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Memorandum

To/Attention	Municipality of Central Elgin, Asset Management and Development Services	**Date**	October 18, 2022
From	Sandra Hayman, P. Eng.	**Project No**	136299
cc			
Subject	384 George Street - Functional Servicing Brief		

Introduction/Background

The site is located within the former Village of Port Stanley on the south side of George Street, approx. 200m west of the George/Front Street intersection. The site is 0.37 ha in size with residential properties to the east and west, and protected treed area to the south. Currently, the site has several residential buildings(cottages) with gravel driveways, treed area along the south portion of the site. The proposed development is a residential condominium, comprised of a townhouse block with five units and 3 single detached houses.

The site is located within the Kettle Creek watershed.

Water Servicing

There is an existing 200mmØ PVC watermain in the George St right of way (ROW) on the south side. As per municipal standards, a new 50mmØ water service (development water main) will be installed, off the existing George St water main, inline with the proposed development entrance/lane. Each unit shall be serviced off the 50mmØ development water main with 25mmØ services and individual unit water meters, as per municipal standards. The existing hydrants located in George St ROW are approx. 95m west and approx. 100m east of the existing gravel entrance.

Sanitary Analysis

There is an existing municipal 200mmØ sanitary sewer running beneath the roadway asphalt along George Street. This sewer will be utilized by installing a new maintenance hole on the existing sewer inline with the proposed lane into the site, and installing a new 200mmØ sanitary sewer connection into the site. There is a total of 8 units proposed for this site (townhouse with 5 units and 3 single detached units). As per municipality standards, total population is calculated with

3.0ppu per unit, which gives a total proposed population of 24. From the attached Sanitary Sewer Design Sheet, the total design flow is 0.38l/s.

Stormwater Management and Drainage

Criteria

This SWM brief addresses the storm drainage and stormwater management (SWM) aspects of this development and has been prepared in accordance with the recommendations and requirements of the following:

a) The Corporation of the Municipality of Central Elgin *Design Guidelines Manual,* 2022;

   The peak flows discharged from the site shall not increase as a result of the proposed development for the calculated 2 through 100-year storm events. (see section 8.01 of the Central Elgin Design Guidelines Manual)

b) The Municipality of Central Elgin's Asset Management and Development Services Department Design Specifications and Requirements;

c) The Ministry of the Environment, Conservation and Parks' *Stormwater Management Planning and Design Manual,* March 2003.

Assumptions/Calculations

Following are stormwater calculations/assumptions for the site:

- The total drainage area for the site is calculated at 0.37 ha (the property area), which is sub-divided into three drainage areas. Area 101 drains to a roadside catch basin (CB) at the northwest corner of the property, area 102 drains to a roadside catch basin at the northeast corner of the property, and area 103 drains to an existing pond feature at the rear (southside) of the property.
- Figure 1 shows pre-development drainage conditions for the site. There are no external drainage areas noted. Calculations are attached to confirm the overall pre-development site runoff coefficient of 0.40. Runoff Coefficients for each individual drainage area are shown on the plan.
- The proposed post-development Runoff coefficients and Impervious values are shown in Figure 2, which is divided into areas that correspond to the existing drainage areas. Calculations are attached to confirm the overall post-development site runoff coefficient of 0.47. Runoff Coefficients for each individual drainage area are shown on the plan.
- The site grading plan has been designed to ensure that stormwater flows will be self-contained on site, up to the 100-year event, and safely conveys up to the 250-year storm event to the George St ROW.

- The rational method was used in the calculation of the critical storage volume required. Attached are the calculations for the 2-year, 5-year and 100-year events for each of the three areas. Due to the small drainage area, it is difficult to provide multiple orifice configurations to restrict post development flows to pre-development levels for each storm event. Therefore, the site has been designed to over-restrict flows for each event to the 2-year storm level, where possible.
- For the drainage area 101/201 post-development run off will be directed to a new CB 3 to be installed with a lead to the existing CB 1 in the adjacent ROW, which is connected to a 750mm storm sewer on the north side of George St (Known as the George St Drain). To restrict 100-year post development flows to 2-year pre-development levels, a mix of 4.75m^3 of surface ponding above the new CB 3 and 10.0m^3 underground storage in a rock trench will be provided to accommodate the calculated required storage of 13.0m^3. Also, a 50mm Orifice will be installed on the outlet of the new CB 3.
- For the drainage area 102/202 post-development run off will be directed to a new CB 4 to be installed with a lead to the existing CB 2 in the adjacent ROW, which is connected to a 750mm storm sewer on the north side of George St (Known as the George St Drain). To restrict 100-year post development flows to 2-year pre-development levels, a mix of 6.13m3 of surface ponding above the new CB 4 and 5.0m3 underground storage in a rock trench to accommodate the calculated required storage of 11.0m3. Also, a 75mm Orifice will be installed on the outlet of the new CB 4.
- For the drainage area 103/203 post-development run off will be directed to the existing pond feature at the southeast of the development site. The calculated post development runoff for the 2-year, 5-year and 100-year storms are equal to the existing runoff, respectively. Therefore, no new mitigating measures are required.
- Sediment and Erosion Control Measures during construction are shown on the Conceptual Grading and Servicing drawing. The measures include silt fencing along the property limits in areas that ensure that sediment does not get washed onto the surrounding properties during storm events, as well as other measures as necessary such as straw bale filters, prompt reseeding of bare earth, and swales to direct flows etc. Monitoring during construction will be required to ensure proper maintenance of these measures.

Conclusion

The minimal increase in runoff for the 2-year to 100-year storm events will be accommodated with surface ponding and underground rock trenches.

The 250-year storm flow has been designed to be conveyed overland to the George St right of way.

Sediment and Erosion Control measures during construction are shown on the Conceptual Grading and Servicing drawing.

Sincerely,

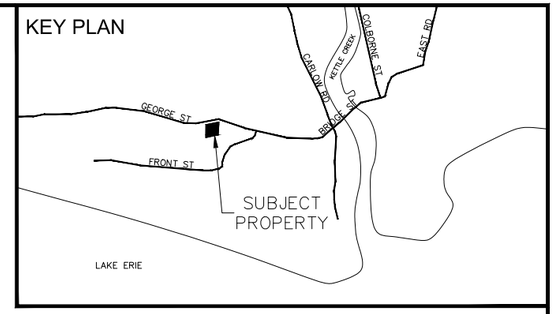
IBI Group

Sandra Hayman, P. Eng.

Associate, Manager Civil Engineering

SH/encl.

FIGURES



LEGEND

280.00 – EXISTING GROUND CONTOUR

CATCHMENT AREA NUMBER

101 | 0.90
0.550 | 10

RUNOFF COEFFICIENT

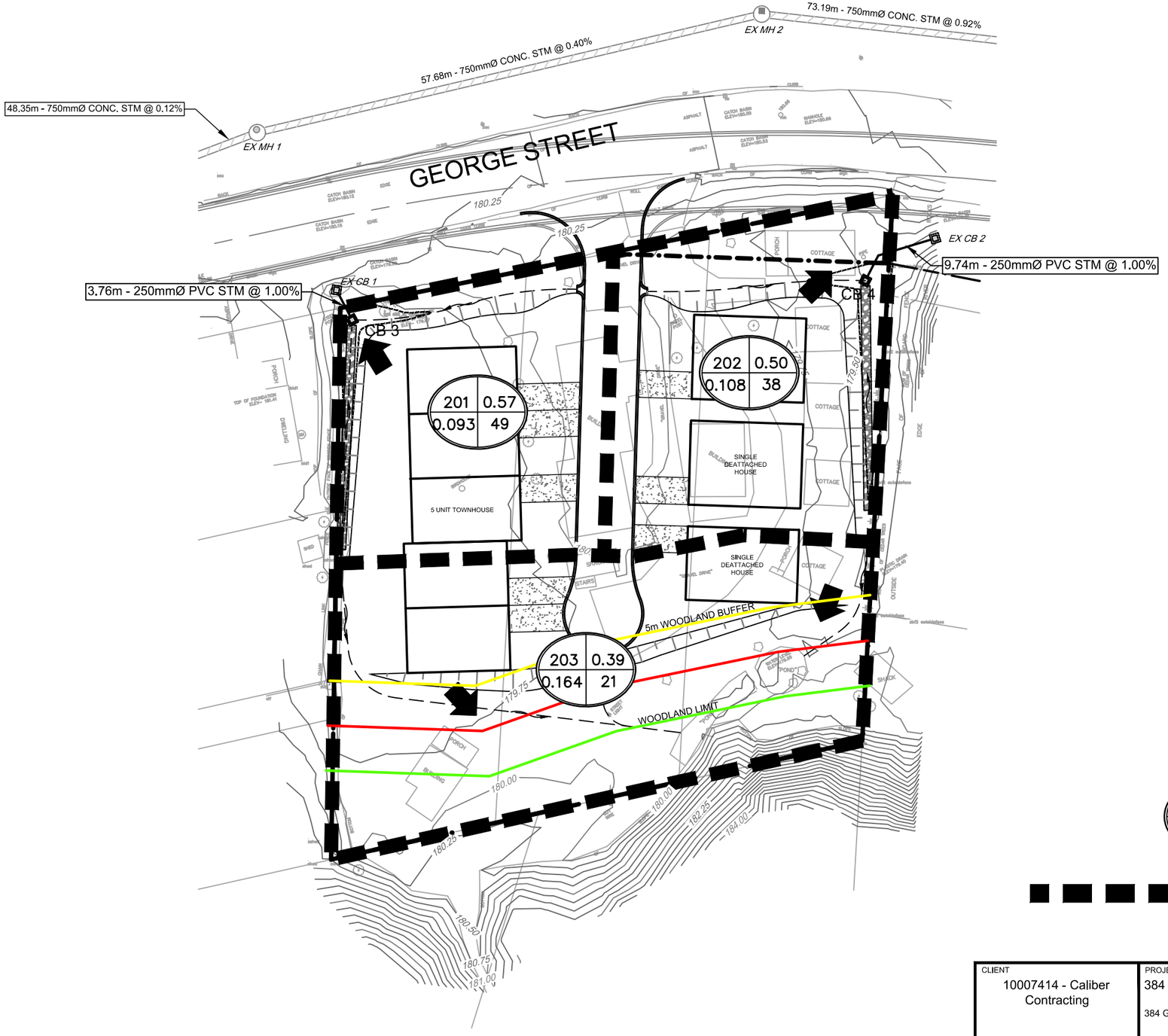
PERCENT IMPERVIOUS

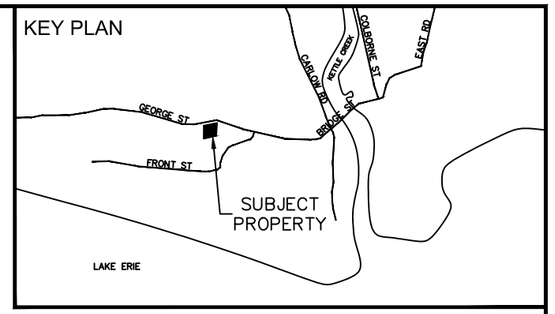
AREA (ha)

– EXISTING STORMWATER CATCHMENT AREA

– EXISTING OVERLAND FLOW

CLIENT: 10007414 - Caliber Contracting 130 Shearson Cres, Cambridge, ON N1T 1J4	PROJECT NAME: 384 George St 384 George St	IBI GROUP Suite 101 - 410 Albert Street Waterloo ON N2L 3V3 Canada tel 519 585 2255 ibigroup.com	
	SCALE: 1:500 / DATE: 2022-10-18 PROJECT ENG: SH / DRAWN BY: CJDW CHECKED BY: SH / APPROVED BY: SH PROJECT NO: 136299	FIGURE NAME: PRE-DEVELOPMENT STORMWATER DRAINAGE AREA	FIGURE NO.: 1 / REVISION: 1





LEGEND

CATCHMENT AREA NUMBER

201 | 0.90
0.550 | 10

RUNOFF COEFFICIENT

PERCENT IMPERVIOUS

AREA (ha)

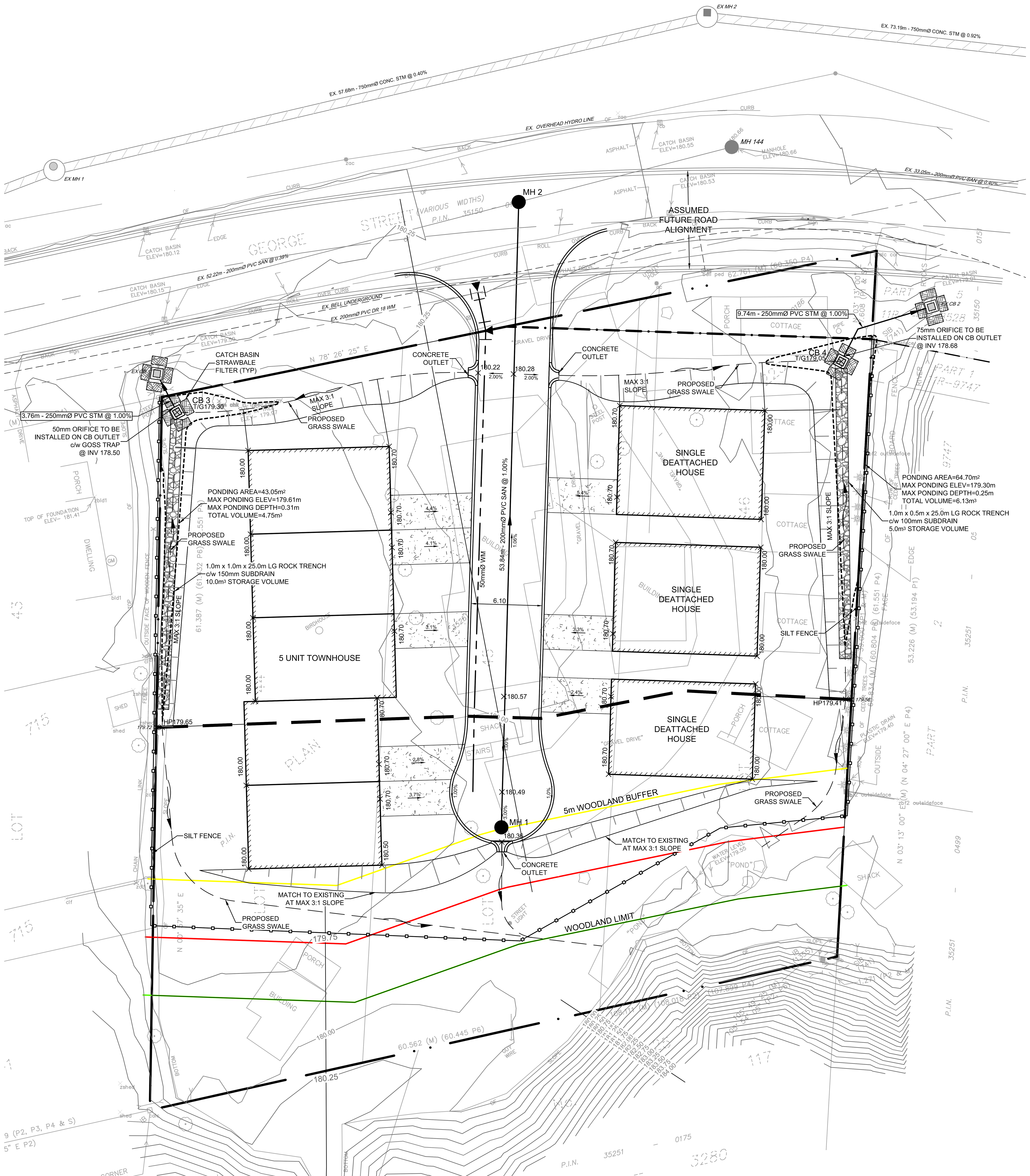
– PROPOSED STORMWATER CATCHMENT AREA

– PROPOSED MAJOR OVERLAND FLOW

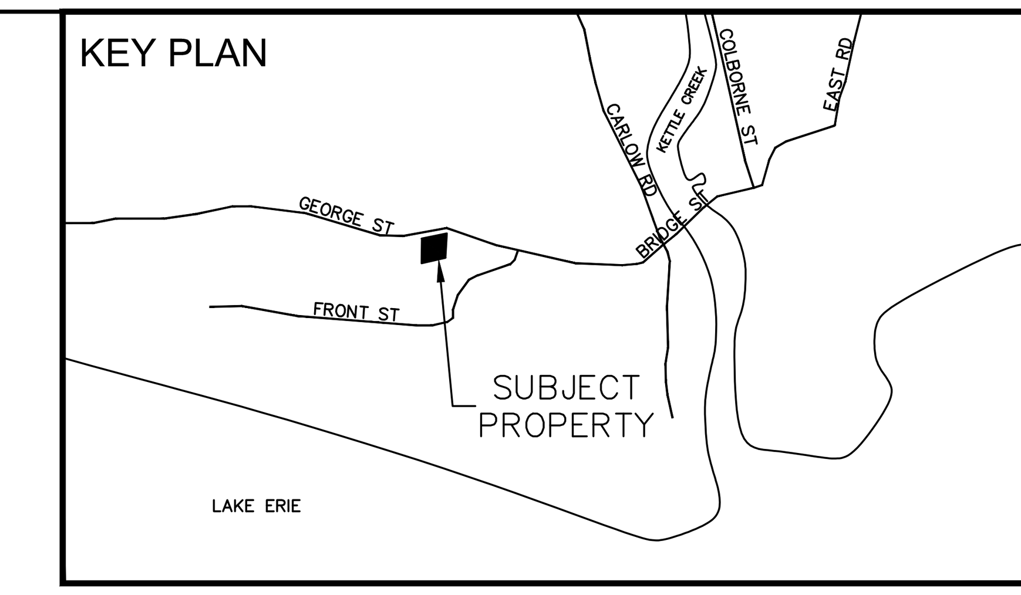
CLIENT: 10007414 - Caliber Contracting 130 Shearson Cres, Cambridge, ON N1T 1J4	PROJECT NAME: 384 George St 384 George St	IBI GROUP Suite 101 - 410 Albert Street Waterloo ON N2L 3V3 Canada tel 519 585 2255 ibigroup.com	
	SCALE: 1:500 / DATE: 2022-10-18 PROJECT ENG: SH / DRAWN BY: CJDW CHECKED BY: SH / APPROVED BY: SH PROJECT NO: 136299	FIGURE NAME: POST DEVELOPMENT STORMWATER DRAINAGE AREA	FIGURE NO.: 2 / REVISION: 1

SCALE CHECK 1 in 10mm

File Location: W:\136299_384_George_St\7.0_Production\7.03_Design\04_CivilSheets\136299-SWM.dwg Last Saved: October 18, 2022 2:32:21 PM by Cedric.Walsh Plotted: Tuesday, October 18, 2022, by Cedric.Walsh



KEY PLAN



CLIENT

10007414 - Caliber Contracting

130 Shearson Cres, Cambridge, ON N1T 1J4

ISSUES

No.	DESCRIPTION	DATE
1	ISSUED TO MUNICIPALITY	2022-10-18

PRELIMINARY

CONSULTANTS

SEAL

IBI GROUP
Suite 101 - 410 Albert Street
Waterloo ON N2L 3V3 Canada
tel 519 585 2255
ibigroup.com

PROJECT

384 George St

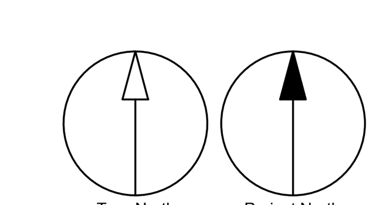
384 George St

PROJECT NO:
136299

DRAWN BY: CJDW	CHECKED BY: SH
PROJECT MGR: DG	APPROVED BY: SH

SHEET TITLE

CONCEPTUAL GRADING & SERVICING



SHEET NUMBER	ISSUE
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SCALE CHECK 10mm

SWM & SAN CALCULATIONS

(updated Oct. 18/22)

SANITARY SEWER DESIGN SHEET (PRELIMINARY)
MUNICIPALITY OF CENTRAL ELGIN

POPULATION DENSITIES

		Lot Basis		Hectare Basis	
LOW DENSITY/SINGLE FAMILY		3.0	ppu	44	upha
MED. DENSITY/SEMI-DETACHED		6.0	ppu	65	upha
HIGH DENSITY		N/A	ppu	N/A	upha
COMMERCIAL		--------	ppu	60	ppha
Institiual	(LIGHT - 20,000 l/h/d)	--------	ppu	53	ppha
INDUSTRIAL	(HEAVY - 50,000 l/h/d)	--------	ppu	150	ppha

DESIGN CRITERIA

SEWAGE	=	250.00 l/cap/day	0.0029	l/ha
SEWAGE (INCL. UNCERTAINTY)			0.0032	l/ha
UNCERTAINTY	=	10%		
INFILTRATION	=	8640 l/ha/day	0.1000	l/s/ha
PEAKING FACTOR	=	1+(14/(4+P^.5)		

DATE	2022-10-17
DESIGN	CJDW
CHECKED	SH
PROJECT	136299

PROJECT NAME: **384 George Street**

LOCATION				AREA			POPULATION					SEWAGE FLOW				SEWER DESIGN					PROFILE						%
AREA NO.	STREET	FROM	TO	NET OR GROSS	DELTA HEC.	TOTAL HEC.	PER HEC.	PER LOT	No. OF LOTS	DELTA POP.	TOTAL POP.	PEAKING. FACT.	INFIL. l/sec	SEW. l/sec	TOTAL l/sec	SIZE mm	n	SLOPE %	CAP. l/sec	VEL. m/sec	LENGTH m	FALL IN SEWER	Headloss u/s (m)	DROP U/S MH	INVERT ELEV. U.S.	INVERT ELEV. D.S.	CAPACITY UTILIZED
101	Site	MH1	MH2	GROSS	0.37	0.37	132	3	8	24	24	4.37	0.04	0.34	0.38	200	0.013	1.00	32.67	1.04	53.8	0.538			178.279	177.741	1.16%

384 George Street
Port Stanley, ON

136299
October 18, 2022

Calculation of Runoff Coefficient

Pre Dev

Area ID		Area (ha)	C value	C*A	Timp	Timp*A
101	Buildings	0.012	0.90	0.011	100%	0.0121
	Gravel Driveway	0.003	0.90	0.002	100%	0.0027
	Open Space	0.072	0.25	0.018	0%	0
	Total	**0.087**		**0.031**		**0.0148**
	Average C/%Imp		**0.36**			**17%**
102	Buildings	0.018	0.90	0.016	100%	0.0181
	Gravel Driveway	0.024	0.90	0.021	100%	0.0235
	Open Space	0.051	0.25	0.013	0%	0
	Total	**0.093**		**0.050**		**0.0416**
	Average C/%Imp		**0.54**			**45%**
103	Buildings	0.011	0.90	0.010	100%	0.011
	Gravel Driveway	0.018	0.90	0.016	100%	0.018
	Open Space	0.156	0.25	0.039	0%	0
	Total	**0.186**		**0.065**		**0.029**
	Average C/%Imp		**0.35**			**16%**
Overall	**Average C/%Imp**	**0.365**	**0.40**			**23%**

Post Dev

Area ID		Area (ha)	C value	C*A	Timp	Timp*A
201	Buildings	0.034	0.90	0.031	100%	0.0344
	Asphalt Lane	0.011	0.90	0.010	100%	0.0109
	Open Space	0.048	0.25	0.012	0%	0
	Total	**0.093**		**0.053**		**0.0453**
	Average C/%Imp		**0.57**			**49%**
202	Buildings	0.030	0.90	0.027	100%	0.0301
	Asphalt Lane	0.011	0.90	0.010	100%	0.0111
	Open Space	0.067	0.25	0.017	0%	0
	Total	**0.108**		**0.054**		**0.0412**
	Average C/%Imp		**0.50**			**38%**
203	Buildings	0.027	0.90	0.024	100%	0.027
	Asphalt Lane	0.008	0.90	0.007	100%	0.008
	Open Space	0.129	0.25	0.032	0%	0
	Total	**0.164**		**0.064**		**0.0350**
	Average C/%Imp		**0.39**			**21%**
Overall	**Average C/%Imp**	**0.365**	**0.47**			**33%**

384 George Street
Port Stanley, ON
October 18/22
136299

PreDevelopment Flow Calculations

Rainfall Intensity Parameters (From Central Elgin Draft Design Guidelines 2021)

	100 yr	5yr	2yr
A =	51.5	31.1	23.6
B =	-0.699	-0.699	-0.699

$I = A*t^B$ Yarnell Formula

Area 101 (PreDev-Existing Flows)

A =	0.0869	Ha	
C =	0.36		
T =	15	min	
T =	0.25	hr	
$I_{(100yr)}$ =	135.72	mm/hr	(From Central Elgin Draft Design Guidelines 2021)
$I_{(5yr)}$ =	81.96	mm/hr	(From Central Elgin Draft Design Guidelines 2021)
$I_{(2yr)}$ =	62.19	mm/hr	(From Central Elgin Draft Design Guidelines 2021)
$Qp_{(100yr)}$ =	11.83	l/s	
$Qp_{(5yr)}$ =	7.14	l/s	
$Qp_{(2yr)}$ =	5.42	l/s	

IBI GROUP

Stormwater Management
Rational Method
Municipality of Central Elgin IDF requirements

Project: 384 George St
Location: Port Stanley, ON
Date: October 13/22
Job No. 136299

Design Criteria

Area 201
Calculate Total Storage needed
to restrict 100 yr flows to 2 year storm predev levels

Area =	0.093	hectares
Predevelopment C =	0.36	
IDF Curve =	100	year
Predevelopment Tc =	15.00	minutes
I =	134.67	mm/hr
Outflow Restriction =	0.005	cms (2 year predev flow)
Post Development C =	0.57	

Calculation of Critical Storage Volume

Rainfall Duration (min)	Rainfall Intensity (mm/hr)	Peak Runoff (m^3/s)	Storm Runoff (m^3)	Release Flow (m^3)	Required Storage (m^3)	
5	292.52	0.04	13	2	11	
10	180.19	0.03	16	3	13	
15	135.72	0.02	18	5	13	*
20	111.00	0.02	20	7	13	
30	83.60	0.01	22	10	12	
40	68.37	0.01	24	13	11	
50	58.50	0.01	26	16	9	
60	51.50	0.01	27	20	8	
70	46.24	0.01	28	23	6	
80	42.12	0.01	30	26	4	
90	38.79	0.01	31	29	1	
100	36.04	0.01	32	33	-1	
110	33.71	0.00	33	36	-3	
120	31.72	0.00	33	39	-6	

Required On Site Storage = 13 m^3
for the 100 Yr Storm

384 George Street
Port Stanley, ON
October 18/22
136299

PreDevelopment Flow Calculations

Rainfall Intensity Parameters (From Central Elgin Draft Design Guidelines 2021)

	100 yr	5yr	2yr
A =	51.5	31.1	23.6
B =	-0.699	-0.699	-0.699

$I = A*t^B$ Yarnell Formula

Area 102 (PreDev-Existing Flows)

A =	0.0929	Ha	
C =	0.54		
T =	15	min	
T =	0.25	hr	
$I_{(100yr)}$ =	135.72	mm/hr	(From Central Elgin Draft Design Guidelines 2021)
$I_{(5yr)}$ =	81.96	mm/hr	(From Central Elgin Draft Design Guidelines 2021)
$I_{(2yr)}$ =	62.19	mm/hr	(From Central Elgin Draft Design Guidelines 2021)
$Qp_{(100yr)}$ =	18.97	l/s	
$Qp_{(5yr)}$ =	11.45	l/s	
$Qp_{(2yr)}$ =	8.69	l/s	

Design Criteria

Area 202

Calculate Total Storage needed

to restrict 100 yr flows to 2 year storm predev levels

Area =	0.093	hectares
Predevelopment C =	0.54	
IDF Curve =	100	year
Predevelopment Tc =	15.00	minutes
I =	134.67	mm/hr
Outflow Restriction =	0.009	cms (2 year predev flow)
Post Development C =	0.57	

Calculation of Critical Storage Volume

Rainfall Duration (min)	Rainfall Intensity (mm/hr)	Peak Runoff (m^3/s)	Storm Runoff (m^3)	Release Flow (m^3)	Required Storage (m^3)	
5	292.52	0.04	13	3	10	
10	180.19	0.03	16	5	11	*
15	135.72	0.02	18	8	10	
20	111.00	0.02	20	10	9	
30	83.60	0.01	22	16	6	
40	68.37	0.01	24	21	3	
50	58.50	0.01	26	26	0	
60	51.50	0.01	27	31	-4	
70	46.24	0.01	28	37	-8	
80	42.12	0.01	30	42	-12	
90	38.79	0.01	31	47	-16	
100	36.04	0.01	32	52	-20	
110	33.71	0.00	33	57	-25	
120	31.72	0.00	33	63	-29	

Required On Site Storage = 11 m^3

for the 100 Yr Storm

384 George Street
Port Stanley, ON
October 18/22
136299

PreDevelopment Flow Calculations

Rainfall Intensity Parameters (From Central Elgin Draft Design Guidelines 2021)

	100 yr	5yr	2yr
A =	51.5	31.1	23.6
B =	-0.699	-0.699	-0.699

$I = A*t^B$ Yarnell Formula

Area 103 (PreDev-Existing Flows)

A =	0.1856	Ha	
C =	0.35		
T =	15	min	
T =	0.25	hr	
$I_{(100yr)}$ =	135.72	mm/hr	(From Central Elgin Draft Design Guidelines 2021)
$I_{(5yr)}$ =	81.96	mm/hr	(From Central Elgin Draft Design Guidelines 2021)
$I_{(2yr)}$ =	62.19	mm/hr	(From Central Elgin Draft Design Guidelines 2021)
$Qp_{(100yr)}$ =	24.69	l/s	
$Qp_{(5yr)}$ =	14.91	l/s	
$Qp_{(2yr)}$ =	11.32	l/s	

384 George Street
Port Stanley, ON
October 18/22
136299

Post Development Flow Calculations

Rainfall Intensity Parameters (From Central Elgin Draft Design Guidelines 2021)

	100 yr	5yr	2yr
A =	51.5	31.1	23.6
B =	-0.699	-0.699	-0.699

$I = A*t^B$ Yarnell Formula

Area 203 (PostDev-Proposed Flows)

A =	0.164	Ha	
C =	0.39		
T =	15	min	
T =	0.25	hr	
$I_{(100yr)}$ =	135.72	mm/hr	(From Central Elgin Draft Design Guidelines 2021)
$I_{(5yr)}$ =	81.96	mm/hr	(From Central Elgin Draft Design Guidelines 2021)
$I_{(2yr)}$ =	62.19	mm/hr	(From Central Elgin Draft Design Guidelines 2021)
$Qp_{(100yr)}$ =	24.05	l/s	
$Qp_{(5yr)}$ =	14.53	l/s	
$Qp_{(2yr)}$ =	11.02	l/s	

Project: 384 George St
Location: Port Stanley, ON
Date: October 13/22
Job No. 136299

Orifice Calculation

Location	Orifice Size (mm)	Orifice Area A (m2)	K	h (m)	Qr (cms)	Required Qr (predev 2 yr flow) (cms)
CB Area 201	50	0.002	0.6	1.09	0.005	0.005

Orifice Invert = 178.50 m
Max Ponding Elev = 179.61 m
Therefore use a 50mm dia orifice.

Storage Volume Drainage Area 201

Volume Required	13	m^3

CB3 stage storage

Elevation (m)	Area (m^2)	Average End Volume (m^3)	Total Average End Storage (m^3)
179.30	0.36		
179.35	1.89	0.06	0.06
179.40	6.02	0.20	0.25
179.45	12.60	0.47	0.72
179.50	21.20	0.85	1.56
179.55	31.61	1.32	2.88
179.60	43.05	1.87	4.75

Rock Trench

Width	1	m
Height	1	m
Length	25	m
Void Ratio	0.4	
Rock Trench Volume	10	m^3
Total Volume Provided	14.75	m^3

Project: 384 George St
Location: Port Stanley, ON
Date: October 13/22
Job No. 136299

Orifice Calculation

Location	Orifice Size (mm)	Orifice Area A (m2)	K	h (m)	Qr (cms)	Required Qr (predev 2 yr flow) (cms)
CB Area 202	75	0.004	0.6	0.63	0.009	0.009

Orifice Invert = 178.68 m
Max Ponding Elev = 179.35 m

Therefore use a 60mm dia orifice.

Storage Volume for Drainage Area 202

Volume Required	11	m^3

CB4 stage storage

Elevation (m)	Area (m^2)	Average End Volume (m^3)	Total Average End Storage (m^3)
179.05	0.36		
179.10	2.30	0.07	0.07
179.15	7.44	0.24	0.31
179.20	15.83	0.58	0.89
179.25	21.20	0.93	1.82
179.30	43.39	1.61	3.43
179.35	64.70	2.70	6.13

Rock Trench

Width	1	m
Height	0.5	m
Length	25	m
Void Ratio	0.4	
Rock Trench Volume	5	m^3
Total Volume Provided	11.13	m^3