Servicing Report – St. Mary's Coptic Orthodox Church

Project # 160410203

Prepared for:
St. Mary's Coptic Orthodox Church

Prepared by:
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Sign-off Sheet

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1.0 INTRODUCTION

Stantec Consulting Ltd. has been commissioned by St Mary's Coptic Orthodox Church to prepare a servicing study in support of a zoning amendment to be submitted concurrently with a site plan control application for the proposed development located at 1 Canfield Road within the city of Ottawa. The total proposed site area is 0.73 ha and is bounded by Parkmount Crescent to the west, Greenbank to the east and Canfield Road to the south (see Location Plan below in **Figure 1**).

The existing development conditions on site consist of a church property with associated parking and access road through Canfield Road. The subject site also includes three residential dwellings; units 15 and 17 on Parkmount Crescent and unit 9 on Canfield Road (see **Drawing EX-1** for existing condition plan).

The proposed site will consist of the existing church and a proposed two (2) storey institutional building. the proposed site includes the existing residential units 15 and 17 on Parkmount Crescent which will be replaced by parking areas. Similarly, the proposed site includes the existing residential unit 9 on Canfield Road and a portion of the backyard of the existing residential unit on 13 Parkmount Crescent (see proposed site plan displayed in **Appendix E**).

The existing church property is zoned as I1B (Minor Institutional Zone). The zoning for the surrounding properties that form part of the proposed site plan are to be amended from R1 (Residential First Density Zone) to I1B zoning that allows for the construction of the proposed institutional building.

The intent of this report is to provide a servicing scenario for the site that is free of conflicts, provides on-site servicing in accordance with City of Ottawa design guidelines, and utilizes the existing local infrastructure in accordance with the criteria and constraints outlined through consultation with City of Ottawa staff (see Correspondence in **Appendix F**).

Figure 1: Site Location

2.0 BACKGROUND

Documents referenced in the preparation of the design for the St Mary's Coptic Orthodox Church development include:

- Geotechnical Report, St. Mary's Coptic, WSP, May 2019.
- *City of Ottawa Sewer Design Guidelines*, 2nd Ed., City of Ottawa, October 2012
- Technical Bulletin ISTB-2014-02 Revision to Ottawa Design Guidelines – Water, City of Ottawa, May 2014
- Technical Bulletin PIEDTB-2016-01 Revisions to Ottawa Design Guidelines – Sewer, City of Ottawa, September 2016
- Technical Bulletin ISTB-2018-01 Revision to Ottawa Design Guidelines – Sewer, City of Ottawa, March 2018
- City of Ottawa Design Guidelines – Water Distribution, City of Ottawa, July 2010.
- City of Ottawa Water Distribution Design Guidelines, City of Ottawa, October 2012
- Technical Bulletin ISTB-2018-02 Revision to Ottawa Design Guidelines – Water Distribution, City of Ottawa, March 2018

3.0 WATER SUPPLY SERVICING

3.1 BACKGROUND

The proposed development will consist of an existing church with the addition of a proposed 2 storey institutional building complete with associated infrastructure, parking and access areas. The site is located on the northwest corner of Canfield and Greenbank Road within the city of Ottawa. The existing church is currently serviced by the 300mm diameter watermain within the Canfield Road right of way (ROW) through a water service that will be removed upon the installation of the newly proposed site connection (see **Drawing EX-1**). The proposed water network will consist of an onsite hydrant and a 150mm diameter watermain that will connect to the existing 300mm diameter watermain along Canfield Road. Water servicing for the existing church will be provided through a connection to the proposed building internal plumbing as shown on **Drawing SSP-1**.

The property is located within the City's Pressure Zone 2W. The ground elevation at the proposed building connection is approximately 89.10m. Under normal operating conditions, hydraulic grade-lines vary from approximately 127m to 134m, confirmed through boundary conditions provided by the City (see **Appendix A.3**).

3.2 WATER DEMAND

3.2.1 Domestic Water Demand

Water demands for the development were estimated using the Ministry of Environment's Design Guidelines for Drinking Water Systems (2008) and the Ottawa Design Guidelines – Water Distribution (2010). A consumption rate of 28,000 L/gross ha/day was used to estimate the institutional average daily rate for both existing and proposed buildings.

The average day demand (AVDY) for the site was determined to be 0.14 L/s. The maximum daily demand (MXDY) is 1.5 times the AVDY for institutional areas, which is 0.21 L/s. The peak hour demand (PKHR) is 1.8 times the MXDY, resulting in 0.38 L/s. Detailed calculations are included in **Appendix A.1.**

3.2.2 Fire Flow Requirement

The water demand required to protect the buildings in case of a fire was determined using the Fire Underwriters Survey (FUS) method and in accordance with Section 7.2.11 of the Ontario Building Code. The proposed building was assessed as ordinary construction and fully sprinklered based on the building's intended use. Per FUS Guidelines, such institutional buildings are considered as low hazard occupancies. The minimum required fire flow to protect the development is 133 L/s (8,000L/min). FUS calculations can be found in **Appendix A.2**.

3.3 PROPOSED WATER SERVICING

Per the City`s site boundary conditions and based on an approximate elevation of 89.10m, adequate domestic water flows are available with a pressure range of 53.9 to 63.9 psi; which complies with the City`s preferred pressure range of 50 to 80 psi. The determined maximum day demand plus fire flow of 8,000L/min results in a residual pressure of 52.5 psi; which is above the City's requirement for a minimum residual pressure of 20 psi during fire flow conditions. As a result, the existing municipal watermain on Canfield Road is adequate to supply the development`s water needs. The proposed onsite hydrant falls within the required 45m distance to the proposed building's entrance. Moreover, the existing hydrant across the street on Canfield Road is within 75m from the proposed structure therefore it can provide 5,700 L/min (as per City of Ottawa Technical Bulleting ISTB-2018-02), which combined with the proposed fire hydrant is sufficient to meet the proposed development 8,000 L/min fire flow requirement.

3.4 SUMMARY

The proposed development is located in an area of the City's water distribution system that has sufficient capacity to provide both the required institutional and emergency fire flows.

4.0 WASTEWATER SERVICING

4.1 BACKGROUND

The existing church is currently serviced by a 150mm diameter sewer that connects to the existing 200mm diameter sanitary sewer within the Canfield Road ROW at the southern boundary of the site as shown on **Drawing EX-1**. The proposed building's sanitary discharge will be conveyed by a proposed 150mm diameter sanitary sewer and will connect into the existing church's service connection at the most downstream onsite sanitary monitoring manhole as shown on **Drawing SA-1**. The sanitary design sheet is included in **Appendix B.1**.

4.2 DESIGN CRITERIA

As outlined in the City of Ottawa Sewer Design Guidelines and the MECP's Design Guidelines for Sewage Works, the following criteria were used to calculate estimated wastewater flow rates and to size the sanitary sewers:

- Minimum Velocity – 0.6 m/s (0.8 m/s for upstream sections)
- Maximum Velocity – 3.0 m/s
- Manning roughness coefficient for all smooth wall pipes – 0.013
- Peak Factor – 1.5 (commercial and institutional)
- Extraneous Flow Allowance – 0.33 L/s/ha
- Manhole Spacing – 120 m
- Minimum Cover – 2.5m
- Average wastewater generation for institutional buildings – 28,000 L/gross ha/day

4.3 PROPOSED SERVICING

The proposed site will be serviced by gravity sewers which will direct wastewater flows (approx. 0.45 L/s with allowance for infiltration) to the existing 200mm diameter sanitary sewer along Canfield Road. A Sanitary sewer design sheet for the proposed sewers is included in **Appendix B.1**. A full port backwater valve is to be installed on the sanitary service for the proposed building to prevent any surcharge from the downstream sewer main from impacting the proposed property. A sump pump is also required in the proposed building to discharge internal sewage into the proposed sanitary sewer

The capacity of the downstream sewer has been confirmed to be sufficient to convey the additional peak flows (~0.33 L/s) from the proposed building through pre-consultation with City of Ottawa staff. City correspondence can be found in **Appendix B.2**.

5.0 STORMWATER MANAGEMENT

5.1 OBJECTIVES

The objective of this stormwater management (SWM) plan is to determine the measures required to control the quantity and quality of stormwater released from the proposed development to meet the criteria established during pre-consultation with the City and the Rideau Valley Conservation Authority (RVCA), and to provide sufficient detail for approval and construction.

5.2 SWM CRITERIA AND CONSTRAINTS

Criteria were established by combining current design practices outlined by the City of Ottawa Design Guidelines (2012), and through consultation with City of Ottawa staff. The following summarizes the criteria, with the source of each criterion indicated in brackets:

General

- Assess impact of 100 year event outlined in the City of Ottawa Sewer Design Guidelines on major & minor drainage system (City of Ottawa).
- Post development runoff from the subject site, up to and including the 100-year storm event, is to be restricted to a 2-year allowable release rate calculated using a runoff coefficient (C) equal to the lesser of a C of 0.50 or the actual pre-development existing site runoff coefficient, and a calculated time of concentration (Tc) using an appropriate method to justify the parameter selection (Tc of 20 minutes should be used for all pre-development calculations without engineering justification); Tc of 10 minutes shall be used for all post-development calculations). The pre-development drainage area (area that currently drains to the Canfield Road storm sewer) shall be used to determine the target release rate (City of Ottawa).
- Post-development site grading shall match existing property line grades in order to minimize disruption to the adjacent residential properties. It shall be documented and demonstrated that development of the existing residential lots on Parkmount Crescent does not adversely impact the drainage patterns of the subdivision (City of Ottawa).
- Provide quality control of on-site runoff to achieve 80% TSS removal (RVCA).

Storm Sewer & Inlet Controls

- Proposed site to discharge the existing 300 mm diameter storm sewer within the Canfield Road ROW at the existing dead end maintenance hole (City of Ottawa).
- A storm sewer monitoring maintenance hole is required to be installed at the property line (inside the property) (City of Ottawa).
- Size on-site storm sewers to convey at minimum the 2 year storm event under free-flow conditions using City of Ottawa I-D-F parameters (City of Ottawa). However, it should be

noted that the receiving storm sewer on Canfield Road is a 300 mm diameter pipe and as such, the proposed storm sewers across the development have been sized with a maximum diameter of 300 mm and as steep as possible while getting acceptable cover of the storm sewers at the upstream end. As a result, some of the proposed storm sewers are shown to be surcharged in the storm sewer design sheet, assuming the 2-year post development runoff is conveyed through the minor system.

- 100-year Storm HGL to be a minimum of 0.30 m below building foundation footing (City of Ottawa). However, this is not a concern since the proposed building will be equipped with a full port backwater valve and a sump pump.

Surface Storage & Overland Flow

- Building openings to be a minimum of 0.30m above the 100-year water level (City of Ottawa).
- Maximum depth of flow under either static or dynamic conditions shall be less than 0.35 m (City of Ottawa).
- Provide adequate emergency overflow conveyance off-site (City of Ottawa).

5.3 STORMWATER MANAGEMENT PLAN

The intent of the stormwater management plan presented herein is to mitigate any negative impact that the proposed development will have on the existing storm sewer infrastructure and adjacent properties while providing adequate capacity to service the proposed institutional development.

The proposed stormwater management plan is designed to detain runoff on the roof of the proposed building, on the surface within parking lot sags, and underground below the parking areas to ensure that peak flows after construction will not exceed the allowable site release rate detailed below.

In addition, it is proposed to re-direct overland runoff from the external rearyard area west of the site (DICB-7on **Drawing SD-1**) through a proposed storm sewer which will discharge into a proposed grassed swale that will direct external runoff to an existing low area in the back of Lot 13 on Parkmount Crescent as per the existing drainage patterns shown on **Drawing EXSD-1**.

5.3.1 Allowable Release Rate

Based on available topographic information, available 2k mapping, as well as visual site inspections, the existing conditions drainage patterns for the site were determined as shown on **Drawing EXSD-1**. As can be seen on the drawing, the existing condition runoff coefficient for the site area discharging into the existing Canfield Road storm sewer is greater than 0.50 and as such, 0.50 has been used for target release rate calculations.

The existing church site is currently serviced through a network of catchbasins on the parking lots, a service lateral from the existing building for foundation drainage, and existing storm sewers which are connected to the existing 300 mm diameter pipe on Canfield Road. The existing church building has an arched roof and as such uncontrolled roof runoff is discharged onto adjacent surface areas and captured into the existing parking lot catchbasins.

The time of concentration (Tc) for the existing church site was calculated using a storm sewer design sheet as shown in **Appendix C.2**. The storm sewer calculations resulted in a final time of concentration at the outlet equal to 10.96 minutes.

The modified rational method was used to estimate the target release rate for the site as summarized in **Table 1** below. Detailed calculations have been included in **Appendix C.2.**

Table 1: Stormwater Target Release Rate

Drainage Area (ha)	Runoff Coefficient (C)	Time of Concentration (min)	2-Year Intensity (mm/hr)	Target Release Rate (L/s)
0.35	0.50	11	73.17	**35.6**

1. On-site storage is to be provided to attenuate the 100-year storm peak flows to the target release rate.

5.3.2 Storage Requirements

The proposed site is 93% impervious and as such, it requires quantity control measures to meet the restrictive stormwater release criteria. Inlet control devices in combination with roof storage, surface grading, and underground storage (storage pipe/ Stormtech unit) will be provided to detain stormwater in excess of the allowable release rate and to avoid surface ponding during the 2-year event. **Drawing SD-1** shows the drainage areas, ICD and roof drain schedules, location of underground storage areas, and proposed storm sewer infrastructure.

5.4 PCSWMM MODEL

Key parameters for the subject area are summarized below; an example input file is provided for the 100-year, 3hr Chicago storm which indicates all other parameters (see **Appendix C.3**). This analysis was performed using PCSWMM, which is a front-end GUI to the EPA-SWMM engine. Model files can be examined in any program which can read EPA-SWMM files version 5.1.013.

5.4.1 Hydrologic Parameters

Table 2 presents the general subcatchment parameters used:

Table 2: General Subcatchment Parameters

Subcatchment Parameter	Value
Infiltration Method	Horton

Subcatchment Parameter	Value
Max. Infil. Rate (mm/hr)	76.2
Min. Infil. Rate (mm/hr)	13.2
Decay Constant (1/hr)	4.14
N Imperv	0.013
N Perv	0.25
Dstore Imperv (mm)	1.57
Dstore Perv (mm)	4.67

Table 3 presents the individual parameters that vary for each of the proposed and existing subcatchments tributary to the Canfield Road storm sewer.

Table 3: Subcatchment Parameters

Area ID	Area (ha)	Width (m)	Slope (%)	% Impervious	Runoff Coefficient	Description
DICB-6	0.14	44.0	1.0	18.6%	0.33	External Area
DICB-7	0.14	58.0	1.0	20.0%	0.34	External Area
EX-BLDG_1	0.02	43.0	1.0	100.0%	0.90	Existing Building
EX-BLDG_2	0.02	43.0	1.0	100.0%	0.90	Existing Building
L101A	0.07	70.0	1.0	95.7%	0.87	Parking
L102A	0.06	62.0	1.0	81.4%	0.77	Parking
L102B	0.09	58.0	1.0	90.0%	0.83	Parking
L102C	0.10	138.0	1.0	92.9%	0.85	Parking
L102D	0.04	60.0	1.0	87.1%	0.81	Parking
R102A	0.12	96.0	0.5	100.0%	0.90	Prop. Roof Storage
UNC-1	0.00	4.0	1.0	78.6%	0.75	Uncontrolled

1. Width parameter measured as twice the length of the flow path for two-sided catchments and equal to the length of the flow path for one-sided catchments.

Table 4 summarizes the storage node parameters used in the model. All catchbasins have been modeled as having an outlet invert as depicted on **Drawings SSP-1**.

Table 4: Storage Node Parameters

Storage Node	Invert Elevation (m)	Rim Elevation[1] (m)	Total Depth (m)	Underground Storage Description
CB3	86.86	88.83	1.97	45m of 900 mm dia. pipe
CB2	86.81	89.00	2.19	40m of 900 mm dia. pipe

Storage Node	Invert Elevation (m)	Rim Elevation[1] (m)	Total Depth (m)	Underground Storage Description
CB1	86.87	88.77	1.90	8m of 900 mm dia. pipe
CB5	87.05	88.87	1.82	Stormtech SC-310 (Approx. 40m)
CB4	86.99	88.87	1.88	6m of 900 mm dia. pipe
ROOF_102A-S	100.00	100.30	0.30	Roof Storage

1. The rim of the storage node represents the maximum allowable flow depth elevation above the storage node (equal to the top of the CB plus the static ponding depth, plus an additional 5cm for subcatchments allowed to cascade downstream).
2. Storage Node ROOF_102A-S represents the proposed building roof storage so the rim and invert elevations used are assumed values to obtain the ponding depths.

5.4.2 Hydraulic Parameters

As per the City of Ottawa Sewer Design Guidelines (2012), Manning's roughness values of 0.013 were used for sewer modeling and overland flow corridors representing roadways.

Storm sewers were modeled to assess friction losses, exit losses, to estimate storage requirements and to determine minor system peak outflows to the outlet. The detailed storm sewer design sheet is included in **Appendix C.1**.

Table 5 below presents the parameters for the outlet links which represent ICDs. An appropriate discharge coefficient was applied for all modeled ICDs.

Table 5: Outlet Parameters for Proposed Catchments

Orifice Name	Catchbasin ID	Tributary Area ID	ICD Type
L101A-O	CB-2	L101A	LMF75
L102A-O	CB-1	L102A	LMF75
L102B-O	CB-3	L102B	LMF75
L102C-O	CB-5	L102C	LMF75
L102D-O	CB-4	L102D	LMF75

The proposed building will provide roof storage. Roof storage requirements and controlled release rate estimates were obtained assuming Standard Watts Model R1100 Accuflow roof drains, 50% open. It is important to note that these roof drains can be replaced by other approved equivalent and that the number of drains can be reduced if multiple-notch drains are used. **Table 6** below presents the parameters for the outlet link and storage node used to represent the proposed roof drains and available storage.

Table 6: Roof Drain Assumptions for Proposed Building

Area ID	Area (m^2)	Number of Drains	Storage Available (m^3)
R102A	1,190	5	48

5.4.3 Model Results and Discussion

Due to grading constraints, one minor subcatchment at the access road (UNC-1) cannot be graded to enter the site minor system and as such it will sheet drain uncontrolled to Canfield Road. Runoff from this uncontrolled area has been considered in the overall release rate to the Canfield Road storm sewer.

As can be seen on **Drawing SD-1**, the existing uncontrolled area sheet draining to Greenbank Road remains the same as per existing conditions and as such it has not been included in the SWM calculations for the proposed development.

Table 7 summarizes the peak uncontrolled 100-year catchment release rates for the uncontrolled catchment tributary to the Canfield Road storm sewer.

Table 7: Peak Uncontrolled (Non-Tributary) 100-Year Release Rate

Area ID	Area (ha)	Qrelease (L/s)
UNC 1	0.005	2.3

Table 8 provides a summary of the storage results from the PCSWMM model.

Table 8: Post Development Storage Requirements

Storage Node ID/Lowest Catchbasin ID	Lowest Catchbasin Top of Grate Elevation (m)	Available Storage (m^3)			Storage Requirements (m^3)	
		Surface Storage	Underground Storage	Total Storage	2-year	100-year
CB3/CB-3	88.52	16.1	28.6	44.7	18.0	47.0
CB2/CB-2	88.80	12.6	25.4	38.0	14.0	36.0
CB1/CB-1A	88.47	37.8	5.1	42.9	5.0	19.0
CB5/CB-5A	88.52	51.1	15.0	66.1	14.0	39.0
CB4/CB-4	88.52	16.5	3.8	20.3	3.0	10.0
ROOF_102A-S	N/A	47.6	N/A	47.6	17.0	48.0

1. 100-year overflows from storage node CB3 spill onto CB1 and have been accounted for in PCSWMM

A Stormtech underground storage system has been sized to provide a volume of 15.0m^3 in area L102C where insufficient cover was available to provide 900 mm diameter pipe for underground storage. **Table 9** summarizes the proposed ICD / roof drain release rates.

Table 9: Proposed ICD/Roof Drains 100-Year Release Rates

Drainage Area	ICD Type	Catchbasin ID	100-year Head (m)	100-Year Release Rate (L/s)
L101A	LMF75	CB-2	2.17	7.1
L102A	LMF75	CB-1	1.78	6.3
L102B	LMF75	CB-3	1.92	6.5
L102C	LMF75	CB-5	1.68	6.4
L102D	LMF75	CB-4	1.71	6.4
R102A	5 x Standard Watts Model R1100 Accuflow Roof Drains- 50% open	N/A	0.15	6.3

The City requires that no surface ponding occurs on the proposed parking lot areas in the 2-year storm and that the maximum total flow depth on the surface be restricted to 35 cm in the 100-year storm. **Table 10** summarizes the total ponding results for the 2-year and 100-year storms as obtained from the PCSWMM models.

Table 10: Total Surface Flow Depth Results

Storage Node ID	Catchbasin ID	Top of Grate Elevation (m)	2 year, 3hr Chicago		100 year, 3hr Chicago	
			Max Surface HGL (m)	Total Surface Ponding Depth (m)	Max Surface HGL (m)	Total Surface Ponding Depth (m)
CB3	CB-3	88.52	87.58	-0.94	88.78	0.26
CB2	CB-2	88.80	87.48	-1.32	88.98	0.18
CB1	CB-1A	88.47	88.09	-0.38	88.65	0.18
CB5	CB-5A	88.52	87.77	-0.75	88.73	0.21
CB4	CB-4	88.52	87.79	-0.73	88.70	0.18
ROOF_102A-S	N/A	100.00	100.11	0.11	100.15	0.15

Table 11 shows the proposed stormwater release rate from the site as obtained from the PCSWMM model for the 100-year, 3hr Chicago storm.

Table 11: Summary of Total 100-Year Release Rates

Minor System 100-Year Release Rate (L/s)	Uncontrolled Area release Rate (L/s)	Target Release Rate (L/s)
38.9	2.3	35.6

As can be seen in the table above, the total 100-year release rate from the site is approximately 41.2 L/s which exceeds the target release rate by 5.6 L/s. This value is considered negligible and it should be noted that although there is available storage on-site to further reduce the release rate from the site, smaller ICD sizes would not adhere to the minimum ICD size and release rate required by the City of Ottawa.

5.5 EXTERNAL RUNOFF

Based on the information available, existing runoff from the rearyard of units 19, 17, and 15 on Parkmount Crescent currently drains north overland to an existing low lying area in the back of unit 13 as shown on **Drawing EXSD-1**. It appears that ponding currently occurs at that location before spilling and continuing north along the rearyards of the units fronting on Parkmount Crescent. Given that the proposed development will be built over units 17 and 15, additional drainage measures are required to direct external runoff from area DICB-7 as shown on **Drawing SD-1** to its current outlet.

As a result, it is proposed to install a 250 mm diameter storm sewer, which will be equipped with a headwall at each end to capture runoff from the external area to the west and convey it to a proposed grassed swale in the back of unit 13 and ultimately to its current outlet. The proposed storm sewer has been sized to convey the 100-year runoff from the external area and it has been included in the storm sewer design sheet included in **Appendix C.1**. The proposed storm sewer, grassed swale and external areas have been included in the PCSWMM model to confirm conveyance capacity and water levels.

5.6 WATER QUALITY CONTROL

The site requires quality control measures to meet 80% Total suspended solids (TSS) removal to conform with the restrictions set out by the RVCA during pre-consultation (see correspondence in **Appendix C.5**). The proposed Stormceptor STC-750 has been sized to provide 83% TSS removal from the contributing parking lot areas. For further details regarding the sizing and specifications of the Stormceptor STC-750 see **Appendix C.4**.

6.0 GRADING AND DRAINAGE

The proposed development site measures approximately 0.73ha in area. Runoff from most of the existing development is captured into the existing parking lot catchbasins and directed south towards Canfield Road with a small portion that slopes towards Greenbank Road along the frontage of the existing church. Rearyard runoff from the existing adjacent residential units fronting Parkmount Crescent generally drains overland in a northern direction. However, there appears to be a localized low point in the back of unit 13, where runoff seems to pond before spilling in the back of unit 11 (see **Drawing EXSD-1**).

Proposed onsite grading has been designed to provide an overland flow outlet towards Canfield Road for most of the site, while keeping the existing sheet drainage towards Greenbank Road along the frontage of the existing church and along the eastern boundary of the proposed building. A proposed swale has been provided along a portion of the northern property line to direct external runoff from the existing rear yard areas west of the site towards the back of unit 11 on Canfield Road as per existing drainage conditions.

A detailed grading plan (see **Drawing GP-1**) has been provided to satisfy the stormwater management requirements, adhere to any geotechnical restrictions (see **Section 10.0**) for the site, manage external overland drainage, and provide for minimum cover requirements for storm and sanitary sewers where possible. Site grading has been established to provide emergency overland flow routes required for stormwater management in accordance with City of Ottawa requirements.

7.0 UTILITIES

As the subject site lies within a mature developed residential community, Hydro, Bell, Gas and Cable servicing for the proposed development should be readily available within the overhead or subsurface plant within the adjacent right of ways. Exact size, location and routing of utilities, along with determination of any off-site works required for redevelopment, will be finalized after design circulation.

8.0 APPROVALS

Ontario Ministry of the Environment, Conservation and Parks (MECP) Environmental Compliance Approvals (ECA) are expected to be required as the proposed site consolidates multiple properties with separate drainage outlets into a singular property under singular ownership.

Requirement for a MECP Permit to Take Water (PTTW) is unlikely for the site due to the limited size of excavations. The geotechnical consultant shall confirm at the time of application that a PTTW is not required.

The RVCA has been consulted and will permit the ultimate discharge of site generated stormwater runoff to Jacob's Creek watercourse provided that 80% TSS removal is achieved with onsite measures of water quality control.

9.0 EROSION CONTROL DURING CONSTRUCTION

Erosion and sediment controls must be in place during construction. The following recommendations to the contractor will be included in contract documents.

1. Implement best management practices to provide appropriate protection of the existing and proposed drainage system and the receiving water course(s).
2. Limit extent of exposed soils at any given time.
3. Re-vegetate exposed areas as soon as possible.
4. Minimize the area to be cleared and grubbed.
5. Protect exposed slopes with plastic or synthetic mulches.
6. Provide sediment traps and basins during dewatering.
7. Install sediment traps (such as SiltSack® by Terrafix) between catch basins and frames.
8. Plan construction at proper time to avoid flooding.

The contractor will, at every rainfall, complete inspections and guarantee proper performance. The inspection is to include:

9. Verification that water is not flowing under silt barriers.
10. Clean and change silt traps at catch basins.

Refer to **Drawing ECDS-1** for the proposed location of silt fences and other erosion control structures.

10.0 GEOTECHNICAL INVESTIGATION AND ENVIRONMENTAL ASSESSMENT

A geotechnical Investigation report was prepared by WSP in May 2019. The report summarizes the existing soil conditions within the subject area and construction recommendations. For details which are not summarized below, please see the original WSP report found in **Appendix D**.

Subsurface soil conditions within the subject area were determined from boreholes distributed across the site. The investigation concluded that the site consisted of asphaltic concrete pavement structure over fill that consisted of silty sand or clay. Bedrock and Auger refusal were not encountered and therefore are at an assumed depth of below 9.8m from ground surface. The ground water level was determined to be between 7.4m and 7.6m below ground surface. The geotechnical report assumed that no grade raises were proposed for the site and although there are no proposed grade raises for the majority of the site, the northern portion of the site will be raised by a maximum of 0.5m to direct overland flows to Canfield Road and get acceptable cover over the sewers.

The required pavement structure of the proposed hard surfaced areas is outlined in **Table 12.**

Table 12: Pavement Structure – Car Only Parking Areas

Light Duty Traffic Thickness (mm)- Cars Only Parking Lots	Heavy Duty Thickness (mm)- Parking Lots and Access Roads	Material Description
40 mm HL3 or SP-12.5 40 mm HL8 or SP-19B	40 mm HL3 or SP-12.5 90 mm HL8 or SP-19	Asphaltic Concrete
200	200	OPSS Granular A Base
250	400	OPSS Granular B Sub-base

11.0 CONCLUSIONS

11.1 WATER SERVICING

Based on the supplied boundary conditions for the existing watermain and estimated domestic and fire flow demands for the subject site, it is anticipated that the proposed servicing in this development will provide sufficient capacity to sustain both the required institutional demands and emergency fire flow demands of the proposed site. Fire flows greater than those required per the FUS Guidelines are available for this development.

11.2 SANITARY SERVICING

The proposed sanitary sewer network is sufficiently sized to provide gravity drainage for the site. The proposed site will be serviced by a gravity sewer service lateral which will direct wastewater flows (approx. 0.45 L/s) to the existing 200mm dia. sanitary sewer within the Canfield Road ROW at the southwest boundary of the proposed site. It has been determined through pre-consultation with the City of Ottawa staff that the downstream sanitary sewer network has sufficient capacity to receive the peak sanitary discharge from the site.

11.3 STORMWATER SERVICING

The proposed stormwater management plan is in accordance with design practices by the City of Ottawa Design Guidelines (2012). Surface storage on parking areas, underground storage within 900 mm diameter pipes and Stormtech storage units, and roof storage on the proposed building will be provided to limit peak storm sewer inflows to downstream storm sewers to the target release rate. Enhanced level of quality control equivalent to 80% TSS removal will be provided through a Stormceptor unit 750.

A proposed storm sewer and a grassed swale will be provided to direct external overland drainage from the residential areas west of the site to the back of unit 11 on Canfield Road as per existing drainage conditions.

11.4 GRADING

Grading for the site has been designed to provide an emergency overland flow route as per City requirements and reflects the overall recommendations provided in the Geotechnical Investigation. Erosion and sediment control measures will be implemented during construction to reduce the impact on existing facilities.

11.5 UTILITIES

It is anticipated that existing infrastructure will be sufficient to provide a means of distribution for the proposed site. Exact size, location and routing of utilities will be finalized after design circulation.

11.6 APPROVALS/PERMITS

Ontario Ministry of the Environment, Conservation and Parks (MECP) Environmental Compliance Approvals (ECA) are expected to be required for the subject site. Approval from the RVCA is anticipated given the stormwater management design adheres to the quality control restrictions provided in pre-consultation.

Appendix A WATER SUPPLY SERVICING

A.1 DOMESTIC WATER DEMAND ESTIMATE

St Marys Coptic Church Expansion - Domestic Water Demand Estimates

- Based on N45 Architecture Inc. Architectural Site Plan (160410203)

Building ID	Area (m^2)	Population	Daily Rate of Demand [1]	Avg Day Demand [2]		Max Day Demand [3]		Peak Hour Demand [3]	
				(L/min)	(L/s)	(L/min)	(L/s)	(L/min)	(L/s)
Proposed Building	3398	-	28,000	6.6	0.110	9.9	0.165	17.8	0.297
Existing Church	921	-	28,000	1.8	0.030	2.7	0.045	4.8	0.081
Total Site :				**8.4**	**0.14**	**12.6**	**0.21**	**22.7**	**0.38**

1 The above calculations assume both the proposed building and existing church fall under the institutional demand rate of 28,000 (L/ha/d) utilizing their respective gross area. These values reference the City of Ottawa Water Distribution Design Guidelines (2010)

2 City of Ottawa water demand criteria used to estimate peak demand rates for insitutional areas are as follows:

maximum day demand rate = 1.5 x average day demand rate

maximum hour demand rate = 1.8 x maximum day demand rate

A.2 FIRE FLOW REQUIREMENTS PER FUS

Stantec

FUS Fire Flow Calculation Sheet

Stantec Project #: 160410203
Project Name: St Mary's Coptic Church
Date: 11/4/2019
Fire Flow Calculation #: 1
Description: Church Expansion Building

Notes:

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Ordinary Construction						1	-
2	Determine Ground Floor Area of One Unit	-						1174	-
	Determine Number of Adjoining Units	-						1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						2	-
4	Determine Required Fire Flow	($F = 220 \times C \times A^{1/2}$). Round to nearest 1000 L/min						-	11000
5	Determine Occupancy Charge	Limited Combustible						-15%	9350
6	Determine Sprinkler Reduction	Conforms to NFPA 13						-30%	-3740
		Standard Water Supply						-10%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						100%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	> 45	16	2	31-60	Wood Frame or Non-Combustible	0%	2151
		East	> 45	26	2	31-60	Wood Frame or Non-Combustible	0%	
		South	0 to 3	25	2	31-60	Wood Frame or Non-Combustible	23%	
		West	> 45	14	2	0-30	Wood Frame or Non-Combustible	0%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							8000
		Total Required Fire Flow in L/s							133.3
		Required Duration of Fire Flow (hrs)							2.00
		Required Volume of Fire Flow (m^3)							960

A.3 BOUNDARY CONDITIONS

Odam, Cameron

From: Armstrong, Justin <justin.armstrong@ottawa.ca>
Sent: Friday, November 08, 2019 7:45 AM
To: Odam, Cameron
Cc: Kilborn, Kris; Paerez, Ana; Surprenant, Eric
Subject: RE: St Mary's Coptic Church- Sanitary peak flow downstream capacity
Attachments: 1 Canfield Nov 2019.pdf

Hi Cameron,

I will follow up with our Asset Management Branch (AMB) to see if there are any known downstream capacity issues – if AMB is unsure, it may be up to you to demonstrate that no capacity issues exist downstream. Is the existing church currently connected to the 200mm SANI in Canfield?

Additionally, you can find boundary conditions based on the new demands you provided below.

Estimated domestic demands and fire flow requirements for the site are as follows:
Average Day Demand - 0.14L/s
Max Day Demand - 0.21L/s
Peak Hour Demand - 0.38L/s

Fire Flow Requirement per FUS - 133L/s (8 000L/m)

The following are boundary conditions, HGL, for hydraulic analysis at 1 Canfield (zone 2W) assumed to be connected to the 305mm on Canfield (see attached PDF for location).

Minimum HGL = 127.0m

Maximum HGL = 134.0m

MaxDay + FireFlow (133L/s) = 126.0m

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

Regards,

Justin Armstrong, E.I.T.
Engineering Intern
Planning, Infrastructure and Economic Development Department - Services de la planification, de l'infrastructure et du développement économique
Development Review - West Branch
City of Ottawa | Ville d'Ottawa

110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2400 ext./poste 21746, justin.armstrong@ottawa.ca

From: Odam, Cameron <Cameron.Odam@stantec.com>
Sent: November 07, 2019 11:32 AM
To: Armstrong, Justin <justin.armstrong@ottawa.ca>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>; Paerez, Ana <Ana.Paerez@stantec.com>; Surprenant, Eric <Eric.Surprenant@ottawa.ca>
Subject: St Mary's Coptic Church- Sanitary peak flow downstream capacity

Hi Justin,

Can you please provide me with confirmation that our total projected sanitary peak flow of **0.45 L/s** for the proposed site, that includes both proposed and existing buildings, falls within the sanitary sewer downstream capacity? The site would outlet to the 200mm sanitary sewer along Canfield road adjacent to the proposed site at 1 Canfield Road. I have attached a PDF of the sanitary design sheet for your reference. Please let me know if you have any questions.

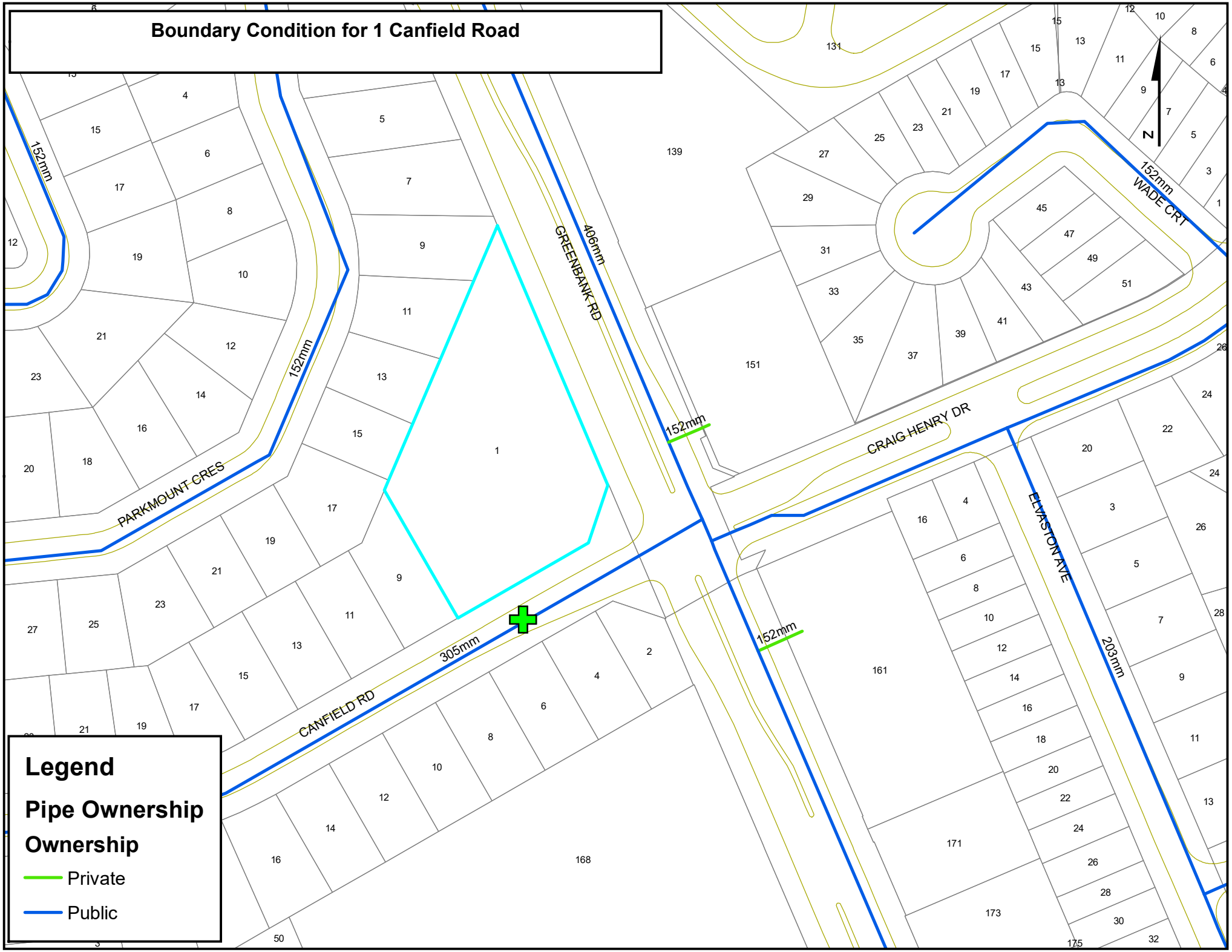
Thanks in advance,

Cameron

Cameron Odam

Direct: +16137244353
Fax: +16137222799
Cameron.Odam@stantec.com

Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4


Boundary Condition for 1 Canfield Road
Legend
Pipe Ownership
Ownership
Private
Public
CANFIELD RD
305mm
PARKMOUNT CRES
152mm
GREENBANK RD
406mm
CRAIG HENRY DR
152mm
ELVASTON AVE
203mm
WADE CRT
152mm
N
1
2
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Appendix B WASTEWATER SERVICING

B.1 SANITARY SEWER DESIGN SHEET

SITE PLAN:

St. Mary's Coptic Church

DATE: 11/21/2019
REVISION:
DESIGNED BY: CO
CHECKED BY: AMP

SANITARY SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160410203

DESIGN PARAMETERS

MAX PEAK FACTOR (RES.)=	4.0	AVG. DAILY FLOW / PERSON	280	L/p/day	MINIMUM VELOCITY	0.60	m/s
MIN PEAK FACTOR (RES.)=	2.0	COMMERCIAL	28,000	L/ha/day	MAXIMUM VELOCITY	3.00	m/s
PEAKING FACTOR (INDUSTRIAL):	2.4	INDUSTRIAL (HEAVY)	55,000	L/ha/day	MANNINGS n	0.013	
PEAKING FACTOR (ICI >20%):	1.5	INDUSTRIAL (LIGHT)	35,000	L/ha/day	BEDDING CLASS	B	
PERSONS / SINGLE	3.4	INSTITUTIONAL	28,000	L/gross ha/day	MINIMUM COVER	2.50	m
PERSONS / TOWN	2.7	INFILTRATION	0.33	L/s/ha	HARMON CORRECTION FACTOR	0.8	
PERSONS / APARTMENT	1.8						

LOCATION			RESIDENTIAL AREA AND POPULATION								COMMERCIAL		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / UNUSED		C+I+I	INFILTRATION			TOTAL	PIPE								
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA	SINGLE	TOWN	APARTMENT	POP.	CUMULATIVE AREA	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	PEAK FLOW	TOTAL AREA	ACCU. AREA	INFILT. FLOW	PEAK FLOW	LENGTH	DIA	MATERIAL	CLASS	SLOPE	CAP. (FULL)	CAP. V PEAK FLOW	VEL. (FULL)	VEL. (ACT.)
			(ha)					(ha)			(L/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(ha)	(ha)	(L/s)	(L/s)	(m)	(mm)			(%)	(L/s)	(%)	(m/s)	(m/s)
I1B	BUILD	EX MH1	0.000	0	0	0	0	0.00	0	4.00	0.00	0.000	0.000	0.00	0.00	0.00	0.00	0.34	0.34	0.00	0.00	0.17	0.510	0.51	0.17	0.33	39.8	150	PVC	DR 28	1.00	15.3	**2.18%**	0.86	0.30
I1A	EX BUILD	EX MH2	0.000	0	0	0	0	0.00	0	4.00	0.00	0.000	0.000	0.00	0.00	0.00	0.00	0.09	0.09	0.00	0.00	0.04	0.220	0.22	0.07	0.12	13.7	150	PVC	DR 28	1.00	15.3	**0.77%**	0.86	0.21
	EX MH2	EX MH1	0.000	0	0	0	0	0.00	0	4.00	0.00	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.04	0.000	0.22	0.07	0.12	9.7	150	PVC	DR 28	1.00	15.3	**0.77%**	0.86	0.21
	EX MH1	TEE	0.000	0	0	0	0	0.00	0	4.00	0.00	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.43	0.00	0.00	0.21	0.000	0.73	0.24	0.45	14.9	150	PVC	DR 28	1.00	15.3	**2.94%**	0.86	0.33

Notes:
1. Institutional area based on gross area of the building used for institutional purposes as per the proposed building architectural plans.
2. The proposed building sanitary service lateral will connect into the existing manhole (EX. MH1).

B.2 BACKGROUND EXCERPTS (SANITARY DRAINAGE)

Odam, Cameron

From: Armstrong, Justin <justin.armstrong@ottawa.ca>
Sent: Friday, November 15, 2019 11:12 AM
To: Odam, Cameron
Cc: Kilborn, Kris; Paerez, Ana; Surprenant, Eric
Subject: RE: St Mary's Coptic Church- Sanitary peak flow downstream capacity

Hi Cameron,

Just following up on this – shouldn't be an issue for the additional 0.33L/s.

Justin

Justin Armstrong, E.I.T.
Engineering Intern
Planning, Infrastructure and Economic Development Department - Services de la planification, de l'infrastructure et du développement économique
Development Review - West Branch
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2400 ext./poste 21746, justin.armstrong@ottawa.ca

From: Odam, Cameron <Cameron.Odam@stantec.com>
Sent: November 08, 2019 10:05 AM
To: Armstrong, Justin <justin.armstrong@ottawa.ca>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>; Paerez, Ana <Ana.Paerez@stantec.com>; Surprenant, Eric <Eric.Surprenant@ottawa.ca>
Subject: RE: St Mary's Coptic Church- Sanitary peak flow downstream capacity

Hi Justin,

Yes – the proposed building will contribute an additional 0.33 L/s.

Cameron

From: Armstrong, Justin <justin.armstrong@ottawa.ca>
Sent: Friday, November 08, 2019 8:17 AM
To: Odam, Cameron <Cameron.Odam@stantec.com>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>; Paerez, Ana <Ana.Paerez@stantec.com>; Surprenant, Eric <Eric.Surprenant@ottawa.ca>
Subject: RE: St Mary's Coptic Church- Sanitary peak flow downstream capacity

Thanks Cameron,

So just to be clear, the 0.45 L/s you referenced earlier is for the entire site (new + proposed)? Based on the design sheet you had attached it looks like the proposed building will be contributing an additional 0.33 L/s to the system?

Justin

From: Odam, Cameron <Cameron.Odam@stantec.com>
Sent: November 08, 2019 8:12 AM
To: Armstrong, Justin <justin.armstrong@ottawa.ca>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>; Paerez, Ana <Ana.Paerez@stantec.com>; Surprenant, Eric <Eric.Surprenant@ottawa.ca>
Subject: RE: St Mary's Coptic Church- Sanitary peak flow downstream capacity

Hi Justin,

Thanks for providing us with the boundary conditions. As for the sanitary peak flow capacity, the existing church is, as you mentioned, currently connected to the 200mm sanitary sewer on Canfield Road. The same connection point is planned to be used for the proposed building by tying into the existing church's sanitary service upstream (onsite). Please let me know once you hear from AMB and what they come up with.

Best,

Cameron

From: Armstrong, Justin <justin.armstrong@ottawa.ca>
Sent: Friday, November 08, 2019 7:45 AM
To: Odam, Cameron <Cameron.Odam@stantec.com>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>; Paerez, Ana <Ana.Paerez@stantec.com>; Surprenant, Eric <Eric.Surprenant@ottawa.ca>
Subject: RE: St Mary's Coptic Church- Sanitary peak flow downstream capacity

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Additionally, you can find boundary conditions based on the new demands you provided below.

Estimated domestic demands and fire flow requirements for the site are as follows:
Average Day Demand - 0.14L/s
Max Day Demand - 0.21L/s
Peak Hour Demand - 0.38L/s

Fire Flow Requirement per FUS - 133L/s (8 000L/m)

The following are boundary conditions, HGL, for hydraulic analysis at 1 Canfield (zone 2W) assumed to be connected to the 305mm on Canfield (see attached PDF for location).

Minimum HGL = 127.0m

Maximum HGL = 134.0m

MaxDay + FireFlow (133L/s) = 126.0m

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation

of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

Regards,

Justin Armstrong, E.I.T.
Engineering Intern
Planning, Infrastructure and Economic Development Department - Services de la planification, de l'infrastructure et du développement économique
Development Review - West Branch
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2400 ext./poste 21746, justin.armstrong@ottawa.ca

From: Odam, Cameron <Cameron.Odam@stantec.com>
Sent: November 07, 2019 11:32 AM
To: Armstrong, Justin <justin.armstrong@ottawa.ca>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>; Paerez, Ana <Ana.Paerez@stantec.com>; Surprenant, Eric <Eric.Surprenant@ottawa.ca>
Subject: St Mary's Coptic Church- Sanitary peak flow downstream capacity

Hi Justin,

Can you please provide me with confirmation that our total projected sanitary peak flow of **0.45 L/s** for the proposed site, that includes both proposed and existing buildings, falls within the sanitary sewer downstream capacity? The site would outlet to the 200mm sanitary sewer along Canfield road adjacent to the proposed site at 1 Canfield Road. I have attached a PDF of the sanitary design sheet for your reference. Please let me know if you have any questions.

Thanks in advance,

Cameron

Cameron Odam

Direct: +16137244353
Fax: +16137222799
Cameron.Odam@stantec.com

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400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

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Appendix C STORMWATER MANAGEMENT

C.1 STORM SEWER DESIGN SHEET

Stantec

St. Mary's Coptic Orthodox Church

DATE: 2019-11-25
REVISION: 1
DESIGNED BY: CO
CHECKED BY: AMP

FILE NUMBER: **160410203**

STORM SEWER DESIGN SHEET
(City of Ottawa)

DESIGN PARAMETERS

$I = a / (t+b)^c$ (As per City of Ottawa Guidelines, 2012)

	1:2 yr	1:5 yr	1:10 yr	1:100 yr
a =	732.951	998.071	1174.184	1735.688
b =	6.199	6.053	6.014	6.014
c =	0.810	0.814	0.816	0.820

MANNING'S n = 0.013 BEDDING CLASS = B
MINIMUM COVER: 2.00 m
TIME OF ENTRY 10 min

LOCATION			DRAINAGE AREA																					PIPE SELECTION										
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (2-YEAR) (ha)	AREA (5-YEAR) (ha)	AREA (10-YEAR) (ha)	AREA (100-YEAR) (ha)	AREA (ROOF) (ha)	C (2-YEAR) (-)	C (5-YEAR) (-)	C (10-YEAR) (-)	C (100-YEAR) (-)	A x C (2-YEAR) (ha)	ACCUM AxC (2YR) (ha)	A x C (5-YEAR) (ha)	ACCUM. AxC (5YR) (ha)	A x C (10-YEAR) (ha)	ACCUM. AxC (10YR) (ha)	A x C (100-YEAR) (ha)	ACCUM. AxC (100YR) (ha)	T of C (min)	$I_{2\text{-YEAR}}$ (mm/h)	$I_{5\text{-YEAR}}$ (mm/h)	$I_{10\text{-YEAR}}$ (mm/h)	$I_{100\text{-YEAR}}$ (mm/h)	$Q_{CONTROL}$ (L/s)	ACCUM. $Q_{CONTROL}$ (L/s)	Q_{ACT} (CIA/360) (L/s)	LENGTH (m)	PIPE WIDTH OR DIAMETEI (mm)	PIPE HEIGHT (mm)	PIPE SHAPE (-)	MATERIAL (-)	CLASS (-)	SLOPE %	Q_{CAP} (FULL) (L/s)	% FULL (-)	VEL. (FULL) (m/s)	VEL. (ACT) (m/s)	TIME OF FLOW (min)
DICB-7	DICB-7	Headwall	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.34	0.000	0.000	0.000	0.000	0.000	0.000	0.048	0.048	10.00	76.81	104.19	122.14	178.56	0.0	0.0	23.6	55.9	250	250	CIRCULAR	PVC	-	0.65	48.7	**48.48%**	0.98	0.83	1.12
																				11.12																			
L102C	CB-5	102	0.10	0.00	0.00	0.00	0.00	0.85	0.00	0.00	0.00	0.085	0.085	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	18.1	14.3	200	200	CIRCULAR	PVC	-	1.00	33.3	**54.44%**	1.05	0.92	0.26
																				10.26																			
L102D	CB-4	102	0.04	0.00	0.00	0.00	0.00	0.81	0.00	0.00	0.00	0.032	0.032	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	6.9	1.4	200	200	CIRCULAR	PVC	-	1.00	33.3	**20.75%**	1.05	0.69	0.03
																				10.03																			
L102B, Half of EX-BLDG	CB-3	102	0.12	0.00	0.00	0.00	0.00	0.85	0.00	0.00	0.00	0.097	0.097	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	20.7	1.4	200	200	CIRCULAR	PVC	-	1.00	33.3	**62.26%**	1.05	0.96	0.02
																				10.02																			
L102A	CB-1	102	0.06	0.00	0.00	0.00	0.00	0.77	0.00	0.00	0.00	0.046	0.046	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	9.9	7.2	200	200	CIRCULAR	PVC	-	1.00	33.3	**29.59%**	1.05	0.77	0.16
																				10.16																			
R102A	BLDG	102	0.00	0.00	0.00	0.00	0.12	0.90	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	6.3	6.3	6.3	3.0	150	150	CIRCULAR	PVC	-	1.00	15.3	**41.15%**	0.86	0.69	0.07
																				10.07																			
	102	101	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.261	0.000	0.000	0.000	0.000	0.000	0.000	10.26	75.83	102.85	120.55	176.23	0.0	6.3	61.2	60.3	300	300	CIRCULAR	PVC	-	0.34	56.1	**109.21%**	0.80	0.80	1.26
																				11.52																			
L101A, Half of EX-BLDG	CB-2	101	0.10	0.00	0.00	0.00	0.00	0.88	0.00	0.00	0.00	0.083	0.083	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	17.8	7.6	200	200	CIRCULAR	PVC	-	1.00	33.3	**53.42%**	1.05	0.91	0.14
																				10.14																			
	101	100A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.344	0.000	0.000	0.000	0.000	0.000	0.000	11.52	71.42	96.79	113.43	165.76	0.0	6.3	74.6	34.7	300	300	CIRCULAR	PVC	-	0.26	49.0	**152.13%**	0.70	0.70	0.83
	100A	100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.344	0.000	0.000	0.000	0.000	0.000	0.000	12.35	68.82	93.22	109.23	159.59	0.0	6.3	72.1	2.0	300	300	CIRCULAR	PVC	-	0.34	56.1	128.60%	0.80	0.80	0.04
	100	EX MH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.344	0.000	0.000	0.000	0.000	0.000	0.000	12.39	68.70	93.05	109.02	159.29	0.0	6.3	72.0	8.8	300	300	CIRCULAR	PVC	-	0.34	56.1	**128.39%**	0.80	0.80	0.18
																				12.58																			

C.2 EXISTING DEVELOPMENT CONDITIONS CALCULATIONS

Stantec

St. Mary's Coptic Orthodox Church - 1 Canfield Road	
DATE:	2019-11-22
REVISION:	1
DESIGNED BY:	AMP
CHECKED BY:	-

STORM SEWER DESIGN SHEET
(City of Ottawa)

Existing Development Conditions to estimate time of concentration

FILE NUMBER: 160410203

DESIGN PARAMETERS

$I = a / (t+b)^c$ (As per City of Ottawa Guidelines, 2012)

	1:2 yr	1:5 yr	1:10 yr	1:100 yr
a =	732.951	998.071	1174.184	1735.688
b =	6.199	6.053	6.014	6.014
c =	0.810	0.814	0.816	0.820

MANNING'S n = 0.013 BEDDING CLASS = B
MINIMUM COVER: 2.00 m
TIME OF ENTRY 10 min

LOCATION			DRAINAGE AREA																					PIPE SELECTION										
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (2-YEAR) (ha)	AREA (5-YEAR) (ha)	AREA (10-YEAR) (ha)	AREA (100-YEAR) (ha)	AREA (ROOF) (ha)	C (2-YEAR) (-)	C (5-YEAR) (-)	C (10-YEAR) (-)	C (100-YEAR) (-)	A x C (2-YEAR) (ha)	ACCUM. AxC (2YR) (ha)	A x C (5-YEAR) (ha)	ACCUM. AxC (5YR) (ha)	A x C (10-YEAR) (ha)	ACCUM. AxC (10YR) (ha)	A x C (100-YEAR) (ha)	ACCUM. AxC (100YR) (ha)	T of C (min)	$I_{2\text{-YEAR}}$ (mm/h)	$I_{5\text{-YEAR}}$ (mm/h)	$I_{10\text{-YEAR}}$ (mm/h)	$I_{100\text{-YEAR}}$ (mm/h)	$Q_{CONTROL}$ (L/s)	ACCUM. $Q_{CONTROL}$ (L/s)	Q_{ACT} (CIA/360) (L/s)	LENGTH (m)	PIPE WIDTH OR DIAMETEI (mm)	PIPE HEIGHT (mm)	PIPE SHAPE (-)	MATERIAL (-)	CLASS (-)	SLOPE %	Q_{CAP} (FULL) (L/s)	% FULL (-)	VEL. (FULL) (m/s)	VEL. (ACT) (m/s)	TIME OF FLOW (min)
Half of EX-4, Half of EX-BLDG	CB1	CB2	0.18	0.00	0.00	0.00	0.00	0.82	0.00	0.00	0.00	0.144	0.144	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	30.7	28.3	250	250	CIRCULAR	PVC	-	1.00	60.4	**50.87%**	1.22	1.05	0.45
Half of EX-4, Half of EX-BLDG	CB2	STM	0.18	0.00	0.00	0.00	0.00	0.82	0.00	0.00	0.00	0.144	0.288	0.000	0.000	0.000	0.000	0.000	0.000	10.45	75.12	101.88	119.41	174.55	0.0	0.0	60.1	38.4	300	300	CIRCULAR	PVC	-	1.00	96.2	**62.50%**	1.37	1.25	0.51
																				10.96																		

Stormwater Management Calculations

File No: **160410203**
Project: **St. Mary's Coptic Orthodox Church**
Date: **14-Nov-19**

SWM Approach:
Post development peak flows restricted to the 2-year runoff from existing area directed to Canfiled Road storm sewer with a C of 0.50

Existing Development Site Conditions:

Overall Runoff Coefficient for Site and Sub-Catchment Areas Tributary to Canfield Road Storm Sewer

Runoff Coefficient Table								
Catchment Type	**Sub-catchment Area ID / Description**		**Area (ha) "A"**		**Runoff Coefficient "C"**	**"A x C"**		**Overall Runoff Coefficient**
Existing Parking Areas to Canfield Road Storm Sewer	EX-4	Hard	0.261		0.9	0.235		
		Soft	0.039		0.2	0.008		
		Subtotal		0.300			0.243	0.81
Existing Church Building	EX-BLDG	Hard	0.050		0.9	0.045		
		Soft	0.000		0.2	0.000		
		Subtotal		0.050			0.045	0.90
Total				**0.350**			**0.29**	
Overall Runoff Coefficient= C:								**0.82**

Stormwater Management Calculations

Project #160410203, St. Mary's Coptic Orthodox Church
Modified Rational Method Calculatons for Storage

2 yr Intensity
City of Ottawa

$I = a/(t + b)^c$

a =	732.951
b =	6.199
c =	0.81

t (min)	I (mm/hr)
10	76.81
20	52.03
30	40.04
40	32.86
50	28.04
60	24.56
70	21.91
80	19.83
90	18.14
100	16.75
110	15.57
120	14.56

Target Release Rate from Site

Subdrainage Area: Post development peak flows restricted to C=0.50
Area (ha): 0.350
C: 0.50

Time of concentration estimated based on existing storm sewer system design sheet

tc (min)	I (2 yr) (mm/hr)	Qtarget (L/s)
11	73.17	**35.6**

C.3 PCSWMM MODEL INPUT EXAMPLE

```
[TITLE]


[OPTIONS]
;;Options             Value
;;------------------ ------------
FLOW_UNITS           LPS
INFILTRATION         HORTON
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         ELEVATION
MIN_SLOPE            0
ALLOW_PONDING        YES
SKIP_STEADY_STATE    NO
START_DATE           05/09/2019
START_TIME           00:00:00
REPORT_START_DATE    05/09/2019
REPORT_START_TIME    00:00:00
END_DATE             05/10/2019
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:01:00
DRY_STEP             00:01:00
ROUTING_STEP         1
RULE_STEP            00:00:00
INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              6

[FILES]
USE HOTSTART "C:\ana's\church\PCSWMM\2CHI.HSF"

[EVAPORATION]
;;Type           Parameters
;;-------------- ----------
CONSTANT     0.0
DRY_ONLY     NO

[RAINGAGES]
;;                Rain      Time   Snow   Data
;;Name            Type      Intrvl Catch  Source
;;--------------- --------- ------ ------ ----------
RG1               INTENSITY 0:10   1.0    TIMESERIES 2yr3hrChicago

[SUBCATCHMENTS]
;;                                                 Total    Pcnt.              Pcnt.
  Curb     Snow
;;Name            Raingage         Outlet          Area     Imperv   Width    Slope
  Length   Pack
;;--------------- ---------------- ---------------- -------- -------- --------
-------- -------- --------
;0.33
```

DICB-6	RG1	headwall	0.142584	18.571	44	1
0						
;0.34						
DICB-7	RG1	DICB7	0.143068	20	58	1
0						
;0.90						
EX-BLDG_1	RG1	CB3	0.022834	100	43	1
0						
;0.90						
EX-BLDG_2	RG1	CB2	0.023271	100	43	1
0						
;0.87						
L101A	RG1	CB2	0.073558	95.714	70	1
0						
;0.77						
L102A	RG1	CB1	0.06482	81.429	62	1
0						
;0.83						
L102B	RG1	CB3	0.093194	90	58	1
0						
;0.85						
L102C	RG1	CB5	0.104131	92.857	138	1
0						
;0.81						
L102D	RG1	CB4	0.044655	87.143	60	1
0						
;0.90						
R102A	RG1	ROOF_102A-S	0.119026	100	96	0.5
0						
;0.75						
UNC-1	RG1	OF1	0.004807	78.571	4	1
0						

[SUBAREAS]

;;Subcatchment	N-Imperv	N-Perv	S-Imperv	S-Perv	PctZero	RouteTo	PctRouted
DICB-6	0.013	0.25	1.57	4.67	0	PERVIOUS	100
DICB-7	0.013	0.25	1.57	4.67	0	PERVIOUS	100
EX-BLDG_1	0.013	0.25	1.57	4.67	0	OUTLET	
EX-BLDG_2	0.013	0.25	1.57	4.67	0	OUTLET	
L101A	0.013	0.25	1.57	4.67	0	OUTLET	
L102A	0.013	0.25	1.57	4.67	0	OUTLET	
L102B	0.013	0.25	1.57	4.67	0	OUTLET	
L102C	0.013	0.25	1.57	4.67	0	OUTLET	
L102D	0.013	0.25	1.57	4.67	0	OUTLET	
R102A	0.013	0.25	1.57	4.67	0	OUTLET	
UNC-1	0.013	0.25	1.57	4.67	0	OUTLET	

[INFILTRATION]

;;Subcatchment	MaxRate	MinRate	Decay	DryTime	MaxInfil
DICB-6	76.2	13.2	4.14	7	0
DICB-7	76.2	13.2	4.14	7	0
EX-BLDG_1	76.2	13.2	4.14	7	0
EX-BLDG_2	76.2	13.2	4.14	7	0
L101A	76.2	13.2	4.14	7	0
L102A	76.2	13.2	4.14	7	0
L102B	76.2	13.2	4.14	7	0
L102C	76.2	13.2	4.14	7	0

```
L102D            76.2       13.2       4.14       7          0
R102A            76.2       13.2       4.14       7          0
UNC-1            76.2       13.2       4.14       7          0

[OUTFALLS]
;;               Invert     Outfall      Stage/Table      Tide
;;Name           Elev.      Type         Time Series      Gate Route To
;;-------------- ---------- ------------ ---------------- ---- ----------------
EX-STM           86.26      FIXED        86.86            NO
OF1              0          FREE                          NO
OF2              87.41      FREE                          NO

[STORAGE]
;;               Invert   Max.     Init.    Storage    Curve
      Evap.
;;Name           Elev.    Depth    Depth    Curve      Params
      Frac.    Infiltration parameters
;;-------------- -------- -------- -------- ---------- -------- -------- --------
-------- -------- ----------------------
CB1              86.87    1.9      0        TABULAR    L102A-V                    0
      0
CB2              86.81    2.19     0        TABULAR    L101A-V                    0
      0
CB3              86.86    1.97     0        TABULAR    L102B-V                    0
      0
CB4              86.99    1.88     0        TABULAR    L102D-V                    0
      0
CB5              87.05    1.82     0        TABULAR    L102C-V                    0
      0
DICB7            87.86    0.84     0        FUNCTIONAL 0        0        1.13     0
      0
headwall         87.5     1.46     0        FUNCTIONAL 0        0        0        0
      0
ROOF_102A-S      100      0.3      0        TABULAR    ROOF_102A-V                0
      0
STM100           86.29    3        0        FUNCTIONAL 0        0        1.13     0
      0
STM100A          86.3     2.95     0        FUNCTIONAL 0        0        1.13     0
      0
STM101           86.42    2.27     0        FUNCTIONAL 0        0        1.13     0
      0
STM102           86.63    2        0        FUNCTIONAL 0        0        1.13     0
      0

[CONDUITS]
;;               Inlet            Outlet                      Manning    Inlet
Outlet     Init.      Max.
;;Name           Node             Node             Length     N          Offset
Offset     Flow       Flow
;;-------------- ---------------- ---------------- ---------- ---------- ----------
---------- ---------- ----------
C1               STM102           STM101           60.3       0.013      86.93
86.72      0          0
C2               STM101           STM100A          34.7       0.013      86.72
86.63      0          0
C3               STM100A          STM100           2          0.013      86.6
86.59      0          0
C4               STM100           EX-STM           8.8        0.013      86.59
86.56      0          0
C5               headwall         OF2              24.4       0.035      87.5
87.41      0          0
C6               DICB7            headwall         55.9       0.013      87.86
87.5       0          0
```

```
[WEIRS]
;;               Inlet            Outlet           Weir         Crest      Disch.
 Flap End      End
;;Name           Node             Node             Type         Height     Coeff.
 Gate Con.     Coeff.     Surcharge  RoadWidth  RoadSurf   Coeff. Curve
;;-------------- ---------------- ---------------- ------------ ----------
---------- ---- -------- ---------- ---------- ---------- ----------
----------------
L102B-OV         CB3              CB1              TRANSVERSE   88.78      1.84
 NO   0        0           YES
L102C-OV         CB5              CB1              TRANSVERSE   88.82      1.84
 NO   0        0           YES
L102D-OV         CB4              CB3              TRANSVERSE   88.82      1.84
 NO   0        0           YES

[OUTLETS]
;;               Inlet            Outlet           Outflow    Outlet
Qcoeff/                    Flap
;;Name           Node             Node             Height     Type
QTable         Qexpon     Gate
;;-------------- ---------------- ---------------- ---------- ----------------
---------------- ---------- ----
L101A-O          CB2              STM101           86.81      FUNCTIONAL/HEAD  5.005
          0.5         NO
L102A-O          CB1              STM102           86.87      FUNCTIONAL/HEAD  5.005
          0.5         NO
L102B-O          CB3              STM102           86.86      FUNCTIONAL/HEAD  5.005
          0.5         NO
L102C-O          CB5              STM102           87.05      FUNCTIONAL/HEAD  5.005
          0.5         NO
L102D-O          CB4              STM102           86.99      FUNCTIONAL/HEAD  5.005
          0.5         NO
ROOF_102A-O      ROOF_102A-S      STM102           100        TABULAR/HEAD
ROOF_102A-Q                  NO

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4
Barrels
;;-------------- ------------ ---------------- ---------- ---------- ----------
----------
C1               CIRCULAR     0.3              0          0          0          1

C2               CIRCULAR     0.3              0          0          0          1

C3               CIRCULAR     0.3              0          0          0          1

C4               CIRCULAR     0.3              0          0          0          1

C5               TRIANGULAR   0.3              1.8        0          0          1

C6               CIRCULAR     0.25             0          0          0          1

L102B-OV         RECT_OPEN    0.1              12         0          0
L102C-OV         RECT_OPEN    0.1              17         0          0
L102D-OV         RECT_OPEN    0.1              12         0          0

[TRANSECTS]

NC 0.02     0.02     0.013
X1 PrivateRd        2        0        6        0.0       0.0       0.0       0.0
0.0
GR 0.21     0        0        6
```

```
[LOSSES]
;;Link            Inlet      Outlet     Average    Flap Gate  SeepageRate
;;--------------- ---------- ---------- ---------- ---------- ----------
C1                0          0.02       0          NO         0
C2                0          0.06       0          NO         0
C3                0          1.32       0          NO         0

[CURVES]
;;Name            Type       X-Value    Y-Value
;;--------------- ---------- ---------- ----------


ROOF_102A-Q       Rating     0          0
ROOF_102A-Q                  0.025      1.5773
ROOF_102A-Q                  0.05       3.1545
ROOF_102A-Q                  0.075      3.9431
ROOF_102A-Q                  0.1        4.7318
ROOF_102A-Q                  0.125      5.5204
ROOF_102A-Q                  0.15       6.309


L101A-V           Storage    0          0
L101A-V                      0.9        56.5
L101A-V                      0.901      0
L101A-V                      1.99       0
L101A-V                      2.19       126.4
L101A-V                      2.1901     0

L102A-V           Storage    0          0
L102A-V                      0.9        11.3
L102A-V                      0.901      0
L102A-V                      1.6        0
L102A-V                      1.9        253.3
L102A-V                      1.901      0

L102B-V           Storage    0          0
L102B-V                      0.9        63.6
L102B-V                      0.901      0
L102B-V                      1.66       0
L102B-V                      1.92       138.4
L102B-V                      1.9201     0
L102B-V                      1.97       0

L102C-V           Storage    0          0
L102C-V                      0.75       40
L102C-V                      0.751      0
L102C-V                      1.47       0
L102C-V                      1.77       342.4
L102C-V                      1.7701     0
L102C-V                      1.82       0

L102D-V           Storage    0          0
L102D-V                      0.9        8.5
L102D-V                      0.901      0
L102D-V                      1.53       0
L102D-V                      1.83       110.6
L102D-V                      1.8301     0
L102D-V                      1.88       0

ROOF_102A-V       Storage    0          0
ROOF_102A-V                  0.025      23
ROOF_102A-V                  0.05       93
```

```
ROOF_102A-V                 0.075      208
ROOF_102A-V                 0.1        370
ROOF_102A-V                 0.125      579
ROOF_102A-V                 0.14       950
ROOF_102A-V                 0.15       952


[REPORT]
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]
Subcatch   DICB-6           EXTERNAL
Subcatch   DICB-7           EXTERNAL
Subcatch   EX-BLDG_1        Ex-no-store
Subcatch   EX-BLDG_2        Ex-no-store
Subcatch   L101A            PARKING
Subcatch   L102A            PARKING
Subcatch   L102B            PARKING
Subcatch   L102C            PARKING
Subcatch   L102D            PARKING
Subcatch   R102A            ROOF-STORE
Subcatch   UNC-1            UNCONTROLLED
Node       STM100           MN
Node       STM100A          MN
Node       STM101           MN
Node       STM102           MN
Link       C1               PIPE
Link       C2               PIPE
Link       C3               PIPE
Link       C4               PIPE
Link       C5               MJ
Link       L101A-O          LMF75
Link       L102A-O          LMF75
Link       L102B-O          LMF75
Link       L102C-O          LMF75
Link       L102D-O          LMF75
Link       ROOF_102A-O      ROOF-DRAINS

[MAP]
DIMENSIONS       360955.733385005 5021313.29346049 361085.224132484 5021474.86232962
UNITS            Meters
```

C.4 STORMCEPTOR SIZING

Detailed Stormceptor Sizing Report – St. Mary's Coptic Church

Project Information & Location			
Project Name	St Mary's Coptic Church	**Project Number**	160410203
City	Ottawa	**State/ Province**	Ontario
Country	Canada	**Date**	11/14/2019
Designer Information		**EOR Information (optional)**	
Name	Cameron Odam	**Name**	
Company	Stantec Consulting Ltd.	**Company**	
Phone #	613-724-4353	**Phone #**	
Email	cameron.odam@stantec.com	**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	St. Mary's Coptic Church
Recommended Stormceptor Model	STC 750
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	83
PSD	Fine Distribution
Rainfall Station	OTTAWA MACDONALD-CARTIER INT'L 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**
STC 300	74
STC 750	83
STC 1000	84
STC 1500	85
STC 2000	87
STC 3000	89
STC 4000	91
STC 5000	92
STC 6000	93
STC 9000	95
STC 10000	95
STC 14000	96
StormceptorMAX	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**	4093
Rainfall Station Name	OTTAWA MACDONALD-CARTIER INT'L A	**Total Rainfall (mm)**	20978.1
Station ID #	6000	**Average Annual Rainfall (mm)**	567.0
Coordinates	45°19'N, 75°40'W	**Total Evaporation (mm)**	1725.1
Elevation (ft)	370	**Total Infiltration (mm)**	2050.0
Years of Rainfall Data	37	**Total Rainfall that is Runoff (mm)**	17203.0

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)	0.36
Imperviousness %	90.20

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

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	69.50
Water Quality Flow Rate (L/s)	

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

Design Details	
Stormceptor Inlet Invert Elev (m)	86.60
Stormceptor Outlet Invert Elev (m)	86.60
Stormceptor Rim Elev (m)	89.25
Normal Water Level Elevation (m)	
Pipe Diameter (mm)	300
Pipe Material	PVC - plastic
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	St. Mary's Coptic Church

Site Details

Drainage Area

Total Area (ha)	0.36
Imperviousness %	90.20

Surface Characteristics

Width (m)	120.00
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	

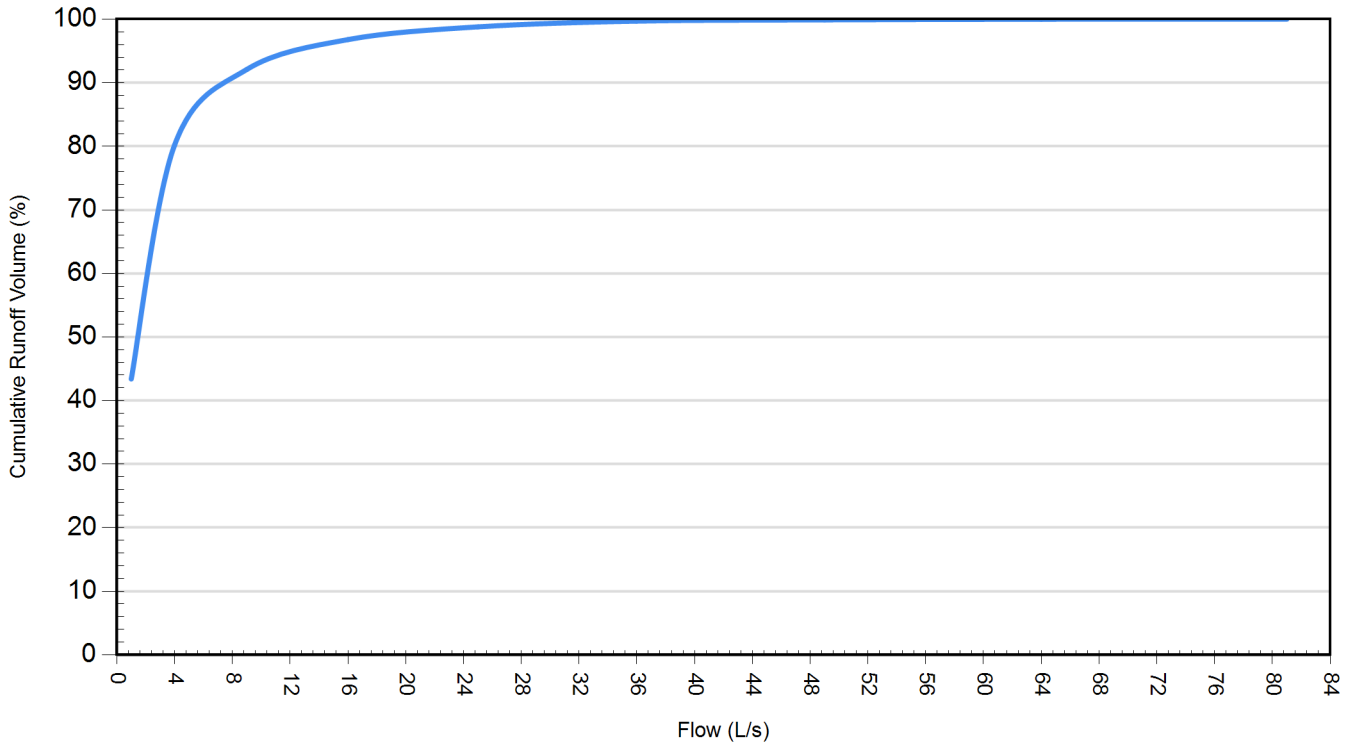
TSS Availability Parameters

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

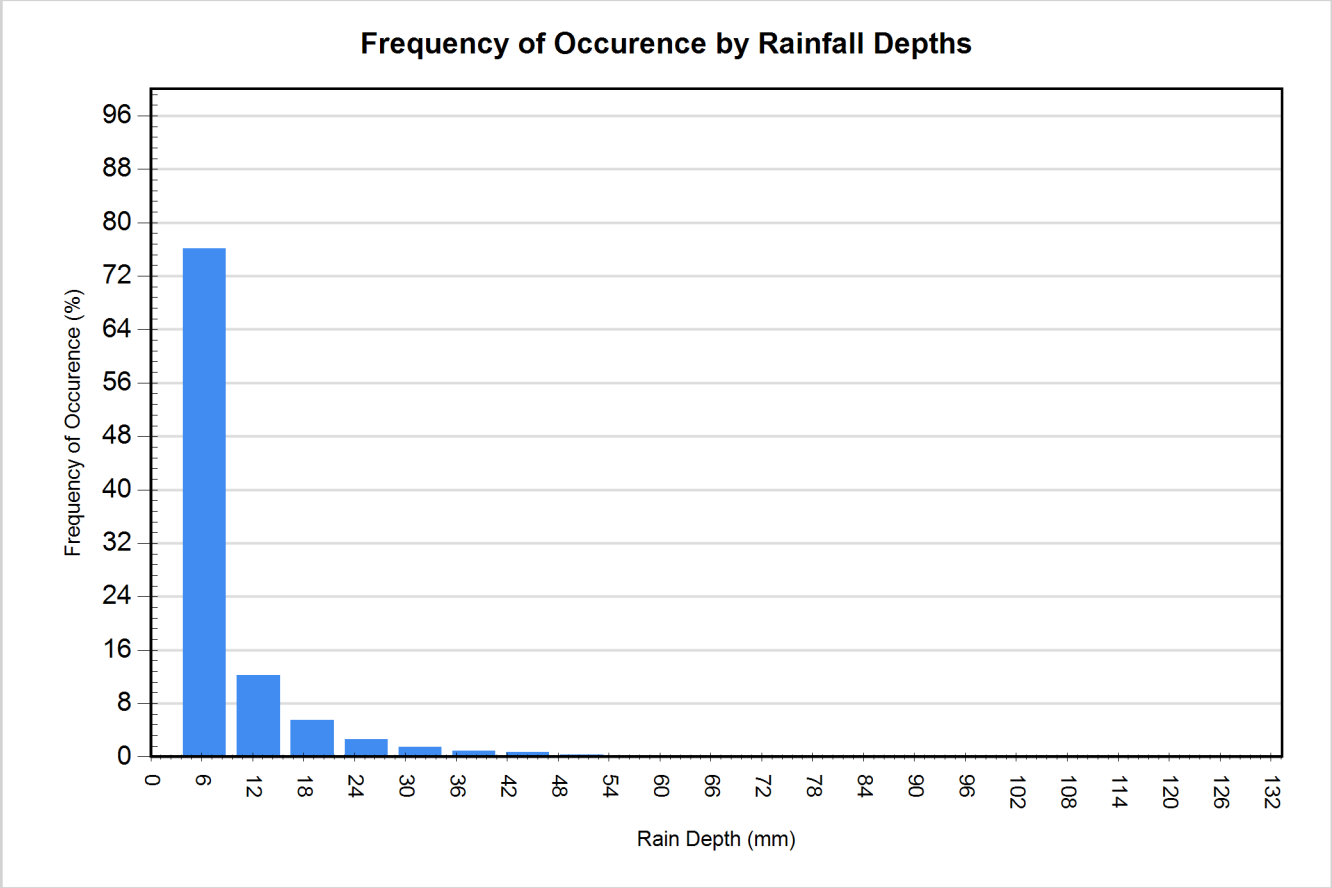
Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (L/s)	Runoff Volume (m^3)	Volume Over (m^3)	Cumulative Runoff Volume (%)
1	27064	35301	43.4
4	49996	12365	80.2
9	57434	4925	92.1
16	60369	1989	96.8
25	61620	738	98.8
36	62176	182	99.7
49	62317	41	99.9
64	62355	3	100.0
81	62358	0	100.0

Cumulative Runoff Volume by Runoff Rate

For area: 0.36(ha), imperviousness: 90.20%, rainfall station: OTTAWA MACDONALD-CARTIER INT'L A



Rainfall Event Analysis				
Rainfall Depth (mm)	**No. of Events**	**Percentage of Total Events (%)**	**Total Volume (mm)**	**Percentage of Annual Volume (%)**
6.35	3113	76.1	5230	24.9
12.70	501	12.2	4497	21.4
19.05	225	5.5	3469	16.5
25.40	105	2.6	2317	11.0
31.75	62	1.5	1765	8.4
38.10	35	0.9	1206	5.8
44.45	28	0.7	1163	5.5
50.80	12	0.3	557	2.7
57.15	7	0.2	378	1.8
63.50	1	0.0	63	0.3
69.85	1	0.0	64	0.3
76.20	1	0.0	76	0.4
82.55	0	0.0	0	0.0
88.90	1	0.0	84	0.4
95.25	0	0.0	0	0.0
101.60	0	0.0	0	0.0
107.95	0	0.0	0	0.0
114.30	1	0.0	109	0.5
120.65	0	0.0	0	0.0
127.00	0	0.0	0	0.0



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

C.5 BACKGROUND EXCERPTS (STORM DRAINAGE)

Odam, Cameron

From: Eric Lalande <eric.lalande@rvca.ca>
Sent: Tuesday, November 12, 2019 11:24 AM
To: Odam, Cameron
Subject: RE: Water quality control criteria - Proposed St. Mary's Coptic Church (1 Canfield Road)

Hi Cameron,

The RVCA will require that the development provides enhanced water quality protection (80% TSS removal) for the subject site. Best management practices are encouraged where possible to enhance existing development.

Please let me know if you have any further questions.

Eric Lalande, MCIP, RPP
Planner, Rideau Valley Conservation Authority
613-692-3571 x1137

From: Odam, Cameron <Cameron.Odam@stantec.com>
Sent: Friday, November 08, 2019 11:56 AM
To: Eric Lalande <eric.lalande@rvca.ca>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>; Paerez, Ana <Ana.Paerez@stantec.com>
Subject: RE: Water quality control criteria - Proposed St. Mary's Coptic Church (1 Canfield Road)

Hi Eric,

No problem – the approximate distance to the outlet is 335m, see the provided attachment. As for the requested plans, see attached preliminary site servicing and grading plan. Please let me know if this is sufficient enough information for you to move forward with. If you have any other questions or inquiries please let me know.

Best,

Cameron

From: Eric Lalande <eric.lalande@rvca.ca>
Sent: Friday, November 08, 2019 11:08 AM
To: Odam, Cameron <Cameron.Odam@stantec.com>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>; Paerez, Ana <Ana.Paerez@stantec.com>
Subject: RE: Water quality control criteria - Proposed St. Mary's Coptic Church (1 Canfield Road)

Hi Cameron,

Can you provide additional details, such as a site plan, along with the distance to the outlet? Further, does the addition require the addition of outdoor parking area to the site?

Thank you,

Eric Lalande, MCIP, RPP
Planner, Rideau Valley Conservation Authority
613-692-3571 x1137

From: Odam, Cameron <Cameron.Odam@stantec.com>
Sent: Friday, November 08, 2019 9:53 AM
To: Eric Lalande <eric.lalande@rvca.ca>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>; Paerez, Ana <Ana.Paerez@stantec.com>; Jamie Batchelor <jamie.batchelor@rvca.ca>
Subject: Water quality control criteria - Proposed St. Mary's Coptic Church (1 Canfield Road)

Hi Eric,

I hope this email finds you well. We are working on a site located on 1 Canfield Road in Ottawa. The proposed development consists of a building addition to an existing church which is currently serviced through a 300 mm diameter storm sewer on Canfield Road. It is our understanding that the receiving watercourse is Graham Creek, can you please provide us with confirmation on whether onsite water quality control is required and if so, can you please provide us with the onsite water quality control criteria?
Please let me know if you have any questions.

Thanks in advance,

Cameron

Cameron Odam

Direct: +16137244353
Fax: +16137222799
Cameron.Odam@stantec.com

Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

Appendix D GEOTECHNICAL INVESTIGATION

ST. MARY COPTIC CHURCH PROPOSED DEVELOPMENT

GEOTECHNICAL INVESTIGATION

ST. MARY COPTIC CHURCH

DRAFT GEOTECHNICAL REPORT

PROJECT NO.: 191-04634-00
DATE: MAY 2019

WSP
SUITE 300
2611 QUEENSVIEW DRIVE
OTTAWA, ON, CANADA K2B 8K2

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F: +1 613 829-8299
WSP.COM

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TABLES

APPENDICES

1 INTRODUCTION

1.1 CONTEXT

WSP Canada Inc. (WSP) was retained by St. Mary Coptic Orthodox Church to conduct a geotechnical investigation at 1 Canfield Road and the seven surrounding properties, in Ottawa, Ontario as shown in Drawing No. 1 in Appendix A.

The scope of work for this investigation is outlined in WSP's Proposal, dated January 9, 2019 and subsequent project correspondence.

The purpose of the geotechnical investigation was to obtain subsurface information at the site by means of an exploratory borehole. This report presents the findings of the investigation and provides comments and recommendations which may affect the design and construction of the proposed development. The Phase 1 Environmental Site Assessment (ESA) is provided under a separate cover.

1.2 PROJECT AND SITE DESCRIPTION

The Site is located in the northeast corner of the Canfield Road and Greenbank Road intersection, in the City of Ottawa and consists of seven municipal properties; 1 and 9 Canfield Road, and 9, 11, 13, 15, and 17 Parkmount Crescent. A site location map is provided as Drawing No. 1 in Appendix A.

The Site is irregular in shape, with frontage on both Canfield Road and Parkmount Crescent, and is approximately 0.95 ha in plan area. Currently, the property at 1 Canfield Road is occupied by the St. Mary Coptic Orthodox Church, while all other properties are occupied by residential dwellings.

Our understanding is that the project will be undertaken in two phases. Phase 1 is the construction of a community building to be constructed north of the existing church building. Phase 2 will consist of demolishing the existing church building and reconstruction of a church building that will be larger than the existing church. Based on conversations with the client it is understood that basement is being considered for the proposed structures. It is also understood that the properties at 9 Canfield Road, and 9, 11, 13, 15, and 17 Parkmount Crescent are to be demolished in order to provide space for a parking lot with approximately 100 spaces. It is not known at this time how many storeys are proposed for the new structures.

1.3 OBJECTIVES AND LIMITATIONS

The current report was prepared at the request and for the sole use of the St. Mary Coptic Orthodox Church according to the specific terms of the mandate given to WSP. The use of this report by a third party, as well as any decision based upon this report, is under this party's sole responsibility. WSP may not be held accountable for any possible damages resulting from third party decisions based on this report.

Furthermore, any opinions regarding conformity with laws and regulations expressed in this report are technical in nature; the report is not and shall not, in any case, be considered as a legal opinion.

Information in this report is only valid for the borehole locations as described.

Reference should be made to the Limitations of this Report, attached in Appendix D, which follows the text but forms an integral part of this document.

2 SITE INVESTIGATION

2.1 SCOPE OF WORK

The scope of work for this assignment included:

- A desk study and review of existing geotechnical information in the general area;
- Laying out of boreholes and obtaining utility locates at the project site;
- Drilling of exploratory boreholes;
- In-situ soil sampling and testing, including Standard Penetration Testing (SPT);
- Obtaining soil samples for additional review and laboratory testing;
- Laboratory testing;
- Geotechnical analysis; and
- Preparation of this report which presents the results of the investigation and provides geotechnical recommendations related to the design and construction of the proposed development.

2.2 INVESTIGATION PROCEDURES

The geotechnical investigation was carried out in April and May 2019.

2.2.1 DESKTOP STUDY

Surficial geology maps indicate that the area is underlain offshore marine deposits consisting of silt and clay, with minor amounts of sand and gravel. This deposit is underlain by deltaic and estuarine deposits of Champlain Sea Sediments consisting of medium to fine grained sand. Bedrock geology maps indicate the bedrock in the general area consists of dolostone and limestone from the Oxford Formation.

2.2.2 FIELD INVESTIGATION

The field investigation was carried out on April 22 and May 2, 2019 and included the drilling of four boreholes, BH19-1 thru BH19-4, within the footprint of the proposed buildings.

The boreholes were advanced using a track-mounted drill rig supplied and operated by Ohlmann Geotechnical Services (OGS) of Almonte, Ontario. The boreholes were advanced using hollow-stem augers to depths ranging from 3.7 metres (m) to 9.8 m below the existing ground surface. Soil samples retrieved during drilling were logged and visually classified in the field by a member of WSP's geotechnical staff.

The borehole locations are shown on Drawing No. 2 in Appendix A. The borehole logs are included in Appendix B of this report. On May 2, 2019 the locations and elevations of the boreholes were surveyed by Stantec and will be included in the final report.

2.2.3 LABORATORY TESTING

Upon completion of drilling and in-situ testing, soil samples were returned to WSP's laboratory for further examination, classification and testing. A laboratory testing program on selected representative soil samples is currently ongoing. The testing program consists of the determination of natural water content, grain size distribution, Atterberg limits (Plasticity)

and chemical analyses of soil corrosivity. Some results were available that the time of this report, such as the results of the corrosivity testing and have been incorporated into this draft report. The remaining results will be included in the final report.

3 SUBSURFACE GEOTECHNICAL CONDITIONS

The subsurface conditions encountered within the boreholes are discussed in the following sections. Detailed descriptions of the soil and groundwater conditions encountered at the borehole locations are included in the individual borehole logs in Appendix B.

3.1 SOIL CONDITIONS

3.1.1 PAVEMENT STRUCTURE

An asphaltic flexible concrete pavement structure was encountered at the surface of all boreholes. The pavement structure encountered consists of hot mix asphalt supported by a granular base. The asphalt thickness was found to be 30 mm in all the boreholes drilled at the site. Supporting the asphalt surface was a granular base consisting of crushed sand and gravel. The thickness of the granular base ranged from 270 mm to 320 mm and extended to depths ranging from 300 mm to 350 mm below the existing ground surface.

3.1.2 FILL

A layer of fill was encountered underlying the granular base in all the boreholes. This layer of fill extended to depths ranging from 1.0 m to 1.7 m below the existing ground surface.

In boreholes BH19-1 and BH19-3 this layer of fill consisted of silty sand with trace to some clay. The SPT "N" values within this layer of fill ranged from 5 blows to 12 blows per 305 mm of penetration indicating a loose to compact state of packing.

The grain size distribution for one selected sample of granular portion of the fill is presented in Appendix C. A summary of this grain size distribution is also presented in the table below.

Table 3.1 Results of Grain Size Analyses for Fill

Borehole No.	Sample No.	Grain Size Distribution		
		% Gravel	% Sand	% Fines (Silt and Clay)
BH19-2	SS-2	2	54	44

The natural moisture content of this sample of the fill was 24 percent.

In boreholes BH19-2 and BH19-4 the layer of fill consisted of silty clay. The two SPT "N" values within the silty clay fill were 7 blows and 8 blows per 305 mm of penetration indicating a firm to stiff state of packing.

3.1.3 SILTY CLAY

In boreholes BH19-1 and BH19-3, a layer of native silty clay was encountered underlying the silty sand fill. This deposit extended to a depth of 4.7 m in boreholes BH19-1 and BH19-3. This deposit was not encountered in boreholes BH19-2 and BH19-4.

SPT "N" values within the silty clay ranged from 6 blows to 14 blows per 305 mm indicating a firm to stiff consistency.

The results of Atterberg limit testing, carried out on a selected sample of the silty clay gave a liquid limit value of 33 percent and a plasticity index of 18 percent, indicating a low plasticity clay soil. The measured water content of the samples of silty clay was 27 percent, which is below the liquid limit of this sample.

3.1.4 SILTY SAND

A layer of native silty sand with trace clay was encountered underlying the silty clay fill in boreholes BH19-2 and BH19-4 and underlying the native silty clay in boreholes BH19-1 and BH19-3. The silty sand deposit extended to the depth of drilling, ranging from 3.7 m to 9.8 m below the existing ground surface.

SPT "N" values within the silty sand ranged from 12 blows per 305 mm of penetration and greater than 50 blows per 50 mm of penetration, indicating a compact to very dense state of packing.

Table 3.2 Results of Grain Size Analyses for Silty Sand

Borehole No.	Sample No.	Grain Size Distribution			
		% Gravel	% Sand	% Silt	% Clay
BH19-1	SS-8	0	72	21	7

The natural moisture content of one sample of the silty sand was 14 percent.

3.2 BEDROCK CONDITIONS

Neither bedrock nor auger refusal were encountered in the boreholes drilled at the Site. Bedrock is therefore inferred to be more than 9.8 m below the existing ground surface.

3.3 GROUNDWATER CONDITIONS

Piezometers were installed in boreholes BH19-1 and BH19-3 during the field investigation to allow for subsequent observations of the groundwater levels. The groundwater levels within the piezometers were measured on May 9th, 2019, sixteen days and seven days after the well installations for boreholes BH19-1 and BH19-3, respectively. The following are the results.

Borehole No.	Groundwater Depth
BH19-1	7.6
BH19-3	7.4

These piezometers have been left in place after this investigation and should be properly decommissioned by others during construction.

3.4 SUMMARY

A summary of the soil and groundwater conditions encountered at the site is presented in the table below.

Table 3.3 Simplified Stratigraphy and Groundwater Depths

Borehole No.	Simplified Stratigraphy (Depth in metres)					Measured Groundwater Depth (m)	Notes
	Asphaltic Concrete	Granular Base	Fill	Silty Clay	Silty Sand		
BH19-1	0 - 0.03	0.03 - 0.3	0.3 - 1.7	1.7 - 4.7	4.7 - 9.8	7.6	Borehole terminated at 9.8 m in depth
BH19-2	0 - 0.03	0.03 - 0.3	0.3 - 1.7	--	1.7 - 9.8	--	Borehole terminated at 9.8 m in depth
BH19-3	0 - 0.03	0.03 - 0.35	0.35 - 1.0	1.0 - 4.7	4.7 - 9.8	7.4	Borehole terminated at 9.8 m in depth
BH19-4	0 - 0.03	0.03 - 0.3	0.3 - 1.7	--	1.7 - 3.7	--	Borehole terminated at 3.7 m in depth

4 RECOMMENDATIONS

4.1 GENERAL

This section of the report provides engineering guidance related to the geotechnical design aspects of the project based on our interpretation of the available information described herein and project requirements. Contractors bidding on or undertaking the works should examine the factual results of the investigation, satisfy themselves as to the adequacy of the factual information for construction, and make their own interpretation of the factual data as it affects their proposed construction techniques, schedule, safety, and equipment capabilities. Reference should be made to the Limitations of this Report, attached in Appendix D, which follows the text but forms an integral part of this document.

The general subsurface conditions encountered in the boreholes include an asphaltic concrete pavement structure overlying fill consisting of either silty sand or silty clay. In boreholes BH19-2 and BH19-4 the fill overlies a layer of native silty sand. In boreholes BH19-1 and BH19-3 a layer of native silty clay was encountered underlying the fill and overlying the native silty sand. Neither bedrock nor auger refusal were encountered and therefore the bedrock elevation is is inferred to be below 9.8 m in depth.

4.2 SEISMIC CONSIDERATION

4.2.1 LIQUEFACTION POTENTIAL

The soils at the site are not considered to be susceptible to seismic liquefaction based on the soil type, the SPT N values encountered within these soils and the groundwater level observed at the site.

4.2.2 SEISMIC SITE CLASSIFICATION

As outlined in the 2012 Ontario Building Code, building foundations must be designed to resist a minimum earthquake force. In accordance with Table 4.1.8.4.A of the 2012 Ontario Building Code, the seismic site response for foundations placed on either engineered fill or compact to very dense silty sand would have a site classification of Class D.

4.3 GRADE RAISE

It is understood that no grade raise is proposed at the Site.

4.4 FOUNDATIONS

It is understood that a basement is being considered for the proposed development and therefore excavations would extend to an approximate depth of 2.5 m and therefore be founded on either the engineered fill, native silty sand or the native silty clay.

For a foundation with a minimum width of 1.0 m placed on native silty sand, silty clay or engineered fill (extending to the native material) the following resistances may be assumed:

- The unfactored ultimate geotechnical bearing resistance can be taken as 500 kPa. A resistance factor of 0.5 should be applied to this value, yielding a factored bearing resistance of 250 kPa at ULS (Ultimate Limit States).
- The geotechnical resistance at the Serviceability Limit State (SLS) can be taken as 100 kPa.

It should be noted that placing foundations on different materials (such as silty sand or silty clay) may results in differential settlement. Foundations should either be placed all on the same material type, or the structure designed such that different sections can move independent of each other.

For a foundation with a minimum width of 1.0 m placed on the native silty sand or on engineered fill which itself is placed on the native silty sand the following resistances may be assumed:

- The unfactored ultimate geotechnical bearing resistance can be taken as 600 kPa. A resistance factor of 0.5 should be applied to this value, yielding a factored bearing resistance of 300 kPa at ULS (Ultimate Limit States).
- The geotechnical resistance at the Serviceability Limit State (SLS) can be taken as 200 kPa.

4.5 FROST PROTECTION

Foundations for heated structures should be protected against frost with a minimum of 1.5 m of earth cover or the thermal equivalent if insulation is used. Foundations for unheated structures should be provided with a minimum of 1.8 m of earth cover or the thermal equivalent if insulation is used.

In the event that foundations are to be constructed during the winter months, foundation soils and side slopes of excavations are required to be protected from freezing temperatures immediately upon excavation and exposure to sub-zero temperatures until such time as heat can be applied to the building or the foundations have sufficient earth cover to prevent freezing of subgrade soils.

4.6 SLABS-ON-GRADE

In preparation for the construction of the basement floor slab, all loose, wet, and disturbed material should be removed from beneath the floor slab. Provision should be made for at least 200 millimetres of Ontario Provincial Standard Specification (OPSS) Granular A to form the base of the floor slab. Any bulk fill required below the underside of the Granular A should consist of OPSS Granular B Type II. The under slab fill should be placed in maximum 300-millimetre thick lifts. The required degree of compaction is discussed in section 4.11.

All subgrades should be reviewed by WSP prior to placement of any geotextile, granular base, concrete, etc.

4.7 LATERAL EARTH PRESSURES

Lateral Earth Pressure

The lateral earth pressure acting on retaining walls, etc. may be calculated using the following expression:

$$P = K(\gamma h+q)$$

Where: P = lateral earth pressure (kPa) acting at depth h

K = earth pressure coefficient; for unrestrained walls and structures where some movement is acceptable (such as retaining walls) use a coefficient of active earth pressure (K_a) equal to 0.3, for restrained walls (such as basement walls) use the coefficient of earth pressure at rest (K_0) equal to 0.5

γ = the density of the backfill; use 21.5 kN/m^3 for compacted granular backfill or 19 kN/m^3 for native silty sand

h = the depth to the point of interest (m)

q = the magnitude of any design surcharge at the ground surface;

The above values assume free-draining granular backfill will be used. If this is not the case then the above values may need to be adjusted based on the soil type used, and water pressures should be considered in the calculation of lateral pressures. WSP can provide additional guidance based on actual building plans if required.

Seismic Earth Pressure

Earth pressures will be higher under seismic loading conditions. In order to account for seismic earth pressures the total earth pressure during a seismic event (including both the seismic and static components) may be assumed to be:

$$\sigma_h(z) = K_a \gamma z + (K_{AE} - K_a) \gamma (H-z)$$

Where: $\sigma_h(z)$ = the total earth pressure at depth z (kPa);

K_a = the active earth pressure coefficient (0.3);

γ = the unit weight of soil (21.5 kN/m^3 for granular fill);

K_{AE} = the combined active earth pressure and seismic earth pressure coefficient (use 0.8);

H = the total height of the wall (m)

z = the depth below the top of the wall (m)

The above earth pressure values (both static and seismic) are unfactored values.

4.8 FOUNDATION WALL BACKFILL

Foundation elements should be backfilled with either:

- non-frost-susceptible sand and/or gravel which meets the gradation requirements for OPSS Granular B Type I;
- or 19 millimetre clear crushed stone, which is separated from other soils with a Class II non-woven geotextile having an FOS not exceeding 100 microns to prevent loss of adjacent sand, or silty soils into the clear stone. It should be noted that the use of clear stone as foundation backfill may lead to unfavourable growing conditions for plant matter placed in overlying topsoil.

In areas where pavement or other hard surfacing will be in contact the building, differential frost heaving could occur between the granular fill (if sand or crushed stone is used) and other areas. To reduce this differential heaving, the backfill adjacent to the wall can be placed to form a frost taper. The frost taper should be brought up to pavement subgrade level from 1.5 metres below finished exterior grade at a slope of 3 horizontal to 1 vertical, or flatter, away from the wall. The fill should be placed in maximum 300-millimetre thick lifts and compacted to the specifications in section 4.10.

To avoid damaging or laterally displacing the structures, care should be exercised when compacting fill adjacent to new structures. Heavy equipment should be kept a minimum of 1 m away from the structure during backfilling. The 1 m width adjacent to the wall should be compacted using hand-operated equipment unless otherwise authorized.

4.9 SITE SERVICES

Excavations are expected to be within the fill, silty clay or silty sand. Details of the proposed site services are not available at this time; however it is assumed that they will include localized trenches throughout the site. Trenches can be temporarily supported using sloped excavations (see Section 4.13.2) or trench boxes.

Bedding for site services should be in accordance with the relevant OPSD standard drawing and would typically consist of Granular "A". Where wet or disturbed conditions are encountered in the base of the trench it may be necessary to over-excavate and replace unsuitable soils with compacted granular fill to provide a stable sub-grade for the bedding. The use of clear stone as a bedding and cover material is not recommended as the finer particles of the native soils and backfill may migrate into the voids of the clear stone, resulting in loss of pipe support.

Cover material above the spring line should consist of Granular "A" or Granular "B" material with a maximum particle size of 25 mm.

Backfill may consist of additional granular fill, or properly moisture conditioned silty clay. Where backfill is below paved areas (such as parking lots) and is within the frost depth, the backfill profile (above the minimum cover required) in the trench should be made to match the native soils on either side as much as is practical in order to minimize the potential for differential frost heave. As a result, portions of the silty clay above the water table may be retained, moisture conditioned (if necessary) and re-used.

Any service trenches which extend below the water table should have clay cut-offs installed across the trench at regular intervals (typically 100 m) to prevent the trench acting as a drain and lowering the groundwater table in the general area. These cut-offs should extend the full width of the trench and must completely penetrate the bedding, cover and any other granular materials in the trench.

The above are general guidelines for typical site services. All services installations should be completed in accordance with the relevant OPSS's and OPSD's for the particular application and size. WSP can provide additional review during detailed design based on the actual services proposed if required.

The required degree of compaction is discussed in section 4.11.

4.10 PAVEMENTS

4.10.1 PREPARATION FOR PAVING

The scope of the geotechnical investigation included boreholes drilled at the existing church property at 1 Canfield Road. Due to access constraints, no boreholes were drilled on the properties of 9 Canfield Road, and 9, 11, 13, 15, and 17 Parkmount Crescent. Prior to the placement of any granular materials, any existing topsoil any other deleterious material must be removed and the underlying soil proof rolled and inspected by a geotechnical engineer. Any sort of "spongey" material will need to be sub-excavated. Fill material to raise the grade or replace sub-excavated material must meet the requirements for OPSS Select Subgrade Material (SSM). This fill material should be placed in lifts not exceeding 300 mm (loose) and be uniformly compacted. The base and sub-base material are to be placed in lifts not exceeding 300 mm (loose). Both stripping and proof-rolling operations should be observed and carried out to the satisfaction of a geotechnical engineer.

It is understood that the existing structures of the above properties are to be demolished. The debris from the demolition must be removed from any area underlying the proposed parking lot. Material used to level the properties after the demolition is complete must meet the requirements of a SSM and should be placed in lifts not exceeding 300 mm (loose).

The requirements for compaction and discussed in section 4.11 below.

4.10.2 PAVEMENT RECOMMENDATIONS

Detailed traffic loads have not been provided at this time, however based on the subsoil conditions encountered, conventional asphaltic (flexible) pavement designs are considered to be appropriate for proposed paved parking areas for cars and light weight trucks, driveways and access roads. Based on the results of this investigation and experience, the following asphaltic pavement design is recommended for the indicated areas.

Table 4-1 Recommended Pavement Structures

Pavement Layer	Light Duty Roads and Parking Areas	Heavy Duty Roads (Delivery Trucks, Fire Routes, Access Roads, etc.)
Asphaltic Concrete	40 mm HL3 or SP-12.5 40 mm HL8 or SP-19	40 mm HL3 or SP-12.5 90 mm HL8 or SP-19
OPSS Granular A Base	200 mm	200 mm
OPSS Granular B Sub-Base	250 mm	400 mm

Asphalt materials and placement specifications should be in accordance with relevant Provincial standard specifications. The asphaltic cement should be PG 58-34.

4.11 BACKFILLING AND COMPACTION

Backfill for foundation excavations and any below grade structures should comprise free draining OPSS Granular "A" or "B" materials. Backfill should be placed in shallow lifts, not exceeding 200 mm loose thickness.

The existing site materials are not considered suitable for reuse as structural fill. The suitability of imported materials should be confirmed prior to placement from both a geotechnical and environmental perspective. However, the existing soils at the site are adequate for use as general earth fill but may require moisture conditioning (either wetting or drying) prior to placement and compaction.

To avoid damaging or laterally displacing the structures, care should be exercised when compacting fill adjacent to new structures or adjacent to existing retaining walls. Heavy equipment should be kept a minimum of 1 m away from the structure during backfilling. The 1 m width adjacent to the wall should be compacted using hand-operated equipment unless otherwise authorized.

The compaction requirements for OPSS Granular "A" base underlying slabs-on-grade or asphaltic concrete or OPSS Granular "B" sub-base underlying OPSS Granular "A" as part of the pavement structure should be compacted to 100% of the material's Standard Proctor Maximum Dry Density (SPMDD). Fill material underlying structural elements, supporting site services or underlying the pavement structure should be compacted to a minimum of 98% of the material's SPMDD. Bedding for site services not underlying the pavement structure or structural elements and general fill should be compacted to a to a minimum of 95% of the material's SPMDD.

4.12 CORROSION AND CEMENT TYPE

Two samples were submitted to Eurofins for testing related to soil corrosivity and potential exposure of concrete elements to sulphate attack. The results of these tests are included in **Appendix C** and summarized in table below.

Table 4-2 Results of Soil Corrosivity Testing

Borehole/ Sample No.	Soil Type	Chloride (%)	Electrical Conductivity (mS/cm)	pH	Resistivity (ohm-cm)	Sulphate (%)
BH19-1/SS5	Silty Clay	0.012	0.27	8.3	3700	0.02
BH19-1/SS7B	Silty Sand	0.006	0.11	8.57	9090	<0.01

The soil resistivity values suggest a low to moderately corrosive environment for buried steel elements. These values must be taken into consideration during design of below-grade steel elements.

The test result indicates a negligible soluble sulphate content and sulphate resistant Portland cement is not required.

4.13 CONSTRUCTION CONSIDERATIONS

4.13.1 CONSTRUCTION DEWATERING

The groundwater level at the site was found to be between 7.4 m and 7.6 m below the existing ground surface elevation at the time of the investigation. It is expected that is the proposed structures have a one storey basement and excavation for foundations may extend to a maximum depth of 5 m below the existing ground surface (the maximum depth the native silty sand was encountered). Based on these assumptions it is likely that seepage into the excavations can be managed using properly filtered sumps or ditches. For deeper excavations extended close to, or below the expected groundwater level additional or more complex dewatering will be required. WSP can provide additional guidance based on the size and depth of anticipated excavations, if required during detailed design.

The excavations above the observed groundwater level would not be expected to require a MOECC Environmental Activity and Sector Registration (EASR – which covers construction dewatering up to 400,000 l/day) or a Permit to Take Water (PTTW – which is required for dewatering in excess of 400,000 l/day). If substantially deeper excavations are required or construction is scheduled during wetter periods (such as the spring) then this assumption should be reviewed during detailed design.

4.13.2 TEMPORARY EXCAVATIONS

All excavations should be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). Part III of Ontario Regulation 213/91 deals with excavations.

The soils within the expected excavation include fill, native silty clay and native silty sand above the groundwater level. For preliminary planning purposes these soils can be classified as a Type 3 Soil above the groundwater table (or depth of dewatering). Excavations within Type 3 soil require side slopes with a minimum gradient of 1 horizontal to 1 vertical. Should the excavation extend below the groundwater table (or depth of dewatering), the soils would be considered to be Type 4.

If required, WSP can provide additional guidance based on preliminary excavation plans, depths, etc. during the detailed design phase of the project.

4.13.3 FOUNDATION SUBGRADE PREPARATION

The geotechnical bearing resistances provided in Section 4.4 assume that the foundation soils will not be disturbed by construction activities. Proper de-watering and protection of exposed soil subgrades will be important to the construction of the foundations. All excavated surfaces should be kept free of frost, water, etc. during the course of construction. All

excavated surfaces should be inspected by a qualified geotechnical engineer who is familiar with the findings of this investigation and the design and construction of similar structures.

4.13.4 WINTER CONSTRUCTION

In the event that construction is required during freezing temperatures, the potentially frost susceptible subgrade below the footings and floor slabs should be protected immediately from freezing using straw, propane heaters, polystyrene insulation, insulated tarpaulins, or other suitable means that prevent any underlying soil from freezing.

5 CLOSURE

The Limitations of Report, as presented in Appendix D, are an integral part of this report.

We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact this office.

WSP Canada Inc.

Report prepared by:

Daniel Wall, B. Eng, EIT

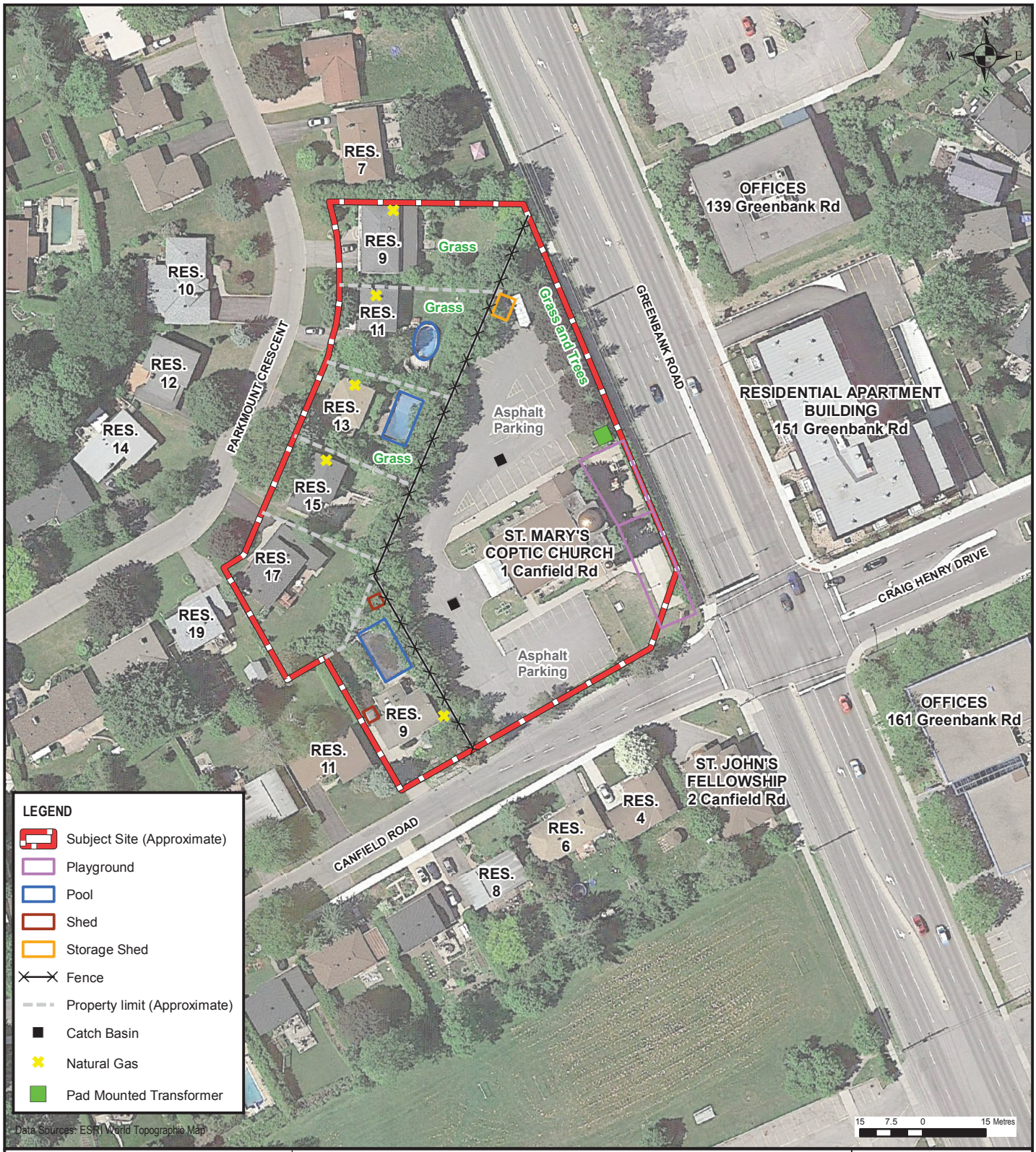
Reviewed by:

Elsayed Mohamed, P. Eng.
Senior Geotechnical Engineer

APPENDIX

A

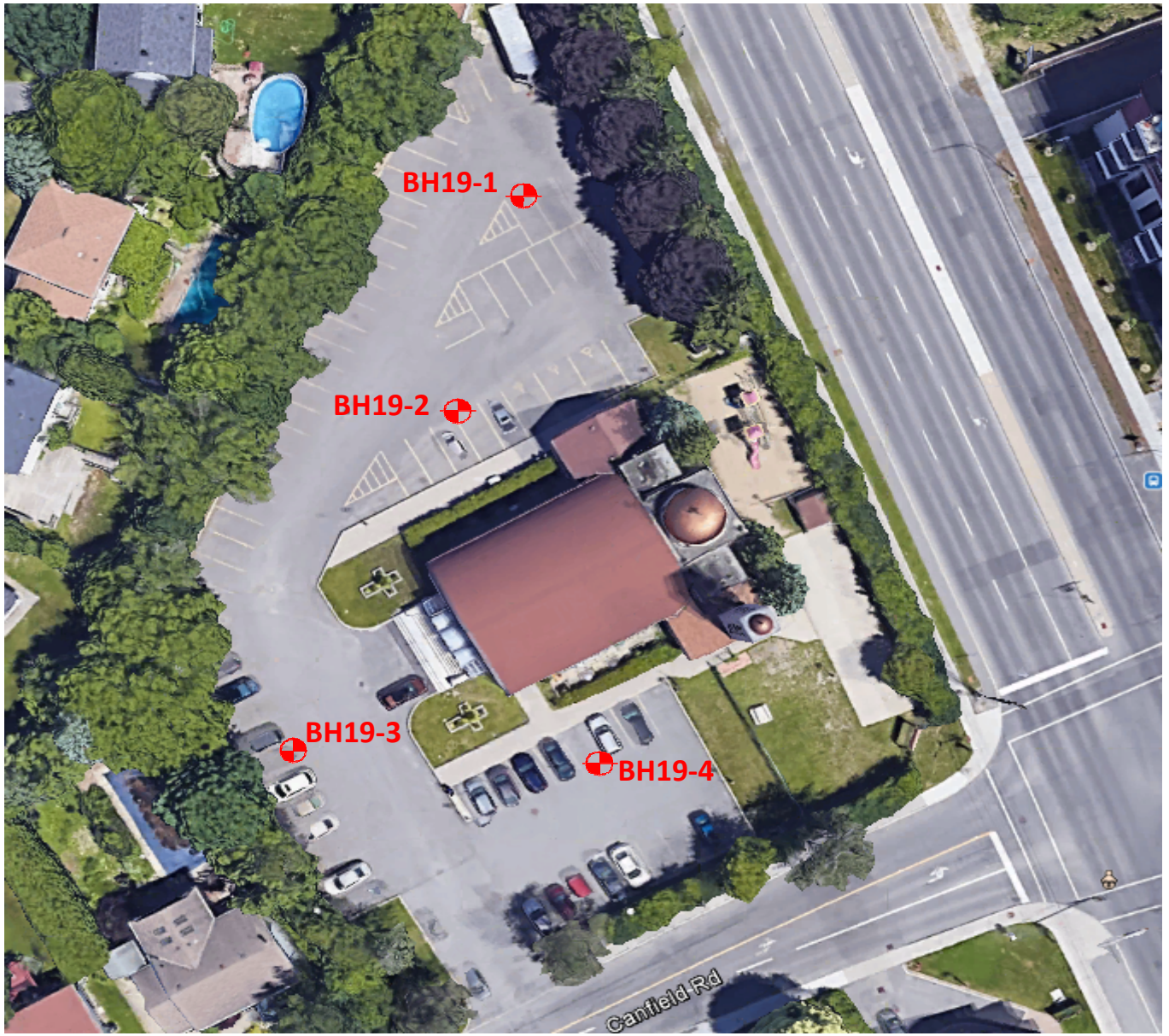
DRAWINGS



wsp
2611 QUEENSVIEW DRIVE, SUITE 300
OTTAWA, ONTARIO CANADA K2B 8K2
TEL.: 613-829-2800 | FAX: 613-829-8299 | WWW.WSP.COM

PROJECT: ST. MARY COPTIC CHURCH	SCALE: 1:1 300
	DRAWN BY: CP / CHECKED BY: AM
TITLE: SITE LOCATION PLAN	PROJECT NO: 191-04634-00
	DATE: MAY 2019
CLIENT: ST. MARY COPTIC CHURCH	FIGURE NO: 1 / REV.: -

Document Path: S:\SIG\Temp\Projet_Ottawa_Queensview\191-04634-00\1_LVR\MXD_191_04634_00_ESAP1_F2_002_SCM_190501.mxd



Client:	St. Mary Coptic Church			Title:	Borehole Location Plan
Project#:	191-03052-00	DWG #:	2	Project:	Geotechnical Investigation St. Mary Coptic Church
Drawn:	DW	Approved:	ME		
Date:	May 2019	Scale:	N. T. S.		
Size:	Letter	Rev:	0		

APPENDIX

B

BOREHOLE LOGS

LOG OF BOREHOLE BH19-1

PROJECT: St. Mary Coptic Church
CLIENT: St. Mary Coptic Church
PROJECT LOCATION: 1 Canfield Rd, Nepean
DATUM: n/a
BH LOCATION: See Borehole Location Plan

DRILLING DATA
Method: Hollow Stem Auger Drilling
Diameter: 203 mm
Date: Apr 22/2019

REF. NO.: 191-04634-00
ENCL NO.:

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	**ASPHALT** - 30 mm						
0.0	**SAND and crushed GRAVEL**, trace silt, brown, moist (Granular Base)	1	GRAB				
0.3	**SILTY SAND**, some clay, brown, moist, loose (Fill)	2	SS	5			2 54 (44)
1.7	**SILTY CLAY**, grey brown, moist, firm to stiff	3A 3B	SS	12			
		4	SS	14		Cuttings	
		5	SS	8			
		6	SS	6			
4.7	**SILTY SAND**, trace clay, grey brown, moist, dense to very dense	7A 7B	SS	46		Bentonite	
		8	SS	47			0 72 21 7

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

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

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
25 50 75

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

LOG OF BOREHOLE BH19-1

PROJECT: St. Mary Coptic Church
CLIENT: St. Mary Coptic Church
PROJECT LOCATION: 1 Canfield Rd, Nepean
DATUM: n/a
BH LOCATION: See Borehole Location Plan

DRILLING DATA
Method: Hollow Stem Auger Drilling
Diameter: 203 mm
Date: Apr 22/2019

REF. NO.: 191-04634-00
ENCL NO.:

ELEV / DEPTH (m)	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (25 50 75)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	SILTY SAND, trace clay, grey brown, moist, dense to very dense(Continued) - Silty Clay seam noted between 6.1 m to 6.4 m in depth		9	SS	49							
7							Sand					
							Screen W. L. 7.6 mBGL May 09, 2019					
			10	SS	31							
8												
9												
			11	SS	>50/12 mm		Sand					
9.8	**END OF BOREHOLE** 1) 37.5 mm piezometer installed at 9.1 m below the existing ground surface. 2) Date Groundwater Depth May 9, 2019 7.6 m											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

WSP SOIL LOG GINT.GPJ SPL.GDT 12/5/19

LOG OF BOREHOLE BH19-2

PROJECT: St. Mary Coptic Church
CLIENT: St. Mary Coptic Church
PROJECT LOCATION: 1 Canfield Rd, Nepean
DATUM: n/a
BH LOCATION: See Borehole Location Plan

DRILLING DATA
Method: Hollow Stem Auger Drilling
Diameter: 203 mm
Date: May 02/2019

REF. NO.: 191-04634-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 25 50 75	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	**ASPHALT** - 30 mm											
0.0	**SAND and crushed GRAVEL**, trace silt, brown, moist (Granular Base)		1	GRAB								
0.4	**SILTY CLAY**, grey brown, moist, firm (FILL)		2	GRAB								
1			3	SS	7							
1.7	**SILTY SAND**, trace clay, brown, moist, compact to dense		4A	SS	23							
2			4B	SS								
			5A	SS	12							
3			5B	SS								
			6	SS	23							
	- Silty Clay seam noted between 3.8 m to 3.95 m in depth		7	SS	23							
4												
			8	SS	14							
5												
			9	SS	29							
	- Silty Clay seam noted between 5.8 m to 5.9 m in depth											
6												

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

LOG OF BOREHOLE BH19-2

PROJECT: St. Mary Coptic Church
CLIENT: St. Mary Coptic Church
PROJECT LOCATION: 1 Canfield Rd, Nepean
DATUM: n/a
BH LOCATION: See Borehole Location Plan

DRILLING DATA
Method: Hollow Stem Auger Drilling
Diameter: 203 mm
Date: May 02/2019

REF. NO.: 191-04634-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (25 50 75)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	SILTY SAND, trace clay, brown, moist, compact to dense(Continued)											
			10	SS	35							
7												
	- wet below 7.7 m in depth		11	SS	27							
8												
9			12	SS	33							
9.8	**END OF BOREHOLE**											
	1) Groundwater observed at 7.2 m below existing ground surface											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

WSP SOIL LOG GINT.GPJ SPL.GDT 12/5/19

LOG OF BOREHOLE BH19-3

PROJECT: St. Mary Coptic Church
CLIENT: St. Mary Coptic Church
PROJECT LOCATION: 1 Canfield Rd, Nepean
DATUM: n/a
BH LOCATION: See Borehole Location Plan

DRILLING DATA
Method: Hollow Stem Auger Drilling
Diameter: 203 mm
Date: May 02/2019

REF. NO.: 191-04634-00
ENCL NO.:

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
0.0	**ASPHALT** - 30 mm					
0.0	**SAND and crushed GRAVEL**, trace silt, brown, moist (Granular Base)	1	GRAB			
0.3	**SILTY SAND**, brown, moist (Fill)	2A	SS	6		
		2B	SS			
1.1	**SILTY CLAY**, grey brown, moist, firm to stiff	3	SS	16		
		4	SS	9		Cuttings
		5	SS	8		
		6	SS	7		
4.7	**SILTY SAND**, trace clay, grey brown, moist, compact to very dense	7A	SS	24		
		7B	SS			Bentonite
		8	SS	20		

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

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

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
25 50 75

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

WSP SOIL LOG GINT.GPJ SPL.GDT 12/5/19

LOG OF BOREHOLE BH19-3

PROJECT: St. Mary Coptic Church
CLIENT: St. Mary Coptic Church
PROJECT LOCATION: 1 Canfield Rd, Nepean
DATUM: n/a
BH LOCATION: See Borehole Location Plan

DRILLING DATA
Method: Hollow Stem Auger Drilling
Diameter: 203 mm
Date: May 02/2019

REF. NO.: 191-04634-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (25 50 75)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	SILTY SAND, trace clay, grey brown, moist, compact to very dense(Continued) - Silty Clay seam noted between 5.3 m to 5.5 m in depth		9	SS	24							
7							Sand					
							W. L. 7.4 mBGL May 09, 2019					
							Screen					
	- very dense below 7.6 m in depth		10	SS	50/50 mm							
8												
9												
			11	SS	50/50 mm		Sand					
9.8	**END OF BOREHOLE** 1) 50 mm piezometer installed at 9.1 m below the existing ground surface. 2) Date / Groundwater Depth May 9, 2019 — 7.4 m											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

WSP SOIL LOG GINT.GPJ SPL.GDT 12/5/19

LOG OF BOREHOLE BH19-4

PROJECT: St. Mary Coptic Church
CLIENT: St. Mary Coptic Church
PROJECT LOCATION: 1 Canfield Rd, Nepean
DATUM: n/a
BH LOCATION: See Borehole Location Plan

DRILLING DATA
Method: Hollow Stem Auger Drilling
Diameter: 203 mm
Date: Apr 22/2019

REF. NO.: 191-04634-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 25 50 75	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	**ASPHALT** - 30 mm											
0.0	**SAND and crushed GRAVEL**, trace silt, brown, moist (Granular Base)		1	GRAB								
0.3	**SILTY CLAY**, grey brown, moist, firm to stiff (FILL)		2	SS	8							
1.7	**SILTY SAND**, trace clay, moist, compact to dense		3A 3B	SS	32							
	- Silty Clay seam noted between 2.3 m to 2.6 m in depth		4A 4B	SS	16							
			5	SS	19							
3.7	**END OF BOREHOLE** 1) Borehole is dry upon completion of drilling											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

WSP SOIL LOG GINT.GPJ SPL.GDT 12/5/19

Explanation of Terms Used in the Record of Boreholes

Sample Type

AS	Auger sample
BS	Block sample
CS	Chunk sample
DO	Drive open
DS	Dimension type sample
FS	Foil sample
RC	Rock core
SC	Soil core
SS	Spoon sample
SH	Shelby tube Sample
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

Penetration Resistance

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) required to drive a 50 mm (2 in) drive open sampler for a distance of 300 mm (12 in).

WH – Samples sinks under "weight of hammer"

Dynamic Cone Penetration Resistance, N_d:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) to drive uncased a 50 mm (2 in) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in).

Textural Classification of Soils

Classification	Particle Size
Boulders	> 200 mm
Cobbles	75 mm - 200 mm
Gravel	4.75 mm - 75 mm
Sand	0.075 mm – 4.75 mm
Silt	0.002 mm-0.075 mm
Clay	<0.002 mm

Coarse Grain Soil Description (50% greater than 0.075 mm)

Terminology	Proportion
Trace	0-10%
Some	10-20%
Adjective (e.g. silty or sandy)	20-35%
And (e.g. sand and gravel)	> 35%

Soil Description

a) Cohesive Soils(*)

Consistency	Undrained Shear Strength (kPa)	SPT "N" Value
Very soft	<12	0-2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very stiff	100-200	15-30
Hard	>200	>30

(*) Hierarchy of Shear Strength prediction

1. Lab triaxial test
2. Field vane shear test
3. Lab. vane shear test
4. SPT "N" value
5. Pocket penetrometer

b) Cohesionless Soils

Density Index (Relative Density)	SPT "N" Value
Very loose	<4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

Soil Tests

w	Water content
w_p	Plastic limit
w_l	Liquid limit
C	Consolidation (oedometer) test
CID	Consolidated isotropically drained triaxial test
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement
D_R	Relative density (specific gravity, Gs)
DS	Direct shear test
ENV	Environmental/ chemical analysis
M	Sieve analysis for particle size
MH	Combined sieve and hydrometer (H) analysis
MPC	Modified proctor compaction test
SPC	Standard proctor compaction test
OC	Organic content test
U	Unconsolidated Undrained Triaxial Test
V	Field vane (LV-laboratory vane test)
γ	Unit weight

APPENDIX

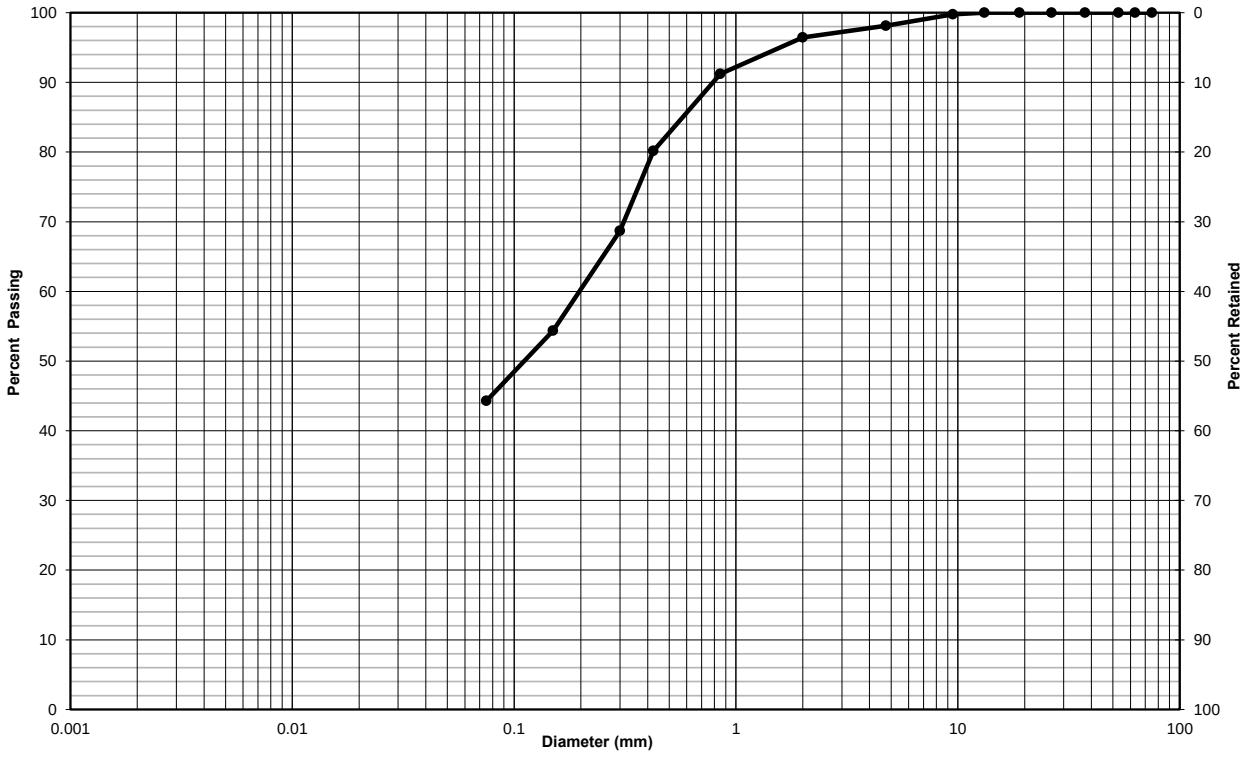
C

LABORATORY TESTING RESULTS

Particle-Size Analysis of Soils
(ASTM D422)

Client:	St. Mary Coptic Church	**Lab no.:**	508-1
Project/Site:	St. Mary Coptic Church	**Project no.:**	191-04634-00

Borehole no.:	BH19-1	Sample no.:	SS2
Depth:	0.75-1.35m		



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

	Gravel	Sand	Clay & Silt	Silt	Clay
Percent %	1.9	53.9	44.3	-	-

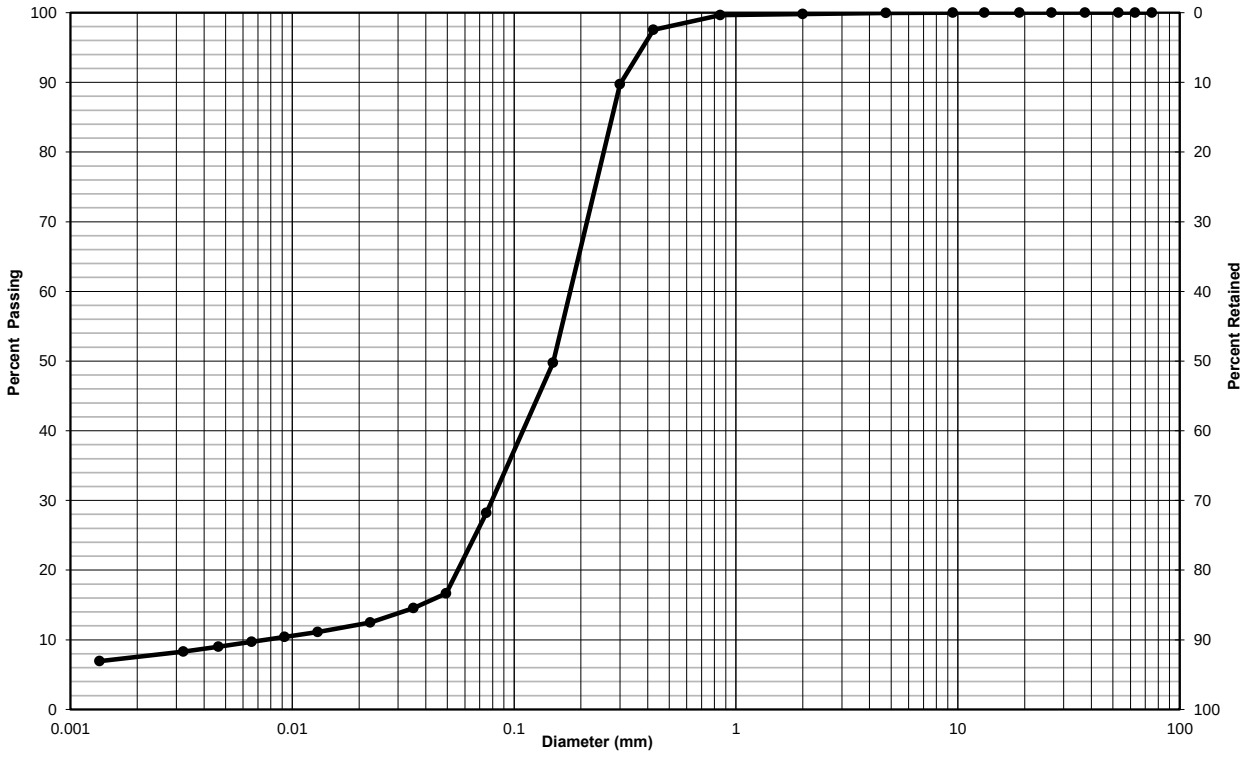
Remarks:

Performed by:	Rupesh Subedi	**Date:**	May 2, 2019
Verified by:	Nick Krebs	**Date:**	May 6, 2019

Particle-Size Analysis of Soils
(ASTM D422)

Client:	St. Mary Coptic Church	**Lab no.:**	508-5
Project/Site:	St. Mary Coptic Church	**Project no.:**	191-04634-00

Borehole no.:	BH19-1	Sample no.:	SS8
Depth:	5.3-5.9m		



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

	Gravel	Sand	Clay & Silt	Silt	Clay
Percent %	0.0	71.8	28.2	20.8	7.4

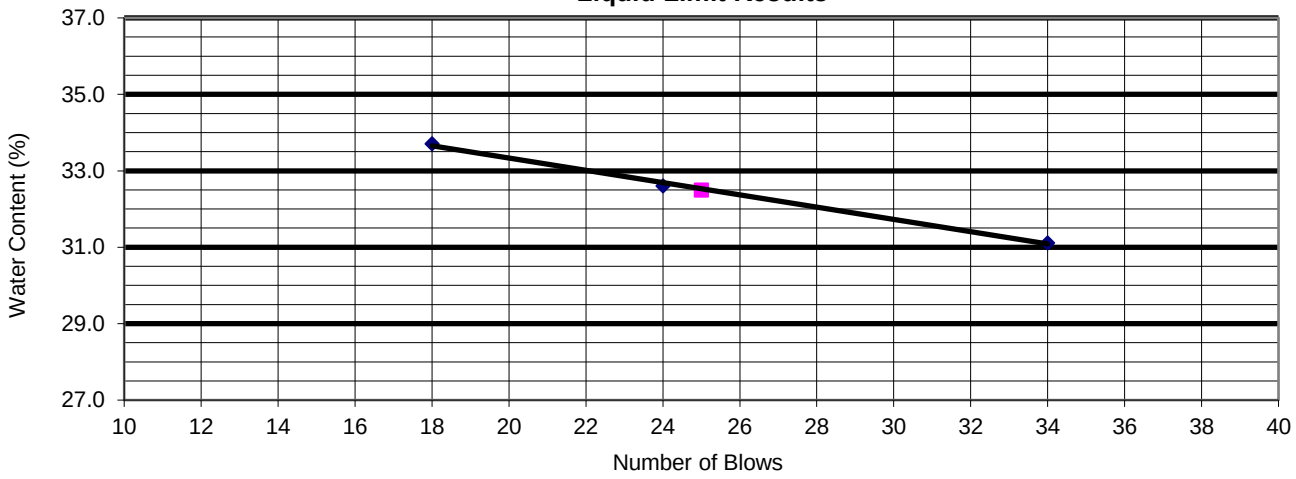
Remarks:

Performed by:	Rupesh Subedi	**Date:**	May 3, 2019
Verified by:	Nick Krebs	**Date:**	May 6, 2019

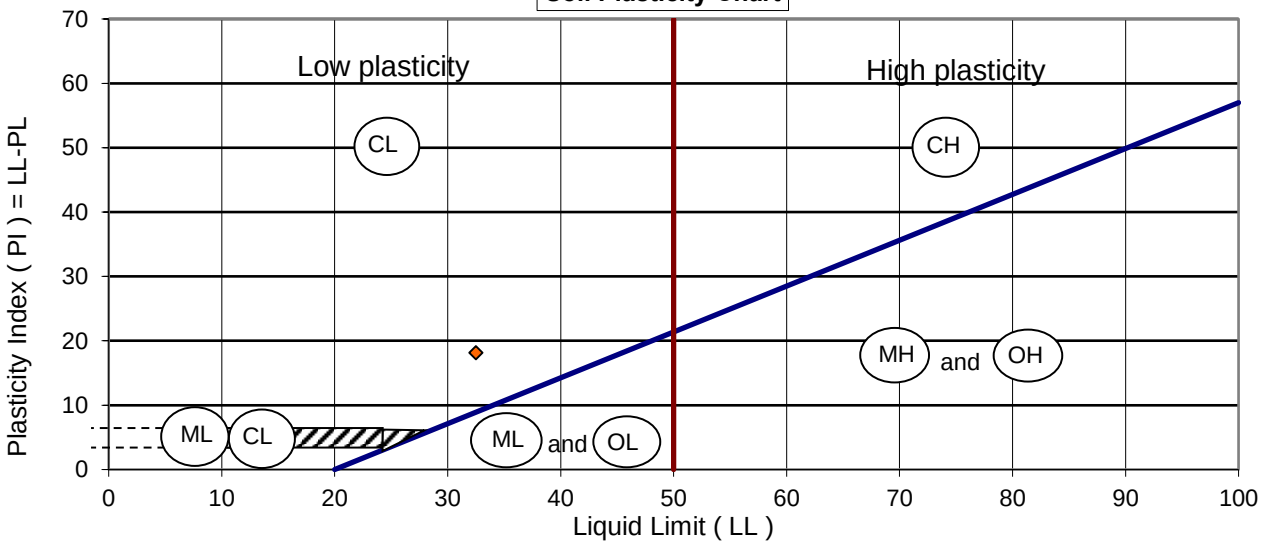
Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	St. Mary Coptic Church	**Lab No.:**	508-2
Project/Site:	St. Mary Coptic Church	**Project No.:**	191-04634-00
Borehole No.:	BH19-1	Sample No.:	SS4
Sample Depth:	2.3-2.9m		

Liquid Limit Results



Soil Plasticity Chart



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content %
33	14	18	26.5

Sample Description: **CL - Low plasticity, inorganic clay**

Performed By:	Rupesh Subedi	**Date:**	May 2, 2019
Verified By:	Nick Krebs	**Date:**	May 6, 2019

Certificate of Analysis

eurofins | Environment Testing

Client: WSP Canada Inc. (SPL)
146 Colonnade Rd., Unit 17
Ottawa, ON
K2E 7Y1
Attention: Mr. Daniel Wall
PO#:
Invoice to: WSP Canada Inc.

Report Number: 1906324
Date Submitted: 2019-04-29
Date Reported: 2019-05-07
Project: St Mary Coptic Church 191-04634-00
COC #: 201126

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1423299 Soil 2019-04-22 BH19-1 SS5	1423300 Soil 2019-04-22 BH19-1 SS7B
Anions	Cl	0.002	%			0.012	0.006
	SO4	0.01	%			0.02	<0.01
General Chemistry	Electrical Conductivity	0.05	mS/cm			0.27	0.11
	pH	2.00				8.30	8.57
	Resistivity	1	ohm-cm			3700	9090

Guideline = *** = Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

APPENDIX

D

LIMITATIONS OF THIS REPORT

LIMITATIONS OF REPORT

This report is intended solely for the Client named. The material in it reflects our best judgment in light of the information available to WSP Canada Incorporated (WSP) at the time of preparation. Unless otherwise agreed in writing by WSP, it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

The conclusions and recommendations given in this report are based on information determined at the test hole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

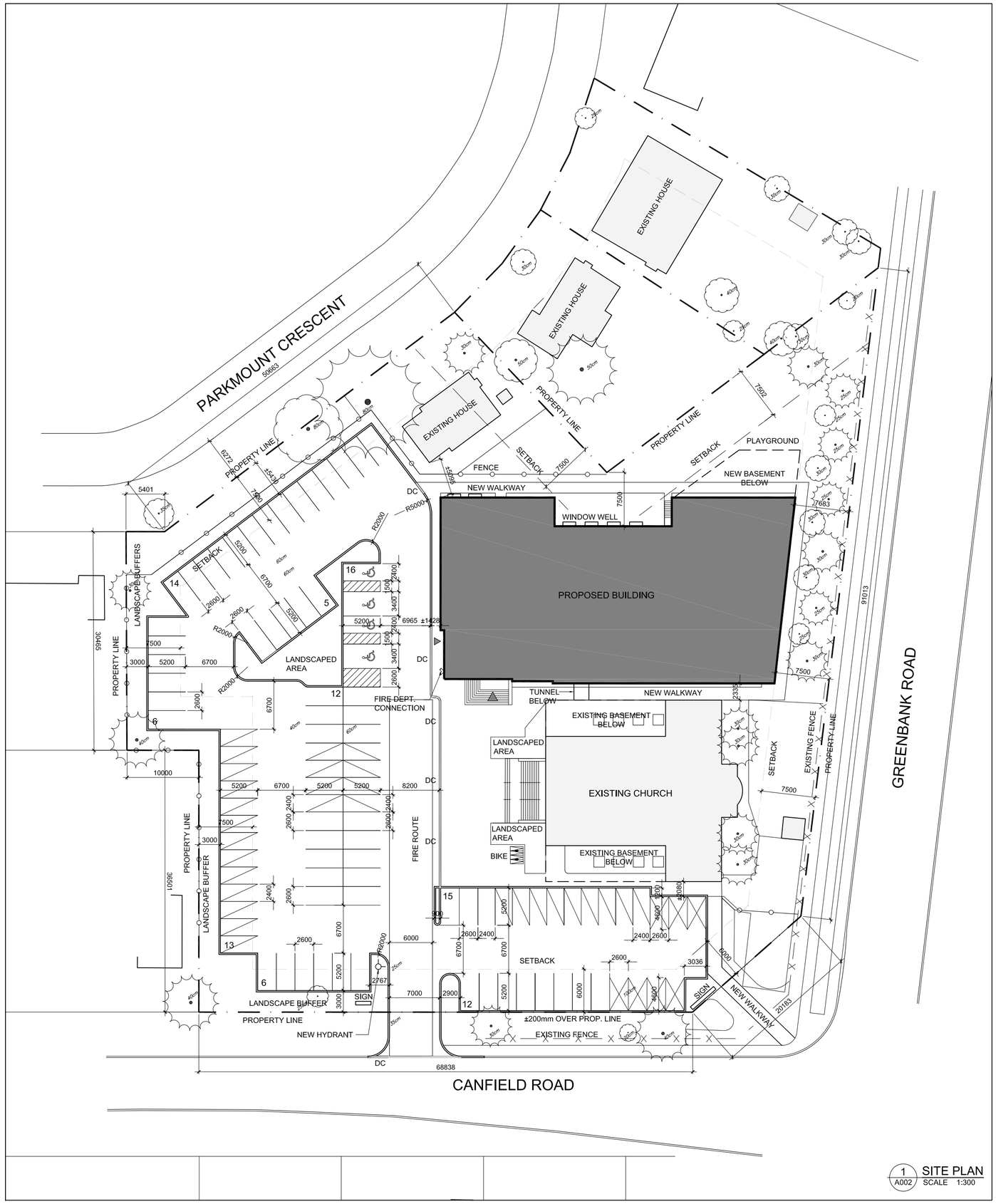
The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of test holes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. WSP accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

Appendix E PROPOSED SITE PLAN



1 A002 SITE PLAN
SCALE 1:300

SURVEY INFORMATION TAKEN FROM:

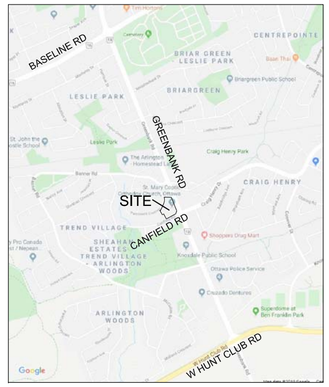
TOPOGRAPHIC PLAN of SURVEY of
LOTS 19, 38, 39, 40, 41 AND 42 AND PART OF BLOCK J REGISTERED PLAN 485324
CITY OF OTTAWA

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 REGULATIONS MADE UNDER THEM.
2. THIS SURVEY WAS COMPLETED ON THE 9th. DAY OF JUNE, 2019.

STANTEC GEOMATICS Ltd
400-1331 Clyde Ave, Ottawa, Ontario, K2C 3G4
Tel.: (613) 722-4420
www.stantec.com



\- A002 KEY PLAN
SCALE

ZONING INFORMATION

ZONING MECHANISM	REQUIRED (OTTAWA ZONING BY-LAW, 2008-250)	PROVIDED
ZONING CODE	I1B [428]	CHURCH
MINIMUM LOT AREA	1000 m²	7797.96 m²
MINIMUM LOT WIDTH	30 m	68.84 m
MINI. FRONT YARD SETBACK	6 m	18.18 m (EXISTING)
MINI. CORNER YARD	7.5 m	7.5 m
MINI. REAR YARD	7.5 m	7.5 m
MINI. INTER. SIDE YARD	7.5 m	19.46 m
MAX. BUILDING HEIGHT	18 m	7.8 m
PROPOSED PARKING SPACE		99
PROPOSED BICYCLE SPACE	3 (1 /1500 m²)	4
GROSS FLOOR AREA — EXISTING		1205.5 m² (12,976 s.f)
GROSS FLOOR AREA — PROPOSED		2924.1 m² (31,475 s.f)
GROSS FLOOR AREA — TOTAL		4129.6 m² (44,451 s.f)

PARKING SPACE TABLE

BUILDING	REQUIRED BY-LAW — ASSEMBLY AREA	RATE	SPACE	PROVIDED
EXISTING CHURCH	CHURCH HALL: 275 m²	28 10 / 100 m²	89	99
PROPOSED ACTIVITY CENTRE	GYM & LOUNGE: 570 m²	57 10 / 100 m²		
	OFFICE: 100 m²	4 2.4 / 100 m²		

PARKING SPACE DIMENSION

DIMENSION	QNTY.	BY-LAW PROVISIONS
2.6 x 5.2 m	58	
3.4 x 5.2 m TYPE A (B-F)	2	1 MINI. REQD. 4 PROVIDED
2.4 x 5.2 m TYPE B (B-F)	2	
2.4 x 5.2 m REDUCED	30	34 SPOTS 37.4% (40% MAX.)
2.6 x 4.6 m REDUCED	7	
TOTAL	99	

LEGEND

- PROPERTY LINE
- YARD SETBACK
- FENCE
- PROPOSED BUILDING
- EXISTING BUILDING
- MAIN ENTRANCE
- STANDARD PARKING SPACE 2.6 x5.2 m
- REDUCED PARKING SPACE 2.6 x4.6 m
- REDUCED PARKING SPACE 2.4 x5.2 m

ST. MARY COPTIC ORTHODOX CHURCH
OTTAWA, CANADA

no.	revision	date

N45 ARCHITECTURE INC.
71 Bank Street, 7th Floor - Ottawa, Ontario, K1P 5N2
tel. 613.224.0095 fax 613.224.9811

project
ST. MARY COPTIC ORTHODOX CHURCH EXPANSION
1 CANFIELD RD, OTTAWA, ON.

construction north — true north

seal

drawing title
SITE PLAN - NEW WORK

scale	drawn by
AS SHOWN	N.F
date	checked by
OCTOBER 2019	R.M
project number	drawing number
15-134	A-002

CONTRACTOR TO VERIFY ALL DIMENSIONS AND NOTIFY THE ARCHITECT OF ANY DISCREPANCIES BEFORE WORK COMMENCES.
DO NOT SCALE DRAWINGS.

revision

Appendix F PRE-CONSULTATION MEETING MINUTES

Kilborn, Kris

From: Meloshe, Nancy
Sent: Friday, October 18, 2019 4:24 PM
To: bishoy_samy@hotmail.com; Robert Matthews; Smith, Molly; Lalonde, Isabelle; Kilborn, Kris; O'Grady, Lauren
Subject: Fwd: 1 Canfield Road - Preconsultation Follow up
Attachments: 1 Canfield - Study and Plan Identification List - Oct 18, 2019.pdf

FYI

Get Outlook for iOS

From: Dickinson, Mary <mary.dickinson@ottawa.ca>
Sent: Friday, October 18, 2019 4:11:46 PM
To: Meloshe, Nancy <Nancy.Meloshe@stantec.com>
Subject: 1 Canfield Road - Preconsultation Follow up

Please accept this email as formal follow-up for the pre-consultation from Thursday October 3, 2019 for the 1 Canfield Drive.

Summary of Proposed Project

- This proposal is to add a second supporting building to the site that will include uses that compliment the church use including a gym, classrooms for Sunday school, and meeting/office space.
- Keep the existing church building.
- Incorporate 9 Canfield, and 17 and 15 Parkmount Crescent into the church property to be converted to parking area.
- The new building is proposed to be immediately north of the existing church.
- 9 and 11 Parkmount are proposed to remain in their current form as detached dwellings.
- 13 Parkmount lot area is proposed to be adjusted to accommodate the new building behind it, but the house is proposed to remain as-is.
- Proposal for newly configured parking lot with access from Canfield Drive.
- Proposal includes visual screening of the parking lot using fencing and landscaping adjacent to Parkmount Crescent.
- 96 parking spaces proposed.
- Where previous proposal included plans for a new larger church building, the current proposal will rely on offering more liturgies which will accommodate a growing congregation without needing a larger church.

Policy Framework

- Official Plan Designation: General Urban Area
- Zoning By-law Designation: I1B[428] (existing church property), and R1FF (residential lots to be incorporated into the site design).

History

- An initial preconsultation was carried out in June 2016. A second preconsultation was carried out on June 11, 2018.

- Over the past two years, a number of meetings have taken place with the church and their team, the Councillor's office, and the community, the most recent of which was on March 7, 2019. Since this meeting, the development concept and approach have changed in accordance with what has been described above.

Comments

Planning/Policy (Mary Dickinson)

- Compatibility and mitigation of the impacts of the development's proposed new edge along an established residential street will be a key consideration for this project, and will need to be covered thoroughly in the planning rationale.
- If additional lands are to be incorporated into the subject site, it must result in a logical land holding. If the church is not successful in purchasing all proposed lots, and the result is that the new church lands propose to wrap around one or some of the existing 'holdout' lots on Parkmount, this will have a significant impact on the ability to successfully integrate the residential and institutional uses. A continuous and logical lot fabric along Parkmount is essential.
- Please review the Official Plan policies relating to intensification and include a section in the Planning Rationale explaining how the proposed scenario fits within the city vision for growth in the urban area.
- A thorough transportation analysis will be required as part of this application.
- You indicated that you intend to calculate parking requirements for the whole development based on the rate of 10 parking spaces per 100 m2 of gfa of assembly space. Assembly space would include sanctuaries, meeting halls, gyms, classrooms etc. but would not include hallways, kitchens, washrooms, storage rooms, stages, etc. As long as all uses within the building are considered as 'place of worship' or accessory/associated with the place of worship use, then this approach is reasonable.

Transportation (Josiane Gervais)

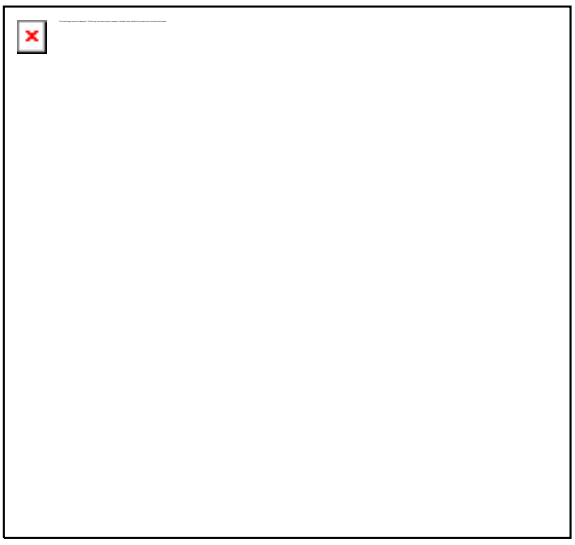
- Follow Traffic Impact Assessment Guidelines
- The Screening/Scoping should be re-submitted for the new proposal.
- Start this process asap. The application will not be deemed complete until the submission of the draft step 1-4, including the functional draft RMA package (if applicable) and/or monitoring report (if applicable).
- ROW protection on Canfield between Cramer and Greenbank is 24m even.
- ROW protection on Greenbank between Highway 417 and West Hunt Club is 37.5m even.
- Noise Impact Studies required for the following:
- Road
- Stationary (if there will be any exposed mechanical equipment due to the proximity to neighbouring noise sensitive land uses)
- Minimum clear throat length requirement on Canfield is 8-15m, depending on site generated traffic.
- On site plan:

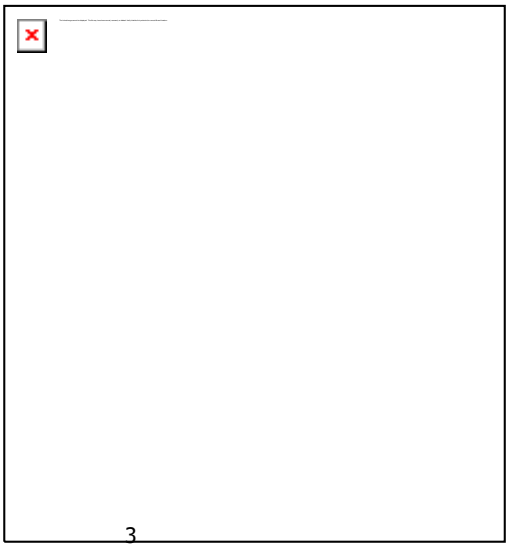
- Show all details of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks.
- Turning templates will be required for all accesses showing the largest vehicle to access the site; required for internal movements and at all access (entering and exiting and going in both directions).
- Show all curb radii measurements; ensure that all curb radii are reduced as much as possible
- Show lane/aisle widths.
- Sidewalk is to be continuous across access as per City Specification 7.1.
- Grey out any area that will not be impacted by this application.

Engineering (Eric Surprenant)

General:

- Please be advised that as the subject site is currently comprised of multiple separate parcels of land the approval exemption under O.Reg. 525/98 would not apply and an Environmental Compliance Approval (ECA) would be required.
  Ontario Regulation 525/98:
  3. Subsection 53(1) and (3) of the Act do not apply to the use, operation, establishment, alteration, extension or replacement of or a change in a storm water management facility that,
  (a) is designed to service one lot or parcel of land;
  (b) discharges into a storm sewer that is not a combined sewer;
  (c) does not service industrial land or a structure located on industrial land; and
  (d) is not located on industrial land.
  If the parcels are consolidated into one parcel the noted approval exemption would apply subject to confirmation that there is no external drainage from the adjacent lands.
- Any easements on the subject site shall be identified and respected by any development proposal and shall adhere to the conditions identified in the easement agreement.
- Please provide an **Existing Conditions/Removals Plan**.
- Please document the **Interim and Ultimate Servicing Scenarios/Conditions.**
- Any portion of the subject property which is intended to be used for permanent or temporary snow storage shall be as shown on the Site Plan and Grading Plan. Snow storage shall not interfere with approved grading and drainage patterns or servicing. Snow storage areas shall be setback from the property lines, foundations, fencing or landscaping a minimum of 1.5m. Snow storage areas shall not occupy driveways, aisles, required parking spaces or any portion of a road allowance.





Disclaimer:
The City of Ottawa does not guarantee the accuracy or completeness of the data and information contained on the above image(s) and does not assume any responsibility or liability with respect to any damage or loss arising from the use or interpretation of the image(s) provided. This image is for schematic purposes only.

Water:

- A 300mm dia. watermain is located in Canfield Road.
- A connection to the 406mm dia. watermain in Greenbank Road is not permitted.
- A private fire hydrant is anticipated to be required within the subject site to provide sufficient fire protection.
- Please assess that there is a sufficient number of hydrants at sufficient proximities to actually provide the required fire flow the building(s) as per Technical Bulletin ISTB-2018-02 *Revision to Ottawa Design Guidelines-Water Distribution* dated March 21, 2018. Both the capacity of the hydrant and the proximity to the building structure are required to be considered. Please review Technical Bulletin ISTB-2018-02 Appendix I: *Guideline on Coordination of Hydrant Placement with Required Fire Flow* and document and discuss that the minimum number of hydrants needed to deliver the required fire flow is being provided.
- The subject site is located within the 2W Pressure Zone.
- A Water Meter Sizing Questionnaire will be required to be completed following Site Plan Approval for the proposed building.
- The existing water services for the residential lots on Parkmount Cres. and Canfield Rd. are required be blanked at the main.
- Please provide the following information to the City of Ottawa via email to request water distribution network boundary conditions for the subject site. Please note that once this information has been provided to the City of Ottawa it takes approximately 5-10 business days to receive boundary condition results for hydraulic analysis.
    - Type of Development
    - Site Address
    - A plan showing the proposed water service connection location.
    - **Average Daily Demand** (L/s)
    - **Maximum Daily Demand** (L/s)
    - **Peak Hour Demand** (L/s)
    - **Fire Flow** (L/min)
      Fire flow demand requirements shall be based on Fire Underwriters Survey (FUS) Water Supply for Public Fire Protection 1999 as per the Ottawa Design Guidelines – Water Distribution, First Edition, Document WDG001, July 2010, City of Ottawa Clause 4.2.11.
    - Provide a copy of the **FUS calculations.**

Storm Sewer:

- A 300mm dia. concrete storm sewer is located within Canfield Road.
- No service connection to Greenbank Road is permitted.
- Connect the storm service to the existing dead-end maintenance hole on Canfield Road to avoid the requirement for an additional maintenance hole within the ROW as the proposed service will exceed 50% the dia. of the existing rigid (concrete) sewer main.

- A storm sewer monitoring maintenance hole is required to be installed at the property line (inside the property) as per *Sewer-Use By-Law 2003-514 (14) Monitoring Devices*.
- The existing services for the residential lots on Parkmount Cres. and Canfield Rd. are required to be removed.

Sanitary:

- A 200mm dia. sanitary sewer is located with Canfield Road.
- A connection to the Greenbank Road Trunk sewer is not permitted.
- Connect the sanitary service to the existing dead-end maintenance hole on Canfield Road to avoid the requirement for an additional maintenance hole within the ROW as the service will exceed 50% the dia. of the existing rigid (concrete) sewer main.
- Analysis and demonstration that there is sufficient/adequate residual capacity to accommodate any increase in wastewater flows in the receiving and downstream wastewater system is required to be provided.
- Please comply with the wastewater design flow parameters *in Technical Bulletin PIEDTB-2018-01.*
- A sanitary sewer monitoring maintenance hole is required to be installed at the property line (inside the property) as per *Sewer-Use By-Law 2003-514 (14) Monitoring Devices*.

Stormwater Management Criteria:

- In the absence of area specific SWM criteria please control post-development runoff from the subject site, up to and including the 100-year storm event, to a **2-year allowable release rate** calculated using an allowable runoff coefficient (C) determined using the smaller of (lesser of) a runoff coefficient of 0.5 or the actual pre-development existing site runoff coefficient (Cl.8.3.7.3), and a calculated time of concentration (T_c) using an appropriate method to justify the parameter selection (*T_c of 20 minutes should be used for all pre-development calculations without engineering justification; T_c of 10 minutes shall be used for all post-development calculations*). The pre-development drainage area (define the area that currently drains to the Canfield Road storm sewer) shall be used to determine the target release rate.
- Please note that the install date of the 300mm dia. storm sewer in Canfield Road (1963) is pre-1970. Storm sewers systems were only designed to a 2-year level of service not a 5-year level of service pre-1970. Therefore, post-development flows for the subject site are to be controlled up to and including a 100-year storm event to a **2-year allowable release rate**.
- As per *Technical Bulletin PIEDTB-2016-01 section 8.3.11.1 (p.12 of 14)* **there shall be no surface ponding on private parking areas during the 2-year storm rainfall event**. Depending on the SWM strategy proposed underground or additional underground storage may be required to satisfy this requirement.
- As stormwater treatment is not addressed offsite **(Graham Creek watercourse)**, onsite measures may be requested/required. Please consult with the local conservation authority (RVCA) regarding water quality criteria prior to submission of a Site Plan Control Proposal application to establish the water quality control criteria for the site.
- When using the modified rational method to calculate the storage requirements for the site any underground storage (pipe storage etc.) should not be included in the overall available storage. The modified rational method assumes that the restricted flow rate is constant throughout the storm which underestimates the storage requirement prior to the 1:100 year head elevation being reached. Please note that if you wish to utilize any underground storage as available storage, the $Q_{(release)}$ must be modified to compensate for the lack of head on the orifice. An assumed average release rate equal to 50% of the peak allowable rate shall be applied. Otherwise, disregard the underground storage as available storage or provide modeling to support SWM strategy.

- Please note that the minimum orifice dia. for a plug style ICD is 83mm and the minimum flow rate from a vortex ICD is 6 L/s in order to reduce the likelihood of plugging.
- Please ensure that the elevation at the property line through any private approach is set a minimum 15cm higher (vertical clearance above the spill elevation) than the established spill elevation on Canfield Road and Greenbank Road to ensure that during extreme events and if a catchbasin becomes blocked, the major system will spill to the next downstream roadway segment and not back onto the subject site property.
- Post-development site grading shall match existing property line grades in order to minimize disruption to the adjacent residential properties. **It shall be documented and demonstrated that development of the existing residential lots on Parkmount Cres. does not adversely impact the drainage patterns of the subdivision**.
- Please provide a **Pre-Development Drainage Area Plan** to define the pre-development drainage areas/patterns. Establishing pre-development drainage areas is essential is determining the allowable release rate for the subject development.
- Excerpts from any relevant reports shall be provided in the report as supporting documentation.
- Please note that if rooftop control drains are proposed as part of the stormwater management strategy for this development a memorandum sealed by a professional mechanical engineer that confirms that the roof design will meet the stormwater management objectives with flow control drains and roof spill scuppers in accordance with clause 7.4.10.4 of the 2012 Ontario Building Code will be required to be provided prior to Site Plan Approval. This memorandum will ensure the engineered flow controls function as designed and don't over-top the roof. The scupper is to be constructed to a maximum elevation equal to the top of the roof drain. Examples of the memorandum can be provided to reference if requested.
- Please note that if rooftop ponding has been proposed as part of the stormwater management strategy for this development a memorandum sealed by a professional structural engineer that confirms that the building structure has been designed to accommodate rooftop storage is required to be provided prior to Site Plan Approval. Examples of the memorandum can be provided to reference if requested.
- Please investigate and review the existing servicing and stormwater management strategy for the site. Existing servicing and SWM conditions shall be identified and discussed in the report.

Exterior Site Lighting:

- Please note that any proposed light fixtures (both pole-mounted and wall mounted) must be part of the approved Site Plan. All external light fixtures must meet the criteria for Full Cut-off Classification as recognized by the Illuminating Engineering Society of North America (IESNA or IES), and must result in minimal light spillage onto adjacent properties (as a guideline, 0.5 fc is normally the maximum allowable spillage). In order to satisfy these criteria, the please provide the City with a **Site Lighting Plan, Photometric Plan and Certification (Statement) Letter** from an acceptable professional engineer stating that the design is compliant.

Permits and Approvals:

- The consultant shall determine if this project will be subject to an Environmental Compliance Approval (ECA) for Private Sewage Works. It shall be determined if the exemptions set out under Ontario Regulation 525/98: *Approval Exemptions* are satisfied.

Capital Works:

- No **Capital Construction** works are currently planned for Canfield Road.

Geotechnical Investigation

- A Geotechnical Report is required to be submitted.

Phase One Environmental Site Assessment

- A Phase 1 ESA is required to be completed in accordance with Ontario Regulation 153/04 in support of a development application to determine the potential for site contamination.

Guide to preparing City of Ottawa Studies and Plans:
http://ottawa.ca/en/development-application-review-process-0/guide-preparing-studies-and-plans

Servicing Study Guidelines for Development Applications:
http://ottawa.ca/en/development-application-review-process-0/servicing-study-guidelines-development-applicationsi

To request City of Ottawa plan(s) or report information please contact the City of Ottawa Information Centre:
InformationCentre@ottawa.ca
(613) 580-2424 ext. 44455

-Please note that these comments are considered preliminary based on the information available to date and therefore maybe amended or the criteria provided altered as additional details become available and presented to the City.

Urban Design (Melanie Knight)

- The design of the site should address the relationship between the new 2-storey building and the remaining house (15 Parkmount Cres). A fence is recommended if the house is to function separate from the site (as indicated in the pre-consult meeting).
- Pedestrian access should be provided directly to the corner of Greenbank and Canfield, currently a fence prevents direct pedestrian access from this corner. The Site Plan and Landscape Plan should include clear pedestrian pathways from this corner as well as from Canfield through the parking lot to the church and new building.
- The landscape buffer between Parkmount and the proposed parking lot should be as wide as possible and consist of dense landscaping such as coniferous shrubs and trees to provide a year-round buffer.
- Fencing should be provided around the periphery of the site adjacent to the residential uses.

Application Type and Requirements

- This proposal will require a Major Zoning By-law Amendment Application and a Site Plan Control application under the 'Complex' category. Please see the application forms for current fees associated with each of these.
- Please find attached the Plan and Study Identification List. Note that in addition to the requested paper copies, pdf copies of all submission material is required.
- For the site plan control application, the owner may be subject to additional Engineering Design Review and Inspection Fees. A portion of these fees are captured at the time of application, where the balance is determined through the cost estimates that are provided at the end of the review process. The total owing is equal to four per cent of the value of the hard servicing (roads, sewers, watermains, sidewalks, curbs, stormwater etc.) and two per cent of the soft servicing (landscaping, parking lot construction etc.) are payable prior to the registration. Securities will also be required to be posted as a condition of approval at a rate equal to 50% of all on-site works and 100% of all works in the right of way.

- It is recommended that the site plan and zoning application be submitted and reviewed concurrently.
- Please note that parkland dedication and community benefit contributions requirements will be changing as a result of Bill 108. The details are not currently known. As of right now, typical cash in lieu of parkland fees apply at a rate of 2% of the value of the land, unless proof of previous payment can be provided. If payment is required, a credit will be given for the demolition of any existing building (ie. the detached dwellings), such that the fees will only apply to the uplift on the property.
- Please contact Building Code Services to determine what your approximate Development Charges and other applicable fees will be at the time of issuance of a building permit.
- Early consultation with the community is supported.

Mary Dickinson, MCIP, RPP
Planner
Development Review West
Urbaniste
Examen des demandes d'aménagement ouest

City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 13923
ottawa.ca/planning / ottawa.ca/urbanisme

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Appendix G DRAWINGS