Belleville Stormwater Management System

2023 Annual Report

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1. Introduction

2023 marks the first year of annual reporting under the City of Belleville's Consolidated Linear Infrastructure (CLI) Environmental Compliance Approval (ECA) for the Belleville Stormwater Management System [1]. The ECA document will be referenced throughout the text of this report. The CLI-ECA is administered by Ontario's Ministry of the Environment, Conservation and Parks (MECP) under the Ontario Water Resources Act and Environmental Protection Act [2]. It is the City's permission and set of conditions for operating, maintaining, and altering the sewage collection system in Belleville. Schedule E, section 5 of the CLI-ECA lays out reporting requirements including an annual performance report submitted to the MECP by April 30th of each year, made available to the public on the City's website. This report has been created to satisfy that requirement.

2. Background Information

The Belleville Stormwater Management (SWM) System is a network of pipes, treatment facilities, and outfalls that convey runoff from developed areas in the municipality to receiving watercourses. The municipal boundary is situated in the Moira River watershed, which drains to the Bay of Quinte. The municipal stormwater system is owned and operated by the Corporation of the City of Belleville and consists of more than 172 km of storm sewers and ditches, one pumping station, and 52 SWM facilities.

Table 1: System Information

CLI-ECA Number	151-S701
System Owner	The Corporation of the City of Belleville

3. Monitoring and Analysis

Schedule E, Section 5.2.2 of the CLI-ECA requires that the annual report include a summary of all required monitoring data, if applicable, along with an interpretation of the data and an overview of the condition and operational performance of the system and any adverse effects on the natural environment.

3.1. Sampling at CSE Wet Pond

In 2023, staff collected samples required per Schedule E, section 10.0 System Specific Conditions at the College Street East Wet Pond (CSE). The requirement was to sample after three storm events of 10 mm or greater over a 24 hour period at the inlet and outlet of the pond; sampling during the spring, summer, and fall where possible. Required parameters to be sampled include:

- Total suspended solids (TSS)
- Total phosphorus (TP)

- Oil and grease (petroleum hydrocarbons)
- Heavy metals, including
    - Mercury (Hg)
    - Lead (Pb)
    - Manganese (Mn)
    - Cadmium (Cd)
    - Zinc (Zn)
    - Copper (Cu)
    - Iron (Fe)
    - Chromium (Cr)

Three sets of samples were collected: one each in June, November, and December. Generally, concentrations of the parameters sampled are at low concentrations. Sampling is required at both the inlet and outlet of the pond after an event is finished. Results from the sampling are shown in Table 2.

Table 2: Analytical results from sampling conducted at CSE.

Parameter	Units	Date	Inlet Concentration	Outlet Concentration
Cadmium	mg/L	**19-Dec-23**	0.000007	0.000010
Cadmium	mg/L	**22-Nov-23**	0.000012	0.000011
Cadmium	mg/L	**13-Jun-23**	0.000006	0.000005
Chromium	mg/L	**19-Dec-23**	0.00098	0.00100
Chromium	mg/L	**22-Nov-23**	0.00144	0.00089
Chromium	mg/L	**13-Jun-23**	0.00109	0.00082
Copper	mg/L	**19-Dec-23**	0.0011	0.0011
Copper	mg/L	**22-Nov-23**	0.0013	0.0013
Copper	mg/L	**13-Jun-23**	0.0014	0.0009
Iron	mg/L	**19-Dec-23**	0.375	0.407
Iron	mg/L	**22-Nov-23**	0.481	0.477
Iron	mg/L	**13-Jun-23**	0.522	0.239
Lead	ng/L	**19-Dec-23**	0.00044	0.00051
Lead	ng/L	**22-Nov-23**	0.00043	0.00045
Lead	ng/L	**13-Jun-23**	0.00060	0.00029
Manganese	mg/L	**19-Dec-23**	0.0312	0.0310
Manganese	mg/L	**22-Nov-23**	0.0245	0.0586
Manganese	mg/L	**13-Jun-23**	0.0295	0.0364
Mercury	mg/L	**19-Dec-23**	ND	ND
Mercury	mg/L	**22-Nov-23**	ND	ND
Mercury	mg/L	**13-Jun-23**	ND	ND
Oil & Grease (total)	ug/L	**19-Dec-23**	ND	ND
Oil & Grease (total)	ug/L	**22-Nov-23**	3	2
Oil & Grease (total)	ug/L	**13-Jun-23**	ND	3.00
Phosphorus	mg/L	**19-Dec-23**	0.028	0.041
Phosphorus	mg/L	**22-Nov-23**	0.056	0.043

Parameter	Units	Date	Inlet Concentration	Outlet Concentration
Phosphorus	mg/L	**13-Jun-23**	ND	ND
TSS	mg/L	**19-Dec-23**	10	13
TSS	mg/L	**22-Nov-23**	10	20
TSS	mg/L	**13-Jun-23**	6	14
Zinc	mg/L	**19-Dec-23**	0.006	0.009
Zinc	mg/L	**22-Nov-23**	0.01	0.01
Zinc	mg/L	**13-Jun-23**	0.006	0.004

3.2. Analysis of Sample Results

There is no set limit for the concentration of parameters of interest leaving the stormwater management facility. For the purposes of comparison, when examining concentrations of each parameter against the Provincial Water Quality Objectives (PWQO), the quality of effluent from the facility is better than the PWQO in almost all cases. In two instances, the concentration of iron was slightly higher than the PWQO and in another it was under the objective. There was no observable sheen of oil or grease noted. Overall, no concerns are raised, and staff will continue to monitor. Based on the required sampling, the pond appears to work as designed.

Note that some outlet concentrations are higher than inlet concentrations. This is because of the required timing and location of the sampling. Since SWM ponds are generally designed to mimic plug flow or a “first in, first out” flow condition, at the end of a rain event it should be expected that the highest concentration of sediment loadings would be pushed toward the outlet (much of pollutant reduction occurs during the settling period between rain events). The sample results generally reflect this and so calculating a removal efficiency from the inlet to outlet for these events would not be indicative of pond performance.

Note that an additional, voluntary sample was collected on June 12, 2023 with an inlet sample collected at the beginning of the rain event and an outlet sample collected at the end of the rain event. From this event, over a 96% removal of sediment was achieved.

Staff are looking to improve sampling strategies in the future while continuing to comply with the requirements of the ECA. Additional sampling guidance is expected when the MECP publishes monitoring requirements for stormwater systems.

Overall, in terms of facility performance, it appears that the pond functions very well based on visual inspection and the measured performance during vs. after a storm.

3.3. Other Required Monitoring

There was no other required monitoring in 2023. It is anticipated that monitoring as part of future operations will be informed by the MECP’s guidelines.

4. Operations and Maintenance

Schedule E, section 5.2.4, 5.2.5, and 5.2.6 of the CLI-ECA requires that the annual report include a summary of operating issues and corrective actions taken, as well as calibration, maintenance and repairs carried out on parts of the system.

4.1. Operating Issues and Corrective Actions

All stormwater management facilities are generally inspected at least once per year. Often storm ponds are inspected more frequently, up to four times per year. Potential issues are noted during inspections and site visits, and operations staff follow up as needed. The Cannifton Rd Pumping Station is checked on a weekly basis and monitored with an alarm system. Operators responded to occasional alarms and corrected issues as required such as loss of power or minor repairs to pumps or other equipment.

In 2023, staff noted dry-weather flow with high sediment loadings discharging from a storm outlet after following up on a complaint from a local resident. After investigation, it was determined that the source was related to a water main break. The both issues were corrected.

There were no significant operating issues in 2023.

4.1.1. Calibration, Maintenance and Repairs

Monitoring is conducted via grab samples sent to a lab for analysis. Handheld monitoring equipment, when used, is calibrated by staff as recommended by the manufacturer or before each use. This includes a pH probe, and a dissolved oxygen probe. There is no other equipment installed in the systems that requires calibration.

Generally, minor repairs and maintenance are required including items such as:

- Removing trash or debris
- Clearing inlets and outlets
- Mowing grass
- Fixing broken gates, locks, fences
- Removing dead trees
- Fixing catch basin grates
- Removing blockages
- Removing sediment from OGS units
- Pump and generator maintenance

At the Cannifton Rd pumping station, operators complete checks and perform maintenance on pumps, floats, alarms, levels, and similar items.

Larger maintenance projects are scheduled through the annual budget process and implemented through consultants and contractors. In 2023 a tender was awarded to repair a

liner and remove sediment from the CME Ph 1-3 storm pond and this work will be conducted in 2024.

5. Customer Feedback

Few customer complaints are received about the stormwater management system. Generally, staff investigate complaints on a case-by-case basis.

One complaint was received about sediment discharge from a stormwater outlet. This is further discussed in section 4.1.

One complaint was received regarding unauthorized dumping of building materials into a catch basin. This issue was referred to the City's Bylaw enforcement group for enforcement and education.

6. Alterations to the Authorized System

No alterations to the system were approved and completed in 2023.

7. Spills and Abnormal Discharge Events

No spills or abnormal discharge events occurred in 2023.

7.1. Overflows and Spills of Sewage

There were no collection system overflows or spills during the reporting period.

8. Actions to Improve and Correct Performance

Section 5.2.10 of the CLI-ECA requires that the Annual Report include a summary of actions taken to improve performance of any aspect of the authorize system.

In 2023, a tender was awarded to remove sediment and conduct repairs at the CME 1-2 stormwater management pond. This work will commence in 2024.

In 2023, design of upgrades to the Cannifton Rd pumping station were completed and put out for tender. Construction is planned to begin in 2024.

9. Summary and Conclusions

2023 was the first year of annual reporting under the City of Belleville's new CLI-ECA for the Belleville Stormwater Management System. Through monitoring, regular inspection, maintenance, and planned upgrades the system will continue to operate effectively. Improvements will continue to be made as the CLI-ECA is fully implemented over the next several years.

10. References

[1] “Environmental Compliance Approval For a Municipal Stormwater Management System: ECA No. 151-S701, Issue 3.” Ontario Ministry of the Environment, Conservation and Parks, May 16, 2023.

[2] “Municipal Consolidated Linear Infrastructure Environmental Compliance Approvals.” Ontario Ministry of the Environment, Conservation and Parks, Jun. 12, 2023. Accessed: Mar. 27, 2024. [Online]. Available: https://www.ontario.ca/page/municipal-consolidated-linear-infrastructure-environmental-compliance-approvals