

342-348 Queen Mary Street, Ottawa
Stormwater Management Brief



Project # CW-3-25

Prepared for:

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By:

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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 m² and, in comparison with the predevelopment impervious areas (total 280 m²) 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 m³. 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 m³ 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:

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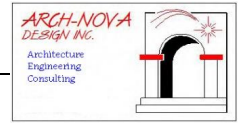
June 02, 2025



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Appendix A: Calculations

PRE-DEVELOPMENT

The pre-development time of concentration is **10.00** minutes

where:

$$I_5 = 998.071 / (T_c + 6.053)^{0.814}$$

$$I_5 = \mathbf{104.2 \text{ mm/hr}}$$

$$I_{100} = 1735.688 / (T_c + 6.014)^{0.820}$$

$$I_{100} = \mathbf{178.6 \text{ mm/hr}}$$

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

$$Q_{5pre} = (2.78) \cdot (C) \cdot (I_5) \cdot (A)$$

$$Q_{5pre} = 2.78 \times 0.55 \times 104.2 \times 0.1132$$

$$Q_{5pre} = \mathbf{18.04 \text{ L/s}}$$

$$Q_{100pre} = (2.78) \cdot (C) \cdot (I_{100}) \cdot (A)$$

$$Q_{100pre} = 2.78 \times 0.55 \times 178.6 \times 0.1132$$

$$Q_{100pre} = \mathbf{30.91 \text{ L/s}}$$

0.55 Actual C factor

POST-DEVELOPMENT (UNCONTROLLED RUNOFF)

The post-development time of concentration is **10.00** minutes

where:

$$I_5 = 998.071 / (T_c + 6.053)^{0.814}$$

$$I_5 = \mathbf{104.2 \text{ mm/hr}}$$

$$I_{100} = 1735.688 / (T_c + 6.014)^{0.820}$$

$$I_{100} = \mathbf{178.6 \text{ mm/hr}}$$

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
TOTAL		0.0500	100.0%		0.035
Weighted C =				0.70	

$$Q_{5post} = (2.78) \cdot (C) \cdot (I_5) \cdot (A)$$

$$Q_{5post} = 2.78 \times 0.70 \times 104.2 \times 0.0500$$

$$Q_{5post} = \mathbf{10.14 \text{ L/s}}$$

$$Q_{100post} = (2.78) \cdot (C) \cdot (I_{100}) \cdot (A)$$

$$Q_{100post} = 2.78 \times 0.70 \times 178.6 \times 0.0500$$

$$Q_{100post} = \mathbf{17.38 \text{ L/s}}$$

0.70 Actual C factor



- Building/Roof
- Green Area
- Asphalt/Pathway

342-348 Queen Mary Street SWM PREDEVELOPMENT

ARCH-NOVA Design Inc.

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PRE-DEVELOPMENT

The pre-development time of concentration is **10** minutes

where:

$$I_5 = 998.071 / (T_c + 6.053)^{0.814}$$

$$I_5 = \mathbf{104.2 \text{ mm/hr}}$$

$$I_{100} = 1735.688 / (T_c + 6.014)^{0.820}$$

$$I_{100} = \mathbf{178.6 \text{ mm/hr}}$$

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
TOTAL		0.0000	0.0%		0.000
Weighted C =					0.00

$$Q_{5pre} = (2.78) \cdot (C) \cdot (I_5) \cdot (A)$$

$$Q_{5pre} = 2.78 \times 0.00 \times 104.2 \times 0.0000$$

$$Q_{5pre} = \mathbf{0.00 \text{ L/s}}$$

$$Q_{100pre} = (2.78) \cdot (C) \cdot (I_{100}) \cdot (A)$$

$$Q_{100pre} = 2.78 \times 0.00 \times 178.6 \times 0.0000$$

$$Q_{100pre} = \mathbf{0.00 \text{ L/s}}$$

POST-DEVELOPMENT (CONTROLLED RUNOFF)

The post-development time of concentration is **10** minutes

where:

$$I_5 = 998.071 / (T_c + 6.053)^{0.814}$$

$$I_5 = \mathbf{104.2 \text{ mm/hr}}$$

$$I_{100} = 1735.688 / (T_c + 6.014)^{0.820}$$

$$I_{100} = \mathbf{178.6 \text{ mm/hr}}$$

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

$$Q_{5post} = (2.78) \cdot (C) \cdot (I_5) \cdot (A)$$

$$Q_{5post} = 2.78 \times 0.70 \times 104.2 \times 0.0630$$

$$Q_{5post} = \mathbf{12.77 \text{ L/s}}$$

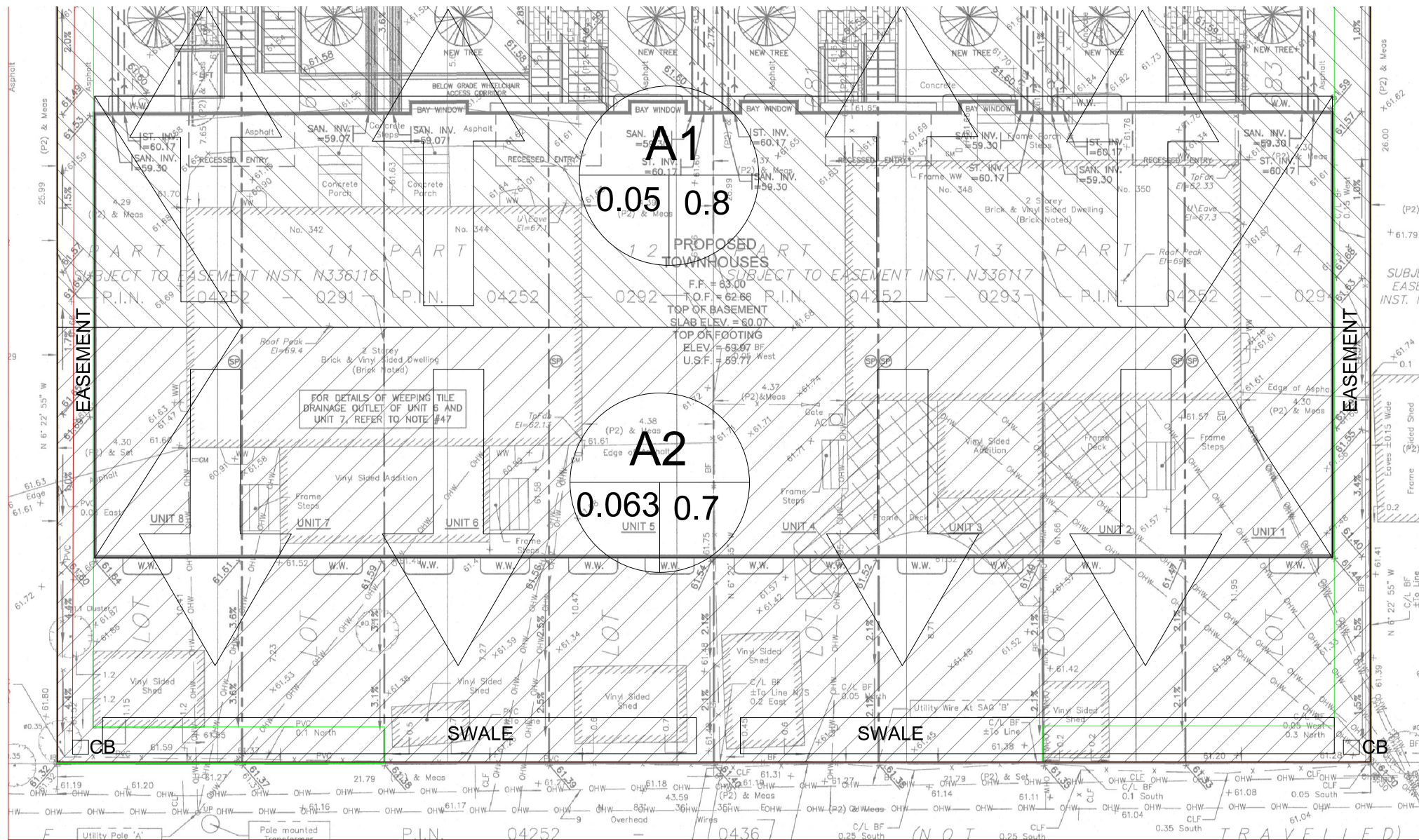
$$Q_{100post} = (2.78) \cdot (C) \cdot (I_{100}) \cdot (A)$$

$$Q_{100post} = 2.78 \times 0.88 \times 178.6 \times 0.0630$$

$$Q_{100post} = \mathbf{27.37 \text{ L/s}}$$

Actual C factor

C factor increased 25% for 100-year storm



ARCH-NOVA Design Inc

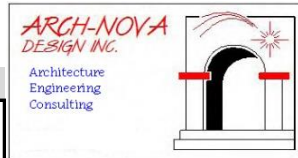
45 Banner Road NEPEAN ON K2H 8X
613-702-3403 contact@archnova.c

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

25.27 0.817607

Controlled allowable runoff

5-year	0.66	l/sec
100-year	-13.53	l/sec

Controlled allowable runoff

5-year	7.90	l/sec
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Storage Volumes (5-Year Storm)					
Project : 342-348 Queen Mary Street					
Tc = 10.00 (mins) C _{AVG} = 0.70 (dimensionless) 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 (dimensionless) 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					



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)