City of Waterloo
IPPW, City Utilities

2024 STORMWATER MANAGEMENT SYSTEM ANNUAL REPORT

CLI-ECA Stormwater Management 112-S701

January 1, 2024 to December 31, 2024

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1. Introduction

The 2024 Annual Report has been prepared in accordance with the terms and requirements set out in the Consolidated Linear Infrastructure Environmental Compliance Approval (CLI-ECA) 112-S701, issued to the City of Waterloo on February 8, 2023 under the *Environmental Protection Act,* 1990. It covers the period of January 1 to December 31, 2024 and must be submitted to the Ministry of Environment, Conservation and Parks (MECP) no later than April 30, 2025. It must be made available to the public no later than June 1 of the same year.

The municipal stormwater management (SWM) system serving the City of Waterloo's drainage area is a separate system for stormwater (i.e. designed not to convey sanitary sewage or combined sewage) within the Grand River Conservation Authority (GRCA) watershed.

The SWM system includes storm sewer mains, catchbasins and maintenance holes, stormwater management ponds, culverts, ditches, stormwater management facilities, outlets, and third pipe collection systems.

The City of Waterloo Subwatershed drains 74 km^2 of land to the west of the Grand River and includes Laurel Creek and several other tributaries that join at various points along the catchment. The drainage area primarily comprises lands within the City of Waterloo municipal boundary. Land-use throughout the subwatershed is diverse, including agricultural, wetland, and woodlands in the headwaters. Approximately half of the subwatershed is urbanized with continuing growth and development within the City.[1]

This report is organized into sections to cover the following information: monitoring of SWM infrastructure, interpretation of environmental trends, operations of the SWM infrastructure and system, summary of complaints, summary of alterations, spills and abnormal discharges, actions to correct performance, additional notes, and making the information available to the public.

[1] This paragraph is an excerpt from "the consultant's report". Information on this report can be found in section **2.1.1**.

2. Monitoring Programs

The City conducts three monitoring programs designed to collect data related to the SWM system condition and performance:

1) A creek-based water quality sampling program (Laurel Creek Water Quality Monitoring) that is delivered by a consultant and detailed in section **2.1;**
2) A stormwater management facility sampling program (Pond Monitoring for individual ECA requirements) that is conducted by City Utilities staff and detailed in section **2.2**; and,
3) A program focused on our rain gauges and flow monitoring within our linear network that is managed by City Utilities staff and detailed in section **2.3**.

2.1 Laurel Creek Water Quality Monitoring Program (LCWQMP)

The purpose of the Laurel Creek Water Quality Monitoring Program (LCWQMP) is to monitor the baseline conditions of various water quality indices within the urban water systems in the City of Waterloo, presented and summarized here from the "Laurel Creek Water Quality Monitoring Program – 2024 Season", February 2025 report. In 2024, the program included 13 pre-determined sampling locations (stations) that are representative of the overall catchment area of the City and described in sub-section 2.1.1. The key receivers within the network of stations included: Laurel Creek, Clair Creek, Beaver Creek, Monastery Creek (at City border), Forwell Creek, Colonial Creek, and Critter Creek.

For each station, the following sampling was performed by a consultant and water samples were sent to a CALA certified laboratory for analysis:

- Regular seasonal events: thirteen (13) sample events per station – once every two weeks from May to August;
- Rainfall events: approximately three (3) wet weather samples during the monitoring season;
- Freeze/thaw events: at least three (3) grab samples per monitoring site between January and April; and,
- Turbidity measurements were collected at all thirteen (13) sites as part of freeze-thaw, routine, and wet-weather visits.

All data collected from the sampling events are summarized in the appendices.

2.1.1 Laurel Creek Water Quality Monitoring Program Catchment Area

In 2024, the LCWQMP monitored 13 locations (**Figure 1)** to capture a wide range of land-use throughout the subwatershed. The LCWQMP began in 1997 and has evolved

over the years. A consultant currently delivers this program; prior to 2022, the University of Waterloo delivered the program. As part of the program, the consultant prepared a report entitled “Laurel Creek Water Quality Monitoring Program – 2024 Season” (hereafter referred to as “the consultant’s report”), which informed the sections of this Stormwater Management System Annual Report related to the LCWQMP.

Sampling locations are shown in **Table 1** and are illustrated in **Figure 1**. Sampling locations are split between the broad categories of rural (Sites #20, #21, #23 and #17) and mixed (i.e., reservoir outlets; Sites #7 and #10) land use, located in the upper subwatershed; and urban (Sites #3, #5, #8, #14. #24, #25, #26, #27) land use, mostly located in the lower subwatershed (**Figure 1**). Locations categorized as rural primarily receive agricultural runoff, except for Site #21. Site #21 captures the relatively pristine headwaters before Laurel Creek is joined by Monastery Creek and Beaver Creek, which drain agricultural lands. Site #23 is strongly influenced by the wetland directly preceding the sampling location on Wilmot Line.

The urban sampling sites in the lower subwatershed capture runoff from residential and industrial areas. Sites #8 and #5 are located along Clair Creek, which primarily passes through residential neighborhoods until connecting with Laurel Creek in Waterloo Park. Site #3 is located on Laurel Creek, capturing the combined impacts of Clair Creek, Waterloo Park, Silver Lake, and Uptown Waterloo. The two mixed land-use sites, Site #10 and Site #7 are both located towards the north-western edge of Waterloo and located directly downstream of controlled reservoirs.

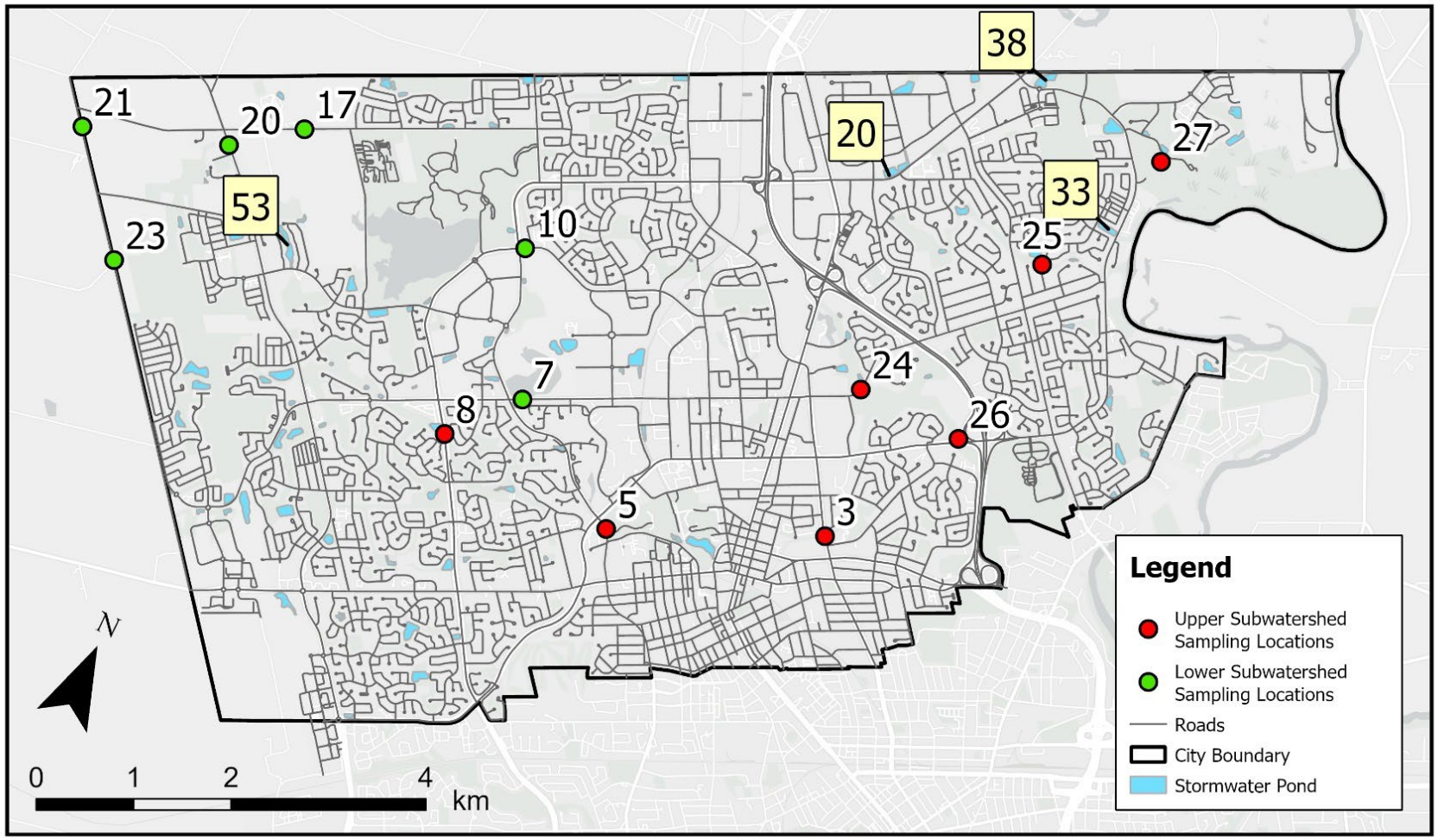
Sites #24 and #25 were added to the LCWQMP to better understand water quality at the more urbanized land-use regions of the subwatershed. At the east end of the city, Site #25 receives discharge from the monitored ponds #38, #33, and #20. Site #26 is the outflow of the Laurel Creek subwatershed into the Grand River.

Table 1: LCW Water Quality Sampling Locations. Adapted from the Consultant’s Report.

Site	Site Location	Land-Use Classification	Rationale for Selection of Site	Drainage Area (ha)
3	Laurel Creek at Weber	Urban – Residential / Industrial	Understanding of residential / industrial lands run-off (water represents combined impacts of Clair Creek, Waterloo Park, Silver Lake, Uptown Waterloo)	5607.1
5	Clair Creek downstream of Westmount	Urban – Residential	Understanding of residential lands run-off	1244.6

Site	Site Location	Land-Use Classification	Rationale for Selection of Site	Drainage Area (ha)
7	Laurel Creek downstream of Columbia St	Mixed – Reservoir	Downstream of Columbia Lake controlled reservoir	3464.1
8	Clair Creek at Fischer-Hallman Rd	Urban – Residential	Understanding of residential lands run-off	722.0
10	Laurel Creek at Westmount & Bearinger Rd	Mixed – Reservoir	Controlled reservoir downstream of Laurel Creek Conservation Area	3225.4
17	Beaver Creek at Conservation Rd	Rural – Agricultural	Understanding of agricultural run-off and turbidity impacts (site is rural headwaters of Laurel Creek)	697.4
20	Laurel Creek at Erbsville Rd	Rural – Agricultural	Understanding of residential lands run-off	1893.1
21	Laurel Creek at Wilmot Line	Rural – Pristine / Reference	Pristine headwaters prior to agricultural drain influence	760.2
23	Monastery Creek at Wilmot Line	Rural – Agricultural / Wetland	Understanding of agricultural and wetland influence	799.4
24	Forwell Creek at Lexington Rd Bridge	Urban – Industrial	Understanding of urbanized land use and chloride impacts	910.0
25	Colonial Creek at Denholm	Urban – Residential / Industrial	Understanding of urbanized land use and discharge from monitored ponds # 38, #33 and #20	unknown
26	Laurel Creek outflow at entrance to Waterloo WWTP	Urban – Park	Outflow of LCW into the Grand River	unknown
27	Critter Creek	Urban – Park	Outflow of small wetland	unknown

Figure 1: LCW and Pond Sampling Locations.



2.1.2 Laurel Creek Water Quality Monitoring Program Data

Table A1 in Appendix 1 outlines all water quality data collected for the Laurel Creek Water Quality Program in 2024.

2.2 Pond Monitoring – Individual ECA Requirement

Pond monitoring to meet individual ECA requirements (data shown in Table A2 in Appendix 2) was conducted as follows:

- Sampling at four (4) ponds; and
- Sampling for three (3) rainfall wet events per year – two (2) of the events occurring between May and September.

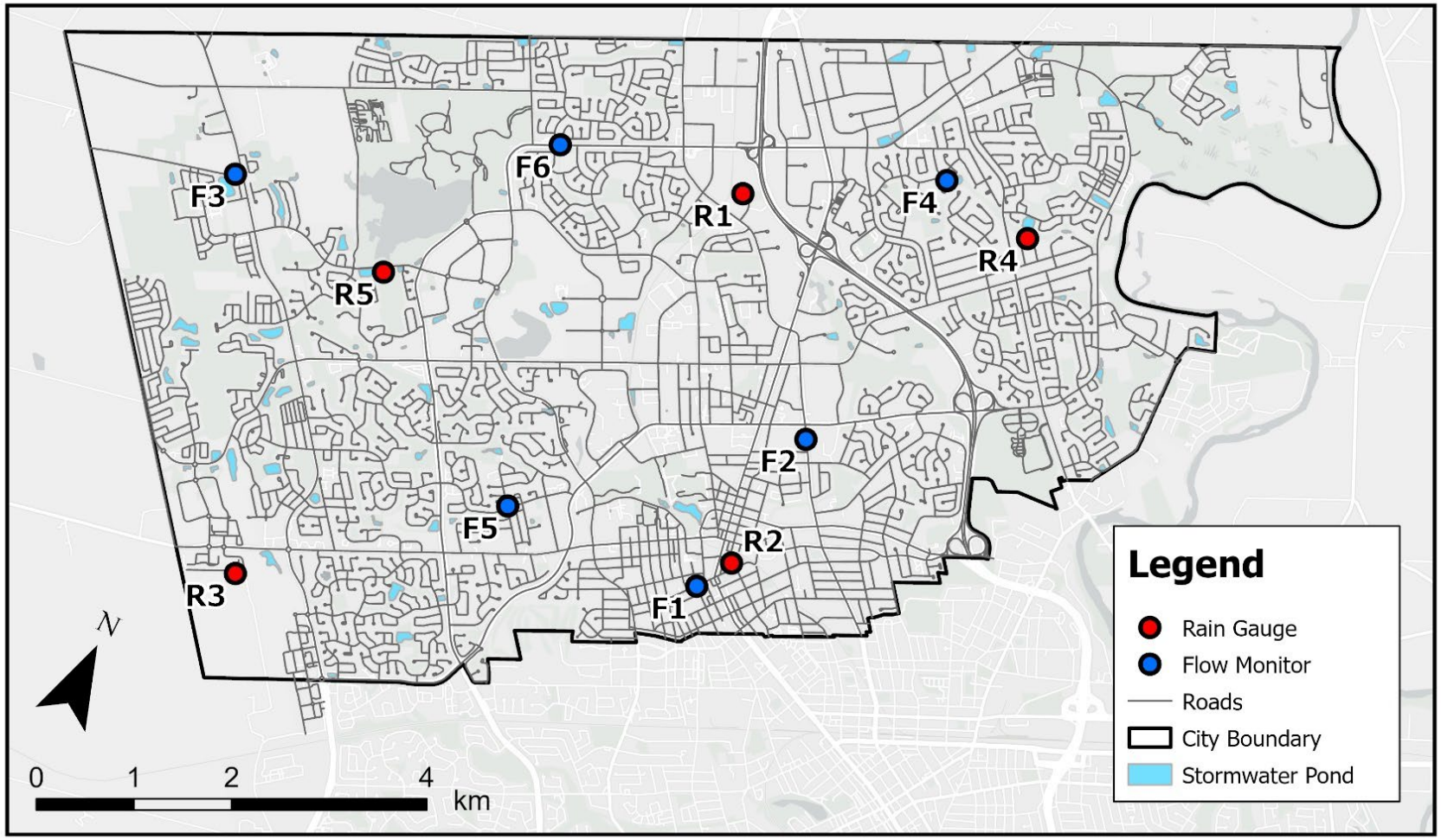
2.3 Stormwater Flow and Rain Gauge Network Monitoring Program

Flow and precipitation monitoring was conducted as follows:

- Data collection using six (6) permanent flow monitors at specific locations as per the Stormwater Risk Assessment Project
- Five (5) rain gauges
- One (1) weather station

Figure 2 shows the locations for flow monitors and rain gauges.

Figure 2: Flow Monitor and Rain Gauge Network. Rain Gauges are Labelled with the Suffix "R", While Flow Monitors are Labelled with the Suffix "F".



2.4 Monitoring Results Analysis for the Laurel Creek Water Quality Monitoring Program

The following sub-sections outline the supporting information for the LCWQMP, climate considerations, details on the analysed water quality parameters, and provides analysis on performance of the subwatersheds within the City. The information provided is sourced from the consultant's report, including some excerpts which are noted as such.

2.4.1 Supporting Information for Monitoring Results

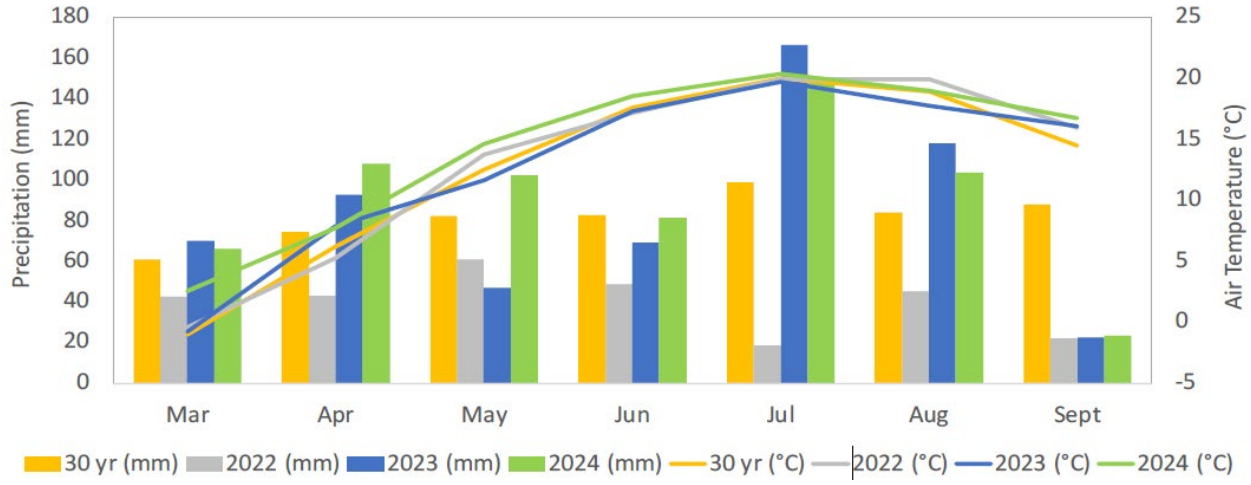
There were no significant localized heavy rainfall flooding issues, lab problems, or changes to the sampling parameters or locations during the 2024 monitoring season.

2.4.2 Climate Parameters

The following is an excerpt from the consultant's report:

Monthly temperatures and rainfall for 2024 are presented in **Figure 3**. Total precipitation over the course of the monitoring season was 11% higher than the historical average. Seasonally, early spring (Mar to Apr), late spring (May to Jun) and summer (Jul to Aug) were all wetter (28%, 11%, 38%, respectively) than the long-term average for those months; however, early-fall (Sept) was 73% drier than the long-term average. By the time sampling began, most of the snowpack had melted as a result of daily average temperatures being above 0 ºC for most of March. From the middle of May onward, daily temperatures were above 25 ºC, often approaching 30 ºC, while summer temperatures remained quite hot due to peak daytime temperatures.

Figure 3: Average Rainfall and Air Temperatures. Adapted from the Consultant's Report.



Note: Air temperature and precipitation data for the 2024 monitoring season was sourced from the Kitchener/Waterloo weather station (Climate ID: 6144239). Historical climate data for Waterloo (30-year average from 1981-2010) was sourced from the weather station Waterloo Wellington A (Climate ID: 6149387).

2.4.3 Water Quality Parameters

Table 2 lists the water quality guidelines and thresholds used to ensure aquatic habitat protection for the Laurel Creek Water Quality Monitoring Program.

Table 2: Water Quality Guidelines and Thresholds. Adapted from the Consultant's Report.

Indicator	Water Quality Thresholds	Guideline/Reference
Chloride	- 640 mg/L acute (24 to 96 hours) - 120 mg/L chronic (7-day exposures for fish and invertebrates, 24-hour for aquatic plants and algae)	CWQG / CCME

Water Temperature	- Warmwater Fishery (downstream of Laurel Creek Reservoir)
	  ○ Maximum instream temperature of 26ºC (1 Jun – 1 Aug)
	  ○ Maximum instream temperature of 29ºC (1 Aug - 31 Oct)
	- Coldwater Fishery (upstream of Laurel Creek Reservoir)
	  ○ Maximum instream temperature of 22ºC (1 Apr – 31 Oct)
		Laurel Creek Watershed Study, (GRCA, 1993); Weatherbee et al, 1993; Draper et al, 1992

Dissolved Oxygen	- Warm water Fishery (downstream of Laurel Creek Reservoir) - Minimum 5.5 mg/L - Coldwater Fishery (upstream of Laurel Creek Reservoir) - Minimum 6.5 mg/L	CWQG / CCME

Indicator	Water Quality Thresholds	Guideline/Reference
pH	- 6.5 to 9.0 long term - 6.5 to 8.5	CWQG / CCME and PWQO
Suspended Solids	- Instream maximum of 25 mg/L	CWQG / CCME
Phosphorus	- Instream maximum of 30 ug/L (upstream of Laurel Creek Reservoir) - Instream maximum of 80 ug/L (downstream of Laurel Creek Reservoir)	CCME Nutrient Framework
Nitrate	- Maximum of 3.0 mg/L-N long term - Maximum of 124 mg/L-N short term	CWQG / CCME and GRCA

CCME = Canadian Council of Ministers of the Environment
CWQG = Canadian Water Quality Guidelines
PWQO = Provincial Water Quality Objectives
GRCA = Grand River Conservation Authority

2.4.4 Analysis of Overall Performance

The following sub-sections outline the supporting information for the LCWQMP, climate considerations, details on the analysed water quality parameters, and provides analysis on performance of the subwatersheds within the City.

2.4.4.1 Electrical Conductivity

Urban sites generally showed elevated electrical conductivity (EC) as compared to rural and reservoir outlet sites. This data was also consistent with logger data that was collected. Site #24 continues to show the highest EC levels in the City and is an area of concern as a surrogate for chlorides. The 2024 findings were the same as the previous year.

2.4.4.2 Chloride

Chloride levels are linked to EC and urban sites generally showed substantially elevated chloride concentrations as compared to rural and reservoir outlet stations. Site #24 continues to show the highest chloride levels in the City, consistent with the behaviour of EC. Mean chloride concentrations for all urban sites were consistently above the chronic threshold (120 mg/L) throughout the season. Only one rural site (Site #7) exceeded guidelines, although this was only at the beginning of the season, decreasing to below guidelines in May. These levels are indicative of stress to the health of fisheries and potentially nearby vegetation within the lower subwatershed. The 2024 findings were the same as the previous year.

2.4.4.3 Major Ions

Major ions (various) were variable with clear urban vs rural trends and impacts from precipitation. There are no applicable water quality thresholds for these ions and the following describes the trends observed.

Sodium

Consistent with chloride levels, sodium levels were substantially elevated at the urban stations and lower at the rural and reservoir outlet stations – EC, chloride and sodium are indicative of road salting operations and chronic accumulation of salt in soils. The 2024 findings were the same as the previous year.

Potassium

Potassium was slightly elevated at the urban stations and the presence of potassium is indicative of anthropogenic and agricultural influences. The 2024 findings were the same as the previous year.

Calcium

Calcium at the two reservoir outlets was lower than the majority of stations, as is consistent with results since 2019. This is attributed to pH impacts in the reservoirs and potential uptake by aquatic organisms in the reservoirs.

Magnesium

The following is an excerpt from the consultant's report:

Magnesium levels were similar and consistent among rural and reservoir outlet sites. By contrast, levels at urban sites were more variable and slightly higher, particularly at Site #24 and Site #25, suggesting anthropogenic influences like rapid water movement and absence of bankside vegetation (no plant uptake).

Sulphate

While initially higher than other rural sites, sulphate levels at the reservoir outlets decreased substantially after the freeze-thaw period likely due to biogenic process in the impoundments. Levels were slightly elevated in the urban areas, with this trend potentially being a result of agricultural or industrial runoff.

2.4.4.4 Water Temperature

Water temperature was generally higher at the urban stations; however, the highest temperatures were observed at the two reservoir outlet sites (Sites #7 and #10). All

urban sites remained below the warm water fisheries thresholds for Jun-Aug (26°C) and Aug-Oct (29°C). The rural and pristine sites remained below the coldwater fisheries threshold (22°C).

2.4.4.5 Dissolved Oxygen

Dissolved oxygen levels were relatively consistent across the City but generally exceeded the minimum thresholds (CWQG) for most sites. Site #8 was particularly low (< 5.5 mg/L) in late-June onwards and considered to be a poor habitat for potential fish populations. The 2024 findings were the same as the previous year.

2.4.4.6 pH

pH ranged between 7.8 and 8.8 for all sites except for the reservoir outlets, which had notably higher levels and several exceedances of CWQG thresholds in the summer. These higher levels are potentially indicative of primary production within the reservoirs.

2.4.4.7 Suspended Solids & Turbidity

Suspended solids and turbidity are inter-related parameters as they are the direct and indirect measurement, respectively, of solids in water. The following is an excerpt from the consultant's report:

The threshold per CWQG for TSS is 25 mg/L and, in comparison to previous years, there were very few exceedances in 2024: attributable to the more frequent and smaller precipitation events. Rural Site 17 and urban Sites 5 and 8 only had one exceedance each – and these occurred after very large rain events in July the previous day. There was no appreciable difference between the amplitude of TSS levels between rural or urban sites. The large spikes in TSS associated with high precipitation events have also been demonstrated since 2021 when spikes in sediment were observed after large rain events.

2.4.4.8 Phosphorus

Phosphorus levels varied across the City and the mean varied between 20 and 72 ug/L for dry weather base-line conditions. Higher concentrations above guidance thresholds were observed, often after precipitation events at both rural and urban stations. Higher concentration events in both the upper and lower Laurel Creek subwatershed are attributed to agricultural run-off and residential fertilizer use.

2.4.4.9 Nitrates

Nitrates were generally well below guidance levels throughout the monitoring program. Rare exceedances were noted for the agriculturally impacted stations and at the historically elevated Site #25 (Denholm). The Denholm station elevations are likely a result of fertilizer use at larger estate properties in the area. The 2024 findings were the same as the previous year.

2.4.5 Recommendations for Watershed Health

The following sub-sections are excerpts from the recommendations from the consultant's report in consideration for the water quality trends observed in the City's watercourses.

2.4.5.1 Upper Laurel Creek Subwatershed

- Elevated nutrients, primarily total phosphorus, in Monastery Creek (Site #23) and the upper reach of Laurel Creek (Site #17) are a challenge to mitigate considering that the loading is originating on agricultural lands outside City boundaries. Reduction in nutrient loading would be beneficial in improving the aquatic ecology in the overall LCW. Options that could be considered to help mitigate nutrient loads include:
  - Identification of specific properties and grants to these property owners to assist with restoration of riparian vegetation;
  - The GRCA administering a Rural Water Quality Program that provides funds to farmers so that they implement Best Management Practices (BMPs) to improve water quality. As a reference, BMPs for rural water quality includes ways to manage the land and protect the waterway, which could be done in collaboration with the Township and GRCA; and,
  - Consideration for an engineered wetland at the entry point to City lands for these creeks where removals of nutrients could be achieved. An Environmental Assessment would be required for this type of project as 1) land acquisition may be required and 2) subwatershed modification would require consultation with agencies (GRCA, MNRF, etc.) and the public.
- In addition to nutrient concerns for Monastery Creek (Site #23) as noted above, increasing thermal trends and low dissolved oxygen are problematic with respect to aquatic health. Remediation, now that the culvert has been repaired, should include removal of slumped road material (at the lip of the culvert) and overgrown grasses that continue to clog the channel.

2.4.5.2 Lower Laurel Creek Subwatershed

- Site #25 continues to show elevated nitrate. To determine where nitrate may be originating, it is recommended to perform some sampling at locations upstream and downstream to determine if a source can be established.
- Chloride and sodium concentrations are very high throughout the lower subwatershed and arising from chronic sources of salt in the soils from road salting operations. As noted in the 2022 and 2023 reports, changes to road salting poses a significant challenge based on cost of salt versus other options. Changes in these practices would involve the Transportation Division and public consultation based on potential increased capital and operations costs.
- For various locations in the lower subwatershed, naturalization to reduce bank erosion and improve aquatic health would be beneficial, although this needs to be balanced by available space in the creek corridor.
- Nutrient spikes in the LCW have been noted for several residential areas. Policy and public engagement / education for restrictions or voluntary reduction in lawn fertilization is an option for addressing these loads.
- Consider strengthening enforcement for sedimentation controls and protection during construction activities adjacent to waterways.

3. Interpretation of Environmental Trends

The City of Waterloo does not collect or maintain environmental trend data. However, it is predicted[2] that the primary climate change-driven weather impacts within the City's subwatershed will be short term increased precipitation intensity, rapid snow melt, and rises in temperature. A comparison between the 2024 and the 30-year normal temperature is shown on **Figure 3.**

In 2021, the City received a National Disaster Mitigation Program grant for the update and calibration of the City's existing Stormwater Management (SWM) Model. The updated and calibrated model was then used for a flood risk assessment of the City's SWM infrastructure. The purpose of the risk assessment was to establish the extent of flood hazards and identify deficiencies to help the City of Waterloo develop solutions for impacted public/private properties and allow for better preparedness for emergency flood events and future climate change conditions.

In support of the model calibration to better understand the effect of changing climate on the linear stormwater system, the City implemented a City-wide permanent rain gauge and flow monitoring network. The stormwater flow monitoring and rain gauge program was undertaken in 2022 and calibration of the City's existing stormwater model was completed in early 2023.

3.1 Stormwater Risk Assessment

The update, refinement, and calibration of the existing SWM Model will allow the City to better understand the effect of changing climate on the linear stormwater system, to more accurately predict risk of flooding throughout our higher risk areas under various weather event scenarios, climate change adaptation scenarios, and to determine proposed development/infill impacts on the existing system. The City plans to take a more proactive role in identifying these areas to mitigate risk and build flood resiliency City-wide.

Data gathered in 2022 was used for the initial calibration of the existing SWM Model and to generate a Modeled Stormwater Risk Assessment Report. The report and model were finalized in early 2023. Another calibration of the SWM Model is expected to be conducted in 2028.

As part of the methodology used for the risk assessment, the following environmental indicators were considered under the environmental risk category:

[2] Ontario Provincial Climate Change Impact Assessment, Technical Report, January 2023, Ministry of Environment, Conservation, and Parks, Province of Ontario.

- Water Quality Impact to Environmentally Sensitive Areas
- Erosivity Impacts
- Contamination of Ground/Source Drinking Water

These indicators provided the basis for evaluating environmental risks for each sub-basin within the subwatershed.

The risk assessment includes the identification of system deficiencies to be considered in future mitigation planning and incorporated into the City's capital plan. A geographic representation of the environmental flood risk model is presented in **Figure 4.**

3.2 Precipitation

Through the Stormwater Risk Assessment and Model Calibration project, inspection of collected rainfall data showed considerable variation in rainfall measurements across the City's five (5) rain gauges in terms of rate, maximum depth, event start and end, and total volume for various storm events recorded over the monitoring period. Environment and Climate Change Canada historical data showed five (5) stations within a search radius of 25 kilometres, with data available between 2021 and 2024. Examining rainfall data of these stations demonstrated a similar pattern of varying rainfall events. A comparison of the rainfall data with the City of Waterloo's IDF curves showed that the largest storms that occurred in 2024 were roughly equivalent to 2-year events, further supporting the monitoring observations. Continuous rain and flow data collection could ensure better accuracy of the model predictions under different wet weather conditions.

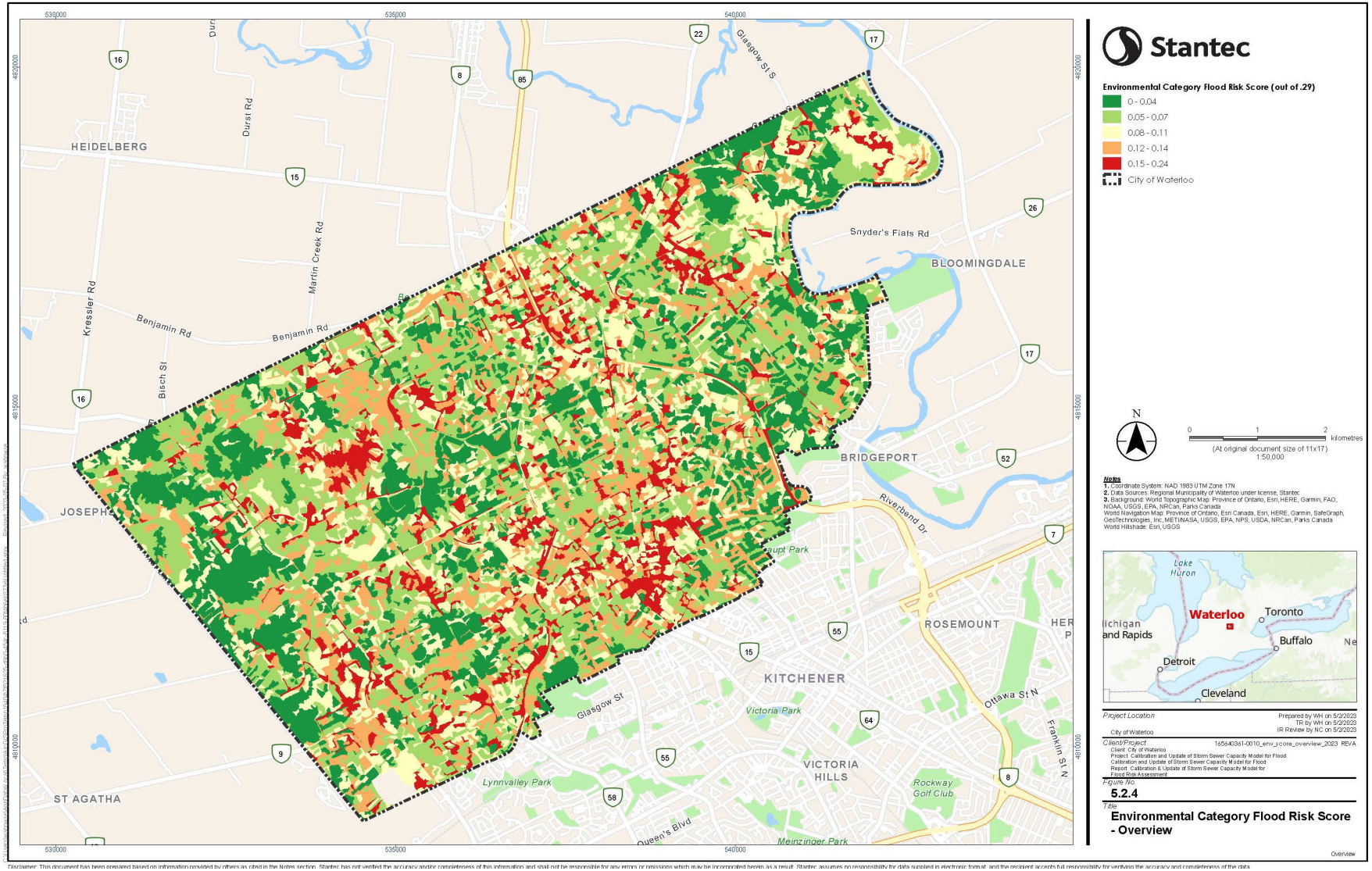
3.3 Flooding, Bank Erosion, and Siltation

The City does not have an established flood database. However, creek and stormwater inspections (bank erosion) are performed annually and as needed after a rain event.

In terms of siltation, through the LCWQMP, it was observed that the behaviour of subwatershed turbidity spikes with elevated stream flow is a well-established correlation. The data shows that the turbidity drops over time after a precipitation event has passed. It does not provide any meaningful quantitative data for the City in terms of decision making.

Further data gathering is required to better understand these environmental trends.

Figure 4: Environmental Category Flood Risk Score – Overview.



4. Operations

4.1 Operational Problems Experienced

During 2024, there were instances where the equipment used for recording operations data (e.g. inspections) was out of service. When it occurred, this downtime disrupted day-to-day operations, resulting in delays in recording the data.

4.2 Inspections, Maintenance, and Repairs

Inspections of stormwater infrastructure are completed proactively to catch issues and perform maintenance before they pose a problem, as described in **Table 3**.

Table 3: Inspections and Maintenance Programs.

Maintenance Program	Program Description	Frequency	# Completed in 2024
SWM Pond Inspection	Inspection includes outfall channels, outlet structures, upstream/downstream dam banks, control valves, emergency spill ways, permanent ponds, vegetation, forebays, water quality, inlets, pond buffers, and reporting of repairs needed.	Annually and post rain event.	301
SWM Pond Sign Inspection	Inspection includes sign condition and reporting on the need to replace a missing sign.	Once per month over the winter months (Nov 1st – April 1st).	230
Storm Sewer Flushing	Reactive flushing due to storm main obstructions.	As needed.	3
Catchbasin Inspection	Inspection includes structure condition, functionality assessment, and damages reporting.	One area annually based on 7-year rotation.	1,163
Catchbasin Cleaning	Cleaning of catchbasins as per established cleaning cycle.	One area annually based on 7-year rotation.	2,860
Maintenance Hole Inspection	Inspection includes structure condition, functionality assessment, and damages reporting.	One area annually based on 7-year rotation.	192
OGS Inspection	Inspection includes structure condition, functionality assessment, and damages reporting.	Once annually.	14

Maintenance Program	Program Description	Frequency	# Completed in 2024
OGS Cleaning	Depending on the inspection, a list of OGS in need of cleaning is generated. Cleaning is performed by an external contractor.	As needed annually based on inspections. OGSs near the Excess Soil Facility (5 units) are cleaned as needed.	16
Culvert Inspection	Inspection includes structure condition, functionality assessment, and damages reporting.	Once annually.	96
Creek Inspection	Inspected for obstruction, channel conditions, and any evidence of pollution.	Occurs in response to large rain events (>15 mm) and high wind events. At least once per creek annually.	150
Grate Inspection	Inspection includes structure condition, functionality assessment, and damages reporting.	Inspected prior to and following rain events exceeding 5 mm.	1481

As identified during inspections or as a result of reports, some components of the City's stormwater management infrastructure were in need of maintenance, repair, or replacement (**Table 4**).

Table 4: Maintenance and Repairs.

Type of Maintenance/Repair	# of Occurrences
Catchbasin	201
Culvert	5
Infiltration Gallery	1
Manhole	26
Sinkhole	17
Storm Sewer/Service	7
Total	**257**

4.3 Calibration and Maintenance of Monitoring Equipment

All monitoring equipment used in 2024 is owned or provided by City Utilities and its consultants and are maintained and calibrated on a regular basis to ensure reliable and accurate data. Field instruments including those used for water quality measurements are calibrated before use or at routine intervals. Similarly, data loggers, rain gauges,

and flow monitors are calibrated at installation and receive ongoing maintenance and recalibration on a scheduled basis. When a piece of equipment no longer holds calibration, it is removed from service to be repaired or replaced. These steps help maintain the integrity of the monitoring program and support consistent, high quality data collection.

5. Complaints

Table 5 includes a summary of all stormwater-related complaints that the City received, as well as typical responses.

Table 5: Summary of Complaints.

Complaint Type	Number Received	Description	Response
Animal Rescue	1	An animal has been found to be stuck in a piece of stormwater infrastructure (usually a catchbasin).	Stormwater operators are sent out to retrieve the animal.
Catchbasins	47	A perceived issue with the function of a City catchbasin has been observed.	Stormwater operators are sent to assess the issue and administer corrective action. If another department is better suited to respond, then they are informed and the issue is transferred to them.
Maintenance Hole	9	A perceived issue with the function of a City maintenance hole has been observed.	Stormwater operators are sent to assess the issue and administer corrective action. If another department is better suited to respond, then they are informed and the issue is transferred to them.
Private Property Drainage Issue	12	Drainage issue relating to stormwater has occurred on private property.	The issue is discussed further with the property owner. If the issue occurs solely on private property, the property owner is provided with potential options to address the issue. It is up to their discretion whether they would like to pursue any of these options further. If the issue is a result of City infrastructure, the appropriate City departments are involved to implement a resolution.

Complaint Type	Number Received	Description	Response
Sink Hole	14	Sinkhole has been noted around stormwater infrastructure.	Stormwater operators are sent to assess the issue and administer corrective action. If another department is better suited to respond, then they are informed and the issue is transferred to them.
Spills into SW Infrastructure	6	A spill of a potentially environmentally hazardous substance was observed.	Stormwater operators are sent to assess the issue and administer corrective action. If another department is better suited to respond, then they are informed and the issue is transferred to them.
Stormwater Pond	11	A perceived issue with the function of a City stormwater pond has been observed.	Stormwater operators are sent to assess the issue and administer corrective action. If another department is better suited to respond, then they are informed and the issue is transferred to them.
Stormwater Pond Sign	1	A perceived issue with the function of a City stormwater pond sign has been observed.	Stormwater operators are sent to assess the issue and administer corrective action. If another department is better suited to respond, then they are informed and the issue is transferred to them.
Total	101	-	-

6. Summary of Alterations to the System

6.1 Summary of All Alterations

Table 6 shows the summary of alterations to the stormwater system for 2024.

Table 6: Summary of Alterations.

Alteration Type	Number of Completed Alterations	Number of Alterations that Pose a Significant Drinking Water Threat
Pre-Authorized Storm Sewer, Ditch, or Culvert	4	0
Pre-Authorized Stormwater Management Facility	0	0
Pre-Authorized Third Pipe	0	0
Previously Approved Works	0	0
Schedule C Works	0	0

6.2 Significant Alterations

No significant alterations to the system were made in 2024.

7. Spills and Abnormal Discharge Events

When spills occur in the City of Waterloo, they are logged and tracked through our spill reporting procedure. **Table 7** below provides details about reported spills in 2024 including duration, volume, and response actions. For drinking water spills, only those > 50,000 L are included.

Table 7: Spills Events.

Date	Location / Receiver	Description of Spill / Event	Estimated Volume	Actions Taken
05/01/2024	Near 521 Westvale Dr	Car Accident – car hit hydro vault – non PCB hydraulic fluid leak	Approx. 200L	GHD to respond on behalf of Enova Power Corp. City staff placed booms along Maple Hill Creek and worked with GHD to clean up the material to the best of our abilities.
06/19/2024	Near 220 Frobisher Dr	Vehicle Collision – Fire Services fighting the vehicle fire. Water used for fire fighting was washing the motor oil / materials into the nearby catchbasins.	<10L	GLF was dispatched to clean out the affected catchbasins. Booms and pads were placed around and in the catchbasins by City staff prior to GLF's arrival.
09/26/2024	Brandenburg Blvd @ Bonn Ave	Painter Washing Equipment into Catchbasin	Approx, 1L of paint and approx. 180L of water used to wash off equipment.	Contractor pumped the sump of the catchbasin into pails and cleaned the remaining material with a shop vac. Spill was contained to the catchbasin.
08/29/2024	Near 373 Bridge St W	GRT Transit Bus - coolant leak	Approx. 10L	Sorbent material was placed around the spill and swept up once completed.
09/26/2024	Columbia St W @ Westmount Rd N	Watermain Break – chlorinated water	60,000L	Watermains were valved down and the repairs to the main break were taking place. Sediment bags were used on the discharge end of the dewatering pumps.
10/15/2024	Freemont St	Water Softener Salt – salt disposed into catchbasin on street	Approx. 1Kg	Water softener salt removed from catchbasin sump.
10/25/2024	645 Conrad Pl	Cardboard Fire at Waste Management Facility	Approx. 100,000L of Water – Fire Dept	Waste Management performed the clean up using vac trucks and water treatment trailers.

Date	Location / Receiver	Description of Spill / Event	Estimated Volume	Actions Taken
12/03/2024	Near 133 Weber St N	Watermain Break – chlorinated water going into Storm system	Approx. 50,000L	Watermain was valved down and break was isolated. Sediment bags were used on the discharge end of the dewatering hose.

8. Actions Taken to Improve or Correct Performance

8.1 Actions Taken in Current Reporting Year

Table 8 lists the actions taken to improve the planning, operation, and maintenance of the stormwater system.

Table 8: Actions Taken.

#	Issue	Actions to be Taken	Completion Date
1	SOP revisions/development	SOPs review and creation of new ones to ensure standard performance.	Ongoing
2	Reconfiguration of Catchbasin and Manhole Inspection/Cleaning Program	Divide the City into seven zones, with one zone targeted each year to ensure that catchbasins and manholes are inspected and cleaned on a seven-year rotation.	April 2025
3	Creek Stabilization/Rehabilitation	Continue training and implementation of creek stabilization/rehabilitation techniques to expand knowledge and operational capacity	Ongoing

8.2 Update on Actions for Previous Reporting Year

Three actions identified in the 2023 report have been successfully completed, including:

- Calibration of the Stormwater Model and Risk Assessment
- Set up rain gauge and flow monitoring network
- Transition to in-house CB cleaning program

9. Additional Notes / Comments

The following is a list of significant projects or expected impacts for the stormwater system within the City of Waterloo:

- Beaver Creek Meadows Development Area – the City is proceeding in the next few years (2025 to 2028) with infrastructure works in support of residential unit growth. Several stormwater ponds, stormwater piping, and related works will require systems alterations permitting, review, and expansion of the operations and maintenance programs.
- The City continues to receive planning applications for intensification in the City's core area and in proximity to transit corridors. These developments will require systems alterations permitting, review, and expansion of the operations and maintenance programs.
- The City will develop action plans in response to recommendations received from the monitoring and flow monitoring data gathered in the next 2 years.

10. Making Available to the Public

This document is available digitally on the City of Waterloo website.

https://www.waterloo.ca/en/living/stormwater-management.aspx