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SERVICING REPORT - 2370 WALKLEY ROAD

City File No.: D07-12-19-0164

September 5th, 2023

Prepared for:
Richcraft Homes Ltd.

Prepared by:
Stantec Consulting Ltd.

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160401534

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1 Introduction

Stantec Consulting Ltd. has been commissioned by Richcraft Hones Ltd. to prepare the following Servicing and Stormwater Management Report in support of the proposed redevelopment works located at 2370 Walkley Road in the City of Ottawa.

The 8.1 ha site is situated at the south side of Walkley Road, southeast of the Walkley and St. Laurent Boulevard intersection. The site is currently zoned IL H (11) and consists of a warehouse primarily serving as the Farm Boy Distribution Centre with surface parking and private driveways. The site is bound by Walkley Road to north, the existing Mather Drain and an existing office building to the west, a Giant Tiger supermarket and delivery warehouse to the east, and the Canadian National (CN) rail corridor to the south, as shown in **Figure 1** below.

Figure 1: Key Plan

The proposed works consists of expanded parking spaces and private driveways at the east, south and west of the site, along with a realigned and new stormwater sewer system that conveys drainage from existing lands to the east through the site to the Mather Drain at the west.

1.1 Objective

This site servicing and stormwater management (SWM) report presents a servicing scheme that is free of conflicts, provides on-site servicing in accordance with City of Ottawa Guidelines, and uses existing municipal infrastructure in accordance with any limitations communicated.

Criteria and constraints identified in the Novatech Servicing and Stormwater Management Report for the neighbouring Giant Tiger Head Office site have been used as a basis for the detailed servicing design of the proposed stormwater works. Specific and potential development constraints to be addressed are as follows:

- Storm Sewer Servicing
    - Define major and minor conveyance systems in conjunction with the proposed grading plan
    - Determine the stormwater management storage requirements to meet the allowable release rate for the site
    - Define and size the proposed storm sewers that will collect discharge from the realigned existing ditch at the east and from the private storm sewers servicing the neighbouring Giant Tiger Head Office site to the existing Mather Drain at the southwest.

- Prepare a grading plan in accordance with the proposed site plan and existing grades.

The accompanying drawings illustrate the proposed stormwater servicing for the expanded parking lot and driveways on site.

2 Background

Documents referenced in preparing this stormwater and servicing report for 2370 Walkley Road include:

- *City of Ottawa Sewer Design Guidelines* (SDG), City of Ottawa, October 2012, including all subsequent technical bulletins
- *Servicing and Stormwater Management Report – Giant Tiger Head Office (2480 Walkley Road), Ottawa,* Novatech, April 2019
- *Bylaw 223/57* for Easements of the Mather Drain Easements at 2370 Walkley Road, City of Ottawa and Township of Gloucester, County of Carleton, July 1957
- *Geotechnical Recommendations for Parking Lot Expansion 2370 Walkley Road*, Paterson Group, March 2023.

3 Stormwater Management and Servicing

3.1 Objectives

The goal of this stormwater servicing and management plan is to determine the measures necessary to control the quantity and quality of stormwater released from the proposed design to meet the criteria established during the consultation process with City of Ottawa staff, and to provide sufficient details required for approval.

3.2 Stormwater Management (SWM) Criteria

The Stormwater Management (SWM) criteria were established by combining current design practices outlined by the City of Ottawa Sewer Design Guidelines (SDG) (October 2012), review of similar SWM criteria established in the Novatech SWM Report for the neighbouring Giant Tiger site (2019), and through consultation with City of Ottawa staff. The following summarizes the criteria, with the source of each criterion indicated in brackets:

General

- Use of the dual drainage principle (City of Ottawa SDG)
- Wherever feasible and practical, site-level measures should be used to reduce and control the volume and rate of runoff (City of Ottawa SDG)
- Assess impact of 100-year event outlined in the City of Ottawa Sewer Design Guidelines on the major and minor drainage systems (City of Ottawa SDG)
- The post-development discharge under both the 5-year and 100-year storm events from the site are to be restricted to the 100-year pre-development discharge rate.
- Provide on-site water quality control with a minimum of 80 % TSS removal (Novatech SWM Report for Giant Tiger)

3.3 Existing Conditions

The site is delineated into several subcatchment areas plus the existing building, as shown in the Storm Drainage Plan (see **Drawing SD-1**). Existing subcatchments have been delineated based on relative locations of proposed parking lot expansion to compare directly to the post-development scenario. The overall existing parking area pre-development runoff coefficient was determined as C=0.56.

Table 3-1: Drainage Areas with Pre-Development Runoff Coefficient C

Subcatchments	C	A (ha)
EX-1	0.57	1.29
EX-2	0.55	0.63
EX-3	0.45	0.78
EX-4	0.78	0.31
EX-5	0.65	0.27
Total Parking Area	**0.56**	**3.28**

Minor catchment areas remaining entirely pervious under the proposed development scenario and not tributary to the proposed storm conveyance system have been omitted for clarity, and will continue to discharge overland to the Mather Drain.

Runoff from existing parking areas is additionally joined by roof runoff from an approximate 1.32ha building area (C=0.90) discharging to an existing on-site sewer and ultimately to the Mather Drain. The pre-development release rates for the site have been determined using the rational method and the drainage areas identified above. A time of concentration for pre-development areas (10 minutes) was assigned based on their proximity to the existing drainage outlet. The peak development flow rates shown in **Table 3-2** have been calculated using the rational method, while the pre-development discharge rates under both the 2-year and 100-year storm events are broken down by subcatchment areas in

Table 3-3: Pre-development Discharge Rates as follows:

$$Q = 2.78\,(C)(I)(A)$$

Where:
$Q = peak\ flow\ rate, L/s$
$C = site\ runoff\ coefficient$
$I = rainfall\ intensity, mm/hr\ (per\ City\ of\ Ottawa\ IDF\ curves)$
$A = drainage\ area, ha$

Table 3-2: Peak Pre-Development Discharge Rate

Design Storm	Pre-Development Rate (L/s)
2-year	**395**
5-year	**536**
100-year	**1148**

Table 3-3: Pre-development Discharge Rates

Subcatchments	2-Year (L/s)	5-Year (L/s)	100-Year (L/s)
EX-1	157	213	456
EX-2	74	100	215
EX-3	75	102	218
EX-4	52	70	150
EX-5	37	51	109
Total Parking Area*	**395**	**536**	**1148**

*Note: Total may not sum exactly due to rounding.

To obtain the target release rate under the 100-year storm event, the runoff coefficient values have been increased by 25 % to match the 25 % increase for the C coefficients post-development under the 100-year storm event, as per the City of Ottawa SDG. Therefore, the target release rate for the 100-year storm has been calculated with a pre-development runoff coefficient **C=0.70**.

3.4 Stormwater Management Design

The Modified Rational Method was employed to assess the rate and volume of runoff anticipated during post-development rainfall events. The site assumes seven subcatchment areas as defined by the proposed grades and the location and nature of inlet control devices (ICDs) following the expansion of the parking lot. A summary of subdrainage areas and runoff coefficients is provided in **Table 3-4** below. Further details can be found in **Appendix A.1**, while **Drawing SD-1** illustrates the drainage areas.

Table 3-4: Drainage Areas with Post-Development Runoff Coefficient C

Subcatchments	C	A (ha)
EX-1	0.57	1.29
EX-2	0.69	0.63
EX-3	0.67	0.80
EX-4	0.83	0.30
EX-5	0.90	0.27
Total Parking Area	**0.67**	**3.28**

3.4.1 ALLOWABLE RELEASE RATE

As summarized in **Table 3-2** above, the pre-development release rates were determined using the rational method. Given the proposed development consists of expanded parking areas and that there will be no changes made to the overall site drainage outlet to the existing Mather Drain, the post-development release rate for 2370 Walkley Road will be controlled to the pre-development discharge of the matching storm event. As no surface ponding is typically permitted for the 2-year design storm event, an increase in the estimated post development discharge for the 2-year storm scenario is expected due to the increase in impervious area from the proposed parking expansion. Given existing site constraints, lack of existing on-site stormwater management to reduce peak system outflows, and the availability of the Mather Drain to receive such flows under existing conditions, it is assumed that this increase for the 2-year storm event will have negligible impact on downstream systems.

3.4.2 QUANTITY CONTROL

The site requires quantity control measures to meet the pre-development stormwater release rates. It is proposed that surface storage complete with inlet control devices (ICDs) at the catch basins be used to reduce the site peak outflow rate to pre-development conditions. A spreadsheet using the Modified Rational Method (MRM) was used to size the ICDs for surface storage, as shown in **Appendix A.1**. Area EX-1 has been omitted from the MRM sheet (including associated runoff a part of the site overall allowable release rate) as no proposed works are identified for the area.

3.4.2.1 Surface Storage

Surface storage in the expanded parking areas will be achieved using catch basins equipped with an orifice or inlet control device (ICD) to restrict minor system peak flows as outlined below in **Table 3-5**, which shows the characteristics of the proposed ICDs (see **Appendix A.1** for detailed calculations).

Table 3-5: Schedule of Inlet Control Devices

Catchbasin ID	Tributary Area ID	ICD Type	2-Yr Head (m)	100-Yr Head (m)	2-Yr Flow (L/s)	100-Yr Flow (L/s)	Outlets to
CBMH 108	EX-2	145 mm Orifice	1.45	1.65	53.8	57.3	HDWL-1
CBMH 102A-1	EX-3	215 mm Orifice	1.36	1.91	114.4	135.7	HDWL-1
CBMH 111A-1	EX-5	190 mm Orifice	0.46	1.07	51.9	79.1	STM 111

The table below summarizes the required and available surface storage under the 100-year event.

Table 3-6: Summary of Surface Storage in 100-Year Event

Catchbasin ID	Tributary Area ID	Required Storage (m^3)	Provided Storage (m^3)
CBMH 108	EX-2	148.7	177.8
CBMH 102A-1	EX-3	118.2	118.2

CBMH 111A-1	EX-5	33.0	35.0

The Modified Rational Method spreadsheet identifies a potential requirement for ponded volume during the 2-year event for area EX-2 (CBMH 108). It should be noted that this volume is provided to manage depth of flow of runoff within the subcatchment controlled based on the maximum capture rate of the grate for CBMH108 (see table in **Appendix A.1**). As this depth of flow will not impact associated fire routes or travel lanes to the northeast, no concerns are identified with the ICD sizing as proposed.

3.4.2.2 Uncontrolled Areas

Uncontrolled areas represent drainage areas that either covers parking areas that remain largely unchanged, and thus continue to drain uncontrolled as per existing conditions, or have a small, expanded parking area that cannot be graded to direct stormwater flow to enter the storm sewer system.

Area EX-1 does not have any new asphalt area proposed as part of the driveway and parking expansion, so stormwater will continue to drain to the existing east ditch as per existing conditions. As no change to impervious area is proposed, EX-1 has not been considered in development of peak post-development flows and pre-development targets within the Modified Rational Method calculation sheet. An expanded culvert conveying flows from the area to the downstream piped system outletting to the Mather Drain has been provided to ensure relief of discharge up to and including the 2-year design storm event. Major system flows for area EX-1 are assumed to be managed on-site as per existing conditions.

Runoff from the parking lot expansion within area EX-4 is directed to a 2.0 m wide curb cut proposed at the western site boundary with rip rap to discharge at the surface into the Mather Drain.

Table 3-7: Peak Post-Development Discharge Rates from Uncontrolled Areas

Design Storm	EX-1 Discharge (L/s)	EX-4 Discharge (L/s)	Total Uncontrolled (L/s)*
2-Year	157	52	**210**
5-Year	213	72	**285**
100-Year	456	150	**605**

*Note: Total may not sum exactly due to rounding.

3.4.2.3 Results

The proposed stormwater management plan meets the requirements noted in sections above and attempts to match existing drainage patterns. **Table 3-8** provides a summary of the peak design discharge rates calculated from the MRM analysis, shown in **Appendix A.1**.

Table 3-8: Summary of 2-Year and 100-Year Event Release Rates

Drainage areas	2-year Peak Discharge (L/s)	5-Year Peak Discharge (L/s)	100-Year Peak Discharge (L/s)
Controlled, Outlet 1 (EX-2 and EX-3)	168	182	193
Controlled, Outlet 2 (EX-5)	52	70	79
Uncontrolled Areas (EX-4)	52	72	150
Total (L/s)*	**273**	**324**	**420**
Target (L/s)	**239**	**324**	**695**

*Note: Total may not sum exactly due to rounding.

3.4.3 QUALITY CONTROL

Given the site will continue to drain to the existing Mather Drain, it is assumed stormwater quality control criteria previously identified by the Rideau Valley Conservation Authority (RVCA) as established in the Novatech Stormwater Servicing Report for the neighbouring Giant Tiger site would be required. It was required that on-site quality control with a minimum of 80 % TSS long term removal is to be established for re-developed portions of the site. Area EX-1 is to remain as per existing conditions and has thus not been assessed for the quality control requirement.

Three Stormceptor oil/grit separators have been specified for this purpose and are arranged to treat flows captured by the proposed storm sewer segments within subcatchments EX-2, EX-3 and EX-5. Using a fine particle size distribution and the Stormceptor Sizing Tool, a Stormceptor model EFO4 has been selected for each of the three catch basin manholes proposed for the site and will achieve a range of 82 % to 91 % TSS removal, exceeding the minimum required TSS removal level of 80 %. The detailed Stormceptor sizing reports are included in **Appendix A.4**. The three oil/grit separators are located to treat approximately 96% of new impervious areas, enabling an overall quality treatment level of 81% TSS reduction.

While a Stormceptor EFO4 has been specified for all three catch basins, the objective is to demonstrate the ability to meet the water quality requirement. Other treatment systems with equivalent TSS removal capabilities based on parameters specified within the sizing reports may also be used.

3.5 Proposed Stormwater Servicing

The proposed stormwater servicing comprises three 1200 mm diameter catch basin manholes (CBMHs), a realigned CSP culvert, upsized to 600 mm diameter, conveying discharge from the ditch serving existing catchment area EX-1, a 525 mm diameter storm sewer and inlet conveying flow from the realigned ditch at the east to a proposed 1350mm diameter storm sewer replacing the existing ditch that previously conveyed stormwater discharge from the private storm sewers servicing the neighbouring Giant Tiger site. The proposed 1350mm sewer continues to the headwall outlet at the Mather Drain at the southwest.

Rip rap locations as per OPSD 810.010 complete with geotextile fabric are proposed at the end of the realigned ditch at the east and the storm trunk sewer outlet to the Mather Drain. Two additional drainage outlets are proposed for the expanded parking area at the west (EX-4 and EX-5). Area EX-4 could not be graded into the storm trunk sewer, and will be equipped with rip rap as per OPSD 801.010 and convey drainage from the expanded parking space directly to the existing Mather Drain.

The existing 300 mm diameter catch basin lead connected to the roof drain will be extended to the proposed storm trunk sewer.

Details of the pipe sizing and structures can be found in **Appendix A.3**, while **Drawing SD-1** showcases the pipe layouts**.**

4 Site Grading

The site measures approximately 3.33 ha in area. A detailed site servicing and grading plan (see **Drawing SSGP-1**) has been prepared to satisfy the stormwater management requirements described in **Section 3** and to allow for positive drainage away from the face of the building.

The topographic survey plan indicates that the pavement in the existing parking spaces and private driveways is relatively flat; the parking lot and driveway at the west drain towards the Mather Drain, and the east and south driveway and parking lot drains east to the existing ditch, which in turn conveys flows toward the southwest corner of the site and into the Mather Drain.

The site servicing and grading plan satisfies the grading and drainage objectives for the proposed development site. The proposed grading respects the existing grades at the property lines and provides adequate overland flow routes. The site grading has been designed to maintain the existing drainage patterns for the non-surface storage areas.

5 Approvals

The proposed parking lot expansion and storm sewers maintains the existing drainage patterns to the existing Mather Drain, which is a private drain. However, as the proposed storm trunk sewers conveys flows from the private storm sewers servicing the neighbouring Giant Tiger Head Office site, an Environmental Compliance Approval (ECA) from the Ministry of the Environment, Conservation, and Parks (MECP) is required for the proposed storm sewers servicing the shared works.

6 Erosion and Sediment Control During Construction

To protect downstream water quality and prevent sediment build-up in catch basins and storm sewers, erosion and sediment control measures must be implemented during construction. The following recommendations will be included in the contract documents and communicated to the Contractor.

1. Implement best management practices to provide appropriate protection of the existing and proposed drainage system and the receiving water course(s).
2. Limit the extent of the exposed soils at any given time.
3. Re-vegetate exposed areas as soon as possible.
4. Minimize the area to be cleared and grubbed.
5. Protect exposed slopes with geotextiles, geogrid, or synthetic mulches.
6. Install silt barriers/fencing around the perimeter of the site as indicated in **Drawing ECDS-1** to prevent the migration of sediment offsite.
7. Install trackout control mats (mud mats) at the entrance/egress to prevent migration of sediment into the public ROW.
8. Provide sediment traps and basins during dewatering works.
9. Install sediment traps (such as SiltSack® by Terrafix) between catch basins and frames.
10. Schedule the construction works at times which avoid flooding due to seasonal rains.

The Contractor will also be required to complete inspections and guarantee the proper performance of their erosion and sediment control measures at least after every rainfall. The inspections are to include:

- Verification that water is not flowing under silt barriers.
- Cleaning and changing the sediment traps placed on catch basins.

Refer to **Drawing ECDS-1** for the proposed location of silt fences, sediment traps, and other erosion control measures.

7 Geotechnical Investigation

A geotechnical investigation memo was prepared by Paterson Group on March 6, 2023 to provide an assessment of the subsurface conditions for the parking lot expansion. The subsurface profile generally consists of approximately 0.5 m to 1 m thickness of fill, comprising of silty sand with crushed stone and underlain by a silty clay deposit. From available geological mapping, the bedrock consists of shale with an overburden drift thickness of about 3 m to 5 m.

Based on Paterson's recommendations, the site is suitable for the proposed development. Pipe bedding and backfill materials should be in accordance with the most recent Material Specifications and Standard Detail Drawings by the City of Ottawa. Furthermore, it is concluded that the permanent slopes detailed in the Site Servicing and Grading Plan drawing (**Drawing SSGP-1**) are acceptable.

The recommended rigid pavement structure is further presented in

Table 7-1 below.

Table 7-1: Recommended Pavement Structure

Material	Access Lanes, Ramp and Heavy Truck Parking Areas
Wear Course – Superpave 12.5 Asphaltic Concrete	40 mm
Binder Course – Superpave 19.0 Asphaltic Concrete	50 mm
BASE – OPSS Granular A Crushed Stone	150 mm
SUBBASE – OPSS Granular B Type II	450 mm

Refer to the full geotechnical report attached in **Appendix B.3** for further details.

8 Conclusions

8.1 Stormwater Servicing and Management

Surface storage at catch basin manholes (CBMHs) equipped with inlet control devices (ICDs) have been proposed to limit the stormwater discharge rate for the 5-year and 100-year event to the equivalent storm event peak pre-development release rate. The remaining site area not identified for redevelopment drains uncontrolled as per existing conditions to the existing ditches at the east and to the existing Mather Drain to the west. Oil/grit separators are provided to meet the 80% TSS removal water quality requirement for redeveloped site areas.

8.2 Grading

The site measures approximately 3.33 ha in area and comprises of expanded parking spaces and a proposed storm sewer. The site grading and drainage patterns will be maintained as much as possible and will not be negatively impacted by the proposed parking lot expansion.

8.3 Approvals

An Environmental Compliance Approval (ECA) from the Ministry of the Environment, Conservation and Parks (MECP) will be required for the proposed storm trunk sewer, as it will convey stormwater discharge from the private storm sewer servicing the neighbouring Giant Tiger Head Office site to the Mather Drain.

8.4 Geotechnical Investigation

Based on the geotechnical investigation, the site is considered suitable for the proposed parking lot expansion, and it is recommended that the pipe bedding and backfill materials should be in accordance with the most recent Material Specifications and Standard Detail Drawings by the City of Ottawa. The permanent slopes detailed in the Site Servicing and Grading Plan drawing are acceptable.

APPENDICES

Appendix A Stormwater Servicing and Management

A.1 Modified Rational Method (MRM) Calculations

Stormwater Management Calculations

File No: **160401534**
Project: **2370 Walkley Road**
Date: **21-Jul-23**

SWM Approach:
Post-development to Pre-development flows

Post-Development Site Conditions:

Overall Runoff Coefficient for Site and Sub-Catchment Areas

Runoff Coefficient Table

Catchment Type	Sub-catchment Area ID / Description		Area (ha) "A"		Runoff Coefficient "C"	"A x C"		Overall Runoff Coefficient
Controlled - Tributary	EX-5	Hard	0.270		0.9	0.243		
		Soft	0.000		0.2	0.000		
		Subtotal		0.27			0.243	0.900
Uncontrolled - Tributary	EX-4	Hard	0.270		0.9	0.243		
		Soft	0.030		0.2	0.006		
		Subtotal		0.3			0.249	0.830
Controlled - Tributary	EX-3	Hard	0.537		0.9	0.483		
		Soft	0.263		0.2	0.053		
		Subtotal		0.8			0.536	0.670
Controlled - Tributary	EX-2	Hard	0.441		0.9	0.397		
		Soft	0.189		0.2	0.038		
		Subtotal		0.63			0.4347	0.690
Total				**2.000**			**1.463**	
Overall Runoff Coefficient= C:								**0.73**

Total Roof Areas	**0.000 ha**
Total Tributary Surface Areas (Controlled and Uncontrolled)	**1.700 ha**
Total Tributary Area to Outlet	**1.700 ha**
Total Uncontrolled Areas	**0.300 ha**
Total Site	**2.000 ha**

Stormwater Management Calculations

Project #160401534, 2370 Walkley Road
Modified Rational Method Calculations for Storage

2 yr Intensity
City of Ottawa

$I = a/(t + b)^c$

a =	732.951
b =	6.199
c =	0.810

t (min)	I (mm/hr)
10	76.81
20	52.03
30	40.04
40	32.86
50	28.04
60	24.56
70	21.91
80	19.83
90	18.14
100	16.75
110	15.57
120	14.56

Subdrainage Area: Predevelopment Tributary Area to Outlet
Area (ha): 2.0000
C: 0.56

Estimated Time of Concentration after Development

tc (min)	I (2 yr) (mm/hr)	Q2yr (L/s)
10	76.81	**239**

2 YEAR Modified Rational Method for Entire Site

Subdrainage Area: EX-5 — Controlled - Tributary
Area (ha): 0.27
C: 0.90

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.8	51.9	51.9	0.0	**0.0**
20	52.0	35.1	35.1	0.0	**0.0**
30	40.0	27.1	27.1	0.0	**0.0**
40	32.9	22.2	22.2	0.0	**0.0**
50	28.0	18.9	18.9	0.0	**0.0**
60	24.6	16.6	16.6	0.0	**0.0**
70	21.9	14.8	14.8	0.0	**0.0**
80	19.8	13.4	13.4	0.0	**0.0**
90	18.1	12.3	12.3	0.0	**0.0**
100	16.7	11.3	11.3	0.0	**0.0**
110	15.6	10.5	10.5	0.0	**0.0**
120	14.6	9.8	9.8	0.0	**0.0**

Storage: Surface Storage Above CB

Orifice Equation: $Q = CdA(2gh)^{0.5}$ Where C = 0.61
Orifice Diameter: 190.00 mm
Invert Elevation 70.71 m
T/G Elevation 71.59 m
Max Ponding Depth 0.00 m
Downstream W/L 0.00 m

	Stage	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Volume Check
2-year Water Level	71.26	0.46	51.9	0.0	0.0	OK

Subdrainage Area: EX-4 — Uncontrolled - Tributary
Area (ha): 0.30
C: 0.83

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.8	53.2	53.2		
20	52.0	36.0	36.0		
30	40.0	27.7	27.7		
40	32.9	22.7	22.7		
50	28.0	19.4	19.4		
60	24.6	17.0	17.0		
70	21.9	15.2	15.2		
80	19.8	13.7	13.7		
90	18.1	12.6	12.6		
100	16.7	11.6	11.6		
110	15.6	10.8	10.8		
120	14.6	10.1	10.1		

Subdrainage Area: EX-3 — Controlled - Tributary
Area (ha): 0.80
C: 0.67

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.8	114.4	114.4	0.0	**0.0**
20	52.0	77.5	77.5	0.0	0.0
30	40.0	59.7	59.7	0.0	0.0
40	32.9	49.0	49.0	0.0	0.0
50	28.0	41.8	41.8	0.0	0.0
60	24.6	36.6	36.6	0.0	0.0
70	21.9	32.7	32.7	0.0	0.0
80	19.8	29.5	29.5	0.0	0.0
90	18.1	27.0	27.0	0.0	0.0
100	16.7	25.0	25.0	0.0	0.0
110	15.6	23.2	23.2	0.0	0.0
120	14.6	21.7	21.7	0.0	0.0

Storage: Surface Storage Above CB

Orifice Equation: $Q = CdA(2gh)^{0.5}$ Where C = 0.61
Orifice Diameter: 215.00 mm
Invert Elevation 70.93 m
T/G Elevation 72.60 m
Max Ponding Depth 0.00 m
Downstream W/L 0.00 m

	Stage	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Volume Check
2-year Water Level	72.40	1.36	114.4	0.0	0.0	OK

Subdrainage Area: EX-2 — Controlled - Tributary
Area (ha): 0.63
C: 0.69

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.8	92.8	53.8	39.0	**23.4**
20	52.0	62.9	53.8	9.1	10.9
30	40.0	48.4	48.4	0.0	0.0
40	32.9	39.7	39.7	0.0	0.0
50	28.0	33.9	33.9	0.0	0.0
60	24.6	29.7	29.7	0.0	0.0
70	21.9	26.5	26.5	0.0	0.0
80	19.8	24.0	24.0	0.0	0.0
90	18.1	21.9	21.9	0.0	0.0
100	16.7	20.2	20.2	0.0	0.0
110	15.6	18.8	18.8	0.0	0.0
120	14.6	17.6	17.6	0.0	0.0

Storage: Above CB

Orifice Equation: CdA(2gh)^0.5 Where C = 0.61
Orifice Diameter: 145.00 mm
Invert Elevation 70.99 m
T/G Elevation 72.39 m
Max Ponding Depth 0.13 m
Downstream W/L 0.00 m

	Stage	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Volume Check
2-year Water Level	72.52	1.45	53.8	23.4	23.4	irate Controlled

Project #160401534, 2370 Walkley Road
Modified Rational Method Calculations for Storage

5 yr Intensity
City of Ottawa

$I = a/(t + b)^c$

a =	998.071
b =	6.053
c =	0.814

t (min)	I (mm/hr)
10	104.19
20	70.25
30	53.93
40	44.18
50	37.65
60	32.94
70	29.37
80	26.56
90	24.29
100	22.41
110	20.82
120	19.47

Subdrainage Area: Predevelopment Tributary Area to Outlet
Area (ha): 2.0000
C: 0.56

Estimated Time of Concentration after Development

tc (min)	I (5 yr) (mm/hr)	Q5yr (L/s)
10	104.19	**324**

5 YEAR Modified Rational Method for Entire Site

Subdrainage Area: EX-5 — Controlled - Tributary
Area (ha): 0.27
C: 0.90

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	104.2	70.4	69.6	0.8	0.5
20	70.3	47.5	69.6	0.0	0.0
30	53.9	36.4	69.6	0.0	0.0
40	44.2	29.8	69.6	0.0	0.0
50	37.7	25.4	69.6	0.0	0.0
60	32.9	22.3	69.6	0.0	0.0
70	29.4	19.8	69.6	0.0	0.0
80	26.6	17.9	69.6	0.0	0.0
90	24.3	16.4	69.6	0.0	0.0
100	22.4	15.1	69.6	0.0	0.0
110	20.8	14.1	69.6	0.0	0.0
120	19.5	13.2	69.6	0.0	0.0

Storage: Surface Storage Above CB

Orifice Equation: $Q = CdA(2gh)^{0.5}$ Where C = 0.61
Orifice Diameter: 190.00 mm
Invert Elevation 70.71 m
T/G Elevation 71.59 m
Max Ponding Depth 0.04 m
Downstream W/L 69.90 m

	Stage	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Volume Check
5-year Water Level	71.63	0.83	69.6	0.5	0.7	OK
					0.23	

Subdrainage Area: EX-4 — Uncontrolled - Tributary
Area (ha): 0.30
C: 0.83

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	104.2	72.1	72.1		
20	70.3	48.6	48.6		
30	53.9	37.3	37.3		
40	44.2	30.6	30.6		
50	37.7	26.1	26.1		
60	32.9	22.8	22.8		
70	29.4	20.3	20.3		
80	26.6	18.4	18.4		
90	24.3	16.8	16.8		
100	22.4	15.5	15.5		
110	20.8	14.4	14.4		
120	19.5	13.5	13.5		

Subdrainage Area: EX-3 — Controlled - Tributary
Area (ha): 0.80
C: 0.67

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	104.2	155.3	127.7	27.6	16.6
20	70.3	104.7	104.7	0.0	0.0
30	53.9	80.4	80.4	0.0	0.0
40	44.2	65.8	65.8	0.0	0.0
50	37.7	56.1	56.1	0.0	0.0
60	32.9	49.1	49.1	0.0	0.0
70	29.4	43.8	43.8	0.0	0.0
80	26.6	39.6	39.6	0.0	0.0
90	24.3	36.2	36.2	0.0	0.0
100	22.4	33.4	33.4	0.0	0.0
110	20.8	31.0	31.0	0.0	0.0
120	19.5	29.0	29.0	0.0	0.0

Storage: Surface Storage Above CB

Orifice Equation: $Q = CdA(2gh)^{0.5}$ Where C = 0.61
Orifice Diameter: 215.00 mm
Invert Elevation 70.93 m
T/G Elevation 72.60 m
Max Ponding Depth 0.13 m
Downstream W/L 70.04 m

	Stage	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Volume Check
5-year Water Level	72.73	1.69	127.7	16.6	16.6	OK
					0.00	

Subdrainage Area: EX-2 — Controlled - Tributary
Area (ha): 0.63
C: 0.69

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	104.2	125.9	54.6	71.3	42.8
20	70.3	84.9	54.6	30.3	36.3
30	53.9	65.2	54.6	10.5	19.0
40	44.2	53.4	53.4	0.0	0.0
50	37.7	45.5	45.5	0.0	0.0
60	32.9	39.8	39.8	0.0	0.0
70	29.4	35.5	35.5	0.0	0.0
80	26.6	32.1	32.1	0.0	0.0
90	24.3	29.4	29.4	0.0	0.0
100	22.4	27.1	27.1	0.0	0.0
110	20.8	25.2	25.2	0.0	0.0
120	19.5	23.5	23.5	0.0	0.0

Storage: Surface Storage Above CB

Orifice Equation: $Q = CdA(2gh)^{0.5}$ Where C = 0.61
Orifice Diameter: 145.00 mm
Invert Elevation 70.99 m
T/G Elevation 72.39 m
Max Ponding Depth 0.17 m
Downstream W/L 70.97 m

	Stage	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Volume Check
5-year Water Level	72.56	1.50	54.6	42.8	42.9	OK
					0.17	

Project #160401534, 2370 Walkley Road
Modified Rational Method Calculations for Storage

100 yr Intensity
City of Ottawa

$I = a/(t + b)^c$

a =	1735.688
b =	6.014
c =	0.820

t (min)	I (mm/hr)
10	178.56
20	119.95
30	91.87
40	75.15
50	63.95
60	55.89
70	49.79
80	44.99
90	41.11
100	37.90
110	35.20
120	32.89

100 YEAR Predevelopment Target Release from Portion of Site

Subdrainage Area: Predevelopment Tributary Area to Outlet
Area (ha): 2.0000
C: 0.70

Estimated Time of Concentration after Development

tc (min)	I (100 yr) (mm/hr)	Q100yr (L/s)
10	178.56	**695**

100 YEAR Modified Rational Method for Entire Site

Subdrainage Area: EX-5 — Controlled - Tributary
Area (ha): 0.27
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.6	134.0	79.1	55.0	**33.0**
20	120.0	90.0	79.1	11.0	13.2
30	91.9	69.0	79.1	0.0	0.0
40	75.1	56.4	79.1	0.0	0.0
50	64.0	48.0	79.1	0.0	0.0
60	55.9	42.0	79.1	0.0	0.0
70	49.8	37.4	79.1	0.0	0.0
80	45.0	33.8	79.1	0.0	0.0
90	41.1	30.9	79.1	0.0	0.0
100	37.9	28.5	79.1	0.0	0.0
110	35.2	26.4	79.1	0.0	0.0
120	32.9	24.7	79.1	0.0	0.0

Storage: Surface Storage Above CB

Orifice Equation: $Q = CdA(2gh)^{0.5}$ Where C = 0.61
Orifice Diameter: 190.00 mm
Invert Elevation 70.71 m
T/G Elevation 71.59 m
Max Ponding Depth 0.28 m
Downstream W/L 69.90 m

	Stage	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Volume Check
100-year Water Level	71.87	1.07	79.1	33.0	35.0	OK
					2.02	

Subdrainage Area: EX-4 — Uncontrolled - Tributary
Area (ha): 0.30
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.6	148.9	148.9		
20	120.0	100.0	100.0		
30	91.9	76.6	76.6		
40	75.1	62.7	62.7		
50	64.0	53.3	53.3		
60	55.9	46.6	46.6		
70	49.8	41.5	41.5		
80	45.0	37.5	37.5		
90	41.1	34.3	34.3		
100	37.9	31.6	31.6		
110	35.2	29.4	29.4		
120	32.9	27.4	27.4		

Subdrainage Area: EX-3 — Controlled - Tributary
Area (ha): 0.80
C: 0.84

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.6	332.6	135.7	196.9	**118.2**
20	120.0	223.4	135.7	87.8	105.3
30	91.9	171.1	135.7	35.5	63.8
40	75.1	140.0	135.7	4.3	10.3
50	64.0	119.1	135.7	0.0	0.0
60	55.9	104.1	135.7	0.0	0.0
70	49.8	92.7	135.7	0.0	0.0
80	45.0	83.8	135.7	0.0	0.0
90	41.1	76.6	135.7	0.0	0.0
100	37.9	70.6	135.7	0.0	0.0
110	35.2	65.6	135.7	0.0	0.0
120	32.9	61.3	135.7	0.0	0.0

Storage: Surface Storage Above CB

Orifice Equation: $Q = CdA(2gh)^{0.5}$ Where C = 0.61
Orifice Diameter: 215.00 mm
Invert Elevation 70.93 m
T/G Elevation 72.60 m
Max Ponding Depth 0.35 m
Downstream W/L 70.04 m

	Stage	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Volume Check
100-year Water Level	72.95	1.91	135.7	118.2	118.2	OK
					0.04	

Subdrainage Area: EX-2 — Controlled - Tributary
Area (ha): 0.63
C: 0.86

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.6	269.7	57.3	212.4	127.4
20	120.0	181.2	57.3	123.9	**148.7**
30	91.9	138.8	57.3	81.5	146.6
40	75.1	113.5	57.3	56.2	134.9
50	64.0	96.6	57.3	39.3	117.9
60	55.9	84.4	57.3	27.1	97.6
70	49.8	75.2	57.3	17.9	75.2
80	45.0	68.0	57.3	10.7	51.1
90	41.1	62.1	57.3	4.8	25.9
100	37.9	57.3	57.3	0.0	0.0
110	35.2	53.2	53.2	0.0	0.0
120	32.9	49.7	49.7	0.0	0.0

Storage: Surface Storage Above CB

Orifice Equation: $Q = CdA(2gh)^{0.5}$ Where C = 0.61
Orifice Diameter: 145.00 mm
Invert Elevation 70.99 m
T/G Elevation 72.39 m
Max Ponding Depth 0.35 m
Downstream W/L 70.97 m

	Stage	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Volume Check
100-year Water Level	72.74	1.65	57.3	148.7	177.8	OK
					29.14	

Stormwater Management Calculations

Project #160401534, 2370 Walkley Road
Modified Rational Method Calculations for Storage

SUMMARY TO OUTLET

Tributary Area	1.700 ha		
Total 2yr Flow to HDWL-1 (Outlet 1)	168.2 L/s		
Total 2yr Flow to STM 111 (Outlet 2)	51.9 L/s	Vrequired	Vavailable*
Total 2yr Flow to Sewer	220.1 L/s	23	23 m^3
Uncontrolled Area	0.300 ha		
Total 2yr Flow Uncontrolled	53.2 L/s		
Total Area	2.000 ha		
Total 2yr Flow	273.3 L/s		
Target	239.1 L/s		

Project #160401534, 2370 Walkley Road
Modified Rational Method Calculations for Storage

SUMMARY TO OUTLET

Tributary Area	1.700 ha			
Total 5yr Flow to HDWL-1 (Outlet 1)	182.3 L/s			
Total 5yr Flow to STM 111 (Outlet 2)	69.6 L/s	Vrequired	Vavailable*	
Total 5yr Flow to Sewer	251.9 L/s	60	60 m^3	**NOT OK!!!**
Uncontrolled Area	0.300 ha			
Total 5yr Flow Uncontrolled	72.1 L/s			
Total Area	2.000 ha			
Total 5yr Flow	324.0 L/s			
Target	324.4 L/s			

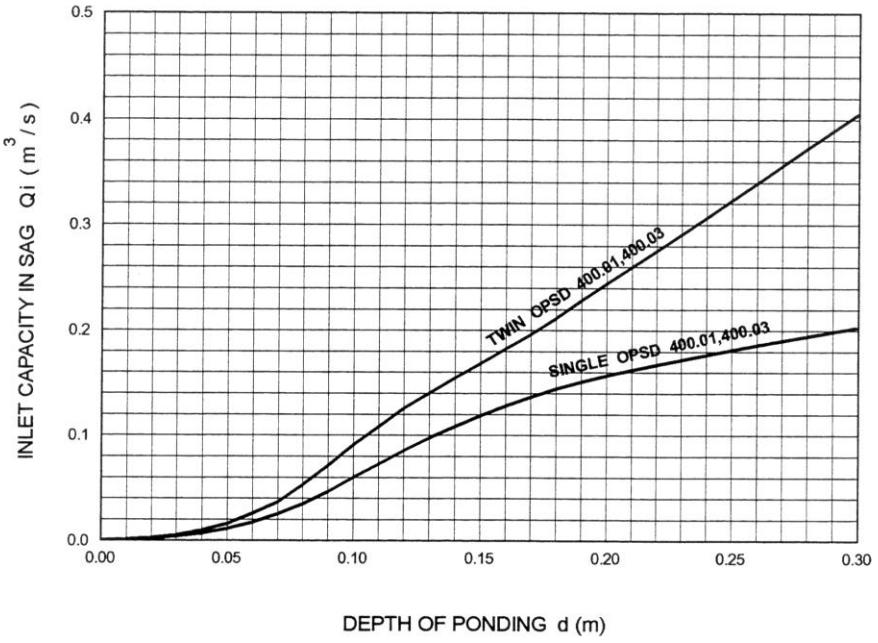
Project #160401534, 2370 Walkley Road
Modified Rational Method Calculations for Storage

SUMMARY TO OUTLET

Tributary Area	1.700 ha			
Total 100yr Flow to HDWL-1 (Outlet 1)	193.0 L/s			
Total 100yr Flow to STM 111 (Outlet 2)	79.1 L/s	Vrequired	Vavailable*	
Total 100yr Flow to Sewer	272.0 L/s	300	331 m^3	Ok
Uncontrolled Area	0.300 ha			
Total 100yr Flow Uncontrolled	148.9 L/s			
Total Area	2.000 ha			
Total 100yr Flow	420.9 L/s			
Target	695.0 L/s			

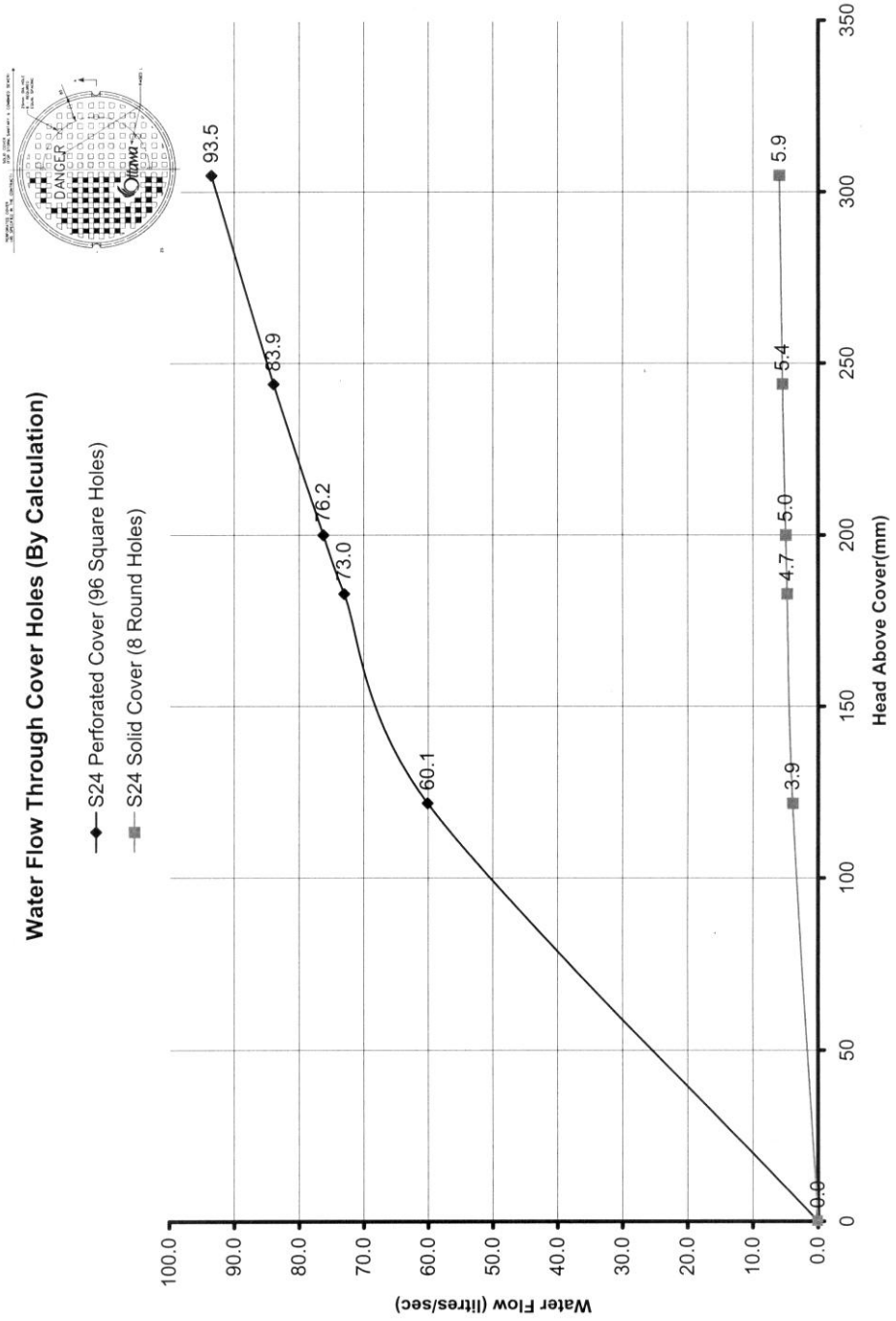
Surface Inlet Capacity At Road Sags[8]

Design Chart 4.19: Inlet Capacity at Road Sag



[8] From the *MTO Drainage Management Manual*

Calculated Water Flow through Cover Holes
Calculation by R. Holmes



A.2 Correspondence with the RVCA on Stormwater Quality Control

Wu, Michael

From: Jamie Batchelor <jamie.batchelor@rvca.ca>
Sent: Tuesday, 14 February, 2023 09:27
To: Wu, Michael
Cc: Gillis, Sheridan
Subject: RE: 2370 Walkley Road Stormwater Quality Control Criteria

Good Morning Michael,

Thanks you for your inquiry. Due to changes enacted through Bill 23 and Ontario Regulation 596/22, the Conservation Authority can no longer provide comments on water quality requirements on site specific applications. Therefore, the decision whether on-site water quality treatment is required and what would trigger on-site water quality now rests with the City.

However, I can provide general information in relation to the Mather Award Drain. The appropriate water quality target for the MacEwen Creek Subwatershed which includes the Mather Award Drain is 'enhanced' (80% TSS Removal).

Given that the stormwater will be directed directly to the Mather Award Municipal Drain, the RVCA would review any stormwater management plan for the outlet with a focus on ensuring there is no impact to natural hazards, specifically flooding or erosion. For your information, there are also studies or documents which affect this area:

- https://www.rvca.ca/media/k2/attachments/CSW2016_McEwan_FINAL.pdf

If you have any questions do not hesitate to contact me.

From: Wu, Michael <Michael.Wu@stantec.com>
Sent: Tuesday, February 7, 2023 2:37 PM
To: Jamie Batchelor <jamie.batchelor@rvca.ca>
Cc: Gillis, Sheridan <Sheridan.Gillis@stantec.com>
Subject: 2370 Walkley Road Stormwater Quality Control Criteria

Good afternoon, Jamie:

I hope you are doing well.

I am writing to request stormwater quality control criteria for the proposed parking lot expansion and stormwater works on 2370 Walkley Road in the City of Ottawa.

Below is a list of some key site information:

1. The existing parking lot on site will be expanded, complete with new stormwater sewer and catch basins that will discharge to the existing Mather Drain to the southwest of the site
2. Stormwater quantity control for the site is anticipated to be provided via surface storage at the catch basins and the remaining site uncontrolled as per existing conditions.
3. The allowable stormwater release rate is to be calculated using:
    a. Allowable Runoff Coefficient (C): 0.56
    b. Allowable flowrate: Control post-development discharge to the predevelopment discharge under both the 5-year and 100-year storm events.

Attached is the storm drainage plan and a site map for your information.

Thank you in advance for your time and assistance. Please let me know if you require any additional information from our end.

Regards,

Michael Wu, EIT
Civil Engineering Intern, Community Development

Work: (613) 738-6033
Mobile: (613) 858-0548
michael.wu@stantec.com

Stantec
300 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

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Atención: Este correo electrónico proviene de fuera de Stantec. Por favor, tome precauciones adicionales.

A.3 Storm Sewer Design Sheet

Stantec

2370 Walkley Road

DATE: 2023-07-21
REVISION: 2
DESIGNED BY: MJS
CHECKED BY: DT

STORM SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160401534

DESIGN PARAMETERS

$I = a / (t+b)^c$ (As per City of Ottawa Guidelines, 2012)

	1:2 yr	1:5 yr	1:10 yr	1:100 yr
a =	732.951	998.071	1174.184	1735.688
b =	6.199	6.053	6.014	6.014
c =	0.810	0.814	0.816	0.820

MANNING'S n = 0.013
MINIMUM COVER: 2.00 m
TIME OF ENTRY 10 min
BEDDING CLASS = B
MANNING'S CSP = 0.024

LOCATION			DRAINAGE AREA																					PIPE SELECTION										
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (2-YEAR) (ha)	AREA (5-YEAR) (ha)	AREA (10-YEAR) (ha)	AREA (100-YEAR) (ha)	AREA (ROOF) (ha)	C (2-YEAR) (-)	C (5-YEAR) (-)	C (10-YEAR) (-)	C (100-YEAR) (-)	A x C (2-YEAR) (ha)	ACCUM AxC (2YR) (ha)	A x C (5-YEAR) (ha)	ACCUM. AxC (5YR) (ha)	A x C (10-YEAR) (ha)	ACCUM. AxC (10YR) (ha)	A x C (100-YEAR) (ha)	ACCUM. AxC (100YR) (ha)	T of C (min)	$I_{2\text{-YEAR}}$ (mm/h)	$I_{5\text{-YEAR}}$ (mm/h)	$I_{10\text{-YEAR}}$ (mm/h)	$I_{100\text{-YEAR}}$ (mm/h)	$Q_{CONTROL}$ (L/s)	ACCUM. $Q_{CONTROL}$ (L/s)	Q_{ACT} (CIA/360) (L/s)	LENGTH (m)	PIPE WIDTH OR DIAMETEI (mm)	PIPE HEIGHT (mm)	PIPE SHAPE (-)	MATERIAL (-)	CLASS (-)	SLOPE %	Q_{CAP} (FULL) (L/s)	% FULL (-)	VEL. (FULL) (m/s)	TIME OF FLOW (min)
EX-1	110	109	1.29	0.00	0.00	0.00	0.00	0.57	0.00	0.00	0.00	0.735	0.735	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	156.9	55.0	600	600	CIRCULAR	CSP	-	0.30	182.2	**86.12%**	0.64	1.41
																				11.41									600	600								
EXTERNAL FROM GT	105	104	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	16.25	58.97	79.72	93.35	136.28	1661.8	1661.8	1661.8	5.3	1350	1350	CIRCULAR	CONCRETE	-	0.50	3937.3	**42.21%**	2.66	0.04
																				16.29																		
EX-2	106	104	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.735	0.000	0.000	0.000	0.000	0.000	0.000	11.41	71.77	97.28	114.00	166.59	57.3	57.3	203.9	33.5	525	525	CIRCULAR	CONCRETE	-	0.35	265.4	**76.82%**	1.19	0.48
																				11.90																		
	104	103	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.735	0.000	0.000	0.000	0.000	0.000	0.000	16.29	58.88	79.61	93.21	136.08	0.0	1719.1	1839.4	54.3	1350	1350	CIRCULAR	CONCRETE	-	0.20	2490.2	**73.87%**	1.69	0.56
	103	102	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.735	0.000	0.000	0.000	0.000	0.000	0.000	16.85	57.72	78.02	91.34	133.35	0.0	1719.1	1837.0	106.9	1350	1350	CIRCULAR	CONCRETE	-	0.20	2490.2	**73.77%**	1.69	1.10
EX-3, EX-BLDG	102	101	0.00	0.00	0.00	1.32	0.00	0.00	0.00	0.00	0.90	0.000	0.735	0.000	0.000	0.000	0.000	1.187	1.187	17.95	55.58	75.10	87.91	128.31	135.7	1854.8	2391.4	19.9	1350	1350	CIRCULAR	CONCRETE	-	0.20	2490.2	**96.03%**	1.69	0.19
	101	100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.735	0.000	0.000	0.000	0.000	0.000	1.187	18.14	55.23	74.62	87.35	127.48	0.0	1854.8	2388.0	6.7	1350	1350	CIRCULAR	CONCRETE	-	0.20	2490.2	**95.90%**	1.69	0.06
																				18.20									1350	1350								

Notes:

1) Giant Tiger External controlled release rate derived from Servicing and Stormwater Management Report 117203 dated January 24, 2019, prepared by Novatech. Combines existing west development uncontrolled outflow (1274L/s, Table 9.2 page 13 PDF) and east (new) development controlled restricted outflow (387.8L/s, Section 12.0 page 19 PDF). Time of concentration estimated from east (new) development design sheet (page 53 PDF).

Project No. 117203
Project Name: Giant Tiger Head Office
Project Location: 2480 Walkley Road

NOVATECH
Engineers, Planners & Landscape Architects

Date: January 2018
Date Revised: April 2019

2 Year Storm Sewer Design Sheet

LOCATION			AREA (Ha)				FLOW					PROPOSED SEWER							
AREA ID	FROM	TO	TOTAL AREA (ha)	R= 0.2	R= 0.9	R	INDIV 2.78 AR	ACCUM 2.78 AR	TIME OF CONC.	RAINFALL INTENSITY I	PEAK FLOW Q (l/s)	PIPE SIZE (mm)	PIPE SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min.)	EXCESS CAPACITY (l/s)	Q/Qfull
R-01	BLDG	STMMH 120	0.790	0.000	0.790	0.90					42.50	254.0	2.00	15.5	87.82	1.73	0.15	45.32	0.48
A-01	CBMH 1	MAIN	0.138	0.005	0.133	0.87	0.34	0.34	10.00	76.81	25.77	203.2	1.00	4.0	34.25	1.06	0.06	8.48	0.75
A-02	CBMH 2	MAIN	0.122	0.041	0.081	0.66	0.23	0.23	10.00	76.81	17.32	254.0	1.00	23.3	62.10	1.22	0.32	44.79	0.28
	STMMH 120	STMMH 118						0.56	10.32	75.61	84.92	304.8	1.00	41.1	100.98	1.38	0.50	16.07	0.84
A-03	CBMH 3	STMMH 118	0.226	0.070	0.156	0.68	0.43	0.43	10.00	76.81	32.97	254.0	0.50	9.3	43.91	0.87	0.18	10.95	0.75
	STMMH 118	STMMH 112						0.99	10.81	73.82	115.60	381.0	0.50	101.2	129.47	1.13	1.49	13.87	0.89
A-06	CBMH 5	STMMH 116	0.247	0.023	0.224	0.83	0.57	0.57	10.00	76.81	44.03	304.8	0.50	22.7	71.41	0.98	0.39	27.38	0.62
A-08	CBMH 7	STMMH 116	0.161	0.004	0.157	0.88	0.40	0.40	10.00	76.81	30.34	304.8	0.50	22.2	71.41	0.98	0.38	41.07	0.42
	STMMH 116	STMMH 114						0.97	10.38	75.38	72.99	381.0	0.50	27.0	129.47	1.13	0.40	56.48	0.56
A-05	CBMH 6	STMMH 114	0.264	0.019	0.245	0.85	0.62	0.62	10.00	76.81	47.89	304.8	1.00	22.7	100.98	1.38	0.27	53.09	0.47
A-07	CBMH 8	STMMH 114	0.210	0.010	0.200	0.87	0.51	0.51	10.00	76.81	38.86	304.8	0.50	21.2	71.41	0.98	0.36	32.55	0.54
	STMMH 114	STMMH 112						2.10	10.78	73.95	155.13	381.0	1.00	18.9	183.10	1.60	0.20	27.96	0.85
	STMMH 112	STMMH 106						3.09	12.30	68.98	255.50	533.4	0.50	69.9	317.57	1.42	0.82	62.07	0.80
A-13	CB 11	STMMH 110	0.052	0.000	0.052	0.90	0.13	0.13	10.00	76.81	9.99	381.0	0.80	80.7	163.77	1.43	0.94	153.77	0.06
A-14	CBMH 11	STMMH 110	0.050	0.003	0.047	0.86	0.12	0.12	10.00	76.81	9.16	686.0	0.30	26.2	481.17	1.30	0.34	472.01	0.02
A-15	STMMH 110	STMMH 108	0.568	0.302	0.266	0.53	0.83	1.08	10.94	73.38	79.46	381.0	0.50	62.3	129.47	1.13	0.92	50.01	0.61
A-10	CBMH 10	MAIN	0.236	0.047	0.189	0.76	0.50	0.50	10.00	76.81	38.33	304.8	1.00	18.8	100.98	1.38	0.23	62.66	0.38
A-09	CBMH 9	MAIN	0.290	0.015	0.275	0.86	0.70	0.70	10.00	76.81	53.49	304.8	1.00	20.6	100.98	1.38	0.25	47.50	0.53
A-16	STMMH 108	STMMH 106	0.079	0.016	0.063	0.76	0.17	2.44	11.85	70.36	172.00	457.2	0.50	83.0	210.53	1.28	1.08	38.53	0.82
A-17	STMMH 106	STMMH 104	0.099	0.010	0.089	0.83	0.23	5.76	13.12	66.59	426.14	685.8	0.30	80.3	480.80	1.30	1.03	54.66	0.89
A-04	CBMH 4	STMMH 124	0.219	0.071	0.148	0.67	0.41	0.41	10.00	76.81	31.47	254.0	1.00	31.6	62.10	1.22	0.43	30.63	0.51
A-11	STMMH 124	STMMH 122	0.358	0.135	0.223	0.64	0.63	1.04	10.43	75.19	78.41	381.0	0.50	101.2	129.47	1.13	1.49	51.06	0.61
A-12	STMMH 122	STMMH 104	0.362	0.154	0.208	0.60	0.61	1.65	11.92	70.15	115.67	457.2	0.50	83.8	210.53	1.28	1.09	94.86	0.55
	STMMH 104	OGS						7.41	14.15	63.85	515.62	762.0	0.30	5.9	636.77	1.39	0.07	121.15	0.81
	OGS	STMMH 102						7.41	14.22	63.67	514.30	762.0	0.30	88.7	636.77	1.39	1.06	122.47	0.81
	STMMH 102	STMMH 100						7.41	15.28	61.12	495.35	762.0	0.30	81.4	636.77	1.39	0.97	141.42	0.78
	STMMH 100	HEADWALL						7.41	16.25	58.96	479.40	762.0	0.30	68.0	636.77	1.39	0.81	157.38	0.75

***Note: Storm sewer design sheet flows are peak uncontrolled flows. Flows will be attenuated with ICD's which will increase the excess capacity in the pipes**

Definitions
Q = 2.78 AIR
Q = Peak Flow, in Litres per second (L/s)
A = Area in hectares (ha)
I = 2 YEAR Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min Velocity = 0.76 m/sec.
3) 2 Year intensity = $732.951 / (time + 6.199)^{0.810}$

A.4 Detailed Stormceptor Sizing Reports

Stormceptor® FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

02/09/2023

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20

Site Name:	EX-2

Drainage Area (ha):	0.63
Runoff Coefficient 'c':	0.69

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

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	14.03
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:	2370 Walkley Road
Project Number:	160401534
Designer Name:	Michael Wu
Designer Company:	Stantec
Designer Email:	Michael.Wu@stantec.com
Designer Phone:	613-738-6033
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	85
EFO6	93
EFO8	97
EFO10	98
EFO12	99

Recommended Stormceptor EFO Model: EFO4

Estimated Net Annual Sediment (TSS) Load Reduction (%): 85

Water Quality Runoff Volume Capture (%): > 90

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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 (%)
0.5	8.6	8.6	0.60	36.0	30.0	100	8.6	8.6
1	20.3	29.0	1.21	73.0	60.0	100	20.3	29.0
2	16.2	45.2	2.42	145.0	121.0	93	15.1	44.1
3	12.0	57.2	3.63	218.0	181.0	86	10.3	54.4
4	8.4	65.6	4.83	290.0	242.0	81	6.9	61.2
5	5.9	71.6	6.04	363.0	302.0	78	4.7	65.9
6	4.6	76.2	7.25	435.0	363.0	76	3.5	69.4
7	3.1	79.3	8.46	508.0	423.0	73	2.2	71.6
8	2.7	82.0	9.67	580.0	483.0	70	1.9	73.6
9	3.3	85.3	10.88	653.0	544.0	67	2.2	75.8
10	2.3	87.6	12.08	725.0	604.0	65	1.5	77.3
11	1.6	89.2	13.29	798.0	665.0	64	1.0	78.3
12	1.3	90.5	14.50	870.0	725.0	64	0.8	79.1
13	1.7	92.2	15.71	943.0	786.0	63	1.1	80.2
14	1.2	93.5	16.92	1015.0	846.0	63	0.8	81.0
15	1.2	94.6	18.13	1088.0	906.0	62	0.7	81.7
16	0.7	95.3	19.34	1160.0	967.0	62	0.4	82.1
17	0.7	96.1	20.54	1233.0	1027.0	61	0.5	82.6
18	0.4	96.5	21.75	1305.0	1088.0	60	0.2	82.8
19	0.4	96.9	22.96	1378.0	1148.0	58	0.2	83.1
20	0.2	97.1	24.17	1450.0	1208.0	57	0.1	83.2
21	0.5	97.5	25.38	1523.0	1269.0	56	0.3	83.5
22	0.2	97.8	26.59	1595.0	1329.0	54	0.1	83.6
23	1.0	98.8	27.79	1668.0	1390.0	53	0.5	84.1
24	0.3	99.1	29.00	1740.0	1450.0	51	0.1	84.2
25	0.0	99.1	30.21	1813.0	1511.0	48	0.0	84.2
30	0.9	100.0	36.25	2175.0	1813.0	40	0.4	84.6
35	0.0	100.0	42.30	2538.0	2115.0	35	0.0	84.6
40	0.0	100.0	48.34	2900.0	2417.0	30	0.0	84.6
45	0.0	100.0	54.38	3263.0	2719.0	27	0.0	84.6
Estimated Net Annual Sediment (TSS) Load Reduction =								**85 %**

Climate Station ID: 6105978 *Years of Rainfall Data*: 20

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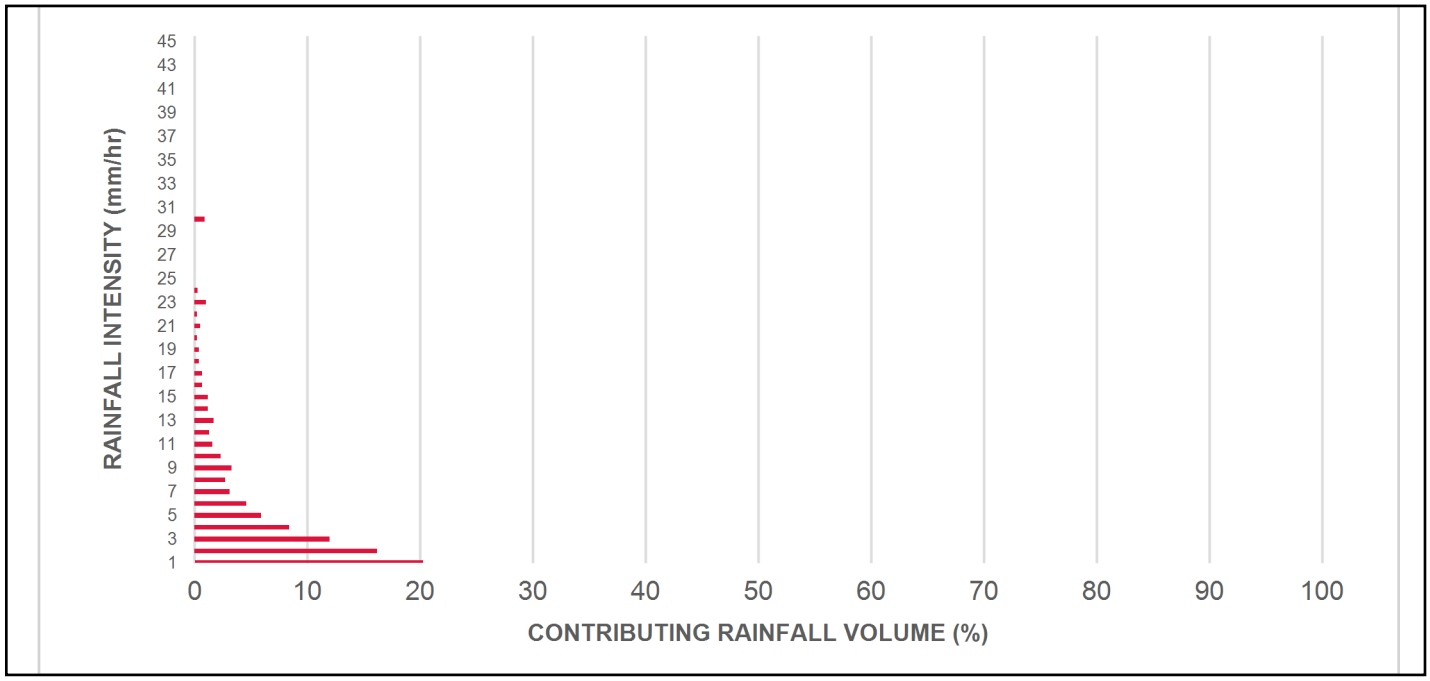
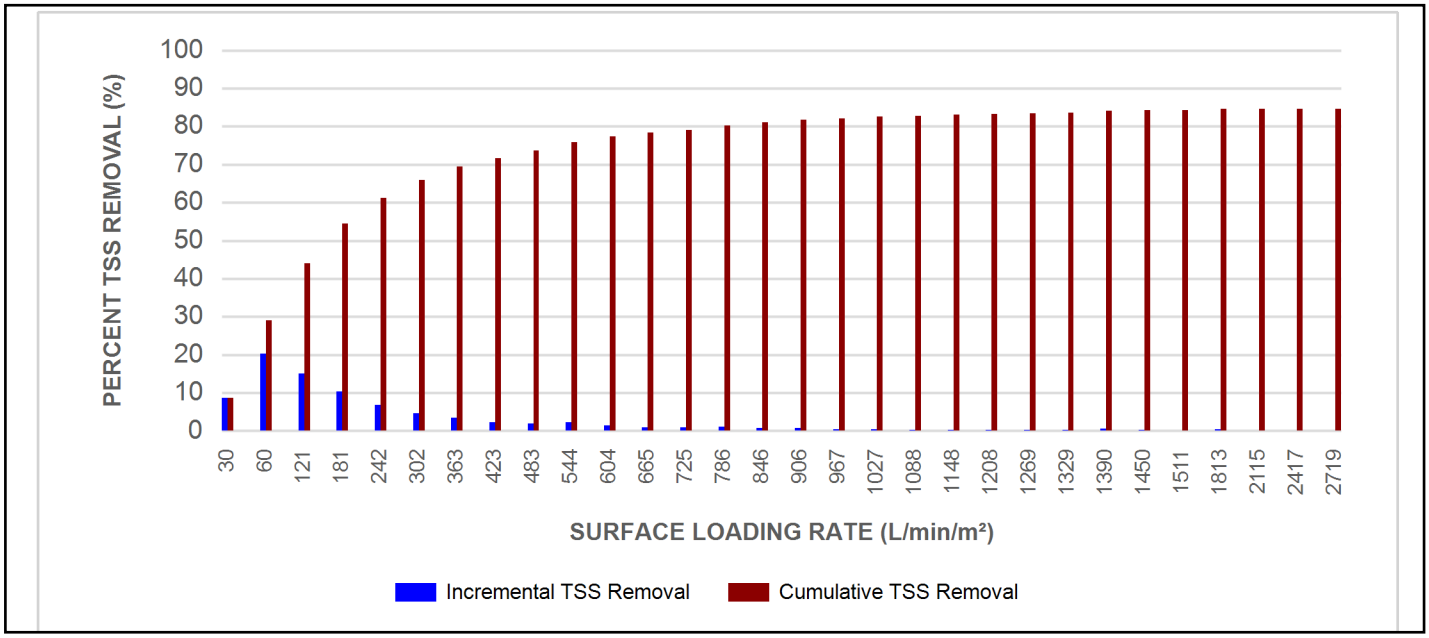
RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



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

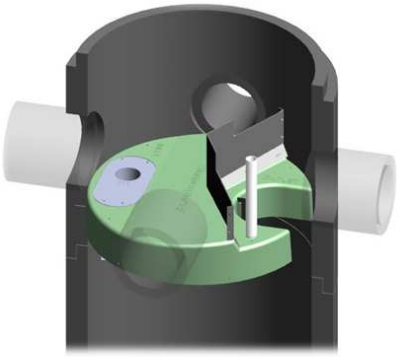
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

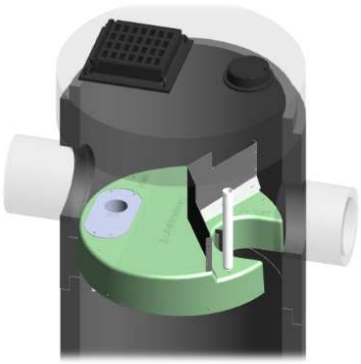
DESIGN FLEXIBILITY

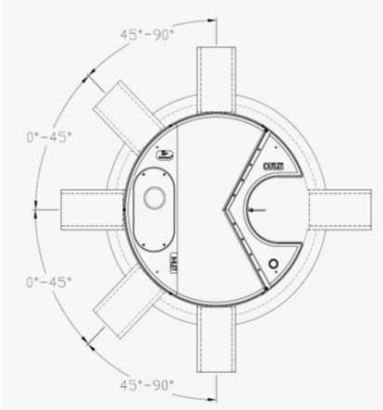
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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

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 of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

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/m^2 to 2600 L/min/m^2) 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.

Stormceptor® FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

02/09/2023

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20

Site Name:	EX-3

Drainage Area (ha):	0.78
Runoff Coefficient 'c':	0.69

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

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	17.37
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:	2370 Walkley Road
Project Number:	160401534
Designer Name:	Michael Wu
Designer Company:	Stantec
Designer Email:	Michael.Wu@stantec.com
Designer Phone:	613-738-6033
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	82
EFO6	91
EFO8	96
EFO10	98
EFO12	99

Recommended Stormceptor EFO Model: EFO4

Estimated Net Annual Sediment (TSS) Load Reduction (%): 82

Water Quality Runoff Volume Capture (%): > 90

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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.

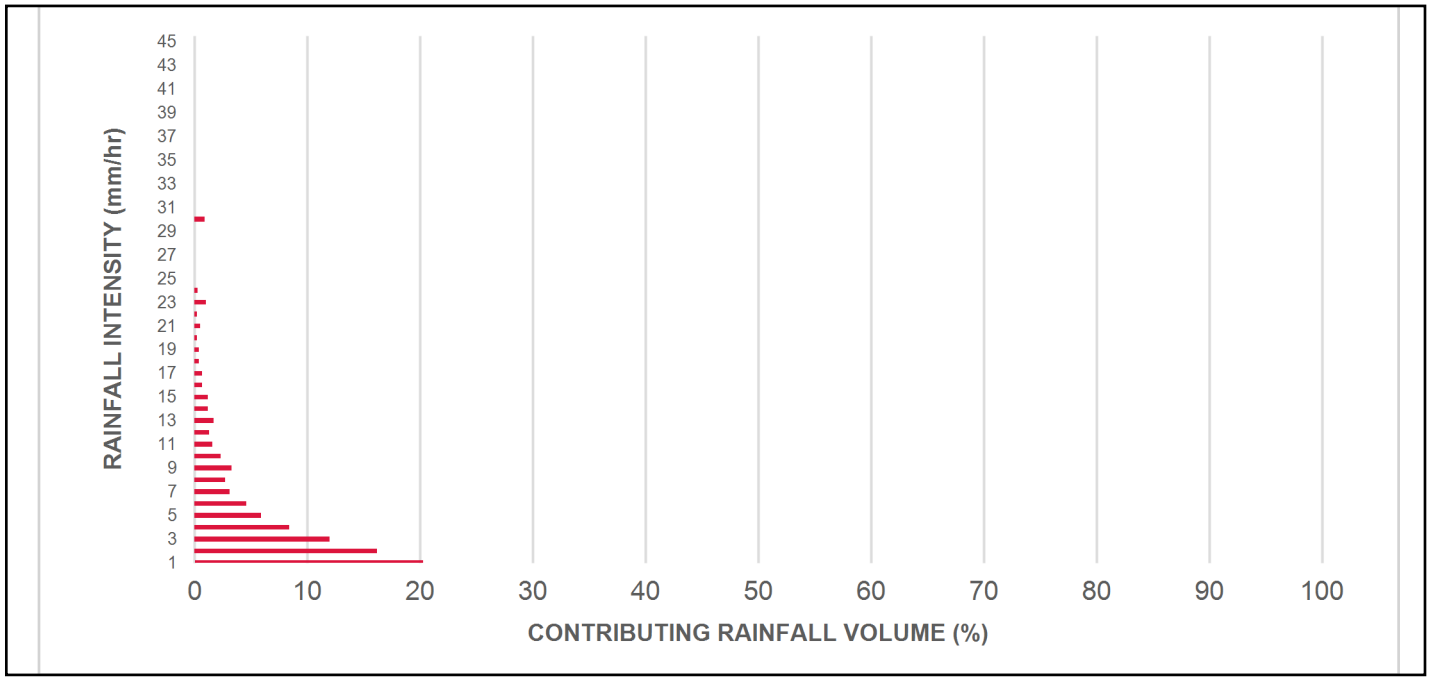
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Stormceptor® EF Sizing Report

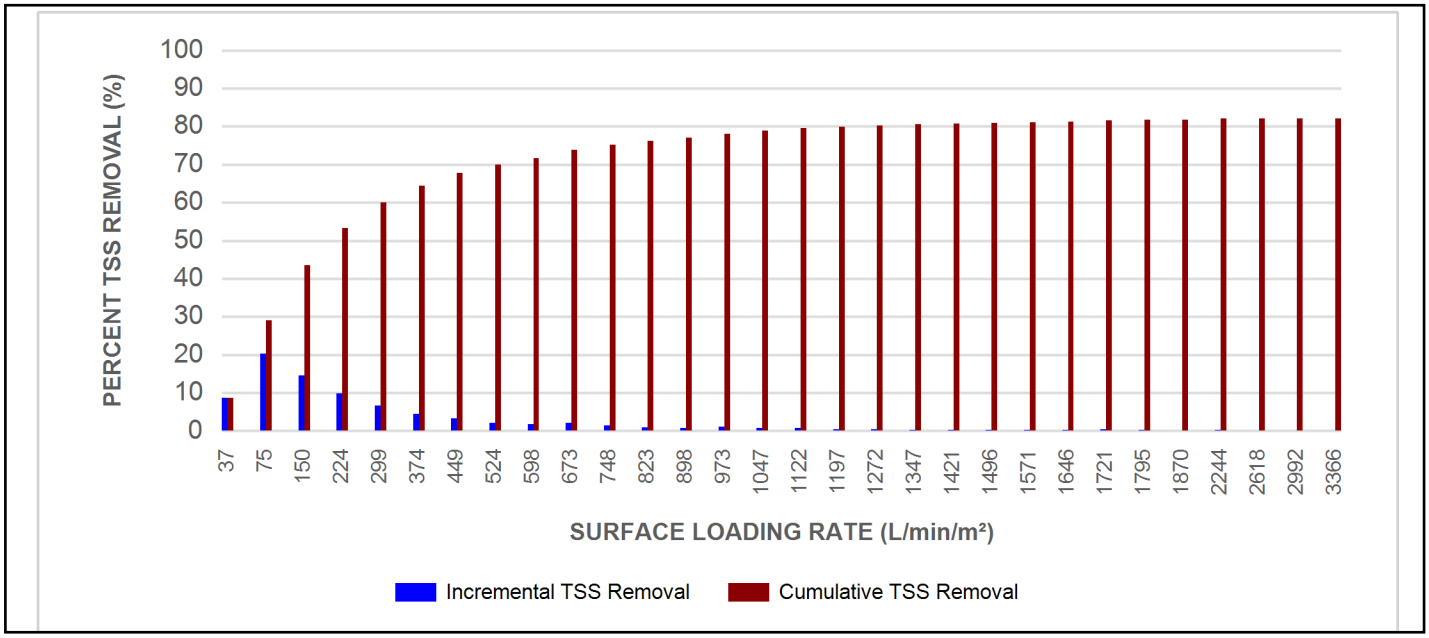
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.6	8.6	0.75	45.0	37.0	100	8.6	8.6
1	20.3	29.0	1.50	90.0	75.0	100	20.3	29.0
2	16.2	45.2	2.99	180.0	150.0	89	14.5	43.5
3	12.0	57.2	4.49	269.0	224.0	82	9.9	53.3
4	8.4	65.6	5.98	359.0	299.0	78	6.6	60.0
5	5.9	71.6	7.48	449.0	374.0	75	4.5	64.4
6	4.6	76.2	8.98	539.0	449.0	72	3.3	67.8
7	3.1	79.3	10.47	628.0	524.0	68	2.1	69.9
8	2.7	82.0	11.97	718.0	598.0	65	1.8	71.6
9	3.3	85.3	13.47	808.0	673.0	64	2.1	73.8
10	2.3	87.6	14.96	898.0	748.0	64	1.5	75.2
11	1.6	89.2	16.46	987.0	823.0	63	1.0	76.2
12	1.3	90.5	17.95	1077.0	898.0	62	0.8	77.0
13	1.7	92.2	19.45	1167.0	973.0	62	1.1	78.1
14	1.2	93.5	20.95	1257.0	1047.0	61	0.7	78.9
15	1.2	94.6	22.44	1347.0	1122.0	59	0.7	79.5
16	0.7	95.3	23.94	1436.0	1197.0	57	0.4	79.9
17	0.7	96.1	25.44	1526.0	1272.0	55	0.4	80.3
18	0.4	96.5	26.93	1616.0	1347.0	54	0.2	80.5
19	0.4	96.9	28.43	1706.0	1421.0	52	0.2	80.8
20	0.2	97.1	29.92	1795.0	1496.0	49	0.1	80.9
21	0.5	97.5	31.42	1885.0	1571.0	47	0.2	81.1
22	0.2	97.8	32.92	1975.0	1646.0	45	0.1	81.2
23	1.0	98.8	34.41	2065.0	1721.0	43	0.4	81.6
24	0.3	99.1	35.91	2155.0	1795.0	41	0.1	81.7
25	0.0	99.1	37.40	2244.0	1870.0	39	0.0	81.7
30	0.9	100.0	44.89	2693.0	2244.0	33	0.3	82.0
35	0.0	100.0	52.37	3142.0	2618.0	28	0.0	82.0
40	0.0	100.0	59.85	3591.0	2992.0	25	0.0	82.0
45	0.0	100.0	67.33	4040.0	3366.0	22	0.0	82.0
Estimated Net Annual Sediment (TSS) Load Reduction =								**82 %**

Climate Station ID: 6105978 *Years of Rainfall Data*: 20

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



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

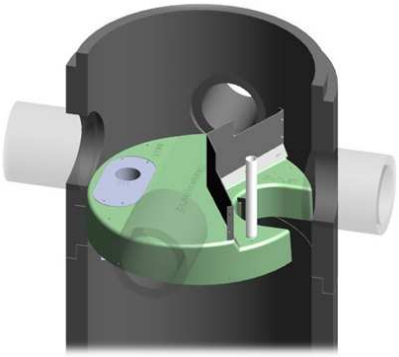
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

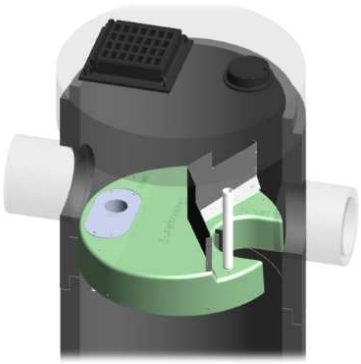
DESIGN FLEXIBILITY

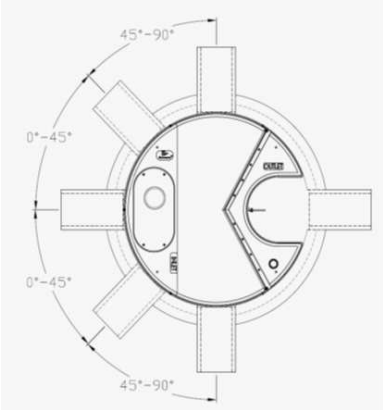
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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

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 of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

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/m^2 to 2600 L/min/m^2) 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.

Stormceptor® FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

02/09/2023

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20

Site Name:	EX-6

Drainage Area (ha):	0.27
Runoff Coefficient 'c':	0.90

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

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	7.84
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:	2370 Walkley Road
Project Number:	160401534
Designer Name:	Michael Wu
Designer Company:	Stantec
Designer Email:	Michael.Wu@stantec.com
Designer Phone:	613-738-6033
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	91
EFO6	97
EFO8	99
EFO10	100
EFO12	100

Recommended Stormceptor EFO Model: EFO4

Estimated Net Annual Sediment (TSS) Load Reduction (%): 91

Water Quality Runoff Volume Capture (%): > 90

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THIRD-PARTY TESTING AND VERIFICATION

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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)

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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

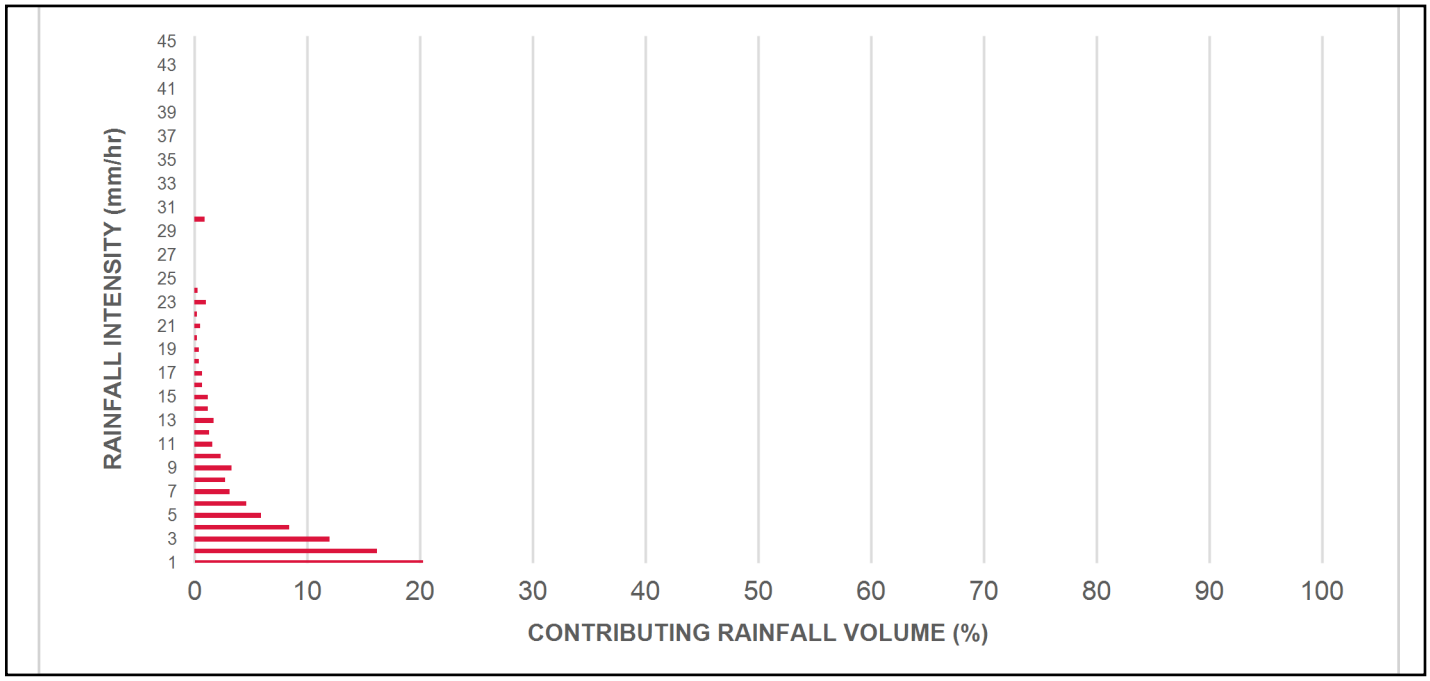
Stormceptor® EF Sizing Report

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 (%)
0.5	8.6	8.6	0.34	20.0	17.0	100	8.6	8.6
1	20.3	29.0	0.68	41.0	34.0	100	20.3	29.0
2	16.2	45.2	1.35	81.0	68.0	100	16.2	45.2
3	12.0	57.2	2.03	122.0	101.0	96	11.5	56.7
4	8.4	65.6	2.70	162.0	135.0	92	7.8	64.5
5	5.9	71.6	3.38	203.0	169.0	88	5.2	69.7
6	4.6	76.2	4.05	243.0	203.0	83	3.8	73.6
7	3.1	79.3	4.73	284.0	236.0	82	2.5	76.1
8	2.7	82.0	5.40	324.0	270.0	80	2.2	78.2
9	3.3	85.3	6.08	365.0	304.0	78	2.6	80.9
10	2.3	87.6	6.76	405.0	338.0	77	1.8	82.6
11	1.6	89.2	7.43	446.0	372.0	75	1.2	83.8
12	1.3	90.5	8.11	486.0	405.0	74	1.0	84.8
13	1.7	92.2	8.78	527.0	439.0	72	1.2	86.0
14	1.2	93.5	9.46	567.0	473.0	71	0.9	86.9
15	1.2	94.6	10.13	608.0	507.0	69	0.8	87.7
16	0.7	95.3	10.81	649.0	540.0	67	0.5	88.2
17	0.7	96.1	11.48	689.0	574.0	66	0.5	88.6
18	0.4	96.5	12.16	730.0	608.0	65	0.3	88.9
19	0.4	96.9	12.84	770.0	642.0	64	0.3	89.2
20	0.2	97.1	13.51	811.0	676.0	64	0.1	89.3
21	0.5	97.5	14.19	851.0	709.0	64	0.3	89.6
22	0.2	97.8	14.86	892.0	743.0	64	0.2	89.8
23	1.0	98.8	15.54	932.0	777.0	63	0.6	90.4
24	0.3	99.1	16.21	973.0	811.0	63	0.2	90.6
25	0.0	99.1	16.89	1013.0	844.0	63	0.0	90.6
30	0.9	100.0	20.27	1216.0	1013.0	61	0.6	91.1
35	0.0	100.0	23.64	1419.0	1182.0	57	0.0	91.1
40	0.0	100.0	27.02	1621.0	1351.0	53	0.0	91.1
45	0.0	100.0	30.40	1824.0	1520.0	48	0.0	91.1
Estimated Net Annual Sediment (TSS) Load Reduction =								**91 %**

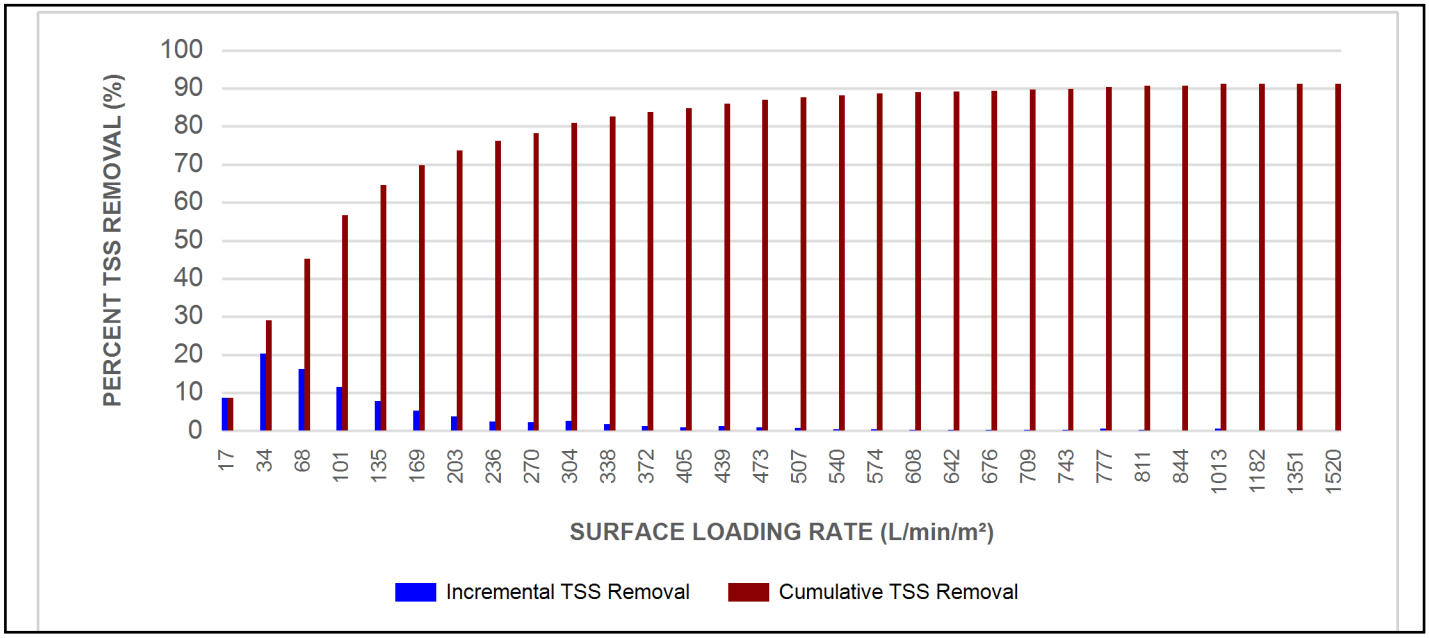
Climate Station ID: 6105978 *Years of Rainfall Data*: 20

imbrium

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



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

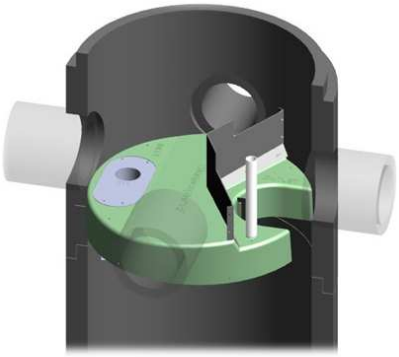
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

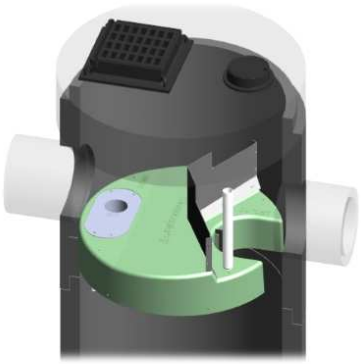
DESIGN FLEXIBILITY

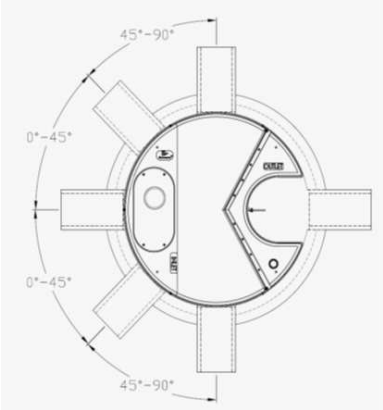
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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

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 of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

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/m^2 to 2600 L/min/m^2) 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.

Appendix B External Reports

B.1 Mather Drain Easements (Bylaw 223/57), City of Ottawa and Township of Glouchester, Carleton County, July 1957

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BY-LAW NUMBER 223/57

A by-law of The Corporation of the City of Ottawa to provide for drainage work on the Mather Drain in the City of Ottawa and in the Township of Gloucester and for borrowing on the credit of the municipality the sum of $26,930.00 therefor.

Provisionally adopted the 15th day of July, 1957.

WHEREAS the drainage work hereinafter described is required for the drainage of Saunderson Drive and other roads in the City of Ottawa;

AND WHEREAS certain lands and roads in the Township of Gloucester will also be affected by the said drainage work;

AND WHEREAS the Director of Planning and Works of the Corporation has petitioned the Council of the Corporation pursuant to subsection 2 of section 2 of The Municipal Drainage Act to proceed with the said work;

AND WHEREAS the Council has procured an examination to be made by W. G. McGeorge, O.L.S., C.E., being a person competent for such purpose, of the said area proposed to be drained and the means suggested for the drainage thereof and of other lands and roads liable to assessment under The Municipal Drainage Act and has also procured plans, specifications and estimates of the drainage work to be made by the said W. G. McGeorge and an assessment to be made by him of the lands and roads to be benefited by the said drainage work, and of other lands and roads liable for contribution thereto, stating as nearly as he can the proportion of benefit, outlet liability and injurying liability, which, in his opinion, will be derived or incurred in consequence of such drainage work by every road or lot or portion of lot, the said assessment so made being the assessment hereinafter by this by-law enacted to be assessed and levied upon the roads and lots or parts of lots hereinafter in that behalf specially set forth and described; and the report of the said W. G. McGeorge in respect thereof, and of the said drainage work being as follows:

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AND WHEREAS the Council is of opinion that the drainage work in question is desirable;

AND WHEREAS it will be necessary to raise the said sum of $26,930.00 by the issue of debentures;

AND WHEREAS the Ontario Municipal Board has by its order dated the 8th day of August, 1957 approved of the undertaking by the Corporation of the said capital expenditure and of the exercise by the Corporation of its powers to proceed with, authorize or provide moneys for the said undertaking and of the passing of all requisite by-laws for such purposes, including debenture by-laws;

AND WHEREAS it is expedient to provide that the said debentures shall be payable over a period of fifteen years next after the date of their issue and shall bear interest at the rate of five and one-half per centum (5½%) per annum and to make the principal of the said debt repayable in yearly sums during the said period of fifteen years in such amounts respectively that the aggregate amount payable for principal and interest in any year shall be equal as nearly as may be to the amount payable for principal and interest in each of the other years and so that each instalment of principal shall be for an even thousand dollars or multiple thereof;

AND WHEREAS it will be necessary to raise annually by a special rate during the currency of the said debentures a sum sufficient to provide for the said yearly instalments of principal and interest as they shall respectively become payable;

AND WHEREAS the amount of the whole rateable property of ratepayers in the City of Ottawa according to the last revised assessment roll thereof is $400,531,000.00;

AND WHEREAS the amount of the existing debenture debt of the Corporation (exclusive of debts created for local improvement purposes) is $38,191,768.00 whereof no part is in arrears for either principal or interest;

THEREFORE the Council of The Corporation of the City of Ottawa enacts as follows:

1. The said report, plans, specifications, assessments and estimates are hereby adopted and the drainage work as therein indicated and set forth shall be made and constructed in accordance therewith.

2. The sum of $26,930.00 shall be borrowed by the Corporation upon the credit of the Corporation at large from such bank, co-partner or person as may be willing to loan the sum to provide for the Corporation's share of the cost of constructing the drainage work described in the report of W. G. McGeorge dated the 2nd day of July, 1957.

3. For the purpose of borrowing the said sum of $26,930.00 debentures of the Corporation of a like amount shall be issued in sums of not less than $1,000.00 Canadian currency each all of which debentures shall be dated the 1st day of October, 1957.

4. The principal sum of the said debentures shall be repaid in annual instalments at the time and in the manner shown upon the following schedule and the respective amount of principal and interest payable in each year during the currency of the said debentures shall be as follows:

Year	Amount of Interest Payable	Amount of Principal Payable	Annual Payment
1	$ 1481.15	$ 1201.77	$ 2682.92
2	1415.05	1267.87	2682.92
3	1345.32	1337.60	2682.92
4	1271.75	1411.17	2682.92
5	1194.14	1488.78	2682.92
6	1112.25	1570.67	2682.92
7	1025.87	1657.05	2682.92
8	934.73	1748.19	2682.92
9	838.58	1844.34	2682.92
10	737.14	1945.78	2682.92
11	630.12	2052.80	2682.92
12	517.22	2165.70	2682.92
13	398.10	2284.82	2682.92
14	272.44	2410.48	2682.92
15	139.86	2542.98	2682.84
	$13,313.72	$26,930.00	$40,243.72

5. The said debentures shall be payable both as to principal and interest in lawful money of Canada in the office of such chartered bank or banking corporation in Canada or elsewhere as may be designated thereon.

6. During the currency of the said debentures there shall be raised annually by a special rate sufficient therefor, over and above all other rates, on all the rateable property in the City of Ottawa, according to the last revised assessment roll, for the payment of the said debentures and the interest thereon, the respective sums set forth in the fourth column of the schedule set forth in section 4 of this by-law.

7. Pending the sale of debentures, or in lieu of selling the same, the Council may by resolution authorize the Mayor of the said Corporation and the Treasurer thereof to raise money by way of loan on the security of such debentures or upon the security of some part of them, and to hypothecate any or all of the said debentures as security for the repayment of the said loan.

8. This by-law comes into force on the date of final passing thereof.

GIVEN under the corporate seal of the City of Ottawa this 3rd day of September 1957.

N. L. Ogilvie
CITY CLERK.

Geo. N. Nelms
MAYOR.

Chatham, July 2nd, 1957.

To the Mayor and Council
of the City of Ottawa.

Gentlemen:

In accordance with instructions, I have made the necessary examination with a view to providing drainage for Saunderson Drive and other City roads draining thereto, all being shown on the plans of subdivision registered as numbers 627, 643 (parts One and Two) and 656 (the area in question being commonly referred to as Elmvale Acres.) I find that the said roads are now partially drainged by open ditches, constructed along the sides of the roads in question, most of the water eventually reaching the ditches along Saunderson Drive.

Saunderson Drive follows, generally, the course of a natural depression, in which there was constructed many years ago, (under the provisions of the Ditches and Watercourses Act) a ditch known as the H. M. Mather Award Ditch. Along the course of Saunderson Drive, this ditch has been obliterated and replaced by the road ditches mentioned, but Southerly, or downstream, from the Southerly end of Saunderson Drive, it is still in existence and provides the only outlet now available for the road ditches referred to. This downstream portion of said Award Ditch is much out of repair and entirely inadequate and I recommend that it be assumed as a Municipal Drain (to be known as the H.M. Mather Drain) and be repaired, improved and extended, under the provisions of the Municipal Drainage Act, as provided for herein. The original Award Ditch terminated at or near Russell Road and the work, provided for herein, will extend Easterly therefrom, for a distance of about 3200 feet, to what is known as Green's Creek, the extension following, generally, the course of a small creek, which has been improved and straightened to some extent.

It is my understanding that tentative plans have been made for the installation of a storm sewer along Saunderson Drive and the work provided for herein will not only provide a necessary outlet for the existing road ditches but will be deep enough and of adequate capacity to provide an outlet for the storm sewer as planned. The construction of the said storm sewer would, in my opinion, be of great benefit to the Elmvale Acres area.

There is a considerable area of unsubdivided land, which is within the limits of the City and lies Southerly from the Elmvale Acres Subdivision. The most feasible outlet, for these unsubdivided lands, would also seem to be this H.M. Mather

Drain. If, and when, these lands are subdivided and developed, it will be necessary to further improve the said Drain, but, once this drain is brought under the provisions of the Municipal Drainage Act, as provided for herein, the proceedings necessary for its improvement will not be difficult.

As constructed, the Mathers Award Ditch, when it reaches a point on the property now owned by A. and I. Lithwick, (± 70 acres, Lot 18, Con. J.G.), turns Easterly to and across St. Laurent Boulevard; thence runs southerly along the Easterly side of said Boulevard to Walkley Road, where it jogs Easterly for a few feet before crossing said Road and continuing Southerly. There are a number of serious objections to this arrangement and provision is made herein for changing the course so that instead of turning Easterly, at the point on the Lithwick property referred to, the drain will continue Southerly across the remainder of said lot 18, across Lot 19, Walkley Road, Lot A, Concession 5 R.F. and a portion of Lot 1, Concession 5 R.F. to rejoin the existing drain. This alteration in the course of the drain will not only make the drain more efficient, but will also result in the elimination of one highway culvert and the hazard, which accompanies the existence of an open drain along the travelled portion of a Highway. Provision has been made, in the estimates and specification, for a new bridge or culvert across Walkley Road.

The existing pipe culverts under the track of the Federal District Railway on Lot 4, Concession 5 R.F. are inadequate, the combined cross-section area of the two culverts being only approximately twenty-five square feet. Keeping in mind the future development of the drainage area in question, it will be desirable to provide an additional culvert or bridge with a cross-section area of at least seventy-five square feet, with provision to allow for at least two feet of additional depth, below the bottom of the drain provided for herein. I assess the entire cost of providing such additional culvert (and of maintaining the same), including any expenses incidental to the preparation of plans and securing their approval, against the Federal District Commission, owner of the said Railway.

The existing culvert at Hawthorne Road is of ample capacity but it may be necessary to underpin the abutments and lower the bottom of the culvert and provision is made in the estimates for this work.

In the portion of the drain in the vicinity of Russell Road, there is a very high rate of fall and, in my opinion, the capacity of the existing culvert at said Road is sufficient, at least for the time being. Because of the nature of the

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ground, at the point in question, I would not expect that any underpinning of the abutments of the culverts will be necessary as a result of the work provided for herein.

The existing culvert under the track of the New York Central Railway is not as large as it should be, but in view of the fact that the operation of trains on this track has been abandoned, and, of the possible elimination of the necessity for maintaining the culvert in question, I have made no provision in this report for its enlargement. If it should develop that this culvert has to be maintained and that it interferes with the proper working of the drain, steps can be taken, under the provisions of the Municipal Drainage Act, to remedy the situation.

The plan, forming part of this report, shows the location of the Drain and the lands and roads affected and the profile and specification, which also forms parts of this report, give the data necessary for the proper carrying out of the work provided for.

My estimate of the cost of the work is as follows:

IN THE CITY OF OTTAWA

To excavation from stake Numbered 123, at limit between N½ and S½ of Lot 17, J.G. Con., formerly in Twp. of Gloucester, to Stake 200, at present City Limit (at point approx. 200 ft. E. of Hawthorne Road) - 7475 lineal feet (estimated excavation - 16000 cu. yds. of earth) including disposal of excavated material, replacement of fences, etc.	$ 8000.00	
To construction of new concrete culvert at Walkley Road complete including all material and workmanship	$ 5000.00	
To underpinning existing bridge or culvert at Hawthorne Road, complete, including all material and workmanship	$ 1000.00	
To amount of allowances for farm bridges under Subsec. 4 of Sec.8 of the Drainage Act - detailed herein below	$ 2000.00	
To amount of allowances for Award Ditch incorporated into the work, under Subsec. 6 of Sec. 8 of the Drainage Act - Detailed herein below	$ 9.00	
To amount of allowances for damages to lands and crops (if any) under Subsec. 7 of Sec. 8 of the Drainage Act detailed herein below	$ 479.00	
To amount of allowances for land taken for the drainage work, under Subsec. 8 of Sec. 8 of the Drainage Act - detailed herein below	$ 257.00	
Total Cost of work in City of Ottawa exclusive of cost of work under track of Federal District Railway, on Lot 1, Con. 5 R.F.		$16745.00

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Carried Forward		$16745.00

IN THE TOWNSHIP OF GLOUCESTER

To excavation from Stake 200, at limit between City of Ottawa and Twp. of Gloucester, to Stake 265½ at Green's Creek - 6526 lineal feet - estimated excavation 7600 cu. yds. of earth and 1000 cu. yds. of shale	$ 5800.00	
To amount of allowances for severance, under subsec. 5 of Sec. 8 of the Drainage Act - detailed herein below	$ 1000.00	
To amount of allowances for private or award ditches incorporated into the work under subsec. 6 of sec. 8 of the Drainage Act - detailed herein below	$ 201.00	
To amount of allowance for damages to lands and crops (if any) under subsec. 7 of sec. 8 of the Drainage Act - detailed herein below	$ 400.00	
To amount of allowances for land taken for the Drainage Work under Subsec. 8 of sec. 8 of the Drainage act - detailed herein below	$ 2.00	
Total Cost of work in Township of Gloucester		$ 7403.00
Add for incidental expenses such as engineering, superintending, bylaw, etc. including $500 for bylaw and clerk's fees in City of Ottawa and $100 for bylaw and Clerk's fees in Gloucester		$ 4352.00
MAKING A TOTAL OF		$28500.00

This sum I assess, in the annexed schedules, against the lands and roads in the City of Ottawa and Township of Gloucester, which are liable to assessment therefor.

As provided for hereinabove, the cost of the required new culvert under the track of the Federal District Railway is charged against the Federal District Commission.

The cost of the new culvert required at Walkley Road and the cost of underpinning or lowering the culvert at Hawthorne Road are charged against the Corporation of the City of Ottawa, which Corpporation has jurisdiction over Walkley Road and Hawthorne Road.

The portion of the Drainage work, herein reported on (exclusive of the culvert under the Federal District Railway track) from its upper to Northerly end, at the limit between the N½ and S½ of Lot 17, J.G. Concession (Formerly in the Township of Gloucester but now in the City of Ottawa) down to the present limit between said City and said Township (at a point about 200 feet easterly from Hawthorne Road) shall

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be maintained by the City of Ottawa and the balance of the said Drainage Work, from said present limit, to Green's Creek, shall be maintained by the Township of Gloucester. In each case the cost of maintenance shall be assessed against all the lands and roads, in both Municipalities, assessed for work herein provided for, said lands and roads paying in the same relative proportions as for the whole work provided for herein.

I have the honour to be,

Gentlemen,

Your obedient servant,

(Sgd.) W. G. McGeorge, O.L.S., C.E.

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DETAILS OF ALLOWANCES UNDER SECTION 8, OF THE DRAINAGE ACT

IN THE CITY OF OTTAWA

	Subsec.4	Subsec.6	Subsec.7	Subsec.8
E 88ac.S½ Lot 17 Con.J.G. (Bert Dowler)	$ 500.00	$ 1.00	$ 57.00	$ 1.00
E.70ac.Lot 18 Con.J.G. (A.& I.Lithwick)	$ 500.00	$ 1.00	$ 113.00	$ 100.00
E 3 ac.Lot 19 Con.JG (O. McCartney)	$ --	$ 1.00	$ 40.00	$ 150.00
Lot A, Con. 5 R.F. (Federal Dist.Comm)	$ --	$ 1.00	$ 42.00	$ 1.00
N.165ac. Lot 1 (Ex.Ry.) Con. 5 R.F. (Federal District Commission)	$ --	$ 1.00	$ 75.00	$ 1.00
S 39.5ac. (Ex-Ry.) Lot 2, Con. 5 R.F. (H.E.P.C. of Ontario.	$ --	$ 1.00	$ 25.00	$ 1.00
N 40½ac. E½ (Ex.Ry.) Lot 2, Cone.5R.F. (R. Hill)	$ 500.00	$ 1.00	$ 60.00	$ 1.00
S½E½ Lot 2, Con. 5 R.F. (Highcraft Building Ltd)	$ 500.00	$ 1.00	$ 55.00	$ 1.00
All W. City Limit Lot 3, Con. 6R.F. (A. Groulx)	$ --	$ 1.00	$ 12.00	$ 1.00
Totals in Ottawa	$2000.00	$ 9.00	$ 479.00	$ 257.00

IN THE TOWNSHIP OF GLOUCESTER

	Subsec.5	Subsec.6	Subsec.7	Subsec.8
A. Groulx's 34 ac.Lot 3, Con.6R.F. (A. Groulx)	$ 500.00	$ 1.00	$ 125.00	$ 1.00
A. E. Ritchie's 179 ac. Lot 4,Con.6R.F. (A.E. Ritchie)	$ 500.00	$ 200.00	$ 275.00	$ 1.00
Totals in Gloucester	$1000.00	$ 201.00	$ 400.00	$ 2.00

CHATHAM, Ontario, July 2nd, 1957.

(Sgd.) W. G. McGeorge
O.L.S., C.E.

26/914

SCHEDULE OF ASSESSMENT ON ROADS IN THE CITY OF OTTAWA FOR THE REPAIR, IMPROVEMENT AND EXTENSION OF THE H. M. MATHER DRAIN

Con.	Lot or Part of Lot	Acres Affected	Values of Benefit	Value of Outlet Liability	Assessed Owner
	Audrey Avenue Plan M97	12/3		$ 35.00	City of Ottawa
	Martha Avenue Plan M97	1 3/4	$ 25.00	$ 35.00	City of Ottawa
	Balharrie Avenue Plans M95&86	2		$ 40.00	City of Ottawa
	Susan Street Plan M97	9/10	$ 5.00	$ 18.00	City of Ottawa
	Joliffe Street Plan M95	9/10		$ 18.00	City of Ottawa
	Nerta Street Plan M95	9/10		$ 18.00	City of Ottawa
	Gwen Street Plan M86	9/10		$ 18.00	City of Ottawa
	St. Laurent Blvd.	6 2/3	$5125.00	$ 165.00	City of Ottawa
	Dunne Street Plan 662(2) YES	2/3		$ 15.00	City of Ottawa
	Othello Avenue Plan 643(1) & 662(2)	3 1/4		$ 80.00	City of Ottawa
	Olympia Cres. Plan 643(1)	2	$ 20.00	$ 50.00	City of Ottawa
	Hall Street Plan 643(1)	1/2	$ 10.00	$ 15.00	City of Ottawa
	Naples Avenue Plan 643(1)	3/4	$ 15.00	$ 20.00	City of Ottawa
	Saunderson Drive Plans 627, 643(2) & 662(2) YES	6	$ 12325.00	$ 150.00	City of Ottawa
	Hutton Avenue Plan 627	1 4/5		$ 45.00	City of Ottawa
	Cuba Avenue Plan 649 YES	2/3		$ 20.00	City of Ottawa
	Raglan Avenue Plan 627	3/4	$ 10.00	$ 20.00	City of Ottawa
	Hastings Avenue Plan 370	9/10		$ 25.00	City of Ottawa
	Edgecombe Street Plan 370	9/10		$ 25.00	City of Ottawa
	Guildford Street Plan 370	9/10		$ 25.00	City of Ottawa
	Smyth Road	8	$ 30.00	$ 200.00	City of Ottawa
	Shelley Drive Plan 665	2 1/2		$ 65.00	City of Ottawa
	Botsford Road Plan 665	1/3		$ 10.00	City of Ottawa
	Pullen Avenue Plan 665	1/3		$ 10.00	City of Ottawa
	Hamlet Road Plan 627 & 643(1)	4 3/4	$ 40.00	$ 120.00	City of Ottawa
	Tweed Avenue Plan 627	9/10		$ 25.00	City of Ottawa
	Haig Drive	5 1/2	$ 15.00	$ 140.00	City of Ottawa
	Colson Avenue Plan 643(2)	1 9/10	$ 20.00	$ 50.00	City of Ottawa
	Quinlan Road Plan 643(2)	2		$ 50.00	City of Ottawa
	Dauphin Road Plan 627	1 2/5		$ 35.00	City of Ottawa

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SCHEDULE OF ASSESSMENT IN THE CITY OF OTTAWA (Continued)

Con	Lot or Part of Lot	Acres Affected	Values of Benefit	Value of Outlet Liability	Assessed Owner
	Wingate Drive Plan 643(1) & 643(2)	4	$ 25.00	$ 100.00	City of Ottawa
	Chapman Blvd. Plans 653, 656	6	$ 50.00	$ 150.00	City of Ottawa
	Portage Avenue Plan 656	1 1/2		$ 40.00	City of Ottawa
	Dorval Ave. Plans 656 & 662(1)	1 2/5		$ 35.00	City of Ottawa
	Weston Drive Plan 662	6	$ 45.00	$ 150.00	City of Ottawa
	Alton Street Plan 662(1)	3/7		$ 10.00	City of Ottawa
	Fairdale Ave. Plan 662(1)	1.10		$ 25.00	City of Ottawa
	Camrose Avenue Plan 662(1)	3/7		$ 10.00	City of Ottawa
	Cork Street Plan 662(1)	1/7		$ 3.00	City of Ottawa
	Arch Street Plan 662(1)	3/4		$ 20.00	City of Ottawa
	Vincent Street Plan 662(2)	1/7		$ 4.00	City of Ottawa
	Tilson Street Plan 662(2)	1/7	$ 5.00	$ 4.00	City of Ottawa
	Corry Street Plan 662(2)	1/7	$ 10.00	$ 4.00	City of Ottawa
	Oxbow Avenue Plan 553	3/4		$ 20.00	City of Ottawa
	Elmsife Avenue Plan 553	3/4		$ 20.00	City of Ottawa
	Pleasant Park Avenue Plan 553	1 2/3		$ 40.00	City of Ottawa
	Linda Lane	4/5		$ 20.00	City of Ottawa
	Kilborn Avenue	7 3/4		$ 200.00	City of Ottawa
	Russell Road	3 1/4		$ 25.00	City of Ottawa
	Walkley Road	13	$ 150.00	$ 263.00	City of Ottawa
	Conroy Road	3		$ 50.00	City of Ottawa
	Hawthorne Road	7	$ 170.00	$ 100.00	City of Ottawa
	Assessment against City of Ottawa for culverts at Walkley Road and Hawthorne Road			$ 6000.00	

Total on City Streets and Roads	$ 20930.00
Total on City for Highway Culverts	$ 6000.00
TOTAL ASSESSMENT - City of Ottawa -	$ 26930.00

CHATHAM, Ontario, July 2nd, 1957.

(Sgd.) W. G. McGeorge
O.L.S., C.E.

26919

SCHEDULE OF ASSESSMENT ON LANDS AND ROADS IN THE TOWNSHIP OF GLOUCESTER
FOR THE REPAIR, IMPROVEMENT AND EXTENSION
OF THE H.M. MATHERS DRAIN

Con.	Lot or Part of Lot		Acres Affected	Value of Benefit	Value of Outlet Liability	Assessed Owner
6R.F.	J. Fitzgerald's 4 3/5 ac.W. of Russell Road	Lot 2	3		$ 8.00	J. Fitzgerald
	A. Groulx's 13.9ac.W. of Russell Road	" 2	13	$ 50.00	$ 36.00	A. Groulx
	A. Groulx's 34 ac.	" 3	34	$ 570.00	$ 65.00	A. Groulx
	W. Ironsides' 7 ac.W. of Russell Road	" 3	7		$ 14.00	W. Ironsides
	J. Gibson's 1½ ac.W. of Russell Road	" 3	1½		$ 3.00	J. Gibson
	D.V.A. 2 ac.W. of Russell Road	Lot 3	2		$ 5.00	Dept. V. Affairs
	W 42.6 ac.E. Russell Rd.	" 3	5		$ 8.00	P.E. Alexander
	All E. City Limit	Lot 4	150	$ 650.00		E. Ritchie
	All E. Russell Rd. & W. N.Y.C.Ry.	Lot 5	5	$ 25.00	$ 5.00	H. Haase
	N.Y.Central Ry.Right-of-Way		2	$ 25.00	$ 1.00	N.Y.C.Ry.Co. or Can.Nat.Ry.Co.
	Russell Road		5	$ 100.00	$ 5.00	Ottawa Sub.Road Com.

Total on lands for benefit	$1320.00
Total on lands for outlet	$ 145.00
Total on Ottawa Sub.Rd.Comm.	$ 105.00
TOTAL ASSESSMENT - Gloucester	$1570.00

CHATHAM, Ontario, July 2nd, 1957.

(Sgd.) W. G. McGeorge,
O.L.S., C.E.

26919

SPECIFICATION FOR THE REPAIR, IMPROVEMENT AND EXTENSION OF THE H.M. MATHERS DRAIN IN THE CITY OF OTTAWA AND TOWNSHIP OF GLOUCESTER

The work, to be done under this specification, comprises the repair and improvement of the H.M. Mather Drain, from Stake 123, (at the limit between the Northerly and Southerly halves of Lot 17, Concession J.G., formerly in the Township of Gloucester, but now in the City of Ottawa) to the point at or near Russell Road (where the said Drain, as constructed under the Ditches and Watercourses Act, ended) and its extension, from said last mentioned point to Stake 265¼, at the creek known as Green's Creek. The stakes, to which reference is made are planted along the course of the work, 100 feet apart and numbered consecutively (with the exception that the distance between Stakes 166 and 169 is 75 feet, due to straightening of the Drain).

From Stake 123 to Stake 147, at the point on Lot 18, Concession J.G., where the existing Drain turns Easterly towards St. Laurent Boulevard, the work shall follow the existing Drain. From said Stake 147 to Stake 166, a new channel shall be constructed. As shown on the plan, accompanying this report, the new channel will run straight from Stake 147 to the Northerly limit of Walkley Road, intersecting the said Northerly limit at a point immediately West of the Westerly limit of St. Laurent Boulevard; thence will cross Walkley Road at right angles and will run, in a straight line to intersect the existing Drain again at Stake 166. From said Stake 166, to Stake 203, the work shall follow the existing Drain, but in the vicinity of the Federal District Railway the exact alignment of the drain shall be subject to the direction of the Commissioner so that the location of the drain will fit in with the location of the new culvert to be provided by the Federal District Commission. From Stake 203 to Stake 244, the work shall follow the general course of the existing channel, but, shall be straightened so as to eliminate all short bends and loops in said channel. This straightening will involve widening of the existing channel, on one side only, in some sections and constructing entirely new channels in other sections, such as from near Stake 206 to near Stake 216, from near Stake 218 to near Stake 220, from near Stake 227 1/3, to near Stake 229½, from Stake 232 to near Stake 234½,

26919.

and from near Stake 237 to near Stake 244, it being intended that, this straightening shall be carried out under the direction of the Commissioner appointed to have charge of the work. From said Stake 244, to Green's Creek, the work shall follow the existing channel. Where the existing channel is followed, it is intended that the centre line of the new Drain shall correspond with the centre line of the existing channel, except where straightening can be accompanlished by moving the new centre line closer to one side of the existing channel.

The work shall be carried out in accordance with the data shown on the profile, forming part of this report, the finished bottom to be, at no place, higher than indicated by the grade line on the profile. The elevation of the finished bottom shall be determined from the Bench Marks, the positions of which are indicated on said profile. The depth for each Stake, shown on the profile, is intended to be measured from the surface of the ground, alongside the stake, to the finished bottom and is given for the information of Contractors and others interested, but the work must be governed by the Bench Marks. The bottom width, throughout, shall be not less than Six feet and side slopes shall be not less than One Horizontal to One Vertical.

The excavated material shall generally be taken out, as nearly as possible, one half on each side of the Drain, but where new channels are constructed, in order to straighten the Drain, it is intended that the abandoned channels shall be filled to the extent that excavated materials are available. The excavated material, except where used to fill the abandoned channel, shall be kept not less than four feet clear of the nearest edge of the completed Drain, and shall be levelled back, evenly, for a further distance of at least 30 feet, the levelling being done with a bulldozer or other suitable machine and the earth being left in condition for easy cultivation. Where the earth is used to fill up portions of the existing drain, which are being abandoned, it shall be levelled and left reasonably uniform on top.

In crossing Walkley Road, the excavation shall be made of the full size required by the profile and specifications unless the Contractor is required, by the Commissioner in charge, to modify the

26919

cross-section of the drain to conform more closely with the culvert to be constructed.

The bridge, or culvert, to be constructed on Walkley Road shall have a clear span of at least Twelve (12) feet and a clear height of opening of at least Six feet. The footings of the abutments shall go to a depth at least four feet below the required bottom of the drain. The culvert shall be constructed of reinforced concrete in accordance with plans and specifications that will meet the requirements of the Ontario Department of Highways. If wings are provided the culvert shall have a width of roadway at least Thirty (30) feet. If no wings are provided the culvert shall be at least Fifty (50') feet in length.

Where the Drain crosses the right-of-way of the Federal District Railway, the work shall consist of the construction of an additional culvert (with a cross section area of at least 75 square feet and with the invert of the new culvert not higher than elevation 226 feet, according to the datum established for the Drain) and the necessary excavation from the ends of the new culvert to the limits of the right-of-way. This work shall be done without unnecessary interference with railway traffic. If the Federal District Commissioner does not exercise its option of doing all the work on its Railway right-of-way, the Contractor for the excavation of the Drain will be required to make the said excavation at the ends of the culvert as part of his Contract.

Included, in the work of excavation, shall be the necessary excavation under the existing highway bridges or culverts at Hawthorne Road and Russell Road and it is intended that this excavation shall be carried out without unnecessary injury to said bridges.

On the right-of-way of the New York Central Railway, the work shall consist of the deepening of the Drain to the required depth in the existing culvert and the excavation of the Drain, to the required dimensions, from the ends of the existing culvert to the limits of the right-of-way. If the Railway Company does not exercise its option of doing the work on the said right-of-way, the Contractor for

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the excavation will be required to do this work as part of his Contract.

All trees and brush in the existing channel, which is being improved, or which will be in the course of the improved channel, shall be removed and piled up clear of the excavated material.

All fences, which will be interfered with in doing the work, shall be handled carefully and shall promptly be replaced in as good condition as the materials will permit.

The whole work shall be carried out in a neat and workmanlike manner and to the satisfaction of the Commissioner appointed by the City of Ottawa to carry out the work provided for herein.

In doing the work, across any public highway, care shall be taken to protect the travelling public, the Contractor being required to erect, and maintain until the completion of the work, all signs, lights and barricades necessary to indicate dangerous conditions and being held responsible for all loss and damage sustained by reason of his failure to take all reasonable precautions.

CHATHAM, Ontario, July 2nd, 1957.

(Sgd.) W. G. McGeorge,
O.L.S., C.E.

OT 26919
GL58501

BY-LAW NUMBER 2357

A by-law of The Corporation of the City of Ottawa to provide for drainage work on the Mather Drain in the City of Ottawa and in the Township of Gloucester and for borrowing on the credit of the municipality the sum of $26,930.00 therefor.

1st Reading ..July 17/57.....

2nd Reading .....

3rd Reading ..Sept. 3/57.....

I CERTIFY THAT THE WITHIN INSTRUMENT IS DULY ENTERED AND REGISTERED IN THE REGISTRY OFFICE FOR THE REGISTRY DIVISION OF THE COUNTY OF CARLETON ON THE 16th DAY OF Sept A. D. 1957 AT 9 55 O'CLOCK a M., AS No. 26919 FOR THE CITY OF OTTAWA.

L. O'Flanagan
REGISTRAR

I CERTIFY THAT THE WITHIN INSTRUMENT IS DULY ENTERED AND REGISTERED IN THE REGISTRY OFFICE FOR THE REGISTRY DIVISION OF THE COUNTY OF CARLETON ON THE 16th DAY OF Sept A. D. 1957 AT 9 55 O'CLOCK a M., AS No. 58501 FOR THE MUNICIPALITY OF Gloucester

L. O'Flanagan
REGISTRAR

LEGAL DEPARTMENT

CITY HALL OTTAWA

B.2 Giant Tiger Head Office Servicing and Stormwater Management Report, Novatech, April 2019

SERVICING AND STORMWATER MANAGEMENT REPORT

GIANT TIGER HEAD OFFICE
2480 WALKLEY ROAD
OTTAWA, ONTARIO

Prepared by:

NOVATECH
Suite 200, 240 Michael Cowpland Drive
Kanata, Ontario
K2M 1P6

January 24, 2019
Revised Date: April 25, 2019

Novatech File: 117203
Ref No. R-2019-018

NOVATECH
Engineers, Planners & Landscape Architects

April 25, 2019

Planning and Infrastructure Approvals
City of Ottawa
110 Laurier Avenue West
Ottawa, Ontario, K1P 1J1

Attention: **Don Herweyer, MCIP, RPP**

Dear Mr. Herweyer:

Reference: **2480 Walkley Road, Ottawa**
Servicing and Stormwater Management Report
Our File No.: 117203

Please find enclosed the 'Servicing and Stormwater Management Report' for the above noted project. This report has been revised per City of Ottawa Comments dated February 28, 2019 and is hereby resubmitted for review and approval.

Should you have any questions or require additional information, please contact the undersigned.

Yours truly,

NOVATECH

Cara Ruddle, P.Eng.
Senior Project Manager | Land Development Engineering

cc: Jean-Marc Desjarlais, Giant Tiger

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICIES

LIST OF ENGINEERING DRAWINGS (IN REPORT)

LIST OF ENGINEERING DRAWINGS (SEPARATE FROM REPORT)

See Appendix F for Drawing Listing

1.0 INTRODUCTION

Novatech has been retained to prepare a Servicing and Stormwater Management Report for the proposed development located at 2480 Walkley Road, Ottawa, Ontario. This report will support a Site Plan and Rezoning Application for the subject development. **Figure 1** Key Plan shows the site location.

2.0 EXISTING CONDITIONS

The total site area is approximately 10.9 hectares in size and is currently developed with an existing Giant Tiger Store, an office component, warehouse space and associated parking. There are existing entrances to the site from Banton Street and Walkley Road.

The site is bounded by Walkley Road to the north, a vacant property and Hawthorne Road to the east, a rail corridor and existing commercial/industrial development to the south, and existing commercial/industrial development to the west. The topography slopes in a southerly direction towards the Mather Award Ditch which is located to the west of the site. There is a grade drop of approximately 2.5m across the site. **Figure 2** shows the existing site conditions.

3.0 PROPOSED DEVELOPMENT

It is proposed to re-develop approximately 5.45ha of the site with a new Giant Tiger Store and Head Office Building with underground parking and surface parking lots. The existing store, office area and a portion of the existing warehouse will be demolished as part of the site development. The remaining portion of the existing warehouse will remain in operation. **Figure 3** shows the proposed development. The existing store and office area are to remain in operation during the construction of the proposed store and office building. Access to the site will remain from Banton Street and Walkley Road. There are also road modifications proposed which includes the construction of a signalized intersection at Melfort Street and Walkley Road to service the proposed development. It should be noted that this report should be read in conjunction with the engineering drawing set. The relevant engineering drawings are referenced throughout the report and the full drawing set is listed in the last appendices (Appendix F).

4.0 SITE CONSTRAINTS

A geotechnical investigation was also completed for the subject development and a report provided entitled 'Geotechnical Investigation Proposed Re-Development of Commercial Site – Phase 1 2480 Walkley Road Ottawa, Ontario' prepared by Gemtec dated September 5, 2018. The report indicates there are some issues to be considered in the grading and servicing design due to the native soils present which include:

- A grade raise restriction of 0.6m above original ground is not to be exceeded without further consolidation testing.
- Seepage barriers are to be installed along the sewer trenches to prevent potential groundwater lowering.
- Stub drains are to be provided at catchbasins to provide adequate drainage of parking areas.
- An Environmental Activity and Sector Registry (EASR) may be required depending on the depth of proposed services and groundwater levels at the time of construction.

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6

Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

GIANT TIGER HEAD OPERATIONS

KEYPLAN

SCALE		
N.T.S		
DATE	JOB	FIGURE
JAN 2019	117203	1

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SHT8X11.DWG - 216mmx279mm

M:\2017\117203\CAD\Design\Figures\117203-REPORT FIGS.dwg, EX, Jan 15, 2019 - 3:09pm, mhrehoriak

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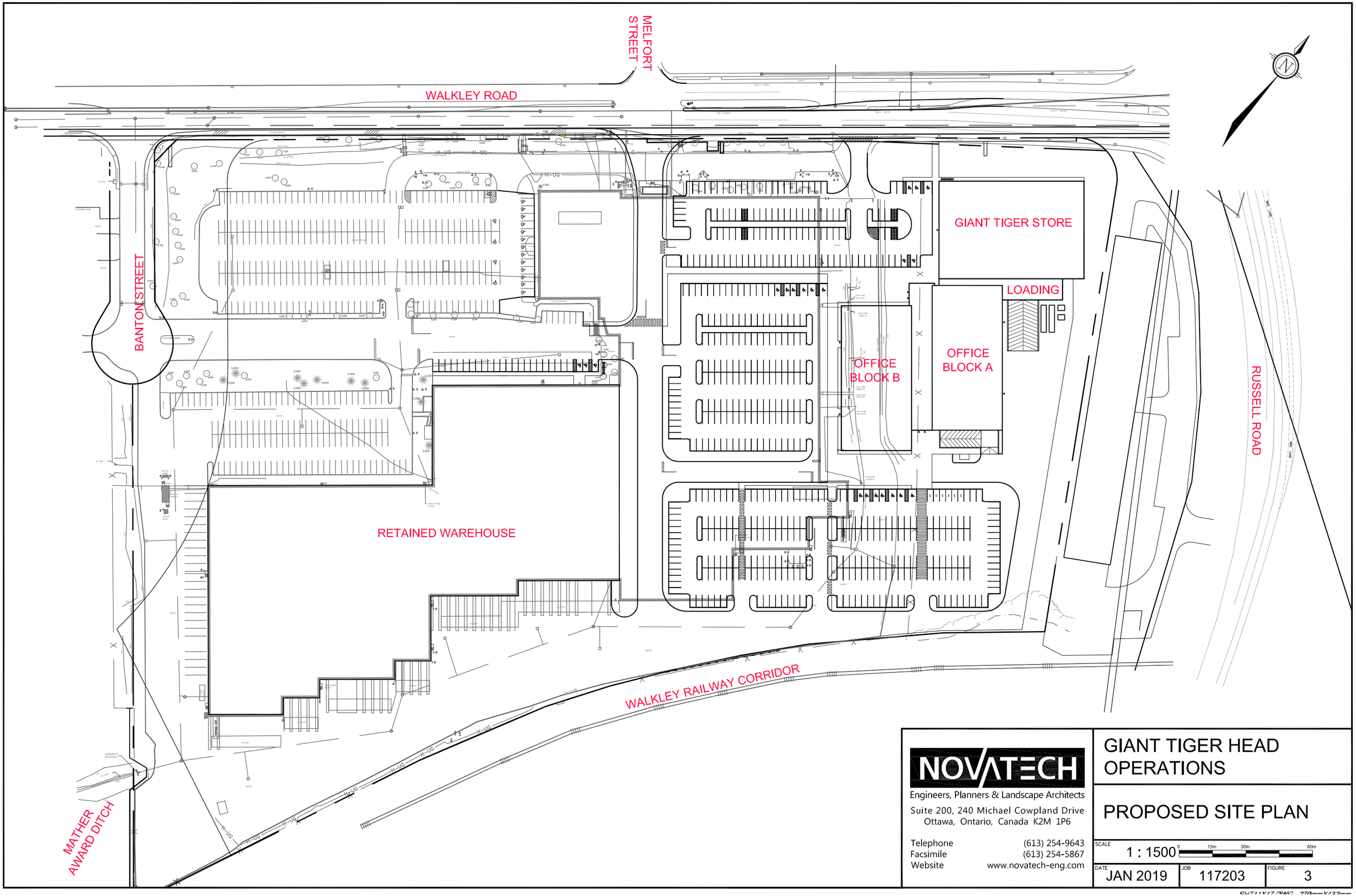
Website www.novatech-eng.com

GIANT TIGER HEAD OPERATIONS

EXISTING CONDITIONS

SCALE 1 : 1500 (0, 15m, 30m, 60m)

DATE JAN 2019 | JOB 117203 | FIGURE 2



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Website www.novatech-eng.com

GIANT TIGER HEAD OPERATIONS

PROPOSED SITE PLAN

SCALE 1 : 1500 (0, 15m, 30m, 60m)

DATE JAN 2019 | JOB 117203 | FIGURE 3

5.0 SERVICING REPORT REFERENCES

- Gemtec, Geotechnical Investigation Proposed Re-Development of Commercial Site – Phase 1 2480 Walkley Road Ottawa, Ontario, Dated September 5, 2018.

6.0 WATER SERVICING

The existing development is currently serviced from the 400mm diameter watermain in Walkley Road. There is currently a 250mm diameter private watermain on site that loops around the existing development and connects to the existing 400mm diameter watermain in two locations. The 250mm diameter watermain provides fire protection for the site by servicing multiple hydrants around the building and a sprinkler system within the building. The domestic water demands are serviced by a 100mm diameter watermain that extends from the 250mm diameter private watermain. A portion of the existing watermain infrastructure will be temporarily removed during the building demolition. The existing 250mm diameter watermain along the north side of the site will be extended to service the proposed buildings. This watermain will also be extended south where is will reconnect with the existing 250mm diameter watermain that runs along the south side of the existing warehouse to provide a looped system. Refer to the General Plan of Services (117203-GP) for further details.

Design Criteria from the City of Ottawa Water Distribution Guidelines and the Ontario Building Code were used to calculate the theoretical water demands the existing and proposed development. The demand calculations are based on flow requirements from the different uses on the site which include a retail store, commercial office and warehouse space. A summary of the existing and proposed development demands are provided in **Table 6.1** and **Table 6.2** respectively.

Table 6.1 Existing Development Water Demand Summary

	Retail Store	Commercial Office	Warehouse Office	Warehouse	Totals
Floor Area	2950	7000	1700	N/A	
No. Bathrooms	2	N/A	5	5	
No. Loading Bays	N/A	N/A	N/A	55	
Total Daily Volume (Litres)	17210.0	56451.6	18459.7	13000	105121.3
Avg. Day Demand (L/s)	0.199	0.653	0.214	0.150	1.22
Max Day Demand (L/s)	0.299	0.980	0.320	0.226	1.83
Peak Hour Demand (L/s)	0.538	1.764	0.577	0.406	3.29

Table 6.2 Proposed Development Water Demand Summary

	Retail Store	Commercial Office	Warehouse Office	Warehouse	Totals
Floor Area	2800	15600	1700	N/A	
No. Bathrooms	2	N/A	5	0	
No. Loading Bays	N/A	N/A	N/A	40	
Total Daily Volume (Liters)	16460.0	125806.5	18459.7	6000	166726.1
Avg. Day Demand (L/s)	0.191	1.456	0.214	0.069	1.93
Max Day Demand (L/s)	0.286	2.184	0.320	0.104	2.89
Peak Hour Demand (L/s)	0.514	3.931	0.577	0.188	5.21

The required fire demand was calculated using the Fire Underwriters Survey (FUS) Guidelines. The fire demand was calculated for each building in the proposed condition, the retained existing 1 storey warehouse building, proposed 4 storey office building with atrium, and the proposed 1 storey retail building with loading area. The FUS calculations indicate that the proposed 4 storey office building at 317 L/s is governing fire flow for the proposed development.

This water demand information was submitted to the City for boundary conditions from the City's water model. The proposed boundary conditions from the City assume that the site will remain connected to the existing 400mm diameter watermain in Walkley Road which is in the 2C pressure zone of the City of Ottawa water distribution network. Refer to **Table 6.3** for a summary of the proposed boundary conditions.

Table 6.3 Water Boundary Conditions

Criteria	Head (m)	Pressure[1] (psi)
Max HGL	124.0	65.2
Min HGL	130.5	74.4
Max Day + Fire Flow	120.0	59.5

[1]Pressures based on proposed finished floor elevation of 78.15

These boundary conditions were input into the hydraulic model EPANET for analyzing the performance of the proposed and existing watermain systems for three theoretical conditions: 1) High Pressure check under Average Day conditions 2) Peak Hour demand 3) Maximum Day + Fire Flow demand. The model indicates that the system can provide adequate pressures for domestic use by extending a 200mm service from the existing 250mm diameter watermain.

The proposed development is to be sprinklered with the Siamese located at the main entrance of the office building. There are two existing and two proposed hydrants on site which will provide fire protection for the proposed development. Refer to Fire Flow model schematic in **Appendix A** for the existing and proposed hydrant locations.

The fire flow required for the proposed development as indicated previously is 19,000 L/min (317 L/s) based on the FUS guidelines. As per the City of Ottawa Technical Bulletin ISTB-2018-02 Appendix I, the aggregate fire flow of all contributing fire hydrants within 150m of the site should not be less than the required fire flow. In the case of the proposed development there are 4 class AA (blue top) hydrants within 150m of front entrance of the building. The total combined aggregate flow from the four hydrants as per Table 1 in the ISTB-2018-02 technical bulletin would allow for a total fire flow of 20,900 L/min.

The following **Table 6.4** summarizes the results from the hydraulic water model.

Table 6.4 Water Analysis Results Summary

Condition	Service Connection Location	Demand (L/s)	Min/Max Allowable Operating Pressures (psi)	Limits of Design Operating Pressures (psi)
High Pressure	Walkley Road	1.93	80psi (Max)	78.20
Maximum Daily Demand and Fire Flow	Walkley Road	319.89	20psi (Min)	49.44
Peak Hour	Walkley Road	5.21	40psi (Min)	65.18

Therefore, based on the proceeding analysis it can be concluded that the watermain, as designed, will provide adequate system pressures for the fire flow + maximum day demand and peak hour demand. Refer to **Appendix A** for detailed model results, schematics of the model and boundary conditions.

7.0 SANITARY SERVICING

The existing development is currently serviced by a private 150mm diameter sanitary service which connects to the existing 1050mm x 675mm diameter sanitary trunk sewer within Walkley Road. It is proposed to service the new development with a proposed 150mm diameter sanitary sewer that connects to the existing 150mm diameter service on site. Refer to the General Plan of Services (117203-GP) for more details.

The total theoretical peak sanitary flow for the proposed development along with the existing retained warehouse are calculated to be 9.48 L/s using City of Ottawa Design Guidelines. The total sanitary flow is calculated based on an area of 6.38 ha for the retained warehouse (light industrial use) and 4.27 ha for the proposed office and retail store (commercial use). The existing 150mm diameter sewer at a slope of 1.0% has a theoretical capacity of 15.2 L/s and the existing sanitary trunk sewer along Walkley Road has adequate capacity for the proposed development. Refer to **Appendix B** for Sanitary Drainage Area Plan and design sheet for further details.

8.0 STORM SERVICING

There is an existing 750mm diameter sewer outlet to the Mather Award Drain at the south west corner of the site. This existing storm sewer services only the existing developed portion of the property. It is proposed to service the new developed portion of the site by constructing an additional, new 750mm diameter storm sewer outlet to the Mather Award ditch. The existing storm sewer will continue to service the retained warehouse and existing parking areas. Refer to the General Plan of Services (117203-GP) for more details.

The proposed storm sewers have been sized to convey the uncontrolled 2-year storm event using the Rational Method; as per the *City of Ottawa Sewer Design Guidelines (OSDG)* (October 2012). The existing 750mm diameter outlet pipe has a slope of 0.3% with a full-flow capacity of 636 L/s (Manning's Equation). Refer to **Appendix C** for the Storm Sewer Drainage Area Plan and design sheet for further details.

9.0 STORM DRAINAGE AND STORMWATER MANAGEMENT

The proposed storm drainage and stormwater management design for the site is discussed in the following sections of the report.

9.1 Stormwater Management Criteria and Objectives

The stormwater management criteria and objectives for the site are as follows, per the City of Ottawa's requirements:

- Provide a dual drainage system (i.e. minor and major system flows);
- Maximize the use of rooftop and surface storage available on site;
- Control the 100-year post-development flow from the site to an allowable release rate corresponding to the 5-year pre-development peak flow (as established during the pre-consultation process with the City of Ottawa);
- Ensure that no surface ponding will occur on the paved surfaces (i.e., private drive aisles or parking lots) during the 2-year storm event;
- Provide on-site water quality control equivalent to an 'Enhanced' Level of Protection (i.e., minimum 80% long-term TSS removal), as required by the Conservation Authority; and,
- Provide guidelines to ensure that site preparation and construction is in accordance with the current Best Management Practices for Erosion and Sediment Control.

9.2 Existing Conditions

As indicated previously there is an existing private storm sewer system servicing the existing development. This system and its outlet to the Mather Award Drain will continue to service the existing development. Refer to **Figure 117203-EX,** in **Appendix D**, which shows the existing drainage area.

9.2.1 Hydrologic and Hydraulic Modeling

The site was modelled under existing conditions using a dual-drainage model created in PCSWMM, as the typical Rational method approach would not yield an accurate estimate of the existing peak flows. The PCSWMM model simulates the storage and routing of flows through the

existing network. The model was developed to determine the allowable release rate for the re-developed portion of the site.

Design Storms

The design storms used in the existing conditions analysis model include the 3-hour Chicago distribution and the 12-hour SCS Type II distribution for return periods of 1:2 years, 1:5 years and 1:100 years. IDF data was taken from the *City of Ottawa Sewer Design Guidelines* (OSDG) (October 2012). The 3-hour Chicago storm distribution was found to generate the highest peak flows and the model results from this distribution are documented in the following tables.

Parking Lot

The existing storm sewer system catchbasins are not restricted by inlet control devices (ICDs). Runoff from the existing parking lot runoff is uncontrolled. They are only restricted by the capacity of the existing storm pipes.

Rooftops

Under existing conditions, runoff from the building rooftops is directed to a system of roof drains. A roof plan from JASEL Engineering (*Roof Storm Drain Review for Headquarters and Warehouse Areas,* September 2013) can be found in **Appendix D**. **Table 9.1** lists the design release rates from each section of the roof under existing conditions.

Table 9.1: Existing Conditions Model – Roof Drains

Drainage Area ID	2.24 L/s Roof Drains		1.68 L/s Roof Drains		Total Release Rate (L/s)
	# of Roof Drains	Release Rate (L/s)	# of Roof Drains	Release Rate (L/s)	
EX-R1	13	29.1	0	0	29.1
EX-R2	8	17.9	1	1.7	19.6
EX-R3	15	33.6	51	85.6	119.2

The existing conditions model schematic, parameters and output files are provided in **Appendix D**.

9.2.2 Peak Flow Summary

The peak flows generated by the existing conditions model are summarized in **Table 9.2**.

Table 9.2: Existing Conditions Peak Flows

Design Event	Peak Flows – West Side (L/s) (Existing Development to Remain)				Peak Flows – East Side (L/s) (Proposed Redevelopment)			Site Total (L/s)
	Warehouse Roof (EX-R1)	Warehouse Addition Roof (EX-R2)	Parking Lot (EX-01 – EX-15)	Total (West)	Retail Store Roof (EX-R3)	Parking Lot (EX-16)	Total (East)	
2-Yr	29	20	607	656	119	195	314	970
5-Yr	29	20	796	845	119	269	**388**	1,233
100-Yr	29	20	1,225	1,274	119	484	603	1,877

9.2.3 Allowable Release Rate

During the pre-consultation process, the City of Ottawa stated that the allowable release rate will be the 5-year peak flow under existing conditions.

West Side – Existing Development to Remain

Under proposed conditions, the west side of the site will remain as per existing conditions. There are no proposed changes to the drainage system servicing the west side of the site, and no changes to the existing conditions flows from this area.

East Side – Proposed Redevelopment

Drainage areas EX-R3 and EX-16 (shown on **Figure 117203-EX** in **Appendix D**) represent the portion of the site to be redeveloped (east side). The allowable release rate for the proposed development is the 5-year existing conditions peak flow from the east side of the site (388 L/s), as seen in **Table 9.2**.

A model schematic for the existing conditions scenario visually displays the west side and east side sections of the site plan is provided in **Appendix D**.

9.3 Proposed Conditions – Quantity Control

As stated in **Section 9.1**, the criteria specific to quantity control for the Site are as follows:

- Control the 100-year post-development flow from the site to an allowable release rate corresponding to the 5-year pre-development peak flow; and,
- Ensure that no surface ponding will occur on the paved surfaces (i.e., private drive aisles or parking lots) during the 2-year storm event.

The proposed development on the east side of the site will be serviced by a proposed storm sewer system, which will be completely independent of the existing system. The proposed storm sewers will be routed through the south side of the site, parallel to the existing storm sewers, and outlet to the Mather Award Drain through a new headwall adjacent to the existing outlet headwall in the southwest corner of the site. The proposed drainage areas are shown on **Figure 117203-PR** in **Appendix D**.

The site's quantity control system will include a combination of underground storage, parking lot surface storage, grassed swales and rooftop controls. The underground storage portion consists of oversized 900mm dia. or 1050 mm dia. storm sewers, located upstream of structures fitted within an inlet control device. The proposed storm sewer system can be viewed on **Drawing 117203-GP**.

9.3.1 Hydrologic and Hydraulic Modelling

The performance of the proposed stormwater management system was evaluated using a dual-drainage model created in PCSWMM, which simulates the storage and routing of flows through the proposed storm drainage network. The results of the analysis were used to:

- Size the proposed ICDs within the parking lot and determine the overall release rate; and,
- Determine required amount of underground storage and surface ponding depths.

Design Storms

The 3-hour Chicago storm distribution generated the highest peak flows for the proposed conditions model and was selected as the critical design event. The model results represent the 3-hour Chicago storm distribution.

The model was 'stress tested' using a 100-year (+20%) 3-hour Chicago storm distribution. This represents a 20% increase both the intensity and volume of the 100-year storm.

The proposed conditions model schematic, parameters and output files are provided in **Appendix D**.

9.3.2 Model Results

The following sections outline the stormwater management strategy for the proposed building (rooftop controls), and storage within the parking lot and grassed swale.

Results – Office Building Roof

Runoff from the roof of the office building will be attenuated using Watts adjustable 'Accutrol' flow-control roof drains (model number RD-100-A-ADJ). A total of 41 roof drains will be provided within 10 rooftop storage areas. The roof drains were calculated based on the Modified Rational Method.

Table 9.4 summarizes the results for the proposed building rooftop for both the 5-year and the 100-year design events. Detailed roof drain calculations and figure showing the rooftop drainage areas is provided in **Appendix D**.

Table 9.3: Proposed Conditions Results (Office Building Roof)

Drainage Area ID and Area (ha)	Number of Roof Drains	Number of Roof Drain Storage Areas	Controlled Flow (L/s)		Maximum Ponding Depth (m)		Storage Volume Required (m^3)		Max. Storage Available (m^3)
			5-Yr	100-Yr	5-Yr	100-Yr	5-Yr	100-Yr	
R-01 (0.798 ha)	41	10	33.1	57.3	0.08	0.14	148.8	292.5	314.1

As indicated in **Table 9.4**, the building roof will provide sufficient storage for both the 5-year and 100-year design events.

Results – Parking Lot

Runoff from the parking lot will be captured by the proposed on-site storm sewer network and attenuated by ICDs. Storage will be provided within a combination of underground storage (i.e. pipes / structures) and surface storage.

Catchbasin inlets are located either within localized low points (sags) or are on a continuous grade. For catchbasins at low points, the inlet control device (ICD) governs the total inflow to the storm sewer system. For on-grade catchbasins, the PCSWMM model uses inlet rating curves (captured flow vs. bypass flow) to simulate the inlet capture rates based on standard City of Ottawa rating curves (provided in **Appendix D**). The catchbasins on-grade will be equip with standard 83mm diameter ICDs.

The underground and surface storage provided upstream of each ICD are represented in the model using storage curves, which use a depth vs. area relationship to represent the corresponding storage volume at a given elevation. Refer to **Appendix D** for detailed storage volume calculations and the individual storage curves used in the model for each drainage area / control structure.

ICD sizes, design flows, and ponding depths are provided in **Table 9.3** below. The specifications for the Tempest LMF & MHF ICDs are found in **Appendix D**.

Table 9.4: Proposed Conditions Model Results (Parking Lot)

Structure ID	STM ID	ICD Parameters		2-Year		5-Year		100-year		100-year (+20%)	
		Model / Diameter	T/G Elev. (m)	Flow Depth (m)	Peak Flow (L/s)	Flow Depth (m)	Peak Flow (L/s)	Flow Depth (m)	Peak Flow (L/s)	Flow Depth (m)	Peak Flow (L/s)
Catchbasins (In-Sag's)											
CBMH01	A-01	LMF 77	77.20	0.00	6.9	0.11	7.2	0.27	7.4	0.31	7.4
CBMH02	A-02	LMF 77	77.40	0.00	7.2	0.13	7.5	0.21	7.6	0.21	7.7
CBMH03	A-03	LMF 77	77.10	0.00	7.6	0.13	7.8	0.24	8.0	0.29	8.1
CBMH04	A-04	LMF 77	77.10	0.00	7.5	0.12	7.7	0.23	7.9	0.26	8.0
CBMH06	A-05	MHF 82	77.25	0.00	20.4	0.11	21.4	0.20	21.8	0.23	21.9
CBMH05	A-06	MHF 82	77.00	0.00	7.0	0.11	7.3	0.21	7.5	0.24	7.5
CBMH08	A-07	MHF 72	76.80	0.00	7.0	0.12	7.3	0.22	7.5	0.25	7.5
CBMH07	A-08	LMF 77	76.65	0.00	7.0	0.12	7.3	0.22	7.5	0.25	7.5
CBMH09	A-09	MHF 103	76.95	0.00	30.1	0.12	31.6	0.23	32.4	0.26	32.6
CBMH10	A-10	LMF 94	77.00	0.00	11.1	0.12	11.5	0.22	11.7	0.25	11.8
CB21	A-11	LMF 77	76.90	0.00	5.8	0.00	7.4	0.12	7.7	0.15	7.7
CBMH11	A-12	MHF 110	76.00	0.00	31.4	0.12	34.4	0.22	35.3	0.23	35.5
CB20	A-17	MHF 110	75.70	0.00	19.8	0.00	29.8	0.26	33.7	0.34	34.5
STMMH 110	A-18, A-22	LMF 77	77.30	0.00	5.4	0.00	6.5	0.15	8.7	0.24	8.8
CB18	A-19	LMF 101	76.65	0.00	11.9	0.09	13.3	0.18	13.6	0.19	13.6
CB19	A-20	MHF 98	76.25	0.00	18.6	0.00	25.6	0.15	28.8	0.19	29.0
Catchbasins (On-Grade)											
CB17	A-13	MHF 83	77.00	0.02	5.6	0.02	8.1	0.03	13.8	0.04	16.0
CB16	A-14	MHF 83	76.50	0.02	7.7	0.03	11.5	0.05	18.0	0.05	18.0
CB14	A-15	MHF 83	76.30	0.02	6.8	0.03	10.4	0.05	18.0	0.06	18.0
CB15	A-16	MHF 83	76.50	0.03	10.7	0.03	14.4	0.05	18.0	0.05	18.0

The model results demonstrate that each storage area provides sufficient underground storage to ensure no surface ponding during the 2-year design event (the 2-year HGL elevation at each structure containing an ICD does not exceed the corresponding top of grate elevation).

The model results also demonstrate that the site has sufficient storage to attenuate the 100-year peak flow to the allowable release rate, as there are no 100-year major system flows off-site.

The catchbasins along the north-south access road adjacent to the existing warehouse are on a continuous grade and provide no surface storage for ponding. As such, these areas experience a minimal flow depth corresponding to the bypass flow at each inlet. Flows bypassing these CBs eventually drain into either CBMH11 or CB20 (located at the south end of the access road), which have been sized to accommodate the bypass flows (no surface ponding in the 2-year design event and sufficient storage for the 100-year event).

Results – Grassed Swale

Runoff from drainage area A-21 will drain to a grassed swale of varying depth with 3:1 side slopes. The swale will convey flow to CB12 in the southeast corner of the site, which is equipped with an ICD. Due to the varying longitudinal slope and swale depth, the grassed swale has been modeled in PCSWMM as a storage node that has a depth vs. area curve representing the available storage within the swale. The ICD size, design flows, and ponding depths for CB12 are provided in **Table 9.5**.

Table 9.5: Proposed Conditions Model Results (Grassed Swale)

Structure ID	STM ID	ICD Parameters		2-Year		5-Year		100-year		100-year (+20%)	
		Diameter (mm)	T/G Elev. (m)	Flow Depth (m)	Peak Flow (L/s)	Flow Depth (m)	Peak Flow (L/s)	Flow Depth (m)	Peak Flow (L/s)	Flow Depth (m)	Peak Flow (L/s)
CB12	A-21	LMF 94	76.70	0.30	11.1	0.40	11.4	0.58	11.9	0.63	12.0

As seen in the table above, the ICD for drainage area A-21 has been sized to ensure a maximum depth of 0.60m in the grassed swale.

9.3.3 Peak Flow Summary

Table 9.6 provides a summary of the total proposed flows from the site and compares them to the site's allowable release rate.

Table 9.6: Proposed Conditions Model Summary

Design Event	Allowable Release Rate (L/s)	Controlled Minor System Release Rate (L/s)	Major System Release Rate (L/s)
2-year	388	270	0
5-year		329	0
100-year		**388**	0
100-year (+20%)	-	403	23

As indicated in **Table 9.6**, the post-development flows from the site will be controlled to the allowable release rate (388 L/s) for all storms up to and including the 100-year design event. This represents a significant reduction in the total 100-year site flow rate when compared to existing conditions.

9.4 Proposed Conditions – Quality Control

Quality control of stormwater shall be provided to an *Enhanced* level of treatment or 80% removal of total suspended solids. Quality control for stormwater from parking and paved surfaces will be provided through the installation of an oil grit separator unit (refer to drainage area to WQT unit figure provided in **Appendix D**). The proposed OGS unit is a CDS PMSU4040-8 which will provide

enhanced levels of water quality prior to discharging into the Mather Award Drain. The target level of protection for long term removal of 80% total suspended solids with an overall treatment of 100% of the total runoff.

Refer to **Appendix D** for the CDS unit operation, design, performance and maintenance summary parameters as well as the annual TSS removal efficiency data.

10.0 INTERIM SERVICING AND GRADING

The site development requires an interim grading and servicing design while the existing store and office are being demolished. Upon completion of the demolition the remainder of the site construction will be completed.

Considerations such as public access, truck movements and loading access were considered in the interim condition. Access to the existing store from Banton Street will remain as per existing conditions. When the new store and office is open access will remain from Banton Street to the existing northern access road (parallel to Walkley Road). The new development will also be accessible from the existing entrance directly from Walkley Road. A temporary north-south internal access road will be constructed for truck deliveries to the store.

Once the demolition has been completed the remainder of the parking areas and the proposed north-south internal access road will be completed. The servicing and grading has been designed to accommodate the interim condition. The oil grit separator, storm sewer and stormwater management devices for the proposed store and office building will be operational. An overland flow route has also been provided.

11.0 EROSION AND SEDIMENT CONTROL

11.1 Temporary Measures

Temporary erosion and sediment control measures will be implemented during construction. Silt fence, mud mats and filter bags in catchbasins will be used as erosion and sediment control measures.

Erosion and sediment control measures should be inspected daily and after every rain event to determine maintenance, repair or replacement requirements. Sediments or granulars that enter site sewers shall be removed immediately by the contractor. These measures will be implemented prior to the commencement of construction and maintained in good order until vegetation has been established. Refer to the Erosion and Sediment Control Plan (117203-ESC) for additional information.

12.0 CONCLUSIONS AND RECOMMENDATIONS

- The existing private 250mm diameter water system will be extended to provide domestic flows and fire protection to service the proposed development. The watermain infrastructure will continue to be looped for redundancy. The existing watermain infrastructure can provide adequate domestic flows and pressure for fire protection.
- The existing 150mm diameter sanitary sewer servicing the existing development will be extended to service the proposed buildings. There is an existing trunk sanitary sewer along Walkley Road that has adequate capacity to service the proposed development.
- Runoff from the parking lot and grassed swale will be controlled by inlet control devices. There will be no surface ponding in the 2-year design event, and a maximum of 0.25m of surface ponding in the 100-year design event.
- Runoff from the office building roof will be controlled by Accutrol roof drains prior to discharging to the proposed storm sewer network.
- The total post-development site flow will be approximately 387.8 L/s during the 100-year design event and overcontrolled in the 2-year and 5-year design events, which does not exceed the allowable release rate of 388.0 L/s.
- Quality control of stormwater will be provided through the installation of an oil grit separator unit (CDS PMSU4040-8) which will provide enhanced levels of water quality prior to discharging into the Mather Award Drain.
- An overland flow route is provided.
- Erosion and sediment control measures will be implemented prior to and during construction.

B.3 Geotechnical Recommendations Memo (Paterson Group, March 2023)

PATERSON GROUP

memorandum

re: **Geotechnical Recommendations for Parking Lot Expansion**
2370 Walkley Road – Ottawa – Ontario

to: Richcraft Properties Ltd. - **Ms. Fairouz Wahab** – FWahab@richcraft.com

date: March 6, 2023

file: PG6595-MEMO.01

Further to your request, Paterson Group (Paterson) prepared this memorandum to provide our geotechnical recommendations pertaining to the proposed parking lot expansion to be located at the aforementioned site.

During the preparation of the memo, Paterson reviewed the following drawing prepared by Stantec:

- ❑ Site Servicing and Grading Plan – Revision 1 dated January 30, 2023
  Drawing No. SSGP-1, Project No. 160401534

Based on our review of this drawing, the proposed development consists of expanding the asphalt-paved parking lot at the south end of the site to provide additional parking for transport trucks. This involves the entombment of an existing watercourse within a 1,350 mm diameter storm pipe.

Available Subsurface Information

In reviewing available subsurface information from the vicinity of the site, the subsurface profile generally consists of an approximate 0.5 to 1 m thickness of fill, composed of silty sand with crushed stone, which is underlain by a silty clay deposit.

Available geological mapping indicates that the bedrock at the subject site consists of shale of Carlsbad formation with an overburden drift thickness of about 3 to 5 m.

Geotechnical Recommendations

The subject site is considered suitable for the proposed development, from a geotechnical perspective. Our detailed geotechnical recommendations for pavement design, pipe bedding and backfill, permanent slopes, temporary excavation side slopes, groundwater control, and winter construction are provided in the following subsections.

Pavement Design

The pavement design for the proposed parking lot expansion is provided in Table 1 below.

Table 1 - Recommended Pavement Structure – Access Lanes, Loading Areas and Heavy Truck Parking

Thickness (mm)	Material Description
40	**Wear Course** - Superpave 12.5 Asphaltic Concrete
50	**Binder Course** - Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
450	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either fill, in situ soil, or OPSS Granular B Type I or II material placedover fill or in situ soil.	

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type I or II material.

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project. The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 99% of the material's standard Proctor maximum dry density (SPMDD) using suitable compaction equipment.

Where the proposed asphalt surface, recommended above, meets the existing asphalt surface, the following joint transition detail should be employed:

- A 300 mm wide section of the existing asphalt should be saw cut from the existing pavement edge to provide a sound surface to abut the proposed pavement structure.

- It is recommended to mill a 300 mm wide and 40 mm deep section of the existing asphalt at the saw cut edge.

Pipe Bedding and Backfill

Bedding and backfill materials should be in accordance with the most recent Material Specifications and Standard Detail Drawings from the Department of Public Works and Services, Infrastructure Services Branch of the City of Ottawa.

A minimum of 150 mm of OPSS Granular A should be placed for bedding for sewer pipes when placed on a soil subgrade. The bedding should extend to the spring line of the pipe. Cover material, from the spring line to a minimum of 300 mm above the obvert of the pipe, should consist of OPSS Granular A (concrete or PSM PVC pipes) or sand (concrete pipe). The bedding and cover materials should be placed in maximum 225 mm thick lifts and compacted to 98% of the material's SPMDD.

The trench backfill material within the frost zone (about 1.8 m below finished grade) and above the cover material should match the soils exposed at the trench walls to minimize differential frost heaving. The trench backfill should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the material's SPMDD. All cobbles larger than 200 mm in their longest direction should be segregated from re-use as trench backfill.

Permanent Slopes

The Site Servicing and Grading Plan drawing, referenced above, indicates new permanent slopes at the southern boundary of the site ranging from approximately 3H:1V to 5H:1V.

These permanent slopes have been reviewed, and are considered acceptable, from a geotechnical perspective.

Temporary Excavation Side Slopes

The side slopes of the excavations in the soil and fill overburden materials should be cut back at acceptable slopes, as described below. The subsoil at this site is considered to be mainly Type 2 and 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects.

The excavation side slopes above the groundwater level extending to a maximum depth of 3 m should be cut back at 1H:1V or flatter. The flatter slope is required for excavation below groundwater level.

Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should be kept away from the excavation sides.

Slopes in excess of 3 m in height should be periodically inspected by the geotechnical consultant in order to detect if the slopes are exhibiting signs of distress.

It is recommended that a trench box be used at all times to protect personnel working in trenches with steep or vertical sides. It is expected that services will be installed by "cut and cover" methods and excavations will not be left open for extended periods of time.

Groundwater Control

It is anticipated that groundwater infiltration into the excavations should be low to moderate and controllable using open sumps. The contractor should be prepared to direct water away from all subgrades, regardless of the source, to prevent disturbance to the founding medium.

For typical ground or surface water volumes being pumped during the construction phase, typically between 50,000 to 400,000 L/day, it is required to register on the Environmental Activity and Sector Registry (EASR). A minimum of two to four weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan to be prepared by a Qualified Person as stipulated under O.Reg. 63/16. If a project qualifies for a PTTW based upon anticipated conditions, an EASR will not be allowed as a temporary dewatering measure while awaiting the MECP review of the PTTW application.

Winter Construction

Precautions must be taken if winter construction is considered for this project. The subsoil conditions at this site consist of frost susceptible materials. In the presence of water and freezing conditions, ice could form within the soil mass. Heaving and settlement upon thawing could occur.

In the event of construction during below zero temperatures, the founding stratum of the pipe should be protected from freezing temperatures using straw, propane heaters and tarpaulins or other suitable means.

In this regard, the base of the excavations should be insulated from sub-zero temperatures immediately upon exposure and until such time that sufficient soil cover has been placed in order to prevent freezing at the founding level of the pipe.

Trench excavations and pavement construction are also difficult activities to complete during freezing conditions without introducing frost into the subgrade or in the excavation walls and bottoms. Precautions should be taken if such activities are to be carried out during freezing conditions. Additional information could be provided, if required.

Conclusion

When construction of the proposed development is proceeding, Paterson should be notified in order to review the excavated subgrades and to perform compaction testing on fill materials.

We trust that this Information satisfies your immediate requirements.

Best Regards,

Paterson Group Inc.

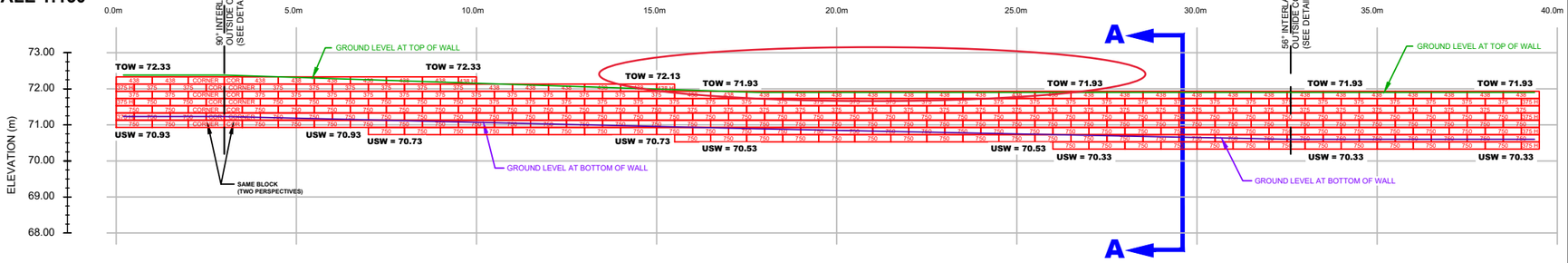
Killian Bell, B.Eng.

Scott S. Dennis, P.Eng.

ISSUED FOR REVIEW

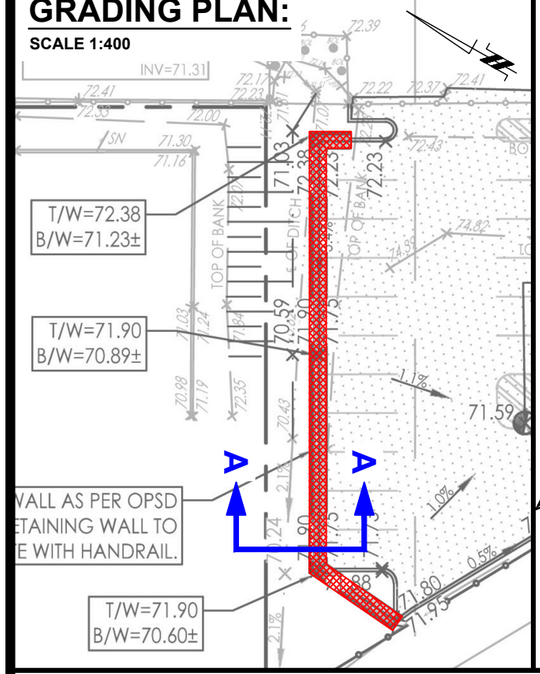
PROFILE VIEW:

SCALE 1:150



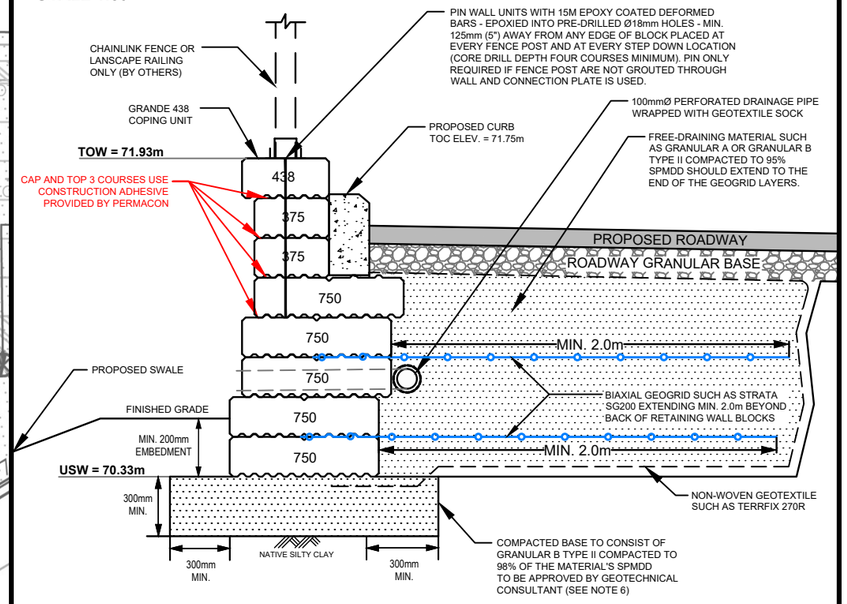
GRADING PLAN:

SCALE 1:400



CROSS SECTION A-A:

SCALE 1:30



DETAIL 1:

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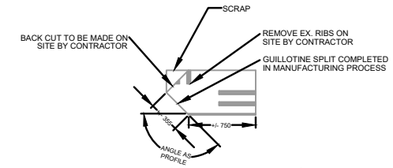
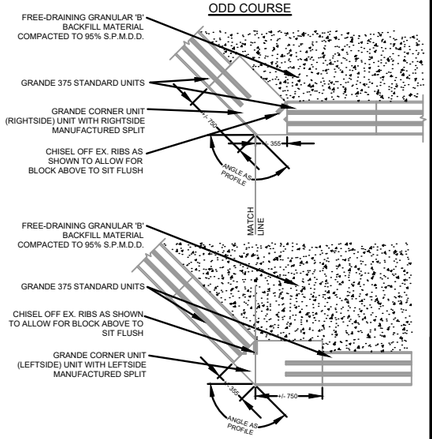


CORNER UNIT DETAILS

PLAN VIEW
GRANDE SINGLE DEPTH
ODD COURSE



PLAN VIEW
GRANDE SINGLE DEPTH
EVEN COURSE

NOTES:

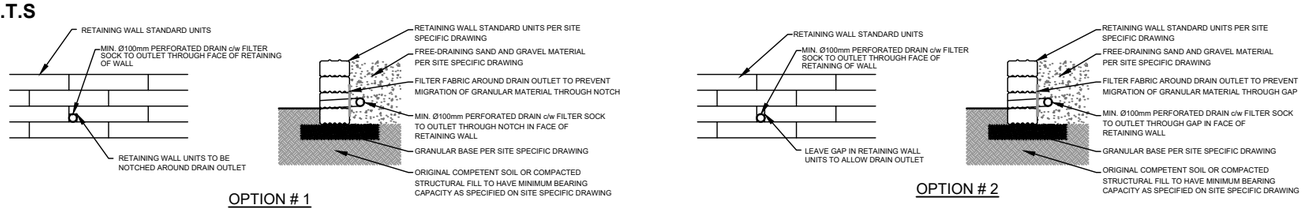
1. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR UTILITY CLEARANCES AND CONSTRUCTION SITE SAFETY. PATERSON GROUP SHALL NOT BE RESPONSIBLE FOR MEANS OR METHODS OF CONSTRUCTION OR FOR SAFETY OF WORKERS OR OF THE PUBLIC.
2. THIS DESIGN IS BASED ON THE FOLLOWING SOIL PROPERTIES:

PROPERTY	RETAINED FILL	FOUNDATION MEDIUM
FRICTION ANGLE - ϕ	38°	33°
UNIT WEIGHT - γ	21 kN/m3	18 kN/m3
COHESION - C	0	5 kPa
SOIL TYPE	OPSS GRANULAR B TYPE II	VERY STIFF SILTY CLAY

   MATERIAL PROPERTIES ARE BASED ON SITE EVALUATION BY PATERSON GROUP AND DISCUSSIONS WITH CONTRACTOR. SEISMIC LOADING WAS EVALUATED ACCORDING TO THE CURRENT CANADIAN HIGHWAY BRIDGE DESIGN CODE WITH A PEAK GROUND ACCELERATION VALUE OF 0.296.
3. THIS DESIGN IS BASED ON A GRADING PLAN PROVIDED BY STANTEC, PROJECT No. 160401534, SITE SERVICING AND GRADING PLAN, DRAWING No. SSGP-1, REVISION 1 DATED JUNE 22, 2023 . THE WALL BASE DESIGN ASSUMES A BEARING RESISTANCE AT SLS OF 150 kPa ON VERY STIFF SILTY CLAY. THE SITE GEOTECHNICAL ENGINEER SHOULD OBSERVE THE BEARING CONDITIONS AND ADJUST THE THICKNESS OF THE GRANULAR BASE OR RECOMMEND CONCRETE BEDDING TO ACCOMMODATE THE SITE CONDITIONS, IF NECESSARY.
4. RETAINING WALL DESIGN WITH A GLOBAL STABILITY FACTOR GREATER THAN 1.5 UNDER STATIC CONDITIONS AND 1.1 UNDER SEISMIC CONDITIONS. WALL GEOMETRY AND GRADE ELEVATIONS ABOVE AND BELOW THE WALL SHOULD CONFORM WITH THE GRADING PLAN PROVIDED HERE IN IF ACTUAL SITE GRADES VARY SIGNIFICANTLY FROM THOSE SHOWN OR IF THE BACK SLOPE DOES NOT CONFORM, INSTALLATION SHALL NOT PROCEED UNTIL THE DESIGN IS VERIFIED OR MODIFIED IN THE APPLICABLE AREA.
5. PRECAST UNITS SHALL BE GRANDE RETAINING WALL UNITS MANUFACTURED UNDER LICENSE FROM PERMACON.
6. THE WALL BASE SHALL CONSIST OF A MINIMUM OF 300mm OF OPSS GRANULAR B TYPE II. THE GRANULAR BEDDING LAYER SHOULD EXTEND AT LEAST 300mm BEYOND THE FRONT BLOCK FACE AND A MINIMUM OF 300mm BEYOND THE REAR BLOCK FACE. THE BASE SHALL BE SMOOTHED TO ENSURE COMPLETE CONTACT OF RETAINING WALL UNIT WITH BASE. SURFACE OF GRANULAR BASE MAY BE DRESSED WITH FINER AGGREGATE TO AID LEVELING. ENSURE GRADATION OF DRESSING MATERIAL IS SUCH AS TO PRECLUDE LOSS OF FINES INTO BASE. THE THICKNESS OF DRESSING LAYER SHOULD NOT EXCEED 3 TIMES THE MAXIMUM PARTICLE SIZE USED.
7. WALL IS DESIGNED WITH A MIN. 200mm TOE EMBEDMENT WITH A CONCRETE BEDDING LAYER EXTENDING A MINIMUM 300mm BEYOND THE FACE, AND A MINIMUM 300mm BEYOND THE HEEL OF THE BASE BLOCK.
8. THE CONDITIONS WILL BE EVALUATED BY THE GEOTECHNICAL ENGINEER DURING PREPARATION FOR WALL CONSTRUCTION IN EACH AREA TO CONFIRM THE SUBSURFACE PROFILE INDICATED BY THE GEOTECHNICAL REPORT WITHIN THE FOOTPRINT OF THE PROPOSED WALL . WHERE GRANULAR BEDDING WILL NOT BE SUFFICIENT, THE USE OF CONCRETE BEDDING MAY BE REQUIRED AND WILL BE PROVIDED AS SITE INSTRUCTIONS.
9. BACKFILL MATERIAL SHALL BE APPROVED BY THE SITE GEOTECHNICAL ENGINEER PRIOR TO USE AND SHOULD CONSIST OF OPSS GRANULAR B TYPE II B FOLLOWED BY SUITABLE BACKFILL MATERIAL. ALL FILL WITHIN A 1H:1V ZONE UP AND BACK FROM THE HEEL SHOULD ALSO BE COMPACTED. BACKFILL SHALL BE PLACED IN MAXIMUM 300mm LOOSE LIFTS AND COMPACTED TO A MINIMUM OF 95% OF SPMDD. MOISTURE CONTENT SHOULD BE CONTROLLED AND MAINTAINED WITHIN -3 TO +4 PERCENT OF OPTIMUM.
10. MAINTAIN TEMPORARY GRADES TO DIVERT SURFACE WATER AWAY FROM THE RETAINING WALL EXCAVATION. SLOPE FINAL BACKFILL TO PROVIDE POSITIVE DRAINAGE AND TO ELIMINATE PONDING.
11. EXCAVATION SIDE SLOPE SHOULD BE PROTECTED TEMPORARILY DURING CONSTRUCTION FROM PRECIPITATION EVENTS BY PLACEMENT OF TARPS.
12. ALL RETAINING WALL RELATED INSPECTIONS (BEARING SURFACE, COMPACTION, BLOCK INSTALLATION, ETC.) MUST BE COMPLETED BY PATERSON GROUP. ONCE THE WALL CONSTRUCTION IS COMPLETED AND REVIEWED BY PATERSON DURING CONSTRUCTION, A CERTIFICATE LETTER WILL BE ISSUED BY PATERSON GROUP.
13. ANY CUTTING OF BLOCKS TO SUIT SITE CONDITIONS OR WALL DESIGN WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.
14. USE MASONRY ADHESIVE RECOMMENDED BY THE SUPPLIER FOR THE TOP THREE COURSES AND CAP
15. PRELIMINARY PROFILE PROVIDED. PROFILE IS AT THE DISCRETION OF THE INSTALLED AND SHOULD FOLLOW MANUFACTURERS RECOMMENDATIONS.
16. THE CONTRACTOR SHOULD REFER TO THE INSTALLATION MANUAL PROVIDED FOR THE RETAINING WALL BLOCK TYPE PROVIDED HEREIN FOR ADDITIONAL DETAILS ON ACCEPTABLE INSTALLATION PRACTICES.

DRAINAGE DETAILS:

N.T.S



OPTION # 1

OPTION # 2

DETAIL 2:

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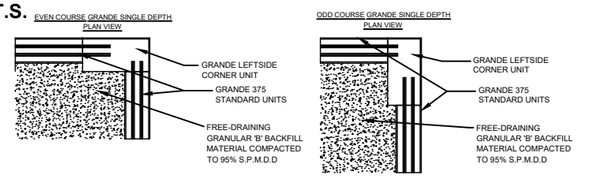

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL

RICHCRAFT

PROPOSED RETAINING WALL
2370 WALKELY ROAD

OTTAWA, ONTARIO

Title:

GRANDE RETAINING WALL DESIGN

Stamp: LICENSED PROFESSIONAL ENGINEER 19/07/2023 J. R. VILLENEUVE 100504314 PROVINCE OF ONTARIO

Scale: AS SHOWN	Date: 07/2023
Drawn by: NFRV	File No.: PG6595
Checked by: JV	Dwg. No.: PG6595-1
Approved by: FA	Revision No.:

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