

City of St. Catharines

# Stormwater Management System



**2023 Annual Performance Report**

For submission to the Ministry of Environment, Conservation and Parks

April 2024

## TABLE OF CONTENTS

<b>1.0 INTRODUCTION AND PURPOSE</b> .....	<b>3</b>
<b>2.0 BACKGROUND</b> .....	<b>3</b>
2.1 STORMWATER MANAGEMENT SYSTEM.....	3
<b>3.0 2023 STORMWATER ACTIVITIES</b> .....	<b>11</b>
3.1 ENVIRONMENTAL EDUCATION AND PUBLIC OUTREACH ACTIVITIES .....	11
3.2 OPERATIONS AND MAINTENANCE ACTIVITIES .....	13
3.3 CAPITAL WORKS PROJECTS .....	16
3.4 SYSTEM MONITORING ACTIVITIES .....	16
<b>4.0 2024 PLANNED STORMWATER ACTIVITIES</b> .....	<b>18</b>
4.1 PLANNED 2024 PROGRAMS, ACTIVITIES AND MAINTENANCE.....	18
<b>5.0 SUMMARY</b> .....	<b>20</b>

## LIST OF TABLES

Table 1: Stormwater Management System Characteristics* .....	8
Table 2: Stormwater Management Facilities .....	8
Table 3: Rainfall Summary April to November 2023 compared to a Typical Year .....	17
Table 4: Planned 2024 Programs, Activities and Maintenance .....	19

## LIST OF FIGURES

<b>Figure 1:</b> Typical Combined Sewer System.....	5
<b>Figure 2:</b> Typical Separated Sewer System .....	6
<b>Figure 3:</b> Urban Stormwater Flows.....	7
<b>Figure 4:</b> Typical Stormwater Pond.....	10

## APPENDICIES

Appendix A: St. Catharines Ponds and Natural Watershed

Appendix B: St. Catharines Storm Sewers and Ditches

Appendix C: Summary – 2023 Sewer Improvement Projects

## 1.0 Introduction and Purpose

The City of St. Catharines (the City or St. Catharines) owns and operates the St. Catharines Stormwater Management System, which is operated under a Consolidated Linear Infrastructure Environmental Compliance Approval (CLI-ECA), ECA Number: 023-S701, issued by the Ministry of Environment, Conservation, and Parks (MECP). The new CLI-ECA replaces the numerous pipe-by-pipe Environmental Compliance Approvals (ECAs) that were previously issued for components of the municipal system. The streamlined CLI-ECA outlines pre-authorized conditions for changes to the system and requires standardized operating and reporting conditions to safeguard accountability and oversight, with enhanced requirements for monitoring and system operation. One condition of this CLI-ECA is preparing an annual report outlining related actions for the previous year; this report is intended to fulfill that requirement.

It is important to note this is the first year an annual report under the CLI-ECA is required and while the report covers the 2023 year (January 1 – December 31), the CLI-ECA was not in place for the entire time. Additionally, some of the CLI-ECA requirements are phased in and so not all the requirements were in place for the full period either. As additional requirements come into effect and additional information becomes available it will be reflected in future annual reports.

## 2.0 Background

### 2.1 Stormwater Management System

The Municipal Stormwater Management (SWM) System serving the St. Catharines' drainage area, is a separate system for stormwater (i.e. designed not to convey sanitary or combined sewage) within the Lake Ontario watershed. The Municipal SWM System consists of storm sewers, urban ditches and swales, culverts, catch basins, outlets, and stormwater management facilities (SWF) including wet ponds, constructed wetlands, and dry ponds, and other components such as Oil/Grit Separators (OGS). This system helps to protect water quality and lowers the risk of flooding that can damage property and impact the environment.

This CLI-ECA covers the entire Municipal SWM System owned and operated by the City of St. Catharines. It does not cover municipal or privately owned sewage works on industrial or commercial land or roadside ditches outside of the urban area.

This Municipal SWM System does not contain any third pipe systems or storage tanks.

The City's SWM System is designed to collect stormwater from private and public properties across the city. The City's stormwater system operates in conjunction with

assets from both the Regional Municipality of Niagara and Ministry of Transportation Ontario (MTO); such as storm sewers and ponds. The stormwater assets operated by the Regional Municipality of Niagara and the MTO and are beyond the scope of this report.

All the watersheds in St Catharines drain into Lake Ontario. The drainage includes three major waterways (Welland Ship Canal, Twelve Mile Creek, and the former Welland Canal), and 25 urban watercourses / creeks totaling 120 kilometres in length. Notable features include three beaches (Lakeside Beach, Sunset Beach, and Jones Beach), Martindale Pond, and Provincially Significant Wetlands (e.g. Barnsdale and Briarsdale Marshes). A map depicting the locations of these local watershed features can be found in **Appendix A**.

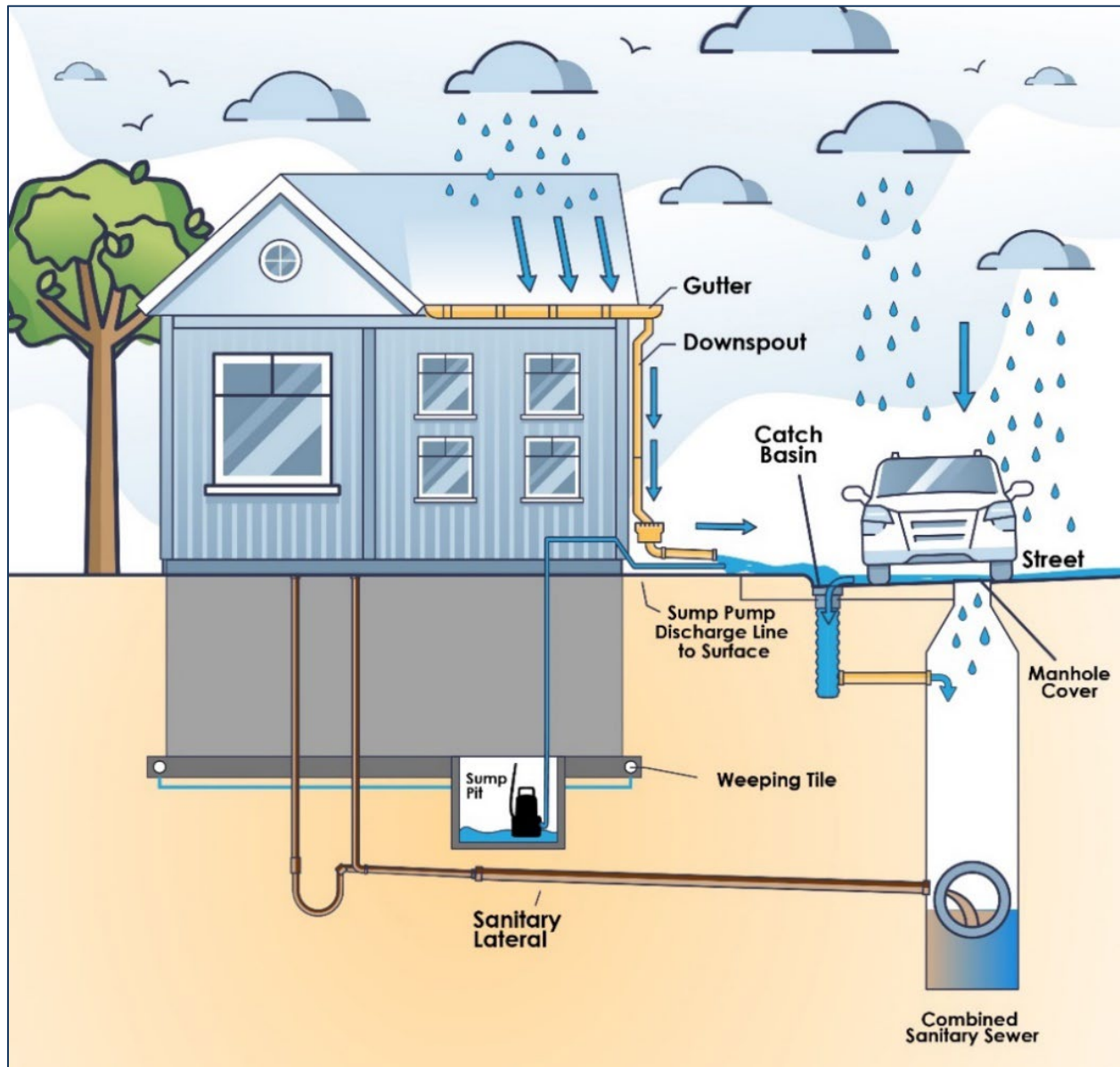
### **Types of Sewers**

St. Catharines is serviced through networks of combined, partially separated and fully separated sanitary and storm sewers. These types of sewers are defined as follows:

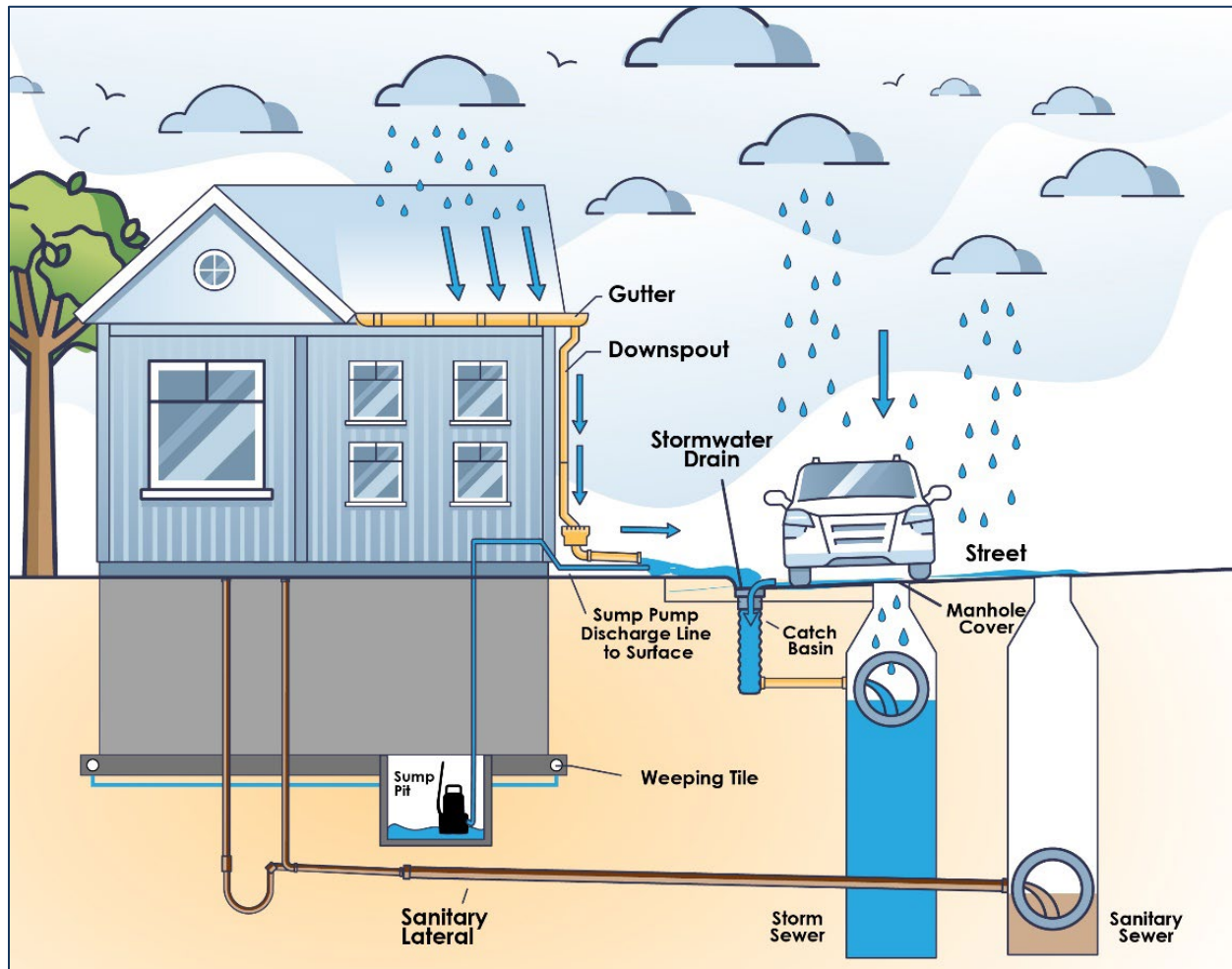
- Combined – All sanitary and stormwater flows are collected within the same sewer.
- Partially Separated – Stormwater from roadways is collected in a separate storm sewer. The partially separated sanitary sewer collects all sanitary flows and some stormwater from weeping tiles and roof leaders.
- Fully Separated – Only sanitary flows are collected within the sanitary sewer - there are no stormwater connections. All stormwater is collected within a separate storm sewer. These types of sewers are mandatory for all new developments where no new stormwater connections to the sanitary sewer are allowed.

#### **NOTES:**

- The above sewer type definitions are slightly different, than those defined in the CLI-ECA. The City is working to better align these discrepancies, as part of the ongoing transitional efforts for improved consistency.
- Additional information on the City's Wastewater Collection System can be found in the annual reports, posted on the City's website at [www.stcatharines.ca](http://www.stcatharines.ca).

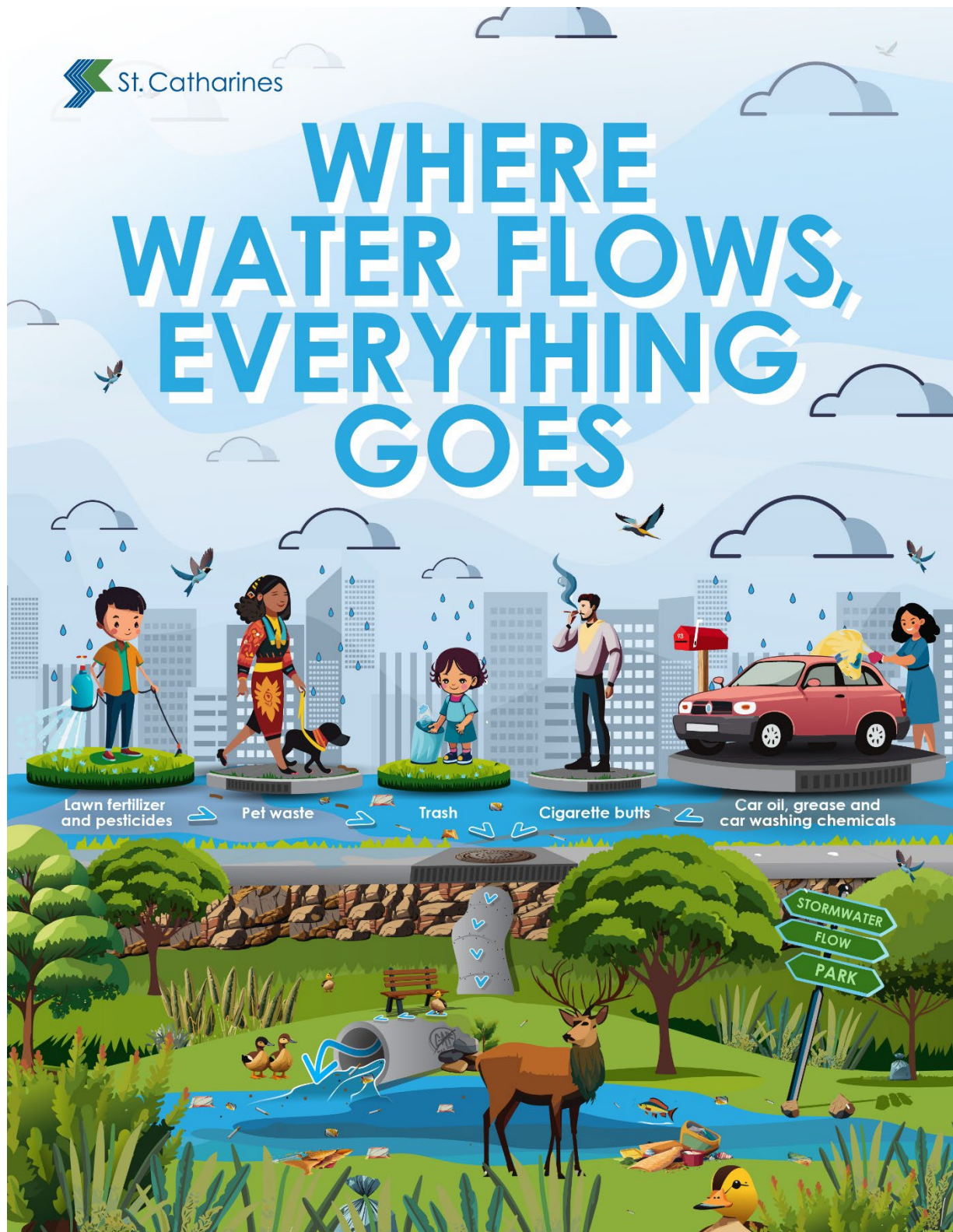


**Figure 1:** Typical Combined Sewer System



**Figure 2:** Typical Separated Sewer System

Stormwater including rain and snow melt enters the SWM System through rain leaders, weeping tiles, and run-off from impervious surfaces such as driveways, parking lots, and roadway drainage. Stormwater captured in combined sewers is transported to a wastewater treatment plant. Conversely, stormwater captured in a storm sewer, ditches or swales enters the SWM System and is discharged directly to our local waterways, typically with minimal treatment. A map depicting the City's storm sewers by size (diameter) and urban ditches can be found in **Appendix B**.



**Figure 3:** Urban Stormwater Flows



## Components of the Stormwater Management System

In addition to storm sewers, ditches and swales, culverts, catch basins and outlets, the City’s SWM System also includes other components that offer some treatment to stormwater before discharged into the natural environment. These other components are designed to help eliminate harmful pollutants picked up in stormwater runoff including harmful bacteria from pet waste, fertilizers, motor oil, detergents, trash, and sediment. These SWM facilities include wet and dry stormwater ponds, a constructed wetland and OGSs. Characteristics of St. Catharines SWM System can be found below in **Table 1**.

Table 1: Stormwater Management System Characteristics\*

System Characteristic	Measurement or Unit
Length of Storm Sewers	~406 km
Length of Ditches/Swales	~143 km
Number of Stormwater Ponds	4
Number of Constructed Wetlands	1
Number of Oil, Grit Separators	23
Number of Stormwater Outlets	~400

\* Above reported metrics reflects the St. Catharines’ SWM System characterises listed in the CLI-ECA

## Stormwater Management Facilities - Stormwater Ponds and Constructed Wetlands

St. Catharines maintains several Stormwater Management Facilities including four wet stormwater ponds, including one constructed wetland, and one dry stormwater pond. Dry stormwater ponds hold water for a given period of time (typically 24 to 72 hours) to allow pollutants to settle out. Wet stormwater ponds, on the other hand, maintain a permanent pool of water throughout the year. **Figure 4** depicts how a typical stormwater pond would function. A constructed wetland operates similar to a wet stormwater pond, with an added benefit of providing important habitat for local species. The City also owns two additional informal ponds (duck ponds) at Happy Rolph’s Animal Farm. These informal ponds are not designed for formal stormwater management and are outside of the scope of the CLI-ECA. A list of the various City owned and operated wet and dry SWM ponds can be found in **Table 2** and illustrated in **Appendix A**.

Table 2: Stormwater Management Facilities

<b>Asset ID</b>	<b>Asset Type</b>	<b>Location</b>
SWP4	Stormwater Management Wet Pond	Erion Road Pond
SWP7	Stormwater Management Wet Pond	Garden City Golf Course East Pond
SWP5	Stormwater Management Constructed Wetland	Pelham Road Pond
SWP13	Stormwater Management Wet Pond	132 Cushman Road
SWP3	Stormwater Management Dry Pond	Scullers Way Pond



**Figure 4:** Typical Stormwater Pond

### Stormwater Quality – Oil/Grit Separators

The City owns and operates 35 OGS that contribute to protecting stormwater quality. Of these, 23 are part of St. Catharines' SWM System and listed on the CLI-ECA. The remainder are located at City-owned buildings and facilities (E.g. arenas, fire halls, etc.) and are not part of the SWM System and not included in the scope of the CLI-ECA.

OGS are installed in strategic locations to help remove suspended solids and debris from stormwater runoff. They can also trap oil and other floatable materials. These devices come in a variety of configurations but are generally unnoticeable and look like a typical manhole cover. **Figure 5** illustrates the inside configuration of a typical OGS.



**Figure 5:** Typical OGS Configuration – View looking down inside the manhole chamber into the OGS device.

### 3.0 2023 Stormwater Activities

The City undertook a number of projects and programs related to the SWM System in 2023. For the purposes of this report the actions are categorized as Environmental Education and Public Outreach Activities; Operations and Maintenance; Capital Works Projects; and System Monitoring. These actions were taken, in part, to address CLI-ECA requirements.

#### 3.1 Environmental Education and Public Outreach Activities

Public education and awareness campaigns have always been an important and highly visible component of the City's stormwater activities. The City participated in the annual Niagara Children's Water Festival at the new location of Brock University (previously held at Ball's Falls Conservation Area). Last year, the festival was held from April 25 to 27 and provided engaging presentations and activities focused on water themes, with

approximately 2,100 students attending in person.

Additionally, the City hosted a booth at the Spring and Garden Home Show on April 14 - 16, 2023. Residents were engaged with games, information, a rain barrel raffle and free give aways (including reusable metal straws and pet waste bags) to encourage conversations about the link between local water quality through a lens of consumer habits and pet ownership responsibilities.

The City also offered brochures and pamphlets to educate homeowners about flooding issues such as the seasonal property flood action checklist and a basement flooding guide for suggestions on how to best protect a home and help prevent urban community flooding.

### **Rain Barrel Sale**

On May 6, 2023, the City of St. Catharines held its 16th annual rain barrel sale for residents. The City subsidized the cost of 324 rain barrels, offering them for sale at a cost of \$60. It is estimated that the installation of each new rain barrel removes 1.2 m<sup>3</sup> of stormwater annually, and that approximately 20% are installed on properties serviced by a combined sewer, with the rest being installed on properties serviced by separated, nominally separated, or partially separated sewers. On average each rain barrel is filled six times per year (Region of Waterloo).

### **Urban Forestry**

The City is working towards a goal of 30% canopy cover by the year 2030. One of the benefits of tree canopy is to help slow down stormwater runoff and support erosion control measures. Current canopy coverage within the urban boundary has been estimated at 22.5% (2019). The Urban Forestry Management Plan (UFMP) created in 2011, outlines the action items necessary to be able to achieve target canopy goals including a robust tree planting program, public education on tree stewardship, the tree giveaway program, etc.

### **Tree Giveaway**

The City has two tree giveaways, in the spring and fall, with approximately 1,000 trees distributed to residents annually. Since 2017, about 7,000 trees have been distributed. The trees provided to residents are native tree varieties and typically the City offers four species of trees per giveaway. The trees come in a 3-to-5-gallon pot making it easy to pick up and fit in any size vehicle for residents to take home and plant on their property.

### **Annual Tree Planting**

The City plants approximately 1,000 trees (50mm caliper size) per year on City property. The vast majority of these are on boulevards and parks throughout the urban area. Approximately 90% of those trees are native species, chosen to support the natural ecosystem.

### **Restoration Planting**

The City partners with the Niagara Peninsula Conservation Authority (NPCA) to plant native shrub and tree species in strategic locations on City owned parks and greenspaces, with the goal of naturalizing those areas. Environmental restoration technicians from the NPCA assist with site and species selection for these projects. This initiative is hosted twice a year and typically includes riparian buffer zone protection areas.

Community partnerships, including with the NPCA, the Niagara Community Foundation, and other local environmental and community groups, result in approximately 1,400 trees planted per year.

### **Watercourse Erosion Control**

St. Catharines is committed to maintaining sustainable natural watercourses to prevent the erosion of City owned property and reduce impacts to private property. The City has completed a Watercourse Flooding and Erosion Control Study to identify priority areas. Watercourses will meander naturally within their valleys. Rehabilitation is undertaken if erosion is impacting public or private infrastructure. When possible, this is done using natural channel design techniques. In the City's 2023 Capital Budget, \$600,000 was allocated to an Environmental Assessment to address previously identified deficiencies.

## **3.2 Operations and Maintenance Activities**

### **Street Sweeping Program**

The City has an annual street sweeping program, to help improve water quality in stormwater runoff. The removal of sediment including salt and debris accumulated on the side of roads, is an important part of protecting our local waterways. Street sweeping was completed on all City roads twice a year (spring and fall). In addition, all roads with curbs are swept two additional times during the summer months. The budget for the street sweeping program in 2023 was \$257,343.

### **Watercourse and Drainage Corridor Inspections and Cleaning**

The City has an annual drainage corridor cleaning program, in which watercourses and open channels are inspected. The objective of the program is to remove accumulations of debris (including organic and other debris/garbage) that are obstructing, or may obstruct flow in watercourses, open channels, and storm outlets. Each year, all local water courses are inspected and maintained throughout St Catharines.

### **Outlet and Culvert Inspection and Maintenance**

The City has an inspection and maintenance program for grates located at ditch and culvert inlets and outlets. These grates help capture unwanted debris that would otherwise significantly impede stormwater flows. Typically, inspections are done, at minimum, twice per year while priority locations are inspected monthly and before significant rain events. Maintenance and repairs are completed as required. In 2023, there were 159 locations where grates were inspected bi-annually, and an additional 32 priority locations receiving enhanced inspections.

### **Catch Basin Cleaning, Maintenance and Repair**

The City has a catch basin cleaning program that is designed to ensure they are operating properly and mitigate ponding on road surfaces. Catch basin sumps are proactively cleaned once every five years. In 2023, the City proactively inspected and cleaned 2,761 catch basins. The budget for this cleaning was \$108,420.

Additionally, in 2023, the City respond to 41 complaints related to plugged or slow drainage catch basins that were either cleared by hand or vacuum cleaned. As well, 52 catch basins received additional repair works including cracked frames, frame settling or broken leads.

### **Oil/Grit Separator Inspections and Cleaning**

The City inspects and cleans all OGS annually. In 2023 the City cleaned 20 OGS. The budget for this cleaning was \$31,000.

### **Sewer / Outlet Repairs**

Storm sewer maintenance, repair and CCTV inspection is completed as required. In 2023 the City repaired one storm sewer main. Additionally, one section of storm sewer was CCTV inspected to identify operational deficiencies.

The City also repairs storm sewer outlets on an as needed basis when repairs are required. In 2023, two storm sewer outlets required repairs.

## **Road Culvert Inspection and Maintenance**

Culverts are inspected on an as required basis to identify maintenance needs related to structure, erosion measures and debris removal to ensure stormwater can flow freely. The City received 76 complaints regarding culverts which required maintenance services including cleaning, flushing, repair or replacement.

## **Roadside Ditch Inspection and Maintenance**

Roadside ditch inspections are done on a complaint basis. In 2023 the City received 112 complaints regarding ditch drainage issues. These complaints were responded to with an inspection and maintenance was completed where required.

## **Salt Management Plan**

St. Catharines has a salt management plan with respect to winter control activities. The use of salt is vital to providing safe roadways throughout the winter season, and the main objective of the salt management plan is to reduce salt's negative environmental impacts by delivering the right amount of salt at the right place at the right time. Some of the actions coming out of the Salt Management Plan include:

- Pre-wetting – At critical locations ( such as bridges and hills, for example) a brine solution is applied to the road. Brine can reduce the total amount of salt needed as it reduces the amount of salt that is lost by bouncing or blowing off the road.
- Electronic Spread Controls - which provide consistent application rates that are tied into a truck's speedometer.
- Automated Vehicle Locations – GPS systems are utilized to allow staff to monitor the deployment of the fleet including what streets have been done, whether or not the trucks have been plowing, salting, or sanding and what the application rates are.
- Information Tools – Vehicle mounted infrared thermometers allow staff to determine the pavement temperature of the road and plan winter control operations accordingly.
- An indoor salt storage facility is in place at the Lake Street Service Centre. This not only keeps the salt itself inside, but also allows for trucks to be loaded indoors on an impermeable surface which reduces the amount of salt lost to wind and run-off.
- Sand (with a minimal amount of salt) is applied to the roads in agricultural areas, outside of the urban boundary.

## **Storm Response**

In 2023, City staff responded to numerous surface flooding and water ponding events



on the road. These events were generally the result of the accumulation of debris, sediment, or damage to existing infrastructure such as culverts or outfalls, resulting in capacity reduction in the system, or overland flooding during wet weather events. The City's typical response to these issues includes debris removal, replacement of damaged culverts, catch basin maintenance and dredging of ditches to restore the normal flow.

### **Storm Sewer Related Public Complaints**

In 2023, the City received 24 complaints regarding the SWM system, which included odour complaints, sink holes and missing catch basin covers. All complaints were investigated and corrective actions were taken as needed. These complaints were in addition to the various service requests (e.g. ditch maintenance) noted elsewhere in this report.

### **3.3 Capital Works Projects**

#### **Storm Sewer Projects**

In 2023, the City invested \$1,258,000 into a number of storm sewer projects. These capital investments resulted in improvements to the system specifically to reduce stormwater impacts in these catchments. In some cases these involve sewer separation projects, where new storm sewers are installed in areas with combined sewers, to help divert stormwater drainage. This reduces the risk for basement flooding and reduces the amount of flows treated at wastewater treatment plants. In addition, the City cost shared one storm sewer project in conjunction with Regional roadworks, with the Regional Municipality of Niagara. A summary of all the projects and their status is included as **Appendix C**.

### **3.4 System Monitoring Activities**

#### **Niagara Peninsula Conservation Authority (NPCA)- Stream Flow Monitoring**

The NPCA monitors stream flow, rainfall, and other meteorological information at two locations (Walker Creek and Port Dalhousie) in the St. Catharines watershed. The information is transmitted to the NPCA where it is monitored and analyzed. The data provides the NPCA an up-to-date picture of the conditions within the watershed. The data and location of these gauges can be found on the [NPCA website](#).

#### **Niagara Peninsula Conservation Authority - Watershed Report Card 2023**

The NPCA prepares an annual report card every five years to provide a summary of the state of local forests, wetlands, and water resources. It involves analyzing data from

groundwater quality, surface water quality, forest conditions, and watershed features across the watershed. The surface water quality is assessed using three indicators – Phosphorus, E. coli, and benthic macroinvertebrates. While the water quality does vary, St. Catharines watercourses are rated as fair or poor water quality, which is typical for an urban area. The NPCA reports that most watersheds in the Niagara Region as poor water quality.

### Rainfall Monitoring

In 2023, the City retained GM BluePlan Engineering (GMBP) to complete an analysis of the sanitary sewer system. Rainfall analysis for the City was completed as part of the work. **Table 3** summarizes the total rainfall volume, maximum one-hour volume and maximum twenty-four-hour volume for the seven-month period of April to November (Non-winter Reporting Period) in 2023.

**Table 3: Rainfall Summary April to November 2023 compared to a Typical Year**

Area	Rain Gauge	Total Rainfall (mm)	Max 1-hr Rainfall (mm)	Max 24-hr Rainfall (mm)
North St. Catharines (2023)	Port Dal WWTP	431.75	31	36
South St. Catharines (2023)	Env Centre	450.25	18.5	41.5
Typical Year Rainfall (1989)		519.10	27.5	47.6

From 2016 to 2023, total rainfall, within the non-winter reporting period, ranged from 276 mm to 692 mm, with an average rainfall of 449 mm. The rainfall in 2023 was the closest to the “average year” based on the rank-sum of the difference from the average based on the total volume and max 1-hr and max 24-hr rainfall intensity.

The Typical Year (1989) rainfall was slightly above the 2016 to 2023 average, at 15% above the total volume, 23% above the max 1-hr rainfall intensity (22mm per hour), and 2% above the max 24-hr intensity (46mm per day). For more information please see the St. Catharines Wastewater Collection System 2023 Annual Report.

### Stormwater Model

In 2023, the City collaborated with Niagara Region to develop a hydraulic model of its SWM System. The model was developed using InfoSWMM and Innovyze modelling software which predominantly utilizes the US EPA Stormwater Management Model (EPA-SWMM) structure and computation engine.

The City’s GIS data, which includes storm sewer pipes, manholes and ditches, was

used as the basis of the network development. Further work is required to refine and calibrate the model.

### **Response to Spills and Abnormal Events**

In 2023, the City reported one significant event that impacted the City's SWM system. On January 12, 2023, St. Catharines Fire Services responded to an explosion and fire at 20 Keefer Road. As a part of the fire fighting efforts, approximately 10 million litres of water was discharged into the surrounding area and ultimately drained into Lake Ontario. The MECP has supported the subsequent investigation and is taking a lead role in addressing any environmental concerns. The incident is currently before the courts.

## **4.0 2024 Planned Stormwater Activities**

### **4.1 Planned 2024 Programs, Activities and Maintenance**

The City will continue to invest in maintaining the SWM System. **Table 4** summarizes the various activities that the City of St. Catharines will continue to implement for 2024, of which includes system monitoring activities and programs, environmental education and public outreach activities and operations and maintenance activities. The City has approved a multi-year budget for 2024, 2025 and 2026. The approved capital budget investment for sanitary sewer is:

- \$3.8 million in 2024
- \$6.4 million in 2025
- \$4.7 million in 2026

A copy of the approved multi-year capital budget can be found posted on the [City of St. Catharines website](#).

*Table 4: Planned 2024 Programs, Activities and Maintenance*

<b>Planned 2024 Programs, Activities and Maintenance</b>	
<b>Project</b>	<b>2024 Budget</b>
<b>System Monitoring Activities</b>	
Sewer System Update	Ongoing
Rainfall Monitoring Program	Ongoing
Sewer Sampling	Ongoing
Sewershed Analysis	\$10,000
<b>Environmental Education &amp; Outreach Activities</b>	
Environmental Education	Ongoing
2024 Rain Barrel Program	\$37,000
Tree Giveaway	Ongoing
Annual Tree Planting	Ongoing
Restoration Planting	Ongoing
Water Erosion Control	Ongoing
<b>Operation and Maintenance Activities</b>	
Street Sweeping	Ongoing
Watercourse and Drainage Corridor Inspections and Cleaning	Ongoing
Outlet & Culvert Inspection and Maintenance	Ongoing
Catch Basin Cleaning, Maintenance and Repair	Ongoing
Oil/Grit Separator Cleaning	Ongoing
Storm Sewer / Outfall Repair	Ongoing
Road Culvert Inspection and Maintenance	Ongoing
Salt Management Plan	Ongoing

### **Additional Information**

No additional information has been requested by the Niagara District MECP office.

## **5.0 Summary**

The City of St. Catharines operates the St. Catharines Stormwater Management System, which services a population of approximately 137,800 residents. The system is operated under Consolidated Linear Infrastructure Environmental Compliance Approval Number: 023-S701. One condition of this approval is an annual report outlining related actions implemented for the previous year; this report is intended to fulfill that requirement.

This report summarizes the activities taken by the City in 2023 to operate, maintain, manage, monitor, and renew the stormwater management system. A wide variety of activities were undertaken with budget approval and expenditure of approximately \$2.3 million. A copy of the approved Operating and Capital budgets for 2024 to 2026 can be found on the [City of St. Catharines website](#). These activities demonstrate the City of St. Catharines is in full compliance with the various CLI-ECA requirements.

It is important to note this is the first annual report under the CLI-ECA and while the report covers the 2023 year (January 1 – December 31), the CLI-ECA was not in place for the entire time. Additionally, some of the CLI-ECA requirements are being phased in and not all the requirements have been in place for the full period. As additional requirements come into effect and additional information becomes available, these will be reflected in future annual reports.

City of St. Catharines

# Stormwater Management System

March 2024

**City Hall**  
50 Church Street  
St. Catharines, ON

**Mailing Address**  
PO Box 3012,  
St. Catharines, ON L2R 7C2

Tel: 905.688.5600  
TTY: 905.688.4889  
[stcatharines.ca](http://stcatharines.ca)

