

LRU LEASING INC.

FUNCTIONAL SERVICING REPORT

0 Mercer Street

OCTOBER 2025 (UPDATED FEBRUARY 2026) – 24-8715

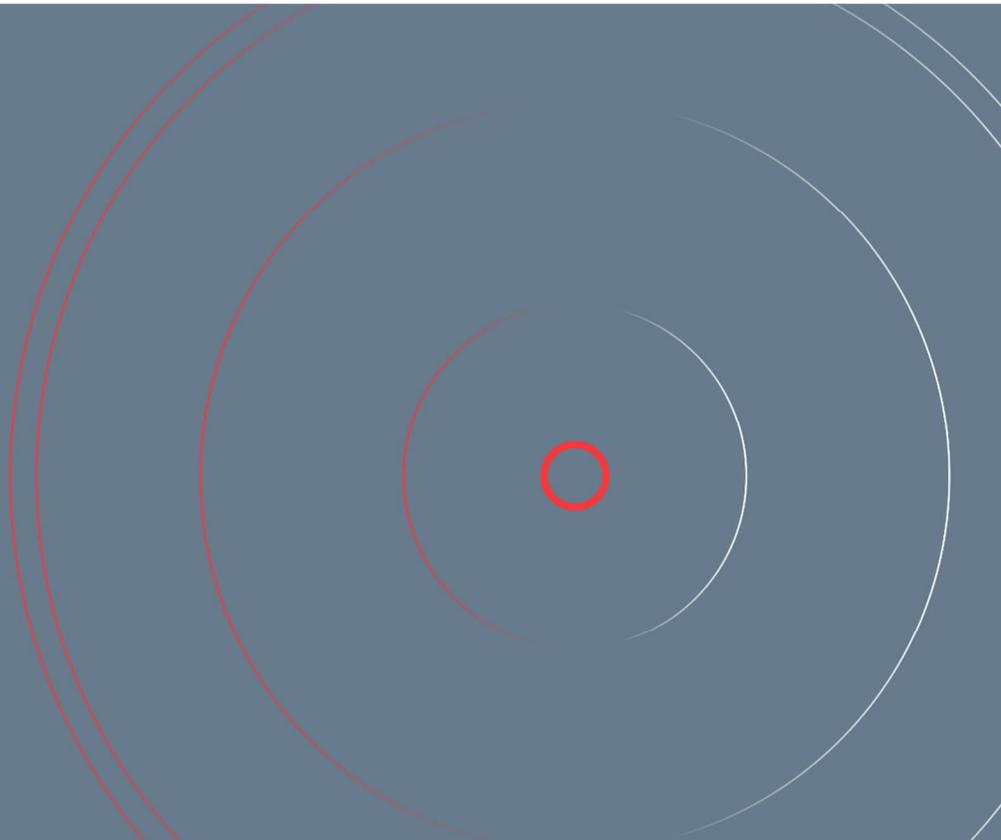


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- Appendix B – Sanitary Sewer and Storm Sewer Design Sheets
- Appendix C – Stormwater Management Calculations

1.0 INTRODUCTION

This Functional Servicing Report (‘FSR’) has been prepared to support a site-specific Zoning By-law Amendment (‘ZBA’) application for the site municipally known as 0 Mercer Street at the intersection of Mercer Street and Hanna Street East (referred to as the ‘Site’). The report has been prepared on behalf of the applicant, LRU Leasing Inc. (or ‘client’) to outline the servicing strategy, including supporting studies and related information for the transportation, sanitary, stormwater management, and watermain servicing for the site.

The site exists in the broader context of the South Central Planning District, which features industrial uses. This area has been gradually transitioning to support residential uses in recent years. This planning application intends to serve as an appropriate medium-density transition from the existing single-detached neighborhood to the industrial uses to the north through the construction of two 4-storey residential buildings with 32 units each. To service the development, 80 parking spaces are proposed with one access driveway through Hanna Street East, and one access driveway through Mercer Street.

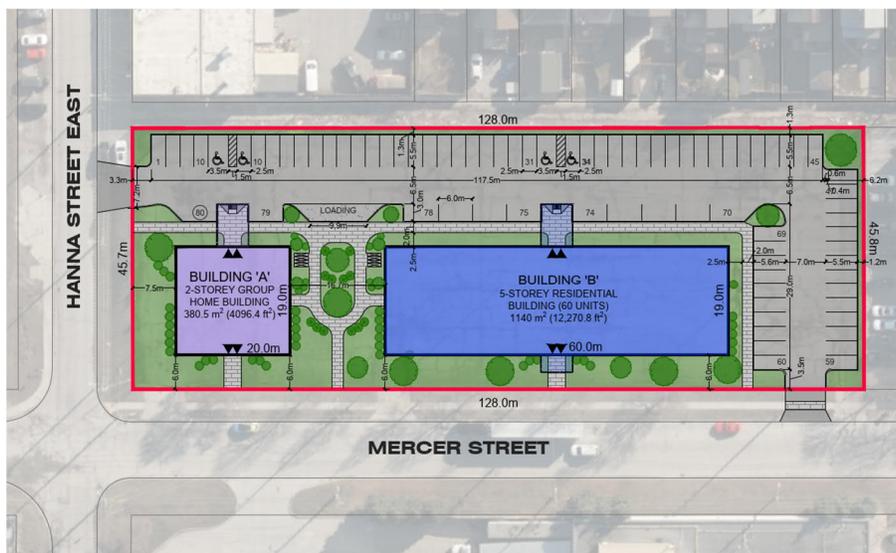


Figure 1: Site Layout and Location

1.1 REFERENCE DOCUMENTS

The following documents and drawings were referenced when completing this study:

- City of Windsor Development Manual (City of Windsor, 2015);
- City of Windsor Sewer Atlas (City of Windsor);
- MappMyCity Sewer Mapping (City of Windsor);
- Design Criteria for Environmental Compliance Approval (MECP, 2023); and
- Windsor/Essex Region Stormwater Management Standards Manual (WERSMSM, 2018).

2.0 TRANSPORTATION SERVICING

2.1 EXISTING CONDITIONS

The subject property is approximately 0.59 hectares in size. It is bounded by a commercial development to the south, residential dwellings and a commercial plaza to the east, Mercer Street to the west, and Hanna Street East to the north. The site currently consists of a large parking lot.

There are currently four driveway accesses to the property: three from Mercer Street and one from Hanna Street East. These existing driveway accesses will be removed to accommodate the proposed development.

2.2 PROPOSED ROADWAYS

The proposed development will have two access points: one from Mercer Street and another from Hanna Street East. The internal road network will consist of a parking lot with drive aisles 7 m and 6 m wide, providing a total of 80 parking spaces. Refer to Appendix A, Figure 1.0 for the parking lot layout.

The pavement structure will be designed in accordance with geotechnical recommendations and finalized during detailed design.

3.0 SANITARY SERVICING

3.1 EXISTING CONDITIONS

Currently, there are no known sanitary services to the subject property. An existing oval-shaped (500x375 mm) combined sewer is located to the west along Mercer Street, and a 300 mm diameter combined sewer is located directly north of the development along Hanna Street East. Through discussions with the City of Windsor, it was determined that the existing oval-shaped combined sewer on Mercer Street will provide sanitary servicing for the proposed development.

An assessment of the existing combined sewer network along Mercer Street was completed between Manholes 3C506 and 3C508 to compare existing and proposed conditions. The evaluation was carried out using a sanitary sewer design sheet to estimate expected flows in the downstream municipal combined sewer under both the existing and proposed scenario.

Table 1 shows the design parameters used to assess the current condition of the existing combined sewer. The design criteria were established by the City of Windsor Development Manual (2015).

Table 1: Sanitary Design Criteria

CRITERIA	CITY OF WINDSOR DEVELOPMENT MANUAL
Hydraulic Sewer Sizing	Manning's Equation
Population Densities: <ul style="list-style-type: none"> Commercial Residential 	74 people/ha (232 people) 2.5 people/unit (23 people)
Average Daily Sewage	0.0042 litres/second/capita
Peaking Factor	6 (population under 1,000)
Extraneous Flow	0.280 litres/ hectare/second
Manning's Roughness Coefficient 'n'	0.013
Minimum Sewer Size (mm)	150
Pipe Velocity (m/s) <ul style="list-style-type: none"> Minimum Maximum 	0.76 3.00
Minimum Slope (%) <ul style="list-style-type: none"> 150mm 200mm 	0.60 0.52
Sewer Surcharging	Maximum Hydraulic Grade Line

Figure 2 illustrates the drainage area considered for this assessment, shown in blue. The subject property is outlined in red for reference. Under existing conditions, the subject site is included within the drainage area but is assumed to have a contributing population of zero.

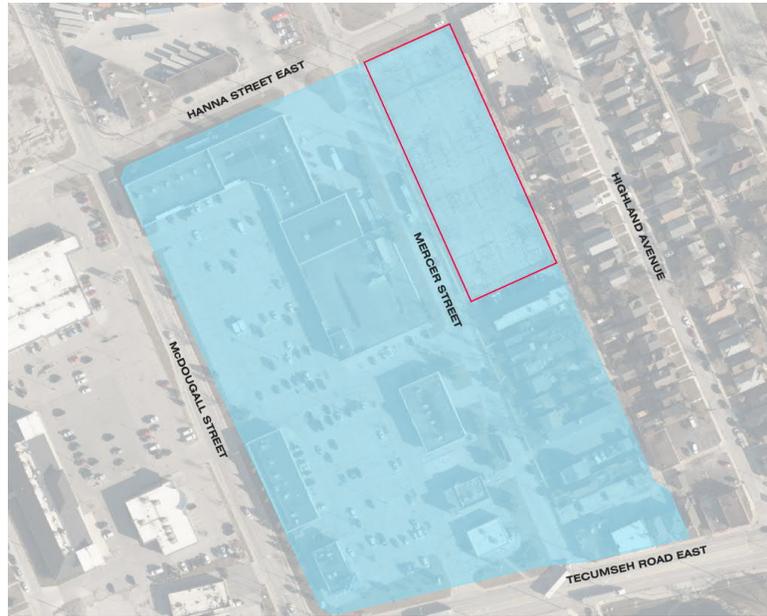


Figure 2: Sanitary Drainage Area Considered

Refer to Appendix B for the existing conditions calculations.

3.2 PROPOSED CONDITIONS

The same parameters were used to assess the proposed conditions, with the only difference being the addition of 60 residential units and the group home. This results in a total estimated population increase of 160 people. Table 2 summarizes the assumed population densities and the resulting population for the new development.

Table 2: Population Density for Proposed Development

Unit Type	Population Density	Population
High Density Residential	2.5 people/unit	150 People
Group Home	10 people/unit	10 People

During dry weather conditions, the addition of flows from the proposed development results in a minor increase of 4.04 L/s, raising the total flow from 7.69 L/s to 11.73 L/s. Given that this total flow represents only approximately 38% of the pipe's full-flow capacity of 30.51 L/s, the sewer is confirmed to be operating well below capacity. As such, the hydraulic grade line remains below the pipe's obvert under proposed dry weather flow conditions.

Table 3 presents the expected peak flows resulting from the proposed development.

Table 3: Proposed Peak Sanitary Flows

Sanitary Drainage Area (Ha)	Population	Expected Peak Flow (L/s)
0.59	160	4.20

Refer to Appendix B for the proposed conditions calculations.

3.3 PROPOSED SANITARY SITE SERVICING

Refer to the attached Figure 2.0 (in Appendix A) which illustrates the proposed servicing layout. The sanitary servicing for the proposed development is as follows:

- All sanitary flows from within the development will be conveyed via a proposed 200mm diameter sanitary internal network, which should connect to the springline of the existing oval 500mmx375mm combined sewer along Mercer Street.

The sanitary sewer functional design sheets are provided in Appendix B. Criteria used in flow calculations are listed in Table 1.

The existing invert elevations of the sanitary sewer along Mercer Street allows for adequate cover at the top end of the internal sewers. However, proposed inverts and ground elevations are subject to change during detailed design.

All serviced buildings where the bottom of the footings are below the sewer and the hydraulic grade line is less than 300 mm below the basement floor elevation, shall be equipped with a sewage ejector pump. It is recommended that all serviced buildings install sewage ejector pumps to provide a hydraulic break between the sewer and the building lot.

All existing inverts to be confirmed during detailed design. Redundant connections identified during detailed design, if any, to be abandoned in accordance with City of Windsor Engineering Best Practice BP1.3.3.

4.0 STORMWATER SERVICING

4.1 EXISTING CONDITIONS

An existing 1200 mm diameter storm sewer is located along Mercer Street to the west, and a 1500 mm diameter storm sewer is located directly north of the site along Hanna Street East. Through discussions with the City of Windsor, it was determined that the storm sewer on Mercer Street will provide storm servicing for the proposed development.

The site currently consists of a large parking lot with several catch basins, which are assumed to outlet to the existing storm sewer network on Mercer Street. However, the exact connection point to the Mercer Street storm sewer is to be confirmed during detailed design.

Although the site is near completely impervious under existing conditions, it was agreed with the City to apply a runoff coefficient of 0.5 and use the 2-year peak flow event to calculate the allowable release rate. A total Site catchment area of 0.59 ha is used for the pre-development condition analysis. Based on a review of the ERCA public interactive mapping, existing soil conditions on the site consist of Brookston Clay Loam which has a hydrologic soil group (HSG) D classification.

The existing conditions design inputs and calculations are presented in Appendix C.

4.2 DESIGN CRITERIA

The following storm sewer design criteria for this property are outlined in Table 4 below. The design criteria were established by the City of Windsor Development Manual (2015).

Table 4: Storm Sewer Design Criteria

CRITERIA	CITY OF WINDSOR DEVELOPMENT MANUAL
Design Method	Rational Method
Standard Return Period	1 in 5 years Storm Event
Rainfall Intensity	$i = a / (t+b)^c$ a = 1259.0 b = 8.80 c = 0.838
Minimum Cover Depth (m)	1.00
Minimum Sewer Size (mm)	300
Manning's Roughness Coefficient 'n'	0.013
Runoff Coefficient:	
Roofs	0.95
Road Pavement	0.90
Landscape	0.20
Full Flow Velocity:	

CRITERIA	CITY OF WINDSOR DEVELOPMENT MANUAL
Minimum	0.76 metres per second
Maximum	3.00 metres per second
Min. Slope:	
300mm dia.	0.30%
375mm dia.	0.23%
450mm dia.	0.18%
600mm dia.	0.12%
Max. Inlet Time	20 minutes
Minimum Manhole Size	1200mm

4.3 STORMWATER QUANTITY CONTROL

Through communication with the City of Windsor, it was determined that the allowable storm flows for the site must be reduced by the estimated peak sanitary flows. This reduction is required because a Combined Sewer Overflow (CSO) is located directly downstream of the connection point and during heavy storm events, the sewer system is assumed to converge.

Based on this criteria, the allowable storm flows are to be reduced by the peak sanitary flow, which were determined to be 4.20L/s in Section 3.2, Table 3.

Table 5 summarizes the calculated allowable release rate and corresponding 100-year storage volume requirements, determined using the Modified Rational Method.

Table 5: Water Quantity Control Volume Requirements

Site Area (Ha)	Runoff Coefficient	Allowable Release Rate (L/s)	Reduced Allowable Release Rate (L/s)	100-yr Storage Requirements (m ³)
0.59	0.89	47.27	43.07	177

Quantity control for future development is expected to be achieved through a combination of parking lot surface storage, pipe storage, and an underground storage chamber. During the Urban Stress Test (UST), runoff shall be maintained on-site where no overland flow will spillover onto adjacent properties. Refer to Appendix C for preliminary stormwater storage calculations.

4.4 PROPOSED STORM SERVICING

Refer to the attached Figure 2.0 (in Appendix A) which illustrates the proposed servicing plan. The stormwater servicing for the proposed development is as follows:

- The proposed building and parking lot will be serviced through a new storm sewer network constructed within the proposed development, which will outlet into the existing 1200mm dia. storm sewer located to the west of the property along Mercer Road.
- The proposed storm sewers have been sized to accommodate a 1:5-year storm event.

- The outflow from the site was restricted to the 2-year pre-development release rate, further reduced by the estimated sanitary peak flow. This represents a release rate of 43.1 L/s.
- Stormwater quantity control will be provided through a combination of surface storage, underground pipe storage, and an underground storage chamber, with a total storage requirement of approximately 177m³.
- Major system overland flow depths are to be maintained below 0.30 m in depth during all storms, up to and including, the governing 100-year event. During the Urban Stress Test (UST) event, ponding depths within the parking lot must be maintained below proposed building entrances and fully contained on site.
- Stormwater quality control will be provided through an Oil and Grit Separator (OGS) unit. The specific size and configuration of the OGS unit will be determined during detailed design.
- The release rate into the receiving network will be controlled via a Tempest Inlet Control Device, the specific size and configuration of this unit will be determined during detailed design.

Refer to the storm sewer design sheets provided in Appendix B.

All existing inverts to be confirmed during detailed design. Redundant connections identified during detailed design, if any, to be abandoned in accordance with City of Windsor Engineering Best Practice BP1.3.3.

During detailed design, a Stormwater Management Report is required in accordance with the Windsor Essex Region Stormwater Management Standards Manual to confirm the required storage volumes necessary to restrict flows to pre-development conditions.

5.0 WATERMAIN SERVICING

5.1 EXISTING CONDITIONS

Currently, there are no known water services to the subject property. There is an existing 150 mm diameter watermain located along the east side of the Mercer Street right-of-way (ROW), and a 750 mm diameter trunk watermain located along the west side of the same ROW. Additionally, a 150 mm diameter watermain is located directly north of the site along Hanna Street East.

5.2 PROPOSED WATERMAIN SERVICING

Refer to the attached Figure 2.0 (in Appendix A) which illustrates the proposed servicing plan. The watermain servicing for the proposed development is as follows:

- The existing 150mm diameter watermain within the right-of-way of Mercer Street will be used to service the proposed multi-unit residential building and group home.
- A 150mm diameter watermain will extend into the site and provide servicing to the proposed buildings as well as a fire hydrant located within 40m of the main entrances.

No pressure/flow testing has been completed for this development. During detailed design, pressure testing of the existing watermain on Mercer Street may be required.

The detailed design of the watermain is to be consistent with the requirements of Windsor Utility Commissions (W.U.C.) and the Ontario Building Code (OBC). The detailed design process will be coordinated with W.U.C.

Redundant connections identified during detailed design, if any, to be abandoned in accordance with City of Windsor Engineering Best Practice BP1.3.3.

6.0 UTILITIES

6.1 GAS

Existing Enbridge infrastructure is available in the area. Future coordination with Enbridge will be required during detailed design.

6.2 BELL

Existing Bell service is available to the east of the subject property along the alley way. Future coordination with Bell will be required during detailed design.

6.3 COGECO

Cogeco has aerial fibre located around the property and can provide fibre services to both buildings. Future coordination with Cogeco will be required during detailed design.

6.4 MNSI

MNSi has aerial plant in the area and can service the buildings with Fibre. Future coordination with MNSi will be required during detailed design.

6.5 ENWIN

Enwin hydro is located along Mercer Street and Hanna Street East. Future coordination with Enwin will be required during detailed design.

7.0 CONCLUSIONS

This FSR presents a site servicing strategy for the proposed development that addresses the requirements of the applicable regulatory agencies and provides the basis for detailed servicing design.

We trust this report sufficiently addresses the site servicing requirements and allows for approval of the Zoning Bylaw Amendment ('ZBA') application. Should there be any questions or comments, please feel free to contact the undersigned.

Sincerely,

Counterpoint Land Development by Dillon Consulting Limited



Kristine Wilkinson, P.Eng.
Project Engineer



Jaidy Wilson, EIT
Civil Designer

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APPENDIX A

UTILITY AND GRADING PLANS

APPENDIX B

SANITARY SEWER AND STORM SEWER DESIGN SHEETS

**EXISTING CONDITIONS ANALYSIS - MERCER STREET
SANITARY SEWER DESIGN SHEET**

Project Name: Mercer Street at Hanna
Project No: 24-8715

The Peaking Factor was derived:
Using Harmon Formula= **N** (Y or N)
From a Table= **Y**
Value from table= **6.000**

Residential Average Daily Flow= **363** L/Cap.D
Peak Extraneous Flow= **0.280** L/Ha.S

Outlet Invert Elevation= **184.120**

Mannings 'n'= **0.013**

Basement Floor Elevation =

Ground Elevation at Outlet = **187.297**

City of Windsor

Total Area= **4.530**

Hydraulic Grade Line Cover =

Location			Flow Characteristics								Sewer Design/Profile										Cover			
ROAD/STN	LOCATION		INDIVIDUAL		CUMULATIVE		PEAKING FACTOR M	POP FLOW Q(p) (L/s)	PEAK EXTR. FLOW Q(i) (L/s)	PEAK DESIGN FLOW Q(d) (L/s)	CAPACITY (L/s)	LENGTH (m)	MAJOR AXIS (a) (mm)	MINOR AXIS (b) (mm)	Wall Thickness (mm)	SLOPE (%)	UPPER INVERT (m)	LOWER INVERT (m)	FALL (m)	VELOCITY (m/s)	DROP IN LOWER MANHOLE (m)	Ground Elevation Upper MH	Cover @ Up MH (m)	Cover @ Low MH (m)
	FROM MH	TO MH	POP	AREA (ha.)	POP	AREA (ha.)																		
Mercer Street	E 3C506	E 3C507	255	3.66	255	3.66	6.000	6.426	1.026	7.45	166.51	67.8	500	375	16	0.43	184.420	184.130	0.290	1.13	0.000	187.367	2.431	2.714
Mercer Street	E 3C507	E 3C508	0	0.87	255	4.53	6.000	6.426	1.268	7.69	30.51	69.7	500	375	16	0.01	184.130	184.120	0.010	0.21		187.360	2.714	2.661

**PROPOSED CONDITIONS ANALYSIS - MERCER STREET
SANITARY SEWER DESIGN SHEET**

Project Name: Mercer Street at Hanna
Project No: 24-8715

The Peaking Factor was derived:
Using Harmon Formula= **N** (Y or N)
From a Table= **Y**
Value from table= **6.000**

Residential Average Daily Flow= **363** L/Cap.D
Peak Extraneous Flow= **0.280** L/Ha.S

Outlet Invert Elevation= **184.120**

Mannings 'n'= **0.013**

Basement Floor Elevation =

Ground Elevation at Outlet = **187.297**

City of Windsor

Total Area= **4.530**

Hydraulic Grade Line Cover =

Location			Flow Characteristics								Sewer Design/Profile								Cover					
ROAD/STN	LOCATION		INDIVIDUAL		CUMULATIVE		PEAKING FACTOR M	POP FLOW Q(p) (L/s)	PEAK EXTR. FLOW Q(i) (L/s)	PEAK DESIGN FLOW Q(d) (L/s)	CAPACITY (L/s)	LENGTH (m)	MAJOR AXIS (a) (mm)	MINOR AXIS (b) (mm)	Wall Thickness (mm)	SLOPE (%)	UPPER INVERT (m)	LOWER INVERT (m)	FALL (m)	VELOCITY (m/s)	DROP IN LOWER MANHOLE (m)	Ground Elevation Upper MH	Cover @ Up MH (m)	Cover @ Low MH (m)
	FROM MH	TO MH	POP	AREA (ha.)	POP	AREA (ha.)																		
Mercer Street	E 3C506	E 3C507	255	3.66	255	3.66	6.000	6.426	1.026	7.45	166.51	67.8	500	375	16	0.43	184.420	184.130	0.290	1.13	0.000	187.367	2.431	2.714
Mercer Street	E 3C507	E 3C508	160	0.87	415	4.53	6.000	10.458	1.268	11.73	30.51	69.7	500	375	16	0.01	184.130	184.120	0.010	0.21		187.360	2.714	2.661

MERCER STREET AT HANNAH SANITARY SEWER DESIGN SHEET

Project Name: Mercer Street at Hanna
Project No: 24-8715

The Peaking Factor was derived:
Using Harmon Formula= **N** (Y or N)
From a Table= **Y**
Value from table= **6**

Residential Average Daily Flow= **363** L/Cap.D
Peak Extraneous Flow= **0.280** L/Ha.S

Outlet Invert Elevation= **184.295**

Mannings 'n'= **0.013**

Basement Floor Elevation =

Ground Elevation at Outlet = **187.300**

City of Windsor

Total Area= **0.586**

Hydraulic Grade Line Cover =

Location			Flow Characteristics								Sewer Design/Profile								Cover				
ROAD/STN	LOCATION		INDIVIDUAL		CUMULATIVE		PEAKING FACTOR M	POP FLOW Q(p) (L/s)	PEAK EXTR. FLOW Q(i) (L/s)	PEAK DESIGN FLOW Q(d) (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE DIA. (mm)	Wall Thickness (mm)	SLOPE (%)	UPPER INVERT (m)	LOWER INVERT (m)	FALL (m)	VELOCITY (m/s)	DROP IN LOWER MANHOLE (m)	Ground Elevation Upper MH	Cover @ Up MH (m)	Cover @ Low MH (m)
	FROM MH	TO MH	POP	AREA (ha.)	POP	AREA (ha.)																	
Building 'A'	Stub	SMH-2	10	0.04	10	0.04	6.000	0.252	0.011	0.26	15.23	4.5	150	5	1.00	185.025	184.981	0.045	0.86	0.419	187.580	2.400	2.490
Building 'B'	Stub	SMH-2	150	0.11	150	0.11	6.000	3.780	0.032	3.81	15.23	9.2	150	5	1.00	185.115	185.023	0.092	0.86	0.461	187.670	2.400	2.448
	SMH-2	SMH-1	0	0.43	160	0.59	6.000	4.032	0.164	4.20	23.65	7.6	200	6	0.52	184.562	184.522	0.040	0.75	0.200	187.625	2.857	2.782
	SMH-1	Mainline	0	0.00	160	0.59	6.000	4.032	0.164	4.20	23.65	5.2	200	6	0.52	184.322	184.295	0.027	0.75		187.510	2.982	2.799

MERCER STREET AT HANNA
STORM SEWER DESIGN SHEET

Project Name: Mercer Street at Hanna
Project Number: 24-8715

Intensity Option # 1
1) Intensity (i) = a/(t+b)^c 2) Intensity (i) = a*t^b 3) Insert Intensity

Based on 1:5 Year Storm Event
Windsor, Ontario

a= 1259.000
b= 8.800
c= 0.838

a=
b=

i=

Manning's n = 0.013

Total Area (ha)= 0.59 Outlet Invert Elevation= 182.185 Ground Elevation @ Outlet = 187.45

Location			Sewer Design / Profile											Cover										
Road /Stations	From MH	To MH	Area (ha)	Run. Coef.	2.78AC	Accum. 2.78AC	T of In (min)	T of F (min)	T of Conc. (min)	Intensity (mm/hr)	Exp. Flow (L/s)	Capacity (L/s)	Velocity (m/s)	Wall Thickness (mm)	Length (m)	Pipe Dia. (mm)	Slope (%)	Invert Up MH	Invert Low MH	Fall (m)	Drop Across Low MH (m)	Ground Elev Up MH	Cover @ Up MH (m)	Cover @ Low MH (m)
	Building 'A'	CBMH-2	0.04	0.95	0.10	0.10	15.0	0.17	15.00	88.40	8.88	15.23	0.86	13	8.9	150	1.00	185.573	185.484	0.09	0.750	187.400	1.66	1.25
	CBMH-2	CBMH-1	0.30	0.80	0.66	0.76	15.0	1.62	15.17	87.87	66.56	84.09	0.76	41	74.0	375	0.23	184.734	184.564	0.17	0.075	186.900	1.75	1.94
	Building 'B'	CBMH-1	0.11	0.95	0.30	0.30	15.0	0.12	15.00	88.40	26.62	59.47	1.21	20	8.8	250	1.00	185.327	185.239	0.09	0.750	187.400	1.80	1.41
	CBMH-1	STMH-3	0.04	0.90	0.11	1.17	15.0	0.45	16.79	83.18	97.23	124.27	0.78	42	20.9	450	0.19	184.489	184.449	0.04	0.150	186.920	1.94	2.37
	Underground Storage	STMH-3	0.00	1.00	0.00	0.00	15.0	0.07	15.00	88.40	0.00	212.70	0.75	49	2.9	600	0.12	184.303	184.299	0.00		187.320	2.37	2.36
	STMH-3	STMH-2	0.09	0.80	0.20	1.36		0.68	17.24	81.99	111.89	212.70	0.75	49	30.7	600	0.12	184.299	184.262	0.04	0.025	187.310	2.36	2.49
	STMH-2	STMH-1	0.01	0.60	0.01	1.38		0.08	17.92	80.23	110.34	53.84	0.76	34	3.5	300	0.31	184.237	184.227	0.01	2.000	187.400	2.83	2.96
	STMH-1	Mainline	0.00	0.00	0.00	1.38		0.29	17.99	80.04	110.08	53.84	0.76	34	13.4	300	0.31	182.227	182.185	0.04		187.520	4.96	4.93

APPENDIX C

STORMWATER MANAGEMENT CALCULATIONS



Stormwater Management Calculations	Project: Mercer Street at Hanna	No.: 24-8715
Rational Method Calculations	By: JW	Date: 10/22/2025
	Checked: KAW	Scenario: Existing
		Page: 1

Calculation of existing runoff rate is undertaken using the Rational Method: $Q = CIA / 360$

- Where: Q = Peak flow rate (litres/second)
- C = Runoff coefficient
- I = Rainfall intensity (mm/hour)
- A = Catchment area (hectares)

Project Area **0.59** hectares

Composite Runoff Coefficient		
Land Use	Area (m ²)	C
Parking Lot	5,859	0.50
Composite Runoff Coefficient	5,859	0.50

Time of Concentration							
Method	Up EL (m)	Down EL (m)	Length (m)	Slope (%)	Area (ha)	C	Min Inlet Time (min)
	187.57	187.00	43.85	1.30	0.59	0.50	20
Bransby Williams						t_c (min) =	20.0
Airport						t_c (min) =	N/A

Rainfall intensity calculated in accordance with Sault Ste. Marie IDF Parameters:
(if only two parameters are provided, enter B as "0" and C as positive number)

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

- Where: A, B, and C = IDF Parameters From Local Municipality Guidelines
- I = Rainfall intensity (mm/hour)
- T = Time of concentration (hours)

Return Period (Years)	2	5	10	25	50	100
A	854.0	1259.0	1511.0	1851.0	2114.0	2375.0
B	7.0	8.8	9.5	10.2	10.6	11.0
C	0.818	0.838	0.845	0.852	0.858	0.861
T (mins) **	20.0	20.0	20.0	20.0	20.0	20.0
I (mm/hr)	57.6	75.3	86.5	101.5	112.3	123.5
Q (L/s)	47.27	61.81	71.00	83.26	92.12	101.29
Q (m ³ /s)	0.047	0.062	0.071	0.083	0.092	0.101



Stormwater Management Calculations Rational Method Calculations	Project: Mercer Street at Hanna	No.: 24-8715	
	By: JW	Date: 10/22/2025	Page:
	Checked: KAW	Scenario: Proposed	2

Calculation of existing runoff rate is undertaken using the Rational Method: $Q = CIA / 360$

Where: Q = Peak flow rate (litres/second)

C = Runoff coefficient

I = Rainfall intensity (mm/hour)

A = Catchment area (hectares)

$$100 - \text{year } C \text{ Value} = \frac{\text{Storage Depth (from Section 3.3.2.1 WERSMSM)}}{108\text{mm (100 Year 24 hour Rainfall)}}$$

Project Area 0.59 hectares

$$\text{Storage Depth} = 72 + 0.33x \text{ (Hydrological Soil Group D)}$$

Composite Runoff Coefficient		
Land Use	Area (m ²)	C
Roofs	1,520.57	0.95
Road Pavement/Sidewalks	2,753.76	0.90
Landscape	1,585.05	0.20
Composite Runoff Coefficient	5,859.38	0.72
100 - Year C Value		0.89

Storage | 100-yr C
95.879 0.888

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

Rainfall intensity calculated in accordance with Windsor A. IDF Parameters:

(if only two parameters are provided, enter B as "0" and C as positive number)

Where: A, B, and C = IDF Parameters From Local Municipality Guidelines

I = Rainfall intensity (mm/hour)

T = Time of concentration (Minutes)

Return Period (Years)	2	5	10	25	50	100
A	854.0	1259.0	1511.0	1851.0	2114.0	2375.0
B	7.0	8.8	9.5	10.2	10.6	11.0
C	0.82	0.84	0.85	0.85	0.86	0.86
T (mins)	15.0	15.0	15.0	15.0	15.0	15.0
I (mm/hr)	68.1	88.4	101.3	118.4	130.9	143.7
Total Q (L/s)	80.3	104.2	119.4	153.5	185.1	207.8
Total Q (m ³ /s)	0.080	0.104	0.119	0.154	0.185	0.208

Catchment ID
1:5 Year Modified Rational

start time 0
increment 2

Catchment Parameters

Area 0.59 ha
 Runoff C 0.72
 Ax C 0.42
 target* 43.07 L/s
 Sreq'd 56 m³

* Reduced by the estimated peak sanitary flows

Catchment ID
1:100 Year Modified Rational

start time 0
increment 2

Catchment Parameters

Area 0.59 ha
 Runoff C 0.89
 Ax C 0.52
 target* 43.07 L/s
 Sreq'd 177 m³

time (min)	Intensity (mm/hr)	Flow (m ³ /s)	Vol in (m ³)	target (m ³ /s)	vol out (m ³)	net (m ³)
0	203.49	0.240	0.00	0.043	0	0.00
2	171.40	0.202	24.24	0.043	5	19.08
4	148.66	0.175	42.05	0.043	10	31.72
6	131.63	0.155	55.85	0.043	16	40.35
8	118.36	0.140	66.97	0.043	21	46.29
10	107.72	0.127	76.18	0.043	26	50.34
12	98.97	0.117	83.99	0.043	31	52.98
14	91.64	0.108	90.73	0.043	36	54.55
16	85.40	0.101	96.64	0.043	41	55.29
18	80.03	0.094	101.88	0.043	47	55.36
20	75.35	0.089	106.57	0.043	52	54.89
22	71.22	0.084	110.82	0.043	57	53.96
24	67.57	0.080	114.68	0.043	62	52.66
26	64.30	0.076	118.23	0.043	67	51.04
28	61.35	0.072	121.50	0.043	72	49.14
30	58.69	0.069	124.53	0.043	78	47.00
32	56.27	0.066	127.35	0.043	83	44.66
34	54.06	0.064	129.99	0.043	88	42.13
36	52.03	0.061	132.47	0.043	93	39.44
38	50.16	0.059	134.80	0.043	98	36.60
40	48.43	0.057	137.01	0.043	103	33.64
42	46.83	0.055	139.10	0.043	109	30.56
44	45.34	0.053	141.08	0.043	114	27.38
46	43.95	0.052	142.97	0.043	119	24.10
48	42.65	0.050	144.77	0.043	124	20.73
50	41.43	0.049	146.49	0.043	129	17.28
52	40.28	0.047	148.14	0.043	134	13.76
54	39.20	0.046	149.72	0.043	140	10.18
56	38.19	0.045	151.24	0.043	145	6.53
58	37.23	0.044	152.70	0.043	150	2.82
60	36.32	0.043	154.11	0.043	155	-0.94
62	35.46	0.042	155.47	0.043	160	-4.75
64	34.64	0.041	156.78	0.043	165	-8.61
66	33.86	0.040	158.05	0.043	171	-12.51
68	33.12	0.039	159.28	0.043	176	-16.45
70	32.41	0.038	160.47	0.043	181	-20.42
72	31.74	0.037	161.62	0.043	186	-24.44
74	31.10	0.037	162.74	0.043	191	-28.49
76	30.48	0.036	163.83	0.043	196	-32.57
78	29.89	0.035	164.89	0.043	202	-36.68
80	29.33	0.035	165.92	0.043	207	-40.81
82	28.78	0.034	166.92	0.043	212	-44.98
84	28.26	0.033	167.90	0.043	217	-49.17
86	27.76	0.033	168.86	0.043	222	-53.38
88	27.28	0.032	169.79	0.043	227	-57.62
90	26.82	0.032	170.69	0.043	233	-61.88
92	26.37	0.031	171.58	0.043	238	-66.16
94	25.94	0.031	172.45	0.043	243	-70.46
96	25.52	0.030	173.30	0.043	248	-74.79
98	25.12	0.030	174.13	0.043	253	-79.12
100	24.74	0.029	174.94	0.043	258	-83.48

time (min)	Intensity (mm/hr)	Flow (m ³ /s)	Vol in (m ³)	target (m ³ /s)	vol out (m ³)	net (m ³)
0	301.3176	0.436	0.00	0.043	0	0.00
2	260.9507	0.377	45.28	0.043	5	40.12
4	230.7008	0.334	80.07	0.043	10	69.73
6	207.1319	0.300	107.83	0.043	16	92.33
8	188.2161	0.272	130.65	0.043	21	109.97
10	172.6763	0.250	149.82	0.043	26	123.98
12	159.6673	0.231	166.24	0.043	31	135.23
14	148.6063	0.215	180.52	0.043	36	144.34
16	139.0783	0.201	193.08	0.043	41	151.73
18	130.7793	0.189	204.25	0.043	47	157.73
20	123.4813	0.179	214.28	0.043	52	162.60
22	117.0100	0.169	223.36	0.043	57	166.50
24	111.2298	0.161	231.62	0.043	62	169.60
26	106.0332	0.153	239.20	0.043	67	172.01
28	101.3344	0.147	246.19	0.043	72	173.83
30	97.0637	0.140	252.66	0.043	78	175.13
32	93.1638	0.135	258.67	0.043	83	175.98
34	89.5875	0.130	264.29	0.043	88	176.43
36	86.2953	0.125	269.55	0.043	93	176.52
38	83.2539	0.120	274.50	0.043	98	176.30
40	80.4351	0.116	279.16	0.043	103	175.79
42	77.8148	0.113	283.57	0.043	109	175.04
44	75.3722	0.109	287.75	0.043	114	174.05
46	73.09	0.106	291.72	0.043	119	172.85
48	70.95	0.103	295.50	0.043	124	171.46
50	68.94	0.100	299.10	0.043	129	169.89
52	67.06	0.097	302.54	0.043	134	168.16
54	65.27	0.094	305.84	0.043	140	166.29
56	63.59	0.092	309.00	0.043	145	164.28
58	62.00	0.090	312.03	0.043	150	162.14
60	60.50	0.087	314.94	0.043	155	159.89
62	59.07	0.085	317.75	0.043	160	157.53
64	57.71	0.083	320.45	0.043	165	155.07
66	56.42	0.082	323.06	0.043	171	152.51
68	55.18	0.080	325.59	0.043	176	149.86
70	54.01	0.078	328.02	0.043	181	147.13
72	52.89	0.076	330.39	0.043	186	144.32
74	51.81	0.075	332.67	0.043	191	141.44
76	50.79	0.073	334.89	0.043	196	138.49
78	49.80	0.072	337.04	0.043	202	135.48
80	48.86	0.071	339.13	0.043	207	132.40
82	47.95	0.069	341.17	0.043	212	129.26
84	47.08	0.068	343.14	0.043	217	126.07
86	46.24	0.067	345.07	0.043	222	122.83
88	45.44	0.066	346.94	0.043	227	119.53
90	44.66	0.065	348.77	0.043	233	116.19
92	43.91	0.064	350.55	0.043	238	112.80
94	43.19	0.062	352.29	0.043	243	109.37
96	42.50	0.061	353.99	0.043	248	105.90
98	41.83	0.060	355.64	0.043	253	102.39
100	41.18	0.060	357.27	0.043	258	98.85