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SPA AIP1: 10 January 2025 SBM-24-2350

MCGW Properties Corp.
130 Dearborn Place
Waterloo, ON, N2J 4N5

Attn: Tristin Deveau
Development Planner, City of Waterloo

Re: Functional Site Servicing Brief
Proposed Commercial Building
200 Weber Street North, Waterloo, Ontario

1. INTRODUCTION

This Functional Site Servicing Brief (Brief) has been prepared by Strik, Baldinelli, Moniz Ltd (SBM) for MCGW Properties Corp. to address the requirements of the Pre-Submission Consultation comments dated January 30, 2023.

This Brief is intended to represent a component of the Complete Engineering Submission to be submitted to the Engineering & Construction Division at the City of Waterloo (City) and should be read in conjunction with all other submitted documents. The Engineering Drawings C1–C5 by SBM, provided separately as well as the Site Plan, Photometric Drawings and Landscape Drawings, prepared by others, have been prepared to address the City's requirements.

The total area of the subject site is approximately 1.12 ha, and is situated within the Laurel/Clair Special Policy Area and GRCA Regulatory Flood Plain and Floodway. The property is bordered by Weber Street North to the West, Waterloo fire station to the North, long term care home to the South and Residential townhomes to the East. Laurel creek is located approximately 30 m to the East of the subject site. There is an existing easement located along the North of the property as there is a storm sewer leading into the Laurel creek. It is our understanding that the proposed development strategy includes the construction of a two-storey commercial building with Retail and Office spaces, on-grade parking lots with drive aisles, and a landscaped area.

Refer to Site Plan A1-OP1a prepared by MMA Architect Inc. dated January 2025, and the Topographic Plan of Survey prepared by Callon Dietz, dated January 2025, attached in **Appendix A**.

Design requirements have been based on the Chapter 7 of the City of Waterloo Engineering Manual 2013 (CWEM), Region of Waterloo and Area Municipalities Design Guidelines and Supplemental Specifications for Municipal Services February 2024 (DGSSMS), Ministry of Environment, Conservation and Parks (MECP) Design Guidelines for Drinking-Water Systems (DGDWS), 2008, MECP Stormwater Management Planning and Design Manual (SWMPDM) and the current edition of the Ontario Building Code (OBC 2024).

2. SANITARY SERVICING

Based on the City of Waterloo Sanitary Layout G.C.T. NO: 6-3, dated June 12, 2023, attached in **Appendix B**, the proposed development is tributary to the existing 250 mm diameter municipal sanitary sewer located within Weber Street North ROW. According to Section 5.7 of MECP Design Guidelines, the minimum size of a sanitary service connection is 100mm and the minimum slope shall be designed to achieve velocities of not less than 0.6 m/s. As per the municipal as-built drawing no. 41-257 dated January 15, 2003, there is an existing 100mm sanitary service connection to the subject site which will be utilized for this development. Contractor to confirm the size, slope, location and inverts before start of the construction.

According to Section B.2.1.2.3 of DGSSMS, the average flow for a commercial development is 0.5 L/s/ha and the Harmon Peaking Factor is 2.5. Multiplying the total site area with average flow 0.5 L/s/ha and peaking factor of 2.5 results in a peak flow of 1.4 L/s. The infiltration rate is calculated to be 0.28 L/s multiplying 1.12 ha of subject site area with extraneous flow of 0.25 L/s/ha as per Section B.3.1.2.6 of DGSSMS. Adding the infiltration flow to the peak flow resulted in a total flow volume of 1.68 L/s. Refer to the Sanitary Design Sheet provided in **Appendix B** for the sanitary calcs.

The sanitary design sheet shows that the proposed 100 mm dia. sanitary service at 2.0% slope provides a conveyance capacity of 7.30 L/s and is sufficient to convey the proposed developments flows. The capacity of the existing 250mm dia. municipal sewer is calculated to be approx. 29.71 L/s based on the municipal as-built drawing no. 41-257, attached in **Appendix B** which resulted in the sewer being 5.65% full when considering the flows from the proposed development.

3. STORM SERVICING AND STORMWATER MANAGEMENT

As per the pre-consultation comments, this section of the brief is to address the Stormwater management (SWM) quantity and quality controls to attenuate post-development flows to pre-development flows for the 5-to-100-year storm events.

3.1 Pre-Development Conditions

Pre-development conditions were obtained from the Topographic Plan of Survey prepared by Callon Dietz provided in **Appendix A**. Under the pre-development conditions, the 1.12 ha subject site is an open space comprised of gravel and broken asphalt area. The pre-development impervious percentage was calculated to be 68.71% as presented in the SWM calculations provided in **Appendix C**.

Surface runoff from the property is generally conveyed overland in the north-easterly direction towards the Laurel Creek. Refer to the existing grading shown on the Existing Conditions, Removals and Sediment & Erosion Control Plan (see drawing C2, provided separately).

3.2 Post-Development Conditions

Post-development conditions were obtained from the Site Plan by MMA Architect Inc., attached in **Appendix A**. Under the post-development conditions, the 1.12 ha site will be comprised of the proposed building (approximately 3068.7 m^2), asphalt/concrete area (approximately 4415.5 m^2) and landscaped/amenity areas (approximately 959.9m^2). The post-development impervious percentage is calculated to be 88.63% for the entire site as presented in the SWM calculations. The SWM calculations attached in **Appendix C**, show that the post-development impervious percentage of 88.63% for the entire site, is greater than the pre-development.

Therefore, additional storm water quantity controls are required for this development for the 100-year storm event per current standards.

Due to the increase in impervious cover, increased stormwater runoff is anticipated. SWM quantity controls will be implemented to restrict 5-year and 100-year post-development flows to the 5 year and 100-year pre-development flows per the DGSSMS, with on-site storage for the City's 5 and 100-year design storm events.

3.3 Storm Servicing

Based on the City of Waterloo Storm Layout G.C.T. NO: 6-3, dated June 28, 2023, provided in **Appendix C**, the site is tributary to the existing 525mm diameter storm sewer within the Weber Street North ROW. As per the municipal as-built drawing no. 41-257, the subject site consists of a 200mm dia. PVC storm service tied to the existing catchbasin, which ultimately leads to the Laurel Creek through the existing 3100 x 2100 culvert. A 525mm storm sewer at a slope of 0.30% is proposed to service the site and connect to the existing 525mm storm sewer. The subject site is proposed to be serviced primarily by catch basin manholes/catch basins located within the asphalt areas to control the on-site flows. A 150mm dia. rainwater leader is proposed on the north-east side of the building to convey roof flows to the 600mm dia. storm sewer between CBMH4 and CBMH3. An orifice plate of 450 mm size is proposed at the downstream of CBMH2 to restrict the site flows to 5-year storm event. Refer to Site Servicing plan, C3 prepared by SBM, provided separately.

3.4 Stormwater Management – Quantity Control

3.4.1 Hydrologic Model

Hydrologic modelling was performed using Personal Computer Storm Water Management Model (PCSWMM) software, a widely accepted model for urban developments, to generate runoff hydrographs and route flows through the catchment areas.

3.4.2 Rainfall Data

The City of Waterloo IDF parameters used for the 5-year to 100-year return period is as follows:

Table 1: City of Waterloo IDF Curves

Return Period	Parameters			Duration (Hours)
	A	B	C	
5	1101	9.258	0.882	3
25	3261	16.193	0.938	3
100	4692	17.437	0.956	3

A Chicago rainfall distribution with the IDF curves provided in Table 1 and the fraction r = 0.38 was used as per MTO Drainage Manual Chapter 8.

3.4.3 Pre-Development PCSWMM Output

As seen in the SWM Calculations provided in **Appendix C**, the entire site excluding the creek area is considered as single catchment A101 under the pre-development conditions. Catchment area A101 has a calculated impervious percentage of 68.71% as shown on the SWM calculations considering the C-value for asphalt and

gravel as 0.9 and 0.7 respectively. The pre-development parameters and the catchment area A101 is shown on the Existing Conditions, Removals, and Sediment & Erosion Control Plan (C2), provided separately, and the Table 2 presented below.

Table 2: Pre-Development Catchment Parameters

Catchment	Area (ha)	% Impervious	Overland Flow Length (m)	Overland Slope (%)	SCS Curve Number
A101	1.052	68.71	95	0.63	84

An SCS curve number of 84 was determined for the pervious areas, based on a conservatively assumed Hydrologic Soil Group D per Table A.3 of SWMM5.1.

3.4.4 Post-Development PCSWMM Output

As shown in the SWM Calculations provided in **Appendix C**, the entire site excluding the creek area (same as in pre-development conditions) is divided into six (6) controlled catchment areas A201, A202, A203, A204, A205, A206 and three (3) uncontrolled catchment areas U201, U202, U203 under the post-development conditions. Refer to post-development catchment area drawing attached in **Appendix C.** Catchment area A206 is the roof area of the building, with impervious percentage of 100%. Catchment areas A203 and A204 is calculated to have an impervious percentage of 100% as well.

Uncontrolled catchment area U201 is comprised of some landscaped areas north of the subject property. The stormwater runoff that will not infiltrate is uncontrolled and conveyed overland off site towards the north of the site, generally matching to the existing conditions. Catchment area U201 uncontrolled peak outflows during the 5 and 100-year storm events are 0.43 L/s and 5.37 L/s, respectively, as calculated with PCSWMM.

Uncontrolled catchment area U202 is comprised of mostly landscaped area and a part of asphalt drive aisle. Flows from this catchment area is uncontrolled and conveyed to the Weber Street North ROW. Catchment area U202 uncontrolled peak outflows during the 5 and 100-year storm events are 2.71 L/s and 15.32 L/s, respectively, as calculated with PCSWMM.

Uncontrolled catchment area U203 is comprised of mostly asphalt area and less landscaped area. Flows from this catchment area flows uncontrolled ultimately towards the south of the subject site as per the existing topographic elevations. Catchment area U203 uncontrolled peak outflows during the 5 and 100-year storm events are 46.93 L/s and 108.88 L/s, respectively, as calculated with PCSWMM.

Controlled catchment area A206 is the roof of the proposed building. The stormwater is stored on the rooftop of the building, controlled via six (6) flow-controlled roof drains, and then conveyed to the surface of catchment area A204 via rainwater leader.

Controlled catchment areas A201, A202, A203, A204 and A205 is comprised of asphalt parking lots/driving aisles and grassed/landscaped areas. The stormwater from these catchment areas drains to CBMH6, CBMH5, CBMH2, CBMH3 and CBMH4, respectively and is retained and restricted (at a maximum ponding depth of 0.3m as per MTO Drainage Management Manual Design Chart 4.19: Inlet Capacity at Road Sag) through the proposed 600mm diameter underground storm sewers. The volume of the structures (Catchbasin manholes and Catchbasin) are included in the storage calculation. A 450mm diameter orifice plan is proposed to be installed at the downstream

of CBMH2 to restrict the flows from post- to pre-development levels. At a major storm event, the overland flows will exit the site via the specified overland flow routes towards the Lurel Creek situated north of the subject site. Refer to Site Servicing drawing C3, provided separately.

The post-development parameters and catchment areas are shown on the Site Grading and Stormwater Management Plan (C4) and the Table 3 presented below.

Table 3: Post-Development Catchment Parameters

Catchment	Area (ha)	% Impervious	Overland Flow Length (m)	Overland Slope (%)	SCS Curve Number
A201	0.316	72.81	85	2.05	80
A202	0.097	90.24	19	4.00	80
A203	0.031	100.00	17	1.00	80
A204	0.046	100.00	19	3.00	80
A205	0.049	98.99	23	4.00	80
A206	0.307	100.00	9	2.00	80
U201	0.015	0.00	3	0.33	80
U202	0.042	17.87	5	0.26	80
U203	0.150	91.45	22	1.63	80

3.4.4 PCSWMM Modelling Output

The post-development flows generated from the site during the 5-year to 100-year design storms are to be attenuated to the pre-development levels. It is proposed that the attenuation will occur using rooftop storages, surface storages and sub-surface storages (pipes and structures).

As catchment areas A206 is just the rooftop of the proposed building, the roof-drains on the rooftop storage provide sufficient control for the entire catchment area. A total of six (6) flow-controlled roof-drains are modelled based on the flow rates specified for the Watts Adjustable Accutrol Weir flow-controlled roof drain, based on an assumed 6-inch (0.15 m) depth and “fully exposed” weir opening setting, which results in a maximum flow rate of 11.4 L/s (1.9 L/s) per drain (to be co-ordinated with the Mechanical Engineer). These restricted flows are to be directed through the building to the proposed 150 storm PDC at 2.0% slope. The flow control roof drains are modelled as orifices in the PCSWMM model and flow results can be found in **Appendix C**.

A peak outflow of 120.72 L/s is generated through the downstream 450 mm orifice for the 5-year storm event and a maximum outflow of 274.17 L/s is generated for the 100-year storm event. These values are the same or are below the allowable pre-development flow rates shown in the table below. Please refer to the Engineering Drawing Sheet C4, provided separately, and the PCSWMM results, provided in **Appendix C**.

Storages utilized in the modelling are structures CBMH2, CBMH3, CBMH4, CBMH5 and CBMH6 with 600mm diameter super pipes connecting the structures (total storage volume of 13.1 m^3 and 46.8 m^3 for 5 and 100 years respectively), surface ponding (total storage volume of 0.36 m^3 and 1.91 m^3 for 5 and 100 years, respectively) and the rooftop storage (82.44 m^3 and 237.4 m^3 for 5 and 100 years, respectively).

Table 4: Flow Rate Summary

Storm Event	Pre-Development Flows (L/s)	Post-Development Flows (L/s)
5-year	185.86	120.72
25-year	380.08	222.09
100-year	519.61	274.17

The 5- to 100-year post-development flows are attenuated to the 5-year and 100-year pre-development per the DGSSMS, with on-site storage and an orifice plate flow restrictor. Major storms beyond 100-year events are conveyed overland towards the existing Laurel Creek.

3.5 Stormwater Management – Quality Control

To address the water quality of the subject site, an OGS is proposed (CDS model PMSU2015-4 or approved equivalent) to be installed prior to stormwater entering the municipal storm system. The OGS is specified to provide the annual TSS removal efficiency of 80% to meet the MECP standard requirements. Refer to **Appendix C** for all details and calculations of the CDS model PMSU2015-4, and the Site Servicing Plan C3, provided separately for the exact location. Maintenance of the OGS during construction is the Contractor's responsibility and it is the owner's responsibility during the life cycle of the unit.

4. WATER SERVICING CONSIDERATIONS

4.1 General Considerations

Based on the City of Waterloo Watermain Layout G.C.T. NO: 6-3, dated February 21, 2024, attached in **Appendix D**, the subject site is tributary to the existing 300 mm dia. PVC watermain within Weber Street North ROW. There is an existing 150mm dia. water service connection to the subject site which will be utilized for this commercial development.

Water distribution system performance criteria and requirements for specific demand conditions were used according to Section 3.4.2 Domestic Water Demands within the Design Guidelines for Drinking-Water Systems (MCEP) 2008, the DGSSMS (2024).

- Minimum water pressures to be maintained in the distribution system of:
    - Minimum of 140 kPa (20 psi) at maximum day demand flow plus fire flow,
    - Minimum of 275 kPa (50 psi) at maximum hourly demand flow,
    - Minimum of 350 kPa (50 psi) at average day demand flow,
    - Maximum residual pressure shall not exceed 700 kPa (100 psi).
- Maximum day peaking factor of 2.75 and a maximum hour peaking factor of 4.13
- Maximum velocity in the watermain under all flow conditions shall not exceed 5.0 m/s

The domestic water demand was determined based on the Site Plan prepared by MMA Architect Inc., provided in **Appendix A**. The average day demand is estimated to be 0.11 L/s based on the commercial average flow of 28 m3/ha-day as per the Section 3.4.3 of MECP. And the maximum hourly flow and maximum daily flow is calculated to be 0.43 L/s and 0.29 L/s respectively, using the peaking factors mentioned above. Refer to **Appendix D** for water demand, velocity and turnover calculations.

4.2 Water Demand for Fire Protection

The proposed commercial building is classified under Part 3 of the Ontario Building Code, therefore an adequate water supply for firefighting will be required. As per section B.2.2.3 of DGSSMS, the fire flow requirements are determined according to the Fire Underwriters Survey (FUS). According to the municipal water layout drawing G.C.T. No. 6-3, the nearest fire hydrant to the subject site is located in front of municipal no. 215 across the Weber Street North, therefore a new hydrant is proposed for the proposed development.

As the proposed commercial development will be having a sprinkler system, the fire-fighting demand was determined as per FUS. Refer to Water Supply for Public Fire Protection calculations attached in **Appendix D**. The required supply fire flow rate is estimated to be 15000 L/min according to the assumed type of construction. Adding it to the maximum day demand of 17.4 L/min, the total required supply fire flow rate is calculated to be 15017 L/min. Further, the velocity calculation was done for the proposed 150mm diameter service connection and is estimated to be 0.025 m/s which is below the maximum allowable velocity of 5.0 m/s as per Section B.2.3.4 of DGSSMS (2024).

Section B.2.4.3 of the DGSSMS, requires the minimal residual pressure in a fire flow scenario including domestic demand to be not less than 140 kPa (20 psi) at any hydrant lateral or fire service connection. Section B.2.4.3 of the DGSSMS also requires that the maximum residual pressure shall not exceed 700 kPa (100 psi). As there is no fire hydrant flow test available at this time, a detailed calculation will be done during the detail design phase to determine the pressure loss at the building under the fire flow conditions.

As per the City of Waterloo design standards, the fire hydrants shall be located within 90 horizontally of any portion of a building perimeter that is required to face the street and the Siamese connection for sprinkler systems shall be on the building near the main entrance, not more than 45 m from the fire hydrant. The new fire hydrant is proposed to adhere to this requirement. Refer to SBM's Site Servicing Plan, C3, provided separately for the proposed water service connection and fire hydrant locations.

4.3 Water Quality

Section 8.8.2. of the MOE's Design Guidelines for Drinking-Water Systems 2008 on Water Quality states that stagnation and excessive retention time in the distribution system may result in a deterioration of water quality. It is proposed that water shall not remain unused in the watermain for more than 3 days (72 hours) under average day demand. The calculations provided in Appendix D show that the water distribution system has a 2.19 hours drawdown time which is substantially less than the 3 days (72 hours).

5. LIMITATIONS

This Design Brief was prepared by Strik, Baldinelli, Moniz Ltd. for MCGW Properties Corp. and the City of Waterloo. Use of this Brief by any third party, or any reliance upon its findings, is solely the responsibility of that party. Strik, Baldinelli, Moniz Ltd. accepts no responsibility for damages, if any, suffered by a third party as a result of decisions made or actions undertaken as a result of this Brief. Third party use of this Brief, without the express written consent of the Consultant, denies any claims, whether in contract, tort, and/or any other cause of action in law, against the Consultant.
All findings and conclusions presented in this Design Brief are based on site conditions as they appeared during the period of the investigation. This Brief is not intended to be exhaustive in scope, or to imply a risk-free facility.

It should be recognized that the passage of time may alter the opinions, conclusions, and recommendations provided herein.

The design was limited to the documents referenced above and on the SBM drawings provided separately. SBM Ltd. accepts no responsibility for the accuracy of the information provided by others. All designs and recommendations presented in this Brief are based on the information available at the time of the review. This document is deemed to be the intellectual property of SBM in accordance with Canadian copyright law.

6. CLOSURE

We trust this Brief meets your satisfaction. Should you have any questions or require further information, please do not hesitate to contact us.

Respectfully submitted,

Strik, Baldinelli, Moniz Ltd.

Planning • Civil • Structural • Mechanical • Electrical

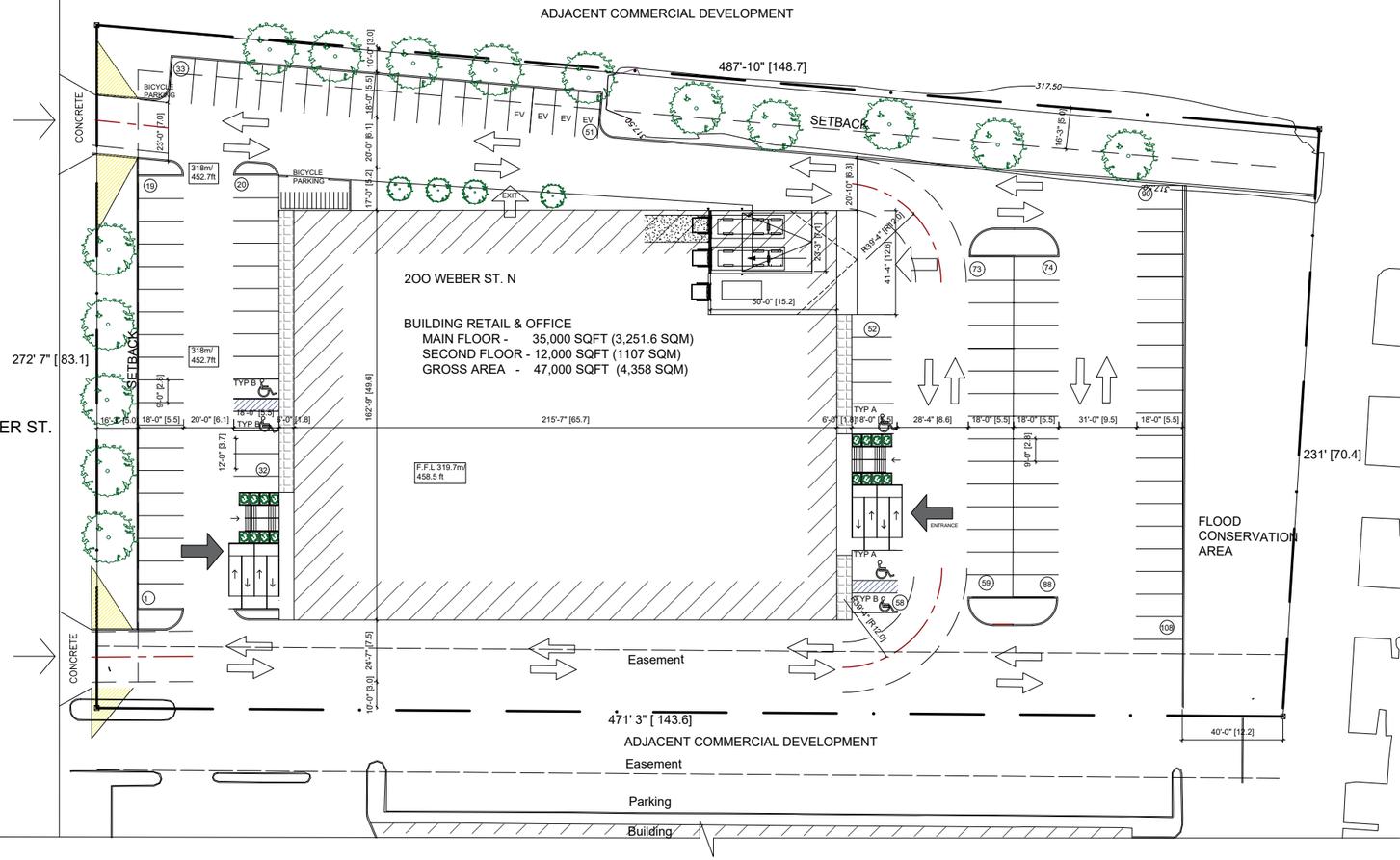


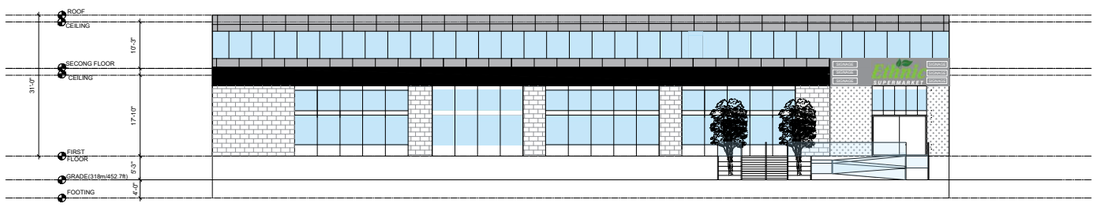
Hassan Ahmad, M.Eng., P.Eng.
Civil Eng III

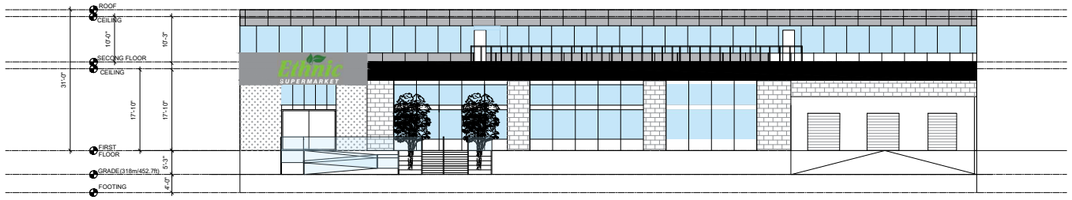
Mary George, EIT
Civil Engineer in Training III

APPENDIX A

Site Plan A1-OP1a prepared by MMA Architect Inc. dated January 2025
Topographic Plan of Survey prepared by Callon Dietz dated July 26, 2024
Region of Waterloo As-built drawing No. 41-257 dated January 15, 2003
Region of Waterloo As-built drawing No. 41-258 dated January 15, 2003







AREAS:

LOT: 120,000 SF (11,147.6 SM)
2.768 Acres (1.12 ha)

BUILDING AREA : 36,700 SF (3,530.6 SM)
NO OF FLOORS : 2

FLOOR AREAS	
1ST FLOOR (RETAIL) AREA :	35,000 SF (3,251.6 SM)
2ND FLOOR (OFFICE) AREA :	12,000 SF (1,170.0 SM)
TOTAL BUILDING FLOOR AREA :	47,000 SF (4366.0 SM)

HEIGHT OF BUILDING : 29' (8.8 M)

ZONING: EXISTING C5-27
ZONING PROPOSED: SITE SPECIFIC (REFERENCE FROM C1-20)

SETBACKS (SECTION 8.3.2)	REQUIRED	PROPOSED
FRONT (STREET)	16.4 ft (5.0 m)	16.4 ft (5.0 m)
REAR (EAST)	16.4 ft (5.0 m)	40 ft (12.2 m)
SIDE (N)	16.4 ft (5.0 m)	16.4 ft (5.0 m)
SIDE (S) (MINOR VARIANCE)	16.4 ft (5.0 m)	9.8 ft (3.0m)

CITY OF WATERLOO ZONING BYLAWS FOR PARKING

	REQUIRED	PROVIDED
PARKING (SECTION 8.3.9) BUILDING FLOOR AREA / 100m2 NON-RESIDENTIAL (propsed area C parking) (2.8M X 5.5M) TOTAL	3251.6/100+ 1107/100 32.5+ 11X 2.8 = 122 122	 108
ACCESSIBLE PARKING (SECTION 6.4) TYPE A (3.7M X 5.5M) QUANTITY : TYPE B (2.4M X 5.5M)QUANTITY :	 2 3	 3 3
ELECTRIC VEHICLE PARKING PROVISION QUANTITY (SECTION 6.3) :	(3% OF 122) 4	 4
LOADING SPACE - TYPE B (SECTION 6.9.4.1) (3M X 12M X 4.5M)	2	2
BICYCLE PARKING (SECTION 6.6.2.C.iv.A) (0.6M X 2M)	(10% OF 122) 12	 15

LEGEND:
EXIST. WALLS
DEMO WALLS
NEW WALL
MAJOR ENTRY/ EXIT
MINOR ENTRY/ EXIT

DATE	NO.	ISSUED FOR
10 DEC'24		REVISION
08 DEC'24		REVISION
19 NOV'24		REVIEW
18 NOV'24		CLIENT REVIEW
29 SEP'24		CLIENT REVIEW
25 SEP'24		CLIENT REVIEW
31 JUL'24		CLIENT REVIEW
25 JUL'24		CLIENT REVIEW
22 JUL'24		CLIENT REVIEW
19 JUL'24		REVIEW

PROJECT
GROCERY STORE CONCEPT
200 WEBER ST. N
WATERLOO ,ON

DWG. TITLE
PROPOSED SITE PLAN – OPTION 1A

DATE : JULY 2024
SCALE : AS NOTED
DESIGNED BY :
DRAWN BY : NS
CHECKED BY : SM
APPROVED BY : SM
PROJECT NO. : 24–128
DWG. NO.
A1–OP1a

1
A–1A
1:300

MMA Architect Inc.
850 OUELLETTE AVE.
WINDSOR, ON. N9A 4M9 (519) 973-9044
Email: smiller@mma-architect.com

NuFusion & ASSOCIATES

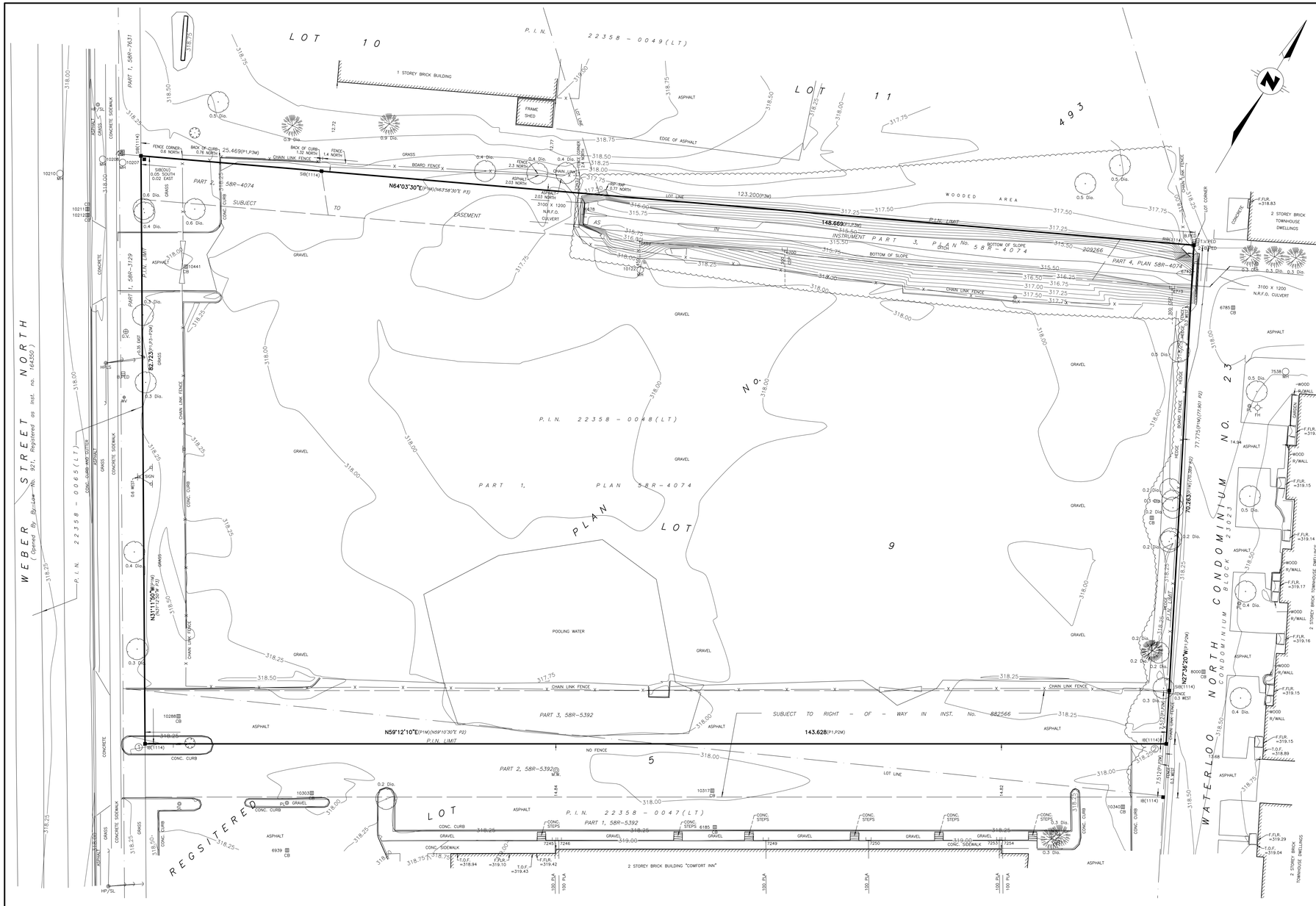
Ethnic SUPERMARKET

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TOPOGRAPHICAL PLAN OF SURVEY
OF PART OF
LOTS 5 AND 9
REGISTERED PLAN No. 493
IN THE
CITY OF WATERLOO
REGIONAL MUNICIPALITY OF WATERLOO
SCALE 1:250 (Metric)

4 2 0 4 8 12 16 20
{ SCALE IN METRES }

AMIR KESHAVARZ
ONTARIO LAND SURVEYOR



INTEGRATION DATA

OBSERVED REFERENCE POINTS (ORP's):
UTM-17 NAD83 CSRS v6 2010

POINT ID	NORTHING	EASTING
ORP 1	4813804.02	538983.44
ORP 2	4813877.54	539106.73

COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN

VERTICAL CONTROL DATA

MONUMENT NUMBER: 0011968U518
TYPE: BRASS TABLET
LOCATION: WATERLOO SOUTHEAST CORNER OF KING STREET NORTH AND UNIVERSITY AVENUE, TABLET IN FACE OF NORTH CONCRETE FOUNDATION WALL OF ROYAL BANK OF CANADA BUILDING (FACING UNIVERSITY AVENUE), 44cm EAST FROM NORTHWEST CORNER OF BUILDING AND 10cm BELOW STONE FACING.
DATUM: CGVD28:78
ORDER: SECOND
GEODETIC ELEVATION: 324.759m

NOTES

BEARINGS HEREON ARE UTM GRID BEARINGS AND ARE DERIVED FROM OBSERVED REFERENCE POINTS 1 AND 2, BY REAL TIME NETWORK (RTN) OBSERVATIONS, UTM ZONE 17, NAD83 CSRS 2010.

FOR BEARING COMPARISONS, A ROTATION OF 0°19'00" COUNTER-CLOCKWISE, WAS APPLIED TO THE BEARINGS FROM P2, P3.

NO ATTEMPT WAS MADE (WITH THE EXCEPTION OF SEWER INVERTS) TO LOCATE OR SHOW BURIED SERVICES HEREON.

SPOT ELEVATIONS ARE FROZEN ON LAYER: "SPOT_ELEVATIONS"

ALL DIMENSIONS SHOWN ARE MEASURED, UNLESS OTHERWISE NOTED.

DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.99961869.

LEGEND

□	DENOTES SURVEY MONUMENT SET
■	DENOTES SURVEY MONUMENT FOUND
SIB	DENOTES STANDARD IRON BAR
SSIB	DENOTES SHORT STANDARD IRON BAR
IB	DENOTES IRON BAR
RIB	DENOTES 16mm DIAMETER ROUND IRON BAR
CC	DENOTES CUT CROSS
OU	DENOTES ORIGIN UNKNOWN
WIT	DENOTES WITNESS
M	DENOTES MEASURED
1017	DENOTES CALLON, DIETZ, O.L.S.'s
1114	DENOTES METZ AND LORENTZ LTD. (JOHN METZ, O.L.S.)
P1	DENOTES TOPOGRAPHICAL PLAN OF SURVEY BY CALLON DIETZ DATED NOVEMBER 2, 2005 (FILE No: 05-15133A) (PLAN No: C-1103)
P2	DENOTES PLAN 58R-5392
P3	DENOTES PLAN 58R-4074
B.P.	DENOTES BELL PEDESTAL
C.B.	DENOTES CATCH BASIN
F.FLR.	DENOTES FINISHED FLOOR ELEVATION
F.H.	DENOTES FIRE HYDRANT
G.M.	DENOTES GAS MAIN
G.P.	DENOTES GUARD POST
G.V.	DENOTES GAS VALVE
H.P.	DENOTES HYDRO POLE
J.B.	DENOTES JUNCTION BOX
M.H.	DENOTES MAN HOLE
N.R.F.O.	DENOTES NON-RIGID FRAME OPEN
PL	DENOTES LAMP POST
PO	DENOTES POST
R/WALL	DENOTES RETAINING WALL
S.L.	DENOTES STREET LIGHT
S.P.	DENOTES SUPPORT POST
T.L.	DENOTES TRAFFIC LIGHT
T.O.F.	DENOTES TOP OF FOUNDATION ELEVATION
W.V.	DENOTES WATER VALVE
	DENOTES CONIFEROUS TREE
	DENOTES DECIDUOUS TREE
	DENOTES ELECTRICAL METER
	DENOTES GATE
	DENOTES GAS METER
	DENOTES MISCELLANEOUS TRAFFIC SIGN
	DENOTES POLE ANCHOR
	DENOTES SHRUB

CATCH BASIN / MANHOLE SCHEDULE

POINT NO.	LID ELEV.	INVERT ELEV.	SIZE(mm)	TYPE	DIRECTION	FEATURE
5959	317.86					CB
		316.45	300	CONC	EAST	
		316.32	300	CONC	WEST	
6185	318.14		FULL	OF	DIRT	CB
6780	317.85		COULD	NOT	OPEN	CB
6939	318.10					CB
		316.79	200	CONC	NORTHWEST	
7538	318.41					MH
		315.18	250	CONC	SOUTHEAST	
		314.57	250	CONC	NORTH	
		314.60	250	CONC	SOUTH	
8000	318.25					CB
		316.88	250	CONC	NORTHWEST	
10122	318.15					MH
		316.39	150	IP	EAST	

CATCH BASIN / MANHOLE SCHEDULE

POINT NO.	LID ELEV.	INVERT ELEV.	SIZE(mm)	TYPE	DIRECTION	FEATURE
10207	318.04		COULD	NOT	OPEN	MH
10208	318.02		COULD	NOT	OPEN	MH
10210	317.98		COULD	NOT	OPEN	MH
10211	317.72					CB
10212	317.71					
		316.60	300	CPP	NORTH	
10288	318.03					CB
10303	317.81					CB
		316.45	300	CONC	EAST	
		316.32	300	CONC	WEST	
10317	317.82					CB
		316.71	300	CONC	EAST	
10340	317.82		FULL	OF	DIRT	CB
10441	317.95					CB
		316.90	200	PL	SOUTH	
		316.88	150	CONC	EAST	

CULVERT SCHEDULE

POINT NO.	TOP ELEV.	INVERT ELEV.	SIZE(mm)	TYPE	DIRECTION
5481		317.12	150	CONC	EAST
6414		316.60	300	CPP	NORTH
6415		317.08	150	PL	NORTH
6678		315.33	3100x1200	N.R.F.O.	WEST
6889		315.84	450	IP	SOUTH
6700		316.81	300	CSP	SOUTH
6743		315.31	3100x1200	N.R.F.O.	EAST
6773		316.59	300	CSP	SOUTH
7245		318.53	100	PLA	SOUTH
7246		318.53	100	PLA	SOUTH
7249		318.59	100	PLA	SOUTH
7250		318.57	100	PLA	SOUTH
7253		318.60	100	PLA	SOUTH
7254		318.59	100	PLA	SOUTH

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:

(1) THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE REGULATIONS MADE UNDER THEM.
(2) THE SURVEY WAS COMPLETED ON THE 15th DAY OF JULY, 2024.

JULY 26, 2024
DATE

AMIR KESHAVARZ
ONTARIO LAND SURVEYOR

THIS PLAN OF SURVEY RELATES TO AOLS PLAN SUBMISSION FORM NUMBER V-81885.

H:\PROJECTS\2024\24-26343 200 Weber St. N. Waterloo Topobound\Drawings\Topo24_E-2046.dwg July 26, 2024

Callon Dietz INCORPORATED
ONTARIO LAND SURVEYORS
CARLETON PLACE LONDON NORTH BAY
info@callondietz.com callondietz.com

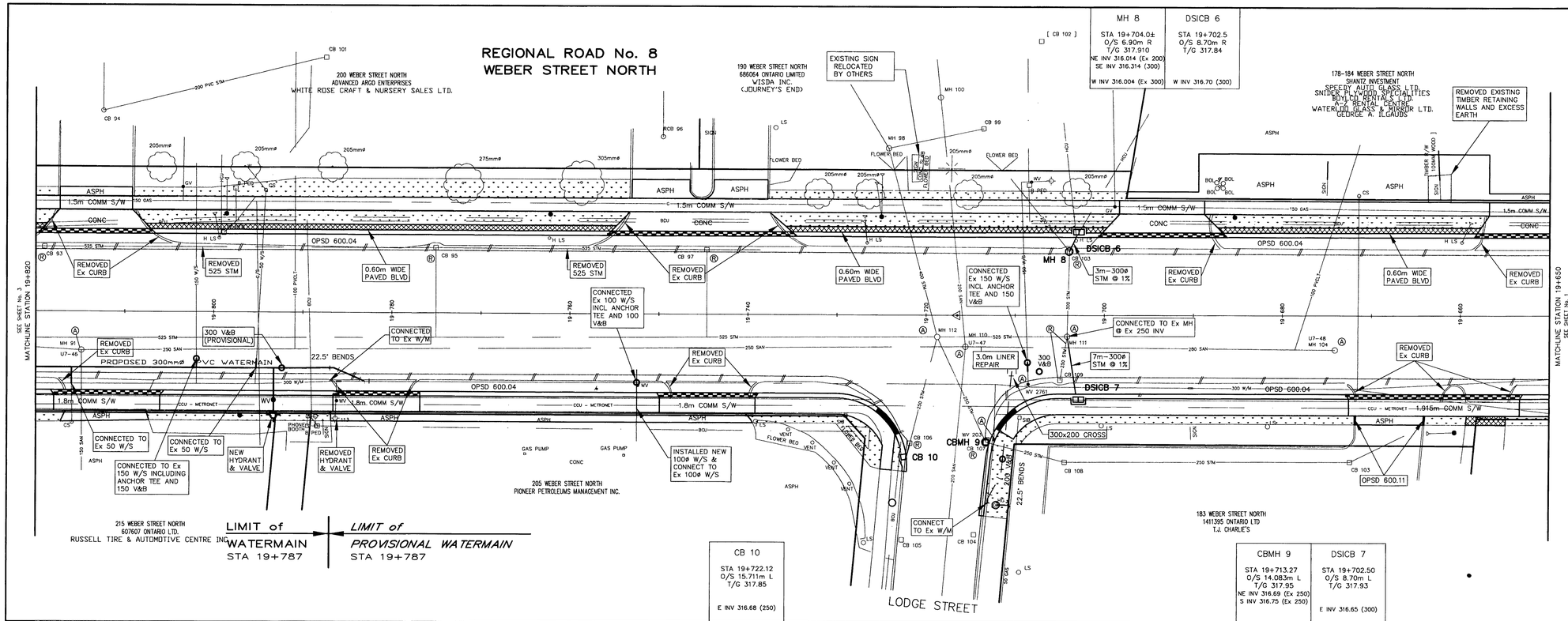
REGISTERED ISO 9001:2015

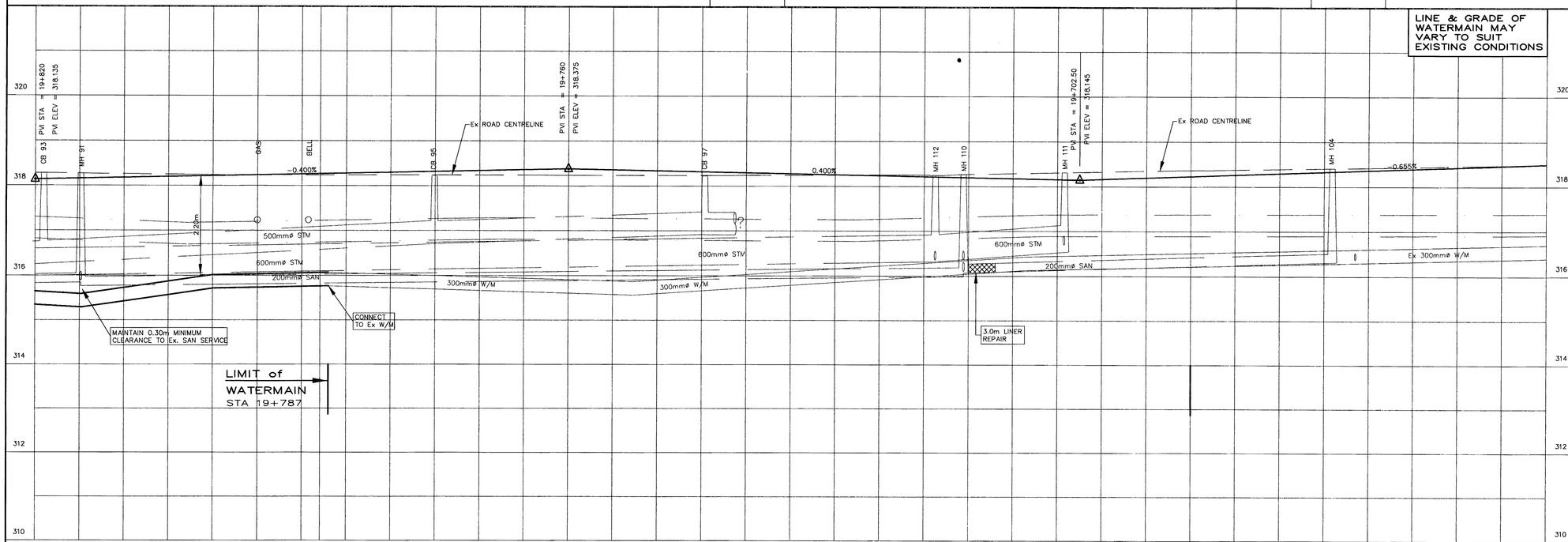
SURVEY BY: J.B.	DRAWN BY: Ian S	FILE No: 24-26343	PLAN No: E-2046

METRIC DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

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REGIONAL ROAD No. 8
WEBER STREET NORTH





STATION	19+820	19+800	19+780	19+760	19+740	19+720	19+700	19+680	19+660
EXISTING	318.30	318.26	318.26	318.25	318.22	318.27	318.33	318.40	318.46
DESIGN	318.135	318.215	318.295	318.375	318.295	318.215	318.161	318.292	318.423

NORTH ARROW

NOTES:
1. THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS, AND OTHER UNDERGROUND AND ABOVE GROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF POSITION IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.
2. CATCH BASIN GRATE ELEVATIONS AND OFFSETS ARE AT EDGE OF PAVEMENT, UNLESS OTHERWISE SPECIFIED. MANHOLE COVER ELEVATIONS AND OFFSETS ARE AT CENTRE OF COVER.

LEGEND:
- RESIDENTIAL DRIVEWAY RESTORATION AND PAVED BOULEVARD (ASPHALT)
- ASPH — COMMERCIAL DRIVEWAY RESTORATION (ASPHALT)
- CONC — COMMERCIAL DRIVEWAY RESTORATION (CONCRETE)
- BOULEVARD RESTORATION (100mm TOPSOIL AND NURSERY SOD)
- BUTT JOINT
- OPSD 600.04 CONCRETE CURB AND GUTTER
- OPSD 600.04 REINFORCED CONCRETE CURB AND GUTTER
- H LS — EXISTING HYDRO POLES. RELOCATED PRIOR TO CONSTRUCTION BY OTHERS.
- (A) — ADJUSTED TO SUIT FINISHED GRADE
- (A) — REMOVED EXISTING CB FRAME AND COVER. REPLACED WITH NEW MH FRAME AND COVER AS SPECIFIED AND ADJUSTED TO SUIT FINISHED GRADE
- (R) — REMOVED
- REMOVED EXISTING CURB

ROAD RESTORATION:
50mm HL-3 (BY OTHERS, NOT THIS CONTRACT)
90mm HL-4
150mm GRANULAR 'A'
450mm GRANULAR 'B'

ABBREVIATIONS:
BLT — BITUMINOUS FIBRE SANITARY LATERAL
ACLT — ASBESTOS CEMENT SANITARY LATERAL
PVCLT — POLY-VINYL CHLORIDE SANITARY LATERAL
CILT — CAST IRON SANITARY LATERAL

No.	REVISIONS	BY	DATE

CONTROLLING B.M. RMW TOPO 760058 ELEV 318.950
TOPOGRAPHIC MONUMENT IN CONCRETE CURB OF ASPHALT TRAFFIC ISLAND AT INTERSECTION OF WEBER STREET AND UNIVERSITY AVENUE.
FIELD BOOK No. 5065 – BOOK 1

ISSUE BLOCK	BY	DATE
RECORD DRAWING	JR	15 JAN 03
ISSUED FOR CONSTRUCTION	RT	5 SEPT 02
ISSUED FOR TENDER	RT	15 JULY 02

REGIONAL ROAD No. 8
WEBER STREET NORTH

ROADWAY & UNDERGROUND SERVICING IMPROVEMENTS
STA 19+~~450~~ 650 to 19+~~850~~ 820

The Regional Municipality of Waterloo

DRAWN BY:
CONTRACT No. 2002-019
CHECKED BY: SVDK
FILE No. 5065
DATE: 15 JULY '02
DRAWING No. 653
SCALE HOR. 1:250 VER. 1:50
SHEET 2 OF 19
CADD FILE NAME: I:\DCCADD\2002-019\02-019-02R.DWG

41-25

REGIONAL ROAD No. 8
WEBER STREET NORTH

REGIONAL ROAD No. 57
UNIVERSITY AVENUE

MATCHLINE STATION 19+980
SEE SHEET No. 4

MATCHLINE STATION 19+820
SEE SHEET No. 2

238-244 WEBER STREET NORTH
ASMUSSEN SERVICES & HOLDINGS
UNI-WEB MINIMART
DONUT QUEEN

230-234 WEBER STREET NORTH
LEON SOBKOWSKI
J & J CARDS & COLLECTIBLES
TERRY YANEC
MILAN KOVACEVIC

216 WEBER STREET NORTH
CITY of WATERLOO
FIRE STATION #1

245 WEBER STREET NORTH
SUNCOR INC.
GARY D. MOSER
(SUNOCO GASBAR)

221-239 WEBER STREET NORTH
1130814 ONTARIO INC.
ARDENT CORPORATION
1148381 ONTARIO LTD.
WESTON FABRICS LTD.
CASEY CARPENTER
PETER FOSTER

215 WEBER STREET NORTH
607607 ONTARIO LTD.
RUSSELL, TIRE & AUTOMOTIVE CENTRE INC.

R=2007.83
L=105.89
Lc=105.87
Tan=52.96
Δ=3°01'18"
N32°43'21"W

TEMPORARY INSTALLATION OF DCB 11 as per RMoW STD DWG 388

TEMPORARY INSTALLATION OF DSICB 13 as per RMoW STD DWG 388

2mx3m EASEMENT

CONNECTED 1.5m-300ø CB LEAD TO Ex MH 82

CONNECTED TO Ex 100 W/S

REPLACED SANITARY LATERAL

0.60m WIDE PAVED BLVD

BELL STRUCTURE ADJUSTED BY OTHERS

INSTALLED BY DIRECTIONAL DRILLING

2.0m FROM CENTRE OF Ex 900 STM

300mmø PVC WATERMAIN

CONNECTED TO Ex W/S

ANCHOR TEE AND 100 V&B

22.5° BEND

LOCATION CONFIRMED SANITARY LATERAL REPLACED

NEW HYDRANT & VALVE

250 CB LEAD CONNECTED TO EXISTING 900 MM STORM SEWER

250 MM CB LEAD CONNECTED TO EXISTING 900 MM STORM SEWER

RECONSTRUCTED MH ROOF

2mx3m EASEMENT

2.50m FROM C/L STA 19+840

4m-525ø STM @ 1%

6m-300ø STM @ 1%

Ex 1425 x 1300 STORM

MH 12

DCB 11

DSICB 14

SICB 17

SICB 15

DSICB 13

OPSD 600.04

OPSD 600.11

OPSD 401.01A

1.5m COMM S/W

1.8m COMM S/W

CONC

ASPH

GRASS

CONC SLAB

SICB 17	DSICB 14	SICB 15	DCB 11	DSICB 13	MH 12 (1500ø)
STA 19+926.0 O/S 6.508m L T/G 318.40 E INV 316.925 (250)	STA 19+910.0 O/S 9.503m R T/G 318.15 E INV 316.65 (300)	STA 19+873.0 O/S 8.70m L T/G 318.17 E INV 316.72 (250)	STA 19+820.0 O/S 8.70m R T/G 317.79 E INV 316.29 (300)	STA 19+820.0 O/S 8.70m L T/G 317.96 E INV 316.46 (300)	STA 19+825.4 O/S 7.0m R T/C 317.88 NE INV 315.82 (525) S INV 316.23 (300) W INV 315.9± (450)

NORTH ARROW

NOTES:
1. THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS, AND OTHER UNDERGROUND AND ABOVE GROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF POSITION IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.
2. CATCH BASIN GRATE ELEVATIONS AND OFFSETS ARE AT EDGE OF PAVEMENT, UNLESS OTHERWISE SPECIFIED. MANHOLE COVER ELEVATIONS AND OFFSETS ARE AT CENTRE OF COVER.

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- RESIDENTIAL DRIVEWAY RESTORATION AND PAVED BOULEVARD (ASPHALT)
- ASPH — COMMERCIAL DRIVEWAY RESTORATION (ASPHALT)
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- OPSD 600.04 CONCRETE CURB AND GUTTER
- OPSD 600.04 REINFORCED CONCRETE CURB AND GUTTER
- H LS — EXISTING HYDRO POLES RELOCATED PRIOR TO CONSTRUCTION BY OTHERS.
- (A) — ADJUSTED TO SUIT FINISHED GRADE
- (A1) — REMOVED EXISTING CB FRAME AND COVER. REPLACED WITH NEW MH FRAME AND COVER AS SPECIFIED AND ADJUSTED TO SUIT FINISHED GRADE
- (R) — REMOVED
- EXISTING CURB REMOVED

ROAD RESTORATION:

50mm HL-3 (BY OTHERS, NOT THIS CONTRACT)
90mm HL-4
150mm GRANULAR 'A'
450mm GRANULAR 'B'

ABBREVIATIONS:

BLT – BITUMINOUS FIBRE SANITARY LATERAL
ACLT – ASBESTOS CEMENT SANITARY LATERAL
PVCLT – POLY-VINYL CHLORIDE SANITARY LATERAL
CILT – CAST IRON SANITARY LATERAL

LINE & GRADE OF WATERMAIN MAY VARY TO SUIT EXISTING CONDITIONS

MATCH Ex ROAD CENTRELINE
PVI STA = 19+940
PVI ELEV = 318.700
PVI STA = 19+920
PVI ELEV = 318.535
PVI STA = 19+820
PVI ELEV = 318.135
0.825%
0.400%
MAINTAIN 0.50m MINIMUM CLEARANCE TO Ex. STM SEWER.
MAINTAIN 0.15m MINIMUM CLEARANCE TO Ex. W/M
MAINTAIN 0.15m MINIMUM CLEARANCE TO SAN SERVICE
MAINTAIN 0.30m MINIMUM CLEARANCE TO Ex. CB LEAD
45° VERTICAL BENDS
PROPOSED 300mmø PVC WATERMAIN
PROPOSED ROAD CENTRELINE
Ex ROAD CENTRELINE
900mmø STM
1067mmø STM
250mmø SAN
300mmø W/M
200mmø SAN
250ø STORM LEAD SICB 15
2.20m
Ex BELL
MH 82 STM
MH 80 SAN
BELL DUCT
CABLE TV
MH 86
SICB 14
SICB 15
MH 84
MH 89
MH 90

DESIGN	318.93	318.860	318.700	318.535	318.455	318.375	318.295	318.215	318.135	DESIGN
EXISTING	318.93	318.86	318.70	318.57	318.49	318.44	318.41	318.36	318.28	EXISTING
STATION	19+980	19+960	19+940	19+920	19+900	19+880	19+860	19+840	19+820	STATION

No.	REVISIONS	BY	DATE

CONTROLLING B.M. RMW TOPO 760058 ELEV 318.950
TOPOGRAPHIC MONUMENT IN CONCRETE CURB OF ASPHALT TRAFFIC ISLAND AT INTERSECTION OF WEBER STREET AND UNIVERSITY AVENUE.
FIELD BOOK No. 5065 – BOOK 1

ISSUE BLOCK	BY	DATE
RECORD DRAWING	JR	15 JAN 03
ISSUED FOR CONSTRUCTION	RTF	5 SEPT 02
ISSUED FOR TENDER	RTF	15 JULY 02

REGIONAL ROAD No. 8
WEBER STREET NORTH

ROADWAY & UNDERGROUND SERVICING IMPROVEMENTS STA 19+820 to 19+980

The Regional Municipality of Waterloo

DRAWN BY:	CONTRACT No. 2002-019
CHECKED BY: SVDK	FILE No. 5065
DATE: 15 JULY '02	DRAWING No. 653
SCALE HOR. 1:250 VER. 1:50	SHEET 3 OF 19
CADD FILE NAME: I:\DOCADD\2002-019\02-019-03R.DWG	

41-255

APPENDIX B

City of Waterloo Sanitary Layout G.C.T. NO: 6-3, dated June 12, 2023
Sanitary Sewer Design Sheet by SBM

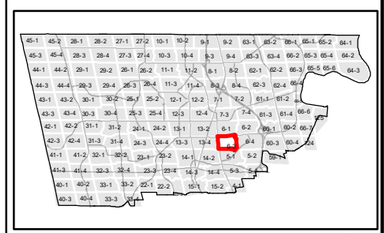
SANITARY LAYOUT
G.C.T. NO: 6-3
Date: 12 June, 2023

- Trunk Manhole
- Local Manhole
- Local Manhole (Private)
- Local Manhole (Region of W.)
- Local Manhole (Kitchener)
- Local Manhole (UoW)
- Local Manhole (Proposed)

- Trunk Main
- Trunk Main (Kitchener)
- Local Main
- Local Main (Private)
- Local Main (Region of W.)
- Local Main (Kitchener)
- Local Main (UoW)
- Forcemain
- Local Main (Proposed)

- Fitting
- Valve
- Chamber
- Clean Out
- Discharge Structure
- Meter Chamber
- Pumping Station
- Treatment Plant
- Storage Basin

- Easement



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Revision Date: 23 Mar 2018
Produced by: Engineering Services, IPPW
Imagery: May 2014
Property Information © 2001-2015
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THIS IS NOT A PLAN OF SURVEY

200 Webber Street North

CITY OF
WATERLOO, Ontario

Project Number: SBM-24-2350
Date: January 9, 2025
Design By: Mge
Checked By: HA
File: S:\2024 Jobs\SBM-24-2350 Uniweber Property Inc.- 200 Weber Street North, Waterloo\04 dDocs\03 Civil\Calculations\SANITARY\SBM-24-2350 Uniweber Property Inc.- 200 Weber Street North, Waterloo - SAN - 2024-12-04.xls

SANITARY SEWER DESIGN SHEET

ENGINEERING AND PUBLIC WORKS

Drainage Area Plan No: N/A

Design Parameters

Average Daily Flow
Residential 275 L/c/day
Commercial 0.5 L/s/ha
Industrial 1.0 L/s/ha
Inst. / School 2.5 L/s/ha

Mannings "*n*" 0.0130
Min. Velocity 0.8 m/sec
Max. Velocity 3.0 m/sec
Residential Harmon Peaking Factor (F)
Commerical Harmon Peaking Factor (F) 2.5
Extraneous Flows 0.25 L/s/ha

Harmon Peaking Factor Equation:

$$F = 1 + \frac{14}{4 + \sqrt{P}} \quad (P = Population/1{,}000)$$

LOCATION				RESIDENTIAL AREAS and POPULATION										SCHOOL, INSTITUTIONAL			COMMERCIAL			INDUSTRIAL				INFILTRATION			DESIGN						
				HECTARES OF EACH DENSITY										HECTARES AND FLOW OF EACH ZONING																		
														2.50 *L/s/ha*			0.50 *L/s/ha*			1.00 *L/s/ha*											
STREET	AREA NO.	MANHOLE LOCATION		R2	R3	R4/R5	R6	R7	R8	R9	POPUL.	CUMUL POPUL.	PEAK FACTOR "F"	PEAK RES. FLOW	AREA	CUMUL AREA	PEAK FLOW	AREA	CUMUL AREA	PEAK FLOW	AREA	CUMUL AREA	PEAK FLOW	TOTALS-C-I FLOW	AREA	CUMUL AREA	INFIL FLOW	TOTAL VOLUME FLOW	LENGTH	SLOPE	PIPE SIZE	CAPACITY	FULL FLOW VELOCITY
		FROM MH	TO MH	**36**	**72**	**108**	**196**	**312**	**387**	**775**																						
				ha	*ha*	*ha*	*ha*	*ha*	*ha*	*ha*	*1000s*	*1000s*		*L/sec*	*ha*	*ha*	*L/sec*	*ha*	*ha*	*L/sec*	*ha*	*ha*	*L/sec*	*L/sec*	*ha*	*ha*	*L/sec*	*L/sec*	*m*	*%*	*mm*	*L/sec*	*m/s*
Webber Street North		BLDG.	EX. Service								0.000	0.000	4.5	0.0000	0.00	0.00	0.0000	1.12	1.12	1.4000	0.00	0.00	0.0000	1.4000	1.12	1.12	0.2800	1.6800		2.00	100	7.3013	0.930

*Design calculations per Section B.3.1.2.3 of Region of Waterloo DGSSMS Feb 2024 and MECP Guildelines for Sewage Works

APPENDIX C

City of Waterloo Storm Layout G.C.T. NO: 6-3, dated June 28, 2023
Stormwater Management Calculations by SBM
Chicago Hyetograph Creation
PCSWMM Pre-development Conditions Layout
PCSWMM Pre-development Modelling Output
PCSWMM Post-development Conditions Layout
PCSWMM Post-development Modelling Output
Echelon CDS model PMSU2015-4 (OGS) Calculations and Details

STORM LAYOUT

G.C.T. NO: 6-3

Date: 28 June, 2023

- Single Catchbasin
- Single Catchbasin (Private)
- Single Catchbasin, (Region of W.)
- Single Catchbasin, (Kitchener)
- Double Catchbasin
- Double Catchbasin (Private)
- Double Catchbasin, (Region of W.)
- Double Catchbasin,(Kitchener)
- Inlet
- Single Ditch Inlet Catchbasin
- Single Ditch Inlet Catchbasin (Prv)
- OGS
- OGS (others)
- Manhole
- Manhole, (Private)
- Manhole, (Region of W.)
- Manhole, (Kitchener)
- CWC Manhole
- Catchbasin Manhole
- Catchbasin Manhole (Private)
- Catchbasin Manhole, (Region of W.)
- Double Catchbasin Manhole
- Double Catchbasin Manhole (Prv)
- Double Catchbasin Manhole, (Region of W.)
- Ditch Inlet Catchbasin Manhole
- Ditch Inlet Catchbasin Manhole (Prv)
- Ditch Inlet Catchbasin Manhole, (Region of W.)
- Collector
- Collector (Private)
- Collector, (Region of W.)
- Collector, (Kitchener)
- Culvert
- Ditch
- Infiltration Pipe
- InfiltrationInfra Facility
- Infiltration Gallery
- Soakaway Pit
- Chamber
- Cleanout
- Discharge Structure
- Underground Storage
- SWM Pond
- Easement

Map © 2018, City of Waterloo
Revision Date: 23 March 2018
Produced by: Engineering Services, IPPW
Imagery: May 2014
Property Information © 2001-2015
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STRIK BALDINELLI MONIZ
PLANNING · CIVIL · STRUCTURAL · MECHANICAL · ELECTRICAL

LONDON LOCATION
1599 Adelaide St. N., Unit 301
London, ON N5X 4E8
P: 519-471-6667

KITCHENER LOCATION
132 Queen St. S. Unit 4
Kitchener, ON N2G 1V9
P: 519-725-8093

www.sbmltd.ca

sbm@sbmltd.ca

SWM Calculations

DATE: January 10, 2025
JOB N0.: SBM-24-2350

Client: MCGW Properties Corp.
Project: Proposed Commerical Development
Location: 200 Webber Street North, Waterloo, Ontario

TOTAL SITE RUNOFF COEFFICIENT

TOTAL POST-DEVELOPMENT AREA (FOR REFERENCE ONLY)

	Area (m2)	C	A*C
Total Area:	10520.79		
Building Area:	3068.00	0.9	2761.20
Concrete/Asphalt:	5865.56	0.9	5279.00
Gravel:	0.00	0.7	0.00
Landscaped/Open:	1587.24	0.2	317.45
Totals:	10520.79		8357.65
Ceq = Sum(A*C)/Sum(A) =	0.79		

CITY OF WATERLOO DESIGN STORM PARAMETERS*

Return Period (years)	A,B,C Parameters		
	A	B	C
5	1101	9.258	0.882
25	3261	16.193	0.938
100	4692	17.437	0.956

*Intensity i=A/(t+B)^C (mm/hr)
* Refer to the City of Waterloo Volume 6 - Stormwater Management

PRE-DEVELOPMENT FLOWS

PRE-DEVELOPMENT TOTAL SITE AREA (A101)

	Area (m^2)		
Total Area:	10520.79		
Building Area:	0.00	0.9	0.00
Concrete/Asphalt:	1265.90	0.9	1139.31
Gravel:	8348.23	0.7	5843.76
Landscaped/Open:	906.66	0.2	181.33
Totals:	10520.79		7164.40
Ceq = Sum(A*C)/Sum(A) =	0.68		

TABLE 1: PRE-DEVELOPMENT SUBCATCHMENT PARAMETERS

Pre-Development Catchment Area	Total Area (m2)	Total Area (ha)	Land Use 1 Runoff Coefficient (Ceq)	Weighted C Value	Flow Length (m)	Width (m)	% Slope	[4] % Impervious	[2] N- Imperv	[2] N- Perv	[3] Dstore - Imperv (mm)	[3] Dstore- Perv (mm)	[1] SCS Curve Numbers
A101	10520.790	1.052	10520.790	0.68	95	110	0.63	68.71	0.011	0.15	1.905	3.81	84

Average Hydrological Soil Group of D for the site (Assumed)
[1] Values from A.4 of Storm Water Management Model User's Manual Version 5.1
[2] Values from A.6 of Storm Water Management Model User's Manual Version 5.1
[3] Values based on calculated depth of storage media x void ratio for 19mm clear stone (0.4)
[4] Sample Calculation to Convert from C to % Impervious:

% Impervious = x
C = x(0.9) + (1-x)0.2 (ie. weighted C value)
therefore 0.7x = C - 0.2
x = (C-0.2)/0.7

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POST DEVELOPMENT UNCONTROLLED FLOWS

POST-DEVELOPMENT CONDITIONS

POST-DEVELOPMENT UNCONTROLLED AREA (U201)

	Area (m^2)		
Total Area:	149.78		
Building Area:	0.00	0.9	0.00
Concrete/Asphalt:	0.00	0.9	0.00
Gravel:	0.00	0.7	0.00
Landscaped/Open:	149.78	0.2	29.96
Totals:	149.78		29.96
Ceq = Sum(A*C)/Sum(A) =	0.20		

POST-DEVELOPMENT UNCONTROLLED AREA (U202)

	Area (m^2)		
Total Area:	424.34		
Building Area:	0.00	0.9	0.00
Concrete/Asphalt:	75.84	0.9	68.26
Gravel:	0.00	0.7	0.00
Landscaped/Open:	348.50	0.2	69.70
Totals:	424.34		137.96
Ceq = Sum(A*C)/Sum(A) =	0.33		

POST-DEVELOPMENT UNCONTROLLED AREA (U203)

	Area (m^2)		
Total Area:	1502.74		
Building Area:	0.00	0.9	0.00
Concrete/Asphalt:	1374.24	0.9	1236.81
Gravel:	0.00	0.7	0.00
Landscaped/Open:	128.50	0.2	25.70
Totals:	1502.74		1262.51
Ceq = Sum(A*C)/Sum(A) =	0.84		

POST-DEVELOPMENT CONTROLLED FLOWS

POST-DEVELOPMENT CONTROLLED AREA (A201)

	Area (m^2)	C	A*C
Total Site Area:	3163.46		
Building Area:	0.00	0.9	0.00
Concrete/Asphalt:	2303.32	0.9	2072.99
Rooftop Landscaped/Open:	0.00	0.4	0.00
Landscaped/Open:	860.14	0.2	172.03
Totals:	3163.46		2245.02
C_{eq} = Sum(A*C)/Sum(A) =	0.71		

POST-DEVELOPMENT CONTROLLED AREA (A202)

	Area (m^2)	C	A*C
Total Site Area:	972.94		
Building Area:	0.00	0.9	0.00
Concrete/Asphalt:	878.00	0.9	790.20
Rooftop Landscaped/Open:	0.00	0.4	0.00
Landscaped/Open:	94.94	0.2	18.99
Totals:	972.94		809.19
C_{eq} = Sum(A*C)/Sum(A) =	0.83		

POST-DEVELOPMENT CONTROLLED AREA (A203)

	Area (m^2)	C	A*C
Total Area:	306.52		
Building Area:	0.00	0.9	0.00
Concrete/Asphalt/Amenity:	306.42	0.9	275.78
Rooftop Landscaped/Open:	0.00	0.4	0.00
Landscaped/Open:	0.10	0.2	0.02
Totals:	306.52		275.80
C_{eq} = Sum(A*C)/Sum(A) =	0.90		

POST-DEVELOPMENT CONTROLLED AREA (A204)

	Area (m^2)	C	A*C
Total Site Area:	446.49		
Building Area:	0.00	0.9	0.00
Concrete/Asphalt:	446.39	0.9	401.75
Rooftop Landscaped/Open:	0.00	0.4	0.00
Landscaped/Open:	0.10	0.2	0.02
Totals:	446.49		401.77
C_{eq} = Sum(A*C)/Sum(A) =	0.90		

POST-DEVELOPMENT CONTROLLED AREA (A205)

	Area (m^2)	C	A*C
Total Area:	486.40		
Building Area:	0.00	0.9	0.00
Concrete/Asphalt:	481.35	0.9	433.22
Rooftop Landscaped/Open:	0.00	0.4	0.00
Landscaped/Open:	5.05	0.2	1.01
Totals:	486.40		434.23
C_{eq} = Sum(A*C)/Sum(A) =	0.89		

POST-DEVELOPMENT CONTROLLED AREA (A206)

	Area (m^2)	C	A*C
Total Area:	3068.12		
Building Area:	3068.00	0.9	2761.20
Concrete/Asphalt:	0.00	0.9	0.00
Rooftop Landscaped/Open:	0.00	0.4	0.00
Landscaped/Open:	0.12	0.2	0.02
Totals:	3068.12		2761.22
C_{eq} = Sum(A*C)/Sum(A) =	0.90		

POST-DEVELOPMENT TOTAL CONTROLLED AREA (A201 + A202 + A203 + A204 + A205)

	Area (m^2)	C	A*C
Total Site Area:	8443.93		
Building Area:	3068.00	0.9	2761.20
Concrete/Asphalt:	4415.48	0.9	3973.93
Landscaped/Open (on R	0.10	0.4	0.04
Landscaped/Open:	960.35	0.2	192.07
Totals:	8443.93		6927.24
C_{eq} = Sum(A*C)/Sum(A) =	0.82		

Imperviousness % = 88.63 %

TABLE 2: POST-DEVELOPMENT SUBCATCHMENT PARAMETERS

Pre-Development Catchment Area	Total Area (m2)	Total Area (ha)	Land Use 1 Runoff Coefficient (Ceq)	Weighted C Value	Flow Length (m)	Width (m)	% Slope	[4] % Impervious	[2] N- Imperv	[2] N- Perv	[3] Dstore - Imperv (mm)	[3] Dstore- Perv (mm)	[1] SCS Curve Numbers
A201	3163.460	0.316	3163.460	0.71	85	37	2.05	72.81	0.011	0.15	1.905	3.81	80
A202	972.940	0.097	972.940	0.83	19	52	4.00	90.24	0.011	0.15	1.905	3.81	80
A203	306.520	0.031	306.520	0.90	17	18	1.00	99.97	0.011	0.15	1.905	3.81	80
A204	446.490	0.045	446.490	0.90	19	24	3.00	99.98	0.011	0.15	1.905	3.81	80
A205	486.400	0.049	486.400	0.89	23	21	4.00	98.96	0.011	0.15	1.905	3.81	80
A206	3068.120	0.307	3068.120	0.90	9	341	2.00	100.00	0.011	0.15	1.905	3.81	80
U201	149.780	0.015	149.780	0.20	3	53	0.33	0.00	0.011	0.15	1.905	3.81	80
U202	424.344	0.042	424.344	0.33	5	88	0.26	17.87	0.011	0.15	1.905	3.81	80
U203	1502.740	0.150	1502.740	0.84	22	68	1.63	91.45	0.011	0.15	1.905	3.81	80

Average Hydrological Soil Group of D for the site (Assumed)

[1] Values from A.4 of Storm Water Management Model User's Manual Version 5.1

[2] Values from A.6 of Storm Water Management Model User's Manual Version 5.1

[3] Values based on calculated depth of storage media x void ratio for 19mm clear stone (0.4)

[4] Sample Calculation to Convert from C to % Impervious:

% Impervious = x
C = x(0.9) + (1-x)0.2 (ie. weighted C value)
therefore 0.7x = C - 0.2
x = (C-0.2)/0.7

TABLE 3: SUMMARY OF FLOW RATES

Storm Event	Pre-Development Flows (L/s)	Post-Development Flows (L/s)
5-Year	185.86	120.72
25-Year	380.08	222.09
100-Year	519.61	274.17

Post development total flows are less than pre-development flows.

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CHICAGO HYETOGRAPH CREATION: 5 YEAR RETURN PERIOD

DATE: January 9, 2025
JOB No.: SBM-24-3300

Client: MCCAW Properties Corp.
Project: Proposed Commercial Development
Location: 260 Weber Street North, Waterloo, Ontario

CITY OF WATERLOO DESIGN STORM PARAMETERS*

Return Period (years)	IDAZ Parameters		
	A	B	C
5	1101	9.258	0.882
25	1263	10.293	0.848
100	4682	17.437	0.956

*Intensity i=A/(t+B)^C (mm/hr)
* Refer to the City of Waterloo Volume 6 - Stormwater Management

Rainfall Duration= 3 hours
Rainfall Duration= 180 minutes
Starting Time= 0.00
Time Step= 0.01
r= 0.38 MTO DMM Section B, Page 14

t_p= 1
t_p * r= 0.38
t_p * (1-r)= 0.62

i_p= 141.3 peak rainfall intensity, mm/h
t_b= 68.4 time before the peak intensity, min
t_a= 111.6 time after the peak intensity, min
Total Rainfall Depth= 32.3 mm

$i_p = \frac{A}{(\Delta t + B)^C}$ = peak rainfall intensity

Before the peak:

$i_b = \frac{A((1-r)t_p)(1-r)+B)}{[t_p(1-r)+B]^C}$

After the peak:

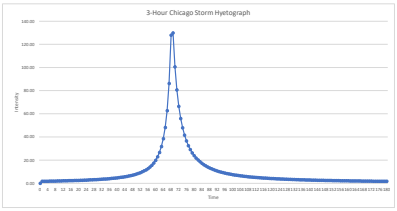
$i_a = \frac{A(t(1-r)t_p)(1-r)+B)}{[t_p(1-r)+B]^C}$

A,B,C Parameters

Return Period (Years)	A	B	C
5	1101.000	9.258	0.882

5-Year Hyetograph

t_b OR t_a	Time (min)	Time (h:m)	Intensity	Rainfall Depth
68.40	0	0:00	0.00	0.000
67.40	1	0:01	1.77	0.029
66.40	2	0:02	1.80	0.030
65.40	3	0:03	1.83	0.030
64.40	4	0:04	1.86	0.031
63.40	5	0:05	1.89	0.032
62.40	6	0:06	1.93	0.032
61.40	7	0:07	1.96	0.033
60.40	8	0:08	2.00	0.033
59.40	9	0:09	2.03	0.034
58.40	10	0:10	2.07	0.035
57.40	11	0:11	2.11	0.035
56.40	12	0:12	2.15	0.036
55.40	13	0:13	2.20	0.037
54.40	14	0:14	2.24	0.037
53.40	15	0:15	2.29	0.038
52.40	16	0:16	2.34	0.039
51.40	17	0:17	2.39	0.040
50.40	18	0:18	2.44	0.041
49.40	19	0:19	2.50	0.042
48.40	20	0:20	2.56	0.043
47.40	21	0:21	2.62	0.044
46.40	22	0:22	2.69	0.045
45.40	23	0:23	2.75	0.046
44.40	24	0:24	2.82	0.047
43.40	25	0:25	2.90	0.048
42.40	26	0:26	2.98	0.050
41.40	27	0:27	3.06	0.051
40.40	28	0:28	3.15	0.052
39.40	29	0:29	3.24	0.054
38.40	30	0:30	3.34	0.056
37.40	31	0:31	3.44	0.057
36.40	32	0:32	3.55	0.059
35.40	33	0:33	3.67	0.061
34.40	34	0:34	3.80	0.063
33.40	35	0:35	3.93	0.065
32.40	36	0:36	4.07	0.068
31.40	37	0:37	4.23	0.070
30.40	38	0:38	4.39	0.073
29.40	39	0:39	4.57	0.076
28.40	40	0:40	4.76	0.079
27.40	41	0:41	4.97	0.083
26.40	42	0:42	5.19	0.087
25.40	43	0:43	5.43	0.091
24.40	44	0:44	5.70	0.095
23.40	45	0:45	5.99	0.100
22.40	46	0:46	6.32	0.105
21.40	47	0:47	6.67	0.111
20.40	48	0:48	7.06	0.118
19.40	49	0:49	7.50	0.125
18.40	50	0:50	8.00	0.133
17.40	51	0:51	8.55	0.142
16.40	52	0:52	9.18	0.153
15.40	53	0:53	9.89	0.165
14.40	54	0:54	10.71	0.179
13.40	55	0:55	11.67	0.194
12.40	56	0:56	12.78	0.213
11.40	57	0:57	14.10	0.235
10.40	58	0:58	15.67	0.261
9.40	59	0:59	17.59	0.293
8.40	60	1:00	19.95	0.332
7.40	61	1:01	22.91	0.382
6.40	62	1:02	26.71	0.445
5.40	63	1:03	31.72	0.529
4.40	64	1:04	38.55	0.643
3.40	65	1:05	48.25	0.804
2.40	66	1:06	62.78	1.046
1.40	67	1:07	86.19	1.436
0.40	68	1:08	127.96	2.133
0.60	69	1:09	129.83	2.164
1.60	70	1:10	100.56	1.676
2.60	71	1:11	80.64	1.344
3.60	72	1:12	66.44	1.107
4.60	73	1:13	55.91	0.932
5.60	74	1:14	47.88	0.798
6.60	75	1:15	41.59	0.693
7.60	76	1:16	36.57	0.609
8.60	77	1:17	32.48	0.541
9.60	78	1:18	29.11	0.485
10.60	79	1:19	26.29	0.438
11.60	80	1:20	23.91	0.399
12.60	81	1:21	21.87	0.365
13.60	82	1:22	20.12	0.335
14.60	83	1:23	18.59	0.310
15.60	84	1:24	17.25	0.288
16.60	85	1:25	16.07	0.268
17.60	86	1:26	15.03	0.250
18.60	87	1:27	14.10	0.235
19.60	88	1:28	13.26	0.221
20.60	89	1:29	12.51	0.209
21.60	90	1:30	11.83	0.197
22.60	91	1:31	11.22	0.187
23.60	92	1:32	10.66	0.178
24.60	93	1:33	10.14	0.169
25.60	94	1:34	9.67	0.161
26.60	95	1:35	9.24	0.154
27.60	96	1:36	8.84	0.147
28.60	97	1:37	8.47	0.141
29.60	98	1:38	8.13	0.136
30.60	99	1:39	7.81	0.130
31.60	100	1:40	7.52	0.125
32.60	101	1:41	7.24	0.121
33.60	102	1:42	6.99	0.116
34.60	103	1:43	6.74	0.112
35.60	104	1:44	6.52	0.109
36.60	105	1:45	6.30	0.105
37.60	106	1:46	6.10	0.102
38.60	107	1:47	5.92	0.099
39.60	108	1:48	5.74	0.096
40.60	109	1:49	5.57	0.093
41.60	110	1:50	5.41	0.090
42.60	111	1:51	5.26	0.088
43.60	112	1:52	5.12	0.085
44.60	113	1:53	4.98	0.083
45.60	114	1:54	4.85	0.081
46.60	115	1:55	4.73	0.079
47.60	116	1:56	4.61	0.077
48.60	117	1:57	4.50	0.075
49.60	118	1:58	4.39	0.073
50.60	119	1:59	4.29	0.071
51.60	120	2:00	4.19	0.070
52.60	121	2:01	4.10	0.068
53.60	122	2:02	4.01	0.067
54.60	123	2:03	3.92	0.065
55.60	124	2:04	3.84	0.064
56.60	125	2:05	3.76	0.063
57.60	126	2:06	3.68	0.061
58.60	127	2:07	3.61	0.060
59.60	128	2:08	3.54	0.059
60.60	129	2:09	3.47	0.058
61.60	130	2:10	3.40	0.057
62.60	131	2:11	3.34	0.056
63.60	132	2:12	3.28	0.055
64.60	133	2:13	3.22	0.054
65.60	134	2:14	3.17	0.053
66.60	135	2:15	3.11	0.052
67.60	136	2:16	3.06	0.051
68.60	137	2:17	3.01	0.050
69.60	138	2:18	2.96	0.049
70.60	139	2:19	2.91	0.048
71.60	140	2:20	2.86	0.048
72.60	141	2:21	2.82	0.047
73.60	142	2:22	2.77	0.046
74.60	143	2:23	2.73	0.046
75.60	144	2:24	2.69	0.045
76.60	145	2:25	2.65	0.044
77.60	146	2:26	2.61	0.044
78.60	147	2:27	2.57	0.043
79.60	148	2:28	2.54	0.042
80.60	149	2:29	2.50	0.042
81.60	150	2:30	2.47	0.041
82.60	151	2:31	2.43	0.041
83.60	152	2:32	2.40	0.040
84.60	153	2:33	2.37	0.039
85.60	154	2:34	2.34	0.039
86.60	155	2:35	2.31	0.038
87.60	156	2:36	2.28	0.038
88.60	157	2:37	2.25	0.037
89.60	158	2:38	2.22	0.037
90.60	159	2:39	2.19	0.037
91.60	160	2:40	2.17	0.036
92.60	161	2:41	2.14	0.036
93.60	162	2:42	2.11	0.035
94.60	163	2:43	2.09	0.035
95.60	164	2:44	2.06	0.034
96.60	165	2:45	2.04	0.034
97.60	166	2:46	2.02	0.034
98.60	167	2:47	1.99	0.033
99.60	168	2:48	1.97	0.033
100.60	169	2:49	1.95	0.033
101.60	170	2:50	1.93	0.032
102.60	171	2:51	1.91	0.032
103.60	172	2:52	1.89	0.031
104.60	173	2:53	1.87	0.031
105.60	174	2:54	1.85	0.031
106.60	175	2:55	1.83	0.031
107.60	176	2:56	1.81	0.030
108.60	177	2:57	1.79	0.030
109.60	178	2:58	1.78	0.030
110.60	179	2:59	1.76	0.029
111.60	180	3:00	1.74	0.029



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CHICAGO HYETOGRAPH CREATION: 25 YEAR RETURN PERIOD

DATE: January 9, 2025
JOB No.: SBM-23-2-300

Client: MCGW Properties Corp.
Project: Proposed Commercial Development
Location: 200 Weldon Street North, Waterloo, Ontario

CITY OF WATERLOO DESIGN STORM PARAMETERS*

Return Period (years)	A,B,C Parameters		
	A	B	C
5	1501	9.258	0.862
25	3261	16.193	0.938
100	4682	17.437	0.956

*Intensity i=A/(t+B)^C (mm/hr)
* Refer to the City of Waterloo Volume 4 - Stormwater Management

Rainfall Duration= 3 hours
Rainfall Duration= 180 minutes
Starting Time= 0.00
Time Step= 0.01
r= 0.38 MTO DMM Section B, Page 14

t_p= 1
t_p * r= 0.38
t_p * (1-r)= 0.62

i_p= 226.3 peak rainfall intensity, mm/h
t_b= 68.4 time before the peak intensity, min
t_a= 111.6 time after the peak intensity, min
Total Rainfall Depth= 69.0 mm

$i_t = \frac{A}{(t + B)^C}$ = peak rainfall intensity

Before the peak:

$i_t = \frac{A(1-c)(t_b/r) + B)}{(t_b/r + B)^{c+1}}$

After the peak:

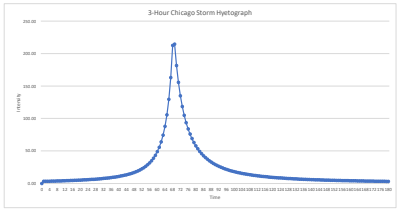
$i_t = \frac{A(1-c)(t-(1-r)) + B)}{(t_a(1-r) + B)^{c+1}}$

A,B,C Parameters

Return Period (Years)	A	B	C
25	3261.000	16.193	0.938

25-Year Hyetograph

% Of i_p	Time (min)	Time (h:m)	Intensity	Rainfall Depth
68.40	0	0:00	0.00	0.000
67.40	1	0:01	3.28	0.055
66.40	2	0:02	3.35	0.056
65.40	3	0:03	3.42	0.057
64.40	4	0:04	3.49	0.058
63.40	5	0:05	3.57	0.059
62.40	6	0:06	3.65	0.061
61.40	7	0:07	3.73	0.062
60.40	8	0:08	3.81	0.064
59.40	9	0:09	3.90	0.065
58.40	10	0:10	4.00	0.067
57.40	11	0:11	4.09	0.068
56.40	12	0:12	4.19	0.070
55.40	13	0:13	4.30	0.072
54.40	14	0:14	4.41	0.073
53.40	15	0:15	4.52	0.075
52.40	16	0:16	4.64	0.077
51.40	17	0:17	4.77	0.080
50.40	18	0:18	4.90	0.082
49.40	19	0:19	5.04	0.084
48.40	20	0:20	5.19	0.086
47.40	21	0:21	5.34	0.089
46.40	22	0:22	5.50	0.092
45.40	23	0:23	5.67	0.094
44.40	24	0:24	5.85	0.097
43.40	25	0:25	6.04	0.101
42.40	26	0:26	6.24	0.104
41.40	27	0:27	6.45	0.107
40.40	28	0:28	6.67	0.111
39.40	29	0:29	6.91	0.115
38.40	30	0:30	7.16	0.119
37.40	31	0:31	7.43	0.124
36.40	32	0:32	7.71	0.129
35.40	33	0:33	8.02	0.134
34.40	34	0:34	8.34	0.139
33.40	35	0:35	8.69	0.145
32.40	36	0:36	9.06	0.151
31.40	37	0:37	9.46	0.158
30.40	38	0:38	9.89	0.165
29.40	39	0:39	10.36	0.173
28.40	40	0:40	10.86	0.181
27.40	41	0:41	11.41	0.190
26.40	42	0:42	12.00	0.200
25.40	43	0:43	12.65	0.211
24.40	44	0:44	13.36	0.223
23.40	45	0:45	14.13	0.236
22.40	46	0:46	14.98	0.250
21.40	47	0:47	15.92	0.265
20.40	48	0:48	16.96	0.283
19.40	49	0:49	18.12	0.302
18.40	50	0:50	19.41	0.324
17.40	51	0:51	20.86	0.348
16.40	52	0:52	22.50	0.375
15.40	53	0:53	24.36	0.406
14.40	54	0:54	26.47	0.441
13.40	55	0:55	28.90	0.482
12.40	56	0:56	31.71	0.529
11.40	57	0:57	34.99	0.583
10.40	58	0:58	38.85	0.647
9.40	59	0:59	43.44	0.724
8.40	60	1:00	48.95	0.816
7.40	61	1:01	55.67	0.928
6.40	62	1:02	63.98	1.066
5.40	63	1:03	74.44	1.241
4.40	64	1:04	87.86	1.464
3.40	65	1:05	105.53	1.759
2.40	66	1:06	129.48	2.158
1.40	67	1:07	163.14	2.719
0.40	68	1:08	212.69	3.545
0.60	69	1:09	214.66	3.578
1.60	70	1:10	181.47	3.025
2.60	71	1:11	155.63	2.594
3.60	72	1:12	135.09	2.252
4.60	73	1:13	118.49	1.975
5.60	74	1:14	104.88	1.748
6.60	75	1:15	93.56	1.559
7.60	76	1:16	84.05	1.401
8.60	77	1:17	75.98	1.266
9.60	78	1:18	69.06	1.151
10.60	79	1:19	63.09	1.052
11.60	80	1:20	57.90	0.965
12.60	81	1:21	53.35	0.889
13.60	82	1:22	49.34	0.822
14.60	83	1:23	45.80	0.763
15.60	84	1:24	42.64	0.711
16.60	85	1:25	39.81	0.664
17.60	86	1:26	37.28	0.621
18.60	87	1:27	34.99	0.583
19.60	88	1:28	32.92	0.549
20.60	89	1:29	31.04	0.517
21.60	90	1:30	29.33	0.489
22.60	91	1:31	27.76	0.463
23.60	92	1:32	26.33	0.439
24.60	93	1:33	25.01	0.417
25.60	94	1:34	23.79	0.397
26.60	95	1:35	22.67	0.378
27.60	96	1:36	21.63	0.361
28.60	97	1:37	20.67	0.344
29.60	98	1:38	19.77	0.330
30.60	99	1:39	18.94	0.316
31.60	100	1:40	18.16	0.303
32.60	101	1:41	17.43	0.291
33.60	102	1:42	16.75	0.279
34.60	103	1:43	16.12	0.269
35.60	104	1:44	15.52	0.259
36.60	105	1:45	14.95	0.249
37.60	106	1:46	14.42	0.240
38.60	107	1:47	13.93	0.232
39.60	108	1:48	13.45	0.224
40.60	109	1:49	13.01	0.217
41.60	110	1:50	12.59	0.210
42.60	111	1:51	12.19	0.203
43.60	112	1:52	11.81	0.197
44.60	113	1:53	11.45	0.191
45.60	114	1:54	11.11	0.185
46.60	115	1:55	10.78	0.180
47.60	116	1:56	10.47	0.175
48.60	117	1:57	10.18	0.170
49.60	118	1:58	9.89	0.165
50.60	119	1:59	9.63	0.160
51.60	120	2:00	9.37	0.156
52.60	121	2:01	9.12	0.152
53.60	122	2:02	8.89	0.148
54.60	123	2:03	8.67	0.144
55.60	124	2:04	8.45	0.141
56.60	125	2:05	8.24	0.137
57.60	126	2:06	8.05	0.134
58.60	127	2:07	7.86	0.131
59.60	128	2:08	7.67	0.128
60.60	129	2:09	7.50	0.125
61.60	130	2:10	7.33	0.122
62.60	131	2:11	7.17	0.119
63.60	132	2:12	7.01	0.117
64.60	133	2:13	6.86	0.114
65.60	134	2:14	6.71	0.112
66.60	135	2:15	6.57	0.110
67.60	136	2:16	6.44	0.107
68.60	137	2:17	6.31	0.105
69.60	138	2:18	6.18	0.103
70.60	139	2:19	6.06	0.101
71.60	140	2:20	5.94	0.099
72.60	141	2:21	5.83	0.097
73.60	142	2:22	5.72	0.095
74.60	143	2:23	5.61	0.094
75.60	144	2:24	5.51	0.092
76.60	145	2:25	5.41	0.090
77.60	146	2:26	5.31	0.088
78.60	147	2:27	5.22	0.087
79.60	148	2:28	5.13	0.085
80.60	149	2:29	5.04	0.084
81.60	150	2:30	4.95	0.083
82.60	151	2:31	4.87	0.081
83.60	152	2:32	4.79	0.080
84.60	153	2:33	4.71	0.079
85.60	154	2:34	4.64	0.077
86.60	155	2:35	4.56	0.076
87.60	156	2:36	4.49	0.075
88.60	157	2:37	4.42	0.074
89.60	158	2:38	4.35	0.073
90.60	159	2:39	4.29	0.071
91.60	160	2:40	4.22	0.070
92.60	161	2:41	4.16	0.069
93.60	162	2:42	4.10	0.068
94.60	163	2:43	4.04	0.067
95.60	164	2:44	3.98	0.066
96.60	165	2:45	3.92	0.065
97.60	166	2:46	3.87	0.064
98.60	167	2:47	3.81	0.064
99.60	168	2:48	3.76	0.063
100.60	169	2:49	3.71	0.062
101.60	170	2:50	3.66	0.061
102.60	171	2:51	3.61	0.060
103.60	172	2:52	3.56	0.059
104.60	173	2:53	3.51	0.059
105.60	174	2:54	3.47	0.058
106.60	175	2:55	3.42	0.057
107.60	176	2:56	3.38	0.056
108.60	177	2:57	3.34	0.056
109.60	178	2:58	3.30	0.055
110.60	179	2:59	3.25	0.054
111.60	180	3:00	3.21	0.054



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CHICAGO HYETOGRAPH CREATION: 100 YEAR RETURN PERIOD

DATE: January 9, 2025
JOB No.: SBM-23-2-310

Client: MCGW Properties Corp.
Project: Proposed Commercial Development
Location: 280 Weber Street North, Waterloo, Ontario

CITY OF WATERLOO DESIGN STORM PARAMETERS*

Return Period (years)	A,B,C Parameters		
	A	B	C
5	1501	9.258	0.882
25	3263	15.393	0.948
100	4692	17.437	0.956

*Intensity i=A/(t+B)^C (mm/hr)
* Refer to the City of Waterloo Volume 4 - Stormwater Management

Rainfall Duration= 3 hours
Rainfall Duration= 180 minutes
Starting Time= 0.00
Time Step= 0.01
r= 0.38 MTO DMM Section B, Page 14

t_p= 1
t_p * r= 0.38
t_p * (1-r)= 0.62

i_p= 289.3 peak rainfall intensity, mm/h
t_b= 68.4 time before the peak intensity, min
t_a= 111.6 time after the peak intensity, min
Total Rainfall Depth= 89.8 mm

Return Period (Years)	A,B,C Parameters A	B	C
100	4692.000	17.437	0.956

$i_p = \frac{A}{(t_p + B)^C}$ = peak rainfall intensity

Before the peak:

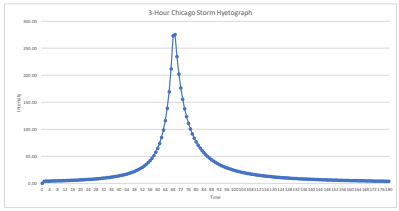
$i_b = \frac{A(1-r)t_b/(1-B)}{[t_b/r + B]^{-C}}$

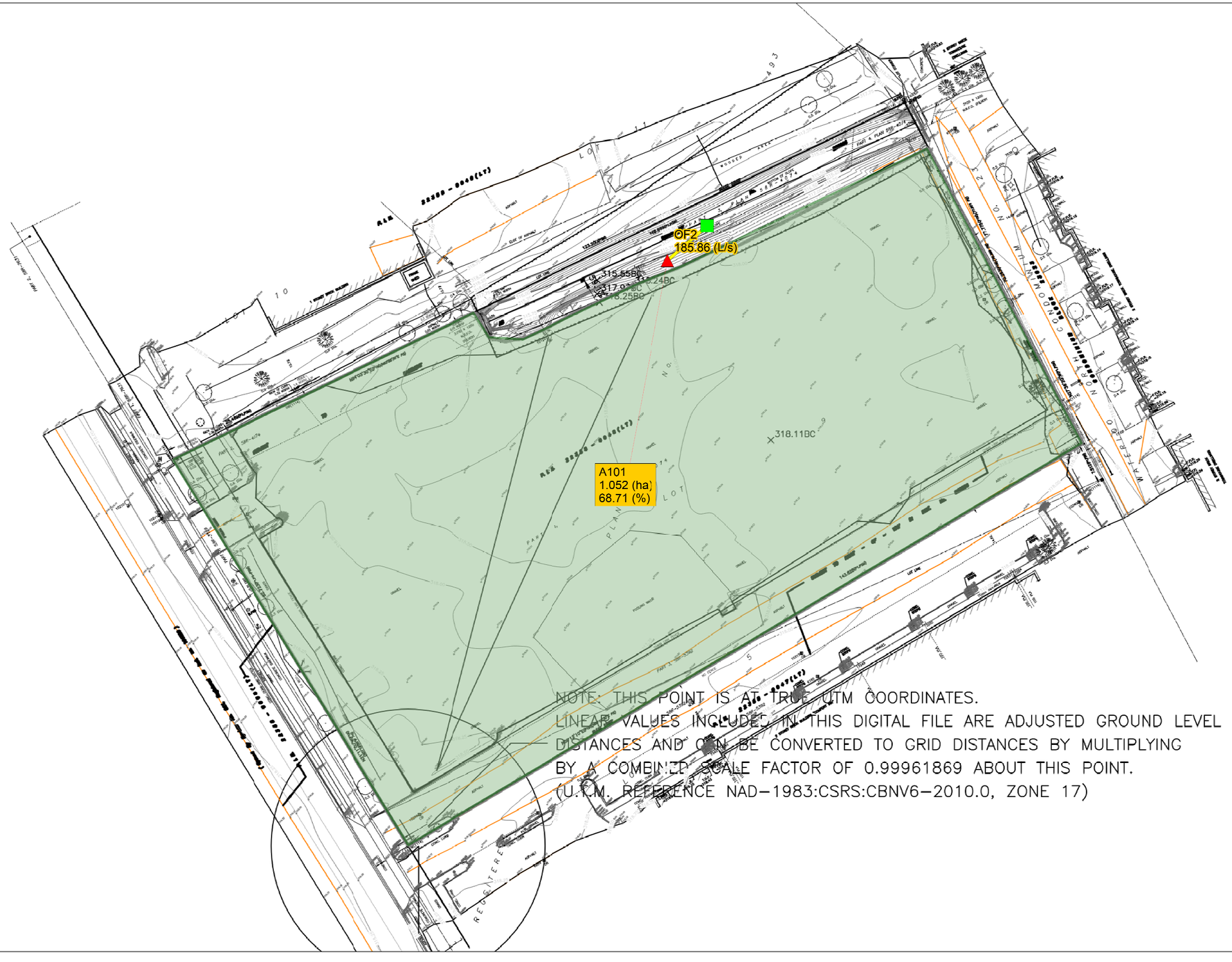
After the peak:

$i_a = \frac{A(1)-r)t_a/(1-t))+B]}{[t_a/(1-r) + B]^{-C}}$

100-Year Hyetograph

t_b OR t_a	Time (min)	Time (h:m)	Intensity	Rainfall Depth
68.40	0	0:00	0.00	0.000
67.40	1	0:01	3.94	0.066
66.40	2	0:02	4.02	0.067
65.40	3	0:03	4.11	0.069
64.40	4	0:04	4.21	0.070
63.40	5	0:05	4.31	0.072
62.40	6	0:06	4.41	0.073
61.40	7	0:07	4.52	0.075
60.40	8	0:08	4.63	0.077
59.40	9	0:09	4.74	0.079
58.40	10	0:10	4.86	0.081
57.40	11	0:11	4.99	0.083
56.40	12	0:12	5.12	0.085
55.40	13	0:13	5.26	0.088
54.40	14	0:14	5.40	0.090
53.40	15	0:15	5.55	0.092
52.40	16	0:16	5.71	0.095
51.40	17	0:17	5.87	0.098
50.40	18	0:18	6.04	0.101
49.40	19	0:19	6.23	0.104
48.40	20	0:20	6.42	0.107
47.40	21	0:21	6.62	0.110
46.40	22	0:22	6.83	0.114
45.40	23	0:23	7.05	0.118
44.40	24	0:24	7.29	0.121
43.40	25	0:25	7.54	0.126
42.40	26	0:26	7.80	0.130
41.40	27	0:27	8.08	0.135
40.40	28	0:28	8.38	0.140
39.40	29	0:29	8.69	0.145
38.40	30	0:30	9.02	0.150
37.40	31	0:31	9.38	0.156
36.40	32	0:32	9.76	0.163
35.40	33	0:33	10.16	0.169
34.40	34	0:34	10.59	0.177
33.40	35	0:35	11.06	0.184
32.40	36	0:36	11.56	0.193
31.40	37	0:37	12.09	0.202
30.40	38	0:38	12.67	0.211
29.40	39	0:39	13.29	0.222
28.40	40	0:40	13.97	0.233
27.40	41	0:41	14.70	0.245
26.40	42	0:42	15.49	0.258
25.40	43	0:43	16.36	0.273
24.40	44	0:44	17.31	0.288
23.40	45	0:45	18.35	0.306
22.40	46	0:46	19.49	0.325
21.40	47	0:47	20.76	0.346
20.40	48	0:48	22.16	0.369
19.40	49	0:49	23.71	0.395
18.40	50	0:50	25.45	0.424
17.40	51	0:51	27.40	0.457
16.40	52	0:52	29.60	0.493
15.40	53	0:53	32.09	0.535
14.40	54	0:54	34.93	0.582
13.40	55	0:55	38.19	0.637
12.40	56	0:56	41.96	0.699
11.40	57	0:57	46.35	0.772
10.40	58	0:58	51.50	0.858
9.40	59	0:59	57.62	0.960
8.40	60	1:00	64.95	1.082
7.40	61	1:01	73.84	1.231
6.40	62	1:02	84.80	1.413
5.40	63	1:03	98.51	1.642
4.40	64	1:04	115.99	1.933
3.40	65	1:05	138.79	2.313
2.40	66	1:06	169.16	2.819
1.40	67	1:07	211.69	3.528
0.40	68	1:08	272.82	4.547
0.60	69	1:09	275.22	4.587
1.60	70	1:10	234.47	3.908
2.60	71	1:11	202.31	3.372
3.60	72	1:12	176.47	2.941
4.60	73	1:13	155.39	2.590
5.60	74	1:14	137.95	2.299
6.60	75	1:15	123.37	2.056
7.60	76	1:16	111.04	1.851
8.60	77	1:17	100.52	1.675
9.60	78	1:18	91.47	1.525
10.60	79	1:19	83.63	1.394
11.60	80	1:20	76.79	1.280
12.60	81	1:21	70.78	1.180
13.60	82	1:22	65.47	1.091
14.60	83	1:23	60.76	1.013
15.60	84	1:24	56.56	0.943
16.60	85	1:25	52.79	0.880
17.60	86	1:26	49.41	0.823
18.60	87	1:27	46.35	0.772
19.60	88	1:28	43.58	0.726
20.60	89	1:29	41.06	0.684
21.60	90	1:30	38.76	0.646
22.60	91	1:31	36.66	0.611
23.60	92	1:32	34.74	0.579
24.60	93	1:33	32.97	0.549
25.60	94	1:34	31.33	0.522
26.60	95	1:35	29.83	0.497
27.60	96	1:36	28.43	0.474
28.60	97	1:37	27.14	0.452
29.60	98	1:38	25.93	0.432
30.60	99	1:39	24.81	0.414
31.60	100	1:40	23.77	0.396
32.60	101	1:41	22.79	0.380
33.60	102	1:42	21.87	0.365
34.60	103	1:43	21.02	0.350
35.60	104	1:44	20.21	0.337
36.60	105	1:45	19.46	0.324
37.60	106	1:46	18.74	0.312
38.60	107	1:47	18.07	0.301
39.60	108	1:48	17.44	0.291
40.60	109	1:49	16.84	0.281
41.60	110	1:50	16.27	0.271
42.60	111	1:51	15.74	0.262
43.60	112	1:52	15.23	0.254
44.60	113	1:53	14.75	0.246
45.60	114	1:54	14.29	0.238
46.60	115	1:55	13.85	0.231
47.60	116	1:56	13.44	0.224
48.60	117	1:57	13.05	0.217
49.60	118	1:58	12.67	0.211
50.60	119	1:59	12.31	0.205
51.60	120	2:00	11.97	0.199
52.60	121	2:01	11.64	0.194
53.60	122	2:02	11.33	0.189
54.60	123	2:03	11.03	0.184
55.60	124	2:04	10.74	0.179
56.60	125	2:05	10.47	0.174
57.60	126	2:06	10.20	0.170
58.60	127	2:07	9.95	0.166
59.60	128	2:08	9.71	0.162
60.60	129	2:09	9.47	0.158
61.60	130	2:10	9.25	0.154
62.60	131	2:11	9.03	0.151
63.60	132	2:12	8.83	0.147
64.60	133	2:13	8.63	0.144
65.60	134	2:14	8.43	0.141
66.60	135	2:15	8.25	0.137
67.60	136	2:16	8.07	0.135
68.60	137	2:17	7.90	0.132
69.60	138	2:18	7.73	0.129
70.60	139	2:19	7.57	0.126
71.60	140	2:20	7.42	0.124
72.60	141	2:21	7.27	0.121
73.60	142	2:22	7.12	0.119
74.60	143	2:23	6.98	0.116
75.60	144	2:24	6.84	0.114
76.60	145	2:25	6.71	0.112
77.60	146	2:26	6.59	0.110
78.60	147	2:27	6.46	0.108
79.60	148	2:28	6.34	0.106
80.60	149	2:29	6.23	0.104
81.60	150	2:30	6.11	0.102
82.60	151	2:31	6.01	0.100
83.60	152	2:32	5.90	0.098
84.60	153	2:33	5.80	0.097
85.60	154	2:34	5.70	0.095
86.60	155	2:35	5.60	0.093
87.60	156	2:36	5.51	0.092
88.60	157	2:37	5.41	0.090
89.60	158	2:38	5.32	0.089
90.60	159	2:39	5.24	0.087
91.60	160	2:40	5.15	0.086
92.60	161	2:41	5.07	0.085
93.60	162	2:42	4.99	0.083
94.60	163	2:43	4.91	0.082
95.60	164	2:44	4.84	0.081
96.60	165	2:45	4.76	0.079
97.60	166	2:46	4.69	0.078
98.60	167	2:47	4.62	0.077
99.60	168	2:48	4.55	0.076
100.60	169	2:49	4.49	0.075
101.60	170	2:50	4.42	0.074
102.60	171	2:51	4.36	0.073
103.60	172	2:52	4.30	0.072
104.60	173	2:53	4.24	0.071
105.60	174	2:54	4.18	0.070
106.60	175	2:55	4.12	0.069
107.60	176	2:56	4.06	0.068
108.60	177	2:57	4.01	0.067
109.60	178	2:58	3.96	0.066
110.60	179	2:59	3.90	0.065
111.60	180	3:00	3.85	0.064





Legend

- Outfalls
- Storages
- Conduits
- Subcatchments

N

400 m

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

WARNING 01: wet weather time step reduced to recording interval for Rain Gage COW

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 1
Number of nodes 2
Number of links 1
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
COW	5-YEAR	INTENSITY	1 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
A101	1.05	110.74	68.71	0.6300	COW	OF2

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OF2	OUTFALL	317.90	1.00	0.0	
SU1	STORAGE	0.00	5.00	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	OF2	SU1	CONDUIT	400.0	130.9444	0.0100

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	1.00	0.79	0.25	1.00	1	35668.61

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... LPS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 12/20/2024 00:00:00
Ending Date 12/21/2024 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance ..... 0.001524 m

**************************	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
**************************	---------	-------
Total Precipitation	0.034	32.323
Evaporation Loss	0.000	0.000
Infiltration Loss	0.008	7.198
Surface Runoff	0.025	23.759
Final Storage	0.001	1.378
Continuity Error (%)	-0.038	

**************************	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
**************************	---------	---------
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.025	0.250
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.025	0.250
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

Time-Step Critical Elements

None

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step	:	4.50 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00
Time Step Frequencies	:	
5.000 - 3.155 sec	:	100.00 %
3.155 - 1.991 sec	:	0.00 %
1.991 - 1.256 sec	:	0.00 %
1.256 - 0.792 sec	:	0.00 %
0.792 - 0.500 sec	:	0.00 %

Subcatchment Runoff Summary

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
A101	32.32	0.00	0.00	7.20	21.24	2.52	23.76	0.25	185.86	0.735

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
OF2	OUTFALL	0.00	0.00	317.90	0 00:00	0.00
SU1	STORAGE	0.00	0.00	0.00	0 00:00	0.00

Node Inflow Summary

Node	Type	Maximum Lateral	Maximum Total	Time of Max	Lateral Inflow	Total Inflow	Flow Balance

Node	Type	Inflow LPS	Inflow LPS	Occurrence days hr:min	Volume 10^6 ltr	Volume 10^6 ltr	Error Percent	
OF2	OUTFALL	185.86	185.86	0 01:11	0.25	0.25	0.000	
SU1	STORAGE	0.00	0.00	0 00:00	0	0	0.000	ltr

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SU1	0.000	0	0	0	0.000	0	0 00:00	0.00

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
OF2	25.22	11.46	185.86	0.250
System	25.22	11.46	185.86	0.250

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.00	0 00:00	0.00	0.00	0.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Tue Dec 24 13:51:38 2024
Analysis ended on: Tue Dec 24 13:51:38 2024
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

WARNING 01: wet weather time step reduced to recording interval for Rain Gage COW

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 1
Number of nodes 2
Number of links 1
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
COW	25-YEAR	INTENSITY	1 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
A101	1.05	110.74	68.71	0.6300	COW	OF2

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OF2	OUTFALL	317.90	1.00	0.0	
SU1	STORAGE	0.00	5.00	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	OF2	SU1	CONDUIT	400.0	130.9444	0.0100

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	1.00	0.79	0.25	1.00	1	35668.61

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... LPS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 12/20/2024 00:00:00
Ending Date 12/21/2024 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance ..... 0.001524 m

*************************	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
*************************	---------	-------
Total Precipitation	0.073	69.099
Evaporation Loss	0.000	0.000
Infiltration Loss	0.011	10.080
Surface Runoff	0.061	57.660
Final Storage	0.001	1.380
Continuity Error (%)	-0.030	

*************************	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
*************************	---------	---------
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.061	0.607
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.061	0.607
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

Time-Step Critical Elements

None

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step	:	4.50 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00
Time Step Frequencies	:	
5.000 - 3.155 sec	:	100.00 %
3.155 - 1.991 sec	:	0.00 %
1.991 - 1.256 sec	:	0.00 %
1.256 - 0.792 sec	:	0.00 %
0.792 - 0.500 sec	:	0.00 %

Subcatchment Runoff Summary

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
A101	69.10	0.00	0.00	10.08	46.51	11.15	57.66	0.61	380.08	0.834

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
OF2	OUTFALL	0.00	0.00	317.90	0 00:00	0.00
SU1	STORAGE	0.00	0.00	0.00	0 00:00	0.00

Node Inflow Summary

Node	Type	Maximum Lateral	Maximum Total	Time of Max	Lateral Inflow	Total Inflow	Flow Balance

Node	Type	Inflow LPS	Inflow LPS	Occurrence days hr:min	Volume 10^6 ltr	Volume 10^6 ltr	Error Percent	
OF2	OUTFALL	380.08	380.08	0 01:11	0.607	0.607	0.000	
SU1	STORAGE	0.00	0.00	0 00:00	0	0	0.000	ltr

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SU1	0.000	0	0	0	0.000	0	0 00:00	0.00

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
OF2	25.76	27.25	380.08	0.607
System	25.76	27.25	380.08	0.607

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.00	0 00:00	0.00	0.00	0.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Tue Dec 24 14:01:03 2024
Analysis ended on: Tue Dec 24 14:01:03 2024
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

WARNING 01: wet weather time step reduced to recording interval for Rain Gage COW

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 1
Number of nodes 2
Number of links 1
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
COW	100-YEAR	INTENSITY	1 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
A101	1.05	110.74	68.71	0.6300	COW	OF2

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OF2	OUTFALL	317.90	1.00	0.0	
SU1	STORAGE	0.00	5.00	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	OF2	SU1	CONDUIT	400.0	130.9444	0.0100

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	1.00	0.79	0.25	1.00	1	35668.61

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... LPS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 12/20/2024 00:00:00
Ending Date 12/21/2024 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance ..... 0.001524 m

*************************	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
*************************	---------	-------
Total Precipitation	0.095	89.873
Evaporation Loss	0.000	0.000
Infiltration Loss	0.012	11.007
Surface Runoff	0.082	77.515
Final Storage	0.001	1.379
Continuity Error (%)	-0.031	

*************************	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
*************************	---------	---------
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.082	0.815
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.082	0.815
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

Time-Step Critical Elements

None

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step	:	4.50 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00
Time Step Frequencies	:	
5.000 - 3.155 sec	:	100.00 %
3.155 - 1.991 sec	:	0.00 %
1.991 - 1.256 sec	:	0.00 %
1.256 - 0.792 sec	:	0.00 %
0.792 - 0.500 sec	:	0.00 %

Subcatchment Runoff Summary

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
A101	89.87	0.00	0.00	11.01	60.79	16.72	77.51	0.82	519.61	0.862

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
OF2	OUTFALL	0.00	0.00	317.90	0 00:00	0.00
SU1	STORAGE	0.00	0.00	0.00	0 00:00	0.00

Node Inflow Summary

Node	Type	Maximum Lateral	Maximum Total	Time of Max	Lateral Inflow	Total Inflow	Flow Balance

Node	Type	Inflow LPS	Inflow LPS	Occurrence days hr:min	Volume 10^6 ltr	Volume 10^6 ltr	Error Percent	
OF2	OUTFALL	519.61	519.61	0 01:11	0.815	0.815	0.000	
SU1	STORAGE	0.00	0.00	0 00:00	0	0	0.000	ltr

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SU1	0.000	0	0	0	0.000	0	0 00:00	0.00

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
OF2	25.88	36.45	519.61	0.815
System	25.88	36.45	519.61	0.815

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.00	0 00:00	0.00	0.00	0.00

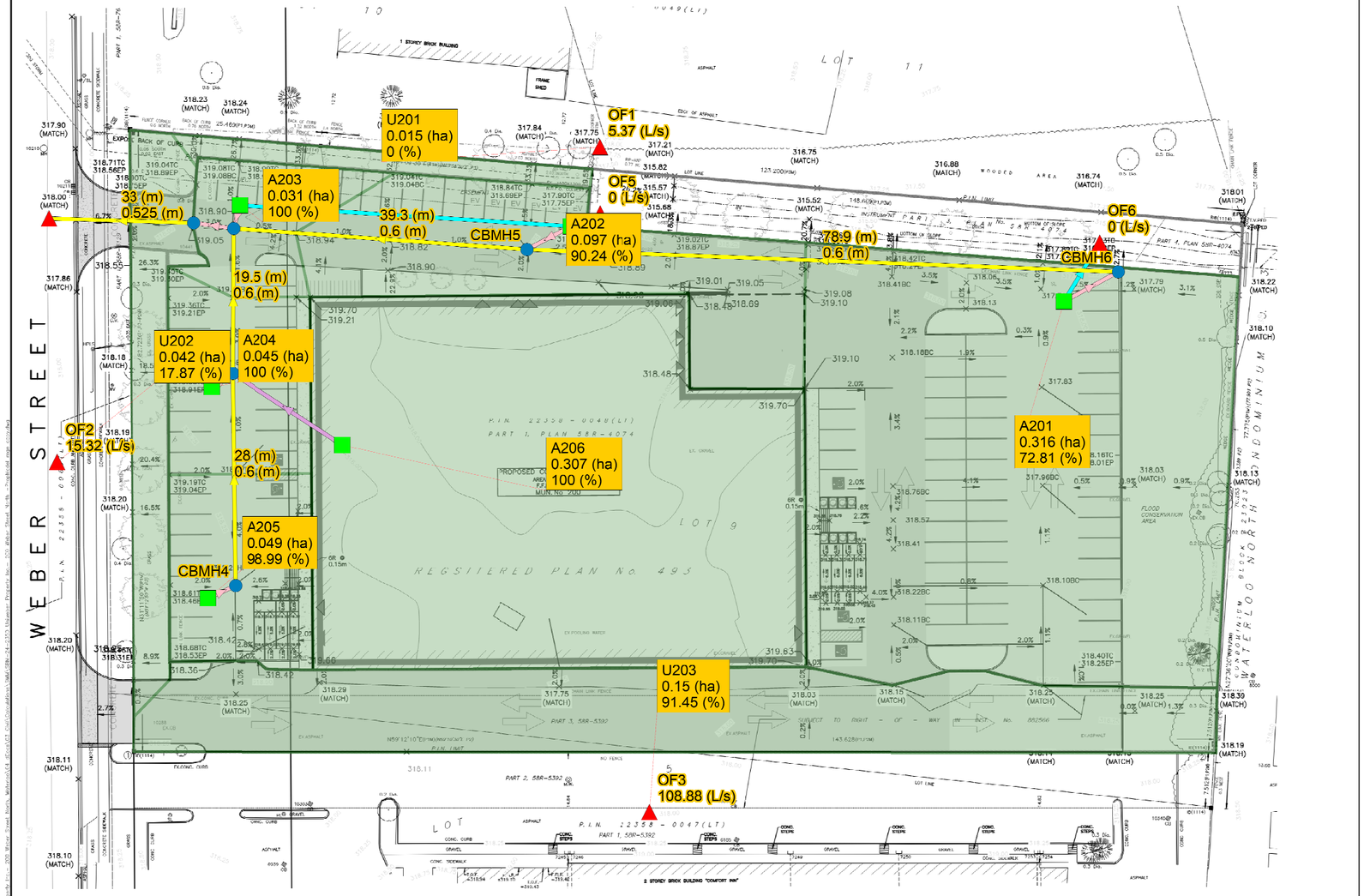
****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Tue Dec 24 14:02:20 2024
Analysis ended on: Tue Dec 24 14:02:20 2024
Total elapsed time: < 1 sec



AS CONSTRUCTED SERVICES	COMPLETION		No.	REVISIONS	D/M/Y	BY
		DESIGN XX				
		DRAWN XX				
		CHECKED XX				
		APPROVED XX/KAM				
		DATE 20/12/2024				
		CAD 19-XXXX				

CONSULTANT

STRIK BALDINELLI MONIZ
PLANNING - CIVIL - STRUCTURAL - MECHANICAL - ELECTRICAL
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ENGINEER'S STAMP

PRELIMINARY NOT FOR CONSTRUCTION

ENGINEER'S STAMP

CLIENT

CLIENT
ADDRESS
LONDON, ON
POSTAL CODE
P: XXX.XXX.XXXX
E: XXX@XXX.XXX

SCALE

SCALE - 1:
1.0 0

Legend

- Junctions
- Outfalls
- Storages
- Conduits
- Orifices
- Weirs
- Outlets
- Subcatchments

N

0.5 km

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

WARNING 01: wet weather time step reduced to recording interval for Rain Gage COW

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 9
Number of nodes 18
Number of links 15
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
COW	5-YEAR	INTENSITY	1 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
A201	0.32	37.18	72.81	2.0500	COW	SU7
A202	0.10	51.05	90.24	4.0000	COW	SU6
A203	0.03	18.23	100.00	1.0000	COW	SU8
A204	0.04	23.68	100.00	3.0000	COW	SU5
A205	0.05	21.30	98.99	2.0000	COW	SU9
A206	0.31	341.11	100.00	2.0000	COW	SU1
U201	0.01	50.00	0.00	0.3300	COW	OF1
U202	0.04	84.00	17.87	0.2600	COW	OF2
U203	0.15	68.18	91.45	1.6300	COW	OF3

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
CBMH2	JUNCTION	316.19	2.71	0.0	
CBMH3	JUNCTION	316.63	2.11	0.0	
CBMH4	JUNCTION	316.82	1.47	0.0	
CBMH5	JUNCTION	316.31	2.29	0.0	
CBMH6	JUNCTION	316.70	0.90	0.0	
ORIFICE-LINK	JUNCTION	316.19	2.71	0.0	
OF1	OUTFALL	317.74	0.00	0.0	
OF2	OUTFALL	318.13	0.00	0.0	
OF3	OUTFALL	318.00	0.00	0.0	
OF4	OUTFALL	316.09	0.53	0.0	
OF5	OUTFALL	0.00	0.00	0.0	
OF6	OUTFALL	0.00	0.00	0.0	
SU1	STORAGE	328.50	0.15	0.0	
SU5	STORAGE	318.74	0.13	0.0	
SU6	STORAGE	318.60	0.12	0.0	
SU7	STORAGE	317.60	0.16	0.0	
SU8	STORAGE	318.90	0.04	0.0	
SU9	STORAGE	318.29	0.07	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	CBMH6	CBMH5	CONDUIT	78.9	0.3169	0.0130
C5	CBMH5	CBMH2	CONDUIT	39.3	0.3053	0.0130
C6	CBMH4	CBMH3	CONDUIT	28.0	0.6786	0.0130
C7	CBMH3	CBMH2	CONDUIT	19.5	0.7180	0.0130
C8	ORIFICE-LINK	OF4	CONDUIT	33.0	0.3030	0.0130
OR1	CBMH2	ORIFICE-LINK	ORIFICE			
OR2	SU9	CBMH4	ORIFICE			
OR3	SU5	CBMH3	ORIFICE			
OR4	SU8	CBMH2	ORIFICE			
OR5	SU6	CBMH5	ORIFICE			
OR6	SU7	CBMH6	ORIFICE			
W1	SU8	SU6	WEIR			
W2	SU7	OF6	WEIR			
W3	SU6	OF5	WEIR			
C9	SU1	CBMH3	OUTLET			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow

C1	CIRCULAR	0.60	0.28	0.15	0.60	1	345.65
C5	CIRCULAR	0.60	0.28	0.15	0.60	1	339.31
C6	CIRCULAR	0.60	0.28	0.15	0.60	1	505.83
C7	CIRCULAR	0.60	0.28	0.15	0.60	1	520.30
C8	CIRCULAR	0.53	0.22	0.13	0.53	1	236.76

NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.

Analysis Options

Flow Units ..... LPS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 12/20/2024 00:00:00
Ending Date 12/21/2024 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance ..... 0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	0.034	32.323
Evaporation Loss	0.000	0.000
Infiltration Loss	0.004	3.675
Surface Runoff	0.029	27.265
Final Storage	0.001	1.404
Continuity Error (%)	-0.067	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.029	0.287
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.027	0.273
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.001	0.014
Continuity Error (%)	0.016	

Time-Step Critical Elements

None

Highest Flow Instability Indexes

Link OR6 (2)

Routing Time Step Summary

Minimum Time Step	:	4.50 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.01
Percent Not Converging	:	0.00
Time Step Frequencies	:	
5.000 - 3.155 sec	:	100.00 %
3.155 - 1.991 sec	:	0.00 %

```
      1.991 -  1.256 sec      :     0.00 %
      1.256 -  0.792 sec      :     0.00 %
      0.792 -  0.500 sec      :     0.00 %
```

Subcatchment Runoff Summary

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
A201	32.32	0.00	0.00	6.69	22.51	1.76	24.27	0.08	67.75	0.751
A202	32.32	0.00	0.00	2.35	27.90	0.68	28.59	0.03	31.03	0.884
A203	32.32	0.00	0.00	0.00	30.92	0.00	30.92	0.01	10.53	0.957
A204	32.32	0.00	0.00	0.00	30.92	0.00	30.92	0.01	15.78	0.957
A205	32.32	0.00	0.00	0.24	30.61	0.07	30.68	0.02	16.56	0.949
A206	32.32	0.00	0.00	0.00	30.92	0.00	30.92	0.09	109.74	0.957
U201	32.32	0.00	0.00	24.26	0.00	6.80	6.80	0.00	0.43	0.210
U202	32.32	0.00	0.00	20.01	5.52	5.50	11.03	0.00	2.71	0.341
U203	32.32	0.00	0.00	2.06	28.28	0.60	28.87	0.04	46.93	0.893

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
CBMH2	JUNCTION	0.03	0.38	316.57	0 01:12	0.38
CBMH3	JUNCTION	0.02	0.10	316.73	0 01:10	0.10
CBMH4	JUNCTION	0.00	0.07	316.89	0 01:10	0.07
CBMH5	JUNCTION	0.01	0.27	316.58	0 01:12	0.27
CBMH6	JUNCTION	0.01	0.18	316.88	0 01:11	0.18
ORIFICE-LINK	JUNCTION	0.03	0.26	316.45	0 01:12	0.26
OF1	OUTFALL	0.00	0.00	317.74	0 00:00	0.00
OF2	OUTFALL	0.00	0.00	318.13	0 00:00	0.00
OF3	OUTFALL	0.00	0.00	318.00	0 00:00	0.00
OF4	OUTFALL	0.02	0.23	316.32	0 01:12	0.23
OF5	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OF6	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
SU1	STORAGE	0.01	0.03	328.53	0 02:39	0.03
SU5	STORAGE	0.00	0.02	318.76	0 01:10	0.02
SU6	STORAGE	0.00	0.04	318.64	0 01:10	0.04
SU7	STORAGE	0.00	0.06	317.66	0 01:10	0.06
SU8	STORAGE	0.00	0.02	318.92	0 01:10	0.02
SU9	STORAGE	0.00	0.02	318.31	0 01:10	0.02

Node Inflow Summary

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent	
CBMH2	JUNCTION	0.00	125.60	0 01:11	0	0.224	0.063	
CBMH3	JUNCTION	0.00	32.83	0 01:10	0	0.11	0.044	
CBMH4	JUNCTION	0.00	16.60	0 01:10	0	0.015	-0.054	
CBMH5	JUNCTION	0.00	89.73	0 01:11	0	0.104	-0.054	
CBMH6	JUNCTION	0.00	68.02	0 01:10	0	0.0767	0.024	
ORIFICE-LINK	JUNCTION	0.00	120.37	0 01:12	0	0.224	0.032	
OF1	OUTFALL	0.43	0.43	0 01:21	0.00102	0.00102	0.000	
OF2	OUTFALL	2.71	2.71	0 01:10	0.00463	0.00463	0.000	
OF3	OUTFALL	46.93	46.93	0 01:10	0.0433	0.0433	0.000	
OF4	OUTFALL	0.00	120.72	0 01:12	0	0.224	0.000	
OF5	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	ltr
OF6	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	ltr
SU1	STORAGE	109.74	109.74	0 01:10	0.0949	0.0949	0.002	
SU5	STORAGE	15.78	15.78	0 01:10	0.0139	0.0139	-0.008	
SU6	STORAGE	31.03	31.03	0 01:10	0.0277	0.0277	-0.004	
SU7	STORAGE	67.75	67.75	0 01:10	0.0767	0.0767	-0.052	
SU8	STORAGE	10.53	10.53	0 01:10	0.00959	0.00959	-0.007	
SU9	STORAGE	16.56	16.56	0 01:10	0.015	0.015	-0.009	

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SU1	0.040	8	0	0	0.082	17	0 02:39	1.93
SU5	0.000	0	0	0	0.000	1	0 01:10	15.80
SU6	0.000	0	0	0	0.000	3	0 01:10	30.74
SU7	0.000	0	0	0	0.000	6	0 01:10	68.02
SU8	0.000	0	0	0	0.000	10	0 01:10	10.49
SU9	0.000	0	0	0	0.000	4	0 01:10	16.60

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
OF1	7.82	0.15	0.43	0.001
OF2	10.67	0.50	2.71	0.005
OF3	14.37	3.48	46.93	0.043
OF4	99.20	2.61	120.72	0.224
OF5	0.00	0.00	0.00	0.000
OF6	0.00	0.00	0.00	0.000
System	22.01	6.74	156.08	0.273

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	64.77	0 01:11	0.99	0.19	0.28
C5	CONDUIT	86.39	0 01:11	0.66	0.25	0.54
C6	CONDUIT	16.40	0 01:10	0.64	0.03	0.15
C7	CONDUIT	32.36	0 01:10	1.02	0.06	0.17
C8	CONDUIT	120.72	0 01:12	1.22	0.51	0.47
OR1	ORIFICE	120.37	0 01:12			0.84
OR2	ORIFICE	16.60	0 01:10			
OR3	ORIFICE	15.80	0 01:10			
OR4	ORIFICE	10.49	0 01:10			
OR5	ORIFICE	30.74	0 01:10			
OR6	ORIFICE	68.02	0 01:10			
W1	WEIR	0.00	0 00:00		0.00	
W2	WEIR	0.00	0 00:00		0.00	
W3	WEIR	0.00	0 00:00		0.00	
C9	DUMMY	1.93	0 02:39			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C5	1.00	0.00	0.12	0.00	0.88	0.00	0.00	0.00	0.98	0.00
C6	1.00	0.00	0.64	0.00	0.36	0.00	0.00	0.00	1.00	0.00
C7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.89	0.10	0.00	0.00	0.00	0.00

****

Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Fri Jan 10 12:24:38 2025
Analysis ended on: Fri Jan 10 12:24:38 2025
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

WARNING 01: wet weather time step reduced to recording interval for Rain Gage COW

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 9
Number of nodes 18
Number of links 15
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
COW	25-YEAR	INTENSITY	1 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
A201	0.32	37.18	72.81	2.0500	COW	SU7
A202	0.10	51.05	90.24	4.0000	COW	SU6
A203	0.03	18.23	100.00	1.0000	COW	SU8
A204	0.04	23.68	100.00	3.0000	COW	SU5
A205	0.05	21.30	98.99	2.0000	COW	SU9
A206	0.31	341.11	100.00	2.0000	COW	SU1
U201	0.01	50.00	0.00	0.3300	COW	OF1
U202	0.04	84.00	17.87	0.2600	COW	OF2
U203	0.15	68.18	91.45	1.6300	COW	OF3

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
CBMH2	JUNCTION	316.19	2.71	0.0	
CBMH3	JUNCTION	316.63	2.11	0.0	
CBMH4	JUNCTION	316.82	1.47	0.0	
CBMH5	JUNCTION	316.31	2.29	0.0	
CBMH6	JUNCTION	316.70	0.90	0.0	
ORIFICE-LINK	JUNCTION	316.19	2.71	0.0	
OF1	OUTFALL	317.74	0.00	0.0	
OF2	OUTFALL	318.13	0.00	0.0	
OF3	OUTFALL	318.00	0.00	0.0	
OF4	OUTFALL	316.09	0.53	0.0	
OF5	OUTFALL	0.00	0.00	0.0	
OF6	OUTFALL	0.00	0.00	0.0	
SU1	STORAGE	328.50	0.15	0.0	
SU5	STORAGE	318.74	0.13	0.0	
SU6	STORAGE	318.60	0.12	0.0	
SU7	STORAGE	317.60	0.16	0.0	
SU8	STORAGE	318.90	0.04	0.0	
SU9	STORAGE	318.29	0.07	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	CBMH6	CBMH5	CONDUIT	78.9	0.3169	0.0130
C5	CBMH5	CBMH2	CONDUIT	39.3	0.3053	0.0130
C6	CBMH4	CBMH3	CONDUIT	28.0	0.6786	0.0130
C7	CBMH3	CBMH2	CONDUIT	19.5	0.7180	0.0130
C8	ORIFICE-LINK	OF4	CONDUIT	33.0	0.3030	0.0130
OR1	CBMH2	ORIFICE-LINK	ORIFICE			
OR2	SU9	CBMH4	ORIFICE			
OR3	SU5	CBMH3	ORIFICE			
OR4	SU8	CBMH2	ORIFICE			
OR5	SU6	CBMH5	ORIFICE			
OR6	SU7	CBMH6	ORIFICE			
W1	SU8	SU6	WEIR			
W2	SU7	OF6	WEIR			
W3	SU6	OF5	WEIR			
C9	SU1	CBMH3	OUTLET			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow

C1	CIRCULAR	0.60	0.28	0.15	0.60	1	345.65
C5	CIRCULAR	0.60	0.28	0.15	0.60	1	339.31
C6	CIRCULAR	0.60	0.28	0.15	0.60	1	505.83
C7	CIRCULAR	0.60	0.28	0.15	0.60	1	520.30
C8	CIRCULAR	0.53	0.22	0.13	0.53	1	236.76

NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.

Analysis Options

Flow Units ..... LPS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 12/20/2024 00:00:00
Ending Date 12/21/2024 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance ..... 0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	0.073	69.099
Evaporation Loss	0.000	0.000
Infiltration Loss	0.006	5.448
Surface Runoff	0.066	62.275
Final Storage	0.001	1.404
Continuity Error (%)	-0.041	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.066	0.655
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.062	0.624
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.003	0.031
Continuity Error (%)	0.000	

Time-Step Critical Elements

None

Highest Flow Instability Indexes

Link OR6 (4)

Routing Time Step Summary

Minimum Time Step	:	4.50 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.02
Percent Not Converging	:	0.01
Time Step Frequencies	:	
5.000 - 3.155 sec	:	100.00 %
3.155 - 1.991 sec	:	0.00 %

1.991 - 1.256 sec : 0.00 %
1.256 - 0.792 sec : 0.00 %
0.792 - 0.500 sec : 0.00 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
A201	69.10	0.00	0.00	9.90	49.29	8.55	57.84	0.18	130.52	0.837
A202	69.10	0.00	0.00	3.49	61.09	3.14	64.23	0.06	54.65	0.930
A203	69.10	0.00	0.00	0.00	67.70	0.00	67.70	0.02	18.06	0.980
A204	69.10	0.00	0.00	0.00	67.70	0.00	67.70	0.03	26.58	0.980
A205	69.10	0.00	0.00	0.36	67.02	0.33	67.34	0.03	28.48	0.975
A206	69.10	0.00	0.00	0.00	67.70	0.00	67.70	0.21	182.60	0.980
U201	69.10	0.00	0.00	36.02	0.00	31.85	31.85	0.00	3.25	0.461
U202	69.10	0.00	0.00	29.69	12.10	26.05	38.15	0.02	9.36	0.552
U203	69.10	0.00	0.00	3.06	61.91	2.74	64.66	0.10	83.60	0.936

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
CBMH2	JUNCTION	0.05	0.60	316.79	0 01:12	0.59
CBMH3	JUNCTION	0.03	0.16	316.79	0 01:12	0.15
CBMH4	JUNCTION	0.00	0.10	316.92	0 01:10	0.10
CBMH5	JUNCTION	0.01	0.50	316.81	0 01:12	0.50
CBMH6	JUNCTION	0.01	0.25	316.95	0 01:10	0.25
ORIFICE-LINK	JUNCTION	0.04	0.37	316.56	0 01:12	0.37
OF1	OUTFALL	0.00	0.00	317.74	0 00:00	0.00
OF2	OUTFALL	0.00	0.00	318.13	0 00:00	0.00
OF3	OUTFALL	0.00	0.00	318.00	0 00:00	0.00
OF4	OUTFALL	0.04	0.32	316.41	0 01:12	0.32
OF5	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OF6	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
SU1	STORAGE	0.03	0.06	328.56	0 02:32	0.06
SU5	STORAGE	0.00	0.03	318.77	0 01:10	0.03
SU6	STORAGE	0.00	0.05	318.65	0 01:10	0.05
SU7	STORAGE	0.00	0.10	317.70	0 01:10	0.10
SU8	STORAGE	0.00	0.03	318.93	0 01:10	0.03
SU9	STORAGE	0.00	0.03	318.32	0 01:10	0.03

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent	
CBMH2	JUNCTION	0.00	226.15	0 01:12	0	0.506	0.011	
CBMH3	JUNCTION	0.00	56.61	0 01:10	0	0.24	0.093	
CBMH4	JUNCTION	0.00	28.46	0 01:10	0	0.033	-0.050	
CBMH5	JUNCTION	0.00	181.90	0 01:10	0	0.245	-0.259	
CBMH6	JUNCTION	0.00	130.74	0 01:10	0	0.183	0.299	
ORIFICE-LINK	JUNCTION	0.00	221.96	0 01:12	0	0.506	0.012	
OF1	OUTFALL	3.25	3.25	0 01:13	0.00478	0.00478	0.000	
OF2	OUTFALL	9.36	9.36	0 01:12	0.016	0.016	0.000	
OF3	OUTFALL	83.60	83.60	0 01:10	0.097	0.097	0.000	
OF4	OUTFALL	0.00	222.09	0 01:12	0	0.506	0.000	
OF5	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	ltr
OF6	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	ltr
SU1	STORAGE	182.60	182.60	0 01:10	0.208	0.208	0.002	
SU5	STORAGE	26.58	26.58	0 01:10	0.0305	0.0305	-0.000	
SU6	STORAGE	54.65	54.65	0 01:10	0.0623	0.0623	0.000	
SU7	STORAGE	130.52	130.52	0 01:10	0.183	0.183	-0.018	
SU8	STORAGE	18.06	18.06	0 01:10	0.021	0.021	0.000	
SU9	STORAGE	28.48	28.48	0 01:10	0.033	0.033	-0.001	

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SU1	0.088	18	0	0	0.181	37	0 02:32	4.24
SU5	0.000	0	0	0	0.000	2	0 01:10	26.54
SU6	0.000	0	0	0	0.001	9	0 01:10	53.92
SU7	0.000	0	0	0	0.000	22	0 01:10	130.74
SU8	0.000	0	0	0	0.000	27	0 01:10	17.93
SU9	0.000	0	0	0	0.000	13	0 01:10	28.46

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
OF1	8.78	0.63	3.25	0.005
OF2	12.60	1.47	9.36	0.016
OF3	14.63	7.67	83.60	0.097
OF4	99.40	5.89	222.09	0.506
OF5	0.00	0.00	0.00	0.000
OF6	0.00	0.00	0.00	0.000
System	22.57	15.66	301.68	0.624

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	129.05	0 01:10	1.08	0.37	0.51
C5	CONDUIT	173.54	0 01:12	0.64	0.51	0.91
C6	CONDUIT	28.34	0 01:10	0.75	0.06	0.20
C7	CONDUIT	56.33	0 01:10	1.09	0.11	0.39
C8	CONDUIT	222.09	0 01:12	1.49	0.94	0.65
OR1	ORIFICE	221.96	0 01:12		1.00	
OR2	ORIFICE	28.46	0 01:10			
OR3	ORIFICE	26.54	0 01:10			
OR4	ORIFICE	17.93	0 01:10			
OR5	ORIFICE	53.92	0 01:10			
OR6	ORIFICE	130.74	0 01:10			
W1	WEIR	0.00	0 00:00		0.00	
W2	WEIR	0.00	0 00:00		0.00	
W3	WEIR	0.00	0 00:00		0.00	
C9	DUMMY	4.24	0 02:32			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.01	0.00
C5	1.00	0.00	0.12	0.00	0.88	0.00	0.00	0.00	0.97	0.00
C6	1.00	0.00	0.64	0.00	0.36	0.00	0.00	0.00	1.00	0.00
C7	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C8	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

****

Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C5	0.01	0.01	0.01	0.01	0.01

Analysis begun on: Fri Jan 10 12:26:22 2025
Analysis ended on: Fri Jan 10 12:26:23 2025
Total elapsed time: 00:00:01

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

WARNING 01: wet weather time step reduced to recording interval for Rain Gage COW

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 9
Number of nodes 18
Number of links 15
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
COW	100-YEAR	INTENSITY	1 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
A201	0.32	37.18	72.81	2.0500	COW	SU7
A202	0.10	51.05	90.24	4.0000	COW	SU6
A203	0.03	18.23	100.00	1.0000	COW	SU8
A204	0.04	23.68	100.00	3.0000	COW	SU5
A205	0.05	21.30	98.99	2.0000	COW	SU9
A206	0.31	341.11	100.00	2.0000	COW	SU1
U201	0.01	50.00	0.00	0.3300	COW	OF1
U202	0.04	84.00	17.87	0.2600	COW	OF2
U203	0.15	68.18	91.45	1.6300	COW	OF3

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
CBMH2	JUNCTION	316.19	2.71	0.0	
CBMH3	JUNCTION	316.63	2.11	0.0	
CBMH4	JUNCTION	316.82	1.47	0.0	
CBMH5	JUNCTION	316.31	2.29	0.0	
CBMH6	JUNCTION	316.70	0.90	0.0	
ORIFICE-LINK	JUNCTION	316.19	2.71	0.0	
OF1	OUTFALL	317.74	0.00	0.0	
OF2	OUTFALL	318.13	0.00	0.0	
OF3	OUTFALL	318.00	0.00	0.0	
OF4	OUTFALL	316.09	0.53	0.0	
OF5	OUTFALL	0.00	0.00	0.0	
OF6	OUTFALL	0.00	0.00	0.0	
SU1	STORAGE	328.50	0.15	0.0	
SU5	STORAGE	318.74	0.13	0.0	
SU6	STORAGE	318.60	0.12	0.0	
SU7	STORAGE	317.60	0.16	0.0	
SU8	STORAGE	318.90	0.04	0.0	
SU9	STORAGE	318.29	0.07	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	CBMH6	CBMH5	CONDUIT	78.9	0.3169	0.0130
C5	CBMH5	CBMH2	CONDUIT	39.3	0.3053	0.0130
C6	CBMH4	CBMH3	CONDUIT	28.0	0.6786	0.0130
C7	CBMH3	CBMH2	CONDUIT	19.5	0.7180	0.0130
C8	ORIFICE-LINK	OF4	CONDUIT	33.0	0.3030	0.0130
OR1	CBMH2	ORIFICE-LINK	ORIFICE			
OR2	SU9	CBMH4	ORIFICE			
OR3	SU5	CBMH3	ORIFICE			
OR4	SU8	CBMH2	ORIFICE			
OR5	SU6	CBMH5	ORIFICE			
OR6	SU7	CBMH6	ORIFICE			
W1	SU8	SU6	WEIR			
W2	SU7	OF6	WEIR			
W3	SU6	OF5	WEIR			
C9	SU1	CBMH3	OUTLET			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow

C1	CIRCULAR	0.60	0.28	0.15	0.60	1	345.65
C5	CIRCULAR	0.60	0.28	0.15	0.60	1	339.31
C6	CIRCULAR	0.60	0.28	0.15	0.60	1	505.83
C7	CIRCULAR	0.60	0.28	0.15	0.60	1	520.30
C8	CIRCULAR	0.53	0.22	0.13	0.53	1	236.76

NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.

Analysis Options

Flow Units ..... LPS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 12/20/2024 00:00:00
Ending Date 12/21/2024 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance ..... 0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	0.095	89.873
Evaporation Loss	0.000	0.000
Infiltration Loss	0.006	6.069
Surface Runoff	0.087	82.434
Final Storage	0.001	1.404
Continuity Error (%)	-0.038	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.087	0.867
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.083	0.827
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.004	0.041
Continuity Error (%)	0.000	

Time-Step Critical Elements

None

Highest Flow Instability Indexes

Link OR6 (4)

Routing Time Step Summary

Minimum Time Step	:	0.09 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.02
Percent Not Converging	:	0.01
Time Step Frequencies	:	
5.000 - 3.155 sec	:	99.98 %
3.155 - 1.991 sec	:	0.02 %

1.991 - 1.256 sec : 0.00 %
1.256 - 0.792 sec : 0.00 %
0.792 - 0.500 sec : 0.00 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
A201	89.87	0.00	0.00	11.02	64.42	13.07	77.50	0.24	177.68	0.862
A202	89.87	0.00	0.00	3.89	79.84	4.76	84.60	0.08	70.87	0.941
A203	89.87	0.00	0.00	0.00	88.48	0.00	88.48	0.03	23.32	0.985
A204	89.87	0.00	0.00	0.00	88.48	0.00	88.48	0.04	34.19	0.985
A205	89.87	0.00	0.00	0.40	87.59	0.49	88.08	0.04	36.78	0.980
A206	89.87	0.00	0.00	0.00	88.48	0.00	88.48	0.27	234.34	0.984
U201	89.87	0.00	0.00	40.15	0.00	48.50	48.50	0.01	5.37	0.540
U202	89.87	0.00	0.00	33.07	15.81	39.73	55.54	0.02	15.32	0.618
U203	89.87	0.00	0.00	3.41	80.92	4.17	85.08	0.13	108.88	0.947

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
CBMH2	JUNCTION	0.06	0.78	316.97	0 01:13	0.78
CBMH3	JUNCTION	0.03	0.35	316.98	0 01:12	0.34
CBMH4	JUNCTION	0.00	0.16	316.98	0 01:12	0.15
CBMH5	JUNCTION	0.02	0.71	317.02	0 01:13	0.71
CBMH6	JUNCTION	0.01	0.36	317.06	0 01:12	0.35
ORIFICE-LINK	JUNCTION	0.05	0.42	316.61	0 01:13	0.42
OF1	OUTFALL	0.00	0.00	317.74	0 00:00	0.00
OF2	OUTFALL	0.00	0.00	318.13	0 00:00	0.00
OF3	OUTFALL	0.00	0.00	318.00	0 00:00	0.00
OF4	OUTFALL	0.04	0.35	316.44	0 01:13	0.35
OF5	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OF6	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
SU1	STORAGE	0.04	0.07	328.57	0 02:28	0.07
SU5	STORAGE	0.00	0.04	318.78	0 01:10	0.04
SU6	STORAGE	0.00	0.06	318.66	0 01:10	0.06
SU7	STORAGE	0.00	0.12	317.72	0 01:10	0.12
SU8	STORAGE	0.00	0.03	318.93	0 01:10	0.03
SU9	STORAGE	0.00	0.04	318.33	0 01:10	0.04

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent	
CBMH2	JUNCTION	0.00	280.82	0 01:10	0	0.669	0.015	
CBMH3	JUNCTION	0.00	73.06	0 01:10	0	0.314	0.075	
CBMH4	JUNCTION	0.00	36.71	0 01:10	0	0.0432	-0.095	
CBMH5	JUNCTION	0.00	243.24	0 01:10	0	0.327	-0.157	
CBMH6	JUNCTION	0.00	177.58	0 01:10	0	0.245	0.155	
ORIFICE-LINK	JUNCTION	0.00	274.27	0 01:12	0	0.669	0.018	
OF1	OUTFALL	5.37	5.37	0 01:12	0.00728	0.00728	0.000	
OF2	OUTFALL	15.32	15.32	0 01:12	0.0233	0.0233	0.000	
OF3	OUTFALL	108.88	108.88	0 01:10	0.128	0.128	0.000	
OF4	OUTFALL	0.00	274.17	0 01:13	0	0.669	0.000	
OF5	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	ltr
OF6	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	ltr
SU1	STORAGE	234.34	234.34	0 01:10	0.272	0.272	0.002	
SU5	STORAGE	34.19	34.19	0 01:10	0.0398	0.0398	-0.000	
SU6	STORAGE	70.87	70.87	0 01:10	0.0821	0.0821	0.000	
SU7	STORAGE	177.68	177.68	0 01:10	0.245	0.245	-0.002	
SU8	STORAGE	23.32	23.32	0 01:10	0.0274	0.0274	0.000	
SU9	STORAGE	36.78	36.78	0 01:10	0.0432	0.0432	-0.001	

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SU1	0.115	23	0	0	0.237	49	0 02:28	5.55
SU5	0.000	0	0	0	0.000	3	0 01:10	34.11
SU6	0.000	0	0	0	0.001	15	0 01:10	69.69
SU7	0.000	0	0	0	0.001	40	0 01:10	177.58
SU8	0.000	0	0	0	0.000	44	0 01:10	23.12
SU9	0.000	0	0	0	0.000	21	0 01:10	36.71

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
OF1	9.15	0.92	5.37	0.007
OF2	13.36	2.03	15.32	0.023
OF3	14.70	10.10	108.88	0.128
OF4	99.44	7.81	274.17	0.669
OF5	0.00	0.00	0.00	0.000
OF6	0.00	0.00	0.00	0.000
System	22.78	20.87	382.15	0.827

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	174.77	0 01:10	1.08	0.51	0.77
C5	CONDUIT	216.66	0 01:10	0.77	0.64	1.00
C6	CONDUIT	36.61	0 01:10	0.80	0.07	0.42
C7	CONDUIT	69.99	0 01:09	1.07	0.13	0.69
C8	CONDUIT	274.17	0 01:13	1.59	1.16	0.74
OR1	ORIFICE	274.27	0 01:12			1.00
OR2	ORIFICE	36.71	0 01:10			
OR3	ORIFICE	34.11	0 01:10			
OR4	ORIFICE	23.10	0 01:10			
OR5	ORIFICE	69.69	0 01:10			
OR6	ORIFICE	177.58	0 01:10			
W1	WEIR	0.01	0 01:10		0.02	
W2	WEIR	0.00	0 00:00		0.00	
W3	WEIR	0.00	0 00:00		0.00	
C9	DUMMY	5.55	0 02:28			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C5	1.00	0.00	0.12	0.00	0.88	0.00	0.00	0.00	0.97	0.00
C6	1.00	0.00	0.64	0.00	0.36	0.00	0.00	0.00	1.00	0.00
C7	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C8	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

****

Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C5	0.10	0.10	0.14	0.01	0.01
C8	0.01	0.01	0.01	0.12	0.01

Analysis begun on: Fri Jan 10 12:27:18 2025
Analysis ended on: Fri Jan 10 12:27:18 2025
Total elapsed time: < 1 sec

CDS ESTIMATED NET ANNUAL TSS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD
AND A FINE PARTICLE SIZE DISTRIBUTION

Echelon Environmental
55 Albert Street, Suite #200 | Markham, ON, L3P 2T4
www.echelonenvironmental.ca info@echelonenvironmental.ca 905-948-0000

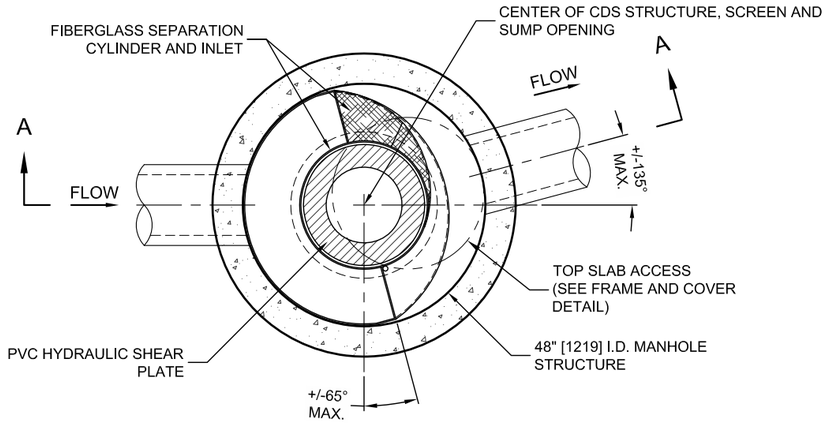
Project Name:	200 Weber St N	**Engineer:**	**Strik Baldinelli Moniz**
Location:	Waterloo, ON	**Contact:**	Mary George, EIT
OGS ID:	1	**Report Date:**	7-Jan-25

Area:	0.844	ha	**Rainfall Station #**	200	
C Value:	0.82		**Particle Size Distribution**	FINE	
CDS Model:	PMSU2015-4		**CDS Treatment Capacity:**	20	l/s

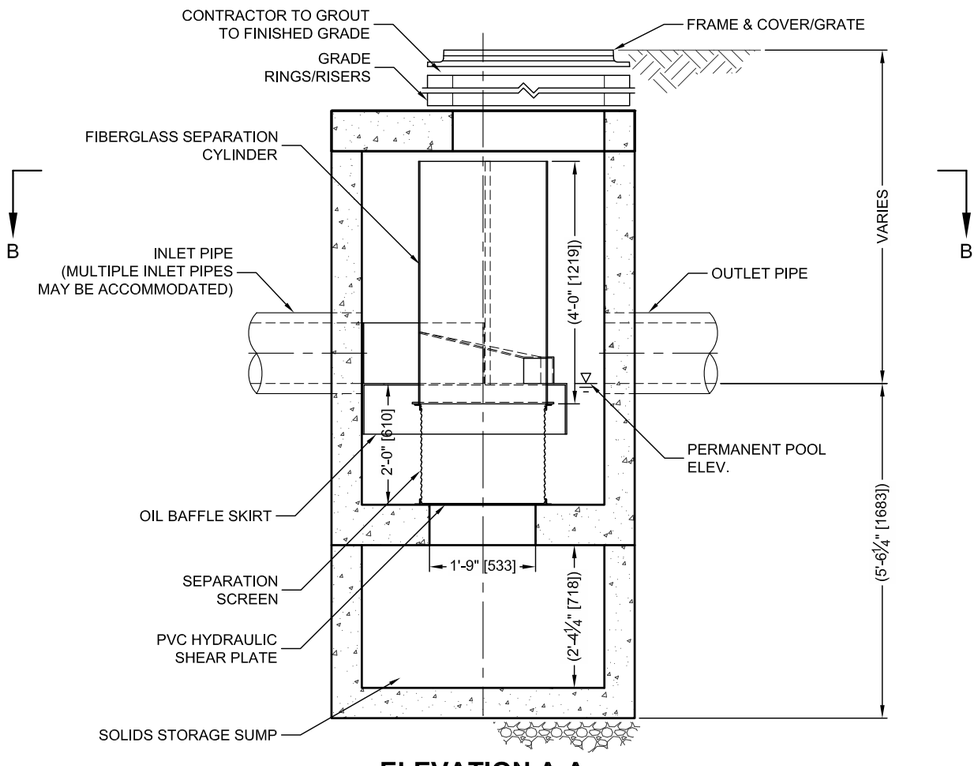
Rainfall Intensity[1] (mm/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (l/s)	Treated Flowrate (l/s)	Operating Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
0.5	8.5%	8.5%	1.0	1.0	4.9	97.5	8.3
1.0	9.7%	18.2%	1.9	1.9	9.7	96.1	9.3
1.5	8.5%	26.7%	2.9	2.9	14.6	94.7	8.1
2.0	8.2%	34.9%	3.8	3.8	19.4	93.3	7.6
2.5	6.2%	41.1%	4.8	4.8	24.3	91.9	5.7
3.0	6.3%	47.4%	5.8	5.8	29.1	90.5	5.7
3.5	3.9%	51.3%	6.7	6.7	34.0	89.1	3.5
4.0	4.0%	55.3%	7.7	7.7	38.8	87.7	3.5
4.5	4.0%	59.3%	8.7	8.7	43.7	86.3	3.4
5.0	3.5%	62.8%	9.6	9.6	48.5	84.9	3.0
6.0	6.4%	69.2%	11.5	11.5	58.3	82.2	5.3
7.0	4.7%	74.0%	13.5	13.5	68.0	79.4	3.8
8.0	3.4%	77.4%	15.4	15.4	77.7	76.6	2.6
9.0	2.6%	79.9%	17.3	17.3	87.4	73.8	1.9
10.0	1.9%	81.9%	19.2	19.2	97.1	71.0	1.4
15.0	9.1%	90.9%	28.9	19.8	100.0	48.2	4.4
20.0	3.8%	94.7%	38.5	19.8	100.0	36.1	1.4
25.0	2.7%	97.5%	48.1	19.8	100.0	28.9	0.8
30.0	0.7%	98.1%	57.7	19.8	100.0	24.1	0.2
35.0	0.8%	98.9%	67.4	19.8	100.0	20.7	0.2
40.0	0.5%	99.4%	77.0	19.8	100.0	18.1	0.1
45.0	0.3%	99.6%	86.6	19.8	100.0	16.1	0.0
50.0	0.0%	99.6%	96.2	19.8	100.0	14.5	0.0

Predicted Net Annual TSS Removal Efficiency = 80.0%
Predicted Annual Rainfall Treated = 91.4%

1 - Based on 34 years of hourly rainfall data from Canadian Station 6149387, Waterloo ON
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.
3 - CDS Efficiency based on testing conducted at the University of Central Florida
4 - CDS design flowrate and scaling based on standard manufacturer model & product specifications



PLAN VIEW B-B
N.T.S.



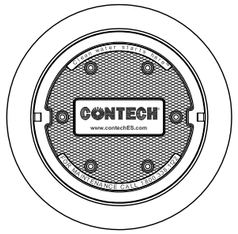
ELEVATION A-A
N.T.S.

CDS PMSU2015-4-C DESIGN NOTES

CDS PMSU2015-4-C RATED TREATMENT CAPACITY IS 0.7 CFS [19.8 L/s], OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 10.0 CFS [283 L/s]. IF THE SITE CONDITIONS EXCEED 10.0 [283 L/s] CFS, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD CDS PMSU2015-4-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

FRAME AND GRATE
(DIMENSION VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (CFS OR L/s)	*
PEAK FLOW RATE (CFS OR L/s)	*
RETURN PERIOD OF PEAK FLOW (YRS)	*
SCREEN APERTURE (2400 OR 4700)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH CONSTRUCTION PRODUCTS REPRESENTATIVE. www.contech-cpi.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.
7. MANHOLE MANUFACTURED TO ASTM C478 SPECIFICATION.

INSTALLATION NOTES
1. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
2. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
3. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
4. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
5. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

rainwater MANAGEMENT
Port Coquitlam, B.C.
604-944-9265 888-966-7246 Fax: 604-676-2601

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 8,511,500; 8,581,783; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

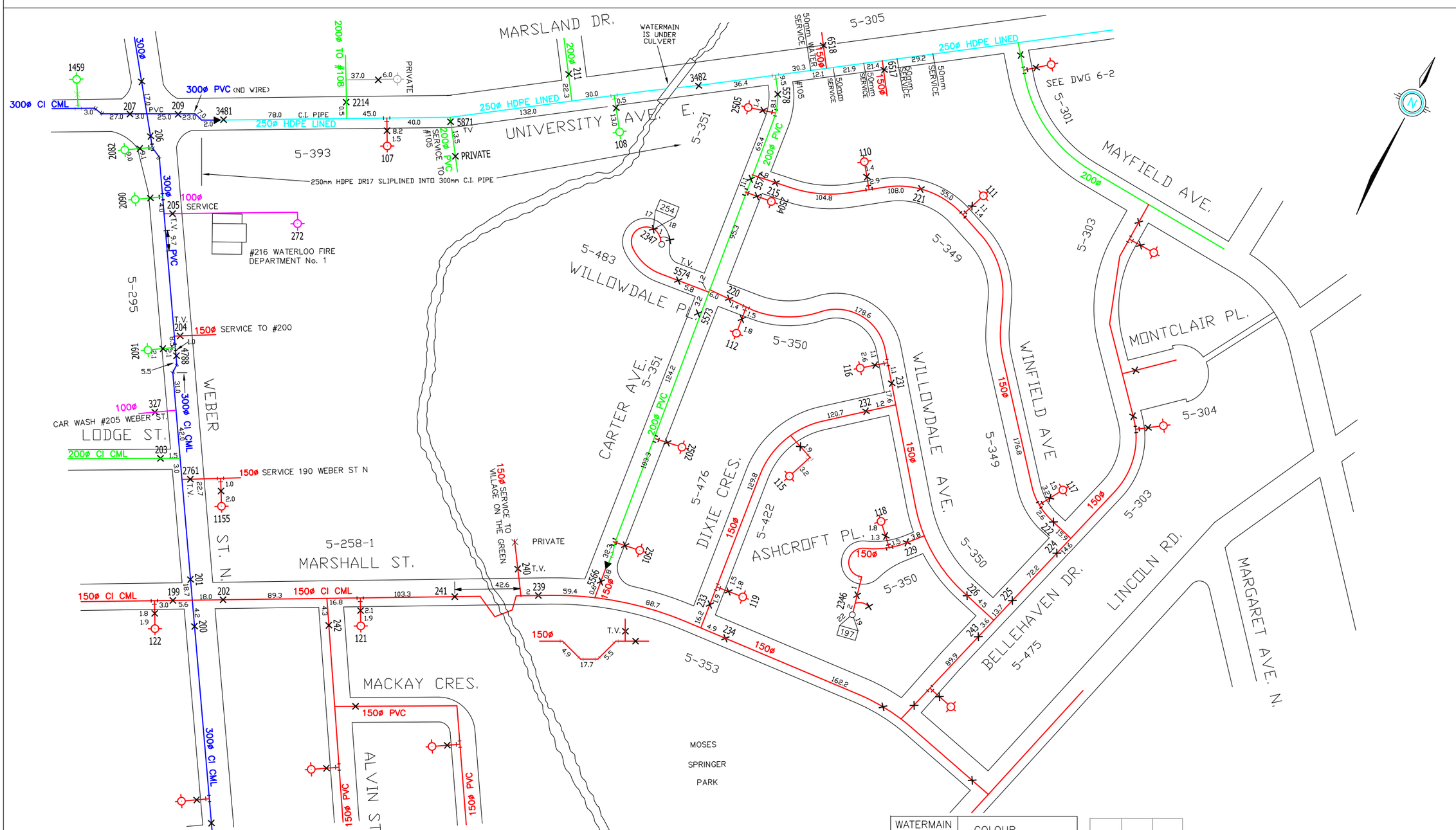
CONTECH® CONSTRUCTION PRODUCTS INC.
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APPENDIX D

City of Waterloo Watermain Layout G.C.T. NO: 6-3, dated February 21, 2024
Commercial Water Demand, Velocity and Turnover Calculation By SBM
Water Supply for Public Fire Protection (FUS) by SBM



NOTE

THE ACCURACY OF INFORMATION SHOWN ON THIS DRAWING IS NOT GUARANTEED TO ENSURE ITS ACCURACY, IT SHOULD BE VERIFIED IN THE FIELD.

LEGEND

HYDRANT 1000 — DIM 2.0m OR AS SHOWN

VALVE 1000

WATERMAIN SIZE	COLOUR
100 mm	MAGENTA
150 mm	RED
200 mm	GREEN
250 mm	CYAN
300 mm	BLUE
350 mm	9
400 mm	113
450 mm	220
600 mm	112
750 mm	140
900 mm	243

13-2	6-1	6-2
13-4	6-3	6-4
14-2	5-1	5-2

NOTE: ALL MEASUREMENTS SHOWN ARE IN METRIC UNLESS OTHERWISE SPECIFIED

2 21 2024	B.P.	VARIOUS ADDITIONS	CITY OF Waterloo	WATERMAIN LAYOUT
98 04 14	M.M.	DELETED VALVES		
DATE	INT	REVISION	DRAWN BY: IRENE	G.C.T. NO. 6-3
CAD STAT. NO.1	DATE 2 21 2024		SCALE N.T.S.	

STRIK BALDINELLI MONIZ
PLANNING · CIVIL · STRUCTURAL · MECHANICAL · ELECTRICAL

LONDON LOCATION
1599 Adelaide St. N., Unit 301
London, ON N5X 4E8
P: 519-471-6667

KITCHENER LOCATION
132 Queen St. S. Unit 4
Kitchener, ON N2G 1V9
P: 519-725-8093

www.sbmltd.ca

sbm@sbmltd.ca

COMMERCIAL WATER DEMAND, VELOCITY, AND TURNOVER CALCULATION

DATE:	January 3, 2025
JOB No.:	SBM-24-2350

Client:	**MCGW Properties Corp.**
Project:	**Proposed Commerical Development**
Location:	**200 Webber Street North, Waterloo, Ontario**

DEMAND CALCULATION

Max. Day Peaking Factor =	2.75	
Max. Hour Peaking Factor =	4.13	
*Commercial Average Flow=28m3/(ha*d) =	28000.0	L/day/ha

	Units/Area (ha)	Population	Avg. Day (L/s)	Max. Hour (L/s)	Max. Day (L/s)
Commercial Area	0.33		0.11	0.43	0.29
Total			**0.11**	**0.43**	**0.29**

*Refer to MOECC "The Design Guidelines for Drinking-Water Systems" (2016)

VELOCITY CALCULATION

Diameter (mm)	Demand (L/s)	Velocity (m/s)
150	0.43	0.025

Maximum allowable velocity in the watermain under all flow conditions shall not exeel 5.0 m/s per section B.2.3.4 DGSSMS February 2024

VOLUME CALCULATION

Diameter (mm)	Length from Municipal Watermain to Building (m)	Volume (Litres)
150	47.00	830.56
	Total	830.56

TURNOVER CALCULATIONS

Average Day Demand (L/s)	Volume (L)	Hours	Days
0.11	830.56	2.190	0.09

Maximum recommended turnover of 3 days (72 hours)

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sbm@sbmltd.ca

Water Supply for Public Fire Protection (Fire Underwriters Survey)

	For data entry
	Calculated, not for data entry

DATE:	December 4, 2024
JOB N0.:	SBM-24-2350

Client:	**MCGW Properties Corp.**
Project:	**Proposed Commerical Development**
Location:	**200 Webber Street North, Waterloo, Ontario**

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

Type of Construction:	**Ordinary**		**1.0**	
*Total Floor Area, m^2:			**4358.00**	
	Baseline Fire Flow, L/min		14523	
	Baseline Fire Flow to the nearest 1,000 L/min		**15000**	
Fire Hazard of Contents:	**Combustible**		**1.00**	
			15000.0	
Sprinkler Modification:	**Yes - NFPA Standard**		**0.3**	
			-4500.0	
Separation, Side 1:	**20.1 to 30m**	15%		
Separation, Side 2:	**> 45m**	0%		
Separation, Side 3:	**20.1 to 30m**	15%		
Separation, Side 4:	**> 45m**	0%		
	Sum of Separation Coefficients (Shall Not Exceed 75%:)		**30%**	
			4500.0	
	F, L/min (Shall not exceed 45,000 L/min or be less than 2,000 L/min)		15000	
	***Required Supply Flow Rate, L/min =**	**15000**	=	250 L/s

*Rounded to the nearest 1000 L/min per the Fire Underwriters Survey 1999 Guidelines
As per the Fire Underwirtes Survey 1999, this is an estimated fire flow requirements. Actual flow shall be confirmed by the Sprinkler designer.

**Maximum Day Demand, L/min =	17.4
Required Supply Fire Flow + Maximum Day Demand, L/min =	**15017**