FINAL

City of Sault Ste. Marie
Fleet Asset Management Plan

June 2024

City of Sault Ste. Marie
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Revision History

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1. Introduction

AECOM Canada Ltd. (AECOM) was retained by The City of Sault Ste. Marie (the "City") to develop an asset management plan (AMP) to comply with the requirements of Ontario Regulation 588/17 (O. Reg. 588/17) in respect to its non-core municipal infrastructure assets. The scope of work for this investigation is outlined in AECOM's proposal dated May 25th, 2023, and subsequent project correspondence.

1.1 Background

Sault Ste. Marie is a city located on the St. Mary's River, north of the United States of America, bordering three of the Great Lakes with an estimated population of 72,051 (2021). The City provides a wide range of public services to their constituents, with the public expectation that these services function efficiently at a certain level. The provision of these services requires the management of the physical assets to meet desired service levels, manage risks, and provide long-term financial sustainability. These assets include, but are not limited to roads, bridges, sidewalks, wastewater assets, stormwater management assets, landfill, fleets, buildings, and parks.

In accordance with the terms of reference for this assignment, it is understood that the City is proceeding with an AMP to comply with the second phase of the regulatory requirements in respect to its non-core municipal infrastructure assets, in accordance with O. Reg. 588/17, by July 1st, 2024. The non-core assets to be covered in the scope, as defined by the regulation, include the City's protection services, solid waste, parks and cemetery, facilities, fleet, roadway appurtenances, and active transportation.

1.2 Objectives

The objective of this AMP is to deliver a financial and technical roadmap for managing the City's fleet assets and to provide the means for the City to maximize value from its assets, at the lowest overall expense, while at the same time enhancing service levels for its residents. Furthermore, the objective of this AMP is to align with the guidelines laid out in the City's Strategic AM Policy and Section 5 of Ontario Regulation (O. Reg.) 588/17.

Mercury Associates, Inc (Mercury) has conducted a comprehensive review of the City's fleet operations for the Public Work and Engineering Service (PWES) fleets in 2021, known as "Fleet Practices Review Final Report". The project scope consisted of four main components, including fleet benchmarking, cost of service, management practice review, and rightsizing study.

Organizations that implement good asset management (AM) practices will benefit from improved business and financial performance, effective investment decisions, and better risk management. Stakeholders can expect lower total asset life cycle costs, higher asset performance, and confidence in sustained future performance.

1.3 AM Provincial Requirements

The O. Reg. 588/17 came into effect in 2018 and stipulates specific AM requirements to be in place within Ontario municipalities by certain key dates (**Table 1-1**). The development of this AMP is one of the steps to guide the City towards meeting the July 1st, 2024, deadline.

Table 1-1: O. Reg. 588/17: AM Planning for Municipal Infrastructure

Description: A regulation made under the Infrastructure for Jobs and Prosperity Act, 2015, stating that every municipality shall prepare and update a Strategic AM Policy, and that every municipality shall prepare an AM Plan for its core infrastructure assets by July 1, 2022, and an AM Plan for all other infrastructure assets by July 1, 2024. The regulation outlines several requirements that each AM Plan must follow, such as including current and proposed level of service. Core municipal infrastructure assets include water, wastewater, stormwater, road, and bridge assets.	
Deadline Date	**Regulatory Requirement**
July 1st, 2019	All municipalities are required to prepare their first Strategic AM Policy.
July 1st, 2022	All municipalities are required to have an AM Plan for its entire core municipal infrastructure (i.e., water, wastewater, stormwater, roads, and bridges & culverts).
July 1st, 2024	All municipalities are required to have an AM Plan for infrastructure assets not included under their core assets.
July 1st, 2025	All AM Plans must include information about the LoS that the municipality proposes to provide, the lifecycle activities and associated costs needed to achieve those LoS, available funding, any funding shortfalls, and the risk of failing to meet the proposed LoS.

1.4 Scope

The following elements are included within the scope of this AMP:

- A summary of the asset inventory, including the replacement cost of the assets, the average age of the assets, the condition of the assets, and data gap analysis (**Section 2**).
- The City's level of service (LoS) objectives, stakeholder identification, LoS framework, and future demand drivers (**Section 3**).
- Asset lifecycle management strategies and funding needs to maintain current LoS, minimize associated asset risks, and to optimize costs over the whole lifecycle of the asset (**Sections 4** and **5**).

1.5 Relationship to Other Corporate Documents

This AMP is a tactical plan which links "top-down" strategic objectives with "bottom-up" operational activities. **Figure 1-1**Figure 1-1: The City's AM Line of Sight demonstrates the line-of-sight between AM strategic objectives and tactical and operational AM elements, including the relationship this AMP has to the other plans in the City's hierarchy of documents.

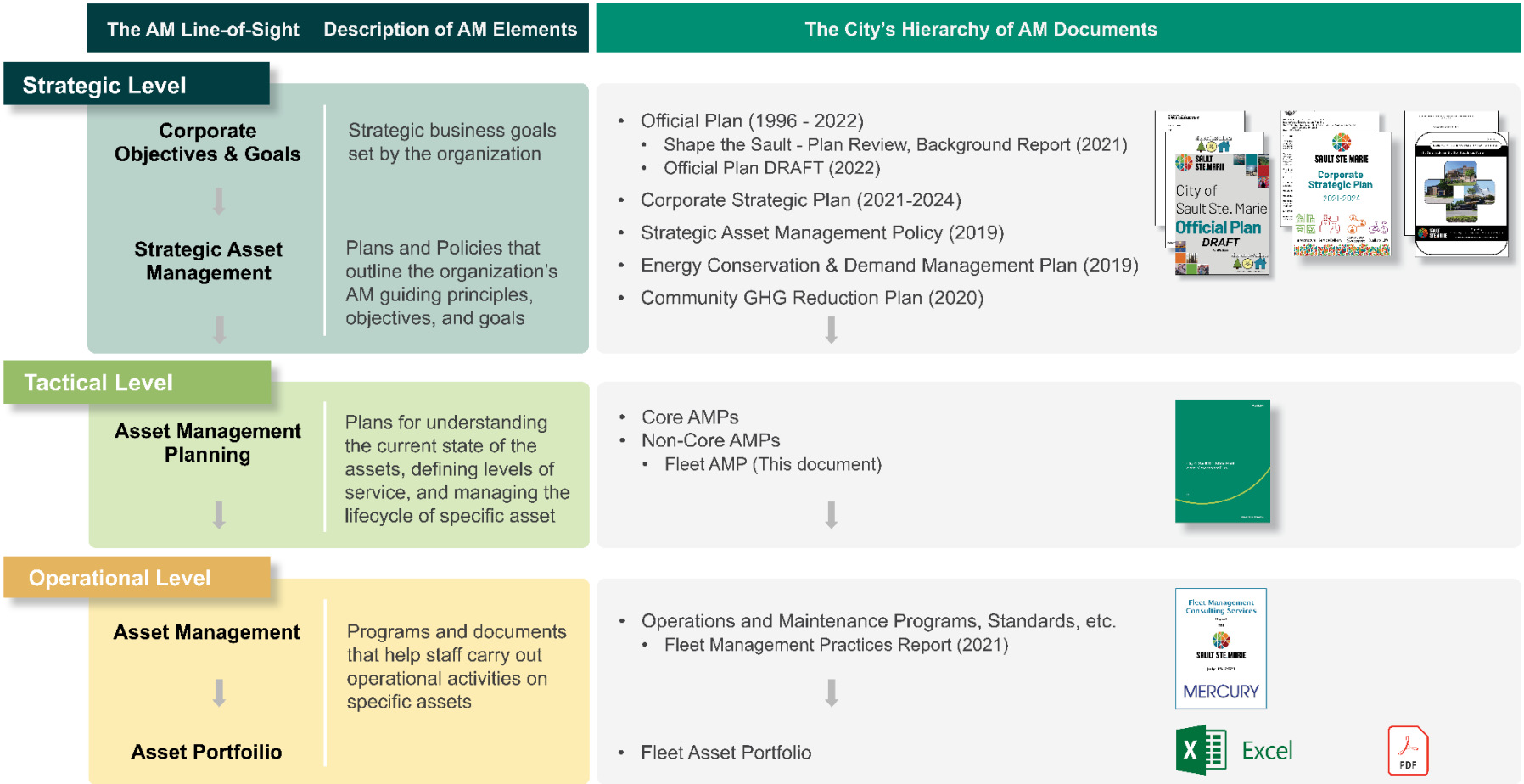

Figure 1-1: The City's AM Line of Sight

2. State of Infrastructure

Fleet assets are managed by the Fleet Management Division, who provides service for all City's operational vehicles, public transit vehicles, public work, transit, and arena equipment, except those used by the City's Fire and Rescue and Police Service. Almost all other City department utilize vehicles/equipment for their day-to-day operation and public service activities. Fleet Management is responsible for maintaining these fleet assets in a timely and efficiently manner to support the continuous delivery of City services every day. Currently, Fleet Management Division manages over 600 assets that range significantly in both complexity and value. Fleet Management Services provides all the licensing, registration, and insurance of the vehicles and maintains preventative maintenance activities.

The inventory of fleet is a comprehensive catalog detailing the quantity, condition, and specifications of these components within the City. By analyzing the inventory and assessing the data gaps, this section facilitates informed decision-making and strategic resource allocation, providing essential insights into the maintenance needs and financial requirements.

2.1 Asset Hierarchy

To fulfill the requirements of O. Reg. 588/17 and to pave the way for robust long range asset management planning, the City necessitates a logically segmented asset breakdown structure (hierarchy) within the ambit of this AMP. Achieving this requires a sufficiently granular classification of Fleet assets, enabling the identification of individual assets due for renewal. Striking the right balance is also crucial, as there is a fine trade-off between ensuring adequate granularity to provide essential information and avoiding excessive granularity that could make the effort to collect and manage information more burdensome than the usefulness derived from it.

In **Figure 2-1**, the hierarchy of Fleet is illustrated, showcasing four main categories: Public Work and Engineering Service (PWES) Fleet, Community Development and Enterprise Service (CDES) Fleet, Public Work (PW) Equipment, and Community Service Department (CSD) Equipment. Each category is further broken down into subcategories. This asset hierarchy establishes a logical indexing of the City's fleet assets, categorizing them into primary (parent) and secondary (child- and grandchild) assets. Such a structure forms the foundational framework for subsequent discussions and analysis, enabling the drill-down to a specific asset within the hierarchy to support maintenance planning or track costs at the asset level or higher levels.

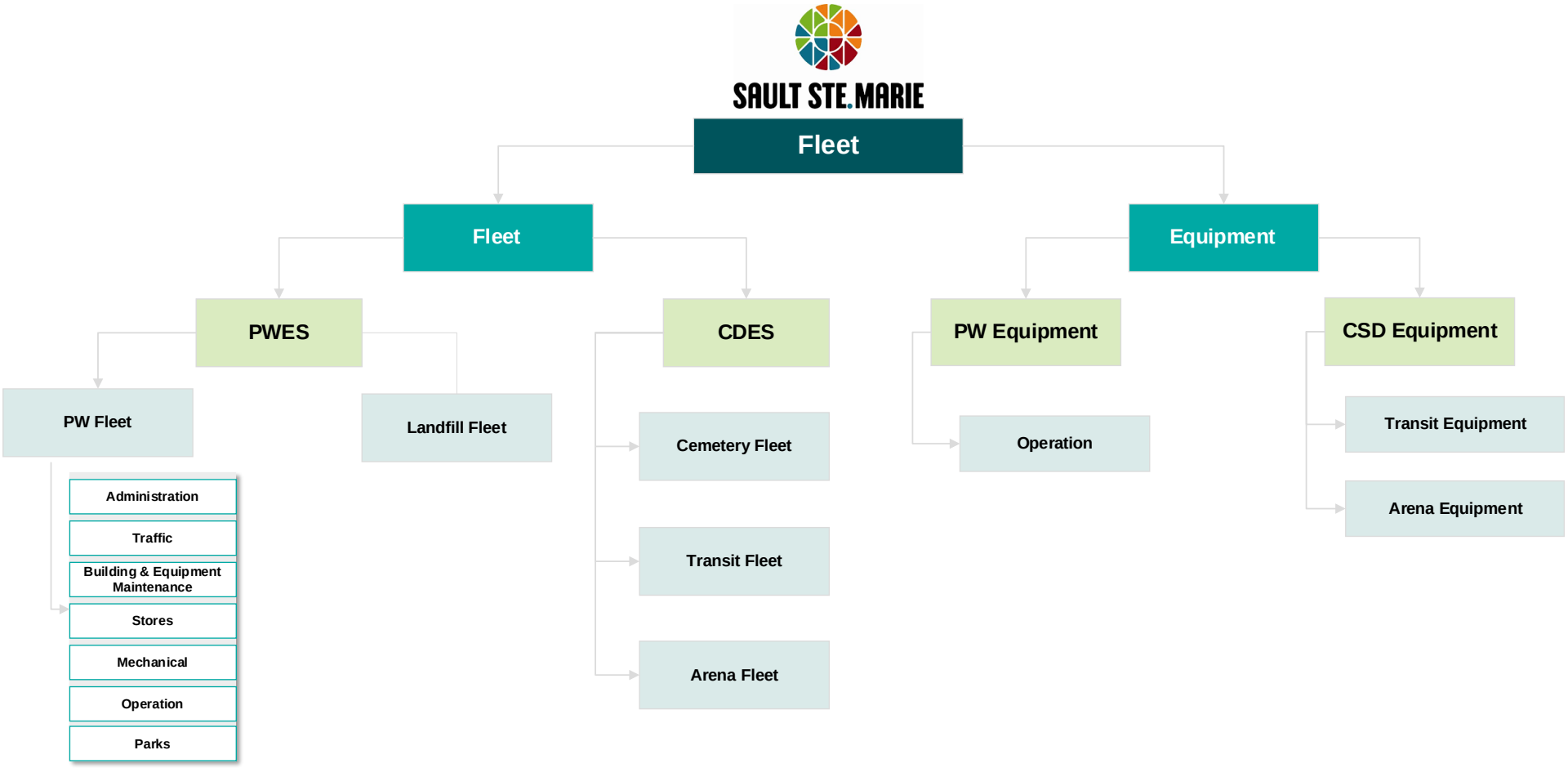

Figure 2-1: City of Sault Ste. Marie Fleet Asset Hierarchy

2.2 Current State of the Assets

2.2.1 Asset Inventory

A completed fleet asset inventory is compiled based on the raw data provided by the City at the initial stage of the project, which was obtained from the following sources:

- Active Capital Assets 2021
- BUS LIST - As of Feb 2023
- Copy of Equipment Cemetery 2022
- Transit Capital 22 - Updated August 24, 2022
- FINAL 2023 UPDATE SSM Public Works Replacement Plan Workbook updated 20230309.

Table 2-1 presents the summary of the City's fleet asset inventory. In total, the City fleet team manages 409 fleets and 204 equipment, serving different city service departments.

Table 2-1: Fleet Inventory Summary

Asset Group	Departments	Asset Class	Quantity	Unit
Fleet	PWES Fleet	PW - Admin Fleet	4	Ea.
		PW - Building Equipment Maintenance Fleet	12	Ea.
		PW - Operation Fleet	202	Ea.
		PW - Mechanical Fleet	1	Ea.
		PW - Stores Fleet	1	Ea.
		PW - Traffic Fleet	16	Ea.
		PW - Park Fleet	77	Ea.
		Landfill Fleet	9	Ea.
	CDES Fleet	Arena Fleet	5	Ea.
		Cemetery Fleet	32	Ea.
		Transit Fleet	50	Ea.
Equipment	PW Equipment	PW - Operation Equipment	18	Ea.
	CSD Equipment	Arena Equipment	2	Ea.
		Transit Equipment	184	Ea.
Total Fleet			**409**	**Ea.**
Total Equipment			**204**	**Ea.**

2.2.2 Current Asset Replacement Value

The asset replacement value is the estimated cost that would be incurred to replace an existing asset with a new one of similar functionality, at current market prices. This value represents the monetary amount required to reproduce or procure an asset equivalent to the one being assessed. Examining the distribution of asset replacement values allows the City to comprehend which asset categories hold the highest value for both the City and the public.

The finalized asset replacement values were determined with the largest numbers of the following:

- Escalating the original asset purchase costs to 2024 dollars, by the average inflation rate of the past 10 years (2014-2023) at 2.11%.
- Current replacement cost from AECOM cost library and Mercury Fleet Assessment Report.

Table 2-2 presents the unit replacement cost and the total replacement value for fleet asset categories within the City. Notably, the Public Work fleet constitutes the most significant portion, accounting for a replacement value of approximately $36 million, followed by the Transit fleet at $20 million, the Landfill fleet at $2.4 million, the Cemetery fleet at $1.9 million, Transit equipment at $1.9 million, Public Work operation equipment at $0.77 million, Arean fleet at $0.54 million, and Arena equipment at $0.14 million. The combined replacement value for all these categories amounts to approximately $63 million. Note that all total replacement values are rounded to the nearest thousand.

Table 2-2 Current Replacement Value

Asset Group	Departments	Asset Class	Replacement Cost Range	Total Replacement Value (2024)
Fleet	PWES Fleet	PW - Admin Fleet	$25,000 - $45,000	$139,000
		PW - Building Equipment Maintenance Fleet	$10,000 - $201,000	$779,000
		PW - Operation Fleet	$8,000 - $632,000	$27,852,000
		PW - Mechanical Fleet	$45,000	$45,000
		PW - Stores Fleet	$25,000	$25,000
		PW - Traffic Fleet	$13,000 - $205,000	$1,901,000
		PW - Park Fleet	$8,000 - $336,000	$4,915,000
		Landfill Fleet	$21,000 - $305,000	$2,400,000
	CDES Fleet	Arena Fleet	$102,000 - $117,000	$544,000
		Cemetery Fleet	$8,000 - $195,000	$1,940,000
		Transit Fleet	$25,000 - $604,000	$19,739,000
Equipment	PW Equipment	PW - Operation Equipment	$8,000 - $135,000	$770,000
	CSD Equipment	Arena Equipment	$6,000 - $135,000	$141,000
		Transit Equipment	$3,000 - $108,000	$1,849,000
Total Fleet				**$60,279,000**
Total Equipment				**$2,760,000**
Total				**$63,039,000**

It is noted that the replacement costs are estimated based on the Class 4[1] cost estimation approach. These estimates are typically prepared with limited information, resulting in wide accuracy ranges. Class 4 estimates serve various purposes, including project screening, feasibility assessment, concept evaluation, and preliminary budget approval. They are utilized for detailed strategic planning, business development, project screening at more advanced stages, alternative scheme analysis, confirmation of economic and technical feasibility, and approval to proceed to the next stage. Typically, depending on the construction complexity of the project, relevant reference information, and other associated risks, the accuracy ranges for Class 4 estimates fall within the following bounds (could exceed based on various criteria):

- On the lower side, -10% to -20%
- On the higher side, +20% to +30%

It is also worth noting that the total replacement values are presented in inflated dollars and have been marked up by 5% to 30% for fleet assets, which accounts for market markup and any necessary service cost.

[1] Association for the Advancement of Cost Engineering (AACE) International Recommended Practice No. 18R-97. Cost Estimate Classification System - As Applied In Engineering, Procurement, and Construction for the Building and General Construction Industries, 2020, Retrieved in February 2024

2.2.3 Age and Remaining Service Life

The asset age is based on the install year of the assets and the remaining service life (RSL) is estimated by considering both the age and the expected service life (ESL) in years. In practice, different assets will deteriorate at varying rates, and their deterioration may not necessarily follow a linear pattern over time. However, it is crucial to consider the level of effort required to predict failure in relation to the asset value. For highly valuable assets, more sophisticated deterioration modelling may be justified. Conversely, for low-value assets, the cost of deterioration modelling might surpass the replacement cost of the asset. Moreover, the actual service life can vary significantly from the ESL. ESL is defined as the period over which an asset is available for use and able to provide the required LoS at acceptable risk and serviceability (i.e., without unforeseen costs of disruption for maintenance and repair). In some instances, a variation in expected vs. actual service life is evident due to the following factors:

- **Operating Conditions and Demands:** Some assets are operated intermittently or even infrequently or are being operated at a lower demand than their designed capacity. Thus, the actual operating "age" of the asset is reduced.
- **Environment:** Some assets are exposed to very aggressive environmental conditions (e.g., corrosive chemicals), while other assets are in relatively benign conditions; thus, the deterioration of assets is affected differently.
- **Maintenance:** Assets are maintained through renewal or replacement of components, which prolongs the service life of the asset.
- **Technological Obsolescence:** Some assets can theoretically be maintained indefinitely, although considerations such as the cost to maintain the asset, its energy efficiency, and the cost to upgrade to an updated technology that would result in cost savings are likely to render this approach uneconomical.

Figure 2-2 shows the weighted average asset age and RSL as a proportion of average ESL for each asset class. The ESL and RUL data for fleet assets are counted in months. Overall, the weighted average age of Transit equipment, Cemetery fleet, Arena fleet, PW - Park fleet, PW - Store fleet and PW – Mechanical fleet is equal to or beyond the weighted average ESL. The Transit fleet, Landfill fleet and Arena equipment have relatively longer RUL compared to the other asset classes.

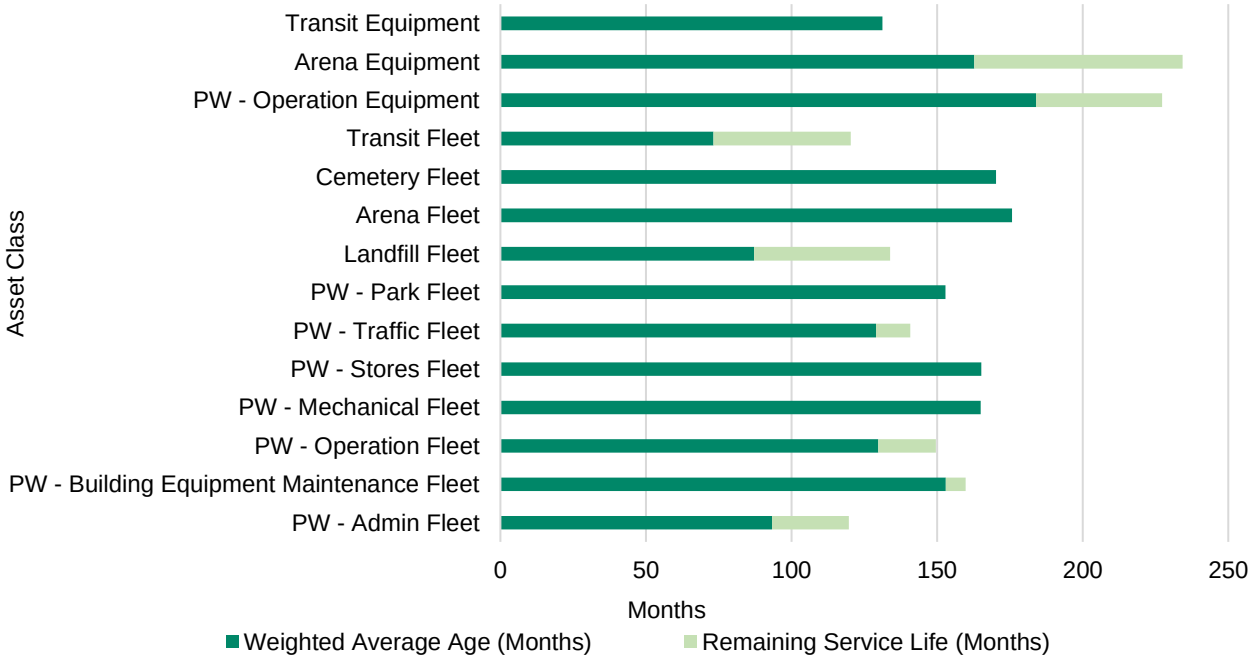

Figure 2-2: Fleet Weighted Average Age and Remaining Service Life

2.2.4 Asset Condition

Regular condition assessments for fleet assets are recommended to monitor the condition and support the asset management decision. For other asset categories that do not have condition assessment results, the two-parameter Weibull distribution function was used to assess the current condition and to project the future condition of the City's fleet assets. The Weibull distribution has been used extensively in reliability studies and lifetime prediction models in industries ranging from automotive to oil & gas and provides a suitable distribution for this type of analysis.

The underlying premise of the Weibull-shaped deterioration is that while some assets fail prematurely due to severe conditions or improper installation, other assets are very long-lived and function well beyond their theoretical ESL. In order to perform a high order network-level analysis, it was assumed that assets would fail (and require replacement) within a deterioration envelope / curve approximated by a Weibull probability distribution. The two-parameter Weibull cumulative distribution has two parameters for scale and shape, as set out in Equation [1]:

$$f(x;\alpha,\beta) = e^{-\left(\frac{x}{\beta}\right)^{\alpha}} \quad [1]$$

Where: x = Age
α = Shape parameter (or slope)
β = Scale parameter

A set of Weibull cumulative distribution functions was leveraged to simulate a set of deterioration curves for assets with different ESLs as shown in **Figure 2-3**.

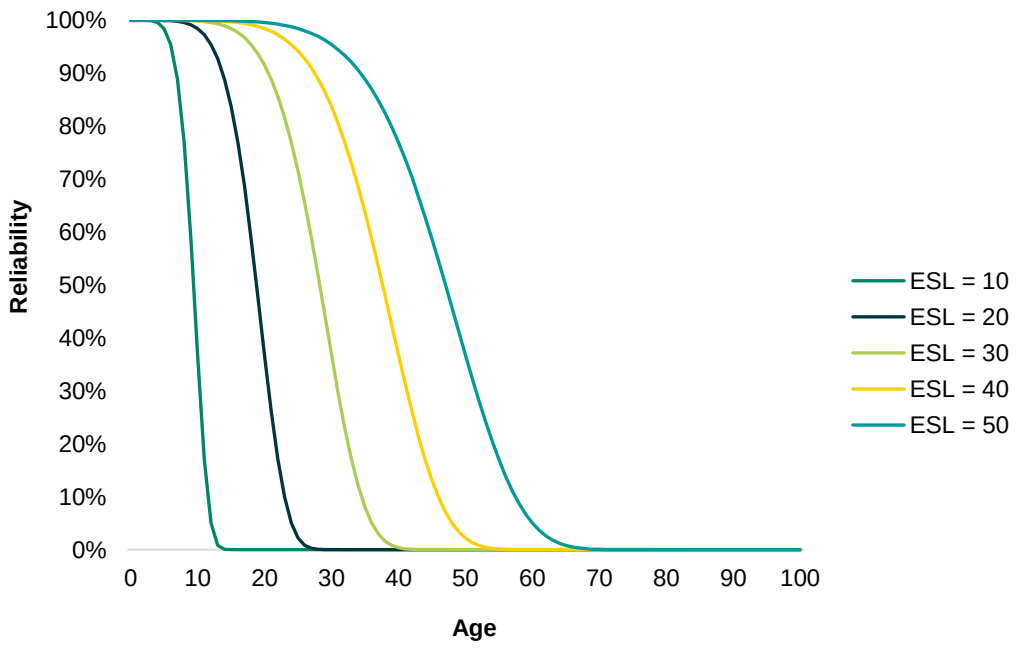

Figure 2-3: Asset Deterioration Curve Samples

The asset condition ratings were based on the five-point condition rating scale presented in **Table 2-3.**

Table 2-3: Condition Assessment Rating Details

Physical Condition Rating	Condition Description
1 - Very Good	The asset is new or in new condition, meets or exceeds all current standards of practice, shows no signs of deterioration, and is fully operable.
2 - Good	The asset has minimal signs of deterioration, generally meets all current standards of practice, and is fully operable.
3 - Fair	The asset may show moderate signs of deterioration, generally meets the current standard of practice, asset performance may decrease and cause service interruptions and is fully operable.
4 - Poor	The asset is approaching its end-of-life expectancy, shows significant signs of deterioration, major components may need to be rebuilt or replaced, may be functioning at an acceptable level is expected to deteriorate further.
5 - Very Poor	The asset is beyond its life expectancy, may no longer meet the current standard of practice, major component may no longer be serviceable, shows significant deterioration, functions at a limited capacity, and may pose a safety hazard if used.

Table 2-4 and **Figure 2-4** present the condition ratings of the City's fleet with respective replacement values in non-inflated dollars. The known condition ratings span from "Very Good" to "Very Poor," with "Very Good" and "Good" collectively contributing 57% to the overall replacement value. 37% of the assets are in Very Poor condition.

Table 2-4: Fleet Condition Summary

Rank	Condition Rating	Replacement Value	% of Replacement Value
1	Very Good	$30,338,000	48%
2	Good	$5,421,000	9%
3	Fair	$1,778,000	3%
4	Poor	$2,042,000	3%
5	Very Poor	$23,494,000	37%
Total		**$63,073,000**	**100%**

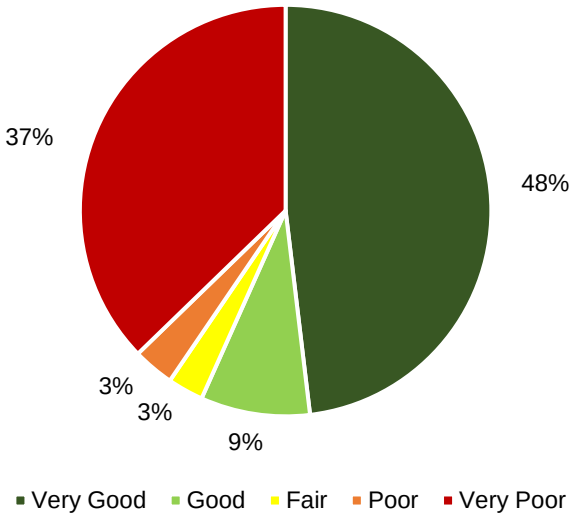

Figure 2-4: Fleet Asset Condition Weighted by Replacement Value

Figure 2-5 shows the condition summary breakdown for each asset class, weighted by replacement value. For Public Work – Admin fleet ($90 thousand), Landfill fleet ($1.8 million), Transit fleet ($13 million), Public Work Operation equipment ($12 million) and Arena equipment assets ($0.14 million), over 50% of the assets are in Very Good condition.

Over 50% of the Public Work – Building Equipment Maintenance fleets ($0.45 million) and Public Work – Operation fleets ($15 million) are in Very Good and Good condition.

For the Arena fleet ($0.34 million) and Cemetery fleet ($1.2 million), over 50% of the assets are in Very Poor condition. Public Work – Store fleet (one vehicle valued at $25 thousand) and Public Work – Mechanical fleet (one vehicle valued at $45 thousand) have the worst overall weighted condition, with 100% of the total replacement value in very poor condition.

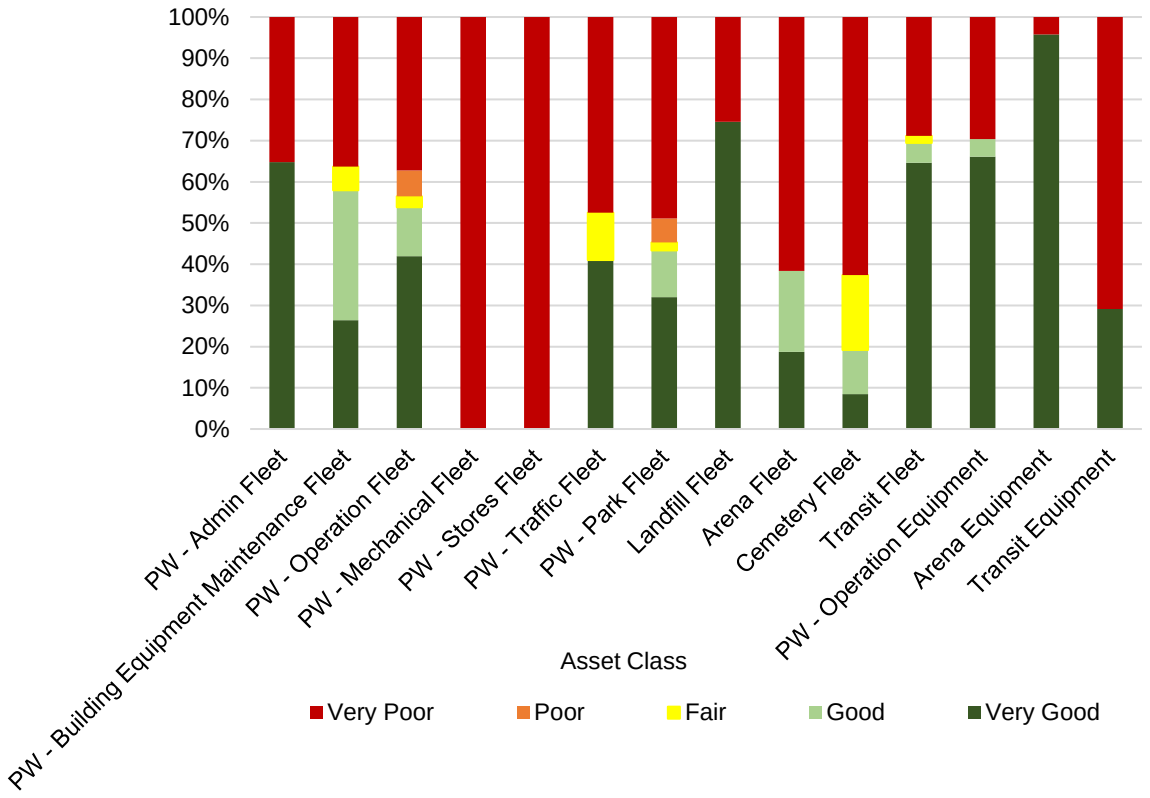

Figure 2-5: Condition Summary for Each Asset Class Weighted by Replacement Value

2.3 Asset Data Gap Analysis

This section summarizes the current state of the City's asset data by assessing the quality of the asset inventory. Specifically, this section identifies existing data gaps, determines the overall confidence in the current asset data, and introduces good practices of data management.

2.3.1 Data Gap Observations

The City's fleet assets were previously stored across multiple spreadsheets. This project has successfully centralized the data into a single inventory. Additionally, it has addressed and filled gaps in key data, such as expected service life and replacement costs, achieving a 100% completeness rate. **Table 2-5** provides a summary of data completeness levels in the compiled fleet inventory across key data attributes. It is recommended that the City continue to work on filling any remaining gaps, ensuring a comprehensive and up-to-date database.

Table 2-5: Asset Data Completeness

Asset Group	Inventory Completeness (%)					
	Asset ID	Location	Install Date	Condition	Expected Service Life	Replacement Cost
Fleet	93%	78%	100%	100%	100%	100%

2.3.2 Data Confidence

The quality of asset data is critical to effective AM, accurate financial forecasts, and informed decision-making. For this reason, it is important to know what the reliability of the information is for the State of Infrastructure analysis of the fleet assets. **Table 2-6** provides a description for the data confidence grades used to classify the reliability of the

asset data. This can serve as a reference for the City to assess the quality of their asset data. A brief summary and explanation of the available data can be seen in **Table 2-7**. Overall, The Fleet asset inventory data are comprehensive in terms of the six key parameters required for the Asset management data analysis.

Table 2-6: Data Confidence Grading Scale

Confidence Grades	Description
A - Highly reliable	Data is based on sound records, procedures, investigations, and analysis, documented properly and agreed as the best method of assessment. Dataset is complete and estimated to be accurate ± 2%
B - Reliable	Data is based on sound records, procedures, investigations, and analysis, documented properly but has minor shortcomings, for example some of the data is old, some documentation is missing and/or reliance is placed on unconfirmed reports or some extrapolation. Dataset is complete and estimated to be accurate ± 10%
C - Uncertain	Data is based on sound records, procedures, investigations, and analysis which is incomplete or unsupported, or extrapolated from a limited sample for which grade A or B data are available. Dataset is substantially complete but up to 50% is extrapolated data and accuracy is estimated ± 25%
D - Very Uncertain	Data is based on unconfirmed verbal reports and/or cursory inspections and analysis. Dataset may not be fully complete, and most data is estimated or extrapolated. Accuracy ± 40%
E - Unknown	None or very little data held.

Table 2-7: Asset Data Confidence

Asset Group	Inventory Confidence					
	Asset ID	Location	Install Date	Condition	Expected Service Life	Replacement Cost
Fleet	A	B	A	A	A	A

2.3.3 Data Management Practice

The asset data lifecycle is a sequence of stages that data goes through from its initial build (i.e., data capture and entry) to its eventual archival and/or deletion at the end of its useful life[2]. A clear definition and understanding of the organization's process for acquiring, storing, utilizing, assessing, improving, archiving, and deleting data (see **Figure 2-6**) will ensure good data management practices and help to sustain levels of data quality required to support AM activities.

[2] TechTarget Network (2020): Definition: Data Life Cycle

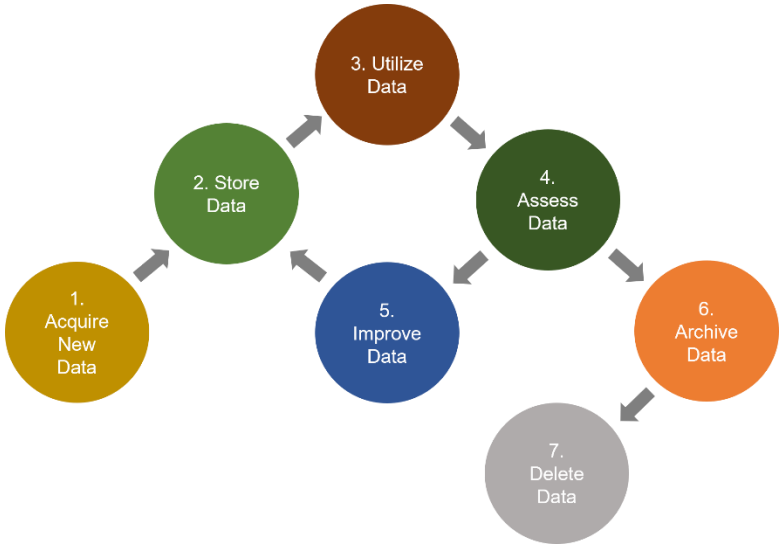

Figure 2-6: Asset Information Lifecycle

The seven key stages of the asset data lifecycle are described in more detail below:

- **Acquiring New Data**: The majority of new asset data arises from asset creation, refurbishment, and overhaul activities. New data may also come by way of inheritance or transfers from other business units, organizations, or third parties. As such, it is important to have clearly defined processes in place not only to add or update asset data but also to migrate and merge data from other sources.
    - New assets for the fleet should be consistently added to the inventory and a minimum required data set defined to maintain inventory accuracy and reliability. The required data includes the new vehicle make, model, VIN, fuel type, original purchase price, purchase location, etc.
- **Storing Data**: The way asset data is stored is an important consideration for overall data quality. Having a planned approach to data storage will inevitably reduce the likelihood of duplication and inconsistencies across datasets within the organization. Depending on the needs of the organization, this stage may involve procuring new software to adequately house the data, along with a data backup and recovery plan to ensure that the necessary data protection and privacy standards are met.
    - Assets are typically stored in either the CMMS or the maintained asset inventory spreadsheet. For fleet assets, typical information including periodical kilometre reading, engine oil level, general vehicle condition, and last service dates need to be captured and maintained to be updated during the daily data management process.
- **Utilizing / Analysing Data**: This aspect of the asset information lifecycle is where users encounter the data to support data-driven activities within the organization. Data can be viewed, processed, edited, and published to allow users to access the data outside the organization. Critical data that has been modified should be fully traceable to maintain the integrity of the data. As such, it is important to communicate to the users why asset data is so important, and how it is used to inform decisions within the organization.
    - Previously, the City conducted a fleet assessment regarding the Public Work fleets and certain analytical results were supporting the lifecycle activities decision-making.
- **Assessing Data**: Assessing the data quality helps to determine the level of confidence in the information and ensures that decision-makers are making informed decisions based on the quality of data available to them. Moreover, it is important to fully understand the availability and quality of the asset data before issuing information publicly. Some of the results of data degradation, due to improper or lack of assessment, may include:
    - Poor asset performance due to lack of information and understanding of asset behaviour.
    - Non-compliance with statutory regulations or safety requirements.
    - Safety incidents due to risks not being identified or reported.

- Asset failure due to gaps in maintenance planning.

- **Improving Data**: Improving data quality involves establishing clear targets which are intended to be communicated widely across the organization. It is imperative that the organization understands the costs, benefits, and risks associated with any data improvements since the cost of the improvement may outweigh the overall benefit. It is also important to note that *more* data does not necessarily mean *better* data. It is very possible to collect data that does not add value to the organization. As such, it is critical that the organization aligns its data improvement targets with its AM objectives and considers the data-driven decisions staff need to make at the operational and strategic level, to ensure that the *right* data is being improved upon.
- **Archiving Data**: Archiving data is the process of storing data that is no longer active or required but is able to be retrieved in case it is needed again. Data that is archived is stored in a location where no usage or maintenance occurs. It is recommended that a data archive strategy exists within an organization in order to lay out the data archival requirements, which includes the following factors:
    - Consider what data should be archived and articulate the reasons behind the archival decisions.
    - Examine any legal obligations pertaining to the retention of data records.
    - Determine the appropriate duration for retaining different categories of data records.
    - Evaluate the risks associated with the inability to retrieve specific data records.
    - Specify the authorized individuals or entities who should have access to archived data records.
    - Establish the expected timeframe for retrieving archived data records.
    - Communicate these requirements across the organization to ensure staff understand why records are being archived, how they can access archived data records, and for how long archived data records can still be accessed.
- **Deleting Data:** The deletion of data is the final component of the asset information lifecycle. Typically, within organizations there is a resistance to permanently delete data, otherwise known as data “squirrelling”, due to the overall capacity of storing data increasing and the cost decreasing. However, within the organization’s data archive strategy, a retention period should be specified to indicate when data should be deleted, along with any processes to follow, such as obtaining prior authorization.

3. Levels of Service

3.1 Purpose

Level of Service (LoS) supports every aspect of the overall AM System. The objective of establishing clearly defined service levels is to help the City meet stakeholder values, achieve its strategic goals, make informed decisions, and implement effective asset lifecycle activities.

Documenting LoS is a proven practice that will enable the City to:

- Link corporate strategic objectives to customer expectations and technical operations.
- Balance customer needs and expectations while evaluating the effectiveness of operations and whether the right LoS is being provided at the right cost.
- Transition from an “Asset Stewardship” approach that focuses on making decisions based on maintaining assets in an acceptable condition to a “Serviceability” approach that is geared towards making decisions based on balancing the costs, risks, and goals for the LoS being provided by the City’s assets.
- Communicate the physical nature of infrastructure that the City owns and is financially responsible for while promoting the use of LoS to enable effective consultation with stakeholders regarding alternative funding options according to desired LoS outcomes.
- Make recommendations on strategies that the City can take now to minimize future renewal costs while ensuring that adequate LoS can be delivered without burdening future generations.
- Assess internal (e.g., program changes) and external (e.g., climate change) factors that have the potential to impact the City’s ability to deliver services and how these factors may impact the LoS being provided.
- Implement a corporate continuous improvement program to further optimize AM across all service areas.

O. Reg. 588/17 mandates that Ontario municipalities must report their current LoS by July 1, 2024. Additionally, the proposed LoS for all municipal assets including core and noncore assets should be reported by July 1, 2025.

3.2 Objectives

Defining LoS objectives is important for drawing a line of sight between the City’s corporate objectives and the tangible asset performance outcomes. To do so, the LoS objectives must take into consideration stakeholder interests to develop asset performance measures that aim to meet the needs and expectations of the community. By doing this, the City will ensure that their assets are striving towards optimal performance, not only operationally, but economically, socially, and sustainably as well.

Every stakeholder has certain interests in the service being provided and in general. The City’s corporate objective is to lift up the community and build pride, and attract people (visitors, employers, and employees). The City’s Comprehensive Background Report[3] for the New Official Plan outlined the overarching themes that reflect the City’s value, as shown in **Table 3-1.** Each overarching theme is also assigned a corporate service objective.

The development of level of service targets should be aligned with these corporate objectives which will be addressed in the next iteration of the AMP.

Table 3-1: The City’s Overarching Themes and Objectives

Overarching Themes	Corporate Objective
Healthy Community	Supports healthy living, active transportation, access to passive and active recreation, social interaction and the creation of spaces that are comfortable, safe, and accessible for all ages and abilities (the “8 to 80 Cities” concept).
Environmental Sustainability	Supports energy conservation and efficiency, improved air quality, reduced greenhouse gas emissions and climate change adaptation.

[3] City of Sault Ste Marie (2021): Comprehensive Background Report.

Overarching Themes	Corporate Objective
Integrated Mobility	Supports accessibility and choice of a diversity of transportation modes.
Sense of Place	Fosters a welcoming place for all that establishes connection and provides a memorable experience to visitors.
Sustainable Growth	Stimulates reinvigoration of neighbourhoods to provide a complete range of housing, services, employment, and recreation.
Economic Resiliency	Supports the growth and diversification of the City's economy.
Social Equity	Contributes to creating a welcoming and inclusive community, focusing on the removal of systemic barriers so that everyone has access to an acceptable standard of living and can fully participate in all aspects of community life.
Cultural Vitality	Celebrates the City's history, diverse communities, and natural and cultural heritage, with the Downtown as the City's core destination for arts and culture.

3.3 Stakeholder Identification

A stakeholder is any person or organization that can affect, be affected by, or perceive themselves to be affected by a decision or an activity. Stakeholder analysis is the process of understanding stakeholder needs, expectations, and perceptions relative to the stakeholder's level-of-interest and level-of-influence over the organization. The organization typically engages with their stakeholders to:

- Establish which activities or services matter most to them.
- Understand their risk appetite and risk threshold.
- Understand their willingness to pay for services.

Stakeholders can take many forms and may be internal (i.e., staff, Council) or external (i.e., the public, regulatory agencies, suppliers, neighbouring municipalities, etc.) to the organization. The following groups were identified as key stakeholders for fleet during the LoS workshop held with City staff. This is not intended to be an exhaustive list; however, the following groups provide a good starting point for the City to move forward to the next stage. The City's key stakeholder groups are identified below.

- Residential Customers
- Industrial, Commercial & institutional (ICI) Customers
- Regulatory Agencies
- Neighbouring Municipalities
- Environmental Groups
- Internal City Departments
- School Boards and Post Secondary Institutions
- Social Services

3.3.1 Legislated and Regulatory Requirements

Fleet assets are critical to the City's ability to provide essential services to the community, and for protecting the health and safety of the public. As such, key legislative requirements exist for the City's infrastructure assets, which ensure that minimum requirements are met and standards are in place that promote a high quality of life (i.e., clean drinking water and safe roads, etc.). A sample of key Federal and Provincial legislated requirements are outlined below in **Table 3-2**. Monitoring and development programs relevant to fleet assets are also listed.

Table 3-2: Legislated and Regulatory Requirements

Federal	Provincial

• Motor Vehicle Safety Act
• Canadian Environmental Protection Act, 1999 (CEPA)
• Federal Sustainable Development Act
	• Highway Traffic Act
	• Ontario's Drive Clean Program
	• Ontario Public Service Green Fleet Directive
	• Environmental Assessment Act
	  • Ontario Regulation 231 – Transit Projects and Metrolinx Undertakings
	• Environmental Protection Act
	  • Ontario Regulation 85 – End of Life Vehicles
	• Commercial Vehicle Operating Registration (CVOR)
	• Bus driver licensing through Ontario Drive Test Centres

3.4 O. Reg 588/17 Levels of Service Metrics

Currently, O. Reg 588/17 only identifies levels of service metrics for core assets. A number of key LoS performance measures for fleet assets have been identified in consultation with City staff through workshops, are detailed in **Section 3.5**.

3.5 Levels of Service Performance Targets

Establishing LoS targets is an important part of continual improvement and performance management. Without performance targets, it is difficult to ascertain whether goals are being met, or the extent of the gap if they are not. Incorporating targets into the City's LoS framework helps to ensure that targets are reasonable, aligned with customer expectations, and evaluated on an objective basis by considering cost-benefit trade-offs.

One of the key challenges in setting infrastructure performance targets in a municipal environment is that they can often become biased and/or politically motivated. Therefore, it is important to review LoS targets with internal and external stakeholders, especially the customers who will be impacted the most by changes in service delivery. An important aspect of evaluating LoS targets is determining how the user is willing to pay for the service. Regulatory requirements are an exception; however, they only provide the minimum service standard. Cost is still an important parameter to consider when assessing the merits of service improvements. To deal with the financial realities, it is necessary to:

- Calculate how much the service costs based on current LoS.
- Determine the cost associated with varying the LoS.
- Assess the customers' willingness to pay.

It is important that any targets set be realistic and achievable. Therefore, it is not advisable that the City sets any firm targets until their current performance has been fully assessed. O. Reg. 588/17 requires AMPs to include proposed levels of service and a formalized financial strategy by July 1, 2025.

A total of 10 LoS performance measures for Fleet Service have been documented. A summary of the City's fleet service level metrics is presented in **Table 3-3**.

Table 3-3: Levels of Service Performance Metrics (Fleet)

	Asset Category	Universal Service Value	LoS Performance Measure	Unit	Is Data Available? (Y/N)
1.	Fleet – Public Works and Engineering Services	Environment & Sustainability	Number of Vehicles that are Electric or Hybrid	#	TBD
2.	Fleet – Public Works and Engineering Services	Environment & Sustainability	Total Annual Fuel Volume Used for Vehicles	Litres	TBD
3.	Fleet – Public Works and Engineering Services	Quality & Reliability	% of Vehicles and Equipment Past Their Optimum Service Life	%	TBD
4.	Fleet – Public Works and Engineering Services	Quality & Reliability	Total Idle Time for Front Line Vehicles	hrs	TBD
5.	Fleet – Public Works and Engineering Services	Quality & Reliability	Mileage per Vehicle	km / Vehicle	TBD
6.	Fleet – Public Works and Engineering Services	Quality & Reliability	Total Repairs per Vehicle	Repairs/ Vehicle	TBD
7.	Fleet – Transit	Access & Capacity	Total Transit Ridership per Year	# Boardings	Y
8.	Fleet – Transit	Quality & Reliability	Average Age of Fleet in Years	Age (Years)	Y
9.	Fleet – Transit	Environment & Sustainability	Total Annual Fuel Consumption	Litres	TBD

3.6 Future Demand Drivers

Demand management is a critical component of managing the desired LoS in a sustainable manner, now and into the future. Understanding demand drivers enables the City to proactively develop effective, long-term strategies that are suitable for the City's unique political, environmental, social, and technological landscape.

A summary of factors identified from the LoS workshop that would impact fleet service levels include, but are not limited to, the following:

- Technology.
- Electrification.
- Energy and Demand Management.
- Funding level.
- Climate Change.

On November 2, 2021, the City's Planning Division released the Comprehensive Background Report for updating the Official Plan[4]. The City's Official Plan guides local decision-making on land use, development, and public infrastructure over the next 20 years. The City's population is expected to reach 80,000 people by 2031, and 83,300 people by 2036. Employment is projected to grow by approximately 6,000 jobs, from 31,000 jobs in 2016 to 36,900 jobs in 2036.

When additional assets to accommodate this population and employment growth are introduced to the City's portfolio, additional human resources, training, and funding are required to maintain and operate, and renew or replace those assets. O. Reg. 588/17 requires municipalities by July 1, 2025, to estimate capital expenditures and significant operating costs to achieve the proposed LoS and accommodate projected increases in demand caused by population and employment growth. This includes the estimated capital expenditures and significant operating costs related to new construction and / or to upgrade existing municipal infrastructure assets. The City will have to address these aspects during the later phases of the AM regulatory compliance process and before the 2025 deadline.

[4] City of Sault Ste Marie (1996): Official Plan

4. Asset Management Strategies

4.1 Asset Lifecycle Management Introduction

Asset lifecycle management focuses on the specific activities that should be undertaken during all phases of the asset lifecycle. Considering the entire asset lifecycle ensures that the City makes sound decisions that take into account present and future service delivery needs.

The overarching goal of lifecycle management is to maximize the long-term benefits and services that the City's assets deliver while minimizing the associated costs and risks in the long run. Every asset has a lifecycle cost, which is the total cost of all activities undertaken throughout its service life. Part of the purpose of the AM planning process is to fully understand and predict the long-range financial requirements for the City's infrastructure, facilitating planning and resource management in the most cost-effective manner possible. **Figure 4-1** illustrates how costs typically accumulate over an asset's life. It is worth noting that the ongoing operations and maintenance, renewal & replacement, and disposal costs accumulate up to many multiples of the initial acquisition costs. As such, it is important to fully understand the entire lifecycle costs before proceeding with asset acquisition.

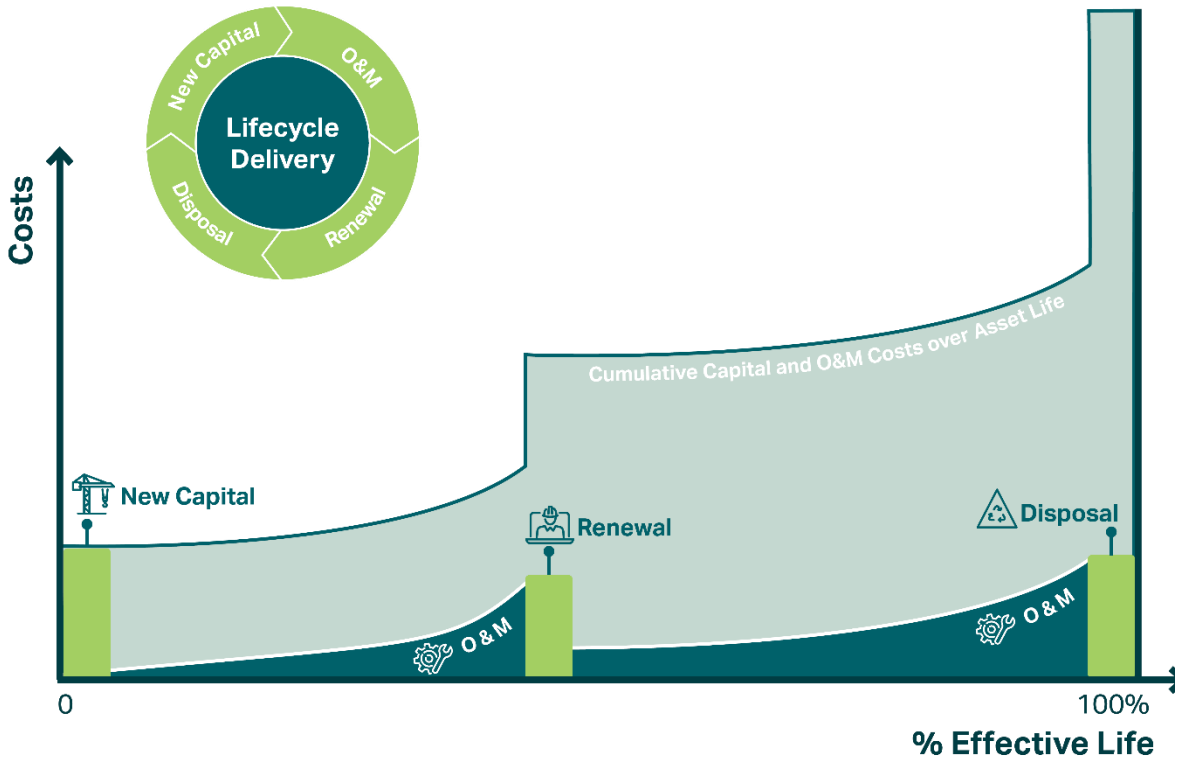

Figure 4-1: Lifecycle Cost Accumulation Over Asset Life

Asset lifecycle management strategies are typically organized into the following categories.

1. **Asset Acquisition / Procurement / Construction**: Acquisition includes expansion activities and upgrading activities to extend services to previously unserved areas or meet the demands of growth and functional requirements. When acquiring new assets, the City should evaluate credible alternative design solutions, considering how the asset will be managed at each of its lifecycle stages. AM and full lifecycle considerations for the acquisition of new assets include, but are not limited to, the following:

    - Growing demands for public service and public transit.

- The asset's operability and maintainability.
- Supply chain considerations.
- Adaptation to climate change.
- Staff skill and availability to manage the asset.
- The manner of the asset's eventual disposal.

2. **Asset Operations and Maintenance (O&M)**: As new assets are commissioned, the City assumes the responsibility of operating and maintaining the asset according to O&M standards to ensure its safety and reliability. The operations staff provides the necessary day-to-day support for operating the assets. Maintenance expenses include periodic preventive maintenance to ensure that the infrastructure can provide reliable service throughout the life of the asset and corrective maintenance that is required to repair defective assets as needed. Inadequate funding for O&M will adversely impact the lifespan of assets. The number of O&M resources required in any period is a function of the current inventory of infrastructure and the total O&M needs for each asset. As the inventory of infrastructure grows, total O&M requirements will also increase.

3. **Renewal and Replacement:** The third aspect of full lifecycle costing pertains to the renewal and replacement of assets that have deteriorated to the point where they no longer provide the required service. Renewal or rehabilitation costs may be incurred during the life of an asset where an investment is made to improve its condition and/or functionality, for example, overhaul the equipment and vehicle engines. Replacement activities are expected to occur once an asset has reached the end of its useful life, and renewal is no longer a viable option.

4. **Decommissioning and Disposal:** There will inevitably come to a point in time when an asset must be removed from service, and depending on the type of asset, there may be significant costs associated with its decommissioning and disposal. Factors that may influence the decision to retire an asset include changes leading to non-compliance, the inability of the asset to handle increased LoS, technological advances rendering the asset obsolete, the cost of retaining the asset exceeding the benefits gained, the current risk associated with the asset's failure becoming intolerable, assets negatively impacting service delivery or negative impacts on the environment (e.g., old buses are unsafe for delivering services), or assets no longer suitable for their original purpose (e.g., the old police cars are not suitable for patrol services, but still reliable for light-duty public service).

Normally, major costs that may be incurred during disposal and decommissioning derive from the environmental impact of the disposal and, if required, the rehabilitation and decontamination of land. However, some cost savings may be achieved through the residual value of the asset or by exploring alternative uses for the asset. In all cases, it is important to consider disposal and decommissioning as the strategy employed has the potential to attract significant stakeholder attention. For that reason, the costs and risks associated with disposal and decommissioning should be equally considered in the City's capital investment decision-making process.

4.2 Asset Acquisition Strategies

The City's motivations for acquiring fleet assets are multifaceted. Firstly, there is a compelling need to accommodate the expanding service scope, fueled by the growing workload and demand on public services. Furthermore, the increasing population and diversity have added to these demands. Recognizing the crucial role of data accuracy, the City also acknowledges the necessity for an advanced fleet management system.

Electrification predicted to have minimal impact on waste generation but will impact the waste collection fleet and the fueling costs. The City's fleet asset acquisition strategies are also strongly driven by the federal regulations[5] and their Greenhouse Gas (GHG) Emissions Reduction Plan[6].

- Federal plans embrace EV: Regulations published by Federal Government in 2023 laid out plans to phase out passenger vehicles powered only by gasoline or diesel in 2035. As these vehicles are replace the City should be mindful of the increased maintenance and purchase costs of Hybrid Electric Vehicles (HEV) and Plug-In Electric Vehicles (PEV).
- Green house gas emission reduction plan: During the first stage of the plan, the City conducted a GHG inventory study, revealing that 56% of the City's GHG emissions were generated by vehicle fleet and equipment. Therefore, the transition to a green fleet is an importation consideration when acquiring fleet assets.

Table 4-1 summarizes the acquisition activities associated with the City's fleet assets.

Table 4-1: Acquisition Activities for Fleet Assets

Asset Group	Activities Undertaken by the City	Notes

Fleet	• Fleet and equipment acquisition.
	• Electric vehicle (EV) charging station construction.
	• Compressed natural gas (CNG) fueling station construction.
	• Garage and maintenance shop upgrade.
	• Advanced fleet information management system.
		• Guided by the financial assessments, the City primarily opts for asset purchases rather than leasing. However, in order to address peak demand during certain seasons, the City also engages in occasional seasonal rentals.
		• The City has initiated a pilot project since 2011 for implementing EVs and EV charging stations. The project's scope includes:
		  • 1 pick-up truck.
		  • 2 EV units for transit (approved but not yet purchased).
		  • 1 EV Zamboni.
		  • Vehicle chargers at Wastewater Treatment Plants.

As shown in **Table 4-1**, many of the City's acquisition activities are associated with green transformation. In general, the shift towards a green fleet represents a significant change that will require increased capital investments in the short term. This is particularly evident in the substantial funding needed for developing and establishing the supporting infrastructure. Although the initial capital expenditure may pose financial challenges, the long-term benefits of reduced environmental impact and enhanced sustainability make it a worthwhile investment for the community's future well-being. **Table 4-2** summarizes the impact of green fleet acquisition activities on the City's capital expenditures.

Table 4-2: The Impact of Green Fleet Acquisition Activities on The City's Capital Expenditures

Activities	Impact on Capital Expenditures
Green fleet acquisition	• Pro: Lower sales tax compared to conventional vehicles. • Pro: Federal and Provincial rebates and grants available (still in the early stage). • Con: High acquisition costs compare to the standard gasoline vehicles. • Con: Limited availability for the heavy-duty vehicles and specialized equipment. • Con: Relative longer waiting times. • Con: Highly rely on the stability and availability of the electricity grid.
Green infrastructure investment (EV charging stations, CNG fueling stations, etc.)	• High construction costs. • High costs associated with garage and maintenance shop upgrade.

[5] Transport Canada. (2024, January 22). Canada's Zero-Emission vehicle sales targets. Retrieved from Transport Canada.
[6] City of Sault Ste. Marie. (2024). Greenhouse Gas Emissions Reduction Plan. Retrieved from City of Sault Ste. Marie.

4.3 Asset Operations and Maintenance Strategies

Effective O&M of assets is crucial for sustainable performance and longevity. Managing O&M costs involves developing comprehensive strategies that optimize resource utilization while ensuring asset reliability. Proactive maintenance schedules and condition monitoring can help identify potential issues before they escalate, reducing unplanned downtime and minimizing repair costs. Implementing energy-efficient technologies and best practices in fleet AM also contribute to cost-effectiveness over the asset's lifecycle. **Table 4-3** summarizes the O&M activities associated with the City's fleet assets.

Table 4-3: O&M Activities for Fleet Assets

Asset Group	Activities Undertaken by the City	Notes

Fleet	• Car washing.
	• Regular safety inspection.
	• Service (Oil change) per 300 hours of service.
	• Oil sampling.
	• Exhaust emission testing.
	• Tire pressure check.
	• Tire rotation and replacement.
	• Car repair and parts replacement.
	• Fuel consumption and EV battery charging.
	• LED light replacement.
	• Driver training and education.
	• Fleet information system and server maintenance.
		• The City has established a maintenance budget for spare parts acquisition, with the flexibility to utilize the capital budget for major expenses.
		• The City has a separate budget for car insurance, distinct from the legal budget.
		• The City may contract out services as needed, while transit services are handled on-site by their staff. Transit services include:
		  • Use high-quality lubricants.
		  • Use stainless steel components.
		  • All buses are taken off the road every six months and subjected to a complete mechanical inspection.

With the green fleet transformation, the City may also need to consider O&M activities specifically for EVs. With less or no consumption of fossil fuel, the amount of greenhouse gas emissions would be significantly reduced. In addition, EVs have fewer moving parts, resulting in reduced wear and tear and, therefore, lower maintenance expenses. While EVs still require periodic maintenance, such as brake system checks and battery inspections, the absence of complex engine components often leads to a more cost-effective O&M profile. Furthermore, the lower reliance on fossil fuels for power contributes to potential long-term savings, offering an economic incentive for the adoption of EVs in the context of operational sustainability and efficiency. However, after certain years of use or every 100-120 thousand kilometres driven, the batteries will depreciate significantly to reduce the effective mileage range, and the subsequent battery replacements will induce a large expenditure, which might take up to 20% to 30% of the total vehicle purchase cost.

4.4 Renewal and Replacement Strategies

Renewal often involves upgrading or refurbishing existing assets to extend their lifespan, while replacement entails acquiring new assets. The costs associated with these activities include not only the direct expenses of acquisition but also indirect costs such as downtime during the transition, training for new technologies, and potential disposal or recycling costs.

Similar to the acquisition of fleet assets, the City's decision to renew and replace fleet assets is driven by a variety of factors. Changes in service scope, increased workload, and growing population and diversity can necessitate the replacement of vehicles with larger capacity or upgraded features. As the current fleet ages and becomes obsolete, the need for renewal becomes imperative to maintain operational efficiency and meet evolving demands. Additionally, a strategic shift towards environmental sustainability may prompt the replacement of conventional vehicles with a green fleet, aligning with the City's commitment to reducing its environmental impact. These drivers collectively guide the strategies for fleet asset renewal and replacement, ensuring that the fleet remains modern, efficient, and aligned with evolving operational requirements.

4.5 Decommissioning and Disposal Strategies

Effective asset decommissioning and disposal are integral components of strategic AM. As the City's fleet assets approach the end of their lifecycle or become obsolete, a systematic approach to their removal and decommissioning

is essential. This process involves careful planning, environmental considerations, and adherence to the City's regulatory requirements. **Table 4-4** summarizes the decommissioning and disposal activities associated with the City's fleet assets.

Table 4-4: Decommissioning and Disposal Activities for Fleet Assets

Asset Group	Activities Undertaken by the City	Notes
Fleet	• Sell the old vehicles for residual values. • Trade in the old vehicles for new ones. • Repurpose the vehicles. For example, retired police cars can be used as service cars. • Vehicle scrapping.	• The decommissioning process is conducted by the Shop Clerk and mechanic, and the asset is marked as "Inactive" in the system. • Assets are traded in to offset the cost of new acquisitions. • Due to age and poor condition, some assets are sold for scrap metal.

4.6 Risk Associated with Lifecyle Activities

In the context of AM, risk is defined as the consequence or impact of uncertainties on AM objectives. These uncertainties span a spectrum of events, including financial market fluctuations, unexpected asset failures, changes in regulatory environments, and other factors capable of influencing the performance or condition of assets. Risk management, developed to handle uncertainties in a systematic and timely manner, is a practical framework that ensures thoughtful decision-making and protects the achievement of goals. The risk management process generally follows a series of steps, as outlined in **Table 4-5**.

Table 4-5: Key Steps in the Risk Management Process

Step	Description
1. Establish the context	• Define the scope of the risk management process and the objectives that the City seeks to achieve through effective risk management. • Consider the City's internal and external factors and understand stakeholder expectations.
2. Risk identification	• Identify potential risks that could impact the City's AM objectives.
3. Risk analysis	• Utilize qualitative or quantitative analysis methods to assess risks.
4. Risk evaluation	• Evaluate the likelihood and impact of identified risks. • Prioritize risks based on their criticality.
5. Risk treatment	• Develop strategies to reduce the likelihood and impact of identified risks. • Implement preventive measures to address potential issues proactively. • Establish contingency plans for managing risks that cannot be eliminated.
6. Monitor and review	• Regularly update risk assessments to reflect evolving circumstances. • Develop KPIs and monitoring tools to track the effectiveness of risk treatment strategies. • Learn from the City's past experiences and continuously improve risk management strategies.

Over the course of an asset's service life, the accelerating rate of deterioration with age poses inherent risks, inevitably leading to a corresponding increase in maintenance costs. **Figure 4-2** illustrates a general asset deterioration curve. This trend becomes particularly pronounced in the final phase of the asset's service life, where the cost of maintenance experiences a rapid escalation, highlighting the financial risks associated with prolonged neglect. This phenomenon underscores the critical importance of preventive maintenance in the early stages of an asset's service life. By addressing risks proactively during these initial periods, the potential financial burden tied to accelerated deterioration in later stages can be effectively mitigated.

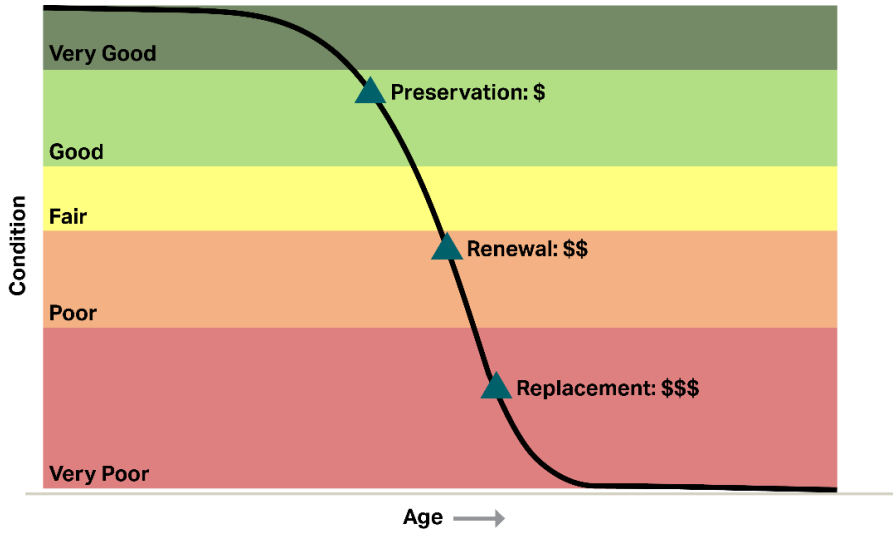

Figure 4-2: Asset Deterioration Curve and Renewal Costs

Beyond the general guidance, the City's approach to risk management should be tailored to its overarching goals, financial resources, and willingness to tolerate uncertainties. To help shape the City's risk management process, AECOM recommends taking into account the following key considerations:

1. **Supply Chain Disruptions**:

   The automotive industry has been hit the hardest by supply chain disruptions during the COVID-19 pandemic. A critical issue has been the semiconductor shortage, resulting in fewer options, higher prices, and extended waiting times for delivery since then. Consequently, the City may face increased costs when purchasing new vehicles.

2. **Environmental Requirements**:

   In the City's GHG Emissions Reduction Plan, the City has initiated the transition to purchasing only vehicles that are highly efficient, run on zero-carbon and renewable energy fuels, and support transportation electrification opportunities. This aligns with the Canadian Federal Government's target for all federally financed bus purchases to be zero-emission.

3. **Risks Associated with Developing City's Electrical Vehicle Fleets**:

   Despite the environmental benefits, there are several risks associated with developing EV fleet, such as:

   - Potential supply chain vulnerabilities and high upfront costs: in the current market, electrical vehicles would spend an average of 20% to 30% more in purchasing compared to similar gasoline or diesel models. And due to the high demand, the delivery time the electrical vehicles might take up to 2 to 6 months for some popular or specialized models. They might impact the service efficiency and productivity of the City's fleet team.
   - Limited Heavy-duty Engineering EV and Specialized Equipment: the major car vendors in the current market have not offered lots of electrical alternatives for heavy-duty electric engineering vehicles and specialized equipment, such as the pick-up truck at Class 5 commercial grade (equivalent to Ford F450).
   - Significant Investment in Charging Infrastructure and Maintenance Facilities: the productivity of the EV fleet team highly depends on the development of the charging infrastructure. The City needs to invest to deploy its exclusive or additional public charging station to ensure the service vehicles can be charged timely and adequately. Furthermore, EVs have different maintenance requirements compared to traditional vehicles, which means the current service facilities need to be upgraded accordingly and the fleet operators need to be trained to maintain the EVs effectively.
   - Range Anxiety: the charging time for a common electric vehicle might take up to 1.5 to 3 hours, depending on the battery size and electric power. The mileage range per charge could vary from 200 kilometres to 500 kilometres, based on the vehicle's running temperature and duties performed (cold temperature and high-speed driving reduce the battery efficiency). In this case, an enhanced vehicle charging plan needs to be conducted by the service planner to maximize the vehicle's efficiency and prepare for any potential breakdown due to insufficient power.
   - Uncertainties Regarding Battery Lifespan: The battery might depreciate significantly after 8-10 years or every 120 thousand to 150 thousand kilometres of running. The lifespan becomes shorter in a more frequent usage or in the cold territories. The battery replacement can incur a significant capital expenditure, taking up to 20 to 40% of the original purchasing price, and will cause a certain level of service interruption.
   - Reliability Concerns: Mechanical breakdowns and software glitches for the EVs are expected, especially considering some EV products in the markets are immature in mechanical reliability and software stability, as lack of long-term testing and improvement. Substantial expenditures and major service breakdowns might happen due to this circumstance.
   - Unqualified EV Manufacturers: some newcomers in the EV manufacturing industry are facing uncertain futures resulting from financial crises, rising interest rates, and supply shortages. Company bankruptcy or suspension of manufacturing certain models of the vehicle might become an uncertainty to the City's fleet team, with the risk of vehicle out-of-commissioning due to a lack of parts and services.

5. Funding Need Analysis

Financial forecasting and capital planning are a critical element in ensuring the efficient and sustainable management of infrastructure. This involves estimating future financial needs and developing a strategic plan to secure the necessary funding for maintenance, renewal, or expansion of assets. By accurately forecasting financial requirements and implementing a well-structured capital plan, the City can not only ensure the long-term viability of their infrastructure systems but also effectively manage costs, reduce environmental risks, and protect public health.

The financial projections presented in the subsequent sections provide visualizations of the results from the financial model, considering two scenarios: **Scenario 1** considers like-for-like replacement, while **Scenario 2** considers green fleet expansion. The subsequent sections are structured as follows:

Section 5.1 shows the assumptions adopted in the financial model to determine the reinvestment and replacement decisions for each subcategory of fleet assets.

Section 5.2 assesses the annual funding requirements for the next 20 years (2024-2043). Additionally, a smoothed allocation of annual funding is provided to align with the City's budgeting requirements.

Section 5.3 summarizes the O&M budget forecast over the next 10 years (2024-2033).

Section 5.5 presents the full funding needed over the next 10 years (2024-2033). The full funding expenditure profile includes the budget required for capital, O&M, and disposal.

Section 5.6 summarizes the City's fleet asset funding strategies and available grants for supporting the fleet asset management lifecycle activities.

5.1 Reinvestment Forecast and Lifecycle Modeling

The lifecycle analysis was conducted using an MS Excel Asset Lifecycle Model that integrated asset inventory, age, ESLs, replacement values, and condition to establish a theoretical replacement cycle for each fleet asset. The reinvestment forecasts prepared for this assessment provide estimates of the costs required over the next 20 years to sustain each of the City's fleet assets. A financial dashboard was developed to present the results of the lifecycle modelling (**Appendix A**).

The annual reinvestment needs for the fleet assets were determined based on their age and ESL in years in inflated dollar values and are based on the following assumptions:

- Base year: the base year used is 2024. Any historic asset valuations have been inflated using the experienced inflation rate.
- Analytical Period: the analysis period for capital reinvestment needs is from 2024 to 2043, and the analysis period for full funding needs is from 2024 to 2033.
- Funding Restriction: no funding restrictions are applied.
- Replace at the End of ESL: Assets will be replaced when their theoretical end of useful life is reached.
- Incorporation with Mercury Report: for the Public Work fleets covered in the Mercury Fleet Assessment Report[7], the lifecycle replacement schedule is aligned with the recommendation from that report.
- Cost markup for Like-for-Like Replacement: 5% markup applied to account for required service charging and dealership markups.
- Cost markup for Green Fleet Expansion: 30% markup applied to account for the price increase of the EV or hybrid vehicles compared to the original fossil fuel vehicles.
- Backlog Smooth-out: replace assets that are in Very Poor condition and have already exceeded their ESL, depending on their designated replacement year (Designated Replacement Year = Asset Install Year

[7] Mercury Associates Inc. (2021): SSM Fleet Practices Review Final Report

+ Estimated Service Life), The backlog replacements were planned to be allocated within the first four years of the analysis period, determined by applying the following logic:

- If the designated asset replacement year is between 1996 and 2005, they will be replaced on 2024-06-01.
- If the designated asset replacement year is between 2006 and 2015, they will be replaced on 2025-01-01.
- If the designated asset replacement year is between 2016 and 2019, they will be replaced on 2026-01-01.
- If the designated asset replacement year is between 2020 and 2023, they will be replaced on 2027-01-01.

- Future Inflation: AECOM applied an annual inflation rate forecast to this analysis, as presented in **Table 5-1**.

Table 5-1: Inflation Rate for Different Years Throughout 20 Years[8]

Year	Inflation Rate
2024	7%
2025	6%
2026	5%
2027	4%
2028	4%
2029	3%
2030 - 2043	3%

- O&M Funding Needs: The annual operation and maintenance (O&M) funding needs are estimated by applying the Vehicle Equivalent Unit (benchmarking O&M cost/VEU) methodology and escalated with the inflation rate forecast presented in **Table 5-1** for the next 20 years.
- Capital Expansion Funding Needs: The annual new asset acquisition (expansion) funding needs are forecasted by escalating the City of SSM's average historical expansion expenditure from 2019 to 2024 with the inflation rate forecast presented in **Table 5-1**.
- Asset Disposal Funding Needs: The annual disposal and decommissioning (disposal) funding needs are forecasted by annual capital reinvestment needs multiplied by the disposal rate, which is 1% in this exercise.
- The cost numbers are rounded to the nearest $1,000.

5.2 Capital Reinvestment Need Analysis

5.2.1 Scenario 1: Like-for-Like Replacement

The like-for-like replacement scenario is to replace the existing vehicles with new ones of similar functionality and same fuel types, whereas over 95% of the current fleets are driven by fossil fuel. In this case, the City's fleet assets require an average annual reinvestment rate of $8.0 million over the period 2024-2033 and $9.7 million over 2034-2043 in inflated dollar values, as presented in **Figure 5-1**. This is equivalent to a total of approximately $178 million over the next 20-year period. Notably, the reinvestment funding needs for the Transit fleet account for the largest share in most years, which incur the expenditure spikes in the years 2027, 2031, 2037 and 2041. The reinvestment funding needs for Public Work fleets are $3.1 million over the period 2024-2033 and $3.8 million over 2034-2043 in inflated dollar values.

[8] AECOM Analysis, "Rising Inflation", June 2022, Retrieved in October 2022

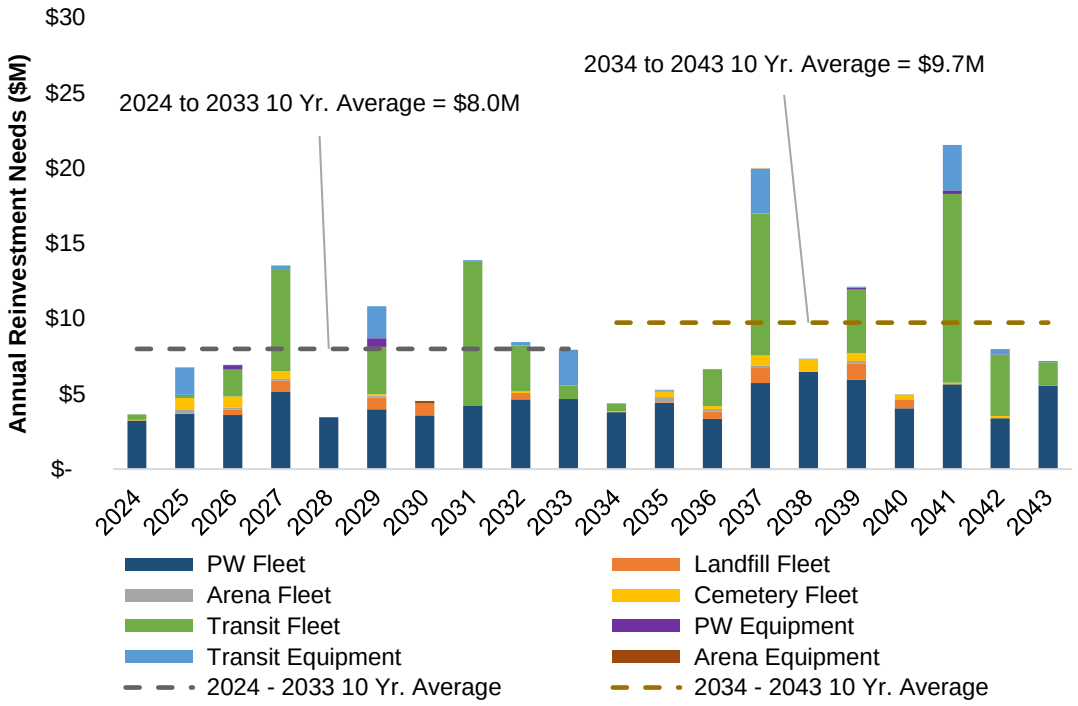

Figure 5-1: Fleets 20-Year Reinvestment Need (Scenario 1: Like-for-Like)

The detailed 20-year reinvestment needs for fleet assets are presented in **Table 5-2** in inflated dollar values according to the business case values.

Table 5-2: Fleet Asset 20-Year Total and Annual Average Reinvestment Needs

Asset Class	Annual Average Reinvestment Need	20-Year Total
PW Fleet	$4,419,000	$88,365,000
Landfill Fleet	$311,000	$6,205,000
Arena Fleet	$77,000	$1,523,000
Cemetery Fleet	$278,000	$5,558,000
Transit Fleet	$3,035,000	$60,696,000
PW Equipment	$62,000	$1,234,000
Arena Equipment	$10,000	$198,000
Transit Equipment	$680,000	$13,581,000
Total	**$8,872,000**	**$177,360,000**

To better align with the City's budgeting requirements, the annual capital reinvestment needs for the City's fleet assets have been evenly distributed over the next 20 years, as illustrated in **Figure 5-2.** This smoothing of reinvestment requirements aims to facilitate the City's budgeting processes by providing a more predictable and steadier financial outlook. Rather than experiencing significant fluctuations in capital expenditure from year to year, this approach allows for a more consistent and manageable financial planning for the City throughout the period of 2024-2043.

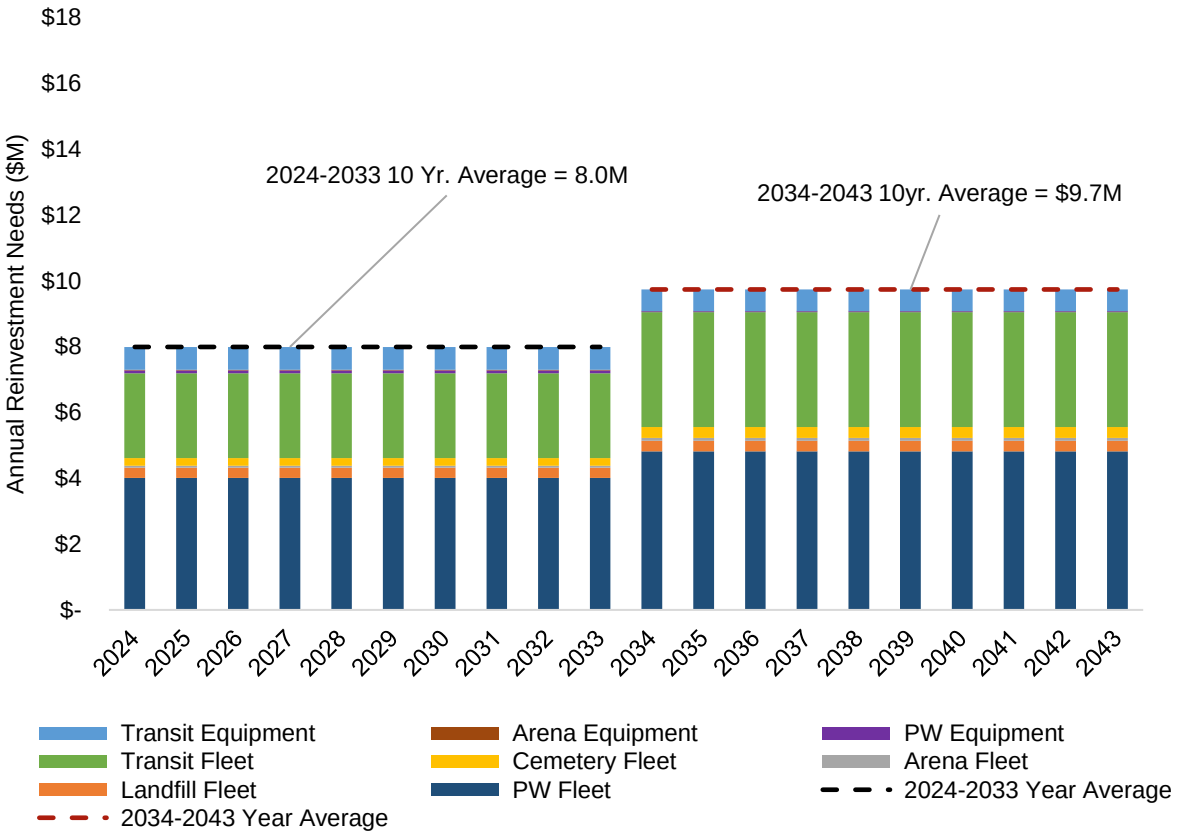

Figure 5-2: Fleet Asset 20-Year Smoothed Annual Reinvestment Needs (Scenario 1: Like-For-Like)

5.2.2 Scenario 2: Green Fleet Expansion

The green fleet expansion scenario is to replace the existing vehicles with new ones of similar functionality with cleaner energy types, such as pure electric vehicles, hybrid, and plug-in hybrid vehicles. The green fleet alternatives are not available for all types of vehicles (refer to **Section 4.6**). Only the vehicles belonging to automobile, carts, LD (Light-Duty) Truck, SUV and Transit Bus class categories are considered to be replaced with electric vehicles or different types of hybrid vehicles in this green fleet expansion scenario. In this case, a plus 30% price adjustment is applied to the vehicle replacement costs to account for the average price increase between traditional fossil fuel vehicles and green vehicles (refer to **Section 4.6**). **Table 5-3** summarizes the number of vehicles in the City's fleet that are possible to be replaced with green vehicle alternatives by each vehicle category and the price difference.

Table 5-3: Vehicles of Different Class Categories Available to Be Replaced with Green Vehicles

Class Category	Green Fleet Option	Number of Vehicles Affected	Price Increase
Automobile	Hybrid/EV	17	103,000
Carts	EV	10	168,000
LD Truck	Hybrid/EV	90	1,717,000
SUV	Hybrid/EV	6	103,000
Transit Bus	EV Bus	42	4,791,000
Total		**165**	**6,880,000**

In total, there are 165 vehicles of varies class categories could potentially be replaced with green vehicles, which incurs a total additional cost of $6.9 million.

In this case, The City's fleet assets require an average annual reinvestment rate of $8.8 million over the period 2024-2033 and $10.9 million over 2034-2043 in inflated dollar values, as presented in **Figure 5-3**. This is equivalent to a total of approximately $197 million over the next 20-year period. Notably, the reinvestment funding needs for the Transit fleet account for the largest share in most years, which incur the expenditure spikes in the years 2027, 2031, 2037 and 2041. The reinvestment funding needs for Public Work fleets are $3.3 million over the period 2024-2033 and $3.7 million over 2034-2043 in inflated dollar values.

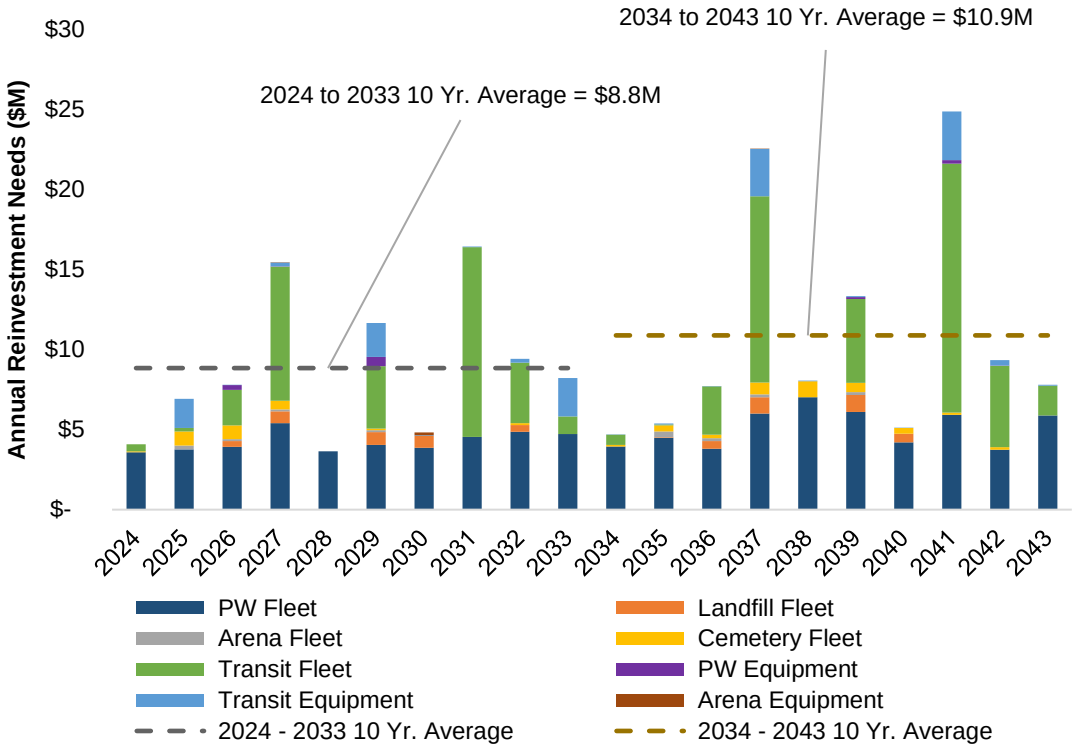

Figure 5-3: Fleets 20-Year Reinvestment Need (Scenario 2: Green Fleet)

The detailed 20-year reinvestment needs for fleet assets are presented in **Table 5-4** in inflated dollar values according to the business case values.

Table 5-4: Fleet Asset 20-Year Total and Annual Average Reinvestment Needs (Scenario 2: Green Fleet)

Asset Class	Annual Average Reinvestment Need	20-Year Total
PW Fleet	$4,667,000	$93,340,000
Landfill Fleet	$311,000	$6,205,000
Arena Fleet	$77,000	$1,523,000
Cemetery Fleet	$312,000	$6,232,000
Transit Fleet	$3,744,000	$74,864,000
PW Equipment	$62,000	$1,234,000
Arena Equipment	$10,000	$198,000
Transit Equipment	$680,000	$13,581,000
Total	**$9,863,000**	**$197,177,000**

To better align with the City’s budgeting requirements, the annual capital reinvestment needs for the City's fleet assets have been evenly distributed over the next 20 years, as illustrated in **Figure 5-4.** This smoothing of reinvestment requirements aims to facilitate the City’s budgeting processes by providing a more predictable and

steadier financial outlook. Rather than experiencing significant fluctuations in capital expenditure from year to year, this approach allows for a more consistent and manageable financial planning for the City throughout the period of 2024-2043.

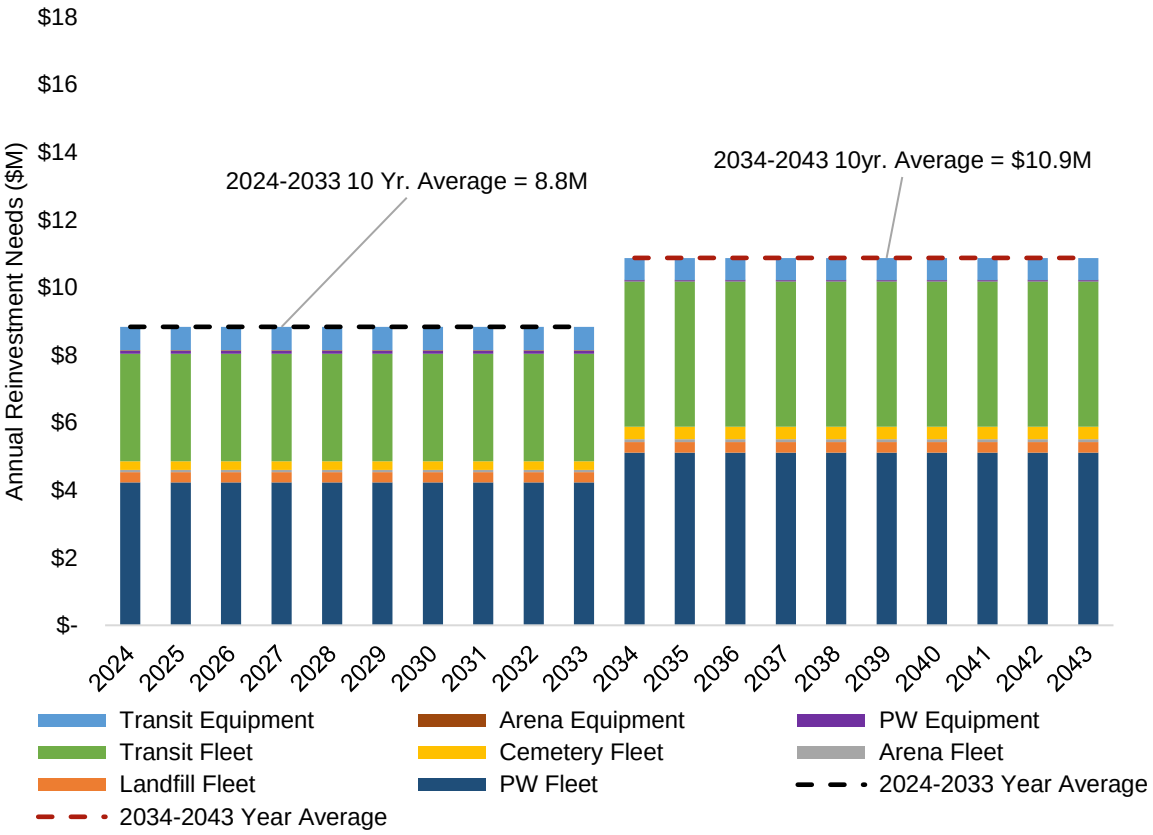

Figure 5-4: Fleet Asset 20-Year Smoothed Annual Reinvestment Needs (Scenario 2: Green Fleet)

5.3 O&M Funding Need Analysis

5.3.1 Vehicle Equivalent Unit

The concept of Vehicle Equivalent Units (VEUs) is used in fleet management to determine staffing and cost requirements for vehicle maintenance. It represents a way to aggregate different types of vehicles within a fleet into a common unit measurement. In this case, the average annual O&M costs per vehicle equivalent unit (VEU) are applied to estimate the O&M costs needed for each fleet asset. According to other municipal studies in Canada and the U.S.A., the cost per Vehicle Equivalent Unit (VEU) range corrected for inflation is $2,300 to $3,900[9]. Generally, the newer of the vehicles, the fewer O&M costs are required.

The average maintenance and repair cost per VEU for the City of SSM's fleet is $5,456/VEU in 2021[10]. AECOM inflated the benchmarking cost into 2024 dollars and the cost breakdown is presented in **Table 5-5**.

[9] Mercury Associates Inc. (2021): SSM Fleet Practices Review Final Report
[10] Mercury Associates Inc. (2021): SSM Fleet Practices Review Final Report

Table 5-5: Maintenance and Repair Benchmarking Cost Per VEU

Maintenance Cost Item	Cost per VEU
In-house Labour	$3,094
Sublet Repair Service	$1,000
Parts	$1,844
Total Cost Per VEU	**$5,982**

The VEUs for a regular automobile (sedan) equals one, and the vehicles under other class categories have different VEU values depending on their size, function, and duty level compared to the regular automobile. **Table 5-6** summarizes the VEUs/unit and the maintenance and repair cost per class category.

Table 5-6: VEUs/Unit and the Maintenance and Repair Cost Per Class Category

Class Category	VEU(s)/Unit	Annual Maintenance and Repair Cost
Transit Bus	7.50	$44,194
HD Truck	6.46	$38,056
MD Truck	4.50	$26,516
Off-Road and Construction	4.44	$26,163
Grounds Equip	1.76	$10,371
Material Handling	1.76	$10,371
LD Truck	1.63	$9,606
Van	1.50	$8,839
Automobile	1.00	$5,892
SUV	1.00	$5,892
Carts	1.00	$5,892
Large Equipment	0.80	$4,714
Trailer	0.74	$4,355
Attachments	0.64	$3,795
Mounted	0.40	$2,357
Stationary	0.40	$2,357
Equipment-Small	0.30	$1,768
Miscellaneous Equipment	0.20	$1,178
Equipment-Testing	0.20	$1,178
Steamer	0.20	$1,178
Transit Equipment	0.20	$1,178

5.3.2 10-Year O&M Funding Forecast

The O&M funding needs are totalized based on the maintenance cost/vehicle summarized in **Table 5-6**. **Figure 5-5** and **Table 5-7** show the O&M funding forecast for the next 10 years from 2024 to 2033. The annual average forecasted O&M funding need is $8.4 million over the next 10 years in inflated dollar value.

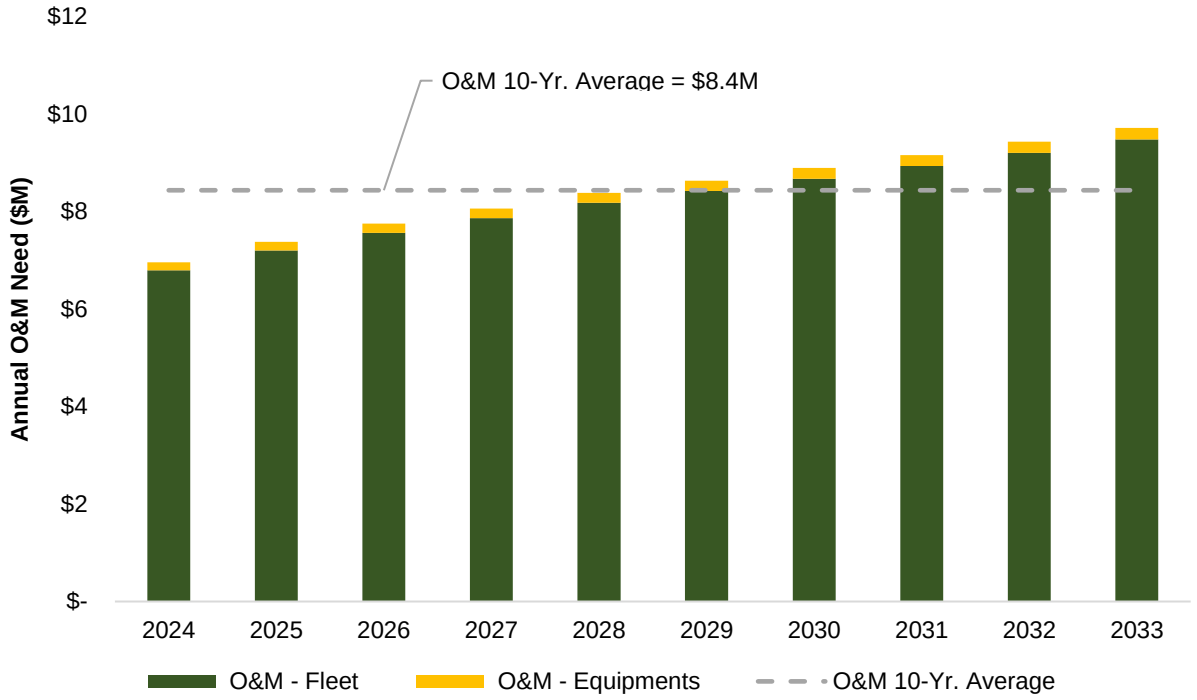

Figure 5-5: Fleet 10-Year O&M Forecast

The detailed 10-year O&M budgets for fleet assets are presented in **Table 5-7** in inflated dollar values.

Table 5-7: Fleet 10-Year Total and Annual O&M Budget

O&M Category	Annual Average Budget	10-Year Total
Fleet O&M	$8,226,000	$82,259,000
Equipment O&M	$207,000	$2,065,000
Total	**$8,433,000**	**$84,324,000**

5.4 Capital Expansion Funding Needs

5.4.1 Green Fleet Infrastructure Investment Needs

To address the growing demand for vehicle charging, both for public and private vehicles, the municipality should consider implementing several key actions, such as:

- Investment in public charging stations in high-traffic areas such as recreational facilities, city hall, public parking lots, and transportation hubs.
- Upgrade the existing fleet maintenance garage and bus servicing facilities to support the operation and maintenance needs of the EV fleet.

By analyzing the 2021 to 2024 capital budgets published by the City, the historical expenditures in green fleet infrastructure investment were captured, and the historical costs were summarized in **Table 5-8.** The average expenditure for the green fleet infrastructure over the past 3 years was $0.81 million.

Table 5-8: Historical Green Fleet Infrastructure Investment

Capital Year	Asset Class	Cost Item	Cost
2024	Transit Fleet	Electrical Upgrade and Charging Units	$825,000
2023	Transit Fleet	Infrastructure Modifications for Elec Bus	$450,000
2022	Transit Fleet	Charging Station	1,166,000
	Transit Fleet	EV Infrastructure Design	
Total			**$2,441,000**
3-Year Average			**$814,000**

5.4.2 Capital Expansion Funding Needs

By analyzing the 2019 to 2023 capital budgets published by the City, the historical capital expansion (definition refers to **Section 4.2**) expenditures were captured, and the historical costs were summarized in **Table 5-9**. The average expenditure for the green fleet infrastructure over the past 5 years was $3.58 million.

Table 5-9: Historical Capital Expenditure

Capital Year	Fleet	Equipment	Total
2023	$5,555,000	$499,000	$6,054,000
2022	$3,609,000	$583,000	$4,192,000
2021	$2,205,000	$0	$2,205,000
2020	$1,559,000	$0	$1,559,000
2019	$2,267,000	$0	$2,267,000
2019-2023 Average	**$3,039,000**	**$541,000**	**$3,580,000**

5.5 Full Funding Need Profile

5.5.1 Scenario 1: Like-for-Like Replacement

Figure 5-6 shows a full picture of the City's fleet funding forecast for the next 10 years. This graph provides the City with a comprehensive understanding of the full funding requirements, essential for effective financial planning activities. The total annual full funding needs for scenario 1: like-for-like replacement, were combined with the following:

- Capital reinvestment needs (**Figure 5-1**)
- Projected fleet O&M cost (**Figure 5-5**).
- The annual capital expansion funding needs forecasted by escalating the City of SSM's average historical capital expansion expenditure (**Table 5-9**) with the inflation rate forecast presented in **Table 5-1**.
- One percent of the annual replacement cost was added to account for the asset disposal cost. Note that *PS 3280 Asset Retirement Obligations*[11] is a new accounting standard covering asset retirement obligations that applies to all Canadian public sector entities that prepare their financial statements under PSAB.

With these additions, the City's fleet full funding requirement increases to approximately $205 million over the next 10 years, averaging $20.5 million per year in inflated dollar value.

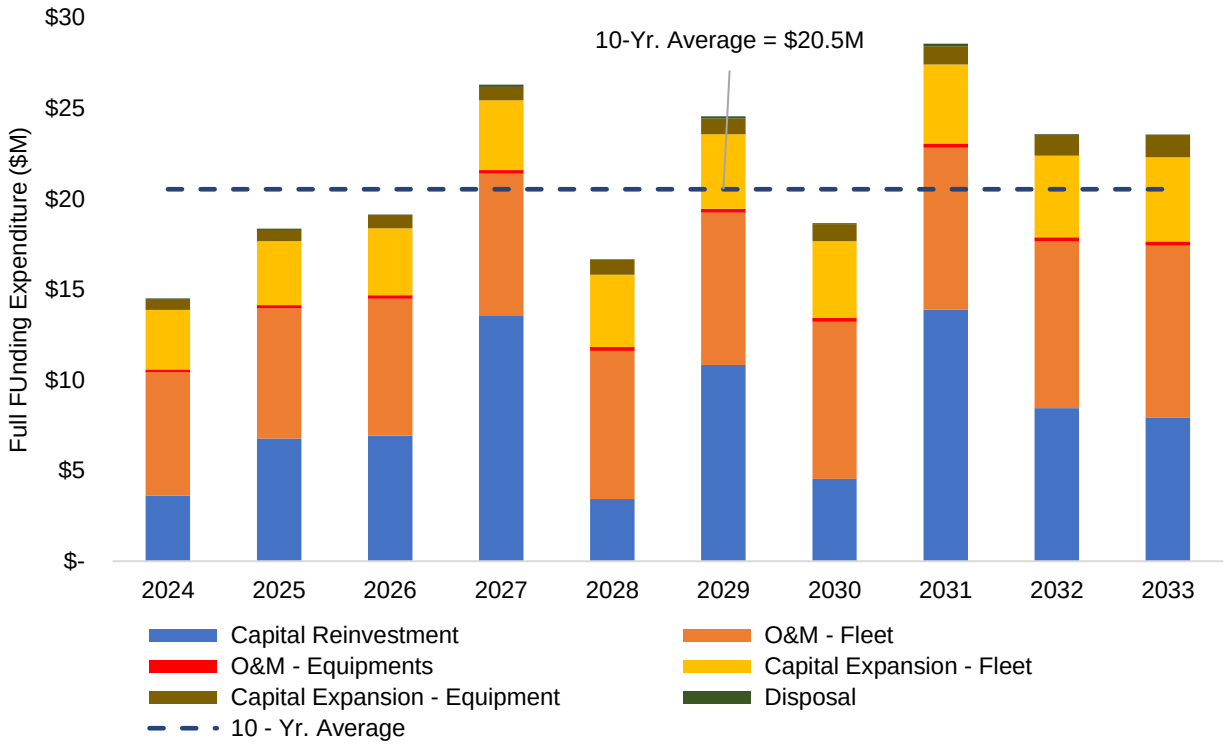

Figure 5-6: Fleet Asset Full Funding Needs (Scenario 1: Like-For-Like)

5.5.2 Scenario 2: Green Fleet Expansion

Figure 5-7 shows a full picture of the City's fleet funding forecast for the next 10 years. This graph provides the City with a comprehensive understanding of the full funding requirements, essential for effective financial planning activities. The total annual full funding needs for scenario 1: like-for-like replacement, were combined with the following:

[11] Public Sector Accounting Board (PSAB). (2021). PS 3280 - Asset Retirement Obligations.

- Capital reinvestment needs (**Figure 5-3**)
- Projected fleet O&M cost (**Figure 5-5**).
- The annual green fleet Infrastructure investment needs forecasted by escalating the City of SSM's average historical green fleet Infrastructure investment (**Table 5-8**) with the inflation rate forecast presented in **Table 5-1**.
- The annual capital expansion funding needs forecasted by escalating the City of SSM's average historical capital expansion expenditure (**Table 5-9**) with the inflation rate forecast presented in **Table 5-1**.
- One percent of the annual replacement cost was added to account for the asset disposal cost. Note that *PS 3280 Asset Retirement Obligations*[12] is a new accounting standard covering asset retirement obligations that applies to all Canadian public sector entities that prepare their financial statements under PSAB.

With these additions, the City's fleet full funding requirement increases to approximately $224 million over the next 10 years, averaging $22.4 million per year in inflated dollar value.

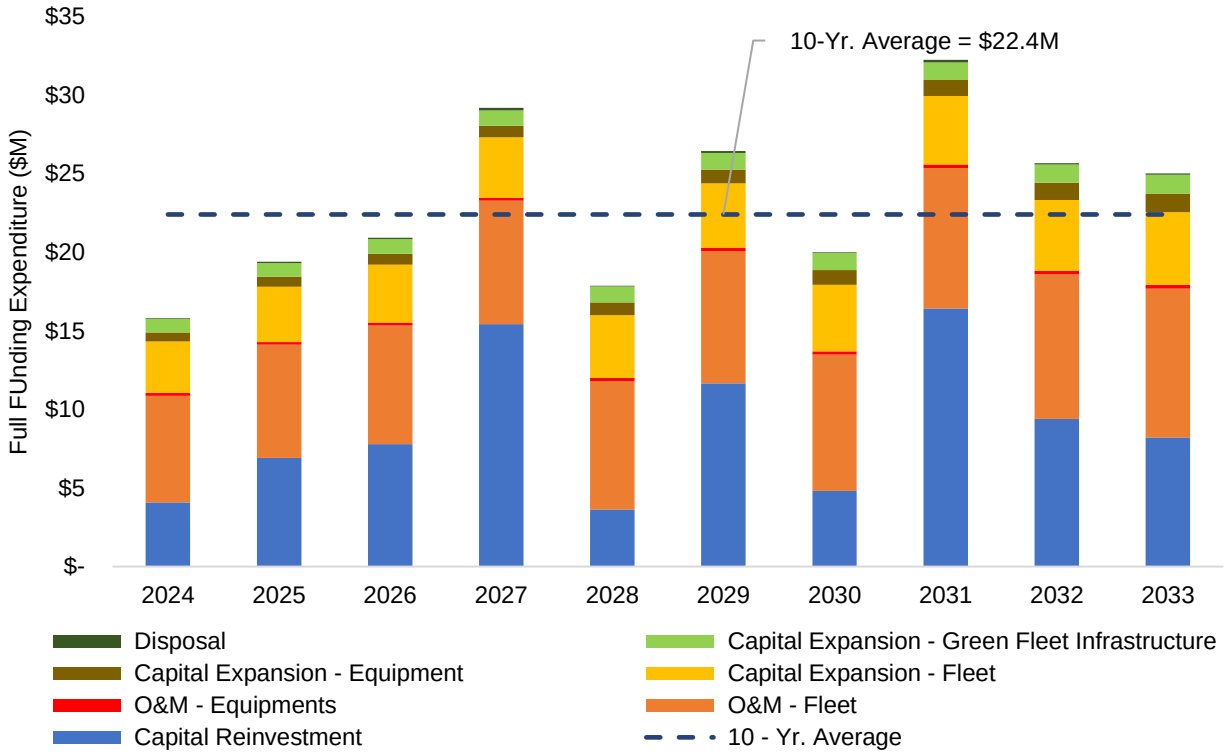

Figure 5-7: Fleet Asset Full Funding Needs (Scenario 2: Green Fleet)

[12] Public Sector Accounting Board (PSAB). (2021). PS 3280 - Asset Retirement Obligations.

5.6 Funding Strategies

The City's public works fleet is primarily supported by the property tax levy, while transit heavily depends on funding from both Federal and Provincial governments, constituting approximately 75% of its financial support. However, there is a growing concern about the sustainability of government funding for transit. The lack of continuous financial support from the government may result in a significant decrease in capital investment, affecting the City's ability to deliver services to desired levels. In light of these concerns, AECOM encourages the City to actively explore alternative funding sources to mitigate potential challenges. This section introduces the following potential funding options that could be considered, acknowledging that the City's eligibility for these funds is subject to certain criteria:

- Canada Community-Building Fund (CCBF)
- Investing in Canada Infrastructure Program
- Zero Emission Transit Fund
- Canada Infrastructure Bank (CIB)
- Federal incentives for zero-emission vehicles (ZEVs)
  - The Incentives for Zero-Emission Vehicles Program
  - The Incentives for Medium- and Heavy-Duty Zero-Emission Vehicles (iMHZEV) Program
- Green Municipal Fund (GMF)
- Green Freight Program (GFP)

5.6.1 Canada Community-Building Fund (CCBF)

The CCBF, previously known as the Federal Gas Tax Fund, is a permanent source of upfront funding distributed twice a year to territories and provinces. The delivery of the CCBF to municipalities varies by province or territory, with allocation following a per-capita basis for provinces, territories, and First Nations[13].

The CCBF is administered in Ontario through a bilateral agreement with the Government of Ontario, the Association of Municipalities of Ontario (AMO), and municipalities. This program allocates approximately $816 million annually to 641 communities in Ontario, with an additional top-up of $816.5 million provided in 2020 to expedite communities' recovery from the COVID-19 pandemic. Notably, as of 2022, the City has received over $9 million through the CCBF, granting the City flexibility to strategically invest across 19 distinct project categories[14].

5.6.2 Investing in Canada Infrastructure Program

Administered by the Government of Canada, the Investing in Canada Infrastructure Program delivers long-term and stable funding to communities with the aim of addressing environmental challenges, fostering clean growth, and enhancing resilience to climate change. Through bilateral agreements, over $33 billion in funding is allocated to provinces and territories, supporting a diverse range of infrastructure projects nationwide[15].

The program encompasses investments across four targeted funding streams: the public transit stream, the green infrastructure stream, the community, culture, and recreation infrastructure stream, and the rural and northern communities' infrastructure stream. The public transit stream allocates funds for the construction, expansion, and enhancement of public transit infrastructure. The focus of these investments is on projects that aim to increase the capacity of public transit systems, enhance the quality and safety of existing or future transit infrastructure, and

[13] The Canada Community-Building Fund. (2022). Infrastructure Canada. Infrastructure Canada - The Canada Community-Building Fund. Retrieved on February 12th, 2024.

[14] Ontario's 2021–22 federal Canada Community-Building Fund allocations and top-up amounts. (2021). Infrastructure Canada. Backgrounder: Ontario's 2021–22 federal Canada Community-Building Fund allocations and top-up amounts - Canada.ca. Retrieved on February 12th, 2024.

[15] Investing in Canada Infrastructure Program. (2023). Infrastructure Canada. Infrastructure Canada - Investing in Canada Infrastructure Program. Retrieved on February 12th, 2024.

improve overall access to public transit systems. In pursuit of funding through this stream, the City has actively submitted proposals for the following projects[16]:

- Electrification of Transit System.
- Transit Facility and Equipment Upgrades.
- Purchase of Rolling Stock Assets.
- Relocation of the Downtown Transit Terminal Construction and Renovation.
- Transit Facility and Equipment Upgrades.
- Purchase of Transit Ticket Vending Machines.
- Purchase and Installation of Transit Bus Shelter.

5.6.3 Zero Emission Transit Fund

The Zero Emission Transit Fund is a separate fund that builds on the existing Investing in Canada Infrastructure Program[17]. Through this fund, the Government of Canada is investing $2.75 billion over five years, starting in 2021, to support public transit and school bus operators in planning for electrification. The funding also supports the purchase of 5,000 zero-emission buses and the construction of necessary infrastructure, including charging facilities and facility upgrades.

There are two components under the Zero Emission Transit Fund for which projects are eligible for funding:

- Planning Projects: Eligible projects include studies, modeling, and feasibility analyses that will support the development of future larger-scale capital projects.
- Capital Projects: Eligible capital projects include buses, charging and refueling infrastructure, and other ancillary infrastructure needs.

5.6.4 Canada Infrastructure Bank (CIB)

The CIB is a Crown corporation mandated to invest in transformative infrastructure projects. With almost 50 partnerships spanning the entire country, including small communities and large urban areas, the CIB focuses on five key investment areas: public transit, green infrastructure, clean power, trade and transportation, and broadband infrastructure[18].

In the public transit sector, their involvement extends to advising, investing in, and building knowledge with public transit owners and service providers, with a particular emphasis on initiatives such as zero-emission buses, light rail transit, and bus rapid transit. Since the announcement of the $10 billion Growth Plan in October 2020, the CIB has formed partnerships and approved investments for the purchase of 1,300 zero-emission public transit and school buses. Moving forward, the CIB has set a long-term target to invest $5 billion in public transit, with a specific allocation of at least $1.5 billion for zero-emission buses and associated infrastructure[19].

[16] Investing in Canada Infrastructure Program: Projects Under Review. (2022). Infrastructure Canada. Infrastructure Canada - Investing in Canada Infrastructure Program: Projects Under Review. Retrieved on February 12th, 2024.

[17] Zero Emission Transit Fund. (2023). Infrastructure Canada. Infrastructure Canada - Zero Emission Transit Fund. Retrieved on February 12th, 2024.

[18] Public Transit. (n.d.). Canada Infrastructure Bank. Public Transit | Canada Infrastructure Bank (CIB) (cib-bic.ca). Retrieved on February 12th, 2024.

[19] Government of Canada targets zero emission bus transportation with launch of new fund. (2021). Infrastructure Canada. Government of Canada targets zero emission bus transportation with launch of new fund - Canada.ca. Retrieved on February 12th, 2024.

5.6.5 Federal incentives for zero-emission vehicles (ZEVs)

There are Federal incentives available for buying or leasing zero-emission vehicles (ZEVs) through two programs, each tailored to different vehicle types[20]:

- **The Incentives for Zero-Emission Vehicles (iZEV) Program**

  The Incentives for Zero-Emission Vehicles (iZEV) Program, launched in May 2019, aims to promote the adoption of Zero-Emission Vehicles (ZEVs) among Canadians and Canadian organizations. Individuals and organizations in Canada are eligible for up to $5,000 at the point of sale when purchasing or leasing light-duty ZEVs such as cars, SUVs, and light pick-up trucks.

- **The Incentives for Medium- and Heavy-Duty Zero-Emission Vehicles (iMHZEV) Program**

  Initiated on July 11th, 2022, the Incentives for Medium- and Heavy-Duty Zero-Emission Vehicles (iMHZEV) Program offers up to $200,000 at the point of sale for the purchase or lease of medium- and heavy-duty Zero-Emission Vehicles (ZEVs) with a gross weight rating exceeding 8,500 lbs. To qualify, the vehicle must be intended for use on public streets, roads, highways, or other paved surfaces. Eligible organizations can benefit from up to 10 incentives in a calendar year, reaching a maximum cap of $1,000,000.

5.6.6 Green Municipal Fund (GMF)

The GMF is a financial initiative in Canada dedicated to supporting sustainability and environmental projects at the municipal level. Managed by the Federation of Canadian Municipalities (FCM), the GMF provides funding and resources to assist municipalities across the country in undertaking projects that contribute to environmental sustainability, energy efficiency, and the reduction of greenhouse gas (GHG) emissions[21].

In the context of fleet management, the GMF allocates funds for pilot projects, feasibility studies, and capital projects aimed at reducing or avoiding fossil fuel use in municipal service delivery vehicles. Eligible projects should aim to reduce greenhouse gas (GHG) emissions by 20% compared to an existing or modeled baseline measurement. Priority during the evaluation of applications will be given to projects that demonstrate transformative potential, significant impacts, and a strong implementation framework.

5.6.7 Green Freight Program (GFP)

The GFP aims to assist fleets in reducing fuel consumption and greenhouse gas emissions. It offers support through various means, such as fleet energy assessments, retrofits, engine repowers, adopting logistical best practices, and acquiring low-carbon vehicles[22]. The program operates through two funding streams. Stream 1 (Assess and Retrofit) offers grant funding of up to $250,000 for Third-Party Fleet Energy Assessments and Truck/Trailer Equipment Retrofits. Meanwhile, Stream 2 (Repower and Replace) offers non-repayable contributions for fuel switching, engine repowers, and the procurement of low-carbon alternative fuel vehicles. Under Stream 2, the program covers up to 50% of the incremental cost for purchasing low-carbon alternative fuel vehicles or 50% of total project costs, with a maximum cap of $5 million per project. It is important to note that Stream 2 is currently closed, and submitted proposals are under review.

[20] Zero-emission vehicles. (2024). Transport and Infrastructure, Government of Canada. Zero-emission vehicles - Incentives - Canada.ca Retrieved on February 12th, 2024.
[21] Funding opportunities. (n.d.). Green Municipal Fund. Funding opportunities | Green Municipal Fund. Retrieved on February 12th, 2024.

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6. Implementation Plan and Continuous Improvement

Continuous improvement is an important component of any AM program and is achieved through the implementation of recommended improvement initiatives which support sustainable service delivery. AECOM has identified a set of activities that represents the next stage of AM planning and implementation within the City, as shown in **Table 6-1**.

Table 6-1: Recommended AM Improvement Initiatives

Index	Improvement Initiative	Description
1.	Refine the asset hierarchy and inventory.	• Continue maintaining the fleet inventory and updating it as assets are acquired or disposed of. • Keep tracking mileage/hours for vehicles and equipment in the fleet asset inventory to better align with the actual asset condition.
2.	Establish and implement a data information management strategy	• Asset data will be centralized, digitized and accessible to all staff. • Annual updates for the state of infrastructure data attributes such as the asset inventory, including the age and condition of the assets. • Staff will have the ability to collect and update asset data in the field and in real time. • Workflows will be documented and digitized
3.	Track the vehicle operational data within the Computerized Maintenance Management System (CMMS)	• The operation data for vehicles should be recorded within the CMMS. • Vehicle operational data including: - Monthly odometer reading - Fuel consumption - Vehicle service date and next service date forecast - Any vehicle inspection and diagnosis reports - Parts replacement and vehicle repair history - Factory warranty expiration dates - Vehicle insurance policy and expiration date - Insurance claims history • Keeping track of the vehicle's operational data is beneficial for monitoring the vehicle status, preventing critical malfunction and service interruption, planning adequate vehicle service, retaining moderate insurance premiums, and making decisions on lifecycle activities, such as vehicle renewal, replacement, and retirement.
4.	Develop a formalized fleet condition assessment process and use condition grading schemes for fleet assets.	• Currently, the condition of the fleet is not tracked with a well-developed asset condition rating grading system specialized for fleet assets. • The grading system should include a description directly tied to each condition grade, along with details about the asset's performance and the necessary level of corrective and preventive maintenance required for assets falling within a certain condition rating category. This process will enable the City to keep track of and better forecast asset renewal needs. • Perform condition assessments on the most critical assets first. This ensures that assets are assessed using the same methodology and prioritized based on their criticality. It facilitates a more defensible business case when addressing issues of asset degradation with senior management and the Council.
5.	Refine the LoS Framework.	• Collect current asset performance data for key performance indicators (KPIs) that are not currently being tracked. • Analyze asset performance data to identify trends and establish annual performance benchmarks. • Engage in discussions with key stakeholders to establish service level targets and identify associated costs to meet those targets. • Once LoS targets have been decided upon, the City should develop strategies on how to meet service level targets, considering its existing operating environment (i.e., staff availability, current funding, resources, etc.). • Develop a Customer Consultation Plan to engage the public and other stakeholders on the LoS framework and better understand customers' willingness to pay for enhanced service levels.

Index	Improvement Initiative	Description
6.	Incorporate risk assessment for future iterations of the AM plan, and use the risk assessment results to drive future condition assessments and financial needs forecasting	• Conduct a comprehensive criticality and risk assessment of assets to inform work prioritization. • Review risk attribute values periodically to ensure alignment with business objectives and risk appetite. • Overlay the risk model with the current state of the assets (i.e., condition) and the financial forecast. Using this approach, the City could focus its monitoring, maintenance, renewal and replacement budget and activities on high-risk assets. Medium-risk infrastructure could be addressed through the mitigation of failure via regular monitoring, while low-risk assets could be accepted with caution.
7.	Continue to find ways to improve AM initiatives across the City by maintaining a high level of AM awareness through training, communication, and knowledge sharing.	• Conduct an AM Software Assessment to identify future system requirements, which may involve enhancing existing software, adding new features, or replacing the current system. • Develop a Knowledge Retention Strategy and Internal Communications Plan to document staff AM knowledge and experience for reporting and succession planning purposes. Communicate AM improvement initiatives and enhance AM awareness internally through internal communication.
8.	Update AM Plans	• Updates to the performance measures, and targets for the LoS framework, every 2 to 5 years. • Annual updates to the lifecycle strategies, including the O&M, renewal, upgrades, growth, and regulatory compliance strategies. • Updates to the financial strategies, such as asset valuations, long-term capital plans, operating budgets, and revenue sources.
9	Grant application program	• The city should initiate an internal program for developing grant applications tailored to organizational objectives and align to the criteria of various funding programs. (refer to **Section 5.6** for available grant options). • Guidance includes: - Aligning with grant-specific criteria: prepare the grant application align with the requirements, and place emphasis on the key aspects relevant to the grant objectives. - Developing a grant application proposal: the application will be a project proposal that resonates with the grant agencies' goals, which should articulate clear objectives and expected outcome. - Budget planning: the financial plans must resonate with the grant's objectives, presenting transparency in fund utilization and emphasizing the project's viability and long-term financial sustainability. - Demonstrating feasibility and organization capacity: presenting a realistic project timeline, clear milestones, and a well-thought-out implementation plan. - Compliance, Reporting, and Effective Project Management: a robust project management strategy should be devised, illustrating the City's capacity to effectively manage, oversee, and report on the project's progress, in accordance with the grant's stipulations. - Preparing and Organizing Supporting Documents: these documents will be organized and presented in a manner that lucidly supports and enhances the application. - Final Review and Submission Process: prior to submission, each application should undergo a thorough review to ensure it meets the specific criteria and guidelines of the respective grant program.

Appendix A - Fleet MS Excel Lifecycle Model