Site Servicing and Stormwater Management Report 178 Nepean Street, 219/223 Bank Street Site Plan, Ottawa, ON

Type of Document:
Site Plan Submission

Client:
Smart Living Properties
226 Argyle Avenue
Ottawa, ON

Project Number: OTT-22028796-A0

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Date Submitted:
December 14, 2022

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Legal Notification

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1 Introduction

Smart Living Properties retained EXP Services Inc. (EXP) to undertake a site servicing and stormwater management study in support of a site plan application for the development of 178 Nepean, 219/223 Bank Street property located in Ottawa, ON.

The site is legally described as Lot 35 (South Nepean Street) and part of Lot 3 (East Bank Street) and part of Lot 35 (North Lisgar Street) Registered Plan 2996 in the City of Ottawa. It is located between Nepean Street, Bank Street and Lisgar Street with frontage on all three roads. The client wants to develop the site into a nine-storey mix-use building. Plan Refer to Figure 1 for the site location.

This report will discuss the adequacy of the existing municipal sewers and watermains to convey the storm runoff, sanitary flows and water demands that will result from the proposed development. This report also provides a design brief in support of the engineering drawings, for the Site Plan Control Application submission and City of Ottawa approval.

2 Existing Conditions

The site is mostly covered with two-story and three-story building structures that are adjacent two each other. These structures vary in height, and they all have a flat roof. There is a small asphalt parking area that is accessible through a driveway on Nepean Street. The driveway itself is located on the adjacent property while the parking area is located on the subject property. The parking area sheet drains towards Nepean Street.

3 Existing Infrastructure

Based on the information provided on the topographical survey prepared by Annis, O'sullivan, Vollebekk Ltd. Dated August 24, 2022, and the City of Ottawa GIS website, the following municipal infrastructure was identified.

Nepean Street

- A 525mm dia. Concrete Sanitary sewer pipe within the road.
- A 600mm dia. Concrete Stormwater pipe within the road.
- A 305mm dia. Ductile Iron water pipe on the south side of the road.

Bank Street

- A 825mm dia. Concrete Stormwater pipe within the road.
- A 300mm dia. PVC Sanitary sewer pipe within the road.
- A 305mm dia. PVC water pipe within the road.

Lisgar Street

- A 675mm dia. Concrete Stormwater pipe within the road.
- A 375mm dia. Concrete Sanitary sewer pipe within the road.
- A 305mm dia. Ductile Iron water pipe on the south side of the road.

4 Proposed Development

The proposed development will consist of a nine-story mix use building that includes one hundred and ninety-five (195) bachelor units, thirty-five (35) barrier-free bachelor units, ten (10) 1-bedroom units, twelve (12) 2-bedroom units, eleven (11) 3-bedroom units, five (5) commercial spaces in the basement level and five (5) commercial spaces on the ground floor. The building will also have a garbage room, moving room, amenity space, mail room and administrative room on the ground level; a bike storage area and a lockers room on the basement level.

The proposed building will maintain the heritage components of the existing building and incorporate them into the new proposed structure.

The proposed development will be serviced using the existing watermain, sanitary and storm sewers fronting the site on Bank Street. Stormwater management will be handled on the roof of the proposed building.

5 Referenced Guidelines

Various documents were referred to in preparing the current report including:

- Sewer Design Guidelines, Second Edition, Document SDG002, October 2012, City of Ottawa (Guidelines) including:
  - Technical Bulletin ISDTB-2012-4 (20 June 2012)
  - Technical Bulletin ISDTB-2014-01 (05 February 2014)
  - Technical Bulletin PIEDTB-2016-01 (September 6, 2016)
  - Technical Bulletin ISDTB-2018-01 (21 March 2018)
  - Technical Bulletin ISDTB-2018-04 (27 June 2018)
  - Technical Bulletin ISDTB-2019-02 (08 July 2019)
- Ottawa Design Guidelines – Water Distribution, July 2010 (WDG001), including:
  - Technical Bulletin ISDTB-2014-02 (May 27, 2014)
  - Technical Bulletin ISTB-2018-02 (21 March 2018)
- Ontario Ministry of Transportation (MTO) Drainage Manual, 1995-1997
- Stormwater Management Planning and Design Manual, Ontario Ministry of the Environment and Climate Change, March 2003 (SMPDM).
- Design Guidelines for Drinking-Water Systems, Ontario Ministry of the Environment and Climate Change, 2008 (GDWS).
- Fire Underwriters Survey, Water Supply for Public Fire Protection (FUS), 2020
- Ontario Building Code 2012, Ministry of Municipal Affairs and Housing

6 Watermain Servicing

Two new 100mm dia. water service lines will be extended from the existing 305mm dia. watermain on Bank Street to the proposed building. Refer to the site servicing plan C100 for more details on the location of existing and proposed water services.

Fire protection demands have been calculated in subsequent sections using the latest version of the Fire Underwriter Survey. There are existing fire hydrants within the vicinity of the proposed building that will provided the required flow.

6.1 Domestic Water Demands

The domestic water demands are estimated below, utilizing parameters from the WDG001 and the GDWS. Table 6.1 summarizes the parameters used.

Table 6-1: Water System Design Criteria

Design Parameter	Value
Population Density – bachelor and 1-bedroom	1.4 persons/unit
Population Density – 2-bedroom	2.1 persons/unit
Population Density – 3-bedroom	3.1 persons/unit
City of Ottawa Average Day Demands	280 L/person/day
Commercial Average Day Demands	28,000 L/ha/day
Max Day Peaking Factor (MECP method when less than 500 persons)	3.22 x Average Day Demands
Peak Hour Factor (MECP method when less than 500 persons)	4.92 x Average Day Demands
City of Ottawa Commercial Max Day Peaking Factor	1.5 x Average Day Demands
City of Ottawa Commercial Peak Hour Factor	1.8 x Max Day Demands
Depth of Cover Required	2.4m
Maximum Allowable Pressure	690 kPa (100 psi)
Minimum Allowable Pressure	275.8 kPa (40 psi)
Minimum Allowable Pressure during fire flow conditions	137.9 kPa (20 psi)

Population:

230- Bachelor Apartments x 1.4 person/unit	= 322 Persons
10-1 Bedroom Apartments x 1.4 person/unit	= 14 Persons
12-2 Bedroom Apartments x 2.1 person/unit	= 25.2 Persons
11-3 Bedroom Apartments x 3.1 person/unit	= 34.1 Persons
Total	= 396 Persons
Average daily water consumption	= 280 L/person/day
Maximum Day Factor	= 3.22 x Avg. Day (from GDWS, Table 3-3)
Maximum Hour Factor	= 4.82 x Avg. Day (from GDWS, Table 3-3)

The average, maximum day and peak hour domestic demands for the building are as follows:

Domestic Residential Water Demands:

Average Day	396 persons * 280 L/person/day = 110,880L/day = 110,880 / 86,400 sec/day = 1.283 L/sec
Maximum Day	= 3.22 x 1.283 = 4.13 L/sec

Peak Hour	= 4.82 x 1.283 = 6.186 L/sec

Commercial area:

Total retail space area of building	= 1,739m^2
Average Day Demand	= 28,000L/ha/day
Average daily water consumption	= 28,000L/ha/day * (1hec/10,000m^2) * 1739m^2 = 4,869.2 L/day
Maximum Day Factor	= 1.5 x Avg. Day (from WDG001)
Maximum Hour Factor	= 1.8 x Max. Day (from WDG001)

Domestic Commercial Water Demands:

Average Day	= 4,869.2 L/day x (1 / 86,400) sec/day = 0.056L/sec
Maximum Day	= 1.5 x 0.056 = 0.085 L/sec
Peak Hour	= 1.8 x 1.5 x 0.056 = 0.152L/sec

Total Domestic Water Demands:

Average Day	= 1.28+0.056 = 1.34L/s
Maximum Day	= 4.13+0.085 = 4.21L/s
Peak Hour	= 6.186+0.152 = 6.34L/s

Detailed calculations of the domestic water demands are provided in Table B1 of Appendix B.

6.2 Fire Flow Requirements

The required fire flow for the proposed site was estimated based on the Fire Underwriters Survey. The following equation from the latest version of the Fire Underwriters Survey (2020) was used for calculation of the supply rates required to be supplied by the hydrant.

$F = 220 * C\sqrt{A}$

where:

- F = the required fire flow in liters per minute
- C = coefficient related to the type of construction
- A = the total floor area in square meters

Table 6-2: Summary of Required Fire Flow Protection

Item	Design Value
Floors Above Grade	9 floors
Construction Coefficient	1.0
Fire Protection Type	Sprinkler System
Building Height (m)	32.5m
Building Area (sq.m)	12135
F=220C$\sqrt{A}$ (L/sec)	24,235/min (24,000 rounded to closest 1,000)
Reduction due to low Occupancy	-0%
Reduction due to Sprinkler System	-50%
Increase due to separation	30%
Fire Flow Requirement (L/min)	19,200 or 19,000 L/min (rounded to closest 1,000) or 317 L/sec

The fire flow requirement for the proposed building was found to be 317/sec. Refer to Table 1 in Appendix B for detailed calculations.

The fire flow required is expected to be accommodated by using the existing fire hydrants surrounding the site. The closest three hydrants to the subject property are located in the following places:

- Southwest corner of Bank Street and Lisgar Street.
- Southwest corner of Bank Street and Nepean Street.
- On the south side of Nepean Street, Approx. 45m east of the northeast corner of the subject site.

7 Sanitary Sewer Design

The sanitary service will be provided by connecting the proposed building to the existing 825mm dia. sanitary sewer located on Bank Street. It is proposed to connect the building to a proposed testing maintenance hole via a 135mm sanitary service. From there, the testing maintenance hole will connect to the existing main via a 200mm dia. sanitary pipe.

The sanitary sewer system is designed based on a population flow, commercial area and area-based infiltration allowance. The flows were calculated using City of Ottawa design guidelines as follows:

Population:

230- Bachelor Apartments x 1.4 person/unit	= 322 Persons
10-1 Bedroom Apartments x 1.4 person/unit	= 14 Persons
12-2 Bedroom Apartments x 2.1 person/unit	= 25.2 Persons
11-3 Bedroom Apartments x 3.1 person/unit	= 34.1 Persons
Total	= 396 Persons

Commercial Area:

1,739m^2 of Commercial space

Residential Sanitary Flow:

Average Domestic Flow = 350 L/person/day

Domestic Flow	= 396 x 350 L/person/day x (1/86,400 sec/day) = 1.6 L/sec
Peak Factor	= 1 + (14 / (4 + (396/1000)$^{0.5}$) * K (K = 1) = 4.024 (4.0 Max)
Q Peak Domestic	= 1.6 L/sec x 4 = 6.4 L/sec

Commercial Sanitary Flow:

Average Domestic Flow	= 50,000 L/gross ha/day
Domestic Flow	= 1,739m^2 x (1ha/10000m^2) x 50,000 L/ha/day x (1/86,400 sec/day) = 0.101 L/sec
Peak Factor	= 1.5
Q Peak Domestic	= 0.101 L/sec x 1.5 = 0.151 L/sec

Infiltration:

Q Infiltration	= 0.28 L/ha/sec x 0.203 ha (Total Area of Site) = 0.057 L/sec

Total Peak Sewage Flow:

Total Sanitary Flow = 6.4+0.151+0.057 **= 6.61 L/sec**

The proposed 135mm and 200mm sanitary pipes having a slope of 2.00% and 1.00% will have a full flow capacity of 16.3 L/s and 36.1 L/s respectively. The proposed pipe capacity is sufficient to accommodate the anticipated sanitary flow from the proposed building. It is proposed that the existing 600mm dia. concrete combined sewer has enough capacity to accommodate the proposed development.

8 Stormwater Management

8.1 Design Criteria

The proposed stormwater system is designed in conformance with the latest version of the City of Ottawa Design Guidelines (October 2012). Section 5 “Storm and Combined Sewer Design” and Section 8 “Stormwater Management”. A summary of the design criteria that relates to this design report is the proceeding sections below.

Minor System Design Criteria

- The storm sewers have been designed and sized based on the Rational Method and the Manning’s Equation under free flow conditions for the 2-year storm using a 10-minute inlet time.
- The allowable release rate for the site is limited to a 2-year storm event using a time of concentration of 10 minutes and a runoff coefficient of 0.50. Flows in excess of the 2-year and up to the 100-year storm event will be detained onsite.

Major System Design Criteria

- The major system has been designed to accommodate onsite detention with sufficient capacity to attenuate the 100-year design storm. Excess runoff above the 100-year event will flow overland offsite.

- Onsite storage is provided for up to the 100-year design storm through surface ponding within the roof areas. Calculations of the required onsite storage volumes have been supported by calculations provided in Appendix D.
- Calculation of the required storage volumes has been prepared based on the Modified Rational Method as identified in Section 8.3.10.3 of the City's Sewer Guidelines.

8.2 Pre-Development Conditions

The site is covered with existing two-storey and three-storey structures that are adjacent to each other. There is a small asphalt parking area and a small gravel area at the back of the property. The calculated runoff coefficient for the site was found to be 0.89. however based on the City of Ottawa requirements outlined in the pre-consultation meeting minutes, the maximum allowable runoff coefficient for the site will be limited to 0.5. This C value along with a time of concentration (Tc) of 10 minutes has been used to calculate the allowable release rate for the site. Table D1 to Table D3 in Appendix D provided detailed calculations under pre-development conditions.

8.3 Runoff Coefficients

Runoff coefficients used were based on actual areas taken from CAD. Runoff coefficients for impervious surfaces (roofs, asphalt, and concrete) were taken as 0.90, gravel areas were taken as 0.70, whereas pervious surfaces (grass/landscaping) were taken as 0.20. Average runoff coefficients for sub-catchments (or drainage areas) were calculated using the area weight. The runoff coefficients for pre-development and post-development catchments are provided in

and D5 respectively, with a summary provided in Table 8-1 below.

Table 8-1: Summary of Runoff Coefficients

Location	Area (hectares)	Pre-Development Runoff Coefficient, C_{AVG}	Post-Development Runoff Coefficient, C_{AVG}
Entire Site	0.1948	0.89	0.90

8.4 Calculation of Allowable Release Rate

The allowable release rate from the site is based on 2-year storm event with a runoff coefficient of 0.50 and a time of concentration of 10 minutes. To control runoff from the site to the allowable release rate, post-development flows from the building footprint will be restricted, and on-site storage will be provided up to the 100-year storm event.

The following parameters will be used to determine the allowable release rates from the proposed site to the capped 375mm storm sewer at the property line, using the Rational method.

$Q_{ALL} = 2.78\ C\ I\ A$

where:

Q_{ALL} = Peak Discharge (L/sec)
C = Runoff Coefficient (C=0.50)
I = Average Rainfall Intensity for return period (mm/hr)
= 732.951/(Tc+6.199)^0.810 (2-year)
Tc = Time of concentration (mins)

A = Drainage Area (hectares)

Q_{ALL} = 2.78 * 0.50 * 76.81mm/hr * 0.1948 ha = 20.80 L/sec

The allowable discharge rate, based on the 2-year storm, was calculated to be 20.80 L/sec. To control runoff from the site it will be necessary to limit post-development flows for all storm return periods up to the 100-year event using flow control and detention of runoff, as noted in the following sections.

8.5 Calculation of Post-Development Runoff

To calculate the post-development runoff coefficient and required storage volumes, the site has been divided into two (2) catchment areas. The area labelled P1 represents the footprint of the building. This area will be controlled using roof drains that will restrict the flow to the allowable release limit. Area P2 is an uncontrolled area located at the back of the property that will sheet drain towards Nepean Street. Refer to the post-development watershed plan C400 for more details on the site catchment areas.

The post-development average runoff coefficient for the site was calculated as 0.90. Based on the storm drainage areas the 2-year, 5-year and 100-year post-development peak flows are calculated based on the Rational Method and are summarized in Table 7-2 below with detailed calculations provided in **Table D6** of Appendix D.

Area No	Area (ha)	Storm = 2 yr			Storm = 5 yr			Storm = 100 yr		
		C_{AVG}	Q (L/sec)	Q_{CAP} (L/sec)	C_{AVG}	Q (L/sec)	Q_{CAP} (L/sec)	C_{AVG}	Q (L/sec)	Q_{CAP} (L/sec)
P1	**0.1900**	**0.90**	**36.51**	**(7.12)**	**0.90**	**49.53**	**(9.66)**	**1.00**	**94.31**	**(18.40)**
P2	**0.0048**	**0.90**	**0.92**	**(0.92)**	**0.90**	**1.25**	**(1.25)**	**1.00**	**2.38**	**(2.38)**
Total	**0.0470**		**37.43**	**8.05**		**50.78**	**10.91**		**96.70**	**20.78**

Table 8-2: Summary of Post-Development Flows

In summary, the building area P1 will be controlled to the allowable release rate calculated for the site using roof drains. Area P2 will drain uncontrolled towards the ROW. The total release rate from the site during the 100-yr storm event will be 20.78 L/s.

8.6 Flow Control and Storage Method

It will be necessary to control runoff to the allowable rate; therefore, runoff will be detained using an inlet control device (ICDs) installed at the roof level. This will ensure that sufficient stormwater detention is provided and that the peak flows entering the storm sewer on Bank Street will be equal to or less than the allowable rate.

Based on the allowable release rate for the site, the required stormwater storage volume for the 100-year storm event will be 54.2 m^3. Detailed calculations using the Modified Rational Method of the onsite storage requirements are provided in Appendix D.

This storage will be provided on the roof of the proposed building. There are 20 proposed roof drains located at the different roof levels of the proposed building. These drains will be used to control the release from the site to match the allowable release rate. The weirs of all 20 drains will be set to the half-open position. This will limit the release rate from all 20 drains to 19.43L/s under the 100 years storm event, which is less than the calculated allowable release rate. The roof will also provide a maximum of 77.2m^3 using a maximum storage depth of 150mm on the roof structure. The detailed calculations for the roof drains are provided in Appendix D.

8.7 Quality Control Requirement

Rideau Valley Conservation Authority (RVCA) has confirmed that there are no quality control requirements for this site. Correspondence with RVCA can be found in Appendix D.

9 Erosion and Sediment Control

During all construction activities, erosion and sedimentation shall be controlled by the following techniques:

- extent of exposed soils shall be limited at any given time,
- exposed areas shall be re-vegetated as soon as possible,
- filter cloth shall be installed between frame and cover of the existing catch basins and catch basin manholes as identified on the site grading and erosion control plan,
- light duty silt fencing will be used to control runoff around the construction area. Silt fencing locations are identified on the erosion and sediment control plan.
- visual inspection shall be completed daily on sediment control barriers and any damage repaired immediately. Care will be taken to prevent damage during construction operations,
- In some cases, barriers may be removed temporarily to accommodate the construction operations. The affected barriers will be reinstated at night when construction is completed,
- Sediment control devices will be cleaned of accumulated silt as required. The deposits will be disposed of as per the requirements of the contract,
- during the course of construction, if the engineer believes that additional prevention methods are required to control erosion and sedimentation, the contractor will install additional silt fences or other methods as required to the satisfaction of the engineer, and
- Construction and maintenance requirements for erosion and sediment controls are to comply with Ontario Provincial Standard Specification (OPSS) OPSS 805, and City of Ottawa specifications.

10 Conclusions

This report addresses servicing and stormwater runoff from the proposed development located at 178 Nepean Street, 219/223 Bank Street, City of Ottawa, Ontario. The proposed development will consist of a nine-story mix-use building that includes 230 bachelor units, ten 1-bedroom units, twelve 2-bedroom units, eleven 3-bedroom units, 5 commercial spaces on the ground floor and 5 commercial spaces at the basement level. The following summarizes the servicing requirements for the site:

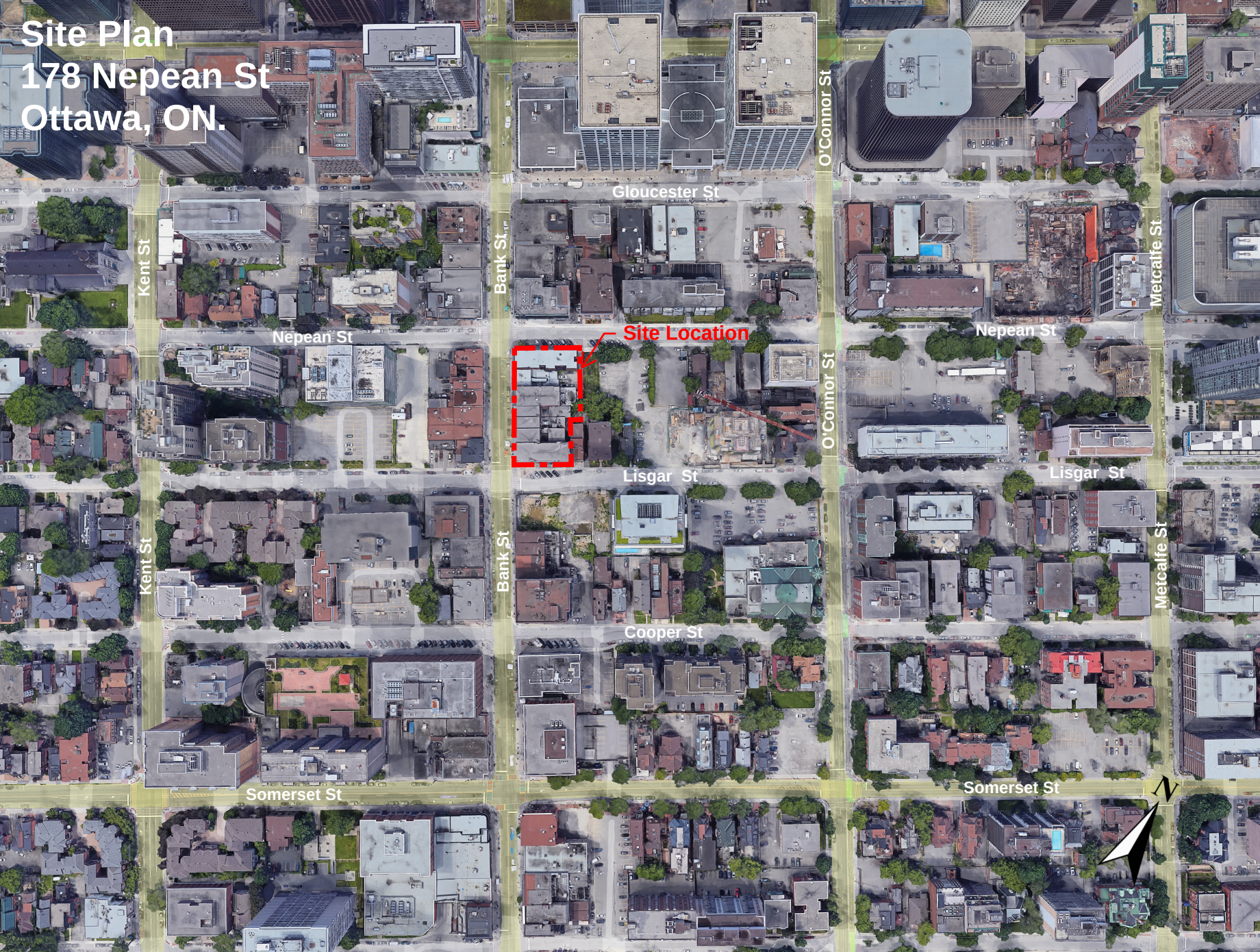
- The runoff rate from the proposed site was calculated based on a runoff coefficient of 0.90 and a time of concentration of 10 minutes for a 2-year storm event, connecting to the 825mm storm sewer pipe on Bank Street. The allowable release rate was calculated to be 20.80L/sec. Runoff in excess of this will be detained on site for up to the 100-year storm.
- Inlet control devices (ICDs) will be installed at the roof level to control the release rate from the site to the allowable 20.78/s. The estimated storage required to control peak flows to the allowable release rate was 54.2 m^3 based on the Modified Rational Method.
- The proposed development has a peak sanitary flow of 6.61 L/sec based on City of Ottawa Guidelines. 200mm and 135mm sewer lateral pipes will be installed with a slope of 1.0% and 2.0% having a full

flow capacity of 36.1L/sec and 16.3L/s. This lateral will extend into the property and connect to the building.

- Two new 100mm dia. water service connections will be extended from the existing 305mm dia. watermain on Bank Street to the proposed building. The required peak hour domestic water demand for the site was found to be 6.34L/s.
- The Maximum Required Fire Flow (RFF) based on the Fire Underwriter Survey (FUS) was calculated at 317 L/sec. The site fire demands will be provided using the existing fire hydrants surrounding the property.
- During all construction activities, erosion and sedimentation will be controlled on-site.

Appendix A – Figures

Figure 1: Site Location Plan


Site Plan
178 Nepean St
Ottawa, ON.
Gloucester St
Kent St
Bank St
O'Connor St
Metcalfe St
Nepean St
Site Location
Lisgar St
Cooper St
Somerset St
N

Appendix B – Water Servicing

Table B1: Water Demand Chart

Table B2: Fire Flow Requirements Based on Fire Underwriters Survey (FUS) 2020

TABLE B1
Water Demand Chart

Junction Number (Building)	No. of Units										Total Pop	Residential Demands					Commercial						Total Demands in (L/sec)		
	Singles/Semis/Towns				Apartments														Peaking Factors (x Avg Day)						
	Single Familty	Semi	Duplex	Townhome	Bachelor	1-Bed Apt	2-Bed Apt	3-Bed Apt	4-Bed Apt	Avg Apt.		Avg Day Demand (L/day)	Max Day Peaking Factor	Max Hour Peaking Factor	Max Day Demand (L/day)	Peak Hourly Demand (L/day)	Area (m^2)	Avg Demand (L/day)	Max Day	Peak Hour	Max Day Demand (L/day)	Peak Hour Demand (L/day)	Avg Day (L/s)	Max Day (L/s)	Peak Hour (L/s)
Building					230	10	12	11			396.0	110,880	3.22	4.82	356,590	534,885	1739	4,869	1.5	2.7	7303.8	13146.8	1.34	4.21	6.34
Totals =					230	10	12	11			396.0	110,880			356,590	534,885					7,304	13,147	1.34	4.21	6.34

Unit Densities	Persons/Unit
Singles	3.4
Semi-Detached	2.7
Duplex	2.3
Townhome	2.7
Bachelor Apt Unit	1.4
1-Bed Apt Unit	1.4
2-Bed Apt Unit	2.1
3-Bed Apt Unit	3.1
4-Bed Apt Unit	4.1
Avg. Apt Unit	1.8

Residential

Residential Consumption (L/pers/day) =	280	
Max Day Peaking Factor (* avg day) =	2.5	3.22
Peak Hour Factor (* avg day) =	5.5	4.82

Based on MECP Table 3-3. Less than 500 persons

Industrrial/Commercial/Institutional Water Consumption

Light Industrial (L/gross ha/day) =	35,000
Heavy Industrial (L/gross ha/day) =	55,000
Commer/Instit (L/m^2 floor/day) =	3
Max Day Peaking Factor (* avg day) =	1.5
Peak Hour Factor (* avg day) =	2.7

Project:	
OTT-22028796-A0 - 178 Nepean, 219/223 Bank Street	
Designed:	Location:
Y. Ammouri, M.Eng, P.Eng	
Checked:	178 Nepean, 219/223 Bank Street, Ottawa, Ontario
Chris Collins	
File Reference:	Page No:
22028796 - Water - Demand Chart.xlsx	1 of 1

TABLE B2: FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020
PROJECT: 178 Nepean Street, 219/223 Bank Street
Building No: **Mix Use**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where: F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Ordinary Construction				1	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used		12135.0 m²	
	Roof Amenity		105	100%	105			
	Floor 9		1040	100%	1040			
	Floor 8		1040	100%	1040			
	Floor 7		1138	100%	1138			
	Floor 6		1246	100%	1246			
	Floor 5		1246	100%	1246			
	Floor 4		1246.00	100%	1246			
	Floor 3		1630	100%	1630			
	Floor 2		1582	100%	1582			
	Floor 1		1862	100%	1862			
	Basement (At least 50% below grade, not included)		1910	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							24,235
Fire Flow (F)	Rounded to nearest 1,000							**24,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Combustible	0%	0	24,000
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	Adequate Sprinkler Conforms to NFPA13	-30%	-7,200	16,800
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	-2,400	14,400
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Fully Supervised Sprinkler System	-10%	-2,400	12,000
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Type IV-III (U)	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	25	4	20.1 to 30	Type IV-III (U)	26.1	9	234.9	4F	5%	5%	30%	7,200	19,200
	East	3.3	2	3.1 to 10	Type IV-III (U)	20	6	120	2F	15%	15%			
	South	38	5	30.1 to 45	Type IV-III (U)	22.4	9	201.6	6	0%	0%			
	West	20	3	10.1 to 20	Type IV-III (U)	52.5	9	472.5	3F	10%	10%			
												Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =		**19,000**
												Total Required Fire Flow (RFF), L/sec =		**317**
Obtain Required Fire Flow												Can the Total Fire Flow be Capped at 10,000 L/min (167 L/sec) based on "TECHNCAL BULLETIN ISTB-2018-02", (yes/no) =		**No**
												Total Required Fire Flow (RFF). If RFF < 167 use RFF (L/sec) =		**317**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

Appendix C – Sanitary Sewer Design Sheets

Table C1: Sanitary Sewer Calculation Sheet

TABLE C1 - SANITARY SEWER CALCULATION SHEET

LOCATION				RESEDENTIAL AREAS AND POPULAITONS												COMMERCIAL			INDUSTRIAL			INSTITUTIONAL			INFILTRATION			FOUNDATION DRAIN			TOTAL FLOW (L/s)	SEWER DATA						
Street	U/S MH	D/S MH	Desc	Area (ha)	NUMBER OF UNITS							POPULATION		Peak Factor	Peak Flow (L/sec)	AREA (ha)		Peak Flow (L/sec)	AREA (ha)		Factor (per MOE)	AREA (Ha)	ACCU AREA (Ha)	Peak Flow (L/sec)	AREA (ha)		INFILT FLOW (L/sec)	AREA (ha)		FOUND FLOW (L/sec)		Nom Dia (mm)	Actual Dia (mm)	Slope (%)	Length (m)	Capacity (L/sec)	Q/Q_{CAP} (%)	Full Velocity (m/s)
					Singles	Semis	Towns	1-Bed Apt.	2-Bed Apt.	3-Bed Apt.	4-Bed Apt.	INDIV	ACCU			INDIV	ACCU		INDIV	ACCU					INDIV	ACCU		INDIV	ACCU									
Site	BLDG	SANMH		0.20				240	12	11		396	396	4.00	6.42	0.174	0.174	0.151042							0.203	0.203	0.057				6.62	135	135.00	2.00	1.600	16.3	41%	1.72
	SANMH	EX SAN PIPE											396	4.00	6.42		0.174	0.151042								0.203	0.057				6.62	200	200.00	1.00	10.200	32.8	20%	1.21
				0.203				240				396													0.203												

Residential Avg. Daily Flow, q (L/p/day) =	350	Commercial Peak Factor =	1.5	(when area >20%)	Peak Population Flow, (L/sec) =	P*q*M/86.4	Unti Type / Persons/Unit
Commercial Avg. Daily Flow (L/gross ha/day) =	50,000		1.0	(when area <20%)	Peak Extraneous Flow, (L/sec) =	I*Ac	Singles 3.0
or L/gross ha/sec =	0.579				Residential Peaking Factor, M =	1 + (14/(4+P^0.5)) * K	Semi-Detached 2.7
Institutianal Avg. Daily Flow (L/s/ha) =	50,000	Institutional Peak Factor =	1.5	(when area >20%)	A_c = Cumulative Area (hectares)		Townhomes 2.7
or L/gross ha/sec =	0.579		1.0	(when area <20%)	P = Population (thousands)		Single Apt. Unit 1.4
Light Industrial Flow (L/gross ha/day) =	35,000						2-bed Apt. Unit 2.1
or L/gross ha/sec =	0.40509	Residential Correction Factor, K =	1.00		Sewer Capacity, Qcap (L/sec) =	$1/N \; S^{1/2} \; R^{2/3} \; A_c$	3-bed Apt. Unit 3.1
Light Industrial Flow (L/gross ha/day) =	55,000	Manning N =	0.013		(Manning's Equation)		4-bed Apt. Unit 3.8
or L/gross ha/sec =	0.637	Peak extraneous flow, I (L/s/ha) =	0.28	(Total I/I)			
Extraneous Flows from Existing Areas (L/s/gross ha) =	5.00						

Designed:	Project:
Y. Ammouri M.Eng, P.Eng	OTT-22028796-A0 - 178 Nepean, 219/223 Bank Street
Checked:	Location:
Chris Collins	178 Nepean, 219/223 Bank Street, Ottawa, Ontario
File Reference:	Page No:
22028796 - SAN Design Sheet.xlsx	**1 of 1**

Appendix D – SWM Design Sheets

Table D1: Calculation of Average Runoff Coefficients for Pre-Development Conditions

Table D2: Calculation of Peak Runoff Under Pre-Development Condtions

Table D3: Estimation of Allowable Peak Flows

Table D4: Average Runoff Coefficients For Post-Development Conditions

Table D5: Summary of Post-Development Peak Flows (Uncontrolled and Controlled)

Table D6: Storage Volumes for 2-year, 5-year, and 100-year Storms (MRM)

Table D7: 5-year & 100-year Roof Design Sheet - For Roof Drains using Flow Controlled Roof Drains

Correspondence with RVCA

TABLE D1
CALCULATION OF AVERAGE RUNOFF COEFFICIENTS FOR PRE-DEVELOPMENT CONDTIONS

Area No.	Outlet Location	Hardscape Areas C=0.90		Gravel Areas C=0.70		Grassed Areas C=0.20		Sum AC	Total Area (m^2)	C_{AVG}
		Area (m^2)	A * C	Area (m^2)	A * C	Area (m^2)	A * C			
E1	ROW	1882.000	1693.800	35.000	24.500	31.000	6.200	1724.5	1948.00	0.89

TABLE D2
CALCULATION OF PEAK RUNOFF UNDER PRE-DEVELOPMENT CONDTIONS

Area No	Outlet Location	Area (ha)	Time of Conc, Tc (min)	Storm = 2 yr			Storm = 5 yr			Storm = 100 yr		
				I_2 (mm/hr)	Cavg	Q_2 (L/sec)	I_5 (mm/hr)	Cavg	Q_5 (L/sec)	I_{100} (mm/hr)	Cavg	Q_{100} (L/sec)
Site	ROW	0.19480	10	76.81	0.89	36.8	104.29	0.89	50.0	178.56	1.00	96.7

Notes
1) Intensity, I = 732.951/(Tc+6.199) $^{0.810}$ (2-year, City of 0ttawa)
2) Intensity, I = 998.071/(Tc+6.035) $^{0.814}$ (5-year, City of 0ttawa)
3) Intensity, I = 1735.688/(Tc+6.014) $^{0.820}$ (100-year, City of Ottawa)
4) Cavg for 100-year is increased by 25% to a maximum of 1.0
5) Allowable Capture Rate is based on 2-year storm at Tc=10 minutes, and discharging to combined sewer on Bronson Avenue

TABLE D3
ESTIMATION OF ALLOWABLE PEAK FLOWS (Based on Max C=0.50 with Tc=10mins & 2-yr Storm)

Area No	Outlet Location	Area (ha)	Time of Conc, Tc (min)	Storm = 2 yr		
				I_2 (mm/hr)	Cavg	Q_{2ALLOW} (L/sec)
Site	ROW	0.19480	10	76.81	0.50	20.80

Allowable Discharge (based on 2-yr storm)

Notes
1) Intensity, I = 732.951/(Tc+6.199) $^{0.810}$ (2-year, City of 0ttawa)
2) Allowable Capture Rate is based on 2-year storm at Tc=10 minutes, and discharging to combined sewer on Bronson Avenue

TABLE D4
AVERAGE RUNOFF COEFFICIENTS FOR POST-DEVELOPMENT CONDITIONS

$C_{HARDSCAPE}$ = 0.90 C_{GRAVEL} = 0.70 C_{GRASS} = 0.20

Area No.	Hardscape Areas (m^2)	A * C_{HARD}	Gravel Areas (m^2)	A * C_{GRAVEL}	Grassed Areas (m^2)	A * C_{GRASS}	Sum AC	Total Area (m^2)	C_{AVG}	Comment
P1	1900	0.9		0.7		0.2	1710.0	1900	0.90	Building Area
P2	48	0.9		0.7		0.2	43.2	48	0.90	uncontrolled area at the back
Total								**1948**	**0.90**	

Notes

TABLE D5
SUMMARY OF POST-DEVELOPMENT PEAK FLOWS (Uncontrolled and Controlled)

Area No	Area (ha)	Time of Conc, Tc (min)	Storm = 2 yr				Storm = 5 yr				Storm = 100 yr			
			C_{AVG}	I_2 (mm/hr)	Q (L/sec)	Q_{CAP} (L/sec)	C_{AVG}	I_5 (mm/hr)	Q (L/sec)	Q_{CAP} (L/sec)	C_{AVG}	I_{100} (mm/hr)	Q (L/sec)	Q_{CAP} (L/sec)
P1	0.1900	10	0.90	76.81	36.51	**(7.12)**	0.90	104.19	49.53	**(9.66)**	1.00	178.56	94.31	**(18.40)**
P2	0.0048	10	0.90	76.81	0.92	**(0.92)**	0.90	104.19	1.25	**(1.25)**	1.00	178.56	2.38	**(2.38)**
total (storm)	0.1948				37.43	8.05			50.78	10.91			96.70	20.78
foundation drain														

Notes
1) Intensity, I = 732.951/(Tc+6.199) $^{0.810}$ (2-year, City of 0ttawa)
2) Intensity, I = 998.071/(Tc+6.035) $^{0.814}$ (5-year, City of 0ttawa)
3) Intensity, I = 1735.688/(Tc+6.014) $^{0.820}$ (100-year, City of Ottawa)
4) Cavg for 100-year is increased by 25% to a maximum of 1.0
5) Time of Concentration, Tc = ***10 mins***
6) For Flows under column Qcap which are shown in brackets ***(0.0)*** *, denotes flows that are uncontrolled)*

Table D6 Storage Volumes for 2-year, 5-Year and 100-Year Storms (MRM)

Area No: P1
C_{AVG} = 0.90 (2-yr)
C_{AVG} = 0.90 (5-yr)
C_{AVG} = 1.00 (100-yr, Max 1.0)
Time Interval = 10.00 (mins)
Drainage Area = 0.1900 (hectares)

Actual Release Rate (L/sec) = 18.40
Percentage of Actual Rate (City of Ottawa requirement) = 100%
Release Rate Used for Estimation of 100-year Storage (L/sec) = 18.4

Duration (mins)	Release Rate = 7.12 (L/sec), Return Period = 2 (years), IDF Parameters, A = 733.0, B = 0.810, (I = A/(T_c+C)), C = 6.199					Release Rate = 9.66 (L/sec), Return Period = 5 (years), IDF Parameters, A = 998.1, B = 0.814, (I = A/(T_c+C)), C = 6.053					Release Rate = 18.4 (L/sec), Return Period = 100 (years), IDF Parameters, A = 1735.7, B = 0.820, (I = A/(T_c+C)), C = 6.014				
	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	167.2	79.5	7.1	72.4	0.0	230.5	109.6	9.7	99.9	0.0	398.6	210.6	18.4	192.2	0.0
10	76.8	36.5	7.1	29.4	17.6	104.2	49.5	9.7	39.9	23.9	178.6	94.3	18.4	75.9	45.5
20	52.0	24.7	7.1	17.6	21.1	70.3	33.4	9.7	23.7	28.5	120.0	63.4	18.4	45.0	53.9
30	40.0	19.0	7.1	11.9	21.4	53.9	25.6	9.7	16.0	28.8	91.9	48.5	18.4	30.1	54.2
40	32.9	15.6	7.1	8.5	20.4	44.2	21.0	9.7	11.3	27.2	75.1	39.7	18.4	21.3	51.1
50	28.0	13.3	7.1	6.2	18.6	37.7	17.9	9.7	8.2	24.7	64.0	33.8	18.4	15.4	46.1
60	24.6	11.7	7.1	4.6	16.4	32.9	15.7	9.7	6.0	21.6	55.9	29.5	18.4	11.1	40.0
70	21.9	10.4	7.1	3.3	13.8	29.4	14.0	9.7	4.3	18.1	49.8	26.3	18.4	7.9	33.2
80	19.8	9.4	7.1	2.3	11.1	26.6	12.6	9.7	3.0	14.2	45.0	23.8	18.4	5.4	25.7
90	18.1	8.6	7.1	1.5	8.1	24.3	11.5	9.7	1.9	10.2	41.1	21.7	18.4	3.3	17.9
100	16.7	8.0	7.1	0.8	5.0	22.4	10.7	9.7	1.0	5.9	37.9	20.0	18.4	1.6	9.7
110	15.6	7.4	7.1	0.3	1.8	20.8	9.9	9.7	0.2	1.6	35.2	18.6	18.4	0.2	1.3
120	14.6	6.9	7.1	-0.2	-1.4	19.5	9.3	9.7	-0.4	-2.9	32.9	17.4	18.4	-1.0	-7.4
130	13.7	6.5	7.1	-0.6	-4.8	18.3	8.7	9.7	-1.0	-7.5	30.9	16.3	18.4	-2.1	-16.2
140	12.9	6.1	7.1	-1.0	-8.2	17.3	8.2	9.7	-1.5	-12.2	29.2	15.4	18.4	-3.0	-25.2
150	12.3	5.8	7.1	-1.3	-11.7	16.4	7.8	9.7	-1.9	-17.0	27.6	14.6	18.4	-3.8	-34.3
160	11.7	5.5	7.1	-1.6	-15.2	15.6	7.4	9.7	-2.3	-21.8	26.2	13.9	18.4	-4.5	-43.6
170	11.1	5.3	7.1	-1.8	-18.8	14.8	7.1	9.7	-2.6	-26.6	25.0	13.2	18.4	-5.2	-52.9
180	10.6	5.1	7.1	-2.1	-22.4	14.2	6.7	9.7	-2.9	-31.6	23.9	12.6	18.4	-5.8	-62.4
190	10.2	4.8	7.1	-2.3	-26.0	13.6	6.5	9.7	-3.2	-36.5	22.9	12.1	18.4	-6.3	-71.9
200	9.8	4.7	7.1	-2.5	-29.7	13.0	6.2	9.7	-3.5	-41.5	22.0	11.6	18.4	-6.8	-81.5
210	9.4	4.5	7.1	-2.6	-33.4	12.6	6.0	9.7	-3.7	-46.6	21.1	11.2	18.4	-7.2	-91.1
220	9.1	4.3	7.1	-2.8	-37.1	12.1	5.8	9.7	-3.9	-51.6	20.4	10.8	18.4	-7.6	-100.8
230	8.8	4.2	7.1	-3.0	-40.8	11.7	5.6	9.7	-4.1	-56.7	19.7	10.4	18.4	-8.0	-110.6
240	8.5	4.0	7.1	-3.1	-44.6	11.3	5.4	9.7	-4.3	-61.8	19.0	10.0	18.4	-8.4	-120.4
250	8.2	3.9	7.1	-3.2	-48.3	10.9	5.2	9.7	-4.5	-67.0	18.4	9.7	18.4	-8.7	-130.3
260	8.0	3.8	7.1	-3.3	-52.1	10.6	5.0	9.7	-4.6	-72.1	17.8	9.4	18.4	-9.0	-140.2
270	7.7	3.7	7.1	-3.5	-55.9	10.3	4.9	9.7	-4.8	-77.3	17.3	9.1	18.4	-9.3	-150.1
280	7.5	3.6	7.1	-3.6	-59.8	10.0	4.7	9.7	-4.9	-82.5	16.8	8.9	18.4	-9.5	-160.1
290	7.3	3.5	7.1	-3.7	-63.6	9.7	4.6	9.7	-5.0	-87.8	16.3	8.6	18.4	-9.8	-170.1
300	7.1	3.4	7.1	-3.7	-67.4	9.5	4.5	9.7	-5.2	-93.0	15.9	8.4	18.4	-10.0	-180.1
310	6.9	3.3	7.1	-3.8	-71.3	9.2	4.4	9.7	-5.3	-98.3	15.5	8.2	18.4	-10.2	-190.2
320	6.7	3.2	7.1	-3.9	-75.2	9.0	4.3	9.7	-5.4	-103.6	15.1	8.0	18.4	-10.4	-200.3
330	6.6	3.1	7.1	-4.0	-79.1	8.8	4.2	9.7	-5.5	-108.8	14.7	7.8	18.4	-10.6	-210.4
Max =					**21.4**					**28.8**					**54.2**

Notes
1) Peak flow is equal to the product of 2.78 x C x I x A
2) Rainfall Intensity, I = $A/(Tc+C)^B$
3) Release Rate = Min (Release Rate, Peak Flow)
4) Storage Rate = Peak Flow - Release Rate
5) Storage = Duration x Storage Rate
6) Maximum Storage = Max Storage Over Duration
7) Parameters a,b,c are for City of Ottawa

City of Ottawa IDF Data (from SDG002)

IDF curve equations (Intensity in mm/hr)

100 year Intensity = $1735.688 / (\text{Time in min} + 6.014)^{0.820}$
50 year Intensity = $1569.580 / (\text{Time in min} + 6.014)^{0.820}$
25 year Intensity = $1402.884 / (\text{Time in min} + 6.018)^{0.819}$
10 year Intensity = $1174.184 / (\text{Time in min} + 6.014)^{0.816}$
5 year Intensity = $998.071 / (\text{Time in min} + 6.053)^{0.814}$
2 year Intensity = $732.951 / (\text{Time in min} + 6.199)^{0.810}$

Table D7: 5-year & 100-year Roof Design Sheet - For Roof Drains using Flow Controlled Roof Drains

Project: 178 Nepean St, 219/223 Bank St
Location: Ottawa, ON.
Date: DEC 2022

Area #	Drain Type	Roof Drain Type	No Drains per Area	No of Weirs per Drain	Weir Position	Runoff Coeff (Cavg)		Drainage Area		5-year Event						100-year Event						Maximium Storage Provided at Spill Elevation			
						5-year	100-year	m^2	ha	Runoff Rate (L/sec)	5yr Ponding Depth (mm)	Roof Drain Capacity Per Weir (gpm)	Roof Drain Capacity Per Drain per weir (gpm)	Roof Drain Capacity Per Drain (L/sec)	Total Flow From Roof Drains (L/sec)	Runoff Rate (L/sec)	100yr Ponding Depth (mm)	Roof Drain Capacity Per Weir (gpm)	Roof Drain Capacity Per Drain per weir (gpm)	Roof Drain Capacity Per Drain (L/sec)	Total Flow From Roof Drains (L/sec)	Area Available for Storage (m^2)	Max Prism Depth (mm)	Max Prisim Volume (m^3)	Total Volume (m3)
A1	RD	RD1	1	1	4-1/2 open	0.90	0.90	179.6	0.0180	4.681	103	15.3	15.3	0.965	0.965	8.021	130	18.0	18.0	1.136	1.136	164.3	150	8.2	8.22
A2	RD	RD1	1	1	4-1/2 open	0.90	0.90	63.8	0.0064	1.662	81	13.0	13.0	0.819	0.819	2.849	107	15.7	15.7	0.991	0.991	63.8	150	3.2	3.19
A3	RD	RD1	1	1	4-1/2 open	0.90	0.90	288.7	0.0289	7.526	110	16.0	16.0	1.009	1.009	12.897	136	18.6	18.6	1.173	1.173	255.3	150	12.8	12.76
A4	RD	RD1	1	1	4-1/2 open	0.90	0.90	203.6	0.0204	5.308	102	15.2	15.2	0.959	0.959	9.096	128	17.8	17.8	1.123	1.123	203.6	150	10.2	10.18
A5	RD	RD1	1	1	4-1/2 open	0.90	0.90	246.7	0.0247	6.431	116	16.6	16.6	1.047	1.047	11.021	146	19.6	19.6	1.237	1.237	176.7	150	8.8	8.83
A6	RD	RD1	1	1	4-1/2 open	0.90	0.90	112.6	0.0113	2.936	92	14.2	14.2	0.893	0.893	5.031	119	16.9	16.9	1.066	1.066	112.6	150	5.6	5.63
A7	RD	RD1	1	1	4-1/2 open	0.90	0.90	114.0	0.0114	2.973	93	14.3	14.3	0.900	0.900	5.095	119	16.9	16.9	1.066	1.066	114.0	150	5.7	5.70
A8	RD	RD1	1	1	4-1/2 open	0.90	0.90	47.3	0.0047	1.232	74	12.3	12.3	0.773	0.773	2.111	100	15.0	15.0	0.946	0.946	47.3	150	2.4	2.36
A9	RD	RD1	1	1	4-1/2 open	0.90	0.90	48.3	0.0048	1.260	74	12.3	12.3	0.773	0.773	2.159	101	15.1	15.1	0.953	0.953	48.3	150	2.4	2.42
A10	RD	RD1	1	1	4-1/2 open	0.90	0.90	36.2	0.0036	0.943	68	11.7	11.7	0.738	0.738	1.615	93	14.3	14.3	0.900	0.900	36.2	150	1.8	1.81
A11	RD	RD1	1	1	4-1/2 open	0.90	0.90	37.1	0.0037	0.967	68	11.7	11.7	0.738	0.738	1.658	93	14.3	14.3	0.900	0.900	37.1	150	1.9	1.86
A12	RD	RD1	1	1	4-1/2 open	0.90	0.90	118.1	0.0118	3.079	102	15.2	15.2	0.959	0.959	5.276	131	18.1	18.1	1.142	1.142	85.8	150	4.3	4.29
A13	RD	RD1	1	1	4-1/2 open	0.90	0.90	39.9	0.0040	1.041	80	12.9	12.9	0.813	0.813	1.784	109	15.9	15.9	1.003	1.003	24.0	150	1.2	1.20
A14	RD	RD1	1	1	4-1/2 open	0.90	0.90	51.1	0.0051	1.333	94	14.4	14.4	0.906	0.906	2.284	127	17.7	17.7	1.117	1.117	22.9	150	1.1	1.15
A15	RD	RD1	1	1	4-1/2 open	0.90	0.90	43.7	0.0044	1.139	72	12.1	12.1	0.761	0.761	1.951	98	14.8	14.8	0.933	0.933	43.7	150	2.2	2.18
A16	RD	RD1	1	1	4-1/2 open	0.90	0.90	51.8	0.0052	1.350	76	12.5	12.5	0.786	0.786	2.314	102	15.2	15.2	0.959	0.959	51.8	150	2.6	2.59
A17	RD	RD1	1	1	4-1/2 open	0.90	0.90	11.4	0.0011	0.296	55	10.5	10.5	0.661	0.296	0.508	66	11.5	11.5	0.726	0.508	11.4	150	0.6	0.57
A18	RD	RD1	1	1	4-1/2 open	0.90	0.90	32.3	0.0032	0.841	76	12.5	12.5	0.786	0.786	1.441	109	15.9	15.9	1.003	1.003	15.6	150	0.8	0.78
A19	RD	RD1	1	1	4-1/2 open	0.90	0.90	17.3	0.0017	0.451	55	10.5	10.5	0.661	0.451	0.773	69	11.8	11.8	0.744	0.744	17.3	150	0.9	0.87
A20	RD	RD1	1	1	4-1/2 open	0.90	0.90	11.8	0.0012	0.308	62	11.1	11.1	0.702	0.308	0.528	78	12.7	12.7	0.799	0.528	11.8	150	0.6	0.59
Totals						0.9	0.9	**1,755**	**0.1755**	45.755		**263.88**		**16.65**	**15.68**	**78.41**		**315.66**		**19.92**	**19.43**	**1543**		**77.2**	**77.2**
Min											**55**						**66**								
Max											**116**						**146**								

Runoff Based on the Following:

Storm Frequency (years) =	5	100
Time of Conc (mins) =	10	10
Storm Intensity (mm/hr) =	104.2	178.6

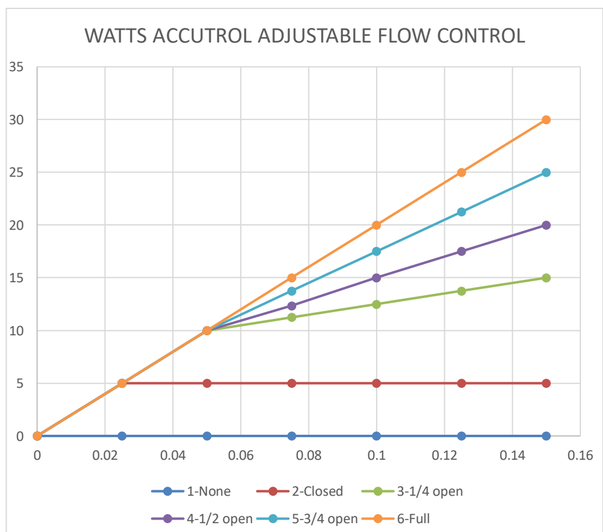
Qyr(cont) = 11.8
V2yr = 16.3

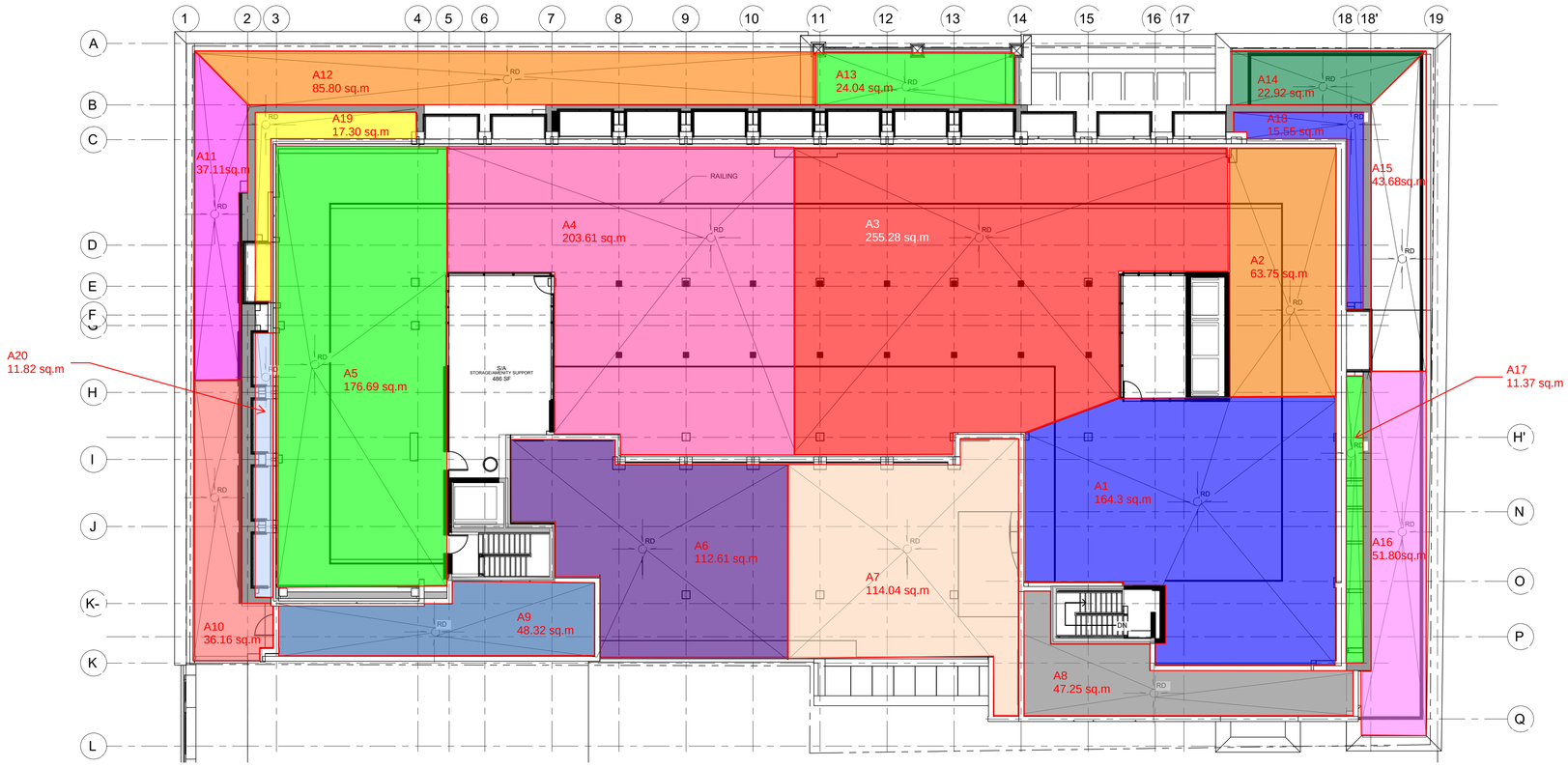
Roof Drain Types

Drain Type =	RD1	RD2
Max Overflow Depth (mm)	150 mm	150 mm
Flow Controlled (Yes/No)	Yes	No
Ponding	Yes	No
Weir Desc	Accutrol	n/a
No. Weirs	1	n/a

Roof Drains have Following Flow Rates: WATTS Flow Conttolled Drain

Weir Position		Flow (gpm) per depth							Max Flow Rate per Weir
		0	25	50	75	100	125	150	
		0	0.025	0.05	0.075	0.1	0.125	0.15	
1-None		0	0	0	0	0	0	0	0.000
2-Closed		0	5	5	5	5	5	5	0.315
3-1/4 open		0	5	10	11	13	14	15	0.946
4-1/2 open		0	5	10	12	15	18	20	1.262
5-3/4 open		0	5	10	14	18	21	25	1.577
6-Full		0	5	10	15	20	25	30	1.893





ALL CONTRACTORS TO VERIFY ALL DIMENSIONS ON SITE AND TO REPORT ALL ERRORS AND/OR OMISSIONS TO THE ARCHITECT.

ALL CONTRACTORS MUST COMPLY WITH ALL CODES AND BYLAWS AND OTHER AUTHORITIES HAVING JURISDICTION OVER THE WORK.

DO NOT SCALE DRAWINGS.

THIS DRAWING MAY NOT BE USED FOR CONSTRUCTION UNTIL SIGNED BY THE ARCHITECT.

#	Description	Date

CONSULTANTS:
STRUCTURAL –
MECHANICAL –
CIVIL –
ELECTRICAL –
LANDSCAPING –

PROJECT:

178 Napean Street,
219/223 Bank Street.

DRAWING:

ROOF DRAINS PLAN

DATE	2022-12-05 4:13:30 PM
SCALE	1 : 100
DRAWN BY	Auteur
REVIEWED BY	Vérificateur
PR. NO.	Project Number
DRAWING NO.	A104

Momen Siam

Subject: FW: 178 Nepean Street, 219/223 Bank Street Quality Control Requirements

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From: Eric Lalande <eric.lalande@rvca.ca>
Sent: Monday, December 5, 2022 3:16 PM
To: Yasser Ammouri <Yasser.Ammouri@exp.com>
Subject: RE: 178 Nepean Street, 219/223 Bank Street Quality Control Requirements

Hi Yasser,

Thanks for the clarification, based on the site plan, the RVCA will have no quality control requirements.

Thank you,

Eric Lalande, MCIP, RPP
Planner, RVCA
613-692-3571 x1137

From: Yasser Ammouri <Yasser.Ammouri@exp.com>
Sent: Monday, December 5, 2022 3:08 PM
To: Eric Lalande <eric.lalande@rvca.ca>
Subject: RE: 178 Nepean Street, 219/223 Bank Street Quality Control Requirements

Hello Eric,

No problem.
Attached is the site plan we have for the site.
Essentially, the site will be almost 100% covered by a new building. There will be no driveways or parking areas.
Stormwater quantity control will be provided on the roof.
The City has asked the RVCA to provide the quality control requirement in the pre-consultation meeting.

Please let me know if you would like to set up a call to discuss the project, and I'll be more than happy to set it up.

Thank you.

Yasser Ammouri, M.Eng., P.Eng.
EXP | Design Engineer
t : +1.343.804.4900 | e : yasser.ammouri@exp.com
exp.com | legal disclaimer
keep it green, read from the screen

From: Eric Lalande <eric.lalande@rvca.ca>
Sent: Monday, December 5, 2022 2:57 PM

To: Yasser Ammouri <Yasser.Ammouri@exp.com>
Subject: RE: 178 Nepean Street, 219/223 Bank Street Quality Control Requirements

Hi Yasser,

Thanks for the catch. I just took a double check and you are correct, I had misread the routing of the outlet. That being said do you have a site plan of the project?

Eric Lalande, MCIP, RPP
Planner, RVCA
613-692-3571 x1137

From: Yasser Ammouri <Yasser.Ammouri@exp.com>
Sent: Monday, December 5, 2022 2:54 PM
To: Eric Lalande <eric.lalande@rvca.ca>
Cc: Chris Collins <Chris.Collins@exp.com>; Momen Siam <Momen.Siam@exp.com>
Subject: RE: 178 Nepean Street, 219/223 Bank Street Quality Control Requirements

Hello Eric,

Thank you for your email.
I wanted to double check with you since the city records do not show any combined sewers in the area.
Attached is an image of the available infrastructure surrounding the site.

If RVCA has no requirements, we will pass this on to the City.

Thanks.

Yasser Ammouri, M.Eng., P.Eng.
EXP | Design Engineer
t : +1.343.804.4900 | e : yasser.ammouri@exp.com
exp.com | legal disclaimer
keep it green, read from the screen

From: Eric Lalande <eric.lalande@rvca.ca>
Sent: Thursday, December 1, 2022 4:08 PM
To: Yasser Ammouri <Yasser.Ammouri@exp.com>
Cc: Chris Collins <Chris.Collins@exp.com>; Momen Siam <Momen.Siam@exp.com>
Subject: RE: 178 Nepean Street, 219/223 Bank Street Quality Control Requirements

Hi Yasser,

The Property is in an area of combined sewers, the RVCA has no quality control requirements for the site, and will rely on the municipal system for providing for Quality protections.

Thank you,

Eric Lalande, MCIP, RPP
Planner, RVCA
613-692-3571 x1137

From: Yasser Ammouri <Yasser.Ammouri@exp.com>
Sent: Thursday, December 1, 2022 3:10 PM
To: Eric Lalande <eric.lalande@rvca.ca>
Cc: Chris Collins <Chris.Collins@exp.com>; Momen Siam <Momen.Siam@exp.com>
Subject: 178 Nepean Street, 219/223 Bank Street Quality Control Requirements

Hello Eric,

We have been retained to complete the civil design as part of a site plan control application to redevelop the property on 178 Nepean Street, 219/223 Bank Street in Ottawa, Ontario.
As part of the requirements by the city of Ottawa, we would like you to confirm the site's stormwater management quality control requirements.
Please let us know the level of treatment that would be required for this site.

If you need any other information, please feel free to contact me.

Regards.

Yasser Ammouri, M.Eng., P.Eng.
EXP | Design Engineer
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