2022

Asset Management Plan

KINGSTON

Foreword

The City of Kingston was amalgamated in 1998 and today serves a population of approximately 133,000 residents and 30,000 post-secondary students between September and May. It is uniquely situated between Toronto, Ottawa and Montreal with easy access to all three by Highway 401 which runs through the City. With its location along the shores of Lake Ontario, at the mouth of the Cataraqui River and the start end of the St. Lawrence River, Kingston is surrounded by natural beauty that enhances life for its residents.

Kingston's economy is centered on public institutions and establishments including Queens University, the Royal Military College of Canada, St. Lawrence College, as well as healthcare, correctional and military facilities. The City has played a unique role in the history of Canada, including a brief stint as the Nation's First capital. Today you can see this reflected in its historical downtown and monuments.

Over time, the City has established asset management practices for the management of its infrastructure assets; however, more recent efforts have been made to formalize those practices within an Asset Management Framework. These improvements will result in improved decision-making abilities and sustainable financial practices. The Asset Management Plan is a living document that presents the City's core, and eventually non-core asset portfolio in terms of what is owned, the levels of service provided by them, life cycle management activities and financial strategies. This iteration of the plan includes the City's Transportation and Stormwater asset portfolios. Water & Wastewater services managed by Utilities Kingston have been captured in their Asset Management Plan, originally created in 2017, updated and recently approved by Council on October 19, 2021.

Kingston's Asset Management Framework already includes the Strategic Asset Management Policy, accepted by Council in 2019, Report #19-091. This policy is intended to define the City's expectations, key principles and governance framework for the practice of asset management at the City. The policy, along with other documents related to asset management are all developed to be in alignment with the City's Strategic Plan, as well as other important planning documents.

As per the most recent strategic plan, the City has established priorities for the current term, up until 2022. All these priorities are in some way supported by the City's infrastructure, thus improvements to the management of that infrastructure will support the achievement of these priorities.

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1.0 Executive Summary

Located along the beautiful shores of eastern Lake Ontario, the City of Kingston offers a stable and diversified economy that includes global corporations, advanced healthcare facilities, top-notch educational institutions, affordable living and vibrant entertainment and tourism activities. With a population of approximately 133,000 residents and 30,000 post-secondary students between September and May, City of Kingston staff are responsible for delivering a wide array of services to ensure the quality of life and prosperity of the community. With the goal of delivering the services to the quality and level expected by the community, the City of Kingston has made a commitment to asset management planning with the goal of balancing expenditures, services and risk across the diverse asset portfolios.

This Asset Management Plan (AMP) includes "core municipal infrastructure assets" as defined by the Ministry of Infrastructure in O.Reg. 588/17. For the City of Kingston, this includes assets related to their transportation and stormwater systems. The remaining core assets related to water and wastewater systems are the responsibility of Utilities Kingston and are included in their approved plan.

The City owns many transportation-related assets and is responsible for maintaining and replacing them where necessary. The goal is to ensure a high level of performance for both the urban and rural areas of the city. For the purposes of this AMP, the transportation asset group has been sub-divided into subsidiary levels of assets which includes roads, bridges, culverts, and retaining walls. The replacement cost for the entire transportation system is approximately $1.6 billion.

Stormwater management has become an increasingly important topic as municipalities across Canada experience an increase in storm events regarding both frequency and severity. The City is responsible for maintaining and replacing its stormwater assets where necessary and ensuring a high level of performance for both the urban and rural areas. The stormwater asset group has been segregated into secondary levels of assets, which includes storm structures, mains, ponds and outlets. The replacement cost for the entire stormwater system is approximately $382 million.

The overall replacement value of both the transportation and stormwater asset portfolios is $1.98 billion as shown in Table E 1 and Table E 2.

Table E 1. Transportation Replacement Values

Asset	Count	Unit	Replacement Value
Roads	879	Kilometer	$1,403,870,630
Bridges	49	Each	$123,022,000
Culverts	88	Each	$68,407,786
Retaining Walls	8	Each	$1,767,270
Total Transportation			**$1,597,067,686**

Table E 2. Stormwater Replacement Values

Asset	Count	Unit	Replacement Value
Storm Ponds	29	Each	$14,816,040
Storm Mains	334	Kilometer	$364,849,562
Storm Outlets	42	Each	$730,044
Storm Structures	35	Each	$2,275,000
Total Stormwater			**$382,670,646**

Depending on the method used to determine condition (e.g., age, OCI), scores were converted to condition ratings categories. For example, condition scores for roads were based on the Overall Condition Index (OCI), which provides a score from 1-100 based on pavement condition inspections. These scores were then categorized into the descriptive categories that are provided in Table E 3.

Table E 3. Asset Condition Rating

Condition Rating	Definition
Very Good	The asset is fit for the future. It is well maintained, in good condition, new or recently rehabilitated
Good	The asset is adequate. It is acceptable and generally within the mid-stage of its expected service life
Fair	The asset requires attention. The asset shows signs of deterioration, and some elements exhibit deficiencies.
Poor	There is an increasing potential for its condition to affect the service it provides. The asset is approaching the end of its service life, the condition is below the standard and a large portion of the system exhibits significant deterioration.
Very Poor	The asset is un-fit for sustained service. It is near or beyond its expected service life and shows signs of advanced deterioration. Elements may be unusable.
Unknown	Not enough data exists to estimate condition.

The breakdown of the assets within each condition rating category is shown in Figure E 1. Since roads and storm mains make up the largest proportion of the asset portfolio, the breakdown based on percentage is shown in Figure E 2. As can be seen in the figures, a large proportion of the assets are in Very Good to Fair categories.

Figure E 1. Breakdown of Assets within Each Condition Category by Replacement Value
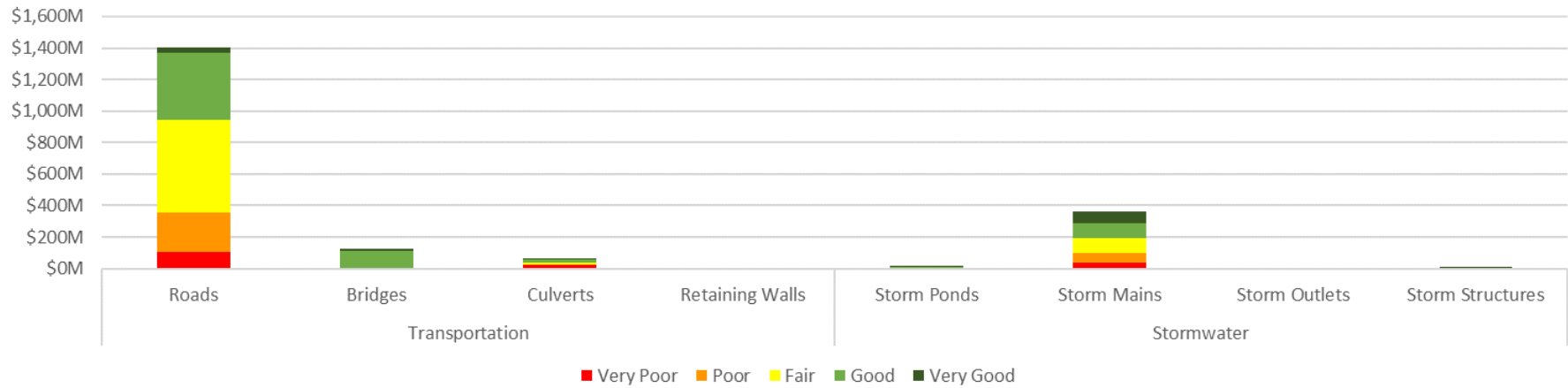
Figure E 2. Breakdown of Assets within Each Condition Category by Percentage of Replacement Value
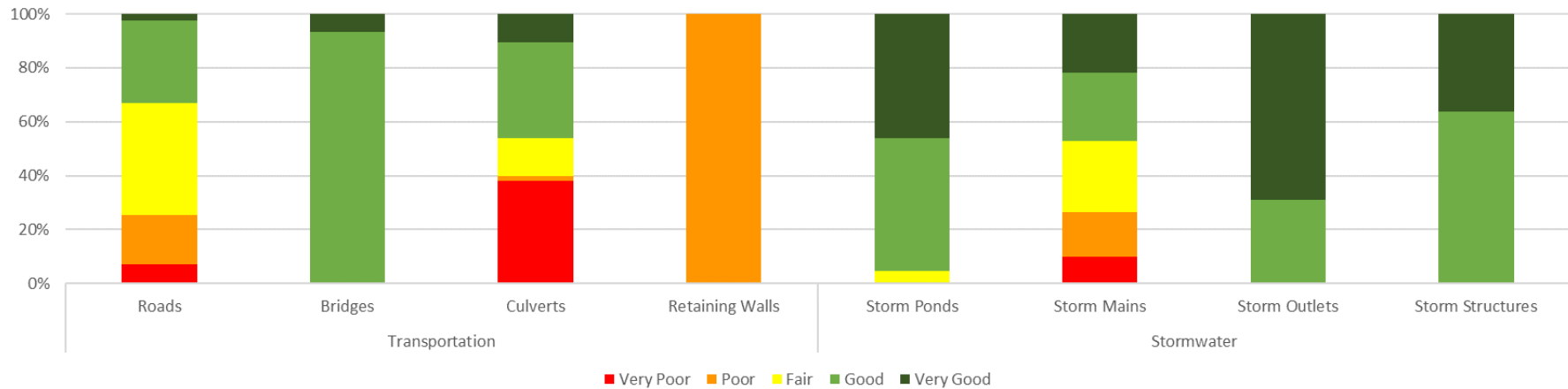
The City of Kingston has developed this Asset Management Plan (AMP) to address the requirements of Ontario Regulation 588/17. In order to support the AMP, a comprehensive Level of Service (LOS) Framework has been developed for roads, bridges, culverts, and stormwater assets. This framework will help establish a relationship between the levels of service being provided by the City's infrastructure systems and the associated operating and capital expenditures required to achieve the LOS.

The structure of the LOS tables for the City were developed by leveraging international best practices. The tables were developed in accordance with Ontario Regulation 588/17 Asset Management Planning for Municipal Infrastructure made under the *Infrastructure for Jobs and Prosperity Act*, 2015. City staff identified current data sources used for each measure.

The LOS tables were developed for the core service groups and comprised of the following structure:

1. **Service Attributes** consists of a phrase which describes an important area of focus for each service group. Some examples of Key Service Attributes include Cost Efficiency, Safety and Reliability. The listed Key Service Attributes are meant to cover all important aspects of the service and be easy for the customer/public to understand and recognize.

2. **LOS Statement** consists of a short sentence, which describes the outputs of the service category. Each LOS Statement corresponds to a Key Service Attribute. Each LOS Statement should clearly state customer standards and be measurable.

3. **Performance Measures** identify specific areas of focus that can be measured to support each Key Service Attribute. One or more performance measures can be listed for each Key Service Attribute. The LOS tables provide two types of Performance Measures: Customer and Technical. Each Performance Measure should be defined to be SMART (specific, measurable, achievable, relevant, and time-based). Each Performance Measure is further subdivided into four components, which are represented as additional columns in the LOS table. These components detail the Performance Measure and Current Performance.

4. **Current Performance** are values that indicate the current performance for each performance measure for the most recent complete calendar year (which is 2021 at the time of writing).

The City's lifecycle strategy describes the set of planned actions that the City undertakes to sustain levels of service while managing risk at the lowest possible lifecycle cost, in alignment with levels of service (LOS) and risk strategies. The types of lifecycle activities are shown in Table E 4.

This AMP includes the determination of the estimated capital expenditures and significant operating costs required to maintain the current levels of service, as stated in O.Reg. 588/17 5.(2)6.vi. The cost to maintain current levels of service is $67.9M annually.

Accurate condition assessment plays a key role in determining future expenditure needs. The roads and bridges have up-to-date and well-established programs for assessing asset performance. The performance of stormwater assets is currently determined by asset age relative to the service life. A CCTV inspection program is planned to help staff understand actual network performance.

This asset management plan is intended to be a living document that is updated at recurring intervals. A key component of asset management is ensuring the continuous improvement of asset management practices. The final section of the plan outlines strategies for enhancing the asset management plan, as well as overall improvements to the asset management program at the City. While each figure of the proposed improvements and roadmap items have been identified with absolute starts and finishes implementing them will be more than just a set of projects, but rather an evolution of a continuous improvement program that forms the basis for the City's overall long-term asset management journey.

Table E 4. Lifecycle Activities

Lifecycle Activity	Description
Non-Infrastructure	Actions or policies that can lower costs or extend asset life
Maintenance	Regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events
Renewal / Rehabilitation	Significant repairs designed to extend the life of the asset.
Replacement / Construction	Activities that are expected to occur once an asset has reached the end of its useful life and renewal / rehabilitation is no longer an option.
Disposal	Activities associated with disposing of an asset once it has reached the end of its useful life or is otherwise no longer needed by the municipality.
Expansion / Growth / Service Improvements	Planned activities required to extend services to previously un-serviced areas - or expand services to meet growth demands.

2.0 Introduction

Located along the beautiful shores of eastern Lake Ontario, the City of Kingston offers a stable and diversified economy that includes global corporations, advanced healthcare facilities, top-notch educational institutions, affordable living and vibrant entertainment and tourism activities. With a population of approximately 133,000 residents and 30,000 post-secondary students between September and May, Kingston is charged with delivering a wide array of services to ensure the quality of life and prosperity of the community. With the goal of delivering the services to the quality and level expected by the community, the City of Kingston made a commitment to asset management planning with the goal of balancing expenditures, services and risk across the diverse asset portfolios. The 2019 asset management policy sets out the commitments to define its asset management system and define a strategy to guide processes, meet regulatory requirements, and improve efficiency and accountability.

2.1 Purpose of the Asset Management Plan

An asset management plan (AMP) is a crucial component of any asset management framework, and thus its development and implementation will greatly improve the City's current efforts in Asset Management. The Federation of Canadian Municipalities (FCM) defines an asset management plan as, "a plan developed for the management of one or more infrastructure assets that combines multidisciplinary management techniques (including technical and financial) over the life cycle of the asset in the most cost-effective manner to provide a specified level of service". This first iteration of the AMP will enhance the City's management of their Core Transportation and Stormwater assets. Water & Wastewater services which are managed by Utilities Kingston have been captured in their Asset Management Plan, originally created in 2017, updated and recently approved by Council on October 19, 2021.

Another component of the Asset Management Framework is the Asset Management Policy, which was adopted by Council in 2019. The AM objectives as outlined in the Asset Management Policy are listed below:

- Establish an asset management system that integrates strategic planning, budgeting, service levels, and risk,
- Provide service levels that balance customer expectations with financial means and risk,
- Enhance transparency and accountability of the decision-making process,
- Ensure asset investment is considered through a holistic approach to maximize the lifecycle of the assets as well as included in the planning for new assets,
- Provide justification of investment decisions related to infrastructure assets by linking these decisions to long-term consequences,
- Prepare long-term financial plans to ensure sustainable funding for rehabilitation, replacement or decommissioning of assets,
- Ensure that the addition of new assets or enhancements of existing consider the City's ability to fund the required additional maintenance and future upgrades within a sustainable plan and,
- Define the processes for future decision makers within the City while maintaining corporate knowledge.

2.2 Scope of Assets

This AMP includes "core municipal infrastructure assets" as defined by the Ministry of Infrastructure in O.Reg. 588/17. For the City of Kingston, this includes assets related to transportation and stormwater systems. The remaining core assets related to water and wastewater systems are the responsibility of Utilities Kingston and thus are captured in their updated 2021 AMP. Below is the list of assets included:

Service Area: Transportation System

- Category: Roads
  The sub-categories include the road network.

- Category: Structures
  The sub-categories include bridges, culverts, and retaining walls.

Service Area: Stormwater System

- Category: Collection
  The sub-categories include storm mains, storm ponds, outlets, and associated structures.

Furthermore, at the time of commencement of this AMP development, the Waaban Crossing (formerly named the Third Crossing) has not yet been completed and does not form part of the City's core asset inventory. As a result, it has not been included in the main reporting of this AMP but is referenced where applicable.

In future, this bridge will represent a significant portion of the overall bridges and culvert replacement value. The exclusion of the Waaban Crossing from this AMP will not affect the results of the 10-year forecast since there will be a limited amount of major capital projects required on the new bridge. However, there will be ongoing maintenance and inspection needs that will be addressed.

2.3 Alignment with the City's Vision, Mission and Strategic Goals

One of the foundational concepts of asset management is ensuring there is a clear line of sight between organizational objectives, asset management objectives and any activities related to asset management. Therefore, when determining the purpose and desired outcomes of AM for the City, it is important to first consider the City's broad goals and overall strategic direction.

The City of Kingston's Mission and Vision statements broadly defines what the City strives to provide for its citizens and how they intend to do so.

Mission
To enhance the quality of life for present and future generations by providing progressive, professional services and leadership that reflects the needs of all those who work, live, visit, or play in the City of Kingston.

Vision
We are a progressive, innovative corporation with satisfied citizens and employees. Our fiscal health enables us to update our infrastructure and grow our business community. We support a high quality of life for all of our citizens, and they value the services we provide.

In addition to these broad goals, each term, City Council approves a Strategic Plan that defines a Vision and priorities for the next four years. Most recently, in May 2019, Council approved the 2019-2022 Strategic Plan, which continues to push forward the vision to make Kingston a smart, livable and leading City.

Listed below are the guiding principles that Council applies to decision making, policy development and resource allocation and Figure 2 outlines the five strategic priorities for 2019 – 2022 and some examples of how they are supported by initiatives that are directly related to City owned assets.

- Environmental sustainability and stewardship to safeguard future generations;
- Fiscal responsibility and accountability to create efficiencies and synergies, balance tax and non-tax revenue, and manage debt effectively;
- Promotion of social, economic and health equity;
- Urban and rural equity to balance appropriate service delivery across regions;
- Public engagement to collect diverse perspectives and to act fairly, sustainably, responsibly and equitably on behalf of our citizens;
- The measurement of service standards to ensure high quality customer service;
- Innovative approaches and new smart technologies to support fiscal management; and
- Positive and inspiring work environments to attract and retain talent.

Figure 1. Line of Sight between Strategic Objectives and Asset Management

Line of Sight

Strategic Plan
Outlines the organization goals, vision and objectives

Strategic Asset Management Policy
Outilnes the principles, requirements and responsibility for asset management

Asset Management Plan
Outlines the City-wide asset management practices, state of the infrastructure, levels of service, and lifecycle and funding plans.
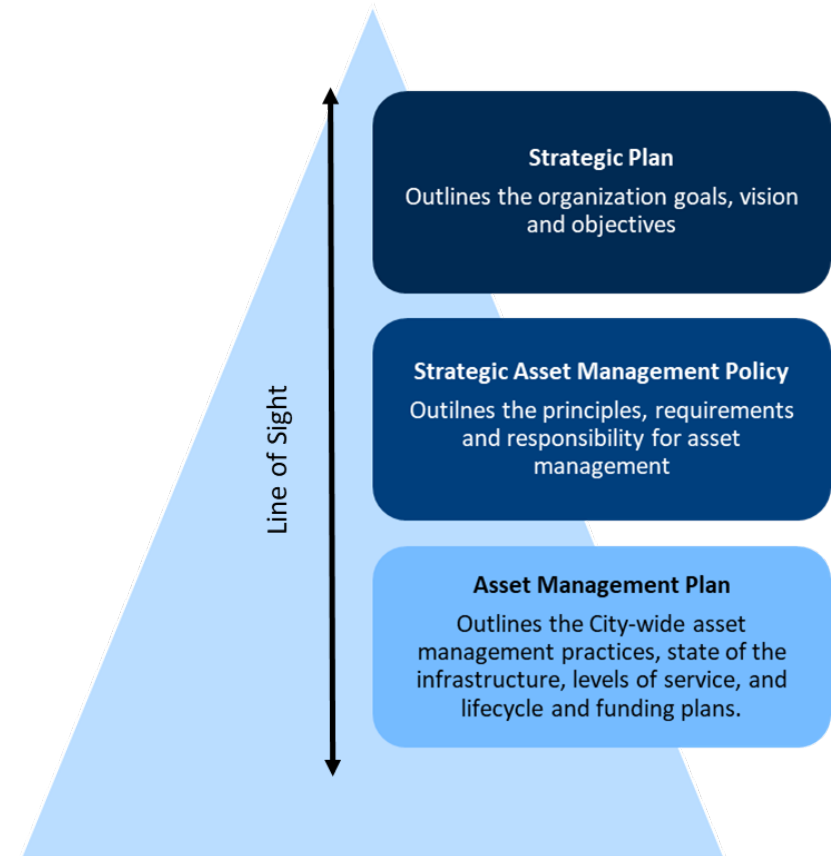
Figure 2. City of Kingston 2019-2022 Strategic Priorities

	Demonstrate Leadership on Climate Action	• Complete an energy retrofit of City buildings that will achieve an estimated 2-3 percent corporate GHG reduction. • Purchase electric transit and light duty fleet vehicles to achieve approximately 7 percent corporate GHG reduction.
	Increase Housing Affordability	• Identify opportunities for densification through a variety of studies that would need to be in alignment with the City's transportation and stormwater systems.
	Improve Walkability, Roads and Transportation	• Several initiatives planned for 2022 related to road improvements to make active transportation more appealing and improve walkability. Over the last 3 years the City has rehabilitated ~65 lane kilometers of our road network annually. • Design and construction of active transportation routes.
	Strengthen Economic Development Opportunities	• Facilitate the establishment of new institutions such as a Healthcare Innovation Hub and St. Lawrence College downtown campus that would need to be supported by the City's transportation and stormwater systems.
	Foster Healthy Citizens and Vibrant Spaces	• Continue the implementation of the Waterfront Master Plan and implement several waterfront park rejuvenation projects.

The City's Key Principles for Asset Management

The City's Asset Management Policy has defined some key principles to be used in support of the City's organizational goals as they relate to asset management. These are summarized below in Table 1.

Table 1. The City of Kingston's Key Principles for Asset Management

Principle	Definition
Holistic	Take a comprehensive approach that looks at the "big picture" (i.e. the combined implications of managing all aspects rather than a compartmental approach). This includes the functional interdependencies and contributions of assets within asset systems and the different management of assets across all lifecycle phases.
Systematic	Take a methodical approach (i.e. formal, repeatable, and consistent) to the management of assets.
Systemic	Make asset investment decisions in an asset system context, not just to optimize the individual asset itself.
Risk-based	Manage asset risk associated with attaining levels of service and focusing resources, expenditures, and priorities based on risk and associated cost/benefit.
Optimal	Make asset investment decisions based on trade-offs between competing factors of service level (including asset performance), risk and cost.
Sustainable	Take a long-term, lifecycle-based approach in estimating asset investment and activities, thus developing effective asset management strategies for the long term.
Integrated	Coordinate the above principles to ensure the delivery of justified services and well-defined outcomes.
Aligned	Ensure that the asset management system complements the strategic objectives of the City, as well as other key business systems, legislation, and regulation.

2.4 Governance and Relationships to Other Planning Documents

In support of the effort to achieve line of sight between Asset Management and other planning initiatives at the City, it is necessary to integrate this AMP and any future iterations with other documents that set out how the City operates. Table 2 summarizes some of these key documents.

Table 2. City of Kingston Strategic Documents

Strategic Document	Purpose
Kingston's Strategic Plan	Sets out the strategic vision and priorities for the current Council term.
The Official Plan	Sets out land-use planning goals and policies that guide physical development, protection of natural and cultural heritage, resource management, and necessary supporting infrastructure.
Climate Leadership Plan (CLP)	Updated in 2021, this plan is an integrated corporate and community change management strategy which outlines the impacts of ongoing initiatives, objectives and actions to chart a path of achieving the City's target of carbon neutrality by 2040.
Emergency Management Plan	In the event of an emergency, the plan assigns responsibilities and guides the actions of key officials.
Utilities Kingston Asset Management Plan	Provides an overview of the state of the infrastructure, levels of service, lifecycle management strategies and financial strategies for water, wastewater assets, as well as other assets operated by Utilities Kingston.
Multi-year Accessibility Plan	Outlines the strategies in place to prevent and remove barriers and meet the requirements under the Accessibility of Ontarians with Disabilities Act (AODA) and the Integrated Accessibility Standards Regulation. Applies to Customer Service, Employment, Transportation, Information and Communication and Design of Public Spaces.
Multi-year Capital Plan	Sets out 15-year capital expenditures for infrastructure replacement and renewal and other capital priorities.
Multi-year Financial Plan	4-year operating budget to fund day-to-day operations.
City of Kingston Accessibility Standards	Provides the overarching framework to guide the review and development of the City of Kingston policies, standards, procedures, by-laws and guidelines to comply with O.Reg. 191/11, the Integrated Accessibility Standards Regulation developed under the AODA.
City of Kingston Annual Report	An overview of the progress made on the priorities outlined in Council Strategic Plans.
Corporate Master Plans	Several plans that recommend the preferred long-term strategies for the infrastructure or program in question. For example: Transportation Master Plan, Active Transportation Master Plan, Waterfront Master Plan, Parks and Recreation Master Plan, Archeological Master Plan, 10-Year Housing and Homelessness Plan, Kingston Culture Plan, Public Art Master Plan.

2.5 Utilities Kingston and the City of Kingston

Utilities Kingston has provided the residents of Kingston with safe and reliable utility services for more than 100 years. Over the years the name and corporate structure have changed, but one thing has remained constant: Utilities Kingston is a City-owned utility company accountable to the City of Kingston, City Council, and the residents of the local community.

As shown in Figure 3, Utilities Kingston is owned by Ontario Corporation No. 1425447, which is in turn wholly owned by the City of Kingston. In the figure, the grey lines show Ownership; and the blue lines show Management.

Through this structure, which is unique in Canada, Utilities Kingston manages, operates, and maintains the assets of the water, wastewater, natural gas and electricity utilities, and the broadband networking business.
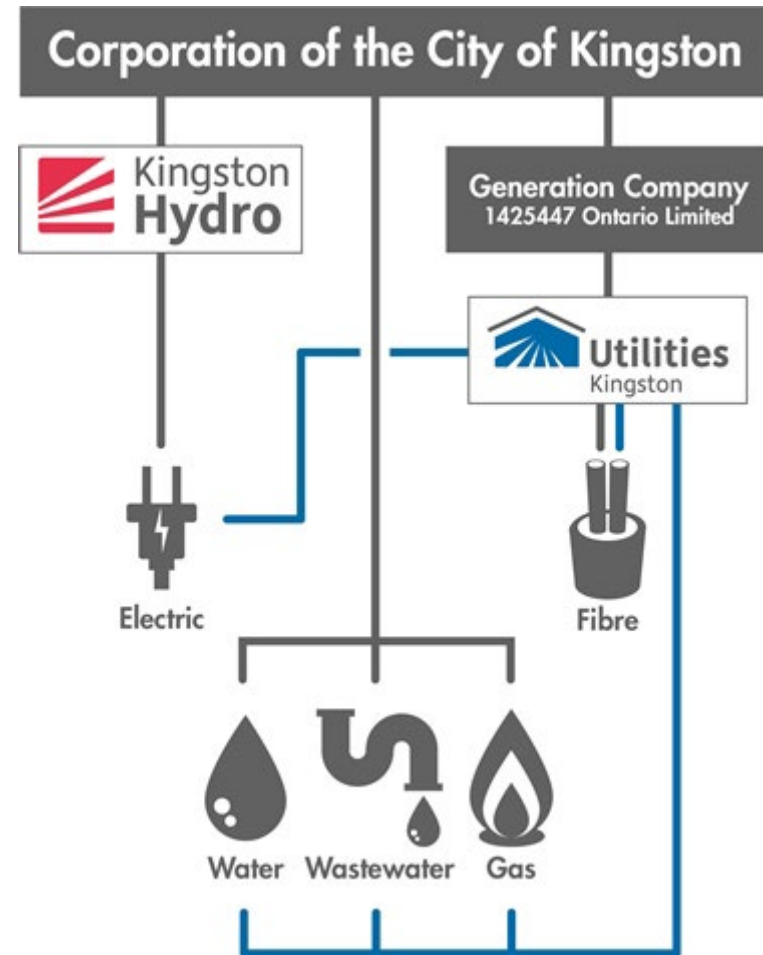
Figure 3. Utilities Kingston and City of Kingston Relationship

2.6 Provincial Asset Management Planning Requirements

The 'Building Together: Guide for Municipal Asset Management Plans' was published by the Province of Ontario in 2012 to encourage municipalities in Ontario to develop AMPs in a consistent manner. The guide outlines sections that should be included and the content that should be found within each one, including: State of Local Infrastructure, Levels of Service, Asset Lifecycle Management Strategies, and Financing Strategies. To further encourage municipalities to develop AMPs, Provincial and Federal governments made them a pre-requisite to access capital funding grants.

In 2015, Ontario passed the *Infrastructure for Jobs and Prosperity Act* which affirmed the role that municipal infrastructure systems play in supporting the vitality of local economies. The first regulation made under this act was Ontario Regulation 588/17 – Asset Management Planning for Municipal Infrastructure. O. Reg 588/17 further expands on the Building Together Guide, mandating specific requirements for municipal AM Policies and AMPs, phased in over a five-year period.

Below is a summary of timelines and general requirements of O.Reg. 588/17. This AMP is intended to be compliant with the July 1, 2022, requirements.

July 1, 2019

The City requires an AM policy that articulates specific principles and commitments that will guide decisions around when, why and how money is spent on infrastructure systems.

July 1, 2022

The City requires an AMP that documents the current levels of service being provided and the costs to sustain them for the City's water, wastewater, stormwater, roads and bridges infrastructure systems (i.e. 'core' assets per O.Reg. 588/17).

July 1, 2024

The City requires an AMP that documents the current levels of service being provided and costs to sustain them for all infrastructure systems in the City.

July 1, 2025

The City requires an AMP that documents the current levels of service being provided, the costs to sustain the current levels of service, the desired levels of service, the costs to achieve the desired levels of service, and the financial strategy to fund the expenditures necessary to achieve the desired levels of service for all infrastructure systems in the City.

2.7 Developing the Core Asset Management Plan

For the creation of this AMP, initial steps included data collection and compilation, developing an analysis tool, and meeting with various working groups to discuss, review and provide feedback on each component of the AMP. Key tasks that have already taken place or will take place include:

- Background Data Collection
- Inventory Assessment and Gap Analysis
- Process, Workflow and Resource Analysis
- Develop Corporate Asset Management Plan Structure

- Level of Service Analysis
- Condition and Risk Assessment Protocols
- Lifecycle Management Strategy
- Implementation Roadmap
- Submission of the Asset Management Plan to Working Groups Incorporating Revisions
- Submission of the Final AMP and Presentation to Council.

Developing, implementing, and updating an AMP is a large undertaking that requires buy-in and support from various levels of the City's organization. Table 3 identifies the roles and responsibilities of the key stakeholders involved.

Table 3. Asset Management Plan Stakeholders

Key Stakeholder	Roles and Responsibilities
City Council	• Approve the Asset Management policy and Corporate Asset Management Plan • Serve as representatives of stakeholder and community needs particularly as it relates to determining the services and service levels to be provided • Approve funding levels for both capital and operating budgets developed through the Asset Management Framework • Support ongoing efforts to continuously improve and implement asset management plans
Corporate Management Team (CMT)	• Endorse corporate asset management plans and policy • Participate in the process of aligning asset management strategies and plans with organizational strategies and objectives • Communicate the vision of asset management at a corporate level, encourage engagement with the processes and provide the guidance necessary to ensure alignment and integration across the organization
Asset Management Steering Committee	• Implement the Asset Management policy • Provide input on needs of department, current status of assets, and current levels of service • Support and comply with data collection requirements • Participate in the regular review of all documentation, data, and asset measurement tools to ensure continued relevance and applicability of existing policies and practices • Document the alignment of Asset Management Plans with the priorities established and projects requested through the budget process • Participate in the development of the corporate asset management work plans pertaining to their areas of expertise
Chief Financial Officer & Treasurer	• Ensure alignment between the City's asset management financing plan and the City's long-term financial plan

The development of this AMP is also defined and supported by several legislated requirements, policies and guidelines including:

- Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructure
- Infrastructure for Jobs and Prosperity Act, 2015
- Building Together – Guide for Municipal Asset Management Plans
- Corporate Strategic Plan
- Strategic Asset Management Policy (Report Number 19-091)
- The ISO 55000 series of standards for asset management
- International Infrastructure Management Manual
- FCM Asset Management Readiness Scale
- Institute of Asset Management, an Anatomy
- Reliability Web Uptime Elements

2.8 Continually Improving the Asset Management Plan

The future of asset management in municipalities has a large data and analytical component. This approach has the advantage of providing a progressive system that can help the City operationalize the processes over the coming years, while being able to continually improve its structure.

In future iterations, this AMP will evolve to further reflect the City's Strategic Plan and advances made to the City's Asset Management Policy. This will enable the City to develop more sophisticated AMPs to accompany future budgets, Official Plans and Infrastructure Master Plans. Table 4 below outlines components of the AM Framework that should be continually updated and timelines to do so.

Table 4. Timeframes and Update Frequency of Asset Management Planning Documents

Document	Frequency
Asset Management Policy	• Reviewed by the Asset Management Steering Committee annually and following any updates to the Strategic Plan • Full re-evaluation every 5 years
Asset Management Plan	• Annual update to data • Full update every 5 years to be approved by Council
Capital and Operating Budget	• Annual Development Process

2.9 Climate Change and Asset Management

Climate change is one of the most complex challenges facing municipalities today. In recent years, Ontario has experienced a significant number of extreme weather events and its adverse impacts such as flooding, ice storms, power outages, and infrastructure damage. Rising average temperatures, shifting historical precipitation patterns with increased intensity, duration and frequency of storm events and periods of drought, increasing windstorms, and fluctuations in lake levels are anticipated to continue and Asset Management Plans must reflect this reality.

The City's is in the process of evaluating the climate impacts, risks, and vulnerabilities the municipal government currently faces, or is expected to experience in the future, due to climate change. Understanding climate related risks and vulnerabilities that impact the City allows municipal operations, policies, and procedures to best align with the future climate. Positioning adaptation planning throughout the municipal government will provide proactive decision-making, climate orientated action and implementation focused on creating a climate responsible and resilient community.

The City has partnered with local experts in climate change and Asset Management to ensure that the City's policies and practices adapt to reduce both immediate and long-term impacts to municipal infrastructure. Through assessing the probability and risk associated with various climate factors, various design and operational practices can be altered to proactively build resilience into the systems to help mitigate the impacts from extreme weather. This strategy will ensure that all asset life is maintained efficiently.

2.10 Risk Management Framework

In the context of Asset Management, risk is the multiple of the consequence of an asset failing and the likelihood that the event will occur. During the development of this plan, a risk framework was developed in collaboration with the City's subject matter experts and based on best-in-class practices for risk assessment. The likelihood of failure is expressed as a percentage and calculated for each asset based on available condition data and deterioration modelling. As previously mentioned, the consequence of failure framework is based on the parameters specific to each asset category based on their financial, social, and environmental impact.

2.11 Asset Management Plan Limitations and Assumptions

This AMP was developed based on the best available information. Some assumptions based on professional judgement were made to address any information gaps. The following points summarize the assumptions and limitations of the AMP:

Roads

- Using unit costs for rehabilitation and re-construction activities provided by relevant SME.
- Using City provided deterioration curves, standard non-linear curves are used for road classes that were not provided.
- Using inspected OCI if available, age/ESL if no OCI is available.

Bridges and Culverts

- Using the average age of the network if the age of an asset is blank (applied to 6/137 assets).
- Using BCI if available, age/ESL if no BCI is available.
- Used the description in Structure Type to simplify the type to the following categories: Concrete, Steel, Corrugated Steel Pipe (CSP), and Pedestrian.

Stormwater

- Standard non-linear curves were used for the asset deterioration.
- Using the most current date between install date and most recent construction while subsequently using the average age in cases where both were blank. Using contract year if blank for Storm Structures.
- Using 300mm if the diameter was blank.
- The closest nominal diameter was applied for the unit costs. Storm pipe cost includes trenching, labour and equipment, bedding, backfill, compaction, dewatering, and maintenance holes. Assumes a depth up to 5 meters.
- Only incorporating headwalls - Note that 70% of outlets and 4% of inlets are missing all asset data.

Overall

- The estimated annual operating costs included an assumed increase as the element group's performance deteriorates or nears the end of its life.
- The estimated annual reactive maintenance costs included an assumed increase as the element's performance deteriorates or nears the end of its life.
- The estimated annual risk costs include an assumed increase as the element's performance deteriorates or nears the end of its life.

2.12 Asset Management Plan Structure

This plan has been designed to meet the July 1, 2022, O.Reg. 588/17 requirements, which is an AMP that documents the current levels of service being provided and the costs to sustain them for the City's core assets. Since Utilities Kingston is responsible for covering water, & wastewater, this plan has two major sections: Transportation and Stormwater.

For each of the service areas, the following subsections will be applied:

1. State of Local Infrastructure
2. Levels of Service
3. Lifecycle Management Strategy
4. Forecasted Lifecycle Activity Costs

The plan is concluded with the Improvement and Monitoring sections which are inclusive of both service areas. The following describes each of the subsections in detail:

2.12.1 State of Local Infrastructure

The State of Local Infrastructure for both service areas includes the following information:

- A summary of the asset portfolio and their associated replacement and financial valuation costs.
- Asset age summary, including the average age of assets in each category compared to their average estimated service life.
- Overview of observed condition (e.g. BCI or OCI) or predicted condition based on asset age.
- Data sources used in the analysis, rated for confidence, with any assumptions made clearly documented.

Depending on the method used to determine condition (e.g. age, OCI), scores were converted to condition ratings based on methods that are outlined in each of the service areas Asset Condition section. For example, condition scores for roads were based on the Overall Condition Index (OCI), which provides a score from 1-100 based on pavement condition inspections. These scores were then converted to a score from 0-1 and then finally categorized into the descriptive categories that are provided in Table 5 below.

Table 5. Asset Condition Rating

Condition Rating	Definition
Very Good	The asset is fit for the future. It is well maintained, in good condition, new or recently rehabilitated
Good	The asset is adequate. It is acceptable and generally within the mid-stage of its expected service life
Fair	The asset requires attention. The asset shows signs of deterioration, and some elements exhibit deficiencies.
Poor	There is an increasing potential for its condition to affect the service it provides. The asset is approaching the end of its service life, the condition is below the standard and a large portion of the system exhibits significant deterioration.
Very Poor	The asset is un-fit for sustained service. It is near or beyond its expected service life and shows signs of advanced deterioration. Elements may be unusable.
Unknown	Not enough data exists to estimate condition.

Given the reliance that appropriate asset management planning has on data quality, documenting data sources and assessing their quality is an important step in the development of asset management plans, thus taking the time to ensure the best available data is being used will result in high quality analysis that builds the foundation for all AMPs moving forward. This practice also provides a level of transparency for readers to understand that some assumptions may have been made to fill gaps in the data. Table 6 below describes the data confidence ratings and their respective criteria. This information has been used as a basis to provide recommendations for improvement in future iterations of the plan.

Table 6. Data Confidence Ratings

Data Quality Rating	Definition
High	No concerns identified, and data appears to be very consistent, or further information from staff on the origin of the data has been provided suggesting high confidence.
Medium	Minor or no data concerns identified
Low	Major data concerns identified

2.12.2 Levels of Service

The City of Kingston is developing an Asset Management Plan (AMP) that follows the Province's structure outlined in the Building Together: Guide for Municipal Asset Management Plans and will address the requirements of Ontario Regulation 588/17. In order to support the AMP, a comprehensive Level of Service (LOS) Framework was developed for roads, bridges, culverts, and stormwater assets. These frameworks help establish a relationship between the levels of service being provided by the City's infrastructure systems and the associated operating and capital expenditures required to achieve the LOS.

The structure of the LOS tables for the City were developed by leveraging international best practices. The tables were developed in accordance with Ontario Regulation 588/17 Asset Management Planning for Municipal Infrastructure made under the Infrastructure for Jobs and Prosperity Act, 2015.

The LOS tables were developed for the core service groups and comprised of the following structure:

1. **Service Attributes** consists of a phrase which describes an important area of focus for each service group. Examples of Key Service Attributes include Cost Efficient, Safe, Reliable, etc. The listed Key Service Attributes are meant to cover all important aspects of the service and be easy for the customer/public to understand and recognize.

2. **LOS Statement** consists of a short sentence, which describes the outputs of the service category. Each LOS Statement corresponds to a Key Service Attribute. Each LOS Statement should clearly state customer standards and be measurable.

3. **Performance Measures** identify specific areas of focus that can be measured to support each Key Service Attribute. One or more performance measures can be listed for each Key Service Attribute. The LOS tables provide two types of Performance Measures: Customer and Technical. Each Performance Measure should be defined to be SMART (specific, measurable, achievable, relevant, and time-based). Each Performance Measure is further subdivided into four components, which are represented as additional columns in the LOS table. These components detail the Performance Measure and Current Performance.

4. **Current Performance** are values that indicate the current performance for each performance measure for the most recent complete calendar year (which is 2021 at the time of writing).

2.12.3 Lifecycle Management Strategy

The City's lifecycle strategy describes the set of planned actions that the City undertakes to sustain levels of service, while managing risk at the lowest possible lifecycle cost, in alignment with levels of service (LOS) and risk strategies. The types of lifecycle activities are shown in Table 7.

Table 7. Lifecycle Activities

Lifecycle Activity	Description
Non-Infrastructure	Actions or policies that can lower costs or extend asset life
Maintenance	Regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events
Renewal / Rehabilitation	Significant repairs designed to extend the life of the asset.
Replacement / Construction	Activities that are expected to occur once an asset has reached the end of its useful life and renewal / rehabilitation is no longer an option.
Disposal	Activities associated with disposing of an asset once it has reached the end of its useful life or is otherwise no longer needed by the municipality.
Expansion / Growth / Service Improvements	Planned activities required to extend services to previously un-serviced areas - or expand services to meet growth demands.

These activities form the basis of the Lifecycle Management Strategy section of the City's AMP. This will enable the City to establish and report on possible options for which lifecycle activities could potentially be undertaken to maintain the current levels of service as well as the associated risks and costs. This reporting is necessary to meet the requirements of O.Reg. 588/17.

2.12.4 Improvement and Monitoring

The improvement and monitoring section will provide the City with prioritized areas for improvement by asset type, as well as suggestions for continual improvement to the AMP in the years to come.

Through the project the City established roles and responsibilities of the various stakeholder groups for monitoring and execution. This is important as it follows the guiding principles of the City's Strategic Plan of ensuring fiscal responsibility and accountability.

The City has taken the suggestions from O.Reg. 588/17 and the Building Together – Guide for Municipal Asset Management Plans to create a plan that can be continually adjusted and be treated as a "living document". The City of Kingston's Asset Management Policy ensures that to support the City's Strategic Plan we must continually review and improve upon the AM system, practices, strategy and related processes.

Transportation

	Roads	Structure
Total Replacement Value	$1,403,870,630	$193,197,056
Overall Average Condition	Fair	Good

3.0 Transportation

Transportation is a key element of everyday living and should be carefully planned to meet community transportation needs. The City of Kingston created its first Active Transportation Master Plan in June 2018. The Plan reflects the City's unique transportation features, and how a 20% active transportation mode share will be achieved by 2034. The plan includes significant investment in infrastructure and programming. Through the development of the Core Asset Management Plan, an inventory of the transportation assets, and financial planning to help achieve current goals was reviewed.

3.1 State of the Local Infrastructure

3.1.1 Asset Inventory and Valuation

The City of Kingston owns many transportation-related assets and is responsible for maintaining and replacing them where necessary. The goal is to ensure a high level of performance for both the urban and rural areas of the city. For the purposes of this AMP, the transportation asset group has been segregated into subsidiary levels of assets which includes roads, bridges, culverts, and retaining walls.

The replacement cost for the entire transportation system is approximately $1.6 billion. This is shown compared to its financial valuation in Table 8. The financial valuation differs from the replacement valuation as it is based on the initial costs of construction and applies depreciation over time, up until the current year; whereas replacement costs represent how much it would cost to replace the asset in today's dollars.

Table 8. Financial Accounting Valuation and Replacement Cost Valuation (Transportation)

Financial Accounting Valuation	Replacement Valuation
$523,971,024	$1,597,067,686

Figure 4 and Table 9 present the transportation asset portfolio broken down into its sub-categories. Roads make up most of the portfolio and account for approximately $1.4 billion or 88% of all transportation assets included in this plan. Secondary to roads are bridges which account for approximately $123M or 8% of the portfolio.

This valuation does not include the Waaban Crossing Bridge, which is expected to be completed in late 2022 with a value of approximately $160M. This will have a significant impact on future bridge expenditure needs in the long-term. Capital maintenance and rehabilitation costs have been incorporated into the City's long-term capital plans. No major capital expenditures are forecasted within the next 10-years but there will be ongoing maintenance and inspection requirements

Figure 4. Asset Categories by Replacement Value (Transportation)

Culverts, $68,407,786 , 4%

Retaining Walls, $1,767,270 , 0%

Bridges, $123,022,000 , 8%

Roads, $1,403,870,630 , 88%

■ Roads   ■ Bridges   ■ Culverts   ■ Retaining Walls
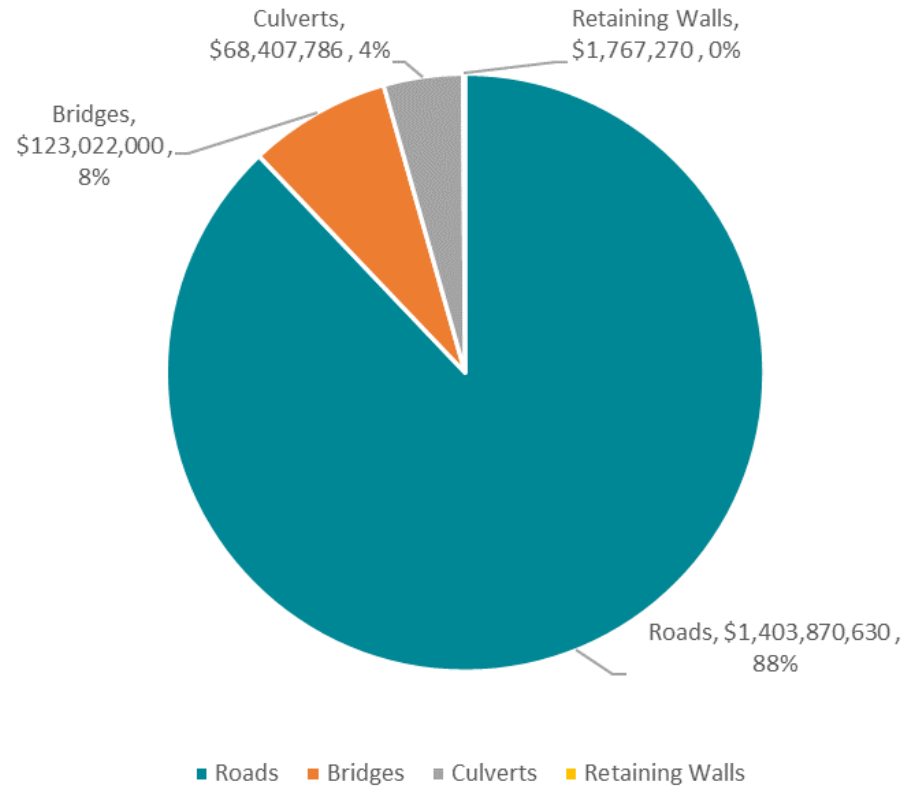
Table 9. Asset Quantities and Replacement Values (Transportation)

Category	Asset	Count	Unit	Replacement Value
Roads	Roads	879	Kilometer	$1,403,870,630
Structures	Bridges	49	Each	$123,022,000
	Culverts	88	Each	$68,407,786
	Retaining Walls	8	Each	$1,767,270
Total Transportation				**$1,597,067,686**

3.1.2 Asset Age Summary

Figure 5 summarizes the average age of assets in the transportation portfolio compared to the average estimated service lives. Presenting the asset portfolio in this manner provides a quick snapshot of where the transportation assets generally are within their lifecycle, which in turn can provide an idea of overall condition based on age. Except for culverts, transportation assets have between 25% and 50% of their average useful life remaining which translates to assets that are between fair and good condition. Based on this data alone, culverts would be expected to be in poor condition since less than 20% of the average Estimated Service Life (ESL) is remaining. Figure 6 presents the year of construction for transportation assets by replacement costs. This shows that a great deal of investment in the transportation portfolio occurred prior to 1960, and more recently the only spending has been related to roads. It should be noted that the portion of the graph that represents construction that occurred before 1960 had to be altered to make the rest of the data more readable. The current asset registry indicates that replacement costs for roads constructed prior to 1960 amount to $759 million. It should be noted that this is likely also a result of installation dates defaulting to 1900 where the data was not available within the City's systems.

Figure 5. Average Asset Age as a Proportion of Average Asset ESL (Transportation)
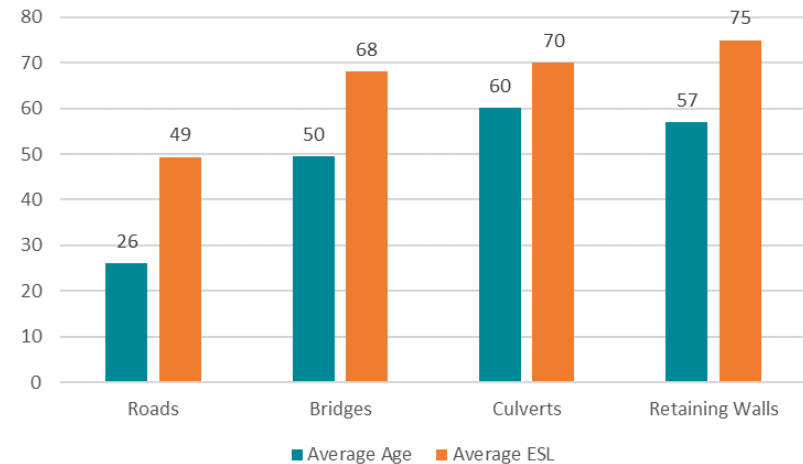
Figure 6. Construction Years by Replacement Value (Transportation)
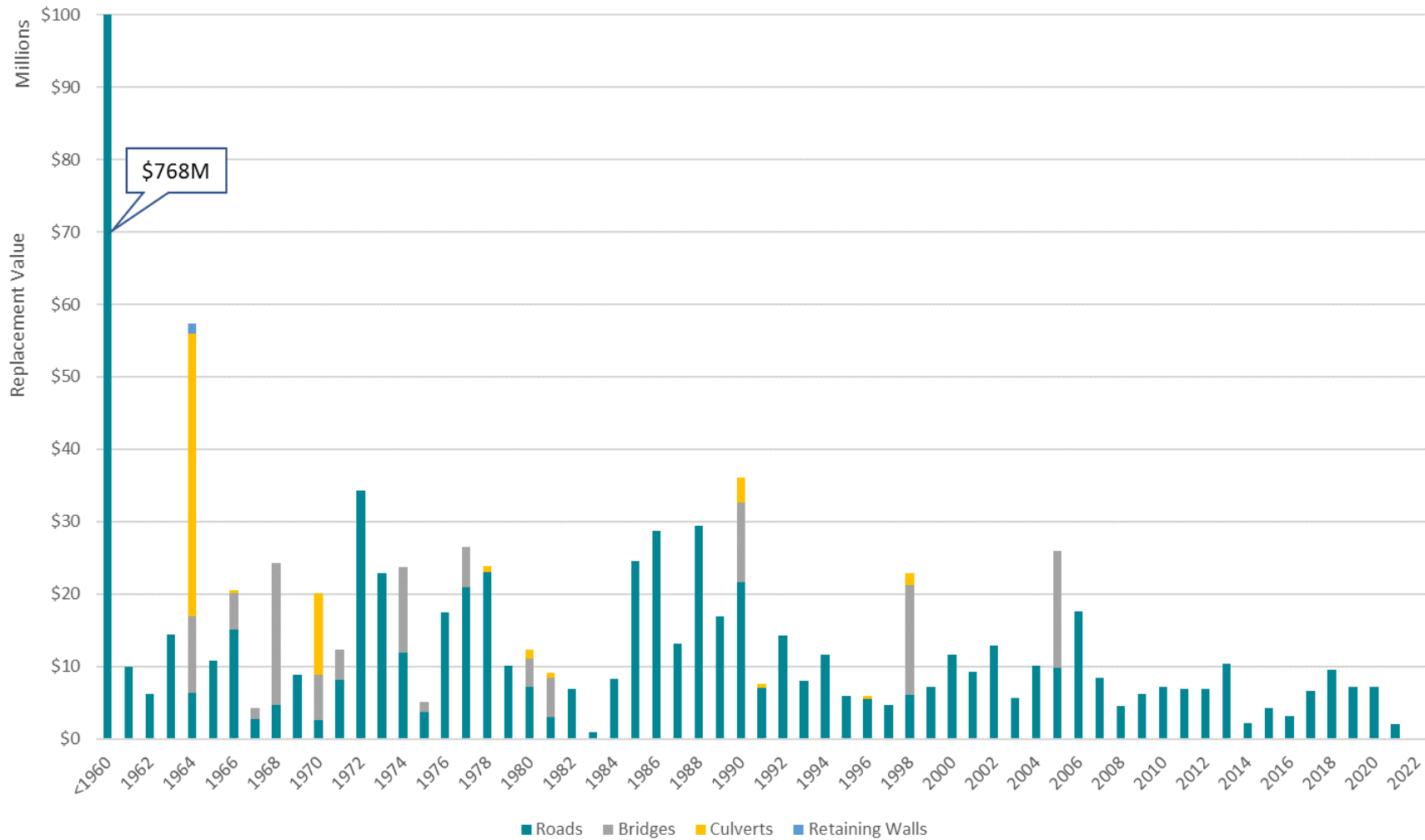
3.1.3 Asset Condition

The condition scores were established using the available condition data provided by the City. For transportation assets that are captured in this AMP this included the overall condition index (OCI) for roads and the bridge condition index (BCI) for bridges and culverts. Where there were gaps in information, a condition score was calculated using age as a proportion of useful life. The condition rating scale is provided in Table 10 and example photos are provided in Figure 7 to Figure 11. Figure 12 and Figure 13 provides the distribution of assets in each condition category. Overall, the transportation portfolio is in fair condition, as a result of roads predominantly falling in the fair, poor and very poor condition categories. Since most transportation assets have up-to-date condition data obtained during inspections, the information provided here does not necessarily align with the age information presented in the preceding section. This illustrates the importance of having good, timely and reliable condition data to avoid having to rely solely on age-based condition ratings.

The condition scores, replacement and remediation triggers found within this AMP are presented in the absence of public input, more specifically, tolerability. Customer tolerability studies and surveys present users of the infrastructure systems, residents, with an option for level of service or condition of an asset along with an associated cost. Condition or level of service states and costs are presented in such a way that the customer can connect a given level of service with a corresponding cost and at a scale that they can understand. Cost impacts are communicated in view of their current municipal tax bill versus budget level or percentage-based impacts.

Table 10. Condition Rating Scale and its Asset Condition Values (Transportation)

Condition Rating	Roads: OCI	Bridges and Culverts: BCI
Very Good	100-81	100-81
Good	80-61	80-71
Fair	60-41	70-61
Poor	40-21	60-51

Figure 7. Example of Very Good Road (OCI 100-81)

Figure 8. Example of Good Road (OCI 80-61)

Figure 9. Example of Fair Road (OCI 60-41)

Figure 10. Example of Poor Road (OCI 40-21)

Figure 11. Example of Very Poor Road (OCI 20-0)

Figure 12. Condition Distribution by Replacement Value (Transportation)
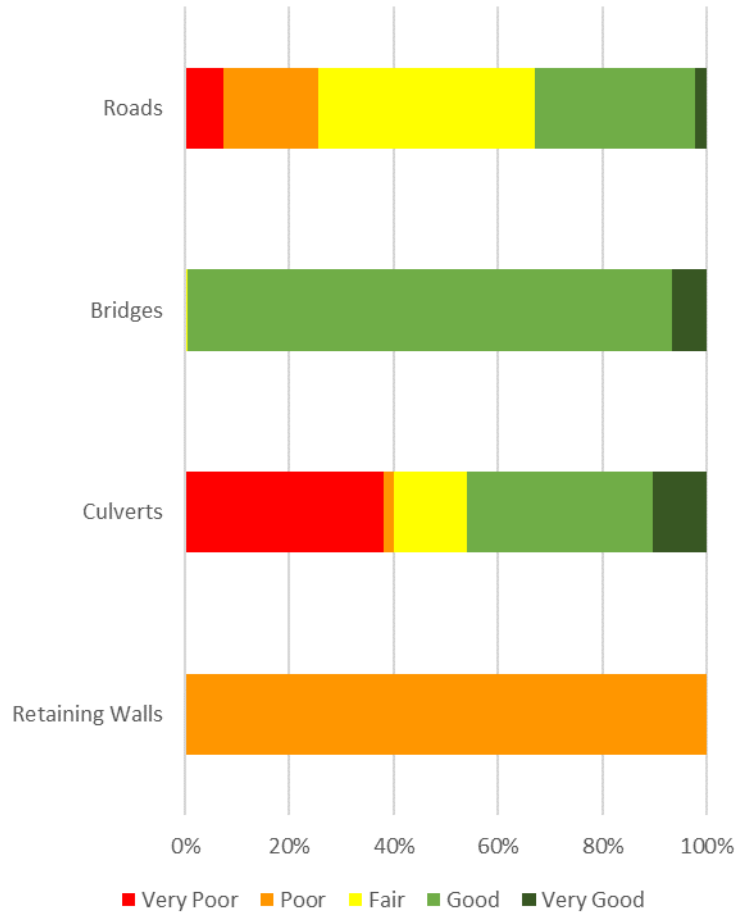
Figure 13. Condition Distribution by Replacement Value (Roads)
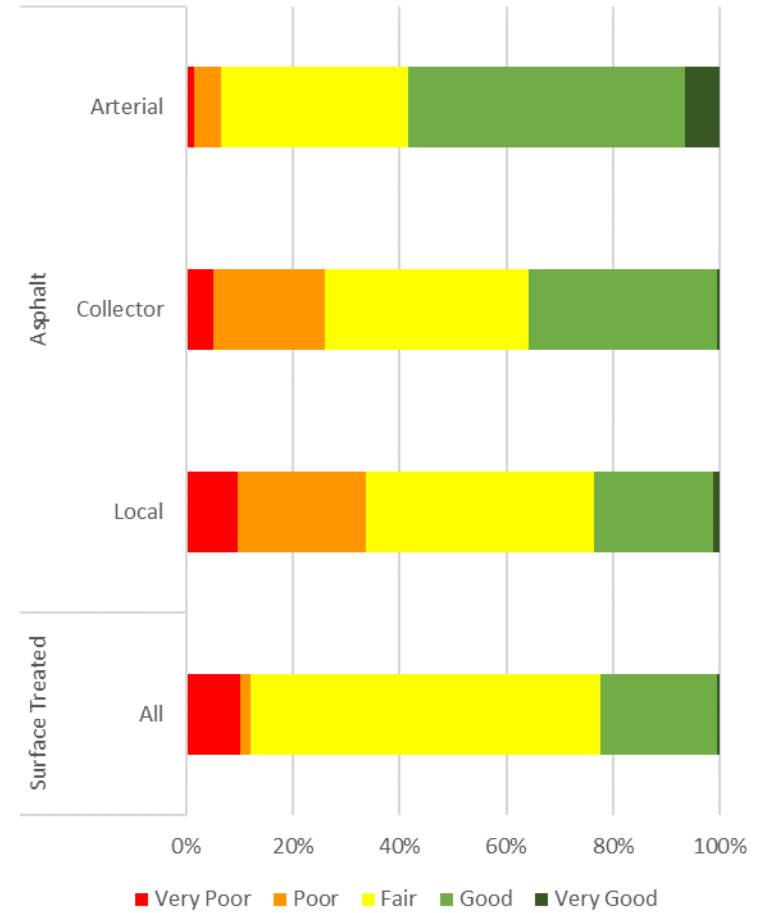
3.1.4 Data Sources and Confidence

Each individual record was assessed for accuracy and reliability and assigned a confidence score. This will allow the City to identify the specific asset data that has low confidence, as well as be able to communicate overall confidence scores in the future. Table 11 provides the data confidence scores for each transportation asset category.

Table 11. Data and Confidence (Transportation)

Asset Category	Confidence Rating	Confidence Comment
Roads	High	Few data gaps, missing data comes from OCI inspections. ESL and Replacement Costs for those if applicable were based on industry benchmarks
Bridges	Medium	Approx. 20% of assets missing installation/inspection/rehab years, condition data and deck length values
Culverts	Medium	Approx. 27% of assets missing Installation/Inspection/Rehab years, condition data and Total Deck length values
Retaining Walls	Low	8 assets. Missing Installation/Inspection/Replacement years and condition data. ESL provided by GMBP

3.2 Levels of Service

Establishing levels of service can provide an understanding of the relationship between requirements and costs. It is important for the City to set realistic levels of service (LOS), which support the City's goals and strategic plan. This section will outline the Transportation LOS, to help develop a better understanding of what is required to achieve and maintain desired performance.

3.2.1 Ontario's Requirements for Asset Management Planning

O.Reg. 588/17 requires municipalities to report current LOS performance in the AMP for core assets by July 1, 2022, and for non-core assets by July 1, 2024. There are two levels required from the regulation:

1. Legislated community levels of service – uses **qualitative** parameters to explain the desired LOS
2. Technical levels of service – uses **quantitative** metrics to explain the scope of service delivered

The LOS framework is explained in the following section.

3.2.2 Levels of Service Performance Metrics

The LOS in this AMP have been developed by taking a service-centric approach to AM. This is achieved by identifying the key customer-facing services and sub-services that the City provides and relating them to the assets that support the delivery of those services. Thus, asset-related decisions can be made and understood in the context of service attributes such as quality, safety, reliability, and environmental stewardship.

The performance measures were selected based on their applicability to the City's overall strategic goals.

The City's transportation service objective is to promote an integrated transportation system for the City through land use patterns, density, and design that supports pedestrians, cyclists, transit users, commercial traffic, and private vehicles. It is the intent of transportation policies that the system is safe, accessible, connected, and efficient, while minimizing environmental impacts and optimizing lifecycle costs.

The following sections shows the customer focused performance measures followed by the technical focused performance measures.

Customer Service Attribute: Safety

LOS Statement: Providing an operational and accessible transportation network that is safe for all modes and uses of the transportation network.

Table 12. Customer LOS for Safety (Transportation)

Performance Measure	2021 Performance
Description of road network in the municipality and its level of connectivity	Good connectivity of a range of arterial, collector and local roads throughout the City.
Description of the traffic that is supported by municipal bridges (e.g., heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, cyclists).	The City's bridges support a range of traffic types, including heavy and light vehicles, pedestrians and cyclists. They are used as part of major transportation routes that accommodate all types of travel including emergency response, transportation of goods/services, and personal travel.

Customer Service Attribute: Quality

LOS Statement: Providing a transportation network at the appropriate material quality with smooth and safe surfaces.

Table 13. Customer LOS for Quality (Transportation)

Performance Measure	2021 Performance
Description that illustrates the different levels of road class pavement condition.	The average OCI for Arterial, Collector and Local roads all fall within the range that the City considers Fair condition.
Description or images of the condition of bridges and how this would affect use of the bridges.	On average, the majority of bridges are in good condition, thus providing reliable bridge availability to the public.
Description or images of the condition of culverts and how this would affect use of the culverts.	On average, the majority of culverts are in good condition, thus providing reliable service to the public.
Percentage of rights-of-way assets that meet the target quality level	**Future**

Customer Service Attribute: Reliability

LOS Statement: Providing a transportation network that is reliable.

Table 14. Customer LOS for Reliability (Transportation)

Performance Measure	2021 Performance
Percentage of Assets that are meeting condition performance objectives.	92%

Technical Service Attribute: Safety

LOS Statement: Providing an operational and accessible transportation network that is safe for all modes and uses of the transportation network.

Table 15. Technical LOS for Safety (Transportation)

Performance Measure	2021 Performance
Number of lane-kilometres of each of arterial roads, collector roads and local roads as a proportion of square kilometres of land area of the municipality	Arterial = 1.1 Collector = 0.3 Local = 2.6
Percentage of bridges in the municipality with loading or dimensional restrictions.	0

Technical Service Attribute: Quality

LOS Statement: Providing a transportation network at the appropriate material quality with smooth and safe surfaces.

Table 16. Technical LOS for Quality (Transportation)

Performance Measure	2021 Performance
Average Pavement Condition Index (for paved roads)	50 OCI
Average Surface Condition (for unpaved roads)	62 OCI
For bridges in the municipality, the average bridge condition index value.	76 BCI
For structural culverts in the municipality, the average bridge condition index value	55 BCI
Percentage of regulated signs that meet retro reflectivity targets	**Future**

Technical Service Attribute: Reliability

LOS Statement: Providing a transportation network that is reliable.

Table 17. Technical LOS for Reliability (Transportation)

Performance Measure	2021 Performance
Percentage of road assets in poor or better condition	93%
Percentage of bridge assets in poor or better condition	86%
Percentage of sidewalk assets in poor or better condition	**Future**
# of potholes identified per lane km (by road classification)	**Future**

Technical Service Attribute: Optimized Whole Lifecycle Cost

LOS Statement: Providing a cost-efficient transportation network for all modes.

Table 18. Technical LOS for Optimized Whole Life Cycle Cost (Transportation)

Performance Measure	2021 Performance
Annual average of projected 10-year roadway and structure asset renewal budget as a Percentage of current replacement value	1.64%
Road preventative maintenance as a percentage of total maintenance	**Future**
Maintenance cost (non-winter control) per lane km	**Future**
Winter control cost per lane km	**Future**

3.3 Asset Lifecycle Management Strategy

This section of the Plan outlines the specific activities required to maintain the levels of service. The lifecycle strategies for each transportation asset were developed based on consultation with City staff and industry best practices. The following subsections summarize the lifecycle activities.

3.3.1 Lifecycle Activities

Some core assets, including roads and structures, are subject to certain lifecycle activities mandated by regulating bodies including the Provincial government. For instance, O.Reg. 239/02 Minimum Maintenance Standards, outlines requirements for road maintenance including but not limited to snow removal, potholes and cracks. Similarly, O.Reg. 104/97, Standards for Bridges, mandates biennial bridge inspections. These regulations help ensure that Ontario's transportation networks remain in a state of good repair and are safe for pedestrians, motorists and cyclists alike. These and other lifecycle strategies for roads and bridges and culverts are outlined in the following sections.
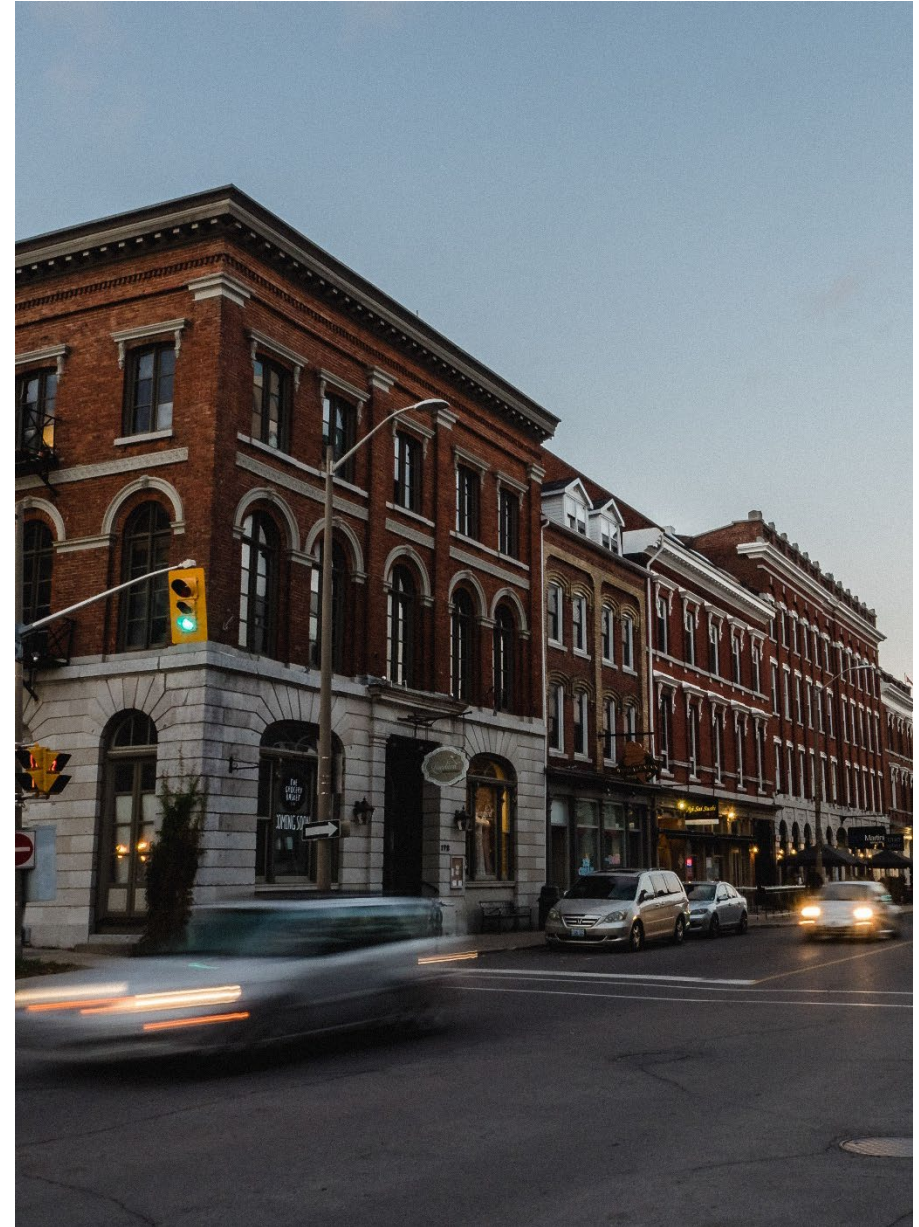
Non-Infrastructure Solutions

Actions or policies that can lower costs and extend useful lives.

Table 19. Non-Infrastructure Solutions (Road Network)

Description of Activities Practiced by the City	Frequency
Transportation Master Plans (TMP) (2015)	Next update in 2023-2024
Active Transportation Master Plan (ATMP)	To be updated as part of the next Transportation Master plan update.
Transit Five Year Business Plan	5-year cycle
Traffic Studies/Counts	Request-based with some planned/proactive
Pavement Condition Assessment	2-year cycle
Sidewalk Inspections	Annual
Official Plan reviews (and other related planning update)	
Development Charges Studies	5-year cycle – with next study required in 2024

Table 20. Non-Infrastructure Solutions (Bridge and Culvert)

Description of Activities Practiced by the City	Frequency
Environmental Assessments	As required
OSIM Inspections	Every 2 years
Transportation Master Plan	Every 5 years
Active Transportation Master Plan	Every 5 years

Maintenance Activities

Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events.

Table 21. Maintenance Activities (Road Network)

Description of Activities Practiced by the City	Frequency
Road Inspections as per the Minimum Maintenance Standards	As per O.Reg. frequency
Sweeping: Winter cleanup (all urban cross-sections)	Spring
Sweeping: Routine sweeping (roads and cycle lanes)	Downtown, cycling lanes 3 times per summer, as required based on customer service request or identified through road patrol
Sweeping: Fall sweeping (leaves)	Every fall
Line painting and pavement markings	Annual program (Water-borne lines repainted annually)
Crack Sealing	Prior to micro surfacing (annual program as per rehab strategies)

Additional maintenance as per findings of MMS inspections with frequency as identified through road patrol or customer reports are as follows for roads:

- Pothole patching
- Road cut repairs
- Curb repairs
- Guiderail damage
- Sign repairs/replacement

The following maintenance activities practiced by the City are at an as required frequency for roads:

- Ditching
- Catch basin repairs
- Manhole adjustments
- Road cut repairs

The following winter control activities practiced by the City are at an as required based on storm events frequency for roads:

- Plowing
- Sanding and Salting
- Anti-icing

The following outlines maintenance activities for bridge and culvert structures over 3 metres.

Table 22. Maintenance Activities (Bridge and Culvert)

Description of Activities Practiced by the City	Frequency
OSIM Inspections	Every 2 years
Expansion joint cleaning	Annual in the spring
Concrete sealing and cleaning	Every five years
Vegetation and debris removal	As required
Guiderail repairs	OSIM/Road Patrol
Cathodic Protection (including monthly inspections and maintenance on equipment)	Monthly

Maintenance activities for bridge and culvert structures under 3 metres are done on an as required frequency (establishing a formal program in the future) by visual inspections.

Renewal / Rehabilitation Activities

Significant repairs designed to extend the life of the asset.

Table 23. Renewal and Rehabilitation Activities (Road Network)

Description of Activities Practiced by the City	Frequency
Arterial and Collector Roads: Crack sealing and double micro-surfacing	When OCI is >65 and <80
Arterial and Collector Roads: Single micro surface treatment	When minimum - 5 years or OCI >65 and <80, performed a maximum of 2 times per asset.
Arterial and Collector Roads: Minor Mill and Overlay	When minimum - 5 years or OCI >50 and <65
Rural Surface Treated: Single surface treat	Every 7 years or when OCI >70 and <80
Rural Surface Treated: Pulverize and double surface treat	When OCI >40 and <55

Table 24. Renewal and Rehabilitation Activities (Bridge and Culvert)

Description of Activities Practiced by the City	Frequency
Repairs as identified by OSIM for structures over 3m	As per OSIM inspection recommendations

Road Network: Replacement / Construction Activities

Activities that are expected to occur once an asset has reached the end of its useful life and renewal/ rehab is no longer an option.

Table 25. Replacement / Construction Activities (Road Network)

Description of Activities Practiced by the City	Frequency
Arterial and Collector Roads: Full depth with local base repairs	When OCI >40 and <50
Arterial and Collector Roads: Full surface reconstruction and localized base repairs	When OCI <40
Rural Surface Treated: Reconstruction	When drainage or base failures are observed

Table 26. Replacement / Construction Activities (Bridge and Culvert)

Description of Activities Practiced by the City	Frequency
Bridge replacement	As per OSIM inspection recommendations
Replace culverts	When deemed end of useful life due to failure

Road Network: Disposal Activities

Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality.

Table 27. Disposal Activities (Road Network)

Description of Activities Practiced by the City	Frequency
Asphalt re-use	As required
Roadside ditch-cleanout screening and re-use (using as topsoil)	As part of the ditch-cleanouts
Contaminated and excess material disposal	As required through construction
Roadway decommissioning (land transfer agreements, and specific requirements)	As required

Table 28. Disposal Activities (Bridge and Culvert)

Description of Activities Practiced by the City	Frequency
Through construction	As required

Road Network:
Expansion / Growth / Service Improvement Activities

Planned activities required to extend services to previously unserved areas or expand services to meet growth demands.

Table 29. Expansion / Growth / Service Improvement Activities (Road Network)

Description of Activities Practiced by the City	Frequency
Widening	As identified through Official Plan
Retrofit to add Cycle Lanes	As identified through the ATMP and other studies
Various multi-modal transportation solutions	As identified through the ATMP, TMP and other studies
Pedestrian infrastructure improvements	As identified through the ATMP and neighborhood studies
Pedestrian crossing addition/improvements	As identified through the ATMP and neighborhood studies
New sections of road	As identified through the Official Plan/Subdivision Plan/TMP
Right of way service enhancements/reductions	As identified through the ATMP, neighborhood studies, as opportunities are identified
Cross section adjustments/conversions	As identified through the Subdivision Design Guidelines, TMP
Active Transportation infrastructure addition	As identified through the ATMP
On demand changes as per development	As identified through the Development applications

Table 30. Expansion / Growth / Service Improvement Activities (Bridge and Culvert)

Description of Activities Practiced by the City	Frequency
Identified through Council/City Strategic Planning	Every 4 years
Access to subdivision	As identified in the TMP
Addition of sidewalks and AT infrastructure	As required
Bridges/MTO/Rail	As required

3.3.2 Funding the Lifecycle Activities

The City uses the lifecycle strategies described in Section 3.3 to plan work and determine future expenditure needs. The technical LOS used in the AM analysis for Transportation assets was defined as maintaining the current portion of assets with poor or better performance. The cost to maintain this scenario was determined to be $65.5M annually over a 10-year period and resulted in the performance forecast shown in Figure 14. The percentage of assets in poor or better condition would hold around 91%.

Figure 14. Transportation Performance Forecast for Cost to Maintain LOS
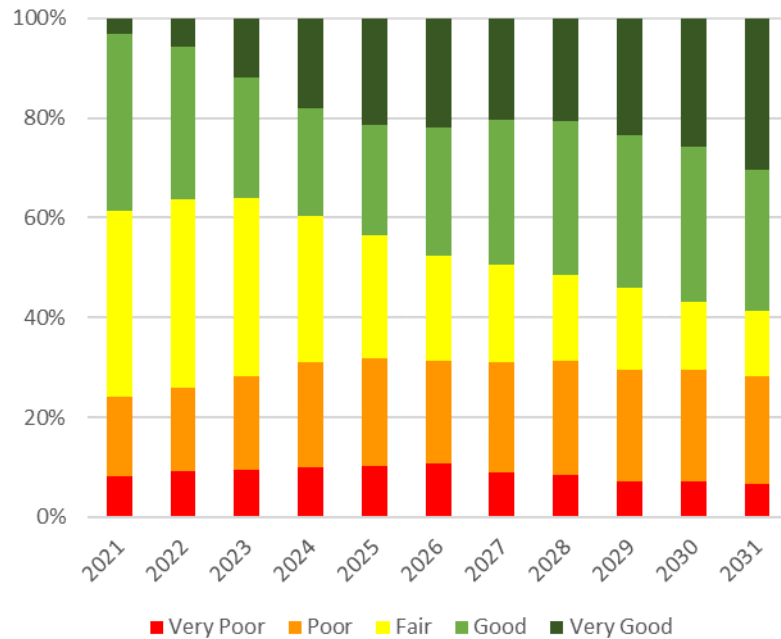
Stormwater

Stormwater Collection

Total Replacement Value	$382,670,646
Overall Average Condition	Fair

4.0 Stormwater

Stormwater management is crucial to reduce the effect of excessive and contaminated runoff from urban areas. The City of Kingston has placed an emphasis on stormwater quality, specifically by i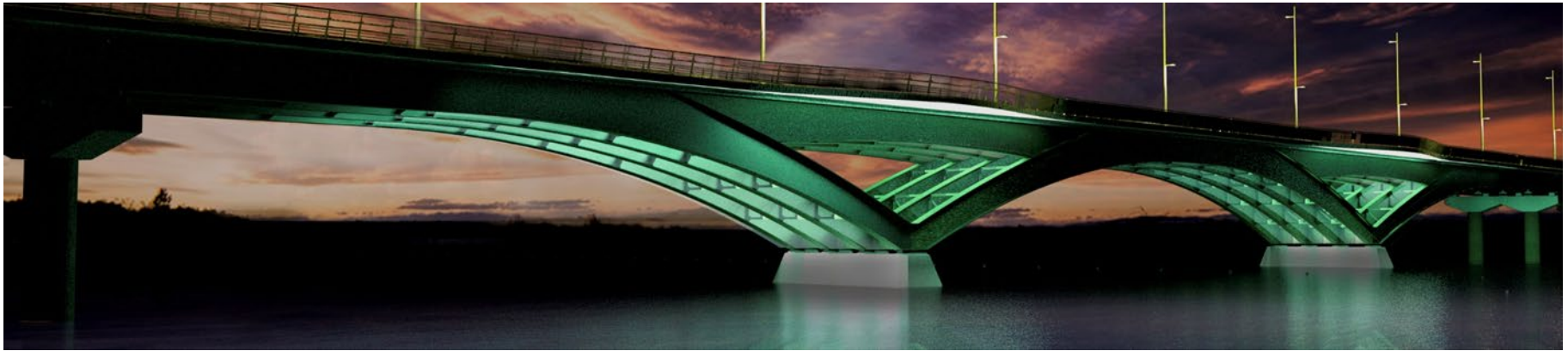mplementing the "Fish and Frogs Forever Program", to educate citizens about the impacts on water pollution to their local aquatic ecosystems. The City's strategic plan also emphasizes environmental sustainability and stewardship to safeguard future generations. Through the development of the Core Asset Management Plan, an inventory of the transportation assets, and financial planning to help achieve current goals was reviewed.

4.1 State of the Local Infrastructure

4.1.1 Asset Inventory and Valuation

Stormwater management has become an increasingly important topic as municipalities around Canada experience an increase in storm events regarding both frequency and severity. The City of Kingston is responsible for maintaining and replacing its stormwater assets when necessary and ensuring a

high level of performance for both the urban and rural areas. The stormwater asset group has been broken down into secondary levels of assets, which includes storm structures, mains, ponds and outlets.

The replacement cost for the entire stormwater system is approximately $400 million. This is shown compared to its financial valuation in Table 31. Financial valuation differs from replacement costs as it is based on the initial costs of construction and applies depreciation over time, up until the current year; whereas replacement costs represent how much it would cost to replace the asset in today's dollars.

Table 31. Financial Accounting and Replacement Cost Valuation (Stormwater)

Financial Accounting Valuation	Replacement Valuation
$144,248,853	$382,670,646

Figure 15 and Table 32 below presents the stormwater asset portfolio broken down into its different categories. Stormwater mains make up much of the portfolio and are valued at approximately $383 million in replacement costs or 95% of the entire portfolio.

Figure 15. Asset Categories by Replacement Value (Stormwater)
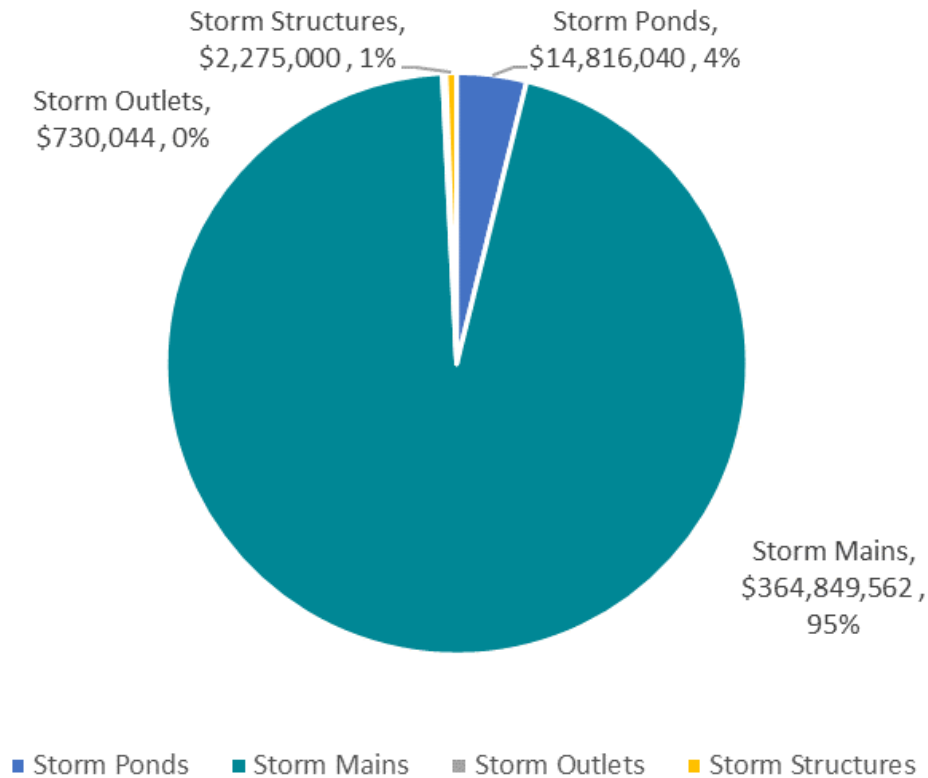
Table 32. Asset Quantities and Replacement Values (Stormwater)

Category	Asset	Count	Unit	Replacement Value
Stormwater Collection	Storm Ponds	29	Each	$14,816,040
Stormwater Collection	Storm Mains	334	Kilometer	$364,849,562
Stormwater Collection	Storm Outlets	42	Each	$730,044
Stormwater Collection	Storm Structures	35	Each	$2,275,000
Total Stormwater				**$382,670,646**

4.1.2 Asset Age Summary

Figure 16 summarizes the average age of assets in the stormwater portfolio compared to the average estimated service life. Presenting the asset portfolio in this manner provides a quick snapshot of where the stormwater assets generally are in their lifecycle, which in turn provides overall condition based on age. On average, each asset category in the stormwater portfolio is early in its lifecycle, with storm ponds, outlets and structures all having 70% or more remaining useful life; storm mains are older on average and have approximately 50% of their average ESL's remaining.

Figure 20 on the following page presents the year of construction for stormwater assets by replacement costs. It should also be noted that the portion of the graph that represents construction that occurred before 1960 had to be altered to make the rest of the data more readable. The current asset registry indicates that replacement costs for storm mains constructed prior to 1960 amount to $95 million.

It should be noted that 30% of storm outlets and 85% of storm structures were missing construction date. The average age had to be used to fill the data gaps. The City has plans towards improving the stormwater data in the coming years.

Figure 16. Average Asset Age as a Proportion of Average Asset ESL (Stormwater)
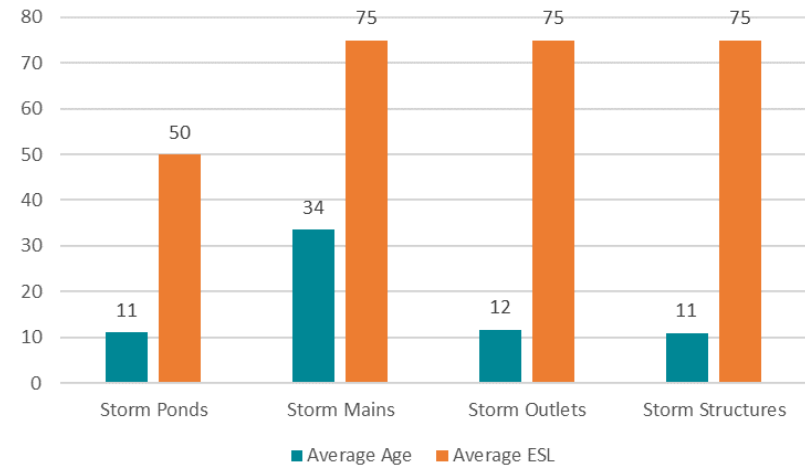
Figure 17. Construction Years by Replacement Value (Stormwater)
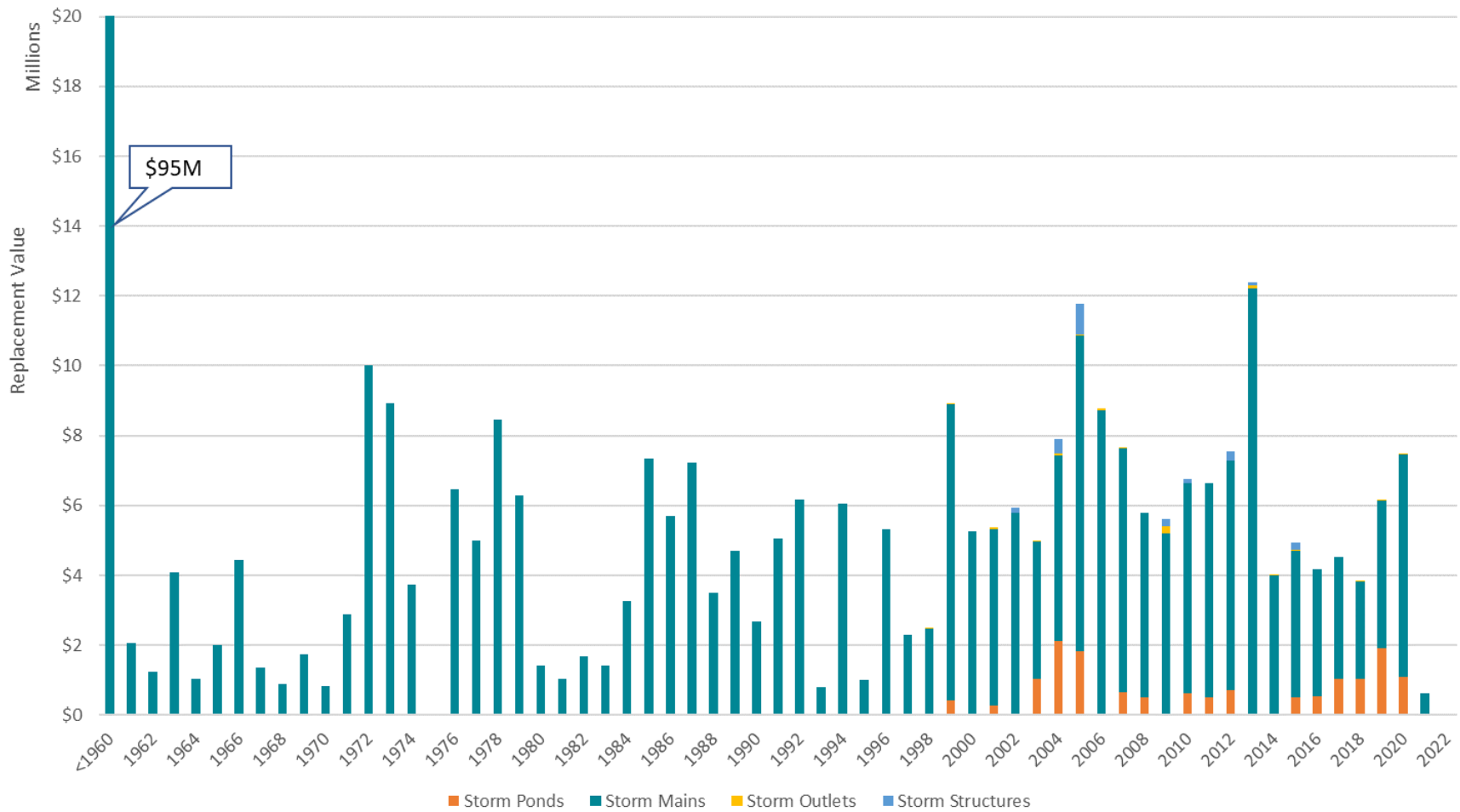
4.1.3 Asset Condition

Asset condition for all stormwater assets has been determined using age as limited CCTV data was available at the time of developing this plan. At present CCTV inspections of storm sewers are completed on an as required basis (e.g., maintenance concern, pre-design, or post construction) however a new annual inspection program is planned and budgeted to commence in 2022. Table 33 presents the logic used to convert age as a proportion of remaining useful life into a condition rating.

Figure 18 presents the asset condition distribution by replacement value. Since condition was determined based on age for all stormwater assets, this is in alignment with the age data presented in the preceding section. Overall, the stormwater portfolio is in the good or very good rating categories, except for a portion of the storm mains and storm ponds.

Table 33. Condition Rating Scale and its Asset Condition Values (Stormwater)

Condition Rating	Stormwater Mains: % of ESL remaining (non-linear)	Remaining Assets: % of ESL remaining (linear)
Very Good	100%	100%
Good	55%	75%
Fair	35%	50%
Poor	15%	25%

Figure 18. Condition Distribution by Replacement Value (Stormwater)
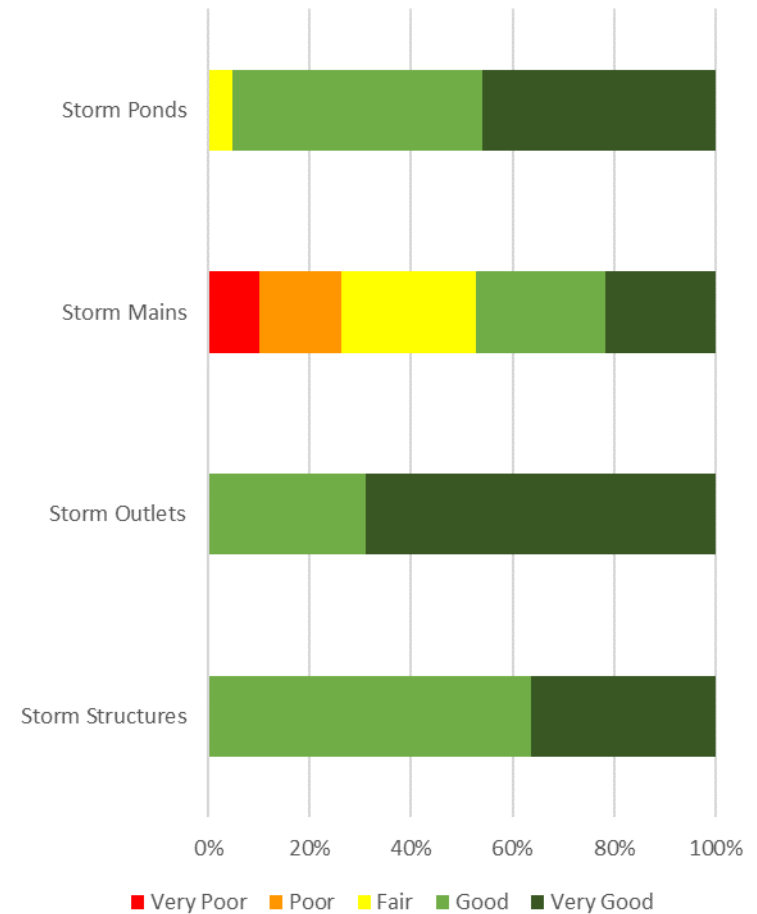
4.1.4 Data Sources and Confidence

Each individual record was assessed for accuracy, reliability and assigned a confidence score according to an agreed upon framework. This will allow the City to identify the specific asset data that has low confidence, as well as be able to communicate overall confidence scores in the future. All data was extracted from the City's inventories at the end of 2021. Table 34 below provides the data confidence ratings for each stormwater asset category.

Table 34. Data and Confidence (Stormwater)

Asset Category	Confidence Rating	Confidence Comment
Storm Ponds	Medium	16% of ponds missing Area values, 6% missing installation/rehabilitation dates.
Storm Mains	Medium	0.4% missing size information. No condition assessment data available. CCTV inspections currently only completed as part of new construction and development.
Storm Outlets	Medium	30% of assets missing installation/rehabilitation dates.
Storm Structures	Low	85% of assets missing Installation/Rehabilitation Dates

4.2 Levels of Service

4.2.1 Ontario's Requirements for Asset Management Planning

O.Reg. 588/17 requires municipalities to report current LOS performance in the AMP for core assets by July 1st, 2022, and for non-core assets by July 1st, 2024. There are two levels required from this regulation:

1. Legislated community levels of service – uses **qualitative** parameters to explain the desired LOS
2. Technical levels of service – uses **quantitative** metrics to explain the scope of service delivered

The City has established both levels for the required stormwater facilities, which are explained in the following section.

4.2.2 Other Levels of Service Performance Metrics

As previously mentioned, the LOS in this Plan has been developed by taking a service-centric approach to AM. This is achieved by identifying the key customer-facing services and sub-services that the City provides and relating them to the assets that support the delivery of those services. Thus, asset-related decisions can be made and understood in the context of service attributes such as quality, reliability and environmental stewardship.

The City's Stormwater service objective is to provide sufficient capacity and reliability for the effective and sustainable drainage of stormwater quality and quantity to both protect and benefit the community and environment.

Table 35 to Table 39 show the performance measures which are customer and technical focused respectively.

Customer Service Attribute: Reliable

LOS Statement: Providing stormwater services with minimal impact to the community.

Table 35. Customer LOS for Reliability (Stormwater)

Performance Measure	2021 Performance
Description 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.	Urban areas protected from ROW/ infrastructure flooding through urban ditch system or underground storm collection, some with defined outlets. Most rural areas protected from flooding through provision of municipal drains or rural ditch systems, some with defined outlets

Customer Service Attribute: Environmental Stewardship

LOS Statement: Providing stormwater services that protect and benefit the environment.

Table 36. Customer LOS for Environmental Stewardship (Stormwater)

Performance Measure	2021 Performance
Percentage of community with stormwater quality control	Future

Technical Service Attribute: Reliable

LOS Statement: Providing stormwater services with minimal impact to the community.

Table 37. Technical LOS for Reliability (Stormwater)

Performance Measure	2021 Performance
Percentage of stormwater mains in poor or better condition	90%
Percentage of ponds in poor or better condition	100%
Percentage of properties in municipality resilient to a 100-year storm	90%
Percentage of the municipal stormwater management system resilient to a 5-year storm	95%

Technical Service Attribute: Environmental Stewardship

LOS Statement: Providing stormwater services that protect and benefit the environment.

Table 38. Technical LOS for Environmental Stewardship (Stormwater)

Performance Measure	2021 Performance
Percentage of stormwater management ponds, oil-grit separator units, and storm outfalls in compliance with Environmental Compliance Approval requirements for water quality	Future

Technical Service Attribute: Cost Efficient

LOS Statement: Providing stormwater services in an efficient manner.

Table 39. Technical LOS for Cost Efficiency (Stormwater)

Performance Measure	2021 Performance
Capital investment vs sustainable investment forecast	Future

4.3 Asset Lifecycle Management Strategy

This section of the Plan outlines the specific activities required to maintain the levels of service. Defining a set of preferred lifecycle activities for each asset is important to maintain coordination of investments and optimize the asset lifecycle. The lifecycle strategies for stormwater assets were developed based on consultation with City staff and industry best practices and are summarized in the following subsections.

4.3.1 Lifecycle Activities

These activities form the basis of an Asset Management Strategy section of the City's AMP. This will enable the City to establish and report on possible options for which lifecycle activities could potentially be undertaken to maintain the current levels of service as well as the associated risks and costs. This reporting is necessary to meet the requirements of O.Reg. 588/17. The lifecycle strategies for stormwater assets and ponds are provided in Table 40 to Table 50, respectively.

Non-Infrastructure Solutions

Actions or policies that can lower costs and extend useful lives.

Table 40. Non-Infrastructure Solutions (Stormwater Mains)

Description of Activities Practiced by the City	Frequency
Master Plans	5-10 years
Flood studies	As required
Capacity Studies/Analysis	As required, require 20% reduction in post-development flows where there is a capacity constraint
Stormwater model	Not established but plans to implement in the future (long term)
CCTV Inspections	Following construction and commissioning. An Inspection program is planned and budgeted to commence in 2022

Table 41. Non-Infrastructure Solutions (Stormwater Ponds)

Description of Activities Practiced by the City	Frequency
Bathymetric Surveys	As required (establishing a formal program in the future, currently not an immediate need based on the age of ponds)
Master Plans	5-10 years
Flood studies	As required
Capacity Studies/Analysis	As required, require 20% reduction in post-development flows where there is a capacity constraint
Stormwater model	Not established but plans to implement in the future (long term)

Maintenance Activities

Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events.

Table 42. Maintenance Activities (Stormwater Mains)

Description of Activities Practiced by the City	Frequency
Spot Repairs	As required
Flushing	Prior to CCTV, based on identified issues, and following construction and commissioning

Table 43. Maintenance Activities (Stormwater Ponds)

Description of Activities Practiced by the City	Frequency
Inspection	Annual
Grate cleaning	As required
Vegetation removal	Annual

Renewal / Rehabilitation Activities

Significant repairs designed to extend the life of the asset.

Table 44. Renewal and Rehabilitation Activities (Stormwater Mains)

Description of Activities Practiced by the City	Frequency
Relining	Not currently done but plan to implement in the future

Table 45. Renewal and Rehabilitation Activities (Stormwater Ponds)

Description of Activities Practiced by the City	Frequency
Erosion control	As identified through the annual inspection
Outlet reconstruction	As identified through the annual inspection
Outfall reconstruction	As identified through the annual inspection
Dredging/Cleanouts (include the pond forebay and main pond areas)	As identified through the annual inspection

Replacement / Construction Activities

Significant repairs designed to extend the life of the asset.

Table 46. Replacement / Construction Activities (Stormwater Mains)

Description of Activities Practiced by the City	Frequency
Full pipe replacement (coordinated)	As required
Repair/Replacement (Collaboration and Coordination with Utilities Kingston for repair and replacement of infrastructure as a joint reconstruction project. The City manages the repair and replacement of stormwater assets)	Per Engineering Services multi-year (4 year) infrastructure plan as approved by City Council based on terms of Council.

Replacement and construction activities are not applicable to stormwater ponds.

Disposal Activities

Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the municipality.

Table 47. Disposal Activities (Stormwater Mains)

Description of Activities Practiced by the City	Frequency
Removed as part of the project or abandoned	As required

Table 48. Disposal Activities (Stormwater Ponds)

Description of Activities Practiced by the City	Frequency
Sediment disposal	As required

Expansion / Growth / Service Improvement Activities

Planned activities required to extend services to previously unserved areas or expand services to meet growth demands.

Table 49. Expansion / Growth / Service Improvement Activities (Stormwater Mains)

| Description of Activities Practiced by the City	Frequency
Pipe upsizing	As identified in the Master Plan, Flood studies and Capacity Studies/Analysis
Combined Sewer Separation	Led by Utilities Kingston
New subdivisions	Through development
Replacement of ditches with storm sewers	As identified in the Master Plan, Flood studies and Capacity Studies/Analysis
Coordination with other works	As required

Table 50. Expansion / Growth / Service Improvement Activities (Stormwater Ponds)

Description of Activities Practiced by the City	Frequency
Expansion	Through development

4.3.2 Funding the Lifecycle Activities

The City uses the lifecycle strategies described in Section 4.3 to plan work and determine future expenditure needs. The technical LOS used in the AM analysis for Stormwater assets was defined as maintaining the current portion of assets with poor or better performance. The cost to maintain this scenario was determined to be $2.4M annually over a 10-year period and resulted in the performance forecast shown in Figure 19. The percentage of assets in poor or better condition holds around 90%.

Figure 19. Stormwater Performance Forecast for Cost to Maintain LOS
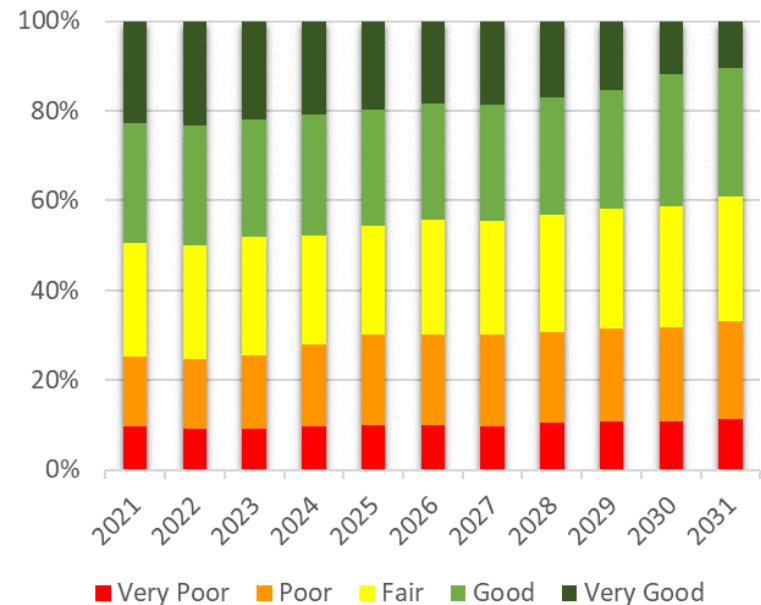
5.0 Improvement and Monitoring

This asset management plan is intended to be a living document that is updated at recurring intervals. A key component of asset management is ensuring continuous improvement of asset management practices. This section outlines strategies to be implemented for improving the asset management plan, as well as overall improvements to the asset management program at the City.

5.1 Improving Future Asset Management Plans

Data gaps and the assumptions made to fill them serve as a good basis from which improvements can be made. Addressing these will improve data quality and confidence and thus improve the analysis used for future iterations of the City's AMP. The City will begin the work required to develop similar asset management plans for all non-core assets to meet the O. Reg 588/17 requirement of July 1, 2024. Table 51 below outlines some opportunities for improvement related to the Transportation and Stormwater data.

Table 51. Opportunities for Improvement

Section	Opportunity
Transportation	**Bridges & Culverts**: Efforts will be made to complete gaps in data related to installation years and condition data. This will result in fewer assumptions being made and thus a more robust data set for lifecycle forecasting. **Retaining Walls**: To date, eight assets have been included in the registry. Crucial data related to installation year and condition will be updated by including these assets in future inspection programs. **Roads:** A high confidence in roads data will continue to be maintained by continuing to employ industry best practices as they evolve.
Stormwater	**Ponds, outlets and structures**: This data was generally ranked as low to medium confidence. Plans are in place to gather missing data for installation and rehabilitation dates. Additionally, these assets should be included in a visual inspection program so that condition data in future does not have to be assumed based on age. **Mains:** An opportunity exists to improve the City's current CCTV inspection program. Moving forward, these inspections should be carried out in accordance with NASSCO 7 to ensure well defined practices and procedures are being used. Additionally, it is important to gather missing information on pipe diameter so that appropriate ESLs and replacement costs can be assigned. This initial action is planned to commence in the last half of 2022.

5.2 Advancing Corporate Asset Management Capabilities

5.2.1 Asset Management Maturity Assessment

In the development of this AMP, an Asset Management Maturity Assessment was carried out with various stakeholder groups across the City of Kingston. This exercise engaged stakeholders from 19 different groups covering 16 categories associated with enterprise asset management. This exercise provided a snapshot of the current state of AM practices and established a target for where those practices could be in three and five years. Groups that participated in the survey and subsequent workshops included:

- Airport Services
- Climate Leadership
- Corporate Asset Management & Fleet Services
- Cultural Services
- Engineering Services
- Facilities Management & Construction Services
- Financial Services
- Fire & Rescue
- Housing & Social Services
- Information Systems & Technology
- Major Projects Office
- Planning, Building & Licensing Services
- Public Works
- Recreation & Leisure Services
- Rideaucrest Long Term Care
- Solid Waste Services
- Transit
- Transportation & Parking Services

The maturity assessment was based on industry best practices from the International Infrastructure Management Manual (IPWEA, 2015), and the ISO 55000 Series of Standards (ISO/IEC, 2014). In advance of the workshops, an online survey was developed and distributed to stakeholders to capture key information. The survey asked participants to identify the current and target (3-year and 5-year) maturity against the key categories of asset management listed below:

- Asset Condition
- Asset Management Decision-Making
- Asset Management Framework and Strategy
- Asset Management Plans
- Asset Management Service Delivery Models (Internal and external)
- Asset Management Team
- Asset Register Data
- Capital Planning
- Continuous Improvement
- Demand Forecasting
- Financial and Funding Strategies
- Information Systems
- Levels of Service
- Management Systems
- Operations and Maintenance Planning
- Risk Management

Each question was rated according to a defined scale of one (1) to five (5) as shown in Table 52.

Overall, 28 participants from the City believe the current state of AM practices to be at approximately "2", meaning "The processes and capabilities are in development or are partially implemented" and have set a 5-year target of approximately "4" – "The activities are fully developed, implemented and are being integrated". Detailed results are included in the following section. The results observed are typical to those of most municipalities beginning their Asset Management program.

The aggregate scores for all of the ratings are shown in Figure 20 and Table 53. It should be noted that the graph and table summarize the average overall results by each stakeholder group equally and is not weighted nor accounted for the value of the asset portfolio. An individual radar chart has also been developed for each of the stakeholder groups. This information provides an understanding of opportunities for improvement. For example, Asset Management Plans ranks amongst the lowest for the current state, yet with the upcoming O.Reg. 588/17 requirement deadlines, the City should see a significant improvement in this category.

Table 52. Maturity State Descriptions

Numerical Rating	Maturity Level	Description
1	Aware	The organization is aware of the benefits of the capability/processes; however, no implementation has started
2	Basic	The processes/capability are in development or are partially implemented.
3	Core	The organization's processes/capabilities are developed and implemented.
4	Intermediate	The activities are fully developed, implemented and are being integrated
5	Advanced	The processes are fully implemented, optimized and are being continually improved.

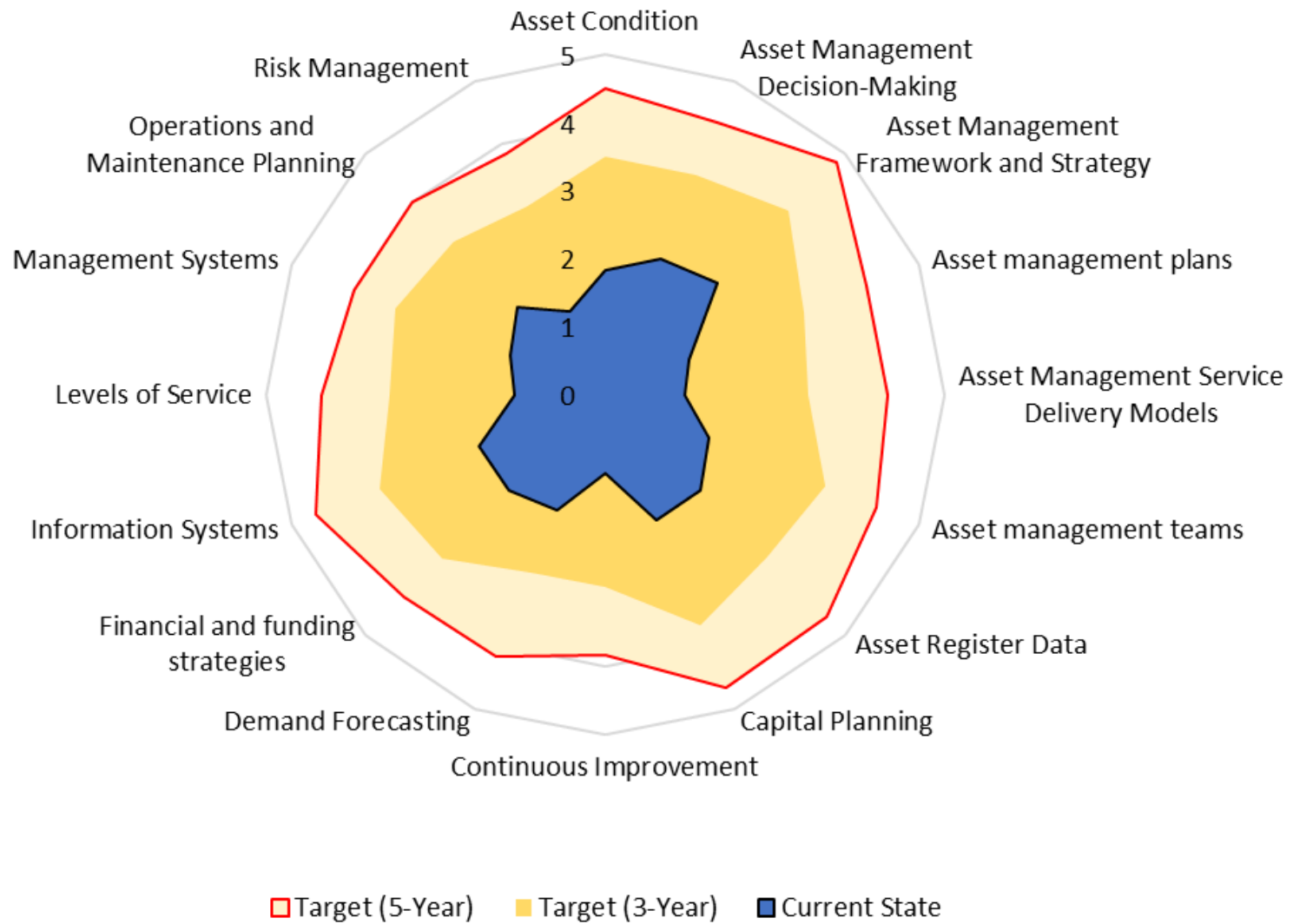**Figure 20. Asset Management Maturity Assessment Results (Radar Chart)**

Table 53. Asset Management Maturity Assessment Results (Tabulated)

Category	Target (5-Year)	Target (3-Year)	Current State
Asset Condition	4.50	3.50	2.33
Asset Management Decision-Making	4.50	3.46	2.18
Asset Management Framework and Strategy	4.61	3.46	2.11
Asset Management Plans	4.07	3.00	1.69
Asset Management Service Delivery Models (Internal and External)	4.14	3.14	1.78
Asset Management Teams	4.32	3.32	1.84
Asset Register Data	4.53	3.38	2.41
Capital Planning	4.32	3.36	2.36
Continuous Improvement	4.29	3.04	1.63
Demand Forecasting	4.07	2.89	1.93
Financial and Funding Strategies	4.33	3.33	2.27
Information Systems	4.30	3.19	1.96
Levels of Service	4.39	3.25	2.11
Management Systems	4.11	3.21	1.85
Operations and Maintenance Planning	4.11	3.18	2.00
Risk Management	4.43	3.46	2.11
Grand Total:	**4.32**	**3.26**	**2.05**

Overall, the City of Kingston is taking significant steps forward in the asset management journey. The City has recently reviewed the current maturity, best practices and technology environment and recommended a future state and implementation. Several recommended initiatives have been identified and a review of resourcing requirements is currently under development.

To move to a more optimal future state from a technological perspective, the City will follow these guiding principles:

1. **Commitment to Asset Register:** The ideal state would be to transition to a centralized repository that includes all data required for forecasting performance and measuring levels of service for all asset groups (e.g. ArcGIS), capturing 100% of all assets owned to a level that is achievable and sustainable for continuous updates. However, a more appropriate approach would be to focus on asset classes / categories where limited data exists and incorporate them into the corporate register. Therefore, it is recommended to minimize the number of repositories and have a policy to review existing solutions before a new one is implemented. A review of a consolidated decision support tool will be evaluated as part of a longer-term strategy.

2. **Application and System Integration:** Once an asset register platform is established, we will define what information will be hosted within the register itself while defining what systems will integrate directly with the asset register.

3. **Accountability for Data:** The key to success of this initiative is to ensure data is consistent and reliable, which requires a clear understanding of who is accountable and responsible for data. This requires the need for clear definitions of the roles and responsibilities for data management. Therefore, a data governance framework and policy will be implemented at a future date.

4. **Comprehensive Data Management Work Processes:** Once a clear definition of what information will be maintained within the asset register, it is critical to audit and develop comprehensive strategies around all work processes that capture assets and asset information, such as updating asset information and retiring assets while maintaining historical data. Building confidence in the asset register data along with implementing processes to maintain this information will be critical to the long-term success of this initiative.

5. **Data Reporting Strategy:** The objective of the asset register is to provide information to support AM process requirements, of which a significant requirement is reporting. City staff will be working to clearly define reporting requirements while ensuring the processes to input and maintain Asset Register information is clearly outlined and understood.

While each of these initiatives and roadmap items have been identified with absolute starts and finishes implementing them will be more than just a set of projects, but rather a continuous improvement program that forms the basis for the City's overall asset management journey over the long-term. Included within the roadmap is a preliminary analysis of future resourcing requirements for implementation. This is still being refined at the time of the finalization of this report, but any resourcing requirements will be addressed through the approval of the 2023 capital and operating plans. To enhance, assist and drive success a continuous learning and staff training program will be developed through the adoption of an Asset Management Training Program supported by Human Resources (Organizational Development), Corporate Asset Management and the Asset Management Steering Committee.