

**RESIDENTIAL DEVELOPMENT  
1040 SOMERSET STREET WEST  
OTTAWA, ONTARIO**

**STORMWATER MANAGEMENT REPORT**

**Prepared by:**

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**File No.: 112191  
Report Reference No.: R-2013-004  
April 02, 2013**

April 02, 2013

City of Ottawa  
Planning and Growth Management Department  
Development Review Branch (Urban Services)  
Infrastructure Approvals Division  
110 Laurier Avenue West, 4<sup>th</sup> Floor  
Ottawa ON, K1P 1J1

**Attention: Mr. Josh White**

Dear Sir:

**Reference: Residential Development  
1040 Somerset Street West  
Stormwater Management Report  
Our File No.: 112191**

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Enclosed herein is the Stormwater Management Report for the proposed Residential development at 1040 Somerset Street West, located in the southeast quadrant of the Breezehill Avenue North / Somerset Street West intersection. This report is submitted in support of the zoning amendment and site plan application for the site and presents a stormwater management plan for the re-development of the site.

Trusting this report is adequate for your purposes. Should you have any questions, or require additional information, please contact us.

Yours truly,

**NOVATECH ENGINEERING CONSULTANTS LTD.**



Greg MacDonal, P.Eng  
Senior Project Manager

JAG/jag

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- 112191-GP General Plan of Services
- 112191-GR Grading and Erosion Control Plan
- 112191-STM Stormwater Management Plan
- 12909-12 Claridge Lts 1 2 3 PL 73 T F1 Topographical Survey

## 1.0 INTRODUCTION

The proposed Residential (1040 Somerset Street West) development is located in the southeast quadrant of the Breezehill Avenue North / Somerset Street West intersection in the City of Ottawa, as shown in Figure 1a – Aerial Photo and Figure 1b – Key Plan. The subject site is bounded by the following: single-detached dwellings converted for ground-floor commercial uses (1047-1055 Somerset Street West) to the north; O-Train transit corridor to the east; a meditation center and an auto repair shop (53 Breezehill Avenue North) to the south; and a proposed 23-storey condominium building (1050 Somerset Street West) to the west. The existing properties are currently occupied by a one storey building with commercial uses, including an auto care shop, a charity organization and an art studio. The proposed re-development of the site will consist of a 38-storey tower with 338 condominium units to be constructed in one phase. The condominium building will include approximately 2,100 ft<sup>2</sup> of commercial floor space, located on the ground floor. Also, a total of approximately 160 underground parking spaces will be provided on 7 levels of underground parking and 1 ground floor loading area. Refer to Figure 2 – Site Plan for details.

**Figure 1a: Aerial Photo of Subject Site**

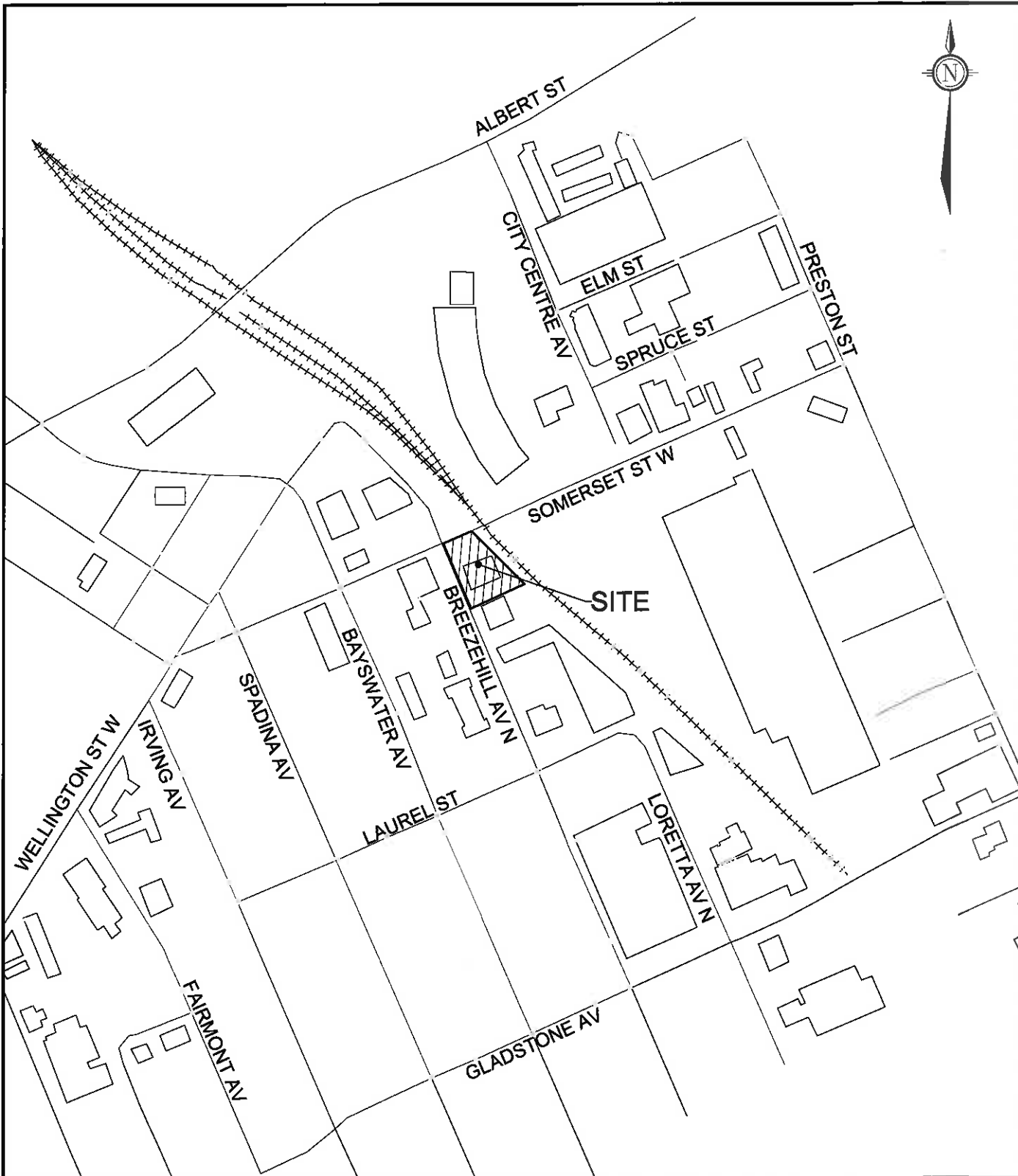


Photo courtesy of [www.bing.com/maps](http://www.bing.com/maps)

The subject site is approximately 0.13 ha in area. The development will have a single two-way vehicular ramp access to the underground parking garage as well as a ground floor drive-in loading area located on Breezehill Avenue North, south of Somerset Street West. A copy of the topographical survey which shows the property outline is included in the back of this report. Refer to Figure 3 – Existing Conditions. The construction schedule for the proposed development is as follows:

- Phase 1 starting in 2013, build-out expected in 2016.

This stormwater management report will provide a solution to manage stormwater runoff from the site.



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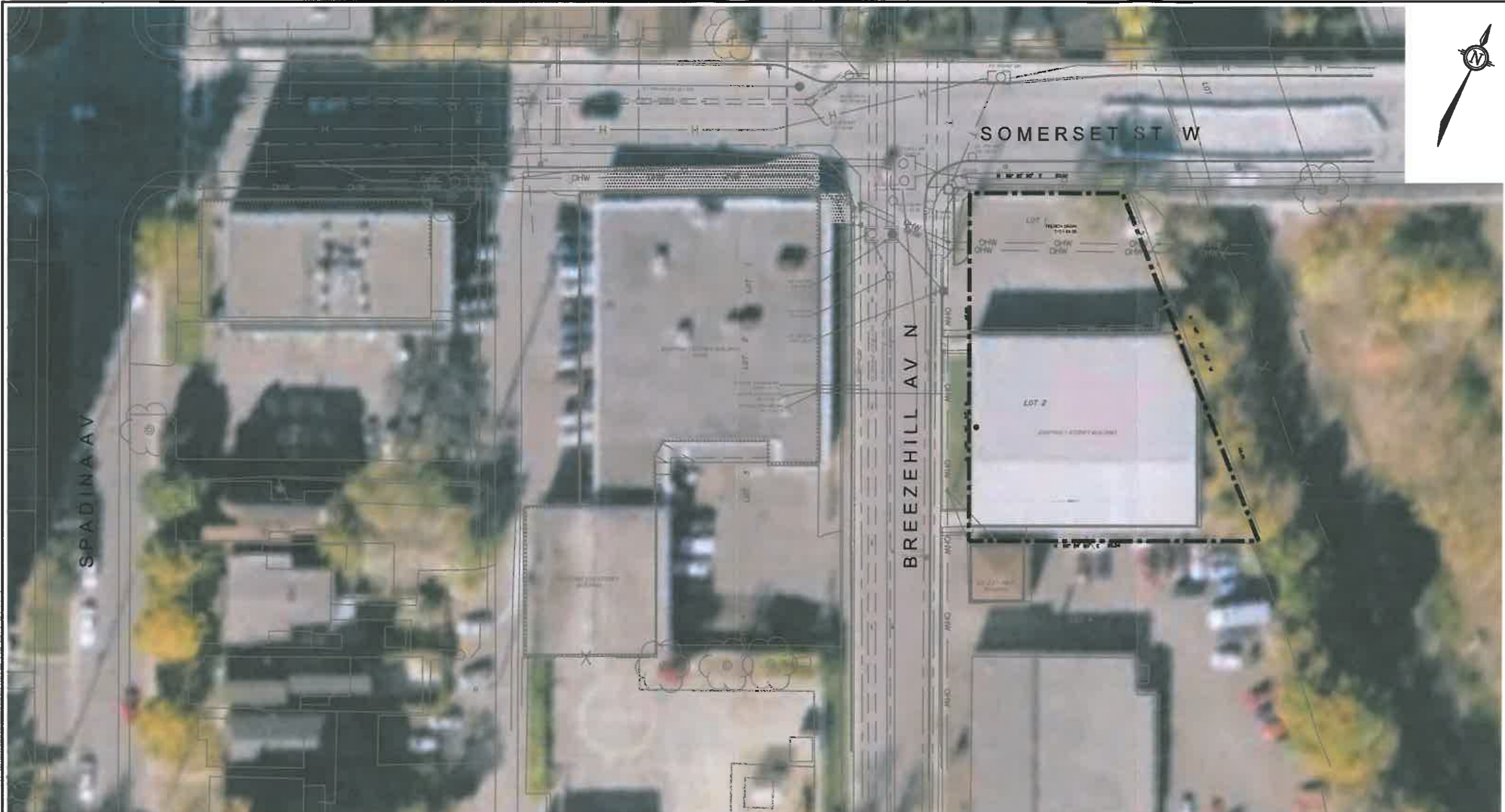
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**CITY OF OTTAWA**  
 1040 SOMERSET STREET WEST  
**KEY PLAN**

NTS      JAN 2013      112191      **FIGURE 1B**



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**LEGEND**  
 - - - - - SITE PLAN AREA

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CITY OF OTTAWA  
 1040 SOMERSET STREET WEST  
**EXISTING CONDITIONS**  
 NTS JAN 2013 112191 FIGURE 3

## 2.0 CRITERIA

Through correspondence with the City of Ottawa and our knowledge of development requirements in the area, the following criteria have been adopted to control post-development stormwater discharge from the site:

- Control proposed development flows, up to and including the 100-year storm event, to a 5-year allowable release rate calculated using a runoff coefficient (C) of 0.50 and a time of concentration ( $T_c$ ) of 20 minutes;
- Determine size and location of proposed drainage system components and identify any modifications required to existing infrastructure to meet SWM targets;
- Provide source controls which are in conformity with the City of Ottawa requirements, where possible;
- Limit ponding to 0.15 m for all rooftop storage areas and 0.30 m for all parking storage areas; and
- Provide guidelines to ensure that site preparation and construction is in accordance with the current Best Management Practices for Erosion and Sediment Control.

The approach to the stormwater management design is to determine the allowable release rate for the site, calculate the uncontrolled flow, and ensure that the remaining flow, in combination with the uncontrolled flow, does not exceed the allowable release rate. All proposed development runoff in excess of the allowable release rate, will be attenuated on-site prior to being released into the storm sewer on Somerset Street West and Breezehill Avenue North.

## 3.0 EXISTING CONDITIONS

### 3.1 The Site

Under existing conditions, the site in question is currently occupied by a one storey building with commercial uses, including an auto care shop, a charity organization and an art studio, as illustrated in Figure 3. Stormwater flows from the site are currently conveyed to the existing storm sewer system via overland flows to Somerset Street West, Breezehill Avenue North as well as the abutting Ottawa O-Train land.

As part of this development, all stormwater will be controlled on site and discharged via a 250 mm dia. storm service from the proposed condominium development that will connect to the existing 1350 mm dia. storm sewer on Breezehill Avenue North. The proposed storm service connection to the building will be equipped with a backwater valve.

### 3.2 Allowable Release Rate

The City requires that on-site stormwater management be implemented to control post-development stormwater discharge for the 100 year storm event to that value calculated using a 5-year storm, a time of concentration ( $T_c$ ) of 20 minutes and a runoff coefficient (C) of 0.50. The allowable release rate for the proposed 0.13 ha development was calculated using the Rational Method to be 13.13 L/s as follows:



Total Drainage Area (A) = 0.13 ha  
 Runoff Coefficient ( $C_{allow}$ ) = 0.50  
 Intensity ( $I_{5allow}$ ) = 70.25 mm/hr

$Q_{allow} = 2.78 \text{ CIA}$   
 $Q_{allow} = 2.78 \times 0.50 \times 70.25 \text{ mm/hr} \times 0.13 \text{ ha}$   
 $Q_{allow} = 13.13 \text{ L/s}$

#### 4.0 PROPOSED DEVELOPMENT STORMWATER MANAGEMENT DESIGN

Stormwater runoff flow from the site will be a combination of uncontrolled direct runoff and controlled flow. Stormwater management will be achieved through the use of rooftop controls. The site will be graded such that flows in excess of the 100-year storm event will be conveyed overland to Somerset Street West as well as Breezehill Avenue North.

#### 4.1 Drainage Areas

The development will consist of a number of drainage areas which are highlighted on the Storm Drainage Area Plan (112191-STM) enclosed in the back of this report. The following is a detailed description of how the flows from each area will be managed.

**Table 4.1 Drainage Area Descriptions**

Drainage Area No	Total area (ha)	Runoff Coefficient - C	Description
A-01	0.006	0.90	Uncontrolled
A-02	0.002	0.90	Uncontrolled
R-01	0.011	0.90	Controlled – Roof Drain
R-02	0.011	0.90	Controlled – Roof Drain
R-03	0.014	0.90	Controlled – Roof Drain
R-04	0.004	0.90	Controlled – Roof Drain
R-05	0.004	0.90	Controlled – Roof Drain
R-06	0.004	0.90	Controlled – Roof Drain
R-07	0.002	0.90	Controlled – Roof Drain
R-08	0.002	0.90	Controlled – Roof Drain
R-09	0.003	0.90	Controlled – Roof Drain
R-10	0.003	0.90	Controlled – Roof Drain
R-11	0.003	0.90	Controlled – Roof Drain
R-12	0.009	0.90	Controlled – Roof Drain
R-13	0.012	0.90	Controlled – Roof Drain
R-14	0.007	0.90	Controlled – Roof Drain
R-15	0.010	0.90	Controlled – Roof Drain
R-16	0.010	0.90	Controlled – Roof Drain
R-17	0.010	0.90	Controlled – Roof Drain
R-18	0.001	0.90	Controlled – Roof Drain
R-19	0.004	0.90	Controlled – Roof Drain
R-20	0.001	0.90	Controlled – Roof Drain
<b>Total =</b>	<b>0.13</b>		

Drainage Areas A-01, A-02 are the surficial uncontrolled runoff at the ground elevation that will both flow overland towards Breezehill Avenue North, Somerset Street West as well as the transit corridor. Drainage Areas R-01 through R-20 are rooftop areas large enough for surface storage, therefore allowing controlled flow.

All the stormwater runoff from the controlled roof top areas R-01 to R-20, will flow overland and internally and then be directed out of the site through direct connections to the existing 1350 mm dia. storm sewer on Breezehill Avenue North.

**4.2 Uncontrolled Development Flows**

The uncontrolled development flows from Areas A-01, A-02 were calculated using the Rational Method with a time of concentration (Tc) of 20 minutes and are summarized in Table 4.2. Detailed calculations are contained in Appendix B.

**Table 4.2 Proposed Development Uncontrolled Flows Summary**

Area No	POST DEVELOPMENT UNCONTROLLED RUNOFF										
	5-Year Event					100-Year Event					
	C	Tc (min)	I (mm/hr)	Area (ha)	Q (L/s)	C	Tc (min)	I (mm/hr)	Area (ha)	Q (L/s)	
A-01	0.90	20.00	70.25	0.0059	1.03	1.00	20.00	119.95	0.0059	1.96	
A-02	0.90	20.00	70.25	0.0023	0.40	1.00	20.00	119.95	0.0023	0.75	
<b>Total =</b>					<b>1.43</b>	<b>Total =</b>					<b>2.71</b>

Based on the above calculations, the 5-year uncontrolled flow is 1.43 L/s and the 100-year uncontrolled flow is 2.71 L/s. Roof top control will be utilized to control the flow from the entire site.

**4.2.1 Remaining Allowable Release Rate**

The maximum allowable storm flow for the remaining areas is the allowable release rate for the entire site less the uncontrolled flow. The following table indicates the allowable release rate for the entire site, the uncontrolled runoff and the remaining allowable release rate for the rest of the site areas for both the 5-year and 100-year storm events.

**Table 4.2.1 Remaining Allowable Release Rate Summary**

Area	Flow (L/s)	Flow (L/s)	
		5-Year	100-Year
Entire Site (Legal Boundary) Allowable		13.13	13.13
Uncontrolled		1.43	2.71
Remaining Allowable Flow		11.70	10.42

**4.3 Controlled Development Flows**

Stormwater flows from Areas R-01 through R-20 were calculated to be 22.21 L/s for the 5-year storm event and 42.13 L/s for the 100-year storm event. The both the 5-year and 100-year storm event exceeds the maximum allowable flow for these areas; therefore roof drain flow controls will be required. Detailed calculations are contained in Appendix B.

Due to the extent of hard surface areas and the limited allowable release rate, runoff in excess of the allowable quantity will be stored on site, up to and including the 100-year storm event. Flow from the building roof will be controlled by modified Zurn rooftop drains. Flow through these drains is dependent on the height of water above the drain (H- Head) and the number of notches in the drain. Flow from each rooftop area has been summarized in Table 4.3a. Detailed calculations are included in Appendix B.

**Table 4.3a Roof Drain Flow Summary**

Area No	Zurn Specification	L/s/m of head	ZURN ROOFDRAIN CONTROL PARAMETERS			
			5-Year Event		100-Year Event	
			Depth (m)	Total Flow (L/s)	Depth (m)	Total Flow (L/s)
R-01	ZCF121-1W-X4-Z-105-10-77	3.73	0.11	0.40	0.14	0.52
R-02	ZCF121-1W-X4-Z-105-10-77	3.73	0.11	0.42	0.15	0.55
R-03	ZCF121-1W-X4-Z-105-10-77	3.73	0.12	0.43	0.15	0.56
R-04	-	-	0.00	0.67	0.00	1.27
R-05	-	-	0.00	0.67	0.00	1.27
R-06	-	-	0.00	0.67	0.00	1.27
R-07	ZCF121-1W-X1-Z-105-10-77	3.73	0.03	0.51	0.05	0.72
R-08	ZCF121-1W-X1-Z-105-10-77	3.73	0.04	0.51	0.05	0.73
R-09	-	-	0.00	0.53	0.00	1.01
R-10	-	-	0.00	0.57	0.00	1.08
R-11	-	-	0.00	0.61	0.00	1.16
R-12	ZCF121-1W-X4-Z-105-10-77	3.73	0.11	0.39	0.14	0.51
R-13	ZCF121-1W-X4-Z-105-10-77	3.73	0.11	0.40	0.14	0.52
R-14	ZCF121-1W-X4-Z-105-10-77	3.73	0.10	0.37	0.13	0.49
R-15	ZCF121-1W-X4-Z-105-10-77	3.73	0.11	0.40	0.14	0.52
R-16	ZCF121-1W-X4-Z-105-10-77	3.73	0.11	0.40	0.14	0.52
R-17	ZCF121-1W-X4-Z-105-10-77	3.73	0.11	0.40	0.14	0.52
R-18	ZCF121-1W-X4-Z-105-10-77	3.73	0.07	0.27	0.10	0.38
R-19	ZCF121-1W-X4-Z-105-10-77	3.73	0.10	0.36	0.13	0.48
R-20	ZCF121-1W-X4-Z-105-10-77	3.73	0.07	0.27	0.10	0.38
			<b>Total =</b>	<b>9.24</b>	<b>Total =</b>	<b>14.45</b>

The Modified Rational Method was used to determine the storage volume required for the various rooftop drainage areas. Based on a controlled flow provided via the modified Zurn rooftop drains, the ponding depth on the roof above the drains will vary between 0.00 – 0.12 m for the 5-year storm event and 0.00 – 0.15 m for the 100-year storm event, as determined through iterative calculations using the release rate, head, and corresponding storage. The flow rate for a standard Zurn roof drain (per 1 notch) is 5 G.P.M. per inch of head (1.49 L/s per 100mm of ponding), but this can be reduced by designing the weir. Refer to the Appendix B for details outlining the modified rational method used, the ponding depth, and stage-storage curves for each controlled drainage area. Zurn roof drain information, including the specification for the weirs is contained in Appendix C.

#### 4.4 Major Overland Drainage

In the case of a storm event greater than the 100-year, scuppers will be included in the building design at a depth of 0.15 m from the roof drain to provide an overflow for excess runoff. An overland drainage flow route for major system runoff will be provided by grading the site such that excess stormwater runoff will flow overland towards Somerset Street West as well as Breezehill Avenue North.

## 5.0 EROSION AND SEDIMENT CONTROL MEASURES

Temporary and permanent erosion and sediment control measures will be implemented prior to, during and after construction; and will be inspected regularly.

To prevent sediment and debris from entering the storm system during construction, the following erosion and sediment control measures will be implemented during construction in accordance with the "Guidelines on Erosion and Sediment Control for Urban Construction Sites" (Government of Ontario, May 1987):

- Filter cloth will be placed under the grates of all area drains and remain in place until vegetation has been established and construction is completed;
- Street sweeping and cleaning will be performed on all roads adjacent to active construction on a regular basis;
- Stockpiles will be stabilized against erosion, and;
- Silt fence will be placed along the surrounding property lines to prevent contaminated surface runoff from migrating towards adjacent sites and straw bale check dams will be used if necessary.

As for permanent measures, seeding of disturbed areas and establishing grass growth will be utilized.

## 6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of this report, a stormwater management scheme has been identified that will achieve the allowable release rate required by the City. Therefore, the following conclusions are made:

- Stormwater discharge from the site will be controlled to marginally more than the allowable 5-year pre-development storm event rate of 13.13 L/s (17.16 L/s) by utilizing rooftop storage for both the 5-year and 100-year post-development storm events; this would have negligible impact on the existing City storm sewer system.
- The site will be graded such that flows in excess of the 100-year storm event will be conveyed overland to Somerset Street West as well as Breezehill Avenue North.
- Sediment and erosion control measures will be implemented during construction.

## 7.0 CLOSURE

This report has been prepared in accordance with the requirements for site plan submission and is hereby submitted for approval.

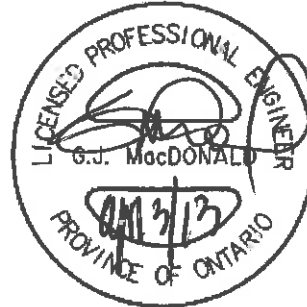
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**APPENDIX A  
IDF CURVES, RATIONAL METHOD, RUNOFF**

**RATIONAL METHOD**

The Rational Method was used to determine both the allowable runoff as well as the proposed development runoff for the site. The equation is as follows:

$$Q=2.78 \text{ CIA}$$

Where:

Q is the runoff in L/s

C is the weighted runoff coefficient\*

I is the rainfall intensity in mm/hr\*\*

A is the area in hectares

\*The weighted runoff coefficient is determined for each of the catchment areas as follows:

$$C = \frac{(A_{perv} \times C_{perv}) + (A_{imp} \times C_{imp})}{A_{tot}}$$

Where:

$A_{perv}$  is the pervious area in hectares

$C_{perv}$  is the pervious area runoff coefficient ( $C_{perv}=0.20$ )

$A_{imp}$  is the impervious area in hectares

$C_{imp}$  is the impervious area runoff coefficient ( $C_{imp}=0.90$ )

$A_{tot}$  is the catchment area ( $A_{perv} + A_{imp}$ ) in hectares

\*\* The rainfall intensity is taken from the City of Ottawa IDF Curves with a time of concentration of 20 min (refer to attached IDF Curves) as specified by the City of Ottawa.

**ALLOWABLE RELEASE RATE AS SPECIFIED BY THE CITY**

The allowable release rate was calculated for the proposed 0.1345 ha re-developed site, using a runoff coefficient (C) of 0.50 and a time of concentration ( $T_c$ ) of 20 minutes, as specified by the City of Ottawa.

Drainage Area (A) = 0.1345 ha

Runoff Coefficient (C) = 0.50

Intensity (I5) = 70.25 mm/hr

$Q_5 = 2.78 \text{ CIA}$

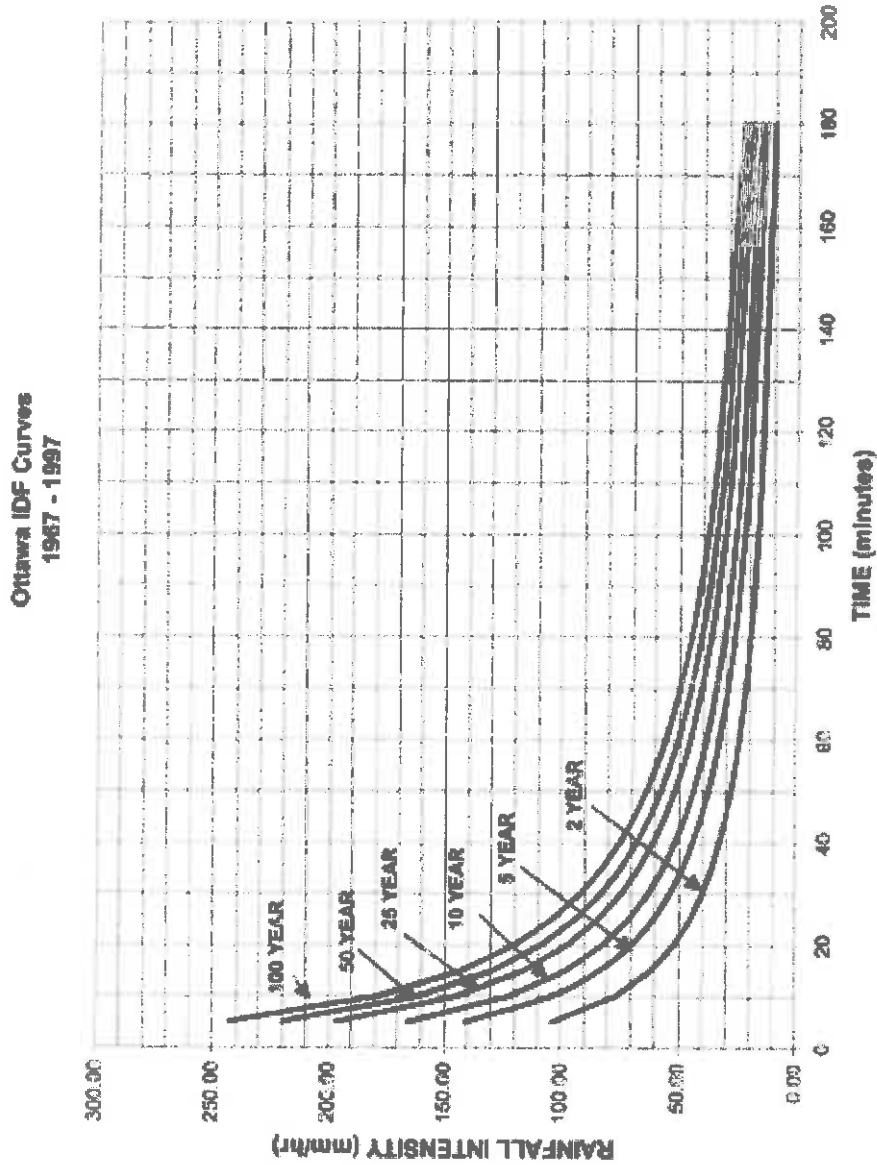
$Q_5 = 2.78 \times 0.50 \times 70.25 \text{ mm/hr} \times 0.1345 \text{ ha}$

$Q_5 = 13.13 \text{ L/s}$

Ottawa Sewer Design Guidelines

APPENDIX 5-A

OTTAWA INTENSITY DURATION FREQUENCY (IDF) CURVE



\* IDF CURVE FROM OTTAWA SEWER DESIGN GUIDELINES - NOV 2004



**APPENDIX B  
SWM CALCULATIONS**

RESIDENTIAL DEVELOPMENT  
(1040 SOMERSET STREET WEST)



Runoff Coefficients

Drainage Area	Total Area (m <sup>2</sup> )	Hard Surface Area		Gravel Area		Grass Area		5-Year Runoff Coefficient	100-Year Runoff Coefficient
		Area (m <sup>2</sup> )	C	Area (m <sup>2</sup> )	C	Area (m <sup>2</sup> )	C		
R-01	108.0	108.0	0.90	0.0	0.70	0.0	0.20	0.90	1.00
R-02	108.0	108.0	0.90	0.0	0.70	0.0	0.20	0.90	1.00
R-03	136.7	136.7	0.90	0.0	0.70	0.0	0.20	0.90	1.00
R-04	38.2	38.2	0.90	0.0	0.70	0.0	0.20	0.90	1.00
R-05	38.2	38.2	0.90	0.0	0.70	0.0	0.20	0.90	1.00
R-06	38.2	38.2	0.90	0.0	0.70	0.0	0.20	0.90	1.00
R-07	23.9	23.9	0.90	0.0	0.70	0.0	0.20	0.90	1.00
R-08	24.9	24.9	0.90	0.0	0.70	0.0	0.20	0.90	1.00
R-09	30.3	30.3	0.90	0.0	0.70	0.0	0.20	0.90	1.00
R-10	32.5	32.5	0.90	0.0	0.70	0.0	0.20	0.90	1.00
R-11	34.8	34.8	0.90	0.0	0.70	0.0	0.20	0.90	1.00
R-12	93.7	93.7	0.90	0.0	0.70	0.0	0.20	0.90	1.00
R-13	120.3	120.3	0.90	0.0	0.70	0.0	0.20	0.90	1.00
R-14	66.2	66.2	0.90	0.0	0.70	0.0	0.20	0.90	1.00
R-15	103.6	103.6	0.90	0.0	0.70	0.0	0.20	0.90	1.00
R-16	102.5	102.5	0.90	0.0	0.70	0.0	0.20	0.90	1.00
R-17	102.2	102.2	0.90	0.0	0.70	0.0	0.20	0.90	1.00
R-18	12.6	12.6	0.90	0.0	0.70	0.0	0.20	0.90	1.00
R-19	35.9	35.9	0.90	0.0	0.70	0.0	0.20	0.90	1.00
R-20	12.6	12.6	0.90	0.0	0.70	0.0	0.20	0.90	1.00
A-01	58.7	58.65	0.90	0.0	0.70	0.00	0.20	0.90	1.00
A-02	22.6	22.58	0.90	0.0	0.70	0.00	0.20	0.90	1.00
<b>Total</b>	<b>1344.55</b>	<b>1344.55</b>	<b>0.90</b>	<b>0.0</b>	<b>0.70</b>	<b>0.0</b>	<b>0.20</b>	<b>0.90</b>	<b>1.00</b>

# RESIDENTIAL DEVELOPMENT (1040 SOMERSET STREET WEST)

## Zurn Roof Drains

Opening	G.P.M. Per Inch of Head	L.P.M. Per Inch (25 mm) of Head	L/s Per Metre of Head	L/s Per 0.15 m of Head
Standard - X1	5.00	22.730	14.915	2.237
Reduced - X2	3.75	17.048	11.186	1.678
Reduced - X3	2.50	11.365	7.458	1.119
Max Reduced - X4	1.25	5.683	3.729	0.559



### SAMPLE CALCULATION:

#### AREA R-01

Number of notches (N) = 1

Head (H) = 0.107 m for 5-year event

Head (H) = 0.140 m for 100-year event

$$Q_{5 \text{ all}} = 3.729 \text{ L/s/m/notch} \times H \times N$$

$$Q_{5 \text{ all}} = 3.729 \text{ L/s/m/notch} \times 0.107 \text{ m} \times 1 \text{ notch}$$

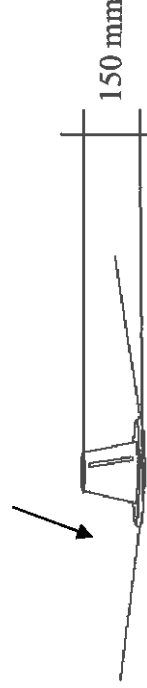
$$Q_{5 \text{ all}} = 0.40 \text{ L/s}$$

$$Q_{100 \text{ all}} = 3.729 \text{ L/s/m/notch} \times H \times N$$

$$Q_{100 \text{ all}} = 3.729 \text{ L/s/m/notch} \times 0.14 \text{ m} \times 1 \text{ notch}$$

$$Q_{100 \text{ all}} = 0.52 \text{ L/s}$$

No. of Notches



RESIDENTIAL DEVELOPMENT  
(1040 SOMERSET STREET WEST)



Controlled Flow

5 YR

Area No	Area (ha)	C <sub>947</sub>	Time (min)	Intensity mm/hr	Uncontrolled runoff L/s	Control System	Zurr Model Number	Release Rate (L/s/m of head)	Noiches	Depth (m)	Controlled Flow (L/s)	Storage available (m³)	Storage used (m³)
R-01	0.0108	0.90	20.00	70.25	1.90	Zurr Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.107	0.40	5.188	1.91
R-02	0.0108	0.90	20.00	70.25	1.90	Zurr Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.112	0.42	4.435	1.87
R-03	0.0137	0.90	20.00	70.25	2.40	Zurr Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.116	0.43	5.608	2.60
R-04	0.0038	0.90	20.00	70.25	0.67	Zurr Roof	-	#N/A	1	0.000	0.67	0.543	0.00
R-05	0.0038	0.90	20.00	70.25	0.67	Zurr Roof	-	#N/A	1	0.000	0.67	0.543	0.00
R-06	0.0038	0.90	20.00	70.25	0.67	Zurr Roof	-	#N/A	1	0.000	0.67	0.543	0.00
R-07	0.0024	0.90	20.00	70.25	0.42	Zurr Roof	ZCF121-1W-X1-Z-105-10-	14.92	1	0.034	0.51	0.299	0.10
R-08	0.0025	0.90	20.00	70.25	0.44	Zurr Roof	ZCF121-1W-X1-Z-105-10-	14.92	1	0.035	0.51	0.312	0.11
R-09	0.0030	0.90	20.00	70.25	0.53	Zurr Roof	-	#N/A	1	0.000	0.53	0.403	0.00
R-10	0.0032	0.90	20.00	70.25	0.57	Zurr Roof	-	#N/A	1	0.000	0.57	0.430	0.00
R-11	0.0035	0.90	20.00	70.25	0.61	Zurr Roof	-	#N/A	1	0.000	0.61	0.459	0.00
R-12	0.0094	0.90	20.00	70.25	1.65	Zurr Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.105	0.39	4.538	1.57
R-13	0.0120	0.90	20.00	70.25	2.11	Zurr Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.108	0.40	5.911	2.23
R-14	0.0066	0.90	20.00	70.25	1.16	Zurr Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.101	0.37	3.173	0.96
R-15	0.0104	0.90	20.00	70.25	1.82	Zurr Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.106	0.40	5.049	1.80
R-16	0.0102	0.90	20.00	70.25	1.80	Zurr Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.106	0.40	5.009	1.78
R-17	0.0013	0.90	20.00	70.25	1.80	Zurr Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.106	0.40	4.940	1.77
R-18	0.0013	0.90	20.00	70.25	0.22	Zurr Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.071	0.27	0.481	0.05
R-19	0.0036	0.90	20.00	70.25	0.63	Zurr Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.096	0.36	1.349	0.35
R-20	0.0013	0.90	20.00	70.25	0.22	Zurr Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.071	0.27	0.481	0.05
Roof Storage	0.1253	0.90	20.00	70.25	22.21	-	-	-	-	-	9.24	49.69	17.16
A-01	0.0059	0.90	20.00	70.25	1.03	no control	-	-	-	-	-	-	-
A-02	0.0023	0.90	20.00	70.25	0.40	no control	-	-	-	-	-	-	-
CB Storage	0.0081	0.90	20.00	70.25	1.43	ICD	-	-	-	-	0.00	0.00	0.00
Total:	0.1345				23.63						9.24	49.69	17.16

RESIDENTIAL DEVELOPMENT  
(1040 SOMERSET STREET WEST)



Area ID	Area (ha)	C <sub>weir</sub>	Time (min)	Intensity mm/hr	Uncontrolled runoff L/s	Control System	Zurr. Model Number	Release Rate (L/s/m of head)	Notches	Depth (m)	Controlled Flow (L/s)	Storage available (m <sup>3</sup> )	Storage used (m <sup>3</sup> )
R-01	0.0108	1.00	20.00	119.95	3.60	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.140	0.52	5.186	4.20
R-02	0.0108	1.00	20.00	119.95	3.60	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.146	0.55	4.435	4.13
R-03	0.0137	1.00	20.00	119.95	4.56	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.150	0.56	5.608	5.61
R-04	0.0038	1.00	20.00	119.95	1.27	Zurn Roof	-	#N/A	1	0.000	1.27	0.543	0.00
R-05	0.0038	1.00	20.00	119.95	1.27	Zurn Roof	-	#N/A	1	0.000	1.27	0.543	0.00
R-06	0.0038	1.00	20.00	119.95	1.27	Zurn Roof	-	#N/A	1	0.000	1.27	0.543	0.00
R-07	0.0024	1.00	20.00	119.95	0.80	Zurn Roof	ZCF121-1W-X1-Z-105-10-	14.92	1	0.049	0.72	0.299	0.28
R-08	0.0025	1.00	20.00	119.95	0.83	Zurn Roof	ZCF121-1W-X1-Z-105-10-	14.92	1	0.049	0.73	0.312	0.30
R-09	0.0030	1.00	20.00	119.95	1.01	Zurn Roof	-	#N/A	1	0.000	1.01	0.403	0.00
R-10	0.0032	1.00	20.00	119.95	1.08	Zurn Roof	-	#N/A	1	0.000	1.08	0.430	0.00
R-11	0.0035	1.00	20.00	119.95	1.16	Zurn Roof	-	#N/A	1	0.000	1.16	0.459	0.00
R-12	0.0094	1.00	20.00	119.95	3.12	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.137	0.51	4.538	3.48
R-13	0.0120	1.00	20.00	119.95	4.01	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.141	0.52	5.911	4.86
R-14	0.0066	1.00	20.00	119.95	2.21	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.132	0.49	3.173	2.16
R-15	0.0104	1.00	20.00	119.95	3.45	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.138	0.52	5.049	3.97
R-16	0.0102	1.00	20.00	119.95	3.42	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.138	0.52	5.009	3.92
R-17	0.0102	1.00	20.00	119.95	3.41	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.138	0.52	4.940	3.89
R-18	0.0013	1.00	20.00	119.95	0.42	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.101	0.38	0.481	0.15
R-19	0.0036	1.00	20.00	119.95	1.20	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.129	0.48	1.349	0.86
R-20	0.0013	1.00	20.00	119.95	0.42	Zurn Roof	ZCF121-1W-X4-Z-105-10-	3.73	1	0.101	0.38	0.481	0.15
Roof Storage	0.1263	1.00	20.00	119.95	42.13						14.45	49.69	37.95
A-01	0.0059	1.00	20.00	119.95	1.96	no control							
A-02	0.0023	1.00	20.00	119.95	0.75	no control							
CB Storage	0.0081	1.00	20.00	119.95	2.71	ICD					0.00	0.00	0.00
Total:	0.1345				44.84						14.45	49.69	37.95

Note: In all cases, there is only one notch in the Zurn roof drain end and flows through each drain is further reduced with and adjustable weir. See Zurn roof drains sheet and adjustable weir specification for more details on the reduction of flow.

RESIDENTIAL DEVELOPMENT  
(1040 SOMERSET STREET WEST)



Allowable release rate

Area	0.13 ha
C	0.5
$t_c$	20 min
$i_b$	70.25
$Q_{allowable} = 2.78 \times C \times i \times A$	
	13.13 L/s

Summary table

Area ID	Area (ha)	Runoff		Storage available (m <sup>3</sup> )		Storage used	
		5 year event L/s	100 year event L/s	5 year event (m <sup>3</sup> )	100 year event (m <sup>3</sup> )		
<b>Controlled</b>							
Roof	0.1263	9.24	14.45	49.69	17.16	37.95	
CB	-	-	-	-	-	-	
<b>Uncontrolled</b>							
A-01	0.0059	1.03	1.96	-	-	-	
A-02	0.0023	0.40	0.75	-	-	-	
<b>Total:</b>	<b>0.13</b>	<b>10.67</b>	<b>17.16</b>	<b>49.69</b>	<b>17.16</b>	<b>37.95</b>	

REQUIRED STORAGE - 5-YEAR EVENT				
AREA R-01 BUILDING ROOF				
DITTA/W: IDF CURVE				
Area =	0.011	ha	Qallow =	0.41
C =	0.65		Qol(max) =	1.51
			Nochase =	1
Time (min)	Intensit. (mm/hr)	Q (L/s)	Qnet (L/s)	%ol (m <sup>3</sup> )
5	141.18	3.61	3.41	1.02
10	104.19	2.62	2.42	1.46
15	83.56	2.26	1.86	1.87
20	70.25	1.90	1.50	1.80
25	60.91	1.65	1.25	1.87
30	53.93	1.46	1.06	1.90
35	48.52	1.31	0.91	1.91
40	44.18	1.19	0.79	1.91
45	40.63	1.10	0.70	1.88
50	37.65	1.02	0.62	1.85
55	35.12	0.95	0.55	1.81
60	32.94	0.89	0.49	1.78
65	31.04	0.84	0.44	1.71
70	29.37	0.78	0.39	1.65
75	27.96	0.75	0.35	1.59
80	26.66	0.72	0.32	1.53
85	25.37	0.69	0.29	1.48
90	24.13	0.66	0.26	1.43

Notes: %ol = Qnet x time  
Qnet = Q - Qallow

Pooling Depth (5-Year Storm)		
Area (m <sup>2</sup> )	H (m)	H (m)
0	0.00	0.00
0	0.00	0.01
2	0.01	0.02
4	0.04	0.03
7	0.10	0.04
12	0.19	0.05
17	0.33	0.06
23	0.53	0.07
30	0.79	0.08
37	1.12	0.09
46	1.54	0.10
56	2.05	0.11
66	2.65	0.12
78	3.36	0.13
90	4.22	0.14
104	5.19	0.15

Linear Interpolation			
0.11	H	0.10	H = 0.107 m
2.05	1.91	1.54	Qallow = 0.41

Note: Qallow is the flow rate through an or-controlled Zum Roof Drain (3.73 L/s/m of head.)

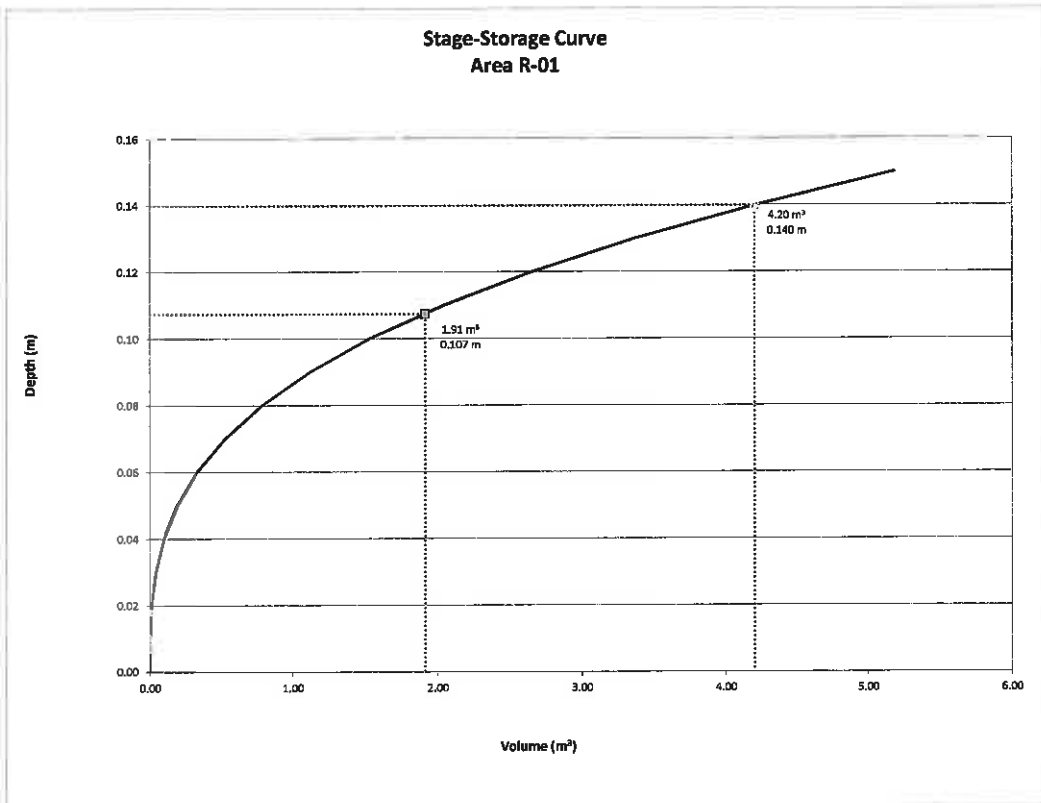
REQUIRED STORAGE - 100-YEAR EVENT				
AREA R-01 BUILDING ROOF				
DITTA/W: IDF CURVE				
Area =	0.011	ha	Qallow =	0.52
C =	1.00		Qol(max) =	2.0
			Nochase =	1
Time (min)	Intensit. (mm/hr)	Q (L/s)	Qnet (L/s)	%ol (m <sup>3</sup> )
5	242.70	7.29	6.77	2.03
10	178.59	5.36	4.84	2.90
15	142.89	4.29	3.77	3.39
20	119.85	3.60	3.08	3.70
25	103.85	3.12	2.60	3.90
30	91.87	2.76	2.24	4.03
35	82.58	2.48	1.96	4.11
40	75.15	2.26	1.74	4.17
45	69.05	2.07	1.55	4.19
50	63.95	1.92	1.40	4.20
55	59.62	1.79	1.27	4.19
60	55.83	1.68	1.16	4.17
65	52.65	1.59	1.06	4.14
70	49.79	1.49	0.97	4.06
75	47.28	1.42	0.90	4.04
80	44.99	1.36	0.83	3.99
85	42.95	1.29	0.77	3.93
90	41.11	1.23	0.71	3.86

Notes: %ol = Qnet x time  
Qnet = Q - Qallow

Pooling Depth (5-Year Storm)		
Area (m <sup>2</sup> )	H (m)	H (m)
0	0.00	0.00
0	0.00	0.01
2	0.01	0.02
4	0.04	0.03
7	0.10	0.04
12	0.19	0.05
17	0.33	0.06
23	0.53	0.07
30	0.79	0.08
37	1.12	0.09
46	1.54	0.10
56	2.05	0.11
66	2.65	0.12
78	3.36	0.13
90	4.22	0.14
104	5.19	0.15

Linear Interpolation			
0.14	H	0.13	H = 0.140 m
4.22	4.20	3.99	Qallow = 0.52

Note: Qallow is the flow rate through an or-controlled Zum Roof Drain (3.73 L/s/m of head.)



REQUIRED STORAGE - 6-YEAR EVENT				
AREA	R-02	BUILDING ROOF		
OTTAWA IDF CURVE				
Area =	6 071	m <sup>2</sup>	Q <sub>all</sub> =	0.42
L =	11.90	m	Q <sub>all</sub> (m <sup>3</sup> /s) =	1.87
			Notes =	1
Time (min)	Intensity (mm/hr)	Q (L/s)	Q <sub>net</sub> (L/s)	Vol (m <sup>3</sup> )
5	141.18	3.82	3.40	1.02
10	104.19	2.82	2.40	1.14
15	83.56	2.26	1.84	1.05
20	70.25	1.90	1.48	1.77
25	60.90	1.65	1.23	1.84
30	53.83	1.46	1.04	1.87
35	48.52	1.31	0.89	1.87
40	44.16	1.19	0.77	1.88
45	40.83	1.10	0.68	1.83
60	37.65	1.02	0.60	1.79
55	35.12	0.95	0.53	1.75
60	32.94	0.89	0.47	1.69
65	31.04	0.84	0.42	1.63
70	29.37	0.79	0.37	1.57
75	27.86	0.75	0.33	1.50
80	26.56	0.72	0.30	1.43
85	25.37	0.69	0.27	1.36
90	24.29	0.66	0.24	1.28

Notes: Vol = Q<sub>net</sub> x time  
Q<sub>net</sub> = Q - Q<sub>all</sub>

Ponding Depth (5-Year Storm)		
Area (m <sup>2</sup> )	H (m)	Q (L/s)
0	0.00000	0.00
0	0.00131	0.01
2	0.01051	0.02
4	0.03548	0.03
6	0.08410	0.04
10	0.16428	0.05
14	0.28385	0.06
19	0.45074	0.07
25	0.67283	0.08
32	0.95700	0.09
39	1.31412	0.10
48	1.74909	0.11
57	2.27080	0.12
67	2.88712	0.13
77	3.60594	0.14
89	4.43515	0.15

Linear Interpolation			
0.12	H	0.11	H = 0.112 m
2.27	1.87	1.75	Q <sub>all</sub> = 1.87 m <sup>3</sup> /s

Note: Q<sub>all</sub> is the flow rate through an overcontrolled Zum Roof Drain (3.73 L/s/m of head).

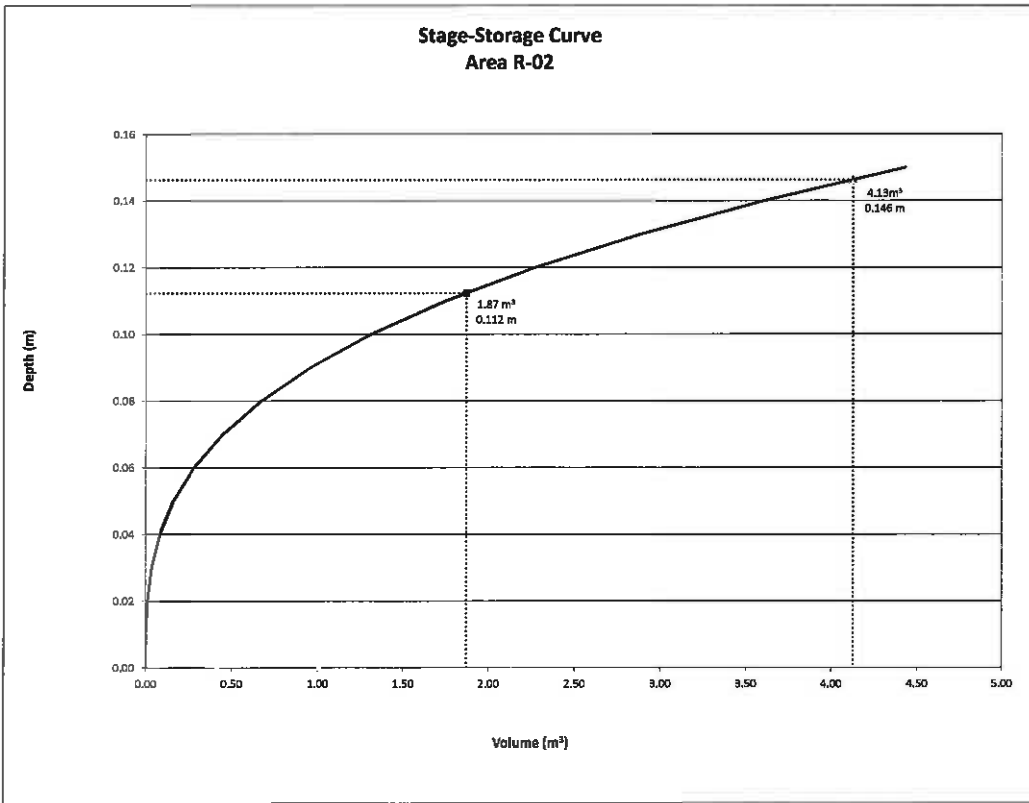
REQUIRED STORAGE - 100-YEAR EVENT				
AREA	R-02	BUILDING ROOF		
OTTAWA IDF CURVE				
Area =	11 071	m <sup>2</sup>	Q <sub>all</sub> =	0.55
L =	17.00	m	Q <sub>all</sub> (m <sup>3</sup> /s) =	2.15
			Notes =	1
Time (min)	Intensity (mm/hr)	Q (L/s)	Q <sub>net</sub> (L/s)	Vol (m <sup>3</sup> )
5	242.70	7.29	6.74	2.02
10	178.58	5.38	4.82	2.89
15	142.88	4.29	3.75	3.37
20	119.85	3.60	3.06	3.67
25	103.85	3.12	2.57	3.66
30	91.87	2.76	2.21	3.99
35	82.58	2.43	1.84	4.08
40	75.16	2.26	1.71	4.11
45	69.06	2.07	1.53	4.13
60	63.05	1.82	1.38	4.13
55	59.62	1.79	1.26	4.11
60	56.89	1.68	1.13	4.06
65	52.85	1.58	1.04	4.04
70	49.79	1.50	0.96	3.95
75	47.28	1.42	0.87	3.85
80	44.59	1.35	0.81	3.87
85	42.85	1.29	0.76	3.80
90	41.11	1.23	0.69	3.73

Notes: Vol = Q<sub>net</sub> x time  
Q<sub>net</sub> = Q - Q<sub>all</sub>

Ponding Depth (100-Year Storm)		
Area (m <sup>2</sup> )	H (m)	Q (L/s)
0	0.00	0.00
0	0.00	0.01
2	0.01	0.02
4	0.04	0.03
6	0.06	0.04
10	0.16	0.05
14	0.28	0.06
19	0.45	0.07
25	0.67	0.08
32	0.96	0.09
39	1.31	0.10
43	1.73	0.11
57	2.27	0.12
67	2.89	0.13
77	3.61	0.14
89	4.44	0.15

Linear Interpolation			
0.15	H	0.14	H = 0.146 m
4.44	4.13	3.81	Q <sub>all</sub> = 4.13 m <sup>3</sup> /s

Note: Q<sub>all</sub> is the flow rate through an overcontrolled Zum Roof Drain (3.73 L/s/m of head).





REQUIRED STORAGE - 5-YEAR EVENT					
AREA	R-03	BUILDING ROOF			
Area =	0.0137	ha	Q <sub>allow</sub> =	0.47	
C =	0.90		Vol(max) =	2.60	
			N <sub>catch</sub> =	1	
Time (min)	Intensity (mm/hr)	Q (L/s)	Q <sub>net</sub> (L/s)	Vol (m <sup>3</sup> )	
5	141.18	4.63	4.40	1.32	
10	104.19	3.56	3.13	1.88	
15	83.56	2.89	2.43	2.19	
20	70.26	2.40	1.97	2.37	
25	60.00	2.08	1.65	2.48	
30	53.83	1.64	1.11	2.56	
35	48.62	1.66	1.23	2.58	
40	44.18	1.51	1.08	2.60	
45	40.63	1.39	0.96	2.59	
50	37.65	1.29	0.99	2.57	
55	35.12	1.20	0.77	2.56	
60	32.84	1.13	0.70	2.51	
65	31.04	1.08	0.83	2.47	
70	29.37	1.00	0.57	2.41	
75	27.89	0.95	0.52	2.38	
80	26.56	0.91	0.48	2.37	
85	25.37	0.87	0.44	2.23	
90	24.29	0.83	0.40	2.17	

Notes: Vol = Q<sub>net</sub> x time  
Q<sub>net</sub> = Q - Q<sub>allow</sub>

Ponding Depth (5 Year Storm)		
Area (m <sup>2</sup> )	H (m)	Vol (m <sup>3</sup> )
0	0.00	0.00
0	0.00	0.01
2	0.01	0.02
4	0.04	0.03
8	0.11	0.04
12	0.21	0.05
18	0.36	0.06
24	0.67	0.07
32	0.85	0.08
40	1.21	0.09
50	1.66	0.10
60	2.21	0.11
72	2.87	0.12
84	3.65	0.13
98	4.56	0.14
112	5.61	0.15

Linear Interpolation			
0.12	H	0.11	H = 0.118 m
2.60	Q <sub>allow</sub>	2.21	Q <sub>allow</sub> = 2.30 L/s

Note: Q<sub>allow</sub> is the flow rate through an overcontrolled Zum Roof Drain (3.73 L/s/m of head.)

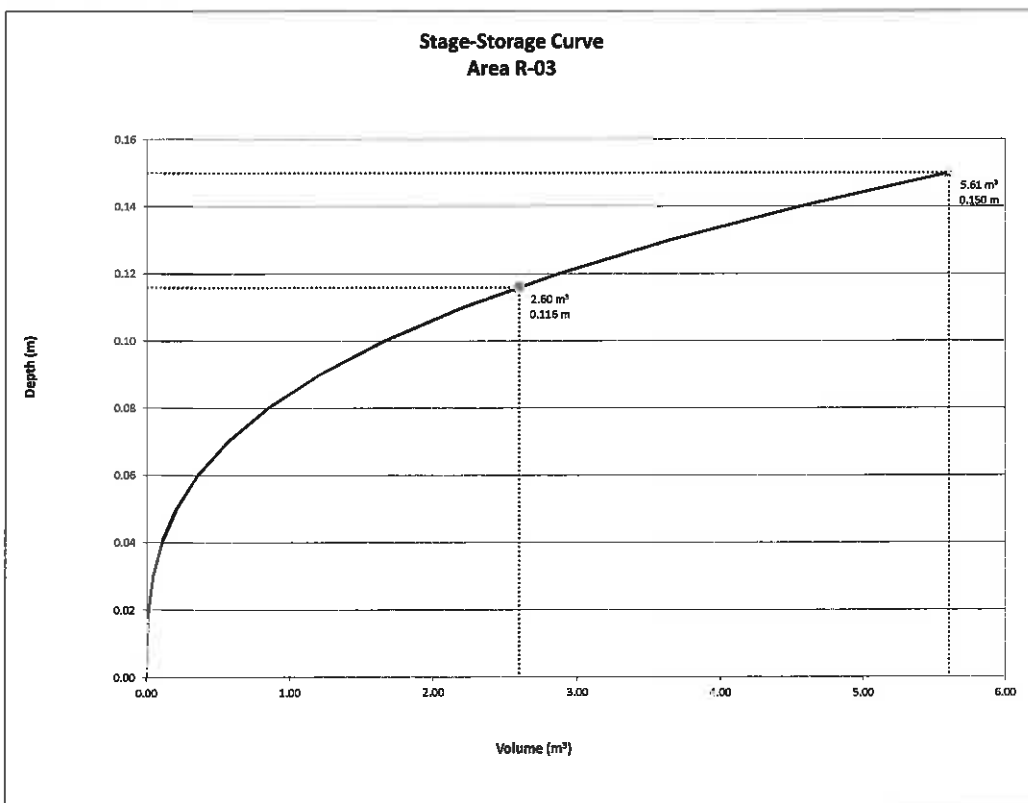
REQUIRED STORAGE - 100-YEAR EVENT					
AREA	R-03	BUILDING ROOF			
Area =	0.0137	ha	Q <sub>allow</sub> =	0.57	
C =	1.00		Vol(max) =	5.61	
			N <sub>catch</sub> =	1	
Time (min)	Intensity (mm/hr)	Q (L/s)	Q <sub>net</sub> (L/s)	Vol (m <sup>3</sup> )	
5	242.70	9.23	8.66	2.60	
10	178.58	6.79	6.22	3.79	
15	142.89	5.43	4.86	4.38	
20	119.95	4.58	3.98	4.78	
25	103.85	3.95	3.38	5.07	
30	91.67	3.49	2.93	5.27	
35	82.58	3.14	2.57	5.40	
40	75.15	2.86	2.29	5.49	
45	68.05	2.62	2.06	5.56	
50	63.95	2.43	1.86	5.59	
55	59.62	2.27	1.70	5.61	
60	55.89	2.12	1.59	5.61	
65	52.65	2.00	1.43	5.59	
70	48.79	1.88	1.33	5.57	
75	47.26	1.80	1.23	5.53	
80	44.99	1.71	1.14	5.49	
85	42.95	1.63	1.07	5.43	
90	41.11	1.56	1.00	5.38	

Notes: Vol = Q<sub>net</sub> x time  
Q<sub>net</sub> = Q - Q<sub>allow</sub>

Ponding Depth (100-Year Storm)		
Area (m <sup>2</sup> )	H (m)	Vol (m <sup>3</sup> )
0	0.00	0.00
0	0.00	0.01
2	0.01	0.02
4	0.04	0.03
8	0.11	0.04
12	0.21	0.05
18	0.36	0.06
24	0.67	0.07
32	0.85	0.08
40	1.21	0.09
50	1.66	0.10
60	2.21	0.11
72	2.87	0.12
84	3.65	0.13
98	4.56	0.14
112	5.61	0.15

Linear Interpolation			
0.15	H	0.14	H = 0.150 m
5.61	Q <sub>allow</sub>	4.56	Q <sub>allow</sub> = 4.91 L/s

Note: Q<sub>allow</sub> is the flow rate through an overcontrolled Zum Roof Drain (3.73 L/s/m of head.)



REQUIRED STORAGE - 5-YEAR EVENT				
AREA		BUILDING ROOF		
OTTAWA IDF CURVE				
Area =	0.0038	ha	Q <sub>eff</sub> =	0.17
C =	0.40		Vol(max) =	0.20
			Notes:	1
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m <sup>3</sup> )
5	141.18	1.25	0.88	0.20
10	104.19	1.00	0.89	0.20
15	83.66	0.80	0.13	0.12
20	70.25	0.67	0.00	0.00
25	60.90	0.58	-0.08	-0.13
30	53.93	0.52	-0.15	-0.28
35	48.52	0.46	-0.21	-0.43
40	44.18	0.42	-0.25	-0.60
45	40.83	0.39	-0.28	-0.76
50	37.63	0.36	-0.31	-0.93
55	35.12	0.34	-0.33	-1.10
60	32.94	0.31	-0.36	-1.28
65	31.04	0.29	-0.37	-1.46
70	29.37	0.27	-0.39	-1.64
75	27.89	0.27	-0.40	-1.82
80	26.56	0.25	-0.42	-2.00
85	25.37	0.24	-0.43	-2.18
90	24.28	0.23	-0.44	-2.37

Notes: Vol = Qnet x time  
Qnet = Q - Q<sub>eff</sub>

Ponding Depth (5 Year Storm)		
Area (m <sup>2</sup> )	V (m <sup>3</sup> )	H (m)
0	0.00	0.00
1	0.00	0.01
5	0.09	0.02
12	0.12	0.03
21	0.28	0.04
33	0.54	0.05

Linear Interpolation			
Area (m <sup>2</sup> )	H (m)	H =	Q <sub>eff</sub> (L/s)
0.04	0.03	0.000 m	
0.28	0.12		

#1/A

\* 5-year event will flow uncontrolled since no ponding.  
\*\* 100-year event will flow uncontrolled since no ponding.

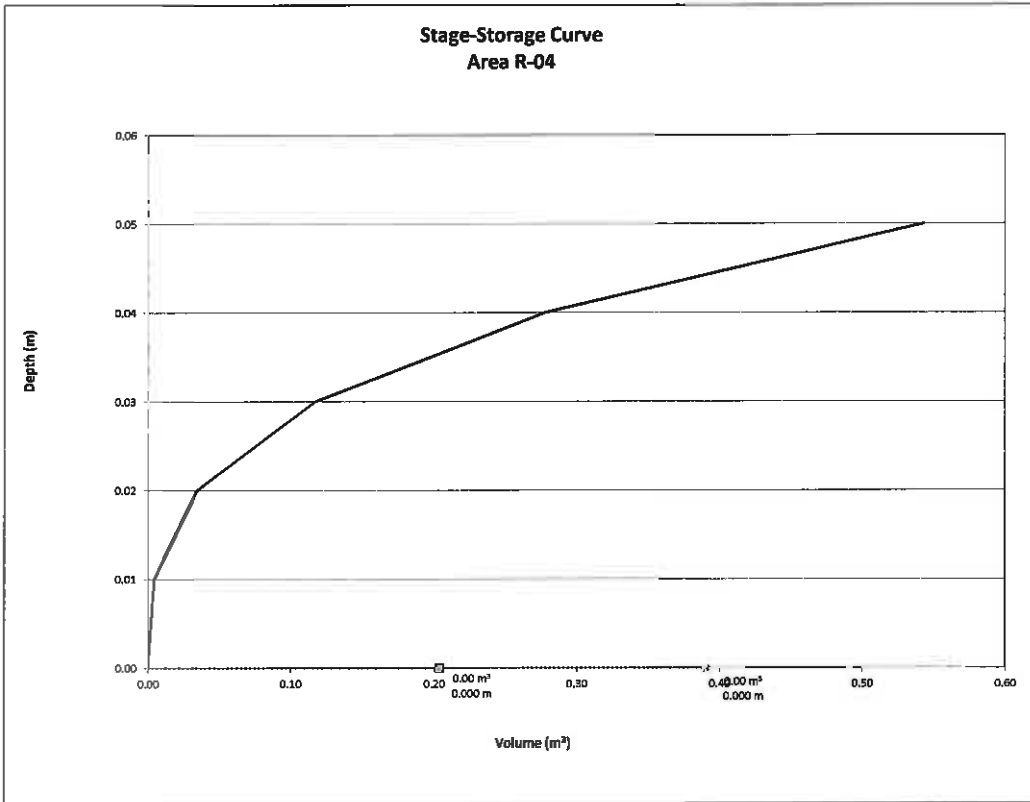
REQUIRED STORAGE - 100-YEAR EVENT				
AREA		BUILDING ROOF		
OTTAWA IDF CURVE				
Area =	0.0038	ha	Q <sub>eff</sub> =	0.27
C =	0.40		Vol(max) =	0.39
			Notes:	1
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m <sup>3</sup> )
5	242.70	2.68	1.31	0.39
10	178.66	1.90	0.63	0.38
15	142.89	1.52	0.25	0.22
20	118.95	1.27	0.00	0.00
25	103.85	1.10	-0.17	-0.25
30	91.87	0.98	-0.28	-0.53
35	82.59	0.88	-0.39	-0.83
40	75.15	0.80	-0.47	-1.13
45	69.05	0.73	-0.54	-1.45
50	63.95	0.68	-0.59	-1.77
55	59.82	0.63	-0.64	-2.10
60	55.89	0.59	-0.68	-2.44
65	52.65	0.56	-0.71	-2.77
70	49.79	0.53	-0.74	-3.11
75	47.26	0.50	-0.77	-3.46
80	44.99	0.48	-0.79	-3.80
85	42.95	0.46	-0.81	-4.15
90	41.11	0.44	-0.83	-4.50

Notes: Vol = Qnet x time  
Qnet = Q - Q<sub>eff</sub>

Ponding Depth (100-Year Storm)		
Area (m <sup>2</sup> )	V (m <sup>3</sup> )	H (m)
0	0.00	0.00
1	0.00	0.01
5	0.03	0.02
12	0.12	0.03
21	0.28	0.04
33	0.54	0.05

Linear Interpolation			
Area (m <sup>2</sup> )	H (m)	H =	Q <sub>eff</sub> (L/s)
0.05	0.04	0.000 m	
0.54	0.28		

#1/A



REQUIRED STORAGE - 5-YEAR EVENT				
AREA		BUILDING ROOF		
OTTAWA IDF CURVE				
Area =	0.0018 ha	Qallow =	0.87	
C =	0.90	Roofing =	0.35	
		Noises =	1	
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m <sup>3</sup> )
5	141.18	1.45	0.58	0.20
10	104.18	1.00	0.33	0.20
15	83.58	0.80	0.13	0.12
20	70.25	0.67	0.00	0.00
25	60.90	0.58	-0.09	-0.13
30	53.93	0.52	-0.15	-0.28
35	48.52	0.46	-0.21	-0.43
40	44.18	0.42	-0.26	-0.59
45	40.63	0.39	-0.28	-0.73
50	37.65	0.36	-0.31	-0.83
55	35.12	0.34	-0.33	-1.10
60	32.84	0.31	-0.36	-1.28
65	31.04	0.30	-0.37	-1.46
70	29.37	0.28	-0.39	-1.63
75	27.89	0.27	-0.40	-1.82
80	26.54	0.25	-0.42	-2.00
85	25.37	0.24	-0.43	-2.18
90	24.28	0.23	-0.44	-2.38

Notes: Vol = Qnet x time  
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)		
Area (m <sup>2</sup> )	H (m)	H (m)
0	0.00	0.00
1	0.00	0.01
5	0.03	0.02
12	0.12	0.03
21	0.28	0.04
33	0.54	0.05

Linear Interpolation			
Area (m <sup>2</sup> )	H (m)	H (m)	H = 0.000 m
0.02	0.02	0.01	
0.03	0.20	0.00	Q <sub>allow</sub> =

\* 5-year event will flow uncontrolled since no ponding.  
\*\* 100-year event will flow uncontrolled since no ponding.

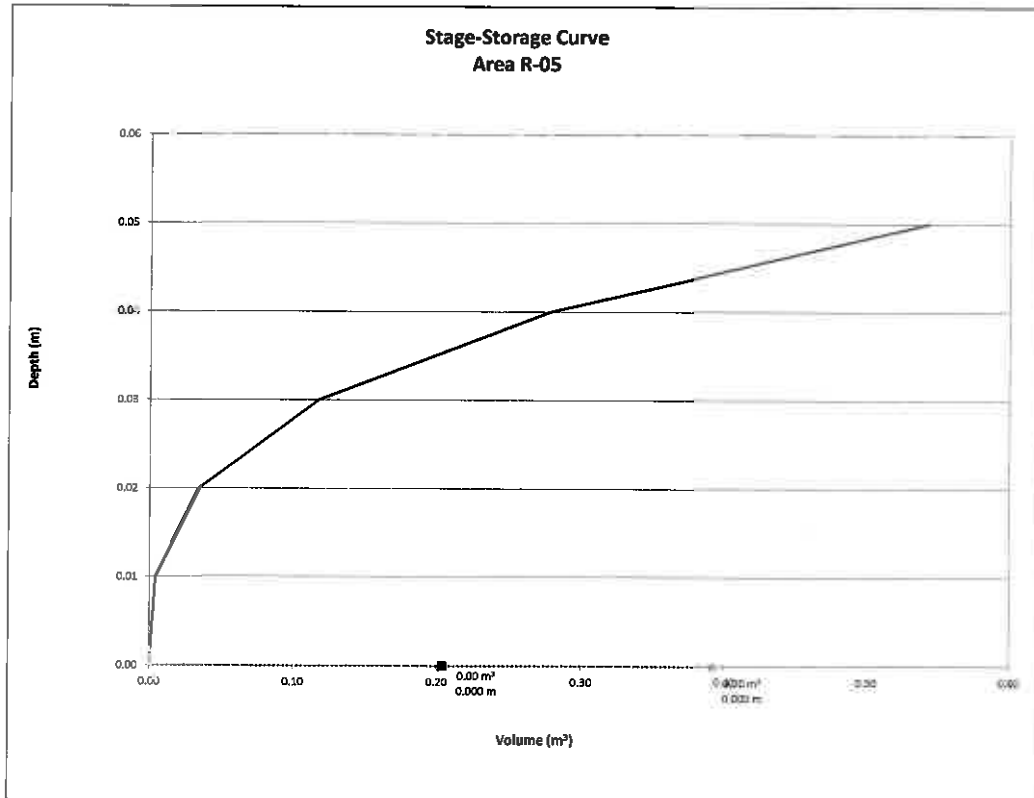
REQUIRED STORAGE - 100-YEAR EVENT				
AREA		BUILDING ROOF		
OTTAWA IDF CURVE				
Area =	0.0036 ha	Qallow =	1.07	
C =	0.90	Roofing =	0.35	
		Noises =	1	
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m <sup>3</sup> )
5	242.70	2.58	1.31	0.39
10	178.58	1.80	0.63	0.38
15	142.69	1.52	0.25	0.22
20	118.95	1.27	0.00	0.00
25	103.85	1.10	-0.17	-0.26
30	91.87	0.98	-0.29	-0.53
35	82.58	0.88	-0.39	-0.83
40	75.16	0.80	-0.47	-1.13
45	69.08	0.73	-0.54	-1.55
50	63.95	0.68	-0.59	-1.77
55	59.82	0.63	-0.64	-2.10
60	55.79	0.59	-0.68	-2.44
65	52.65	0.56	-0.71	-2.77
70	49.79	0.53	-0.74	-3.11
75	47.26	0.50	-0.77	-3.46
80	44.99	0.48	-0.79	-3.80
85	42.97	0.46	-0.81	-4.16
90	41.11	0.44	-0.83	-4.60

Notes: Vol = Qnet x time  
Qnet = Q - Qallow

Ponding Depth (100 Year Storm)		
Area (m <sup>2</sup> )	H (m)	H (m)
0	0.00	0.00
1	0.00	0.01
5	0.03	0.02
12	0.12	0.03
21	0.28	0.04
33	0.54	0.05

Linear Interpolation			
Area (m <sup>2</sup> )	H (m)	H (m)	H = 0.000 m
0.05	0.05	0.04	
0.54	0.39	0.28	Q <sub>allow</sub> =

#N/A





REQUIRED STORAGE 5-YEAR EVENT					
AREA R-07		BUILDING ROOF			
OTTAWA IDF CURVE					
Area = 0.0024 ha		Qallow = 7.0 L/s			
C = 0.90		Qallow / (Area) = 0.10			
		Roofing = 1			
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m³)	
5	141.18	0.84	0.33	0.10	
10	104.19	0.82	0.11	0.07	
15	63.56	0.50	-0.01	-0.01	
20	70.25	0.42	-0.09	-0.11	
25	60.90	0.38	-0.15	-0.22	
30	53.93	0.32	-0.19	-0.34	
35	48.52	0.29	-0.22	-0.46	
40	44.18	0.28	-0.25	-0.59	
45	40.63	0.24	-0.27	-0.72	
50	37.66	0.23	-0.28	-0.85	
55	35.12	0.21	-0.30	-0.99	
60	32.94	0.20	-0.31	-1.13	
65	31.04	0.19	-0.32	-1.28	
70	29.37	0.18	-0.33	-1.40	
75	27.90	0.17	-0.34	-1.54	
80	26.56	0.16	-0.35	-1.69	
85	25.37	0.15	-0.36	-1.83	
90	24.29	0.15	-0.36	-1.97	

Notes: Vol = Qnet x time  
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)			
Area (m²)	V (m³)	H (m)	
0	0.00	0.00	
1	0.00	0.01	
3	0.02	0.02	
6	0.06	0.03	
11	0.15	0.04	
18	0.30	0.05	

Linear Interpolation			
0.04	H	0.03	H = 0.034 m
0.15	H	0.06	Qallow = 7.0 L/s

Note: Qallow is the flow rate through an or-controlled Zurn Roof Drain (14.92 L/s/m of head).

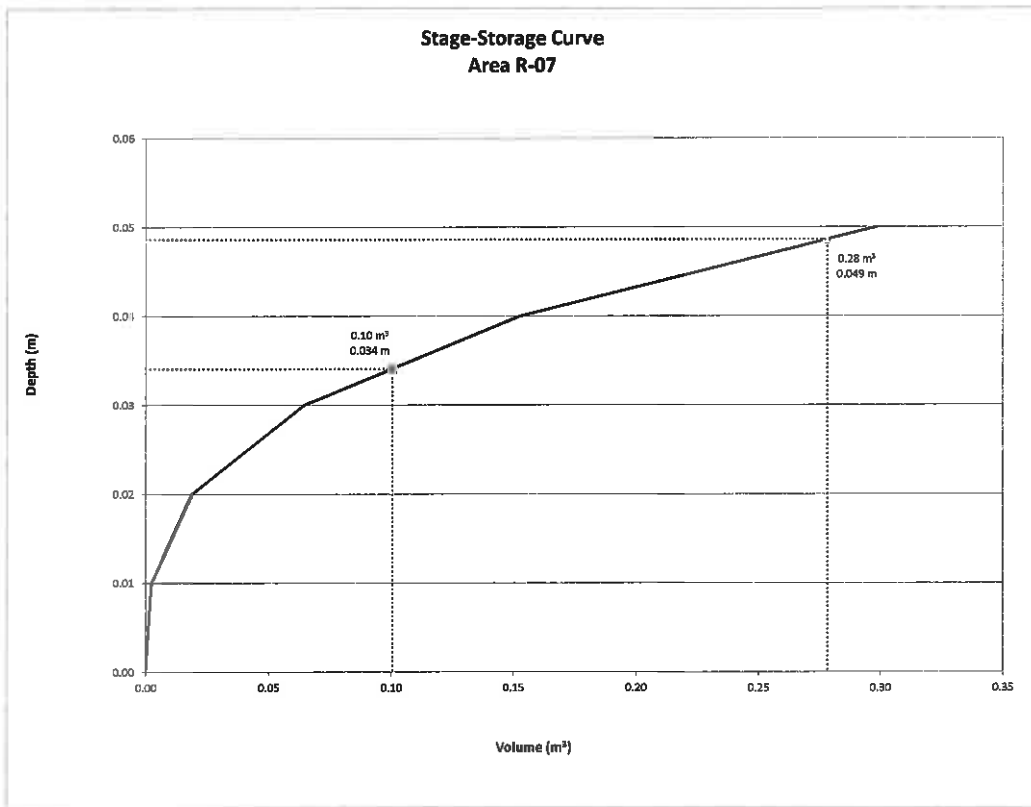
REQUIRED STORAGE 100-YEAR EVENT					
AREA R-07		BUILDING ROOF			
OTTAWA IDF CURVE					
Area = 0.0024 ha		Qallow = 0.72 L/s			
C = 1.00		Qallow / (Area) = 0.25			
		Roofing = 1			
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m³)	
5	242.70	1.81	0.89	0.27	
10	178.56	1.19	0.46	0.28	
15	142.69	0.95	0.23	0.20	
20	119.35	0.79	0.07	0.06	
25	103.85	0.69	-0.03	-0.05	
30	91.87	0.61	-0.11	-0.20	
35	82.58	0.55	-0.17	-0.37	
40	75.15	0.50	-0.22	-0.54	
45	69.05	0.46	-0.26	-0.71	
50	63.95	0.43	-0.30	-0.88	
55	59.62	0.40	-0.33	-1.04	
60	55.89	0.37	-0.35	-1.27	
65	52.65	0.35	-0.37	-1.51	
70	49.79	0.33	-0.39	-1.85	
75	47.23	0.31	-0.41	-1.84	
80	44.89	0.30	-0.42	-2.03	
85	42.95	0.29	-0.44	-2.23	
90	41.11	0.27	-0.46	-2.43	

Notes: Vol = Qnet x time  
Qnet = Q - Qallow

Ponding Depth (100-Year Storm)			
Area (m²)	V (m³)	H (m)	
0	0.00	0.00	
1	0.00	0.01	
3	0.02	0.02	
6	0.06	0.03	
11	0.15	0.04	
18	0.30	0.05	

Linear Interpolation			
0.05	H	0.04	H = 0.049 m
0.30	H	0.15	Qallow = 0.72 L/s

Note: Qallow is the flow rate through an or-controlled Zurn Roof Drain (14.92 L/s/m of head).



REQUIRED STORAGE - 4-YEAR EVENT					
AREA		BUILDING ROOF			
OTTAWA IDF CURVE					
Area =	1.012E ha	Qallow =	0.51	Vol(m <sup>3</sup> ) =	0.11
C =	1.00	N <sub>urban</sub> =	1		
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m <sup>3</sup> )	
5	141.18	0.88	0.38	0.11	
10	104.19	0.65	0.13	0.08	
15	83.58	0.52	0.01	0.00	
20	70.26	0.44	-0.08	-0.09	
25	60.90	0.38	-0.14	-0.20	
30	53.03	0.34	-0.18	-0.32	
35	46.62	0.30	-0.21	-0.46	
40	44.18	0.28	-0.24	-0.58	
45	40.63	0.25	-0.26	-0.71	
50	37.66	0.23	-0.26	-0.84	
55	35.12	0.22	-0.30	-0.98	
60	32.84	0.21	-0.31	-1.12	
65	31.04	0.19	-0.32	-1.27	
70	29.37	0.18	-0.33	-1.39	
75	27.89	0.17	-0.34	-1.54	
80	26.58	0.17	-0.35	-1.68	
85	25.37	0.16	-0.36	-1.82	
90	24.29	0.15	-0.36	-1.96	

Notes: Vol = Qnet x time  
Qnet = Q - Qallow

Pooling Depth (5-Year Storm)		
Area (m <sup>2</sup> )	v (m)	H (m)
0	0.00	0.00
1	0.00	0.01
3	0.02	0.02
7	0.07	0.03
12	0.18	0.04
19	0.31	0.05

Linear Interpolation			
0.04	H	0.03	H = 0.035 m
0.16	0.11	0.07	Q <sub>allow</sub> = 0.46 L/s

Note: Qallow is the flow rate through an uncontrolled Zurn Roof Drain (14.92 L/s/m of head.)

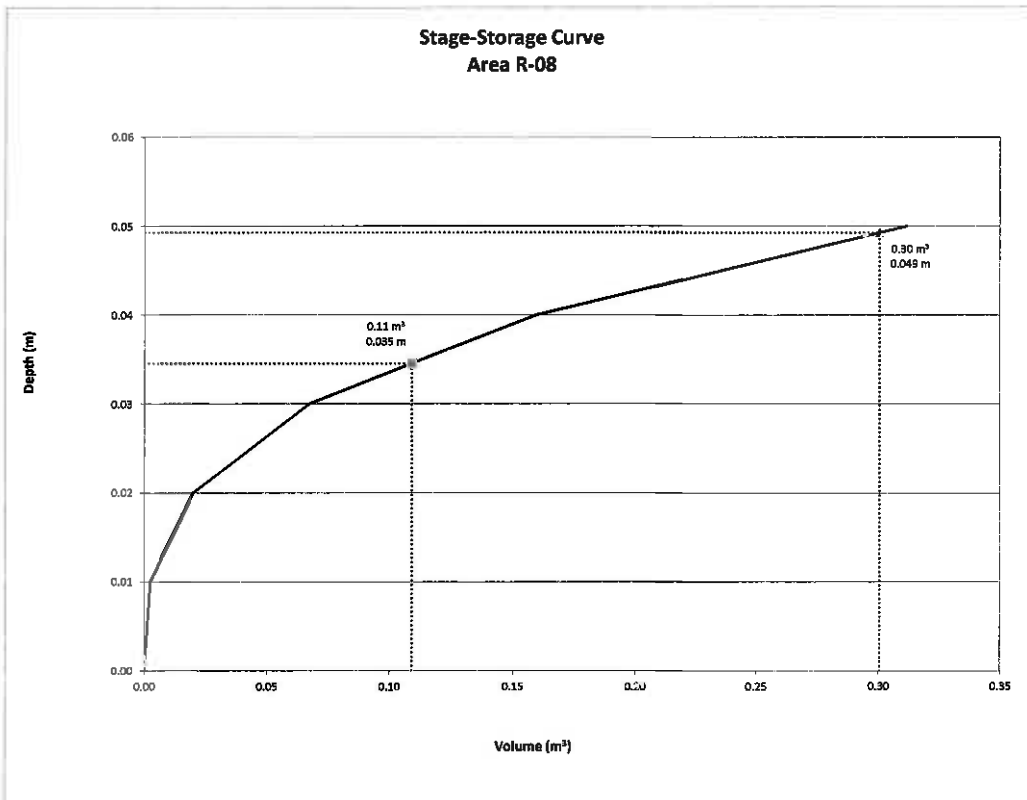
REQUIRED STORAGE - 100-YEAR EVENT					
AREA		BUILDING ROOF			
OTTAWA IDF CURVE					
Area =	0.1035 ha	Qallow =	0.73	Vol(m <sup>3</sup> ) =	0.30
C =	1.00	N <sub>urban</sub> =	1		
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m <sup>3</sup> )	
5	242.70	1.68	0.94	0.28	
10	178.56	1.24	0.70	0.30	
15	141.89	0.99	0.26	0.23	
20	119.65	0.83	0.10	0.11	
25	103.95	0.72	-0.02	-0.02	
30	91.87	0.64	-0.10	-0.18	
35	82.58	0.57	-0.16	-0.34	
40	76.15	0.52	-0.21	-0.51	
45	69.06	0.48	-0.26	-0.68	
50	63.05	0.44	-0.28	-0.87	
55	59.62	0.41	-0.32	-1.06	
60	56.69	0.39	-0.35	-1.25	
65	52.65	0.36	-0.37	-1.44	
70	48.79	0.34	-0.39	-1.64	
75	47.26	0.33	-0.41	-1.83	
80	44.99	0.31	-0.42	-2.03	
85	42.85	0.30	-0.44	-2.23	
90	41.11	0.28	-0.45	-2.43	

Notes: Vol = Qnet x time  
Qnet = Q - Qallow

Pooling Depth (100-Year Storm)		
Area (m <sup>2</sup> )	v (m)	H (m)
0	0.00	0.00
1	0.01	0.01
3	0.02	0.02
7	0.07	0.03
12	0.18	0.04
19	0.31	0.05

Linear Interpolation			
0.05	H	0.04	H = 0.048 m
0.31	0.30	0.16	Q <sub>allow</sub> = 0.51 L/s

Note: Qallow is the flow rate through an uncontrolled Zurn Roof Drain (14.92 L/s/m of head.)



REQUIRED STORAGE - 5-YEAR EVENT				
AREA	R-09	BUILDING ROOF		
OTTAWA IDF CURVE				
Area =	0.0030	ha	Callos =	0.53
C =	1.00		Vol(m <sup>3</sup> ) =	0.16
			Notes =	
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m <sup>3</sup> )
5	141.18	1.07	0.54	0.16
10	104.19	0.79	0.26	0.18
15	83.66	0.63	0.10	0.09
20	70.25	0.53	0.00	0.00
25	60.90	0.46	-0.07	-0.10
30	53.93	0.41	-0.12	-0.22
35	48.52	0.37	-0.16	-0.34
40	44.18	0.34	-0.19	-0.47
45	40.83	0.31	-0.22	-0.60
50	37.86	0.29	-0.21	-0.73
55	35.12	0.27	-0.28	-0.87
60	32.94	0.25	-0.28	-1.01
65	31.04	0.24	-0.29	-1.15
70	29.37	0.22	-0.31	-1.29
75	27.89	0.21	-0.32	-1.43
80	26.56	0.20	-0.33	-1.58
85	25.37	0.19	-0.34	-1.72
90	24.26	0.18	-0.35	-1.87

Notes: Vol = Qnet x time  
Qnet = Q - Qallow

Ponding Depth (5 Year Storm)		
Area (m <sup>2</sup> )	Depth (m)	Vol (m <sup>3</sup> )
0	0.00	0.00
1	0.00	0.01
4	0.03	0.02
9	0.08	0.03
16	0.21	0.04
24	0.40	0.05

Linear Interpolation				
0.04	H	0.03	H =	0.000 m
0.21	0.16	0.09	Q <sub>allow</sub> =	

N/A

REQUIRED STORAGE - 100-YEAR EVENT				
AREA	R-09	BUILDING ROOF		
OTTAWA IDF CURVE				
Area =	0.0030	ha	Callos =	1.01
C =	1.00		Vol(m <sup>3</sup> ) =	0.31
			Notes =	
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m <sup>3</sup> )
5	242.70	2.05	1.04	0.31
10	177.66	1.51	0.50	0.30
15	142.89	1.21	0.20	0.18
20	119.85	1.01	0.00	0.00
25	103.85	0.88	-0.13	-0.20
30	91.87	0.77	-0.24	-0.42
35	82.53	0.70	-0.31	-0.66
40	75.15	0.63	-0.33	-0.90
45	69.05	0.58	-0.43	-1.15
50	63.95	0.54	-0.47	-1.41
55	59.62	0.50	-0.51	-1.67
60	55.89	0.47	-0.54	-1.94
65	52.65	0.44	-0.57	-2.21
70	49.79	0.42	-0.59	-2.48
75	47.26	0.40	-0.61	-2.75
80	44.93	0.39	-0.63	-3.03
85	42.85	0.36	-0.65	-3.30
90	41.11	0.35	-0.66	-3.58

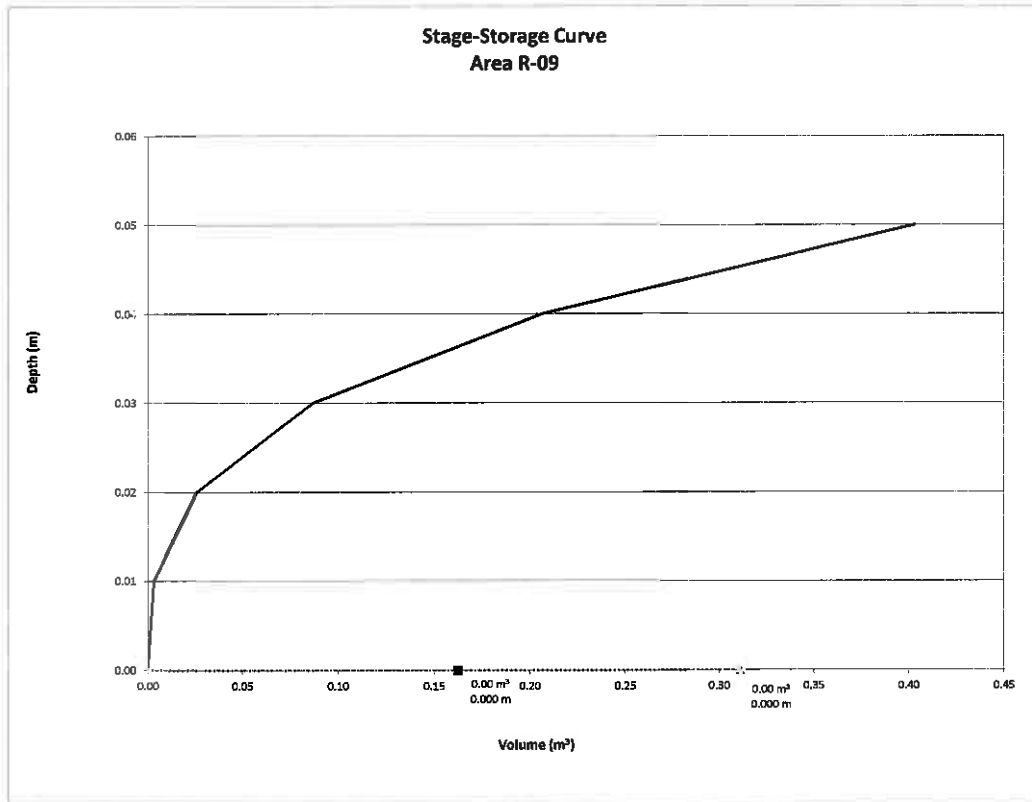
Notes: Vol = Qnet x time  
Qnet = Q - Qallow

Ponding Depth (100-Year Storm)		
Area (m <sup>2</sup> )	Depth (m)	Vol (m <sup>3</sup> )
0	0.00	0.00
1	0.00	0.01
4	0.03	0.02
9	0.08	0.03
16	0.21	0.04
24	0.40	0.05

Linear Interpolation				
0.05	H	0.04	H =	0.000 m
0.40	0.31	0.21	Q <sub>allow</sub> =	

N/A

\* 5-year event will flow uncontrolled since no ponding.  
\*\* 100-year event will flow uncontrolled since no ponding.



REQUIRED STORAGE 5-YEAR EVENT				
AREA	P (10)	BUILDING ROOF		
OTTAWA IDF CURVE				
Area =	0.00%	Int =	Qallow =	0.57
C =	0.90	h =	H(allow) =	0.17
			Notes =	1
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m <sup>3</sup> )
5	141.18	1.15	0.68	0.17
10	104.19	0.85	0.28	0.17
15	83.56	0.68	0.11	0.10
20	70.25	0.57	0.00	0.00
25	60.80	0.49	-0.08	-0.11
30	53.63	0.44	-0.13	-0.24
35	48.52	0.39	-0.18	-0.37
40	44.18	0.36	-0.21	-0.51
45	40.83	0.33	-0.24	-0.65
50	37.85	0.31	-0.28	-0.79
55	35.12	0.29	-0.28	-0.94
60	32.94	0.27	-0.33	-1.09
65	31.04	0.27	-0.32	-1.24
70	28.97	0.24	-0.33	-1.39
75	27.89	0.23	-0.34	-1.54
80	26.50	0.22	-0.36	-1.70
85	25.37	0.21	-0.38	-1.86
90	24.29	0.20	-0.37	-2.01

Notes: Vol = Qnet x time  
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)		
Area (m <sup>2</sup> )	H (m)	H (ft)
0	0.00	0.00
1	0.00	0.01
4	0.03	0.02
9	0.09	0.03
16	0.22	0.04
26	0.43	0.06

Linear Interpolation			
Area	H	H	H = 0.000 m
0.04	0.03		
0.22	0.04	Q <sub>obs</sub> =	

R/W

\* 5-year event will flow uncontrolled since no ponding.  
\*\* 100-year event will flow uncontrolled since no ponding.

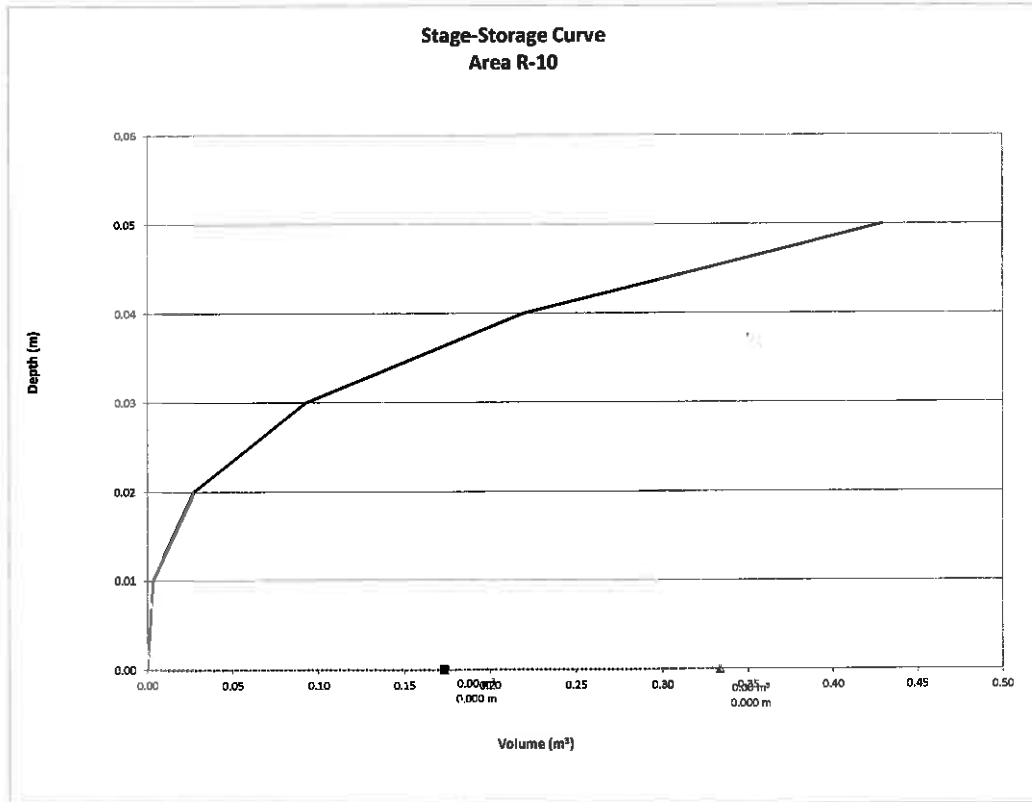
REQUIRED STORAGE 100-YEAR EVENT				
AREA	P (10)	BUILDING ROOF		
OTTAWA IDF CURVE				
Area =	0.00%	Int =	Qallow =	1.04
C =	0.90	h =	H(allow) =	0.17
			Notes =	
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m <sup>3</sup> )
5	242.70	2.19	1.11	0.33
10	178.56	1.81	0.53	0.82
15	142.89	1.29	0.21	0.19
20	119.95	1.09	0.00	0.00
25	103.85	0.94	-0.14	-0.21
30	91.87	0.83	-0.25	-0.45
35	82.58	0.75	-0.33	-0.70
40	75.15	0.68	-0.40	-0.96
45	69.05	0.62	-0.46	-1.23
50	63.95	0.58	-0.50	-1.51
55	59.62	0.54	-0.54	-1.79
60	55.89	0.50	-0.58	-2.07
65	52.65	0.48	-0.60	-2.36
70	49.79	0.45	-0.63	-2.63
75	47.28	0.43	-0.65	-2.94
80	44.99	0.41	-0.67	-3.23
85	42.95	0.39	-0.69	-3.53
90	41.11	0.37	-0.71	-3.83

Notes: Vol = Qnet x time  
Qnet = Q - Qallow

Ponding Depth (100-Year Storm)		
Area (m <sup>2</sup> )	H (m)	H (ft)
0	0.00	0.00
1	0.00	0.01
4	0.03	0.02
9	0.09	0.03
16	0.22	0.04
26	0.43	0.06

Linear Interpolation			
Area	H	H	H = 0.000 m
0.05	0.04		
0.43	0.22	Q <sub>obs</sub> =	

R/W





REQUIRED STORAGE - 5-YEAR EVENT				
AREA R-11 BUILDING ROOF				
OTTAWA IDF CURVE				
Area =	0.0036	ha	Q <sub>alt</sub> =	0.61
C =	0.05		V <sub>0</sub> (max) =	0.00
			N <sub>catch</sub> =	1
Time (min)	Intensity (mm/hr)	Q (L/s)	Q <sub>net</sub> (L/s)	% of (m <sup>3</sup> )
5	141.18	1.28	0.82	0.19
10	104.18	0.91	0.30	0.18
15	83.58	0.73	0.12	0.11
20	70.25	0.61	0.00	0.00
25	60.60	0.53	-0.09	-0.12
30	53.95	0.47	-0.14	-0.25
35	48.62	0.42	-0.18	-0.39
40	44.18	0.38	-0.23	-0.54
45	40.63	0.35	-0.28	-0.69
50	37.66	0.33	-0.28	-0.85
55	35.12	0.31	-0.30	-1.00
60	32.93	0.29	-0.32	-1.16
65	31.04	0.27	-0.34	-1.32
70	29.37	0.26	-0.35	-1.49
75	27.89	0.24	-0.37	-1.65
80	26.58	0.23	-0.37	-1.80
85	25.37	0.22	-0.37	-1.96
90	24.29	0.21	-0.40	-2.15

Note: Vol = Q<sub>net</sub> x time  
Q<sub>net</sub> = Q - Q<sub>alt</sub>

Ponding Depth (5-Year Storm)		
Area (m <sup>2</sup> )	V (m <sup>3</sup> )	H (m)
0	0.00	0.00
1	0.00	0.01
4	0.05	0.02
10	0.10	0.03
18	0.24	0.04
28	0.46	0.05

Linear Interpolation			
Area (m <sup>2</sup> )	H (m)	Q <sub>alt</sub> (L/s)	H = 0.000 m
0.04	0.03	0.03	
0.24	0.10	0.10	

RVA

\* 5-year event will flow uncontrolled since no ponding.  
\*\* 100-year event will flow uncontrolled since no ponding.

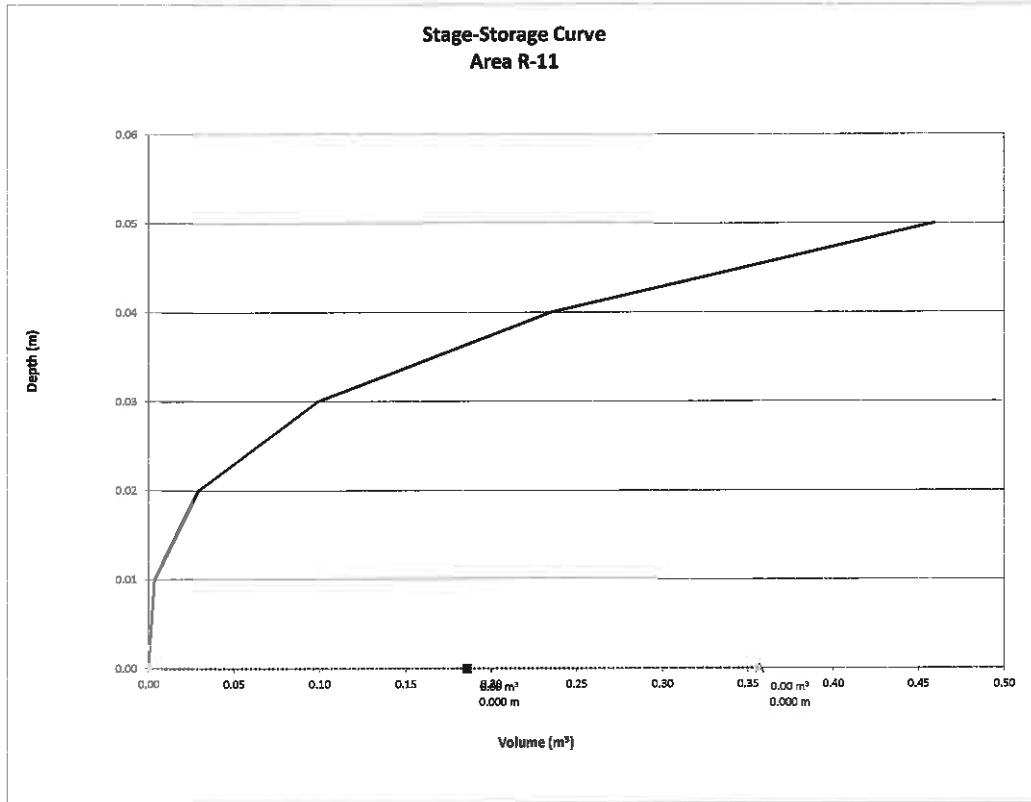
REQUIRED STORAGE - 100-YEAR EVENT				
AREA R-11 BUILDING ROOF				
OTTAWA IDF CURVE				
Area =	0.0036	ha	Q <sub>alt</sub> =	1.16
C =	1.00		V <sub>0</sub> (max) =	0.06
			N <sub>catch</sub> =	1
Time (min)	Intensity (mm/hr)	Q (L/s)	Q <sub>net</sub> (L/s)	% of (m <sup>3</sup> )
5	242.70	2.35	1.19	0.03
10	178.56	1.73	0.57	0.34
15	142.89	1.39	0.22	0.20
20	119.85	1.16	0.00	0.00
25	103.85	1.01	-0.15	-0.23
30	91.87	0.89	-0.27	-0.49
35	82.58	0.80	-0.38	-0.78
40	75.15	0.73	-0.43	-1.04
45	69.05	0.67	-0.49	-1.33
50	63.95	0.62	-0.54	-1.62
55	59.62	0.58	-0.58	-1.92
60	55.89	0.54	-0.62	-2.23
65	52.65	0.51	-0.65	-2.54
70	49.79	0.48	-0.68	-2.85
75	47.28	0.46	-0.70	-3.16
80	44.99	0.44	-0.72	-3.48
85	42.95	0.42	-0.74	-3.80
90	41.11	0.40	-0.76	-4.11

Note: Vol = Q<sub>net</sub> x time  
Q<sub>net</sub> = Q - Q<sub>alt</sub>

Ponding Depth (100-Year Storm)		
Area (m <sup>2</sup> )	V (m <sup>3</sup> )	H (m)
0	0.00	0.00
1	0.00	0.01
4	0.03	0.02
10	0.10	0.03
18	0.24	0.04
28	0.46	0.05

Linear Interpolation			
Area (m <sup>2</sup> )	H (m)	Q <sub>alt</sub> (L/s)	H = 0.000 m
0.05	0.04	0.04	
0.46	0.24	0.24	

RVA



REQUIRED STORAGE - 5 YEAR EVENT				
AREA	R-12	BUILDING ROOF		
OTTAWA IDF CURVE				
Area =	0.90 ha	Q <sub>allow</sub> =	0.3 l/s	
C =	0.90	Vol <sub>max</sub> =	1.57 m <sup>3</sup>	
Notches =	-			
Time (min)	Intensity (mm/hr)	Q (L/s)	Q <sub>net</sub> (L/s)	Vol (m <sup>3</sup> )
5	141.18	3.31	2.92	0.88
10	104.18	2.44	2.05	1.23
15	75.58	1.96	1.57	1.41
20	70.25	1.85	1.26	1.51
25	60.60	1.45	1.04	1.58
30	53.63	1.26	0.87	1.57
35	48.52	1.14	0.75	1.57
40	44.18	1.04	0.65	1.55
45	40.63	0.96	0.56	1.52
50	37.65	0.88	0.49	1.48
55	35.12	0.82	0.43	1.43
60	32.94	0.77	0.38	1.38
65	31.04	0.73	0.34	1.32
70	29.37	0.69	0.30	1.26
75	27.89	0.65	0.26	1.19
80	26.56	0.62	0.23	1.12
85	25.37	0.59	0.20	1.04
90	24.29	0.57	0.18	0.97

Notes: Vol = Q<sub>net</sub> x time  
Q<sub>net</sub> = Q - Q<sub>allow</sub>

Ponding Depth (5 Year Storm)		
Area (m <sup>2</sup> )	H (m)	Vol (m <sup>3</sup> )
0	0.00	0.00
0	0.00	0.01
2	0.01	0.02
4	0.04	0.03
6	0.09	0.04
10	0.17	0.05
15	0.29	0.06
20	0.46	0.07
26	0.69	0.08
33	0.96	0.09
40	1.34	0.10
48	1.73	0.11
58	2.32	0.12
68	2.95	0.13
79	3.69	0.14
91	4.54	0.15

Linear Interpolation			
Area (m <sup>2</sup> )	H (m)	Vol (m <sup>3</sup> )	H (m)
0.11	0.10		0.105 m
1.79	1.57	1.34	Q <sub>allow</sub> = 0.3 l/s

Note: Q<sub>allow</sub> is the flow rate through an oversized Zum Roof Drain (3.73 L/s/m of head.)

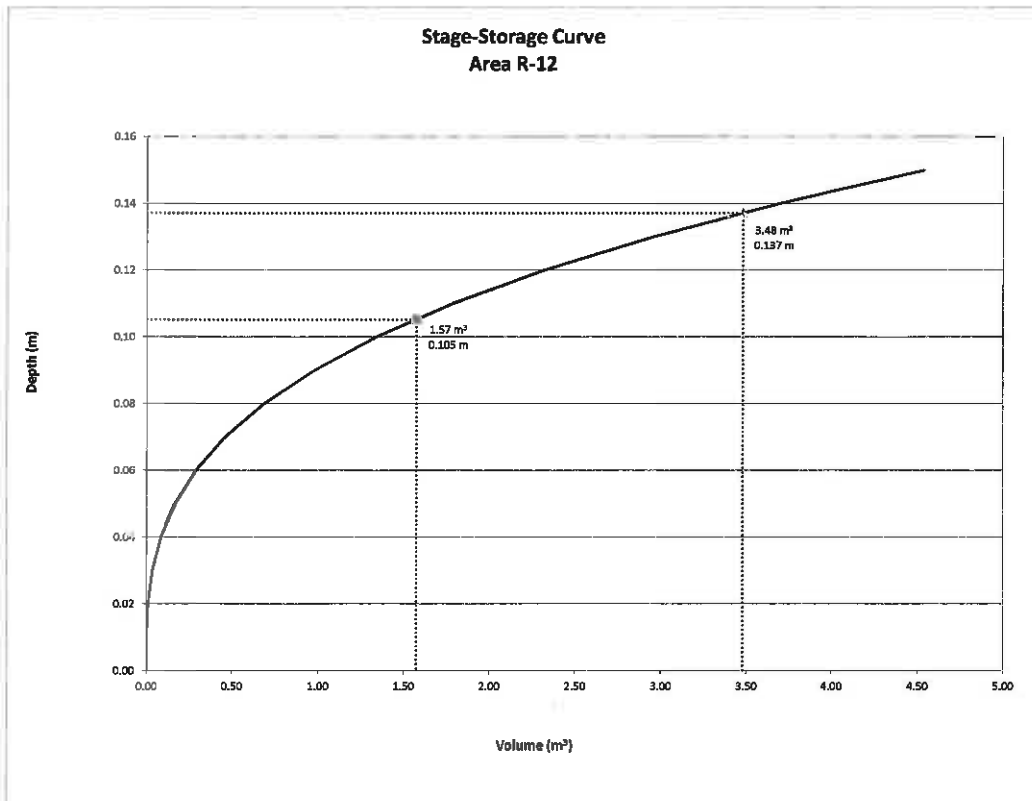
REQUIRED STORAGE - 100-YEAR EVENT				
AREA	R-12	BUILDING ROOF		
OTTAWA IDF CURVE				
Area =	0.90 ha	Q <sub>allow</sub> =	0.3 l/s	
C =	0.90	Vol <sub>max</sub> =	3.48 m <sup>3</sup>	
Notches =	-			
Time (min)	Intensity (mm/hr)	Q (L/s)	Q <sub>net</sub> (L/s)	Vol (m <sup>3</sup> )
5	242.70	6.22	5.81	1.74
10	176.58	4.65	4.14	2.48
15	142.89	3.72	3.21	2.65
20	119.95	3.12	2.61	3.14
25	103.85	2.71	2.20	3.29
30	91.87	2.39	1.88	3.39
35	82.58	2.15	1.64	3.45
40	75.15	1.96	1.45	3.47
45	69.05	1.80	1.29	3.48
50	63.95	1.67	1.16	3.47
55	59.62	1.55	1.04	3.44
60	56.89	1.46	0.95	3.41
65	52.85	1.37	0.86	3.36
70	49.79	1.30	0.79	3.31
75	47.26	1.25	0.72	3.24
80	44.90	1.17	0.66	3.18
85	42.95	1.12	0.61	3.11
90	41.11	1.07	0.58	3.03

Notes: Vol = Q<sub>net</sub> x time  
Q<sub>net</sub> = Q - Q<sub>allow</sub>

Ponding Depth (100-Year Storm)		
Area (m <sup>2</sup> )	H (m)	Vol (m <sup>3</sup> )
0	0.00	0.00
0	0.00	0.01
2	0.01	0.02
4	0.04	0.03
6	0.09	0.04
10	0.17	0.05
15	0.29	0.06
20	0.46	0.07
26	0.69	0.08
33	0.96	0.09
40	1.34	0.10
48	1.73	0.11
58	2.32	0.12
68	2.95	0.13
79	3.69	0.14
91	4.54	0.15

Linear Interpolation			
Area (m <sup>2</sup> )	H (m)	Vol (m <sup>3</sup> )	H (m)
0.14	0.13		0.137 m
3.69	3.48	2.95	Q <sub>allow</sub> = 0.3 l/s

Note: Q<sub>allow</sub> is the flow rate through an oversized Zum Roof Drain (3.73 L/s/m of head.)



REQUIRED STORAGE - 5 YEAR EVENT				
AREA R-12		BUILDING ROOF		
OTTAWA IDF CURVE				
Area =	0.0170	ha	Qallow =	0.41
C =	0.40		Vol (max) =	2.29
			N, (days) =	1
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m <sup>3</sup> )
5	141.18	4.25	3.85	1.15
10	104.19	3.14	2.74	1.64
15	83.58	2.52	2.12	1.90
20	70.26	2.11	1.71	2.08
25	60.90	1.83	1.43	2.15
30	53.93	1.62	1.22	2.20
35	48.52	1.46	1.06	2.22
40	44.18	1.33	0.93	2.23
45	40.83	1.22	0.82	2.22
50	37.65	1.13	0.73	2.20
55	35.12	1.06	0.66	2.17
60	32.94	0.99	0.59	2.13
65	31.04	0.93	0.53	2.08
70	29.37	0.88	0.48	2.03
75	27.89	0.84	0.44	1.93
80	26.56	0.80	0.40	1.82
85	25.37	0.78	0.38	1.85
90	24.29	0.73	0.33	1.79

Notes: Vol = Qnet x time  
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)		
Area (m <sup>2</sup> )	V (m <sup>3</sup> )	H (m)
0	0.00	0.00
1	0.00	0.01
2	0.01	0.02
5	0.05	0.03
8	0.11	0.04
13	0.22	0.05
19	0.38	0.06
26	0.60	0.07
34	0.90	0.08
43	1.26	0.09
53	1.75	0.10
64	2.33	0.11
76	3.01	0.12
89	3.75	0.13
103	4.51	0.14
118	5.31	0.15

Linear Interpolation			
Area (m <sup>2</sup> )	H (m)	Area (m <sup>2</sup> )	H (m)
0.11	0.10		0.108 m
2.53	0.23	1.75	Qallow =

Note: Qallow is the flow rate through an orifice-controlled Roof Drain (3.73 L/s/m of head.)

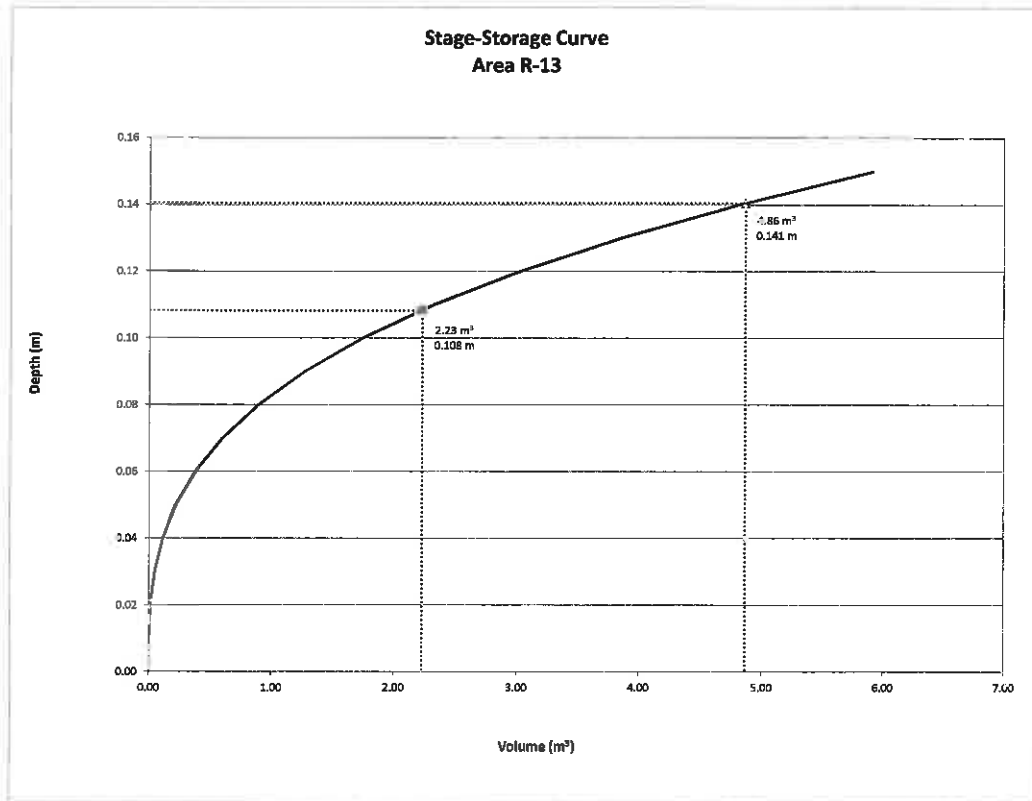
REQUIRED STORAGE - 100-YEAR EVENT				
AREA R-13		BUILDING ROOF		
OTTAWA IDF CURVE				
Area =	0.0170	ha	Qallow =	0.62
C =	0.40		Vol (max) =	4.86
			N, (days) =	1
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m <sup>3</sup> )
5	242.70	8.12	7.60	2.23
10	178.58	5.97	5.45	3.27
15	142.88	4.78	4.20	3.83
20	119.06	4.01	3.40	4.19
25	100.85	3.47	2.95	4.43
30	91.87	3.07	2.55	4.59
35	82.58	2.76	2.24	4.71
40	75.15	2.51	1.99	4.78
45	69.06	2.31	1.79	4.83
50	63.95	2.14	1.62	4.86
55	59.82	1.99	1.47	4.86
60	56.59	1.87	1.35	4.86
65	52.65	1.76	1.24	4.84
70	49.79	1.67	1.15	4.81
75	47.26	1.59	1.08	4.77
80	44.99	1.53	0.98	4.73
85	42.95	1.44	0.92	4.67
90	41.11	1.37	0.85	4.62

Notes: Vol = Qnet x time  
Qnet = Q - Qallow

Ponding Depth (100-Year Storm)		
Area (m <sup>2</sup> )	V (m <sup>3</sup> )	H (m)
0	0.00	0.00
1	0.00	0.01
2	0.01	0.02
5	0.05	0.03
8	0.11	0.04
13	0.22	0.05
19	0.38	0.06
26	0.60	0.07
34	0.90	0.08
43	1.26	0.09
53	1.75	0.10
64	2.33	0.11
76	3.01	0.12
89	3.75	0.13
103	4.51	0.14
118	5.31	0.15

Linear Interpolation			
Area (m <sup>2</sup> )	H (m)	Area (m <sup>2</sup> )	H (m)
0.15	0.14		0.141 m
5.91	0.48	4.81	Qallow =

Note: Qallow is the flow rate through an orifice-controlled Roof Drain (3.73 L/s/m of head.)



REQUIRED STORAGE - 5-YEAR EVENT				
AREA	BUILDING ROOF			
OTTAWA IDF CURVE				
Area = 0.0083 ha	Gallow = 0.37			
C = 0.90	Vol(max) = 5.06			
Notes: Vol = Qnet x time Qnet = Q - Qallow				
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m <sup>3</sup> )
5	141.18	2.34	1.97	0.98
10	104.19	1.72	1.35	0.81
15	85.56	1.38	1.01	0.91
20	70.25	1.16	0.79	0.95
25	60.80	1.01	0.64	0.96
30	53.95	0.89	0.52	0.94
35	48.52	0.80	0.43	0.91
40	44.18	0.73	0.38	0.87
45	40.63	0.67	0.30	0.82
50	37.65	0.62	0.26	0.78
55	35.12	0.58	0.21	0.70
60	32.94	0.55	0.18	0.63
65	31.04	0.51	0.14	0.56
70	29.37	0.49	0.12	0.43
75	27.89	0.46	0.09	0.41
80	26.56	0.44	0.07	0.33
85	25.37	0.42	0.05	0.25
90	24.20	0.40	0.03	0.17

REQUIRED STORAGE - 100-YEAR EVENT				
AREA	BUILDING ROOF			
OTTAWA IDF CURVE				
Area = 0.0060 ha	Gallow = 0.48			
C = 0.90	Vol(max) = 1.16			
Notes: Vol = Qnet x time Qnet = Q - Qallow				
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m <sup>3</sup> )
5	242.70	4.46	3.97	1.19
10	175.55	3.28	2.79	1.68
15	142.89	2.63	2.14	1.82
20	118.95	2.21	1.72	2.06
25	103.86	1.91	1.42	2.13
30	91.87	1.69	1.20	2.16
35	82.58	1.62	1.03	2.16
40	75.15	1.38	0.89	2.14
45	69.05	1.27	0.78	2.11
50	63.95	1.16	0.69	2.06
55	59.62	1.10	0.61	2.00
60	55.62	1.03	0.64	1.94
65	52.85	0.97	0.48	1.85
70	49.79	0.92	0.43	1.79
75	47.26	0.87	0.39	1.71
80	44.99	0.83	0.34	1.62
85	42.95	0.79	0.30	1.53
90	41.11	0.76	0.27	1.43

Ponding Depth (5 Year Storm)		
Time (min)	V (m <sup>3</sup> )	H (m)
0	0.00	0.00
0	0.00	0.01
1	0.01	0.02
3	0.03	0.03
5	0.06	0.04
7	0.12	0.05
10	0.20	0.06
14	0.32	0.07
18	0.48	0.08
23	0.68	0.09
28	0.94	0.10
34	1.25	0.11
41	1.62	0.12
48	2.07	0.13
55	2.58	0.14
63	3.17	0.15

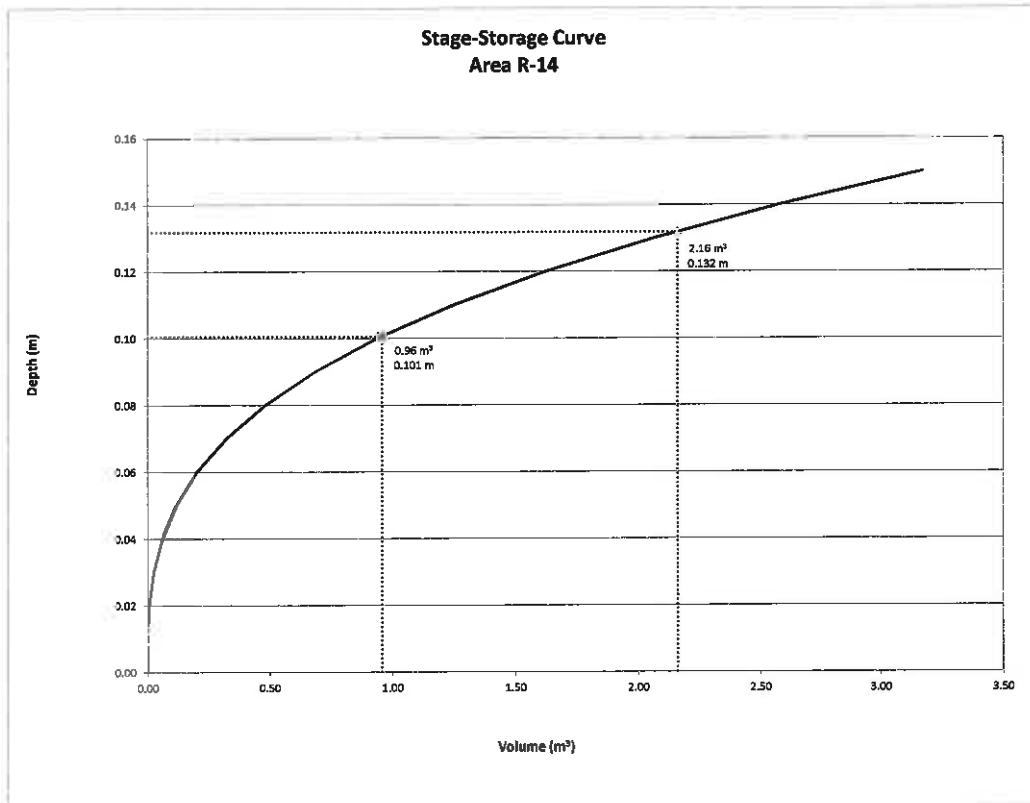
Ponding Depth (100-Year Storm)		
Time (min)	V (m <sup>3</sup> )	H (m)
0	0.00	0.00
0	0.00	0.01
1	0.01	0.02
3	0.03	0.03
5	0.06	0.04
7	0.12	0.05
10	0.20	0.06
14	0.32	0.07
18	0.48	0.08
23	0.68	0.09
28	0.94	0.10
34	1.25	0.11
41	1.62	0.12
48	2.07	0.13
55	2.58	0.14
63	3.17	0.15

Linear Interpolation			
H	0.10	H =	0.101 m
0.11	0.98	0.94	Q <sub>allow</sub> = 3.73 L/s/m of head

Note: Gallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)

Linear Interpolation			
H	0.13	H =	0.132 m
0.14	2.58	2.07	Q <sub>allow</sub> = 3.73 L/s/m of head

Note: Gallow is the flow rate through an overcontrolled Zurn Roof Drain (3.73 L/s/m of head.)



REQUIRED STORAGE - 5-YEAR EVENT				
AREA R-15 BUILDING ROOF				
OTTAWA IDF CURVE				
Area =	0.21 ha	fa	Qallow =	0.51
C =	0.70		Q(max) =	1.93
			Notes =	
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m <sup>3</sup> )
5	141.18	3.88	3.28	0.88
10	104.19	2.70	2.30	1.36
15	73.56	2.17	1.77	1.59
20	70.25	1.82	1.42	1.71
25	60.80	1.68	1.18	1.77
30	63.93	1.40	1.00	1.80
35	48.52	1.26	0.86	1.80
40	44.18	1.16	0.76	1.79
45	40.65	1.05	0.85	1.78
50	37.65	0.98	0.58	1.73
55	35.12	0.91	0.61	1.63
60	32.94	0.85	0.42	1.63
65	31.04	0.80	0.40	1.58
70	29.37	0.76	0.36	1.52
75	27.89	0.72	0.32	1.45
80	26.56	0.69	0.29	1.38
85	25.37	0.66	0.26	1.31
90	24.23	0.63	0.23	1.24

Notes: Vol = Qnet x time  
Qnet = Q - Qallow

Flooding Depth (5-Year Storm)		
Area m <sup>2</sup>	V m <sup>3</sup>	H m
0	0.00	0.00
0	0.00	0.01
2	0.01	0.02
4	0.04	0.03
7	0.10	0.04
11	0.19	0.05
16	0.32	0.06
22	0.51	0.07
29	0.77	0.08
36	1.09	0.09
45	1.60	0.10
54	1.96	0.11
65	2.58	0.12
76	3.29	0.13
88	4.10	0.14
101	5.05	0.15

Linear Interpolation:			
Area	H	Q <sub>allow</sub>	H
0.11	0.10		0.106 m
1.89	1.80		Q <sub>allow</sub> = 0.51
1.60			

Note: Qallow is the flow rate through an overcontrolled 200 Roof Drain (3.73 L/s/m of head.)

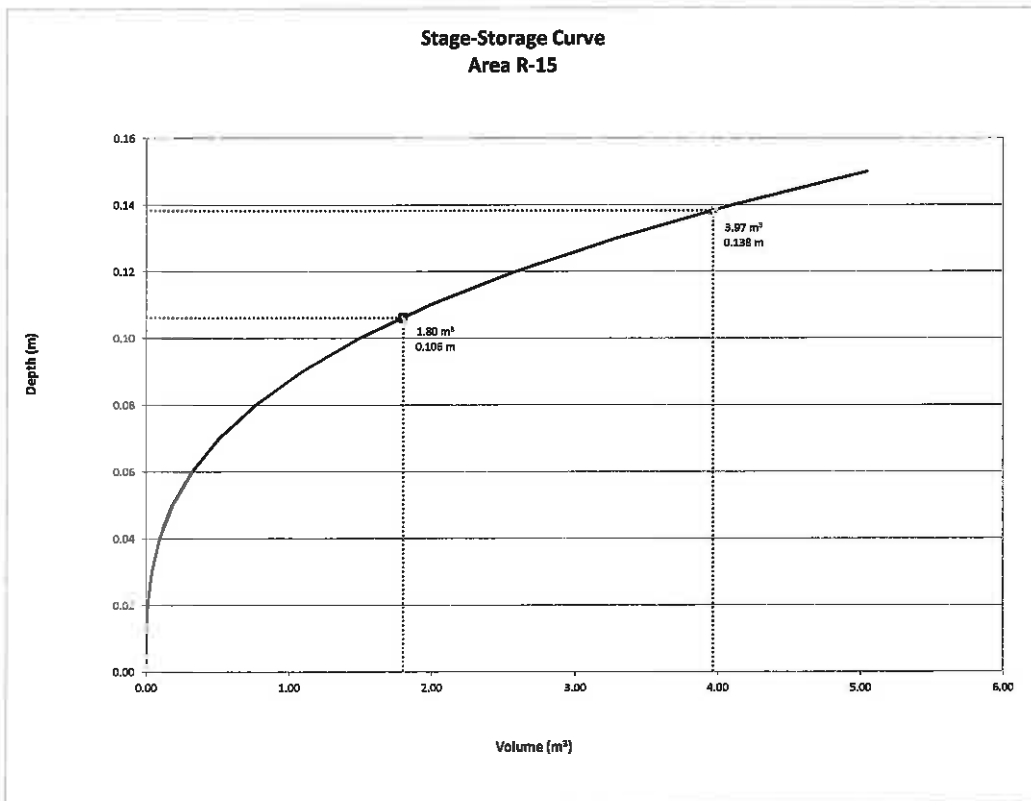
REQUIRED STORAGE - 100-YEAR EVENT				
AREA R-15 BUILDING ROOF				
OTTAWA IDF CURVE				
Area =	0.21 ha	fa	Qallow =	0.52
C =	1.00		Q(max) =	5.97
			Notes =	
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m <sup>3</sup> )
5	242.70	6.60	6.47	1.64
10	178.58	5.14	4.62	2.77
15	142.89	4.12	3.60	3.24
20	119.05	3.45	2.93	3.52
25	103.85	2.89	2.47	3.71
30	91.87	2.65	2.13	3.83
35	82.58	2.38	1.86	3.90
40	75.15	2.16	1.64	3.95
45	69.05	1.99	1.47	3.97
50	63.65	1.84	1.32	3.97
55	59.62	1.72	1.20	3.95
60	56.59	1.61	1.09	3.92
65	52.65	1.52	1.00	3.89
70	48.79	1.43	0.91	3.84
75	47.26	1.36	0.84	3.78
80	44.99	1.30	0.79	3.72
85	42.85	1.24	0.72	3.66
90	41.11	1.18	0.66	3.59

Notes: Vol = Qnet x time  
Qnet = Q - Qallow

Flooding Depth (100-Year Storm)		
Area m <sup>2</sup>	V m <sup>3</sup>	H m
0	0.00	0.00
0	0.00	0.01
2	0.01	0.02
4	0.04	0.03
7	0.10	0.04
11	0.19	0.05
16	0.32	0.06
22	0.51	0.07
29	0.77	0.08
36	1.09	0.09
45	1.60	0.10
54	1.96	0.11
65	2.58	0.12
76	3.29	0.13
88	4.10	0.14
101	5.05	0.15

Linear Interpolation:			
Area	H	Q <sub>allow</sub>	H
0.14	0.13		0.136 m
4.10	3.97		Q <sub>allow</sub> = 0.52
3.29			

Note: Qallow is the flow rate through an overcontrolled 200 Roof Drain (3.73 L/s/m of head.)



REQUIRED STORAGE - 5-YEAR EVENT				
AREA		BUILDING ROOF		
OTTAWA IDF CURVE				
Area =	0.0102	ha	Qallow =	6.40
C =	0.90		Vallow(m³) =	1.78
			Noflows =	1
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m³)
5	141.18	3.82	3.22	0.97
10	104.19	2.87	2.26	1.37
15	83.58	2.14	1.75	1.87
20	70.25	1.80	1.41	1.89
25	60.90	1.56	1.17	1.75
30	53.93	1.38	0.99	1.78
35	48.52	1.24	0.85	1.78
40	44.16	1.13	0.74	1.77
45	40.85	1.04	0.66	1.75
50	37.85	0.97	0.57	1.71
55	35.12	0.90	0.51	1.67
60	32.64	0.84	0.46	1.62
65	31.04	0.80	0.40	1.58
70	29.37	0.75	0.36	1.50
75	27.89	0.71	0.32	1.44
80	26.56	0.68	0.29	1.37
85	25.37	0.65	0.26	1.30
90	24.29	0.62	0.23	1.23

Note: Vol = Qnet x time  
Qnet = Q - Qallow

Flooding Depth (5-Year Storm)		
Area (m²)	V (m³)	H (m)
0	0.00	0.00
0	0.00	0.01
2	0.01	0.02
4	0.04	0.03
7	0.09	0.04
11	0.19	0.05
16	0.32	0.06
22	0.51	0.07
28	0.76	0.08
36	1.08	0.09
45	1.48	0.10
54	1.98	0.11
64	2.58	0.12
75	3.28	0.13
87	4.07	0.14
100	5.01	0.15

Linear Interpolation			
Area	H	Area	H
0.11	0.10		0.108 m
1.98	1.78		Q <sub>allow</sub> = 6.40

Note: Qallow is the flow rate through an e-controlled Zum Roof Drain (3.73 L/s/m of head.)

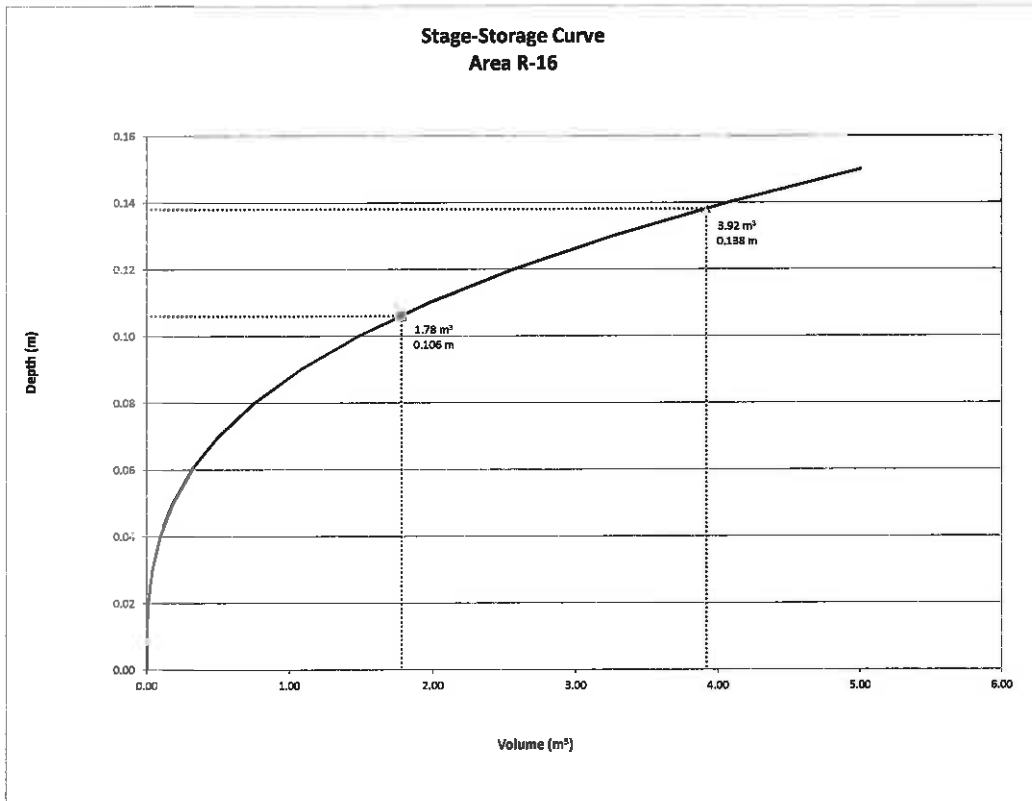
REQUIRED STORAGE - 100-YEAR EVENT				
AREA		BUILDING ROOF		
OTTAWA IDF CURVE				
Area =	0.0102	ha	Qallow =	0.52
C =	0.90		Vallow(m³) =	0.45
			Noflows =	1
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m³)
5	242.70	6.51	6.40	1.92
10	178.56	5.09	4.57	2.74
15	142.89	4.07	3.56	3.20
20	119.95	3.72	2.90	3.48
25	103.86	2.98	2.44	3.66
30	91.87	2.62	2.10	3.78
35	82.58	2.35	1.84	3.86
40	75.15	2.14	1.63	3.90
45	69.05	1.97	1.45	3.92
50	63.95	1.82	1.31	3.92
55	59.82	1.70	1.18	3.90
60	55.80	1.59	1.08	3.88
65	52.85	1.50	0.98	3.84
70	49.79	1.42	0.90	3.79
75	47.26	1.35	0.83	3.74
80	44.99	1.28	0.77	3.68
85	42.95	1.22	0.71	3.61
90	41.11	1.17	0.66	3.54

Note: Vol = Qnet x time  
Qnet = Q - Qallow

Flooding Depth (100-Year Storm)		
Area (m²)	V (m³)	H (m)
0	0.00	0.00
0	0.00	0.01
2	0.01	0.01
4	0.04	0.03
7	0.09	0.04
11	0.19	0.05
16	0.32	0.06
22	0.51	0.07
28	0.76	0.08
36	1.08	0.09
45	1.48	0.10
54	1.98	0.11
64	2.58	0.12
75	3.28	0.13
87	4.07	0.14
100	5.01	0.15

Linear Interpolation			
Area	H	Area	H
0.14	0.13		0.138 m
4.07	3.92		Q <sub>allow</sub> = 0.52

Note: Qallow is the flow rate through an e-controlled Zum Roof Drain (3.73 L/s/m of head.)



REQUIRED STORAGE - 5-YEAR EVENT					
AREA R-17			BUILDING ROOF		
OTTAWA IDF CURVE					
Area =	5.0102	m <sup>2</sup>	Q <sub>allow</sub> =	0.40	L/s/m <sup>2</sup>
C =	1.90		Vol (m <sup>3</sup> ) =	1.77	
			Q <sub>allow</sub> =	1	
Time (min)	Intensity (mm/hr)	Q (L/s)	Q <sub>net</sub> (L/s)	Vol (m <sup>3</sup> )	
5	141.18	3.81	3.21	0.96	
10	104.18	2.86	2.26	1.36	
15	83.66	2.14	1.74	1.68	
20	70.25	1.80	1.40	1.88	
25	60.60	1.56	1.18	1.74	
30	53.93	1.38	0.95	1.78	
35	48.52	1.24	0.84	1.77	
40	44.18	1.13	0.73	1.75	
45	40.83	1.04	0.64	1.73	
50	37.85	0.96	0.56	1.69	
55	35.12	0.90	0.50	1.64	
60	32.94	0.84	0.44	1.59	
65	31.04	0.79	0.39	1.54	
70	29.37	0.75	0.35	1.47	
75	27.86	0.71	0.31	1.41	
80	26.56	0.68	0.28	1.34	
85	25.37	0.65	0.25	1.27	
90	24.29	0.62	0.22	1.19	

Notes: Vol = Q<sub>net</sub> x time  
Q<sub>net</sub> = Q - Q<sub>allow</sub>

Ponding Depth (5-Year Storm)		
Area m <sup>2</sup>	H m	Vol m <sup>3</sup>
0	0.00	0.00
0	0.00	0.01
2	0.01	0.02
4	0.04	0.03
7	0.09	0.04
11	0.16	0.05
16	0.32	0.06
22	0.50	0.07
28	0.75	0.08
36	1.07	0.09
44	1.46	0.10
53	1.95	0.11
63	2.53	0.12
74	3.22	0.13
86	4.02	0.14
99	4.94	0.15

Linear Interpolation			
H	Q <sub>allow</sub>	H	Q <sub>allow</sub>
0.11	0.10	1.95	0.106 m
1.95	1.46		0.106 m

Note: Q<sub>allow</sub> is the flow rate through an overcontrolled Zurn Roof Drain (3.75 L/s/m of head.)

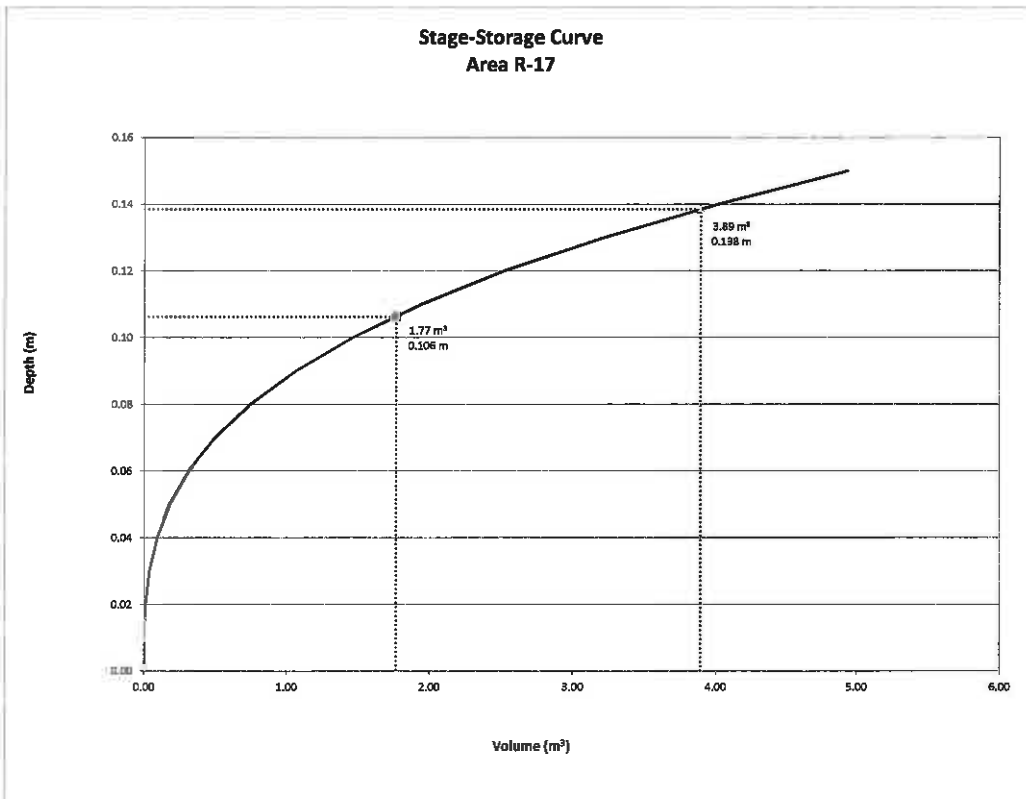
REQUIRED STORAGE - 100-YEAR EVENT					
AREA R-17			BUILDING ROOF		
OTTAWA IDF CURVE					
Area =	0.0102	m <sup>2</sup>	Q <sub>allow</sub> =	0.52	L/s/m <sup>2</sup>
C =	1.90		Vol (m <sup>3</sup> ) =	3.89	
			Q <sub>allow</sub> =	1	
Time (min)	Intensity (mm/hr)	Q (L/s)	Q <sub>net</sub> (L/s)	Vol (m <sup>3</sup> )	
5	242.70	6.90	6.38	1.91	
10	178.66	5.07	4.55	2.73	
15	142.89	4.08	3.54	3.19	
20	118.95	3.41	2.89	3.47	
25	103.85	2.95	2.43	3.65	
30	91.87	2.61	2.09	3.78	
35	82.53	2.35	1.83	3.84	
40	75.15	2.14	1.62	3.88	
45	69.05	1.98	1.54	3.89	
50	63.95	1.82	1.30	3.89	
55	59.62	1.69	1.17	3.87	
60	55.86	1.59	1.07	3.85	
65	52.65	1.50	0.98	3.81	
70	49.79	1.41	0.92	3.76	
75	47.23	1.34	0.82	3.70	
80	44.99	1.28	0.78	3.64	
85	42.96	1.22	0.70	3.57	
90	41.11	1.17	0.65	3.50	

Notes: Vol = Q<sub>net</sub> x time  
Q<sub>net</sub> = Q - Q<sub>allow</sub>

Ponding Depth (100-Year Storm)		
Area m <sup>2</sup>	H m	Vol m <sup>3</sup>
0	0.00	0.00
0	0.00	0.01
2	0.01	0.02
4	0.04	0.03
7	0.09	0.04
11	0.16	0.05
16	0.32	0.06
22	0.50	0.07
28	0.75	0.08
36	1.07	0.09
44	1.46	0.10
53	1.95	0.11
63	2.53	0.12
74	3.22	0.13
86	4.02	0.14
99	4.94	0.15

Linear Interpolation			
H	Q <sub>allow</sub>	H	Q <sub>allow</sub>
0.14	0.13	4.02	0.138 m
4.02	3.89		0.138 m

Note: Q<sub>allow</sub> is the flow rate through an overcontrolled Zurn Roof Drain (3.75 L/s/m of head.)



REQUIRED STORAGE - 5-YEAR EVENT				
AREA R-18 BUILDING ROOF				
OTTAWA IDF CURVE				
Area =	0.10	ha	Qallow =	0.27
C =	0.10		Qmax =	0.09
			Notches =	1
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m³)
5	141.18	0.44	0.17	0.05
10	104.19	0.39	0.06	0.03
15	83.56	0.28	-0.01	-0.01
20	70.25	0.22	-0.05	-0.06
25	60.90	0.19	-0.06	-0.12
30	53.03	0.17	-0.10	-0.18
35	48.52	0.15	-0.12	-0.25
40	44.18	0.14	-0.13	-0.31
45	40.63	0.13	-0.14	-0.38
50	37.65	0.12	-0.15	-0.45
55	35.12	0.11	-0.16	-0.53
60	32.94	0.10	-0.17	-0.60
65	31.04	0.10	-0.17	-0.67
70	29.37	0.09	-0.18	-0.75
75	27.89	0.09	-0.18	-0.82
80	26.58	0.08	-0.19	-0.90
85	25.37	0.08	-0.19	-0.97
90	24.29	0.08	-0.19	-1.05

Notes: Vol = Qnet x time  
Qnet = Q - Qallow

Ponding Depth (5-Year Storm)		
Area (m²)	V (m³)	H (m)
0	0.00	0.00
0	0.00	0.01
0	0.00	0.02
0	0.00	0.03
1	0.01	0.04
1	0.02	0.05
2	0.03	0.06
2	0.05	0.07
3	0.07	0.08
3	0.10	0.09
4	0.14	0.10
5	0.19	0.11
6	0.25	0.12
7	0.31	0.13
8	0.39	0.14
10	0.48	0.15

Linear Interpolation			
0.08	H	0.07	H = 0.071 m
0.07	Q	0.05	Q <sub>allow</sub> = 0.05

Note: Qallow is the flow rate through an oversized Zurn Roof Drain (3.73 L/s/m of head.)

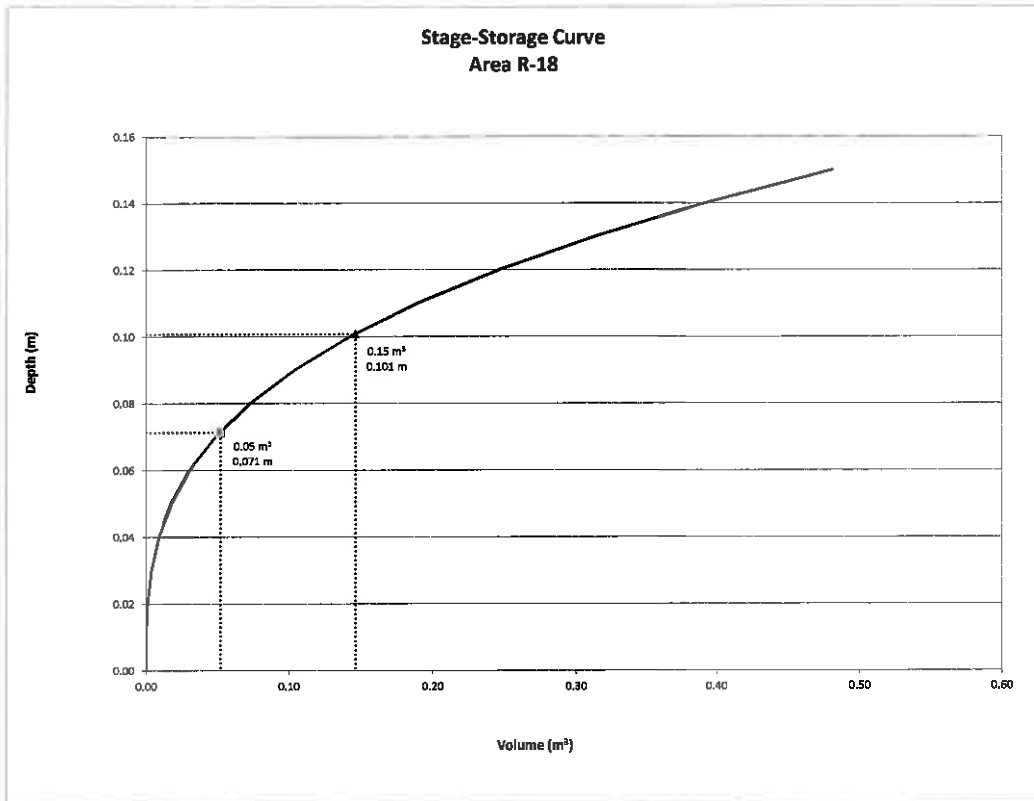
REQUIRED STORAGE - 100-YEAR EVENT				
AREA R-18 BUILDING ROOF				
OTTAWA IDF CURVE				
Area =	0.10	ha	Qallow =	0.32
C =	0.10		Qmax =	0.15
			Notches =	1
Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m³)
5	242.70	0.85	0.47	0.14
10	178.58	0.62	0.24	0.15
15	142.98	0.50	0.12	0.11
20	119.96	0.42	0.04	0.05
25	103.85	0.38	-0.02	-0.03
30	91.87	0.32	-0.06	-0.11
35	82.58	0.29	-0.09	-0.19
40	75.15	0.26	-0.12	-0.28
45	69.05	0.24	-0.14	-0.27
50	63.95	0.22	-0.16	-0.47
55	59.82	0.21	-0.17	-0.67
60	55.95	0.20	-0.18	-0.88
65	52.65	0.18	-0.20	-0.78
70	44.79	0.17	-0.21	-0.87
75	47.26	0.17	-0.21	-0.97
80	44.99	0.16	-0.22	-1.07
85	42.95	0.15	-0.23	-1.17
90	41.11	0.14	-0.24	-1.25

Notes: Vol = Qnet x time  
Qnet = Q - Qallow

Ponding Depth (100-Year Storm)		
Area (m²)	V (m³)	H (m)
0	0.00	0.00
0	0.00	0.01
0	0.00	0.02
0	0.00	0.03
1	0.01	0.04
1	0.02	0.05
2	0.03	0.06
2	0.05	0.07
3	0.07	0.08
3	0.10	0.09
4	0.14	0.10
5	0.19	0.11
6	0.25	0.12
7	0.31	0.13
8	0.39	0.14
10	0.48	0.15

Linear Interpolation			
0.11	H	0.1	H = 0.101 m
0.19	Q	0.14	Q <sub>allow</sub> = 0.14

Note: Qallow is the flow rate through an oversized Zurn Roof Drain (3.73 L/s/m of head.)





REQUIRED STORAGE - 5-YEAR EVENT				
AREA R-19 BUILDING ROOF				
OTTAWA IDF CURVE		Q <sub>allow</sub> = 0.36		
Area =	0.0038 ha	Q <sub>allow</sub> = 0.55		
C =	0.90	Notches = 1		
Time (min)	Intensity (mm/hr)	Q (L/s)	Q <sub>net</sub> (L/s)	d <sub>t</sub> (m)
5	141.18	1.27	0.91	0.27
10	104.19	0.94	0.58	0.36
15	83.56	0.75	0.39	0.38
20	70.25	0.63	0.27	0.33
25	60.80	0.55	0.19	0.28
30	53.93	0.48	0.12	0.22
35	48.52	0.44	0.08	0.16
40	44.18	0.40	0.04	0.09
45	40.63	0.37	0.01	0.01
50	37.65	0.34	-0.02	-0.08
55	35.12	0.32	-0.04	-0.15
60	32.94	0.30	-0.06	-0.23
65	31.04	0.28	-0.08	-0.32
70	29.37	0.26	-0.10	-0.40
75	27.89	0.25	-0.11	-0.49
80	26.56	0.24	-0.12	-0.58
85	25.37	0.23	-0.13	-0.67
90	24.29	0.22	-0.14	-0.77

Notes: d<sub>t</sub> = Q<sub>net</sub> x time  
Q<sub>net</sub> = Q - Q<sub>allow</sub>

Ponding Depth (5 Year Storm)		
Area (m <sup>2</sup> )	I <sub>a</sub> (m)	H (m)
0	0.00	0.00
0	0.00	0.01
0	0.00	0.02
1	0.01	0.03
2	0.03	0.04
3	0.05	0.05
4	0.09	0.06
6	0.14	0.07
8	0.20	0.08
10	0.29	0.09
12	0.40	0.10
15	0.53	0.11
17	0.69	0.12
20	0.95	0.13
23	1.10	0.14
27	1.35	0.15

Linear Interpolation			
Q <sub>allow</sub>	H	Q <sub>allow</sub>	H
0.10	0.09		0.098 m
0.40	0.20	0.35	0.129 m

Note: Q<sub>allow</sub> is the flow rate through an uncontrolled 20mm Roof Drain (3.75 L/s/m of head.)

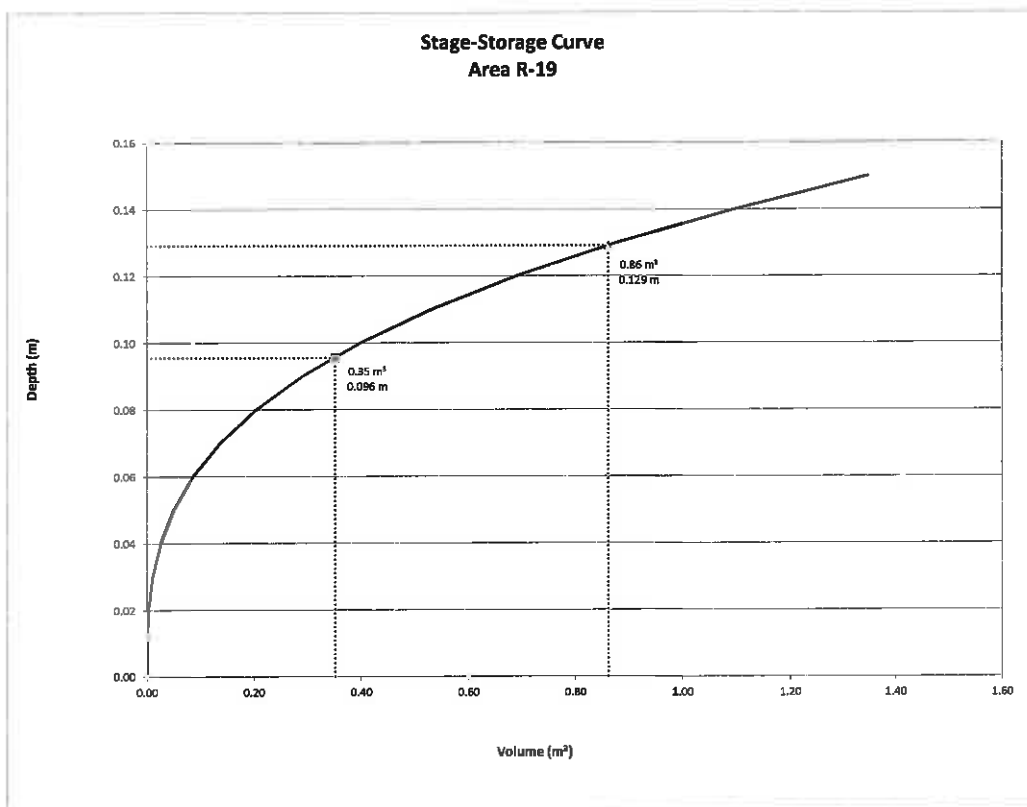
REQUIRED STORAGE - 100-YEAR EVENT				
AREA R-19 BUILDING ROOF				
OTTAWA IDF CURVE		Q <sub>allow</sub> = 0.45		
Area =	0.0038 ha	Q <sub>allow</sub> = 0.70		
C =	1.00	Notches = 1		
Time (min)	Intensity (mm/hr)	Q (L/s)	Q <sub>net</sub> (L/s)	d <sub>t</sub> (m)
5	242.70	2.42	1.94	0.58
10	178.56	1.78	1.50	0.78
15	142.89	1.43	0.85	0.85
20	119.05	1.20	0.72	0.88
25	103.85	1.04	0.56	0.84
30	91.87	0.92	0.44	0.79
35	82.58	0.82	0.34	0.72
40	75.15	0.75	0.27	0.65
45	69.05	0.69	0.21	0.57
50	63.65	0.64	0.16	0.48
55	58.62	0.60	0.12	0.38
60	53.89	0.56	0.08	0.28
65	49.45	0.53	0.05	0.18
70	45.26	0.50	0.02	0.07
75	41.28	0.47	-0.01	-0.04
80	37.56	0.45	-0.03	-0.15
85	34.05	0.43	-0.05	-0.26
90	30.71	0.41	-0.07	-0.37

Notes: d<sub>t</sub> = Q<sub>net</sub> x time  
Q<sub>net</sub> = Q - Q<sub>allow</sub>

Ponding Depth (100-Year Storm)		
Area (m <sup>2</sup> )	I <sub>a</sub> (m)	H (m)
0	0.00	0.00
0	0.00	0.01
0	0.00	0.02
1	0.01	0.03
2	0.03	0.04
3	0.05	0.05
4	0.09	0.06
6	0.14	0.07
8	0.20	0.08
10	0.29	0.09
12	0.40	0.10
15	0.53	0.11
17	0.69	0.12
20	0.95	0.13
23	1.10	0.14
27	1.35	0.15

Linear Interpolation			
Q <sub>allow</sub>	H	Q <sub>allow</sub>	H
0.10	0.09		0.129 m
0.40	0.20	0.66	0.129 m

Note: Q<sub>allow</sub> is the flow rate through an uncontrolled 20mm Roof Drain (3.75 L/s/m of head.)



REQUIRED STORAGE - 5-YEAR EVENT					
AREA	R-20	BUILDING ROOF			
OTTAWA IDF CURVE					
Area =	0.0015 ha	Q <sub>allow</sub> =	0.37		
C =	0.80	Vol <sub>(max)</sub> =	0.0E		
		Note: =	1		
Time (min)	Intensity (mm/hr)	Q (L/s)	Q <sub>net</sub> (L/s)	Vol (m <sup>3</sup> )	
5	141.18	0.44	0.17	0.05	
10	104.18	0.33	0.06	0.03	
15	83.56	0.26	-0.01	-0.01	
20	70.25	0.22	-0.05	-0.08	
25	60.80	0.19	-0.08	-0.12	
30	53.93	0.17	-0.10	-0.18	
35	48.52	0.15	-0.12	-0.25	
40	44.18	0.14	-0.13	-0.31	
45	40.63	0.13	-0.14	-0.38	
50	37.65	0.12	-0.15	-0.45	
55	35.12	0.11	-0.16	-0.53	
60	32.94	0.10	-0.17	-0.60	
65	31.04	0.10	-0.17	-0.67	
70	29.37	0.09	-0.18	-0.75	
75	27.89	0.09	-0.18	-0.82	
80	26.56	0.08	-0.19	-0.90	
85	25.37	0.08	-0.19	-0.97	
90	24.29	0.08	-0.19	-1.05	

Notes: Vol = Q<sub>net</sub> x time  
Q<sub>net</sub> = Q - Q<sub>allow</sub>

Ponding Depth (5-Year Storm)		
Area (m <sup>2</sup> )	H (m)	Vol (m <sup>3</sup> )
0	0.00	0.00
0	0.00	0.01
0	0.00	0.02
0	0.00	0.03
1	0.01	0.04
1	0.02	0.06
2	0.03	0.06
2	0.05	0.07
3	0.07	0.07
3	0.10	0.09
4	0.14	0.10
5	0.19	0.11
6	0.25	0.12
7	0.31	0.13
8	0.39	0.14
10	0.48	0.15

Linear Interpolation			
Area (m <sup>2</sup> )	H (m)	Vol (m <sup>3</sup> )	H (m)
0.08	0.07		0.071 m
0.07	0.05	0.05	Q <sub>allow</sub> = 0.37 L/s

Note: Q<sub>allow</sub> is the flow rate through an orifice-controlled Zurn Roof Drain (3.73 L/s/m of head.)

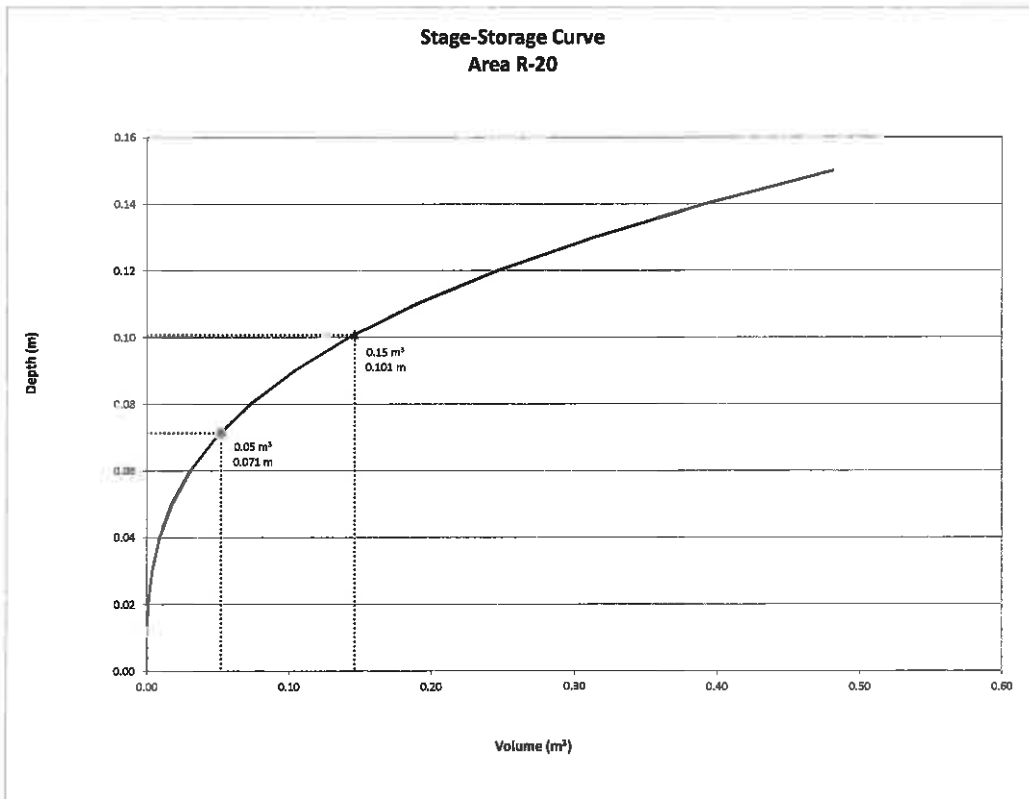
REQUIRED STORAGE - 100-YEAR EVENT					
AREA	R-20	BUILDING ROOF			
OTTAWA IDF CURVE					
Area =	0.5013 ha	Q <sub>allow</sub> =	0.38		
C =	1.00	Vol <sub>(max)</sub> =	0.15		
		Note: =	1		
Time (min)	Intensity (mm/hr)	Q (L/s)	Q <sub>net</sub> (L/s)	Vol (m <sup>3</sup> )	
5	242.70	0.85	0.47	0.14	
10	178.56	0.62	0.24	0.15	
15	142.69	0.50	0.12	0.11	
20	119.95	0.42	0.04	0.05	
25	103.85	0.36	-0.02	-0.03	
30	91.87	0.32	-0.06	-0.11	
35	82.58	0.29	-0.09	-0.19	
40	75.15	0.26	-0.12	-0.28	
45	69.05	0.24	-0.14	-0.37	
50	63.95	0.22	-0.16	-0.47	
55	59.62	0.21	-0.17	-0.57	
60	55.79	0.20	-0.18	-0.68	
65	52.65	0.18	-0.20	-0.76	
70	49.79	0.17	-0.21	-0.87	
75	47.26	0.17	-0.21	-0.97	
80	44.99	0.16	-0.22	-1.07	
85	42.85	0.15	-0.23	-1.17	
90	41.11	0.14	-0.24	-1.28	

Notes: Vol = Q<sub>net</sub> x time  
Q<sub>net</sub> = Q - Q<sub>allow</sub>

Ponding Depth (100-Year Storm)		
Area (m <sup>2</sup> )	H (m)	Vol (m <sup>3</sup> )
0	0.00	0.00
0	0.00	0.01
0	0.00	0.02
0	0.00	0.03
1	0.01	0.04
1	0.02	0.05
2	0.03	0.06
2	0.05	0.07
3	0.07	0.08
3	0.10	0.09
4	0.14	0.10
5	0.19	0.11
6	0.25	0.12
7	0.31	0.13
8	0.39	0.14
10	0.48	0.15

Linear Interpolation			
Area (m <sup>2</sup> )	H (m)	Vol (m <sup>3</sup> )	H (m)
0.11	0.1		0.101 m
0.19	0.15	0.14	Q <sub>allow</sub> = 0.38 L/s

Note: Q<sub>allow</sub> is the flow rate through an orifice-controlled Zurn Roof Drain (3.73 L/s/m of head.)



**APPENDIX C  
ZURN ROOF DRAIN**



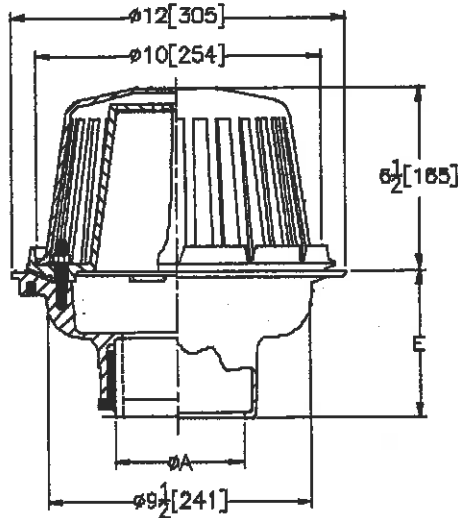
# ZCF121

## 12" [305] DIAMETER ROOF DRAIN TAG

SPECIFICATION SHEET



Dimensional Data (inches and [mm]) are Subject to Manufacturing Tolerances and Change Without Notice



A Pipe Size Inches / [mm]	Approx. Wt. Lbs. / [kg]	Dome Open Area Sq. In. / [sq cm]
2-3-4 [51-76-102]	22 [10]	78 [503]
5-6 [127-152]		

**ENGINEERING SPECIFICATION:** ZURN ZCF121 12" [305] diameter "Control-Flo" roof drain for dead-level roof construction, Dura-Coated cast iron body. "Control-Flo" weir shall be linear functioning with integral membrane flashing clamp/gravel guard and Poly-Dome. All data shall be verified proportional to flow rates.

**OPTIONS** (Check/specify appropriate options)

**PIPE SIZE**

- 2 thru 6 [50 thru 150]
- 2 thru 6 [50 thru 150]
- 2 thru 6 [50 thru 150]
- 2,3,4 [50,75,100]

(Specify size/type) **OUTLET**

- \_\_\_\_\_ IC Inside Caulk
- \_\_\_\_\_ IP Threaded
- \_\_\_\_\_ NH No-Hub
- \_\_\_\_\_ NL Neo-Loc

**E BODY HT. DIM.**

- 5 1/4 [133]
- 3 3/4 [95]
- 5 1/4 [133]
- 4 5/8 [117]

**PREFIXES**

- \_\_\_\_\_ Z D.C.C.I. Body with Poly-Dome\*
- \_\_\_\_\_ ZA D.C.C.I. Body with Aluminum Dome

**SUFFIXES**

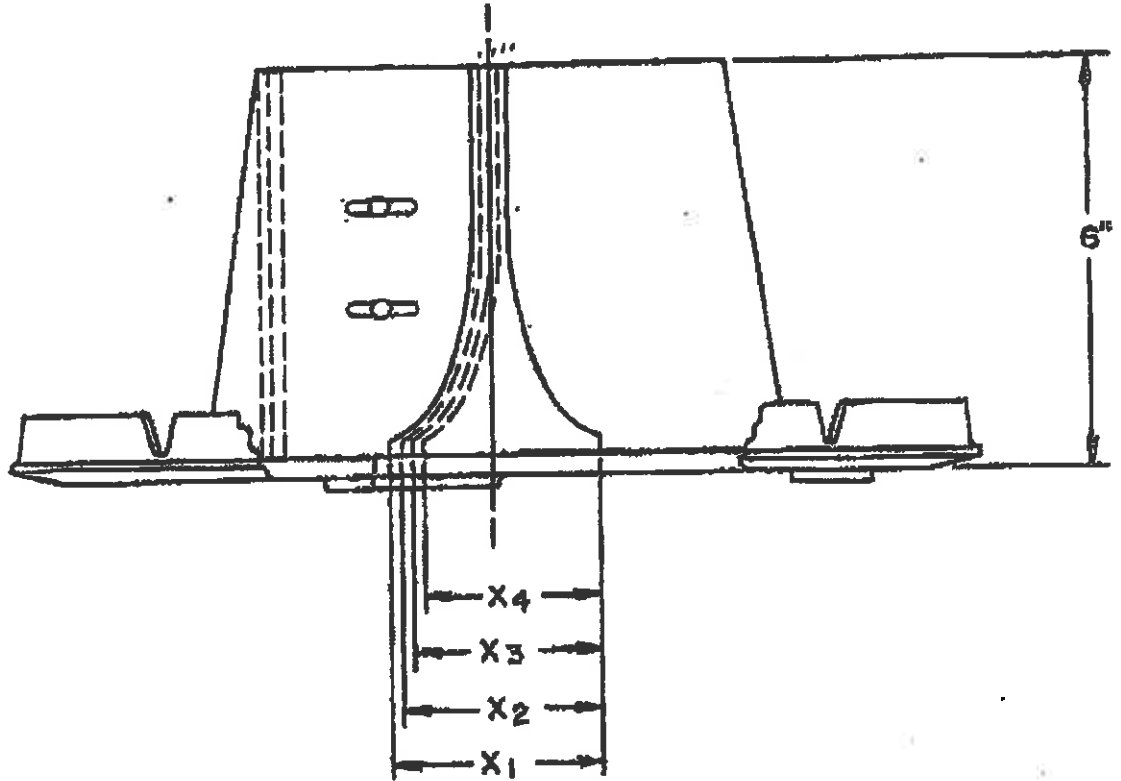
- |   |   |
|---|---|
| _____ -A Waterproof Flange  | _____ -R Roof Sump Receiver   |
| _____ -AR Acid Resistant Epoxy Coated Finish                                    | _____ -SC Secondary Clamp Collar  |
| _____ -BS Bronze Mesh Screen Over Dome  | _____ -SE 3 3/4 [95] Slotted Extension - Inverted Roof                    |
| _____ -C Underdeck Clamp  | _____ -SSM Stainless Steel Mesh Screen Over Dome                          |
| _____ -DP Top Set® Roof Deck Plate (Replaces both the -C and -R)                | _____ -TC Neo-LocTest CapGasket (2 [51] to 4 [102] NL Bottom Outlet Only) |
| _____ -DR Adjustable Drain Riser Extension Assembly 3-5/8" [92] to 7-1/4" [184] | _____ -VP Vandal Proof Secured Top  |
| _____ -E Static Extension 1 [25] thru 4 [102] (Specify Ht.)                     | _____ -84 Stainless Steel Perforated Gravel Guard                         |
| _____ -EB Elevating Body Plate  | _____ -85 Stainless Steel Perforated Extension                            |
| _____ -ES Static Extension with Secondary Clamp Collar Body                     | _____ -89 2 [51] High External Water Dam                                  |
| _____ -FG Flush Grate (Replaces Dome Strainer)                                  | _____ -90 90° Threaded Side Outlet Body                                   |
| _____ -G Galvanized Cast Iron   |   |

REV. A DATE: 05/17/04 C.N. NO. 89816

DWG. NO. 63603 PRODUCT NO. ZCF121

\*REGULARLY FURNISHED UNLESS OTHERWISE SPECIFIED

**NOTE:**  
 ADJUSTABLE WEIR CAN BE ADJUSTED TO FLOW AT VARIOUS RATES. FOR SIZING CONTACT ZURN IND., INC.



OPENING	G.P.M. PER INCH OF HEAD	MAX FLOW G.P.M.
X <sub>1</sub>	10 5'	60 30
X <sub>2</sub>	7.5 3.75	45 22.5
X <sub>3</sub>	5.0 2.5	30 15
X <sub>4</sub>	2.5 1.25	15 7.5

ADJUSTABLE WEIR FOR SLOPED-ROOF  
 "CONTROL-FLO" ROOF DRAIN

PRODUCT NUMBER  
 Z-105-10-77

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 ZURN IND., INC.

**ZURN** a step ahead of tomorrow

ZURN INDUSTRIES, INC.  
 ERIE, PA. U.S.A. 16512

DRAWING NUMBER  
 P-13521

This drawing is to be used in conjunction with the ZURN CONTROL-FLO ROOF DRAIN and is not to be used for any other purpose without the written permission of Zurn Industries, Inc., Erie, Pa.

CR 1-1-88 at CR cso. MM appo. AB LABY REV. CHN. DATE BY CRD. APPD.

**APPENDIX D  
CORRESPONDENCE**

### **ATTACHED DRAWINGS**

- 7 112191-GP GENERAL PLAN OF SERVICES
- 8 112191-GR GRADING AND EROSION CONTROL PLAN
- 9 112191-STM STORMWATER MANAGEMENT PLAN
- 10 12909-12 Claridge Lts 1 2 3 PL 73 T F1 Topographical Survey