D.B. Gray Engineering Inc.

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

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SITE SERVICING & STORMWATER MANAGEMENT REPORT

601 LAURIER AVENUE WEST
OTTAWA, ONTARIO

REPORT NO. 23121

SEPTEMBER 3, 2025

CONTENTS

LIST OF APPENDICES

1.0 INTRODUCTION

This report has been prepared in support of the Zoning By-law Amendment application for 601 Laurier Avenue West in Ottawa, Ontario. The Zoning By-law Amendment would permit the development of the proposed 28-storey, 326-unit apartment building. The property is currently occupied by two apartment buildings to be demolished.

2.0 WATER SERVICING

2.1 WATER SUPPLY FOR FIREFIGHTING

In accordance with City of Ottawa Technical Bulletin ISTB-2021-03, when calculating the required fire flow where pipe sizing is not affected, the Ontario Building Code Method is to be used. Using the Ontario Building Code Method, the required fire flow was calculated to be 9,000 L/min (150 L/s). In accordance with City of Ottawa Technical Bulletin ISTB-2021-03, when the Ontario Building Code Method yields a required fire flow of 9,000 L/min (150 L/s), the Fire Underwriters Survey Method is to be used instead. Using the Fire Underwriters Survey Method, the required fire flow was subsequently calculated to be 10,000 L/min (166.7 L/s). Refer to calculations in Appendix A.

The boundary conditions in the 200 mm Laurier Avenue West municipal watermain provided by the City of Ottawa for the 166.7 L/s fire flow at the subject property indicate a hydraulic grade line (HGL) of 105.5 m. Refer to Appendix A. This HGL calculates to 241 kPa (35 psi). Since the pressure is above the Ontario Building Code's minimum required pressure of 140 kPa (20 psi), there is an adequate water supply for firefighting from the existing municipal water distribution system.

In accordance with City of Ottawa Technical Bulletin ISTB-2018-02, the aggregate flow of all contributing fire hydrants within 150 m of the building shall not be less than the required fire flow. In accordance with City of Ottawa Technical Bulletin ISTB-2018-02 Appendix I, Class AA fire hydrants within 75 m can contribute 5,700 L/min (95 L/s).

The two closest existing municipal fire hydrants are Class AA and are within 75 m of the proposed building; one is located between 18 Cambridge Street North and 60 Cambridge Street North; and the other is located at the intersection of Laurier Avenue West and Bronson Avenue. Each can contribute 5,700 L/min (95 L/s) for an aggregate flow of 11,400 L/min (190 L/s), which is greater than the required fire flow of 10,000 L/min (166.7 L/s).

2.2 DOMESTIC WATER SUPPLY

In accordance with

i. the City of Ottawa Water Design Guidelines for the populations and peaking factors, and
ii. City of Ottawa Technical Bulletin ISTB-2021-03 for the consumption rate, and

based on the 239 – 1 bedroom apartment units and 87 – 2 bedroom apartment units, the average daily demand was calculated to be 1.7 L/s, the maximum daily demand was calculated to be 4.2 L/s and the maximum hourly demand was calculated to be 9.2 L/s. Refer to calculations in Appendix A. Since the average daily demand is more than 50,000 L/day, a redundant water supply separated by an isolation valve is required to avoid the creation of a vulnerable service area.

The boundary conditions in the 200 mm Laurier Avenue West municipal watermain provided by the City of Ottawa at the subject property indicate a minimum HGL of 107.5 m and a maximum HGL of 115.7 m. Refer to Appendix A. Based on these boundary conditions, the pressure at the water meter is calculated to vary between 288 kPa (42 psi) and 369 kPa (53 psi). This is an acceptable range for the proposed development.

A 150 mm water service connecting to the existing 200 mm Laurier Avenue West municipal watermain could service the sprinkler system. The same 150 mm water service would provide an adequate domestic water supply.

3.0 SANITARY SERVICING

In accordance with

i. the City of Ottawa Sewer Design Guidelines for the populations,
ii. City of Ottawa Technical Bulletin ISTB-2018-01 for the average daily flow, Harmon Formula correction factor and infiltration allowance, and
iii. the Harmon Formula for the peaking factor, and

based on the 239 – 1 bedroom apartment units and 87 – 2 bedroom apartment units, the post-development sanitary flow rate was calculated to be 5.37 L/s. A 250 mm sanitary sewer service at the minimum 1% slope (59.47 L/s capacity) could service the development. At the design flow rate the sanitary sewer service would only be at 9% of its capacity. The 250 mm sanitary sewer service would connect to the existing 250 mm Laurier Avenue West municipal combined sewer, which at 0.5% slope has a capacity of 42.05 L/s. Refer to calculations in Appendix B. The post-development increase in flow is expected to have an acceptable impact on the 250 mm Laurier Avenue West municipal combined sewer.

4.0 STORMWATER MANAGEMENT

4.1 QUANTITY CONTROL

It is expected that the stormwater quantity control criterion will be to control the post-development peak flows with the use of flow control roof drains to the pre-development 2-year peak flow rate using the post-development roof area, a calculated pre-development runoff coefficient not more than 0.5 and a calculated pre-development time of concentration not less than 10 minutes. It was calculated that the pre-development conditions reflect a runoff coefficient of 0.58 during the 100-year event and 0.51 during the 2-year event. Using the Rational Method with a time of concentration of 10 minutes, the pre-development flow rates were calculated to be 57.40 L/s during the 100-year event and 21.62 L/s during the 2-year event. Using the Rational Method with the post-development roof area of 1,300 sq.m, a time of concentration of 10 minutes and runoff coefficient of 0.5, the expected target release rate for the roof was calculated to be 13.88 L/s. The Rational and Modified Rational Methods were used to calculate the post-development flow rates and corresponding storage volumes. Refer to calculations in Appendix C.

Drainage Area I (Uncontrolled Flow to Slater Street – 700 sq.m)
The north side of the property would drain uncontrolled off site to Slater Street. The flow rate is calculated at a time of concentration of 10 minutes.

	100-Year Event
Maximum Flow Rate	21.72 L/s

Drainage Area II (Uncontrolled Flow to Laurier Avenue West – 275 sq.m)
The south side of the property would drain uncontrolled off site to Laurier Avenue West. The flow rate is calculated at a time of concentration of 10 minutes.

	100-Year Event
Maximum Flow Rate	4.19 L/s

Drainage Area III (Penthouse Roof – 300 sq.m)
The 2 roof drains would be flow control type roof drains, which would restrict the flow of stormwater and cause it to pond on the roof.

	100-Year Event
Maximum Release Rate	3.07 L/s
Maximum Volume Stored	8.39 cu.m

Drainage Area IV (Level 28 Roof – 475 sq.m)
The 4 roof drains would be flow control type roof drains, which would restrict the flow of stormwater and cause it to pond on the roof.

	100-Year Event
Maximum Release Rate	5.92 L/s
Maximum Volume Stored	11.91 cu.m

Drainage Area V (Level 6 Roof – 250 sq.m)
The roof drain would be a flow control type roof drain, which would restrict the flow of stormwater and cause it to pond on the roof.

	100-Year Event
Maximum Release Rate	1.65 L/s
Maximum Volume Stored	8.60 cu.m

Summary

The maximum post-development release rate during the 100-year event for the entire property was calculated to be 36.55 L/s, which is 36% less than the pre-development flow rate during the 100-year event. The maximum post-development release rate during the 100-year event through the roof drains was calculated to be 24.29 L/s, which is 75% more than the expected target release rate. To achieve the maximum post-development release rate, a maximum storage volume of 29.90 cu.m would be required. The post-development reduction in flow is expected to have a positive impact on the 900 mm Slater Street municipal storm sewer.

	100-Year Event
Target Release Rate	13.88 L/s
Maximum Release Rate	24.29 L/s
Maximum Volume Required	29.90 cu.m

4.2 STORM SERVICING

The peak unrestricted roof flow rate during the 100-year event was calculated to be 64.53 L/s. The peak restricted roof flow rate during the 100-year event was calculated to be 24.29 L/s. A 300 mm storm sewer service at the minimum 1% slope (96.70 L/s capacity) could service the development. At the peak restricted 100-year flow rate the storm sewer service would only be at 25% of its capacity. The 300 mm storm sewer service would connect to a municipal storm sewer extension north on Bronson Avenue to the existing 900 mm Slater Street municipal storm sewer, which at 2.88% slope has a capacity of 3,201 L/s. Refer to calculations in Appendix C.

5.0 CONCLUSIONS

1. There is an adequate water supply for firefighting from the existing municipal water distribution system.
2. There is an acceptable range of water pressures in the existing municipal water distribution system.
3. The post-development increase in sanitary flow is expected to have an acceptable impact on the existing municipal combined sewer.
4. The post-development reduction in stormwater flow is expected to have a positive impact on the existing municipal storm sewer.

APPENDIX A

WATER SERVICING

D.B. Gray Engineering Inc.

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March 24, 2025

601 Laurier Avenue West

28-Storey Apartment Building

Ottawa, Ontario

FIRE FLOW CALCULATIONS

FUS Method

RFF = Required Fire Flow in litres per minute
= $220CA^{0.5}$

C = Construction Coefficient related to the type of construction of the building
= 0.8 Type II Noncombustible Construction

A = Total Effective Floor Area in square meters of the building

Penthouse:	304	0%	0	sq.m Effective Floor Area
Level 28:	778	0%	0	sq.m Effective Floor Area
Level 27:	778	0%	0	sq.m Effective Floor Area
Level 26:	778	0%	0	sq.m Effective Floor Area
Level 25:	778	0%	0	sq.m Effective Floor Area
Level 24:	778	0%	0	sq.m Effective Floor Area
Level 23:	778	0%	0	sq.m Effective Floor Area
Level 22:	778	0%	0	sq.m Effective Floor Area
Level 21:	778	0%	0	sq.m Effective Floor Area
Level 20:	778	0%	0	sq.m Effective Floor Area
Level 19:	778	0%	0	sq.m Effective Floor Area
Level 18:	778	0%	0	sq.m Effective Floor Area
Level 17:	778	0%	0	sq.m Effective Floor Area
Level 16:	778	0%	0	sq.m Effective Floor Area
Level 15:	778	0%	0	sq.m Effective Floor Area
Level 14:	778	0%	0	sq.m Effective Floor Area
Level 13:	778	0%	0	sq.m Effective Floor Area
Level 12:	778	0%	0	sq.m Effective Floor Area
Level 11:	778	0%	0	sq.m Effective Floor Area
Level 10:	778	50%	389	sq.m Effective Floor Area
Level 9:	778	50%	389	sq.m Effective Floor Area
Level 8:	779	50%	389.5	sq.m Effective Floor Area
Level 7:	785	50%	392.5	sq.m Effective Floor Area
Level 6:	1,175	50%	587.5	sq.m Effective Floor Area
Level 5:	1,175	50%	587.5	sq.m Effective Floor Area
Level 4:	1,243	50%	621.5	sq.m Effective Floor Area
Level 3:	1,243	50%	621.5	sq.m Effective Floor Area
Level 2:	1,243	100%	1,243	sq.m Effective Floor Area
Level 1:	1,275	100%	1,275	sq.m Effective Floor Area
	24,782	sq.m	6,496	sq.m Total Effective Floor Area

RFF = 14,185 L/min

= 14,000 L/min (rounded to nearest 1,000 L/min)

Occupancy and Contents Adjustment Factor

-15% Limited Combustible Contents

= -2,100 L/min Occupancy and Contents Adjustment Factor

RFF = 11,900 L/min

Automatic Sprinkler Protection Credit

30% Sprinkler system designed, installed and maintained in accordance with NFPA standards

10% Standard water supply for both the sprinkler system and fire department hose lines

= 4,760 L/min Automatic Sprinkler Protection Credit

Exposure Adjustment Charge

Side	Charge	Distance	Construction	Length	Storeys	Factor
North	0%	over 30 m				
East	17%	3.1 m to 10 m	Type V	15	3	45
South	10%	20.1 m to 30 m	Type V	28	4	112
West	0%	over 30 m				

27% Exposure Adjustment Charge

= 3,213 L/min Exposure Adjustment Charge

RFF = 10,353 L/min

= 10,000 L/min (rounded to nearest 1,000 L/min)

= 166.7 L/s

166.7 L/s Fire Flow HGL: 105.5 m

Elevation at Fire Hydrant: 80.9 m

Static Pressure at Fire Hydrant: 24.6 m 241 kPa 35 psi

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March 24, 2025

601 Laurier Avenue West

28-Storey Apartment Building

Ottawa, Ontario

WATER DEMAND CALCULATIONS

	Number of Units	Persons per Unit	Population
1 Bedroom:	239	1.4	334.6
2 Bedroom:	87	2.1	182.7
3 Bedroom:	0	3.1	0
Total:	326		517.3

Average Daily Demand:	280	L/capita/day				
	100.6	L/min	1.7	L/s	26.6	USgpm
Maximum Daily Demand:	2.5	(Peaking factor as per City of Ottawa Water Design Guidelines)				
	251.5	L/min	4.2	L/s	66.4	USgpm
Maximum Hourly Demand:	2.2	(Peaking factor as per City of Ottawa Water Design Guidelines)				
	553.2	L/min	9.2	L/s	146.1	USgpm

Elevation of Water Meter:	78.1	m				
Basement Floor Elevation:	77.2	m				
Minimum HGL:	107.5	m				
Static Pressure at Water Meter:	29.4	m	288	kPa	42	psi
Maximum HGL:	115.7	m				
Static Pressure at Water Meter:	37.6	m	369	kPa	53	psi

D.B. Gray Engineering Inc.

Ryan Faith <r.faith@dbgrayengineering.com>

RE: Request for Boundary Conditions - 601 Laurier Avenue West

1 message

Wessel, Shawn <shawn.wessel@ottawa.ca> Tue, Oct 15, 2024 at 11:36 AM
To: Ryan Faith <r.faith@dbgrayengineering.com>, "Fawzi, Mohammed" <mohammed.fawzi@ottawa.ca>
Cc: Douglas Gray <d.gray@dbgrayengineering.com>

Hello Ryan and good morning.

Please find requested boundary conditions, below:

The following are boundary conditions, HGL, for hydraulic analysis at 601 Laurier Avenue West (zone 1W) assumed to be a dual connection to the 203mm watermain on Laurier Avenue West (see attached PDF for location).

Minimum HGL: 107.5 m

Maximum HGL: 115.7 m

Max Day + Fire Flow (166.7 L/s): 105.5 m

Please refer to Guidelines and Technical bulletin ISDTB-2014-02 concerning basic day demands greater than 0.5 L/s.

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.

If you require additional information or clarification, please do not hesitate to contact me anytime.

Thank you

Please be advised that I will be away Nov 4-12 inclusive. Please contact the City File Lead or Sr. Engineer in my absence.

Regards,

Shawn Wessel, A.Sc.T.,rcji

Pronouns: he/him | Pronom: il

Project Manager - Infrastructure Approvals

Gestionnaire de projet – Approbation des demandes d'infrastructures

Development Review Central Branch | Direction de l'examen des projets d'aménagement, Centrale

Planning, Development & Building Services Department (PDBS) | Direction générale des services de la planification, de l'aménagement et du bàtiment (DGSPAB)

City of Ottawa | Ville d'Ottawa

110 Laurier Ave. W. | 110, avenue Laurier Ouest, Ottawa ON K1P 1J1

(613) 580 2424 Ext. | Poste 33017

Int. Mail Code | Code de Courrier Interne 01-14

shawn.wessel@ottawa.ca

*****Please also note that, while my work hours may be affected by the current situation and am working from home, I still have access to email, video conferencing and telephone. Feel free to schedule video conferences and/or telephone calls, as necessary.*****

From: Ryan Faith <r.faith@dbgrayengineering.com>
Sent: Tuesday, September 24, 2024 5:16 PM
To: Wessel, Shawn <shawn.wessel@ottawa.ca>; Fawzi, Mohammed <mohammed.fawzi@ottawa.ca>
Cc: Douglas Gray <d.gray@dbgrayengineering.com>
Subject: Request for Boundary Conditions - 601 Laurier Avenue West

Hi Shawn and Mohammed,

Please provide the boundary conditions for the 200 mm Laurier Avenue West municipal watermain at 601 Laurier Avenue West. We have calculated the following expected demands:

Fire flow demand: 166.7 L/s
Average daily demand: 1.8 L/s
Maximum daily demand: 4.6 L/s
Maximum hourly demand: 10.1 L/s

Fire flow + maximum daily demand: 171.3 L/s

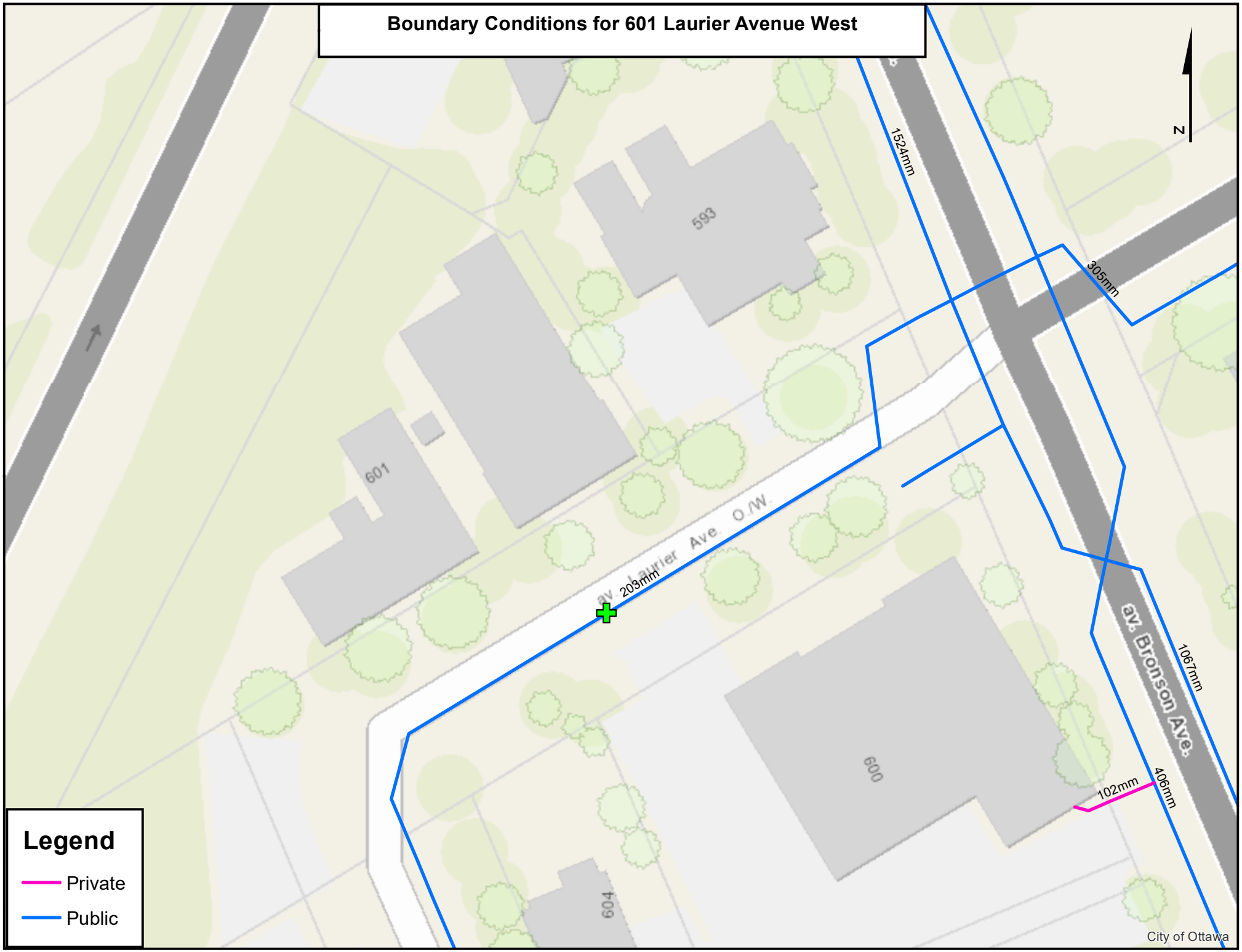
Calculations are attached.

Thanks,

Ryan Faith
D.B. Gray Engineering Inc.
700 Long Point Circle
Ottawa, Ontario K1T 4E9
613-425-8044

601 Laurier Avenue West REVISED October 2024.pdf
358K

Boundary Conditions for 601 Laurier Avenue West



APPENDIX B

SANITARY SERVICING

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700 Long Point Circle
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SANITARY SEWER CALCULATIONS

Project: 601 Laurier Avenue West
28-Storey Apartment Building
Ottawa, Ontario

Date: March 24, 2025

Residential Average Daily Flow:	280	L/capita/day
Commercial Average Daily Flow:	28,000	L/ha/day
Institutional Average Daily Flow:	28,000	L/ha/day
Light Industrial Average Daily Flow:	35,000	L/ha/day
Heavy Industrial Average Daily Flow:	55,000	L/ha/day
Infiltration Allowance:	0.33	L/s/ha

Residential Peaking Factor:	Harmon Formula
Harmon Formula Correction Factor:	0.8
Commercial Peaking Factor:	1.5
Institutional Peaking Factor:	1.5
Industrial Peaking Factor:	Ministry of the Environment
Manning's Roughness Coefficient:	0.013

		Residential													Commercial				Infiltration			Q	Sewer Data						
		Individual									Cumulative				Individual	Cumulative			Individual	Cumulative									
Location		Single	Semi	Duplex	Apartment	Apartment	Apartment	Apartment	Area	Population	Area	Population	Peaking	Flow Rate	Area	Area	Peaking	Flow Rate	Area	Area	Flow Rate	Total	Length	Nominal	Actual	Slope	Velocity	Q_{Full}	
From	To	Family	Detached		(1 Bed)	(2 Bed)	(3 Bed)	(Average)	(ha)		(ha)		Factor	(L/s)	(ha)	(ha)	Factor	(L/s)	(ha)	(ha)	(L/s)	Flow Rate (L/s)	(m)	Diameter (mm)	Diameter (mm)	(%)	(m/s)	Capacity (L/s)	Q / Q_{Full}
		ppu = 3.4	ppu = 2.7	ppu = 2.3	ppu = 1.4	ppu = 2.1	ppu = 3.1	ppu = 1.8																				
Proposed Building	MHCH 10723				239	87			0.1609	517.3	0.1609	517.3	3.17	5.32					0.1609	0.1609	0.05	5.37		250	250	1	1.21	59.47	9%
																							Existing 250 mm Laurier Avenue West Municipal Combined Sewer:		250	250	0.5	0.86	42.05	

APPENDIX C

STORMWATER MANAGEMENT

March 24, 2025

601 Laurier Avenue West

Ottawa, Ontario

STORMWATER MANAGEMENT CALCULATIONS

Modified Rational Method

PRE-DEVELOPMENT CONDITIONS

100-YEAR EVENT

			C
Roof Area:	625	sq.m	1.00
Hard Area:	250	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Soft Area:	1,125	sq.m	0.25
Total Catchment Area:	2,000	sq.m	0.58
Area (A):	2,000	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	179	mm/hr	
Runoff Coeficient (C):	0.58		
100-Year Pre-Development Flow Rate (2.78AiC):	57.40	L/s	

2-YEAR EVENT

			C
Roof Area:	625	sq.m	0.90
Hard Area:	250	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Soft Area:	1,125	sq.m	0.20
Total Catchment Area:	2,000	sq.m	0.51
Area (A):	2,000	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	77	mm/hr	
Runoff Coeficient (C):	0.51		
2-Year Pre-Development Flow Rate (2.78AiC):	21.62	L/s	

TARGET RELEASE RATE

			C
Roof Area:	1,300	sq.m	0.90
Hard Area:	0	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Soft Area:	0	sq.m	0.20
Total Catchment Area:	1,300	sq.m	0.90
Area (A):	1,300	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	77	mm/hr (2-Year Event)	
Runoff Coeficient (C):	0.5		
Target Release Rate (2.78AiC):	13.88	L/s	

100-YEAR EVENT

DRAINAGE AREA I (Uncontrolled Flow to Slater Street)

(100-YEAR EVENT)

			C
Roof Area:	275	sq.m	1.00
Hard Area:	50	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Permeable Paver Area:	150	sq.m	0.375
Soft Area:	225	sq.m	0.25
Total Catchment Area:	700	sq.m	0.63
Area (A):	700	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	179	mm/hr	
Runoff Coeficient (C):	0.63		
Flow Rate (2.78AiC):	21.72	L/s	

DRAINAGE AREA II (Uncontrolled Flow to Laurier Avenue West)

(100-YEAR EVENT)

			C
Roof Area:	0	sq.m	1.00
Hard Area:	0	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Permeable Paver Area:	125	sq.m	0.375
Soft Area:	150	sq.m	0.25
Total Catchment Area:	275	sq.m	0.31
Area (A):	275	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	179	mm/hr	
Runoff Coeficient (C):	0.31		
Flow Rate (2.78AiC):	4.19	L/s	

DRAINAGE AREA III (Penthouse Roof)

(100-YEAR EVENT)

			C
Total Catchment Area:	300	sq.m	1.00

No. of Roof Drains: 2
Slots per Wier: 1 0.01242 L/s/mm/slot (5 USgpm/in/slot)

Depth at Roof Drains: 124 mm

Maximum Release Rate: 3.07 L/s Pond Area: 204 sq.m

Maximum Volume Stored: 8.39 cu.m

Maximum Volume Required: 8.39 cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Required Storage Volume (cu.m)
10	179	14.89	3.07	11.82	7.09
15	143	11.92	3.07	8.85	7.96
20	120	10.00	3.07	6.93	8.32
25	104	8.66	3.07	5.59	8.39
30	92	7.66	3.07	4.59	8.27
35	83	6.89	3.07	3.82	8.02
40	75	6.27	3.07	3.20	7.67
45	69	5.76	3.07	2.69	7.26
50	64	5.33	3.07	2.26	6.79
55	60	4.97	3.07	1.90	6.28
60	56	4.66	3.07	1.59	5.73
65	53	4.39	3.07	1.32	5.15
70	50	4.15	3.07	1.08	4.55
75	47	3.94	3.07	0.87	3.92
80	45	3.75	3.07	0.68	3.27
85	43	3.58	3.07	0.51	2.61
90	41	3.43	3.07	0.36	1.94
95	39	3.29	3.07	0.22	1.25
100	38	3.16	3.07	0.09	0.55
105	36	3.04	3.04	0.00	0.00
110	35	2.94	2.94	0.00	0.00
115	34	2.84	2.84	0.00	0.00
120	33	2.74	2.74	0.00	0.00
150	28	2.30	2.30	0.00	0.00
180	24	1.99	1.99	0.00	0.00
210	21	1.76	1.76	0.00	0.00
240	19	1.59	1.59	0.00	0.00

DRAINAGE AREA IV (Level 28 Roof)

(100-YEAR EVENT)

				C
Total Catchment Area:	475	sq.m		1.00

No. of Roof Drains:	4	
Slots per Wier:	1	0.01242 L/s/mm/slot (5 USgpm/in/slot)
Depth at Roof Drains:	119	mm
Maximum Release Rate:	5.92	L/s

Pond Area:	300	sq.m
Maximum Volume Stored:	11.91	cu.m
Maximum Volume Required:	11.91	cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Required Storage Volume (cu.m)
10	179	23.58	5.92	17.66	10.60
15	143	18.87	5.92	12.95	11.66
20	120	15.84	5.92	9.92	11.91
25	104	13.71	5.92	7.80	11.70
30	92	12.13	5.92	6.22	11.19
35	83	10.90	5.92	4.99	10.48
40	75	9.92	5.92	4.01	9.62
45	69	9.12	5.92	3.20	8.65
50	64	8.45	5.92	2.53	7.59
55	60	7.87	5.92	1.96	6.46
60	56	7.38	5.92	1.46	5.27
65	53	6.95	5.92	1.04	4.04
70	50	6.57	5.92	0.66	2.77
75	47	6.24	5.92	0.32	1.46
80	45	5.94	5.92	0.03	0.12
85	43	5.67	5.67	0.00	0.00
90	41	5.43	5.43	0.00	0.00
95	39	5.21	5.21	0.00	0.00
100	38	5.01	5.01	0.00	0.00
105	36	4.82	4.82	0.00	0.00
110	35	4.65	4.65	0.00	0.00
115	34	4.49	4.49	0.00	0.00
120	33	4.34	4.34	0.00	0.00
150	28	3.65	3.65	0.00	0.00
180	24	3.16	3.16	0.00	0.00
210	21	2.79	2.79	0.00	0.00
240	19	2.51	2.51	0.00	0.00

DRAINAGE AREA V (Level 6 Roof)

(100-YEAR EVENT)

			C
Total Catchment Area:	250	sq.m	1.00

No. of Roof Drains: 1
Slots per Wier: 1 0.01242 L/s/mm/slot (5 USgpm/in/slot)

Depth at Roof Drain: 133 mm

Maximum Release Rate: 1.65 L/s Pond Area: 195 sq.m

Maximum Volume Stored: 8.60 cu.m

Maximum Volume Required: 8.60 cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Required Storage Volume (cu.m)
10	179	12.41	1.65	10.76	6.46
15	143	9.93	1.65	8.29	7.46
20	120	8.34	1.65	6.69	8.03
25	104	7.22	1.65	5.57	8.36
30	92	6.38	1.65	4.74	8.53
35	83	5.74	1.65	4.09	8.60
40	75	5.22	1.65	3.58	8.58
45	69	4.80	1.65	3.15	8.51
50	64	4.44	1.65	2.80	8.40
55	60	4.14	1.65	2.50	8.24
60	56	3.88	1.65	2.24	8.06
65	53	3.66	1.65	2.01	7.85
70	50	3.46	1.65	1.81	7.62
75	47	3.28	1.65	1.64	7.37
80	45	3.13	1.65	1.48	7.11
85	43	2.99	1.65	1.34	6.83
90	41	2.86	1.65	1.21	6.54
95	39	2.74	1.65	1.09	6.24
100	38	2.63	1.65	0.99	5.93
105	36	2.54	1.65	0.89	5.61
110	35	2.45	1.65	0.80	5.28
115	34	2.36	1.65	0.72	4.95
120	33	2.29	1.65	0.64	4.61
150	28	1.92	1.65	0.27	2.46
180	24	1.66	1.65	0.02	0.17
210	21	1.47	1.47	0.00	0.00
240	19	1.32	1.32	0.00	0.00

D.B. Gray Engineering Inc.

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

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STORM SEWER CALCULATIONS

Rational Method

100-YEAR EVENT

Project: 601 Laurier Avenue West
28-Storey Apartment Building
Ottawa, Ontario

Date: March 24, 2025

Manning's Roughness Coefficient: 0.013

Location		Individual					Cumulative				Sewer Data							
From	To	Roof C = 1.00 (ha)	Hard C = 1.00 (ha)	Gravel C = 0.875 (ha)	Soft C = 0.25 (ha)	2.78AC	2.78AC	Time (min)	Rainfall Intensity (mm/hr)	Q Flow Rate (L/s)	Length (m)	Nominal Diameter (mm)	Actual Diameter (mm)	Slope (%)	Velocity (m/s)	Q_{Full} Capacity (L/s)	Time (min)	Q / Q_{Full}
Roof Drains	300 ST	0.0275				0.0765	0.0765	10.00	179	13.65								
Roof Drains	300 ST	0.0300				0.0834	0.0834	10.00	179	14.89								
							Flow through flow control roof drains:			3.07								
Roof Drains	300 ST	0.0475				0.1321	0.1321	10.00	179	23.58								
							Flow through flow control roof drains:			5.92								
Roof Drains	300 ST	0.0250				0.0695	0.0695	10.00	179	12.41								
							Flow through flow control roof drain:			1.65								
Proposed Building							0.3614	10.00	179	64.53								
								Restricted upstream flow:		24.29		300	300	1	1.37	96.70		25%
											Existing 900 mm Slater Street Municipal Storm Sewer:	900	914	2.88	4.88	3,201		