STORMWATER MANAGEMENT REPORT

Project Location:

10972 Seymour Avenue
Fort Erie
ON

Prepared for:
Roseglen Homes
Seymour Townhomes

Prepared by:
Karugu Consulting Inc.

November 16, 2021
File: 21020

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FIGURES

1 INTRODUCTION

This report addresses the stormwater management plan in support of a site plan application for the development proposed at 10972 Seymour Avenue, Fort Erie, Ontario. The subject site is approximately 0.17 hectares and located west of Spears Avenue and immediately south of Seymour Avenue. (Refer to Figure 1).

The proposal is for an eight (8) unit street townhouse development on the south side of Seymour Avenue.

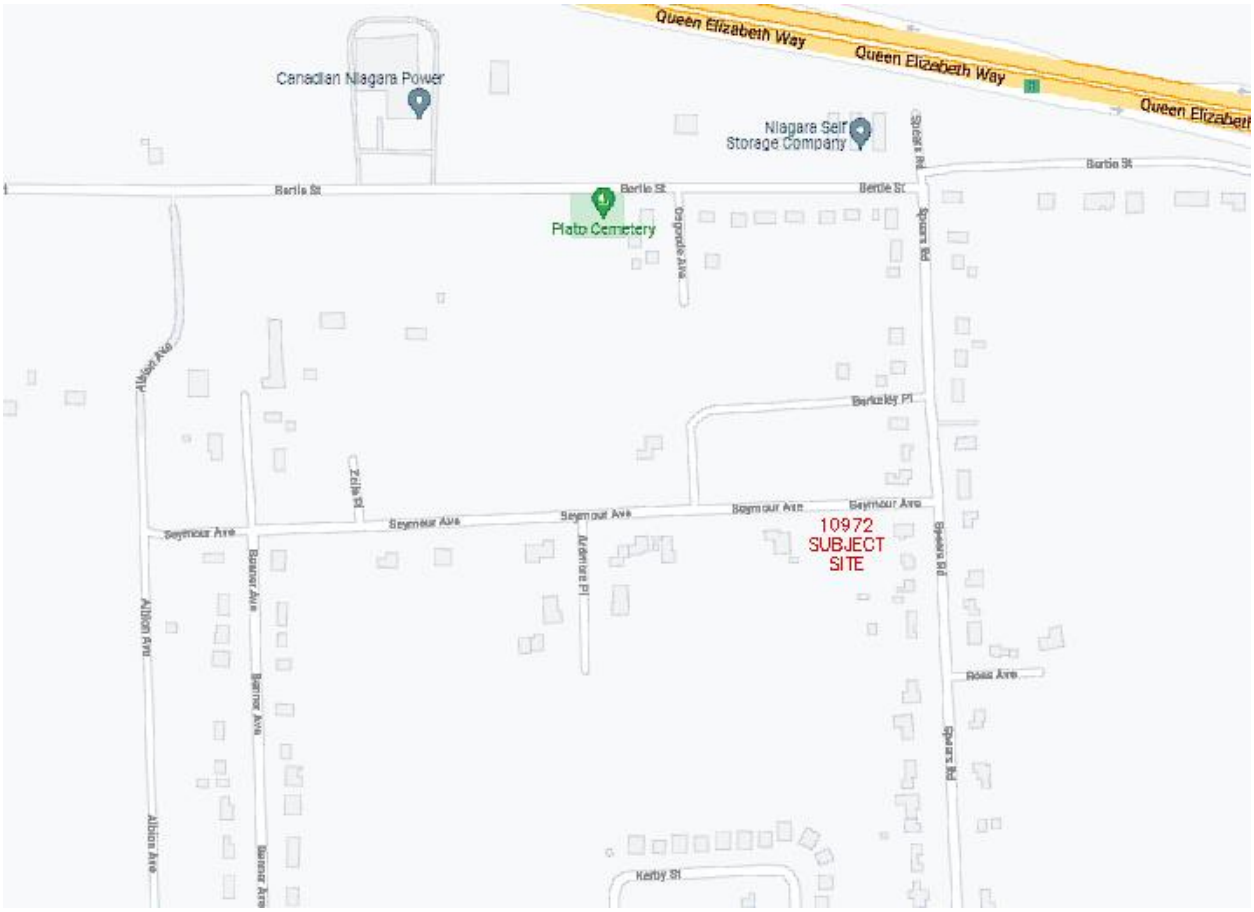

Figure 1 - Location Plan

2 EXISTING CONDITIONS

2.1 Site Characteristics

The site is currently vacant and has an area of 1705 m^2 (0.1705 Ha). Based on a topographical survey undertaken by The Larocque Group, dated September 3, 2021, Drainage Area 101 slopes north towards Seymour Avenue roadside ditch and Drainage Area 102 slopes to the south.

The existing site statistics are as follows:**(See Figure No. 2)**:

Roof Area	0 m^2	c=0.90	ac=	0.00
Concrete/Asphalt	0 m^2	c=0.90	ac=	0.00
Gravel	0 m^2	c=0.60	ac=	0.00
Pervious	1705m^2	c=0.25	ac=	426.25
Total	1705 m^2		ac=	426.25

Composite predevelopment coefficient =426.25/ 1705 = 0.25

SEYMOUR AVENUE

(BY REGISTERED PLAN No. 448)

PIN 64236-0129(LT)

CENTRE LINE OF ROAD

EDGE OF ASPHALT ROAD

GRAVEL SHOULDER

MB

CENTRE LINE OF DITCH

GRAVEL DRIVEWAY

CONCRETE DRIVEWAY

MUNICIPAL No. 1007

N85°46'30"E 51.130

N4°17'W 33.354

2.0m HIGH CHAIN LINK FENCE

1.5m HIGH CHAIN LINK FENCE

DS

101 | 0.25 | 1269

102 | 0.25 | 436

LOT 99 | LOT 98 | LOT 97 | LOT 90 | LOT 89 | LOT 88 | LOT 100 | LOT 91

REG'D PLAN No. 448

PIN 64236 - 0206 (LT)

PIN 64236-0207(LT)

PIN 64236-0204(LT)

PIN 64236-0208(LT)

ROBERT PLACE

(BY REGISTERED PLAN No. 448)
(NOT TRAVELLED)

PIN 64236-0203(LT)

LEGEND:

- PROPERTY LINE
- D/S DOWN SPOUT
- PROPOSED DRAINAGE DIRECTION
- EXISTING DRAINAGE DIRECTION
- SWALE
- OVERLAND FLOW ROUTE
- SILT FENCE
- x 252.55 EXISTING ELEVATION
- x **252.55** PROPOSED ELEVATION
- x **252.55** EXISTING ELEVATION TO REMAIN
- EXISTING SANITARY MANHOLE
- EXISTING STORM MANHOLE
- PROPOSED SINGLE/DOUBLE CATCHBASIN
- PROPOSED CATCHBASIN MANHOLE
- EXISTING HYDRANT & VALVE
- WV PROPOSED WATER VALVE
- M WATER METER
- EXTERNAL DRAINAGE AREA

DRAINAGE AREA #

101 | 0.25 | 1269

RUNOFF COEFFICIENT

AREA (M²)

KARUGU CONSULTING INC.

111 Waterloo St. Suite 200
London, ON N6B 2M4
Tel: 226-270-2559
Cell: 519-694-5383
Website: www.karugu.com

CLIENT NAME:

10972 SEYMOUR AVENUE,
FORT ERIE, ON

DRAWING NAME:

STORM PRE-DEVELOPMENT
FIG 2

DESIGNED BY:	GK	DATE:	NOV 16, 2021
DRAWN BY:	GK	SURVEYED BY:	THE LAROCQUE GROUP
CHECKED BY:	GK	PROJECT No.	21020
SCALE:	1:250		

3 PROPOSED CONDITIONS

3.1 Proposed Site Characteristics

The proposed development will comprise an eight-unit street townhouse development, driveways off Seymour Avenue and landscaped areas as shown on Figure 3.

The post-development site statistics are as follows:

Overall Site:

Roof Area	636 m^2	c=0.90	ac=	572.40
Asphalt/Conc. Areas	444 m^2	c=0.90	ac=	399.60
Pervious Areas	625 m^2	c=0.25	ac=	156.25
Total	1705 m^2		ac=	1128.25

Composite runoff coefficient, C = 1128.25 / 1705 = 0.66

Area 201:

Roof Area	17 m^2	c=0.90	ac=	15.30
Asphalt/Conc. Areas	422 m^2	c=0.90	ac=	379.80
Pervious Areas	235 m^2	c=0.25	ac=	58.75
Total	674 m^2		ac=	453.85

Composite runoff coefficient, C = 453.85 / 674 = 0.67

Area 202:

Roof Area	619 m^2	c=0.90	ac=	557.10
Asphalt/Conc. Areas	22 m^2	c=0.90	ac=	19.80
Pervious Areas	390 m^2	c=0.25	ac=	97.50
Total	1031 m^2		ac=	674.40

Composite runoff coefficient, C = 674.4 / 1031 = 0.65

This site was included in the Spears/ High Pointe Servicing Study. As per this study, the site was assigned a runoff coefficient of 0.50. The Overall site Post development runoff coefficient, (C=0.66), will be higher than that assigned in the study, (C=0.50) thereby indicating that in the proposed conditions runoff will be higher than anticipated.

To mitigate post development runoff, it is proposed to direct runoff from Drainage Area 202 to a Dry Infiltration Swale as shown on Figure 3. Downspouts will be installed at the rear of the building so as to direct roof runoff to the infiltration swale. The grading of the infiltration facility is such that when its capacity is exceeded, it shall overflow onto the side yard swales which drain to the Seymour Avenue roadside ditch. Drainage Area 101 will drain uncontrolled onto Seymour roadside ditch.

The Dry Infiltration Swale is proposed to run along the rear property line. The infiltration swale will assist in reducing runoff from the site and to enhance at source infiltration. The design of the dry swale facility references the "*Low Impact Development Stormwater Management Planning and Design Guide"* developed by Credit Valley Conservation (CVC) and Toronto and Region Conservation Authority (TRCA). The Infiltration swale facility has been sized through an iterative process to come up with the adequate size.

The Infiltration facility is sized to capture and infiltrate 18.64m^3 [see section 3.1.1].

Based on a 3-hour, 2-year storm event, the total runoff generated on the site is as follows:

The IDF curve parameters for the two-year storm event per The Town of Fort Erie Guidelines for Development of New Subdivisions are as follows:

A=628.05, B=6.652 and C=0.796.

The 3-hour rainfall intensity = 0.0100 m/hr per the formular "$i = \frac{\mathrm{A}}{(\mathrm{t+B})\text{^}\mathrm{c}}$"

Area 201

Q=0.0100m/hr x 3hr x 697 x 0.67 = 14.01m^3

Area 202

Q=0.0100m/hr x 3 x 1008 x 0.65 = 19.66m^3

Runoff retained in Infiltration facility = 18.64m^3

Runoff existing Drainage Area 202 1 = 1.02m3 [19.66-18.64]

Total flow out of site = **15.03** [14.01 (Area 201)+1.02 (Area 2.2)]

Total rain volume on site = 0.0100mm/hr x 3 hrs x 1705m^2 = **51.15**m^3

Therefore, the effective runoff coefficient for this site is 0.29 [15.03/51.15]. This effective Runoff Coefficient is used to calculate peak flows from site as shown in calculations included in Appendix A.

Table 1: Peak Flow Summary

Storm Event (YR)	Peak Flow (m^3/s)		
	Existing	Proposed (with mitigation)	Allowable - (Spears/Highpoint Study)
2	7.93	9.19	15.85
5	10.14	11.77	20.29
10			
25			
50			
100	26.91	31.21	53.82

For higher storms that would result in the storage being exceeded, the facility will overtop at its east and east ends on to the side yard swales and onto the roadside ditch along Seymour Avenue.

The proposed stormwater management plan will result in an overall runoff coefficient of 0.29. This is less than the 0.5 assigned in the Spears/ High Pointe Servicing Study and the SWM Plan can therefore be considered adequate.

(BY REGISTERED PLAN No. 448)

PIN 64236-0129(LT)

SANMH1

CENTRE LINE OF ROAD

EDGE OF ASPHALT ROAD

GRAVEL SHOULDER

CENTRE LINE OF DITCH

MB

450ø CULVERT @ 0.5%

INV 191.40

INV 191.44

INV 191.50

INV 191.56

INV 191.62

N85°46'30"E 51.130

201 | 0.67 | 697

202 | 0.65 | 1008

4.0%

2.0%

3.2%

2.3%

2.0%

LOT 95

LOT 98

LOT 97

LOT 90

REG'D PLAN No. 448

PIN 64236 - 0206 (LT)

CONCRETE DRIVEWAY

PIN 64236-0207

MUNICIPAL No. 1007

LOT 89

GRAVEL DRIVEWAY

N41°7'W 33.354

1.5m HIGH CHAIN LINK FENCE

ROBERT PLACE

(BY REGISTERED PLAN No. 448)

(NOT TRAVELLED)

PIN 64236-0203(LT)

LOT 100

PIN 64236-0204(LT)

LOT 91

PIN 64236-0208(LT)

LEGEND:

- PROPERTY LINE
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- SWALE
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- EXISTING HYDRANT & VALVE
- WV PROPOSED WATER VALVE
- M WATER METER
- DRAINAGE AREA DIRECTLY TO SEYMOUR AVENUE

DRAINAGE AREA #

201 | 0.25 | 697

RUNOFF COEFFICIENT

AREA (M²)

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CLIENT NAME:

10972 SEYMOUR AVENUE, FORT ERIE, ON

DRAWING NAME:

STORM POST-DEVELOPMENT FIG 3

DESIGNED BY:	GK	DATE:	NOV 16, 2021
DRAWN BY:	GK	SURVEYED BY:	THE LAROCQUE GROUP
CHECKED BY:	GK	PROJECT No.	21020
SCALE:	1:250		

3.1.1 Facility Sizing

The volume of the infiltration facility has been optimized as 18.64m^3 and calculated as follows:

The proposed infiltration swale will have a surface area of 46.6m^2 and 1.0m deep.

The storage volume for the swale is as follows:
Within the clear stone (40% void ratio): 46.6x1.0x0.4 = **18.64m^3**

3.2 Inspection and Maintenance

Maintenance of the infiltration swale will involve maintenance of the vegetative cover as well as periodic inspection for less frequent maintenance needs. Generally, routine maintenance will be; weeding, pruning, mowing and litter removal. Inspections annually and after every major storm event (> 25 mm), will determine whether corrective action is necessary to address gradual deterioration or abnormal conditions.

For the first six months following construction, the site should be inspected after each storm event greater than 10mm or a minimum of twice. Subsequently, inspections should be conducted in the spring of each year and after rainfall events greater than 25 mm. Two or three growing seasons may be required to establish vegetation to the desired level. During this period, erosion and sediment control practices, such as mats or blankets, should be used to help protect swale structure.

3.3 WATER QUALITY CONTROL

Driveways and parking areas shall be the main contributors of suspended solids from this site. Runoff from these areas is proposed to be routed onto vegetated areas (roadside ditch). Quality control from this site will be achieved by routing runoff over vegetated areas. Some studies such as a 2001 field test in Virginia reported to USEPA (Shaw, Kuo, Fassman, and Pan), discovered that a 274 metre long highway median swale at 3% gradient effectively reduced total suspended solids by 94% and total phosphorous by 99%. Therefore, quality control for runoff from this site can be considered to be effectively provided along the drainage swales (ditch) and vegetated areas.

3.4 Erosion and Sediment Control

Prior to any grading or servicing works taking place on-site, sediment and erosion control measures must be in place to prevent the transport of sediments off the site and into the secondary drains or adjacent properties. The location and design of sediment control will include:

- Installation of siltation control fencing
- Proposed and/or existing manholes/catchbasins or inlets within the work area are to be protected from silt by wrapping their tops with filter fabric or providing a sediment trap around the structure
- Proposed swales are to be sodded after they have been shaped in order to prevent scouring and/or down-cutting of the swale invert.

The erosion control measures shall be maintained in good repair during the entire construction period until all construction is complete or until determined they are no longer required.

4 SUMMARY

The proposed development's storm water servicing requirements can be adequately addressed through the overland flow routes for conveyance and the proposed LID Facility (Infiltration Swale) to provide both quantity and quality controls.

Overall site grading will provide for both minor and major overland flow conveyance as well as provide adequate cover over services and generally match existing road and boundary grades with appropriate slopes.

KARUGU CONSULTING INC.

George Karugu, P.Eng.

APPENDIX A

CALCULATIONS

PROJECT : 21033- Seymour Townhoses
DATE : 2021-11-16

Existing Conditions

Land Type	Area, A (ha)	C	A x C
Landscape	0.1705	0.25	0.0426
Asphalt/Conc	0.0000	0.90	0.0000
Gravel	0.0000	0.60	0.0000
Building	0.0000	0.90	0.0000
Total	*0.1705*		*0.0426*

Pre Development weighted Runoff Coefficent *0.25*

Factored Runoff Cofficent :		
Year	Factor	Modified Runoff Factor
2	1.00	0.250
5	1.00	0.250
10	1.00	0.250
25	1.10	0.275
50	1.20	0.300
100	1.25	0.313

City of Hamilton IDF Values	[i=A/(t+B)^C]		
Year	A	B	
2	628.1	6.652	0.796
5	747.9	6.800	0.768
10			
25			
50			
100	2317.4	11.000	0.836

Peak Runoff by Modified Rational Method for Time of Concentration =		10.0min	
Year	Rainfall	Peak Flow	
	mm/hr	m3/sec	L / Sec
2	66.94	0.008	7.93
5	85.67	0.010	10.14
10			
25			
50			
100	181.81	0.027	26.91

Peak Flow
Q = C * i * A / 360 cms
C = Runoff Coefficient
i = Rainfall intensity (mm/hr)
A = Drainage area (ha)

PROJECT : 21033- Seymour Townhoses
DATE : 2021-11-16

Proposed Conditions - Overall (Infiltration Facility Factored in)

Land Type	Area, A (ha)	C	A x C

POST Development Runoff Coefficent with Mitigation(See Section 3.1) *0.29*

Factored Runoff Cofficent :		
Year	Factor	Modified Runoff Factor
2	1.00	0.290
5	1.00	0.290
10	1.00	0.290
25	1.10	0.319
50	1.20	0.348
100	1.25	0.363

City of Hamilton IDF Values	[i=A*(t)^B]		
Year	A	B	
2	628.1	6.652	0.796
5	747.9	6.800	0.768
10			
25			
50			
100	2317.4	11.000	0.836

Peak Runoff by Modified Rational Method for Time of Concentration =10 min		10.0000 hr	
Year	Rainfall	Peak Flow	
	mm/hr	m3/sec	L / Sec
2	66.94	0.009	9.19
5	85.67	0.012	11.77
10			
25			
50			
100	181.81	0.031	31.21

Peak Flow
Q = C * i * A / 360 cms
C = Runoff Coefficient
i = Rainfall intensity (mm/hr)

PROJECT : 21033- Seymour Townhoses
DATE : 2021-11-16

Proposed Conditions - Overall (Per Spears/Highpoint Study))

Land Type	Area, A (ha)	C	A x C

POST Development Runoff Coefficent per Spears/Highpoint Study *0.50*

Factored Runoff Cofficent :		
Year	Factor	Modified Runoff Factor
2	1.00	0.500
5	1.00	0.500
10	1.00	0.500
25	1.10	0.550
50	1.20	0.600
100	1.25	0.625

City of Hamilton IDF Values		[i=A*(t)^B]	
Year	A	B	
2	628.1	6.652	0.796
5	747.9	6.800	0.768
10			
25			
50			
100	2317.4	11.000	0.836

Peak Runoff by Modified Rational Method for Time of Concentration =10 min		10.0000 hr	
Year	Rainfall	Peak Flow	
	mm/hr	m3/sec	L / Sec
2	66.94	0.016	15.85
5	85.67	0.020	20.29
10			
25			
50			
100	181.81	0.054	53.82

Peak Flow
Q = C * i * A / 360 cms
C = Runoff Coefficient
i = Rainfall intensity (mm/hr)