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Date March 7, 2023 **Report No.** 2023-122

To Chair and Members
Committee of the Whole - Operations

From Inderjit Hans, P. Eng., PMP
General Manager, Public Works Commission

1.0 Type of Report

Consent Item	[X]
Item For Consideration	[ ]

2.0 Topic Wastewater Operations - 2022 Annual Summary Report [Financial Impact – None]

3.0 Recommendation

THAT Report 2023-122 titled “Wastewater Operations – 2022 Annual Summary Report”, BE RECEIVED.

4.0 Executive Summary

Wastewater Operations completes a summary report for Council on an annual basis to highlight activities of the past year. The report provides an overview and analysis of the Treatment, Maintenance and Compliance sections of the division as well as some key performance indicators, the status of capital projects and planned activities for the upcoming year.

In 2022, performance at the Brantford Wastewater Treatment Plant (WWTP) continued to be in compliance with all regulatory requirements and also met the more stringent voluntary targets for the Grand River Watershed the majority of the time. In December 2022, the City was recognized with the Silver level

recognition, with a score of 90%, as part of the Grand River Watershed-wide Wastewater Optimization Program. Wastewater Maintenance continues to ensure that all equipment and infrastructure within the wastewater facilities remains operational. Wastewater Compliance continues to monitor sanitary and storm sewer discharges from industrial, commercial and institutional users throughout the City in order to identify concerns and work with dischargers to achieve full compliance with the Sewer Use By-law. Wastewater Compliance also successfully managed the City's response to 22 spills to minimize the impact to sanitary and storm systems.

Several key capital projects were completed in 2022 while significant progress was made on some projects that are still on-going. Major capital works will commence in 2023 including the design of a new effluent pumping station to allow discharge of effluent during high Grand River flow/flooding events and a new UV disinfection system to replace the old chlorination/de-chlorination processes and improve the effluent quality. The City assumed operations of a new Wastewater Pumping Station (WWPS) at 87 Stauffer Rd which serves new development in the Northwest area of the City.

In October 2022, the City received its new storm water and sanitary collection systems Consolidated Linear Infrastructure Environmental Compliance Approvals (CLI-ECAs) for the first time. The CLI-ECAs issued by the Ministry of Environment, Conservation and Parks (MECP) outline reporting and monitoring requirements for the storm and sanitary collection systems. In 2023, Wastewater Operations staff will lead the implementation of the different requirements identified in the CLI-ECAs for the City. City Council approved a new Stormwater Technologist position to comply with the requirements of the CLI-ECAs.

5.0 Purpose and Overview

The purpose of this report is to update Council about the activities of the Wastewater Operations division which includes the Treatment, Maintenance and Compliance sections for the period of January 1st to December 31st, 2022.

6.0 Background

Wastewater produced in the City of Brantford by its 104,688 residents, industrial, commercial and institutional (ICI) properties is treated at the Brantford Wastewater Treatment Plant (WWTP). The wastewater is conveyed to the WWTP by the City's ten (10) Wastewater Pumping Stations (WWPS) and gravity trunk sewers within the City's wastewater collection system.

The WWTP (commissioned in 1960) is a conventional activated sludge plant (primary and secondary treatment). Treated effluent is discharged to the Grand River. Biosolids generated at the WWTP are land applied as a soil conditioner to local agricultural fields. The ten (10) WWPS were built in the past 62 years since the WWTP was commissioned and are located throughout the City. The Stauffer Road WWPS located in the Northwest area of the City is the newest pumping station which was commissioned in February 2022.

Owners of municipal wastewater treatment plants in Ontario are required to complete and submit annual reports to the Ministry of the Environment, Conservation and Parks (MECP). In October 2022, the MECP issued new Consolidated Linear Infrastructure Environmental Compliance Approvals (CLI-ECA's) for the storm and sanitary collection systems to the City. The City is required to complete the following documents as identified in the CLI-ECA's:

- Operations and Maintenance (O&M) Manual;
- Storm Water Monitoring Plan;
- Significant Drinking Water Threat Assessment Report; and
- Annual Performance Report.

The reporting period for the first annual performance report will start in 2023 and must be submitted to the MECP in April 2024. .

7.0 Corporate Policy Context

The Wastewater Operations 2022 Annual Summary Report documents how the division's activities are in line with Council's desired outcome of "Priority #7-The City is mitigating its environmental footprint and adapting to climate change" by:

- Using the tools within the Sewer-use By-law to work with local industries to improve influent quality received at the WWTP;
- Maintaining all equipment to ensure that all WWPS and the WWTP can operate to their full capabilities;
- Striving to achieve stringent voluntary targets from the WWTP to reduce the impact on the Grand River and ultimately Lake Erie; even under high flow events.

8.0 Input From Other Sources

Staff from the Environmental Services and Finance Departments as well as the Climate Change Officer were consulted in the development of the Wastewater Operations 2022 Annual Summary Report.

9.0 Analysis

The City of Brantford's Wastewater Operations Annual Summary Report provides Council with a divisional update on an annual basis. This report summarizes activities of the division as well as other key areas. The report is broken down into the following sections:

- Wastewater Treatment
- Wastewater Maintenance
- Wastewater Compliance
- Key Performance Indicators
- Capital Project Updates
- Planned 2023 Activities

9.1 Wastewater Treatment

Wastewater Treatment section is responsible for the day-to-day operations of the WWTP and assumes all regulatory responsibility of the wastewater facilities (WWTP and WWPS).

9.1.1 Performance

Municipal wastewater treatment facilities in Ontario are required to be in compliance with effluent limits issued by the MECP through a site-specific Environmental Compliance Approval (ECA). The City has also committed to meeting more stringent effluent voluntary targets for nitrogen and phosphorous through the Grand River Watershed-wide Wastewater Optimization Program (GRWWOP). Reduction in nitrogen and phosphorous levels in the effluent is beneficial in improving the Grand River and the Lake Erie ecosystems. Municipalities in the GRWWOP utilize optimization principles to make best use of their resources with a goal of achieving improved performance. The program

also provides technical assistance to municipalities requiring additional support.

In 2022, the City was in compliance with all requirements of their MECP issued ECA. The City also achieved the seasonal voluntary targets (1 mg/L in summer and 2 mg/L in winter) for total ammonia nitrogen in all 12 months, but achieved the voluntary target (0.3 mg/L) for total phosphorous in 10 of 12 months. The voluntary target for total phosphorus was not met due to on-going capital works requiring parts of the treatment processes offline. Wastewater Operations continued to optimize the use of chemicals to control operational costs. The City will continue to strive to achieve the voluntary targets in all months and maintain compliance in the future.

In December 2022 at the annual GRWWOP workshop, the City received the Silver recognition level based on 2021 data through the GRWWOP's Recognition Program.

9.1.2 Wastewater Flows

Wastewater flows are typically highest in the spring, but can be high in the fall depending on the timing of precipitation each year. High flows are related to inflow and infiltration (I&I) which is the result of precipitation or groundwater entering the sanitary collection system instead of the storm collection system. The increased water puts pressure on pumping capacities at the WWPS and treatment processes at the WWTP.

The average and maximum daily flows to the plant for each month in 2022 are compared to the plant's rated capacity and trended in Figure 1.

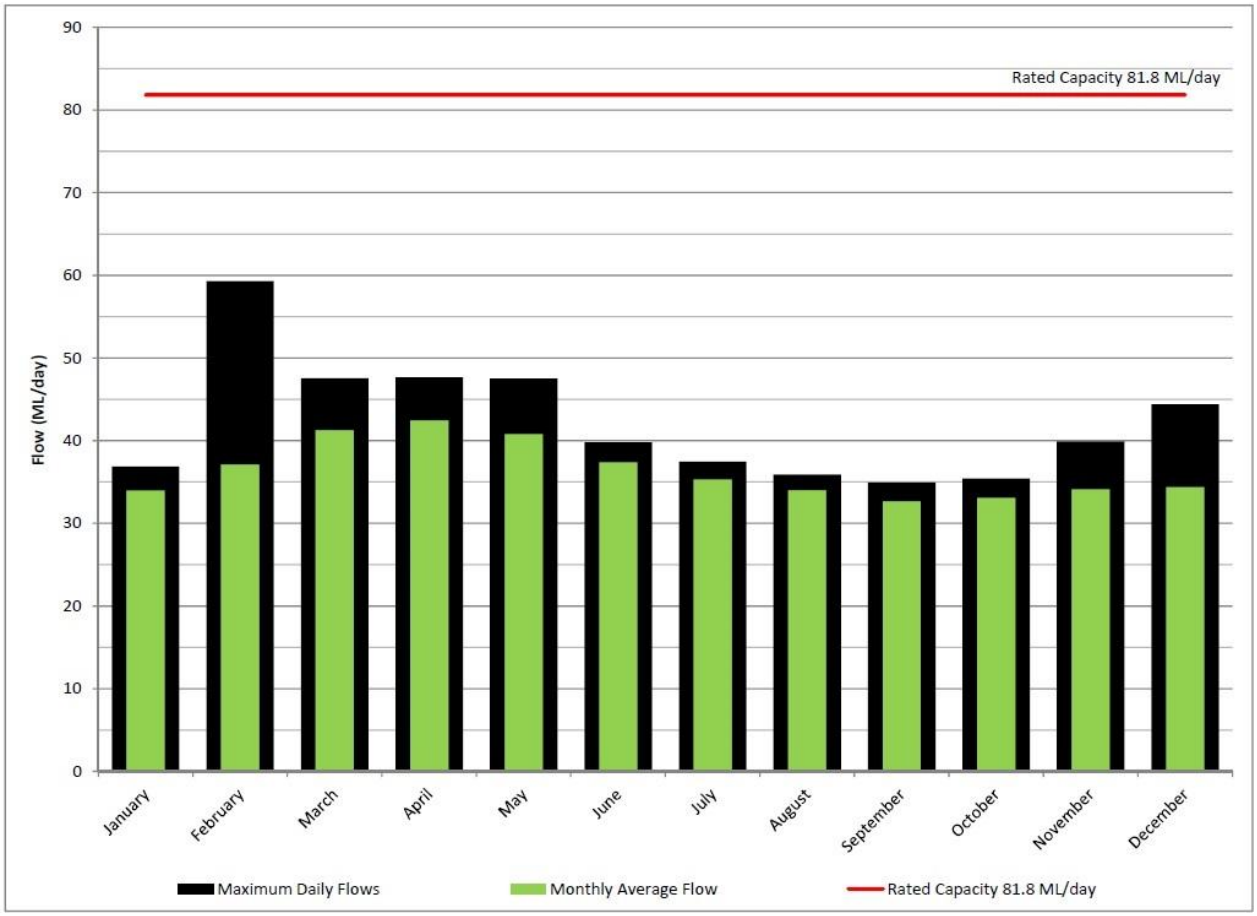


Figure 1 - 2022 Monthly Average and Maximum Daily Flows Compared to the Rated Capacity

The average daily flow in 2022 was approx. 44% of the rated capacity and average flows did not fluctuate significantly month to month. The maximum flow days in 2022 occurred in February which is typically the start of the high flow season due to higher precipitation.

9.2 Maintenance

Wastewater Maintenance section is responsible for all repairs and maintenance of equipment at the wastewater facilities. The majority of the activities performed are preventative maintenance which ensures equipment remains operational. When failures occur, staff also complete reactive maintenance to return equipment back to service as soon as possible.

9.2.1 Wastewater Treatment Plant

Some of the major maintenance activities that were completed at the WWTP in 2022 included the following:

- Completed treatment plant wide process and security alarm system upgrades;
- Installed a new grit classifier in the preliminary treatment building;
- Installed new biosolids storage tank mixers; and
- Completed digester, chemical and primary clarification Programmable Logic Controller (PLC) upgrades.

The highlighted maintenance activities completed at the wastewater treatment plant had an estimated total value of $259,800.

9.2.2 Wastewater Pumping Stations

Some of the major activities that were completed at the wastewater pumping stations in 2022 included the following:

- Assumed operations of the new WWPS at 87 Stauffer Rd.; and
- Performed condition assessments on the wet wells and forcemains at Woodlawn, Lawren S. Harris and Somerset pumping stations.

9.3 Compliance

Wastewater Compliance section is responsible for monitoring discharges to the sanitary system throughout Brantford, ensuring that all Industrial, Commercial and Institutional (ICI) properties are provided with a solid understanding of the Sewer-use By-law and ensure compliance with all of the provisions within. Wastewater Compliance continues to monitor effluents in major trunk lines and from industrial dischargers to identify concerns and implement sustainable solutions to improve quality of the effluent discharged to the City's sanitary system. Currently six industrial dischargers are in compliance agreements with the City while working towards compliance with the Sewer Use By-law. The successful upgrades at a local food product manufacturer resulted in the elimination of their

wastewater discharge and loading reduction of nearly 1000 households in September 2022. Continued progress at the City's largest industrial discharger should provide additional relief at the City's WWTP in 2023.

In October 2022, Compliance staff were called to respond to a large scale industrial fire. Compliance staff worked over the next several days to prevent any immediate impacts to the natural environment. During the following months, staff continued to work with other City departments, local contractors and consultants to ensure impacts were mitigated.

9.4 Key Performance Indicators

The City has developed Key Performance indicators (KPI's) for select parameters to track each division's success year to year. Table 1 is a summary of the annual KPI's for Wastewater Operations over the period of 2021 to 2022.

Table 1 - Annual Summary of Wastewater Operations KPI's 2021 to 2022

Key Performance Indicators	2021	2022
Chemical Costs per ML Treated	$41.07	$48.60
Biosolids Disposal Costs per ML Treated	$26.41	$27.38
Electricity Consumption (kWh) per ML Treated	590.46	585.69
# of WWTP Non-Compliance Events	0	0
Breakdown Maintenance as % of Total Maintenance Hours	3.4%	5.9%
% of Time Raw Sewage Quality Has Exceeded By-law Limits	10.3%	12%
# of Complaints Received	4	5
# of Spills Impacting Sanitary and Storm Collection Systems	33	22

Based on the KPI's in Table 1, some key observations over the last two (2) years include the following:

- There was a large increase in chemical costs per ML treated from 2021 to 2022 due to significant increases to the cost of all chemicals. The increase in cost is attributed to increase in the cost

of raw materials, fuel, transportation and labour. Similar cost increases are seen by utilities across Canada and United States;

- There was no significant changes to the amount of biosolids disposal costs per ML treated in 2022 as the decant system continued to reduce the volumes significantly;

- There was no significant change to the electricity consumption per ML treated in 2022. Wastewater Treatment staff will make adjustments to optimize blower control with the goal to reduce electricity usage in 2023.

- The increase in percentage of breakdown maintenance was due to a failure of larger process equipment such as the grit classifier, three (3) process boilers and primary clarifiers 5 and 6;

- Five (5) odour complaints were received in 2022 which is similar to 2021, which staff addressed by working with local industrial facilities; and

- The number of spill events that resulted in an impact to the sanitary and storm systems has increased from 2021 to 2022.

9.5 Capital Projects

Annually, the City develops and updates a 10-year capital forecast which includes upgrades to wastewater facilities. All capital projects are delivered by Environmental Services Department. The COVID-19 pandemic slowed down the progress of capital projects by increasing wait times for deliveries of equipment.

9.5.1 Completed Capital Projects

In 2022, the following capital projects were completed at the wastewater facilities:

- Assessment of the Wastewater Operations Maintenance program, which delivered a road map to optimize the maintenance program;

- Installation of actuators on the Raw Sewage Pumping Station and Preliminary Treatment Building control valves to allow

automated control of the Raw Sewage Pumping Station and Preliminary Treatment Building; and

- Installation of magnetic flow meters on the two (2) influent force mains for accurately measuring flow to the WWTP.

9.5.2 On- Going Capital Projects

- Upgrades to primary clarifiers #1, #2 and #4, which should be completed in Q1 of 2023;
- Rehabilitation of the anaerobic digesters, which should be completed in Q1 of 2024;
- Condition assessment and upgrades to secondary clarifiers. The condition assessment is estimated to be completed in Q2 of 2023 and the construction upgrades are expected to be completed in Q4 of 2025;
- Environmental Assessment and design of the upgrades to the Empey St. WWPS have been completed and construction of the upgrades is to begin in Q2 2023 and anticipated to be completed by Q1 2025;
- Replacement of the WWTP process boilers to meet TSSA requirements. The design of the project is to be completed and tendered for construction in 2023; and
- Design of a new UV disinfection system, which is estimated to be completed by Q4 of 2023, which will lead into completion of construction in 2025.

9.6 Planned 2023 Activities

The following list represents a summary of some of Wastewater Operations' planned activities for 2023:

- Continue to maintain current performance from the WWTP, while striving to consistently achieve the voluntary targets in the Grand River WMP on a monthly basis.
- Support the continued progress of on-going capital projects.
- Support the initiation of the following key 2023 capital projects:

  - Design of a new UV disinfection system;
  - Construction of the Empey WWPS Upgrades;
  - Environmental Assessment of the Effluent Pumping Station;
- Continue to support major industrial dischargers in maintaining compliance with the Sewer-Use By-law.
- Ensure on-going progress is being realized in long-term Compliance Agreements with industries.
- Implement the requirements of the newly issued Consolidated Linear Infrastructure Environmental Compliance Approvals (CLI-ECA) for the storm and wastewater collection systems.

10.0 Financial Implications

There are no financial implications resulting from this report.

The Wastewater Operations division is 100% funded from the revenue generated from user fees and wastewater rate. Wastewater capital projects are funded from Development Charges as well as the wastewater rate. User fees revenue is generated through programs under the Sewer-use By-law and from the septage receiving station. A comparison of Brantford's monthly average sewer cost for a single family home (17 cubic meters per month) to other local municipalities is trended in Figure 2.

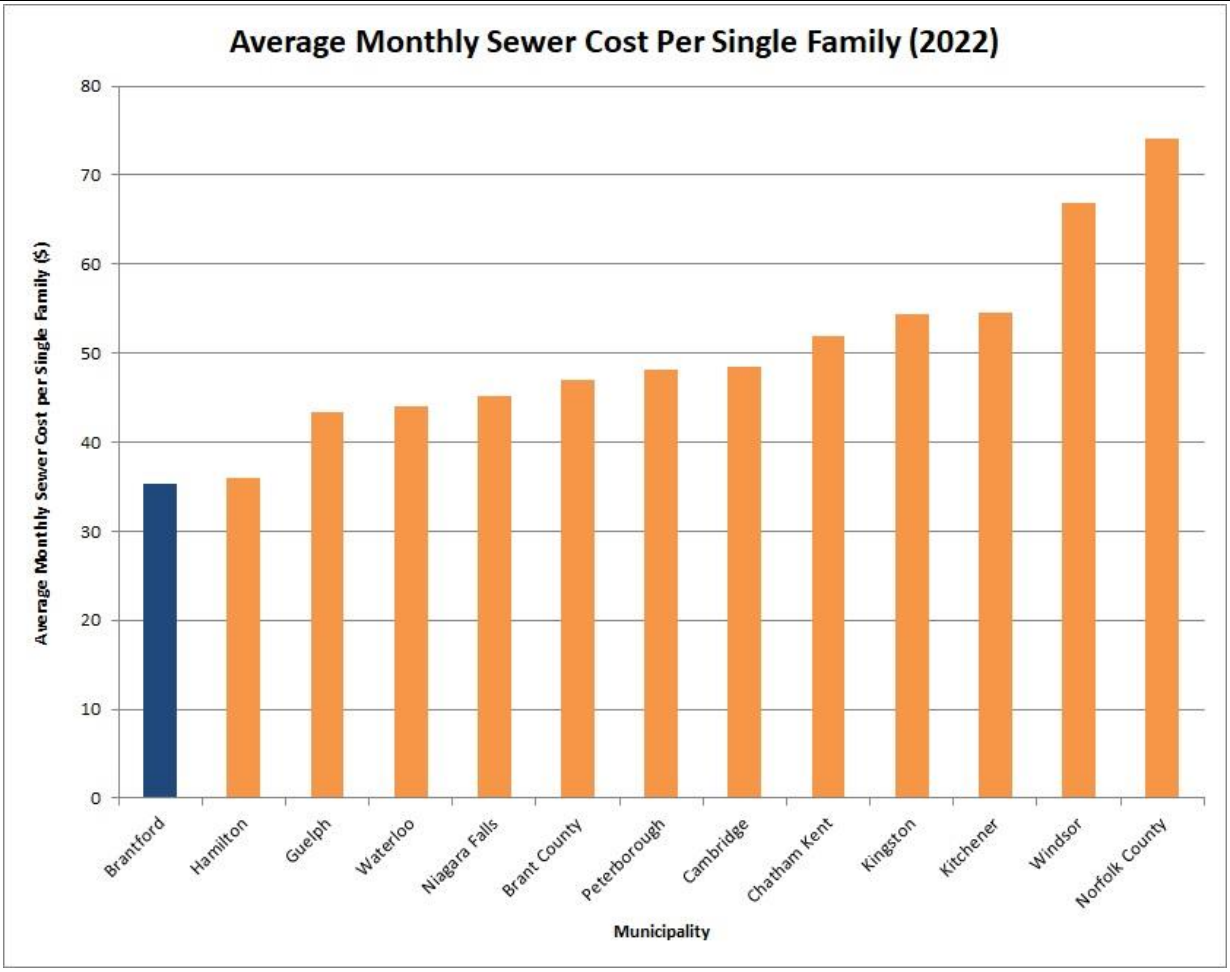


Figure 2 - Comparison of Monthly Average Sewer Cost for a Single Family Home in 2022

The comparison in Figure 2 shows that the City's monthly average sewer cost for a single family home in 2022 is the lowest compared to other local municipalities.

11.0 Climate and Environmental Implications

The Wastewater Operations division takes great pride in being good environmental stewards. To achieve this goal, the Compliance, Maintenance and Treatment sections of the division work together to reduce any impacts on the environment. This is demonstrated by not only being in compliance with all regulations, but by achieving more stringent voluntary targets. By focusing on achieving the best performance possible, the City's wastewater infrastructure reduces its impact on the environment.

Table 2 outlines a summary of greenhouse gas (GHG) emissions from the WWTP from 2021 to 2022. There was an overall increase in GHG emissions

from electricity and natural gas use by 170 tonnes of carbon dioxide equivalent (T of CO_2e). There was also an increase in GHG emissions from wastewater treatment and discharge by 0.01 T of CO_2e. However, it should be noted that the WWTP treated more ML of wastewater in 2022 compared to 2021 which has an impact on GHG emissions. Additionally, another climate and environmental implication of the WWTP is the by-product of methane gas from the anaerobic sludge digestion. From 2021 to 2022, since there was more wastewater to be treated, there was an increase in the amount of methane gas generated and wasted and a decrease in the amount of methane gas used to power the boilers at the WWTP.

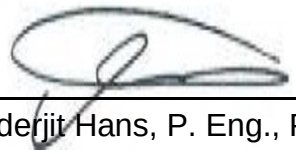
Table 2 – Summary of GHG Emissions from WWTP from 2021 to 2022

	2021	2022	Difference
GHG emissions from electricity and natural gas use (T of CO_2e)	659	829	+170
Wastewater treated (ML)	11,851	13,265	+1,414
GHG emissions from wastewater treatment and discharge (T of CO_2e)	0.085	0.096	+0.01
Electricity GHG emissions per ML treated (kg of CO_2e)	15.03	14.88	-0.1438
Methane generated (m^3)	1,575,186	1,665,813	+90,627
Methane used (m^3)	822,351.80	779,062	-43,288
Methane wasted (m^3)	752,834.20	886,750	+133,915

In 2023, two key wastewater capital projects will commence: ultraviolet (UV) disinfection and WWTP effluent pumping station. Both projects have the potential to significantly increase electricity usage at the WWTP. Even though the increase of electrical usage may increase GHG emissions, the elimination of the two disinfection chemicals will reduce the GHG emissions caused by the production and delivery of the chemicals as well as any impacts of discharge to the natural environment.

12.0 Conclusion

Despite the substantial increase in overall costs due to the lingering effects caused by the pandemic, Wastewater Operations continued to improve upon its KPIs. Wastewater Operations also continued to maintain the high standards set by the Grand River Watershed-wide Wastewater Optimization Program by achieving silver recognition.



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Attachments

Not applicable

Copy to:

Not applicable

In adopting this report, is a by-law or agreement required? If so, it should be referenced in the recommendation section.

By-law required	[ ] yes	[X] no
Agreement(s) or other documents to be signed by Mayor and/or City Clerk	[ ] yes	[X] no
Is the necessary by-law or agreement being sent concurrently to Council?	[ ] yes	[X] no