TATHAM ENGINEERING

Enhancing our communities

Victoria Annex

STORMWATER MANAGEMENT REPORT

Georgian Communities

File 120174 | April 7, 2021

Document Control

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Date:

April 7, 2021

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Issue	Date	Description
1	November 19, 2020	Final Report
2	April 7, 2021	Revision 1

Document Contents

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Drawings

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1 Introduction

Tatham Engineering Limited has been retained by Georgian Communities to prepare a Stormwater Management Report in support of the Victoria Annex Residential Development in the Town of Collingwood. This Stormwater Management (SWM) report provides a summary of existing and proposed drainage conditions for the subject property and confirms the stormwater management design meets current standards and guidelines and best efforts as they relate to existing conditions and constraints. Mitigative strategies for siltation and erosion control for the development will also be addressed.

This report was prepared recognizing provincial and municipal guidelines on water resources and the environment, including the following publications:

- The Ministry of Environment, Conservation and Parks (MECP) *Stormwater Management Planning and Design Manual (March 2003)*
- The Nottawasaga Valley Conservation Authority (NVCA) *Stormwater Technical Guide (December 2013)*
- The Nottawasaga Valley Conservation Authority (NVCA) *Technical Design Guidelines, Standard, and Policies for Siltation and Erosion Control (July 2003)*
- The Ministry of Transportation Ontario (MTO) *Drainage Manual (1994)*
- *Town of Collingwood Development Standards (July 2007)*

2 Development Site

2.1 SITE LOCATION

The subject site is located at 400 Maple Street in the Town of Collingwood and is bounded by Fifth Street to the north, Sixth Street to the south, Maple Street to the east and existing residential properties to the west. The legal description of the property is (Part 1) Lots 10, 11 and 12 on Registered Plan 45 located in the Town of Collingwood, County of Simcoe.

A site location map has been provided as Figure 1.

2.2 EXISTING CONDITIONS

2.2.1 Development Site

The subject site houses the former Victoria Public School, which has been vacant since 2001, and has a total site area of approximately 0.60 ha. The abandoned school building is located in the middle of the site along the west property line and is approximately 235 m^2 in size. There are gravel areas located to the north and south of the building, and both are approximately 2,320 m^2 in size. There is also a grass area located east of the school with a size of approximately 1,065 m^2 in size. The entire site is surrounded by a chain link fence. A topographic survey for the site and adjacent streets was completed by Tatham in June 2005.

2.2.2 Subsurface Conditions

Terraprobe Inc. completed test pits for the property in January 2005 and May 2015. Soils found were fine sand and grey silt ranging in depths of 1.2 to 2.0 metres respectively. Heavy clay and shale were discovered below depths of 2.5 metres and bedrock elevations were expected to be encountered at approximately 3 metres. However, ground water elevations, which were approximately 1.5 metres below grade, caused the test pits to collapse. Brick debris, concrete blocks and fill from a previously demolished school building was also found within the property.

Terraprobe completed an additional investigation in October 2020, which included 9 boreholes and groundwater monitoring. Results from this investigation were similar to the previous findings namely:

- 6 boreholes were comprised of sand at depths ranging from 0.05 to 2.6 metres;
- 3 boreholes were comprised of fill at depths ranging from 0.05 to 2.3 metres;
- all boreholes contained sandy silt below the sand or fill layers at depths of 2.3 to 4.7 metres;

- auger refusal was encountered between 1.6 to 4.7 metres indicating presence of boulders, bedrock or debris;
- groundwater elevations were determined to be a minimum of 1.2 metres below the surface while some boreholes were dry at auger refusal; and
- groundwater elevations are established at approximately ±184.00 while bedrock elevations are estimated between 180.30 and 182.50.

2.3 PROPOSED DEVELOPMENT

The proposed development will consist of a total of 19 residential units as follows:

- 4 detached residential units fronting the surrounding streets (1 to Fifth Street, 2 to Maple Street and 1 to Sixth Street);
- 10 semi-detached residential units fronting the surrounding streets (2 to Fifth Street, 6 to Maple Street and 2 to Sixth Street);
- 5 condominium units.

Of the 4 detached units, 2 will have detached garages and 2 will have attached garages. The building and garage areas will be approximately 130 m² and 40 m² respectively in size. All of the semi-detached units will have attached garages. The combined building and garage area of these units is approximately 160 m². As noted, all of the detached and semi-detached units will front directly onto the boundary roads.

The existing 235 m² two-storey school building will be converted into 2 dwelling units. accompanied by a 72 m² carport immediately adjacent to the east. A second 165 m² condominium building, referred to as the Coach House, will be constructed southeast of the Annex and will contain surface level parking for the 3 dwelling units above. Each of the dwelling units in the Coach House will be approximately 850 m² in size each.

The development will be serviced with municipal water and sanitary sewer connections as well as hydro, gas, cable and telephone.

A preliminary site plan is provided in Drawing SP-1.

3 Pre-Development Drainage Conditions

The pre-development drainage conditions are shown on the Pre-Development Drainage Plan, Drawing DP-1.

3.1 EXISTING DRAINAGE SYSTEM

Currently, the on-site grading divides the minor stormwater runoff events towards 3 drainage areas which discharge into 2 different outlets as detailed below. Drainage Area E1 (0.12 ha) is located in the northwest corner of the property and has a runoff coefficient of 0.39.

- Drainage Area E2 (0.17 ha) is located in the northeast corner of the property and has a runoff coefficient of 0.51 (runoff coefficients were determined based on MTO Drainage Manual).
- Drainage Area E3 has a runoff coefficient of 0.44 and drains towards a catch basin which is connected to an existing storm sewer on Sixth Street. The Sixth Street storm sewer discharges westerly to the Oak Street storm drain.
- Outlet 1 collects runoff from the north 0.29 ha of the site and consists of Drainage Areas E1 and E2.
- Outlet 2 collects runoff from the south 0.31 ha of the site and consists of Drainage Area E3.
- Stormwater runoff from E1 and E2 is collected in catch basins which are connected directly to an existing sanitary maintenance hole located in the middle of the property adjacent to the eastern property line and discharge to the sanitary sewer on Maple Street.

3.2 RUNOFF COEFFICIENTS

The composition for each pre-development drainage area and composite runoff coefficients are shown in Table 1.

Table 1: Pre-Development Composite Runoff Coefficients

AREA	SIZE (HA)	GRASSED AREA (HA) C = 0.25	GRAVEL AREA (HA) C = 0.80	IMPERVIOUS AREA (HA) C = 0.90	COMPOSITE RUNOFF COEFFICIENT
E1	0.12	0.091	0.007	0.020	0.39
E2	0.17	0.088	0.078	0.001	0.51
E3	0.31	0.211	0.085	0.019	0.44

3.3 PEAK FLOWS

The existing catch basins located on-site are not maintained and are full of debris. During a previous storm event, limited stormwater flow was observed in the sanitary maintenance hole from Drainage Areas E1 and E2. It is assumed the existing storm sewer connected to the sanitary maintenance hole is damaged and a portion of the runoff infiltrates into the sub-grade before it enters the sanitary sewer. Regardless, the existing storm sewer should be disconnected from the sanitary sewer as soon as possible in order to eliminate further storm runoff from entering the sanitary system.

The pre-development peak flow rates were calculated using the Rational Method; calculations are included in Appendix A with the results summarized in Table 2 by catchment area and Table 3 by outlet. It is noted that the blockage of sewers and infiltration of the stormwater runoff into the subgrade was not considered when completing the pre-development runoff rates.

Table 2: Pre-Development Runoff Rates by Catchment

AREA	PRE-DEVELOPMENT PEAK FLOWS (m^3/s)					
	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
E1*	0.010	0.013	0.015	0.018	0.020	0.022
E2*	0.018	0.024	0.028	0.033	0.036	0.040
E3	0.030	0.040	0.046	0.054	0.060	0.066
Total	**0.059**	**0.077**	**0.089**	**0.104**	**0.115**	**0.127**

*Drainage areas connected to the existing sanitary sewer on Maple Street

Table 3: Pre-Development Runoff Rates by Outlet

OUTLET	PRE-DEVELOPMENT PEAK FLOWS (m^3/s)					
	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Maple Street	0.000	0.000	0.000	0.000	0.000	0.000
Fifth Street	0.000	0.000	0.000	0.000	0.000	0.000
Sixth Street	0.030	0.040	0.046	0.054	0.060	0.066
Sanitary Sewer	0.029	0.037	0.043	0.050	0.056	0.061
Total	**0.059**	**0.077**	**0.089**	**0.104**	**0.115**	**0.127**

Runoff from the property during major storms currently spill onto and are conveyed along the respective streets adjacent to the property which ultimately outlet to Georgian Bay. Fifth Street and Maple Street are approximately 7 metre wide paved residential roads without curb and gutter. Catch basins are located at the intersection of Fifth Street and Maple Street; however, grading along Fifth Street and Maple Street is relatively flat and runoff collects in low-lying areas along the boulevards. Sixth Street is a 9 metre wide paved collector road consisting of curb and gutter and storm sewer.

4 Post-Development Drainage Conditions

The post-development drainage conditions are shown on the Post-Development Drainage Plan and the Storm Sewer Design Plan, Drawings DP-2 and STM-1.

4.1 PROPOSED DRAINAGE SYSTEM

As described in Chapter 3 Pre-Development Drainage Conditions, the north half of the property is connected directly to the sanitary sewer on Maple Street while the remaining south half is connected to the existing storm sewer on Sixth Street. A storm sewer was installed along Fifth Street in 2015 in support of this development property. All of the existing storm sewers surrounding the subject property are shallow have less cover than Town standards specify.

Therefore, given the site constraints and available outlets, the proposed drainage design re-directs stormwater runoff as follows:

- The majority of the Drainage Area P3 (0.28 ha) will be collected in a series of catch basins connected to the existing storm sewer on Sixth Street.
- The remaining portion of the internal development Drainage Area P3 (0.06 ha) will be collected in a series of catch basins connected to the existing storm sewer on Fifth Street.
- The external Drainage Areas P1, P2 and P4, consist of roofs and driveways and will drain overland as sheet flow across the yards/sidewalks/boulevards and discharge onto the respective streets, similar to the adjacent free hold residential properties throughout the immediate area.

Fill will be placed at moderate depths between 0.0 and 0.5 metres to provide adequate drainage throughout the site. Due to the shallow Seasonal High Ground Water Elevations (SHGWE), the proposed external dwelling units will have crawl spaces in order to maintain the necessary 0.5 metre separation between the SHGWE and the underside of the basement slab. The proposed Coach House will be a slab-on-grade design. Existing contours and proposed drainage patterns are shown on Drawing SG-1.

Runoff along Fifth Street will continue to drain west towards Beech Street while runoff along Maple Street will continue to drain north to the existing storm system at the intersection of Fifth Street and Maple Street. The existing storm sewer connected to the sanitary sewer on Maple Street will be disconnected.

4.2 RUNOFF COEFFICIENTS

Drainage Area P1 (0.12 ha) is located in the northwest corner of the property and has a runoff coefficient of 0.65. Drainage Area P2 (0.10 ha) is located in the northeast corner of the property and has a runoff coefficient of 0.62. Drainage Area P3 (0.28 ha) is located in the middle of the property and has an overall runoff coefficient of 0.60. Runoff from Drainage Area P3 is collected in the internal storm sewer system and includes Internal Drainage Areas 101-102 and 201-205. Drainage Area P4 (0.11 ha) is located along the southern property line and has a runoff coefficient of 0.65. The composition for each post-development drainage area and composite runoff coefficients are shown in Table 4.

Table 4: Post-Development Composite Runoff Coefficients

AREA	SIZE (HA)	GRASSED AREA (HA) C = 0.25	IMPERVIOUS AREA (HA) C = 0.90	COMPOSITE RUNOFF COEFFICIENT
P1	0.12	0.043	0.073	0.66
P2	0.10	0.039	0.057	0.64
P3	0.28	0.120	0.159	0.62
P4	0.11	0.047	0.063	0.62

4.3 PEAK FLOWS

Drainage Areas P1 and P2 will drain overland as sheet flow onto Fifth Street and Maple Street, respectively. The sidewalks and boulevards along Fifth Street and Maple Street will be raised to provide positive drainage away from the proposed buildings to their respective streets. Concrete curb and gutter will be installed along the development side of Maple Street in order to improve overland flow routes to the existing storm sewers located at the intersection of Fifth Street and Maple Street. The existing asphalt gutter on Maple Street will be maintained to convey flows to the storm sewer system and will be reinstated on the development side where disturbed to install services and driveways. Similar to Drainage Areas P1 and P2, Drainage Area P4 will drain overland as sheet flow across the existing sidewalk and boulevard along Sixth Street similar to the adjacent residents surrounding the development.

Internal catch basins and storm sewers will collect the internal site runoff for Drainage Area P3 and discharge directly to the storm sewer systems on the adjacent streets. Drainage Areas 101 and 102 will discharge to Fifth Street while Drainage areas 201-205 will discharge to Sixth Street.

Extending storm sewers from the adjacent streets along Maple Street to the condominium road was considered; however, the existing storm sewers range in depths from 0.15 to 0.90 metres

below the existing asphalt. These depths are too shallow to extend the sewer and would result in conflicts with existing infrastructure as well as on-going maintenance issues due to freeze/thaw conditions. Therefore, side yard easements are proposed adjacent to Unit 2B for the Fifth Street outlet and adjacent to Unit 9B for the Sixth Street outlet. This approach will maximize cover over the storm sewer pipes while still allowing the necessary surface drainage for minor storm events.

The post-development peak runoff rates were calculated using the Rational Method and are included in Appendix B. A summary of the results are presented in Table 5 by drainage area and Table 6 by outlet.

Table 5: Post-Development Runoff Rates by Catchment

AREA LABEL	POST-DEVELOPMENT PEAK FLOWS (m^3/s)					
	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
P1	0.017	0.022	0.025	0.029	0.032	0.036
P2	0.013	0.017	0.020	0.024	0.026	0.029
P3	0.038	0.049	0.057	0.067	0.074	0.081
P4	0.015	0.019	0.022	0.026	0.029	0.032
Total	**0.082**	**0.107**	**0.124**	**0.146**	**0.161**	**0.178**

Table 6: Post-Development Runoff Rates by Outlet

OUTLET	POST-DEVELOPMENT PEAK FLOWS (m^3/s)					
	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Maple Street	0.013	0.017	0.020	0.024	0.026	0.029
Fifth Street	0.023	0.029	0.034	0.040	0.044	0.049
Sixth Street	0.046	0.061	0.070	0.082	0.091	0.100
Sanitary Sewer	0.000	0.000	0.000	0.000	0.000	0.000
Total	**0.082**	**0.107**	**0.124**	**0.146**	**0.161**	**0.178**

Post-Development runoff directed to Maple Street has increased from pre-development conditions as a consequence of removing runoff directed to the sanitary sewer system. As depicted on Drawing DP-2, efforts have been taken to minimize the size of catchment P2 and thus minimize sheet flows to Maple Street. A "best efforts" strategy has been employed for the Fifth Street and Sixth Street outlets to minimize post-development flow rates. Quantity control in the form of 75 mm diameter orifices will be installed on both outlets. Storm pipes have also been upsized from the required 250 mm diameter to 300 mm diameter to maximize the storage in the system while achieving sufficient cover over storm sewer pipes.

These quantity controls allow post-development flow rates to be less than or equal to pre-development flow rates for the Sixth Street outlet for the 2 year and 5 year design storms. Storage volume requirements for the Sixth Street outlet were calculated from the Modified Rational Method as shown in Appendix C. Table 7 presents the storage in the Sixth Street outlet and the orifice discharge for varying water levels. Note the first structure (CB404) is surcharged at a water level of 185.00 metres. Orifice discharge calculations are shown in Appendix D.

Table 7: Storage Volume & Orifice Discharge for Sixth Street

WATER LEVEL (m)	STORAGE VOLUME (m3)	ORIFICE DISCHARGE (m^3/s)
184.00	0.0	0.000
184.10	0.1	0.004
184.20	1.2	0.006
184.30	3.8	0.008
184.40	6.6	0.009
184.50	8.2	0.011
184.60	9.2	0.012
184.70	9.6	0.013
184.80	9.9	0.014
184.90	10.2	0.015
185.00	10.5	0.015
185.10	**10.7**	**0.016**

In order to provide control during the 2 year storm event, 14 m3 of storage is required. In order to provide control for the 5 year storm event, 20 m3 is required.

The drainage areas directed towards Fifth Street and Maple Street (P1 and P2, respectively) are considered small in size relative to the overall catchment area and are not expected to adversely impact the existing downstream storm sewer system. Storm sewer sizing calculations for Drainage Area P3 (101-102 and 201-205) are provided in Appendix B.

Major post development stormwater runoff events from the property will drain overland along the proposed internal access road and spill onto Maple Street then continue to be conveyed along the respective streets adjacent to the property which ultimately outlet to Georgian Bay.

4.4 STORMWATER QUALITY

Lawn areas and landscaping along internal flow routes will promote infiltration and sediment removal prior to discharging into the municipal street and storm sewer system. Drainage Area P3 will be collected in the internal storm sewer system. Drainage Areas 101-102 collect runoff from landscaped and roof areas while Drainage Areas 201-205 collect runoff from landscaped, roof and paved areas. Runoff from grassed areas and roofs is considered clean. However, runoff from paved areas including the access road require treatment prior to being discharged off-site. Therefore, runoff from Drainage Areas 201-205 will pass through a Stormceptor prior to entering the existing storm sewer system on Sixth Street to provide quality control to the effluent. The Stormceptor was sized using the PCSWMM Sizing Tool provided by the Stormceptor manufacturer, Imbrium Systems. The results of the sizing tool are presented in Appendix E along with a detail of the specified Stormceptor (EF04). The Stormceptor along with the landscaped areas will provide enhanced (Level 1) protection as outlined by MECP guidelines.

5 Siltation & Erosion Control

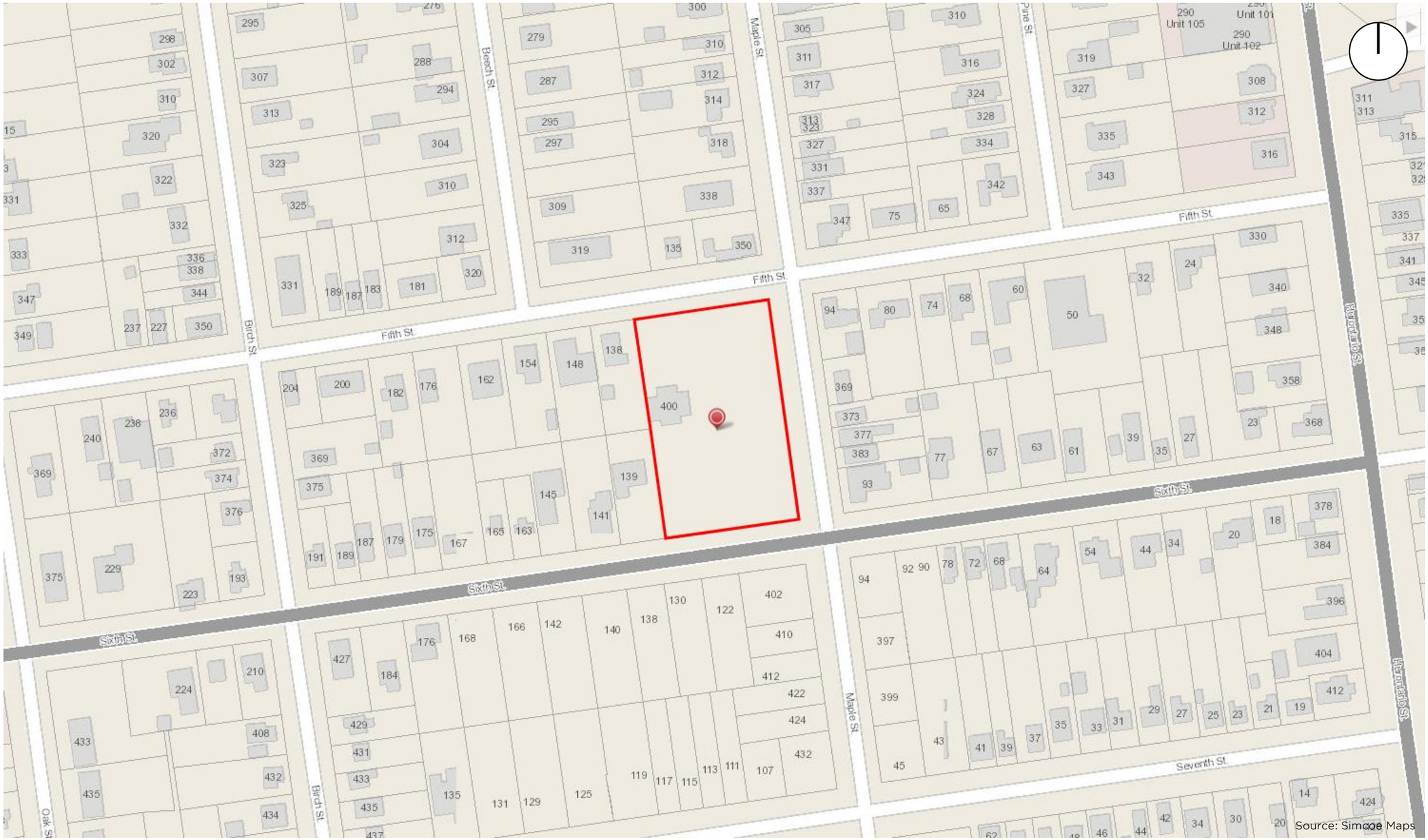
Siltation and erosion control measures will be implemented for all construction activities occurring at the site including topsoil stripping, material stockpiling, road construction, grading operations and house construction. In order to minimize environmental impacts, the following erosion and sediment control measures will be enforced before, during and after construction:

- disturbance activities will be minimized where possible;
- silt fence will be installed before construction to control movement and deposition of sediment;
- construction vehicle access will be limited and entrances will be constructed with stone mud mats to minimize off-site tracking of material; and
- a re-vegetation strategy for landscaped areas will be implemented immediately after construction is completed.

Erosion and sediment control measures will be implemented before the outset of construction activities and will be inspected every two weeks or after storm events greater than 25 mm. Repairs to the control measures will be made as necessary and additional control measures will be provided as required. Drawing EC-1 outlines the proposed siltation and erosion control strategy for the site.

6 Summary

The proposed stormwater management plan presented in this report confirms that the proposed development can proceed while not adversely impacting the drainage surrounding the site. The elimination of the surface runoff into the sanitary sewer will reduce the overall amount of stormwater infiltration to the sewage treatment plant. Raising the grades and constructing curbs along the development side of Maple Street will improve the poor drainage conditions in the area. Stormwater will be conveyed through a Stormceptor EF04 prior to entering the Sixth Street storm sewer in order to provide enhance (Level 1) stormwater quality. Appropriate siltation and erosion control measures will be implemented to ensure minimal sediment transfer from the development occurs.



VICTORIA ANNEX

Figure 1: Site Location - Map

SITE STATISTICS

ZONE	R3-38
USE	CONDO/SUBDIVISION
MUNICIPAL ADDRESS	400 MAPLE STREET, COLLINGWOOD
PARKING PROVIDED	2 PER UNIT PLUS 1 ACCESSIBLE

SUBJECT LANDS

PROPERTY AREA	6011 m²
PROPOSED UNITS	19
MAXIMUM DENSITY	19 UNITS

SINGLE DETACHED – 4 LOTS
GFA 379.8 m² (4,087.9 ft²) MINIMUM

SEMI DETACHED – 10 UNITS
GFA 350.1 m² (3,768.4 ft²) MINIMUM

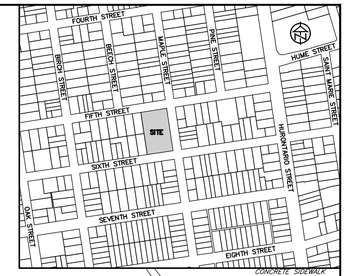
TOWNHOME – 3 UNITS (COACH HOUSE)
ABOVE 6 PARKING SPACES

VICTORIA ANNEX SEMI DETACHED – 2 UNITS

NOTES

1. LEGAL SURVEY COMPLETED BY J.D. BARNES DATED NOVEMBER 11, 2020.

PROVISION	SINGLES 'R3' REQUIRED	SINGLES PROPOSED	SEMIS 'R3' REQUIRED	SEMIS PROPOSED	GROUP/CLUSTER 'R3' REQUIRED	GROUP/CLUSTER 'R3' PROPOSED
NUMBER OF UNITS		4		10		5
LOT AREA (MIN)	325 m²	381.0 m²	275 m²	263.1 m²	NIL	1842.2 m²
LOT FRONTAGE	10.0 m	13.9 m	9.0 m	9.6 m	NIL	13.9 m
FRONT YARD	4.5 m	4.5 m	4.5 m	4.5 m	6.0 m	42.6 m
EXTERIOR SIDE YARD	4.5 m	4.5 m	4.5 m	N/A	6.0 m	N/A
INTERIOR SIDE YARD	1.2 m	1.2 m	1.2 m & 0.0	1.2 m & 0.0	6.0 m	4.39–2.5 m
REAR YARD	7.5 m	7.2 m	7.5 m	7.2 m	7.5 m	0.02 m
HEIGHT (MAX)	12.0 m	12.0 m	12.0 m	12.0 m	12.0 m	TO BE VERIFIED
COVERAGE (MAX)	45%	43.8%	40%	45.9%	N/A	27.4%
LANDSCAPED AREA (MIN)	35%	48.2%	35%	43.5%	40%	39.6%
PARKING SPACES	2/UNIT	2/UNIT	2/UNIT	2/UNIT	2/UNIT	2/UNIT
ACCESSIBLE PARKING					1	1
GARAGE ACCESSORY BUILDINGS						
INTERIOR SIDE YARD	1.0 m	1.8 m			1.0 m	1.2 m
REAR YARD	1.0 m	1.9 m			1.0 m	19.9 m
SETBACK TO BLDGS	2.0 m	3.0 m			2.0 m	3.1 m
COVERAGE (MAX)	15%	5.3%			15%	3.9%
GROUND AREA (MAX)	75 m²	20.4 m²			200 m²	72.0 m²
HEIGHT (MAX)	7.0 m	4.8 m			7.0 m	7.0 m



KEY PLAN
NTS

MAPLE STREET

FIFTH STREET

SIXTH STREET

UNIT 3 (THE NEWPORT) FFE=187.20 USS=184.50 USF=184.35
UNIT 4B (THE CARMICHAEL) FFE=187.20 USS=184.50 USF=184.35
UNIT 4A (THE CARMICHAEL) FFE=187.20 USS=184.50 USF=184.35
UNIT 5A (THE CARMICHAEL) FFE=187.20 USS=184.50 USF=184.35
UNIT 5B (THE CARMICHAEL) FFE=187.20 USS=184.50 USF=184.35
UNIT 6A (THE MAPLE) FFE=187.20 USS=184.50 USF=184.35
UNIT 6B (THE MAPLE) FFE=187.20 USS=184.50 USF=184.35
UNIT 7 (THE MADELINE) FFE=187.20 USS=184.50 USF=184.35
GARAGE (UNIT 3)
GARAGE (UNIT 7)
UNIT 2B (THE MAPLE) FFE=187.20 USS=184.50 USF=184.35
UNIT 2A (THE MAPLE) FFE=187.20 USS=184.50 USF=184.35
UNIT 1 (THE BROOKE) FFE=187.20 USS=184.50 USF=184.35
UNIT A (THE ALPINE)
UNIT B (THE BARRINGTON)
GARAGE
UNIT E (THE ELIOTT)
UNIT D (THE DAVIS)
UNIT C (THE CLARKSON)
UNIT 8A (THE MAPLE) FFE=187.20 USS=184.50 USF=184.35
UNIT 8B (THE MAPLE) FFE=187.20 USS=184.50 USF=184.35
UNIT 9 (THE BROOKE) FFE=187.20 USS=184.50 USF=184.35
BRICK ENTRANCE PILLARS (SEE LANDSCAPE DRAWINGS)
ASPHALT
BOLLARDS
CONCRETE TRANSFORMER PAD (SEE ELECTRICAL DRAWINGS)
COMMUNITY MAILBOX (BY CANADA POST)
WASTE DISPOSAL (SEE LANDSCAPE DRAWINGS)
STAMPED CONCRETE (SEE LANDSCAPE DRAWINGS)
AMENITY SPACE (SEE LANDSCAPE DRAWINGS)
3.0m STORM SEWER EASEMENT
1.5 m CONC. S/W
1.5 m CONC. SIDEWALK
HEDGE

TBM2 – ELEVATION 185.79
NAIL AND WASHER IN NORTH FACE OF HYDRO POLE LOCATED ON SOUTH SIDE OF SIXTH STREET APPROXIMATELY 40 m WEST OF INTERSECTION OF SIXTH STREET AND MAPLE STREET.

TOWN APPROVAL

BENCHMARKS

TBM1 – ELEVATION 181.18
#01084957 RIB WITH BRONZE CAP AT SOUTHEAST CORNER OF HIGH AND SIXTH STREET ON GRASS BOULEVARD APPROXIMATELY 0.30 m SOUTH OF SOUTH EDGE OF CURB.

TBM2 – ELEVATION 185.79
NAIL AND WASHER IN NORTH FACE OF HYDRO POLE LOCATED ON SOUTH SIDE OF SIXTH STREET APPROXIMATELY 40 m WEST OF INTERSECTION OF SIXTH STREET AND MAPLE STREET.

NOTES

ALL DIMENSIONS, ELEVATIONS AND SIZES ARE IN METRIC UNITS UNLESS INDICATED. PIPE SIZES ARE IN MILLIMETRES UNLESS OTHERWISE INDICATED. ELEVATIONS ARE IN METRES UNLESS INDICATED.

No.	REVISION DESCRIPTION	DATE
1.	FIRST SUBMISSION TO TOWN	NOV 2020
2.	SECOND SUBMISSION TO TOWN	APR 2021

ENGINEER STAMP

LICENSED PROFESSIONAL ENGINEER K. R. SANSOM Apr 19/21 PROVINCE OF ONTARIO

VICTORIA ANNEX
GEORGIAN COMMUNITIES
TOWN OF COLLINGWOOD

SITE PLAN

TATHAM ENGINEERING

DESIGN: KRS/MJF	FILE: 120174	DWG:	
DRAWN: MJF	DATE: SEP 2020	**SP-1**	
CHECK: KRS	SCALE: 1:200	Sheet No. 5 of 9	

Drawing Name: 120174-SP01.dwg, Plotted: Apr 09, 2021

LEGEND

PRE-DEVELOPMENT CATCHMENT BOUNDARY

A – CATCHMENT IDENTIFICATION NUMBER

B – CATCHMENT (AREA IN HECTARES)

C – RUNOFF COEFFICIENT

EXISTING MINOR OVERLAND FLOW DIRECTION

EXISTING MAJOR OVERLAND FLOW DIRECTION

MAPLE STREET

FIFTH STREET

SIXTH STREET

E1 0.12 | 0.39

E2 0.17 | 0.51

E3 0.31 | 0.44

EXISTING BUILDING (VICTORIA SCHOOL ANNEX)

EXISTING BUILDING (139 SIXTH STREET)

EX. BUILDING (138 FIFTH STREET)

EXISTING 50Ø WATER SERVICE (APPROXIMATE LOCATION)

TOWN APPROVAL

DISCLAIMER AND COPYRIGHT

CONTRACTOR MUST VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME. ANY DISCREPANCIES MUST BE REPORTED TO THE ENGINEER BEFORE COMMENCING WORK. DRAWINGS ARE NOT TO BE SCALED.

BENCHMARKS

TBM1 – ELEVATION 181.18
#010840957 RIB WITH BRONZE CAP AT SOUTHEAST CORNER OF HIGH AND SIXTH STREET ON GRASS BOULEVARD APPROXIMATELY 0.30 m SOUTH OF SOUTH EDGE OF CURB.

TBM2 – ELEVATION 185.79
NAIL AND WASHER IN NORTH FACE OF HYDRO POLE LOCATED ON SOUTH SIDE OF SIXTH STREET APPROXIMATELY 40 m WEST OF INTERSECTION OF SIXTH STREET AND MAPLE STREET.

NOTES

ALL DIMENSIONS, ELEVATIONS AND SIZES ARE IN METRIC UNITS UNLESS INDICATED. PIPE SIZES ARE IN MILLIMETRES UNLESS OTHERWISE INDICATED. ELEVATIONS ARE IN METRES UNLESS INDICATED.

No.	REVISION DESCRIPTION	DATE
1.	FIRST SUBMISSION TO TOWN	NOV 2020
2.	SECOND SUBMISSION TO TOWN	APR 2021

ENGINEER STAMP

LICENSED PROFESSIONAL ENGINEER
K. R. SANSOM
Apr 19/21
PROVINCE OF ONTARIO

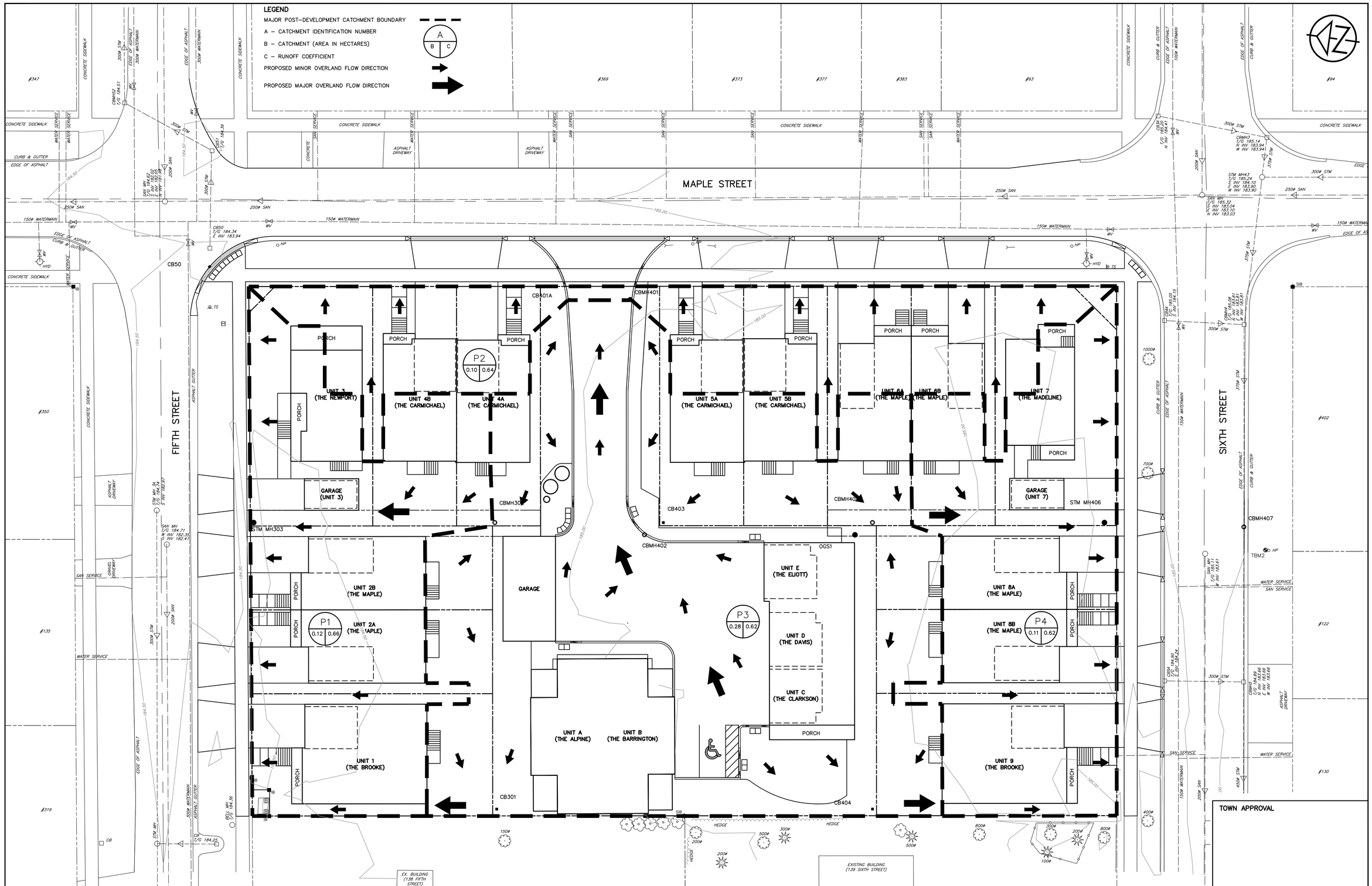
VICTORIA ANNEX
GEORGIAN COMMUNITIES
TOWN OF COLLINGWOOD

PRE-DEVELOPMENT DRAINAGE PLAN

TATHAM ENGINEERING

DESIGN: KRS/MJF	FILE: 120174	DWG: DP-1
DRAWN: MJF	DATE: SEP 2020	
CHECK: KRS	SCALE: 1:200	

Drawing Name: 120174-DP01.dwg, Plotted: Apr 09, 2021



DISCLAIMER AND COPYRIGHT

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BENCHMARKS

TBM1 – ELEVATION 181.18
#010840957 RIB WITH BRONZE CAP AT SOUTHEAST CORNER OF HIGH AND SIXTH STREET ON GRASS BOULEVARD APPROXIMATELY 0.30 m SOUTH OF SOUTH EDGE OF CURB.

TBM2 – ELEVATION 185.79
NAIL AND WASHER IN NORTH FACE OF HYDRO POLE LOCATED ON SOUTH SIDE OF SIXTH STREET APPROXIMATELY 40 m WEST OF INTERSECTION OF SIXTH STREET AND MAPLE STREET.

NOTES

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No.	REVISION DESCRIPTION	DATE
1.	FIRST SUBMISSION TO TOWN	NOV 2020
2.	SECOND SUBMISSION TO TOWN	APR 2021

ENGINEER STAMP

LICENSED PROFESSIONAL ENGINEER
K. R. SANSOM
Apr 19/21
PROVINCE OF ONTARIO

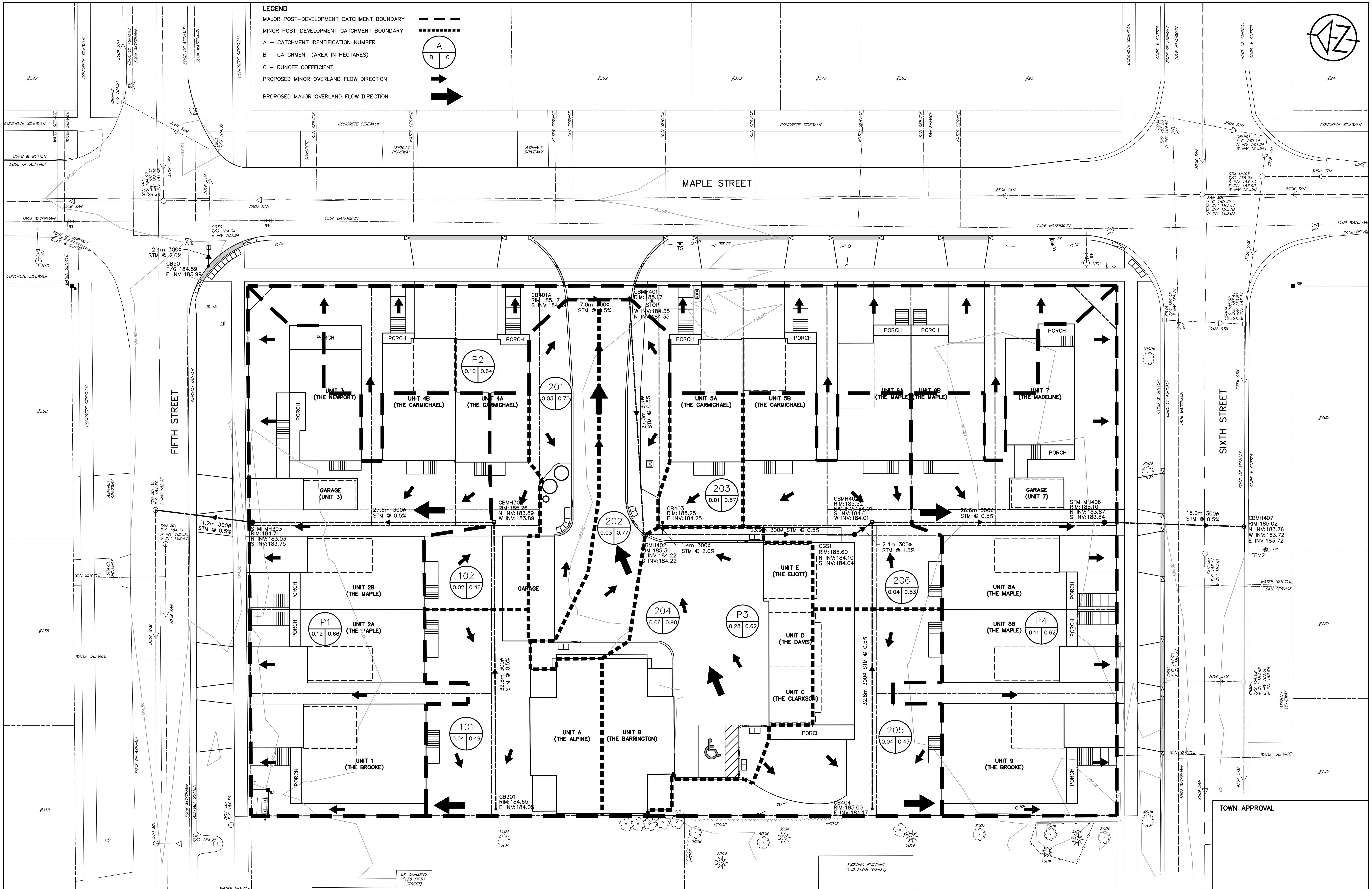
VICTORIA ANNEX
GEORGIAN COMMUNITIES
TOWN OF COLLINGWOOD

TATHAM ENGINEERING

POST–DEVELOPMENT DRAINAGE PLAN

DESIGN: KRS/MJF	FILE: 120174	DWG:	DP-2
DRAWN: MJF	DATE: SEP 2020		
CHECK: KRS	SCALE: 1:200		

Drawing Name: 120174–DP02.dwg, Plotted: Apr 09, 2021



DISCLAIMER AND COPYRIGHT

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BENCHMARKS

TBM1 – ELEVATION 181.18
#010840957 RIB WITH BRONZE CAP AT SOUTHEAST CORNER OF HIGH AND SIXTH STREET ON GRASS BOULEVARD APPROXIMATELY 0.30 m SOUTH OF SOUTH EDGE OF CURB.

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NOTES

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No.	REVISION DESCRIPTION	DATE
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2.	SECOND SUBMISSION TO TOWN	APR 2021

ENGINEER STAMP

LICENSED PROFESSIONAL ENGINEER
K. R. SANSOM
Apr 19/21
PROVINCE OF ONTARIO

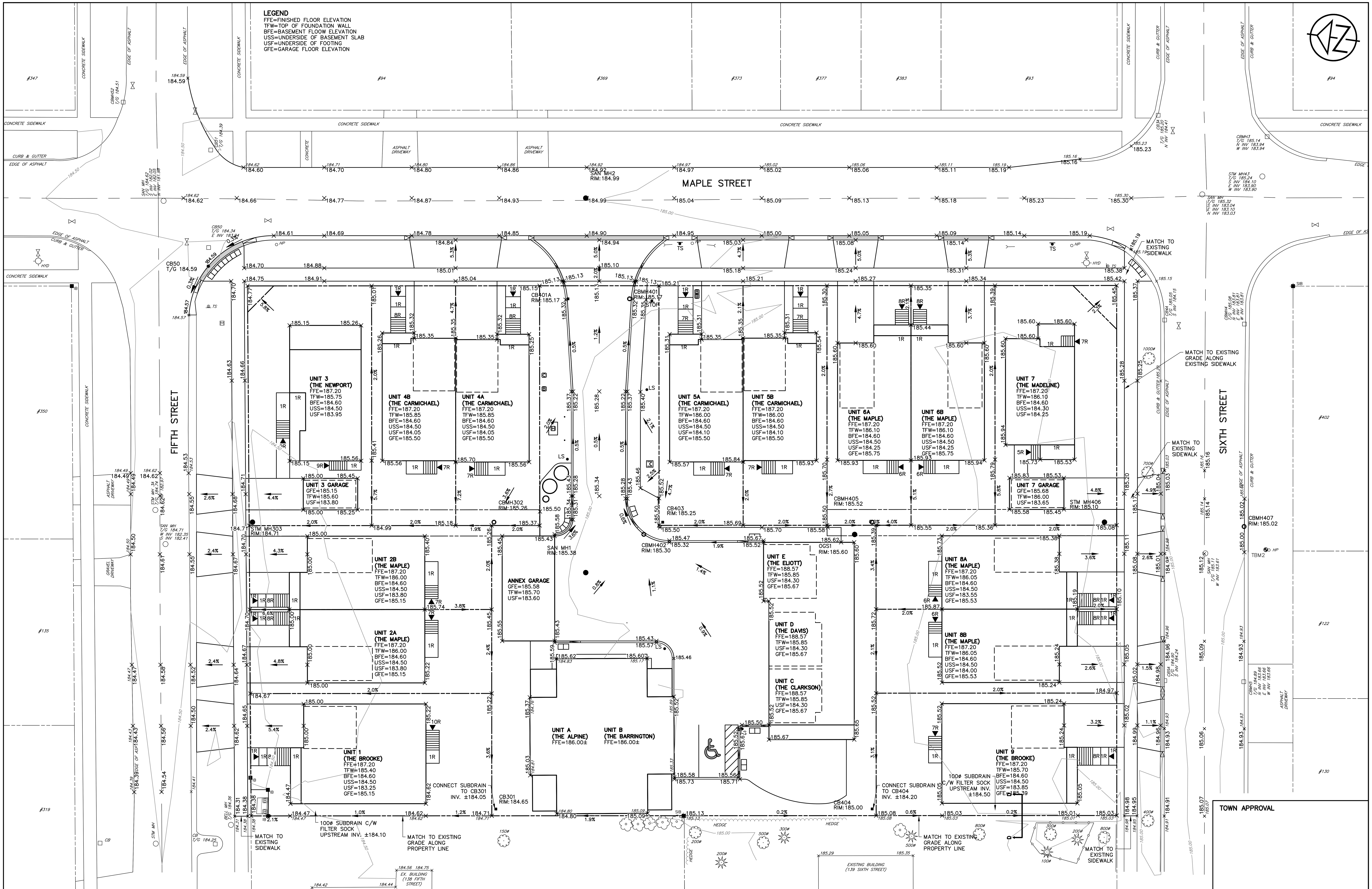
VICTORIA ANNEX
GEORGIAN COMMUNITIES
TOWN OF COLLINGWOOD

STORM SEWER
CATCHMENT PLAN

TATHAM ENGINEERING

DESIGN: KRS/MJF	FILE: 120174	DWG:	
DRAWN: MJF	DATE: SEP 2020	STM-1	
CHECK: KRS	SCALE: 1:200		

Drawing Name: 120174-STM01.dwg, Plotted: Apr 09, 2021



DISCLAIMER AND COPYRIGHT	BENCHMARKS	NOTES
CONTRACTOR MUST VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME. ANY DISCREPANCIES MUST BE REPORTED TO THE ENGINEER BEFORE COMMENCING WORK. DRAWINGS ARE NOT TO BE SCALED. TATHAM ENGINEERING LIMITED CLAIMS COPYRIGHT TO THIS DRAWING WHICH MAY NOT BE USED FOR ANY PURPOSE OTHER THAN THAT PROVIDED IN THE CONTRACT BETWEEN THE OWNER/CLIENT AND THE ENGINEER WITHOUT THE EXPRESS CONSENT OF TATHAM ENGINEERING LIMITED.	TBM1 – ELEVATION 181.18 #010840957 RIB WITH BRONZE CAP AT SOUTHEAST CORNER OF HIGH AND SIXTH STREET ON GRASS BOULEVARD APPROXIMATELY 0.30 m SOUTH OF SOUTH EDGE OF CURB. TBM2 – ELEVATION 185.79 NAIL AND WASHER IN NORTH FACE OF HYDRO POLE LOCATED ON SOUTH SIDE OF SIXTH STREET APPROXIMATELY 40 m WEST OF INTERSECTION OF SIXTH STREET AND MAPLE STREET.	ALL DIMENSIONS, ELEVATIONS AND SIZES ARE IN METRIC UNITS UNLESS INDICATED. PIPE SIZES ARE IN MILLIMETRES UNLESS OTHERWISE INDICATED. ELEVATIONS ARE IN METRES UNLESS INDICATED.

No.	REVISION DESCRIPTION	DATE
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2.	SECOND SUBMISSION TO TOWN	APR 2021

ENGINEER STAMP

LICENSED PROFESSIONAL ENGINEER
K. R. SANSOM
Apr19/21
PROVINCE OF ONTARIO

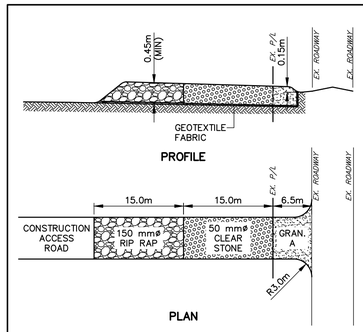
VICTORIA ANNEX
GEORGIAN COMMUNITIES
TOWN OF COLLINGWOOD

SITE GRADING PLAN

TATHAM ENGINEERING

DESIGN: KRS/MJF	FILE: 120174	DWG: SG-1
DRAWN: MJF	DATE: SEP 2020	
CHECK: KRS	SCALE: 1:200	Sheet No. 7 of 9

Drawing Name: 120174–SG01.dwg, Plotted: Apr 09, 2021



STONE SIZE – THE STONE PAD SHALL BE A MIN. 450 mm THICK. USE GRANULAR A FOR THE FIRST 6.5 m FROM THE ENTRANCE/EXIT, 50 mm ø CLEAR STONE FOR NEXT 15 m AND 150 mm ø RIP RAP FOR THE REMAINING 15 m.

LENGTH – AS REQUIRED BUT NOT LESS THAN 36.5 m.

WIDTH – 7 m MIN. BUT NOT LESS THAN THE WIDTH AT POINTS WHERE INGRESS AND EGRESS OCCURS.

GEOTEXTILE FABRIC – TERRAFIX 270R OR APPROVED EQUAL TO BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING STONE.

SURFACE WATER – ALL SURFACE WATER FLOWING OR DIRECTED TOWARD CONSTRUCTION ENTRANCES SHALL BE DIRECTED ACROSS THE ACCESS THROUGH A TEMPORARY CULVERT.

MAINTENANCE – THE CONTRACTOR SHALL MAINTAIN THE ENTRANCE IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO THE PUBLIC RIGHT–OF–WAY. THIS MAY REQUIRE PERIODIC DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO THE PUBLIC RIGHT–OF–WAY MUST BE REMOVED IMMEDIATELY BY THE CONTRACTOR. UPON OBSERVATION OF CONTINUOUS MUD TRACKING ONTO ADJACENT STREETS, THE STONE MAT IS TO BE FULLY REPLACED.

WASHING – WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO THE PUBLIC RIGHT–OF–WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.

INSPECTION & MAINTENANCE – REQUIRED MAINTENANCE AFTER EACH RAIN EVENT SHALL BE PROVIDED BY THE CONTRACTOR.

STONE MUD MAT TO BE REMOVED UPON COMPLETION ALL SITE SERVICING WORKS AND WHEN APPROVED BY THE ENGINEER. SEE LANDSCAPE PLANS FOR RESTORATION DETAILS.

STONE MUD MAT DETAIL
NTS

LEGEND

HEAVY DUTY SILT FENCE

SBCD STRAW BALE CHECK DAM

MAPLE STREET

FIFTH STREET

SIXTH STREET

INSTALL CATCH BASIN SEDIMENT TRAP (REQUIRED BEFORE AND AFTER RELOCATION)

INSTALL CATCH BASIN SEDIMENT TRAP

INSTALL CATCH BASIN SEDIMENT TRAPS

TEMPORARY STONE MUD MAT (SEE DETAIL)

EXISTING BUILDING (VICTORIA SCHOOL ANNEX)

EXISTING BUILDING (139 SIXTH STREET)

EX. BUILDING (136 FIFTH STREET)

EXISTING 50ø WATER SERVICE (APPROXIMATE LOCATION)

TBM1 – ELEVATION 181.18
#010840957 RIB WITH BRONZE CAP AT SOUTHEAST CORNER OF HIGH AND SIXTH STREET ON GRASS BOULEVARD APPROXIMATELY 0.30 m SOUTH OF SOUTH EDGE OF CURB.

TBM2 – ELEVATION 185.79
NAIL AND WASHER IN NORTH FACE OF HYDRO POLE LOCATED ON SOUTH SIDE OF SIXTH STREET APPROXIMATELY 40 m WEST OF INTERSECTION OF SIXTH STREET AND MAPLE STREET.

TOWN APPROVAL

DISCLAIMER AND COPYRIGHT

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BENCHMARKS

TBM1 – ELEVATION 181.18
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No.	REVISION DESCRIPTION	DATE
1.	FIRST SUBMISSION TO TOWN	NOV 2020
2.	SECOND SUBMISSION TO TOWN	APR 2021

ENGINEER STAMP

LICENSED PROFESSIONAL ENGINEER K. R. SANSOM Apr 19/21 PROVINCE OF ONTARIO

VICTORIA ANNEX
GEORGIAN COMMUNITIES
TOWN OF COLLINGWOOD

SILTATION AND EROSION CONTROL PLAN

TATHAM ENGINEERING

DESIGN: KRS/MJF	FILE: 120174	DWG:	EC-1
DRAWN: MJF	DATE: SEP 2020		
CHECK: KRS	SCALE: 1:200	Sheet No.	3 of 9

Drawing Name: 120174–EC01.dwg, Plotted: Apr 09, 2021

Appendix A: Pre-Development Runoff Calculations

TATHAM ENGINEERING

Storm Sewer Design Sheet

Project Information

400 Maple Street	120174

Drawing Reference

120174-DP01	November 12-20

Prepared By

MJF	November 12-20

Reviewed By

KRS	November 13-20

Engineer's Stamp

Municipality

Town of Collingwood

Design Storm

2 year

Time of Concentation

10 mins

IDF Curve Coefficients

Year	2
A	807.44
B	6.75
C	0.83

Manning's Coefficient

Pipe	Value
CSP	0.024
Conc.	0.013
PVC	0.013

STREET NAME	AREA LABEL / ID	UPSTREAM MANHOLE	DOWNSTREAM MANHOLE	TRIBUTARY AREA (ha)	RUNOFF COEFFICIENT	AREA × RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA × RUNOFF COEFFICIENT	TIME OF CONCENTRATION (min.)	RAINFALL INTENSITY (mm/hr)	PEAK FLOW (m^3/s)	MANNING'S ROUGHNESS COEFFICIENT	PIPE LENGTH (m)	SLOPE (%)	ACTUAL PIPE DIAMETER (mm)	FULL FLOW VELOCITY (m/s)	FULL FLOW CAPACITY (m^3/s)	ACTUAL VELOCITY (m/s)	TRAVEL TIME (min.)	CALCULATED PIPE DIAMETER (mm)	PERCENT OF FULL FLOW (%)	TOTAL TIME OF TRAVEL (min.)
	E1			0.12	0.39	0.05	0.12	0.05	10.00	78.28	0.010											
	E2			0.17	0.51	0.09	0.17	0.09	10.00	78.28	0.018											
	E3			0.31	0.44	0.14	0.31	0.14	10.00	78.28	0.030											

TATHAM ENGINEERING

Storm Sewer Design Sheet

Project Information

400 Maple Street	120174

Drawing Reference

120174-DP01	November 12-20

Prepared By

MJF	November 12-20

Reviewed By

KRS	November 13-20

Engineer's Stamp

Municipality

Town of Collingwood

Design Storm

5 year

Time of Concentation

10 mins

IDF Curve Coefficients

Year	5
A	1135.40
B	7.50
C	0.84

Manning's Coefficient

Pipe	Value
CSP	0.024
Conc.	0.013
PVC	0.013

STREET NAME	AREA LABEL / ID	UPSTREAM MANHOLE	DOWNSTREAM MANHOLE	TRIBUTARY AREA (ha)	RUNOFF COEFFICIENT	AREA × RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA × RUNOFF COEFFICIENT	TIME OF CONCENTRATION (min.)	RAINFALL INTENSITY (mm/hr)	PEAK FLOW (m^3/s)	MANNING'S ROUGHNESS COEFFICIENT	PIPE LENGTH (m)	SLOPE (%)	ACTUAL PIPE DIAMETER (mm)	FULL FLOW VELOCITY (m/s)	FULL FLOW CAPACITY (m^3/s)	ACTUAL VELOCITY (m/s)	TRAVEL TIME (min.)	CALCULATED PIPE DIAMETER (mm)	PERCENT OF FULL FLOW (%)	TOTAL TIME OF TRAVEL (min.)
	E1			0.12	0.39	0.05	0.12	0.05	10.00	102.27	0.013											
	E2			0.17	0.51	0.09	0.17	0.09	10.00	102.27	0.024											
	E3			0.31	0.44	0.14	0.31	0.14	10.00	102.27	0.040											

TATHAM ENGINEERING

Storm Sewer Design Sheet

Project Information

400 Maple Street	120174

Drawing Reference

120174-DP01	November 12-20

Prepared By

MJF	November 12-20

Reviewed By

KRS	November 13-20

Engineer's Stamp

Municipality

Town of Collingwood

Design Storm

10 year

Time of Concentation

10 mins

IDF Curve Coefficients

Year	10
A	1387.00
B	7.97
C	0.85

Manning's Coefficient

Pipe	Value
CSP	0.024
Conc.	0.013
PVC	0.013

STREET NAME	AREA LABEL / ID	UPSTREAM MANHOLE	DOWNSTREAM MANHOLE	TRIBUTARY AREA (ha)	RUNOFF COEFFICIENT	AREA × RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA × RUNOFF COEFFICIENT	TIME OF CONCENTRATION (min.)	RAINFALL INTENSITY (mm/hr)	PEAK FLOW (m^3/s)	MANNING'S ROUGHNESS COEFFICIENT	PIPE LENGTH (m)	SLOPE (%)	ACTUAL PIPE DIAMETER (mm)	FULL FLOW VELOCITY (m/s)	FULL FLOW CAPACITY (m^3/s)	ACTUAL VELOCITY (m/s)	TRAVEL TIME (min.)	CALCULATED PIPE DIAMETER (mm)	PERCENT OF FULL FLOW (%)	TOTAL TIME OF TRAVEL (min.)
	E1			0.12	0.39	0.05	0.12	0.05	10.00	118.36	0.015											
	E2			0.17	0.51	0.09	0.17	0.09	10.00	118.36	0.028											
	E3			0.31	0.44	0.14	0.31	0.14	10.00	118.36	0.046											

TATHAM ENGINEERING

Storm Sewer Design Sheet

Project Information

400 Maple Street	120174

Drawing Reference

120174-DP01	November 12-20

Prepared By

MJF	November 12-20

Reviewed By

KRS	November 13-20

Engineer's Stamp

Municipality

Town of Collingwood

Design Storm

25 year

Time of Concentation

10 mins

IDF Curve Coefficients

Year	25
A	1676.20
B	8.30
C	0.86

Manning's Coefficient

Pipe	Value
CSP	0.024
Conc.	0.013
PVC	0.013

STREET NAME	AREA LABEL / ID	UPSTREAM MANHOLE	DOWNSTREAM MANHOLE	TRIBUTARY AREA (ha)	RUNOFF COEFFICIENT	AREA × RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA × RUNOFF COEFFICIENT	TIME OF CONCENTRATION (min.)	RAINFALL INTENSITY (mm/hr)	PEAK FLOW (m^3/s)	MANNING'S ROUGHNESS COEFFICIENT	PIPE LENGTH (m)	SLOPE (%)	ACTUAL PIPE DIAMETER (mm)	FULL FLOW VELOCITY (m/s)	FULL FLOW CAPACITY (m^3/s)	ACTUAL VELOCITY (m/s)	TRAVEL TIME (min.)	CALCULATED PIPE DIAMETER (mm)	PERCENT OF FULL FLOW (%)	TOTAL TIME OF TRAVEL (min.)
	E1			0.12	0.39	0.05	0.12	0.05	10.00	138.40	0.018											
	E2			0.17	0.51	0.09	0.17	0.09	10.00	138.40	0.033											
	E3			0.31	0.44	0.14	0.31	0.14	10.00	138.40	0.054											

TATHAM ENGINEERING

Storm Sewer Design Sheet

Project Information

400 Maple Street	120174

Drawing Reference

120174-DP01	November 12-20

Prepared By

MJF	November 12-20

Reviewed By

KRS	November 13-20

Engineer's Stamp

Municipality

Town of Collingwood

Design Storm

50 year

Time of Concentation

10 mins

IDF Curve Coefficients

Year	50
A	1973.10
B	9.00
C	0.87

Manning's Coefficient

Pipe	Value
CSP	0.024
Conc.	0.013
PVC	0.013

STREET NAME	AREA LABEL / ID	UPSTREAM MANHOLE	DOWNSTREAM MANHOLE	TRIBUTARY AREA (ha)	RUNOFF COEFFICIENT	AREA × RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA × RUNOFF COEFFICIENT	TIME OF CONCENTRATION (min.)	RAINFALL INTENSITY (mm/hr)	PEAK FLOW (m^3/s)	MANNING'S ROUGHNESS COEFFICIENT	PIPE LENGTH (m)	SLOPE (%)	ACTUAL PIPE DIAMETER (mm)	FULL FLOW VELOCITY (m/s)	FULL FLOW CAPACITY (m^3/s)	ACTUAL VELOCITY (m/s)	TRAVEL TIME (min.)	CALCULATED PIPE DIAMETER (mm)	PERCENT OF FULL FLOW (%)	TOTAL TIME OF TRAVEL (min.)
	E1			0.12	0.39	0.05	0.12	0.05	10.00	153.18	0.020											
	E2			0.17	0.51	0.09	0.17	0.09	10.00	153.18	0.036											
	E3			0.31	0.44	0.14	0.31	0.14	10.00	153.18	0.060											

TATHAM ENGINEERING

Storm Sewer Design Sheet

Project Information

400 Maple Street	120174

Drawing Reference

120174-DP01	November 12-20

Prepared By

MJF	November 12-20

Reviewed By

KRS	November 13-20

Engineer's Stamp

Municipality

Town of Collingwood

Design Storm

100 year

Time of Concentation

10 mins

IDF Curve Coefficients

Year	100
A	2193.10
B	9.04
C	0.87

Manning's Coefficient

Pipe	Value
CSP	0.024
Conc.	0.013
PVC	0.013

STREET NAME	AREA LABEL / ID	UPSTREAM MANHOLE	DOWNSTREAM MANHOLE	TRIBUTARY AREA (ha)	RUNOFF COEFFICIENT	AREA × RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA × RUNOFF COEFFICIENT	TIME OF CONCENTRATION (min.)	RAINFALL INTENSITY (mm/hr)	PEAK FLOW (m^3/s)	MANNING'S ROUGHNESS COEFFICIENT	PIPE LENGTH (m)	SLOPE (%)	ACTUAL PIPE DIAMETER (mm)	FULL FLOW VELOCITY (m/s)	FULL FLOW CAPACITY (m^3/s)	ACTUAL VELOCITY (m/s)	TRAVEL TIME (min.)	CALCULATED PIPE DIAMETER (mm)	PERCENT OF FULL FLOW (%)	TOTAL TIME OF TRAVEL (min.)
	E1			0.12	0.39	0.05	0.12	0.05	10.00	168.45	0.022											
	E2			0.17	0.51	0.09	0.17	0.09	10.00	168.45	0.040											
	E3			0.31	0.44	0.14	0.31	0.14	10.00	168.45	0.066											

Appendix B: Post-Development Runoff Calculations

TATHAM ENGINEERING

Storm Sewer Design Sheet

Project Information

Victoria Annex	120174

Drawing Reference

120174-DP02	April 06-21

Prepared By

MJF	April 06-21

Reviewed By

KRS	April 07-21

Engineer's Stamp

Municipality

Town of Collingwood

Design Storm

2 year

Time of Concentation

10 mins

IDF Curve Coefficients

Year	2
A	807.44
B	6.75
C	0.83

Manning's Coefficient

Pipe	Value
CSP	0.024
Conc.	0.013
PVC	0.013

STREET NAME	AREA LABEL / ID	UPSTREAM MANHOLE	DOWNSTREAM MANHOLE	TRIBUTARY AREA (ha)	RUNOFF COEFFICIENT	AREA × RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA × RUNOFF COEFFICIENT	TIME OF CONCENTRATION (min.)	RAINFALL INTENSITY (mm/hr)	PEAK FLOW (m^3/s)	MANNING'S ROUGHNESS COEFFICIENT	PIPE LENGTH (m)	SLOPE (%)	ACTUAL PIPE DIAMETER (mm)	FULL FLOW VELOCITY (m/s)	FULL FLOW CAPACITY (m^3/s)	ACTUAL VELOCITY (m/s)	TRAVEL TIME (min.)	CALCULATED PIPE DIAMETER (mm)	PERCENT OF FULL FLOW (%)	TOTAL TIME OF TRAVEL (min.)
Fifth Street	P1			0.116	0.66	0.076	0.116	0.076	10.000	78.276	0.017											
Maple Street	P2			0.096	0.64	0.061	0.096	0.061	10.000	78.276	0.013											
	P3			0.280	0.62	0.174	0.280	0.174	10.000	78.276	0.038											
Sixth Street	P4			0.109	0.62	0.068	0.109	0.068	10.000	78.276	0.015											
Fifth Street	101	CB301	CBMH302	0.041	0.49	0.020	0.041	0.020	10.000	78.276	0.004	0.013	32.8	0.5%	250	0.86	0.042	0.52	1.05	107	10.4%	11.05
Fifth Street	102	CBMH302	STM MH303	0.019	0.46	0.009	0.060	0.029	11.047	74.443	0.006	0.013	27.6	0.5%	250	0.86	0.042	0.57	0.81	120	14.2%	11.86
Sixth Street	201	CB401A	CBMH401	0.026	0.70	0.018	0.026	0.018	10.000	78.276	0.004	0.013	7.0	0.5%	250	0.86	0.042	0.51	0.23	103	9.4%	10.23
Sixth Street	202	CBMH401	CBMH402	0.031	0.77	0.024	0.057	0.042	10.229	77.399	0.009	0.013	27.0	0.5%	250	0.86	0.042	0.64	0.71	140	21.5%	10.94
Sixth Street	203	CB403	CBMH402	0.014	0.57	0.008	0.014	0.008	10.000	78.276	0.002	0.013	1.4	2.0%	250	1.71	0.084	0.68	0.03	58	2.1%	10.03
Sixth Street	204	CBMH402	OGS1	0.062	0.90	0.056	0.133	0.106	10.938	74.824	0.022	0.013	23.9	0.5%	250	0.86	0.042	0.81	0.49	196	52.3%	11.43
Sixth Street	205	CB404	CBMH405	0.044	0.47	0.021	0.044	0.021	10.000	78.276	0.004	0.013	32.8	0.5%	250	0.86	0.042	0.53	1.04	108	10.7%	11.04
Sixth Street	-	OGS1	CBMH405	0.000	0.00	0.000	0.133	0.106	11.431	73.140	0.022	0.013	2.4	1.3%	250	1.38	0.068	1.14	0.03	162	31.7%	11.47
Sixth Street	206	CBMH405	CBMH406	0.042	0.53	0.022	0.219	0.149	11.466	73.023	0.030	0.013	26.6	0.5%	250	0.86	0.042	0.86	0.52	221	71.8%	11.98
Sixth Street	-	CBMH406	CBMH407	0.000	0.00	0.000	0.219	0.149	11.983	71.349	0.029	0.013	16.0	0.5%	250	0.86	0.042	0.86	0.31	219	70.1%	12.29

TATHAM ENGINEERING

Storm Sewer Design Sheet

Project Information

Victoria Annex	120174

Drawing Reference

120174-DP02	April 06-21

Prepared By

MJF	April 06-21

Reviewed By

KRS	April 07-21

Engineer's Stamp

Municipality

Town of Collingwood

Design Storm

5 year

Time of Concentation

10 mins

IDF Curve Coefficients

Year	5
A	1135.40
B	7.50
C	0.84

Manning's Coefficient

Pipe	Value
CSP	0.024
Conc.	0.013
PVC	0.013

STREET NAME	AREA LABEL / ID	UPSTREAM MANHOLE	DOWNSTREAM MANHOLE	TRIBUTARY AREA (ha)	RUNOFF COEFFICIENT	AREA × RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA × RUNOFF COEFFICIENT	TIME OF CONCENTRATION (min.)	RAINFALL INTENSITY (mm/hr)	PEAK FLOW (m^3/s)	MANNING'S ROUGHNESS COEFFICIENT	PIPE LENGTH (m)	SLOPE (%)	ACTUAL PIPE DIAMETER (mm)	FULL FLOW VELOCITY (m/s)	FULL FLOW CAPACITY (m^3/s)	ACTUAL VELOCITY (m/s)	TRAVEL TIME (min.)	CALCULATED PIPE DIAMETER (mm)	PERCENT OF FULL FLOW (%)	TOTAL TIME OF TRAVEL (min.)
Fifth Street	P1			0.116	0.66	0.076	0.116	0.076	10.000	102.271	0.022											
Maple Street	P2			0.096	0.64	0.061	0.096	0.061	10.000	102.271	0.017											
	P3			0.280	0.62	0.174	0.280	0.174	10.000	102.271	0.049											
Sixth Street	P4			0.109	0.62	0.068	0.109	0.068	10.000	102.271	0.019											
Fifth Street	101	CB301	CBMH302	0.041	0.49	0.020	0.041	0.020	10.000	102.271	0.006	0.013	32.8	0.5%	250	0.86	0.042	0.56	0.97	118	13.6%	10.97
Fifth Street	102	CBMH302	STM MH303	0.019	0.46	0.009	0.060	0.029	10.974	97.717	0.008	0.013	27.6	0.5%	250	0.86	0.042	0.61	0.75	133	18.6%	11.73
Sixth Street	201	CB401A	CBMH401	0.026	0.70	0.018	0.026	0.018	10.000	102.271	0.005	0.013	7.0	0.5%	250	0.86	0.042	0.55	0.21	114	12.3%	10.21
Sixth Street	202	CBMH401	CBMH402	0.031	0.77	0.024	0.057	0.042	10.214	101.234	0.012	0.013	27.0	0.5%	250	0.86	0.042	0.68	0.66	155	28.1%	10.87
Sixth Street	203	CB403	CBMH402	0.014	0.57	0.008	0.014	0.008	10.000	102.271	0.002	0.013	1.4	2.0%	250	1.71	0.084	0.73	0.03	64	2.7%	10.03
Sixth Street	204	CBMH402	OGS1	0.062	0.90	0.056	0.133	0.106	10.872	98.173	0.029	0.013	23.9	0.5%	250	0.86	0.042	0.86	0.46	217	68.6%	11.34
Sixth Street	205	CB404	CBMH405	0.044	0.47	0.021	0.044	0.021	10.000	102.271	0.006	0.013	32.8	0.5%	250	0.86	0.042	0.57	0.97	119	14.0%	10.97
Sixth Street	-	OGS1	CBMH405	0.000	0.00	0.000	0.133	0.106	11.337	96.131	0.028	0.013	2.4	1.3%	250	1.38	0.068	1.23	0.03	180	41.7%	11.37
Sixth Street	206	CBMH405	CBMH406	0.042	0.53	0.022	0.219	0.149	11.370	95.991	0.040	0.013	26.6	0.5%	250	0.86	0.042	0.86	0.52	245	94.3%	11.89
Sixth Street	-	CBMH406	CBMH407	0.000	0.00	0.000	0.219	0.149	11.887	93.832	0.039	0.013	16.0	0.5%	250	0.86	0.042	0.86	0.31	242	92.2%	12.20

TATHAM ENGINEERING

Storm Sewer Design Sheet

Project Information

Victoria Annex	120174

Drawing Reference

120174-DP02	April 06-21

Prepared By

MJF	April 06-21

Reviewed By

KRS	April 07-21

Engineer's Stamp

Municipality

Town of Collingwood

Design Storm

10 year

Time of Concentation

10 mins

IDF Curve Coefficients

Year	10
A	1387.00
B	7.97
C	0.85

Manning's Coefficient

Pipe	Value
CSP	0.024
Conc.	0.013
PVC	0.013

STREET NAME	AREA LABEL / ID	UPSTREAM MANHOLE	DOWNSTREAM MANHOLE	TRIBUTARY AREA (ha)	RUNOFF COEFFICIENT	AREA × RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA × RUNOFF COEFFICIENT	TIME OF CONCENTRATION (min.)	RAINFALL INTENSITY (mm/hr)	PEAK FLOW (m^3/s)	MANNING'S ROUGHNESS COEFFICIENT	PIPE LENGTH (m)	SLOPE (%)	ACTUAL PIPE DIAMETER (mm)	FULL FLOW VELOCITY (m/s)	FULL FLOW CAPACITY (m^3/s)	ACTUAL VELOCITY (m/s)	TRAVEL TIME (min.)	CALCULATED PIPE DIAMETER (mm)	PERCENT OF FULL FLOW (%)	TOTAL TIME OF TRAVEL (min.)
Fifth Street	P1			0.116	0.66	0.076	0.116	0.076	10.000	118.359	0.025											
Maple Street	P2			0.096	0.64	0.061	0.096	0.061	10.000	118.359	0.020											
	P3			0.280	0.62	0.174	0.280	0.174	10.000	118.359	0.057											
Sixth Street	P4			0.109	0.62	0.068	0.109	0.068	10.000	118.359	0.022											
Fifth Street	101	CB301	CBMH302	0.041	0.49	0.020	0.041	0.020	10.000	118.359	0.007	0.013	32.8	0.5%	250	0.86	0.042	0.58	0.94	125	15.7%	10.94
Fifth Street	102	CBMH302	STM MH303	0.019	0.46	0.009	0.060	0.029	10.936	113.346	0.009	0.013	27.6	0.5%	250	0.86	0.042	0.64	0.72	141	21.6%	11.66
Sixth Street	201	CB401A	CBMH401	0.026	0.70	0.018	0.026	0.018	10.000	118.359	0.006	0.013	7.0	0.5%	250	0.86	0.042	0.57	0.21	120	14.2%	10.21
Sixth Street	202	CBMH401	CBMH402	0.031	0.77	0.024	0.057	0.042	10.205	117.219	0.014	0.013	27.0	0.5%	250	0.86	0.042	0.71	0.63	164	32.6%	10.84
Sixth Street	203	CB403	CBMH402	0.014	0.57	0.008	0.014	0.008	10.000	118.359	0.003	0.013	1.4	2.0%	250	1.71	0.084	0.76	0.03	68	3.1%	10.03
Sixth Street	204	CBMH402	OGS1	0.062	0.90	0.056	0.133	0.106	10.838	113.849	0.033	0.013	23.9	0.5%	250	0.86	0.042	0.86	0.46	229	79.6%	11.30
Sixth Street	205	CB404	CBMH405	0.044	0.47	0.021	0.044	0.021	10.000	118.359	0.007	0.013	32.8	0.5%	250	0.86	0.042	0.59	0.93	126	16.2%	10.93
Sixth Street	-	OGS1	CBMH405	0.000	0.00	0.000	0.133	0.106	11.303	111.505	0.033	0.013	2.4	1.3%	250	1.38	0.068	1.28	0.03	190	48.4%	11.33
Sixth Street	206	CBMH405	CBMH406	0.042	0.53	0.022	0.219	0.149	11.335	111.351	0.046	0.013	26.6	0.5%	300	0.97	0.068	0.97	0.46	259	67.3%	11.79
Sixth Street	-	CBMH406	CBMH407	0.000	0.00	0.000	0.219	0.149	11.793	109.147	0.045	0.013	16.0	0.5%	300	0.97	0.068	0.97	0.28	257	66.0%	12.07

TATHAM ENGINEERING

Storm Sewer Design Sheet

Project Information

Victoria Annex	120174

Drawing Reference

120174-DP02	April 06-21

Prepared By

MJF	April 06-21

Reviewed By

KRS	April 07-21

Engineer's Stamp

Municipality

Town of Collingwood

Design Storm

25 year

Time of Concentation

10 mins

IDF Curve Coefficients

Year	25
A	1676.20
B	8.30
C	0.86

Manning's Coefficient

Pipe	Value
CSP	0.024
Conc.	0.013
PVC	0.013

STREET NAME	AREA LABEL / ID	UPSTREAM MANHOLE	DOWNSTREAM MANHOLE	TRIBUTARY AREA (ha)	RUNOFF COEFFICIENT	AREA × RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA × RUNOFF COEFFICIENT	TIME OF CONCENTRATION (min.)	RAINFALL INTENSITY (mm/hr)	PEAK FLOW (m^3/s)	MANNING'S ROUGHNESS COEFFICIENT	PIPE LENGTH (m)	SLOPE (%)	ACTUAL PIPE DIAMETER (mm)	FULL FLOW VELOCITY (m/s)	FULL FLOW CAPACITY (m^3/s)	ACTUAL VELOCITY (m/s)	TRAVEL TIME (min.)	CALCULATED PIPE DIAMETER (mm)	PERCENT OF FULL FLOW (%)	TOTAL TIME OF TRAVEL (min.)
Fifth Street	P1			0.116	0.66	0.076	0.116	0.076	10.000	138.402	0.029											
Maple Street	P2			0.096	0.64	0.061	0.096	0.061	10.000	138.402	0.024											
	P3			0.280	0.62	0.174	0.280	0.174	10.000	138.402	0.067											
Sixth Street	P4			0.109	0.62	0.068	0.109	0.068	10.000	138.402	0.026											
Fifth Street	101	CB301	CBMH302	0.041	0.49	0.020	0.041	0.020	10.000	138.402	0.008	0.013	32.8	0.5%	250	0.86	0.042	0.61	0.90	132	18.4%	10.90
Fifth Street	102	CBMH302	STM MH303	0.019	0.46	0.009	0.060	0.029	10.898	132.831	0.011	0.013	27.6	0.5%	250	0.86	0.042	0.66	0.69	149	25.3%	11.59
Sixth Street	201	CB401A	CBMH401	0.026	0.70	0.018	0.026	0.018	10.000	138.402	0.007	0.013	7.0	0.5%	250	0.86	0.042	0.59	0.20	128	16.6%	10.20
Sixth Street	202	CBMH401	CBMH402	0.031	0.77	0.024	0.057	0.042	10.197	137.138	0.016	0.013	27.0	0.5%	250	0.86	0.042	0.74	0.61	174	38.1%	10.80
Sixth Street	203	CB403	CBMH402	0.014	0.57	0.008	0.014	0.008	10.000	138.402	0.003	0.013	1.4	2.0%	250	1.71	0.084	0.79	0.03	72	3.6%	10.03
Sixth Street	204	CBMH402	OGS1	0.062	0.90	0.056	0.133	0.106	10.804	133.392	0.039	0.013	23.9	0.5%	250	0.86	0.042	0.86	0.46	243	93.3%	11.27
Sixth Street	205	CB404	CBMH405	0.044	0.47	0.021	0.044	0.021	10.000	138.402	0.008	0.013	32.8	0.5%	250	0.86	0.042	0.61	0.89	134	18.9%	10.89
Sixth Street	-	OGS1	CBMH405	0.000	0.00	0.000	0.133	0.106	11.269	130.668	0.038	0.013	2.4	1.3%	250	1.38	0.068	1.34	0.03	202	56.7%	11.30
Sixth Street	206	CBMH405	CBMH406	0.042	0.53	0.022	0.219	0.149	11.298	130.497	0.054	0.013	26.6	0.5%	300	0.97	0.068	0.97	0.46	274	78.9%	11.76
Sixth Street	-	CBMH406	CBMH407	0.000	0.00	0.000	0.219	0.149	11.757	127.934	0.053	0.013	16.0	0.5%	300	0.97	0.068	0.97	0.28	272	77.3%	12.03

TATHAM ENGINEERING

Storm Sewer Design Sheet

Project Information

Victoria Annex	120174

Drawing Reference

120174-DP02	April 06-21

Prepared By

MJF	April 06-21

Reviewed By

KRS	April 07-21

Engineer's Stamp

Municipality

Town of Collingwood

Design Storm

50 year

Time of Concentation

10 mins

IDF Curve Coefficients

Year	50
A	1973.10
B	9.00
C	0.87

Manning's Coefficient

Pipe	Value
CSP	0.024
Conc.	0.013
PVC	0.013

STREET NAME	AREA LABEL / ID	UPSTREAM MANHOLE	DOWNSTREAM MANHOLE	TRIBUTARY AREA (ha)	RUNOFF COEFFICIENT	AREA × RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA × RUNOFF COEFFICIENT	TIME OF CONCENTRATION (min.)	RAINFALL INTENSITY (mm/hr)	PEAK FLOW (m^3/s)	MANNING'S ROUGHNESS COEFFICIENT	PIPE LENGTH (m)	SLOPE (%)	ACTUAL PIPE DIAMETER (mm)	FULL FLOW VELOCITY (m/s)	FULL FLOW CAPACITY (m^3/s)	ACTUAL VELOCITY (m/s)	TRAVEL TIME (min.)	CALCULATED PIPE DIAMETER (mm)	PERCENT OF FULL FLOW (%)	TOTAL TIME OF TRAVEL (min.)
Fifth Street	P1			0.116	0.66	0.076	0.116	0.076	10.000	153.176	0.032											
Maple Street	P2			0.096	0.64	0.061	0.096	0.061	10.000	153.176	0.026											
	P3			0.280	0.62	0.174	0.280	0.174	10.000	153.176	0.074											
Sixth Street	P4			0.109	0.62	0.068	0.109	0.068	10.000	153.176	0.029											
Fifth Street	101	CB301	CBMH302	0.041	0.49	0.020	0.041	0.020	10.000	153.176	0.009	0.013	32.8	0.5%	250	0.86	0.042	0.63	0.87	138	20.3%	10.87
Fifth Street	102	CBMH302	STM MH303	0.019	0.46	0.009	0.060	0.029	10.873	147.315	0.012	0.013	27.6	0.5%	250	0.86	0.042	0.68	0.67	155	28.1%	11.55
Sixth Street	201	CB401A	CBMH401	0.026	0.70	0.018	0.026	0.018	10.000	153.176	0.008	0.013	7.0	0.5%	250	0.86	0.042	0.61	0.19	133	18.4%	10.19
Sixth Street	202	CBMH401	CBMH402	0.031	0.77	0.024	0.057	0.042	10.191	151.849	0.018	0.013	27.0	0.5%	250	0.86	0.042	0.76	0.59	181	42.2%	10.78
Sixth Street	203	CB403	CBMH402	0.014	0.57	0.008	0.014	0.008	10.000	153.176	0.003	0.013	1.4	2.0%	250	1.71	0.084	0.81	0.03	75	4.0%	10.03
Sixth Street	204	CBMH402	OGS1	0.062	0.90	0.056	0.133	0.106	10.782	147.908	0.043	0.013	23.9	0.5%	300	0.97	0.068	0.96	0.41	253	63.6%	11.20
Sixth Street	205	CB404	CBMH405	0.044	0.47	0.021	0.044	0.021	10.000	153.176	0.009	0.013	32.8	0.5%	250	0.86	0.042	0.63	0.87	139	20.9%	10.87
Sixth Street	-	OGS1	CBMH405	0.000	0.00	0.000	0.133	0.106	11.196	145.273	0.043	0.013	2.4	1.3%	250	1.38	0.068	1.38	0.03	210	63.0%	11.22
Sixth Street	206	CBMH405	CBMH406	0.042	0.53	0.022	0.219	0.149	11.225	145.092	0.060	0.013	26.6	0.5%	300	0.97	0.068	0.97	0.46	285	87.7%	11.68
Sixth Street	-	CBMH406	CBMH407	0.000	0.00	0.000	0.219	0.149	11.683	142.297	0.059	0.013	16.0	0.5%	300	0.97	0.068	0.97	0.28	283	86.0%	11.96

TATHAM ENGINEERING

Storm Sewer Design Sheet

Project Information

Victoria Annex	120174

Drawing Reference

120174-DP02	April 06-21

Prepared By

MJF	April 06-21

Reviewed By

KRS	April 07-21

Engineer's Stamp

Municipality

Town of Collingwood

Design Storm

100 year

Time of Concentation

10 mins

IDF Curve Coefficients

Year	100
A	2193.10
B	9.04
C	0.87

Manning's Coefficient

Pipe	Value
CSP	0.024
Conc.	0.013
PVC	0.013

STREET NAME	AREA LABEL / ID	UPSTREAM MANHOLE	DOWNSTREAM MANHOLE	TRIBUTARY AREA (ha)	RUNOFF COEFFICIENT	AREA × RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA × RUNOFF COEFFICIENT	TIME OF CONCENTRATION (min.)	RAINFALL INTENSITY (mm/hr)	PEAK FLOW (m^3/s)	MANNING'S ROUGHNESS COEFFICIENT	PIPE LENGTH (m)	SLOPE (%)	ACTUAL PIPE DIAMETER (mm)	FULL FLOW VELOCITY (m/s)	FULL FLOW CAPACITY (m^3/s)	ACTUAL VELOCITY (m/s)	TRAVEL TIME (min.)	CALCULATED PIPE DIAMETER (mm)	PERCENT OF FULL FLOW (%)	TOTAL TIME OF TRAVEL (min.)
Fifth Street	P1			0.116	0.66	0.076	0.116	0.076	10.000	168.449	0.036											
Maple Street	P2			0.096	0.64	0.061	0.096	0.061	10.000	168.449	0.029											
	P3			0.280	0.62	0.174	0.280	0.174	10.000	168.449	0.081											
Sixth Street	P4			0.109	0.62	0.068	0.109	0.068	10.000	168.449	0.032											
Fifth Street	101	CB301	CBMH302	0.041	0.49	0.020	0.041	0.020	10.000	168.449	0.009	0.013	32.8	0.5%	250	0.86	0.042	0.64	0.85	142	22.4%	10.85
Fifth Street	102	CBMH302	STM MH303	0.019	0.46	0.009	0.060	0.029	10.851	162.152	0.013	0.013	27.6	0.5%	250	0.86	0.042	0.70	0.66	161	30.9%	11.51
Sixth Street	201	CB401A	CBMH401	0.026	0.70	0.018	0.026	0.018	10.000	168.449	0.009	0.013	7.0	0.5%	250	0.86	0.042	0.63	0.19	137	20.3%	10.19
Sixth Street	202	CBMH401	CBMH402	0.031	0.77	0.024	0.057	0.042	10.187	167.024	0.020	0.013	27.0	0.5%	250	0.86	0.042	0.78	0.58	187	46.4%	10.76
Sixth Street	203	CB403	CBMH402	0.014	0.57	0.008	0.014	0.008	10.000	168.449	0.004	0.013	1.4	2.0%	250	1.71	0.084	0.84	0.03	78	4.4%	10.03
Sixth Street	204	CBMH402	OGS1	0.062	0.90	0.056	0.133	0.106	10.762	162.790	0.048	0.013	23.9	0.5%	300	0.97	0.068	0.97	0.41	262	70.0%	11.17
Sixth Street	205	CB404	CBMH405	0.044	0.47	0.021	0.044	0.021	10.000	168.449	0.010	0.013	32.8	0.5%	250	0.86	0.042	0.65	0.84	144	23.0%	10.84
Sixth Street	-	OGS1	CBMH405	0.000	0.00	0.000	0.133	0.106	11.174	159.897	0.047	0.013	2.4	1.3%	250	1.38	0.068	1.38	0.03	218	69.3%	11.20
Sixth Street	206	CBMH405	CBMH406	0.042	0.53	0.022	0.219	0.149	11.203	159.698	0.066	0.013	26.6	0.5%	300	0.97	0.068	0.97	0.46	296	96.5%	11.66
Sixth Street	-	CBMH406	CBMH407	0.000	0.00	0.000	0.219	0.149	11.661	156.614	0.065	0.013	16.0	0.5%	300	0.97	0.068	0.97	0.28	294	94.7%	11.94

Appendix C: Modified Rational Method for Quantity Control Storage Requirements

TATHAM ENGINEERING

Modified Rational Method Calculation

Project Details

Victoria Annex	120174

Prepared By

MJF	April 7, 2021

Municipality

Town of Collingwood

Pre-Development Analysis

Catchment ID:	E3
Catchment Area (ha):	0.31
Runoff Coefficient:	0.44
Time of Concentration (min):	10.00

Post-Development Analysis

	Controlled	Uncontrolled
Catchment ID:	201-206	P4
Catchment Area (ha):	0.22	0.11
Runoff Coefficient:	0.68	0.62
Time of Concentration (min):	10.00	10.00

Design Storm	2YR	5YR	10YR	25YR	50YR	100YR
A	807	1135	1387	1676	1973	2193
B	6.75	7.50	7.97	8.30	9.00	9.04
C	0.83	0.84	0.85	0.86	0.87	0.87
i (mm/hr)	78	102	118	138	153	168
Runoff C	0.44	0.44	0.44	0.48	0.53	0.55
Q (m^3/s)	0.03	0.04	0.05	0.06	0.07	0.08

Design Storm		2YR	5YR	10YR	25YR	50YR	100YR
201-206	i (mm/hr)	78	102	118	138	153	168
	Runoff C	0.68	0.68	0.68	0.75	0.82	0.85
	Q (m^3/s)	0.03	0.04	0.05	0.06	0.08	0.09
P4	i (mm/hr)	78	102	118	138	153	168
	Runoff C	0.68	0.62	0.68	0.75	0.82	0.85
	Q (m^3/s)	0.02	0.02	0.02	0.03	0.04	0.04

Peak Runoff Rate (m^3/s) - Rational Method (Q=CiA/360)

Storm	$Q_{EXISTING}$	$Q_{NO\ CONTROLS}$	$Q_{UNCONTROLLED}$	$Q_{CONTROLLED}$	Q_{TOTAL}
2YR	0.030	0.048	0.016	0.014	0.030
5YR	0.039	0.061	0.019	0.020	0.039
10YR	0.046	0.073	0.024	0.021	0.046
25YR	0.059	0.094	0.031	0.027	0.059
50YR	0.071	0.114	0.038	0.033	0.071
100YR	0.081	0.130	0.043	0.038	0.081

Required Storage Volumes (m^3) - Modified Rational Method ($V_p = Q_p \times D - Q_o \times ((D + t_c)/2)$)

Dur. (min)	2YR	5YR
10	11.0	13.2
20	14	16
30	14	16
40	12	13
50	10	10
60	8	7
70	5	2

Appendix D:
Orifice Discharge Calculations

TATHAM ENGINEERING	Project:	Victoria Annex	Date:	2021-04-07
	File No.:	120174	Designed:	MJF
	Subject:	Oriface Discharge Calculations	Checked	KRS

OGS1 North Inlet Orifice

Orifice Dia. (mm)	75	
Cross Sectional Area (m^2)	0.0044	
Orifice Coefficient	0.80	Short tube orifice
Orifice Invert Elevation (m)	184.10	

Water Elevation (m)	Head (m)	Discharge (cms)	
184.00	0.00	0.000	
184.10	0.00	0.000	
184.20	0.06	0.004	
184.30	0.16	0.006	
184.40	0.26	0.008	
184.50	0.36	0.009	
184.60	0.46	0.011	
184.70	0.56	0.012	
184.80	0.66	0.013	
184.90	0.76	0.014	
185.00	0.86	0.015	
185.10	0.96	0.015	Surcharge 1st structure (CB404)

CBMH405 West Inlet Orifice

Orifice Dia. (mm)	75	
Cross Sectional Area (m^2)	0.0044	
Orifice Coefficient	0.80	Short tube orifice
Orifice Invert Elevation (m)	184.01	

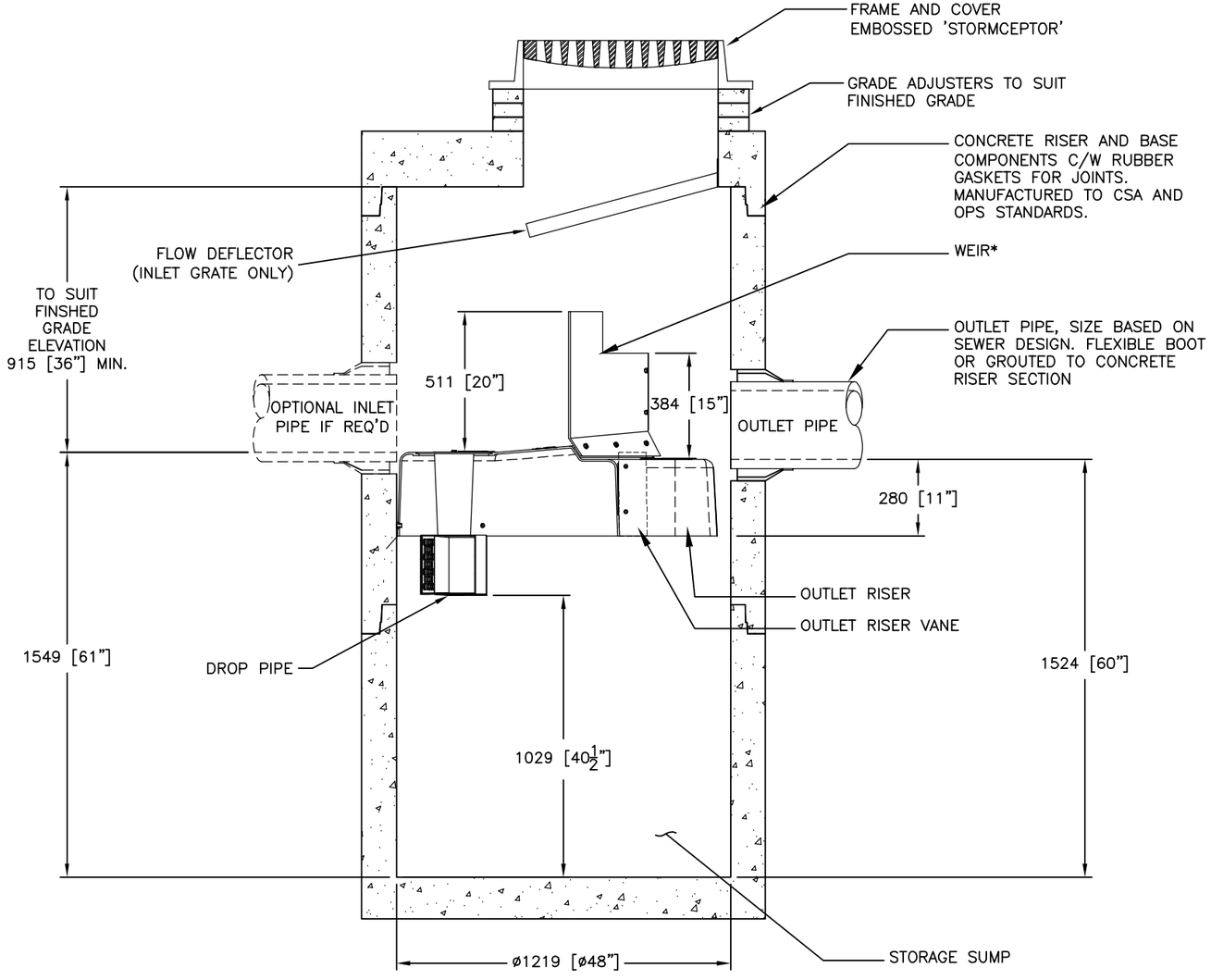
Water Elevation (m)	Head (m)	Discharge (cms)	
184.00	0.00	0.000	
184.10	0.05	0.004	
184.20	0.15	0.006	
184.30	0.25	0.008	
184.40	0.35	0.009	
184.50	0.45	0.011	
184.60	0.55	0.012	
184.70	0.65	0.013	
184.80	0.75	0.014	
184.90	0.85	0.014	
185.00	0.95	0.015	
185.10	1.05	0.016	Surcharge 1st structure (CB404)

STM MH303 South Inlet Orifice

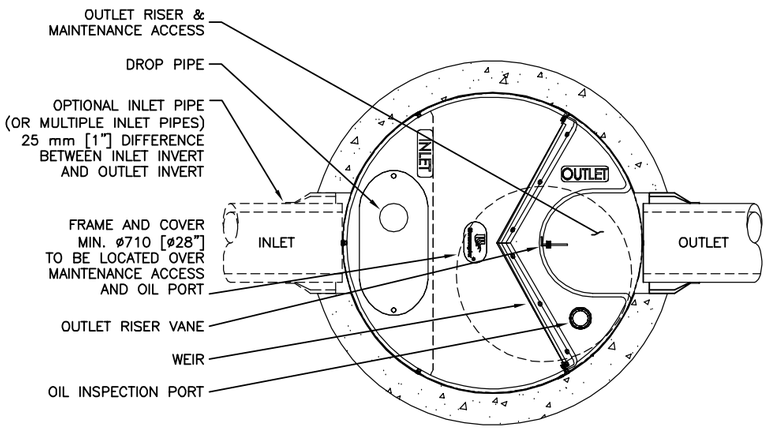
Orifice Dia. (mm)	75	
Cross Sectional Area (m^2)	0.0044	
Orifice Coefficient	0.80	Short tube orifice
Orifice Invert Elevation (m)	183.75	

Water Elevation (m)	Head (m)	Discharge (cms)	
183.75	0.00	0.000	
183.85	0.06	0.004	
183.95	0.16	0.006	
184.05	0.26	0.008	
184.15	0.36	0.009	
184.25	0.46	0.011	
184.35	0.56	0.012	
184.45	0.66	0.013	
184.55	0.76	0.014	
184.65	0.86	0.015	Surcharge 1st structure (CB301)

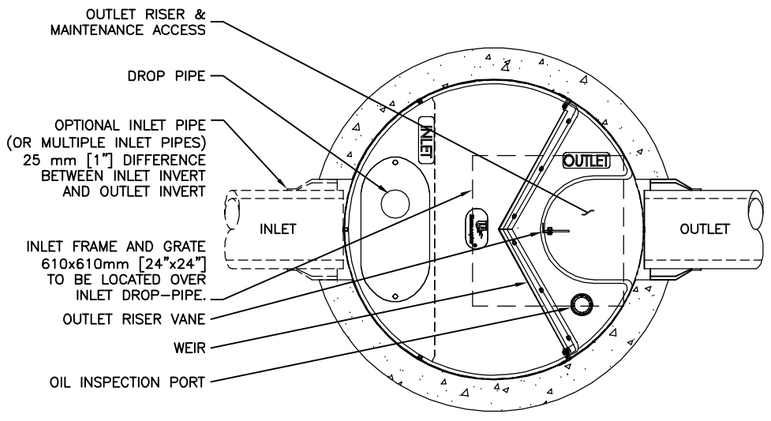
Appendix E:
Stormceptor Sizing



SECTION VIEW



PLAN VIEW (STANDARD)



PLAN VIEW (INLET TOP)

FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL STORMCEPTOR REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS. ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE (IF REQUIRED).

GENERAL NOTES:

* MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m^2 (27.9 gpm/ft^2) FOR STORMCEPTOR EF4 AND 535 L/min/m^2 (13.1 gpm/ft^2) FOR STORMCEPTOR EFO4 (OIL CAPTURE CONFIGURATION). WEIR HEIGHT IS 150 mm (6 INCH) FOR EF04.

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
2. STORMCEPTOR STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. UNLESS OTHERWISE NOTED, BYPASS INFRASTRUCTURE, SUCH AS ALL UPSTREAM DIVERSION STRUCTURES, CONNECTING STRUCTURES, OR PIPE CONDUITS CONNECTING TO COMPLETE THE STORMCEPTOR SYSTEM SHALL BE PROVIDED AND ADDRESSED SEPARATELY.
4. DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEER'S SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
5. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING CLUTCHES PROVIDED)
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT THE DEVICE FROM CONSTRUCTION-RELATED EROSION RUNOFF.
E. DEVICE ACTIVATION, BY CONTRACTOR, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE STORMCEPTOR UNIT IS CLEAN AND FREE OF DEBRIS.

STANDARD DETAIL
NOT FOR CONSTRUCTION

SITE SPECIFIC DATA REQUIREMENTS

STORMCEPTOR MODEL	EF4
STRUCTURE ID	*
WATER QUALITY FLOW RATE (L/s)	*
PEAK FLOW RATE (L/s)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
DRAINAGE AREA (HA)	*
DRAINAGE AREA IMPERVIOUSNESS (%)	*

PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

MARK	DATE	REVISION DESCRIPTION	BY
1	6/8/18	UPDATES	JSK
0	5/26/17	INITIAL RELEASE	JSK

Stormceptor® EF

SCALE = NTS

imbrium®
7007 RIDGE ROAD, SUITE 350, HANOVER, MD 21076
USA 888-279-9828 CA 800-388-4601 INTL +1-416-960-9900

DATE: 5/26/2017

DESIGNED:	DRAWN:
JSK	JSK
CHECKED:	APPROVED:
BSF	SP
PROJECT No.:	SEQUENCE No.:
EF4	*

SHEET: 1 OF 1

Stormceptor®

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

11/16/2020

Province:	Ontario
City:	Collingwood
Nearest Rainfall Station:	OWEN SOUND MOE
NCDC Rainfall Station Id:	6132
Years of Rainfall Data:	40

Site Name:	Victoria Annex

Drainage Area (ha):	0.22
Runoff Coefficient 'c':	0.64

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0

Required Water Quality Runoff Volume Capture (%):	
Estimated Water Quality Flow Rate (L/s):	
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	Victoria Annex
Project Number:	120174
Designer Name:	Mark Figueroa
Designer Company:	Tatham Engineering Limited
Designer Email:	mfigueroa@tathameng.com
Designer Phone:	705-888-6509
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	87
EFO6	91
EFO8	92
EFO10	93
EFO12	93

Recommended Stormceptor EFO Model: EFO4

Estimated Net Annual Sediment (TSS) Load Reduction (%): 87

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THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

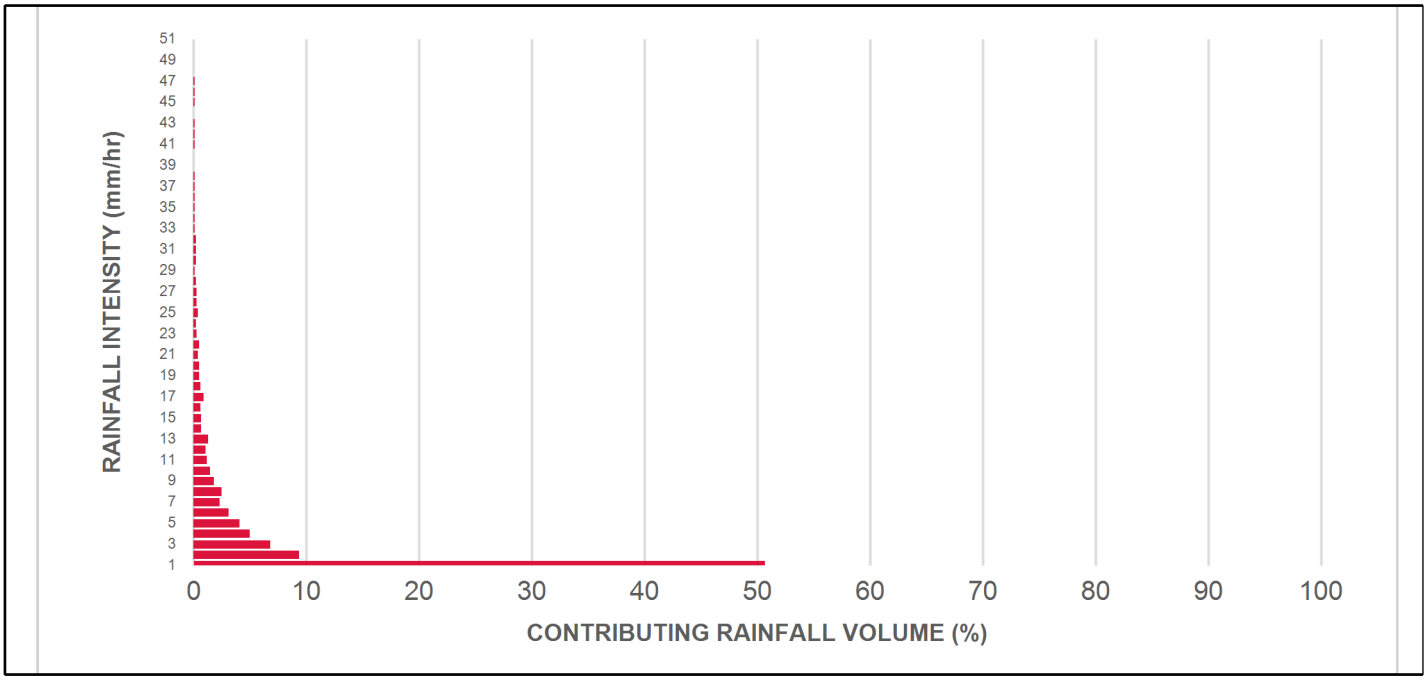
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Stormceptor® EF Sizing Report

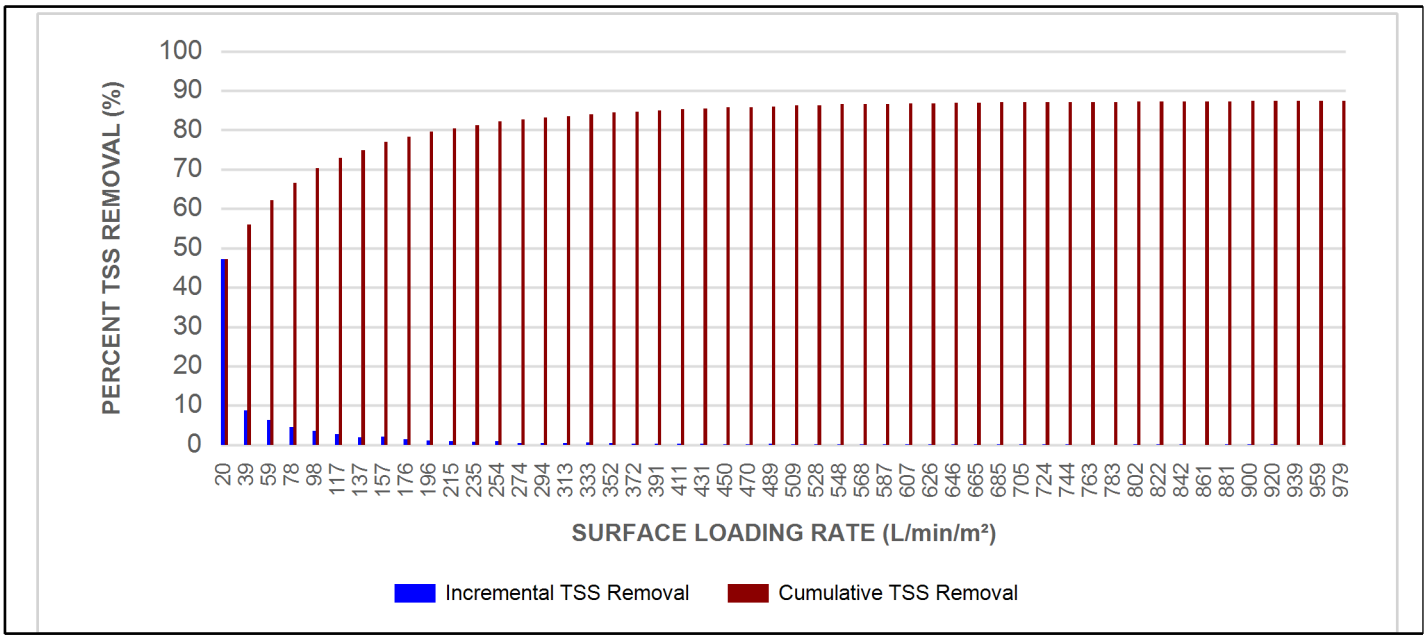
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
1	50.7	50.7	0.39	23.0	20.0	93	47.2	47.2
2	9.4	60.1	0.78	47.0	39.0	93	8.7	55.9
3	6.8	66.9	1.17	70.0	59.0	92	6.3	62.1
4	5.0	71.9	1.57	94.0	78.0	90	4.5	66.6
5	4.1	76.0	1.96	117.0	98.0	88	3.6	70.3
6	3.1	79.1	2.35	141.0	117.0	86	2.7	72.9
7	2.3	81.4	2.74	164.0	137.0	84	1.9	74.8
8	2.5	83.9	3.13	188.0	157.0	81	2.0	76.9
9	1.8	85.7	3.52	211.0	176.0	79	1.4	78.3
10	1.5	87.2	3.91	235.0	196.0	77	1.2	79.5
11	1.2	88.4	4.31	258.0	215.0	75	0.9	80.4
12	1.1	89.5	4.70	282.0	235.0	73	0.8	81.2
13	1.3	90.8	5.09	305.0	254.0	72	0.9	82.1
14	0.7	91.5	5.48	329.0	274.0	70	0.5	82.6
15	0.7	92.2	5.87	352.0	294.0	68	0.5	83.1
16	0.6	92.8	6.26	376.0	313.0	66	0.4	83.4
17	0.9	93.7	6.65	399.0	333.0	64	0.6	84.0
18	0.6	94.3	7.05	423.0	352.0	63	0.4	84.4
19	0.5	94.8	7.44	446.0	372.0	61	0.3	84.7
20	0.5	95.3	7.83	470.0	391.0	59	0.3	85.0
21	0.4	95.7	8.22	493.0	411.0	58	0.2	85.2
22	0.5	96.2	8.61	517.0	431.0	57	0.3	85.5
23	0.3	96.5	9.00	540.0	450.0	57	0.2	85.7
24	0.2	96.7	9.39	564.0	470.0	56	0.1	85.8
25	0.4	97.1	9.79	587.0	489.0	55	0.2	86.0

Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
26	0.3	97.4	10.18	611.0	509.0	55	0.2	86.2
27	0.3	97.7	10.57	634.0	528.0	54	0.2	86.3
28	0.2	97.9	10.96	658.0	548.0	54	0.1	86.5
29	0.1	98.0	11.35	681.0	568.0	53	0.1	86.5
30	0.2	98.2	11.74	705.0	587.0	53	0.1	86.6
31	0.2	98.4	12.13	728.0	607.0	52	0.1	86.7
32	0.2	98.6	12.53	752.0	626.0	52	0.1	86.8
33	0.1	98.7	12.92	775.0	646.0	52	0.1	86.9
34	0.1	98.8	13.31	799.0	665.0	52	0.1	86.9
35	0.1	98.9	13.70	822.0	685.0	52	0.1	87.0
36	0.1	99.0	14.09	845.0	705.0	52	0.1	87.0
37	0.1	99.1	14.48	869.0	724.0	51	0.1	87.1
38	0.1	99.2	14.87	892.0	744.0	51	0.1	87.1
39	0.0	99.2	15.27	916.0	763.0	51	0.0	87.1
40	0.0	99.2	15.66	939.0	783.0	51	0.0	87.1
41	0.1	99.3	16.05	963.0	802.0	51	0.1	87.2
42	0.1	99.4	16.44	986.0	822.0	51	0.1	87.2
43	0.1	99.5	16.83	1010.0	842.0	51	0.1	87.3
44	0.0	99.5	17.22	1033.0	861.0	51	0.0	87.3
45	0.1	99.6	17.61	1057.0	881.0	51	0.1	87.3
46	0.1	99.7	18.01	1080.0	900.0	51	0.1	87.4
47	0.1	99.8	18.40	1104.0	920.0	50	0.1	87.4
48	0.0	99.8	18.79	1127.0	939.0	50	0.0	87.4
49	0.0	99.8	19.18	1151.0	959.0	50	0.0	87.4
50	0.0	99.8	19.57	1174.0	979.0	50	0.0	87.4
						Estimated Net Annual Sediment (TSS) Load Reduction =		**87 %**

RAINFALL DATA FROM OWEN SOUND MOE RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



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Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

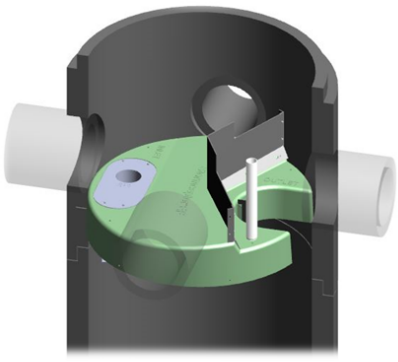
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

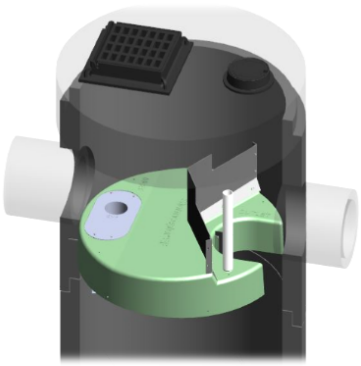
DESIGN FLEXIBILITY

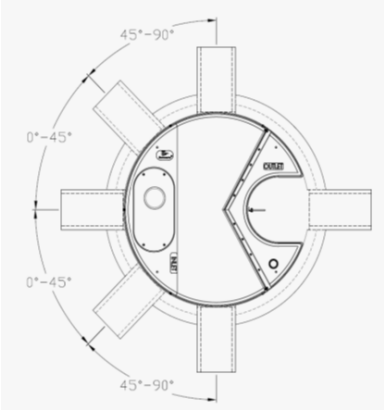
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing shall be determined using historical rainfall data and a sediment removal performance curve derived from the actual third-party verified laboratory testing data. The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m2 to 2600 L/min/m2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.