Jacobs

Memorandum

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Subject	**Flow Monitoring Summary [FINAL]**		Lakeshore Sanitary Sewer System Hydraulic Model
Attention	Albert Dionne, Manager of Water/Wastewater Services	**Project No.**	CE801100
From	Stu Mitchell, Project Manager		
Date	July 29, 2021		
Copies to	**Sannan Mansoor, Krystal Kalbol, Sydnee Rivest**		

1. Purpose

A sanitary sewer flow monitoring program was initiated on March 9, 2021 to aid in updating and recalibrating of the existing Sanitary Sewer System Hydraulic Model for the Municipality of Lakeshore. The flow monitoring program is scheduled to last until the end of August 2021. A total of 10 flow monitors and 2 rain gauges were installed throughout the Municipality of Lakeshore by AMG Environmental Group. The locations of these flow monitors and rain gauges are shown in Figure 1.

A virtual modelling workshop was conducted on July 21, 2021 and a summary of the flow monitoring results was requested by the Municipality for the storm event of July 16, 2021. The purpose of this memorandum is to summarize the results of the flow monitoring program up to July 22, 2021. The data used for this summary is preliminary and has not been reviewed for quality assurance. Based on this preliminary data, the storm event of July 16, 2021 was the most significant in terms of peak intensity and total rainfall depth which caused significant surcharging in the sanitary system. The peak intensity recorded was 61 mm/hr with a total rainfall depth of 67 mm for a storm duration of approximately 11 hours at Denis St. Pierre WPCP.

2. Flow Monitors

Table 1 summarizes the data from the 10 flow monitors from March 9, 2021 to July 22, 2021. The average flow and depth values are included along with minimum and maximum recorded flow and depth during this time period. The maximum recorded depth provides indication of the sewer surcharge state; sewer is observed to be surcharged if the maximum water depth exceeds the diameter or height of the sewer. Pipe full capacity (pfc), percentage of full capacity, and a ratio of recorded depth to pipe diameter (d/D) is also included in Table 1 to understand magnitude of surcharge.

Flow monitor location FM 10 at Lalonde Street started malfunctioning post July 7, 2021 as per AMG online web portal. As a result, storm event of July 16, 2021 showed no recorded data at this location and therefore, the results from this flow monitor are excluded from Table 1 below. However, no surcharge was observed during the monitoring period at this location up to July 7, 2021.

Table 1 Flow monitoring summary

Flow Monitor-Street	Sewer Diameter (D in mm)	Pipe full capacity (l/s)	Parameter	Average	Minimum	Maximum	Time of peak	% full capacity[1]	max. depth/diameter[2] (d/D)
FM01 – Amy Croft Drive	300	60	Flow (l/s)	7.44	0.26	88.27	July 16 @ 11:10 am)	147%	
			Depth (d in mm)	74.23	18.03	3460.04	July 16 @ 17:05 am)		11.5
FM02 – Russell Road	450	90	Flow (l/s)	16.98	1.09	152.68	July 16 @ 11:35 am)	170%	
			Depth (d in mm)	125.76	62.65	1599	July 16 @ 2:30 pm)		3.6
FM03 – Patillo Road	250	32	Flow (l/s)	4.2	0.45	68.72	July 16 @ 8:20 pm)	215%	
			Depth (d in mm)	93.35	63.59	1628.38	July 16 @ 2:30 pm)		6.5
FM04 – Old Tecumseh Road	600	213	Flow (l/s)	33.12	0.94	347.77	July 16 @ 11:55 am)	163%	
			Depth (d in mm)	206.16	131.52	3160.21	July 17 @ 4:40 am)		5.3
FM05 – Puce Road	200	20	Flow (l/s)	7.58	0.31	47.75	July 16 @ 11:30 am)	239%	
			Depth (d in mm)	144.21	13.88	4825.67	July 16 @ 9:00 pm)		24.1
FM06 – County Road 22	750	270	Flow (l/s)	64.69	10.76	384.35	July 16 @ 11:55 am)	142%	
			Depth (d in mm)	258.41	154.45	3371.98	July 16 @ 3:45 pm)		4.5
FM07 – Rourke Line	750	466	Flow (l/s)	66.07	12.97	406.44	July 16 @ 11:40 am)	87%	
			Depth (d in mm)	235.97	111.52	5394.86	July 16 @ 4:10 pm)		7.2
FM08 – Rego Drive	900	427	Flow (l/s)	17.04	0.3	229.02	July 16 @ 11:50 am)	54%	
			Depth (d in mm)	174.4	61.06	5473.44	July 16 @ 4:20 pm)		6.1
FM09 – Kilrea Avenue	525	112	Flow (l/s)	30.35	1.85	114.73	July 17 @ 8:45 am)	102%	
			Depth (d in mm)	201.67	108.03	5182.11	July 16 @ 4:00 pm)		9.9

Notes:

1. % full capacity greater than 100 % indicates the sewer is operating under surcharge conditions. Standard design practice is to design sanitary sewers to operate at less than 85 % of the pipe full capacity.
2. Maximum depth to diameter (d/D) greater than 1.0 indicates the sewer is operating under surcharge conditions.

3. Conclusions

The following conclusions are derived from the preliminary flow monitoring data:

- All the flow monitors indicate significant surcharge conditions during the storm event of July 16, 2021 except for FM 10 where data was not recorded post July 7, 2021. FM 10 did not show any surcharge during the flow monitoring period from March 9 to July 7, 2021.

- Flow monitors FM05, FM06, FM07, FM08, and FM09 also showed surcharge conditions for June 25, 2021 storm event, although they were not as significant as compared to July 16 storm event. The peak intensity for June 25 storm event was recorded at 58 mm/hr with total rainfall depth of 49 mm for a storm duration of 19.3 hours at Denis St. Pierre RG.

- The maximum surcharge was observed at Puce Road at FM 05 location in 200 mm-diameter sewer where maximum water depth recorded was 4825 mm.

- During a low intensity rain event such as March 26 storm event (peak intensity of 18.29 mm/hr with total rainfall depth of 33 mm for 7-hour storm duration), minimal surcharging is observed as only FM05 and FM09 monitoring locations showed surcharge conditions. Under dry weather flow, no surcharge is observed at any of the flow monitoring locations.

- The average flows for March, April, and May were under the plant rerated average design capacity of 14,500 m^3/day. However, flow bypass was observed at Denis St. Pierre WPCP during the events of March 26 and April 9, 2021. Data for June and July is not available as of this date, however flow bypass is expected for the storm events of June 25 and July 16.

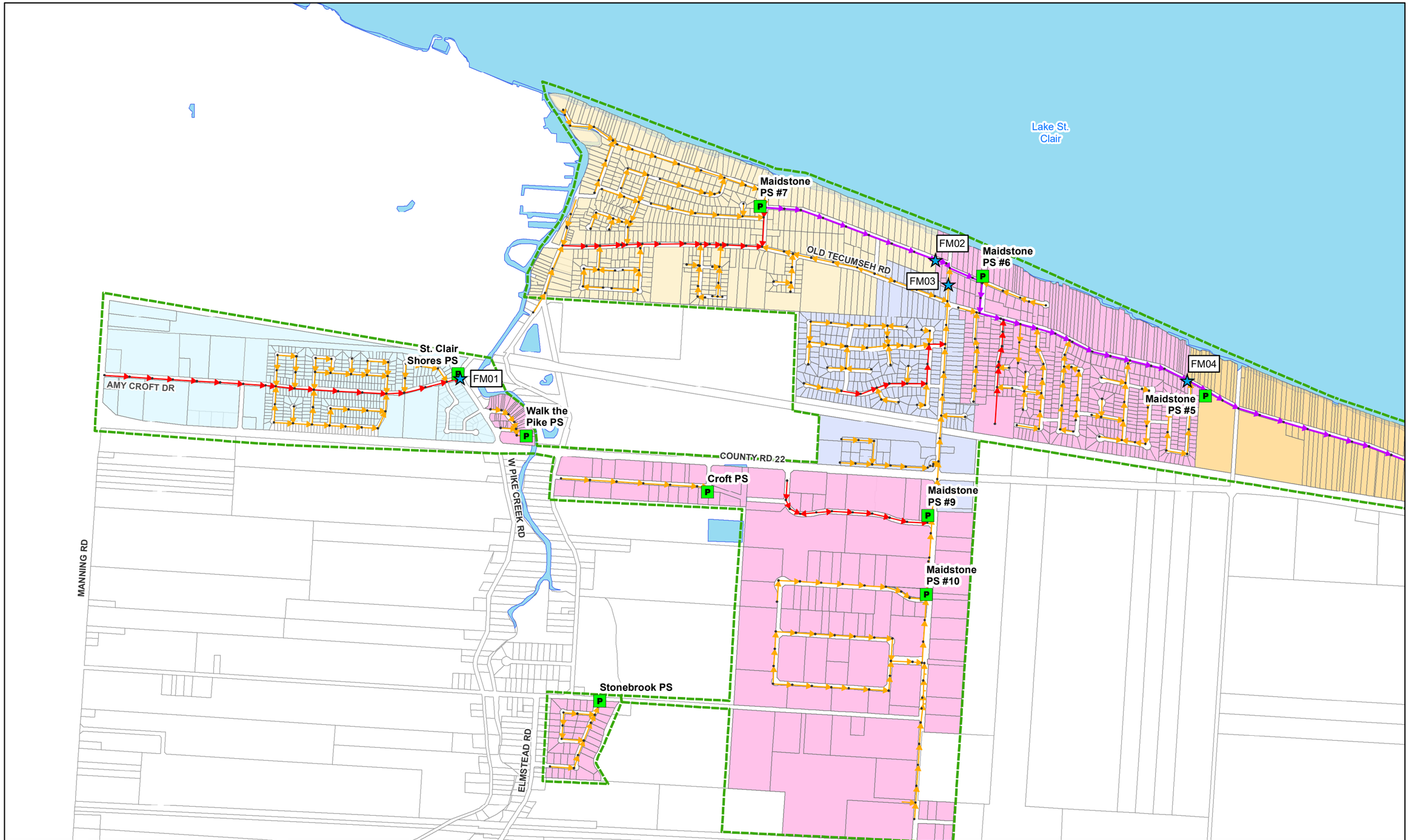

Figure 1a
Flow monitoring locations
Flow Monitoring Summary
Municipality of Lakeshore, Ontario

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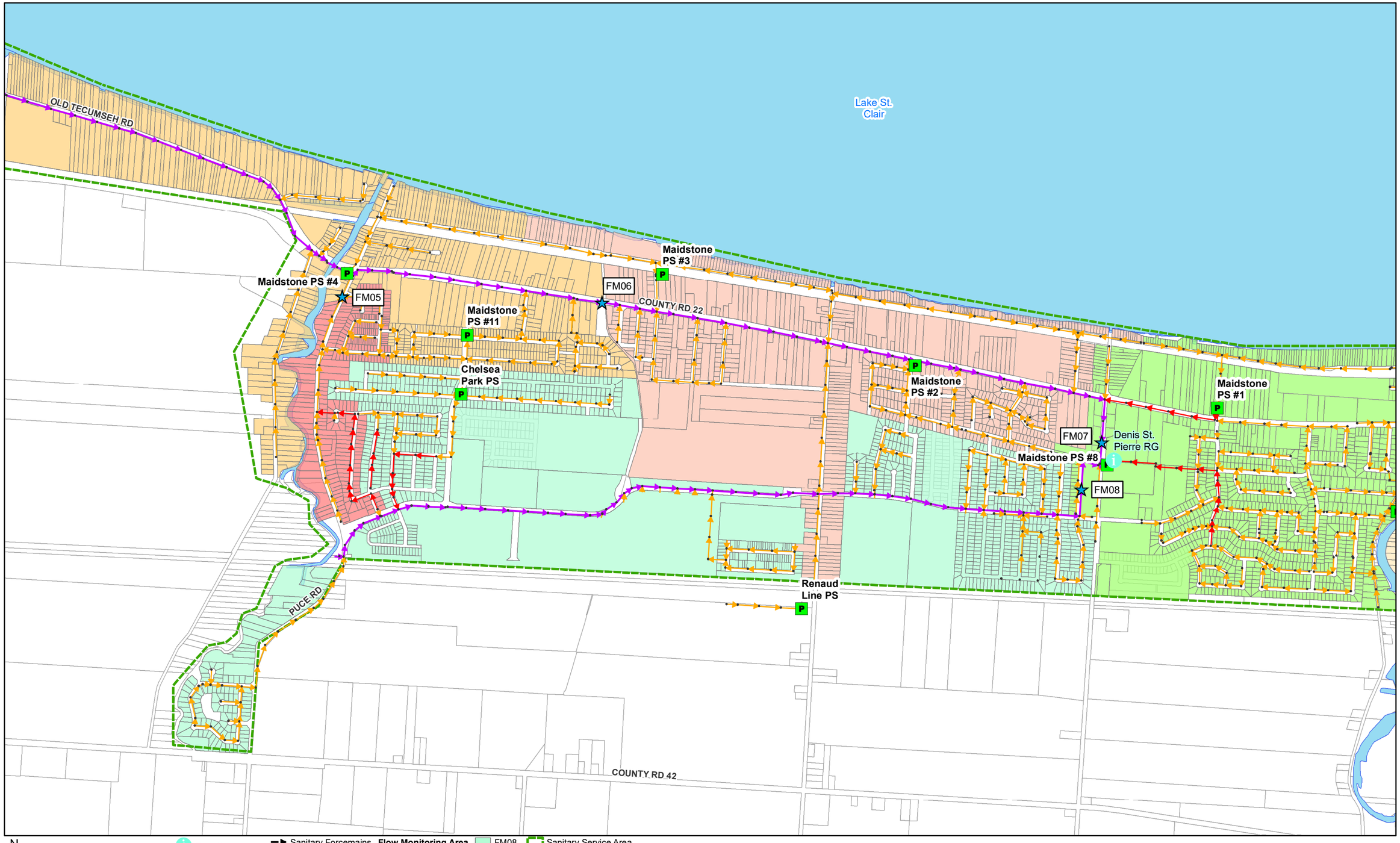

Figure 1b
Flow monitoring locations
Flow Monitoring Summary
Municipality of Lakeshore, Ontario

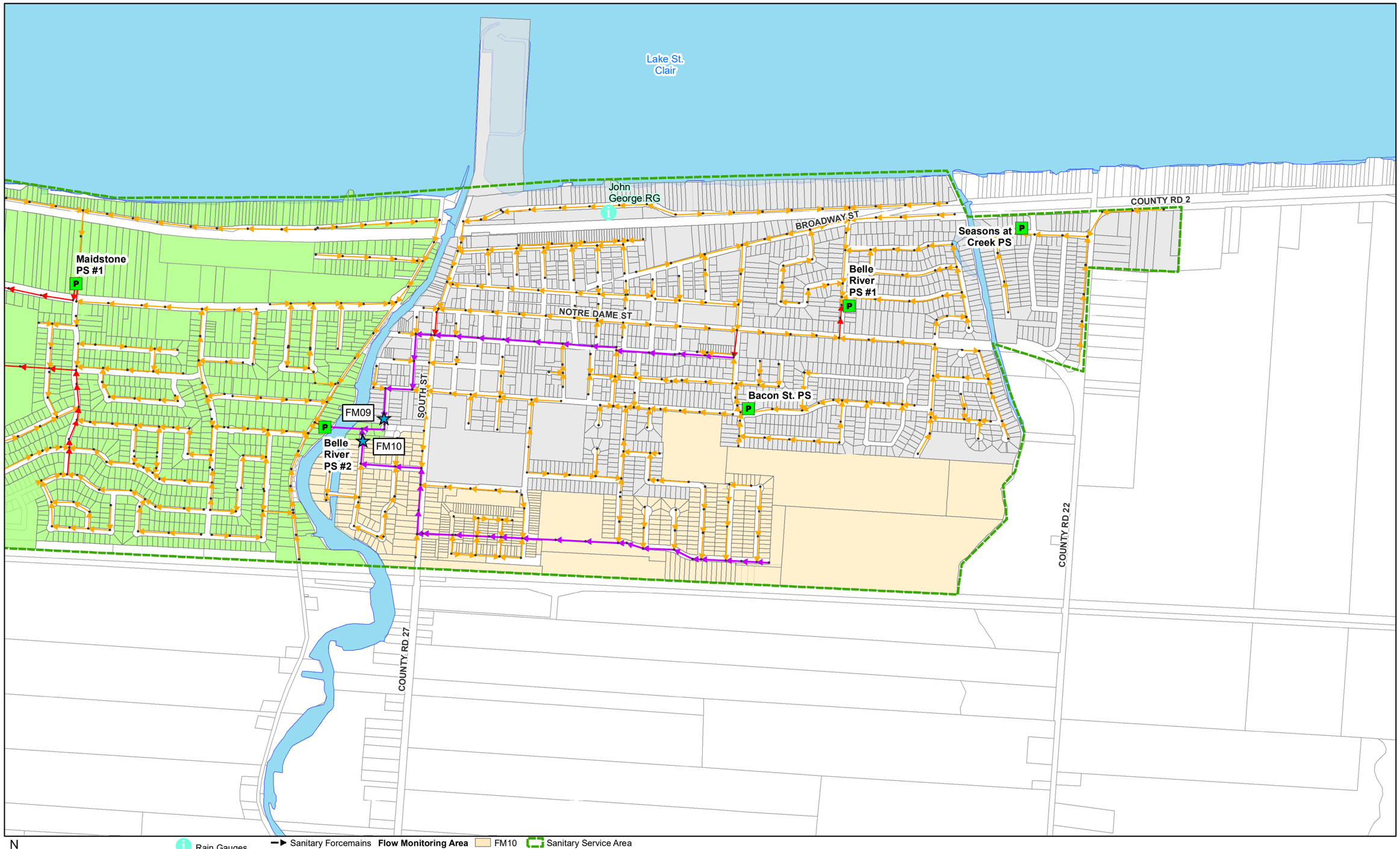

Figure 1c
Flow monitoring locations
Flow Monitoring Summary
Municipality of Lakeshore, Ontario