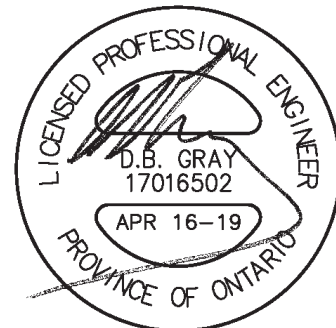


# SERVICING BRIEF & STORMWATER MANAGEMENT REPORT

Mitch Owens / Boundary Road  
Ottawa, Ontario

Report No. 18029

December 18, 2018  
Revised March 5, 2019  
Revised April 16, 2019



NOT VALID UNLESS  
SIGNED & DATED

## D. B. GRAY ENGINEERING INC.

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# SERVICING BRIEF & STORMWATER MANAGEMENT REPORT

Mitch Owens / Boundary Road  
Ottawa, Ontario

This Servicing Brief & Stormwater Management Report is a description of the services for a 5,213 sq.m. (+56,000 sq.ft.) cross dock facility and addresses the stormwater management requirements of 4.2 hectares of land located at the southwest of the Mitch Owens Road / Boundary Road intersection.

This report forms part of the stormwater management design for the proposed development. Also refer to drawings C-1 to C-8 prepared by D. B. Gray Engineering Inc.

## WATER SUPPLY FOR FIREFIGHTING:

The property is in a rural area with no municipal water supply. The proposed building will have a sprinkler system. The mechanical engineer has calculated that 114,000 litres (+25,000 imperial gallons) is the required water supply. A water fill station (an underground tank with a water chute and draw pipe) with this capacity is proposed to be located adjacent to the fire route near the entrance to the site. A fire pump will draw from the underground tank and supply the sprinkler system (see mechanical engineering drawings documents).

## ON-SITE WELL:

An existing drilled well, located approximately 52m from the front (north) façade of the proposed building, will be used.

## ON-SITE SEWAGE SYSTEM:

An on-site septic system is proposed. It will be is a Class 4 system consisting of a 30,000 L septic tank, a dosing reservoir, two ECOFLO ST-730P Biofilter treatment units, a pump chamber and an area bed. A septic permit has been issued by the Ottawa Septic System Office (OSSO).

## STORMWATER MANAGEMENT:

### Water Quality:

The South Nation Conservation Authority (SNC) has advised that 80% total suspended solids (TSS) removal is required.

Rainfall runoff from approximately 86% of the total developed (and virtually all of the hard surfaces) will drain to one of three grassed stormwater detention areas. The grassed detention areas will have minimal slopes that will keep flow velocities low making them effective for pollutant removal and they will tend to increase the removal of TSS. The low flow conditions in these grassed areas will filter out coarse sediment from runoff and the grass will take up nutrients.

To achieve 80% TSS removal oil/grit separator (OGS) manholes (AquaShield Aqua-Swirl Concentrator model AS-4) are proposed to be located in the outlet pipe of each of three stormwater detention. The Aqua-Swirl model AS-4 has a sediment capacity of 0.9 cubic metres and an oil/debris capacity of 720 litres.

Based on software supplied by the manufacturer, the OGS in the outlet pipe of Stormwater Detention Area A1 (serving Drainage Area IV) will remove approximately 87% of TSS from the runoff produced by the subject drainage area. Output from the manufacturer's software is attached to the report.

Based on software supplied by the manufacturer, the OGS in the outlet pipe of Stormwater Detention Area A1 (serving Drainage Area IV) will remove approximately 87% of TSS from the runoff produced by the subject drainage area. Output from the manufacturer's software is attached to the report.

Based on software supplied by the manufacturer, the OGS in the outlet pipe of Stormwater Detention Area C (serving Drainage Area VI) will remove approximately 85% of TSS from the runoff produced by the subject drainage area. Output from the manufacturer's software is attached to the report

An erosion and sediment control plan has been developed to be implemented during construction, (see drawing C-3 and notes 2.1 to 2.5 on drawing C-5). In summary: to filter out construction sediment a silt fence barrier will be installed around the perimeter of the site; straw bale check dams will be installed in the roadside ditch and swales; and geotextile fabric mud mats will be install at all points of egress to public roads

## Water Quantity:

The stormwater quantity control measures detailed in this report are based on the following criteria:

- For 5-year storm event the release rate for post-development storm events is equal to or less than the flow produced by the pre-development (existing) conditions.
- For 100-year storm event the release rate for post-development storm events is 80% or less than the flow produced by the pre-development (existing) conditions.

Calculations are based on the Rational Method. The runoff coefficients for the 100 year event are increased by 25% to maximum 1.00.

It is calculated that the pre-development conditions reflect a 5-year runoff coefficient of 0.30 and 0.38 for the 100-year. Using the Airport Formula for sheet flow, it is calculated that the existing time of concentration is 52 minutes for the 5-year event and 47 minutes for the 100-year. Using the Rational Method; the pre-development (existing) 5-year peak flow is 128.28 l/s and 292.61 l/s for the 100-year. Therefore the maximum allowable release rate is 128.28 l/s and 234.09 l/s (80% of 292.61 l/s) for the 5 and 100-year respectively.

Stormwater will be stored within the development on the roof of the proposed building in three stormwater detention areas (depressed grassed areas).

### Drainage Area I (Uncontrolled Flow Off Site – 6,060 sq.m.):

The runoff from the perimeter of the site (about 14% of the total) will be allowed to flow uncontrolled off the site.

	100-year	5-year
The maximum flow rate:	76.20 l/s	35.57 l/s

### Drainage Area II (Roof 1 – 1087 sq.m.):

The roof drain on Roof 1 will be a flow control type which will restrict the flow and cause the storm water to pond on Roof 1. The flow control type roof drain shall be installed with a parabolic shaped slotted weir (3 slot per weir drain at 0.0124 l/s per mm per slot - 5 USgpm per inch per slot): Watts roof drain with a Watts Accutrol Weir RD-100 or equal. As per the Ontario Building Code scuppers are require to prevent the water on the roof from exceeding 150mm. During the 100-year event about 9% of the flow will flow out of the scuppers. The drainage from this roof discharges to grade, 50% drains to Drainage Area IV and 50% drains to drainage Area VI.

	100-year	5-year
The maximum roof drain release rate:	8.50 l/s	6.14 l/s
The maximum scupper release rate:	<u>0.88 l/s</u>	<u>0.00 l/s</u>
The maximum release rate:	9.38 l/s	6.14 l/s
The maximum ponding depth:	114 mm	83 mm
The maximum stored volume:	33.09 cu.m.	15.63 cu.m.

Drainage Area II (Roof 2 – 805 sq.m.):

The roof drain on Roof 2 will be a flow control type which will restrict the flow and cause the storm water to pond on Roof 2. The flow control type roof drain shall be installed with a parabolic shaped slotted weir (2 slot per weir drain at 0.0124 l/s per mm per slot - 5 USgpm per inch per slot): Watts roof drain with a Watts Accutrol Weir RD-100 or equal. As per the Ontario Building Code scuppers are required to prevent the water on the roof from exceeding 150mm. During the 100-year event about 17% of the flow will flow out of the scuppers. The drainage from this roof discharges to grade, 50% drains to Drainage Area IV and 50% drains to drainage Area VI.

	100-year	5-year
The maximum roof drain release rate:	5.67 l/s	4.16 l/s
The maximum scupper release rate:	<u>1.15 l/s</u>	<u>0.00 l/s</u>
The maximum release rate:	6.82 l/s	4.16 l/s
The maximum ponding depth:	114 mm	84 mm
The maximum stored volume:	24.73 cu.m.	12.15 cu.m.

Drainage Area III (Roof 3 – 872 sq.m.):

The roof drain on Roof 3 will be a flow control type which will restrict the flow and cause the storm water to pond on Roof 3. The flow control type roof drain shall be installed with a parabolic shaped slotted weir (2 slot per weir drain at 0.0124 l/s per mm per slot - 5 USgpm per inch per slot): Watts roof drain with a Watts Accutrol Weir RD-100 or equal. As per the Ontario Building Code scuppers are required to prevent the water on the roof from exceeding 150mm. During the 100-year event about 23% of the flow will flow out of the scuppers. The drainage from this roof discharges to grade and drains to Drainage Area V.

	100-year	5-year
The maximum roof drain release rate:	5.67 l/s	4.22 l/s
The maximum scupper release rate:	<u>1.69 l/s</u>	<u>0.00 l/s</u>
The maximum release rate:	7.36 l/s	4.22 l/s
The maximum ponding depth:	114 mm	85 mm
The maximum stored volume:	26.84 cu.m.	13.60 cu.m.

Drainage Area III (Roof 4 – 805 sq.m.):

The roof drain on Roof 4 will be a flow control type which will restrict the flow and cause the storm water to pond on Roof 4. The flow control type roof drain shall be installed with a parabolic shaped slotted weir (2 slot per weir drain at 0.0124 l/s per mm per slot - 5 USgpm per inch per slot): Watts roof drain with a Watts Accutrol Weir RD-100 or equal. As per the Ontario Building Code scuppers are required to prevent the water on the roof from exceeding 150mm. During the 100-year event less than 1% of the flow will flow out of the scuppers. The drainage from this roof discharges to grade and drains to Drainage Area V.

	100-year	5-year
The maximum roof drain release rate:	5.67 l/s	4.04 l/s
The maximum scupper release rate:	<u>0.03 l/s</u>	<u>0.00 l/s</u>
The maximum release rate:	5.70 l/s	4.04 l/s
The maximum ponding depth:	114 mm	81 mm

The maximum stored volume: 26.84 cu.m. 12.34 cu.m.

Drainage Area III (Roof 5 – 805 sq.m.):

The roof drain on Roof 5 will be a flow control type which will restrict the flow and cause the storm water to pond on Roof 5. The flow control type roof drain shall be installed with a parabolic shaped slotted weir (2 slot per weir drain at 0.0124 l/s per mm per slot - 5 USgpm per inch per slot): Watts roof drain with a Watts Accutrol Weir RD-100 or equal. As per the Ontario Building Code scuppers are required to prevent the water on the roof from exceeding 150mm. During the 100-year event less than 1% of the flow will flow out of the scuppers. The drainage from this roof discharges to grade and drains to Drainage Area V.

	100-year	5-year
The maximum roof drain release rate:	5.67 l/s	4.04 l/s
The maximum scupper release rate:	<u>0.03 l/s</u>	<u>0.00 l/s</u>
The maximum release rate:	5.70 l/s	4.04 l/s
The maximum ponding depth:	114 mm	81 mm
The maximum stored volume:	26.84 cu.m.	12.34 cu.m.

Drainage Area III (Roof 6 – 618 sq.m.):

The roof drain on Roof 6 will be a flow control type which will restrict the flow and cause the storm water to pond on Roof 6. The flow control type roof drain shall be installed with a parabolic shaped slotted weir (2 slot per weir drain at 0.0124 l/s per mm per slot - 5 USgpm per inch per slot): Watts roof drain with a Watts Accutrol Weir RD-100 or equal. As per the Ontario Building Code scuppers are required to prevent the water on the roof from exceeding 150mm. The drainage from this roof discharges to grade and drains to Drainage Area V.

	100-year	5-year
The maximum roof drain release rate:	5.63 l/s	3.98 l/s
The maximum scupper release rate:	<u>0.00 l/s</u>	<u>0.00 l/s</u>
The maximum release rate:	5.63 l/s	3.98 l/s
The maximum ponding depth:	113 mm	80 mm
The maximum stored volume:	18.32 cu.m.	8.26 cu.m.

Drainage Area IV (9,479 sq.m.):

During five-year event an inlet control device (ICD) located in the inlet of the outlet culvert for Stormwater Detention Area A1 will control the release of stormwater from Drainage Area IV. During the one hundred-year event, in addition to the ICD, a broad-crested weir will control the release of stormwater. The ICD and weir will restrict the flow and force the stormwater to back up into the detention area. The broad-crested weir will be a concrete curb with a 1.40m long depressed section. The top of the depressed portion of the curb will be 0.02 m below the 100-year ponding elevation and will release 6.76 l/s. The ICD shall be a plug style with a round orifice design manufactured by Pedro Plastics (or approved equal manufactured by IPEX) and shall be sized by the manufacturer for a discharge rate of 32.94 l/s at 0.53m head. It is calculated that an orifice area of 16,719 sq.mm. ( $\pm 146$  mm diameter) and a discharge coefficient of 0.61 will restrict the outflow rate to 32.94 l/s at a head of 0.53m. Based on

this orifice the maximum outflow rate for the 1:5 year storm event is calculated to be 27.97 l/s at 0.38 m.

	100-year	5-year
The maximum ICD release rate:	32.94 l/s	27.97 l/s
The maximum weir release rate:	<u>6.76 l/s</u>	<u>0.00 l/s</u>
The maximum release rate:	39.70 l/s	27.97 l/s
The maximum ponding elevation:	77.24 m	77.10 m
The maximum ponding depth:	0.60 m	0.45 m
The maximum stored volume:	337.54 cu.m.	150.22 cu.m.

#### Drainage Area V (10,256 sq.m.):

During five-year event an inlet control device (ICD) located in the inlet of the outlet culvert for Stormwater Detention Area B1 will control the release of stormwater from Drainage Area V. During the one hundred-year event, in addition to the ICD, a broad-crested weir will control the release of stormwater. The ICD and weir will restrict the flow and force the stormwater to back up into the detention area. The broad-crested weir will be a concrete curb with a 1.30m long depressed section. The top of the depressed portion of the curb will be 0.05 m below the 100-year ponding elevation and will release 24.70 l/s. The ICD shall be a plug style with a round orifice design manufactured by Pedro Plastics (or approved equal manufactured by IPEX) and shall be sized by the manufacturer for a discharge rate of 67.04 l/s at 0.46m head. It is calculated that an orifice area of 36,715 sq.mm. (+216 mm diameter) and a discharge coefficient of 0.61 will restrict the outflow rate to 67.04 l/s at a head of 0.46m. Based on this orifice the maximum outflow rate for the 1:5 year storm event is calculated to be 56.65 l/s at 0.33 m.

	100-year	5-year
The maximum ICD release rate:	67.04 l/s	56.65 l/s
The maximum weir release rate:	<u>24.70 l/s</u>	<u>0.00 l/s</u>
The maximum release rate:	91.75 l/s	56.65 l/s
The maximum ponding elevation:	77.24 m	77.11 m
The maximum ponding depth:	0.57 m	0.44m
The maximum stored volume:	274.52 cu.m.	115.55 cu.m.

#### Drainage Area IV (11,280 sq.m.):

During five-year event an inlet control device (ICD) located in the inlet of the outlet culvert for Stormwater Detention Area C1 will control the release of stormwater from Drainage Area IV. During the one hundred-year event, in addition to the ICD, a broad-crested weir will control the release of stormwater. The ICD and weir will restrict the flow and force the stormwater to back up into the detention area. The broad-crested weir will be a concrete curb with a 1.97m long depressed section. The top of the depressed portion of the curb will be 0.03 m below the 100-year ponding elevation and will release 17.46 l/s. The ICD shall be a plug style with a round orifice design manufactured by Pedro Plastics (or approved equal manufactured by IPEX) and shall be sized by the manufacturer for a discharge rate of 8.99 l/s at 0.57m head. It is calculated that an orifice area of 4,418 sq.mm. (+75 mm diameter) and a discharge coefficient of 0.61 will restrict the outflow rate to 8.99 l/s at a head of 0.57m. Based on



this orifice the maximum outflow rate for the 1:5 year storm event is calculated to be 8.09 l/s at 0.46 m.

	100-year	5-year
The maximum ICD release rate:	8.99 l/s	8.09 l/s
The maximum weir release rate:	<u>17.46 l/s</u>	<u>0.00 l/s</u>
The maximum release rate:	26.45 l/s	8.09 l/s
The maximum ponding elevation:	77.24 m	77.14 m
The maximum ponding depth:	0.61 m	0.46 m
The maximum stored volume:	414.51 cu.m.	248.42 cu.m.

As previously stated the maximum allowable release rate (pre-development flow rate) for the 100-year storm event for the site is 234.09 l/s. The maximum post-development release rate for the 100-year storm event is calculated to be 234.091 l/s, equal to the maximum allowable. To achieve this release rate the total maximum required storage capacity for the 1:100-year event is 1183.23 cu.m.

The maximum allowable release rate (pre-development flow rate) for the 5-year storm event for the site is 128.28 l/s. The maximum post-development release rate for the 5-year storm event is calculated to be 128.28 l/s, equal to the maximum allowable. To achieve this release rate the total maximum required storage capacity for the 1:5-year event is 588.50 cu.m.

## CONCLUSIONS:

1. The mechanical engineer has calculated that 25,000 imperial gallons is the required water supply for the sprinkler system and for firefighting. A water fill station with this capacity is proposed.
2. A drilled well is proposed.
3. An on-site Class 4 septic system is proposed. A septic permit has been issued by the Ottawa Septic System Office (OSSO).
4. Oil/grit separator manholes proposed to be located in the outlet pipe of each of three stormwater detention areas have been sized to remove at least 80% TSS.
5. An erosion and sediment control plan has been developed to be implemented during construction.
6. With the proposed stormwater management design the 5-year post-development storm event is equal to the 5-year flow produced by the (existing) pre-development and the 100-year post-development storm event is equal to 80% of the 100-year flow produced by the (existing) pre-development.



## STORMWATER MANAGEMENT CALCULATIONS

The orifice calculations are based on the following formula:

$$Q = C_d \times A_o \sqrt{2gh} \times 1000$$

where:

Q = flowrate in litres per second

$C_d$  = coefficient of discharge

$A_o$  = orifice area in sq.m.

g = 9.81 m/s<sup>2</sup>

h = head above orifice in meters

Storage calculations on the roof are based on the following formula for volume of a cone:

$$V = (A \times d)/3$$

where:

V = volume in cu.m.

A = ponding area in sq.m.

d = ponding depth in meters

Storage calculations for the stormwater detention area are based on the following formula for volume of a prismatical shape (the formula is accurate if both length and width are changing proportionally):

$$V = (A_{top} + A_{bottom} + (A_{top} \times A_{bottom})^{0.5}) / 3 \times d$$

where:

V = volume in cu.m.

$A_{top}$  = area of pond in sq.m.

$A_{bottom}$  = area of bottom of depressed area

d = ponding depth in meters

## Summary Table

ONE HUNDRED YEAR EVENT				
Drainage Area	Maximum Allowable Release Rate	Maximum Release Rate	Maximum Volume Required	Maximum Volume Stored
	L/s	L/s	cu.m	cu.m
AREA I (Uncontrolled Flow Off Site)	-	76.20	-	-
AREA II (Roof 1 & 2) 50% Drains to Area IV - 50% to VI	-	16.20	57.81	57.81
AREA III (Roof 3, 4, 5 & 6) Drains to Area V	-	24.39	98.84	98.84
AREA IV	-	39.70	337.54	337.54
AREA V	-	91.75	274.52	274.52
AREA VI	-	26.45	414.51	414.51
TOTAL ( Release Rate: Area I + IV + V + VI)	234.09	234.09	1183.23	1183.23

FIVE YEAR EVENT				
Drainage Area	Maximum Allowable Release Rate	Maximum Release Rate	Maximum Volume Required	Maximum Volume Stored
	L/s	L/s	cu.m	cu.m
AREA I (Uncontrolled Flow Off Site)	-	35.57	-	-
AREA II (Roof 1 & 2) 50% Drains to Area IV - 50% to VI	-	10.30	27.79	27.79
AREA III (Roof 3, 4, 5 & 6) Drains to Area V	-	16.28	46.53	46.53
AREA IV	-	27.97	150.22	150.22
AREA V	-	56.65	115.55	115.55
AREA VI	-	8.09	248.42	248.42
TOTAL ( Release Rate: Area I + IV + V + VI)	128.28	128.28	588.50	588.50

Mitch Owens Road / Boundary Road  
Ottawa, Ontario

STORM WATER MANAGEMENT CALCULATIONS  
Rational Method

ONE HUNDRED YEAR EVENT

Maximum Allowable Release Rate  
Pre-Development Conditions

			C
Roof Area:	0	sq.m	1.00
Asphalt/Concrete Area:	0	sq.m	1.00
Gravel Area:	0	sq.m	0.875
"Woodland" Area:	42067	sq.m	0.375
			as per Table 5.7 Ottawa Sewer Design Guidelines: Woodland - Flat Clay / Silt Loam x 125%
<hr/>			
Total Catchment Area:	42067	sq.m	0.38

Airport Formula

$$T_c = \frac{3.26 (1.1 - C) (L)^{1/2}}{S_w^{0.33}} \text{ min}$$

Runoff Coefficient (C):	0.38	
Sheet Flow Distance (L):	180	m
Slope of Land (Sw):	0.3	%
Time of Concentration (Sheet Flow):	47	min

Area (A):	42067	sq.m
Time of Concentration:	47	min
Rainfall Intensity (i):	66.7	mm/hr (100-year event)
Runoff Coefficient (C):	0.38	

Pre-development 100-year Flow Rate (2.78AiC):	292.61	L/s
100-Year Maximum Allowable Release Rate (80% of Pre-development)	234.09	L/s

## DRAINAGE AREA I (Uncontrolled Flow Off Site)

(ONE HUNDRED-YEAR EVENT)

			C
Roof Area:	0	sq.m	1.00
Asphalt/Concrete Area:	0	sq.m	1.00
Gravel Area:	32	sq.m	0.875
Landscaped Area:	6028	sq.m	0.25
			<hr/>
Total Catchment Area:	6060	sq.m	0.25
Area (A):	6060	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	178.6	mm/hr (100-year event)	
Runoff Coefficient (C):	0.25		
Flow Rate (2.78AIC):	76.20	L/s	

# DRAINAGE AREA II (Roof 1)

(ONE HUNDRED-YEAR EVENT)

			C
Roof Area:	1087	sq.m	1.00
Asphalt/Concrete Area:	0	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	0	sq.m	0.25

Total Catchment Area: 1087 sq.m 1.00

No. of Roof Drains: 2  
 Slots per Wier: 3 0.0124 L/s/mm/slot (5 USGPM/in/slot)

Depth at Roof Drain: 114 mm

Maximum Roof Drain Release Rate:	8.50	L/s		Pond Area:	688	sq.m
Maximum Scupper Release Rate:	0.88	L/s		Achieved Volume:	33.09	cu.m
	9.38	L/s		Max. Volume Required:	33.09	cu.m

Time	i	2.78AiC	Roof Drain Release Rate	Scupper Release Rate	Total Release Rate	Stored Rate	Stored Volume
min.	mm/hr	L/s	L/s	L/s	L/s	L/s	cu.m
5	242.7	73.34	8.50	0.00	8.50	64.84	19.45
10	178.6	53.96	8.50	0.00	8.50	45.45	27.27
15	142.9	43.18	8.50	0.00	8.50	34.68	31.21
20	120.0	36.25	8.50	0.17	8.68	27.57	33.09
25	103.8	31.38	8.50	0.82	9.32	22.06	33.09
30	91.9	27.76	8.50	0.88	9.38	18.38	33.09
35	82.6	24.95	8.50	0.70	9.20	15.75	33.09
40	75.1	22.71	8.50	0.42	8.92	13.79	33.09
45	69.1	20.87	8.50	0.11	8.61	12.25	33.09
50	64.0	19.33	8.50	0.00	8.50	10.82	32.47
55	59.6	18.02	8.50	0.00	8.50	9.51	31.39
60	55.9	16.89	8.50	0.00	8.50	8.39	30.19
65	52.6	15.91	8.50	0.00	8.50	7.41	28.88
70	49.8	15.05	8.50	0.00	8.50	6.54	27.48
75	47.3	14.28	8.50	0.00	8.50	5.78	25.99
80	45.0	13.60	8.50	0.00	8.50	5.09	24.44
85	43.0	12.98	8.50	0.00	8.50	4.48	22.83
90	41.1	12.42	8.50	0.00	8.50	3.92	21.16
95	39.4	11.92	8.50	0.00	8.50	3.41	19.45
100	37.9	11.45	8.50	0.00	8.50	2.95	17.70
105	36.5	11.03	8.50	0.00	8.50	2.53	15.91
110	35.2	10.64	8.50	0.00	8.50	2.13	14.08
115	34.0	10.28	8.50	0.00	8.50	1.77	12.23
120	32.9	9.94	8.50	0.00	8.50	1.44	10.34
125	31.9	9.63	8.50	0.00	8.50	1.12	8.43
130	30.9	9.34	8.50	0.00	8.50	0.83	6.50
135	30.0	9.06	8.50	0.00	8.50	0.56	4.54
140	29.2	8.81	8.50	0.00	8.50	0.31	2.57
145	28.4	8.57	8.50	0.00	8.50	0.07	0.57
150	27.6	8.34	8.34	0.00	8.34	0.00	0.00
180	23.9	7.22	7.22	0.00	7.22	0.00	0.00
210	21.1	6.39	6.39	0.00	6.39	0.00	0.00
240	19.0	5.74	5.74	0.00	5.74	0.00	0.00
270	17.3	5.23	5.23	0.00	5.23	0.00	0.00
300	15.9	4.80	4.80	0.00	4.80	0.00	0.00
330	14.7	4.45	4.45	0.00	4.45	0.00	0.00
360	13.7	4.15	4.15	0.00	4.15	0.00	0.00
390	12.9	3.89	3.89	0.00	3.89	0.00	0.00
420	12.1	3.66	3.66	0.00	3.66	0.00	0.00
450	11.5	3.46	3.46	0.00	3.46	0.00	0.00
480	10.9	3.29	3.29	0.00	3.29	0.00	0.00
510	10.4	3.13	3.13	0.00	3.13	0.00	0.00
540	9.9	2.99	2.99	0.00	2.99	0.00	0.00
570	9.5	2.86	2.86	0.00	2.86	0.00	0.00
600	9.1	2.74	2.74	0.00	2.74	0.00	0.00
630	8.7	2.64	2.64	0.00	2.64	0.00	0.00
660	8.4	2.54	2.54	0.00	2.54	0.00	0.00
690	8.1	2.45	2.45	0.00	2.45	0.00	0.00
720	7.8	2.36	2.36	0.00	2.36	0.00	0.00

## DRAINAGE AREA II (Roof 2)

(ONE HUNDRED-YEAR EVENT)

			C
Roof Area:	805	sq.m	1.00
Asphalt/Concrete Area:	0	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	0	sq.m	0.25
<b>Total Catchment Area:</b>	<b>805</b>	<b>sq.m</b>	<b>1.00</b>

No. of Roof Drains: 2  
 Slots per Wier: 2    0.0124 L/s/mm/slot (5 USGPM/in/slot)

Depth at Roof Drain: 114 mm

Maximum Roof Drain Release Rate:	5.67	L/s	Pond Area:	514	sq.m
Maximum Scupper Release Rate:	1.15	L/s	Achieved Volume:	24.73	cu.m
	6.82	L/s	Max. Volume Required:	24.73	cu.m

Time	i	2.78AIC	Roof Drain Release Rate	Scupper Release Rate	Total Release Rate	Stored Rate	Stored Volume
min.	mm/hr	L/s	L/s	L/s	L/s	L/s	cu.m
5	242.7	54.31	5.67	0.00	5.67	48.65	14.59
10	178.6	39.96	5.67	0.00	5.67	34.29	20.57
15	142.9	31.98	5.67	0.00	5.67	26.31	23.68
20	120.0	26.84	5.67	0.57	6.24	20.61	24.73
25	103.8	23.24	5.67	1.08	6.75	16.49	24.73
30	91.9	20.56	5.67	1.15	6.82	13.74	24.73
35	82.6	18.48	5.67	1.04	6.70	11.78	24.73
40	75.1	16.82	5.67	0.84	6.51	10.30	24.73
45	69.1	15.45	5.67	0.62	6.29	9.16	24.73
50	64.0	14.31	5.67	0.40	6.07	8.24	24.73
55	59.6	13.34	5.67	0.18	5.85	7.49	24.73
60	55.9	12.51	5.67	0.00	5.67	6.84	24.62
65	52.6	11.78	5.67	0.00	5.67	6.11	23.84
70	49.8	11.14	5.67	0.00	5.67	5.47	22.99
75	47.3	10.58	5.67	0.00	5.67	4.91	22.08
80	45.0	10.07	5.67	0.00	5.67	4.40	21.12
85	43.0	9.61	5.67	0.00	5.67	3.94	20.11
90	41.1	9.20	5.67	0.00	5.67	3.53	19.07
95	39.4	8.83	5.67	0.00	5.67	3.16	17.99
100	37.9	8.48	5.67	0.00	5.67	2.81	16.88
105	36.5	8.17	5.67	0.00	5.67	2.50	15.74
110	35.2	7.88	5.67	0.00	5.67	2.21	14.58
115	34.0	7.61	5.67	0.00	5.67	1.94	13.39
120	32.9	7.36	5.67	0.00	5.67	1.69	12.18
125	31.9	7.13	5.67	0.00	5.67	1.46	10.96
130	30.9	6.91	5.67	0.00	5.67	1.25	9.71
135	30.0	6.71	5.67	0.00	5.67	1.04	8.45
140	29.2	6.52	5.67	0.00	5.67	0.85	7.18
145	28.4	6.35	5.67	0.00	5.67	0.68	5.89
150	27.6	6.18	5.67	0.00	5.67	0.51	4.59
180	23.9	5.35	5.35	0.00	5.35	0.00	0.00
210	21.1	4.73	4.73	0.00	4.73	0.00	0.00
240	19.0	4.25	4.25	0.00	4.25	0.00	0.00
270	17.3	3.87	3.87	0.00	3.87	0.00	0.00
300	15.9	3.56	3.56	0.00	3.56	0.00	0.00
330	14.7	3.29	3.29	0.00	3.29	0.00	0.00
360	13.7	3.07	3.07	0.00	3.07	0.00	0.00
390	12.9	2.88	2.88	0.00	2.88	0.00	0.00
420	12.1	2.71	2.71	0.00	2.71	0.00	0.00
450	11.5	2.56	2.56	0.00	2.56	0.00	0.00
480	10.9	2.43	2.43	0.00	2.43	0.00	0.00
510	10.4	2.32	2.32	0.00	2.32	0.00	0.00
540	9.9	2.21	2.21	0.00	2.21	0.00	0.00
570	9.5	2.12	2.12	0.00	2.12	0.00	0.00
600	9.1	2.03	2.03	0.00	2.03	0.00	0.00
630	8.7	1.95	1.95	0.00	1.95	0.00	0.00
660	8.4	1.88	1.88	0.00	1.88	0.00	0.00
690	8.1	1.81	1.81	0.00	1.81	0.00	0.00
720	7.8	1.75	1.75	0.00	1.75	0.00	0.00

## DRAINAGE AREA III (Roof 3)

(ONE HUNDRED-YEAR EVENT)

			C
Roof Area:	872	sq.m	1.00
Asphalt/Concrete Area:	0	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	0	sq.m	0.25

Total Catchment Area: 872 sq.m 1.00

No. of Roof Drains: 2  
 Slots per Wier: 2 0.0124 L/s/mm/slot (5 USGPM/in/slot)

Depth at Roof Drain: 114 mm

Maximum Roof Drain Release Rate:	5.67	L/s	Pond Area:	558	sq.m
Maximum Scupper Release Rate:	1.69	L/s	Achieved Volume:	26.84	cu.m
	7.36	L/s			

Max. Volume Required: 26.84 cu.m

Time min.	i mm/hr	2.78AiC L/s	Roof Drain	Scupper	Total	Stored Rate L/s	Stored Volume cu.m
			Release Rate L/s	Release Rate L/s	Release Rate L/s		
5	242.7	58.84	5.67	0.00	5.67	53.17	15.95
10	178.6	43.29	5.67	0.00	5.67	37.62	22.57
15	142.9	34.64	5.67	0.00	5.67	28.97	26.07
20	120.0	29.08	5.67	1.04	6.71	22.37	26.84
25	103.8	25.17	5.67	1.61	7.28	17.89	26.84
30	91.9	22.27	5.67	1.69	7.36	14.91	26.84
35	82.6	20.02	5.67	1.57	7.24	12.78	26.84
40	75.1	18.22	5.67	1.36	7.03	11.18	26.84
45	69.1	16.74	5.67	1.13	6.80	9.94	26.84
50	64.0	15.50	5.67	0.89	6.56	8.95	26.84
55	59.6	14.45	5.67	0.65	6.32	8.13	26.84
60	55.9	13.55	5.67	0.43	6.09	7.46	26.84
65	52.6	12.76	5.67	0.21	5.88	6.88	26.84
70	49.8	12.07	5.67	0.01	5.68	6.39	26.84
75	47.3	11.46	5.67	0.00	5.67	5.79	26.04
80	45.0	10.91	5.67	0.00	5.67	5.24	25.14
85	43.0	10.41	5.67	0.00	5.67	4.74	24.19
90	41.1	9.97	5.67	0.00	5.67	4.30	23.20
95	39.4	9.56	5.67	0.00	5.67	3.89	22.17
100	37.9	9.19	5.67	0.00	5.67	3.52	21.11
105	36.5	8.85	5.67	0.00	5.67	3.18	20.02
110	35.2	8.53	5.67	0.00	5.67	2.86	18.90
115	34.0	8.24	5.67	0.00	5.67	2.57	17.76
120	32.9	7.97	5.67	0.00	5.67	2.30	16.60
125	31.9	7.72	5.67	0.00	5.67	2.05	15.41
130	30.9	7.49	5.67	0.00	5.67	1.82	14.20
135	30.0	7.27	5.67	0.00	5.67	1.60	12.98
140	29.2	7.07	5.67	0.00	5.67	1.40	11.74
145	28.4	6.87	5.67	0.00	5.67	1.21	10.49
150	27.6	6.69	5.67	0.00	5.67	1.02	9.22
180	23.9	5.79	5.67	0.00	5.67	0.13	1.35
210	21.1	5.13	5.13	0.00	5.13	0.00	0.00
240	19.0	4.61	4.61	0.00	4.61	0.00	0.00
270	17.3	4.19	4.19	0.00	4.19	0.00	0.00
300	15.9	3.85	3.85	0.00	3.85	0.00	0.00
330	14.7	3.57	3.57	0.00	3.57	0.00	0.00
360	13.7	3.33	3.33	0.00	3.33	0.00	0.00
390	12.9	3.12	3.12	0.00	3.12	0.00	0.00
420	12.1	2.94	2.94	0.00	2.94	0.00	0.00
450	11.5	2.78	2.78	0.00	2.78	0.00	0.00
480	10.9	2.64	2.64	0.00	2.64	0.00	0.00
510	10.4	2.51	2.51	0.00	2.51	0.00	0.00
540	9.9	2.40	2.40	0.00	2.40	0.00	0.00
570	9.5	2.29	2.29	0.00	2.29	0.00	0.00
600	9.1	2.20	2.20	0.00	2.20	0.00	0.00
630	8.7	2.11	2.11	0.00	2.11	0.00	0.00
660	8.4	2.04	2.04	0.00	2.04	0.00	0.00
690	8.1	1.96	1.96	0.00	1.96	0.00	0.00
720	7.8	1.90	1.90	0.00	1.90	1.90	81.95



# DRAINAGE AREA III (Roof 4)

(ONE HUNDRED-YEAR EVENT)

			C
Roof Area:	805	sq.m	1.00
Asphalt/Concrete Area:	0	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	0	sq.m	0.25

Total Catchment Area: 805 sq.m 1.00

No. of Roof Drains: 2  
 Slots per Wier: 2 0.0124 L/s/mm/slot (5 USGPM/in/slot)

Depth at Roof Drain: 114 mm

Maximum Roof Drain Release Rate: 5.67 L/s  
 Maximum Scupper Release Rate: 0.03 L/s  
5.70 L/s

Pond Area: 558 sq.m

Achieved Volume: 26.84 cu.m

Max. Volume Required: 26.84 cu.m

Time min.	i mm/hr	2.78AiC L/s	Roof Drain	Scupper	Total	Stored Rate L/s	Stored Volume cu.m
			Release Rate L/s	Release Rate L/s	Release Rate L/s		
5	242.7	54.31	5.67	0.00	5.67	48.65	14.59
10	178.6	39.96	5.67	0.00	5.67	34.29	20.57
15	142.9	31.98	5.67	0.00	5.67	26.31	23.68
20	120.0	26.84	5.67	0.00	5.67	21.17	25.41
25	103.8	23.24	5.67	0.00	5.67	17.57	26.36
30	91.9	20.56	5.67	0.00	5.67	14.89	26.80
35	82.6	18.48	5.67	0.03	5.70	12.78	26.84
40	75.1	16.82	5.67	0.00	5.67	11.15	26.75
45	69.1	15.45	5.67	0.00	5.67	9.78	26.42
50	64.0	14.31	5.67	0.00	5.67	8.64	25.93
55	59.6	13.34	5.67	0.00	5.67	7.67	25.32
60	55.9	12.51	5.67	0.00	5.67	6.84	24.62
65	52.6	11.78	5.67	0.00	5.67	6.11	23.84
70	49.8	11.14	5.67	0.00	5.67	5.47	22.99
75	47.3	10.58	5.67	0.00	5.67	4.91	22.08
80	45.0	10.07	5.67	0.00	5.67	4.40	21.12
85	43.0	9.61	5.67	0.00	5.67	3.94	20.11
90	41.1	9.20	5.67	0.00	5.67	3.53	19.07
95	39.4	8.83	5.67	0.00	5.67	3.16	17.99
100	37.9	8.48	5.67	0.00	5.67	2.81	16.88
105	36.5	8.17	5.67	0.00	5.67	2.50	15.74
110	35.2	7.88	5.67	0.00	5.67	2.21	14.58
115	34.0	7.61	5.67	0.00	5.67	1.94	13.39
120	32.9	7.36	5.67	0.00	5.67	1.69	12.18
125	31.9	7.13	5.67	0.00	5.67	1.46	10.96
130	30.9	6.91	5.67	0.00	5.67	1.25	9.71
135	30.0	6.71	5.67	0.00	5.67	1.04	8.45
140	29.2	6.52	5.67	0.00	5.67	0.85	7.18
145	28.4	6.35	5.67	0.00	5.67	0.68	5.89
150	27.6	6.18	5.67	0.00	5.67	0.51	4.59
180	23.9	5.35	5.35	0.00	5.35	0.00	0.00
210	21.1	4.73	4.73	0.00	4.73	0.00	0.00
240	19.0	4.25	4.25	0.00	4.25	0.00	0.00
270	17.3	3.87	3.87	0.00	3.87	0.00	0.00
300	15.9	3.56	3.56	0.00	3.56	0.00	0.00
330	14.7	3.29	3.29	0.00	3.29	0.00	0.00
360	13.7	3.07	3.07	0.00	3.07	0.00	0.00
390	12.9	2.88	2.88	0.00	2.88	0.00	0.00
420	12.1	2.71	2.71	0.00	2.71	0.00	0.00
450	11.5	2.56	2.56	0.00	2.56	0.00	0.00
480	10.9	2.43	2.43	0.00	2.43	0.00	0.00
510	10.4	2.32	2.32	0.00	2.32	0.00	0.00
540	9.9	2.21	2.21	0.00	2.21	0.00	0.00
570	9.5	2.12	2.12	0.00	2.12	0.00	0.00
600	9.1	2.03	2.03	0.00	2.03	0.00	0.00
630	8.7	1.95	1.95	0.00	1.95	0.00	0.00
660	8.4	1.88	1.88	0.00	1.88	0.00	0.00
690	8.1	1.81	1.81	0.00	1.81	0.00	0.00
720	7.8	1.75	1.75	0.00	1.75	0.00	0.00

# DRAINAGE AREA III (Roof 5)

(ONE HUNDRED-YEAR EVENT)

			C
Roof Area:	805	sq.m	1.00
Asphalt/Concrete Area:	0	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	0	sq.m	0.25
<b>Total Catchment Area:</b>	<b>805</b>	<b>sq.m</b>	<b>1.00</b>

No. of Roof Drains: 2  
 Slots per Wier: 2    0.0124 L/s/mm/slot (5 USGPM/in/slot)

Depth at Roof Drain: 114 mm

Maximum Roof Drain Release Rate:	5.67	L/s	Pond Area:	558	sq.m
Maximum Scupper Release Rate:	0.03	L/s	Achieved Volume:	26.84	cu.m
	5.70	L/s	Max. Volume Required:	26.84	cu.m

Time	i	2.78AIC	Roof Drain Release Rate	Scupper Release Rate	Total Release Rate	Stored Rate	Stored Volume
min.	mm/hr	L/s	L/s	L/s	L/s	L/s	cu.m
5	242.7	54.31	5.67	0.00	5.67	48.65	14.59
10	178.6	39.96	5.67	0.00	5.67	34.29	20.57
15	142.9	31.98	5.67	0.00	5.67	26.31	23.68
20	120.0	26.84	5.67	0.00	5.67	21.17	25.41
25	103.8	23.24	5.67	0.00	5.67	17.57	26.36
30	91.9	20.56	5.67	0.00	5.67	14.89	26.80
35	82.6	18.48	5.67	0.03	5.70	12.78	26.84
40	75.1	16.82	5.67	0.00	5.67	11.15	26.75
45	69.1	15.45	5.67	0.00	5.67	9.78	26.42
50	64.0	14.31	5.67	0.00	5.67	8.64	25.93
55	59.6	13.34	5.67	0.00	5.67	7.67	25.32
60	55.9	12.51	5.67	0.00	5.67	6.84	24.62
65	52.6	11.78	5.67	0.00	5.67	6.11	23.84
70	49.8	11.14	5.67	0.00	5.67	5.47	22.99
75	47.3	10.58	5.67	0.00	5.67	4.91	22.08
80	45.0	10.07	5.67	0.00	5.67	4.40	21.12
85	43.0	9.61	5.67	0.00	5.67	3.94	20.11
90	41.1	9.20	5.67	0.00	5.67	3.53	19.07
95	39.4	8.83	5.67	0.00	5.67	3.16	17.99
100	37.9	8.48	5.67	0.00	5.67	2.81	16.88
105	36.5	8.17	5.67	0.00	5.67	2.50	15.74
110	35.2	7.88	5.67	0.00	5.67	2.21	14.58
115	34.0	7.61	5.67	0.00	5.67	1.94	13.39
120	32.9	7.36	5.67	0.00	5.67	1.69	12.18
125	31.9	7.13	5.67	0.00	5.67	1.46	10.96
130	30.9	6.91	5.67	0.00	5.67	1.25	9.71
135	30.0	6.71	5.67	0.00	5.67	1.04	8.45
140	29.2	6.52	5.67	0.00	5.67	0.85	7.18
145	28.4	6.35	5.67	0.00	5.67	0.68	5.89
150	27.6	6.18	5.67	0.00	5.67	0.51	4.59
180	23.9	5.35	5.35	0.00	5.35	0.00	0.00
210	21.1	4.73	4.73	0.00	4.73	0.00	0.00
240	19.0	4.25	4.25	0.00	4.25	0.00	0.00
270	17.3	3.87	3.87	0.00	3.87	0.00	0.00
300	15.9	3.56	3.56	0.00	3.56	0.00	0.00
330	14.7	3.29	3.29	0.00	3.29	0.00	0.00
360	13.7	3.07	3.07	0.00	3.07	0.00	0.00
390	12.9	2.88	2.88	0.00	2.88	0.00	0.00
420	12.1	2.71	2.71	0.00	2.71	0.00	0.00
450	11.5	2.56	2.56	0.00	2.56	0.00	0.00
480	10.9	2.43	2.43	0.00	2.43	0.00	0.00
510	10.4	2.32	2.32	0.00	2.32	0.00	0.00
540	9.9	2.21	2.21	0.00	2.21	0.00	0.00
570	9.5	2.12	2.12	0.00	2.12	0.00	0.00
600	9.1	2.03	2.03	0.00	2.03	0.00	0.00
630	8.7	1.95	1.95	0.00	1.95	0.00	0.00
660	8.4	1.88	1.88	0.00	1.88	0.00	0.00
690	8.1	1.81	1.81	0.00	1.81	0.00	0.00
720	7.8	1.75	1.75	0.00	1.75	0.00	0.00

## DRAINAGE AREA III (Roof 6)

(ONE HUNDRED-YEAR EVENT)

			C
Roof Area:	618	sq.m	1.00
Asphalt/Concrete Area:	0	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	0	sq.m	0.25
<b>Total Catchment Area:</b>	<b>618</b>	<b>sq.m</b>	<b>1.00</b>

No. of Roof Drains: 2  
 Slots per Wier: 2    0.0124 L/s/mm/slot (5 USGPM/in/slot)

Depth at Roof Drain: 113 mm

Maximum Roof Drain Release Rate:	5.63	L/s	Pond Area:	383	sq.m
Maximum Scupper Release Rate:	0.00	L/s	Achieved Volume:	18.32	cu.m
	5.63	L/s	Max. Volume Required:	18.32	cu.m

Time	i	2.78AIC	Roof Drain Release Rate	Scupper Release Rate	Total Release Rate	Stored Rate	Stored Volume
min.	mm/hr	L/s	L/s	L/s	L/s	L/s	cu.m
5	242.7	41.70	5.63	0.00	5.63	36.07	10.82
10	178.6	30.68	5.63	0.00	5.63	25.05	15.03
15	142.9	24.55	5.63	0.00	5.63	18.92	17.03
20	120.0	20.61	5.63	0.00	5.63	14.98	17.98
25	103.8	17.84	5.63	0.00	5.63	12.21	18.32
30	91.9	15.78	5.63	0.00	5.63	10.16	18.28
35	82.6	14.19	5.63	0.00	5.63	8.56	17.98
40	75.1	12.91	5.63	0.00	5.63	7.28	17.48
45	69.1	11.86	5.63	0.00	5.63	6.24	16.84
50	64.0	10.99	5.63	0.00	5.63	5.36	16.08
55	59.6	10.24	5.63	0.00	5.63	4.62	15.24
60	55.9	9.60	5.63	0.00	5.63	3.98	14.31
65	52.6	9.04	5.63	0.00	5.63	3.42	13.33
70	49.8	8.55	5.63	0.00	5.63	2.93	12.29
75	47.3	8.12	5.63	0.00	5.63	2.49	11.21
80	45.0	7.73	5.63	0.00	5.63	2.10	10.09
85	43.0	7.38	5.63	0.00	5.63	1.75	8.94
90	41.1	7.06	5.63	0.00	5.63	1.44	7.76
95	39.4	6.78	5.63	0.00	5.63	1.15	6.54
100	37.9	6.51	5.63	0.00	5.63	0.89	5.31
105	36.5	6.27	5.63	0.00	5.63	0.64	4.05
110	35.2	6.05	5.63	0.00	5.63	0.42	2.78
115	34.0	5.84	5.63	0.00	5.63	0.22	1.49
120	32.9	5.65	5.63	0.00	5.63	0.02	0.18
125	31.9	5.47	5.47	0.00	5.47	0.00	0.00
130	30.9	5.31	5.31	0.00	5.31	0.00	0.00
135	30.0	5.15	5.15	0.00	5.15	0.00	0.00
140	29.2	5.01	5.01	0.00	5.01	0.00	0.00
145	28.4	4.87	4.87	0.00	4.87	0.00	0.00
150	27.6	4.74	4.74	0.00	4.74	0.00	0.00
180	23.9	4.11	4.11	0.00	4.11	0.00	0.00
210	21.1	3.63	3.63	0.00	3.63	0.00	0.00
240	19.0	3.27	3.27	0.00	3.27	0.00	0.00
270	17.3	2.97	2.97	0.00	2.97	0.00	0.00
300	15.9	2.73	2.73	0.00	2.73	0.00	0.00
330	14.7	2.53	2.53	0.00	2.53	0.00	0.00
360	13.7	2.36	2.36	0.00	2.36	0.00	0.00
390	12.9	2.21	2.21	0.00	2.21	0.00	0.00
420	12.1	2.08	2.08	0.00	2.08	0.00	0.00
450	11.5	1.97	1.97	0.00	1.97	0.00	0.00
480	10.9	1.87	1.87	0.00	1.87	0.00	0.00
510	10.4	1.78	1.78	0.00	1.78	0.00	0.00
540	9.9	1.70	1.70	0.00	1.70	0.00	0.00
570	9.5	1.63	1.63	0.00	1.63	0.00	0.00
600	9.1	1.56	1.56	0.00	1.56	0.00	0.00
630	8.7	1.50	1.50	0.00	1.50	0.00	0.00
660	8.4	1.44	1.44	0.00	1.44	0.00	0.00
690	8.1	1.39	1.39	0.00	1.39	0.00	0.00
720	7.8	1.34	1.34	0.00	1.34	0.00	0.00



# DRAINAGE AREA V

(ONE HUNDRED-YEAR EVENT)

			C
Roof Area:	0	sq.m	1.00
Asphalt/Concrete Area:	457	sq.m	1.00
Gravel Area:	9128	sq.m	0.875
Landscaped Area:	671	sq.m	0.25
<hr/>			
Total Catchment Area:	10256	sq.m	0.84

Water Elevation:	77.24	m	Granular Surface Storage			
			Area	Max. Depth		
Invert of Culvert Inlet:	76.68	m	sq.m	m		
			1315	0.35	155.52	cu.m
Centroid of ICD Orifice:	76.79	m (ICD in Culvert Inlet)				
			Stormwater Detention Area B1			
Head:	0.46	m	Area	Avg. Depth		
			sq.m	m		
Orifice Diameter:	216	mm	214	0.49	78.72	cu.m
			Stormwater Detention Area B2			
Orifice Area:	36715	sq.mm	Area	Avg. Depth		
			sq.m	m		
Coefficient of Discharge:	0.61		135	0.35	40.28	cu.m
Maximum ICD Release Rate:	67.04	L/s				
Maximum Weir Release Rate:	24.70	L/s				
Maximum Release Rate:	91.75	L/s	Achieved Volume: 274.52 cu.m			
			Max. Volume Required: 274.52 cu.m			

Time min.	i mm/hr	2.78AiC L/s	Release Rate				Total Inflow L/s	ICD Release Rate L/s	Weir Rate L/s	Total Release Rate L/s	Stored Rate L/s	Stored Volume cu.m
			from Roof 3 L/s	from Roof 4 L/s	from Roof 5 L/s	from Roof 6 L/s						
			5	242.7	581.05	5.67						
10	178.6	427.48	5.67	5.67	5.67	5.63	450.12	67.04	0.00	67.04	383.07	229.84
15	142.9	342.10	5.67	5.67	5.67	5.63	364.73	67.04	0.00	67.04	297.69	267.92
20	120.0	287.17	6.71	5.67	5.67	5.63	310.85	67.04	15.03	82.08	228.77	274.52
25	103.8	248.62	7.28	5.67	5.67	5.63	272.86	67.04	22.80	89.85	183.02	274.52
30	91.9	219.94	7.36	5.67	5.67	5.63	244.26	67.04	24.70	91.75	152.51	274.52
35	82.6	197.70	7.24	5.70	5.70	5.63	221.96	67.04	24.19	91.24	130.73	274.52
40	75.1	179.90	7.03	5.67	5.67	5.63	203.90	67.04	22.47	89.52	114.39	274.52
45	69.1	165.31	6.80	5.67	5.67	5.63	189.08	67.04	20.35	87.40	101.68	274.52
50	64.0	153.11	6.56	5.67	5.67	5.63	176.63	67.04	18.08	85.12	91.51	274.52
55	59.6	142.74	6.32	5.67	5.67	5.63	166.03	67.04	15.80	82.84	83.19	274.52
60	55.9	133.82	6.09	5.67	5.67	5.63	156.88	67.04	13.57	80.62	76.26	274.52
65	52.6	126.04	5.88	5.67	5.67	5.63	148.89	67.04	11.45	78.49	70.39	274.52
70	49.8	119.20	5.68	5.67	5.67	5.63	141.84	67.04	9.44	76.48	65.36	274.52
75	47.3	113.13	5.67	5.67	5.67	5.63	135.77	67.04	7.72	74.76	61.01	274.52
80	45.0	107.71	5.67	5.67	5.67	5.63	130.35	67.04	6.11	73.15	57.19	274.52
85	43.0	102.83	5.67	5.67	5.67	5.63	125.47	67.04	4.60	71.64	53.83	274.52
90	41.1	98.42	5.67	5.67	5.67	5.63	121.06	67.04	3.17	70.22	50.84	274.52
95	39.4	94.41	5.67	5.67	5.67	5.63	117.04	67.04	1.84	68.88	48.16	274.52
100	37.9	90.74	5.67	5.67	5.67	5.63	113.38	67.04	0.58	67.62	45.75	274.52
105	36.5	87.38	5.67	5.67	5.67	5.63	110.01	67.04	0.00	67.04	42.97	270.69
110	35.2	84.28	5.67	5.67	5.67	5.63	106.91	67.04	0.00	67.04	39.87	263.12
115	34.0	81.41	5.67	5.67	5.67	5.63	104.05	67.04	0.00	67.04	37.00	255.31
120	32.9	78.75	5.67	5.67	5.67	5.63	101.39	67.04	0.00	67.04	34.34	247.27
125	31.9	76.28	5.67	5.67	5.67	5.47	98.76	67.04	0.00	67.04	31.72	237.87
130	30.9	73.97	5.67	5.67	5.67	5.31	96.29	67.04	0.00	67.04	29.24	228.10
135	30.0	71.81	5.67	5.67	5.67	5.15	93.98	67.04	0.00	67.04	26.93	218.14
140	29.2	69.79	5.67	5.67	5.67	5.01	91.81	67.04	0.00	67.04	24.76	208.01
145	28.4	67.89	5.67	5.67	5.67	4.87	89.77	67.04	0.00	67.04	22.73	197.72
150	27.6	66.10	5.67	5.67	5.67	4.74	87.85	67.04	0.00	67.04	20.81	187.28
180	23.9	57.22	5.67	5.35	5.35	4.11	77.70	67.04	0.00	67.04	10.65	115.06
210	21.1	50.62	5.13	4.73	4.73	3.63	68.84	67.04	0.00	67.04	1.80	22.67
240	19.0	45.50	4.61	4.25	4.25	3.27	61.88	61.88	0.00	61.88	0.00	0.00
270	17.3	41.40	4.19	3.87	3.87	2.97	56.31	56.31	0.00	56.31	0.00	0.00
300	15.9	38.05	3.85	3.56	3.56	2.73	51.74	51.74	0.00	51.74	0.00	0.00
330	14.7	35.24	3.57	3.29	3.29	2.53	47.92	47.92	0.00	47.92	0.00	0.00
360	13.7	32.85	3.33	3.07	3.07	2.36	44.68	44.68	0.00	44.68	0.00	0.00
390	12.9	30.80	3.12	2.88	2.88	2.21	41.88	41.88	0.00	41.88	0.00	0.00
420	12.1	29.01	2.94	2.71	2.71	2.08	39.45	39.45	0.00	39.45	0.00	0.00
450	11.5	27.43	2.78	2.56	2.56	1.97	37.31	37.31	0.00	37.31	0.00	0.00
480	10.9	26.03	2.64	2.43	2.43	1.87	35.41	35.41	0.00	35.41	0.00	0.00
510	10.4	24.79	2.51	2.32	2.32	1.78	33.71	33.71	0.00	33.71	0.00	0.00
540	9.9	23.66	2.40	2.21	2.21	1.70	32.18	32.18	0.00	32.18	0.00	0.00
570	9.5	22.65	2.29	2.12	2.12	1.63	30.80	30.80	0.00	30.80	0.00	0.00
600	9.1	21.73	2.20	2.03	2.03	1.56	29.55	29.55	0.00	29.55	0.00	0.00
630	8.7	20.88	2.11	1.95	1.95	1.50	28.40	28.40	0.00	28.40	0.00	0.00
660	8.4	20.11	2.04	1.88	1.88	1.44	27.35	27.35	0.00	27.35	0.00	0.00
690	8.1	19.39	1.96	1.81	1.81	1.39	26.37	26.37	0.00	26.37	0.00	0.00
720	7.8	18.73	0.00	1.75	1.75	1.34	23.58	23.58	0.00	23.58	0.00	0.00

# DRAINAGE AREA VI

(ONE HUNDRED-YEAR EVENT)

			C
Roof Area:	0	sq.m	1.00
Asphalt/Concrete Area:	2787	sq.m	1.00
Gravel Area:	5572	sq.m	0.875
Landscaped Area:	2921	sq.m	0.25
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Total Catchment Area:	11280	sq.m	0.74

Water Elevation:	77.24	m				
Invert of Culvert Inlet:	76.64	m	Granular Surface Storage			
			Area	Max. Depth		
			sq.m	m		
Centroid of ICD Orifice:	76.68	m (ICD in Culvert Inlet)	1309	0.36	159.16	cu.m
Head:	0.57	m				
Orifice Diameter:	75	mm				
Orifice Area:	4418	sq.mm	Stormwater Detention Area C			
			Area	Avg. Depth		
			sq.m	m		
Coefficient of Discharge:	0.61		584	0.48	255.35	cu.m
Maximum Release Rate:	8.99	L/s				
Maximum Weir Release Rate:	17.46	L/s				
Maximum Release Rate:	26.45	L/s				
			Achieved Volume:		414.51	cu.m
			Max. Volume Required:		414.51	cu.m

Time min.	i mm/hr	2.78AiC L/s	50% of Release Rate			Total Inflow L/s	ICD Release Rate L/s	Weir Release Rate L/s	Total Release Rate L/s	Stored Rate L/s	Stored Volume cu.m
			from Roof 1 L/s	from Roof 2 L/s	Total L/s						
			Roof 1 L/s	Roof 2 L/s	Total L/s						
5	242.7	566.27	4.25	2.83	573.36	8.99	0.00	8.99	564.37	169.31	
10	178.6	416.61	4.25	2.83	423.70	8.99	0.00	8.99	414.71	248.82	
15	142.9	333.40	4.25	2.83	340.49	8.99	0.00	8.99	331.49	298.34	
20	120.0	279.87	4.34	3.12	287.32	8.99	0.00	8.99	278.33	334.00	
25	103.8	242.29	4.66	3.38	250.33	8.99	0.00	8.99	241.34	362.01	
30	91.9	214.35	4.69	3.41	222.45	8.99	0.00	8.99	213.46	384.22	
35	82.6	192.67	4.60	3.35	200.62	8.99	0.00	8.99	191.63	402.43	
40	75.1	175.33	4.46	3.26	183.05	8.99	1.34	10.33	172.71	414.51	
45	69.1	161.11	4.31	3.15	168.56	8.99	6.05	15.04	153.52	414.51	
50	64.0	149.22	4.25	3.03	156.50	8.99	9.34	18.33	138.17	414.51	
55	59.6	139.11	4.25	2.92	146.29	8.99	11.69	20.68	125.61	414.51	
60	55.9	130.41	4.25	2.83	137.50	8.99	13.37	22.36	115.14	414.51	
65	52.6	122.83	4.25	2.83	129.92	8.99	14.64	23.64	106.29	414.51	
70	49.8	116.17	4.25	2.83	123.25	8.99	15.57	24.56	98.69	414.51	
75	47.3	110.26	4.25	2.83	117.34	8.99	16.24	25.23	92.11	414.51	
80	45.0	104.97	4.25	2.83	112.06	8.99	16.71	25.70	86.36	414.51	
85	43.0	100.22	4.25	2.83	107.31	8.99	17.04	26.03	81.28	414.51	
90	41.1	95.92	4.25	2.83	103.01	8.99	17.25	26.24	76.76	414.51	
95	39.4	92.01	4.25	2.83	99.10	8.99	17.38	26.37	72.72	414.51	
100	37.9	88.43	4.25	2.83	95.52	8.99	17.45	26.44	69.09	414.51	
105	36.5	85.16	4.25	2.83	92.24	8.99	17.46	26.45	65.80	414.51	
110	35.2	82.13	4.25	2.83	89.22	8.99	17.42	26.42	62.80	414.51	
115	34.0	79.34	4.25	2.83	86.43	8.99	17.36	26.35	60.07	414.51	
120	32.9	76.75	4.25	2.83	83.84	8.99	17.27	26.27	57.57	414.51	
125	31.9	74.34	4.25	2.83	81.43	8.99	17.17	26.16	55.27	414.51	
130	30.9	72.09	4.25	2.83	79.18	8.99	17.04	26.04	53.14	414.51	
135	30.0	69.99	4.25	2.83	77.07	8.99	16.91	25.90	51.17	414.51	
140	29.2	68.02	4.25	2.83	75.10	8.99	16.77	25.76	49.35	414.51	
145	28.4	66.16	4.25	2.83	73.25	8.99	16.62	25.61	47.65	414.51	
150	27.6	64.42	4.17	2.83	71.43	8.99	16.38	25.37	46.06	414.51	
180	23.9	55.77	3.61	2.67	62.06	8.99	14.68	23.67	38.38	414.51	
210	21.1	49.33	3.19	2.37	54.89	8.99	13.01	22.00	32.90	414.51	
240	19.0	44.34	2.87	2.13	49.34	8.99	11.57	20.56	28.79	414.51	
270	17.3	40.35	2.61	1.94	44.90	8.99	10.32	19.31	25.59	414.51	
300	15.9	37.08	2.40	1.78	41.26	8.99	9.24	18.23	23.03	414.51	
330	14.7	34.34	2.22	1.65	38.21	8.99	8.29	17.28	20.93	414.51	
360	13.7	32.01	2.07	1.54	35.62	8.99	7.44	16.43	19.19	414.51	
390	12.9	30.01	1.94	1.44	33.40	8.99	6.69	15.68	17.71	414.51	
420	12.1	28.27	1.83	1.36	31.45	8.99	6.01	15.01	16.45	414.51	
450	11.5	26.73	1.73	1.28	29.75	8.99	5.40	14.39	15.35	414.51	
480	10.9	25.37	1.64	1.22	28.23	8.99	4.85	13.84	14.39	414.51	
510	10.4	24.16	1.56	1.16	26.88	8.99	4.34	13.33	13.55	414.51	
540	9.9	23.06	1.49	1.11	25.66	8.99	3.88	12.87	12.79	414.51	
570	9.5	22.07	1.43	1.06	24.56	8.99	3.45	12.44	12.12	414.51	
600	9.1	21.17	1.37	1.02	23.56	8.99	3.05	12.05	11.51	414.51	
630	8.7	20.35	1.32	0.98	22.64	8.99	2.69	11.68	10.97	414.51	
660	8.4	19.60	1.27	0.94	21.80	8.99	2.35	11.34	10.47	414.51	
690	8.1	18.90	1.22	0.91	21.03	8.99	2.03	11.02	10.01	414.51	
720	7.8	18.26	1.18	0.88	20.32	8.99	1.73	10.72	9.60	414.51	

# FIVE YEAR EVENT

## Maximum Allowable Release Rate

### Pre-Development Conditions

			C
Roof Area:	0	sq.m	0.90
Asphalt/Concrete Area:	0	sq.m	0.90
Gravel Area:	0	sq.m	0.70
"Woodland" Area:	42067	sq.m	0.30
			as per Table 5.7 Ottawa Sewer Design Guidelines: Woodland - Flat Clay / Silt Loam x 125%
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Total Catchment Area:	42067	sq.m	0.30

#### Airport Formula

$$T_c = \frac{3.26 (1.1 - C) (L)^{1/2}}{S_w^{0.33}} \text{ min}$$

Runoff Coefficient (C):	0.30	
Sheet Flow Distance (L):	180	m
Slope of Land (Sw):	0.3	%
Time of Concentration (Sheet Flow):	52	min

Area (A):	42067	sq.m
Time of Concentration:	52	min
Rainfall Intensity (i):	36.6	mm/hr (5-year event)
Runoff Coefficient (C):	0.30	

Pre-development 100-year Flow Rate (2.78AiC): 128.28 L/s  
(5-Year Maximum Allowable Release Rate)



## DRAINAGE AREA I (Uncontrolled Flow Off Site)

(FIVE-YEAR EVENT)

			C
Roof Area:	0	sq.m	0.90
Asphalt/Concrete Area:	0	sq.m	0.90
Gravel Area:	32	sq.m	0.70
Landscaped Area:	6028	sq.m	0.20
			<hr/>
Total Catchment Area:	6060	sq.m	0.20
Area (A):	6060	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	104.2	mm/hr (5-year event)	
Runoff Coefficient (C):	0.20		
Flow Rate (2.78A/C):	35.57	L/s	

# DRAINAGE AREA II (Roof 1)

(FIVE-YEAR EVENT)

			C
Roof Area:	1087	sq.m	0.90
Asphalt/Concrete Area:	0	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	0	sq.m	0.20

Total Catchment Area: 1087 sq.m 0.90

No. of Roof Drains: 2  
 Slots per Wier: 3 0.0124 L/s/mm/slot (5 USGPM/in/slot)

Depth at Roof Drain: 83 mm

Maximum Roof Drain Release Rate:	6.14	L/s		Pond Area:	420	sq.m
Maximum Scupper Release Rate:	0.00	L/s				
	6.14	L/s		Achieved Volume:	15.63	cu.m

Max. Volume Required: 15.63 cu.m

Time	i	2.78AiC	Roof Drain Release Rate	Scupper Release Rate	Total Release Rate	Stored Rate	Stored Volume
min.	mm/hr	L/s	L/s	L/s	L/s	L/s	cu.m
5	141.2	38.40	6.14	0.00	6.14	32.26	9.68
10	104.2	28.34	6.14	0.00	6.14	22.20	13.32
15	83.6	22.72	6.14	0.00	6.14	16.59	14.93
20	70.3	19.11	6.14	0.00	6.14	12.97	15.56
25	60.9	16.56	6.14	0.00	6.14	10.42	15.63
30	53.9	14.67	6.14	0.00	6.14	8.53	15.35
35	48.5	13.20	6.14	0.00	6.14	7.06	14.82
40	44.2	12.02	6.14	0.00	6.14	5.88	14.11
45	40.6	11.05	6.14	0.00	6.14	4.91	13.26
50	37.7	10.24	6.14	0.00	6.14	4.10	12.31
55	35.1	9.55	6.14	0.00	6.14	3.41	11.27
60	32.9	8.96	6.14	0.00	6.14	2.82	10.16
65	31.0	8.44	6.14	0.00	6.14	2.30	8.99
70	29.4	7.99	6.14	0.00	6.14	1.85	7.77
75	27.9	7.58	6.14	0.00	6.14	1.45	6.51
80	26.6	7.22	6.14	0.00	6.14	1.09	5.21
85	25.4	6.90	6.14	0.00	6.14	0.76	3.88
90	24.3	6.61	6.14	0.00	6.14	0.47	2.52
95	23.3	6.34	6.14	0.00	6.14	0.20	1.14
100	22.4	6.09	6.09	0.00	6.09	0.00	0.00
105	21.6	5.87	5.87	0.00	5.87	0.00	0.00
110	20.8	5.66	5.66	0.00	5.66	0.00	0.00
115	20.1	5.47	5.47	0.00	5.47	0.00	0.00
120	19.5	5.29	5.29	0.00	5.29	0.00	0.00
125	18.9	5.13	5.13	0.00	5.13	0.00	0.00
130	18.3	4.98	4.98	0.00	4.98	0.00	0.00
135	17.8	4.83	4.83	0.00	4.83	0.00	0.00
140	17.3	4.70	4.70	0.00	4.70	0.00	0.00
145	16.8	4.57	4.57	0.00	4.57	0.00	0.00
150	16.4	4.45	4.45	0.00	4.45	0.00	0.00
180	14.2	3.86	3.86	0.00	3.86	0.00	0.00
210	12.6	3.41	3.41	0.00	3.41	0.00	0.00
240	11.3	3.07	3.07	0.00	3.07	0.00	0.00
270	10.3	2.80	2.80	0.00	2.80	0.00	0.00
300	9.5	2.57	2.57	0.00	2.57	0.00	0.00
330	8.8	2.38	2.38	0.00	2.38	0.00	0.00
360	8.2	2.22	2.22	0.00	2.22	0.00	0.00
390	7.7	2.09	2.09	0.00	2.09	0.00	0.00
420	7.2	1.96	1.96	0.00	1.96	0.00	0.00
450	6.8	1.86	1.86	0.00	1.86	0.00	0.00
480	6.5	1.76	1.76	0.00	1.76	0.00	0.00
510	6.2	1.68	1.68	0.00	1.68	0.00	0.00
540	5.9	1.61	1.61	0.00	1.61	0.00	0.00
570	5.7	1.54	1.54	0.00	1.54	0.00	0.00
600	5.4	1.47	1.47	0.00	1.47	0.00	0.00
630	5.2	1.42	1.42	0.00	1.42	0.00	0.00
660	5.0	1.37	1.37	0.00	1.37	0.00	0.00
690	4.8	1.32	1.32	0.00	1.32	0.00	0.00
720	4.7	1.27	1.27	0.00	1.27	0.00	0.00

## DRAINAGE AREA II (Roof 2)

(FIVE-YEAR EVENT)

			C
Roof Area:	805	sq.m	0.90
Asphalt/Concrete Area:	0	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	0	sq.m	0.20
Total Catchment Area:	805	sq.m	0.90

No. of Roof Drains:	2		
Slots per Wier:	2	0.0124 L/s/mm/slot (5 USGPM/in/slot)	
Depth at Roof Drain:	84	mm	
Maximum Roof Drain Release Rate:	4.16	L/s	Pond Area: 322 sq.m
Maximum Scupper Release Rate:	0.00	L/s	
	4.16	L/s	Achieved Volume: 12.15 cu.m
			Max. Volume Required: 12.15 cu.m

Time	i	2.78AIC	Roof Drain Release	Scupper Release	Total Release	Stored Rate	Stored Volume
min.	mm/hr	L/s	L/s	L/s	L/s	L/s	cu.m
5	141.2	28.43	4.16	0.00	4.16	24.27	7.28
10	104.2	20.99	4.16	0.00	4.16	16.82	10.09
15	83.6	16.83	4.16	0.00	4.16	12.67	11.40
20	70.3	14.15	4.16	0.00	4.16	9.99	11.98
25	60.9	12.27	4.16	0.00	4.16	8.10	12.15
30	53.9	10.86	4.16	0.00	4.16	6.70	12.06
35	48.5	9.77	4.16	0.00	4.16	5.61	11.78
40	44.2	8.90	4.16	0.00	4.16	4.74	11.36
45	40.6	8.18	4.16	0.00	4.16	4.02	10.85
50	37.7	7.58	4.16	0.00	4.16	3.42	10.26
55	35.1	7.07	4.16	0.00	4.16	2.91	9.60
60	32.9	6.64	4.16	0.00	4.16	2.47	8.90
65	31.0	6.25	4.16	0.00	4.16	2.09	8.14
70	29.4	5.92	4.16	0.00	4.16	1.75	7.36
75	27.9	5.62	4.16	0.00	4.16	1.45	6.54
80	26.6	5.35	4.16	0.00	4.16	1.19	5.69
85	25.4	5.11	4.16	0.00	4.16	0.95	4.82
90	24.3	4.89	4.16	0.00	4.16	0.73	3.93
95	23.3	4.69	4.16	0.00	4.16	0.53	3.02
100	22.4	4.51	4.16	0.00	4.16	0.35	2.09
105	21.6	4.35	4.16	0.00	4.16	0.18	1.15
110	20.8	4.19	4.16	0.00	4.16	0.03	0.20
115	20.1	4.05	4.05	0.00	4.05	0.00	0.00
120	19.5	3.92	3.92	0.00	3.92	0.00	0.00
125	18.9	3.80	3.80	0.00	3.80	0.00	0.00
130	18.3	3.68	3.68	0.00	3.68	0.00	0.00
135	17.8	3.58	3.58	0.00	3.58	0.00	0.00
140	17.3	3.48	3.48	0.00	3.48	0.00	0.00
145	16.8	3.38	3.38	0.00	3.38	0.00	0.00
150	16.4	3.30	3.30	0.00	3.30	0.00	0.00
180	14.2	2.86	2.86	0.00	2.86	0.00	0.00
210	12.6	2.53	2.53	0.00	2.53	0.00	0.00
240	11.3	2.27	2.27	0.00	2.27	0.00	0.00
270	10.3	2.07	2.07	0.00	2.07	0.00	0.00
300	9.5	1.90	1.90	0.00	1.90	0.00	0.00
330	8.8	1.77	1.77	0.00	1.77	0.00	0.00
360	8.2	1.65	1.65	0.00	1.65	0.00	0.00
390	7.7	1.54	1.54	0.00	1.54	0.00	0.00
420	7.2	1.45	1.45	0.00	1.45	0.00	0.00
450	6.8	1.38	1.38	0.00	1.38	0.00	0.00
480	6.5	1.31	1.31	0.00	1.31	0.00	0.00
510	6.2	1.24	1.24	0.00	1.24	0.00	0.00
540	5.9	1.19	1.19	0.00	1.19	0.00	0.00
570	5.7	1.14	1.14	0.00	1.14	0.00	0.00
600	5.4	1.09	1.09	0.00	1.09	0.00	0.00
630	5.2	1.05	1.05	0.00	1.05	0.00	0.00
660	5.0	1.01	1.01	0.00	1.01	0.00	0.00
690	4.8	0.98	0.98	0.00	0.98	0.00	0.00
720	4.7	0.94	0.94	0.00	0.94	0.00	0.00

# DRAINAGE AREA III (Roof 3)

(FIVE-YEAR EVENT)

			C
Roof Area:	872	sq.m	0.90
Asphalt/Concrete Area:	0	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	0	sq.m	0.20

Total Catchment Area: 872 sq.m 0.90

No. of Roof Drains: 2  
 Slots per Wier: 2 0.0124 L/s/mm/slot (5 USGPM/in/slot)

Depth at Roof Drain: 85 mm

Maximum Roof Drain Release Rate: 4.22 L/s  
 Maximum Scupper Release Rate: 0.00 L/s  
 4.22 L/s

Pond Area: 357 sq.m

Achieved Volume: 13.60 cu.m

Max. Volume Required: 13.60 cu.m

Time min.	i mm/hr	2.78AiC L/s	Roof Drain	Scupper	Total	Stored Rate L/s	Stored Volume cu.m
			Release Rate L/s	Release Rate L/s	Release Rate L/s		
5	141.2	30.80	4.22	0.00	4.22	26.58	7.97
10	104.2	22.73	4.22	0.00	4.22	18.51	11.11
15	83.6	18.23	4.22	0.00	4.22	14.01	12.61
20	70.3	15.33	4.22	0.00	4.22	11.11	13.33
25	60.9	13.29	4.22	0.00	4.22	9.06	13.60
30	53.9	11.77	4.22	0.00	4.22	7.54	13.58
35	48.5	10.59	4.22	0.00	4.22	6.36	13.36
40	44.2	9.64	4.22	0.00	4.22	5.42	13.00
45	40.6	8.86	4.22	0.00	4.22	4.64	12.53
50	37.7	8.21	4.22	0.00	4.22	3.99	11.98
55	35.1	7.66	4.22	0.00	4.22	3.44	11.36
60	32.9	7.19	4.22	0.00	4.22	2.97	10.68
65	31.0	6.77	4.22	0.00	4.22	2.55	9.95
70	29.4	6.41	4.22	0.00	4.22	2.19	9.18
75	27.9	6.08	4.22	0.00	4.22	1.86	8.38
80	26.6	5.80	4.22	0.00	4.22	1.57	7.55
85	25.4	5.53	4.22	0.00	4.22	1.31	6.70
90	24.3	5.30	4.22	0.00	4.22	1.08	5.82
95	23.3	5.08	4.22	0.00	4.22	0.86	4.92
100	22.4	4.89	4.22	0.00	4.22	0.67	4.00
105	21.6	4.71	4.22	0.00	4.22	0.49	3.07
110	20.8	4.54	4.22	0.00	4.22	0.32	2.12
115	20.1	4.39	4.22	0.00	4.22	0.17	1.16
120	19.5	4.25	4.22	0.00	4.22	0.03	0.18
125	18.9	4.11	4.11	0.00	4.11	0.00	0.00
130	18.3	3.99	3.99	0.00	3.99	0.00	0.00
135	17.8	3.88	3.88	0.00	3.88	0.00	0.00
140	17.3	3.77	3.77	0.00	3.77	0.00	0.00
145	16.8	3.67	3.67	0.00	3.67	0.00	0.00
150	16.4	3.57	3.57	0.00	3.57	0.00	0.00
180	14.2	3.09	3.09	0.00	3.09	0.00	0.00
210	12.6	2.74	2.74	0.00	2.74	0.00	0.00
240	11.3	2.46	2.46	0.00	2.46	0.00	0.00
270	10.3	2.24	2.24	0.00	2.24	0.00	0.00
300	9.5	2.06	2.06	0.00	2.06	0.00	0.00
330	8.8	1.91	1.91	0.00	1.91	0.00	0.00
360	8.2	1.78	1.78	0.00	1.78	0.00	0.00
390	7.7	1.67	1.67	0.00	1.67	0.00	0.00
420	7.2	1.58	1.58	0.00	1.58	0.00	0.00
450	6.8	1.49	1.49	0.00	1.49	0.00	0.00
480	6.5	1.42	1.42	0.00	1.42	0.00	0.00
510	6.2	1.35	1.35	0.00	1.35	0.00	0.00
540	5.9	1.29	1.29	0.00	1.29	0.00	0.00
570	5.7	1.23	1.23	0.00	1.23	0.00	0.00
600	5.4	1.18	1.18	0.00	1.18	0.00	0.00
630	5.2	1.14	1.14	0.00	1.14	0.00	0.00
660	5.0	1.10	1.10	0.00	1.10	0.00	0.00
690	4.8	1.06	1.06	0.00	1.06	0.00	0.00
720	4.7	1.02	1.02	0.00	1.02	1.02	44.12

# DRAINAGE AREA III (Roof 4)

(FIVE-YEAR EVENT)

Roof Area:	805	sq.m					C 0.90
Asphalt/Concrete Area:	0	sq.m					0.90
Gravel Area:	0	sq.m					0.70
Landscaped Area:	0	sq.m					0.20

Total Catchment Area: 805 sq.m 0.90

No. of Roof Drains: 2  
 Slots per Wier: 2 0.0124 L/s/mm/slot (5 USGPM/in/slot)

Depth at Roof Drain: 81 mm

Maximum Roof Drain Release Rate: 4.04 L/s  
 Maximum Scupper Release Rate: 0.00 L/s  
Pond Area: 335 sq.m  
Achieved Volume: 12.34 cu.m

Max. Volume Required: 12.34 cu.m

Time	i	2.78AiC	Roof Drain Release Rate	Scupper Release Rate	Total Release Rate	Stored Rate	Stored Volume
min.	mm/hr	L/s	L/s	L/s	L/s	L/s	cu.m
5	141.2	28.43	4.04	0.00	4.04	24.39	7.32
10	104.2	20.99	4.04	0.00	4.04	16.94	10.17
15	83.6	16.83	4.04	0.00	4.04	12.79	11.51
20	70.3	14.15	4.04	0.00	4.04	10.11	12.13
25	60.9	12.27	4.04	0.00	4.04	8.22	12.34
30	53.9	10.86	4.04	0.00	4.04	6.82	12.28
35	48.5	9.77	4.04	0.00	4.04	5.73	12.04
40	44.2	8.90	4.04	0.00	4.04	4.86	11.66
45	40.6	8.18	4.04	0.00	4.04	4.14	11.18
50	37.7	7.58	4.04	0.00	4.04	3.54	10.63
55	35.1	7.07	4.04	0.00	4.04	3.03	10.01
60	32.9	6.64	4.04	0.00	4.04	2.59	9.34
65	31.0	6.25	4.04	0.00	4.04	2.21	8.63
70	29.4	5.92	4.04	0.00	4.04	1.87	7.87
75	27.9	5.62	4.04	0.00	4.04	1.58	7.09
80	26.6	5.35	4.04	0.00	4.04	1.31	6.28
85	25.4	5.11	4.04	0.00	4.04	1.07	5.45
90	24.3	4.89	4.04	0.00	4.04	0.85	4.60
95	23.3	4.69	4.04	0.00	4.04	0.65	3.72
100	22.4	4.51	4.04	0.00	4.04	0.47	2.83
105	21.6	4.35	4.04	0.00	4.04	0.31	1.93
110	20.8	4.19	4.04	0.00	4.04	0.15	1.01
115	20.1	4.05	4.04	0.00	4.04	0.01	0.08
120	19.5	3.92	3.92	0.00	3.92	0.00	0.00
125	18.9	3.80	3.80	0.00	3.80	0.00	0.00
130	18.3	3.68	3.68	0.00	3.68	0.00	0.00
135	17.8	3.58	3.58	0.00	3.58	0.00	0.00
140	17.3	3.48	3.48	0.00	3.48	0.00	0.00
145	16.8	3.38	3.38	0.00	3.38	0.00	0.00
150	16.4	3.30	3.30	0.00	3.30	0.00	0.00
180	14.2	2.86	2.86	0.00	2.86	0.00	0.00
210	12.6	2.53	2.53	0.00	2.53	0.00	0.00
240	11.3	2.27	2.27	0.00	2.27	0.00	0.00
270	10.3	2.07	2.07	0.00	2.07	0.00	0.00
300	9.5	1.90	1.90	0.00	1.90	0.00	0.00
330	8.8	1.77	1.77	0.00	1.77	0.00	0.00
360	8.2	1.65	1.65	0.00	1.65	0.00	0.00
390	7.7	1.54	1.54	0.00	1.54	0.00	0.00
420	7.2	1.45	1.45	0.00	1.45	0.00	0.00
450	6.8	1.38	1.38	0.00	1.38	0.00	0.00
480	6.5	1.31	1.31	0.00	1.31	0.00	0.00
510	6.2	1.24	1.24	0.00	1.24	0.00	0.00
540	5.9	1.19	1.19	0.00	1.19	0.00	0.00
570	5.7	1.14	1.14	0.00	1.14	0.00	0.00
600	5.4	1.09	1.09	0.00	1.09	0.00	0.00
630	5.2	1.05	1.05	0.00	1.05	0.00	0.00
660	5.0	1.01	1.01	0.00	1.01	0.00	0.00
690	4.8	0.98	0.98	0.00	0.98	0.00	0.00
720	4.7	0.94	0.94	0.00	0.94	0.00	0.00

# DRAINAGE AREA III (Roof 5)

(FIVE-YEAR EVENT)

			C
Roof Area:	805	sq.m	0.90
Asphalt/Concrete Area:	0	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	0	sq.m	0.20
Total Catchment Area:	805	sq.m	0.90

No. of Roof Drains: 2  
 Slots per Wier: 2    0.0124 L/s/mm/slot (5 USGPM/in/slot)

Depth at Roof Drain: 81 mm

Maximum Roof Drain Release Rate:	4.04	L/s					
Maximum Scupper Release Rate:	0.00	L/s				Pond Area:	335 sq.m
	4.04	L/s				Achieved Volume:	12.34 cu.m
						Max. Volume Required:	12.34 cu.m

Time	i	2.78AIC	Roof Drain Release	Scupper Release	Total Release	Stored	Stored Volume
min.	mm/hr	L/s	L/s	L/s	L/s	L/s	cu.m
5	141.2	28.43	4.04	0.00	4.04	24.39	7.32
10	104.2	20.99	4.04	0.00	4.04	16.94	10.17
15	83.6	16.83	4.04	0.00	4.04	12.79	11.51
20	70.3	14.15	4.04	0.00	4.04	10.11	12.13
25	60.9	12.27	4.04	0.00	4.04	8.22	12.34
30	53.9	10.86	4.04	0.00	4.04	6.82	12.28
35	48.5	9.77	4.04	0.00	4.04	5.73	12.04
40	44.2	8.90	4.04	0.00	4.04	4.86	11.66
45	40.6	8.18	4.04	0.00	4.04	4.14	11.18
50	37.7	7.58	4.04	0.00	4.04	3.54	10.63
55	35.1	7.07	4.04	0.00	4.04	3.03	10.01
60	32.9	6.64	4.04	0.00	4.04	2.59	9.34
65	31.0	6.25	4.04	0.00	4.04	2.21	8.63
70	29.4	5.92	4.04	0.00	4.04	1.87	7.87
75	27.9	5.62	4.04	0.00	4.04	1.58	7.09
80	26.6	5.35	4.04	0.00	4.04	1.31	6.28
85	25.4	5.11	4.04	0.00	4.04	1.07	5.45
90	24.3	4.89	4.04	0.00	4.04	0.85	4.60
95	23.3	4.69	4.04	0.00	4.04	0.65	3.72
100	22.4	4.51	4.04	0.00	4.04	0.47	2.83
105	21.6	4.35	4.04	0.00	4.04	0.31	1.93
110	20.8	4.19	4.04	0.00	4.04	0.15	1.01
115	20.1	4.05	4.04	0.00	4.04	0.01	0.08
120	19.5	3.92	3.92	0.00	3.92	0.00	0.00
125	18.9	3.80	3.80	0.00	3.80	0.00	0.00
130	18.3	3.68	3.68	0.00	3.68	0.00	0.00
135	17.8	3.58	3.58	0.00	3.58	0.00	0.00
140	17.3	3.48	3.48	0.00	3.48	0.00	0.00
145	16.8	3.38	3.38	0.00	3.38	0.00	0.00
150	16.4	3.30	3.30	0.00	3.30	0.00	0.00
180	14.2	2.86	2.86	0.00	2.86	0.00	0.00
210	12.6	2.53	2.53	0.00	2.53	0.00	0.00
240	11.3	2.27	2.27	0.00	2.27	0.00	0.00
270	10.3	2.07	2.07	0.00	2.07	0.00	0.00
300	9.5	1.90	1.90	0.00	1.90	0.00	0.00
330	8.8	1.77	1.77	0.00	1.77	0.00	0.00
360	8.2	1.65	1.65	0.00	1.65	0.00	0.00
390	7.7	1.54	1.54	0.00	1.54	0.00	0.00
420	7.2	1.45	1.45	0.00	1.45	0.00	0.00
450	6.8	1.38	1.38	0.00	1.38	0.00	0.00
480	6.5	1.31	1.31	0.00	1.31	0.00	0.00
510	6.2	1.24	1.24	0.00	1.24	0.00	0.00
540	5.9	1.19	1.19	0.00	1.19	0.00	0.00
570	5.7	1.14	1.14	0.00	1.14	0.00	0.00
600	5.4	1.09	1.09	0.00	1.09	0.00	0.00
630	5.2	1.05	1.05	0.00	1.05	0.00	0.00
660	5.0	1.01	1.01	0.00	1.01	0.00	0.00
690	4.8	0.98	0.98	0.00	0.98	0.00	0.00
720	4.7	0.94	0.94	0.00	0.94	0.00	0.00

## DRAINAGE AREA III (Roof 6)

(FIVE-YEAR EVENT)

			C
Roof Area:	618	sq.m	0.90
Asphalt/Concrete Area:	0	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	0	sq.m	0.20
			0.20
Total Catchment Area:	618	sq.m	0.90

No. of Roof Drains:	2		
Slots per Wier:	2	0.0124 L/s/mm/slot (5 USGPM/in/slot)	
Depth at Roof Drain:	80	mm	
Maximum Roof Drain Release Rate:	3.98	L/s	Pond Area: 227 sq.m
Maximum Scupper Release Rate:	0.00	L/s	
	3.98	L/s	Achieved Volume: 8.26 cu.m
			Max. Volume Required: 8.26 cu.m

Time	i	2.78AIC	Roof Drain Release	Scupper Release	Total Release	Stored Rate	Stored Volume
min.	mm/hr	L/s	L/s	L/s	L/s	L/s	cu.m
5	141.2	21.83	3.98	0.00	3.98	17.85	5.36
10	104.2	16.11	3.98	0.00	3.98	12.14	7.28
15	83.6	12.92	3.98	0.00	3.98	8.94	8.05
20	70.3	10.86	3.98	0.00	3.98	6.89	8.26
25	60.9	9.42	3.98	0.00	3.98	5.44	8.16
30	53.9	8.34	3.98	0.00	3.98	4.36	7.85
35	48.5	7.50	3.98	0.00	3.98	3.53	7.41
40	44.2	6.83	3.98	0.00	3.98	2.86	6.86
45	40.6	6.28	3.98	0.00	3.98	2.31	6.23
50	37.7	5.82	3.98	0.00	3.98	1.85	5.54
55	35.1	5.43	3.98	0.00	3.98	1.46	4.80
60	32.9	5.09	3.98	0.00	3.98	1.12	4.03
65	31.0	4.80	3.98	0.00	3.98	0.82	3.22
70	29.4	4.54	3.98	0.00	3.98	0.57	2.38
75	27.9	4.31	3.98	0.00	3.98	0.34	1.52
80	26.6	4.11	3.98	0.00	3.98	0.13	0.63
85	25.4	3.92	3.92	0.00	3.92	0.00	0.00
90	24.3	3.76	3.76	0.00	3.76	0.00	0.00
95	23.3	3.60	3.60	0.00	3.60	0.00	0.00
100	22.4	3.46	3.46	0.00	3.46	0.00	0.00
105	21.6	3.34	3.34	0.00	3.34	0.00	0.00
110	20.8	3.22	3.22	0.00	3.22	0.00	0.00
115	20.1	3.11	3.11	0.00	3.11	0.00	0.00
120	19.5	3.01	3.01	0.00	3.01	0.00	0.00
125	18.9	2.92	2.92	0.00	2.92	0.00	0.00
130	18.3	2.83	2.83	0.00	2.83	0.00	0.00
135	17.8	2.75	2.75	0.00	2.75	0.00	0.00
140	17.3	2.67	2.67	0.00	2.67	0.00	0.00
145	16.8	2.60	2.60	0.00	2.60	0.00	0.00
150	16.4	2.53	2.53	0.00	2.53	0.00	0.00
180	14.2	2.19	2.19	0.00	2.19	0.00	0.00
210	12.6	1.94	1.94	0.00	1.94	0.00	0.00
240	11.3	1.75	1.75	0.00	1.75	0.00	0.00
270	10.3	1.59	1.59	0.00	1.59	0.00	0.00
300	9.5	1.46	1.46	0.00	1.46	0.00	0.00
330	8.8	1.36	1.36	0.00	1.36	0.00	0.00
360	8.2	1.26	1.26	0.00	1.26	0.00	0.00
390	7.7	1.19	1.19	0.00	1.19	0.00	0.00
420	7.2	1.12	1.12	0.00	1.12	0.00	0.00
450	6.8	1.06	1.06	0.00	1.06	0.00	0.00
480	6.5	1.00	1.00	0.00	1.00	0.00	0.00
510	6.2	0.96	0.96	0.00	0.96	0.00	0.00
540	5.9	0.91	0.91	0.00	0.91	0.00	0.00
570	5.7	0.87	0.87	0.00	0.87	0.00	0.00
600	5.4	0.84	0.84	0.00	0.84	0.00	0.00
630	5.2	0.81	0.81	0.00	0.81	0.00	0.00
660	5.0	0.78	0.78	0.00	0.78	0.00	0.00
690	4.8	0.75	0.75	0.00	0.75	0.00	0.00
720	4.7	0.72	0.72	0.00	0.72	0.00	0.00



# DRAINAGE AREA IV

(FIVE-YEAR EVENT)

				C
Roof Area:	0	sq.m		0.90
Asphalt/Concrete Area:	4399	sq.m		0.90
Gravel Area:	3942	sq.m		0.70
Landscaped Area:	1138	sq.m		0.20
<hr/>				
Total Catchment Area:	9479	sq.m		0.73

Water Elevation:	77.10	m							
					Granular Surface Storage				
					Area	Max. Depth			
Invert of Culvert Inlet:	76.64	m			sq.m	m			
					412	0.16	21.49	cu.m	
Centroid of ICD Orifice:	76.71	m (ICD in Culvert Inlet)							
					Stormwater Detention Area A1				
					Area	Avg. Depth			
Head:	0.38	m			sq.m	m			
Orifice Diameter:	146	mm			341	0.35	101.54	cu.m	
Orifice Area:	16719	sq.mm			Stormwater Detention Area A2				
					Area	Avg. Depth			
Coefficient of Discharge:	0.61				sq.m	m			
					148	0.21	27.19	cu.m	
Maximum ICD Release Rate:	27.97	L/s							
Maximum Weir Release Rate:	0.00	L/s							
Maximum Release Rate:	27.97	L/s					Achieved Volume:	150.22	cu.m
							Max. Volume Required:	150.22	cu.m

Time min.	i mm/hr	2.78AiC L/s	50% of Release Rate		Total Inflow L/s	ICD Release Rate L/s	Weir Release Rate L/s	Total Release L/s	Stored Rate L/s	Stored Volume cu.m
			from Roof 1 L/s	from Roof 2 L/s						
5	141.2	272.62	3.07	2.08	277.77	27.97	0.00	27.97	249.80	74.94
10	104.2	201.20	3.07	2.08	206.35	27.97	0.00	27.97	178.38	107.03
15	83.6	161.35	3.07	2.08	166.50	27.97	0.00	27.97	138.53	124.68
20	70.3	135.66	3.07	2.08	140.81	27.97	0.00	27.97	112.84	135.40
25	60.9	117.59	3.07	2.08	122.74	27.97	0.00	27.97	94.77	142.16
30	53.9	104.14	3.07	2.08	109.29	27.97	0.00	27.97	81.32	146.37
35	48.5	93.69	3.07	2.08	98.84	27.97	0.00	27.97	70.87	148.83
40	44.2	85.32	3.07	2.08	90.47	27.97	0.00	27.97	62.50	150.00
45	40.6	78.45	3.07	2.08	83.61	27.97	0.00	27.97	55.64	150.22
50	37.7	72.71	3.07	2.08	77.86	27.97	0.00	27.97	49.89	149.67
55	35.1	67.82	3.07	2.08	72.98	27.97	0.00	27.97	45.00	148.52
60	32.9	63.61	3.07	2.08	68.77	27.97	0.00	27.97	40.80	146.86
65	31.0	59.95	3.07	2.08	65.10	27.97	0.00	27.97	37.13	144.80
70	29.4	56.72	3.07	2.08	61.87	27.97	0.00	27.97	33.90	142.37
75	27.9	53.85	3.07	2.08	59.00	27.97	0.00	27.97	31.03	139.65
80	26.6	51.29	3.07	2.08	56.44	27.97	0.00	27.97	28.47	136.67
85	25.4	48.99	3.07	2.08	54.14	27.97	0.00	27.97	26.17	133.46
90	24.3	46.90	3.07	2.08	52.05	27.97	0.00	27.97	24.08	130.04
95	23.3	45.00	3.07	2.08	50.15	27.97	0.00	27.97	22.18	126.45
100	22.4	43.27	3.05	2.08	48.40	27.97	0.00	27.97	20.43	122.56
105	21.6	41.68	2.93	2.08	46.69	27.97	0.00	27.97	18.72	117.95
110	20.8	40.21	2.83	2.08	45.12	27.97	0.00	27.97	17.15	113.20
115	20.1	38.85	2.74	2.03	43.61	27.97	0.00	27.97	15.64	107.94
120	19.5	37.59	2.65	1.96	42.20	27.97	0.00	27.97	14.23	102.45
125	18.9	36.42	2.56	1.90	40.88	27.97	0.00	27.97	12.91	96.86
130	18.3	35.33	2.49	1.84	39.66	27.97	0.00	27.97	11.69	91.16
135	17.8	34.30	2.42	1.79	38.51	27.97	0.00	27.97	10.54	85.37
140	17.3	33.35	2.35	1.74	37.43	27.97	0.00	27.97	9.46	79.48
145	16.8	32.44	2.28	1.69	36.42	27.97	0.00	27.97	8.45	73.52
150	16.4	31.60	2.22	1.65	35.47	27.97	0.00	27.97	7.50	67.48
180	14.2	27.38	1.93	1.43	30.74	27.97	0.00	27.97	2.77	29.89
210	12.6	24.24	1.71	1.26	27.22	27.22	0.00	27.22	0.00	0.00
240	11.3	21.81	1.54	1.14	24.48	24.48	0.00	24.48	0.00	0.00
270	10.3	19.86	1.40	1.04	22.29	22.29	0.00	22.29	0.00	0.00
300	9.5	18.26	1.29	0.95	20.50	20.50	0.00	20.50	0.00	0.00
330	8.8	16.92	1.19	0.88	19.00	19.00	0.00	19.00	0.00	0.00
360	8.2	15.78	1.11	0.82	17.72	17.72	0.00	17.72	0.00	0.00
390	7.7	14.80	1.04	0.77	16.62	16.62	0.00	16.62	0.00	0.00
420	7.2	13.95	0.98	0.73	15.66	15.66	0.00	15.66	0.00	0.00
450	6.8	13.20	0.93	0.69	14.82	14.82	0.00	14.82	0.00	0.00
480	6.5	12.53	0.88	0.65	14.07	14.07	0.00	14.07	0.00	0.00
510	6.2	11.93	0.84	0.62	13.40	13.40	0.00	13.40	0.00	0.00
540	5.9	11.40	0.80	0.59	12.80	12.80	0.00	12.80	0.00	0.00
570	5.7	10.91	0.77	0.57	12.25	12.25	0.00	12.25	0.00	0.00
600	5.4	10.47	0.74	0.55	11.75	11.75	0.00	11.75	0.00	0.00
630	5.2	10.07	0.71	0.53	11.30	11.30	0.00	11.30	0.00	0.00
660	5.0	9.70	0.68	0.51	10.88	10.88	0.00	10.88	0.00	0.00
690	4.8	9.35	0.66	0.49	10.50	10.50	0.00	10.50	0.00	0.00
720	4.7	9.04	0.64	0.47	10.15	10.15	0.00	10.15	0.00	0.00



# DRAINAGE AREA VI

(FIVE-YEAR EVENT)

			C
Roof Area:	0	sq.m	0.90
Asphalt/Concrete Area:	2787	sq.m	0.90
Gravel Area:	5572	sq.m	0.70
Landscaped Area:	2921	sq.m	0.20
Total Catchment Area:			0.62

Water Elevation:	77.14	m			
Invert of Culvert Inlet:	76.64	m			
Centroid of ICD Orifice:	76.68	m (ICD in Culvert Inlet)			
Head:	0.46	m			
Orifice Diameter:	75	mm			
Orifice Area:	4418	sq.mm			
Coefficient of Discharge:	0.61				
Maximum Release Rate:	8.09	L/s			
Maximum Weir Release Rate:	0.00	L/s			
Maximum Release Rate:	8.09	L/s			

			Granular Surface Storage	
	Area	Max. Depth		
	sq.m	m		
	646	0.26	55.18	cu.m

			Stormwater Detention Area C	
	Area	Avg. Depth		
	sq.m	m		
	562	0.37	193.25	cu.m

	Achieved Volume:	248.42	cu.m	
	Max. Volume Required:	248.42	cu.m	

Time min.	i mm/hr	2.78AiC L/s	50% of Release Rate		Total Inflow L/s	ICD Release Rate L/s	Weir Release Rate L/s	Total Release L/s	Stored Rate L/s	Stored Volume cu.m
			from Roof 1 L/s	from Roof 2 L/s						
			5	141.2						
10	104.2	202.55	3.07	2.08	207.71	8.09	0.00	8.09	199.62	119.77
15	83.6	162.44	3.07	2.08	167.59	8.09	0.00	8.09	159.50	143.55
20	70.3	136.57	3.07	2.08	141.72	8.09	0.00	8.09	133.64	160.36
25	60.9	118.38	3.07	2.08	123.53	8.09	0.00	8.09	115.45	173.17
30	53.9	104.84	3.07	2.08	109.99	8.09	0.00	8.09	101.90	183.43
35	48.5	94.32	3.07	2.08	99.47	8.09	0.00	8.09	91.39	191.91
40	44.2	85.90	3.07	2.08	91.05	8.09	0.00	8.09	82.96	199.11
45	40.6	78.98	3.07	2.08	84.13	8.09	0.00	8.09	76.05	205.33
50	37.7	73.20	3.07	2.08	78.35	8.09	0.00	8.09	70.27	210.80
55	35.1	68.28	3.07	2.08	73.43	8.09	0.00	8.09	65.35	215.64
60	32.9	64.04	3.07	2.08	69.19	8.09	0.00	8.09	61.11	219.99
65	31.0	60.35	3.07	2.08	65.50	8.09	0.00	8.09	57.42	223.92
70	29.4	57.10	3.07	2.08	62.25	8.09	0.00	8.09	54.17	227.50
75	27.9	54.22	3.07	2.08	59.37	8.09	0.00	8.09	51.28	230.77
80	26.6	51.64	3.07	2.08	56.79	8.09	0.00	8.09	48.70	233.78
85	25.4	49.32	3.07	2.08	54.47	8.09	0.00	8.09	46.38	236.56
90	24.3	47.22	3.07	2.08	52.37	8.09	0.00	8.09	44.28	239.13
95	23.3	45.31	3.07	2.08	50.46	8.09	0.00	8.09	42.37	241.52
100	22.4	43.56	3.05	2.08	48.69	8.09	0.00	8.09	40.60	243.62
105	21.6	41.96	2.93	2.08	46.97	8.09	0.00	8.09	38.89	245.00
110	20.8	40.48	2.83	2.08	45.39	8.09	0.00	8.09	37.31	246.23
115	20.1	39.11	2.74	2.03	43.88	8.09	0.00	8.09	35.79	246.95
120	19.5	37.85	2.65	1.96	42.45	8.09	0.00	8.09	34.37	247.45
125	18.9	36.67	2.56	1.90	41.13	8.09	0.00	8.09	33.04	247.84
130	18.3	35.57	2.49	1.84	39.90	8.09	0.00	8.09	31.81	248.12
135	17.8	34.54	2.42	1.79	38.74	8.09	0.00	8.09	30.66	248.31
140	17.3	33.57	2.35	1.74	37.66	8.09	0.00	8.09	29.57	248.41
145	16.8	32.66	2.28	1.69	36.64	8.09	0.00	8.09	28.55	248.42
150	16.4	31.81	2.22	1.65	35.68	8.09	0.00	8.09	27.60	248.36
180	14.2	27.57	1.93	1.43	30.92	8.09	0.00	8.09	22.84	246.64
210	12.6	24.41	1.71	1.26	27.38	8.09	0.00	8.09	19.29	243.11
240	11.3	21.96	1.54	1.14	24.63	8.09	0.00	8.09	16.54	238.24
270	10.3	19.99	1.40	1.04	22.43	8.09	0.00	8.09	14.34	232.36
300	9.5	18.38	1.29	0.95	20.62	8.09	0.00	8.09	12.54	225.66
330	8.8	17.04	1.19	0.88	19.11	8.09	0.00	8.09	11.03	218.30
360	8.2	15.89	1.11	0.82	17.83	8.09	0.00	8.09	9.74	210.39
390	7.7	14.90	1.04	0.77	16.72	8.09	0.00	8.09	8.63	202.01
420	7.2	14.04	0.98	0.73	15.75	8.09	0.00	8.09	7.67	193.24
450	6.8	13.29	0.93	0.69	14.90	8.09	0.00	8.09	6.82	184.13
480	6.5	12.62	0.88	0.65	14.15	8.09	0.00	8.09	6.07	174.71
510	6.2	12.02	0.84	0.62	13.48	8.09	0.00	8.09	5.39	165.02
540	5.9	11.48	0.80	0.59	12.87	8.09	0.00	8.09	4.79	155.10
570	5.7	10.99	0.77	0.57	12.32	8.09	0.00	8.09	4.24	144.96
600	5.4	10.54	0.74	0.55	11.82	8.09	0.00	8.09	3.74	134.63
630	5.2	10.13	0.71	0.53	11.37	8.09	0.00	8.09	3.28	124.12
660	5.0	9.76	0.68	0.51	10.95	8.09	0.00	8.09	2.87	113.46
690	4.8	9.42	0.66	0.49	10.56	8.09	0.00	8.09	2.48	102.65
720	4.7	9.10	0.64	0.47	10.21	8.09	0.00	8.09	2.12	91.70

## Mitch Owens Road / Boundary Road Ottawa, Ontario

### BROAD CRESTED WEIR CALCULATIONS

1:100 YEAR EVENT

#### DRAINAGE AREA IV

#### (SWM Detention Area A1 Overflow Weir)

Length of Weir based on an assumed coefficient of discharge (Cd):

if Q =	6.76	L/s	(maximum permitted flow)	
=	0.00676	cu.m/s		assumes Cd= 0.577
& H =	0.02	m	(max. depth of water above top of weir)	(assumes P/H is large)
then L =	1.40	m	(length of weir)	$L = Q / ((1.705) \times H^{(3/2)})$

Length of Weir based on a calculated coefficient of discharge (Cd):

if P =	0.53	m	(depth of pond)	
& Lp =	10.0	m	(width of pond perpendicular to direction of flow)	
then Vp =	0.00	m/s	(velocity in pond)	$Vp = Q / ((P+H) / Lp)$
& E =	0.02	m	(energy)	$E = H + V^2/2g$
& Cd =	0.577			$= 0.577 \times (E/H)^{(3/2)}$
if Q =	6.76	L/s	(maximum permitted flow)	
=	0.00676	cu.m/s		
& H =	0.02	m	(depth of water above top of weir)	
then L =	1.40	m	(length of weir)	$L = Q / (Cd^{(2/3)} \times (2 \times 9.81)^{(1/2)} \times H^{(3/2)})$

## DRAINAGE AREA V (SWM Detention Area B1 Overflow Weir)

Length of Weir based on an assumed coefficient of discharge (Cd):

if Q =	24.70	L/s (maximum permitted flow)	assumes Cd= 0.577
=	0.02470	cu.m/s	(assumes P/H is large)
& H =	0.05	m (max. depth of water above top of weir)	
then L =	1.30	m (length of weir) $L = Q / ((1.705) \times H^{(3/2)})$	

Length of Weir based on a calculated coefficient of discharge (Cd):

if P =	0.46	m (depth of pond)	
& Lp =	3.2	m (width of pond perpendicular to direction of flow)	
then Vp =	0.02	m/s (velocity in pond) $Vp = Q / ((P+H) / Lp)$	
& E =	0.05	m (energy) $E = H + V^2/2g$	
& Cd =	0.578	= $0.577 \times (E/H)^{(3/2)}$	
if Q =	24.70	L/s (maximum permitted flow)	
=	0.02470	cu.m/s	
& H =	0.05	m (depth of water above top of weir)	
then L =	1.30	m (length of weir) $L = Q / (Cd^{(2/3)} \times (2 \times 9.81)^{(1/2)} \times H^{(3/2)})$	

## DRAINAGE AREA VI (SWM Detention Area C Overflow Weir)

Length of Weir based on an assumed coefficient of discharge (Cd):

if Q =	17.46	L/s (maximum permitted flow)	assumes Cd= 0.577
=	0.01746	cu.m/s	(assumes P/H is large)
& H =	0.03	m (max. depth of water above top of weir)	
then L =	1.97	m (length of weir) $L = Q / ((1.705) \times H^{(3/2)})$	

Length of Weir based on a calculated coefficient of discharge (Cd):

if P =	0.57	m (depth of pond)	
& Lp =	19.0	m (width of pond perpendicular to direction of flow)	
then Vp =	0.00	m/s (velocity in pond) $Vp = Q / ((P+H) / Lp)$	
& E =	0.03	m (energy) $E = H + V^2/2g$	
& Cd =	0.577	= $0.577 \times (E/H)^{(3/2)}$	
if Q =	17.46	L/s (maximum permitted flow)	
=	0.01746	cu.m/s	
& H =	0.03	m (depth of water above top of weir)	
then L =	1.97	m (length of weir) $L = Q / (Cd^{(2/3)} \times (2 \times 9.81)^{(1/2)} \times H^{(3/2)})$	



# Sizing Report

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## Site Information

Project Name: 5592 Boundary Rd. Site Area (hectares): 1.0425  
 Unit Label: OGS1 Runoff Coeff. : .75  
 Unit Location: Ottawa, ON Target Removal Efficiency(%): 80% based on NJDEP

## Product Recommendation

Aqua-Swirl™ Model	Net Annual TSS Removal Efficiency	Chamber Diameter	Maximum Inside Diameter (mm)		Oil/Debris Storage Capacity	Sediment Storage Capacity
			Offline	BYP <sup>5</sup>		
<b>AS-4</b>	<b>87.60 %</b>	1296 mm.	303 mm.	603 mm.	720 L	0.9 m <sup>3</sup>

## Rainfall Information

NCDC Station<sup>1</sup>: OTTAWA MACDONALD-CARTIER INT'L A Data Range<sup>4</sup>: 261,759 readings taken hourly between 1967 to 2007 (~40 years)

Rainfall Event Range (mm/hre)	Rainfall Interval Point (mm/hre)	Operating Rate (Lps/m <sup>2</sup> )	Total Rainfall (%)	Removal Efficiency (%) <sup>2</sup>	Relative Efficiency(%)
02.00 - 03.00	02.50	03.67	44.18	94.12	41.58
03.00 - 04.00	03.50	05.14	21.52	91.87	19.77
04.00 - 05.00	04.50	06.61	11.68	89.24	10.42
05.00 - 06.00	05.50	08.08	06.68	86.25	05.76
06.00 - 07.00	06.50	09.55	04.03	82.90	03.34
07.00 - 08.00	07.50	11.02	01.99	79.17	01.58
08.00 - 09.00	08.50	12.49	01.84	75.09	01.38
09.00 - 10.00	09.50	13.96	01.81	70.63	01.28
10.00 - 15.00	12.50	18.37	04.12	55.08	02.27
15.00 - 20.00	17.50	25.72	01.02	21.83	00.22
<b>Total Cumulative Rainfall %:</b>			<b>98.87<sup>3</sup></b>	<b>Net Annual %:</b>	<b>87.60</b>

## Sales Agent Information

Agent Name: Dave Kanters Phone: 416-347-2799  
 Company Name: Soleno Fax: \_\_\_\_\_  
 Address: 347, 15-75 Bayly St. W. E-mail: dkanters@soleno.com  
 City, State Zip: Ajax, ON L1S7K7

## Footnotes

- Recorded as hourly precipitation rainfall data (inches), National Climatic Data Center (NCDC)
- Based on Tennessee Tech University laboratory testing of the AquaSwirl™ Model AS-3 for OK-110 silica particles 50-125 microns(Neary, 2002)
- 90% Rainfall Event, calculated as a cumulative percentile of individual events, [www.stormwatercenter.net](http://www.stormwatercenter.net), sizing criteria (Center for Watershed Protection)
- NCDC data may not be consecutive, skipping days, months and/or years in the range of dates.
- The Aqua-Swirl™ Internal Bypass (BYP) provides full treatment of the "first flush," while the peak design storm is diverted and channeled through the main conveyance pipe. Please refer to your local representative for more information.
- When applicable, the performance curve was adjusted via Pecllet Scaling to provide estimated sizing per NJDEP PSD (d50 = 67 microns).



# Sizing Report

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## Site Information

Project Name: 5592 Boundary Rd. Site Area (hectares): 1.3356  
 Unit Label: OGS2 Runoff Coeff. : .73  
 Unit Location: Ottawa, ON Target Removal Efficiency(%): 80% based on NJDEP

## Product Recommendation

Aqua-Swirl™ Model	Net Annual TSS Removal Efficiency	Chamber Diameter	Maximum Inside Diameter (mm)		Oil/Debris Storage Capacity	Sediment Storage Capacity
			Offline	BYP <sup>5</sup>		
<b>AS-4</b>	<b>84.00 %</b>	1296 mm.	303 mm.	603 mm.	720 L	0.9 m <sup>3</sup>

## Rainfall Information

NCDC Station<sup>1</sup>: OTTAWA MACDONALD-CARTIER INT'L A Data Range<sup>4</sup>: 261,759 readings taken hourly between 1967 to 2007 (~40 years)

Rainfall Event Range (mm/hre)	Rainfall Interval Point (mm/hre)	Operating Rate (Lps/m <sup>2</sup> )	Total Rainfall (%)	Removal Efficiency (%) <sup>2</sup>	Relative Efficiency(%)
02.00 - 03.00	02.50	04.58	44.18	92.77	40.99
03.00 - 04.00	03.50	06.41	21.52	89.62	19.29
04.00 - 05.00	04.50	08.25	11.68	85.90	10.03
05.00 - 06.00	05.50	10.08	06.68	81.60	05.45
06.00 - 07.00	06.50	11.91	04.03	76.74	03.09
07.00 - 08.00	07.50	13.75	01.99	71.31	01.42
08.00 - 09.00	08.50	15.58	01.84	65.31	01.20
09.00 - 10.00	09.50	17.41	01.81	58.75	01.06
10.00 - 15.00	12.50	22.91	04.12	35.63	01.47
<b>Total Cumulative Rainfall %:</b>			<b>97.85<sup>3</sup></b>	<b>Net Annual %:</b>	<b>84.00</b>

## Sales Agent Information

Agent Name: Dave Kanters Phone: 416-347-2799  
 Company Name: Soleno Fax: \_\_\_\_\_  
 Address: 347, 15-75 Bayly St. W. E-mail: dkanters@soleno.com  
 City, State Zip: Ajax, ON L1S7K7

## Footnotes

- Recorded as hourly precipitation rainfall data (inches), National Climatic Data Center (NCDC)
- Based on Tennessee Tech University laboratory testing of the AquaSwirl™ Model AS-3 for OK-110 silica particles 50-125 microns(Neary, 2002)
- 90% Rainfall Event, calculated as a cumulative percentile of individual events, [www.stormwatercenter.net](http://www.stormwatercenter.net), sizing criteria (Center for Watershed Protection)
- NCDC data may not be consecutive, skipping days, months and/or years in the range of dates.
- The Aqua-Swirl™ Internal Bypass (BYP) provides full treatment of the "first flush," while the peak design storm is diverted and channeled through the main conveyance pipe. Please refer to your local representative for more information.
- When applicable, the performance curve was adjusted via Pecllet Scaling to provide estimated sizing per NJDEP PSD (d50 = 67 microns).





# Sizing Report

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## Site Information

Project Name: 5592 Boundary Rd. Site Area (hectares): 1.2226  
 Unit Label: OGS3 Runoff Coeff. : .76  
 Unit Location: Ottawa, ON Target Removal Efficiency(%): 80% based on NJDEP

## Product Recommendation

Aqua-Swirl™ Model	Net Annual TSS Removal Efficiency	Chamber Diameter	Maximum Inside Diameter (mm)		Oil/Debris Storage Capacity	Sediment Storage Capacity
<b>AS-4</b>	<b>84.86 %</b>	1296 mm.	Offline	BYP <sup>5</sup>	720 L	0.9 m <sup>3</sup>
			303 mm.	603 mm.		

## Rainfall Information

NCDC Station<sup>1</sup>: OTTAWA MACDONALD-CARTIER INT'L A Data Range<sup>4</sup>: 261,759 readings taken hourly between 1967 to 2007 (~40 years)

Rainfall Event Range (mm/hre)	Rainfall Interval Point (mm/hre)	Operating Rate (Lps/m <sup>2</sup> )	Total Rainfall (%)	Removal Efficiency (%) <sup>2</sup>	Relative Efficiency(%)
02.00 - 03.00	02.50	04.37	44.18	93.11	41.13
03.00 - 04.00	03.50	06.11	21.52	90.18	19.41
04.00 - 05.00	04.50	07.86	11.68	86.73	10.13
05.00 - 06.00	05.50	09.61	06.68	82.77	05.53
06.00 - 07.00	06.50	11.35	04.03	78.29	03.16
07.00 - 08.00	07.50	13.10	01.99	73.29	01.46
08.00 - 09.00	08.50	14.85	01.84	67.78	01.25
09.00 - 10.00	09.50	16.59	01.81	61.75	01.12
10.00 - 15.00	12.50	21.83	04.12	40.56	01.67
<b>Total Cumulative Rainfall %:</b>			<b>97.85<sup>3</sup></b>	<b>Net Annual %:</b>	<b>84.86</b>

## Sales Agent Information

Agent Name: Dave Kanters Phone: 416-347-2799  
 Company Name: Soleno Fax: \_\_\_\_\_  
 Address: 347, 15-75 Bayly St. W. E-mail: dkanters@soleno.com  
 City, State Zip: Ajax, ON L1S7K7

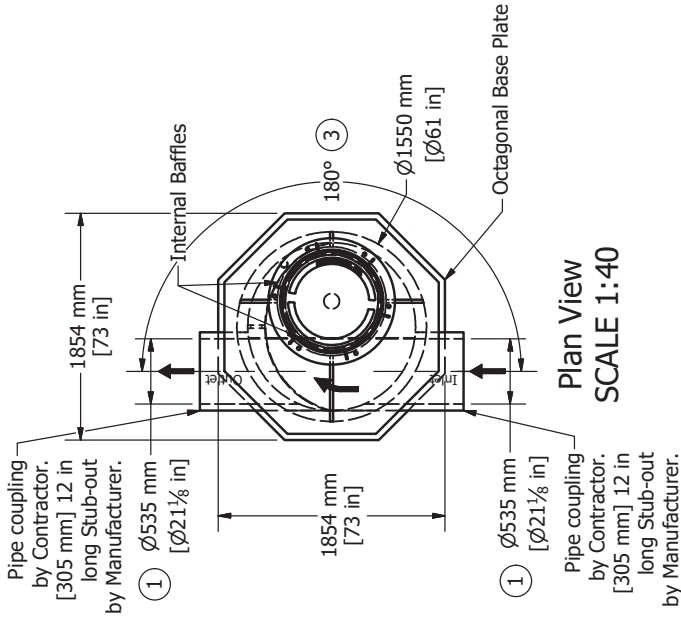
## Footnotes

- Recorded as hourly precipitation rainfall data (inches), National Climatic Data Center (NCDC)
- Based on Tennessee Tech University laboratory testing of the AquaSwirl™ Model AS-3 for OK-110 silica particles 50-125 microns(Neary, 2002)
- 90% Rainfall Event, calculated as a cumulative percentile of individual events, [www.stormwatercenter.net](http://www.stormwatercenter.net), sizing criteria (Center for Watershed Protection)
- NCDC data may not be consecutive, skipping days, months and/or years in the range of dates.
- The Aqua-Swirl™ Internal Bypass (BYP) provides full treatment of the "first flush," while the peak design storm is diverted and channeled through the main conveyance pipe. Please refer to your local representative for more information.
- When applicable, the performance curve was adjusted via Peplet Scaling to provide estimated sizing per NJDEP PSD (d50 = 67 microns).

Aqua-Swirl High Density Polyethylene (HDPE) Stormwater Treatment System

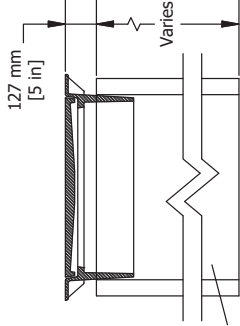


Projected View  
SCALE 1:80



Plan View  
SCALE 1:40

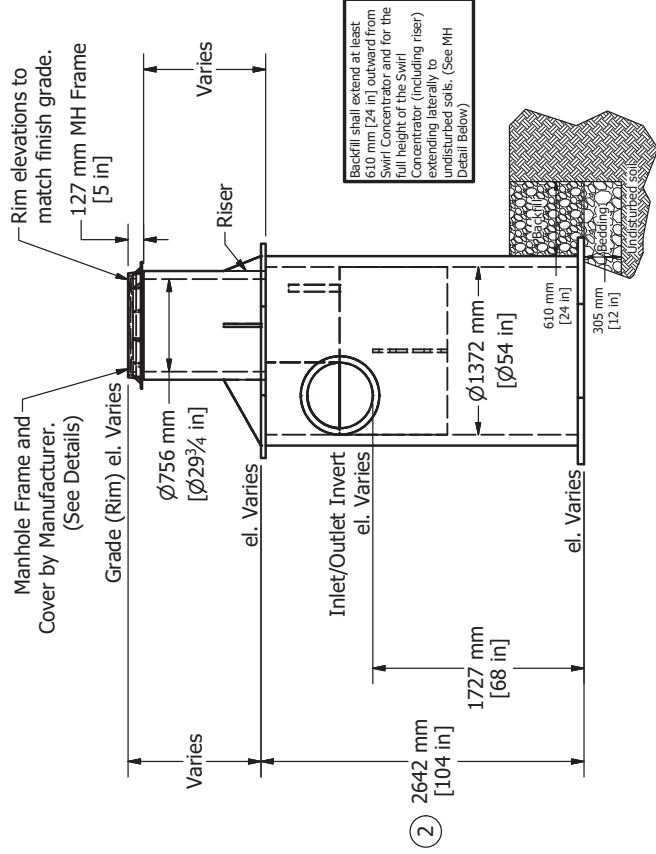
Please see accompanied Aqua-Swirl specification notes. See Site Plan for actual system orientation. Approximate dry (pick) weight: 1000 kg [2200 lbs].



Adjustable Frame and Cover

System shall be designed for the following capacities:  
Swirl Treatment Flow: 91 L/s [3.2 cfs]  
Swirl Sediment Storage: 0.91 m<sup>3</sup> [32 ft<sup>3</sup>]  
Swirl Oil/Debris Storage: 719 L [190 gal]

- 1 AS-4 BYP inlet/outlet pipe size ranges from 305 mm [12 in] to 686 mm [27 in].
- 2 AS-4 chamber height may vary from 2337 mm [92 in] to 2718 mm [107 in], depending on inlet/outlet pipe size.
- 3 Orientation may vary from a minimum of 90° to a maximum of 180°.



Elevation View  
SCALE 1:40

Structure #:	AS-4 STD	Revised	Rw. Date
Drawn By:	OFlores		
Scale:	As Shown		
Date:	3/8/2018		
U.S. Patent No. 6524473 and other Patent Pending			

Aqua-Shield® WATER TREATMENT SOLUTIONS 2733 Kanasta Drive, Suite 111, Chattanooga, TN 37243 Phone (600) 868-1112 www.aquashieldinc.com		Aqua-Swirl Concentrator AS-4 BYP CW STD Standard Detail	
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## City of Ottawa Servicing Study Checklist

### General Content

**Executive Summary (for large reports only):** not applicable

**Date and revision number of the report:** see page 1 of Servicing Brief and Stormwater Management Report

**Location map and plan showing municipal address, boundary, and layout of proposed development:** see drawings C-1 to C-6

**Plan showing the site and location of all existing services:** see drawings C-1 to C63

**Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere:** not applicable

**Summary of Pre-consultation Meetings with City and other approval agencies:** not available

**Reference and confirm conformance to higher level studies and reports ( Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defensible design criteria:** not applicable

**Statement of objectives and servicing criteria:** see page 1 of Servicing Brief and Stormwater Management Report

**Identification of existing and proposed infrastructure available in the immediate area:** see drawings C-1 to C-6

**Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development ( Reference can be made to the Natural Heritage Studies, if available).** see drawings C-1 to C-6

**Concept level master grading plan to confirm existing and proposed grades in the development and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths:** not applicable

**Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts:** not applicable

**Proposed phasing of the development, if applicable:** not applicable

**Reference to geotechnical studies and recommendations concerning servicing:** see note 1.5 on drawing C-1

**All preliminary and formal site plan submissions should have the following information:**

- **Metric scale:** included
- **North arrow:** included
  - **(including construction North):** not included
- **Key Plan:** included

- **Name and contact information of applicant and property owner:** not available
- **Property limits:** included
  - **including bearings and dimensions:** not included
- **Existing and proposed structures and parking areas:** included
- **Easements, road widening and rights-of-way:** included
- **Adjacent street names:** included

**Development Servicing Report: Water**

**Confirm consistency with Master Servicing Study, if available:** not applicable

**Availability of public infrastructure to service proposed development:** see page 2 of Servicing Brief and Stormwater Management Report

**Identification of system constraints:** see page 2 of Servicing Brief and Stormwater Management Report

**Confirmation of adequate domestic supply and pressure:** not applicable

**Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow locations throughout the development:** see page 2 Servicing Brief and Stormwater Management Report

**Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves:** not applicable

**Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design:** not applicable

**Address reliability requirements such as appropriate location of shut-off valves:** not applicable

**Check on the necessity of a pressure zone boundary modification:.** not applicable

**Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range:** not applicable

**Description of the proposed water distribution network, including locations of proposed connections to the existing systems, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions:** not applicable

**Description of off-site required feeder mains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation:** not applicable

**Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines:** not applicable

**Provision of a model schematic showing the boundary conditions locations, streets , parcels, and building locations for reference:** not applicable

**Development Servicing Report: Wastewater**

**Summary of proposed design criteria:** see page 2 of Servicing Brief

**(Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure):** not applicable

**Confirm consistency with Master Servicing Study and /or justification for deviations:** not applicable

**Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and conditions of sewers:** not applicable

**Descriptions of existing sanitary sewer available for discharge of wastewater from proposed development:** see page 3 Servicing Brief and Stormwater Management Report

**Verify available capacity in downstream sanitary sewer and / or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable):** not applicable

**Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix C) format.** not applicable

**Description of proposed sewer network including sewers, pumping stations, and forcemains:** not applicable

**Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality):** not applicable

**Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development:** not applicable

**Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity:** not applicable

**Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding:** not applicable

**Special considerations such as contamination, corrosive environment etc:** not applicable

#### **Development Servicing Report: Stormwater Checklist**

**Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property):** see pages 2-5 of Servicing Brief and Stormwater Management Report

**Analysis of available capacity in existing public infrastructure.** not applicable

**A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern:** see drawing C-1

**Water quality control objective (e/g/ controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer**

**design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects:** see Servicing Brief and Stormwater Management Report

**Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements:** Servicing Brief and Stormwater Management Report

**Descriptions of the references and supporting information.**  
**Set-back from private sewage disposal systems.** not applicable

**Watercourse and hazard lands setbacks:** not applicable

**Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed:** the pre-application consultation record is not yet been issued

**Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists:** not applicable

**Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).** see drawings C-1 to C-6 and Servicing Brief and Stormwater Management Report

**Identification of watercourses within the proposed development and how watercourses will be protected, or , if necessary, altered by the proposed development with applicable approvals.** see drawings C-1 to C-6 and Servicing Brief and Stormwater Management Report

**Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions:** see Servicing Brief and Stormwater Management Report

**Any proposed diversion of drainage catchment areas from one outlet to another. :** not applicable

**Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities. :** not applicable

**If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event:** not applicable

**Identification of potential impacts to receiving watercourses:** Servicing Brief and Stormwater Management Report

**Identification of municipal drains and related approval requirements. :** not applicable

**Descriptions of how the conveyance and storage capacity will be achieved for the development:** see pages 2-5 of Servicing Brief and Stormwater Management Report

**100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading:**

**Inclusion of hydraulic analysis including hydraulic grade line elevations. :** not applicable

**Description of approach to erosion and sediment control during construction for the protection of receiving watercourses of drainage corridors:** see notes 2.1 to 2.5 on drawing C-3

**Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplains elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current:** not applicable

**Identification of fill constraints related to floodplain and geotechnical investigation. :** not applicable

#### **Approval and Permit Requirements: Checklist**

**The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:**

**Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act: see page 2 of Servicing Brief and Stormwater Management Report**

**Application for Certificate of Approval (CofA) under the Ontario Water Resources Act:**

**Changes to Municipal Drains. :** not applicable

**Other permits (National Capital commission, Parks Canada, public Works and Government Services Canada, Ministry of transportation etc.) :** not applicable

#### **Conclusion Checklist**

**Clearly stated conclusions and recommendations:** see page 5 of Servicing Brief and Stormwater Management Report

**Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.**

**All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario:** included