FUNCTIONAL SERVICING & PRELIMINARY STORMWATER MANAGEMENT REPORT

2421 & 2431 NEW STREET

CITY OF BURLINGTON
HALTON REGION

PREPARED FOR:

TRG (NEW-GUELPH) INC.

PREPARED BY:

C.F. CROZIER & ASSOCIATES INC.
2800 HIGH POINT DRIVE, SUITE 100
MILTON, ON L9T 6P4

DECEMBER 2017

CFCA FILE NO. 1473-4780

The material in this report reflects best judgment in light of the information available at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. C.F. Crozier & Associates Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

CROZIER
CONSULTING ENGINEERS

Revision Number	Date	Comments
Rev. 0	December 15, 2017	Issued for first submission

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 GENERAL DESCRIPTION 1

3.0 WATER SERVICING 2

3.1 Existing Water Servicing 2
3.2 Design Water Demand 2
3.2.1 Hydrant Flow Test 3
3.3 Proposed Water Servicing 4

4.0 SANITARY SERVICING 4

4.1 Existing Sanitary Servicing 4
4.2 Design Sanitary Demand 4
4.3 Proposed Sanitary Servicing 4

5.0 DRAINAGE CONDITIONS 5

5.1 Existing Drainage 5
5.2 Proposed Drainage 5

6.0 STORMWATER MANAGEMENT 6

6.1 Stormwater Design Criteria 6
6.2 Stormwater Quantity Control 6
6.3 Stormwater Quality Control 7

7.0 EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION 8

8.0 CONCLUSIONS AND RECOMMENDATIONS 8

LIST OF TABLES

Table 1: Equivalent Population Estimates
Table 2: Estimated Design Water Demand
Table 3: Estimated Fire Demand Flow
Table 4: Estimated Design Sanitary Demand
Table 5: Pre-Development Land Areas and Runoff Coefficients
Table 6: Post-Development Land Areas and Runoff Coefficients
Table 7: Pre- and Post-Development Flow Rates and Required Storage Volumes
Table 8: Uncontrolled Pre- and Post-Development Flow Rates

LIST OF APPENDICES

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

LIST OF DRAWINGS

Drawing C102: Preliminary Site Servicing Plan
Drawing C103: Preliminary Site Grading Plan

LIST OF FIGURES

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

1.0 INTRODUCTION

C.F. Crozier & Associates Inc. (Crozier) were retained by TRG Inc. to prepare a Functional Servicing and Stormwater Management Report to support an Official Plan Amendment (OPA) and Zoning By-law Amendment (ZBA) to permit the proposed development at 2421 & 2431 New Street in the City of Burlington.

The purpose of this report is to demonstrate that the proposed development is feasible from a servicing and stormwater management perspective.

2.0 GENERAL DESCRIPTION

The subject properties are approximately 0.7 ha (1.74 acres) and are located in a mixed commercial/ residential area in Burlington. Three 1-storey commercial buildings currently exist within the properties (2421 & 2431 New Street).

The properties are bounded by:

- Residential properties to the west
- An existing 6-storey building to the south
- New Street to the east
- Commercial buildings to the north

The project will consist of the development of the properties to include the following:

- An 11-storey residential condominium with 139 units
- An 11-storey senior's residence with 223 units connected in a U-shape on the second level
- One level of surface parking & two levels of underground parking totaling 320 spaces
- Retail units on the ground level fronting New Street

This report was prepared with reference to the following materials:

- The most recent Site Plan # 6966 (The Rosseau Group & WZMH Architects, December 12, 2017)
- The Topographic and Legal Survey of #2421 and #2431 New Street City of Burlington (December 8, 2017)
- City of Burlington Development Application Pre-Consultation Form (July 19, 2017)
- Various City of Burlington and Halton Region As-Constructed Drawings (1984 – 2010)
- City of Burlington Commercial and Industrial Site Plan Requirements – Dwg. No. S-116
- Water and Wastewater Linear Design Manual – Halton Region (2017)
- Engineering Standard Drawings manual – City of Burlington (2015 - 2017)

3.0 WATER SERVICING

3.1 Existing Water Servicing

A 300 mm diameter C.I. watermain is located south of the subject property within the New Street right-of-way (WM. Connections & 200mm SAN. SEW. New Street, 40m E. of Delaware Ave. to Beverly Dr., City of Burlington & Regional Municipality of Halton, 1984).

The three existing one-storey commercial buildings located within the subject properties are currently serviced by two connections to the 300 mm diameter watermain along New St. Both existing service connections will be decommissioned and removed at the onset of construction. Additional removal and restoration details for the water service connections will be provided at the detailed design stage.

3.2 Design Water Demand

The subject property was separated into residential and commercial land uses to estimate an equivalent population necessary to determine the design flows. The Halton Regional Water and Wastewater Linear Design Manual was used to determine equivalent population estimates for existing and proposed conditions. The results are provided in **Table 1**, and detailed calculations are provided in **Appendix A.**

Table 1: Equivalent Population Estimates

Standard	Condition	Commercial Occupant Load	Residential Occupant Load	Total Occupant Load
Halton Region Water and Wastewater Linear Design Manual: Table 2-1 (April 2015, V3)	Existing	63	N/A	63
	Proposed	63	608	671

The Halton Region Water and Wastewater Linear Design Manual was referenced to calculate water demands for the proposed development based on the equivalent population estimates for the site. The existing and the proposed average day water demands were compared to show the increase in water demand from the proposed development. **Table 2** summarizes the existing and proposed water demand and detailed calculations are provided in **Appendix A**.

Table 2: Estimated Design Water Demand

Standard	Average Daily Demand (L/s)			Proposed Maximum Daily Demand (L/s)	Proposed Maximum Hourly Demand (L/s)
	Existing	Proposed	Increase		
Halton Region Water and Wastewater Linear Design Manual	0.2	2.14	1.94	4.81	8.19

For the proposed development, the average daily water demand is 2.14 L/s, which is an increase of 1.94 L/s from existing conditions. The design water demand was estimated using the Halton Region Water and Wastewater Linear Design Manual (April 2015). The design water demand is determined as the greater of the following criteria (2.2.1):

- Maximum hourly demand
- Maximum daily demand plus fire flow

The Fire Underwriters Survey (FUS) method was used to calculate the fire flow requirements for the proposed development. The water demand calculations are provided in **Appendix A**. In order to determine the available fire flow and pressure within the existing watermain system, a hydrant flow test was required. The estimated fire flow requirements are summarized in **Table 3** and provided in **Appendix A,** were calculated based on the gross-floor area of the proposed building, as per the Site Plan # 6966 (The Rosseau Group & WZMH Architects, Dec 12 2017), and non-combustible building construction.

Table 3: Estimated Fire Demand Flow

Method	Demand Flow (L/s)	Demand Flow (USGPM)	Duration (h)
Fire Underwriters Survey	183	2,904	2.00

Therefore, the maximum daily demand plus the fire flow was selected as it was significantly greater than the maximum hourly demand yielding a final design demand of 188 L/s.

3.2.1 Hydrant Flow Test

A hydrant flow test was completed on the existing 300 mm diameter watermain on New Street on December 12, 2017. The test was conducted in accordance with NFPA 291 and Halton Region criteria. The test was performed on the two hydrants located the closest to the development site at 2421 & 2431 New Street.

According to Halton Region, the proposed development can be serviced by the existing 300 mm diameter watermain if the following criteria are met:

- Minimum watermain pressure under maximum day demand is 20 PSI
- Available fire flow at 20 PSI of watermain pressure must be greater than the fire flow demand

The available fire flow at 20 PSI for the existing 300 mm diameter watermain was calculated using the results from the hydrant flow test. The projected available fire flow at 20 PSI is 145 L/s (2,304 US GPM). The required fire flow is to be confirmed by the architect and mechanical engineer at the Site Plan stage. Refer to **Appendix A** for the hydrant test results and projected available fire flow demand calculation.

3.3 Proposed Water Servicing

Water supply for the development is proposed to be provided through a new 200 mm diameter water service connection to the existing 300 mm watermain within the New St. right of way. The proposed water service will split into a 100 mm diameter domestic water service and a 200 mm diameter fire line.

The mechanical engineer will design the internal water system, including the internal sprinkler system, within the building and the underground parking structure. The proposed water service and the extent of the underground parking are shown on drawing **C102**: Preliminary Site Servicing Plan.

4.0 SANITARY SERVICING

4.1 Existing Sanitary Servicing

The existing commercial buildings located within the subject properties are currently serviced using two lateral connections to the existing 200 mm diameter sanitary main along New Street. The sewer laterals will be decommissioned at the onset of construction and removed (if necessary). Additional removal details for the laterals will be provided at the detailed design stage.

4.2 Design Sanitary Demand

The Halton Region Water and Wastewater Linear Design Manual was utilized alongside the Karp Namisniak Tamamoto drawing A-PP1 and the population estimate described in section 3.2 to calculate the sanitary design flows for the proposed development.

A unit sewage flow rate of 275 L/person/day was used for the residential population and 24750 L/ha/day was used for the commercial population for the 0.7 ha proposed development. Infiltration flow and a peaking factor were applied to the average daily sewage flow to obtain the total estimated peak design sewage flow. A summary of the results is presented in **Table 4** below, with detailed calculations provided in **Appendix B**.

Table 2: Estimated Design Sanitary Demand

Method	Condition	Average Wastewater Flow (L/s)	Peaking Factor	Infiltration Flow (L/s)	Total Design Sanitary Flow (L/s)
Halton Region	Existing	0.20	3.43	0.2	0.89
	Proposed	1.94	3.91	0.2	7.81
				Total Sanitary Flow Increase:	6.92

4.3 Proposed Sanitary Servicing

It is proposed to service the subject property by replacing the existing sanitary lateral, on the eastern side in front of 2431 New Street, with a 200 mm diameter PVC lateral connecting to the existing manhole on New Street. The existing sanitary lateral on the west side, in front of 2421 New Street, will be abandoned, filled with grout and plugged on both ends.

The mechanical engineer will design the internal sanitary sewage collection system within the buildings and the underground parking structure. The proposed sanitary service is shown on drawing **C102**.

The sanitary connection and the corresponding capacity of the sanitary main is subject to Region review to confirm its compliance with Regional standards.

5.0 DRAINAGE CONDITIONS

5.1 Existing Drainage

According to the topographic survey (KRCMAR, November 29 2017), existing stormwater drainage splits between two main catchments. Catchment 101 consists of 0.64 ha of the property draining to five (5) catch basins within the property boundaries and one (1) catch basin on the adjacent property to the east. It is assumed that all of these catch basins convey drainage to the existing 300 mm diameter storm sewer on New Street. All major overland flow is directed to New Street where it is conveyed westward. Catchment 102 consists of the remaining 0.06 ha of the site where runoff is directed to the north perimeter of the property by means of overland flow, which leaves the site uncontrolled. **Figure 1** shows the delineation of the drainage areas.

Table 5 summarizes the pre-development land areas and weighted runoff coefficients.

Table 5: Pre-Development Land Areas and Runoff Coefficients

Catchment ID	Pervious Area (ha)	Impervious Area (ha)	Total Area (ha)	Weighted Runoff Coefficient
101	0	0.64	0.64	0.90
102	0.04	0.02	0.06	0.51

Note: Refer to **Appendix C** for Stormwater Management Calculations.

5.2 Proposed Drainage

As previously noted, the proposed development consists of an 11-storey residential condominium with 139 units and an 11-storey senior's residence with 223 units. The proposed grading and stormwater management system for the site has been designed to meet the drainage criteria per the City of Burlington.

The subject property has been divided into two post-development stormwater catchment areas as shown on **Figure 2**. A storm sewer network, internal to the site, will convey minor system flows generated within Catchment 201 towards the existing 300 mm diameter storm sewer. Major overland flow within catchment 201 is directed to New Street. Catchment 202, which is completely pervious, will runoff uncontrolled towards the northern and eastern perimeter of the property, mimicking existing conditions.

Table 6 provides details of the catchment areas and runoff coefficients for post-development conditions.

Table 6: Post-Development Land Areas and Runoff Coefficients

Catchment ID	Pervious Area (ha)	Impervious Area (ha)	Total Area (ha)	Weighted Runoff Coefficient
201	0.20	0.48	0.68	0.66
202	0.02	0	0.02	0.25

Note: Refer to **Appendix C** for Stormwater Management Calculations.

The Preliminary Site Servicing Plan (**C102**) and Preliminary Site Grading Plan (**C103)** illustrate the internal storm sewer network and connections, as well as, the proposed drainage of the site.

6.0 STORMWATER MANAGEMENT

6.1 Stormwater Design Criteria

The proposed development site must comply with the City of Burlington Engineering Standards.

The specific design criteria based on City of Burlington requirements include:

- **Stormwater Quantity**: Provide post-development to 5-year pre control for a range of design storms (5, 10, 25, 50 and 100-year storms)
- **Stormwater Quality**: "Enhanced" protection level for the developed portion of the site (80% TSS Removal for 90% of the annual runoff)

6.2 Stormwater Quantity Control

Using City of Burlington intensity-duration-frequency (IDF) data, the Modified Rational Method was used to determine both the pre-development and post-development peak flow rates and the required stormwater storage.

Table 7 below provides a summary of the site flows.

Table 7: Pre- and Post-Development Flow Rates and Required Storage Volumes

Storm	Pre-Development Flow Rate (Catchment 101) (L/s)	Post-Development Flow Rate (Catchment 201) (L/s)	Target Post-Development Flow Rate (Q_{target}) (L/s)	Storage Volume Required (m^3)
5-year	141	109	141	0
10-year	161	126		0
25-year	188	161		12
50-year	230	194		32
100-year	252	220		53

Note 1: Refer to **Appendix C** for modified rational calculations.

Table 7 demonstrates the controlled flow rate (141 L/s) in the post development conditions, for all storm events up to and including the 100-year storm event, is equal to the 5-year pre-development flow rate. All runoff from catchment 201 will be captured and controlled via the proposed area drains, storm sewer network and orifice control. The proposed area drains will capture the stormwater runoff and water will be conveyed through the proposed internal storm sewer network, designed by the mechanical engineer. The internal storm sewer system will outlet to the existing 300 mm diameter storm sewer on New Street via the existing 250 mm diameter storm sewer connection. An orifice control is proposed on the downstream side of the proposed stormwater tank to provide peak flow control. No rooftop controls are proposed at this time.

The proposed stormwater quantity volume control will consist of a 100 m^3 underground storage tank to be installed inside the underground parking. The proposed storage tank will be complete with an emergency overflow and access hatch. Based on the modified rational method, a total of 53 m^3 of storage is required therefore the proposed underground stormwater tank provides sufficient storage and the stormwater quantity volume control requirement is met. The Preliminary Servicing Plan (**C102**) illustrates the location of the proposed stormwater storage tank. Detailed calculations are provided in **Appendix C.**

As described in section 5.2, Catchment 202 will be uncontrolled with stormwater flowing overland towards the northern and eastern perimeters of the site. **Table 8** summarizes the uncontrolled peak stormwater flows under both existing and proposed drainage conditions.

Table 8: Uncontrolled Pre- and Post-Development Flow Rates

Storm	Pre-Development Flow Rate (Catchment 102) (L/s)	Post-Development Flow Rate (Catchment 202) (L/s)
5-year	7.5	1.7
10-year	8.6	2.0
25-year	11.0	2.6
50-year	14.5	3.4
100-year	19.9	4.6

Table 8 demonstrates that for all design storm events, the peak stormwater flow discharging uncontrolled from the subject property decreases significantly. Detailed calculations are provided in **Appendix C.**

Based on the above analysis and proposed design, we conclude that the stormwater management quantity objectives have been met.

6.3 Stormwater Quality Control

Stormwater quality controls for the site must incorporate measures to provide an Enhanced Level of Protection (Level 1) according to the MOE (March 2003) guidelines. Enhanced water quality protection involves the removal of at least 80% of total suspended solids (TSS) from 90% of the annual runoff volume. Water quality control will be provided through an oil/grit separator (OGS).

A Stormceptor Oil-Grit-Separator STC 2000 or approved equivalent was sized based on drainage area of 0.68 ha and an imperviousness of 82%. The oil/grit separator (OGS) will be installed in the underground parking garage close to the property line to provide quality control to runoff before leaving the site. Refer to **Appendix C** for OGS details.

7.0 EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION

Erosion and sediment controls will 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 The City of Burlington. These controls will be inspected after each significant rainfall event to ensure that they are maintained in proper working condition. An Erosion and Sediment Control Plan, together with detailed phasing and staging requirements, will be tailored to the final detailed design of the development.

The following erosion and sediment controls will be included during construction on the site:

- **Silt Fencing**: A silt fence will be installed on the site perimeter to intercept runoff. The site engineer and the owner may add additional silt fencing if needed prior to, during, and following construction.

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

- **Siltsacks in Catchbasins**: A siltsack shall be installed in the existing storm sewer catchbasins near the site along New Street.

All necessary details and locations will be provided at the detailed design stage as noted above.

8.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the information provided in this report, we offer the following conclusions:

1. The proposed development of the site includes an 11-storey residential condominium with 139 units and an 11-storey senior's residence with 223 units, commercial retail units, 320 associated parking spaces and landscaped areas. The property will have an internal private roadway and private access point to New Street.

2. Domestic peak water demand for the proposed condominium complex is 8.19 L/s. A design fire flow of 183.30 L/s for 2.0 hours is required.

3. Water demand for the proposed development will be met using a 200 mm diameter PVC water service connection. This new water service will connect to the existing 300 mm municipal watermain along New Street.

4. Peak sanitary flow for the proposed condominium complex is 7.81 L/s.

5. Sanitary flows from the proposed development will be conveyed using a private internal sanitary sewer network that connects to the existing 200 mm diameter sanitary sewer along New Street.

6. Stormwater management for the proposed development will include controlling the post-development peak flows to the 5-year pre-development peak flow for all storm events up to and including the 100-year storm event.

7. Stormwater storage is provided through a proposed 100 m^3 underground storage tank to be installed in the underground parking.

8. Stormwater will be captured by area drains, conveyed through the proposed internal storm sewer network and outlet to the existing 300 mm diameter storm sewer on New Street. The existing 250 mm diameter storm sewer connection to New Street is to be maintained.

9. An Enhanced Level of Protection (80% TSS removal) for stormwater quality control will be provided through an OGS unit within the parking garage installed before the property line

10. A detailed Erosion and Sediment Control Plan will be provided at the detailed design stage.

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

Respectfully submitted,

C.F. CROZIER & ASSOCIATES INC.

Marwan Zahra, E.I.T
Land Development

C.F. CROZIER & ASSOCIATES INC.

Nicole Sylvester, E.I.T
Water Resources

C.F. CROZIER & ASSOCIATES INC.

Nick Constantin, M.Sc., P. Eng
Senior Project Manager

\BS
I:\1400\1473-TRG\4780-2421 & 2431 New St\Reports\2017.12.15 FSR & SWM Report .docx

APPENDIX A

Water Demand Calculations

CROZIER & ASSOCIATES Consulting Engineers

Project: 2421 & 2431 New st
Project NO.: 1473-4780

Date: 11/21/2017
Designed By: MZ
Checked By:

Population Estimate

			References
Design Criteria - Halton Region			
Existing Conditions: Three one-storey commercial buildings			
Light Commercial Areas	90	p/ha	Halton Region Water and Wastewater Linear Design Manual: Table 2-1 (April 2015, V3)
Site Area:	0.70	ha	
Equivalent population:	**63**	**persons**	
Proposed Conditions: 360 Residential Suites and 466 m2 of commercial area			
Population Density:	1.68	ppu	As per Halton Region Standards
No. of units:	362	units	
Equivalent population:	608	persons	
Light Commercial Areas	90	p/Ha	Halton Region Water and Wastewater Linear Design Manual: Table 2-1 (April 2015, V3)
Site Area:	0.70	Ha	
Equivalent population:	63	persons	
Total Equivalent population:	**671**	**persons**	
Commercial + Residential)			

Project: 2421 & 2431 New st
Project NO.: 1473-4780

Date: 11/21/2017
Designed By: MZ
Checked By: NAS

Existing Water Demand

Design Criteria - Halton Region

Existing Population:	63 persons	
Average Daily Demand: (Light commercial)	275 L/capita/day	
Peaking Factors		
Maximum Daily Demand:	2.25	NOTE: Peaking factors are based on a commercial classification
Maximum Hourly Demand:	2.25	

Flows	L/day	L/s
Average Daily Demand:	17325	0.20
Maximum Daily Demand:	38981	0.45
Maximum Hourly Demand:	38981	0.45

References

CFCA Population Estimate Design Sheet (November 21, 2017)

Halton Region Water and Wastewater Linear Design Manual: Sec 2.4 (April 2015, V3)

CROZIER & ASSOCIATES Consulting Engineers

Project: 2421 & 2431 New st
Project NO.: 1473-4780

Date: 11/21/2017
Designed By: MZ
Checked By: NAS

Proposed Water Demand

References

Design Criteria - Halton Region

Average Daily Demand: 275 L/capita/day — Halton Region Water and Wastewater Linear Design Manual: Sec 2.4 (April 2015, V3)

Residential Population: 608 persons
Commercial Population: 63 persons — CFCA Population Estimate Design Sheet (November 21, 2017)

Peaking Factors

	Residential	Commercial
Maximum Daily Demand:	2.25	2.25
Maximum Hourly Demand:	4.00	2.25

Halton Region Water and Wastewater Linear Design Manual: Sec 2.4 (April 2015, V3)

Flows

	Residential (L/day)	Commercial (L/day)	Total (L/day)	Total (L/s)	
Average Daily Demand:	167244	17325.00	184569.00	2.14	
Maximum Daily Demand:	376299	38981	415280.25	4.81	
Maximum Hourly Demand:	668976	38981	707957.25	8.19	
Fire Flow:			15837120.00	183.30	Maximum Fire Flow from FUS Analysis

System shall be designed to meet the greater of either of the following:
a: Maximum Daily Demand Plus Fire Flow
b: Maximum Hourly Demand

Halton Region Water and Wastewater Linear Design Manual: Sec 2.2.1 (April 2015, V3)

a: 4.81 + 183.30 = 188.11 L/s
b: 8.19 L/s

188.11 L/s > 8.19 L/s therefore use criteria a.

CROZIER & ASSOCIATES Consulting Engineers

Project: 2421 & 2431 New St
Project NO.: 1473-4780

Date: 11/21/2017
Designed By: MZ
Checked By: NAS

Fire Flow Calculations - Fire Underwriters Survey Method

Water Supply for Public Fire Protection (1999)
Fire Underwriters Survey
Notes:

1.) The development will use ordinary construction (C-value = 1.0).
2.) Building gross-floor area is to be confirmed once Zoning By-Law Amendment isapproved.
3.) The building is assumed to have complete automatic sprinkler protection.
4.) The building is classified as a low hazard occupancy as per the appendix of the Water Supply for Public Fire Protection (1999) by FUS.

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 metres (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 and email from WZMH Architects)

0.8 C-Value	5804.0 sq.m	GFA of largest two adjoining floors
	5661.0 sq.m	GFA of 50% of the floors above the largest two adjoining floors

Therefore F = 18,800 L/min

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	-15%		

-25% Reduction(%)
-4,700 L/min reduction

Subtotal = 14,100 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 complete automatic sprinkler protection (50% reduction)**
-7,050 L/min reduction

Water Supply for Public Fire Protection - 1999
Fire Underwriters Survey

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 metres 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)
Residential Building (West)	20	10%	1,410
Houses (North)	31	5%	705
Gast Station (East)	28	10%	1,410
		Total Surcharge	**3,525**

Determine Required Fire Flow

No.1	18,800	
No. 2	-4,700	reduction
No. 3	-7,050	reduction
No. 4	3,525	surcharge
Required Flow:	**10,575**	**L/min**
Rounded to nearest 1000 L/min:	**11,000**	**L/min** or **183.3 L/s**
		2,904.0 USGPM

Note: USGPM = 0.264*(L/min)

Determine Required Fire Storage Volume

Flow from above	11,000 L/min
Required duration	2.00 hours
Therefore:	**1,320,000 Litres or**
	1,320 m^3 or
	290,359 gal (Imp)

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

CROZIER & ASSOCIATES
Consulting Engineers

PROJECT: 2421 & 2431 New Street
PROJECT No.: 1473-4780
DATE: 12/14/2017
UPDATE: 12/15/2017
DESIGN: AP
CHECK: MZ

Projected Fire Flow Calculations

Test	Hydrant Location / ID	Static Pressure	Residual Pressure during Test	Flow from Hydrant Test	Desired Residual Pressure*	Projected Fire Flow Available at 20 psi
		Ps	Pt	Qt	Pr	Qr
		(psi)	(psi)	(USGPM)	(psi)	(USGPM)
1	2421 New Street	100	61	668	20	985
2			60	1034		1,503
3			58	1627		2,304

*Regional Municipality of Halton Water and Wastewater Linear Design Manual Section 2.5.4 (2017)

$Q_r = Q_t \times ((P_s - P_r)/(P_s - P_t))^{0.54}$ Formula to determine available flow as per AWWA M17 (1989)

NOTE: Projected fire flows are calculated on the basis of hydrant tests carried out by Vipond on December 12, 2017 at 1:00 PM.

FIRST FOR FIRE PROTECTION
VIPOND INC
est. 1945

FLOW TEST RESULTS

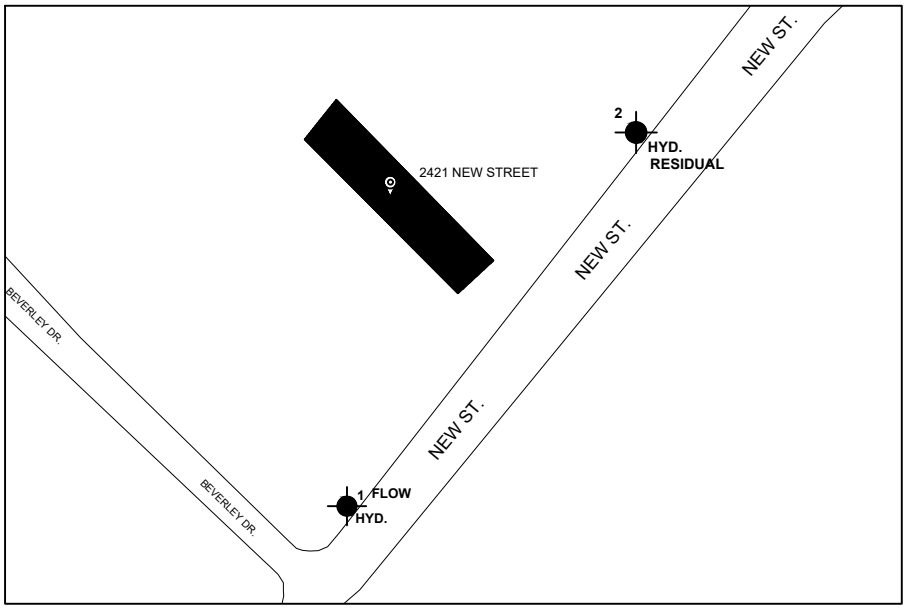
DATE : DECEMBER.12 2017 TIME : 1:00 PM

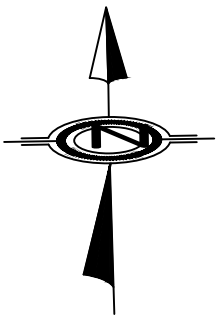
LOCATION :

2421 NEW STREET

BURLINGTON, ONTARIO

TEST BY : J.MABEN , A.JACOME, P.U.C.





STATIC PRESSURE : 100 PSI

TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (INCHES)	DISCHARGE CO-EFFICIENT	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	DISCHARGE (U.S.GPM)
1	1	1-3/4"		61	54	668
2	1	2-1/2"		60	38	1034
3	2	2-1/2"		58	23/24	1627

FIRST FOR FIRE PROTECTION

VIPOND INC est. 1945

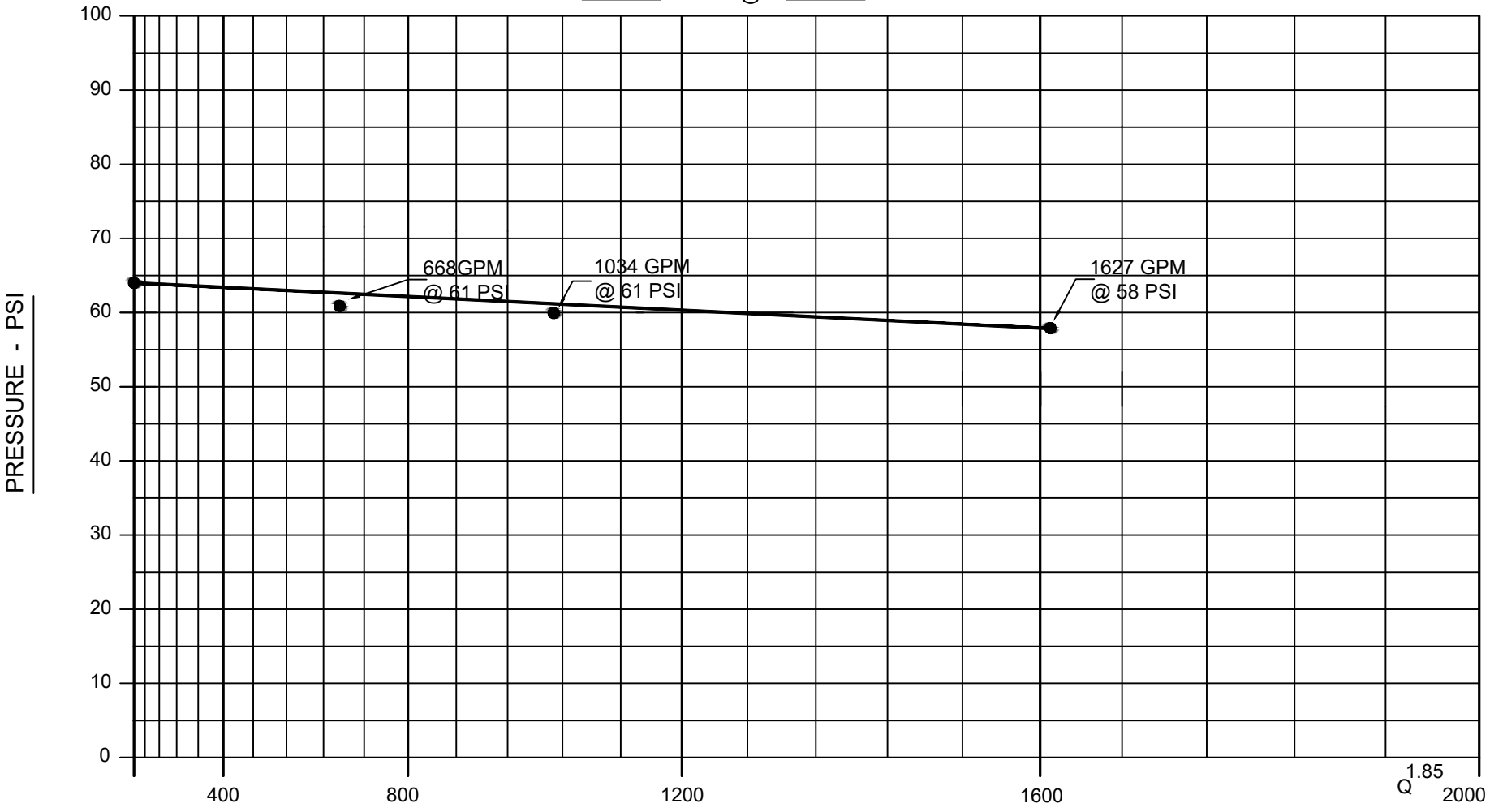
	BY : VIPOND	2 OF 2
2421 NEW STREET	OFFICE : MISSISSAUGA	
BURLINGTON, ONTARIO	TEST BY : J.MABEN , A.JACOME, P.U.C.	

STATIC : 64 PSI

61 PSI @ 668 GPM

60 PSI @ 1034 GPM

58 PSI @ 1627 GPM



VIP-DES-FO5-C

APPENDIX B

Sanitary Flow Calculations

CROZIER & ASSOCIATES Consulting Engineers

Project: 2421 & 2431 New st
Project NO.: 1473-4780

Date: 11/21/2017
Designed By: MZ
Checked By: NAS

Existing Sanitary Demand

References

Design Criteria - Halton Region

Site Area: 0.70 ha

Average Wastewater Flow (Light commercial): 24750 L/Ha/day
17325.00 L/day
0.20 L/s

Halton Region Water and Wastewater Linear Design Manual: Table 3-2 (April 2015, V3)

Infiltration Allowance: 0.29 L/s/ha
0.20 L/s

Halton Region Water and Wastewater Linear Design Manual: Sec 3.2.4 (April 2015, V3)

Peaking Factor
Commercial: $M_e = 0.8\,(1 + \frac{14}{4 + \sqrt{P_e}})$
Me: 3.43

Halton Region Water and Wastewater Linear Design Manual: Sec 3.2.3b) (April 2015, V3)

Design flow = avg. daily dry weather flow * peaking factor + infiltration

Design Flow: 0.89 L/s
76,803 L/day

Halton Region Water and Wastewater Linear Design Manual: Sec 3.2.1 (April 2015, V3)

CROZIER & ASSOCIATES Consulting Engineers

Project: 2421 & 2431 New st
Project NO.: 1473-4780

Date: 11/21/2017
Designed By: MZ
Checked By: NAS

Proposed Sanitary Demand

References

Design Criteria - Halton Region

Residential Population:	608	persons	CFCA Population Estimate Design Sheet (October 27, 2017)
Commercial Population:	63	persons	
Commercial Area:	466	m^2	
Total Site Area:	0.70	ha	Karp Namisniak Yamamoto drawing A-SP1, Project #15005

Residential

Average Wastewater Flow - Apartments (>6 stories high):	275	L/capita/day	Halton Region Water and Wastewater Linear Design Manual: Table 3-1 (April 2015, V3)
	167244	L/day	
	1.94	L/s	

Commercial

Average Wastewater Flow - Light Commercial Areas:	24750	L/ha/day	Halton Region Water and Wastewater Linear Design Manual: Table 3-2 (April 2015, V3)
	1153.35	L/day (use commercial area)	
	0.01	L/s	

Peaking Factor

$$M = \left(1 + \frac{14}{4 + \sqrt{P + P_e}}\right)$$

Note: P is in thousands

M: 3.91

Halton Region Water and Wastewater Linear Design Manual: Sec 3.2.3a) (April 2015)

Infiltration Allowance	0.29	L/s/ha (use total site area)	Halton Region Water and Wastewater Linear Design Manual: Sec 3.2.4 (April 2015, V3)
	0.20	L/s	

Design flow: avg. daily dry weather flow * peaking factor + infiltration
Design flow: (1.94+0.01)*3.91+ 0.20

Halton Region Water and Wastewater Linear Design Manual: Sec 3.2.1 (April 2015, V3)

Design Flow:	7.81	L/s
	674,892	L/day

APPENDIX C

Stormwater Management Calculations

Project: 2421 & 2431 New Street
Project No.: 1473-4780

Date: 12/4/2017
Updated: 12/15/2017
Designed By: BS
Checked By:

Modified Rational Calculations - Peak Flows Summary

MUNICIPALITY: City of Burlington

Runoff Coefficient Adjustments		
Return Period	**Pre Development Coefficients**	**Post Development Coefficients**
5 & 10 Yr (base)	0.90	0.66
25 Yr	0.99	0.72
50 Yr	1.00	0.79
100 Yr	1.00	0.82

*Runoff coefficients are for Catchments 101 and 201 as per C.F. Crozier Figure 1 & 2

Peak Flows (L/s)				
Return Period	Q_{pre} [1]	Q_{post} [2]	Q_{target}	**Storage Required** (m^3)
5 yr	140.61	109.48	140.61	0.00
10 yr	161.43	125.69	140.61	0.00
25 yr	187.89	160.93	140.61	12.19
50 yr	230.23	193.61	140.61	31.80
100 yr	251.64	220.43	140.61	52.77

1. Pre-development peak flows for catchment 101
2. Post development peak flows for catchment 201

Uncontrolled Peak Flows (L/s)		
Return Period	Q_{pre} [1]	Q_{post} [2]
5 yr	7.74	1.44
10 yr	8.88	1.66
25 yr	11.38	2.12
50 yr	15.05	2.81
100 yr	20.57	3.84

1. Pre-development peak flows for catchment 102
2. Post development peak flows for catchment 202

Peak Flow

$$Q_{target} = 0.00278 \bullet C_{target} \bullet i_{(Td)} \bullet A$$

Project: 2421 & 2431 New Street
Project No.: 1473-4780

Date: 12/4/2017
Updated: #######
Designed By: BS
Checked By: MZ

Modified Rational Method - Catchment Areas

PRE-DEVELOPMENT

Catchment 101			
Land Use	**Area** (ha)	**Area** (m^2)	
Exisiting Building	0.16	1645.93	
Existing Paved	0.47	4733.39	**C**
Total Impervious	0.64	6379.32	0.90
Total Catchment	**0.64**	**6379.32**	**0.90**

No Pervious Land in Catchment 101

Catchment 102			
Land Use	**Area** (ha)	**Area** (m^2)	
Existing Landscape	0.04	364.52	
Existing Paved	0.02	249.84	**C**
Total Impervious	0.02	249.84	0.90
Total Pervious	0.04	364.52	0.25
Total Catchment	**0.06**	**614.36**	**0.51**

Pervious and Impervious areas from C.F. Crozier Figure 1

POST-DEVELOPMENT

Catchment 201			
Land Use	**Area** (ha)	**Area** (m^2)	
Proposed Building	0.30	3029.88	
Proposed Back Driveway	0.04	413.41	
Proposed Landscape	0.12	1227.41	**C**
Proposed Perm. Pavement	0.21	2129.3	0.50
Total Impervious	0.34	3443.29	0.90
Total Pervious	0.12	1227.41	0.25
Total Catchment	**0.68**	**6800**	**0.66**

Catchment 202			
Land Use	**Area** (ha)	**Area** (m^2)	
Proposed Landscape	0.02	235.72	**C**
Total Pervious	0.02	235.72	0.25
Total Catchment	**0.02**	**235.72**	**0.25**

Pervious and Impervious areas from C.F. Crozier Figure 2

Project: 2421 & 2431 New Street
Project No.: 1473-4780

Date: 12/4/2017
Updated: 12/15/2017
Designed By: BS
Checked By: MZ

Modified Rational Method - Input Data

Storm Data: City of Burlington

Runoff Coefficient Adjustments		
Return Period	**Pre Development Coefficients**	**Post Development Coefficients**
5 & 10 Yr (base)	0.90	0.66
25 Yr	0.99	0.72
50 Yr	1.00	0.79
100 Yr	1.00	0.82

*Runoff coefficients are for Catchments 101 and 201 as per C.F. Crozier Figure 1 & 2

Time of Concentration: 10 min

Return Period	A	B	C	i mm/hr
2 yr	592.6	6	0.78	68.16
5 yr	697.4	5	0.764	88.09
10 yr	798.5	5	0.763	101.14
25 yr	926.9	5	0.762	117.72
50 yr	1019.4	5	0.761	129.82
100 yr	1114.2	5	0.76	141.89

Notes

City of Burlington "SEWER DESIGN: Recommended Runoff Coefficients" Standard Dwg. No. S-3D (1999)

City of Burlington "INTENSITY, DURATION, FREQUENCY CURVES" Standard Dwg. No. S-IDF (1999)

CROZIER & ASSOCIATES Consulting Engineers

Project: 2421 & 2431 New Street
Project No.: 1473-4780

Date: 12/4/2017
Updated: 12/15/2017
Designed By: BS
Checked By: MZ

MODIFIED RATIONAL METHOD - 5 year post to 5 year target

MUNICIPALITY: City of Burlington

5-yr Pre-Development Peak Flow

Weighted RC	i (mm/hr)	A (ha)	Q (m^3/s)	Q_{pre} (L/s)
0.90	88.09	0.64	0.14	140.61

Target Peak Flow (5-yr Pre)

Weighted RC	i (mm/hr)	A (ha)	Q (m^3/s)	Q_{target} (L/s)
0.90	88.09	0.64	0.14	140.61

5-yr Post-Development Peak Flow

C	i (mm/hr)	A (ha)	Q (m^3/s)	Q_{post} (L/s)
0.66	88.09	0.68	0.11	109.48

Storage Volume Determination				
T_d min	**i** mm/hr	**T_d** sec	**Q_{post}** m^3/s	**S_d** Site
10	88.09	600	0.11	-18.68
20	59.63	1200	0.07	-37.62
30	46.11	1800	0.06	-65.58
40	38.06	2400	0.05	-97.40
50	32.65	3000	0.04	-131.37
60	28.74	3600	0.04	-166.71
70	25.76	4200	0.03	-203.00
80	23.41	4800	0.03	-239.99
90	21.50	5400	0.03	-277.52
100	19.92	6000	0.02	-315.47
110	18.58	6600	0.02	-353.77
120	17.44	7200	0.02	-392.35
130	16.44	7800	0.02	-431.19
140	15.57	8400	0.02	-470.23
150	14.79	9000	0.02	-509.45
160	14.10	9600	0.02	-548.84
170	13.48	10200	0.02	-588.36
180	12.92	10800	0.02	-628.01
190	12.41	11400	0.02	-667.78
200	11.95	12000	0.01	-707.64
210	11.52	12600	0.01	-747.60
220	11.13	13200	0.01	-787.64
230	10.76	13800	0.01	-827.76
240	10.43	14400	0.01	-867.96
250	10.11	15000	0.01	-908.21
260	9.82	15600	0.01	-948.53
270	9.55	16200	0.01	-988.91
280	9.29	16800	0.01	-1029.34
290	9.05	17400	0.01	-1069.82
300	8.82	18000	0.01	-1110.35
310	8.61	18600	0.01	-1150.91
			REQUIRED STORAGE VOLUME:	**-19**

Equations:

Intensity
$I = A / (Tc + 5)^C$

Peak Flow
$Q_{target} = 0.00278 \bullet C_{target} \bullet i_{(Td)} \bullet A$

Storage
$S_d = Q_{post} \bullet T_d - Q_{target} (T_d + T_c) / 2$

CROZIER & ASSOCIATES Consulting Engineers

Project: 2421 & 2431 New Street
Project No.: 1473-4780

Date: 12/4/2017
Updated: 12/15/2017
Designed By: BS
Checked By: MZ

MODIFIED RATIONAL METHOD - 10 year post to 5 year target

MUNICIPALITY: City of Burlington

10-yr Pre-Development Peak Flow

Weighted RC	i (mm/hr)	A (ha)	Q (m^3/s)	Q_{pre} (L/s)
0.90	101.14	0.64	0.16	161.43

Target Peak Flow (5 -yr Pre)

Weighted RC	i (mm/hr)	A (ha)	Q (m^3/s)	Q_{target} (L/s)
0.90	88.09	0.64	0.14	140.61

10-yr Post-Development Peak Flow

C	i (mm/hr)	A (ha)	Q (m^3/s)	Q_{post} (L/s)
0.66	101.14	0.68	0.13	125.69

Storage Volume Determination				
T_d	**i**	**T_d**	**Q_{post}**	**S_d**
min	mm/hr	sec	m^3/s	Site
10	101.14	600	0.13	-8.95
20	68.49	1200	0.09	-24.40
30	52.98	1800	0.07	-50.20
40	43.74	2400	0.05	-80.45
50	37.53	3000	0.05	-113.17
60	33.04	3600	0.04	-147.46
70	29.62	4200	0.04	-182.84
80	26.92	4800	0.03	-219.03
90	24.73	5400	0.03	-255.84
100	22.91	6000	0.03	-293.14
110	21.38	6600	0.03	-330.84
120	20.06	7200	0.02	-368.87
130	18.92	7800	0.02	-407.19
140	17.91	8400	0.02	-445.74
150	17.02	9000	0.02	-484.51
160	16.23	9600	0.02	-523.46
170	15.52	10200	0.02	-562.57
180	14.87	10800	0.02	-601.83
190	14.29	11400	0.02	-641.22
200	13.75	12000	0.02	-680.72
210	13.26	12600	0.02	-720.33
220	12.81	13200	0.02	-760.04
230	12.39	13800	0.02	-799.84
240	12.00	14400	0.01	-839.73
250	11.64	15000	0.01	-879.69
260	11.31	15600	0.01	-919.71
270	10.99	16200	0.01	-959.81
280	10.70	16800	0.01	-999.97
290	10.42	17400	0.01	-1040.18
300	10.16	18000	0.01	-1080.45
310	9.91	18600	0.01	-1120.76
REQUIRED STORAGE VOLUME:				**-9**

Equations:

Intensity
$I = A / (Tc + 5)^C$

Peak Flow
$Q_{target} = 0.00278 \bullet C_{target} \bullet i_{(Td)} \bullet A$

Storage
$S_d = Q_{post} \bullet T_d - Q_{target} (T_d + T_c) / 2$

Project: 2421 & 2431 New Street
Project No.: 1473-4780

Date: 12/4/2017
Updated: 12/15/2017
Designed By: BS
Checked By: MZ

MODIFIED RATIONAL METHOD - 25 year post to 5 year target

MUNICIPALITY: City of Burlington

25-yr Pre-Development Peak Flow

Weighted RC	i (mm/hr)	A (ha)	Q (m^3/s)	Q_{pre} (L/s)
0.90	117.72	0.64	0.19	187.89

Target Peak Flow (5-yr Pre)

Weighted RC	i (mm/hr)	A (ha)	Q (m^3/s)	Q_{target} (L/s)
0.90	88.09	0.64	0.14	140.61

25-yr Post-Development Peak Flow

C	i (mm/hr)	A (ha)	Q (m^3/s)	Q_{post} (L/s)
0.72	117.72	0.68	0.16	160.93

Storage Volume Determination				
T_d min	**i** mm/hr	**T_d** sec	**Q_{post}** m^3/s	**S_d** Site
10	117.72	600	0.16	12.19
20	79.76	1200	0.11	4.30
30	61.72	1800	0.08	-16.84
40	50.97	2400	0.07	-43.69
50	43.74	3000	0.06	-73.71
60	38.51	3600	0.05	-105.74
70	34.53	4200	0.05	-139.18
80	31.39	4800	0.04	-173.65
90	28.84	5400	0.04	-208.92
100	26.72	6000	0.04	-244.81
110	24.93	6600	0.03	-281.22
120	23.40	7200	0.03	-318.06
130	22.07	7800	0.03	-355.26
140	20.90	8400	0.03	-392.78
150	19.86	9000	0.03	-430.56
160	18.94	9600	0.03	-468.57
170	18.11	10200	0.02	-506.80
180	17.36	10800	0.02	-545.22
190	16.67	11400	0.02	-583.80
200	16.05	12000	0.02	-622.53
210	15.48	12600	0.02	-661.40
220	14.95	13200	0.02	-700.40
230	14.46	13800	0.02	-739.51
240	14.01	14400	0.02	-778.73
250	13.59	15000	0.02	-818.05
260	13.20	15600	0.02	-857.45
270	12.83	16200	0.02	-896.94
280	12.49	16800	0.02	-936.51
290	12.16	17400	0.02	-976.16
300	11.86	18000	0.02	-1015.87
310	11.57	18600	0.02	-1055.65
			REQUIRED STORAGE VOLUME:	**12**

Equations:

Intensity
$I = A / (Tc + 5)^C$

Peak Flow
$Q_{target} = 0.00278 \bullet C_{target} \bullet i_{(Td)} \bullet A$

Storage
$S_d = Q_{post} \bullet T_d - Q_{target} (T_d + T_c) / 2$

CROZIER & ASSOCIATES Consulting Engineers

Project: 2421 & 2431 New Street
Project No.: 1473-4780

Date: 12/4/2017
Updated: 12/15/2017
Designed By: BS
Checked By: MZ

MODIFIED RATIONAL METHOD - 50 year post to 5 year target

MUNICIPALITY: City of Burlington

50-yr Pre-Development Peak Flow

Weighted RC	i (mm/hr)	A (ha)	Q (m^3/s)	Q_{pre} (L/s)
1.00	129.82	0.64	0.23	230.23

Target Peak Flow (5 -yr Pre)

Weighted RC	i (mm/hr)	A (ha)	Q (m^3/s)	Q_{target} (L/s)
0.90	88.09	0.64	0.14	140.61

50-yr Post-Development Peak Flow

C	i (mm/hr)	A (ha)	Q (m^3/s)	Q_{post} (L/s)
0.79	129.82	0.68	0.19	193.61

Storage Volume Determination				
T_d min	**i** mm/hr	**T_d** sec	**Q_{post}** m^3/s	**S_d** Site
10	129.82	600	0.19	31.80
20	88.01	1200	0.13	30.95
30	68.13	1800	0.10	14.15
40	56.27	2400	0.08	-9.52
50	48.30	3000	0.07	-37.01
60	42.53	3600	0.06	-66.93
70	38.14	4200	0.06	-98.54
80	34.68	4800	0.05	-131.40
90	31.86	5400	0.05	-165.22
100	29.53	6000	0.04	-199.80
110	27.55	6600	0.04	-235.00
120	25.86	7200	0.04	-270.71
130	24.39	7800	0.04	-306.87
140	23.10	8400	0.03	-343.40
150	21.95	9000	0.03	-380.26
160	20.93	9600	0.03	-417.40
170	20.02	10200	0.03	-454.79
180	19.19	10800	0.03	-492.41
190	18.43	11400	0.03	-530.24
200	17.75	12000	0.03	-568.25
210	17.11	12600	0.03	-606.42
220	16.53	13200	0.02	-644.74
230	15.99	13800	0.02	-683.21
240	15.49	14400	0.02	-721.80
250	15.03	15000	0.02	-760.51
260	14.60	15600	0.02	-799.33
270	14.19	16200	0.02	-838.26
280	13.81	16800	0.02	-877.27
290	13.45	17400	0.02	-916.38
300	13.12	18000	0.02	-955.57
310	12.80	18600	0.02	-994.84
			REQUIRED STORAGE VOLUME:	**32**

Equations:

Intensity
$I = A / (Tc + 5)^C$

Peak Flow
$Q_{target} = 0.00278 \bullet C_{target} \bullet i_{(Td)} \bullet A$

Storage
$S_d = Q_{post} \bullet T_d - Q_{target} (T_d + T_c) / 2$

CROZIER & ASSOCIATES Consulting Engineers

Project: 2421 & 2431 New Street
Project No.: 1473-4780

Date: 12/4/2017
Updated: 12/15/2017
Designed By: BS
Checked By: MZ

MODIFIED RATIONAL METHOD - 100 year post to 5 year target

MUNICIPALITY: City of Burlington

100-yr Pre-Development Peak Flow

Weighted RC	i (mm/hr)	A (ha)	Q (m^3/s)	Q_{pre} (L/s)
1.00	141.89	0.64	0.25	251.64

Target Peak Flow (5 -yr Pre)

Weighted RC	i (mm/hr)	A (ha)	Q (m^3/s)	Q_{pre} (L/s)
0.90	88.09	0.64	0.14	140.61

100-yr Post-Development Peak Flow

C	i (mm/hr)	A (ha)	Q (m^3/s)	Q_{post} (L/s)
0.82	141.89	0.68	0.22	220.43

Storage Volume Determination

T_d min	i mm/hr	T_d sec	Qpost m^3/s	S_d Site
10	141.89	600	0.22	47.89
20	96.19	1200	0.15	52.77
30	74.46	1800	0.12	39.48
40	61.50	2400	0.10	18.38
50	52.79	3000	0.08	-7.07
60	46.49	3600	0.07	-35.29
70	41.69	4200	0.06	-65.44
80	37.90	4800	0.06	-97.01
90	34.83	5400	0.05	-129.67
100	32.27	6000	0.05	-163.19
110	30.11	6600	0.05	-197.43
120	28.26	7200	0.04	-232.25
130	26.66	7800	0.04	-267.57
140	25.24	8400	0.04	-303.32
150	23.99	9000	0.04	-339.44
160	22.88	9600	0.04	-375.88
170	21.88	10200	0.03	-412.61
180	20.97	10800	0.03	-449.60
190	20.15	11400	0.03	-486.82
200	19.40	12000	0.03	-524.25
210	18.71	12600	0.03	-561.87
220	18.07	13200	0.03	-599.66
230	17.48	13800	0.03	-637.61
240	16.94	14400	0.03	-675.70
250	16.43	15000	0.03	-713.93
260	15.95	15600	0.02	-752.29
270	15.51	16200	0.02	-790.76
280	15.09	16800	0.02	-829.34
290	14.70	17400	0.02	-868.02
300	14.34	18000	0.02	-906.80
310	13.99	18600	0.02	-945.66
			REQUIRED STORAGE VOLUME:	**53**

Equations:

Intensity
$I = A / (Tc + 5)^C$

Peak Flow
$Q_{target} = 0.00278 \bullet C_{target} \bullet i_{(Td)} \bullet A$

Storage
$S_d = Q_{post} \bullet T_d - Q_{target} (T_d + T_c) / 2$

Project: 2421 & 2431 New Street
Project No.: 1473-4780

Date: 12/4/2017
Updated: 12/15/2017
Designed By: BS
Checked By: MZ

Catchment 102 & 202 Summary of Peak Flows

MUNICIPALITY: City of Burlington

Runoff Coefficient Adjustments		
Return Period	**Pre Development Coefficients**	**Post Development Coefficients**
5 & 10 Yr (base)	0.51	0.25
25 Yr	0.57	0.28
50 Yr	0.68	0.33
100 Yr	0.85	0.41

* Runoff coefficients are for Catchments 102 and 202 as per C.F. Crozier Figure 1 & 2

Pre-Development Peak Flow (Catchment 102)

Storm Event	C	i (mm/hr)	A (ha)	Q (L/s)
5 yr	0.51	88.09	0.06	7.74
10 yr	0.51	101.14	0.06	8.88
25 yr	0.57	117.72	0.06	11.38
50 yr	0.68	129.82	0.06	15.05
100 yr	0.85	141.89	0.06	20.57

Refer to C.F. Crozier Figure 1 & 2

Post-Development Peak Flow (Catchment 202)

Storm Event	C	i (mm/hr)	A (ha)	Q (L/s)
5 yr	0.25	88.09	0.02	1.44
10 yr	0.25	101.14	0.02	1.66
25 yr	0.28	117.72	0.02	2.12
50 yr	0.33	129.82	0.02	2.81
100 yr	0.41	141.89	0.02	3.84

Refer to C.F. Crozier Figure 1 & 2

Peak Flow

$Q_{target} = 0.00278 \bullet C_{target} \bullet i_{(Td)} \bullet A$

Detailed Stormceptor Sizing Report – 2421 & 2431 New Street

Project Information & Location			
Project Name	2421 & 2431 New Street	**Project Number**	5587
City	Burlington	**State/ Province**	Ontario
Country	Canada	**Date**	12/15/2017
Designer Information		**EOR Information (optional)**	
Name	Amanda Pinto	**Name**	
Company	Crozier	**Company**	
Phone #	905-875-0026	**Phone #**	
Email	apinto@cfcrozier.ca	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	2421 & 2431 New Street
Recommended Stormceptor Model	STC 2000
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	81
PSD	City of Toronto PSD
Rainfall Station	HAMILTON A

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 300	66
STC 750	76
STC 1000	77
STC 1500	78
STC 2000	81
STC 3000	83
STC 4000	86
STC 5000	86
STC 6000	88
STC 9000	91
STC 10000	91
STC 14000	94
StormceptorMAX	Custom

Stormceptor
The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.
Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology
Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:
• Site parameters
• Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
• Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
• TSS load
• Detention time of the system

Hydrology Analysis
PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour). Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station			
State/Province	Ontario	**Total Number of Rainfall Events**	4624
Rainfall Station Name	HAMILTON A	**Total Rainfall (mm)**	20907.2
Station ID #	3194	**Average Annual Rainfall (mm)**	614.9
Coordinates	43°10'N, 79°56'W	**Total Evaporation (mm)**	1533.6
Elevation (ft)	77	**Total Infiltration (mm)**	3739.9
Years of Rainfall Data	34	**Total Rainfall that is Runoff (mm)**	15633.7

Notes
• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules. • Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed. • For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Drainage Area	
Total Area (ha)	0.70
Imperviousness %	82.0

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.000	0.000
0.006	234000.000

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	
Water Quality Flow Rate (L/s)	

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cms)	

Design Details	
Stormceptor Inlet Invert Elev (m)	
Stormceptor Outlet Invert Elev (m)	
Stormceptor Rim Elev (m)	
Normal Water Level Elevation (m)	
Pipe Diameter (mm)	
Pipe Material	
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

City of Toronto PSD		
Particle Diameter (microns)	Distribution %	Specific Gravity
10.0	20.0	2.65
30.0	10.0	2.65
50.0	10.0	2.65
95.0	20.0	2.65
265.0	20.0	2.65
1000.0	20.0	2.65

Site Name	2421 & 2431 New Street

Site Details

Drainage Area

Total Area (ha)	0.70
Imperviousness %	82.0

Surface Characteristics

Width (m)	167.00
Slope %	2
Impervious Depression Storage (mm)	0.508
Pervious Depression Storage (mm)	5.08
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency

Maintenance Frequency (months) >	12

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (mm/hr)	61.98
Min. Infiltration Rate (mm/hr)	10.16
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation

Daily Evaporation Rate (mm/day)	2.54

Dry Weather Flow

Dry Weather Flow (lps)	0

Winter Months

Winter Infiltration	0

TSS Loading Parameters

TSS Loading Function	

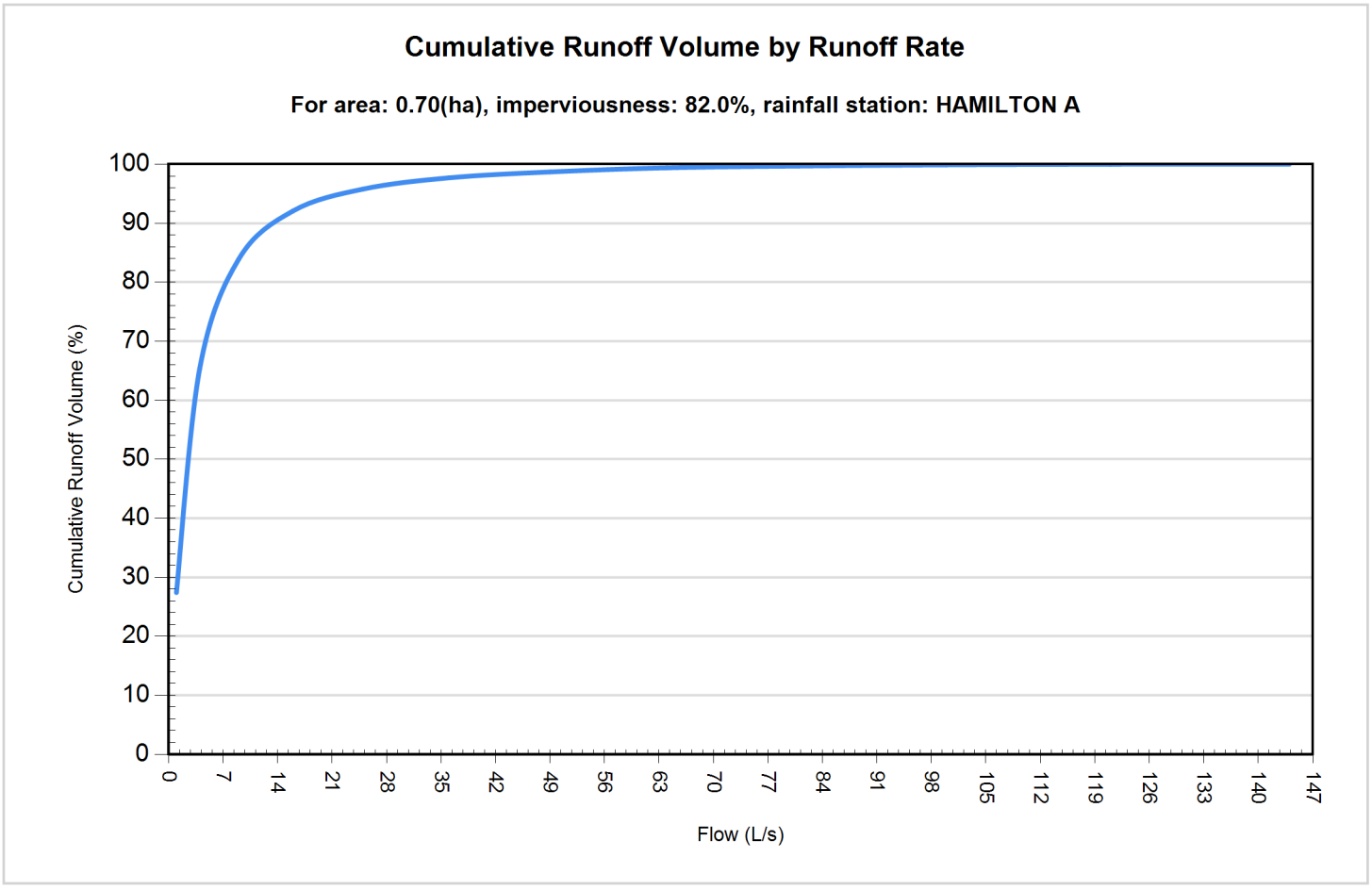
Buildup/Wash-off Parameters

Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

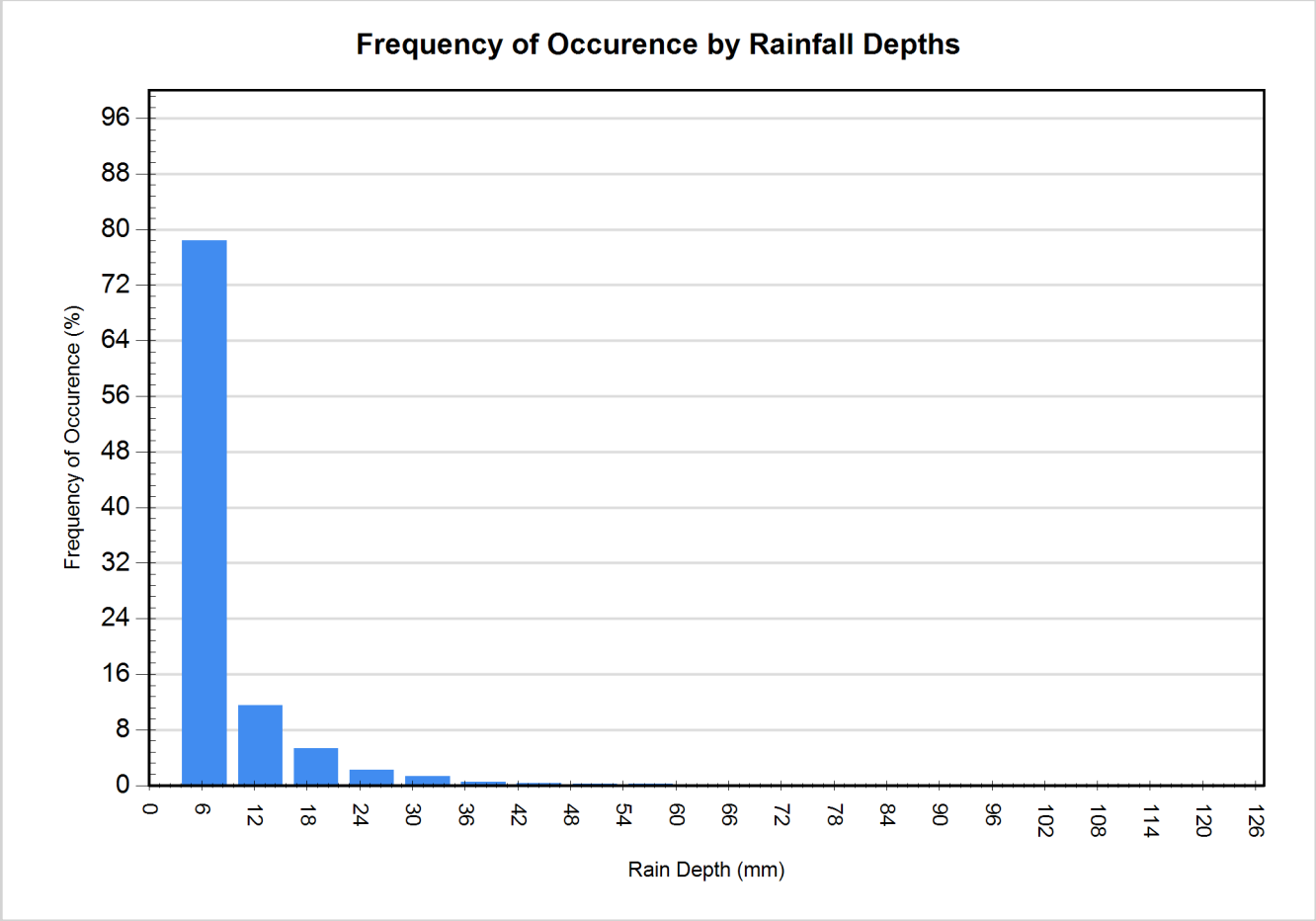
TSS Availability Parameters

Availability Constant A	
Availability Factor B	
Availability Exponent C	
Min. Particle Size Affected by Availability (micron)	

Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (L/s)	**Runoff Volume (m³)**	**Volume Over (m³)**	**Cumulative Runoff Volume (%)**
1	30140	79900	27.4
4	71917	38121	65.4
9	92303	17739	83.9
16	101287	8746	92.1
25	105464	4570	95.8
36	107532	2501	97.7
49	108651	1382	98.7
64	109319	714	99.4
81	109741	292	99.7
100	109969	64	99.9
121	110027	7	100.0
144	110033	0	100.0



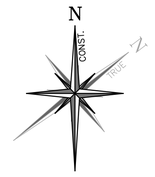
Rainfall Event Analysis				
Rainfall Depth (mm)	**No. of Events**	**Percentage of Total Events (%)**	**Total Volume (mm)**	**Percentage of Annual Volume (%)**
6.35	3626	78.4	5550	26.5
12.70	531	11.5	4870	23.3
19.05	245	5.3	3798	18.2
25.40	101	2.2	2215	10.6
31.75	60	1.3	1687	8.1
38.10	24	0.5	842	4.0
44.45	13	0.3	543	2.6
50.80	7	0.2	326	1.6
57.15	10	0.2	545	2.6
63.50	4	0.1	240	1.1
69.85	0	0.0	0	0.0
76.20	0	0.0	0	0.0
82.55	0	0.0	0	0.0
88.90	0	0.0	0	0.0
95.25	1	0.0	90	0.4
101.60	1	0.0	96	0.5
107.95	1	0.0	106	0.5
114.30	0	0.0	0	0.0
120.65	0	0.0	0	0.0

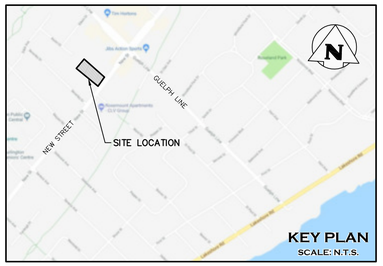


For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications

FIGURES







LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (0.5m)
- EXISTING CONTOUR (1.0m)
- EXISTING DITCH
- EXISTING GRADE (× 215.00)
- EXISTING OVERLAND FLOW DIRECTION
- STORM DRAINAGE CATCHMENT
- CATCHMENT I.D. (ID)
- AREA (ha) | RUNOFF COEFFICIENT (A | RC)

No.	ISSUE / REVISION	YYYY/MMM/DD
0	ISSUED FOR FIRST SUBMISSION	2017/DEC/15

ELEVATION NOTE:

ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE REFERRED TO CITY OF BURLINGTON BENCHMARK No. 360
ELEVATION = 87.949m

SURVEY NOTES:

SURVEY COMPLETED BY KRCMAR (2017/NOV/29)
REFERENCE No.: 17-218TP01

DISTANCES SHOWN HEREON ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

SITE PLAN NOTE:

DESIGN ELEMENTS SHOWN ARE BASED ON SITE PLAN PREPARED BY WZMH ARCHITECTS, DEC. 12, 2017

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

2421 AND 2431 NEW STREET CITY OF BURLINGTON

Drawing

PRE-DEVELOPMENT DRAINAGE PLAN

NOT FOR CONSTRUCTION

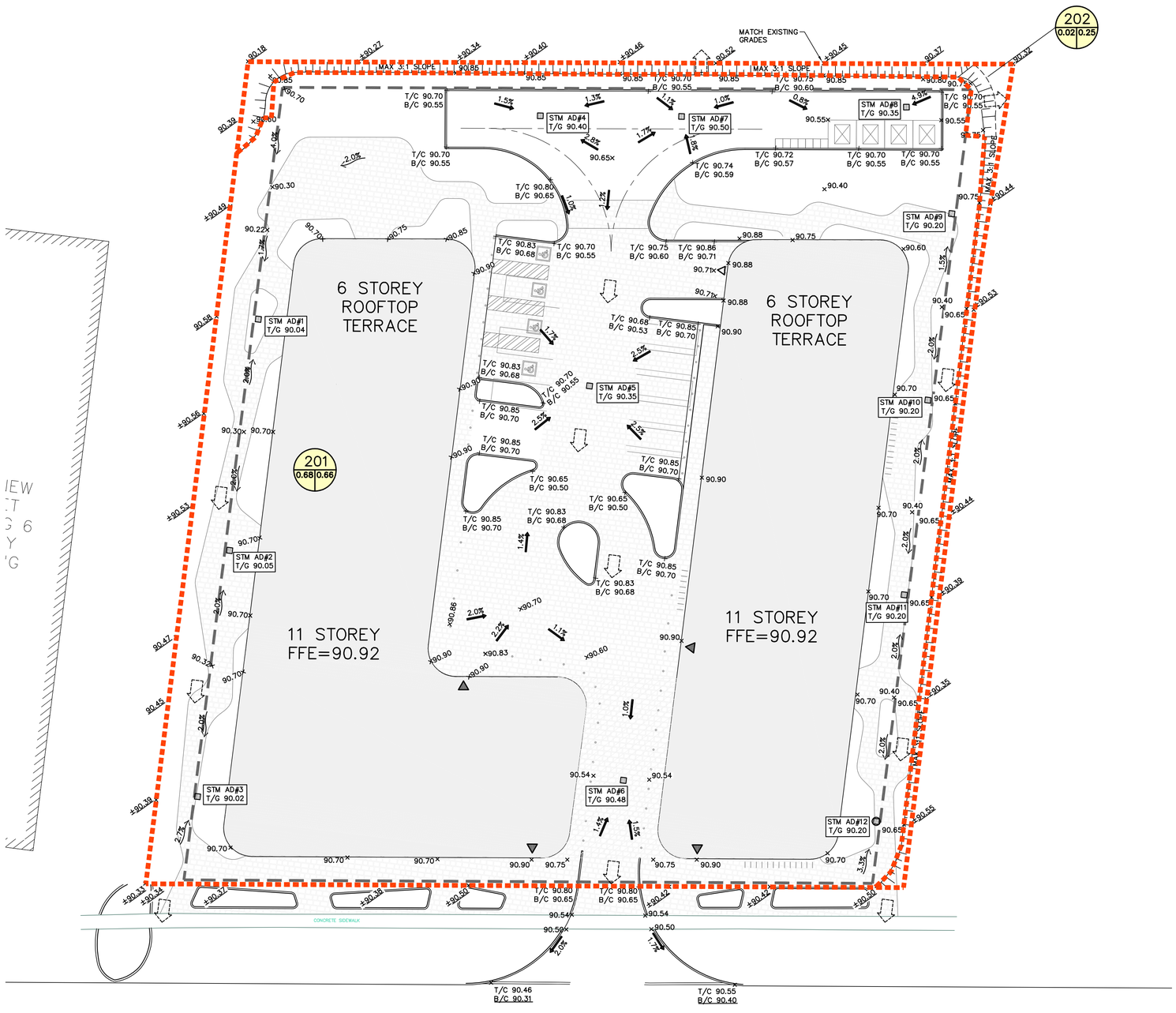
Stamp

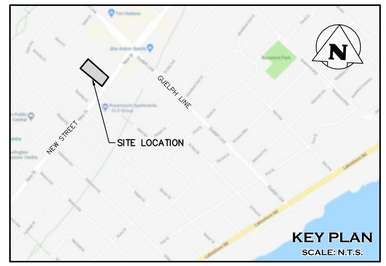
PRELIMINARY

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

Drawn	Design	Project No.	
C.S.	M.Z.	1473-4780	
Check	Check	Scale	Dwg.
S.C.S.	N.A.S.	1: 250	FIG.1

5 0m 5 10 15 20
SCALE: 1: 250





LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (0.5m)
- EXISTING CONTOUR (1.0m)
- EXISTING DITCH
- PROPOSED GRADE (×215.00)
- OVERLAND FLOW DIRECTION
- STORM DRAINAGE CATCHMENT
- CATCHMENT I.D. (ID)
- AREA (ha) | RUNOFF COEFFICIENT (A|RC)

No.	ISSUE / REVISION	YYYY/MMM/DD
0	ISSUED FOR FIRST SUBMISSION	2017/DEC/15

ELEVATION NOTE:

ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE REFERRED TO CITY OF BURLINGTON BENCHMARK No. 360
ELEVATION = 87.949m

SURVEY NOTES:

SURVEY COMPLETED BY KRCMAR (2017/NOV/29)
REFERENCE No.: 17-218TP01

DISTANCES SHOWN HEREON ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

SITE PLAN NOTE:

DESIGN ELEMENTS SHOWN ARE BASED ON SITE PLAN PREPARED BY WZMH ARCHITECTS, DEC. 12, 2017

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

2421 AND 2431 NEW STREET CITY OF BURLINGTON

Drawing

POST-DEVELOPMENT DRAINAGE PLAN

NOT FOR CONSTRUCTION

Stamp

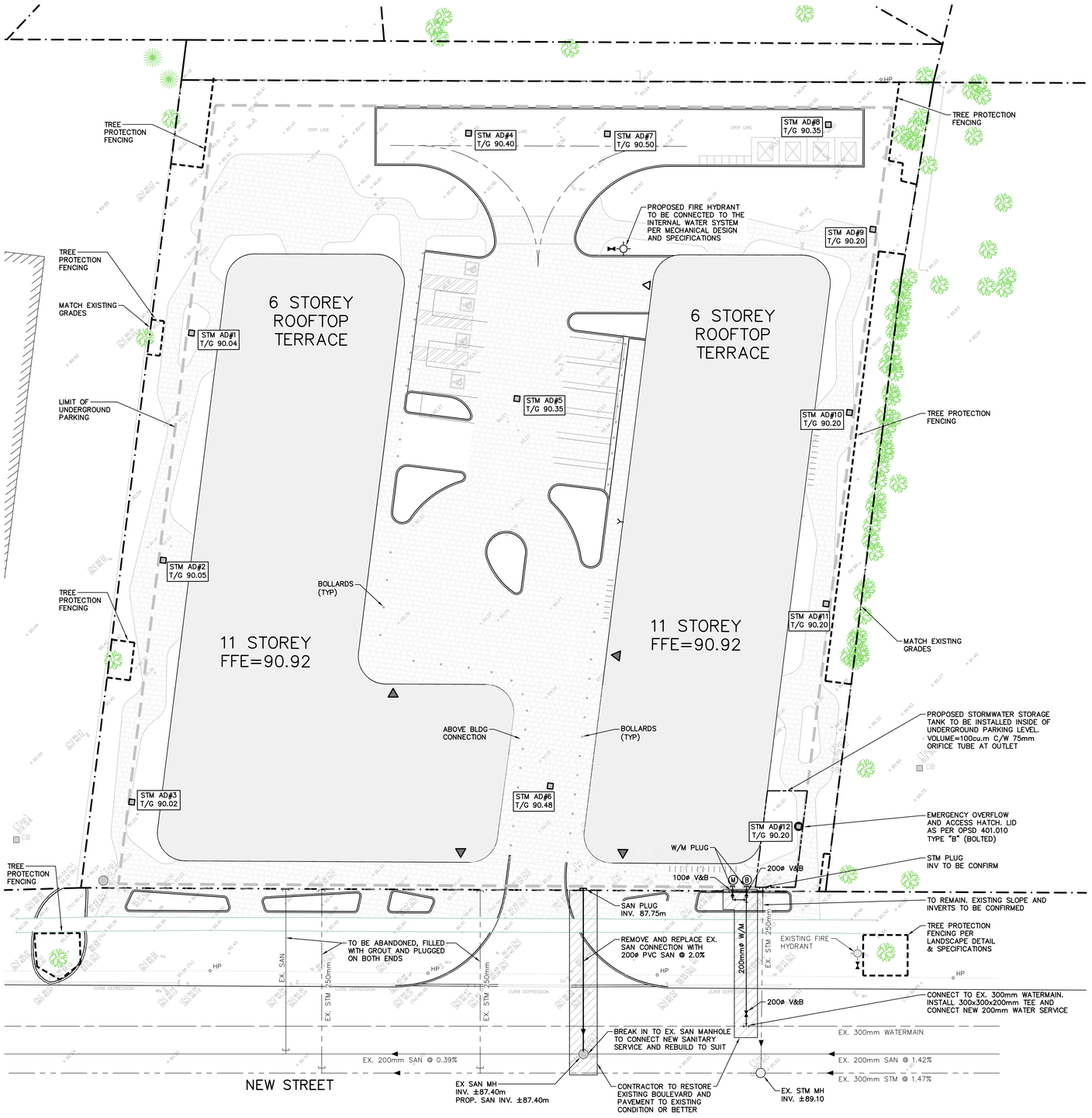
PRELIMINARY

CROZIER & ASSOCIATES Consulting Engineers
2800 High Point Drive
Suite 100
Milton, ON L9T 6P4
905 875-0026 T
905 875-4915 F
www.cfcrozier.ca

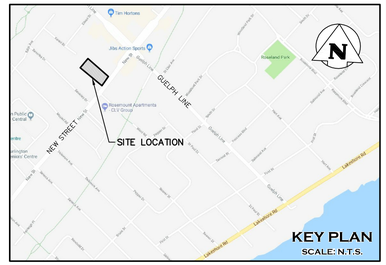
Drawn	Design	Project No.	
C.S.	M.Z.	1473-4780	
Check	Check	Scale	Dwg.
S.C.S	N.A.S.	1: 250	FIG.2

5 0m 5 10 15 20
SCALE: 1: 250

DRAWINGS



N
CONST.
TRUE



REGIONAL APPROVAL

REGION DESIGN OF WATER &/OR WASTEWATER SERVICES APPROVED SUBJECT TO DETAILED CONSTRUCTION CONFORMING TO HALTON REGION STANDARDS & SPECIFICATIONS & LOCATION APPROVAL FROM AREA MUNICIPALITY.

SIGNED: _____ DATED: _____
INFRASTRUCTURE PLANNING & POLICY

THE APPLICANT SHOULD BE AWARE THAT THE APPROVAL OF THE WATER SYSTEM ON PRIVATE PROPERTY IS THE RESPONSIBILITY OF THE LOCAL MUNICIPALITY. REGARDLESS, THE APPLICANT MUST ENSURE THAT THE REGION OF HALTON'S STANDARDS AND SPECIFICATIONS ARE MET. (THE WATER AND WASTEWATER LINEAR DESIGN MANUAL MAY BE OBTAINED FROM THE DATA MANAGEMENT GROUP AT 905-825-6032). FURTHERMORE, ALL WATER QUALITY TESTS MUST BE COMPLETED TO THE REGION OF HALTON'S SATISFACTION, BEFORE THE WATER SUPPLY CAN BE TURNED ON.

THE LIMITS OF MUNICIPAL ROW DISTURBED AREAS TO BE REINSTATED ARE APPROXIMATE AND SHALL BE REVIEWED BY CITY PRIOR TO FINAL RESTORATION.

EXISTING UTILITIES AND SERVICES

CONTRACTOR SHALL NOTE THAT THE CONSTRUCTION ZONE HAS NUMEROUS EXISTING UNDERGROUND UTILITIES AND SERVICES, SOME OF WHICH ARE TO BE ABANDONED OR REMOVED, AND OTHERS WHICH ARE TO BE PROTECTED AND MAINTAINED IN SERVICE.

PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL RETAIN THE SERVICES OF A COMPANY, WHICH SPECIALIZES IN SUBSURFACE UTILITY ENGINEERING FOR THE PURPOSES OF LOCATING, MARKING AND SURVEYING ALL UNDERGROUND UTILITIES AND SERVICES. ALL CURRENT METHODS SHALL BE USED FOR THESE LOCATIONS INCLUDING ELECTRONIC METHODS, VACUUM EXCAVATIONS, SURVEYING MANHOLES AND CHAMBERS ETC.

THE UTILITIES AND SERVICES SHALL BE SURVEYED AND TIED INTO THE PROJECT COORDINATE SYSTEM. A COPY OF THE SURVEY SHALL BE PROVIDED TO THE ENGINEER FOR RECORD PURPOSES.

ANY CONFLICT WITH THE PROPOSED WORKS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL LOCATIONS FOR PROTECTION AND TEMPORARY RELOCATION OF UNDERGROUND UTILITIES AND SERVICES AS REQUIRED FOR THE COMPLETE INSTALLATION OF THE PROPOSED WORKS.

LEGEND

- PROPERTY LINE
- EXISTING FENCE
- 215.00 EXISTING GRADE
- EXISTING FIRE HYDRANT & GATE VALVE
- EXISTING SINGLE CATCHBASIN
- HP EXISTING HYDRO POLE
- EXISTING WATERMAIN
- EXISTING STORM SEWER & MANHOLE
- EXISTING SANITARY SEWER & MANHOLE
- PROPOSED AREA DRAIN TO BE INSTALLED PER MECHANICAL DESIGN AND SPCIFICATIONS
- PROPOSED SIAMESE (FIRE DEPT.) CONNECTION
- UNDERGROUND PARKING GARAGE OUTLINE
- BUILDING ENTRANCE (PERSONNEL DOOR)
- PARKING GARAGE ENTRANCE (OVERHEAD DOOR)
- PROPOSED MAJOR OVERLAND FLOW DIRECTION
- PROPOSED FIRE HYDRANT & GATE VALVE
- PROPOSED WATERMAIN & GATE VALVE
- M PROPOSED WATER METER TO BE INSTALLED INSIDE OF BUILDING PER MECHANICAL DETAILS AND SPECIFICATIONS
- B PROPOSED BACKFLOW PREVENTOR TO BE INSTALLED INSIDE OF BUILDING PER MECHANICAL DETAILS AND SPECIFICATIONS
- PROPOSED SANITARY SEWER

CITY OF BURLINGTON AS CONSTRUCTED DRAWING REFERENCE:
MN-3 SHEET 4 (JUNE, 1985)
MN-3 SHEET 5

NOT FOR CONSTRUCTION

Stamp: PRELIMINARY

No.	ISSUE / REVISION	YYYY/MMM/DD
0	ISSUED FOR FIRST SUBMISSION	2017/DEC/15

ELEVATION NOTE:

ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE REFERRED TO CITY OF BURLINGTON BENCHMARK No. 360
ELEVATION = 87.949m

SURVEY NOTES:

SURVEY COMPLETED BY KRCMAR (2017/NOV/29)
REFERENCE No.: 17-218TP01

DISTANCES SHOWN HEREON ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

SITE PLAN NOTE:

DESIGN ELEMENTS SHOWN ARE BASED ON SITE PLAN PREPARED BY WZMH ARCHITECTS, DEC. 12, 2017

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.

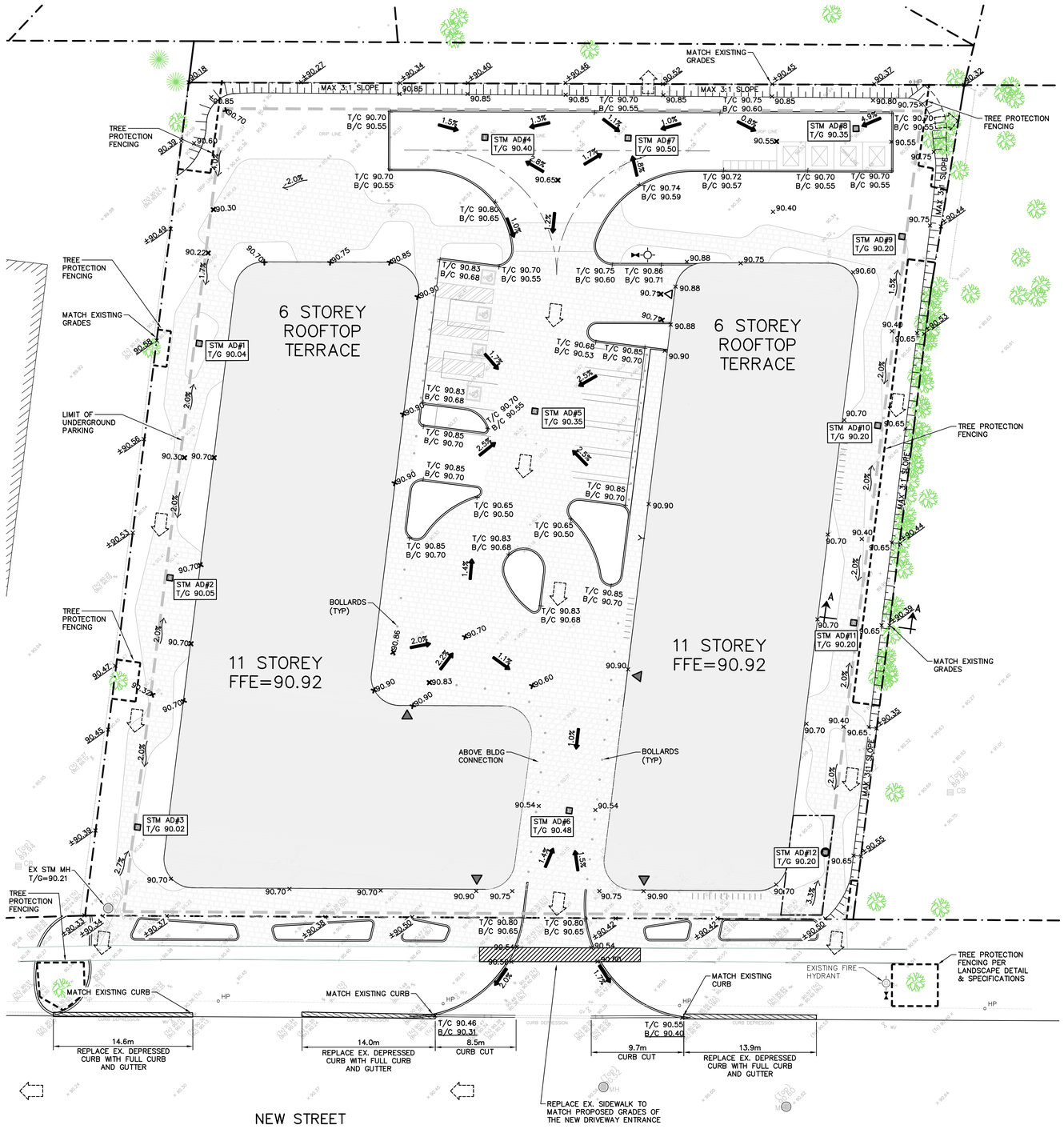
ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project
2421 AND 2431 NEW STREET CITY OF BURLINGTON

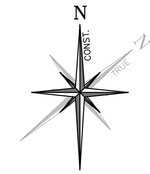
Drawing
PRELIMINARY SITE SERVICING PLAN

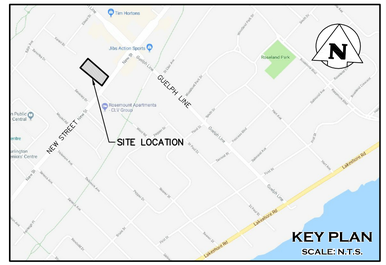
CROZIER & ASSOCIATES Consulting Engineers
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON L9T 6P4
905 875-0026 T
905 875-4915 F
WWW.CFCROZIER.CA

Drawn	Design	Project No.	
C.S.	M.Z.		1473-4780
Check	Check	Scale	Dwg.
S.C.S.	N.A.S.	1:250	C102



5 0m 5 10 15 20
SCALE: 1:250





LEGEND

- PROPERTY LINE
- EXISTING FENCE
- 215.00 EXISTING GRADE
- EXISTING FIRE HYDRANT & GATE VALVE
- EXISTING SINGLE CATCHBASIN
- HP EXISTING HYDRO POLE
- EXISTING MANHOLE
- PROPOSED AREA DRAIN TO BE INSTALLED PER MECHANICAL DESIGN AND SPCIFICATIONS
- PROPOSED SIAMESE (FIRE DEPT.) CONNECTION
- 215.00 PROPOSED GRADE
- 215.00 PROPOSED GRADE (TO MATCH EXISTING)
- 2.0% PROPOSED MINOR FLOW DIRECTION
- 2.0% PROPOSED GRASSED SWALE
- PROPOSED SLOPE (3:1 MAX.)
- UNDERGROUND PARKING GARAGE OUTLINE
- BUILDING ENTRANCE (PERSONNEL DOOR)
- PARKING GARAGE ENTRANCE (OVERHEAD DOOR)
- PROPOSED MAJOR OVERLAND FLOW DIRECTION
- PROPOSED FIRE HYDRANT & GATE VALVE TO BE INSTALLED PER MECHANICAL DETAILS AND SPECIFICATIONS
- PERMEABLE PAVERS PER LANDSCAPE DETAILS AND SPECIFICATIONS

REGIONAL APPROVAL

REGION DESIGN OF WATER &/OR WASTEWATER SERVICES APPROVED SUBJECT TO DETAILED CONSTRUCTION CONFORMING TO HALTON REGION STANDARDS & SPECIFICATIONS & LOCATION APPROVAL FROM AREA MUNICIPALITY.

SIGNED: _____ DATED: _____
INFRASTRUCTURE PLANNING & POLICY

THE APPLICANT SHOULD BE AWARE THAT THE APPROVAL OF THE WATER SYSTEM ON PRIVATE PROPERTY IS THE RESPONSIBILITY OF THE LOCAL MUNICIPALITY. REGARDLESS, THE APPLICANT MUST ENSURE THAT THE REGION OF HALTON'S STANDARDS AND SPECIFICATIONS ARE MET. (THE WATER AND WASTEWATER LINEAR DESIGN MANUAL MAY BE OBTAINED FROM THE DATA MANAGEMENT GROUP AT 905-825-6032). FURTHERMORE, ALL WATER QUALITY TESTS MUST BE COMPLETED TO THE REGION OF HALTON'S SATISFACTION, BEFORE THE WATER SUPPLY CAN BE TURNED ON.

THE LIMITS OF MUNICIPAL ROW DISTURBED AREAS TO BE REINSTATED ARE APPROXIMATELY AND SHALL BE REVIEWED BY CITY PRIOR TO FINAL RESTORATION.

EXISTING UTILITIES AND SERVICES

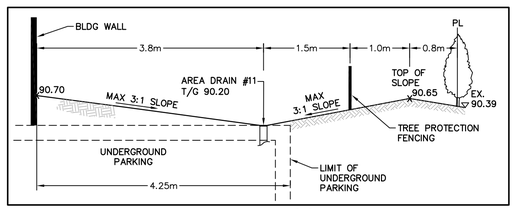
CONTRACTOR SHALL NOTE THAT THE CONSTRUCTION ZONE HAS NUMEROUS EXISTING UNDERGROUND UTILITIES AND SERVICES, SOME OF WHICH ARE TO BE ABANDONED OR REMOVED, AND OTHERS WHICH ARE TO BE PROTECTED AND MAINTAINED IN SERVICE.

PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL RETAIN THE SERVICES OF A COMPANY, WHICH SPECIALIZES IN SUBSURFACE UTILITY ENGINEERING FOR THE PURPOSES OF LOCATING, MARKING AND SURVEYING ALL UNDERGROUND UTILITIES AND SERVICES. ALL CURRENT METHODS SHALL BE USED FOR THESE LOCATIONS INCLUDING ELECTRONIC METHODS, VACUUM EXCAVATIONS, SURVEYING MANHOLES AND CHAMBERS ETC.

THE UTILITIES AND SERVICES SHALL BE SURVEYED AND TIED INTO THE PROJECT COORDINATE SYSTEM. A COPY OF THE SURVEY SHALL BE PROVIDED TO THE ENGINEER FOR RECORD PURPOSES.

ANY CONFLICT WITH THE PROPOSED WORKS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL LOCATIONS FOR PROTECTION AND TEMPORARY RELOCATION OF UNDERGROUND UTILITIES AND SERVICES AS REQUIRED FOR THE COMPLETE INSTALLATION OF THE PROPOSED WORKS.



SECTION 'A'
TYPICAL CROSS SECTION
SCALE: N.T.S.

CONSTRUCTION NOTE:
CONTRACTOR TO REGRADE AND REINSTATE THE MUNICIPAL BOULEVARD IN THE AREA OF THE REMOVED EXISTING DRIVEWAYS TO MATCH EXISTING BOULEVARD GRADES

NOT FOR CONSTRUCTION

Stamp: PRELIMINARY

No.	ISSUE / REVISION	YYYY/MMM/DD
0	ISSUED FOR FIRST SUBMISSION	2017/DEC/15

ELEVATION NOTE:
ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE REFERRED TO CITY OF BURLINGTON BENCHMARK No. 360
ELEVATION = 87.949m

SURVEY NOTES:
SURVEY COMPLETED BY KRCMAR (2017/NOV/29)
REFERENCE No.: 17-218TP01
DISTANCES SHOWN HEREON ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

SITE PLAN NOTE:
DESIGN ELEMENTS SHOWN ARE BASED ON SITE PLAN PREPARED BY WZMH ARCHITECTS, DEC. 12, 2017

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
2421 AND 2431 NEW STREET CITY OF BURLINGTON

Drawing
PRELIMINARY SITE GRADING PLAN

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

Drawn	C.S.	Design	M.Z.	Project No.	1473-4780
Check	S.C.S.	Check	N.A.S.	Scale	1:250
				Dwg.	C103