



# Stormwater Management and Servicing Report

*Proposed Residential Development  
City of Windsor PS-080/2020*

*817 Elinor Street, 0 Elinor Street, 0 Wyandotte Street East  
Southwest Corner of Elinor Street and Wyandotte Street East  
Windsor, Ontario*

*Our Project No. 21-a161*

December 17, 2021

Catherine Girgis, P.Eng.  
Project Engineer

SUBMITTED TO:  
The Corporation of the City of Windsor

The principal objective of this report is to provide the proposed site servicing for a new residential development to be located at 817 Elinor Street. This shall include the stormwater storage requirement, in accordance with the storm water management guidelines.

### **Available Infrastructure**

Based on the City of Windsor Sewer Atlas and the topographic survey, the current property is serviced by the following:

- 1800 mm diameter reinforced concrete pipe storm sewer on Wyandotte Street East
- 675 mm diameter reinforced concrete pipe storm sewer on Elinor Street
- 350 mm diameter asbestos cement pipe sanitary sewer on Elinor Street
- Existing watermain
- Existing private drain connections to the property shall be determined prior to construction

### **Current Conditions**

The site has been vacant for a minimum of 15 years and is covered in short prairie grass. The property covers an area of 2,724 square metres (29,321 square feet / 0.67 acres) with a runoff coefficient of 0.20.

Based on our analysis (attached) and applying an overland routing of 78 m at a 0.45% slope and using a Manning's "n" of 0.15, it was found that the time of concentration would be approximately 41 minutes, which translates to a release rate of 0.0072 cubic metres per second.

The existence of private drain connections to the site are not known. During construction, if the contractor becomes aware of an existing connection, the service will be videoed, reviewed by the City of Windsor, and re-used if feasible. City of Windsor service abandonment standards shall be followed for any redundant services.

## **STORM**

### **Proposed Development**

The proposed project includes the construction of 3 – 6-unit residential buildings and a curbed parking lot. In the developed condition, the surface condition breakdown will be as follows:

Building Area	706 square metres
Paved/Hardscape Area	1,343 square metres
Landscaped Area	675 square metres

The introduction of the new on-site storm network would change the overland flow distance, in addition to accounting for the flow on paved infrastructure. The expected time of concentration for both these values results is approximately 2 minutes. Based on the attached calculations, the anticipated runoff for the evaluated storm events would be:

5-year Event	0.0072 cubic metres per second
100-year Event	0.0120 cubic metres per second

Based on the calculated values, the pre-development run-off of 0.0072 cubic metres per second will govern; and will be the basis for determining the storage requirement.

### **Runoff Control**

Based on the establishing of the 5-year and 100-year event flood storage levels and an anticipated elevation of the outlet, it was found that an equivalent of a 50 mm diameter opening is required. Assuming a minimum orifice size of 4" (100 mm) (City of Windsor standard), a Tempest ® Inlet Control Devices will be introduced to control the outflow to a maximum release rate of 7.2 l/s.

### **Storage Requirements**

Based on the requirements already noted in this report, it was found that the site would require a minimum storage capacity of 54 cubic metres for the 1:5-year storm and 127 cubic metres for the 1:100-year storm.

The storage for the 5-year storm shall be accommodated in an ADS Stormtech stormwater chamber system, as well as underground in pipes, manhole and catch basin. The high-water level shall be no greater than 0.30 m below the parking lot catch basin elevation. For the 1:100-year storm event, the high-water level will be 176 m; with minimum underground storage capacity of 48 cubic metres.

### **SANITARY**

The site shall be serviced with a single private drain connection, complete with sampling manhole located on the property line.

### **Closing**

Should you have any questions or comments regarding this report, please feel free to contact our office.





# HADDAD, MORGAN AND ASSOCIATES LTD.

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## Stormwater Management Calculations

The following storm calculations have been provided for the proposed development in accordance with the Windsor/Essex Regional Stormwater Management Standards Manual.

**Project :** Proposed Residential Development

**Project No.** 21-a161

**Location:** Elinor Street and Wyandotte Street East, Windsor, Ontari

**Date:** December 16, 2021

### Pre- Development Condition

		C value (5 yr)	AC value
Total Area	2,724 sq.m.		
Building Area	- sq.m.	0.95	0.00
Pavement Area	- sq.m.	0.90	0.00
Gravel Area	- sq.m.	0.70	0.00
Landscape	2,724 sq.m.	0.20	544.80

**C pre-development**

**0.20**

**\*C Undeveloped**

**0.20**

\* Pre-development C value selected based on historical development standards

### Developed Condition

		C value	AC value
Total Area	2,724 sq.m.		
Building Area	706 sq.m.	0.95	670.70
Pavement Area	1,343 sq.m.	0.95	1,275.85
Gravel Area	- sq.m.	0.70	-
Landscape	675 sq.m.	0.20	135.00

**C developed 100 yr (see below)**

**0.90**

**C developed 5 yr**

**0.74**

### Sheet Flow Analysis

Runoff Distance (overland)	78	m
Surface Type	Grass - Short Praire	
Manning's n	0.15	
Slope	0.45%	
User input add. flow time	0	minutes
24 Hour rainfall event SCS Type II*	68.0	minutes
Sheet flow Overtop and Meadows	41.13	minutes
+ shallow time	0.00	minutes
<b>Total time</b>	<b>41.13</b>	<b>minutes</b>

Runoff Distance (overland)	12.5	
Surface Type	Smooth Concrete/Asphalt	
Manning's n	0.013	
Slope	1.2%	
User input add. flow time	0	
24 Hour rainfall event SCS Type II*	68.0	
actual time per storm network design	0.91	minutes
+ pipe flow time	1.14	minutes
<b>Total time</b>	<b>2.05</b>	<b>minutes</b>

C 100 Year Calculation

Impervious %	75%		Hydraulic Soil Group	D
Impervious adjust	0	sq.m	Storage Depth (mm)	96.82
			C 100 year (eq. 3.3.2.2)	0.90
Zero release Storage Volume	263.7	CM		

Design Storage I values (a/(T+b)<sup>c</sup>)

2 year	35.91	mm/hr	140.95	mm/hr
5 year	47.51	mm/hr	170.79	mm/hr
100 year	78.93	mm/hr	260.16	mm/hr

Rational Method Calculation

2 year Discharge rate	5.44	L/s	78.94	L/s
5 year Discharge rate	7.20	L/s	95.65	L/s
100 Year Discharge rate	11.95	L/s	176.62	L/s

Restricted Flow Rate

Orifice/Restrictor Calculation

Center of orifice	174.27	m	Cd	0.62	0.62 = sharp Orifice
Surface elevation	175.40	m			0.80 = tube
Calculated Orifice Size (5 year)	56.33	mm	Elevation difference	1.105	m
Orifice Diameter	50	mm			
Discharge Rate	5.67	L/s	Control Rate Required	7.20	L/s
					O.K.

An IPEX flow control device shall be installed to control the outflow to the restricted rate.

100 year release:

Free surface Elevation	176.00	m	Elevation difference	1.70	m	0.60
Discharge Rate	7.03	L/s				O.K.

**5 year storage Calculation**

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td min.	Intensity mm/hr	Flow Rate L/s	Total Vol. L	Release L	Storage L
5	139.57	78.16	23,449	1,005	22,444
10	107.72	60.32	36,193	2,705	33,488
15	88.40	49.50	44,554	4,406	40,148
20	75.35	42.19	50,632	6,106	44,526
25	65.89	36.90	55,345	7,807	47,538
30	58.69	32.87	59,163	9,507	49,656
35	53.02	29.69	62,356	11,208	51,149
40	48.43	27.12	65,093	12,908	52,185
45	44.63	24.99	67,481	14,609	52,873
50	41.43	23.20	69,598	16,309	53,289
55	38.69	21.67	71,497	18,010	53,488
60	36.32	20.34	73,218	19,710	53,508
65	34.24	19.18	74,791	21,411	53,381
70	32.41	18.15	76,239	23,111	53,128
75	30.79	17.24	77,580	24,812	52,769
80	29.33	16.42	78,829	26,512	52,317
85	28.01	15.69	79,998	28,212	51,786
90	26.82	15.02	81,097	29,913	51,184
91	26.59	14.89	81,309	30,253	51,056

Developed Time of Concentration	2.05
Applied Runoff Coefficient	0.74

<b>Storage Requirement</b>	<b>53,508 L</b>
	<b>53.51 c.m.</b>

Drainage Structures			
underground			
			CM
	<b>Total</b>	<b>0.00</b>	<b>c.m.</b>
<b>MH</b>	1	1.41	
<b>CB</b>	2	0.86	
	<b>Total</b>	<b>2.28</b>	<b>c.m.</b>
<b>Piping</b>		0.93	
	<b>Total</b>	<b>0.93</b>	<b>c.m.</b>

<b>Storage Provided</b>	<b>3.21 c.m.</b>
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Volume Required in Chambers	50.30
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\*\* release rate is based on time interval less time of concentration (no release considered prior to Tc)

**100 year storage Calculation**

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td min.	Intensity mm/hr	Flow Rate L/s	Total Vol. L	Release L	Storage L
5	218.23	148.16	44,447	1,247	43,200
10	172.68	117.23	70,338	3,357	66,981
15	143.67	97.54	87,785	5,467	82,317
20	123.48	83.83	100,598	7,578	93,020
25	108.56	73.70	110,556	9,688	100,868
30	97.06	65.90	118,614	11,798	106,815
35	87.91	59.68	125,330	13,909	111,421
40	80.44	54.61	131,058	16,019	115,038
45	74.21	50.38	136,033	18,129	117,903
50	68.94	46.81	140,417	20,240	120,178
55	64.42	43.74	144,330	22,350	121,979
60	60.50	41.07	147,856	24,460	123,395
65	57.05	38.73	151,061	26,571	124,490
70	54.01	36.67	153,997	28,681	125,316
75	51.29	34.82	156,703	30,791	125,912
80	48.86	33.17	159,212	32,902	126,310
85	46.66	31.68	161,549	35,012	126,537
90	44.66	30.32	163,735	37,122	126,613
95	42.84	29.09	165788.88	39,233	126,556
100	41.18	27.95	167724.71	41,343	126,382
105	39.64	26.91	169555.2	43,453	126,102
110	38.23	25.95	171291.03	45,564	125,727
115	36.92	25.06	172941.39	47,674	125,267
120	35.70	24.24	174514.21	49,784	124,730

Developed Time of Concentration	2.05
Applied Runoff Coefficient	0.90

<b>Storage Requirement</b>	<b>126,613 L</b>
	<b>126.61 c.m.</b>

Surface Storage			
		75.89	c.m.
	<b>Total</b>	<b>75.89</b>	<b>c.m.</b>
<b>MH</b>	1	1.41	
<b>CB</b>	2	0.86	
	<b>Total</b>	<b>2.28</b>	<b>c.m.</b>
<b>Piping</b>		0.93	
	<b>Total</b>	<b>0.93</b>	<b>c.m.</b>

<b>Surface Storage Provided</b>	<b>75.89</b>	<b>c.m.</b>
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<b>Storage Provided</b>	<b>79.10</b>	<b>c.m.</b>
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<b>Surface + MH/CB + Pipes</b>		
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<b>Volume Required in Chambers</b>	<b>47.52</b>
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