Small Scale Hydrogeological Assessment
Commercial Property at
12476 Highway 50,
Caledon, Ontario

Report #5277 – BVD
May 15, 2020

Prepared for:
BVD Petroleum
130 Delta Park Boulevard,
Brampton, Ontario
Tel : 416-848-4111

Prepared by:
A & A Environmental Consultants Inc.
16 Young Street
Woodstock, ON N4S 3L4
Tel: 519 266-4680
Fax: 519 266-3666

A & A ENVIRONMENTAL CONSULTANTS INC.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

A & A Environmental Consultants Inc. (A&A) was retained by BVD Petroleum (the client) to evaluate the potential impact from the proposed development of a hotel on local groundwater/surface water resources by conducting a small-scale hydrogeological study. The subject site is located at intersection of Highway 50 and George Bolton Parkway, Caledon, ON, (see Map Showing the Site Location in Appendix A). The Site is bound with commercial properties on all sides. The area of the Site is approximately 12,616 m^2 (3.12 acres). At the time of the investigation, the site was occupied by a Retail Fuel Outlet (RFO) however the majority of the site was vacant.

The topography in the vicinity of the subject site (a 100-meter radius) has a downslope from the north to southeast. An elevation of 240 meters above sea level (masl) is recorded in the center of the site (see Figure 3). The site slopes downward from the west edge of the site to the northeast boundary. The lowest part of the site is recorded at 239 masl. The topographic map shows water flowing in a southeast direction. Water flows from the site towards catchment basins along the adjacent roadways or infiltrate the grounds surface in the vacant are of the site.

Geological Maps identified the site to be Halton Till characterized by predominantly silt to silty clay matrix, high in matrix carbonate content and clast poor. Halton Till onlaps the hummocky southern flank of the Oak Ridges Moraine, in particular in the Humber River watershed where the till can reach more than 30m thick (Barnett et al, 1998). The tills thickness reduces sharply away from the Oak Ridges Moraine in broad low-relief plains east of the Humber River Watershed (Barnett et al, 1998). Thin, discontinuous fine-grained, glaciolacustrine sediments and interbedded beds and lenses of Halton Till appear to indicate a facies gradation to the sediments of the adjacent low-relief plains, particularly in the area of glacial lake deposits north of Markham (Barnett et al, 1998). Halton drift consists of thicker diamicton deposits, up to 15 m thick, represented by the Palgrave ridge (Barnett et al, 1998). It commonly contains quasi-continuous silt, clay, and fine sand beds and lenses that are 0.5–2 m thick (Barnett et al, 1998). The physiographic landform of the site is identified as Till Plains (drumlinized) partially in the South

Slope region (western half of the site) and partially in the Peel Plain Region (Eastern half of the site). The surficial geology identified the site to be Tilll deposits, characterized by Clay to silt-textured till (derived from glaciolacustrine deposits or shale). Bedrock in the area of the Site is part of the Georgian Bay Formation; Blue Mountain Formation; Billings Formation; Collingwood Member; Eastview Member characterized as Shale, limestone, dolostone, siltstone. These rocks were formed from weathering of the Precambrian surface (sandstones and shales) and from the calcareous marine creature skeletons. These sediments were formed during the continental shift where this area was in tropical area. This created an abundance of sea life. Sedimentary rock was formed in these seas and during areas of sea water; the high salt content caused the limestone to change to dolostone. This process creates pores in the dolostone which allows other crystals from different minerals to form.

A search of the MECP well records show a total of 51 wells located within 500 meters of the surrounding area as follows: two are test holes, two are livestock/domestic, one is not used, seven are monitoring test holes, thirteen are monitoring wells, one is industrial/domestic, one is industrial, ten are domestic, two are commercial and twelve have no use listed. It is clear from the MECP water well database and the information obtained during the field survey that the local residents obtain their water from both municipal water supply system and private domestic wells. The subject site is also expected to utilize the municipal water system when developed. The MECP well records show groundwater was found between 0.3-68.0 mbgl, for wells drilled to total depth between 3.66-68.6 mbgl. However, the drilling program completed at this site show the groundwater was found between 1.32-6.645 mbgl for monitoring wells drilled between 6.875-8.627 mbgl.

The water table in the study area was defined by installing a total of four monitoring wells in the area of the proposed development. The selection of the monitoring wells was based on the predicted water flow direction, taking into consideration the site location and accessibility for the drill crew. The four monitoring wells installed by A&A were drilled to a maximum depth of 7.62 m. There were seven groundwater monitoring events that took place. All wells contained water in each of the monitoring events except for MW-2 during the first monitoring even on February

18, 2020. The events took place February 18, 2020, February 27, 2020, March 13, 2020, March 23, 2020, March 30, 2020, April 9, 2020, and May 7, 2020. It was concluded that groundwater was present on site at elevations between 236 to 240 meters above sea level (masl). A groundwater contour map was plotted using "Golden Software" (Surfer 8) and the measurements of groundwater levels taken on May 7, 2020 from the four monitoring wells. This map shows well MW-8 being at the lowest water elevation compared with the other wells. The general direction of groundwater flow was found to be in northeast direction.

The total precipitation (rainfall plus snowfall) in 2015 was 1064.1 mm, with the greatest amounts falling in October and November. July and August show the highest mean daily temperatures during the year and the lowest temperatures were recorded in February. The average annual precipitation from 1989-2019 was calculated using historical data collected at the meteorological station located in Toronto, ON. The average annual precipitation over the thirty-year period was 857 mm. For the same period, it was calculated that approximately 401 mm/year would be lost to evapotranspiration (Environment Canada, 2018); leaving a total of approximately 345 mm/year available for groundwater recharge and surface runoff.

Based on the water balance assessment, moderate changes are anticipated in the infiltration and runoff due to the proposed development at the subject site. There will be an increase in surface runoff due to the development on-site. A storm water management plan will be needed to manage the storm water runoff on site. The analysis results indicate that all health and non-health related parameters were below the Peel Storm By-Law 53-2010 and Peel Sanitary By-Law 53-2010.

RECOMMENDATION

Based on the obtained information from this study, A&A has the following recommendation:

1. A stormwater management plan will be needed to mitigate the creation of excess stormwater runoff.

No adverse impact on the groundwater resources is expected to occur during the developments of the subject site with the implementations of these recommended actions.

1.0 INTRODUCTION

A & A Environmental Consultants Inc. (A&A) was retained by BVD Petroleum (the client) to evaluate the potential impact from the proposed development of a hotel and retail fuel outlet (RFO) on local groundwater/surface water resources by conducting a small-scale hydrogeological study. The subject site is located at intersection of Alder Street and C Line, Orangeville, ON, (see Map Showing the Site Location in Appendix A). The Site is bound with commercial properties on all sides. The area of the Site is approximately 12,616 m^2 (3.12 acres). At the time of the investigation, the site was made up of an RFO and a large vacant field.

This study describes a small-scale hydrogeological study to obtain a better understanding of the groundwater resources within the study area and includes the characterization of the site using all available geological and hydrogeological information; a discussion of the groundwater quality and a report for the site with conclusions and recommendations.

There is no relationship between the client and A&A other than third-party independent assessor.

1.1 Scope of Work

The scope of work included the following where applicable:

- Perform visual/olfactory examination of the site and a walk-through inspection of the property to look for signs of any environmental issues.
- Characterize the site's geological, topography, meteorology, hydrogeology, and groundwater conditions.
- Determination of current activities at the site.
- Obtain utility line locates for all public and private utility lines.
- Drill eight boreholes to a maximum depth of 7.62 m in selected locations. The boreholes will be drilled with a hydraulic soil drill fitted with 4-inch augers.
- Install at four groundwater monitoring wells to cover the entire site. The wells will be constructed of 51 mm (2") PVC risers with 3.05m long Schedule 40 PVC slotted well screen. Slip end caps will be installed at the end of the riser pipe with threaded drive-

points at the bottom of the well. The borehole annuluses will be backfilled with silica sand to approximately 0.3 m above the well screen. A bentonite seal will be placed on the sand pack with a second seal at about 0.3 mbgl. The well will be fitted with a dedicated inertial sampler. The well will be installed by a licensed well technician, tagged in accordance with Regulation 903 and recorded on the Ministry of the Environment, Conservation and Park's (MECP) water well information system (WWIS).

- A level survey will be conducted at the site, which consists of measuring the elevation of the top of the well, relative to an arbitrary benchmark. This level survey will be conducted to provide the information used to calculate the groundwater table elevation.
- The groundwater will be sampled and analyzed for selected parameters of concerns.
- Groundwater samples will be evaluated using information obtained from the newly installed monitoring wells following MECP sampling protocol and procedures.
- Evaluate the potential impact of the proposed development on the ground water and surface water resources and their users.
- Provision of a reasonable conclusion regarding the environmental condition of the site.
- Development of recommendations for follow-up investigations if needed.

1.2 Changes to Scope of Work

No changes were made to the scope of work.

2.0 DESCRIPTION OF THE SUBJECT SITE

The subject site is an irregular shaped lot with an area of 12,616 m^2. The site lies in the southern side of Caledon, ON east of the intersection of Highway 50 and George Bolton Parkway. The site is bounded by commercial buildings on all sides with Highway 50 on its northeast boundary and George Bolton Parkway on its northeast boundary. The site lies in an urban setting with mostly commercial properties. The study site is located within the Humber River watershed which contains the Humber River and its two smaller branches the West Humber River and the East Humber River. The Humber River has its origins in the Niagara Escarpment and Oak Ridges Moraine and flows south to empty into Lake Ontario north of Etobicoke, Ontario.

The approximate UTM coordinates are Zone 17T; 603777m Easting and 4856814m Northing.

The site is zoned as being, "CNB – Bolton Highway Commercial" as quoted from the Town of Caledon Zoning By-law 2006-50 as amended and is located on the eastern corner of the intersection of Highway 50 and George Bolton Parkway. The site is occupied by an RFO and large vacant field.

3.0 DEVELOPMENT PLAN

It is understood that the proposed commercial buildings will consist of the following:

- Two buildings, named the Marriot Hotel and the Retail Fuel Outlet, are proposed to be developed on the site.
    - The Marriot Hotel is approximately 1174 m^2 and is rectangular in shape.
    - The Retail Fuel Outlet is approximately 120 m^2 and is rectangular in shape and does already exist on the property.
- A parking area for:
    - 123 total parking spaces.
- There will be an access road from both Highway 50 and George Bolton Parkway.

The total site area is 12, 616 m^2 with total finished developed area of 8,561 m^2.

4.0 PHYSICAL SETTING

4.1 Topography

The regional topography, which is an area within a 5 km radius from the site, has one slope. The Town of Caledon would slope southeast towards the Humber River. The site sits in the Humber River Watershed that consists of the main channel, The Humber River, and then two smaller branches, the East Humber and the West Humber. All together the Humber River Watershed drains an area of 911 km^2 with 1,800km of waterways and 600 bodies of water (Toronto and Region Conservation Authority, 2019). The main branch has its source in the Niagara Escarpment and flows 126 km south to empty into Lake Ontario at Humber Bay east of Etobicoke and ranges from 320 masl to 80 masl (Toronto and Region Conservation Authority, 2019). The East Humber has its origins in the Kettle Lakes Region of the Richmond Hill and King Township while the West Humber has its origins in the King City region. The watershed has a mixed land use with 54% rural, 33% urban and 13% urbanizing (Toronto and Region Conservation Authority, 2019).

The topography in the vicinity of the subject site (a 100-meter radius), has a downslope from northwest to southeast. An elevation of 140 masl is recorded in the center of the site (see Figure 3). The site slopes downward from the west edge of the site to the east boundary. The lowest part of the site is recorded at an elevation of 139 masl. The topographic map shows water flowing in a southeast direction. Surface water would either flow to catchment basins located along the roadways or infiltrate the grounds surface in the vacant field.

4.2 Geology

The surface deposit in this region, like all of Ontario, was once covered by massive glaciers during the late Wisconsin glacial period. The grinding action of the moving ice masses produced a considerable amount of rock materials, ranging in size from boulders to rock flour which was distributed over the landscape.

Quaternary Geology: The physiography of southern Ontario was altered considerably by the glacial and interglacial episodes that took place throughout the Quaternary period (2 million

years to present). Southern Ontario's glacial history is very complex and has been interpreted and discussed by many (Barnett 1992; Karrow 1967; Chapman and Putnam 1984; Dreimanis and Goldthwait 1973; etc). The sedimentary record of southern Ontario provides evidence for three distinct climatic stages during the Quaternary period: the Illinoisan glacial stage (130-180,000 years before present (y.b.p), Sangamonian interglacial stage (110-130,000 y.b.p.) and the Wisconsinan glacial stage (110-10,000 y.b.p; Johnson et al, 1997).

The Quaternary geology identified the site to be Halton Till characterized by predominantly silt to silty clay matrix, high in matrix carbonate content and clast poor. Halton Till onlaps the hummocky southern flank of the Oak Ridges Moraine, in particular in the Humber River watershed where the till can reach more than 30m thick (Barnett et al, 1998). The tills thickness reduces sharply away from the Oak Ridges Moraine in broad low-relief plains east of the Humber River Watershed (Barnett et al, 1998). Thin, discontinuous fine-grained, glaciolacustrine sediments and interbedded beds and lenses of Halton Till appear to indicate a facies gradation to the sediments of the adjacent low-relief plains, particularly in the area of glacial lake deposits north of Markham (Barnett et al, 1998). Halton drift consists of thicker diamicton deposits, up to 15 m thick, represented by the Palgrave ridge (Barnett et al, 1998). It commonly contains quasi-continuous silt, clay, and fine sand beds and lenses that are 0.5–2 m thick (Barnett et al, 1998).

Paleozoic Geology: Bedrock in the area of the Site is part of the Georgian Bay Formation characterized as shale and Limestone. These rocks were formed from weathering of the Precambrian surface (sandstones and shales) and from the calcareous marine creature skeletons. These sediments were formed during the continental shift where this area was in tropical area. This created an abundance of sea life. Sedimentary rock was formed in these seas and during areas of sea water; the high salt content caused the limestone to change to dolostone. This process creates pores in the dolostone which allows other crystals from different minerals to form (University of Waterloo, 2017).

The drilling program conducted for this study indicates the overburden deposits are generally consistent across the property. The soil profile consists of a layer of sandy silt for a few boreholes followed by silty clay to depth. The sandy silt extends to depths ranging from approximately 0 m

to 1.52 mbgl. The silty clay was a gray-brown in nature and found to be dry with increasing moisture with depth. The silty clay extends to depths ranging from approximately 1.52 mbgl to 7.62 mbgl. Bedrock was not encountered during the drilling program.

5.0 HYDROGEOLOGICAL CONDITIONS

5.1 Hydrogeology

Groundwater and surface water are expected to flow towards the natural slope of the ground surface. Although the surface topography typically has great influence on the groundwater flow it has been observed in several areas that bedrock topography also has a significant influence on the flow, in some cases more so than surface topography. In the latter case, this is believed to be due to relatively impermeable bedrock underlying a much more permeable sand overburden. Based on the regional topography, groundwater flow is inferred to be in a southeast direction towards a tributary of the Humber River. The groundwater flow direction may also be influenced by utility trenches and other subsurface structures and may migrate in the bedding stone of the subsurface utility trenches.

During the investigation on the site, four groundwater monitoring wells were installed within the annulus of boreholes BH-02, BH-05, BH-07 and BH-08 during this investigation (see Figure 4 in Appendix A – Monitoring Wells Location Map). The wells were constructed of 51 mm (2") PVC risers with a 3.05m long Schedule 40 PVC slotted well screen. A ‘J-plug’ secure end cap was installed at the top of the riser pipe with a threaded drive-point at the bottom of the well screen. The borehole annulus was backfilled with silica sand to approximately 0.3m above the well screen. A bentonite seal was placed on the sand pack to about 0.3mbgl. The wells were fitted with a dedicated inertial sampler and a protective, flush-mount steel well protector was installed around the risers. The wells were installed by A&A, licensed well technicians in accordance with Ontario Regulation 903.

These wells are used to determine the quality and direction of groundwater flow. A level survey was conducted at the site, which consisted of measuring the elevation of the top of the well casings, relative to a benchmark. This level survey was conducted to provide information used to

calculate the groundwater table elevation, hydraulic gradient and flow direction. Groundwater levels were obtained from each monitoring well on February 18, 2020, February 27, 2020, March 13, 2020, March 23, 2020, March 30, 2020, April 9, 2020, and May 7, 2020. They were recorded to the nearest 0.01 m accuracy, using an electronic water-table level tape. The total depth of each well was measured and recorded. The groundwater elevations are shown in the well logs (see Tables 1-7 below). These show the highest elevation at MW-2 near the southwest corner and the lowest at MW-8 near the east property boundary.

Groundwater flow direction was determined using the groundwater elevation of the May 7, 2020 groundwater monitoring event.

Table 1 – Monitoring Well Details February 18, 2020

Project Address: 12476 Highway 50, Caledon, ON			Project #: 5277 BVD	
Date Logged: February 18, 2020			Logged By: T. Demers and J. Osborne	
Monitoring Well #	MW-2	MW-5	MW-7	MW-8
Location	Southern corner of the site in the southern side of the proposed hotel building	Western side of the site in the northern corner of the proposed hotel building	Northeast side of the site, west of the UST nest	Northeast side of the site, north of the pump island
Pipe Size (mm)	51	51	51	51
UTM Zone	17T	17T	17T	17T
Easting	603756	603722	603806	603819
Northing	4856747	4856796	4856830	4856849
Top of Pipe (masl)	240.77	240.4	240.31	240.23
Water Level (m)	0	2.445	6.645	2.666
Water Level (masl)	N/A	237.96	233.67	237.56
Total Depth (m)	8.586	7.029	6.875	6.907
Benchmark of 240 masl for a catchment basin north of the convenience store				

Table 2 – Monitoring Well Details February 27, 2020

Project Address: 12476 Highway 50, Caledon, ON			Project #: 5277 BVD	
Date Logged: February 27, 2020			Logged By: J. Stuart and J. Osborne	
Monitoring Well #	MW-2	MW-5	MW-7	MW-8
Location	Southern corner of the site in the southern side of the proposed hotel building	Western side of the site in the northern corner of the proposed hotel building	Northeast side of the site, west of the UST nest	Northeast side of the site, north of the pump island
Pipe Size (mm)	51	51	51	51
UTM Zone	17T	17T	17T	17T
Easting	603756	603722	603806	603819
Northing	4856747	4856796	4856830	4856849
Top of Pipe (masl)	240.77	240.4	240.31	240.23
Water Level (m)	1.32	2.177	5.389	2.485
Water Level (masl)	239.45	238.22	234.92	237.75
Total Depth (m)	8.627	7.662	6.896	6.954
Benchmark of 240 masl for a catchment basin north of the convenience store				

Table 3 – Monitoring Well Details March 13, 2020

Project Address: 12476 Highway 50, Caledon, ON			Project #: 5277 BVD	
Date Logged: March 13, 2020			Logged By: J.Osborne	
Monitoring Well #	MW-2	MW-5	MW-7	MW-8
Location	Southern corner of the site in the southern side of the proposed hotel building	Western side of the site in the northern corner of the proposed hotel building	Northeast side of the site, west of the UST nest	Northeast side of the site, north of the pump island
Pipe Size (mm)	51	51	51	51
UTM Zone	17T	17T	17T	17T
Easting	603756	603722	603806	603819
Northing	4856747	4856796	4856830	4856849
Top of Pipe (masl)	240.77	240.4	240.31	240.23
Water Level (m)	0.246	0.782	1.374	4.095
Water Level (masl)	240.524	239.618	238.936	236.135
Total Depth (m)	8.627	7.662	6.896	6.954
Benchmark of 240 masl for a catchment basin north of the convenience store				

Table 4- Monitoring Well Details March 23, 2020

Project Address: 12476 Highway 50, Caledon, ON			Project #: 5277 BVD	
Date Logged: March 23, 2020			Logged By: J. Osborne	
Monitoring Well #	MW-2	MW-5	MW-7	MW-8
Location	Southern corner of the site in the southern side of the proposed hotel building	Western side of the site in the northern corner of the proposed hotel building	Northeast side of the site, west of the UST nest	Northeast side of the site, north of the pump island
Pipe Size (mm)	51	51	51	51
UTM Zone	17T	17T	17T	17T
Easting	603756	603722	603806	603819
Northing	4856747	4856796	4856830	4856849
Top of Pipe (masl)	240.77	240.4	240.31	240.23
Water Level (m)	0.690	0.805	1.601	1.682
Water Level (masl)	240.080	239.595	238.709	238.548
Total Depth (m)	8.627	7.662	6.896	6.954
Benchmark of 240 masl for a catchment basin north of the convenience store				

Table 5- Monitoring Well Details March 30, 2020

Project Address: 12476 Highway 50, Caledon, ON			Project #: 5277 BVD	
Date Logged: March 30, 2020			Logged By: T. Thornton	
Monitoring Well #	MW-2	MW-5	MW-7	MW-8
Location	Southern corner of the site in the southern side of the proposed hotel building	Western side of the site in the northern corner of the proposed hotel building	Northeast side of the site, west of the UST nest	Northeast side of the site, north of the pump island
Pipe Size (mm)	51	51	51	51
UTM Zone	17T	17T	17T	17T
Easting	603756	603722	603806	603819
Northing	4856747	4856796	4856830	4856849
Top of Pipe (masl)	240.77	240.4	240.31	240.23
Water Level (m)	1.285	0.755	1.522	1.561
Water Level (masl)	239.485	239.645	238.788	238.669
Total Depth (m)	8.627	7.662	6.896	6.954
Benchmark of 240 masl for a catchment basin north of the convenience store				

Table 6 – Monitoring Well Details April 9, 2020

Project Address: 12476 Highway 50, Caledon, ON			Project #: 5277 BVD	
Date Logged: April 9, 2020			Logged By: T. Demers	
Monitoring Well #	MW-2	MW-5	MW-7	MW-8
Location	Southern corner of the site in the southern side of the proposed hotel building	Western side of the site in the northern corner of the proposed hotel building	Northeast side of the site, west of the UST nest	Northeast side of the site, north of the pump island
Pipe Size (mm)	51	51	51	51
UTM Zone	17T	17T	17T	17T
Easting	603756	603722	603806	603819
Northing	4856747	4856796	4856830	4856849
Top of Pipe (masl)	240.77	240.4	240.31	240.23
Water Level (m)	1.312	0.761	1.621	1.681
Water Level (masl)	239.458	239.639	238.689	238.549
Total Depth (m)	8.627	7.662	6.896	6.954
Benchmark of 240 masl for a catchment basin north of the convenience store				

Table 7 – Monitoring Well Details May 7, 2020

Project Address: 12476 Highway 50, Caledon, ON			Project #: 5277 BVD	
Date Logged: May 7, 2020			Logged By: T. Demers	
Monitoring Well #	MW-2	MW-5	MW-7	MW-8
Location	Southern corner of the site in the southern side of the proposed hotel building	Western side of the site in the northern corner of the proposed hotel building	Northeast side of the site, west of the UST nest	Northeast side of the site, north of the pump island
Pipe Size (mm)	51	51	51	51
UTM Zone	17T	17T	17T	17T
Easting	603756	603722	603806	603819
Northing	4856747	4856796	4856830	4856849
Top of Pipe (masl)	240.77	240.4	240.31	240.23
Water Level (m)	1.078	0.815	1.733	1.851
Water Level (masl)	239.692	239.585	238.577	238.379
Total Depth (m)	8.627	7.662	6.896	6.954
Benchmark of 240 masl for a catchment basin north of the convenience store				

The seasonal change in groundwater hydraulic gradient due to rainfall and spring runoff have a significant influence on the groundwater flow velocities, so the groundwater flow velocities was calculated using a hydraulic gradient of 0.0114 m/m (MW-2 to MW-8) and an calculate hydraulic conductivity 1.0 x 10^{-5} cm/s for silty clay to clay at depth material, with an estimated porosity of 35% (Fetter 2001). The average linear velocity can thus be calculated using the following equation:

Where "k" is the hydraulic conductivity, "i" is the hydraulic gradient, and "n "the porosity. By using the above information, the average linear velocities for the silty clay material are estimated to be between 0.147 m/year.

$$v = \frac{ki}{n}$$

A groundwater contour map, shown below in Figure 5, Appendix A, was plotted using Golden Surfer™ (Surfer 8) and the measurements of groundwater levels taken on May 7, 2020 from the four monitoring wells installed in the unconfined, near surface aquifer. This map shows well MW-8 being at the lowest water elevation compared with the other wells used. The general direction of groundwater flow was found to be in northeast direction.

5.2 Meteorological Conditions

Meteorological conditions, such as precipitation (rainfall and snowfall) and temperature are of particular interest for understanding the existing surface water regime; the amount of water available for groundwater recharge; and for developing a surface water management system at the subject site. Data for describing the climatic variables was obtained from the Environment Canada meteorological station at Bolton SPS meteorological station, located in Caledon, ON (See Table 8 below). However, climate varies across large area both spatially and temporally with local variation created by such factors as topography and prevailing winds. Human activities can also affect local climate. Deforestation may increase stream and peak flood flows while decreasing evapotranspiration. Urbanization can increase cloudiness, precipitation and extreme winter

temperatures while decreasing relative humidity, incident radiation and wind speed (Phillips and McCulloch, 1972).

The total precipitation (rainfall plus snowfall) in 2015 was 1064.1 mm, with the greatest amounts falling in October and November. July and August show the highest mean daily temperatures during the year and the lowest temperatures were recorded in February.

Table 8 – 2015 Meteorological Data (Caledon, ON)

MONTH	TOTAL PRECIPITATION (mm)	MEAN TEMPERATURE (°C)
JANUARY	**138.4**	**-4.9**
FEBRUARY	**76.7**	**-9.8**
MARCH	**43.4**	**0.6**
APRIL	**93.0**	**2.1**
MAY	**67.8**	**11.7**
JUNE	**54.8**	**18.5**
JULY	**109.2**	**20.0**
AUGUST	**82.3**	**20.2**
SEPTEMBER	**35.6**	**12.8**
OCTOBER	**127.3**	**9.4**
NOVEMBER	**175.6**	**-1.9**
DECEMBER	**60.0**	**-8.0**
SUM	**1064.1**	
AVERAGE		**5.9**

*Denotes incomplete data

Climate is usually defined as normals (or averages) of weather variable over a 30-year period as defined by the World Meteorological Organization (WMO). These "climate normals" refer to arithmetic calculations based on observed climate values for a given location over a specified time period. Climate normals are often used to classify a region's climate and for research in many environmental fields. There are many ways to calculate "climate normals" and the most useful ones adhere to accepted standards. The WMO considers thirty years long enough to eliminate year-to-year variations. Thus, the WMO climatological standard period for normal's calculations are computer over a 30-year period of consecutive records, starting January 1st and

ending December 31st. In addition, the WMO established that normal's should be arithmetic means calculated for each month of the year form daily data with a limited number of allowable missing values.

The average annual precipitation from 1989-2019 was calculated using historical data collected at the meteorological station located in Caledon Ontario as well as the Toronto Regional Conservation Authority water balance tool. The average annual precipitation was used to estimate the total amount of water available for surface water and groundwater resources. The average annual precipitation over the thirty-year period was 857 mm/year. For the same period, it was calculated that approximately 401 mm/year would be lost to evapotranspiration (Environment Canada, 2018); leaving a total of approximately 456 mm/year available for groundwater recharge and surface runoff.

The natural freeze-thaw cycle, which occurs each year in southern Ontario, significantly impacts the rate and timing of surface water runoff and groundwater recharge. Typically, watercourses in the Toronto area are frozen over by late January and clear by late March to mid April. There is usually snow on the ground by the end of December, with the greatest accumulations in January and February. By late March, warmer spring temperatures melt the snow pack and normally there is little or no snow cover remaining by the end of April. From January to early March surficial soils are normally frozen and relatively impervious to infiltration. Most of the spring melt waters end up as surface runoff, contributing to high flows in the water bodies near the site.

Climate change has had a significant impact on this region and other regions of Canada. In recent years, it has been noted that snow does not accumulate on the ground until January, rather than in late December. In a warming climate, more precipitation will fall in the form of rain rather than snow, filling reservoirs to capacity earlier than normal. Additionally, a warming climate will result in snow melting earlier in the year than in previous decades, disrupting the traditional timing of melt water runoff. Together, these changes mean less snow accumulation in the winter and earlier snow-derived water runoff in the spring, challenging the capacities of existing water reservoirs.

5.3 Groundwater Recharge

Recharge or infiltration to the groundwater system occurs by the migration of precipitation through the surficial soil. The amount of recharge or infiltration at a specific site depends on the amount of precipitation evaporated back into the atmosphere, the amount of water transpired from natural vegetation to the air, site topography, type of vegetation and surficial soil type. Surficial geology influences recharge rates. Areas of hummocky topography exhibit higher recharge rates since soil run-off collects in depressions where it can then infiltrate through the surficial soils. Reduction in recharge within urban settings occur due to paved driveways/roads or impermeable rooftop surfaces.

5.4 Hydraulic Properties

The amount and rate of groundwater flow through porous media is determined by the hydraulic properties of the unit, particularly hydraulic conductivity (K), the hydraulic gradient and porosity. The response of a flow system to various stresses is largely determined by the previously mentioned parameters along with storage. Hydraulic conductivity is a key hydraulic parameter that can be estimated by numerous field and laboratory methods including slug tests and pumping tests.

5.5 Water Balance Assessment

The Site is currently developed with an RFO on its eastern corner while the rest of the site is undeveloped.

5.6 Site-Level Water Balance

The basic water balance for a particular area can be expressed as:

$P = ET + R + I + \Delta S$

(Thornthwaite and Mather, 1957)

Where:

P = Precipitation (mm/year)

ET = Evapotranspiration (mm/year)

R = Runoff (mm/year)

I = Infiltration (mm/year)

ΔS = Change in groundwater storage (taken as zero under steady state conditions) (mm/year)

Based on the Thornthwaite and Mather methodology, the water balance is accounting water in the hydrologic cycle. Precipitation (P) falls as rain and snow. It can run off towards lakes and streams (R), infiltrate to the groundwater table (I), or evaporate from surface water and vegetation (ET). When long-term average values of P, R, I, and ET are used there is minimal or no net change to groundwater storage (ΔS).

5.6.1 Precipitation and Evapotranspiration

Based on the Canada Climate Normals data from Environment Canada for Caledon Station for the years 1989 to 2019. The average annual precipitation over the thirty-year period was 857 mm. For the same period, it was calculated that approximately 401 mm/year would be lost to evapotranspiration (according to Thornthwaite Formula-Environment Canada, 2018); leaving a total of approximately 456 mm/year available for groundwater recharge and surface runoff.

5.6.2 Infiltration and Runoff

As indicated, there is a water surplus of 456 mm/year at the Site, which becomes the infiltration and runoff components of the water balance. The rate of infiltration at a site is expected to vary, based on a number of factors to be considered in any infiltration model. To partition the available water surpluses into infiltration and surface runoff, the MECP infiltration factor was used. The MECP SWM Planning and Design Manual (2003) methodology for calculating total infiltration based on topography, soil type and land cover was used and a corresponding runoff component was calculated for the soil moisture storage conditions. The calculated volumes of infiltration and runoff in the stage of pre-development and post-development are presented in Appendix F and are discussed as follows.

5.6.2.1 Pre-development

Considering the fact that the site is fairly level with a slight slope to the north, medium combination of silt and clay, and occupied by an RFO; the site may have an infiltration factor of 0.5, i.e., 50% of water surplus (228 mm/year). In the meantime, a total of 240 mm/year will become the runoff. Based on the Site's area of 12616 m^2, a total of 2403 m^3 per year will infiltrate, while a total volume of 3827 m^3 per year will become runoff.

5.6.2.2 Post-development

Based on the information provided by the amendment to an existing approved site plan, it is anticipated that after development, approximately 66% of the site area will be the impervious and hard surface area occupied by the buildings and parking area and 34% will be the pervious area, unpaved areas represent landscaped and green area.

Assuming that 20% of the precipitation will become the evaporation in the non-permeable surface areas, the infiltration volume was calculated to be 1896 m^3 per year, which is a deficit of 507 m^3 per year after the development, while the runoff volume was calculated to be 4847 m^3 per year, which is a surplus of 1030 m^3 per year after the development.

Based on the water balance assessment, moderate changes are anticipated in the infiltration and runoff due to the proposed development at the subject site. There will be a moderate increase in surface runoff due to the development on-site. A stormwater management plan will be needed to mitigate the creation of excess stormwater runoff

5.7 Groundwater Discharge

As part of the water cycle, groundwater is a major contributor to flow in many streams and rivers and strongly influences river and wetland habitats for plants and animals. Groundwater enters the ground in recharge areas and leaves the ground at discharge points. Discharge is continuous as long as sufficient water is available above the discharge point. The most visible evidence of groundwater discharge occurs as seepage or springs along watercourse banks and is also noted within stream beds as upwellings and boiling creek bed sediments. Based on the groundwater

elevation encounter during this investigation groundwater discharge will be required during the site construction at this site.

5.7.1 Construction Dewatering Requirements

Construction dewatering is intended to lower the groundwater levels in the excavation areas in order to provide a "dry" working condition for excavations and construction of foundations and/or associated sewer systems.

The construction dewatering generally depends on the design specifications of the foundation and footings, and the proposed sewer system (invert elevation, length and size of underground utility pipes), and the site hydrogeological conditions such as existing ground water levels and flow regime. Drawdown levels are not required and dewatering discharge rates are not needed to achieve the required drawdown levels for maintaining a dry working condition and stable excavation bottom and slopes for the subject site.

5.7.2 Pre-construction Dewatering

Based on the propose design plan, the new development consists of construction of one building with the existing RFO left in place. The building will be built with a slab on grade floor with footings being put no deeper than 2.1 m (6.8 ft). The developed area at the site is approximately 6242 m^2 which the area of the hotel development, not including the existing RFO.

5.7.3 In-construction Dewatering

Based on the proposed development, the excavation for construction of the building footings will mainly take place in the till deposits. The till deposit as described before is characterized by predominantly silt to silty clay matrix, high in matrix carbonate content and clast poor. The highest water level measured in the till deposits was 240.080 masl at Monitoring Well MW-2, which is below the proposed designed footing, and below the target water level for construction. The proposed development is going to excavate above the groundwater table at each lot site which will allow for no in-construction dewatering. There is the possibility that surface water may accumulate and find its way down the foundation walls during a heavy rain fall and melting snow in the spring season, which will be required to be pumped out off site.

5.7.4 Post-Construction Dewatering

Based on the proposed development, the excavation for construction of the building footings will mainly take place in the till deposits. The highest water level measured in the till deposits was 240.080 masl at Monitoring Well MW-2, which is below the proposed designed footing and the target water level for construction. Based on the obtain information, no long-term groundwater management is required because no post-construction discharge of groundwater is needed for the proposed development.

5.8 Permit-To-Take-Water/EASR Posting

Any construction dewatering or water takings in Ontario is governed by Ontario Regulation 387/04 – the Water Taking and Transfer, an Ontario Regulation made under the Ontario Water Resources Act (OWRA), and/or Ontario Regulation 63/16 – Registrations under Part II.2 of the Act – Water Taking, made under Environmental Protection Act.

According to O. Reg. 387/04, any water taking over 50,000 litres per day should not take place without a valid permit, which shall be applied in accordance with the MECP's Permit-to-Take-Water (PTTW) Manual, dated April 2005. According to O. Reg. 63/16, the construction site dewatering between 50,000 L/day and 400,000 L/day shall be registered through Environmental Activity and Sector Registry (EASR).

Based on the site condition, positive dewatering will not be workable at the Site for the building footings construction. The construction dewatering (likely by sump pumping) and post construction drainage were evaluated to be in a mount below 50,000 L/day. Therefore, a PTTW or EASR posting will not be required.

6.0 POTENTIAL CONSTRUCTION DEWATERING IMPACTS

6.1 Local Water Use

A search of the MECP well records show a total of 51 wells located within 500 meters of the surrounding area as follows: two are test holes, two are livestock/domestic, one is not used, seven are monitoring test holes, thirteen are monitoring wells, one is industrial/domestic, one is industrial, ten are domestic, two are commercial and twelve have no use listed.

It is clear from the MECP water well database and the information obtained during the field survey that the local residents obtain their water from a mix of a municipal water supply system and private domestic well. The subject site is expected to utilize the municipal water system when developed. Table 5 presents the summary of the wells from the well records, showing the UTM coordinate, drilling date, total depth and water found elevation. The MECP well records show groundwater was found between 0.30-68.0 mbgl, for wells drilled between 3.66-68.6 mbgl. It should be noted that the water levels provided in these tables do not represent current water level depths because those wells more likely measured at the time of drilling. However, the drilling program completed at this site show the groundwater was found between 1.32-6.645 mbgl for monitoring wells drilled between 6.875-8.627 mbgl.

The Site and the surrounding properties are expected to be serviced by the municipal water system. Therefore, there should be no impact on the domestic water wells.

Table 9 – Water Wells on and within 0.5 km of the Proposed Development

Well No.	UTM Coordinate Zone 17T		Date Drilled	Total Depth	Water Level	Water Use
	Easting	Northing		(mbgl)	(mbgl)	
4900363	604119	4856695	1966	30.48	Unknown	No Use Listed
7048899	603899	4856857	2007	17.07	Unknown	No Use Listed
7051218	603826	4856896	2007	Unknown	Unknown	No Use Listed
7270670	604246	4857120	2015	Unknown	Unknown	No Use Listed
7194728	604278	4856876	2012	Unknown	Unknown	No Use Listed
7196143	603797	4857038	2013	6.10	Unknown	No Use Listed
7168757	604060	4856717	2010	Unknown	Unknown	No Use Listed

Well No.	UTM Coordinate Zone 17T		Date Drilled	Total Depth	Water Level	Water Use
	Easting	Northing		(mbgl)	(mbgl)	
7205569	604227	4856816	2013	Unknown	Unknown	No Use Listed
7212225	604256	4856656	2013	Unknown	Unknown	No Use Listed
4900361	604229	4856559	1953	13.72	Unknown	No Use Listed
4900317	603433	4857241	1959	31.70	Unknown	No Use Listed
7245851	603359	4856909	2015	Unknown	Unknown	No Use Listed
4909892	604104	4856730	2005	Unknown	Unknown	Commercial
4904495	603805	4857065	1974	68.6	68.0	Commercial
4905188	603835	4857013	1977	64.0	63.09	Domestic
4905282	603665	4856973	1977	50.29	43.59	Domestic
4908578	603517	4856992	2000	56.70	54.25	Domestic
4900366	603926	4856908	1967	49.38	48.16	Domestic
4904191	603849	4856975	1973	54.0	54.0	Domestic
4903682	603555	4856988	1971	56.69	26.52/54.25	Domestic
4900364	603877	4856887	1963	40.54	39.32	Domestic
4900365	603726	4857032	1963	59.43	44.50/53.64/57.30	Domestic
4903715	604095	4856773	1971	50.29	46.02	Domestic
4903666	604140	4856763	1971	50.60	44.81	Domestic
4904095	603835	4857203	1973	49.38	45.42	Industrial
4904849	603661	4857133	1976	45.72	42.67	Industrial/Domestic
7263877	603719	4857108	2016	6.10	Unknown	Monitoring
7263876	603742	4857240	2016	6.10	Unknown	Monitoring
7196588	603701	4856983	2012	4.88	0.61	Monitoring
7263863	603658	4857161	2016	6.10	Unknown	Monitoring
7230416	603826	4856810	2014	3.81	Unknown	Monitoring
7263862	603761	4857206	2016	6.10	Unknown	Monitoring
7196589	603628	4856894	2012	3.66	0.30	Monitoring
7196590	603653	4856928	2012	7.32	6.71	Monitoring
7247414	604191	4857096	2015	4.57	Unknown	Monitoring
7219133	604227	4856836	2014	7.62	Unknown	Monitoring
7230417	603801	4856817	2014	7.62	Unknown	Monitoring
7230415	603819	4856840	2014	7.62	Unknown	Monitoring
7263868	603668	4857246	2016	6.10	Unknown	Monitoring
7143511	603836	4856847	2009	9.14	Unknown	Monitoring Test Hole
7143512	603839	4856833	2009	9.14	Unknown	Monitoring Test Hole
7172124	604060	4856764	2011	6.10	Unknown	Monitoring Test Hole

Well No.	UTM Coordinate Zone 17T		Date Drilled	Total Depth	Water Level	Water Use
	Easting	Northing		(mbgl)	(mbgl)	
7196141	603831	4857064	2013	5.79	Unknown	Monitoring Test Hole
7196142	603802	4857091	2013	6.10	Unknown	Monitoring Test Hole
7196144	603775	4857041	2013	0.61	Unknown	Monitoring Test Hole
7172123	604045	4856837	2011	7.62	Unknown	Monitoring Test Hole
4903187	604065	4856743	1969	50.90	44.12	Not Used
4900316	603686	4856848	1967	47.24	44.12	Livestock/Domestic
4900367	603929	4856959	1967	45.11	42.06/42.67	Livestock/Domestic
7229211	604224	4856821	2014	3.66	Unknown	Test Hole
7257669	604214	4857167	2016	4.57	1.22	Test Hole

6.2 Wellhead Protection Sensitivity Area

The Site and the neighboring properties are not located within any wellhead protection area. However domestic drinking wells area located with in 500m of the site. Therefore, there should be no impact on the public wells however some impacted may occur to local private wells due to the construction dewatering.

6.3 Surface Water

There are catchment basins located along Highway 50 and George Bolton Parkway. During the site visits, no standing water was visible. After development of this site, more runoff water will be created. This should be considered during the creation of a storm water management plan.

6.4 Potential Sources of Contamination

No sources of apparent environmental concern were noted on neighbouring properties; however, an RFO is operating on the subject site that could be an environmental concern.

6.5 Ground Subsidence in Adjacent Structures

Under certain conditions, dewatering activities can cause ground settlement which results from the increase in effective stresses caused by the lowering of groundwater level and subsequent decrease in pore pressure. Based on obtained groundwater levels during this investigation, no influenced is anticipated due to the new reconstruction.

7.0 GROUNDWATER QUALITY

7.1 Groundwater Sampling Protocol

Groundwater samples were collected from the monitoring wells using dedicated inertial samplers. Clean nitrile gloves were used to minimize the potential for secondary contamination of the samples. Sampling of the monitoring wells was conducted February 27, 2020. The groundwater sampling was compared to Peel Storm By-Law 53-2010 and Peel Sanitary By-Law 53-2010.

Specific Quality Assurance/Quality Control (QA/QC) measures were undertaken to ensure that the groundwater samples collected and the subsequent chemical analyses of the samples provided representative results. Upon arrival at each well site, the well was inspected for signs of damage or interference, the well cap removed and the top-of-pipe depth to the water table and to the bottom of the well measured using a Solinst electric depth meter. The top-of-pipe to ground level was also measured. This data was recorded on the field monitoring log sheets and any abnormalities were noted. The volume of the water in the well was calculated and three times this volume was purged from the well using the pre-installed Waterra inertial pumps. All samples were collected into the appropriate bottles, each supplied by the laboratory. Groundwater samples were kept on ice in coolers until delivered to AGAT Laboratories Ltd. (AGAT), of Mississauga, Ontario. AGAT is accredited by the Standards Council of Canada (SCC) and Canadian Association of Laboratory Accreditation (CALA) and is licensed for these tests by the MECP. All samples submitted to the laboratory were identified by a unique sample number. In addition, the laboratory carried out its own internal QA/QC procedures. The results of the chemical analyses are shown in the Certificates of Analysis in Appendix C.

7.2 Assessment of Water Quality

The following observations were made after careful review of the results of analysis. The health-related parameters tested were Arsenic; Cadmium; Chromium; Fluoride and Lead. The non-health related parameters tested were pH; Total Suspended Solids; Aluminum; Copper; Manganese; Titanium and Zinc. Results of analysis were compared to the Peel Storm By-Law 53-2010 and Peel Sanitary By-Law 53-2010.

7.2.1 Health Related Parameters

- **Total Arsenic:** Arsenic is a semi-metal, a member of the nitrogen family occurring naturally in the environment. It is odorless and tasteless. Consumption in food and water are the major sources of arsenic exposure for the majority of North American citizens. People may also be exposed from industrial sources, as arsenic is used in semiconductor manufacturing, petroleum refining, wood preservatives, animal feed additives, and herbicides. Arsenic can combine with other elements to form inorganic and organic arsenicals. In general, inorganic derivatives are regarded as more toxic than the organic forms and it is primarily the inorganic forms which are present in water. Exposure to arsenic at high levels poses serious health effects as it is a known human carcinogen. In addition, it has been reported to affect the vascular system in humans and has been associated with the development of diabetes. In the monitoring wells, indication of levels of arsenic fell well below the allowable limit for the Peel Sanitary By-Law 53-2010.
- **Total Cadmium:** Cadmium is a rare element that is extremely unlikely to be present as a significant natural contaminant in drinking water. Cadmium compounds used in electroplated materials and electroplating wastes may be a significant source of drinking water contamination. Other than occupational exposure and inhalation from cigarette smoke, food is the main source of cadmium intake. In the monitoring wells, indication levels of cadmium fell far below the allowable limit of 0.7 mg/L for the Peel Sanitary By-Law 53-2010.
- **Total Chromium:** If Chromium is present in raw water, it may be oxidized to a more harmful hexavalent form during chlorination. Chromium in the more highly oxidized form

may be present in older yellow paints and in residues from plating operations and around old re-circulating water cooling systems. In the monitoring wells, indication levels of total chromium fell far below the allowable limit of 5 mg/L for the Peel Sanitary By-Law 53-2010.

- **Fluoride:** When fluoride is added to drinking water, it is recommended that the concentration be adjusted to 0.5-0.8 mg/L, the optimum level for control of tooth decay. Where supplies contain naturally occurring fluoride at levels higher than 1.5 mg/L but less than 2.4 mg/L the Ministry of the Health and Long-Term Care recommends an approach through local boards of health to raise public and professional awareness to control excessive exposure to fluoride from other sources. Fluoride in the groundwater samples fell far below the allowable limit of 10 mg/L for the Peel Sanitary By-Law 53-2010.
- **Total Lead:** Lead is typically only present as a result of corrosion of lead solder, lead containing brass fittings or lead pipes which are found close to or in domestic plumbing and the service connection to buildings. Lead ingestion should be avoided particularly by pregnant women and young children, who are the most susceptible. It is recommended that only the cold-water supply be used for drinking/consumption and only after five minutes of flushing to rid the system of standing water. Corrosion inhibitor addition or other water chemistry adjustments may be made at the treatment plant to reduce lead corrosion rates where necessary. In the monitoring wells, levels of lead fell far below the allowable limit of 3 mg/L for the Peel Sanitary By-Law 53-2010.

7.2.2 Non-health Related Parameters

- **pH:** pH is a parameter that indicates the acidity of a water sample. The principal objective in controlling pH is to produce a water that is neither corrosive nor produces incrustation. In the monitoring well tested, indication of pH levels fell within the appropriate range set out by the Peel Sanitary By-Law 53-2010.

- **Total Suspended Solids (TSS):** TSS are particles that are larger than 2 microns found in the water column. Most suspended solids are made up of inorganic materials, though bacteria and algae can also contribute to the total solids concentration. Pollutants such

as dissolved metals and pathogens can attach to suspended particles and enter the water. In the monitoring wells, levels of TSS fell far below the allowable limit of 350 mg/L for the Peel Sanitary By-Law 53-2010.

- **Total Aluminum:** Aluminum in untreated water is present in the form of fine particles of alumino-silicate clay. These clay particles are effectively removed in coagulation/filtration. Aluminum found in coagulant treated water is due to the presence of aluminum left over from use of the coagulant. High aluminum can cause coating of the pipes resulting in increased energy requirements for pumping, interference with certain industrial processes and flocculation. Medical studies have not provided clear evidence that residual aluminum has any effect on health. The aluminum found in the monitoring wells sampled, does not exceeded the Peel Sanitary By-Law 53-2010.

- **Total Copper:** Copper occurs naturally in the environmental but is rarely present in raw water. Copper is used extensively in domestic plumbing in tubing and fittings and is an essential trace component in food. Although the intake of large doses of copper has resulted in adverse health effects such as stomach upsets, the levels at which this occurs are much higher than regulated limits. In the monitoring wells, copper was below the standard set the Peel Sanitary By-Law 53-2010.

- **Total Manganese:** Manganese is objectionable in water supplies because it stains black and produces an undesirable taste. Manganese is present in some groundwater because of chemically reducing underground conditions coupled with presence of manganese mineral deposits. Manganese is also occasionally present, seasonally, in surface waters when anaerobic decay processes in sediments occurring. Manganese in the samples collected from the monitoring well fell below the standards set out by the Peel Sanitary By-Law 53-2010.

- **Total Titanium:** Titanium is an element found naturally in many igneous and sedimentary rocks. Titanium compounds are stable in soil, so only small amounts of titanium end up in water from the weathering of rocks. Titanium may also be present in groundwater due to

manufacturing effluent. Titanium is relatively non-toxic. It does not accumulate in the human body. Titanium in the samples collected from the monitoring well fell below the limits set out by the Peel Sanitary By-Law 53-2010

- **Total Zinc:** Zinc occurs in small amounts in almost all igneous rocks. The natural zinc content in soil is estimated to be 1-300 mg/kg. Zinc can impart an undesirable taste to drinking water. In natural surface water the concentration of zinc is usually below 10µg/L and in groundwater is between 10-40 µg/L. Acute toxicity can occur in humans if excessive amounts of zinc are ingested. Zinc in the groundwater samples analyzed fell below the guidelines set out by the Peel Sanitary By-Law 53-2010.

Table 10 – Summary of Groundwater Samples

Sample Description				MW5	MW8
Date Sampled				02/27/2020	02/27/2020
Parameter	Unit	G / S	RDL	976756	976757
Escherichia coli	CFU/100mL	200	1	ND	ND

Sample Description				MW5	MW8
Date Sampled				02/27/2020	02/27/2020
Parameter	Unit	G / S	RDL	976756	976757
Fecal Coliform	CFU/100mL	0	1	ND	ND

Sample Description				MW5	MW8
Date Sampled				02/27/2020	02/27/2020
Parameter	Unit	G / S	RDL	976756	976757
Oil and Grease (animal/vegetable) in water	mg/L	150	0.5	<0.5	<0.5
Oil and Grease (mineral) in water	mg/L	15	0.5	<0.5	<0.5
Methylene Chloride	mg/L	2	0.0003	<0.0003	<0.0003
Methyl Ethyl Ketone	mg/L	8.0	0.0009	<0.0009	<0.0009
cis- 1,2-Dichloroethylene	mg/L	4	0.0002	<0.0002	<0.0002
Chloroform	mg/L	0.04	0.0002	<0.0002	<0.0002
Benzene	mg/L	0.01	0.0002	<0.0002	<0.0002
Trichloroethylene	mg/L	0.4	0.0002	<0.0002	<0.0002
Toluene	mg/L	0.27	0.0002	<0.0002	<0.0002
Tetrachloroethylene	mg/L	1	0.0001	<0.0001	<0.0001
trans-1,3-Dichloropropylene	mg/L	0.14	0.0003	<0.0003	<0.0003
Ethylbenzene	mg/L	0.16	0.0001	<0.0001	<0.0001
1,1,2,2-Tetrachloroethane	mg/L	1.4	0.0001	<0.0001	<0.0001
Styrene	mg/L	0.2	0.0001	<0.0001	<0.0001
1,2-Dichlorobenzene	mg/L	0.05	0.0001	<0.0001	<0.0001
1,4-Dichlorobenzene	mg/L	0.08	0.0001	<0.0001	<0.0001
Total Xylenes	mg/L	1.4	0.0001	<0.0001	<0.0001
PCBs	mg/L	0.001	0.0002	<0.0002	<0.0002

Sample Description				MW5	MW8
Date Sampled				02/27/2020	02/27/2020
Parameter	Unit	G / S	RDL	976756	976757
Di-n-butyl phthalate	mg/L	0.08	0.0005	<0.0005	<0.0005
Bis(2-Ethylhexyl)phthalate	mg/L	0.012	0.0005	<0.0005	<0.0005

Sample Description				MW5		MW8
Date Sampled				02/27/2020		02/27/2020
Parameter	Unit	G / S	RDL	976756	RDL	976757
pH	pH Units	5.5-10	NA	8.01	NA	7.76
CBOD (5)	mg/L	300	5	<5	5	<5
Total Suspended Solids	mg/L	350	10	31	10	38
Fluoride	mg/L	10	0.05	<0.05	0.33	<0.33
Sulphate	mg/L	1500	0.50	74.7	5.0	245
Total Cyanide	mg/L	2	0.002	<0.002	0.002	<0.002
Phenols	mg/L	1.0	0.002	<0.002	0.002	<0.002
Total Phosphorus	mg/L	10	0.02	0.07	0.02	0.04
Total Kjeldahl Nitrogen	mg/L	100	0.10	<0.10	0.10	0.74
Total Aluminum	mg/L	50	0.020	5.98	0.020	1.14
Total Antimony	mg/L	5	0.020	<0.020	0.020	<0.020
Total Arsenic	mg/L	1	0.015	<0.015	0.015	<0.015
Total Cadmium	mg/L	0.7	0.010	<0.010	0.010	<0.010
Total Chromium	mg/L	5	0.015	<0.015	0.015	<0.015
Total Cobalt	mg/L	5	0.020	<0.020	0.020	<0.020
Total Copper	mg/L	3	0.010	<0.010	0.010	<0.010
Total Lead	mg/L	3	0.020	<0.020	0.020	<0.020
Total Manganese	mg/L	5	0.020	0.195	0.020	0.912
Total Mercury	mg/L	0.01	0.0002	<0.0002	0.0002	<0.0002
Total Molybdenum	mg/L	5	0.020	<0.020	0.020	<0.020
Total Nickel	mg/L	3	0.015	<0.015	0.015	<0.015
Total Selenium	mg/L	1	0.020	<0.020	0.020	<0.020
Total Silver	mg/L	5	0.010	<0.010	0.010	<0.010
Total Tin	mg/L	5	0.025	<0.025	0.025	<0.025
Total Titanium	mg/L	5	0.020	0.120	0.020	0.032

Sample Description				MW5		MW8
Date Sampled				02/27/2020		02/27/2020
Parameter	Unit	G / S	RDL	976756	RDL	976757
Total Zinc	mg/L	3	0.020	<0.020	0.020	<0.020

Comments: RDL - Reported Detection Limit;

G / S - Guideline / Standard: Refers to Peel Storm By-Law 53-2010 and Peel Sanitary By-Law 53-2010

NOTE: Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

8.0 CONCLUSIONS AND RECOMMENDATION

The assessment of the available data indicates that:

- A & A Environmental Consultants Inc. (A&A) was retained by BVD Petroleum (the client) to evaluate the potential impact from the proposed development of a hotel on local groundwater/surface water resources by conducting a small-scale hydrogeological study. The subject site is located at intersection of Highway 50 and George Bolton Parkway, Caledon, ON. The area of the Site is approximately 12, 616 m^2 (3.12 acres). At the time of the investigation, the site was occupied by an RFO with a large portion still vacant.

- The topography on the Subject Site was between 240 masl to the west and 239 masl to the east. The topographic map shows water flowing in a southeast direction. Water flows from the site towards catchment basins along adjacent roadways or simply infiltrates the grounds surface in the vacant area of the site.

- Geological Maps identified the site to be Halton Till characterized by predominantly silt to silty clay matrix, high in matrix carbonate content and clast poor. The physiographic landform of the site is identified as Till Plains (drumlinized) partially in the South Slope region (western half of the site) and partially in the Peel Plain Region (Eastern half of the site). The surficial geology identified the site to be Till deposits, characterized by Clay to silt-textured till (derived from glaciolacustrine deposits or shale). Bedrock in the area of the Site is part of the Georgian Bay Formation; Blue Mountain Formation; Billings Formation; Collingwood Member; Eastview Member characterized as Shale, limestone, dolostone, siltstone.

- A search of the MECP well records show a total of 51 wells located within 500 meters of the surrounding area as follows: two are test holes, two are livestock/domestic, one is not used, seven are monitoring test holes, thirteen are monitoring wells, one is industrial/domestic, one is industrial, ten are domestic, two are commercial and twelve have no use listed.

- The MECP well records show groundwater was found between 0.3-68.0 mbgl, for wells drilled to total depth between 3.66-68.6 mbgl. However, the drilling program completed at this site show the groundwater was found between 1.32-6.645 mbgl for monitoring wells drilled between 6.875-8.627 mbgl.

- The water table in the study area was defined by installing a total of four monitoring wells in the area of the proposed development. The four monitoring wells installed by A&A were drilled to a maximum depth of 8.891 m. There were three groundwater monitoring events that took place. All wells contained water in each of the seven monitoring events except for MW-2 which was drying during the February 18, 2020 event. The events took place on February 18, 2020, February 27, 2020, March 13, 2020, March 23, 2020, March 30, 2020, April 9, 2020, and May 7, 2020. It was concluded that groundwater is present on site at elevations between 236 and 240 masl.

- A groundwater contour map was plotted using "Golden Software" (Surfer 8) and the measurements of groundwater levels taken on May 7, 2020 from the four monitoring wells. This map shows well MW-8 being at the lowest water elevation compared with the other wells. The general direction of groundwater flow was found to be in northeast direction.

- The total precipitation (rainfall plus snowfall) in 1995 was 1064.1 mm. The average annual precipitation from 1989-2019 was 857 mm. For the same period, it was calculated that approximately 401 mm/year would be lost to evapotranspiration (Environment Canada, 2018); leaving a total of approximately 456 mm/year available for groundwater recharge and surface runoff.

- Based on the water balance assessment, large changes are anticipated in the infiltration and runoff due to the proposed development at the subject site. There will be a massive increase in surface runoff due to the development on-site. A storm water management plan will be needed to manage the storm water runoff on site.

- The analysis results indicate that all health and non-health related parameters were below the Peel Storm By-Law 53-2010 and Peel Sanitary By-Law 53-2010.

- Based on the obtained information from this study, A&A has the following recommendation:

    1. A stormwater management plan will be needed to mitigate the creation of excess stormwater runoff.

No adverse impact on the groundwater resources is expected to occur during the developments of the subject site with the implementations of these recommended actions.

SIGNED:

Thomas Demers, BASc. (Hons. Env.), EIT
Project Manager

SIGNED:

Dr. Ali A. Rasoul, Ph.D., EP, P. Geo.
Senior Hydrogeologist

9.0 REFERENCES

Barnett, P.J., 1992. Quaternary geology of Ontario, p. 1011-1088. **In** P.C. Thurston, H.R. Williams, R.H. Sutcliffe and G.M. Stott, eds., Geology of Ontario. Ontario Geological Survey, Toronto, Special Volume 4, Part 2, 1525 p.

Region of Peel, 2010, THE REGIONAL MUNICIPALITY OF PEEL BY-LAW NUMBER 53-2010. https://www.peelregion.ca/council/bylaws/2010s/2010/bl-53-2010.pdf

Cooper, H.H., Jr. and Jacob, C.E., 1946. A generalized graphical method for evaluating formation constant and summarizing well-field history: American Geophysics Union Transactions, v. 27, no.4, p526-534.

Environment Canada, 2018. Evapotranspiration. Obtained from: http://farmwest.com/climate/et. Accessed on March 22, 2020.

Earthfx. 2006. ViewLog modeled GRD output files dated June 9, 2006.

Fetter, C. W., 2001, Applied Hydrogeology, Upper Saddle River, New Jersey 07458, Fourth Edition.

Geological Survey of Canada Map 1263A, titled *Geology, Toronto-Windsor Area, Ontario*.

Government of Ontario, 2003. Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines. Obtained from: http://www.creditvalleyca.ca/wp-content/uploads/2011/03/std01_079707.pdf. Accessed on March 22, 2020.

Ontario Geological Survey Preliminary Map P.2222, titled *Quaternary Geology, Sarnia-Brights Cove Area*.

Ontario Geological Survey Preliminary Map P.2206, *Bedrock Topography, Sarnia- Brights Cove Area.*

Phillips, D.W. and McCulloch, J.A.W., 1972, The Climate of the Great Lakes Basin: Climatological Studies, Number 20, Environment Canada, Atmospheric Environment Service.

Thornthwaite, C. W., and J. R. Mather published the first version entitled “The Water Balance,” *Publications in Climatology* VIII (1): 1-104, Drexel Institute of Climatology, Centerton, NJ.

University of Waterloo Southern Ontario Paleozic Rocks, 2017, https://uwaterloo.ca/earth-sciences-museum/resources/minerals-ontario/southern-ontario-paleozoic-rocks Accessed on: March 22, 2020

Waterloo Hydrogeological, Inc. 2004. Six Conservation Authorities FEFLOW Groundwater Model, Conceptual Model Report. Obtained from: http://thamesriver.on.ca/wp-content/uploads/Groundwater/ModelingProject/Concept_Model_Report_Final.pdf. Accessed on: March 22, 2020.

Toronto and Region Conservation Authority. 2019. Watershed Features-Humber River. Obtained from: https://trca.ca/conservation/watershed-management/humber-river/watershed-features/ Accessed on: February 27, 2020

P.J. Barnett, D.R. Sharped, H.A.J. Russell, T.A. Brennand. G. Gorrell, F. Kenny and A. Pugin, 1998, On The Origin of the Oak Ridges Moraine. Obtained from https://web.archive.org/web/20071128150001/http://www.sfu.ca/personal/tabrenna/pubs_files/Barnettetal98_ORM_CJES.pdf Accessed on: March 2, 2020

10.0 QUALIFICATIONS OF THE ASSESSORS

A & A Environmental Consultants Inc. is a multi-disciplinary environmental consulting firm offering consulting services in the fields of site assessments (Phase I-II), cleanups, water resource studies, aggregate permitting, landfill design and monitoring, geotechnical studies, air quality studies, designated substances surveys and environmental impact studies. A&A has more than 20 years of experience in environmental consulting in the province of Ontario, Alberta, Saskatchewan, British Columbia and have preformed thousands of projects from small scale Phase I ESAs to large scale landfill design, hydro-geological studies and groundwater management plans. We have a number of senior, experienced staff who consult in a variety of disciplines and offer our clients expert knowledge in both the technical aspects of a project and the environmental regulations applicable.

Dr. Ali A. Rasoul, Ph.D., EP, P. Geo., QP

Principal Consultant

The report was reviewed by Dr. Ali A. Rasoul, a Principal Consultant with A&A. He has over 20 years experience in his field. He has completed hundreds of environmental projects including Phase I/II/III ESAs, mould assessments, hydrogeological investigations, designated substances surveys and water management plans. He is a licensed Professional Geoscientist with the Association of Professional Geoscientists of Ontario and a licensed Well Technician in the Province of Ontario (Ministry of the Environment, Conservation and Parks). He is also a licensed Professional Geoscientist in Alberta, Saskatchewan and British Columbia. Dr. Rasoul is registered as a “Qualified Person” for conducting ESAs as defined under Ontario Regulation 153/04 and 511/09.

11.0 LIMITATIONS

The report was prepared for the exclusive use of the client. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third party. Should additional parties require reliance on this report, written authorization from A&A will be required. With respect to third parties, A&A has no liability or responsibility for losses of any kind whatsoever including direct or consequential financial effects on transactions or property values, or requirement for follow-up actions and costs.

The investigation undertaken by A&A with respect to this report and any conclusions or recommendations made in this report reflect A&A's judgment based on the site conditions observed at the time of the site inspection on the date(s) set out in this report and on information available at the time of preparation of this report. This report has been prepared for specific application to this site and it is based, in part, upon visual observations of the site as described in this report. Unless otherwise stated, the findings cannot be extended to previous or future site conditions, or portions of the site, which were unavailable for direct investigation. A&A has used professional judgment in analysing this information and formulating these conclusions.

A&A makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.

APPENDIX A – Site Maps

Figure 1 – Map Showing the Site Location

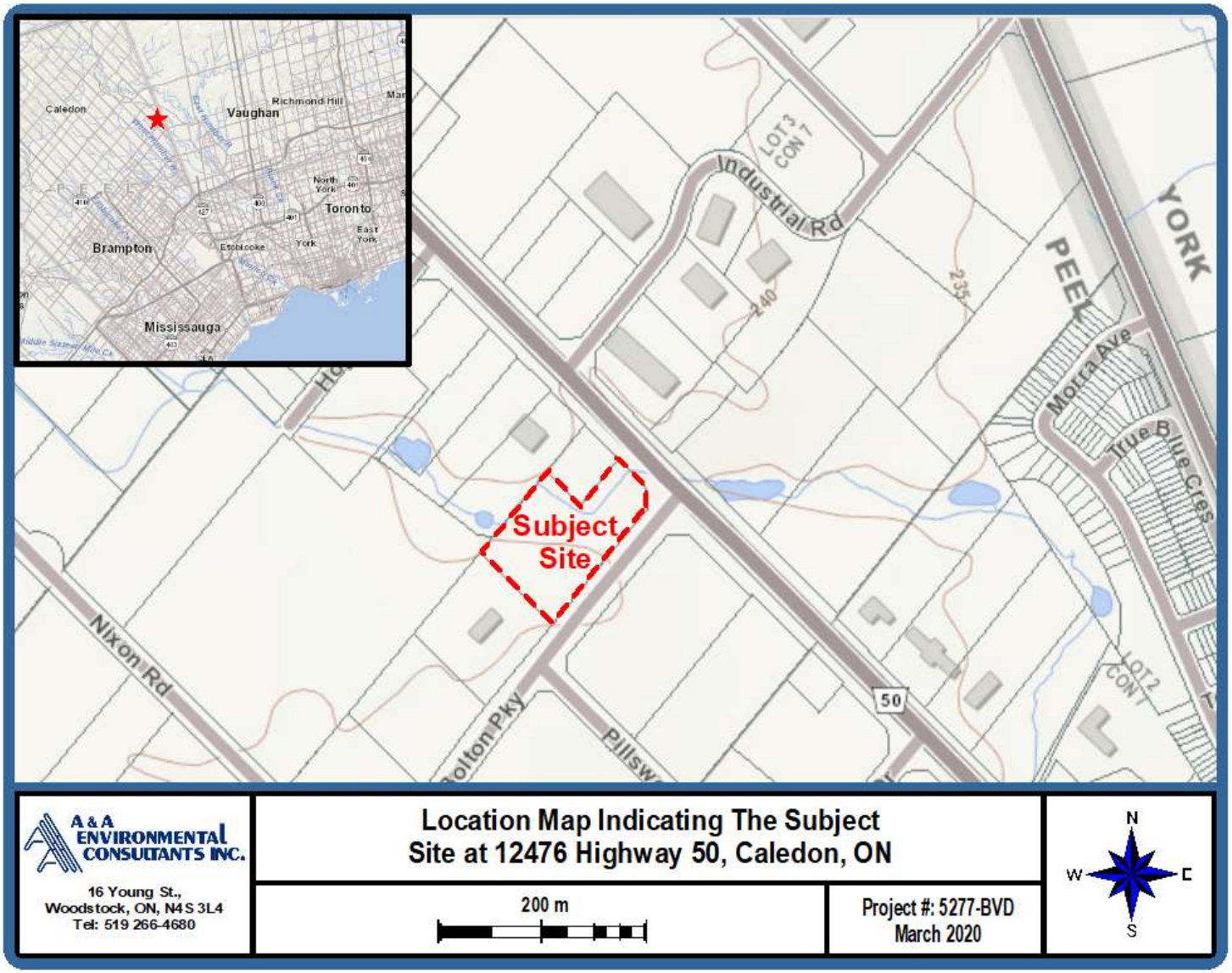


Figure 2 – Satellite Map of Site and Subject Study Area

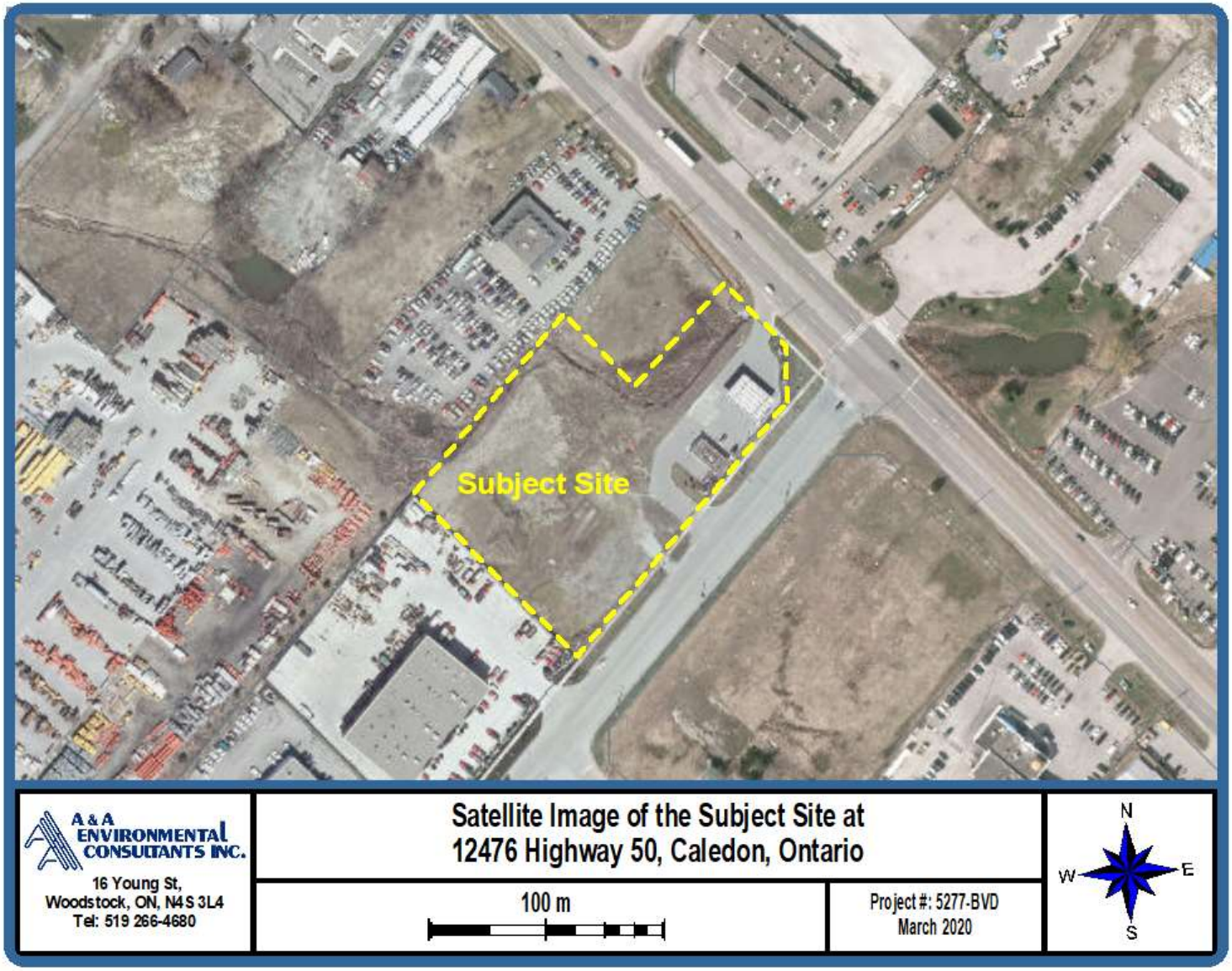


Figure 3 – Topographic Map

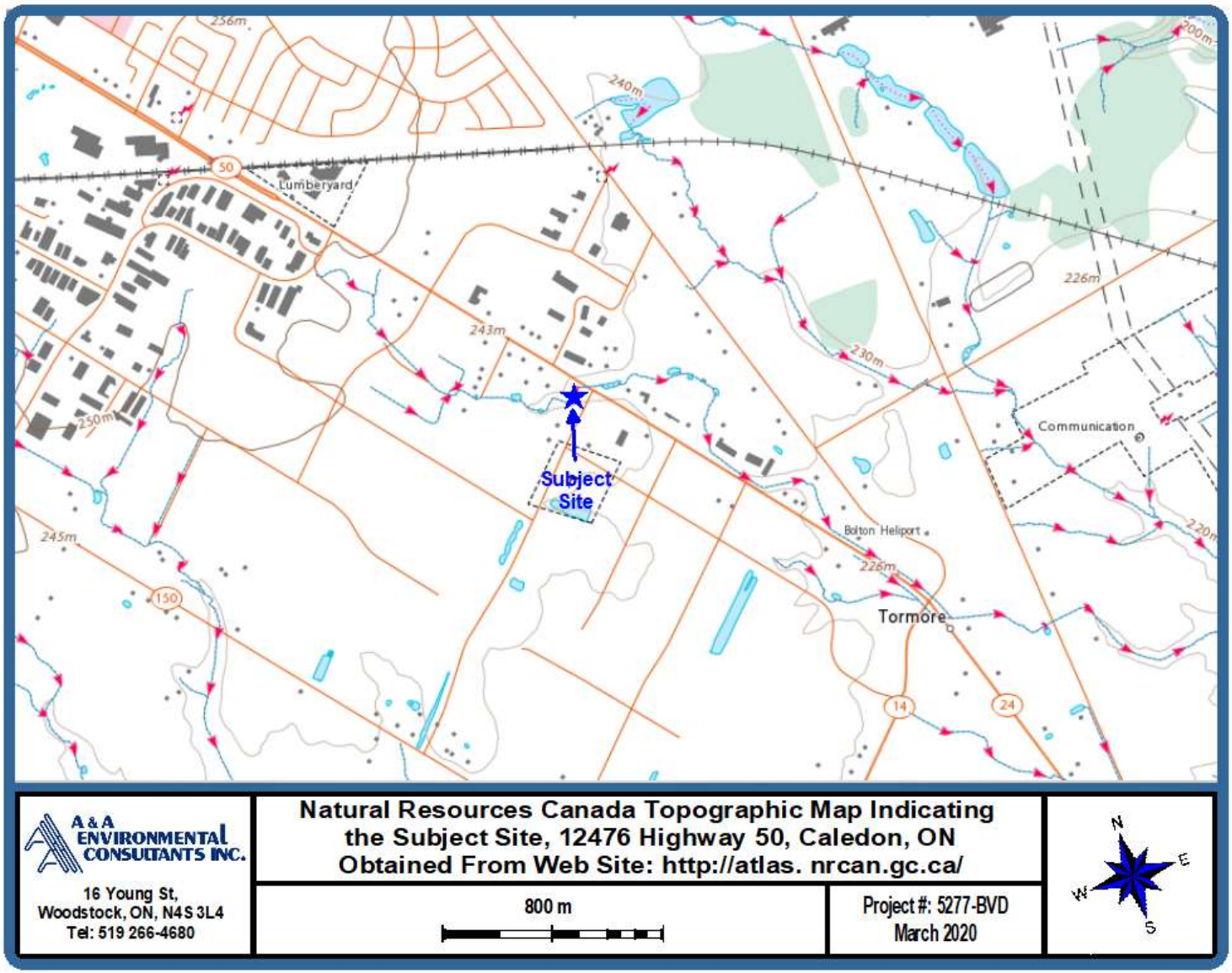
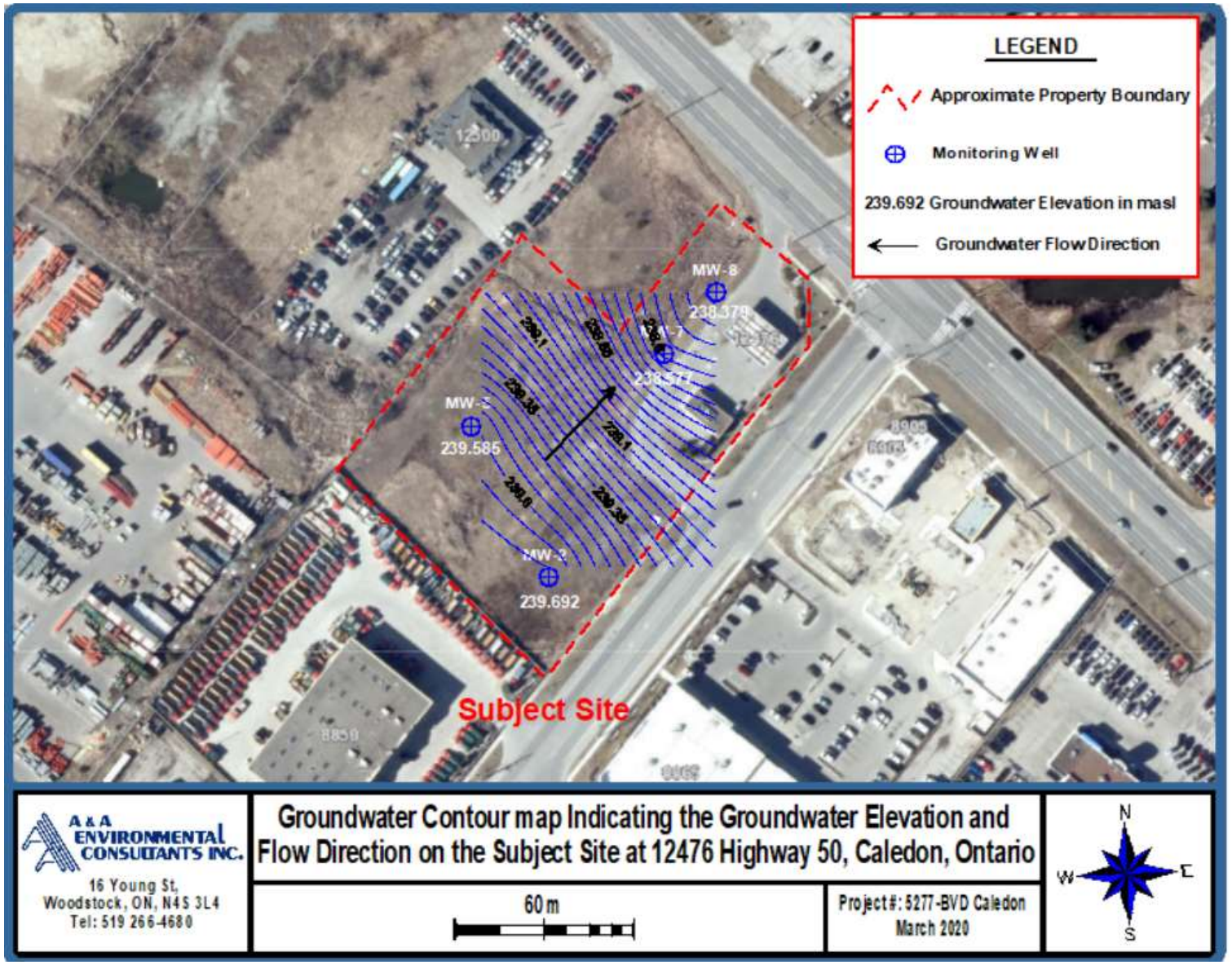


Figure 4 – Monitoring Wells Location Map

Figure 5 – Groundwater Contour Map

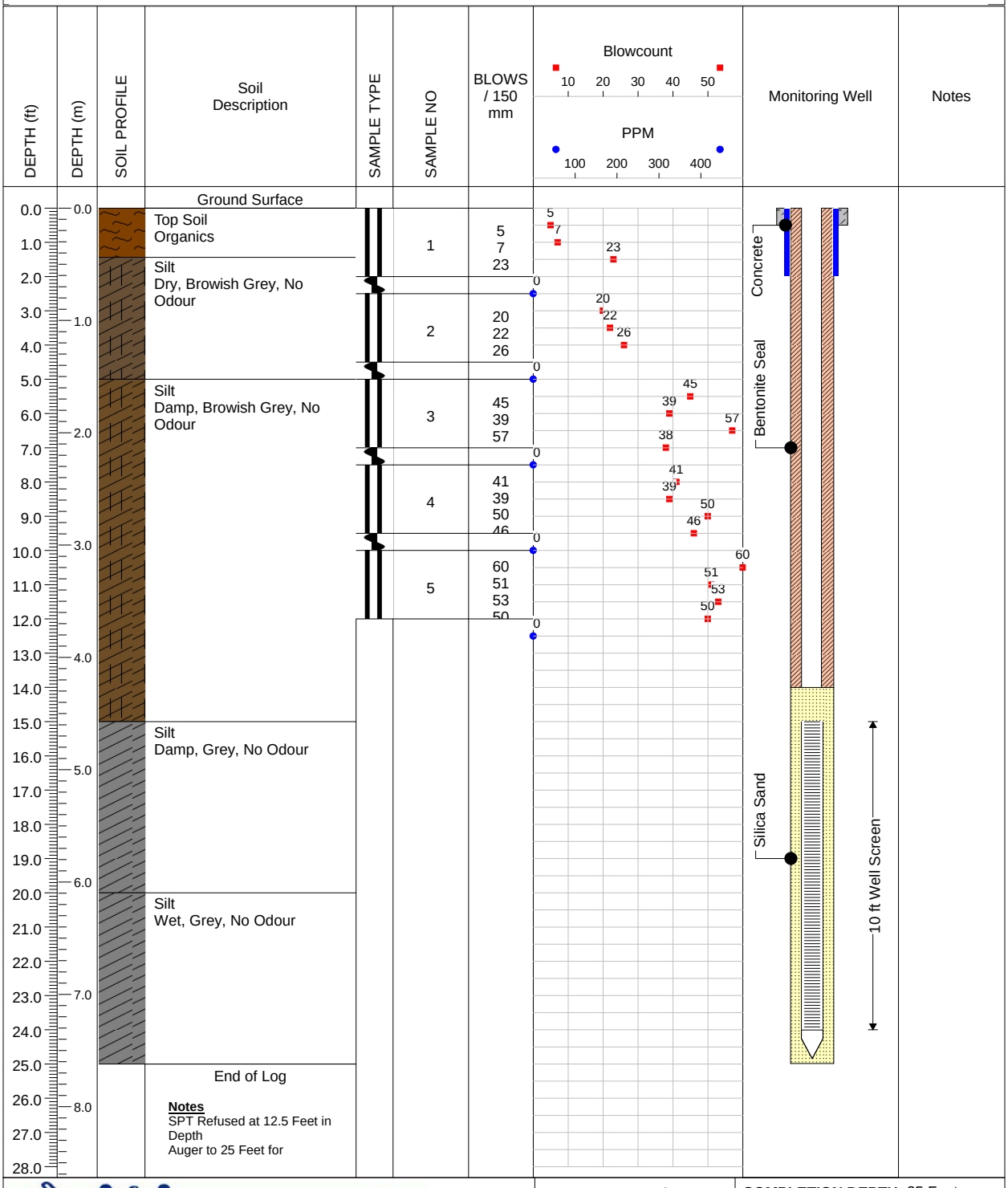


APPENDIX B – Borehole Logs

PROJECT: BVD Bolton	**BH LOCATION:** Southwest Corner of Site	**BOREHOLE NO: BH/MW-2**
PROJECT NO: 5276/5277	**LOCATION:** 12476 Highway 50, Bolton, ON	
PROJECT MANAGER: T. Demers	**COMPANY NAME:** A&A Environmental	

SAMPLE TYPE SHELBY TUBE CORE SAMPLE SPT SAMPLE GRAB SAMPLE NO RECOVERY

BACKFILL TYPE BENTONITE PEA GRAVEL SLOUGH GROUT DRILL CUTTINGS



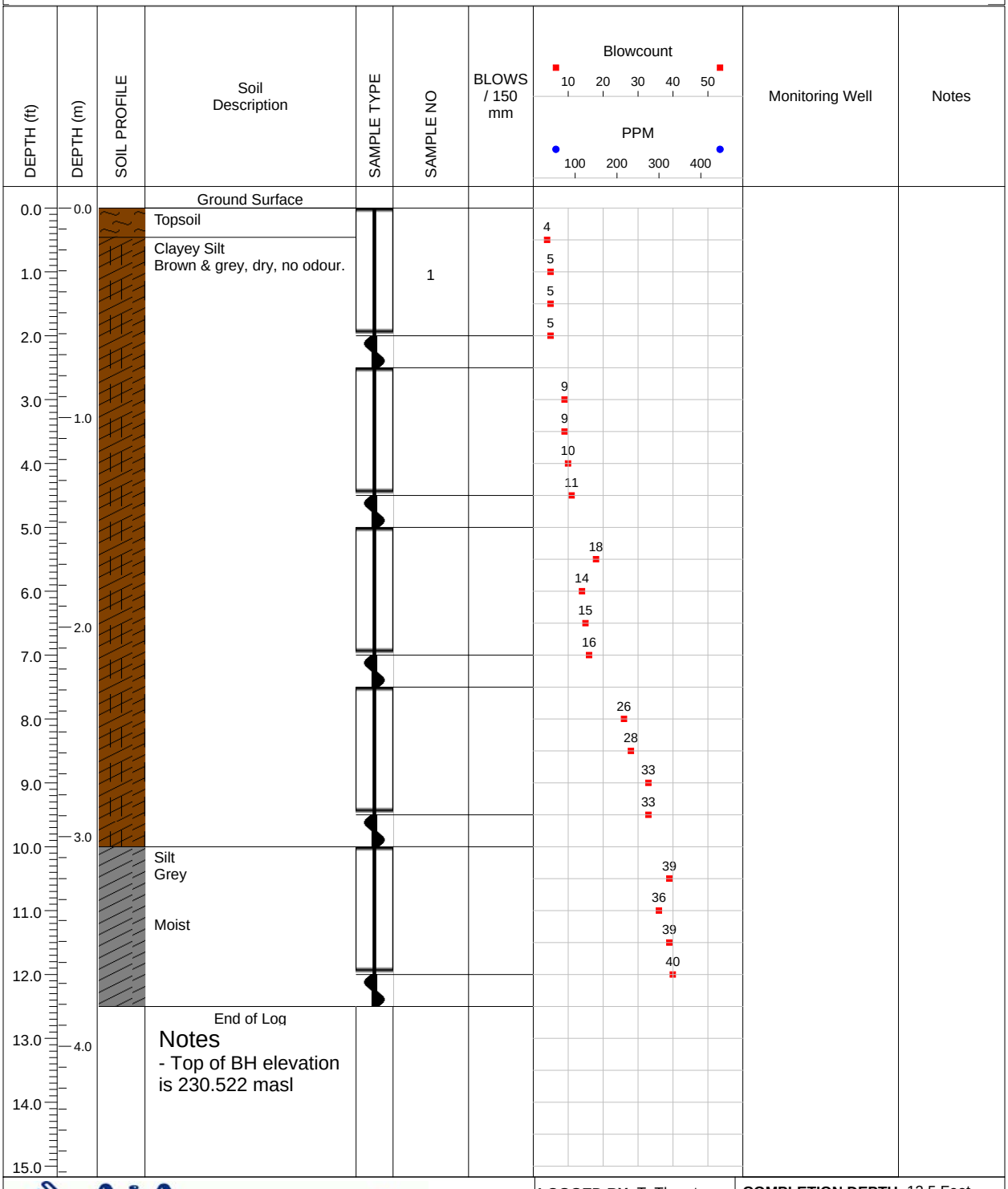
LOGGED BY: T. Thornton	**COMPLETION DEPTH:** 25 Feet
REVIEWED BY: A. Rasoul	**DRILL METHOD:** SPT/Auger
DRILL DATE: Feb 11, 2020	**PAGE:** 1 of 1

A&A ENVIRONMENTAL CONSULTANTS INC.
16 Young Street Woodstock, ON

PROJECT: BVD Bolton	**BH LOCATION:** Central west area of site	**BOREHOLE NO: BH3**
PROJECT NO: 5276/5277	**LOCATION:** 12476 Highway 50, Bolton, ON	
PROJECT MANAGER: T. Demers	**COMPANY NAME:** A&A Environmental	

SAMPLE TYPE SHELBY TUBE CORE SAMPLE SPT SAMPLE GRAB SAMPLE NO RECOVERY

BACKFILL TYPE BENTONITE PEA GRAVEL SLOUGH GROUT DRILL CUTTINGS



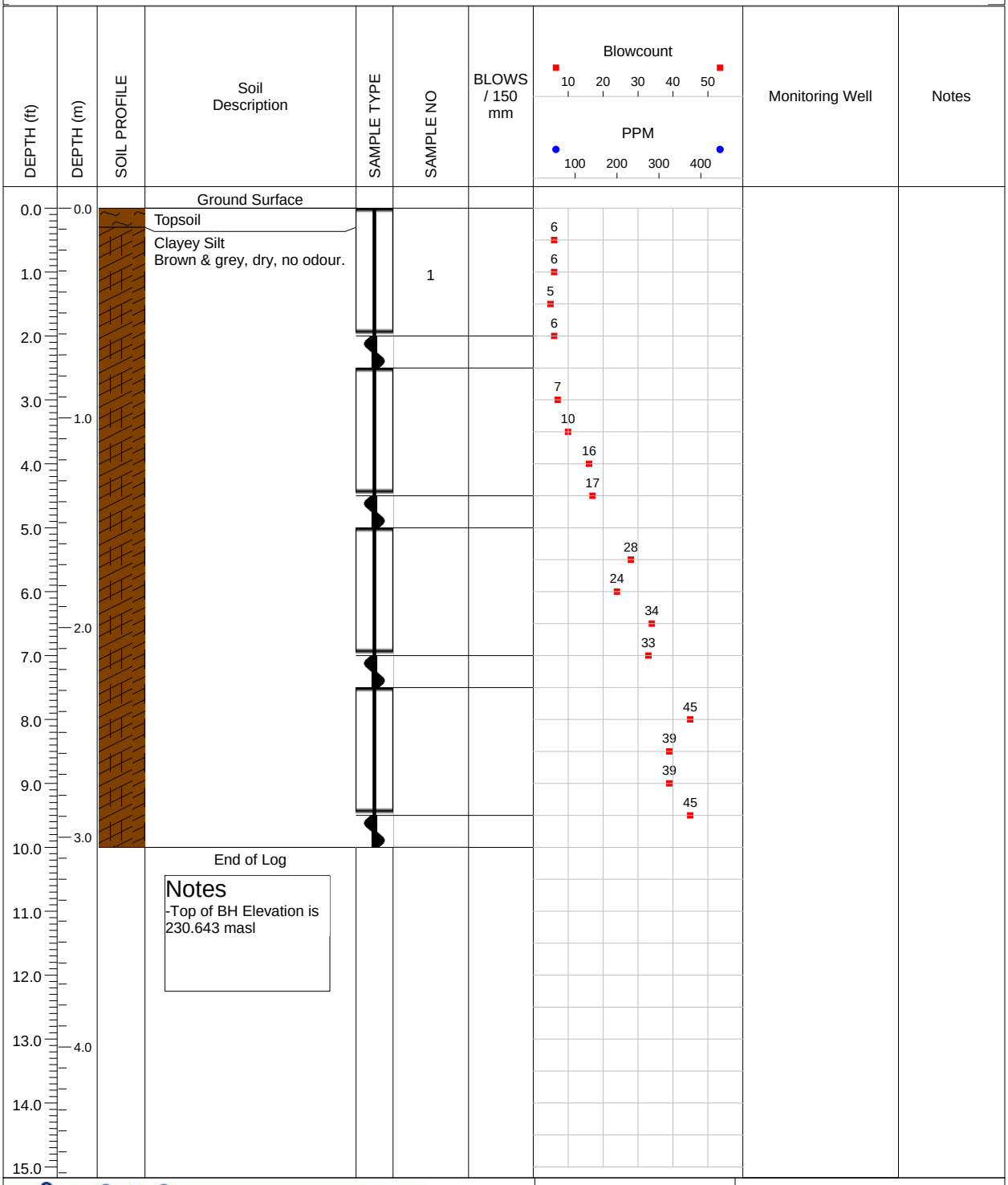
A&A ENVIRONMENTAL CONSULTANTS INC.
16 Young Street Woodstock, ON

LOGGED BY: T. Thornton	**COMPLETION DEPTH:** 12.5 Feet
REVIEWED BY: A. Rasoul	**DRILL METHOD:** SP
DRILL DATE: Feb 11, 2020	**PAGE:** 1 of 1

PROJECT: BVD Bolton	**BH LOCATION:** Central west boundary of subject site	**BOREHOLE NO: BH4**
PROJECT NO: 5276/5277	**LOCATION:** 12476 Highway 50, Bolton, ON	
PROJECT MANAGER: T. Demers	**COMPANY NAME:** A&A Environmental	

SAMPLE TYPE SHELBY TUBE CORE SAMPLE SPT SAMPLE GRAB SAMPLE NO RECOVERY

BACKFILL TYPE BENTONITE PEA GRAVEL SLOUGH GROUT DRILL CUTTINGS



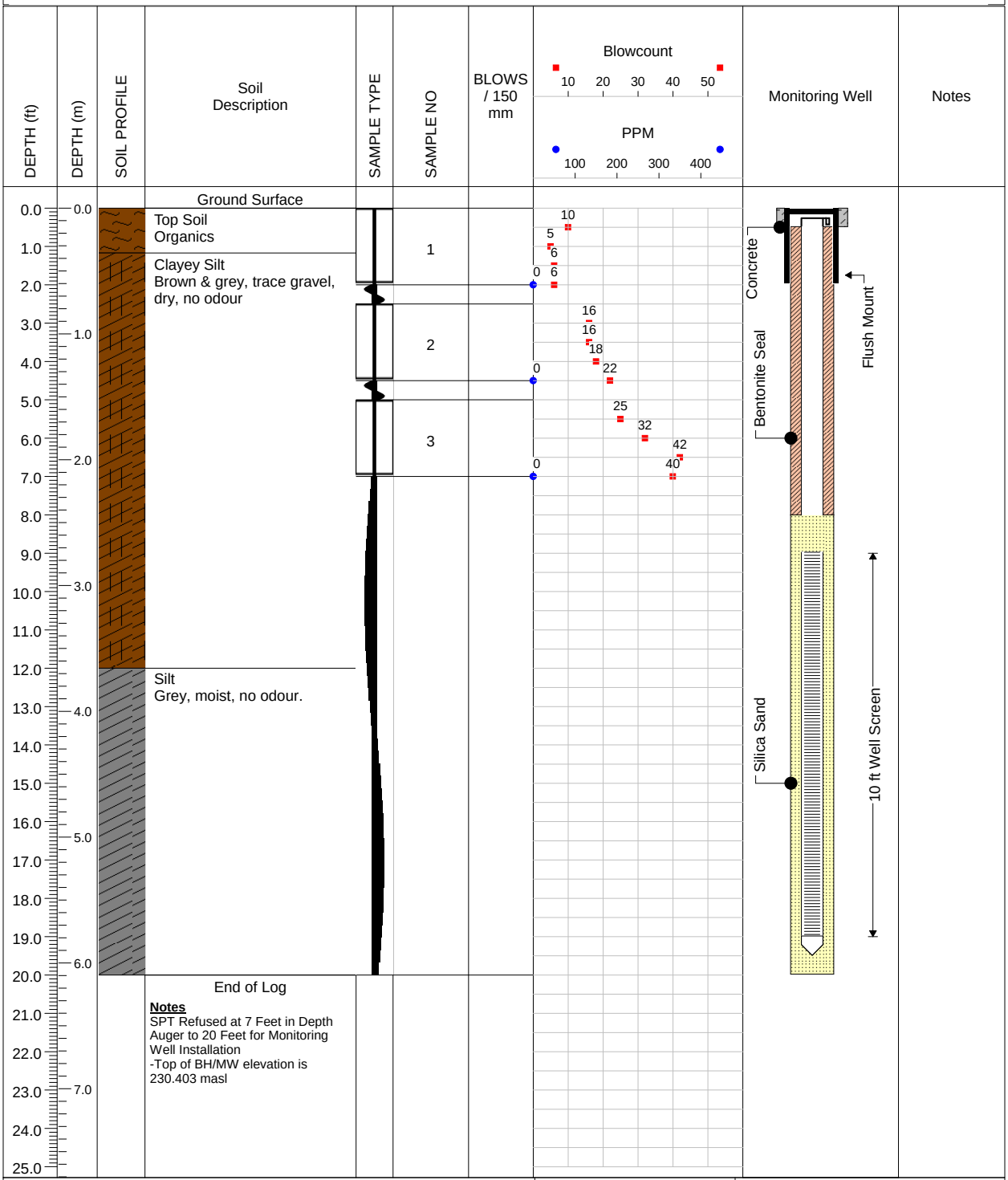
A&A ENVIRONMENTAL CONSULTANTS INC.
16 Young Street Woodstock, ON

LOGGED BY: T. Thornton	**COMPLETION DEPTH:** 10 Feet
REVIEWED BY: A. Rasoul	**DRILL METHOD:** SP
DRILL DATE: Feb 11, 2020	**PAGE:** 1 of 1

PROJECT: BVD Bolton	**BH LOCATION:** Northwest portion of subject site	**BOREHOLE NO: BH/MW-5**
PROJECT NO: 5276/5277	**LOCATION:** 12476 Highway 50, Bolton, ON	
PROJECT MANAGER: T. Demers	**COMPANY NAME:** A&A Environmental	

SAMPLE TYPE SHELBY TUBE CORE SAMPLE SPT SAMPLE GRAB SAMPLE NO RECOVERY

BACKFILL TYPE BENTONITE PEA GRAVEL SLOUGH GROUT DRILL CUTTINGS



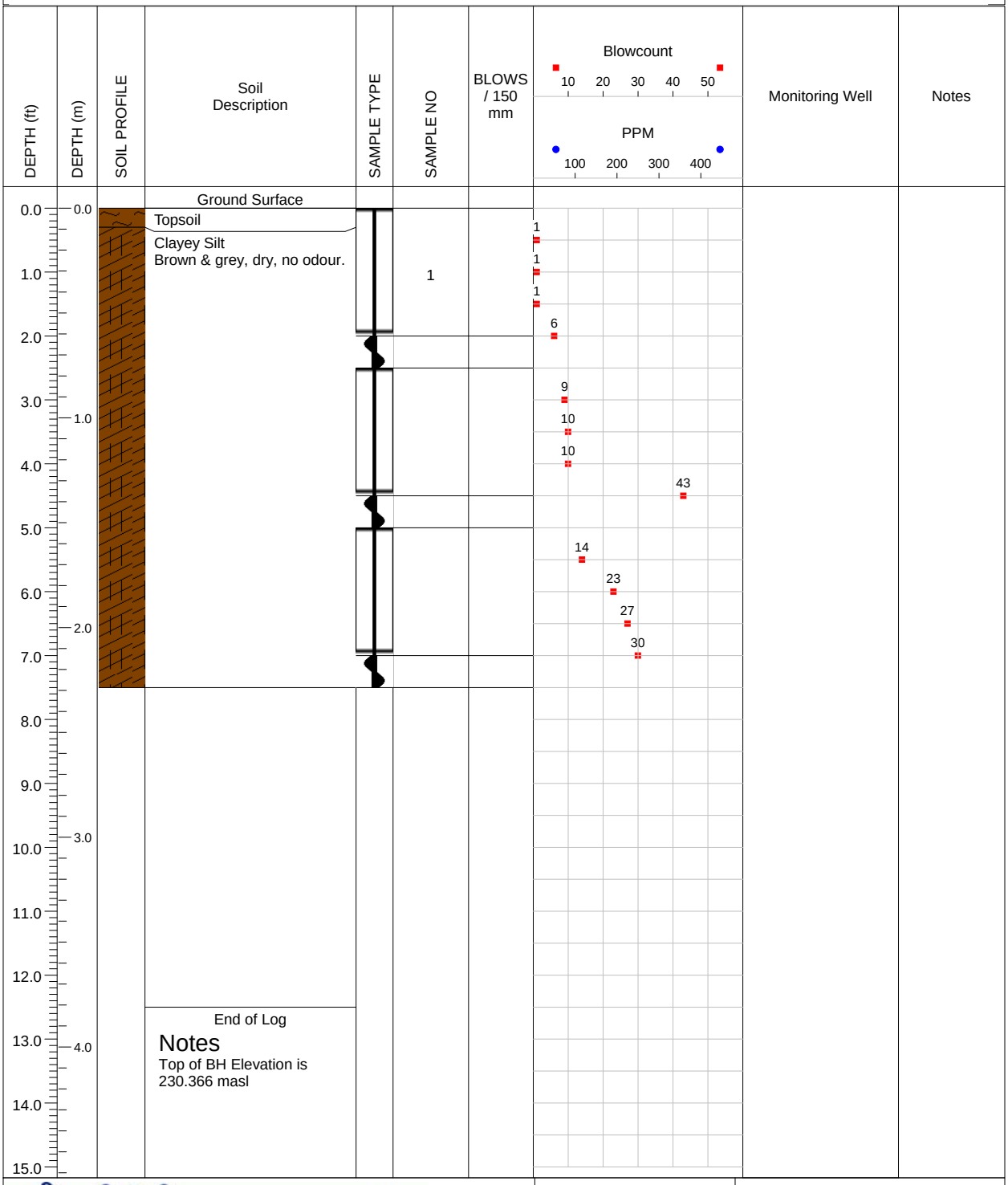
LOGGED BY: T. Thornton	**COMPLETION DEPTH:** 20 Feet
REVIEWED BY: A. Rasoul	**DRILL METHOD:** SPT/Auger
DRILL DATE: Feb 11, 2020	**PAGE:** 1 of 1

A&A ENVIRONMENTAL CONSULTANTS INC.
16 Young Street Woodstock, ON

PROJECT: BVD Bolton	**BH LOCATION:** Central portion of subject site	**BOREHOLE NO: BH6**
PROJECT NO: 5276/5277	**LOCATION:** 12476 Highway 50, Bolton, ON	
PROJECT MANAGER: T. Demers	**COMPANY NAME:** A&A Environmental	

SAMPLE TYPE SHELBY TUBE CORE SAMPLE SPT SAMPLE GRAB SAMPLE NO RECOVERY

BACKFILL TYPE BENTONITE PEA GRAVEL SLOUGH GROUT DRILL CUTTINGS



LOGGED BY: T. Thornton	**COMPLETION DEPTH:** 7.5 Feet
REVIEWED BY: A. Rasoul	**DRILL METHOD:** SP
DRILL DATE: Feb 11, 2020	**PAGE:** 1 of 1

A&A ENVIRONMENTAL CONSULTANTS INC.
16 Young Street Woodstock, ON

APPENDIX C – Certificate of Chemical Analysis

AGAT Laboratories

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

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC
16 Young Street
WOODSTOCK, ON N4S3L4
(519) 266-4680
ATTENTION TO: Ali Rasoul
PROJECT: 5277-BVD Bolton HydroG
AGAT WORK ORDER: 20T579146
MICROBIOLOGY ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer
TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor
WATER ANALYSIS REVIEWED BY: Jacky Zhu, Spectroscopy Technician
DATE REPORTED: Mar 13, 2020
PAGES (INCLUDING COVER): 13
VERSION*: 1

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

*Notes

Disclaimer:

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days following analysis, unless expressly agreed otherwise in writing. Please contact your Client Project Manager if you require additional sample storage time.*
- *AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.*
- *This report shall not be reproduced or distributed, in whole or in part, without the prior written consent of AGAT Laboratories.*
- *The test results reported herewith relate only to the samples as received by the laboratory.*
- *Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the information contained in this document.*
- *All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.*

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 20T579146

PROJECT: 5277-BVD Bolton HydroG

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

ATTENTION TO: Ali Rasoul

SAMPLING SITE:

SAMPLED BY:

E. Coli (Using MI Agar)

DATE RECEIVED: 2020-02-28

DATE REPORTED: 2020-03-13

		SAMPLE DESCRIPTION:		MW5	MW8
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		2020-02-27	2020-02-27
Parameter	Unit	G / S	RDL	976756	976757
Escherichia coli	CFU/100mL	200	1	ND	ND

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Peel Storm By-Law 53-2010
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

976756-976757 ND - Not Detected.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Vivine Basily

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 20T579146

PROJECT: 5277-BVD Bolton HydroG

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

ATTENTION TO: Ali Rasoul

SAMPLING SITE:

SAMPLED BY:

Fecal Coliforms in Water

DATE RECEIVED: 2020-02-28

DATE REPORTED: 2020-03-13

				SAMPLE DESCRIPTION:	MW5	MW8
				SAMPLE TYPE:	Water	Water
				DATE SAMPLED:	2020-02-27	2020-02-27
Parameter	Unit	G / S	RDL		976756	976757
Fecal Coliform	CFU/100mL	0	1		ND	ND

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Peel Storm By-Law 53-2010
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

976756 ND - Not Detected.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Vivine Basily

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 20T579146

PROJECT: 5277-BVD Bolton HydroG

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

ATTENTION TO: Ali Rasoul

SAMPLING SITE:

SAMPLED BY:

Peel Region Sanitary/Storm - Organics

DATE RECEIVED: 2020-02-28

DATE REPORTED: 2020-03-13

					SAMPLE DESCRIPTION:	MW5	MW8
					SAMPLE TYPE:	Water	Water
					DATE SAMPLED:	2020-02-27	2020-02-27
Parameter	Unit	G / S: A	G / S: B	RDL		976756	976757
Oil and Grease (animal/vegetable) in water	mg/L	150		0.5		<0.5[<A]	<0.5[<A]
Oil and Grease (mineral) in water	mg/L	15		0.5		<0.5[<A]	<0.5[<A]
Methylene Chloride	mg/L	2	0.0052	0.0003		<0.0003[<B]	<0.0003[<B]
Methyl Ethyl Ketone	mg/L	8.0		0.0009		<0.0009[<A]	<0.0009[<A]
cis- 1,2-Dichloroethylene	mg/L	4	0.0056	0.0002		<0.0002[<B]	<0.0002[<B]
Chloroform	mg/L	0.04	0.002	0.0002		<0.0002[<B]	<0.0002[<B]
Benzene	mg/L	0.01	0.002	0.0002		<0.0002[<B]	<0.0002[<B]
Trichloroethylene	mg/L	0.4	0.008	0.0002		<0.0002[<B]	<0.0002[<B]
Toluene	mg/L	0.27	0.002	0.0002		<0.0002[<B]	<0.0002[<B]
Tetrachloroethylene	mg/L	1	0.0044	0.0001		<0.0001[<B]	<0.0001[<B]
trans-1,3-Dichloropropylene	mg/L	0.14	0.0056	0.0003		<0.0003[<B]	<0.0003[<B]
Ethylbenzene	mg/L	0.16	0.002	0.0001		<0.0001[<B]	<0.0001[<B]
1,1,2,2-Tetrachloroethane	mg/L	1.4	0.017	0.0001		<0.0001[<B]	<0.0001[<B]
Styrene	mg/L	0.2		0.0001		<0.0001[<A]	<0.0001[<A]
1,2-Dichlorobenzene	mg/L	0.05	0.0056	0.0001		<0.0001[<B]	<0.0001[<B]
1,4-Dichlorobenzene	mg/L	0.08	0.0068	0.0001		<0.0001[<B]	<0.0001[<B]
Total Xylenes	mg/L	1.4	0.0044	0.0001		<0.0001[<B]	<0.0001[<B]
PCBs	mg/L	0.001	0.0004	0.0002		<0.0002[<B]	<0.0002[<B]
Di-n-butyl phthalate	mg/L	0.08	0.015	0.0005		<0.0005[<B]	<0.0005[<B]
Bis(2-Ethylhexyl)phthalate	mg/L	0.012	0.0088	0.0005		<0.0005[<B]	<0.0005[<B]
Total Nonylphenol	mg/L	0.02		0.001		<0.001[<A]	<0.001[<A]
Total Nonylphenol Ethoxylates	mg/L	0.2		0.010		<0.010[<A]	<0.010[<A]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Peel Sanitary By-Law 53-2010, B Refers to Peel Storm By-Law 53-2010
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

976756-976757 Oil and Grease animal/vegetable is a calculated parameter. The calculated value is the difference between Total O&G and Mineral O&G.
Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene and o-Xylene.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 20T579146

PROJECT: 5277-BVD Bolton HydroG

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

ATTENTION TO: Ali Rasoul

SAMPLING SITE:

SAMPLED BY:

Peel Sanitary/Storm Sewer Use By-Law - Inorganics

DATE RECEIVED: 2020-02-28

DATE REPORTED: 2020-03-13

					SAMPLE DESCRIPTION:		MW8
					SAMPLE TYPE:		Water
					DATE SAMPLED:		2020-02-27
Parameter	Unit	G / S: A	G / S: B	RDL	976756	RDL	976757
pH	pH Units	5.5-10	6.0-9.0	NA	8.01	NA	7.76
CBOD (5)	mg/L	300	15	5	<5[<B]	5	<5[<B]
Total Suspended Solids	mg/L	350	15	10	31[B-A]	10	38[B-A]
Fluoride	mg/L	10		0.05	<0.05[<A]	0.33	<0.33[<A]
Sulphate	mg/L	1500		0.50	74.7[<A]	5.0	245[<A]
Total Cyanide	mg/L	2	0.02	0.002	<0.002[<B]	0.002	<0.002[<B]
Phenols	mg/L	1.0	0.008	0.002	<0.002[<B]	0.002	<0.002[<B]
Total Phosphorus	mg/L	10	0.4	0.02	0.07[<B]	0.02	0.04[<B]
Total Kjeldahl Nitrogen	mg/L	100	1	0.10	<0.10[<B]	0.10	0.74[<B]
Total Aluminum	mg/L	50		0.020	5.98[<A]	0.020	1.14[<A]
Total Antimony	mg/L	5		0.020	<0.020[<A]	0.020	<0.020[<A]
Total Arsenic	mg/L	1	0.02	0.015	<0.015[<B]	0.015	<0.015[<B]
Total Cadmium	mg/L	0.7	0.008	0.010	<0.010[<A]	0.010	<0.010[<A]
Total Chromium	mg/L	5	0.08	0.015	<0.015[<B]	0.015	<0.015[<B]
Total Cobalt	mg/L	5		0.020	<0.020[<A]	0.020	<0.020[<A]
Total Copper	mg/L	3	0.05	0.010	<0.010[<B]	0.010	<0.010[<B]
Total Lead	mg/L	3	0.120	0.020	<0.020[<B]	0.020	<0.020[<B]
Total Manganese	mg/L	5	0.05	0.020	0.195[B-A]	0.020	0.912[B-A]
Total Mercury	mg/L	0.01	0.0004	0.0002	<0.0002[<B]	0.0002	<0.0002[<B]
Total Molybdenum	mg/L	5		0.020	<0.020[<A]	0.020	<0.020[<A]
Total Nickel	mg/L	3	0.08	0.015	<0.015[<B]	0.015	<0.015[<B]
Total Selenium	mg/L	1	0.02	0.020	<0.020[<B]	0.020	<0.020[<B]
Total Silver	mg/L	5	0.12	0.010	<0.010[<B]	0.010	<0.010[<B]
Total Tin	mg/L	5		0.025	<0.025[<A]	0.025	<0.025[<A]
Total Titanium	mg/L	5		0.020	0.120[<A]	0.020	0.032[<A]
Total Zinc	mg/L	3	0.04	0.020	<0.020[<B]	0.020	<0.020[<B]

Certified By:

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 20T579146

PROJECT: 5277-BVD Bolton HydroG

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

ATTENTION TO: Ali Rasoul

SAMPLING SITE:

SAMPLED BY:

Peel Sanitary/Storm Sewer Use By-Law - Inorganics

DATE RECEIVED: 2020-02-28 **DATE REPORTED: 2020-03-13**

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Peel Sanitary By-Law 53-2010, B Refers to Peel Storm By-Law 53-2010
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

976756-976757 Elevated RDL indicates the degree of sample dilution prior to the analysis in order to keep analytes within the calibration range of the instrument and to reduce matrix interference.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

Guideline Violation

AGAT WORK ORDER: 20T579146

PROJECT: 5277-BVD Bolton HydroG

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

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

ATTENTION TO: Ali Rasoul

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
976756	MW5	ON Peel SM	Peel Sanitary/Storm Sewer Use By-Law - Inorganics	Total Manganese	mg/L	0.05	0.195
976756	MW5	ON Peel SM	Peel Sanitary/Storm Sewer Use By-Law - Inorganics	Total Suspended Solids	mg/L	15	31
976757	MW8	ON Peel SM	Peel Sanitary/Storm Sewer Use By-Law - Inorganics	Total Manganese	mg/L	0.05	0.912
976757	MW8	ON Peel SM	Peel Sanitary/Storm Sewer Use By-Law - Inorganics	Total Suspended Solids	mg/L	15	38

AGAT Laboratories

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

Quality Assurance

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

AGAT WORK ORDER: 20T579146

PROJECT: 5277-BVD Bolton HydroG

ATTENTION TO: Ali Rasoul

SAMPLING SITE:

SAMPLED BY:

Microbiology Analysis

RPT Date: Mar 13, 2020			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
E. Coli (Using MI Agar)															
Escherichia coli	976800		ND	ND	NA	< 1									
Fecal Coliforms in Water															
Fecal Coliform	976825		ND	ND	NA	< 1									

Comments: ND - Not Detected, NA - % RPD Not Applicable.

Certified By: Divine Basily

AGAT Laboratories

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

Quality Assurance

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

AGAT WORK ORDER: 20T579146

PROJECT: 5277-BVD Bolton HydroG

ATTENTION TO: Ali Rasoul

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: Mar 13, 2020			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Peel Region Sanitary/Storm - Organics															
Oil and Grease (animal/vegetable) in water		TW	< 0.5	< 0.5	NA	< 0.5	100%	70%	130%	101%	70%	130%	101%	70%	130%
Oil and Grease (mineral) in water		TW	< 0.5	< 0.5	NA	< 0.5	84%	70%	130%	80%	70%	130%	81%	70%	130%
Methylene Chloride	971080		< 0.0003	< 0.0003	NA	< 0.0003	108%	60%	130%	108%	60%	130%	113%	60%	130%
Methyl Ethyl Ketone	971080		< 0.0009	< 0.0009	NA	< 0.0009	71%	60%	130%	84%	60%	130%	111%	60%	130%
cis- 1,2-Dichloroethylene	971080		< 0.0002	< 0.0002	NA	< 0.0002	85%	60%	130%	111%	60%	130%	108%	60%	130%
Chloroform	971080		< 0.0002	< 0.0002	NA	< 0.0002	85%	60%	130%	116%	60%	130%	106%	60%	130%
Benzene	971080		< 0.0002	< 0.0002	NA	< 0.0002	116%	60%	130%	83%	60%	130%	81%	60%	130%
Trichloroethylene	971080		< 0.0002	< 0.0002	NA	< 0.0002	71%	60%	130%	113%	60%	130%	90%	60%	130%
Toluene	971080		< 0.0002	< 0.0002	NA	< 0.0002	82%	60%	130%	112%	60%	130%	106%	60%	130%
Tetrachloroethylene	971080		< 0.0001	< 0.0001	NA	< 0.0001	119%	60%	130%	108%	60%	130%	106%	60%	130%
trans-1,3-Dichloropropylene	971080		< 0.0003	< 0.0003	NA	< 0.0003	90%	60%	130%	82%	60%	130%	70%	60%	130%
Ethylbenzene	971080		< 0.0001	< 0.0001	NA	< 0.0001	71%	60%	130%	98%	60%	130%	97%	60%	130%
1,1,2,2-Tetrachloroethane	971080		< 0.0001	< 0.0001	NA	< 0.0001	84%	60%	130%	82%	60%	130%	91%	60%	130%
Styrene	971080		< 0.0001	< 0.0001	NA	< 0.0001	73%	60%	130%	93%	60%	130%	91%	60%	130%
1,2-Dichlorobenzene	971080		< 0.0001	< 0.0001	NA	< 0.0001	76%	60%	130%	91%	60%	130%	89%	60%	130%
1,4-Dichlorobenzene	971080		< 0.0001	< 0.0001	NA	< 0.0001	75%	60%	130%	89%	60%	130%	92%	60%	130%
PCBs		TW	< 0.0002	< 0.0002	NA	< 0.0002	105%	60%	130%	101%	60%	130%	100%	60%	130%
Di-n-butyl phthalate		TW	< 0.0005	< 0.0005	NA	< 0.0005	87%	60%	130%	76%	60%	130%	85%	60%	130%
Bis(2-Ethylhexyl)phthalate		TW	< 0.0005	< 0.0005	NA	< 0.0005	74%	60%	130%	84%	60%	130%	85%	60%	130%
Total Nonylphenol	976756	976756	< 0.001	< 0.001	NA	< 0.001	116%	60%	140%	79%	50%	120%	78%	50%	120%
Total Nonylphenol Ethoxylates	976756	976756	< 0.010	< 0.010	NA	< 0.010	85%	60%	140%	89%	50%	120%	51%	50%	120%

Comments: Tap water analysis has been performed as QC sample testing for duplicate and matrix spike due to insufficient sample volume.
When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By:

AGAT Laboratories

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

Quality Assurance

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

AGAT WORK ORDER: 20T579146

PROJECT: 5277-BVD Bolton HydroG

ATTENTION TO: Ali Rasoul

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Mar 13, 2020

PARAMETER	Batch	Sample Id	DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Peel Sanitary/Storm Sewer Use By-Law - Inorganics															
pH	974396		8.44	8.71	3.1%	NA	101%	90%	110%						
CBOD (5)	973704		<5	<5	NA	< 5	100%	75%	125%						
Total Suspended Solids	982397		<10	<10	NA	< 10	100%	80%	120%						
Fluoride	976756	976756	<0.05	<0.05	NA	< 0.05	100%	90%	110%	104%	90%	110%	110%	85%	115%
Sulphate	976756	976756	74.7	76.8	2.8%	< 0.10	100%	70%	130%	108%	80%	120%	107%	70%	130%
Total Cyanide	967060		<0.002	<0.002	NA	< 0.002	106%	70%	130%	107%	80%	120%	109%	70%	130%
Phenols	980682		<0.002	<0.002	NA	< 0.002	104%	90%	110%	105%	90%	110%	106%	80%	120%
Total Phosphorus	976813		0.05	0.05	NA	< 0.02	101%	70%	130%	101%	80%	120%	95%	70%	130%
Total Kjeldahl Nitrogen	976813		0.61	0.70	13.7%	< 0.10	97%	70%	130%	94%	80%	120%	99%	70%	130%
Total Aluminum	982419		0.241	0.238	1.3%	< 0.020	102%	70%	130%	102%	80%	120%	100%	70%	130%
Total Antimony	982419		<0.020	<0.020	NA	< 0.020	98%	70%	130%	89%	80%	120%	97%	70%	130%
Total Arsenic	982419		<0.015	<0.015	NA	< 0.015	102%	70%	130%	101%	80%	120%	115%	70%	130%
Total Cadmium	982419		<0.010	<0.010	NA	< 0.010	101%	70%	130%	100%	80%	120%	110%	70%	130%
Total Chromium	982419		<0.015	<0.015	NA	< 0.015	100%	70%	130%	102%	80%	120%	106%	70%	130%
Total Cobalt	982419		<0.020	<0.020	NA	< 0.020	100%	70%	130%	101%	80%	120%	107%	70%	130%
Total Copper	982419		<0.010	<0.010	NA	< 0.010	103%	70%	130%	104%	80%	120%	106%	70%	130%
Total Lead	982419		<0.020	<0.020	NA	< 0.020	102%	70%	130%	107%	80%	120%	105%	70%	130%
Total Manganese	982419		0.069	0.069	NA	< 0.020	104%	70%	130%	105%	80%	120%	107%	70%	130%
Total Mercury	976325		<0.0002	<0.0002	NA	< 0.0002	104%	70%	130%	97%	80%	120%	95%	70%	130%
Total Molybdenum	982419		<0.020	<0.020	NA	< 0.020	102%	70%	130%	100%	80%	120%	108%	70%	130%
Total Nickel	982419		<0.015	<0.015	NA	< 0.015	106%	70%	130%	107%	80%	120%	110%	70%	130%
Total Selenium	982419		<0.020	<0.020	NA	< 0.020	100%	70%	130%	99%	80%	120%	99%	70%	130%
Total Silver	982419		<0.010	<0.010	NA	< 0.010	106%	70%	130%	112%	80%	120%	108%	70%	130%
Total Tin	982419		<0.025	<0.025	NA	< 0.025	105%	70%	130%	104%	80%	120%	114%	70%	130%
Total Titanium	982419		<0.020	<0.020	NA	< 0.020	98%	70%	130%	97%	80%	120%	104%	70%	130%
Total Zinc	982419		<0.020	<0.020	NA	< 0.020	101%	70%	130%	99%	80%	120%	108%	70%	130%

Comments: NA signifies Not Applicable.
If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Certified By:

AGAT Laboratories

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

Method Summary

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

AGAT WORK ORDER: 20T579146

PROJECT: 5277-BVD Bolton HydroG

ATTENTION TO: Ali Rasoul

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Microbiology Analysis			
Escherichia coli	MIC-93-7010	EPA 1604	Membrane Filtration
Fecal Coliform	MIC-93-7000	SM 9222 D	MF/INCUBATOR
Trace Organics Analysis			
Oil and Grease (animal/vegetable) in water	VOL-91-5011	EPA SW-846 3510C & SM5520	BALANCE
Oil and Grease (mineral) in water	VOL-91-5011	EPA SW-846 3510C & SM 5520	BALANCE
Methylene Chloride	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
cis- 1,2-Dichloroethylene	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
Chloroform	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
Benzene	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
Trichloroethylene	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
Toluene	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
Tetrachloroethylene	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
trans-1,3-Dichloropropylene	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
Ethylbenzene	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
1,1,2,2-Tetrachloroethane	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
Styrene	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
Total Xylenes	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
PCBs	ORG-91-5112	EPA SW-846 3510C & 8082A	GC/ECD
Di-n-butyl phthalate	ORG-91-5114	EPA SW-846 3510C & 8270E	GC/MS
Bis(2-Ethylhexyl)phthalate	ORG-91-5114	EPA SW-846 3510C & 8270E	GC/MS
Total Nonylphenol	ORG-250-5120	modified from ASTM D7485-16	LC/MS/MS
Total Nonylphenol Ethoxylates	ORG-250-5120	modified from ASTM D7485-16	LC/MS/MS

AGAT Laboratories

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

Method Summary

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

AGAT WORK ORDER: 20T579146

PROJECT: 5277-BVD Bolton HydroG

ATTENTION TO: Ali Rasoul

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
pH	INOR-93-6000	modified from SM 4500-H+ B	PC TITRATE
CBOD (5)	INOR-93-6006	SM 5210 B	DO METER
Total Suspended Solids	INOR-93-6028	modified from EPA 1684,ON MOECC E3139,SM 2540C,D	BALANCE
Fluoride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Total Cyanide	INOR-93-6051	modified from MOECC E3015; SM 4500-CN- A, B, & C	TECHNICON AUTO ANALYZER
Phenols	INOR-93-6050	MOE ROPHEN-E3179 & SM 5530 D	TECHNICON AUTO ANALYZER
Total Phosphorus	INOR-93-6022	modified from SM 4500-P B and SM 4500-P E	SPECTROPHOTOMETER
Total Kjeldahl Nitrogen	INOR-93-6048	modified from EPA 351.2 and SM 4500-NORG D	LACHAT FIA
Total Aluminum	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Antimony	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Arsenic	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cadmium	MET -93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Chromium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cobalt	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Copper	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Lead	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Manganese	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Mercury	MET-93-6100	modified from EPA 245.2 and SM 3112 B	CVAAS
Total Molybdenum	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Nickel	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Selenium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Silver	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Tin	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Titanium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Zinc	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS

AGAT Laboratories

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

Chain of Custody Record

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

Report Information:

Company: A & A Environmental Consultants Inc.
Contact: Dr. Ali Rasoul
Address: 16 Young St
Woodstock, ON
Phone: 519-266-4680 Fax: 519-266-3666
Reports to be sent to:
1. Email: arasoul@aaenvironmental.ca, labresults@aaenvironmental.ca
2. Email: jstuart@aaenvironmental.ca, tdemers@aaenvironmental.ca

Project Information:

Project: 5277 - BVD Bolton HydroG
Site Location: Bolton ON
Sampled By:
AGAT Quote #: ASAA1130 PO: 5277
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☑ No ☐
Company:
Contact:
Address:
Email:

Regulatory Requirements:

☐ No Regulatory Requirement
(Please check all applicable boxes)

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

☑ Sewer Use
☑ Sanitary ☑ Storm
Region PEEL (Indicate One)
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
(Indicate One)

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

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

Sample Matrix Legend

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

Laboratory Use Only

Work Order #: 20T579146

Cooler Quantity: 1 Large
Arrival Temperatures: 5.6 | 5.1 | 5.4 / 1.9 | 2.4 | 2.1
Custody Seal Intact: ☐ Yes ☐ No ☐ N/A
Notes:

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days
Rush TAT (Rush Surcharges Apply)
☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day
OR Date Required (Rush Surcharges May Apply):

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

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

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Y / N (Field Filtered - Metals, Hg, CrVI)	O. Reg 153: Metals and Inorganics	O. Reg 153: All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (incl. Hydrides)	O. Reg 153: ORPs: ☐ B-HWS ☐ Cl ☐ CN ☐ Cr^{6+} ☑ EC ☐ FOC ☐ Hg ☑ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use	Metals Soil 93-101	Metals Water 93-196	CCME F1-F4/VOCs Soil 91-248	CCME F1-F4/VOCs Water 91-249	CCME F1-F4/ BTEX Water 91-205	CCME F1-F4/ BTEX Soil 91-101
MW5	Feb 27/20	1100	14	GW		N															☑					
MW8	Feb 27/20	1130	14	GW		N															☑					

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
J Stuart	Feb 28/20		Brendan	Feb 28/20	10 35
Brendan	Feb 28/20	1230			

Page 1 of 1
N°:

Document ID: DIV-75-1511.015

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

Date Issued: March 16, 2015

APPENDIX D – MECP Well Records

Water Well Records - Report #5276

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
CALEDON TOWN (ALBION CON 07 002	17 604119 4856695 W	1966-10 1714	2					4900363 () A	GREY CLAY 0015 BLUE CLAY 0045 HPAN MSND STNS 0050 WHIT CLAY 0090 HPAN 0092 WHIT CLAY 0100
CALEDON TOWN (BOLTON	17 603899 4856857 W	2007-07 6607	2.00				0025 31	7048899 (Z72462) A054666	BRWN SAND GRVL 0005 BRWN SILT SNDY 0015 BRWN CLAY SILT 0040 GREY SILT SNDY 0056
CALEDON TOWN (BOLTON	17 603826 4856896 W	2007-08 7241			///:			7051218 (Z63615) A054666 A	
CALEDON TOWN (ALBION	17 604246 4857120 W	2015-11 7215						7270670 (C31857) A197251 P	
CALEDON TOWN (ALBION	17 604278 4856876 W	2012-10 7215						7194728 (C19395) A136209 P	
CALEDON TOWN (ALBION	17 603797 4857038 W	2013-01 7241	1.25				0010 10	7196143 (Z165710) A143768	BRWN FILL 0002 BRWN SILT 0009 GREY SILT 0020
CALEDON TOWN (ALBION	17 604060 4856717 W	2010-03 6607						7168757 (M06523) A094856 P	
CALEDON TOWN (ALBION	17 604227 4856816 W	2013-04 7215						7205569 (C21876) A145092 P	
CALEDON TOWN (ALBION	17 604256 4856656 W	2013-10 6607						7212225 (C22189) A146848 P	
CALEDON TOWN (ALBION CON 07 002	17 604229 4856559 W	1953-11 1307	24					4900361 () A	BRWN CLAY 0012 GREY CLAY STNS 0021 GREY MSND GRVL 0028 GREY CLAY STNS 0040 GREY MSND GRVL 0045

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
CALEDON TOWN (ALBION CON 06 004	17 603433 4857241 W	1959-07 1325	36 18					4900317 () A	BRWN CLAY 0018 BLUE CLAY 0061 BLUE CLAY MSND 0080 BLUE CLAY 0104
CALEDON TOWN (ALBION	17 603359 4856909 W	2015-05 7230						7245851 (C29827) A128940 P	
									12
CALEDON TOWN (ALBION CON 07 002	17 604104 4856730 W	2005-07 7143	5			CO		4909892 (Z15126) A015065	
CALEDON TOWN (ALBION CON 07 003	17 603805 4857065 W	1974-08 1556	6 6	FR 0205 FR 0223	90/223/3/2:30	CO		4904495 ()	BRWN LOAM CLAY 0003 BLUE CLAY 0148 BLUE CLAY STNS 0180 GREY GRVL CLAY BLDR 0193 GREY SHLE 0225
									CO 2
CALEDON TOWN (ALBION CON 07 003	17 603835 4857013 W	1977-06 3108	6	UK 0207	133/209/3/3:0	DO		4905188 ()	BLCK LOAM 0003 YLLW CLAY SNDY 0031 GREY CLAY SNDY 0051 GREY SAND GVLY 0067 BLUE CLAY GVLY 0092 SAND GRVL 0101 BLUE CLAY SOFT 0158 SAND GRVL 0165 BLUE CLAY SOFT 0188 BLUE SHLE 0210
CALEDON TOWN (ALBION CON 06 003	17 603665 4856973 W	1977-11 5206	6	FR 0143	94/130/6/2:0	DO	0152 8	4905282 ()	BRWN LOAM 0002 BRWN CLAY 0006 BLUE CLAY 0132 GREY FSND 0143 GREY CSND 0165
CALEDON TOWN (ALBION CON 06 003	17 603517 4856992 W	2000-03 6300	6 5	FR 0178	126//7/10:0	DO	0178 6	4908578 (212395)	LOAM 0001 BRWN CLAY 0014 BLUE CLAY 0125 SAND 0136 BLUE CLAY 0174 FSND 0178 SAND CLN 0186
CALEDON TOWN (ALBION CON 07 003	17 603926 4856908 W	1967-06 5203	5	FR 0158	104/106/20/4:0	DO	0154 4	4900366 ()	BRWN CLAY 0020 BLUE CLAY 0109 QSND 0152 CSND 0162
CALEDON TOWN (ALBION CON 07 003	17 603849 4856975 W	1973-09 4406	6	FR 0177	70/170/2/12:0	DO		4904191 ()	GREY CLAY 0171 BLUE GRVL 0177
CALEDON TOWN (ALBION CON 06 003	17 603555 4856988 W	1971-08 4610	5	FR 0087 FR 0178	132/172//:	DO	0182 4	4903682 ()	BRWN CLAY GRVL 0013 BLUE CLAY 0057 BLUE HPAN 0066 BLUE CLAY 0087 BLUE CLAY SILT 0096 BLUE MSND CLAY 0104 BLUE MSND CLAY 0178 BLUE GRVL FSND CSND 0184 BLUE CLAY 0186

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
CALEDON TOWN (ALBION CON 07 003	17 603877 4856887 W	1963-09 1714	2	FR 0129	124//3/:	DO	0129 4	4900364 ()	BRWN CLAY 0042 FSND 0062 HPAN 0129 MSND 0133
CALEDON TOWN (ALBION CON 07 003	17 603726 4857032 W	1963-12 2613	4	FR 0146 FR 0176 FR 0188	122/135/7/12:0	DO	0147 4	4900365 ()	YLLW CLAY 0023 GREY CLAY 0066 GREY CLAY STNS 0146 GREY FSND 0154 GREY CLAY 0176 MSND CLAY 0179 HPAN 0188 CSND 0189 HPAN 0194 SHLE 0195
CALEDON TOWN (ALBION CON 07 004	17 604095 4856773 W	1971-11 5206	5	FR 0151	115/145/10/6:0	DO	0161 4	4903715 ()	BRWN CLAY 0035 BLUE CLAY SILT 0159 MSND 0165
CALEDON TOWN (ALBION CON 07 003	17 604140 4856763 W	1971-06 5206	5	FR 0147	120/135/20/6:0	DO	0158 8	4903666 ()	BRWN CLAY 0030 BLUE CLAY 0147 FSND 0166
									DO 10
CALEDON TOWN (ALBION CON 07 003	17 603835 4857203 W	1973-03 4610	7	FR 0149	127/154/5/1:0	IN	0159 3	4904095 ()	BRWN CLAY 0018 BLUE CLAY STNS 0045 BLUE CLAY 0085 BLUE CLAY GRVL 0098 BLUE CLAY 0149 BLUE FSND 0162
									IN 1
CALEDON TOWN (ALBION CON 07 003	17 603661 4857133 W	1976-01 5206	5	FR 0140	130/140//6:0	IN DO	0141 3	4904849 ()	BRWN CLAY 0018 BLUE CLAY 0045 SILT 0068 BLUE CLAY 0140 FSND 0145 SILT 0150
									IN DO 1
CALEDON TOWN (ALBION	17 603719 4857108 W	2016-05 6607	2.00			MO	0010 10	7263877 (Z170061) A196699	BRWN SAND GRVL LOOS 0002 BRWN CLAY SILT DNSE 0015 GREY CLAY DNSE 0020
CALEDON TOWN (ALBION	17 603742 4857240 W	2016-05 6607	2.00			MO	0009 11	7263876 (Z169992) A196672	BRWN FILL GRVL SOFT 0004 BRWN CLAY SILT DNSE 0020
CALEDON TOWN (ALBION	17 603701 4856983 W	2012-12 7324	1.99	FR 0002		MO	0011 5	7196588 (Z147641) A139186	GREY SILT GRVL DRY 0001 GREY SILT CLAY SOFT 0006 BRWN CLAY SILT HARD 0016
CALEDON TOWN (ALBION CON 07 003	17 603658 4857161 W	2016-05 6607	2.00			MO	0010 10	7263863 (Z162536) A201541	BRWN SAND LOOS 0002 BRWN CLAY SILT DNSE 0015 GREY CLAY DNSE 0020

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
CALEDON TOWN (ALBION	17 603826 4856810 W	2014-08 7472	2.04			MO	0015 10	7230416 (Z195422) A168391	BRWN FILL LOOS 0005 BRWN SILT CLAY PCKD 0015 GREY CLAY SILT PCKD 0025
CALEDON TOWN (ALBION	17 603791 4857206 W	2016-05 6607	2.00			MO	0009 11	7263862 (Z147927) A201547	BRWN GRVL SAND SOFT 0004 BRWN CLAY SILT DNSE 0020
CALEDON TOWN (ALBION	17 603628 4856894 W	2012-12 7324	1.99	FR 0001		MO	0007 5	7196589 (Z147613) A139186	GREY GRVL SILT FILL 0000 GREY SILT SAND SNDY 0002 GREY CLAY SILT SLTY 0004 GREY CLAY 0012
CALEDON TOWN (ALBION	17 603653 4856928 W	2012-12 7324	1.99	FR 0022		MO	0017 5	7196590 (Z147614) A139186	GREY SILT SAND GRVL 0001 BRWN SILT CLAY DRY 0004 BRWN CLAY DRY 0014 GREY CLAY 0024
CALEDON TOWN (ALBION	17 604191 4857096 W	2015-08 7472	2.04			MO	0010 5	7247414 (Z214828) A188312	BRWN FSND SILT LOOS 0010 GREY CLAY SILT PCKD 0015
CALEDON TOWN (ALBION	17 604227 4856836 W	2014-03 6902	2.00			MO	0015 13	7219133 (Z166585) A159597	BLCK 0000 GREY GRVL SAND STNS 0001 GREY FILL CLAY SILT 0003 GREY SILT CLAY STNS 0023 BRWN SAND DNSE 0025
CALEDON TOWN (ALBION	17 603801 4856817 W	2014-08 7472	2.04			MO	0015 10	7230417 (Z195424) A166032	BRWN FILL LOOS 0005 BRWN SILT CLAY PCKD 0015 GREY CLAY SILT PCKD 0025
CALEDON TOWN (ALBION	17 603819 4856840 W	2014-08 7472	2.04			MO	0015 10	7230415 (Z195423) A168390	BRWN FILL LOOS 0005 BRWN SILT CLAY PCKD 0015 GREY CLAY SILT PCKD 0025
CALEDON TOWN (ALBION	17 603668 4857246 W	2016-05 6607	2.00			MO	0010 10	7263868 (Z223889) A201539	BLCK LOAM SOFT 0001 BRWN SILT CLAY DNSE 0012 GREY CLAY SILT DNSE 0020
									MO 13
CALEDON TOWN (ALBION CON 06 003	17 603836 4856847 W	2009-09 7383	2			MT	0010 20	7143511 (Z096102) A069019	BRWN SAND GRVL SLTY 0030
CALEDON TOWN (ALBION CON 06 003	17 603839 4856833 W	2009-09 7383	2			MT	0020 10	7143512 (Z096101) A069019	BRWN SAND GRVL 0030

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
CALEDON TOWN (ALBION	17 604060 4856764 W	2011-10 7241	2.04			MT	0010 10	7172124 (Z138896) A121005	BRWN FILL GRVL LOOS 0002 BRWN CLAY SILT DNSE 0010 GREY CLAY SILT DNSE 0015 GREY CLAY SILT SOFT 0020
CALEDON TOWN (ALBION	17 603831 4857064 W	2013-01 7241	1.25			MT	0009 10	7196141 (Z165752) A143775	BRWN FILL 0002 BRWN SILT 0010 GREY SILT 0019
CALEDON TOWN (ALBION	17 603802 4857091 W	2013-01 7241	1.25			MT	0009 10	7196142 (Z165751) A143690	BRWN FILL 0002 BRWN SILT 0010 GREY SILT 0020
CALEDON TOWN (ALBION	17 603775 4857041 W	2013-01 7241	1.25			MT	0010 10	7196144 (Z165753) A143774	BRWN FILL 0002 BRWN SILT 0002 GREY SILT
CALEDON TOWN (ALBION	17 604045 4856837 W	2011-10 7241	2.44			MT	0015 10	7172123 (Z138895) A114296	BRWN FILL GRVL LOOS 0001 BRWN CLAY SILT DNSE 0010 GREY CLAY SILT DNSE 0015 GREY CLAY SILT WBRG 0025
									MT 7
CALEDON TOWN (ALBION CON 07 003	17 604065 4856743 W	1969-02 4813	6	FR 0145	132/135/10/12:0	NU		4903187 () A	BRWN CLAY 0018 BLUE CLAY 0145 MSND SILT 0156 SHLE 0167
									NU 1
CALEDON TOWN (ALBION CON 06 003	17 603686 4856848 W	1967-12 4813	5	FR 0145	120/147/4/3:0	ST DO	0146 9	4900316 ()	BRWN CLAY 0018 BLUE CLAY 0145 FSND 0155
CALEDON TOWN (ALBION CON 07 003	17 603929 4856959 W	1967-10 3316	5	FR 0138 FR 0140	112/126/2/6:0	ST DO	0137 8	4900367 ()	CLAY GRVL 0090 MSND SILT 0138 FSND 0148
									ST DO 2
CALEDON TOWN (ALBION CON 07 002	17 604224 4856821 W	2014-09 7215	2			TH	0002 5	7229211 (Z183544) A169227	BRWN CLAY SILT 0012
CALEDON TOWN (ALBION	17 604214 4857167 W	2016-01 7215	2	0004		TH	0005 10	7257669 (Z203516) A197159	GREY FILL SAND 0008 GREY CLAY 0015

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
									TH 2

Total Wells: 51

Notes:
UTM: UTM in Zone, Easting, Northing and Datum is NAD83; L: UTM estimated from Centroid of Lot; W: UTM not from Lot Centroid
DATE CNTR: Date Work Completedand Well Contractor Licence Number
CASING DIA: .Casing diameter in inches
WATER: Unit of Depth in Fee. See Table 4 for Meaning of Code

PUMP TEST: Static Water Level in Feet / Water Level After Pumping in Feet / Pump Test Rate in GPM / Pump Test Duration in Hour : Minutes
WELL USE: See Table 3 for Meaning of Code
SCREEN: Screen Depth and Length in feet
WELL: WEL (AUDIT #) Well Tag . A: Abandonment; P: Partial Data Entry Only
FORMATION: See Table 1 and 2 for Meaning of Code

1. Core Material and Descriptive terms

Code	Description	Code	Description	Code	Description	Code	Description	Code	Description
BLDR	BOULDERS	FCRD	FRACTURED	IRFM	IRON FORMATION	PORS	POROUS	SOFT	SOFT
BSLT	BASALT	FGRD	FINE-GRAINED	LIMY	LIMY	PRDG	PREVIOUSLY DUG	SPST	SOAPSTONE
CGRD	COARSE-GRAINED	FGVL	FINE GRAVEL	LMSN	LIMESTONE	PRDR	PREV. DRILLED	STKY	STICKY
CGVL	COARSE GRAVEL	FILL	FILL	LOAM	TOPSOIL	QRTZ	QUARTZITE	STNS	STONES
CHRT	CHERT	FLDS	FELDSPAR	LOOS	LOOSE	QSND	QUICKSAND	STNY	STONEY
CLAY	CLAY	FLNT	FLINT	LTCL	LIGHT-COLOURED	QTZ	QUARTZ	THIK	THICK
CLN	CLEAN	FOSS	FOSILIFEROUS	LYRD	LAYERED	ROCK	ROCK	THIN	THIN
CLYY	CLAYEY	FSND	FINE SAND	MARL	MARL	SAND	SAND	TILL	TILL
CMTD	CEMENTED	GNIS	GNEISS	MGRD	MEDIUM-GRAINED	SHLE	SHALE	UNKN	UNKNOWN TYPE
CONG	CONGLOMERATE	GRNT	GRANITE	MGVL	MEDIUM GRAVEL	SHLY	SHALY	VERY	VERY
CRYS	CRYSTALLINE	GRSN	GREENSTONE	MRBL	MARBLE	SHRP	SHARP	WBRG	WATER-BEARING
CSND	COARSE SAND	GRVL	GRAVEL	MSND	MEDIUM SAND	SHST	SCHIST	WDFR	WOOD FRAGMENTS
DKCL	DARK-COLOURED	GRWK	GREYWACKE	MUCK	MUCK	SILT	SILT	WTHD	WEATHERED
DLMT	DOLOMITE	GVLY	GRAVELLY	OBDN	OVERBURDEN	SLTE	SLATE		
DNSE	DENSE	GYPS	GYPSUM	PCKD	PACKED	SLTY	SILTY		
DRTY	DIRTY	HARD	HARD	PEAT	PEAT	SNDS	SANDSTONE		
DRY	DRY	HPAN	HARDPAN	PGVL	PEA GRAVEL	SNDY	SANDYOAPSTONE		

2. Core Color

Code	Description
WHIT	WHITE
GREY	GREY
BLUE	BLUE
GREN	GREEN
YLLW	YELLOW
BRWN	BROWN
RED	RED
BLCK	BLACK
BLGY	BLUE-GREY

3. Well Use

Code	Description	Code	Description
DO	Domestic	OT	Other
ST	Livestock	TH	Test Hole
IR	Irrigation	DE	Dewatering
IN	Industrial	MO	Monitoring
CO	Commercial	MT	Monitoring TestHole
MN	Municipal		
PS	Public		
AC	Cooling And A/C		
NU	Not Used		

4. Water Detail

Code	Description	Code	Description
FR	Fresh	GS	Gas
SA	Salty	IR	Iron
SU	Sulphur		
MN	Mineral		
UK	Unknown		

APPENDIX E – Water Balance Calculation

	Area (m^2)	Infiltration Factors				Precipitation Data		Calculated	
		Topography	Soil	Cover	Accumulative Infiltration Factors	P (mm/y) (m^3/y)	E (mm/y) (m^3/y)	I (mm/y) (m^3/y)	R (mm/y) (m^3/y)
Pre-development									
Impervious Area	2073					857 (1777)	171 (354)	0 (0)	686 (1422)
Pervious Area	10543	0.2 (Flat)	0.2 (Silt)	0.1	0.5	857 (9035)	401 (4228)	228 (2404)	228 (2404)

Inputs	m^3/year	Outputs	m^3/year
Total Precipitation	10812	Total Evapotranspiration	4582
		Total Infiltration	2403
		Total Runoff	3827
Total	10812	Total	10812
Difference (Inputs-Outputs)		0	

Post Development									
Impervious Area	4301					857 (3686)	171 (735)	0 (0)	686 (2951)
Pervious Area	8315	0.2 (Flat)	0.2 (Silt)	0.1	0.5	857 (7126)	401 (3334)	228 (1896)	228 (1896)

Inputs	m^3/year	Outputs	m^3/year
Total Precipitation	10812	Total Evapotranspiration	4069
		Total Infiltration	1896
		Total Runoff	4847
Total	10812	Total	10812
Difference (Inputs-Outputs)		0	

Developmental Impacts	Infiltration	Runoff
Sub-Total Post-Development	1896 (m^3/y)	4847 (m^3/y)
The Different Due to the Propose Development	-507 (m^3/y)	+1030 (m^3/y)