

**FUNCTIONAL SERVICING &
PRELIMINARY STORMWATER
MANAGEMENT REPORT**

**109, 115, & 133 BRIDGEPORT ROAD EAST
AND 30 WEBER STREET NORTH**

**CITY OF WATERLOO
REGION OF WATERLOO**

PREPARED FOR:

SCHEMBRI GROUP OF COMPANIES

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TABLE OF CONTENTS

1.0	INTRODUCTION	1
2.0	SITE DESCRIPTION.....	1
3.0	WATER SERVICING	2
3.1	Existing Water Servicing.....	2
3.2	Design Water Demand.....	2
3.3	Fire Flow Demand.....	3
3.4	Proposed Water Servicing	4
4.0	SANITARY SERVICING.....	4
4.1	Existing Sanitary Servicing	4
4.2	Design Sanitary Flow	5
4.3	Proposed Sanitary Servicing	5
5.0	DRAINAGE CONDITIONS.....	5
5.1	Existing Drainage.....	6
5.2	Proposed Drainage	7
6.0	STORMWATER MANAGEMENT.....	8
6.1	Stormwater Quantity Control	9
6.2	Stormwater Quality Control.....	10
7.0	EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION	11
8.0	CONCLUSIONS AND RECOMMENDATIONS	11

LIST OF TABLES

Table 1:	Estimated Domestic Water Demand
Table 2:	Estimated Fire Demand Flows
Table 3:	Estimated Sanitary Design Flows
Table 4:	Pre-Development Catchment Areas and Runoff Coefficients
Table 5:	Post-Development Catchment Areas and Runoff Coefficients
Table 6:	Peak Flow Summary (Entire Site)
Table 7:	Peak Flow Summary (Site Outlets)

LIST OF APPENDICES

Appendix A:	Water Demand Calculations
Appendix B:	Sanitary Flow Calculations
Appendix C:	Stormwater Management Calculations

LIST OF DRAWINGS

Drawing C101:	Existing Conditions, Erosion and Sediment Control, and Removals Plan
Drawing C102:	Preliminary Site Servicing Plan
Drawing C103:	Preliminary Site Grading Plan

LIST OF FIGURES

Figure 1:	Pre-Development Drainage Plan
Figure 2:	Post-Development Drainage Plan

1.0 Introduction

C.F. Crozier & Associates Inc. (Crozier) was retained by Schembri Group of Companies to prepare a Functional Servicing and Preliminary Stormwater Management Report in support of the Official Plan Amendment (OPA) and Zoning By-Law Amendment (ZBA) for the proposed mixed-use development located at 109, 115, and 133 Bridgeport Road East and 30 Weber Street North in the City of Waterloo. The purpose of this report is to demonstrate that the proposed development is feasible from a functional servicing and stormwater management perspective and conforms with the requirements of the City of Waterloo (City), Region of Waterloo (Region), and the Grand River Conservation Authority (Conservation Authority).

The reports and design standards referenced during the preparation of this report include:

- Region of Waterloo Development Charges Background Study (Watson & Associates, April 2019)
- Ministry of the Environment Design Guidelines for Drinking-Water Systems (2008).
- Region of Waterloo and Area Municipalities Design Guidelines and Supplemental Specifications for Municipal Services (January 2021)
- Ministry of Environment Stormwater Management Planning and Design Manual (March 2003)
- City of Waterloo Development Engineering Manual (2013)

This report has been prepared to support the first submission of the Official Plan and Zoning By-Law Amendment Application for the property located at 109, 115, and 133 Bridgeport Road East and 30 Weber Street North.

2.0 Site Description

The site encompasses an area of approximately 1.25 ha and currently consists of two commercial buildings, one residential dwelling, internal at-grade parking lot, landscaped areas, and paved access to Bridgeport Road East, Weber Street North, and Royal Street. Prior to demolition in 2012 the property known as 115 Bridgeport consisted of a two-storey commercial building, at-grade paved parking and access to Bridgeport Road East, Weber Street North, and Royal Street. The site, located in a mixed-use commercial area in the City of Waterloo, is bounded by Bridgeport Road East to the north, Weber Street North to the west, Royal Street to the south, and residential properties to the east.

According to the Site Plan prepared by ABA Architects Inc. dated May 2022, the proposed development will consist of the following elements:

- Three residential towers atop a shared podium rising to 25 (Building A), 24 (Building B), and 22 (Building C) storeys, respectively. The residential building will consist of commercial area (350 sq.m.), residential units (622 units), and above-ground parking spaces (569 spaces)
- A six (6) storey parking structure (Building D).
- Three (3) site access points (one (1) from Royal Street and two (2) from Bridgeport Road East.
- A 6.1 m Internal roadway complete with parking and loading areas.
- Amenity and associated landscaped areas

The existing commercial buildings, residential dwelling, at-grade parking area, and site access points will be demolished to accommodate the proposed mixed-use development.

3.0 Water Servicing

The City of Waterloo is responsible for the operation and maintenance of the public watermain network. The existing and proposed water servicing are discussed in the following sections.

3.1 Existing Water Servicing

The existing water servicing infrastructure close to the site includes:

- A 150 mm diameter watermain located on the south side of Bridgeport Road East (City of Waterloo Watermain Layout, April 2021).
- A 300 mm diameter cast iron watermain located on the east side of Weber Street North (City of Waterloo as-constructed drawing 15-1297, July 2019).
- A 150 mm diameter PVC watermain located on the north side of Royal Street (City of Waterloo as-constructed drawing 15-1297, July 2019).
- Three fire hydrants located at the following locations per the City of Waterloo as-constructed drawing 15-1297, July 2019 and topographic survey (ACI Survey Consultants August 20, 2016).
 - Northwestern corner of the site at the intersection of Bridgeport Road East and Weber Street North.
 - Southwestern corner of the site at the intersection of Weber Street North and Royal Street.
 - Southeastern corner of the site approximately 100 m east from the intersection of Weber Street North and Royal Street.

Per review of the as-contracted drawings and pre-consultation notes it is anticipated that that the existing buildings at 109 and 133 Bridgeport Road East, and 30 Weber Street North are serviced by the municipal watermain surrounding the site. These existing services will be located and decommissioned during construction.

3.2 Design Water Demand

The water demand for the proposed development was calculated with reference to the City of Waterloo Water Distribution Master Plan (April 2017) and the Ministry of Environment Design Guidelines for Drinking-Water Systems (2008). The City of Waterloo design criteria requires an average daily water demand of 225 L/capita/day for residential use and 0.5 L/s/ha for commercial use. Per Schedule 4 of the Watson & Associates - Region of Waterloo Development Charges Background Study (April 2019) a population per unit of 1.30 and 2.10 were utilized for individual bedroom units and multiple bedroom units, respectively to determine the approximate population of the development.

Table 1 summarizes the overall water demand for the proposed development. Appendix A contains the detailed water demand calculations.

Table 1: Estimated Domestic Water Demand

Standard	Type	Average Daily Water Demand (L/s)	Maximum Daily Water Demand (L/s)	Peak Hourly Water Demand (L/s)
Region of Waterloo	Residential	2.4	6.7	10.1
	Commercial	0.02	0.04	0.04
	Total	2.5	6.8	10.1

Note: References to design guidelines are provided in Appendix A

Using the City of Waterloo, Region of Waterloo, and the Ministry of the Environment design criteria for domestic water demand, the estimated average daily demand and peak hourly demand for the proposed development are 2.5 L/s and 10.1 L/s, respectively.

3.3 Fire Flow Demand

The Fire Underwriters Survey method was used to estimate the fire flow requirements for the proposed development. This calculation is based on the building type assumption of fire-resistive construction and the gross floor area of the largest floor from the Site Plan prepared by ABA Architects Inc. (May 2022). The estimated fire flow requirements are used to estimate the preliminary watermain size required to service the development. The building Architect and Mechanical Engineer will confirm the estimated fire flow demand at the Site Plan Approval and Building Permit stage.

Table 2 summarizes the estimated fire flow demand and duration necessary to meet fire protection for the proposed development. Appendix A contains the Fire Underwriters Survey calculations.

Table 2: Estimated Fire Demand Flows

Method	Demand Flow (L/s)	Duration (h)
Fire Underwriters Survey	167	2.0

Based on the fire flow calculations the required fire flow was calculated to be 167 L/s for a duration of 2.0 hours.

It should be noted that the fire flows determined from the FUS method is a conservative estimate for comparison purposes only. The Mechanical Engineer for this development will complete the required analysis for fire protection and the Architect will design fire separation methods per the determined fire flow rate to meet municipally available flows and pressures. Based on the estimated domestic water demand (10.1 L/s) and fire flow demand (167 L/s) summarized in Table 1 and Table 2, the total design flow for the internal water distribution system is approximately 177.1 L/s.

The Region of Waterloo Water Distribution Model was used to determine the existing available pressures and flows within the Weber Street watermain and confirm that it has sufficient capacity to service the proposed development. According to the modelling results dated June 15, 2022, the available fire flows on Weber Street ranged from 696.6 L/s to 752.8 L/s which is significantly larger than the required fire flow of 167 L/s. The results from the modelling can be referenced in Appendix A.

A hydrant flow tests will be completed as part of the design process to determine the existing available pressures and flows within the Royal Street watermain. These results will be used to confirm that the existing system has capacity to service the proposed development.

3.4 Proposed Water Servicing

The development is proposed to be serviced by a 150 mm diameter PVC water service, connecting to the existing 150 mm diameter PVC watermain along Royal Street using a tapping sleeve and valve connection. The Preliminary Site Servicing Plan (Drawing C102) illustrates the location and design of the proposed water services. The proposed 150 mm diameter watermain will split into a 150 mm diameter fire line and 100 mm diameter domestic water service line to service the proposed building. The water services will enter a servicing room within the proposed building complete with a water meter and backflow prevention before servicing each tower.

The existing hydrant on Royal Street is proposed to remain in accordance with the Ontario Building Code 3.2.5.8. The internal water system of the building will be designed per Mechanical Engineer's details and specifications. The available fire flows on Royal Street were confirmed to range from 696.6 L/s to 752.8 L/s based on the Region of Waterloo Water Distribution Model; therefore, there is sufficient flow in the Royal Street watermain to meet the required fire flows determined by the FUS. It should be noted that a hydrant flow test will be complete during the detailed design process to confirm the Region of Waterloo Water Distribution Modelling results. The existing water services that service 109 and 133 Bridgeport Road East and 30 Weber Street North are to be decommissioned and removed as part of the proposed water servicing strategy.

4.0 Sanitary Servicing

The City of Waterloo is responsible for the operation and maintenance of the public sanitary sewage network. The existing and proposed sanitary servicing are discussed in the following sections.

4.1 Existing Sanitary Servicing

The existing sanitary servicing infrastructure close to the site includes:

- A 300 mm diameter SDR sanitary sewer on Royal Street running east to west at a slope of approximately 0.5% (City of Waterloo as-constructed drawing 15-1297, July 2019)
- A 300 mm diameter sanitary sewer on Weber Street North running south to north (City of Waterloo as-constructed drawing 15-1297, July 2019)
- A 250 mm diameter sanitary sewer on Bridgeport Road East running east to west (City of Waterloo G.C.T. number 5-3, January 11, 2022)
- A sanitary lateral servicing 30 Weber Street North from Royal Street (City of Waterloo as-constructed drawing 15-1297, July 2019)

According to the City of Waterloo Record of Pre-Submission Consultation (October 19, 2021) and as-constructed drawings of Royal Street (City of Waterloo as-constructed drawing 15-1297, July 2019) there are two 200 mm diameter sanitary laterals installed at the property line of 115 Bridgeport Road that were extended during the reconstruction of Royal Street to service the future development. Additionally, it is anticipated that the existing buildings at 109 and 133 Bridgeport Road East, and 30 Weber Street North are serviced by the municipal sanitary sewer surrounding the site. These existing services will be located and decommissioned during construction.

4.2 Design Sanitary Flow

The Region of Waterloo and Area Municipalities Design Guidelines and Supplemental Specifications (January 2020) was referenced to calculate the sanitary sewage design flows for the proposed development. Per the design guidelines an average design flow of 275 L/capita/day and 0.5 L/s/ha were utilized for the proposed residential and commercial uses, respectively. Per Schedule 4 of the Watson & Associates - Region of Waterloo Development Charges Background Study (April 2019) a population per unit of 1.30 and 2.10 were utilized for individual bedroom units and multiple bedroom units, respectively to determine the approximate population of the development.

Infiltration flow into the sanitary sewer and peaking factors were applied to the average flow to obtain the total estimated design sewage flows for the proposed development. Table 3 summarizes the results and Appendix B contains the detailed sanitary design flow calculations.

Table 3: Estimated Sanitary Design Flows

Standard ¹	Type	Average Flow (L/s)	Peaking Factor	Peak Flow (L/s)	Infiltration Flow (L/s)	Total Peak Flow ² (L/s)
Region of Waterloo	Residential	3.0	3.82	11.4	0.31	11.7
	Commercial	0.04	2.5	0.04		

Note: ¹ References to design guidelines are provided in Appendix B

² Peak flow includes infiltration flow

As shown in Table 3, it is estimated that the total sanitary peak flow for the proposed development is 11.7 L/s which includes the proposed residential, commercial, and infiltration flows. The proposed sanitary service was sized to convey a total peak sanitary sewage flow of 11.7 L/s for the development, as determined by The Region of Waterloo and Area Municipalities Design Guidelines and Supplemental Specifications (January 2021).

4.3 Proposed Sanitary Servicing

The development is proposed to be serviced by two existing 200 mm diameter sanitary services, connecting to the existing 200 mm sanitary stubs along Royal Street. The proposed sanitary services will be designed per the Region of Waterloo's standards. Based on a minimum pipe slope of 1%, the existing 200 mm diameter sanitary sewer will have the capacity to convey the internal sanitary flows from the site to the existing 300 mm sanitary sewer on Royal Street.

The Preliminary Site Servicing Plan (Drawing C102) illustrates the location of the proposed sanitary sewer and connections to the building and parking garage. The internal sanitary system of the building will be designed per the Mechanical Engineer's details and specifications.

The existing sanitary services that service 109 and 133 Bridgeport Road East and 30 Weber Street North are to be decommissioned and removed as part of the proposed sanitary servicing strategy.

5.0 Drainage Conditions

The drainage conditions for the site in both pre-development and post-development conditions are outlined in the following sections.

5.1 Existing Drainage

According to the topographic survey prepared by ACI Survey Consultants (August 20, 2016), the site consists of one residential dwelling, two commercial buildings, associated at-grade parking lots, and paved access to Bridgeport Road East, Weber Street North, and Royal Street. Prior to demolition in 2012 the property known as 115 Bridgeport consisted of a two-storey commercial building, at-grade paved parking, and access to Bridgeport Road East, Weber Street North, and Royal Street.

The site is generally sloped from north-east to south-west with Bridgeport Road East and Royal Street having existing grades higher than most of the site creating depression storage within the middle of the site. Water from the depression storage area drains towards the residential property to the east (Municipal Number 196) and is eventually directed towards Royal Street. Most of the stormwater runoff from the site drains uncontrolled towards the eastern residential property before being directed to the Royal Street right-of-way (Catchment 101). The western and northern portions of the property drain uncontrolled to the Weber Street North right-of-way (Catchment 102) and the Bridgeport Road East right-of-way (Catchment 103), respectively.

The site currently accepts external stormwater runoff from four (4) residential properties to the north including 125-131 Bridgeport Road East (Catchment EX1). The stormwater runoff from Catchment EX1 collects in the depression storage area and outlets to the residential property to the east (Municipal Number 196) before being directed to the Royal Street right-of-way.

There are three (3) outlets for the major overland flows from the site based on the existing site topographic survey. The main overland flow outlet discharges through the eastern residential property before runoff is directed towards the Royal Street right-of-way. The second and third overland flow outlets are at the northern and western extents of the site that drain towards the Bridgeport Road East and Weber Street North rights-of-way before being collected in the existing storm sewer infrastructure. These overland flow outlets are proposed to remain under the post-development conditions.

Table 4 summarizes the pre-development catchment areas and the runoff coefficients. Figure 1 illustrates the Pre-Development Drainage Plan.

Table 4: Pre-Development Catchment Areas and Runoff Coefficients

Catchment ID	Description	Impervious Area ² (m ²)	Pervious Area (m ²)	Weighted Runoff Coefficient ¹	Outlet
101	Past commercial building, existing Grassed, and paved parking areas.	8,833	796	0.85	East Residential Property and Royal Street Right-of-way
102	Existing Buildings, landscaped, and paved areas	2,026	-	0.90	Weber Street North Right-of-way
103	Existing Paved, and landscaped areas	492	364	0.62	Bridgeport Road East Right-of-way
EX1	Existing dwellings, paved driveways, and landscaped areas	580	1,909	0.40	East Residential Property and Royal Street Right-of-way

1. The runoff coefficient values were obtained from Section 8.2.1.6 of the Region of Waterloo and Area Municipalities Design Guidelines and Supplemental Specifications for Municipal Services
2. Catchment 101 impervious area includes the impervious area of the commercial building and paved areas that were demolished in 2012.

The weighted runoff coefficients and impervious area calculations have been calculated using the pre-development conditions from circa 2012, prior to the demolition of the commercial building and associated parking areas.

5.2 Proposed Drainage

Based on the Site Plan prepared by ABA Architects Inc. (May 2022), the proposed development will consist of three residential towers atop a shared podium rising to 25 (Building A), 24 (Building B), and 22 (Building C) storeys, associated surface and above grade parking areas, and landscaped/amenity areas. Access to the site will be provided from three (3) proposed entrances from Bridgeport Road East and Royal Street North.

The proposed site grading divides the site into six (6) post-development drainage catchments, as shown on the Post-Development Drainage Plan (Figure 2):

- Catchment 201 (A = 0.74 ha; RC = 0.90) consists of uncontrolled drainage from the proposed building footprint. The minor and major system stormwater will be collected and conveyed via roof leaders discharging directly to the internal storm sewer network
- Catchment 202 (A = 0.13 ha; RC = 0.69) consists of uncontrolled drainage from the western limits of the site along Weber Street North. All drainage from this catchment is conveyed overland via sheet flow to the Weber Street North right-of-way consistent with the pre-development drainage conditions.
- Catchment 203 (A = 0.10 ha; RC = 0.49) consists of uncontrolled drainage from the northern limits of the site along Bridgeport Road East. All drainage from this catchment is conveyed overland via sheet flow to the Bridgeport Road East right-of-way consistent with the pre-development drainage conditions.
- Catchment 204 (A = 0.21 ha; RC = 0.59) consists of drainage from the from the proposed internal roadway. The minor system stormwater runoff will be collected and conveyed by the proposed internal storm sewer system before discharging to the existing storm sewer network on Royal Street. The major system stormwater flows will be split and conveyed overland to the Royal Street right-of-way and eastern residential property via overland sheet flow through the drive aisle.
- Catchment 205 (A = 0.07 ha; RC = 0.36) consists of uncontrolled drainage from the southern limits of the site along Royal Street. All drainage from this catchment is conveyed overland via sheet flow to the Royal Street right-of-way consistent with the pre-development drainage conditions.
- Catchment EX1 (A = 0.25 ha; RC = 0.40) consists of uncontrolled external drainage from the four existing residential properties to the north of the site including 125-131 Bridgeport Road East. The minor system stormwater runoff will be collected and conveyed by proposed drainage swales and ditch inlet catchbasin. A sump pump will be installed to direct the water to the proposed internal storm sewer system before discharging to the existing storm sewer network on Royal Street. The major system stormwater will be conveyed overland to the eastern residential property via the proposed culvert.

Upon development, the minor system will be conveyed from the site to the existing storm sewer network on Royal Street through the internal storm sewer network consisting of storm sewer, catchbasins, and grassed swales. An oil-grit separator, located downstream of the internal storm sewer network will provide the required quality controls for the stormwater runoff. Following quality control, the minor system stormwater will be conveyed through the existing 450 mm diameter storm lateral to the existing 1345 mm x 855 mm elliptical storm sewer within Royal Street.

The proposed emergency overland flow routes for most of the site have been graded to mimic the flow direction and patterns of the existing conditions by directing stormwater to the Royal Street right-of-way, Weber Street North right-of-way, and Bridgeport Road East right-of-way. A small portion of the eastern limits of the site including Catchment EX1 and a portion of Catchment 204 will discharge towards the eastern residential property before being directed towards the Royal Street right-of-way. It should be noted that the catchment area discharging to the eastern property under post-development conditions has been significantly reduced and all efforts have been made to direct emergency stormwater flow routes away from the eastern residential property and towards Royal Street.

Table 5 provides details of the catchment areas and runoff coefficients for the post-development conditions.

Table 5: Post-Development Catchment Areas and Runoff Coefficients

Catchment ID	Description	Impervious Area (m ²)	Pervious Area (m ²)	Weighted Runoff Coefficient ¹	Outlet (Minor/Major)
201	Proposed residential building and above ground parking garage.	7,432	-	0.90	Royal Street Storm Sewer
202	Proposed sidewalks and landscaped areas	872	407	0.69	Weber Street North Right-of-way
203	Proposed sidewalks and landscaped areas	362	605	0.49	Bridgeport Street East Right-of-way
204	Proposed internal roadway and landscaped areas	1,099	1,028	0.59	Royal Street Storm sewer/Eastern Property
205	Proposed site access and landscaped areas	116	590	0.36	Royal Street right-of-way
EX1	Existing residential dwellings and rear yards	580	1,909	0.40	Royal Street Storm sewer/Eastern Property

1. The runoff coefficient values were obtained from Section 8.2.1.6 of the Region of Waterloo and Area Municipalities Design Guidelines and Supplemental Specifications for Municipal Services.

Refer to the Post-Development Drainage Plan (Figure 2) for the proposed drainage conditions and the Preliminary Site Servicing and Preliminary Site Grading Plans (Figures C702 and C703, respectively) that illustrate the proposed storm sewer servicing and site drainage.

6.0 Stormwater Management

The stormwater management design criteria for the site are based on the City of Waterloo Development Engineering Manual (2013) and the City of Waterloo Record of Pre-Submission Consultation comments (October 19, 2021).

The stormwater management criteria include:

- **Quantity Control:** Post development flows are to be reduced to the pre-development levels for all storms up to and including the 100-year storm event (post-development runoff to pre-development runoff).
- **Quality Control:** At least 70% removal of Total Suspended Solids will be provided with "Normal Protection" according to the City of Waterloo Record of Pre-Submission Consultation comments dated October 19, 2021.

6.1 Stormwater Quantity Control

As discussed in Section 6.0, stormwater quantity control requirements for the site include controlling the post-development events to the pre-development events for storms up to and including the 100-year event. All storm events greater than the 100-year event are to be released uncontrolled.

Using the City of Waterloo's intensity-duration-frequency (IDF) data, the rational method was used to determine the pre-development and post-development flows from the site. The peak flow targets for the site are based on the pre-development flows for the storm events up to and including the 100-year event.

It should be noted that the circa 2012 pre-development site conditions were used in the rational method calculations to determine the weighted runoff coefficients for each catchment. The pre-development and post-development flow rates for the site are summarized in Table 6.

Table 6: Peak Flow Summary (Entire Site)

Storm Event (year)	*Pre-Development (L/s)	Post-Development (L/s)	Net Change (Post-to-Pre) (L/s)
2-year	261	239	-22
5-year	351	321	-29
25-year	491	450	-41
100-year	637	584	-53

*Pre-development flows calculated using circa 2012 site conditions.

Based on the rational method the uncontrolled flows for all storm events up to and including the 100-year event are reduced under post development conditions due to an increase in pervious area (i.e., landscaped and amenity areas). The rational calculations can be referenced in Appendix C. Due to the reduction in overall peak flows, quantity controls have not been proposed for the site.

Under post development conditions, there are three outlets for the minor overland flow which include the Royal Street right-of-way, Weber Street North right-of-way, and Bridgeport Road East right-of-way. The eastern residential property will act as an overland flow route for Catchment EX1 and a portion of Catchment 204 during major storm events. To ensure that the post-development uncontrolled flows to each outlet are not increased under post-development conditions, the rational method was used to determine the pre-development and post-development flows to each respective outlet.

The pre-development and post-development uncontrolled flows for each outlet are outlined in Table 7.

Table 7: Peak Flow Summary (Site Outlets)

Outlet	Storm Event (yr)	Pre-Development (L/s)	Post-Development (L/s)	Net Change (Post-to-Pre) (L/s)
Royal Street ¹	2	208	209	1
	5	279	280	1
	25	391	392	2
	100	507	509	2
Weber Street North ²	2	41	20	-30
	5	56	27	-40
	25	78	38	-56
	100	101	49	-72
Bridgeport Road East ³	2	12	11	-1
	5	16	14	-2
	25	23	20	-2
	100	30	26	-4

1. Pre-development Catchments include 101 and EX1; Post-development Catchments include 201, 204, 205 and EX1

2. Pre-development Catchment 102; Post-development Catchments 202

3. Pre-development Catchment 103; Post-development Catchments 203

As per the rational calculations the uncontrolled flows directed to Weber Street North and Bridgeport Road East from the site are reduced for all storm events up to and including the 100-year storm event. The uncontrolled flows directed to the eastern residential property are decreased under post-development conditions as flows from most of the site are now directed primarily to Royal Street and away from the neighbouring properties.

Stormwater runoff that would have been directed to the east under pre-development conditions will now be collected in the internal storm sewer network and directed to the Royal Street storm sewer network under post-development conditions. A 300 mm diameter CSP culvert has been proposed below the eastern access road to direct stormwater runoff to the east as part of the emergency overland flow route for this portion of the site. During an emergency runoff event a portion of Catchment 204 and EX1 will be directed to the eastern property which is reduced under post-development conditions.

Minor event stormwater runoff from Catchments 201, 204, and EX1 will be collected and conveyed by the internal storm sewer system before discharging into the existing sewer on Royal Street. During the major storm events all stormwater runoff from the site will be conveyed via overland sheet flow to each respective outlet.

6.2 Stormwater Quality Control

Stormwater quality controls for the site must incorporate measures to provide a Normal Level of Protection according to the MOE (March 2003) guidelines. Normal water quality protection involves the removal of at least 70% of the total suspended solids (TSS) from 90% of the annual runoff volume.

Water quality control for Catchment 201, 204, and EX1 will be provided using an oil-grit separator (Stormceptor EFO6 or approved equivalent). The oil-grit-separator will provide quality control for runoff before discharging towards the Royal Street storm sewer network. Details of the proposed oil-grit separator can be referenced in Appendix C.

Catchments 202, 204, and 205 will discharge uncontrolled towards the municipal right-of-way, consistent with the existing overland flow conditions. The uncontrolled flow from these catchments is deemed minor and primarily consists of clean landscape runoff, therefore quality control has not been provided for these catchments.

7.0 Erosion and Sediment Controls During Construction

The design of the erosion and sediment controls can be referenced on the Existing Conditions, Erosion & Sediment Control, and Removals Plan (Drawing C101). The erosion and sediment controls are required to be installed prior to the beginning of any construction activities. They will be maintained until the site is stabilized or as directed by the Site Engineer and/or City of Waterloo. Controls will be inspected after each significant rainfall event and maintained in proper working condition.

Light Duty Silt Fencing

Light duty silt fencing will be installed on the perimeter of the site to intercept sheet flow. Additional silt fencing may be added based on field decisions by the Site Engineer and Owner, prior to, during, and following construction.

Rock Mud Mat

A rock mud mat will be installed at the entrance to the construction zone to prevent mud tracking from the site onto surrounding lands and the perimeter roadway network. All construction traffic will be restricted to this access only.

Silt sacks in Catchbasins

A silt sack will be installed in each new catch basin as they are installed. The silt sack will provide sediment control to prevent silt and sediment from entering the storm water system. Silt sacks will also be installed on the existing catchbasins during construction to prevent sediment from entering the existing storm sewer pipe.

8.0 Conclusions and Recommendations

This report was prepared in support of the Official Plan and Zoning By-Law Amendment Application for the property located at 109, 115, and 133 Bridgeport Road East and 30 Weber Street North in the City of Waterloo. The proposed development can be serviced for water, sanitary, and stormwater management in accordance with the City and the Region requirements.

Our conclusions and recommendations include:

Proposed Water Services

1. The domestic peak hourly water demand for the proposed development is 10.1 L/s. The design fire flow is 167 L/s for 2.0 hours.
2. Water demand for the proposed development will be met by connecting a 150 mm diameter PVC water service to the existing 150 mm diameter watermain on Royal Street. The proposed watermain will split into a 150 mm diameter fire line and 100 mm diameter domestic line to service the proposed development.

Proposed Sanitary Services

1. Total peak sanitary flow for the proposed development is 11.7 L/s.
2. Sanitary services for the proposed development will be provided using two 200 mm diameter PVC sanitary laterals which will connect to the existing sanitary sewer stubs on Royal Street. A 200 mm diameter sanitary service lateral has been provided for the residential building and a separate service lateral has been provided for the above-grade parking structure.

Stormwater Management

1. The site's stormwater runoff will be collected in catchbasins and conveyed through the internal storm sewer network for events up to and including the 5-year storm event before discharging into the existing sewer on Royal Street. Stormwater runoff from the northern, western, and southern extents of the site will flow uncontrolled towards the Bridgeport Road East, Weber Street North and Royal Street rights-of-way, respectively.
2. Stormwater quantity controls are not required for the site as the stormwater runoff from the site is generally reduced for all storm events up to and including the 100-year storm event under post-development conditions.
3. Stormwater quality controls for the site will be provided by an in-line-oil-grit separator (Stormceptor EFO6 or approved equivalent) unit installed prior to discharging to the existing storm sewer on Royal Street.

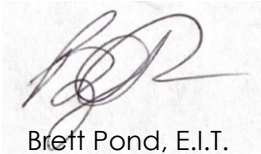
Erosion and Sediment Controls

Erosion and sediment controls are required to be installed prior to the beginning of any construction activities. They will be maintained until the site is stabilized or as directed by the Site Engineer and/or City of Waterloo. Controls will be inspected after each significant rainfall event and maintained in proper working condition.

Based on the above conclusions, we recommend the approval of the Official Plan and Zoning By-Law Amendment from the perspective of functional servicing and preliminary stormwater management.

Respectfully submitted,

C.F. CROZIER & ASSOCIATES INC.



Brett Pond, E.I.T.
Land Development

BP/

C.F. CROZIER & ASSOCIATES INC.



Jurgen Koehler, P.Eng.
Associate - Land Development

I:\2217- Schembri Group of Companies\6286- 115 & 133 Bridgeport Rd E\Reports\2022.08.08_(2217-6286)_FSRSWM_Final.docx

APPENDIX A

Water Demand Calculations

Proposed Domestic Water Demand

Notes & References

Site Area: 1.25 ha
 Number of units: 622 units
 Population: 938 capita

Units	P.P.U	# of Units	Population
1 Bedroom	1.30	459	596
2+ Bedrooms	2.10	163	342
Total	-	622	938

Design Parameters (Residential)

Average Demand (L/capita/d)
225

Water Demand Residential:

Average Daily Demand = 210,958 L/day
 = **2.4** L/s

Peaking Factors (Residential)

Max Day = 2.75
 Peak Hour = 4.13

Average Day = **2.4** L/s
 Max Day = **6.7** L/s
 Peak Hour = **10.1** L/s

Design Parameters (Commercial)

Average Demand (L/s/ha)
0.5

Water Demand Commercial:

Commercial Area = 350 m²
 = 0.04 ha

Average Daily Demand (general) = 0.5 L/s/ha
 Peaking Factor = 2.5

Average Day = **0.02** L/s
 Max Day = **0.04** L/s
 Peak Hour = **0.04** L/s

Municipality	Average Daily Water Demand (L/s)	Max Day Demand (L/s)	Peak Hourly Demand (L/s)
Region of Waterloo	2.5	6.8	10.1

Site area per Site Plan prepared by ABA Architects Inc. dated May 2022.

Population per unit from Appendix A Schedule 4 of Watson & Associates Region of Waterloo Development Charges Background Study (April 2019)

Average Demand from Section B2.2.2 from the Region of Waterloo and Area Municipalities - Design Guidelines for Municipal Services (January 2021)

Peaking Factors from Table 3.1 of MOE - Design Guidelines for Drinking-Water Systems (2008)

Max Day = Average Day Demand * Max Day
 Peak Hour = Average Day Demand * Peak Hour

Site area per Site Plan prepared by ABA Architects Inc. dated March 2, 2022.

Peaking factor from Section B3.1.2.3 from the Region of Waterloo and Area Municipalities - Design Guidelines for Municipal Services (January 2021)

Demand calculations include residential and commercial flows.



Project: 115 & 133 Bridgeport Road East
Project NO.: 2217-6286

Date: 2/7/2022
Updated: 6/9/2022
Designed By: CM/BP
Checked By: JRK

Water Supply for Public Fire Protection (1999)

Fire Underwriters Survey

Assumptions:

- 1.) Construction type for the proposed highrise buildings is assumed to be fire-resistive and non-combustible based on similar types of construction and email correspondence with the Architect dated April 12, 2022.
- 2.) Building gross-floor area is based on Site Plan prepared by ABA Architects Inc. dated May 2022
- 3.) The building will be equipped with complete automatic sprinkler protection based on email correspondence with the Architect dated April 12, 2022.

Part II - Guide for Determination of Required Fire Flow

1. An estimate of fire flow required for a given area may be determined by the formula:

$$F = 220 * C * \sqrt{A}$$

Where:

- F = the required fire flow in litres per minute
C = coefficient related to the type of construction
= 1.5 for wood frame construction (structure essentially all combustible)
= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior)
= 0.8 for non-combustible construction (unprotected metal structural components)
= 0.6 for fire-resistive construction (fully protected frame, floors, roof)
A = The total floor area in square meters (including all storeys, but excluding basements at least 50 percent below grade) in the building considered.

Proposed Development (GFA and Type of Construction are as per site plan)

<u>0.6</u> *C-Value	<u>7,698.50</u> sq.m
	<u>3,757.50</u> sq.m

GFA area of largest floor

Therefore F = 14,100 L/min

GFA of 25% of each of the two immediately adjoining floors.

Fire flow determined above shall not exceed:
30,000 L/min for wood frame construction
30,000 L/min for ordinary construction
25,000 L/min for non-combustible construction
25,000 L/min for fire-resistive construction

2. Values obtained in No. 1 may be reduced by as much as 25% for occupancies having low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

*Non-Combustible	-25%	Free Burning	15%
Limited Combustible	-15%	Rapid Burning	25%
Combustible	0%		

-25% Reduction(%)
-3,525 L/min reduction

Subtotal = 10,575 L/min

Note: Flow determined shall not be less than 2,000 L/min

3. Sprinklers - The value obtained in No. 2 above may be reduced by up to 50% for complete automatic sprinkler protection.

☒ Assume NFPA 13 or other NFPA sprinkler Standard with full supervision (50% reduction)
-5,288 L/min reduction

Part II - Guide for Determination of Required Fire Flow

4. Exposure - To the value obtained in No. 2, a percentage should be added for structures exposed within 45 meters by the fire area under consideration. The percentage shall depend upon the height, area, and construction of the building(s) being exposed, the separation, openings in the exposed building(s), the length and height of exposure, the provision of automatic sprinklers and/or outside sprinklers in the building(s) exposed, the occupancy of the exposed building(s) and the effect of hillside locations on the possible spread of fire.

Separation	Charge	Separation	Charge
0 to 3 m	25%	20.1 to 30 m	10%
3.1 to 10 m	20%	30.1 to 45 m	5%
10.1 to 20 m	15%	>45 m	0%

Exposed buildings

Name	Distance	Charge	Surcharge (L/min)
Existing Commercial (North)	28 m	10%	1,058
Existing Detached Homes (East)	12.5 m	15%	1,586
Existing Detached Homes (South)	30 m	10%	1,058
Existing Commercial (West)	40m	5%	529
Total Surcharge			4,230

Determine Required Fire Flow

No.1 14,100
No. 2 -3,525 reduction
No. 3 -5,288 reduction
No. 4 4,230 surcharge

Required Flow: 9,518 L/min
Rounded to nearest 1000 L/min: 10,000 L/min or 167 L/s
2,640 USGPM

Note: USGPM = 0.264*(L/min)

Required Duration of Fire Flow	
Flow Required (L/min)	Duration (hours)
2,000 or less	1.00
3,000	1.25
4,000	1.50
5,000	1.75
6,000	2.00
8,000	2.00
10,000	2.00
12,000	2.50
14,000	3.00
16,000	3.50
18,000	4.00
20,000	4.50
22,000	5.00
24,000	5.50
26,000	6.00
28,000	6.50
30,000	7.00
32,000	7.50
34,000	8.00
36,000	8.50
38,000	9.00
40,000 and over	9.50

Date: June 15, 2022

Cole Martin
Crozier, Consulting Engineers
2800 High Point Drive, Suite 100
Milton, ON L9T 6P4
t. 905-875-0026
e. cmartin@cfcrozier.ca

Dear: Cole

Re: Region of Waterloo - Request for Watermain Information

Please find the results of the modeling simulations for boundary conditions requested on May 5nd, 2022. The results included a figure showing the locations of the nodes from the Region's model. Attached are a series of spreadsheets containing results for Average Day, Maximum Day demands and available fire flows at nodes JCT_20421 located at Weber St N and Royal St, and JCT_21406 at Weber St N and Bridgeport Rd E. The diurnal 24 hour demand distribution accounts for the minimum hour and peak hour peaking factors. The minimum hourly demand on the average day represents the minimum hour, and the maximum hourly demand on the maximum day represents the peak hour.

Table 1 – Modeling Results

Node	Elevation (mASL)	Demand		Fire Flow Results	
		Ave Day (L/s)	Max Day (L/s)	Design Flow (L/s)	Design Pressure (m)
JCT_20421	324.0	10.1	10.1	696.6	27.4
JCT_21406	324.0	8.7	8.7	752.8	20.3

A fire flow analysis shows the maximum flow available at a node with an associated design pressure during the maximum day scenario while maintaining the minimum design pressure of 14 m (140 kPa) at all nodes within the pressure zone.

If you have any questions, please contact me.

Kevin Dolishny P.Eng.
Senior Engineer, Water Services
c. 226-.751.4551
e. kdolishny@regionofwaterloo.ca

WAT 4

Location: Intersection of Weber St N and Royal St

JCT_20421 Average Day 24 Hour Simulation

Time	Demand (L/s)	Head (m)	Pressure (m)
00:00 hrs	5.87	379.81	55.81
01:00 hrs	4.35	380.18	56.18
02:00 hrs	5.06	382.31	58.31
03:00 hrs	5.46	382.48	58.48
04:00 hrs	4.86	383.00	59.00
05:00 hrs	3.95	383.27	59.27
06:00 hrs	6.27	382.49	58.49
07:00 hrs	13.45	380.47	56.47
08:00 hrs	16.38	379.21	55.21
09:00 hrs	13.45	378.51	54.51
10:00 hrs	13.15	378.34	54.34
11:00 hrs	12.54	378.10	54.10
12:00 hrs	11.84	377.99	53.99
13:00 hrs	11.23	377.94	53.94
14:00 hrs	10.42	377.94	53.94
15:00 hrs	9.71	378.02	54.02
16:00 hrs	10.32	377.98	53.98
17:00 hrs	10.92	378.60	54.60
18:00 hrs	12.64	378.71	54.71
19:00 hrs	13.75	378.77	54.77
20:00 hrs	13.85	378.92	54.92
21:00 hrs	12.94	379.16	55.16
22:00 hrs	11.43	379.44	55.44
23:00 hrs	9.10	379.79	55.79

Average Day HGL:

379.64

Minimum Hour:

383.27

JCT_20421 Maximum Day 24 Hour Simulation

Time	Demand (L/s)	Head (m)	Pressure (m)
00:00 hrs	4.76	380.49	56.49
01:00 hrs	2.94	382.64	58.64
02:00 hrs	3.75	382.68	58.68
03:00 hrs	4.45	379.60	55.60
04:00 hrs	4.25	380.05	56.05
05:00 hrs	3.54	380.24	56.24
06:00 hrs	6.58	379.22	55.22
07:00 hrs	13.66	377.67	53.67
08:00 hrs	15.98	377.61	53.61
09:00 hrs	11.44	379.51	55.51
10:00 hrs	8.91	379.96	55.96
11:00 hrs	8.30	379.77	55.77
12:00 hrs	7.29	377.94	53.94
13:00 hrs	9.31	377.80	53.80
14:00 hrs	12.24	379.30	55.30
15:00 hrs	10.22	377.67	53.67
16:00 hrs	13.65	378.95	54.95
17:00 hrs	14.36	377.09	53.09
18:00 hrs	16.79	376.49	52.49
19:00 hrs	18.00	375.91	51.91
20:00 hrs	17.80	377.03	53.03
21:00 hrs	15.98	377.37	53.37
22:00 hrs	10.83	378.41	54.41
23:00 hrs	7.59	380.21	56.21

Maximum Day HGL:

378.90

Peak Hour:

375.91

Available Flow (L/s)	Residual Pressure (m)
----------------------	-----------------------

0.0	54.0
20.0	53.8
40.0	53.5
60.0	53.2
80.0	52.9
100.0	52.5
120.0	52.1
140.0	51.7
160.0	51.2
180.0	50.7
200.0	50.2
220.0	49.6
240.0	49.0
260.0	48.4
280.0	47.7
300.0	47.0
320.0	46.3
340.0	45.6
360.0	44.8
380.0	44.0
400.0	43.2
420.0	42.3
440.0	41.4
460.0	40.5
480.0	39.5
500.0	38.6
520.0	37.6
540.0	36.5
560.0	35.5
580.0	34.4
600.0	33.2
620.0	32.1
640.0	30.9
660.0	29.7
680.0	28.5
696.6	27.4

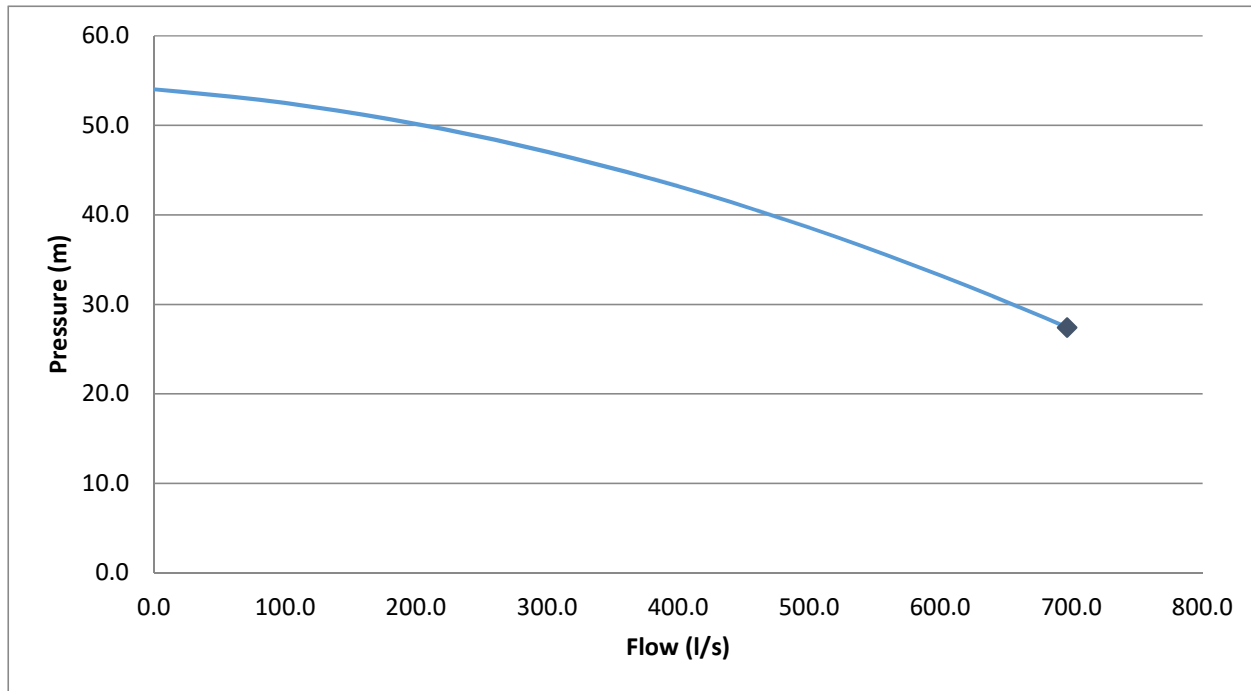
Fire Flow Analysis

Fire Flow Node:	JCT_20421
Design Flow (L/s):	696.6
Design Pressure (m):	27.4

Design Flow: The final adjusted flow at the node to maintain the minimum design pressure (14m (140 kPa)) at ALL locations within the pressure zone.

Design Pressure: The lowest allowable pressure at the node to maintain the minimum design pressure (14m (140 kPa)) at ALL locations within the pressure zone.

Critical Node ID: The constraining node within the pressure zone that drops to the minimum design pressure of (14m (140 kPa)) during the design flow.



WAT 4

Location: Intersection of Weber St N and Bridgeport Rd E

JCT_21406 Average Day 24 Hour Simulation

Time	Demand (L/s)	Head (m)	Pressure (m)
00:00 hrs	5.06	379.59	55.59
01:00 hrs	3.76	380.03	56.03
02:00 hrs	4.35	382.19	58.19
03:00 hrs	4.69	382.35	58.35
04:00 hrs	4.17	382.90	58.90
05:00 hrs	3.40	383.19	59.19
06:00 hrs	5.39	382.32	58.32
07:00 hrs	11.48	380.09	56.09
08:00 hrs	13.99	379.02	55.02
09:00 hrs	11.53	378.30	54.30
10:00 hrs	11.28	378.12	54.12
11:00 hrs	10.77	377.87	53.87
12:00 hrs	10.17	377.76	53.76
13:00 hrs	9.66	377.72	53.72
14:00 hrs	8.97	377.73	53.73
15:00 hrs	8.36	377.82	53.82
16:00 hrs	8.87	377.80	53.80
17:00 hrs	9.38	378.42	54.42
18:00 hrs	10.83	378.51	54.51
19:00 hrs	11.77	378.56	54.56
20:00 hrs	11.84	378.72	54.72
21:00 hrs	11.06	378.96	54.96
22:00 hrs	9.78	379.27	55.27
23:00 hrs	7.80	379.66	55.66

Average Day HGL:

379.45

Minimum Hour:

383.19

JCT_21406 Maximum Day 24 Hour Simulation

Time	Demand (L/s)	Head (m)	Pressure (m)
00:00 hrs	4.13	379.88	55.88
01:00 hrs	2.58	380.35	56.35
02:00 hrs	3.24	379.63	55.63
03:00 hrs	3.84	379.55	55.55
04:00 hrs	3.68	379.95	55.95
05:00 hrs	3.08	380.16	56.16
06:00 hrs	5.70	379.14	55.14
07:00 hrs	11.72	377.47	53.47
08:00 hrs	13.70	377.34	53.34
09:00 hrs	9.88	379.33	55.33
10:00 hrs	7.74	379.78	55.78
11:00 hrs	7.23	379.91	55.91
12:00 hrs	6.38	379.28	55.28
13:00 hrs	8.05	377.65	53.65
14:00 hrs	10.47	379.07	55.07
15:00 hrs	8.79	377.51	53.51
16:00 hrs	11.67	378.66	54.66
17:00 hrs	12.26	376.83	52.83
18:00 hrs	14.31	377.66	53.66
19:00 hrs	15.35	375.53	51.53
20:00 hrs	15.19	376.58	52.58
21:00 hrs	13.65	376.98	52.98
22:00 hrs	9.30	378.28	54.28
23:00 hrs	6.55	378.33	54.33

Maximum Day HGL:

378.54

Peak Hour:

375.53

Available Flow (L/s)	Residual Pressure (m)
----------------------	-----------------------

0.0	55.4
25.0	55.0
50.0	54.5
75.0	54.2
100.0	53.7
125.0	53.1
150.0	52.5
175.0	51.8
200.0	51.0
225.0	50.2
250.0	49.3
275.0	48.4
300.0	47.4
325.0	46.3
350.0	45.2
375.0	44.1
400.0	42.9
425.0	41.6
450.0	40.3
475.0	38.9
500.0	37.5
525.0	36.0
550.0	34.5
575.0	32.9
600.0	31.3
625.0	29.6
650.0	27.9
675.0	26.1
700.0	24.3
725.0	22.4
750.0	20.5
752.8	20.3

Fire Flow Analysis

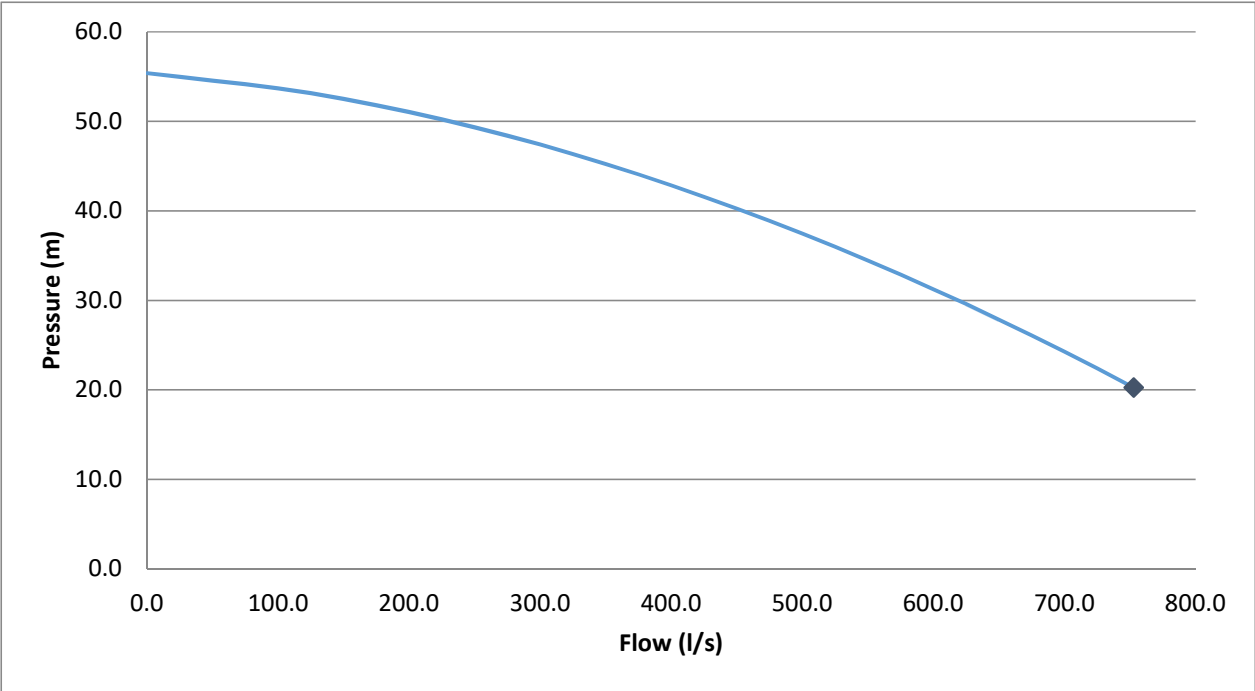
Fire Flow Node:	JCT_21406
Design Flow (L/s):	752.8
Design Pressure (m):	20.3

- Design Flow:

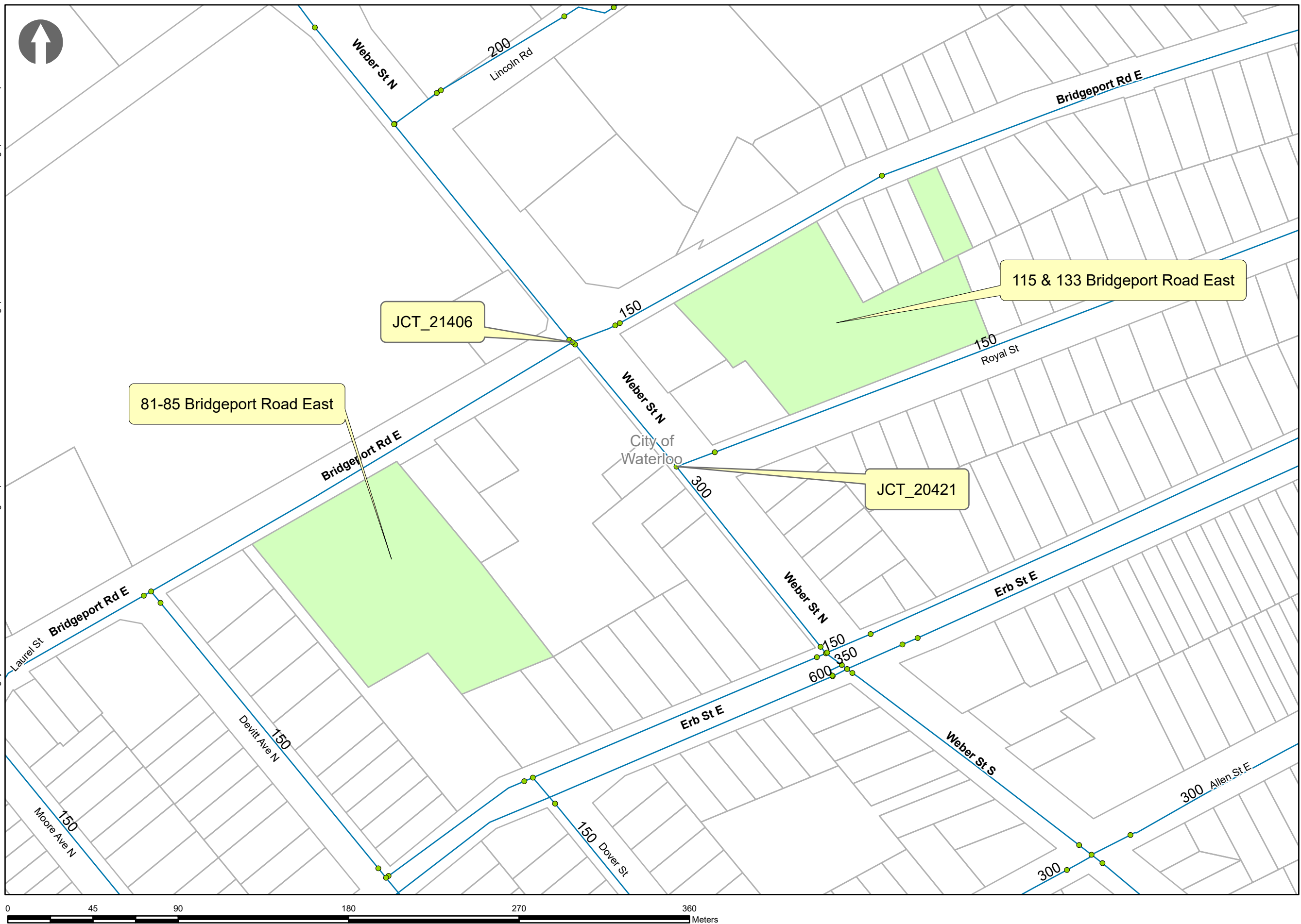
The final adjusted flow at the node to maintain the minimum design pressure (14m (140 kPa)) at ALL locations within the pressure zone.
- Design Pressure:

The lowest allowable pressure at the node to maintain the minimum design pressure (14m (140 kPa)) at ALL locations within the pressure zone.
- Critical Node ID:

The constraining node within the pressure zone that drops to the minimum design pressure of (14m (140 kPa)) during the design flow.



Time: 11:49 AM Date: 2022-06-15 Author: DNguyen Document Path: I:\Info\Water\Modelling Requests\2022\Crozier\81-85 & 115 & 133 Bridgeport Rd East.aprx



Region of Waterloo

TRANSPORTATION AND ENVIRONMENTAL SERVICES

Water Services
150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.regionofwaterloo.ca

Junction

- Active

Pipe

- Active

Roads

Roads

- Arterial/Collector
- Local

Non modelling data Layer

- Regional Municipal Boundaries
- Assessment Parcels (MPAC)
- Subject Site

81-81 & 155 & 133
Bridgeport Road East, Waterloo

APPENDIX B

Sanitary Flow Calculations

Proposed Sanitary Design Flow

Site Area: 1.25 ha
Number of units: 622 units
Population: 938 capita

Residential Sanitary Flow

Units	P.P.U	# of Units	Population
1 Bedroom	1.30	459	596
2+ Bedrooms	2.10	163	342
Total	-	622	938

Design Parameters

Average Flow (L/capita/d)
275

Sanitary Design Flow:

Average Daily Flow = 257,838 L/d
= 3.0 L/s

Harmon Peak Factor: M = 3.82

Residential Peak Flow = 11.4 L/s

Commercial Sanitary Flow

Unit Type	GFA (m2)	GFA (ha)
Commercial	350	0.04

Design Parameters

Average Flow (L/s/ha)
0.5

Sanitary Design Flow

Average Daily Flow = 0.02 L/s
Peak Factor = 2.5
Commercial Peak Flow = 0.04 L/s

Infiltration Flow:

Infiltration = 0.250 L/s/ha
Total Infiltration = 0.31 L/s

Municipality	Residential Peak Flow (L/s)	Commercial Peak Flow (L/s)	Infiltration Flow (L/s)	Overall Peak Development Flow (L/s)
Region of Waterloo	11.4	0.04	0.31	11.7

Notes & References

Site area per Site Plan prepared by ABA Architects Inc. dated May 2022.

Population per unit from Appendix A Schedule 4 of Watson & Associates Region of Waterloo Development Charges Background Study (April 2019)

Average Flow from Section B.3.1.2.1 from the Region of Waterloo and Area Municipalities - Design Guidelines for Municipal Services (January 2021)

Average Daily Flow = Average Daily Flow (L/cap./day) * population / 86400

$$M = 1 + \frac{14}{4 + P^{0.5}}$$

Peak Flow = Average Daily Flow * M

Average Flow for general commercial from Section B.3.1.2.3 of Region of Waterloo and Area Municipalities Design Guidelines and Supplemental Specifications (January, 2021)

Peak Factor from Section B.3.1.2.3 of Region of Waterloo and Area Municipalities Design Guidelines and Supplemental Specifications (January, 2021)

Infiltration Allowance from Section B.3.1.2.6 of Region of Waterloo and Area Municipalities Design Guidelines and Supplemental Specifications (January, 2021)

Total Design Flow = Residential Peak Flow + Commercial Peak Flow + Total Infiltration

APPENDIX C

Stormwater Management Calculations

Rational Calculations - Input Parameters

Storm Data: **Waterloo** (per City of Waterloo Standards)

Time of Concentration: $T_c = 10$ min

Return Period	A	B	C	I (mm/hr)
2 yr	1101	9.258	0.882	81.05
5 yr	1755	12.347	0.895	108.82
25 yr	3261	16.193	0.938	152.44
100 yr	4692	17.437	0.956	197.84

Note: Rainfall Intensity statistics provided per City of Waterloo IDF Curve.

Pre-Development Conditions				
Catchment	Impervious Area (m ²)	Pervious Area (m ²)	Total Area (m ²)	Runoff Coefficient C
101	8,833	796	9,629	0.85
102	2,026	0	2,026	0.90
103	492	364	856	0.62
EX1	580	1,909	2,489	0.40
Total	11,931	3,069	15,000	-

Uncontrolled to Royal Street
 Uncontrolled to Weber Street North
 Uncontrolled to Bridgeport Street East
 Uncontrolled to Royal Street

*Runoff coefficients taken from Section B.4.2.1.6 of the Region of Waterloo and Area Municipalities Guidelines for Municipal Services (January 2021)

Post - Development Conditions				
Catchment	Impervious Area (m ²)	Pervious Area (m ²)	Total Area (m ²)	Runoff Coefficient C
201	7,432	0	7,432	0.90
202	872	407	1,279	0.69
203	362	605	967	0.49
204	1,099	1,028	2,127	0.59
205	116	590	706	0.36
EX1	580	1,909	2,489	0.40
Total	10,461	4,539	15,000	-

Uncontrolled to Royal Street
 Uncontrolled to Weber Street North
 Uncontrolled to Bridgeport Street East
 Uncontrolled to Royal Street
 Uncontrolled to Royal Street
 Uncontrolled to Royal Street

*Runoff coefficients taken from Section B.4.2.1.6 of the Region of Waterloo and Area Municipalities Guidelines for Municipal Services (January 2021)

Equations:

$$Q_{\text{post}} = 0.0028 \cdot C_{\text{post}} \cdot I(T_d) \cdot A$$

$$I = \frac{A}{(t_c + B)^C}$$

Rational Calculations - Peak Flows Summary

Pre-Development Flows of Development Area (L/s)					
Return Period	Q ₁₀₁	Q ₁₀₂	Q ₁₀₃	EX1	Q _{pre Total}
2 yr	184.9	41.4	12.1	22.7	261.1
5 yr	248.3	55.6	16.3	30.4	350.6
25 yr	347.8	77.8	22.8	42.7	491.1
100 yr	451.4	101.0	29.6	55.4	637.3

Post-Development Flows of Development Area (L/s)							
Return Period	Q ₂₀₁	Q ₂₀₂	Q ₂₀₃	Q ₂₀₄	Q ₂₀₅	EX1	Q _{post Total}
2 yr	151.8	20.1	10.8	28.3	5.7	22.7	239.4
5 yr	203.8	27.0	14.5	38.0	7.7	30.4	321.5
25 yr	285.5	37.8	20.4	53.2	10.8	42.7	450.3
100 yr	370.5	49.1	26.4	69.0	14.0	55.4	584.4

Peak Flows Summary (L/s)			
Return Period	Q _{Pre Total}	Q _{Post Total}	Net Change (Post-to-Pre)
2 yr	261.1	239.4	-21.7
5 yr	350.6	321.5	-29.1
25 yr	491.1	450.3	-40.8
100 yr	637.3	584.4	-52.9

Equations:

$$Q_{\text{post}} = 0.0028 \cdot C_{\text{post}} \cdot i(T_d) \cdot A$$

Rational Calculations - Summary

Outlet to Royal Street - Uncontrolled

Storm Event (yr)	Peak Flow (L/s)					Difference (L/s)
	Pre- Development	Post-Development				
		101+EX1	201	204+EX1	205	
2	207.6	151.8	51.0	5.7	208.5	0.9
5	278.7	203.8	68.4	7.7	279.9	1.2
25	390.5	285.5	95.8	10.8	392.1	1.6
100	506.7	370.5	124.4	14.0	508.9	2.1

Outlet to Weber Street North Right-of-way - Uncontrolled

Storm Event (yr)	Pre- Development (L/s)	Post- Development (L/s)	Difference (L/s)
	102	202	
2	41.4	20.1	21.3
5	55.6	27.0	28.5
25	77.8	37.8	40.0
100	101.0	49.1	51.9

Outlet to Bridgeport Road East Right-of-way - Uncontrolled

Storm Event (yr)	Pre- Development (L/s)	Post- Development (L/s)	Difference (L/s)
	103	203	
2	12.1	10.8	1.3
5	16.3	14.5	1.7
25	22.8	20.4	2.4
100	29.6	26.4	3.1

Stormceptor®EF Sizing Report

STORMCEPTOR®

ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

06/09/2022

Province:	Ontario	Project Name:	115 Bridgeport Road East
City:	Waterloo	Project Number:	2217-6286
Nearest Rainfall Station:	WATERLOO WELLINGTON AP	Designer Name:	Brett Pond
Climate Station Id:	6149387	Designer Company:	C.F. Crozier & Associates
Years of Rainfall Data:	34	Designer Email:	bpond@cfcrozier.ca
		Designer Phone:	226-567-9393
Site Name:	115 & 133 Bridgeport Road East	EOR Name:	
		EOR Company:	
Drainage Area (ha):	1.20	EOR Email:	
Runoff Coefficient 'c':	0.61	EOR Phone:	

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

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	27.73
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	75
EFO6	86
EFO8	92
EFO10	95
EFO12	97

Recommended Stormceptor EFO Model: **EFO6**
 Estimated Net Annual Sediment (TSS) Load Reduction (%): **86**
 Water Quality Runoff Volume Capture (%): **> 90**

Stormceptor® EF Sizing Report

THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

PARTICLE SIZE DISTRIBUTION (PSD)

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

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

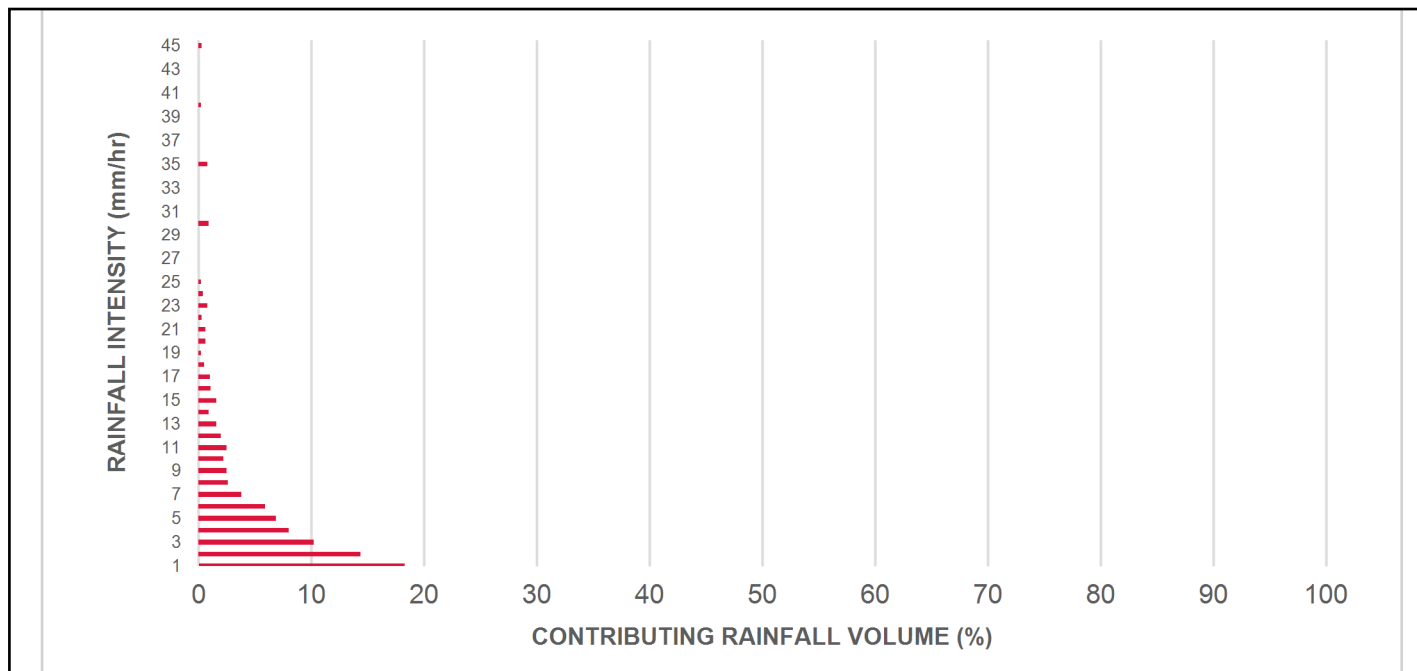
Stormceptor[®] EF Sizing Report

Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m ²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.5	8.5	1.02	61.0	23.0	100	8.5	8.5
1	18.3	26.8	2.03	122.0	46.0	100	18.3	26.8
2	14.4	41.3	4.07	244.0	93.0	97	14.0	40.9
3	10.2	51.5	6.10	366.0	139.0	91	9.3	50.1
4	8.0	59.5	8.14	488.0	186.0	86	6.9	57.0
5	6.9	66.4	10.17	610.0	232.0	82	5.7	62.6
6	5.9	72.3	12.21	733.0	279.0	80	4.7	67.3
7	3.8	76.1	14.24	855.0	325.0	78	2.9	70.3
8	2.6	78.7	16.28	977.0	371.0	75	2.0	72.2
9	2.5	81.1	18.31	1099.0	418.0	73	1.8	74.0
10	2.2	83.3	20.35	1221.0	464.0	71	1.5	75.6
11	2.5	85.8	22.38	1343.0	511.0	69	1.7	77.3
12	2.0	87.8	24.42	1465.0	557.0	67	1.3	78.6
13	1.6	89.4	26.45	1587.0	604.0	65	1.0	79.7
14	0.9	90.4	28.49	1709.0	650.0	64	0.6	80.3
15	1.6	91.9	30.52	1831.0	696.0	64	1.0	81.3
16	1.1	93.0	32.56	1954.0	743.0	64	0.7	82.0
17	1.0	94.0	34.59	2076.0	789.0	63	0.7	82.6
18	0.5	94.6	36.63	2198.0	836.0	63	0.3	83.0
19	0.2	94.8	38.66	2320.0	882.0	62	0.1	83.1
20	0.6	95.4	40.70	2442.0	928.0	62	0.4	83.5
21	0.6	96.1	42.73	2564.0	975.0	62	0.4	83.9
22	0.3	96.4	44.77	2686.0	1021.0	61	0.2	84.1
23	0.8	97.2	46.80	2808.0	1068.0	60	0.5	84.6
24	0.4	97.6	48.84	2930.0	1114.0	59	0.3	84.8
25	0.2	97.8	50.87	3052.0	1161.0	58	0.1	84.9
30	0.9	98.7	61.05	3663.0	1393.0	53	0.5	85.4
35	0.8	99.5	71.22	4273.0	1625.0	45	0.4	85.7
40	0.2	99.7	81.40	4884.0	1857.0	40	0.1	85.8
45	0.3	100.0	91.57	5494.0	2089.0	35	0.1	85.9
Estimated Net Annual Sediment (TSS) Load Reduction =								86 %

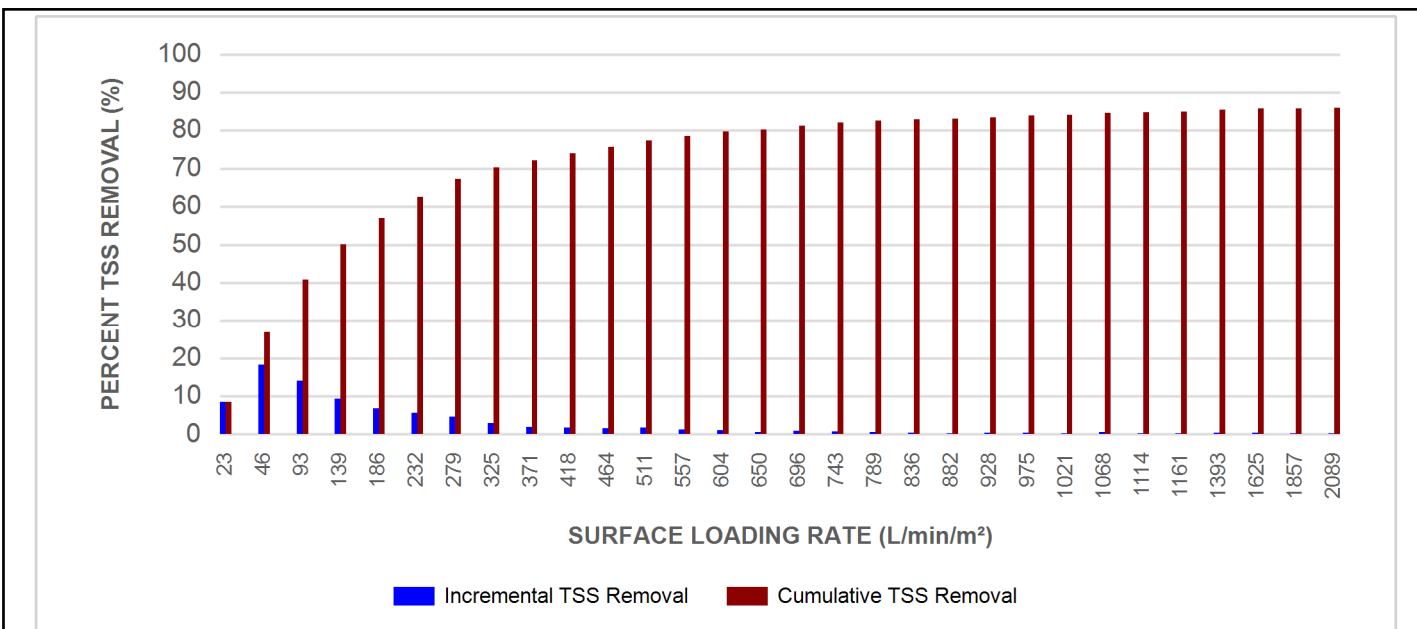
Climate Station ID: 6149387 Years of Rainfall Data: 34

Stormceptor® EF Sizing Report

RAINFALL DATA FROM WATERLOO WELLINGTON AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Stormceptor® EF Sizing Report

Maximum Pipe Diameter / Peak Conveyance

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

SCOUR PREVENTION AND ONLINE CONFIGURATION

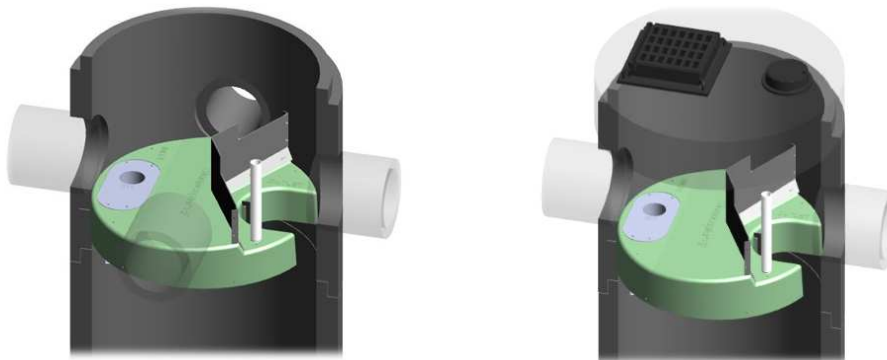
► **Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

DESIGN FLEXIBILITY

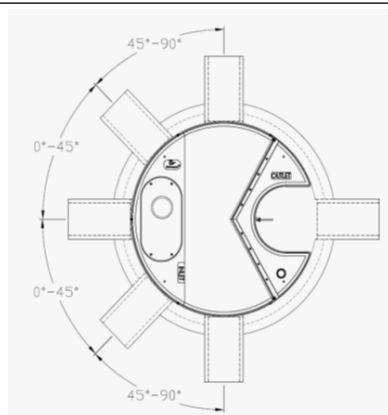
► **Stormceptor® EF and EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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

OIL CAPTURE AND RETENTION

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



Stormceptor® EF Sizing Report



INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

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

For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft³)

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

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

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

1.3 SUBMITTALS

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

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

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

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

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

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

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

Stormceptor® EF Sizing Report

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

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing 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/m² to 1400 L/min/m², 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/m² and 1400 L/min/m² 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/m² shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m². No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m².

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m² shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m², and shall be calculated using a simple proportioning formula, with 1400 L/min/m² 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/m².

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m².

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

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

Stormceptor® EF Sizing Report

assess whether light liquids captured after a spill are effectively retained at high flow rates.

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

Drawings



THROUGHOUT EARTHWORKS, GRADING, AND SERVING WORK, APPROPRIATE TRAFFIC SIGNS (TRUCK TURNING ETC.) MUST BE SET UP ALONG ROYAL STREET IN ACCORDANCE WITH ONTARIO TRAFFIC MANUAL BOOK 7

SITE REMOVAL NOTE:

1. REMOVE ALL EXISTING SURFACE MATERIALS AS REQUIRED TO COMPLETE THE SITE WORKS AND DISPOSE OF OFF SITE
2. STRIP AND REMOVE ALL TOPSOIL
3. REMOVE ALL SURFACE INFRASTRUCTURE ON TOWN PROPERTY AS REQUIRED TO ACCOMMODATE NEW CONSTRUCTION

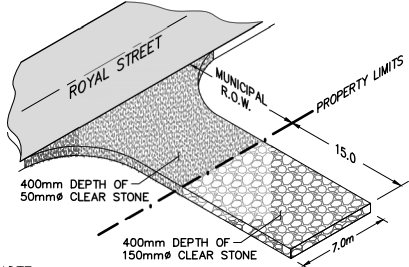
EROSION & SEDIMENT CONTROL NOTES:

1. EROSION & SEDIMENT CONTROL MEASURES MUST BE INSTALLED PRIOR TO THE COMMENCEMENT OF SITE WORKS.
2. EROSION & SEDIMENT CONTROLS MUST BE INSPECTED ON A REGULAR BASIS AND AFTER EVERY RAIN FALL EVENT, AND MUST BE MAINTAINED AND REPAIRED IN A TIMELY MANNER TO PREVENT SEDIMENT FROM LEAVING THE SITE.
3. EXISTING AND PROPOSED CATCHBASINS ARE TO BE PROTECTED WITH FILTER CLOTH AND 150mm OF 50mm STONE COVER DURING CONSTRUCTION.
4. IT IS REQUIRED TO STABILIZE ALL AREAS THAT WILL REMAIN DISTURBED FOR MORE THAN 30 DAYS.
5. MUD MAT, SILT FENCE, AND CATCHBASIN PROTECTION ARE NOT TO BE REMOVED UNTIL COMPLETION OF CONSTRUCTION.
6. ALL SILT FENCES SHOWN ARE OFFSET FROM PROPERTY LINE FOR CLARITY ONLY. INSTALL SILT FENCE IN SUITABLE LOCATION FOR THE DURATION OF THE PROJECT.

7. SEDIMENT AND EROSION CONTROL MEASURES WILL BE IMPLEMENTED PRIOR TO, AND MAINTAINED DURING THE CONSTRUCTION PHASES, TO PREVENT ENTRY OF SEDIMENT INTO THE WATER.
8. THE EROSION AND SEDIMENT CONTROL STRATEGIES OUTLINED ON THE PLANS ARE NOT STATIC AND MAY NEED TO BE UPGRADED/AMENDED AS SITE CONDITIONS CHANGE TO PREVENT SEDIMENT RELEASES TO THE NATURAL ENVIRONMENT. THE GRCA ENFORCEMENT OFFICER SHOULD BE IMMEDIATELY CONTACTED SHOULD THE EROSION AND SEDIMENT CONTROL PLANS CHANGE FROM THE APPROVED PLANS.
9. ALL EROSION AND SEDIMENT CONTROL MEASURES SHOULD BE INSPECTED WEEKLY, AFTER EVERY RAINFALL AND SIGNIFICANT SNOW MELT EVENT, AND DAILY DURING PERIODS OF EXTENDED RAIN OR SNOW MELT.
10. ALL DAMAGED EROSION AND SEDIMENT CONTROL MEASURES SHOULD BE REPAIRED AND/OR REPLACED WITHIN 48 HOURS OF THE INSPECTION.
11. ALL DISTURBED AREAS WILL BE STABILIZED AND RESTORED WITH NATIVE/NON-INVASIVE SPECIES UPON COMPLETION OF THE WORK.
12. A REHABILITATION PLAN IS TO BE IMPLEMENTED TO RESTORE THE CONSTRUCTION SITE BACK TO ITS PRE-CONSTRUCTION STATE, OR BETTER.
13. THE CONTRACTOR SHALL MONITOR THE WEATHER SEVERAL DAYS IN ADVANCE OF THE ONSET OF THE PROJECT TO ENSURE THAT THE WORKS WILL BE CONDUCTED DURING FAVOURABLE WEATHER CONDITIONS.

MUD MAT DETAIL

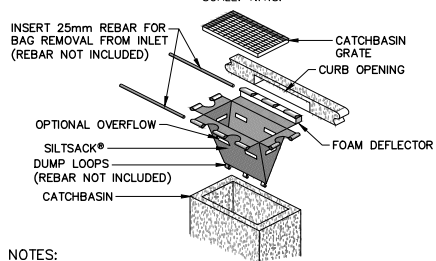
SCALE: N.T.S.



NOTE:
GEOTEXTILE (TERRAFIX 270R OR APPROVED EQUAL) TO BE PLACED AS SEPARATION BARRIER BETWEEN EXISTING GROUND AND CLEAR STONE.

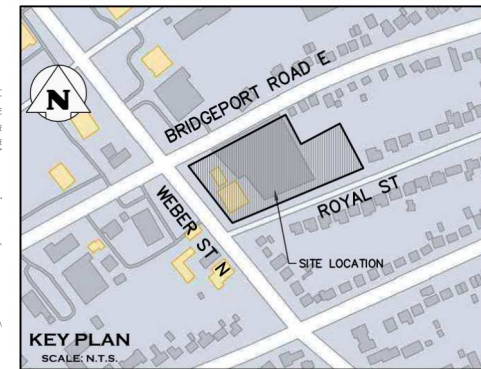
'SILTSACK' DETAIL

SCALE: N.T.S.



NOTES:

1. INSTALL TERRAFIX 'SILTSACK' IN ALL CATCHBASINS & CATCHBASIN MANHOLES AFFECTED BY CONSTRUCTION.
2. INSTALL TERRAFIX 'SILTSACK' IN ALL NEW CATCHBASINS & CATCHBASIN MANHOLES.



LEGEND	
	PROPERTY LINE
	EXISTING CONTOUR (0.5m)
	EXISTING CONTOUR (1.0m)
	EXISTING FENCE
	EXISTING GRADE
	MUD-MAT; SEE DETAIL
	SILT FENCE; SEE DETAIL
	SILT SACK; SEE DETAIL



SCALE: 1:300

REVISIONS	
0	ISSUED FOR FIRST SUBMISSION
2022/AUG/08	
No.	ISSUE / REVISION
YYYY/MM/DD	

ELEVATION NOTE:

ELEVATIONS ARE REFERRED TO MEAN SEA LEVEL, COVE-1928/1978 DATUM AND ARE DERIVED FROM GPS OBSERVATIONS USING THE SMARTNET REAL TIME NETWORK (RTN)

SURVEY NOTES:

SURVEY COMPLETED BY ACD SURVEY CONSULTANTS ON THE 20TH DAY OF JULY, 2016. FILE NO. WAT-SGCT5-11-17138 (1)

SITE PLAN NOTES:

DESIGN ELEMENTS SHOWN ARE BASED ON SITE PLAN PREPARED BY ABA ARCHITECTS INC. PROJECT NO.: 2019-104 (2022/05/24)

DRAWING NOTES:

THIS DRAWING IS THE EXCLUSIVE PROPERTY OF C.F. CROZIER & ASSOCIATES INC. AND THE REPRODUCTION OF ANY PART OF IT WITHOUT PRIOR WRITTEN CONSENT OF THIS OFFICE IS STRICTLY PROHIBITED.
THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO CONSTRUCTION. THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT. DO NOT SCALE THIS DRAWING. ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project
BRIDGEPORT & WEBER
115 & 133 BRIDGEPORT ROAD EAST
CITY OF WATERLOO

Drawing
EXISTING CONDITIONS, EROSION & SEDIMENT CONTROL, AND REMOVALS PLAN

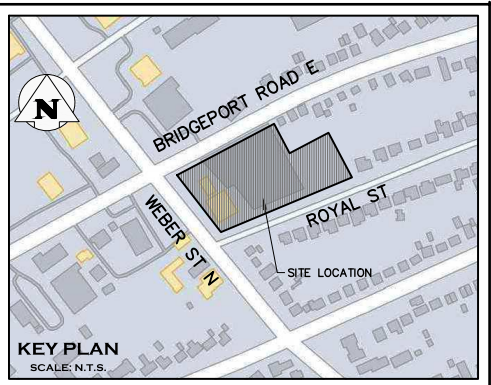
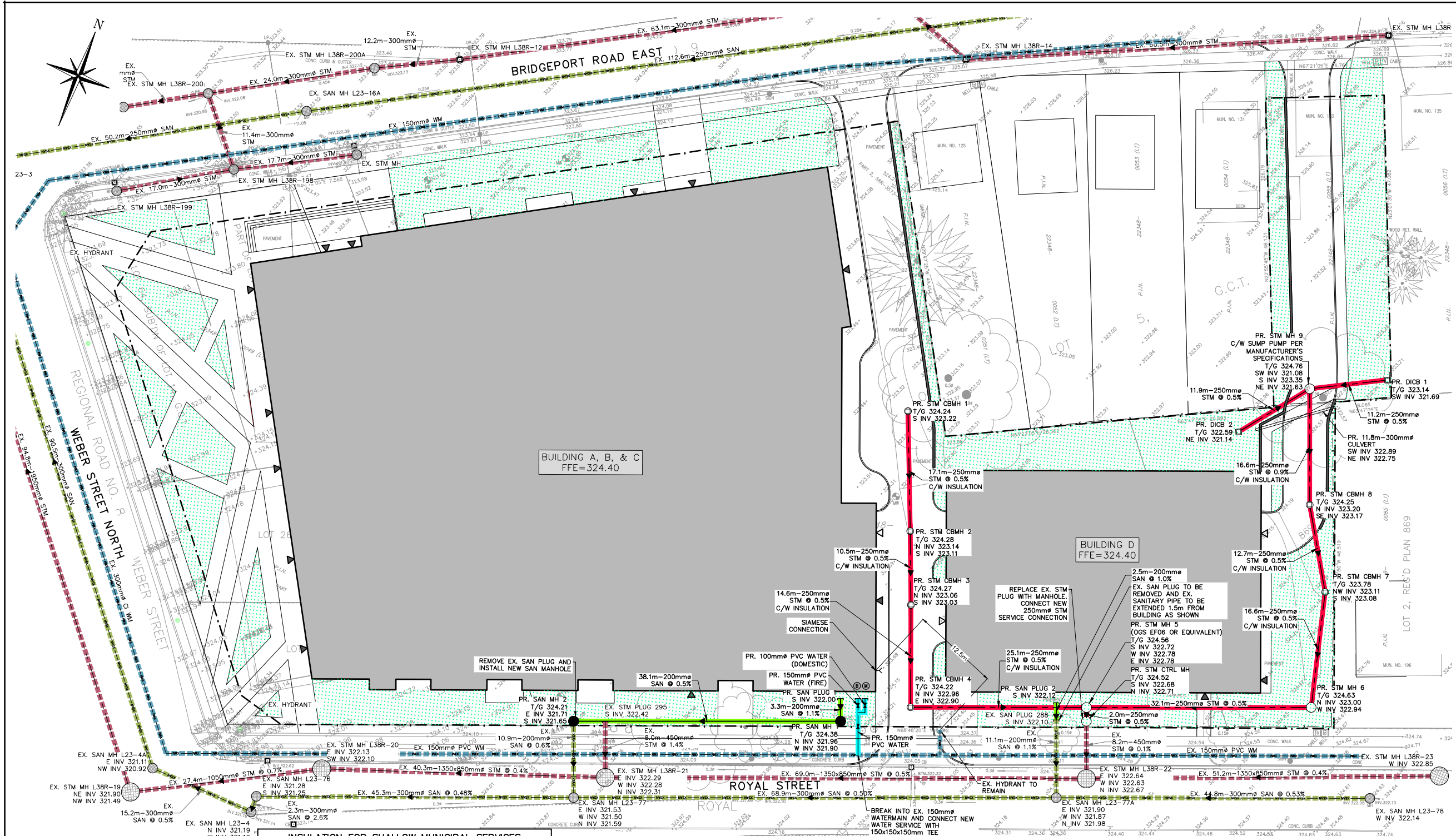


Drawn	S.O.	Design	S.O./B.P.	Project No.	2217-6286
Check	J.K.	Check	N.C.	Scale	1:300
				Dwg.	C101

NOT FOR CONSTRUCTION

FOR REVIEW

NOT TO BE USED FOR CONSTRUCTION



LEGEND	
	PROPERTY LINE
	EXISTING WATERMAIN & GATE VALVE
	EXISTING STORM SEWER & MANHOLE
	EXISTING SINGLE CATCHBASIN
	EXISTING SANITARY SEWER & MANHOLE
	PROPOSED WATERMAIN & GATE VALVE
	PROPOSED FIRE HYDRANT & GATE VALVE
	PROPOSED SIAMESE CONNECTION
	PROPOSED WATER METER PER MECHANICAL DESIGN AND SPECIFICATIONS
	PROPOSED BACKFLOW PREVENTER PER MECHANICAL DESIGN AND SPECIFICATIONS
	PROPOSED STORM SEWER & MANHOLE
	PROPOSED SINGLE CATCHBASIN
	PROPOSED SANITARY SEWER & MANHOLE
	BUILDING ENTRANCE (PERSONNEL DOOR)
	PARKING GARAGE ENTRANCE (OVERHEAD DOOR)
	PROPOSED RETAINING WALL

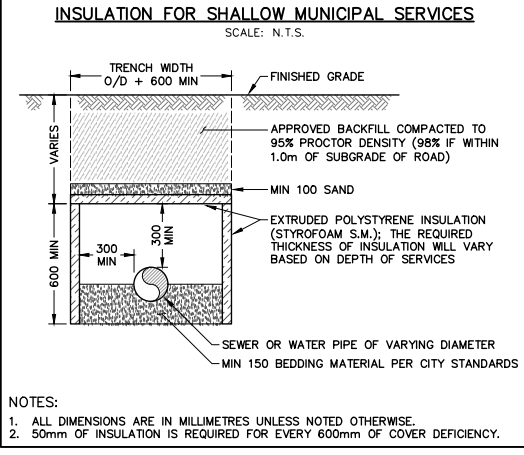
No.	ISSUE / REVISION	DATE
0	ISSUED FOR FIRST SUBMISSION	2022/AUG/08
1	ISSUE / REVISION	YYYY/MM/DD

ELEVATION NOTE:
ELEVATIONS ARE REFERRED TO MEAN SEA LEVEL, COVE-1928/1978 DATUM AND ARE DERIVED FROM GPS OBSERVATIONS USING THE SMARTNET REAL TIME NETWORK (RTN)

SURVEY NOTES:
SURVEY COMPLETED BY ACI SURVEY CONSULTANTS ON THE 20TH DAY OF JULY, 2016. FILE NO. WAT-SGC15-11-17138 (1)

SITE PLAN NOTES:
DESIGN ELEMENTS SHOWN ARE BASED ON SITE PLAN PREPARED BY ABA ARCHITECTS INC. PROJECT NO.: 2019-104 (2022/05/24)

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NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. 50mm OF INSULATION IS REQUIRED FOR EVERY 600mm OF COVER DEFICIENCY.

NOT FOR CONSTRUCTION

FOR REVIEW

NOT TO BE USED FOR CONSTRUCTION

Project

BRIDGEPORT & WEBER
115 & 133 BRIDGEPORT ROAD EAST
CITY OF WATERLOO

Drawing

PRELIMINARY
SITE SERVICING PLAN

Engineer

CROZIER
CONSULTING ENGINEERS

2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON L9T 6P4
905-875-0026 T
905-875-4915 F
WWW.CFCROZIER.CA

Drawn

S.O.

Design

S.O./B.P.

Project No.

2217-6286

Check

J.K.

Check

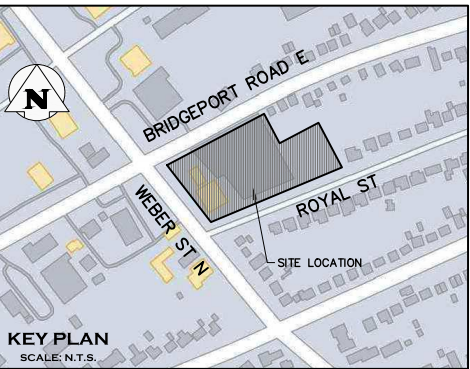
N.C.

Scale

1:300

Dwg.

C102



LEGEND	
	PROPERTY LINE
	EXISTING CONTOUR (0.5m)
	EXISTING CONTOUR (1.0m)
	EXISTING FENCE
	EXISTING GRADE
	PROPOSED GRADE
	PROPOSED GRADE (TO MATCH EXISTING)
	PROPOSED MINOR FLOW DIRECTION
	PROPOSED GRASSED SWALE
	PROPOSED RETAINING WALL
	PROPOSED SLOPE (3:1 MAX.)
	BUILDING ENTRANCE
	PARKING GARAGE ENTRANCE (OVERHEAD DOOR)
	PROPOSED MAJOR OVERLAND FLOW DIRECTION
	EXISTING MAJOR OVERLAND FLOW DIRECTION
	PROPOSED STORM SEWER & MANHOLE
	PROPOSED RIP RAP

No.	ISSUE / REVISION	DATE
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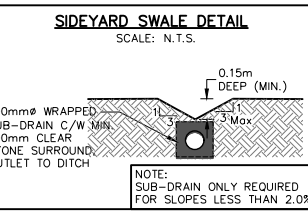
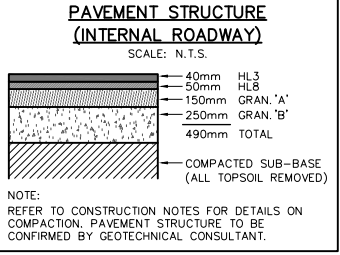
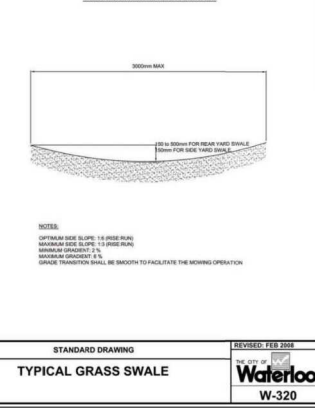
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Project
BRIDGEPORT & WEBER
115 & 133 BRIDGEPORT ROAD EAST
CITY OF WATERLOO

Drawing
PRELIMINARY
SITE GRADING PLAN

2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON L9T 6P4
905-875-0026 T
905-875-4915 F
WWW.CFCROZIER.CA

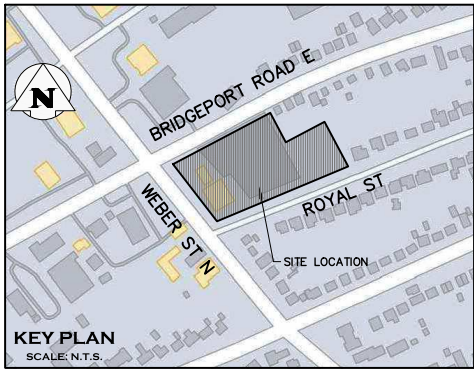
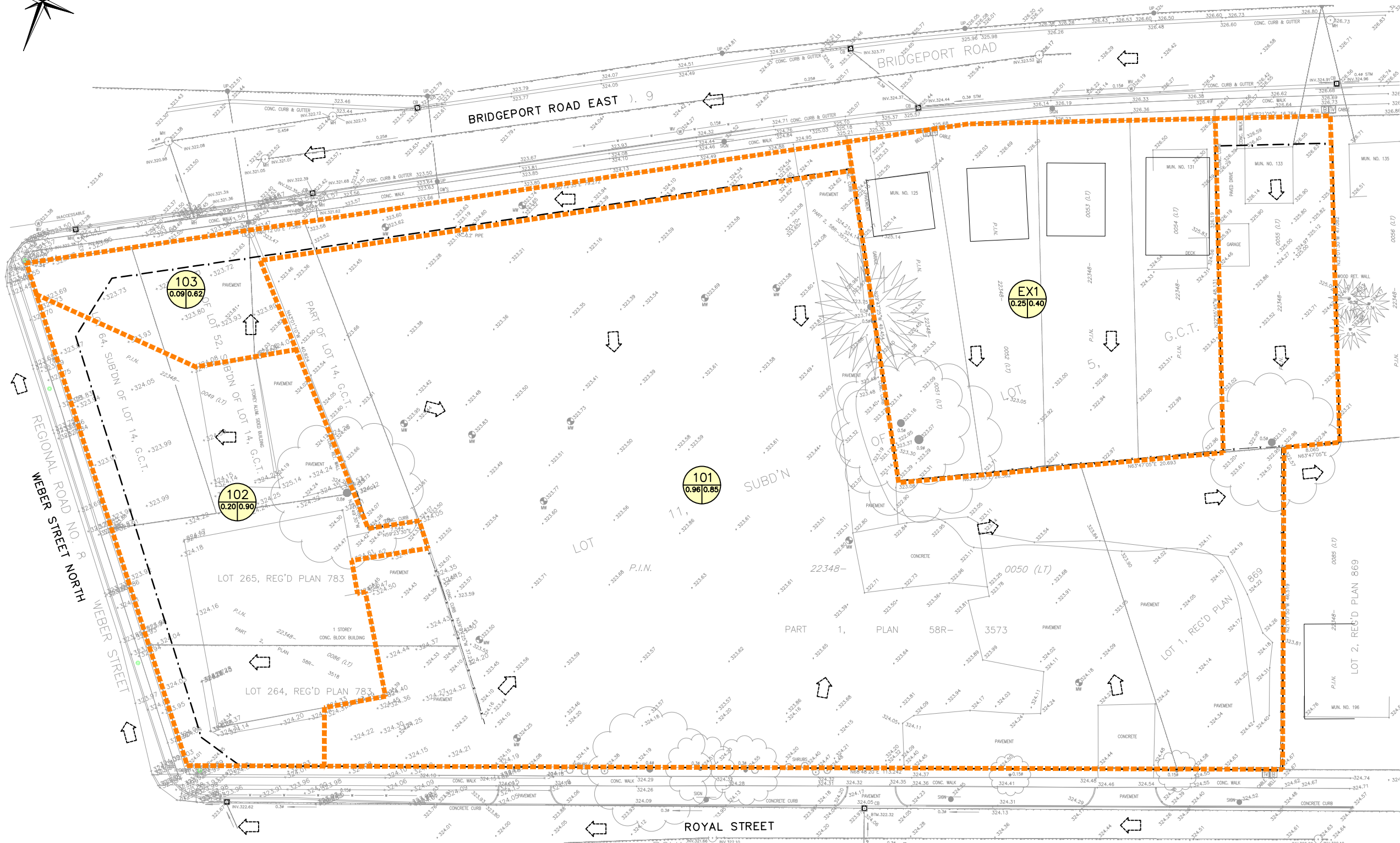
Drawn	S.O.	Design	S.O./B.P.	Project No.	2217-6286
Check	J.K.	Check	N.C.	Scale	1:300
				Dwg.	C103



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FIGURES



LEGEND

- PROPERTY LINE
- - - - - STORM DRAINAGE CATCHMENT
- EXISTING OVERLAND FLOW DIRECTION
- ID A/IRC CATCHMENT I.D. AREA (ha) | RUNOFF COEFFICIENT

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SURVEY NOTES:
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Project
BRIDGEPORT & WEBER
115 & 133 BRIDGEPORT ROAD EAST
CITY OF WATERLOO

Drawing
PRE-DEVELOPMENT DRAINAGE PLAN

NOT FOR CONSTRUCTION

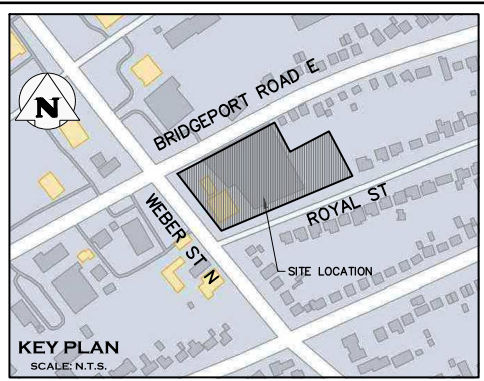
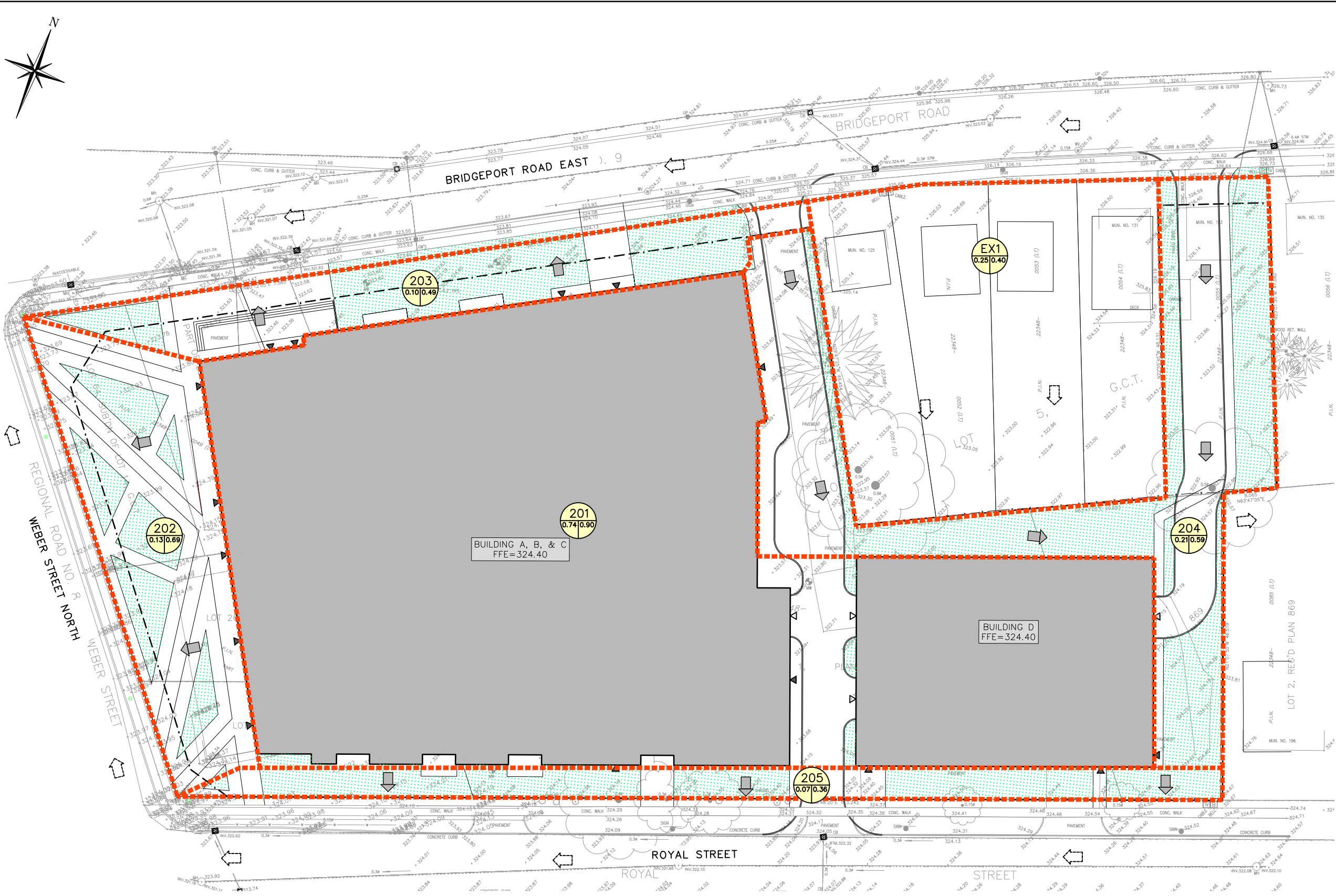
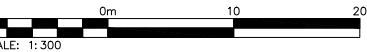
FOR REVIEW
NOT TO BE USED FOR CONSTRUCTION

CROZIER
CONSULTING ENGINEERS

2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON L9T 6P4
905-875-0026 T
905-875-4915 F
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Drawn	S.O.	Design	S.O./B.P.	Project No.	2217-6286
Check	J.K.	Check	N.C.	Scale	1:300

Dwg. **FIG1**



LEGEND

- PROPERTY LINE
- STORM DRAINAGE CATCHMENT
- EXISTING OVERLAND FLOW DIRECTION
- PROPOSED MAJOR OVERLAND FLOW DIRECTION
- ID CATCHMENT I.D.
- AREA (ha) | RUNOFF COEFFICIENT

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SURVEY NOTES:
SURVEY COMPLETED BY A.C. SURVEY CONSULTANTS ON THE 20TH DAY OF JULY, 2016. FILE NO. WAT-50C15-11-17138 (1)

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Project
BRIDGEPORT & WEBER
115 & 133 BRIDGEPORT ROAD EAST
CITY OF WATERLOO

Drawing
POST-DEVELOPMENT DRAINAGE PLAN

NOT FOR CONSTRUCTION

Engineer
FOR REVIEW
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CROZIER CONSULTING ENGINEERS

2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON L9T 6P4
905-875-0026 T
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Drawn	S.O.	Design	S.O./B.P.	Project No.	2217-6286	
Check	J.K.	Check	N.C.	Scale	1:300	
					Dwg.	FIG2