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SAULT STE. MARIE

CITY OF SAULT STE. MARIE

WASTEWATER ASSET MANAGEMENT PLAN

FINAL | 60735219 | June 2025

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Revision History

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Draft V0	April 7th, 2025	Draft - Wastewater AM Plan Update		Chris Lombard	Project Manager
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Table of Contents

Figures

Tables

List of Abbreviations

Abbreviation	Description
AM	Asset Management
AMP	Asset Management Plan
ARC	Arc Chambers
CCTV	Closed Circuit Television
CIBI	Canadian Infrastructure Benchmarking Initiative
CMMS	Computerized Maintenance Management System
Conveyance-FM	Conveyance – Force Mains
Conveyance-GRAV	Conveyance – Gravity Mains
Conveyance-MH & CHAM	Conveyance – Manholes and Chambers
Conveyance-SC	Conveyance – Service Connections
ESL	Expected Service Life
FIPPA	Freedom of Information and Protection of Privacy Act
FLSH	Flushing
GIS	Geographic Information System
I&I	Inflow & infiltration
LoS	Level of Service
MFIPPA	Municipal Freedom of Information and Protection of Privacy Act
O&M	Operations and Maintenance
O. Reg.	Ontario Regulation
PUC	Public Utilities Commission
RSL	Remaining Service Life
SCADA	Supervisory Control and Data Acquisition
WWTP-EE	Wastewater Treatment Plant East End
WWTP-WE	Wastewater Treatment Plant West End

1 Introduction

AECOM Canada ULC (AECOM) was retained by The City of Sault Ste. Marie (the "City") to update the asset management plan developed in 2022 to comply with the third phase (Phase III) of the Ontario Regulation 588/17 (O. Reg. 588/17) requirements in respect to its core municipal infrastructure assets. The scope of work is outlined in AECOM's proposal dated September 20, 2024, 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 on two of the Great Lakes with an estimated population of 73,368 (2016). The City provides a wide range of public services to their constituents with the expectation from the public that these services are expected to 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 to 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 asset management plan to comply with the third phase of the regulatory requirements in respect to its core municipal infrastructure assets, in accordance with O. Reg. 588/17, by July 1, 2025. The core assets to be included in the scope, as defined by the regulation, include the City's wastewater assets, stormwater management assets, roads, and bridges and culverts.

1.2 Scope and Objectives

In 2015, the City's first Asset Management Plan (AMP) was published. In 2019, by the City Council approval, the Strategic Asset Management (AM) Policy for the City came into effect. In 2022, the City published its core asset AMPs. Following that, the City developed the AMPs for its non core assets in 2024.

Organizations that implement good 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.

The AMPs capture the City's infrastructure assets and deliver a financial and technical roadmap for the management of the City's assets. The intent of this plan is to provide the means for the City to maximize value from its assets, at the lowest overall expense while, at the same time, enhance service levels for its residents.

The objective of Phase III is to update all the core and non-core AMPs to comply with the July 1st, 2025, deadline set by O. Reg. 588/17. Phase III will update the AMP by incorporating the latest asset information, with a focus on:

- Updating the current AMPs to integrate proposed Levels of Service (LoS).
- Defining the lifecycle activities and associated costs required to achieve those LoS.
- Identify the available funding and any funding shortfalls.
- Document the risk(s) of failing to meet the proposed LoS for all asset classes over a 10-year period.

This AMP is an update of the 2022 AMP for the City's Wastewater management system, as shown in **Table 1-1**. Other core and non-core AMPs are presented under separate reports.

Table 1-1: In-Scope Wastewater Assets

Asset Category	Sub-Assets
Wastewater Treatment Plants	East End Wastewater Treatment Plant (WWTP-EE) and West End Wastewater Treatment Plant (WWTP-WE) including Structural, Process Mechanical, Building Mechanical, Electrical, and Instrumentation & Control Assets.
Pump Stations	Structural, Process Mechanical, Building Mechanical, Electrical, and Instrumentation & Control Assets.
Wastewater Conveyance System	Wastewater gravity mains, force mains, manholes, chambers, and service connections.

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

- Asset hierarchy, 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 gaps analysis (**Sections 2**).
- The City's level of service objectives, stakeholder identification, current levels of service (LoS) determined in accordance with the qualitative descriptions and technical metrics outlined in O. Reg 588/17, proposed service levels, LoS forecast, and future demand drivers (**Section 3**).
- Asset lifecycle management strategies, lifecycle activities and funding needs to achieve proposed LoS, risk of not meeting proposed LoS, available funding and funding gap, and alternative (non-financial) strategies to manage funding shortfall (**Section 4** and **Section 5**)

1.3 Asset Management 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 1-2**). The development of this AMP is one of the steps to guide the City towards meeting the July 1st, 2025 deadline.

Table 1-2: O. Reg. 588/17: AM Planning for Municipal Infrastructure

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.

2 State of Infrastructure

The City's wastewater conveyance system is a combination of linear sewer mains and force mains that is connected to the City's 25 sanitary pumping stations. Wastewater generated by the City flows through over 664 kilometers of service connections, gravity, and force mains before it eventually reaches the City's two wastewater treatment plants, namely the East End Wastewater Treatment Plant (WWTP-EE) and West End Wastewater Treatment Plant (WWTP-WE).

WWTP-EE is located at 2221 Queen Street East. The plant was constructed in two stages in 1959 and 1972, respectively, providing primary treatment only. In 1987, a sludge dewatering facility was added, and the plant was upgraded in 2006 to a biological nutrient removal (BNR) plant with ultraviolet (UV) disinfection. The design flow for this treatment plant is 36,000 m^3/day.

Originally constructed in approximately 1984 and located at 55 Allens Side Road, WWTP-WE provides conventional activated sludge treatment for a design capacity of 20 MLD. A detailed facility condition assessment was completed for WWTP-WE in 2014. The City is currently completing a phase one upgrade with subsequent upgrades to follow in the future phases.

The wastewater conveyance system, including small pump stations, is managed by City Staff, while the ongoing operations of the City's large wastewater infrastructure, including wastewater treatment plants and the large pump stations, are contracted out to the Public Utilities Commission (PUC).

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 requires a logically segmented asset break down structure (hierarchy) under the scope of this AMP. To do so, the core wastewater conveyance system must become sufficiently granular to recognize which individual assets are due for renewal. However, it is important to balance the fine trade-off between adequate granularity to provide essential information with too much granularity that the data collection and management effort eclipses the usefulness of the data itself.

The City has a wide range of wastewater assets organized hierarchically, as presented in **Figure 2-1**. This breakdown of the infrastructure is derived from the way that assets are presented within the data sources, which indicates program area's responsibilities and parent-child relationships within each asset type.

Figure 2-1 shows the two plants WWTP-EE and WWTP-WE, and each of which includes sub-categories: structural, process mechanical, building mechanical, electrical, and instrumentation & control.

Pump Stations are also segmented to 25 sub-sections, named PS 1 to PS 25, including further sub-categories. Moreover, conveyance system encompasses three main asset categories, which are sewers, service connections, and manholes & chambers.

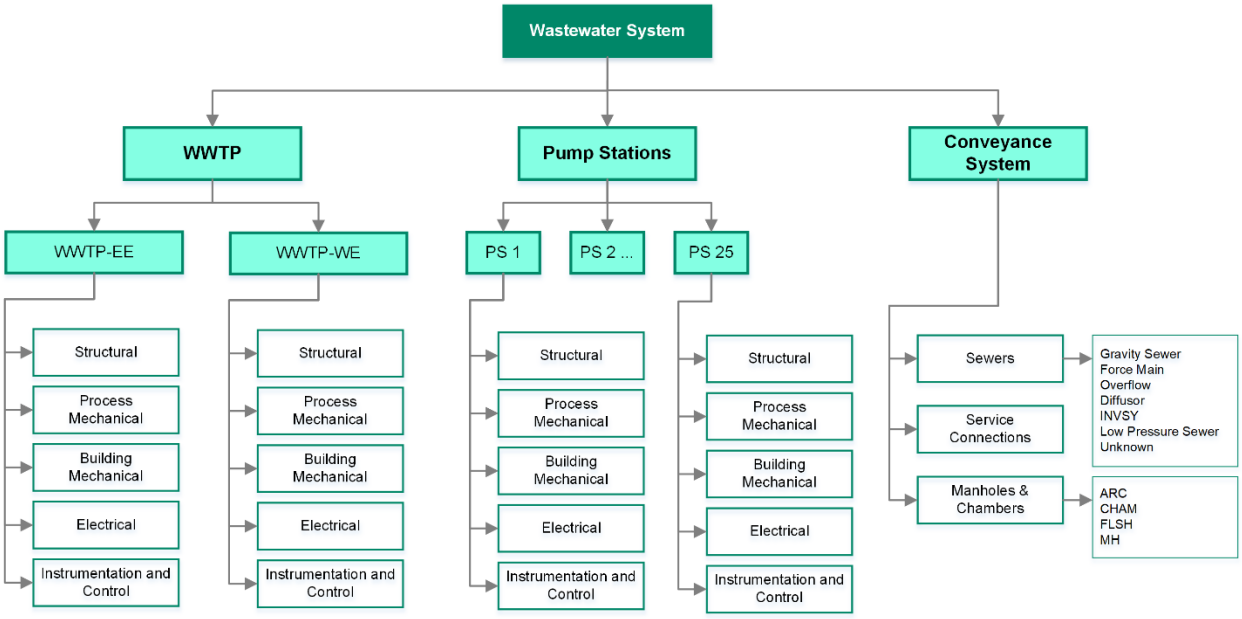

Figure 2-1: City of Sault Ste. Marie Wastewater Asset Hierarchy

2.2 Current State of the Assets

2.2.1 Asset Inventory

Table 2-1 provides a summary of the wastewater inventory for each asset category within City's wastewater conveyance system.

Table 2-1: Wastewater Asset Inventory Summary

Asset Group	Asset Category	Asset Sub-Category	Sub-Category Quantity	Unit	Count of Inventory Records
Wastewater System	Wastewater Treatment Plants	WWTP-EE	1	Ea.	379
		WWTP-WE	1	Ea.	648
	Pump Stations	Pump Stations	25	Ea.	497
	Conveyance	Force Mains	14	km	192
		Gravity Mains	380	km	5,682
		Manholes and Chambers	5,057	Ea.	5,057
		Service Connections	270	km	26,295
Total					**38,750**

2.2.2 Current Asset Replacement Value

The City's wastewater system is valued at approximately $1.9 Billion. **Table 2-2** presents the current replacement value of each asset category. The gravity mains account for the highest replacement value, which is approximately $1.6 Billion, followed by service connections, contributing to over $512 Million. WWTP-EE and WWTP-WE are valued at approximately $155 Million and $114 Million, respectively. Pump stations constitute approximately $29 Million. It should be noted that 45% was considered as a markup rate, including removing existing infrastructure, engineering (Design and Contract administration), contingencies, and mobility.

Table 2-2: Wastewater Current Replacement Value

Asset Group	Asset Category	Asset Sub-Category	Unit Replacement Cost ($ / Unit)	Total Replacement Value (2025)
Wastewater System	Wastewater Treatment Plants	WWTP-EE	$1,000 - $250,000 / Ea.	$154,827,000
		WWTP-WE	$1,000 - $250,000 / Ea.	$114,321,000
	Pump Stations	Pump Stations	$1,000 - $ 250,000 / Ea.	$29,851,000
	Conveyance	Force Mains	$500 - $9,000 / m	$42,138,000
		Gravity Mains	$500 - $9,000 / m	$989,722,000
		Manholes and Chambers	$10,000 - $35,000 / Ea.	$92,159,000
		Service Connections	$500 - $2,300 / m	$512,119,000
			WWTP Sub Total	**$269,148,000**
			Pump Stations Sub Total	**$29,851,000**
			Conveyance Sub Total	**$1,636,138,000**
			Total	**$1,897,521,000**

2.2.3 Age and Remaining Service Life

In practice, various assets will deteriorate at different rates and not necessarily linearly over time. However, it is pivotal to keep in mind the level of effort required to predict failure compared with the asset value. More sophisticated deterioration modelling may be warranted for very high value assets, whilst the cost of deterioration modeling for low-value assets may very well exceed the replacement cost of the asset. The actual service life can vary significantly from the estimated service life (ESL). The latter is defined as the period over which an asset is available for use and able to provide the required LoS at an 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 refurbishment 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 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.

Initially, the average age was calculated based on the purchased and installation year of each individual asset. Then, based on the age of the asset and the ESL (collected from a State of Infrastructure Workshop with the City, and additional information provided by the City), the remining service life (RSL) was calculated. It should be noted that in the case that age was higher compared to ESL, RSL was considered as zero.

Table 2-3 and **Figure 2-2** present the weighted average age, weighted average ESL, and remaining service life for various asset sub-categories within the City’s wastewater system. The average age of the assets ranges from 24 to 54 years with average ESLs that vary from 57 to 80 years. It should be noted that service connections, gravity mains, and manholes & chambers are the oldest in comparison with other assets. The minimum weighted average is WWTP-WE,

24 years, which is the average of all components. The minimum RSL is related to force mains, 26 years, compared to WWTP-WE that has an average RSL of 38 years.

Each WWTP comprises various components with different ESLs, depending on their function, material, usage, and operational conditions. To estimate the overall ESL at the plant level, we applied a weighted average approach, which considers the relative significance of each component based on replacement value. As a result of this approach, the two WWTPs exhibit different overall ESLs. This variation is driven by differences in their asset compositions.

Table 2-3: Wastewater Average Age, ESL, and Remaining Service Life

Asset Group	Asset Sub-Category	Weighted Average Age	Weighted Average ESL	Remaining Service Life
Wastewater System	WWTP-EE	28	59	31
	WWTP-WE	24	62	38
	Pump Stations	27	57	30
	Conveyance-FM*	49	75	26
	Conveyance-GRAV*	49	78	29
	Conveyance-MH & CHAM*	47	80	33
	Conveyance-SC*	54	80	26

* FM = Force Main, GRAV = Gravity Main, MH & CHAM = Manhole and Chamber, SC = Service Connections

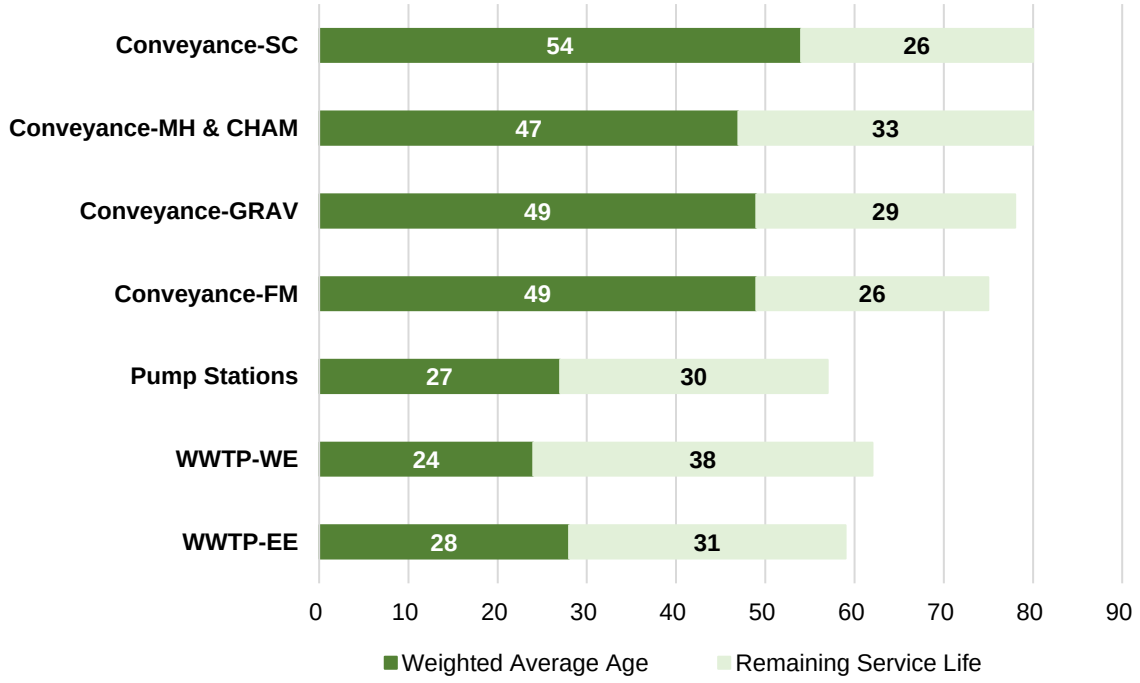

Figure 2-2: Wastewater System Weighted Average Age and Remaining Service Life

Figure 2-3 shows the installation profile of the City's wastewater system according to asset sub-categories. It should be noted that a significant proportion of gravity sewers and service connections was installed before 1965, contributing to the highest replacement values for these two categories. In addition, WWTP-WE components were installed from 1981 to 1985 as the first phase, and from 2016 to date as another phase. WWTP-EE, however, was initialized from 1986 to 1990 in the first step and developed from 2006 to 2010.

Figure 2-4, on the other hand, illustrates the linear assets profile based on 10-year periods to better understand how much gravity mains, force mains, and service connections are contributing to replacement values.

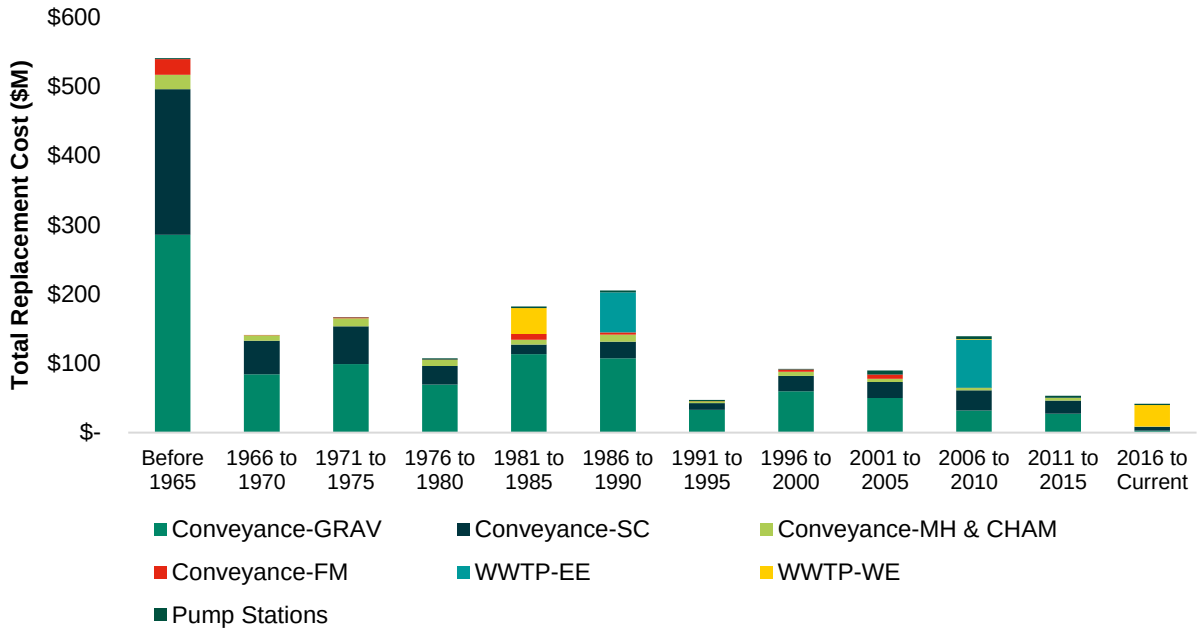

Figure 2-3: Wastewater Installation Profile

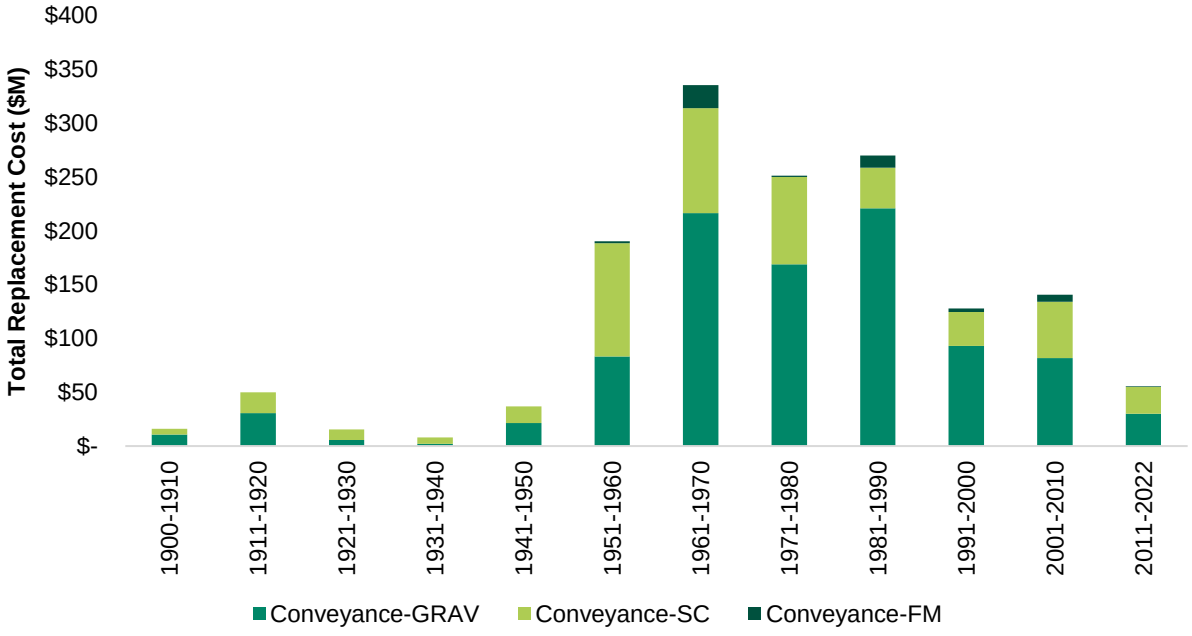

Figure 2-4: Installation Profile of Wastewater Mains and Service Connections

2.2.3.1 Type of Pipe Materials

Table 2-4 provides information about different pipes materials employed within each sub-category. For instance, there are 158 km of asbestos cement pipes, which is the highest contribution to gravity mains, followed by PVC and vitrified clay, with approximately 97 and 72 km, respectively. For service connections, however, almost 154 km of materials are unknown, which represents approximately 50% of all service connections. PVC and asbestos cement with about 65 and 48 km are other materials utilized for service connections. **Figure 2-5**, **Figure 2-6**, and **Figure 2-7** show the percentage of each material type by length for gravity mains, force mains, and service connections, respectively.

Table 2-4: Sewers and Service Connections by Materials Type

Type of Main	Material	Total Length (km)
Gravity Mains	Asbestos Cement	158
	Concrete	29
	Other	9.6
	PVC	97
	Unknown	24
	Vitrified Clay	72
Force Mains	Cast Iron	1.5
	Concrete	3.5
	Concrete Pressure Pipe	1.2
	Ductile Iron	2.4
	HDPE	2.1
	Polyethylene	4.2
	PVC	2.0
	Unknown	0.3
Service Connections	Asbestos Cement	49
	Other	2.3
	PVC	65
	Unknown	154

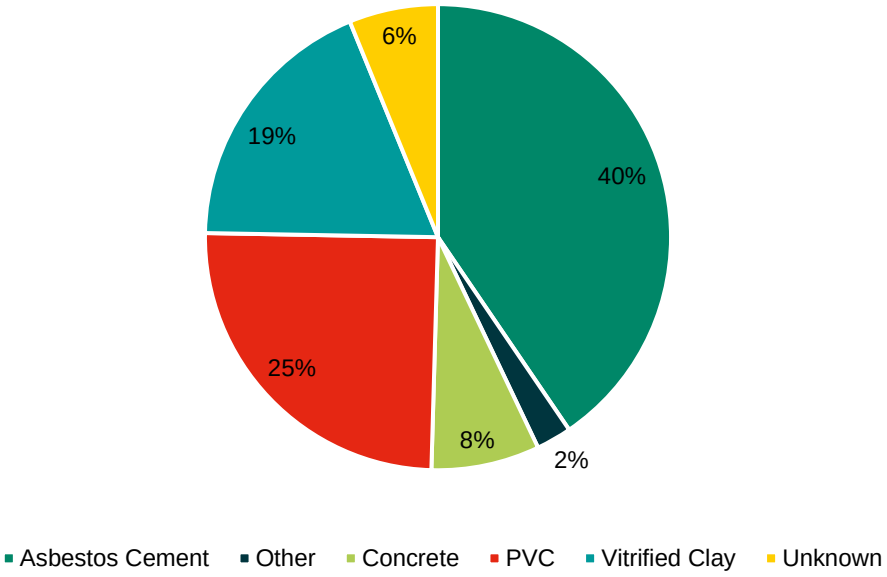

Figure 2-5: Gravity Mains Materials

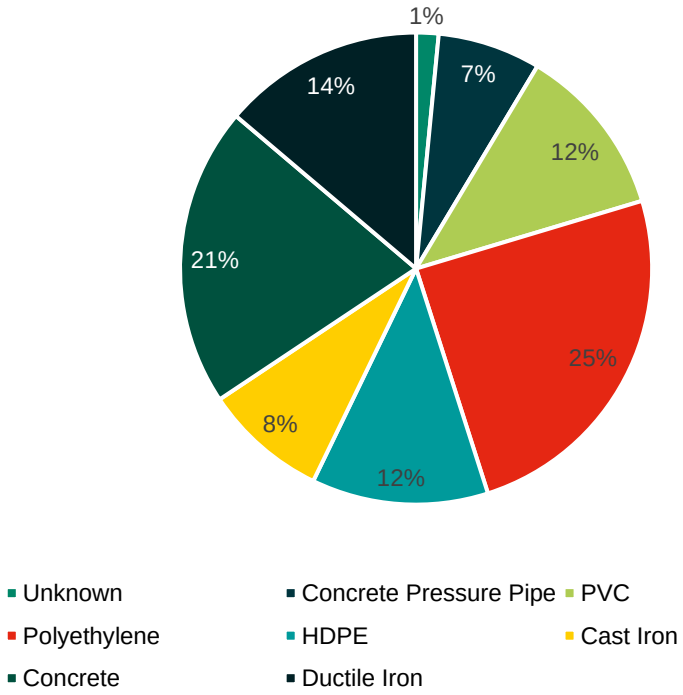

Figure 2-6: Force Mains Materials

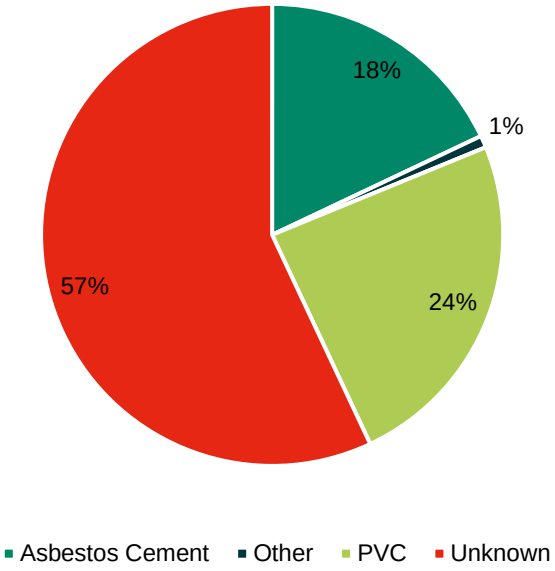

Figure 2-7: Service Connection Materials

2.2.4 Asset Condition

All assets are expected to deteriorate over their lifetime, and their assigned condition reflects the physical state of the asset. The City conducted wastewater facility condition assessment for the WWTP-WE in 2012, and for all WWTPs and PSs in 2022. The 2022 condition assessment results were used to update this AMP.

The condition assessments for forcemains located in River Road and Queen Street (2014) were incorporated in this AMP as they provided in-depth condition assessment analysis and also remaining service life of the forcemains. It is worth mentioning that CCTV inspections are more accurate than age-based calculations, and that the City has conducted CCTV inspections of its gravity sewer assets in the past. However, no CCTV data was available in digital format and was therefore not considered in this assessment. It should be noted that no on-site condition assessments were carried out for this project. Hence, age-based approach has been applied to assess the condition of wastewater assets that has no consumable condition data. Accordingly, a two-parameter Weibull distribution function was used to assess the current condition of the wastewater assets. The Weibull distribution has been used extensively in reliability studies and lifetime prediction models in industries ranging from automotive to the 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. 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 were leveraged to simulate a set of deterioration curves for assets with different ESLs as shown in **Figure 2-8**.

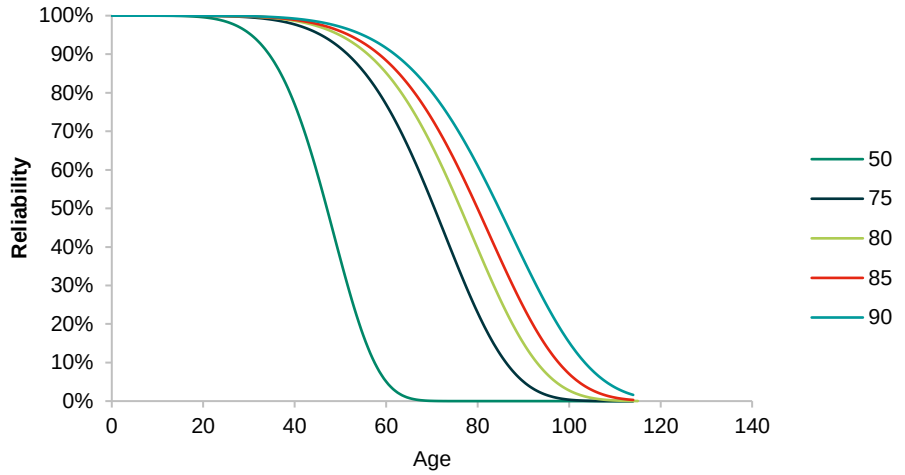

Figure 2-8: Asset Deterioration Curve Samples

Table 2-5 summarizes the condition grade of the City's wastewater infrastructure with associated replacement values. 57% of the assets are in the very good condition, with total replacement value of approximately $1.1 Billion, and only 9.1% of the infrastructure is in the very poor condition with total replacement value of $172 Million. Good condition accounts for 22.3% of the existing infrastructure, having a replacement value of around $423 Million. Fair and poor condition assets make up 9.2% and 2.8%, respectively.

Table 2-5: Wastewater Condition Summary

Rank	Condition Rating	Replacement Value	% of Replacement Value
1	Very Good	$1,075,894,974	56.7%
2	Good	$423,147,406	22.3%
3	Fair	$174,572,024	9.2%
4	Poor	$53,130,616	2.8%
5	Very Poor	$172,674,502	9.1%
Total		**$1,897,522,000**	**100%**

Additionally, **Figure 2-9** and **Table 2-6** granulate the condition of the assets based on different asset sub-categories and their corresponding replacement values. Considering the age-based calculations, sewer mains and service connections are expected to predominate the capital investment due to value of assets in very poor conditions.

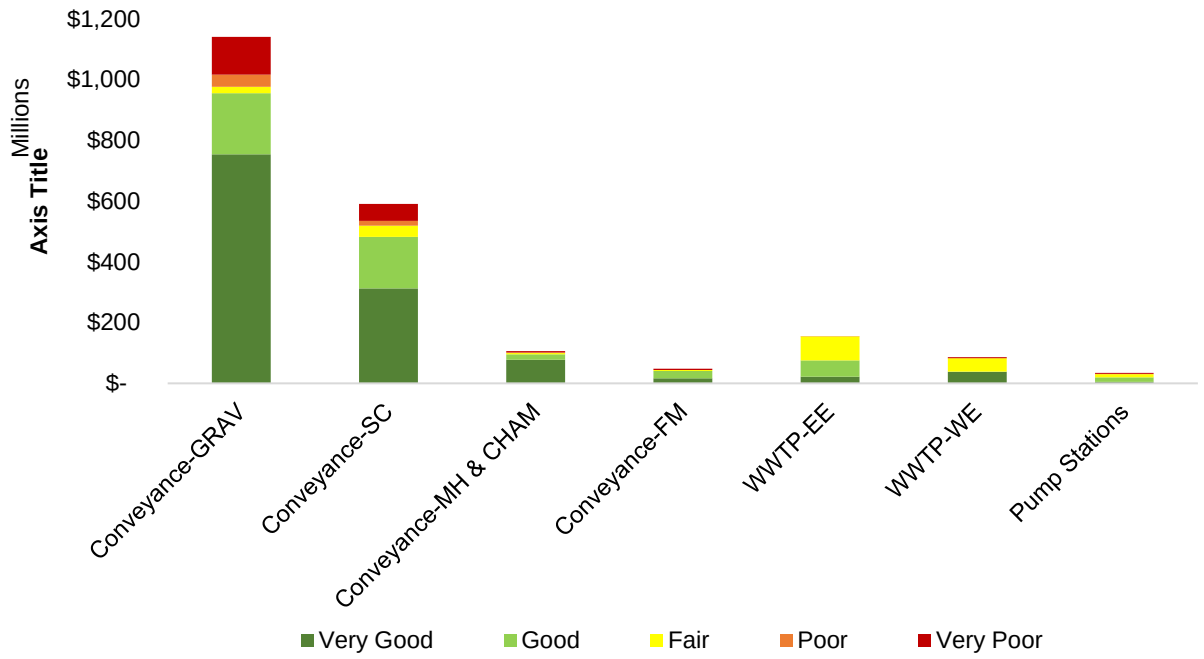

Figure 2-9: Wastewater Condition Summary for Asset Categories

* FM = Force Main, GRAV = Gravity Main, MH & CHAM = Manhole and Chamber, SC = Service Connections

Table 2-6: Distribution of Condition for Wastewater Asset Categories

Condition Rating	Gravity Mains	Service Connections	Manholes and Chambers	Force Mains	WWTP-EE	WWTP-WE	Pump Stations	Total Condition Summary
Very Good	65%	52%	72%	33%	14%	44%	14%	**55%**
Good	18%	18%	16%	49%	35%	1%	43%	**19%**
Fair	2%	6%	5%	6%	51%	51%	29%	**10%**
Poor	3%	3%	1%	0%	1%	0%	5%	**3%**
Very Poor	12%	20%	6%	11%	0%	4%	9%	**13%**
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

2.2.4.1 Gravity Sewers

Table 2-7 and **Figure 2-10** compare gravity sewers' conditions in terms of their diameters categorized into four groups: <450mm, 450 to 1,500 mm, >= 1,500 mm, and Unknown. As shown, pipes with size of less than 450 mm contribute to the highest replacement values, accounting for the highest proportion of poor (approximately $33.5 Million) and very poor condition (approximately $97.6 Million).

Table 2-7: Gravity Sewers Condition by Diameter

Condition Rating	< 450Ø	450Ø - 1,500Ø	≥ 1,500Ø	Unknown
Very Good	$437,531,000	$161,345,000	$50,428,000	$4,760,000
Good	$123,944,000	$50,150,000	$-	$421,000
Fair	$14,523,000	$3,987,000	$-	$11,000
Poor	$33,558,000	$546,000	$-	$-
Very Poor	$97,552,000	$10,423,000	$-	$551,000
Total	**$707,106,000**	**$226,449,000**	**$50,428,000**	**$5,741,000**

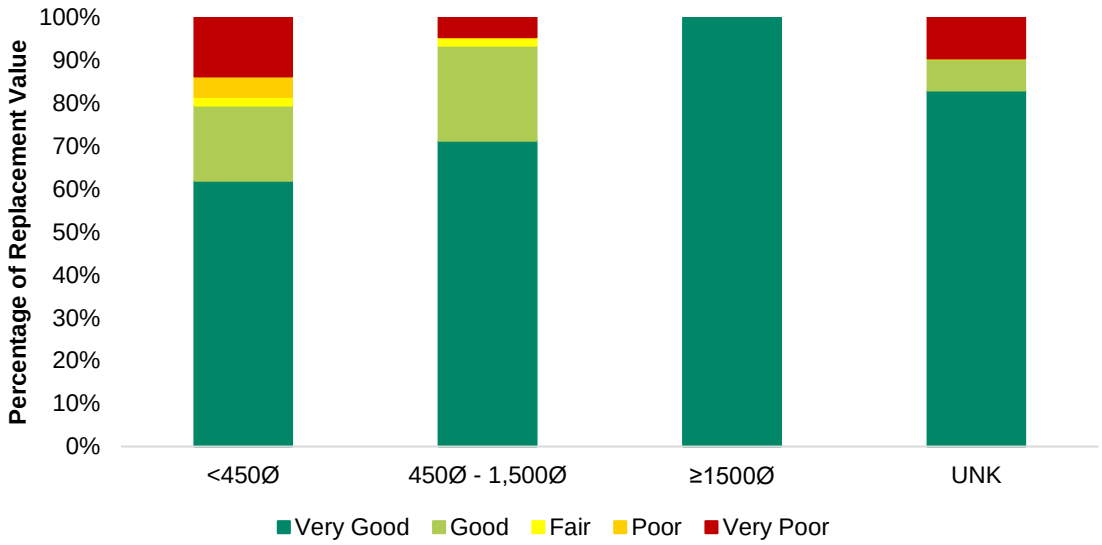

Figure 2-10: Gravity Sewers Condition Distribution by Diameter

2.2.4.2 Force Mains

Table 2-8 compares force mains in terms of their conditions, based upon their diameter: <450 mm, 450 to 1,500mm, and Unknown. As seen, force mains with sizes smaller than 450 mm contribute to almost $14 Million, among which approximately 54% pertains to very good condition (**Figure 2-11**). Moreover, size 450mm to 1,500 mm also makes up the highest replacement values, $27 Million. Around 76% of this range of diameters are in a good condition (**Table 2-8** and **Figure 2-11**) - see note under **Table 2-8**. Unknown pipes, although with a negligible contribution, are in a very good condition.

Table 2-8: Force Mains Condition by Diameter

Condition Rating	< 450Ø	450Ø - 1,500Ø *	Unknown
Very Good	$7,601,000	$6,578,000	$39,000
Good	$71,000	$21,078,000	$-
Fair	$2,091,000	$254,000	$-
Poor	$-	$-	$-
Very Poor	$4,431,000	$-	$-
Total	**$14,192,000**	**$27,909,000**	**$39,000**

** NOTE: The largest diameter for Force Mains is 1,400 mm, however, the range of numbers created to make the table consistent with the Gravity Sewers' table*

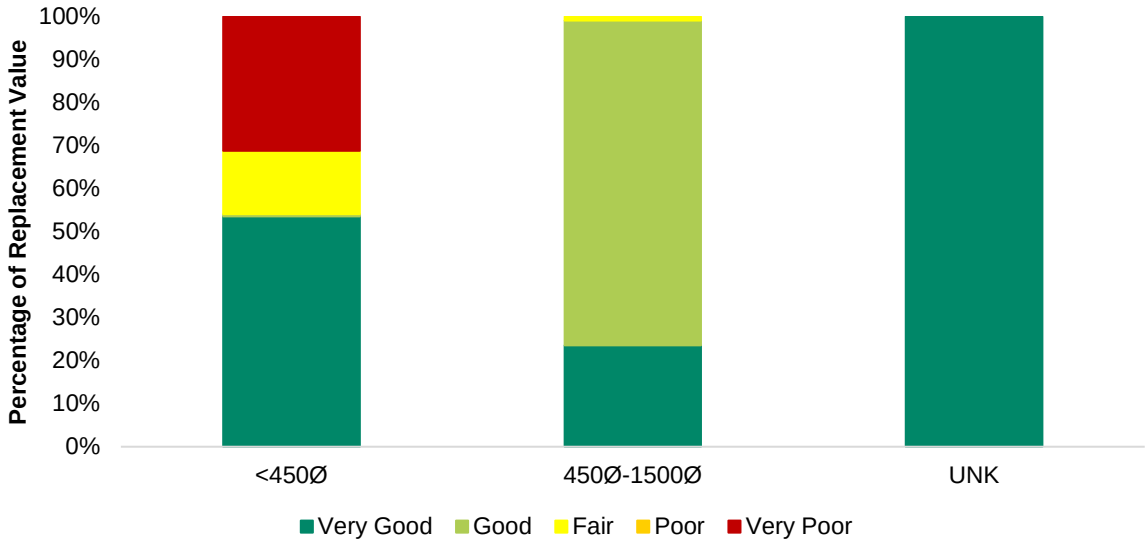

Figure 2-11: Force Mains Condition by Diameter

2.3 Asset Data Gap Analysis

2.3.1 Data Gap Observations

Table 2-9 provides a summary of observed data gaps in the compiled wastewater asset inventory across key data attributes that help to make informed decisions over the asset lifecycle for this AMP.

Table 2-9: Observations on Asset Data Completeness

Asset Group	Inventory Completeness (%)						
	Asset ID	Name / Location	Install Date	Inspection Date	Condition	Expected Service Life	Replacement Cost
Wastewater	99.5%	100%	90%	3%*	3%*	100%	100%

* This % reflect the condition assessment taken in 2022 for all WWTPs and PSs.
** The gap is filled during the development of this AM plan.

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 wastewater assets. **Table 2-10** provides a description for the data confidence grades used to classify the reliability of the asset data used in this data gap analysis. Through consultation with City staff during a State of Infrastructure Workshop, the asset attribute data for the in-scope wastewater assets were assigned the grades outlined in **Table 2-11**.

Table 2-10: 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 2-11: High-Level Asset Data Confidence Grades

Asset Category	Data Confidence Average Grade		
	Inventory	Age	Condition
Wastewater	B	B	B

2.3.3 Data Management Practice

The asset data lifecycle is a sequence of stages that data goes through from its initial creation (i.e., data capture and entry) to its eventual archival and/or deletion at the end of its useful life[1]. A clear definition and understanding of the organization's process for acquiring, storing, utilizing, assessing, improving, archiving, and deleting data (see **Figure 2-12**) will ensure good data management practices and help to sustain levels of data quality required to support AM activities.

Figure 2-12: Asset Information Lifecycle

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

1. **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 to migrate and merge data from other sources.

[1] TechTarget Network, Definition: Data Life Cycle, 2020.

2. **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 a 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.
3. **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.
4. **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.
5. **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.
6. **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 considers the following:
    - What data should be archived and why?
    - Are there any legal obligations for retaining data records?
    - How long should data records be retained?
    - What is the risk associated with not being able to retrieve data records?
    - Who should be able to access archived data records?
    - What is the expected timeframe to retrieve archived data records?

    Clearly communicating these requirements across the organization is key to ensuring staff are educated on why records are being archived, how they can access archived data records, and for how long archived data records can still be accessed.
7. **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 missing period.

2.3.3.1 Current Data Management State

The City’s Public Works and Engineering Services Department staff are involved in wastewater data management. The City’s wastewater data is currently stored in GIS, Excel spreadsheets, reports, and as-built drawings. Currently,

the City updates assets in the GIS post-construction, and there may be a lag in obtaining as-builts and adding/updating data.

The City is following the mandate in records retention procedures for municipalities as per Freedom of Information and Protection of Privacy Act (FIPPA) and the Municipal Freedom of Information and Protection of Privacy Act (MFIPPA).

2.3.3.2 Future Data Management State

The City will develop and implement a software strategy that helps streamline data management following this AMP. Eventually, the City plans to have a clear and efficient data management process and comprehensive and robust asset inventory to support their AM decision making. The implementation plan for data improvement is presented in **Section 6**.

3 Level 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.

The O. Reg. 588/17 requires that all AMPs include the current and proposed LoS, determined in accordance with the qualitative descriptions and technical metrics provided (see **Section 1.3**).

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[2] (2021) 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.

[2] City of Sault Ste Marie. 2021. Comprehensive Background Report.

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

Overarching Themes	LoS 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.
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 Sault's history, diverse communities and natural and cultural heritage, with the Downtown as the Sault'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.
- 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 wastewater service at the LoS workshops. 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.

- Council.
- Residents.
- Industrial, Commercial, Institutional (ICI).
- Regulatory Agencies (i.e., Ministry of the Environment, Conservation and Parks [MECP], Fisheries and Oceans Canada [DFO]).
- Government Agencies (i.e., Environment and Climate Change Canada [ECCC] and Michigan Department of Environment, Great Lakes, and Energy [EGLE]).
- Neighbouring Municipalities or Downstream Municipalities (i.e., First Nations including Garden River First Nation, Batchewana First Nation, and Echo Bay, and municipalities from the US including Chippewa County, Michigan, and the City of Sault Ste Marie, Michigan).
- Environmental groups (i.e., Bi-National Public Advisory Council [BPAC] [US & Canada joint committee], Clean North, International Joint Commission, and Stream keepers).
- Developers.
- Other City Departments (e.g., Planning Department).
- Contractors and suppliers (e.g., EDS).

3.4 O. Reg. 588/17 Levels of Service Metrics

O. Reg. 588/17 requires legislated community levels of service. Community levels of service use qualitative descriptions to describe the scope or quality of service delivered by an asset category. O. Reg. 588/17 also requires legislated technical levels of service. Technical levels of service use metrics to measure the scope or quality of service being delivered by an asset category.

Table 3-2 presents a summary of the City's wastewater service level for O. Reg. 588/17 Metrics. References are provided to show where O. Reg. 588/17 requirement has been attained.

Table 3-2: O. Reg. 588/17 Levels of Service Metrics (Wastewater Services)

O. Reg 588/17 LoS Performance Measure	Unit	Community or Technical LoS	Current LoS Performance (2021)
Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal wastewater system.	Text / Map	Community	• Wastewater connectivity map (See **Figure 3-1**)
% of properties connected to the municipal wastewater system.	%	Technical	• 89% of the City's properties are connected to the municipal wastewater system.
Description of how combined sewers in the municipal wastewater system are designed with overflow structures in place which allow overflow during storm events to prevent backups into homes.	Text	Community	• The City is no longer serviced by combined sewers.
Description of the frequency and volume of overflows in combined sewers in the municipal wastewater system that occur in habitable areas or beaches.	Text	Community	• The City is no longer serviced by combined sewers.
# of events per year where combined sewer flow in the municipal wastewater system exceeds system capacity compared to the total number of properties connected to the municipal wastewater system.	#	Technical	• The City is no longer serviced by combined sewers.
Description of how stormwater can get into sanitary sewers in the municipal wastewater system, causing sewage to overflow into streets or backup into homes.	Text	Community	• Stormwater can get into the wastewater system through manhole covers, inflow and infiltration (I&I), as well as cross connections from residential properties.
Description of how sanitary sewers in the municipal wastewater system are designed to be resilient to avoid events described in previous paragraph.	Text	Community	• The sanitary system is designed with overflows; the sanitary sewers must be built to City's design standards and bylaws.
Description of the effluent that is discharged from sewage treatment plants in the municipal wastewater system.	Text	Community	• Effluent can be defined as water pollution, such as the outflow from a sewage treatment facility. The effluent from the East End and West End treatment facilities in Sault Ste Marie have documented compliance limits, and objectives in the recent Environmental Compliance Approvals (ECA) for the East End Plant and West End Plant. • The effluent criteria include effluent flow rates, and parameters for Carbonaceous Biochemical Oxygen Demand ($CBOD_5$), suspended solids, phosphorous,

O. Reg 588/17 LoS Performance Measure	Unit	Community or Technical LoS	Current LoS Performance (2021)
			ammonia, unionized *E. coli*, Ph, Residual Chlorine, and Phenol. • Refer to the Objective and Compliance Limits in ECA Report no. 5922-BZNHV3 and 3973-AFPTCN for West End and East End Wastewater Treatment Plan, respectively.
# of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system.	#	Technical	• Nine instances of public / private basement flooding due to main blockages. 233 instances of sanitary/stormwater issues (rodding requests) compared to 26,384 connected properties in 2021.
# of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system.	#	Technical	• Zero (violation of sewer use bylaw)

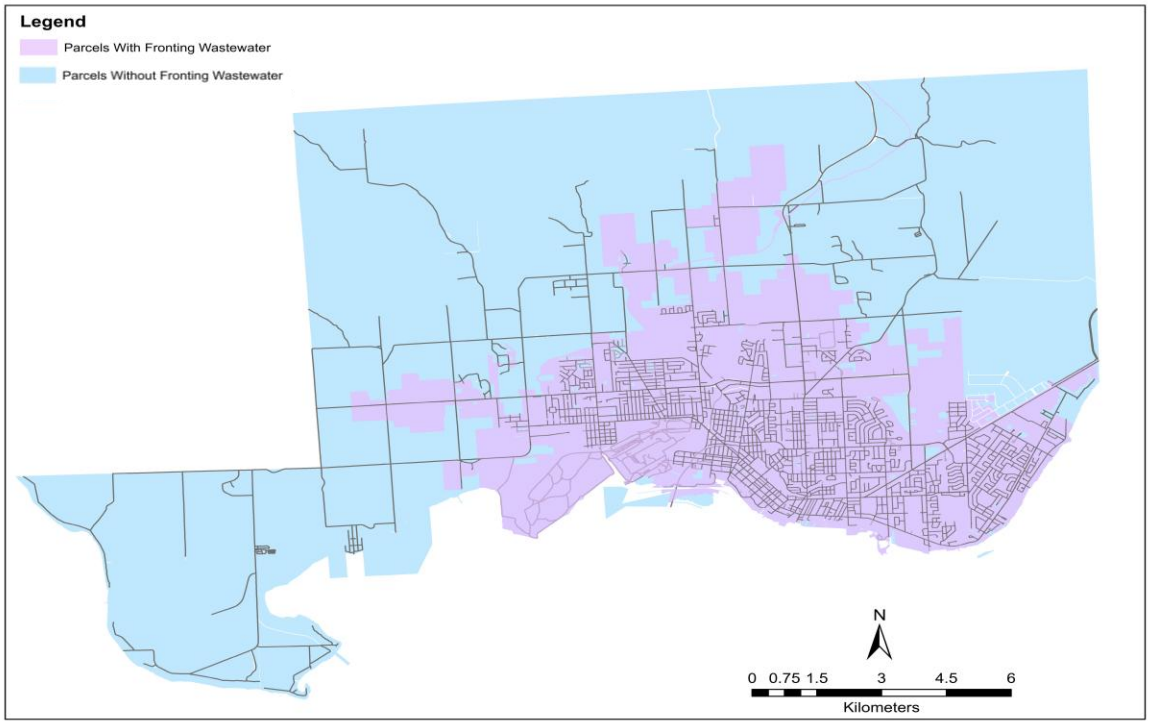

Figure 3-1: City of Sault Ste Marie Wastewater Service Connectivity Map

3.5 Proposed Levels of Service

Establishing LoS targets is an important part of continual improvement and performance management. Without 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 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 willing the user is 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 lifecycle activities and cost associated with varying the LoS.
- Assess the customers' willingness to pay.

It is important that any targets set be realistic and achievable. O. Reg. 588/17 requires AMPs to include proposed levels of service by July 1, 2025.

A summary of the City's wastewater service level metrics is presented in **Table 3-4**. Each metric was indicated with its current trend and proposed trend for the next 10 years, represented by legends, taking into account the nature of the measure, data availability, and whether the trend impacts positively or negatively on the proposed LoS. The LoS trend legends are described in **Table 3-3**.

Table 3-3: LoS Trend Legend

Symbol	Name	Description
	Positively Increasing	KPI is improving steadily over time, showing progress toward goals.
	Positively Stable	KPI is at a strong, desirable level and consistently maintained.
	Positively Decreasing	KPI is improving as lower values indicate better performance.
	Negatively Increasing	KPI is worsening over time, signaling a need for corrective action.
	Negatively Stable	KPI remains poor with no improvement or further decline.
	Negatively Decreasing	KPI is declining in a way that reflects worsening performance.

Table 3-4: Wastewater Current and Proposed Levels of Service

LoS #	Service Area	LoS Measure	Unit of Measure	LoS Category	Current Performance	Performance Trend		Lifecycle Activities to Meet Proposed LoS	Budget Impact to Meet Proposed LOS	Risk of Not Meeting Proposed LoS
						Current	Proposed			
1	Wastewater	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal wastewater system	Text / Map	Customer	Wastewater connectivity map (See **Figure 3-1**)	→	→	• NA	• N/A	• N/A
2	Wastewater	% of properties connected to the municipal wastewater system	%	Technical	89%	→	→	• Respond to development	• Varies	• Some areas remain on private systems, increasing risk of environmental contamination • Limited expansion due to coordination with roadwork
3	Wastewater	Description of how combined sewers in the municipal wastewater system are designed with overflow structures in place which allow overflow during storm events to prevent backups into homes	Text	Customer	The City is no longer serviced by combined sewers.	N/A	N/A	• N/A	• No Budget Impact	• N/A
4	Wastewater	Description of the frequency and volume of overflows in combined sewers in the municipal wastewater system that occur in habitable areas or beaches	Text	Customer						
5	Wastewater	# of events per year where combined sewer flow in the municipal wastewater system exceeds system capacity compared to the total number of properties connected to the municipal wastewater system	#	Technical						
6	Wastewater	Description of how stormwater can get into sanitary sewers in the municipal wastewater system, causing sewage to overflow into streets or backup into homes	Text	Customer	See **Table 3-2**	N/A	N/A	• Replacement of linear assets is tied to road work • Coordination with road work limits capital renewal frequency stretching renewal timelines	• Moderate to High	• Cross connections remain a challenge to address • Old pipes not replaced regularly contribute to I&I and backup risk
7	Wastewater	Description of how sanitary sewers in the municipal wastewater system are designed to be resilient to avoid events described in previous paragraph	Text	Customer	See **Table 3-2**	N/A	N/A			• Aging infrastructure and deferred renewal compromise resilience • Master plan and collection model may help identify high-risk segments
8	Wastewater	Description of the effluent that is discharged from sewage treatment plants in the municipal wastewater system	Text	Customer	See **Table 3-2**	N/A	N/A	• The City's transition to UV disinfection improves effluent quality	• One-time capital investment	• However, annual variability and unclear sources of violations present compliance risks
9	Wastewater	# of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system	#	Technical	See **Table 3-2**	→	→	• Enforcement to prevent grease from entering the wastewater system. • City has a robust flushing and maintenance program	• Low to Moderate	• Main breaks result in reduced system capacity • Significant events like the 100-year storm can lead to backflows
10	Wastewater	# of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system	#	Technical	Zero	→	→	• The City's transition to UV disinfection improves effluent quality	• No immediate budget impact	• Violation frequency varies year to year; root causes are sometimes unclear
11	Wastewater	% of Linear Assets in Fair and Better Condition	%	Technical	86.0%	→	→	• Condition Assessment • Replace aged mains	• High	• Renewal rate is limited due to alignment with roadwork schedules • Delayed replacements can increase risk of failure and I&I issues
12	Wastewater	% of Vertical Assets in Fair and Better Condition	%	Technical	88.8%	↑	↑	• Inspect and replace	• Low to Moderate	• Generally lower risk, but aging or underperforming assets still require attention

Performance Trend Legend:

↑ Positively Increasing	→ Positively Stable	↓ Positively Decreasing	↑ Negatively Increasing	→ Negatively Stable	↓ Negatively Decreasing

3.6 2025-2034 10-Year Levels of Service Forecast

Considering the City's characteristics, growth projections, and strategic objectives, the proposed performance trend for each LoS metric for the next 10 years is projected and outlined in **Table 3-5**. This table indicates whether each measure is expected to trend upward, downward, or remain stable, taking into account the nature of the measure, data availability, and whether the projected trend impacts positively or negatively on the proposed level of service.

Table 3-5: 2025-2034 10-Year Levels of Service Forecast

LoS #	Service Area	LoS Measure	Unit of Measure	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Proposed Trend	Basis for Forecast
1	Wastewater	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal wastewater system	Text / Map					Positively Stable						→	City subject matter expert opinion
2	Wastewater	% of properties connected to the municipal wastewater system	%					Positively Stable						→	City subject matter expert opinion
3	Wastewater	Description of how combined sewers in the municipal wastewater system are designed with overflow structures in place which allow overflow during storm events to prevent backups into homes	Text					N/A						N/A	N/A
4	Wastewater	Description of the frequency and volume of overflows in combined sewers in the municipal wastewater system that occur in habitable areas or beaches	Text					N/A						N/A	N/A
5	Wastewater	# of events per year where combined sewer flow in the municipal wastewater system exceeds system capacity compared to the total number of properties connected to the municipal wastewater system	#					N/A						N/A	N/A
6	Wastewater	Description of how stormwater can get into sanitary sewers in the municipal wastewater system, causing sewage to overflow into streets or backup into homes	Text					N/A						N/A	N/A
7	Wastewater	Description of how sanitary sewers in the municipal wastewater system are designed to be resilient to avoid events described in previous paragraph	Text					N/A						N/A	N/A
8	Wastewater	Description of the effluent that is discharged from sewage treatment plants in the municipal wastewater system	Text					N/A						N/A	N/A
9	Wastewater	# of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system	#					Positive Stable						→	N/A
10	Wastewater	# of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system	#	0	0	0	0	0	0	0	0	0	0	→	City subject matter expert opinion
11	Wastewater	% of Linear Assets in Fair and Better Condition	%	86%	86%	85%	85%	84%	84%	83%	83%	82%	82%	→	Lifecycle Modeling (Based on City's Forecasted Budget Scenario, See **Figure 5-5**)
12	Wastewater	% of Vertical Assets in Fair and Better Condition	%	89%	92%	80%	83%	85%	96%	97%	98%	99%	75%	↑	Lifecycle Modeling (Based on City's Forecasted Budget Scenario, See **Figure 5-8**)

Performance Trend Legend:

↑ Positively Increasing	→ Positively Maintain	↓ Positively Decreasing	↑ Negatively Increasing	→ Negatively Maintain	↓ Negatively Decreasing

3.7 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.

Factors identified during the LoS workshop that would impact wastewater service levels now and into the future include, but are not limited to, the following:

- Aging infrastructure (i.e., clay tile sewers and old concrete sewers, etc.).
- Regulatory changes.
- Staff availability (i.e., technical skill availability, skill gaps from changing technology, etc.).
- Succession management & skills transfer (i.e., succession plan to have licensed wastewater operators to operate the facilities, etc.).
- Funding (i.e., having proper AM plans to optimize service delivery with minimum rates).
- Contractor availability (i.e., contractors' availability for big projects, etc.).
- Climate change (i.e., higher I&I from precipitation, higher water level at Great Lakes, etc.).
- Supply Chain (i.e., material and equipment availability for capital projects, etc.).
- Fluctuations on contract pricings.
- Population growth.

On November 2, 2021, the City's Planning Division released the Comprehensive Background Report for updating the Official Plan[3]. The City's Official Plan guides the local decision-making on land use, development and public infrastructure over the next 20 years. The City's population is expected to reach approximately 80,000 people by 2031, and 83,300 people by 2036. Employment is projected to grow by about 6,000 jobs, from approximately 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. This has been addressed in **Section 5.4**.

[3] 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 entire asset lifecycles can ensure that the City makes sound decisions that consider present and future service delivery needs.

The overarching goal of lifecycle management is to maximize the long-term benefits and services that our 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 the activities undertaken throughout its service life. Part of the purpose of the asset management planning process is to fully understand and predict the long-range financial requirements for the City's infrastructure to facilitate 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 accumulation of the ongoing operations and maintenance, renewal & replacement and disposal costs is many multiples of the initial acquisition costs. As such, it is important to fully understand the entire lifecycle costs across an asset's entire life before proceeding with asset acquisition.

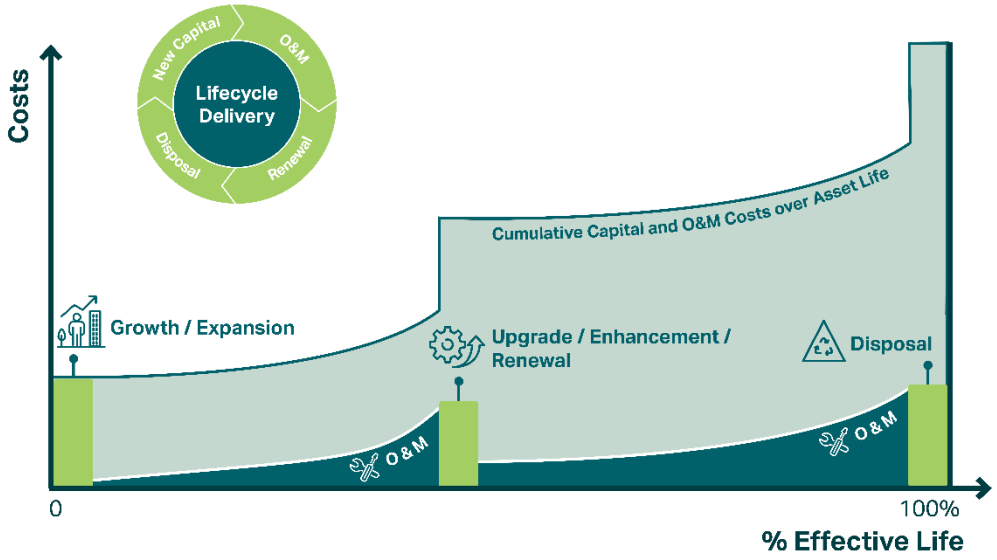

Figure 4-1: Lifecycle Cost Accumulation Over Asset Life

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 expand services to meet growth demands and to meet functional requirements. When acquiring new assets, the City should evaluate credible alternative design solutions that consider how the asset is to be managed at each of its lifecycle stages. Asset management and full life cycle considerations for the acquisition of new assets include, but are not limited to the following:

   - The asset's operability and maintainability.
   - Availability and management of spares.
   - 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 infrastructure is commissioned, the City accepts the responsibility of operating and maintaining the infrastructure according to O&M standards to ensure that the infrastructure is safe and reliable. Operations staff provide the day-to-day support required to operate infrastructure. In few cases, operation costs are minor, but for most there are significant increases. For example, underground pipes require almost no operational support while a facility such as a pump station requires full-time staff to operate the facility safely and efficiently. 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 and when needed. Inadequate funding for O&M will have an adverse impact on the lifespan of assets. The amount of O&M resources required in any period is a function of the current inventory of infrastructure and total O&M needs required for each asset. As the inventory of infrastructure grows, total O&M requirements will also grow.

3. **Renewal and Replacement:** The third portion of full life cycle costing relates to the renewal and replacement of infrastructure that have deteriorated to the point where it no longer provides the required service. Renewal cost is sometimes incurred during the life of an asset where an investment is made to improve the condition and / or functionality of the asset e.g., re-lining of a pipe. Replacement activities that are expected to occur once an asset has reached the end of its useful life and rehabilitation is no longer an option.

4. **Decommissioning and Disposal:** There will inevitably come 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 remove an asset from service include changes to legislation that cause the asset to be in non-compliance, the inability of the asset to cope with increased service levels, technology advances that render the asset obsolete, the cost of retaining the asset is greater than the benefit gained, or the current risk associated with the asset's failure is not tolerable.

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. In some cases, there will be residual liabilities and risks to consider if a decision is made to partially abandon the asset as opposed to fully disposing of its components (e.g., leaving a non-functioning pipe in the ground, or an inactive building standing). 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 Wastewater Assets Management Strategies

The asset management strategies that are employed by the City to manage the wastewater system throughout their lifecycle is summarized in **Table 4-1**.

Table 4-1: Lifecycle Management Strategies for Wastewater Assets

Asset Group	Lifecycle Activity	Description of Activities Practiced by the City	Benefit or Risk Associated with the Activities
Wastewater	**Acquisition**	**All Wastewater Assets** • Assumption of subdivisions, commercial and industrial extensions, local improvements, etc. • Council approved specific initiatives. • Pipes that do not meet capacity requirements are upsized to increase capacity. • Undertake Environmental Compliance Approval (ECA). **Treatment Plants and Large Pump Stations** • Projects typically relate to process upgrades. The current upgrades on the East End WWTP are primarily focusing on improving the quality of wastewater treatment, while for the West End WWTP, the focus is on improving flow and replacing components.	• To extend services to previously unserved areas or expand services to accommodate asset enhancements. • Adequate planning and implementation of infrastructure projects help to manage existing and potential growth pressures and address other demand factors.
	Operations and Maintenance	**Sewers** • Flushing and cleaning. • Spot repairs. • Reactive CCTV Inspections of sewers. • Emergency blockage or failure responses. • Force mains valve exercising.	• Flushing and cleaning activities can remove debris to ensure desired capacity and help identify potential problems before they happen. • Spot repair will fix mains that have or may collapse and cause disruptions to service, backups and / or overflows. • Emergency blockage responses will remove partial or full blockages from mains that cause disruptions to service, backups and / or overflows and restore the main operational functions. • Valve exercising program ensure valves can be easily located and operated when and as needed.
		Manholes & Chambers • Routine inspections. • Performing maintenance as needed.	• Routine inspections for manholes & chambers to address the flow concerns or easement flooding issues.
		Service Connections • Clean-out installed. • Blockage removal. • Laterals unplug. • Relaying • Clay laterals replacement.	• Maintenance of service connections ensures assets are operating properly and reduce potential claims. • Replacement of clay and/or substandard laterals ensures that aged older pipe materials are replaced to reduce failures.

Asset Group	Lifecycle Activity	Description of Activities Practiced by the City	Benefit or Risk Associated with the Activities
		Small Pump Stations • Routine inspection once a week. • Maintain the electronic components that monitor station security, controls, and diagnostics. • Clean the grease, debris and foam build-up from wet well. • Wash down and remove debris in the pump station chambers. • Annual oil change. • Emergency repairs.	• Regular inspections of facilities ensure wastewater facilities are operating properly and that potential maintenance issues are identified and prioritized for repair to avoid equipment failure. • Regular scheduled maintenance activities at wastewater facilities ensure that the facilities continue to operate properly. • SCADA upkeep to monitor and improve the efficiency and capacity of wastewater facilities and assets. • Facilities emergency repairs due to failure alarm or reported failure to reduce the possibility of a spill or other system failure.
		Wastewater Treatment Plants and Large Pump Stations • Regularly scheduled inspections and maintenance by the Public Utilities Commission (PUC). • PUC has a standard routine for maintaining the facilities. • Implement SCADA upkeep projects. • Emergency repairs.	
	Renewal and Replacement	**Sewers** • Sewer replacements are coordinated with road reconstructions. • The City prioritizes replacing clay sewers. • Redundancy for critical force mains is a concern the City aims to address.	• Coordination of sewer works together with road reconstruction. Allows the management of a range of assets within any road right-of-way to be optimally coordinated, leading to reduced cost and limited disruption to businesses and residents. • Replacing older pipe materials such as Clay sewers with Polyvinyl Chloride (PVC) pipes to reduce potential main failures. • Critical force main redundancy ensures wastewater network availability in case of a force main failure and unavailability.
		Manholes & Chambers • Replaced at the same time as the sewer mains. • Minor defects observed on site are addressed under the maintenance budget.	• Bundling similar works to manage related assets and reduce overall lifecycle cost.
		Service Connections • Replaced at the same time as the sewer mains. • Minor defects observed on site are addressed under the maintenance budget.	• Bundling similar works to manage related assets and reduce overall lifecycle cost.
		Small Pump Stations • The small pump stations are assessed annually in terms of priorities for renewal/replacement.	• Renewal or replacement of underperforming wastewater facility assets reduce potential loss of service caused by unplanned failure.

Asset Group	Lifecycle Activity	Description of Activities Practiced by the City	Benefit or Risk Associated with the Activities
		Wastewater Treatment Plants and Large Pump Stations • The City is looking to conduct detailed condition assessments for larger pump stations. • Large pump stations operated by PUC are renewed based on functional needs. • Wastewater treatment facilities assets are renewed / replaced based on facility inspection reports.	
	Disposal	• Current practice is removal of old assets and landfill disposal. • Equipment is disposed or inventoried as spare parts.	• Ensure assets are disposed in compliance with waste regulations in Ontario.
	Non-Infrastructure	• Sanitary flow monitoring project to monitor and track I&I. • Perform sewer capacity studies. • Plan formalized condition assessment programs. • Master Plans and Official Plan.	• Monitoring and tracking I&I will facilitate identification of future remedial actions as may be required. Reducing infiltration and inflow will mitigate overflows and by-passes during periods of intense rainfall. • Sewer capacity studies provide the ability to understand the need to upsize pipes to accommodate needs. • Condition assessment programs help to identify and record asset condition to inform decision-making for maintenance and capital programs. • Master Plans and Official Plan include strategic planning / budgeting and project prioritization enable to inform long-term decision making.

5 Funding Need Analysis

5.1 Capital and Operating Budget

5.1.1 Capital Budget - Historical Expenditure and Future Forecast

Historical capital expenditures for wastewater services have typically included maintaining and upgrading West End Plant, East End Plant, Pump Stations, Miscellaneous Capital, Emergency Repairs, PUC Capital Budget, and studies to ensure compliance with all wastewater regulations and other requirements, and maintain assets in good working order. **Figure 5-1** present the capital reinvestment budget forecast.

Figure 5-1: Capital Reinvestment Budget Forecast

Asset Class	Asset Category	Asset Type	2025-2029 5-Year Average Reinvestment Budget
	Linear	Wastewater Mains, Manholes & Chambers, and Service Connections	$2,000,000
Wastewater	Facilities	East End Treatment Plant, West End Treatment Plant, and Pump Stations	$3,200,000*
		Total	**$5,500,000**

**This number represents the regular capital reinvestment budget; the City's forecasted capital budget also include update projects (including EE UV upgrade, WE Phase II upgrade, etc.), which is incorporated in the service level forecast in this AMP.*

5.1.2 Operating Budget - Historical Expenditure and Future Forecast

The City's historical operating expenditures for wastewater services have centered on routine maintenance and operation of the collection system and facilities, ensuring regulatory compliance and enforcement, and maintaining SCADA and communication systems. These expenditures also support compliance management and reporting, and drive continuous optimization of both collection and treatment processes.

Figure 5-2: Operating Budget Forecast

Asset Class	Asset Category	Asset Type	2025-2029 5-Year Average O&M Budget
	Linear	Wastewater Mains, Manholes & Chambers, and Service Connections	$2,800,000
Wastewater	Facilities	East End Treatment Plant, West End Treatment Plant, and Pump Stations	$7,100,000
		Total	**$9,900,000**

5.2 Capital Reinvestment Funding Needs Analysis

This section outlines the capital funding scenarios analyse approach, assumptions, and presents service level trends regarding asset condition under various budget scenarios.

5.2.1 Lifecycle Model Approach and Assumptions

The lifecycle analysis was implemented within an PowerBI Model. The analysis involves integrating key asset attribute information including asset inventory, age, expected service lives, replacement values, and condition to create a theoretical asset replacement cycle for each asset. The other relevant capital upgrade needs information (e.g., the City's current plan for WWTP-EE and WE upgrade) were also considered in the lifecycle model. The 2023 condition assessment results of the WWTPs and PSs are incorporate in the analysis. A financial dashboard was developed to present the lifecycle modeling results.

The annual reinvestment needs for the wastewater assets were determined based on their age and ESL in years (i.e., replacing assets that have exceeded their ESL, in inflated dollar values, incorporating the following assumptions on inflations:

- The base year used is 2025. Any historic asset replacement values have been inflated using the experienced inflation rate from Non-Residential Building Construction Price Index (NRBCPI).
- Inflation rate: the inflation rates adopted for the financial model are presented in **Table 5-1**. The inflation for 2025 and later is determined based on the City's input.

Table 5-1: Inflation Rate[4]

Year	Inflation Rate
2022	7%
2023	7.1%
2024	6%
2025	2%
2026	2%
2027	2%
2028	2%
2029	2%
2030 - 2034	2%

Table 5-2 presents the proposed reinvestment targets for wastewater infrastructure from 2025 to 2034. It outlines the intervention measures and target percentages for each asset type, along with the resulting average annual reinvestment rates over the 10-year period.

[4] Past inflation data obtained from NRBCPI using the non-residential; yearly result taken from an average of quarterly results. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1810027601

Table 5-2: Wastewater Reinvestment Assumptions

	Asset	Measure	Target	Resulting 10-Yr. Annual Avg. Reinvestment Rate (2025-2034)
Wastewater Linear	Wastewater Gravity Mains	Percentage of gravity mains exceeding their expected service life, that are replaced in 2025 and thereafter	100%	1.3%
	Wastewater Force Mains	Percentage of force mains exceeding their expected service life, that are replaced in 2025 and thereafter	100%	
	Wastewater Service Connections	Percentage of required replacement of service connections when replacing gravity mains addressed	100%	
	Wastewater Manholes & Chambers	Percentage of required replacement of manholes & chambers when replacing gravity mains addressed	100%	
Wastewater Facilities	Wastewater Pump Stations	Percentage of wastewater pump station assets exceeding their expected service life, that are replaced in 2025 and thereafter	100%	1.5%
		Structural and Building Envelope are assigned with repair cost annually	0.1% of replacement value	
	Wastewater Treatment Plants – East End	Percentage of East End WWTP assets exceeding their expected service life, that are replaced in 2025 and thereafter	100%	
		Structural and Building Envelope are assigned with repair cost annually	0.1% of replacement value	
		WWTP-EE upgrade projects (2025 to 2029)	100%	
	Wastewater Treatment Plants – West End	Percentage of west end wastewater treatment plant assets exceeding their expected service life, that are replaced in 2023 and thereafter	100%	
		Structural and Building Envelope are assigned with repair cost annually	0.1% of replacement value	
		WWTP-WE upgrade projects (2025 to 2029)	100%	

In the future, when condition assessment programs are implemented for linear, conditions will be used to update the renewal and replacement forecast to better inform asset reinvestment needs.

5.2.2 Wastewater Linear Assets Budget Scenarios & 10-Year Service Level Forecast

This section presents the budget scenario analysis and the 10-year service level forecast for wastewater linear assets.

5.2.2.1 Budget Scenarios Setting for Wastewater Linear Assets

Table 5-3 budget scenarios setting for linear assets. Scenario 1 (S1) is a “Do Nothing” approach with zero expenditure; S2 assumes an ideal, unconstrained budget enabling asset replacement at end-of-life; and S3 reflects the City’s defined budget at $2.0 Million annually.

Table 5-3: Wastewater Linear Assets Budget Scenarios

Scenario		Description	Budgets
S1	Do Nothing	Spend Nothing	$0 Million
S2	Unconstrained Budget	Replace assets at end of life	Unlimited
S3	City's Planned Budget	City's Current Planned Budget	$2.0 Million annual budget

5.2.2.2 Wastewater Linear Assets Funding Need

The average annual reinvestment estimates for the City's wastewater linear is $25 Million over the next 10 years in inflated dollar values. This is equivalent to a total of approximately $255 Million over the next 10-year period, as presented in **Figure 5-5**. The City should note that there are significant backlogs for reinvestment on the sewer gravity mains, force mains, and service connections which have already exceeded their ESLs. This theoretical expenditure spike is presented in the year 2025 in **Figure 5-5.**

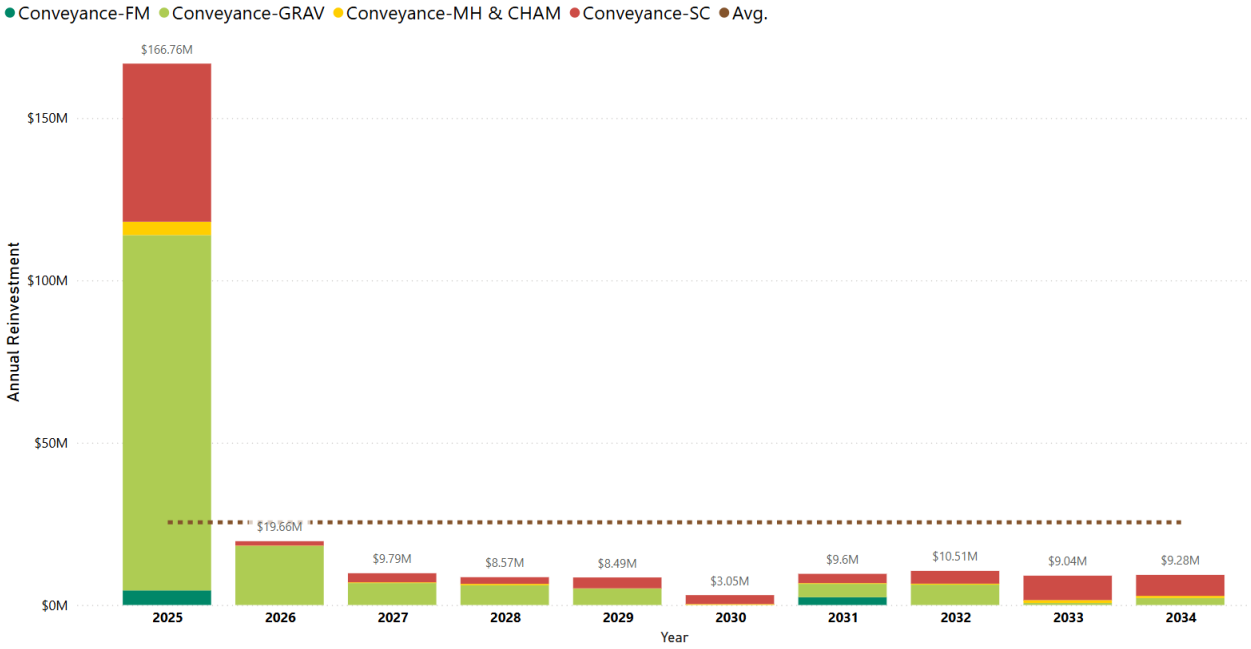

Figure 5-3: 10-Year Funding Need for Wastewater Linear Assets – Unlimited Budget Scenario

The detailed 10-year reinvestment needs for gravity mains, force mains, service connections, manholes and chambers are presented in **Table 5-4** in inflated dollar values.

Table 5-4: Wastewater Linear Assets 10-Year Total and Annual Average Capital Reinvestment Need

Asset Type	Annual Average Need	10-Year Total
Wastewater Gravity Mains	$15,872,000	$158,723,000
Wastewater Force mains	$690,000	$6,900,000
Wastewater Service Connections	$8,182,000	$81,820,000
Wastewater Manholes & Chambers	$730,000	$7,302,000
Total	**$25,475,000**	**$254,745,000**

5.2.2.3 Wastewater Linear Assets 10-Year Service Level Trend Forecast

Figure 5-4 presents the projected condition of wastewater linear assets under three funding scenarios over a 10-year period. Currently, 86% of linear assets are in fair or better condition. Under the "Do Nothing" scenario, the service level declines steadily to 80% by 2034. With an unlimited budget of approximately $25 Million annually, the asset

condition improves to 95. Under the City's current budget of $2 Million annually, the service level declines more moderately, reaching 82% by 2034.

These projections indicate that the City's current funding is not sufficient to sustain current service levels for wastewater linear assets over the long term. While the decline under the current budget is gradual, it still reflects increasing deferred maintenance and future risk. Additional investment or complementary strategies may be needed to close this gap and preserve long-term system performance.

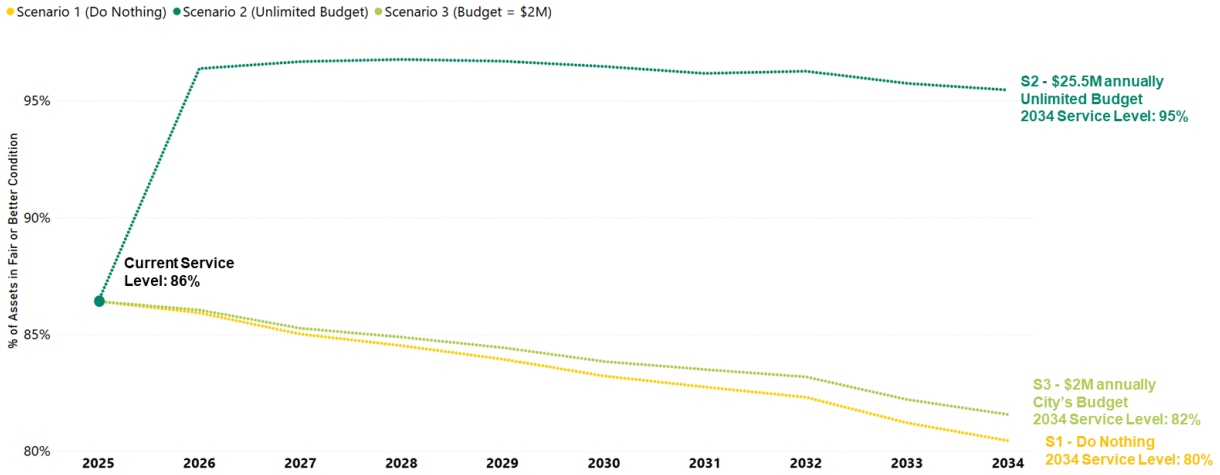

Figure 5-4: Wastewater Linear Assets Levels of Service Trend in the Next 10-Year for All Budget Scenarios

Figure 5-5 illustrates the projected condition distribution of wastewater linear assets from 2025 to 2034, assuming the City maintains its current annual investment of $2 Million. Currently, 61% of assets are in very good condition, with only a small proportion rated as poor or very poor. However, under continued funding at this level, the condition of the asset base is expected to decline steadily. By 2034, only 44% of assets are projected to remain in very good condition, while the share of assets in poor or very poor condition increases from 13% to 18%.

The gradual decline reflects the aging network and the impact of deferred reinvestment. Without additional investment or the implementation of life-extension strategies, a growing portion of the system will fall into poor to very poor condition categories.

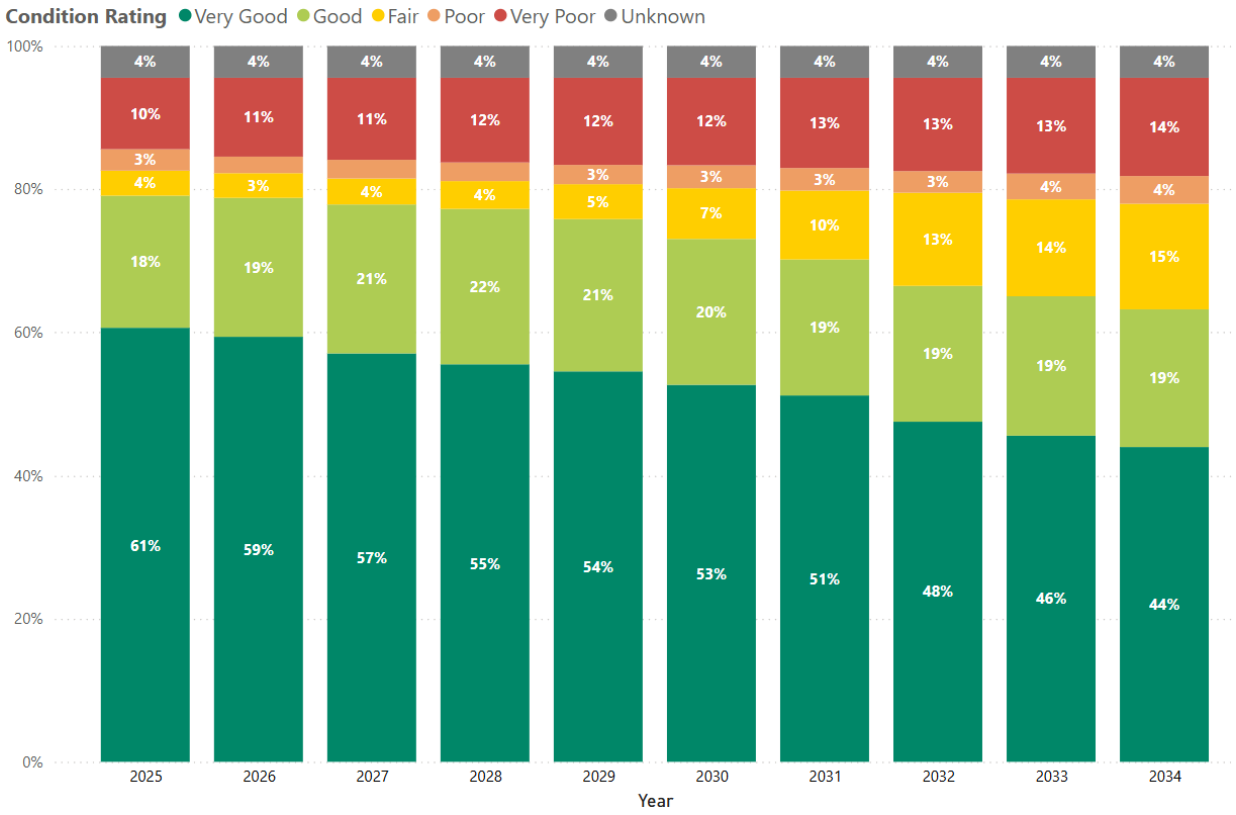

Figure 5-5: Wastewater Linear Assets Condition Projection under Scenario 3 - City's Planned Budget

5.2.3 Wastewater Facilities Budget Scenarios & 10-Year Service Level Forecast

This section presents the budget scenario results and the 10-year service level forecast for wastewater facilities.

5.2.3.1 Budget Scenarios Setting for Wastewater Linear Assets

Table 5-6 shows budget scenario setting for wastewater facilities. S1 is a "Do Nothing" approach with zero expenditure; S2 assumes an ideal, unconstrained budget enabling asset replacement at end-of-life or rehab where applicable; and S3 reflects the City's defined budget at $3.2 Million annually.

Table 5-5: Wastewater Facility Assets Budget Scenarios

Scenario		Description	Budgets
S1	Do Nothing	Spend Nothing	$0 Million
S2	Unconstrained Budget	Replace assets at end of life or rehab where applicable	Unlimited
S3	City's Planned Budget	City's Current Planned Budget	$3.2 Million annual budget

5.2.3.2 Wastewater Facilities Funding Need

The average annual reinvestment estimates for the City's wastewater facility is $3.3 Million over the next 10 years in inflated dollar values. This is equivalent to a total of approximately $33 Million over the next 10-year period, as presented in **Figure 5-6**. The reinvestment needs vary significantly from year to year. A funding need spike is observed in 2025, where total reinvestment needs reach $13.8 Million, primarily driven by needs at the Pump Stations and the WWTP-EE facility. It is noted that the planned upgrade project including the EE UV upgrade, WE Phase II upgrade, etc. in the next 5 years is factored in this funding need analysis.

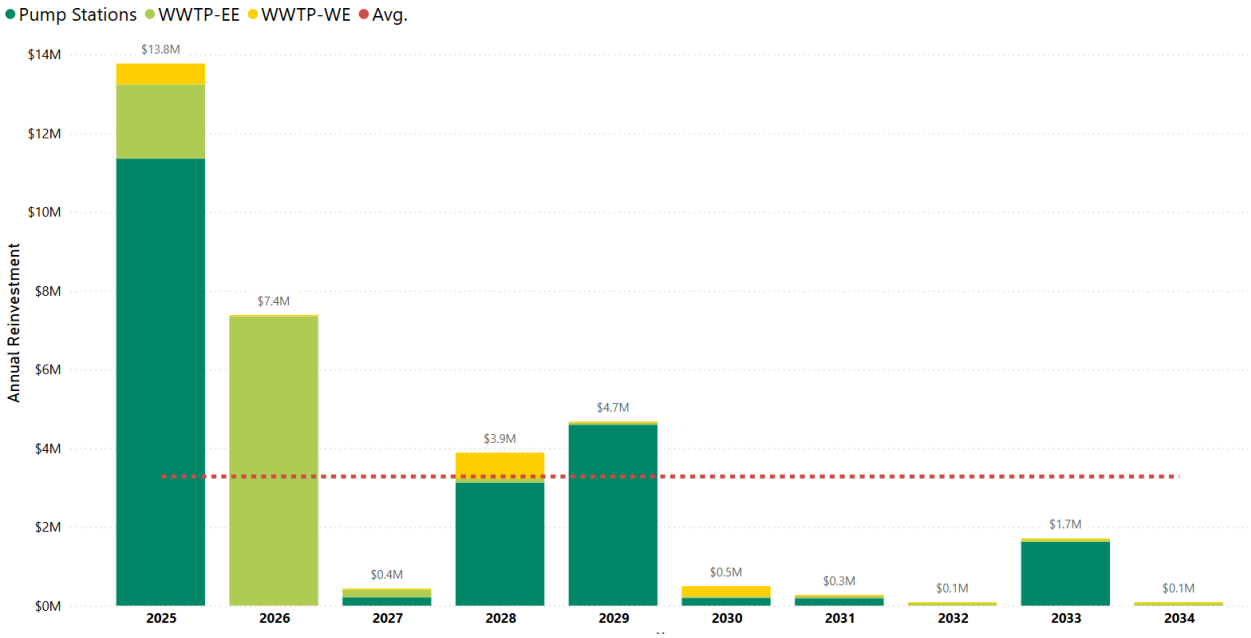

Figure 5-6: 10-Year Funding Need for Wastewater Facility Assets – Unlimited Budget Scenario

The detailed 10-year reinvestment needs for pump stations, and WWTPs are presented in **Table 5-6** in inflated dollar values.

Table 5-6: Wastewater Facilities 10-Year Total and Annual Average Capital Reinvestment Need

Asset Type	Annual Average Need	10-Year Total
Wastewater Pump Stations	$2,129,000.00	$21,290,000
Wastewater Treatment Plants – East End	$982,000.00	$9,820,000
Wastewater Treatment Plants – West End	$170,000.00	$1,700,000
Total	**$3,281,000**	**$32,810,000**

5.2.3.3 Wastewater Facilities 10-Year Service Level Trend Forecast

This analysis models the service level in terms of condition of wastewater facility assets over a 10-year horizon under three funding scenarios shown in **Figure 5-7**. Currently, approximately 88.8% of the City's wastewater facility assets

are in fair or better condition. In a “do nothing” scenario, the condition of the asset base declines significantly, with only 50% of assets projected to remain in fair or better condition by 2034. In a scenario assuming unlimited funding results in a stabilized condition level of approximately 75% by 2034. Notably, the City’s current budget scenario—based on an annual investment of approximately $3.2 Million—yields nearly identical results, also achieving a projected service level of 75% by 2034.

This finding indicates that the City’s current level of capital investment in wastewater facility assets is very close to adequate for maintaining asset condition over the next decade.

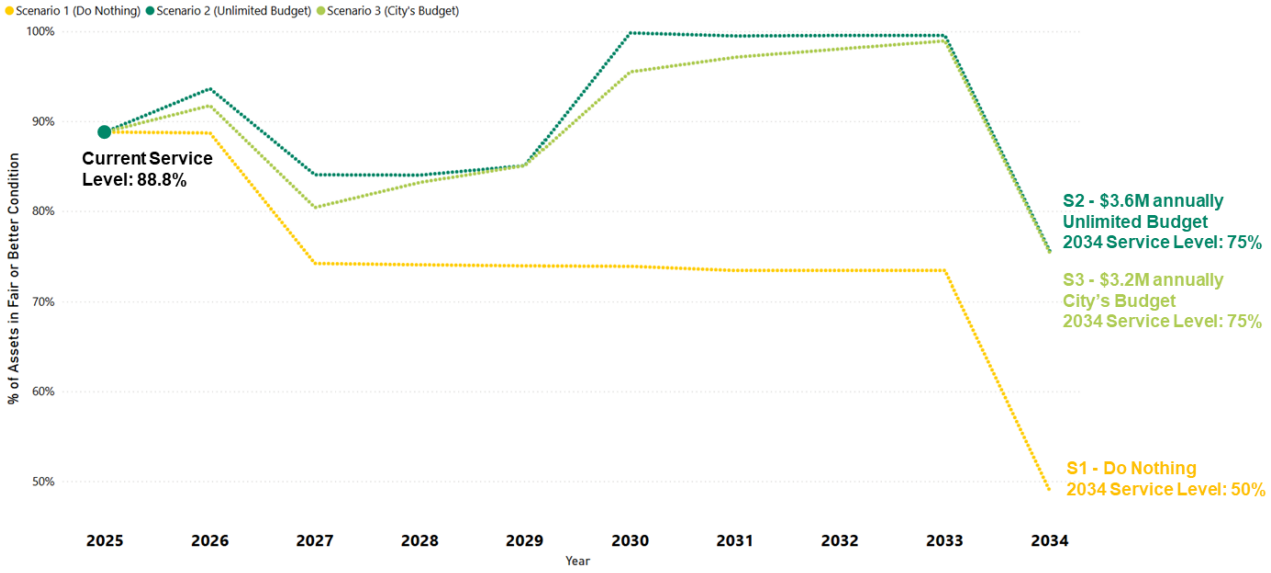

Figure 5-7: Wastewater Facilities Levels of Service Trend in the Next 10-Year for All Budget Scenarios

Figure 5-8 shows the detailed condition distribution profile under the City’s planned budget scenario for facility wastewater assets. Notably, the percentage of assets in poor and very poor condition peaks in 2028–2029, reflecting the impact of aging infrastructure before major reinvestment efforts take effect. From 2030 onward, the condition profile improves and stabilizes, indicating that the City’s current level of investment is sufficient to maintain overall system performance, provided that assets are renewed in a timely and strategic manner.

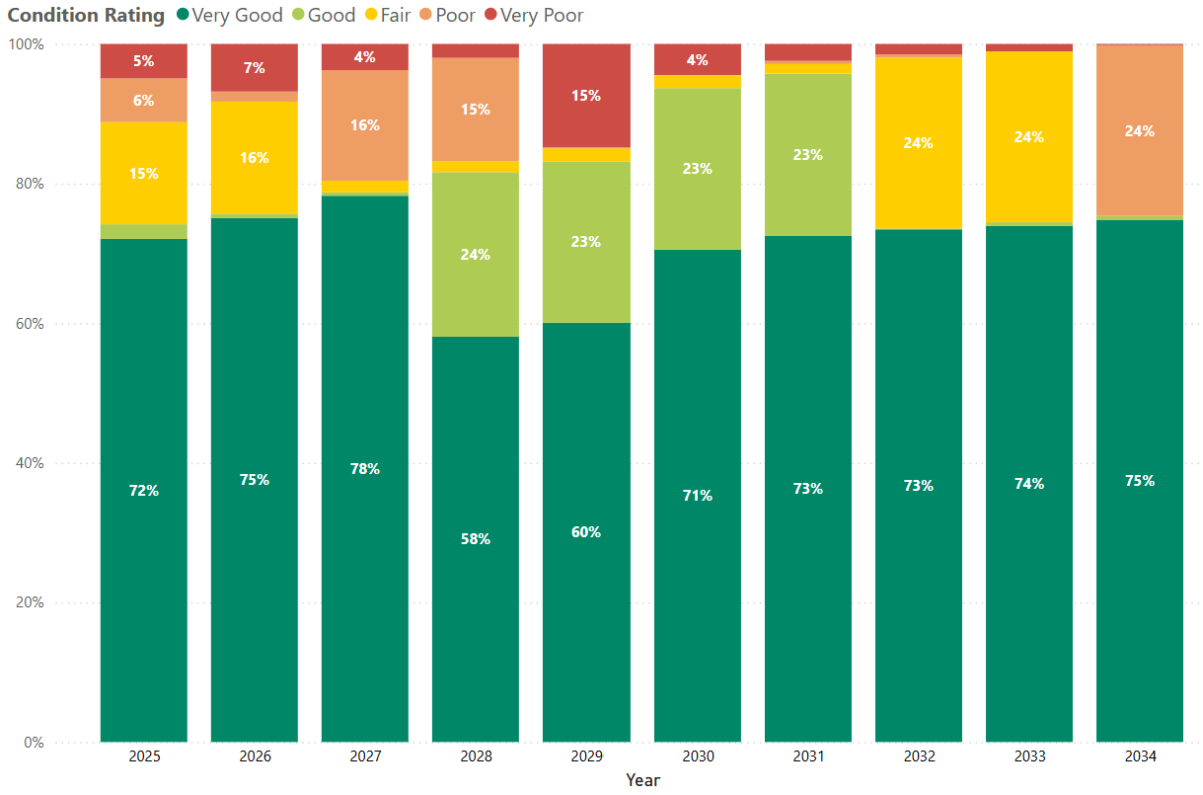

Figure 5-8: Wastewater Facilities Condition Projection under Scenario 3 - City's Planned Budget

5.3 50-Year Reinvestment Need

Looking ahead over the long term, the average annual reinvestment estimate for all the City's wastewater linear and facility assets is $53 Million over the next 50 years in inflated dollar value, for a total of approximately $2.7 Billion, as presented in **Figure 5-9**. Considering the reinvestment needs starting from around 2039, a significant amount of the City's aged gravity mains will require renewal or replacement as they will approach and exceed their theoretical ESLs.

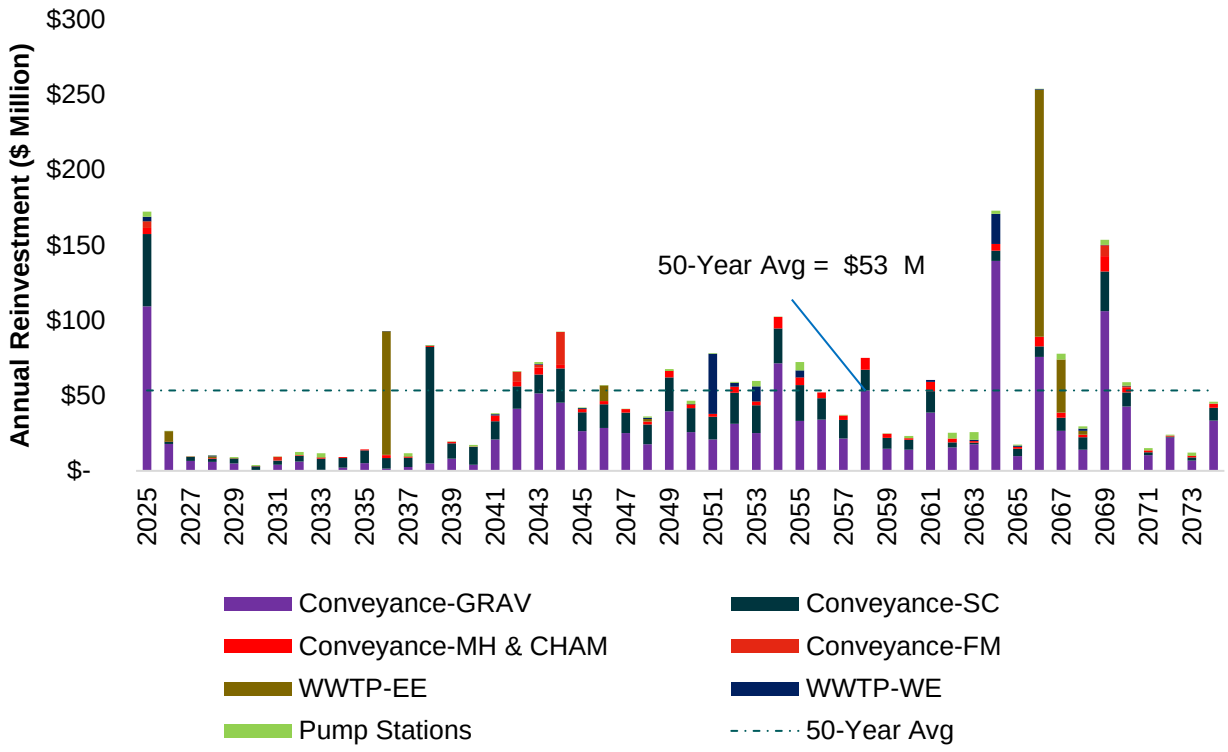

Figure 5-9: Wastewater System 50-Year Reinvestment Needs – Unlimited Budget Scenario

5.4 Growth Related Capital Funding Need

The growth-related capital funding for wastewater services includes a need to acquire the Biosolids Management Facility, estimated at $43.8 Million over 2025–2029. Base O&M costs are estimated at $1.5 Million (in 2023-dollar values)—allocated 80% to wastewater and 20% to solid waste—and will be adjusted for inflation. Due to a learning curve, the first two years of operation (2027–2028) will incur costs at 150% of the base rate. Consequently, an additional annual O&M budget of approximately $1.3 Million (in 2025 dollars) is needed for wastewater services, rising to about $1.9 Million during the initial two years. This translates to a total of $14 Million in O&M funding needs over the next 10 years for the Biosolids Management Facility.

5.5 Full Funding Profile

Figure 5-10 shows a full picture of the City's wastewater funding need forecast over the next 10 years, which provides the City the full funding requirements in order to perform effective financial planning activities. The total annual reinvestment cost from **Figure 5-3** has been overlaid with the City's annual average wastewater O&M cost. In addition, 1% of the annual reinvestment is used as an allocation for asset disposal costs.

The City's wastewater full funding requirement increases to approximately $218 Million over the next 10 years with additional funding requirement, and O&M, disposal for all linear and facility assets, equivalent to $21.8 Million per year in inflated dollar value (growth related lifecycle cost not included, see **Section 5.4** for estimated funding need for growth).

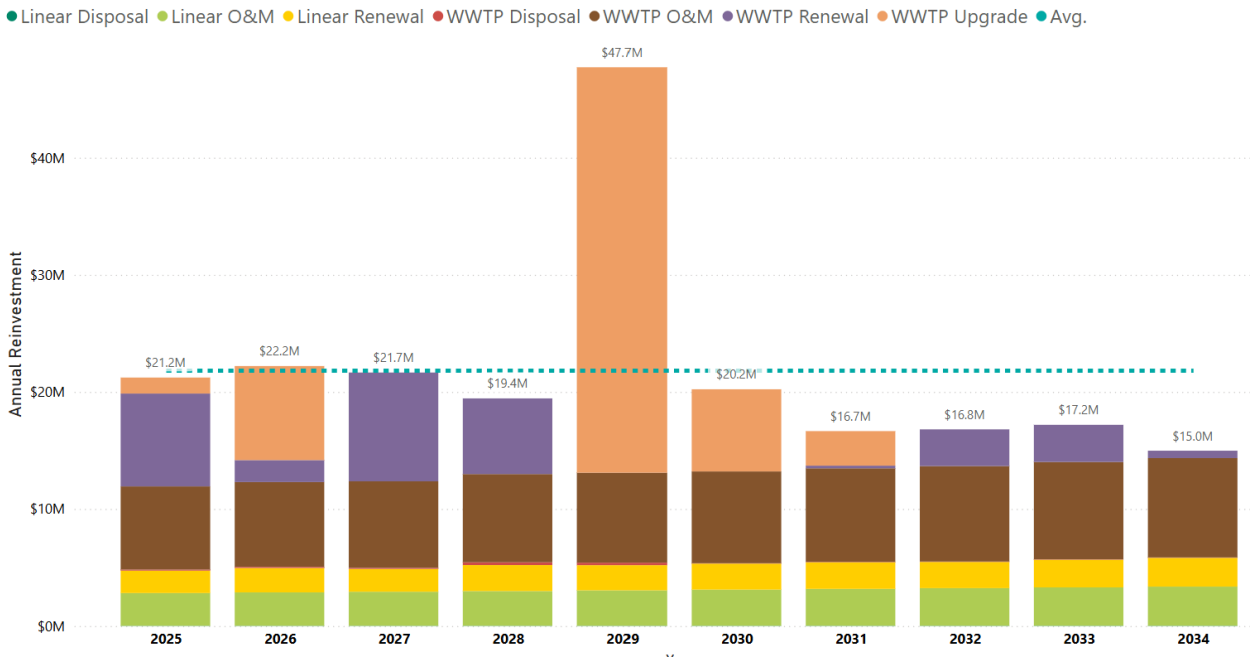

Figure 5-10: Full Funding Profile (City's Planned Capital Reinvestment Budget Scenario Included)

5.6 Funding Gaps & Risk

The City intends to continue to invest in the growth and renewal of the Wastewater assets over the next 10 years. **Table 5-7** compares the City planned capital reinvestment budget against the capital reinvestment funding needs. The shortfall between the City planned capital reinvestment budget against the capital reinvestment funding needs is referred to as the "funding gap".

Table 5-7: Funding Gap – Capital Reinvestment Funding Needs vs. Budget Forecast

Asset Class	10-Year Need Total ($Million)	10-Year City Budget Total ($Million)	10-Year Gap Total ($Million)
Wastewater Facilities	$33	$32	Very Close to Adequate
Wastewater Linear	$255	$20	$235

The growth-related capital funding need is outlined in **Section 5.4**, which further exacerbates the funding gap for the City's wastewater management system by highlighting additional investments required to accommodate future growth.

As described in **Section 3.5**, risks are identified for each service level performance measure. **Table 5-8** provides a high-level overview of the key risks associated with funding gaps, as well as the potential consequences and impacts of not meeting the proposed service levels.

Table 5-8: Risk of Delayed Intervention for Wastewater System

Key Risk	Asset	Potential Consequences/Impacts
Insufficient funding to keep up with population and demand increases	All Wastewater assets	- Constrained growth (e.g., impacts on housing supply) - Difficulty balancing growth-related and renewal budgets
Insufficient funding for linear asset lifecycle renewals	Linear Assets	- Reputational risk to the City - Unwanted media attention - Declining asset condition over time - Greater reliance on reactive maintenance - Reactive interventions are costlier than proactive actions - Increased frequency of service interruptions and asset failures - Compromised regulatory compliance - Ministry of the Environment, Conservation and Parks (MECP) violations (e.g., health and safety concerns, beach closures) - Reduced system resiliency and redundancy
		- Aging pipes not replaced contribute to increased inflow and infiltration (I&I) - Elevated risk of sewer backups
Higher vulnerability of assets to emergencies/ extreme weather events	All Wastewater assets	- Damage to infrastructure from more frequent and severe weather due to climate change - Accelerated asset deterioration - Risks of sewer backups - Additional pressure on already constrained financial resources
Insufficient funding for operations and maintenance	All Wastewater assets	- Increasing annual maintenance costs as infrastructure ages - Emergency responses divert resources from routine maintenance - More time spent responding to complaints and public inquiries

5.7 Funding Sources & Alternative Strategies

The Funding Gap represents the shortfall between optimal and forecasted funding levels. Addressing this gap requires careful strategic consideration. Options may include increasing revenues (e.g., user rates, taxes), issuing debt, adjusting the LoS, or accepting elevated asset-related risks. Each of these choices involves trade-offs that must be weighed in light of financial sustainability, regulatory obligations, and community expectations.

The City's current internal funding and external funding source include, but not limited to:

- Sewer Rate
- Reserves
- Long Term Debt
- Debt Servicing
- Ontario Community Infrastructure Fund
- Housing Enabling Water Systems Fund
- Canada Community Building Fund

Internal funding such as sewer rate is secure and guaranteed. This refers to stable revenue sources under the City's direct control. While external funding, such as provincial or federal grants, is considered at risk. These external sources are subject to change based on policy shifts or economic conditions. Overreliance on such funding creates vulnerability, as any reduction can compromise planned infrastructure investments or service continuity.

The City has acknowledged the growing backlog of reinvestment needs within its wastewater infrastructure, a challenge that continues to escalate under current funding limitations. To begin addressing this gap, City Council approved a 10 per cent annual increase to the average residential sanitary sewer bill, effective January 1, 2024.

Recognizing the constrains of internal funding and limitations and uncertainties associated with external funding, it becomes increasingly important to explore complementary approaches that do not depend solely on financial sources. In this context, alternative or non-financial strategies play a critical role in enhancing the City's ability to manage service levels and asset performance within existing fiscal constraints. **Table 5-9** highlights the City's non-financial strategies to address the identified wastewater funding gap. These strategies are designed to support long-term financial sustainability through alternative delivery methods, changes in practices or policies, and system optimization, without relying solely on increased funding.

Table 5-9: Non-Financial Strategies to Address Funding Gaps for Wastewater Service

Category	Strategy	Description / Actions
Planning & Prioritization	I&I Studies and Capacity Modeling	Use hydraulic models and I&I studies to identify and prioritize capacity issues caused by aging infrastructure and cross connections.
	Performance Condition Assessment and Formalize Risk Assessment	The City will continue to maintain and enhance asset condition data while developing a formalized risk assessment framework to support evidence-based, risk-informed decision-making. Risk considerations are still in the early stages of integration into asset management decisions. Establishing a structured and consistent risk assessment process will enhance the transparency and repeatability of decision-making.
	Master Planning & Resilience Mapping	Incorporate high-risk segments identified in the wastewater Master Plan into capital planning.
	Continuously Coordinate Pipe Replacement with Road Renewal Planning	Align renewal of linear assets closely with planned road reconstruction to minimize cost while managing I&I and failure risks. The City already implement good practice by triggering pipe replacement based on road renewal schedules, which helps avoid unnecessary rework and surface disruption. However, there is an opportunity to enhance and formalize this coordination by adopting a more proactive, corridor-based bundling approach. This means moving beyond reactive alignment to strategically coordinating utility and road reinvestments earlier in the capital planning cycle. By jointly prioritizing projects at corridors, using asset condition and risk to optimize timing, and identifying corridors where full upgrades can be bundled, the City can maximize cost-efficiency, reduce construction-related disruptions, and better manage risks such as I&I or pipe failure.
	Consider Pipe Lining	Assess opportunities to extend the service life of aging sewer mains through trenchless relining technologies, particularly in areas where road reconstruction is not scheduled in the near term. Lining reduces infiltration, delays costly full replacement, and minimizes surface disruption.
Operational & Engineering Solutions	Cross-connection Removal	Identify and remove stormwater inflow sources and cross-connections, focusing on neighborhoods with aging pipes and I&I risks.
	Process Optimization (UV Transition)	Maximize the benefit of UV disinfection by optimizing operational protocols to reduce the likelihood of effluent violations.
	Flushing, Grease Enforcement & Maintenance	Maintain robust maintenance programs and enforce by-laws related to grease and other contributors to backups.
Regulatory & Policy	Monitoring & Compliance	Improve effluent monitoring to quickly detect issues, assess root causes, and prevent future violations.
Redundancy & Optimization	Proactive Inspections & Equipment Redundancy	Regularly inspect and maintain vertical assets; install redundancy where needed to ensure service reliability.
	Process Optimization	Balance operational performance with cost and energy savings at treatment plants.

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. While the City's wastewater assets are in a relatively good condition at the moment, there are future challenges that must be contended with considering the 50-year projection presented in **Figure 5-9**. It is important to address these challenges thoroughly and promptly to leave a positive legacy for future generations.

A suite of improvement initiatives has been identified for the next update of AM planning for the City's wastewater assets, as outlined below:

- **Recommendation 1: Refine asset data and fill data gaps to make more informed and defensible decisions.**

  Continue to collect data and fill gaps in the GIS inventory to have a more accurate representation of the current state of wastewater infrastructure. The City has made great effort in ensuring that the GIS is the primary source of truth for its assets by capturing much of the inventory within the system. It is recommended that the City continue to merge asset data from various drawings, spreadsheets, and other databases through the process of digitizing, transforming, or georeferencing assets to capture the whole inventory.

- **Recommendation 2: Develop a Data Governance Framework to provide a holistic and consistent approach to the City's wastewater data management practices**.

  A Data Governance Framework includes developing an Asset Information and Data Standards Strategy to clearly define what asset data exists, who is accountable for managing it, methods of data collection, and safeguarding data quality. The successful deployment of a Data Governance Framework aims to achieve the following benefits:

  - Enhanced data integrity to support reliable analysis.
  - Improved data management workflows and processes.
  - Improved AM reporting.
  - Clearly defined data management roles & responsibilities.

- **Recommendation 3: Review business process for asset acquisition and design workflow diagrams to formally document AM processes.**

  An opportunity exists for the City to continually reevaluate its business practices, including data management, to promote information sharing between roles, departments, and systems. The development of process maps is an excellent resource for visualizing the flow of information and formalizing procedures.

- **Recommendation 4: Develop a regular wastewater sewer condition assessment program**.

  Condition assessment is one of the primary steps utilized prior to performing maintenance, rehabilitation, or replacement activities. In sewers, the most commonly used inspection technique is CCTV for sewers up to 1,200 mm; larger sewers can be good candidates for multi-sensor inspection (MSI). For force mains, applicable pressure system condition assessment tools can be considered including leak detection. Wall thickness measurement can also be considered for ductile iron and cast-iron force mains. The results from this inspection will be used to evaluate the internal condition of the pipeline to determine the structural and operational condition. A CCTV program will allow the City to:

  - Better forecast infrastructure renewal and rehabilitation needs.
  - Avoid infrastructure failures and the resulting economic, social, and environmental costs.

- Leverage cost-effective methods to extend the life of assets before the asset becomes too deteriorated and must be replaced.

- **Recommendation 5: Develop a regular wastewater facilities condition assessment program.**

  The last wastewater facilities condition assessment for the West End WWTP was performed in 2013. Condition assessment of the East End WWTP has been completed in 2023. AECOM recommends that the City to continously updates wastewater facility asset (treatment plants and the pump stations) condition at least every five years to inform maintenance, renewal, or replacement plans. A detailed condition assessment can include:

  - Inventory confirmations of key process equipment including process structural, process mechanical, process electrical and process instrumentation, building structures and systems, and site work.
  - Completion of all required asset class attributes (includes capturing manufacturer, model, serial number, and year installed).
  - Determining the current condition grade of each asset using a consistent condition rating scale.
  - Application of consequence of failure/criticality values based upon established criteria and information derived from discussion with plant staff.
  - Populating current asset replacement value based on local and recent cost data.
  - Developing a risk assessment and forecasting model.

  In addition, to ensure condition assessment results can be effectively incorporated into the next AMP update, the City will assign unique asset IDs across all wastewater-related databases. This will enable linkage between the asset inventory and condition assessment results, supporting the maintenance of a single source of truth for asset information.

- **Recommendation 6: Refine the Levels of Service Framework.**

  The AMP represents the City's Levels of Service in alignment with the requirements of O. Reg. 588/17 July 1, 2025 deadline. The City will continue its efforts to:

  – Regularly record LoS performance measures to monitor changes over time and identify emerging trends.

  – Review and update performance measures as needed to ensure they remain relevant and effective.

  – Periodically assess proposed LoS to confirm alignment with shifting community expectations, regulatory changes, City priorities, available resources, and observed performance trends—supporting adaptive and responsive service delivery.

  – Continuously enhance demand management by routinely evaluating future demand drivers that influence service delivery and asset use, integrating these insights into long-term capital planning to ensure LoS remains responsive to changing needs.

- **Recommendation 7: Develop a Formalized Risk Assessment Framework and use risk scores to drive financial needs forecasting.**

  The use of a risk-based approach to inform financial needs provides a clear direction in maintenance, rehabilitation, and replacement work in terms of balancing priorities. It also provides transparency to the public and other stakeholders to demonstrate that decisions are made in an impartial and consistent manner, without unreasonable bias, and in accordance with agreed upon policy and priorities.

- **Recommendation 8: Implement a CMMS / Work Management System.**

  The City will conduct an AM Software Strategy following the completion of this AM plan to identify future system requirements that may include enhancing existing software, adding-on, or replacing.

- **Recommendation 9**: **Refine and Regularly Update the Wastewater Lifecycle Funding Model.**

  The current wastewater funding model is built on available data, assumptions, and generalized asset information, providing a high-level estimate of future funding needs. As such, it is essential to refine the model periodically by incorporating updated data—such as asset condition assessments, project cost information, and implementation

schedules—to improve its accuracy. Project timing and costs should also be reviewed and adjusted as projects near execution to ensure realistic planning and budgeting.

- **Recommendation 10: Strengthen Renewal Planning for Wastewater Linear Assets through Corridor-Based Coordination on Infrastructure Renewal and Potential Life Extension Strategies.**

  While funding for wastewater facilities appears to be close to adequate, a significant funding gap exists for wastewater linear assets. The aging of sewer mains poses increasing risks to the wastewater collection system service delivery. Over the next 10 years (2025-2034), the funding gap for linear assets is estimated at approximately **$235 Million**. In the longer term, as illustrated in **Figure 5-9**, renewal needs are projected to rise substantially over the next 50 years, highlighting the importance of long-range financial planning for linear assets. To address these challenges, it is recommended that the City:

  – Enhance corridor-based coordination by aligning the renewal of linear assets with planned road reconstruction to minimize lifecycle costs and service disruptions; the City currently demonstrates sound practice by triggering pipe replacement based on road renewal schedules, minimizing surface disruption and rework. To build on this, the City is recommended to enhance its coordination efforts by adopting a proactive corridor-based bundling approach. This involves jointly prioritizing capital projects across road and utility programs earlier in the planning cycle, using asset condition and risk data to optimize timing, and identifying corridors where full upgrades can be bundled. This strategic integration will help maximize cost-efficiency, minimize disruption, and better manage infrastructure risks such as I&I and pipe failure

  – Assess opportunities for trenchless lining of aging sewer mains, particularly in areas where road reconstruction is not scheduled in the near term. Trenchless lining can extend asset life, reduce infiltration, delay costly full replacement, and significantly minimize surface disruption.

  – Review and update financial model assumptions for wastewater linear assets, including ESLs and replacement values. Incorporate new data as it becomes available—such as results from the ongoing CCTV inspection program—to improve the accuracy of long-term funding need projections.

- **Recommendation 11: Continue to monitor growth needs and integrate growth related wastewater infrastructure funding needs into the financial forecast and update the Wastewater AM Plan as appropriate.**

  As referenced in **Section 3.7**, the City's wastewater system is expected to grow in line with an increase in the City's population. AECOM recommends that the City:

  − Includes growth-related capital needs as part of the capital budgeting.

  − Coordinates AM planning and development planning processes to ensure that the infrastructure systems that are built to serve new growth can be sustained over the long term.

  − Ensures that the wastewater asset inventory is always kept current as new assets are added and existing assets are refurbished or retired.

- **Recommendation 12: Continue to find ways to improve AM initiatives across the City by maintaining a high level of AM awareness through training, AM buy-in, communication, and knowledge sharing.**

  ISO 55010[5] identifies the that the financial and non-financial functions of AM within organizations are generally inadequately aligned. The lack of alignment between financial and non-financial functions can be attributed to silos in an organization, including reporting structures, functional / operational business processes, and related technical data. Financial and non-financial alignment needs to work both "vertically" and "horizontally", as follows:

  − Vertical Alignment: financial and non-financial asset-related directives by management are informed by accurate upward information flows, effectively implemented across the appropriate levels of the organization.

[5] International Organization for Standardization (2019): ISO 55010 - Asset management — Guidance on the alignment of financial and non-financial functions in asset management

- Horizontal alignment: financial and non-financial information that flows between departments conducting functions such as operations, engineering, maintenance, financial accounting, and management, etc. should use the same terminology and refer to the assets identified in the same way.

- **Recommendation 13: Develop a Knowledge Retention Strategy to document staff AM knowledge and experience for succession planning purposes.**

  Communicate AM improvement initiatives and enhance AM awareness internally through internal communication.

- **Recommendation 14: Develop a Change Management & Communications Plan.**

  AM buy-in and support are needed from all levels of the City to ensure that AM standards, practices, and tools are properly adopted and incorporated into day-to-day work activities. A successful Change Management & Communications Plan will depend on the following factors:

  - AM buy-in from Council, senior management, staff, and departments.
  - AM objectives are realistic and achievable.
  - AM improvement initiatives are appropriately resourced.
  - A network of AM champions is developed and empowered across the City.

Recommendation 15: Public and Council Engagement Activities.

Establish a structured approach to public and Council engagement to ensure the AMP aligns with community expectations, supports informed decision-making, and enhances transparency, the City is committed to establishing a structured approach to public and Council engagement. While several engagement activities have already been undertaken, these efforts lay the foundation for a more consistent and strategic approach moving forward.

For Council engagement, the City has held presentations and conducted media events to share key project updates. It is recommended the development of Councillor Tool Kits could equip elected officials with clear and consistent messaging, including project overviews and frequently asked questions, to help them confidently respond to inquiries from residents. Suggested content for the tool kits includes:

- Overview of the City's Infrastructure Network
- Unique Conditions and Localized Challenges
- Investment in Infrastructure: Past, Present, and Future
- How the City Plans and Delivers Maintenance
- Why Continued Investment in Infrastructure Is Critical
- Asset Types and How They Guide Investment Priorities
- Introduction to Asset Management Principles
- Service Levels: What Residents Can Expect
- How Climate Change Impacts Infrastructure and their Maintenance
- Leveraging Technology to Improve Infrastructure Management
- Funding Sources and Budget Allocation
- How Infrastructure Are Prioritized and Selected for Maintenance

On the public engagement side, the City has shared information through existing channels, and this could be enhanced through a dedicated project webpage. This webpage would serve as a central hub for infrastructure planning updates, offering frequently asked questions, downloadable resources, project timelines, contact information, and an interactive feature to encourage two-way communication. A targeted social media strategy is also recommended to further broaden outreach—leveraging platforms such as Facebook and Instagram, including the use of sponsored posts to promote project milestones and public input opportunities.

The recommended engagement strategies would help foster public trust, define customer-focused performance targets, and ensure that the AMP reflects the evolving priorities of both Council and the broader community.

APPENDIX A

Wastewater Asset Inventory

A

Appendix A - Wastewater Asset Inventory

The City’s wastewater asset inventory is presented as a separate MS Excel file.

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