PRELIMINARY HYDROGEOLOGICAL INVESTIGATION

Proposed Residential and Commercial Development
11476 Highway 26
Collingwood, Ontario

PREPARED FOR:

Integricon Property Restoration and Construction Group Inc.

DS Project No: 22-189-400
Date: February 15, 2023

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DS Project No. 22-189-400 **February 15, 2023**

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RE: Preliminary Hydrogeological Investigation – 11476 Highway 26, Collingwood, ON

DS Consultants Limited (DS) was retained by Integricon Property Restoration and Construction Group Inc. (IPCG) to complete a preliminary hydrogeological investigation for the proposed development at 11476 Highway 26, Collingwood, Ontario (Site). The site is currently vacant and will be developed for residential and commercial use. The northern portion of the site is covered with a wooded area and the southern portion is covered with a demolished building structure. The proposed development will consist of two mixed-use buildings A and B with a common one (1) level of underground parking (P1). The existing ground elevation at the Site is about 181-178.9 meters above sea level (masl) with an elevation difference of 2.1 m and the proposed finished floor elevation is 181.5 masl. At the time of writing this report, no detailed below-grade designs were available. The assumed P1 floor level would be approximately 3 m below the proposed finish floor level (Elev. 178.5 masl).

The preliminary hydrogeological investigation for the site includes an overview of the existing geological and hydrogeological conditions at the Site and the surrounding area, an assessment of the hydrogeological constraints, impacts of the proposed development on the local groundwater and provides an estimation of construction dewatering requirements during the proposed development phase. This investigation is based on monitoring wells installed by DS and SPL in support of the geotechnical and hydrogeological investigations at the Site.

If needed, the results of the investigation can be used in support of an application for a Permit to Take Water (PTTW) or an Environmental Activity Sector Registry (EASR) for construction dewatering from the Ministry of the Environment, Conservation and Parks (MECP) and a potential discharge permit from the Town of Collinwood.

Based on the results of our investigation, the following conclusions and recommendations are presented:

1. Based on the MECP water well records search, there are thirteen (13) water well records within a 500 meters-radius of the Site. Of these, four (4) water wells are noted as domestic (DO) water supply well and one (1) is noted as a commercial water supply well. All other wells are noted as test holes, dewatering well or monitoring well or not-in-use well.

2. In December 2014, SPL Consultants Ltd. drilled eleven (11) boreholes to bedrock depth between 1.4 and 3.1 mbgs. One (1) borehole was drilled and cored into bedrock to a depth of 5.2 mbgs as part of this geotechnical investigation. Also, SPL installed four (4) monitoring wells. Of these, three (3) monitoring wells were screened between 1.5 and 1.8 mbgs into the overburdened sand and the other well was screened into the bedrock at a depth of 5.5 mbgs. In July 2022, DS installed an additional two (2) overburden monitoring wells at the site to depths of 1.4 and 1.6 mbgs, the bedrock depth at the site.

3. The study area (500 m radius) lies within the Simcoe Lowlands physiographic region of southern Ontario and is characterized by the sand plain physiographic landform. The surficial geology in the study area consists of sand, gravel and minor silt and clay of coarse-textured lacustrine deposits and Paleozoic bedrock. Based on the subsurface investigation, soils at the site consist of sand to the bedrock depth between 1.4 and 2.1 meters below the existing ground surface.

4. Six (6) monitoring wells were used for the current groundwater assessment. DS measured groundwater levels in all monitoring wells on August 5, 2022. Groundwater was found in overburden monitoring wells between 0.37 mbgs and 0.88 mbgs and the bedrock well at 0.52 mbgs.

5. Single Well Response Tests (SWRTs) were completed in monitoring wells on July 21, 2022, to estimate hydraulic conductivity (k) for the representative geological units in which the well screens were completed. The value of calculated hydraulic conductivity (k) for sand ranges from 2.5×10^{-5} to 1.0×10^{-5} m/s. The k-value for the bedrock is 7.0×10^{-7} m/s.

6. DS completed a preliminary water balance study for the site. To inform the design of Low Impact Development (LID) measures, a Thornthwaite monthly water balance model was completed and used to evaluate pre-development and post-development hydrological conditions at the Site Based on the results of the pre-development and post-development water balance completed, the proposed development is expected to produce a decrease in annual infiltration (3,020 m^3/year) and an increase in annual runoff (11,972 m^3/year). The effects are the result of increased impervious areas, replacing pervious areas of the Site. The results can be used to design appropriate LID measures to compensate for any anticipated changes or deficits in site hydrology.

7. Dewatering requirements (Short-term and Long-term Discharge):

   The requirements for dewatering or groundwater control during the construction period are as follows.

Underground Level (P1)	Flow Rate Q- without a safety factor (L/day)	Flow Rate Q- with a safety factor x 2.0 (L/day)	Stormwater Removal (if needed) (@ 10 mm/24 hrs.) (L/day)	Total Flow Rate (L/day)
Short-term Discharge	86,000	172,000	180,000	352,000
Long-term Discharge	32,000	64,000	-	64,000

The estimations of dewatering flow rates are based on the k-values which were obtained from on-site in-situ permeability tests and assuming no hydraulic connection to a nearby Lake. Due to the proximity of Georgian Bay, DS recommends conducting a long-term pumping test (24 hrs) to better establish aquifer properties such as transmissivity and storativity and obtain a more accurate dewatering estimate.

8. Dewatering permits requirements: The pumping rates during the construction of buildings with a P1 level is less than 400,000 L/day and therefore, a PTTW application is not likely to be required but an EASR application may be required to be submitted to the MECP for short-term dewatering. A permit is not required if water taking is maintained below the 50,000 L/day. Also, the anticipated permanent drainage volume for buildings is more than 50,000 L/day and therefore, a PTTW is expected permanently. However, this requirement can be changed based on the actual permanent volumes after the construction of the building.

9. One (1) groundwater sample (unfiltered) was collected from monitoring well BH 14-7 on July 22, 2022, and submitted to SGS Laboratory in Mississauga, Ontario for analysis. SGS Laboratory is a Canadian Association of Laboratory Accreditation Inc. (CALA) and Canadian Standard Association (CSA) certified**.** The unfiltered groundwater sample was analyzed and compared against the Town of Collingwood Sewer Use By-law (No. 2009-118) and for groundwater discharge options.

10. Groundwater quality analysis indicated that no parameters were in exceedance of the Town of Collingwood Sanitary and Storm Sewer Use Criteria. Therefore, groundwater can be discharged into the Town's sewers without treatment. However, a discharge permit may be required from the town/ if groundwater is discharged into sewers for the short-term term and long-term dewatering.

11. Based on the MECP WWRs, groundwater users are not expected in the maximum predicted radius of Influence of 103 meters. However, a door-to-door water well survey may be requested by the Region before the start of construction to establish baseline groundwater conditions within a 500 m area or the zone of influence.

12. There is a wetland area located at the north half portion of the site. Georgian Bay is located about 140 m northwest of the northern side of the Site. Impacts on surface water features due to potential dewatering activities are expected since surface water bodies are existed at the Site or near the predicted zone of influence (103 m from the center of excavation).

13. In conformance with Regulation 903 of the Ontario Water Resources Act, the decommissioning of any dewatering system and monitoring wells should be carried out by a licensed contractor under the supervision of a licensed water well technician.

Should you have any questions regarding these findings, please contact the undersigned.

DS Consultants Ltd.

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1. INTRODUCTION

DS Consultants Limited (DS) was retained by Integricon Property Restoration and Construction Group Inc. (IPCG) to complete a preliminary hydrogeological investigation for the proposed development at 11476 Highway 26, Collingwood, Ontario (Site). The location of the Site is shown in **Figure 1**. The site is currently vacant and will be developed for residential and commercial use. The northern portion of the site is covered with a wooded area and the southern portion is covered with a demolished building structure. The proposed development will consist of two mixed-use buildings A and B with a common one (1) level of underground parking(P1). The existing ground elevation at the Site is about 181-178.9 meters above sea level (masl) with an elevation difference of 2.1 m and the proposed finished floor elevation is 181.5 masl. At the time of writing this report, no detailed below-grade designs were available. The assumed P1 floor level would be approximately 3 m below the proposed finish floor level (Elev. 178.5 masl).

The preliminary hydrogeological investigation for the site includes an overview of the existing geological and hydrogeological conditions at the Site and the surrounding area, an assessment of the hydrogeological constraints, impacts of the proposed development on the local groundwater and provides an estimation of construction dewatering requirements during the proposed development phase. This investigation is based on monitoring wells installed by DS and SPL Consultants Ltd. in support of the geotechnical and hydrogeological investigations at the Site.

1.1 Purpose

The purpose of this investigation was to review and determine the need for dewatering, estimate dewatering rates, assess groundwater quality and determine the need for a Permit to Take Water (PTTW) or an Environmental Activity Sector Registry (EASR) from the Ministry of Environment, Conservation and Parks (MECP) in addition to requirements to obtain discharge permits from the Town of Collingwood, if needed. Potential impacts related to construction dewatering and associated monitoring/mitigation measures were also investigated.

1.2 Scope of Work

The scope of work for this investigation included:

(i) Site visits;

(ii) Collecting and interpreting available reports and data including the MECP Water Well Records (WWR), geotechnical, hydrogeological and environmental studies completed at the Site;

(iii) In-situ hydraulic conductivity testing in newly installed monitoring wells;

(iv) Site-Specific Water Balance Analysis;

(v) Estimation of temporary groundwater flow rate during the construction;

(vi) Assessing groundwater quantity and quality to evaluate discharge options; and,

(vii) Data analyses and report preparation.

2. FIELDWORK

- In December 2014, SPL Consultants Ltd. drilled eleven (11) boreholes to bedrock depth between 1.4 and 3.1 mbgs. One (1) borehole was drilled and cored into bedrock to a depth of 5.2 mbgs as part of this geotechnical investigation. Also, SPL installed four (4) monitoring wells. Of these, three (3) monitoring well was screened between 1.5 and 1.8 mbgs into the overburdened sand and the other well was screened into the bedrock at a depth of 5.5 mbgs. In July 2022, DS installed an additional two overburden monitoring wells at the site to depths of 1.4 and 1.6 mbgs, the bedrock depth at the site.

- A total of six (6) monitoring wells were used to access the groundwater conditions at the Site. All monitoring wells available with water were developed before use to allow for groundwater level monitoring, hydraulic conductivity testing, and assess groundwater quality.

- Four (4) single well response tests (SWRTs) were completed in monitoring wells by performing a rising head test to estimate the hydraulic conductivity value of formations/soils at the Site.

- One (1) unfiltered groundwater sample was collected to assess discharge options for dewatering water during construction. The groundwater sample was compared against the Town of Collingwood Sewer Use By-law.

3. PHYSICAL SETTING

Available topographic maps and environmental, geotechnical, and hydrogeological reports were used to develop an understanding of the physical setting of the study area. The borehole logs from all investigations at the Site as well as the Ministry of the Environment, Conservation and Parks Water Wells Records (MECP WWRs) were used to interpret the geological and hydrogeological conditions at the Site.

3.1 Physiography and Drainage

The site is situated within the Blue Mountains Watersheds within the jurisdiction of the Nottawasaga Valley Conservation Authority. The area is characterized by gently rolling land, and slopes north. There is a wetland area located at the north half portion of the site. The topography at the site is flat and gently slopes north with a surface elevation ranging from 181-178.9 masl. Georgian Bay is located about 140 m northwest of the northern side of the Site.

3.2 Geology

The following presents a brief description of regional and site geology based on the review of available information and site-specific soil investigations by DS and Pinchin.

3.2.1 Quaternary Geology

The study area (500 m radius) lies within the Simcoe Lowlands physiographic region of southern Ontario and is characterized by the sand plain physiographic landform. The surficial geology in the study area consists of sand, gravel and minor silt and clay of coarse-textured lacustrine deposits and Paleozoic bedrock. The surficial geology map is shown in **Figure 2.**

3.2.2 Bedrock Geology

Available published mapping indicates that the bedrock in the area is the Limestone of the Lindsay Formation (Simcoe Group) (MNDM Map 2544 Bedrock Geology of Ontario). Based on the review of local boreholes and well record information the depth to bedrock is estimated to be approximately 1.5-2 m below ground level.

3.2.3 Site Geology

On-site subsurface soils were interpreted from the boreholes/monitoring wells (BHs/MWs) drilled by DS and SPL. The locations of the BHs/MWs are shown in **Figure 3** and detailed subsurface conditions are presented on the borehole Logs in **Appendix A**. The geological cross-section (A-A') is presented in **Figure 7.** The subsurface conditions in the boreholes are summarized in the following paragraphs.

Fill: Fill material consisting of sandy silt and containing organics was encountered in all boreholes and was extended to a depth of about 0.5 m below the existing ground surface(mbgs).

Sand deposits: Below the fill material, sand was encountered in all the boreholes and extended to the bedrock depths between 1.4 and 2.1 m mbgs.

Limestone Bedrock: Based on the subsurface investigation, the bedrock depth at the site is between 1.4 and 2.1 meters below the existing ground surface.

3.3 Hydrogeology

The hydrogeology at the Study site was evaluated using the on-site monitoring wells installed by DS and PSPL, local domestic wells and existing hydrogeological reports for the area.

3.3.1 Local Groundwater Use

As part of the hydrogeological study, DS completed a search of the Ministry of the Environment, Conservation and Parks (MECP) Water Well Record (WWR) database. Based on the MECP water well records search, there are thirteen (13) water well records within a 500 meters-radius of the Site (**Appendix**

B). Of these, four (4) water wells are noted as domestic (DO) water supply well and one (1) is noted as a commercial water supply well. All other wells are noted as test holes, dewatering well or monitoring well or not-in-use well. **Figure 1** shows the MECP water well location plan. The study area is served by a municipal water supply.

3.3.2 Groundwater Conditions

Six (6) monitoring wells were used for the current groundwater assessment. DS measured groundwater levels in all monitoring wells on August 5, 2022. **Table 3-1** presents the groundwater levels in all monitoring wells**.** Groundwater was found in overburden monitoring wells between 0.37 and 0.88 mbgs and bedrock well at 0.50 mbgs and the groundwater flow is expected to be north to the northeast towards Georgian Bay. The groundwater flow direction is presented in **Figure 4**.

Table 3-1: Groundwater Levels in Monitoring Wells

Well ID	Ground Elevation (masl)	Well Depth (mbgs)	Screened Interval (mbgs)	Formation	Depth to Water (mbgs)	Groundwater Elevation (masl)
BH/MW 22-1	181.0	1.6	0.8-1.6	Sand	0.63	180.37
BH/MW 22-5	179.1	1.4	0.8-1.4	Sand	0.69	178.41
BH/MW 14-1	178.8	1.3	0.5-1.3	Sand	0.37	178.43
BH/MW 14-3	179.1	1.5	0.7-1.5	Sand	0.73	178.37
BH/MW 14-8	178.8	1.8	1.0-1.8	Sand	0.88	177.92
BH/MW 14-7	179.2	5.5	2.5-5.5	Limestone	0.50	178.70

3.3.3 Hydraulic Conductivity

A single well response test (SWRT) was completed in monitoring wells with sufficient water on July 21, 2022, to estimate hydraulic conductivity (k) for the representative geological units in which the well screens were completed. The test was completed by performing a rising head test with the use of a one-litre bailer to 'instantaneously' remove water from the well. A data logger was placed in the well to monitor recovery. The hydraulic conductivity (k) value was calculated using the Bouwer & Rice method. **Table 3-2** presents the Hydraulic Conductivity (k) result for the representative geological unit. The value of calculated hydraulic conductivity (k) for sand ranges from 2.5×10^{-5} to 1×10^{-5} m/s. The k-value for the bedrock is 7.0×10^{-7} m/s. The hydraulic testing results are provided in **Appendix C.**

Table 3-2: Hydraulic Conductivity (k) Test Result

Well ID	Screened Interval (mbgs)	Screened Formation	K- Value (m/s)
BH/MW 22-1	0.8-1.6	Sand	2.5×10^{-5}
BH/MW 22-5	0.8-1.4	Sand	1.4×10^{-5}
BH/MW 14-1	0.5-1.3	Sand	1.0×10^{-5}
BH/MW 14-7	2.5-5.5	Limestone	7.0×10^{-7}

3.3.4 Groundwater Quality

One (1) groundwater sample (unfiltered) was collected from monitoring well BH 14-7 on July 22, 2022, and submitted to SGS Laboratory in Mississauga, Ontario for analysis. SGS Laboratory is a Canadian Association of Laboratory Accreditation Inc. (CALA) and Canadian Standard Association (CSA) certified**.** The unfiltered groundwater sample was analyzed and compared against the Town of Collingwood Sewer Use By-law (No.2009-118) for groundwater discharge options. Groundwater quality analysis indicated that no parameters were in exceedance of the Town of Collingwood Sanitary and Storm Sewer Use Criteria. The certificate of analysis is provided in **Appendix D.**

4. DRAFT SITE WATER BALANCE

DS completed a preliminary water balance study for the site. The Site is currently vacant land. The Site is proposed to be developed for a mixed-use occupying an area of about 28,169 m^2 (2.82 ha). To inform the preliminary design of Low Impact Development (LID) measures, a Thornthwaite monthly water balance model was completed and used to evaluate pre-development and post-development hydrological conditions at the Site. The results can be used to design appropriate LID measures to compensate for any anticipated changes or deficits in site hydrology.

4.1 Existing Conditions (Pre-Development)

The Site has a total area of 28,169 m^2 and includes approximate pervious areas totalling 14397 m^2 of wooded area and 9927 m^2 of vacant area and an impervious area of 3,845 m^2. **Figure 5** shows the pre-development conceptual model considered for establishing current hydrologic conditions.

4.2 Proposed Development (Post-Development)

For the water balance calculations in this report, it is estimated that the proposed mixed-use development will have impervious areas (including building, paved/road/driveway/walkway) of about 12,395 m^2 and the remaining area of 15,774 m^2 will be developed as a pervious area. **Figure 6** shows the post-development conceptual model considered for establishing post-hydrologic conditions.

4.3 Water Balance Components (Thornthwaite Monthly Water Balance Model)

The Thornthwaite water balance (Thornthwaite, 1948; Mather, 1978; 1979) is an accounting type method used to analyze the allocation of water among various components of the hydrologic cycle. Inputs to the model are monthly temperature, Site latitude, precipitation, and stormwater run-on. Outputs include monthly potential and actual evapotranspiration, evaporation, water surplus, total infiltration, and total runoff. For ease of calculation, a spreadsheet model was used for the computation.

When precipitation (P) occurs, it can either runoff (R) through the surface water system, infiltrate (I) to the water table, or evaporate/evapotranspiration (ET) from the earth's surface and vegetation. The sum of R and I is termed the water surplus (S). When long-term averages of P, R, I and ET are used, there is no

net change in groundwater storage (ST). Annually, however, there is a potential for minor changes in ST. The annual water budget can be stated as **P = ET + R + I + ST** and the components are discussed below.

Precipitation (P)

Based on the precipitation data from the Thornbury Slama Weather Station in Ontario, the average precipitation for the area is about 992 mm/year for the period between 1981 and 2010. Also, the average monthly temperature from this station has been used. The monthly distribution of precipitation is presented in **Table E-1, Appendix E.**

Storage (ST)

Groundwater storage (ST) of native soils for the existing Site was estimated using values of Water Holding Capacity (mm) of respective land use and soil types identified in Table 3.1 of the Storm Water Management (SWM) Planning & Design Manual (MOE, March 2003). The land uses, soil types and respective water-holding capacities shown in **Table 4-1** were chosen to represent existing conditions and applied to March for monthly calculations.

Table 4-1: Water Holding Capacity of Native Soils in Pervious Areas

Land Uses	Soil Types(pre- and post-development	Water Holding Capacity (mm/year)	
		Pre-Development	Post-Development
Open Space- Wooded area	Sandy Loam/Sandy Loam	300	300
Open Space- Pervious area	Sandy Loam/Clay Loam	75	100

Using the procedures outlined in the SWM Planning & Design Manual for the above land use and soil type, the annual change in storage is zero (0).

Evapotranspiration (ET)

Monthly Potential Evapotranspiration (PET) is estimated using monthly temperature data and is defined as a water loss from a homogeneous vegetation-covered area that never lacks water (Thornthwaite,1948; Mather, 1978). In the Thornthwaite water balance model, PET is calculated using the Hamon equation (Hamon, 1061).

PET Hamon = 13.97 * d * D2 * Wt

Where:

d = the number of days in the month

D = the mean monthly hours of daylight in units of 12 hours

Wt = a saturated water vapour density term = 4.95 * e0.627/100

T = the monthly mean temperature in degrees Celsius

The calculated Actual Evapotranspiration (AET) is based on PET and changes in ST (Δ ST). Where there is not enough P to satisfy PET, a reduction in ST occurs. As a result, volumes of AET are less than PET. Also, it is assumed that evaporation will occur and will amount to 15% of the total precipitation for an impervious cover.

Precipitation Surplus (S)

Precipitation surplus is calculated as P–ET. For pervious areas, ET is considered AET and for impervious areas, ET is evaporation.

Infiltration (I) and Runoff (R)

For pervious areas, precipitation surplus has two components in the Thornthwaite model: a runoff component (overland flow that occurs when soil moisture capacity is exceeded) and an infiltration component. The accumulation of infiltration factors for topography, soil types and the cover as prescribed in Table 3.2 of the SWM Planning & Design Manual, MECP (2003) gives infiltration factors for existing conditions on the Site as shown below in **Table 4-2**. The runoff component calculated in the pre-development and post-development is the remaining volume of precipitation surplus following AET, ET and infiltration.

Table 4-2: Pre-Development and Post-Development Conditions – Infiltration Factors

Land Uses	Topography	Soil	Cover	Infiltration factor	Runoff Coefficient
Pre- Development Conditions					
Open Space- Wooded Area	0.3	0.3	0.2	0.80	0.20
Open Space- Pervious Area	0.3	0.3	0.1	0.70	0.30
Post-Development Conditions					
Urban Lawn/Landscape	0.3	0.2	0.1	0.60	0.40

4.4 Water Balance Analysis

To predict outputs of the pre-development and post-development water balance, various inputs were entered into the Thornthwaite model including monthly precipitation and temperature, Site latitude, water holding capacity values for native soils and factors of infiltration as discussed in section 4.3. The analysis is summarised below, and the detailed calculations are presented in **Appendix E.**

4.4.1 Water Balance- Pre-Development

The average precipitation for the area is about 992 mm/year. For the pervious area, the calculated PET is 579 mm/year or about 58 % of the total precipitation. The monthly distribution of ST for the pervious area in sandy loam produced a unit area annual AET of 556 mm and 500 mm. For the impervious areas, it is assumed that evaporation will occur and will amount to 15% of total precipitation. Given a pervious area

of 24,324 m2 and an impervious area of 3,845 m2, the pre-development is expected to produce an evapotranspiration/AET of 13,541 m^3/year, an infiltration of 8,441 m^3/year and a runoff of 5,962 m^3/year. The detailed calculations are presented in **Table E-2, Appendix E.**

4.4.2 Water Balance- Post-Development (Without mitigation)

A post-development water balance was completed using the conceptual plan for future development. In the post-construction scenario, changes in land use will result in about 13,395 m^2 of impervious surfaces and 15,774 m^2 of pervious areas (landscaped/wooded area). The monthly distribution of ST for the landscaped area produced an annual AET of 512 mm and for the wooded area produced an annual AET of 512 mm. For the impervious areas, it is assumed that evaporation will occur and will amount to 15% of total precipitation. Given a total pervious and impervious area, the proposed development is expected to produce an evapotranspiration/AET of 10,551 m^3/year, an infiltration of 5,421 m^3/year and a runoff of 11,972 m^3/year. The detailed calculations are presented in **Table E-3, Appendix E.**

4.4.3 Water Balance Results- Pre-Development to Post-Development Changes

Based on the results of the pre-development and post-development water balance completed, the proposed development is expected to produce a decrease in annual infiltration (3,020 m^3/year) and an increase in annual runoff (11,972 m^3/year). The effects are the result of increased impervious areas, replacing pervious areas of the Site. The analysis is summarized below in **Table 4-3**.

Table 4-3: Summary of Water Balance- Pre-Development and Post-Development (Without Mitigation)

Development Stage	Unit	Infiltration	Runoff	Evaporation/AET
Pre-Development	m^3/year	8,441	5,962	13,541
Post-Development (No mitigation)	m^3/year	5,421	11,972	10,551
Change (Pre- to Post-Development)- No Mitigation	Change- m^3/year	-3,020	+ 6,009	-2,990
Note: -ve- Decrease, + ve- Increase				

5. CONSTRUCTION DEWATERING

Based on the available conceptual design the proposed development will consist of a common one (1) level of underground parking (P1) with the assumed finished floor level at 3 metres below the average ground level(mbgl). Below is a summary of the below-grade construction:

a. The area for dewatering: 18,000 m^2
b. Underground Structure: P1 Underground Parking (P1)
c. Considered Average Grade: 181.5 masl
d. Lowest Finished Floor Level (P1): 3 mbgs (Elev. 178.5 masl)
e. Deepest Excavation (Elevator Pit and Sump): 5 mbgs (Elev. 176.5 masl)
f. Highest Groundwater Elevation: 180.4 masl

5.1 Estimation of Flow Rate - Unsealed Excavation

This section calculates the estimated dewatering required during the construction of the proposed buildings based on the above-noted k-value, the highest groundwater elevations at the site using the steady-state flow equation for unsealed excavation as follows. The estimated flow rates for the proposed buildings are summarised in **Table 5-1**.

$$Q_R = K\,x\frac{H^2 - h^2}{0.733}\,x\,Log\,(R_0/r_e)$$

$$r_e = \left(\frac{(a\,x\,b)}{\pi}\right)^{0.5}$$

$$R_0 = (r_e + 3000)(H - h)(k^{0.5})$$

Table: 5-1 Estimation of Flow Rate (Short-term Discharge) – P1 Level (Buildings)

Parameters	P1 Level
K -Hydraulic conductivity(geomean) (m/s)-Sand/Bedrock	2 x 10^{-5}/7x 10^{-7}
H-Distance from water level to the bottom of an aquifer (m)	4.5
h -Depth of water in the well while pumping (m)	0.0
Approximate Area (a x b) m^2	18,000
r_e–equivalent radius, where a and b excavation dimensions (m)	76
R_o- Radius of the cone of depression	103(Max)
Estimated Flow Rate- L/day (without safety factor)	86,000
Estimated Flow Rate- L/day (with safety factor x2)	**172,000**

The following assumptions were made while estimating the flow rate.

1. No recharge from the nearby lake.

2. Bedrock is competent and the effect of structural features such as joints, fractures etc. on permeability (secondary permeability) is limited. K-values can be different with depth based on the nature of the bedrock.

5.2 Total Estimation of Flow Rate (Short-Term/ Temporary Discharge)-P1 Level (Buildings)

The estimated flow rate during the construction of buildings with a P1 level would be 172,000 L/day. The estimated stormwater that may be required to be removed is about 180,000 L/day. The estimated flow rates are summarised in **Table 4-2.**

The estimations of dewatering flow rates are based on the k-values which were obtained from on-site in-situ permeability tests and represent the permeability value of the immediate area of these monitoring wells. Due to the proximity of Georgian Bay, DS recommends conducting a long-term pumping test (24 hrs) to better establish aquifer properties such as transmissivity and storativity and obtain a more accurate dewatering estimate. This test is best done when the actual design is available to strategically position the depth and location of the pumping wells for future use during construction.

Table 5-2: Total Construction Dewatering (Short-term Discharge)- P1 Level (Buildings)

Level	Flow Rate Q- without a safety factor (L/day)	Flow Rate Q- with a safety factor x 1.5 (L/day)	Stormwater Removal (if needed) (@ 10 mm/24 hrs.) (L/day)	Total Flow Rate (L/day)
P1	86,000	172,000	180,000	352,000

5.3 Permanent Drainage (Long-term Discharge) or Foundation Drains

Following the construction of the underground structure, long-term groundwater flow to the underfloor drainage system for the building will be a function of the upward flux and drainage along the foundation wall. The estimated permanent flow rate for buildings after construction would be 64,000 L/day with a safety factor of x 2. The estimated permanent drainage flow rates for the P1 level estimated using a steady-state flow equation are summarised in **Table 5-3.**

Table 5-3: Post-Construction Dewatering - Long-term Discharge -P1 level (Buildings)

Parameters	P1 Level(Buildings)
K -Hydraulic conductivity (m/s)	2×10^{-5}
H-Distance from water level to the bottom of an aquifer (m)	1
h -Depth of water in the well while pumping (m)	0
Approximate Area (a x b) m^2	18,000
r_e–equivalent radius, where a and b excavation dimensions (m)	76
R_o- Radius of the cone of depression	89
Estimated Flow Rate- L/day (without safety factor)	32,000
Estimated Flow Rate- L/day (with safety factor x 2)	**64,000**

5.4 Permit Requirements

5.4.1 Environmental Activity and Sector Registry (EASR) /Permit to Take Water (PTTW) Application

An Environmental Activity Sector Registration (EASR) is required to be submitted to the Ministry of the Environment, Conservation and Parks (MECP) if the taking of groundwater and stormwater for a temporary construction project is between 50,000 L/day and 400,000 L/ day. The EASR application is an online registry and should be submitted to the MECP before any construction dewatering. A PTTW is required to be submitted to the MECP if the taking of groundwater and stormwater for a temporary construction project is more than 400,000 L/ day.

The pumping rates during the construction of buildings with a P1 level is less than 400,000 L/day and therefore, a PTTW application is not likely to be required but an EASR application may be required to be submitted to the MECP for short-term dewatering. Also, the anticipated permanent drainage volume for buildings is more than 50,000 L/day and therefore, a PTTW is expected permanently. However, this requirement can be changed based on the actual permanent volumes after the construction of the building.

5.4.2 Discharge Permits (Construction Dewatering)

A discharge permit will be required from the Town of Collingwood if private water is to be sent to the sewer system for short- and long-term discharge.

6. POTENTIAL IMPACTS

The following are the predicted potential impacts because of construction dewatering:

6.1 Local Groundwater Use

The area is fully serviced by a municipal water supply. Use of groundwater as a source of drinking water is not expected within a 500-meter radius of the Site and therefore, no short-term or long-term impacts are anticipated to private water wells because of dewatering activities.

6.2 Current PTTW Search

The MECP PTTW Open Data Catalogue was searched within a 1 km radius of the Site. The search indicated that there are no active PTTWs within 1000 meters of the Site. Groundwater interferences are not expected for the Site because of pumping activities in the surrounding area if any.

6.3 Source Protection Area

The Site is located within the Nottawasaga Valley Source Protection Area (S.P.A). The Source Protection Plan contains policies aimed at protecting drinking water sources by reducing or eliminating significant threats to the source of municipal drinking water. The study area is serviced by municipal water. Therefore, no impacts are anticipated on the drinking water supply within the zone of influence.

6.4 Highly Vulnerable Aquifer

The Site is located within a Highly Vulnerable Aquifer (HVA) with a vulnerability score of 6. This score indicates that groundwater is highly vulnerable to contamination from the surface.

6.5 Wellhead Protection Area

The Site and the study area are not located around municipal wells. Also, the Site does not fall within the wellhead protection area (WHPA)-E for water quality.

6.6 Intake Protection Zone

The Site and the study area are not located within a water intake protection zone (IPZ). No IPZ impacts are anticipated due to the proposed temporary or long-term dewatering.

6.7 Surface Water

There is a wetland area located at the north half portion of the site. Georgian Bay is located about 140 m northwest of the northern side of the Site. Impacts on surface water features due to potential dewatering activities are expected since surface water bodies are existed at the Site or near the predicted zone of influence (103 m from the center of excavation).

6.8 Point of Discharge and Groundwater Quality

Groundwater quality analysis indicated that no parameters were in exceedance of the Town of Collingwood Sanitary and Storm Sewer Use Criteria. Therefore, groundwater can be discharged into the Town's sewers without treatment. However, a discharge permit may be required from the town/the Region if the water is discharged into sewers for the short-term term and long-term dewatering.

7. MONITORING AND MITIGATION

Based on the finding of hydrogeological assessment and associated potential impacts due to development, the following monitoring and mitigation program is provided:

- A baseline private well survey and groundwater monitoring may be required before the construction to confirm groundwater users within the predicted zone of influence or 500 meters radius.

- Baseline groundwater quality has been assessed and established before construction. However, groundwater quality can change based on several factors (land-use change, spills, etc.) and should be monitored during construction dewatering and after construction to ensure that water quality meets the guideline or regulations associated with any permits from the MECP and the Town of Collingwood.

- If a groundwater dewatering system is set up at the Site, daily and weekly monitoring should be implemented to assess the groundwater conditions such as water levels, measurement of discharge flow, discharge water quality, and any adverse impacts as a result of dewatering.

- In conformance with Regulation 903 of the Ontario Water Resources Act, the decommissioning of any dewatering system and monitoring wells should be carried out by a licensed contractor under the supervision of a licensed water well technician.

8. LIMITATIONS

This report was prepared for the sole use of the addressee to provide an assessment of the hydrogeological conditions on the property. The information presented in this report is based on information collected during the completion of the hydrogeological investigation. DS Consultants Ltd. was required to use and rely upon various information sources produced by other parties. The information provided in this report reflects DS's judgment in light of the information available at the time

of report preparation. This report may not be relied upon by any other person or entity without the written authorization of DS Consultants Ltd. The scope of services performed in the execution of this investigation may not be appropriate to satisfy the needs of other users, and any use or reuse of these documents or findings, conclusions, and recommendations represented herein, is at the sole risk of said users. The conclusions drawn from the Hydrogeological report were based on information at selected observation and sampling locations. Different conditions between and beyond these locations may become apparent during future investigations or on-site work, which could not be detected or anticipated at the time of this investigation. DS Consultants Ltd. cannot be held responsible for hydrogeological conditions at the Site that was not apparent from the available information.

Should you have any questions regarding these findings, please contact the undersigned.

DS Consultants Ltd.

Prepared By:

P.A. Patel

Pradeep Patel, P.Geo.
Hydrogeologist

PROFESSIONAL GEOSCIENTIST
P.A. Patel Feb 15/23
PRADEEPKUMAR A. PATEL
PRACTISING MEMBER
2710
ONTARIO

Reviewed By:

Martin Gedeon

Martin Gedeon, M.Sc., P.Geo.
Senior Hydrogeologist

9. CONSULTANTS QUALIFICATIONS

Martin Gedeon, M.Sc., P.Geo., QP_{ESA}, is a Professional Geoscientist (P.Geo.) with over 26 years of experience as an environmental/hydrogeological consultant in the areas of groundwater and soil monitoring, environmental site assessments, environmental due diligence, and remediation. Martin has significant experience in physical and contaminant hydrogeology across Canada and overseas and has provided hydrogeological/environmental technical support on various projects. Martin has prepared hundreds of hydrogeological reports in support of permit applications for a private sector development application, municipal dewatering operations, and provincial infrastructure projects across the province.

Pradeep Patel, M.Sc., P.Geo. is a hydrogeologist at DS Consultants Ltd. and has more than 10 years of experience working in the environmental industry. He participates in numerous Hydrogeological and Geotechnical investigation projects. His experience includes the preparation of construction dewatering activities and hydrogeological investigations in support of Environmental Activity and Sector Registry (EASR) and Permit to Take Water (PTTW) applications.

10. REFERENCES

Chapman, L.J., and D.F. Putnam; The Physiography of Southern Ontario, Third Edition, Ontario Geological Survey Special Volume 2; 1984, & 2007.

Freeze, R.A. and J.A. Cherry. “Groundwater”. Prentice-Hall, Inc. Englewood Cliffs, NJ. 1979.

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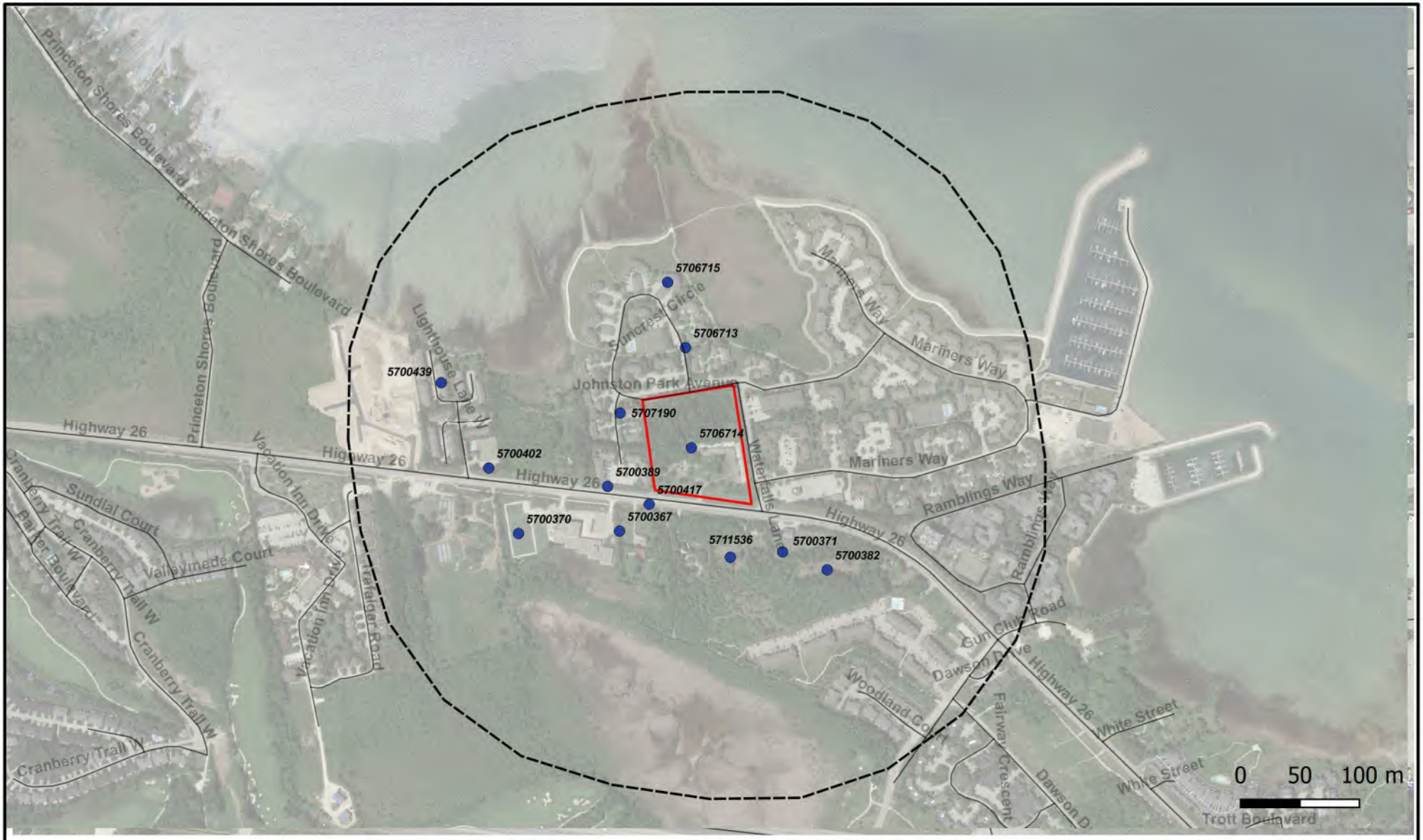
Pat M. Cashman and Martin Preene; Groundwater Lowering in Construction- Second Edition, CRC Press.

FIGURES



Legend

- Approx Site Boundary
- 500m Buffer
- Registered Water Well (MECP WWR)

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Telephone: (905) 264-9393
www.dsconsultants.ca

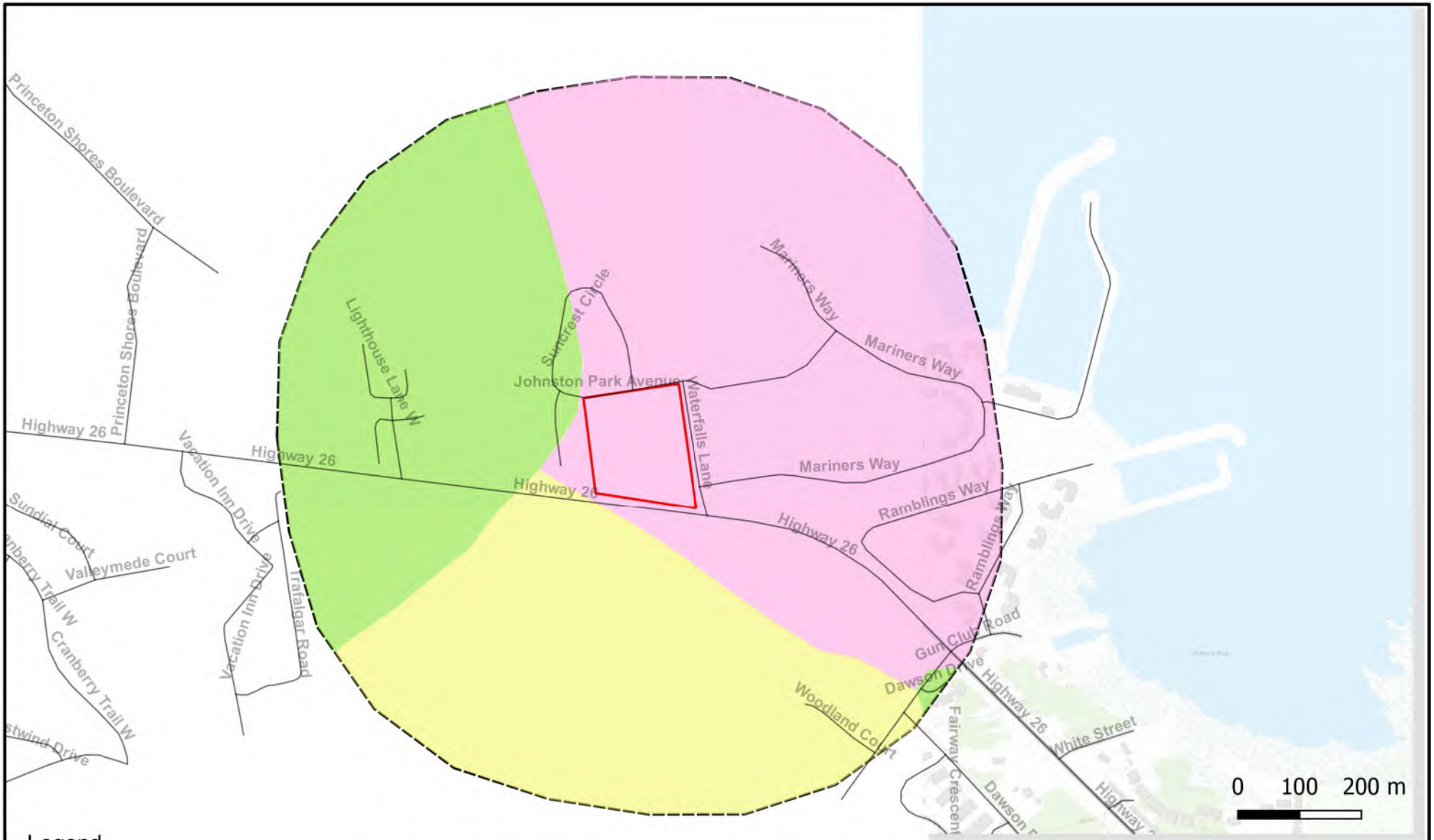
Project: HYDROGEOLOGICAL INVESTIGATION
11476 Highway 26, Collingwood, Ontario

Title: **SITE LOCATION AND MECP WELL RECORDS**

Client: Integricon Property Restoration And Construction Group

Size:	Approved By:	Drawn By:	Date:
8.5 x 11	P.P	L.G	AUGUST 2022
Rev: 0	Scale: As Shown	Project No.: 22-189-400	Figure No.: 1

Image/Map Source: *Google Satellite Image*



Legend

- 500 Buffer
- Approx Site Boundary
- 14b - Lacustrine Deposits
- 5b - Sandy Silt Till
- 3 - Paleozoic Bedrock

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Project: HYDROGEOLOGICAL INVESTIGATION
11476 Highway 26, Collingwood, Ontario

Title: **SURFICIAL GEOLOGY MAP**

Client: Integricon Property Restoration And Construction Group

Size:	Approved By:	Drawn By:	Date:
8.5 x 11	P.P	L.G	AUGUST 2022
Rev: 0	Scale: As Shown	Project No.: 22-189-400	Figure No.: 2

Image/Map Source: *Google Satellite Image*

Legend

- Approx site boundary
- Monitoring Well (DS 2022)
- Borehole (DS 2022)
- Monitoring Well (SPL 2014)
- Borehole (SPL 2014)

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Project: HYDROGEOLOGICAL INVESTIGATION
11476 Highway 26, Collingwood, Ontario

Title: **BOREHOLE AND MONITORING WELL LOCATIONS**

N

Client: Integricon Property Restoration And Construction Group

Size:	Approved By:	Drawn By:	Date:
8.5 x 11	P.P	L.G	AUGUST 2022
Rev: 0	Scale: As Shown	Project No.: 22-189-400	Figure No.: 3

Image/Map Source: *Google Satellite Image*

Legend

- Approx Site Boundary
- Monitoring Well (DS 2022)
- Borehole (DS 2022)
- Monitoring Wells (SPL 2014)
- Borehole (SPL 2014)
- Groundwater Flow Direction
- Groundwater Contours

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Project: HYDROGEOLOGICAL INVESTIGATION
11476 Highway 26, Collingwood, Ontario

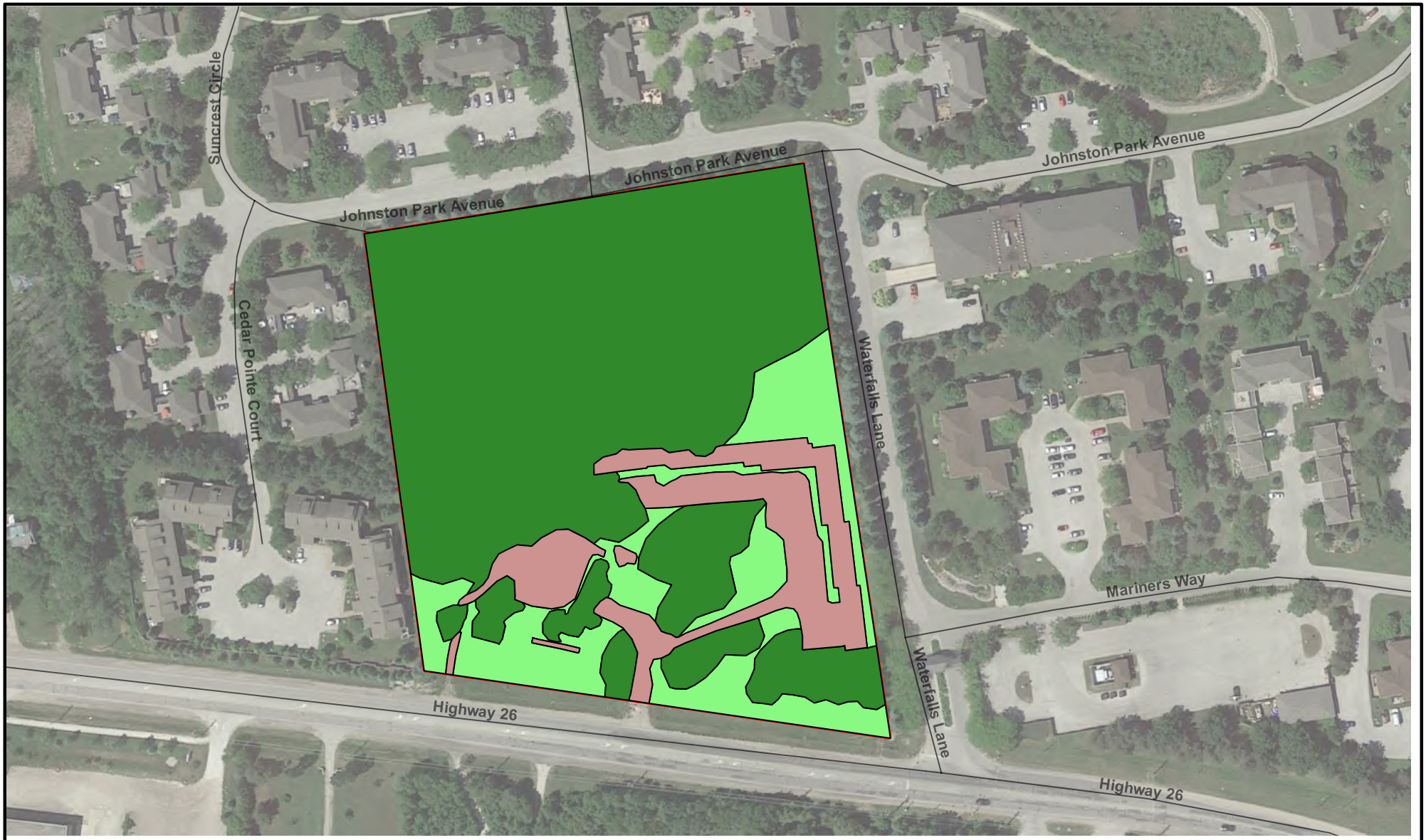
Title: **GROUNDWATER FLOW DIRECTION MAP**

N

Client: Integricon Property Restoration And Construction Group

Size:	Approved By:	Drawn By:	Date:
8.5 x 11	P.P	L.G	AUGUST 2022
Rev: 0	Scale: As Shown	Project No.: 22-189-400	Figure No.: 4

Image/Map Source: *Google Satellite Image*



Legend

- Approx site boundary
- Impervious Area
- Forest
- Landscaped (lawn)

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Client: Integricon Property Restoration And Construction Group

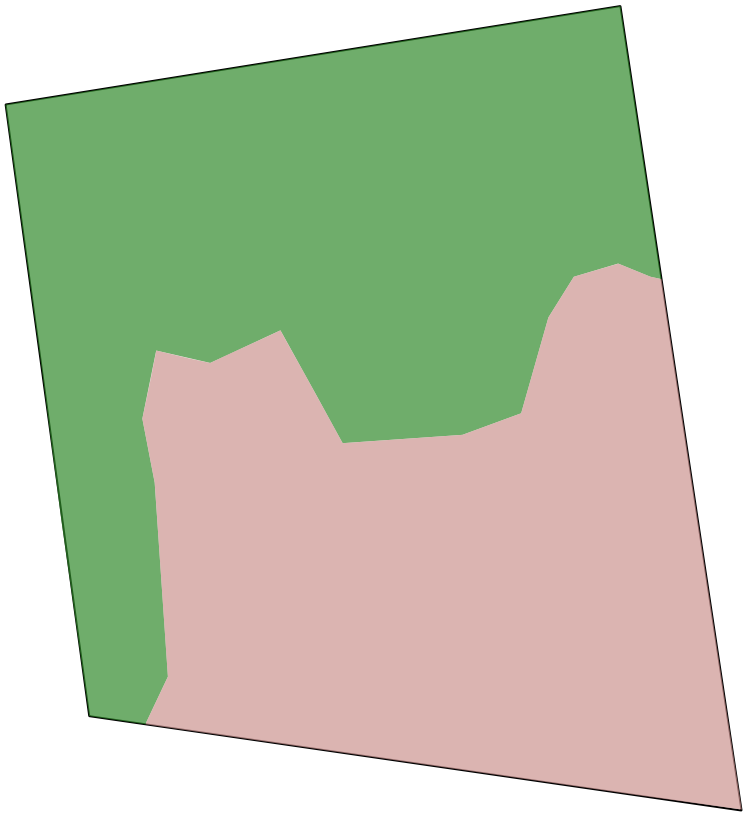
Project: HYDROGEOLOGICAL INVESTIGATION
11476 Highway 26, Collingwood, Ontario

Title: **PRE-DEVELOPMENT CONCEPTUAL SITE MODEL**

N

Size:	Approved By:	Drawn By:	Date:
8.5 x 11	P.P	L.G	AUGUST 2022
Rev: 0	Scale: As Shown	Project No.: 22-189-400	Figure No.: **5**

Image/Map Source: *Google Satellite Image*



Area

BULDING AND PAVED PARKING 13771.76 SM

FOREST AREA 14397.39 SM

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Project: HYDROGEOLOGICAL INVESTIGATION
11476 Highway 26, Collingwood, Ontario

Title: **POST-DEVELOPMENT CONCEPTUAL SITE MODEL**

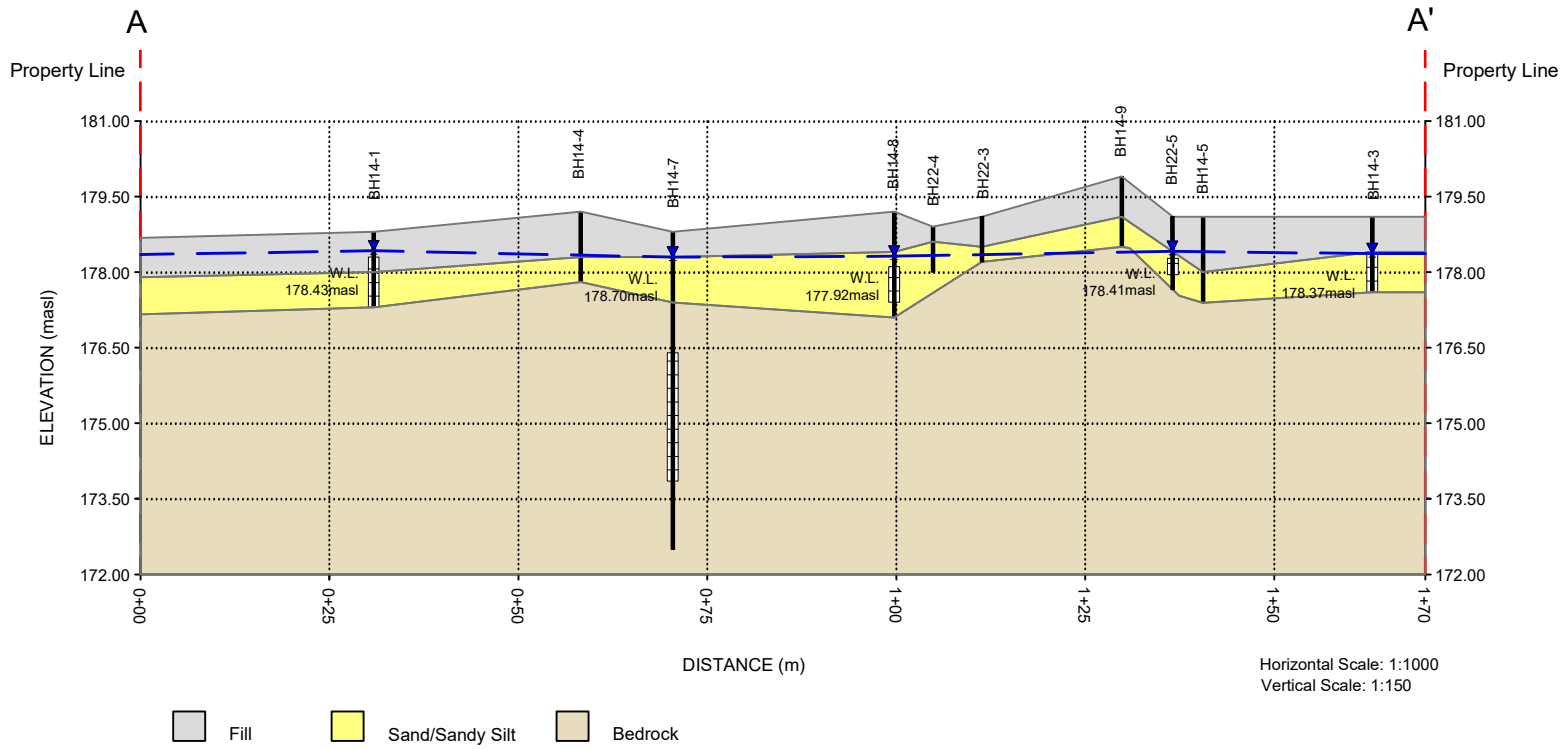
N

Client: Integricon Property Restoration And Construction Group

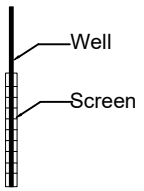
Size:	Approved By:	Drawn By:	Date:
8.5 x 11	P.P	L.G	AUGUST 2022
Rev: 0	Scale: As Shown	Project No.: 22-189-400	Figure No.: **6**

Image/Map Source: *Google Satellite Image*

Path:j:\-gis\2022 projects\22-189-400 11476 highway 26, collingwood, on\7-misc\cad\geological cross section 22-189.dwg



Groundwater Elevation (05 Aug 2022)



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Client: INTEGRICON PROPERTY RESTORATION & CONSTRUCTION GROUP

Project: HYDROGEOLOGICAL INVESTIGATION
11476 Highway 26, Collingwood, ON

Title: **GEOLOGICAL CROSS SECTION A-A'**

Size:	Approved By:	Drawn By:	Date:
8.5 x 11	P.P	S.Y	February 2023
Rev.	**Scale:**	**Project No:**	**Figure No.**
	As Shown	22-189-400	**7**

APPENDICES

Appendix A: Borehole Logs

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LOG OF BOREHOLE BH22-1

PROJECT: Geotechnical Investigation
CLIENT: Integricon Property Restoration and Construction Group Inc.
PROJECT LOCATION: 11476 Highway 26, Collingwood, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4929716.695 E 559282.851

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Jun-02-2022

REF. NO.: 22-189-400
ENCL NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "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
181.0												
0.0 180.8	**TOPSOIL:** 150mm											
0.2 180.2	**FILL:** silty sand, trace gravel, some roots/organics, wet, very loose		1	SS	2	▽	W. L. 180.3 m Aug 05, 2022		○			
0.8 179.4	**SAND:** some silt, trace rootlets, trace clay, trace gravel, wet, very dense		2	SS	50/ 100 mm		180		○			5 76 15 4
			3	SS	50/ 100 mm				○			
1.6	**END OF BOREHOLE:** Notes: 1) Auger refusal at depth of 1.6m on inferred bedrock. 2) 50mm dia. monitoring well installed upon completion. 3) Water Level Readings: Date: Water Level(mbgl): July 22, 2022 0.86 Aug 5, 2022 0.64											

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

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

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LOG OF BOREHOLE BH22-2

PROJECT: Geotechnical Investigation
CLIENT: Integricon Property Restoration and Construction Group Inc.
PROJECT LOCATION: 11476 Highway 26, Collingwood, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4929674.096 E 559271.109

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Jun-02-2022

REF. NO.: 22-189-400
ENCL NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "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
179.0												
0.0 / 179.0	**ASPHALT:** 50 mm						179					
0.1 / 178.7	**GRANULAR BASE:** sand and gravel, 250mm											
0.3 / 178.2	**FILL:** silty sand, some gravel, brown, moist, compact		1	SS	10							
0.8 / 178.1	**SILTY SAND:** trace gravel, brown, wet, very dense		2	SS	50/ 100 mm							
0.9	**END OF BOREHOLE:** Notes: 1) Augar refusal at depth of 0.9m on inferred bedrock. 2) Water at depth of 0.8m during drilling.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

DS SOIL LOG-2021-FINAL 22-189-400.GPJ DS.GDT 22-8-15

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Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH22-3

PROJECT: Geotechnical Investigation
CLIENT: Integricon Property Restoration and Construction Group Inc.
PROJECT LOCATION: 11476 Highway 26, Collingwood, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4929702.12 E 559328.961

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Jun-02-2022

REF. NO.: 22-189-400
ENCL NO.: 4

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 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
179.0												
0.0 / 178.9	**ASPHALT:** 50 mm											
0.1 / 178.7	**GRANULAR:** sand and gravel, 200 mm											
0.3 / 178.2	**FIL:** silty sand with topsoil, trace gravel, brown, moist, loose		1	SS	6							
0.8 / 178.1	**SAND:** trace gravel, yellowish brown, wet, very dense		2	SS	50/150 mm							
0.9	**END OF BOREHOLE:** Notes: 1) Augar refusal at depth of 0.9m on inferred bedrock. 2) Water at depth of 0.8m during drilling.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

DS SOIL LOG-2021-FINAL 22-189-400.GPJ DS.GDT 22-8-15

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH22-4

PROJECT: Geotechnical Investigation
CLIENT: Integricon Property Restoration and Construction Group Inc.
PROJECT LOCATION: 11476 Highway 26, Collingwood, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4929651.171 E 559308.876

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Jun-02-2022

REF. NO.: 22-189-400
ENCL NO.: 5

SOIL PROFILE			SAMPLES			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 / NATURAL MOISTURE CONTENT / LIQUID LIMIT (w_P w 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
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" / 0.3 m							
178.9												
0.0 / 178.8	**ASPHALT:** 50 mm											
0.1 / 178.6	**GRANULAR:** sand and gravel, 250 mm											
0.3	**SILTY SAND:** trace clay, trace gravel, yellowish brown, wet, dense to very dense		1	SS	30				○			
			2	SS	50/ 100 mm							
178.0							178					
0.9	**END OF BOREHOLE:** Notes: 1) Augar refusal at depth 0.9m on inferred bedrock.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

DS SOIL LOG-2021-FINAL 22-189-400.GPJ DS.GDT 22-8-15

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH22-5

PROJECT: Geotechnical Investigation
CLIENT: Integricon Property Restoration and Construction Group Inc.
PROJECT LOCATION: 11476 Highway 26, Collingwood, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4929709.071 E 559356.738

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Jun-02-2022

REF. NO.: 22-189-400
ENCL NO.: 6

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "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
179.1												
0.0 / 179.0	**ASPHALT:** 50 mm											
0.1	**GRANULAR:** sand and gravel, 550 mm		1	SS	10		179					
178.5												
0.6	**GRAVELLY SAND:** some silt, trace clay, yellowish brown, wet, very dense					W. L. 178.4 m Aug 05, 2022						
			2	SS	60		178					25 54 16 5
177.7												
1.4	**END OF BOREHOLE:**											

Notes:
1) Augar refusal at depth of 1.4m on inferred bedrock.
2) 50mm dia. monitoring well installed upon completion.
3) Water Level Readings:
Date: Water Level(mbgl):
July 22, 2022 0.74
Aug 5, 2022 0.69

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

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

LOG OF BOREHOLE BH14-01

PROJECT: Geotechnical Investigation
CLIENT: C.C. Tatham & Associates Ltd.
PROJECT LOCATION: 11476 Highway 26, Collingwood, Ontario
DATUM: Geodetic
BH LOCATION: N 0 E 1

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150mm
Date: Dec/12/2014

REF. NO.: 10001104
DRG. NO.: 2

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	GR	SA	SI	CL
178.8										
178.8 / 0.0	**ASPHALT:** 50mm									
0.1 / 178.6	**GRANULAR BASE/SUBBASE:** 150mm, sand and gravel									
0.2	**FILL:** silty sand, some clay, trace gravel, light brown to brown, moist o very moist, loose	1	SS	15	W. L. 178.3 m Jan 19, 2015 W. L. 178.2 m Dec 12, 2014	178				
178.0 / 0.8	**SAND:** some silt, trace clay, trace gravel, oxidized, light brown, wet, loose	2	SS	6			4	80	11	5
177.3 / 1.5	**END OF BOREHOLE ON ASSUMED BEDROCK**									

Notes:
1. Auger refusal at 1.46m on assumed bedrock
2. Installed 50 mm diameter monitoring well upon completion
3. Water Level Measurements in Monitoring Well:

Date	W.L. Depth (m)	W.L. Elev. (m)
Dec. 12, 2014	0.63	178.17
Jan. 19, 2015	0.46	178.34

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)
REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

SPL SOIL LOG 10001104 BH LOGS.GPJ SPL.GDT 2/5/15

LOG OF BOREHOLE BH14-02

PROJECT: Geotechnical Investigation

CLIENT: C.C. Tatham & Associates Ltd.

PROJECT LOCATION: 11476 Highway 26, Collingwood, Ontario

DATUM: Geodetic

BH LOCATION: N 0 E 2

DRILLING DATA

Method: Hollow Stem Auger

Diameter: 150mm

Date: Dec/12/2014

REF. NO.: 10001104

DRG. NO.: 3

ELEV / DEPTH (m)	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: 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
178.9 / 0.0	**ASPHALT:** 25mm										
178.8 / 0.1	**GRANULAR BASE/SUBBASE:** 150mm, sand and gravel										
178.7 / 0.2	**FILL:** silty sand, some gravel, trace clay, brown, moist to very moist, compact		1	SS	15				○		
178.1 / 0.8	**SAND:** some silt, some gravel, trace clay, light brown, very moist to wet, compact		2	SS	14		178		○		
177.8 / 1.1	25mm seam of organic material, wet										
	END OF BOREHOLE ON ASSUMED BEDROCK										

Notes:
1. Auger refusal at 1.07m on assumed bedrock
2. Borehole was wet at bottom upon completion of drilling

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

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

SPL SOIL LOG 10001104 BH LOGS.GPJ SPL.GDT 2/5/15

LOG OF BOREHOLE BH14-03

PROJECT: Geotechnical Investigation
CLIENT: C.C. Tatham & Associates Ltd.
PROJECT LOCATION: 11476 Highway 26, Collingwood, Ontario
DATUM: Geodetic
BH LOCATION: N 0 E 3

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150mm
Date: Dec/11/2014

REF. NO.: 10001104
DRG. NO.: 4

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "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
179.1												
0.0 / 179.0	**TOPSOIL:** 100mm											
0.1	**FILL:** sand, trace silt, trace gravel, trace organics, light brown, moist, very loose to loose		1	SS	4		179		○			
178.4												
0.8	**SAND:** trace silt, trace clay, trace gravel, oxidized, brown, wet, loose		2	SS	9	W. L. 178.3 m Jan 19, 2015	178		○			1 90 4 5
177.6												
1.5	**END OF BOREHOLE ON ASSUMED BEDROCK**											

Notes:
1. Auger refusal at 1.52m on assumed bedrock
2. Installed 50 mm diameter monitoring well upon completion
3. Water Level Measurements in Monitoring Well:

Date	W.L. Depth (m)	W.L. Elev. (m)
Dec. 12, 2014	0.99	178.14
Jan. 19, 2015	0.87	178.26

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

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

LOG OF BOREHOLE BH14-04

PROJECT: Geotechnical Investigation
CLIENT: C.C. Tatham & Associates Ltd.
PROJECT LOCATION: 11476 Highway 26, Collingwood, Ontario
DATUM: Geodetic
BH LOCATION:

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150mm
Date: Dec/12/2014

REF. NO.: 10001104
DRG. NO.: 5

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: 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
179.2												
179.0 / 0.0	**ASPHALT:** 25mm											
	FILL: silty sand, trace clay, trace gravel, dark brown, trace topsoil, very moist, very loose		1	SS	3		179		○			
178.7 / 0.5	some clay, wet											
178.5 / 0.8	compact											
178.4 / 0.9	**SAND:** trace silt, trace clay, trace gravel, oxidized, brown, wet, compact		2	SS	13				○			
1							178					
177.9 / 1.4	**END OF BOREHOLE ON ASSUMED BEDROCK**											

Notes:
1. Auger refusal at 1.37m on assumed bedrock
2. Borehole was wet at bottom upon completion of drilling

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

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

LOG OF BOREHOLE BH14-05

PROJECT: Geotechnical Investigation
CLIENT: C.C. Tatham & Associates Ltd.
PROJECT LOCATION: 11476 Highway 26, Collingwood, Ontario
DATUM: Geodetic
BH LOCATION:

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150mm
Date: Dec/11/2014

REF. NO.: 10001104
DRG. NO.: 6

SOIL PROFILE			SAMPLES			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 / NATURAL MOISTURE CONTENT / LIQUID LIMIT (w_P w 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
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m							
179.1												
0.0 / 179.0	**TOPSOIL:** 100mm											
0.1 / 178.8	**FILL:** sand and gravel, trace silt, trace clay, trace topsoil, reddish brown, dense		1	SS	31		179					
0.3	some clay, dark brown, moist to very moist											
178.4												
0.8	silty sand, some gravel, some clay, wet, compact		2	SS	16							
1 / 178.1												
1.1	**SAND:** trace silt, trace clay, trace gravel, oxidized, brown, wet, compact						178					
177.5												
1.7	**END OF BOREHOLE ON ASSUMED BEDROCK** Notes: 1. Auger refusal at 1.65m on assumed bedrock 2. Borehole was wet at bottom upon completion of drilling											

SPL SOIL LOG 10001104 BH LOGS.GPJ SPL.GDT 2/5/15

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

LOG OF BOREHOLE BH14-07

PROJECT: Geotechnical Investigation
CLIENT: C.C. Tatham & Associates Ltd.
PROJECT LOCATION: 11476 Highway 26, Collingwood, Ontario
DATUM: Geodetic
BH LOCATION:

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150mm
Date: Dec/11/2014

REF. NO.: 10001104
DRG. NO.: 7

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
178.8						
0.0 / 178.7	**TOPSOIL:** 100mm					
0.1 / 178.4	**FILL:** silty sand, some gravel to gravelly, trace to some clay, trace topsoil, light brown, moist, compact	1	SS	13		
0.5 / 178.1	**SAND:** some silt, trace clay, trace gravel, oxidized, brown, moist to very moist, compact				W. L. 178.3 m Jan 19, 2015	
0.8 / 177.5	some clay, wet	2	SS	12		178
1.4 / 177.1	**AUGER REFUSAL / ROCK CORING STARTED** Refer Log of Rock Core BH14-07 **RUN 1**					
1.8	**RUN 2**					
175.5 / 3.3	**RUN 3**					
174.0 / 4.8	**RUN 4**					

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

SPL SOIL LOG 10001104 BH LOGS.GPJ SPL.GDT 2/5/15

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical Investigation

CLIENT: C.C. Tatham & Associates Ltd.

PROJECT LOCATION: 11476 Highway 26, Collingwood, Ontario

DATUM: Geodetic

BH LOCATION:

DRILLING DATA

Method: Hollow Stem Auger

Diameter: 150mm

Date: Dec/11/2014

REF. NO.: 10001104

DRG. NO.: 7

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "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
	RUN 4(Continued)										
172.5											
6.3	**END OF BOREHOLE** Notes: 1. Auger refusal at 1.37m on assumed bedrock 2. Installed 50 mm diameter monitoring well upon completion 3. Water Level Measurements in Monitoring Well: Date W.L. Depth (m) W.L. Elev. (m) Dec. 12, 2014 0.57 178.25 Jan. 19, 2015 0.48 178.34										

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

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

LOG OF ROCK CORE BH14-07

PROJECT: Geotechnical Investigation
CLIENT: C.C. Tatham & Associates Ltd.
LOCATION: 11476 Highway 26, Collingwood, Ontario
DATUM: Geodetic
BH LOCATION:

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150mm
Date: Dec/11/2014

REF. NO.: 10001104
DRG. NO.: 7

(m) ELEV / DEPTH	ROCK DESCRIPTION	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES	Weathering Index	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm^3) E (GPa)
177.5	Rock Surface															
177.4 / 0.1	**LIMESTONE:** slightly weathered to fresh, fine- to coarse-grained, fossiliferous, argillaceous, grey		1	NQ	87	0		0	>25							
177.1 / 0.4									>25							
1.8									15							
									6							
			2	NQ	100	93		83	3							
									0							
									4							
175.5 / 3.3										Soft Layer at 3.36m for 30mm						
									1							
									1							
			3	NQ	100	92		77	5							
									0							
									3							
174.0 / 4.8									0							
									1							
			4	NQ	100	98		98	0							
									1							
									0							
172.5 / 6.3	**END OF BOREHOLE**															

Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered θ = angle to the core axis E = Modulus of Elasticity

*: UCS [Mpa]≈ 24 $I_{S(50)}$

LOG OF BOREHOLE BH14-08

PROJECT: Geotechnical Investigation
CLIENT: C.C. Tatham & Associates Ltd.
PROJECT LOCATION: 11476 Highway 26, Collingwood, Ontario
DATUM: Geodetic
BH LOCATION:

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150mm
Date: Dec/11/2014

REF. NO.: 10001104
DRG. NO.: 8

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
179.2										
0.0 / 179.0	**TOPSOIL:** 125mm									
0.1	**FILL:** fine sand, trace to some gravel, trace silt, trace clay, trace topsoil, trace organics, light brown, moist to very moist, very loose		1	SS	3		179			
178.4										
0.8	**SAND:** trace silt, trace clay, trace gravel, trace mollusks, oxidized, brown, very moist to wet, compact		2	SS	13	W. L. 178.3 m Jan 19, 2015	178			
1 / 177.7										
1.5	some gravel to gravelly, light brown		3	SS	19					19 64 11 6
2 / 177.1										
2.1	**END OF BOREHOLE ON ASSUMED BEDROCK**									

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

Notes:
1. Auger refusal at 2.10m on assumed bedrock
2. Installed 50 mm diameter monitoring well upon completion
3. Water Level Measurements in Monitoring Well:

Date	W.L. Depth (m)	W.L. Elev. (m)
Dec. 12, 2014	0.90	178.27
Jan. 19, 2015	0.85	178.35

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

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ 8=3% Strain at Failure

LOG OF BOREHOLE BH14-09

PROJECT: Geotechnical Investigation
CLIENT: C.C. Tatham & Associates Ltd.
PROJECT LOCATION: 11476 Highway 26, Collingwood, Ontario
DATUM: Geodetic
BH LOCATION:

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150mm
Date: Dec/11/2014

REF. NO.: 10001104
DRG. NO.: 9

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "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 / NATURAL MOISTURE CONTENT / LIQUID LIMIT (w_P w 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
179.9												
179.8 / 0.1	**ASPHALT:** 50mm											
179.7 / 0.2	**GRANULAR BASE/SUBBASE:** 150mm, sand and gravel											
	FILL: silty sand, some gravel, trace to some clay, light brown, moist to very moist, compact		1	SS	21				○			
179.2 / 0.8	**SAND:** trace silt, trace clay, trace gravel, trace mollusks, light brown, wet, compact		2	SS	14		179		○			
178.6 / 1.4	**END OF BOREHOLE ON ASSUMED BEDROCK**											

Notes:
1. Auger refusal at 1.37m on assumed bedrock
2. Water level was 1.05m upon completion of drilling

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

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

SPL SOIL LOG 10001104 BH LOGS.GPJ SPL.GDT 2/5/15

LOG OF BOREHOLE BH14-12

PROJECT: Geotechnical Investigation

CLIENT: C.C. Tatham & Associates Ltd.

PROJECT LOCATION: 11476 Highway 26, Collingwood, Ontario

DATUM: Geodetic

BH LOCATION:

DRILLING DATA

Method: Hollow Stem Auger

Diameter: 150mm

Date: Dec/11/2014

REF. NO.: 10001104

DRG. NO.: 10

SOIL PROFILE			SAMPLES			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 / NATURAL MOISTURE CONTENT / LIQUID LIMIT (W_P W 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
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m							
179.7												
0.0 / 179.6	**TOPSOIL:** 100mm											
0.1	**FILL:** sand and gravel, some silt, trace clay, pieces of pvc piping, light grey, moist, loose		1	SS	7		179					
178.9												
0.8	**SAND:** some silt, trace clay, trace gravel, oxidized, light brown, very moist to wet, compact		2	SS	12							
1												
			3	SS	14		178					
2												
177.4												
2.3	**GRAVELLY SAND:** some silt, trace clay, greyish brown, wet, compact		4	SS	23		177					
3 / 176.6												
3.1	**END OF BOREHOLE ON ASSUMED BEDROCK** Notes: 1. Auger refusal and spoon bouncing at 3.05m on assumed bedrock 2. Water level was 2.42m upon completion of drilling											

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^{3}$, $\times^{3}$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

Appendix B: MECP Water Well Record Summary

Table: MECP Water Wells Records (500 m Radius)

Project: 22-189-400

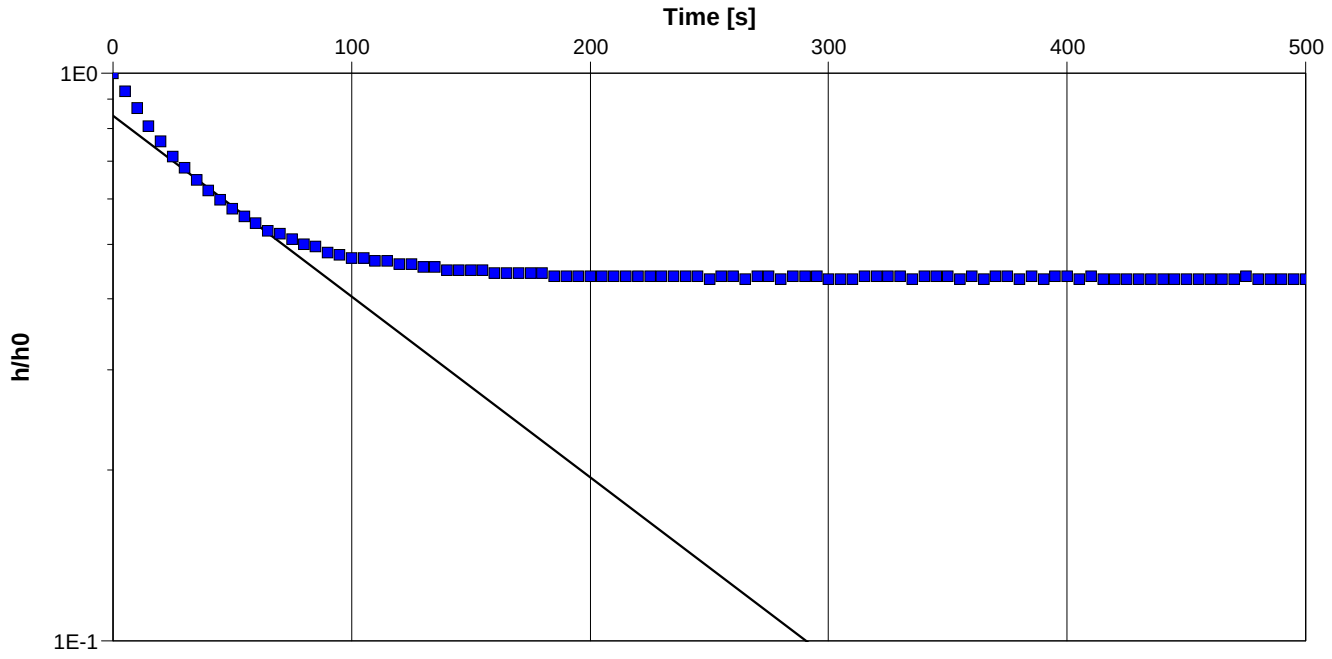
Location: 11476 Highway 26, Collingwood, ON

MOECC WWR ID	Easting	Northing	Depth		Thickness		Stratigraphy				Water Found		Static Level		Water Kind	Date Completed	Status	Water Use
	UTM N17	UTM N17	(ft)	(m)	(ft)	(m)	Color	Primary	Secondary	Tertiary	(ft)	(m)	(ft)	(m)				
5700382	559513	4929509	12	3.7	12	3.7	-	MSND	-	-	18	5.5	-	-	Not Stated	12/Oct/55	-	-
			28	8.5	16	4.9	-	LMSN	-	-								
5711536	559350	4929530	1	0.3	1	0.3	Brown	Clay	-	-	15	4.6	-	-	Fresh	9/Oct/74	Water supply	Domestic
			6	1.8	5	1.5	Grey	Clay	Gravel	STNS								
			30	9.1	24	7.3	Grey	SHLE	-	-								
5700389	559143	4929649	18	5.5	18	5.5	-	Clay	BLDR	-	-	-	-	-	-	2/Oct/57	Water supply	Commercial
			36	11.0	18	5.5	-	LMSN	-	-								
5700367	559163	4929574	3	0.9	3	0.9	-	MSND	-	-	35	10.7	-	-	Fresh	29/Sep/50	Water supply	Domestic
			35	10.7	32	9.8	-	SHLE	-	-								
5700370	558993	4929570	9	2.7	9	2.7	-	Clay	MSND	LMSN	18	5.4864	-	-	Fresh	12/Feb/52	Water supply	Domestic
			18	5.5	9	2.7	-	LMSN	-	-								
5700417	559213	4929619	4	1.2	4	1.2	-	Loam	-	-	17	5.1816	-	-	Sulphur	22/Jun/64	Water supply	Domestic
			8	2.4	4	1.2	Grey	Clay	STNS	-								
			18	5.5	10	3.0	White	MSND	-	-								
5700371	559438	4929539	5	1.5	5	1.5	-	Gravel	LMSN	-	16	4.8768	-	-	Fresh	18/Feb/52	Water supply	Domestic
			16	4.9	11	3.4	-	LMSN	-	-								
5706713	559274	4929884	14	4.3	14	4.3	-	MSND	-	-	20	6.096	-	-	Fresh	18/Feb/52	Water supply	Domestic
			25	7.6	11	3.4	-	LMSN	-	-								
5700402	558943	4929680	2	0.6	2	0.6	-	Loam	-	-	53	16.154	-	-	-	31/Dec/60	Water supply	Domestic
			5	1.5	3	0.9	Yellow	Clay	-	-								
			8	2.4	3	0.9	-	Gravel	-	-								
			54	16.5	46	14.0	-	LMSN	-	-								
5706714	559284	4929714	13	4.0	13	4.0	-	MSND	-	-	25	7.62	-	-	Fresh	5/Jun/68	Water supply	Domestic
			25	7.6	12	3.7	-	LMSN	-	-								
5706715	559244	4929994	14	4.3	14	4.3	-	HPAN	-	-	23	7.0104	-	-	Fresh	6/Jun/68	Water supply	Domestic
			25	7.6	11	3.4	-	Rock	-	-								
5707190	559164	4929774	7	2.1	7	2.1	Brown	MSND	Clay	-	18	5.4864	-	-	-	6/Jun/70	Water supply	Domestic
			25	7.6	18	5.5	Grey	Rock	-	-								
5700439	558863	4929825	15	4.6	15	4.6	-	PRDG	-	-	-	-	-	-	-	28/Apr/67	Water supply	Domestic
			40	12.2	25	7.6	Grey	LMSN	-	-								

Appendix C: Hydraulic Conductivity Analysis

	Slug Test Analysis Report
	Project: Hydrogeological Investigation
	Number: 22-189-400
	Client: IPR And Construction Group Inc.

Location: Collingwood, ON	Slug Test: BH14-1	Test Well: BH14-1
Test Conducted by: LG		Test Date: 7/21/2022
Analysis Performed by:	Bouwer & Rice	Analysis Date: 7/26/2022
Aquifer Thickness: 1.50 m		

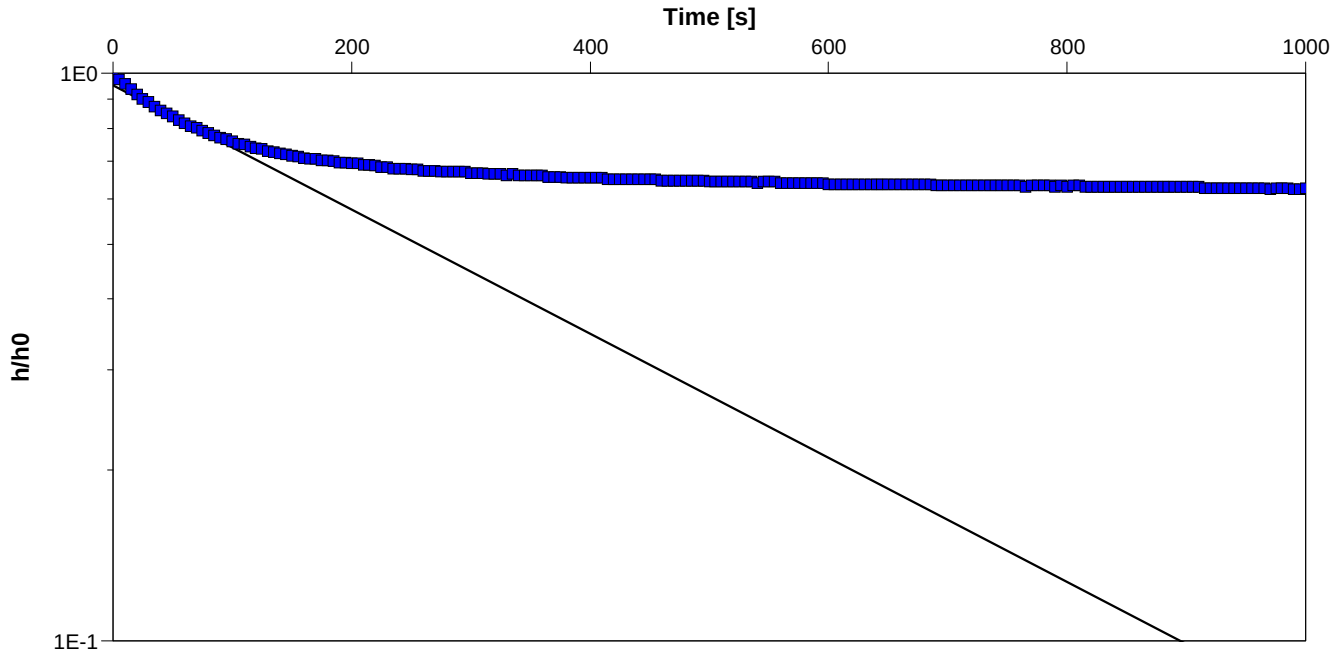


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH14-1	1.02×10^{-5}	

	Slug Test Analysis Report
	Project: Hydrogeological Investigation
	Number: 22-189-400
	Client: IPR And Construction Group Inc.

Location: Collingwood, ON	Slug Test: BH14-7	Test Well: BH14-7
Test Conducted by: LG		Test Date: 7/21/2022
Analysis Performed by:		Analysis Date: 7/26/2022
Aquifer Thickness: 5.40 m		

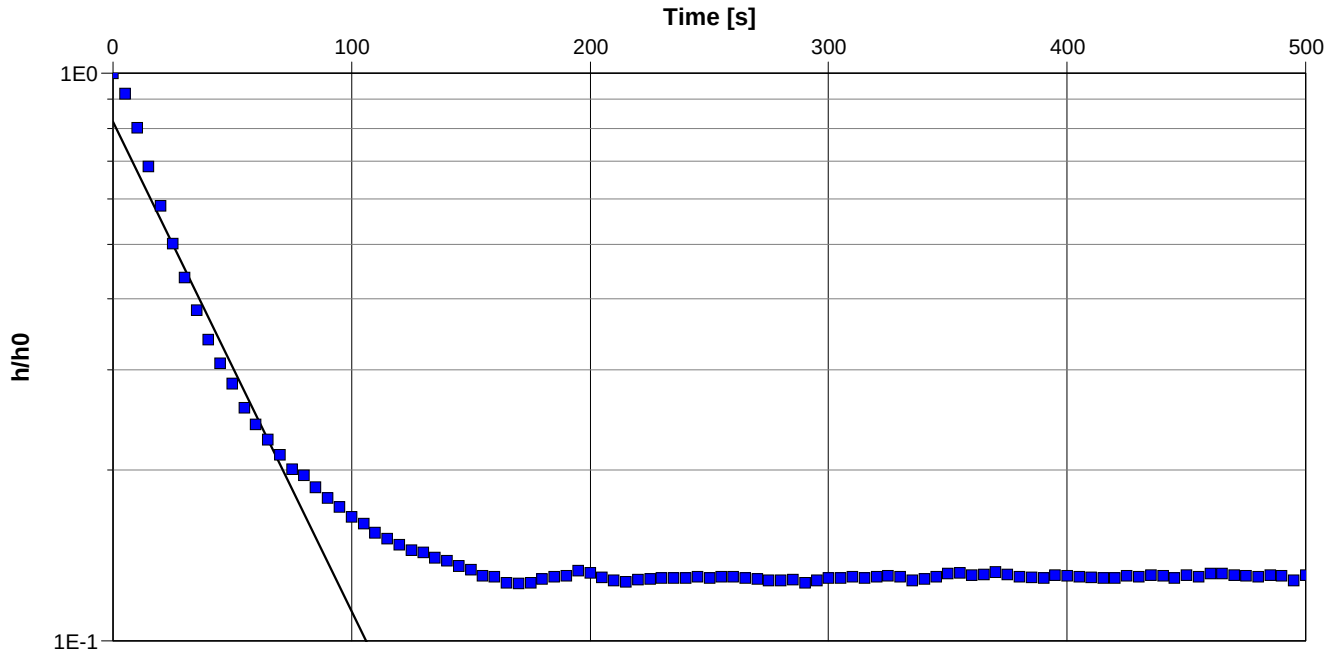


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH14-7	7.12×10^{-7}	

	Slug Test Analysis Report
	Project: Hydrogeological Investigation
	Number: 22-189-400
	Client: IPR And Construction Group Inc.

Location: Collingwood, ON	Slug Test: BH22-1	Test Well: BH22-1
Test Conducted by: LG		Test Date: 7/21/2022
Analysis Performed by:	Bouwer & Rice	Analysis Date: 7/26/2022
Aquifer Thickness: 5.40 m		

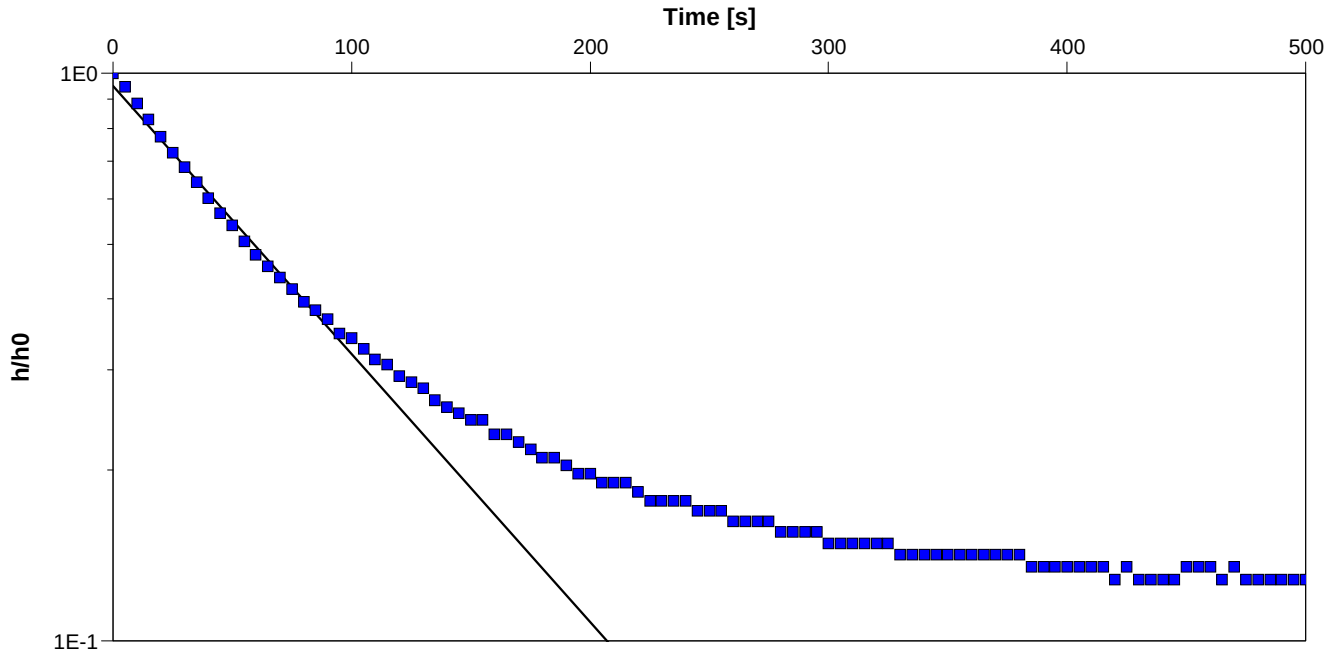


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH22-1	2.57×10^{-5}	

	Slug Test Analysis Report
	Project: Hydrogeological Investigation
	Number: 22-189-400
	Client: IPR And Construction Group Inc.

Location: Collingwood, ON	Slug Test: BH22-5	Test Well: BH22-5
Test Conducted by: LG		Test Date: 7/21/2022
Analysis Performed by:	Bouwer & Rice	Analysis Date: 7/26/2022
Aquifer Thickness: 1.50 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH22-5	1.39×10^{-5}	

Appendix D: Groundwater Quality Certificate of Analysis

FINAL REPORT

CA40248-JUL22 R2

22-189-400, Collingwood

Prepared for

DS Consultants

FINAL REPORT

CA40248-JUL22 R2

First Page

CLIENT DETAILS

Client	DS Consultants
Address	6221 Highway 7 Vaughan, Ontario L4H 0K8. Canada
Contact	Lili Ghasemi
Telephone	905-264-9393
Facsimile	905-264-2685
Email	Lili.ghasemi@dsconsultants.ca
Project	22-189-400, Collingwood
Order Number	
Samples	Ground Water (1)

LABORATORY DETAILS

Project Specialist	Brad Moore Hon. B.Sc
Laboratory	SGS Canada Inc.
Address	185 Concession St., Lakefield ON, K0L 2H0
Telephone	705-652-2143
Facsimile	705-652-6365
Email	brad.moore@sgs.com
SGS Reference	CA40248-JUL22
Received	07/22/2022
Approved	08/23/2022
Report Number	CA40248-JUL22 R2
Date Reported	08/23/2022

COMMENTS

RL - SGS Reporting Limit

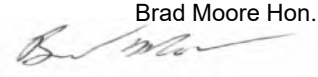
Temperature of Sample upon Receipt: 9 degrees C
Cooling Agent Present: Yes
Custody Seal Present: Yes

Chain of Custody Number: 032982

Revision 1 - Sample ID updated from MW-1 to BH14-7 as per client request

SIGNATORIES

Brad Moore Hon. B.Sc



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FINAL REPORT

CA40248-JUL22 R2

Client: DS Consultants
Project: 22-189-400, Collingwood
Project Manager: Lili Ghasemi
Samplers: Lili Ghasemi

MATRIX: WATER

L1 = PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E

Sample Number	8
Sample Name	BH14-7
Sample Matrix	Ground Water
Sample Date	22/07/2022

Parameter	Units	RL	L1	Result
General Chemistry				
Biochemical Oxygen Demand (BOD5)	mg/L	2		< 4 ↑
Total Suspended Solids	mg/L	2		191
Total Kjeldahl Nitrogen	as N mg/L	0.5		2.3
Metals and Inorganics				
Cyanide (total)	mg/L	0.01		< 0.01
Sulphate	mg/L	2		27
Fluoride	mg/L	0.06		0.06
Sulphide	mg/L	0.02		< 0.02
Aluminum (total)	mg/L	0.001		0.843
Antimony (total)	mg/L	0.0009	0.02	< 0.0009
Arsenic (total)	mg/L	0.0002	0.005	0.0006
Bismuth (total)	mg/L	0.00001		0.00001
Cadmium (total)	mg/L	0.000003	0.0001	0.000176
Chromium (total)	mg/L	0.00008	0.1	0.00175
Cobalt (total)	mg/L	0.000004	0.0009	0.000502
Copper (total)	mg/L	0.0002	0.001	0.0037
Iron (total)	mg/L	0.007	0.3	5.09
Lead (total)	mg/L	0.00009	0.005	0.00080
Manganese (total)	mg/L	0.00001		0.250
Molybdenum (total)	mg/L	0.00004	0.04	0.00068
Nickel (total)	mg/L	0.0001	0.025	0.0020
Phosphorus (total)	mg/L	0.003	0.01	0.469

Client: DS Consultants
Project: 22-189-400, Collingwood
Project Manager: Lili Ghasemi
Samplers: Lili Ghasemi

MATRIX: WATER

L1 = PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E

Sample Number	8
Sample Name	BH14-7
Sample Matrix	Ground Water
Sample Date	22/07/2022

Parameter	Units	RL	L1	Result
Metals and Inorganics (continued)				
Selenium (total)	mg/L	0.00004	0.1	0.00014
Silver (total)	mg/L	0.00005	0.0001	< 0.00005
Tin (total)	mg/L	0.00006		0.00322
Titanium (total)	mg/L	0.00005		0.0251
Vanadium (total)	mg/L	0.00001	0.006	0.00334
Zinc (total)	mg/L	0.002	0.02	0.012
Microbiology				
E. Coli	cfu/100mL	0	100	4
Oil and Grease				
Oil & Grease (total)	mg/L	2		< 2
Oil & Grease (animal/vegetable)	mg/L	4		< 4
Oil & Grease (mineral/synthetic)	mg/L	4		< 4

Client: DS Consultants
Project: 22-189-400, Collingwood
Project Manager: Lili Ghasemi
Samplers: Lili Ghasemi

MATRIX: WATER

L1 = PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E

Sample Number	8
Sample Name	BH14-7
Sample Matrix	Ground Water
Sample Date	22/07/2022

Parameter	Units	RL	L1	Result
Other (ORP)				
pH	No unit	0.05	8.6	7.43
Chloride	mg/L	1		680
Mercury (total)	mg/L	0.00001	0.0002	< 0.00001
PCBs				
Polychlorinated Biphenyls (PCBs) - Total	mg/L	0.0001		< 0.0001
Phenols				
4AAP-Phenolics	mg/L	0.002	0.001	0.005
SVOCs				
Hexachlorobenzene	mg/L	0.00001	0.00000 65	< 0.0001↑
VOCs				
Chloroform	mg/L	0.0005		< 0.0005
1,2-Dichlorobenzene	mg/L	0.0005		< 0.0005
1,4-Dichlorobenzene	mg/L	0.0005		< 0.0005
Methylene Chloride	mg/L	0.0005	0.1	< 0.0005
1,1,2,2-Tetrachloroethane	mg/L	0.0005	0.07	< 0.0005
Tetrachloroethylene (perchloroethylene)	mg/L	0.0005	0.05	< 0.0005
Trichloroethylene	mg/L	0.0005	0.02	< 0.0005

Client: DS Consultants
Project: 22-189-400, Collingwood
Project Manager: Lili Ghasemi
Samplers: Lili Ghasemi

MATRIX: WATER

L1 = PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E

Sample Number	8
Sample Name	BH14-7
Sample Matrix	Ground Water
Sample Date	22/07/2022

Parameter	Units	RL	L1	Result
VOCs - BTEX				
Benzene	mg/L	0.0005	0.1	< 0.0005
Ethylbenzene	mg/L	0.0005	0.008	< 0.0005
Toluene	mg/L	0.0005	0.0008	< 0.0005
Xylene (total)	mg/L	0.0005		< 0.0005
m-p-xylene	mg/L	0.0005	0.002	< 0.0005
o-xylene	mg/L	0.0005	0.04	< 0.0005

EXCEEDANCE SUMMARY

Parameter	Method	Units	Result	PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E L1
BH14-7				
Hexachlorobenzene	EPA 3510C/8270D	mg/L	< 0.0001	0.0000065
Cadmium	SM 3030/EPA 200.8	mg/L	0.000176	0.0001
Copper	SM 3030/EPA 200.8	mg/L	0.0037	0.001
Iron	SM 3030/EPA 200.8	mg/L	5.09	0.3
Phosphorus	SM 3030/EPA 200.8	mg/L	0.469	0.01
4AAP-Phenolics	SM 5530B-D	mg/L	0.005	0.001

QC SUMMARY

Anions by discrete analyzer

Method: US EPA 325.2 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-026

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chloride	DIO5079-JUL22	mg/L	1	<1	0	20	104	80	120	82	75	125
Sulphate	DIO5079-JUL22	mg/L	2	<2	1	20	113	80	120	87	75	125

Biochemical Oxygen Demand

Method: SM 5210 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-007

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Biochemical Oxygen Demand (BOD5)	BOD0042-JUL22	mg/L	2	< 2	5	30	114	70	130	NV	70	130

Cyanide by SFA

Method: SM 4500 | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Cyanide (total)	SKA0228-JUL22	mg/L	0.01	<0.01	ND	10	94	90	110	88	75	125

QC SUMMARY

Fluoride by Specific Ion Electrode

Method: SM 4500 I Internal ref.: ME-CA-[ENVIEWL-LAK-AN-014

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Fluoride	EWL0430-JUL22	mg/L	0.06	<0.06	ND	10	102	90	110	96	75	125

Mercury by CVAAS

Method: EPA 7471A/SM 3112B I Internal ref.: ME-CA-[ENVISPE-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Mercury (total)	EHG0043-JUL22	mg/L	0.00001	< 0.00001	ND	20	120	80	120	115	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Silver (total)	EMS0211-JUL22	mg/L	0.00005	<0.00005	ND	20	102	90	110	91	70	130
Aluminum (total)	EMS0211-JUL22	mg/L	0.001	<0.001	0	20	106	90	110	111	70	130
Arsenic (total)	EMS0211-JUL22	mg/L	0.0002	<0.0002	17	20	102	90	110	87	70	130
Bismuth (total)	EMS0211-JUL22	mg/L	0.00001	<0.00001	ND	20	96	90	110	87	70	130
Cadmium (total)	EMS0211-JUL22	mg/L	0.000003	<0.000003	3	20	100	90	110	107	70	130
Cobalt (total)	EMS0211-JUL22	mg/L	0.000004	<0.000004	1	20	101	90	110	106	70	130
Chromium (total)	EMS0211-JUL22	mg/L	0.00008	<0.00008	13	20	102	90	110	123	70	130
Copper (total)	EMS0211-JUL22	mg/L	0.0002	<0.0002	4	20	100	90	110	97	70	130
Iron (total)	EMS0211-JUL22	mg/L	0.007	<0.007	10	20	94	90	110	102	70	130
Manganese (total)	EMS0211-JUL22	mg/L	0.00001	<0.00001	1	20	104	90	110	108	70	130
Molybdenum (total)	EMS0211-JUL22	mg/L	0.00004	<0.00004	17	20	104	90	110	100	70	130
Nickel (total)	EMS0211-JUL22	mg/L	0.0001	<0.0001	2	20	103	90	110	96	70	130
Lead (total)	EMS0211-JUL22	mg/L	0.00009	<0.00001	4	20	101	90	110	116	70	130
Phosphorus (total)	EMS0211-JUL22	mg/L	0.003	<0.003	ND	20	94	90	110	NV	70	130
Antimony (total)	EMS0211-JUL22	mg/L	0.0009	<0.0009	16	20	107	90	110	100	70	130
Selenium (total)	EMS0211-JUL22	mg/L	0.00004	<0.00004	6	20	104	90	110	118	70	130
Tin (total)	EMS0211-JUL22	mg/L	0.00006	<0.00006	ND	20	98	90	110	NV	70	130
Titanium (total)	EMS0211-JUL22	mg/L	0.00005	<0.00005	ND	20	107	90	110	NV	70	130
Vanadium (total)	EMS0211-JUL22	mg/L	0.00001	<0.00001	ND	20	101	90	110	91	70	130
Zinc (total)	EMS0211-JUL22	mg/L	0.002	<0.002	0	20	96	90	110	118	70	130

QC SUMMARY

Microbiology

Method: SM 9222D | Internal ref.: ME-CA-IENVIMIC-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
E. Coli	BAC9375-JUL22	cfu/100mL	-	ACCEPTED	ACCEPTED							

Oil & Grease

Method: MOE E3401 | Internal ref.: ME-CA-IENVIGC-LAK-AN-019

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Oil & Grease (total)	GCM0401-JUL22	mg/L	2	<2	NSS	20	102	75	125			

QC SUMMARY

Oil & Grease-AV/MS

Method: MOE E3401/SM 5520F | Internal ref.: ME-CA-[ENV]GC-LAK-AN-019

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Oil & Grease (animal/vegetable)	GCM0401-JUL22	mg/L	4	< 4	NSS	20	NA	70	130			
Oil & Grease (mineral/synthetic)	GCM0401-JUL22	mg/L	4	< 4	NSS	20	NA	70	130			

pH

Method: SM 4500 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0431-JUL22	No unit	0.05	NA	0		102			NA		

Phenols by SFA

Method: SM 5530B-D | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
4AAP-Phenolics	SKA0222-JUL22	mg/L	0.002	<0.002	ND	10	104	80	120	111	75	125

QC SUMMARY

Polychlorinated Biphenyls

Method: MOE E3400/EPA 8082A | Internal ref.: ME-CA-[ENV]GC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Polychlorinated Biphenyls (PCBs) - Total	GCM0396-JUL22	mg/L	0.0001	<0.0001	NSS	30	89	60	140	NSS	60	140

Semi-Volatile Organics

Method: EPA 3510C/8270D | Internal ref.: ME-CA-[ENV]GC-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Hexachlorobenzene	GCM0425-JUL22	mg/L	0.00001	< 0.0001	NSS	30	89	50	140	NSS	50	140

Sulphide by SFA

Method: SM 4500 | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-008

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Sulphide	SKA0227-JUL22	mg/L	0.02	<0.02	ND	20	85	80	120	NA	75	125

QC SUMMARY

Suspended Solids

Method: SM 2540D | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Suspended Solids	EWL0455-JUL22	mg/L	2	< 2	1	10	95	90	110	NA		

Total Nitrogen

Method: SM 4500-N C/4500-NO3- F | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-002

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Kjeldahl Nitrogen	SKA0225-JUL22	as N mg/L	0.5	<0.5	ND	10	105	90	110	98	75	125

QC SUMMARY

Volatile Organics

Method: EPA 5030B/8260C | Internal ref.: ME-CA-[ENV]GC-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
1,1,2,2-Tetrachloroethane	GCM0391-JUL22	mg/L	0.0005	<0.0005	ND	30	104	60	130	109	50	140
1,2-Dichlorobenzene	GCM0391-JUL22	mg/L	0.0005	<0.0005	ND	30	108	60	130	106	50	140
1,4-Dichlorobenzene	GCM0391-JUL22	mg/L	0.0005	<0.0005	ND	30	106	60	130	104	50	140
Benzene	GCM0391-JUL22	mg/L	0.0005	<0.0005	ND	30	108	60	130	106	50	140
Chloroform	GCM0391-JUL22	mg/L	0.0005	<0.0005	ND	30	106	60	130	105	50	140
Ethylbenzene	GCM0391-JUL22	mg/L	0.0005	<0.0005	ND	30	109	60	130	107	50	140
m-p-xylene	GCM0391-JUL22	mg/L	0.0005	<0.0005	ND	30	109	60	130	106	50	140
Methylene Chloride	GCM0391-JUL22	mg/L	0.0005	<0.0005	ND	30	104	60	130	104	50	140
o-xylene	GCM0391-JUL22	mg/L	0.0005	<0.0005	ND	30	109	60	130	107	50	140
Tetrachloroethylene (perchloroethylene)	GCM0391-JUL22	mg/L	0.0005	<0.0005	ND	30	104	60	130	103	50	140
Toluene	GCM0391-JUL22	mg/L	0.0005	<0.0005	ND	30	107	60	130	106	50	140
Trichloroethylene	GCM0391-JUL22	mg/L	0.0005	<0.0005	ND	30	107	60	130	104	50	140

QC SUMMARY

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

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

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS	Insufficient sample for analysis.
RL	Reporting Limit.
↑	Reporting limit raised.
↓	Reporting limit lowered.
NA	The sample was not analysed for this analyte
ND	Non Detect

Results relate only to the sample tested.
Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.
"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

This report supersedes all previous versions.

-- End of Analytical Report --

SGS Request for Laboratory Services and CHAIN OF CUSTODY

Industries & Environment - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Fax: 705-652-6365 Web: www.sgs.com/environment
- London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361

No: 032982

Page 1 of 1

Laboratory Information Section - Lab use only

Received By: Sandra Abdelmalek
Received By (signature): [signature]
Received Date: 7 / 22 / 22 (mm/dd/yy)
Received Time: 11 : 30 (hr : min)
Custody Seal Present: Yes [X] No [ ]
Custody Seal Intact: Yes [X] No [ ]
Cooling Agent Present: Yes [X] No [ ] Type: ice
Temperature Upon Receipt (°C) 9 . 9 . 9

CA-40248-July22

LAB LIMS #:

REPORT INFORMATION	INVOICE INFORMATION
Company: DS Consultant	[ ] (same as Report Information)
Contact: Lili Ghaseni	Company: DS Accounting
Address: 6221 Hwy 7 Vaughan, ON	Contact:
Phone: 647-607-1943	Address:
Fax:	Phone:
Email: lili.ghaseni@dsconsultant.ca	Email: Accounting@dsconsultants

Quotation #:
P.O. #:
Project #: 22-189-400
Site Location/ID: Collingwood, ON

TURNAROUND TIME (TAT) REQUIRED

[X] Regular TAT (5-7days)

TAT's are quoted in business days (exclude statutory holidays & weekends). Samples received after 6pm or on weekends: TAT begins next business day

RUSH TAT (Additional Charges May Apply): [ ] 1 Day [ ] 2 Days [ ] 3 Days [ ] 4 Days

PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

Specify Due Date:

*NOTE: DRINKING (POTABLE) WATER SAMPLES FOR HUMAN CONSUMPTION MUST BE SUBMITTED WITH SGS DRINKING WATER CHAIN OF CUSTODY

REGULATIONS

[ ] O.Reg 153/04 [ ] O.Reg 406/19
[ ] Table 1 [ ] Res/Park Soil Texture:
[ ] Table 2 [ ] Ind/Com [ ] Coarse
[ ] Table 3 [ ] Agri/Other [ ] Medium/Fine
[ ] Table ______ Appx. ______
Soil Volume [ ] <350m3 [ ] >350m3

Other Regulations:
[ ] Reg 347/558 (3 Day min TAT)
[ ] PWQO [ ] MMER
[ ] CCME [ ] Other:
[ ] MISA
[ ] ODWS Not Reportable *See note

Sewer By-Law:
[X] Sanitary
[X] Storm
Municipality: Collingwood

RECORD OF SITE CONDITION (RSC) [ ] YES [ ] NO

ANALYSIS REQUESTED

Column groups: M & I — Field Filtered (Y/N); Metals & Inorganics (incl CrVI, CN, Hg pH,(B(HWS),EC,SAR-soil) (Cl, Na-water)); Full Metals Suite (ICP metals plus B(HWS-soil only) Hg, CrVI); ICP Metals only (Sb,As,Ba,Be,B,Cd, Cr,Co,Cu,Pb,Mo,Ni,Se,Ag,Tl,U,V,Zn). SVOC — PAHs only; SVOCs (all incl PAHs, ABNs, CPs). PCB — PCBs ([ ] Total [ ] Aroclor). PHC — F1-F4 + BTEX; F1-F4 only (no BTEX). VOC — VOCs (all incl BTEX); BTEX only. Pest — Pesticides (Organochlorine or specify other). Other (please specify) — ~~ADD - Metals & Hg~~; X Sanitary and Storm; Sewer Use: (Specify pkg:); Water Characterization Pkg (General [ ] Extended [ ]). SPLP — Specify tests: [ ] Metals [ ] VOC [ ] 1,4-Dioxane [ ] OCP [ ] ABN. TCLP — Specify tests: [ ] M&I [ ] VOC [ ] PCB [ ] B(a)P [ ] ABN [ ] Ignit.

#	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	Other: ADD - Metals & Hg (struck)	Other: Sanitary and Storm	COMMENTS
1	MW-1	July 22/2022	11:00 am	17	GW	~~X~~	X	
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

Observations/Comments/Special Instructions

Sampled By (NAME): Lili Ghaseni	Signature: [signature]	Date: 22/07/22 (mm/dd/yy)	Pink Copy - Client
Relinquished by (NAME): Lili Ghaseni	Signature: [signature]	Date: 22/07/22 (mm/dd/yy)	Yellow & White Copy - SGS

Revision #: 1.6
Date of Issue: 02 May 2022

Appendix E: Site Water Balance Analysis

TABLE E-1

CLIMATE NORMALS 1981-2010 (THORNBURY SLAMA CLIMATE STATION, ONTARIO)

Water Balance-11476 Highway 26, Collingwood

	Thornthwaite (1948)					
Month	Mean Temperature (°C)	Heat Index	Unadjusted Potential Evapotranspiration (mm)	Daylight Correction Value	Adjusted Potential Evapotranspiration (mm)	Total Precipitation (mm)
January	-6.3	0.0	0.0	0.81	0.0	100.0
February	-5.4	0.0	0.0	0.82	0.0	68.4
March	-1.5	0.0	0.0	1.02	0.0	64.0
April	5.5	1.2	25.7	1.12	28.7	65.3
May	11.5	3.5	55.8	1.26	70.3	82.7
June	16.7	6.2	82.6	1.28	105.7	79.1
July	19.8	8.0	98.8	1.29	127.5	72.1
August	19.2	7.7	95.7	1.20	114.8	78.2
September	15.5	5.5	76.4	1.04	79.4	95.9
October	9.1	2.5	43.6	0.95	41.4	87.3
November	3.1	0.5	14.0	0.81	11.4	99.6
December	-2.7	0.0	0.0	0.77	0.0	99.4
TOTALS		**35.1**	**492.5**		**579.2**	**992.0**

Notes: Daylight Correction values obtained from Instruction and Tables For Computing Potential Evapotranspiration and The Water Balance (Thornthwaite & Mather, 1957)

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Vaughan, Ontario L4H 0K8
Telephone: (905) 264 - 9393
www.dsconsultants.ca

TABLE G-E

Post-development Water Balance

Water Balance- Water Balance-11476 Highway 26, Collingwood

Catchments and Hydrologic Components			Month												Total
			March	April	May	June	July	August	September	October	November	December	January	February	
PET - Adjusted Potential Evapotranspiration (mm)			0.00	28.75	70.28	105.72	127.45	114.78	79.41	41.42	11.37	0.00	0.00	0.00	**579.18**
P - Total Precipitation (mm)			64.00	65.30	82.70	79.10	72.10	78.20	95.90	87.30	99.60	99.40	100.00	68.40	**992.00**
P-PET (mm)			64.00	36.55	12.42	-26.62	-55.35	-36.58	16.49	45.88	88.23	99.40	100.00	68.40	-
Soil Moisture Deficit (mm)			0.00	0.00	0.00	-26.62	-81.97	-118.55	-102.07	-56.19	0.00	0.00	0.00	0.00	-
11476 Highway 26, Collingwood	Pervious Area-Wooded Area	Soil Moisture Storage (mm)	300.00	300.00	300.00	273.38	218.03	181.45	197.93	243.81	300.00	300.00	300.00	300.00	-
		Actual Potential Evapotranspiration (mm)	0.00	28.75	70.28	104.54	117.43	102.56	79.41	41.42	11.37	0.00	0.00	0.00	**555.76**
		P-AET (mm)	64.00	36.55	12.42	-25.44	-45.33	-24.36	16.49	45.88	88.23	99.40	100.00	68.40	-
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-25.44	-70.77	-95.13	-78.64	-32.76	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	25.44	45.33	24.36	-16.49	-45.88	-32.76	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	64.00	36.55	12.42	0.00	0.00	0.00	0.00	0.00	55.47	99.40	100.00	68.40	**436.24**
		MOECC Infiltration Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	
		Run-Off Coefficient	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-
		Infiltration (mm)	51.20	29.24	9.94	0.00	0.00	0.00	0.00	0.00	44.37	79.52	80.00	54.72	**348.99**
		Run-Off (mm)	12.80	7.31	2.48	0.00	0.00	0.00	0.00	0.00	11.09	19.88	20.00	13.68	**87.25**
		Catchment Area (m^2) = 14397.00					Subcatchment Monthly Volumes								
		Infiltration (m^3)	737.13	421.00	143.06	0.00	0.00	0.00	0.00	0.00	638.84	1144.85	1151.76	787.80	**5024.45**
		Run-Off (m^3)	184.28	105.25	35.77	0.00	0.00	0.00	0.00	0.00	159.71	286.21	287.94	196.95	**1256.11**
	Pervious Area-Open space-vacant land	Soil Moisture Storage (mm)	75.00	75.00	75.00	48.38	0.00	0.00	16.49	62.37	75.00	75.00	75.00	75.00	-
		Actual Potential Evapotranspiration (mm)	0.00	28.75	70.28	100.99	89.95	78.20	79.41	41.42	11.37	0.00	0.00	0.00	**500.38**
		P-AET (mm)	64.00	36.55	12.42	-21.89	-17.85	0.00	16.49	45.88	88.23	99.40	100.00	68.40	-
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-21.89	-39.75	-39.75	-23.26	0.00	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	21.89	17.85	0.00	-16.49	-23.26	0.00	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	64.00	36.55	12.42	0.00	0.00	0.00	0.00	22.62	88.23	99.40	100.00	68.40	**491.62**
		MOECC Infiltration Factor	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	
		Run-Off Coefficient	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	-
		Infiltration (mm)	44.80	25.59	8.69	0.00	0.00	0.00	0.00	15.83	61.76	69.58	70.00	47.88	**344.13**
		Run-Off (mm)	19.20	10.97	3.73	0.00	0.00	0.00	0.00	6.79	26.47	29.82	30.00	20.52	**147.49**
		Catchment Area (m^2) = 9927.00					Subcatchment Monthly Volumes								
		Infiltration (m^3)	444.73	254.00	86.31	0.00	0.00	0.00	0.00	157.17	613.09	690.72	694.89	475.30	**3416.22**
		Run-Off (m^3)	190.60	108.86	36.99	0.00	0.00	0.00	0.00	67.36	262.75	296.02	297.81	203.70	**1464.10**
		Total Precipitation (mm)	64.00	65.30	82.70	79.10	72.10	78.20	95.90	87.30	99.60	99.40	100.00	68.40	**992.00**
		Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
		Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
		Evaporation (mm)	9.60	9.80	12.41	11.87	10.82	11.73	14.39	13.10	14.94	14.91	15.00	10.26	**148.80**
		Run-Off (mm)	54.40	55.51	70.30	67.24	61.29	66.47	81.52	74.21	84.66	84.49	85.00	58.14	**843.20**
		Catchment Area (m^2) = 3845.00					Subcatchment Monthly Volumes								
		Evaporation (m^3)	36.91	37.66	47.70	45.62	41.58	45.10	55.31	50.35	57.44	57.33	57.68	39.45	572.14
		Run-Off (m^3)	209.17	213.42	270.28	258.52	235.64	255.58	313.43	285.32	325.52	324.86	326.83	223.55	3242.10
							Total Catchment Volumes								
Total AET (m^3)			0.00	699.24	1709.46	2507.60	2583.66	2252.79	1931.66	1007.49	276.61	0.00	0.00	0.00	**12968.53**
Total Evaporation (m^3)			36.91	37.66	47.70	45.62	41.58	45.10	55.31	50.35	57.44	57.33	57.68	39.45	572.14
Total Infiltration (m^3)			1181.86	675.01	229.38	0.00	0.00	0.00	0.00	157.17	1251.93	1835.57	1846.65	1263.11	8440.67
Total Runoff (m^3)			584.05	427.53	343.04	258.52	235.64	255.58	313.43	352.68	747.98	907.10	912.58	624.20	5962.31

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TABLE E-3

Post-development Water Balance

Water Balance- Water Balance-11476 Highway 26, Collingwood

Catchments and Hydrologic Components			Month												Total
			March	April	May	June	July	August	September	October	November	December	January	February	
PET - Adjusted Potential Evapotranspiration (mm)			0.00	28.75	70.28	105.72	127.45	114.78	79.41	41.42	11.37	0.00	0.00	0.00	**579.18**
P - Total Precipitation (mm)			64.00	65.30	82.70	79.10	72.10	78.20	95.90	87.30	99.60	99.40	100.00	68.40	**992.00**
P-PET (mm)			64.00	36.55	12.42	-26.62	-55.35	-36.58	16.49	45.88	88.23	99.40	100.00	68.40	-
Soil Moisture Deficit (mm)			0.00	0.00	0.00	-26.62	-81.97	-118.55	-102.07	-56.19	0.00	0.00	0.00	0.00	-
11476 Highway 26, Collingwood	Pervious Area-Wooded Area	Soil Moisture Storage (mm)	300.00	300.00	300.00	273.38	218.03	181.45	197.93	243.81	300.00	300.00	300.00	300.00	-
		Actual Potential Evapotranspiration (mm)	0.00	28.75	70.28	104.54	117.43	102.56	79.41	41.42	11.37	0.00	0.00	0.00	**555.76**
		P-AET (mm)	64.00	36.55	12.42	-25.44	-45.33	-24.36	16.49	45.88	88.23	99.40	100.00	68.40	-
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-25.44	-70.77	-95.13	-78.64	-32.76	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	25.44	45.33	24.36	-16.49	-45.88	-32.76	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	64.00	36.55	12.42	0.00	0.00	0.00	0.00	0.00	55.47	99.40	100.00	68.40	**436.24**
		MOECC Infiltration Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	
		Run-Off Coefficient	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-
		Infiltration (mm)	51.20	29.24	9.94	0.00	0.00	0.00	0.00	0.00	44.37	79.52	80.00	54.72	**348.99**
		Run-Off (mm)	12.80	7.31	2.48	0.00	0.00	0.00	0.00	0.00	11.09	19.88	20.00	13.68	**87.25**
		Catchment Area (m^2) = 14397.00					Subcatchment Monthly Volumes								
		Infiltration (m^3)	737.13	421.00	143.06	0.00	0.00	0.00	0.00	0.00	638.84	1144.85	1151.76	787.80	**5024.45**
		Run-Off (m^3)	184.28	105.25	35.77	0.00	0.00	0.00	0.00	0.00	159.71	286.21	287.94	196.95	**1256.11**
	Pervious Area-Open space-vacant land	Soil Moisture Storage (mm)	100.00	100.00	100.00	73.38	18.03	0.00	16.49	62.37	100.00	100.00	100.00	100.00	-
		Actual Potential Evapotranspiration (mm)	0.00	28.75	70.28	102.18	97.40	81.50	79.41	41.42	11.37	0.00	0.00	0.00	**512.30**
		P-AET (mm)	64.00	36.55	12.42	-23.08	-25.30	-3.30	16.49	45.88	88.23	99.40	100.00	68.40	-
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-23.08	-48.37	-51.67	-35.19	0.00	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	23.08	25.30	3.30	-16.49	-35.19	0.00	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	64.00	36.55	12.42	0.00	0.00	0.00	0.00	10.69	88.23	99.40	100.00	68.40	**479.70**
		MOECC Infiltration Factor	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	
		Run-Off Coefficient	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	-
		Infiltration (mm)	38.40	21.93	7.45	0.00	0.00	0.00	0.00	6.42	52.94	59.64	60.00	41.04	**287.82**
		Run-Off (mm)	25.60	14.62	4.97	0.00	0.00	0.00	0.00	4.28	35.29	39.76	40.00	27.36	**191.88**
		Catchment Area (m^2) = 1377.00					Subcatchment Monthly Volumes								
		Infiltration (m^3)	52.88	30.20	10.26	0.00	0.00	0.00	0.00	8.84	72.89	82.12	82.62	56.51	**396.33**
		Run-Off (m^3)	35.25	20.13	6.84	0.00	0.00	0.00	0.00	5.89	48.60	54.75	55.08	37.67	**264.22**
		Total Precipitation (mm)	64.00	65.30	82.70	79.10	72.10	78.20	95.90	87.30	99.60	99.40	100.00	68.40	**992.00**
		Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
		Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
		Evaporation (mm)	9.60	9.80	12.41	11.87	10.82	11.73	14.39	13.10	14.94	14.91	15.00	10.26	**148.80**
		Run-Off (mm)	54.40	55.51	70.30	67.24	61.29	66.47	81.52	74.21	84.66	84.49	85.00	58.14	**843.20**
		Catchment Area (m^2) = 12395.00					Subcatchment Monthly Volumes								
		Evaporation (m^3)	118.99	121.41	153.76	147.07	134.05	145.39	178.30	162.31	185.18	184.81	185.93	127.17	1844.38
		Run-Off (m^3)	674.29	687.98	871.31	833.38	759.63	823.90	1010.38	919.77	1049.36	1047.25	1053.58	720.65	10451.46
							Total Catchment Volumes								
Total AET (m^3)			0.00	453.45	1108.58	1645.72	1824.82	1588.72	1252.68	653.35	179.38	0.00	0.00	0.00	**8706.70**
Total Evaporation (m^3)			118.99	121.41	153.76	147.07	134.05	145.39	178.30	162.31	185.18	184.81	185.93	127.17	1844.38
Total Infiltration (m^3)			790.00	451.20	153.33	0.00	0.00	0.00	0.00	8.84	711.73	1226.97	1234.38	844.32	5420.77
Total Runoff (m^3)			893.82	813.37	913.91	833.38	759.63	823.90	1010.38	925.66	1257.67	1388.22	1396.60	955.27	11971.79

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