Stormwater Management Report

Holiday Inn Express
Town of Cobourg
Engage Project No. 20005

Engage Engineering Ltd.

May 2020

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1.0 Introduction

1.1 Purpose

Engage Engineering Limited (Engage) has been retained to prepare a Stormwater Management (SWM) Report in support of the proposed Holiday Inn Express development located along the future Depalma Drive extension in the Town of Cobourg (Cobourg). The development will include the construction of a hotel complete with a surface parking lot and a variety of landscape features. The purpose of this report is to quantify the impact that the proposed development will have on runoff rates and to recommend any stormwater management measures required to maintain post-development flows to pre-development levels while providing appropriate quality controls.

Recommendations made in this report will be in accordance with Cobourg and Ganaraska Region Conservation Authority (GRCA) requirements, in addition to current stormwater management best practices.

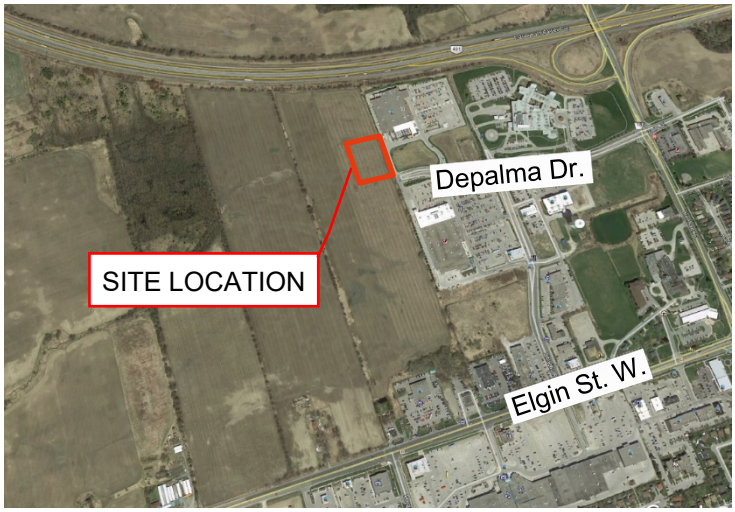
1.2 Site Description

The Depalma development is located to the north of Elgin Street West (County Road #2) in the Town of Cobourg, County of Northumberland. The site abuts existing commercial areas and Elgin Street to the south, Highway 401 to the north, existing agricultural to the west, and existing commercial areas and Depalma Drive to the east. The hotel site will be located on the east side of the future Depalma development site as identified on the Location Plan included as **Figure 1**.

The ultimate development plans for the entire site include a mix of commercial/retail buildings and future road connections. It is expected that the ultimate site will be developed under a draft plan process and require further planning and engineering studies. The initial phase, which is the subject of this report, is the proposed hotel block at the eastern edge of the site.

A similar detailed SWM report will be prepared as part of the planning/approval process for the entire site that will detail the stormwater management measures for the entire development including the hotel site.

Figure 1 – Location Plan



2.0 Hydrologic Analysis

2.1 Existing Conditions

The existing site is a 0.75 hectare parcel of land located to the west of Deplama Drive. The site drains from east to west towards the low area at the west of the ultimate Depalma Development site. The legal limits of the property are shown on the Site Plan prepared by Chamberlain Architect Services Limited, which is included as **Figure 2**. The topography is shown on the Topographic Survey Plan prepared by Sylvester and Brown Ltd., which is included as **Figure 3**. The survey was utilized to determine existing elevations, locations of existing features on the site, and to establish proposed grading and servicing design for the proposed development of the site.

There is approximately 1.0m of relief from the high point along the east to the low point at the west property line. The topography is shown on the **Existing Storm Drainage Area Plan** which is included as **Figure 4**.

Existing catchment area **EX1** is 0.75ha and includes drainage for the entire site and drains from east to west. The existing surface of the site is comprised of agricultural area.

The existing characteristics of the drainage areas are summarized in **Table 1** below.

Table 1 – Existing Drainage Areas (ha)

Catchment ID	Cropland	Gravel	Impervious	Total
EX1	0.75	0.00	0.00	0.75

2.2 Proposed Conditions

Under the proposed condition, the topography will change to accommodate the grading for the proposed hotel and parking area. There are five (5) proposed drainage catchment areas identified on the **Proposed Storm Drainage Area Plan** included as **Figure 5**. The respective catchment areas and their characteristics are summarized below.

Proposed catchment area **PR1** is 0.42ha and provides drainage for a large south west portion of the site including the proposed bioretention cell and large portion of the parking lot. This area drains to the south-west to the bioretention cell allowing for infiltration as well as an overflow to the proposed storm sewer system. It consists of grassed and impervious areas.

Proposed catchment area **PR2** consists of 0.13ha and includes drainage for the proposed building. This area will be collected by internal roof drains and outlet to the proposed storm sewer system.

Proposed catchment area **PR3** consists of 0.19ha and includes drainage for the northern portion of the site that drains to the proposed storm sewer system. Due to grading constraints it was not possible to drain this area to the bioretention cell. It consists of grassed and impervious areas.

Proposed catchment area **PR4** is 0.01ha and consists of the proposed connection to the future roadway. It consists of grassed and impervious areas and due to grading constraints, it was not possible to drain this area to the storm sewer system. This area will sheet flow to the west.

Proposed catchment area **PR5** is 0.01ha and consists of the proposed connection to the future Depalma Drive extension. It consists of grassed and impervious areas and due to grading constraints, it was not possible to drain this area to the storm sewer system. This area will sheet flow to the south.

The characteristics of the proposed drainage areas are summarized in **Table 2** below:

Table 2 – Proposed Drainage Areas (ha)

Surface Type	Grass	Impervious	Total
PR1	0.147	0.271	0.418
PR2	0.000	0.126	0.126
PR3	0.078	0.113	0.191
PR4	0.005	0.004	0.009
PR5	0.003	0.003	0.006

2.3 Hydrologic Parameters

The hydrologic parameters for the site under existing and proposed conditions were developed based on the site conditions and topography. The parameters are summarized in **Table 3** below. Detailed spreadsheets are included in **Appendix A.**

Table 3 – Existing and Proposed Hydrologic Parameters

Catchment ID	Area (ha)	% Impervious	Runoff Coefficient	Tc (Calc.)
EX1	0.75	0.00%	0.35	20.2
PR1	0.42	64.9%	0.67	3.9
PR2	0.13	100.0%	0.90	2.0
PR3	0.19	59.2%	0.63	3.4
PR4	0.01	44.4%	0.54	0.5
PR5	0.01	50.0%	0.58	0.3
PR Total	0.75	68.0%	0.69	4.0

The peak runoff for the existing and proposed conditions were calculated for the 2-year through 100-year return periods using the Rational Method and the hydrologic parameters identified in the previous section. Spreadsheets with the Rational Method calculations are included in **Appendix A** and the calculations are summarized in **Table 4** below.

Table 4 – Pre and Post Development Peak Flows

Catchment ID	Peak Flows (m3/s)					
	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
EX1	**0.029**	**0.037**	**0.044**	**0.056**	**0.068**	**0.077**
PR1	0.046	0.061	0.072	0.092	0.112	0.131
PR2	0.019	0.025	0.029	0.037	0.045	0.053
PR3	0.020	0.026	0.031	0.040	0.048	0.056
PR4	0.001	0.001	0.001	0.002	0.002	0.002
PR5	0.001	0.001	0.001	0.001	0.001	0.002
PR Total	**0.086**	**0.114**	**0.135**	**0.172**	**0.209**	**0.244**

The results indicate that in the absence of any quantity controls, the peak flows leaving the hotel site will increase under the proposed conditions when compared to existing conditions. Some form of quantity control is required; however it will be controlled by an off-site SWM facility as part of the larger Depalma Development.

3.0 Stormwater Management

3.1 Quantity Control

As identified in the Depalma Drive Functional Stormwater Management Report dated May 2019, prepared by Engage Engineering Ltd. an off-site temporary SWM facility will be utilized to provide quantity controls for the hotel site as well as the Depalma Drive extension. This SWM facility will provide temporary quantity controls until the ultimate SWM facility is designed and constructed that provides controls for the entire Depalma Drive development. Refer to the above mentioned report for further details on the temporary SWM facility. Once the Master Drainage Plan study being completed by the County of Northumberland has been finalized, the location and ultimate outlet will need to be selected.

3.2 Quality Control

Quality control will be required for the propsoed hotel site as the asphalt parking lot will contain suspended solids and contaminants. Quality control to an enhanced level will be provided for the site through a quality control treatment train approach consisting of an oil-grit separator (OGS), and a bioretention cell.

Quality control for the entire site will be provided by an OGS located downstream in the storm sewer system. The proposed OGS has been sized as a Stormceptor STC1000. The OGS was sized based on a site area of 0.75Ha and impervious area approximation of 68%. The OGS sizing report is included in **Appendix B**. The proposed Stormceptor STC1000 is specified to provide a net annual removal efficiency of 80% and treat 90% of runoff volume.

To provide additional quality control and a best efforts LID approach for the site, a bioretention cell will be used for drainage area PR1. The bioretention cell will be located in the southwest corner of the site and treat and promote groundwater re-charge for over 50% of the site area.

The main function of a bioretention cell is to promote filtration and infiltration of runoff while providing temporary storage. The soil in the location of the proposed bioretention cell is primarily clayey silt as per the geotechnical assessment included in **Appendix H**. The soil has an infiltration rate of approximately 12mm/hr which is translated from the percolation rate of 50min/cm. There was groundwater observed in the location to be at a depth of 1.2mbg which translates to an approximate elevation of 104.00m as per the results from BH112-20 in **Appendix H**. The bottom of the proposed bioretention cell is 104.50, which translates to a clearance to groundwater of 0.5m. Although this does not meet the recommended 1.0m clearance according to the CVC guidelines, due to the relatively high groundwater levels on the site, this is the best case scenario and will still promote groundwater recharge for most seasons of the year.

The depth of the engineered soil within the bioretention cell will be reduced to maintain a maximum separation between the bottom of the cell and the ground water elevation. Additionally, the cell will require an underdrain as the infiltration rate is less than the minimum 15mm/hr required for full infiltration. The use of an underdrain indicates the cell is not relying on full infiltration and will reduce the risk of the bioretention cell becoming inundated.

The bioretention cell was designed using the Credit Valley Conservation (CVC) Low Impact Development Stormwater Management Planning and Design Guide (Version 1.0, dated 2010). The design calculations and design guide information have been included in **Appendix C**. Calculations for the cell are explained below:

The bioretention cell depth was calculated to be a maximum of **1.19m** using the following equation:

$$\boldsymbol{d_{cmax} = i * (t_s - \frac{d_p}{i})/V_r}$$

A 48-hour time to drain has been used in the calculation in accordance with LID guidelines.

The stone reservoir depth was calculated to be a maximum of **1.44m** using the following equation:

$$\boldsymbol{d_{rmax} = i * (t_s/V_r)}$$

The minimum bioretention cell footprint was calculated to be **105.90m^2** using the following equation:

$$\boldsymbol{A_f = WQV/(d_c * V_r)}$$

Water quality volume (WQV) for use in the above equation was calculated based on the CVC's Table 7.1 – Water Quality Storage Requirements. For infiltration features servicing a runoff area with an impervious level of 64.9%, a storage volume of 32.4m^3/ha is required to provide enhanced 80% long term SS removal. The actual volume was calculated using the contributing area to be **13.56m^3**.

The proposed bioretention cell will be 0.99m deep, with a 0.32m stone reservoir depth and have a footprint area of 106m^2. This stone reservoir depth along with the footprint area and void space ratio of 0.4 will provide the site with **13.57m^3** of quality control volume which is greater than the required 13.56m^3.

An overflow DICB will be provided in case the bioretention cell becomes inundated during a large storm event. This DICB will allow for a maximum ponding of 100mm before activation, which will then direct flows to the storm sewer. Details for this bioretention cell are located on the Detailed Design Drawings included in **Appendix I**. A 3.0m wide emergency overflow spillway has been incorporated into the cell at an elevation of 105.95m as per the **Servicing Plan** included in **Appendix I**. Weir sizing calculations can be found in **Appendix D**. The weir will convey the 100-year peak flow should the cell become inundated.

Landscaping of the bioretention cell is important to the function and appearance of the facility and will decrease the level of maintenance required. The cell is recommended to be planted with a combination of native trees, shrubs, and perennial herbaceous plants.

The 80% TSS removal from the bioretention cell, combined with the 80% TSS removal from the OGS will exceed the MOE SWPDM requirements of 80% TSS removal for Enhanced level protection.

3.3 Stormwater Conveyance

Runoff from the hotel site will be conveyed to the temporary SWM facility downstream of the site in one of two methods: via surface drainage systems (including storm sewers and swales) and major overland flow routes.

Minor Storms
Minor storm events, up to and including the 5-year storm for the hotel development, will be conveyed in the storm sewer system. The storm sewer system was designed in accordance with best practices with all sections of pipe operating below 80% capacity for the 5-year storm during and the design sheet is included in **Appendix E**. The storm sewer is shown on the **Servicing Plan** included in **Appendix I**. On-site drainage will also be conveyed to the bioretention facility and storm sewer by conveyance swales that direct flows around the rear of the hotel. These swales have been sized according to the design sheet in **Appendix F** and are summarized in **Table 5** below.

Table 5 – Swale Sizing

Swale	Characteristics	Cross Sectional Area (m^2)	Maximum Flow Rate (m^3/s)	Percent Capacity at 100-Year Flow	Velocity (m/s)
PR1 Entrance Swale	3:1 side slope, 1.0% long (min) slope; 0.15m deep (min)	0.068	0.011	28%	0.42
PR3 Swale	3:1 side slope, 0.5% long (min) slope; 0.15m deep (min)	0.068	0.004	15%	0.25

Major Storms
Major flows including the 10 through 100-year storms, will be conveyed via overland flow routes to the future SWM facility. The overland flow routes are shown on **the Grading Plan** included in **Appendix I.** The road side ditches and enhanced grassed swale on the Depalma Drive extension will serve will as the major overland flow route for the hotel development. These overland flow routes are identified in the Depalma Drive Functional Stormwater Management Report dated May 2019.

Home Depot Site Future Conveyance

Through discussions with the Town it was identified that the Home Depot site to the east of the Depalma Drive site is to drain to the future SWM facility on the Depalma Lands. The current Home Depot site is serviced by a temporary quantity control pond that outlets to the storm sewer to the east. This is identified in the report prepared by Counterpoint Engineering Inc. dated September 2006. The Home Depot site will provide its own quantity control measures on site and will release to the west towards the Depalma Drive site with a maximum flow rate 0.146m^3/s as identified in the report. There is a future storm sewer connection to the home depot lands at the north east corner of the hotel site. A proposed storm sewer has been designed to take this controlled flow rate and direct it to the future SWM facility. The storm sewer system was designed in accordance with best practices with all sections of pipe operating below 80% capacity for the 5-year storm during and the design sheet is included in **Appendix E**.

4.0 Culvert Sizing

One culvert will need to be installed under the proposed entrance to the hotel development to convey flows in the swale to the bioretention cell. The proposed culvert under the entrance is a 19.0m long, 250mm diameter HDPE culvert at 1.0%.

Calculations supporting the proposed culvert sizing are included in **Appendix F** and are summarized in **Table 6** below:

Table 6 - Culvert Characteristics

Culvert ID	Design Storm	Flow Rate Through Culvert (m^3/s)	High Water Elev. (m)	Outlet Velocity (m/s)
Entrance Crossing	100-Yr	0.011	105.80	0.32

5.0 Operation and Maintenance

Proper operation and maintenance has an important impact on the long-term performance of the Stormwater Management facilities that have been constructed to control stormwater runoff. The Holiday Inn Express site has a number of stormwater features that have been designed and implemented to manage runoff on the site. These features include:

- Bioretention Cell
- Oil-Grit Separator (OGS)

These features need to be monitored and maintained on a consistent basis in order to ensure proper form and function. Neglecting the required monitoring and

maintenance can result in the facilities not operating as intended and result in costly repairs in the future.

5.1 Facility Monitoring

Inspections of the bioretention cell, and OGS should be conducted to confirm the facility performance as well as to identify the type and frequency of additional maintenance activities. During the first two years of operation, inspections should be conducted after each significant rainfall event to ensure proper functioning of the system; this will average between 3 to 6 inspections per year. After this initial period, inspection frequency can be reduced to a single annual inspection.

Below is a checklist of items that should be monitored during the facility inspection:

Bioretention Cell

- **Observe water level in bioretention cell** – standing water for extended periods could indicate blockage. If prolonged standing water is observed, inspect for built up sediment and/or debris.
- **Observe and measure sediment levels in the bottom of the facility** – If significant sediment is observed (greater than 0.1 m depth) it should be removed. Monitoring during the first two years should be conducted to confirm the rate of accumulation of sediment. This will assist in determining a standardized cleanout schedule for the facility.
- **Observe piped outlet structure** – partial blockage of the outlet or accumulated sediment in the structure could result in prolonged ponding.

Oil-Grit Separator (OGS)

- **Observe and measure sediment levels in the OGS** – Inspect and measure the sediment level in the OGS using a graduated pole. When the sediment level reaches 15% of the storage capacity it should be removed. Monitoring during the first two years should be used to confirm the rate of accumulation of sediment. This will assist in determining a standardized cleanout schedule for the facility.
- **Observe inlet and outlet pipes and structures** – partial blockage of the inlet/outlet or accumulated sediment in the structure could result in prolonged ponding of the basin.
- **Observe presence of oil/fuel accumulation** – if evidence of petroleum products is present, the unit should be cleaned.

5.2 Facility Maintenance

Maintenance of the SWM facilities should be conducted on an as required basis as part of the monitoring program for the site. Maintenance will be more frequent during the first two years of operation while the site is developing, and the vegetation is

maturing. After this initial period, maintenance frequency can be standardized based on the findings of the facility monitoring.

Below is a checklist of maintenance items that should be performed as required by the monitoring schedule above:

Bioretention Cell

- **Debris Removal** - trash/debris removal will be required of the facility in the spring of each year, to remove debris that has accumulated over the winter season. Apart from "spring cleaning", trash removal should be completed on a periodic basis throughout the year.
- **Sediment Removal** - sediment will need to be removed periodically from the bioretention cell in order to maintain intended performance. The rate of accumulation of sediment is dependent on several factors including:
    - Characteristics of upstream areas (level of imperviousness)
    - Upstream land use and activities, especially during the construction phase of the development prior to sodding of all yards.
    - Winter control practices (e.g. level of sand used)

  Sediment should be removed from the bioretention cell when the accumulated depth reaches 0.10m at the monitoring locations. It can be removed by means of a vacuum excavation truck or excavation equipment. Care should be taken not to excavate any of the bioretention media during sediment removal.
- **Grass Cutting** - it is preferable to maintain the facility in as natural a state as possible; longer grass and natural vegetation tend to enhance water quality and SWM performance. Grass cutting around the top perimeter of the bioretention cell can be completed on an as- required basis for aesthetic reasons but the vegetation within the bioretention cell should be left in a natural state. If the grass in the bioretention cell needs to be cut due to aesthetic concerns, it should be cut as infrequently as possible to maintain an acceptable aesthetic standard.

Additional information regarding the monitoring and maintenance of bioretention cells has been provided in **Appendix G** and is an excerpt from the Credit Valley Conservation (CVC) Low Impact Development Stormwater Management Planning and Design Guide (Version 1.0, dated 2010).

Oil-Grit Separator (OGS)

- **Sediment Removal** - sediment will need to be removed periodically from the OGS in order to maintain intended performance. The rate of accumulation of sediment is dependent on several factors including:
    - Characteristics of upstream areas (level of imperviousness)
    - Upstream land use and activities, especially during the construction phase of the development prior to sodding of all yards.
    - Winter control practices (e.g. level of sand used)

- Sediment should be removed from the OGS when the accumulated sediment depth reaches 15% of storage capacity. Sediment can be removed by means of a vacuum excavation truck or excavation equipment.

Operation and maintenance of oil-grit separators should be conducted per the manufacturer's recommendations. A copy of the respective manufacturers operation and maintenance manual is included in **Appendix G**.

6.0 Erosion and Sediment Control

The development of the site, particularly the stripping of the site, will result in an area of exposed native soil, which in turn has the potential to erode and contribute sediment to downstream receivers. To mitigate these effects, an erosion and sediment control strategy was developed for the site. Elements of the strategy incorporate best practices as outlined in the *Erosion and Sediment Control Guidelines for Urban Construction, GGHCA*.

The erosion and sediment control plan has been established to best protect downstream receivers during the construction period. A silt fence barrier will first be erected downgrade of the construction area.

Silt Fence: Silt fence will be utilized as a perimeter control and will be installed as shown on the **Erosion & Sediment Control Plan** included in **Appendix I**. Silt fence will be installed in accordance with OPSD 219.130 and may require periodic maintenance during the construction period.

Mud Mat: A mud mat will be installed as shown on the **Erosion & Sediment Control Plan** included in **Appendix I**. The mudmat will consist of 2 layers of 200 mm rip rap on geotextile. The mudmat will reduce the amount of mud and debris that is tracked from the site on to Depalma Drive. The contractor shall maintain the mat by "turning" it as it becomes clogged or adding additional rip rap as needed to maintain the effectiveness of the mat.

7.0 Summary

The proposed development includes the construction of one hotel building, an asphalt parking lot and landscape features. Although peak flows from the hotel site will increase when compared to the existing conditions, no form of quantity control is provided on the hotel site. A temporary SWM facility downstream of the site will be utilized to provide quantity controls for the hotel site as well as the Depalma Drive extension and is detailed under separate cover. This SWM facility will provide temporary quantity controls until the ultimate SWM facility is designed and constructed that provides controls for the entire Depalma Drive development.

Quality control is proposed to be provided via an on-site treatment train approach with the installation of a bioretention cell combined with a STC1000 oil-grit separator. These combined systems will provide an Enhanced Level of quality control.

The use of the above noted facilities will provide the required quality and quantity control and also promote groundwater re-charge through infiltration. The proposed SWM strategy will ensure that the proposed development does not have a negative impact on downstream receivers.

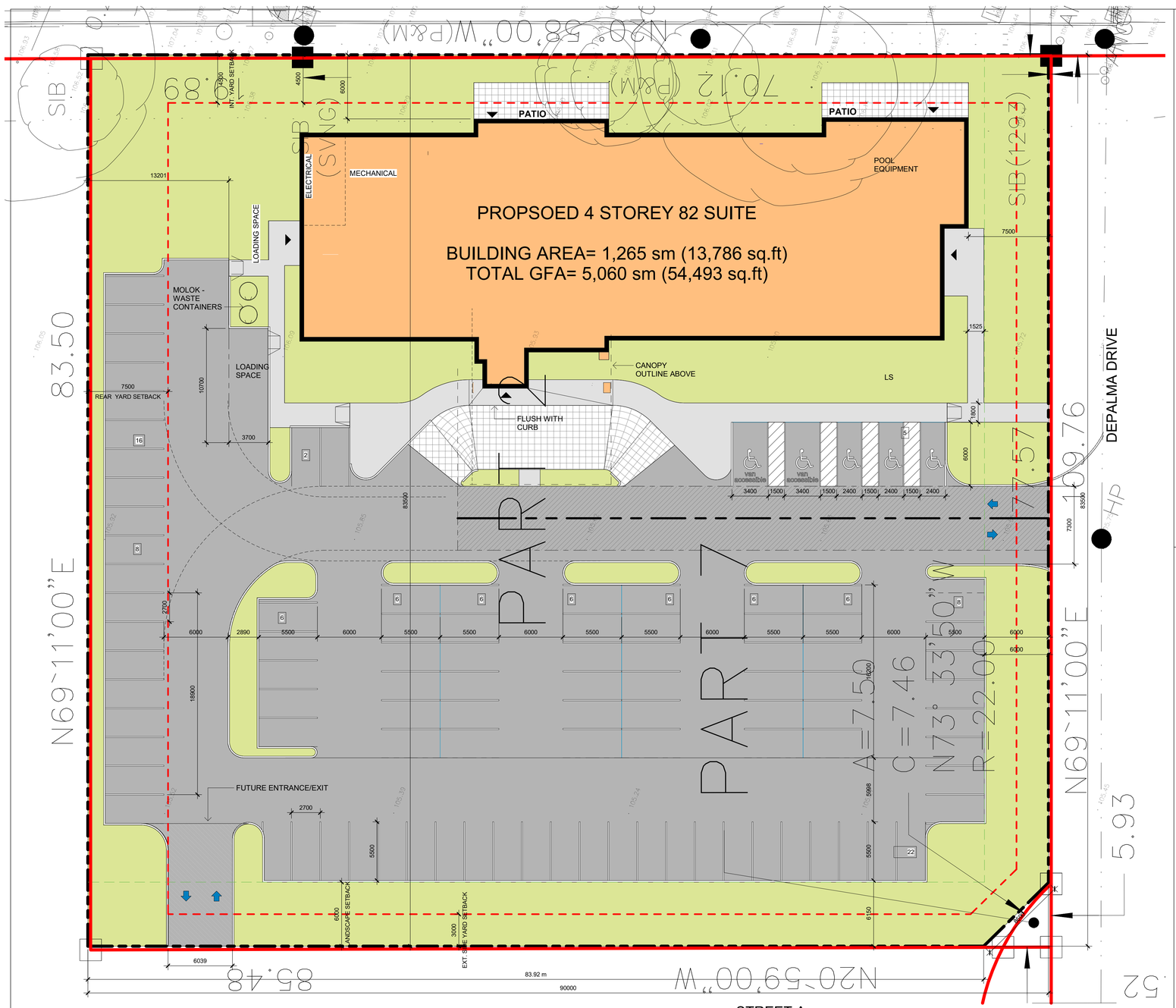
Prepared by:

Brad Parsons, P. Eng
Water Resources Engineer

Reviewed by:

Mackenzie Crowley, E.I.T

Figure 2: Site Plan



1 A001 SITE PLAN
1 : 200

ZONING INFORMATION

ZONE: ZONE(b) ZONING BY- LAW	REQUIRED	PROVIDED
FSI:	.25	.67
MAXIMUM HEIGHT	4 STOREYS	4 STOREYS (16.0M)
MINIMUM REQUIRED FRONT YARD	9.0 m	10.0 m
MINIMUM REQUIRED SIDE YARD	3.0 m	10.0 m
MINIMUM REQUIRED REAR YARD	7.5 m	10.0 m
LOT AREA	740 m²	7496 m²
LOT FRONTAGE	30.0 m	90.0 m

O.B.C.CLASSIFICATION	
GROUP A2, DIVISION 2, UP TO 6 STOREYS, ANY AREA, SPRINKLERED	O.B.C. 3.2.2.24
GROUP C, UP TO 6 STOREYS, SPRINKLERED, NONCOMBUSTIBLE CONSTRUCTION	O.B.C. 3.2.2.43

PARKING REQUIREMENTS	REQUIREMENTS	REQUIRED	REFERENCE
(GUEST ROOMS =82 ROOM) MEETING/RESTAURANT AREA= 130m²) OFFICE AREA = 45 SQ.M	1 FOR EACH ROOM 82 1 SPACE / 9m² 130/ 9 = 14.4 1 SPACE / 33m² 45/33 = 1.36	98	BY-LAW #85-2003
ACCESSIBLE PARKING	ONE PARKING SPACEFOR EVERY 20 PARKING SPACES FOR ANY USE THAT HAS 20 AND 100 PARKING SPACES	5 (3 TYPE"A" & 2 TYPE"B")	O. Reg. 4 13/12, 80.36(1),(3)
LOADING SPACE		1	

PROVIDED PARKING

TYPE	DESCRIPTION	COUNT
ACCESSIBLE PARKING - TYPE (A)	3.4x6m	2
ACCESSIBLE PARKING - TYPE (B)	2.4x6m	3
TYPICAL PARKING	2.7x5.5m	93
		98

SITE STATISTICS

DESCRIPTION	AREA (SM)	AREA (SF)	PERCENTAGE
BUILDING AREAS			
HOTEL	1264.00 m²	13606 ft²	16.9%
	1264.00 m²	13606 ft²	16.9%
HARD LANDSCAPE			
ASPHALT	3388.22 m²	36471 ft²	45.2%
PAVER	221.69 m²	2386 ft²	3.0%
SIDEWALK	278.73 m²	3000 ft²	3.7%
	3888.64 m²	41857 ft²	51.9%
SOFT LANDSCAPE			
LANDSCAPE	2346.68 m²	25259 ft²	31.3%
	2346.68 m²	25259 ft²	31.3%
	7499.32 m²	80722 ft²	100.0%

SITE NOTES

1. RAISE CONCRETE WALK/CURB MAX 150mm ABOVE ASPHALT. REFER TO LANDSCAPE DRAWINGS FOR DETAILS AND CIVIL ENG. DRAWINGS FOR GRADE.
2. DEPRESSED CONCRETE WALK.
3. NEW RAISED CONCRETE CURB/ISLAND.
4. PAINTED "STOP" ON PAVEMENT.
5. DEPRESSED CURB TO MEET BARRIER FREE ACCESS REQUIREMENTS. REFER TO TYPICAL DETAIL.
6. BIKE RACKS. REFER TO LANDSCAPE DRAWINGS.

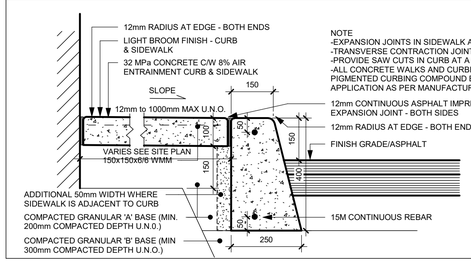
GENERAL NOTES

1. MAX. SLOPE OF LANDSCAPED AREAS TO BE 1:3.
2. PROVIDE TOE WALL WHERE GRADE DIFFERENCE EXCEEDS 0.6M.
3. PROVIDE 1100MM HIGH GUARDRAIL WHERE GRADE DIFFERENCE EXCEEDS 0.6M.
4. DEPRESS CONCRETE CURBS AT SIDEWALKS TO MEET SIDEWALK DEPRESSATION TO THE SATISFACTION OF THE DIRECTOR OF ENGINEERING.
5. ALL SIDEWALK FINISHES AT BUILDING ENTRANCES TO BE POURED CONCRETE BORDERED WITH CONC. CURBS UNLESS OTHERWISE NOTED.
6. ALL CONC. CURBS SHALL BE 150MM ABOVE FINISHED ASPHALT UNLESS OTHERWISE NOTED.
7. SHADED AREAS AT ENTRANCE RAMPS DENOTES HEAVY DUTY ASPHALT PAVING.
8. ANY CONFLICT WITH EXISTING SERVICES SHALL BE RECTIFIED AT THE APPLICANTS EXPENSE.
9. LANDSCAPE BERMS SHALL NOT ENCROACH ON BOULEVARD.
10. PAVEMENT GRADES: MIN. 0.5%, MAX. 5.0%.
11. DRAINAGE SWALES: MIN. 2.0%, MAX 5.0%.
12. OUTSIDE LIGHTING TO BE DIRECTED DOWNWARD AS WELL AS INWARD.
13. DRIVEWAY ENTRANCE SHALL BE CONSTRUCTED WITH HEAVY DUTY ASPHALT FROM THE BACK OF THE MUNICIPAL CURB OR EDGE OF PAVEMENT TO THE PROPERTY LINE (AREA HIGHLIGHTED ON DRAWING(S)) TO CITY STANDARDS

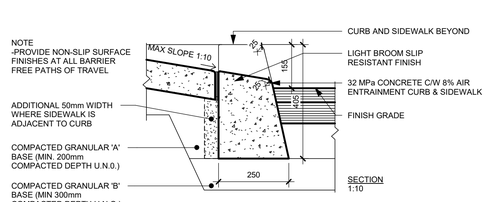
SITE PLAN LEGEND

- ENTRANCE / EXIT
- LANDSCAPE SETBACK LINE
- BUILDING SETBACK LINE
- PROPERTY LINE
- SIAMESE CONNECTION
- PROPOSED FIRE HYDRANT
- LIGHT STANDARD
- PROPOSED PAD MOUNTED TRANSFORMER (REFER TO ELECTRICAL DRAWINGS
- DEPRESSED CURB
- NO PARKING SIGN FOR FIRE ROUTE
- MH MANHOLE
- CB CATCHBASIN
- DESIGNATED BARRIER-FREE PARKING SPACE
- TRAFFIC DIRECTION
- CU PROPOSED MECHANICAL CONDENSING UNIT ON CONCRETE HOUSEKEEPING PAD - SEE MECH DWGS
- 6m WIDE FIRE ROUTE WITH HEAVY DUTY ASPHALT
- LANDSCAPE / SOD AREA
- CONCRETE SIDEWALK
- PEDESTRIAN CROSSING

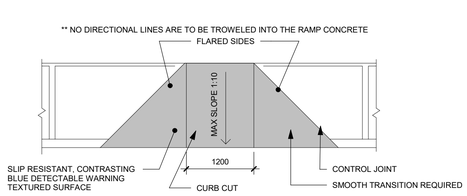
GENERAL NOTES:
1. ALL CONC. BASES TO BE ARCHITECTURAL BASE I. FLAG POLE, LIGHT POST, ETC.
2. ALL MECHANICAL UNITS ON THE GROUND TO BE SCREENED WITH A 3'-6" CEDAR FENCE. UNLESS OTHERWISE NOTED. REFER TO LANDSCAPE DRAWINGS



3 A001 CONCRETE CURB DETAIL
1 : 10



4 A001 RAMP SLOPE DETAIL
1 : 10



2 A001 DEPRESSED CURB
1 : 50

Chamberlain Architects Constructors Managers

Chamberlain Architect Services Limited

4671 Palladium Way (Unit 1)
Burlington, Ontario. L7M 0W9
CANADA

Phone: 905.631.7777

www.chamberlainIPD.com

NO.	ISSUED	DATE

SEAL

CONSTRUCTION NORTH TRUE NORTH

HOLIDAY INN EXPRESS

DEPALMA DRIVE,
COBOURG, ON

SHEET NAME

SITE PLAN

START DATE	2020-03-20
DRAWN BY	GP
CHECKED BY	Checker
SCALE	As indicated
PROJECT NO.	119007
DRAWING	A001

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2020-04-01 5:32:56 PM

Figure 3: Topographic Survey

I REQUIRE THIS PLAN TO BE DEPOSITED UNDER THE LAND TITLES ACT

DATE JANUARY 31, 2020

FRED PETRICH, B.Sc.
ONTARIO LAND SURVEYOR

PLAN 39R- 14070

RECEIVED AND DEPOSITED

DATE Feb. 3/20

"Dana Holland"

REPRESENTATIVE FOR LAND REGISTRAR
FOR THE LAND TITLES DIVISION
OF NORTHUMBERLAND (No. 39)

SCHEDULE

PART	LOT	CON	P.I.N.
1	PART OF THE ROAD ALLOWANCE BETWEEN LOTS 22 AND 23 AND PART OF LOT 22	1	PART OF 51085–1478
2	PART OF LOT 22		
3			
4			
5			
6			
7			

PLAN OF SURVEY OF

PART OF THE ROAD ALLOWANCE BETWEEN LOTS 22 and 23, and PART OF LOT 22

CONCESSION 1

(GEOGRAPHIC TOWNSHIP OF HAMILTON)

TOWN OF COBOURG

COUNTY OF NORTHUMBERLAND

SCALE: 1:1000

0m 10 25 50 100 metres

FRED PETRICH, B.Sc., O.L.S., O.L.I.P

METRIC

DISTANCES AND CO–ORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

BEARING NOTE

BEARINGS ARE UTM GRID, REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 17 (81° 00' WEST LONGITUDE) NAD83 (ORIGINAL) AND ARE CONSISTENT WITH THE COORDINATE SYSTEM INTEGRATION OF PLAN 39R–13146.

GRID SCALE CONVERSION

DISTANCES ON THIS PLAN MAY BE CONVERTED TO GRID DISTANCES BY MULTIPLYING BY A COMBINED SCALE FACTOR OF 1.0001979.

NOTES

ALL PLANTED MONUMENTS ARE IRON BARS UNLESS OTHERWISE STATED. ALL FOUND MONUMENTS ARE STAMPED 'S&B' UNLESS OTHERWISE STATED.

LEGEND

■	DENOTES SURVEY MONUMENT FOUND
□	DENOTES SURVEY MONUMENT PLANTED
IB	DENOTES IRON BAR
SSIB	DENOTES SHORT STANDARD IRON BAR
SIB	DENOTES STANDARD IRON BAR
SB	DENOTES SUBDIVISION BAR
OU	DENOTES ORIGIN UNKNOWN
1293	DENOTES E.L. BROWN, O.L.S.
SVNG	DENOTES SPEIGHT, VAN NOSTRAND & GIBSON, O.L.S.
MMM	DENOTES MARSHALL MACKLIN MONAGHAN, O.L.S.
MTOM	DENOTES MINISTRY OF TRANSPORTATION OF ONTARIO MONUMENT
765	DENOTES G.T. HORTON, O.L.S.
1250	DENOTES T.S. FLUKE, O.L.S.
1005	DENOTES C.F. FLEISCHMANN, O.L.S.
S&B	DENOTES SYLVESTER & BROWN LTD.
DFP	DENOTES DONEVAN FLEISCHMANN PETRICH LTD.
NI	DENOTES NOT IDENTIFIABLE.
P	DENOTES PLAN 39R–13146
WIT	DENOTES WITNESS

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE 25th DAY OF JANUARY, 2020.

JANUARY 30, 2020
DATE

FRED PETRICH B.Sc.
ONTARIO LAND SURVEYOR

SYLVESTER & BROWN
LAND SURVEYING
191 TORONTO ROAD
PORT HOPE, ONTARIO L1A 3V5
OFFICE: 905–885–2260
FAX: 905–885–1293

DRAWN: MDM | CHECKED: AK | SHEET SIZE: 24"x36" | JOB No: P2019–060

(LOCALLY KNOW AS) ELGIN STREET
(COUNTY ROAD No. 2)
(REGISTERED PLAN 174 / P–1947–13)
(BY ORDER IN COUNCIL No. 194/99, INST. No. 276951)

P.I.N. 51085–1045

(ROAD ALLOWANCE BETWEEN CONCESSIONS 'A' AND 1)

Figure 4: Existing Storm Drainage Area Plan

NORTH

EX1
0.35 | 0.75

LEGEND

POST-DEVELOPMENT STORM DRAINAGE AREA

EXTERNAL DRAINAGE AREA

OVERLAND FLOW DIRECTION

EX1 — CATCHMENT NAME

RUNOFF COEFFICIENT 0.79 | 0.231 — AREA (ha)

ENGAGE ENGINEERING

www.engageeng.ca • 171 King Street, Suite 120, Peterborough, ON • Phone: (705) 755-0427

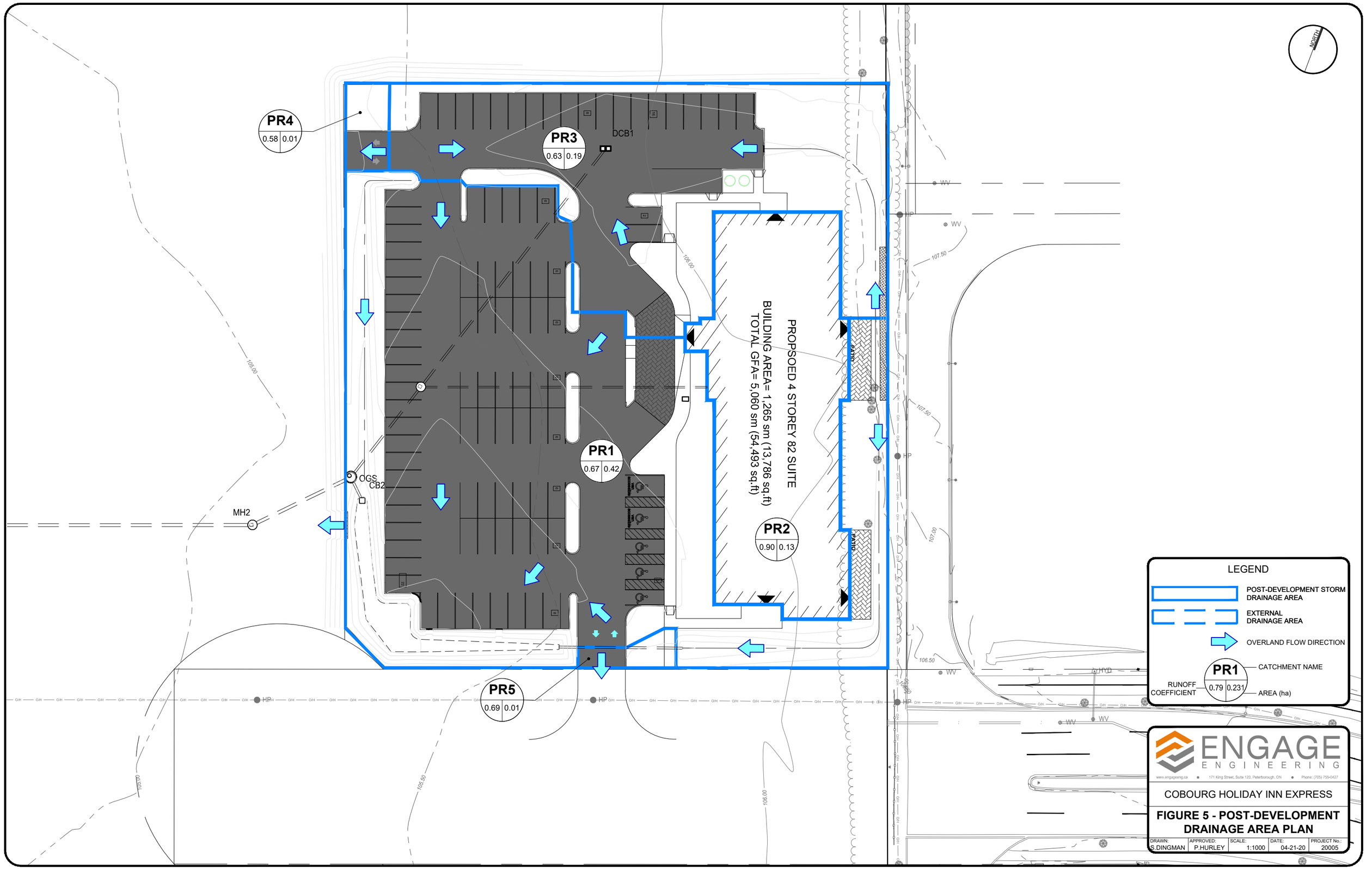
COBOURG HOLIDAY INN EXPRESS

FIGURE 4 - PRE-DEVELOPMENT DRAINAGE AREA PLAN

DRAWN:	APPROVED:	SCALE:	DATE:	PROJECT No.:
S.DINGMAN	P.HURLEY	1:1000	04-21-20	20005

S:\01 - Projects\20000\20005 - Cobourg Fairfield Hotel\02 Design\01 - Drawings\01 - Current Drawings\20005 - ST2.dwg PRINTED: May 14, 2020

Figure 5: Proposed Storm Drainage Area Plan



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Appendix A: Rational Method Calculations

Rational Method Calculations

Project Name: Cobourg Holiday Inn Express
Project No: 20005
Rain Gauge: Cobourg

Designed By: BP
Date: 2020-05-12

Catchment Name and Description		Land Use and Areas (Ha)							Catchment Characteristics									Runoff Coefficient						Peak Flows (m^3/s)					
Name	Description	Wetland(0.05)	Woods (0.30)	Grass (0.25)	Crop (0.35)	Pasture (0.34)	Impervious (0.90)	**Total**	% Imperviousness	Soils Group	Composite Runoff Coefficient	Length (m)	Average Slope (%)	Calculated Time of Concentration (min)	Minimum Time of Concentration (min)	Time to Peak (min)	Time to Peak (hr)	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
EX1				0.750				**0.750**	0.00%	BC	0.35	77.0	1.2	20.2	10.0	13.5	0.22	0.35	0.35	0.35	0.39	0.42	0.44	0.029	0.037	0.044	0.056	0.068	0.077
PR1				0.147			0.271	**0.418**	64.86%	BC	0.67	65.0	1.2	3.9	10.0	6.7	0.11	0.67	0.67	0.67	0.74	0.81	0.84	0.046	0.061	0.072	0.092	0.112	0.131
PR2							0.126	**0.126**	100.00%	BC	0.90	25.0	0.5	2.0	10.0	6.7	0.11	0.90	0.90	0.90	0.99	1.08	1.13	0.019	0.025	0.029	0.037	0.045	0.053
PR3				0.078			0.113	**0.191**	59.16%	BC	0.63	50.0	1.0	3.4	10.0	6.7	0.11	0.63	0.63	0.63	0.70	0.76	0.79	0.020	0.026	0.031	0.040	0.048	0.056
PR4				0.005			0.004	**0.009**	44.44%	BC	0.54	7.0	2.7	0.5	10.0	6.7	0.11	0.54	0.54	0.54	0.59	0.65	0.67	0.001	0.001	0.001	0.002	0.002	0.002
PR5				0.003			0.003	**0.006**	50.00%	BC	0.58	3.5	2.0	0.3	10.0	6.7	0.11	0.58	0.58	0.58	0.63	0.69	0.72	0.001	0.001	0.001	0.001	0.001	0.002
PR Sum				0.225			0.510	**0.750**	68.02%	BC	0.69	70.0	1.2	4.0	10.0	6.7	0.11	0.69	0.69	0.69	0.76	0.82	0.86	0.086	0.114	0.135	0.172	0.209	0.244
PR1 Culvert	Entrance Culvert/Channel Flow			0.04			0.02	**0.057**	27.46%	BC	0.43	70.0	1.2	5.1	10.0	6.7	0.11	0.43	0.43	0.43	0.47	0.51	0.54	0.004	0.005	0.006	0.008	0.010	0.011
PR3 Channel	Channel Sizing Flows			0.05			0.00	**0.052**	5.77%	BC	0.29	40.0	0.5	21.1	10.0	14.0	0.23	0.29	0.29	0.29	0.32	0.35	0.36	0.002	0.002	0.002	0.003	0.004	0.004

Notes:

Runoff Coefficients

1. Runoff coefficients, and CN values taken from GRCA Technical and Engineering Guidelines for SWM Submissions
2. Runoff coefficients have been adjusted for storms exceeding the 10-year return period as follows: 25 Year - 1.10; 50-Year: 1.20; 100-Year: 1.25
3. Runoff coefficients and areas have been adjusted to match GRCA standards as per conversations with GRCA staff in stead of using measured impervious areas.

Time of Concentration

1.Tc calculcated using Airport equation for C<0.4 and Bransby Willisams for C>0.4
2. Tp calculated as 0.67Tc.

Appendix B: OGS Sizing Calculations

Detailed Stormceptor Sizing Report – Cobourg Holiday Inn Express

Project Information & Location			
Project Name	Depalma Drive	**Project Number**	19006
City	Cobourg	**State/ Province**	Ontario
Country	Canada	**Date**	5/7/2019
Designer Information		**EOR Information (optional)**	
Name	Brad Parsons	**Name**	
Company	Engage Engineering	**Company**	
Phone #	705-755-0427	**Phone #**	
Email	brad@engageeng.ca	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	Cobourg Holiday Inn Express
Recommended Stormceptor Model	STC 1000
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	80
PSD	Fine Distribution
Rainfall Station	PETERBOROUGH A

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary		
Stormceptor Model	**% TSS Removal Provided**	**% Runoff Volume Captured Provided**
STC 300	69	84
STC 750	79	94
STC 1000	80	94
STC 1500	81	94
STC 2000	84	98
STC 3000	85	98
STC 4000	88	100
STC 5000	89	100
STC 6000	90	100
STC 9000	93	100
STC 10000	93	100
STC 14000	95	100
StormceptorMAX	Custom	Custom

Stormceptor
The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.
Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology
Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:
• Site parameters
• Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
• Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
• TSS load
• Detention time of the system

Hydrology Analysis
PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour). Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station			
State/Province	Ontario	**Total Number of Rainfall Events**	2875
Rainfall Station Name	PETERBOROUGH A	**Total Rainfall (mm)**	14412.0
Station ID #	6418	**Average Annual Rainfall (mm)**	450.4
Coordinates	44°14'N, 78°22'W	**Total Evaporation (mm)**	939.7
Elevation (ft)	621	**Total Infiltration (mm)**	4588.9
Years of Rainfall Data	32	**Total Rainfall that is Runoff (mm)**	8883.4

Notes
• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules. • Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed. • For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Drainage Area	
Total Area (ha)	0.75
Imperviousness %	68.02

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.000	0.000

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	90.00
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	
Water Quality Flow Rate (L/s)	

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cms)	

Design Details	
Stormceptor Inlet Invert Elev (m)	
Stormceptor Outlet Invert Elev (m)	
Stormceptor Rim Elev (m)	
Normal Water Level Elevation (m)	
Pipe Diameter (mm)	
Pipe Material	
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	Cobourg Holiday Inn Express

Site Details

Drainage Area

Total Area (ha)	0.75
Imperviousness %	68.02

Surface Characteristics

Width (m)	173.00
Slope %	2
Impervious Depression Storage (mm)	0.508
Pervious Depression Storage (mm)	5.08
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency

Maintenance Frequency (months) >	12

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (mm/hr)	61.98
Min. Infiltration Rate (mm/hr)	10.16
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation

Daily Evaporation Rate (mm/day)	2.54

Dry Weather Flow

Dry Weather Flow (lps)	0

Winter Months

Winter Infiltration	0

TSS Loading Parameters

TSS Loading Function	

Buildup/Wash-off Parameters

Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

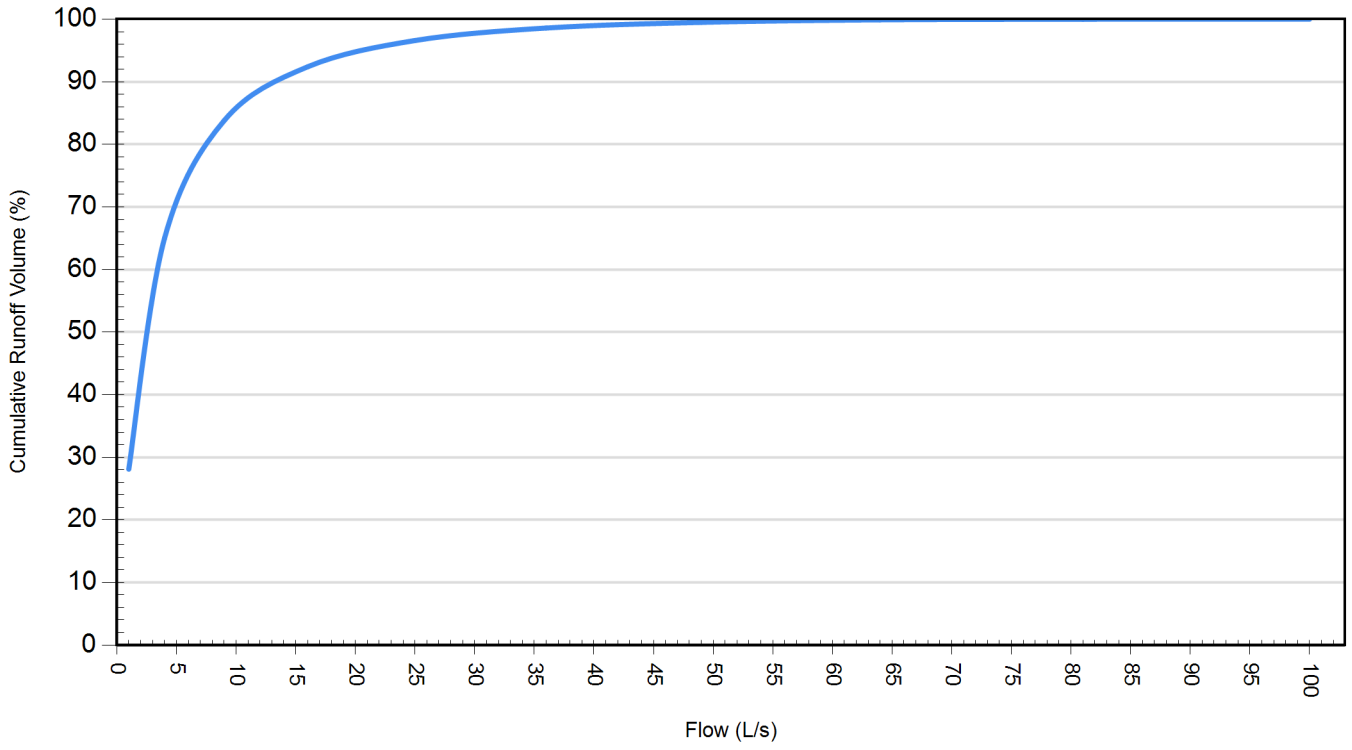
TSS Availability Parameters

Availability Constant A	
Availability Factor B	
Availability Exponent C	
Min. Particle Size Affected by Availability (micron)	

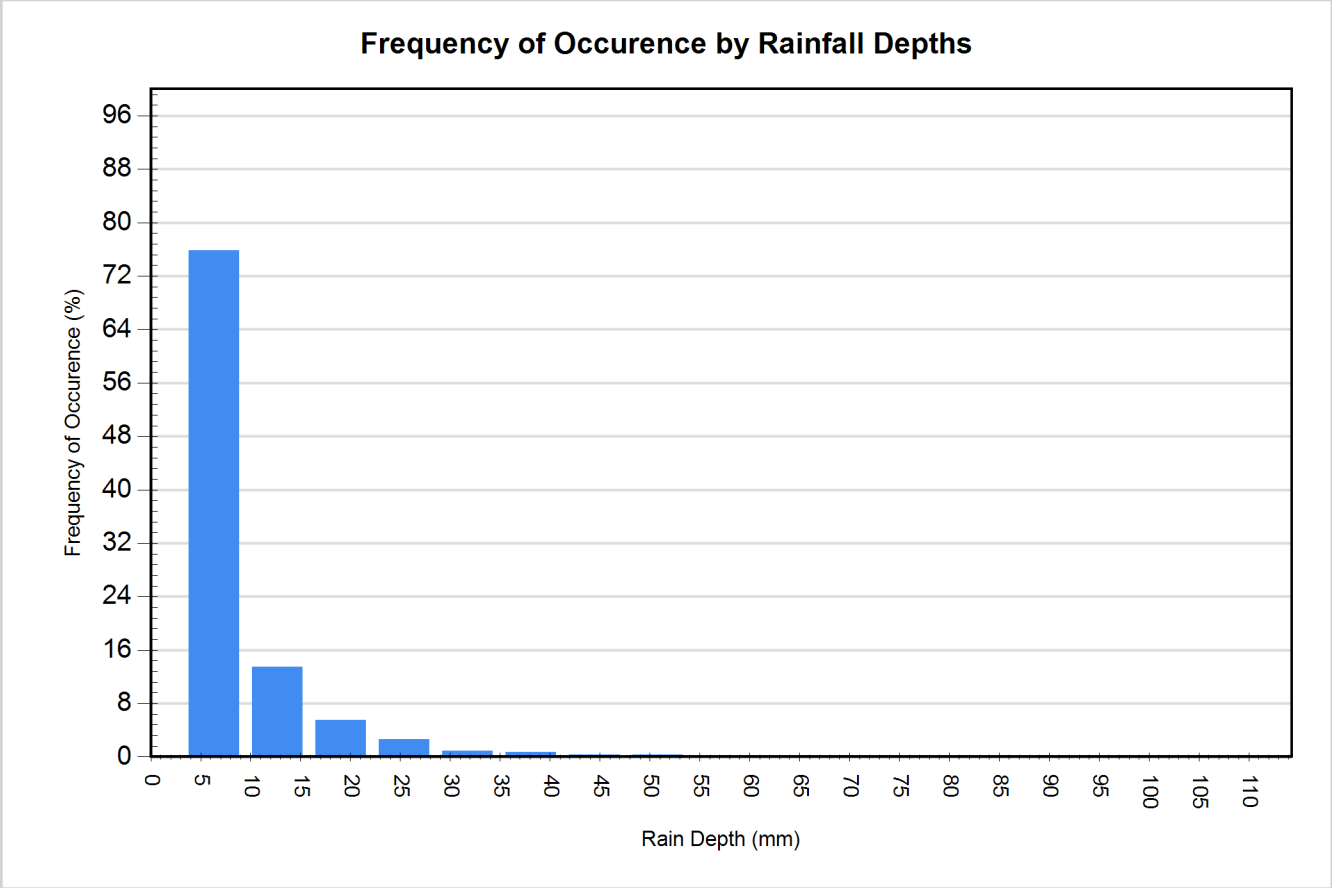
Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (L/s)	**Runoff Volume (m^3)**	**Volume Over (m^3)**	**Cumulative Runoff Volume (%)**
1	18861	48206	28.1
4	43572	23494	65.0
9	56228	10835	83.8
16	61969	5093	92.4
25	64776	2286	96.6
36	66129	933	98.6
49	66747	314	99.5
64	66991	71	99.9
81	67053	8	100.0
100	67061	0	100.0

Cumulative Runoff Volume by Runoff Rate

For area: 0.75(ha), imperviousness: 68.02%, rainfall station: PETERBOROUGH A



Rainfall Event Analysis				
Rainfall Depth (mm)	**No. of Events**	**Percentage of Total Events (%)**	**Total Volume (mm)**	**Percentage of Annual Volume (%)**
6.35	2180	75.8	3694	25.6
12.70	388	13.5	3639	25.2
19.05	157	5.5	2488	17.3
25.40	75	2.6	1649	11.4
31.75	25	0.9	694	4.8
38.10	21	0.7	724	5.0
44.45	8	0.3	327	2.3
50.80	8	0.3	385	2.7
57.15	5	0.2	272	1.9
63.50	4	0.1	243	1.7
69.85	2	0.1	135	0.9
76.20	1	0.0	73	0.5
82.55	0	0.0	0	0.0
88.90	0	0.0	0	0.0
95.25	1	0.0	90	0.6
101.60	0	0.0	0	0.0
107.95	0	0.0	0	0.0



For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications

Appendix C: Quality Control & Bioretention Cell Calculations

Bioretention Cell Sizing

Project Name: Cobourg Holiday Inn Express
Project No: 20005
Designed By: BP
Date: 2020-05-12

Soil Information			
Geotechnical Report prepared by Cambium Inc. dated February 10, 2020 (Ref No: 10331-001)			
Borehole	Soil Characteristics	Percolation ratte (cm/sec)	Infiltration Rate (mm/hr)
112-20	Clayey Silt	T=50 min/cm	12

Cell Depth - $d_{c\ max} = i*(t_s-d_p/i)/V_r$		
i = native soil infiltration rate	12	mm/hr
V_r = void space ratio (40% =0.4)	0.4	%
t_s = time to drain	48	hr
d_p = max. surface ponding depth	100	mm
$d_{c\ max}$ = max. bioretention cell depth	**1190**	**mm**

Stone Reservoir Depth - $d_{r\ max}=i*(t_s/V_r)$		
i = native soil infiltration rate	12	mm/hr
Vr = void space ratio (40% =0.4)	0.4	%
ts = time to drain	48	hr
dr max = max. stone reservoir depth	**1440**	**mm**

Cell Footprint - $A_f=WQV/(d_c*V_r)$				
WQV = water quality volume	13.56	m^3	WQV = Storage Req'd* Site Area	
d_c = bioretention cell depth	0.32	m	*Storage (m^3/ha)	32.43
V_r = void space ratio (40% =0.4)	0.4	%	Contributing Area (ha)	0.42
A_f = footprint surface area	**105.90**	**m^2**	WQV (m^3)	13.56

Notes:

1. *Storage requirement value taken from 'Table 7.1:Water Quality Storage Requirements'.
2. Calculations taken from CVC Low Impact Development Stormwater Management Planning and Design Guide section 4.5.2

Water Quality Sizing Criteria

Project Name:	Cobourg Holiday Inn Express	**Designed By:**	BP
Project No:	20005	**Date:**	2020-05-12

Site Data			
Protection Level:		Enhanced	
Facility Type:		Infiltration	
Area	=	0.418	ha
% Impervious Calculated	=	64.86	%
Impervious Area	=	0.27	ha
Required Storage Volume			
Vs	=	32.43	m^3/ha
Vs	=	13.6	m^3

Notes:

Table 3.2: Water Quality Storage Requirements based on Receiving Waters (MOE SWMPD Manual)

		Storage Volume (m^3/ha) for Impervious Level				
Protection Level	SWMP Type	0%	35%	55%	70%	85%
Enhanced 80% long-term S.S. removal	Infiltration	25	25	30	35	40
	Wetlands	80	80	105	120	140
	Hybrid Wet Pond/Wetland	110	110	150	175	195
	Wet Pond	140	140	190	225	250
Normal 70% long-term S.S. removal	Infiltration	20	20	20	25	30
	Wetlands	60	60	70	80	90
	Hybrid Wet Pond/Wetland	75	75	90	105	120
	Wet Pond	90	90	110	130	150
Basic 60% long-term S.S. removal	Infiltration	20	20	20	20	20
	Wetlands	60	60	60	60	60
	Hybrid Wet Pond/Wetland	60	60	70	75	80
	Wet Pond	60	60	75	85	95
	Dry Pond (Continuous Flow)	90	90	150	200	240

Appendix D: Overflow Weir Calculations

Weir Sizing

Project Name:	Cobourg Holiday Inn Express	**Designed By:**	BP
Project No:	20005	**Date:**	2020-05-14

Weir Parameters					
Type:[1]	Broad Crested Rectangular		Weir Invert:	105.95	m
Peak Flow:	0.244	m^3/s	Weir Height:	0.15	m
			Width:	3	m

Stage Discharge	
Elevation (m)	Weir Flow (m^3/s)
105.95	0.000
105.98	0.020
106.00	0.057
106.03	0.105
106.05	0.162
106.08	0.226
106.10	0.297

Weir Overflow Results		
Pond Elevation at Peak Flow:	106.082	m
Freeboard:	0.018	m
Velocity:	0.618	m/s

Notes:

1. Flows over rectangular broad crested weir calculated based on weir equations in MTO Drainage Manual Chapter 8, Section Flow Over Weirs and Notches.

Appendix E: Storm Sewer Design Sheet

Storm Sewer Design Sheet

Project Name: Cobourg Holiday Inn Express
Project No: 20005

Design Storm: 5 Year
Rain Station: Cobourg
Initial ToC: 10
Max Capacity: 85 %

Designed By: BP
Date: 2019-04-10

Location			Hydrologic Parameters						Peak Flow			Pipe Properties					Hydraulics			
Location/Description	From Structure	To Structure	Area (ha)	Runoff Coefficient	A*C	Cumulative A*C	Time of Concentration (min)	Intensity (mm/hr)	Extraneous Flow (m^3/s)	Cumulative Extraneous Flow (m^3/s)	Total Peak Flow (m^3/s)	Pipe Diameter (mm)	Pipe Slope (%)	Pipe Length (m)	Pipe Material	Manning's Coefficient, n	Velocity in Sewer (m/s)	Pipe Capacity (L/s)	% Capacity	Actual Velocity (m/s)
PR3	DCB1	MH2	0.191	0.63	0.12	0.12	10.00	78.1		0.00	**0.026**	300	0.50	46.6	PVC	0.013	0.97	0.068	38.2%	0.90
PR2	Building	MH2	0.126	0.90	0.11	0.11	10.00	78.1		0.00	**0.025**	250	0.50	44.1	PVC	0.013	0.86	0.042	58.5%	0.89
	MH2	OGS	0.000	0.00	0.00	0.23	10.80	74.8		0.00	**0.049**	300	0.50	17.6	PVC	0.013	0.97	0.068	71.1%	1.05
PR1+PR2+PR3	OGS	MH3	0.418	0.67	0.28	0.51	11.11	73.6		0.00	**0.105**	450	0.50	16.8	PVC	0.013	1.27	0.202	52.1%	1.28
	MH3	Outlet	0.000	0.00	0.00	0.51	11.33	72.8		0.15	**0.250**	525	0.50	76.5	PVC	0.013	1.40	0.304	82.2%	1.57
Home Depot Site	EX.MH	MH5	0.000	0.00	0.00	0.00	10.00	78.1	0.15	0.15	**0.146**	450	0.50	24.8	PVC	0.013	1.27	0.202	72.4%	1.38
	MH5	MH6	0.000	0.00	0.00	0.00	10.33	76.7		0.15	**0.146**	450	0.50	85.6	PVC	0.013	1.27	0.202	72.4%	1.38
	MH6	MH3	0.000	0.00	0.00	0.00	11.45	72.3		0.15	**0.146**	450	0.50	66.8	PVC	0.013	1.27	0.202	72.4%	1.38

Note: Flow from Home Depot site taken from Home Depot SWM Report prepared by Counterpoint Engineering

Appendix F: Channel Design Sheet & Culvert Sizing

Channel Design Sheet

Project Name: Cobourg Holiday Inn Express
Project No: 20005

Designed By: BP
Date: 2020-05-13

Location	Contributing Area and Flow		Channel Properties						Hydraulics					
Channel Description	Description	Flow (m^3/s)	Bed Slope	Side Slope (X:1)	Bottom Width (m)	Depth (m)	Lining Material	Manning's n	Channel Capacity (m^3)	% Capacity	Cross Sectional Area (m^2)	Wetted Perimter (m)	Flow Depth (m)	Velocity (m/s)
PR1 Entrance Swale	Depth Varies, Min 0.15m Deep	0.011	0.0100	3.000	0.0	0.15	Grass	0.03	0.04	28%	0.068	0.95	0.09	0.42
PR 3 Swale	Depth Varies, Min 0.15m Deep	0.004	0.0050	3.000	0.0	0.15	Grass	0.03	0.03	15%	0.068	0.95	0.07	0.25

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 14 2020

HDPE Entrance Culvert

Invert Elev Dn (m)	=	105.5300
Pipe Length (m)	=	19.0000
Slope (%)	=	1.0000
Invert Elev Up (m)	=	105.7200
Rise (mm)	=	250.0
Shape	=	Circular
Span (mm)	=	250.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Pipe, Beveled Ring Entrance
Culvert Entrance	=	45D bevels
Coeff. K,M,c,Y,k	=	0.0018, 2.5, 0.03, 0.74, 0.2

Embankment

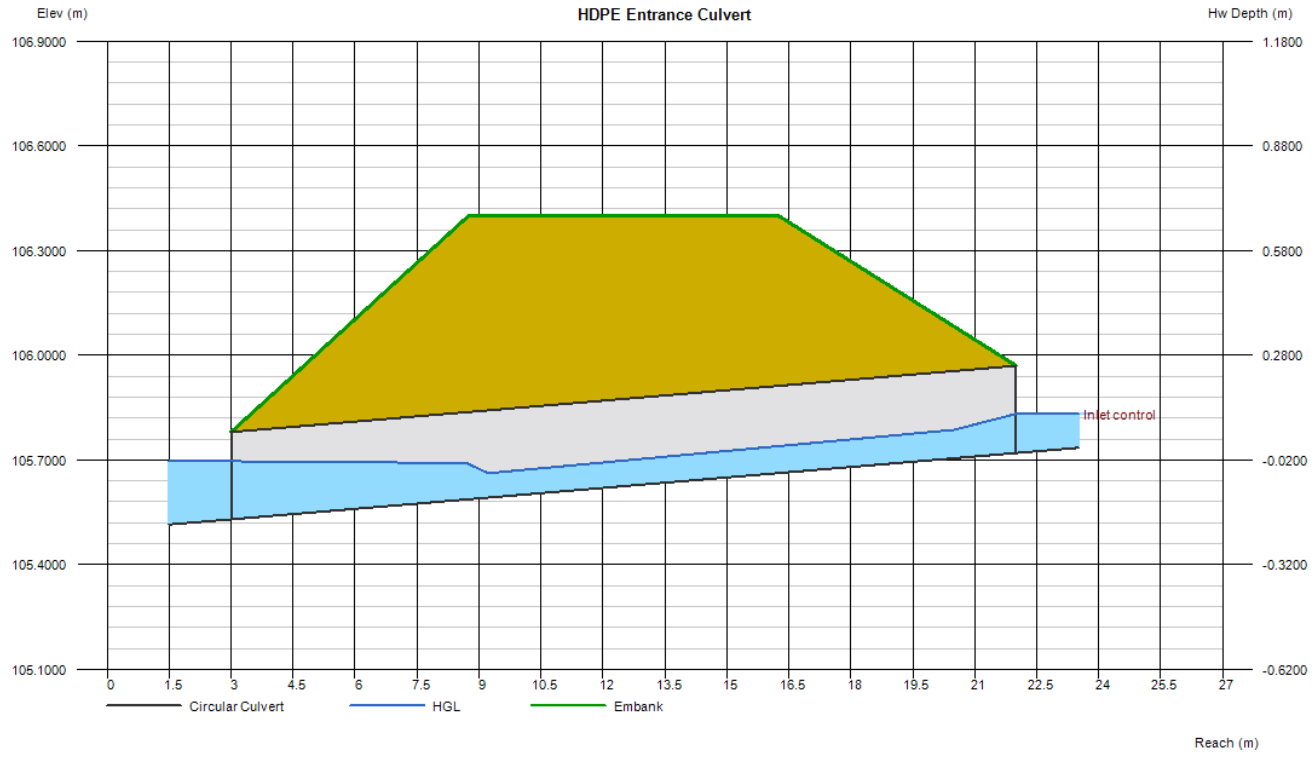
Top Elevation (m)	=	106.4000
Top Width (m)	=	7.5000
Crest Width (m)	=	7.0000

Calculations

Qmin (cms)	=	0.0110
Qmax (cms)	=	0.0110
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	0.0110
Qpipe (cms)	=	0.0110
Qovertop (cms)	=	0.0000
Veloc Dn (m/s)	=	0.3167
Veloc Up (m/s)	=	0.7716
HGL Dn (m)	=	105.6965
HGL Up (m)	=	105.8030
Hw Elev (m)	=	105.8324
Hw/D (m)	=	0.4497
Flow Regime	=	Inlet Control



Appendix G: Bioretention Cell & OGS Inspection and Maintenance

- Ponded water at the surface of the bioretenton facility should drain within 24 hours of the end of the storm event. The filter media bed should fully drain within a maximum period of 72 hours.
- Excessive sediment accumulation should not be present.

4.5.3 Maintenance and Construction Costs

Inspection and Maintenance
Bioretention requires routine inspection and maintenance of the landscaping as well as periodic inspection for less frequent maintenance needs or remedial maintenance. Generally, routine maintenance will be the same as for any other landscaped area, weeding, pruning, and litter removal. Routine operation and maintenance tasks are key to public acceptance of highly visible bioretention units.

Periodic inspections after major storm events will determine whether corrective action is necessary to address gradual deterioration or abnormal conditions. For the first two years following construction the facility should be inspected at least quarterly and after every major storm event (> 25 mm). Subsequently, inspections should be conducted in the spring and fall of each year and after major storm events.

While maintenance can be performed by landscaping contractors who are already providing similar landscape maintenance services on the property, they will need some additional training on bioretention needs. This training should focus on elevation differences needed for ponding, mulching requirements, acceptability of ponding after a rainstorm, and fertilizer requirements. The planting plan should be kept for maintenance records and used to help maintenance staff identify which plants are weeds or invasive.

Aside from homeowner initiated rain garden projects, legally binding maintenance agreements are a necessity for bioretention facilities on private property. Agreements should specify the property owner's responsibilities and the municipality's right to enter the property for inspection or corrective action. Agreements must require regular inspection and maintenance and should refer to an inspection checklist. The construction contract should include a care and replacement warranty to ensure vegetation is properly established and survives during the first growing season following construction.

The expected lifespan of infiltration practices is not well understood, however, it can be expected that it will vary depending on pretreatment practice maintenance frequency, and the sediment texture and load coming from the catchment.

Routine Maintenance and Operation
Routine inspection and maintenance activities as shown in Table 4.5.6 are necessary for the continued operation of bioretention areas.

Table 4.5.6 Suggested routine inspection and maintenance activities for bioretention

Activity	Schedule
▪ Inspect for vegetation density (at least 80% coverage), damage by foot or vehicular traffic, channelization, accumulation of debris, trash and sediment, and structural damage to pretreatment devices.	After every major storm event (>25 mm), quarterly for the first two years, and twice annually thereafter.
▪ Regular watering may be required during the first two years until vegetation is established;	As needed for first two years of operation.
▪ Remove trash and debris from pretreatment devices, the bioretention area surface and inlet and outlets.	At least twice annually. More frequently if desired for aesthetic reasons.
▪ Remove accumulated sediment from pretreatment devices, inlets and outlets; ▪ Trim trees and shrubs; ▪ Replace dead vegetation, remove invasive growth; ▪ Repair eroded or sparsely vegetated areas; ▪ Remove accumulated sediment on the bioretention area surface when dry and exceeds 25 mm depth (PDEP, 2006); ▪ If gullies are observed along the surface, regrading and revegetating may be required.	Annually or as needed

Annual Inspection and Maintenance

The annual spring cleaning should consist of an inspection and corrective maintenance tasks described in Table 4.5.7

Table 4.5.7 Suggested inspection items and corrective actions for bioretention

Inspection Item	Corrective Actions
Vegetation health, diversity and density	• Remove dead and diseased plants. • Add reinforcement planting to maintain desired vegetation density. • Prune woody matter. • Check soil pH for specific vegetation. • Add mulch to maintain 75 mm layer.
Sediment build up and clogging at inlets	• Remove sand that may accumulate at the inlets or on the filter bed surface following snow melt. • Examine drainage area for bare soil and stabilize. Apply erosion control such as silt fence until the area is stabilized. • Check that pretreatment is properly functioning. For example, inspect grass filter strips for erosion or gullies. Reseed as necessary.
Ponding for more than 48 hours	• Check underdrain for clogging and flush out. • Apply core aeration or deep tilling • Mix amendments into the soil • Remove the top 75 mm of bioretention soil • Replace bioretention soil

Installation and Operation Costs

Due to the wide range in bioretention types and designs, the costs can vary widely. Rain gardens can be very economical if constructed by the homeowner. The costs for a simple rain garden excavated by a homeowner would only include the plants, mulch, and, if necessary, soil amendments. On the other end of the spectrum, stormwater

planters will cost much more per square meter because of the concrete sidewalls, underdrain structure, and professional design costs. The materials used in the construction of bioretention are typical of construction and landscaping projects.

In a study by the Center for Watershed Protection to estimate and compare construction costs for various stormwater BMPs, the median base construction cost for bioretention was estimated to be $62,765 (2006 USD) per impervious hectare treated with estimates ranging from $49,175 to $103,165 (CWP, 2007b). These estimates do not include design and engineering costs, which could range from 5 to 40% of the base construction cost (CWP, 2007b).

4.5.4 References

American Association of State Highway and Transportation Officials (AASHTO). 2002. Geotextile Specification for Highway Applications. AASHTO M 288-00. Washington DC.

Amrhein, C., Strong, J.E., and Mosher, P.A. 1992. Effect of de-icing salts on metal and organic matter mobilization in roadside soils. *Environmental Science and Technology*. Vol. 26, No. 4, pp. 703-709.

Bauske, B., Goetz, D. 1993. Effects of de-icing salts on heavy metal mobility. *Acta Hydrochimica Hydrobiologica*. Vol. 21. pp. 38-42.

Center for Watershed Protection (CWP). 2007a. *National Pollutant Removal Database – Version 3.* September 2007. Ellicott City, MD.

Center for Watershed Protection (CWP). 2007b. Urban Stormwater Retrofit Practices. Manual 3 in the Urban Subwatershed Restoration Manual Series. Ellicott City, MD.

City of Portland. 2004. *Portland Stormwater Management Manual*. Prepared by the Bureau of Environmental Services (BES). Portland, OR.

City of Toronto. 2007. Design Guidelines for 'Greening' Surface Parking Lots. November, 2007.

Davis, A.P. 2007. Field performance of bioretention: Water Quality. *Environmental Engineering Science*. Vol. 24. No. 8. pp. 1048-1064.

Davis, A. 2008. Field performance of bioretention: hydrology impacts. *Journal of Hydrological Engineering*. Feb 2008. 90-96.

Davis, A., M. Shokouhian, H. Sharma and C. Minami. 2001. Laboratory Study of Biological Retention for Urban Stormwater Management. *Water Environment Research.* 73(5): 5-14.

Inspection and Maintenance. Easy. Convenient.

When it rains, oils, sediment and other contaminants are captured and contained by over 40,000 Stormceptor units operating worldwide. While Stormceptor's patented scour prevention technology ensures captured pollutants remain in the unit during all rainfall events, the accumulated pollutants must eventually be removed as part of a regular maintenance program.

If neglected, oil and sediment gradually build up and diminish any BMP's efficiency, harming the environment and leaving owners and operators vulnerable to fines, surcharges and bad publicity.

Maintenance is a must

Ease, frequency and cost of maintenance are often overlooked by specifiers when considering the merits of a stormwater treatment system. In reality, maintenance is fundamental to the long-term performance of any stormwater quality treatment device.

While regular maintenance is crucial, it shouldn't be complicated. An ongoing maintenance program with Stormceptor is convenient and practically effortless. With virtually no disruptions, you can concentrate on your core business.

Quick inspections

Inspections are easily carried out above ground from any standard surface access cover through a visual inspection of the orifice and drop tee components. A sludge judge and oil dip-stick are all that are needed for sediment and oil depth measurements.

Easy unit access

Maintenance is typically conducted from the same surface access cover, eliminating the need for confined space entry into the unit. Your site remains undisturbed, saving you time and money.

No muss, no fuss and fast

Maintenance is performed quickly and inexpensively with a standard vacuum truck. Servicing usually takes less than two hours, with no disruption to your site.

A complete stormwater management plan for Stormceptor extends beyond installation and performance to regular maintenance. It's the smart, cost-effective way to ensure your unit continues to remove more pollutants than any other separator for decades to come.

Stormceptor maintenance recommendations

- Units should be inspected post-construction, prior to being put into service.
- Inspect every six months for the first year of operation to determine the oil and sediment accumulation rate.
- In subsequent years, inspections can be based on first-year observations or local requirements.
- Cleaning is recommended once the sediment depth reaches 15% of storage capacity, (generally taking one year or longer). Local regulations for maintenance frequency may vary.
- Inspect the unit immediately after an oil, fuel or chemical spill.
- A licensed waste management company should remove captured petroleum waste products from any oil, chemical or fuel spills and dispose responsibly.

With over 40,000 units operating worldwide, Stormceptor performs and protects every day, in every storm.

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Appendix H: Geotechnical Report

Geotechnical Investigation Report – Fairfield Hotel, Depalma Drive, Cobourg, Ontario

2020-05-15

Prepared for:
2648888 Ontario Inc.

 Reference No.: 10331-001

CAMBIUM INC.
866.217.7900
cambium-inc.com

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1.0 Introduction

Cambium Inc. (Cambium) was retained by 2648888 Ontario Inc. (Client) to complete a geotechnical investigation to assist in the design and construction of a hotel and pool, west of the existing Depalma Drive in Cobourg, Ontario (Site). The land is currently undeveloped and used for farming, with a relatively flat topography. It is understood that the new building will have four (4) storeys and no basement, with 1,245 square meters of building area and approximately ninety-one (91) surrounding parking spaces.

The geotechnical investigation was required to confirm existing subsurface conditions, including soil and groundwater, and prepare design and construction recommendations for the proposed building and associated parking areas. A Site Plan, including borehole locations, is included as Figure 1 of this report.

This report presents the methodology and findings of the geotechnical investigation at the Site and address requirements and constraints for the design and construction of the building and associated parking areas.

2.0 Methodology

2.1 Borehole Investigation

A borehole investigation was conducted on January 16 and 17, 2020 to assess the subsurface conditions at the Site. Twelve (12) boreholes, designated as BH/MW101-20 through BH112-20, were advanced throughout the Site to obtain subsurface conditions for geotechnical purposes. Boreholes BH/MW101-20 through BH105-20 were advanced within the footprint of the proposed building to depths of 6.6 m below ground surface (mbgs) and 8.1 mbgs. Boreholes BH106-20 through BH112-20 were advanced to 3.5 mbgs within the proposed parking area and driveways. UTM coordinates and elevations of the boreholes were obtained using a Real Time Kinematic (RTK) survey unit. The elevations were surveyed relative (m rel) to the top of nut of a fire hydrant located on Depalma drive, east of the proposed Site, as shown on Figure 1. The fire hydrant was assigned an elevation of 100.00 m.

Drilling and sampling was completed using a track-mounted drill rig under the supervision of a Cambium technician. The boreholes were advanced to the sampling depths by means of continuous flight solid stem augers with 50 mm O.D. split spoon samplers. Standard Penetration Test (SPT) N values were recorded for the sampled intervals as the number of blows required to drive a split spoon sampler 305 mm into the soil using a 63.5 kg drop hammer falling 750 mm, as per ASTM D1586 procedures. The SPT N values are used in this report to assess consistency of cohesive soils and relative density of non-cohesive materials. Soil samples were collected at 0.75 m intervals up to 3.0 m depth and 1.5 m intervals beyond 3.0 m depth. The encountered soil units were logged in the field using visual and tactile methods and samples were placed in labelled plastic bags for transport, future reference, possible laboratory testing, and storage. The boreholes were checked for groundwater and general stability prior to backfilling. All boreholes were backfilled and sealed in accordance with Ontario Regulation (O.Reg.) 903, as amended.

One (1) borehole, BH/MW101-20, was outfitted with a monitoring well to allow for measurement of the static groundwater level at the Site.

Borehole logs are provided in Appendix A. Site soil and groundwater conditions are described and geotechnical recommendations are discussed in the following sections of this report.

2.2 Physical Laboratory Testing

Physical laboratory testing, including five (5) particle distribution analyses (LS-702,705), was completed on selected soil samples to confirm textural classification, determine an estimated infiltration rate, and assess geotechnical parameters. Moisture content testing was completed on all soil samples. Testing results are provided in Appendix B and are discussed in subsequent sections of this report.

3.0 Subsurface Conditions

Subsurface conditions at the Site consist of a surficial layer of topsoil overlying fine grained silt to silt and clay soils which overlie a compact glacial till material. Bedrock was not encountered during the borehole investigation.

The individual soil units are described in detail below and are shown on the borehole logs provided in Appendix A.

3.1 Topsoil

A surficial layer of topsoil was encountered at each borehole locations. The topsoil varied in depth from 175 mm to 305 mm, with an average thickness of 235 mm.

Assessments of organic matter content or other topsoil quality tests were beyond the scope of this study.

3.2 Silt

A layer of silt with various amounts of sand and clay was encountered beneath the topsoil in each boreholes. The silt layer varies in thickness from 0.4 m to 2.6 m, with the thicker layer at the north end of the Site. Trace organic material was observed to a depth of 0.7 mbgs in boreholes BH107-20 and BH110-20. The silt was light brown in colour and generally moist to wet at the time of the investigation, with natural moisture content varying from 22% to 35% based on laboratory testing. The silt has a very loose to compact relative density based on SPT N values of 3 to 20, with values increasing with depth.

3.3 Clayey Silt to Silt and Clay

Beneath the silt discussed above, a layer of clayey silt to silt and clay with a trace amount of sand was encountered in all of the boreholes. In boreholes BH/MW101-20 to BH105-20, the clayey silt to silt and clay extended to depths ranging from 4.9 mbgs to 6.3 mbgs, and to the termination depth of 3.5 mbgs in boreholes BH106-20 to BH112-20. The cohesive soils were light brown to grey in colour and were generally wetter than plastic limit (WTPL), with natural moisture content of 17% to 41% based on laboratory testing. The SPT values of the clayey silt

to silt and clay varied from 4 to 27, indicating a firm to very stiff consistency, generally increasing with depth. A soft seam was encountered in borehole BH105-20, at a depth of 2.1 mbgs, before becoming stiff again at 3.1 mbgs.

Four (4) samples of the clayey silt to silt and clay were submitted to Cambium's Materials Testing laboratory for particle size distribution analysis. The testing results are provided in Appendix B and are summarized in Table 1 based on the Unified Soil Classification System (USCS).

Table 1 Particle Size Distribution Analysis – Clayey Silt to Silt and Clay

Borehole	Depth (mbgs)	Soil	% Gravel	% Sand	% Silt	% Clay	% Moisture
BH102-20 SS3	1.5-2.0	Clayey Silt	0	6	64	20	25
BH104-20 SS3	1.5-2.0	Silt and Clay	0	3	57	40	33
BH107-20 SS5	3.0-3.5	Silt and Clay	0	3	59	38	24
BH112-20 SS2	0.8-1.2	Clayey Silt	0	4	63	33	31

3.4 Glacial Till

Glacial till soils were encountered beneath the silt and clay described above and extended to the borehole termination depths of 6.6 mbgs to 8.1 mbgs in boreholes BH/MW101-20 through to BH105-20. The composition of the glacial till varied from a clayey silt with some sand and trace gravel, to silt and sand with trace to some gravel. The till was grey in colour and was wet and WTPL at the time of the investigation, with natural moisture content of 10% to 17% based on laboratory testing. The cohesive glacial till has a stiff relative density, and the cohesionless glacial till has a compact relative density based on SPT N values ranging from 10 to 15.

One sample of the glacial till was submitted to Cambium's Materials Testing laboratory for particle size distribution analysis. The testing results are provided in and are summarized in Table 2 based on the Unified Soil Classification System (USCS).

Table 2 Particle Size Distribution Analysis – Glacial Till

Borehole	Depth (mbgs)	Soil	% Gravel	% Sand	% Silt	% Clay	% Moisture
BH103-20 SS7	6.1-6.6	Clayey Silt, some Sand	4	12	56	28	17

3.5 Bedrock

Bedrock was not encountered within the investigation depths.

3.6 Groundwater

All boreholes were open upon completion of drilling, with the exception of BH108-20 which caved to 0.68 mbgs. Groundwater seepage was encountered in all of the boreholes at completion of drilling between 1.1 mbgs and 4.9 mbgs (97.45 m rel to 93.40 m rel). During the drilling investigation, wet soils were first encountered at approximately 1.5 mbgs. The measured static groundwater level in the monitoring well in borehole BH/MW101-20 was 0.70 mbgs on January 23, 2020 and 0.40 mbgs on January 28, 2020.

The measured groundwater levels in the monitoring well is summarized in Table 3.

Table 3 Measured Groundwater Depth

Borehole	Ground Elevation (m rel)	Date Measured	Groundwater Depth (mbgs)	Groundwater Elevation (m rel)
BH/MW101-20	98.69 m rel	January 23, 2020	0.70	97.99
BH/MW101-20	98.69 m rel	January 28, 2020	0.40	98.29

Despite elevated groundwater seepage in the monitoring well and in other boreholes throughout the Site, soils at this depth were light brown in colour, indicating they are generally located above the groundwater table. The light brown colour and various seams or lenses of coarser material within the finer cohesive soils further indicates the shallow groundwater reflects a perched groundwater elevation. Grey soils were first encountered between 4.5 mbgs and 4.9 mbgs (93.95 m rel to 93.60 m rel). The grey colour of the soil indicates prolonged exposure to groundwater, providing reducing, anoxic conditions. Additionally, the seasonal Site

conditions at the time of drilling (freeze/thaw cycles) indicates that the seepage encountered at the shallow depths is also a result of perched seasonal water from the surface, trapped at the top of the clayey silt and silt and clay material.

Based on these observations, a more representative groundwater level is approximately 4.5 mbgs (93.90 m rel). Regardless, some groundwater should be anticipated during the construction. It should be noted that groundwater levels at the Site may fluctuate seasonally and in response to climatic events.

3.7 Estimated Infiltration Rate

As per Engage Engineering's request on March 19, 2020, the particle distribution analysis from borehole BH112-20 SS2 (0.75 m – 1.2 m) was used to determine an estimated infiltration rate. Soils in the vicinity of boreholes BH109-20 to BH112-20, between depths of 1.0 m – 2.0 m, were a consistent clayey silt material. Below the clayey silt, silt and clay soils were observed.

Based on the particle distribution analysis, a lab-based percolation rate of greater than 50 min/cm was established, corresponding to an estimated infiltration rate of less than 12 mm/hour, as per the Supplementary Guidelines to the Ontario Building Code 1997. SG-6 Percolation Time and Soil Descriptions. Toronto, Ontario (Ontario Ministry of Municipal Affairs and Housing, 1997).

4.0 Geotechnical Considerations

The following recommendations are based on the borehole information and are intended to assist designers. Recommendations should not be construed as providing instructions to contractors, who should form their own opinions about site conditions. It is possible that subsurface conditions beyond the borehole locations may vary from those observed. If significant variations are found before or during construction, Cambium should be contacted so that we can reassess our findings, if necessary.

4.1 Site Preparation

The near surface silt soils can be very unstable if they are wet or saturated. Such conditions are common in the spring and late fall. Under these conditions, temporary use of granular fill, and possibly reinforcing geotextiles, may be requires to prevent severe rutting on construction access routes.

Existing areas where topsoil or organic material / rootlets have been identified should be excavated and removed from beneath the proposed structure and associated parking and driveways. The native subgrade material should be inspected by a Geotechnical Engineer and proof rolled prior to backfilling up to the required grades.

Excavations for the building structure should extend to 1.8 mbgs to reach competent material, as the subgrade conditions at this depth consist of compact / stiff to very stiff silt or clayey silt material. Footings for the building can be founded on standard strip and spread footings at this depth. In lieu of excavating down to 1.8 mbgs beneath the building structure, an alternative is to found the building on grade beams supported on helical piles extending into the compact glacial till soils.

The very loose to loose silt material encountered immediately is not adequate for supporting a typical floor slab. Subexcavation to a depth of approximately 0.9 m below existing grades and backfilling with engineered fill, in accordance with recommendations provided in Sections 4.3 and 4.4 is recommended to prepare the area below the floor slab.

In the parking areas, the very loose to loose material is not competent to support the pavement structure loadings without some pavement distress. As such, these areas should be subexcavated and backfilled and the pavement structure should be prepared in accordance with Section 4.9.

4.2 Frost Penetration

Based on climate data and design charts, the maximum frost penetration depth below the pavement at the Site is estimated at 1.2 mbgs.

Footings for the proposed structure should be situated below this depth for frost protection or should be protected with insulation.

It is assumed that any pavement structure thickness will be less than 1.2 m; therefore, grading and drainage are important for good pavement and life expectancy. Any services/utilities should be located below this depth or be appropriately insulated.

4.3 Excavations and Dewatering

All excavations must be carried out in accordance with the latest edition of the Occupational Health and Safety Act (OHSA). The loose to compact / firm to very stiff native soils may be classified as Type 3 soils above the groundwater table and may be excavated with unsupported side slopes no steeper than 1H:1V. Excavations below the groundwater table may be classified as Type 4 soils in accordance with OHSA with unsupported side slopes no steeper than 3H:1V, or the excavation should be fully supported (shored).

Some perched groundwater seepage is anticipated. Considering the consistency fine-grained nature of the subgrade soils, the groundwater seepage will be slow and should be controllable with filtered sumps and pumps within the excavations, provided that the excavations do no sit open for a long period of time. Consideration can be given to digging a test excavation prior to construction to observe how quickly the groundwater seeps in the excavation. If the excavations are completed and backfilled quickly and the work is completed in a traditionally drier season, a Permit to Take Water (PTTW) and/or registration on the Environmental Activity

and Sector Registry (EASR) are likely not required as pumping rates will likely not exceed 50,000 L/day.

Excavation side slopes should be protected from exposure to precipitation and associated ground surface runoff and should be inspected regularly for signs of instability. If localized instability is noted during excavation or if wet conditions are encountered, the side slopes should be flattened as required to maintain safe working conditions, or the excavation sidewalls must be fully supported (shored).

It is noted that the elevation of the groundwater table will vary due to seasonal conditions and in response to heavy precipitation events.

4.4 Backfill and Compaction

Excavated topsoil from the Site is not appropriate for use as fill below grading. Excavated silt to silt and clay, not containing organics or any other deleterious material, may be appropriate for use as fill below grading, provided that the actual or adjusted moisture content at the time of construction is within a range that permits compaction to required densities. Some moisture content adjustments may be required depending upon seasonal conditions. Geotechnical inspections and testing of engineered fill are required to confirm acceptable quality.

Any engineered fill below foundations should be placed in lifts appropriate to the type of compaction equipment used on site, and be compacted to a minimum of 100% of standard Proctor maximum dry density (SPMDD), as confirmed by nuclear densometer testing. If conditions are wet at the time of construction, compaction of granular fill may not be possible and 19 mm diameter crushed clear stone wrapped in a geotextile filter fabric (Terrafix 270R or equivalent) should be used in place of engineered fill.

Foundation wall and any buried utility backfill material should consist of free-draining imported granular material. Most of the native site soils are too fine-grained to provide proper drainage, and as such this should be accomplished using well graded Granular B Type 1 material complying with OPSS 1010. The fill should be placed in maximum 200 mm thick lifts and

compacted to a minimum of 98% of SPMDD, taking care not to damage any utility pipes during compaction.

The backfill material, if any, in the upper 300 mm below the pavement subgrade elevation should be compacted to 100 % of SPMDD in all areas.

4.5 Foundation Design

It is understood that the proposed structure will have four storeys above grade and no basement level. Assuming the Site is prepared as outlined above, the native subsoils at 1.8 mbgs are competent to support the structure on conventional strip and spread footings. At this depth the footings are below the frost penetration depth and in the competent silt or clayey silt material. The footings on the compact / stiff to very stiff soil may be designed for an allowable bearing capacity of 150 kPa at serviceability limit state (SLS) and 225 kPa at ultimate limit state (ULS). Settlement potential at the SLS loading is less than 25 mm and differential settlement should be less than 10 mm.

The quality of the subgrade should be inspected should be inspected by Cambium during construction, and prior to constructing the footings to confirm bearing capacity estimates.

Alternatively, the proposed building can be supported on grade beams and helical piles. A specialty contractor should be retained to design and install the helical piles based on the overall design. If helical piles are selected to support the structure, they will likely need to extend into the compact glacial till to a minimum depth of 6.5 mbgs, corresponding to an elevation of approximately 92.0 m rel. At this depth and elevation, the piles will be below frost penetration and the glacial till soils are suitable for anchoring the helical piles and providing the required support for the building structure. Final grade beam design should be completed once a specific helical pile contractor has been retained. Any interior footings could also be founded on helical piles

4.6 Subdrains

Given the possibility of seasonally high groundwater levels at the Site, geotextile wrapped perforated pipe subdrains set in a trench of clear stone and connected to an appropriate frost-

free outlet are recommended for all footings. Subdrains should be placed around the perimeter of the building footprint.

4.7 Floor Slabs

The subgrade for the floor slab should be prepared as outlines in Section 4. The floor slab should be constructed on a minimum of 200 mm of OPSS 1010 Granular A compacted to 100% of SPMDD is order to create a stable working surface, to distribute loadings, and for drainage purposes. Subgrade soils should be leveled, proof-rolled, and inspected by a Geotechnical Engineer. Any soft or loose areas identified would need to be subexcavated.

4.8 Buried Utilities

Trench excavations above the groundwater table should generally consider Type 3 soil conditions, which require side slopes no steeper than 1H:1V. Excavations below the groundwater table that will be left open for any significant period of time should consider Type 4 soil conditions, with side slopes no steeper than 3H:1V, or they should be shored.

Any services/utilities should be located 1.2 m below final grade or be appropriately insulated.

Bedding and cover material for any services should consist of OPSS 1010-3 Granular A or B Type II, placed in accordance with pertinent Ontario Provincial Standard Drawings (OPSD 802.013). The bedding and cover material shall be placed in maximum 200 mm thick lifts and should be compacted to at least 98% SPMDD. The cover material shall be a minimum of 300 mm over the top of the pipe and compacted to 98% SPMDD, taking care not to damage the utility pipes during compaction.

4.9 Pavement Design

The performance of the pavement is dependent on proper subgrade preparation. All topsoil and organic materials should be removed down to native material and backfilled with approved engineered fill or native material, compacted to 98% SPMDD. The subgrade should be proof rolled and inspection by a Geotechnical Engineer. Any areas where rutting or appreciable

deflection is noted should be subexcavated and replaced with suitable fill. The fill should be compacted to at least 98% SPMDD.

The recommended minimum pavement structure design has been developed for two traffic loading scenarios: light duty and heavy duty. The heavy duty design is appropriate for areas where some truck/bus traffic is anticipated while the light duty design is appropriate for areas where no truck/bus traffic is expected. A thicker subbase layer is recommended based on the loose to compact relative density and the fine grained nature of the native soils below the pavement. The recommended minimum pavement structure is provided in Table 4.

Table 4 Recommended Minimum Pavement Structure

Pavement Layer	Light Duty	Heavy Duty
Surface Course Asphalt (HL3 or HL4)	40 mm	40 mm
Binder Course Asphalt (HL8)	50 mm	90 mm (2 lifts)
Granular Base (OPSS 1010 Granular A)	150 mm	150 mm
Granular Subbase (OPSS 1010 Granular B)	300 mm	400 mm

Material thickness substitutions must be approved by the Design Engineer.

The thickness of the subbase layer could be increased at the discretion of the Engineer, to accommodate site conditions at the time of construction, including soft or weak subgrade soil replacement.

Compaction of the subgrade should be verified by the Engineer prior to placing the granular fill. Granular layers should be placed in 150 mm thick lifts and compacted to at least 98% SPMDD (ASTM D698) standard. The granular materials specified should conform to OPSS standard, as confirmed by appropriate materials testing.

The final asphalt surface should be sloped at a minimum of 2% to shed runoff. Abutting pavements should be sawcut to provide clean vertical joints with new pavement areas.

4.10 Design Review and Inspections

Testing and inspections should be carried out during construction operations to examine and approve subgrade conditions, placement and compaction of fill materials, and dewatering

requirements. Concrete used during construction should also be tested for slump, air entrainment and compressive strength.

We should be contacted to review and approve design drawings, prior to tendering or commencing construction, to ensure that all pertinent geotechnical-related factors have been addressed. It is important that onsite geotechnical supervision be provided at this site for excavation and backfill procedures, deleterious soil removal, subgrade inspections and compaction and concrete testing.

5.0 Closing

We trust that the information contained in this report meets your current requirements. If you have any questions or comments regarding this document please contact the undersigned at 705-752-7900 ext. 332

Respectfully submitted,

Cambium Inc.

Prepared by:

Juan Monroy, EIT.
Project Coordinator

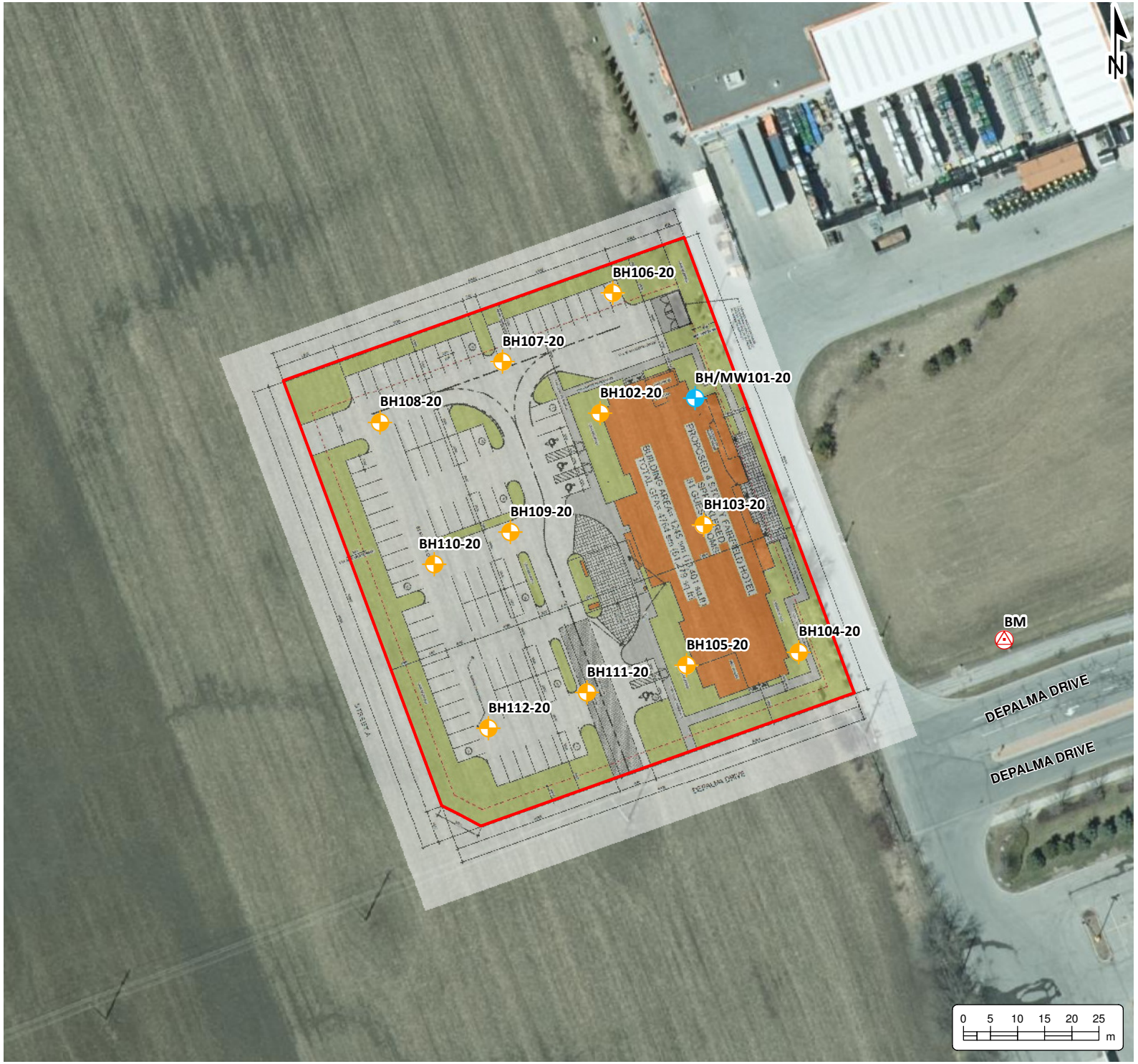
Reviewed by:

Stuart Baird, M.Eng., P.Eng.
General Manager – Geotechnical and Construction Monitoring

SEB/jdm

\\camfile\Projects\10300 to 10399\10331-001 GEO - Fairfield Hotel, Depalma Drive, Cobourg\Deliverables\2020-02-10 RPT Fairfield Hotel, Depalma Drive, Geotech.docx

Appended Figures



GEOTECHNICAL INVESTIGATION

2648888 ONTARIO INC.
Depalma Drive,
Cobourg, Ontario

LEGEND

- Benchmark
- Borehole Location
- Monitoring Well Location
- Site (approximate)

Notes:
- Benchmark is the top nut of a fire hydrant and has an assumed elevation of 100.0 m.
- Site is approximate and was obtained from the Fairfield Hotel, Sit Plan, Drawing A001, Dated December 2, 2019.
- 2018 imagery was obtained from the Cobourg online GIS.
- Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
- Cambium Inc. makes every effort to ensure this map is free from errors but cannot be held responsible for any damages due to error or omissions. This map should not be used for navigation or legal purposes. It is intended for general reference use only.

CAMBIUM
P.O. Box 325, 52 Hunter Street East
Peterborough, Ontario, K9H 1G5
Tel: (705) 742.7900 Fax: (705) 742.7907
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BOREHOLE LOCATION PLAN

Project No.:	10331-001	Date:	January 2020
		Rev.:	
Scale:	1:1,000	Projection:	NAD 1983 UTM Zone 17N
Created by:	TLC	Checked by:	JM
Figure:	1		

O:\GIS\project_MXDs\10300-10399\10331-001 GEO - Fairfield Hotel, Depalma Drive, Cobourg\2020-01-24 FIG 1 - Borehole Location Plan.mxd

Appendix A
Borehole Logs

CAMBIUM
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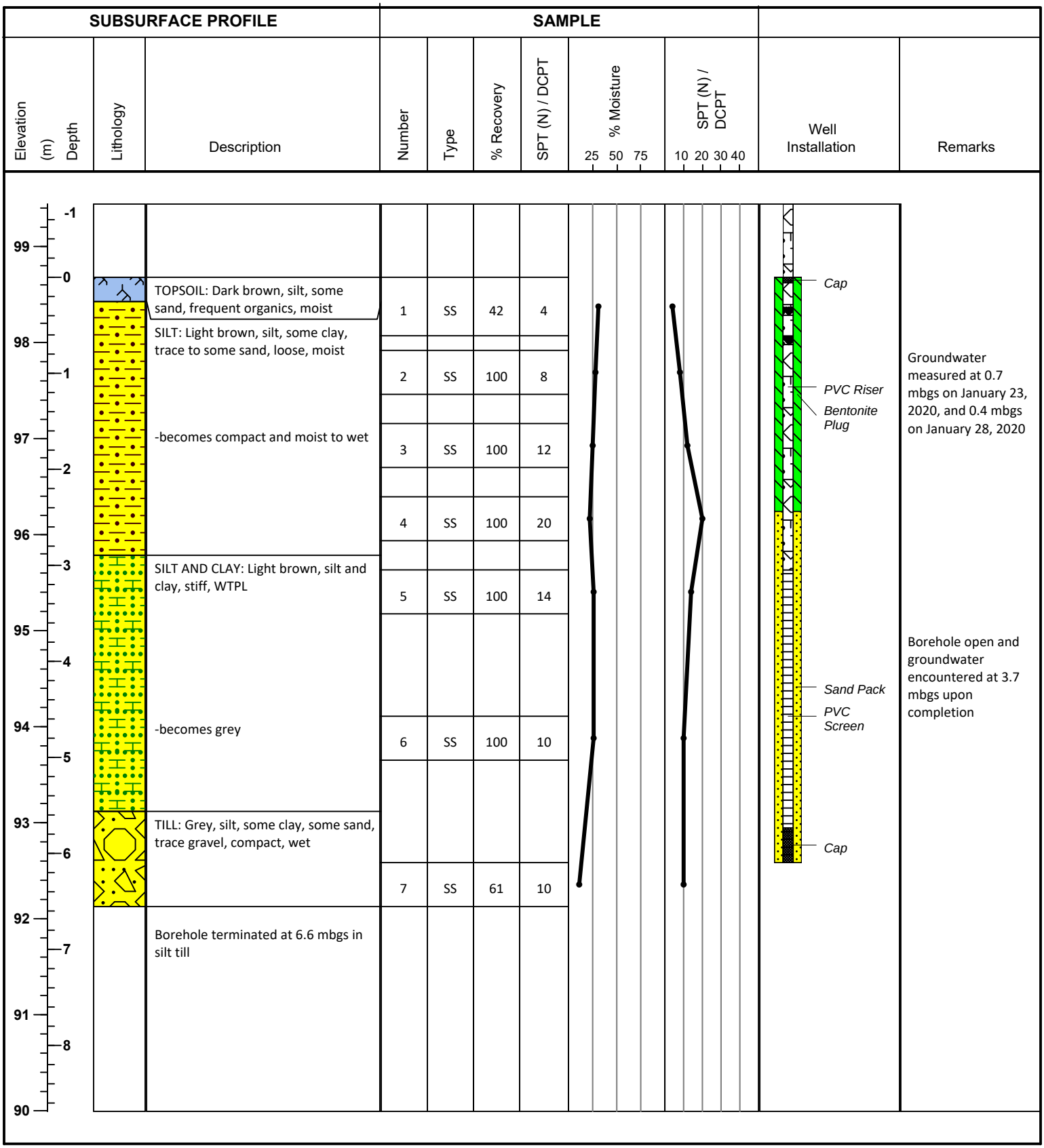
Log of Borehole: BH/MW101-20

Client:	2648888 Ontario Inc.	**Project Name:**	Geotechnical Investigation	**Project No.:**	10331-001
Contractor:	Drilltech Drilling Ltd.	**Method:**	Solid Stem Auger	**Date Completed:**	January 17, 2020
Location:	Depalma Drive, Cobourg, ON	**UTM:**	17 T 724335.6 m E 4873107.3 m N	**Elevation:**	98.69 m rel



Logged By: J. Monroy **Input By:** J. Monroy

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Log of Borehole: BH102-20

Client:	2648888 Ontario Inc.	**Project Name:**	Geotechnical Investigation	**Project No.:**	10331-001
Contractor:	Drilltech Drilling Ltd.	**Method:**	Solid Stem Auger	**Date Completed:**	January 17, 2020
Location:	Depalma Drive, Cobourg, ON	**UTM:**	17 T 724318.0 m E 4873104.6 m N	**Elevation:**	98.47 m rel

SUBSURFACE PROFILE			SAMPLE								
Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
98.47 / 0		TOPSOIL: Dark brown, silt, some sand, frequent organics, moist	1	SS	50	3				
97.47 / 1		SILT: Light brown, silt, some clay, trace to some sand, loose, moist	2	SS	100	9				
96.47 / 2		CLAYEY SILT: Light brown, clayey silt, trace sand, stiff to very stiff, WTPL	3	SS	94	15				
95.47 / 3		SILT AND CLAY: Light brown, silt and clay, stiff, WTPL	4	SS	78	19				
94.47 / 4		SILT AND CLAY: Light brown to grey, silt and clay, very stiff, WTPL to MWTPL	5	SS	100	9				
93.47 / 5			6	SS	100	16				
92.47 / 6		TILL: Grey, clayey silt, some sand, stiff, WTPL	7	SS	83	11				
91.47 / 7		Borehole terminated at 6.6 mbgs in clayey silt till								

GSA SS3:
0% Gravel
6% Sand
64% Silt
30% Clay

Borehole open and groundwater encountered at 1.2 mbgs upon completion

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Log of Borehole: BH103-20

Client:	2648888 Ontario Inc.	**Project Name:**	Geotechnical Investigation	**Project No.:**	10331-001
Contractor:	Drilltech Drilling Ltd.	**Method:**	Solid Stem Auger	**Date Completed:**	January 17, 2020
Location:	Depalma Drive, Cobourg, ON	**UTM:**	17 T 724337.0 m E 4873083.9 m N	**Elevation:**	98.29 m rel

SUBSURFACE PROFILE			SAMPLE							
Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
99 / -1										
98 / 0		TOPSOIL: Dark brown, silt, some sand, frequent organics, moist	1	SS	100	6				
		SILT: Light brown, silt, some sand, trace to some clay, some organics, loose to compact, moist	2	SS	94	14				
97 / 1										
		CLAYEY SILT: Light brown, clayey silt, very stiff, WTPL	3	SS	100	16				
96 / 2		-trace to some sand	4	SS	100	15				
		SILT AND CLAY: Light brown to grey, silt and clay, stiff, WTPL to MWTPL	5	SS	100	14				
95 / 3										
94 / 4			6	AS	0	15				Borehole open and groundwater encountered at 4.9 mbgs upon completion
93 / 5		TILL: Grey, clayey silt, some sand, trace gravel, stiff, WTPL	7	SS	100	10				GSA SS7: 4% Gravel 12% Sand 56% Silt 28% Clay
92 / 6										
91 / 7			8	SS	100	11				
90 / 8		Borehole terminated at 8.1 mbgs in clayey silt till								

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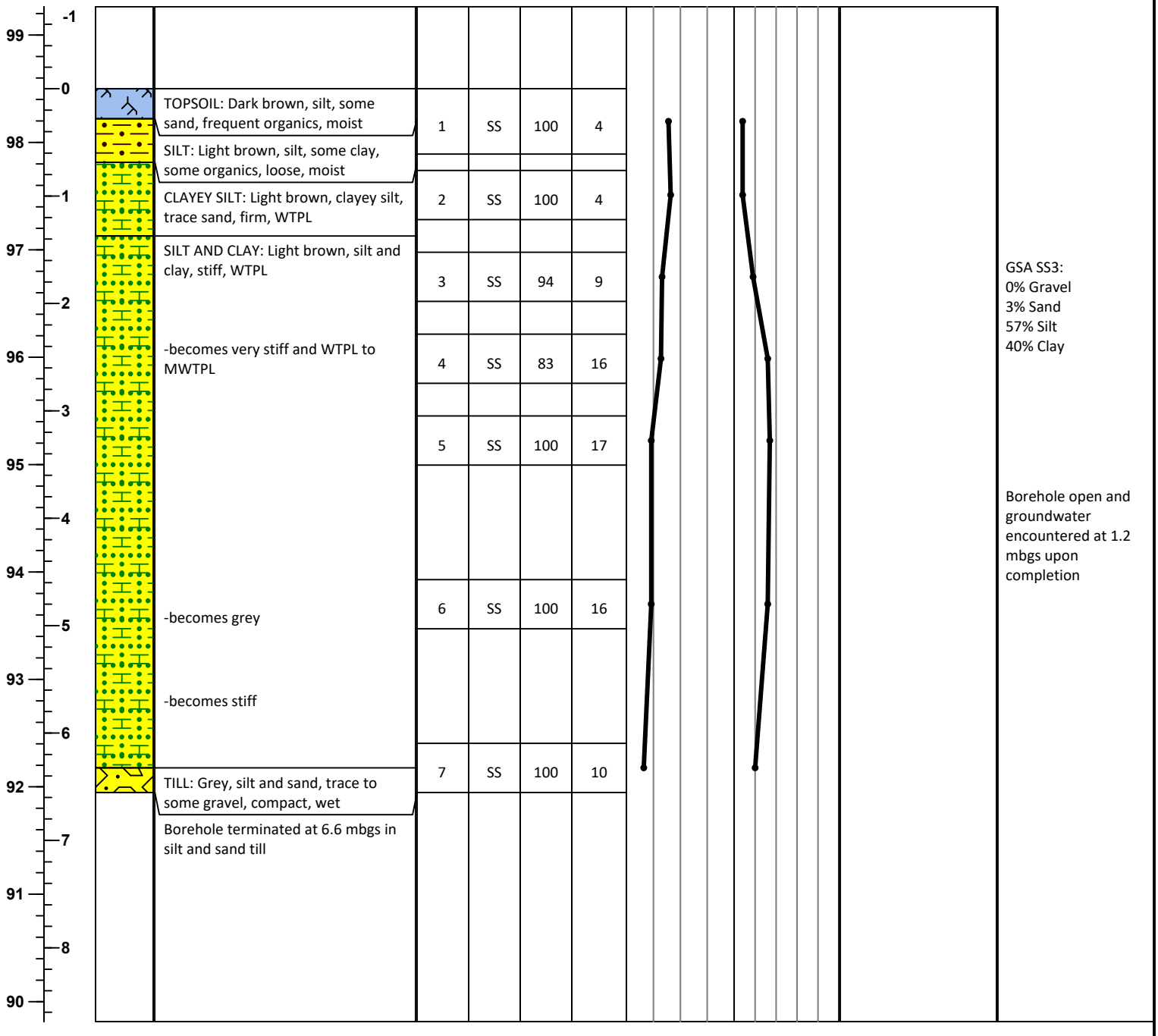
Log of Borehole: BH104-20

Client:	2648888 Ontario Inc.	**Project Name:**	Geotechnical Investigation	**Project No.:**	10331-001
Contractor:	Drilltech Drilling Ltd.	**Method:**	Solid Stem Auger	**Date Completed:**	January 16, 2020
Location:	Depalma Drive, Cobourg, ON	**UTM:**	17 T 724354.6 m E 4873060.4 m N	**Elevation:**	98.50 m rel



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Log of Borehole: BH105-20

Client: 2648888 Ontario Inc.
Project Name: Geotechnical Investigation
Project No.: 10331-001
Contractor: Drilltech Drilling Ltd.
Method: Solid Stem Auger
Date Completed: January 16, 2020
Location: Depalma Drive, Cobourg, ON
UTM: 17 T 724333.9 m E 4873057.9 m N
Elevation: 98.16 m rel

Elevation (m)	Depth	Description	Number	Type	% Recovery	SPT (N) / DCPT	Well Installation	Remarks
98	0	TOPSOIL: Dark brown, silt, some sand, frequent organics, moist	1	SS	100	4		
		SILT: Light brown, silt, some clay, trace sand, tarce organics, loose, moist	2	SS	100	8		
97	1	CLAYEY SILT: Light brown, clayey silt, firm, APL to WTPL						
		-becomes very stiff	3	SS	100	21		
96	2	SILT AND CLAY: Light brown, silt and clay, soft, WTPL to MWPL	4	SS	0	3		
95	3	-becomes stiff	5	SS	100	15		
94	4							
		-becomes grey	6	SS	100	13		
93	5	TILL: Grey, silt and sand, some gravel, trace clay, compact, wet						
92	6		7	SS	83	15		
91	7	Borehole terminated at 6.6 mbgs in silt and sand till						Borehole open and groundwater encountered at 1.2 mbgs upon completion
90	8							

% Moisture: 25 50 75
SPT (N) / DCPT: 10 20 30 40

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Input By: J. Monroy

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Log of Borehole: BH106-20

Client:	2648888 Ontario Inc.	**Project Name:**	Geotechnical Investigation	**Project No.:**	10331-001
Contractor:	Drilltech Drilling Ltd.	**Method:**	Solid Stem Auger	**Date Completed:**	January 16, 2020
Location:	Depalma Drive, Cobourg, ON	**UTM:**	17 T 724320.3 m E 4873126.7 m N	**Elevation:**	98.56 m rel

SUBSURFACE PROFILE			SAMPLE							
Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
99 / 0		TOPSOIL: Dark brown, silt, some sand, frequent organics, moist	1	SS	100	4				
98 / 1		SILT: Light brown, silt, some sand, trace clay, loose, moist -moist to wet	2	SS	100	9				
97 / 2		CLAYEY SILT: Light brown, clayey silt, stiff, WTPL to MWTPL	3	SS	100	12				
96 / 3		SILT AND CLAY: Light brown, silt and clay, very stiff, WTPL to MWTPL	4	SS	61	17				
95 / 4		Borehole terminated at 3.5 mbgs in silt and clay	5	SS	100	16				Borehole open and groundwater encountered at 1.1 mbgs upon completion
94 / 5										
93 / 6										
92 / 7										
91 / 8										
90										

Logged By: J. Monroy **Input By:** J. Monroy

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Log of Borehole: BH107-20

Client:	2648888 Ontario Inc.	**Project Name:**	Geotechnical Investigation	**Project No.:**	10331-001
Contractor:	Drilltech Drilling Ltd.	**Method:**	Solid Stem Auger	**Date Completed:**	January 16, 2020
Location:	Depalma Drive, Cobourg, ON	**UTM:**	17 T 724300.0 m E 4873114.0 m N	**Elevation:**	98.36 m rel

SUBSURFACE PROFILE			SAMPLE							
Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
99 / -1										
98 / 0		TOPSOIL: Dark brown, silt, some sand, frequent organics, moist	1	SS	100	4				
		SILT: Light brown, silt, some sand and clay, trace organice, loose, moist								
97 / 1		SILT: Light brown, silt, some clay, trace sand, very loose, moist	2	SS	100	3				
		CLAYEY SILT: Light brown, clayey silt, stiff, WTPL to MWTPL	3	SS	100	10				
96 / 2		SILT AND CLAY: Light brown, silt and clay, very stiff, WTPL	4	SS	89	15				
95 / 3			5	SS	100	20				GSA SS5: 0% Gravel 3% Sand 59% Silt 38% Clay
94 / 4		Borehole terminated at 3.5 mbgs in silt and clay								Borehole open and groundwater encountered at 1.2 mbgs upon completion
93 / 5										
92 / 6										
91 / 7										
90 / 8										

Logged By: J. Monroy **Input By:** J. Monroy

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Log of Borehole: BH108-20

Client:	2648888 Ontario Inc.	**Project Name:**	Geotechnical Investigation	**Project No.:**	10331-001
Contractor:	Drilltech Drilling Ltd.	**Method:**	Solid Stem Auger	**Date Completed:**	January 16, 2020
Location:	Depalma Drive, Cobourg, ON	**UTM:**	17 T 724277.4 m E 4873102.9 m N	**Elevation:**	97.95 m rel

SUBSURFACE PROFILE			SAMPLE							
Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
98 / 0		TOPSOIL: Dark brown, silt, some sand, frequent organics, moist	1	SS	100	5				Borehole caved to 0.61 mbgs with groundwater below cave upon completion
		SILT AND SAND: Light brown, silt and fine grained sand, loose, moist								
97 / 1		SILT: Light brown, silt, some sand, trace clay, loose, moist to wet	2	SS	83	7				
		CLAYEY SILT: Light brown, clayey silt, trace sand, stiff, WTPL	3	SS	94	14				
96 / 2										
		SILT AND CLAY: Light brown, silt and clay, stiff to very stiff, WTPL	4	SS	83	21				
95 / 3										
			5	SS	100	13				
94 / 4		Borehole terminated at 3.5 mbgs in silt and clay								
93 / 5										
92 / 6										
91 / 7										
90 / 8										

Logged By: J. Monroy **Input By:** J. Monroy

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Log of Borehole: BH109-20

Client:	2648888 Ontario Inc.	**Project Name:**	Geotechnical Investigation	**Project No.:**	10331-001
Contractor:	Drilltech Drilling Ltd.	**Method:**	Solid Stem Auger	**Date Completed:**	January 17, 2020
Location:	Depalma Drive, Cobourg, ON	**UTM:**	17 T 724301.4 m E 4873082.6 m N	**Elevation:**	98.09 m rel

SUBSURFACE PROFILE			SAMPLE							
Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
98 / 0		TOPSOIL: Dark brown, silt, some sand, frequent organics, moist	1	SS	100	4				
		SILT: Light brown, silt, trace to some sand, loose, moist								
97 / 1		-some clay, becomes moist to wet	2	SS	100	8				
		CLAYEY SILT: Light brown, clayey silt, very stiff, WTPL	3	SS	94	20				
96 / 2		SILT AND CLAY: Light brown, silt and clay, very stiff, WTPL to MWTPL	4	SS	100	21				
95 / 3			5	SS	100	17				
94 / 4		Borehole terminated at 3.5 mbgs in silt and clay								Borehole open and groundwater encountered at 1.8 mbgs upon completion
93 / 5										
92 / 6										
91 / 7										
90 / 8										

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Log of Borehole: BH110-20

Client:	2648888 Ontario Inc.	**Project Name:**	Geotechnical Investigation	**Project No.:**	10331-001
Contractor:	Drilltech Drilling Ltd.	**Method:**	Solid Stem Auger	**Date Completed:**	January 16, 2020
Location:	Depalma Drive, Cobourg, ON	**UTM:**	17 T 724287.4 m E 4873076.6 m N	**Elevation:**	97.85 m rel

SUBSURFACE PROFILE			SAMPLE							
Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
98 / 0		TOPSOIL: Dark brown, silt, some sand, frequent organics, moist	1	SS	100	4				
		SILT: Light brown, silt, some sand, trace organics, loose, moist								
97 / 1		SILT: Light brown, silt, some sand, some clay, loose, moist to wet	2	SS	100	7				
		CLAYEY SILT: Light brown, clayey silt, very stiff, WTPL to MWTPL	3	SS	100	16				
96 / 2		SILT AND CLAY: Light brown, silt and clay, very stiff, WTPL	4	SS	72	27				
95 / 3		-becomes stiff, WTPL to MWTPL	5	SS	100	12				Borehole open and groundwater encountered at 1.2 mbgs upon completion
94 / 4		Borehole terminated at 3.5 mbgs in silt and clay								
93 / 5										
92 / 6										
91 / 7										
90 / 8										

Logged By: J. Monroy **Input By:** J. Monroy

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Log of Borehole: BH111-20

Client:	2648888 Ontario Inc.	**Project Name:**	Geotechnical Investigation	**Project No.:**	10331-001
Contractor:	Drilltech Drilling Ltd.	**Method:**	Solid Stem Auger	**Date Completed:**	January 16, 2020
Location:	Depalma Drive, Cobourg, ON	**UTM:**	17 T 724315.5 m E 4873053.0 m N	**Elevation:**	98.0 m rel

SUBSURFACE PROFILE			SAMPLE							
Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
98 / 0		TOPSOIL: Dark brown, silt, some sand, frequent organics, moist	1	SS	100	0				
		SILT: Light brown, silt, some sand, trace clay, very loose, moist								
97 / 1		CLAYEY SILT: Light brown, clayey silt, trace to some sand, stiff to very stiff, WTPL	2	SS	100	13				
			3	AS	0	19				
96 / 2										
		SILT AND CLAY: Light brown, silt and clay, trace gravel, firm to stiff, WTPL to MWTPL	4	SS	100	7				
95 / 3			5	SS	100	8				Borehole open and groundwater encountered at 1.2 mbgs upon completion
94 / 4		Borehole terminated at 3.5 mbgs in silt and clay								
93 / 5										
92 / 6										
91 / 7										
90 / 8										

Logged By: J. Monroy **Input By:** J. Monroy

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Log of Borehole: BH112-20

Client:	2648888 Ontario Inc.	**Project Name:**	Geotechnical Investigation	**Project No.:**	10331-001
Contractor:	Drilltech Drilling Ltd.	**Method:**	Solid Stem Auger	**Date Completed:**	January 16, 2020
Location:	Depalma Drive, Cobourg, ON	**UTM:**	17 T 724297.4 m E 4873046.3 m N	**Elevation:**	97.74 m rel

SUBSURFACE PROFILE			SAMPLE							
Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
98 / 0		TOPSOIL: Dark brown, silt, some sand, frequent organics, moist	1	SS	100	4				GSA SS2: 0% Gravel 4% Sand 63% Silt 33% Clay
		SILT: Light brown, silt, some sand, trace clay, loose, moist								
97 / 1		CLAYEY SILT: Light brown, clayey silt, trace sand, firm to stiff, WTPL	2	SS	94	4				
96 / 2			3	SS	100	12				
		-becomes very stiff								
95 / 3			4	SS	89	17				Borehole open and groundwater encountered at 1.2 mbgs upon completion
		SILT AND CLAY: Light brown, silt and clay, trace sand, stiff, WTPL								
94 / 4			5	SS	100	9				
		Borehole terminated at 3.5 mbgs in silt and clay								
93 / 5										
92 / 6										
91 / 7										
90 / 8										

Logged By: J. Monroy **Input By:** J. Monroy

Appendix B
Physical Laboratory Testing Results

Grain Size Distribution Chart

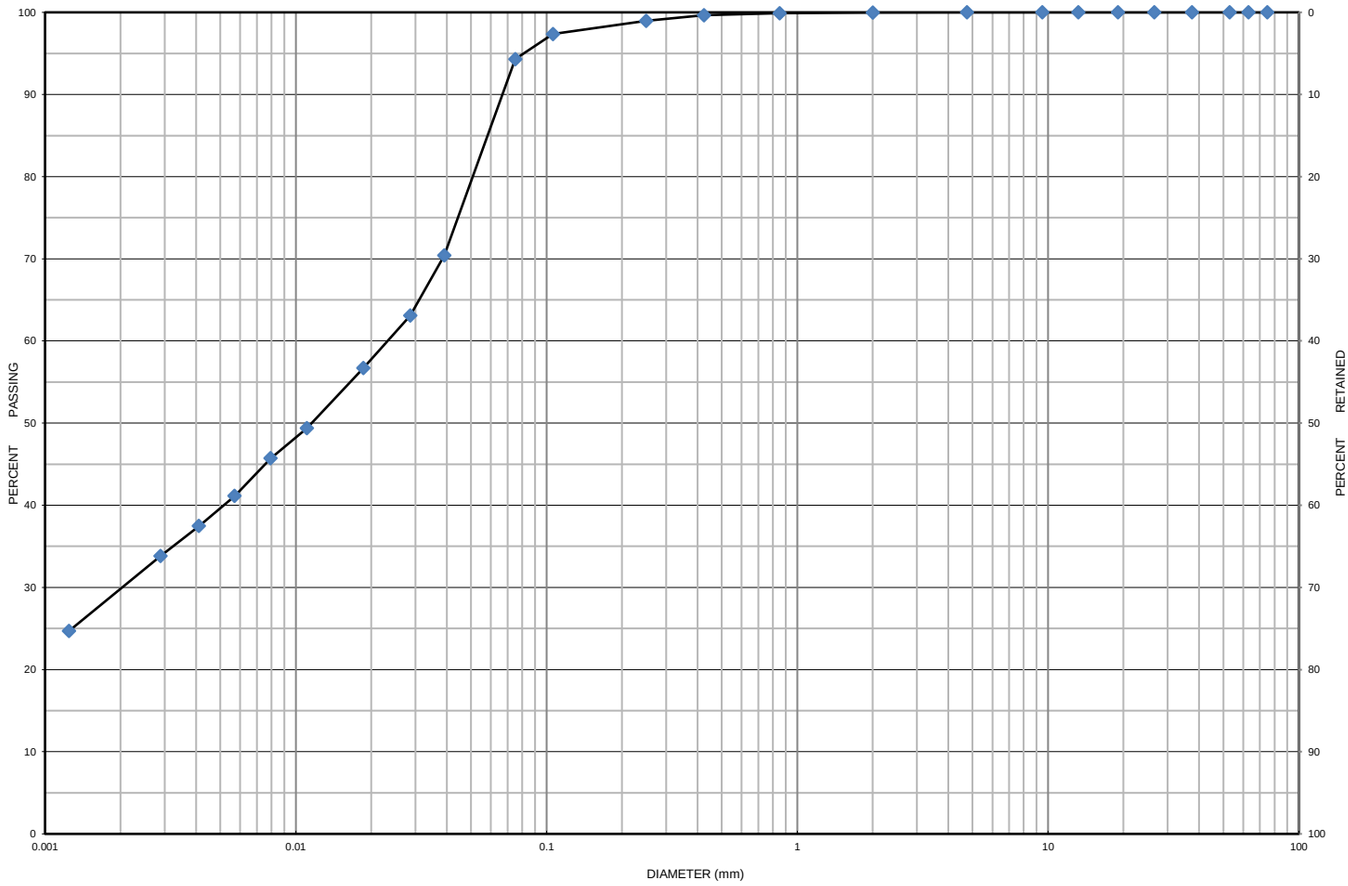
Project Number: *10331-001* **Client:** *2648888 Ontario Inc.*

Project Name: *Geotechnical - Fairfield Hotel, Depalma Drive, Cobourg*

Sample Date: *January 16-17, 2020* **Sampled By:** *Juan Monroy - Cambium Inc.*

Location: *BH 102-20 SS 3* **Depth:** *1.5 m to 2 m* **Lab Sample No:** *S-20-0063*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
BH 102-20	SS 3	1.5 m to 2 m	0	6	94		24.5

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Clayey Silt trace Sand	ML	0.023	0.002	0.000	-	-

Issued By: _____ *Date Issued:* *January 29, 2020*

(Senior Project Manager)

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Grain Size Distribution Chart

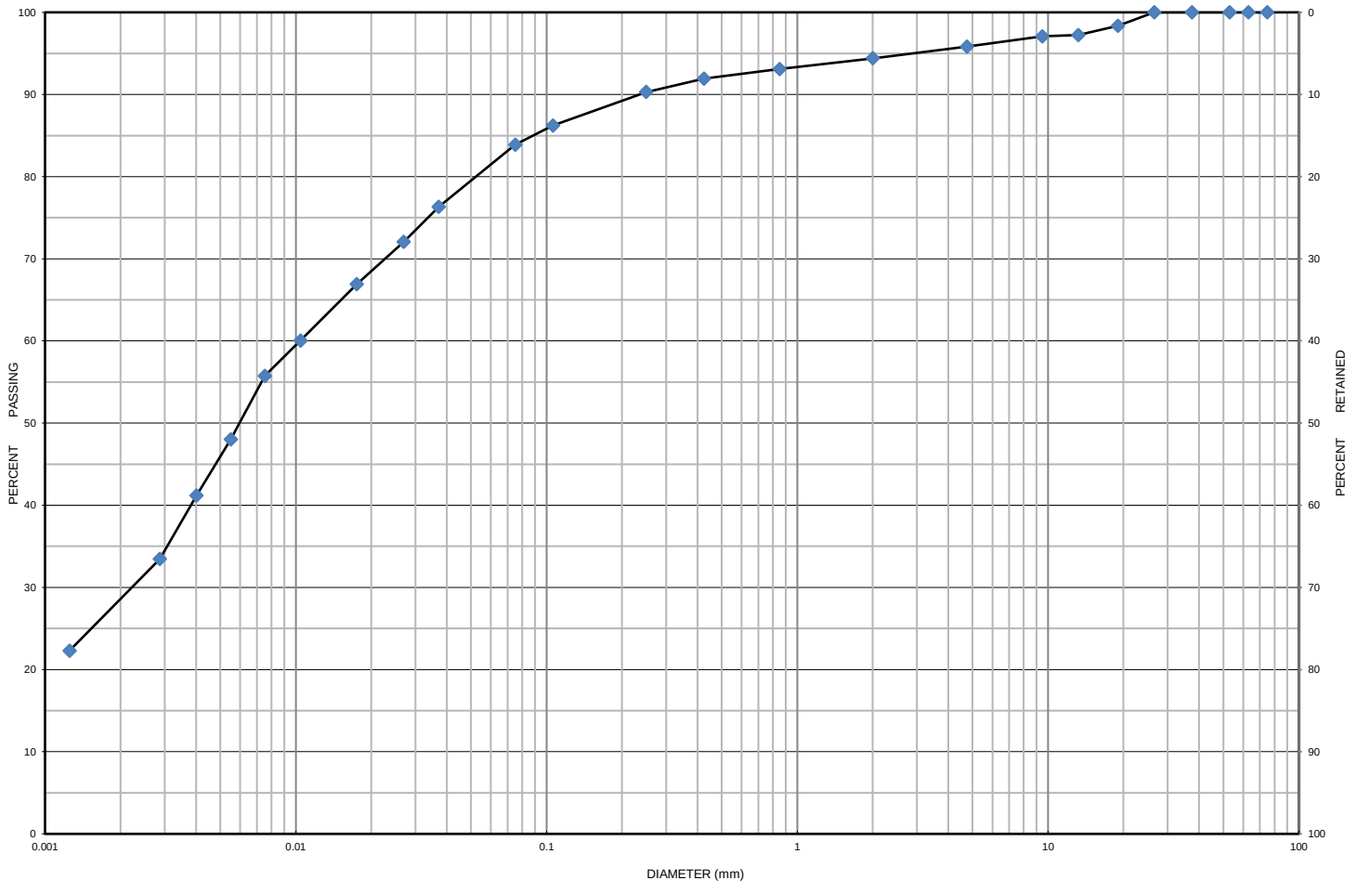
Project Number: *10331-001* **Client:** *2648888 Ontario Inc.*

Project Name: *Geotechnical - Fairfield Hotel, Depalma Drive, Cobourg*

Sample Date: *January 16-17, 2020* **Sampled By:** *Juan Monroy - Cambium Inc.*

Location: *BH 103-20 SS 7* **Depth:** *6.1 m to 6.6 m* **Lab Sample No:** *S-20-0064*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
BH 103-20	SS 7	6.1 m to 6.6 m	4	12	84		17.1

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Clayey Silt some Sand trace Gravel	ML	0.0110	0.0022	0.0000	-	-

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Grain Size Distribution Chart

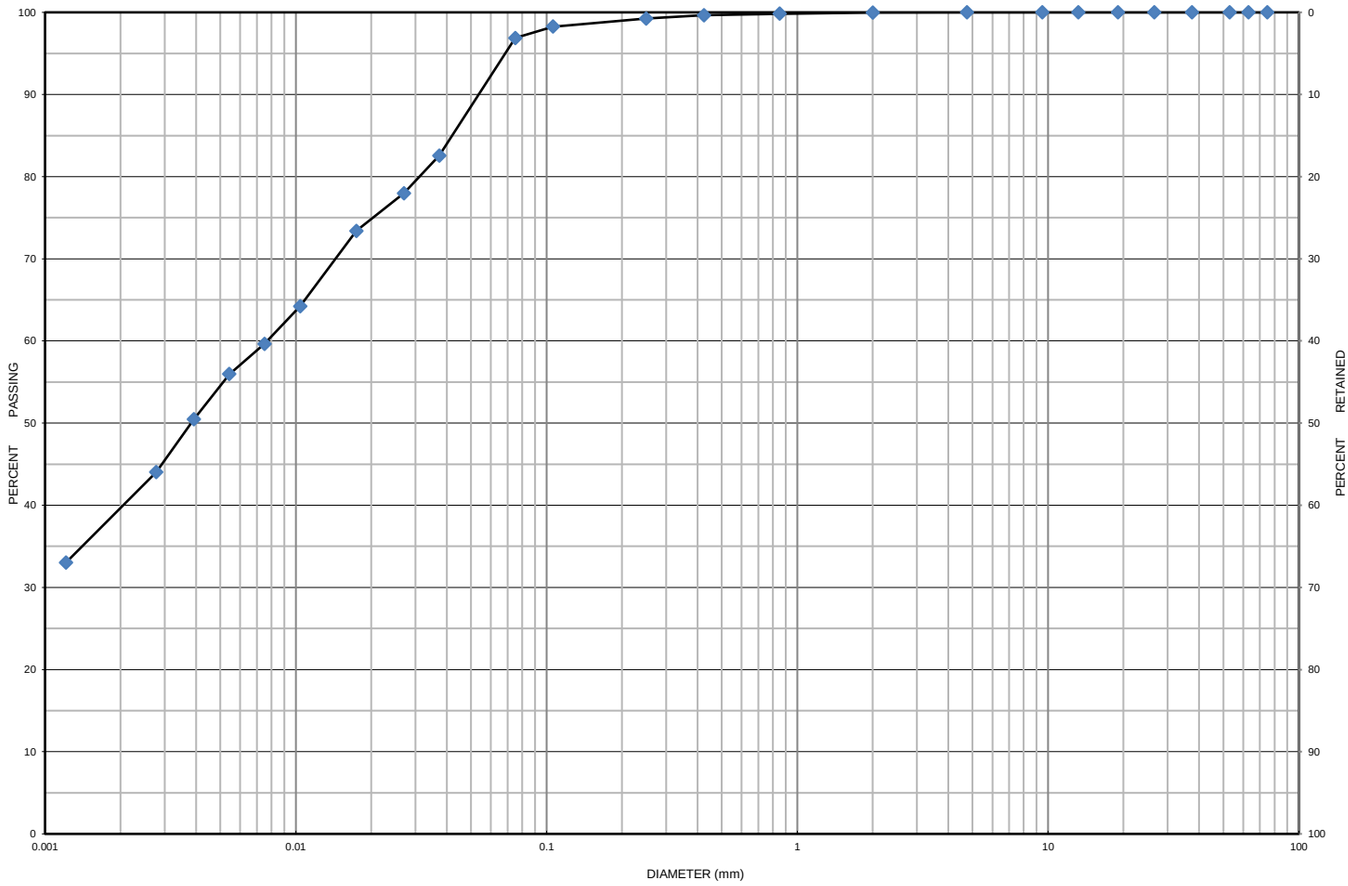
Project Number: *10331-001* **Client:** *2648888 Ontario Inc.*

Project Name: *Geotechnical - Fairfield Hotel, Depalma Drive, Cobourg*

Sample Date: *January 16-17, 2020* **Sampled By:** *Juan Monroy - Cambium Inc.*

Location: *BH 104-20 SS 3* **Depth:** *1.5 m to 2 m* **Lab Sample No:** *S-20-0065*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
BH 104-20	SS 3	1.5 m to 2 m	0	3	97		33.0

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Silt and Clay trace Sand	ML	0.0079	0.0000	0.0000	-	-

Issued By: _____ *Date Issued:* *January 29, 2020*

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Grain Size Distribution Chart

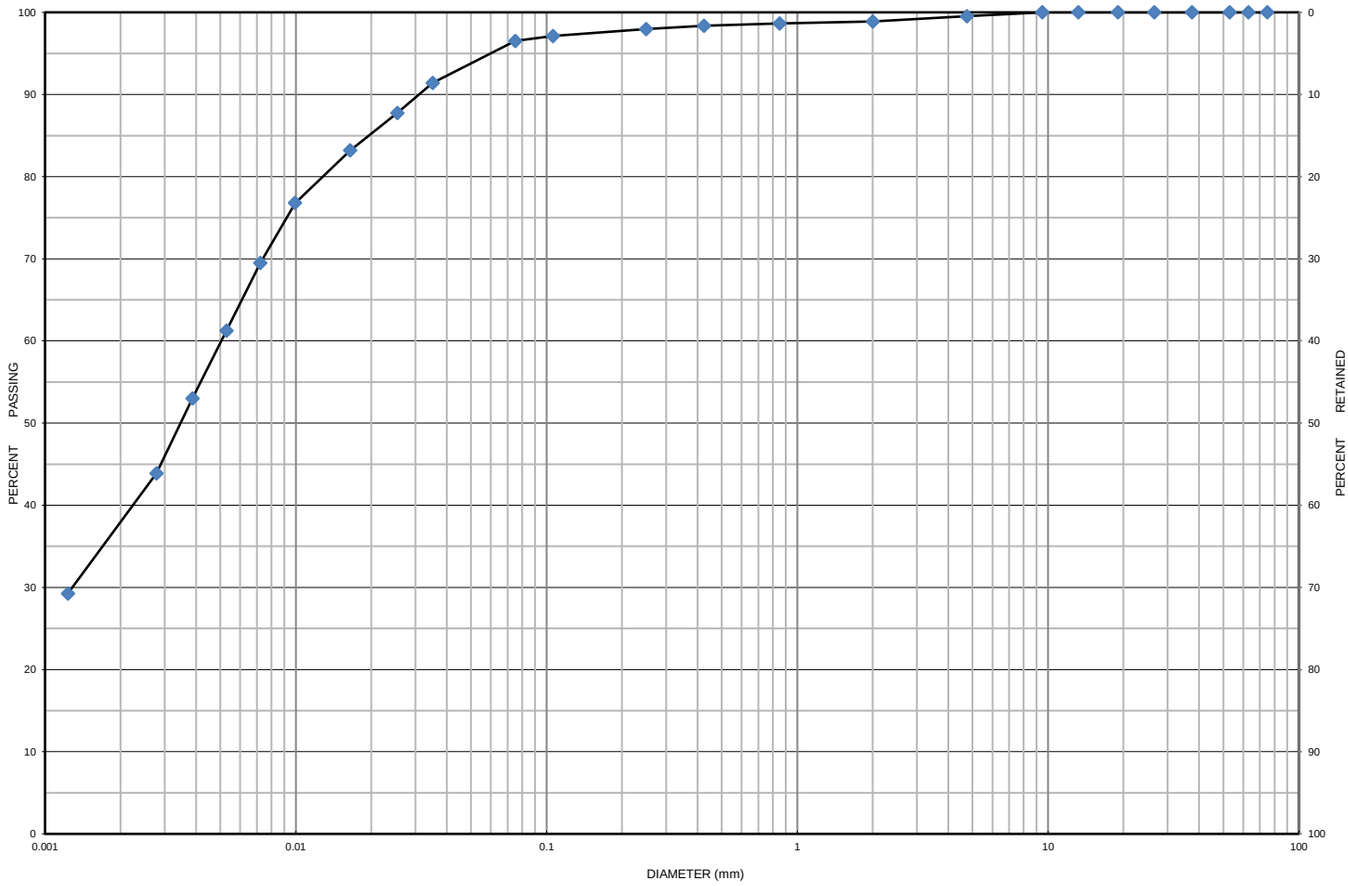
Project Number: *10331-001* **Client:** *2648888 Ontario Inc.*

Project Name: *Geotechnical - Fairfield Hotel, Depalma Drive, Cobourg*

Sample Date: *January 16-17, 2020* **Sampled By:** *Juan Monroy - Cambium Inc.*

Location: *BH 107-20 SS 5* **Depth:** *3 m to 3.5 m* **Lab Sample No:** *S-20-0066*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
BH 107-20	SS 5	3 m to 3.5 m	0	3	97		23.7

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Silt and Clay trace Sand	ML	0.0050	0.0014	0.0000	-	-

Issued By: _____ *Date Issued:* *January 29, 2020*

(Senior Project Manager)

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Grain Size Distribution Chart

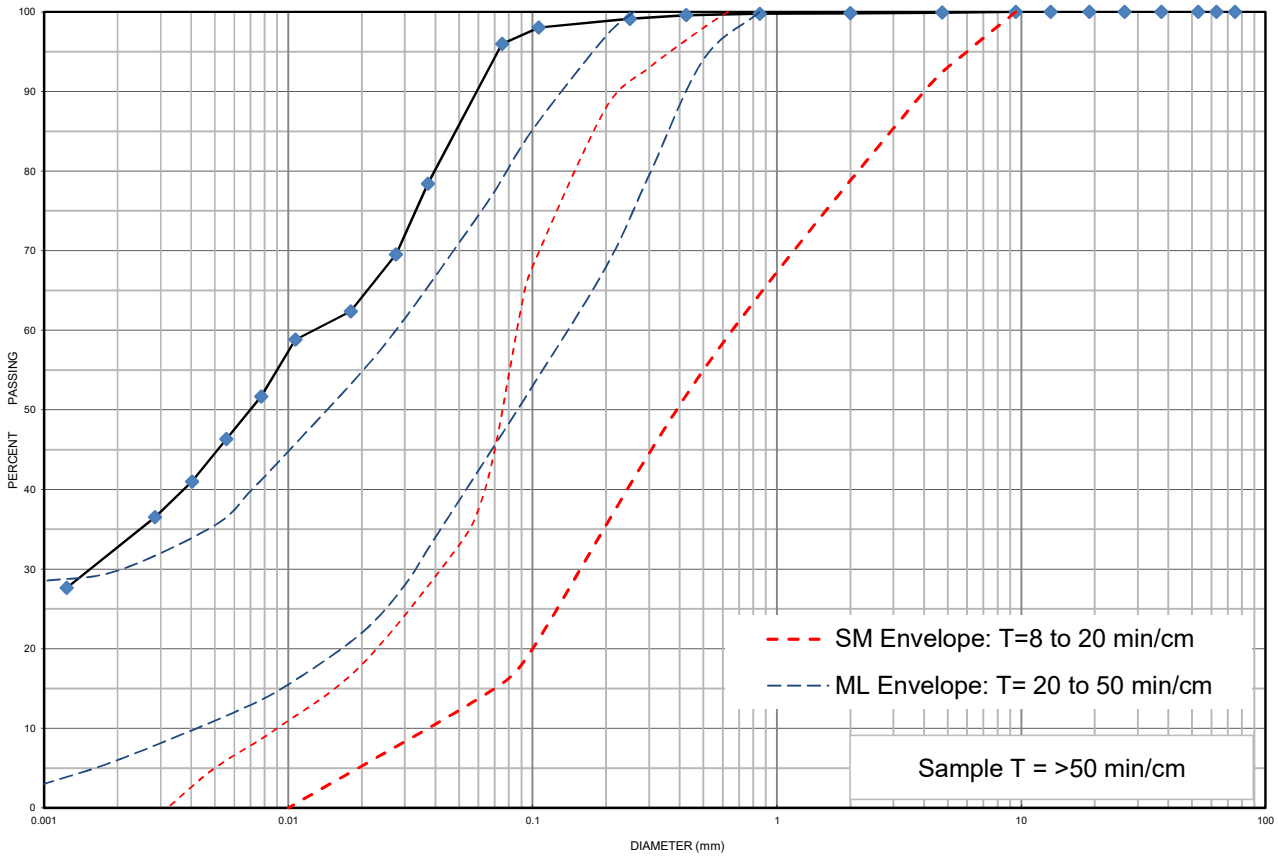
Project Number: *10331-001* **Client:** *2648888 Ontario Inc.*

Project Name: *Geotechnical - Fairfield Hotel, Depalma Drive, Cobourg*

Sample Date: *January 16-17, 2020* **Sampled By:** *Juan Monroy - Cambium Inc.*

Location: *BH 112-20 SS 2* **Depth:** *0.8 m to 1.2 m* **Lab Sample No:** *S-20-0067*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
BH 112-20	SS 2	0.8 m to 1.2 m	0	4	**63**	**33**	31.2

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Clayey Silt trace Sand	ML	0.014	0.0016	0.0	-	-

Issued By: _____ *Date Issued:* *March 20, 2020*

(Senior Project Manager)

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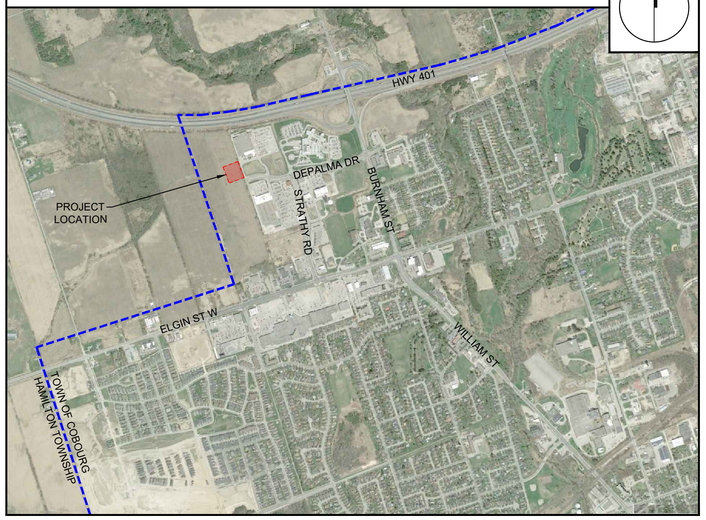
Appendix I: Detailed Design Drawings

COBOURG HOLIDAY INN EXPRESS

TOWN OF COBOURG

ENGAGE PROJECT No. 20005

LOCATION PLAN



DRAWING INDEX

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Cobourg "Ontario's Feel Good Town" Ontario, Canada

2648888 ONTARIO INC

REVISION 1 - 2020-06-05

COBOURG HOLIDAY INN EXPRESS

TOWN OF COBOURG

ENGAGE PROJECT No. - 20005

1st SUBMISSION FOR SPA - 2020-06-05

2648888 ONTARIO INC

ENGAGE ENGINEERING

LEGEND

REMOVAL AND ADJUSTMENTS

- (A) APPURTENANCE ADJUSTMENT BY CONTRACTOR (CB,MH,WV etc.)
- (B) ADJUSTMENT BY OTHERS
- (C) RELOCATE EXISTING CATCHBASIN
- (EX) EXCAVATE/BACKFILL EXIST. CATCHBASIN/MANHOLE
- (S) REMOVE, SALVAGE AND REINSTALL
- (E) TO BE EXPOSED BY CONTRACTOR
- FENCE REMOVAL
- MAINTENANCE HOLE AND SEWER REMOVAL
- VALVE CHAMBER AND WATERMAIN REMOVAL
- CONCRETE PAVEMENT WITH BITUMINOUS SURFACE TO BE REMOVED

UNDERGROUND SERVICES

SEWERS:

- PROP 90.0m-200mm Ø SAN @ 1.00% MH — PROPOSED SANITARY SEWER MAIN AND MANHOLE
- 100.5m-200mm Ø SAN @ 2.12% MH — EXISTING SANITARY SEWER MAIN AND MANHOLE
- PROP 90.0m-300mm Ø STM @ 0.50% MH — PROPOSED STORM SEWER MAIN AND MANHOLE
- 65.3m-300mm Ø STM @ 4.27% MH — EXISTING STORM SEWER MAIN AND MANHOLE
- CBMH — PROPOSED CATCH BASIN MANHOLE
- DCBMH — PROPOSED DOUBLE CATCH BASIN MANHOLE
- CB — PROPOSED CATCH BASIN
- DCB — PROPOSED DOUBLE CATCH BASIN
- CBMH — EXISTING CATCH BASIN MANHOLE
- DCBMH — EXISTING DOUBLE CATCH BASIN MANHOLE
- CB — EXISTING CATCH BASIN
- DCB — EXISTING DOUBLE CATCH BASIN
- DI — EXISTING DITCH INLET CATCH BASIN

WATER:

- PROP 300mm Ø WM VC — PROPOSED WATER MAIN AND VALVE CHAMBER
- 300mm Ø WM VC — EXISTING WATER MAIN AND VALVE CHAMBER
- HYD WV — PROPOSED HYDRANT SET
- HYD WV — EXISTING HYDRANT SET
- WV — PROPOSED WATER VALVE
- WV — EXISTING WATER VALVE
- CURB STOP VALVE
- LAWN SPRINKLER HEAD
- MW — MONITORING WELL

NATURAL GAS:

- 100mm Ø GAS — EXISTING GAS MAIN
- EXISTING GAS VALVE
- VP — EXISTING VENT PIPE

ROAD SURFACE FEATURES:

- EXISTING CONCRETE CURB
- EXISTING FENCE
- EXISTING CONCRETE SIDEWALK
- CONCRETE BARRIER CURB (OPSD 600.110)
- CONCRETE CURB AND GUTTER (OPSD 600.040)
- RESIDENTIAL DRIVEWAY ENTRANCES / DROP CURB
- COMMERCIAL / INDUSTRIAL REINFORCED DROP CURB
- PROPOSED CONCRETE SIDEWALK
- PROPOSED ASPHALT SURFACE
- PROPOSED GRAVEL SURFACE
- PROPOSED INTERLOCKING CONCRETE PAVERS
- PROPOSED STAMPED CONCRETE
- PROPOSED ASHPALT BOULEVARD

LEGAL AND CONTROL SYMBOLS:

- IB — IRON BAR
- RIB — ROUND IRON BAR
- IP — IRON PIPE
- CC — CUT CROSS
- HCM — HORIZONTAL CONTROL MONUMENT
- VCM — VERTICAL CONTROL MONUMENT
- TBM — TEMPORARY BENCHMARK
- BM — BENCHMARK
- 0+000 — STATION CHAINAGE

UTILITIES:

ELECTRICAL:

- HP — HYDRO POLE
- HPLS — HYDRO POLE LIGHT STANDARD
- HPLS — HYDRO POLE LIGHT STANDARD WITH TRANSFORMER
- LS — LIGHT STANDARD
- TS — TRAFFIC SIGNAL POLE
- HW — HANDWELL
- GUY ANCHOR
- DIRECT BURIED ELECTRICAL DUCT/CABLE
- CONCRETE ENCASED ELECTRICAL DUCT

TELECOMMUNICATIONS:

- BHP — BELL HYDRO POLE
- BP — BELL POLE
- BRP — BELL ROGERS POLE
- PED — PEDESTAL
- DIRECT BURIED TELECOMM DUCT/CABLE
- DIRECT BURIED TELECOMM DUCT

SIGNAGE:

- RRS — RAIL ROAD SIGN
- MK — MK
- RS — ROAD SIGN
- SIGN — DISPLAY BOARD SIGN

VEGETATION:

- HEDGE
- TREE CONIFEROUS
- SHRUB CONIFEROUS
- TREE DECIDUOUS
- SHRUB DECIDUOUS
- STUMP

MISCELLANEOUS:

- BH — BOREHOLE
- TP — TEST PIT
- WATER DATUM LINE
- PST — POST
- PM — PARKING METER
- MB — MAILBOX
- RK — BOULDER / ROCK
- BOLLARD
- PILLAR
- POLE — POLE
- TR — TRASH CAN
- OVERHEAD DOOR
- MAN DOOR
- ACCESSIBLE MAN DOOR
- OVERLAND FLOW ROUTE
- 100 PONDING LIMIT

ONTARIO PROVINCIAL STANDARDS

LIGHT DUTY SILT FENCE	OPSD-219.110	OPSS-805 (NOV 2010)
STRAW BALE FLOW CHECK	OPSD-219.180	OPSS-805 (NOV 2010)
CATCH BASIN AND CATCH BASIN MANHOLE FRAME AND GRATE	OPSD-400.020	OPSS-407 (NOV 2014) OPSS-402 (NOV 2013)
MAINTENANCE HOLE, SQUARE FRAME, CIRCULAR COVER	OPSD-401.010	OPSS-407 (NOV 2014) OPSS-402 (NOV 2013)
MAINTENANCE HOLE STEPS SOLID ALUMINUM	OPSD-405.020	OPSS-407 (NOV 2014)
CONCRETE BARRIER CURB	OPSD-600.110	OPSS-353 (NOV 2010)
TACTILE WALKING SURFACE INDICATORS	OPSD-310.039	OPSS-353 (NOV 2010)
1200mm PRECAST MANHOLE	OPSD-701.010	OPSS-407 (NOV 2014) OPSS-402 (NOV 2013)
SANITARY MANHOLE BENCHING DETAILS	OPSD-701.021	OPSS-407 (NOV 2014)
1200mm PRECAST MANHOLE COMPONENTS	OPSD-701.030	OPSS-407 (NOV 2014)
PRECAST CONCRETE CATCH BASIN	OPSD-705.010	OPSS-407 (NOV 2014) OPSS-402 (NOV 2013)
PRECAST CONCRETE DITCH INLET CATCH BASIN	OPSD-705.030	OPSS-407 (NOV 2014) OPSS-402 (NOV 2013)
FLEXIBLE PIPE EMBEDMENT AND BACKFILL EARTH EXCAVATION	OPSD-802.010	OPSS-410 (NOV 2013)
RIGID PIPE EMBEDMENT AND BACKFILL EARTH EXCAVATION TYPE 1 OR 2 SOIL	OPSD-802.030	OPSS-410 (NOV 2013)
CONCRETE SIDEWALK	OPSD-310.010 OPSD-310.020	OPSS-351 (NOV 2010)

STORM SEWER:

1. THE CONTRACTOR SHALL INSTALL BEDDING, BACKFILL AND COVER PER ONTARIO PROVINCIAL STANDARD DRAWING (OPSD) 802.010 FOR PVC PIPE AND SERVICES, AND OPSD 802.030 FOR CONCRETE AND CORRUGATED STEEL PIPE.
2. THE CONTRACTOR SHALL INSTALL PRECAST CONCRETE MANHOLES AS PER OPSD 701.010, 701.011, 701.012, 401.010, 404.020, 405.010 AND 405.020, UNLESS OTHERWISE SPECIFIED ON THE DRAWINGS. CONCRETE MANHOLES SHALL BE BENCHED AS PER OPSD 701.021.
3. THE CONTRACTOR SHALL INSTALL CONCRETE CATCHBASIN MANHOLES AS PER OPSD 701.010, 701.011, 701.012, 401.020, 404.020, 405.010 AND 405.020, UNLESS OTHERWISE SPECIFIED ON THE DRAWINGS. CATCHBASIN MANHOLES SHALL BE PROVIDED WITH A 300mm SUMP.
4. THE CONTRACTOR SHALL INSTALL CONCRETE CATCHBASINS COMPLETE WITH FRAME, GRATE AND 300mm PVC LEAD AS PER OPSD 705.010 AND OPSD 400.020, UNLESS OTHERWISE SPECIFIED ON THE DRAWINGS. CATCHBASINS SHALL BE PROVIDED WITH A 600mm SUMP.
5. THE CONTRACTOR SHALL INSTALL 100mm SUBDRAIN PIPE UNDER CONCRETE CURB AND PAVEMENT STRUCTURE AS PER OPSD 216.021, UNLESS OTHERWISE SPECIFIED ON THE DRAWINGS.
6. THE CONTRACTOR SHALL PERFORM AIR AND DEFLECTION TESTING ON ALL STORM SEWERS IN ACCORDANCE WITH MUNICIPAL STANDARDS AND OPSS 410 RESPECTIVELY.
7. THE CONTRACTOR SHALL CLEAN AND PERFORM CCTV INSPECTION ON ALL STORM SEWERS IN ACCORDANCE WITH OPSS 409. THE SUBDIVIDERS CONSULTING ENGINEER SHALL REPORT ALL IDENTIFIED DEFECTS IN THE NEW STORM SEWER SYSTEM AND PROVIDE PROPOSED CORRECTIVE ACTIONS TO THE TOWN ENGINEER FOR REVIEW AND APPROVAL. ALL DEFECTS SHALL BE CORRECTED TO THE SATISFACTION OF THE TOWN ENGINEER PRIOR TO PUTTING THE SEWERS INTO OPERATION.
8. THE CONTRACTOR SHALL PROVIDE 48 HOURS NOTICE TO THE TOWN'S ENGINEER PRIOR TO CONDUCTING PIPE AIR AND DEFLECTION TESTING, CCTV INSPECTIONS AND/OR CLEANING OF THE STORM SEWER.
9. THE CONTRACTOR SHALL PROVIDE 3 COPIES OF PIPE AIR AND DEFLECTION TESTING RESULTS AND CCTV INSPECTION REPORTS.

SANITARY SEWER:

1. THE CONTRACTOR SHALL INSTALL BEDDING, BACKFILL AND COVER PER ONTARIO PROVINCIAL STANDARD DRAWING (OPSD) 802.010 FOR PVC PIPE AND SERVICES.
2. THE CONTRACTOR SHALL INSTALL PRECAST CONCRETE MANHOLES AS PER OPSD 701.010, 401.010, 404.020, 405.010 AND 405.020, UNLESS OTHERWISE SPECIFIED ON THE DRAWINGS.
3. THE CONTRACTOR SHALL BENCH ALL SANITARY MANHOLES AS PER OPSD 701.021.
4. THE CONTRACTOR SHALL PERFORM AIR AND DEFLECTION TESTING ON ALL SANITARY SEWERS IN ACCORDANCE WITH MUNICIPAL STANDARDS AND OPSS 410 RESPECTIVELY.
5. THE CONTRACTOR SHALL CLEAN AND PERFORM CCTV INSPECTION ON ALL SANITARY SEWERS IN ACCORDANCE WITH OPSS 409. THE SUBDIVIDERS CONSULTING ENGINEER SHALL REPORT ALL IDENTIFIED DEFECTS IN THE NEW SANITARY SEWER SYSTEM AN PROVIDE PROPOSED CORRECTIVE ACTIONS TO THE TOWN'S ENGINEER FOR REVIEW AND APPROVAL. ALL DEFECTS SHALL BE CORRECTED TO THE SATISFACTION OF THE TOWN'S ENGINEER PRIOR TO PUTTING THE SEWERS INTO OPERATION.
6. THE CONTRACTOR SHALL PERFORM DEFLECTION TESTING OF ALL FLEXIBLE SANITARY SEWERS SHALL BE COMPLETED IN ACCORDANCE WITH OPSS MUNI 410.07.16.05. THE SUBDIVIDER'S CONSULTING ENGINEER SHALL PREPARE AND SUBMIT A RECORD OF THE TEST RESULTS TO THE TOWN'S ENGINEER PRIOR TO PUTTING THE SANITARY SEWER INTO OPERATION.
7. THE CONTRACTOR SHALL PERFORM LEAKAGE TESTING OF ALL SANITARY SEWERS SHALL BE COMPLETED IN ACCORDANCE WITH OPSS MUNI 410.07.16.04, EXFILTRATION TEST. THE SUBDIVIDER'S CONSULTING ENGINEER SHALL PREPARE AND SUBMIT A RECORD OF THE TEST RESULTS TO THE TOWN'S ENGINEER PRIOR TO PUTTING THE SANITARY SEWERS INTO SERVICE.
8. THE CONTRACTOR SHALL PROVIDE 48 HOURS NOTICE TO THE TOWN'S ENGINEER PRIOR TO CONDUCTING PIPE AIR AND DEFLECTION TESTING, CCTV INSPECTIONS AND/OR CLEANING OF THE SANITARY SEWER.
9. THE CONTRACTOR SHALL PROVIDE 3 COPIES OF PIPE AIR AND DEFLECTION TESTING RESULTS AND CCTV INSPECTION REPORTS.

WATERMAIN:

1. THE CONTRACTOR SHALL PROVIDE 48HR NOTICE TO LUSI'S ENGINEER PRIOR TO COMMENCING WATERMAIN CONSTRUCTION.
2. ONLY REPRESENTATIVES OF LAKEFRONT UTILITY SERVICES INC. (LUSI) ARE AUTHORIZED TO OPERATE VALVES OR HYDRANTS OF THE EXISTING WATER DISTRIBUTION SYSTEM.
3. THE CONTRACTOR SHALL INSTALL TRACER WIRE ON ALL NEW PVC WATERMAIN.
4. THE CONTRACTOR SHALL INSTALL CATHODIC PROTECTION AS PER OPSD 1109.0110.
5. THE CONTRACTOR SHALL INSTALL RETAINING GLAND RINGS ON ALL WATERMAIN FITTINGS AND CONNECTIONS WHERE THRUST BLOCKS CANNOT BE CONSTRUCTED ON SOLID GROUND.
6. THE CONTRACTOR SHALL INSTALL BEDDING AND BACKFILL AS PER OPSD 802.010.
7. THE CONTRACTOR SHALL INSTALL ALL WATERMAIN AND SERVICES AT A MINIMUM DEPTH OF 1.85 METRES FROM THE PROPOSED FINISH GRADE TO THE TOP OF PIPE.
8. THE CONTRACTOR SHALL MAINTAIN A MINIMUM VERTICAL CLEARANCE BETWEEN WATERMAIN AND SEWER OF 0.50 METRES BELOW OR 0.15 METRES ABOVE.
9. THE CONTRACTOR SHALL INSTALL WATER SERVICES AS PER OPSD 1104.0100, AND AT RIGHT ANGLES TO THE WATERMAIN WHERE POSSIBLE.
10. THE CONTRACTOR SHALL INSTALL ANODE PROTECTION ON ALL WATER SERVICES.
11. THE CONTRACTOR SHALL INSTALL 19mmØ TYPE 'K' COPPER SERVICE CONNECTIONS.
12. THE CONTRACTOR SHALL INSTALL WATER SERVICE BOXES ON ALL WATER SERVICES. WATER SERVICE BOXES SHALL BE LOCATED BETWEEN PROPERTY LINE AND 0.30 METRES TOWARD THE CENTERLINE OF ROAD. SERVICE BOXES SHALL UNDER NO CIRCUMSTANCES BE LOCATED ON PRIVATE PROPERTY.
13. THE CONTRACTOR SHALL INSTALL A 2x4 AT THE END OF THE SERVICE THAT IS VISIBLE, CLEARLY LABELED, PAINTED BLUE, AND IDENTIFIES THE DEPTH TO THE SERVICE INVERT.
14. THE CONTRACTOR SHALL INSTALL ALL WATER SERVICES WITH A MINIMUM OFFSET OF 0.30 METRES FROM THE PROPOSED DRIVEWAY. SERVICE BOXES SHALL UNDER NO CIRCUMSTANCES BE LOCATED WITHIN THE PROPOSED DRIVEWAY.
15. THE CONTRACTOR SHALL INSTALL THRUST BLOCKS FOR VERTICAL BENDS AS PER OPSD 1103.020. THE CONTRACTOR SHALL INSTALL THRUST BLOCKS FOR HORIZONTAL BENDS AS PER OPSD 1103.010.
16. THE CONTRACTOR SHALL INSTALL HYDRANTS AS PER OPSD 1105.010.
17. THE CONTRACTOR SHALL PROVIDE 48 HOURS NOTICE TO THE LUSI'S ENGINEER PRIOR TO CONDUCTING WATERMAIN TESTING.
18. THE CONTRACTOR SHALL COMPLETE FLUSHING AND DISINFECTING OPERATIONS IN ACCORDANCE WITH MECP WATERMAIN DISINFECTION PROCEDURES. PRIOR TO FILLING THE NEW WATERMAIN FROM THE EXISTING WATER DISTRIBUTION SYSTEM THE SUBDIVIDER'S CONSULTING ENGINEER SHALL MEET WITH LUSI STAFF AND THE LUSI ENGINEER TO REVIEW THE MECP PRODEDURES AND THE MANDATORY BACKFLOW PROTECTION MEASURES OF ANSI/AWWA STANDARD C651 TO BE IMPLEMENTED TO COORDINATE THE COMPLETION OF THE FILLING, TESTING, WITNESSING, FLUSHING AND DISINFECTION OF THE NEW WATERMAIN CONSTRUCTION.
19. THE CONTRACTOR SHALL COMPLETE HYDROSTATIC TESTING OF THE NEW WATERMAIN IN ACCORDANCE WITH OPSS 441.07.24.01 AND OPSS 441.07.24.03 AND WITNESSED BY A REPRESENTATIVE OF LUSI. IF THE WATERMAIN IS FILLED FROM THE EXISTING WATER DISTRIBUTION SYSTEM THE BACKFLOW PROTECTION MEASURES OF ANSI/AWWA STANDARD C651 SHALL BE IMPLEMENTED TO THE SATISFACTION OF LUSI'S CERTIFIED OPERATOR WITHIN THE MEANING OF O.REG. 170/03. THE SUBDIVIDERS CONSULTING ENGINEER SHALL DOCUMENT ALL TESTING CALCULATIONS AND SHALL HAVE A LUSI REPRESENTATIVE PRESENT TO WITNESS ALL TEST RESULTS UNTIL A SATISFACTORY RESULT IS ACHIEVED.
20. THE CONTRACTOR SHALL PROVIDE ALL WATERMAIN TESTING RESULTS (INCLUDING CHLORINATION, BACTERIOLOGICAL, PRESSURE AND FLOW) IN ACCORDANCE WITH LUSI SPECIFICATIONS. THE CONTRACTOR SHALL PROVIDE 2 COPIES OF ALL TEST RESULTS.

SURVEY
TOPOGRAPHIC SURVEY PROVIDED BY DONEVAN FLEISCHMANN PETRICH LTD.

BENCHMARK
GEODEDIC BENCHMARK No. 0011910U171

ELEV: 80.156m

NOTES:

1. ALL CONSTRUCTION AND MATERIALS TO BE IN ACCORDANCE WITH:
   - -TOWN OF COBOURG DESIGN STANDARDS
   - -ONTARIO PROVINCIAL STANDARD DRAWINGS & SPECIFICATIONS
   - -APPLICABLE CONTRACT DOCUMENTS AND ALL SPECIFICATIONS REFERENCED HEREIN.
2. THE CONTRACTOR SHALL CONSTRUCT ALL WORK IN ACCORDANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY ACT, HEALTH AND SAFETY REGULATIONS FOR CONSTRUCTION PROJECTS.
3. THE CONTRACTOR SHALL COORDINATE AND PAY FOR ALL PERMITS OR THIRD PARTY WORKS ASSOCIATED WITH SERVICING CONNECTIONS.
4. THE CONTRACTOR SHALL TAKE EXTREME CARE WHEN WORKING IN PROXIMITY TO EXISTING SERVICES.
5. THE CONTRACTOR SHALL RESTORE OR REPLACE DAMAGED SERVICES TO EXISTING OR BETER CONDITION.
6. THE CONTRACTOR SHALL RESTORE ALL DISTURBED AREAS TO EXISTING OR BETTER CONDITION, OR PER THE ENGINEERING AND LANDSCAPE SPECIFICATIONS REFERENCED HEREIN.
7. THE CONTRACTOR SHALL COORDINATE AND PAY FOR ALL TRAFFIC CONTROL AND SAFETY MEASURES IN ACCORDANCE WITH THE ONTARIO TRAFFIC MANUAL, BOOK 7, TEMPORARY CONDITIONS.
8. THE CONTRACTOR SHALL DISPOSE OF ALL WASTE MATERIALS IN ACCORDANCE WITH THE MINISTRY OF THE ENVIRONMENT GUIDELINES AND LOCAL MUNICIPAL BYLAWS.

No.	REVISION	BY	DATE
1.	1st SUBMISSION FOR SPA	SD	2020-06-05

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COBOURG HOLIDAY INN EXPRESS

TOWN OF COBOURG

STANDARD NOTES & LEGEND

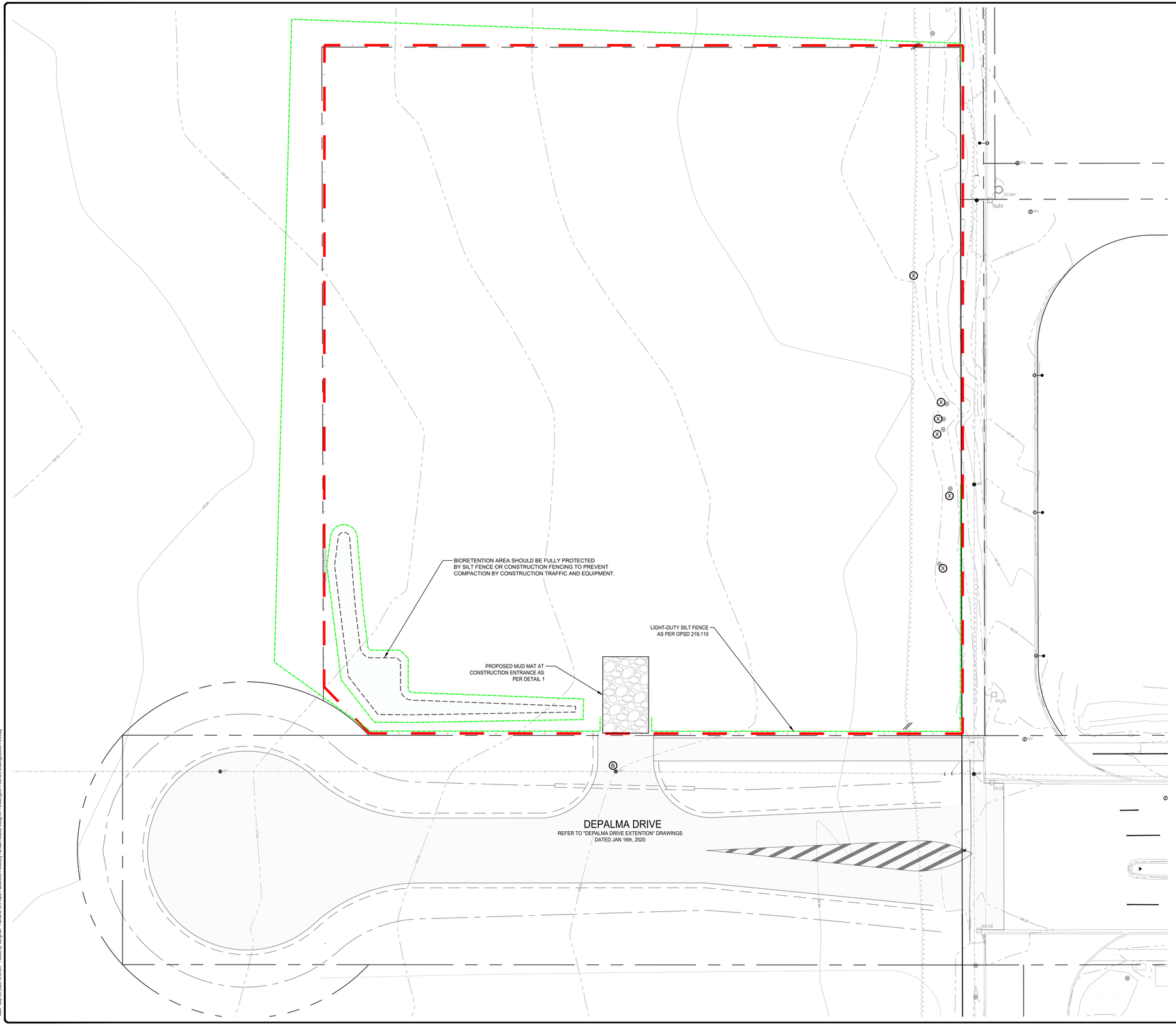
TOWN OF COBOURG

DRAWN BY: S.DINGMAN
DESIGNED BY: S.DINGMAN
APPROVED BY: P.HURLEY
DATE: 2020-04-15
SCALE:

STAMP: LICENSED PROFESSIONAL ENGINEER — P.D. HURLEY 100062172 — 2020-06-05 — PROVINCE OF ONTARIO

PROJECT NUMBER: **20005** | SHEET NAME: **SN** | SHEET: **1 of 4**

20005 - SN



SURVEY
TOPOGRAPHIC SURVEY PROVIDED BY DONEVAN FLEISCHMANN PETRICH LTD.

BENCHMARK
GEODEDIC BENCHMARK No. 0011910U171

ELEV: 80.156m

NOTES:

1. SERVICE CONNECTION INFORMATION MAY BE INCOMPLETE, OR ONLY GENERALLY ACCURATE. SOME SANITARY SERVICES MAY ALSO HAVE SEPARATE CELLAR DRAIN PIPES.
2. TEMPORARY SUPPORT OF EXISTING UTILITY POLES MUST BE APPROVED BY THE OWNER. ALL ASSOCIATED COSTS WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.
3. THE POSITION OF THE POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED.
4. PRIOR TO COMMENCING WORK, THE CONTRACTOR SHALL CONFIRM THE POSITION AND EXACT LOCATION OF ALL SUCH UTILITIES, AND SHALL ASSUME ALL LIABILITY FOR ANY DAMAGE TO THEM MADE DURING THE COURSE OF THE CONTRACT WORK.

REMOVAL AND ADJUSTMENTS

- (A) APPURTENANCE ADJUSTMENT BY CONTRACTOR (CB,MH,WV etc.)
- (B) ADJUSTMENT BY OTHERS
- (C) RELOCATE EXISTING CATCHBASIN
- (EX) EXCAVATE/BACKFILL EX. STRUCTURE
- (S) REMOVE, SALVAGE AND REINSTALL
- (X) REMOVE, PRIOR TO CONTRACT START
- (E) TO BE EXPOSED BY CONTRACTOR

- FENCE REMOVAL
- MAINTENANCE HOLE AND SEWER REMOVAL
- WATER VALVE AND WATERMAIN REMOVAL
- ASPHALT REMOVAL
- LIMIT OF DISTURBANCE

No.	REVISION	BY	DATE
1.	1st SUBMISSION FOR SPA	SD	2020-06-05

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COBOURG HOLIDAY INN EXPRESS

TOWN OF COBOURG

REMOVALS AND EROSION & SEDIMENT CONTROL PLAN

TOWN OF COBOURG

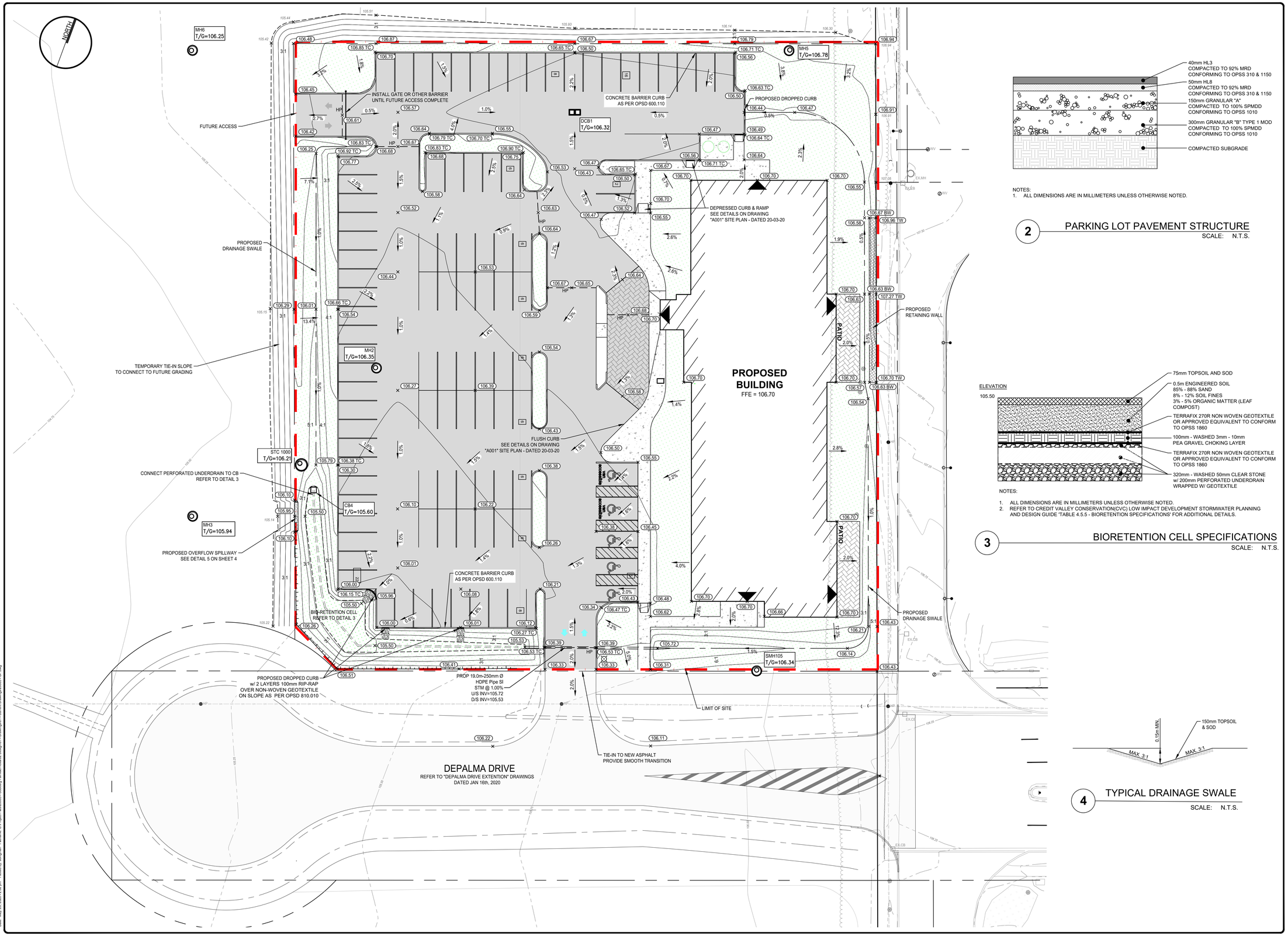
DRAWN BY:	S.DINGMAN
DESIGNED BY:	S.DINGMAN
APPROVED BY:	P.HURLEY
DATE:	2020-04-15

STAMP: LICENSED PROFESSIONAL ENGINEER — P.D. HURLEY — 100062172 — 2020-06-05 — PROVINCE OF ONTARIO

SCALE: 1:250

PROJECT NUMBER:	SHEET NAME:	SHEET:
20005	ES	2 of 4

20005 - ES
Date: May 29, 2020 - 2:04 pm Plotted by: sdingman File name: C:\Project Files\20005 - Cobourg Fairfield Hotel\02 Design\01 - Drawings\01 - Current Drawings\20005 - ES.dwg



NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

2 PARKING LOT PAVEMENT STRUCTURE
SCALE: N.T.S.

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
2. REFER TO CREDIT VALLEY CONSERVATION(CVC) LOW IMPACT DEVELOPMENT STORMWATER PLANNING AND DESIGN GUIDE 'TABLE 4.5.5 - BIORETENTION SPECIFICATIONS' FOR ADDITIONAL DETAILS.

3 BIORETENTION CELL SPECIFICATIONS
SCALE: N.T.S.

4 TYPICAL DRAINAGE SWALE
SCALE: N.T.S.

SURVEY
TOPOGRAPHIC SURVEY PROVIDED
BY DONEVAN FLEISCHMANN PETRICH LTD.

BENCHMARK
GEODEDIC BENCHMARK No. 0011910U171

ELEV: 80.156m

NOTES:

PR.	EX.	FEATURE
		EDGE OF PAVEMENT
		BACK OF CURB
		EDGE OF GRAVEL
		CENTRELINE OF ROAD
		DITCH
		SIDEWALK
		FENCE LINE
		RETAINING WALL
		LIGHT DUTY ASPHALT
		HEAVY DUTY ASPHALT
		GRASS/LANDSCAPED
		CONC. DRIVEWAY RAMP
		ASPH. DRIVEWAY RAMP
		INTERLOCK BRICK
		GAS MAIN
		OVERHEAD BELL
		UNDERGROUND BELL
		OVERHEAD HYDRO
		UNDERGROUND HYDRO
		WATERMAIN
		STORM SEWER
CB		SANITARY SEWER
WS		WATER SERVICE
SS		SANITARY SERVICE
		PROPERTY LINE
		RIGHT-OF-WAY
		WATER VALVE
		WELL
		SANITARY MANHOLE
		CATCH BASIN
		DOUBLE CATCH BASIN
		CATCH BASIN MANHOLE
		DOUBLE CB MANHOLE
		STORM MANHOLE
		FIRE HYDRANT
		IRON BAR
		LIGHT STANDARD
		MAILBOX
		ROAD SIGN
		CONIFEROUS TREE
		DECIDUOUS TREE
		OVERHEAD DOOR
		MAN DOOR
		ACCESSIBLE MAN DOOR

No.	REVISION	BY	DATE
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COBOURG
HOLIDAY INN EXPRESS

TOWN OF COBOURG

GRADING PLAN

TOWN OF COBOURG

DRAWN BY: S.DINGMAN	STAMP: LICENSED PROFESSIONAL ENGINEER P.D. HURLEY 100062172 2020-06-05 PROVINCE OF ONTARIO
DESIGNED BY: S.DINGMAN	
APPROVED BY: P.HURLEY	
DATE: 2020-04-15	
SCALE: 1:250	

PROJECT NUMBER:	SHEET NAME:	SHEET:
20005	GP	3 of 4

20005 - GP
Date: May 29, 2020 - 2:02 pm Plotted by: sdingman Filename: C:\Project Files\20005 - Cobourg Fairfield Hotel\02 Design\01 - Drawings\01 - Current Drawings\20005 - GP.dwg

MH6
T/G=106.25
INV=104.92-E
INV=104.88-S

PROP 85.6m-450mm ø PVC STM @ 0.5%

MH5
T/G=106.78
INV=105.39-SE
INV=105.35-W

PROP 24.8m-450mm ø PVC STM @ 0.5%

DCB1
T/G=106.32
INV=105.03-S

FUTURE CONNECTION TO HOME DEPOT STORMWATER
INVERT ELEVATION TO BE CONFIRMED

EX.MH

EX.CB

INV = 104.90

PROP 66.8m-450mm ø PVC STM @ 0.5%

PROP 46.4m-300mm ø PVC STM @ 0.5%

MH2
T/G=???
INV=104.80-N
INV=104.80-E
INV=104.78-S

PROP 44.1m-250mm ø PVC STM @ 0.5%

PROP 17.0m-300mm ø PVC STM @ 0.5%

INV = 105.02m

PROPOSED
BUILDING
FFE = 106.70

PATIO

STC 1000
T/G=106.21
INV=104.69-N
INV=104.69-SE
INV=104.64-SW

PROP 17.2m-450mm ø PVC STM @ 0.5%

PROP 4.0m-300mm ø
PVC STM @ 2.0%

CB4
T/G=105.60
INV=104.77-NW

<<< TO SWM FACILITY

PROP 76.0m-525mm ø Reinforced Concrete STM @ 0.5%

MH3
T/G=105.94
INV=104.55-NE
INV=104.54-W

PROPOSED OVERFLOW SPILLWAY
SEE DETAIL 5

PROP. 150mm Ø WAT
(COMBINED DOMESTIC & FIRE)
MAINTAIN 1.8m MIN COVER

PROP 19.0m-250mm Ø
HDPE Pipe SI
STM @ 1.00%
U/S INV=105.72
D/S INV=105.53

INV = 104.25m

PATIO

NEW 10.0m-200mm ø
PVC SAN @ 1.0%

SMH105
T/G=106.34
INV=104.13-S
INV=104.15-N

TIE-IN TO NEW 150mmØ WAT
INV = 104.30

TIE-IN TO NEW SAN
INV = 104,13

TIE-IN TO NEW 150mmØ WAT
INV = 104,13

LIMIT OF SITE

PROP. 300mm Ø WAT

EX. 300 Ø DI WAT

DEPALMA DRIVE
REFER TO "DEPALMA DRIVE EXTENTION" DRAWINGS
DATED JAN 16th, 2020

NEW 15.0m-200mm ø
PVC SAN @ -1.0%

NEW 49.4m-200mm ø PVC SAN @ 0.5%

NEW 82.5m-200mm ø PVC SAN @ -0.5%

SMH104
T/G=106.36
INV=104.27-NW
INV=104.23-E

SMH103
T/G=106.20
INV=103.94-E
INV=103.98-W
INV=103.98-N

EX.CB

NORTH

TOP OF POND
ELEV = 106.10m

0.45m | 3.0m OVERFLOW SPILLWAY | 0.45m

0.15m DEEP

3:1

3:1

OVERFLOW SPILLWAY
ELEV = 105.95m

PERMANENT TURF REINFORCEMENT MAT;
NILEX P300 OR EQUIVALENT

5 OVERFLOW SPILLWAY
SCALE: N.T.S.

SURVEY
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BENCHMARK
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ELEV: 80.156m

NOTES:

PR.	EX.	FEATURE
		EDGE OF PAVEMENT
		BACK OF CURB
		EDGE OF GRAVEL
		CENTRELINE OF ROAD
		DITCH
		SIDEWALK
		FENCE LINE
		RETAINING WALL
		LIGHT DUTY ASPHALT
		HEAVY DUTY ASPHALT
		GRASS/LANDSCAPED
		CONC. DRIVEWAY RAMP
		ASPH. DRIVEWAY RAMP
		INTERLOCK BRICK
		GAS MAIN
		OVERHEAD BELL
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		WATERMAIN
		STORM SEWER
CS	CS	SANITARY SEWER
WS	WS	WATER SERVICE
SS	SS	SANITARY SERVICE
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		WELL
		SANITARY MANHOLE
		CATCH BASIN
		DOUBLE CATCH BASIN
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COBOURG
HOLIDAY INN EXPRESS

TOWN OF COBOURG

SITE SERVICING PLAN

TOWN OF COBOURG

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DESIGNED BY: S.DINGMAN	
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DATE: 2020-04-15	
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PROJECT NUMBER:	SHEET NAME:	SHEET:
20005	SS	4 of 4

20005 - SS
Date: May 29, 2020 - 2:03 pm Plotted by: sdingman File=me: C:\Project Files\20005 - Cobourg Fairfield Hotel\02 Design\01 - Drawings\01 - Current Drawings\20005 - SS.dwg