Date August 13, 2019 Report No. 2019-319

To Chair and Members
Committee of the Whole – Operations and Administration

From E. (Beth) Goodger, General Manager
Public Works Commission

1.0 Type of Report
Consent Item [X ]
Item For Consideration [ ]

2.0 Topic Wastewater Operations 2018 Annual Summary Report
[Financial Impact – None]

3.0 Recommendation

4.0 Purpose and Overview
The purpose of this report is to update City Council about the operation and maintenance of the City of Brantford’s Wastewater Treatment Plant and Pumping Stations for the period of January 1st to December 31st, 2018.

5.0 Background
Wastewater from the City of Brantford’s approximate 98,000 residents is conveyed to the Brantford Wastewater Treatment Plant (WWTP) via nine (9) Wastewater Pumping Stations (WWPS) within the collection system of the City. The WWTP was originally commissioned for operation in 1957, a major expansion occurred in 1977 with other upgrades being completed since that
time. Some of the wastewater pumping stations were built around the same time as the WWTP with others being added since then. Some of the processes and equipment from the original plant and pumping stations are still in operation today.

The WWTP is a conventional activated sludge plant with chlorine disinfection followed by de-chlorination prior to its effluent being discharged into the Grand River. Sludge generated at the WWTP is anerobically digested (in the absence of oxygen) and land applied.

Owners of municipal wastewater treatment plants in Ontario are required to complete annual reports for the Ministry of the Environment, Conservation and Parks (MECP). However, there are no requirements to provide this update to Council. Although legislation currently does not exist, this summary report on the operations and maintenance of the City’s municipal wastewater facilities will be voluntarily completed on an annual basis.

6.0 Corporate Policy Context

The Wastewater Operations 2018 Annual Summary Report supports the City’s “Managed Growth and Environmental Leadership” goal, by:

- Maximizing the capabilities of the City’s wastewater infrastructure;
- Achieving performance beyond regulatory compliance that improves water quality in the Grand River and Lake Erie;
- Utilizing the WWTP Strategic Plan (Report PW2017-061) and the SCADA Master Plan (Report PW2016-043) as guides for planning future upgrades to enhance performance of the entire system.

7.0 Input From Other Sources

Staff from Engineering Services and Facilities and Asset Management Departments were consulted in the development of the Wastewater Operations 2018 Annual Summary Report.

8.0 Analysis

The City of Brantford’s Wastewater Operations Annual Summary Report provides an update to City Council summarizing the following areas based on information and data from 2018:
8.1 Performance

Municipal wastewater treatment facilities in Ontario are required to be in compliance with performance criteria defined in the Environmental Compliance Approval (ECA), issued by the MECP. The City has also committed to meeting more stringent voluntary targets established through the Grand River Water Management Plan. If all municipal WWTPs discharging into the Grand River achieve the voluntary targets, water quality in the Grand River will be improved.

The City is a partner in the Watershed-wide Wastewater Optimization Program (WWOP) with other municipalities discharging to the Grand River. The WWOP partners utilize optimization principles to make best use of municipal resources. The program also supports its municipal partners in achieving the voluntary performance targets.

Table 1 is a summary of the performance of the Brantford WWTP compared to some key parameters for 2018.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Average Result</th>
<th>Voluntary Target</th>
<th>ECA Limit</th>
<th>Compliance Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Suspended Solids (mg/L)</td>
<td>6.3</td>
<td>Not Applicable</td>
<td>25.0</td>
<td>Yes</td>
</tr>
<tr>
<td>Carbonaceous Biochemical Oxygen Demand (mg/L)</td>
<td>2.3</td>
<td>Not Applicable</td>
<td>25.0</td>
<td>Yes</td>
</tr>
<tr>
<td>Total Phosphorous (mg/L)</td>
<td>0.2</td>
<td>0.3</td>
<td>1.0</td>
<td>Yes</td>
</tr>
<tr>
<td>E. Coli (CFU/100 mL)</td>
<td>8.9</td>
<td>Not Applicable</td>
<td>200</td>
<td>Yes</td>
</tr>
<tr>
<td>Total Ammonia Nitrogen – May to October (mg/L)</td>
<td>0.3</td>
<td>1.0</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Total Ammonia Nitrogen – November to April (mg/L)</td>
<td>0.6</td>
<td>2.0</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>

Table 1 – 2018 Summary of the Brantford WWTP Performance to Key Parameters
The average results are in compliance with all MECP performance criteria identified in the ECA and the voluntary targets in the Water Management Plan.

Continued effort is being made to further reduce nutrient discharges to the Grand River, which can negatively impact water quality and aquatic life. An example of this is the demonstrated reduction in total phosphorus discharged. The City has achieved these results without the aid of tertiary filtration by utilizing effective process control techniques.

### 8.2 Wastewater Flows

Wastewater flow to the plant varies seasonally, which is typically higher in the first half of the year compared to the second half. This is due to higher rainfall accumulation, which enters the collection system through damaged pipes, chambers or through direct connections from sump pumps and downspouts. This excess water called inflow and infiltration (I and I), puts added pressure on pumping capacities at the WWPS and treatment processes at the WWTP.

The volume of wastewater treated at the WWTP is recorded through the plant’s SCADA system and can be trended for interpretation. Wastewater flows in the collection system are currently monitored at key locations by a number of flow monitors under a separate capital program. The monthly average and maximum daily flows to the plant for 2018 are compared to the plant’s rated capacity and trended in Figure 1.
In 2018, the Brantford WWTP received higher flows to the plant in the first half of the year (approximately 33% higher) compared to the second half. The maximum flow days in 2018 are further evidence of this, as they occurred in February and April. The high flows to the plant in February were caused by the flooding of the Grand River. Although, this caused a significant increase in flow to the plant, it was less than the plant’s rated capacity and did not negatively impact plant performance. The Fifth Avenue WWPS was impacted the most during the flood in February, where all three (3) pumps were required to be in service leaving no redundancy in the event of pump failure.

To assess and adapt to the impacts of inflow and infiltration, Wastewater Operations monitors pumping station flows and capacity and where possible restores pumping capacity when pumps become less efficient which is part of the normal lifecycle of pumping stations. The impact of high flows from rainfall derived inflow and infiltration on the performance of the plant can be mitigated by exercising effective process control at all times.
8.3 Maintenance

Wastewater Operations staff are responsible for the day to day maintenance of equipment at all wastewater facilities. Recently, an increase in the break down frequency of equipment at the plant and pumping stations is occurring, typically due to age, resulting in increased reactive maintenance. In 2018, some of the major maintenance activities that were completed or initiated at the treatment plant include the following:

- Repaired the equipment of three (3) of the six (6) primary clarifiers
- Repaired multiple breaks to the air piping and diffusers
- Repaired damaged effluent chamber and piping
- Rebuilding and replacement of multiple sludge mixers
- Repairs to the digester roofs and waste gas flare
- Installed site-wide fibre optic connections for SCADA communications

In 2018, a detailed condition, performance and capacity assessment was completed, which identified the current and predicted future needs for the wastewater pumping stations. The station maintenance and capital needs were prioritized for future work. Any repairs that required immediate attention were completed by Wastewater Operations staff, which included:

- Returned pumping capacity of all four (4) pumps to the original design at the Empey Street WWPS
- Returned pumping capacity to the original design by replacing a worn pump at the Fifth Ave. WWPS
- A leak from the discharge trough into the control building at the Empey St. WWPS was repaired
- Spare pumps for the Empey St. and Fifth Ave. WWPS were purchased and available to be installed if an in-service pump fails
- Initiated the installation of fibre optic connections and developed SCADA communications at the WWPS

Preventative maintenance is completed on a routine basis to ensure performance of all equipment is operational. However, without warning equipment failure can occur, which will only increase in the future as equipment continues to age.
8.4 Environmental Impacts

The City is required to report any adverse impacts on the environment caused by the WWTP or WWPS. This may include treatment processes being bypassed, overflows from tanks or spills of a contaminant. When an event occurs, the municipality is required to inform the MECP and the local health unit.

In early January, the digester gas pipes froze causing a release of digester gas to the environment. This occurred for the next several days until the temperatures increased and the pipes thawed.

In late August, a contractor found a minor leak of digester gas from decaying gaskets on the roof hatches. Roof hatches on one (1) digester was repaired immediately, but the second couldn’t be repaired until October when additional parts were received.

In early 2019, freezing of the digester gas piping occurred again, which prompted completion of an assessment to determine an approach for remediation. A project to replace the pipe insulation and install heat tracing will be required.

8.5 Capital Projects

The City is currently addressing deficiencies at the wastewater facilities, which were identified in the WWTP Strategic Plan (PW2017-061) and grouped into future capital projects. Capital items are included and detailed within the Capital Budget and Forecast. Since many of these projects require a design and construction phase, they will span multiple years from initiation to completion. Capital projects currently on-going, include the following:

- Replacement of the original WWTP electrical system
- Removal of residuals from the emergency biosolids lagoons to provide contingency biosolids storage
- Replacement of two (2) blowers to more energy efficient units
- Replacement of the biosolids storage tanks decant system
- Upgrades to three of the original primary clarifiers
- Upgrades to the Fifth Ave WWPS

These capital projects are delivered in collaboration between the Environmental Services and Engineering Services Departments in the Public Works Commission.
The City has also committed significant resources to address the issue of high flows in the collection system from inflow and infiltration through capital projects, including:

- Wastewater Collection System Rainfall and Flow Monitoring and Sampling
- CCTV inspections related to Inflow and Infiltration Source Investigation
- Various capital rehabilitation and replacement projects within the wastewater network
- Pumping station drawdown testing and capacity analysis

Further, projects and assessments of the infrastructure will result in additional projects or high priority areas and potential sources of inflow and infiltration. A plan to implement any required repairs will be developed and presented in future capital budget forecasts.

Staff is currently reviewing the 2020-2029 Capital Budget and Forecast which will be presented to Finance Committee and Council in Q4 of 2019 for Council consideration.

The City also completed the Anaerobic Digestion Facility and Green Energy Opportunities Feasibility Study in 2018. A key finding of the Feasibility Study is the physical proximity of the WWTP, Landfill Site and Landfill Gas Utilization Facility along Mohawk Street. This creates an opportunity to develop an integrated system for processing residential household organic wastes which will increase the production of green energy. This has the potential to reduce the overall energy expenditures at these facilities.

The proposed benefits would be achieved through the construction of a new anaerobic digester for processing organic waste at the WWTP, an organics receiving facility and related process infrastructure between the WWTP and Landfill Gas Utilization Facility. The Feasibility Study recommended the anaerobic digestion (AD) process, which is currently being used at the WWTP for sludge stabilization. Total estimated cost of this project is $19.94 million. The City has submitted an application to receive $6 million in funding for the project from the federal grant program. Grant program results are expected by the end of 2019.

The City is currently working on a project to transfer existing digester gas produced at the WWTP to the Landfill Gas Utilization Facility for electricity production.

8.6 Planned 2019 Activities
The following list represents a summary of some of the planned activities for 2019:

- Maintain current performance from the WWTP while striving to consistently achieve the voluntary targets in the Water Management Plan on a monthly basis
- Support the continued progress of capital projects initiated in 2018
- Support the initiation of key 2019 capital projects, including:
  - Rehabilitation of the Empey St. WWPS
  - Anaerobic Digester Cleanout, Inspection and Repairs
  - Replacement of the Aeration System Piping and Diffusers
  - Effluent Pumping Station Feasibility Study
  - Health and Safety Assessment of all Wastewater Facilities
  - Replacement of WWTP Influent Flow Metering
  - Hydraulics Cross-Connection Feasibility Study
  - Ongoing system flow and rainfall monitoring
- Conduct a risk assessment for the WWTP and WWPS
- Continue to support the build out of the Wastewater Operations SCADA system (WWTP and WWPS)
- Continue monitoring capacities at pumping stations and restore to original design, where possible

9.0 **Financial Implications**

Wastewater Treatment Operations and capital projects are 100% funded from the wastewater rate. From 2017 to 2018, wastewater electricity costs were reduced by approximately 19%.

10.0 **Conclusion**

The Brantford Wastewater Treatment Plant (WWTP) and some of the wastewater pumping stations were originally built around 1960. Some of the infrastructure installed during these early projects is still in operation today and has recently shown signs of increased failure. Wastewater Operations has been repairing the failed infrastructure as needed to ensure its continued operation. Planned capital projects are focused on addressing these processes however there is a risk that more failures may occur before the capital upgrades can be completed.

In 2018, significant effort was put towards restoring pumping station capacity to ensure there is capability until upgrades can be completed. With continued focus on achieving enhanced performance, the WWTP was compliant with MECP
effluent requirements and also achieved the more stringent voluntary targets identified in the Grand River Water Management Plan.

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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