sewer Use By-Law to determine whether any of the discharge criteria are in exceedance.

5 POTENTIAL GROUNDWATER IMPACTS

5.1 IMPACTS TO GROUNDWATER USERS

As described in **Section 3.1**, the MECP water well records indicate that thirteen (13) out of the 58 wells within the Study Area were identified as water supply wells (i.e. 8 domestic and 5 public, industrial, irrigation, or livestock). Based on the MECP WWR database (**Figure 1**), the nearest water supply wells to the western areas of the Site that will require dewatering are located along Harvie Road, approximately 225 m away (Well ID #5738555) and 260 m away (Well ID #5720702). Although the ZOI for the proposed development ranges between 10.2 m and 50.0 m for the various lot types, it should be noted that the ZOI will change if multiple lots are dewatered simultaneously.

It should also be noted that there are also supply wells close to portions of the Site that have not been included in the dewatering assessment as there are no below ground works currently planned for this area. These wells are #5720702 along Harvie Road is 9 m from Employment Use Block 67 and Well ID #5710048 along Hwy 400 is 37 m from the SWM facility in the northeast corner of the Site. As changes are made to the site plan, any dewatering activities that may be required in these areas of the Site may potentially impact these water supply wells. As detailed designs become available, consideration should be given to re-evaluate potential impacts to nearby groundwater users and to determine whether a well survey is required for this project.

5.2 IMPACTS TO NEARBY STRUCTURES

During the course of construction dewatering activities and some time after, settlement may occur in saturated unconsolidated soils within a ZOI. As a result, neighbouring buildings, utilities, and underground structures/infrastructures may be at risk when lowering water levels or depressurizing an aquifer.

Based on the dewatering assessment for the proposed construction, the ZOI for the various lot types is anticipated to be between approximately 10.2 m and 50.0 m from the excavation boundary. A geotechnical engineer should be consulted to determine potential settlement impacts to structures from dewatering activities prior to construction and once detailed site plans are available.

It is additionally considered a best practice to develop a pro-active settlement monitoring program in order to signal any potential areas of concern during construction, and the need for additional mitigation measures. As part of a dewatering plan prepared by the dewatering contractor, a settlement monitoring program may be required and should be approved by the consultant supervising the construction (contract administrator), the City of Barrie, and/or the LSRCA prior to the start of construction. Utilities and transit owners may also have stringent monitoring requirements and may need to be consulted prior to approval.

5.3 IMPACTS TO NATURAL HERITAGE SYSTEMS

The proposed development of the Site will result in changes to the size of impervious areas and potential changes to groundwater quality and quantity flowing to surrounding natural areas, Whiskey Creek, and tributaries of Lover's Creek. Best management practices that promote groundwater infiltration and recharge could contribute to mitigating the potential effects of urbanization.

Based on a review of published maps from the Ministry of Natural Resources and Forestry (see **Figure 7**), there are some woodlots within the Study Area. Mapping also indicates that the Lovers Creek Wetland Complex, a Provincially Significant Wetland (PSW), is present approximately 2.5 km east of the Site, outside of the Study Area. As identified in **Section 1.3**, it is expected that there is consistent baseflow or groundwater discharge in the area that contributes to Whiskey Creek and seasonal discharge to the tributaries of Lover's Creek. It is also noted that surface water conditions at the Site are currently being monitored and will be able to provide a better understanding of the groundwater and surface water interactions in the area.

Based on the Preliminary Environmental Impact Study completed by Beacon dated March 2022, the proposed residential and commercial development, with proposed mitigation measures, is not anticipated to have significant negative impacts on the adjacent natural areas (i.e. Whiskey Creek and Lover's Creek). Mitigations measures being proposed as part of the development include the implementation of Low Impact Development (LID) systems, such as lot-level controls within the employment blocks and a bioretention cell capable of infiltration within the stormwater management pond located at the southwest portion of the Site. The proposed LID systems are discussed in detail in the Tatham Preliminary Stormwater Management Report dated March 11, 2022.

It is recommended that impacts to natural heritage features be re-evaluated at the detailed planning stages once the site and servicing plans are available.

5.4 CONTAMINANT MIGRATION

Changes to hydraulic gradient as a result of temporary construction dewatering activities could potentially influence the migration of contaminants from off-site properties. Based on a review of the Ecolog ERIS report included as part of the Phase I ESA (AMEC, January 2006b), there was a former Molson Canada Brewery located east of Highway 400 that is a potential off-site contaminant migration source (i.e. petroleum distillate, waste oils/lubricants, acid waste, oil/fuel spills). However, this potential contaminant source is located down gradient and over approximately 700 m from of the areas requiring construction dewatering and located outside of the calculated potential groundwater ZOI of 10.2 m to 50.0 m.

The Environmental Soil Assessment (AMEC, August 2006) indicated that all soil samples collected from the Site met MECP Table 1 Full Depth Background standards for all tested parameters. It is noted that the available ESA data are from 2006 and should be updated to reflect current conditions at the Site. Based on the information available, construction dewatering activities at the Site are expected to have minimal influence on contaminant migration across the Site however, this understanding should be reassessed once more details regarding design plans become available or if additional environmental studies are completed at the Site.

5.5 WELL DECOMMISSIONING

Following the completion of construction activities, all remaining monitoring wells, well points and eductors (if any) installed at various stages of this project must be decommissioned. The installation and eventual decommissioning of the wells and the dewatering system must be carried out by a licenced water well contractor in accordance with Regulation 903 of the Ontario Water Resources Act.

6 CURRENT AND FUTURE MONITORING

The current monitoring program consists of water level monitoring at all well locations for a period of one year, between December 2021 and December 2022. Dataloggers are installed in select well locations (MW21-01, MW21-02d, MW21-03, MW21-04, and MW21-05s/d) to record continuous water level measurements, and manual water levels readings will be taken during quarterly Site visits. Once the weather permits, two surface water monitoring stations will be installed at the Site to measure water levels in Lover's Creek in the south and Whiskey Creek in the north. Dataloggers will also be installed at both surface water monitoring stations for continuous water level monitoring, which will be supplemented with manual measurements during quarterly Site visits.

A potential future monitoring program may be needed to monitor the dewatering system and document both on-site and off-site impacts, water levels, discharge rates, and discharge quality during dewatering activities. During the period of active dewatering, water levels should be monitored within the excavation and on-site around the perimeter of the excavation to confirm the zone of influence. In addition, discharge quality must be monitored to demonstrate that water quality meets the applicable PWQO criteria. Specifics regarding the monitoring plan, including monitoring locations, monitoring frequency, and triggers for mitigation should be evaluated at a later date once additional details about the site design and construction staging efforts are available.

7 WATER BALANCE ASSESSMENT

A Water Balance Assessment provides an accounting of the water inputs and water outputs within a defined area. In this case, the area of the proposed development is used to estimate the water budgets in the existing condition (Pre-Development) and in the future condition (Post-Development).

The basic assumption of a water budget analysis is that there is a balance between water inputs and outputs, unless there is a clear understanding that water is being removed from storage within the system. The water budget is typically represented in a simple form as:

Water In = Water Out

P + EI = ET + IR + RO + EO

Where:

P	=	Precipitation
EI	=	External Inputs (including run-on, irrigation, and vertical/lateral transfers)
ET	=	Evapotranspiration
IR	=	Infiltration Recharge
RO	=	Runoff
EO	=	External Outputs (including water taking, and vertical/lateral transfers)

In more complex scenarios, lateral inputs through groundwater and surface water, movement between subsurface aquifer layers, and removal from storage can also be considered.

The objectives of the Water Budget Analysis are to:

a) quantify the water budget equation for the existing conditions;

b) quantify the water budget equation for proposed future conditions; and

c) illustrate the amount of change (i.e. a water balance) between the existing or future conditions, and to assess the potential significance of this change so that mitigation methods can be employed to minimize the estimated change.

The Water Budget Analysis for the entire Site was prepared in four (4) steps:

Step 1) Analysis of Climatic Data;

Step 2) Pre-Development Water Budget;

Step 3) Post-Development Water Budget with recharge mitigation;

Step 4) Comparison of Pre-Development to Post-Development to identify potential changes in infiltration recharge or runoff.

The Water Budget Analysis uses methods outlined in “Hydrogeological Technical Information Requirements for Land Development Applications” (MOEE, 1995).

For this study, the water budgets for the Pre-Development and Post-Development scenarios were calculated based on the subwatershed divide boundary located within the Site between the Barrie Creeks and Lover’s Creek subwatersheds.

7.1 ANALYSIS OF CLIMATE DATA

Climate data available from on-line resources maintained by the Meteorological Service of Canada (Environmental Canada) were obtained and analyzed to determine the appropriate values for annual average precipitation and evapotranspiration. The surplus left over after subtraction of the evapotranspiration from the average precipitation is considered to represent the quantity of water available for infiltration and runoff under existing conditions.

Climate data was obtained for the Barrie WPCC Climate Station for the period from 1981 until 2010. These data are provided in **Table G-1, Appendix G**. Mean monthly temperatures were calculated by averaging mean monthly minimum and maximum temperatures. Temperature data were derived from the 30-year (1981-2010) climate data summaries.

The Thornthwaite-Mather method was used to estimate potential and actual evapotranspiration on a monthly basis. The Thornthwaite-Mather method is based on an empirical relationship between potential evapotranspiration and mean air temperature. The method also takes into account the water holding capacity for the soil to compute the actual evapotranspiration and the resulting moisture surplus that is available for infiltration and runoff.

The water holding capacity of the soil depends on two (2) different factors – the soil type and structure, and the type of vegetation growing on the surface. Different types of soil hold different amounts of moisture storage capacity, while different species of vegetation will send roots into the soil to different depths and therefore retain varying amounts of moisture. The water holding capacity for each soil type/vegetation type combination found on the Site was determined from the Environmental Design Criteria of the Stormwater Management Planning and Design Manual published by the MECP in 2003.

The monthly estimates were used to calculate an annual average for precipitation, potential evapotranspiration, actual evapotranspiration, and available moisture surplus for each combination of soil and vegetation type found on-site. The moisture surplus represents the quantity of water available for infiltration and runoff on an annual average basis. Tables that document the details of the Thornthwaite-Mather analysis for the combinations of soil type and land use are provided in **Appendix G.**

The climate-based water budget calculations are included in **Tables G-1 to G-5, Appendix G** and are summarized in **Table 12**. The average annual precipitation for the thirty-year normal data between 1981 and 2010 is about 932.9 mm/m^2/year (mm/year). The annual potential evapotranspiration is calculated in **Table G-1** at 585.5 mm/year. This equates to a potential water surplus of 454.8 mm/year and a soil moisture deficit of 107.4 mm/year. Thus, the net annual water surplus based on potential evapotranspiration is 347.4 mm/year.

The calculations were expanded to include the water holding capacity of the soil as presented in **Tables G-2 to G-5, Appendix G**. This will produce a total moisture surplus based on the calculated actual evapotranspiration. Four (4) combinations of soil type and vegetation type were identified on the Site property for the Pre-Development and Post-Development scenarios. The majority of the surficial soil at the site is considered to be sandy loam. The land use classifications and the corresponding water holding capacities are:

- Sandy Loam, Urban Lawn (75 mm/year);
- Sandy Loam, Cultivated (150 mm/year);
- Sandy Loam, Uncultivated (150 mm/year); and
- Sandy Loam, Wooded (300 mm/year).

Consideration of these factors produces a range of net annual moisture surplus between 363.8 and 386.8 mm/year as summarized in **Table 12**. The soils with higher water holding capacity effectively increase the water removed as evapotranspiration.

The calculated moisture surplus occurs during the winter, spring, and fall months, and a water deficit occurs during the summer months. Much of the water surplus accumulates as snow in the winter. Snowmelt during the mid-winter thaws and in the spring produces runoff or infiltration that is effectively equivalent to the winter and spring surplus.

TABLE 12
CLIMATE BASED WATER BUDGET SUMMARY
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
HIGHWAY 400 & HARVIE ROAD, BARRIE, ON

Year of Climate Data Used	Total Adjusted Potential Evapotranspiration	Total Water Surplus	Total Precipitation	Soil Type	Land Use	Water Holding Capacity	Total Actual Evapotranspiration	Total Moisture Surplus used for Water Balance
	mm/yr	mm/yr	mm/yr			mm/yr	mm/yr	mm/yr
CLIMATE NORMAL 1981-2010	585.5	347.4	932.9	Sandy Loam	Lawns	75	546.1	386.8
					Cultivated	150	556.1	376.8
					Uncultivated	150	556.1	376.8
					Wooded Area	300	569.1	363.8

NOTES:

1) Water Holding Capacity obtained from Environmental Design Criteria of the SWM Planning and Design Manual published by the MOE in 2003.

7.2 PRE-DEVELOPMENT WATER BUDGET

The Pre-Development Water Budget was estimated using the approach recommended in Table 2 of the "Hydrogeological Technical Information Requirements for Land Development Applications" (MECP, 1995). The steps taken to estimate the Pre-Development Water Budget included:

1. Identify sensitive features and to observe existing topography, soil types, and other controls on infiltration and runoff.
2. Delineating drainage catchments and sub-catchments based on observed drainage outlets and physical characteristics as described below.
3. Estimating the quantities of infiltration and runoff for each of the sub-catchment areas and preparing summary estimates for catchments related to identified drainage outlets and for the proposed development area.

The drainage catchments and sub-catchments were defined by considering the following factors:

- Existing elevations;
- Existing property boundaries;
- Post-development features and property boundaries;
- Natural topographical features;
- Slope ratio;
- Land cover; and
- Land use.

The sub-catchments defined for the Pre-Development Water Budget also considered the proposed development areas and future drainage considerations for the proposed development. This was incorporated into the analysis to be able to demonstrate changes in drainage to the identified outlets and infiltration beneath the development area. The defined sub-catchments for the Pre-Development Water Budget are shown on **Figure 8** and in **Table H-1, Appendix H**.

The Infiltration Factor for each Pre-Development sub-catchment was estimated by adding the sub-factors for topography, soil type, and land cover as recommended in the MECP methodology. A geographic information system (GIS) was used to evaluate the topography, soil type and land use for each of the Pre-Development, Current Condition, and Post-Development scenarios and to generate a set of sub-catchments that can be used in analysis of each scenario. The calculated infiltration factor for each catchment was reviewed and updated manually, as a confirmation that they reflect actual conditions.

The volume of Pre-Development Infiltration was estimated as the product of [sub-catchment area] x [moisture surplus] x [Infiltration factor]. The Pre-Development Runoff was estimated by subtracting the volume of infiltration from the total volume of moisture surplus for each sub-catchment. Detailed tables to document the calculations of the Pre-development Water Budgets are provided in **Table H-1 and Table H-2, Appendix H**.

Properties associated with area, slope, soil type, and land cover were analyzed and assigned to each Pre-Development sub-catchment. The values assigned to each Pre-Development sub-catchment are provided

in **Table H-1 and Table H-2, Appendix H**. These values were used to estimate an Infiltration Factor. The Infiltration Factors were reviewed to confirm that they are appropriate and adjusted if necessary. Future Road areas are the Bryne Drive Extension lands that are anticipated to be constructed prior to the current proposed development. The Future Road areas are assumed to be impervious and to generate runoff equivalent to the precipitation volume minus a 10% evaporative loss.

Table H-1 and Table H-2, Appendix H presents the overall analysis of the infiltration and runoff for the catchments that fall within the Barrie Creeks and Lover's Creek subwatersheds, respectively. These tables also document the calculation of volumes associated with input and output parameters for the Pre-Development conditions.

A summary of the Pre-Development water budget calculations is provided in **Table 13**. These values will be used to assess the changes that the proposed development will create relative to the pre-development conditions.

7.2.1 PRE-DEVELOPMENT CATCHMENTS

Figure 8 illustrates the delineation of pre-development catchments and sub-catchments for the Site. The Site is represented by various on-site catchment areas that drain towards Whiskey Creek in the north, Lover's Creek in the south and towards storm sewers via the Bryne Road Extension lands. It is understood that the Bryne Road Extension lands have been conveyed to the City of Barrie at the time of the water balance assessment. For the purpose of understanding runoff contributions being conveyed to the storm sewers from these lands, these catchments have been included in the pre-development water balance analysis. Run-on to the Site is considered to occur from four (4) off-site catchments adjacent to the southern Site boundary and are not part of the planned development. Catchments are typically divided based on drainage divides due to topography and/or outlet location.

The catchment areas have been further subdivided based on similar slopes, soils, and vegetation/land use. The drainage sub-catchments also include consideration of post-development drainage boundaries so that changes to drainage areas can be evaluated for the post-development conditions. The outlets for drainage of the identified Pre-Development catchments are as follows:

Barrie Creeks Subwatershed

On-Site Catchments

- Catchments 101, 102, and 103: Drains northward towards Whiskey Creek
- Catchment 107: Drains to storm sewers via the Bryne Dr Extension lands

Lover's Creek Subwatershed

On-Site Catchments

- Catchments 104a and 106a: Drains towards Lover's Creek
- Catchments 105 and 108a: Drains to storm sewers via the Bryne Dr Extension lands

Off-Site Catchments

- Catchments 104b, 104c, and 106b: Drains towards Lover's Creek via on-site catchments

- Catchment 108b: Drains to storm sewers via the Bryne Dr Extension lands via on-site catchments

Table H-1 and Table H-2, Appendix H provides a summary of the data attributes used to estimate the infiltration factor for each pre-development catchment and sub-catchment. The infiltration factor determined the proportion of the annual water surplus that would infiltrate or runoff within each sub-catchment.

7.2.2 PRE-DEVELOPMENT INFILTRATION

For the Barrie Creeks subwatershed, the estimated total infiltration for the Site in pre-development conditions is 55,420 m^3/yr or an equivalent of 249 mm/year. The calculated infiltration represents approximately 27% of the annual precipitation (933 mm/yr) and 62% of the estimated annual water surplus (403 mm/yr). See Part A on **Table 13.**

For the Lover's Creek subwatershed, the estimated total infiltration for the Site in pre-development conditions is 39,948 m^3/yr (304 mm/year). The calculated infiltration represents approximately 30% of the annual precipitation and run-on (1023 mm/yr) and 61% of the estimated annual water surplus (495 mm/yr). See Part B on **Table 13.**

7.2.3 PRE-DEVELOPMENT RUNOFF

For the Barrie Creeks subwatershed, the total runoff in pre-development conditions is 34,346 m^3/yr (154 mm/year). The calculated runoff represents approximately 17% of the annual precipitation (933 mm/yr) and 38% of the estimated annual water surplus (403 mm/yr). Of this total runoff volume, approximately 23,751 m^3/yr discharges to Whiskey Creek and approximately 10,594 m^3/yr will be directed to storm sewers via the Bryne Drive Extension lands. Refer to Part A on **Table 13.**

For the Lover's Creek subwatershed, the total runoff in pre-development conditions is 25,023 m^3/yr (191 mm/year). The calculated runoff represents approximately 19% of the annual precipitation and run-on (1023 mm/yr) and 39% of the estimated annual water surplus (495 mm/yr). Of this total runoff volume, approximately 17,705 m^3/yr discharges to Lover's Creek and approximately 7,318 m^3/yr will be directed to storm sewers via the Bryne Drive Extension lands. Refer to Part B on **Table 13.**

TABLE 13 WATER BALANCE SUMMARY
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
HIGHWAY 400 & HARVIE ROAD, BARRIE, ON

A. OVERALL WATER BALANCE - BARRIE CREEKS

Characteristics		Pre-development		Post-development (With Recharge mitigation)		Change	
		Volume (m^3/yr)	mm/yr	Volume (m^3/yr)	mm/yr	Volume (m^3/yr)	%
Input	Precipitation	207,794	933	207,794	933	0	0%
	Total In	**207,794**	**933**	**207,794**	**933**	**0**	**0.00%**
Output	Infiltration via Pervious Areas	55,420	249	13,860	62	-41,559	-75%
	Infiltration via LID (Lot Level Controls)	0	0	48,424	90	48,424	>100%
	Total Infiltration	55,420	249	62,285	152	6,865	**12%**
	Run-off to Whiskey Creek	23,751	113	65,203	567	41,452	174.5%
	Run-off to Whiskey Creek via SWMP	0	0	23,062	236	23,062	>100%
	Run-off to Storm Sewers	10,594	840	8,501	840	-2,093	-19.8%
	Run-off Received from Lover's Creek Subwatershed	0	0	6,197	271	6,197	>100%
	Run-off (Net)	34,346	154	102,963	462	68,618	**199.8%**
	Evapotranspiration	118,029	530	48,743	219	-69,286	-58.7%
	Total Out	**207,794**	**933**	**213,991**	**833**	**6,197**	

B. OVERALL WATER BALANCE - LOVER'S CREEK

Characteristics		Pre-development		Post-development (With Recharge mitigation)		Change	
		Volume (m^3/yr)	mm/yr	Volume (m^3/yr)	mm/yr	Volume (m^3/yr)	%
Input	Precipitation	122,489	933	122,489	933	0	0%
	Runon	11,857	90	11,857	90	0	0%
	Total In	**134,347**	**1,023**	**134,347**	**1,023**	**0**	**0.00%**
Output	Infiltration via Pervious Areas	39,948	304	13,662	104	-26,287	-66%
	Infiltration via LID (Lot Level Controls and Bio Retention)	0	0	48,934	91	48,934	>100%
	Total Infiltration	39,948	304	62,595	195	22,647	**57%**
	Run-off North to Whiskey Creek	0	0	-6,197	-271	-6,197	**>100%**
	Run-off to Lover's Creek	17,705	283	15,297	237	-2,409	-13.6%
	Run-off to Lover's Creek via SWMP	0	0	3,909	119	3,909	>100%
	Run-off to Storm Sewers	7,318	877	9,763	840	2,445	33%
	Run-off (Net)	25,023	191	28,969	221	3,946	**15.8%**
	Evapotranspiration	69,375	528	36,585	279	-32,790	-47.3%
	Total Out	**134,347**	**1,023**	**128,150**	**694**	**-6,197**	

7.3 POST-DEVELOPMENT WATER BUDGET

The Post-Development Water Budget was estimated using a similar approach as outlined for the Pre-Development case. The proposed development plan and future drainage plan were used to establish new drainage sub-catchments that relate to the outlets identified in the Pre-Development case. Within each drainage sub-catchment, the area of pervious soils and impervious development (roads, driveways, amenities, and roofs) were estimated based on the post-development storm drainage area plan as provided by Tatham Engineering in the Stormwater Management Report (dated March 11, 2022) and discussions with their team. It was further assumed that buildings would cover 60% of the impervious areas within the various lots.

For the pervious areas, the quantity of infiltration was calculated using the [pervious area] x [precipitation surplus] x [Infiltration Factor]. The Infiltration Factors were reviewed to correspond to the Post-Development conditions. The runoff for the pervious areas was estimated by subtracting the volume of infiltration from the total volume of precipitation surplus for the pervious area in each sub-catchment.

The volume of runoff from the impervious surfaces was estimated using the area of impervious surfaces and the volume of precipitation. A factor of 10% was considered to represent some evaporation in the course of runoff.

The Post-Development Water Budget was compared to the Pre-Development Water Budget to evaluate the effects of the proposed development. The initial Post-Development Water Budget considers the effects of the proposed stormwater management features only. This comparison is intended to identify the changes that will occur due to the proposed development and to provide a target for proposed measures to mitigate the potential impacts of these changes.

Details of the Post-Development Water Budget calculations are provided in **Appendix I** and **Figure 9** illustrates the delineation of drainage catchments and sub-catchments for the Site based on the proposed draft plan.

7.3.1 POST-DEVELOPMENT CATCHMENTS

Figure 9 illustrates the delineation of drainage catchments and sub-catchments for the Site based on the proposed draft plan. The Post-Development scenario introduces various residential blocks (i.e. townhouses, semi-detached logs), mid rise residential blocks, employment use blocks, two stormwater management blocks (SWMP), parks/open space, and associated access roads.

Under post-development conditions, the Site is subdivided into various on-site and off-site catchments drain towards Whiskey Creek in the north, Lover's Creek in the south and towards storm sewers via the Bryne Road Extension lands. Runoff from some of the developed areas around the buildings and roadways will drain to SWM facilities.

It is understood that the Bryne Road Extension lands have been conveyed to the City of Barrie at the time of the water balance assessment. For the purpose of understanding runoff contributions being conveyed to the storm sewers from these lands, these catchments have been included in the post-development water balance analysis.

The outlets for each Post-Development Catchment are summarized below:

Barrie Creeks Subwatershed

On-Site Catchments

- Catchments 201a, 203, 204a, 205b, 208, and 314: Drains northward towards Whiskey Creek
- Catchment 209: SWMP eventually discharges to Whiskey Creek
- Catchments 210a, 211a, 212b, and 214a: Drains towards SWMP located at northeast corner of the Site, eventually discharging to Whiskey Creek
- Catchment 333c and 334: Drains to storm sewers via the Bryne Dr Extension lands

Lover's Creek Subwatershed

On-Site Catchments

- Catchments 207a, 212a, and 213: Drains towards Lover's Creek
- Catchment 206: SWMP eventually discharges to Lover's Creek
- Catchments 202 and 205a,: Drains towards SWMP located in the southern portion of the Site, eventually discharging to Lover's Creek
- Catchments 201b, 201c, 204b, 210b, 211b, and 214b: Drains northward towards Whiskey Creek
- Catchments 332a. 332b, 333a, and 333b: Drains to storm sewers via the Bryne Dr Extension lands

Off-Site Catchments

- Catchments 207b, 216, and 331: Drains towards Lover's Creek via on-site catchments
- Catchment 320: Drains towards Lover's Creek via on-site catchments and SWMP
- Catchment 332c: Drains to storm sewers via the Bryne Dr Extension lands via on-site catchments

Runoff from the developed areas in on-site catchment areas will be affected by the creation of roads, sidewalks, buildings and driveway areas. In addition, the proposed development will result in run-off from certain catchments in the Lover's Creek Subwatershed (i.e. Catchments 201b, 201c, 204b, 210b, 211b, 214b) to drain northward into the Barrie Creeks Subwatershed.

7.3.2 POST-DEVELOPMENT ANALYSIS

Properties associated with area, slope, soil type, and land cover were analyzed and assigned to each Post-Development sub-catchment. The values assigned to each Post-Development sub-catchment are provided in **Table I-1 and Table I-2, Appendix I**. These values were used to estimate an Infiltration Factor. The Infiltration Factors were reviewed to confirm that they are appropriate and adjusted if necessary.

Table I-1 and Table I-2, Appendix I includes the overall analysis of the infiltration and runoff for the total Study Area and also documents the calculation of volumes associated with input and output parameters for the Post-Development condition. These volumes are also expressed in terms of the number of mm of water within each sub-catchment area. The volumes are summed by catchment and for the total property area.

Assumptions incorporated into the water budget for the Post-Development scenario included:

1. Impervious surfaces (roads, driveways and buildings) are assumed to have a 10% evaporative loss.
2. The stormwater management ponds are assumed to be wet ponds and to have a 74% evaporative loss. No infiltration is assumed to occur through the stormwater management ponds. This provides a conservative (low) estimate of potential volumes of infiltration that will be achieved on the site).
3. Runoff in Catchments 202, 205a, 205b, 206 will be captured by the bioretention cell within Catchment 206, with 80% of the volume received by the bioretention cell assumed to infiltrate as per direction from Tatham.
4. Runoff in Catchments 210a, 210b, 211a, 211b, 333c will be captured by lot-level controls within each employment block, with 80% of the volume received by the lot-level controls assumed to infiltrate as per direction from Tatham.
5. Runoff in Catchments 213 will be captured by lot-level controls within the employment block, with 80% of the volume received by the lot-level controls assumed to infiltrate as per direction from Tatham.
6. The assumed pervious areas of the proposed development are assumed to have an infiltration factor equivalent to that of lawns.
7. Run-on from off-site catchments is added to the surplus of the nearest on-site subcatchment (unless otherwise stated), effectively increasing the infiltration and runoff in the receiving catchment.
8. Runoff generated within an on-site Catchment is assumed to be conveyed directly to the outlets without additional opportunity for infiltration.

A summary of the Post-Development water budget calculations is provided in **Table 13**.

7.3.3 POST-DEVELOPMENT INFILTRATION – WITH RECHARGE MITIGATION

In the post-development condition the infiltration through pervious areas within the Barrie Creeks subwatershed is 62,285 m^3/year or 152 mm/yr. This is approximately 16% of the precipitation (933 mm/yr) or 21% of the calculated surplus (714 mm/yr).

For the Lover's Creek subwatershed, infiltration through pervious areas is estimated to be 62,595 m^3/year or 195 mm/yr. This is approximately 19% of the precipitation and run-on (1023 mm/yr) or 26% of the calculated surplus (746 mm/yr).

7.3.4 POST-DEVELOPMENT RUNOFF – WITH RECHARGE MITIGATION

It is noted that as a result of development and changes to the discharge patterns at the Site, a portion of run-off from the Lover's Creek subwatershed in the south will be transferred into the Barrie Creeks subwatershed in the north.

The total runoff generated by the proposed development (without the proposed mitigation measures) for the Barrie Creeks subwatershed, is 102,963 m^3/yr or 462 mm/year. The total calculated Post-Development runoff with recharge mitigation represents approximately 50% of the annual precipitation (933 mm/yr). Of this total runoff volume, approximately 6,197 m^3/yr comes from the Lover's Creek subwatershed in the south, 65,203 m^3/yr discharges to Whiskey Creek, 23,062m^3/yr will be directed to the SWMP before being discharged to Whiskey Creek, and 8,501 m^3/yr will be directed to storm sewers via the Bryne Drive Extension lands. Refer to Part A on **Table 13.**

For the Lover's Creek subwatershed, the total runoff in post-development conditions is 28,969 m^3/yr (221 mm/year). The calculated runoff represents approximately 22% of the annual precipitation and run-on (1023 mm/yr) and 30% of the estimated annual water surplus (746 mm/yr). Of this total runoff volume, approximately 15,297 m^3/yr discharges to Lover's Creek, 3,909 m^3/yr will be directed to the SWMP before discharging to Lover's Creek, and 9,763 m^3/yr will be directed to storm sewers via the Bryne Drive Extension lands. Refer to Part B on **Table 13.**

7.3.5 COMPARISON WITH PRE-DEVELOPMENT – WITH RECHARGE MITIGATION

Table 13 provides a comparison of the water budget estimates for the Pre-Development and Post-Development scenarios with mitigation measures for the overall Site based on the two subwatershed boundaries.

The proposed development with the implementation of recharge mitigation measures will result in an infiltration surplus of 6,865 m^3/yr or 12 % in Barrie Creeks subwatershed in the north when compared to the pre-development scenario, and an infiltration surplus of 22,647 m^3/yr or 57 % in Lover's Creek subwatershed in the south.

Given that the proposed development will result in some changes to drainage catchments between the two subwatershed, about 6,197 m^3/yr of the run-off from Lover's Creek subwatershed will be discharged northward towards Whiskey Creek and into Barrie Creeks subwatershed. The runoff within Barrie Creeks subwatershed is anticipated to increase by 68,618 m^3/yr or 200%, and runoff volumes in Lover's Creek subwatershed are anticipated to increase by 3,946 m^3/yr or 16%.

7.4 WATER BALANCE DISCUSSION

The water balance assessment illustrates that the proposed development will result in a net increase in infiltration of 6,865 m^3/yr (12%) within the Barrie Creeks subwatershed and 22,647 m^3/yr (57%) within the Lover's Creek subwatershed. There will also be a net increase in run-off relative to pre-development conditions in both the Barrie Creeks subwatershed (66,618 m^3/yr or 200%) and the Lover's Creek subwatershed (3,946 m^3/yr or 16%).

Policies in the Drinking Water Source Protection Plan for the South Georgian Bay Lake Simcoe Source Protection Region, and implemented by the LSRCA, require that infiltration for proposed developments be maintained at pre-development values (i.e. within 10%). The results of the water balance analysis demonstrate that pre-development infiltration values can be achieved assuming the implementation of the proposed recharge mitigation measures. In-situ infiltration testing will need to be completed at the detail design stage to confirm feasibility and the design of the proposed LID systems.

A discussion of additional potential mitigation opportunities is provided in the following section.

7.4.1 MITIGATION OPPORTUNITIES

Examples of Low Impact Development (LID) approaches that could be employed to promote infiltration, reduce the infiltration deficit, and reduce runoff volumes include:

- Capture and infiltration of roof drainage and runoff from lot pervious areas (swales, infiltration trenches).
- Enhancement of evapotranspiration of roof drainage.
- Reduction of impervious areas.
- Use of pervious pavement materials (particularly for driveways, sidewalks, and other decorative areas).
- Enhancement of infiltration capacity in pervious areas through use of materials with increased permeability and storage capacity, or grading.

The preferred option to enhance infiltration is to infiltrate water from rooftops, as this is less likely to be influenced by water quality. This LID option can further promote infiltration volumes in areas where additional recharge mitigation measures are required.

Additional consultation with the Conservation Authority and review of the practicality, feasibility, and costs of engineering options will be required to make a decision on the appropriate approach to off-set the potential changes to infiltration and runoff that may result from the proposed development plan.

Please note that the water balance assessment should be updated with the details of any mitigation measures that will be employed at the Site at the detail design stage.

8 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based on the preliminary hydrogeological investigation completed for the Site.

- It is understood that the proposed development at the Site will consist of a large mix of semi-detached homes, townhomes, mid-rise residential, 2-storey employment blocks, stormwater management facilities, open spaces, and parkland.
- The monitoring program has shown that overburden groundwater levels at the Site have stabilized between 2.50 mbgs (300.84 masl in MW21-05s) to 12.14 mbgs (280.69 masl in MW21-02d). It is noted that water levels at the Site are currently being monitored until December 2022. For the dewatering assessment, the highest measured groundwater level at the Site (2.50 mbgs) was used in the dewatering calculations.
- Regional groundwater flow in the area is interpreted to be north to northeast towards Kempenfelt Bay of Lake Simcoe. Locally, the Site is within a subwatershed divide with Barrie Creeks subwatershed to the north and Lover's Creek subwatershed to the south. Based on the measured groundwater elevations, the inferred local groundwater flow across the Site is northeastward towards Whiskey Creek. It is interpreted that Lover's Creek at the Site supports flows during storm events and spring snow melt. Ongoing monitoring will provide a better understanding of seasonal changes to groundwater flow patterns.
- In-situ hydraulic conductivity testing for the overburden wells ranged between 7.4×10^{-7} m/sec and 2.6×10^{-5} m/sec. Based on grain size analysis, the hydraulic conductivity for the overburden materials ranged between 1.0×10^{-8} and 9.5×10^{-5} m/sec. The overburden has been treated as a single continuous unit for the purposes for the dewatering assessment, using the geometric mean hydraulic conductivity value of 3.2×10^{-6} m/s in the calculations based on SWRTs and grain size analysis.
- The preliminary infiltration results at the Site estimate infiltration rates between 13mm/hr in the southern portion to 82 mm/hr in the northern portion. Applying a safety factor of 2.5, the design infiltration rates can be expected to be between 5 and 33 mm/hr. Once detailed designs are available for any proposed infiltration features, it is recommended that in-situ infiltration testing be completed at the proposed locations and depths to refine the design infiltration rates.
- The dewatering assessment estimates the following short-term water taking volume, including a safety factor of 2, for each type of lot within the development:
  - Mid-Rise Residential Block 58 – Building 1: **149,000 L/day**
  - Mid-Rise Residential Block 58 – Building 2: **134,000 L/day**
  - Mid-Rise Residential Block 59 – Building 1: **116,000 L/day**
  - Mid-Rise Residential Block 59 – Building 2: **134,000 L/day**
  - Sem-Detached Lot: **63,000 L/day**

  - Street Townhouse Lot: **64,000 L/day**
  - Back-to-Back Townhouse Lot: **42,000 L/day**

- The dewatering assessment estimates the following long-term water taking volume, including a safety factor of 2, for each type of lot within the development:
  - Mid-Rise Residential Block 58 – Building 1: **33,000 L/day**
  - Mid-Rise Residential Block 58 – Building 2: **29,000 L/day**
  - Mid-Rise Residential Block 59 – Building 1: **24,000 L/day**
  - Mid-Rise Residential Block 59 – Building 2: **29,000 L/day**
  - Sem-Detached Lot: **3,000 L/day**
  - Street Townhouse Lot: **3,000 L/day**
  - Back-to-Back Townhouse Lot: **2,000 L/day**
- The expected daily groundwater taking rate will depend largely on the construction plan/schedule and will need to take into consideration the number and size of excavations being dewatered at a given time. Based on the estimated dewatering rates for each type of lot and given that there are several of each lot type in the proposed development, it is anticipated that daily dewatering rates could exceed 400,000 L/day. It is anticipated that a PTTW could be required for the Site during construction.
- At this preliminary design stage, the timing for the construction of the proposed buildings within the development is unknown at this time. The cumulative long-term drainage discharge volumes will need to be reassessed at the detail design stage to confirm permitting requirements to support the removal of groundwater from building foundation drains. For long-term discharge consideration, if pumping of groundwater is estimated at volumes greater than 50,000 L/day, a PTTW will need to be obtained.
- Based on the groundwater analytical results, all tested parameters met PWQO criteria. Any groundwater pumped from the Site can be discharged to the natural environment "as is" without any pre-treatment. Should sanitary or storm sewers become viable discharge options in the future, it is recommended that groundwater be resampled and analyzed against the City of Barrie Sewer Use By-Law.
- If discharge will be directed to the natural environment, approvals will need to be obtained from the LSRCA and an ECA may be required from the MECP prior to any dewatering activities. The LSRCA and MECP may also require additional PWQO parameters to be analyzed since only select parameters were included in this preliminary hydrogeological report.
- The water balance assessment for the proposed development shows that with mitigation measures proposed by Tatham (stormwater engineers), there will be a surplus of 6,865 m^3/yr (12%) in infiltration in Barrie Creeks subwatershed and a surplus of 22,647 m^3/yr (57%) in infiltration in the Lover's Creek subwatershed, compared to the existing pre-development conditions. With the proposed mitigation measures, runoff volumes will increase by 66,618 m^3/yr (200%) within the Barrie Creeks subwatershed and increase by 3,946 m^3/yr (16%) within the Lover's Creek subwatershed. It is also noted that approximately 6,197m^3/yr of the run-off from Lover's Creek

subwatershed will be discharged northward towards Whiskey Creek and into Barrie Creeks subwatershed as a result of the proposed development.

- The LSRCA requires that infiltration for proposed developments be maintained at pre-development values within 10%. The results of the water balance analysis demonstrates that the pre-development infiltration values can be maintain with the Low Impact Development mitigation measures proposed by the stormwater engineers (Tatham). Additional opportunities to further promote infiltration (if needed) that can be considered at the detailed design stage include capturing and infiltrating roof drainage and runoff from pervious areas, reducing impervious areas, and enhancing infiltration through the use of more pervious materials.
- Once detailed design plans are available, the dewatering calculations, impact assessment, and water balance assessment should be revised to include all buildings and utilities to be installed at the Site along with any proposed mitigation measures to offset the infiltration deficit (if necessary).
- Once detailed design plans are available it may be determined that additional drilling, environmental studies, or settlement analysis may be required as updates are made to the site design. The hydrogeological investigation should be updated based on the findings in these studies.
- In conformance with Regulation 903 of the Ontario Water Resources Act, the installation and eventual decommissioning of any dewatering system wells or monitoring wells should be carried out by a licensed contractor, under the supervision of a licensed water well technician.

9 STANDARD LIMITATIONS

WSP Canada Inc. prepared this report solely for the use of the intended recipient, Barrie-Bryne Developments Ltd., in accordance with the professional services agreement between the parties. In the event a contract has not been executed, the parties agree that the WSP General Terms for Consultant shall govern their business relationship which was provided to you prior to the preparation of this report.

The report is intended to be used in its entirety. No excerpts may be taken to be representative of the findings in the assessment.

The conclusions presented in this report are based on work performed by trained, professional and technical staff, in accordance with their reasonable interpretation of current and accepted engineering and scientific practices at the time the work was performed.

The content and opinions contained in the present report are based on the observations and/or information available to WSP at the time of preparation, using investigation techniques and engineering analysis methods consistent with those ordinarily exercised by WSP and other engineering/scientific practitioners working under similar conditions, and subject to the same time, financial and physical constraints applicable to this project.

WSP disclaims any obligation to update this report if, after the date of this report, any conditions appear to differ significantly from those presented in this report; however, WSP reserves the right to amend or supplement this report based on additional information, documentation or evidence.

WSP makes no other representations whatsoever concerning the legal significance of its findings.

The intended recipient is solely responsible for the disclosure of any information contained in this report. Except for the City of Toronto, if a third party makes use of, relies on, or makes decisions in accordance with this report, said third party is solely responsible for such use, reliance or decisions. WSP does not accept responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken by said third party based on this report.

WSP has provided services to the intended recipient in accordance with the professional services agreement between the parties and in a manner consistent with that degree of care, skill and diligence normally provided by members of the same profession performing the same or comparable services in respect of projects of a similar nature in similar circumstances. It is understood and agreed by WSP and the recipient of this report that WSP provides no warranty, express or implied, of any kind. Without limiting the generality of the foregoing, it is agreed and understood by WSP and the recipient of this report that WSP makes no representation or warranty whatsoever as to the sufficiency of its scope of work for the purpose sought by the recipient of this report.

In preparing this report, WSP has relied in good faith on information provided by others, as noted in the report. WSP has reasonably assumed that the information provided is correct and WSP is not responsible for the accuracy or completeness of such information.

Benchmark and elevations used in this report are primarily to establish relative elevation differences between the specific testing and/or sampling locations and should not be used for other purposes, such as grading, excavating, construction, planning, development, etc.

WSP disclaims any responsibility for consequential financial effects on transactions or property values, or requirements for follow-up actions /or costs.

Design recommendations given in this report are applicable only to the project and areas as described in the text and then only if constructed in accordance with the details stated in this report. The comments made in this report on potential construction issues and possible methods are intended only for the guidance of the designer. The number of testing and/or sampling locations may not be sufficient to determine all the factors that may affect construction methods and costs. We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

Overall conditions can only be extrapolated to an undefined limited area around these testing and sampling locations. The conditions that WSP interprets to exist between testing and sampling points may differ from those that actually exist. The accuracy of any extrapolation and interpretation beyond the sampling locations will depend on natural conditions, the history of Site development and changes through construction and other activities. In addition, analysis has been carried out for the identified chemical and physical parameters only, and it should not be inferred that other chemical species or physical conditions are not present. WSP cannot warrant against undiscovered environmental liabilities or adverse impacts off-Site.

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This limitations statement is considered an integral part of this report.

10 REFERENCES

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FIGURES

Prepared By: Tanya.Peterson

LEGEND:

- SITE BOUNDARY
- 500 m STUDY AREA
- BRYNE DRIVE EXTENSION
- WATERCOURSE
- WATERBODIES
- SUBWATERSHED DIVIDE
- MECP WATER WELL LOCATION

TITLE:
SITE LOCATION MAP AND
MECP WATER WELL RECORDS

PROJECT:
HYDROGEOLOGICAL INVESTIGATION
HWY 400 & HARVIE ROAD
BARRIE, ONTARIO

CLIENT:
BARRIE-BRYNE DEVELOPMENTS LIMITED

	PROJECT NO.:	REVIEWED BY:
wsp	211-11672-00	MY
	DATE: MARCH 2022	FIGURE: 1

D:\aProjects\211-11672-00\MXD\211-11672-00 Figure 1 Site Location.mxd

Prepared By: Tanya.Peterson

N

DOVE CRESCENT
WILDWOOD TRAIL
PATTERSON ROAD
SAWMILL ROAD
LOGGERS RUN
FAWN CRESCENT
GROUSE GLEN
MEADOW LANE
BEACON ROAD
FAIRVIEW ROAD
BIG BAY POINT ROAD
CITYVIEW CIRCLE
FERNDALE DRIVE SOUTH
MONTSERRAND STREET
Whiskey Creek
BROWN STREET
STROUD PLACE
LOOKER DRIVE
ESSA ROAD
HARVIE ROAD
SPEIRS ROAD
WHITE CRESCENT
O'SHAUGHNESSY CRESCENT
LESLIE AVENUE
VETERANS DRIVE
ELMBROOK DRIVE
RAMBLEWOOD DRIVE
BROOKWOOD DRIVE
THRUSHWOOD DRIVE
MAPLETON AVENUE
WARNER ROAD
QUANCE STREET
CAPLAN AVENUE
HUNTER ROAD
REID DRIVE
MAPLEVIEW DRIVE WEST
BRYNE DRIVE
BARRIE VIEW DRIVE
HIGHWAY 400
Lover's Creek
BAYVIEW DRIVE
CHURCHILL DRIVE
CONCERT WAY
NORTH VILLAGE WAY
LIVE 8 WAY
PARK PLACE BOULEVARD
MAPLEVIEW DRIVE EAST
HOOPER ROAD
UNDERS ROAD

0 50 100 200 300
Metres

LEGEND:

- SITE BOUNDARY
- 500 m STUDY
- BRYNE DRIVE EXTENSION
- WATERCOURSE
- WATERBODIES
- STONE-POOR, CARBONATE-DERIVED SILTY TO SANDY TILL
- ICE-CONTACT STRATIFIED DEPOSITS
- FINE-TEXTURED GLACIOLACUSTRINE DEPOSITS - MASSIVE-WELL LAMINATED
- COARSE-TEXTURED GLACIOLACUSTRINE DEPOSITS - FORESHORE-BASINAL DEPOSITS
- ORGANIC DEPOSITS

TITLE:
SURFICIAL GEOLOGY

PROJECT:
HYDROGEOLOGICAL INVESTIGATION
HWY 400 & HARVIE ROAD
BARRIE, ONTARIO

CLIENT:
BARRIE-BRYNE DEVELOPMENTS LIMITED

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PROJECT NO.:	REVIEWED BY:
211-11672-00	MY
DATE: MARCH 2022	FIGURE: 2

D:\aProjects\211-11672-00\MXD\211-11672-00 Figure 2 Surficial Geology.mxd

Prepared By: Tanya.Peterson

LEGEND:

- SITE BOUNDARY
- BRYNE DRIVE EXTENSION
- CROSS SECTION
- WATERCOURSE
- MONITORING WELL
- MONITORING WELL (PREVIOUSLY DRILLED BY WSP)
- PROPOSED SURFACE WATER MONITORING STATION (DRIVEPOINT & STAFF GAUGE) TO BE INSTALLED IN SPRING 2022

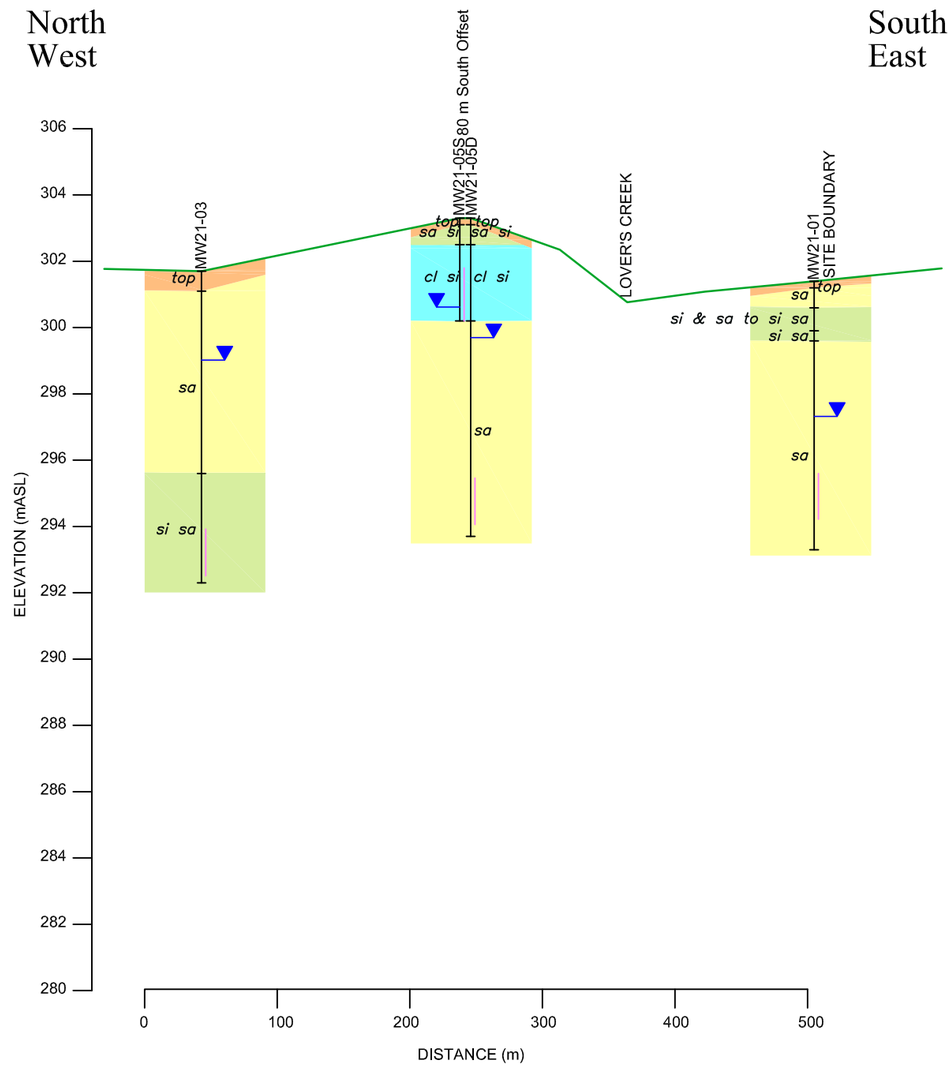
TITLE:
BOREHOLE AND MONITORING WELL LOCATION PLAN

PROJECT:
HYDROGEOLOGICAL INVESTIGATION
HWY 400 & HARVIE ROAD
BARRIE, ONTARIO

CLIENT:
BARRIE-BRYNE DEVELOPMENTS LIMITED

PROJECT NO.:	REVIEWED BY:
211-11672-00	MY
DATE: MARCH 2022	FIGURE: 3

D:\aProjects\211-11672-00\MXD\211-11672-00 Figure 3 BH Locations.mxd



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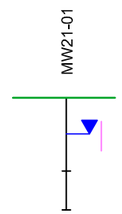


WELL ID

GROUND SURFACE

WATER LEVEL (JAN 19, 2022)/ WELL SCREEN

CHANGE IN STRATIGRAPHY

END OF BORING (mBGL)

SOIL DESCRIPTION:

gr - GRAVEL
fi - FILL
si - SILT
sa - SAND
cl - CLAY
ti - TILL

TOPSOIL

SAND

SAND / SILT

CLAYEY SILT

NOTE:
THE ACTUAL SOIL STRATIFICATION HAS BEEN VERIFIED FROM DATA OBTAINED AT THE WELL LOCATIONS ONLY. THE INFERRED CONTACTS SHOWN ARE BASED ON GEOLOGICAL EVIDENCE AND THESE MAY VARY FROM THOSE SHOWN BETWEEN BORINGS. WELL DATA IS PROJECTED ONTO THE SECTION WHICH ALSO MAY CREATE SOME IRREGULARITIES IN CONTACT DEPTHS.

CROSS SECTION A-A'

HYDROGEOLOGICAL INVESTIGATION
HWY 400 & HARVIE ROAD
BARRIE, ONTARIO

DATE: FEBRUARY 2022

PROJECT: 211-11692-00

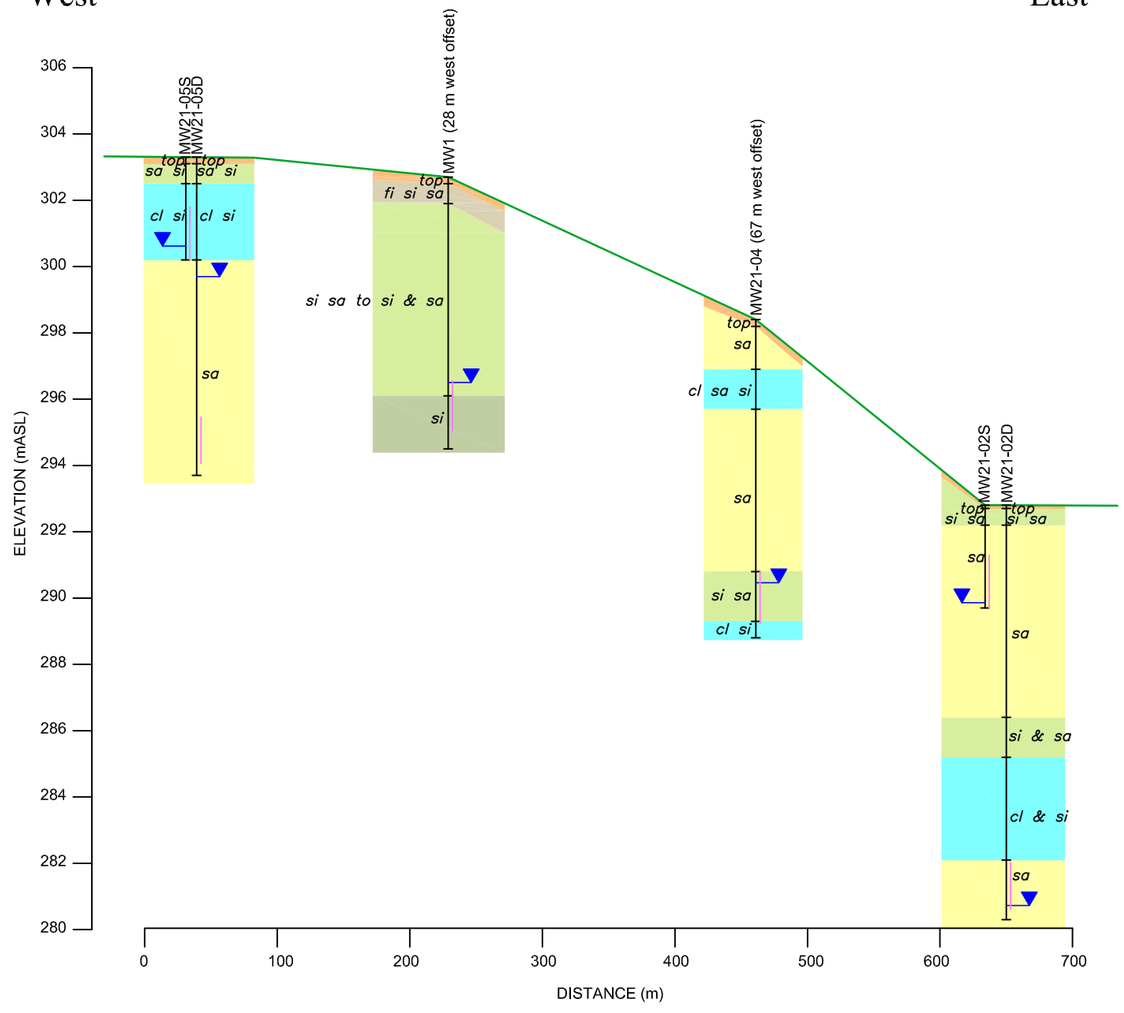
SCALES: AS SHOWN

wsp

FIGURE
4

South
West

North
East



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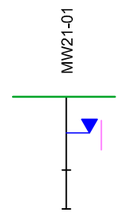


WELL ID

GROUND SURFACE

WATER LEVEL (JAN 19, 2022)/ WELL SCREEN

CHANGE IN STRATIGRAPHY

END OF BORING (mBGL)

SOIL DESCRIPTION:

gr - GRAVEL
fi - FILL
si - SILT
sa - SAND
cl - CLAY
ti - TILL

TOPSOIL

SILT SAND FILL

SAND / SILT

SAND

SILT

CLAYEY SILT

NOTE:
THE ACTUAL SOIL STRATIFICATION HAS BEEN VERIFIED FROM DATA OBTAINED AT THE WELL LOCATIONS ONLY. THE INFERRED CONTACTS SHOWN ARE BASED ON GEOLOGICAL EVIDENCE AND THESE MAY VARY FROM THOSE SHOWN BETWEEN BORINGS. WELL DATA IS PROJECTED ONTO THE SECTION WHICH ALSO MAY CREATE SOME IRREGULARITIES IN CONTACT DEPTHS.

CROSS SECTION B-B'

HYDROGEOLOGICAL INVESTIGATION
HWY 400 & HARVIE ROAD
BARRIE, ONTARIO

DATE: FEBRUARY 2022

PROJECT: 211-11692-00

SCALES: AS SHOWN

wsp

FIGURE
5

Prepared By: Tanya.Peterson

LEGEND:

- SITE BOUNDARY
- BRYNE DRIVE EXTENSION
- WATERCOURSE
- MONITORING WELL
- MONITORING WELL (PREVIOUSLY DRILLED BY WSP)
- GROUNDWATER CONTOURS (mASL)
- GROUNDWATER FLOW DIRECTION

NOTE:
* - NOT INCLUDED IN INTERPOLATION OF GROUNDWATER CONTOURS

TITLE:
GROUNDWATER CONTOURS -
JANUARY 19, 2022

PROJECT:
HYDROGEOLOGICAL INVESTIGATION
HWY 400 & HARVIE ROAD
BARRIE, ONTARIO

CLIENT:
BARRIE-BRYNE DEVELOPMENTS LIMITED

	PROJECT NO.:	REVIEWED BY:
wsp	211-11672-00	MY
	DATE: MARCH 2022	FIGURE: 6

D:\aProjects\211-11672-00\MXD\211-11672-00 Figure 6 Groundwater Contours.mxd

LEGEND:

- SITE BOUNDARY
- BRYNE DRIVE EXTENSION
- WATERBODIES
- UNEVALUATED WETLAND
- PROVINCIALLY SIGNIFICANT WETLAND
- WOODLAND
- ANSI
- WATERCOURSE

TITLE:
NATURAL HERITAGE FEATURES

PROJECT:
HYDROGEOLOGICAL INVESTIGATION
HWY 400 & HARVIE ROAD
BARRIE, ONTARIO

CLIENT:
BARRIE-BRYNE DEVELOPMENTS LIMITED

	PROJECT NO.: 211-11672-00	REVIEWED BY: MY
wsp	DATE: MARCH 2022	FIGURE: 7

Prepared By: Tanya.Peterson

D:\aProjects\211-11672-00\MXD\211-11672-00 Figure 7 NHF.mxd

Prepared By: Tanya.Peterson

LEGEND:

- SITE BOUNDARY
- WATERCOURSE
- PRE DEVELOPMENT CATCHMENTS
- BUILDING
- FUTURE ROAD
- LAWN
- PAVEMENT / ROAD
- UNCULTIVATED
- WOODED AREA
- PRE DEVELOPMENT FLOW DIRECTION

TITLE:
PRE DEVELOPMENT CATCHMENT AREAS

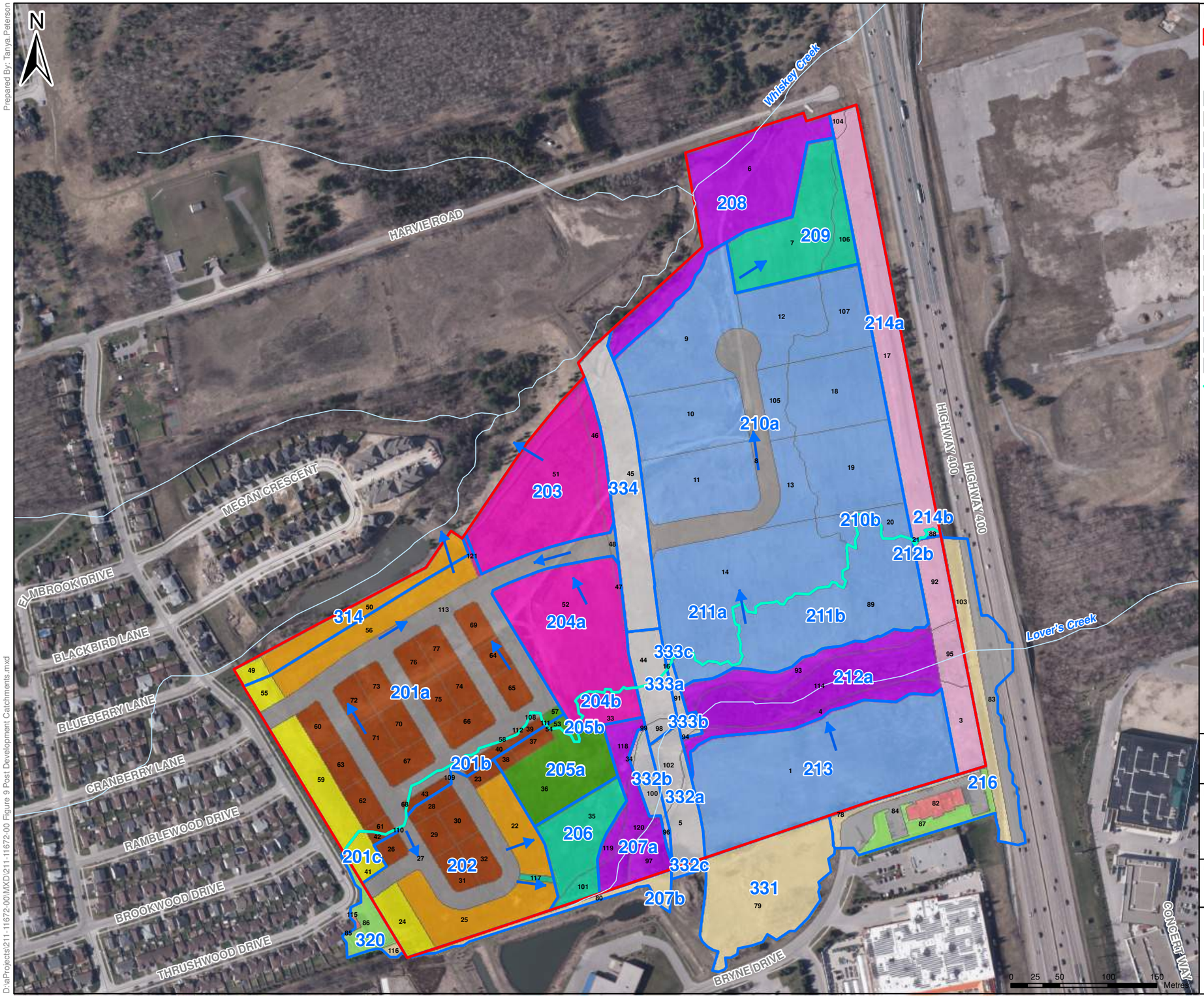
PROJECT:
HYDROGEOLOGICAL INVESTIGATION
HWY 400 & HARVIE ROAD
BARRIE, ONTARIO

CLIENT:
BARRIE-BRYNE DEVELOPMENTS LIMITED

	PROJECT NO.: 211-11672-00	REVIEWED BY: MY
wsp	DATE: MARCH 2022	FIGURE: 8

D:\aProjects\211-11672-00\MXD\211-11672-00 Figure 8 Pre Development Catchments.mxd

Prepared By: Tanya.Peterson



LEGEND:

- SITE BOUNDARY
- WATERCOURSE
- POST DEVELOPMENT CATCHMENTS
- BUILDING
- EMPLOYMENT
- FUTURE ROAD
- HYDRO EASEMENT
- LAWN
- MIDRISE RESIDENTIAL
- OPEN SPACE
- PARK
- PAVEMENT / ROAD
- ROAD WIDENING
- SWMP
- SEMI DETACHED
- TOWNHOUSES
- UNCULTIVATED
- SUBWATERSHED DIVIDE
- POST DEVELOPMENT FLOW DIRECTION (FLOW DIRECTIONS BASED ON DRAINAGE PLAN PROVIDED BY TATHAM ENGINEERING, DATED NOVEMBER 2021)

TITLE:
POST DEVELOPMENT CATCHMENT AREAS

PROJECT:
HYDROGEOLOGICAL INVESTIGATION
HWY 400 & HARVIE ROAD
BARRIE, ONTARIO

CLIENT:
BARRIE-BRYNE DEVELOPMENTS LIMITED

PROJECT NO.:	REVIEWED BY:
211-11672-00	MY
DATE: MARCH 2022	FIGURE: 9

D:\aProjects\211-11672-00\MXD\211-11672-00 Figure 9 Post Development Catchments.mxd

APPENDIX

A MECP WATER WELL RECORDS

MECP Water Well Records

Well Record #

5701441 — **Lot 005 Conc 12** — **INNISFIL TOWNSHIP / SIMCOE**

Date 10/16/1960 (DD/MM/YYYY)

Elev (masl) Easting 603455 Northing 4910715

/ Abandoned-Supply UTM RC 5 margin of error : 100 m - 300 m

Water Found (mbgs) (masl)

Casing Diameter 4 inch Casing Material:

Top of Screen (mbgs) Bottom of Screen (mbgs)

Screen Interval (m)

Flowing?

SWL (mbgs) (masl)

Pumping WL (mbgs) (masl)

Pump Rate (LPM) /

Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions		
0.0					
30.5			FINE SAND /		/
36.6		BLUE	CLAY /		/

5701442 — **Lot 005 Conc 12** — **INNISFIL TOWNSHIP / SIMCOE**

Date 11/7/1960 (DD/MM/YYYY)

Elev (masl) Easting 603460 Northing 4910703

/ Abandoned-Supply UTM RC 5 margin of error : 100 m - 300 m

Water Found (mbgs) (masl)

Casing Diameter 5 inch Casing Material: STEEL

Top of Screen (mbgs) Bottom of Screen (mbgs)

Screen Interval (m)

Flowing?

SWL (mbgs) (masl)

Pumping WL (mbgs) (masl)

Pump Rate (LPM) /

Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions		
0.0					
30.5			FINE SAND /		/
45.7		BLUE	CLAY /		/
76.2			FINE SAND /		/
106.7		BLUE	CLAY /		/
131.1			FINE SAND /		/
137.2		BLUE	CLAY /		/
145.4			FINE SAND /		/

5701450 — **Lot 008 Conc 12** — **BARRIE CITY (INNISFIL) / SIMCOE**

Date 7/6/1965 (DD/MM/YYYY)

Elev (masl) Easting 604858 Northing 4910313

Domestic / Livestock Water Supply UTM RC 5 margin of error : 100 m - 300 m

Water Found 39.6 (mbgs) (masl) FRESH

Casing Diameter 6 inch Casing Material: STEEL

Top of Screen 42.4 (mbgs) Bottom of Screen 44.2 (mbgs)

Screen Interval 1.8 (m)

Flowing? N

SWL 30.5 (mbgs) (masl)

Pumping WL 43.6 (mbgs) (masl)

Pump Rate 9.1 (LPM) 4 / 0

Spec. Cap. 0.69 (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions		
0.0					
16.8			FILL /		/
39.6			COARSE SAND /		/
44.2			FINE SAND /		/

5701534 — **Lot 007 Conc 13** — **INNISFIL TOWNSHIP / SIMCOE**

Date 9/23/1959 (DD/MM/YYYY)

Elev (masl) Easting 604510 Northing 4911657

/ Irrigation Water Supply UTM RC 5 margin of error : 100 m - 300 m

Water Found 30.5 (mbgs) (masl) FRESH

Casing Diameter 4 inch Casing Material: STEEL

Top of Screen 32.6 (mbgs) Bottom of Screen 33.5 (mbgs)

Screen Interval 0.9 (m)

Flowing? N

SWL 25.9 (mbgs) (masl)

Pumping WL 32.0 (mbgs) (masl)

Pump Rate 45.5 (LPM) 2 / 0

Spec. Cap. 7.46 (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions		
0.0					
0.6			TOPSOIL /		/
			TOPSOIL /		/
29.0		YELLOW	MEDIUM SAND /	CLAY	/ STONES
		YELLOW	MEDIUM SAND /	CLAY	/ STONES
30.5		BROWN	MEDIUM SAND /		/

Well Record #

30.5	BROWN	MEDIUM SAND /		/	
31.7	YELLOW	FINE SAND /		/	
	YELLOW	FINE SAND /		/	
33.5	YELLOW	FINE SAND /		/	
	YELLOW	FINE SAND /		/	
33.8		FINE SAND /		/	
		FINE SAND /		/	

5701536 **Lot 007 Conc 13** **INNISFIL TOWNSHIP / SIMCOE**

Date 6/1/1960 DD/MM/YYYY

Elev (masl) Easting 604558 Northing 4911791

/ Public Water Supply UTM RC 5 margin of error : 100 m - 300 m

Water Found 35.1 (mbgs) (masl) FRESH

Casing Diameter 8 inch Casing Material: STEEL

Top of Screen 38.4 (mbgs) Bottom of Screen 44.5 (mbgs)

Screen Interval 6.1 (m)

Flowing? N

SWL 18.3 (mbgs) (masl)

Pumping WL 27.4 (mbgs) (masl)

Pump Rate 272.8 (LPM) 2 / 0

Spec. Cap. 29.83 (LPM/m) Hour / Minute

Depth (m)	Color	Soil Descriptions		
0.0				
0.6		TOPSOIL /		/
33.5	YELLOW	MEDIUM SAND /	GRAVEL	/ CLAY
35.1		FINE SAND /		/
38.1		COARSE SAND /		/
40.2		FINE SAND /		/
41.8		MEDIUM SAND /		/
44.5		FINE SAND /		/

5707449 **Lot 006 Conc 13** **INNISFIL TOWNSHIP / SIMCOE**

Date 8/14/1970 DD/MM/YYYY

Elev (masl) Easting 603614 Northing 4911123

/ Domestic Water Supply UTM RC 4 margin of error : 30 m - 100 m

Water Found 51.8 (mbgs) (masl) FRESH

Casing Diameter 4 inch Casing Material: STEEL

Top of Screen 50.3 (mbgs) Bottom of Screen 51.8 (mbgs)

Screen Interval 1.5 (m)

Flowing? N

SWL 42.7 (mbgs) (masl)

Pumping WL 45.7 (mbgs) (masl)

Pump Rate 22.7 (LPM) 2 / 0

Spec. Cap. 7.46 (LPM/m) Hour / Minute

Depth (m)	Color	Soil Descriptions		
0.0				
8.5		PREVIOUSLY DUG /		/
12.2	GREY	FINE SAND /		/
45.7	GREY	HARDPAN /	STONES	/
51.8		MEDIUM SAND /		/

5708594 **Lot 007 Conc 12** **BARRIE CITY (INNISFIL) / SIMCOE**

Date 11/17/1971 DD/MM/YYYY

Elev (masl) Easting 604644 Northing 4911233

/ Test Hole UTM RC 4 margin of error : 30 m - 100 m

Water Found (mbgs) (masl)

Casing Diameter 1 inch Casing Material: STEEL

Top of Screen 112.8 (mbgs) Bottom of Screen 113.7 (mbgs)

Screen Interval 0.9 (m)

Flowing? N

SWL 64.0 (mbgs) (masl)

Pumping WL (mbgs) (masl)

Pump Rate (LPM) /

Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Color	Soil Descriptions		
0.0				
25.0	BROWN	SAND /	GRAVEL	/
27.1	BROWN	CLAY /	SAND	/
28.7	BROWN	CLAY /	SAND	/ GRAVEL
44.2	BROWN	FINE SAND /	CLAY	/
66.4	GREY	FINE SAND /	CLAY	/
82.6	GREY	CLAY /		/
85.0	GREY	CLAY /	SILT	/
93.3	GREY	FINE SAND /	CLAY	/
122.5	GREY	CLAY /	SILT	/
123.7	GREY	CLAY /	SILT	/ GRAVEL

Well Record #

127.1	GREY	CLAY /	SILT	/	
139.0	GREY	CLAY /	SILT	/	GRAVEL
146.6	GREY	CLAY /		/	
154.8	BROWN	CLAY /	SAND	/	STONES
170.7	GREY	CLAY /	SILT	/	
174.7	GREY	LIMESTONE /		/	

5708595 **Lot 007 Conc 12** **BARRIE CITY (INNISFIL) / SIMCOE**

Date 12/8/1971 (DD/MM/YYYY)

Elev / (masl) Easting 604614 Northing 4911263

Test Hole UTM RC 4 margin of error : 30 m - 100 m

Water Found (mbgs) (masl)

Casing Diameter 2 inch Casing Material: STEEL

Top of Screen 46.9 (mbgs) Bottom of Screen 49.1 (mbgs)

Screen Interval 2.1 (m)

Flowing? N

SWL 23.5 (mbgs) (masl)

Pumping WL (mbgs) (masl)

Pump Rate (LPM) /

Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions			
0.0						
12.2		BROWN	SAND /	GRAVEL	/	
17.4		BROWN	SAND /	GRAVEL	/	CLAY
18.6		BROWN	CLAY /	SILT	/	
22.9			SAND /	CLAY	/	SILT
23.5		BROWN	CLAY /		/	
24.7		GREY	SAND /	CLAY	/	SILT
28.3		BROWN	CLAY /	SILT	/	FINE SAND
35.1			FINE SAND /	CLAY	/	
36.6		BROWN	CLAY /	SAND	/	
39.6		GREY	SAND /	CLAY	/	
42.7		BROWN	CLAY /	SILT	/	
49.4		GREY	FINE SAND /	CLAY	/	SAND
53.9		GREY	CLAY /	SILT	/	
65.5		GREY	FINE SAND /	CLAY	/	SAND
84.4		GREY	CLAY /		/	
95.1		GREY	FINE SAND /		/	
102.4		GREY	CLAY /	SILT	/	
108.8		GREY	CLAY /		/	
121.0		GREY	FINE SAND /		/	

5708596 **Lot 007 Conc 12** **BARRIE CITY (INNISFIL) / SIMCOE**

Date 1/11/1972 (DD/MM/YYYY)

Elev / Not Used (masl) Easting 604614 Northing 4911263

Test Hole UTM RC 4 margin of error : 30 m - 100 m

Water Found 109.7 (mbgs) (masl) FRESH

Casing Diameter 1 inch Casing Material: STEEL

Top of Screen 119.8 (mbgs) Bottom of Screen 120.7 (mbgs)

Screen Interval 0.9 (m)

Flowing? N

SWL 62.5 (mbgs) (masl)

Pumping WL 73.5 (mbgs) (masl)

Pump Rate 377.3 (LPM) 26 / 0

Spec. Cap. 34.39 (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions			
0.0						
12.2		BROWN	SAND /	GRAVEL	/	
18.6		BROWN	SAND /	GRAVEL	/	CLAY
22.9		GREY	SAND /	CLAY	/	SILT
23.5		BROWN	CLAY /		/	
24.7		GREY	SAND /	CLAY	/	SILT
28.3		BROWN	CLAY /	SILT	/	FINE SAND
35.1		BROWN	FINE SAND /	CLAY	/	
36.6		BROWN	CLAY /	SAND	/	
39.6		GREY	SAND /	CLAY	/	
42.7		BROWN	CLAY /	SILT	/	
49.4		GREY	FINE SAND /	CLAY	/	
53.9		GREY	CLAY /	SILT	/	

Well Record #

65.5	GREY	FINE SAND /	CLAY	/
84.4	GREY	CLAY /		/
95.4	GREY	FINE SAND /	CLAY	/
99.4	GREY	CLAY /	SILT	/
107.6	GREY	CLAY /		/
121.9	GREY	FINE SAND /		/
123.7	GREY	CLAY /	SAND	/

5708906 **Lot 008 Conc 12** **BARRIE CITY (INNISFIL) / SIMCOE**

Date 3/28/1972 DD/MM/YYYY

Elev (masl) Easting 604844 Northing 4910703

/ Industrial Water Supply UTM RC 4 margin of error : 30 m - 100 m

Water Found 33.5 (mbgs) (masl) FRESH

Casing Diameter 6 inch Casing Material: STEEL

Top of Screen 39.3 (mbgs) Bottom of Screen 41.1 (mbgs)

Screen Interval 1.8 (m)

Flowing? N

SWL	28.3	(mbgs)	(masl)
Pumping WL	41.8	(mbgs)	(masl)
Pump Rate	181.8	(LPM)	13 / 0
Spec. Cap.	13.56	(LPM/m)	Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions		
0.0					
3.4		BROWN	SAND /		/
		BROWN	SAND /		/
6.1		BROWN	CLAY /		/
		BROWN	CLAY /		/
7.6		BROWN	GRAVEL /		/
		BROWN	GRAVEL /		/
39.9		YELLOW	COARSE SAND /	FINE SAND	/
		YELLOW	COARSE SAND /	FINE SAND	/
43.6		GREY	FINE SAND /	MEDIUM SAND	/
		GREY	FINE SAND /	MEDIUM SAND	/
45.7		GREY	SAND /	CLAY	/
		GREY	SAND /	CLAY	/

5710048 **Lot 007 Conc 12** **BARRIE CITY (INNISFIL) / SIMCOE**

Date 5/5/1972 DD/MM/YYYY

Elev (masl) Easting 604604 Northing 4911323

/ Industrial Water Supply UTM RC 4 margin of error : 30 m - 100 m

Water Found 109.7 (mbgs) (masl) FRESH

Casing Diameter 20 inch Casing Material: STEEL

Top of Screen 110.9 (mbgs) Bottom of Screen 120.4 (mbgs)

Screen Interval 9.4 (m)

Flowing? N

SWL	63.1	(mbgs)	(masl)
Pumping WL	92.7	(mbgs)	(masl)
Pump Rate	909.2	(LPM)	24 / 0
Spec. Cap.	30.75	(LPM/m)	Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions		
0.0					
10.1		BROWN	SAND /	GRAVEL	/
17.7		BROWN	GRAVEL /	SAND	/
22.6		BROWN	SAND /	GRAVEL	/ CLAY
28.0		GREY	CLAY /	GRAVEL	/
40.5		BROWN	SAND /	GRAVEL	/ CLAY
83.2		GREY	CLAY /	SAND	/ SILT
92.4		BROWN	SAND /		/
109.7		GREY	CLAY /	SILT	/
122.5		BROWN	SAND /	CLAY	/
122.8		BROWN	SAND /	CLAY	/

Well Record #

5711172 **Lot 006 Conc 13** **INNISFIL TOWNSHIP / SIMCOE**

Date 7/1/1974 DD/MM/YYYY | Elev (masl) | Easting 603712 | Northing 4911081 | / Domestic | Water Supply | UTM RC 4 | margin of error : 30 m - 100 m

Water Found 40.5 (mbgs) (masl) FRESH

Casing Diameter 5 inch | Casing Material: STEEL

Top of Screen 48.2 (mbgs) | Bottom of Screen 49.1 (mbgs)

Screen Interval 0.9 (m)

Flowing? N

SWL	40.5	(mbgs)	(masl)
Pumping WL	42.7	(mbgs)	(masl)
Pump Rate	31.8	(LPM)	1 / 30
Spec. Cap.	14.91	(LPM/m)	Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			
8.2			PREVIOUSLY DUG / /
17.4		BROWN	FINE SAND / /
20.7		GREY	CLAY / /
49.1		BROWN	SAND / /

5711221 **Lot 006 Conc 13** **INNISFIL TOWNSHIP / SIMCOE**

Date 5/10/1974 DD/MM/YYYY | Elev (masl) | Easting 603626 | Northing 4911050 | / Domestic | Water Supply | UTM RC 4 | margin of error : 30 m - 100 m

Water Found 40.5 (mbgs) (masl) FRESH

Casing Diameter 5 inch | Casing Material: STEEL

Top of Screen 47.9 (mbgs) | Bottom of Screen 48.8 (mbgs)

Screen Interval 0.9 (m)

Flowing? N

SWL	40.5	(mbgs)	(masl)
Pumping WL	42.7	(mbgs)	(masl)
Pump Rate	31.8	(LPM)	1 / 30
Spec. Cap.	14.91	(LPM/m)	Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			
0.6		BLACK	TOPSOIL / /
11.9		BROWN	FINE SAND / /
14.9		GREY	CLAY / /
40.5		BROWN	SAND / /
48.8		BROWN	SAND / /

5713455 **Lot 006 Conc 12** **INNISFIL TOWNSHIP / SIMCOE**

Date 6/17/1975 DD/MM/YYYY | Elev (masl) | Easting 603754 | Northing 4911073 | / Domestic | Water Supply | UTM RC 5 | margin of error : 100 m - 300 m

Water Found 32.0 (mbgs) (masl) FRESH

Casing Diameter 5 inch | Casing Material: STEEL

Top of Screen 43.6 (mbgs) | Bottom of Screen 44.5 (mbgs)

Screen Interval 0.9 (m)

Flowing? N

SWL	32.0	(mbgs)	(masl)
Pumping WL	39.6	(mbgs)	(masl)
Pump Rate	22.7	(LPM)	2 / 0
Spec. Cap.	2.98	(LPM/m)	Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			
2.4		BROWN	CLAY / SAND /
11.0		BROWN	SAND / /
11.3		BROWN	CLAY / /
23.8		GREY	CLAY / /
44.5		BROWN	SAND / /

5714107 **Lot 005 Conc 12** **INNISFIL TOWNSHIP / SIMCOE**

Date 3/16/1977 DD/MM/YYYY | Elev (masl) | Easting 603414 | Northing 4910793 | / Domestic | Water Supply | UTM RC 5 | margin of error : 100 m - 300 m

Water Found 46.6 (mbgs) (masl) FRESH

Casing Diameter 5 inch | Casing Material: STEEL

Top of Screen 49.1 (mbgs) | Bottom of Screen 50.0 (mbgs)

Screen Interval 0.9 (m)

Flowing? N

SWL	42.7	(mbgs)	(masl)
Pumping WL	44.2	(mbgs)	(masl)
Pump Rate	27.3	(LPM)	1 / 0
Spec. Cap.	17.90	(LPM/m)	Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			
4.6		RED	SAND / /
12.2		GREY	CLAY / GRAVEL /
15.2		BROWN	FINE SAND / CLAY /
28.0		BLUE	CLAY / /

Well Record #

46.6	BROWN	SAND /	CLAY	/	
48.2	GREY	MEDIUM SAND /		/	
50.0	BROWN	MEDIUM SAND /		/	

5714186 **Lot 006 Conc 13** **INNISFIL TOWNSHIP / SIMCOE**

Date 6/14/1976 DD/MM/YYYY | Elev (masl) | Easting 603614 | Northing 4911123 | UTM RC 5 margin of error : 100 m - 300 m

/ Domestic | Water Supply

Water Found 36.6 (mbgs) (masl) FRESH

Casing Diameter 5 inch | Casing Material: STEEL

Top of Screen 48.2 (mbgs) | Bottom of Screen 49.1 (mbgs)

Screen Interval 0.9 (m)

Flowing? N

SWL	36.6	(mbgs)	(masl)
Pumping WL	44.2	(mbgs)	(masl)
Pump Rate	27.3	(LPM)	1 / 10
Spec. Cap.	3.58	(LPM/m)	Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions		
0.0					
5.2		BROWN	CLAY /		/
14.6		BROWN	SAND /	CLAY	/
15.8		GREY	CLAY /		/
48.2		BROWN	SAND /		/

5715532 **Lot 008 Conc 12** **INNISFIL TOWNSHIP / SIMCOE**

Date 7/13/1978 DD/MM/YYYY | Elev (masl) | Easting 604764 | Northing 4911123 | UTM RC 5 margin of error : 100 m - 300 m

/ Test Hole

Water Found (mbgs) (masl)

Casing Diameter Casing Material:

Top of Screen (mbgs) | Bottom of Screen (mbgs)

Screen Interval (m)

Flowing?

SWL		(mbgs)	(masl)
Pumping WL		(mbgs)	(masl)
Pump Rate		(LPM)	/
Spec. Cap.		(LPM/m)	Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions		
0.0					
3.0			SAND /	CLAY	/ DIRTY
6.7		BROWN	SILT /	CLAY	/
27.7			SAND /	GRAVEL	/
31.7			SAND /	CLAY	/ LAYERED
51.8			SAND /	CLAY	/ PACKED
69.8		GREY	SAND /	CLAY	/ SILT
73.2		GREY	CLAY /	SAND	/ SILTY
91.4		GREY	CLAY /	SILTY	/
109.7		GREY	CLAY /	SILTY	/ SOFT
115.8		GREY	CLAY /	SAND	/ SILTY
144.2		GREY	CLAY /	SILTY	/
152.4		GREY	CLAY /	HARD	/

5715533 **Lot 008 Conc 12** **INNISFIL TOWNSHIP / SIMCOE**

Date 7/21/1978 DD/MM/YYYY | Elev (masl) | Easting 604964 | Northing 4911123 | UTM RC 5 margin of error : 100 m - 300 m

/ Test Hole

Water Found (mbgs) (masl)

Casing Diameter Casing Material:

Top of Screen (mbgs) | Bottom of Screen (mbgs)

Screen Interval (m)

Flowing?

SWL		(mbgs)	(masl)
Pumping WL		(mbgs)	(masl)
Pump Rate		(LPM)	/
Spec. Cap.		(LPM/m)	Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions		
0.0					
2.1			SAND /	CLAY	/ DIRTY
19.8			SAND /	GRAVEL	/
25.0		GREY	CLAY /	FINE SAND	/ LAYERED
38.7			FINE SAND /	MEDIUM SAND	/ GRAVEL
43.6			FINE SAND /	CLAY	/
51.8		GREY	CLAY /	SILT	/ SAND
82.0			CLAY /	SILTY	/ PACKED
94.5			SILT /	CLAY	/ PACKED
114.0			CLAY /	SILT	/ PACKED

Well Record #

	131.4			SILT /	FINE SAND	/ PACKED
	135.3			SILT /	FINE SAND	/ GRAVEL
	140.2		GREY	CLAY /	HARD	/

5715534 — **Lot 008 Conc 12** — **INNISFIL TOWNSHIP / SIMCOE**

Date 7/25/1978 (DD/MM/YYYY)

Elev (masl) / Not Used — Easting 604914 — Northing 4911123 — Observation Wells — UTM RC 5 — margin of error : 100 m - 300 m

Water Found 115.5 (mbgs) (masl) FRESH

Casing Diameter 2 inch — Casing Material: STEEL

Top of Screen 115.8 (mbgs) — Bottom of Screen 118.9 (mbgs)

Screen Interval 3.0 (m)

Flowing? N

SWL	69.2 (mbgs)	(masl)
Pumping WL	72.2 (mbgs)	(masl)
Pump Rate	(LPM)	/
Spec. Cap.	(LPM/m)	Hour / Minute

Depth (m)	Color			
0.0		Soil Descriptions		
2.1	GREY	CLAY /	SAND	/ LAYERED
21.3		SAND /	GRAVEL	/
42.1		FINE SAND /	FINE GRAVEL	/ CLAY
57.9		CLAY /	SAND	/ SILTY
82.3		CLAY /	SILTY	/
114.6		CLAY /	SILT	/ SOFT
128.0		SILT /	CLAY	/ SAND
135.9		SILT /	FINE SAND	/ GRAVEL
137.2	GREY	CLAY /	HARD	/

5715535 — **Lot 008 Conc 12** — **INNISFIL TOWNSHIP / SIMCOE**

Date 8/4/1978 (DD/MM/YYYY)

Elev (masl) / — Easting 604964 — Northing 4911123 — Abandoned-Quality — UTM RC 5 — margin of error : 100 m - 300 m

Water Found 114.6 (mbgs) (masl) MINERIAL

Casing Diameter 7 inch — Casing Material: STEEL

Top of Screen (mbgs) — Bottom of Screen (mbgs)

Screen Interval (m)

Flowing? N

SWL	67.7 (mbgs)	(masl)
Pumping WL	87.2 (mbgs)	(masl)
Pump Rate	227.3 (LPM)	9 / 0
Spec. Cap.	11.65 (LPM/m)	Hour / Minute

Depth (m)	Color			
0.0		Soil Descriptions		
2.1		SAND /	CLAY	/ DIRTY
15.2		SAND /	GRAVEL	/
24.4		SAND /	CLAY	/
44.2		CLAY /	SAND	/
58.8		CLAY /	SAND	/ SILTY
83.5		CLAY /		/
109.7		CLAY /	SILTY	/ SOFT
116.7		SILT /	FINE SAND	/ PACKED
121.9		SILT /	FINE SAND	/ CLAY
124.1		CLAY /	SILTY	/ PACKED
127.1		CLAY /	SILT	/ SANDY
133.2		FINE SAND /	SILT	/ CLAY

5715728 — **Lot 006 Conc 12** — **INNISFIL TOWNSHIP / SIMCOE**

Date 9/22/1978 (DD/MM/YYYY)

Elev (masl) / Municipal — Easting 603514 — Northing 4910923 — Test Hole — UTM RC 5 — margin of error : 100 m - 300 m

Water Found (mbgs) (masl)

Casing Diameter — Casing Material:

Top of Screen (mbgs) — Bottom of Screen (mbgs)

Screen Interval (m)

Flowing?

SWL	(mbgs)	(masl)
Pumping WL	(mbgs)	(masl)
Pump Rate	(LPM)	/
Spec. Cap.	(LPM/m)	Hour / Minute

Depth (m)	Color			
0.0		Soil Descriptions		
4.6	BROWN	CLAY /	BOULDERS	/ GRAVEL
8.5	GREY	CLAY /	STICKY	/
19.5	GREY	SILT /	CLAY	/ SOFT
25.3	GREY	CLAY /		/

Well Record #

56.7	BROWN	SAND /	GRAVEL	/ PACKED	
68.3	BROWN	SAND /	SILT	/ GRAVEL	
101.8	GREY	CLAY /		/	
117.7	GREY	CLAY /	SOFT	/	
140.8	GREY	CLAY /	HARD	/	
156.7	GREY	CLAY /	SILT	/ SAND	
157.3	GREY	CLAY /	HARD	/	

5716625 **Lot 008 Conc 12** **INNISFIL TOWNSHIP / SIMCOE**

Date 6/15/1979 DD/MM/YYYY
Elev (masl) Easting 604914 Northing 4911123
/ Not Used Water Supply UTM RC 5 margin of error : 100 m - 300 m
Water Found (mbgs) (masl)
Casing Diameter 54 inch Casing Material: STEEL
Top of Screen (mbgs) Bottom of Screen (mbgs)
Screen Interval (m)

Flowing? N
SWL (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color		Soil Descriptions	
0.0					
60.4		BROWN	SAND /	GRAVEL	/ CLAY
82.3		GREY	CLAY /	PACKED	/
90.2		BROWN	SAND /	CLAY	/ LOOSE
113.4		GREY	CLAY /	PACKED	/
120.1		BROWN	SAND /	CLAY	/ LOOSE
122.2		GREY	CLAY /	PACKED	/
128.9		BROWN	SAND /	GRAVEL	/ CLAY
141.7		GREY	CLAY /	HARD	/
153.3		GREY	CLAY /	GRAVEL	/ HARD

5716626 **Lot 008 Conc 12** **INNISFIL TOWNSHIP / SIMCOE**

Date 7/27/1979 DD/MM/YYYY
Elev (masl) Easting 604914 Northing 4911073
/ Not Used Abandoned-Supply UTM RC 5 margin of error : 100 m - 300 m
Water Found (mbgs) (masl)
Casing Diameter 54 inch Casing Material: STEEL
Top of Screen (mbgs) Bottom of Screen (mbgs)
Screen Interval (m)

Flowing?
SWL (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color		Soil Descriptions	
0.0					
22.6		BROWN	SAND /	GRAVEL	/ LOOSE
57.6		GREY	SAND /	CLAY	/ PACKED
81.1		GREY	CLAY /	PACKED	/
91.1		GREY	SAND /	CLAY	/ LAYERED
127.4		GREY	CLAY /	SAND	/ LAYERED
134.4		GREY	CLAY /	GRAVEL	/ LAYERED
140.8		GREY	CLAY /	HARD	/
151.8		GREY	CLAY /	GRAVEL	/ HARD

5720702 **Lot 007 Conc 12** **INNISFIL TOWNSHIP / SIMCOE**

Date 12/10/1985 DD/MM/YYYY
Elev (masl) Easting 604466 Northing 4910589
/ Domestic Water Supply UTM RC 9 unknown UTM
Water Found 10.4 (mbgs) (masl) Not stated
Casing Diameter 30 inch Casing Material: CONCRETE
Top of Screen (mbgs) Bottom of Screen (mbgs)
Screen Interval (m)

Flowing? N
SWL 10.4 (mbgs) (masl)
Pumping WL 14.6 (mbgs) (masl)
Pump Rate (LPM) 0 / 30
Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color		Soil Descriptions	
0.0					
0.3		BROWN	TOPSOIL /	HARD	/
16.5		BROWN	SAND /	PACKED	/

Well Record #

5735778 **Lot 008 Conc 12** **INNISFIL TOWNSHIP / SIMCOE**

Date 12/8/2000 DD/MM/YYYY

Elev (masl) Easting 604858 Northing 4910230

/ Abandoned-Other UTM RC 3 margin of error : 10 - 30 m

Water Found (mbgs) (masl)

Casing Diameter Casing Material:

Top of Screen (mbgs) Bottom of Screen (mbgs)

Screen Interval (m)

Depth (m) Elev (masl)
0.0

Color Soil Descriptions

Flowing?
SWL (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

/ /

5735780 **Lot 008 Conc 12** **INNISFIL TOWNSHIP / SIMCOE**

Date 12/5/2000 DD/MM/YYYY

Elev (masl) Easting 604892 Northing 4910780

/ Abandoned-Other UTM RC 3 margin of error : 10 - 30 m

Water Found (mbgs) (masl)

Casing Diameter Casing Material:

Top of Screen (mbgs) Bottom of Screen (mbgs)

Screen Interval (m)

Depth (m) Elev (masl)
0.0

Color Soil Descriptions

Flowing?
SWL (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

/ /

5736072 **Lot 008 Conc 12** **INNISFIL TOWNSHIP / SIMCOE**

Date 5/27/2001 DD/MM/YYYY

Elev (masl) Easting 604829 Northing 4911127

/ Not Used Abandoned-Other UTM RC 3 margin of error : 10 - 30 m

Water Found (mbgs) (masl)

Casing Diameter Casing Material:

Top of Screen (mbgs) Bottom of Screen (mbgs)

Screen Interval (m)

Depth (m) Elev (masl)
0.0

Color Soil Descriptions

Flowing?
SWL (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

/ /

5736073 **Lot 008 Conc 12** **INNISFIL TOWNSHIP / SIMCOE**

Date 5/29/2001 DD/MM/YYYY

Elev (masl) Easting 604872 Northing 4911141

/ Not Used Abandoned-Other UTM RC 3 margin of error : 10 - 30 m

Water Found (mbgs) (masl)

Casing Diameter Casing Material:

Top of Screen (mbgs) Bottom of Screen (mbgs)

Screen Interval (m)

Depth (m) Elev (masl)
0.0

Color Soil Descriptions

Flowing?
SWL (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

/ /

5736074 **Lot 008 Conc 12** **INNISFIL TOWNSHIP / SIMCOE**

Date 5/29/2001 DD/MM/YYYY

Elev (masl) Easting 604846 Northing 4911133

/ Not Used Abandoned-Other UTM RC 3 margin of error : 10 - 30 m

Water Found (mbgs) (masl)

Casing Diameter Casing Material:

Top of Screen (mbgs) Bottom of Screen (mbgs)

Screen Interval (m)

Depth (m) Elev (masl)
0.0

Color Soil Descriptions

Flowing?
SWL (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

/ /

Well Record #

5738555 **Lot 006 Conc 12** **INNISFIL TOWNSHIP / SIMCOE**

Date 11/18/2003 DD/MM/YYYY | Elev (masl) | Easting 603885 | Northing 4910395 | UTM RC 9 unknown UTM

/ Domestic | Water Supply | FRESH

Water Found 59.4 (mbgs) (masl)

Casing Diameter 6 inch | Casing Material: STEEL

Top of Screen 65.5 (mbgs) | Bottom of Screen 66.4 (mbgs)

Screen Interval 0.9 (m)

Flowing? N

SWL 1.5 (mbgs) (masl)

Pumping WL 66.4 (mbgs) (masl)

Pump Rate 22.7 (LPM) 12 / 0

Spec. Cap. 0.35 (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			
4.6		BROWN	CLAY / /
18.3		GREY	SAND / SILT /
59.4		GREY	CLAY / /
66.4		GREY	SAND / /

5740506 **Lot 005 Conc 12** **INNISFIL TOWNSHIP / SIMCOE**

Date 7/29/2005 DD/MM/YYYY | Elev (masl) | Easting 603515 | Northing 4910572 | UTM RC 3 margin of error : 10 - 30 m

/ Not Used | Abandoned-Other

Water Found (mbgs) (masl)

Casing Diameter | Casing Material:

Top of Screen (mbgs) | Bottom of Screen (mbgs)

Screen Interval (m)

Flowing?

SWL (mbgs) (masl)

Pumping WL (mbgs) (masl)

Pump Rate (LPM) /

Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			
10.1		PREVIOUSLY DUG /	/

5740507 **Lot Conc** **INNISFIL TOWNSHIP / SIMCOE**

Date 7/29/2005 DD/MM/YYYY | Elev (masl) | Easting 603500 | Northing 4910622 | UTM RC 3 margin of error : 10 - 30 m

/ Not Used | Abandoned-Other

Water Found (mbgs) (masl)

Casing Diameter | Casing Material:

Top of Screen (mbgs) | Bottom of Screen (mbgs)

Screen Interval (m)

Flowing?

SWL (mbgs) (masl)

Pumping WL (mbgs) (masl)

Pump Rate (LPM) /

Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			
7.6		PREVIOUSLY DUG /	/

5740508 **Lot 005 Conc 12** **INNISFIL TOWNSHIP / SIMCOE**

Date 7/29/2005 DD/MM/YYYY | Elev (masl) | Easting 603491 | Northing 4910612 | UTM RC 3 margin of error : 10 - 30 m

/

Water Found (mbgs) (masl)

Casing Diameter | Casing Material:

Top of Screen (mbgs) | Bottom of Screen (mbgs)

Screen Interval (m)

Flowing?

SWL (mbgs) (masl)

Pumping WL (mbgs) (masl)

Pump Rate (LPM) /

Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			
9.4		PREVIOUSLY DUG /	/

5740511 **Lot 005 Conc 12** **INNISFIL TOWNSHIP / SIMCOE**

Date 7/29/2005 DD/MM/YYYY | Elev (masl) | Easting 603483 | Northing 4910699 | UTM RC 3 margin of error : 10 - 30 m

/ Not Used | Abandoned-Other

Water Found (mbgs) (masl)

Casing Diameter | Casing Material:

Top of Screen (mbgs) | Bottom of Screen (mbgs)

Screen Interval (m)

Flowing?

SWL (mbgs) (masl)

Pumping WL (mbgs) (masl)

Pump Rate (LPM) /

Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			
9.8		PREVIOUSLY DUG /	/

Well Record #

7049654 — **Lot 002 Conc 12** — **INNISFIL TOWNSHIP / SIMCOE**

Date 7/28/2007 DD/MM/YYYY

Elev (masl) Easting 603535 Northing 4910513

/ Not Used Abandoned-Other UTM RC 3 margin of error : 10 - 30 m

Water Found (mbgs) (masl)

Casing Diameter Casing Material:

Top of Screen (mbgs) Bottom of Screen (mbgs)

Screen Interval (m)

Depth (m) Elev (masl)
0.0

Color Soil Descriptions

/ /

Flowing?
SWL 41.1 (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

7139177 — **Lot Conc** — **BARRIE CITY / SIMCOE**

Date 11/24/2009 DD/MM/YYYY

Elev (masl) Easting 604300 Northing 4911332

/ Not Used Abandoned-Other UTM RC 4 margin of error : 30 m - 100 m

Water Found (mbgs) (masl)

Casing Diameter 36 inch Casing Material: CONCRETE

Top of Screen (mbgs) Bottom of Screen (mbgs)

Screen Interval (m)

Depth (m) Elev (masl)
0.0
7.0

Color Soil Descriptions

/ /

Flowing?
SWL (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

7141933 — **Lot 008 Conc 12** — **BARRIE CITY (INNISFIL) / SIMCOE**

Date 2/5/2010 DD/MM/YYYY

Elev (masl) Easting 604659 Northing 4911259

/ Industrial Abandoned-Other UTM RC 4 margin of error : 30 m - 100 m

Water Found (mbgs) (masl)

Casing Diameter 20 inch Casing Material: STEEL

Top of Screen 109.7 (mbgs) Bottom of Screen 121.9 (mbgs)

Screen Interval 12.2 (m)

Depth (m) Elev (masl)
0.0

Color Soil Descriptions

/ /

Flowing?
SWL 63.1 (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

7141934 — **Lot 008 Conc 12** — **BARRIE CITY (INNISFIL) / SIMCOE**

Date 2/5/2010 DD/MM/YYYY

Elev (masl) Easting 604692 Northing 4911366

/ Monitoring UTM RC 4 margin of error : 30 m - 100 m

Water Found (mbgs) (masl)

Casing Diameter 6 inch Casing Material: STEEL

Top of Screen 121.9 (mbgs) Bottom of Screen 125.0 (mbgs)

Screen Interval 3.0 (m)

Depth (m) Elev (masl)
0.0

Color Soil Descriptions

/ /

Flowing?
SWL 63.1 (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

7164835 — **Lot Conc** — **BARRIE CITY (INNISFIL) / SIMCOE**

Date 3/22/2011 DD/MM/YYYY

Elev (masl) Easting 604549 Northing 4911671

/ UTM RC 3 margin of error : 10 - 30 m

Water Found (mbgs) (masl)

Casing Diameter Casing Material:

Top of Screen (mbgs) Bottom of Screen (mbgs)

Screen Interval (m)

Depth (m) Elev (masl)
0.0

Color Soil Descriptions

/ /

Flowing?
SWL (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

Well Record #

7172012 Lot Conc **INNISFIL TOWNSHIP / SIMCOE**

Date 6/14/2011 DD/MM/YYYY | Elev (masl) | Easting 604514 | Northing 4911724 | UTM RC 3 margin of error : 10 - 30 m | Water Found (mbgs) (masl) | Casing Diameter Casing Material: | Top of Screen (mbgs) Bottom of Screen (mbgs) | Screen Interval (m)

Flowing? | SWL (mbgs) (masl) | Pumping WL (mbgs) (masl) | Pump Rate (LPM) / | Spec. Cap. (LPM/m) Hour / Minute

Depth (m) Elev (masl) 0.0

Color | Soil Descriptions

/ /

7192087 Lot Conc **BARRIE CITY (INNISFIL) / SIMCOE**

Date 10/29/2012 DD/MM/YYYY | Elev (masl) | Easting 604638 | Northing 4911801 | UTM RC 4 margin of error : 30 m - 100 m | Water Found (mbgs) (masl) | Casing Diameter Casing Material: | Top of Screen (mbgs) Bottom of Screen (mbgs) | Screen Interval (m)

Flowing? | SWL (mbgs) (masl) | Pumping WL (mbgs) (masl) | Pump Rate (LPM) / | Spec. Cap. (LPM/m) Hour / Minute

Depth (m) Elev (masl) 0.0

Color | Soil Descriptions

/ /

7207031 Lot Conc **INNISFIL TOWNSHIP / SIMCOE**

Date 7/22/2013 DD/MM/YYYY | Elev (masl) | Easting 604534 | Northing 4911534 | / Monitoring Observation Wells | UTM RC 4 margin of error : 30 m - 100 m | Water Found (mbgs) (masl) | Casing Diameter cm Casing Material: | Top of Screen (mbgs) Bottom of Screen (mbgs) | Screen Interval (m)

Flowing? | SWL (mbgs) (masl) | Pumping WL (mbgs) (masl) | Pump Rate (LPM) / | Spec. Cap. (LPM/m) Hour / Minute

Depth (m) Elev (masl) 0.0

Color | Soil Descriptions

/ /

7207032 Lot Conc **BARRIE CITY (INNISFIL) / SIMCOE**

Date 7/22/2013 DD/MM/YYYY | Monitoring / Elev (masl) | Easting 604678 | Northing 4911815 | UTM RC 4 margin of error : 30 m - 100 m | Water Found (mbgs) (masl) | Casing Diameter Casing Material: | Top of Screen (mbgs) Bottom of Screen (mbgs) | Screen Interval (m)

Flowing? | SWL (mbgs) (masl) | Pumping WL (mbgs) (masl) | Pump Rate (LPM) / | Spec. Cap. (LPM/m) Hour / Minute

Depth (m) Elev (masl) 0.0

Color | Soil Descriptions

/ /

7207033 Lot Conc **INNISFIL TOWNSHIP / SIMCOE**

Date 7/22/2013 DD/MM/YYYY | Monitoring / Elev (masl) | Easting 604554 | Northing 4911724 | Observation Wells | UTM RC 4 margin of error : 30 m - 100 m | Water Found (mbgs) (masl) | Casing Diameter Casing Material: | Top of Screen (mbgs) Bottom of Screen (mbgs) | Screen Interval (m)

Flowing? | SWL (mbgs) (masl) | Pumping WL (mbgs) (masl) | Pump Rate (LPM) / | Spec. Cap. (LPM/m) Hour / Minute

Depth (m) Elev (masl) 0.0

Color | Soil Descriptions

/ /

Well Record #

7207770 — Lot — Conc — BARRIE CITY (INNISFIL) / SIMCOE

Date 7/4/2013 (DD/MM/YYYY)

Elev (masl) Easting 604805 Northing 4910680

/ Monitoring and Te Monitoring and Test Hole UTM RC 4 margin of error : 30 m - 100 m

Water Found 2.3 (mbgs) (masl) Untested

Casing Diameter 2 inch Casing Material: PLASTIC

Top of Screen 3.0 (mbgs) Bottom of Screen 6.1 (mbgs)

Screen Interval 3.0 (m)

Flowing?
SWL (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			
3.0		BROWN	SAND / SILT / LOOSE
5.2		BROWN	SAND / / SILTY
6.1		GREY	SILT / SAND /

7234662 — Lot — Conc — INNISFIL TOWNSHIP / SIMCOE

Date 12/16/2014 (DD/MM/YYYY)

Elev (masl) Easting 604533 Northing 4911798

/ Monitoring Observation Wells UTM RC 4 margin of error : 30 m - 100 m

Water Found 22.5 (mbgs) (masl) Untested

Casing Diameter 5 cm Casing Material: PLASTIC

Top of Screen 21.3 (mbgs) Bottom of Screen 24.4 (mbgs)

Screen Interval 3.1 (m)

Flowing?
SWL (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			
1.5		BROWN	SAND / SILT / SOFT
4.5		GREY	SAND / SILT / DENSE
22.0		BROWN	SAND / SILT / DENSE
24.4		GREY	SAND / SILT / DENSE

7234663 — Lot — Conc — INNISFIL TOWNSHIP / SIMCOE

Date 12/15/2014 (DD/MM/YYYY)

Elev (masl) Easting 604539 Northing 4911743

/ Monitoring Observation Wells UTM RC 4 margin of error : 30 m - 100 m

Water Found 22.5 (mbgs) (masl)

Casing Diameter 5 cm Casing Material: PLASTIC

Top of Screen 21.3 (mbgs) Bottom of Screen 24.4 (mbgs)

Screen Interval 3.1 (m)

Flowing?
SWL (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			
1.5		BROWN	SAND / SILT / SOFT
4.5		GREY	SAND / SILT / DENSE
22.0		BROWN	SAND / SILT / DENSE
24.4		GREY	SAND / SILT / DENSE

7338087 — Lot 008 — Conc 12 — BARRIE CITY (INNISFIL) / SIMCOE

Date 6/17/2019 (DD/MM/YYYY)

Elev (masl) Easting 604774 Northing 4911224

/ Monitoring Observation Wells UTM RC 4 margin of error : 30 m - 100 m

Water Found 2.4 (mbgs) (masl) Untested

Casing Diameter 2 Inch Casing Material: PLASTIC

Top of Screen 0.9 (mbgs) Bottom of Screen 3.4 (mbgs)

Screen Interval 2.4 (m)

Flowing?
SWL (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			
1.5		BROWN	FILL / FILL / SAND
		BROWN	FILL / FILL / SAND
3.0		GREY	CLAY / /
		GREY	CLAY / /

Well Record #

7344555 Lot Conc BARRIE CITY (INNISFIL) / SIMCOE

Date 7/11/2019 DD/MM/YYYY

Elev (masl) Easting 604811 Northing 4911366

/ Monitoring and Te Monitoring and Test Hole UTM RC 4 margin of error : 30 m - 100 m

Water Found (mbgs) (masl) Untested

Casing Diameter 2 Inch Casing Material: PLASTIC

Top of Screen 18.6 (mbgs) Bottom of Screen 21.6 (mbgs)

Screen Interval 3.0 (m)

Flowing?
SWL (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			
		BROWN	SAND / /
		BROWN	/ /
		GREY	/ / WATER-BEARING

7344556 Lot Conc BARRIE CITY (INNISFIL) / SIMCOE

Date 7/11/2019 DD/MM/YYYY

Elev (masl) Easting 604807 Northing 4911115

/ Monitoring and Te Monitoring and Test Hole UTM RC 4 margin of error : 30 m - 100 m

Water Found (mbgs) (masl) Untested

Casing Diameter 2 Inch Casing Material: PLASTIC

Top of Screen 19.5 (mbgs) Bottom of Screen 22.6 (mbgs)

Screen Interval 3.0 (m)

Flowing?
SWL (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			
12.2		BROWN	SAND / /
19.8		BROWN	/ /
22.6		GREY	/ / WATER-BEARING

7344557 Lot Conc BARRIE CITY (INNISFIL) / SIMCOE

Date 7/11/2019 DD/MM/YYYY

Elev (masl) Easting 604908 Northing 4911363

/ Monitoring and Te Monitoring and Test Hole UTM RC 4 margin of error : 30 m - 100 m

Water Found (mbgs) (masl) Untested

Casing Diameter 2 Inch Casing Material: PLASTIC

Top of Screen 17.1 (mbgs) Bottom of Screen 20.1 (mbgs)

Screen Interval 3.0 (m)

Flowing?
SWL (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			
12.2		BROWN	SAND / /
16.8		BROWN	/ /
20.1		GREY	/ / WATER-BEARING

7348466 Lot 006 Conc 13 INNISFIL TOWNSHIP / SIMCOE

Date 11/12/2019 DD/MM/YYYY

Elev (masl) Easting 603682 Northing 4911091

/ UTM RC 4 margin of error : 30 m - 100 m

Water Found (mbgs) (masl)

Casing Diameter Casing Material:

Top of Screen (mbgs) Bottom of Screen (mbgs)

Screen Interval (m)

Flowing?
SWL (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			
			/ /

Well Record #

7351984 — **Lot 008 Conc 12** — **BARRIE CITY (INNISFIL) / SIMCOE**

Date 1/10/2020 (DD/MM/YYYY)
Elev (masl) Easting 604835 Northing 4910705
/ UTM RC 4 margin of error : 30 m - 100 m
Water Found 1.9 (mbgs) (masl) Untested
Casing Diameter 5 cm Casing Material: PLASTIC
Top of Screen 1.5 (mbgs) Bottom of Screen 4.5 (mbgs)
Screen Interval 3.0 (m)

Flowing?
SWL (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			

/ /

7351985 — **Lot 008 Conc 12** — **BARRIE CITY (INNISFIL) / SIMCOE**

Date 1/10/2020 (DD/MM/YYYY)
Elev (masl) Easting 604890 Northing 4910693
/ UTM RC 4 margin of error : 30 m - 100 m
Water Found 3.8 (mbgs) (masl) Untested
Casing Diameter 3 cm Casing Material: PLASTIC
Top of Screen 1.8 (mbgs) Bottom of Screen 4.9 (mbgs)
Screen Interval 3.1 (m)

Flowing?
SWL (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			

/ /

7352150 — **Lot 008 Conc 12** — **BARRIE CITY (INNISFIL) / SIMCOE**

Date 1/10/2020 (DD/MM/YYYY)
Elev (masl) Easting 604901 Northing 4910743
/ UTM RC 4 margin of error : 30 m - 100 m
Water Found 3.8 (mbgs) (masl) Untested
Casing Diameter 3 cm Casing Material: PLASTIC
Top of Screen 1.5 (mbgs) Bottom of Screen 4.6 (mbgs)
Screen Interval 3.1 (m)

Flowing?
SWL (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			

/ /

7368586 — **Lot 008 Conc 13** — **BARRIE CITY (INNISFIL) / SIMCOE**

Date 3/5/2020 (DD/MM/YYYY)
Elev (masl) Easting 604782 Northing 4911746
/ Monitoring Observation Wells UTM RC 4 margin of error : 30 m - 100 m
Water Found (mbgs) (masl)
Casing Diameter 2 inch Casing Material: PLASTIC
Top of Screen 2.3 (mbgs) Bottom of Screen 3.8 (mbgs)
Screen Interval 1.5 (m)

Flowing?
SWL 0.0 (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			
1.8		BROWN	SAND / SILT /
3.8		GREY	SILT / TILL /

7368587 — **Lot 008 Conc 13** — **BARRIE CITY (INNISFIL) / SIMCOE**

Date 3/5/2020 (DD/MM/YYYY)
Elev (masl) Easting 604865 Northing 4911692
/ Monitoring Observation Wells UTM RC 4 margin of error : 30 m - 100 m
Water Found (mbgs) (masl)
Casing Diameter 2 inch Casing Material: PLASTIC
Top of Screen 3.0 (mbgs) Bottom of Screen 4.6 (mbgs)
Screen Interval 1.5 (m)

Flowing?
SWL 0.0 (mbgs) (masl)
Pumping WL (mbgs) (masl)
Pump Rate (LPM) /
Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			
0.3		BROWN	TOPSOIL / /
3.0		BROWN	SILT / SAND /
4.6		GREY	SILT / TILL / DENSE

Well Record #

7368588

Lot 008 Conc 13 **BARRIE CITY (INNISFIL) / SIMCOE**

Date 3/5/2020 DD/MM/YYYY

Elev (masl) **Easting** 604801 **Northing** 4911677

/ **Monitoring Observation Wells** **UTM RC** 4 **margin of error : 30 m - 100 m**

Water Found (mbgs) (masl)

Casing Diameter 2 inch **Casing Material:** PLASTIC

Top of Screen 1.5 (mbgs) **Bottom of Screen** 3.0 (mbgs)

Screen Interval 1.5 (m)

Flowing?

SWL 0.0 (mbgs) (masl)

Pumping WL (mbgs) (masl)

Pump Rate (LPM) /

Spec. Cap. (LPM/m) Hour / Minute

Depth (m)	Elev (masl)	Color	Soil Descriptions
0.0			
3.0		BROWN	SILT / SAND /

APPENDIX

B

BOREHOLE AND MONITORING WELL LOG

LOG OF BOREHOLE MW21-01

PROJECT: BARRIE SMART CENTRES
REF. NO.: 211-11672-00
CLIENT: BARRIE-BRYNE DEVELOPMENTS LTD.
Method: Hollow Stem Augers
ENCL NO.: 1
PROJECT LOCATION: Bryne Drive/Harvie Road, Barrie, Ontario
Diameter: 200mm
DATUM: Relative
Date: Nov/23/2021
BH LOCATION: N 4910619 E 604512

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
301.4	Ground Surface											
301.0 0.0	**TOPSOIL:** 150 mm						Concrete					
0.2	**SAND:** SAND, trace silt, brown, moist, compact		1	SS	12		301					
300.6												
0.8	**SILT AND SAND TO SILTY SAND:** SILT AND SAND, trace to some clay, brown, moist, very loose		2	SS	1							
299.9							300					
1.5	**SILTY SAND:** SILTY SAND, trace cobble											
299.5			3	SS	73							
1.8	fragments, brown, moist, very dense											
	SAND:											
299.1							299					
2.3	SAND, trace to some silt, brown, moist, very dense trace gravel		4	SS	50	▽	W. L. 298.8 m Dec 08, 2021					
298.3							Bentonite					
3.1	trace silt, no gravel, dense		5	SS	40		298					
						▽	W. L. 297.4 m Dec 15, 2021					
296.8							Jan 13, 2022					
4.6	wet, very dense		6	SS	92		296					
			7	SS	95		Sand Screen					
			8	SS	53							0 92 3 5
							294					
293.3			9	SS	28							
8.1	**END OF BOREHOLE** Borehole terminated at 8.1 m below ground surface in SANDS. Installed monitoring well upon completion.											

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

LOG OF BOREHOLE MW21-02D

PROJECT: BARRIE SMART CENTRES
REF. NO.: 211-11672-00
CLIENT: BARRIE-BRYNE DEVELOPMENTS LTD.
Method: Mud Rotary
ENCL NO.: 2
PROJECT LOCATION: Bryne Drive/Harvie Road, Barrie, Ontario
Diameter: 100mm
DATUM: Relative
Date: Nov/26/2021
BH LOCATION: N 4911171 E 604480

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
292.8 / 0.0	Ground Surface					
292.7 / 0.1	**TOPSOIL:** 130 mm				Concrete	
292.3 / 0.6	**SILTY SAND:** SILTY SAND, trace organics, brown, moist to wet, loose	1	SS	6		
1	**SAND:** SAND, trace silt, brown, moist to wet, very loose to loose	2	SS	2	292	
2		3	SS	4	291	
290.4 / 2.4	grey, trace to some silt, moist, dense	4	SS	32		0 63 31 6
289.8 / 3.1	wet to saturated, very dense	5	SS	52	290	
4					289	
288.3 / 4.6	some silt to silty	6	SS	88	288	
5					Bentonite	
6					287	
286.4 / 6.4	**SILT AND SAND:** SILT AND SAND, trace clay, grey, moist to wet, very dense	7	SS	72		
7					286	
285.2 / 7.6	**CLAY AND SILT:** CLAY AND SILT, grey, moist to wet, hard	8	SS	84	285	
8						
9					284	
283.7 / 9.1	50 mm sand and gravel layer	9	SS	>100		
10					283	
282.2 / 10.7		10	SS	115	282	
11						

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE
DYNAMIC CONE PENETRATION RESISTANCE PLOT
PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L
WATER CONTENT (%)
POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE MW21-02D

PROJECT: BARRIE SMART CENTRES — REF. NO.: 211-11672-00
CLIENT: BARRIE-BRYNE DEVELOPMENTS LTD. — Method: Mud Rotary — ENCL NO.: 2
PROJECT LOCATION: Bryne Drive/Harvie Road, Barrie, Ontario — Diameter: 100mm
DATUM: Relative — Date: Nov/26/2021
BH LOCATION: N 4911171 E 604480

(m) ELEV DEPTH	SOIL PROFILE: DESCRIPTION (Continued)	STRATA PLOT	SAMPLES: NUMBER	TYPE	"N" BLOWS/0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT W_P / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WATER CONTENT (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m^3)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
12	**SAND:** SAND, trace to some gravel, grey to brown, moist to wet, very dense(Continued)					Sand, Screen	281					
280.4			11	SS	>150	W. L. 280.7 m Jan 19, 2022			○			3 84 7 6
12.5	**END OF BOREHOLE** Borehole terminated at 12.5 m below ground surface in SAND. Installed monitoring well upon completion. Monitoring well was dry on December 8, 2021.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE MW21-02S

PROJECT: BARRIE SMART CENTRES | REF. NO.: 211-11672-00

CLIENT: BARRIE-BRYNE DEVELOPMENTS LTD. | Method: Hollow Stem Augers | ENCL NO.: 3

PROJECT LOCATION: Bryne Drive/Harvie Road, Barrie, Ontario | Diameter: 200mm

DATUM: Relative | Date: Nov/26/2021

BH LOCATION: N 4911171 E 604478

ELEV (m) / DEPTH	DESCRIPTION	GROUND WATER CONDITIONS	ELEVATION
292.8	Ground Surface		
292.7 / 0.1	**TOPSOIL:** 130 mm	Concrete	
292.3 / 0.6	**SILTY SAND:** SILTY SAND, trace organics, brown, moist to wet, loose		
	SAND: SAND, trace silt, brown, moist to wet, very loose to loose	Bentonite	292
		Sand	291
		Screen	
290.4 / 2.4	grey, trace to some silt, moist, dense		290
289.8 / 3.1	**END OF BOREHOLE** Borehole terminated at 3.1 m below ground surface in SAND. Installed monitoring well upon completion. Monitoring well was dry on December 8, 2021.	W. L. 290.0 m Jan 19, 2022	

Other columns (blank): STRATA PLOT; SAMPLES: NUMBER, TYPE, "N" BLOWS/0.3 m; DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100); SHEAR STRENGTH (kPa): ○ UNCONFINED, + FIELD VANE & Sensitivity, ● QUICK TRIAXIAL, × LAB VANE (20 40 60 80 100); PLASTIC LIMIT W_P, NATURAL MOISTURE CONTENT w, LIQUID LIMIT W_L; WATER CONTENT (%) (10 20 30); POCKET PEN. (Cu) (kPa); NATURAL UNIT WT (kN/m^3); REMARKS AND GRAIN SIZE DISTRIBUTION (%): GR SA SI CL

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE MW21-03

PROJECT: BARRIE SMART CENTRES
REF. NO.: 211-11672-00
CLIENT: BARRIE-BRYNE DEVELOPMENTS LTD.
Method: Mud Rotary
ENCL NO.: 4
PROJECT LOCATION: Bryne Drive/Harvie Road, Barrie, Ontario
Diameter: 100mm
DATUM: Relative
Date: Nov/24/2021
BH LOCATION: N 4910742 E 604042

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
301.7	Ground Surface											
0.0	**TOPSOIL:** 610 mm		1	SS	15		Concrete					
301.1												
300.9	**SAND:**											
0.8	SAND, trace silt, brown, moist, compact		2	SS	9		301					
1	damp to moist, loose											
300.2												
1.5	compact		3	SS	22		300					
2												
299.4												
2.3	wet, dense		4	SS	35		W. L. 299.1 m					
3							W. L. 299.0 m Dec 08, 2021					
298.6												
3.1	trace to some silt		5	SS	48		298					
4							Bentonite					
			6	SS	50		297					
5												
6							296					
295.6												
6.1	**SILTY SAND:** SILTY SAND, brown, wet, very dense		7	SS	>100		295					
7												
			8	SS	>90		294					0 41 53 6
8							Sand Screen					
9							293					
292.5												
9.1	some silt to silty		9	SS	>115							
292.3												
9.4	**END OF BOREHOLE** Borehole terminated at 9.4 m below ground surface in SILTY SAND. Installed monitoring well upon completion.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE MW21-04

PROJECT: BARRIE SMART CENTRES
REF. NO.: 211-11672-00
CLIENT: BARRIE-BRYNE DEVELOPMENTS LTD.
Method: Mud Rotary
ENCL NO.: 5
PROJECT LOCATION: Bryne Drive/Harvie Road, Barrie, Ontario
Diameter: 100mm
DATUM: Relative
Date: Nov/25/2021
BH LOCATION: N 4910979 E 604464

ELEV DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
298.4	Ground Surface				
298.0	**TOPSOIL:** 180 mm				
0.2	**SAND:** SAND, trace silt, brown, damp, loose to compact	1	SS	11	Concrete
1		2	SS	5	298
296.9					
1.5	**CLAYEY SANDY SILT:** CLAYEY SANDY SILT, trace gravel, brown, moist, very dense	3	SS	50	297
2					
296.1					
2.3	grey, some sand seams	4	SS	72	296
295.7					
2.7	**SAND:** SAND, trace silt, brown, wet, very dense				
3					
295.4					
3.1	trace to some silt	5	SS	>94	295
					Bentonite
4					
					294
		6	SS	>100	
5					
					293
6					
		7	SS	>100	292
7					
					291
290.8					
7.6	**SILTY SAND:** SILTY SAND, grey, wet, very dense	8	SS	>100	W. L. 290.5 m
8					W. L. 290.2 m
					Dec 08, 2021
9					
289.3					
9.1	**CLAYEY SILT:** CLAYEY SILT, some sand to sandy, grey, moist to very moist, hard	9	SS	>98	289
288.9					
9.6	**END OF BOREHOLE** Borehole terminated at 9.6 m below ground surface in CLAYEY SILT. Installed monitoring well upon completion.				

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

	GR	SA	SI	CL
9	0	20	68	12

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE MW21-05D

PROJECT: BARRIE SMART CENTRES
REF. NO.: 211-11672-00
CLIENT: BARRIE-BRYNE DEVELOPMENTS LTD.
Method: Mud Rotary
ENCL NO.: 6
PROJECT LOCATION: Bryne Drive/Harvie Road, Barrie, Ontario
Diameter: 100mm
DATUM: Relative
Date: Nov/24/2021
BH LOCATION: N 4910613 E 604222

ELEV DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE	WATER CONTENT (%) w_P PLASTIC LIMIT, w NATURAL MOISTURE CONTENT, w_L LIQUID LIMIT	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
303.3	Ground Surface										
303.2 0.0	**TOPSOIL:** 180 mm				Concrete						
0.2	**SANDY SILT:** SANDY SILT, trace clay, trace gravel, brown, moist, loose	1	SS	4		303					
302.6											
0.8	**CLAYEY SILT:** CLAYEY SILT, trace sand, trace gravel, brown, moist, compact	2	SS	22		302					
301.8											
1.5	slty sand layers	3	SS	26							
		4	SS	16		301					0 3 17 80
300.3											
3.1	**SAND:** SAND, trace silt, brown, wet, very dense	5	SS	56	W. L. 300.0 m Dec 15, 2021	300					
					W. L. 299.7 m Jan 19, 2022						
					W. L. 299.3 m Dec 08, 2021						
		6	SS	>94		298					
		7	SS	>100		297					
						296					
295.7											
7.6	trace to some silt	8	SS	78	Sand Screen						0 89 6 5
		9	SS	63		294					
293.7											
9.6	**END OF BOREHOLE** Borehole terminated at 9.6 m below ground surface in SAND. Installed monitoring well upon completion.										

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

wsp

LOG OF BOREHOLE MW21-05S

PROJECT: BARRIE SMART CENTRES
REF. NO.: 211-11672-00
CLIENT: BARRIE-BRYNE DEVELOPMENTS LTD.
Method: Hollow Stem Augers
ENCL NO.: 7
PROJECT LOCATION: Bryne Drive/Harvie Road, Barrie, Ontario
Diameter: 200mm
DATUM: Relative
Date: Nov/24/2021
BH LOCATION: N 4910613 E 604220

ELEV (m) / DEPTH	DESCRIPTION (SOIL PROFILE)	GROUND WATER CONDITIONS
303.3	Ground Surface	
303.1 / 0.0	**TOPSOIL:** 180 mm	Concrete
0.2	**SANDY SILT:** SANDY SILT, trace clay, trace gravel, brown, moist, loose	
302.6 / 0.8	**CLAYEY SILT:** CLAYEY SILT, trace sand, trace gravel, brown, moist, compact	Bentonite
301.8 / 1.5	slty sand layers	Sand, Screen; W. L. 300.8 m Dec 08, 2021; W. L. 300.6 m Jan 19, 2022
300.3 / 3.1	**END OF BOREHOLE** Borehole terminated at 3.1 m below ground surface in CLAYEY SILT. Installed monitoring well upon completion.	

Column headings: SOIL PROFILE; STRATA PLOT; SAMPLES (NUMBER, TYPE, "N" BLOWS/0.3 m); GROUND WATER CONDITIONS; ELEVATION (303, 302, 301); DYNAMIC CONE PENETRATION RESISTANCE PLOT (20, 40, 60, 80, 100); SHEAR STRENGTH (kPa) ○ UNCONFINED + FIELD VANE & Sensitivity ● QUICK TRIAXIAL × LAB VANE (20, 40, 60, 80, 100); PLASTIC LIMIT w_P, NATURAL MOISTURE CONTENT w, LIQUID LIMIT w_L; WATER CONTENT (%) (10, 20, 30); POCKET PEN. (Cu) (kPa); NATURAL UNIT WT (kN/m^3); REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH18-21

PROJECT: Bryne Drive Extension
REF. NO.: 181-06461-00
CLIENT: City of Barrie
Method: Hollow Stem Auger
ENCL NO.: 4
PROJECT LOCATION: Barrie
Diameter: 200mm
DATUM: Relative
Date: Jun/12/2018
BH LOCATION: See Figure 1

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
297.1	Ground Surface				
296.9 0.3	**TOPSOIL** dark brown, moist	1	SS	8	297
	SILTY SAND FILL mixed with topsoil, brown and dark brown, moist, loose	2	SS	10	296
295.7 1.5	**CLAYEY SANDY SILT TILL** trace sand, trace gravel, brown, moist, stiff to very stiff	3	SS	13	295
		4	SS	10	294
293.1 4.0		5	SS	17	
	SAND trace gravel, some silt, brown, dry to wet, very dense	6	SS	59	293
		7	SS	61	292
		8	SS	56	291
		9	SS	74	290
		10	SS	57	288
		11	SS	78	287
284.5 12.7	End of Borehole				286
					285

W. L. 289.8 m Feb 11. 2018
W. L. 289.4 m Sep 21, 2018

REMARKS AND GRAIN SIZE DISTRIBUTION (%)				
GR	SA	SI	CL	
3	31	49	17	
5	27	42	26	
0	85		(15)	

NOTES:

Groundwater measured at a depth of 6.7 m below site grades on completion of drilling operations.

Water level at 7.7 mbgs measured on September 21, 2018.

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ε=3%: Strain at Failure

LOG OF BOREHOLE MW 1

PROJECT: Bryne Drive Extension
REF. NO.: 181-06461-00
CLIENT: City of Barrie
Method: Hollow Stem Auger
ENCL NO.: 1
PROJECT LOCATION: Barrie
Diameter: 203mm
DATUM: Relative
Date: Sep/07/2021
BH LOCATION: See Figure 1

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
302.7	Ground Surface							
0.0 / 302.5	Straight augered to 4.57m, data from previously drilled BH18-28.							
0.2 / 301.9	**TOPSOIL** dark brown, moist		1	SS	6			
0.8	**SILTY SAND FILL** some gravel, cobbles, orangy brown, moist, loose		2	SS	4		302	
	SILTY SAND to SILT and SAND brown to grey, moist to saturated, loose to dense		3	SS	33		301	
			4	SS	48			0 75 (25)
							Bentonite Holeplug	
			5	SS	44		299	
			6	SS	19		298	
			7	SS	50		297 Sand	
			8	SS	33			
296.1 / 6.6	**SILT** some fine sand, brown, saturated, compact		9	SS	28		W. L. 296.0 m Sep 08, 2021	
			10	SS	50		295	
294.5 / 8.2	**End of Borehole** 51mm diameter monitoring well installed upon completed, screened 6.1mbgs to 7.62mbgs. Date WL(mbg) 07/09/2021 6.67 08/09/2021 6.67							

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)
SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE
PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)
POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

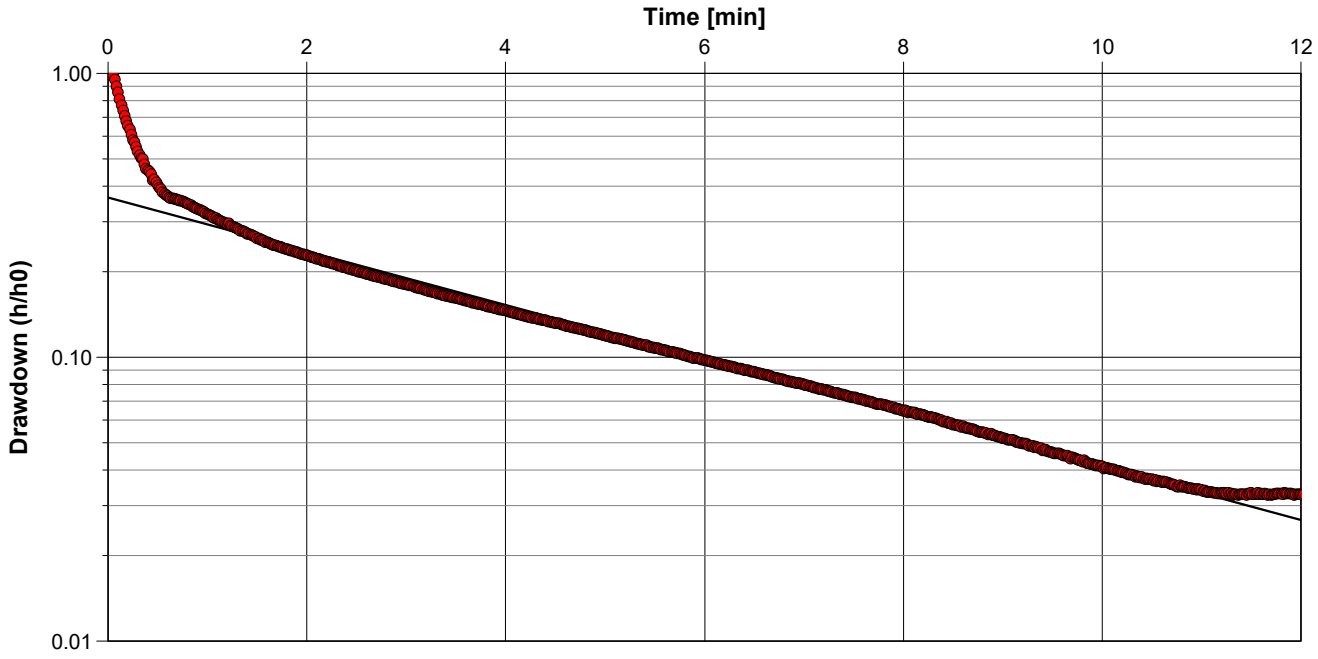
APPENDIX

C

HYDRAULIC CONDUCTIVITY TEST ANALYSIS

	Slug Test Analysis Report
	Project: Preliminary Hydrogeolgocial Investigation
	Number: 211-11672-00
	Client: Barrie-Bryne Developments Ltd.

Location: Hwy 400 & Harvie Rd, Barrie	Slug Test: MW21-02s	Test Well: MW21-02s
Test Conducted by: K.R.		Test Date: 16/12/2021
Analysis Performed by: M.Y.	Bouwer & Rice Method	Analysis Date: 10/01/2022
Aquifer Thickness: 3.20 m		

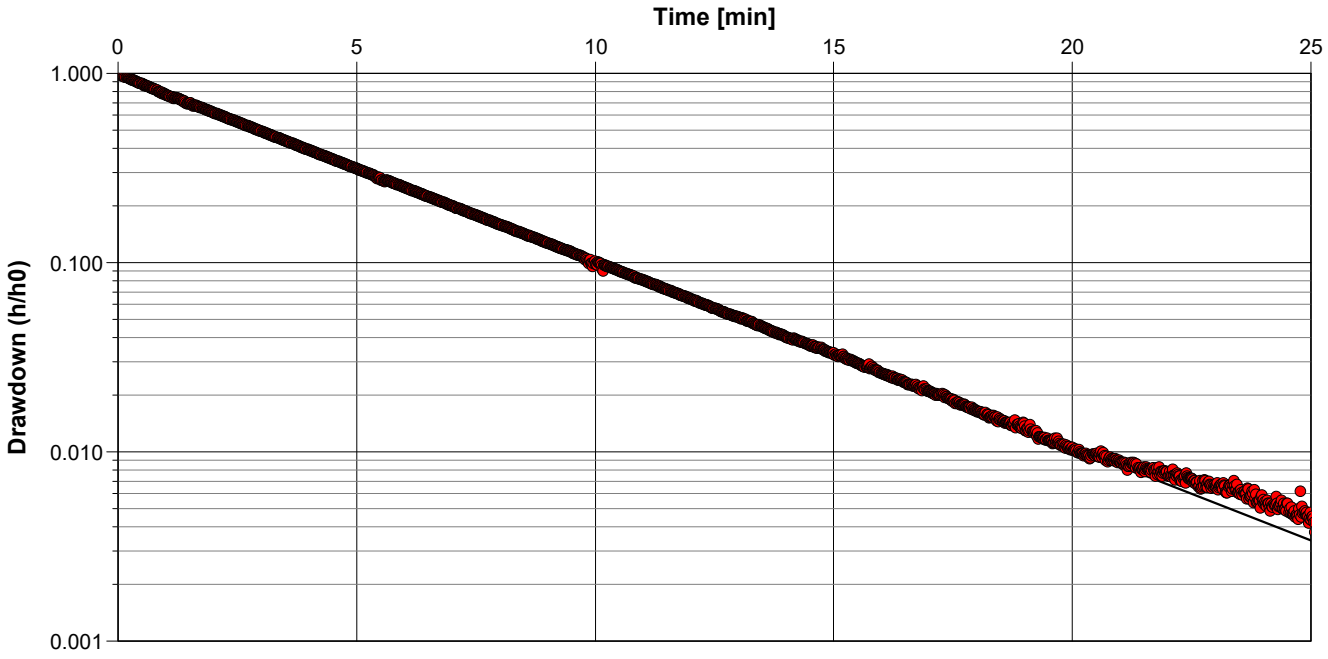


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW21-02s	2.62×10^{-6}	

	Slug Test Analysis Report
	Project: Preliminary Hydrogeolgocial Investigation
	Number: 211-11672-00
	Client: Barrie-Bryne Developments Ltd.

Location: Hwy 400 & Harvie Rd, Barrie	Slug Test: MW21-03	Test Well: MW21-03
Test Conducted by: K.R.		Test Date: 15/12/2021
Analysis Performed by: M.Y.	Bouwer & Rice Method	Analysis Date: 10/01/2022
Aquifer Thickness: 6.80 m		

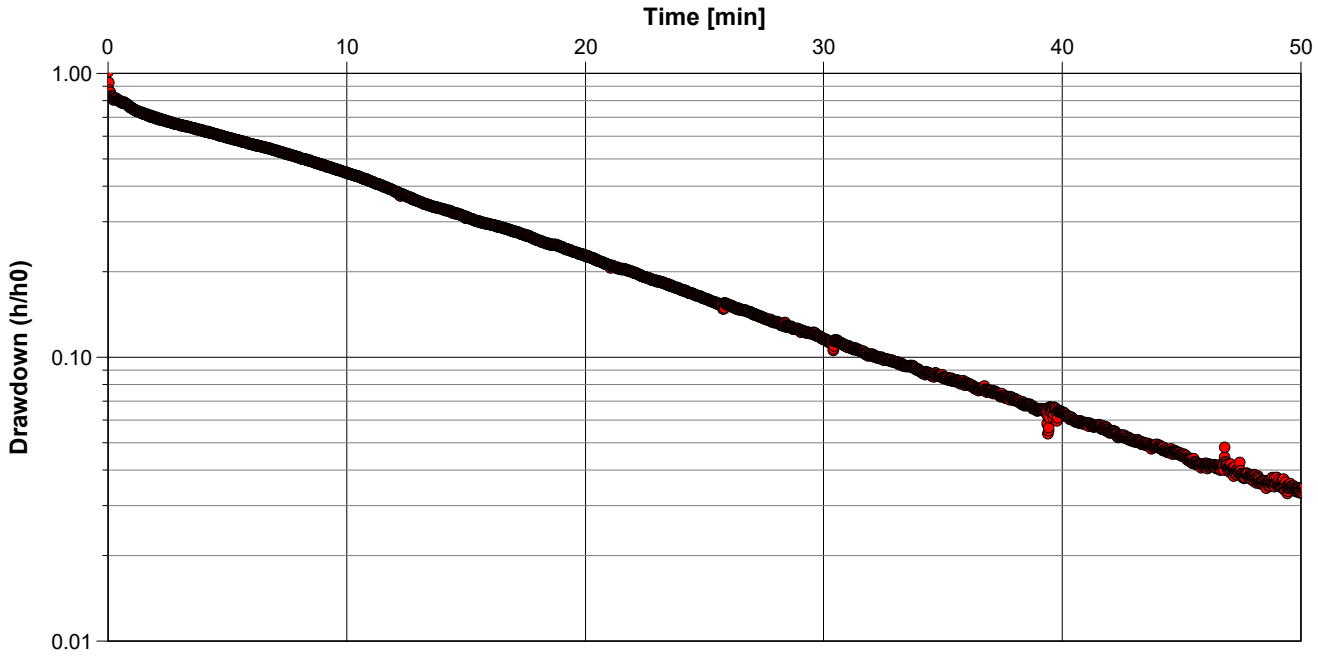


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW21-03	2.94×10^{-6}	

	Slug Test Analysis Report
	Project: Preliminary Hydrogeolgocial Investigation
	Number: 211-11672-00
	Client: Barrie-Bryne Developments Ltd.

Location: Hwy 400 & Harvie Rd, Barrie	Slug Test: MW21-04	Test Well: MW21-04
Test Conducted by: K.R.		Test Date: 16/12/2021
Analysis Performed by: M.Y.	Bouwer & Rice Method	Analysis Date: 10/01/2022
Aquifer Thickness: 1.50 m		

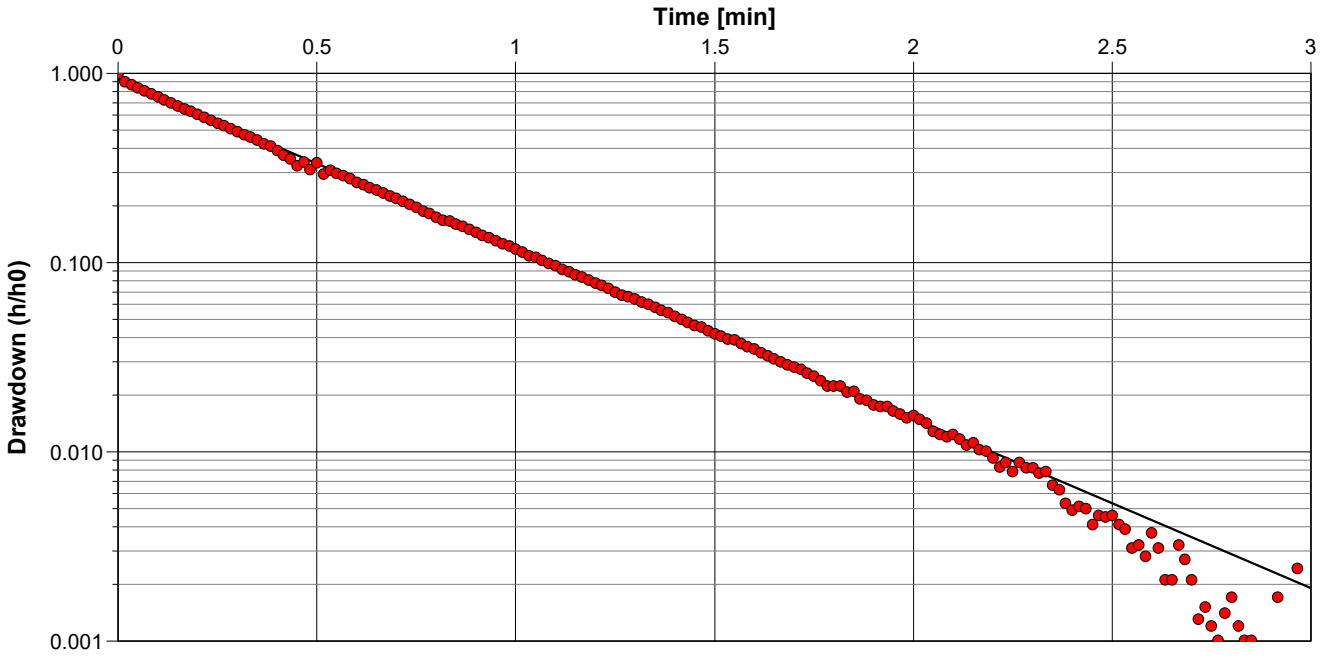


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW21-04	7.35×10^{-7}	

	Slug Test Analysis Report
	Project: Preliminary Hydrogeolgocial Investigation
	Number: 211-11672-00
	Client: Barrie-Bryne Developments Ltd.

Location: Hwy 400 & Harvie Rd, Barrie	Slug Test: MW21-05d	Test Well: MW25-05d
Test Conducted by: K.R.		Test Date: 15/12/2021
Analysis Performed by: M.Y.	Bouwer & Rice Method	Analysis Date: 10/01/2022
Aquifer Thickness: 6.20 m		



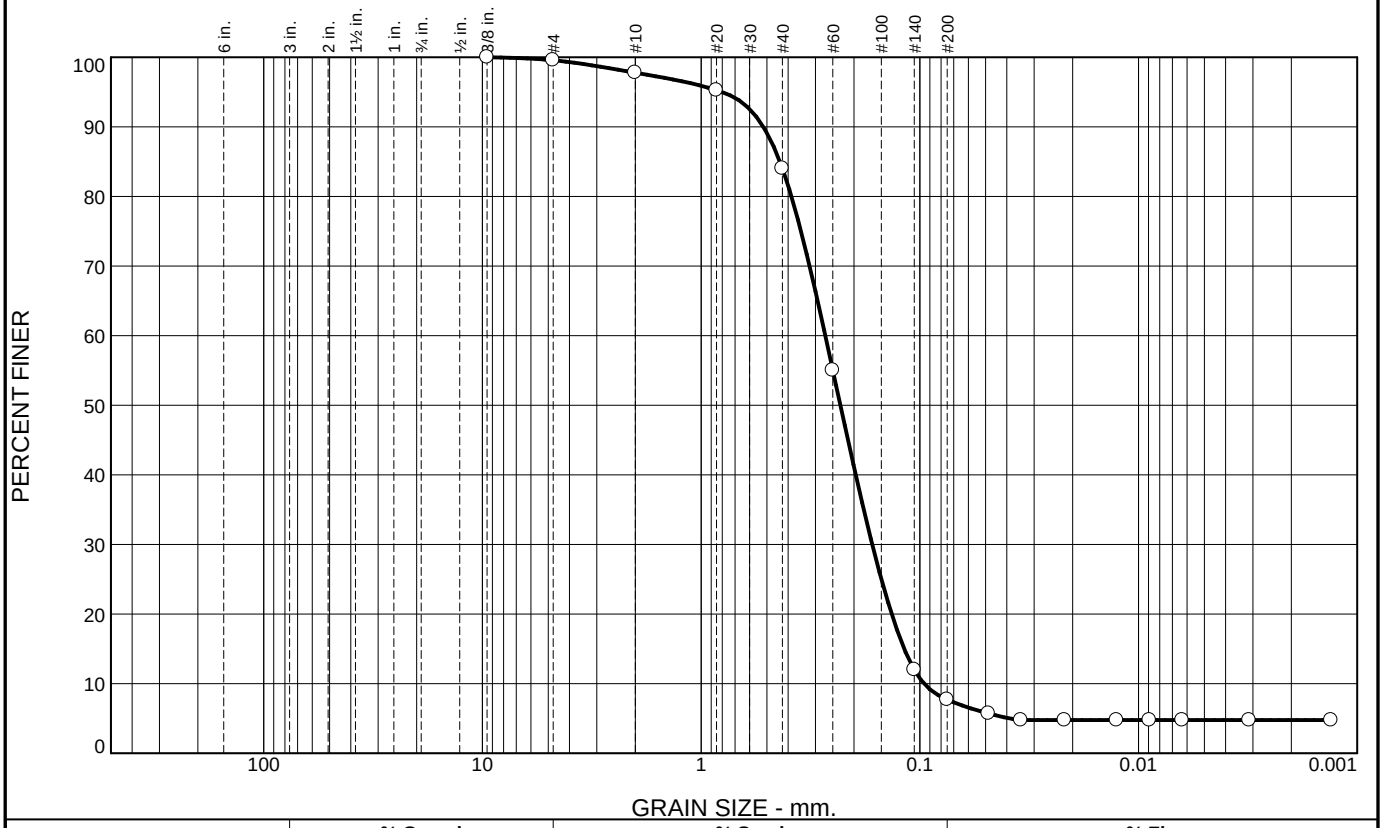
Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW25-05d	2.60×10^{-5}	

APPENDIX

D GRAIN SIZE ANALYSIS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.4	1.8	13.8	76.3	2.9	4.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5mm	100.0		
4.75mm	99.6		
2mm	97.8		
0.850mm	95.3		
0.425mm	84.0		
0.250mm	55.0		
0.106mm	12.0		
0.075mm	7.7		
0.0485 mm.	5.7		
0.0344 mm.	4.8		
0.0218 mm.	4.8		
0.0126 mm.	4.8		
0.0089 mm.	4.8		
0.0063 mm.	4.8		
0.0031 mm.	4.8		
0.0013 mm.	4.8		

* (no specification provided)

Soil Description

Sand, trace clay, trace silt, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.5193 D_{85}= 0.4362 D_{60}= 0.2705
D_{50}= 0.2308 D_{30}= 0.1650 D_{15}= 0.1179
D_{10}= 0.0956 C_u= 2.83 C_c= 1.05

Classification

USCS= AASHTO=

Remarks

Sampled by Nicole C. on Nov.23, 2021

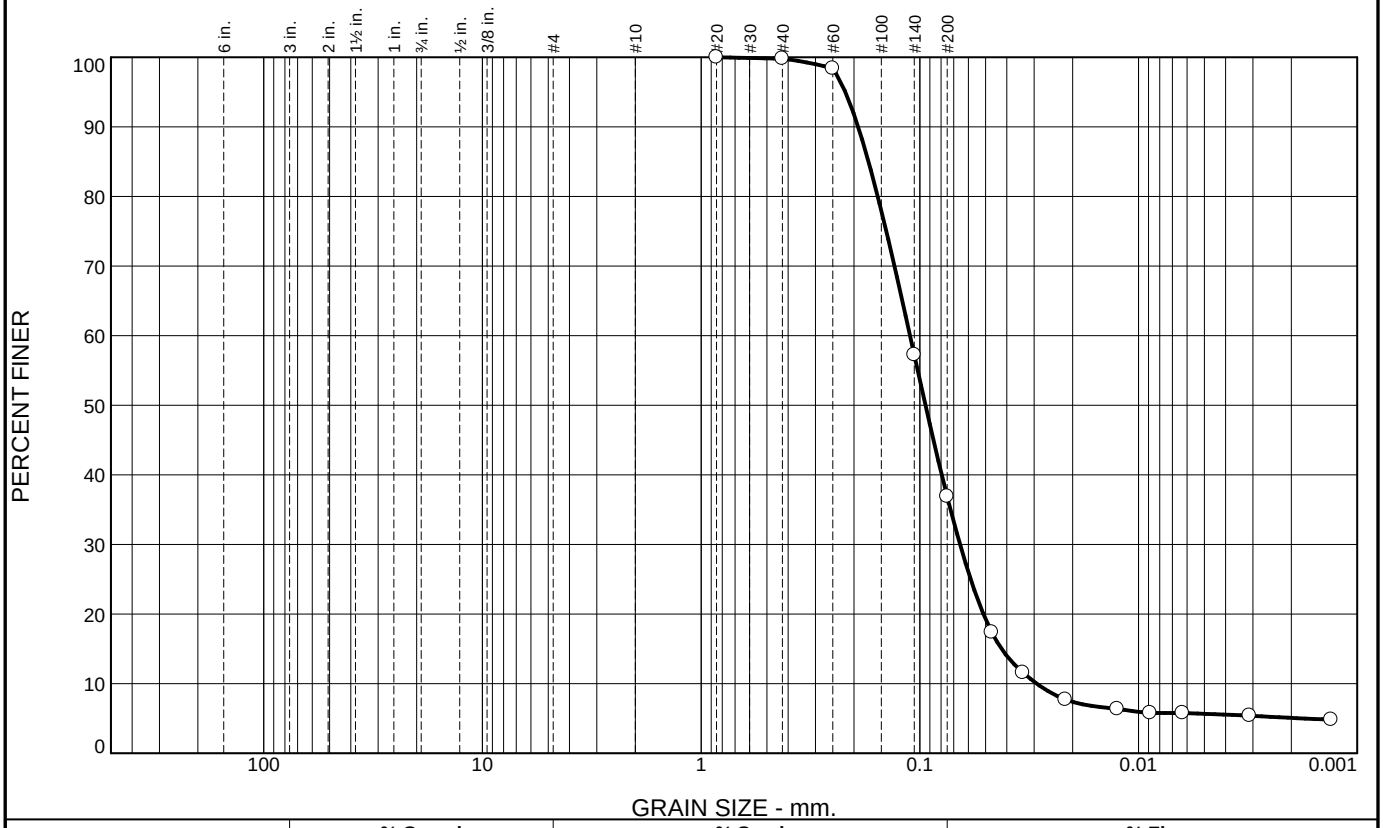
Location: MW21-1 SS8
Sample Number: 21MM-842

Date: 06/12/21

Client: Barrie-Bryne Developments Limited
Project: 211-11672-00 - Barrie SmartCentres Harvie Rd Development

Project No: 211-11672-00 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	62.9	31.2	5.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.850mm	100.0		
0.425mm	99.8		
0.250mm	98.4		
0.106mm	57.2		
0.075mm	36.9		
0.0469 mm.	17.4		
0.0337 mm.	11.6		
0.0216 mm.	7.7		
0.0125 mm.	6.4		
0.0089 mm.	5.8		
0.0063 mm.	5.8		
0.0031 mm.	5.4		
0.0013 mm.	4.8		

* (no specification provided)

Soil Description

Silty sand, trace clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1914 D_{85}= 0.1716 D_{60}= 0.1109
D_{50}= 0.0942 D_{30}= 0.0655 D_{15}= 0.0423
D_{10}= 0.0292 C_u= 3.80 C_c= 1.33

Classification

USCS= AASHTO=

Remarks

Sampled by Nicole C. on Nov.26, 2021

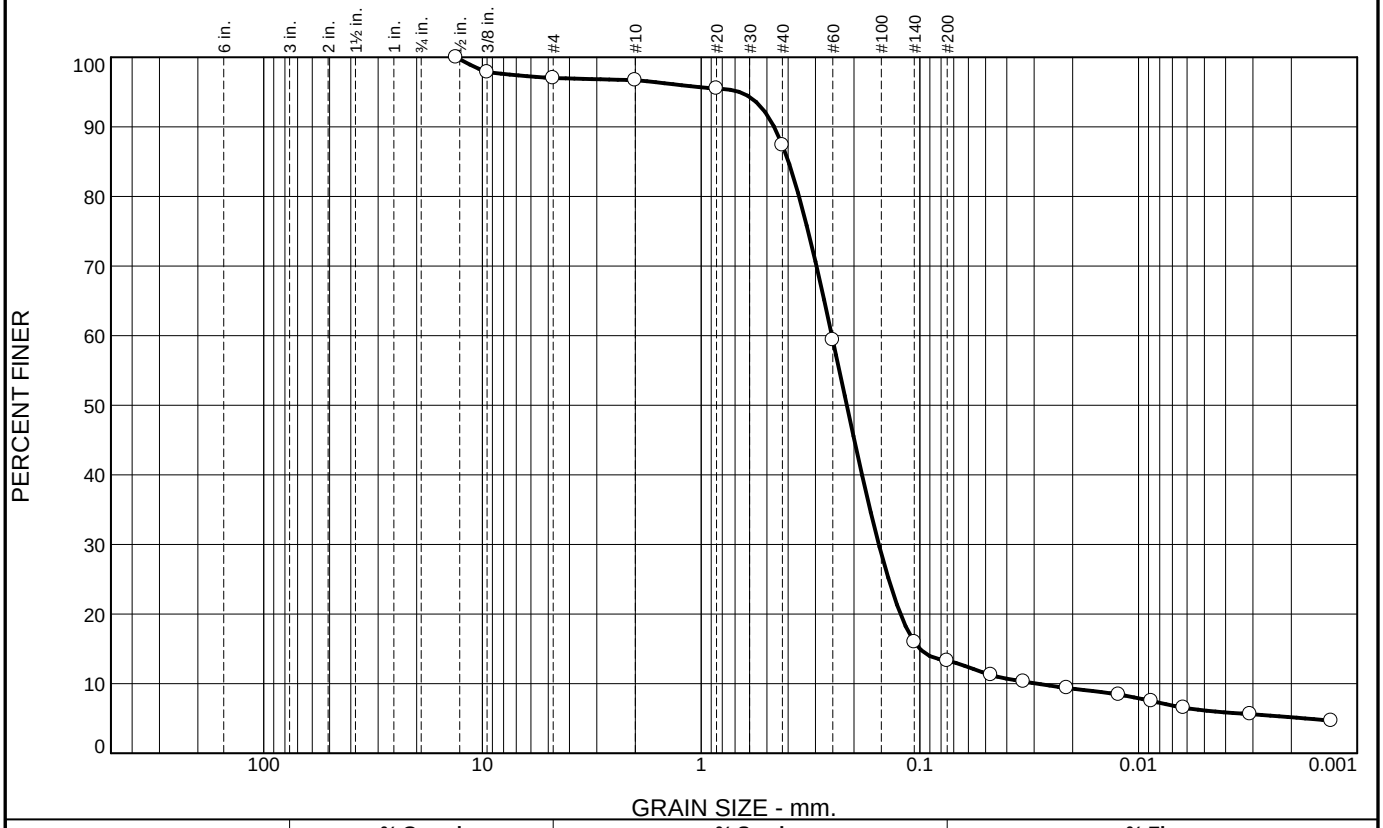
Location: MW21-2 SS4
Sample Number: 21MM-844

Date: 06/12/21

Client: Barrie-Bryne Developments Limited
Project: 211-11672-00 - Barrie SmartCentres Harvie Rd Development

Project No: 211-11672-00 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.0	0.3	9.3	74.1	7.1	6.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
13.2mm	100.0		
9.5mm	97.9		
4.75mm	97.0		
2mm	96.7		
0.850mm	95.5		
0.425mm	87.4		
0.250mm	59.4		
0.106mm	16.0		
0.075mm	13.3		
0.0473 mm.	11.3		
0.0336 mm.	10.3		
0.0213 mm.	9.4		
0.0123 mm.	8.4		
0.0087 mm.	7.5		
0.0062 mm.	6.6		
0.0031 mm.	5.6		
0.0013 mm.	4.7		

* (no specification provided)

Soil Description

Sand, trace silt, trace clay, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.4636 D_{85}= 0.3987 D_{60}= 0.2524
D_{50}= 0.2158 D_{30}= 0.1539 D_{15}= 0.1000
D_{10}= 0.0289 C_u= 8.72 C_c= 3.24

Classification

USCS= AASHTO=

Remarks

Sampled by Nicole C. on Nov.26, 2021

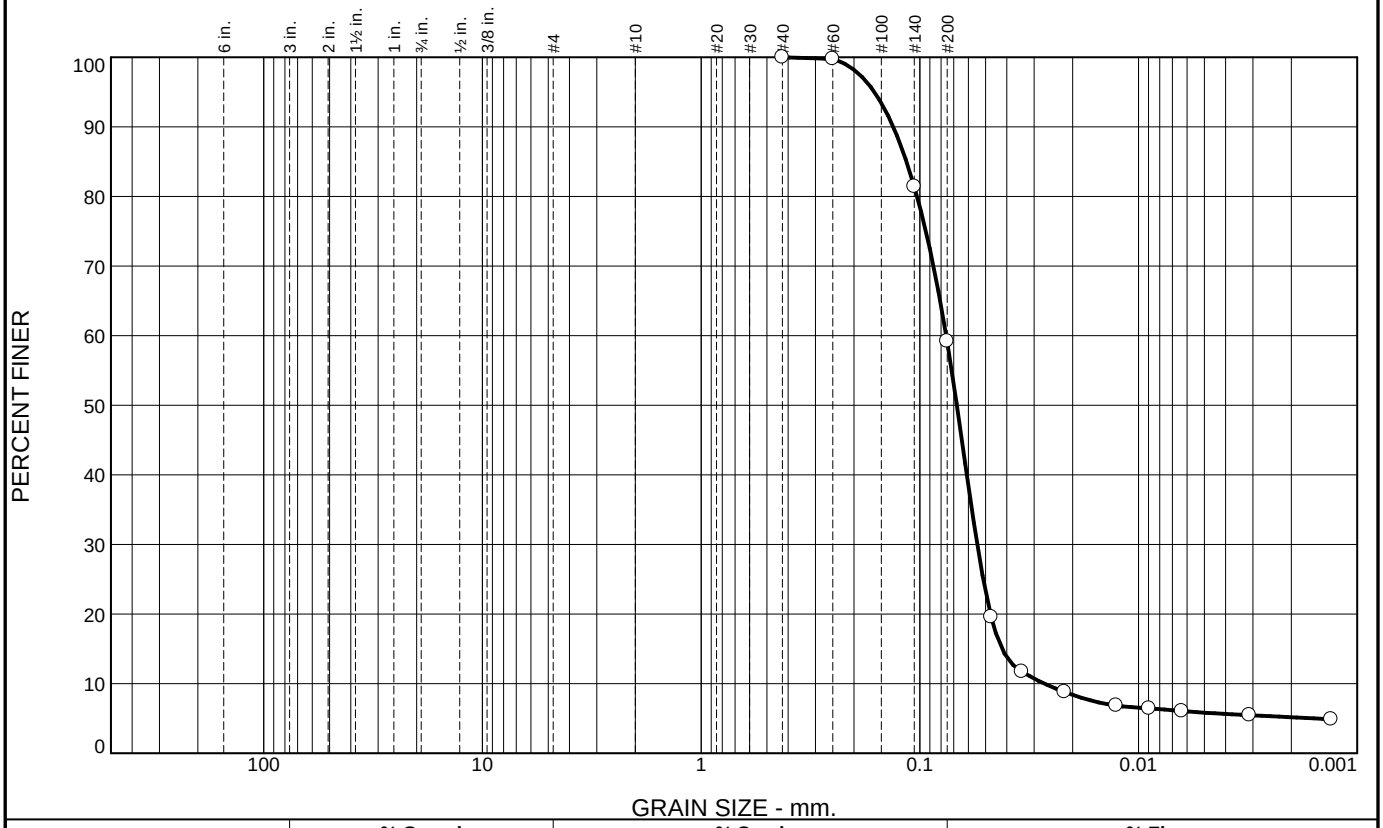
Location: MW21-2 SS11
Sample Number: 21MM-843

Date: 06/12/21

Client: Barrie-Bryne Developments Limited
Project: 211-11672-00 - Barrie SmartCentres Harvie Rd Development

Project No: 211-11672-00 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	40.8	53.4	5.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.425mm	100.0		
0.250mm	99.8		
0.106mm	81.4		
0.075mm	59.2		
0.0471 mm.	19.6		
0.0341 mm.	11.7		
0.0218 mm.	8.8		
0.0126 mm.	6.9		
0.0090 mm.	6.5		
0.0063 mm.	6.1		
0.0031 mm.	5.5		
0.0013 mm.	4.9		

* (no specification provided)

Soil Description

Silt and sand, trace clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1322 D_{85}= 0.1150 D_{60}= 0.0757
D_{50}= 0.0678 D_{30}= 0.0546 D_{15}= 0.0421
D_{10}= 0.0269 C_u= 2.82 C_c= 1.46

Classification

USCS= AASHTO=

Remarks

Sampled by Nicole C. on Nov.24, 2021

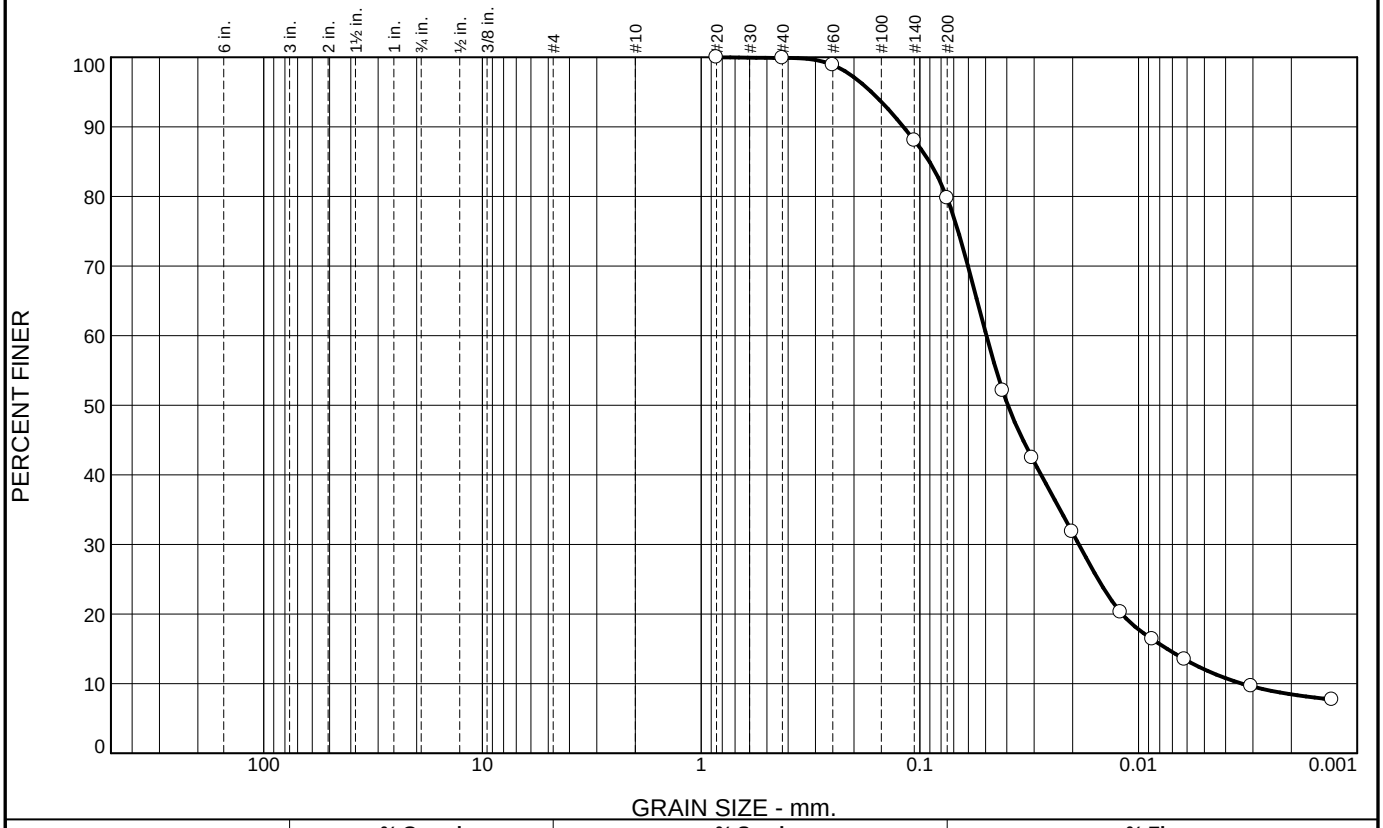
Location: MW21-3 SS8
Sample Number: 21MM-845

Date: 06/12/21

Client: Barrie-Bryne Developments Limited
Project: 211-11672-00 - Barrie SmartCentres Harvie Rd Development

Project No: 211-11672-00 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	20.1	67.7	12.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.850mm	100.0		
0.425mm	99.9		
0.250mm	98.9		
0.106mm	88.0		
0.075mm	79.8		
0.0418 mm.	52.1		
0.0307 mm.	42.4		
0.0201 mm.	31.8		
0.0121 mm.	20.3		
0.0086 mm.	16.4		
0.0062 mm.	13.5		
0.0031 mm.	9.6		
0.0013 mm.	7.7		

* (no specification provided)

Soil Description

Sandy silt, some clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1189 D_{85}= 0.0903 D_{60}= 0.0496
D_{50}= 0.0396 D_{30}= 0.0187 D_{15}= 0.0074
D_{10}= 0.0034 C_u= 14.80 C_c= 2.11

Classification

USCS= AASHTO=

Remarks

Sampled by Nicole C. on Nov.25, 2021

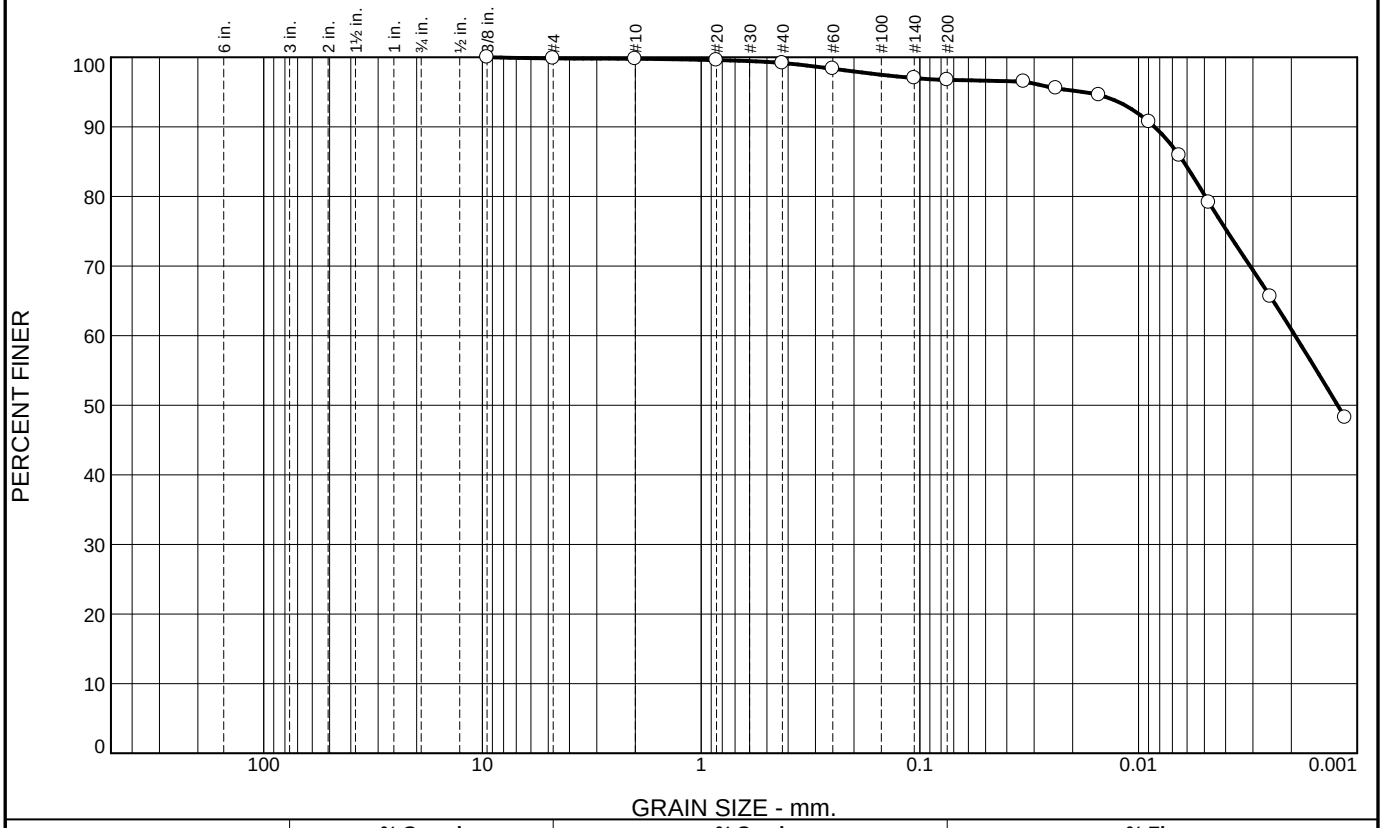
Location: MW21-4 SS8
Sample Number: 21MM-846

Date: 06/12/21

Client: Barrie-Bryne Developments Limited
Project: 211-11672-00 - Barrie SmartCentres Harvie Rd Development

Project No: 211-11672-00 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.0	0.6	2.4	16.6	80.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5mm	100.0		
4.75mm	99.8		
2mm	99.8		
0.850mm	99.6		
0.425mm	99.2		
0.250mm	98.3		
0.106mm	97.0		
0.075mm	96.8		
0.0335 mm.	96.5		
0.0238 mm.	95.5		
0.0152 mm.	94.6		
0.0090 mm.	90.7		
0.0065 mm.	85.9		
0.0048 mm.	79.1		
0.0025 mm.	65.6		
0.0011 mm.	48.3		

* (no specification provided)

Soil Description

Clay, some silt, trace sand, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0084 D_{85}= 0.0062 D_{60}= 0.0019
D_{50}= 0.0012 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sampled by Nicole C. on Nov.24, 2021

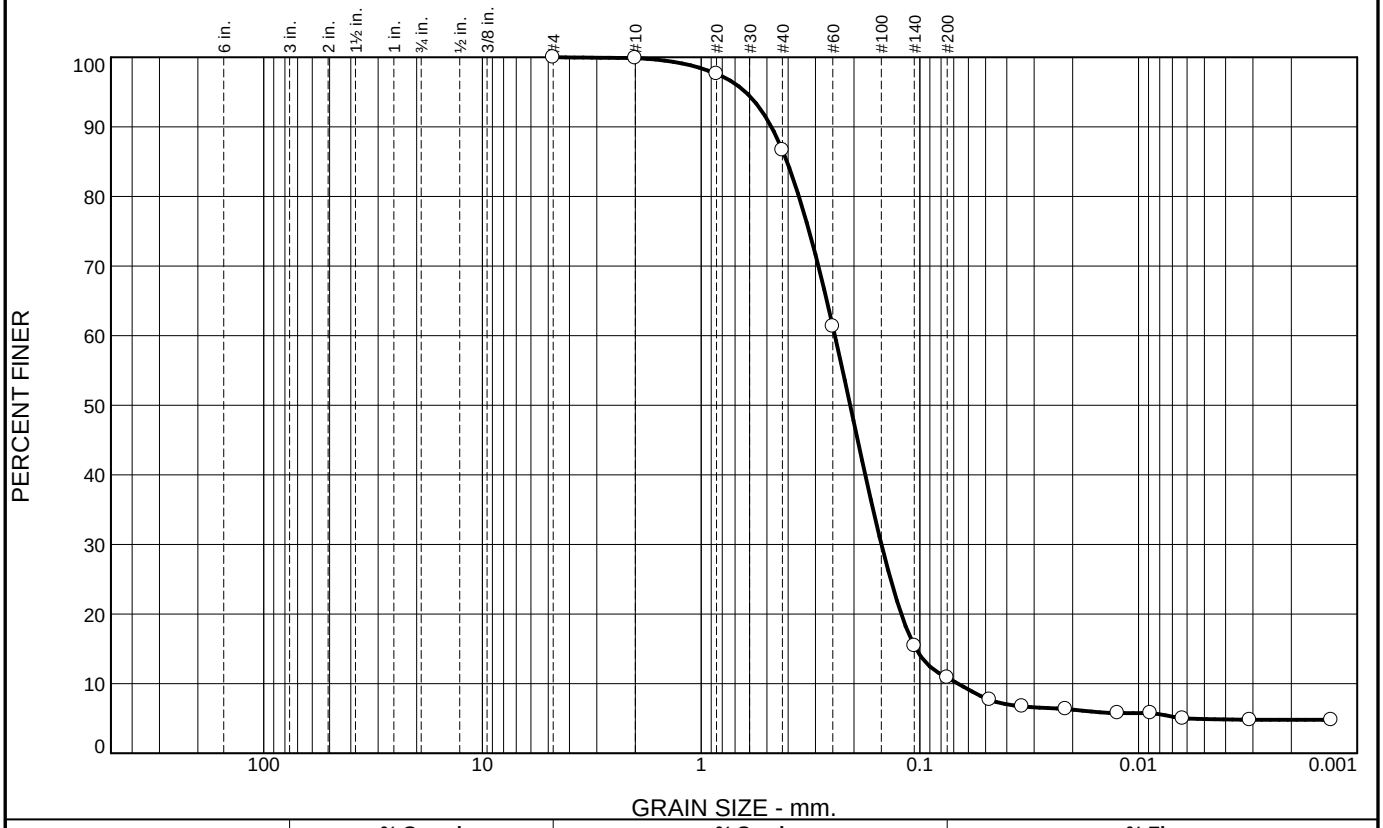
Location: MW21-5 SS4
Sample Number: 21MM-848

Date: 06/12/21

Client: Barrie-Bryne Developments Limited
Project: 211-11672-00 - Barrie SmartCentres Harvie Rd Development

Project No: 211-11672-00 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	13.2	75.8	6.0	4.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4.75mm	100.0		
2mm	99.9		
0.850mm	97.6		
0.425mm	86.7		
0.250mm	61.4		
0.106mm	15.4		
0.075mm	10.9		
0.0480 mm.	7.7		
0.0341 mm.	6.7		
0.0216 mm.	6.4		
0.0125 mm.	5.8		
0.0088 mm.	5.8		
0.0063 mm.	5.0		
0.0031 mm.	4.8		
0.0013 mm.	4.8		

* (no specification provided)

Soil Description

Sand, trace silt, trace clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.4771 D_{85}= 0.4049 D_{60}= 0.2445
D_{50}= 0.2082 D_{30}= 0.1498 D_{15}= 0.1041
D_{10}= 0.0668 C_u= 3.66 C_c= 1.37

Classification

USCS= AASHTO=

Remarks

Sampled by Nicole C. on Nov.24, 2021

Location: MW21-5 SS8
Sample Number: 21MM-847

Date: 06/12/21

Client: Barrie-Bryne Developments Limited
Project: 211-11672-00 - Barrie SmartCentres Harvie Rd Development

Project No: 211-11672-00 **Figure**

APPENDIX

E LABORATORY CERTIFICATE OF ANALYSIS

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: WSP CANADA INC.
561 BRYNE DRIVE, UNITS C&D
BARRIE , ON L4N9Y3
(705) 735-9771
ATTENTION TO: Jason Murchison
PROJECT: 211-11672-00 phase 350
AGAT WORK ORDER: 22T857242
WATER ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Lab Manager
DATE REPORTED: Feb 02, 2022
PAGES (INCLUDING COVER): 9
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

Notes

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AGAT Laboratories

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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 22T857242

PROJECT: 211-11672-00 phase 350

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: Jason Murchison

SAMPLING SITE:Smart Centres

SAMPLED BY:NMC

Water Quality Assessment - PWQO (mg/L)

DATE RECEIVED: 2022-01-26

DATE REPORTED: 2022-02-02

		SAMPLE DESCRIPTION:		MW21-3		MW21-1
		SAMPLE TYPE:		Water		Water
		DATE SAMPLED:		2022-01-25 11:00		2022-01-25 12:00
Parameter	Unit	G / S	RDL	3454513	RDL	3454584
Electrical Conductivity	µS/cm		2	1110	2	487
pH	pH Units	6.5-8.5	NA	7.70	NA	7.67
Saturation pH (Calculated)				6.90		7.34
Langelier Index (Calculated)				0.802		0.326
Hardness (as CaCO3) (Calculated)	mg/L		0.5	446	0.5	139
Total Dissolved Solids	mg/L		10	642	10	252
Alkalinity (as CaCO3)	mg/L		5	220	5	221
Bicarbonate (as CaCO3)	mg/L		5	220	5	221
Carbonate (as CaCO3)	mg/L		5	<5	5	<5
Hydroxide (as CaCO3)	mg/L		5	<5	5	<5
Fluoride	mg/L		0.05	<0.05	0.05	<0.05
Chloride	mg/L		0.12	201	0.10	24.2
Nitrate as N	mg/L		0.05	2.05	0.05	0.34
Nitrite as N	mg/L		0.05	<0.05	0.05	<0.05
Bromide	mg/L		0.05	<0.05	0.05	<0.05
Sulphate	mg/L		0.10	49.8	0.10	3.38
Ortho Phosphate as P	mg/L		0.10	<0.10	0.10	<0.10
Ammonia as N	mg/L		0.02	<0.02	0.02	<0.02
Ammonia-Un-ionized (Calculated)	mg/L	0.02	0.000002	<0.000002	0.000002	<0.000002
Total Phosphorus	mg/L	*	0.02	<0.02	0.02	<0.02
Total Organic Carbon	mg/L		0.5	2.3	0.5	1.9
True Colour	TCU		5	<5	5	<5
Turbidity	NTU		0.5	2.2	0.5	7.2
Total Calcium	mg/L		0.32	142	0.32	50.5
Total Magnesium	mg/L		0.34	22.2	0.34	3.04
Total Potassium	mg/L		1.15	2.47	1.15	<1.15
Total Sodium	mg/L		0.45	62.3	0.45	61.0
Aluminum-dissolved	mg/L	*	0.004	<0.004	0.004	0.005
Total Antimony	mg/L	0.020	0.001	<0.001	0.001	<0.001

Certified By:

AGAT Laboratories

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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 22T857242

PROJECT: 211-11672-00 phase 350

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: Jason Murchison

SAMPLING SITE:Smart Centres

SAMPLED BY:NMC

Water Quality Assessment - PWQO (mg/L)

DATE RECEIVED: 2022-01-26

DATE REPORTED: 2022-02-02

		SAMPLE DESCRIPTION:		MW21-3		MW21-1
		SAMPLE TYPE:		Water		Water
		DATE SAMPLED:		2022-01-25 11:00		2022-01-25 12:00
Parameter	Unit	G / S	RDL	3454513	RDL	3454584
Total Arsenic	mg/L	0.1	0.003	<0.003	0.003	<0.003
Total Barium	mg/L		0.002	0.098	0.002	0.010
Total Beryllium	mg/L	*	0.001	<0.001	0.001	<0.001
Total Boron	mg/L	0.2	0.010	0.011	0.010	<0.010
Total Cadmium	mg/L	0.0002	0.0001	<0.0001	0.0001	<0.0001
Total Chromium	mg/L		0.003	<0.003	0.003	<0.003
Total Cobalt	mg/L	0.0009	0.0005	<0.0005	0.0005	<0.0005
Total Copper	mg/L	0.005	0.001	0.002	0.001	<0.001
Total Iron	mg/L	0.3	0.010	0.094	0.010	0.163
Total Lead	mg/L	*	0.001	<0.001	0.001	0.003
Total Manganese	mg/L		0.002	0.013	0.002	0.008
Dissolved Mercury	mg/L	0.0002	0.0001	<0.0001	0.0001	<0.0001
Total Molybdenum	mg/L	0.040	0.002	<0.002	0.002	<0.002
Total Nickel	mg/L	0.025	0.003	<0.003	0.003	<0.003
Total Selenium	mg/L	0.1	0.002	<0.002	0.002	<0.002
Total Silver	mg/L	0.0001	0.0001	<0.0001	0.0001	<0.0001
Total Strontium	mg/L		0.005	0.356	0.005	0.114
Total Thallium	mg/L	0.0003	0.0003	<0.0003	0.0003	<0.0003
Total Tin	mg/L		0.002	<0.002	0.002	<0.002
Total Titanium	mg/L		0.010	<0.010	0.010	<0.010
Total Tungsten	mg/L	0.030	0.010	<0.010	0.010	<0.010
Total Uranium	mg/L	0.005	0.002	0.003	0.002	<0.002
Total Vanadium	mg/L	0.006	0.002	<0.002	0.002	<0.002
Total Zinc	mg/L	0.030	0.020	<0.020	0.020	<0.020
Total Zirconium	mg/L	0.004	0.004	<0.004	0.004	<0.004
Lab Filtration Aluminum Dissolved				done		done
Lab Filtration mercury				done		done

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 22T857242

PROJECT: 211-11672-00 phase 350

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: Jason Murchison

SAMPLING SITE:Smart Centres

SAMPLED BY:NMC

Water Quality Assessment - PWQO (mg/L)

DATE RECEIVED: 2022-01-26

DATE REPORTED: 2022-02-02

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to PWQO * Variable - refer to guideline reference document
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

3454513-3454584 Dissolved Aluminum & Dissolved Mercury analysis completed on a lab filtered sample.
The calculation of Un-ionized Ammonia was based on lab measured parameters (pH and temperature) rather than the field parameters, these were not provided to the lab. The temperature is recorded at the time of pH measurement. Values are reported as calculated.

Dilution required, RDL has been increased accordingly.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

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Quality Assurance

CLIENT NAME: WSP CANADA INC.

AGAT WORK ORDER: 22T857242

PROJECT: 211-11672-00 phase 350

ATTENTION TO: Jason Murchison

SAMPLING SITE:Smart Centres

SAMPLED BY:NMC

Water Analysis

RPT Date: Feb 02, 2022

PARAMETER	Batch	Sample Id	DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Water Quality Assessment - PWQO (mg/L)															
Electrical Conductivity	3456741		3440	3440	0.0%	< 2	95%	90%	110%	NA			NA		
pH	3456741		7.45	7.55	1.3%	NA	102%	90%	110%	NA			NA		
Total Dissolved Solids	3456626		16	16	NA	< 10	100%	80%	120%	NA			NA		
Alkalinity (as CaCO3)	3456741		295	298	1.0%	< 5	93%	80%	120%	NA			NA		
Bicarbonate (as CaCO3)	3456741		295	298	1.0%	< 5	NA			NA			NA		
Carbonate (as CaCO3)	3456741		<5	<5	NA	< 5	NA			NA			NA		
Hydroxide (as CaCO3)	3456741		<5	<5	NA	< 5	NA			NA			NA		
Fluoride	3454513	3454513	<0.05	<0.05	NA	< 0.05	102%	70%	130%	105%	80%	120%	101%	70%	130%
Chloride	3454513	3454513	201	203	1.0%	< 0.10	90%	70%	130%	104%	80%	120%	NA	70%	130%
Nitrate as N	3454513	3454513	2.05	2.06	0.5%	< 0.05	95%	70%	130%	100%	80%	120%	102%	70%	130%
Nitrite as N	3454513	3454513	<0.05	<0.05	NA	< 0.05	96%	70%	130%	99%	80%	120%	106%	70%	130%
Bromide	3454513	3454513	<0.05	<0.05	NA	< 0.05	105%	70%	130%	103%	80%	120%	108%	70%	130%
Sulphate	3454513	3454513	49.8	50.3	1.0%	< 0.10	98%	70%	130%	102%	80%	120%	103%	70%	130%
Ortho Phosphate as P	3454513	3454513	<0.10	<0.10	NA	< 0.10	101%	70%	130%	106%	80%	120%	104%	70%	130%
Ammonia as N	3456626		0.06	0.05	NA	< 0.02	107%	70%	130%	101%	80%	120%	94%	70%	130%
Total Phosphorus	3450411		<0.02	<0.02	NA	< 0.02	95%	70%	130%	94%	80%	120%	101%	70%	130%
Total Organic Carbon	3439895		1.3	1.2	NA	< 0.5	92%	90%	110%	102%	90%	110%	93%	80%	120%
True Colour	3457151		5	5	NA	< 5	100%	90%	110%	NA			NA		
Turbidity	3451094		2.6	2.6	0.0%	< 0.5	100%	80%	120%	NA			NA		
Total Calcium	3457151		33.4	34.4	2.9%	< 0.10	95%	70%	130%	100%	80%	120%	98%	70%	130%
Total Magnesium	3457151		13.8	14.3	3.6%	< 0.10	98%	70%	130%	104%	80%	120%	101%	70%	130%
Total Potassium	3457151		<1.15	1.16	NA	< 0.50	98%	70%	130%	103%	80%	120%	102%	70%	130%
Total Sodium	3457151		21.0	21.6	2.8%	< 0.10	98%	70%	130%	103%	80%	120%	102%	70%	130%
Aluminum-dissolved	3454513	3454513	<0.004	<0.004	NA	< 0.004	110%	70%	130%	102%	80%	120%	103%	70%	130%
Total Antimony	3457151		<0.001	<0.001	NA	< 0.001	98%	70%	130%	101%	80%	120%	98%	70%	130%
Total Arsenic	3457151		0.460	0.450	2.2%	< 0.003	97%	70%	130%	103%	80%	120%	104%	70%	130%
Total Barium	3457151		0.174	0.174	0.0%	< 0.002	100%	70%	130%	98%	80%	120%	104%	70%	130%
Total Beryllium	3457151		<0.001	<0.001	NA	< 0.001	103%	70%	130%	107%	80%	120%	106%	70%	130%
Total Boron	3457151		0.064	0.064	0.0%	< 0.010	103%	70%	130%	108%	80%	120%	108%	70%	130%
Total Cadmium	3457151		<0.0001	<0.0001	NA	< 0.0001	99%	70%	130%	100%	80%	120%	104%	70%	130%
Total Chromium	3457151		<0.003	<0.003	NA	< 0.003	103%	70%	130%	101%	80%	120%	104%	70%	130%
Total Cobalt	3457151		<0.0005	<0.0005	NA	< 0.0005	103%	70%	130%	102%	80%	120%	105%	70%	130%
Total Copper	3457151		0.002	0.002	NA	< 0.001	100%	70%	130%	102%	80%	120%	103%	70%	130%
Total Iron	3457151		0.379	0.362	4.6%	< 0.010	105%	70%	130%	100%	80%	120%	105%	70%	130%
Total Lead	3457151		<0.001	<0.001	NA	< 0.001	105%	70%	130%	101%	80%	120%	101%	70%	130%
Total Manganese	3457151		0.026	0.025	3.9%	< 0.002	102%	70%	130%	103%	80%	120%	105%	70%	130%
Dissolved Mercury	3462789		<0.0001	<0.0001	NA	< 0.0001	103%	70%	130%	102%	80%	120%	98%	70%	130%
Total Molybdenum	3457151		0.002	0.003	NA	< 0.002	104%	70%	130%	106%	80%	120%	107%	70%	130%
Total Nickel	3457151		<0.003	<0.003	NA	< 0.003	102%	70%	130%	100%	80%	120%	103%	70%	130%

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Quality Assurance

CLIENT NAME: WSP CANADA INC.

AGAT WORK ORDER: 22T857242

PROJECT: 211-11672-00 phase 350

ATTENTION TO: Jason Murchison

SAMPLING SITE:Smart Centres

SAMPLED BY:NMC

Water Analysis (Continued)

RPT Date: Feb 02, 2022			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Total Selenium	3457151		<0.002	<0.002	NA	< 0.002	104%	70%	130%	114%	80%	120%	111%	70%	130%
Total Silver	3457151		<0.0001	<0.0001	NA	< 0.0001	98%	70%	130%	100%	80%	120%	103%	70%	130%
Total Strontium	3457151		0.424	0.424	0.0%	< 0.005	99%	70%	130%	102%	80%	120%	100%	70%	130%
Total Thallium	3457151		<0.0003	<0.0003	NA	< 0.0003	99%	70%	130%	105%	80%	120%	105%	70%	130%
Total Tin	3457151		<0.002	<0.002	NA	< 0.002	106%	70%	130%	99%	80%	120%	100%	70%	130%
Total Titanium	3457151		<0.010	<0.010	NA	< 0.010	100%	70%	130%	103%	80%	120%	101%	70%	130%
Total Tungsten	3457151		<0.010	<0.010	NA	< 0.010	99%	70%	130%	89%	80%	120%	91%	70%	130%
Total Uranium	3457151		<0.002	<0.002	NA	< 0.002	106%	70%	130%	104%	80%	120%	109%	70%	130%
Total Vanadium	3457151		<0.002	<0.002	NA	< 0.002	103%	70%	130%	102%	80%	120%	105%	70%	130%
Total Zinc	3457151		0.033	0.032	NA	< 0.020	104%	70%	130%	103%	80%	120%	106%	70%	130%
Total Zirconium	3457151		<0.004	<0.004	NA	< 0.004	101%	70%	130%	100%	80%	120%	104%	70%	130%

Comments: NA Signifies Not Applicable
Duplicate NA: results are under 5X the RDL and will not be calculated.
Matrix spike NA: Spike level < native concentration. Matrix spike acceptance limits do not apply and are not calculated.

Water Quality Assessment - PWQO (mg/L)

Electrical Conductivity	3454584	3454584	487	490	0.6%	< 2	96%	90%	110%	NA		NA
pH	3454584	3454584	7.67	7.77	1.3%		102%	90%	110%	NA		NA
Alkalinity (as CaCO3)	3454584	3454584	221	226	2.2%	< 5	93%	80%	120%	NA		NA
Bicarbonate (as CaCO3)	3454584	3454584	221	226	2.2%	< 5	NA			NA		NA
Carbonate (as CaCO3)	3454584	3454584	<5	<5	NA	< 5	NA			NA		NA
Hydroxide (as CaCO3)	3454584	3454584	<5	<5	NA	< 5	NA			NA		NA

Comments: If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

Certified By:

Amanjot Bhela
CHARTERED CHEMIST AMANJOT BHELA

AGAT Laboratories

5835 COOPERS AVENUE
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CANADA L4Z 1Y2
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Method Summary

CLIENT NAME: WSP CANADA INC. **AGAT WORK ORDER: 22T857242**

PROJECT: 211-11672-00 phase 350 **ATTENTION TO: Jason Murchison**

SAMPLING SITE:Smart Centres **SAMPLED BY:NMC**

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Electrical Conductivity	INOR-93-6000	modified from SM 2510 B	PC TITRATE
pH	INOR-93-6000	modified from SM 4500-H+ B	PC TITRATE
Saturation pH (Calculated)		SM 2320 B	CALCULATION
Langelier Index (Calculated)		SM 2330B	CALCULATION
Hardness (as CaCO3) (Calculated)	MET-93-6105	modified from EPA SW-846 6010C & 200.7 & SM 2340 B	CALCULATION
Total Dissolved Solids	INOR-93-6028	modified from EPA 1684,ON MOECC E3139,SM 2540C,D	BALANCE
Alkalinity (as CaCO3)	INOR-93-6000	Modified from SM 2320 B	PC TITRATE
Bicarbonate (as CaCO3)	INOR-93-6000	modified from SM 2320 B	PC TITRATE
Carbonate (as CaCO3)	INOR-93-6000	modified from SM 2320 B	PC TITRATE
Hydroxide (as CaCO3)	INOR-93-6000	modified from SM 2320 B	PC TITRATE
Fluoride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Chloride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Bromide	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Ortho Phosphate as P	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6059	modified from SM 4500-NH3 H	LACHAT FIA
Ammonia-Un-ionized (Calculated)		MOE REFERENCE, PWQOs Tab 2	CALCULATION
Total Phosphorus	INOR-93-6022	modified from SM 4500-P B and SM 4500-P E	SPECTROPHOTOMETER
Total Organic Carbon	INOR-93-6049	modified from SM 5310 B	SHIMADZU CARBON ANALYZER
True Colour	INOR-93-6074	modified from SM 2120 B	LACHAT FIA
Turbidity	INOR-93-6044	modified from SM 2130 B	NEPHELOMETER
Total Calcium	MET-93-6105	modified from EPA 6010D	ICP/OES
Total Magnesium	MET-93-6105	modified from EPA 6010D	ICP/OES
Total Potassium	MET-93-6105	modified from EPA 6010D	ICP/OES
Total Sodium	MET-93-6105	modified from EPA 6010D	ICP/OES
Aluminum-dissolved	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Total Antimony	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Arsenic	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Barium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Beryllium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Boron	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cadmium	MET -93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Chromium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cobalt	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Copper	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Iron	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS

AGAT Laboratories

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Method Summary

CLIENT NAME: WSP CANADA INC.

AGAT WORK ORDER: 22T857242

PROJECT: 211-11672-00 phase 350

ATTENTION TO: Jason Murchison

SAMPLING SITE:Smart Centres

SAMPLED BY:NMC

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Total Lead	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Manganese	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Dissolved Mercury	MET-93-6100	modified from EPA 245.2 and SM 3112 B	CVAAS
Total Molybdenum	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Nickel	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Selenium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Silver	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Strontium	INOR-93-6003	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Thallium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Tin	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Titanium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Tungsten	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Uranium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Vanadium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Zinc	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Zirconium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Lab Filtration Aluminum Dissolved	SR-78-9001		FILTRATION
Lab Filtration mercury	SR-78-9001		FILTRATION

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 22T857242

Cooler Quantity:

Arrival Temperatures: 0.1 | 1.2 | 1.3

Custody Seal Intact: ☐ Yes ☒ No ☐ N/A

Notes: Onice

Report Information:

Company: WSP Canada Inc.
Contact: Nicole Corbett / Melanie Yuen
Address: 561 Bryne Dr. Units C+D
Barrie, Ontario
Phone: (705) 888-5629 Fax:
Reports to be sent to:
1. Email: nicole.corbett@wsp.com
2. Email: melanie.yuen@wsp.com

Regulatory Requirements:

(Please check all applicable boxes)

☐ Regulation 153/04
Table ____ (Indicate One)
☐ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture (Check One)
☐ Coarse
☐ Fine

☐ Excess Soils R406
Table ____ (Indicate One)
☐ Regulation 558
☐ CCME

☐ Sewer Use ☐ Sanitary ☐ Storm
____ (Region)
☒ Prov. Water Quality Objectives (PWQO)
☐ Other
____ (Indicate One)

Is this submission for a **Record of Site Condition?** ☐ Yes ☒ No

Report Guideline on *Certificate of Analysis* ☒ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☐ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☒ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
*TAT is exclusive of weekends and statutory holidays

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: 211-11672-00 phase 350
Site Location: Smart Centres
Sampled By: NMC
AGAT Quote #: as per SO PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☒ No ☐

Company:
Contact:
Address:
Email: payables.ontario@wsp.com

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI, DOC (Y/N)	O. Reg 153: Metals & Inorganics	O. Reg 153: Metals - ☐ CrVI, ☐ Hg, ☐ HWSB	O. Reg 153: BTEX, F1-F4 PHCs Analyze F4G if required ☐ Yes ☐ No	O. Reg 153: PAHs	O. Reg 153: PCBs	O. Reg 153: VOC	O. Reg 558: Landfill Disposal Characterization TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	O. Reg 406: Excess Soils SPLP Rainwater Leach SPLP: ☐ Metals ☐ VOCs ☐ SVOCs	O. Reg 406: Excess Soils Characterization Package pH, ICPMS Metals, BTEX, F1-F4	Salt - EC/SAR	WQA PACKAGE	Potentially Hazardous or High Concentration (Y/N)
MW21-3	01/25/22	11 AM/PM	8	GW		N										X	X	
MW21-1	01/25/22	12 AM/PM	8	GW		N										X	X	
		AM/PM																
		AM/PM																
		AM/PM																
		AM/PM																
		AM/PM																
		AM/PM																
		AM/PM																
		AM/PM																
		AM/PM																

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
Nicole Corbett	01/25/22	2:30pm		Jan 26	9:00
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time

Page 1 of 1

N°: T 130341

Document ID: DIV-75-1511.021

Pink Copy - Client | Yellow Copy - AGAT | White Copy- AGAT

Date Issued: March 9, 2021

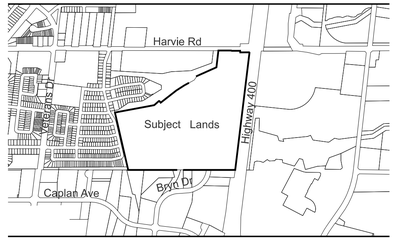
APPENDIX

F

DEWATERING CALCULATIONS

DRAFT PLAN OF SUBDIVISION

PART OF LOTS 5, 6 AND 7
REGISTERED PLAN 67
AND
PART OF LOT 7
CONCESSION 12
NOW IN THE GEOGRAPHIC TOWNSHIP OF INNISFIL
CITY OF BARRIE
COUNTY OF SIMCOE



OWNER'S CERTIFICATE:

I authorize Weston Consulting Group Inc. to prepare and submit this plan for draft approval.

___ ___ ___ ___ ___ Date: ___ ___ ___

BARRIE-BRYNE DEVELOPMENTS
3200 HIGHWAY 7
VAUGHAN, ON L4K 5Z5
647-362-3212

SURVEYOR'S CERTIFICATE:

I hereby certify that the boundaries of the lands being subdivided and their correct relationship to the adjacent lands are accurately and correctly shown on this plan.

___ ___ ___ ___ ___ Date: ___ ___ ___

PIER DE ROSA, OLS, OLIP
JD BARNES LTD
142 COMMERCE PARK DRIVE, UNIT V
BARRIE, ONTARIO L4N 8W8
PHONE:

ADDITIONAL INFORMATION:

[Section 51(17) of the Planning Act, R.S.O. 1990, c. P.13], as amended to December 12, 2021.
a), b), e), f), g), j) & l) - on plan.
c) - on key plan
d) - see statistics
h) - piped water to be installed by developer
i) - sandy silt to sand
k) - all services to be made available by developer

DEVELOPMENT STATISTICS:

BLOCKS	AREA(HA)
Semi-Detached (7.315 m) [Lots 1-33]:	1.914 ha
Street Townhouses (6.0 m) [Blk 34-54]:	2.721 ha
Back to Back Townhouses (6.4 m) [Blk 55-57]:	0.322 ha
Mid Rise Residential [Blk 58-59]:	3.351 ha
Employment Uses [Blks 60-67]:	11.992 ha
Park [Block 68]:	0.900 ha
Open Space [Blk 69-71]:	3.712 ha
SWMP [Blk 72,73]:	1.743 ha
Road Widening [Blk 74]:	2.074 ha
Hydro Easement [Blk 75-77]:	0.944 ha
Access Easement [Blk 78,79]:	0.092 ha
Roads:	3.496 ha
Total:	33.261 ha

SCALE 1:1500

0 75m

WESTON CONSULTING

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REVISIONS LIST

02 MAR 2021	Revise Park & SWM & Open Space limits per Constraints Plan & dimensions/stats.
27 JAN 2021	Insert new survey. Update blocks, dimensions & stats.
10 JAN 2021	Revise S.W.M.P. Blk 72. Add block dimensioning & update stats.
23 DEC 2021	Revise Semi-detached frontages to 7.315 m wide
21 DEC 2021	First draft

File Number:	9683
Drawn By:	SM
Planner:	RG
Scale:	1:1500
CAD:	9683/D3 Draft Plan_2022_03_02.dgn

Drawing Number: D3

CONSTRUCTION DEWATERING ASSUMPTIONS

Hydrogeological Investigation

211-11672-00 Highway 400 & Harvie Road, Barrie, ON

Dupuit-Thiem Equation
Overburden

Table F-1: Construction Dewatering Flow Rate - Mid Rise Resdiential Block 58

Description	Symbol	Value	Unit	Explanation
Input Data				
Ground Elevation		298.50	m asl	Estimated from Topographic Survey
Groundwater Elevation in the overburden		296.00	m asl	Highest Water Level, 2.50 mbgs (MW21-05s)
Base of excavation		293.00	m asl	Estimated to be 4 mbgs, additional 1.5 m for footings
Base of Water-Bearing Zone		288.00	m asl	Estimated based on BH logs
Hydraulic Conductivity	K	3.2E-06	m/s	Geometric mean K value based on Hazen and SWRT
	K	2.8E-01	m/day	Converted to m/day
Dimensions of Excavation (Building 1)	a	21.0	m	Provided by Client
	b	122.0	m	Provided by Client
Dimensions of Excavation (Building 2)	a	24.0	m	Provided by Client
	b	80.0	m	Provided by Client
Output - Building 1				
Target water level		292.00	masl	1 m below base of excavation
Water level above aquifer bottom before dewatering	H	8.0	m	For glaciolacustrine deposits
Water level at excavation wall	h	4.0	m	For glaciolacustrine deposits
Effective radius	r_e	28.6	m	Effective radius of rectangular excavation
Sichardt estimate for radius of influence	R_{sich}	21.5	m	where c = 3000 for well approximation
Radius of influence	R_0	50.0	m	Manipulated value, Re+Rsich
Construction dewatering flow rate	Q	74.4	m^3/day	Construction flow rate - Dupuit Equation
Safety factor	S.F.	2.00		
Maximum Construction Flow Rate (with applied safety factor)	Q_{max}	148.7	m^3/day	during the initial period
Estimated Construction Dewatering Flow Rate		**74,366**	L/day	
Estimated Maximum Construction Flow Rate with Safety Factor		**148,734**	L/day	

Stormwater Estimate

Location	Assumed Precip Event (mm)	Area (m^2)	Total (L)
Excavation	10	2562	25,620
Output - Building 2			
Target water level	292.00	masl	1 m below base of excavation
Water level above aquifer bottom before dewatering	H	8.0	m	For glaciolacustrine deposits
Water level at excavation wall	h	4.0	m	For glaciolacustrine deposits
Effective radius	r_e	24.7	m	Effective radius of rectangular excavation
Sichardt estimate for radius of influence	R_{sich}	21.5	m	where c = 3000 for well approximation
Radius of influence	R_0	46.2	m	Manipulated value, Re+Rsich
Construction dewatering flow rate	Q	66.7	m^3/day	Construction flow rate - Dupuit Equation
Safety factor	S.F.	2.00		
Maximum Construction Flow Rate (with applied safety factor)	Q_{max}	133.4	m^3/day	during the initial period
Estimated Construction Dewatering Flow Rate		**66,697**	L/day	
Estimated Maximum Construction Flow Rate with Safety Factor		**133,396**	L/day	

Stormwater Estimate

Location	Assumed Precip Event (mm)	Area (m^2)	Total (L)
Excavation	10	1920	19,200

CONSTRUCTION DEWATERING ASSUMPTIONS

Hydrogeological Investigation

211-11672-00 Highway 400 & Harvie Road, Barrie, ON

Dupuit-Thiem Equation
Overburden

Table F-2: Construction Dewatering Flow Rate - Mid Rise Resdiential Block 59

Description	Symbol	Value	Unit	Explanation
Input Data				
Ground Elevation		302.50	m asl	Estimated from Topographic Survey
Groundwater Elevation in the overburden		300.00	m asl	Highest Water Level, 2.50 mbgs (MW21-05s)
Base of excavation		297.00	m asl	Estimated to be 4 mbgs, additional 1.5 m for footings
Base of Water-Bearing Zone		292.00	m asl	Estimated based on BH logs
Hydraulic Conductivity	K	3.2E-06	m/s	Geometric mean K value based on Hazen and SWRT
	K	2.8E-01	m/day	Converted to m/day
Dimensions of Excavation (Building 1)	a	21.0	m	Provided by Client
	b	61.3	m	Provided by Client
Dimensions of Excavation (Building 2)	a	24.0	m	Provided by Client
	b	80.0	m	Provided by Client
Output - Building 1				
Target water level		296.00	masl	1 m below base of excavation
Water level above aquifer bottom before dewatering	H	8.0	m	For glaciolacustrine deposits
Water level at excavation wall	h	4.0	m	For glaciolacustrine deposits
Effective radius	r_e	20.2	m	Effective radius of rectangular excavation
Sichardt estimate for radius of influence	R_{sich}	21.5	m	where c = 3000 for well approximation
Radius of influence	R_0	41.7	m	Manipulated value, Re+Rsich
Construction dewatering flow rate	Q	57.7	m^3/day	Construction flow rate - Dupuit Equation
Safety factor	S.F.	2.00		
Maximum Construction Flow Rate (with applied safety factor)	Q_{max}	115.3	m^3/day	during the initial period
Estimated Construction Dewatering Flow Rate		**57,666**	L/day	
Estimated Maximum Construction Flow Rate with Safety Factor		**115,333**	L/day	

Stormwater Estimate

Location	Assumed Precip Event (mm)	Area (m^2)	Total (L)
Excavation	10	1287	12,873
Output - Building 2			
Target water level		296.00	masl	1 m below base of excavation
Water level above aquifer bottom before dewatering	H	8.0	m	For glaciolacustrine deposits
Water level at excavation wall	h	4.0	m	For glaciolacustrine deposits
Effective radius	r_e	24.7	m	Effective radius of rectangular excavation
Sichardt estimate for radius of influence	R_{sich}	21.5	m	where c = 3000 for well approximation
Radius of influence	R_0	46.2	m	Manipulated value, Re+Rsich
Construction dewatering flow rate	Q	66.7	m^3/day	Construction flow rate - Dupuit Equation
Safety factor	S.F.	2.00		
Maximum Construction Flow Rate (with applied safety factor)	Q_{max}	133.4	m^3/day	during the initial period
Estimated Construction Dewatering Flow Rate		**66,697**	L/day	
Estimated Maximum Construction Flow Rate with Safety Factor		**133,396**	L/day	

Stormwater Estimate

Location	Assumed Precip Event (mm)	Area (m^2)	Total (L)
Excavation	10	1920	19,200

CONSTRUCTION DEWATERING ASSUMPTIONS

Hydrogeological Investigation

211-11672-00 Highway 400 & Harvie Road, Barrie, ON

Dupuit-Thiem Equation

Overburden

Table F-3: Construction Dewatering Flow Rate - Semi-Detached Lot

Description	Symbol	Value	Unit	Explanation
Input Data				
Ground Elevation		300.00	m asl	Estimated from Topographic Survey
Groundwater Elevation in the overburden		297.50	m asl	Highest Water Level, 2.50 mbgs (MW21-05s)
Base of excavation		296.60	m asl	Estimated to be 2.4 mbgs, additional 1 m for foundations
Base of Water-Bearing Zone		291.60	m asl	Estimated based on BH logs
Hydraulic Conductivity	K	3.2E-06	m/s	Geometric mean K value based on Hazen and SWRT
	K	2.8E-01	m/day	Converted to m/day
Dimensions of Excavation	a	6.1	m	Provided by Client
	b	19.0	m	Provided by Client
Output				
Target water level		295.60	masl	1 m below base of excavation
Water level above aquifer bottom before dewatering	H	5.9	m	For glaciolacustrine deposits
Water level at excavation wall	h	4.0	m	For glaciolacustrine deposits
Effective radius	r_e	6.1	m	Effective radius of rectangular excavation
Sichardt estimate for radius of influence	R_{sich}	10.2	m	where c = 3000 for well approximation
Radius of influence	R_0	10.2	m	Manipulated value, Re+Rsich
Construction dewatering flow rate	Q	31.5	m^3/day	Construction flow rate - Dupuit Equation
Safety factor	S.F.	2.00		
Maximum Construction Flow Rate (with applied safety factor)	Q_{max}	63.1	m^3/day	during the initial period
Estimated Construction Dewatering Flow Rate		**31,535**	L/day	
Estimated Maximum Construction Flow Rate with Safety Factor		**63,070**	L/day	

Stormwater Estimate

Location	Assumed Precip Event (mm)	Area (m^2)	Total (L)
Excavation	10	116	1,159

CONSTRUCTION DEWATERING ASSUMPTIONS

Hydrogeological Investigation

211-11672-00 Highway 400 & Harvie Road, Barrie, ON

Dupuit-Thiem Equation

Overburden

Table F-4: Construction Dewatering Flow Rate - Street Townhouse Lot

Description	Symbol	Value	Unit	Explanation
Input Data				
Ground Elevation		303.00	m asl	Estimated from Topographic Survey
Groundwater Elevation in the overburden		300.50	m asl	Highest Water Level, 2.50 mbgs (MW21-05s)
Base of excavation		299.60	m asl	Estimated to be 2.4 mbgs, additional 1 m for foundations
Base of Water-Bearing Zone		294.60	m asl	Estimated based on BH logs
Hydraulic Conductivity	K	3.2E-06	m/s	Geometric mean K value based on Hazen and SWRT
	K	2.8E-01	m/day	Converted to m/day
Dimensions of Excavation	a	6.0	m	Provided by Client
	b	19.5	m	Provided by Client
Output				
Target water level		298.60	masl	1 m below base of excavation
Water level above aquifer bottom before dewatering	H	5.9	m	For glaciolacustrine deposits
Water level at excavation wall	h	4.0	m	For glaciolacustrine deposits
Effective radius	r_e	6.1	m	Effective radius of rectangular excavation
Sichardt estimate for radius of influence	R_{sich}	10.2	m	where c = 3000 for well approximation
Radius of influence	R_0	10.2	m	Manipulated value, Re+Rsich
Construction dewatering flow rate	Q	31.8	m^3/day	Construction flow rate - Dupuit Equation
Safety factor	S.F.	2.00		
Maximum Construction Flow Rate (with applied safety factor)	Q_{max}	63.7	m^3/day	during the initial period
Estimated Construction Dewatering Flow Rate		**31,826**	L/day	
Estimated Maximum Construction Flow Rate with Safety Factor		**63,652**	L/day	

Stormwater Estimate

Location	Assumed Precip Event (mm)	Area (m^2)	Total (L)
Excavation	10	117	1,170

CONSTRUCTION DEWATERING ASSUMPTIONS

Hydrogeological Investigation

211-11672-00 Highway 400 & Harvie Road, Barrie, ON

Dupuit-Thiem Equation

Overburden

Table F-5: Construction Dewatering Flow Rate - Back to Back Townhouse Lot

Description	Symbol	Value	Unit	Explanation
Input Data				
Ground Elevation		303.00	m asl	Estimated from Topographic Survey
Groundwater Elevation in the overburden		300.50	m asl	Highest Water Level, 2.50 mbgs (MW21-05s)
Base of excavation		299.60	m asl	Estimated to be 2.4 mbgs, additional 1 m for foundations
Base of Water-Bearing Zone		294.60	m asl	Estimated based on BH logs
Hydraulic Conductivity	K	3.2E-06	m/s	Geometric mean K value based on Hazen and SWRT
	K	2.8E-01	m/day	Converted to m/day
Dimensions of Excavation	a	6.4	m	Provided by Client
	b	10.7	m	Provided by Client
Output				
Target water level		298.60	masl	1 m below base of excavation
Water level above aquifer bottom before dewatering	H	5.9	m	For glaciolacustrine deposits
Water level at excavation wall	h	4.0	m	For glaciolacustrine deposits
Effective radius	r_e	4.7	m	Effective radius of rectangular excavation
Sichardt estimate for radius of influence	R_{sich}	10.2	m	where c = 3000 for well approximation
Radius of influence	R_0	10.2	m	Manipulated value, Re+Rsich
Construction dewatering flow rate	Q	20.9	m^3/day	Construction flow rate - Dupuit Equation
Safety factor	S.F.	2.00		
Maximum Construction Flow Rate (with applied safety factor)	Q_{max}	41.7	m^3/day	during the initial period
Estimated Construction Dewatering Flow Rate		**20,852**	L/day	
Estimated Maximum Construction Flow Rate with Safety Factor		**41,704**	L/day	

Stormwater Estimate

Location	Assumed Precip Event (mm)	Area (m^2)	Total (L)
Excavation	10	61	610

PERMANENT DRAINAGE ASSESSMENT ASSUMPTIONS

Hydrogeological Investigation

211-11672-00 Highway 400 & Harvie Road, Barrie, ON

Dupuit-Thiem Equation

Table F-6: Permanent Drainage Assessment - Mid Rise Residential Block 58

Description	Symbol	Value	Unit	Explanation
Input Data				
Ground surface elevation		298.50	m asl	Estimated from Topographic Survey
Groundwater Elevation		296.00	m asl	Highest Water Level, 2.50 mbgs (MW21-05s)
P1 Elevation		294.50	m asl	Estimated to be 4 mbgs
Base of Water-Bearing Zone		293.50	m asl	Estimated
Hydraulic Conductivity	K	3.2E-06	m/s	Geometric mean K value based on Hazen and SWRT
	K	2.76E-01	m/day	Converted to m/day
Dimensions of the subdrain system - Building 1	a	21.0	m	Provided by Client
	b	122.0	m	Provided by Client
Dimensions of the subdrain system - Building 2	a	24.0	m	Provided by Client
	b	80.0	m	Provided by Client
Output - Building 1				
Target Water Level		294.00	m asl	0.5 m below the P1 slab
Water Level above aquifer bottom	H	2.5	m	Output
Water level at excavation wall	h	0.5	m	Output
Effective Radius	r_e	28.6	m	Effective radius of rectangular excavation
Sichardt Estimate for Radius of Influence	R_{sich}	10.7	m	where c = 3000 for well approximation
Radius of Influence	R_0	39.3	m	Manipulated value, when $R_{sich} < r_{eff,}$ otherwise $R_0 = R_{sich}$
Permanent Drainage Flow Rate	Q	16.3	m^3/day	Drainage flow rate - Dupuit Equation
Safety Factor	S.F.	2.00		
Maximum Drainage Flow Rate (with applied safety factor)	Q_{max}	32.7	m^3/day	
Estimated Permanent Drainage Flow Rate		**16,332**	L/day	
Estimated Maximum Drainage Flow Rate with Safety Factor		**32,664**	L/day	
Output - Building 2				
Target Water Level		294.00	m asl	0.5 m below the P1 slab
Water Level above aquifer bottom	H	2.5	m	Output
Water level at excavation wall	h	0.5	m	Output
Effective Radius	r_e	24.7	m	Effective radius of rectangular excavation
Sichardt Estimate for Radius of Influence	R_{sich}	10.7	m	where c = 3000 for well approximation
Radius of Influence	R_0	35.5	m	Manipulated value, when $R_{sich} < r_{eff,}$ otherwise $R_0 = R_{sich}$
Permanent Drainage Flow Rate	Q	14.5	m^3/day	Drainage flow rate - Dupuit Equation
Safety Factor	S.F.	2.00		
Maximum Drainage Flow Rate (with applied safety factor)	Q_{max}	28.9	m^3/day	
Estimated Permanent Drainage Flow Rate		**14,452**	L/day	
Estimated Maximum Drainage Flow Rate with Safety Factor		**28,905**	L/day	

PERMANENT DRAINAGE ASSESSMENT ASSUMPTIONS

Hydrogeological Investigation

211-11672-00 Highway 400 & Harvie Road, Barrie, ON

Dupuit-Thiem Equation

Table F-7: Permanent Drainage Assessment - Mid Rise Residential Block 59

Description	Symbol	Value	Unit	Explanation
Input Data				
Ground surface elevation		302.50	m asl	Estimated from Topographic Survey
Groundwater Elevation		300.00	m asl	Highest Water Level, 2.50 mbgs (MW21-05s)
P1 Elevation		298.50	m asl	Estimated to be 4 mbgs
Base of Water-Bearing Zone		297.50	m asl	Estimated
Hydraulic Conductivity	K	3.2E-06	m/s	Geometric mean K value based on Hazen and SWRT
	K	2.76E-01	m/day	Converted to m/day
Dimensions of the subdrain system - Building 1	a	21.0	m	Provided by Client
	b	61.3	m	Provided by Client
Dimensions of the subdrain system - Building 2	a	24.0	m	Provided by Client
	b	80.0	m	Provided by Client
Output - Building 1				
Target Water Level		298.00	m asl	0.5 m below the P1 slab
Water Level above aquifer bottom	H	2.5	m	Output
Water level at excavation wall	h	0.5	m	Output
Effective Radius	r_e	20.2	m	Effective radius of rectangular excavation
Sichardt Estimate for Radius of Influence	R_{sich}	10.7	m	where c = 3000 for well approximation
Radius of Influence	R_0	31.0	m	Manipulated value, when $R_{sich} < r_{eff,}$ otherwise $R_0 = R_{sich}$
Permanent Drainage Flow Rate	Q	12.2	m^3/day	Drainage flow rate - Dupuit Equation
Safety Factor	S.F.	2.00		
Maximum Drainage Flow Rate (with applied safety factor)	Q_{max}	24.5	m^3/day	
Estimated Permanent Drainage Flow Rate		**12,249**	L/day	
Estimated Maximum Drainage Flow Rate with Safety Factor		**24,499**	L/day	
Output - Building 2				
Target Water Level		298.00	m asl	0.5 m below the P1 slab
Water Level above aquifer bottom	H	2.5	m	Output
Water level at excavation wall	h	0.5	m	Output
Effective Radius	r_e	24.7	m	Effective radius of rectangular excavation
Sichardt Estimate for Radius of Influence	R_{sich}	10.7	m	where c = 3000 for well approximation
Radius of Influence	R_0	35.5	m	Manipulated value, when $R_{sich} < r_{eff,}$ otherwise $R_0 = R_{sich}$
Permanent Drainage Flow Rate	Q	14.5	m^3/day	Drainage flow rate - Dupuit Equation
Safety Factor	S.F.	2.00		
Maximum Drainage Flow Rate (with applied safety factor)	Q_{max}	28.9	m^3/day	
Estimated Permanent Drainage Flow Rate		**14,452**	L/day	
Estimated Maximum Drainage Flow Rate with Safety Factor		**28,904**	L/day	

PERMANENT DRAINAGE ASSESSMENT ASSUMPTIONS

Hydrogeological Investigation

211-11672-00 Highway 400 & Harvie Road, Barrie, ON

Dupuit-Thiem Equation

Table F-8: Permanent Drainage Assessment - Semi-Detached Lot

Description	Symbol	Value	Unit	Explanation
Input Data				
Ground surface elevation		300.00	m asl	Estimated from Topographic Survey
Groundwater Elevation		297.50	m asl	Highest Water Level, 2.50 mbgs (MW21-05s)
P1 Elevation		297.60	m asl	Estimated to be 2.4 mbgs
Base of Water-Bearing Zone		296.60	m asl	Estimated
Hydraulic Conductivity	K	3.2E-06	m/s	Geometric mean K value based on Hazen and SWRT
	K	2.76E-01	m/day	Converted to m/day
Dimensions of the subdrain system	a	6.1	m	Provided by Client
	b	19.0	m	Provided by Client
Output				
Target Water Level		297.10	m asl	0.5 m below the P1 slab
Water Level above aquifer bottom	H	0.9	m	Output
Water level at excavation wall	h	0.5	m	Output
Effective Radius	r_e	6.1	m	Effective radius of rectangular excavation
Sichardt Estimate for Radius of Influence	R_{sich}	2.1	m	where c = 3000 for well approximation
Radius of Influence	R_0	8.2	m	Manipulated value, when $R_{sich} < r_{eff,}$ otherwise $R_0 = R_{sich}$
Permanent Drainage Flow Rate	Q	1.6	m^3/day	Drainage flow rate - Dupuit Equation
Safety Factor	S.F.	2.00		
Maximum Drainage Flow Rate (with applied safety factor)	Q_{max}	3.2	m^3/day	
Estimated Permanent Drainage Flow Rate		**1,607**	L/day	
Estimated Maximum Drainage Flow Rate with Safety Factor		**3,215**	L/day	

PERMANENT DRAINAGE ASSESSMENT ASSUMPTIONS

Hydrogeological Investigation

211-11672-00 Highway 400 & Harvie Road, Barrie, ON

Dupuit-Thiem Equation

Table F-9: Permanent Drainage Assessment - Street Townhouse Lot

Description	Symbol	Value	Unit	Explanation
Input Data				
Ground surface elevation		303.00	m asl	Estimated from Topographic Survey
Groundwater Elevation		300.50	m asl	Highest Water Level, 2.50 mbgs (MW21-05s)
P1 Elevation		300.60	m asl	Estimated to be 2.4 mbgs
Base of Water-Bearing Zone		299.60	m asl	Estimated
Hydraulic Conductivity	K	3.2E-06	m/s	Geometric mean K value based on Hazen and SWRT
	K	2.76E-01	m/day	Converted to m/day
Dimensions of the subdrain system	a	6.0	m	Provided by Client
	b	19.5	m	Provided by Client
Output				
Target Water Level		300.10	m asl	0.5 m below the P1 slab
Water Level above aquifer bottom	H	0.9	m	Output
Water level at excavation wall	h	0.5	m	Output
Effective Radius	r_e	6.1	m	Effective radius of rectangular excavation
Sichardt Estimate for Radius of Influence	R_{sich}	2.1	m	where c = 3000 for well approximation
Radius of Influence	R_0	8.2	m	Manipulated value, when $R_{sich} < r_{eff,}$ otherwise $R_0 = R_{sich}$
Permanent Drainage Flow Rate	Q	1.6	m^3/day	Drainage flow rate - Dupuit Equation
Safety Factor	S.F.	2.00		
Maximum Drainage Flow Rate (with applied safety factor)	Q_{max}	3.2	m^3/day	
Estimated Permanent Drainage Flow Rate		**1,614**	L/day	
Estimated Maximum Drainage Flow Rate with Safety Factor		**3,227**	L/day	

PERMANENT DRAINAGE ASSESSMENT ASSUMPTIONS

Hydrogeological Investigation

211-11672-00 Highway 400 & Harvie Road, Barrie, ON

Dupuit-Thiem Equation

Table F-10: Permanent Drainage Assessment - Back to Back Townhouse Lot

Description	Symbol	Value	Unit	Explanation
Input Data				
Ground surface elevation		303.00	m asl	Estimated from Topographic Survey
Groundwater Elevation		300.50	m asl	Highest Water Level, 2.50 mbgs (MW21-05s)
P1 Elevation		300.60	m asl	Estimated to be 2.4 mbgs
Base of Water-Bearing Zone		299.60	m asl	Estimated
Hydraulic Conductivity	K	3.2E-06	m/s	Geometric mean K value based on Hazen and SWRT
	K	2.76E-01	m/day	Converted to m/day
Dimensions of the subdrain system	a	6.4	m	Provided by Client
	b	10.7	m	Provided by Client
Output				
Target Water Level		300.10	m asl	0.5 m below the P1 slab
Water Level above aquifer bottom	H	0.9	m	Output
Water level at excavation wall	h	0.5	m	Output
Effective Radius	r_e	4.7	m	Effective radius of rectangular excavation
Sichardt Estimate for Radius of Influence	R_{sich}	2.1	m	where c = 3000 for well approximation
Radius of Influence	R_0	6.8	m	Manipulated value, when $R_{sich} < r_{eff,}$ otherwise $R_0 = R_{sich}$
Permanent Drainage Flow Rate	Q	1.3	m^3/day	Drainage flow rate - Dupuit Equation
Safety Factor	S.F.	2.00		
Maximum Drainage Flow Rate (with applied safety factor)	Q_{max}	2.6	m^3/day	
Estimated Permanent Drainage Flow Rate		**1,283**	L/day	
Estimated Maximum Drainage Flow Rate with Safety Factor		**2,567**	L/day	

APPENDIX

G CLIMATE BASED WATER BUDGET

TABLE G-1
CLIMATIC WATER BUDGET: CLIMATE NORMAL 1981-2010 (BARRIE WPCC CLIMATE STATION)
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
HIGHWAY 400 & HARVIE ROAD, BARRIE, ON

	Thornthwaite (1948)							
Month	**Mean Temperature (°C)**	**Heat Index**	**Potential Evapo-transpiration (mm)**	**Daylight Correction Value**	**Adjusted Potential Evapo-transpiration (mm)**	**Total Precipitation (mm)**	**Surplus (mm)**	**Deficit (mm)**
January	-7.7	0.0	0.0	0.7739	0.00	82.5	82.5	0.0
February	-6.6	0.0	0.0	0.8675	0.00	61.8	61.8	0.0
March	-2.1	0.0	0.0	0.9929	0.00	58.1	58.1	0.0
April	5.6	1.2	25.5	1.1187	28.47	62.2	33.7	0.0
May	12.3	3.9	59.2	1.2287	72.77	82.4	9.6	0.0
June	17.9	6.9	88.6	1.2857	113.91	84.8	0.0	29.1
July	20.8	8.7	104.1	1.2587	131.03	77.2	0.0	53.8
August	19.7	8.0	98.2	1.1648	114.38	89.9	0.0	24.5
September	15.3	5.4	74.9	1.0430	78.08	94.0	15.9	0.0
October	8.7	2.3	40.8	0.9184	37.51	77.5	40.0	0.0
November	2.7	0.4	11.6	0.8063	9.38	88.9	79.5	0.0
December	-3.5	0.0	0.0	0.7452	0.00	73.6	73.6	0.0
TOTALS		**36.8**			**585.5**	**932.9**	**454.8**	**107.4**

TOTAL WATER SURPLUS **347.4** **mm**

NOTES:

1) Water budget adjusted for latitude and daylight.

2) (°C) - Represents calculated mean of daily temperatures for the month.

3) Precipitation and Temperature data from the Barrie WPCC Climate Station located at latitude 44°22'33.012" N, longitude 79°41'23.010" W, elevation 221.00 m.

4) Total Water Surplus (Thornthwaite, 1948) is calculated as total precipitation minus adjusted potential evapotranspiration.

5) Total Moisture Surplus (Thornthwaite and Mather, 1957) is calculated as total precipitation minus actual evapotranspiration.

TABLE G-2
CLIMATIC WATER BUDGET: CLIMATE NORMAL 1981-2010 (BARRIE WPCC CLIMATE STATION)
SANDY LOAM, LAWNS (75 mm HOLDING CAPACITY)
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
HIGHWAY 400 & HARVIE ROAD, BARRIE, ON

	Thornthwaite (1948)									Thornthwaite and Mather (1957)					
Month	**Mean Temperature (°C)**	**Heat Index**	**Potential Evapo-transpiration (mm)**	**Daylight Correction Value**	**Adjusted Potential Evapo-transpiration (mm)**	**Total Precipitation (mm)**	**Surplus (mm)**	**Deficit (mm)**	**TP - PET (mm)**	**Accumulated Potential Water Loss (mm)**	**Soil Moisture (mm)**	**Change in Soil Moisture (mm) (delta S)**	**Actual Evapo-transpiration (mm)**	**Moisture Deficit (mm)**	**Unadjusted Moisture Surplus (mm)**
January	-7.7	0.0	0.0	0.7739	0.00	82.5	82.5	0.0	82.5	0.0	75.0	0.0	0.0	0.0	82.5
February	-6.6	0.0	0.0	0.8675	0.00	61.8	61.8	0.0	61.8	0.0	75.0	0.0	0.0	0.0	61.8
March	-2.1	0.0	0.0	0.9929	0.00	58.1	58.1	0.0	58.1	0.0	75.0	0.0	0.0	0.0	58.1
April	5.6	1.2	25.5	1.1187	28.47	62.2	33.7	0.0	33.7	0.0	75.0	0.0	28.5	0.0	33.7
May	12.3	3.9	59.2	1.2287	72.77	82.4	9.6	0.0	9.6	0.0	75.0	0.0	72.8	0.0	9.6
June	17.9	6.9	88.6	1.2857	113.91	84.8	0.0	29.1	-29.1	-29.1	50.0	-25.0	109.8	4.1	0.0
July	20.8	8.7	104.1	1.2587	131.03	77.2	0.0	53.8	-53.8	-82.9	23.0	-27.0	104.2	26.8	0.0
August	19.7	8.0	98.2	1.1648	114.38	89.9	0.0	24.5	-24.5	-107.4	7.0	-16.0	105.9	8.5	0.0
September	15.3	5.4	74.9	1.0430	78.08	94.0	15.9	0.0	15.9	0.0	22.9	15.9	78.1	0.0	0.0
October	8.7	2.3	40.8	0.9184	37.51	77.5	40.0	0.0	40.0	0.0	62.9	40.0	37.5	0.0	0.0
November	2.7	0.4	11.6	0.8063	9.38	88.9	79.5	0.0	79.5	0.0	75.0	12.1	9.4	0.0	67.4
December	-3.5	0.0	0.0	0.7452	0.00	73.6	73.6	0.0	73.6	0.0	75.0	0.0	0.0	0.0	73.6
TOTALS		**36.8**			**585.5**	**932.9**	**454.8**	**107.4**	**347.4**	**-107.4**	**690.8**	**0.0**	**546.1**	**39.4**	**386.8**

TOTAL WATER SURPLUS **347.4** **mm**

TOTAL MOISTURE SURPLUS **386.8** **mm**

NOTES:

1) Water budget adjusted for latitude and daylight.

2) (°C) - Represents calculated mean of daily temperatures for the month.

3) Precipitation and Temperature data from the Barrie WPCC Climate Station located at latitude 44°22'33.012" N, longitude 79°41'23.010" W, elevation 221.00 m.

4) Total Water Surplus (Thornthwaite, 1948) is calculated as total precipitation minus adjusted potential evapotranspiration.

5) Total Moisture Surplus (Thornthwaite and Mather, 1957) is calculated as total precipitation minus actual evapotranspiration.

TABLE G-3
CLIMATIC WATER BUDGET: CLIMATE NORMAL 1981-2010 (BARRIE WPCC CLIMATE STATION)
SANDY LOAM, CULTIVATED (150 mm HOLDING CAPACITY)
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
HIGHWAY 400 & HARVIE ROAD, BARRIE, ON

	Thornthwaite (1948)									Thornthwaite and Mather (1957)					
Month	**Mean Temperature (°C)**	**Heat Index**	**Potential Evapo-transpiration (mm)**	**Daylight Correction Value**	**Adjusted Potential Evapo-transpiration (mm)**	**Total Precipitation (mm)**	**Surplus (mm)**	**Deficit (mm)**	**TP - PET (mm)**	**Accumulated Potential Water Loss (mm)**	**Soil Moisture (mm)**	**Change in Soil Moisture (mm) (delta S)**	**Actual Evapo-transpiration (mm)**	**Moisture Deficit (mm)**	**Unadjusted Moisture Surplus (mm)**
January	-7.7	0.0	0.0	0.7739	0.00	82.5	82.5	0.0	82.5	0.0	150.0	0.0	0.0	0.0	82.5
February	-6.6	0.0	0.0	0.8675	0.00	61.8	61.8	0.0	61.8	0.0	150.0	0.0	0.0	0.0	61.8
March	-2.1	0.0	0.0	0.9929	0.00	58.1	58.1	0.0	58.1	0.0	150.0	0.0	0.0	0.0	58.1
April	5.6	1.2	25.5	1.1187	28.47	62.2	33.7	0.0	33.7	0.0	150.0	0.0	28.5	0.0	33.7
May	12.3	3.9	59.2	1.2287	72.77	82.4	9.6	0.0	9.6	0.0	150.0	0.0	72.8	0.0	9.6
June	17.9	6.9	88.6	1.2857	113.91	84.8	0.0	29.1	-29.1	-29.1	123.0	-27.0	111.8	2.1	0.0
July	20.8	8.7	104.1	1.2587	131.03	77.2	0.0	53.8	-53.8	-82.9	85.0	-38.0	115.2	15.8	0.0
August	19.7	8.0	98.2	1.1648	114.38	89.9	0.0	24.5	-24.5	-107.4	72.0	-13.0	102.9	11.5	0.0
September	15.3	5.4	74.9	1.0430	78.08	94.0	15.9	0.0	15.9	0.0	87.9	15.9	78.1	0.0	0.0
October	8.7	2.3	40.8	0.9184	37.51	77.5	40.0	0.0	40.0	0.0	127.9	40.0	37.5	0.0	0.0
November	2.7	0.4	11.6	0.8063	9.38	88.9	79.5	0.0	79.5	0.0	150.0	22.1	9.4	0.0	57.4
December	-3.5	0.0	0.0	0.7452	0.00	73.6	73.6	0.0	73.6	0.0	150.0	0.0	0.0	0.0	73.6
TOTALS		**36.8**			**585.5**	**932.9**	**454.8**	**107.4**	**347.4**	**-107.4**	**1545.8**	**0.0**	**556.1**	**29.4**	**376.8**

TOTAL WATER SURPLUS **347.4** **mm**

TOTAL MOISTURE SURPLUS **376.8** **mm**

NOTES:

1) Water budget adjusted for latitude and daylight.

2) (°C) - Represents calculated mean of daily temperatures for the month.

3) Precipitation and Temperature data from the Barrie WPCC Climate Station located at latitude 44°22'33.012" N, longitude 79°41'23.010" W, elevation 221.00 m.

4) Total Water Surplus (Thornthwaite, 1948) is calculated as total precipitation minus adjusted potential evapotranspiration.

5) Total Moisture Surplus (Thornthwaite and Mather, 1957) is calculated as total precipitation minus actual evapotranspiration.

TABLE G-4
CLIMATIC WATER BUDGET: CLIMATE NORMAL 1981-2010 (BARRIE WPCC CLIMATE STATION)
SANDY LOAM, UNCULTIVATED (150 mm HOLDING CAPACITY)
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
HIGHWAY 400 & HARVIE ROAD, BARRIE, ON

	Thornthwaite (1948)									Thornthwaite and Mather (1957)					
Month	**Mean Temperature (°C)**	**Heat Index**	**Potential Evapo-transpiration (mm)**	**Daylight Correction Value**	**Adjusted Potential Evapo-transpiration (mm)**	**Total Precipitation (mm)**	**Surplus (mm)**	**Deficit (mm)**	**TP - PET (mm)**	**Accumulated Potential Water Loss (mm)**	**Soil Moisture (mm)**	**Change in Soil Moisture (mm) (delta S)**	**Actual Evapo-transpiration (mm)**	**Moisture Deficit (mm)**	**Unadjusted Moisture Surplus (mm)**
January	-7.7	0.0	0.0	0.7739	0.00	82.5	82.5	0.0	82.5	0.0	150.0	0.0	0.0	0.0	82.5
February	-6.6	0.0	0.0	0.8675	0.00	61.8	61.8	0.0	61.8	0.0	150.0	0.0	0.0	0.0	61.8
March	-2.1	0.0	0.0	0.9929	0.00	58.1	58.1	0.0	58.1	0.0	150.0	0.0	0.0	0.0	58.1
April	5.6	1.2	25.5	1.1187	28.47	62.2	33.7	0.0	33.7	0.0	150.0	0.0	28.5	0.0	33.7
May	12.3	3.9	59.2	1.2287	72.77	82.4	9.6	0.0	9.6	0.0	150.0	0.0	72.8	0.0	9.6
June	17.9	6.9	88.6	1.2857	113.91	84.8	0.0	29.1	-29.1	-29.1	123.0	-27.0	111.8	2.1	0.0
July	20.8	8.7	104.1	1.2587	131.03	77.2	0.0	53.8	-53.8	-82.9	85.0	-38.0	115.2	15.8	0.0
August	19.7	8.0	98.2	1.1648	114.38	89.9	0.0	24.5	-24.5	-107.4	72.0	-13.0	102.9	11.5	0.0
September	15.3	5.4	74.9	1.0430	78.08	94.0	15.9	0.0	15.9	0.0	87.9	15.9	78.1	0.0	0.0
October	8.7	2.3	40.8	0.9184	37.51	77.5	40.0	0.0	40.0	0.0	127.9	40.0	37.5	0.0	0.0
November	2.7	0.4	11.6	0.8063	9.38	88.9	79.5	0.0	79.5	0.0	150.0	22.1	9.4	0.0	57.4
December	-3.5	0.0	0.0	0.7452	0.00	73.6	73.6	0.0	73.6	0.0	150.0	0.0	0.0	0.0	73.6
TOTALS		**36.8**			**585.5**	**932.9**	**454.8**	**107.4**	**347.4**	**-107.4**	**1545.8**	**0.0**	**556.1**	**29.4**	**376.8**

TOTAL WATER SURPLUS **347.4** **mm**

TOTAL MOISTURE SURPLUS **376.8** **mm**

NOTES:

1) Water budget adjusted for latitude and daylight.

2) (°C) - Represents calculated mean of daily temperatures for the month.

3) Precipitation and Temperature data from the Barrie WPCC Climate Station located at latitude 44°22'33.012" N, longitude 79°41'23.010" W, elevation 221.00 m.

4) Total Water Surplus (Thornthwaite, 1948) is calculated as total precipitation minus adjusted potential evapotranspiration.

5) Total Moisture Surplus (Thornthwaite and Mather, 1957) is calculated as total precipitation minus actual evapotranspiration.

TABLE G-5
CLIMATIC WATER BUDGET: CLIMATE NORMAL 1981-2010 (BARRIE WPCC CLIMATE STATION)
SANDY LOAM, WOODED AREA (300 mm HOLDING CAPACITY)
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
HIGHWAY 400 & HARVIE ROAD, BARRIE, ON

	Thornthwaite (1948)									Thornthwaite and Mather (1957)					
Month	**Mean Temperature (°C)**	**Heat Index**	**Potential Evapo-transpiration (mm)**	**Daylight Correction Value**	**Adjusted Potential Evapo-transpiration (mm)**	**Total Precipitation (mm)**	**Surplus (mm)**	**Deficit (mm)**	**TP - PET (mm)**	**Accumulated Potential Water Loss (mm)**	**Soil Moisture (mm)**	**Change in Soil Moisture (mm) (delta S)**	**Actual Evapo-transpiration (mm)**	**Moisture Deficit (mm)**	**Unadjusted Moisture Surplus (mm)**
January	-7.7	0.0	0.0	0.7739	0.00	82.5	82.5	0.0	82.5	0.0	300.0	0.0	0.0	0.0	82.5
February	-6.6	0.0	0.0	0.8675	0.00	61.8	61.8	0.0	61.8	0.0	300.0	0.0	0.0	0.0	61.8
March	-2.1	0.0	0.0	0.9929	0.00	58.1	58.1	0.0	58.1	0.0	300.0	0.0	0.0	0.0	58.1
April	5.6	1.2	25.5	1.1187	28.47	62.2	33.7	0.0	33.7	0.0	300.0	0.0	28.5	0.0	33.7
May	12.3	3.9	59.2	1.2287	72.77	82.4	9.6	0.0	9.6	0.0	300.0	0.0	72.8	0.0	9.6
June	17.9	6.9	88.6	1.2857	113.91	84.8	0.0	29.1	-29.1	-29.1	272.0	-28.0	112.8	1.1	0.0
July	20.8	8.7	104.1	1.2587	131.03	77.2	0.0	53.8	-53.8	-82.9	227.0	-45.0	122.2	8.8	0.0
August	19.7	8.0	98.2	1.1648	114.38	89.9	0.0	24.5	-24.5	-107.4	209.0	-18.0	107.9	6.5	0.0
September	15.3	5.4	74.9	1.0430	78.08	94.0	15.9	0.0	15.9	0.0	224.9	15.9	78.1	0.0	0.0
October	8.7	2.3	40.8	0.9184	37.51	77.5	40.0	0.0	40.0	0.0	264.9	40.0	37.5	0.0	0.0
November	2.7	0.4	11.6	0.8063	9.38	88.9	79.5	0.0	79.5	0.0	300.0	35.1	9.4	0.0	44.4
December	-3.5	0.0	0.0	0.7452	0.00	73.6	73.6	0.0	73.6	0.0	300.0	0.0	0.0	0.0	73.6
TOTALS		**36.8**			**585.5**	**932.9**	**454.8**	**107.4**	**347.4**	**-107.4**	**3297.8**	**0.0**	**569.1**	**16.4**	**363.8**

TOTAL WATER SURPLUS **347.4** **mm**

TOTAL MOISTURE SURPLUS **363.8** **mm**

NOTES:

1) Water budget adjusted for latitude and daylight.

2) (°C) - Represents calculated mean of daily temperatures for the month.

3) Precipitation and Temperature data from the Barrie WPCC Climate Station located at latitude 44°22'33.012" N, longitude 79°41'23.010" W, elevation 221.00 m.

4) Total Water Surplus (Thornthwaite, 1948) is calculated as total precipitation minus adjusted potential evapotranspiration.

5) Total Moisture Surplus (Thornthwaite and Mather, 1957) is calculated as total precipitation minus actual evapotranspiration.

APPENDIX

H

WATER BUDGET CALCULATIONS – PRE-DEVELOMENT

TABLE H-1 PRE-DEVELOPMENT WATER BUDGET (BY CATCHMENT) - Barrie Creeks Subwatershed
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
HIGHWAY 400 & HARVIE ROAD, BARRIE, ON

Catchment Designation	Subcatchment ID	Outlet	Area	MOE TABLE 2 Components					MOE Infiltration Factor	Adjusted MOE Infiltration Factor	Precipitation	Precipitation Total	Precipitation Surplus	Evapotranspiration	Runon		Net Surplus		Infiltration		Runoff*		Total Infiltration + Runoff
			(m^2)	Cover		Soil		Topography			(mm/a)	(m^3/a)	(mm/a)	(m^3/a)	(mm/a)	(m^3/a)	(mm/a)	(m^3/a)	(mm/a)	(m^3/a)	(mm/a)	(m^3/a)	(m^3/a)
101	49	Whiskey Creek	661.1	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	616.8	376.8	367.7	0	0	376.8	249.1	263.7	174.4	113.0	74.7	249.1
101	50	Whiskey Creek	4260.7	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	3974.8	376.8	2369.4	0	0	376.8	1605.4	263.7	1123.8	113.0	481.6	1605.4
101	51	Whiskey Creek	14247.5	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	13291.5	376.8	7923.3	0	0	376.8	5368.3	263.7	3757.8	113.0	1610.5	5368.3
101	52	Whiskey Creek	14746.8	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	13757.2	376.8	8200.9	0	0	376.8	5556.4	263.7	3889.5	113.0	1666.9	5556.4
101	53	Whiskey Creek	365.3	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	340.8	376.8	203.2	0	0	376.8	137.6	263.7	96.3	113.0	41.3	137.6
101	54	Whiskey Creek	5.0	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	4.7	376.8	2.8	0	0	376.8	1.9	263.7	1.3	113.0	0.6	1.9
101	55	Whiskey Creek	887.5	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	827.9	376.8	493.5	0	0	376.8	334.4	263.7	234.1	113.0	100.3	334.4
101	56	Whiskey Creek	5467.9	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	5101.0	376.8	3040.8	0	0	376.8	2060.2	263.7	1442.2	113.0	618.1	2060.2
101	57	Whiskey Creek	235.9	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	220.1	376.8	131.2	0	0	376.8	88.9	263.7	62.2	113.0	26.7	88.9
101	58	Whiskey Creek	13.4	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	12.5	376.8	7.5	0	0	376.8	5.1	263.7	3.5	113.0	1.5	5.1
101	59	Whiskey Creek	4331.8	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	4041.1	376.8	2409.0	0	0	376.8	1632.1	263.7	1142.5	113.0	489.6	1632.1
101	60	Whiskey Creek	1284.6	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1198.4	376.8	714.4	0	0	376.8	484.0	263.7	338.8	113.0	145.2	484.0
101	61	Whiskey Creek	383.6	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	357.9	376.8	213.3	0	0	376.8	144.5	263.7	101.2	113.0	43.4	144.5
101	62	Whiskey Creek	1237.5	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1154.5	376.8	688.2	0	0	376.8	466.3	263.7	326.4	113.0	139.9	466.3
101	63	Whiskey Creek	1237.5	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1154.5	376.8	688.2	0	0	376.8	466.3	263.7	326.4	113.0	139.9	466.3
101	64	Whiskey Creek	914.6	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	853.2	376.8	508.6	0	0	376.8	344.6	263.7	241.2	113.0	103.4	344.6
101	65	Whiskey Creek	1129.4	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1053.6	376.8	628.1	0	0	376.8	425.5	263.7	297.9	113.0	127.7	425.5
101	66	Whiskey Creek	1542.6	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1439.1	376.8	857.9	0	0	376.8	581.2	263.7	406.9	113.0	174.4	581.2
101	67	Whiskey Creek	1503.5	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1402.6	376.8	836.1	0	0	376.8	566.5	263.7	396.5	113.0	169.9	566.5
101	68	Whiskey Creek	59.1	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	55.2	376.8	32.9	0	0	376.8	22.3	263.7	15.6	113.0	6.7	22.3
101	69	Whiskey Creek	1176.1	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1097.2	376.8	654.0	0	0	376.8	443.1	263.7	310.2	113.0	132.9	443.1
101	70	Whiskey Creek	1237.2	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1154.2	376.8	688.0	0	0	376.8	466.2	263.7	326.3	113.0	139.8	466.2
101	71	Whiskey Creek	1237.5	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1154.5	376.8	688.2	0	0	376.8	466.3	263.7	326.4	113.0	139.9	466.3
101	72	Whiskey Creek	1295.4	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1208.5	376.8	720.4	0	0	376.8	488.1	263.7	341.7	113.0	146.4	488.1
101	73	Whiskey Creek	1328.4	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1239.2	376.8	738.7	0	0	376.8	500.5	263.7	350.4	113.0	150.2	500.5
101	74	Whiskey Creek	1237.5	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1154.5	376.8	688.2	0	0	376.8	466.3	263.7	326.4	113.0	139.9	466.3
101	75	Whiskey Creek	1237.5	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1154.5	376.8	688.2	0	0	376.8	466.3	263.7	326.4	113.0	139.9	466.3
101	76	Whiskey Creek	1277.0	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1191.3	376.8	710.2	0	0	376.8	481.2	263.7	336.8	113.0	144.3	481.2
101	77	Whiskey Creek	1277.0	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1191.3	376.8	710.2	0	0	376.8	481.2	263.7	336.8	113.0	144.3	481.2
101	111	Whiskey Creek	19.2	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	17.9	376.8	10.7	0	0	376.8	7.2	263.7	5.1	113.0	2.2	7.2
101	112	Whiskey Creek	81.1	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	75.7	376.8	45.1	0	0	376.8	30.6	263.7	21.4	113.0	9.2	30.6
101	113	Whiskey Creek	20353.4	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	18987.7	376.8	11318.8	0	0	376.8	7668.8	263.7	5368.2	113.0	2300.7	7668.8
101	121	Whiskey Creek	210.1	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	196.0	376.8	116.8	0	0	376.8	79.2	263.7	55.4	113.0	23.7	79.2
Pre-Development Catchment 101 Total		**North to Whiskey Creek**	**86,483**								**932.9**	**80,680**	**376.8**	**48,094**	**0**	**0**	**376.8**	**32,585**	**264**	**22,810**	**113**	**9,776**	**32,585**
102	6	Whiskey Creek	15097.4	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	14084.4	376.8	8395.9	0	0	376.8	5688.5	263.7	3981.9	113.0	1706.5	5688.5
102	7	Whiskey Creek	8812.3	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	8221.0	376.8	4900.6	0	0	376.8	3320.3	263.7	2324.2	113.0	996.1	3320.3
102	8	Whiskey Creek	7592.4	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	7083.0	376.8	4222.3	0	0	376.8	2860.7	263.7	2002.5	113.0	858.2	2860.7
102	9	Whiskey Creek	10291.1	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	9600.6	376.8	5723.0	0	0	376.8	3877.5	263.7	2714.3	113.0	1163.3	3877.5
102	10	Whiskey Creek	7588.7	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	7079.5	376.8	4220.2	0	0	376.8	2859.3	263.7	2001.5	113.0	857.8	2859.3
102	11	Whiskey Creek	7934.5	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	7402.1	376.8	4412.5	0	0	376.8	2989.6	263.7	2092.7	113.0	896.9	2989.6
102	12	Whiskey Creek	5520.1	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	5149.7	376.8	3069.8	0	0	376.8	2079.9	263.7	1455.9	113.0	624.0	2079.9
102	13	Whiskey Creek	2901.1	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	2706.5	376.8	1613.4	0	0	376.8	1093.1	263.7	765.2	113.0	327.9	1093.1
102	14	Whiskey Creek	17959.2	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	16754.1	376.8	9987.4	0	0	376.8	6766.8	263.7	4736.7	113.0	2030.0	6766.8
102	16	Whiskey Creek	46.0	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	43.0	376.8	25.6	0	0	376.8	17.3	263.7	12.1	113.0	5.2	17.3
102	104	Whiskey Creek	317.7	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	296.4	376.8	176.7	0	0	376.8	119.7	263.7	83.8	113.0	35.9	119.7
102	105	Whiskey Creek	2024.8	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1889.0	376.8	1126.0	0	0	376.8	762.9	263.7	534.0	113.0	228.9	762.9
Pre-Development Catchment 102 Total		**North to Whiskey Creek**	**86,085**								**932.9**	**80,309**	**376.8**	**47,873**	**0**	**0**	**377**	**32,436**	**264**	**22,705**	**113**	**9,731**	**32,436**
103	17	Whiskey Creek	12766.0	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	11909.4	376.8	7099.4	0	0	376.8	4810.1	263.7	3367.0	113.0	1443.0	4810.1
103	18	Whiskey Creek	7448.6	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	6948.8	376.8	4142.3	0	0	376.8	2806.5	263.7	1964.6	113.0	842.0	2806.5
103	19	Whiskey Creek	8258.8	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	7704.7	376.8	4592.9	0	0	376.8	3111.8	263.7	2178.3	113.0	933.5	3111.8
103	20	Whiskey Creek	2230.8	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	2081.1	376.8	1240.6	0	0	376.8	840.5	263.7	588.4	113.0	252.2	840.5
103	21	Whiskey Creek	18.1	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	16.8	376.8	10.0	0	0	376.8	6.8	263.7	4.8	113.0	2.0	6.8
103	106	Whiskey Creek	2147.0	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	2003.0	376.8	1194.0	0	0	376.8	809.0	263.7	566.3	113.0	242.7	809.0
103	107	Whiskey Creek	4684.8	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	4370.5	376.8	2605.3	0	0	376.8	1765.2	263.7	1235.6	113.0	529.6	1765.2
Pre-Development Catchment 103 Total		**North to Whiskey Creek**	**37,554**								**932.9**	**35,034**	**376.8**	**20,884**	**0**	**0**	**377**	**14,150**	**264**	**9,905**	**113**	**4,245**	**14,150**
107	45	Bryne Dr Extension	10116.2	Future Road	0	Sand to Silty Sand	0.3	0.25	0.55	0	932.9	9437.4	839.6	943.7	0	0	839.6	8493.7	0.0	0.0	839.6	8493.7	8493.7
107	46	Bryne Dr Extension	1970.8	Future Road	0	Sand to Silty Sand	0.3	0.25	0.55	0	932.9	1838.5	839.6	183.9	0	0	839.6	1654.7	0.0	0.0	839.6	1654.7	1654.7
107	47	Bryne Dr Extension	286.2	Future Road	0	Sand to Silty Sand	0.3	0.25	0.55	0	932.9	267.0	839.6	26.7	0	0	839.6	240.3	0.0	0.0	839.6	240.3	240.3
107	48	Bryne Dr Extension	244.9	Future Road	0	Sand to Silty Sand	0.3	0.25	0.55	0	932.9	228.4	839.6	22.8	0	0	839.6	205.6	0.0	0.0	839.6	205.6	205.6
Pre-Development Catchment 107 Total		**Storm Sewer via Bryne Dr Extension**	**12,618**								**932.9**	**11,771**	**839.6**	**1,177**	**0**	**0**	**840**	**10,594**	**0**	**0**	**840**	**10,594**	**10,594**
SITE TOTAL			**222,740**								**932.9**	**207,794**	**403.0**	**118,029**	**0**	**0**	**403.0**	**89,765**	**249**	**55,420**	**154**	**34,346**	**89,765**

TABLE H-2 PRE-DEVELOPMENT WATER BUDGET (BY CATCHMENT) - Lover's Creek Subwatershed
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
HIGHWAY 400 & HARVIE ROAD, BARRIE, ON

Catchment Designation	Subcatchment ID	Outlet	Area	MOE TABLE 2 Components					MOE Infiltration Factor	Adjusted MOE Infiltration Factor	Precipitation	Precipitation Total	Precipitation Surplus	Evapotranspiration	Runon		Net Surplus		Infiltration		Runoff*		Total Infiltration + Runoff
			(m^2)	Cover		Soil		Topography			(mm/a)	(m^3/a)	(mm/a)	(m^3/a)	(mm/a)	(m^3/a)	(mm/a)	(m^3/a)	(mm/a)	(m^3/a)	(mm/a)	(m^3/a)	(m^3/a)
104a	22	Lover's Creek	3624.6	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	3381.4	376.8	2015.7	0	0	376.8	1365.7	263.7	956.0	113.0	409.7	1365.7
104a	23	Lover's Creek	460.0	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	429.1	376.8	255.8	0	0	376.8	173.3	263.7	121.3	113.0	52.0	173.3
104a	24	Lover's Creek	2296.4	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	2142.3	376.8	1277.0	179.7	413	556.4	1277.8	389.5	894.5	166.9	383.3	1277.8
104a	25	Lover's Creek	5828.7	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	5437.6	376.8	3241.4	0	0	376.8	2196.2	263.7	1537.3	113.0	658.8	2196.2
104a	26	Lover's Creek	679.8	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	634.2	376.8	378.1	0	0	376.8	256.2	263.7	179.3	113.0	76.8	256.2
104a	27	Lover's Creek	6085.6	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	5677.2	376.8	3384.3	0	0	376.8	2293.0	263.7	1605.1	113.0	687.9	2293.0
104a	28	Lover's Creek	851.3	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	794.2	376.8	473.4	0	0	376.8	320.8	263.7	224.5	113.0	96.2	320.8
104a	29	Lover's Creek	1072.5	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1000.5	376.8	596.4	0	0	376.8	404.1	263.7	282.9	113.0	121.2	404.1
104a	30	Lover's Creek	1072.5	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1000.5	376.8	596.4	0	0	376.8	404.1	263.7	282.9	113.0	121.2	404.1
104a	31	Lover's Creek	1240.6	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1157.3	376.8	689.9	0	0	376.8	467.4	263.7	327.2	113.0	140.2	467.4
104a	32	Lover's Creek	1391.5	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1298.1	376.8	773.8	0	0	376.8	524.3	263.7	367.0	113.0	157.3	524.3
104a	33	Lover's Creek	2129.9	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1987.0	376.8	1184.5	0	0	376.8	802.5	263.7	561.8	113.0	240.8	802.5
104a	34	Lover's Creek	124.0	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	115.7	376.8	68.9	0	0	376.8	46.7	263.7	32.7	113.0	14.0	46.7
104a	35	Lover's Creek	5416.4	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	5052.9	376.8	3012.1	0	0	376.8	2040.8	263.7	1428.6	113.0	612.2	2040.8
104a	36	Lover's Creek	6956.8	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	6490.0	376.8	3868.8	0	0	376.8	2621.2	263.7	1834.9	113.0	786.4	2621.2
104a	37	Lover's Creek	668.5	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	623.6	376.8	371.8	0	0	376.8	251.9	263.7	176.3	113.0	75.6	251.9
104a	38	Lover's Creek	291.3	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	271.8	376.8	162.0	0	0	376.8	109.8	263.7	76.8	113.0	32.9	109.8
104a	39	Lover's Creek	466.1	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	434.8	376.8	259.2	0	0	376.8	175.6	263.7	122.9	113.0	52.7	175.6
104a	40	Lover's Creek	682.9	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	637.1	376.8	379.8	0	0	376.8	257.3	263.7	180.1	113.0	77.2	257.3
104a	41	Lover's Creek	1294.3	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1207.4	376.8	719.8	0	0	376.8	487.7	263.7	341.4	113.0	146.3	487.7
104a	42	Lover's Creek	210.9	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	196.7	376.8	117.3	0	0	376.8	79.5	263.7	55.6	113.0	23.8	79.5
104a	43	Lover's Creek	593.0	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	553.2	376.8	329.8	0	0	376.8	223.4	263.7	156.4	113.0	67.0	223.4
104a	96	Lover's Creek	207.8	Uncultivated	0.15	Sand to Silty Sand	0.3	0.15	0.6	0.6	932.9	193.8	376.8	115.6	0	0	376.8	78.3	226.1	47.0	150.7	31.3	78.3
104a	97	Lover's Creek	1930.1	Uncultivated	0.15	Sand to Silty Sand	0.3	0.15	0.6	0.6	932.9	1800.6	376.8	1073.4	118.33	228	495.1	955.6	297.1	573.4	198.0	382.3	955.6
104a	99	Lover's Creek	7.2	Wooded Area	0.2	Sand to Silty Sand	0.3	0.15	0.65	0.65	932.9	6.7	363.8	4.1	0	0	363.8	2.6	236.5	1.7	127.3	0.9	2.6
104a	100	Lover's Creek	1605.7	Wooded Area	0.2	Sand to Silty Sand	0.3	0.15	0.65	0.65	932.9	1497.9	363.8	913.8	0	0	363.8	584.1	236.5	379.7	127.3	204.4	584.1
104a	101	Lover's Creek	999.5	Wooded Area	0.2	Sand to Silty Sand	0.3	0.15	0.65	0.65	932.9	932.4	363.8	568.8	0	0	363.8	363.6	236.5	236.3	127.3	127.3	363.6
104a	108	Lover's Creek	67.2	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	62.7	376.8	37.3	0	0	376.8	25.3	263.7	17.7	113.0	7.6	25.3
104a	109	Lover's Creek	613.6	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	572.5	376.8	341.3	0	0	376.8	231.2	263.7	161.8	113.0	69.4	231.2
104a	110	Lover's Creek	8.4	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	7.8	376.8	4.7	0	0	376.8	3.2	263.7	2.2	113.0	1.0	3.2
104a	117	Lover's Creek	216.6	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	202.0	376.8	120.4	0	0	376.8	81.6	263.7	57.1	113.0	24.5	81.6
104a	118	Lover's Creek	1549.6	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	1445.6	376.8	861.7	0	0	376.8	583.9	263.7	408.7	113.0	175.2	583.9
104a	119	Lover's Creek	676.0	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	630.7	376.8	376.0	0	0	376.8	254.7	263.7	178.3	113.0	76.4	254.7
104a	120	Lover's Creek	2573.9	Wooded Area	0.2	Sand to Silty Sand	0.3	0.15	0.65	0.65	932.9	2401.2	363.8	1464.8	0	0	363.8	936.3	236.5	608.6	127.3	327.7	936.3
Pre-Development Catchment 104a Total		**East to Lover's Creek**	**53,893**								**932.9**	**50,277**	**375.5**	**30,038**	**298**	**641**	**387.4**	**20,880**	**268**	**14,418**	**120**	**6,462**	**20,880**
105	44	Bryne Dr Extension	3253.2	Future Road	0	Sand to Silty Sand	0.3	0.25	0.55	0	932.9	3034.9	839.6	303.5	0	0	839.6	2731.4	0.0	0.0	839.6	2731.4	2731.4
105	98	Bryne Dr Extension	521.1	Future Road	0	Sand to Silty Sand	0.3	0.15	0.45	0	932.9	486.1	839.6	48.6	0	0	839.6	437.5	0.0	0.0	839.6	437.5	437.5
Pre-Development Catchment 105 Total		**Storm Sewer via Bryne Dr Extension**	**3,774**								**932.9**	**3,521**	**839.6**	**352**	**0**	**0**	**840**	**3,169**	**0**	**0**	**840**	**3,169**	**3,169**
106a	1	Lover's Creek	27203.3	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	25377.9	376.8	15128.1	400.8	10,903	777.6	21152.6	544.3	14806.8	233.3	6345.8	21152.6
106a	2	Lover's Creek	91.2	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	85.0	376.8	50.7	0	0	376.8	34.3	263.7	24.0	113.0	10.3	34.3
106a	3	Lover's Creek	2700.0	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	2518.8	376.8	1501.5	0	0	376.8	1017.3	263.7	712.1	113.0	305.2	1017.3
106a	4	Lover's Creek	3337.8	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	3113.8	376.8	1856.2	0	0	376.8	1257.6	263.7	880.3	113.0	377.3	1257.6
106a	88	Lover's Creek	106.9	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	99.7	376.8	59.4	0	0	376.8	40.3	263.7	28.2	113.0	12.1	40.3
106a	89	Lover's Creek	16717.2	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	15595.5	376.8	9296.7	0	0	376.8	6298.8	263.7	4409.2	113.0	1889.6	6298.8
106a	91	Lover's Creek	524.9	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	489.7	376.8	291.9	0	0	376.8	197.8	263.7	138.4	113.0	59.3	197.8
106a	92	Lover's Creek	2636.7	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	2459.8	376.8	1466.3	0	0	376.8	993.5	263.7	695.4	113.0	298.0	993.5
106a	93	Lover's Creek	4119.7	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	932.9	3843.2	376.8	2291.0	0	0	376.8	1552.2	263.7	1086.6	113.0	465.7	1552.2
106a	94	Lover's Creek	358.9	Wooded Area	0.2	Sand to Silty Sand	0.3	0.15	0.65	0.65	932.9	334.8	363.8	204.3	0	0	363.8	130.6	236.5	84.9	127.3	45.7	130.6
106a	95	Lover's Creek	1851.4	Wooded Area	0.2	Sand to Silty Sand	0.3	0.15	0.65	0.65	932.9	1727.2	363.8	1053.7	0	0	363.8	673.5	236.5	437.8	127.3	235.7	673.5
106a	114	Lover's Creek	9416.3	Wooded Area	0.2	Sand to Silty Sand	0.3	0.15	0.65	0.65	932.9	8784.5	363.8	5359.0	0	0	363.8	3425.5	236.5	2226.6	127.3	1198.9	3425.5
Pre-Development Catchment 106a Total		**East to Lover's Creek**	**69,064**								**932.9**	**64,430**	**374.6**	**38,559**	**401**	**10,903**	**532**	**36,774**	**370**	**25,530**	**163**	**11,244**	**36,774**
108a	5	Bryne Dr Extension	2700.0	Future Road	0	Sand to Silty Sand	0.3	0.25	0.55	0	932.9	2518.9	839.6	251.9	116.2	314	955.8	2580.6	0.0	0.0	955.8	2580.6	2580.6
108a	102	Bryne Dr Extension	1867.8	Future Road	0	Sand to Silty Sand	0.3	0.15	0.45	0	932.9	1742.5	839.6	174.2	0	0	839.6	1568.2	0.0	0.0	839.6	1568.2	1568.2
Pre-Development Catchment 108a Total		**Storm Sewer via Bryne Dr Extension**	**4,568**								**932.9**	**4,261**	**839.6**	**426**	**116**	**314**	**908**	**4,149**	**0**	**0**	**908**	**4,149**	**4,149**
SITE TOTAL			**131,299**								**932.9**	**122,489**	**404.5**	**69,375**	**90**	**11,857**	**494.8**	**64,971**	**304**	**39,948**	**191**	**25,023**	**64,971**

TABLE H-2 PRE-DEVELOPMENT WATER BUDGET (BY CATCHMENT) - Lover's Creek Subwatershed
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
HIGHWAY 400 & HARVIE ROAD, BARRIE, ON

Catchment Designation	Subcatchment ID	Outlet	Area	MOE TABLE 2 Components				MOE Infiltration Factor	Adjusted MOE Infiltration Factor	Precipitation	Precipitation Total	Precipitation Surplus	Evapotranspiration	Runon		Net Surplus		Infiltration		Runoff*		Total Infiltration + Runoff
			(m^2)	Cover		Soil	Topography			(mm/a)	(m^3/a)	(mm/a)	(m^3/a)	(mm/a)	(m^3/a)	(mm/a)	(m^3/a)	(mm/a)	(m^3/a)	(mm/a)	(m^3/a)	(m^3/a)

EXTERNAL AREAS (Run-on Estimates)

Subcatchment Designation	Subcatchment ID	Outlet	Area	MOE TABLE 2 Components				MOE Infiltration Factor	Adjusted Infiltration Factor	Precipitation	Precipitation Total	Precipitation Surplus	Evapotranspiration	Runon		Net Surplus		Infiltration		Runoff*		Total Infiltration + Runoff
			(m^2)	Cover		Soil	Topography			(mm/a)	(m^3/a)	(mm/a)	(m^3/a)	(mm/a)	(m^3/a)	(mm/a)	(m^3/a)	(mm/a)	(m^3/a)	(mm/a)	(m^3/a)	(m^3/a)
104b	85	Lover's Creek	64.2	Building	0	Sand to Silty Sand	0.3	0.25	0.55	0	932.9	59.9	839.6	6.0	0	0	839.6	53.9	0.0	0.0	839.6	53.9	53.9
104b	86	Lover's Creek	2130.8	Lawn	0.05	Sand to Silty Sand	0.3	0.25	0.60	0.6	932.9	1987.8	386.8	1163.7	0	0	386.8	824.2	232.1	494.5	154.7	329.7	824.2
104b	115	Lover's Creek	11.8	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.70	0.7	932.9	11.0	376.8	6.6	0	0	376.8	4.4	263.7	3.1	113.0	1.3	4.4
104b	116	Lover's Creek	244.3	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.70	0.7	932.9	227.9	376.8	135.9	0	0	376.8	92.1	263.7	64.4	113.0	27.6	92.1
Pre-Development Catchment 104b Total		**East to Lover's Creek via Catchment 104a**	**2,451**								**932.9**	**2,287**	**397.6**	**1,312**	**0**	**0**	**398**	**975**	**229**	**562**	**168**	**413**	**975**
104c	80	Lover's Creek	2020.6	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.70	0.7	932.9	1885.0	376.8	1123.7	0	0	376.8	761.3	263.7	532.9	113.0	228.4	761.3
Pre-Development Catchment 104c Total		**North to Lover's Creek Via Catchment 104a**	**2,021**								**932.9**	**1,885**	**376.8**	**1,124**	**0**	**0**	**377**	**761**	**264**	**533**	**113**	**228**	**761**
106b	78	Lover's Creek	764.1	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.70	0.7	932.9	712.8	376.8	424.9	0	0	376.8	287.9	263.7	201.5	113.0	86.4	287.9
106b	79	Lover's Creek	13227.7	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.70	0.7	932.9	12340.2	376.8	7356.1	0	0	376.8	4984.0	263.7	3488.8	113.0	1495.2	4984.0
106b	82	Lover's Creek	1146.3	Building	0	Sand to Silty Sand	0.3	0.25	0.55	0	932.9	1069.4	839.6	106.9	0	0	839.6	962.4	0.0	0.0	839.6	962.4	962.4
106b	83	Lover's Creek	5288.4	Pavement	0	Sand to Silty Sand	0.3	0.25	0.55	0	932.9	4933.5	839.6	493.4	0	0	839.6	4440.2	0.0	0.0	839.6	4440.2	4440.2
106b	84	Lover's Creek	3444.7	Pavement	0	Sand to Silty Sand	0.3	0.25	0.55	0	932.9	3213.5	839.6	321.4	0	0	839.6	2892.2	0.0	0.0	839.6	2892.2	2892.2
106b	87	Lover's Creek	2628.7	Lawn	0.05	Sand to Silty Sand	0.3	0.25	0.60	0.6	932.9	2452.3	386.8	1435.6	0	0	386.8	1016.7	232.1	610.0	154.7	406.7	1016.7
106b	103	Lover's Creek	4112.7	Uncultivated	0.15	Sand to Silty Sand	0.3	0.15	0.60	0.6	932.9	3836.7	376.8	2287.1	0	0	376.8	1549.6	226.1	929.8	150.7	619.8	1549.6
Pre-Development Catchment 106b Total		**Northeast to Lover's Creek via Catchment 106a**	**30,612**								**932.9**	**28,558**	**527.0**	**12,425**	**0**	**0**	**527**	**16,133**	**171**	**5,230**	**356**	**10,903**	**16,133**
108b	81	Bryne Dr Extension	373.5	Future Road	0	Sand to Silty Sand	0.3	0.25	0.55	0	932.9	348.5	839.6	34.8	0	0	839.6	313.6	0.0	0.0	839.6	313.6	313.6
Pre-Development Catchment 108b Total		**Storm Sewer via Bryne Dr Extension**	**374**								**932.9**	**348**	**839.6**	**35**	**0**	**0**	**840**	**314**	**0**	**0**	**840**	**314**	**314**
OFF-SITE TOTAL			**35,458**								**932.9**	**33,079**	**512.8**	**14,896**	**0**	**0**	**512.8**	**18,183**	**178**	**6,325**	**334**	**11,857**	**18,183**

APPENDIX

I WATER BUDGET CALCULATIONS – POST-DEVELOPMENT

TABLE I-1 POST-DEVELOPMENT WATER BUDGET (BY CATCHMENT) - Barrie Creeks Subwatershed
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
HIGHWAY 400 & HARVIE ROAD, BARRIE, ON

ANNUAL PRECIPITATION	EVAPORATION AND EVAPOTRANSPIRATION FACTORS			
	Impervious Areas		Waterbody	
mm	%	mm	%	mm
933	10%	93	74%	690

On-Site Catchment Designation	Subcatchment ID	Outlet	Total Area	Impervious							Pervious		MOE TABLE 2 Components					MOE Infiltration Factor	Adjusted MOE Infiltration Factor
				Total Impervious		Assumed Buildings		Assumed Road/ Parking/ Amenities		Other Impervious	Total Pervious								
			(m^2)	% of Total Area	(m^2)	% of Impervious Area	(m^2)	% of Impervious Area	(m^2)	(m^2)	% of Total Area	(m^2)	Cover		Soil		Topography		
201a	48	Whiskey Creek	244.9	100%	244.9	0%	0.0	100%	244.9	0.0	0%	0	Road	0	Sand to Silty Sand	0.3	0.25	0.55	0
201a	55	Whiskey Creek	887.5	20%	177.5	0%	0.0	100%	177.5	0.0	80%	710	Hydro Easement	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	56	Whiskey Creek	5467.9	75%	4100.9	60%	2460.6	40%	1640.4	0.0	25%	1,367	Semi Detached	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	57	Whiskey Creek	235.9	20%	47.2	0%	0.0	100%	47.2	0.0	80%	189	Park	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	58	Whiskey Creek	13.4	75%	10.1	60%	6.0	40%	4.0	0.0	25%	3	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	59	Whiskey Creek	4331.8	20%	866.4	0%	0.0	100%	866.4	0.0	80%	3,465	Hydro Easement	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	60	Whiskey Creek	1284.6	75%	963.5	60%	578.1	40%	385.4	0.0	25%	321	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	61	Whiskey Creek	383.6	75%	287.7	60%	172.6	40%	115.1	0.0	25%	96	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	62	Whiskey Creek	1237.5	75%	928.1	60%	556.9	40%	371.3	0.0	25%	309	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	63	Whiskey Creek	1237.5	75%	928.1	60%	556.9	40%	371.3	0.0	25%	309	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	64	Whiskey Creek	914.6	75%	685.9	60%	411.5	40%	274.4	0.0	25%	229	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	65	Whiskey Creek	1129.4	75%	847.1	60%	508.2	40%	338.8	0.0	25%	282	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	66	Whiskey Creek	1542.6	75%	1156.9	60%	694.2	40%	462.8	0.0	25%	386	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	67	Whiskey Creek	1503.5	75%	1127.6	60%	676.6	40%	451.0	0.0	25%	376	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	68	Whiskey Creek	59.1	75%	44.3	60%	26.6	40%	17.7	0.0	25%	15	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	69	Whiskey Creek	1176.1	75%	882.1	60%	529.2	40%	352.8	0.0	25%	294	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	70	Whiskey Creek	1237.2	75%	927.9	60%	556.7	40%	371.2	0.0	25%	309	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	71	Whiskey Creek	1237.5	75%	928.1	60%	556.9	40%	371.3	0.0	25%	309	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	72	Whiskey Creek	1295.4	75%	971.5	60%	582.9	40%	388.6	0.0	25%	324	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	73	Whiskey Creek	1328.4	75%	996.3	60%	597.8	40%	398.5	0.0	25%	332	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	74	Whiskey Creek	1237.5	75%	928.1	60%	556.9	40%	371.2	0.0	25%	309	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	75	Whiskey Creek	1237.5	75%	928.1	60%	556.9	40%	371.3	0.0	25%	309	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	76	Whiskey Creek	1277.0	75%	957.7	60%	574.6	40%	383.1	0.0	25%	319	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	77	Whiskey Creek	1277.0	75%	957.7	60%	574.6	40%	383.1	0.0	25%	319	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	111	Whiskey Creek	19.2	75%	14.4	60%	8.6	40%	5.8	0.0	25%	5	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	112	Whiskey Creek	81.1	75%	60.8	60%	36.5	40%	24.3	0.0	25%	20	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
201a	113	Whiskey Creek	20353.4	100%	20353.4	0%	0.0	100%	20353.4	0.0	0%	0	Road	0	Sand to Silty Sand	0.3	0.25	0.55	0
201a	121	Whiskey Creek	210.1	80%	168.1	60%	100.8	40%	67.2	0.0	20%	42	Midrise Residentia	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
Post-Development Catchment 201a Total		**North to Whiskey Creek**	**52,441**	**79%**	**41,490**	**23%**	**11,881**	**56%**	**29,610**	**0**	**21%**	**10,951**							
203	46	Whiskey Creek	1970.8	80%	1576.6	60%	946.0	40%	630.7	0.0	20%	394	Midrise Residentia	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
203	51	Whiskey Creek	14247.5	80%	11398.0	60%	6838.8	40%	4559.2	0.0	20%	2,850	Midrise Residentia	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
Post-Development Catchment 203 Total		**North to Whiskey Creek**	**16,218**	**80%**	**12,975**	**48%**	**7,785**	**32%**	**5,190**	**0**	**20%**	**3,244**							
204a	47	Whiskey Creek	286.2	80%	228.9	60%	137.4	40%	91.6	0.0	20%	57	idrise Residenti	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
204a	52	Whiskey Creek	14746.8	80%	11797.4	60%	7078.4	40%	4719.0	0.0	20%	2,949	idrise Residenti	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
Post-Development Catchment 204a Total		**North to Whiskey Creek**	**15,033**	**80%**	**12,026**	**48%**	**7,216**	**32%**	**4,811**	**0**	**20%**	**3,007**							
205b	53	Whiskey Creek	365.3	20%	73.1	0%	0.0	100%	73.1	0.0	80%	292	Park	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
205b	54	Whiskey Creek	5.0	75%	3.8	60%	2.3	40%	1.5	0.0	25%	1	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
Post-Development Catchment 205b Total		**North to Whiskey Creek**	**370**	**21%**	**77**	**1%**	**2**	**20%**	**75**	**0**	**79%**	**294**							
Post-Development Catchment 205b Total w/MIT		**North to Whiskey Creek**	**370**	**21%**	**77**	**1%**	**2**	**20%**	**75**	**0**	**79%**	**294**							
208	6	Whiskey Creek	15097.4	0%	0.0	0%	0.0	0%	0.0	0.0	100%	15,097	Open Space	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7
Post-Development Catchment 208 Total		**North to Whiskey Creek**	**15,097**	**0%**	**0**	**0%**	**0**	**0%**	**0**	**0**	**100%**	**15,097**							
209	7	Whiskey Creek	8812.3	26%	2291.2	0%	0.0	0%	0.0	2291.2	74%	6,521	SWMP	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
209	106	Whiskey Creek	2147.0	26%	558.2	0%	0.0	0%	0.0	558.2	74%	1,589	SWMP	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
Post-Development Catchment 209 Total		**North to Whiskey Creek**	**10,959**	**26%**	**2,849**	**0%**	**0**	**0%**	**0**	**2,849**	**74%**	**8,110**							
210a	8	Whiskey Creek	7592.4	100%	7592.4	0%	0.0	100%	7592.4	0.0	0%	0	Road	0	Sand to Silty Sand	0.3	0.25	0.55	0
210a	9	Whiskey Creek	10291.1	80%	8232.9	60%	4939.7	40%	3293.2	0.0	20%	2,058	Employment	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
210a	10	Whiskey Creek	7588.7	80%	6070.9	60%	3642.6	40%	2428.4	0.0	20%	1,518	Employment	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
210a	11	Whiskey Creek	7934.5	80%	6347.6	60%	3808.5	40%	2539.0	0.0	20%	1,587	Employment	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
210a	12	Whiskey Creek	5520.1	80%	4416.1	60%	2649.6	40%	1766.4	0.0	20%	1,104	Employment	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
210a	13	Whiskey Creek	2901.1	80%	2320.9	60%	1392.5	40%	928.4	0.0	20%	580	Employment	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
210a	14	Whiskey Creek	17959.2	80%	14367.4	60%	8620.4	40%	5746.9	0.0	20%	3,592	Employment	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
210a	18	Whiskey Creek	7448.6	80%	5958.9	60%	3575.3	40%	2383.6	0.0	20%	1,490	Employment	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
210a	19	Whiskey Creek	8258.8	80%	6607.1	60%	3964.2	40%	2642.8	0.0	20%	1,652	Employment	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
210a	20	Whiskey Creek	2230.8	80%	1784.6	60%	1070.8	40%	713.9	0.0	20%	446	Employment	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
210a	105	Whiskey Creek	2024.8	80%	1619.9	60%	971.9	40%	647.9	0.0	20%	405	Employment	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
210a	107	Whiskey Creek	4684.8	80%	3747.9	60%	2248.7	40%	1499.1	0.0	20%	937	Employment	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
Post-Development Catchment 210a Total		**North to Whiskey Creek via SWM Facility**	**84,435**	**82%**	**69,066**	**44%**	**36,884**	**38%**	**32,182**	**0**	**18%**	**15,369**							
Post-Development Catchment 210a Total w/ MIT		**North to Whiskey Creek via SWM Facility**	**84,435**	**82%**	**69,066**	**44%**	**36,884**	**38%**	**32,182**	**0**	**18%**	**15,369**							
212b	21	Whiskey Creek	18.1	100%	18.1	0%	0.0	100%	18.1	0.0	0%	0	Road Widening	0	Sand to Silty Sand	0.3	0.25	0.55	0
Post-Development Catchment 212b Total		**North to Whiskey Creek via SWM Facility**	**18**	**100%**	**18**	**0%**	**0**	**100%**	**18**	**0**	**0%**	**0**							
Post-Development Catchment 212b Total w/		**North to Whiskey Creek via SWM Facility**	**18**	**100%**	**18**	**0%**	**0**	**100%**	**18**	**0**	**0%**	**0**							
214a	17	Whiskey Creek	12766.0	100%	12766.0	0%	0.0	100%	12766.0	0.0	0%	0	Road Widening	0	Sand to Silty Sand	0.3	0.25	0.55	0
214a	104	Whiskey Creek	317.7	100%	317.7	0%	0.0	100%	317.7	0.0	0%	0	Road Widening	0	Sand to Silty Sand	0.3	0.25	0.55	0
Post-Development Catchment 214a Total		**North to Whiskey Creek via SWM Facility**	**13,084**	**100%**	**13,084**	**0%**	**0**	**100%**	**13,084**	**0**	**0%**	**0**							
314	49	Whiskey Creek	661.1	20%	132.2	0%	0.0	100%	132.2	0.0	80%	529	Hydro Easement	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
314	50	Whiskey Creek	4260.7	75%	3195.5	60%	1917.3	40%	1278.2	0.0	25%	1,065	Semi Detached	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6
Post-Development Catchment 314 Total		**North to Whiskey Creek**	**4,922**	**68%**	**3,328**	**39%**	**1,917**	**29%**	**1,410**	**0**	**32%**	**1,594**							
333c	16	Bryne Dr Extension	46.0	100%	46.0	0%	0.0	100%	46.0	0.0	0%	0	Future ROW	0	Sand to Silty Sand	0.3	0.25	0.55	0
Post-Development Catchment 333c Total		**Storm Sewer via Bryne Dr Extension**	**46**	**100%**	**46**	**0%**	**0**	**100%**	**46**	**0**	**0%**	**0**							
Post-Development Catchment 333c Total w/MIT		**Storm Sewer via Bryne Dr Extension**	**46**	**100%**	**46**	**0%**	**0**	**100%**	**46**	**0**	**0%**	**0**							
334	45	Bryne Dr Extension	10116.2	100%	10116.2	0%	0.0	100%	10116.2	0.0	0%	0	Future ROW	0	Sand to Silty Sand	0.3	0.25	0.55	0
Post-Development Catchment 334 Total		**Storm Sewer via Bryne Dr Extension**	**10,116**	**100%**	**10,116**	**0%**	**0**	**100%**	**10,116**	**0**	**0%**	**0**							
Total Site			**222,740**	**74%**	**165,076**	**29%**	**65,685**	**43%**	**96,541**	**2,849**	**26%**	**57,664**							
Total Site w/MIT			**222,740**	**74%**	**165,076**	**29%**	**65,685**	**43%**	**96,541**	**2,849**	**26%**	**57,664**							

On-Site Catchment Designation	Subcatchment ID	Inputs: Precipitation Annual Average	Precipitation Surplus (Pervious)	Precipitation Surplus (Impervious)	Run-on	Total Inputs	Outputs: Evapotranspiration Pervious	Evapotranspiration Impervious	Total Evapotranspiration	Infiltration Pervious Areas	SWM Infiltration	Total Infiltration	Runoff Pervious	Runoff Building	Runoff Road/ Driveway/ Amenities	Runoff Other Impervious	Total Impervious		Total Runoff		Total Outputs	
		(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)
201a	48	228	0	206	0	228	0	23	23	0	0	0	0	0	206	0	840	206	840	206	933	228
201a	55	828	275	149	0	828	388	17	404	165	0	165	110	0	149	0	168	149	292	259	933	828
201a	56	5,101	529	3,443	0	5,101	747	383	1,129	317	0	317	211	2,066	1,377	0	630	3,443	668	3,655	933	5,101
201a	57	220	73	40	0	220	103	4	107	44	0	44	29	0	40	0	168	40	292	69	933	220
201a	58	13	1	8	0	13	2	1	3	1	0	1	1	5	3	0	630	8	668	9	933	13
201a	59	4,041	1,340	727	0	4,041	1,893	81	1,973	804	0	804	536	0	727	0	168	727	292	1,264	933	4,041
201a	60	1,198	124	809	0	1,198	175	90	265	75	0	75	50	485	324	0	630	809	668	859	933	1,198
201a	61	358	37	242	0	358	52	27	79	22	0	22	15	145	97	0	630	242	668	256	933	358
201a	62	1,154	120	779	0	1,154	169	87	256	72	0	72	48	468	312	0	630	779	668	827	933	1,154
201a	63	1,154	120	779	0	1,154	169	87	256	72	0	72	48	468	312	0	630	779	668	827	933	1,154
201a	64	853	88	576	0	853	125	64	189	53	0	53	35	346	230	0	630	576	668	611	933	853
201a	65	1,054	109	711	0	1,054	154	79	233	66	0	66	44	427	284	0	630	711	668	755	933	1,054
201a	66	1,439	149	971	0	1,439	211	108	319	89	0	89	60	583	389	0	630	971	668	1,031	933	1,439
201a	67	1,403	145	947	0	1,403	205	105	310	87	0	87	58	568	379	0	630	947	668	1,005	933	1,403
201a	68	55	6	37	0	55	8	4	12	3	0	3	2	22	15	0	630	37	668	40	933	55
201a	69	1,097	114	741	0	1,097	161	82	243	68	0	68	45	444	296	0	630	741	668	786	933	1,097
201a	70	1,154	120	779	0	1,154	169	87	255	72	0	72	48	467	312	0	630	779	668	827	933	1,154
201a	71	1,154	120	779	0	1,154	169	87	256	72	0	72	48	468	312	0	630	779	668	827	933	1,154
201a	72	1,208	125	816	0	1,208	177	91	267	75	0	75	50	489	326	0	630	816	668	866	933	1,208
201a	73	1,239	128	836	0	1,239	181	93	274	77	0	77	51	502	335	0	630	836	668	888	933	1,239
201a	74	1,154	120	779	0	1,154	169	87	256	72	0	72	48	468	312	0	630	779	668	827	933	1,154
201a	75	1,154	120	779	0	1,154	169	87	256	72	0	72	48	468	312	0	630	779	668	827	933	1,154
201a	76	1,191	123	804	0	1,191	174	89	264	74	0	74	49	482	322	0	630	804	668	854	933	1,191
201a	77	1,191	123	804	0	1,191	174	89	264	74	0	74	49	482	322	0	630	804	668	854	933	1,191
201a	111	18	2	12	0	18	3	1	4	1	0	1	1	7	5	0	630	12	668	13	933	18
201a	112	76	8	51	0	76	11	6	17	5	0	5	3	31	20	0	630	51	668	54	933	76
201a	113	18,988	0	17,089	0	18,988	0	1,899	1,899	0	0	0	0	0	17,089	0	840	17,089	840	17,089	933	18,988
201a	121	196	16	141	0	196	23	16	39	10	0	10	7	85	56	0	672	141	703	148	933	196
Post-Development Catchment 201a Total		**48,922**		**34,836**	**0**	**48,922**	**5,980**	**3,871**	**9,851**	**2,541**	**0**	**2,541**	**1,694**	**9,975**	**24,861**	**0**	**664**	**34,836**	**697**	**36,530**	**933**	**48,922**
203	46	1,839	152	1,324	0	1,839	215	147	362	91	0	91	61	794	530	0	672	1,324	703	1,385	933	1,839
203	51	13,292	1,102	9,570	0	13,292	1,556	1,063	2,619	661	0	661	441	5,742	3,828	0	672	9,570	703	10,011	933	13,292
Post-Development Catchment 203 Total		**15,130**		**10,894**	**0**	**15,130**	**1,771**	**1,210**	**2,982**	**753**	**0**	**753**	**502**	**6,536**	**4,357**	**0**	**672**	**10,894**	**703**	**11,395**	**933**	**15,130**
204a	47	267	22	192	0	267	31	21	53	13	0	13	9	115	77	0	672	192	703	201	933	267
204a	52	13,757	1,141	9,905	0	13,757	1,611	1,101	2,711	684	0	684	456	5,943	3,962	0	672	9,905	703	10,362	933	13,757
Post-Development Catchment 204a Total		**14,024**	**1,163**	**10,097**	**0**	**14,024**	**1,642**	**1,122**	**2,764**	**698**	**0**	**698**	**465**	**6,058**	**4,039**	**0**	**672**	**10,097**	**703**	**10,563**	**933**	**14,024**
205b	53	341	113	61	0	341	160	7	166	68	0	68	45	0	61	0	168	61	292	107	933	341
205b	54	5	0	3	0	5	1	0	1	0	0	0	0	2	1	0	630	3	668	3	933	5
Post-Development Catchment 205b Total		**346**	**114**	**65**	**0**	**346**	**160**	**7**	**167**	**68**	**0**	**68**	**45**	**2**	**63**	**0**	**174**	**65**	**297**	**110**	**933**	**346**
Post-Development Catchment 205b Total w/MIT		**346**	**114**	**65**	**0**	**346**	**160**	**7**	**167**	**68**	**88**	**156**	**45**	**2**	**63**	**0**	**174**	**65**	**59**	**22**	**933**	**346**
208	6	14,084	5,688	0	0	14,084	8,396	0	8,396	3,982	0	3,982	1,707	0	0	0	0	0	113	1,707	933	14,084
Post-Development Catchment 208 Total		**14,084**	**5,688**	**0**	**0**	**14,084**	**8,396**	**0**	**8,396**	**3,982**	**0**	**3,982**	**1,707**	**0**	**0**	**0**	**0**	**0**	**113**	**1,707**	**933**	**14,084**
209	7	8,221	2,522	556	0	8,221	3,561	1,582	5,143	1,513	0	1,513	1,009	0	0	556	63	556	178	1,565	933	8,221
209	106	2,003	615	135	0	2,003	868	385	1,253	369	0	369	246	0	0	135	63	135	178	381	933	2,003
Post-Development Catchment 209 Total		**10,224**	**3,137**	**691**	**0**	**10,224**	**4,429**	**1,967**	**6,396**	**1,882**	**0**	**1,882**	**1,255**	**0**	**0**	**691**	**63**	**691**	**178**	**1,946**	**933**	**10,224**
210a	8	7,083	0	6,375	0	7,083	0	708	708	0	0	0	0	0	6,375	0	840	6,375	840	6,375	933	7,083
210a	9	9,601	796	6,912	0	9,601	1,124	768	1,892	478	0	478	318	4,147	2,765	0	672	6,912	703	7,231	933	9,601
210a	10	7,079	587	5,097	0	7,079	829	566	1,395	352	0	352	235	3,058	2,039	0	672	5,097	703	5,332	933	7,079
210a	11	7,402	614	5,329	0	7,402	867	592	1,459	368	0	368	246	3,198	2,132	0	672	5,329	703	5,575	933	7,402
210a	12	5,150	427	3,708	0	5,150	603	412	1,015	256	0	256	171	2,225	1,483	0	672	3,708	703	3,879	933	5,150
210a	13	2,706	224	1,949	0	2,706	317	217	533	135	0	135	90	1,169	779	0	672	1,949	703	2,038	933	2,706
210a	14	16,754	1,389	12,063	0	16,754	1,962	1,340	3,302	834	0	834	556	7,238	4,825	0	672	12,063	703	12,619	933	16,754
210a	18	6,949	576	5,003	0	6,949	814	556	1,369	346	0	346	230	3,002	2,001	0	672	5,003	703	5,234	933	6,949
210a	19	7,705	639	5,547	0	7,705	902	616	1,518	383	0	383	256	3,328	2,219	0	672	5,547	703	5,803	933	7,705
210a	20	2,081	173	1,498	0	2,081	244	166	410	104	0	104	69	899	599	0	672	1,498	703	1,567	933	2,081
210a	105	1,889	157	1,360	0	1,889	221	151	372	94	0	94	63	816	544	0	672	1,360	703	1,423	933	1,889
210a	107	4,370	362	3,147	0	4,370	512	350	861	217	0	217	145	1,888	1,259	0	672	3,147	703	3,292	933	4,370
Post-Development Catchment 210a Total		**78,769**	**5,944**	**57,989**	**0**	**78,769**	**8,393**	**6,443**	**14,836**	**3,567**	**0**	**3,567**	**2,378**	**30,969**	**27,020**	**0**	**687**	**57,989**	**715**	**60,367**	**933**	**78,769**
Post-Development Catchment 210a Total w/ MIT		**78,769**	**5,944**	**57,989**	**0**	**78,769**	**8,393**	**6,443**	**14,836**	**3,567**	**48,293**	**51,860**	**2,378**	**30,969**	**27,020**	**0**	**687**	**57,989**	**143**	**12,073**	**933**	**78,769**
212b	21	17	0	15	0	17	0	2	2	0	0	0	0	0	15	0	840	15	840	15	933	17
Post-Development Catchment 212b Total		**17**	**0**	**15**	**0**	**17**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**0**	**15**	**0**	**840**	**15**	**840**	**15**	**933**	**17**
Post-Development Catchment 212b Total w/		**17**	**0**	**15**	**0**	**17**	**0**	**2**	**2**	**0**	**12**	**12**	**0**	**0**	**15**	**0**	**840**	**15**	**168**	**3**	**933**	**17**
214a	17	11,909	0	10,718	0	11,909	0	1,191	1,191	0	0	0	0	0	10,718	0	840	10,718	840	10,718	933	11,909
214a	104	296	0	267	0	296	0	30	30	0	0	0	0	0	267	0	840	267	840	267	933	296
Post-Development Catchment 214a Total		**12,206**	**0**	**10,985**	**0**	**12,206**	**0**	**1,221**	**1,221**	**0**	**0**	**0**	**0**	**0**	**10,985**	**0**	**840**	**10,985**	**840**	**10,985**	**933**	**12,206**
314	49	617	205	111	0	617	289	12	301	123	0	123	82	0	111	0	168	111	292	193	933	617
314	50	3,975	412	2,683	0	3,975	582	298	880	247	0	247	165	1,610	1,073	0	630	2,683	668	2,848	933	3,975
Post-Development Catchment 314 Total		**4,592**	**617**	**2,794**	**0**	**4,592**	**871**	**310**	**1,181**	**370**	**0**	**370**	**247**	**1,610**	**1,184**	**0**	**568**	**2,794**	**618**	**3,041**	**933**	**4,592**
333c	16	43	0	39	0	43	0	4	4	0	0	0	0	0	39	0	840	39	840	39	933	43
Post-Development Catchment 333c Total		**43**	**0**	**39**	**0**	**43**	**0**	**4**	**4**	**0**	**0**	**0**	**0**	**0**	**39**	**0**	**840**	**39**	**840**	**39**	**933**	**43**
Post-Development Catchment 333c Total w/MIT		**43**	**0**	**39**	**0**	**43**	**0**	**4**	**4**	**0**	**31**	**31**	**0**	**0**	**39**	**0**	**840**	**39**	**168**	**8**	**933**	**43**
334	45	9,437	0	8,494	0	9,437	0	944	944	0	0	0	0	0	8,494	0	840	8,494	840	8,494	933	9,437
Post-Development Catchment 334 Total		**9,437**	**0**	**8,494**	**0**	**9,437**	**0**	**944**	**944**	**0**	**0**	**0**	**0**	**0**	**8,494**	**0**	**840**	**8,494**	**840**	**8,494**	**933**	**9,437**
Total Site		**207,794**	**16,663**	**136,898**	**0**	**207,794**	**31,642**	**17,101**	**48,743**	**13,860**	**0**	**13,860**	**8,292**	**55,150**	**81,057**	**691**	**615**	**136,898**	**652**	**145,190**	**933**	**207,794**
Total Site w/MIT		**207,794**	**16,663**	**136,898**	**0**	**207,794**	**31,642**	**17,101**	**48,743**	**13,860**	**48,424**	**62,285**	**8,292**	**55,150**	**81,057**	**691**	**615**	**136,898**	**434**	**96,766**	**933**	**207,794**

TABLE I-2 POST-DEVELOPMENT WATER BUDGET (BY CATCHMENT) - Lover's Creek Subwatershed
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
HIGHWAY 400 & HARVIE ROAD, BARRIE, ON

ANNUAL PRECIPITATION	EVAPORATION AND EVAPOTRANSPIRATION FACTORS			
	Impervious Areas		Waterbody	
mm	%	mm	%	mm
933	10%	93	74%	690

On-Site Catchment Designation	Subcatchment ID	Outlet	Total Area	Impervious						Pervious		MOE TABLE 2 Components					MOE Infiltration Factor	Adjusted MOE Infiltration Factor	Inputs					Outputs									
				Total Impervious		Assumed Buildings		Assumed Road/ Parking/ Amenities		Other Impervious	Total Pervious								Precipitation			Run-on	Total Inputs	Evapotranspiration			Infiltration		Pervious	Building	Road/ Driveway/ Amenities	Other Impervious	Runoff				Total Outputs
																			Annual Average	Surplus (Pervious)	Surplus (Impervious)			Pervious	Impervious	Total Evapotranspiration	Pervious Areas	SWM Infiltration	Total Infiltration					Total Impervious		Total Runoff		
			(m^2)	% of Total Area	(m^2)	% of Impervious Area	(m^2)	% of Impervious Area	(m^2)	(m^2)	% of Total Area	(m^2)	Cover		Soil		Topography			(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^2/yr)	(m^2/yr)	(m^2/yr)	(m^2/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^2/yr)	(m^2/yr)	(m^2/yr)	(m^2/yr)	(m^2/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)
201b	39	Whiskey Creek	466.1	75%	349.6	60%	209.7	40%	139.8	0.0	25%	117	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	435	45	293	0	435	64	33	96	27	0	27	18	176	117	0	630	293	668	312	933	435
201b	40	Whiskey Creek	682.9	75%	512.2	60%	307.3	40%	204.9	0.0	25%	171	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	637	66	430	0	637	93	48	141	40	0	40	26	258	172	0	630	430	668	456	933	637
201b	43	Whiskey Creek	593.0	75%	444.8	60%	266.9	40%	177.9	0.0	25%	148	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	553	57	373	0	553	81	41	122	34	0	34	23	224	149	0	630	373	668	396	933	553
201b	108	Whiskey Creek	67.2	100%	67.2	0%	0.0	100%	67.2	0.0	0%	0	Road	0	Sand to Silty Sand	0.3	0.25	0.55	0	63	0	56	0	63	0	6	6	0	0	0	0	0	56	0	840	56	840	56	933	63
201b	109	Whiskey Creek	613.6	100%	613.6	0%	0.0	100%	613.6	0.0	0%	0	Road	0	Sand to Silty Sand	0.3	0.25	0.55	0	572	0	515	0	572	0	57	57	0	0	0	0	0	515	0	840	515	840	515	933	572
Post-Development Catchment 201b Total		**North to Whiskey Creek via Catchment 201a**	**2,423**	**82%**	**1,987**	**32%**	**784**	**50%**	**1,203**	**0**	**18%**	**436**								**2,260**		**1,669**	**0**	**2,260**	**238**	**185**	**423**	**101**	**0**	**101**	**67**	**658**	**1,010**	**0**	**689**	**1,669**	**716**	**1,736**	**933**	**2,260**
201c	41	Whiskey Creek	1294.3	20%	258.9	0%	0.0	100%	258.9	0.0	80%	1,035	Hydro Easement	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	1,207	400	217	0	1,207	565	24	590	240	0	240	160	0	217	0	168	217	292	378	933	1,207
201c	42	Whiskey Creek	210.9	75%	158.2	60%	94.9	40%	63.3	0.0	25%	53	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	197	20	133	0	197	29	15	44	12	0	12	8	80	53	0	630	133	668	141	933	197
201c	110	Whiskey Creek	8.4	100%	8.4	0%	0.0	100%	8.4	0.0	0%	0	Road	0	Sand to Silty Sand	0.3	0.25	0.55	0	8	0	7	0	8	0	1	1	0	0	0	0	0	7	0	840	7	840	7	933	8
Post-Development Catchment 201c Total		**North to Whiskey Creek via Catchment 201a**	**1,514**	**28%**	**425**	**6%**	**95**	**22%**	**331**	**0**	**72%**	**1,088**								**1,412**		**357**	**0**	**1,412**	**594**	**40**	**634**	**253**	**0**	**253**	**168**	**80**	**278**	**0**	**236**	**357**	**347**	**526**	**933**	**1,412**
202	22	Lover's Creek	3624.6	75%	2718.5	60%	1631.1	40%	1087.4	0.0	25%	906	Semi Detached	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	3,381	350	2,282	0	3,381	495	254	748	210	0	210	140	1,369	913	0	630	2,282	668	2,423	933	3,381
202	23	Lover's Creek	460.0	75%	345.0	60%	207.0	40%	138.0	0.0	25%	115	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	429	44	290	0	429	63	32	95	27	0	27	18	174	116	0	630	290	668	307	933	429
202	24	Lover's Creek	2296.4	20%	459.3	0%	0.0	100%	459.3	0.0	80%	1,837	Hydro Easement	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	2,142	711	386	413	2,555	1,003	43	1,046	624	0	624	416	0	468	0	204	468	385	884	1,113	2,555
202	25	Lover's Creek	5828.7	75%	4371.5	60%	2622.9	40%	1748.6	0.0	25%	1,457	Semi Detached	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	5,438	564	3,670	0	5,438	796	408	1,204	338	0	338	225	2,202	1,468	0	630	3,670	668	3,896	933	5,438
202	26	Lover's Creek	679.8	75%	509.9	60%	305.9	40%	204.0	0.0	25%	170	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	634	66	428	0	634	93	48	140	39	0	39	26	257	171	0	630	428	668	454	933	634
202	27	Lover's Creek	6085.6	100%	6085.6	0%	0.0	100%	6085.6	0.0	0%	0	Road	0	Sand to Silty Sand	0.3	0.25	0.55	0	5,677	0	5,110	0	5,677	0	568	568	0	0	0	0	0	5,110	0	840	5,110	840	5,110	933	5,677
202	28	Lover's Creek	851.3	75%	638.5	60%	383.1	40%	255.4	0.0	25%	213	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	794	82	536	0	794	116	60	176	49	0	49	33	322	214	0	630	536	668	569	933	794
202	29	Lover's Creek	1072.5	75%	804.4	60%	482.6	40%	321.7	0.0	25%	268	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	1,001	104	675	0	1,001	146	75	221	62	0	62	41	405	270	0	630	675	668	717	933	1,001
202	30	Lover's Creek	1072.5	75%	804.4	60%	482.6	40%	321.7	0.0	25%	268	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	1,001	104	675	0	1,001	146	75	221	62	0	62	41	405	270	0	630	675	668	717	933	1,001
202	31	Lover's Creek	1240.6	75%	930.4	60%	558.3	40%	372.2	0.0	25%	310	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	1,157	120	781	0	1,157	169	87	256	72	0	72	48	469	312	0	630	781	668	829	933	1,157
202	32	Lover's Creek	1391.5	75%	1043.6	60%	626.2	40%	417.4	0.0	25%	348	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	1,298	135	876	0	1,298	190	97	287	81	0	81	54	526	350	0	630	876	668	930	933	1,298
202	117	Lover's Creek	216.6	26%	56.3	0%	0.0	0%	0.0	56.3	74%	160	SWMP	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	202	62	14	0	202	88	39	126	37	0	37	25	0	0	14	63	14	178	38	933	202
Post-Development Catchment 202 Total		**East to Lover's Creek via SWM Facility**	**24,820**	**76%**	**18,767**	**29%**	**7,300**	**46%**	**11,411**	**56**	**24%**	**6,053**								**23,154**	**2,341**	**15,724**	**413**	**23,567**	**3,305**	**1,784**	**5,090**	**1,603**	**0**	**1,603**	**1,068**	**6,129**	**9,664**	**14**	**637**	**15,806**	**680**	**16,874**	**950**	**23,567**
Post-Development Catchment 202 Total w/MIT		**East to Lover's Creek via SWM Facility**	**24,820**	**76%**	**18,767**	**29%**	**7,300**	**46%**	**11,411**	**56**	**24%**	**6,053**								**23,154**	**2,341**	**15,724**	**413**	**23,567**	**3,305**	**1,784**	**5,090**	**1,603**	**13,500**	**15,102**	**1,068**	**6,129**	**9,664**	**14**	**637**	**15,806**	**136**	**3,375**	**950**	**23,567**
204b	33	Whiskey Creek	2129.9	80%	1703.9	60%	1022.3	40%	681.6	0.0	20%	426	Ndrise Residenti	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	1,987	165	1,431	0	1,987	233	159	392	99	0	99	66	858	572	0	672	1,431	703	1,497	933	1,987
Post-Development Catchment 204b Total		**North to Whiskey Creek via Catchment 204a**	**2,130**	**80%**	**1,704**	**48%**	**1,022**	**32%**	**682**	**0**	**20%**	**426**								**1,987**	**165**	**1,431**	**0**	**1,987**	**233**	**159**	**392**	**99**	**0**	**99**	**66**	**858**	**572**	**0**	**672**	**1,431**	**703**	**1,497**	**933**	**1,987**
205a	36	Lover's Creek	6956.8	20%	1391.4	0%	0.0	100%	1391.4	0.0	80%	5,565	Park	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	6,490	2,153	1,168	0	6,490	3,039	130	3,169	1,292	0	1,292	861	0	1,168	0	168	1,168	292	2,029	933	6,490
205a	37	Lover's Creek	668.5	75%	501.4	60%	300.8	40%	200.6	0.0	25%	167	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	624	65	421	0	624	91	47	138	39	0	39	26	253	168	0	630	421	668	447	933	624
205a	38	Lover's Creek	291.3	75%	218.5	60%	131.1	40%	87.4	0.0	25%	73	Townhouses	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	272	28	183	0	272	40	20	60	17	0	17	11	110	73	0	630	183	668	195	933	272
Post-Development Catchment 205a Total		**East to Lover's Creek via SWM Facility**	**7,917**	**27%**	**2,111**	**5%**	**432**	**21%**	**1,679**	**0**	**73%**	**5,805**								**7,385**	**2,245**	**1,773**	**0**	**7,385**	**3,170**	**197**	**3,367**	**1,347**	**0**	**1,347**	**898**	**363**	**1,410**	**0**	**224**	**1,773**	**337**	**2,671**	**933**	**7,385**
Post-Development Catchment 205a Total w/MIT		**East to Lover's Creek via SWM Facility**	**7,917**	**27%**	**2,111**	**5%**	**432**	**21%**	**1,679**	**0**	**73%**	**5,805**								**7,385**	**2,245**	**1,773**	**0**	**7,385**	**3,170**	**197**	**3,367**	**1,347**	**2,137**	**3,484**	**898**	**363**	**1,410**	**0**	**224**	**1,773**	**67**	**534**	**933**	**7,385**
206	35	Lover's Creek	5416.4	26%	1408.3	0%	0.0	0%	0.0	1408.3	74%	4,008	SWMP	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	5,053	1,550	342	0	5,053	2,189	972	3,161	930	0	930	620	0	0	342	63	342	178	962	933	5,053
206	101	Lover's Creek	999.5	26%	259.9	0%	0.0	0%	0.0	259.9	74%	740	SWMP	0.05	Sand to Silty Sand	0.3	0.15	0.5	0.5	932	286	63	0	932	404	179	583	143	0	143	143	0	0	63	63	63	206	206	933	932
Post-Development Catchment 206 Total		**East to Lover's Creek**	**6,416**	**26%**	**1,668**	**0%**	**0**	**0%**	**0**	**1,668**	**74%**	**4,748**								**5,985**	**1,836**	**405**	**0**	**5,985**	**2,993**	**1,152**	**3,744**	**1,073**	**0**	**1,073**	**763**	**0**	**0**	**405**	**63**	**405**	**182**	**1,168**	**933**	**5,985**
Post-Development Catchment 206 Total w/ MIT		**East to Lover's Creek**	**6,416**	**26%**	**1,668**	**0%**	**0**	**0%**	**0**	**1,668**	**74%**	**4,748**								**5,985**	**1,836**	**405**	**0**	**5,985**	**2,993**	**1,152**	**3,744**	**1,073**	**934**	**2,007**	**763**	**0**	**0**	**405**	**63**	**405**	**36**	**234**	**933**	**5,985**
207a	97	Lover's Creek	1930.1	0%	0.0	0%	0.0	0%	0.0	0.0	100%	1,930	Open Space	0.15	Sand to Silty Sand	0.3	0.15	0.6	0.6	1,801	727	0	228	2,029	1,073	0	1,073	573	0	573	382	0	0	0	0	0	198	382	1,051	2,029
207a	99	Lover's Creek	7.2	20%	1.4	0%	0.0	100%	1.4	0.0	80%	6	Park	0.05	Sand to Silty Sand	0.3	0.15	0.5	0.5	7	2	1	0	7	3	0	3	1	0	1	1	0	1	0	168	1	323	2	933	7
207a	118	Lover's Creek	1549.6	0%	0.0	0%	0.0	0%	0.0	0.0	100%	1,550	Open Space	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	1,446	584	0	0	1,446	862	0	862	409	0	409	175	0	0	0	0	0	113	175	933	1,446
207a	119	Lover's Creek	676.0	0%	0.0	0%	0.0	0%	0.0	0.0	100%	676	Open Space	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	631	255	0	0	631	376	0	376	178	0	178	76	0	0	0	0	0	113	76	933	631
207a	120	Lover's Creek	2573.9	0%	0.0	0%	0.0	0%	0.0	0.0	100%	2,574	Open Space	0.15	Sand to Silty Sand	0.3	0.15	0.6	0.6	2,401	970	0	0	2,401	1,431	0	1,431	582	0	582	388	0	0	0	0	0	151	388	933	2,401
Post-Development Catchment 207a Total		**East to Lover's Creek**	**6,737**	**0%**	**1**	**0%**	**0**	**0%**	**1**	**0**	**100%**	**6,735**								**6,285**	**2,538**	**1**	**228**	**6,513**	**3,746**	**0**	**3,746**	**1,743**	**0**	**1,743**	**1,023**	**0**	**1**	**0**	**0**	**1**	**152**	**1,024**	**967**	**6,513**
210b	89	Whiskey Creek	16717.2	80%	13373.8	60%	8024.3	40%	5349.5	0.0	20%	3,343	Employment	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	15,595	1,293	11,229	0	15,595	1,826	1,248	3,074	776	0	776	517	6,737	4,492	0	672	11,229	703	11,746	933	15,595
Post-Development Catchment 210b Total		**North to Whiskey Creek via Catchment 210a**	**16,717**	**80%**	**13,374**	**48%**	**8,024**	**32%**	**5,350**	**0**	**20%**	**3,343**								**15,595**	**1,293**	**11,229**	**0**	**15,595**	**1,826**	**1,248**	**3,074**	**776**	**0**	**776**	**517**	**6,737**	**4,492**	**0**	**672**	**11,229**	**703**	**11,746**	**933**	**15,595**
Post-Development Catchment 210b Total		**North to Whiskey Creek via Catchment 210a**	**16,717**	**80%**	**13,374**	**48%**	**8,024**	**32%**	**5,350**	**0**	**20%**	**3,343**								**15,595**	**1,293**	**11,229**	**0**	**15,595**	**1,826**	**1,248**	**3,074**	**776**	**9,397**	**10,173**	**517**	**6,737**	**4,492**	**0**	**672**	**11,229**	**141**	**2,349**	**933**	**15,595**
212a	3	Lover's Creek	2700.0	100%	2700.0	0%	0.0	100%	2700.0	0.0	0%	0	Road Widening	0	Sand to Silty Sand	0.3	0.25	0.55	0	2,519	0	2,267	0	2,519	0	252	252	0	0	0	0	0	2,267	0	840	2,267	840	2,267	933	2,519
212a	4	Lover's Creek	3337.8	0%	0.0	0%	0.0	0%	0.0	0.0	100%	3,338	Open Space	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	3,114	1,258	0	0	3,114	1,856	0	1,856	880	0	880	377	0	0	0	0	0	113	377	933	3,114
212a	92	Lover's Creek	2636.7	100%	2636.7	0%	0.0	100%	2636.7	0.0	0%	0	Road Widening	0	Sand to Silty Sand	0.3	0.25	0.55	0	2,460	0	2,214	0	2,460	0	246	246	0	0	0	0	0	2,214	0	840	2,214	840	2,214	933	2,460
212a	93	Lover's Creek	4119.7	0%	0.0	0%	0.0	0%	0.0	0.0	100%	4,120	Open Space	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	3,843	1,552	0	0	3,843	2,291	0	2,291	1,087	0	1,087	466	0	0	0	0	0	113	466	933	3,843
212a	95	Lover's Creek	1851.4	100%	1851.4	0%	0.0	100%	1851.4	0.0	0%	0	Road Widening	0	Sand to Silty Sand	0.3	0.15	0.45	0	1,727	0	1,554	0	1,727	0	173	173	0	0	0	0	0	1,554	0	840	1,554	840	1,554	933	1,727
212a	114	Lover's Creek	9416.3	0%	0.0	0%	0.0	0%	0.0	0.0	100%	9,416	Open Space	0.15	Sand to Silty Sand	0.3	0.15	0.6	0.6	8,784	3,548	0	0	8,784	5,237	0	5,237	2,129	0	2,129	1,419	0	0	0	0	0	151	1,419	933	8,784
Post-Development Catchment 212a Total		**Lover's Creek**	**24,062**	**30%**	**7,188**	**0%**	**0**	**30%**	**7,188**	**0**	**70%**	**16,874**								**22,447**	**6,358**	**6,035**	**0**	**22,447**	**9,384**	**671**	**10,054**	**4,096**	**0**	**4,096**	**2,262**	**0**	**6,035**	**0**	**251**	**6,035**	**345**	**8,297**	**933**	**22,447**
213	1	Lover's Creek	27203.3	80%	21762.6	60%	13057.6	40%	8705.0	0.0	20%	5,441	Employment	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	25,378	2,104	18,272	10,903	36,281	2,971	2,030	5,001	2,571	0	2,571	1,714	16,197	10,798	0	992	26,994	1,055	28,708	1,334	36,281
Post-Development Catchment 213 Total		**North to Lover's Creek**	**27,203**	**80%**	**21,763**	**48%**	**13,058**	**32%**	**8,705**	**0**	**20%**	**5,441**								**25,378**	**2,104**	**18,272**	**10,903**	**36,281**	**2,971**	**2,030**	**5,001**	**2,571**	**0**	**2,571**	**1,714**	**16,197**	**10,798**	**0**	**992**	**26,994**	**1,055**	**28,708**	**1,334**	**36,281**
Post-Development Catchment 213 Total w/MIT		**North to Lover's Creek**	**27,203**	**80%**	**21,763**	**48%**	**13,058**	**32%**	**8,705**	**0**	**20%**	**5,441**								**25,378**	**2,104**	**18,272**	**10,903**	**36,281**	**2,971**	**2,030**	**5,001**	**2,571**	**22,967**	**25,538**	**1,714**	**16,197**	**10,798**	**0**	**992**	**26,994**	**211**	**5,742**	**1,334**	**36,281**
214b	88	Whiskey Creek	106.9	100%	106.9	0%	0.0	100%	106.9	0.0	0%	0	Road Widening	0	Sand to Silty Sand	0.3	0.25	0.55	0	100	0	90	0	100	0	10	10	0	0	0	0	0	90	0	840	90	840	90	933	100
Post-Development Catchment 214b Total		**North to Whiskey Creek via Catchment 214a**	**107**	**100%**	**107**	**0%**	**0**	**100%**	**107**	**0**	**0%**	**0**								**100**	**0**	**90**	**0**	**100**	**0**	**10**	**10**	**0**	**0**	**0**	**0**	**0**	**90**	**0**	**840**	**90**	**840**	**90**	**933**	**100**
332a	5	Bryne Rd Extension	2700.0	100%	2700.0	0%	0.0	100%	2700.0	0.0	0%	0	Future ROW	0	Sand to Silty Sand	0.3	0.25	0.55	0	2,519	0	2,267	314	2,832	0	252	252	0	0	0	0	0	2,581	0	956	2,581	956	2,581	1,049	2,832
332a	102	Bryne Rd Extension	1867.8	100%	1867.8	0%	0.0	100%	1867.8	0.0	0%	0	Future ROW	0	Sand to Silty Sand	0.3	0.15	0.45	0	1,742	0	1,568	0	1,742	0	174	174	0	0	0	0	0	1,568	0	840	1,568	840	1,568	933	1,742
Post-Development Catchment 332a Total		**Storm Sewer via Bryne Rd Extension**	**4,568**	**100%**	**4,568**	**0%**	**0**	**100%**	**4,568**	**0**	**0%**	**0**								**4,261**	**0**	**3,835**	**314**	**4,575**	**0**	**426**	**426**	**0**	**0**	**0**	**0**	**0**	**4,149**	**0**	**908**	**4,149**	**908**	**4,149**	**1,002**	**4,575**
332b	34	Bryne Rd Extension	124.0	100%	124.0	0%	0.0	100%	124.0	0.0	0%	0	Future Road	0	Sandy to Silty Sand	0.3	0.25	0.55	0	116	0	104	0	116	0	12	12	0	0	0	0	0	104	0	840	104	840	104	933	116
332b	96	Bryne Rd Extension	207.8	100%	207.8	0%	0.0	100%	207.8	0.0	0%	0	Future Road	0	Sandy to Silty Sand	0.3	0.15	0.45	0	194	0	174	0	194	0	19	19	0	0	0	0	0	174	0	840	174	840	174	933	194
332b	100	Bryne Rd Extension	1605.7	100%	1605.7	0%	0.0	100%	1605.7	0.0	0%	0	Future Road	0	Sandy to Silty Sand	0.3	0.15	0.45	0	1,498	0	1,348	0	1,498	0	150	150	0	0	0	0	0	1,348	0	840	1,348	840	1,348	933	1,498
Post-Development Catchment 332b Total		**Storm Sewer via Bryne Rd Extension**	**1,937**	**100%**	**1,937**	**0%**	**0**	**100%**	**1,937**	**0**	**0%**	**0**								**1,807**	**0**	**1,627**	**0**	**1,807**	**0**	**181**	**181**	**0**	**0**	**0**	**0**	**0**	**1,627**	**0**	**840**	**1,627**	**840**	**1,627**	**933**	**1,807**
333a	44	Bryne Rd Extension	3253.2	100%	3253.2	0%	0.0	100%	3253.2	0.0	0%	0	Future ROW	0	Sand to Silty Sand	0.3	0.25	0.55	0	3,035	0	2,731	0	3,035	0	303	303	0	0	0	0	0	2,731	0	840	2,731	840	2,731	933	3,035
333a	98	Bryne Rd Extension	521.1	100%	521.1	0%	0.0	100%	521.1	0.0	0%	0	Future ROW	0	Sand to Silty Sand	0.3	0.15	0.45	0	486	0	438	0	486	0	49	49	0	0	0	0	0	438	0	840	438	840	438	933	486
Post-Development Catchment 333a Total		**Storm Sewer via Bryne Rd Extension**	**3,774**	**100%**	**3,774**	**0%**	**0**	**100%**	**3,774**	**0**	**0%**	**0**								**3,521**	**0**	**3,169**	**0**	**3,521**	**0**	**352**	**352**	**0**	**0**	**0**	**0**	**0**	**3,169**	**0**	**840**	**3,169**	**840**	**3,169**	**933**	**3,521**
333b	2	Bryne Rd Extension	91.2	100%	91.2	0%	0.0	100%	91.2	0.0	0%	0	Future ROW	0	Sand to Silty Sand	0.3	0.25	0.55	0	85	0	77	0	85	0	9	9	0	0	0	0	0	77	0	840	77	840	77	933	85
333b	91	Bryne Rd Extension	524.9	100%	524.9	0%	0.0	100%	524.9	0.0	0%	0	Future ROW	0	Sand to Silty Sand	0.3	0.25	0.55	0	490	0	441	0	490	0	49	49	0	0	0	0	0	441	0	840	441	840	441	933	490
333b	94	Bryne Rd Extension	358.9	100%	358.9	0%	0.0	100%	358.9	0.0	0%	0	Future ROW	0	Sand to Silty Sand	0.3	0.15	0.45	0	335	0	301	0	335	0	33	33	0	0	0	0	0	301	0	840	301	840	301	933	335
Post-Development Catchment 333 Total		**Storm Sewer via Bryne Rd Extension**	**975**	**100%**	**975**	**0%**	**0**	**100%**	**975**	**0**	**0%**	**0**								**910**	**0**	**819**	**0**	**910**	**0**	**91**	**91**	**0**	**0**	**0**	**0**	**0**	**819**	**0**	**840**	**819**	**840**	**819**	**933**	**910**
Total Site			**131,299**	**61%**	**80,351**	**23%**	**30,715**	**36%**	**47,912**	**1,724**	**39%**	**50,949**								**122,489**	**18,881**	**66,434**	**11,857**	**134,347**	**28,060**	**8,525**	**36,585**	**13,662**	**0**	**13,662**	**8,548**	**31,022**	**44,112**	**418**	**575**	**75,552**	**641**	**84,100**	**1,023**	**134,347**
Total Site w/ MIT			**131,299**	**61%**	**80,351**	**23%**	**30,715**	**36%**	**47,912**	**1,724**	**39%**	**50,949**								**122,489**	**18,881**	**66,434**	**11,857**	**134,347**	**28,060**	**8,525**	**36,585**	**13,662**	**48,934**	**62,595**	**8,548**	**31,022**	**44,112**	**418**	**575**	**75,552**	**268**	**35,166**	**1,023**	**134,347**

TABLE I-2 POST-DEVELOPMENT WATER BUDGET (BY CATCHMENT) - Lover's Creek Subwatershed
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
HIGHWAY 400 & HARVIE ROAD, BARRIE, ON

ANNUAL PRECIPITATION	EVAPORATION AND EVAPOTRANSPIRATION FACTORS			
	Impervious Areas		Waterbody	
mm	%	mm	%	mm
933	10%	93	74%	690

																		Inputs												Outputs											
																		Precipitation					Evapotranspiration			Infiltration					Runoff										
On-Site Catchment Designation	Subcatchment ID	Outlet	Total Area	Impervious						Pervious		MOE TABLE 2 Components			MOE Infiltration Factor	Adjusted MOE Infiltration Factor	Annual Average	Surplus (Pervious)	Surplus (Impervious)	Run-on	Total Inputs	Pervious	Impervious	Total Evapotranspiration	Pervious Areas	SWM Infiltration	Total Infiltration	Pervious	Building	Road/ Driveway/ Amenities	Other Impervious	Total Impervious		Total Runoff		Total Outputs	
				Total Impervious		Assumed Buildings		Assumed Road/ Parking/ Amenities	Other Impervious	Total Pervious																													
				% of Total Area		% of Impervious Area		% of Impervious Area		% of Total Area		Cover	Soil	Topography																										
			(m^2)		(m^2)		(m^2)		(m^2)		(m^2)						(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^2/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)
External Areas																																							
207b	80	Lover's Creek	2020.6	0%	0.0	0%	0.0	0%	0.0	0.0	100%	2,021	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	1,885	761	0	0	1,885	1,124	0	1,124	533	0	533	228	0	0	0	0	0	113	228	933	1,885
Post-Development Catchment 207bTotal		**North to Lover's Creek via Catchment 207a**	**2,021**	**0%**	**0**	**0%**	**0**	**0%**	**0**	**0**	**100%**	**2,021**								**1,885**	**761**	**0**	**0**	**1,885**	**1,124**	**0**	**1,124**	**533**	**0**	**533**	**228**	**0**	**0**	**0**	**0**	**0**	**113**	**228**	**933**	**1,885**
216	78	Lover's Creek	764.1	0%	0.0	0%	0.0	0%	0.0	0.0	100%	764	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	713	288	0	0	713	425	0	425	202	0	202	86	0	0	0	0	0	113	86	933	713
216	82	Lover's Creek	1146.3	100%	1146.3	100%	1146.3	0%	0.0	0.0	0%	0	Building	0	Sand to Silty Sand	0.3	0.25	0.55	0	1,069	0	962	0	1,069	0	107	107	0	0	0	0	962	0	0	840	962	840	962	933	1,069
216	83	Lover's Creek	5288.4	100%	5288.4	0%	0.0	100%	5288.4	0.0	0%	0	Pavement	0	Sand to Silty Sand	0.3	0.25	0.55	0	4,934	0	4,440	0	4,934	0	493	493	0	0	0	0	0	4,440	0	840	4,440	840	4,440	933	4,934
216	84	Lover's Creek	3444.7	100%	3444.7	0%	0.0	100%	3444.7	0.0	0%	0	Pavement	0	Sand to Silty Sand	0.3	0.25	0.55	0	3,214	0	2,892	0	3,214	0	321	321	0	0	0	0	0	2,892	0	840	2,892	840	2,892	933	3,214
216	87	Lover's Creek	2628.7	0%	0.0	0%	0.0	0%	0.0	0.0	100%	2,629	Lawn	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	2,452	1,017	0	0	2,452	1,436	0	1,436	610	0	610	407	0	0	0	0	0	155	407	933	2,452
216	103	Lover's Creek	4112.7	0%	0.0	0%	0.0	0%	0.0	0.0	100%	4,113	Uncultivated	0.15	Sand to Silty Sand	0.3	0.15	0.6	0.6	3,837	1,550	0	0	3,837	2,287	0	2,287	930	0	930	620	0	0	0	0	0	151	620	933	3,837
Post-Development Catchment 216 Total		**North to Lover's Creek via Catchment 213**	**17,385**	**57%**	**9,879**	**7%**	**1,146**	**50%**	**8,733**	**0**	**43%**	**7,505**								**16,218**	**2,854**	**8,295**	**0**	**16,218**	**4,148**	**922**	**5,069**	**1,741**	**0**	**1,741**	**1,113**	**962**	**7,332**	**0**	**477**	**8,295**	**541**	**9,408**	**933**	**16,218**
320	85	Lover's Creek	64.2	100%	64.2	100%	64.2	0%	0.0	0.0	0%	0	Building	0	Sand to Silty Sand	0.3	0.25	0.55	0	60	0	54	0	60	0	6	6	0	0	0	0	54	0	0	840	54	840	54	933	60
320	86	Lover's Creek	2130.8	0%	0.0	0%	0.0	0%	0.0	0.0	100%	2,131	Lawn	0.05	Sand to Silty Sand	0.3	0.25	0.6	0.6	1,988	824	0	0	1,988	1,164	0	1,164	495	0	495	330	0	0	0	0	0	155	330	933	1,988
320	115	Lover's Creek	11.8	0%	0.0	0%	0.0	0%	0.0	0.0	100%	12	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	11	4	0	0	11	7	0	7	3	0	3	1	0	0	0	0	0	113	1	933	11
320	116	Lover's Creek	244.3	0%	0.0	0%	0.0	0%	0.0	0.0	100%	244	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	228	92	0	0	228	136	0	136	64	0	64	28	0	0	0	0	0	113	28	933	228
Post-Development Catchment 320 Total		**East to Lover's Creek via Catchment 202 and SWMP**	**2,451**	**0%**	**64**	**0%**	**64**	**0%**	**0**	**0**	**100%**	**2,387**								**2,287**	**921**	**54**	**0**	**2,287**	**1,306**	**6**	**1,312**	**562**	**0**	**562**	**359**	**54**	**0**	**0**	**22**	**54**	**168**	**413**	**933**	**2,287**
331	79	Lover's Creek	13227.7	0%	0.0	0%	0.0	0%	0.0	0.0	100%	13,228	Uncultivated	0.15	Sand to Silty Sand	0.3	0.25	0.7	0.7	12,340	4,984	0	0	12,340	7,356	0	7,356	3,489	0	3,489	1,495	0	0	0	0	0	113	1,495	933	12,340
Post-Development Catchment 331 Total		**North to Lover's Creek via Catchment 213**	**13,228**	**0%**	**0**	**0%**	**0**	**0%**	**0**	**0**	**100%**	**5,702**								**12,340**	**4,984**	**0**	**0**	**12,340**	**7,356**	**0**	**7,356**	**3,489**	**0**	**3,489**	**1,495**	**0**	**0**	**0**	**0**	**0**	**113**	**1,495**	**933**	**12,340**
332c	81	Bryne Rd Extension	373.5	100%	373.5	0%	0.0	100%	373.5	0.0	0%	0	Future Road	0	Sandy to Silty Sand	0.3	0.25	0.55	0	348	0	314	0	348	0	35	35	0	0	0	0	0	314	0	840	314	840	314	933	348
Post-Development Catchment 332c Total		**Storm Sewer via Bryne Rd Extension**	**374**	**100%**	**374**	**0%**	**0**	**100%**	**374**	**0**	**0%**	**0**								**348**	**0**	**314**	**0**	**348**	**0**	**35**	**35**	**0**	**0**	**0**	**0**	**0**	**314**	**0**	**840**	**314**	**840**	**314**	**933**	**348**
External AreaTotal			**35,458**	**29%**	**10,317**	**3%**	**1,211**	**26%**	**9,107**	**0**	**50%**	**17,615**								**33,079**	**9,520**	**8,662**	**0**	**33,079**	**13,934**	**962**	**14,896**	**6,325**	**0**	**6,325**	**3,195**	**1,016**	**7,646**	**0**	**244**	**8,662**	**334**	**11,857**	**933**	**33,079**