

July 23rd, 2025

Christopher Brown
Director of Urban and Retail Design
MMC International Architects Ltd.
64 Queen Street West. Suite 1110
Toronto, ON M5H 2M8

Dear Mr. Brown

Re: Halifax Shopping Centre Annex – Downstream Wastewater Analysis
Mumford Road, Halifax, NS

Strum has been retained by MMC International Architects Ltd. to complete a downstream wastewater analysis for the proposed Halifax Shopping Centre Annex redevelopment on Mumford Road in Halifax, NS (PID 41030636). This analysis has been completed for the existing Halifax Water municipal sanitary network to ensure the existing infrastructure has sufficient capacity downstream of the proposed development. Detailed calculations, population and area estimates, and pipe capacity results from this analysis are shown on drawing 25-11447-SK01. An overview of the information and methodology used for this analysis is outlined in this letter.

1.0 EXISTING SANITARY INFRASTRUCTURE

Based on GIS and as-built record information provided by Halifax Water, it is anticipated that the proposed development will include a sanitary service connection to the existing 600 mm-diameter concrete combined sewer main along Mumford Road. Downstream of the 600mm-diameter combined sewer, the sanitary network connects into an existing 1200mm-diameter trunk sewer main located along the existing railway. Downstream analysis has been completed for both the 600mm-diameter combined sewer up to MH3097, and for the 1200mm-diameter trunk sewer main up to MH3102 (see drawing 25-11447-SK01).

2.0 PROPOSED DEVELOPMENT

The proposed two-phase development includes the construction of four buildings which create an additional 1344 apartment units, 40 townhome units, and 20,800 sf (1932m²) of retail/community space within the existing sewershed. This proposed development will replace three existing buildings which contain a total of ±44,223 sf (4,109m²) of commercial/retail space, equating to an equivalent population of 100 people when using an average dry weather flow of 300 L/person/day, as recommended in the Halifax Water Specification (2025). A net population increase of ±3,203 people is expected from the proposed development. Refer to Halifax Shopping Centre Annex Master Plan completed by MMC International Architects Ltd. for more information on the proposed development.

3.0 METHODOLOGY & RESULTS

Based on GIS and record information received from Halifax Water for the analysis area, the sewersheds for the combined sewer (Area A) and the overall sewer (Areas A+B) up to the respective analysis points were delineated, as shown on drawing 25-11447-SK01. Using Halifax Regional Municipality zoning boundaries and publicly sourced information on the commercial and residential buildings within each zone, the estimated populations within each sewershed were estimated to calculate the tributary flows entering the analysis pipes. In accordance with the Halifax Water Design Specifications & Supplementary Standard Specifications for Water, Wastewater & Stormwater Systems (2025), two separate analysis methods were used for the combined 600mm-diameter sewer and the 1200mm-diameter trunk sewer main.

3.1 Wastewater Flows

To estimate the sanitary flow generated from the sewershed, information from the Halifax Water design specification and the Atlantic Canada Wastewater Systems Guidelines (2022) was used. The following information was used from the Halifax Water design specifications:

- Average Dry Weather Flow = 300 L/person/day
- Density for single-unit dwellings = 3.35 people/unit
- Density for semi-detached & townhouse units = 3.35 people/unit
- Density for multi-unit dwellings = 2.25 people/unit

The following wastewater flows (average daily) were used from the Atlantic Canada Wastewater Systems Guidelines:

- Schools = 115 L/person/day
- Restaurant Spaces = 225 L/day/seat
- Office Spaces = 6 L/day/m²
- Commercial/Retail Areas/Shopping Centres = 6 L/day/m²
- Nursing and rest homes = 450 L/day/resident

To estimate the tributary sewer flows from the sewershed, published values from the Atlantic Canada Wastewater Systems Guidelines were converted to an equivalent population using Halifax Water's average dry weather flow of 300 L/person/day. The estimated equivalent populations generated from each zone are indicated in the table on drawing 25-11447-SK01.

3.2 Combined Sewer (Area A)

A downstream analysis of the existing 600mm-diameter combined sewer was completed as per section 4.2.5.4 – *Wastewater Service Connection to a Combined System* in the Halifax Water design specifications (2025). As described in the specifications, this combined sewer analysis used the "six times dry weather flow (6DWF)" methodology where flow monitoring data is not available. Using this analysis method, pre-development tributary sewer flows were estimated from this sewershed up to MH3097 and were compared to the capacity of the 600mm-diameter pipe. This analysis was then completed for post-development conditions in the sewershed accounting for the increased population and wastewater flows caused by the development. Results from this analysis indicated that the existing 600 mm-diameter combined sewer has sufficient capacity for the sanitary flows generated from Area A in both the pre-development and post-development scenarios.

3.3 Trunk Sewer (Area A+B)

A downstream analysis of the existing 1200mm-diameter trunk sewer was completed as per section 4.2 – *Wastewater Collection System Design* in the Halifax Water design specifications (2025). Using the analysis method described in the HW specifications and the sanitary flow values described in Section 3.1 of this letter, pre-development tributary sewer flows were estimated from the overall sewershed (Area B). It is expected that Area B will not contain any changes during the development of the proposed site, so the post-development sanitary flows for Area B are assumed to match pre-development flows. Since the existing trunk sewer is downstream of the 600mm combined sewer, tributary flows from Area A were combined with the pre/post development sanitary flows from Area B to analyze the increased flows entering the trunk sewer from the proposed development. Results from this analysis indicated that the existing 1200mm-diameter trunk sewer has sufficient capacity for the sanitary flows generated from the overall sewershed (Area A and B) in both pre-development and post-development scenarios.

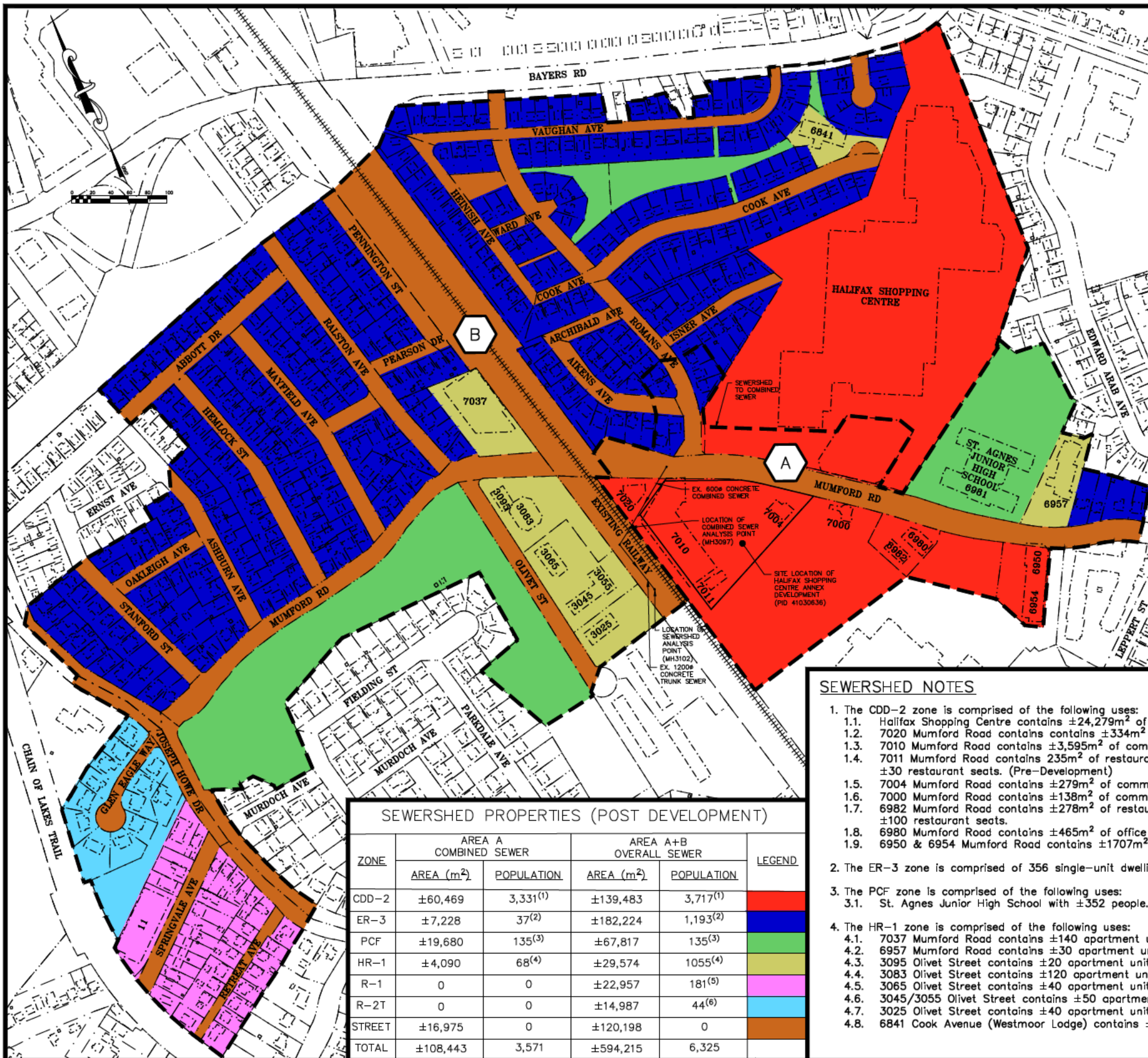
3.4 Model Limitations

Based on the limited amount of record information for the existing analysis pipes, assumptions were made for the slopes of the existing 600mm-diameter and 1200mm-diameter pipes. The slopes of each pipe were assumed to be 0.50% which resulted in the maximum Q/Q_{capacity} in each pipe, resulting in a conservative analysis. If the existing pipe slopes are greater than 0.50%, the existing analysis pipes will have sufficient capacity for the increased flows generated from the Halifax Shopping Centre Annex development.

We trust the above to be satisfactory. If you have any questions, please contact us.

Thank you,

[Redacted Signature]
Rob McKinnon, P.Eng.
Group Manager
Civil Engineering
[Redacted Contact Information]



SEWERSHED PROPERTIES (POST DEVELOPMENT)					
ZONE	AREA A COMBINED SEWER		AREA A+B OVERALL SEWER		LEGEND
	AREA (m ²)	POPULATION	AREA (m ²)	POPULATION	
CDD-2	±60,469	3,331 ⁽¹⁾	±139,483	3,717 ⁽¹⁾	
ER-3	±7,228	37 ⁽²⁾	±182,224	1,193 ⁽²⁾	
PCF	±19,680	135 ⁽³⁾	±67,817	135 ⁽³⁾	
HR-1	±4,090	68 ⁽⁴⁾	±29,574	1055 ⁽⁴⁾	
R-1	0	0	±22,957	181 ⁽⁵⁾	
R-2T	0	0	±14,987	44 ⁽⁶⁾	
STREET	±16,975	0	±120,198	0	
TOTAL	±108,443	3,571	±594,215	6,325	

DOWNSTREAM COMBINED SEWER ANALYSIS NOTES

- The point of calculation for the downstream combined sewer analysis is an existing combined sewer manhole (MH3097) located along the existing railway at the rear property boundary of PID 41030636. The incoming 600# concrete pipe is considered the analysis pipe.
- The existing pipe considered during analysis belongs to the combined system and has the following characteristics based on Halifax Water provided GIS record information:
 - Pipe size = 600#
 - Pipe material = concrete
 - Pipe length = ±74.90m
 - Pipe slope = ±0.50% (assumed)
- Analysis of the existing 600# concrete combined pipe was completed to Section 4.2.5.4 – Wastewater Service Connection to a Combined System of the 2025 Halifax Water Design Specifications for systems where flow monitoring is not available.
- The total pre-development equivalent population for 300 L/person/day within the combined system sewershed (Area A) is anticipated to be ±467 people.
- Pre-development flow and velocity data is calculated within the existing 600# concrete pipe to be:
 - Anticipated flow, Q = 12.3 L/s
 - Q-capacity = 434 L/s
 - Q/Q-capacity = 0.028
 - Partial velocity = 0.67 m/s
- The proposed Halifax Shopping Centre Annex development will introduce ±1386 residential units and ±1,932m² of retail/community space to the combined sewer system. A total population of ±3,203 people (net increase of ±3,103 people, accounting for existing building demolition) will be added to the sewershed using a density of 2.25 people/apartment unit for residential units, and a wastewater flow of 6 L/day/m² for the commercial space (as per Atlantic Canada Wastewater Guidelines).
- Post-development flow and velocity data is calculated within the existing 600# concrete pipe to be:
 - Anticipated flow, Q = 94.4 L/s
 - Q-capacity = 434 L/s
 - Q/Q-capacity = 0.22
 - Partial velocity = 1.23 m/s
- With changes noted between pre and post-development flows and velocities in the 600# concrete pipe it has been concluded that the proposed development will not have a significant negative impact on the combined sewer flows at the 600# concrete pipe flowing into MH3097.

DOWNSTREAM SEWER ANALYSIS NOTES

- The point of calculation for the downstream sewer analysis as provided by Halifax Water is an existing sewer manhole (MH3012) located along the existing railway. The incoming 1200# concrete pipe is considered the analysis pipe.
- The existing pipe considered during analysis has the following characteristics based on Halifax Water provided GIS record information:
 - Pipe size = 1200#
 - Pipe material = concrete
 - Pipe length = ±60.00m
 - Pipe slope = ±0.50% (assumed)
- Analysis of the existing 1200# concrete combined pipe was completed to Section 4.2 – Wastewater Collection System Design of the 2025 Halifax Water Design Specifications.
- The total pre-development equivalent population for 300 L/person/day within the overall sewershed (Areas A+B) is anticipated to be ±3,321 people.
- Pre-development flow and velocity data is calculated within the existing 1200# concrete pipe to be:
 - Anticipated flow, Q = 68.7 L/s
 - Q-capacity = 3,584 L/s
 - Q/Q-capacity = 0.019
 - Partial velocity = 1.24 m/s
- The proposed Halifax Shopping Centre Annex development will introduce additional flows to MH3102 from the combined sewer connection at MH3097, as described in the Downstream Combined Sewer Analysis Notes.
- Post-development flow and velocity data is calculated within the existing 1200# concrete pipe to be:
 - Anticipated flow, Q = 150.7 L/s
 - Q-capacity = 3,584 L/s
 - Q/Q-capacity = 0.042
 - Partial velocity = 1.56 m/s
- With changes noted between pre and post-development flows and velocities in the 1200# concrete pipe it has been concluded that the proposed development will not have a significant negative impact on the sewer flows at the 1200# concrete pipe flowing into MH3102.

SEWERSHED NOTES

- The CDD-2 zone is comprised of the following uses:
 - Halifax Shopping Centre contains ±24,279m² of commercial space.
 - 7020 Mumford Road contains ±334m² of office space.
 - 7010 Mumford Road contains ±3,595m² of commercial space. (Pre-Development)
 - 7011 Mumford Road contains 235m² of restaurant space, and is assumed to contain ±30 restaurant seats. (Pre-Development)
 - 7004 Mumford Road contains ±279m² of commercial space. (Pre-Development)
 - 7000 Mumford Road contains ±138m² of commercial space.
 - 6982 Mumford Road contains ±278m² of restaurant space, and is assumed to contain ±100 restaurant seats.
 - 6980 Mumford Road contains ±465m² of office space.
 - 6950 & 6954 Mumford Road contains ±1707m² of commercial space.
- The ER-3 zone is comprised of 356 single-unit dwellings.
- The PCF zone is comprised of the following uses:
 - St. Agnes Junior High School with ±352 people.
- The HR-1 zone is comprised of the following uses:
 - 7037 Mumford Road contains ±140 apartment units and ±1019m² of commercial space.
 - 6957 Mumford Road contains ±30 apartment units.
 - 3095 Olivet Street contains ±20 apartment units.
 - 3083 Olivet Street contains ±120 apartment units.
 - 3065 Olivet Street contains ±40 apartment units.
 - 3045/3055 Olivet Street contains ±50 apartment units.
 - 3025 Olivet Street contains ±40 apartment units.
 - 6841 Cook Avenue (Westmoor Lodge) contains ±30 residents.

- The R-1 zone is comprised of the following uses:
 - 11 Springvale Avenue contains ±30 apartment units.
 - Springvale Avenue and Retreat Avenue contain a total of 34 single-unit dwellings.
- The R-2T zone is comprised of 13 single-unit dwellings.
- Apartment units have been assumed to have a population density of 2.25 people/unit.
- Single unit dwellings have been assumed to have a population density of 3.35 people/unit.
- Retail spaces (7010, 7004, & 6950/6954 Mumford Road commercial) and shopping centres (Halifax Shopping Centre) have an average daily wastewater flow of 6 L/day/m²*.
- Restaurant spaces (7011 & 6982 Mumford Road) have an average daily wastewater flow of 225 L/day/seat*.
- Schools (St. Agnes Junior High School) have an average daily wastewater flow of 115 L/person/day*.
- Office spaces (7020 Mumford Road commercial & 6980 Mumford Road commercial) have an average daily wastewater flow of 6 L/day/m²*.
- Nursing and rest homes (6841 Cook Avenue) have an average daily wastewater flow of 450 L/day/resident*.

*Average daily wastewater flow values were taken from Atlantic Canada Wastewater Guidelines Manual. Published values were converted to an equivalent population using an average dry weather flow of 300 L/person/day from Halifax Water's specifications (2025).

This drawing was created in Mi'kma'ki; the ancestral, cultural, and spiritual lands of the Mi'kmaq People.



PROJECT	HALIFAX SHOPPING CENTRE ANNEX
DRAWING TITLE	SEWERSHED ZONING MAP

Revision				Date:	July 23/25
No.	Comments	Date	By	Scale:	1:5000
0	Issued For Review	July 23/25	RWM	Project No.:	25-11447
				Drawing No.:	SK01