# PROPOSED

# THREE-STOREY RESIDENTIAL APARTMENT BUILDING SITE

# PART OF LOTS 32 AND 33

# CONCESSION 5 (RIDEAU FRONT)

# 4000 OLD RICHMOND ROAD

# CITY OF OTTAWA

## STORM DRAINAGE REPORT

## REPORT R-819-106

T.L. MAK ENGINEERING CONSULTANTS LTD.

DECEMBER 2024

REFERENCE FILE NUMBER 819-106

## Introduction

For this site plan application, the proponent (Jami Omar Mosque) is proposing to develop a residential apartment building on a property approximately ±0.243 ha. in size and is identified as 4000 Old Richmond Road. At this site, a three (3)-storey low-rise apartment building comprising of 49 units is proposed to be developed on this lot. Currently, the land under consideration is vacant. The proposed development property, 4000 Old Richmond Road, is situated on the east side of Old Richmond Road, south of Seyton Drive and north of Sanibel Private. Its legal property description is Part of Lots 32 and 33 Concession 5 (Rideau Front) Geographical Township of Nepean – City of Ottawa located in Ward #8 – College.

The proposed building at the 4000 Old Richmond Road site is a (3)-storey apartment building comprises a total of 49 units with an underground parking level. The building contains twenty (20) bachelor units, twenty-six (26) 1-bedroom and three (3) 2-bedroom units. Each floor covers a gross floor area of 1,444 $m^2$/floor, for a total building area of 4,333 $m^2$ excluding the underground parking. Stormwater outlet for this site is the existing 750 mm dia. storm sewer located within the Old Richmond Road road right-of-way. Stormwater from this sewer is then routed west and then north to the existing 900 mm dia. trunk storm sewer along Moodie Drive.

From storm-drainage criteria set by the staff at the City of Ottawa's Engineering Department, the allowable post-development runoff release rates shall not exceed the two (2)-year pre-development conditions. The allowable pre-development runoff coefficient is the lesser of the calculated "C" existing value = 0.46 or $C_{allow}$ = 0.5 maximum. If the uncontrolled storm-water runoff exceeds the specified requirements, then on-site storm-water management (SWM) control measures are necessary. The post-development runoff coefficient for this site is estimated at C = 0.78, which exceeds the pre-development allowable $C_{pre}$ = 0.46 criteria for the Old Richmond Road storm sewer without on-site SWM control. Therefore, SWM measures are required. Refer to the attached Drainage Area Plan (Figure 1) as detailed in Appendix A. For Pre and Post site development characteristics, refer also to Dwg. No. 819-106 D-1 for details.

This report will address and detail the grading, drainage, and storm-water management control measures required to develop the said property. Based on the Proposed Site Grading and Servicing Plan (Dwg. No. 819-106 G-1), and on the Proposed Rooftop Storm-water Management Plan (Dwg. No. 819-106 SWM-1), storm water of this lot will be controlled on site by means of the building's flat rooftop.

The storm-water management calculations that follow will detail the extent of on-site SWM control to be implemented and the storage volume required on site to attain the appropriate runoff release that will conform to the City's established drainage criteria and review requirements.

Because the site will be connecting to and outletting into the separated Old Richmond Road storm sewer, therefore, the approval exemption under Ontario Regulations 525/98 would apply since storm water discharges from this site will outlet flow into a downstream a storm sewer. Thus, an

Environmental Compliance Application (ECA) application will not be required to be submitted to the Ministry.

## Site Data

1. Development Property Area

Post-Development Site Area Characteristics

| | | |
|---|---|---|
| Development Lot Area | = | 2,428.0 $m^2$ |
| Roof Surface Area | = | 1,694.80 $m^2$ |
| Concrete and Interlock Area | = | 267.97 $m^2$ |
| Asphalt Area | = | 42.75 $m^2$ |
| Grass Area | = | 422.48 $m^2$ |

$$C = \frac{(1{,}694.80 \times 0.9) + (267.97 \times 0.9) + (42.75 \times 0.9) + (422.48 \times 0.2)}{2{,}428.0}$$

$$C = \frac{1{,}889.464}{2{,}428.0}$$

$$C = 0.778$$

Say "C" $= 0.78$

Therefore, the average post-development "C" for this site is 0.78.

2. Controlled Area Data (NODE #1 TO NODE #3)

| | | |
|---|---|---|
| Roof Surface Area | = | 1,694.80 $m^2$ |
| Total Storm-water Controlled Area | = | 1,694.80 $m^2$ |

$$C = \frac{(1{,}694.80 \times 0.9)}{1{,}694.80}$$

$$C = \frac{1{,}525.32}{1{,}694.80}$$

$$C = 0.90$$

Say "C" $= 0.90$

Therefore, the post-development "C" for the controlled storm-water drainage area of this site is 0.90.

3. Uncontrolled Area Data (NODE #4)

PROPOSED SITE

| | | |
|---|---|---|
| Asphalt Area | = | 42.75 $m^2$ |
| Grass Area | = | 422.48 $m^2$ |
| Interlock Paver and Concrete Area | = | 267.97 $m^2$ |
| Total Storm-water Uncontrolled Area | = | 733.20 $m^2$ |

$$C_2 = \frac{(267.97 \times 0.9) + (422.48 \times 0.2) + (42.75 \times 0.9)}{733.20}$$

$$C_2 = \frac{364.144}{733.20}$$

$$C_2 = 0.4966$$

Say "$C_2$" = 0.50

$$C_{100} = \frac{(267.97 \times 1.0) + (422.48 \times 0.2 \times 1.25) + (42.75 \times 1.0)}{733.20}$$

$$C_{100} = \frac{416.34}{733.20}$$

$$C_{100} = 0.568$$

Say "$C_{100}$" = 0.57

Therefore, the average post-development coefficient runoff for the uncontrolled storm-water drainage area of 733.20 $m^2$ from this site is "$C_2$" = 0.50 and for "$C_{100}$" = 0.57.

The total tributary area consisting of approximately 733.20 square metres will be out-letting off site uncontrolled from the proposed residential building property.

The uncontrolled drainage area of this property is 733.20 $m^2$ and the controlled drainage area of this site is 1,694.80 $m^2$ which totals to 2,428.0 $m^2$.

The SWM area to be controlled is 1,694.80 $m^2$. Refer to the attached "Drainage Area Plan" in Figure 1 of Appendix A for further details.

## Pre-Development Flow Estimation

Maximum allowable off-site flow: two (2)-year storm

Node #101

Pre-Development Site Area Characteristics

| | | |
|---|---|---|
| Development Lot Area | = | 2,428.0 $m^2$ |
| Gravel Area | = | 1,051.74 $m^2$ |
| Grass Area | = | 1,376.26 $m^2$ |

$$C_{2pre} = \frac{(1{,}051.74 \times 0.8) + (1{,}376.26 \times 0.2)}{2{,}428.0}$$

$$C_{2pre} = \frac{1116.644}{2{,}428.0}$$

$$C_{2pre} = 0.4599$$

Say $C_{2pre} = 0.46$

Use $C_{2pre} = 0.46$ maximum allowable for redevelopment

$T_c$ = D/V where D = 40.0 m, ΔH = 0.65 m, S = 1.6%, and V = 0.95 feet/second = 0.29 m/s

Therefore,

$$T_c = \frac{40.0 \text{ m}}{0.29 \text{ m/s}}$$

$T_c = 2.30$ minutes

Use $T_c = 10$ minutes

$I_2$ = 77.10 mm/hr [City of Ottawa, two (2)-year storm]

Using the Rational Method

Q = 2.78 (0.46) (77.10) (0.2428)

Q = 23.94 L/s

Therefore, the total allowable flow off-site is 23.94 L/s.

The pre-development flow of the two (2)-year and 100-year storm event draining off-site is as follows:

Where, Tc = 10 min.

$$Q_{2pre} = 2.78\ CIA$$

$$C_{2pre} = \frac{1,116.648}{2,428.0}$$

$$C_{2pre} = 0.4599$$

Say, $C_{2pre} = 0.46$

$$Q_{2pre} = 2.78\ (0.46)\ (77.10)\ (0.2428)$$

$$= 23.94\ L/s \text{ draining off-site}$$

$$C_{100pre} = \frac{(1,051.74 \times 1.0)\ +\ (1,376.26 \times 0.2 \times 1.25)}{2,428.0}$$

$$C_{100pre} = \frac{1,395.805}{2,428.0}$$

$$C_{100pre} = 0.575$$

Say, $C_{100pre} = 0.58$

$$Q_{100pre} = 2.78\ (0.58)\ (178.6)\ (0.2428)$$

$$= 69.92\ L/s \text{ draining off-site}$$

Therefore under current site conditions the 2-year pre-development flow is estimated at 23.94 L/s and the 100 year pre-development flow is estimated at 69.92 L/s.

A coloured Google image and aerial photography of these current pre-development conditions of the site is provided in Appendix B of this report for reference.

## Post-Development Flow Estimation

Uncontrolled Drainage Areas (NODE #4)

The post-development flow of the two (2)-Year and 100-Year storm event draining off-site from the lot uncontrolled is as follows:

Where, Tc = 10 min.

Node #4

$Q_{2post}$ = 2.78 CIA

Post Development Area Draining off-site uncontrolled is:

| | | |
|---|---|---|
| Concrete and Interlock Area | = | 267.97 $m^2$ |
| Grass Area | = | 422.48 $m^2$ |
| Asphalt Area | = | 42.75 $m^2$ |

$$A_{Total} = 733.20\ m^2$$

$$C_{2post} = \frac{(267.97 \times 0.9) + (422.48 \times 0.2) + (42.75 \times 0.9)}{733.20}$$

$$C_{2post} = \frac{364.144}{733.20}$$

$$C_{2post} = 0.497$$

Say, $C_{2post} = 0.50$ draining off-site uncontrolled.

$$Q_{2post} = 2.78\ (0.50)\ (77.10)\ (0.07332)$$

$$Q_{2post} = 7.86\ L/s$$

$$Q_{100post} = \frac{(42.75 \times 1.0) + (422.48 \times 0.2 \times 1.25) + (267.97 \times 1.0)}{733.20}$$

$$C_{100post} = \frac{416.34}{733.20}$$

$$C_{100post} = 0.568$$

Say, $C_{100post} = 0.57$ draining off-site uncontrolled.

$$Q_{100post} = 2.78\ (0.57)\ (178.6)\ (0.07332)$$

$$Q_{100post} = 20.75\ L/s$$

Therefore, under post development condition, the 2-Year uncontrolled flow off-site is estimated at 7.86 L/s and the 100-Year uncontrolled flow is 20.75 L/s.

For this site, because 733.20 square meters of the site area is drained uncontrolled off-site, the net allowable discharge for this site into the existing sewer system using the two (2)-Year storm event criteria at $C_{pre}$ = 0.46 is calculated as follow: Q = {2.78 (0.46) (77.10) (0.2428) – [2.78 (0.57) (178.6) (0.07332)]} = 23.94 L/s – 20.75 L/s = 3.19 L/s. Therefore, according to this approach, the maximum calculated allowable flow rate off-site is 23.94 L/s and the net allowable controlled flow rate off-site is 3.19 L/s.

The abutting property, Jami Omar Mosque (developer of this lot), had a SWM report prepared by J.L. Richards Ltd. with revised date of September 2005 as part of the requirements for development of the Mosque and this report title page can be found in Appendix C for reference details.

## Stormwater Management Analysis

Based on the above calculation from site information provided and given the small area size of the lot under consideration (2,428.0 $m^2$) therefore to limit the maximum allowable flow off-site to the 2-Year pre-development flow of 23.94 L/s the City of Ottawa Engineering Department recognized that this may not be achievable without a small flow exceedance.

For this proposed development, the building flat roof top will be used to provide Stormwater Magement (SWM) attenuation for this site. Three (3) controlled roof drains are proposed to regulate flow off-site for on-site SWM measures to be incorporated with this proposed development.

The roof drain maximum flow rate proposed is specified as follows under a maximum load of 150 mm: for Roof Drain #1, 1.89 L/s (30.0 US gal./min.), for Roof Drain #2, 1.58 L/s (25.0 US gal./min.), and Roof Drain #3, 1.58 L/s (25.0 US gal./min.) Therefore, the total controlled roof drain flow off-site is 5.05 L/s during the 100-Year event.

Thus for this site, the 2-Year maximum post development flow rate draining off-site is the uncontrolled flow from the lot plus controlled rooftop flow which equals to 11.72 L/s (7.86 L/s + 3.86 L/s) which is less than 23.94 L/s set by the SWM criteria for this site. During the 100-Year event, the maximum post development flow rate off-site is estimated at 25.80 L/s (20.75 L/s + 5.05 L/s) which exceeds the allowable site flow of 23.94 L/s by 1.86 L/s.

Therefore for this proposed development site, the total maximum allowable two (2)-Year release site of 23.94 L/s will not be exceeded since the estimated 2-Year post development flow is 11.72 L/s. For storm events up to and including the 100-Year event the total maximum allowable release rate of 23.94 L/s will be exceeded by 1.86 L/s (estimated at 25.80 L/s) where the flow exceedance is 1.86 L/s for this site.

However, in comparing the pre-development flow of the current site conditions to the post development flow, the SWM regulated flow plus uncontrolled flow from the proposed site under the post development conditions at the 2-Year event = 11.72 L/s and the 100-Year event = 25.80 L/s where both of the post development flow events are less than current pre-development flow estimate for the

site at 2-Year $_{Pre}$ = 23.94 L/s and 100-Year $_{Pre}$ = 69.92 L/s. Therefore with this proposed development, stormwater flow is improved from that of the existing condition.

To the controlled drainage area (flat rooftop of proposed building) the post-development inflow rate during the two (2)-Year and 100-Year storms for the (3) three flat rooftop areas can be calculated as follows:

**Design Discharge Computation**

To Calculate Roof Storage Requirements

The proposed flat roof of the apartment building on the property will incorporate three (3) roof drains to control flow off-site for this development property. The roof drain flow rate proposed ranges from 1.58 L/s (25.0 US gal/min.) to 1.89 L/s (30.0 US gal/min.) for Roof Drain #1 to Roof Drain #3 inclusive. The specified roof drain is the Watts "Adjustable Accutrol Weir" (Model No. RD-100-A-ADJ) with weir opening as specified which will allow the specified flow under a maximum head of 150mm water above the drain for Roof Drain #1, Roof Drain #2, and Roof Drain #3. See Appendix D for roof drain details. Therefore, the stormwater flow that can be controlled from this building flat rooftop and outletted off-site for the 100-Year event is 5.05 L/s and 3.86 L/s for the 2-Year event. Refer to the Proposed Stormwater Management Plan (Dwg. No. 819-106 SWM-1) for roof drain details.

C = 0.9 will be used for sizing roof storage volume in this case.

Inflow rate ($Q_A$) = 2.78 CIA

Where, C = 0.9
A = Surface area of roof
I = (mm/hr)

**For Roof Area No. 1 (NODE #1)**

$Q_{A1}$ = 2.78 CIA

2-Year Event

$C_2$ = 0.90
A = 529.43 $m^2$
I = (mm/hr)

$Q_{A1}$ = 2.78 (0.90) (0.0529 ha.) I
$Q_{A1}$ = 0.1324 I

100-Year Event

$C_{100} = 1.0$
$A = 529.43\ m^2$
I = (mm/hr)

$Q_{A1} = 2.78\ (1.0)\ (0.0529\ ha.)\ I$
$Q_{A1} = 0.1471\ I$

**For Roof Area No. 2 (NODE #2)**

$Q_{A2} = 2.78\ CIA$

2-Year Event

$C_2 = 0.90$
$A = 537.45\ m^2$
I = (mm/hr)

$Q_{A2} = 2.78\ (0.90)\ (0.0538\ ha.)\ I$
$Q_{A2} = 0.1346\ I$

100-Year Event

$C_{100} = 1.0$
$A = 537.45\ m^2$
I = (mm/hr)

$Q_{A2} = 2.78\ (1.0)\ (0.0538\ ha.)\ I$
$Q_{A2} = 0.1496\ I$

**For Roof Area No. 3 (NODE #3)**

$Q_{A3} = 2.78\ CIA$

2-Year Event

$C_2 = 0.90$
$A = 627.92\ m^2$
I = (mm/hr)

$Q_{A3} = 2.78\ (0.90)\ (0.0628\ ha.)\ I$
$Q_{A3} = 0.1571\ I$

100-Year Event

$C_{100} = 1.0$
$A = 627.93\ m^2$
I = (mm/hr)

$Q_{A3} = 2.78\ (1.0)\ (0.0628\ ha.)\ I$
$Q_{A3} = 0.1746\ I$

The summary results of the calculated inflow and the required storage volume of the building's flat rooftop to store the two (2)-year and 100-year storm events are shown in **Tables 1 to 3** inclusive and **4 to 6** inclusive.

**Table 7** summarizes the post-development design flows from the building rooftop area as well as the type of roof drains, the maximum anticipated ponding depths, storage volumes required, and storage volumes provided for the two (2)-year, and 100-year design events.

**Table 7:** Design Flow and Roof Drain Table

| Roof Drain ID & Drainage Area (ha) | Number of Roof Drains | Watts Roof Drain Model ID (Weir Opening) | Controlled Flow per Drain (L/s) | | Approximate Ponding Depth Above Drains (m) | | Storage Volume Required ($m^3$) | | Max. Storage Available ($m^3$) |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2 YR | 100 YR | 2 YR | 100 YR | 2 YR | 100 YR | |
| RD-1 (0.0529 ha) | 1 | RD-100-A-ADJ (FULLY EXPOSED OPENING) | 1.42 | 1.89 | 0.11 | 0.152 | 7.04 | 22.85 | 22.96 |
| RD-2 (0.0538 ha) | 1 | RD-100-A-ADJ (3/4 OPENING) | 1.22 | 1.58 | 0.11 | 0.152 | 7.70 | 24.74 | 25.98 |
| RD-3 (0.0628 ha) | 1 | RD-100-A-ADJ (3/4 OPENING) | 1.22 | 1.58 | 0.11 | 0.152 | 9.57 | 30.24 | 30.44 |
| **Total Roof (0.1695 ha)** | **3** | - | **3.86** | **5.05** | - | - | **24.31** | **77.83** | **79.38** |

## Erosion and Sediment Control

The contractor shall implement Best Management Practices to provide for protection of the receiving storm sewer during construction activities. These practices are required to ensure no sediment and/or associated pollutants are released to the receiving watercourse. These practices include installation of a "siltsack" catch basin sediment control device or equal in catch basins as recommended by manufacturer on-site and off-site within the Old Richmond Road road right-of-way adjacent to this property. Siltsack shall be inspected every 2 to 3 weeks and after every major storm. The deposits will be disposed of as per the requirements of the contract. See Dwg. No. 819-106 ESC-1 for details.

## Conclusion

At this proposed residential building site and to develop this lot to house a (3)-storey 49-unit apartment building on a 0.2428 ha. parcel of land, the estimated allowable flow off-site is calculated at 23.94 L/s based on City of Ottawa Drainage and Stormwater Management (SWM) criteria of 2-Year pre-development flow at $C_{pre}$ = 0.46. For on-site SWM attenuation, the flat rooftop of the proposed mixed-use building will be utilized and (3) controlled roof drains are incorporated with a controlled

maximum release rate of (1.89 L/s or 30.0 U.S. gal/min.) for Roof Drain #1, for Roof Drain #2 (1.58 L/s or 25.0 U.S. gal/min.), and for Roof Drain #3 (1.58 L/s or 25.0 U.S. gal/min.). The controlled flow from this site totals to 3.86 L/s for the 2-Year post development condition and 5.05 L/s for the 100-Year post development condition. The uncontrolled 2-Year post development flow from the remainder of the site is estimated at 7.86 L/s and 20.75 L/s for the 100-Year event respectively.

During the 2-Year storm event for the flat rooftop storage, the ponding depth on this rooftop is estimated at 110 mm at the drain and 0 mm at the roof perimeter assuming a 1.0% (min.) roof pitch to the drain. The rooftop storage available at Roof Area #1 is 8.60 $m^3$, Roof Area #2 is 9.92 $m^3$, and Roof Area #3 is 11.33 $m^3$ for a total of 29.85 $m^3$ which is greater than the required volume of 24.31 $m^3$.

During the 100-Year storm event for the flat rooftop storage, the ponding depth on this rooftop is estimated at 152 mm (6 inches) at the drain and 0 mm at the roof perimeter assuming a 1.0% (min.) roof pitch to the drain. The rooftop storage available at Roof Area #1 is 22.96 $m^3$, Roof Area #2 is 25.98 $m^3$, and Roof Area #3 is 30.44 $m^3$ for a total of 79.38 $m^3$ which is greater than the required volume of 77.83 $m^3$.

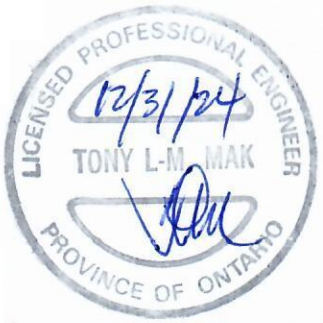
Therefore by means of flat building rooftop storage and grading the site to the proposed grades as shown on the Proposed Site Grading and Servicing Plan (Dwg. No. 819-106, G-1) and Proposed Stormwater Management Plan (Dwg. No. 819-106, SWM-1), the desirable 2-Year and 100-Year storm event detention volume of 29.85 $m^3$ and 79.38 $m^3$ respectively will be available on-site. Refer to Appendix E for detailed calculations of available storage volume.

In comparing the pre-development flow of the current site conditions to the post development flow, the SWM regulated flow plus uncontrolled flow from the proposed site under the post development conditions at the 2-Year event = 11.72 L/s (3.86 L/s + 7.86 L/s) and the 100-Year event = 25.80 L/s (5.05 L/s + 20.75 L/s) where both of the post development flow events are less than current pre-development flow estimate for the site at 2-Year $_{pre}$ = 23.94 L/s and 100-Year $_{pre}$ = 69.92 L/s. Therefore with this proposed development, stormwater flow is improved from that of the existing condition.

The building weeping tile drainage will outlet via its separate 150mm diameter PVC storm lateral. The roof drains will be outletted also via a separate 150mm PVC storm lateral, whereupon both laterals are connected directly to the existing Old Richmond Road 750mm diameter storm sewer. The City of Ottawa recommends that pressurized drain pipe material be used in the building for the roof drain leader pipe in the event of surcharging in the City Storm sewer system. Refer to the proposed grading and servicing plan Dwg. No. 819-106 G-1 for details.

**PREPARED BY T.L. MAK ENGINEERING CONSULTANTS LTD.**

**TONY L. MAK, P.ENG.**



**PROPOSED 4000 OLD RICHMOND ROAD RESIDENTIAL APARTMENT BUILDING DEVELOPMENT SITE**

**TABLE 1**

**TWO (2)-YEAR EVENT**

**REQUIRED BUILDING ROOF AREA 1 STORAGE VOLUME (NODE #1)**

**ROOF DRAIN No. 1**

| $t_c$ **TIME** (minutes) | I **2-YEAR** (mm/hr) | Q **ACTUAL** (L/s) | Q **ALLOW** (L/s) | Q **STORED** (L/s) | **VOLUME STORED** ($m^3$) |
|---|---|---|---|---|---|
| 5 | 102.80 | 13.61 | 1.42 | 12.19 | 3.66 |
| 10 | 77.10 | 10.21 | 1.42 | 8.79 | 5.27 |
| 15 | 63.30 | 8.38 | 1.42 | 6.96 | 6.26 |
| 20 | 52.03 | 6.89 | 1.42 | 5.47 | 6.56 |
| 25 | 45.17 | 5.98 | 1.42 | 4.56 | 6.84 |
| 30 | 40.04 | 5.30 | 1.42 | 3.88 | 6.98 |
| 35 | 36.06 | 4.77 | 1.42 | 3.35 | 7.04 |
| 40 | 32.86 | 4.35 | 1.42 | 2.93 | 7.03 |
| 45 | 30.24 | 4.004 | 1.42 | 2.584 | 6.98 |
| 50 | 28.04 | 3.71 | 1.42 | 2.29 | 6.87 |

Therefore, the required rooftop storage volume is 7.04 $m^3$.

**TABLE 2**

**TWO (2)-YEAR EVENT**

**REQUIRED BUILDING ROOF AREA 2 STORAGE VOLUME (NODE #2)**

**ROOF DRAIN No. 2**

| $t_c$ **TIME** (minutes) | I **2-YEAR** (mm/hr) | Q **ACTUAL** (L/s) | Q **ALLOW** (L/s) | Q **STORED** (L/s) | **VOLUME STORED** ($m^3$) |
|---|---|---|---|---|---|
| 5 | 102.80 | 13.84 | 1.22 | 12.62 | 3.79 |
| 10 | 77.10 | 10.38 | 1.22 | 9.16 | 5.50 |
| 15 | 63.30 | 8.52 | 1.22 | 7.30 | 6.57 |
| 20 | 52.03 | 7.00 | 1.22 | 5.78 | 6.94 |
| 25 | 45.17 | 6.08 | 1.22 | 4.86 | 7.29 |
| 30 | 40.04 | 5.39 | 1.22 | 4.17 | 7.51 |
| 35 | 36.06 | 4.85 | 1.22 | 3.63 | 7.62 |
| 40 | 32.86 | 4.42 | 1.22 | 3.20 | 7.68 |
| 45 | 30.24 | 4.07 | 1.22 | 2.85 | 7.70 |
| 50 | 28.04 | 3.77 | 1.22 | 2.55 | 7.65 |
| 55 | 26.14 | 3.52 | 1.22 | 2.30 | 7.59 |

Therefore, the required rooftop storage volume is 7.70 $m^3$.

**TABLE 3**

**TWO (2)-YEAR EVENT**

**REQUIRED BUILDING ROOF AREA 3 STORAGE VOLUME (NODE #3)**

**ROOF DRAIN No. 3**

| $t_c$ **TIME** (minutes) | I **2-YEAR** (mm/hr) | Q **ACTUAL** (L/s) | Q **ALLOW** (L/s) | Q **STORED** (L/s) | **VOLUME STORED** ($m^3$) |
|---|---|---|---|---|---|
| 5 | 102.80 | 16.15 | 1.22 | 14.93 | 4.48 |
| 10 | 77.10 | 12.11 | 1.22 | 10.89 | 6.53 |
| 15 | 63.30 | 9.94 | 1.22 | 8.72 | 7.85 |
| 20 | 52.03 | 8.17 | 1.22 | 6.95 | 8.34 |
| 25 | 45.17 | 7.09 | 1.22 | 5.87 | 8.81 |
| 30 | 40.04 | 6.29 | 1.22 | 5.07 | 9.13 |
| 35 | 36.06 | 5.67 | 1.22 | 4.45 | 9.35 |
| 40 | 32.86 | 5.16 | 1.22 | 3.94 | 9.46 |
| 45 | 30.24 | 4.75 | 1.22 | 3.53 | 9.53 |
| 50 | 28.04 | 4.41 | 1.22 | 3.19 | 9.57 |
| 55 | 26.14 | 4.11 | 1.22 | 2.89 | 9.54 |
| 60 | 24.56 | 3.86 | 1.22 | 2.64 | 9.50 |
| 65 | 23.15 | 3.64 | 1.22 | 2.42 | 9.44 |

Therefore, the required rooftop storage volume is 9.57 $m^3$.

**TABLE 4**

**100-YEAR EVENT**

**REQUIRED BUILDING ROOF AREA 1 STORAGE VOLUME (NODE #1)**

**ROOF DRAIN No. 1**

| $t_c$ **TIME** (minutes) | I **100-YEAR** (mm/hr) | Q **ACTUAL** (L/s) | Q **ALLOW** (L/s) | Q **STORED** (L/s) | **VOLUME STORED** ($m^3$) |
|---|---|---|---|---|---|
| 10 | 178.60 | 26.27 | 1.89 | 24.38 | 14.63 |
| 15 | 142.90 | 21.02 | 1.89 | 19.13 | 17.22 |
| 20 | 120.00 | 17.65 | 1.89 | 15.76 | 18.91 |
| 25 | 103.90 | 15.28 | 1.89 | 13.39 | 20.09 |
| 30 | 91.90 | 13.52 | 1.89 | 11.62 | 20.93 |
| 35 | 82.60 | 12.15 | 1.89 | 10.26 | 21.55 |
| 40 | 75.10 | 11.05 | 1.89 | 9.16 | 21.98 |
| 45 | 69.10 | 10.17 | 1.89 | 8.28 | 22.36 |
| 50 | 63.90 | 9.40 | 1.89 | 7.51 | 22.53 |
| 55 | 59.60 | 8.77 | 1.89 | 6.88 | 22.70 |
| 60 | 55.90 | 8.22 | 1.89 | 6.33 | 22.79 |
| 65 | 52.65 | 7.75 | 1.89 | 5.86 | 22.85 |
| 70 | 49.80 | 7.326 | 1.89 | 5.436 | 22.83 |
| 75 | 47.26 | 6.95 | 1.89 | 5.06 | 22.77 |
| 80 | 44.99 | 6.62 | 1.89 | 4.73 | 22.70 |

Therefore, the required rooftop storage volume is 22.85 $m^3$.

**TABLE 5**

**100-YEAR EVENT**

**REQUIRED BUILDING ROOF AREA 2 STORAGE VOLUME (NODE #2)**

**ROOF DRAIN No. 2**

| $t_c$ TIME (minutes) | I 100-YEAR (mm/hr) | Q ACTUAL (L/s) | Q ALLOW (L/s) | Q STORED (L/s) | VOLUME STORED ($m^3$) |
|---|---|---|---|---|---|
| 10 | 178.60 | 26.72 | 1.58 | 25.14 | 15.08 |
| 15 | 142.90 | 21.38 | 1.58 | 19.80 | 17.82 |
| 20 | 120.00 | 17.95 | 1.58 | 16.37 | 19.64 |
| 25 | 103.90 | 15.54 | 1.58 | 13.96 | 20.94 |
| 30 | 91.90 | 13.75 | 1.58 | 12.17 | 21.91 |
| 35 | 82.60 | 12.63 | 1.58 | 10.78 | 22.64 |
| 40 | 75.10 | 11.24 | 1.58 | 9.66 | 23.18 |
| 45 | 69.10 | 10.34 | 1.58 | 8.76 | 23.65 |
| 50 | 63.90 | 9.56 | 1.58 | 7.98 | 23.94 |
| 55 | 59.60 | 8.92 | 1.58 | 7.34 | 24.22 |
| 60 | 55.90 | 8.36 | 1.58 | 6.78 | 24.41 |
| 65 | 52.65 | 7.88 | 1.58 | 6.30 | 24.57 |
| 70 | 49.80 | 7.45 | 1.58 | 5.87 | 24.65 |
| 75 | 47.26 | 7.07 | 1.58 | 5.49 | 24.71 |
| 80 | 44.99 | 6.73 | 1.58 | 5.15 | 24.72 |
| 85 | 42.95 | 6.43 | 1.58 | 4.85 | 24.74 |
| 90 | 41.10 | 6.15 | 1.58 | 4.57 | 24.68 |

Therefore, the required rooftop storage volume is 24.74 $m^3$.

**TABLE 6**

**100-YEAR EVENT**

**REQUIRED BUILDING ROOF AREA 3 STORAGE VOLUME (NODE #3)**

**ROOF DRAIN No. 3**

| $t_c$ TIME (minutes) | I 100-YEAR (mm/hr) | Q ACTUAL (L/s) | Q ALLOW (L/s) | Q STORED (L/s) | VOLUME STORED ($m^3$) |
|---|---|---|---|---|---|
| 10 | 178.60 | 31.18 | 1.58 | 29.60 | 17.76 |
| 15 | 142.90 | 24.95 | 1.58 | 23.37 | 21.03 |
| 20 | 120.00 | 20.95 | 1.58 | 19.37 | 23.24 |
| 25 | 103.90 | 18.14 | 1.58 | 16.56 | 24.84 |
| 30 | 91.90 | 16.05 | 1.58 | 14.47 | 26.05 |
| 35 | 82.60 | 14.42 | 1.58 | 12.84 | 26.96 |
| 40 | 75.10 | 13.11 | 1.58 | 11.53 | 27.67 |
| 45 | 69.10 | 12.06 | 1.58 | 10.48 | 28.30 |
| 50 | 63.90 | 11.16 | 1.58 | 9.58 | 28.74 |
| 55 | 59.60 | 10.41 | 1.58 | 8.83 | 29.14 |
| 60 | 55.90 | 9.76 | 1.58 | 8.18 | 29.45 |
| 65 | 52.65 | 9.19 | 1.58 | 7.61 | 29.68 |
| 70 | 49.80 | 8.70 | 1.58 | 7.12 | 29.90 |
| 75 | 47.26 | 8.25 | 1.58 | 6.67 | 30.01 |
| 80 | 44.99 | 7.855 | 1.58 | 6.275 | 30.12 |
| 85 | 42.95 | 7.499 | 1.58 | 5.919 | 30.18 |
| 90 | 41.10 | 7.176 | 1.58 | 5.596 | 30.22 |
| 95 | 39.44 | 6.886 | 1.58 | 5.306 | 30.24 |
| 100 | 37.90 | 6.617 | 1.58 | 5.037 | 30.22 |

Therefore, the required rooftop storage volume is 30.24 $m^3$.

**PROPOSED**

**THREE-STOREY RESIDENTIAL APARTMENT BUILDING SITE**

**PART OF LOTS 32 AND 33**

**CONCESSION 5 (RIDEAU FRONT)**

**4000 OLD RICHMOND ROAD**

**CITY OF OTTAWA**

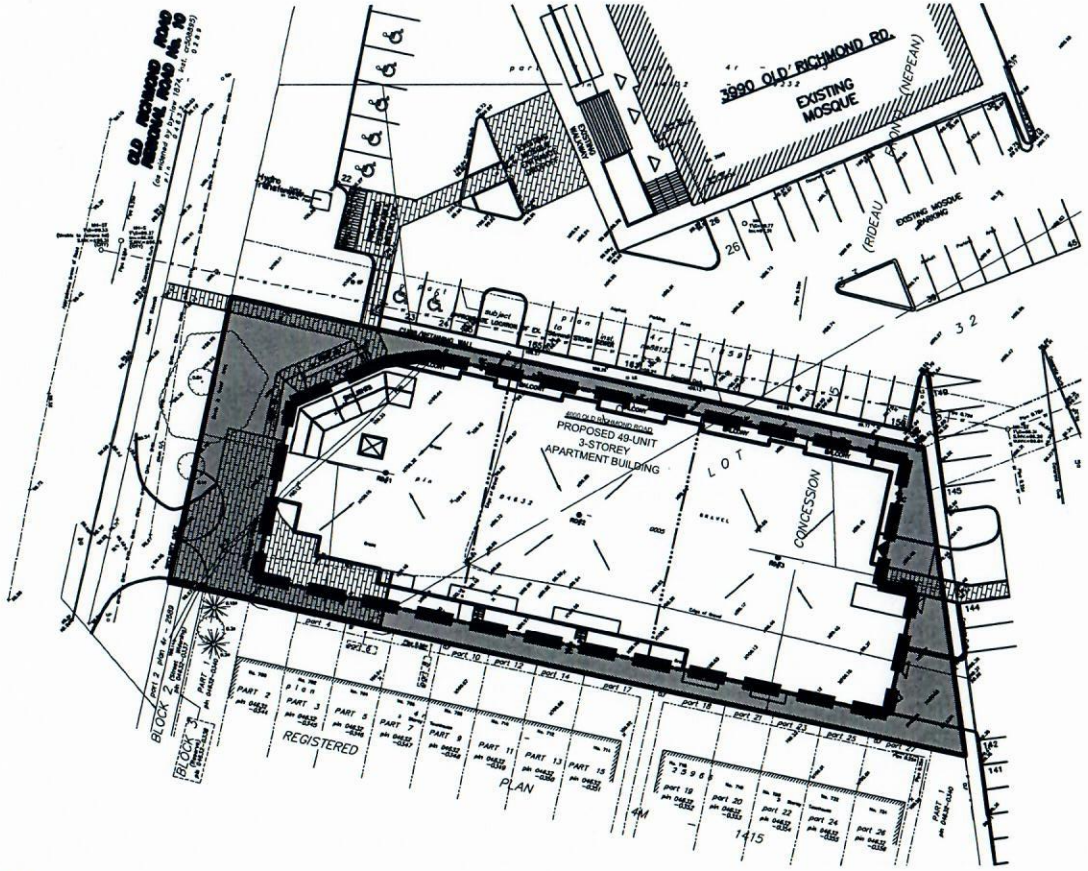
# APPENDIX A

## STORM DRAINAGE AREA PLAN

## FIGURE 1

# PROPOSED 4000 OLD RICHMOND ROAD
# SITE DEVELOPMENT
# DRAINAGE AREA PLAN

N.T.S.




## LEGEND

LIMIT OF CONTROLLED STORM
DRAINAGE AREA = 1,694.80 SQ. M

UNCONTROLLED STORM
DRAINAGE AREA = 733.20 SQ. M

TOTAL AREA = 2,428.0 SQ. M

POST-DEVELOPMENT SITE
AVERAGE "C" = 0.78

T.L. MAK ENGINEERING CONSULTANTS LTD.
CONSULTING ENGINEERS

| PROJECT No. | DATE | DRAWING No. |
|---|---|---|
| 819-106 | DECEMBER 2024 | FIGURE 1 |

**PROPOSED**

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# APPENDIX B

## SITE PRE-DEVELOPMENT CONDITION

## GOOGLE IMAGE 2019

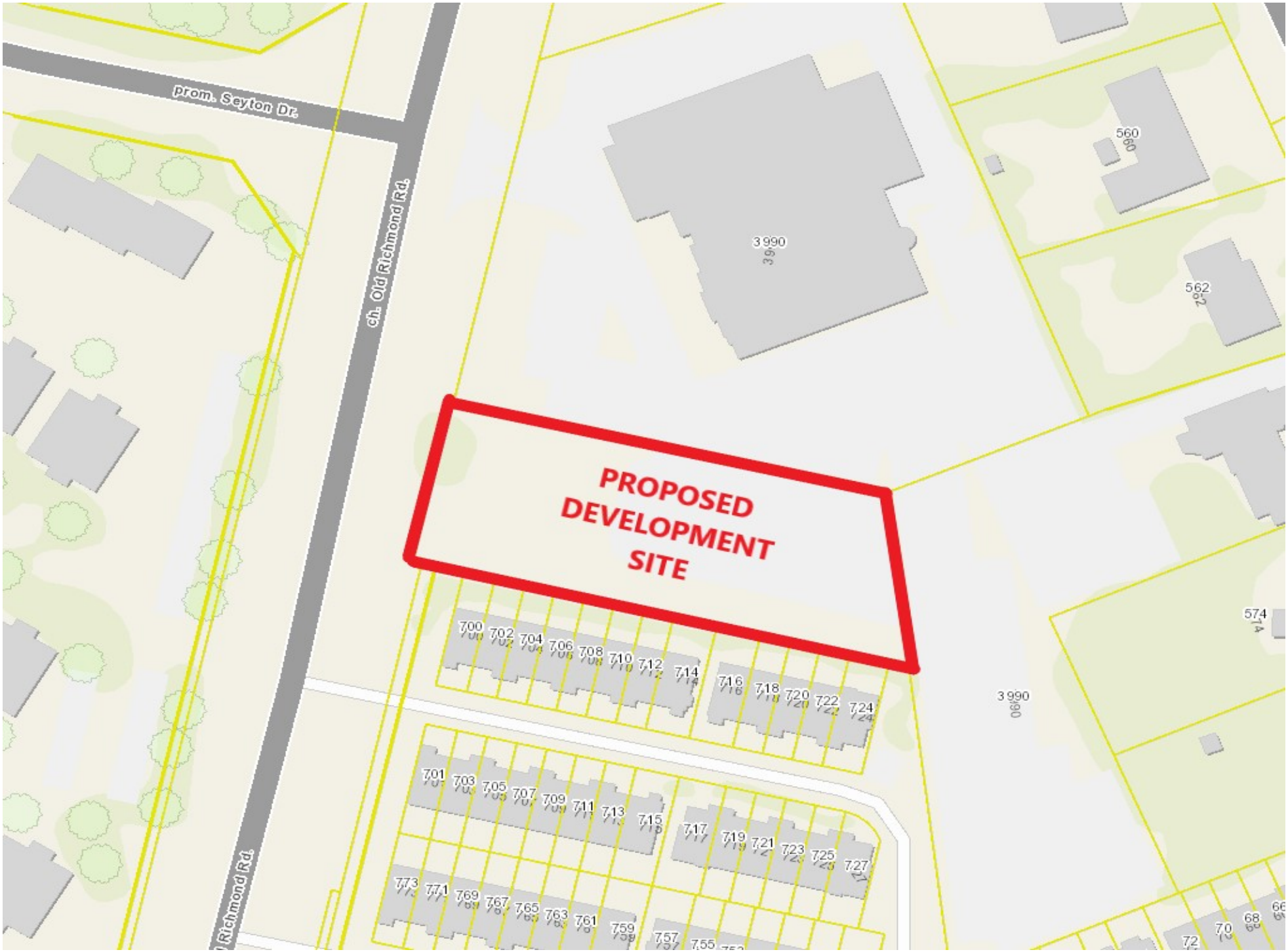
## AND

## AERIAL PHOTOGRAPHY 2019 (GEOOTTAWA)

2019


prom. Seyton Dr.
ch. Old Richmond Rd.
ch. Old Richmond Rd.
prom. Moodie Dr.
PROPOSED DEVELOPMENT SITE
privé Sanibel Priv.
privé Songbird Priv.
3990
3990
560
562
574
578
68
700 702 704 706 708 710 712 714 716 718 720 722 724
701 703 705 707 709 711 713 715 717 719 721 723 725 727
773 771 769 767 765 763 761 759 757 755 753 751 749 747 745
50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
131 123 57 55

2019


prom. Seyton Dr.
ch. Old Richmond Rd.
Old Richmond Rd.
PROPOSED
DEVELOPMENT
SITE
3 990
560
562
574
700
702
704
706
708
710
712
714
716
718
720
722
724
701
703
705
707
709
711
713
715
717
719
721
723
725
727
773
771
769
767
765
763
761
759
757
755
72
70
68

2019

**PROPOSED**

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**CITY OF OTTAWA**

**APPENDIX C**

**JLR Ltd. SWM REPORT**

**TITLE PAGE REFERENCE**

# STORMWATER MANAGEMENT REPORT
# JAMI OMAR MOSQUE
# 572 MOODIE DRIVE
# CITY OF OTTAWA

November 2004
Revised April 2005
Revised September 2005

Prepared for:

**JAMIATUL MUSLEMEEN OF OTTAWA-CARLETON**
64 Langford Crescent
Kanata, Ontario
K2K 2N6

Prepared by:

**J.L. RICHARDS & ASSOCIATES LIMITED**
Consulting Engineers, Architects & Planners
864 Lady Ellen Place
Ottawa, Ontario
K1Z 5M2

JLR 19787-01

**PROPOSED**

**THREE-STOREY RESIDENTIAL APARTMENT BUILDING SITE**

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# APPENDIX D

# PROPOSED ROOF DRAIN

# DETAILS

| WATTS® | Adjustable Accutrol Weir<br>Tag: _____ | Adjustable Flow Control for Roof Drains |
|---|---|---|

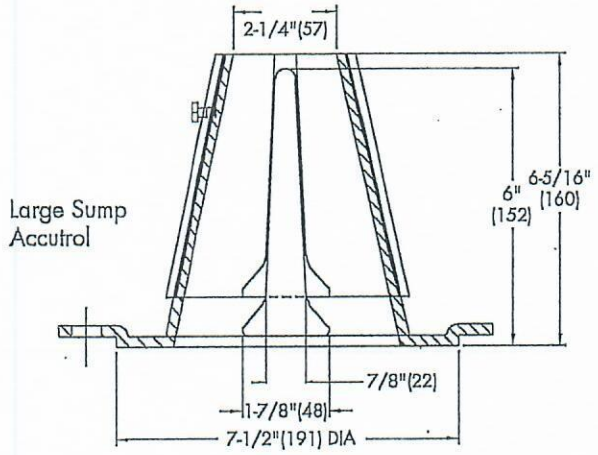
## ADJUSTABLE ACCUTROL (for Large Sump Roof Drains only)

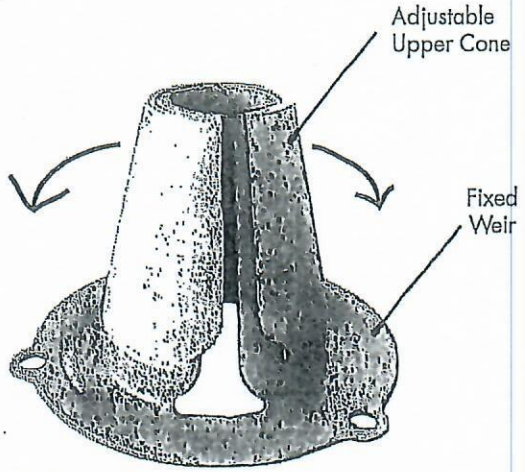
For more flexibility in controlling flow with heads deeper than 2", Watts Drainage offers the Adjustable Accutrol. The Adjustable Accutrol Weir is designed with a single parabolic opening that can be covered to restrict flow above 2" of head to less than 5 gpm per inch, up to 6" of head. To adjust the flow rate for depths over 2" of head, set the slot in the adjustable upper cone according to the flow rate required. Refer to Table 1 below.
Note: Flow rates are directly proportional to the amount of weir opening that is exposed.

**EXAMPLE:**

For example, if the adjustable upper cone is set to cover 1/2 of the weir opening, flow rates above 2"of head will be restricted to 2-1/2 gpm per inch of head.

Therefore, at 3"of head, the flow rate through the Accutrol Weir that has 1/2 the slot exposed will be:
[5 gpm (per inch of head) x 2 inches of head ] + 2-1/2 gpm (for the third inch of head) = 12-1/2 gpm.




1/2 Weir Opening Exposed Shown Above

TABLE 1. Adjustable Accutrol Flow Rate Settings

| Weir Opening Exposed | 1" | 2" | 3" | 4" | 5" | 6" |
|---|---|---|---|---|---|---|
| | Flow Rate (gallons per minute) | | | | | |
| Fully Exposed | 5 | 10 | 15 | 20 | 25 | 30 |
| 3/4 | 5 | 10 | 13.75 | 17.5 | 21.25 | 25 |
| 1/2 | 5 | 10 | 12.5 | 15 | 17.5 | 20 |
| 1/4 | 5 | 10 | 11.25 | 12.5 | 13.75 | 15 |
| Closed | 5 | 5 | 5 | 5 | 5 | 5 |

Job Name _____ Contractor _____

Job Location _____ Contractor's P.O. No. _____

Engineer _____ Representative _____



USA: Tel: (800) 338-2581 • Fax: (828) 248-3929 • Watts.com
Canada: Tel: (905) 332-4090 • Fax: (905) 332-7068 • Watts.ca
Latin America: Tel: (52) 81-1001-8600 • Fax: (52) 81-8000-7091 • Watts.com

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A Watts Water Technologies Company

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# APPENDIX E

## DETAILED CALCULATIONS

## FOR TWO (2)-YEAR AND 100-YEAR

## AVAILABLE STORAGE VOLUME

## AVAILABLE STORAGE VOLUME CALCULATIONS

Two (2)-Year Event

### 1. Roof Storage Area 1 (NODE No. 1)

The flat Roof Area 1 will be used for storm-water detention. This roof area will be drained by a controlled drain designed for a release rate of 22.50 U.S. gal./min. or 1.42 L/s under a head of 110 mm at the drain. Refer to Dwg. 819-106 SWM-1 for roof drain details.

Available flat roof area for storage = 529.43 $m^2$, C = 0.9, @roof slope of 1.0% minimum or 110 mm of water height above the roof drain. Therefore, the available roof area will store a volume as shown below using the reservoir volume equation.

$$V = \frac{(0.11\text{m})[240.53 + 4(57.08) + 0]}{6}$$

$$V = \frac{(0.11)(468.85)}{6}$$

$$V = 8.60\ m^3$$

The available Roof Area 1 storage volume of 8.60 $m^3$ > required two (2)-year storage volume of 7.04 $m^3$ from Table 1.

### 2. Roof Storage Area 2 (NODE No. 2)

The flat Roof Area 2 will be used for storm-water detention. This roof area will be drained by a controlled drain designed for a release rate of 19.40 U.S. gal./min. or 1.22 L/s under a head of 110 mm at the drain. Refer to Dwg. 819-106 SWM-1 for roof drain details.

Available flat roof area for storage = 537.45 $m^2$, C = 0.9, @roof slope of 1.0% minimum or 110 mm of water height above the roof drain. Therefore, the available roof area will store a volume as shown below using the reservoir volume equation.

$$V = \frac{(0.11\text{m})[274.08 + 4(66.72) + 0]}{6}$$

$$V = \frac{(0.11)(504.96)}{6}$$

$$V = 9.92\ m^3$$

The available Roof Area 2 storage volume of 9.92 $m^3$ > required two (2)-year storage volume of 7.70 $m^3$ from Table 2.

**3. Roof Storage Area 3 (NODE No. 3)**

The flat Roof Area 3 will be used for storm-water detention. This roof area will be drained by a controlled drain designed for a release rate of 19.40 U.S. gal./min. or 1.22 L/s under a head of 110 mm at the drain. Refer to Dwg. 819-106 SWM-1 for roof drain details.

Available flat roof area for storage = 627.92 $m^2$, C = 0.9, @roof slope of 1.0% minimum or 110 mm of water height above the roof drain. Therefore, the available roof area will store a volume as shown below using the reservoir volume equation.

$$V = \frac{(0.11\text{m})[315.31 + 4(75.62) + 0]}{6}$$

$$V = \frac{(0.11)(617.79)}{6}$$

$$V = 11.33\ m^3$$

The available Roof Area 3 storage volume of 11.33 $m^3$ > required two (2)-year storage volume of 9.57 $m^3$ from Table 3.

Therefore, the ponding depth at the Roof Drain 1 to 3 inclusive locations is approximately 0.11 m (110 mm), and the two (2)-year level is estimated not to reach the roof perimeter of the building.

Hence, Roof Area 1 to Roof Area 3 inclusive of the proposed residential building flat rooftop storage are adequate to store the minimum required two (2)-year storm event volume of 24.31 $m^3$ given it can store up to 29.85 $m^3$.

## AVAILABLE STORAGE VOLUME CALCULATIONS

100-Year Event

**1. Roof Storage Area 1 (NODE No. 1)**

The flat Roof Area 1 will be used for storm-water detention. Roof area at Drain No. 1 will be drained by a controlled drain designed for a release rate of 30.0 U.S. gal./min. or 1.89 L/s under a head of 152 mm at the Roof Drain #1. Refer to Dwg. 819-106 SWM-1 for roof drain details.

Available flat roof area for storage = 529.43 $m^2$, C = 1.0, @roof slope of 1.0% minimum or 152 mm of water height above the roof drain. Therefore, the available roof area will store a volume as shown below using the reservoir volume equation.

$$V = \frac{(0.152\text{m})[457.32 + 4(112.20) + 0]}{6}$$

$$V = \frac{(0.152)(906.12)}{6}$$

$$V = 22.96\ m^3$$

The available Roof Area 1 storage volume of 22.96 $m^3$ > required 100-year storage volume of 22.85 $m^3$ from Table 4.

**2. Roof Storage Area 2 (NODE No. 2)**

The flat Roof Area 2 will be used for storm-water detention. Roof area at Drain No. 2 will be drained by a controlled drain designed for a release rate of 25.0 U.S. gal./min. or 1.58 L/s under a head of 152 mm at the Roof Drain #2. Refer to Dwg. 819-106 SWM-1 for roof drain details.

Available flat roof area for storage = 537.45 $m^2$, C = 1.0, @roof slope of 1.0% minimum or 152 mm of water height above the roof drain. Therefore, the available roof area will store a volume as shown below using the reservoir volume equation.

$$V = \frac{(0.152\text{m})[537.45 + 4(125.47) + 0]}{6}$$

$$V = \frac{(0.152)(1{,}039.33)}{6}$$

$$V = 25.98\ m^3$$

The available Roof Area 2 storage volume of 25.98 $m^3$ > required 100-year storage volume of 24.74 $m^3$ from Table 5.

**3. Roof Storage Area 3 (NODE No. 3)**

The flat Roof Area 3 will be used for storm-water detention. Roof area at Drain No. 3 will be drained by a controlled drain designed for a release rate of 25.0 U.S. gal./min. or 1.58 L/s under a head of 152 mm at the Roof Drain #3. Refer to Dwg. 819-106 SWM-1 for roof drain details.

Available flat roof area for storage = 627.92 $m^2$, C = 1.0, @roof slope of 1.0% minimum or 152 mm of water height above the roof drain. Therefore, the available roof area will store a volume as shown below using the reservoir volume equation.

$$V = \frac{(0.152\text{m})[611.52 + 4(147.51) + 0]}{6}$$

$$V = \frac{(0.152)(1{,}201.56)}{6}$$

$$V = 30.44\ m^3$$

The available Roof Area 3 storage volume of 30.44 $m^3$ > required 100-year storage volume of 30.24 $m^3$ from Table 6.

Therefore, the ponding depth at the Roof Drain 1 to Roof Drain 3 inclusive location are approximately 0.15 m (152 mm), and at the perimeter of the flat roof area is 0 mm above the roof perimeter surface. Accordingly, it is recommended that five (5) roof scuppers as shown on Dwg. No. 819-106 G-1 and Dwg. No. 819-106 SWM-1 and the architect's roof plan be installed at the perimeter height of the rooftop for emergency overflow purposes in case of blockage from debris build up at the roof drains.

Hence, Roof Area 1 to Roof Area 3 inclusive of the proposed residential building flat rooftop storage are adequate to store the minimum required 100-Year storm event volume of 77.83 $m^3$ given it can store up to 79.38 $m^3$.