



## Niagara Falls – 3090 Montrose Road

<b>Organization:</b> City of Niagara Falls	GM BluePlan Project No: 621014
<b>Attention:</b> Jessica Brownlee	Date: July 25, 2023
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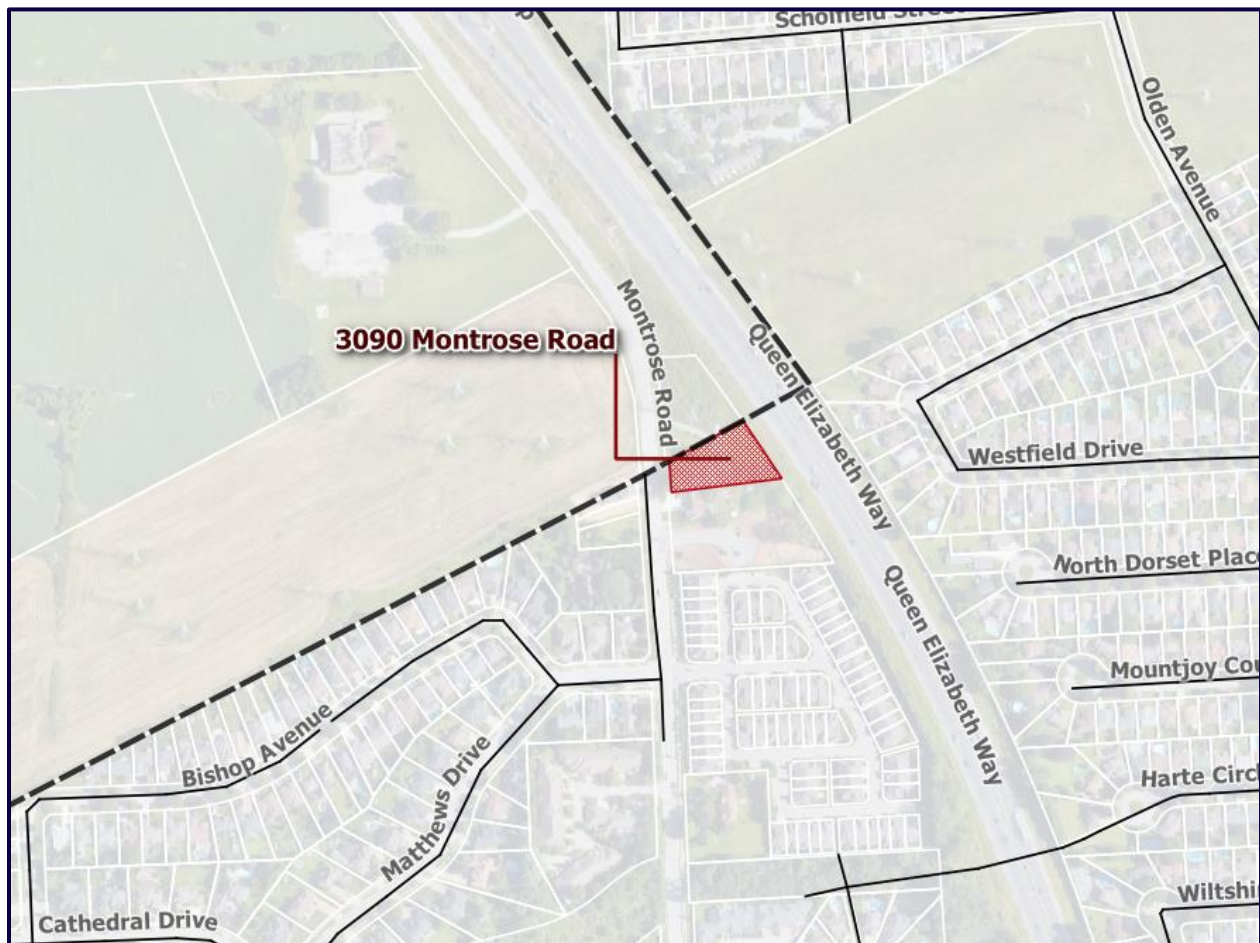


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## 1 Project Scope

The City of Niagara Falls has retained GM BluePlan Engineering to assess the impacts of a proposed development on the City’s existing wastewater systems. The proposed development would consist of an 8-unit residential development consisting of 6 townhouses units and a semi-detached dwelling (2 units) located on 0.282 ha of land. The site is located on the east side Montrose Road between Kalar Road and Thorold Stone Road and borders the Queen Elizabeth Way, shown in **Figure 1**.



**Figure 1: Development Location**

### 1.1 Hydraulic Sanitary Model

The system was assessed using:

- The City’s existing wastewater model that was developed as part of the City’s Pollution Prevention Control Plan (2016) and updated as part of the Region’s Master Servicing Plan Update (2022).

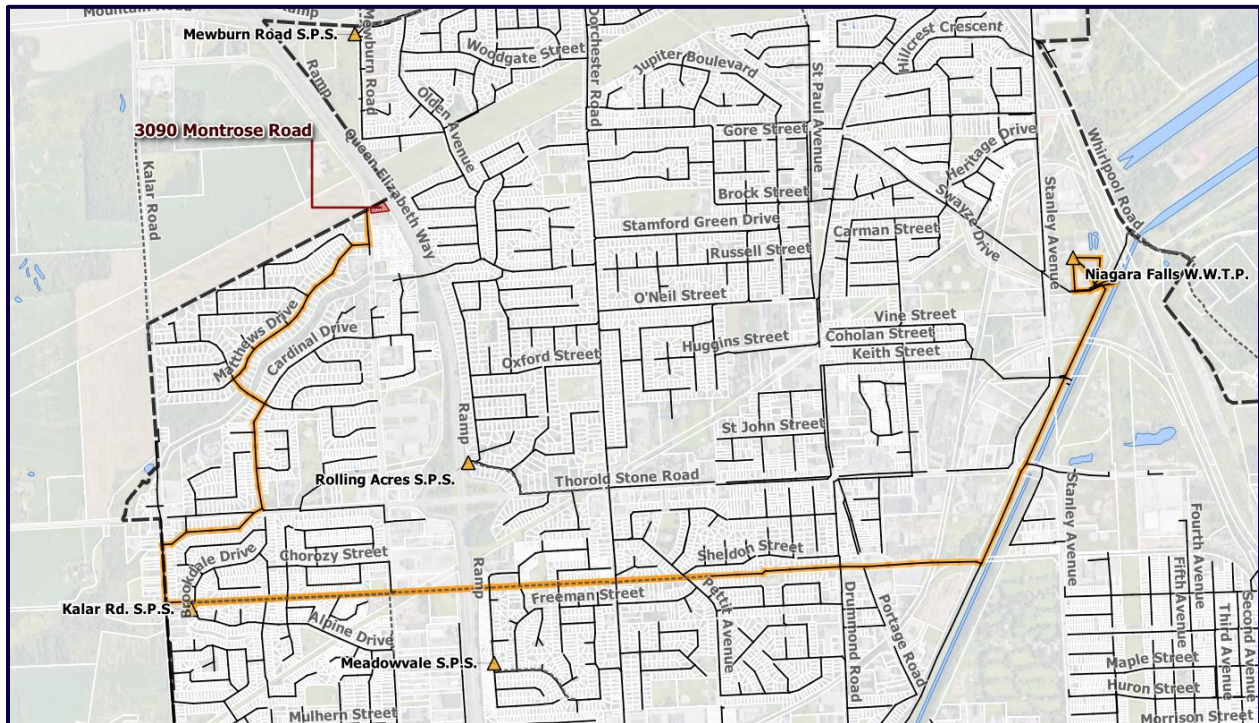
## 2 Sanitary System Review

### 2.1 Local System

The proposed site would tie-in to the existing 200 mm sanitary sewer that runs along the west side of Montrose Road in the boulevard. Downstream of the site, the flows would follow the sewer alignment as shown on **Figure 2**, before ultimately discharging into the Region’s Niagara Falls Wastewater Treatment Plant:

- 315 m of 200 mm sewer on Matthews Drive;
- 686 m of 250 mm sewer on Matthews Drive;
- 187 m of 250 mm sewer on Mount Carmel Boulevard;
- 546 m of 525 mm sewer on Cardinal Drive;
- 477 m of 500 mm sewer on greenspace between Thorold Stone Road and Michael Street;
- 270 m of 500 mm sewer on Kalar Road;
- 140 m of 900 mm sewer east of Kalar Road which discharges to the Kalar Road SPS

The scope of the servicing review will be limited to the sewer upstream of the Kalar Road SPS.



**Figure 2: Wastewater Flow Route**

## 2.2 Wastewater Flow Analysis

The system was evaluated under both existing and post-development conditions to gauge the development impact holistically on the sanitary system. Post-development sanitary flows were calculated by Urban Environmental Management Inc. and supplied in Appendix C of their Functional Servicing and Stormwater Management Design Brief. The Urban Environmental Management Inc. flow rates were reviewed against City of Niagara Falls Engineering Design Standards Manual *Section 3: Sanitary Drainage Systems* methodology, outlined below, with an updated average domestic flow allowance of 255 L/cap/d based on the recently completed 2021 MSPU.

$$Q(d) = \frac{PqM}{86.4} + (I A)$$

Where:

- P = design population in thousands
- q = avg. daily per capita flow in l/cap.day
- M = peaking factor =  $5 / P^{0.2}$ ) (Babbitt Formula)
- I = infiltration in l/ha. sec
- A= tributary area in ha
- Q(d) = peak domestic sewage flow in l/sec (including extraneous flows)

- a) for design purposes a maximum infiltration allowance of 0.28 l/ha.sec has been provided
- b) for design purposes a maximum avg. domestic flow allowance of 450 l/cap.day has been provided
- c) check with Municipal staff when designing sewers in areas where high I/I has been identified

**Table 1** summarizes the Urban Environmental Management Inc. calculated flows against the methodology outlined in the Design Standards Manual. It is noted that the Urban Environmental Management Inc. report used a mixture of values that partially differed from the City's criteria to estimate sanitary flows. The flow value calculated in the Urban Environmental Management Inc. report is higher than the value generated using the City's methodology. The GM BluePlan system review was completed using the flow results generated using the values provided by Urban Environmental Management Inc. modified to use Harmon's Peaking Factor for consistency with the City methodology.

**Table 1: Sanitary Flows**

	Urban Environmental Management Inc.	City of Niagara Falls	Units
Lot Area	0.22		ha
Population	32	19	pop
Per Capita Flow	380	255	L/c/d
Avg Domestic Flow	<i>2 single and semi-detached houses 6 townhouses @ 4 ppu</i>	<i>2 single and semi-detached houses @ 3.27 ppu 6 townhouses at 2.05 ppu</i>	
	0.14	0.06	L/s
Peaking Factor	3.59 ( <b>4.0 Modified</b> )	4 (Harmon's PF)	
Peak Domestic Flow	0.51 ( <b>0.56 Modified</b> )	0.22	L/s
Infiltration Allowance	0.28	0.286	L/s/ha
Contributing Area	0.22	0.22	ha
RDII	0.06	0.00*	L/s
Design Flow	<b>0.57 (0.56 Modified)*</b>	<b>0.22</b>	L/s

\*Redevelopment of existing area. No new RDII contributions.

Note a modified value of 0.56 was used to correct to the peaking factor error in the calculations and to exclude RDII contributions as this was a pre-existing development.

## 2.3 Impact on Sanitary Sewer System Performance

### 2.3.1 Sewer System Capacity

For existing sewer capacities, sewer performance criteria were assessed using the following conditions:

- Maintaining depth of flow in pipe is equal to or less than obvert elevation ( $d/D \leq 1$ ); and, if failing to do so then,
- Maintain system hydraulic grade line (HGL) of a surcharging sewer is below the basement protection freeboard of 1.8 meters below grade.

Under dry weather flow conditions, no downstream sewer surcharging, or system overflows are anticipated under both existing and post-development conditions.

The system performance was reviewed under a variety of design storm conditions under the 2-year, 5-year, and 10-year design storms using the City's existing wastewater model. **Table 2** below summarizes the sewer system performance before and after development.

**Table 2** Wastewater Surcharge Depth & HGL Results

Scenario		Montrose to Matthews Drive at Bishop Avenue (200mm City Sewer)		Matthews Drive at Bishop Ave to Mount Camel Boulevard at Cardinal Dr (250mm City Sewer)		Mount Camel Boulevard at Cardinal Dr to Thorold Stone Rd (525 mm City Sewer)	
		d/D	Freeboard (m)	d/D	Freeboard (m)	d/D	Freeboard (m)
1:2 Year	Pre-Dev	0.61	2.59	>1	1.68	>1	2.56
	Post-Dev	0.88	2.59		1.09		2.39
1:5 Year	Pre-Dev	>1	1.65	>1	0.33	>1	1.89
	Post-Dev		1.65		0.33		1.89
1:10 Year	Pre-Dev	>1	0.29	>1	0.00	>1	1.75
	Post-Dev		0.29		0.00		1.71

As seen in **Table 2**, the existing sewers show surcharging under existing design storm conditions including:

- The 200mm sewer from the development to Matthews Drive are surcharging under the 5 and 10-year design storms to a level exceeding the basement protection freeboard of 1.8 meters below grade
- The 250mm sewer from Matthews Drive at Bishop Avenue to Mount Camel Boulevard at Cardinal Drive are surcharging under the 2, 5, and 10-year design storms to a level exceeding the basement protection freeboard of 1.8 meters below grade
- The 525mm sewer from Mount Camel Boulevard at Cardinal Dr to Thorold Stone Rd are surcharging under the 2, 5 and 10-year design storms; however, pipes only surcharge to a level exceeding the basement protection freeboard of 1.8 meters below grade under the 10-year design storm.

The proposed development’s additional sanitary flows to the system, as shown in **Table 2**, does marginally increase existing surcharging levels or overflow levels.

### 2.3.2 Pump Station Performance

Flows ultimately discharge to the Kalar Road Pump Station. It is noted that the existing peak 2, 5, and 10-year storm flows exceed the capacity of the Pump Station causing upstream surcharging above the 1.8m basement protection freeboard, as identified in the 2021 Region MSPU. The proposed 3090 Montrose Road development represents a less than 0.1% increase in flows to the Pump Station under the 10-year design storm and does not appear to trigger new overflows or storage upgrade needs. Although the additional flows at this time does not trigger any planned upgrades, the applicant should coordinate with the Region regarding pump station capacity allocations.

### 3 Summary and Recommendations

Based on the analysis, the impact of the 3090 Montrose Road development on the sanitary system are as follows:

- There is no surcharging under dry weather flow with pre-and post development flows
- There is existing sewer surcharging downstream of the development, with portions of the sewer currently surcharging above the basement flooding risk level of 1.8 m below grade under the design 2-year storm.
- Further, the proposed development results in:
  - Marginal increase in HGL along the sanitary route;
  - Negligible increase in wastewater flows from the proposed development site to the Kalar Road Pump Station; and,
  - Minor increase in sewer overflows along the route.

It is noted that portions of the existing wastewater sewers downstream of the proposed addition do not meet the City's capacity and performance targets under existing conditions, and that the proposed development is anticipated to have a marginal increase in HGL along the sanitary route. To address the downstream flooding, it is advised that the existing downstream HGL to be reduced via localized wet weather flow reduction interventions.