Greater Napanee

GREATER FOR MANY REASONS

2025

Annual Report

Napanee Water Pollution Control Plant

300 Water Street W.
Napanee, Ontario
K7R 1X3

Prepared: February 2026

Executive Summary

The quality of effluent released to the Napanee River from the Napanee Water Pollution Control Plant (WPCP) during 2025 complied with the limits stipulated in the plant Environmental Compliance Approval (ECA). The average monthly geometric mean values for effluent bacteriological quality measured as *E. Coli.* did not meet the ECA operational objective (<200 CFU/100mL) in four (4) months of the year, due to operational challenges attributed to aging infrastructure. These challenges have been relayed to the MECP local office, and construction is currently underway for a WPCP substantial upgrade. The highest monthly geometric mean was observed in October 2025 at 1,674 CFU/100mL.

Total annual treated flow measured in 2025 decreased by approximately 5 percent when compared to the previous year, with the average day flow representing 70 percent of the plant design capacity. Efforts to detect the inflow and infiltration of potential storm and groundwater sources will continue throughout 2026.

Biosolids generated at the facility were temporarily stored at the Sutcliffe Lagoon and were applied to agricultural land during June, August and November by GFL Environmental, all-in accordance with the sites Certificates of Approval and Ontario Regulation 267/03.

Maintenance and upgrading activities during 2025 included unplanned maintenance to the heat exchanger, secondary clarifier (flight replacement and gearbox bearings replacements), return activated sludge (RAS) pump, and an exhaust fan in the methane gas room. The department also completed one sewer service repair in 2025. Routine sanitary sewer flushing and camera inspections is scheduled for the first quarter of 2026.

Planning for the upgrade and expansion of the aging and hydraulically limited WPCP continued in 2025 with a completed design. The project tender was awarded in Spring 2025, and commenced in Summer 2025.

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Wastewater Flow Data

The Napanee Water Pollution Control Plant (WPCP) is a conventional activated sludge process, with an average day design flow rate of 9,087 m^3/d, and a peak flow rate of 21,370 m^3/d. The average treated flow during 2025 was 6,352 m^3/d, which is approximately 70 percent of the design capacity. Non-compliance with respect to treatment capacity is defined in the Environmental Compliance Approval as:

"…the introduction of sewage flows in excess of the average daily flow (9,087 m^3/d) for any consecutive period of time greater than one year."

The plant design capacity of 9,087 m^3/d was exceeded on 52 days in 2025 which is the same when compared to the 52 days experienced in 2024. WPCP flow data collected during 2025 is presented in Table 1.

The hydraulic capacity of the plant continues to be stressed as a result of high flow experienced during heavy precipitation events or during periods of rapid ice and snow melting. The maximum daily flow during 2025 was on March 17, 2025, when 18,363 m^3/d of inflow was measured, including 1,784 m^3 bypassing the secondary treatment process. The previous day, on March 16, 2025, the highest volume of bypassed influent was observed, where 15,219 m^3 of influent bypassed the secondary treatment process. Although the service area has a separate storm water collection system, improper connections, broken pipes, or faulty joints in sanitary sewers can result in the introduction of ground and storm water into the sanitary collection system. This misdirected hydraulic load on the sanitary system is collectively referred to as inflow and infiltration. Inflow and infiltration is problematic because it occupies treatment capacity that could otherwise be used to treat sanitary wastewater.

Table 1: Summary of flow data for 2025

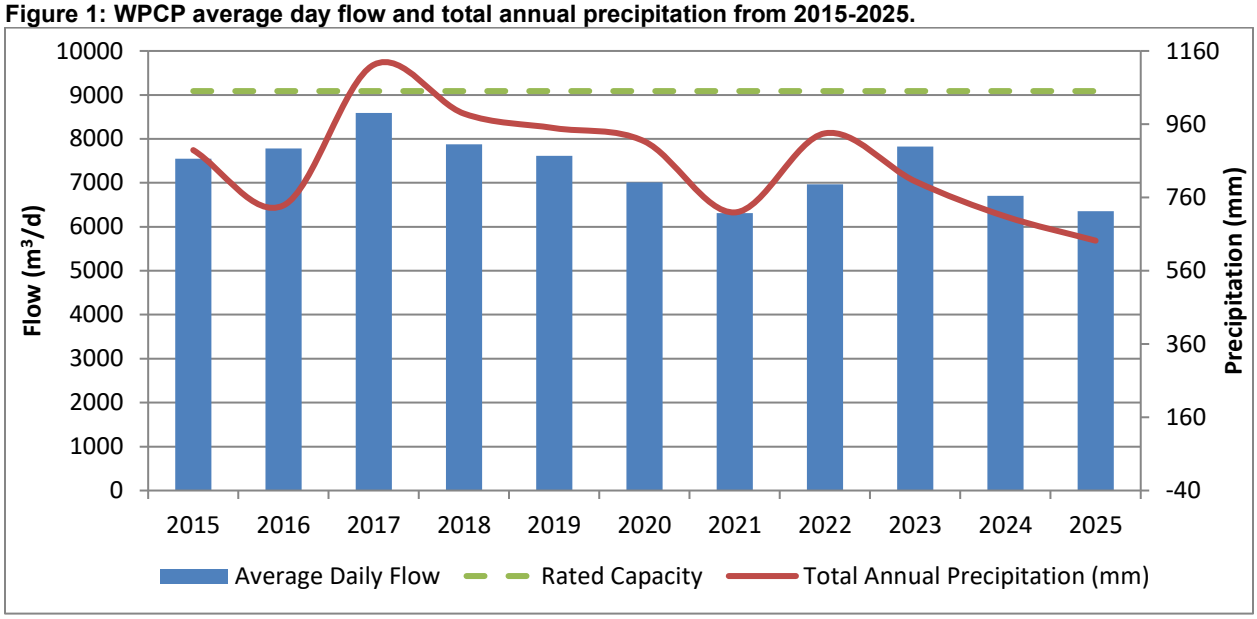
Month	Treated Volume			
	Total (m^3)	Average (m^3/day)	Maximum (m^3/day)	Minimum (m^3/day)
January	189763	6121	13481	4555
February	128991	4607	5886	4124
March	322349	10398	18578	5332
April	294934	9831	17689	7225
May	302387	9754	17998	6622
June	176828	5894	8095	4776
July	134622	4343	4728	3885
August	120639	3892	4936	2881
September	122822	4094	5724	3617
October	141431	4562	9009	3751
November	183158	6105	9188	5109
December	204255	6624	15227	4657
Year Total	2322179			
Average		**6352**		
Min / Max			**18578**	2881
C of A Limit		**9087**	**21370**	

The apparent impact of inflow and infiltration over the past several years on the Napanee system is highlighted by trending annual average day flow with total precipitation as shown below in Figure 1.

Dry weather flow, typically experienced during summer months (July through September), is an approximate representation of sanitary wastewater flows exclusive of the effects of inflow and infiltration. Minimum daily flow rates recorded during those months indicate that dry weather flow accounts for approximately 45 percent of the average day design capacity.

The 2025 average day treated flow was 70 percent of the design capacity, a decrease from 74 percent in 2024. Inflow and infiltration continue to be problematic and repairs to identified issues will continue throughout 2025.

Figure 1: WPCP average day flow and total annual precipitation from 2015-2025.



Efforts to identify and control sources of inflow and infiltration have included the following:

- Greater Napanee Utilities retained a consultant in early 2012 to conduct an inflow and infiltration study. Using this study, collection system deficiencies were corrected in 2013 and 2014.
- Flow meters are installed at six of seven sewage lift stations to determine areas of the collection system most impacted by inflow and infiltration.
- Restoration work has been conducted on manhole joints, connections, and benching as problem areas are identified.
- Covers (dishes) have been installed under the lids of several manholes to prevent surface water from entering through holes in the manhole lids.
- Local construction specifications require that new manhole installations include rubber seals.
- A municipal bylaw prohibits the connection of sump pumps and rain leaders to the sanitary sewer. Staff have had great success in removing existing connections through education and outreach.

Efforts to reduce inflow and infiltration to optimize treatment reserve capacity will be ongoing.

Primary Bypass / Sewage Spills / Lift Station Bypass

Under all but the most extreme conditions, wastewater entering the plant undergoes preliminary treatment (screening and grit removal), primary treatment (gravity separation of solids by sedimentation), and disinfection. If the influent flow rate exceeds 38,000 m^3/d, the excess will bypass the primary clarifiers, mixing with the primary clarifier effluent prior to flowing to the aeration basins. Bypassing of the primary clarifiers did not occur in 2025.

The discharge of untreated sanitary sewage from the collection system can occur at any of the seven sewage lift stations and/or collection system manholes as the result of flooding events, power outages, pump failures, or sewer blockages. Measures are in place to prevent bypassing/spills which include: multiple (backup) pumps at all lift stations, high level alarms, backup power generation capability, and readily available vacuum truck service.

There was also one incident of a manhole at Centre Street and Industrial Blvd overflowing in March 2025, due to a significant rain event. This is a known bottleneck area and is currently under review as part of the Town's Utilities Masterplan project.

Secondary Bypass

If the flow of wastewater directed to the aeration basins exceeds approximately 16,000 m^3/d, the excess will pass over a flat weir (located immediately upstream from the aeration tanks), bypassing the secondary treatment process. Secondary bypassing limits the hydraulic loading on the secondary treatment process (aeration tanks and secondary clarifiers) to prevent washout of activated sludge which is essential for maintaining treatment process performance. Wastewater that bypasses the secondary process (which tends to be weak in strength due to dilution from inflow and infiltration) is blended with the ~16,000 m^3/d of secondary clarifier effluent, prior to disinfection and is

discharged to the Napanee River.

During a significant rain event in March 2025, the aeration cells overflowed onto the ground surface. As a result, the material that overflowed did not receive secondary treatment or disinfection, however the material was highly diluted with rainwater. The quantity of material that overflowed was unknown. Impacted areas were cleaned up following the event.

The volume of secondary bypass discharged during 2025 was 31 percent higher than the volume observed in 2024. This increase can be contributed to a decrease in precipitation and snow melt in 2024, compared to 2025. A summary of the secondary bypass events during 2025 is provided below in Table 2.

Table 2: Summary of secondary bypass events during 2025.

Month	Secondary Bypass Events			
	Total m³	**Events** #	**Duration** hours	**SAC Reference #s**
January	394	1	14	1-SH3VJD
February	0	0	0	
March	22054	4	136	1-IDAV9G 1-J2EZ70 1-MKN1W 1-N2NH85
April	4636	1	94	1-N7MMXL
May	5203	3	81	1-07NL9G 1-09LS2M 1-OGLP61
June	0	0	0	
July	0	0	0	
August	0	0	0	
September	0	0	0	
October	0	0	0	
November	0	0	0	
December	2215	2	35	1-PXSO7D 1-PYQO3F
Annual Total	**34502**		**360**	

*Ministry policy defines a bypass event as an occurrence separated by a period of more than 12 hours from another occurrence. When a bypass stops, it is considered to be the end of the event. If, however, a bypass begins again within 12 hours, it is considered to be the same event.

The relationship between precipitation and secondary bypass volume is illustrated in Figure 2. Staff will continue to follow trends as more inflow and infiltration issues in the wastewater collection system are addressed.

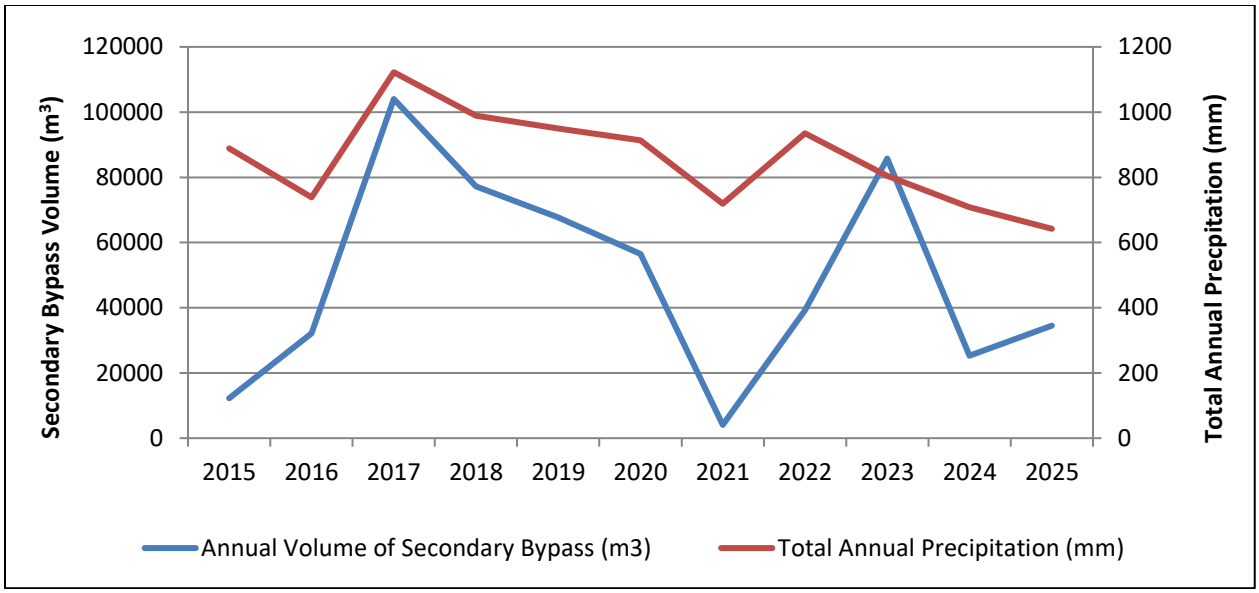


Figure 2: Total annual precipitation and volume of secondary bypass from 2015 to 2025.

BOD_5 and Total Suspended Solids Analytical Data

The removal of biochemical oxygen demand (BOD_5) and suspended solids from municipal wastewater is the primary design function of the Napanee WPCP, which utilizes a conventional activated sludge process. The principal mechanisms of removal include screening, sedimentation, and biodegradation. BOD_5 and suspended solids data collected during 2025 are summarized in Table 3.

Raw sewage entering the treatment process during 2025 was of moderate strength, having BOD_5 and total suspended solids concentrations averaging 134 mg/L and 198 mg/L, respectively. The pollutant removal efficiency of the plant is typical of the conventional activated sludge process with BOD_5 and total suspended solids removals averaging 94.4 percent and 98.5 percent, respectively. Annual average effluent concentrations and mass loadings of both BOD_5 and total suspended solids were well below the compliance limits of 25 mg/L and 227.2 kg/d.

Table 3: Summary of average monthly BOD_5 and suspended solids results for 2025.

Month	BOD_5			Suspended Solids		
	Raw Sewage (mg/L)	Final Effluent (mg/L)	Removal %	Raw Sewage (mg/L)	Final Effluent (mg/L)	Removal %
January	141	9.3	93.4	165	6.9	95.8
February	190	6.0	96.8	235	6.4	97.3
March	117	4.3	96.4	134	7.9	94.1
April	107	4.8	95.5	147	7.0	95.2
May	96	7.0	92.7	159	4.9	96.9
June	103	11.2	89.2	248	9.3	96.2
July	145	9.5	93.5	187	12.9	93.1
August	125	6.5	94.8	200	9.8	95.1
September	154	4.6	97.0	237	5.6	97.7
October	170	7.5	95.6	238	12.1	94.9
November	120	7.3	93.9	198	6.5	96.7
December	130	8.8	93.3	197	6.5	96.7
Average (mg/L)	**134**	**7.2**	**94.4**	**198**	**8.0**	**95.8**
Average (kg/d)		**35.0**			**38.2**	
C of A Limit (mg/L)		**25**			**25**	
C of A Limit (kg/d)		**227.2**			**227.2**	

Phosphorus and Nitrogen Analytical Data

Phosphorus is a nutrient that is essential to biological growth. It is typically present in raw sewage at concentrations sufficient to cause excessive plant and algae growth in natural surface waters if released untreated. Excessive growth in surface water deteriorates the aquatic environment when the plants / algae decompose.

Phosphorus is removed from sewage at the WPCP by the addition of ferric sulfate which forms an insoluble precipitate when it combines with phosphorus in the wastewater. The precipitate is then removed by sedimentation. Ferric sulfate is added to the process immediately downstream from the pre-treatment process but can also be added at the aeration tank influent channel, or at the tail end of the aeration tanks.

The annual average concentration of phosphorus in the raw sewage was 4.52 mg/L, while the average effluent concentration was 0.17 mg/L. Effluent quality consistently met the Environmental Compliance Approval Limit of 1.0 mg/L throughout 2025.

Total Kjeldahl Nitrogen (TKN) represents the total quantity of organically bound nitrogen plus ammonia nitrogen which are the forms that most commonly occur in raw sewage. Removal or conversion of the nitrogen species is important because if released in the form of un-ionized ammonia, it can be toxic to aquatic organisms.

In 2025, the annual average concentration of un-ionized ammonia in the process effluent was 0.061 mg/L which is well under the Federal Wastewater Systems Effluent limit of 1.25mg/L.

Analytical data for phosphorus, nitrogen, pH, temperature, and alkalinity are summarized in Tables 4 and 5.

Table 4: Summary of nutrient data for 2025

Month	Total Phosphorus			TKN		NH_3 (Effluent Only)	
	Raw Sewage (mg/L)	Final Effluent (mg/L)	Removal (%)	Raw Sewage (mg/L)	Final Effluent (mg/L)	Total (mg/L)	Un-ionized (mg/L)
January	4.11	0.15	96.3	46.75	20.40	16.28	0.043
February	5.71	0.11	98.1	53.48	17.55	13.48	0.040
March	3.17	0.18	94.4	28.73	13.15	9.81	0.032
April	2.87	0.14	95.0	23.82	12.30	9.65	0.039
May	4.31	0.12	97.2	34.55	11.40	9.47	0.044
June	4.51	0.16	96.4	33.82	12.04	9.95	0.049
July	4.73	0.30	93.6	42.83	28.55	20.58	0.111
August	4.65	0.17	96.4	46.73	26.50	19.63	0.128
September	5.67	0.16	97.2	52.30	20.86	16.12	0.084
October	5.71	0.23	96.0	51.40	26.85	20.10	0.098
November	4.66	0.15	96.7	35.83	13.43	16.90	0.039
December	4.08	0.12	96.9	32.60	12.3	8.9	0.025
Annual Average	**4.52**	**0.17***	**96.2**	**40.3**	**17.9**	**14.1**	**0.061****

*Environmental Compliance Approval limit: 1 mg/L and Bay of Quinte Remedial Action Plan Objective: 0.3 mg/L
**Federal Wastewater Systems Effluent limit: 1.25mg/L
Note: All samples were collected as 24-hour composite samples

Table 5: Summary of temperature, pH and alkalinity data for 2025

Month	Final Effluent		
	Temperature (°C)	**pH** (pH)	**Alkalinity** (mg/L)
January	10.52	7.14	191
February	9.63	7.16	169
March	9.06	7.27	177
April	10.10	7.35	226
May	13.15	7.26	238
June	16.79	7.14	200
July	19.80	7.15	222
August	21.49	7.15	203
September	20.71	7.12	178
October	18.65	7.14	199
November	15.28	7.11	202
December	11.87	7.14	200
Average	**15.01**	**7.18**	**200**

Note: All measurements were conducted on daily grab samples, typically collected 5 times per week

Disinfection / Bacteriological Testing

Prior to discharge to the Napanee River, the treated effluent is dosed with a disinfectant (chlorine) to inactivate any potential pathogenic organisms that may remain. Bacteriological testing is conducted each week to evaluate the effectiveness of the disinfection process. Grab samples for bacteriological testing (*E. Coli.*) were collected immediately downstream from the chlorine contact chamber, normally during peak flow conditions (between 8am and 10am) when the treatment process is typically most heavily burdened.

During 2025, eight of twelve monthly geometric mean[1] values calculated from weekly analyses were below the operational objective of 200 CFU/100mL. The monthly geometric mean values calculated from weekly analyses in April, June, July and October were above the operational objective. This is attributed to ongoing operational issues related to aging infrastructure. The average monthly geometric mean value

[1] Statistical reduction using geometric mean is consistent with the *Ontario Provincial Water Quality Objectives* and with the U.S. EPA *Bacterial Water Quality Standards for Recreational Waters*.

during 2025 was 236 CFU/100mL.

In response to the Federal regulation requiring the elimination of total chlorine residual from municipal wastewater treatment plant effluents, de-chlorination using sulfur dioxide was introduced at the Napanee facility in January 2010. The average total chlorine residual concentration in effluent discharged to the Napanee River has remained at or below the required 0.02 mg/L since the process was commissioned.

A summary of disinfectant residuals and bacteriological results for 2025 is provided in Table 6.

Table 6: Summary of disinfection and bacteriological data for 2025

Month	Chlorination				De-chlorination				E. Coli.	
	Mass Applied (kg/mo)	Dosage (mg/L)	Residual (mg/L)	Demand (mg/L)	Mass Applied (kg/mo)	Dosage (mg/L)	Average Residual (mg/L)	Max Residual (mg/L)	Geo. Mean (CFU/ 100mL)	Max (CFU/ 100mL)
January	177	0.95	0.46	0.49	153.6	1.16	0.00	0.00	12	40
February	143	1.11	0.47	0.64	140.7	1.52	0.00	0.02	3	6
March	310	0.96	0.51	0.44	159.8	0.70	0.00	0.02	52	1500
April	193	0.66	0.45	0.20	155.1	0.72	0.02	0.00	307	3240
May	260	0.85	0.45	0.40	171	0.75	0.00	0.02	151	360
June	223	1.27	0.31	0.96	183.9	1.43	0.00	0.01	274	12600
July	189	1.41	0.37	1.03	164	1.64	0.01	0.04	290	880000
August	191	1.60	0.44	1.17	161.6	1.66	0.00	0.02	5	20
September	193	1.57	0.49	1.08	158.6	1.72	0.01	0.03	4	9
October	186	1.31	0.38	0.92	158.2	1.56	0.00	0.02	1674	131000
November	245	1.34	0.54	0.80	145.0	1.07	0.00	0.01	12	64
December	194	1.03	0.42	0.60	147.7	1.09	0.00	0.02	51	1740
2025 Average	**209**	**1.17**	**0.44**	**0.73**	**158**	**1.25**	**0.00**		**236**	
2025 Maximum								**0.04**		**880000**
Total	**2504**				**1899.2**					
Objective			**<=0.5**				**<=0.02**		**<=200**	

Notes: Chlorine is measured as total chlorine residual. All samples are collected as grab samples.

2 Maintenance / Improvements & Plant Upsets

Maintenance / Improvements

Notable maintenance activities and process improvements during recent years include the following:

- In 2011, a Municipal Class Environmental Assessment was completed to assess capacity limitations and to plan for the upgrade and/or expansion of the facility over a 20 to 30-year design horizon. The Environmental Study Report concluded that an additional 25 percent average day flow capacity and approximate doubling of peak capacity is required to meet future needs.
- Following the announcement of federal funding assistance in 2019, the Town completed preliminary design studies exploring both retrofit and new-build design concepts. Detailed design of a project focused on the mitigation of process bypassing and renewal of aging equipment commenced in 2022.
- In August 2024, it was announced that the Town would also be receiving significant provincial funding for an upgrade. The new-build design tender was awarded in Spring 2025 and construction commenced in Summer 2025.
- Efforts to detect and reduce inflow and infiltration are ongoing. Flushing and camera inspections of approximately 25% of the collection system takes place each year.
- The 2012 Inflow and Infiltration Study identified several key areas of concern. The targeted areas include infrastructure that has been in service for over 100 years. A considerable amount of infrastructure renewal occurred between 2014 and 2019 with portions of the targeted areas addressed each year. The study has become an integral part of our 10-year capital planning process.
- A Secondary Clarifier was out of service for a period of time in Summer 2025, due to unplanned operational issues.
- The Return Activated Sludge (RAS) Pump #2 was out of service in Fall 2025, due to unplanned operational issues.
- An exhaust fan in the methane gas room was replaced in January 2025.

Process Upsets

Due to a significant snow melt and rain event in March 2025, significant inflow caused the aeration cells to overflow onto the ground surface (causing an overflow and bypass of the secondary treatment process).

During Summer 2025, ongoing unplanned maintenance to one of the Secondary Clarifiers also resulted in the clarifier to be out of service for several weeks, resulting in reduced capacity. To mitigate strain on the system, the WPCP temporarily suspended acceptance of hauled sewage and leachate.

3 Biosolids

Biosolids Quality and WPCP Output (Lagoon Input) Volumes

Accumulated solids (sludge), removed from the municipal wastewater through the treatment process are stabilized in the anaerobic digestion process. The digestion process reduces the quantity of solids requiring disposal by converting the volatile fraction to methane gas. The methane gas is then beneficially used in the plant boiler for process and building heat.

Following the digestion process, the resulting stabilized sludge (referred to as biosolids) is hauled to an off-site storage lagoon owned by Mr. Fred Sutcliffe Jr. (Provisional Environmental Compliance Approval S-3712-39) and located on part lots 5 & 6, Concession IV, in the Town of Greater Napanee. The lagoon is leased by The Town of Greater Napanee for the exclusive temporary storage of biosolids generated at the Napanee WPCP.

An average of 20 m^3 of biosolids were hauled from the WPCP by Sutcliffe's Septic Service, Hartin's Services, and GFL to the Sutcliffe Storage Lagoon each day in 2025. A summary of the volumes hauled during 2025 is provided in Table 7.

Table 7: Summary of biosolids hauled to the storage lagoons for 2025

Month	Lagoon	
	Loads #	Volume m³
January	28	406
February	23	364
March	27	534
April	28	620
May	33	641
June	34	578
July	41	775
August	36	720
September	39	780
October	44	854
November	27	534
December	24	390
Total	**384**	**7196**
Average	**32**	**600**

Agricultural Land Application of Biosolids

In 2025, the land application of biosolids took place on June 4th – 11th, August 12th – 22nd, November 14th – 15th, and November 18th – 29th. A total volume of 5,612 m³ of biosolids were applied by GFL on 52.05 hectares (approximately 129 acres) of land. GFL is contracted to conduct and administer the land application program.

Samples of biosolids were collected each month from the WPCP digester and directly from the lagoon prior to each land application to determine appropriate, compliant rates of application.

The following Tables 8 and 9, summarizes the 2025 land application program.

Table 8: Sites applied with biosolids in 2025

Date 2025	Farmer/Landowner Farm Name	NASM #	Lot	Con	Municipality	Ward	Application Method	Field #	Area Spread (ha)	Total Volume (m3)
June 4-11	MacLean - Perry Rd.	60884	24-27	5 South	Town of Greater Napanee	Fredericksburgh	Surface	2	20.65	2684
August 12-22	MacLean - Chambers Rd.	60884	23	4 South	Town of Greater Napanee	Fredericksburgh	Surface	13	10.50	1364
November 14-15	MacLean - Perry Rd.	60884	24-27	5 South	Town of Greater Napanee	Fredericksburgh	Surface	3	12.90	964
November 18-29	McFaul - Atkins Rd.	60901	18-19	2	City of Belleville	Thurlow	Surface	1B	8.00	600
									52.05	5612

Table 9: Average biosolids quality for 2025

Metals	Maximum Acceptable Concentration (mg/kg)	2025 Average
As	170	5.7
Cd	34	1.3
Co	340	7.5
Cr	2800	22.4
Cu	1700	654.6
Hg	11	0.5
Mo	94	11.0
Ni	420	25.4
Pb	1100	23.4
Se	34	6.1
Zn	4200	925.8
E. Coli	**Maximum Acceptable Concentration (CFU/g)**	
	2,000,000	4556.2
Liquid Biosolids		
Total P (mg/L)		1078.3
Ammonia+Ammonium (mg/L)		467.2
Nitrate+Nitrites (mg/L)		0.6
TKN (mg/L)		1864.8
Potassium (mg/L)		40.8
Solids (mg/L)		36008.7