

Estimated Peak Stormwater Flow Rate
City of Ottawa Sewer Design Guidelines, 2012



Existing Drainage Charateristics From Internal Site

Area	5.68 ha	
C	0.50	Rational Method runoff coefficient
L	107 m	
Up Elev	109.5 m	
Dn Elev	76.59 m	
Slope	30.8 %	
Tc (Actual)	6.5 min	* Tc must be greater than or equal to 10 minutes
Tc	10.0 min	

1) Time of Concentration per Federal Aviation Administration

$$t_c = \frac{1.8(1.1 - C)L^{0.5}}{S^{0.333}}$$

tc, in minutes
C, rational method coefficient, (-)
L, length in ft
S, average watershed slope in %

Estimated Peak Flow

	2-year	5-year	100-year
i	76.8	104.2	178.6 mm/hr
Q	605.9	822.0	1760.8 L/s

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

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Target Flow Rate

Area 5.68 ha

5-year
i 104.2 mm/hr
Q (Total) 822.0 L/s

Estimated Post Development Peak Flow from Unattenuated Areas

Total Area 0.57 ha
C 0.20 Rational Method runoff coefficient

t _c (min)	5-year					100-year				
	i (mm/hr)	Q _{actual} (L/s)	Q _{release} (L/s)	Q _{stored} (L/s)	V _{stored} (m ³)	i (mm/hr)	Q _{actual} [*] (L/s)	Q _{release} (L/s)	Q _{stored} (L/s)	V _{stored} (m ³)
10.0	104.2	32.9	32.9	0.0	0.0	178.6	70.4	70.4	0.0	0.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

Estimated Post Development Peak Flow from Attenuated Areas

Total Area 5.11 ha
C 0.85 Rational Method runoff coefficient

t _c (min)	5-year					100-year				
	i (mm/hr)	Q _{actual} (L/s)	Q _{release} (L/s)	Q _{stored} (L/s)	V _{stored} (m ³)	i (mm/hr)	Q _{actual} (L/s)	Q _{release} (L/s)	Q _{stored} (L/s)	V _{stored} (m ³)
10	104.2	1257.6	372.8	884.9	530.9	178.6	2535.5	751.5	1784.0	1070.4
15	83.6	1008.5	373.5	635.0	571.5	142.9	2029.1	751.5	1277.6	1149.8
20	70.3	847.9	374.1	473.8	568.6	120.0	1703.3	751.5	951.8	1142.1
25	60.9	735.0	374.6	360.4	540.6	103.8	1474.6	751.5	723.1	1084.6
30	53.9	650.9	375.0	275.9	496.7	91.9	1304.5	751.5	553.0	995.4
35	48.5	585.6	375.3	210.3	441.6	82.6	1172.6	751.5	421.1	884.3
40	44.2	533.3	375.6	157.7	378.5	75.1	1067.1	751.5	315.5	757.3
45	40.6	490.4	375.9	114.5	309.2	69.1	980.5	751.5	229.0	618.2
50	37.7	454.5	376.1	78.4	235.1	64.0	908.1	751.5	156.6	469.8
55	35.1	423.9	376.3	47.6	157.2	59.6	846.7	751.5	95.1	313.9
60	32.9	397.6	376.5	21.1	76.1	55.9	793.7	751.5	42.2	151.8
65	31.0	374.7	376.7	0.0	0.0	52.6	747.6	751.5	0.0	0.0
70	29.4	354.5	376.8	0.0	0.0	49.8	707.0	751.5	0.0	0.0
75	27.9	336.6	377.0	0.0	0.0	47.3	671.0	751.5	0.0	0.0
80	26.6	320.6	377.1	0.0	0.0	45.0	638.9	751.5	0.0	0.0
85	25.4	306.2	377.3	0.0	0.0	43.0	609.9	751.5	0.0	0.0
90	24.3	293.2	377.4	0.0	0.0	41.1	583.8	751.5	0.0	0.0
95	23.3	281.3	377.5	0.0	0.0	39.4	560.0	751.5	0.0	0.0
100	22.4	270.5	377.6	0.0	0.0	37.9	538.2	751.5	0.0	0.0
105	21.6	260.5	377.8	0.0	0.0	36.5	518.3	751.5	0.0	0.0
110	20.8	251.3	377.9	0.0	0.0	35.2	499.9	751.5	0.0	0.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

5-year Q_{attenuated}
5-year Max. Storage Required

373.54 L/s
571.5 m³

100-year Q_{attenuated}
100-year Max. Storage Required

751.54 L/s
1149.8 m³

Summary of Release Rates and Storage Volumes

Control Area	5-Year Release Rate (L/s)	5-Year Storage Storage (m ³)	100-Year Release Rate Release Rate (L/s)	100-Year Storage Storage (m ³)
Unattenuated Areas	32.9	0.0	70.4	0.0
Attenuated Areas	373.5	571.5	751.5	1149.8
Total	406.4	571.5	822.0	1149.8

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Target Flow Rate

Area 5.68 ha

5-year

i 104.2 mm/hr

Q (Total) 822.0 L/s

Estimated Post Development Peak Flow from Unattenuated Areas

Total Area 0.57 ha

C 0.20 Rational Method runoff coefficient

5-year						100-year				
t _c (min)	i (mm/hr)	Q _{actual} (L/s)	Q _{release} (L/s)	Q _{stored} (L/s)	V _{stored} (m ³)	i (mm/hr)	Q _{actual} [*] (L/s)	Q _{release} (L/s)	Q _{stored} (L/s)	V _{stored} (m ³)
10.0	104.2	32.9	32.9	0.0	0.0	178.6	70.4	70.4	0.0	0.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

Estimated Post Development Peak Flow from Attenuated Areas

5-year

Q (Attenuated) 375.8 L/s

Total Area 5.11 ha

C 0.85 Rational Method runoff coefficient

5-year						100-year				
t _c (min)	i (mm/hr)	Q _{actual} (L/s)	Q _{release} (L/s)	Q _{stored} (L/s)	V _{stored} (m ³)	i (mm/hr)	Q _{actual} (L/s)	Q _{release} (L/s)	Q _{stored} (L/s)	V _{stored} (m ³)
10	104.2	1257.6	186.4	1071.2	642.7	178.6	2535.5	375.8	2159.8	1295.9
15	83.6	1008.5	186.8	821.8	739.6	142.9	2029.1	375.8	1653.3	1488.0
20	70.3	847.9	187.1	660.9	793.0	120.0	1703.3	375.8	1327.5	1593.0
25	60.9	735.0	187.3	547.7	821.6	103.8	1474.6	375.8	1098.9	1648.3
30	53.9	650.9	187.5	463.4	834.1	91.9	1304.5	375.8	928.8	1671.8
35	48.5	585.6	187.7	397.9	835.7	82.6	1172.6	375.8	796.8	1673.4
40	44.2	533.3	187.8	345.5	829.2	75.1	1067.1	375.8	691.3	1659.1
45	40.6	490.4	187.9	302.5	816.6	69.1	980.5	375.8	604.7	1632.8
50	37.7	454.5	188.0	266.4	799.3	64.0	908.1	375.8	532.4	1597.1
55	35.1	423.9	188.2	235.8	778.1	59.6	846.7	375.8	470.9	1553.9
60	32.9	397.6	188.3	209.4	753.8	55.9	793.7	375.8	417.9	1504.6
65	31.0	374.7	188.3	186.4	726.8	52.6	747.6	375.8	371.8	1450.1
70	29.4	354.5	188.4	166.1	697.6	49.8	707.0	375.8	331.2	1391.2
75	27.9	336.6	188.5	148.1	666.5	47.3	671.0	375.8	295.3	1328.7
80	26.6	320.6	188.6	132.0	633.8	45.0	638.9	375.8	263.1	1262.9
85	25.4	306.2	188.6	117.6	599.6	43.0	609.9	375.8	234.2	1194.3
90	24.3	293.2	188.7	104.5	564.1	41.1	583.8	375.8	208.0	1123.2
95	23.3	281.3	188.8	92.5	527.4	39.4	560.0	375.8	184.2	1050.0
100	22.4	270.5	188.8	81.6	489.8	37.9	538.2	375.8	162.5	974.7
105	21.6	260.5	188.9	71.6	451.2	36.5	518.3	375.8	142.5	897.7
110	20.8	251.3	188.9	62.4	411.8	35.2	499.9	375.8	124.1	819.1

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

5-year Q_{attenuated}
5-year Max. Storage Required

187.66 L/s
835.7 m³

100-year Q_{attenuated}
100-year Max. Storage Required

375.77 L/s
1673.4 m³

Summary of Release Rates and Storage Volumes

Control Area	5-Year Release Rate (L/s)	5-Year Storage Storage (m ³)	100-Year Release Rate Release Rate (L/s)	100-Year Storage Storage (m ³)
Unattenuated Areas	32.9	0.0	70.4	0.0
Attenuated Areas	187.7	835.7	375.8	1673.4
Total	220.5	835.7	446.2	1673.4