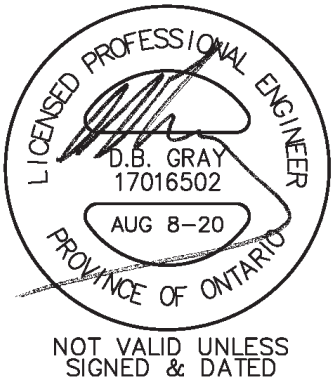
SERVICING BRIEF &
STORMWATER MANAGEMENT REPORT

240 Ferland Street
Ottawa, Ontario

Report No. 19073

August 8, 2020



D.B. Gray Engineering Inc.

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

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SERVICING BRIEF &
STORMWATER MANAGEMENT REPORT

240 Ferland Street
Ottawa, Ontario

This report describes the services and addresses the stormwater management requirements of a property, 710 sq.m. in area, located at 240 Ferland Street (at the corner of Jolliet Avenue) in Ottawa. The property is currently has 5-unit townhouse that will be demolished. A three-storey (plus a basement) 10-unit walkup apartment building is proposed.

This report forms part of the stormwater management design for the proposed development. Refer to drawing C-1 to C-7 also prepared by D. B. Gray Engineering Inc.

WATER SUPPLY FOR FIREFIGHTING:

There is an existing fire hydrant in the municipal road right-of-way located off the southeast corner of the property located about 16 m unobstructed distance to the nearest entrance and 65 m unobstructed distance to the furthest entrance. There are three other existing municipal fire hydrants located in the municipal road right-of-way in the vicinity of the subject property. One is located near the end of Ferland Street (a cul-de-sac) about 58 m unobstructed distance to the property. Another two are located in the Jolliet Avenue right-of-way; one is about 83 m to the west and the other is about 98 m to the east.

A fire flow of 200.0 L/s (12,000 L/min) is required, as calculated as per the Fire Underwriter Survey "Water Supply For Fire Protection".

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 95.0 m during the above flow rate in the municipal watermains at the subject location which calculates to be 367 kPa (53 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 fire flow of all contributing fire hydrants within 150 m of the building can used to supply the required fire flow. All existing municipal hydrants in the vicinity are Class AA. The two closest hydrants are within 75 m and can contribute 5,700 L/min (95 L/s) each; 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 four hydrants is 19,000 L/min (316.7 L/s), which is greater than the required fire flow.

WATER SERVICE:

There is an existing 150 mm municipal watermain in Ferland Street and a 200 mm municipal watermain in Jolliet Avenue.

The 10 apartment units are comprised of two one-bedroom and eight two-bedroom units. Based on the City of Ottawa Water Distribution Design Guidelines for residential properties (two one-bedroom apartment units / 1.4 person per unit; and eight two-bedroom apartment units / 2.1 persons per unit – 350 L/person/day) and Ministry of the Environment Design Guidelines for peaking factors the daily average flow is 0.1 L/s with a maximum daily and maximum hourly demand of 0.8 and 1.2 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. In summary, we required the boundary conditions for the subject area based on the following:

Average Daily Demand: 0.1 L/s.
Maximum Daily Demand: 0.8 L/s.
Maximum Hourly Demand: 1.2 L/s
Fire Flow Demand: 200.0 L/s
Maximum Daily + Fire Flow Demand: 200.8 L/s

Based on the boundary conditions received from the City, the minimum HGL (hydraulic grade line) is 109.0 m and the maximum is 118.2 m. With these HGLs the water pressure at the water meter is calculated to vary from 489 kPa to 579 kPa (71 to 84 psi). This is an acceptable range of water pressures for the proposed development. However, since it is calculated that the water pressure can be above 80 psi at times an on-site pressure check is recommended to determine if a pressure reducing valve (PRV) is required.

Based on the AWWA water flow demand curve, and a water pressure at the meter of 531 kPa (77 psi), the peak demand for the building is expected to be 2.2 L/s (131 L/min / 35 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 1.9 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 proposed 200 mm watermain in Jolliet Avenue.

SANITARY SERVICE:

There is an existing 250 mm municipal sanitary sewer in Ferland Street and a 900 mm municipal sanitary sewer in Jolliet Avenue.

Based on the City of Ottawa Sewer Design Guidelines for a residential property (two one-bedroom apartment units / 1.4 person per unit; and eight two-bedroom apartment units / 2.1 persons per unit; and 6 four-bedroom apartment units (used value for single family dwelling) / 3.4 persons per unit – 280 l/person/day – 3.2 peaking factor); and based on a 0.33 l/s/ha infiltration flow; the post development flow is calculated to be 0.23 L/s. This flow will be adequately handled by the proposed sanitary sewer service connections (150mm at 1% slope - 15.1 L/s capacity) since, at the design flow, it will only be about 0.4% full.

The proposed 150mm sanitary service connections will connect to the 900mm municipal sanitary sewer in Jolliet Avenue which, with a 0.08% slope, has a capacity of 534 L/s. The existing development of five townhouses generates 0.16 L/s. Therefore, the 0.07 L/s increase in sanitary flows contributing to the existing 900mm sanitary sewer is expected to have a negligible impact.

STORMWATER MANAGEMENT:

Water Quality:

An email has been sent to the Rideau Valley Conservation Authority (RVCA) asking them to comment on the stormwater management for the site. They have not yet responded. No permanent quality control measures are proposed.

An erosion and sediment control plan has been developed to be implemented during construction, (see drawing C-4 and notes 2.1 to 2.6 on drawing C-5). In summary: to filter out construction sediment a silt fence barrier will be installed adjacent around the perimeter of property; sediment capture filter sock inserts will be installed in all existing catch basins adjacent to the site and all new catch basins as they are installed; and any material deposited on a public road will 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 2-year storm event using a pre-development runoff coefficient or runoff coefficient of 0.50, whichever is less; and a calculated time of concentration (but not less than 10 minutes). It is calculated that the pre-development conditions reflect a 5-year runoff coefficient of 0.56 and a time of concentration of 2.6 minutes. Therefore, based on runoff coefficient of 0.50, a 10 minute time of concentration; and using the Rational Method; the maximum allowable release rate is 7.58 L/s for all storm events. 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 and on the parking area above a catch basin.

Drainage Area I
(Uncontrolled Flow Off Site – 75 sq.m.):
The runoff from front of the site will be allowed to flow uncontrolled off the site. The flow from is calculated at 10 minutes concentration.

	100-year	5-year
Maximum flow rate:	3.72 L/s	1.96 L/s

Drainage Area II (Roof – 255 sq.m.):
The two roof drains will be flow control types 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): Watts roof drain with a Watts Accutrol Weir RD-100-A1 or equal. The roof drain will be installed at the low point of the roof which will be 150mm lower than the perimeter of the roof. Two scuppers, 375mm wide and installed 150 mm above the roof drains (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). (The storm sewer serving the roof drains will connect to the upstream of the ICD, therefore, the release rate from the roof drains are added to Drainage Area III.)

	100-year	5-year
The maximum release rate:	3.32 L/s	2.47 L/s
The maximum ponding depth:	134 mm	100 mm
The maximum stored volume:	6.22 cu.m.	2.57 cu.m.

Drainage Area III (380 sq.m.):
An inlet control device (ICD) located at the outlet pipe of manhole MH-4 will control the release of stormwater from Drainage Area III. The ICD will restrict the flow and force the stormwater to back up onto the asphalt surface above the catch basin. The ICD shall be a Hydrovex "VHV Vertical Vortex Flow Regulator" and shall be sized by the manufacturer for a discharge rate of 3.86 L/s at 2.63 m head. It is calculated that an orifice area of 1,963 sq.mm. (50 mm diameter) and a discharge coefficient of 0.274 will restrict the outflow rate to 3.86 L/s at a head of 2.63 m. Based on this orifice the maximum outflow rate for the 1:5 year storm event is calculated to be 3.77 L/s at 252 m.

	100-year	5-year
Maximum release rate:	3.86 L/s	3.77 L/s
Maximum water elevation:	56.81 m	57.70 m
Maximum stored volume:	9.42 cu.m.	2.52 cu.m.

The Entire Site:

	100-year	5-year
Maximum permitted release rate:	7.58 L/s	7.58 L/s
Maximum release rate:	7.58 L/s	5.73 L/s
Maximum stored volume:	15.64 cu.m.	5.09 cu.m.

Therefore, the maximum post-development release rate for the 100-year storm event is calculated to be equal to the maximum allowable of 7.58 L/s and to achieve this release

rate the total maximum required capacity is 15.64 cu.m. For the 5-year event the maximum post-development release is calculated to be less than the maximum allowable at 5.73 L/s and to achieve this release rate the total maximum required capacity is 5.09 cu.m.

There is an existing 375 mm municipal storm sewer in Ferland Street and a 600 mm municipal storm sewer in Jolliet Avenue. The foundation drain will drain to a storm sewer connecting the Jolliet Avenue municipal storm sewer. The site storm sewer system is proposed to connect to the Ferland Street municipal storm sewer.

The unrestricted flowrate resulting from one in five-year storm event will produce a peak flow of 11.3 L/s which will be adequately by the proposed storm sewer system with the last pipe segment (250mm at 0.43% - 40.7 L/s capacity) being only at 28% of its capacity (with the restricted flows through the ICD the last pipe will only be at 9% of its capacity. The flows contributing to the 250 mm municipal storm sewer is expected to have a positive impact given the post-development flows from the site are being reduced by 50% (from 11.45 to 9.5.73 L/s) during the 5-year event.

CONCLUSIONS:

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

2. The aggregate flow from the four existing municipal fire hydrants within 150 m of the buildings is greater than the required fire flow.

3. The water pressure in the municipal watermain is adequate for the proposed development. However, since it is calculated that the water pressure can be above 80 psi at times an on-site pressure check is recommended to determine if a pressure reducing valve (PRV) is required.

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

5. The sanitary flow contributing to the existing municipal combined sewer is expected to have a negligible impact.

6. The RVCA has not responded with respect to any required water quality control measures.

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

8. 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 2-year storm event using a pre-development runoff coefficient or runoff coefficient of 0.50, whichever is less; and a calculated time of concentration (but not less than 10 minutes). The maximum allowable release rate is calculated to be 7.58 L/s for all storm events.

9. The maximum post-development release rate for the 100-year storm event is calculated to be equal to the maximum allowable. For the 5-year event the maximum post-development release is calculated to be less than the maximum allowable.

10. The unrestricted flowrate resulting from one in five-year storm event will produce a peak flow will be adequately by the proposed site storm sewer system.

11. The stormwater flows contributing to the 375 mm municipal storm sewer is expected to have a positive impact given the post-development flows from the site are being reduced by 50% during the 5-year event.

D.B. GRAY ENGINEERING INC.

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07-Oct-19
REVISED 31-Oct-19

Proposed 3-Storey (+Basement) 10-Unit Stacked Town Homes 240 Ferland Steet Ottawa, Ontario

Fire Flow Requirements

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
= 1.5 Wood Frame Construction

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

Proposed Building South	3rd Floor	237	sq.m.
	2nd Floor	237	sq.m.
	1st Floor	237	sq.m.
	TOTAL FIRE AREA:	711	sq.m.

F = 8,799 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
			Constuction	Length m	Storeys	Factor
18%	North	3.1 to 10m	W-F	14	3	42
17%	East	3.1 to 10m	W-F	10	3	30
8%	South	20.1 to 30m	W-F	20	2	40
8%	West	20.1 to 30m	W-F	15	3	45
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 Fire Hydrant	57.61	m ASL				
			Static Pressure at Fire Hydrant			
200 L/s FIRE FLOW:	95.0	m ASL	53	psi	367	kPa

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15-Oct-19

REVISED 23-Jul-20

Proposed 3-Storey (+Basement) 10-Unit Stacked Town Homes 240 Ferland Steet Ottawa, Ontario

Water Demand

	Number of Units	Persons Per Unit	Population
APARTMENTS:			
1 Bedroom:	2	1.4	3
2 Bedroom:	8	2.1	17
3 Bedroom:	0	3.1	0
Average Aptarment:	0	1.8	0
TOTAL:	10		20

DAILY AVERAGE

350 litres / person / day

4.8 l/min | 0.1 l/s | 1 USgpm

MAXIMUM DAILY DEMAND 9.5 (Peaking Factor for a population of 20: Table 3-3 MOE Design Guidelines for Drinking-Water Systems)

45.3 l/min | 0.8 l/s | 12 USgpm

MAXIMUM HOURLY DEMAND 14.3 (Peaking Factor for a population of 20: Table 3-3 MOE Design Guidelines for Drinking-Water Systems)

68.1 l/min | 1.1 l/s | 18 USgpm

Elevation of Water Meter: 59.1 m ASL
Floor Elevation: 58.2 m ASL

			Static Pressure at Water Meter		
MINIMUM HGL:	109.0	m ASL	71	psi	489 kPa
MAXIMUM HGL:	118.2	m ASL	84	psi	579 kPa

Gmail by Google

Douglas Gray <d.gray@dbgrayengineering.com>

FW: Boundary Condition Request - 240 Ferland St

1 message

Mottalib, Abdul <Abdul.Mottalib@ottawa.ca> Fri, Oct 18, 2019 at 1:34 PM
To: Douglas Gray <d.gray@dbgrayengineering.com>
Cc: "Mottalib, Abdul" <Abdul.Mottalib@ottawa.ca>

Hi Doug,

As requested, please see the email below.

--

Thanks,

Mohammad Abdul Mottalib, P. Eng.

Extension: 27798

From: ……..
Sent: October 18, 2019 9:36 AM
To: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>
Subject: RE: Boundary Condition Request - 240 Ferland St

The following are boundary conditions, HGL, for hydraulic analysis at 240 Ferland (zone 1E) assumed to be connected to the 152mm on Ferland and the 203mm on Jolliet (see attached PDF for locations).

Minimum HGL = 109.0m, same for all three connections

Maximum HGL = 118.2m, same for all three connection. The maximum pressure is estimated to be above 80 psi. A pressure check at completion of construction is recommended to determine if pressure control is required.

MaxDay + FireFlow (200 L/s) = 80.0m, Ferland connection

MaxDay + FireFlow (200 L/s) = 95.0m, both Jolliet connections

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.

From: Douglas Gray <d.gray@dbgrayengineering.com>
Sent: October 15, 2019 7:20 AM
To: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>
Subject: Boundary Condition Request - 240 Ferland St

Hi Abdul

We are working on a 10-unit stacked townhouse development at 240 Ferland St at the corner of Jolliet Ave.

Please provide the boundary conditions at this location. We have calculated the following expected demands:

Average daily demand: 0.1 L/s.

Maximum daily demand: 0.8 L/s.

Maximum hourly daily demand: 1.2 L/s

Fire Flow demand: 200.0 L/s

Fire Flow + Max Day: 200.8 L/s

Calculations are attached. Also attached is sketch showing the approximately location of the proposed water service connections.

Thanks, Doug

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240 Ferland Oct 2019.pdf
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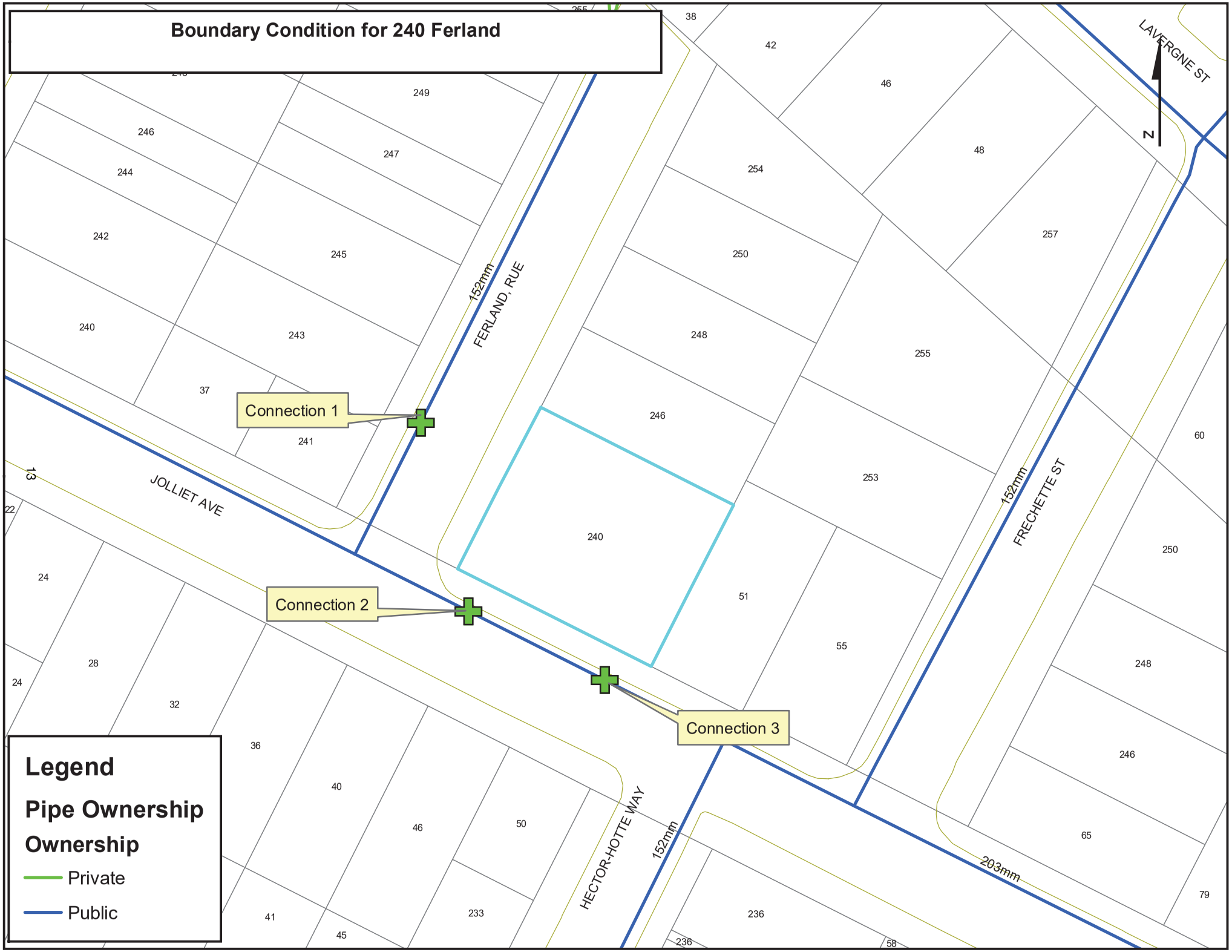
Boundary Condition for 240 Ferland
Connection 1
Connection 2
Connection 3
FERLAND, RUE
JOLLIET AVE
FRECHETTE ST
HECTOR-HOTTE WAY
LAVERGNE ST
152mm
203mm
N
Legend
Pipe Ownership
Ownership
Private
Public

Proposed 3-Storey (+Basement) 10-Unit Stacked Town Homes 240 Ferland Steet Ottawa, Ontario

Peak Water Demand

WATER FIXTURE VALUE
(Table 4-2 AWWA Manual M22)

	No.	F.V.	Total
Bathtub	10	8	80
Toilet - Tank	10	6	60
Toilet - Flush Valve	0	24	0
Lavatory	10	1.5	15.0
Bidet	0	2	0
Urinal - Wall Flush Valve	0	10	0
Shower	0	2.5	0.0
Kitchen Sink	10	1.8	18.0
Dishwasher	10	1.3	13.0
Clothes Washer	10	3	30
Commercial Sink	0	4	0
Janitor Sink	0	4	0
Commercial Dishwasher	0	4	0
Commercial Clothes Washer	0	4	0
Hose 1/2 in	0	5	0
Hose 3/4 in	0	12	0
			216.0

Peak Demand (Figure 4-2 or 4-3 AWWA M22)			30	USGPM		
Pressure @ Meter	531	kPa	77	psi		
Pressure Factor (Table 4-1 AWWA M22)			1.15			
Peak Demand			35	USGPM		
Irrigation - Hose 1/2 in	0		0	USGPM (includes pressure factor)		
TOTAL PEAK DEMAND	131	L/min	35	USGPM	2.2	L/s
		Nominal Size	1.5	in	38	mm
			6.3	ft/s	1.9	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

Project: 240 Ferland Street
Designed By: D.B.G.
04-Aug-20
Page: 1 of 1

Location		Section								Cumulative Residential		Section Non-Residential			Cumulative					Sewer Data n = 0.013								Comments
		Single Family	Semi/Town house	Duplex / Triplex	Apartment (average)	Apartment (1 Bed.)	Apartment (2 Bed.)	Apartment (3 Bed.)	Residential Area	Pop.	Peaking Factor	Area	Flow	Peaking Factor	Flow	Area	Sewage Flow	Infiltration Flow	Total Flow	Type of Pipe	Dia. Actual	Dia. Nom.	Slope	Length	Capacity	Velocity	Ratio	
		ppu = 3.4	ppu = 2.7	ppu = 2.3	ppu = 1.8	ppu = 1.4	ppu = 2.1	ppu = 3.1																				
FROM	TO	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	ha			ha	l/ha/day		l/s	ha	l/s	l/s	l/s		(mm)	(mm)	(%)	(m)	(l/s)	(m/s)	Q/Qfull	
EXISTING DEVELOPMENT - 5 TOWNHOUSE UNITS																												
PROP.	EXIST.		5						0.071	14	3.20					0.071	0.14	0.02	0.16	PVC	152.4	150	1.00	15.1	61.1	3.35	0.003	
BLDG	900 SAN																											
PROPOSED DEVELOPMENT - 10 UNIT WALKUP APARTMENT BUILDING																												
PROP.	EXIST.					2	8		0.071	20	3.20					0.071	0.20	0.02	0.23	PVC	152.4	150	1.00	15.1	61.1	3.35	0.004	
BLDG	900 SAN																											
																				EXISTING 900 SANITARY SEWER IN JOLIETTE AVENUE								
																					914.4	900	0.08		534.2	0.81		

D.B. Gray Engineering Inc.

Douglas Gray <d.gray@dbgrayengineering.com>

RVCA Stormwater Management Comments - 240 Ferland Street

1 message

Ryan Faith <r.faith@dbgrayengineering.com> Wed, Jun 10, 2020 at 2:12 PM
To: jamie.batchelor@rvca.ca
Cc: Douglas Gray <d.gray@dbgrayengineering.com>

Hi Jamie,

We are working on a proposed 10 unit block of stacked townhomes on 710 sq.m of land at 240 Ferland Street in Ottawa.

Please comment on the stormwater management for the site.

I have attached a site plan for your reference.

Thanks,

Ryan Faith

D.B. Gray Engineering Inc.

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

700 Long Point Circle 613-425-8044
Ottawa, Ontario r.faith@dbgrayengineering.com

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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)	-	-	3.72	-	-
AREA II (Roof) (Drains to Area III)	-	-	3.32	6.22	6.22
AREA III	-	-	3.86	9.42	9.42
TOTAL (Area I + III)	22.29	7.58	7.58	15.64	15.64

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)	-	-	1.96	-	-
AREA II (Roof) (Drains to Area III)	-	-	2.47	2.57	2.57
AREA III	-	-	3.77	2.52	2.52
TOTAL (Area I + III)	11.45	7.58	5.73	5.09	5.09

TWO-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)	-	-	1.44	-	-
AREA II (Roof) (Drains to Area III)	-	-	2.14	1.66	1.66
AREA III	-	-	3.76	1.26	1.26
TOTAL (Area I + III)	8.44	7.58	5.20	2.92	2.92

240 Ferland Street

Ottawa, Ontario

STORMWATER MANAGEMENT CALCULATIONS
Rational Method

100-Year Pre-Development Conditions

			C
Roof Area:	196	sq.m	1.00
Asphalt/Concrete Area:	166	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	348	sq.m	0.25
Total Catchment Area:	710	sq.m	0.63

Bransby William Formula (Used when C > 0.40)

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

Sheet Flow Distance (L):	38	m
Slope of Land (Sw):	1.5	%
Area (A):	0.071	ha
Time of Concentration (Sheet Flow):	2.6	min
Area (A):	710	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	179	mm/hr (100-year event)
Runoff Coeficient (C):	0.63	
100-Year Pre-Development Flow Rate (2.78AiC):	22.29	L/s

5-Year Pre-Development Conditions

			C
Roof Area:	196	sq.m	0.90
Asphalt/Concrete Area:	166	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	348	sq.m	0.20
Total Catchment Area:	710	sq.m	0.56

Bransby William Formula (Used when C > 0.40)

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

Sheet Flow Distance (L):	38	m
Slope of Land (Sw):	1.5	%
Area (A):	0.071	ha
Time of Concentration (Sheet Flow):	2.6	min
Area (A):	710	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	104	mm/hr (5-year event)
Runoff Coeficient (C):	0.56	
5-Year Pre-Development Flow Rate (2.78AiC):	11.45	L/s

2-Year Pre-Development Conditions

			C
Roof Area:	196	sq.m	0.90
Asphalt/Concrete Area:	166	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	348	sq.m	0.20
Total Catchment Area:	710	sq.m	0.56

Bransby William Formula (Used when C > 0.40)

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

Sheet Flow Distance (L):	38	m
Slope of Land (Sw):	1.5	%
Area (A):	0.071	ha
Time of Concentration (Sheet Flow):	2.6	min
Area (A):	710	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	77	mm/hr (2-year event)
Runoff Coeficient (C):	0.56	
2-Year Pre-Development Flow Rate (2.78AiC):	8.44	L/s

Maximum Allowable Release Rate

Area (A):	710	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	77	mm/hr (2-year event)
Runoff Coeficient (C):	0.50	
Maximum Allowable Release Rate (2.78AiC):	7.58	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:	75	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	0	sq.m	0.25
Total Catchment Area:	75	sq.m	1.00
Area (A):	75	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	179	mm/hr	
Runoff Coeficient (C):	1.00		
Flow Rate (2.78AiC):	3.72	L/s	

DRAINAGE AREA II (Roof)

(ONE HUNDRED-YEAR EVENT)

			C
Roof Area:	255	sq.m	1.00
Asphalt/Concrete Area:	0	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	0	sq.m	0.25
Total Catchment Area:	255	sq.m	1.00

No. of Roof Drains: 2
Slots per Wier: 1 0.0124 l/s/mm/slot (5 USgpm/in/slot)

Depth at Roof Drain: 134 mm

Maximum Release Rate: 3.32 L/s Pond Area: 139 sq.m

Achieved Volume: 6.22 cu.m

Maximum Volume Required: 6.22 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	17.21	3.32	13.88	4.17
10	179	12.66	3.32	9.34	5.60
15	143	10.13	3.32	6.81	6.13
20	120	8.50	3.32	5.18	6.22
25	104	7.36	3.32	4.04	6.06
30	92	6.51	3.32	3.19	5.74
35	83	5.85	3.32	2.53	5.32
40	75	5.33	3.32	2.01	4.81
45	69	4.89	3.32	1.57	4.25
50	64	4.53	3.32	1.21	3.64
55	60	4.23	3.32	0.91	2.99
60	56	3.96	3.32	0.64	2.31
65	53	3.73	3.32	0.41	1.60
70	50	3.53	3.32	0.21	0.87
75	47	3.35	3.32	0.03	0.13
80	45	3.19	3.19	0.00	0.00
85	43	3.05	3.05	0.00	0.00
90	41	2.91	2.91	0.00	0.00
95	39	2.80	2.80	0.00	0.00
100	38	2.69	2.69	0.00	0.00
105	36	2.59	2.59	0.00	0.00
110	35	2.50	2.50	0.00	0.00
115	34	2.41	2.41	0.00	0.00
120	33	2.33	2.33	0.00	0.00
125	32	2.26	2.26	0.00	0.00
130	31	2.19	2.19	0.00	0.00
135	30	2.13	2.13	0.00	0.00
140	29	2.07	2.07	0.00	0.00
145	28	2.01	2.01	0.00	0.00
150	28	1.96	1.96	0.00	0.00
180	24	1.69	1.69	0.00	0.00
210	21	1.50	1.50	0.00	0.00
240	19	1.35	1.35	0.00	0.00

DRAINAGE AREA III

(ONE HUNDRED-YEAR EVENT)

			C
Roof Area:	26	sq.m	1.00
Asphalt/Concrete Area:	114	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	240	sq.m	0.25
Total Catchment Area:	380	sq.m	0.53

Water Elevation: 56.81 m

Invert of Outlet Pipe - MH-4: 54.16 m

Centroid of ICD Orifice: 54.19 m
(ICD in Outlet Pipe of MH-4)

Head: 2.63 m

Orifice Diameter: 50 mm

Orifice Area: 1963 sq.mm

Coefficient of Discharge: 0.274

Maximum Release Rate: 3.86 L/s

Surface Storage Above Catch Basin

CB/MH	Top Area (sq.m)	Depth (m)	Volume	
CB/MH-3	72	0.21	9.42	cu.m

Achieved Volume: 9.42 cu.m

Maximum Volume Required: 9.42 cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	From Roof (L/s)	Total Inflow (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
5	243	13.49	3.32	16.82	3.86	12.96	3.89
10	179	9.93	3.32	13.25	3.86	9.39	5.64
15	143	7.94	3.32	11.27	3.86	7.41	6.67
20	120	6.67	3.32	9.99	3.86	6.13	7.36
25	104	5.77	3.32	9.10	3.86	5.24	7.86
30	92	5.11	3.32	8.43	3.86	4.57	8.23
35	83	4.59	3.32	7.91	3.86	4.06	8.52
40	75	4.18	3.32	7.50	3.86	3.64	8.74
45	69	3.84	3.32	7.16	3.86	3.30	8.92
50	64	3.56	3.32	6.88	3.86	3.02	9.06
55	60	3.32	3.32	6.64	3.86	2.78	9.18
60	56	3.11	3.32	6.43	3.86	2.57	9.26
65	53	2.93	3.32	6.25	3.86	2.39	9.33
70	50	2.77	3.32	6.09	3.86	2.23	9.38
75	47	2.63	3.32	5.95	3.86	2.09	9.42
80	45	2.50	3.19	5.69	3.86	1.83	8.81
85	43	2.39	3.05	5.43	3.86	1.58	8.04
90	41	2.29	2.91	5.20	3.86	1.34	7.26
95	39	2.19	2.80	4.99	3.86	1.13	6.45
100	38	2.11	2.69	4.79	3.86	0.94	5.63
105	36	2.03	2.59	4.62	3.86	0.76	4.79
110	35	1.96	2.50	4.45	3.86	0.60	3.94
115	34	1.89	2.41	4.30	3.86	0.45	3.07
120	33	1.83	2.33	4.16	3.86	0.30	2.19
125	32	1.77	2.26	4.03	3.86	0.17	1.30
130	31	1.72	2.19	3.91	3.86	0.05	0.41
135	30	1.67	2.13	3.79	3.79	0.00	0.00
140	29	1.62	2.07	3.69	3.69	0.00	0.00
145	28	1.58	2.01	3.59	3.59	0.00	0.00
150	28	1.54	1.96	3.49	3.49	0.00	0.00
180	24	1.33	1.69	3.02	3.02	0.00	0.00
210	21	1.18	1.50	2.67	2.67	0.00	0.00
240	19	1.06	1.35	2.40	2.40	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:	75	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	0	sq.m	0.20
Total Catchment Area:	75	sq.m	0.90
Area (A):	75	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	104	mm/hr	
Runoff Coeficient (C):	0.90		
Flow Rate (2.78AiC):	1.96	L/s	

DRAINAGE AREA II (Roof)

(FIVE-YEAR EVENT)

			C
Roof Area:	255	sq.m	0.90
Asphalt/Concrete Area:	0	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	0	sq.m	0.20
Total Catchment Area:	255	sq.m	0.90

No. of Roof Drains: 2
Slots per Wier: 1 0.0124 l/s/mm/slot (5 USgpm/in/slot)

Depth at Roof Drain: 100 mm

Maximum Release Rate: 2.47 L/s Pond Area: 77 sq.m

Achieved Volume: 2.57 cu.m

Maximum Volume Required: 2.57 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	9.01	2.47	6.53	1.96
10	104	6.65	2.47	4.17	2.50
15	84	5.33	2.47	2.86	2.57
20	70	4.48	2.47	2.01	2.41
25	61	3.89	2.47	1.41	2.12
30	54	3.44	2.47	0.97	1.74
35	49	3.10	2.47	0.62	1.30
40	44	2.82	2.47	0.34	0.83
45	41	2.59	2.47	0.12	0.32
50	38	2.40	2.40	0.00	0.00
55	35	2.24	2.24	0.00	0.00
60	33	2.10	2.10	0.00	0.00
65	31	1.98	1.98	0.00	0.00
70	29	1.87	1.87	0.00	0.00
75	28	1.78	1.78	0.00	0.00
80	27	1.69	1.69	0.00	0.00
85	25	1.62	1.62	0.00	0.00
90	24	1.55	1.55	0.00	0.00
95	23	1.49	1.49	0.00	0.00
100	22	1.43	1.43	0.00	0.00
105	22	1.38	1.38	0.00	0.00
110	21	1.33	1.33	0.00	0.00
115	20	1.28	1.28	0.00	0.00
120	19	1.24	1.24	0.00	0.00
125	19	1.20	1.20	0.00	0.00
130	18	1.17	1.17	0.00	0.00
135	18	1.13	1.13	0.00	0.00
140	17	1.10	1.10	0.00	0.00
145	17	1.07	1.07	0.00	0.00
150	16	1.04	1.04	0.00	0.00
180	14	0.90	0.90	0.00	0.00
210	13	0.80	0.80	0.00	0.00
240	11	0.72	0.72	0.00	0.00

DRAINAGE AREA III

(FIVE-YEAR EVENT)

			C
Roof Area:	26	sq.m	0.90
Asphalt/Concrete Area:	114	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	240	sq.m	0.20
Total Catchment Area:	380	sq.m	0.46

Water Elevation: 56.70 m

Invert of Outlet Pipe - MH-4: 54.16 m

Centroid of ICD Orifice: 54.19 m
(ICD in Outlet Pipe of MH-4)

Head: 2.52 m

Orifice Diameter: 50 mm

Orifice Area: 1963 sq.mm

Coefficient of Discharge: 0.274

Maximum Release Rate: 3.77 L/s

Surface Storage Above Catch Basin

CB/MH	Top Area (sq.m)	Depth (m)	Volume	
CB/MH-3	54	0.10	2.52	cu.m
		Achieved Volume:	2.52	cu.m
		Maximum Volume Required:	2.52	cu.m

Time min	i mm/hr	2.78AiC L/s	From Roof L/s	Total Inflow L/s	Release Rate L/s	Stored Rate L/s	Stored Volume cu.m
5	141	6.83	2.47	9.30	3.77	5.53	1.66
10	104	5.04	2.47	7.51	3.77	3.74	2.24
15	84	4.04	2.47	6.52	3.77	2.74	2.47
20	70	3.40	2.47	5.87	3.77	2.10	2.52
25	61	2.95	2.47	5.42	3.77	1.65	2.47
30	54	2.61	2.47	5.08	3.77	1.31	2.36
35	49	2.35	2.47	4.82	3.77	1.05	2.20
40	44	2.14	2.47	4.61	3.77	0.84	2.01
45	41	1.97	2.47	4.44	3.77	0.67	1.80
50	38	1.82	2.40	4.22	3.77	0.45	1.35
55	35	1.70	2.24	3.94	3.77	0.17	0.55
60	33	1.59	2.10	3.70	3.70	0.00	0.00
65	31	1.50	1.98	3.48	3.48	0.00	0.00
70	29	1.42	1.87	3.29	3.29	0.00	0.00
75	28	1.35	1.78	3.13	3.13	0.00	0.00
80	27	1.28	1.69	2.98	2.98	0.00	0.00
85	25	1.23	1.62	2.85	2.85	0.00	0.00
90	24	1.17	1.55	2.72	2.72	0.00	0.00
95	23	1.13	1.49	2.61	2.61	0.00	0.00
100	22	1.08	1.43	2.51	2.51	0.00	0.00
105	22	1.04	1.38	2.42	2.42	0.00	0.00
110	21	1.01	1.33	2.34	2.34	0.00	0.00
115	20	0.97	1.28	2.26	2.26	0.00	0.00
120	19	0.94	1.24	2.18	2.18	0.00	0.00
125	19	0.91	1.20	2.12	2.12	0.00	0.00
130	18	0.88	1.17	2.05	2.05	0.00	0.00
135	18	0.86	1.13	1.99	1.99	0.00	0.00
140	17	0.84	1.10	1.94	1.94	0.00	0.00
145	17	0.81	1.07	1.88	1.88	0.00	0.00
150	16	0.79	1.04	1.84	1.84	0.00	0.00
180	14	0.69	0.90	1.59	1.59	0.00	0.00
210	13	0.61	0.80	1.41	1.41	0.00	0.00
240	11	0.55	0.72	1.27	1.27	0.00	0.00

TWO-YEAR EVENT

DRAINAGE AREA I (Uncontrolled Flow Off Site)

(TWO-YEAR EVENT)

			C
Roof Area:	0	sq.m	0.90
Asphalt/Concrete Area:	75	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	0	sq.m	0.20
Total Catchment Area:	75	sq.m	0.90

Area (A):	75	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	77	mm/hr
Runoff Coeficient (C):	0.90	
Flow Rate (2.78AiC):	1.44	L/s

DRAINAGE AREA II (Roof)

(TWO-YEAR EVENT)

			C
Roof Area:	255	sq.m	0.90
Asphalt/Concrete Area:	0	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	0	sq.m	0.20
Total Catchment Area:	255	sq.m	0.90

No. of Roof Drains:	2	
Slots per Wier:	1	0.0124 l/s/mm/slot (5 USgpm/in/slot)
Depth at Roof Drain:	86	mm
Maximum Release Rate:	2.14	L/s

Pond Area:	58	sq.m
Achieved Volume:	1.66	cu.m
Maximum Volume Required:	1.66	cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
5	104	6.61	2.14	4.47	1.34
10	77	4.90	2.14	2.76	1.66
15	62	3.94	2.14	1.80	1.62
20	52	3.32	2.14	1.18	1.42
25	45	2.88	2.14	0.74	1.12
30	40	2.55	2.14	0.42	0.75
35	36	2.30	2.14	0.16	0.34
40	33	2.10	2.10	0.00	0.00
45	30	1.93	1.93	0.00	0.00
50	28	1.79	1.79	0.00	0.00
55	26	1.67	1.67	0.00	0.00
60	25	1.57	1.57	0.00	0.00
65	23	1.48	1.48	0.00	0.00
70	22	1.40	1.40	0.00	0.00
75	21	1.33	1.33	0.00	0.00
80	20	1.27	1.27	0.00	0.00
85	19	1.21	1.21	0.00	0.00
90	18	1.16	1.16	0.00	0.00
95	17	1.11	1.11	0.00	0.00
100	17	1.07	1.07	0.00	0.00
105	16	1.03	1.03	0.00	0.00
110	16	0.99	0.99	0.00	0.00
115	15	0.96	0.96	0.00	0.00
120	15	0.93	0.93	0.00	0.00
125	14	0.90	0.90	0.00	0.00
130	14	0.87	0.87	0.00	0.00
135	13	0.85	0.85	0.00	0.00
140	13	0.82	0.82	0.00	0.00
145	13	0.80	0.80	0.00	0.00
150	12	0.78	0.78	0.00	0.00
180	11	0.68	0.68	0.00	0.00
210	9	0.60	0.60	0.00	0.00
240	8	0.54	0.54	0.00	0.00

DRAINAGE AREA III

(TWO-YEAR EVENT)

			C
Roof Area:	26	sq.m	0.90
Asphalt/Concrete Area:	114	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	240	sq.m	0.20
Total Catchment Area:	380	sq.m	0.46

Water Elevation:	56.68	m
Invert of Outlet Pipe - MH-4:	54.16	m
Centroid of ICD Orifice: (ICD in Outlet Pipe of MH-4)	54.19	m
Head:	2.49	m
Orifice Diameter:	50	mm
Orifice Area:	1963	sq.mm
Coefficient of Discharge:	0.27	
Maximum Release Rate:	3.76	L/s

Surface Storage Above Catch Basin

CB/MH	Top Area (sq.m)	Depth (m)	Volume	
CB/MH-3	50	0.08	1.26	cu.m
		Achieved Volume:	1.26	cu.m
		Maximum Volume Required:	1.26	cu.m

Time	i	2.78AiC	From Roof	Total Inflow	Release Rate	Stored Rate	Stored Volume
min	mm/hr	L/s	L/s	L/s	L/s	L/s	cu.m
5	104	5.01	2.14	7.15	3.76	3.39	1.02
10	77	3.72	2.14	5.85	3.76	2.10	1.26
15	62	2.99	2.14	5.13	3.76	1.37	1.23
20	52	2.52	2.14	4.65	3.76	0.90	1.08
25	45	2.18	2.14	4.32	3.76	0.57	0.85
30	40	1.94	2.14	4.07	3.76	0.32	0.57
35	36	1.74	2.14	3.88	3.76	0.13	0.26
40	33	1.59	2.10	3.69	3.69	0.00	0.00
45	30	1.46	1.93	3.39	3.39	0.00	0.00
50	28	1.36	1.79	3.15	3.15	0.00	0.00
55	26	1.27	1.67	2.94	2.94	0.00	0.00
60	25	1.19	1.57	2.75	2.75	0.00	0.00
65	23	1.12	1.48	2.60	2.60	0.00	0.00
70	22	1.06	1.40	2.46	2.46	0.00	0.00
75	21	1.01	1.33	2.33	2.33	0.00	0.00
80	20	0.96	1.27	2.22	2.22	0.00	0.00
85	19	0.92	1.21	2.13	2.13	0.00	0.00
90	18	0.88	1.16	2.04	2.04	0.00	0.00
95	17	0.84	1.11	1.95	1.95	0.00	0.00
100	17	0.81	1.07	1.88	1.88	0.00	0.00
105	16	0.78	1.03	1.81	1.81	0.00	0.00
110	16	0.75	0.99	1.75	1.75	0.00	0.00
115	15	0.73	0.96	1.69	1.69	0.00	0.00
120	15	0.70	0.93	1.63	1.63	0.00	0.00
125	14	0.68	0.90	1.58	1.58	0.00	0.00
130	14	0.66	0.87	1.54	1.54	0.00	0.00
135	13	0.64	0.85	1.49	1.49	0.00	0.00
140	13	0.63	0.82	1.45	1.45	0.00	0.00
145	13	0.61	0.80	1.41	1.41	0.00	0.00
150	12	0.59	0.78	1.37	1.37	0.00	0.00
180	11	0.51	0.68	1.19	1.19	0.00	0.00
210	9	0.46	0.60	1.06	1.06	0.00	0.00
240	8	0.41	0.54	0.95	0.95	0.00	0.00

D.B. GRAY ENGINEERING INC.

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

700 Long Point Circle
Ottawa, Ontario K1T 4E9

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STORM SEWER COMPUTATION FORM

RATIONAL METHOD Q = 2.78 A I R FIVE YEAR EVENT

n = 0.013

Project: 240 Ferland Street

Designed By: DBG

Date: June 10, 2020

LOCATION			AREA (ha)				Individual 2.78 A R	Accum. 2.78 A R	Time of Conc. (min)	Rainfall Intensity i (mm/hr)	Peak Flow Q (l/s)	SEWER DATA									COMMENTS
			Hard	Gravel	Landscape	Roof						Type of Pipe	Dia. Actual (mm)	Dia. Nominal (mm)	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Time of Flow (min)	Ratio Q/Qfull	
STREET	FROM	TO	R = 0.90	R = 0.70	R = 0.20	R = 0.90															
	CB-1	MH-2	0.0011		0.0082	0.0016	0.011	0.011	10.00	104.2	1.2	PVC	254.0	250	0.43	16.3	40.7	0.80	0.34	0.03	
	MH-2	CB/MH-3			0.0020		0.001	0.012	10.34	102.4	1.3	PVC	254.0	250	0.43	8.6	40.7	0.80	0.18	0.03	
	CB/MH-3	MH-4	0.0119		0.0044	0.0255	0.096	0.108	10.52	101.5	11.0	PVC	254.0	250	0.43	19.8	40.7	0.80	0.41	0.27	
	MH-4	EXIST.			0.0088		0.005	0.113	10.93	99.5	11.3	PVC	254.0	250	0.43	8.8	40.7	0.80	0.18	0.28	
											3.77	PVC	254.0	250	0.43	8.8	40.7	0.80	0.18	0.09	RESTRCITED FLOW
		375 ST																			
													EXISTING 375 ST IN FERLAND STREET								
													381.0	375	0.61		142.9	1.25			

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-7

Plan showing the site and location of all existing services: see drawings C-1 to C-7

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-7

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-7

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-5

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-3

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-7 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-7 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 2.6 on drawing C-4

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 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