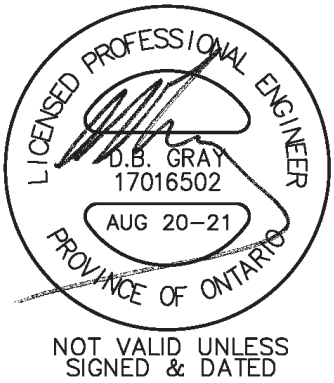
SERVICING BRIEF &
STORMWATER MANAGEMENT REPORT

61 Pinehurst Avenue
Ottawa, Ontario

Report No. 21047

August 20, 2021



NOT VALID UNLESS
SIGNED & DATED

D.B. Gray Engineering Inc.

Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

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SERVICING BRIEF &
STORMWATER MANAGEMENT REPORT

61 Pinehurst Avenue
Ottawa, Ontario

This report describes the services and addresses the stormwater management requirements of a property 307 sq.m. in area located at 61 Pinehurst Avenue in Ottawa. The property currently has a single-dwelling building on it that will be demolished. A three-storey (four levels, including basement apartments), 8-unit apartment building is proposed.

This report forms part of the stormwater management design for the proposed development. Refer to drawings C-1 to C-4 also prepared by D. B. Gray Engineering Inc.

WATER SUPPLY FOR FIREFIGHTING:

There is an existing municipal fire hydrant in the Pinehurst Avenue municipal road right-of-way located at the southeast corner of the Pinehurst Avenue / Scott Street intersection approximately 50 m unobstructed distance to the far side of the front façade proposed building. Since the municipal fire hydrant is located less than the maximum 90 m permitted, a private on-site fire hydrant is not required. There are two other existing municipal fire hydrants in the vicinity. One is located in municipal road right-of-way near the southeast corner of the Pinehurst Avenue / Bullman Street intersection about 93 m unobstructed distance to the proposed building. The other hydrant is located in the Scott Street right-of-way, west of the Scott Street / Parkdale Avenue intersection, about 95 m from the proposed building. All these existing municipal fire hydrants are Class AA (colour coded blue).

A fire flow of 200.0 L/s (12,000 L/min) is required, as calculated as per the Fire Underwriter Survey (FUS) "Water Supply For Fire Protection". (A fire flow of 133.3 L/s (8,000 L/min) was calculated as per FUS based on the proposed building having a sprinkler system. These calculations were also submitted to the City when requesting boundary conditions but a sprinkler system is no long being proposed as an option.)

The boundary conditions for the 200.0 L/s fire flow (based on the city's computer model of the municipal water distribution system) were received from the City. They include a HGL (hydraulic grade line) of 103.8 m for the above flow rate in the 200 mm municipal watermain in Pinehurst Avenue at the subject location. This HGL calculates to be 410 kPa (60 psi). Since the pressure is above 138 kPa (20 psi) there is an adequate water supply for firefighting from the existing municipal water distribution system.

As per City of Ottawa Technical Bulletin ISTB-2018-02, the aggregate flow of all contributing fire hydrants within 150 m of the building can used to supply the required fire flow. The closest hydrant is within 75 m and can contribute 5,700 L/min (95 L/s); and the other two hydrants, being between 75 and 150 m, can contribute 3,800 L/min (63.3 L/s) each (as per Table 1 of ISTB-2018-02). Therefore, the aggregate flow from all three hydrants is 13,300 L/min (221.6 L/s), which is greater than the required fire flow of 12,000 L/min (200.0 L/s).

WATER SERVICE:

The 8 apartment units are comprised of 4 one-bedroom and 4 two-bedroom units. Based on the City of Ottawa Water Distribution Design Guidelines for residential properties (Table 4.1 & Table 4.2: one-bedroom apartment units / 1.4 person per unit; two-bedroom apartment units / 2.1 persons per unit; and 350 L/person/day) and Ministry of the Environment Design Guidelines for peaking factors (Table 3-3) the daily average flow is 0.1 L/s with a maximum daily and maximum hourly demand of 0.5 and 0.8 L/s respectively.

To determine water pressure under these demands, boundary conditions, based on the City of Ottawa computer simulation of the water distribution system, at the subject location, are required.

Based on the boundary conditions received from the City, the minimum HGL (hydraulic grade line) is 105.0 m and the maximum is 115.1 m. With these HGLs the water pressure at the water meter is calculated to vary from 423 kPa to 522 kPa (61 to 76 psi). This is an acceptable range of water pressures for the proposed development.

Based on the AWWA water flow demand curve, and a water pressure at the meter of 476 kPa (69 psi), the peak demand for the building is expected to be 2.5 L/s (147 L/min / 39 USgpm). The AWWA method calculates the instantaneous demand and is used to size the water service. This peak demand will produce an acceptable velocity of 2.2 m/s in the proposed 38 mm water service connection (up to 2.4 m/s is acceptable). The water service will connect to the 200 mm municipal watermain in Pinehurst Avenue.

SANITARY SERVICE:

Based on the City of Ottawa Sewer Design Guidelines for a residential property (Technical Bulletin ISTB-2018-01, Figure 4.3: 4 one-bedroom apartment units / 1.4 person per unit; 4 two-bedroom apartment units / 2.1 persons per unit; 280 l/person/day; and a 3.2 peaking factor); and based on a 0.33 L/s/ha infiltration flow; the post development flow is calculated to be 0.16 L/s. This flow will be adequately handled by the proposed sanitary sewer service connections (150 mm at 1% - 15.89 L/s capacity) since, at the design flow, it will only be about 1% full.

The proposed 150 mm sanitary service connections will connect to the 250 mm municipal sanitary sewer in Pinehurst Avenue which, with a 0.47% slope, has a capacity of 42.53 L/s. The existing single family dwelling is calculated to have generated 0.05 L/s. The 0.11 L/s increase in sanitary flows contributing to the existing 250 mm sanitary sewer is expected to have an acceptable impact.

STORMWATER MANAGEMENT:

Water Quality:

In the pre-consultation comments the Rideau Valley Conservation Authority (RVCA) stated: *"No concerns at this point in time. Water quality protection is not required based on the information provided to date however, best management practices are encouraged where possible."*

No permanent quality control measures are proposed.

An erosion and sediment control plan has been developed to be implemented during construction, (see drawing C-2 and notes 2.1 to 2.5 on drawing C-3). In summary: to filter out construction sediment capture filter sock inserts will be installed in all existing catch basins adjacent to the site; and any material deposited on a public road shall be removed.

Water Quantity:

The stormwater management criteria for quantity control are to control the post development peak flows for the 5-year and 100-year storm events to peak flows during the 5-year storm event using a pre-development runoff coefficient or runoff coefficient of 0.50, whichever is less; and a calculated time of concentration (not less than 10 minutes). It is calculated that the pre-development conditions reflect a 5-year runoff coefficient of 0.59 and a time of concentration of 4 minutes. Therefore, based on a 10 minute time of concentration and the Rational Method, the pre-development flow rate is 10.21 L/s for the 100-year event and 5.27 L/s for the 5-year. However, based on runoff coefficient of 0.50; the maximum allowable release rate is 4.45 L/s for all storm events. The Modified Rational Method is used to calculate the required storage volume. The runoff coefficients for the 100 year event are increased by 25% to maximum 1.00.

Stormwater will be stored within the development on the roof of the proposed building.

Drainage Area I
(Uncontrolled Flow Off Site – 176 sq.m.):
The runoff from the perimeter the site will be allowed to flow uncontrolled off the site. Permeable pavers are proposed to reduce this flow. The flow is calculated at 10 minutes concentration.

	100-year	5-year
Maximum flow rate:	2.89 L/s	1.37 L/s

Drainage Area II (Roof – 131 sq.m.):
The roof drain will be a flow control type which will restrict the flow and cause the storm water to pond on the roof. The flow control type roof drain shall be installed with a parabolic shaped slotted weir (1 slot per weir drain at 0.0124 l/s per mm per slot - 5 USgpm per inch per slot); the opening at top of flow control weir shall be a minimum 50 mm in diameter: Watts roof drain with a Watts Accutrol Weir RD-100-A1 or equal. Four scuppers, each 250 mm wide and installed 150 mm above the roof drains, are required (refer to architectural for exact locations and details). The roof shall be designed to carry the load of water having a 50 mm depth at scupper and 200 mm depth at roof drain (refer to structural).

	100-year	5-year
The maximum release rate:	1.53 L/s	1.15 L/s
The maximum ponding depth:	124 mm	93 mm
The maximum stored volume:	3.40 cu.m.	1.43 cu.m.

The Entire Site:

	100-year	5-year
Pre-development Flow Rate:	10.21 L/s	5.27 L/s
Maximum allowable release rate:	4.45 L/s	4.45 L/s
Maximum release rate:	4.43 L/s	2.52 L/s

Therefore, the maximum post-development release rate for the 100-year storm event is calculated to be less than the maximum allowable and it is 57% less than the pre-development flow rate. For the 5-year event the maximum post-development release is calculated to be 43% less than the maximum allowable and 52% less than the pre-development flow rate.

The unrestricted flowrate resulting from one in five-year storm event will produce a peak flow of 3.42 L/s which will be adequately handled by the proposed storm sewer connection (150mm at 1% - 15.9 L/s capacity) being only at 21% of its capacity. (The storm sewer connection is only 7% full based on the 5-year restricted flowrate (due to the flow control roof drain) of 1.15 L/s.)

The restricted flowrate during a five-year storm event will produce a peak flow off the site of 2.52 L/s during the 5-year event. The 2.52 L/s in stormwater flows contributing to the 375 mm municipal storm sewer in Pinehurst Avenue is expected to have a positive impact given that it is 52% reduction from the pre-development flows.

CONCLUSIONS:

1. A private on-site fire hydrant is not required.

2. There is an adequate water supply for firefighting from the existing municipal water distribution system.

3. The aggregate flow from four contributing fire hydrants within 150 m of the building is 13,300 L/min (221.6 L/s), which is greater than the required fire flow of 12,000 L/min (200.0 L/s).

4. There is an acceptable range of water pressures in the municipal watermain for the proposed development.

5. The peak demand will produce an acceptable velocity of 2.2 m/s in the proposed 38 mm water service connection.

6. The expected sanitary sewage flow rate will be adequately handled by the proposed sanitary sewer service connection.

7. The sanitary flow contributing to the existing municipal sanitary sewer is expected to have an acceptable impact.

8. The RVCA does not require onsite water quality treatment, therefore, no permanent quality control measures are proposed.

9. An erosion and sediment control plan has been developed to be implemented during construction.

10. The stormwater management criteria for quantity control are to control the post development peak flows for the 5-year and 100-year storm events to peak flows during the 5-year storm event using a runoff coefficient of 0.50, and a time of concentration of 10 minutes. The maximum allowable release rate is 4.45 L/s for all storm events. The maximum post-development release rate for the 100-year storm event is calculated to be less than the maximum allowable and it is 57% less than the pre-development flow rate. For the 5-year event the maximum post-development release is calculated to be 43% less than the maximum allowable and 52% less than the pre-development flow rate.

11. The unrestricted flowrate resulting from one in five-year storm event will be adequately by the proposed storm service connection.

12. The restricted flowrate during a five-year storm event will produce a peak flow off the site of 2.52 L/s during the 5-year event. The 2.52 L/s in stormwater flows contributing to the 375 mm municipal storm sewer in Pinehurst Avenue is expected to have a positive impact given that it is 52% reduction from the pre-development flows.

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05-Jul-21
REVISED 05-Aug-21

61 Pinehurst Avenue
Ottawa, Ontario

Proposed 4-Level (including Basement) Apartment Building (Not Sprinklered)

Fire Flow Requirements (including 59 Pinehurst Ave)

Fire flow requirement as calculated as per Fire Underwriter Survey "Water Supply For Fire Protection".

F = 220 C $A^{0.5}$ = the required fire flow in litres per minute

C = coefficient related to the type of construction
= 1.50 Wood Frame Construction

A = total floor area (all storeys excluding basements at least 50% below grade)

	3rd Floor	130	sq.m.
	2nd Floor	130	sq.m.
	Ground Floor	130	sq.m.
	Basement	130	sq.m.
		520	sq.m.
59 Pinehurst Ave	2nd Floor	65	sq.m.
	Ground Floor	80	sq.m.
		145	sq.m.
	TOTAL FIRE AREA:	665	sq.m.

F = 8,510 L/min
= 9,000 L/min (rounded off to the nearest 1,000 L/min)

-15% Charge for Limited-combustible Occupancy

= 7,650 L/min

0% Reduction: No Sprinkler System

= - L/min

Increase for Separation Exposed Buildings

			Adjacent Building			Length-Height Factor
			Constuction	Length m	Storeys	
17%	North	3.1 to 10m	W-F	12	2	24
8%	East	20.1 to 30m	W-F	7	2	14
18%	South	3.1 to 10m	W-F	16	2	32
8%	West	20.1 to 30m	W-F	6	2	12
51%	Total Increase for Exposure (maximum 75%)					

= 3,902 L/min Increase

= 11,552 L/min
F = 12,000 L/min (rounded off to the nearest 1,000 L/min)
= 200.0 L/s

Elevation at C/L of Road 61.95 m ASL

			Static Pressure at Fire Hydrant		
200 L/s FIRE FLOW:	103.8	m ASL	60	psi	410 kPa

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05-Jul-21
REVISED 05-Aug-21

61 Pinehurst Avenue
Ottawa, Ontario

Proposed 4-Level (including Basement) Apartment Building (Sprinklered)

Fire Flow Requirements (including 59 Pinehurst Ave)

Fire flow requirement as calculated as per Fire Undewriter Survey "Water Supply For Fire Protection".

$F = 220\ C\ A^{0.5}$ = the required fire flow in litres per minute

C = coefficient related to the type of construction
= 1.50 Wood Frame Construction

A = total floor area (all storeys excluding basements at least 50% below grade)

	3rd Floor	130	sq.m.
	2nd Floor	130	sq.m.
	Ground Floor	130	sq.m.
	Basement	130	sq.m.
		520	sq.m.
59 Pinehurst Ave	2nd Floor	65	sq.m.
	Ground Floor	80	sq.m.
		145	sq.m.
	TOTAL FIRE AREA:	665	sq.m.

F = 8,510 L/min
= 9,000 L/min (rounded off to the nearest 1,000 L/min)

-15% Charge for Limited-combustible Occupancy

= 7,650 L/min

40% Reduction for Sprinkler System

= 3,060 L/min

Increase for Separation Exposed Buildings

			Adjacent Building			Length-Height
			Constuction	Length m	Storeys	Factor
17%	North	3.1 to 10m	W-F	12	2	24
8%	East	20.1 to 30m	W-F	7	2	14
18%	South	3.1 to 10m	W-F	16	2	32
8%	West	20.1 to 30m	W-F	6	2	12
51%	Total Increase for Exposure (maximum 75%)					

= 3,902 L/min Increase

= 8,492 L/min
F = 8,000 L/min (rounded off to the nearest 1,000 L/min)
= 133.3 l/s

Elevation at C/L of Road 61.95 m ASL

			Static Pressure at Fire Hydrant		
133 l/s FIRE FLOW:	107.2	m ASL	64	psi	444 kPa

D.B. Gray Engineering Inc.

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21-Jun-21
REVISED 05-Aug-21

61 Pinehust Avenue

Proposed 4-Level (including basement) 8-Unit Apartment Building

Ottawa, Ontario

Water Demand

	Number of Units	Persons Per Unit	Population
UNIT TYPE:			
Single Family:	0	3.4	0
Semi- detached:	0	2.7	0
Duplex:	0	2.3	0
Townhouse:	0	2.7	0
APARTMENTS:			
1 Bedroom:	4	1.4	6
2 Bedroom:	4	2.1	8
3 Bedroom:	0	3.1	0
Average Aptarment:	0	1.8	0
		TOTAL:	14

DAILY AVERAGE

350 litres / person / day

3.4	L/min	0.1	L/s	0.9 USgpm

MAXIMUM DAILY DEMAND 9.5 (Peaking Factor for a population of less than 30: Table 3-3 MOE Design Guidelines for Drinking-Water

32.3	L/min	0.5	L/s	8.5 USgpm

MAXIMUM HOURLY DEMAND 14.3 (Peaking Factor for a population of less than 30: Table 3-3 MOE Design Guidelines for Drinking-Water

48.7	L/min	0.8	L/s	12.9 USgpm

Elevation of Water Meter: 61.82 m ASL
Finish Floor Elevation: 60.92 m ASL

			Static Pressure at Water Meter		
MINIMUM HGL:	105.0	m ASL	61	psi	423 kPa
MAXIMUM HGL:	115.1	m ASL	76	psi	522 kPa

D.B. Gray Engineering Inc.

Douglas Gray <d.gray@dbgrayengineering.com>

RE: Boundary Condition Request - 61 Pinehurst Ave

1 message

Jhamb, Nishant <nishant.jhamb@ottawa.ca> Thu, Aug 5, 2021 at 10:40 AM
To: Douglas Gray <d.gray@dbgrayengineering.com>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>

Hello Doug

The following are boundary conditions, HGL, for hydraulic analysis at 61 Pinehurst Avenue (zone 1W) assumed to be connected to the 203 mm watermain on Pinehurst Avenue (see attached PDF for location).

Minimum HGL: 108.0 m

Maximum HGL: 115.1 m

Max Day + Fire Flow (200 L/s): 103.8 m

Max Day + Fire Flow (133.3 L/s): 107.2 m

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

Thank you

Nishant Jhamb, P.Eng

Project Manager |Gestionnaire de projet

Planning, Infrastructure and Economic Development Department - Services de la planification, de l'infrastructure et du développement économique

Development Review - Central Branch

City of Ottawa | Ville d'Ottawa

110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1

613.580.2424 ext./poste 23112, nishant.jhamb@ottawa.ca

Please note: Given the current pandemic, I will be working from home until further notice; reaching me by email is easiest. I will be checking my voicemail, just not as frequently as I normally would be.

From: Jhamb, Nishant
Sent: July 26, 2021 2:31 PM
To: 'Douglas Gray' <d.gray@dbgrayengineering.com>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>
Subject: RE: Boundary Condition Request - 61 Pinehurst Ave

Hi Doug

I will get back to you as soon as I have the boundary conditions.

Please update my contact info.

Thank you

Nishant Jhamb, P.Eng

Project Manager |Gestionnaire de projet

Planning, Infrastructure and Economic Development Department - Services de la planification, de l'infrastructure et du développement économique

Development Review - Central Branch

City of Ottawa | Ville d'Ottawa

110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1

613.580.2424 ext./poste 23112, nishant.jhamb@ottawa.ca

Please note: Given the current pandemic, I will be working from home until further notice; reaching me by email is easiest. I will be checking my voicemail, just not as frequently as I normally would be.

From: Douglas Gray <d.gray@dbgrayengineering.com>
Sent: July 26, 2021 2:28 PM
To: Jhamb, Nishant <nishant.jhamb@ottawa.ca>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>
Subject: Boundary Condition Request - 61 Pinehurst Ave

Hi Nishant

Please provide the boundary conditions at 61 Pinehurst Ave. We have calculated the following expected demands for a 8-unit apartment building.

Average daily demand: 0.1 L/s.

Maximum daily demand: 0.5 L/s.

Maximum hourly daily demand: 0.8 L/s

Fire Flow demand: 200.0 L/s

Fire Flow + Max Day: 200.5 L/s

We are looking at alternative designs so please also provide the boundary conditions for a fire flow demand of 133.3 l/s.

Average daily demand: 0.1 L/s.

Maximum daily demand: 0.5 L/s.

Maximum hourly daily demand: 0.8 L/s

Fire Flow demand: 133.3 L/s

Fire Flow + Max Day: 133.8 L/s

Our calculations are attached.

Thanks, Doug

D.B. Gray Engineering Inc.

Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

700 Long Point Circle Tel: 613-425-8044

Ottawa, Ontario K1T 4E9 d.gray@dbgrayengineering.com

'

'

61 Pinehurst Avenue July 2021.pdf
809K


Boundary Conditions for 61 Pinehurst Avenue
1067
rue Scott St.
av. Pinehurst Ave.
av. Pinehurst
1484
63
61
59
57
203
72
70(A)
66
14
N
Legend
PRIVATE
PUBLIC
City of Ottawa

20-Aug-21

61 Pinehurst Avenue

Ottawa, Ontario

Peak Water Demand

WATER FIXTURE VALUE
(AWWA Manual M22 - Sizing Water Service Lines and Meters)

	No.	F.V.	Total
Bathtub	6	8	48
Tiolet - tank	12	6	72
Tiolet - flush valve	0	24	0
Lavs.	12	1.5	18
Bidet	0	2	0
Urinal - wall flush valve	0	10	0
Shower	6	2.5	15
K. Sink	8	1.8	14.4
Dishwasher	0	1.3	0
Clothes Washer	8	3	24
Commercial Sink	0	4	0
J. Sink	0	4	0
Commercial Dishwasher	0	4	0
Commercial Washer	0	4	0
Hose 1/2 in	0	5	0
Hose 3/4 in	0	12	0
			191.4

Peak Demand (fig 4-2 or 4-3 AWWA M22)			30	USgpm		
Pressure @ Meter	476	kPa	69	psi.		
Pressure Factor (table 4-1 AWWA M22)			1.08			
Peak Demand			32	USgpm		
Irrigation - hose 1/2 in	1		7	USgpm (includes pressure factor)		
TOTAL PEAK DEMAND	147	L/min	39	USgpm	2.5	L/s
		Nominal Size	1.5	in	38	mm
			7.1	ft/s	2.2	m/s

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SANITARY SEWER DESIGN FORM

Average Daily Flows
Residential: 280 L / capita / day
Commercial: 28000 L / ha / day
Instituational: 28000 L / ha / day
Light Industrial: 35000 L / ha / day
Heavy Industrial: 55000 L / ha / day

Infiltration Allowance: 0.33 l / s / ha

Peaking Factor:
Residential (Harmon Equation): $1 + \frac{14}{4 + P^{0.5}}$
P = Population / 1000
Harmon Correction Factor: 0.8
Commercial & Institutional: 1.5 If contrinbution > 20%
Commercial & Institutional: 1 If contrinbution < 20%
Industrial: As per Ottawa Guidelines Appendix 4-B

n = 0.013

Project: 61 Pinehurst Avenue
Designed By: D.B.G
June 1, 2021
Page: 1 of 1

Location		Section								Cumulative Residential		Section Non-Residential			Cumulative					Sewer Data								Comments
		Single Family ppu = 3.4	Semi / Townhouse ppu = 2.7	Duplex / Triplex ppu = 2.3	Apartment (average) ppu = 1.8	Apartment (1 Bed) ppu = 1.4	Apartment (2 Bed) ppu = 2.1	Apartment (3 Bed) ppu = 3.1	Area						Flow	Area	Sewage Flow	Infiltration Flow	Total Flow		Actual Diameter	Nominal Diameter						
From	To	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	(ha)	Pop.	Peaking Factor	Area (ha)	Flow (L/ha/day)	Peaking Factor	(L/s)	(ha)	(L/s)	(L/s)	(L/s)	Material	(mm)	(mm)	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Ratio Q/Qfull	
		Existing Single Family Dwelling																										
Existing Dwelling	Existing 250 SAN	1							0.0307	3.4	3.20					0.0307	0.04	0.01	0.05	PVC	135.0	135	1.00	12.6	11.50	0.80	0.00	
		Proposed Apartment Building																										
Proposed Building	Existing 250 SAN					4	4		0.0307	14	3.20					0.0307	0.15	0.01	0.16	PVC	152.4	150	1.00	12.5	15.89	0.87	0.01	
																					Existing 250 SAN in Pinehurst Avenue							
																					254.0	250	0.47		42.53	0.84		

STORMWATER MANAGEMENT CALCULATIONS

Flow control roof drain calculations are based on the following formula:

$$Q = N \times S \times d \times F$$

where:

- Q = flowrate in litres per second
- N = number of roof drains
- S = slots per weir
- d = pond depth at roof drain in mm
- F = flowrate through each slot
  - 0.0124 litres per second per mm pond depth (5 USgpm per inch)

Storage calculations on the roof area are based on the following formula for volume of a cone:

$$V = (A \times d)/3$$

where:

- V = volume in cu.m.
- A = ponding area in sq.m.
- d = ponding depth in meters

Summary Tables

ONE HUNDRED-YEAR EVENT					
Drainage Area	Pre-Development Flow Rate (L/s)	Maximum Allowable Release Rate (L/s)	Maximum Release Rate (L/s)	Maximum Volume Required (cu.m)	Maximum Volume Stored (cu.m)
AREA I (Uncontrolled Flow Off Site)	-	-	2.89	-	-
AREA II (Roof)	-	-	1.53	3.40	3.40
TOTAL	10.21	4.45	4.43	3.40	3.40

FIVE-YEAR EVENT					
Drainage Area	Pre-Development Flow Rate (L/s)	Maximum Allowable Release Rate (L/s)	Maximum Release Rate (L/s)	Maximum Volume Required (cu.m)	Maximum Volume Stored (cu.m)
AREA I (Uncontrolled Flow Off Site)	-	-	1.37	-	-
AREA II (Roof)	-	-	1.15	1.43	1.43
TOTAL	5.27	4.45	2.52	1.43	1.43

61 Pinehurst Avenue

Ottawa, Ontario

STORMWATER MANAGEMENT CALCULATIONS
Rational Method

PRE-DEVELOPMENT CONDITIONS

100-Year Flow Rate

			C
Roof Area:	95	sq.m	1.00
Asphalt/Concrete Area:	77	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	135	sq.m	0.25
Total Catchment Area:	307	sq.m	0.67

Bransby William Formula

$$Tc = \frac{0.057 \bullet L}{Sw^{0.2} \bullet A^{0.1}} \text{ min}$$

Sheet Flow Distance (L):	30	m
Slope of Land (Sw):	0.1	%
Area (A):	0.0307	ha
Time of Concentration (Sheet Flow):	3.8	min
Area (A):	307	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	179	mm/hr
Runoff Coeficient (C):	0.67	
100-Year Pre-Development Flow Rate (2.78AiC):	10.21	L/s

5-Year Flow Rate

			C
Roof Area:	95	sq.m	0.90
Asphalt/Concrete Area:	77	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	135	sq.m	0.20
Total Catchment Area:	307	sq.m	0.59

Area (A):	307	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	104	mm/hr
Runoff Coeficient (C):	0.59	
5-Year Pre-Development Flow Rate (2.78AiC):	5.27	L/s

Maximum Allowable Release Rate

Area (A):	307	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	104	mm/hr (5 year event)
Runoff Coeficient (C):	0.50	
100-Year Maximum Allowable Release Rate (2.78AiC):	4.45	L/s

ONE HUNDRED YEAR EVENT

DRAINAGE AREA I (Uncontrolled Flow Off Site)

(ONE HUNDRED-YEAR EVENT)

			C
Roof Area:	0	sq.m	1.00
Asphalt/Concrete Area:	8	sq.m	1.00
Permeable Paver Area:	66	sq.m	0.375
Landscaped Area:	102	sq.m	0.25
Total Catchment Area:	176	sq.m	0.33
Area (A):	176	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	179	mm/hr	
Runoff Coeficient (C):	0.33		
Release Rate (2.78AiC):	2.89	L/s	

DRAINAGE AREA II (Roof)

(ONE HUNDRED-YEAR EVENT)

			C
Total Catchment Area:	131	sq.m	1.00

No. of Roof Drains:	1	
Slots per Wier:	1	0.0124 L/s/mm/slot (5 USGPM/in/slot)
Depth at Roof Drain:	124	mm
Maximum Release Rate:	1.53	L/s

Pond Area:	82	sq.m
Achieved Volume:	3.40	cu.m
Maximum Volume Required:	3.40	cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
5	243	8.84	1.53	7.30	2.19
10	179	6.50	1.53	4.97	2.98
15	143	5.20	1.53	3.67	3.30
20	120	4.37	1.53	2.83	3.40
25	104	3.78	1.53	2.25	3.37
30	92	3.35	1.53	1.81	3.26
35	83	3.01	1.53	1.47	3.09
40	75	2.74	1.53	1.20	2.88
45	69	2.51	1.53	0.98	2.65
50	64	2.33	1.53	0.79	2.38
55	60	2.17	1.53	0.64	2.10
60	56	2.04	1.53	0.50	1.80
65	53	1.92	1.53	0.38	1.49
70	50	1.81	1.53	0.28	1.17
75	47	1.72	1.53	0.19	0.84
80	45	1.64	1.53	0.10	0.50
85	43	1.56	1.53	0.03	0.15
90	41	1.50	1.50	0.00	0.00
95	39	1.44	1.44	0.00	0.00
100	38	1.38	1.38	0.00	0.00
105	36	1.33	1.33	0.00	0.00
110	35	1.28	1.28	0.00	0.00
115	34	1.24	1.24	0.00	0.00
120	33	1.20	1.20	0.00	0.00

FIVE-YEAR EVENT

DRAINAGE AREA I (Uncontrolled Flow Off Site)

(FIVE-YEAR EVENT)

			C
Roof Area:	0	sq.m	0.90
Asphalt/Concrete Area:	8	sq.m	0.90
Permeable Paver Area:	66	sq.m	0.30
Landscaped Area:	102	sq.m	0.20
Total Catchment Area:	176	sq.m	0.27
Area (A):	176	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	104	mm/hr	
Runoff Coeficient (C):	0.27		
Release Rate (2.78AiC):	1.37	L/s	

DRAINAGE AREA II (Roof)

(FIVE-YEAR EVENT)

			C
Total Catchment Area:	131	sq.m	0.90

No. of Roof Drains:	1	
Slots per Wier:	1	0.0124 L/s/mm/slot (5 USGPM/in/slot)
Depth at Roof Drain:	93	mm
Maximum Release Rate:	1.15	L/s

Pond Area:	46	sq.m
Achieved Volume:	1.43	cu.m
Maximum Volume Required:	1.43	cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
5	141	4.63	1.15	3.48	1.04
10	104	3.42	1.15	2.27	1.36
15	84	2.74	1.15	1.59	1.43
20	70	2.30	1.15	1.15	1.38
25	61	2.00	1.15	0.85	1.27
30	54	1.77	1.15	0.62	1.11
35	49	1.59	1.15	0.44	0.92
40	44	1.45	1.15	0.30	0.72
45	41	1.33	1.15	0.18	0.49
50	38	1.23	1.15	0.08	0.25
55	35	1.15	1.15	0.00	0.00
60	33	1.08	1.08	0.00	0.00
65	31	1.02	1.02	0.00	0.00
70	29	0.96	0.96	0.00	0.00
75	28	0.91	0.91	0.00	0.00
80	27	0.87	0.87	0.00	0.00
85	25	0.83	0.83	0.00	0.00
90	24	0.80	0.80	0.00	0.00
95	23	0.76	0.76	0.00	0.00
100	22	0.73	0.73	0.00	0.00
105	22	0.71	0.71	0.00	0.00
110	21	0.68	0.68	0.00	0.00
115	20	0.66	0.66	0.00	0.00
120	19	0.64	0.64	0.00	0.00

STORM SEWER DESIGN FORM — FIVE YEAR EVENT

Rational Method — Q = 2.78 A i C

June 28, 2021

n = 0.013

Location		Areas (ha)									Pipe Data									Notes
		Roof	Hard	Gravel	Landscape	Individual	Accum.	Time of	Rainfall Intensity	Peak Flow		Actual	Nominal					Time of		
From	To	C = 0.9	C = 0.9	C = 0.7	C = 0.2	2.78AC	2.78AC	Conc. (min)	i (mm/hr)	Q (L/s)	Material	Diameter (mm)	Diameter (mm)	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Flow (min)	Ratio Q/Qfull	
Roof Drains	Existing 375 ST	0.0131				0.0328	0.0328	10.00	104	3.42	PVC	152.4	150	1.00	13.5	15.9	0.87	0.26	0.21	
										1.15	PVC	152.4	150	1.00	13.5	15.9	0.87	0.26	0.07	Through flow control roof drain
												Existing 375 ST in Pinehurst Avenue								
												381.0	375	0.65		147.5	1.29			

City of Ottawa Servicing Study Checklist

General Content

Executive Summary (for large reports only): not applicable

Date and revision number of the report: see page 1 of Servicing Brief and Stormwater Management Report

Location map and plan showing municipal address, boundary, and layout of proposed development: see drawings C-1 to C-4

Plan showing the site and location of all existing services: see drawings C-1 to C-4

Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere: not applicable

Summary of Pre-consultation Meetings with City and other approval agencies: not available

Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria: not applicable

Statement of objectives and servicing criteria: see page 2 of Servicing Brief and Stormwater Management Report

Identification of existing and proposed infrastructure available in the immediate area: see drawings C-1 to C-4

Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available). see drawings C-1 to C-4

Concept level master grading plan to confirm existing and proposed grades in the development and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths: not applicable

Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts: not applicable

Proposed phasing of the development, if applicable: not applicable

Reference to geotechnical studies and recommendations concerning servicing: see note 1.5 on drawing C-3

All preliminary and formal site plan submissions should have the following information:

- **Metric scale:** included
- **North arrow:** included
    - **(including construction North):** not included
- **Key Plan:** included

- **Name and contact information of applicant and property owner:** not available
- **Property limits**: included
    - **including bearings and dimensions:** not included
- **Existing and proposed structures and parking areas:** included
- **Easements, road widening and rights-of-way:** included
- **Adjacent street names:** included

Development Servicing Report: Water

Confirm consistency with Master Servicing Study, if available: not applicable

Availability of public infrastructure to service proposed development: see page 2 of Servicing Brief

Identification of system constraints: see page 2 of Servicing Brief

Confirmation of adequate domestic supply and pressure: see page 2 of Servicing Brief

Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow locations throughout the development: see page 2 & 7 of Servicing Brief

Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves: see page 2 of Servicing Brief

Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design: not applicable

Address reliability requirements such as appropriate location of shut-off valves: not applicable

Check on the necessity of a pressure zone boundary modification:. not applicable

Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range: not applicable

Description of the proposed water distribution network, including locations of proposed connections to the existing systems, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions: not applicable

Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation: not applicable

Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines: see page 2 of Servicing Brief

Provision of a model schematic showing the boundary conditions locations, streets , parcels, and building locations for reference: not applicable

Development Servicing Report: Wastewater

Summary of proposed design criteria: see page 3 of Servicing Brief

(Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure): not applicable

Confirm consistency with Master Servicing Study and /or justification for deviations: not applicable

Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and conditions of sewers: not applicable

Descriptions of existing sanitary sewer available for discharge of wastewater from proposed development: see page 3 of Servicing Brief

Verify available capacity in downstream sanitary sewer and / or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable): not applicable

Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix C) format. see page 9 of Servicing Brief

Description of proposed sewer network including sewers, pumping stations, and forcemains: see page 3 of Servicing Brief

Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality): not applicable

Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development: not applicable

Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity: not applicable

Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding: not applicable

Special considerations such as contamination, corrosive environment etc: not applicable

Development Servicing Report: Stormwater Checklist

Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property): see page 4 of Servicing Brief and Stormwater Management Report

Analysis of available capacity in existing public infrastructure. not applicable

A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern: see drawing C-1 & C-2

Water quality control objective (e/g/ controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking

into account long-term cumulative effects: see Stormwater Management Report Servicing Brief and Stormwater Management Report

Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements: Servicing Brief and Stormwater Management Report

Descriptions of the references and supporting information.
Set-back from private sewage disposal systems. not applicable

Watercourse and hazard lands setbacks: not applicable

Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed: the pre-application consultation record is not yet been issued

Confirm consistency with sub-waterched and Master Servicing Study, if applicable study exists: not applicable

Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period). see drawings C-1 to C-4 and Servicing Brief and Stormwater Management Report

Identification of watercourses within the proposed development and how watercourses will be protected, or , if necessary, altered by the proposed development with applicable approvals. see drawings C-1 to C-4 and Servicing Brief and Stormwater Management Report

Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions: see Servicing Brief and Stormwater Management Report

Any proposed diversion of drainage catchment areas from one outlet to another. : not applicable

Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities. : not applicable

If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event: not applicable

Identification of potential impacts to receiving watercourses: Servicing Brief and Stormwater Management Report

Identification of municipal drains and related approval requirements. : not applicable

Descriptions of how the conveyance and storage capacity will be achieved for the development: see page 3 of Servicing Brief and Stormwater Management Report

100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading:

Inclusion of hydraulic analysis including hydraulic grade line elevations. : not applicable

Description of approach to erosion and sediment control during construction for the protection of receiving watercourses of drainage corridors: see notes 2.1 to 2.5 on drawing C-3

Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplains elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current: not applicable

Identification of fill constraints related to floodplain and geotechnical investigation. : not applicable

Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act: not applicable

Application for Certificate of Approval (CofA) under the Ontario Water Resources Act:

Changes to Municipal Drains. : not applicable

Other permits (National Capital commission, Parks Canada, public Works and Government Services Canada, Ministry of transportation etc.) : not applicable

Conclusion Checklist

Clearly stated conclusions and recommendations: see page 5 & 6 of Servicing Brief

Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.

All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario: included