

Belleville Stormwater Management System

2024 Annual Report



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1. Introduction

The City of Belleville's Consolidated Linear Infrastructure (CLI) Environmental Compliance Approval (ECA) for the Belleville Stormwater Management System (No. 151-S701) lays out reporting requirements including an annual performance report submitted to Ontario's Ministry of the Environment, Conservation and Parks (MECP) by April 30th each year [1]. The CLI-ECA is administered by the MECP and is issued under the Environmental Protection Act to fulfill requirements of the Ontario Water Resources Act [2]. It is the City's permission and set of conditions for operating, maintaining, and altering the stormwater management system in Belleville. This report has been created to satisfy the requirement in Schedule E, section 5 of the CLI-ECA and will be made available to the public on the City's website.

2. Background Information

The Belleville Stormwater Management (SWM) System is a network of pipes, appurtenances, treatment facilities, pumping station and outfalls that convey runoff from developed areas in the municipality to receiving watercourses. The municipal boundary is primarily 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, 53 SWM facilities and 1 pumping station.

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. This is addressed in sections 3.1 to 3.3 below.

Schedule E, Section 5.2.3 of the CLI-ECA requires a summary and interpretation of environmental trends based on all monitoring information and data for the previous five (5) years. As of this reporting, only 2 years of data have been compiled in relation to the CLI-ECA and therefore an interpretation of trends is not yet possible.

3.1. Sampling at College Street East Wet Pond

In 2024, staff collected samples required per Schedule E, section 10.1 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 in 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)

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

Four sets of samples were collected: two in April, and one each in June and July covering the spring and summer time periods. No storm events of 10 mm or greater occurred in the fall of 2024 and therefore, sampling covering the fall period was not possible.

Sampling is required at both the inlet and outlet of the pond *after* an event is finished. In 2024, staff also sampled the inlet during the first few hours of a rain event to capture the ‘first flush’. This is when runoff entering the storm facility will typically have higher concentrations of sediment and pollutants. This additional sampling was done to better assess pollutant removal and overall pond performance.

Results from the sampling are shown in Table 1. Generally, concentrations of the parameters sampled are at low concentrations. Sample concentrations that fall below the detection limit of the laboratory are denoted by ‘ND’ in Table 1.

Table 1: Analytical results from sampling conducted at CSE.

Parameter	Units	Event Start Date	Inlet Concentration (First Flush)	Inlet Concentration (Post Event)	Outlet Concentration (Post Event)
Cadmium	mg/L	03-Apr-24	0.000026	0.000014	0.000018
Cadmium	mg/L	11-Apr-24	0.000062	0.000011	0.000006
Cadmium	mg/L	06-Jun-24	0.000033	0.000005	ND
Cadmium	mg/L	10-Jul-24	0.000006	0.000005	0.000005
Chromium	mg/L	03-Apr-24	0.00239	0.00155	0.00130
Chromium	mg/L	11-Apr-24	0.00405	0.00283	0.00092
Chromium	mg/L	06-Jun-24	0.00328	0.00086	0.00029
Chromium	mg/L	10-Jul-24	0.00037	0.00047	0.00075
Copper	mg/L	03-Apr-24	0.003	0.002	0.002
Copper	mg/L	11-Apr-24	0.005	0.001	0.001
Copper	mg/L	06-Jun-24	0.007	0.002	ND
Copper	mg/L	10-Jul-24	0.001	ND	ND
Iron	mg/L	03-Apr-24	1.05	0.368	0.531
Iron	mg/L	11-Apr-24	2.23	0.492	0.350
Iron	mg/L	06-Jun-24	1.03	0.101	0.053
Iron	mg/L	10-Jul-24	0.138	0.250	0.179
Lead	mg/L	03-Apr-24	0.00115	0.00032	0.000050

Parameter	Units	Event Start Date	Inlet Concentration (First Flush)	Inlet Concentration (Post Event)	Outlet Concentration (Post Event)
Lead	mg/L	11-Apr-24	0.00214	0.00043	0.00033
Lead	mg/L	06-Jun-24	0.00097	0.00010	0.00009
Lead	mg/L	10-Jul-24	0.00012	0.00022	0.00014
Manganese	mg/L	03-Apr-24	0.0378	0.0141	0.0302
Manganese	mg/L	11-Apr-24	0.0868	0.0398	0.0497
Manganese	mg/L	06-Jun-24	0.0941	0.0130	0.0580
Manganese	mg/L	10-Jul-24	0.0250	0.0213	0.0293
Mercury	mg/L	03-Apr-24	ND	ND	ND
Mercury	mg/L	11-Apr-24	0.00001	0.00001	ND
Mercury	mg/L	06-Jun-24	ND	ND	ND
Mercury	mg/L	10-Jul-24	ND	ND	ND
Oil & Grease (total)	mg/L	03-Apr-24	ND	ND	ND
Oil & Grease (total)	mg/L	11-Apr-24	ND	ND	ND
Oil & Grease (total)	mg/L	06-Jun-24	ND	ND	ND
Oil & Grease (total)	mg/L	10-Jul-24	ND	ND	ND
Phosphorus	mg/L	03-Apr-24	0.049	0.020	0.031
Phosphorus	mg/L	11-Apr-24	0.102	0.029	0.029
Phosphorus	mg/L	06-Jun-24	0.223	0.029	0.029
Phosphorus	mg/L	10-Jul-24	0.047	0.042	0.027
TSS	mg/L	03-Apr-24	39	9	14
TSS	mg/L	11-Apr-24	187	15	16
TSS	mg/L	06-Jun-24	58	2	3
TSS	mg/L	10-Jul-24	8	6	3
Zinc	mg/L	03-Apr-24	0.030	0.014	0.010
Zinc	mg/L	11-Apr-24	0.073	0.007	0.006
Zinc	mg/L	06-Jun-24	0.057	0.006	ND
Zinc	mg/L	10-Jul-24	0.004	0.005	0.003

3.2. Analysis of Sample Results

3.2.1. Overall Water Quality

There is no set limit for the concentration of parameters of interest leaving the stormwater management facility. However, sample results can be compared against the concentrations outlined in Ontario’s Provincial Water Quality Objectives (PWQOs) which are set by the MECP and serve as guidelines for maintaining water quality in surface water bodies, such as lakes and rivers [3]. While not intended for stormwater management facilities, they are useful indicators of water quality and provide context to the results in Table 1.

When examining concentrations of each parameter against the PWQOs, the quality of effluent from the facility is better than the PWQO in most cases. Of the 44 samples taken at the facility’s outlet, less than 10% of results had concentrations that were slightly higher than the PWQO: one result for copper, two results for iron and one result for phosphorus. The parameters with results exceeding the PWQOs are shown in Table 2. Overall, the sample results indicate that the facility is effectively treating stormwater for quality control purposes.

Table 2: Sampling results that exceeded PWQOs at CSE.

Parameter	Units	Outlet Concentration (Post Event)	PWQO
Copper	mg/L	0.002	0.001 or 0.005 (depending on water hardness) ¹
Iron	mg/L	0.531	0.3
Iron	mg/L	0.35	0.3
Phosphorus	mg/L	0.031	0.03

3.2.2. Removal of Sediment and Pollutants

When analyzing the post-event sample results, it was noted 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). Calculating the change in pollutant loadings using post-event sample results is, therefore, not indicative of pond performance.

In 2024, staff implemented changes to the sampling methodology that included an additional sample taken from the inlet during the ‘first flush’ – the first few hours of the rain event when runoff entering the storm facility will typically have higher concentrations of sediment and pollutants. The sample results generally reflect this. In all but four cases, the concentration of sediment and pollutants in samples taken at the outlet post-event were lower than the concentration at the inlet during the ‘first flush’. For Total Suspended Solids (TSS), a reduction of 78% was achieved on average with results varying from 63% to 95%, as shown in Table 3. Staff interpret these results to mean the facility is functioning adequately overall.

¹ The PWQO for copper is hardness dependent. While not a PWQO itself, hardness levels can influence the acceptable levels of other contaminants, such as metals. The interim PWQO for copper is 0.001 mg/L for water with hardness as CaCO₃ of 0-20 mg/L, and 0.005 mg/L for water with hardness as CaCO₃ of >20 mg/L. Water hardness is unknown for the given samples, so staff used the stricter PWQO for analysis.

Table 3: TSS Concentration Results for CSE Wet Pond.

Parameter	Unit	Event Start Date	Inlet Concentration (First Flush)	Outlet Concentration (Post Event)	% Change in concentration (post-event vs. first flush)
TSS	mg/L	03-Apr-24	39	14	-64%
TSS	mg/L	11-Apr-24	187	16	-91%
TSS	mg/L	06-Jun-24	58	3	-95%
TSS	mg/L	10-Jul-24	8	3	-63%

Visual inspections also raised no concerns. There was no observable sheen of oil or grease noted during precipitation events or during quarterly inspections. Additional sampling guidance is expected when the MECP publishes monitoring requirements for stormwater systems; staff will adapt sampling methodologies as applicable.

3.3. Other Required Monitoring

There was no other required monitoring in 2024. 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, inspections, maintenance and repairs carried out on parts of the system, as well as calibration and maintenance carried out on monitoring equipment.

4.1. Inspections, 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. There were no significant operating issues at stormwater management facilities in 2024.

At this time, an O&M Manual is being prepared but is not yet complete; therefore, inspection requirements, including frequency, are not yet determined. The O&M Manual will be completed by July 26, 2025, as per CLI-ECA section 3.2.1., with inspections completed no later than December 31, 2026 and thereafter as outlined in the O&M Manual. The Cannifton Road pumping station is currently under construction; an O&M Manual will be prepared for the upgraded station.

4.2. Maintenance and Repairs

Generally, minor repairs and maintenance were conducted on various parts of the system including:

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

At the Cannifton Road pumping station, operators completed checks and performed maintenance on pumps, floats, alarms, levels, and similar items.

Larger maintenance and repair projects are scheduled through the annual budget process and implemented through consultants and contractors. Major projects completed in 2024 are covered in Section 8: Actions to Improve and Correct Performance.

4.3. Calibration of Monitoring Equipment

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. This includes a pH probe and a dissolved oxygen probe. However, this equipment was not used in 2024 for the stormwater management system. There is no other equipment installed in the system that requires calibration.

5. Customer Complaints

Schedule E, section 5.2.7 of the CLI-ECA includes a summary of any complaints received during the reporting period and steps taken to address them. Typically, few customer complaints are received about the stormwater management system. There were no complaints received in 2024.

6. Alterations to the Authorized System

Schedule E, section 5.2.8 requires a summary of all alterations to the system within the reporting period that are authorized by the ECA, including a list of alterations that pose a Significant Drinking Water Threat. In 2024, there were 3 alterations placed into service that were authorized under this CLI ECA. All 3 were storm sewer extensions. None of the alterations pose a Significant Drinking Water Threat.

7. Spills and Abnormal Discharge Events

Schedule E, section 5.2.9 requires a summary of all spills or abnormal discharge events.

On July 31, 2024, sanitary maintenance holes within close proximity to one another surcharged during a significant storm event, resulting in a discharge of sewage from the sanitary structures and into nearby catch basins. The spill was reported to the Spills Action Centre. Catch basins were vacuumed and roads were swept following the storm.

On April 11, 2024, a vehicle parked in a commercial plaza parking lot on Dundas Street ruptured its fuel tank by hitting a light pole concrete base. The leaked fuel entered a catch basin on the private property that is connected to a storm sewer. Traveling south through this system, the fuel eventually made its way to the Belleville Marsh – a Provincially Significant Wetland. The spill was reported to the Spills Action Centre and the private property owner undertook a clean-up of the Marsh in consultation with the Ministry. To prevent a similar incident from happening in the future, the private property owner installed an oil/grit separator on their property, also in consultation with the Ministry. To prevent a similar incident from happening in the same proximity on City property the City has approved a capital budget item to install an oil/grit separator in 2025 on City property.

8. Actions to Improve and Correct Performance

Schedule E, sections 5.2.10 and 5.2.11 of the CLI-ECA require that the Annual Report include a summary of actions taken to improve or correct performance of any aspect of the authorized system and the status of actions for the previous reporting year.

In 2023, a tender was awarded to remove sediment and conduct pond liner repairs at the CME 1-2 stormwater management pond. Much of this work was completed in 2024. Outstanding items and deficiency corrections are expected to be completed in 2025.

In 2023, design of upgrades to the Cannifton Road pumping station were completed and put out for tender. Construction of planned upgrades, including the replacement of pumps, floats, controls and a generator, commenced in August 2024 with work scheduled for completion in 2025.

In 2024, it was discovered that the outlet of a 600 mm storm pipe designed to convey stormwater to the Moira River was blocked causing upstream catch basins to back up. The outlet was reinstated to correct the issue.

9. Summary and Conclusions

Overall, the system operates effectively due to monitoring, regular inspection, maintenance, and planned upgrades. 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 4." Ontario Ministry of the Environment, Conservation and Parks, Dec. 19, 2024.
- [2] "Municipal Consolidated Linear Infrastructure Environmental Compliance Approvals." Ontario Ministry of the Environment, Conservation and Parks, Sep. 24, 2024. Accessed: Apr. 04, 2025. [Online]. Available: <https://www.ontario.ca/page/municipal-consolidated-linear-infrastructure-environmental-compliance-approvals>
- [3] "Water management: policies, guidelines, provincial water quality objectives." Ontario Ministry of the Environment, Conservation and Parks, Aug. 16, 2021. Accessed: Apr. 04, 2025. [Online]. Available: <https://www.ontario.ca/page/water-management-policies-guidelines-provincial-water-quality-objectives>