# 342-348 Queen Mary Street, Ottawa
# Stormwater Management Brief

Project # CW-3-25

Prepared for:

NCTL INVESTMENTS INC.
Adenike Shittu & Carine Toham

By:

Arch-Nova Design Inc.

May 2025

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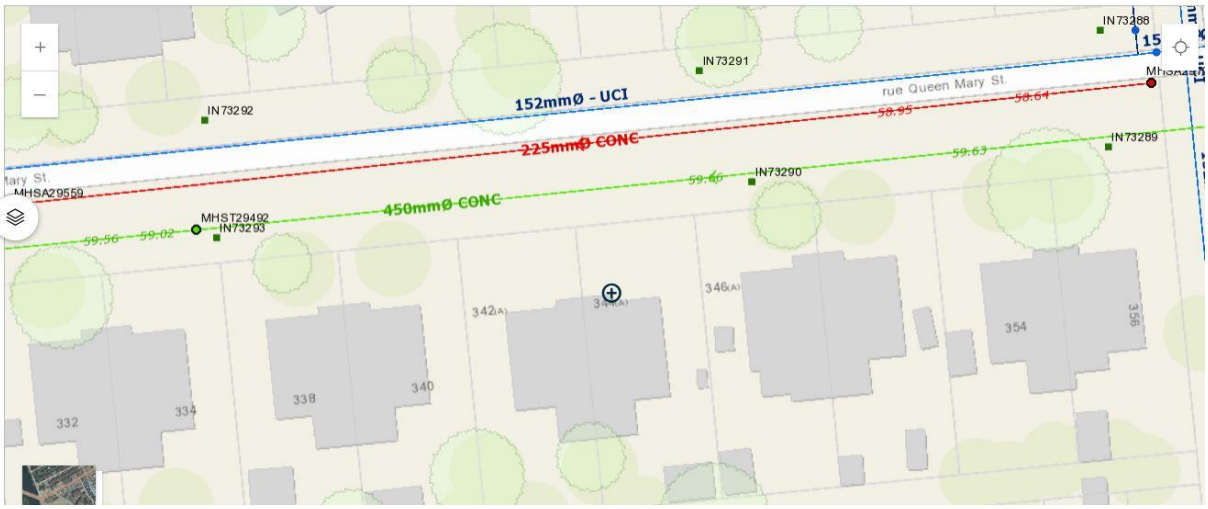
# 1. Introduction

The proposed residential property at 342-348 Queen Street, Ottawa, hereafter referred to as the site, will comprise of 8 townhouses with 3 units per the townhouse.

Currently, on the site are two semidetached dwellings with total of 4 units. Houses are located on two separate lots with a driveway between and sheds at rear.

The infrastructure at Queen Mary Street consists of:

1. Water main 152 mm UCI
2. Sanitary sewer, 225 mm Concrete, and
3. Stormwater sewer 450 mm, Concrete.




**Queen Mary Street: Municipal Infrastructure**

# 2. Stormwater Management Criteria

Design of the stormwater management system is to be completed in conformance with the Ministry of Environment (MOE) Stormwater Management Planning and Design Manual (March 2003) and City of Ottawa Sewer Design Guidelines (2012).

The Rational Method is deemed appropriate for the analysis. As the site is small, the time of concentration was determined to be 10 minutes (minimum TOC for the Rational method).

## 2.1. Assumptions and Rationale

2.1.1. ***Site setup***: Two properties at 342-348 Queen Mary Street have standard urban setup with the front walkway and a backyards with additional storage buildings and shared driveway in-between.

2.1.2. ***Site area and principles for application of Rational Method***: for the purpose of this analysis, it is assumed that the entire area drains toward the street and the runoff is uncontrolled.

The post-development runoff will be partially uncontrolled: the front side of the roof and the front pathways and landscape. The rear side of the of the roof and the backyard will drain over a swale along the south edge of the property into the minor system and further to the street pipe. This portion of the runoff is considered to be controlled.

The property has easements along the east and west edges already surveyed. These easements can be used to install the laterals from the catch basins toward the street.

2.1.3. ***Terrain and slope***: Average site slope is estimated 1.5% and entire site drains toward the front (Queen Mary Street).

2.1.4. ***Vegetation***: existing vegetation will be cleared in accordance with the landscape plans.

2.1.5. ***Pre and post development analysis:*** the goal of this analysis is to assess the site capacity for the proposed development and to prevent the overflow into the system from the newly developed dwellings or flooding of the site.

The main rule for the stormwater analysis is to match the post-development 100-year runoff to the 5-year (separate system) predevelopment runoff. Any excess of water is to be stored on site and released under the allowable release rate.

Proposed 8 dwellings roof plans is about 630 $m^2$ and, in comparison with the predevelopment impervious areas (total 280 $m^2$) will significantly increase the total runoff.

The post-development uncontrolled runoff is calculated to be 14.4 l/sec (5-year) and 17.38 l/sec (100-year) respectively. The predevelopment 5-year runoff is only 18.04 l/sec which leaves only 0.66 l/sec for the allowable controlled runoff. This will increase the drain down time to more than 12 hours as well it will required a large storage space, which is not available on the site. Potential flooding is also assumed.

The second goal is to preserve the system from overflow and backup flow respectively. As the storage on the site is not available to accommodate the match of 100-year post development to 5-year predevelopment runoff, a match of 5-year predevelopment to 5-year post-development runoff may be used.

The post-development 5-year uncontrolled runoff is calculated to be 10.14 l/sec which leaves 7.9 l/sec to match the predevelopment runoff.

In addition, the total 100-year post development runoff will be reduced from 30.91 l/sec to 25.27 l/sec.

For this option, total onsite storage will be 8.61 $m^3$. Storage can be located in backyard as a swale along the south edge as well as in the laterals from the catch basins to the front. The laterals may be oversized (450 mm diameter) with an ICD (each up to 4 l/sec capacity) installed in the monitoring manhole at the property line in front. The swale's estimate volume is 2.5 $m^3$ with depth of 0.3 m and 1.0 m the width at the crest.

# 3. Municipal Stormwater Services

The municipal system for the stormwater is a separate system so 5-year pre and post development we used. The minor system is 450 mm concrete pipe.

At the time of preparation of this analysis, there was no information on the backup flow or flooding the property. Based on this statement, it is assumed that current outflow from the property does not exceed the receiving system's capacity.

By applying the calculation for alternative option, the total outflow will be the same (5-year) and any other and higher runoff will be reduced. For example, the 100-year post-development runoff will be reduced for 19%, from 30.91 l/sec to 25.27 l/sec.

| | | |
|---|---|---|
| **Predevelopment Runoff:** | | |
| **Uncontrolled Runoff** | | |
| 5-year | 18.04 | l/sec |
| 100-year | 30.91 | l/sec |
| | | |
| **Postdevelopment Runoff:** | | |
| **Uncontrolled Runoff** | | |
| 5-year | 10.14 | l/sec |
| 100-year | 17.38 | l/sec |
| **Controlled allowable runoff** | | |
| 5-year | 0.66 | l/sec |
| 100-year | -13.53 | l/sec |
| | | |
| **Controlled allowable runoff** | | |
| 5-year | 7.90 | l/sec |

# 4. Site Grading and Access to Properties

The site grading is in function of the stormwater management and should be designed to create the runoff from dwellings and driveway areas toward the front. The read area is assumed as a controlled runoff area. The backyard is proposed to be sloped toward the property line and a swale along the edge, a catch basins with laterals and the monitoring manholes at the property line.

# 5. Conclusion and Recommendation

The analysis of the pre and post-development in accordance to the MECP and City of Ottawa's guidelines proved that there will be no sufficient storage space on site to accommodate the excess of water. For such a reason, an alternative option was

assessed. The basis for the calculation was to match the 5-year pre- and post-development runoffs. This approach allowed the sufficient space for the storage on the site as well reduces the total post-development runoff. The reduction is calculated to be 19%. for the 100 year storm.

This report provides a basis for detailed design for the proposed property's stormwater management. To protect the site, the report's frame and limits shouldn't be exceeded.

Prepared by:

Zoran Mrdja, P.Eng., FEC

June 02, 2025


Professional Engineers Ontario

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# Appendix A: Calculations

Project Number: CW-03-25 342-348 Queen Mary Street

ARCH-NOVA DESIGN INC. Architecture Engineering Consulting

PRE-DEVELOPMENT

The pre-development time of concentration is 10.00 minutes

where:

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$ $I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$

**$I_5$ = 104.2 mm/hr** $I_{100}$ = **178.6 mm/hr**

| Surface Type | ID | Area (ha) | Percent of total Area | C | A X C (ha) |
|---|---|---|---|---|---|
| Roofs | A1 | 0.02800 | 24.7% | 0.90 | 0.025 |
| Aspalth & Patios | | 0.03520 | 31.1% | 0.70 | 0.025 |
| Green space | | 0.0500 | 44.2% | 0.25 | 0.013 |
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| TOTAL | | 0.1132 | 100.0% | | 0.062 |
| Weighted C = | | | | | 0.55 |

$Q_{5pre} = (2.78)*(C)*(I_5)*(A)$
$Q_{5pre} = 2.78 \times 0.55 \times 104.2 \times 0.1132$
$Q_{5pre} = 18.04$ L/s

$Q_{100pre} = (2.78)*(C)*(I_{100})*(A)$
$Q_{100pre} = 2.78 \times 0.55 \times 178.6 \times 0.1132$
$Q_{100pre} = 30.91$ L/s

0.55 Actual C factor

POST-DEVELOPMENT (UNCONTROLLED RUNOFF)

The post-development time of concentration is 10.00 minutes

where:

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$ $I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$

**$I_5$ = 104.2 mm/hr** $I_{100}$ = **178.6 mm/hr**

| Surface Type | ID | Area (ha) | Percent of total Area | C | A X C (ha) |
|---|---|---|---|---|---|
| Roof & Front Yard | A1 | 0.0500 | 100.0% | 0.70 | 0.035 |
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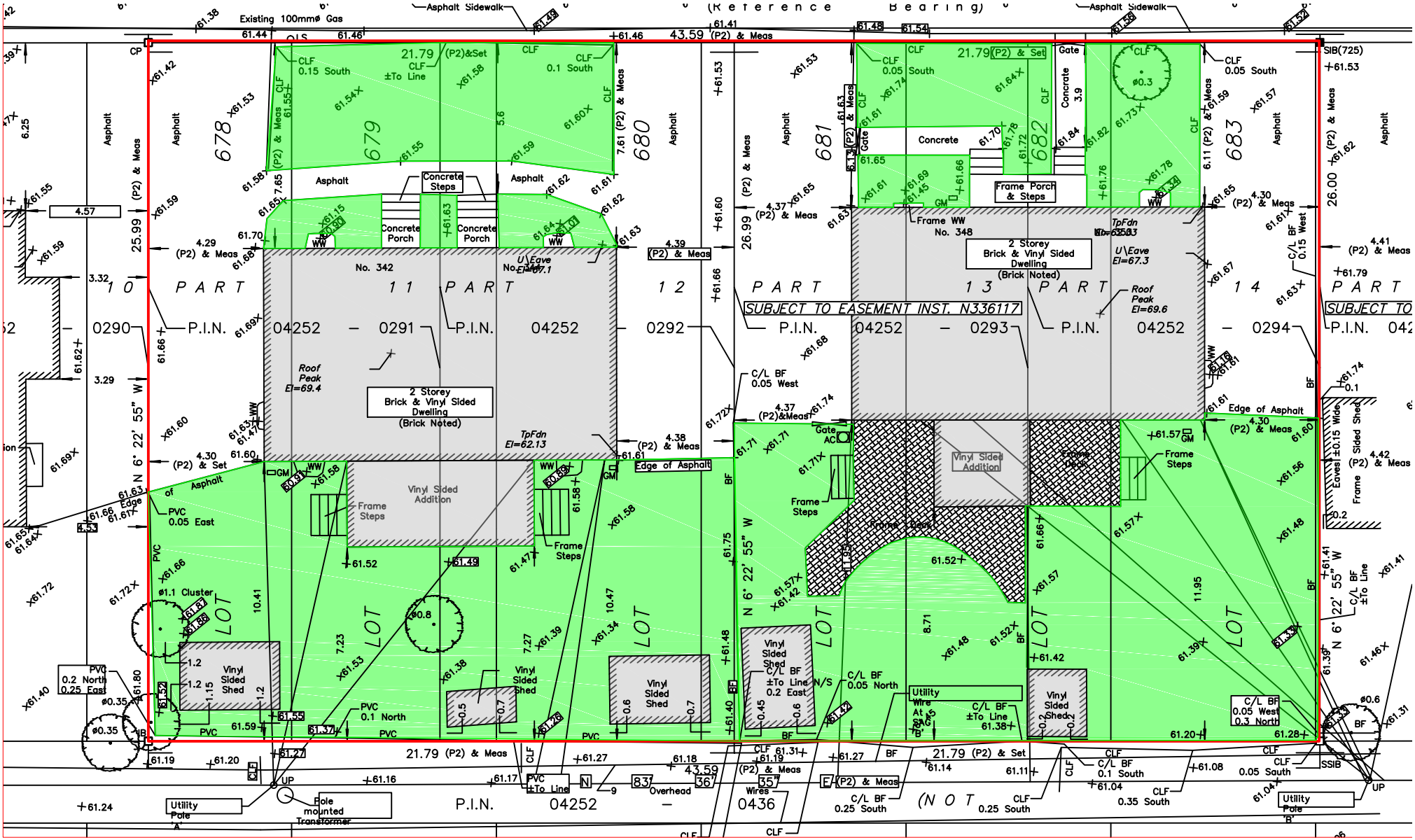
| TOTAL | | 0.0500 | 100.0% | | 0.035 |
| Weighted C = | | | | | 0.70 |

$Q_{5post} = (2.78)*(C)*(I_5)*(A)$
$Q_{5post} = 2.78 \times 0.70 \times 104.2 \times 0.0500$
$Q_{5post} = 10.14$ L/s

$Q_{100post} = (2.78)*(C)*(I_{100})*(A)$
$Q_{100post} = 2.78 \times 0.70 \times 178.6 \times 0.0500$
$Q_{100post} = 17.38$ L/s

0.70 Actual C factor




Building/Roof
Green Area
Asphalt/Pathway

# 342-348 Queen Mary Street
# SWM PREDEVELOPMENT

ARCH-NOVA Design Inc.
45 Banner Road NEPEAN ON K2H 8X5
613-702-3403 contact@archnova.ca

Project Number: CW-03-25 342-348 Queen Mary Street

ARCH-NOVA DESIGN INC.
Architecture
Engineering
Consulting

PRE-DEVELOPMENT

The pre-development time of concentration is 10 minutes

where:

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$ $I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$

**$I_5$ = 104.2 mm/hr** $I_{100}$ = **178.6 mm/hr**

| Surface Type | ID | Area (ha) | Percent of total Area | C | A X C (ha) |
|---|---|---|---|---|---|
| | | 0.00000 | 0.0% | 0.95 | 0.000 |
| | | 0.00000 | 0.0% | 0.95 | 0.000 |
| | | 0.00000 | 0.0% | 0.70 | 0.000 |
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| | | | | | |
| TOTAL | | 0.0000 | 0.0% | | 0.000 |
| Weighted C = | | | | | 0.00 |

$Q_{5pre} = (2.78)*(C)*(I_5)\cdot(A)$
$Q_{5pre} =$ 2.78 x 0.00 x 104.2 x 0.0000
$Q_{5pre} =$ 0.00 L/s

$Q_{100pre} = (2.78)*(C)*(I_{100})\cdot(A)$
$Q_{100pre} =$ 2.78 x 0.00 x 178.6 x 0.0000
$Q_{100pre} =$ 0.00 L/s

POST-DEVELOPMENT (CONTROLLED RUNOFF)

The post-development time of concentration is 10 minutes

where:

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$ $I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$

**$I_5$ = 104.2 mm/hr** $I_{100}$ = **178.6 mm/hr**

| Surface Type | ID | Area (ha) | Percent of total Area | C | A X C (ha) |
|---|---|---|---|---|---|
| A2 | A2 | 0.0630 | 0.0% | 0.70 | 0.044 |
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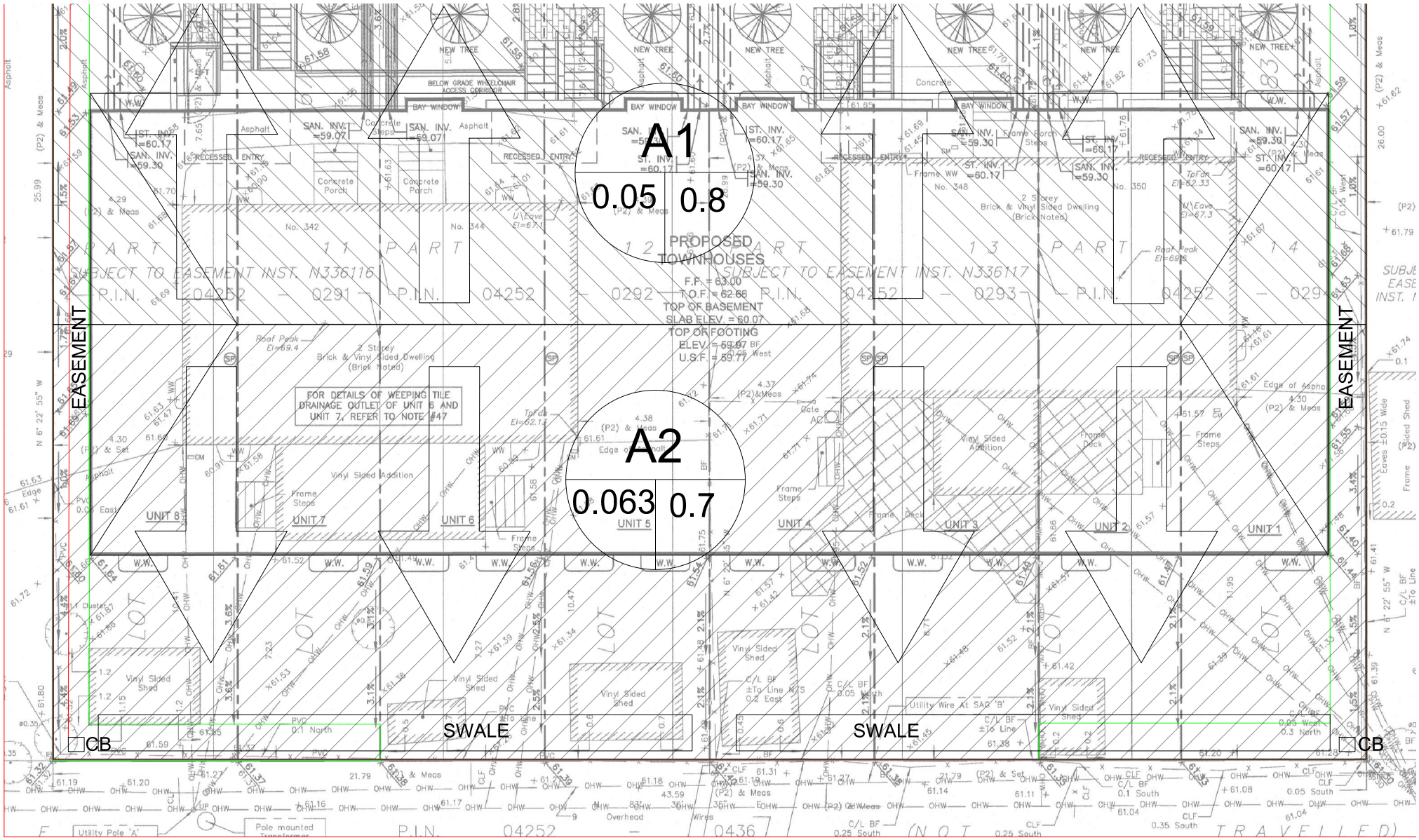
| TOTAL | | 0.063 | 0.0% | | 0.044 |
| Weighted C = | | | | | 0.70 |

Actual C factor

$Q_{5post} = (2.78)*(C)*(I_5)\cdot(A)$
$Q_{5post} =$ 2.78 x 0.70 x 104.2 x 0.0630
$Q_{5post} =$ 12.77 L/s

$Q_{100post} = (2.78)*(C)*(I_{100})\cdot(A)$
$Q_{100post} =$ 2.78 x 0.88 x 178.6 x 0.0630
$Q_{100post} =$ 27.37 L/s

**C factor increased 25% for 100-year storn**




Controlled Runoff (to rear)
Uncontrolled Runoff (to front)

# 342-348 Queen Mary Street
# SWM POSTEVELOPMENT

ARCH-NOVA Design Inc
45 Banner Road NEPEAN ON K2H 8X
613-702-3403 contact@archnova.c

ALLOWABLE RUNOFF


| **Predevelopment Runoff:** | | |
|---|---|---|
| **Uncontrolled Runoff** | | |
| 5-year | 18.04 | l/sec |
| 100-year | 30.91 | l/sec |

| **Postdevelopment Runoff:** | | |
|---|---|---|
| **Uncontrolled Runoff** | | |
| 5-year | 10.14 | l/sec |
| 100-year | 17.38 | l/sec |
| **Controlled allowable runoff** | | |
| 5-year | 0.66 | l/sec |
| 100-year | -13.53 | l/sec |

25.27 0.817607

| **Controlled allowable runoff** | | |
|---|---|---|
| 5-year | 7.90 | l/sec |

## Storage Volumes (5-Year Storm)

**Project :** 342-348 Queen Mary Street

Tc = 10.00 (mins)
$C_{AVG}$ = 0.70 (dimmensionless)
Area = 0.0630 (hectares)
Storm = 5 (year)
Release Rate = 7.90 (L/sec)
Time Interval = 5 (mins)

| Duration (min) | Rainfall Intensity (mm/hr) | Peak Flow (L/sec) | Release Rate (L/sec) | Storage Rate (L/sec) | Storage ($m^3$) |
|---|---|---|---|---|---|
| 1 | 204 | 2.5 | 7.90 | | |
| 6 | 132 | 9.7 | 7.90 | 1.78 | 0.64 |
| 11 | 99 | 12.2 | 7.90 | 4.26 | 2.81 |
| 16 | 80 | 9.9 | 7.90 | 1.97 | 1.89 |
| 21 | 68 | 8.4 | 7.90 | 0.46 | 0.57 |
| 26 | 59 | 7.3 | 7.90 | -0.62 | -0.97 |
| 31 | 53 | 6.5 | 7.90 | -1.43 | -2.66 |
| 36 | 48 | 5.8 | 7.90 | -2.06 | -4.46 |
| 41 | 43 | 5.3 | 7.90 | -2.57 | -6.33 |
| 46 | 40 | 4.9 | 7.90 | -2.99 | -8.26 |
| 51 | 37 | 4.6 | 7.90 | -3.35 | -10.24 |
| 56 | 35 | 4.2 | 7.90 | -3.65 | -12.25 |
| 61 | 33 | 4.0 | 7.90 | -3.91 | -14.30 |
| 66 | 31 | 3.8 | 7.90 | -4.13 | -16.37 |
| 71 | 29 | 3.6 | 7.90 | -4.33 | -18.46 |
| 76 | 28 | 3.4 | 7.90 | -4.51 | -20.57 |
| 81 | 26 | 3.2 | 7.90 | -4.67 | -22.70 |
| 86 | 25 | 3.1 | 7.90 | -4.81 | -24.84 |
| 91 | 24 | 3.0 | 7.90 | -4.94 | -26.99 |
| 96 | 23 | 2.8 | 7.90 | -5.06 | -29.16 |
| 101 | 22 | 2.7 | 7.90 | -5.17 | -31.33 |
| 106 | 21 | 2.6 | 7.90 | -5.27 | -33.52 |
| 111 | 21 | 2.5 | 7.90 | -5.36 | -35.71 |
| 116 | 20 | 2.5 | 7.90 | -5.45 | -37.91 |
| 121 | 19 | 2.4 | 7.90 | -5.53 | -40.11 |
| 126 | 19 | 2.3 | 7.90 | -5.60 | -42.32 |
| 131 | 18 | 2.2 | 7.90 | -5.67 | -44.54 |
| 136 | 18 | 2.2 | 7.90 | -5.73 | -46.77 |

**Notes**

1 ) For a storm duration that is less than the time of concentration the peak flow is equal to the product of 2.78CIA and the ratio of the storm duration to the time of concentration.

2) Rainfall Intensity, I = 998.071 / (Tc + 6.053)^0.814 (5 year, City of Ottawa)
3) Peak Flow = Duration/Tc x 2.78 x C x I x A (Duration < Tc)
4) Peak Flow = 2.78 x C x I x A (Duration > Tc)
5) Storage = Duration x Storage Rate

## Storage Volumes (100-Year Storm)

Tc = 10.00 (mins)
$C_{AVG}$ = 0.70 (dimmensionless)
Area = 0.0630 (hectares)
Storm = 100 (year)
Release Rate = 7.90 (L/sec)
Time Interval = 5 (mins)

| Duration (min) | Rainfall Intensity (mm/hr) | Peak Flow (L/sec) | Release Rate (L/sec) | Storage Rate (L/sec) | Storage ($m^3$) |
|---|---|---|---|---|---|
| 1 | 351 | 4.3 | 7.90 | | |
| 6 | 226 | 16.6 | 7.90 | 8.73 | 3.14 |
| 11 | 170 | 20.8 | 7.90 | 12.93 | 8.54 |
| 16 | 138 | 16.9 | 7.90 | 8.97 | 8.61 |
| 21 | 116 | 14.3 | 7.90 | 6.36 | 8.02 |
| 26 | 101 | 12.4 | 7.90 | 4.51 | 7.03 |
| 31 | 90 | 11.0 | 7.90 | 3.12 | 5.80 |
| 36 | 81 | 9.9 | 7.90 | 2.03 | 4.38 |
| 41 | 74 | 9.1 | 7.90 | 1.16 | 2.84 |
| 46 | 68 | 8.3 | 7.90 | 0.44 | 1.20 |
| 51 | 63 | 7.7 | 7.90 | -0.17 | -0.52 |
| 56 | 59 | 7.2 | 7.90 | -0.68 | -2.30 |
| 61 | 55 | 6.8 | 7.90 | -1.13 | -4.13 |
| 66 | 52 | 6.4 | 7.90 | -1.52 | -6.00 |
| 71 | 49 | 6.0 | 7.90 | -1.86 | -7.91 |
| 76 | 47 | 5.7 | 7.90 | -2.16 | -9.85 |
| 81 | 45 | 5.5 | 7.90 | -2.43 | -11.82 |
| 86 | 43 | 5.2 | 7.90 | -2.68 | -13.82 |
| 91 | 41 | 5.0 | 7.90 | -2.90 | -15.83 |
| 96 | 39 | 4.8 | 7.90 | -3.10 | -17.86 |
| 101 | 38 | 4.6 | 7.90 | -3.29 | -19.91 |
| 106 | 36 | 4.4 | 7.90 | -3.45 | -21.97 |
| 111 | 35 | 4.3 | 7.90 | -3.61 | -24.05 |
| 116 | 34 | 4.1 | 7.90 | -3.76 | -26.14 |
| 121 | 33 | 4.0 | 7.90 | -3.89 | -28.24 |
| 126 | 32 | 3.9 | 7.90 | -4.01 | -30.35 |
| 131 | 31 | 3.8 | 7.90 | -4.13 | -32.47 |
| 136 | 30 | 3.7 | 7.90 | -4.24 | -34.60 |

**Notes**

1 ) For a storm duration that is less than the time of concentration the peak flow is equal to the product of 2.78CIA and the ratio of the storm duration to the time of concentration.

2) Rainfall Intensity, I = 1735.688 / (Tc + 6.014)^0.820 (100 year, City of Ottawa)
3) Peak Flow = Duration/Tc x 2.78 x C x I x A (Duration < Tc)
4) Peak Flow = 2.78 x C x I x A (Duration > Tc)
5) Storage = Duration x Storage Rate

ARCH-NOVA DESIGN INC.
Architecture
Engineering
Consulting

# Appendix B: Guidelines, Existing Reports, Studies, and References, Plans

The following studies and regulations were utilized in the preparation of this report:

- **Design Guidelines for Sewage Works,**

  Ministry of the Environment, 2008., (MOE Design Guidelines)

- **Stormwater Planning and Design Manual,**

  Ministry of the Environment, March 2003.,(SWMP Design Manual)

- **Ontario Building Code Compendium**

  Ministry of Municipal Affairs and Housing Building Development Branch, January 1, 2010 Update.(OBC)