



## Niagara Falls – 7302 Kalar Road

<b>Organization:</b> City of Niagara Falls	GM BluePlan Project No: 621014
<b>Attention:</b> Jessica Brownlee	Date: February 26, 2024
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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 system. The proposed development would consist of a 13-storey residential building with 52 one-bedroom apartment units and 127 two-bedroom apartment units, and a 15-storey residential building with 58 one-bedroom apartment units and 175 two-bedroom apartment units. The development is on approximately 1.286 ha of land bounded by Kalar Road to the west and McLeod Road to the north, as 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 update as part of the Region's Master Servicing Plan Update (2022).

## 2 Sanitary System Review

### 2.1 Local System

The proposed site will tie-in to the existing sewer on Kalar Road as shown in **Figure 2**.

- 1090m of 375mm City sewers from the development on Kalar Rd to Brown Road
- 260m of 525mm City sewers on Brown Road from Kalar Road to Heartland Forest Road
- 80m of 600mm City Sewers on Heartland Forest Road before discharging into the Garner Road SPS

The sanitary flows originating at this proposed development contributes to the Garner Road Sewage Pumping Station (SPS). The scope of the servicing review will be limited to the City-owned sewers upstream of the 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 Hallex Engineering Ltd. and supplied in their Functional Servicing Report. The Hallex Engineering Ltd. 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** below summarizes the Hallex Engineering Ltd. calculated sanitary flows against the methodology outlined in the Design Standards Manual. It is noted that the Hallex Engineering Ltd. report used a mixture of values that partially differed from the City's criteria to estimate sanitary flows. The flow value calculated in the Hallex Engineering Ltd. report is a more conservative estimate 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 Hallex Engineering Ltd. modified to use Harmon's Peaking Factor, without RDII contributions for consistency with the City's methodology.

**Table 1: Sanitary Flows**

	Hallex Engineering Ltd.	Niagara Falls D.C.	Units
Lot Area	1.286		ha
Population	Apartments 110 units @ 2 <i>ppu</i> 302 units @ 4 <i>ppu</i> <b>1428 pop</b>	Apartments 412 units @ 1.55 <i>ppu</i> <b>639 pop</b>	pop
Per Capita Flow	450 L/cap/day	255 L/cap/day	L/cap/day
Avg Domestic Flow	<b>7.44</b>	<b>1.89</b>	L/s
Peaking Factor	4.66 (Babbitt's Peaking Factor) (3.695 modified Harmon's Peaking Factor)	3.917 (Harmon's Peaking Factor)	
Peak Domestic Flow	34.63 (27.48 modified)	7.38	L/s
Infiltration Allowance	0.286	0.286	L/s/ha
RDII	0.37 (0.0*)	0.0*	L/s
Design Flow	34.998 <b>(27.48* modified)</b>	7.38*	L/s

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

## 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 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 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		Development on Kalar Rd to Brown Rd (375mm City Sewer)		Brown Road from Kalar Road to Heartland Forest Rd (525mm City Sewer)		Heartland Forest Road to Garner Rd SPS (600mm City Sewer)	
		d/D	Freeboard (m)	d/D	Freeboard (m)	d/D	Freeboard (m)
1:2 Year	Pre-Dev	0.32	Within obvert	0.25	Within obvert	0.19	Within obvert
	Post-Dev	0.47		0.34		0.25	
1:5 Year	Pre-Dev	0.37		0.28		0.21	
	Post-Dev	0.51		0.36		0.27	
1:10 Year	Pre-Dev	0.40		0.30		0.23	
	Post-Dev	0.53		0.38		0.28	

As seen in **Table 2**, the existing sewers downstream of the development on Kalar Road has sufficient capacity to safely convey the 2-year, 5-year, and 10-year design storms with development flows without sewer surcharging.

### 2.3.2 Pump Station Performance

Flows ultimately discharge to the Region’s Garner Road Sewage Pumping Station (SPS). The 2021 Region MSPU identified Garner Road SPS as having surplus capacity to support growth to 2051. The proposed development population of 1428 people are within the Region’s MSP planned growth population of 2,305 people.

### 3 Summary and Recommendations

Based on the analysis, the impact of the 7302 Kalar Road development on the wastewater system are as follows:

- The existing sewer downstream has sufficient capacity to accommodate the additional flows under the design 10-year storm.

Further, the proposed development:

- Does not trigger planned upgrades in the region trunk or Niagara Falls WWTP per 2021 MSP

Based on the above findings, the proposed development is not expected to have a significant impact on the existing downstream sewer system. However, it is recommended that the applicator contact the Region regarding the development flow contribution to the Region owned pump station.