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Victoria Annex

STORMWATER MANAGEMENT REPORT

Georgian Communities

Document Control

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Date:		
November 19, 2020		

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Issue	Date	Description
1	November 19, 2020	Final Report

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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 m² in size. There are gravel areas located to the north and south of the building, and both are approximately 2,320 m² in size. There is also a grass area located east of the school with a size of approximately 1,065 m² 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	0.045	0.071	0.65
P2	0.10	0.041	0.055	0.62
P3	0.28	0.131	0.150	0.60
P4	0.11	0.041	0.068	0.65

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	0.016	0.021	0.025	0.029	0.032	0.035
P2	0.013	0.017	0.020	0.023	0.025	0.028
P3	0.036	0.048	0.055	0.064	0.071	0.078
P4	0.016	0.020	0.024	0.027	0.030	0.033
Total	0.081	0.106	0.123	0.144	0.159	0.175

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	0.023	0.025	0.028
Fifth Street	0.023	0.029	0.034	0.040	0.044	0.048
Sixth Street	0.046	0.060	0.069	0.081	0.090	0.098
Sanitary Sewer	0.000	0.000	0.000	0.000	0.000	0.000
Total	0.081	0.106	0.123	0.144	0.159	0.175



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 185.04 metres. Orifice discharge calculations are shown in Appendix D.

Table 7: Storage Volume & Orifice Discharge for Sixth Street

WATER LEVEL (m)	STORAGE VOLUME (m ²)	ORIFICE DISCHARGE (m ³ /s)
183.84	0.0	0.000
183.94	0.2	0.004
184.04	1.7	0.006
184.14	4.5	0.008
184.24	7.6	0.009
184.34	10.5	0.011
184.44	12.1	0.012
184.54	13.2	0.013
184.64	13.8	0.014
184.74	14.3	0.015
184.84	14.8	0.015
184.94	15.3	0.016
185.04	15.8	0.017



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.

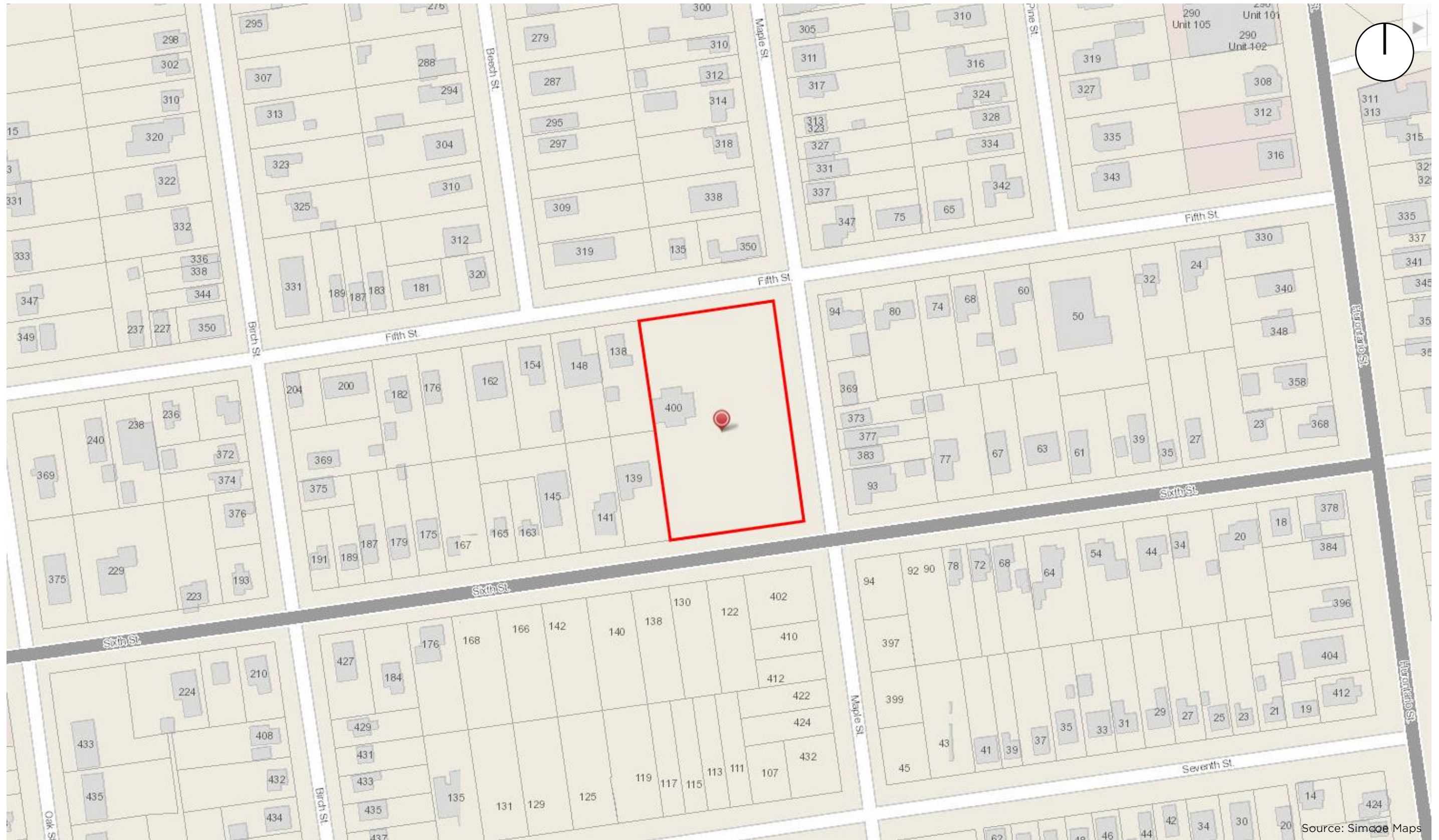
Erosion and sediment control measures will be implemented before the outset of construction activities and will be inspected every two weeks or after storm events greater than 25 mm. Repairs to the control measures will be made as necessary and additional control measures will be provided as required. 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.





Source: Simcoe Maps

VICTORIA ANNEX
 Figure 1: Site Location - Map



SITE STATISTICS
 ZONE R3-38
 USE CONDO/SUBDIVISION
 MUNICIPAL ADDRESS 400 MAPLE STREET, COLLINGWOOD

SUBJECT LANDS
 PROPERTY AREA 6011 m²
 PROPOSED UNITS 19 UNITS
 MAXIMUM DENSITY 19 UNITS

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

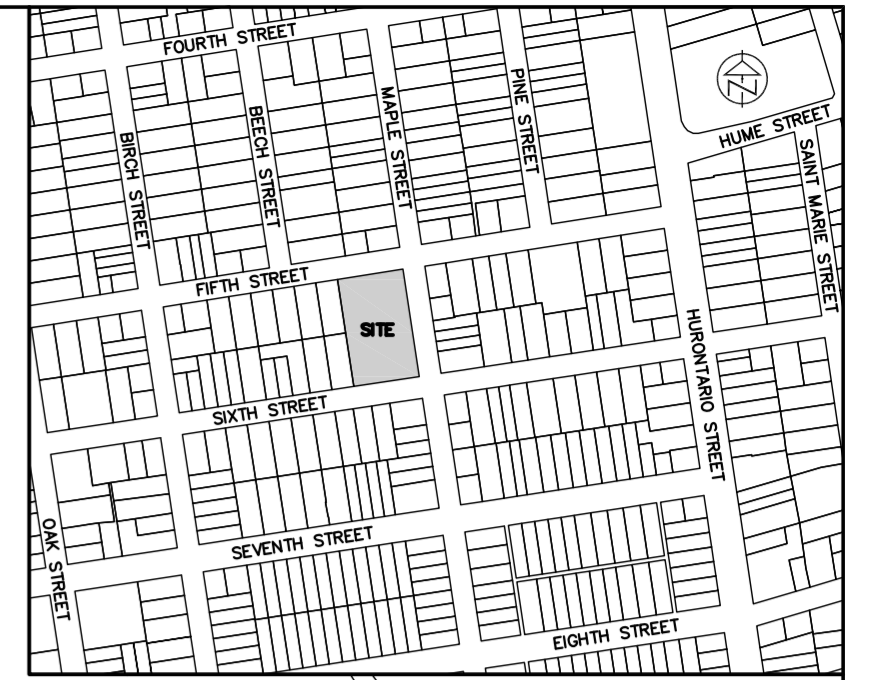
SEMI DETACHED - 10 UNITS
 GFA 350.1 m² (3,768.4 ft²) MINIMUM

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

VICTORIA ANNEX SEMI DETACHED - 2 UNITS

	SINGLES		SEMIS		TOWNHOME UNITS		VICTORIA ANNEX SEMIS	
	REQUIRED	PROPOSED	REQUIRED	PROPOSED	REQUIRED	PROPOSED	REQUIRED	PROPOSED
NUMBER OF UNITS	4	4	10	10	3	3	3	3
LOT AREA (MIN)	325 m ²	381.3 m ²	275 m ²	264.0 m ²	NIL	1842.2 m ²	NIL	1842.2 m ²
LOT FRONTAGE	10.0 m	13.9 m	9.0 m	9.6 m	NIL	13.9 m	NIL	13.9 m
FRONT YARD	4.5 m	4.5 m	4.5 m	4.5 m	4.5 m	29.3 m	14.0 m	42.6 m
EXTERIOR SIDE YARD	4.5 m	4.5 m	4.5 m	N/A	4.5 m	N/A	4.5 m	N/A
INTERIOR SIDE YARD	1.2 m	1.2 m	1.2 m & 0.0	1.2 m & 0.0	NIL	2.5 m	1.2 m & 0.0	0.02-0.26 m
REAR YARD	7.5 m	7.5 m	7.5 m	7.5 m	7.5 m	8.7 m	7.5 m	4.6 m
HEIGHT (MAX)	12.0 m	12.0 m	12.0 m	12.0 m	12.0 m	±10.0 m	15.0 m	12.0 m
COVERAGE (MAX)	40%	46.0%	40%	46.0%	N/A	26.6%	NIL	26.6%
LANDSCAPED AREA	35%	54.0%	35%	45.6%	35%	35.5%	35%	35.5%
PARKING SPACES	2/UNIT	2/UNIT	2/UNIT	2/UNIT	2/UNIT	2/UNIT	2/UNIT	2/UNIT
ACCESSIBLE PARKING								
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 m ²	20.4 m ²					200 m ²	72.0 m ²
HEIGHT (MAX)	7.0 m	4.8 m					7.0 m	7.0 m

NOTES
 1. LEGAL SURVEY COMPLETED BY J.D. BARNES DATED NOVEMBER 11, 2020.
 2. PARKING REQUIREMENT BASED ON TOWN OF COLLINGWOOD ZONING BY-LAW.

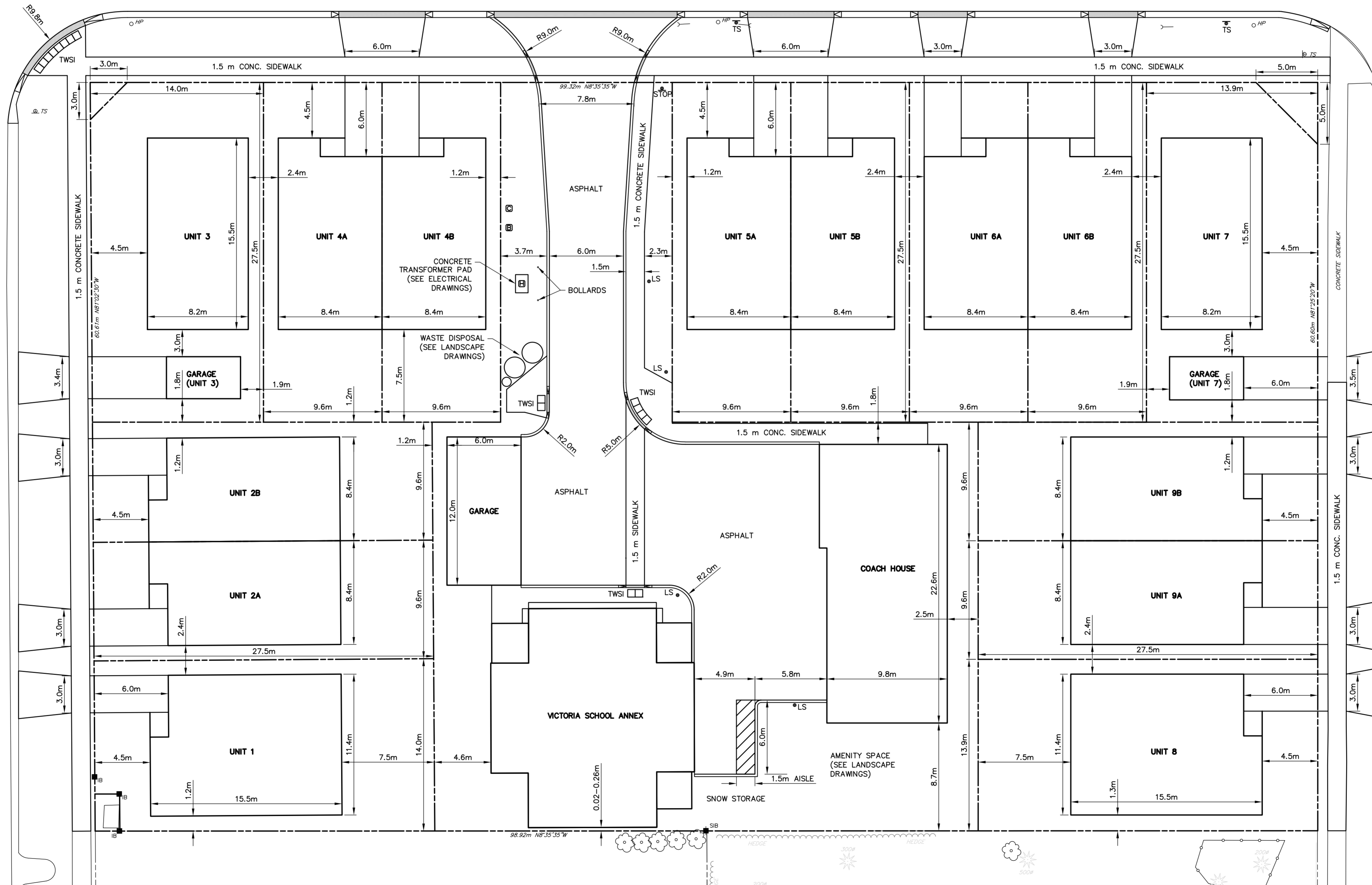


KEY PLAN
NTS

MAPLE STREET

FIFTH STREET

SIXTH STREET



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BENCHMARKS

BM1 - 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.

BM2 - 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.

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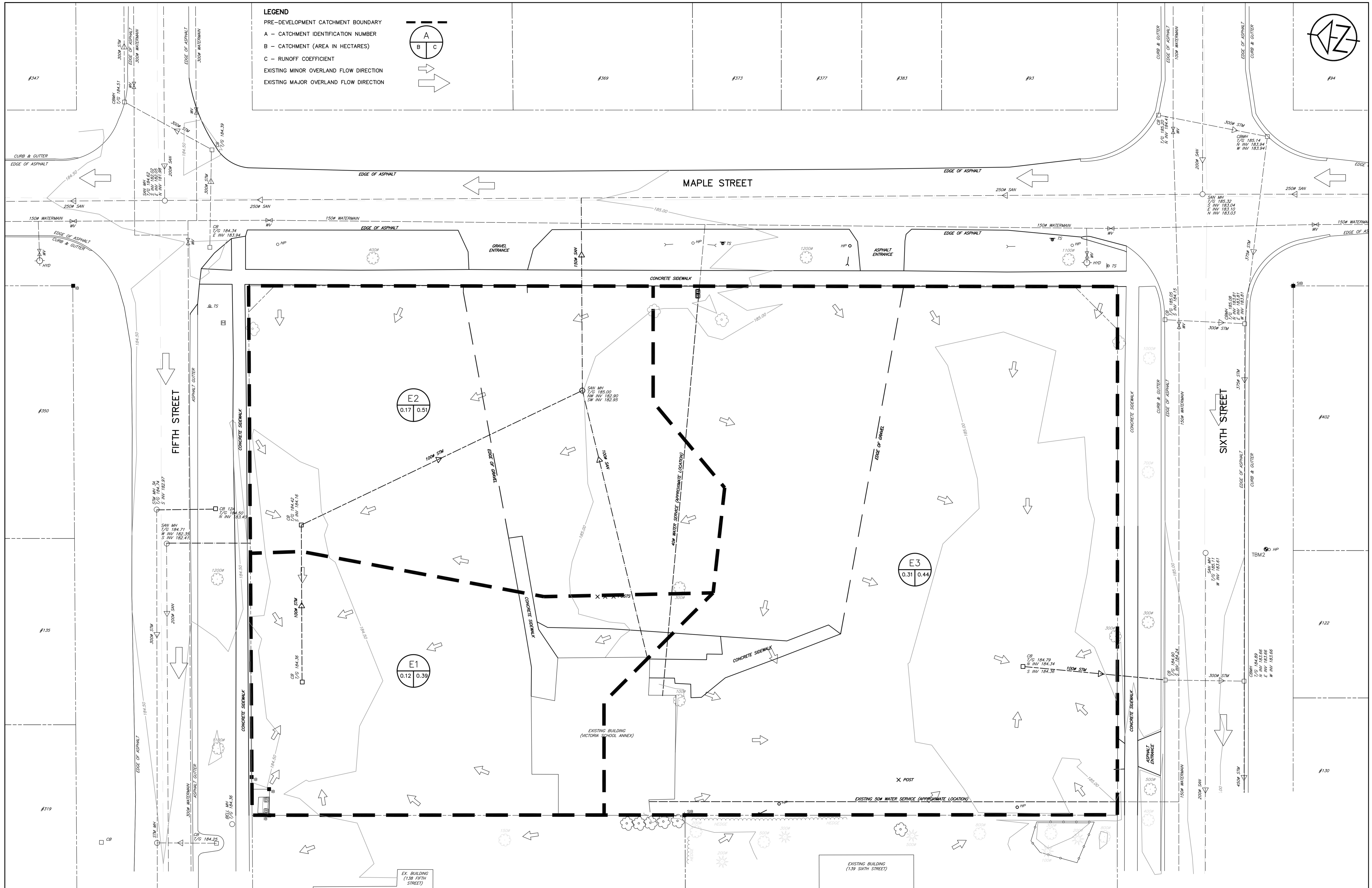
ENGINEER STAMP

VICTORIA ANNEX
GEORGIAN COMMUNITIES
TOWN OF COLLINGWOOD

SITE PLAN



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



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 TBM2 - ELEVATION 185.79
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NOTES
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No.	REVISION DESCRIPTION	DATE	ENGINEER STAMP
1.	FIRST SUBMISSION	NOV 2020	

**VICTORIA ANNEX
 GEORGIAN COMMUNITIES
 TOWN OF COLLINGWOOD**

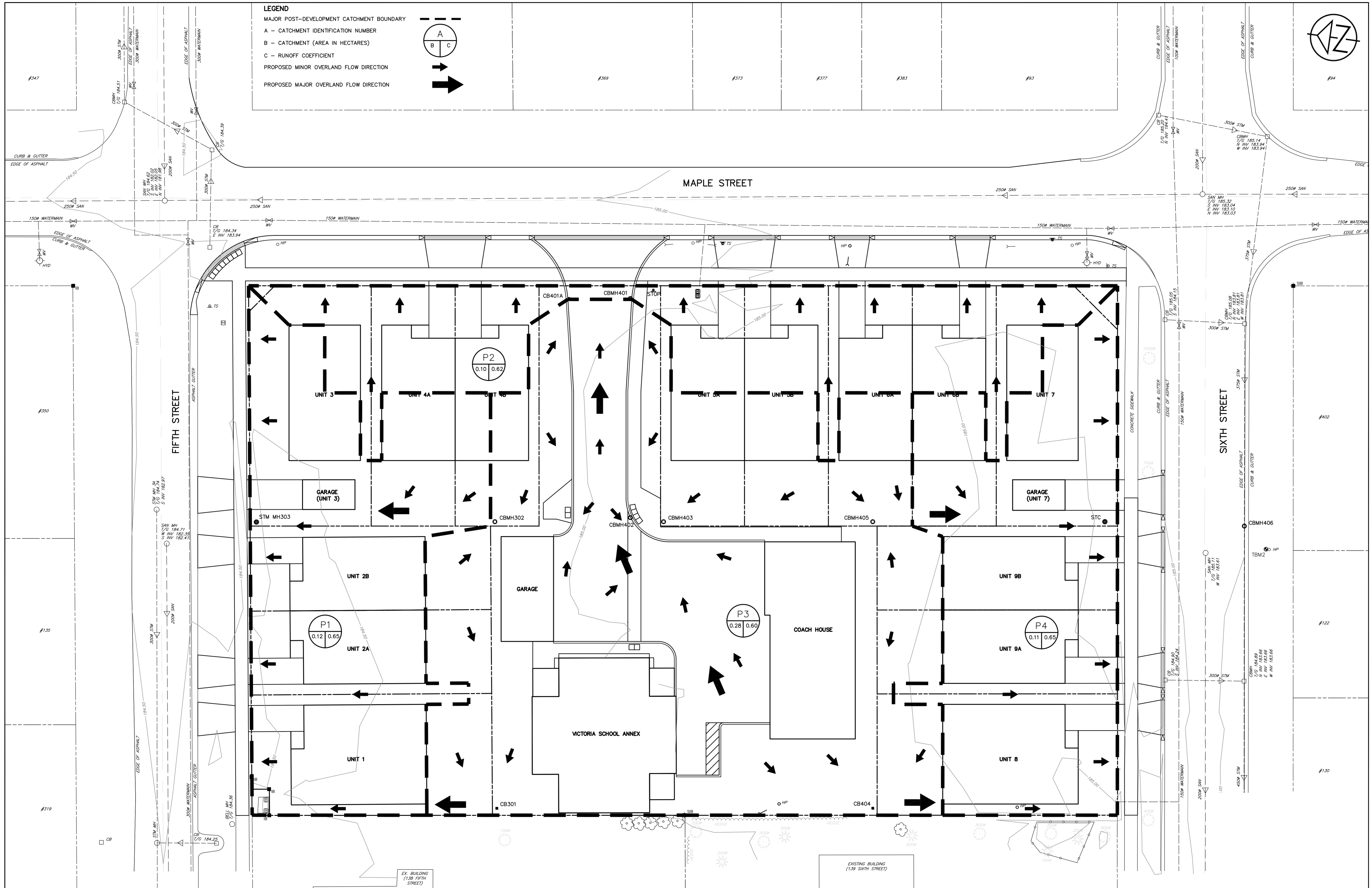
**PRE-DEVELOPMENT
 DRAINAGE PLAN**

TATHAM ENGINEERING

DESIGN: KRS/MJF
 DRAWN: MJF
 CHECK: KRS

FILE: 120174
 DATE: SEP 2020
 SCALE: 1:200

DWG:
DP-1
 Sheet No. 3 of 12



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.
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BENCHMARKS
 TBM1 - ELEVATION 181.18
 #101840957 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.

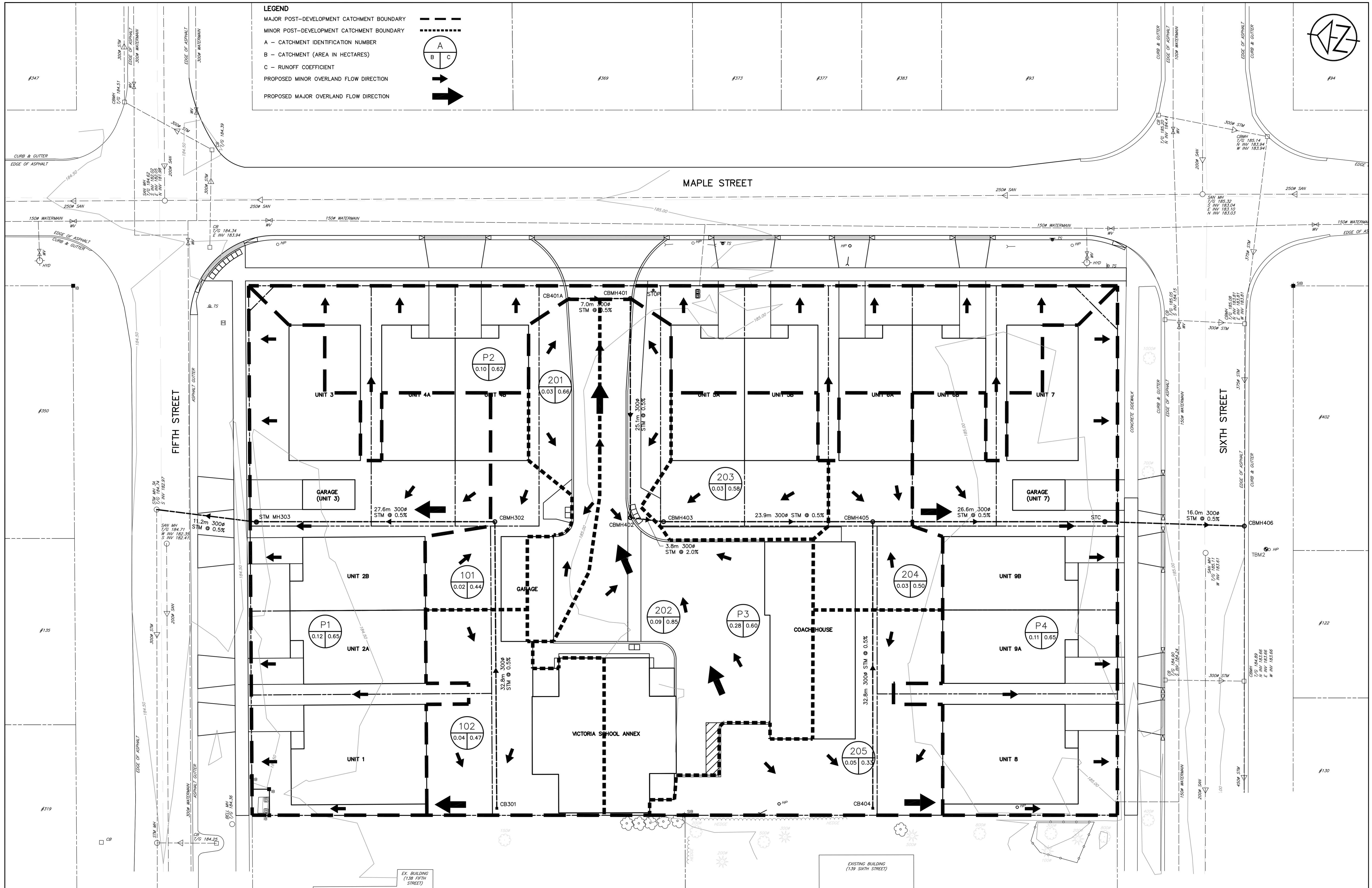
NOTES
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No.	REVISION DESCRIPTION	DATE	ENGINEER STAMP
1.	FIRST SUBMISSION	NOV 2020	

ENGINEER STAMP


VICTORIA ANNEX
GEORGIAN COMMUNITIES
TOWN OF COLLINGWOOD
POST-DEVELOPMENT
DRAINAGE PLAN

TATHAM ENGINEERING
 DESIGN: KRS/MJF FILE: 120174 DWG:
 DRAWN: MJF DATE: SEP 2020 **DP-2**
 CHECK: KRS SCALE: 1:200 Sheet No. 4 of 12



LEGEND
 MAJOR POST-DEVELOPMENT CATCHMENT BOUNDARY
 MINOR POST-DEVELOPMENT CATCHMENT BOUNDARY
 A - CATCHMENT IDENTIFICATION NUMBER
 B - CATCHMENT (AREA IN HECTARES)
 C - RUNOFF COEFFICIENT
 PROPOSED MINOR OVERLAND FLOW DIRECTION
 PROPOSED MAJOR OVERLAND FLOW DIRECTION

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.
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BENCHMARKS
 TBM1 - ELEVATION 181.18
 #101840957 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.

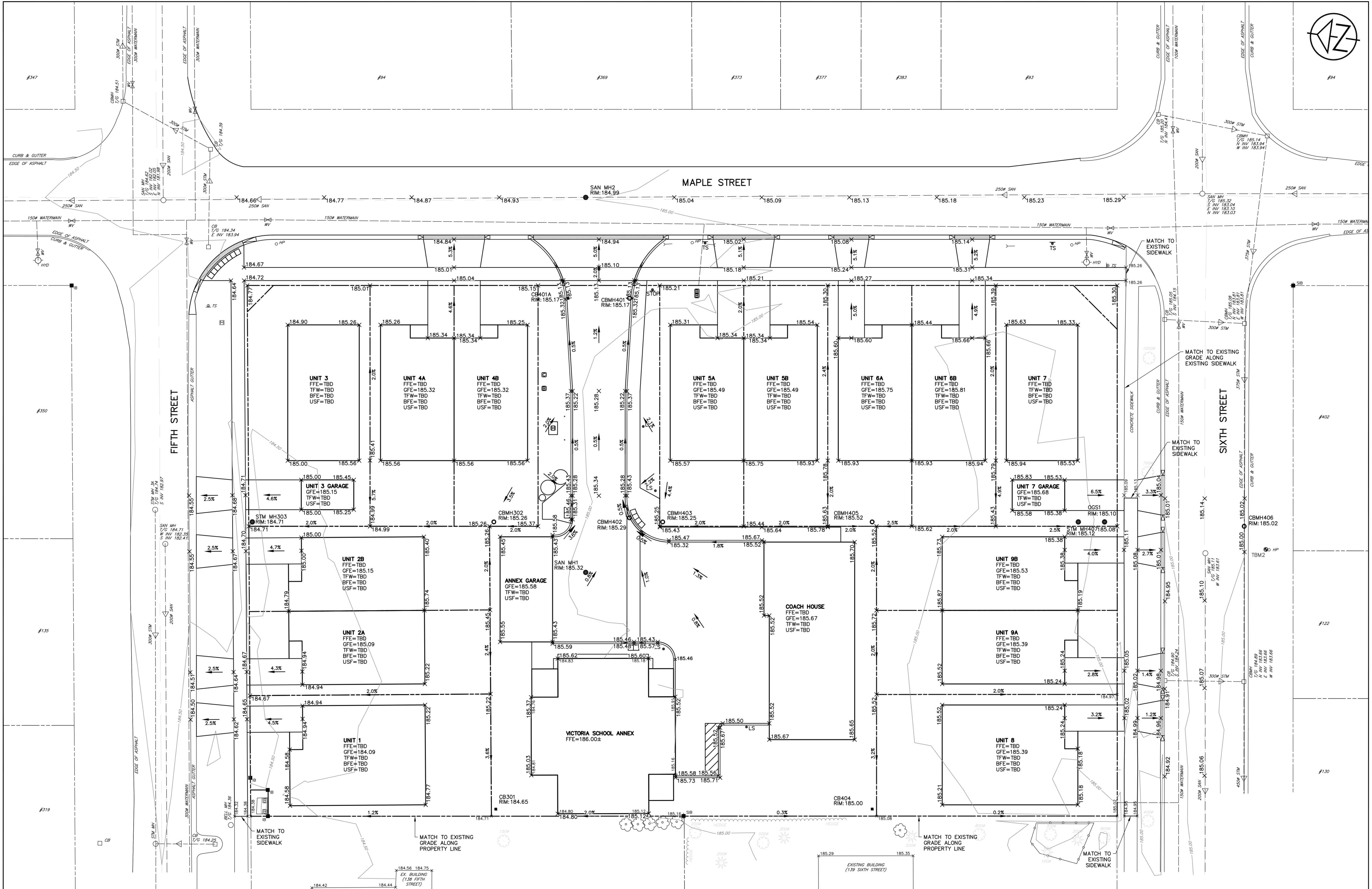
NOTES
 ALL DIMENSIONS, ELEVATIONS AND SIZES ARE IN METRIC UNITS UNLESS INDICATED. PIPE SIZES ARE IN MILLIMETRES UNLESS OTHERWISE INDICATED. ELEVATIONS ARE IN METRES UNLESS INDICATED.

No.	REVISION DESCRIPTION	DATE	ENGINEER STAMP
1.	FIRST SUBMISSION	NOV 2020	

ENGINEER STAMP
 K. R. SANSOM
 1970
 PROFESSIONAL ENGINEER
 CIVIL
 ONTARIO

**VICTORIA ANNEX
 GEORGIAN COMMUNITIES
 TOWN OF COLLINGWOOD**
**STORM SEWER
 CATCHMENT PLAN**

TATHAM ENGINEERING
 DESIGN: KRS/MJF
 DRAWN: MJF
 CHECK: KRS
 FILE: 120174
 DATE: SEP 2020
 SCALE: 1:200
 DWG: **STM-1**
 Sheet No. 5 of 12



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.
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BENCHMARKS
 BM1 - ELEVATION 181.18
 #10840957 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.
 BM2 - 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	ENGINEER STAMP
1.	FIRST SUBMISSION	NOV 2020	

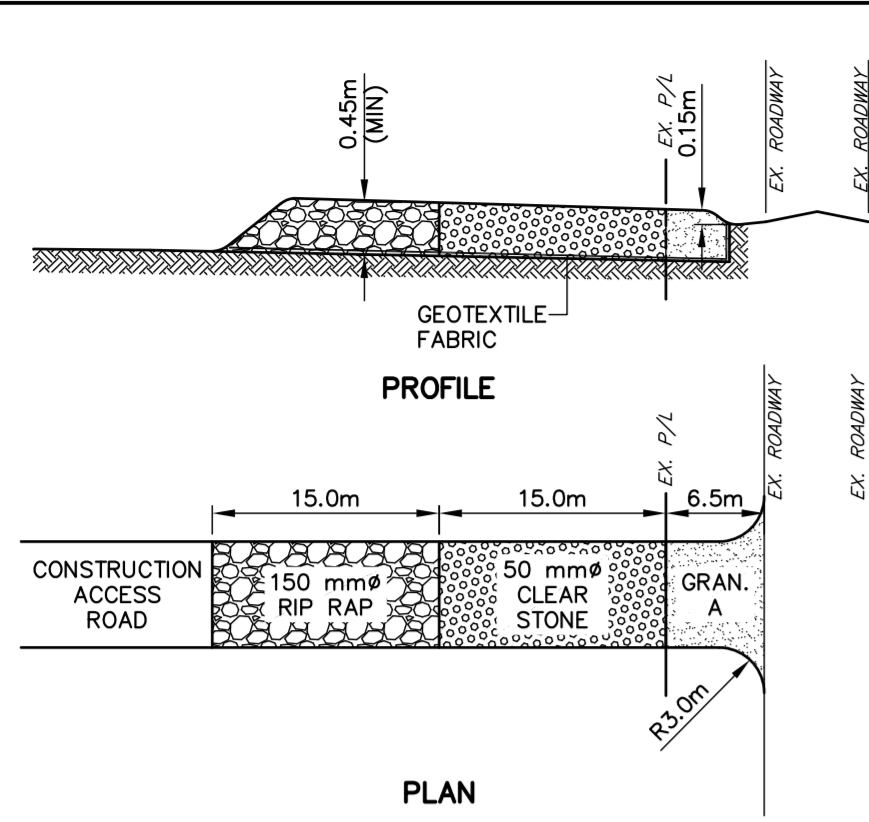


VICTORIA ANNEX
GEORGIAN COMMUNITIES
TOWN OF COLLINGWOOD

SITE GRADING PLAN

TATHAM ENGINEERING

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



STONE MUD MAT DETAIL
NTS

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 ϕ CLEAR STONE FOR NEXT 15 m AND 150 mm ϕ 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.

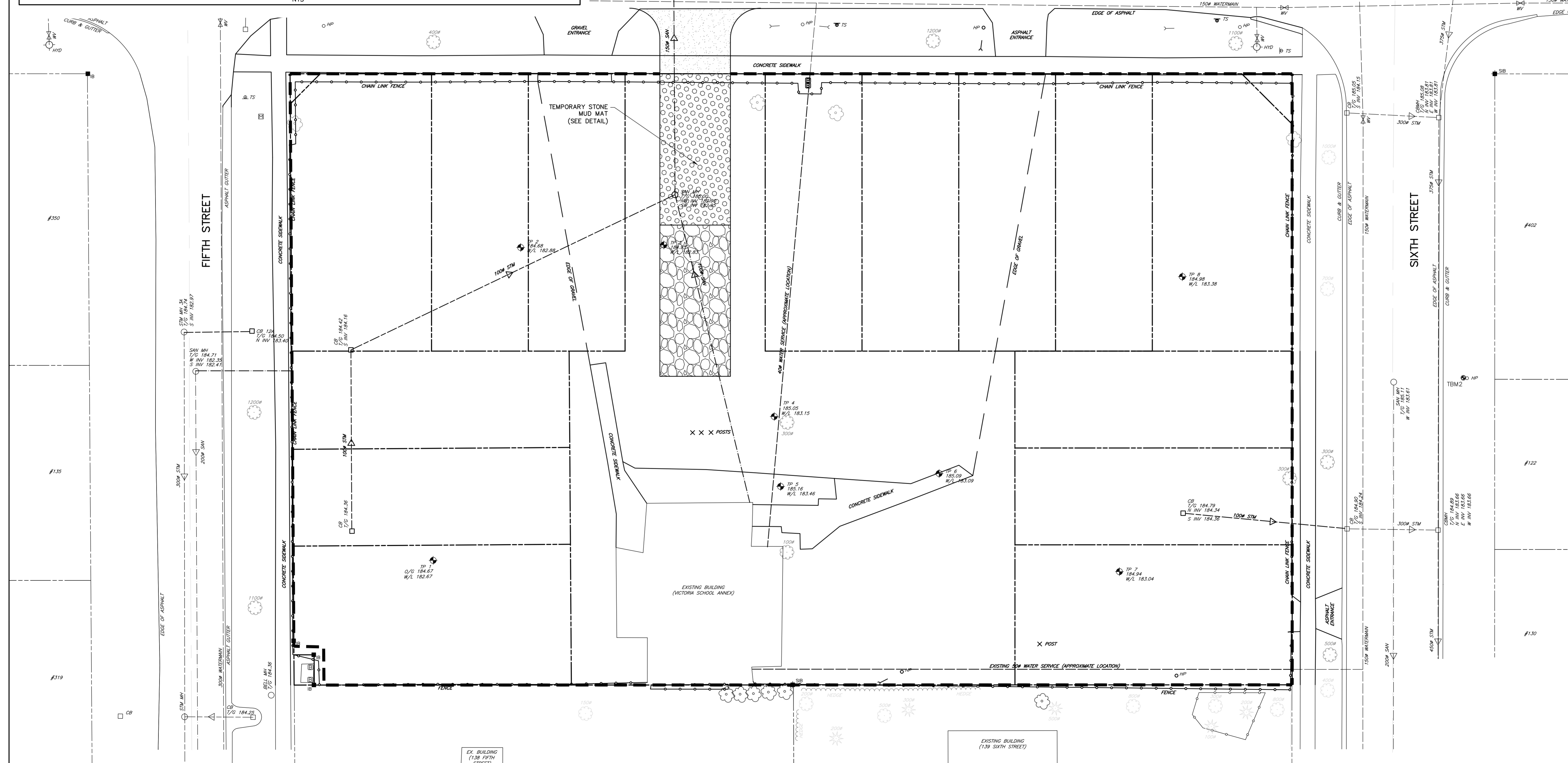
LEGEND

- HEAVY DUTY SILT FENCE
- SBCD STRAW BALE CHECK DAM

MAPLE STREET

FIFTH STREET

SIXTH STREET



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.
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BENCHMARKS
#101840957 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.
#101840958 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.
#101840959 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.

NOTES
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No.	REVISION DESCRIPTION	DATE
1.	FIRST SUBMISSION	NOV 2020

ENGINEER STAMP
K. R. SANSOM
1970
PROFESSIONAL ENGINEER
ONTOARIO

VICTORIA ANNEX
GEORGIAN COMMUNITIES
TOWN OF COLLINGWOOD

SILTATION AND EROSION CONTROL PLAN

TATHAM ENGINEERING

DESIGN: KRS/MJF
DRAWN: MJF
CHECK: KRS

FILE: 120174
DATE: SEP 2020
SCALE: 1:200

DWG: **EC-1**
Sheet No. 3 of 9

Appendix A: Pre-Development Runoff Calculations

Project Information

400 Maple Street	120174
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Drawing Reference

120174-DP01	November 12-20
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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 Concentration

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 x RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA x 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												

Project Information

400 Maple Street	120174
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Drawing Reference

120174-DP01	November 12-20
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Prepared By

MJF	November 12-20
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Reviewed By

KRS	November 13-20
-----	----------------

Engineer's Stamp



Municipality

Town of Collingwood

Design Storm

5 year

Time of Concentration

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 x RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA x 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											

Project Information

400 Maple Street	120174
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Drawing Reference

120174-DP01	November 12-20
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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 Concentration

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 x RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA x 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												

Project Information

400 Maple Street	120174
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Drawing Reference

120174-DP01	November 12-20
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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 Concentration

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 x RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA x 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											

Project Information

400 Maple Street	120174
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Drawing Reference

120174-DP01	November 12-20
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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 Concentration

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 x RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA x 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											

Project Information

400 Maple Street	120174
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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 Concentration

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 x RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA x 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

Project Information

400 Maple Street	120174
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Drawing Reference

120174-DP02	November 12-20
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Prepared By

MJF	November 12-20
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Reviewed By

KRS	November 13-20
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Engineer's Stamp



Municipality

Town of Collingwood

Design Storm

2 year

Time of Concentration

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 x RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA x 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	0.649	0.075	0.116	0.075	10.000	78.276	0.016												
Maple Street	P2			0.096	0.624	0.060	0.096	0.060	10.000	78.276	0.013												
	P3			0.280	0.597	0.167	0.280	0.167	10.000	78.276	0.036												
Sixth Street	P4			0.109	0.654	0.071	0.109	0.071	10.000	78.276	0.016												
Fifth Street	101	CB301	CBMH302	0.021	0.436	0.009	0.021	0.009	10.000	78.276	0.002	0.013	32.8	0.5%	250	0.86	0.042	0.42	1.30	79	4.6%	11.30	
Fifth Street	102	CBMH302	STM MH303	0.042	0.47	0.019	0.062	0.028	11.302	73.570	0.006	0.013	27.6	0.5%	250	0.86	0.042	0.56	0.82	119	13.8%	12.12	
Sixth Street	201	CB401A	CBMH401	0.025	0.663	0.017	0.025	0.017	10.000	78.276	0.004	0.013	7.0	0.5%	250	0.86	0.042	0.50	0.24	100	8.6%	10.24	
Sixth Street	202	CBMH401	CBMH403	0.088	0.853	0.075	0.113	0.092	10.235	77.377	0.020	0.013	25.1	0.5%	250	0.86	0.042	0.78	0.53	188	46.9%	10.77	
Sixth Street	203	CBMH403	CBMH405	0.031	0.579	0.018	0.144	0.110	10.768	75.422	0.023	0.013	23.9	0.5%	250	0.86	0.042	0.82	0.49	199	54.6%	11.26	
Sixth Street	204	CB404	CBMH405	0.028	0.503	0.014	0.028	0.014	10.000	78.276	0.003	0.013	32.8	0.5%	250	0.86	0.042	0.47	1.16	93	7.2%	11.16	
Sixth Street	205	CBMH405	STC EF4	0.047	0.334	0.016	0.218	0.139	11.256	73.727	0.028	0.013	26.6	0.5%	250	0.86	0.042	0.86	0.52	216	67.7%	11.77	

Project Information

400 Maple Street	120174
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Drawing Reference

120174-DP02	November 12-20
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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 Concentration

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 x RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA x 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	0.649	0.075	0.116	0.075	10.000	102.271	0.021													
Maple Street	P2			0.096	0.624	0.060	0.096	0.060	10.000	102.271	0.017													
	P3			0.280	0.597	0.167	0.280	0.167	10.000	102.271	0.048													
Sixth Street	P4			0.109	0.654	0.071	0.109	0.071	10.000	102.271	0.020													
Fifth Street	101	CB301	CBMH302	0.021	0.436	0.009	0.021	0.009	10.000	102.271	0.003	0.013	32.8	0.5%	250	0.86	0.042	0.45	1.21	87	6.1%	11.21		
Fifth Street	102	CBMH302	STM MH303	0.042	0.47	0.019	0.062	0.028	11.211	96.673	0.008	0.013	27.6	0.5%	250	0.86	0.042	0.61	0.76	132	18.2%	11.97		
Sixth Street	201	CB401A	CBMH401	0.025	0.663	0.017	0.025	0.017	10.000	102.271	0.005	0.013	7.0	0.5%	250	0.86	0.042	0.53	0.22	110	11.2%	10.22		
Sixth Street	202	CBMH401	CBMH403	0.088	0.853	0.075	0.113	0.092	10.219	101.208	0.026	0.013	25.1	0.5%	250	0.86	0.042	0.84	0.50	208	61.4%	10.71		
Sixth Street	203	CBMH403	CBMH405	0.031	0.579	0.018	0.144	0.110	10.715	98.886	0.030	0.013	23.9	0.5%	250	0.86	0.042	0.86	0.46	220	71.6%	11.18		
Sixth Street	204	CB404	CBMH405	0.028	0.503	0.014	0.028	0.014	10.000	102.271	0.004	0.013	32.8	0.5%	250	0.86	0.042	0.51	1.08	103	9.4%	11.08		
Sixth Street	205	CBMH405	STC EF4	0.047	0.334	0.016	0.218	0.139	11.180	96.811	0.037	0.013	26.6	0.5%	250	0.86	0.042	0.86	0.52	239	88.9%	11.70		

Project Information

400 Maple Street	120174
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Drawing Reference

120174-DP02	November 12-20
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Prepared By

MJF	November 12-20
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Reviewed By

KRS	November 13-20
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Engineer's Stamp



Municipality

Town of Collingwood

Design Storm

10 year

Time of Concentration

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 x RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA x 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	0.649	0.075	0.116	0.075	10.000	118.359	0.025												
Maple Street	P2			0.096	0.624	0.060	0.096	0.060	10.000	118.359	0.020												
	P3			0.280	0.597	0.167	0.280	0.167	10.000	118.359	0.055												
Sixth Street	P4			0.109	0.654	0.071	0.109	0.071	10.000	118.359	0.024												
Fifth Street	101	CB301	CBMH302	0.021	0.436	0.009	0.021	0.009	10.000	118.359	0.003	0.013	32.8	0.5%	250	0.86	0.042	0.47	1.16	92	7.0%	11.16	
Fifth Street	102	CBMH302	STM MH303	0.042	0.47	0.019	0.062	0.028	11.165	112.193	0.009	0.013	27.6	0.5%	250	0.86	0.042	0.63	0.73	139	21.1%	11.89	
Sixth Street	201	CB401A	CBMH401	0.025	0.663	0.017	0.025	0.017	10.000	118.359	0.005	0.013	7.0	0.5%	250	0.86	0.042	0.55	0.21	116	13.0%	10.21	
Sixth Street	202	CBMH401	CBMH403	0.088	0.853	0.075	0.113	0.092	10.210	117.192	0.030	0.013	25.1	0.5%	250	0.86	0.042	0.86	0.49	220	71.1%	10.70	
Sixth Street	203	CBMH403	CBMH405	0.031	0.579	0.018	0.144	0.110	10.699	114.575	0.035	0.013	23.9	0.5%	250	0.86	0.042	0.86	0.46	233	82.9%	11.16	
Sixth Street	204	CB404	CBMH405	0.028	0.503	0.014	0.028	0.014	10.000	118.359	0.005	0.013	32.8	0.5%	250	0.86	0.042	0.53	1.03	109	10.8%	11.03	
Sixth Street	205	CBMH405	STC EF4	0.047	0.334	0.016	0.218	0.139	11.164	112.198	0.043	0.013	26.6	0.5%	300	0.97	0.068	0.96	0.46	253	63.4%	11.62	

Project Information

400 Maple Street	120174
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Drawing Reference

120174-DP02	November 12-20
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Prepared By

MJF	November 12-20
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Reviewed By

KRS	November 13-20
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Engineer's Stamp

Municipality

Town of Collingwood

Design Storm

25 year

Time of Concentration

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 x RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA x 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	0.649	0.075	0.116	0.075	10.000	138.402	0.029												
Maple Street	P2			0.096	0.624	0.060	0.096	0.060	10.000	138.402	0.023												
	P3			0.280	0.597	0.167	0.280	0.167	10.000	138.402	0.064												
Sixth Street	P4			0.109	0.654	0.071	0.109	0.071	10.000	138.402	0.027												
Fifth Street	101	CB301	CBMH302	0.021	0.436	0.009	0.021	0.009	10.000	138.402	0.003	0.013	32.8	0.5%	250	0.86	0.042	0.49	1.12	98	8.2%	11.12	
Fifth Street	102	CBMH302	STM MH303	0.042	0.47	0.019	0.062	0.028	11.116	131.546	0.010	0.013	27.6	0.5%	250	0.86	0.042	0.66	0.70	148	24.7%	11.81	
Sixth Street	201	CB401A	CBMH401	0.025	0.663	0.017	0.025	0.017	10.000	138.402	0.006	0.013	7.0	0.5%	250	0.86	0.042	0.58	0.20	123	15.2%	10.20	
Sixth Street	202	CBMH401	CBMH403	0.088	0.853	0.075	0.113	0.092	10.202	137.107	0.035	0.013	25.1	0.5%	250	0.86	0.042	0.86	0.49	233	83.2%	10.69	
Sixth Street	203	CBMH403	CBMH405	0.031	0.579	0.018	0.144	0.110	10.690	134.076	0.041	0.013	23.9	0.5%	250	0.86	0.042	0.86	0.46	247	97.0%	11.15	
Sixth Street	204	CB404	CBMH405	0.028	0.503	0.014	0.028	0.014	10.000	138.402	0.005	0.013	32.8	0.5%	250	0.86	0.042	0.55	0.99	115	12.7%	10.99	
Sixth Street	205	CBMH405	STC EF4	0.047	0.334	0.016	0.218	0.139	11.155	131.322	0.051	0.013	26.6	0.5%	300	0.97	0.068	0.97	0.46	268	74.2%	11.61	

Project Information

400 Maple Street	120174
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Drawing Reference

120174-DP02	November 12-20
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Prepared By

MJF	November 12-20
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Reviewed By

KRS	November 13-20
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Engineer's Stamp

Municipality

Town of Collingwood

Design Storm

50 year

Time of Concentration

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 x RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA x 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	0.649	0.075	0.116	0.075	10.000	153.176	0.032													
Maple Street	P2			0.096	0.624	0.060	0.096	0.060	10.000	153.176	0.025													
	P3			0.280	0.597	0.167	0.280	0.167	10.000	153.176	0.071													
Sixth Street	P4			0.109	0.654	0.071	0.109	0.071	10.000	153.176	0.030													
Fifth Street	101	CB301	CBMH302	0.021	0.436	0.009	0.021	0.009	10.000	153.176	0.004	0.013	32.8	0.5%	250	0.86	0.042	0.50	1.09	102	9.1%	11.09		
Fifth Street	102	CBMH302	STM MH303	0.042	0.47	0.019	0.062	0.028	11.086	145.959	0.012	0.013	27.6	0.5%	250	0.86	0.042	0.68	0.68	154	27.4%	11.76		
Sixth Street	201	CB401A	CBMH401	0.025	0.663	0.017	0.025	0.017	10.000	153.176	0.007	0.013	7.0	0.5%	250	0.86	0.042	0.59	0.20	128	16.8%	10.20		
Sixth Street	202	CBMH401	CBMH403	0.088	0.853	0.075	0.113	0.092	10.196	151.817	0.039	0.013	25.1	0.5%	250	0.86	0.042	0.86	0.49	242	92.1%	10.68		
Sixth Street	203	CBMH403	CBMH405	0.031	0.579	0.018	0.144	0.110	10.684	148.542	0.045	0.013	23.9	0.5%	300	0.97	0.068	0.97	0.41	257	66.1%	11.10		
Sixth Street	204	CB404	CBMH405	0.028	0.503	0.014	0.028	0.014	10.000	153.176	0.006	0.013	32.8	0.5%	250	0.86	0.042	0.57	0.97	120	14.0%	10.97		
Sixth Street	205	CBMH405	STC EF4	0.047	0.334	0.016	0.218	0.139	11.096	145.896	0.056	0.013	26.6	0.5%	300	0.97	0.068	0.97	0.46	279	82.4%	11.55		

Project Information

400 Maple Street	120174
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Drawing Reference

120174-DP02	November 12-20
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Prepared By

MJF	November 12-20
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Reviewed By

KRS	November 13-20
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Engineer's Stamp



Municipality

Town of Collingwood

Design Storm

100 year

Time of Concentration

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 x RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA x 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	0.649	0.075	0.116	0.075	10.000	168.449	0.035												
Maple Street	P2			0.096	0.624	0.060	0.096	0.060	10.000	168.449	0.028												
	P3			0.280	0.597	0.167	0.280	0.167	10.000	168.449	0.078												
Sixth Street	P4			0.109	0.654	0.071	0.109	0.071	10.000	168.449	0.033												
Fifth Street	101	CB301	CBMH302	0.021	0.436	0.009	0.021	0.009	10.000	168.449	0.004	0.013	32.8	0.5%	250	0.86	0.042	0.52	1.06	105	10.0%	11.06	
Fifth Street	102	CBMH302	STM MH303	0.042	0.47	0.019	0.062	0.028	11.059	160.693	0.013	0.013	27.6	0.5%	250	0.86	0.042	0.70	0.66	159	30.2%	11.72	
Sixth Street	201	CB401A	CBMH401	0.025	0.663	0.017	0.025	0.017	10.000	168.449	0.008	0.013	7.0	0.5%	250	0.86	0.042	0.61	0.19	133	18.5%	10.19	
Sixth Street	202	CBMH401	CBMH403	0.088	0.853	0.075	0.113	0.092	10.191	166.990	0.043	0.013	25.1	0.5%	300	0.97	0.068	0.96	0.44	251	62.3%	10.63	
Sixth Street	203	CBMH403	CBMH405	0.031	0.579	0.018	0.144	0.110	10.628	163.752	0.050	0.013	23.9	0.5%	300	0.97	0.068	0.97	0.41	266	72.9%	11.04	
Sixth Street	204	CB404	CBMH405	0.028	0.503	0.014	0.028	0.014	10.000	168.449	0.006	0.013	32.8	0.5%	250	0.86	0.042	0.58	0.94	124	15.4%	10.94	
Sixth Street	205	CBMH405	STC EF4	0.047	0.334	0.016	0.218	0.139	11.040	160.823	0.062	0.013	26.6	0.5%	300	0.97	0.068	0.97	0.46	289	90.8%	11.50	

**Appendix C:
Modified Rational Method for
Quantity Control Storage
Requirements**

Modified Rational Method Calculation

Project Details

Victoria Annex	120174
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Prepared By

MJF	November 16, 2020
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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:	201-205	P4
Catchment Area (ha):	0.22	0.11
Runoff Coefficient:	0.64	0.65
Time of Concentration (min):	10.00	10.00

Design Storm	2YR	5YR	10YR	25YR	50YR	100YR	Design Storm	2YR	5YR	10YR	25YR	50YR	100YR	
A	807	1135	1387	1676	1973	2193	201-205	i (mm/hr)	78	102	118	138	153	168
B	6.75	7.50	7.97	8.30	9.00	9.04		Runoff C	0.64	0.64	0.64	0.70	0.76	0.80
C	0.83	0.84	0.85	0.86	0.87	0.87		Q (m ³ /s)	0.03	0.04	0.05	0.06	0.07	0.08
i (mm/hr)	78	102	118	138	153	168	P4	i (mm/hr)	78	102	118	138	153	168
Runoff C	0.44	0.44	0.44	0.48	0.53	0.55		Runoff C	0.64	0.65	0.64	0.70	0.76	0.80
Q (m ³ /s)	0.03	0.04	0.05	0.06	0.07	0.08		Q (m ³ /s)	0.02	0.02	0.02	0.03	0.04	0.04


Peak Runoff Rate (m³/s) - Rational Method (Q=CiA/360)

Storm	Q _{EXISTING}	Q _{NO CONTROLS}	Q _{UNCONTROLLED}	Q _{CONTROLLED}	Q _{TOTAL}	Q _{REDUCTION}
2YR	0.030	0.045	0.015	0.015	0.030	0.030 m ³ /s
5YR	0.039	0.060	0.020	0.019	0.039	0.041 m ³ /s
10YR	0.046	0.069	0.023	0.023	0.046	0.046 m ³ /s
25YR	0.059	0.088	0.029	0.029	0.059	0.059 m ³ /s
50YR	0.071	0.107	0.036	0.035	0.071	0.071 m ³ /s
100YR	0.081	0.122	0.041	0.040	0.081	0.082 m ³ /s

Required Storage Volumes (m³) - Modified Rational Method (V_p = Q_p x D - Q_o x ((D + t_c)/2))

Dur. (min)	2YR	5YR
10	9.1	12.3
20	11	15
30	10	15
40	9	12
50	6	9
60	3	6
70	0	2

Appendix D: Orifice Discharge Calculations

	Project: Victoria Annex	Date: 2020-11-10
	File No.: 120174	Designed: MJF
	Subject: Oriface Discharge Calculations	Checked: KRS

Oriface Dia. (mm) 75
Cross Sectional Area (m²) 0.0044179
Oriface Coefficient 0.80 Short tube oriface
Oriface Invert Elevation (m) 183.84

Water Elevation (m)	Head (m)	Discharge (cms)
183.84	0.00	0.000
183.94	0.06	0.004
184.04	0.16	0.006
184.14	0.26	0.008
184.24	0.36	0.009
184.34	0.46	0.011
184.44	0.56	0.012
184.54	0.66	0.013
184.64	0.76	0.014
184.74	0.86	0.015
184.84	0.96	0.015
184.94	1.06	0.016
185.04	1.16	0.017

Appendix E: Stormceptor Sizing

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

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:	

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):	

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



Stormceptor® EF Sizing Report

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 waterways.

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

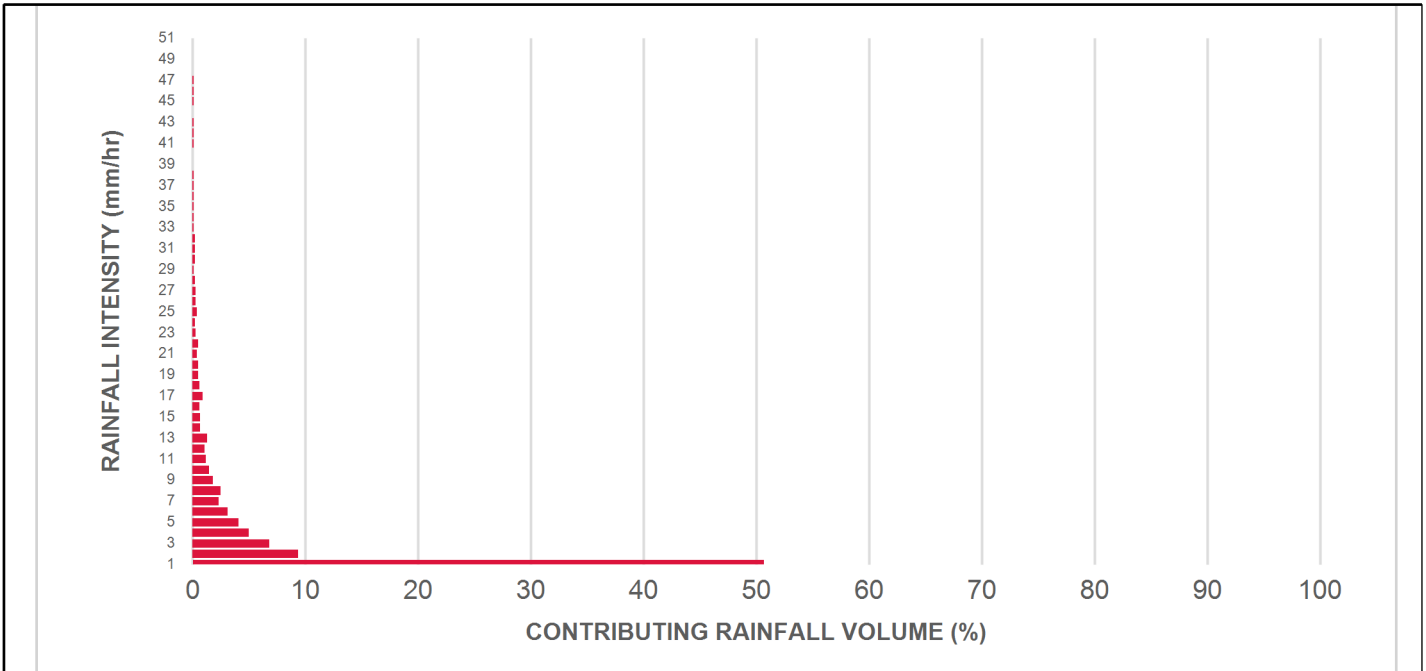
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
1	50.7	50.7	0.39	23.0	20.0	93	47.2	47.2
2	9.4	60.1	0.78	47.0	39.0	93	8.7	55.9
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

Stormceptor® **EF** Sizing Report

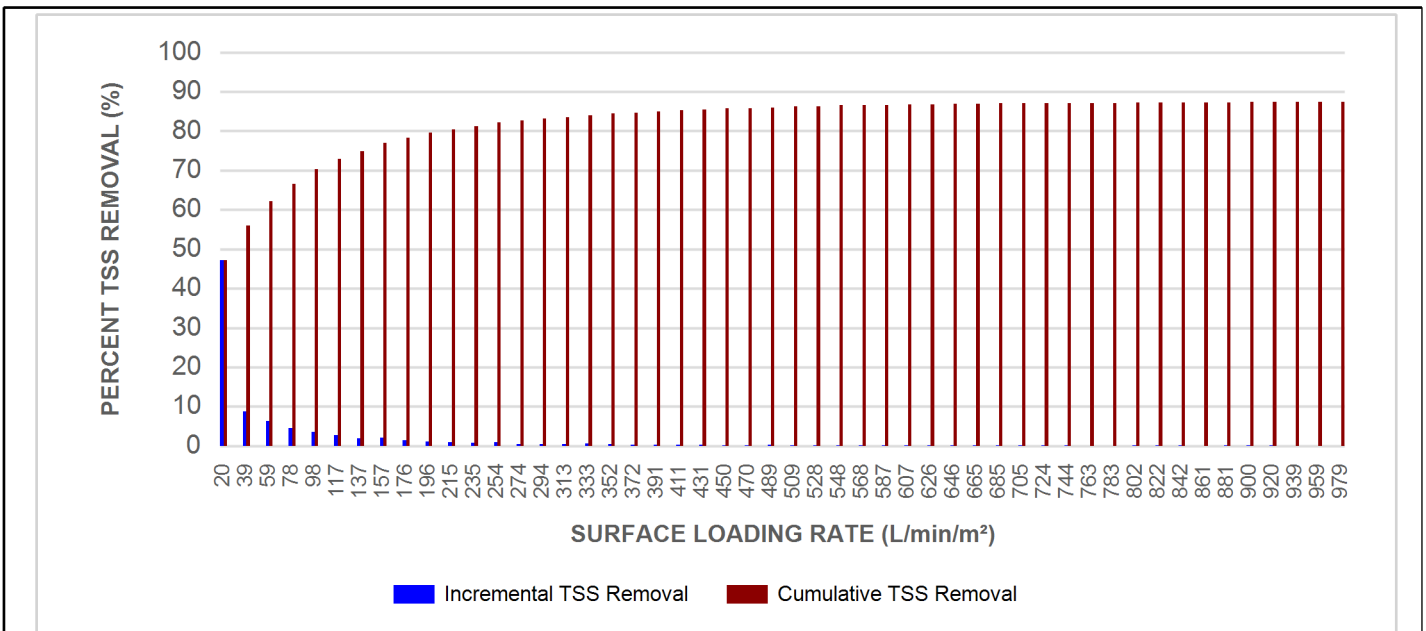
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m ²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
26	0.3	97.4	10.18	611.0	509.0	55	0.2	86.2
27	0.3	97.7	10.57	634.0	528.0	54	0.2	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 %

Stormceptor® EF Sizing Report

RAINFALL DATA FROM OWEN SOUND MOE RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Stormceptor® EF Sizing Report

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

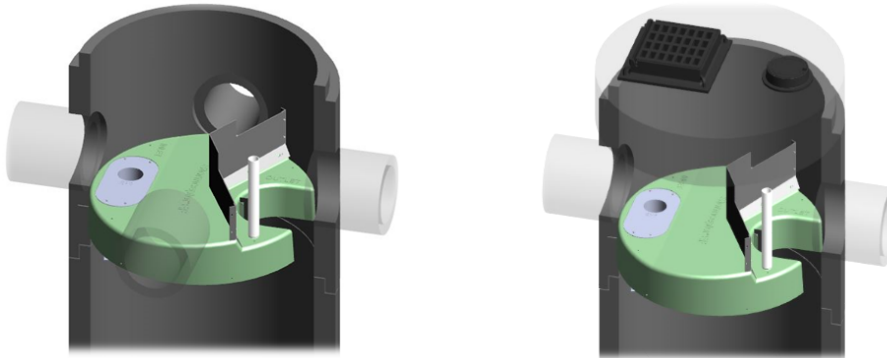
► Stormceptor® EF and EFO feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance 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

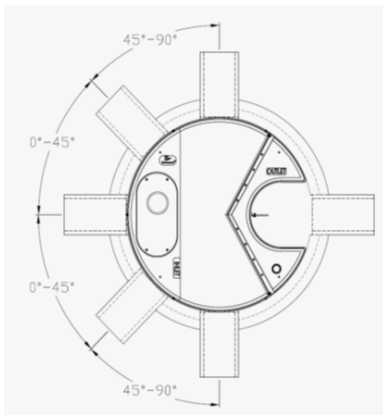
► Stormceptor® EF and EFO offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle,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



Stormceptor® EF Sizing Report



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)	(ft³)	(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/ft³)

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.imbrium.com/stormwater-treatment-solutions/stormceptor-ef>

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit <http://www.imbrium.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



Stormceptor®EF Sizing Report

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/m².

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.

