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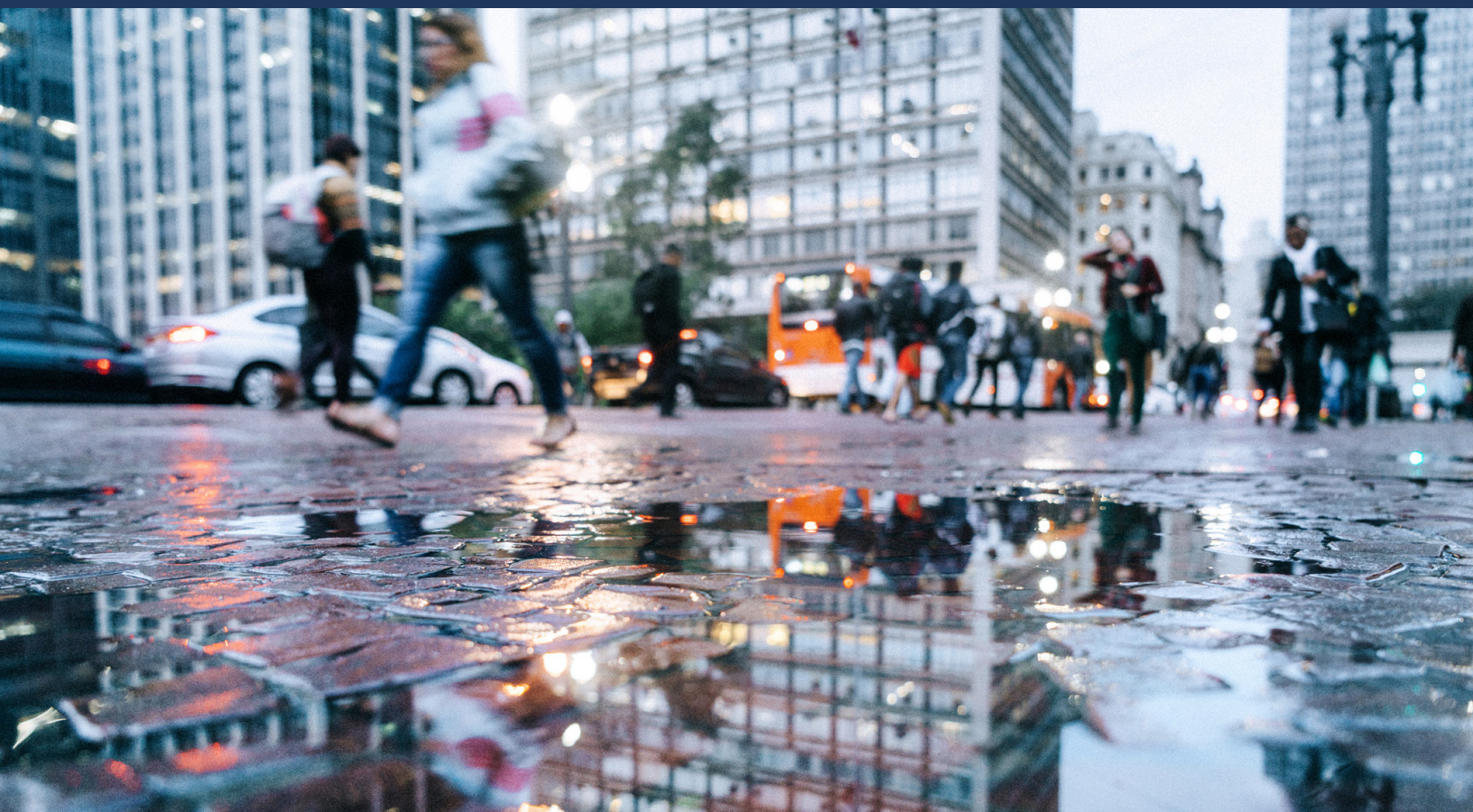
VERSION 2.0

Stormwater Services
Asset Management Plan



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Introduction

1.1 BACKGROUND

Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructure (Sections 5 and 6) requires all municipalities to prepare asset management plans for all their assets. The purpose of this legislation is to have municipalities demonstrate they can maintain their assets, balancing affordability, risk, and service over the next ten years.

To meet the provincial requirements, the City has created this latest version of its Stormwater Services Asset Management Plan. It reports the current state of the assets, target and expected levels of service, strategies and activities applied by the City, historical and forecasted financial details, risks and non-financial strategies and potential improvement actions. It is a strategic document that provides a snapshot of current conditions and establishes a basis for future asset management planning and decision making.

1.2 SUPPORT FOR CITY GOALS

This Asset Management Plan supports the City's 2023-2026 City Strategic Plan and the strategic priority of *a city that is green and resilient*. Specifically, it aligns with the strategic objectives to:

- Reduce emissions associated with the City's operations and facilities.
- Increase resiliency to extreme weather and changing climate conditions.
- Improve key infrastructure through asset management.

1.3 ASSET CLASSES AND TYPES

The regulation requires that for each asset category a summary of the assets is provided. The Stormwater Services Asset Management Plan includes assets that relate to the collection, transmission, treatment, retention, infiltration, control or disposal of stormwater discharged to urban, suburban and rural watercourses in all parts of the City. This also includes containing meltwater and runoff to protect properties, roads, and waterways from flooding, erosion and other impacts to the natural environment. These assets include collection and conveyance assets, stormwater management facilities and fleet.

Stormwater Services Asset Classes and Types

Stormwater Services Collection and Conveyance Assets	
• Collection Pipes	• Stormwater Outfalls
• Stormwater Trunks	• Roadside Ditches
• Stormwater Collectors	• Maintenance Holes/Catch Basins

Stormwater Management Facilities	
• Interceptors	• Infiltration
• Underground Storages	• Oil and Grit Separators
• Wet Ponds	• Low Impact Developments (LIDs)
• Dry Ponds	• Wetlands
• In-Line Pipes	• Flow Monitoring
• Flow Control	• Pumping Stations

Stormwater Services Fleet
• Fleet

The Asset Management Plan does not address the combined sewer system or culvert assets (respectively addressed by the Wastewater and Transportation Asset Management Plans). Neither does this cover mutual drains that are part of the stormwater network but not owned by the City.

There are limitations, gaps and assumptions in the data and analysis underlying this Asset Management Plan, which affect the findings that are presented. These data quality issues are particularly prevalent for stormwater management facilities, for which the data is known to include gaps in condition data, understated replacement costs, and underestimated enhancement and renewal needs. These in turn impact the levels of service and financial analysis, as noted elsewhere in the plan. The City is actively working address data and analysis issues for future versions of the Asset Management Plan.

State of Local Infrastructure

The regulation requires that for each asset category a summary of the replacement costs, average age of the assets, information available on the condition and a description of the municipality's approach to assessing condition is provided. The values in this section are based on asset data from March 2024.

2.1 ASSET INVENTORY AND VALUATION

The total replacement cost of Stormwater Services assets is approximately $16.1 billion as summarized in the table below.

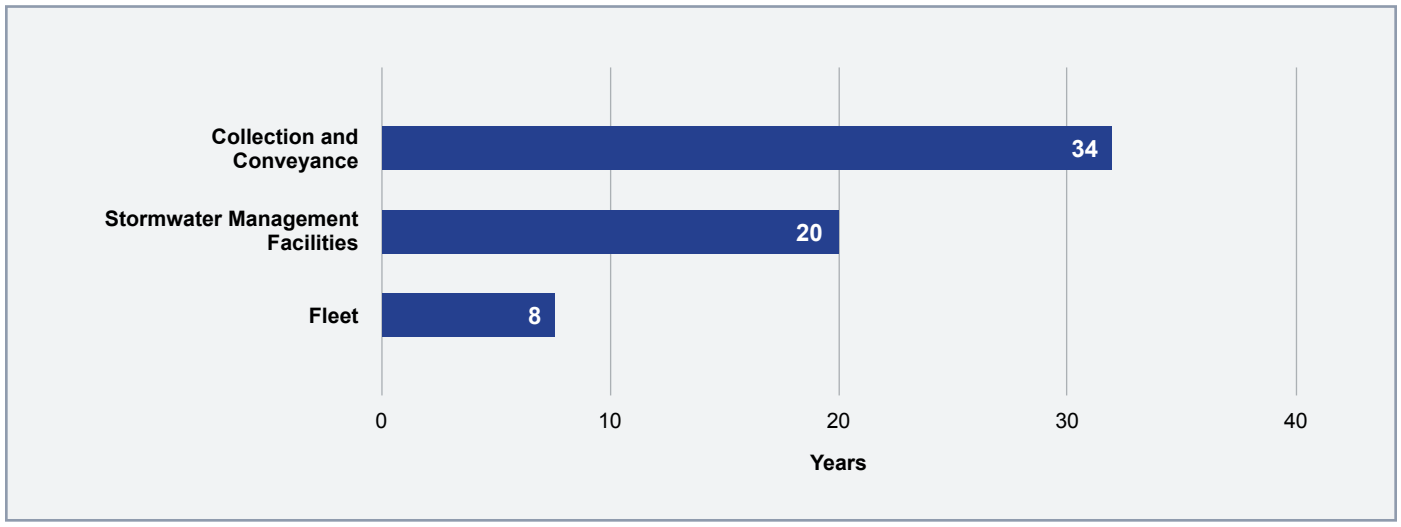
Stormwater Services Asset Inventory and Replacement Cost

Asset Class	Inventory	Replacement Cost (millions; 2024$)
Collection and Conveyance	2,303 Outfalls 3,154 km	$15,642.8
Stormwater Management Facilities	277	$453.1
Stormwater Fleet	36	$1.6

2.2 ASSET AGE AND CONDITION

The age of an asset gives a sense of how close it is to the end of its service life and what renewal interventions may be appropriate. The average age of the City's Stormwater Services assets is shown in the figure below.

Average Age of Stormwater Services Assets

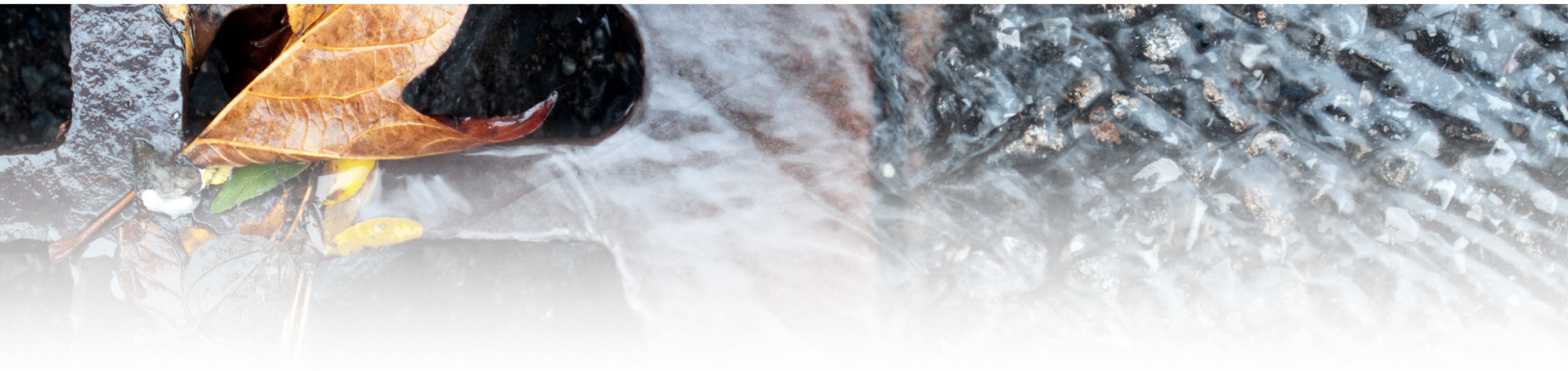


The City uses a range of techniques and solutions to collect and assess condition data, and at various frequencies, which is summarized in the following table.

Condition Data Collection Methods for Stormwater Services Assets

Asset Class	Condition Data Collection Technique	Frequency
Stormwater trunks and collection pipes (<1500mm)	CCTV inspection and conversion to condition grade	Dependent on level of risk. Storm mains that are less than 750mm are inspected every 5-10 years, those above 750mm are inspected at a much lower frequency Some storm assets have annual inspection requirements per their Environmental Compliance Approvals (ECAs)
Stormwater collectors (>1500mm)	Inspection on storm trunks deemed to be nearing end of life by Asset Management Services. Preceded by CCTV if less than 3,000mm	As required in advance of expected lifecycle replacement
Stormwater Outfalls	Visual inspection where feasible and condition assessment	Some condition assessments have been undertaken by Asset Management Services through outfalls EA program (e.g., Ottawa River) but no formal ongoing program
Roadside Ditches	No current formal program but inspection is carried out when reactive ditch cleaning work is requested	Not applicable
Maintenance Holes/Catch Basins	No current formal program but inspection is carried out when reactive work is requested	Not applicable
Stormwater Ponds (Wet ponds and Dry Ponds)	ECA compliant Major and Minor inspections for each pond. Ongoing infiltration monitoring	Once per year and after major events
Flow Control	Visual Inspection (part of pond inspections)	Once per year

Asset Class	Condition Data Collection Technique	Frequency
Oil and Grit Separators	Visual inspection and sediment depth measurement	Once per year
LIDs	ECA compliant inspection. Informal inspections and monitoring (due to new pilot project status of some LID projects)	Once per year
Pumping Stations	Detailed, component level condition assessments are done at the stormwater pumping stations where a need is identified, or an opportunity arises. Condition ratings reflect this detailed information, where available. Condition of pumping stations is based on a desktop assessment and subject matter expert opinion, where condition assessments are not available.	Varies
Interceptors, Underground Storages, In-Line Pipes, Infiltration, Wetlands and Flow Monitoring	No current formal program is in place for these asset types but inspection is carried out when reactive work is requested.	Not Applicable
Fleet	Fleet assets are subject to a regular informal inspection by the client group and regularly scheduled formal inspection by Fleet Services	6 months and original equipment manufacturer maintenance schedule



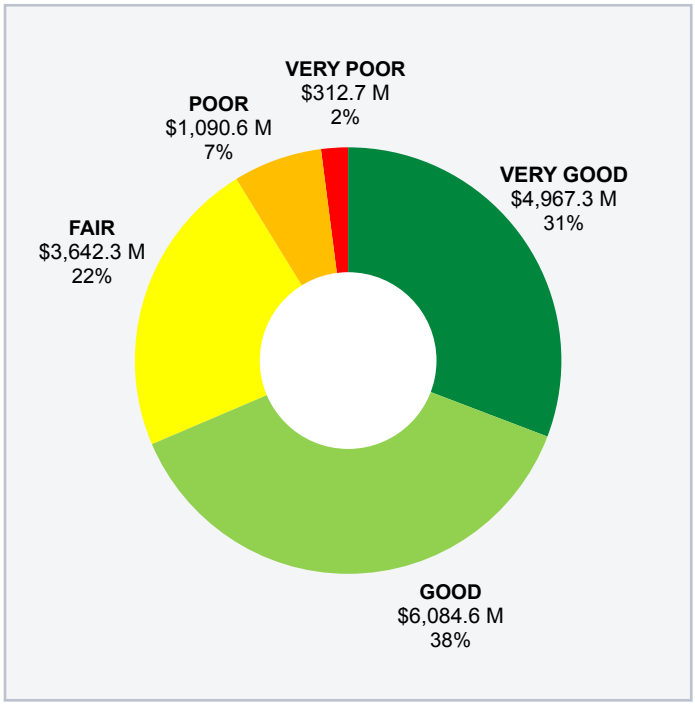
Based on condition data, supplemented by subject matter expert knowledge and professional judgment, the condition of assets is rated on a scale from "Very Good" to "Very Poor" as shown in the table below.

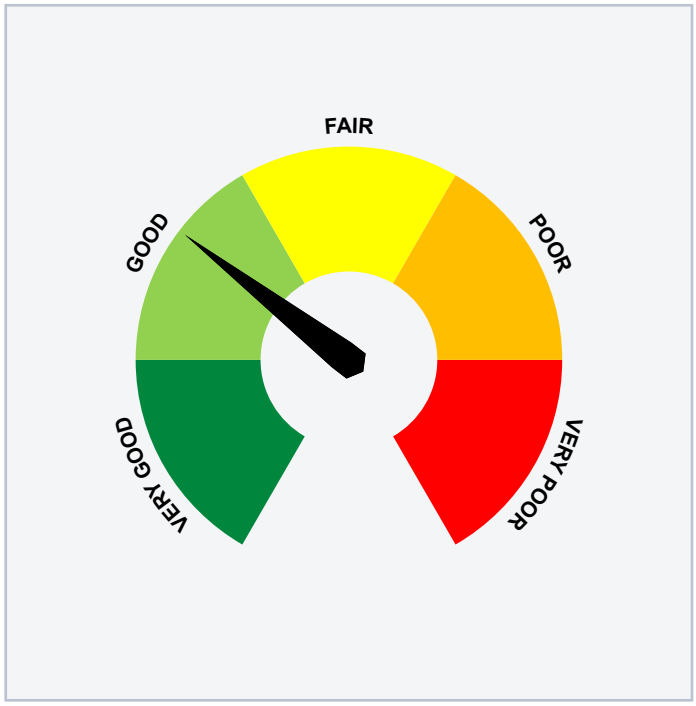
Five-point Scale for Stormwater Services Asset Condition

Rating	Rating Description	Condition (Stormwater Collection and Conveyance Assets)	Condition Grade (Stormwater Management Facilities)	Life Remaining (Fleet)
Very Good	**Sound Physical Condition** No short-term failure risk and no work required	79-100	5	>75%
Good	**Adequate for Now** Acceptable, generally in mid stage of expected service life	59-78	4	51% - 75%
Fair	**Requires Attention** Signs of deterioration, requires attention, some elements exhibit deficiencies	39-58	3	26% - 50%
Poor	**Increasing Potential of Affecting Service** Approaching end of service life, condition below standard, large portion of system exhibits significant deterioration	19-38	2	0% - 25%
Very Poor	**Unfit for Sustained Service (built infrastructure) / Nearing End of Life (fleet)** Near or beyond expected service life, widespread signs of advanced deterioration, some built assets may be unusable	<19	1	<0% (outside of lifecycle)

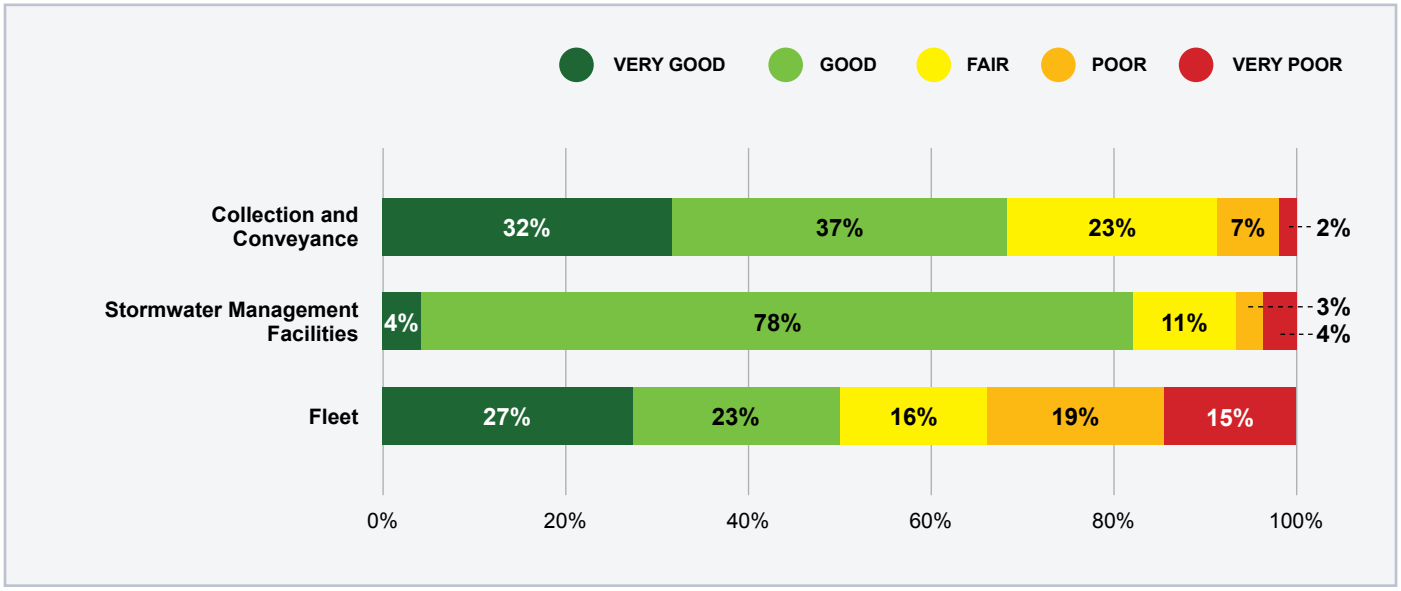
The overall condition rating for Stormwater Services assets is Good to Fair and a breakdown for the various asset classes is shown in the figures below. Condition distribution percentages are weighted based on replacement cost.

Overall Condition Profile of Stormwater Services Assets





Condition Profile of Stormwater Services Assets



Levels of Service

3.1 LEVEL OF SERVICE CONTEXT

The City's assets exist to deliver service to customers. Levels of service measure the actual service delivered so that decisions can be made about the assets based on the service that they provide rather than simply on their condition. The regulation requires that the Asset Management Plan includes for each asset category the levels of service that the municipality proposes to provide for each of the 10 years following the year in which the plan is published.

The Stormwater Services Asset Management Plan establishes level of service measures and reports the current levels of service being provided. The measures align with City goals and recognize that Stormwater Services assets should be managed in a way that:

- Protects the public from surface flooding, basement flooding, overland flooding and riverine flooding during storm events.
- Reduces emissions associated with the City's operations and facilities.
- Increases resiliency to extreme weather and changing climate conditions.
- Protects the water quality of the receiving water bodies.
- Maintains assets in a state of good repair.
- Provides sustainable and affordable services over the long-term.

3.2 HISTORICAL AND CURRENT LEVELS OF SERVICE

The levels of service measures for Stormwater Services are shown in the table below. The performance reported includes:

- Historical performance, showing the service levels reported in the previous version of the Asset Management Plan.
- Current performance, showing the service levels being provided by the City based on the latest available information.

Levels of Service for Stormwater Services

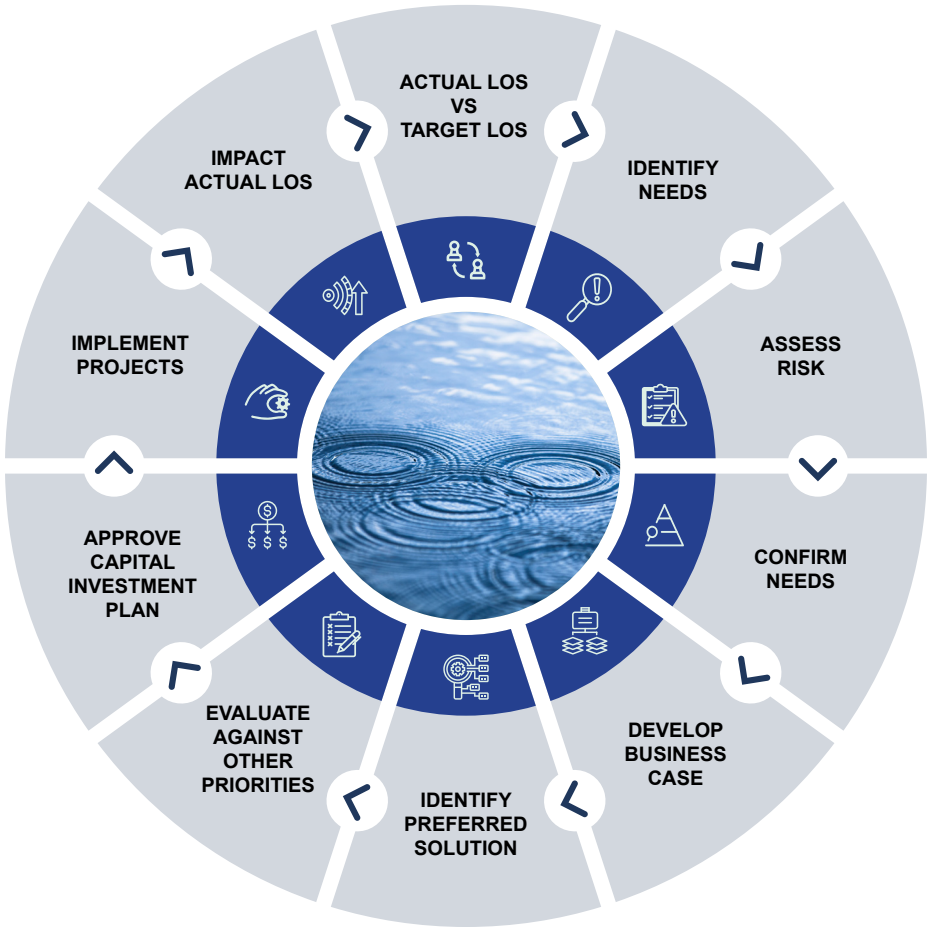
Service Attribute	Community Level of Service	Technical Level of Service	Historical Performance (2019)	Current Performance (2023)
Function	Maintain and operate stormwater management facilities to meet design parameters	Percent of Oil and Grit Separators visually inspected and tested for sediment depth and oil contamination annually	Not reported	100%
		Percent of ponds maintained to as-designed conditions	Not reported	78%
	Reduce emissions associated with the City's operations and facilities	Annual GHG emissions from Stormwater fleet (tonnes CO_2e)	40 t	39 t
Reliability	Provide adequate capacity and accessibility of stormwater services to population served (equity focus)	The ratio of areas of strong equity concern impacted by 1:100 year flood event compared to other urban communities impacted	Not reported	Strong equity concern: 27% (Other areas of the city: 24%)
	Maintain assets in a good state of repair	Percent of fleet assets in fair or better condition	Not reported	66%
		Percent of facilities assets in fair or better condition	Not reported	93%
		Percent of collection and conveyance assets in fair or better condition	Not reported	91%
	The extent of the protection provided by the municipal stormwater management system and the contribution to the overall climate resiliency of the stormwater system	Percent of the municipal stormwater management system resilient to a 1:5 year storm (minor system)*	95% of storm sewers will not surcharge to the surface. 87% of buildings that are connected to a storm sewer will not experience basement flooding.	96% of storm sewers will not surcharge to the surface. 89% of buildings that are connected to a storm sewer will not experience basement flooding.
		Percent of the municipal stormwater management system resilient to a 1:100 year storm (major system)	44% of buildings that are connected to a storm sewer will not experience basement flooding	52% of buildings that are connected to a storm sewer will not experience basement flooding
		Percent of properties in municipality resilient to a 1:100 year storm (major system)*	82% of buildings will not experience overland flooding	83% of buildings will not experience overland flooding
		Percent of properties in municipality resilient to 1:100 year riverine flooding event	99% of buildings will not experience riverine flooding	99% of buildings will not experience riverine flooding
Affordability	Provide sustainable and affordable services over the long-term	Asset renewal funding ratio (renewal funding as a share of replacement cost) for fleet assets	Not reported	9.2%
		Asset renewal funding ratio (renewal funding as a share of replacement cost) for facility assets	Not reported	0.7%
		Asset renewal funding ratio (renewal funding as a share of replacement cost) for linear assets	Not reported	0.2%

**Required by Ontario Regulation 588/17 – see Appendix A for additional information.*

Asset Management Strategy

4.1 PRACTICES, PROCEDURES AND TOOLS

The regulation requires that the Asset Management Plan defines a lifecycle management strategy with respect to the assets in each asset category for the 10-year period. One of the key objectives of asset management is to recognize the objectives of the City and align them with the City's long term financial plans. This will allow Council to make informed decisions and provide clear direction on how the City will balance service levels, risks, and costs.



The City has well-established practices to assess the risk of not meeting community and technical level of service standards and to determine the lowest lifecycle cost activities to reduce the risks to acceptable levels and the associated costs of undertaking them. The Asset Management Plan provides the needs forecast associated with achieving target levels of service and compares it to the planned budget to determine service area gaps or surpluses.

The various lifecycle activities are delivered by different parts of the organization. The asset management process is an opportunity to take a holistic view of the asset lifecycle and identify any assets that would benefit from coordinated implementation of lifecycle strategies. It is important that each type of asset has an appropriate blend of activities across its lifecycle and that staff interacting with the asset understand the interrelations between the various activities and their impact on cost, risk and service level.

4.2 GROWTH, ENHANCEMENT AND RENEWAL

In developing the Stormwater Services Asset Management Plan, a preliminary estimate was prepared of the cost of achieving the target levels of service. The estimates are based on 2024 data and include forecasts of:

- Growth needs based on the Development Charges (DC) By-law (May 2024 update) and Development Charge Background Study Amendment Report and By-laws (October 2024) for stormwater drainage and stormwater-related studies, required to serve the city's growing population.
- Enhancement needs based on input from subject matter experts, required to improve services, meet new or updated standards, or address accessibility.
- Regulatory needs for Collection and Conveyance assets assumed to be equal to the planned budget.
- Renewal needs based on lifecycle modelling, building condition audits, condition assessment findings, and input from subject matter experts, required to maintain assets in a state of good repair. These activities include major repairs, rehabilitation and replacement.
- Other renewal needs for the opportunistic renewal of sewers coordinated as part of other projects, as well as renewal-related activities that do not contribute directly to improvements in asset condition (such as planning, condition assessment, inspections, etc.), which are categorized as "Renewal – Other" to distinguish them in the funding analysis.

Ottawa's population is expected to increase to 1.4 million people by 2046, a significant increase of 40% since 2018, as summarized in the table below. This growth will put pressure on existing assets and services and may require new or expanded assets to meet growing needs.

City of Ottawa Population Projections for 2046

	2046 Projection	Growth since 2018
Population	1,409,650	402,150
Private Households	590,600	194,800
Jobs	827,000	189,500

Source: New Official Plan report to Council (ACS2021-PIE-EDP-0036), October 2021

The table below summarizes the future growth, enhancement, regulatory and renewal needs forecast for Stormwater Services assets.

Growth, Enhancement, Regulatory and Renewal Needs Forecast for Stormwater Services

	10 Year Needs (millions; 2024$)					
Asset Class	**Growth**	**Enhancement**	**Regulatory**	**Renewal**	**Renewal Other**	**Total**
Stormwater Collection and Conveyance	$3.2	$1.7	$1.2	$546.0	$ 234.6	$786.70
Stormwater Facilities[1]	$7.0	$45.2	$0.0	$70.8	$0.4	$123.4
Fleet	$0.1	Not applicable	$0.0	$1.5	Not applicable	$1.6
Total	**$10.3**	**$46.9**	**$1.2**	**$618.3**	**$235.0**	**$911.7**

Totals may not sum exactly due to rounding.

1: There is low confidence in the accuracy of the needs forecasts for some Stormwater Facilities because there are known data gaps, which the City is working to address, as noted in Section 1.3.

As per the regulation, asset management planning also needs to consider the City's Climate Change Master Plan goals for both mitigation strategies to slow climate change impacts, such as reducing greenhouse gas emissions, and adaptation strategies to reduce negative impacts associated with existing and future climate change. The Asset Management Plan estimates the additional future costs due to climate change shown in the table below. These are preliminary estimates based on the latest information available, which will be refined over time.

Estimated Additional Future Costs Due to Climate Change for Stormwater Services

Additional Costs Due to Climate Change	Estimated 10 year Total Additional Cost (millions; 2024$)
Increased operations and maintenance costs due to gradual, long-term impacts of climate change[2]	$40.3
Increased capital renewal costs due to gradual, long-term impacts of climate change[2]	$86.8
Increased operations and maintenance costs due to extreme weather events[3]	$4.6
Increased capital costs to implement climate change mitigation actions including municipal fleet electrification[4]	$0.2
Total	**$131.9**

The estimates do not capture damage to capital infrastructure due to catastrophic/extreme weather events (e.g., tornadoes); increased capital renewal needs due to accelerated asset deterioration; increased growth costs to meet climate change requirements; increased capital renewal costs for assets other than buildings (such as fleet and equipment); and gradual, long-term impacts due to climate hazards other than extreme heat and extreme rainfall (such as drought, ice storms and wildfires).

2: Estimated costs due to gradual, long-term impacts of climate change are based on the Financial Accountability Office of Ontario's "Costing Climate Impacts to Public Infrastructure" study.
3: Estimated operations and maintenance costs due to extreme weather events are based on historical City financial data and Task Force on Climate-Related Financial Disclosures (TCFD) reporting for recent significant weather events.
4: Estimated capital costs to implement climate change mitigation actions are based on the Energy Evolution study (2020) and subsequent detailed studies such as the Green Fleet Strategy.

4.3 OPERATIONS AND MAINTENANCE

Operations strategies are developed to deliver the services and involve consumption of resources such as human resources, energy, chemicals and materials. Maintenance strategies are the regular ongoing activities necessary to keep assets operating, including instances where portions of the asset fail and need immediate repair to make the asset operational again.

New assets acquired or constructed by the City due to growth will incur additional future operations and maintenance costs beyond current expenditures. It is crucial for the City to evaluate these prospective costs and their affordability when making decisions regarding new asset acquisition or construction.

Financing Strategy

The regulation requires that the Asset Management Plan defines a financial strategy with respect to the assets in each asset category for the 10-year period. The City continues to invest responsibly in maintaining infrastructure and has been increasing its capital investments to align with long-range financial plans. Funding targets recommended in the 2017 Comprehensive Asset Management Program were focused on maintaining critical infrastructure in a state of good repair. There will be a need to update the long range financial plans once new service levels are defined to ensure financial sustainability.

5.1 EXPENDITURE HISTORY

For information on historical operating and capital expenditures, refer to the City's historical annual budget documents. Note that historical budget values function as estimates for expenditures, and actual spending may differ from the budgeted amounts shown.

5.2 EXPENDITURE FORECAST

Over the next 10 years, the City will continue investing in infrastructure to support operational expenses, respond to renewal needs, serve growth, and provide enhancements. The planned operating budget is based on Financial Service's 2024 operating budget forecast for Stormwater Services and the planned capital budget is based on the City's 2024 10-year capital budget forecast.

Budget Forecast for Stormwater Services

Component	Budget Forecast (millions; 2024$)										
	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Total
Operating Budget[5]	$34.0	$35.5	$37.0	$38.6	$40.3	$42.1	$43.9	$45.8	$47.7	$49.8	**$414.6**
Capital Budget – Growth[6]	$0.02	($0.05)	($0.04)	($0.04)	($0.03)	($0.03)	($0.02)	($0.02)	($0.01)	($0.01)	**($0.2)**
Capital Budget – Enhancement	$1.0	$2.7	$2.7	$4.4	$6.2	$6.9	$7.0	$7.2	$7.3	$0.0	**$45.4**
Capital Budget – Regulatory	$0.8	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1	**$1.2**
Capital Budget – Renewal	$62.0	$26.7	$20.6	$24.8	$24.5	$28.0	$22.8	$24.3	$26.2	$27.3	**$287.3**
Capital Budget – Renewal Other	$20.9	$21.3	$20.9	$25.5	$27.5	$33.9	$20.2	$20.3	$21.9	$24.5	**$236.7**

Totals may not sum exactly due to rounding.

5: Values shown are net operating budget requirement after expenditure recoveries and revenues.
6: Stormwater growth budget has negative values because the reserve fund balances are in the negative.

Funding Analysis

The regulation requires that an identification of the annual funding projected to be available to undertake lifecycle activities is summarized in the Asset Management Plan. If, based on the funding projected to be available, the municipality identifies a service area shortfall for the lifecycle activities identified, the regulation requires an explanation of how the municipality will manage the risks associated with not undertaking any of the lifecycle activities needed.

The future capital funding needs are compared to planned budgets in order to identify potential service area shortfalls (or "gaps"), the risks to service that could result, and possible strategies to mitigate them.

6.1 SERVICE AREA GAP

An Asset Management Plan provides a forecast of where the City will be in 10 years with respect to some service level targets based on historic decisions on how the City invests in and manages assets. The service area gap is the difference between the forecasted capital investment needs and the investment that the City has budgeted. As a result, service area gaps can and will change as a result of future changes to policy, masterplans, population, service delivery, asset inventory, or investment by the City and other orders of government. Over the next 10 years, the total needs for Stormwater Services assets exceeds the planned budget, leading to a service area gap. The forecasted investment needs, planned budgets and service area gaps are summarized in the table and figures below.

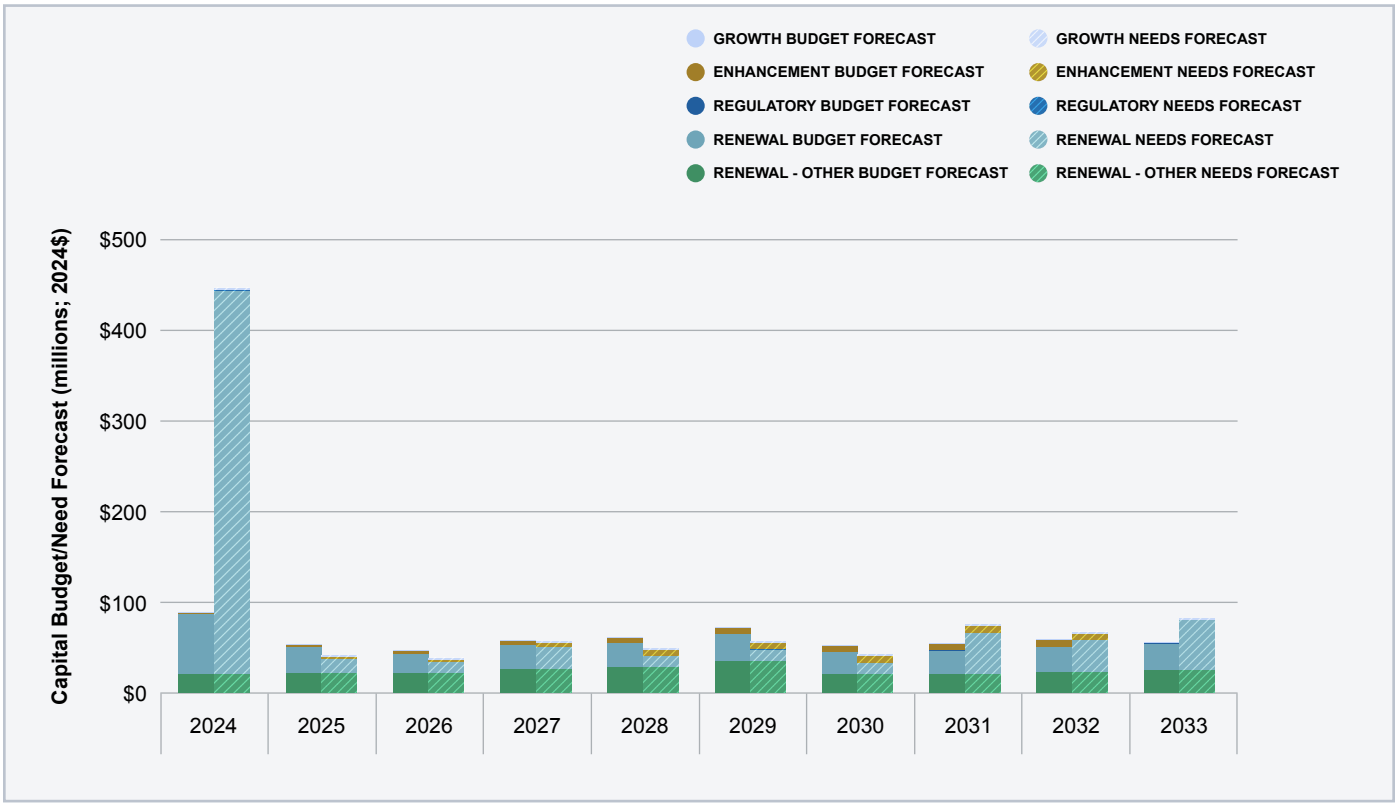
Capital Service Area Gap for Stormwater Services

Asset Class	10 Year Need (millions; 2024$)	10 Year Funding (millions; 2024$)	10 Year Gap (millions; 2024$)
Growth			
Collection & Conveyance	$3.2	$1.8	($1.5)
Stormwater Facilities	$7.0	($2.1)	($9.0)
Fleet	$0.1	$0.1	-
Growth Total	**$10.3**	**($0.2)**	**($10.5)**

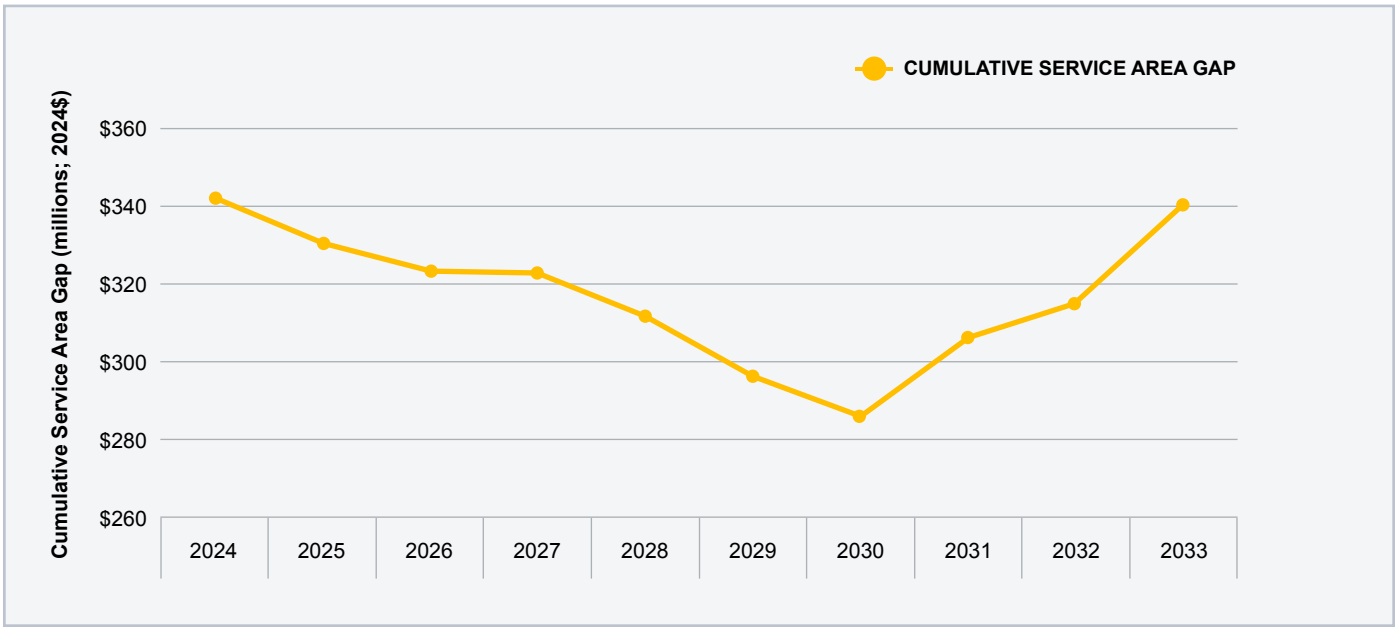
Component	10 Year Need (millions; 2024$)	10 Year Funding (millions; 2024$)	10 Year Gap (millions; 2024$)
Enhancement			
Collection & Conveyance	$1.7	$1.7	-
Stormwater Facilities	$45.2	$43.7	($1.5)
Fleet	Not applicable	Not applicable	-
Enhancement Total	**$46.9**	**$45.4**	**($1.5)**
Regulatory			
Collection & Conveyance	$1.2	$1.2	-
Stormwater Facilities	$0.0	$0.0	-
Fleet	$0.0	$0.0	-
Regulatory Total	**$1.2**	**$1.2**	**-**
Renewal			
Collection & Conveyance	$546.0	$255.1	($290.8)
Stormwater Facilities	$70.8	$30.7	($40.1)
Fleet	$1.5	$1.5	-
Renewal Total	**$618.3**	**$287.3**	**($330.9)**
Renewal - Other			
Collection & Conveyance	$234.6	$234.6	-
Stormwater Facilities	$0.4	$2.2	$1.8
Fleet	Not applicable	Not applicable	-
Renewal - Other Total	**$235.0**	**$236.7**	**$1.8**
Grand Total	**$911.7**	**$570.5**	**($341.1)**

Totals may not sum exactly due to rounding.

Capital Budget and Capital Needs Forecast for Stormwater Services



Cumulative Capital Service Area Gap for Stormwater Services



The above capital service area gap does not include the estimated additional future costs due to climate change outlined in Section 4.2. The City has planned dedicated funding over the next 10 years to support climate change needs through the Climate Change Master Plan and annual GHG and Emissions program. The funding supports not only stormwater services, but all other services provided by the City. The climate change capital funding needs identified for the various City services and the total planned capital funding for climate change initiatives are summarized in the table below. These are preliminary estimates that are being refined and prioritized through various initiatives, but they give a sense of the order-of-magnitude of future planned budget and potential needs. These estimates do not include infrastructure repair or replacement costs for extreme weather events such as tornadoes, riverine flooding or ice storms. The analysis does not capture funding from external sources such as other levels of government. Capital funding will need to be integrated across departmental budgets.

The analysis is based on the City's 2024 ten-year capital budget forecast. It is important to note that the 2024 funding forecast shown is $155 million higher than the final approved 2025 budget forecast, which allocates $91.2 million over 10 years (versus $246.4 million as shown in the table).

Estimated Future Climate Change Capital Budgets and Capital Needs for All City Services[7]

	10 Year Need (millions; 2024$)	10 Year Funding (millions; 2024$)	10 Year Gap (millions; 2024$)
Climate Change	$1,700	$246.4	($1,453.6)

6.2 EXPECTED AND TARGET LEVELS OF SERVICE

For levels of service, the City has established performance targets as well as anticipated performance. These metrics can be compared to assess the alignment between expected and target performance. The table below includes:

- Current performance, showing the service levels being provided by the City based on the latest available information.
- Arrows to show whether the measure is expected to trend upward, downward, or remain relatively stable, with colours to show whether that trend is positive (green) or negative (red) relative to the target level of service.
- Expected performance, showing the service levels expected to be achieved based on the City's planned budget.
- Target performance, showing the City's target level of service based on Council direction, City policy, strategy or master plan, or other reference.

7: The estimates exclude Solid Waste and Transit services because all financial analysis for these services is captured in the respective Long Range Financial Plan.

Expected and Target Levels of Service for Stormwater Services

Service Attribute	Community Level of Service	Technical Level of Service	Current Performance (2023)	Trend (2024 2033)	Expected Performance (2033)	Target Performance (2033)	Source for Target
Function	Maintain and operate stormwater management facilities to meet design parameters	Percent of Oil and Grit Separators visually inspected and tested for sediment depth and oil contamination annually	100%	→	Maintain existing	Maintain existing	Infrastructure and Water Services Department staff
		Percent of ponds maintained to as-designed conditions	78%	→	Maintain existing	Increase	Infrastructure and Water Services Department staff
	Reduce emissions associated with the City's operations and facilities	Annual GHG emissions from Stormwater fleet (tonnes CO_2e)	39 t	Refer to Green Fleet Strategy		Refer to Green Fleet Strategy	
	Provide adequate capacity and accessibility of stormwater services to population served (equity focus)	The ratio of areas with strong equity concern impacted by 1:100 year flood event compared to other urban communities impacted	Strong equity concern: 27% (Other areas of the city: 24%)	Expected performance not available		No set target	
	Maintain assets in a good state of repair	Percent of fleet assets in fair or better condition	66%	↑	10-year average 78%	72%	Lifecycle modelling
		Percent of facilities assets in fair or better condition	93%	↓	72%	No set target	
		Percent of collection and conveyance assets in fair or better condition	91%	↓	81%	93%	Lifecycle modelling
Reliability	The extent of flood protection provided by the municipal stormwater management system and the contribution to the overall climate resiliency of the stormwater system	Percent of the municipal stormwater management system resilient to a 1:5 year storm (minor system)*	96% of storm sewers will not surcharge to the surface. 89% of buildings that are connected to a storm sewer will not experience basement flooding	Expected performance not available		No set target	
		Percent of the municipal stormwater management system resilient to a 1:100 year storm (major system)	52% of buildings that are connected to a storm sewer will not experience basement flooding	Expected performance not available		No set target	
		Percent of properties in municipality resilient to a 1:100 year storm (major system)*	83% of buildings will not experience overland flooding	Expected performance not available		No set target	
		Percent of properties in municipality resilient to 1:100 year riverine flooding event	99% of buildings will not experience riverine flooding	Expected performance not available		No set target	

Service Attribute	Community Level of Service	Technical Level of Service	Current Performance (2023)	Trend (2024 2033)	Expected Performance (2033)	Target Performance (2033)	Source for Target
Affordability	Provide sustainable and affordable services over the long-term	Asset renewal funding ratio (renewal funding as a share of replacement cost) for fleet assets	9.2%	Not applicable		9.4%	Lifecycle modelling
		Asset renewal funding ratio (renewal funding as a share of replacement cost) for facility assets	0.7%	Not applicable		2.8%	Lifecycle modelling
		Asset renewal funding ratio (renewal funding as a share of replacement cost) for Linear assets	0.2%	Not applicable		0.4%	Lifecycle modelling

**Required by Ontario Regulation 588/17.*

↑ **Positive upward trend**	↑ **Negative upward trend**	↓ **Positive downward trend**	↓ **Negative downward trend**	→ **Positive stable trend**	→ **Negative stable trend**

6.3 RISK MANAGEMENT

The City applies a risk-based approach to prioritizing asset renewals. The risk assessment frameworks and methods vary across the different types of assets but are generally based on the importance of each asset in terms of service delivery/continuity and the number of users who could be impacted.

Ontario Regulation 588/17 requires an analysis of the risks associated with the proposed levels of service and implementation of the Asset Management Plan. These key risks and how the City mitigates the most critical risks are summarized in the tables below.

Key Risks and Risk Mitigation for Levels of Service

Risk Area[8]	Potential Impacts	City Response
Funding for Growth	Underfunding may reduce ability to build new infrastructure to support growth in a timely fashion. This could put increased demand on existing infrastructure, reduced redundancy, higher reactive repair costs, and delayed development.	The City regularly updates the master plans and Development Charges By-law that address growth funding needs. Increased growth needs can be incorporated into these updates, and into future updates of the Asset Management Plan.
Lifecycle Renewal Funding	Delays in renewal activities could impact service reliability and increase long-term costs (including operations and maintenance costs).	The City prioritizes capital projects by assessing the condition of infrastructure assets, using a risk-based approach to evaluate the potential impact on service levels, and coordinating with other projects to minimize disruptions. This structured approach prioritizes critical assets and within affordability constraints.
Operations & Maintenance Funding	Underfunding may reduce service reliability and increase emergency repairs.	Operating budget allocations are optimized such that funds are directed towards essential operations, emphasize preventive measures to maintain service levels, and consider public feedback to align with community needs and within affordability constraints.

8: As per section 6 of Ontario Regulation 588/17: the Asset Management Plan shall identify the risks associated with the options for which lifecycle activities could potentially be undertaken to achieve the proposed levels of service as well as the risks associated with those options to the long term sustainability of the municipality.

Risk Area	Potential Impacts	City Response
Climate Change Mitigation & Resilience	Deferral of climate-related initiatives may hinder adaptation, result in service disruptions, increase long-term costs, and put pressure on existing budgets, and risk missing emission reduction targets.	The Climate Change Master Plan (CCMP) and its supporting strategies provide direction for prioritizing climate investments in both mitigation and adaptation. The CCMP also identifies the need to apply a climate lens to asset management and capital projects, including through departmental capital planning and prioritization processes. Implementation of the CCMP and its supporting plans is a shared responsibility across all departments. The response to the 2024 CCMP audit will provide further direction on priorities.
Rising Asset Replacement Costs	Higher costs may lead to project delays and increased financial pressure. Less projects could be completed with the same amount of money.	The City uses comprehensive asset management, emphasizing preventive maintenance, and prioritizes investments based on risk and within affordability constraints. It also conducts long-term financial planning and explores innovative solutions to reduce costs and enhance service delivery.
Fleet Maintenance & Electrification	Higher maintenance costs or insufficient electrical infrastructure could affect fleet reliability and emergency response.	The Green Fleet Strategy recommends an approach that ensures the City has adequate infrastructure in place as it moves forward with vehicle electrification. The strategy recommends proactively developing energy supply and refueling infrastructure ahead of electrification as well as initiating building-level upgrades and civil infrastructure upgrades prior to the purchase of electric vehicles.

Risk Area	Potential Impacts	City Response
Extreme Weather Impacts	More frequent events may damage assets, disrupt services, and increase maintenance needs.	Climate Ready Ottawa – the City's draft climate resiliency strategy – is a long-term strategy and implementation plan that will guide City-wide action and investment to prepare for a much warmer, wetter and unpredictable climate. It includes conducting climate risk assessments for critical infrastructure to prioritize investments and actions. Insurance and City reserves are also available for unplanned costs due to extreme weather.
Operational Pressures from Climate Change	Increased demands on staff and resources may affect other service delivery or increase costs	Climate Ready Ottawa considers future increased operating budget needs due to climate change by guiding long-term action and investment to ensure the city's resilience by 2050. Implementation of priority Energy Evolution projects may result in increases or decreases to operating budgets. Changes to operating budget pressures are considered annually as part of the budget process for specific projects and programs.
Non-Urgent Regulatory & Equity Needs	Delays may impact inclusivity, accessibility, and workplace suitability. Workforce pressures may impact staff retention and morale, which can affect continuity and capacity for emergency response.	The City strives to ensure that critical needs are met and within affordability constraints by prioritizing essential needs and services, seeking grants and partnerships, improving efficiency, engaging with the community, and conducting long-term financial planning. Accessibility and equity upgrades will be prioritized based on identified needs and risks.

Key Risks and Risk Mitigation for Asset Management Plan Implementation

Key Risks to Asset Management Plan Implementation	Response
Population forecasts may change.	Changes to population forecasts will impact the growth needs forecasts, which will be reviewed and updated at least every 5 years as part of the Asset Management Plan update. Key issues can be identified as part of the annual review of the City's progress in implementing the asset management plan and in the "Asset Management Implications" section of individual reports to Council.
Future approved budgets may vary from the planned budgets assumed in the Asset Management Plan financial analysis.	The Asset Management Plan will be updated at least every 5 years, including an updated budget analysis. This will allow for a reassessment of future needs, expected levels of service, and risk. Key impacts due to budget changes can be addressed in the annual review of the City's progress in implementing the asset management plan and in the "Asset Management Implications" section of individual reports to Council.
Council may take on more assets than planned in the Asset Management Plan.	Additional assets will most impact the operations and renewal forecast. Key impacts can be addressed annually as part of the review of the City's progress in implementing the Asset Management Plan and in the "Asset Management Implications" section of individual reports to Council.
Council or changes in legislation/regulation may mandate higher/different target service levels.	Higher or different proposed service levels will impact spending needs which could result in a need to consider alternative approaches to service delivery, increases in revenue to support increased service levels, or a shifting of funding that re-prioritizes service levels and possibly increases risk in other areas. This will be reviewed and updated at least every 5 years as part of the Asset Management Plan update. As indicated above, key impacts can be addressed annually as part of the review of the City's progress in implementing the Asset Management Plan and in the "Asset Management Implications" section of individual reports to Council.

Key Risks to Asset Management Plan Implementation	Response
Changes in asset or financial data, which may affect the findings presented in the Asset Management Plan.	Changes in the data used to produce the Asset Management Plan will be reflected in the Asset Management Plan update at least every 5 years. As indicated above, key impacts can be addressed annually as part of the review of the City's progress in implementing the asset management plan and in the "Asset Management Implications" section of individual reports to Council.

6.4 NON-FINANCIAL STRATEGIES

Given that planned budgets are not expected to be sufficient to fully fund all forecasted asset lifecycle needs, alternative methods must be employed to mitigate the risks associated with underfunding. A variety of non-financial strategies exist or can be implemented to address this issue, including:

- Gather condition assessment data for the assets that lack it to address the data gap and to better inform planning and long-term decision making.
- Implementation of more Low Impact Design projects, where feasible, in response to managing stormwater.
- The ongoing Wet Weather Management program will continue to assess flood risks, identity solutions and prioritize investments.
- Leverage private sector investment by providing rebates or incentives for residents to install backwater valves, sump pumps and landscaping to improve flood protection and reduce stormwater runoff on private properties.
- Introduce education programs around what can be done in response to climate change in relation to preparing and improving flood resilience on private properties.
- Better management of natural hazards in design guidelines such as slope stability, erosion and landslides.
- Implement initiatives from the Fleet Service Review.

Any new strategies may have impacts on residents and services and should be subject to further study prior to being pursued.

Improvement Plan

The regulation requires that the Asset Management Plan demonstrate the municipality's approach to continuous improvement and adoption of appropriate practices regarding asset management planning. Based on the snapshot of current conditions and existing plans presented in this Asset Management Plan, areas of potential improvement include:

- Continue to address data gaps, data management, and record keeping
- Update cost estimates
- Review, track and report levels of service
- Improve and expand needs forecasts, financial forecasts and funding analysis
- Continue populating expected level of service projections
- Further integrate climate change mitigation and adaptation
- Expand the application of an equity and inclusion lens

The Asset Management Plan will be reviewed and updated on a regular basis and over time these improvements will be reflected in future versions of the Plan.

MORE INFORMATION

For more information about the Asset Management Plan, and the background information and reports upon which it is based, please visit ottawa.ca or contact the City of Ottawa Asset Management Service.

Appendix A:

Descriptions of Provincially Legislated Community Levels of Service

The Ontario regulation requires a description, which may include maps, of the user groups or areas of the municipality that are protected from flooding, including the extent of the protection provided by the municipal stormwater management system.

AREAS OF THE MUNICIPALITY THAT ARE PROTECTED FROM FLOODING

The City is exposed to precipitation events of varying intensities and durations (indicated by the storm return period) and associated stormwater runoff primarily from impervious areas. Furthermore, historic patterns are expected to change due to climate change. From a flooding perspective, the overall Level of Service provided by the City's stormwater system can therefore be considered in terms of the number of properties exposed to flood risk for each stated return period including a stress test for climate change.

Effective urban stormwater management uses a combination of lot level, conveyance and end of pipe controls to manage runoff volumes and rates and influence both flood risk potential and receiving water quality. Whilst investment in public infrastructure assets is a key tool that can be used to manage flood risk, it must be recognized that other factors such as groundwater, lot grading and internal plumbing of properties also contribute to flood risk and these cannot necessarily be influenced through public infrastructure investment. A holistic approach is therefore required which also incorporates a range of private-side measures and non-infrastructure solutions such as risk avoidance (e.g. policy that prevents new vulnerable development in floodplains) and risk transfer (e.g. insurance) to best manage storm flooding risks and incentive measures such as grants and rebates. It should be noted that no combination of investment in public infrastructure, private infrastructure and non-infrastructure solutions will truly eliminate flood risk and make properties or buildings "flood proof". Instead, this range of solutions serves to reduce risk as far as reasonably practical and affordable within the constraints associated with historic development practices and other environmental conditions. From a public infrastructure perspective, modern stormwater system design uses the "dual drainage" concept and the overall stormwater system is comprised of both a minor system and a major system. The minor system consists of sewers and ditches designed to

convey runoff from more frequent rainfall events. The major system represents the overland route that the excess runoff will follow when the minor system capacity is exceeded. The major system includes features such as natural and constructed open channels, streets and roadways and overland drainage easements.

This dual drainage concept has not always been applied in the design of new subdivisions and so the design parameters for the stormwater systems vary across the City, depending primarily on age. In general, for those areas built before the 1980s the design standard is typically a minor system with a 1:2 or 1:5 year return period capacity and no designed major system. More modern areas are likely to have a 1:2 year design standard for the minor system and a major system engineered to a 1:100 year design standard. They also typically include backwater valves to protect homes from storm sewer basement flooding. These modern systems are designed so that excess runoff will be conveyed to the major system when the minor system reaches capacity. Surface flooding therefore commonly occurs in streets and roadways and there is often a misconception amongst the public that such drainage is unplanned and therefore undesirable.

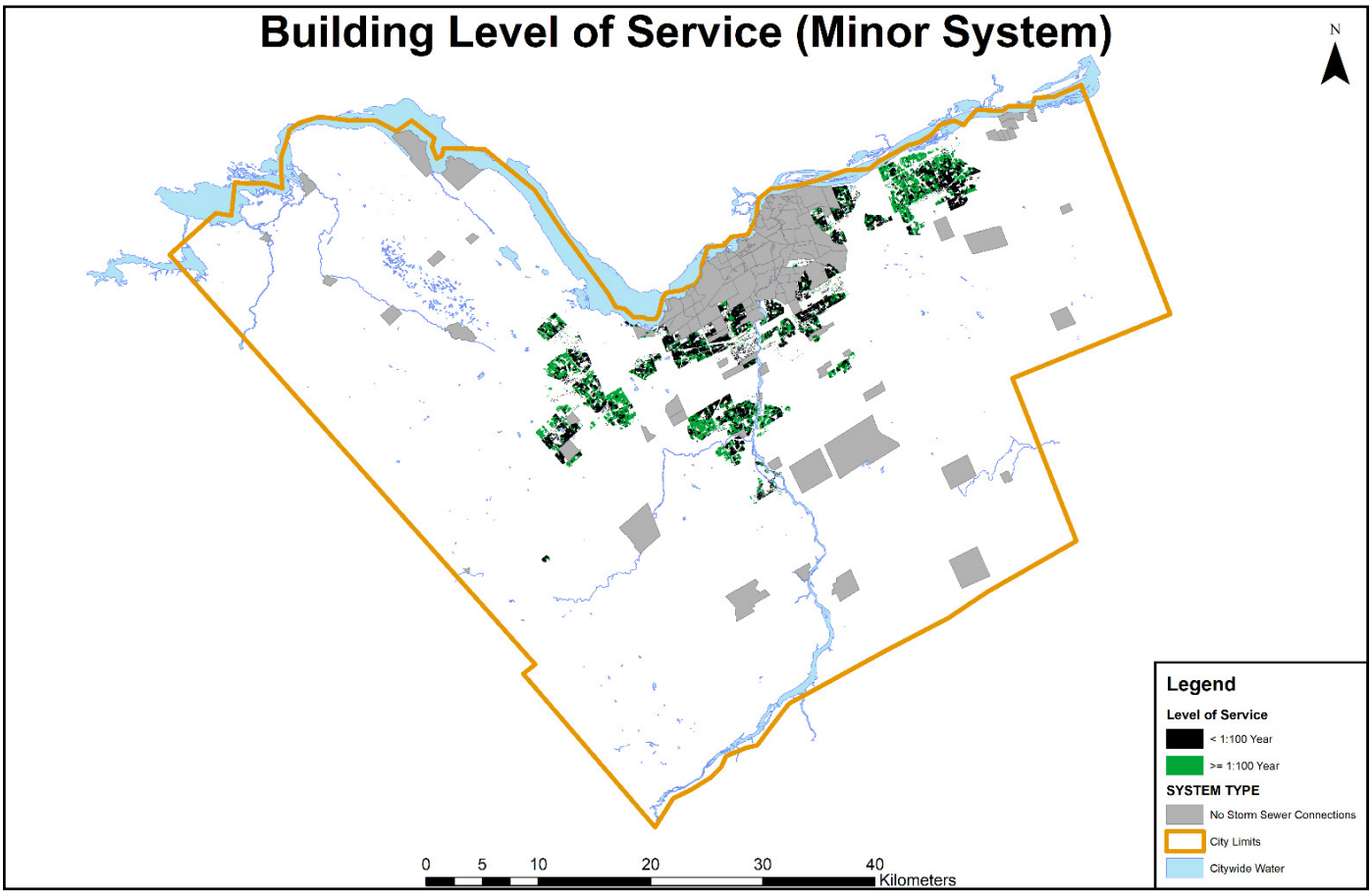
The following sets out the flood risk associated with the:

- Minor system
- Major system
- Riverine systems

MINOR SYSTEM

Figure 9.1 shows the location of all buildings which are estimated to be resilient to storm sewer (minor system) performance in a 1:100-year return period event. These the buildings shown in black in this figure are buildings that are less resilient to the storm sewer performance, though not necessarily at risk of flooding. Many homes built after 1977 have backwater valves which mitigate flood risk by preventing water from the storm sewer from entering the home.

Figure 9.1 Minor System Building Level of Service



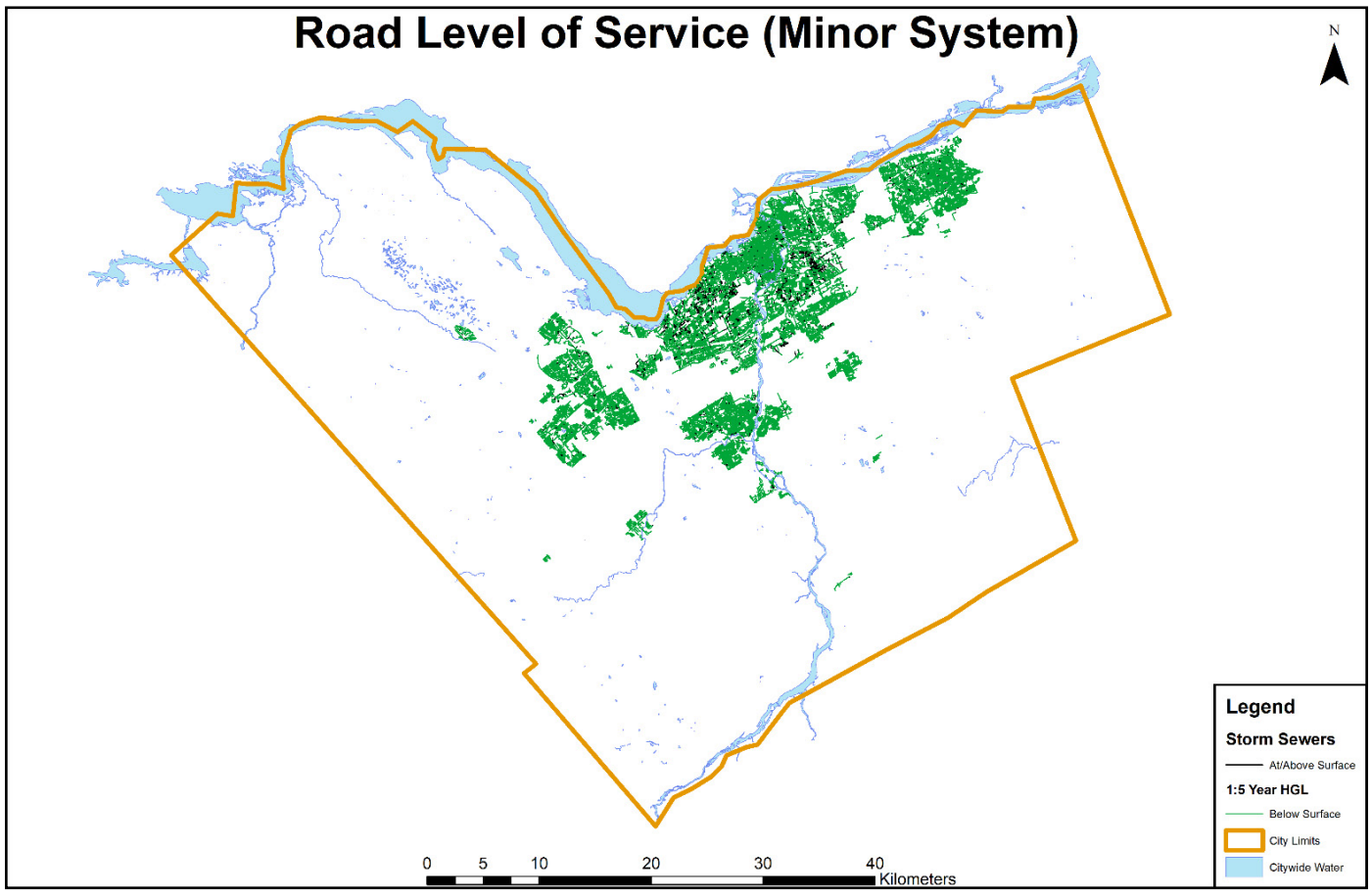
Notes:

1. Buildings in black areas are less resilient to the storm sewer performance, though not necessarily at risk of flooding. Many buildings built after 1977 are equipped with backwater valves which increase flood resilience.
2. Buildings in green areas are resilient to minor system flooding in a 1:100 year event.
3. Grey areas have building within 50 m of a storm sewer, but those buildings are not connected to a storm sewer. These areas are also resilient to minor system flooding in a 1:100 year event.
4. White areas have very few buildings and have no storm sewers. These areas are also resilient to minor system flooding in a 1:100 year event

An alternative view of minor system resilience is the number of storm sewers are expected to surcharge to the ground surface during a 1:5 year return period event.

The pipe sections resilient to a 1:5 year event are shown in green in Figure 9.2 below

Figure 9.2 Minor System Hydraulic Grade Line Level of Service



Notes:
1. Black pipes have hydraulic grade line (HGL) at or above surface in a 1:5 year event.
2. Green pipes have hydraulic grade line (HGL) below surface in a 1:5 year event.
3. White areas have very few buildings and have no storm sewers.

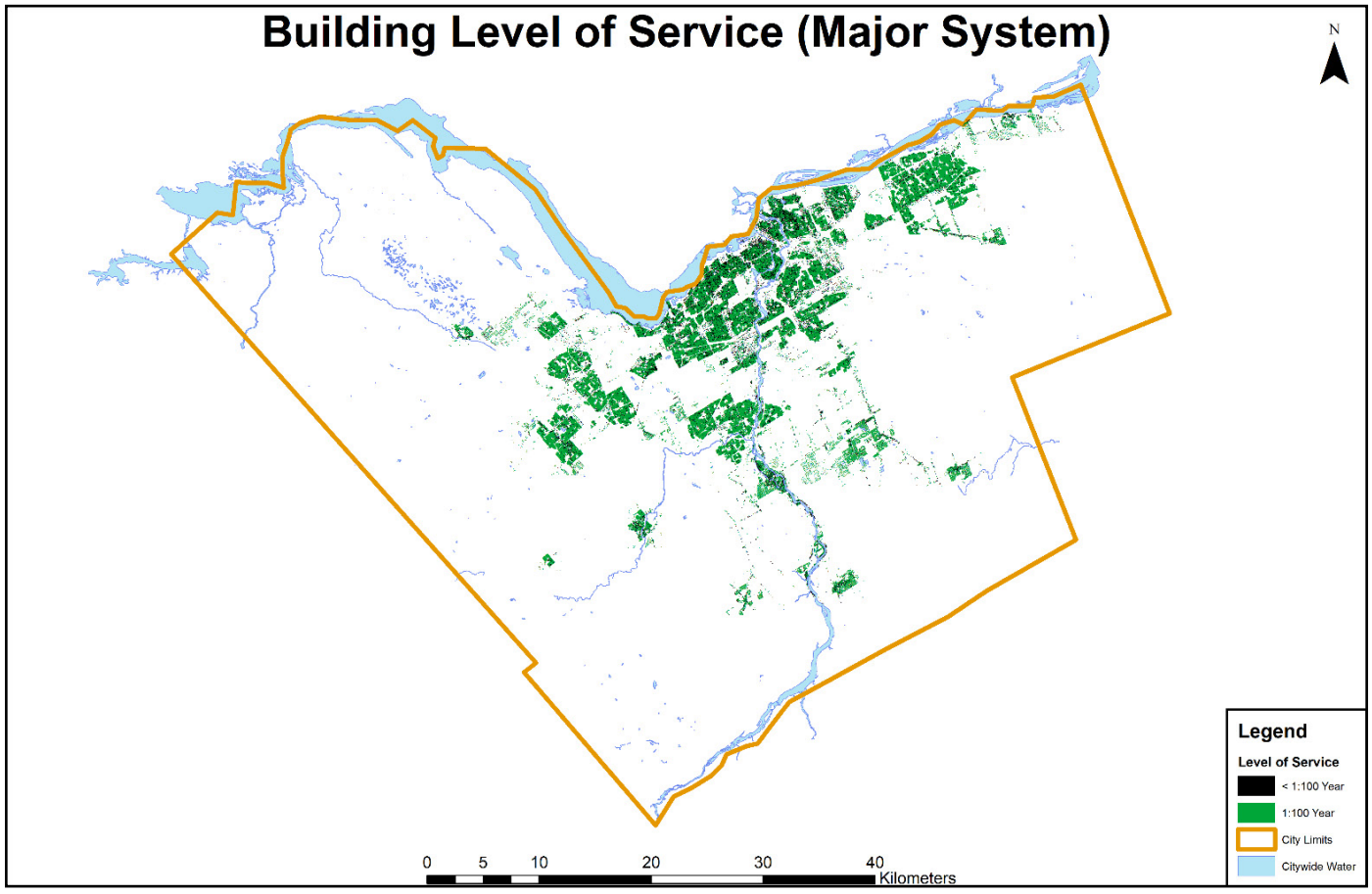
MAJOR SYSTEM

In addition to the minor system, the City's major system poses a potential property flooding risk. The major system represents the overland route where the excess runoff will flow when the minor system capacity is exceeded. The major system includes such features as natural and constructed open channels, streets and roadways and overland drainage easements.

Before the 1980s, neighbourhoods were not designed with the principles of dual drainage. In other words, a rigorous review of the capacity of overland flow routes to convey excess runoff was not conducted. As a result, excess runoff in the pre-1980 neighbourhoods may spill at undesirable locations such as between homes or pond to a depth where they may cause inconvenience or damage before continuing along the right-of-way.

Overall, approximately 81.6% (approximately 156,000) buildings are resilient to overland flooding in a 1:100 year return period event and these are shown in green on Figure 9.3.

Figure 9.3 Major System Level of Service

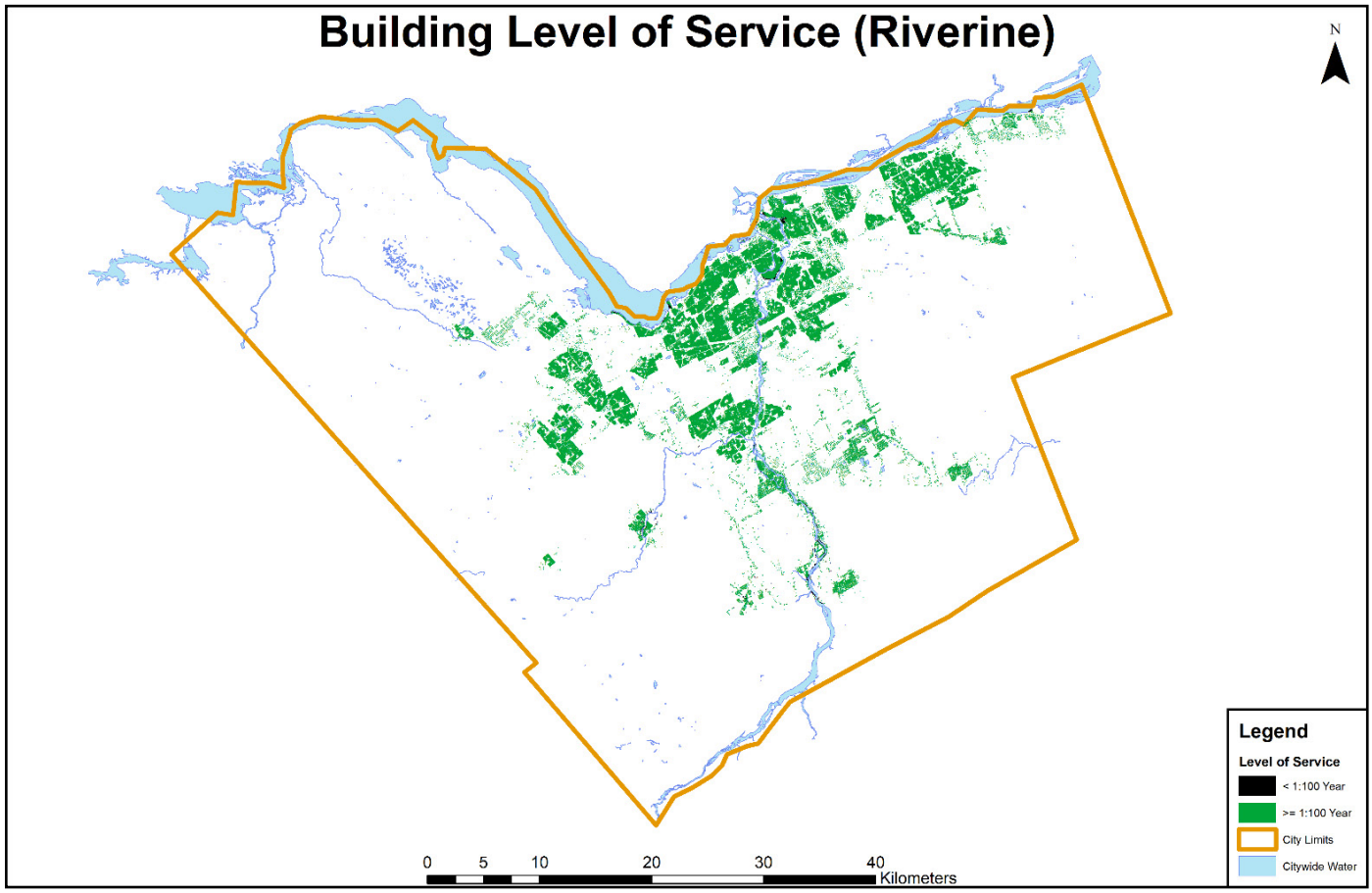


RIVERINE SYSTEM

Riverine flooding can be considered as a special case of major system flooding. It is often useful to distinguish between the two because the river watershed is typically much larger than the major system drainage area and the watershed may not be contained within City limits. The City contains a vast network of riverine systems that are part of either the Ottawa River, Rideau Valley, South Nation or Mississippi Valley watersheds.

The majority of buildings (99% or 192,704 out of 193,874) are resilient to a 1:100 return period riverine event. The buildings that are resilient are illustrated in green in Figure 9.4.

Figure 9.4 Riverine Level of Service



Notes:
1. Black buildings are not resilient to riverine flooding in a 1:100 year event
2. Green buildings are resilient to riverine flooding in a 1:100 year event.
3. White areas have no buildings.