Asset Management Plan 2025

City of Thorold

October 2025

psdcitywide

This Asset Management Plan was prepared by:

psdcitywide

Empowering your organization through advanced asset management, budgeting & GIS solutions

Key Statistics

$927 m	2023 Replacement Cost of Asset Portfolio
78%	Percentage of Assets in Fair or Better Condition
55%	Percentage of Assets with Assessed Condition Data
$11.5 m	Annual Capital Infrastructure Deficit
12 Years	Recommended Timeframe to reach Proposed Levels of Service
2.5%	Target Investment Rate to meet Proposed Levels of Service
1.2%	Actual Investment Rate

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1. Executive Summary

Municipal infrastructure delivers critical services that are foundational to the economic, social, and environmental health and growth of a community. The goal of asset management is to enable infrastructure to deliver an adequate level of service in the most cost-effective manner. This involves the ongoing review and update of infrastructure information and data alongside the development and implementation of asset management strategies and long-term financial planning.

1.1 Scope

This Asset Management Plan (AMP) identifies the current practices and strategies that are in place to manage public infrastructure and makes recommendations where they can be further refined. Through the implementation of sound asset management strategies, the City of Thorold can ensure that public infrastructure is managed to support the sustainable delivery of municipal services.

This AMP includes the following asset categories:

Figure 1 Core and Non-Core Asset Categories

1.2 Compliance

With the development of this AMP the City of Thorold has achieved compliance with July 1, 2025, requirements under O. Reg. 588/17. This includes requirements for proposed levels of service and inventory reporting for all asset categories.

1.3 Findings

The overall replacement cost of the asset categories included in this AMP totals $927 million. 78% of all assets analyzed in this AMP are in fair or better condition and assessed condition data was available for 55% of assets. For the remaining 45% of assets, assessed condition data was unavailable, and asset age was used to approximate condition – a data gap that persists in most municipalities. Generally, age misstates the true condition of assets, making assessments essential to accurate asset management planning, and a recurring recommendation in this AMP.

The development of a long-term, sustainable financial plan requires an analysis of whole lifecycle costs. This AMP uses a combination of proactive lifecycle strategies (paved roads) and replacement only strategies (all other assets) to determine the lowest cost option to maintain the current level of service.

To meet capital replacement and rehabilitation needs for existing infrastructure, prevent infrastructure backlogs, and achieve long-term sustainability, the City's average annual capital requirement totals $23.0 million. Based on a historical analysis of sustainable capital funding sources, the City is committing approximately $11.5 million towards capital projects or reserves per year. As a result, there is currently an annual funding gap of $11.5 million.

It is important to note that this AMP represents a snapshot in time and is based on the best available processes, data, and information at the City. Strategic asset management planning is an ongoing and dynamic process that requires continuous improvement and dedicated resources.

1.4 Recommendations

A financial strategy was developed to address the annual capital funding gap. The following graphics shows annual tax/rate change required to eliminate the City's infrastructure deficit based on a 12-year plan:

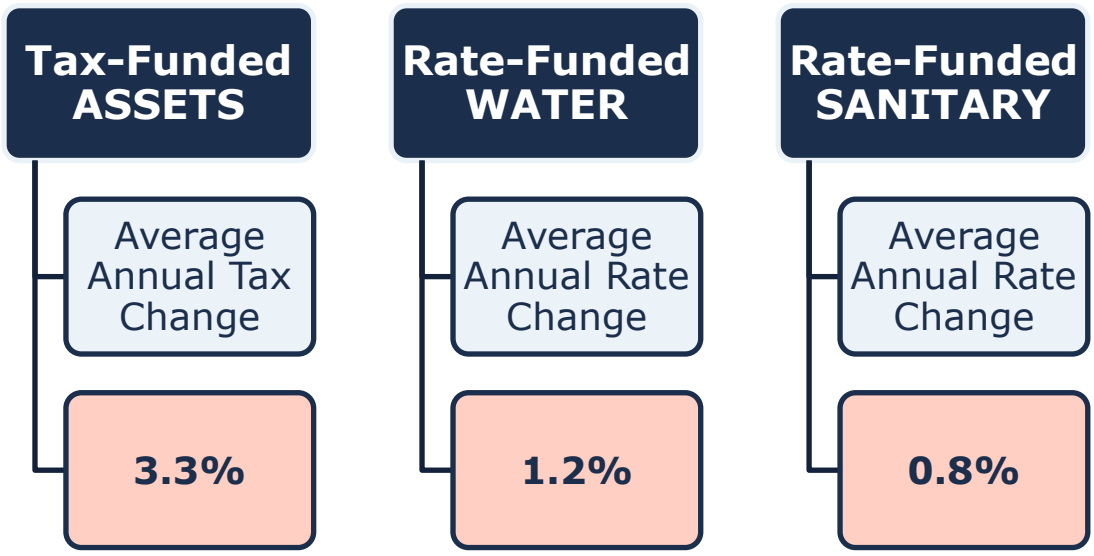


Figure 2 Proposed Tax/Rate Changes

2. Introduction & Context

2.1 Community Profile

Census Characteristic	City of Thorold	Ontario
Population 2021	23,816	14,223,942
Population Change 2016-2021	+ 26.7%	5.8%
Total Private Dwellings	9,856	5,929,250
Population Density	285.9/km^2	15.9/km^2
Land Area	83.29 km^2	892,411.76 km^2

Table 1 City of Thorold Community Profile

The City of Thorold is a lower-tier municipality, part of the Niagara Region, which is surrounded by the larger cities of St. Catharines and Niagara Falls located in southern Ontario.

The City of Thorold was incorporated in 1975 to enhance local governance and manage its growth more effectively, driven by its strategic position along the Welland Canal. The canal's establishment in 1829 catalyzed Thorold's development as an industrial and shipping hub, shaping its economic and cultural landscape. The City's history reflects its transition from a vital maritime center to a diverse community, with ongoing investments in infrastructure and services to support its evolving industrial and residential needs.

Thorold is characterized by its industrial heritage and proximity to the Welland Canal, attracting interest for both commercial and recreational activities. The natural settings of the Niagara Escarpment enrich the area, providing opportunities for outdoor activities such as hiking and cycling, appealing to residents and tourists who enjoy natural landscapes. The City also hosts various cultural events and festivals that celebrate its maritime history and community spirit, further enhancing its appeal.

The City's demand is driven by competitive housing prices and its central location within the Niagara Region, appealing to both families and businesses looking for affordability near larger cities. Additionally, Thorold's educational facilities, including a satellite campus of Brock University, boost the need for housing and local services, supporting economic growth by catering to the educational community. This educational influence creates a vibrant, youthful atmosphere that contributes to the City’s dynamic social fabric.

The City of Thorold’s infrastructure priorities center on enhancing housing, transportation, and community services to support urban growth and connectivity. Efforts are focused on revitalizing urban areas, improving access to major transportation routes, and intensifying land use. Additionally, the City is upgrading critical infrastructure and expanding facilities to meet the evolving needs of its residents.

2.2 Climate Change

Climate change can cause severe impacts on human and natural systems around the world. The effects of climate change include increasing temperatures, higher levels of precipitation, droughts, and extreme weather events. In 2019, Canada's Changing Climate Report (CCCR 2019) was released by Environment and Climate Change Canada (ECCC).

The report revealed that between 1948 and 2016, the average temperature increase across Canada was 1.7°C; moreover, during this time period, Northern Canada experienced a 2.3°C increase. The temperature increase in Canada has doubled that of the global average. If emissions are not significantly reduced, the temperature could increase by 6.3°C in Canada by the year 2100 compared to 2005 levels. Observed precipitation changes in Canada include an increase of approximately 20% between 1948 and 2012. By the late 21st century, the projected increase could reach an additional 24%. During the summer months, some regions in Southern Canada are expected to experience periods of drought at a higher rate. Extreme weather events and climate conditions are more common across Canada. Recorded events include droughts, flooding, cold extremes, warm extremes, wildfires, and record minimum arctic sea ice extent.

The changing climate poses a significant risk to the Canadian economy, society, environment, and infrastructure. The impacts on infrastructure are often a result of climate-related extremes such as droughts, floods, higher frequency of freeze-thaw cycles, extended periods of high temperatures, high winds, and wildfires. Physical infrastructure is vulnerable to damage and increased wear when exposed to these extreme events and climate variabilities. Canadian Municipalities are faced with the responsibility to protect their local economy, citizens, environment, and physical assets.

2.2.1 Thorold Climate Profile

The City of Thorold is located in southern Ontario within the Niagara Region. The City is expected to experience notable effects of climate change which include higher average annual temperatures, an increase in total annual precipitation, and an increase in the frequency and severity of extreme events. According to Climatedata.ca – a collaboration supported by Environment and Climate Change Canada (ECCC) – the City of Thorold may experience the following trends:

Higher Average Annual Temperature

- Between the years 1971 and 2000 the annual average temperature was 8.7 ºC
- Under a high emissions scenario, the annual average temperatures are projected to increase by 4.6 ºC by the year 2050 and over 6.4 ºC by the end of the century.

Increase in Total Annual Precipitation

- Under a high emissions scenario, Thorold is projected to experience an 11% increase in precipitation by the year 2051 and a 16% increase by the end of the century.

Increase in Frequency of Extreme Weather Events

- It is expected that the frequency and severity of extreme weather events will change.

- In some areas, extreme weather events will occur with greater frequency and severity than others especially those impacted by Great Lake winds.

2.2.2 Lake Ontario

Lake Ontario, one of the five Great Lakes, is crucial for its role in providing fresh water to millions and supporting a diverse ecosystem. This lake, shared between the United States and Canada, is a vital resource for about one-third of Canadians in its watershed. The impacts of climate change are increasingly evident around Lake Ontario, including rising water levels that lead to shoreline erosion and threaten nearby infrastructure like parks, bridges, and roads. Additionally, severe weather events such as windstorms and flooding are becoming more frequent, posing risks to both natural and built environments.

The health and stability of Lake Ontario's ecosystem are paramount for public safety and water quality. Climate change exacerbates challenges such as blue-green algae blooms, driven by warmer water temperatures and nutrient runoff from agriculture and urban stormwater. These environmental changes stress water treatment facilities and threaten public health, especially during flooding events that can introduce contaminants into water supplies. Communities around Lake Ontario are facing the need to adapt to these changes to protect both the environment and human health, ensuring the sustainability of this critical freshwater resource.

2.2.3 Integration Climate change and Asset Management

Asset management practices aim to deliver sustainable service delivery - the delivery of services to residents today without compromising the services and well-being of future residents. Climate change threatens sustainable service delivery by reducing the useful life of an asset and increasing the risk of asset failure. Desired levels of service can be more difficult to achieve as a result of climate change impacts such as flooding, high heat, drought, and more frequent and intense storms.

In order to achieve the sustainable delivery of services, climate change considerations should be incorporated into asset management practices. The integration of asset management and climate change adaptation observes industry best practices and enables the development of a holistic approach to risk management.

2.3 Asset Management Overview

Municipalities are responsible for managing and maintaining a broad portfolio of infrastructure assets to deliver services to the community. The goal of asset management is to minimize the lifecycle costs of delivering infrastructure services, manage the associated risks, while maximizing the value ratepayers receive from the asset portfolio.

The acquisition of capital assets accounts for only 10-20% of their total cost of ownership. The remaining 80-90% comes from operations and maintenance. This AMP focuses its analysis on the capital costs to maintain, rehabilitate and replace existing municipal infrastructure assets.

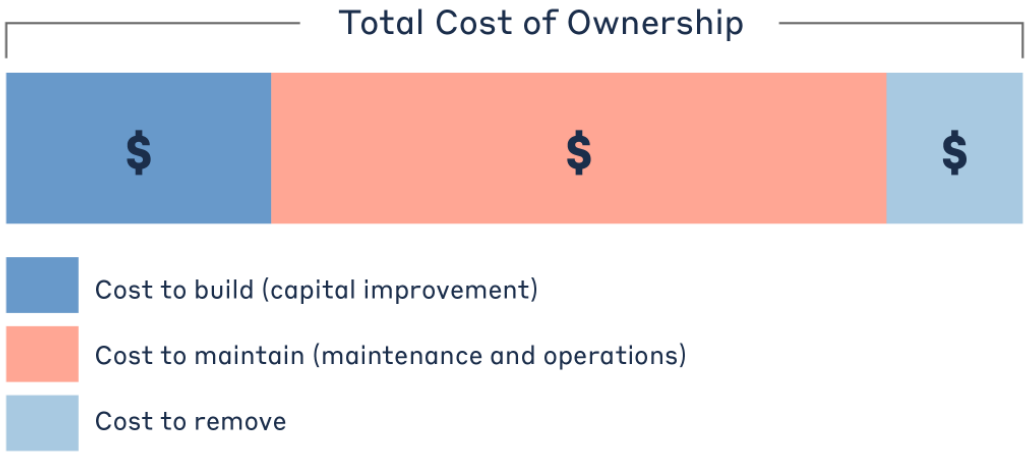


Figure 3 Total Cost of Asset Ownership

These costs can span decades, requiring planning and foresight to ensure financial responsibility is spread equitably across generations. An asset management plan is critical to this planning, and an essential element of broader asset management program.

2.3.1 Foundational Asset Management Documentation

The industry-standard approach and sequence to developing a practical asset management program begins with a Strategic Plan, followed by an Asset Management Policy and an Asset Management Strategy, concluding with an Asset Management Plan.

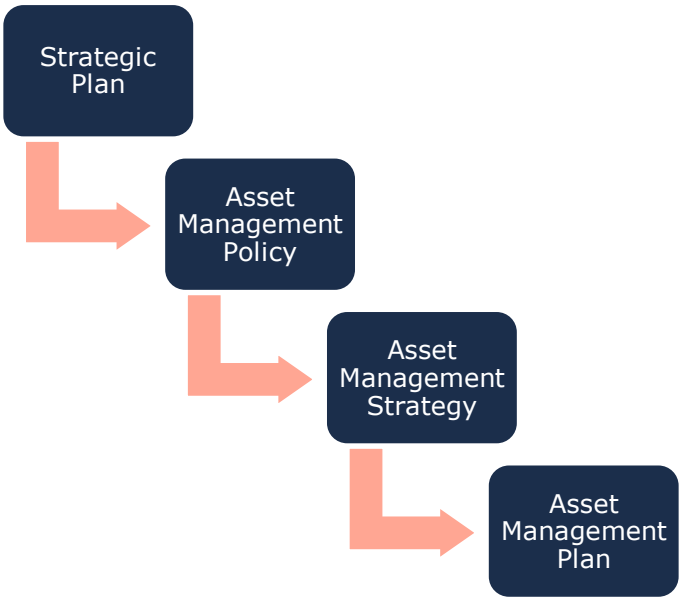


Figure 4 Foundational Asset Management Documents

This industry standard, defined by the Institute of Asset Management (IAM), emphasizes the alignment between the corporate strategic plan and various asset management documents. The strategic plan has a direct, and cascading impact on asset management planning and reporting.

Asset Management Policy

An asset management policy represents a statement of the principles guiding the City's approach to asset management activities. It aligns with the organizational strategic plan and provides clear direction to municipal staff on their roles and responsibilities as part of the asset management program.

The City of Thorold adopted policy number 300-30 "Asset Management Strategic Plan Policy" on June 18, 2019, in accordance with Ontario Regulation 588/17. The City will implement best practices in asset management in the following ways:

- Complete and accurate data
- Condition assessment protocols
- Risk and critical models
- Lifecycle management
- Financial strategy development
- Level of service framework

Asset Management Strategy

An asset management strategy outlines the translation of organizational objectives into asset management objectives and provides a strategic overview of the activities required to meet these objectives. It provides greater detail than the policy on how the City plans to achieve asset management objectives through planned activities and decision-making criteria.

The City's Asset Management Policy contains many of the key components of an asset management strategy and may be expanded in future revisions or as part of a separate strategic document.

Asset Management Plan

The asset management plan (AMP) presents the outcomes of the City's asset management program and identifies the resource requirements needed to achieve a defined level of service. The AMP typically includes the following content:

- State of Infrastructure
- Asset Management Strategies
- Levels of Service
- Financial Strategies

The AMP is a living document that should be updated regularly as additional asset and financial data becomes available. This will allow the City to re-evaluate the state of infrastructure and identify how the organization's asset management and financial strategies are progressing.

2.3.2 Key Concepts in Asset Management

Effective asset management integrates several key components, including lifecycle management, risk & criticality, and levels of service. These concepts are applied throughout this asset management plan and are described below in greater detail.

Lifecycle Management Strategies

The condition or performance of most assets will deteriorate over time. This process is affected by a range of factors including an asset's characteristics, location, utilization, maintenance history and environment. Asset deterioration has a negative effect on the ability of an asset to fulfill its intended function, and may be characterized by increased cost, risk and even service disruption.

To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

There are several field intervention activities that are available to extend the life of an asset. These activities can be generally placed into one of three categories: maintenance, rehabilitation, and replacement. The following table provides a description of each type of activity and the general difference in cost.

Depending on initial lifecycle management strategies, asset performance can be sustained through a combination of maintenance and rehabilitation, but at some point, replacement is required. Understanding what effect these activities will have on the lifecycle of an asset, and their cost, will enable staff to make better recommendations.

Lifecycle Activity	Cost	Typical Associated Risks
Maintenance Activities that prevent defects or deteriorations from occurring	**$**	♦ Balancing limited resources between planned maintenance and reactive, emergency repairs and interventions; ♦ Diminishing returns associated with excessive maintenance activities, despite added costs; ♦ Intervention selected may not be optimal and may not extend the useful life as expected, leading to lower payoff and potential premature asset failure;
Rehabilitation/ Renewal Activities that rectify defects or deficiencies that are already present and may be affecting asset performance	**$$$**	♦ Useful life may not be extended as expected; ♦ May be costlier in the long run when assessed against full reconstruction or replacement; ♦ Loss or disruption of service, particularly for underground assets;

Lifecycle Activity	Cost	Typical Associated Risks
Replacement/ Reconstruction Asset end-of-life activities that often involve the complete replacement of assets	**$$$$$**	♦ Incorrect or unsafe disposal of existing asset; ♦ Costs associated with asset retirement obligations; ♦ Substantial exposure to high inflation and cost overruns; ♦ Replacements may not meet capacity needs for a larger population; ♦ Loss or disruption of service, particularly for underground assets;

Table 2 Lifecycle Management: Typical Lifecycle Interventions

The City's approach to lifecycle management is described within each asset category outlined in this AMP. Staff will continue to evolve and innovate current practices for developing and implementing proactive lifecycle strategies to determine which activities to perform on an asset and when they should be performed to maximize useful life at the lowest total cost of ownership.

Risk & Criticality

Asset risk and criticality are essential building blocks of asset management, integral in prioritizing projects and distributing funds where they are needed most based on a variety of factors. Assets in disrepair may fail to perform their intended function, pose substantial risk to the community, lead to unplanned expenditures, and create liability for the municipality. In addition, some assets are simply more important to the community than others, based on their financial significance, their role in delivering essential services, the impact of their failure on public health and safety, and the extent to which they support a high quality of life for community stakeholders.

Risk is a product of two variables: the probability that an asset will fail, and the resulting consequences of that failure event. It can be a qualitative measurement, (i.e. low, medium, high) or quantitative measurement (i.e. 1-5), that can be used to rank assets and projects, identify appropriate lifecycle strategies, optimize short- and long-term budgets, minimize service disruptions, and maintain public health and safety.

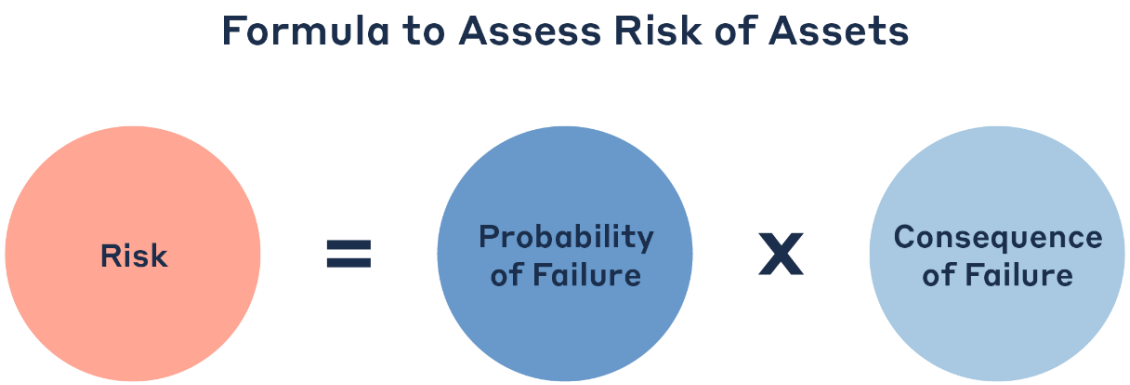


Figure 5 Risk Equations

The approach used in this AMP relies on a quantitative measurement of risk associated with each asset. The probability and consequence of failure are each scored from 1 to 5, producing a minimum risk index of 1 for the lowest risk assets, and a maximum risk index of 25 for the highest risk assets.

Probability of Failure

Several factors can help decision-makers estimate the probability or likelihood of an asset's failure, including its condition, age, previous performance history, and exposure to extreme weather events, such as flooding and ice jams—both a growing concern for municipalities in Canada.

Consequence of Failure

Estimating criticality also requires identifying the types of consequences that the organization and community may face from an asset's failure, and the magnitude of those consequences. Consequences of asset failure will vary across the infrastructure portfolio; the failure of some assets may result primarily in high direct financial cost but may pose limited risk to the community. Other assets may have a relatively minor financial value, but any downtime may pose significant health and safety hazards to residents.

Table 3 illustrates the various types of consequences that can be integrated in developing risk and criticality models for each asset category and segments within. We note that these consequences are common, but not exhaustive.

Type of Consequence	Description
Direct Financial	Direct financial consequences are typically measured as the replacement costs of the asset(s) affected by the failure event, including interdependent infrastructure.
Economic	Economic impacts of asset failure may include disruption to local economic activity and commerce, business closures, service disruptions, etc. Whereas direct financial impacts can be seen immediately or estimated within hours or days, economic impacts can take weeks, months and years to emerge, and may persist for even longer.
Socio-political	Socio-political impacts are more difficult to quantify and may include inconvenience to the public and key community stakeholders, adverse media coverage, and reputational damage to the community and the Municipality.
Environmental	Environmental consequences can include pollution, erosion, sedimentation, habitat damage, etc.
Public Health and Safety	Adverse health and safety impacts may include injury or death, or impeded access to critical services.
Strategic	These include the effects of an asset's failure on the community's long-term strategic objectives, including economic development, business attraction, etc.

Table 3 Risk Analysis: Types of Consequences of Failure

This AMP includes a preliminary evaluation of asset risk and criticality. Each asset has been assigned a probability of failure score and consequence of failure score based on available asset data. These risk scores can be used to prioritize maintenance, rehabilitation, and replacement strategies for critical assets.

These models have been built in Citywide for continued review, updates, and refinements.

Levels of Service

A level of service (LOS) is a measure of the services that the City is providing to the community and the nature and quality of those services. Within each asset category in this AMP, technical metrics and qualitative descriptions that measure both technical and community levels of service have been established and measured as data is available.

The City measures the level of service provided at two levels: Community Levels of Service, and Technical Levels of Service.

Community Levels of Service

Community levels of service are a simple, plain language description or measure of the service that the community receives. For core asset categories as applicable (Roads, Bridges & Culverts, Water, Wastewater, Stormwater) the province, through O. Reg. 588/17, has provided qualitative descriptions that are required to be included in this AMP.

Technical Levels of Service

Technical levels of service are a measure of key technical attributes of the service being provided to the community. These include mostly quantitative measures and tend to reflect the impact of the City's asset management strategies on the physical condition of assets or the quality/capacity of the services they provide.

For core asset categories as applicable, the province, through O. Reg. 588/17, has also provided technical metrics that are required to be included in this AMP.

Current and Proposed Levels of Service

Current LOS are the past performance metrics of an asset category up until present day. In contrast, Proposed LOS looks toward the municipality's goal for asset performance by a defined future date.

It is important to note that O. Reg 588/17 does not dictate which proposed LOS metrics municipality's need to strive for. A proposed LOS will be very specific to each community's resident desires, political goals, and financial capacity. This can range from increasing service levels and costs, to maintaining or even reducing current performance in order to mitigate future cost increases. Regardless of the proposed LOS chosen, O. Reg 588/17 requires municipalities to demonstrate the achievability of their selected metrics.

2.4 Scope & Methodology

2.4.1 Asset Categories for this AMP

This asset management plan for the City of Thorold is produced in compliance with O. Reg. 588/17. The July 2025 deadline under the regulation—the third of three AMPs—requires analysis of core and non-core asset categories, as well as proposed service levels and how to fund them.

The AMP summarizes the state of the infrastructure for the City's asset portfolio, establishes current levels of service and the associated technical and customer oriented key metrics, outlines lifecycle strategies for optimal asset management and performance, and provides financial strategies to reach sustainability for the asset categories listed below.

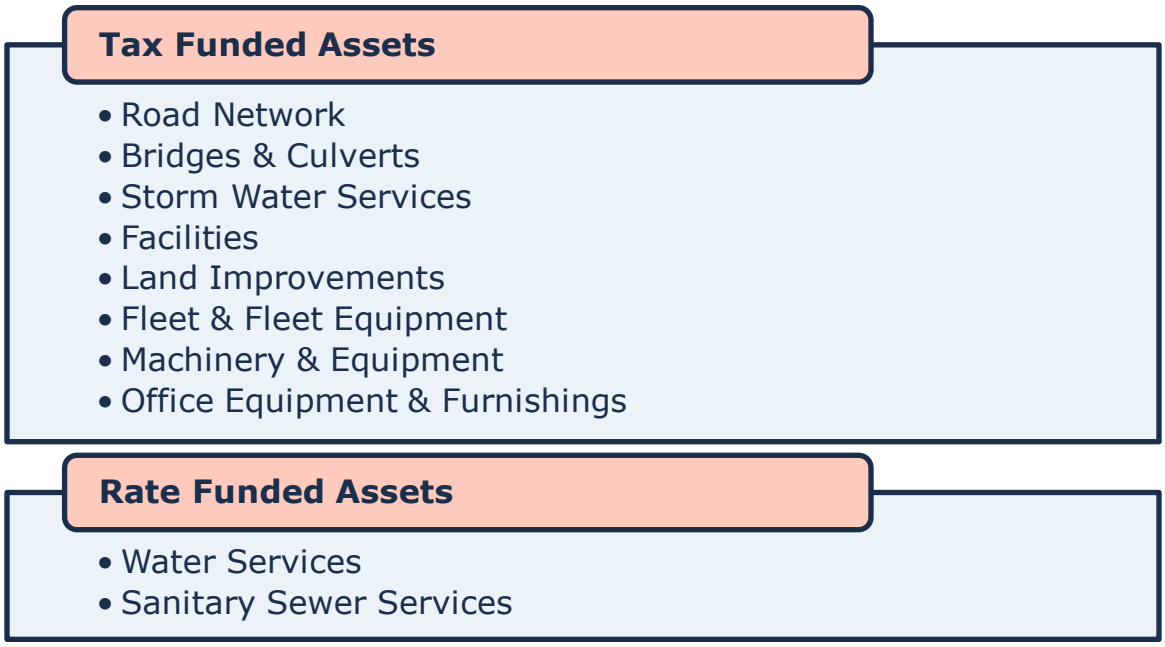


Figure 6 Tax Funded and Rate Funded Asset Categories

2.4.2 Data Effective Date

It is important to note that this plan is based on data as of **December 2023**; therefore, it represents a snapshot in time using the best available processes, data, and information at the City. Strategic asset management planning is an ongoing and dynamic process that requires continuous data updates and dedicated data management resources.

2.4.3 Deriving Replacement Costs

There are a range of methods to determine the replacement cost of an asset, and some are more accurate and reliable than others. This AMP relies on two methodologies:

User-Defined Cost and Cost Per Unit

Based on costs provided by municipal staff which could include average costs from recent contracts; data from engineering reports and assessments; staff estimates based on knowledge and experience.

Cost Inflation / CPI Tables

Historical costs of the assets are inflated based on Consumer Price Index or Non-Residential Building Construction Price Index.

User-defined costs based on reliable sources are a reasonably accurate and reliable way to determine asset replacement costs. Cost inflation is typically used in the absence of reliable replacement cost data. It is a reliable method for recently purchased and/or constructed assets where the total cost is reflective of the actual costs that the City incurred. As assets age, and new products and technologies become available, cost inflation becomes a less reliable method.

2.4.4 Estimated Service Life & Service Life Remaining

The estimated useful life (EUL) of an asset is the period over which the City expects the asset to be available for use and remain in service before requiring replacement or disposal. The EUL for each asset in this AMP was assigned according to the knowledge and expertise of municipal staff and supplemented by existing industry standards when necessary.

By using an asset's in-service data and its EUL, the City can determine the service life remaining (SLR) for each asset. Using condition data and the asset's SLR, the City can more accurately forecast when it will require replacement. The SLR is calculated as follows:

Figure 7 Service Life Remaining Calculation

2.4.5 Reinvestment Rate

As assets age and deteriorate they require additional investment to maintain a state of good repair. The reinvestment of capital funds, through asset renewal or replacement, is necessary to sustain an adequate level of service. The reinvestment rate is a measurement of available or required funding relative to the total replacement cost.

By comparing the actual vs. target reinvestment rate the City can determine the extent of any existing funding gap. The reinvestment rate is calculated as follows:

Figure 8 Target Reinvestment Rate Calculation

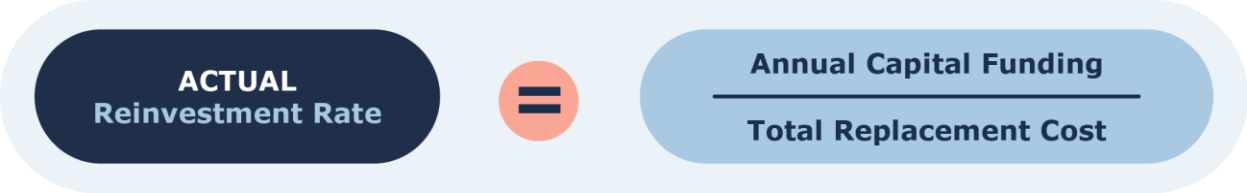


Figure 9 Actual Reinvestment Rate Calculation

2.4.6 Deriving Asset Condition

An incomplete or limited understanding of asset condition can mislead long-term planning and decision-making. Accurate and reliable condition data helps to prevent premature and costly rehabilitation or replacement and ensures that lifecycle activities occur at the right time to maximize asset value and useful life.

A condition assessment rating system provides a standardized descriptive framework that allows comparative benchmarking across the City's asset portfolio. The table below outlines the condition rating system used in this AMP to determine asset condition. This rating system is aligned with the Canadian Core Public Infrastructure Survey which is used to develop the Canadian Infrastructure Report Card. When assessed condition data is not available, service life remaining is used to approximate asset condition.

Condition	Description	Criteria	Service Life Remaining (%)
Very Good	Fit for the future	Well maintained, good condition, new or recently rehabilitated	80-100
Good	Adequate for now	Acceptable, generally approaching mid-stage of expected service life	60-80
Fair	Requires attention	Signs of deterioration, some elements exhibit significant deficiencies	40-60
Poor	Increasing potential of affecting service	Approaching end of service life, condition below standard, large portion of system exhibits significant deterioration	20-40
Very Poor	Unfit for sustained service	Near or beyond expected service life, widespread signs of advanced deterioration, some assets may be unusable	0-20

Table 4 Standard Condition Rating Scale

The analysis in this AMP is based on assessed condition data only as available. In the absence of assessed condition data, asset age is used as a proxy to determine asset condition.

2.5 Ontario Regulation 588/17

As part of the Infrastructure for Jobs and Prosperity Act, 2015, the Ontario government introduced Regulation 588/17 - Asset Management Planning for Municipal Infrastructure (O. Reg 588/17)[1]. Along with creating better performing organizations, more liveable and sustainable communities, the regulation is a key, mandated driver of asset management planning and reporting. It places substantial emphasis on current and proposed levels of service and the lifecycle costs incurred in delivering them.

Figure 10 below outlines key reporting requirements under O. Reg 588/17 and the associated timelines.

[1] O. Reg. 588/17: Asset Management Planning for Municipal Infrastructure https://www.ontario.ca/laws/regulation/170588

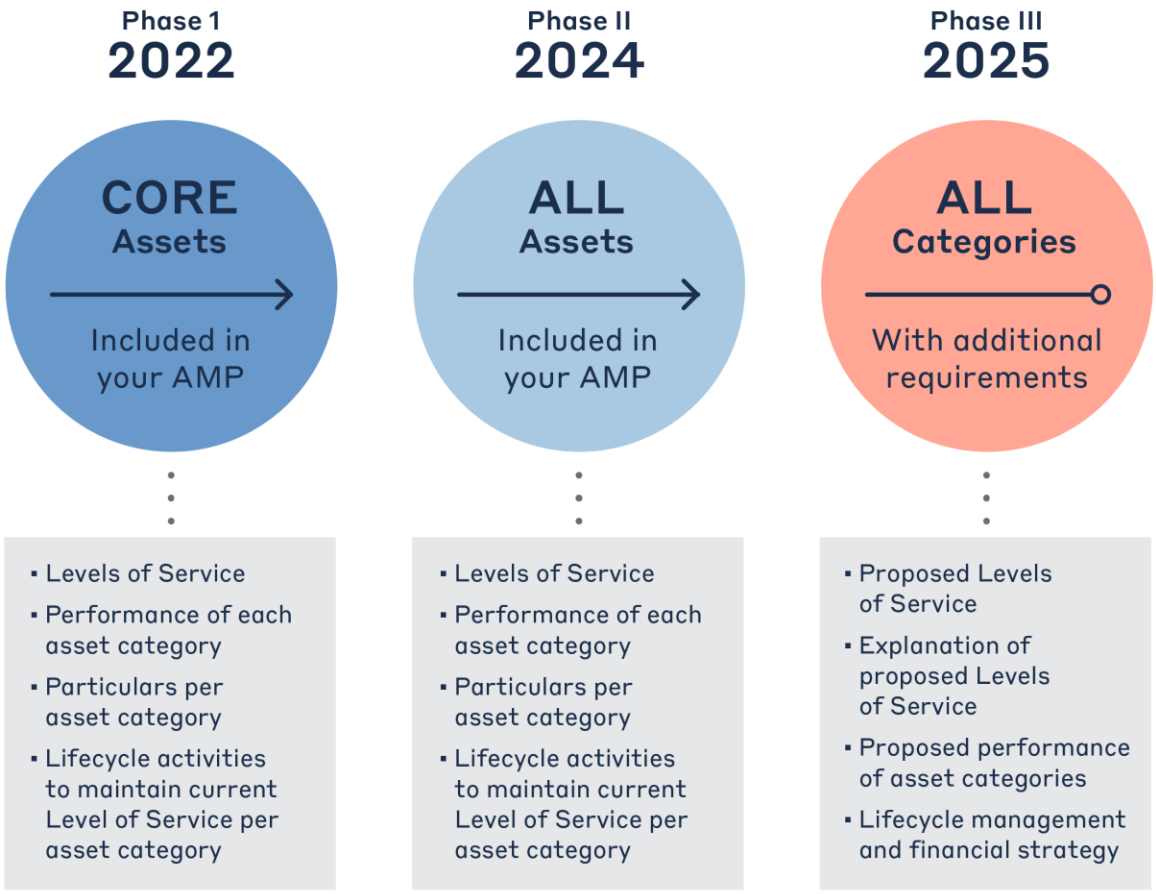


Figure 10 O. Reg. 588/17 Requirements and Reporting Deadlines

2.5.1 O. Reg. 588/17 Compliance Review

Requirement	O. Reg. 588/17 Section	AMP Section Reference	Status
Summary of assets in each category	S.5(2), 3(i)	5.1 – 14.1	Complete
Replacement cost of assets in each category	S.5(2), 3(ii)	5.1 – 14.1	Complete
Average age of assets in each category	S.5(2), 3(iii)	5.3 – 14.3	Complete
Condition of core assets in each category	S.5(2), 3(iv)	5.2 – 14.2	Complete
Description of municipality's approach to assessing the condition of assets in each category	S.5(2), 3(v)	5.4 – 14.4	Complete
Current levels of service in each category	S.5(2), 1(i-ii)	5.7 – 14.7	Complete
Current performance measures in each category	S.5(2), 2	5.7 – 14.7	Complete
Lifecycle activities needed to maintain current levels of service for 10 years	S.5(2), 4	5.4 – 14.4	Complete
Costs of providing lifecycle activities for 10 years	S.5(2), 4	5.5 – 14.5	Complete
Growth considerations	S.6(1), 5	15.1 – 15.2	Complete
Proposed levels of service for each category for next 10 years	S.6(1), 1(i-ii)	5.8 – 14.8	Complete
Explanation of appropriateness of proposed levels of service	S.6(1), 2(i-iv)	4.3	Complete
Lifecycle management activities for proposed levels of service	S.6(1), 4(i)	4.3	Complete
10-year capital costs for proposed levels of service	S.6(1), 4(ii)	Appendix B	Complete
Annual funding availability projections	S.6(1), 4(iii)	4.3	Complete

Table 5 O. Reg. 588/17 Compliance Review

Portfolio Overview

3. State of the Infrastructure

The state of the infrastructure (SOTI) summarizes the inventory, condition, age profiles, and other key performance indicators for the City's infrastructure portfolio. These details are presented for all core and non-core asset categories.

3.1 Asset Hierarchy & Data Classification

Asset hierarchy explains the relationship between individual assets and their components, and a wider, more expansive network and system. How assets are grouped in a hierarchy structure can impact how data is interpreted. Assets were structured to support meaningful, efficient reporting and analysis. Key category details are summarized at asset segment level.

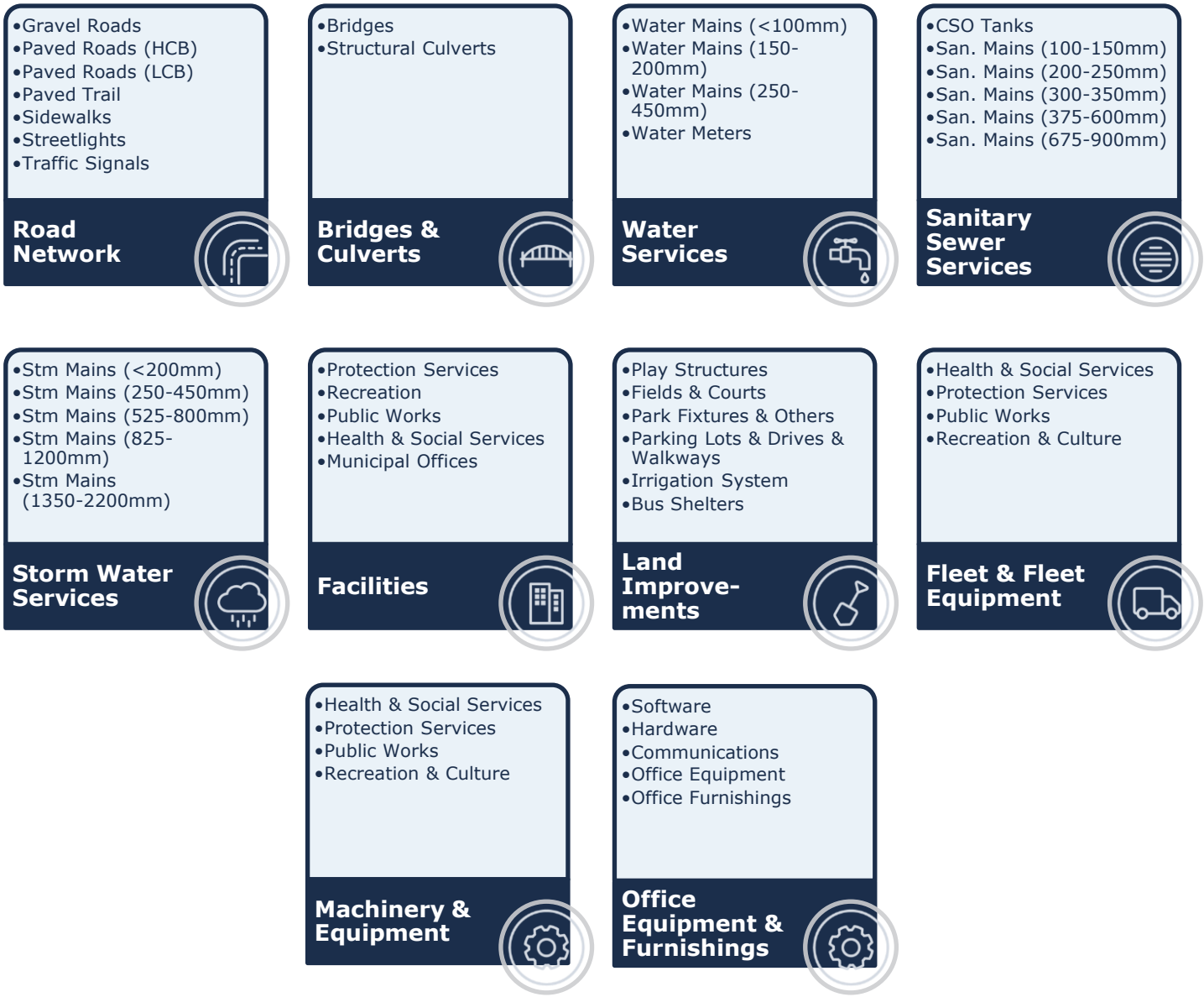


Figure 11 Asset Hierarchy and Data Classification

3.2 Portfolio Overview

3.2.1 Total Replacement Cost of Asset Portfolio

The ten asset categories analyzed in this Asset Management Plan have a total current replacement cost of $927 million. This estimate was calculated using user-defined costing, as well as inflation of historical or original costs to current date. This estimate reflects replacement of historical assets with similar, not necessarily identical, assets available for procurement today. Figure 12 illustrates the replacement cost of each asset category; at 31% of the total portfolio, roads form the largest share of the City's asset portfolio, followed by sanitary sewer services at 17%.

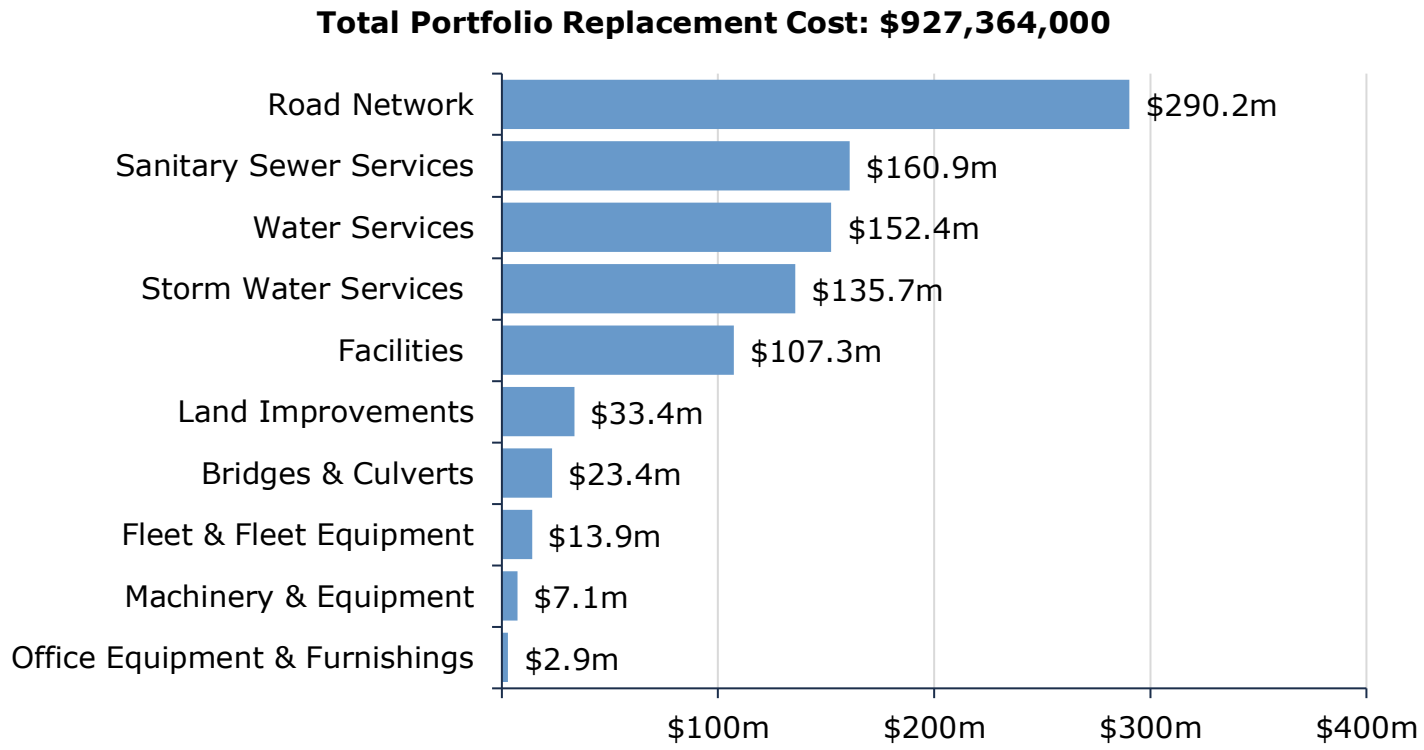


Figure 12 Current Replacement Cost by Asset Category

3.2.2 Target vs. Actual Reinvestment Rate

The graph below depicts funding gaps by comparing the target to the current reinvestment rate. To meet the existing long-term capital requirements, the City requires an annual capital investment of $23.0 million, for a target portfolio reinvestment rate of 2.5%. Currently, annual investment from sustainable revenue sources is $11.5 million, for a current portfolio reinvestment rate of 1.2%. Target and current re-investment rates by asset category are detailed below.

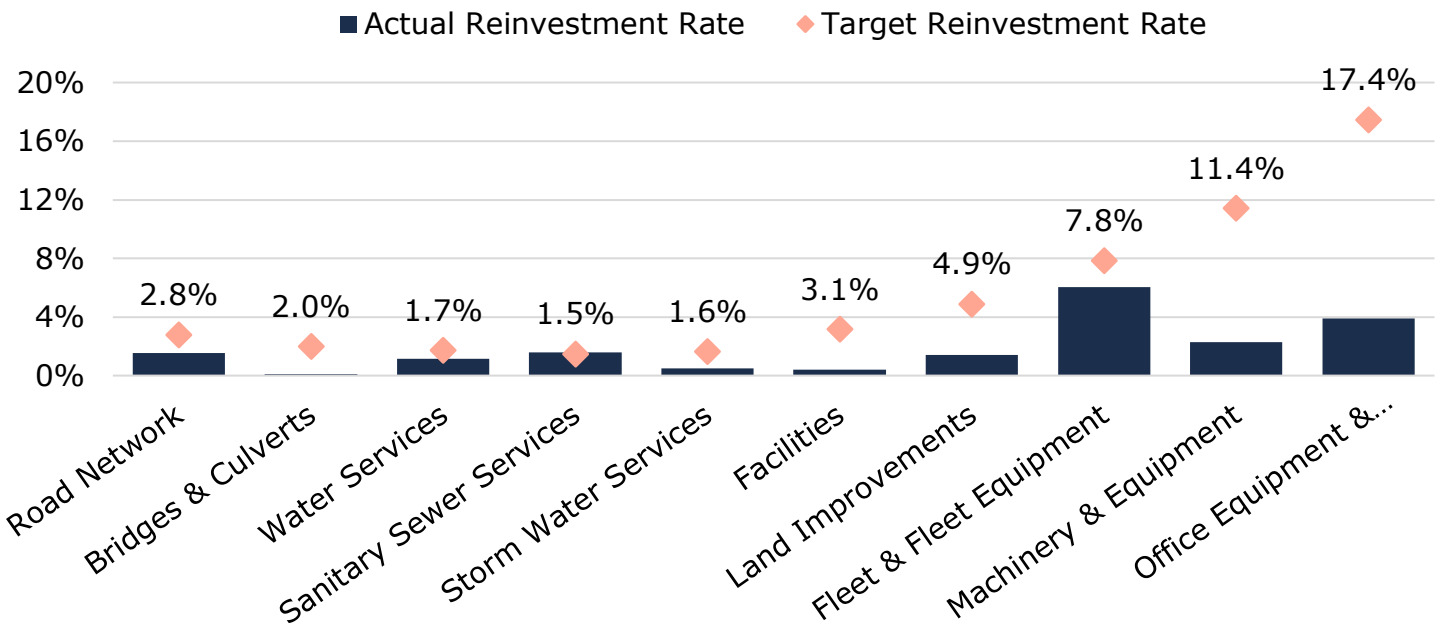


Figure 13 Current Vs. Target Reinvestment Rate

3.2.3 Condition of Asset Portfolio

Figure 14 and Figure 15 summarize asset condition at the portfolio and category levels, respectively. Based on both assessed condition and age-based analysis, 78% of the City's infrastructure portfolio is in fair or better condition, with the remaining 22% in poor or worse condition. Typically, assets in poor or worse condition may require replacement or major rehabilitation in the immediate or short-term. Targeted condition assessments may help further refine the list of assets that may be candidates for immediate intervention, including potential replacement or reconstruction.

Similarly, assets in fair condition should be monitored for disrepair over the medium term. Keeping assets in fair or better condition is typically more cost-effective than addressing assets needs when they enter the latter stages of their lifecycle or decline to a lower condition rating, e.g., poor or worse.

Condition data was available for majority of the road network, bridges and culverts, facilities, land improvements, fleet, and some equipment. For all remaining assets, including major infrastructure such as water and storm water services, age was used as an approximation of condition for these assets. Age-based condition estimations can skew data and lead to potential under- or overstatement of asset needs.

Further, when past assessed condition data was available, it was projected to the current year-end (2023). This 'projected condition' can generate lower condition ratings than those established at the time of the original condition assessment. The rate of this deterioration will also depend on lifecycle curves used to project condition over time.

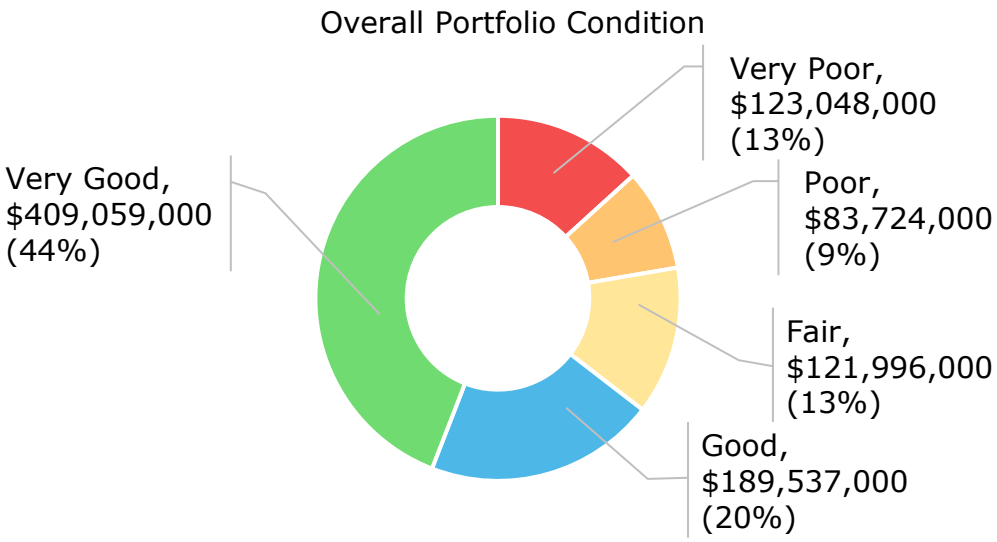


Figure 14 Asset Condition: Portfolio Overview

As further illustrated in Figure 15 at the category level, the majority of major, core infrastructure including roads, bridges, and utilities are in fair or better condition, based on a combination of in-field condition assessment data and age. Fleet and machinery assets, as well as office equipment and furnishings, show slightly lower overall condition ratings but still maintain a significant portion in fair or better condition. See Table 6 for details on how condition data was derived for each asset segment.

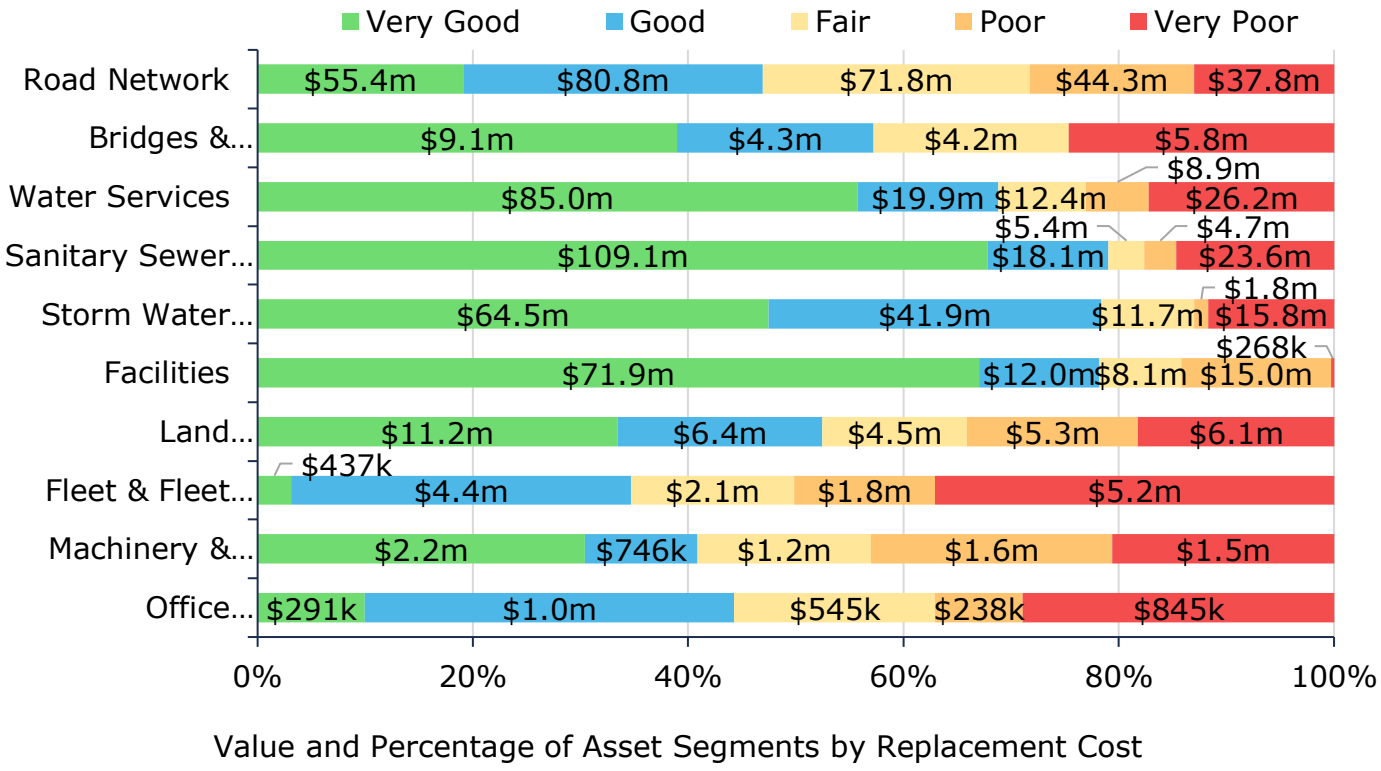


Figure 15 Asset Condition by Asset Category

Source of Condition Data

This AMP relies on assessed condition for 55% of assets, based on and weighted by replacement cost. For the remaining assets, age is used as an approximation of condition. Assessed condition data is invaluable in asset management planning as it reflects the true condition of the asset and its ability to perform its functions. Table 6 below identifies the source of condition data used throughout this AMP.

Asset Category	Asset Segment(s)	% of Assets with Assessed Conditions	Source of Condition Data
Road Network	Paved Roads (HCB)	93%	2023 Pavement Condition Index
	Paved Roads (LCB)	100%	
	Other Road Assets	0%	Age-Based
Bridges & Culverts	Bridges	100%	2024 OSIM Report
	Structural Culverts	97%	
Water Services	All	0%	Age-Based
Sanitary Sewer Services	All	53%	Source Unknown
Storm Water Services	All	0%	Age-Based
Facilities	All	99%	2021 Building Condition Assessments
Land Improvements	All	81%	2021 Building Condition Assessments
Fleet & Fleet Equipment	All	99%	Staff Assessments
Machinery & Equipment	All	66%	Staff Assessments
Office Equipment & Furnishings	All	12%	Staff Assessments

Table 6 Source of Condition Data

3.2.4 Service Life Remaining

Based on asset age, available assessed condition data and estimated useful life, 24% of the City's assets will require replacement within the next 10 years. Refer to Appendix B – 10-Year Capital Requirements.

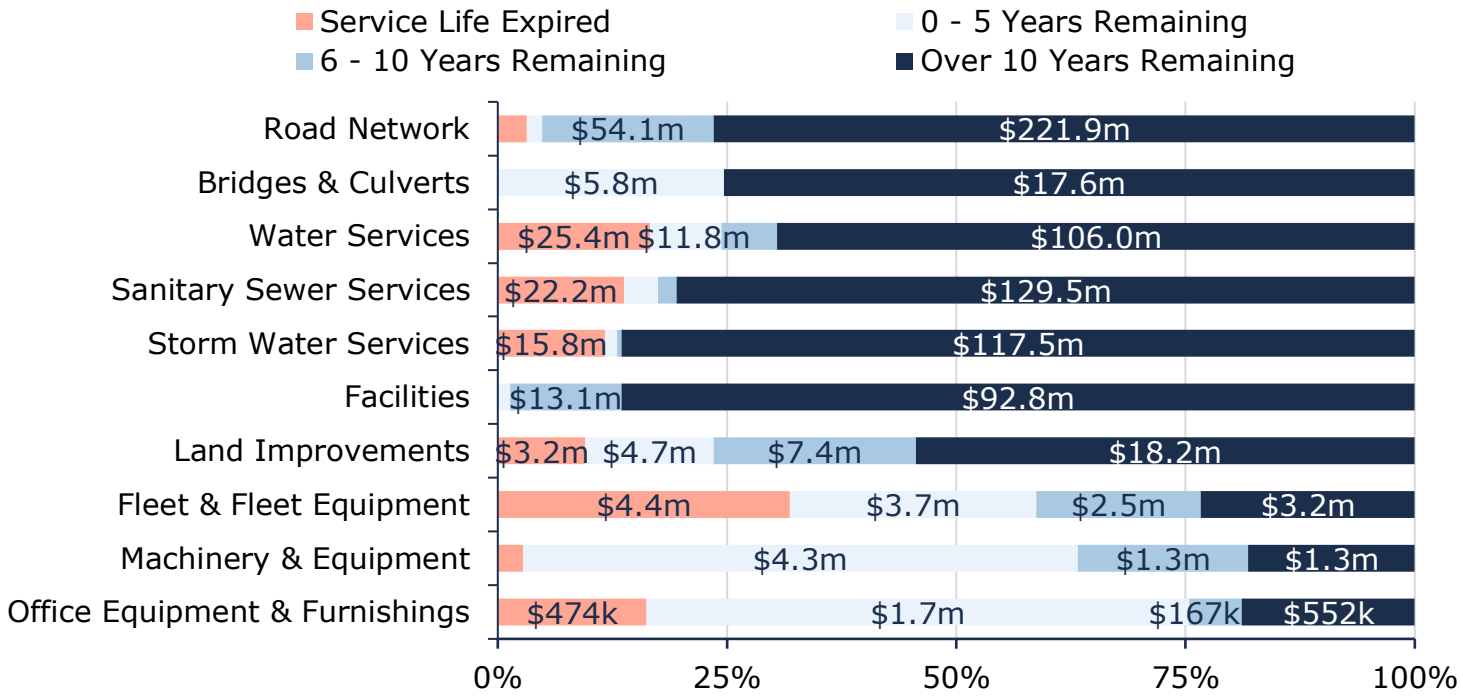


Figure 16 Service Life Remaining by Asset Category

3.2.5 Risk Matrix

Using the risk equation and preliminary risk models, Figure 17 shows how assets across the different asset categories are stratified within a risk matrix.

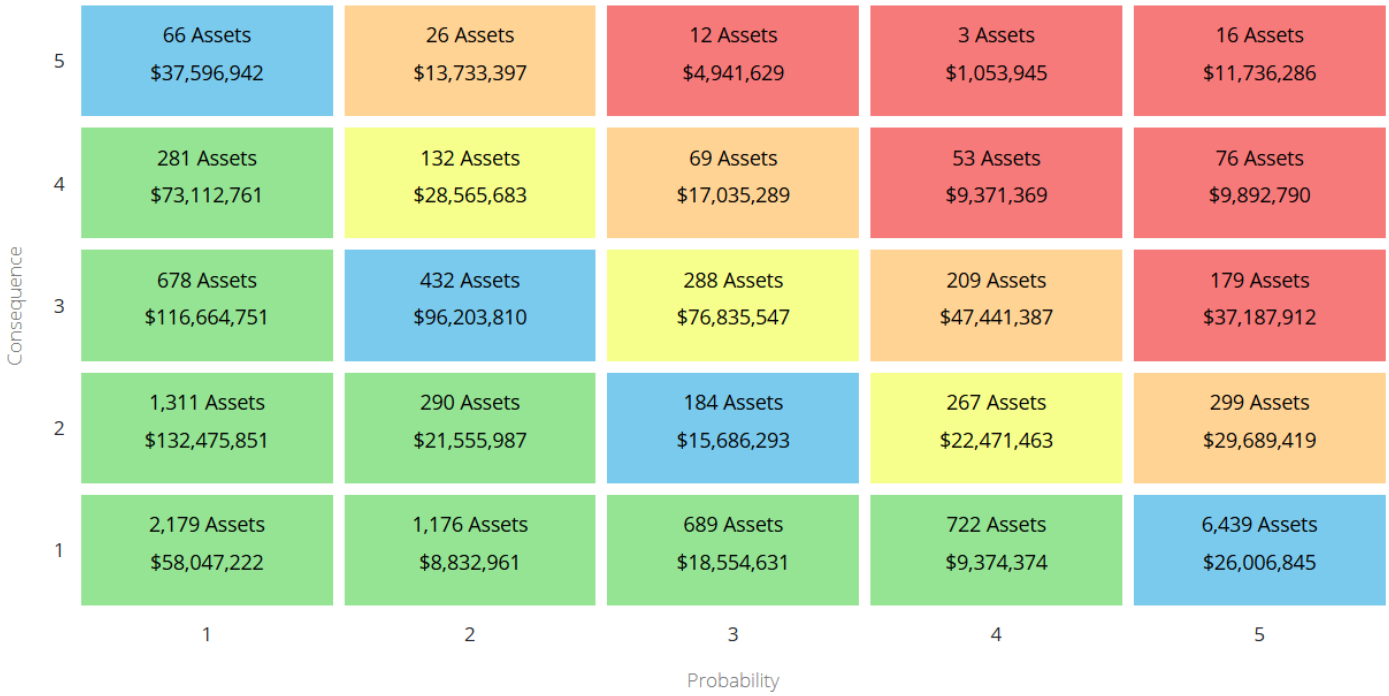


Figure 17 Risk Matrix: All Assets

The analysis shows that based on current risk models, approximately 9% of the City's assets, with a current replacement cost of approximately $87 million, carry a risk rating of 15 or higher (red) out of 25. Assets in this group may have a high probability of failure based on available condition data and age-based estimates and were considered to be most essential to the City.

As new asset attribute information and condition assessment data are integrated with the asset register, asset risk ratings will evolve, resulting in a redistribution of assets within the risk matrix. Staff should also continue to calibrate risk models.

We caution that since risk ratings rely on many factors beyond an asset's physical condition or age, assets in a state of disrepair can sometimes be classified as low-risk, despite their poor condition rating. In such cases, although the probability of failure for these assets may be high, their consequence of failure ratings were determined to be low based on the attributes used and the data available.

Similarly, assets with very high condition ratings can receive a moderate to high-risk rating despite a low probability of failure. These assets may be deemed as highly critical to the City based on their costs, economic importance, social significance, and other factors. Continued calibration of an asset's criticality and regular data updates are needed to ensure these models more accurately reflect an asset's actual risk profile.

3.2.6 Forecasted Capital Requirements

Aging assets require maintenance, rehabilitation, and replacement. Figure 18 below illustrates the cyclical short-, medium- and long-term infrastructure replacement requirements for all asset categories analyzed in this AMP over a 75-year time horizon. On average, $23.0 million is required each year to remain current with capital replacement needs for the City's asset portfolio (red dotted line). Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise. This figure relies on age and available condition data.

The chart also illustrates a backlog of more than $78 million, comprising assets that remain in service beyond their estimated useful life. It is unlikely that all such assets are in a state of disrepair, requiring immediate replacements. This makes continued and expanded targeted and consistent condition assessments integral. Risk frameworks, proactive lifecycle strategies, and levels of service targets can then be used to prioritize projects, continuously refine estimates for both backlogs and ongoing capital needs, and help select the right treatment for each asset. In addition, more effective componentization of buildings will improve these projections, including backlog estimates.

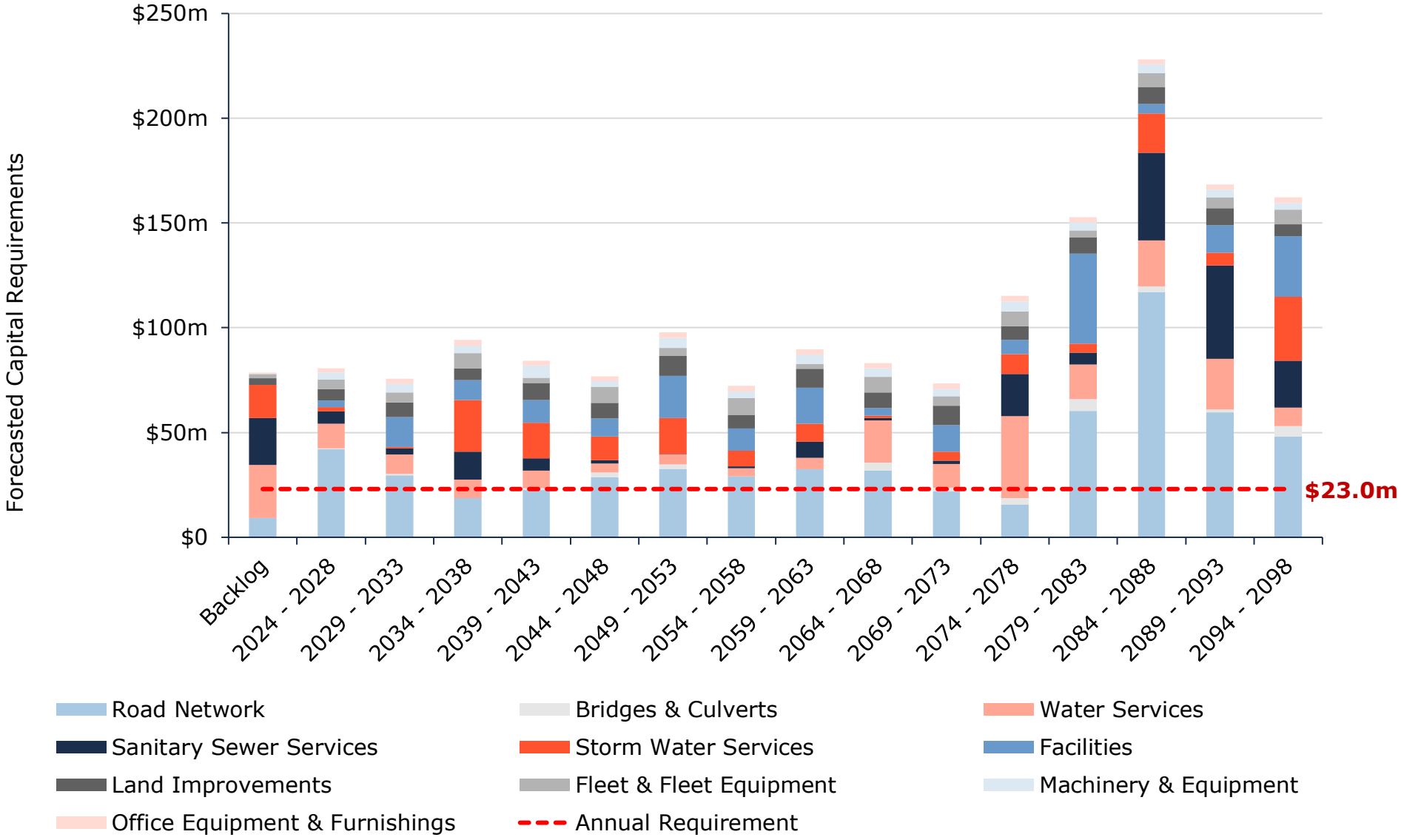


Figure 18 Capital Replacement Needs: Portfolio Overview 2024-2098

Proposed Levels of Service

4. Proposed Levels of Service Analysis

4.1 Overview

4.1.1 O. Reg. 588/17 Proposed Levels of Service Requirements

The third iteration of municipal Asset Management Plans required under O. Reg. 588/17 requires the evaluation of levels of service (LOS) that includes:

- Proposed LOS options (i.e. increase, decrease, or maintain current LOS) and the risks associated with these options.
- How the proposed LOS may differ from current LOS.
- Whether the proposed LOS are achievable; and
- The municipality's ability to afford proposed LOS.

Additionally, a lifecycle management and financial strategy to support the proposed LOS must be identified for a period of 10 years with specific reporting on:

- Identification of lifecycle activities needed to provide the proposed LOS.
- Annual costs over the next 10 years to achieve the proposed LOS; and
- Identification of proposed funding projected to be available.

4.1.2 Considerations

Proposed LOS for the City have been developed through comprehensive engagement with City staff. In order to achieve any target LOS goal, careful consideration should be given to the following:

Financial Impact Assessments

- Assess historical expenditures/budget patterns to gauge feasibility of increasing budgets to achieve increased service levels
- Consider implications of LOS adjustments on other services and other infrastructure programs (i.e. trade-offs)

Infrastructure Condition Assessments

- Regularly assess the condition of critical infrastructure components
- Use standardized condition assessment protocols (where possible) to quantify the state of the infrastructure
- Identify non-critical components where maintenance could potentially be deferred without causing severe degradation
- Use current condition metrics as benchmarks to gauge feasibility of large adjustments to LOS

Service Metrics

- Measure user satisfaction, response times, and other relevant indicators for specific services

Service Impact Assessments

- Evaluate potential impacts on user satisfaction and service delivery due to changes in infrastructure condition

Key Lifecycle Activities

- Implement routine maintenance and inspections to ensure infrastructure reaches its optimal useful life
- Monitor and optimize operational processes for efficiency
- Regularly review and update preventive maintenance schedules
- Prioritize critical infrastructure components for maintenance
- Implement cost-saving measures without compromising safety or compliance
- Develop strategies for managing and communicating service impacts to stakeholders
- Invest in technology and process improvements to enhance maintenance efficiency
- Upgrade critical infrastructure components to improve overall reliability
- Explore opportunities for innovation and efficiency gains

Risk Management

- Identify potential risks to infrastructure and service quality resulting from adjusted service levels
- Develop contingency plans to address unforeseen challenges without compromising service quality
- Monitor performance closely to ensure that the target investment translates to the desired infrastructure condition

Infrastructure Condition Enhancements

- Identify areas for improvement and increased maintenance to enhance overall infrastructure condition

Timelines

- Although O. Reg. 588/17 requires evaluation of expenditures for a 10-year period in pursuit of proposed LOS, it does not require municipalities to achieve the LOS within this 10-year timeframe (ex. a municipality may have a goal to reach X% condition by 2050, the AMP is required to review the first 10 years of the strategy to reach this goal)
- Careful consideration should be given to setting realistic targets for when proposed service levels can be achieved.

Stakeholder Engagement

- It is recommended to ensure adjustments to LOS are not made in isolation and without consultation of various stakeholders. This could include, but is not limited to:
  - Department Heads/Infrastructure Managers
  - Residents
  - Service Users
  - Council
- Efforts should be made to communicate changes to LOS transparently to all affected stakeholders

Flexibility

- Priorities may change over time due to a variety of factors, such as:
  - Financial state of the municipality
  - Availability of grants
  - Significant increases or decreases in population
  - Changes in political priorities
  - Changes in resident priorities
  - New technologies
  - Changes in legislation
- Any proposed changes to LOS should be flexible and able to adapt to changes listed above, and other unforeseen circumstances

4.2 Stakeholder Engagement

Stakeholder engagement is an important aspect in determining appropriate levels of service for a community. Ensuring that council is provided with the sentiments of both administration and the public facilities informed decision making regarding the City's future.

While no dedicated public engagement process was completed specifically for this asset management plan, consideration was given to the residents' survey completed as part of the 2024 strategic plan process. Additionally, surveys were provided to administration to discuss levels of service for each asset category. Summaries of stakeholder engagement results can be found in the following sections.

4.2.1 Administration

Surveys were discussed in a workshop style for each asset category, summarizing the results of the 2021 and 2024 Asset Management Plans and requesting feedback on levels of confidence in the statistics, whether respondents felt that existing service levels met the current needs of the City, and whether they felt they had the resources (financial, man power, or otherwise) to appropriately manage existing assets. The general themes of those workshops are summarized below.

Roads	-See need to increase average condition ratings across the road portfolio -Require additional capital investment in order to increase road conditions
Bridges	-Overall satisfied with average condition -Require increased funding to ensure bridge replacements don't 'fall behind'
Water	-Concern with rapid deterioration of valves -Desire to expand extents of water network, increase number of properties connected to municipal water system
Sanitary	-Overall satisfied with the current provision of sanitary services -Require increased funding to keep up with infrastructure backlog, and sewer mains surpassing their originally intended useful life
Stormwater	-Require increased funding to maintain services in this area -Recommend increased CCTV inspections to gain insight into condition of storm network
Facilities	-Concerns that facilities are not meeting the needs of the community, specifically in sociality and inclusivity -Inadequate resourcing in terms of staffing levels to ensure preventative maintenance and proactive planning can occur
Fleet	-Overall satisfied with the maintenance/management of fleet and equipment

Figure 19 Highlights of Administration Engagement Workshops

4.2.2 Residents

The City of Thorold understands that services are provided for the benefit of the people including residents, businesses, and visitors. The City made available a public survey in the spring of 2024 to aid in updating the City's strategic plan. Highlights of the survey results are summarized below:

204 Survey Responses

Location

- **62%** Urban
- **21%** Rural
- **14%** Semi-Urban
- **3%** Outside of BC

Age

- **12%** < 35 years
- **27%** 36-49 years
- **35%** 50-64 years
- **26%** 65+ years

Services with Highest Satisfaction

- Fire and Rescue Services
- Library
- Cemetery Services
- Water and Sewer Services

Services with Lowest Satisfaction

- Road Infrastructure
- Bylaw Enforcement
- Land Use and Development Planning

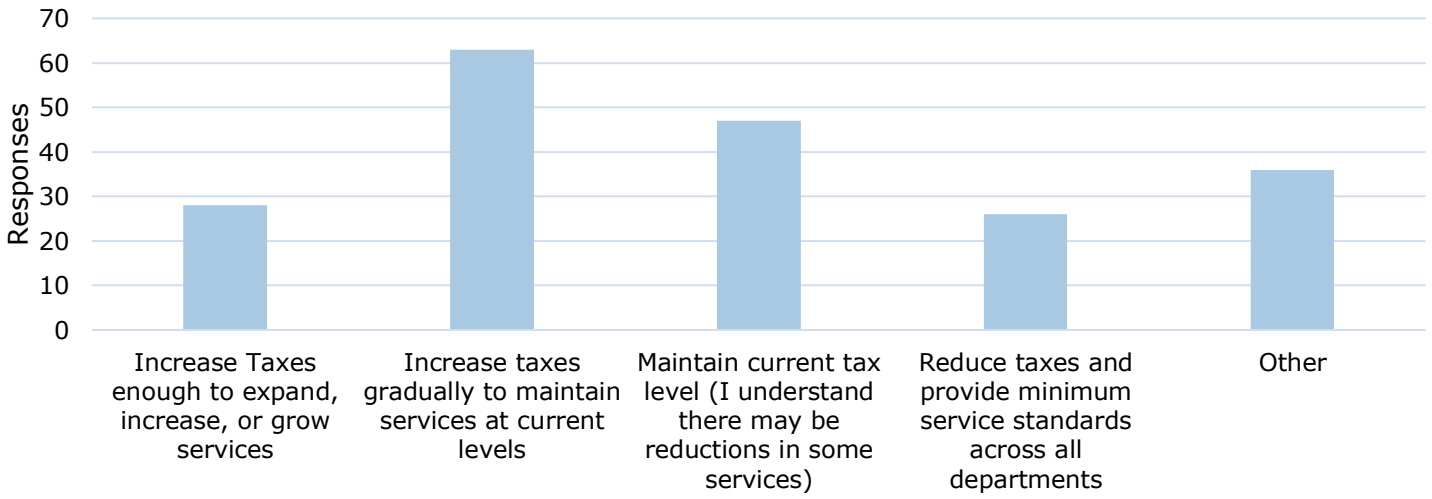


Figure 20 Highlights of Resident Engagement Survey

General Themes of Comments

- Residents expressed concerns about the condition of roads, citing specific issues such as potholes on Main Street and cracks on St. David's Road. There were also requests for sidewalk repairs, especially near Thorold Secondary School. Some residents called for upgrades to stop signs at busy intersections, highlighting safety concerns.
- Residents mentioned the need for better communication and responsiveness from City staff, citing instances where their inquiries about garbage collection schedules and park maintenance were not addressed promptly. Some residents suggested offloading unnecessary services to focus on essential ones like snow removal during winter months.

4.3 Scenario Analysis

The three scenarios outlined in the following section were analyzed as options for proposed service levels for all categories included in this Asset Management Plan.

For reference, current funding levels for the City, based on recent capital investment reporting from sustainable funding sources is 40% funded for tax assets, 68% for water assets, and sanitary assets are fully funded due to subsidization through the Urban Service Area Tax Lexy, which is scheduled to be phased out over the implementation period.

Scenario 1	Scenario 2	Scenario 3
• **Achieve Minor Improvements to Funding Levels** • 50% of ideal tax funding, and • 80% of ideal rate funding in 12 years	• **Achieve Moderate Improvements to Funding Levels** • 75% of ideal tax funding, and • 90% of ideal rate funding in 12 years	• **Achieve 100% of ideal funding for all assets** in 12 years

Figure 21 PLOS Scenario Overview

While all three scenarios were reviewed, ***the City of Thorold selected Scenario 3 as their preferred path forward regarding proposed levels of service***, which is reflected in the financial strategy and 10-year capital replacement forecasts.

4.3.1 Scenario 1: Achieve Minor Improvements to Funding Levels in 12 years

This scenario assumes gradual tax increases, stabilizing at 50% funding for tax-funded assets, and rate increases stabilizing at 80% funding for rate-funded assets, over a period of 12 years.

- Annual Tax Increase ~0.5%
- Annual Water Rate Increase ~0.5%
- Annual Sanitary Rate Increase ~0.3%

While this scenario was modelled for consideration, the City did not elect to move forward with this scenario.

Lifecycle Changes Required for Scenario 1

For all asset categories, no changes to lifecycle strategies are required in order to achieve Scenario 1. For the City's current approach to lifecycle management of each category, refer to the below table to be directed to the specific section of the AMP.

In future iterations of the AMP, it is recommended to more closely analyze changes to lifecycle management strategies to find long-term cost savings and efficiencies.

Affordability/Achievability of Scenario 1

Of the three scenarios analyzed, Scenario 1 is the least expensive option. Reaching 50% of recommended funding immediately would require an increase of 8% in tax revenue. While possible, it would likely not be well received by residents to achieve in a short period of time. With the recommended implementation timeframe of 12 years, tax revenue would be increased gradually from $22.2 million to $23.6 million, water revenue from $5.7 million to $6.1 million, and wastewater revenue from $8.2 million to $8.5 million. Based on these gradual proposed increases, while maintaining existing sustainable grant funding, the available capital funding over the next 12 years for Scenario 1 is indicated in the table below:

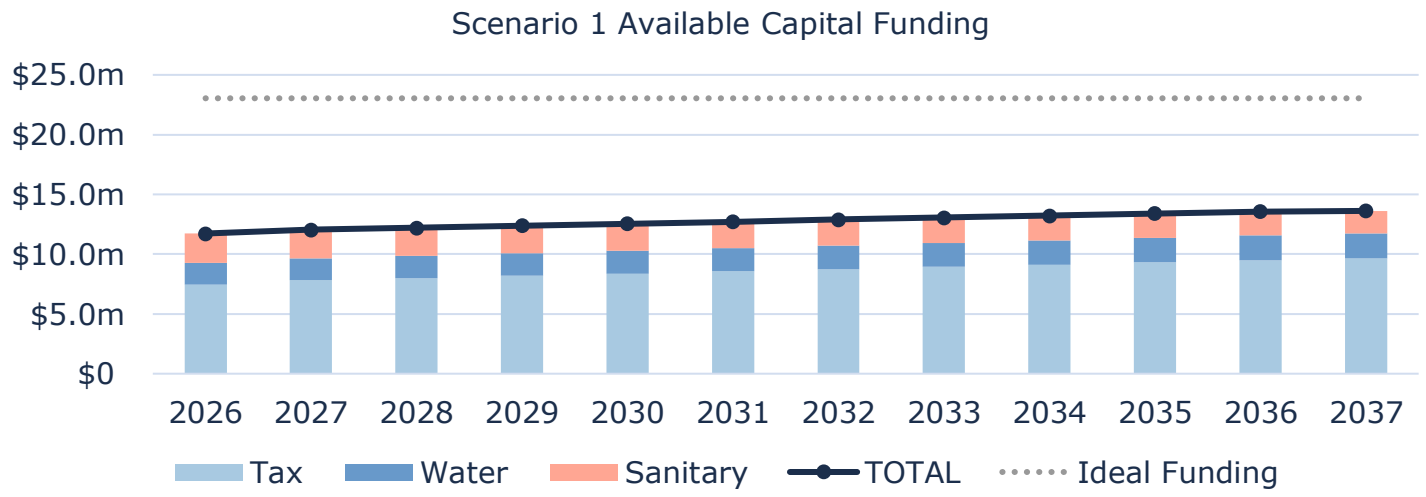


Figure 22 Scenario 1 Available Capital Funding Over Next 12 Years

The above table accounts for both current and future expenditures in order to achieve and maintain the proposed levels of service. This requires a combination of capital spending and saving (i.e. reserves) to ensure future large expenditures can be financed. As an example, Thorold owns and maintains 15 bridges with an estimated useful life of 61 years (on average). Because of the long duration between replacements, and low quantity of assets, it is likely that there will be years with no capital expenditures relating to bridges, however, this does not mean that the City should ignore the funding requirements in these years. Instead, annual funding should be set aside in the form of reserves to ensure funding for upcoming lifecycle events is available when required.

It is important to note that an AMP is a dynamic document which should be reviewed regularly to ensure up-to-date information is incorporated including accurate replacement costs, changes in inventory, changes in available funding sources, and reflection on progress made on previous recommendations.

Changes to Community and Technical Levels of Service for Scenario 1

The City of Thorold does not anticipate any changes to qualitative community levels of services for any of the asset categories included within this AMP. All asset categories will see adjustments to their technical levels of service over time, particularly relating to capital reinvestment rate and average condition of assets. Refer to each asset category for more details.

Risks Associated with Scenario 1

There are pros and cons associated with each scenario analyzed, and each benefit is counter-balanced with consequences. For Scenario 1, the following risks have been identified:

- Increased infrastructure backlog
  - While mitigating the impact of financial increases on residents and businesses, taking 12 years to reach the targeted funding levels means 12 years of sub-optimal lifecycle management of assets. Being unable to complete strategic lifecycle interventions and replacements may result in increased asset failures, reduced reliability, and the potential for costly unbudgeted repairs to maintain services.
  - In addition to the risks of reaching the desired funding levels gradually, Scenario 1 only targets 50% funding for tax assets, and 80% for rate assets. By intentionally underfunding the City's asset portfolio, there is increased risk of services being impacted by deteriorating asset conditions.
- Reliance on Grants
  - As Scenario 1 targets 50% of recommended funding levels for tax assets, and 80% for rate assets, the City will be more reliant on conditional grants, as they become available. While these are beneficial to all municipalities to secure to reduce their tax/rate burden on residents, they are considered an unsustainable revenue source. The City will be more vulnerable to changes in provincial and federal policy and funding programs.
- Missed opportunities for efficiencies
  - While analyzing Scenario 1, no alternative lifecycle strategies were proposed. Mid-lifecycle interventions, such as asphalt overlays and sewer lining, can result in extended lifespans of assets and reduced costs over the lifetime of the assets. By relying on existing lifecycle strategies, the City risks paying more than necessary to maintain their asset inventory.

4.3.2 Scenario 2: Achieve Moderate Improvements to Funding Levels in 12 years

This scenario assumes gradual tax increases, stabilizing at 75% funding for tax-funded assets, and rate increases stabilizing at 90% funding for rate-funded assets, over a period of 12 years.

- Annual Tax Increase ~2.0%
- Annual Water Rate Increase ~0.9%
- Annual Sanitary Rate Increase ~0.5%

While this scenario was modelled for consideration, the City did not elect to move forward with this scenario.

Lifecycle Changes Required for Scenario 2

For all asset categories, no changes to lifecycle strategies are required in order to achieve Scenario 2. In future iterations of the AMP, it is recommended to more closely analyze changes to lifecycle management strategies to find long-term cost savings and efficiencies.

Affordability/Achievability of Scenario 2

Of the three scenarios analyzed, Scenario 2 is a middle option in terms of tax/rate increases. Reaching 75% of full funding immediately would require an increase of 28% in tax revenue. This is not reasonable or realistic to achieve in a short period of time. With the recommended implementation timeframe of 12 years, tax revenue would be increased gradually from $22.2 million to $28.2 million, water revenue from $5.7 million to $6.4 million, and wastewater revenue from $8.2 million to $8.7 million. Based on these gradual proposed increases, while maintaining existing sustainable grant funding, the available capital funding over the next 12 years for Scenario 2 is indicated in the table below:

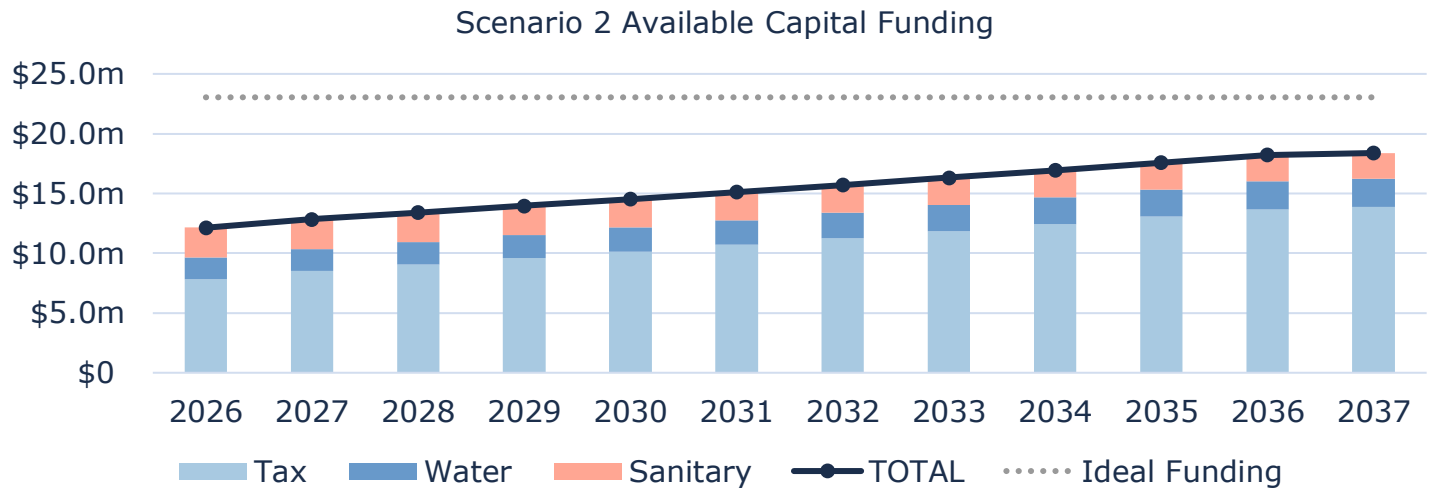


Figure 23 Scenario 2 Available Capital Funding Over Next 12 Years

The above table accounts for both current and future expenditures in order to achieve and maintain the proposed levels of service. This requires a combination of capital spending and saving (i.e. reserves) to ensure future large expenditures can be financed. As an example,

Thorold owns and maintains 15 bridges with an estimated useful life of 61 years (on average). Because of the long duration between replacements, and low quantity of assets, it is likely that there will be years with no capital expenditures relating to bridges, however, this does not mean that the City should ignore the funding requirements in these years. Instead, annual funding should be set aside in the form of reserves to ensure funding for upcoming lifecycle events is available when required.

It is important to note that an AMP is a dynamic document which should be reviewed regularly to ensure up-to-date information is incorporated including accurate replacement costs, changes in inventory, changes in available funding sources, and reflection on progress made on previous recommendations.

Changes to Community and Technical Levels of Service for Scenario 2

The City of Thorold does not anticipate any changes to qualitative community levels of services for any of the asset categories included within this AMP. All asset categories will see adjustments to their technical levels of service over time, particularly relating to capital reinvestment rate and average condition of assets. Refer to each asset category for more details.

Risks Associated with Scenario 2

There are pros and cons associated with each scenario analyzed, and each benefit is counter-balanced with consequences. For Scenario 2, the following risks have been identified:

- Increased infrastructure backlog
  - While mitigating the impact of financial increases on residents and businesses, taking 12 years to reach the targeted funding levels means 12 years of sub-optimal lifecycle management of assets. Being unable to complete strategic lifecycle interventions and replacements may result in increased asset failures, reduced reliability, and the potential for costly unbudgeted repairs to maintain services.
  - In addition to the risks of reaching the desired funding levels gradually, Scenario 2 only targets 75% funding for tax assets, and 90% for rate assets. By intentionally underfunding the City's asset portfolio, there is increased risk of services being impacted by deteriorating asset conditions.
- Reliance on Grants
  - As Scenario 2 targets 75% of recommended funding levels for tax assets, and 90% for rate assets, the City will be more reliant on conditional grants, as they become available. While these are beneficial to all municipalities to secure to reduce their tax/rate burden on residents, they are considered an unsustainable revenue source. The City will be more vulnerable to changes in provincial and federal policy and funding programs.
- Missed opportunities for efficiencies
  - While analyzing Scenario 2, no alternative lifecycle strategies were proposed. Mid-lifecycle interventions, such as asphalt overlays and sewer lining, can result in extended lifespans of assets and reduced costs over the lifetime of the assets. By relying on existing lifecycle strategies, the City risks paying more than necessary to maintain their asset inventory.

4.3.3 Scenario 3: Achieving 100% of Recommended Funding in 12 Years (Preferred Scenario)

This scenario assumes gradual tax and rate increases, stabilizing at 100% of recommended funding for all asset categories over a period of 12 years.

- Annual Tax Increase ~3.3%
- Annual Water Rate Increase ~1.2%
- Annual Wastewater Rate Increase ~0.8%

Lifecycle Changes Required for Scenario 3

For all asset categories, no changes to lifecycle strategies are required in order to achieve Scenario 3. In future iterations of the AMP, it is recommended to more closely analyze changes to lifecycle management strategies to find long-term cost savings and efficiencies.

Affordability/Achievability of Scenario 3

Of the three scenarios analyzed, Scenario 3 is the most expensive option. Reaching full recommended funding immediately would require an increase of 49% in tax revenue. This is not reasonable or realistic to achieve in a short period of time. With the recommended implementation timeframe of 12 years, tax revenue would be increased gradually from $22.2 million to $32.8 million, water revenue from $5.7 million to $6.6 million, and wastewater revenue from $8.2 million to $9.0 million. Based on these gradual proposed increases, while maintaining existing sustainable grant funding, the available capital funding over the next 10 years for Scenario 3 is indicated in the table below:

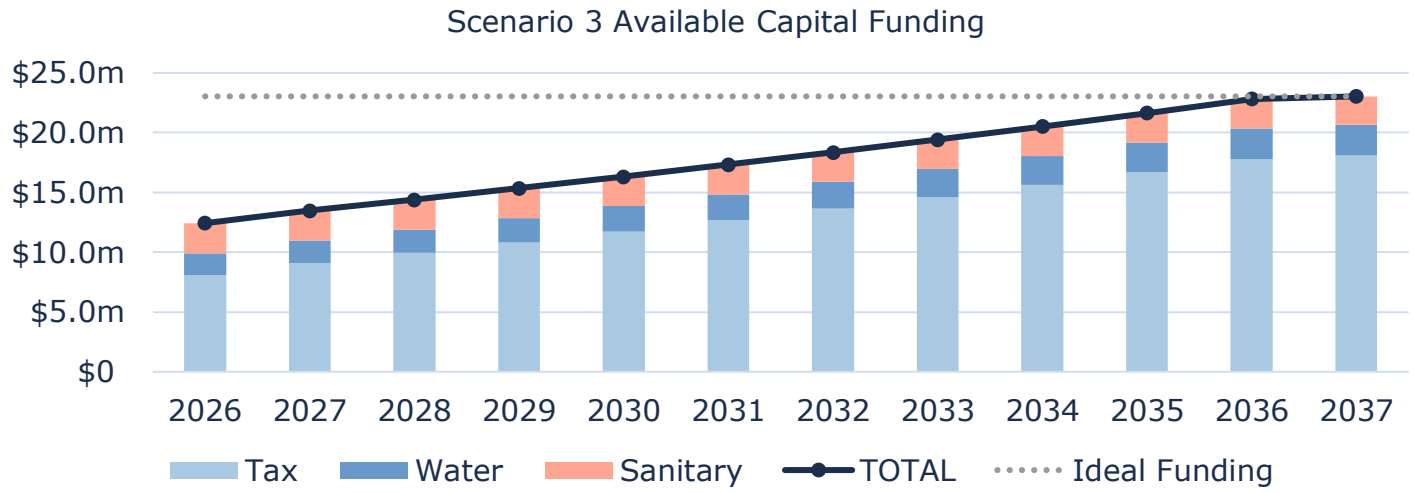


Figure 24 Scenario 3 Available Capital Funding Over Next 12 Years

The above table accounts for both current and future expenditures in order to achieve and maintain the proposed levels of service. This requires a combination of capital spending and saving (i.e. reserves) to ensure future large expenditures can be financed. As an example, Thorold owns and maintains 15 bridges with an estimated useful life of 61 years (on average). Because of the long duration between replacements, and low quantity of assets, it is likely that there will be years with no capital expenditures relating to bridges, however, this does not mean

that the City should ignore the funding requirements in these years. Instead, annual funding should be set aside in the form of reserves to ensure funding for upcoming lifecycle events is available when required.

As the City of Thorold selected Scenario 3 as their preferred proposed level of service, a further breakdown of projected capital expenditures by asset category can be found in Appendix B – 10-Year Capital Requirements.

It is important to note that an AMP is a dynamic document which should be reviewed regularly to ensure up-to-date information is incorporated including accurate replacement costs, changes in inventory, changes in available funding sources, and reflection on progress made on previous recommendations.

Changes to Community and Technical Levels of Service for Scenario 3

The City of Thorold does not anticipate any changes to qualitative community levels of services for any of the asset categories included within this AMP. All asset categories will see adjustments to their technical levels of service over time, particularly relating to capital reinvestment rate and average condition of assets. Refer to each asset category for more details.

Risks Associated with Scenario 3

There are pros and cons associated with each scenario analyzed, and each benefit is counter-balanced with consequences. For Scenario 3, the following risks have been identified:

- Increased infrastructure backlog
  - While mitigating the impact of financial increases on residents and businesses, taking 12 years to reach the targeted funding levels means 12 years of sub-optimal lifecycle management of assets. Being unable to complete strategic lifecycle interventions and replacements may result in increased asset failures, reduced reliability, and the potential for costly unbudgeted repairs to maintain services.
- Missed opportunities for efficiencies
  - While analyzing Scenario 3, no alternative lifecycle strategies were proposed. Mid-lifecycle interventions, such as asphalt overlays and sewer lining, can result in extended lifespans of assets and reduced costs over the lifetime of the assets. By relying on existing lifecycle strategies, the City risks paying more than necessary to maintain their asset inventory.

Appropriateness of Scenario 3 to Meet the City's Needs

City staff emphasized the need to balance financial impacts on residents with the reality of the current state of infrastructure within the municipality. Upon review of all three scenarios, Scenario 3 was selected as the most appropriate option as an annual tax increase of 3.3% was determined to be subjectively manageable to implement, while creating a sustainable future for the City's infrastructure. The risks associated with relying on conditional grants from higher levels of government were deemed to be too great considering the country-wide trend of downloading responsibilities (and costs) to municipal governments and reducing funding opportunities.

Category Analysis: Core Assets

5. Road Network

The City's road network comprises the largest share of its infrastructure portfolio, with a current replacement cost of more than $290 million, distributed primarily between HCB and LCB roads along with paved trails. The City also owns and manages other supporting infrastructure including sidewalks, sound barrier fences, railing, streetlights, and traffic signs.

5.1 Inventory & Valuation

Table 7 summarizes the quantity and current replacement cost of the City's various road network assets as managed in its primary asset management register, Citywide.

Segment	Quantity	Unit of Measure	Replacement Cost	Primary RC Method
Gravel Roads	11.4	Length (km)	Not Planned for Replacement	
Paved Roads - HCB	125.4	Length (km)	$243,345,840	Cost per Unit
Paved Roads - LCB	24.2	Length (km)	$24,261,000	Cost per Unit
Paved Trails	3.1	Length (km)	$9,297,449	CPI
Railing	261	Length (m)	$277,809	CPI
Sidewalks	37.4	Length (km)	$8,236,122	Cost per Unit
Sound Barrier Fence	314	Length (m)	$607,165	CPI
Streetlights	431	Quantity	$3,435,964	CPI
Traffic Signs	2,425	Quantity	$756,421	CPI
TOTAL			**$290,217,770**	

Table 7 Detailed Asset Inventory: Road Network

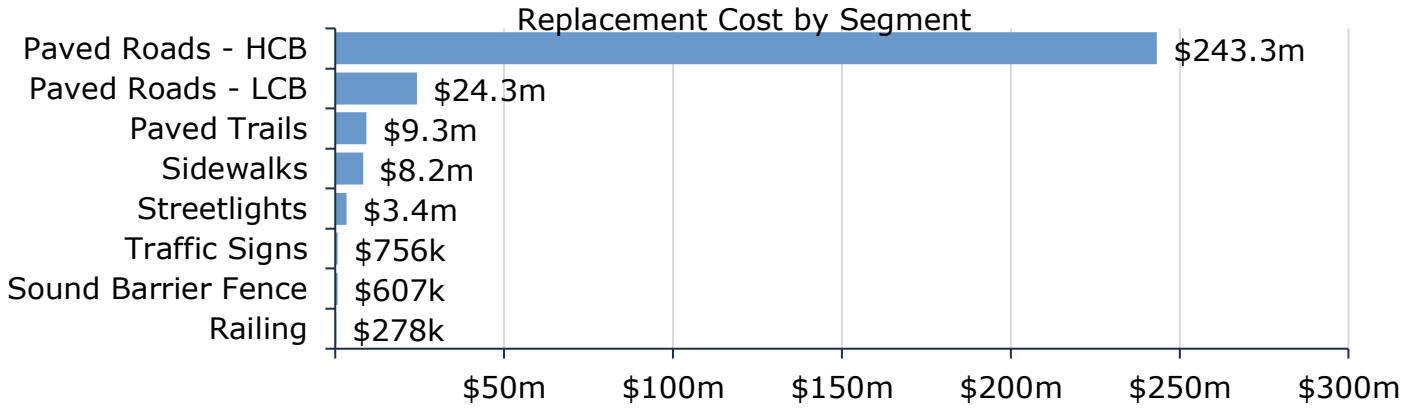


Figure 25 Portfolio Valuation: Road Network

5.2 Asset Condition

Figure 26 summarizes the replacement cost-weighted condition of the City's road network. Based on a combination of field inspection data and age, 72% of assets are in fair or better condition; the remaining 28% of assets are in poor to very poor condition. Condition assessments were available for 96% of paved roads based on replacement cost. This condition data was projected from inspection date to current year to estimate their condition today. No condition data was available for the remaining asset types.

Assets in poor or worse condition may be candidates for replacement in the short term; similarly, assets in fair condition may require rehabilitation or replacement in the medium term and should be monitored for further degradation in condition. As illustrated in Figure 26, the majority of the City's road network assets are in fair or better condition.

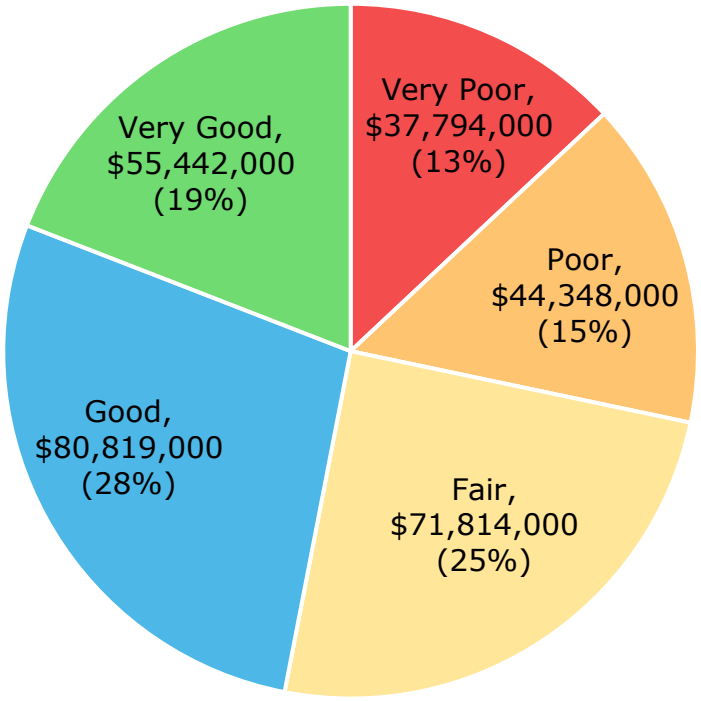


Figure 26 Asset Condition: Road Network Overall

As illustrated in Figure 27, based on condition assessments (for paved roads) and age (all other segments), the majority of the City's paved roads are in fair or better condition; however, 74% of paved trails are in poor or worse condition.

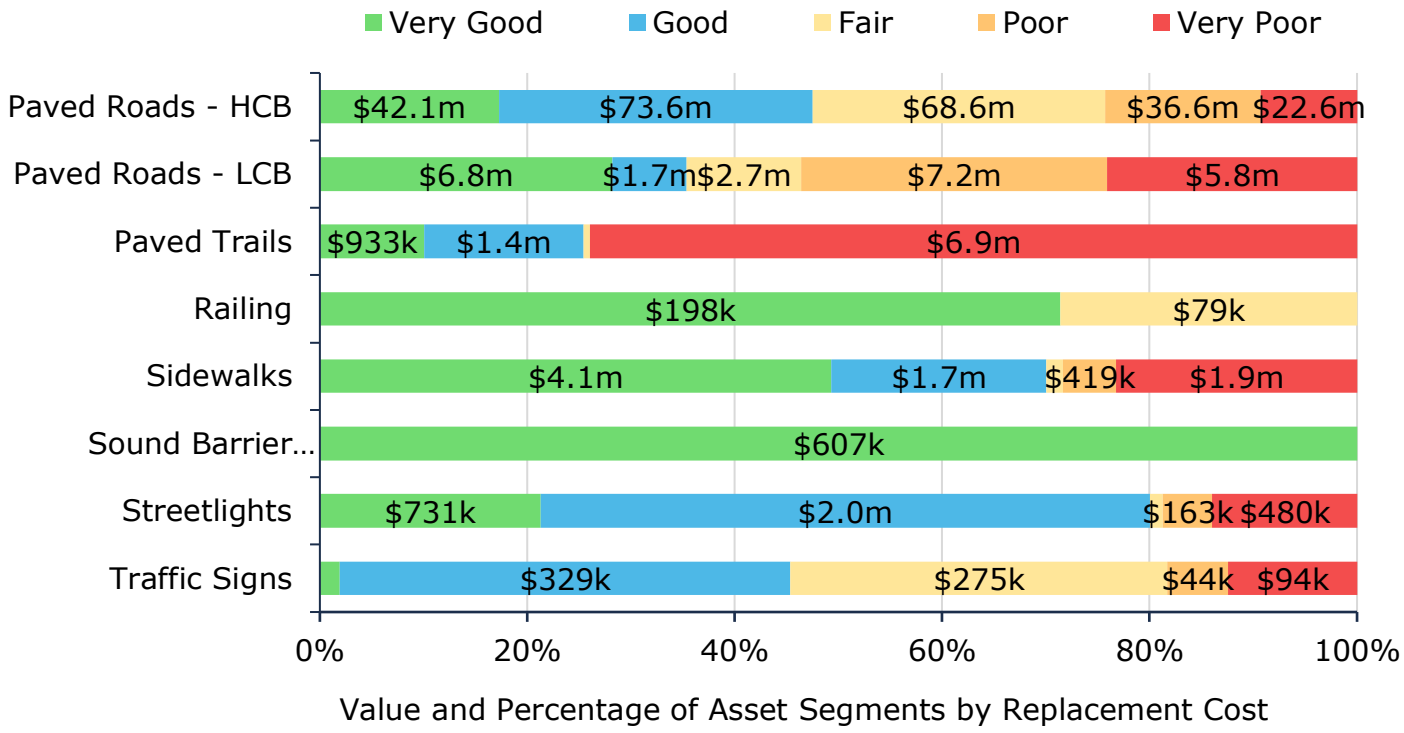


Figure 27 Asset Condition: Road Network by Segment

5.3 Age Profile

An asset's age profile comprises two key values: estimated useful life (EUL), or design life; and the percentage of EUL consumed. The EUL is the serviceable lifespan of an asset during which it can continue to fulfil its intended purpose and provide value to users, safely and efficiently. As assets age, their performance diminishes, often more rapidly as they approach the end of their design life.

In conjunction with condition data, an asset's age profile provides a more complete summary of the state of infrastructure. It can help identify assets that may be candidates for further review through condition assessment programs; inform the selection of optimal lifecycle strategies; and improve planning for potential long-term replacement spikes.

Figure 28 illustrates the average current age of each asset type and its estimated useful life. Both values are weighted by the replacement cost of individual assets.

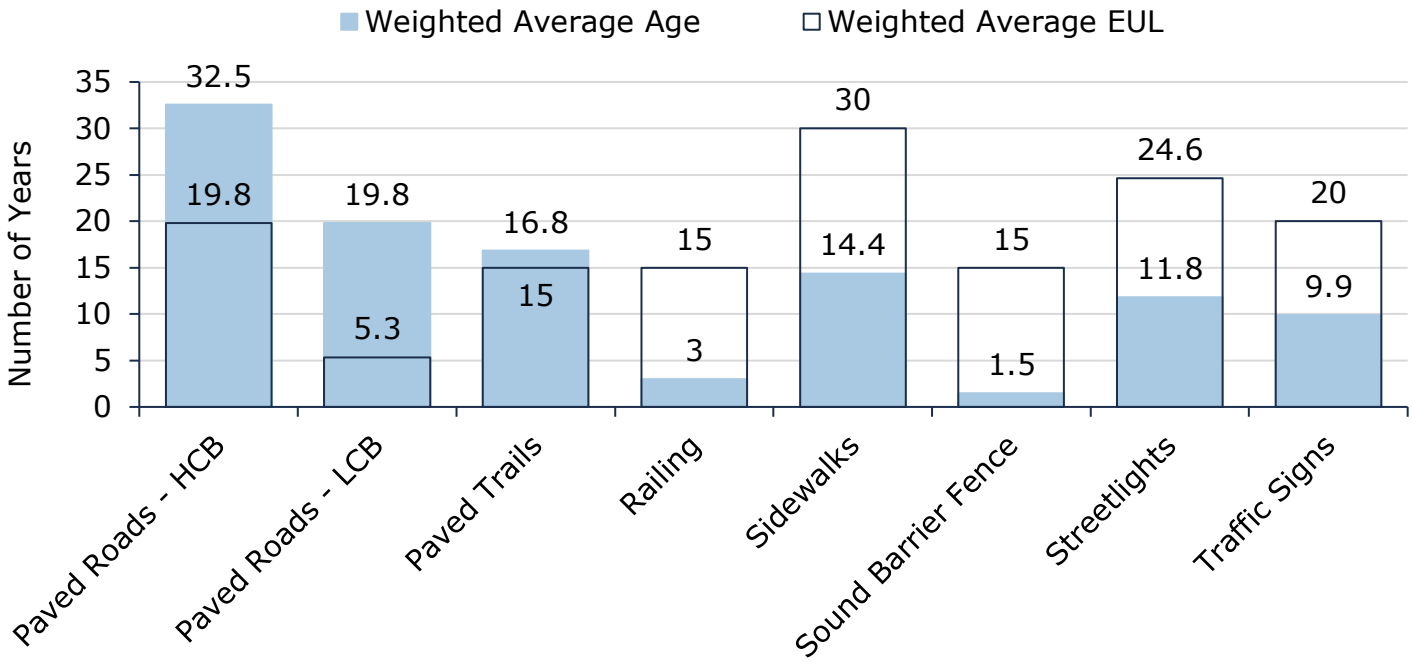


Figure 28 Estimated Useful Life vs. Asset Age: Road Network

Age analysis shows that paved roads and paved trails have exceeded their originally expected lifespans, however, this could reflect the implementation of life extending maintenance activities and is not necessarily a concern. In contrast, sidewalks, railings, and sound barrier fences remain in good condition, with significant lifespan remaining. Streetlights and traffic signs are at mid-life stages, requiring monitoring and routine maintenance. Prioritizing rehabilitation for aging assets while maintaining newer ones is critical.

Although asset age is an important measurement for long-term planning, condition assessments provide a more accurate indication of actual asset needs. Further, useful life estimates established as part of the PSAB 3150 implementation may not be accurate and may not reflect in-field asset performance.

5.4 Current Approach to Lifecycle Management

The condition or performance of most assets will deteriorate over time. This process is affected by a range of factors including an asset's characteristics, location, utilization, maintenance history and environment.

The following lifecycle strategies have been developed as a proactive approach to managing the lifecycle of HCB and LCB roads. Instead of allowing the roads to deteriorate until replacement is required, strategic rehabilitation is expected to extend the service life of roads at a lower total cost.

Paved Roads (HCB)		
Event Name	**Event Class**	**Event Trigger**
Crack Sealing & Patching (as needed)	Preventative Maintenance	Every 5 Years
Mill & Pave (50mm)	Rehabilitation	PCI: 40 (3 Cycles)
Full Road Reconstruction	Replacement	PCI: 25

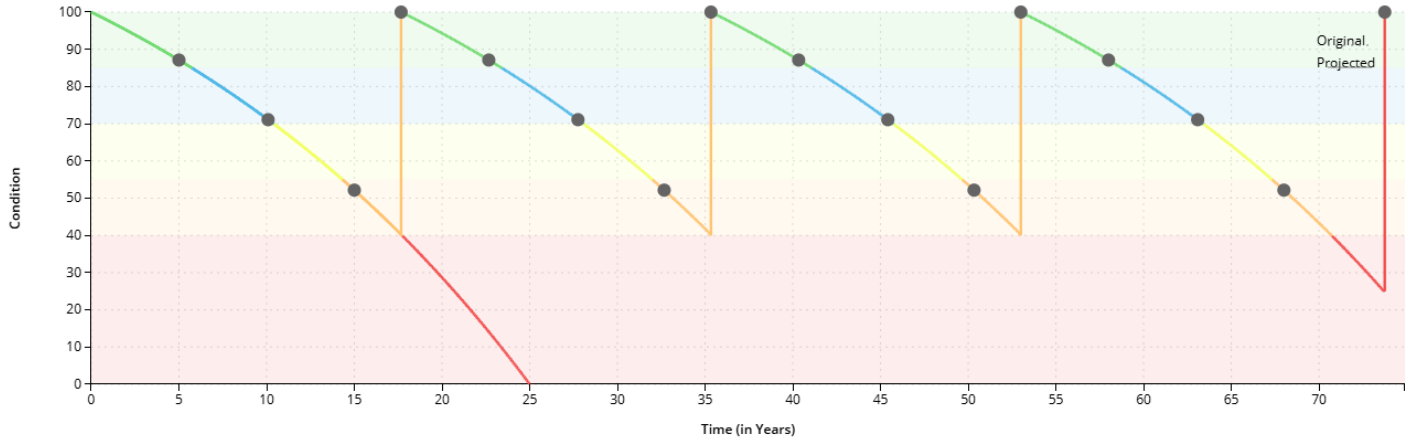


Table 8 Lifecycle Management Strategy: Road Network (HCB Roads)

Paved Roads (LCB)		
Event Name	**Event Class**	**Event Trigger**
Surface Treatment (Single Lift)	Rehabilitation	PCI: 30 (3 Cycles)
Full Road Reconstruction	Replacement	PCI: 20

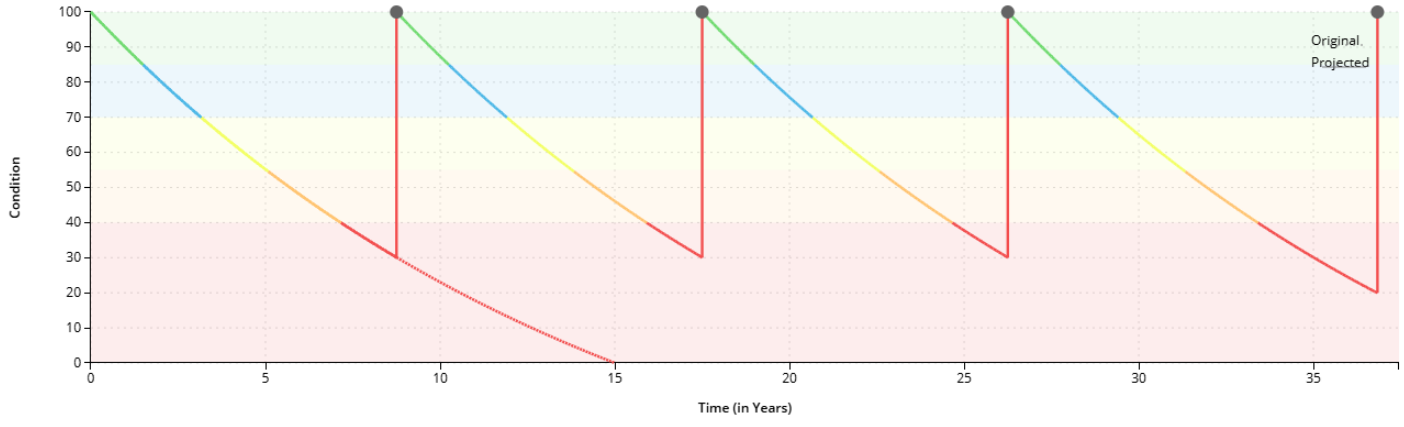


Table 9 Lifecycle Management Strategy: Road Network (LCB Roads)

The following table outlines the City's current lifecycle management strategy.

Activity Type	Description of Current Strategy
Maintenance	Pothole repairs using a combination of cold mix and hot mix asphalt are completed annually based on deficiencies identified through regular road patrols and feedback from the public.
	Crack sealing is completed annually across 1/5th of the road network.
Rehabilitation	Road surface rehabilitation activities are completed annually based on road condition and budget availability.
	Rehabilitation activities include: mill & pave, asphalt overlay, and full depth asphalt reclamation.
	Roads are prioritized based on condition, traffic counts and road classification.
Replacement	Road reconstruction projects (base & surface) are identified based on road condition, risk, and sub-surface asset requirements (water/sewer/storm)
	A 10-year capital forecast is updated regularly, with the first 3-4 years of the plan including named projects.

Table 10 Lifecycle Management Strategy: Road Network

5.5 Forecasted Long-Term Replacement Needs

Figure 13 illustrates the cyclical short-, medium- and long-term infrastructure rehabilitation and replacement requirements for the City's road network. This analysis was run until 2098 to capture at least one iteration of replacement for the longest-lived asset in Citywide Assets, the City's primary asset management system and asset register. The City's average annual requirements (red dotted line) total **$8.0 million per year** for all assets in the road network. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

The chart illustrates substantial capital needs through the forecast period. It also shows a backlog $9.3 million, dominated by paved trails. These projections are based on asset replacement costs, age analysis, and condition data when available, as well as lifecycle modeling (roads only). They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades.

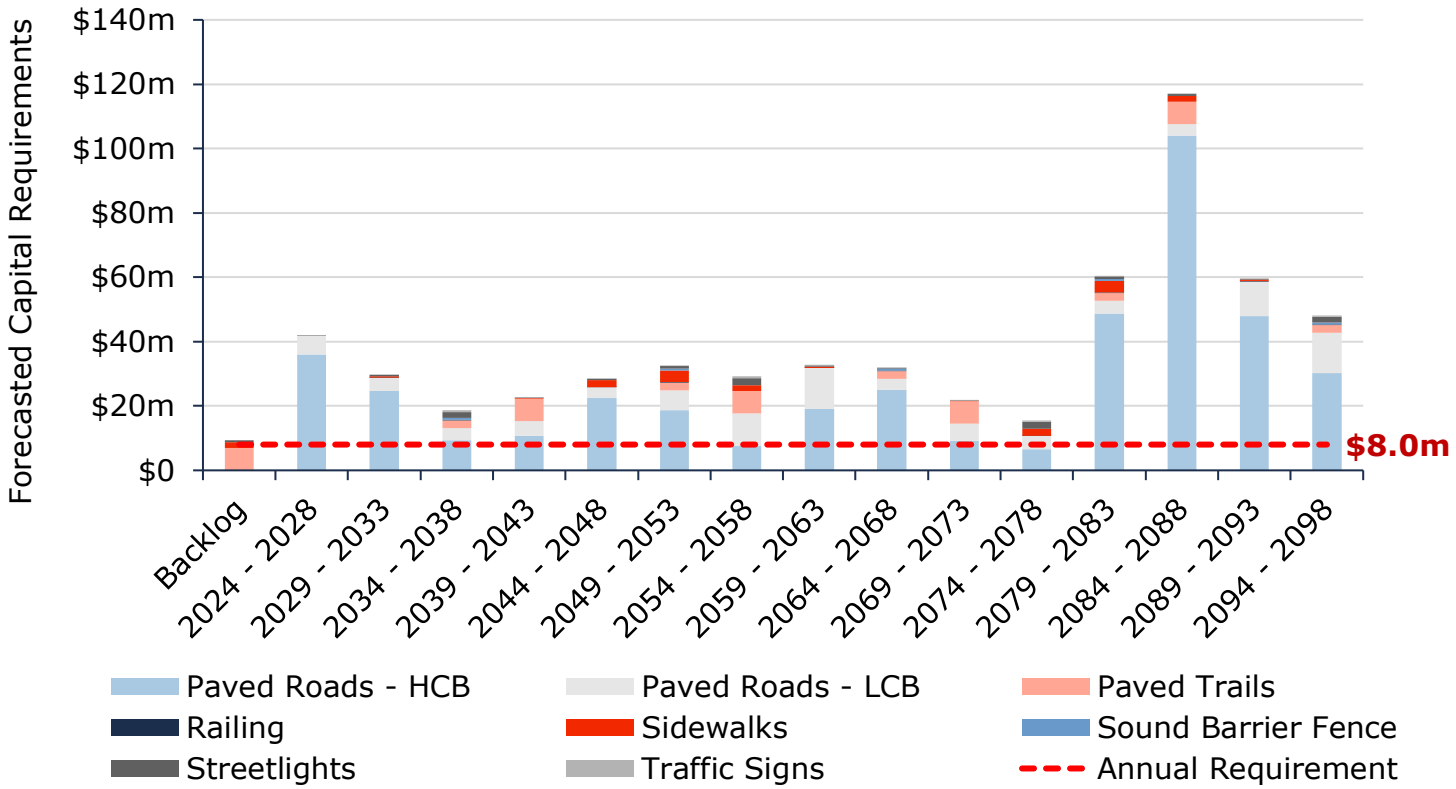


Figure 29 Forecasted Capital Replacement Needs: Road Network 2024-2098

Often, the magnitude of replacement needs is substantially higher than most municipalities can afford to fund. In addition, most assets may not need to be replaced. However, quantifying and monitoring these spikes is essential for long-term financial planning, including establishing dedicated reserves. Regular pavement condition assessments and a robust risk framework will ensure that high-criticality assets receive proper and timely lifecycle intervention, including replacements.

A summary of the 10-year replacement forecast can be found in Appendix B – 10-Year Capital Requirements.

5.6 Risk Analysis

The risk matrix below is generated using available asset data, including condition, replacement costs, surface type, and road class. The risk ratings for assets without useful attribute data were calculated using only condition, and their replacement costs.

The matrix stratifies assets based on their individual probability and consequence of failure, each scored from 1 to 5. Their product generates a risk index ranging from 1-25. Assets with the highest criticality and likelihood of failure receive a risk rating of 25; those with lowest probability of failure and lowest criticality carry a risk rating of 1. As new data and information is gathered, the City may consider integrating relevant information that improves confidence in the criteria used to assess asset risk and criticality.

These risk models have been built into the City's Asset Management Database (Citywide Assets). See *Risk & Criticality* section for further details on approach used to determine asset risk ratings and classifications.

Figure 30 Risk Matrix: Road Network

5.6.1 Qualitative Risks

The following section summarizes key trends, challenges, and risks to road network assets as identified by the City:

Climate Change & Extreme Weather Events

An increase in freeze/thaw cycles causes road pavement to heave and settle. This can cause the accelerated deterioration of road surface pavement which leads to an increased need for maintenance and rehabilitation. The uncertainty surrounding the impact of extreme weather events can make changing conditions difficult to plan for.

Organizational Knowledge & Capacity

Both short- and long-term planning requires the regular collection of infrastructure data to support asset management decision-making. Staff find it a continuous challenge to dedicate staff resource time towards data collection to ensure that road condition and asset attribute data is regularly reviewed and updated.

Lifecycle Management Strategies

The current lifecycle management strategy for roads is considered more reactive than proactive. It is a challenge to find the right balance between maintenance, capital rehabilitation, and the reconstruction of roads. Staff hope to develop better defined strategies that will extend pavement lifecycle and a lower total cost. These strategies will require sustainable annual funding to minimize the deferral of capital works.

5.7 Levels of Service

The tables that follow summarize the City's current levels of service with respect to prescribed KPIs under Ontario Regulation 588/17, as well as any additional performance measures that the City selected for this AMP.

5.7.1 Community Levels of Service

Service Attribute	Qualitative Description	Current LOS (2023)
Scope	Description, which may include maps, of the road network in the municipality and its level of connectivity	See Appendix C – Level of Service Maps & Photos
Quality	Description or images that illustrate the different levels of road class pavement condition	The City recently completed a network-wide condition assessment using Streetscan technology. Every road was given a PCI (Pavement Condition Index) rating from 0-100. Based on the PCI rating a lifecycle activity (maintenance, rehabilitation, or reconstruction) was recommended. Generally speaking, Thorold uses the following condition rating thresholds: ♦ PCI 85-100: Very Good ♦ PCI 70-84: Good ♦ PCI 55-69: Fair ♦ PCI 40-55: Poor ♦ PCI 0-39: Very Poor

Table 11 O. Reg. 588/17 Community Levels of Service: Road Network

5.7.2 Technical Levels of Service

Service Attribute	Technical Metric	Current LOS (2023)
Scope	Lane-km of arterial roads (MMS classes 1 and 2) per land area (km/km^2)	0.32 km/km^2
	Lane-km of collector roads (MMS classes 3 and 4) per land area (km/km^2)	0 km/km^2
	Lane-km of local roads (MMS classes 5 and 6) per land area (km/km^2)	2.84 km/km^2
Quality	Average pavement condition index for paved roads in the City	HCB Roads: 67%
		LCB Roads: 62%
	Average surface condition for unpaved roads in the City (e.g. excellent, good, fair, poor)	Very Poor[2]
Performance	Actual vs. Target Capital Reinvestment Rate	1.5% vs. 2.8%

Table 12 O. Reg. 588/17 Technical Levels of Service: Road Network

5.8 Proposed Levels of Service

As per O. Reg. 588/17, by July 1, 2025, municipalities are required to consider proposed levels of service (PLOS), discuss the associated risks and long-term sustainability of these service levels, and explain the City's ability to afford the PLOS.

The below tables and graphs explain the proposed levels of service scenarios that were analyzed for the road network. Further PLOS analysis at the portfolio level can be found in Section *4. Proposed Levels of Service Analysis.*

[2] No condition data available. Assumption based on age.

5.8.1 PLOS Scenarios Analyzed

Scenario	Description
Scenario 1: Achieving 50% Funding in 12 Years	This scenario assumes gradual tax increases of ~0.5%/year, stabilizing at 50% funding across all tax-funded asset categories in 12 years. ♦ Road network capital funding gradually increases from $3.7m/year to $4.6m/year over a span of 12 years
Scenario 2: Achieving 75% Funding in 12 Years	This scenario assumes gradual tax increases of ~2.0%/year, stabilizing at 75% funding across all tax-funded asset categories in 12 years. ♦ Road network capital funding gradually increases from $4.4m/year to $6.3m/year over a span of 12 years
Scenario 3: Achieving 100% Funding in 12 Years	This scenario assumes gradual tax increases of ~3.3%/year, stabilizing at 100% funding across all tax-funded asset categories in 12 years. ♦ Road network capital funding gradually increases from $4.5m/year to $8.0m/year over a span of 12 years

Table 13 Road Network PLOS Scenario Descriptions

Note: *Funding for the Road Network includes an increasing proportion of the Urban Service Area Levy over the implementation period. Refer to Section 16. Financial Strategy for more information.*

5.8.2 PLOS Analysis Results

Scenario	Technical LOS Outcomes	Initial Value (2025)	15 Year Projection (2039)	30 Year Projection (2054)	Comments
Scenario 1 (50%)	Average Condition	63%	63%	65%	
	Average Asset Risk	8.9	7.6	7.4	
	Average Annual Investment		$4,007,000		Increase taxes by ~0.5% per year for 12 years
	Average Capital re-investment rate		1.4%		
Scenario 2 (75%)	Average Condition	63%	68%	72%	
	Average Asset Risk	8.9	7.4	6.8	
	Average Annual Investment		$6,010,000		Increase taxes by ~2.0% per year for 12 years
	Average Capital re-investment rate		2.1%		
Scenario 3 (100%)	Average Condition	63%	72%	73%	
	Average Asset Risk	8.9	6.9	6.6	
	Average Annual Investment		$8,013,000		Increase taxes by ~3.3% per year for 12 years
	Average Capital re-investment rate		2.8%		

Table 14 Road Network PLOS Scenario Analysis

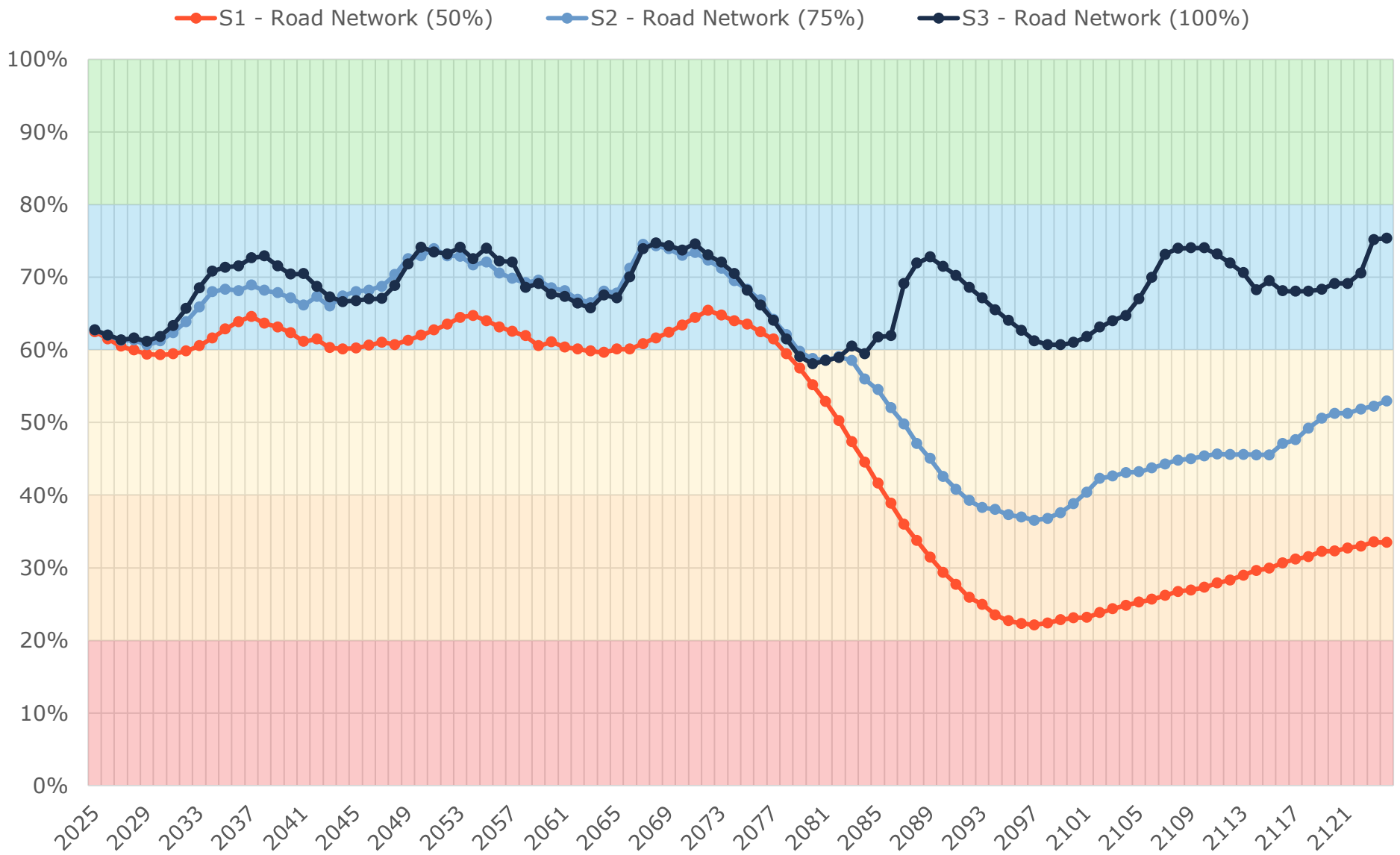


Figure 31 Road Network PLOS Scenario Condition Results

5.8.3 10-Year PLOS Financial Projections

As outlined in Section *4. Proposed Levels of Service Analysis*, the City of Thorold selected Scenario 3 as their preferred proposed levels of service. The main objective is to increase spending gradually to reach a more sustainable funding level to manage the City's current inventory of assets. The following table outlines the funding trajectory over the next 10 years for the road network if the financial strategy for Scenario 3 is implemented.

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Targeted Capital Spending	**$8.0m**	**$8.0m**	**$8.0m**	**$8.0m**	**$8.0m**	**$8.0m**	**$8.0m**	**$8.0m**	**$8.0m**	**$8.0m**
Projected Capital Spending	$4.8m	$5.1m	$5.4m	$5.7m	$6.0m	$6.3m	$6.6m	$6.9m	$7.2m	$7.5m
Funding Deficit	$3.2m	$2.9m	$2.6m	$2.3m	$2.0m	$1.7m	$1.4m	$1.1m	$809k	$475k
Target Reinvestment Rate	**2.8%**	**2.8%**	**2.8%**	**2.8%**	**2.8%**	**2.8%**	**2.8%**	**2.8%**	**2.8%**	**2.8%**
Projected Reinvestment Rate	1.6%	1.8%	1.8%	1.9%	2.0%	2.2%	2.3%	2.4%	2.5%	2.6%

Table 15 Road Network 10-Year PLOS Financial Projections

6. Bridges & Culverts

The City's transportation network also includes bridges and structural culverts, with a current replacement cost of $23 million.

6.1 Inventory & Valuation

Table 16 summarizes the quantity and current replacement cost of bridges and culverts. The City owns and manages 15 bridges and eight structural culverts.

Segment	Quantity	Unit of Measure	Replacement Cost	Primary RC Method
Bridges	15	Assets	$17,805,072	User-Defined
Structural Culverts	8	Assets	$5,554,506	User-Defined
TOTAL			**$23,359,578**	

Table 16 Detailed Asset Inventory: Bridges & Culverts

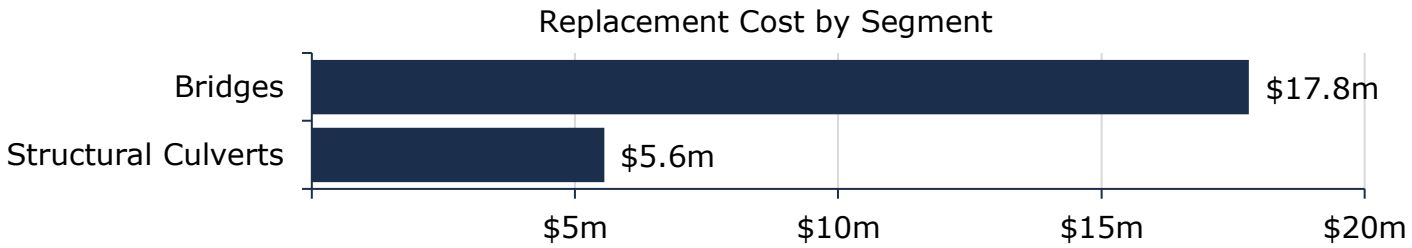


Figure 32 Portfolio Valuation: Bridges & Culverts

6.2 Asset Condition

Figure 33 summarizes the replacement cost-weighted condition of the City's bridges and culverts. Based on the City's recent Ontario Structures Inspection Manual (OSIM) assessments, 75% of bridges and culverts are in fair or better condition. Some elements or components of these structures may be candidates for replacement or rehabilitation in the medium term and should be monitored for further degradation in condition. At 25% of the total bridges and culverts portfolio, assets in poor or worse condition may require replacement in the immediate or short term.

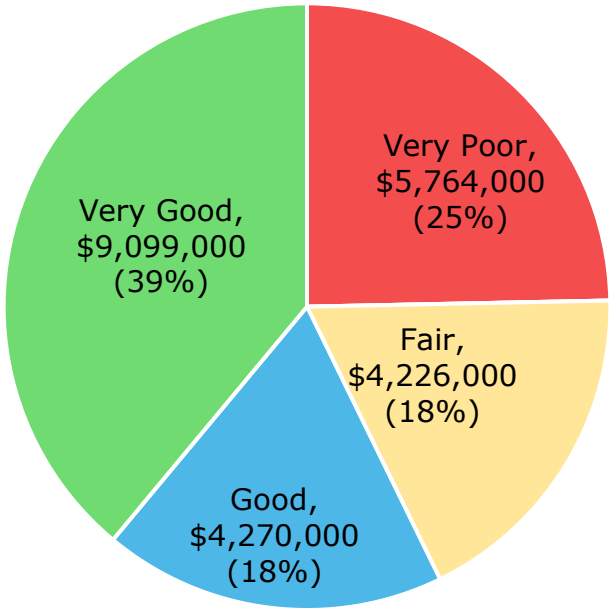


Figure 33 Asset Condition: Bridges & Culverts Overall

As further detailed in Figure 34, based on in-field condition assessments, $3.4 million of bridge assets were assessed as being in very poor condition. Similarly, 42% of structural culverts, with a current replacement cost of $2.3 million were identified as poor or worse. Bridges and structures with a poor or worse rating (i.e., a bridge condition index of less than 60) are not necessarily unsafe for regular use. The OSIM ratings are designed to identify repairs needed to elevate condition ratings to a fair or higher.

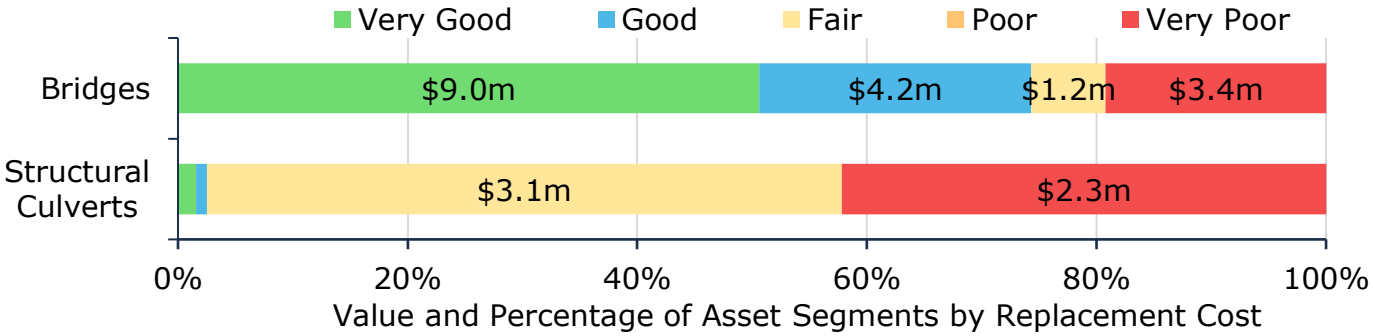


Figure 34 Asset Condition: Bridges & Culverts by Segment

6.3 Age Profile

An asset's age profile comprises two key values: estimated useful life (EUL), or design life; and the percentage of EUL consumed. The EUL is the serviceable lifespan of an asset during which it can continue to fulfil its intended purpose and provide value to users, safely and efficiently. As assets age, their performance diminishes, often more rapidly as they approach the end of their design life.

In conjunction with condition data, an asset's age profile provides a more complete summary of the state of infrastructure. It can help identify assets that may be candidates for further review through condition assessment programs; inform the selection of optimal lifecycle strategies; and improve planning for potential replacement spikes.

Figure 35 illustrates the average current age of each asset type and its estimated useful life. Both values are weighted by the replacement cost of individual assets.

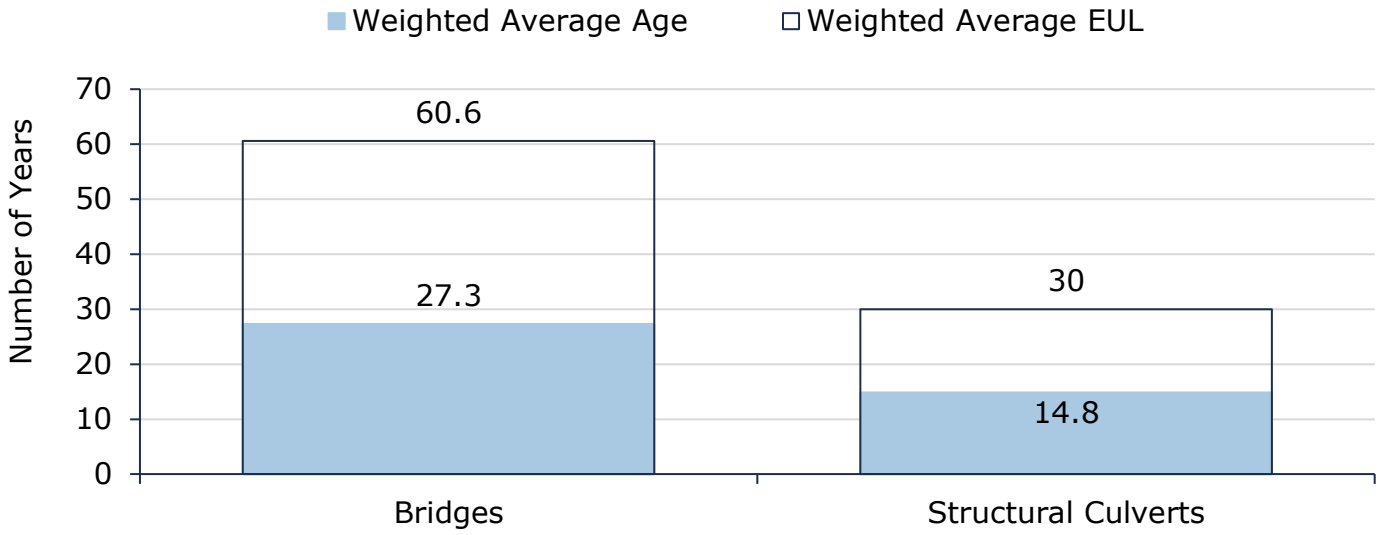


Figure 35 Estimated Useful Life vs. Asset Age: Bridges & Culverts

Age analysis reveals that on average bridges have consumed nearly half of their expected useful life. Structural culverts are nearing the end of their lifecycle, with an average age of 14.8 years against an EUL of 30 years, however a review of reasonable EULs for structural culverts may be warranted given the relatively short expected lifespan calculated within the asset management system. OSIM assessments should continue to be used in conjunction with age and asset criticality to prioritize capital and maintenance expenditures.

6.4 Current Approach to Lifecycle Management

The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

The following table outlines the City's current lifecycle management strategy.

Activity Type	Description of Current Strategy
Maintenance	Recommended maintenance activities are listed in the OSIM inspection reports that are received every 2 years. Due to budget constraints, not all recommended activities can be completed, and prioritization as required.
Rehabilitation / Replacement	There is a 10-year capital forecast for bridges that is developed and prioritized using the OSIM inspection report.
	Many major rehabilitation and replacement projects are entirely dependent on grant funding opportunities and when grants are not available, projects need to be deferred.
	There has been some discussion of permanent bridge closures for structures that are approaching their end-of-life where detour lengths, in the event of closure, are minimal.

Table 17 Lifecycle Management Strategy: Bridges & Culverts

6.5 Forecasted Long-Term Replacement Needs

Figure 36 illustrates the cyclical short-, medium- and long-term infrastructure rehabilitation and replacement requirements for the City's bridges and culverts. This analysis was run until 2098 to capture at least one iteration of replacement for the longest-lived asset in Citywide Assets, the City's primary asset management system and asset register. The City's average annual requirements (red dotted line) for bridges and culverts total **$457,000 per year**. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

Capital needs for bridges and structural culverts are relatively low in the short term, with no significant spikes anticipated over the next 15 years. However, expenditures are expected to gradually rise between 2044 and 2053, driven by structural culvert replacements. A significant peak in capital requirements occurs between 2079 and 2083, reaching nearly $5.6 million. These projections and estimates are based on asset replacement costs, age analysis, and condition data. They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades.

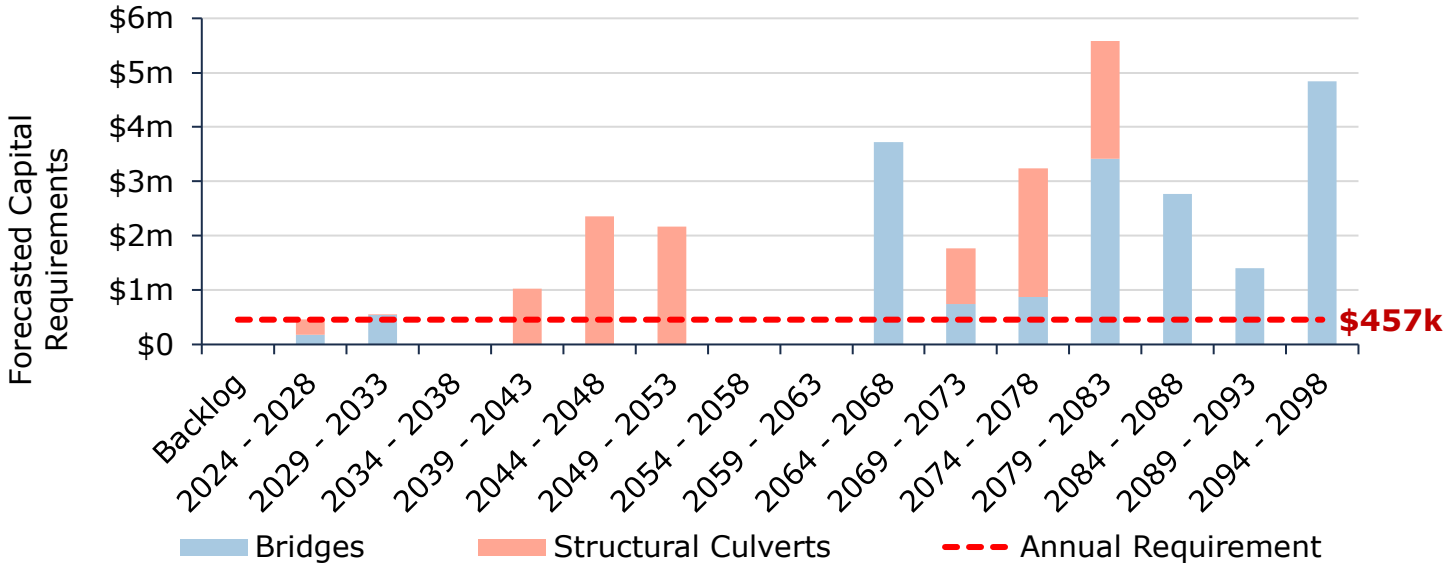


Figure 36 Forecasted Capital Replacement Needs: Bridges & Culverts 2024-2098

Often, the magnitude of replacement needs is substantially higher than most municipalities can afford to fund. In addition, most assets may not need to be replaced. However, quantifying and monitoring these spikes is essential for long-term financial planning, including establishing dedicated reserves. OSIM condition assessments and a robust risk framework will ensure that high-criticality assets receive proper and timely lifecycle intervention, including replacements.

A summary of the 10-year replacement forecast can be found in Appendix B – 10-Year Capital Requirements.

6.6 Risk Analysis

The risk matrix below is generated using available asset data, including condition and replacement costs.

The matrix stratifies assets based on their individual probability and consequence of failure, each scored from 1 to 5. Their product generates a risk index ranging from 1-25. Assets with the highest criticality and likelihood of failure receive a risk rating of 25; those with lowest probability of failure and lowest criticality carry a risk rating of 1. As new data and information is gathered, the City may consider integrating relevant information that improves confidence in the criteria used to assess asset risk and criticality.

These risk models have been built into the City's Asset Management Database (Citywide Assets). See *Risk & Criticality* section for further details on approach used to determine asset risk ratings and classifications.

Figure 37 Risk Matrix: Bridges & Culverts

6.6.1 Qualitative Risks

The following section summarizes key trends, challenges, and risks to bridges and culverts assets as identified by the City:

Aging Infrastructure
As municipal bridges continue to age, there are a handful of structures that are approaching their original useful life. There is currently no decision-making process in place to determine how to plan for structures that will require replacement or disposal.

Capital Funding Strategies
Major capital rehabilitation projects for bridges and culverts are entirely dependent on the availability of grant funding opportunities. When grants are not available, bridge rehabilitation projects may be deferred. An annual capital funding strategy can reduce dependency on grant funding and help prevent deferral of capital works.

6.7 Levels of Service

The tables that follow summarize the City's current levels of service with respect to prescribed KPIs under Ontario Regulation 588/17 as well as any additional performance measures that the City has selected for this AMP.

6.7.1 Community Levels of Service

Service Attribute	Qualitative Description	Current LOS (2023)
Scope	Description of the traffic that is supported by municipal bridges (e.g., heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, cyclists)	Municipal bridges form a key component of the City's transportation network. There are no load or dimensional restrictions on any structures. Traffic that is supported by municipal bridges includes heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians and cyclists.
Quality	Description or images of the condition of bridges & culverts and how this would affect use of the bridges & culverts	See Appendix C – Level of Service Maps & Photos

Table 18 O. Reg. 588/17 Community Levels of Service: Bridges & Culverts

6.7.2 Technical Levels of Service

Service Attribute	Technical Metric	Current LOS (2023)
Scope	% of bridges in the City with loading or dimensional restrictions	0%
Quality	Average bridge condition index value for bridges in the City	69%
	Average bridge condition index value for structural culverts in the City	37%
Performance	Actual vs. Target Capital Reinvestment Rate	0.1% vs. 2.0%

Table 19 O. Reg. 588/17 Technical Levels of Service: Bridges & Culverts

6.8 Proposed Levels of Service

As per O. Reg. 588/17, by July 1, 2025, municipalities are required to consider proposed levels of service (PLOS), discuss the associated risks and long-term sustainability of these service levels, and explain the City's ability to afford the PLOS.

The below tables and graphs explain the proposed levels of service scenarios that were analyzed for bridges and culverts. Further PLOS analysis at the portfolio level can be found in section *4. Proposed Levels of Service Analysis.*

6.8.1 PLOS Scenarios Analyzed

Scenario	Description
Scenario 1: Achieving 50% Funding in 12 Years	This scenario assumes gradual tax increases of ~0.5%/year, stabilizing at 50% funding across all tax-funded asset categories in 12 years. ♦ Bridge and culvert capital funding benefits from 'overfunded' asset category funding being reallocated during early years of implementation, and gradually increases from $108k/year to $228k/year over a span of 12 years
Scenario 2: Achieving 75% Funding in 12 Years	This scenario assumes gradual tax increases of ~2.0%/year, stabilizing at 75% funding across all tax-funded asset categories in 12 years. ♦ Bridge and culvert capital funding gradually increases from $28k/year to $343k/year over a span of 12 years
Scenario 3: Achieving 100% Funding in 12 Years	This scenario assumes gradual tax increases of ~3.3%/year, stabilizing at 100% funding across all tax-funded asset categories in 12 years. ♦ Bridge and culvert capital funding gradually increases from $27k/year to $457k/year over a span of 12 years

Table 20 Bridges & Culverts PLOS Scenario Descriptions

6.8.2 PLOS Analysis Results

Scenario	Technical LOS Outcomes	Initial Value (2025)	15 Year Projection (2039)	30 Year Projection (2054)	Comments
Scenario 1 (50%)	Average Condition	75%	50%	47%	
	Average Asset Risk	8.6	15.8	17.3	
	Average Annual Investment		$228,000		Increase taxes by ~0.5% per year for 12 years
	Average Capital re-investment rate		1.0%		
Scenario 2 (75%)	Average Condition	75%	50%	47%	
	Average Asset Risk	8.6	15.8	17.3	
	Average Annual Investment		$342,000		Increase taxes by ~2.0% per year for 12 years
	Average Capital re-investment rate		1.5%		
Scenario 3 (100%)	Average Condition	75%	50%	47%	
	Average Asset Risk	8.6	15.8	17.3	
	Average Annual Investment		$457,000		Increase taxes by ~3.3% per year for 12 years
	Average Capital re-investment rate		2.0%		

Table 21 Bridges & Culverts PLOS Scenario Analysis

Note: *As bridge assets have long lifespans between replacements, it is typical to not see a large difference in the funding scenario analysis until multiple decades into the future, as is shown in the chart below which emphasized a large divergence beginning in the 2070's.*

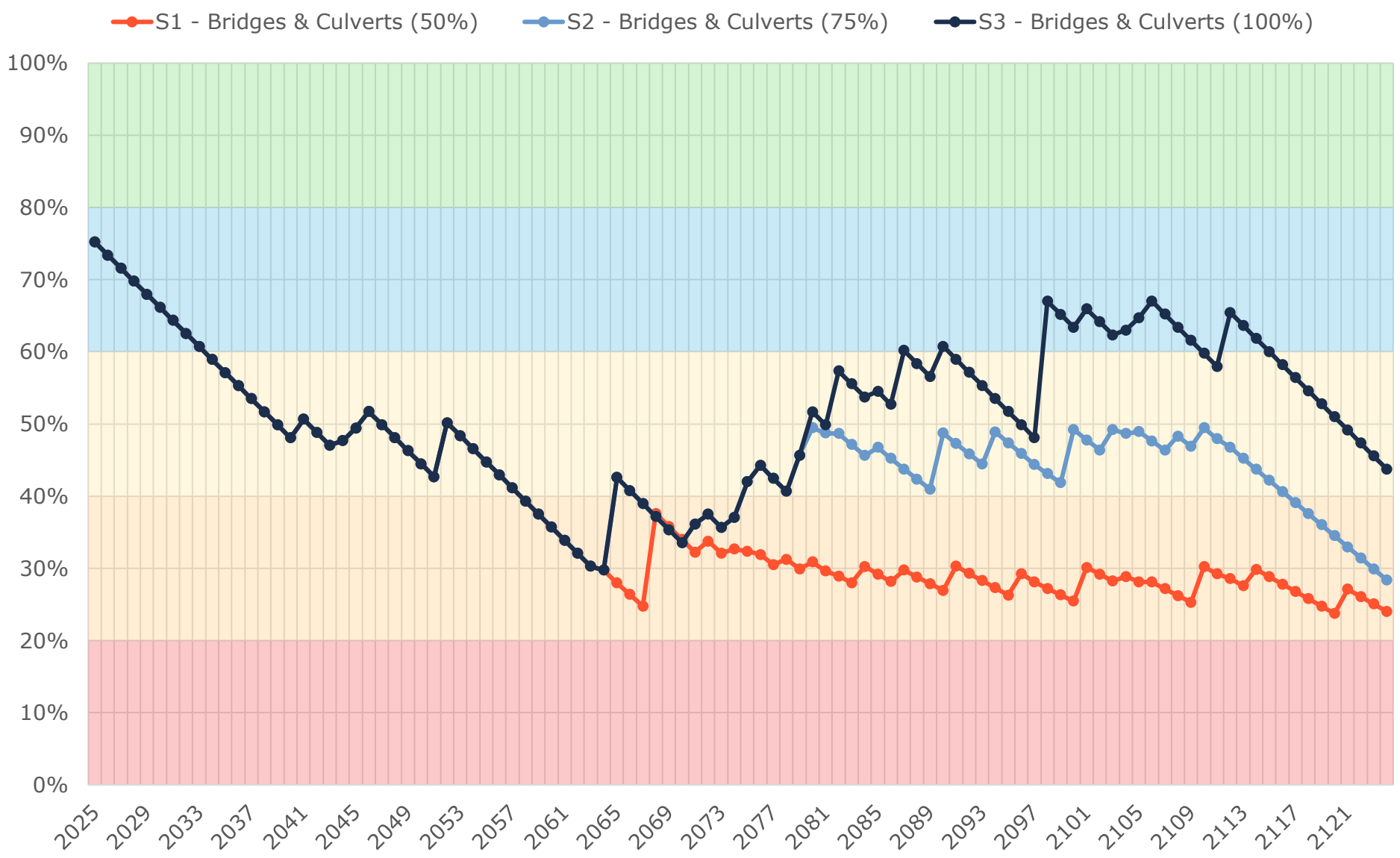


Figure 38 Bridges & Culverts PLOS Scenario Condition Results

6.8.3 10-Year PLOS Financial Projections

As outlined in Section *4. Proposed Levels of Service Analysis* the City of Thorold selected Scenario 3 as their preferred proposed levels of service. The main objective is to increase spending gradually to reach a more sustainable funding level to manage the City's current inventory of assets. The following table outlines the funding trajectory over the next 10 years for bridges and culverts if the financial strategy for Scenario 3 is implemented.

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Targeted Capital Spending	**$457k**	**$457k**	**$457k**	**$457k**	**$457k**	**$457k**	**$457k**	**$457k**	**$457k**	**$457k**
Projected Capital Spending	$61k	$100k	$134k	$169k	$205k	$242k	$280k	$320k	$361k	$403k
Funding Deficit	$396k	$356k	$323k	$288k	$252k	$215k	$176k	$137k	$96k	$53k
Target Reinvestment Rate	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**
Projected Reinvestment Rate	0.3%	0.4%	0.6%	0.7%	0.9%	1.0%	1.2%	1.4%	1.5%	1.7%

Table 22 Bridges & Culverts 10-Year PLOS Financial Projections

7. Water Services

The public works department is responsible for overseeing the City's water services with a total current replacement cost of approximately $152 million including the water distribution system and water meters.

7.1 Inventory & Valuation

Table 23 summarizes the quantity and current replacement cost of the City's various water services assets as managed in its primary asset management register, Citywide Assets.

Segment	Quantity	Unit of Measure	Replacement Cost	Primary RC Method
Water Mains (less than 100mm)	2.1	Length (km)	$3,077,505	Cost per Unit
Water Mains (150mm - 200mm)	85.7	Length (km)	$112,216,971	Cost per Unit
Water Mains (250mm - 450mm)	20.1	Length (km)	$31,813,113	Cost per Unit
Water Meters	9,051	Quantity	$5,341,193	Cost per Unit
TOTAL			**$152,448,783**	

Table 23 Detailed Asset Inventory: Water Services

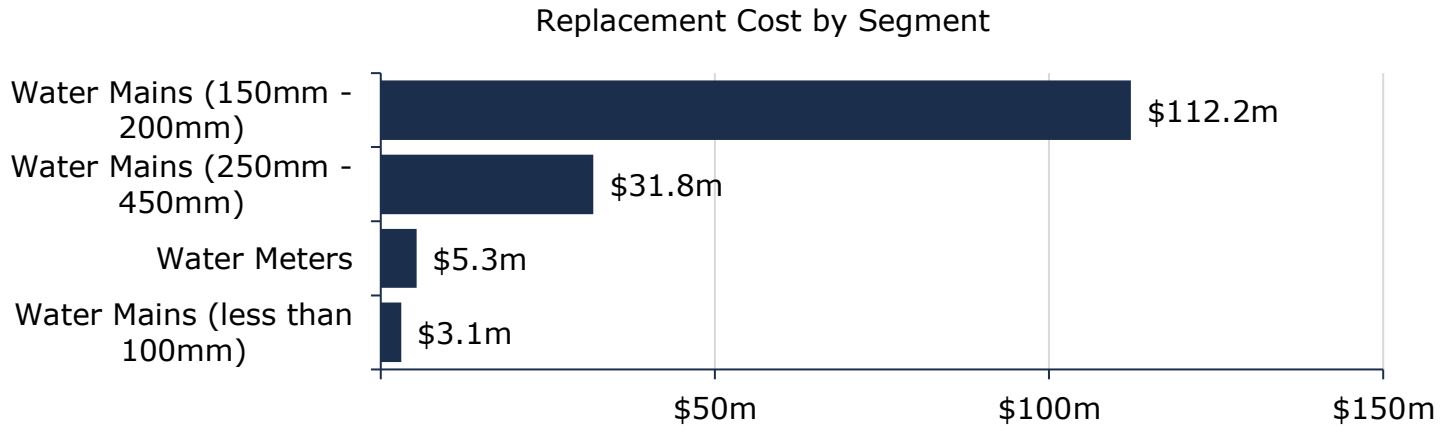


Figure 39 Portfolio Valuation: Water Services

7.2 Asset Condition

Figure 40 summarizes the replacement cost-weighted condition of the City's water services. Based solely on age, 77% of assets are in fair or better condition; the remaining 23% of assets are in poor to very poor condition. Age-based condition estimations can skew data and lead to potential under- or overstatement of asset needs.

Assets in poor or worse condition may be candidates for replacement in the short term; similarly, assets in fair condition may require rehabilitation or replacement in the medium term and should be monitored for further degradation in condition. As illustrated in Figure 40, the majority of the City's water services assets are in fair or better condition.

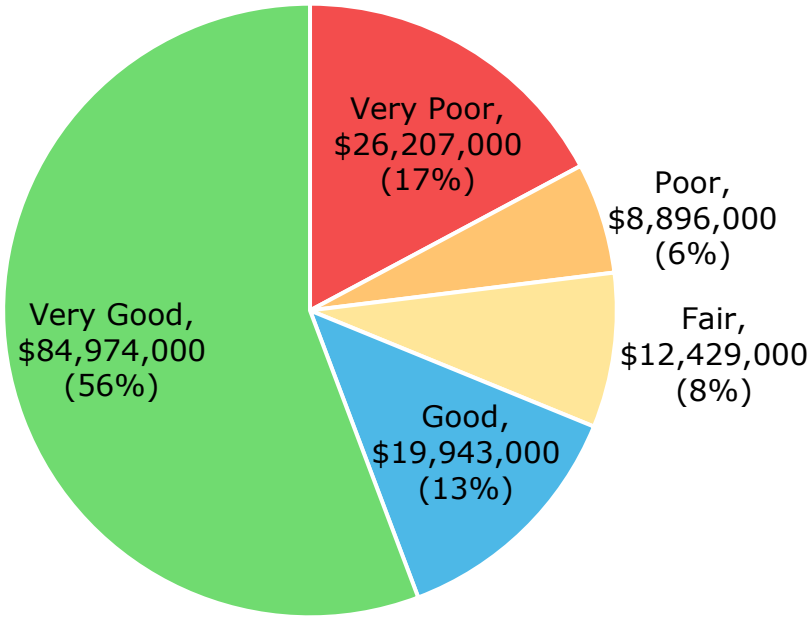


Figure 40 Asset Condition: Water Services Overall

As illustrated in Figure 41, based on condition assessments and age-based conditions, the majority of the City's water mains are in very good condition; however, 65% of water meters are in poor or worse condition.

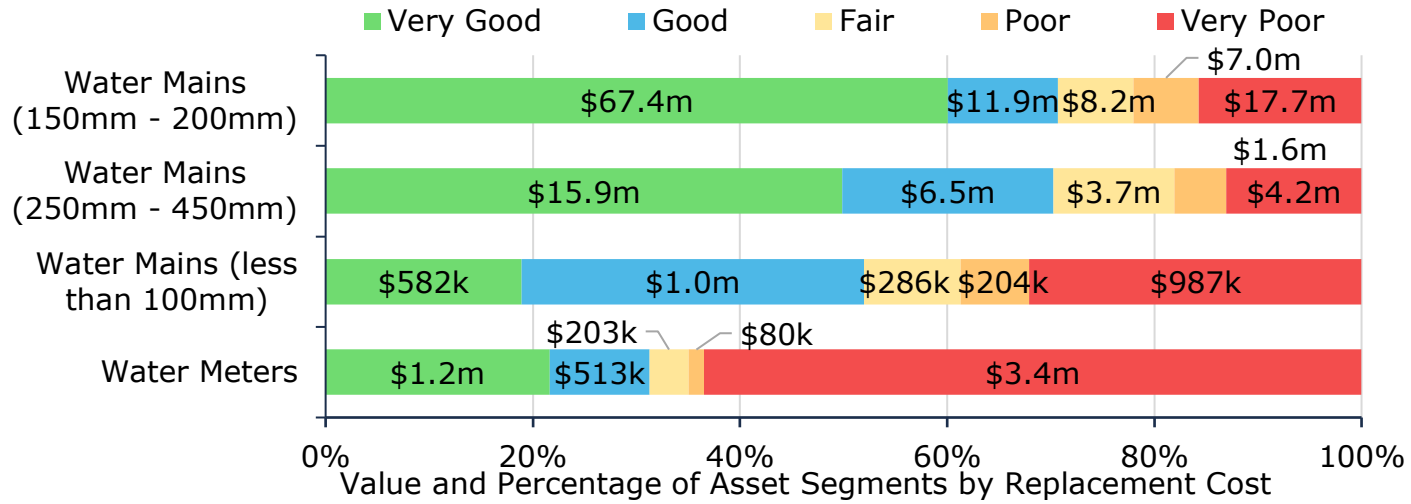


Figure 41 Asset Condition: Water Services by Segment

7.3 Age Profile

An asset's age profile comprises two key values: estimated useful life (EUL), or design life; and the percentage of EUL consumed. The EUL is the serviceable lifespan of an asset during which it can continue to fulfil its intended purpose and provide value to users, safely and efficiently. As assets age, their performance diminishes, often more rapidly as they approach the end of their design life.

In conjunction with condition data, an asset's age profile provides a more complete summary of the state of infrastructure. It can help identify assets that may be candidates for further review through condition assessment programs; inform the selection of optimal lifecycle strategies; and improve planning for potential long-term replacement spikes.

Figure 42 illustrates the average current age of each asset type and its estimated useful life. Both values are weighted by the replacement cost of individual assets.

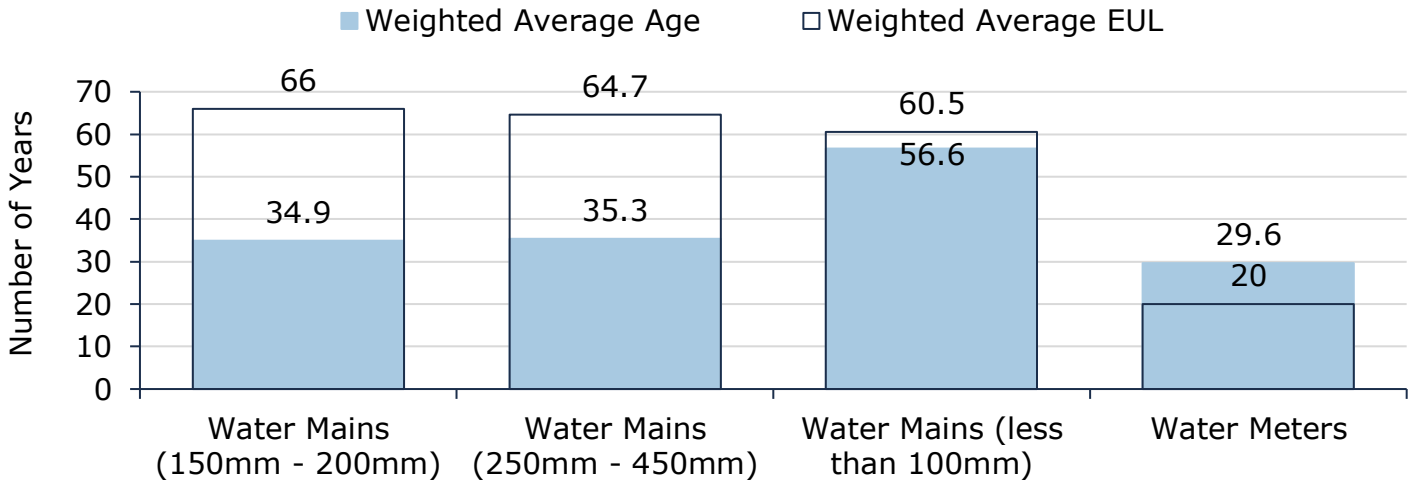


Figure 42 Estimated Useful Life vs. Asset Age: Water Services

7.4 Current Approach to Lifecycle Management

The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

The following table outlines the City's current lifecycle management strategy.

Activity Type	Description of Current Strategy
Maintenance	Valve turning, hydrant flushing, and pressure testing is complete annually to identify maintenance requirements and prevent operational issues.
	Cathodic protection to prevent corrosion is being explored for metal pipes that are not currently projected for replacement within the next 10 years
Rehabilitation/ Replacement	There has been a focus on replacing old cast iron and ductile iron pipes with PVC pipes to address the potential for water main breaks.
	Some trenchless re-lining has been completed on older mains, but staff are not yet sure of the efficacy of re-lining as a broader strategy to rehabilitate pipes that are approaching their end-of-life.
	10-year capital plan includes named projects where rehabilitation or replacement of existing water infrastructure is required.

Table 24 Lifecycle Management Strategy: Water Services

7.5 Forecasted Long-Term Replacement Needs

Figure 43 illustrates the cyclical short-, medium- and long-term infrastructure rehabilitation and replacement requirements for the City's water services. This analysis was run until 2098 to capture at least one iteration of replacement for the longest-lived asset in Citywide Assets, the City's primary asset management system and asset register. The City's average annual requirements (red dotted line) total **$2.6 million per year** for all assets in the water services. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

The chart illustrates substantial capital needs throughout the forecast period. It also shows a backlog $25.4 million, dominated by water mains. These projections are based on asset replacement costs, age analysis, and condition data when available. They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades.

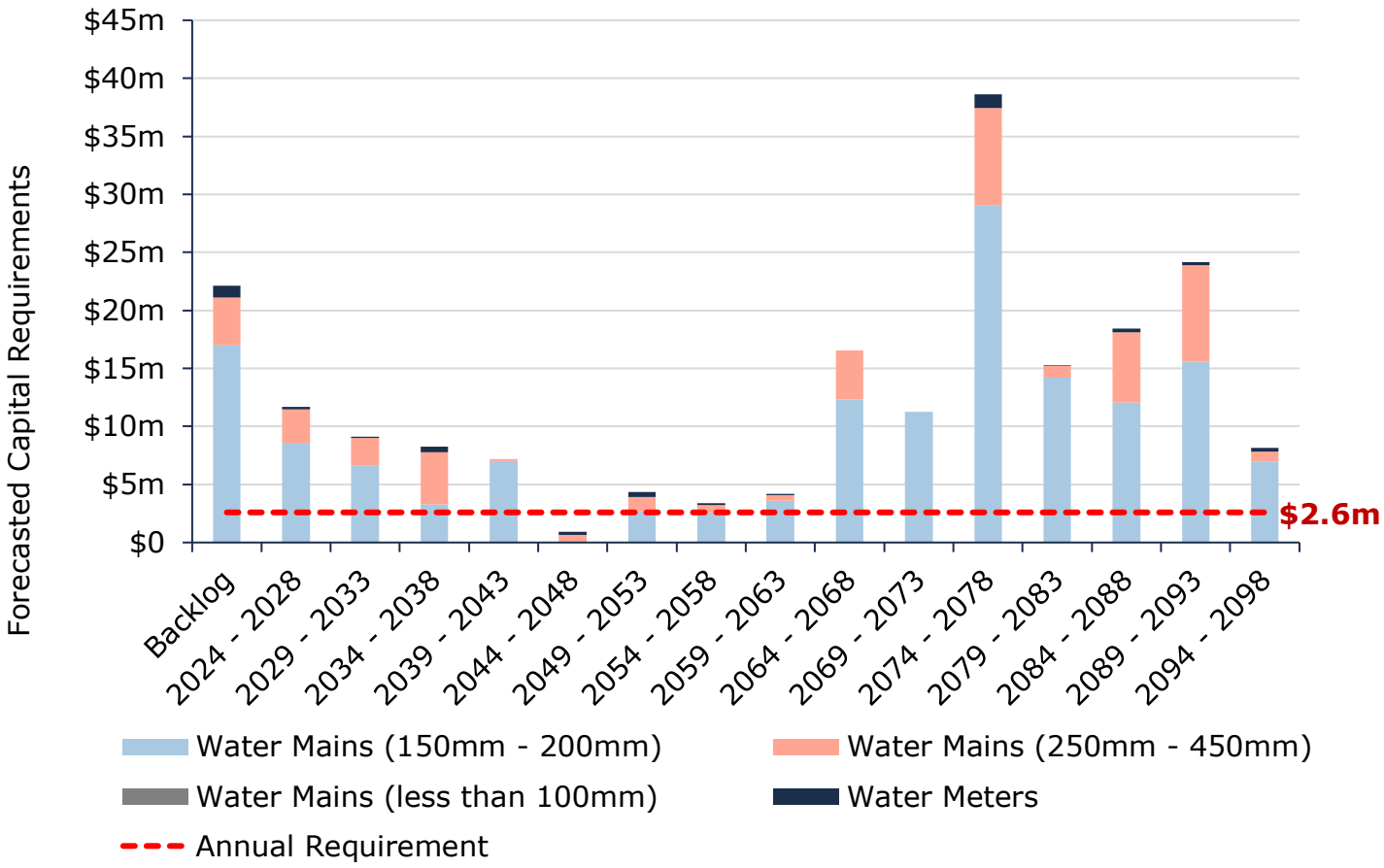


Figure 43 Forecasted Capital Replacement Needs: Water Services 2024-2098

Often, the magnitude of replacement needs is substantially higher than most municipalities can afford to fund. In addition, most assets may not need to be replaced. However, quantifying and monitoring these spikes is essential for long-term financial planning, including establishing dedicated reserves. Regular condition assessments and a robust risk framework will ensure that high-criticality assets receive proper and timely lifecycle intervention, including replacements.

A summary of the 10-year replacement forecast can be found in Appendix B – 10-Year Capital Requirements.

7.6 Risk Analysis

The risk matrix below is generated using available asset data, including condition, material, and diameter. The risk ratings for assets without useful attribute data were calculated using only condition and their replacement costs.

The matrix stratifies assets based on their individual probability and consequence of failure, each scored from 1 to 5. Their product generates a risk index ranging from 1-25. Assets with the highest criticality and likelihood of failure receive a risk rating of 25; those with lowest probability of failure and lowest criticality carry a risk rating of 1. As new data and information is

gathered, the City may consider integrating relevant information that improves confidence in the criteria used to assess asset risk and criticality.

These risk models have been built into the City's Asset Management Database (Citywide Assets). See *Risk & Criticality* section for further details on approach used to determine asset risk ratings and classifications.

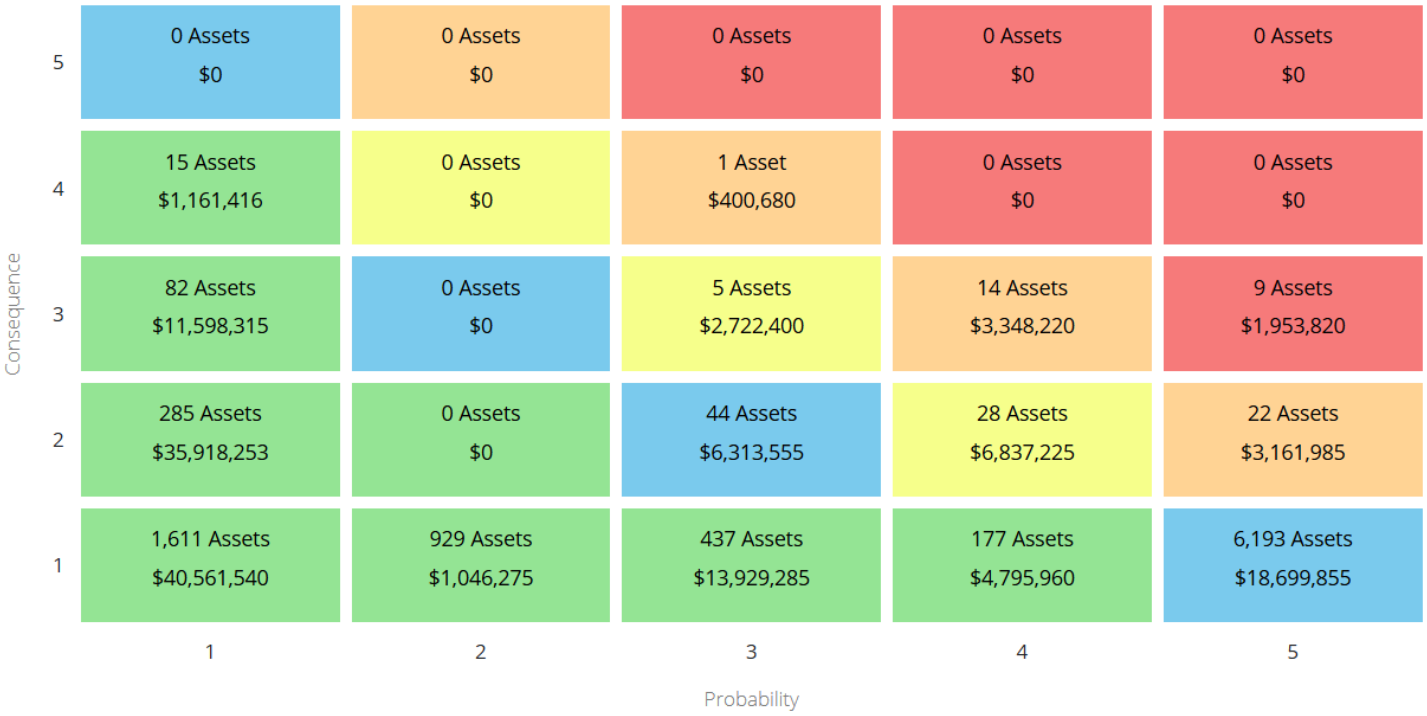


Figure 44 Risk Matrix: Water Services

7.6.1 Qualitative Risks

The following section summarizes key trends, challenges, and risks to water services assets as identified by the City:

Lifecycle Management Strategies

The City's network of watermains is comprised of several different pipe materials. Some materials have higher break rates and present more operational challenges. In recent years there has been a focus on replacing cast iron, ductile iron, and asbestos cement pipes with PVC.

Assessed Condition Data

Watermains are much more difficult to inspect unlike sanitary and storm sewers mains where CCTV camera inspection is possible. Currently staff rely on age-based estimates of current condition and pipe material to try and predict when pipes need to be replaced. There is some uncertainty whether this is an effective approach to determine the current condition of water mains.

7.7 Levels of Service

The tables that follow summarize the City's current levels of service with respect to prescribed KPIs under Ontario Regulation 588/17 as well as any additional performance measures that the City has selected for this AMP.

7.7.1 Community Levels of Service

Service Attribute	Qualitative Description	Current LOS (2023)
	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal water system	See Appendix C – Level of Service Maps & Photos
Scope	Description, which may include maps, of the user groups or areas of the municipality that have fire flow	GIS map provided and will be appended to the AMP. The 2019 City Wide Water Service Master Plan identified fire flow deficiencies in seven areas across the City including: ♦ Thorold North ♦ St. David's Road ♦ Industrial Drive ♦ Industrial Area East of Welland Canal ♦ Allanburg ♦ Brock Business Park ♦ DeCew Road ♦ Hodgkins Avenue ♦ Port Robinson East of Welland Canal ♦ Rolling Meadows A map of these areas is included in Appendix C – Level of Service Maps & Photos.
Reliability	Description of boil water advisories and service interruptions	The City experienced 0 boil water advisories in 2023. On occasion, water service interruptions may occur due to unexpected main breaks, maintenance activities, or water infrastructure replacement. Staff make every effort to keep service interruptions to a minimum.

Table 25 O. Reg. 588/17 Community Levels of Service: Water Services

7.7.2 Technical Levels of Service

Service Attribute	Technical Metric	Current LOS (2023)
Scope	% of properties connected to the municipal water system	93%[3]
	% of properties where fire flow is available	93%[4]
Reliability	# of connection-days per year where a boil water advisory notice is in place compared to the total number of properties connected to the municipal water system	0
	# of connection-days per year where water is not available due to water main breaks compared to the total number of properties connected to the municipal water system	0.00004[5]
Quality	Average condition of water services assets	68%
Performance	Actual vs. Target Capital Reinvestment Rate	1.2% vs. 1.7%

Table 26 O. Reg. 588/17 Technical Levels of Service: Water Services

[3] This figure is based on 2025 metrics.
[4] All properties connected to water system have fire flow.
[5] 15 watermain breaks affecting 12 houses per break, 1 day of disruption (180 connection days) compared to 11,121 water connected properties (x365 days = 4,059,165 connection days).

7.8 Proposed Levels of Service

As per O. Reg. 588/17, by July 1, 2025, municipalities are required to consider proposed levels of service (PLOS), discuss the associated risks and long-term sustainability of these service levels, and explain the City's ability to afford the PLOS.

The below tables and graphs explain the proposed levels of service scenarios that were analyzed for the water services. Further PLOS analysis at the portfolio level can be found in section *4. Proposed Levels of Service Analysis.*

7.8.1 PLOS Scenarios Analyzed

Scenario	Description
Scenario 1: Achieving 80% Funding in 12 Years	This scenario assumes gradual water rate increases of ~0.5%/year, stabilizing at 80% funding in 12 years. ♦ Water services capital funding gradually increases from $1.8m/year to $2.1m/year over a span of 12 years
Scenario 2: Achieving 90% Funding in 12 Years	This scenario assumes gradual water rate increases of ~0.9%/year, stabilizing at 90% funding in 12 years. ♦ Water services capital funding gradually increases from $1.8m/year to $2.3m/year over a span of 12 years
Scenario 3: Achieving 100% Funding in 12 Years	This scenario assumes gradual water rate increases of ~1.2%/year, stabilizing at 100% funding in 12 years. ♦ Water services capital funding gradually increases from $1.8m/year to $2.6m/year over a span of 12 years

Table 27 Water Services PLOS Scenario Descriptions

7.8.2 PLOS Analysis Results

Scenario	Technical LOS Outcomes	Initial Value (2025)	15 Year Projection (2039)	30 Year Projection (2054)	Comments
Scenario 1 (80%)	Average Condition	69%	68%	72%	
	Average Asset Risk	3.7	3.7	3.6	
	Average Annual Investment		$2,076,000		Increase water rates by ~0.5% per year for 12 years
	Average Capital re-investment rate		1.4%		
Scenario 2 (90%)	Average Condition	69%	69%	76%	
	Average Asset Risk	3.7	3.7	3.5	
	Average Annual Investment		$2,336,000		Increase water rates by ~0.9% per year for 12 years
	Average Capital re-investment rate		1.5%		
Scenario 3 (100%)	Average Condition	69%	70%	79%	
	Average Asset Risk	3.7	3.6	3.3	
	Average Annual Investment		$2,595,000		Increase water rates by ~1.2% per year for 12 years
	Average Capital re-investment rate		1.7%		

Table 28 Water Services PLOS Scenario Analysis

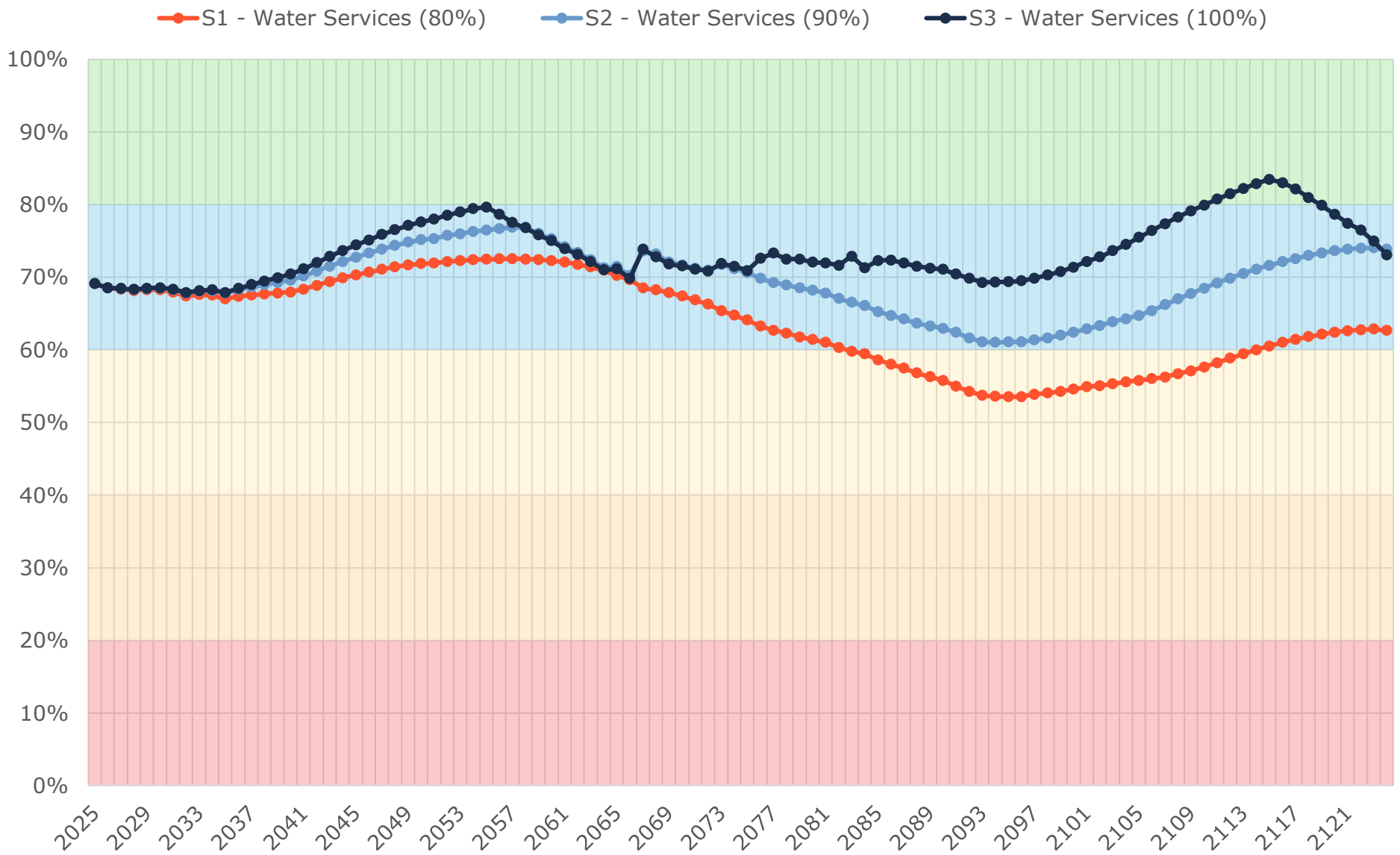


Figure 45 Water Services PLOS Scenario Condition Results

7.8.3 10-Year PLOS Financial Projections

As outlined in Section *4. Proposed Levels of Service Analysis*, the City of Thorold selected Scenario 3 as their preferred proposed levels of service. The main objective is to increase spending gradually to reach a more sustainable funding level to manage the City's current inventory of assets. The following table outlines the funding trajectory over the next 10 years for the water services if the financial strategy for Scenario 3 is implemented.

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Targeted Capital Spending	**$2.6m**	**$2.6m**	**$2.6m**	**$2.6m**	**$2.6m**	**$2.6m**	**$2.6m**	**$2.6m**	**$2.6m**	**$2.6m**
Projected Capital Spending	$1.8m	$1.9m	$2.0m	$2.0m	$2.1m	$2.2m	$2.3m	$2.3m	$2.4m	$2.5m
Funding Deficit	$766k	$697k	$627k	$555k	$483k	$410k	$337k	$262k	$187k	$110k
Target Reinvestment Rate	**1.7%**	**1.7%**	**1.7%**	**1.7%**	**1.7%**	**1.7%**	**1.7%**	**1.7%**	**1.7%**	**1.7%**
Projected Reinvestment Rate	1.2%	1.2%	1.3%	1.3%	1.4%	1.4%	1.5%	1.5%	1.6%	1.6%

Table 29 Water Services 10-Year PLOS Financial Projections

8. Sanitary Sewer Services

The sanitary sewer services provides the essential service of wastewater collection and disposal, for the community, and has a current replacement value of over $160 million.

8.1 Inventory & Valuation

Table 30 summarizes the quantity and current replacement cost of the City's various sanitary sewer services assets as managed in its primary asset management register, Citywide Assets.

Segment	Quantity	Unit of Measure	Replacement Cost	Primary RC Method
CSO Tanks	5	Quantity	$18,102,780	CPI
Sanitary Mains (100mm - 150mm)	1.6	Length (km)	$2,218,150	Cost per Unit
Sanitary Mains (200mm - 250mm)	80.1	Length (km)	$110,191,774	Cost per Unit
Sanitary Mains (300mm - 350mm)	12.5	Length (km)	$18,263,148	Cost per Unit
Sanitary Mains (375mm - 600mm)	5.0	Length (km)	$9,232,436	Cost per Unit
Sanitary Mains (675mm - 900mm)	1.2	Length (km)	$2,849,931	Cost per Unit
TOTAL			**$160,858,220**	

Table 30 Detailed Asset Inventory: Sanitary Sewer Services

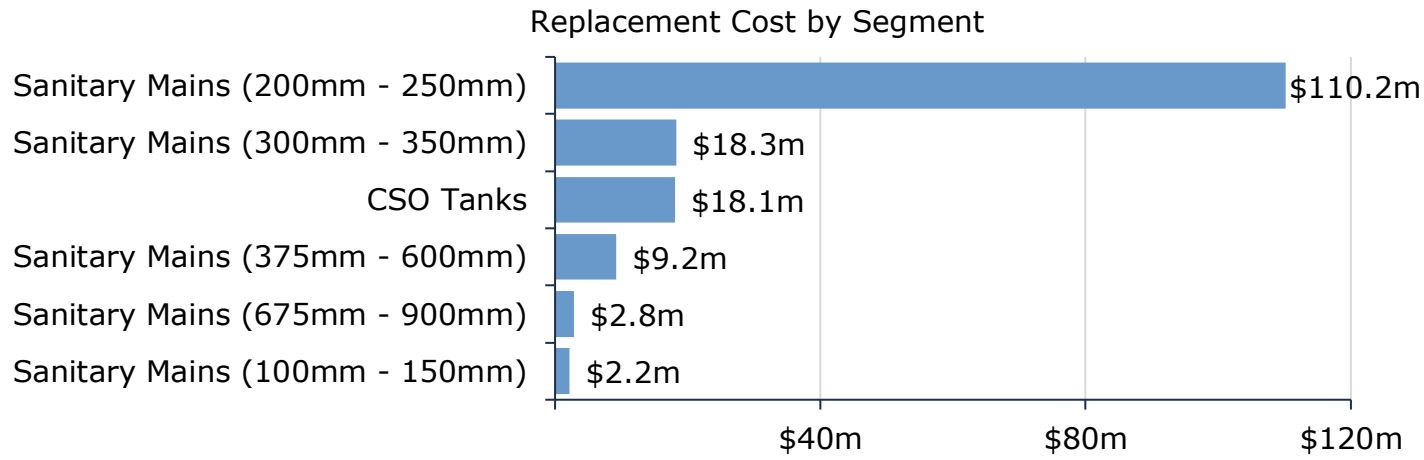


Figure 46 Portfolio Valuation: Sanitary Sewer Services

8.2 Asset Condition

Figure 47 summarizes the replacement cost-weighted condition of the City's sanitary sewer services. Based on a combination of field inspection data and age, 82% of assets are in fair or better condition; the remaining 18% of assets are in poor to very poor condition. Condition assessments were available for 60% of sanitary mains, based on replacement cost. This condition data was projected from inspection date to current year to estimate their condition today. No condition data was available for CSO tanks.

Assets in poor or worse condition may be candidates for replacement in the short term; similarly, assets in fair condition may require rehabilitation or replacement in the medium term and should be monitored for further degradation in condition. As illustrated in Figure 47 the majority of the City's sanitary sewer services assets are in fair or better condition.

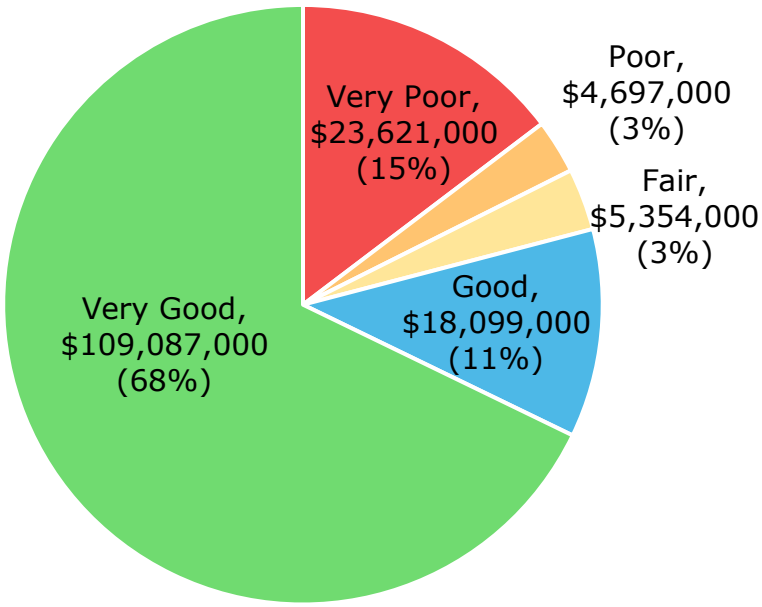


Figure 47 Asset Condition: Sanitary Sewer Services Overall

As illustrated in Figure 48, based on condition assessments and age-based conditions, the majority of the City's sanitary sewer mains are in very good condition with small variations based on diameter.

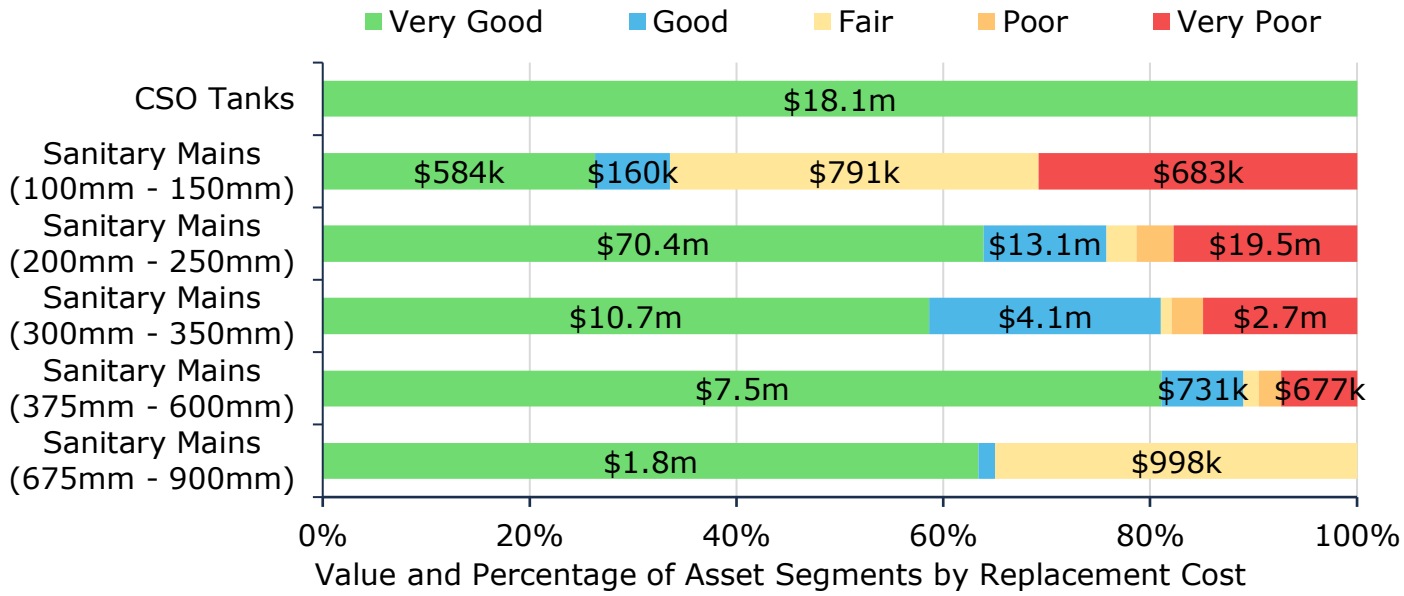


Figure 48 Asset Condition: Sanitary Sewer Services by Segment

8.3 Age Profile

An asset's age profile comprises two key values: estimated useful life (EUL), or design life; and the percentage of EUL consumed. The EUL is the serviceable lifespan of an asset during which it can continue to fulfil its intended purpose and provide value to users, safely and efficiently. As assets age, their performance diminishes, often more rapidly as they approach the end of their design life.

In conjunction with condition data, an asset's age profile provides a more complete summary of the state of infrastructure. It can help identify assets that may be candidates for further review through condition assessment programs; inform the selection of optimal lifecycle strategies; and improve planning for potential long-term replacement spikes.

Figure 49 illustrates the average current age of each asset type and its estimated useful life. Both values are weighted by the replacement cost of individual assets.

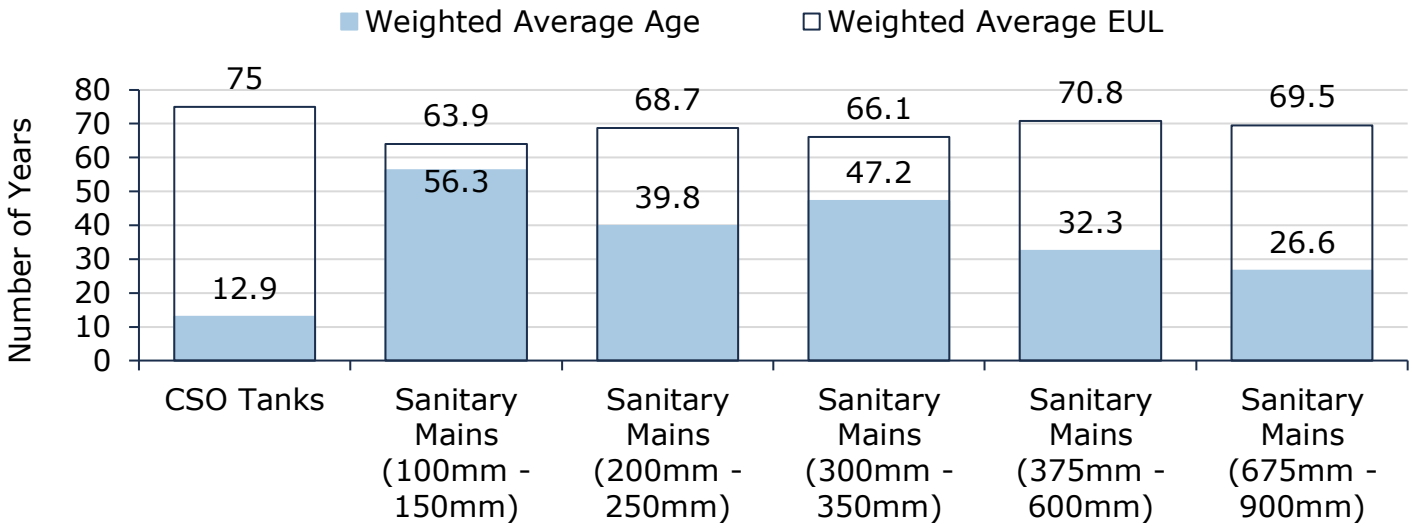


Figure 49 Estimated Useful Life vs. Asset Age: Sanitary Sewer Services

8.4 Current Approach to Lifecycle Management

The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

The following table outlines the City's current lifecycle management strategy.

Activity Type	Description of Current Strategy
Maintenance	Sewer main flushing/cleaning is completed across 1/5th of the network annually prior to CCTV inspections.
	Spot repairs are completed on sewer mains based on the results of the CCTV inspections.
Rehabilitation/ Replacement	There are very few rehabilitation activities required for sanitary mains, apart from minor spot repairs.
	There are a handful of combined sanitary/storm sewers that have been prioritized for replacement and separation.
	Sanitary infrastructure is typically the highest priority among sub-surface infrastructure and tends to drive forward priorities for both water and storm sewer infrastructure with the goal of achieving cost savings through project coordination.
	The 10-year capital plan includes named and prioritized projects to address requirements for sanitary sewer infrastructure

Table 31 Lifecycle Management Strategy: Sanitary Sewer Services

8.5 Forecasted Long-Term Replacement Needs

Figure 50 illustrates the cyclical short-, medium- and long-term infrastructure rehabilitation and replacement requirements for the City's sanitary sewer services. This analysis was run until 2098 to capture at least one iteration of replacement for the longest-lived asset in Citywide Assets, the City's primary asset management system and asset register. The City's average annual requirements (red dotted line) total **$2.4 million per year** for all assets in the sanitary sewer network. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

The chart illustrates substantial capital needs throughout the forecast period. It also shows a backlog of $22.2 million dominated by smaller diameter sanitary mains. These projections are based on asset replacement costs, age analysis, and condition data when available. They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades.

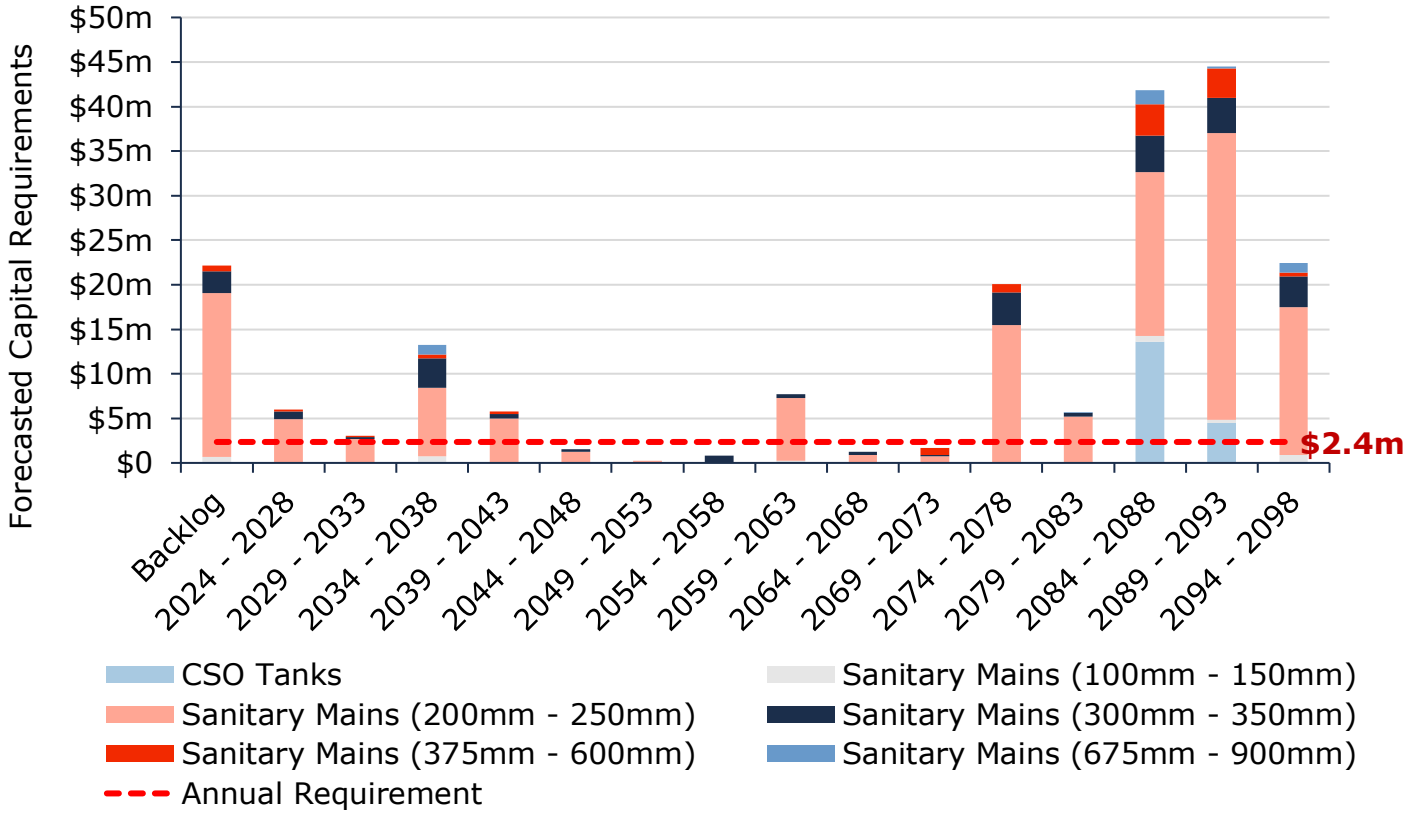


Figure 50 Forecasted Capital Replacement Needs: Sanitary Sewer Services 2024-2098

Often, the magnitude of replacement needs is substantially higher than most municipalities can afford to fund. In addition, most assets may not need to be replaced. However, quantifying and monitoring these spikes is essential for long-term financial planning, including establishing dedicated reserves. Regular condition assessments and a robust risk framework will ensure that high-criticality assets receive proper and timely lifecycle intervention, including replacements.

A summary of the 10-year replacement forecast can be found in Appendix B – 10-Year Capital Requirements.

8.6 Risk Analysis

The risk matrix below is generated using available asset data, including condition and pipe diameter. The risk ratings for assets without useful attribute data were calculated using only condition and their replacement costs.

The matrix stratifies assets based on their individual probability and consequence of failure, each scored from 1 to 5. Their product generates a risk index ranging from 1-25. Assets with the highest criticality and likelihood of failure receive a risk rating of 25; those with lowest probability of failure and lowest criticality carry a risk rating of 1. As new data and information is gathered, the City may consider integrating relevant information that improves confidence in the criteria used to assess asset risk and criticality.

These risk models have been built into the City's Asset Management Database (Citywide Assets). See *Risk & Criticality* section for further details on approach used to determine asset risk ratings and classifications.

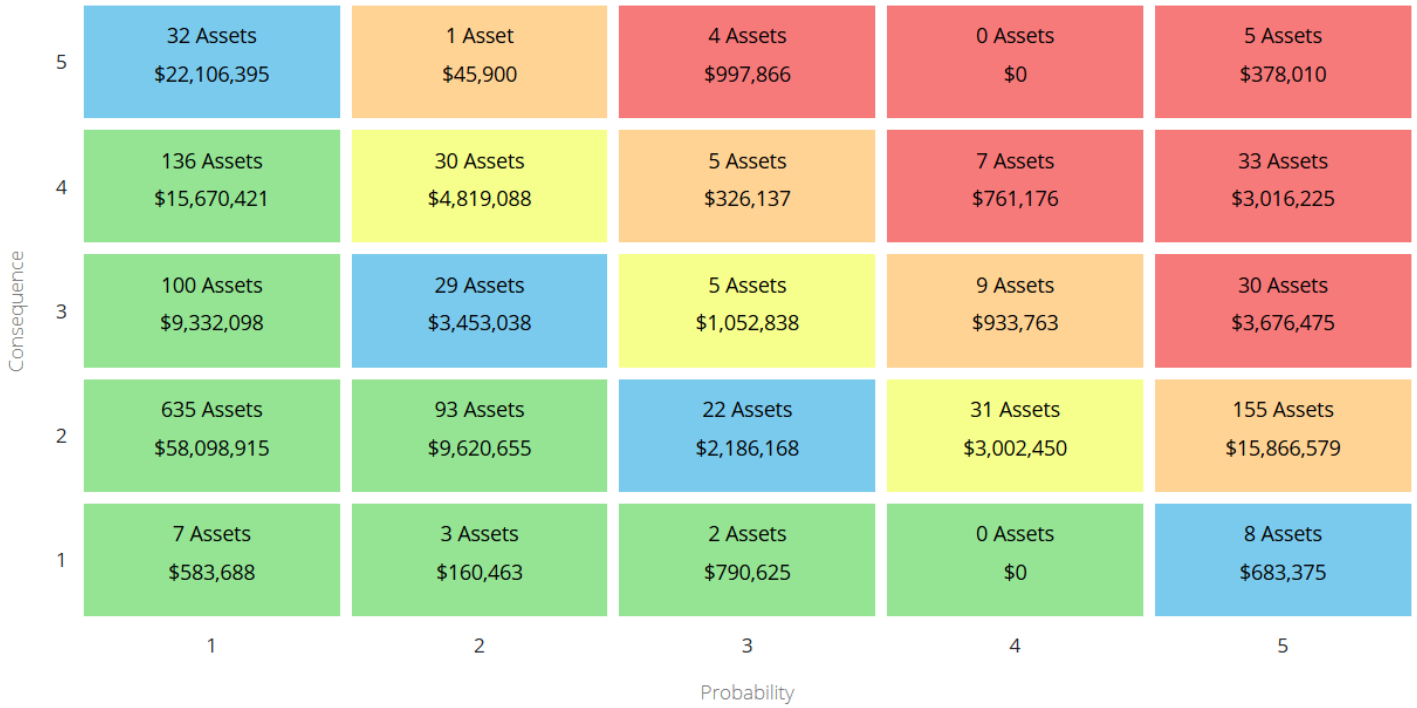


Figure 51 Risk Matrix: Sanitary Sewer Services

8.6.1 Qualitative Risks

The following section summarizes key trends, challenges, and risks to sanitary sewer services assets as identified by the City:

Lifecycle Management Strategies
There are still a handful of combined sewers in the City that are a high priority for replacement to separate the sanitary and stormwater systems. Combined sewers present an elevated risk of sewer overflow and water pollution. Staff aim to reduce the amount of stormwater that is conveyed to wastewater treatment plants.

Asset Data & Information
To address concerns with inflow & infiltration (I&I), staff aim to become more proactive with flow monitoring. A regular flow monitoring program would help identify I&I at an earlier stage and provide staff with data to inform lifecycle planning.

8.7 Levels of Service

The tables that follow summarize the City's current levels of service with respect to prescribed KPIs under Ontario Regulation 588/17 as well as any additional performance measures that the City has selected for this AMP.

8.7.1 Community Levels of Service

Service Attribute	Qualitative Description	Current LOS (2023)
Scope	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal wastewater system	See Appendix C – Level of Service Maps & Photos
Reliability	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	There were a total of 0 combined sewer overflows (CSO) in Thorold in 2023. The City's Pollution Control Plan assessed the conformance to the Ministry of Environment's (MOE) guidelines for CSO abatement. It was determined that although there is potential for minor overflows, the existing system has adequate capacity to satisfy MOE's requirements.

Service Attribute	Qualitative Description	Current LOS (2023)
	Description of the frequency and volume of overflows in combined sewers in the municipal wastewater system that occur in habitable areas or beaches	The vast majority of wastewater discharged into the sewer system receives full treatment and only a small percentage of this sewage overflows. These overflows usually only occur during periods of heavy rain or during seasonal snow melts. The following outlines the number of sewer overflows and total volume over the last three years: ♦ 2023: 0 ♦ 2022: 0 ♦ 2021: 0
	Description of how stormwater can get into sanitary sewers in the municipal wastewater system, causing sewage to overflow into streets or backup into homes	Stormwater can enter into sanitary sewers due to cracks in sanitary mains or through indirect connections (e.g. weeping tiles). In the case of heavy rainfall events, sanitary sewers may experience a volume of water and sewage that exceeds its designed capacity. In some cases, this can cause water and/or sewage to overflow backup into homes. The disconnection of weeping tiles from sanitary mains and the use of sump pumps and pits directing storm water to the storm drain system can help to reduce the chance of this occurring.
	Description of how sanitary sewers in the municipal wastewater system are designed to be resilient to stormwater infiltration	The municipality follows a series of design standards that integrate servicing requirements, land use considerations, when constructing or replacing sanitary sewers. These standards have been determined with consideration of the minimization of sewage overflows, backups, and inflow and infiltration.

Table 32 O. Reg. 588/17 Community Levels of Service: Sanitary Sewer Services

8.7.2 Technical Levels of Service

Service Attribute	Technical Metric	Current LOS (2023)
Scope	% of properties connected to the municipal wastewater system	93%[6]
Reliability	# 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	0
	# of connection-days per year having wastewater backups compared to the total number of properties connected to the municipal wastewater system	0
	# of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system	0
Quality	Average condition of sanitary sewer services assets	75%
Performance	Actual vs. Target Capital Reinvestment Rate	1.6% vs. 1.5%

Table 33 O. Reg. 588/17 Technical Levels of Service: Sanitary Sewer Services

[6] This figure is based on 2025 metrics.

8.8 Proposed Levels of Service

As per O. Reg. 588/17, by July 1, 2025, municipalities are required to consider proposed levels of service (PLOS), discuss the associated risks and long-term sustainability of these service levels, and explain the City's ability to afford the PLOS.

The below tables and graphs explain the proposed levels of service scenarios that were analyzed for the sanitary sewer services. Further PLOS analysis at the portfolio level can be found in Section *4. Proposed Levels of Service Analysis.*

8.8.1 PLOS Scenarios Analyzed

Scenario	Description
Scenario 1: Achieving 80% Funding in 12 Years	This scenario assumes gradual sanitary rate increases of ~0.3%/year, stabilizing at 80% funding in 12 years. ♦ Because of a gradual reduction in subsidization through the Urban Service Area Levy, sanitary services capital funding gradually decreases from $2.5m/year to $1.9m/year over a span of 12 years
Scenario 2: Achieving 90% Funding in 12 Years	This scenario assumes gradual sanitary rate increases of ~0.5%/year, stabilizing at 90% funding in 12 years. ♦ Because of a gradual reduction in subsidization through the Urban Service Area Levy, sanitary services capital funding gradually decreases from $2.5m/year to $2.1m/year over a span of 12 years
Scenario 3: Achieving 100% Funding in 12 Years	This scenario assumes gradual sanitary rate increases of ~0.8%/year, stabilizing at 100% funding in 12 years. ♦ Because of a gradual reduction in subsidization through the Urban Service Area Levy, sanitary services capital funding gradually decreases from $2.5m/year to $2.4m/year over a span of 12 years

Table 34 Sanitary Sewer Services PLOS Scenario Descriptions

Note: *Funding for the Sanitary Services Network includes a decreasing proportion of the Urban Service Area Levy over the implementation period. Refer to Section 16. Financial Strategy for more information.*

8.8.2 PLOS Analysis Results

Scenario	Technical LOS Outcomes	Initial Value (2025)	15 Year Projection (2039)	30 Year Projection (2054)	Comments
Scenario 1 (80%)	Average Condition	75%	80%	80%	
	Average Asset Risk	5.4	4.8	4.6	
	Average Annual Investment		$1,882,000		Increase sanitary rates by ~0.3% per year for 12 years
	Average Capital re-investment rate		1.2%		
Scenario 2 (90%)	Average Condition	75%	81%	80%	
	Average Asset Risk	5.4	4.7	4.6	
	Average Annual Investment		$2,118,000		Increase sanitary rates by ~0.5% per year for 12 years
	Average Capital re-investment rate		1.3%		
Scenario 3 (100%)	Average Condition	75%	83%	80%	
	Average Asset Risk	5.4	4.5	4.6	
	Average Annual Investment		$2,353,000		Increase sanitary rates by ~0.8% per year for 12 years
	Average Capital re-investment rate		1.5%		

Table 35 Sanitary Sewer Services PLOS Scenario Analysis

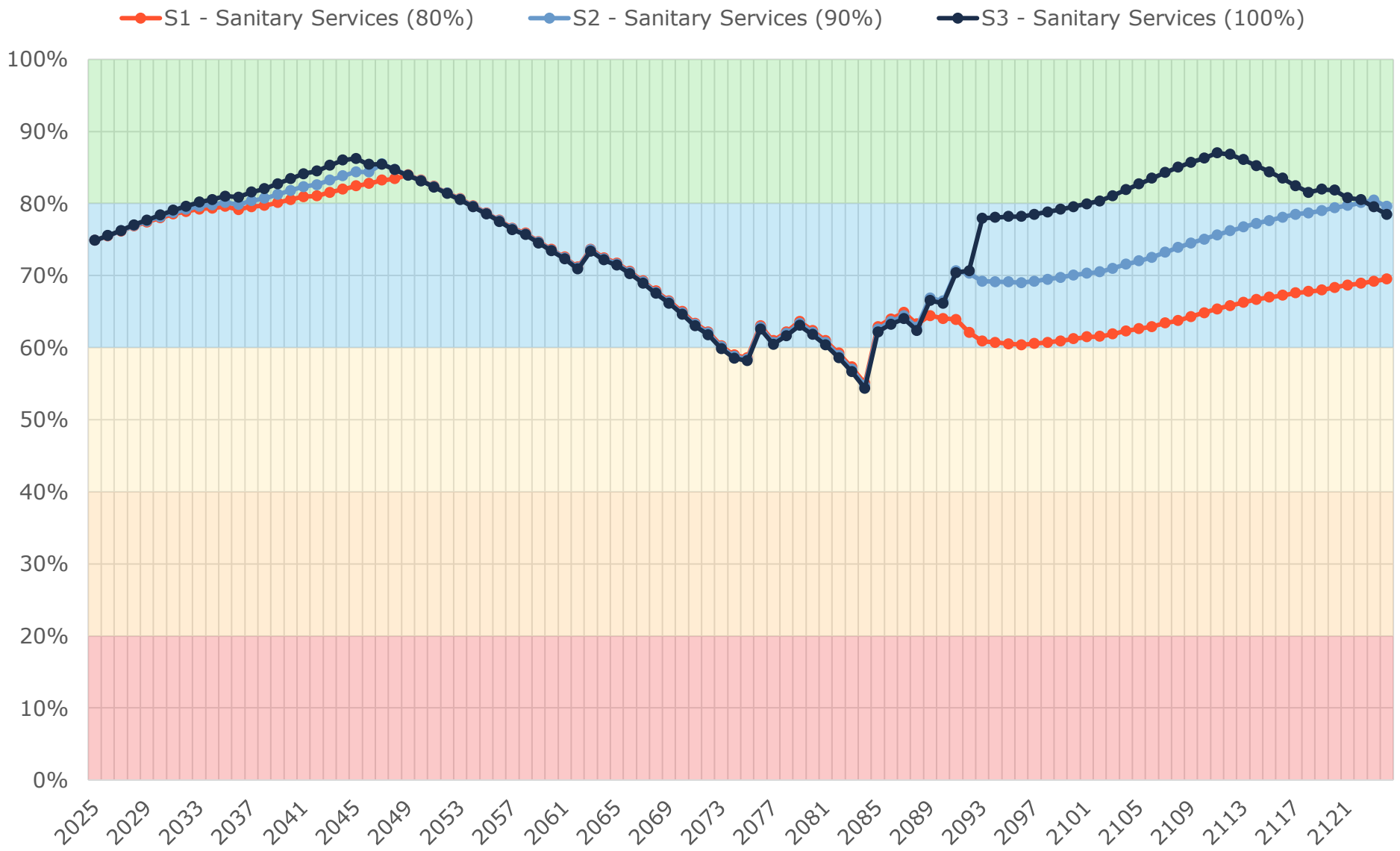


Figure 52 Sanitary Sewer Services PLOS Scenario Condition Results

8.8.3 10-Year PLOS Financial Projections

As outlined in Section *4. Proposed Levels of Service Analysis*, the City of Thorold selected Scenario 3 as their preferred proposed levels of service. The main objective is to increase spending gradually to reach a more sustainable funding level to manage the City's current inventory of assets. The following table outlines the funding trajectory over the next 10 years for the sanitary sewer services if the financial strategy for Scenario 3 is implemented.

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Targeted Capital Spending	**$2.4m**	**$2.4m**	**$2.4m**	**$2.4m**	**$2.4m**	**$2.4m**	**$2.4m**	**$2.4m**	**$2.4m**	**$2.4m**
Projected Capital Spending	$2.5m	$2.5m	$2.5m	$2.5m	$2.5m	$2.5m	$2.5m	$2.5m	$2.5m	$2.4m
Funding Deficit	($152k)	($145k)	($138k)	($132k)	($126k)	($121k)	($116k)	($112k)	($109k)	($103k)
Target Reinvestment Rate	**1.5%**	**1.5%**	**1.5%**	**1.5%**	**1.5%**	**1.5%**	**1.5%**	**1.5%**	**1.5%**	**1.5%**
Projected Reinvestment Rate	1.6%	1.6%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%

Table 36 Sanitary Sewer Services 10-Year PLOS Financial Projections

9. Storm Water Services

The City's storm water services comprises sewer mains and other critical supporting capital assets with a total current replacement cost of approximately $136 million. The City is responsible for over 60 kilometers of storm mains.

9.1 Inventory & Valuation

Table 37 summarizes the quantity and current replacement cost of all storm water services assets available in the City's asset register.

Segment	Quantity	Unit of Measure	Replacement Cost	Primary RC Method
Storm Mains (less than 200mm)	1.1	Length (km)	$1,893,483	Cost per Unit
Storm Mains (250mm - 450mm)	32.0	Length (km)	$54,673,009	Cost per Unit
Storm Mains (525mm - 800mm)	17.6	Length (km)	$42,932,904	Cost per Unit
Storm Mains (825mm - 1200mm)	9.7	Length (km)	$20,777,372	Cost per Unit
Storm Mains (1350mm - 2200mm)	6.0	Length (km)	$15,466,181	Cost per Unit
TOTAL			**$135,742,949**	

Table 37 Detailed Asset Inventory: Storm Water Services

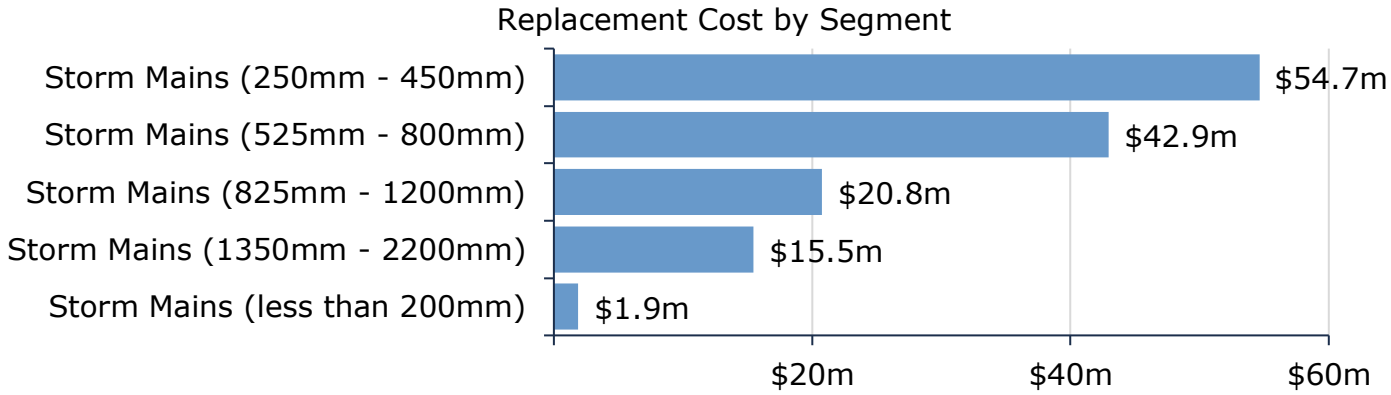


Figure 53 Portfolio Valuation: Storm Water Services

9.2 Asset Condition

Figure 54 summarizes the replacement cost-weighted condition of the City's storm water services assets. Based on age data only, approximately 13% of assets are in poor to very poor condition. These assets may be candidates for replacement in the short term; similarly, assets in fair condition may require rehabilitation or replacement in the medium term and should be monitored for further degradation in condition.

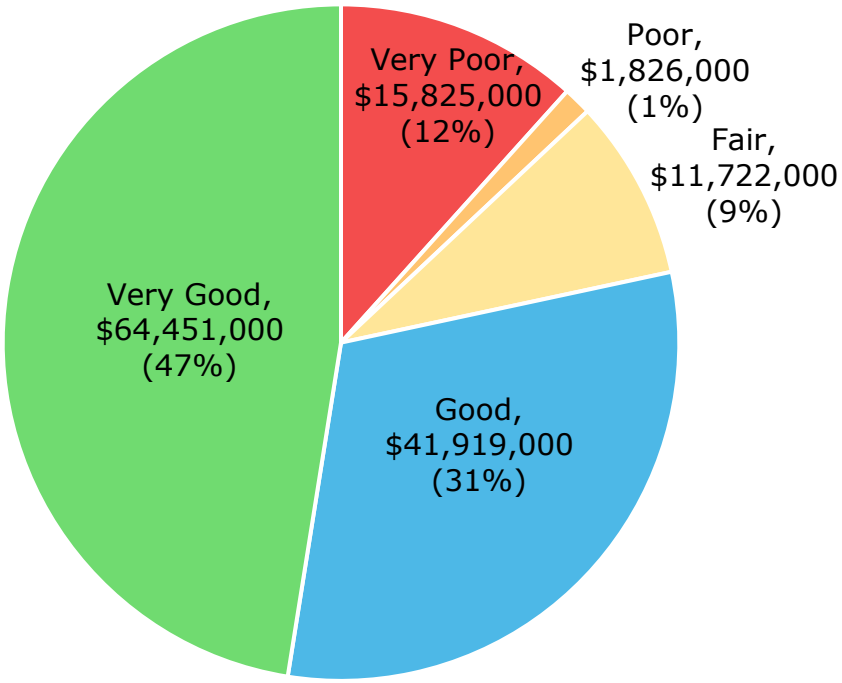


Figure 54 Asset Condition: Storm Water Services Overall

Figure 55 summarizes the age-based condition of storm water services assets. The analysis illustrates that the majority of stormwater mains are in fair or better condition, with slight variations depending on pipe diameter. However, 13% of mains, with a current replacement cost of $17.6 million, are in poor or worse condition.

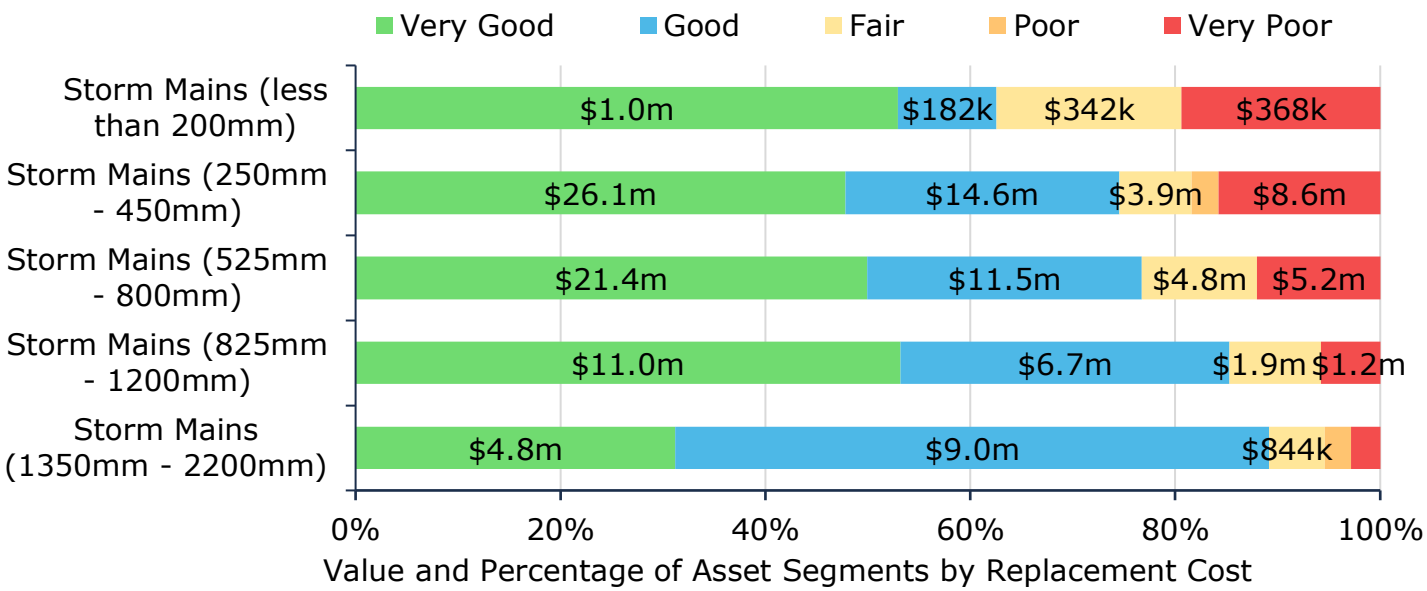


Figure 55 Asset Condition: Storm Water Services by Segment

9.3 Age Profile

An asset's age profile comprises two key values: estimated useful life (EUL), or design life; and the percentage of EUL consumed. The EUL is the serviceable lifespan of an asset during which it can continue to fulfil its intended purpose and provide value to users, safely and efficiently. As assets age, their performance diminishes, often more rapidly as they approach the end of their design life.

In conjunction with condition data, an asset's age profile provides a more complete summary of the state of infrastructure. It can help identify assets that may be candidates for further review through condition assessment programs; inform the selection of optimal lifecycle strategies; and improve planning for potential replacement spikes.

Figure 56 illustrates the average current age of each asset type and its estimated useful life. Both values are weighted by the replacement cost of individual assets.

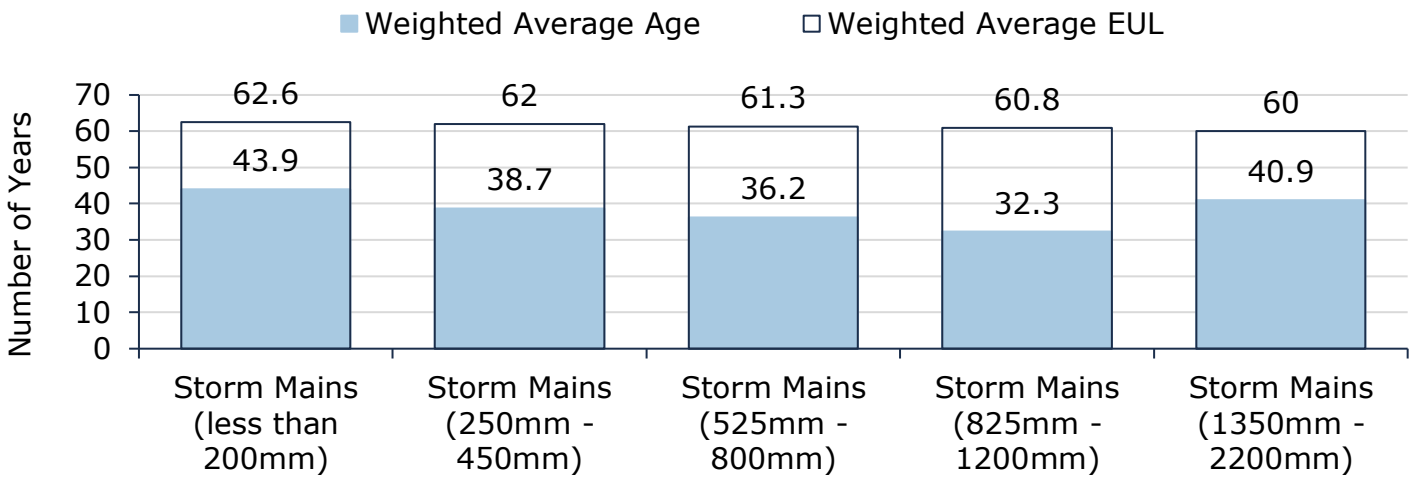


Figure 56 Estimated Useful Life vs. Asset Age: Storm Water Services

Age analysis reveals that on average, storm mains are generally in the mid-to-late stages of their lifecycles. Age profiles and CCTV inspections will help to identify mains in need of replacements and/or upgrades. Extensions to EULs for mains may also be considered based on performance history to date.

9.4 Current Approach to Lifecycle Management

The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

The following table outlines the City's current lifecycle management strategy.

Activity Type	Description of Current Strategy
Maintenance	Catch basins are cleaned annually and outlets are inspected regularly to ensure unobstructed outflow
	All other maintenance activities are completed on a reactive basis when operational issues are identified (e.g. blockages, backups)
Rehabilitation/ Replacement	There are few regular rehabilitation or replacement requirements for storm sewer infrastructure. Priorities are typically driven by needs related to sanitary mains where work can simultaneously be completed to address storm sewers

Table 38 Lifecycle Management Strategy: Storm Water Services

9.5 Forecasted Long-Term Replacement Needs

Figure 57 illustrates the cyclical short-, medium- and long-term infrastructure replacement requirements for the City's storm water services assets. This analysis was run until 2098 to

capture at least one iteration of replacement for the longest-lived asset in Citywide Assets, the City's primary asset management system and asset register. The City's average annual requirements (red dotted line) total **$2.2 million per year** for all assets in the storm water services. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

The chart illustrates an age-based backlog of $15.8 million, dominated by smaller diameter storm mains. While minimal replacements are anticipated in the next decade, beginning in 2034 significant investment will be required. These projections and estimates are based on asset replacement costs and age analysis. They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades.

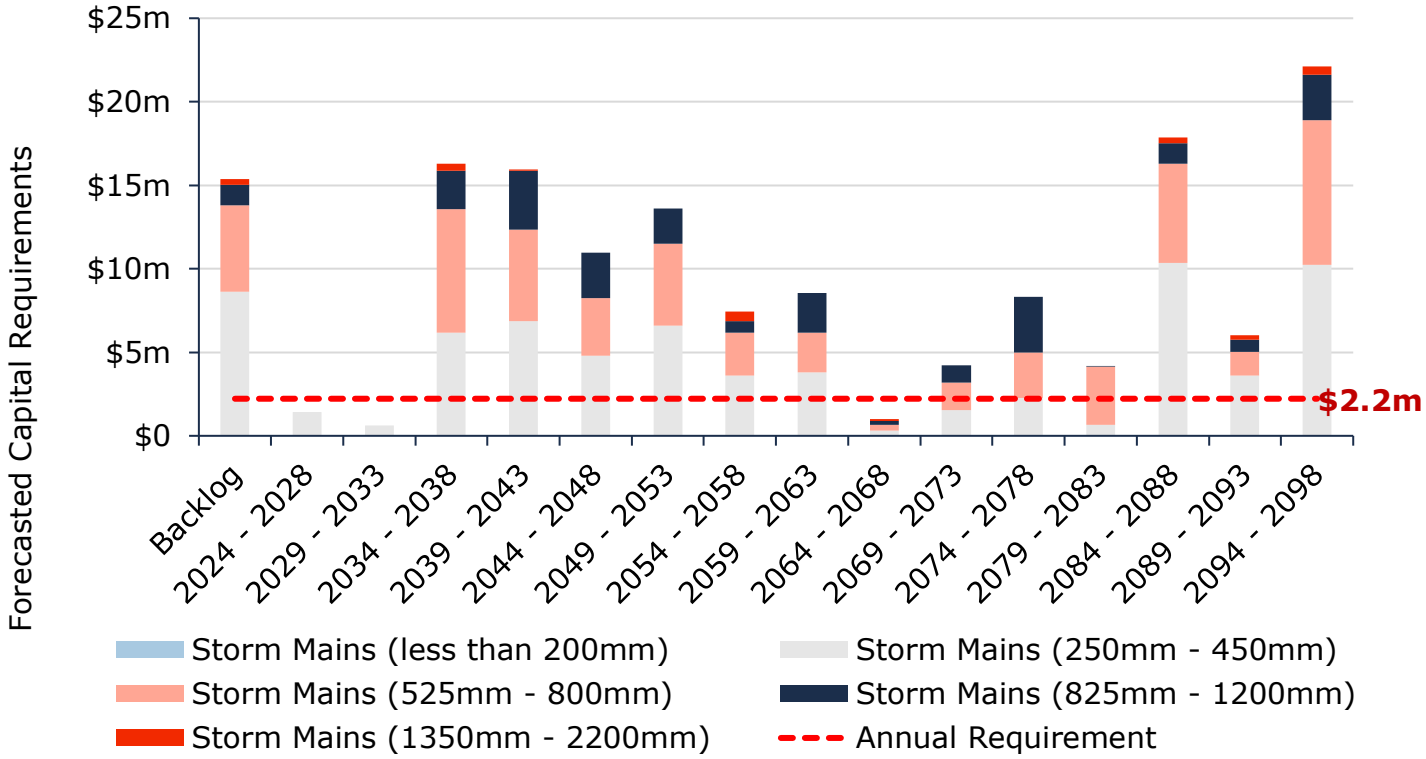


Figure 57 Forecasted Capital Replacement Needs Storm Water Services 2024-2098

Often, the magnitude of replacement needs is substantially higher than most municipalities can afford to fund. In addition, most assets may not need to be replaced. However, quantifying and monitoring these spikes is essential for long-term financial planning, including establishing dedicated reserves. CCTV inspections may reveal a higher or lower backlog. The inspections may also help reduce long-term projections by providing more accurate condition data for mains than age. In addition, a robust risk framework will ensure that high-criticality assets receive proper and timely lifecycle intervention, including replacements.

A summary of the 10-year replacement forecast can be found in Appendix B – 10-Year Capital Requirements.

9.6 Risk Analysis

The risk matrix below is generated using available asset data, including condition and pipe diameter.

The matrix stratifies assets based on their individual probability and consequence of failure, each scored from 1 to 5. Their product generates a risk index ranging from 1-25. Assets with the highest criticality and likelihood of failure receive a risk rating of 25; those with lowest probability of failure and lowest criticality carry a risk rating of 1. As new data and information is gathered, the City may consider integrating relevant information that improves confidence in the criteria used to assess asset risk and criticality.

These risk models have been built into the City's Asset Management Database (Citywide Assets). See *Risk & Criticality* section for further details on approach used to determine asset risk ratings and classifications.

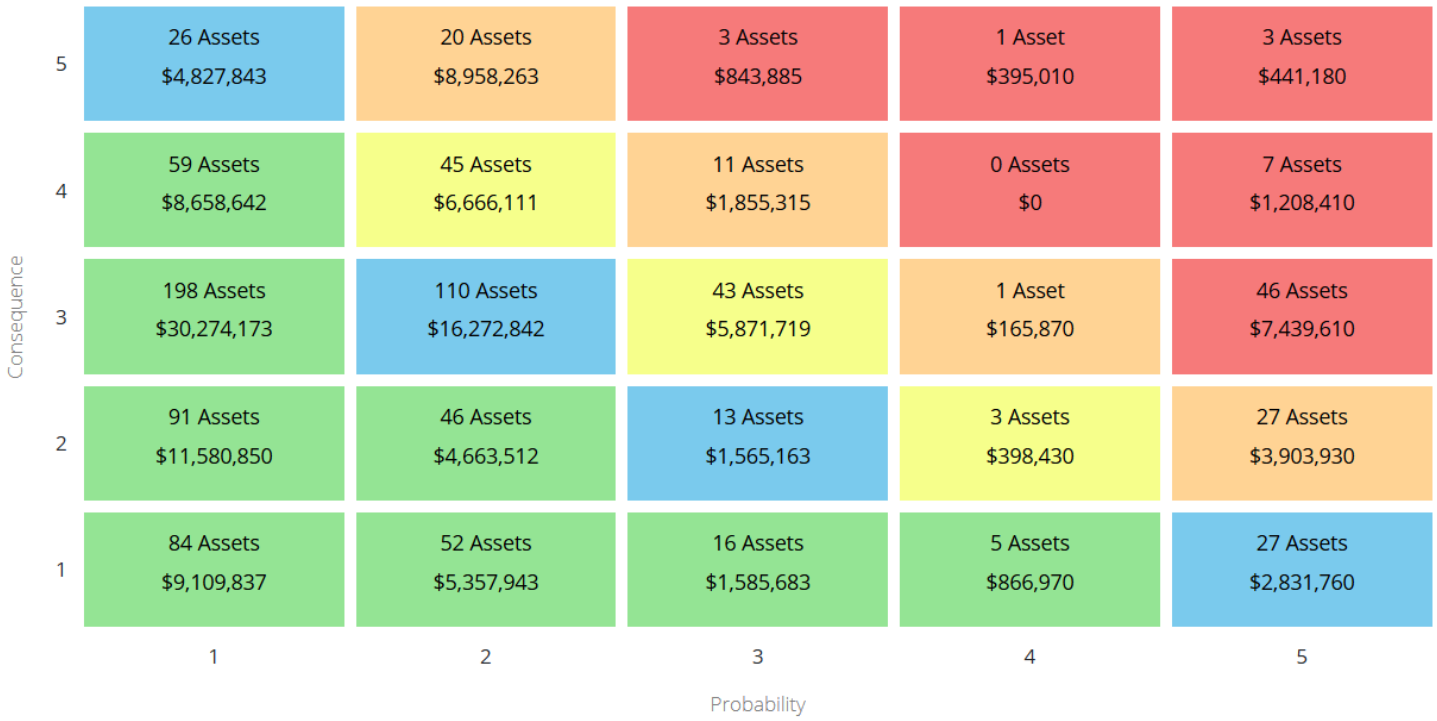


Figure 58 Risk Matrix: Storm Water Services

9.6.1 Qualitative Risks

The following section summarizes key trends, challenges, and risks to storm water services assets as identified by the City:

Asset Data & Information

There is a lack of confidence in the available inventory data for storm sewers. Staff plan to prioritize data refinement efforts to increase confidence in the accuracy and reliability of asset data and information. Once completed there will be greater confidence in the development of data-driven strategies to address infrastructure needs.

Assumption of New Infrastructure

There are several stormwater management ponds that have recently been built or are in the planning process but have not yet been assumed by the City. Once assumed they will be the City's responsibility and staff need to start planning to determine maintenance and rehabilitation requirements.

9.7 Levels of Service

The tables that follow summarize the City's current levels of service with respect to prescribed KPIs under Ontario Regulation 588/17 as well as any additional performance measures that the City has selected for this AMP.

9.7.1 Community Levels of Service

Service Attribute	Qualitative Description	Current LOS (2023)
Scope	Description, which may include map, of the user groups or areas of the City that are protected from flooding, including the extent of protection provided by the municipal storm water network	All commercial, industrial, institutional and urban residential development proposals, including intensification and redevelopment proposals are supported by a Stormwater Management Report (SWM). The SWM Report is prepared by a qualified professional with the primary intent to: ♦ provide recommendations on a stormwater quantity system ♦ document possible impacts of development on watershed flow regimes ♦ document the means by which stormwater volume control will be provided and, ♦ determine measures required during construction to mitigate potential negative impacts of development.

Table 39 O. Reg. 588/17 Community Levels of Service: Storm Water Services

9.7.2 Technical Levels of Service

Service Attribute	Technical Metric	Current LOS (2023)
Scope	% of properties in municipality designed to be resilient to a 100-year storm	0%
	% of the municipal stormwater management system designed to be resilient to a 5-year storm	90%
Quality	Average condition of storm water services assets	71%
Performance	Actual vs. Target Capital Reinvestment Rate	0.5% vs. 1.6%

Table 40 O. Reg. 588/17 Technical Levels of Service: Storm Water Services

9.8 Proposed Levels of Service

As per O. Reg. 588/17, by July 1, 2025, municipalities are required to consider proposed levels of service (PLOS), discuss the associated risks and long-term sustainability of these service levels, and explain the City's ability to afford the PLOS.

The below tables and graphs explain the proposed levels of service scenarios that were analyzed for the storm water services. Further PLOS analysis at the portfolio level can be found in Section *4. Proposed Levels of Service Analysis.*

9.8.1 PLOS Scenarios Analyzed

Scenario	Description
Scenario 1: Achieving 50% Funding in 12 Years	This scenario assumes gradual tax increases of ~0.5%/year, stabilizing at 50% funding across all tax-funded asset categories in 12 years. ♦ Stormwater capital funding benefits from 'overfunded' asset category funding being reallocated during early years of implementation and gradually increases from $855k/year to $1.1m/year over a span of 12 years
Scenario 2: Achieving 75% Funding in 12 Years	This scenario assumes gradual tax increases of ~2.0%/year, stabilizing at 75% funding across all tax-funded asset categories in 12 years. ♦ Stormwater capital funding gradually increases from $687k/year to $1.7m/year over a span of 12 years
Scenario 3: Achieving 100% Funding in 12 Years	This scenario assumes gradual tax increases of ~3.3%/year, stabilizing at 100% funding across all tax-funded asset categories in 12 years. ♦ Stormwater capital funding gradually increases from $684k/year to $2.2m/year over a span of 12 years

Table 41 Storm Water Services PLOS Scenario Descriptions

9.8.2 PLOS Analysis Results

Scenario	Technical LOS Outcomes	Initial Value (2025)	15 Year Projection (2039)	30 Year Projection (2054)	Comments
Scenario 1 (50%)	Average Condition	70%	55%	45%	
	Average Asset Risk	5.9	8.4	9.3	
	Average Annual Investment		$1,110,000		Increase taxes by ~0.5% per year for 12 years
	Average Capital re-investment rate		0.8%		
Scenario 2 (75%)	Average Condition	70%	58%	54%	
	Average Asset Risk	5.9	8.1	8.1	
	Average Annual Investment		$1,665,000		Increase taxes by ~2.0% per year for 12 years
	Average Capital re-investment rate		1.2%		
Scenario 3 (100%)	Average Condition	70%	61%	63%	
	Average Asset Risk	5.9	7.6	6.9	
	Average Annual Investment		$2,221,000		Increase taxes by ~3.3% per year for 12 years
	Average Capital re-investment rate		1.6%		

Table 42 Storm Water Services PLOS Scenario Analysis

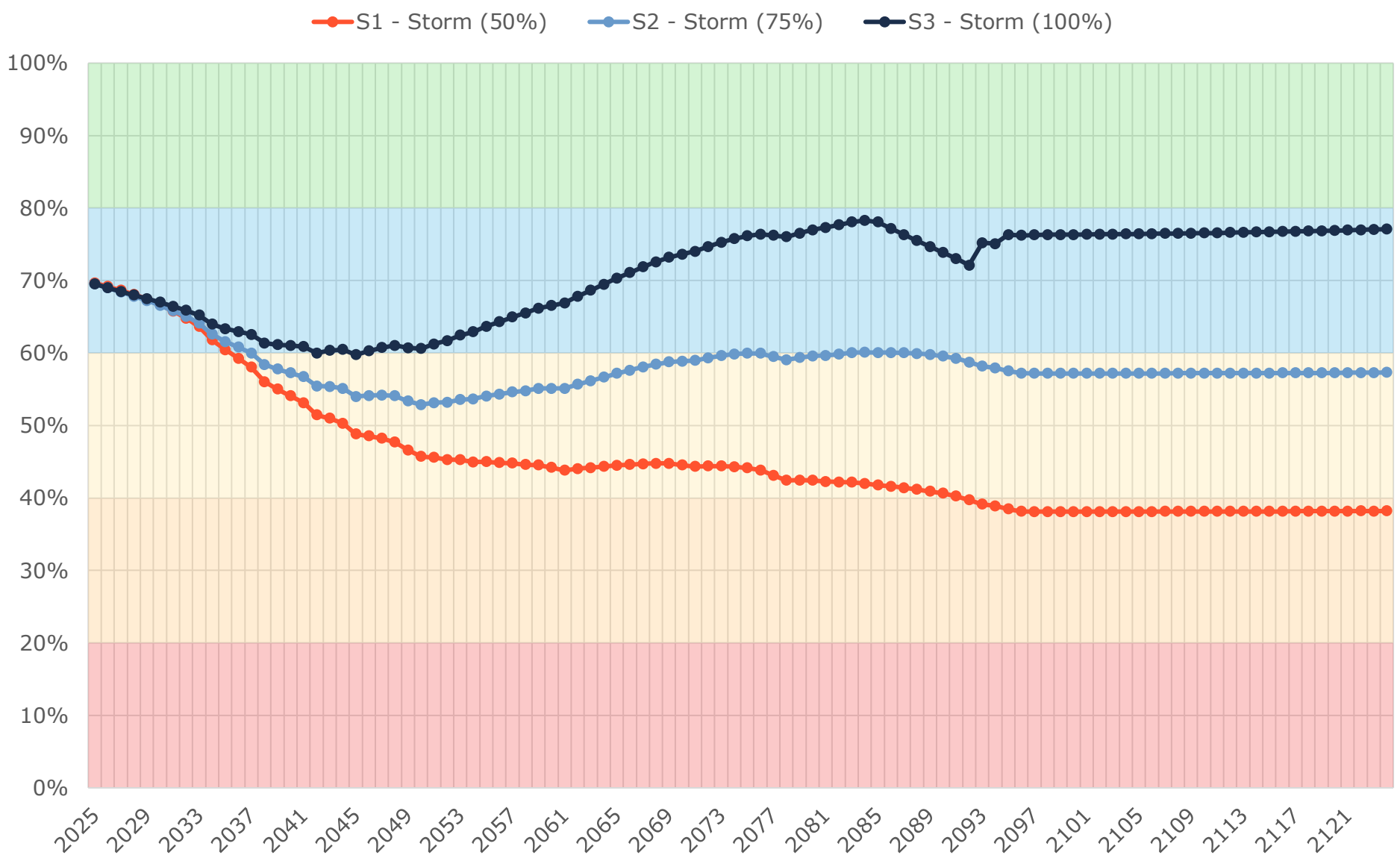


Figure 59 Storm Water Services PLOS Scenario Condition Results

9.8.3 10-Year PLOS Financial Projections

As outlined in Section *4. Proposed Levels of Service Analysis*, the City of Thorold selected Scenario 3 as their preferred proposed levels of service. The main objective is to increase spending gradually to reach a more sustainable funding level to manage the City's current inventory of assets. The following table outlines the funding trajectory over the next 10 years for the storm water services if the financial strategy for Scenario 3 is implemented.

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Targeted Capital Spending	**$2.2m**	**$2.2m**	**$2.2m**	**$2.2m**	**$2.2m**	**$2.2m**	**$2.2m**	**$2.2m**	**$2.2m**	**$2.2m**
Projected Capital Spending	$805k	$946k	$1.1m	$1.2m	$1.3m	$1.5m	$1.6m	$1.7m	$1.9m	$2.0m
Funding Deficit	$1.4m	$1.3m	$1.2m	$1.0m	$901k	$768k	$631k	$489k	$342k	$191k
Target Reinvestment Rate	**1.6%**	**1.6%**	**1.6%**	**1.6%**	**1.6%**	**1.6%**	**1.6%**	**1.6%**	**1.6%**	**1.6%**
Projected Reinvestment Rate	0.6%	0.7%	0.8%	0.9%	1.0%	1.1%	1.2%	1.3%	1.4%	1.5%

Table 43 Storm Water Services 10-Year PLOS Financial Projections

Category Analysis: Non-Core Assets

10. Facilities

The City's facilities portfolio includes public works facilities, city hall, fire stations, and recreation facilities such as arenas. The total current replacement of facilities is estimated at more than $107 million.

10.1 Inventory & Valuation

Table 44 summarizes the quantity and current replacement cost of all buildings assets available in the City's asset register. The quantity listed represents the number of asset records currently available for each department.

Segment	Quantity	Unit of Measure	Replacement Cost	Primary RC Method
Health & Social Services	2 (55)	Facilities (Components)	$3,084,500	CPI
Municipal Offices	1 (100)	Facilities (Components)	$9,061,544	CPI
Protection Services	4 (351)	Facilities (Components)	$19,996,315	CPI
Public Works	3 (223)	Facilities (Components)	$13,844,740	CPI
Recreation	15 (897)	Facilities (Components)	$61,323,216	CPI
TOTAL			**$107,310,315**	

Table 44 Detailed Asset Inventory: Facilities

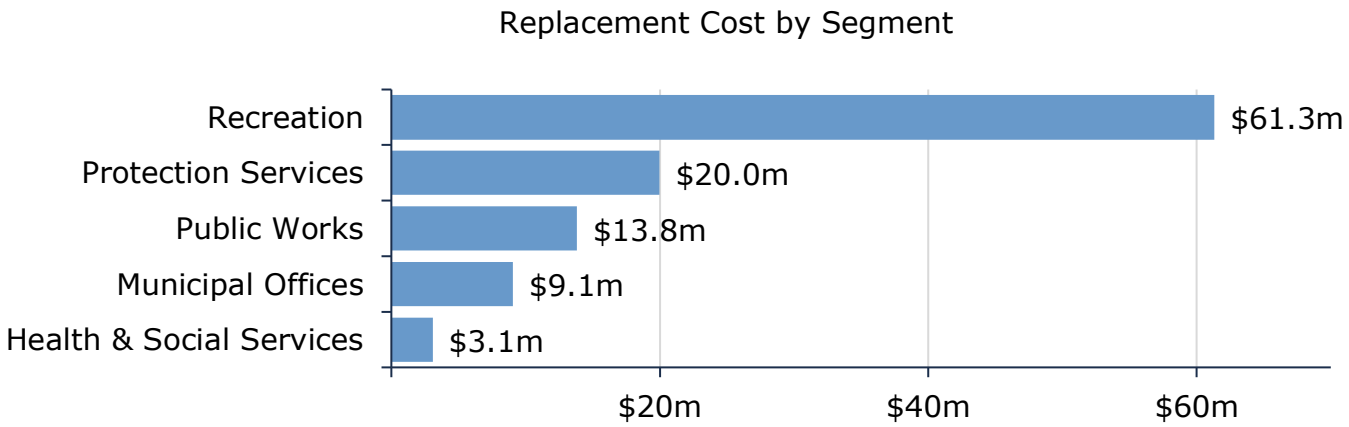


Figure 60 Portfolio Valuation: Facilities

Note: *The above inventory analysis does not include the City's expanded Municipal Operations Centre or new Fire Hall. Because the Asset Management Plan (AMP) is based on year-end 2023 values, and each of these facilities was not completed, they will be incorporated in future AMP updates.*

The expansion to the Municipal Operations Centre was projected to cost $13 million, segmented into the facility itself, land improvements (fencing and parking area), machinery and equipment (stationary equipment, computers, furniture, etc.), and utility connections (sanitary and storm main upgrades).

Considering only the assets that would fall within the Facilities category, the estimated construction cost is approximately $8.1 million. Calculating an average estimated useful life of 56 years (weighted by cost – structural EUL of 75 years, architectural finishes EUL of 40 years, HVAC EULs of 25-30 years, etc.) equates to $146,000 in annual requirement for the Municipal Operations Centre. This figure would be reduced by the amount equal to the existing assets in the City's inventory which have been replaced as part of the expansion project.

With the same philosophy as above, the new Fire Hall was projected to cost $12 million, with the facility itself representing $9.1 million of that figure. Calculating a weighted average estimated useful life of 56 years equates to $163,000 in annual requirement. This figure would be reduced by the amount equal to the old fire hall, if that facility was sold or demolished.

These facilities should be incorporated into budget projections to ensure future capital investments are being funded through reserves savings.

10.2 Asset Condition

Figure 67 summarizes the replacement cost-weighted condition of the City's facilities portfolio. Based primarily on conditions assessments conducted in 2021, 86% of facilities assets are in fair or better condition; however, 14%, with a current replacement cost of more than $14 million are in poor or worse condition. These assets may be candidates for replacement in the short term; similarly, assets in fair condition may require rehabilitation or replacement in the medium term and should be monitored for further degradation in condition.

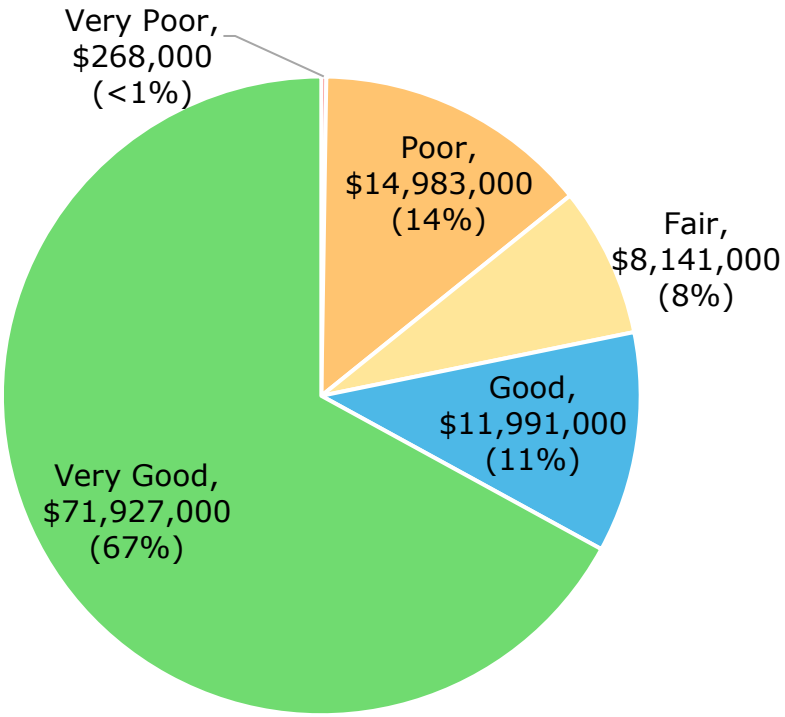


Figure 61 Asset Condition: Facilities Overall

Figure 62 summarizes the age-based condition of facilities by each department. A similar distribution of conditions are seen across all departments indicating that no particular service area is being favored or neglected.

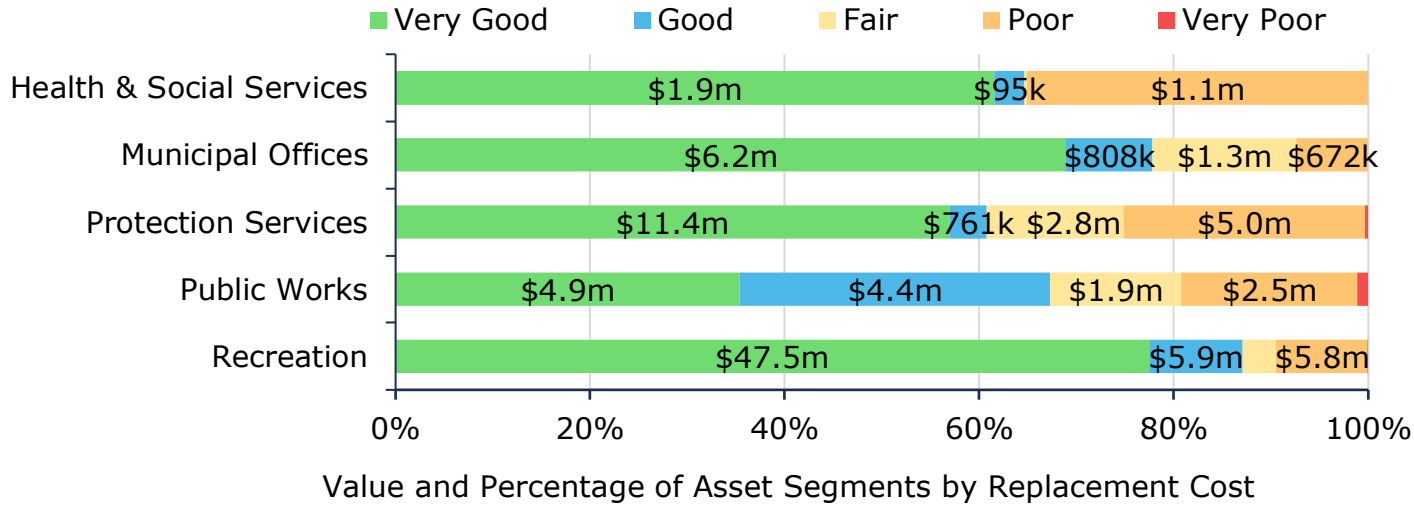


Figure 62 Asset Condition: Facilities by Segment

10.3 Age Profile

An asset's age profile comprises two key values: estimated useful life (EUL), or design life; and the percentage of EUL consumed. The EUL is the serviceable lifespan of an asset during which it can continue to fulfil its intended purpose and provide value to users, safely and efficiently. As assets age, their performance diminishes, often more rapidly as they approach the end of their design life.

In conjunction with condition data, an asset's age profile provides a more complete summary of the state of infrastructure. It can help identify assets that may be candidates for further review through condition assessment programs; inform the selection of optimal lifecycle strategies; and improve planning for potential replacement spikes.

Figure 63 illustrates the average current age of each asset type and its estimated useful life. Both values are weighted by the replacement cost of individual assets.

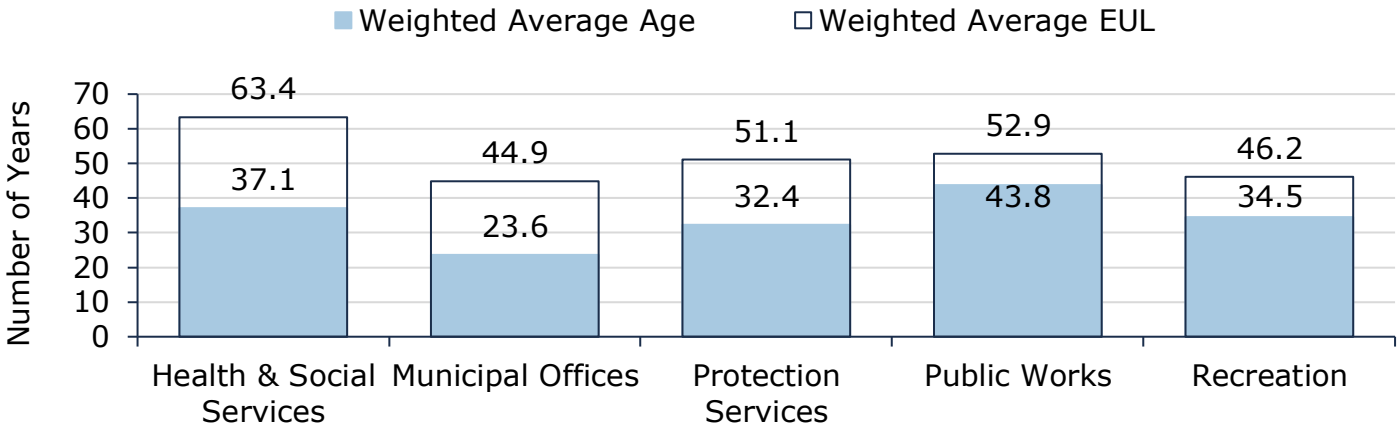


Figure 63 Estimated Useful Life vs. Asset Age: Facilities

Age analysis reveals that, on average, facilities assets are in the mid to late stages of their serviceable life, with public works having the most assets approaching their originally projected end of life. On-going maintenance and rehabilitation efforts may assist in extending service lives beyond original projections.

10.4 Current Approach to Lifecycle Management

The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

Table 45 outlines the City's current lifecycle management strategy.

Activity Type	Description of Current Strategy
Maintenance	Inspections and servicing are completed as per minimum maintenance standards: HVAC conducted quarterly, generators conducted monthly, elevators conducted every 6 months and boilers once a year.
	Servicing reports are reviewed by management staff and typically most, if not all, recommendations are accepted and followed.
	Beginning in 2021 Building Condition Assessments (BCA) was completed on all facility assets. The data collected through the assessments identified recommended repairs and replacement schedules. This information is central to the selection of long-term capital projections. In some cases, the BCA recommend studies to better understand existing state, functionality, and risks (i.e., presence of asbestos) and develop infrastructure management solutions accordingly.
Rehabilitation/ Replacement	Historically many asset replacements have been reactive based on asset component failure. With the completion of the BCA the City intends to become more proactive in their asset lifecycle activities.
	Currently, capital projects are forecasted based on a 10-year planning horizon. Generally, clarity of projects is highest in the first 1-4 years of the plan with projects planned in years 5 and beyond more likely to change over time.

Table 45 Lifecycle Management Strategy: Facilities

10.5 Forecasted Long-Term Replacement Needs

Figure 64 illustrates the cyclical short-, medium- and long-term infrastructure replacement requirements for the City's facilities portfolio. This analysis was run until 2103 to capture at least one iteration of replacement for the longest-lived asset in Citywide Assets, the City's primary asset management system and asset register. The City's average annual requirements (red dotted line) total **$3.4 million per year** for all facilities. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

Replacement needs are forecasted to fluctuate over the next 80 years, with a significant spike between 2079 and 2083 as critical infrastructure reaches the end of its useful life. These projections and estimates are based on current asset records, their replacement costs, and age analysis. They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades.

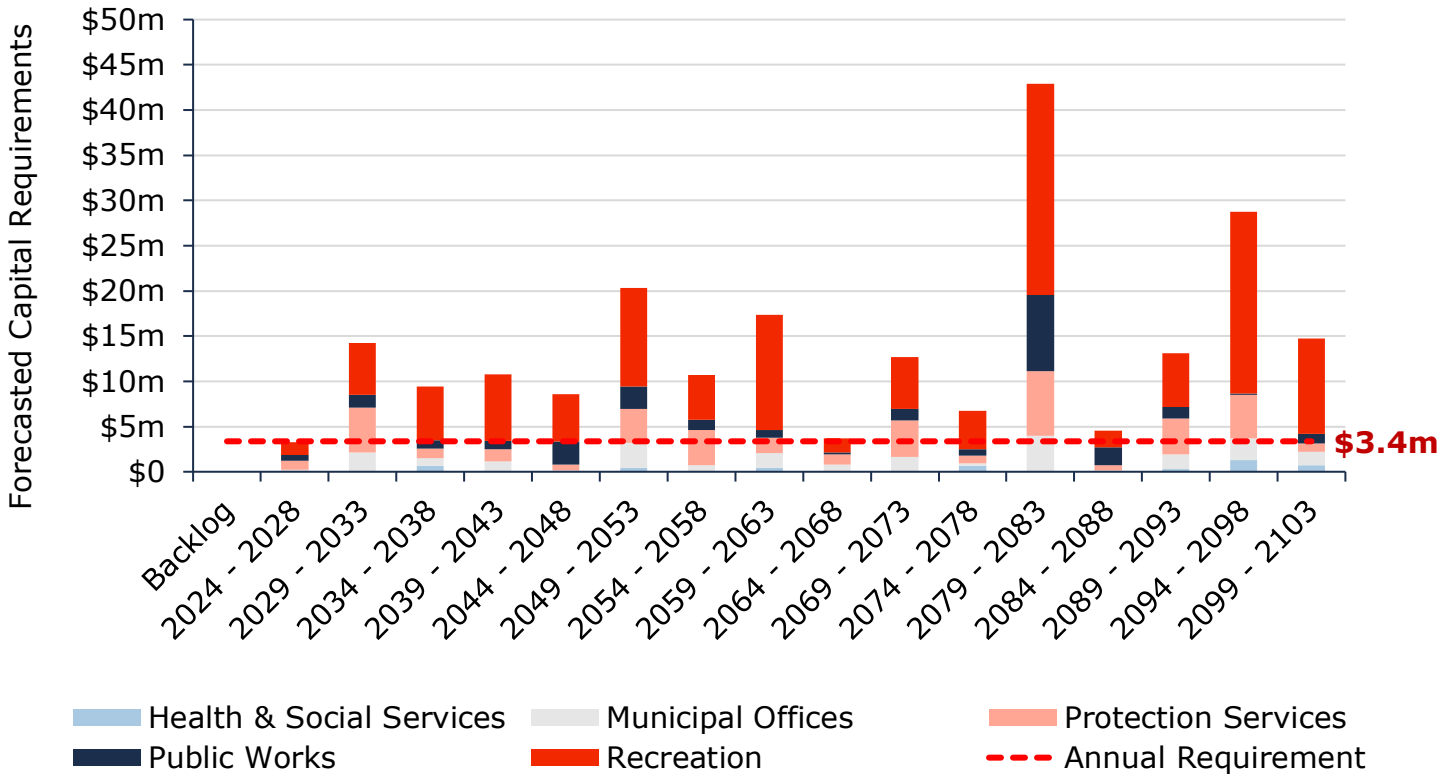


Figure 64 Forecasted Capital Replacement Needs Facilities 2024-2103

Often, the magnitude of replacement needs is substantially higher than most municipalities can afford to fund. In addition, most assets may not need to be replaced. However, quantifying and monitoring these spikes is essential for long-term financial planning, including establishing dedicated reserves. In addition, a robust risk framework will ensure that high-criticality assets receive proper and timely lifecycle intervention, including replacements. In the case of buildings and facilities, detailed componentization is necessary to develop more reliable lifecycle forecasts that reflect the needs of individual elements and components.

A summary of the 10-year replacement forecast can be found in Appendix B – 10-Year Capital Requirements.

10.6 Risk Analysis

The risk matrix below is generated using available asset data, including condition, service life remaining, replacement costs, and building component function. The risk ratings for assets without useful attribute data were calculated using only age, service life remaining, and their replacement costs.

The matrix classifies assets based on their individual probability and consequence of failure, each scored from 1 to 5. Their product generates a risk index ranging from 1-25. Assets with the highest criticality and likelihood of failure receive a risk rating of 25; those with lowest probability of failure and lowest criticality carry a risk rating of 1. As new data and information is gathered, the City may consider integrating relevant information that improves confidence in the criteria used to assess asset risk and criticality.

These risk models have been built into the City's Asset Management Database (Citywide Assets). See *Risk & Criticality* section for further details on approach used to determine asset risk ratings and classifications.

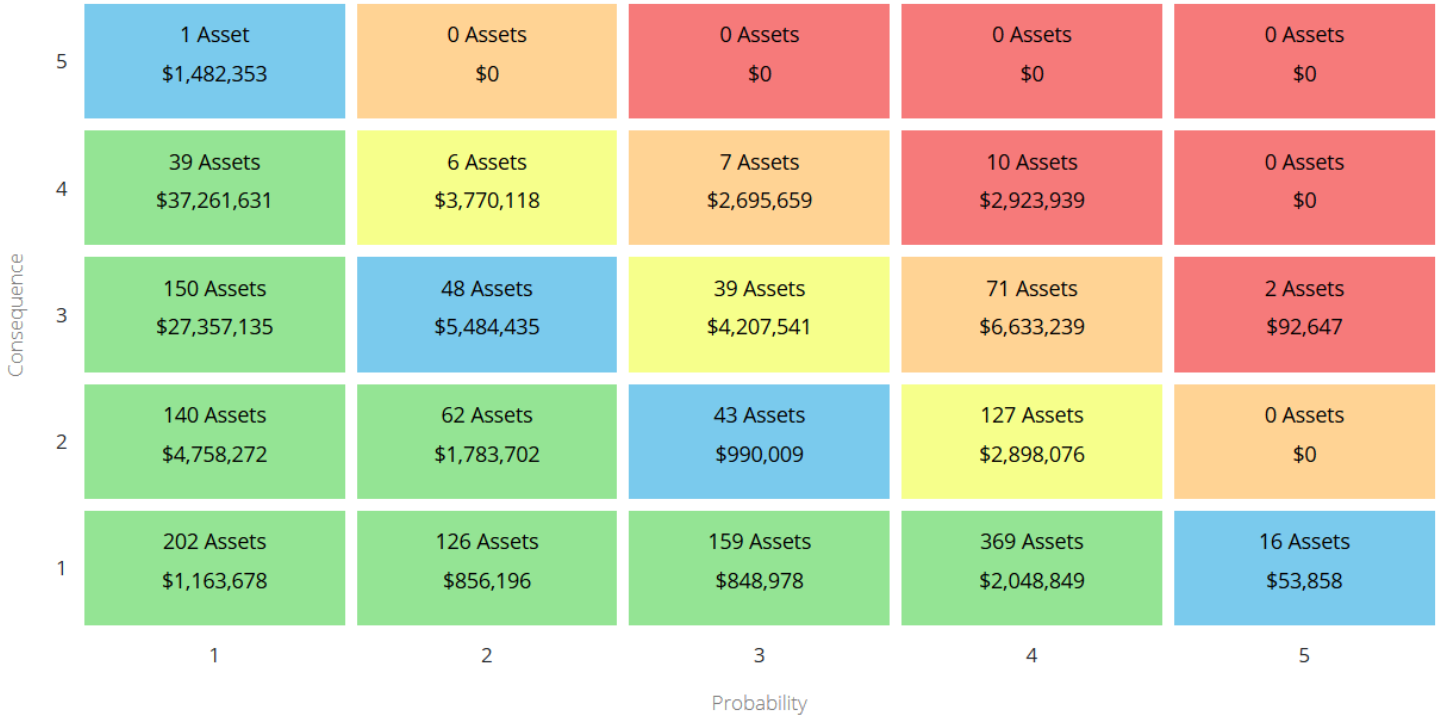


Figure 65 Risk Matrix: Facilities

10.6.1 Qualitative Risks

The following section summarizes key trends, challenges, and risks to facilities assets as identified by the City:

Staff Capacity & Asset Records

Currently not all municipal facilities have a full-time maintenance staff assigned to them. This often creates challenges in both identifying and responding to emergent issues in a timely manner. In some instances (e.g., flooding), the lack of immediate response results in more severe damage than would have occurred otherwise. In addition, due to the age of some facilities building records may be not available or not comprehensive. This lack of information can create challenges when working to inform capital project decisions.

Population Growth

Between 2016 and 2021 Thorold's population increased by 25%, making it the 8th fastest growing city in Canada. This rapid population growth has increased demand for recreational and community facilities. To service the existing and future population growth, the City must prioritize expanding both its operational capacity and capital resources to serve a larger population.

10.7 Levels of Service

The tables that follow summarize the City's current levels of service. There are no specifically prescribed KPIs under Ontario Regulation 588/17 for non-core assets, therefore the KPIs below represent performance measures that the City has selected for this AMP.

10.7.1 Community Levels of Service

Service Attribute	Qualitative Description	Current LOS (2023)
Safe	Appropriate actions and interventions are taken to ensure the regular safe use of facility assets.	Emergent issues are identified and responded to in a timely manner by municipal staff. A comprehensive listing of required repairs has been identified through the BCA; these are reflected in the capital forecasts.
Affordable	Facilities are managed as cost effectively as possible and longer-term costs are identified so that they can be adequately planned for.	Municipal facilities are operated and maintained by both internal staff and external contractors as per minimum maintenance standards. Long-term capital requirements have been identified and financial strategy and planning is underway.
Sustainable	Description of the current condition of municipal facilities and the plans that are in place to maintain or improve the provided level of service	The City of Thorold owns a total of 18 facilities which include community centers, city halls, and fire stations. Based on third-party conducted building condition assessments the average facility asset condition is 81%. With this information the City is working to develop long-term plans to work towards meeting the capital requirements.

Table 46 Community Levels of Service: Facilities

10.7.2 Technical Levels of Service

Service Attribute	Technical Metric	Current LOS (2023)
Safety	Total cost of identified repairs by year vs. total planned investment in repairs	Future Metric
Quality	Average condition of facilities assets	81%
Performance	Actual vs. Target Capital Reinvestment Rate	0.4% vs. 3.1%

Table 47 Technical Levels of Service: Facilities

10.8 Proposed Levels of Service

As per O. Reg. 588/17, by July 1, 2025, municipalities are required to consider proposed levels of service (PLOS), discuss the associated risks and long-term sustainability of these service levels, and explain the City's ability to afford the PLOS.

The below tables and graphs explain the proposed levels of service scenarios that were analyzed for facilities. Further PLOS analysis at the portfolio level can be found in Section *4. Proposed Levels of Service Analysis.*

10.8.1 PLOS Scenarios Analyzed

Scenario	Description
Scenario 1: Achieving 50% Funding in 12 Years	This scenario assumes gradual tax increases of ~0.5%/year, stabilizing at 50% funding across all tax-funded asset categories in 12 years. ♦ Facilities capital funding benefits from 'overfunded' asset category funding being reallocated during early years of implementation and gradually increases from $947k/year to $1.7m/year over a span of 12 years
Scenario 2: Achieving 75% Funding in 12 Years	This scenario assumes gradual tax increases of ~2.0%/year, stabilizing at 75% funding across all tax-funded asset categories in 12 years. ♦ Facilities capital funding gradually increases from $458k/year to $2.5m/year over a span of 12 years
Scenario 3: Achieving 100% Funding in 12 Years	This scenario assumes gradual tax increases of ~3.3%/year, stabilizing at 100% funding across all tax-funded asset categories in 12 years. ♦ Facilities capital funding gradually increases from $450k/year to $3.4m/year over a span of 12 years

Table 48 Facilities PLOS Scenario Descriptions

10.8.2 PLOS Analysis Results

Scenario	Technical LOS Outcomes	Initial Value (2025)	15 Year Projection (2039)	30 Year Projection (2054)	Comments
Scenario 1 (50%)	Average Condition	76%	61%	46%	
	Average Asset Risk	6.5	9.4	12.1	
	Average Annual Investment		$1,682,000		Increase taxes by ~0.5% per year for 12 years
	Average Capital re-investment rate		1.6%		
Scenario 2 (75%)	Average Condition	76%	62%	47%	
	Average Asset Risk	6.5	9.3	12.1	
	Average Annual Investment		$2,524,000		Increase taxes by ~2.0% per year for 12 years
	Average Capital re-investment rate		2.4%		
Scenario 3 (100%)	Average Condition	76%	62%	47%	
	Average Asset Risk	6.5	9.3	12.1	
	Average Annual Investment		$3,365,000		Increase taxes by ~3.3% per year for 12 years
	Average Capital re-investment rate		3.1%		

Table 49 Facilities PLOS Scenario Analysis

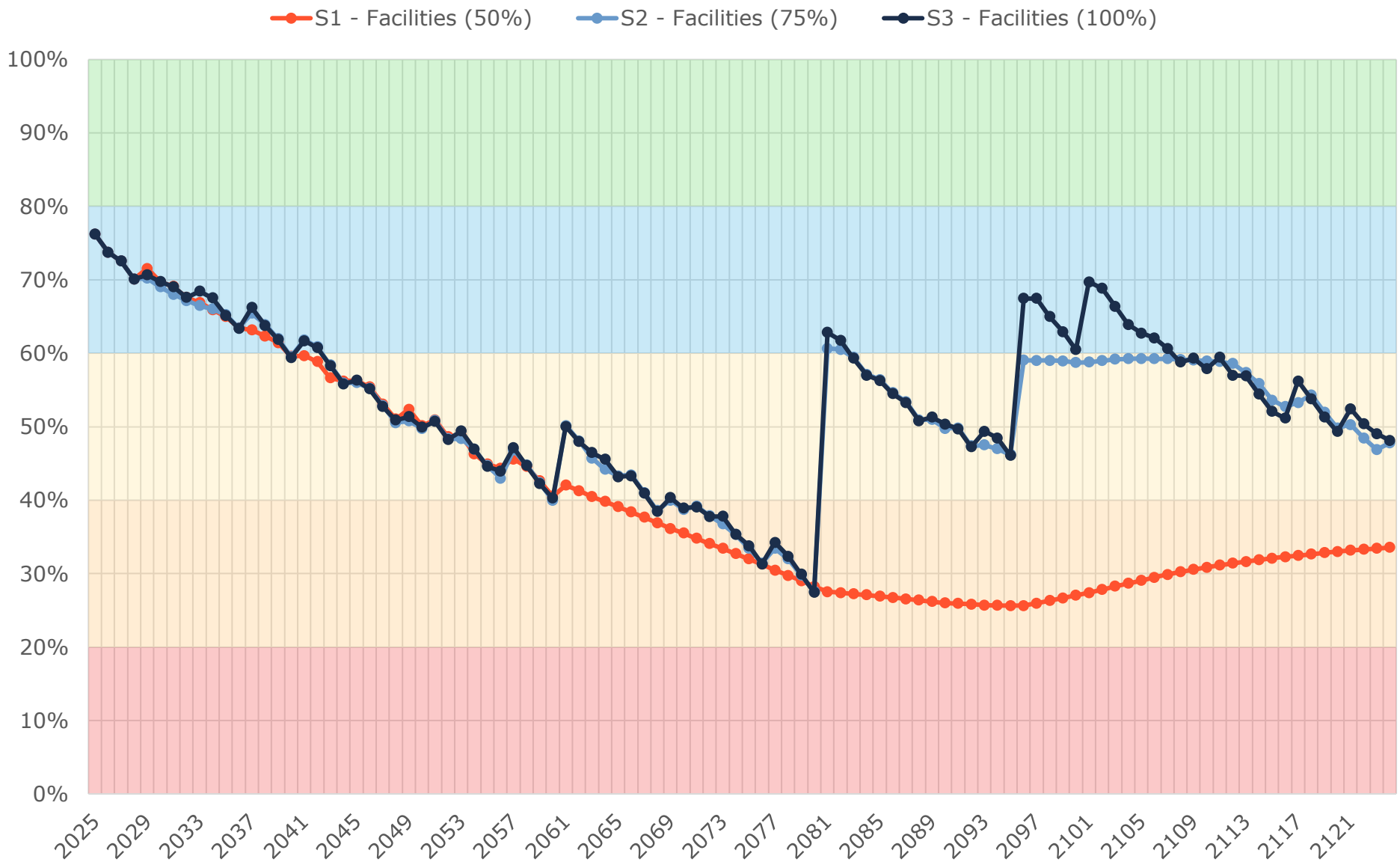


Figure 66 Facilities PLOS Scenario Condition Results

10.8.3 10-Year PLOS Financial Projections

As outlined in Section *4. Proposed Levels of Service Analysis*, the City of Thorold selected Scenario 3 as their preferred proposed levels of service. The main objective is to increase spending gradually to reach a more sustainable funding level to manage the City's current inventory of assets. The following table outlines the funding trajectory over the next 10 years for facilities if the financial strategy for Scenario 3 is implemented.

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Targeted Capital Spending	**$3.4m**	**$3.4m**	**$3.4m**	**$3.4m**	**$3.4m**	**$3.4m**	**$3.4m**	**$3.4m**	**$3.4m**	**$3.4m**
Projected Capital Spending	$680k	$947k	$1.2m	$1.4m	$1.7m	$1.9m	$2.2m	$2.4m	$2.7m	$3.0m
Funding Deficit	$2.7m	$2.4m	$2.2m	$2.0m	$1.7m	$1.5m	$1.2m	$927k	$649k	$362k
Target Reinvestment Rate	**3.1%**	**3.1%**	**3.1%**	**3.1%**	**3.1%**	**3.1%**	**3.1%**	**3.1%**	**3.1%**	**3.1%**
Projected Reinvestment Rate	0.6%	0.9%	1.1%	1.3%	1.5%	1.8%	2.0%	2.3%	2.5%	2.8%

Table 50 Facilities 10-Year PLOS Financial Projections

11. Land Improvements

The City's land improvements portfolio includes recreation infrastructure such as play structures and sports fields, as well as other essential land improvements such as bus shelters, irrigation systems, and parking lots. The total current replacement of land improvements is estimated at approximately $33 million.

11.1 Inventory & Valuation

Table 51 summarizes the quantity and current replacement cost of all land improvements assets available in the City's asset register. Parking lots account for the largest share of the land improvements asset group.

Segment	Quantity	Unit of Measure	Replacement Cost	Primary RC Method
Bus Shelters	15	Assets	$540,315	CPI
Fields & Courts	45	Assets	$1,736,616	CPI
Irrigation System	9	Assets	$234,258	CPI
Park Fixtures & Others	284	Assets	$7,147,683	CPI
Parking Lots, Drives & Walkways	188	Assets	$16,287,777	CPI
Play Structures	82	Assets	$7,500,683	CPI
TOTAL			**$33,447,332**	

Table 51 Detailed Asset Inventory: Land Improvements

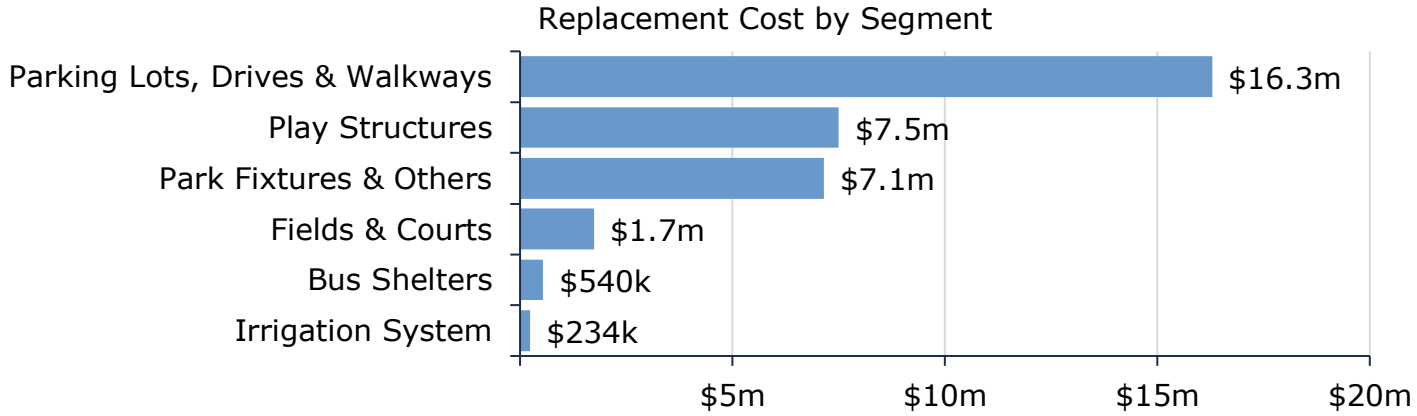


Figure 67 Portfolio Valuation: Land Improvements

11.2 Asset Condition

Figure 68 summarizes the replacement cost-weighted condition of the City's land improvements portfolio. Based on a combination of assessed condition and age data, 66% of assets are in fair or better condition, the remaining 34% are in poor or worse condition. These assets may be candidates for replacement in the short term; similarly, assets in fair condition may require rehabilitation or replacement in the medium term and should be monitored for further degradation in condition.

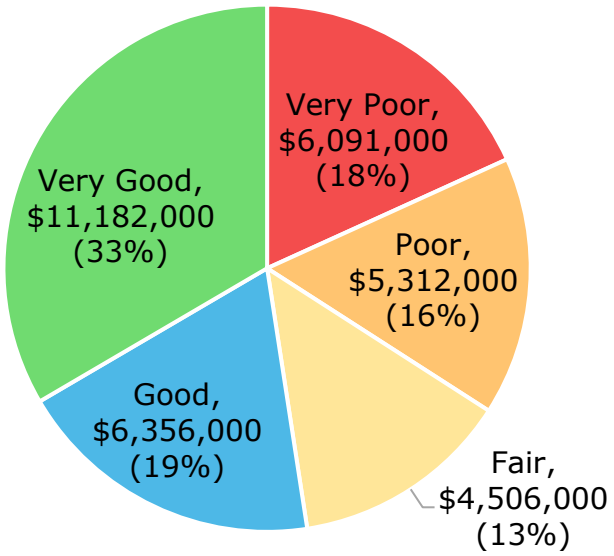


Figure 68 Asset Condition: Land Improvements Overall

Figure 69 summarizes the age-based condition of land improvements by segment. Assets in poor or worse condition are concentrated primarily in irrigation systems.

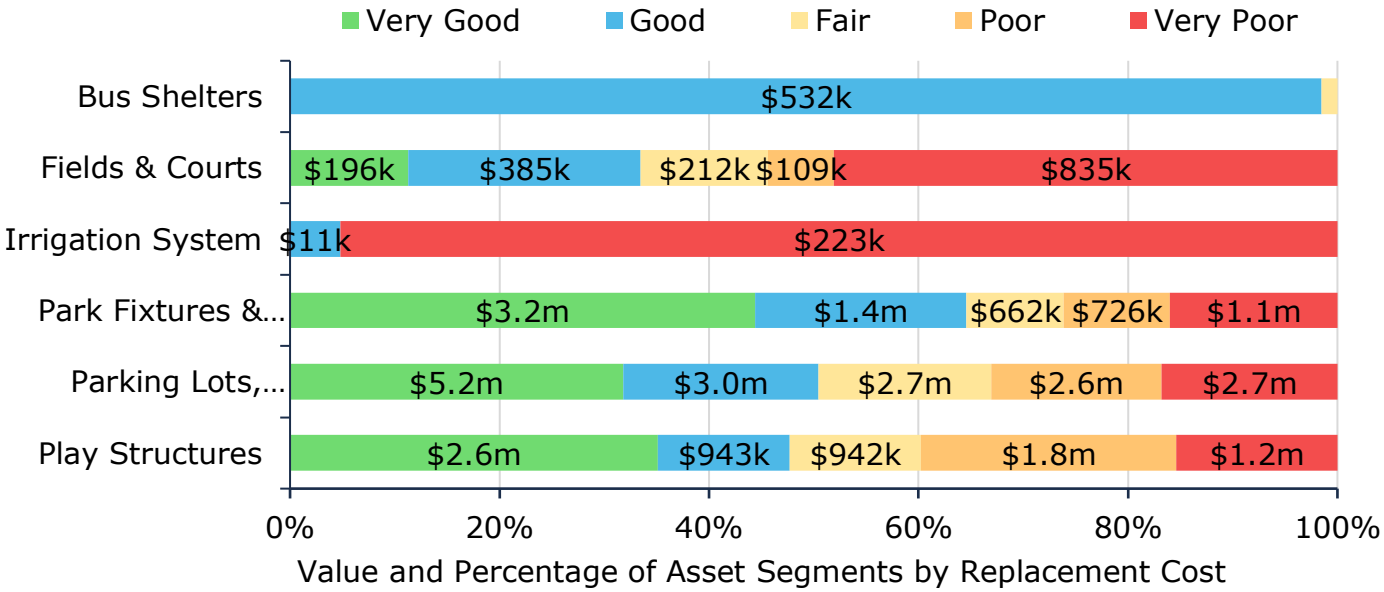


Figure 69 Asset Condition: Land Improvements by Segment

11.3 Age Profile

An asset's age profile comprises two key values: estimated useful life (EUL), or design life; and the percentage of EUL consumed. The EUL is the serviceable lifespan of an asset during which it can continue to fulfil its intended purpose and provide value to users, safely and efficiently. As assets age, their performance diminishes, often more rapidly as they approach the end of their design life.

In conjunction with condition data, an asset's age profile provides a more complete summary of the state of infrastructure. It can help identify assets that may be candidates for further review through condition assessment programs; inform the selection of optimal lifecycle strategies; and improve planning for potential replacement spikes.

Figure 70 illustrates the average current age of each asset type and its estimated useful life. Both values are weighted by the replacement cost of individual assets.

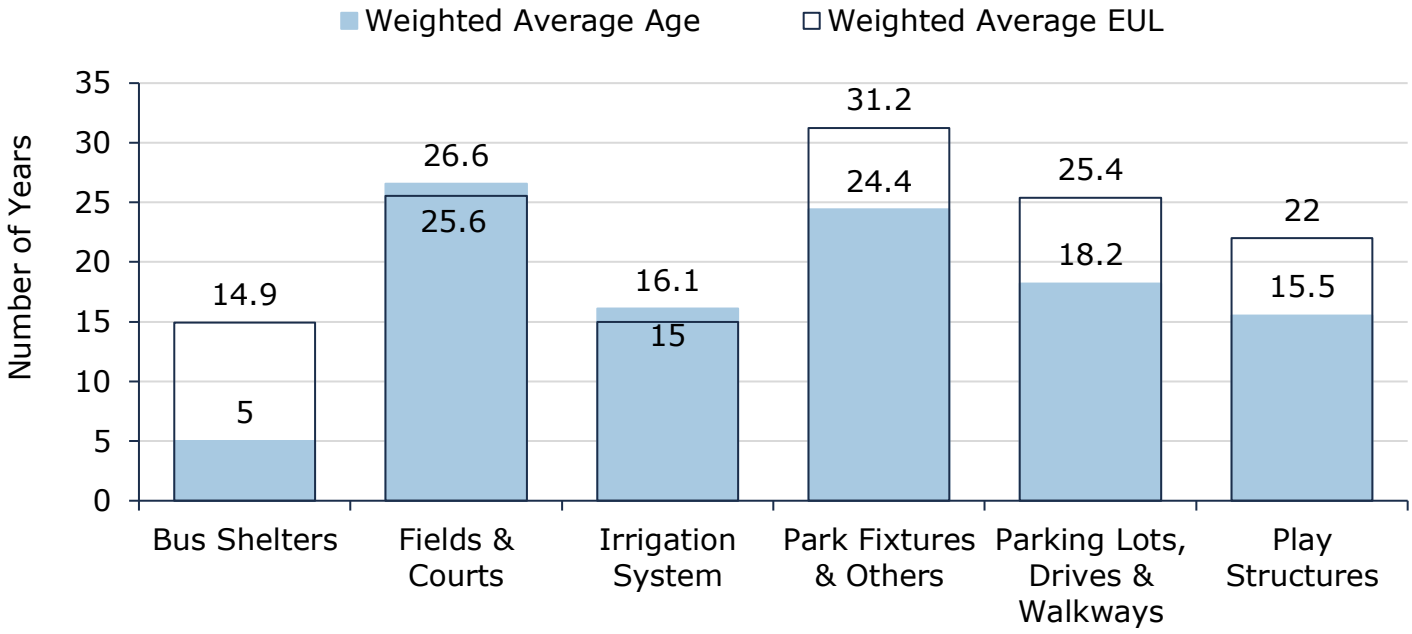


Figure 70 Estimated Useful Life vs. Asset Age: Land Improvements

Age analysis reveals that, on average, sport fields and courts, as well as irrigation systems have exceeded their originally intended design life. The remaining asset segments are in moderate stages of their useful lives.

11.4 Current Approach to Lifecycle Management

The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

Table 52 outlines the City's current lifecycle management strategy.

Activity Type	Description of Current Strategy
Maintenance	On a monthly basis, paved recreational trails are inspected.
	On a weekly basis, staff cut the grass at all City Parks. During this time, a walk-through inspection of park improvement assets is conducted, and work orders are issued for identified deficiencies.
	In March 2020 a comprehensive visual and physical safety inspection audit of all playground structures at all City operated Parks was conducted by an external contractor. Deficiencies were identified and required actions to make pre-2014 installed equipment compliant with CAN/CSA Standard were detailed.
Rehabilitation / Replacement	In 2020 the City of Thorold published a Parks, Trails and Recreation Master Plan which included land improvement assets. The purpose of doing so was to better understand current and projected future needs, assess the parks and recreation services, human resources, policies, and infrastructure and recommend a framework for prioritizing future decisions.
	The City of Thorold continues to advance replacement and rehabilitation projects, often based on recommendations from the Master Plan.

Table 52 Lifecycle Management Strategy: Land Improvements

11.5 Forecasted Long-Term Replacement Needs

Figure 71 illustrates the cyclical short-, medium- and long-term infrastructure replacement requirements for the City's land improvements portfolio. This analysis was run until 2098 to capture at least one iteration of replacement for the longest-lived asset in Citywide Assets, the City's primary asset management system and asset register. The City's average annual requirements (red dotted line) total **$1.6 million per year** for all land improvements. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

Replacement needs are forecasted to remain relatively consistent over the 75-year time horizon, totaling just over $12 million in the next decade. These projections and estimates are based on asset replacement costs and age analysis. They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades.

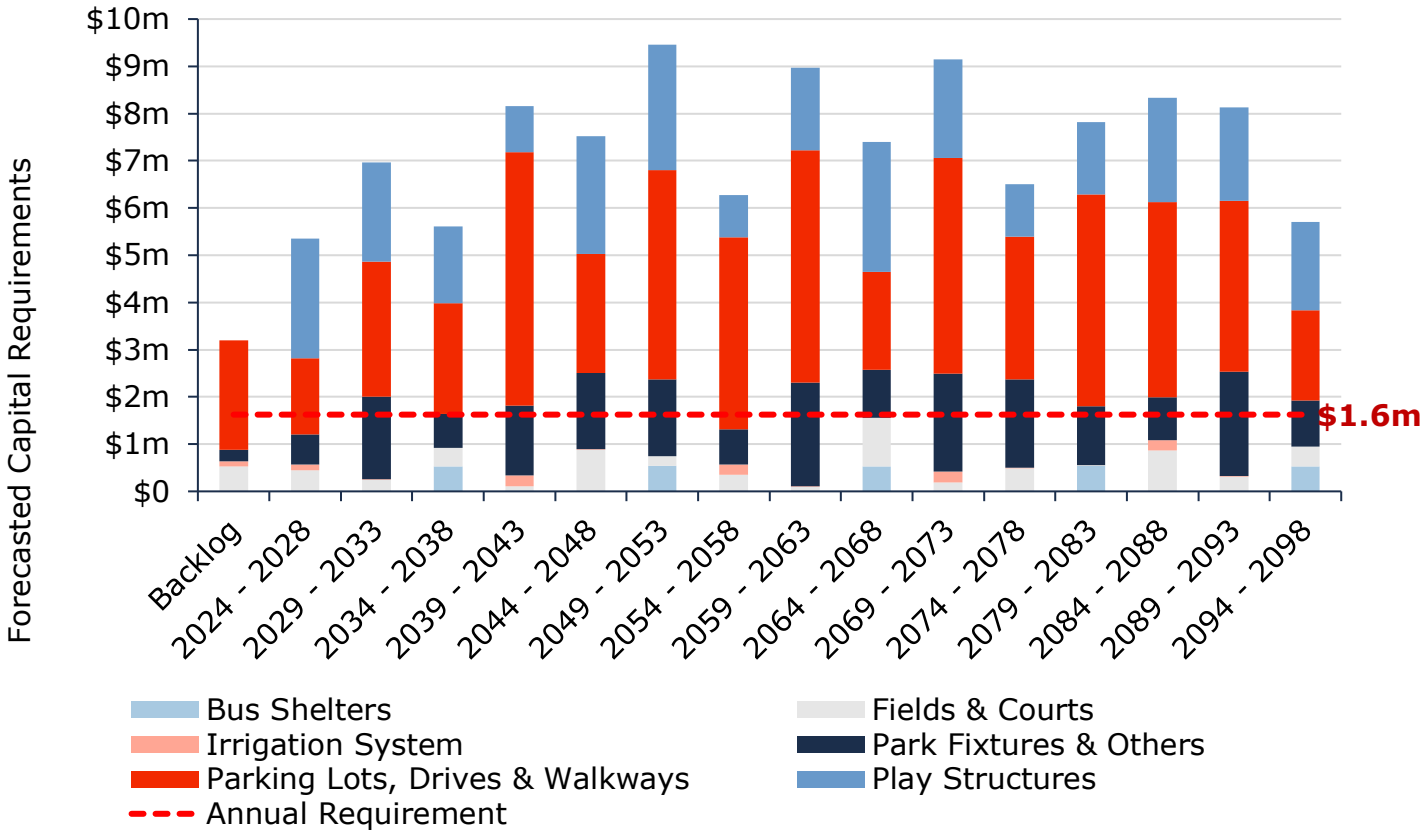


Figure 71 Forecasted Capital Replacement Needs: Land Improvements 2024-2098

Often, the magnitude of replacement needs is substantially higher than most municipalities can afford to fund. In addition, most assets may not need to be replaced. However, quantifying and monitoring these spikes is essential for long-term financial planning, including establishing dedicated reserves. In addition, a robust risk framework will ensure that high-criticality assets receive proper and timely lifecycle intervention, including replacements.

A summary of the 10-year replacement forecast can be found in Appendix B – 10-Year Capital Requirements.

11.6 Risk Analysis

The risk matrix below is generated using available asset data, including condition, replacement costs, and asset function. The risk ratings for assets without useful attribute data were calculated using only condition, and their replacement costs.

The matrix stratifies assets based on their individual probability and consequence of failure, each scored from 1 to 5. Their product generates a risk index ranging from 1-25. Assets with the highest criticality and likelihood of failure receive a risk rating of 25; those with lowest probability of failure and lowest criticality carry a risk rating of 1. As new data and information is gathered, the City may consider integrating relevant information that improves confidence in the criteria used to assess asset risk and criticality.

These risk models have been built into the City's Asset Management Database (Citywide Assets). See *Risk & Criticality* section for further details on approach used to determine asset risk ratings and classifications.

Figure 72 Risk Matrix: Land Improvements

11.6.1 Qualitative Risks

The following section summarizes key trends, challenges, and risks to land improvements assets as identified by the City:

Staff Capacity & Skill Set

Like facility assets, staff's capacity to service land improvement assets is severely constrained. This has been particularly acute in the last several years as the City's population has expanded so rapidly alongside increased use and demand for land improvement assets prompted by COVID-19. In addition, since most staff servicing land improvement assets are post-secondary students, staff turnover is high, which is a challenge. These staff capacity constraints, increased demand from the public and the student prominent workforce dynamic can create risks to meeting an established level of service in a consistent fashion.

Population Growth & Funding

As noted, the City's population has expanded rapidly, especially in the last 5 years, and so too has the demand for land improvement assets. While new development does provide taxation assessment growth the cash flow is not available until development has occurred. This can create timing delays between when additional land improvement assets are needed and when funds for their creation are made available.

11.7 Levels of Service

The tables that follow summarize the City's current levels of service. There are no specifically prescribed KPIs under Ontario Regulation 588/17 for non-core assets, therefore the KPIs below represent performance measures that the City has selected for this AMP.

11.7.1 Community Levels of Service

Service Attribute	Qualitative Description	Current LOS (2023)
Accessible & Reliable	Land Improvement assets provide adequate physical access and are available for their defined use within prescribed working hours	Land Improvement assets primarily consist of sports fields and courts, playground structures, splashpads, and trails. To the extent possible based on budget and existing asset design, these assets are accessible, or plans are in development to improve their accessibility
Safe & Regulatory	Appropriate actions and interventions are taken to ensure the regular safe use of land improvement assets.	Land improvement assets are inspected at various intervals based on the asset type and in most cases are inspected at least weekly. Residents can also file service requests if they identify issues relevant to any of the City's assets.
Affordable	Land improvement assets are managed cost-effectively.	Various maintenance and inspection activities are performed including weekly grass cutting and general inspection. Long-term rehabilitation and replacement decisions are supported and framed by the Parks, Trails, and Recreation Master Plan which was developed to assess the City's near- and long-term recreation needs based on demographics and suitability of existing assets.
Sustainable	There are long-term plans in place for the renewal and replacement of land improvement assets	Most land improvement assets were inspected by a third-party and a detailed listing of recommended interventions, including date and estimated costs were identified. The costs of the interventions are reflected in capital forecasts and the City is actively developing resourcing strategies.

Table 53 Community Levels of Service: Land Improvements

11.7.3 Technical Levels of Service

Service Attribute	Technical Metric	Current LOS (2023)
Scope	Average Playground Equipment Compliance Rating	94%
Accessible & Reliable	Number of playground structures that are AODA compliant vs. Total Number of Playground structures	2 vs 12
	Average Age (weighted by replacement cost) of Playground Structures	15
Quality	Average condition rating of land improvement assets	55%
Performance	Actual vs. Target Capital Reinvestment Rate	1.4% vs. 4.9%

Table 54 Technical Levels of Service: Land Improvements

11.8 Proposed Levels of Service

As per O. Reg. 588/17, by July 1, 2025, municipalities are required to consider proposed levels of service (PLOS), discuss the associated risks and long-term sustainability of these service levels, and explain the City's ability to afford the PLOS.

The below tables and graphs explain the proposed levels of service scenarios that were analyzed for land improvements. Further PLOS analysis at the portfolio level can be found in section *4. Proposed Levels of Service Analysis.*

11.8.1 PLOS Scenarios Analyzed

Scenario	Description
Scenario 1: Achieving 50% Funding in 12 Years	This scenario assumes gradual tax increases of ~0.5%/year, stabilizing at 50% funding across all tax-funded asset categories in 12 years. ♦ Land Improvements capital funding benefits from 'overfunded' asset category funding being reallocated during early years of implementation and gradually increases from $611k/year to $813k/year over a span of 12 years
Scenario 2: Achieving 75% Funding in 12 Years	This scenario assumes gradual tax increases of ~2.0%/year, stabilizing at 75% funding across all tax-funded asset categories in 12 years. ♦ Land Improvements capital funding gradually increases from $477k/year to $1.2m/year over a span of 12 years
Scenario 3: Achieving 100% Funding in 12 Years	This scenario assumes gradual tax increases of ~3.3%/year, stabilizing at 100% funding across all tax-funded asset categories in 12 years. ♦ Land Improvements capital funding gradually increases from $474k/year to $1.6m/year over a span of 12 years

Table 55 Land Improvements PLOS Scenario Descriptions

11.8.2 PLOS Analysis Results

Scenario	Technical LOS Outcomes	Initial Value (2025)	15 Year Projection (2039)	30 Year Projection (2054)	Comments
Scenario 1 (50%)	Average Condition	49%	31%	24%	
	Average Asset Risk	10.4	13.2	14.1	
	Average Annual Investment		$813,000		Increase taxes by ~0.5% per year for 12 years
	Average Capital re-investment rate		2.4%		
Scenario 2 (75%)	Average Condition	49%	37%	36%	
	Average Asset Risk	10.4	12.0	12.5	
	Average Annual Investment		$1,219,000		Increase taxes by ~2.0% per year for 12 years
	Average Capital re-investment rate		3.6%		
Scenario 3 (100%)	Average Condition	49%	44%	46%	
	Average Asset Risk	10.4	11.0	11.1	
	Average Annual Investment		$1,625,000		Increase taxes by ~3.3% per year for 12 years
	Average Capital re-investment rate		4.9%		

Table 56 Land Improvements PLOS Scenario Analysis

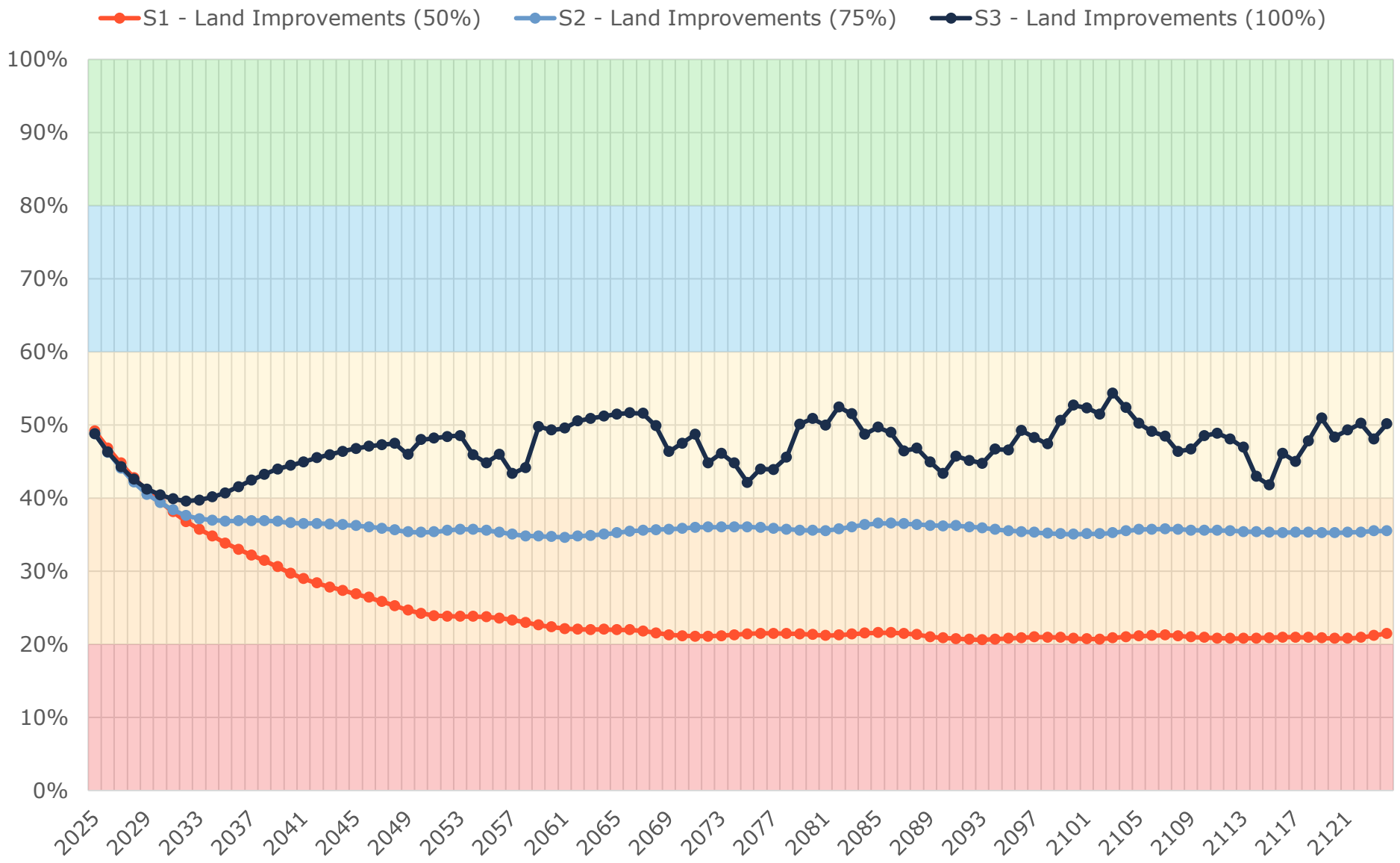


Figure 73 Land Improvements PLOS Scenario Condition Results

11.8.3 10-Year PLOS Financial Projections

As outlined in Section *4. Proposed Levels of Service Analysis*, the City of Thorold selected Scenario 3 as their preferred proposed levels of service. The main objective is to increase spending gradually to reach a more sustainable funding level to manage the City's current inventory of assets. The following table outlines the funding trajectory over the next 10 years for the land improvements if the financial strategy for Scenario 3 is implemented.

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Targeted Capital Spending	**$1.6m**	**$1.6m**	**$1.6m**	**$1.6m**	**$1.6m**	**$1.6m**	**$1.6m**	**$1.6m**	**$1.6m**	**$1.6m**
Projected Capital Spending	$565k	$670k	$761k	$854k	$950k	$1.0m	$1.2m	$1.3m	$1.4m	$1.5m
Funding Deficit	$1.1m	$955k	$864k	$771k	$675k	$575k	$472k	$366k	$256k	$143k
Target Reinvestment Rate	**4.9%**	**4.9%**	**4.9%**	**4.9%**	**4.9%**	**4.9%**	**4.9%**	**4.9%**	**4.9%**	**4.9%**
Projected Reinvestment Rate	1.7%	2.0%	2.3%	2.6%	2.8%	3.1%	3.4%	3.8%	4.1%	4.4%

Table 57 Land Improvements 10-Year PLOS Financial Projections

12. Fleet & Fleet Equipment

The City's fleet and fleet equipment portfolio includes 81 assets that support a variety of general and essential services, including health and social services, protection services, public works, and recreation and culture. The total current replacement of fleet and fleet equipment is estimated at approximately $14 million.

12.1 Inventory & Valuation

Table 58 summarizes the quantity and current replacement cost of all fleet and fleet equipment assets available in the City's asset register. Protection services accounts for the largest share of the fleet and fleet equipment portfolio.

Segment	Quantity	Unit of Measure	Replacement Cost	Primary RC Method
Health & Social Services	17	Quantity	$666,697	CPI
Protection Services	27	Quantity	$8,910,636	CPI
Public Works	35	Quantity	$4,268,449	CPI
Recreation & Culture	2	Quantity	$78,075	CPI
TOTAL			**$13,923,857**	

Table 58 Detailed Asset Inventory: Fleet & Fleet Equipment

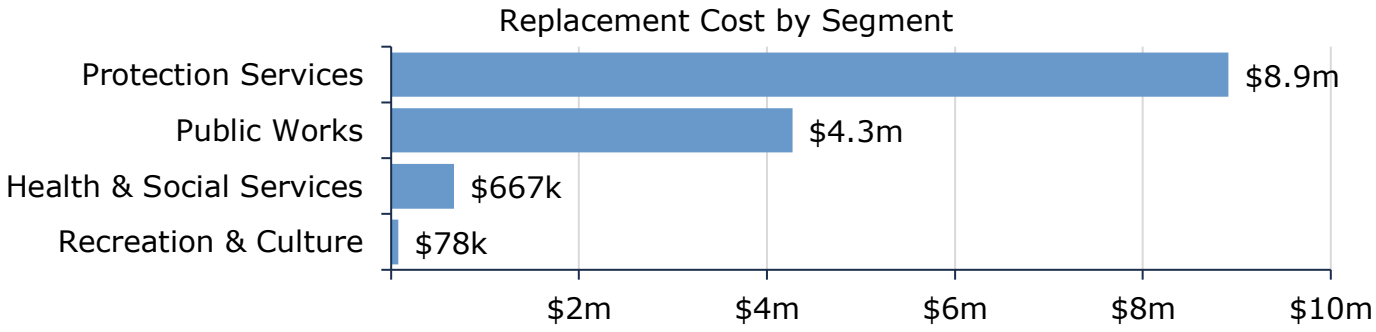


Figure 74 Portfolio Valuation: Fleet & Fleet Equipment

12.2 Asset Condition

Figure 75 summarizes the replacement cost-weighted condition of the City's fleet and fleet equipment portfolio. Based primarily on assessed condition data, 50% of fleet and fleet equipment are in fair or better condition, with the remaining 50% are in poor or worse condition. These assets may be candidates for replacement in the short term; similarly, assets in fair

condition may require rehabilitation or replacement in the medium term and should be monitored for further degradation in condition.

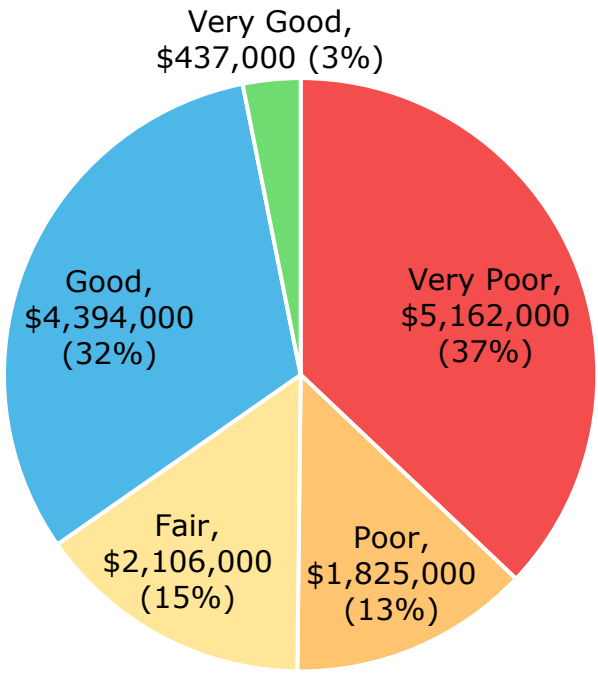


Figure 75 Asset Condition: Fleet & Fleet Equipment Overall

Figure 76 summarizes the condition of fleet and fleet equipment by each department. The City's fleet appears to have an even distribution of condition ratings.

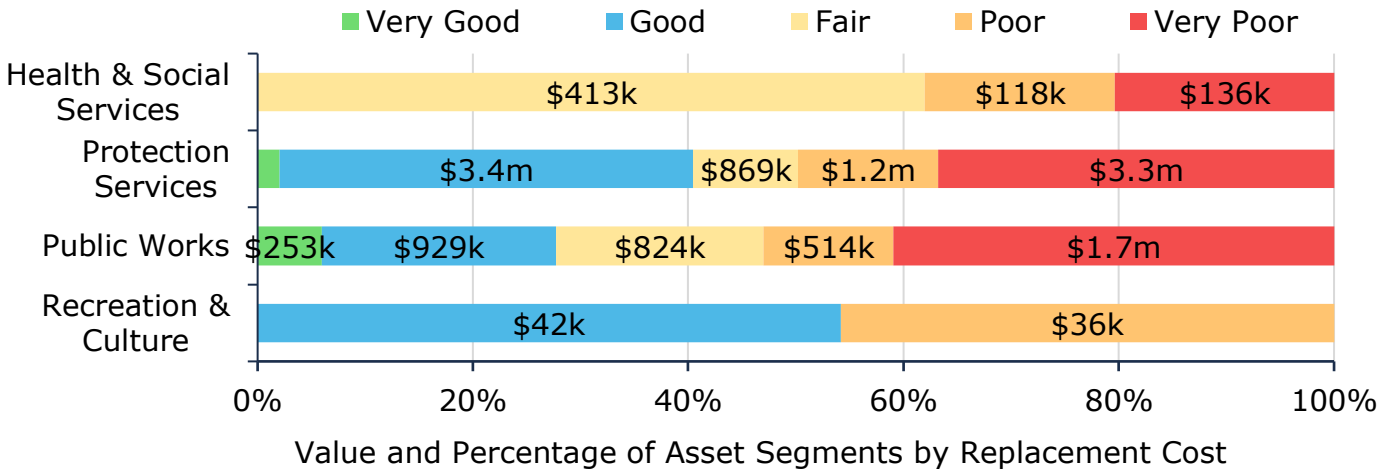


Figure 76 Asset Condition: Fleet & Fleet Equipment by Segment

12.3 Age Profile

An asset's age profile comprises two key values: estimated useful life (EUL), or design life; and the percentage of EUL consumed. The EUL is the serviceable lifespan of an asset during which it can continue to fulfil its intended purpose and provide value to users, safely and efficiently. As

assets age, their performance diminishes, often more rapidly as they approach the end of their design life.

In conjunction with condition data, an asset's age profile provides a more complete summary of the state of infrastructure. It can help identify assets that may be candidates for further review through condition assessment programs; inform the selection of optimal lifecycle strategies; and improve planning for potential replacement spikes.

Figure 77 illustrates the average current age of each asset type and its estimated useful life. Both values are weighted by the replacement cost of individual assets.

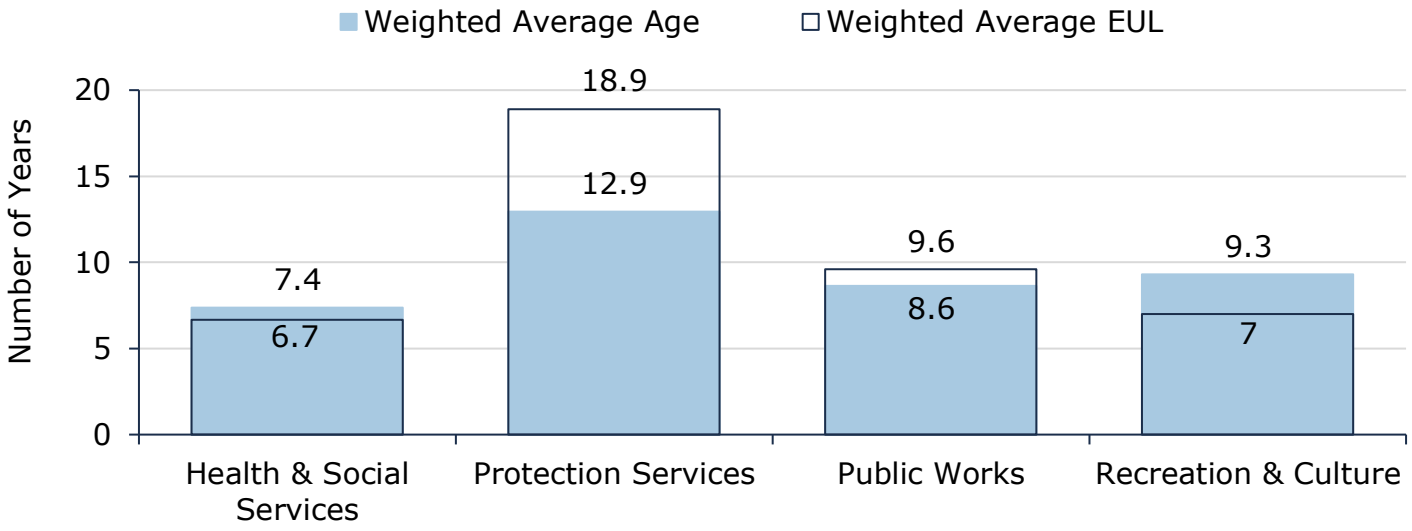


Figure 77 Estimated Useful Life vs. Asset Age: Fleet & Fleet Equipment

Age analysis reveals that, on average, vehicles in health and social services, as well as recreation and culture have exceeded their originally expected useful lives, with public works quickly approaching. Having inaccurate lifespan estimates when fleet vehicles are put into service may be a contributing factor to assets remaining in service past this originally estimated deadline. The City should conduct regular reviews of assigned useful lives to ensure they still reflect real world conditions.

12.4 Current Approach to Lifecycle Management

The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

The following table outlines the City's current lifecycle management strategy.

Activity Type	Description of Current Strategy
Maintenance / Inspections	Annually, all non-fire related fleet and fleet equipment assets are inspected by the on-staff mechanic. Fire fleet equipment testing, and inspection are completed by an external contractor. Fire hose inspections are completed by City Staff.
	Additional non-fire fleet inspections occur based on mileage and/or service hour requirements.
	Tractors and other small rolling equipment used on a seasonal basis are inspected twice a year, in the spring and fall.
	All non-fire fleet assets are maintained and repaired by an on-staff mechanic.
Replacement Inspections	There is a 10-year capital replacement forecasts for fleet assets.
	Non-fire fleet replacement decisions consider asset downtime, maintenance costs, and value on trade-in against the total cost of ownership and the asset's existing utility. A well performing non-fire fleet asset will continue to be utilized beyond its expected useful life; in contrast a poor performing asset may be replaced in advance of its expected useful life.

Table 59 Lifecycle Management Strategy: Fleet & Fleet Equipment

12.5 Forecasted Long-Term Replacement Needs

Figure 78 illustrates the cyclical short-, medium- and long-term infrastructure replacement requirements for the City's fleet and fleet equipment portfolio. This analysis was run until 2038 to capture at least one iteration of replacement for the longest-lived asset in Citywide Assets, the City's primary asset management system and asset register. The City's average annual requirements (red dotted line) total **$1.1 million per year** for all fleet and fleet equipment. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

Replacement needs are forecasted to rise considerably in the current decade, peaking at $7.3 between 2034 and 2038 as vehicles reach the end of their useful life. These projections and estimates are based on asset replacement costs and age analysis. They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades.

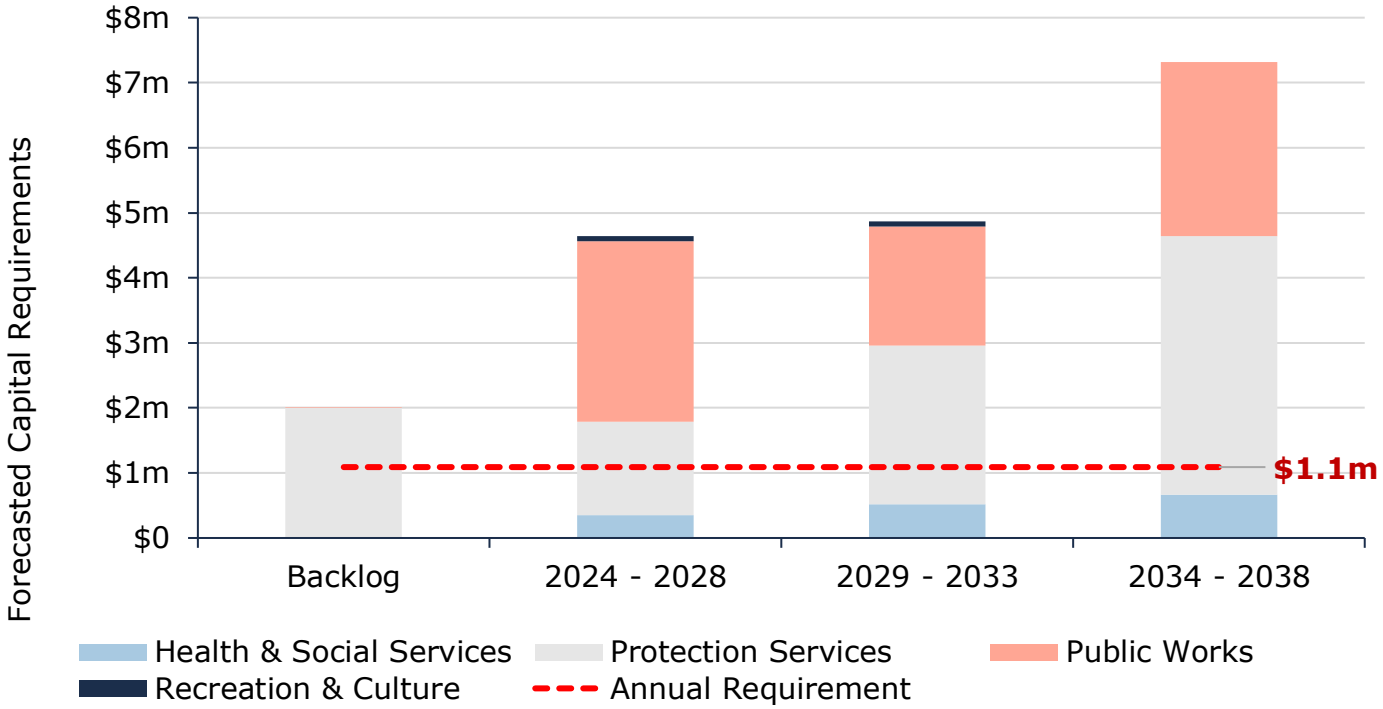


Figure 78 Forecasted Capital Replacement Needs: Fleet & Fleet Equipment 2024-2038

Often, the magnitude of replacement needs is substantially higher than most municipalities can afford to fund. In addition, most assets may not need to be replaced. However, quantifying and monitoring these spikes is essential for long-term financial planning, including establishing dedicated reserves. In addition, a robust risk framework will ensure that high-criticality assets receive proper and timely lifecycle intervention, including replacements.

A summary of the 10-year replacement forecast can be found in Appendix B – 10-Year Capital Requirements.

12.6 Risk Analysis

The risk matrix below is generated using available asset data, including condition, service life remaining, replacement costs, and whether there are alternative/redundancy options. The risk ratings for assets without useful attribute data were calculated using only condition, service life remaining, and their replacement costs.

The matrix stratifies assets based on their individual probability and consequence of failure, each scored from 1 to 5. Their product generates a risk index ranging from 1-25. Assets with the highest criticality and likelihood of failure receive a risk rating of 25; those with lowest probability of failure and lowest criticality carry a risk rating of 1. As new data and information is gathered, the City may consider integrating relevant information that improves confidence in the criteria used to assess asset risk and criticality.

These risk models have been built into the City's Asset Management Database (Citywide Assets). See *Risk & Criticality* section for further details on approach used to determine asset risk ratings and classifications.

Figure 79 Risk Matrix: Fleet & Fleet Equipment

12.6.1 Qualitative Risks

The following section summarizes key trends, challenges, and risks to fleet and fleet equipment assets as identified by the City:

Staff Capacity

Consistently the City finds itself facing resource constraints both in staff and budget. For fleet and fleet equipment assets this was noted as a particular challenge especially for the Fire Protection department as they have been operating without a Deputy Fire Chief for many years. Staffing constraints are a risk to the fire fleet assets and general operations. Fortunately, the Deputy Fire Chief position is expected to be filled in July 2023. This staffing addition is expected to reduce the existing resource constraints that the City is experiencing.

Asset Design

The City noted that fleet and fleet equipment assets sometimes have issues operating in newer subdivisions where roadways may be narrow. In some instances, larger fleet assets may struggle to navigate subdivisions and incur damages as a result (i.e., fleet vehicles hit curbs and sustain damages). This is a risk to the suitability of some of the existing fleet inventory.

12.7 Levels of Service

The tables that follow summarize the City's current levels of service. There are no specifically prescribed KPIs under Ontario Regulation 588/17 for non-core assets, therefore the KPIs below represent performance measures that the City has selected for this AMP.

12.7.1 Community Levels of Service

Service Attribute	Qualitative Description	Current LOS (2023)
Safe & Reliable	Municipal fleet assets are safe for operation; operators are provided appropriate training and evaluation programs.	All fleet assets are inspected at least annually by a City of Thorold staff mechanic. Repairs are completed as needed based on inspections and asset servicing requirements. All staff are required to complete pre-use inspections and document their findings in the assets log and must carry and maintained all required operator licenses.
Sustainable	There are long-term plans in place for the renewal and replacement of fleet and fleet equipment assets	The City of Thorold's fleet assets range in condition from very good to very poor and on average are in fair (40%) condition.

Table 60 Community Levels of Service: Fleet & Fleet Equipment

12.7.2 Technical Levels of Service

Service Attribute	Technical Metric	Current LOS (2023)
Safe & Reliable	% of fleet with pre-trip inspections completed regularly	100%
	% of fleet where required annual safety inspections were completed	38%
	% of fleet assets that have exceeded their expected service life	20%
Quality	Average condition of fleet and fleet equipment	40%
Performance	Actual vs. Target Capital Reinvestment Rate	6.0% vs. 7.8%

Table 61 Technical Levels of Service: Fleet & Fleet Equipment

12.8 Proposed Levels of Service

As per O. Reg. 588/17, by July 1, 2025, municipalities are required to consider proposed levels of service (PLOS), discuss the associated risks and long-term sustainability of these service levels, and explain the City's ability to afford the PLOS.

The below tables and graphs explain the proposed levels of service scenarios that were analyzed for fleet and fleet equipment. Further PLOS analysis at the portfolio level can be found in section *4. Proposed Levels of Service Analysis.*

12.8.1 PLOS Scenarios Analyzed

Scenario	Description
Scenario 1: Achieving 50% Funding in 12 Years	This scenario assumes gradual tax increases of ~0.5%/year, stabilizing at 50% funding across all tax-funded asset categories in 12 years. ♦ Fleet capital funding is reduced from $839k/year to $545k/year ensure all assets can be funded to the 50% level
Scenario 2: Achieving 75% Funding in 12 Years	This scenario assumes gradual tax increases of ~2.0%/year, stabilizing at 75% funding across all tax-funded asset categories in 12 years. ♦ Fleet capital funding is reduced from $839k/year to $817k/year ensure all assets can be funded to the 75% level
Scenario 3: Achieving 100% Funding in 12 Years	This scenario assumes gradual tax increases of ~3.3%/year, stabilizing at 100% funding across all tax-funded asset categories in 12 years. ♦ Fleet capital funding gradually increases from $839k/year to $1.1m/year over a span of 12 years

Table 62 Fleet & Fleet Equipment PLOS Scenario Descriptions

12.8.2 PLOS Analysis Results

Scenario	Technical LOS Outcomes	Initial Value (2025)	15 Year Projection (2039)	30 Year Projection (2054)	Comments
Scenario 1 (50%)	Average Condition	35%	17%	17%	
	Average Asset Risk	11.4	14.8	14.6	
	Average Annual Investment		$545,000		Increase taxes by ~0.5% per year for 12 years
	Average Capital re-investment rate		3.9%		
Scenario 2 (75%)	Average Condition	35%	29%	29%	
	Average Asset Risk	11.4	13.0	13.2	
	Average Annual Investment		$817,000		Increase taxes by ~2.0% per year for 12 years
	Average Capital re-investment rate		5.9%		
Scenario 3 (100%)	Average Condition	35%	42%	48%	
	Average Asset Risk	11.4	11.1	9.7	
	Average Annual Investment		$1,090,000		Increase taxes by ~3.3% per year for 12 years
	Average Capital re-investment rate		7.8%		

Table 63 Fleet & Fleet Equipment PLOS Scenario Analysis

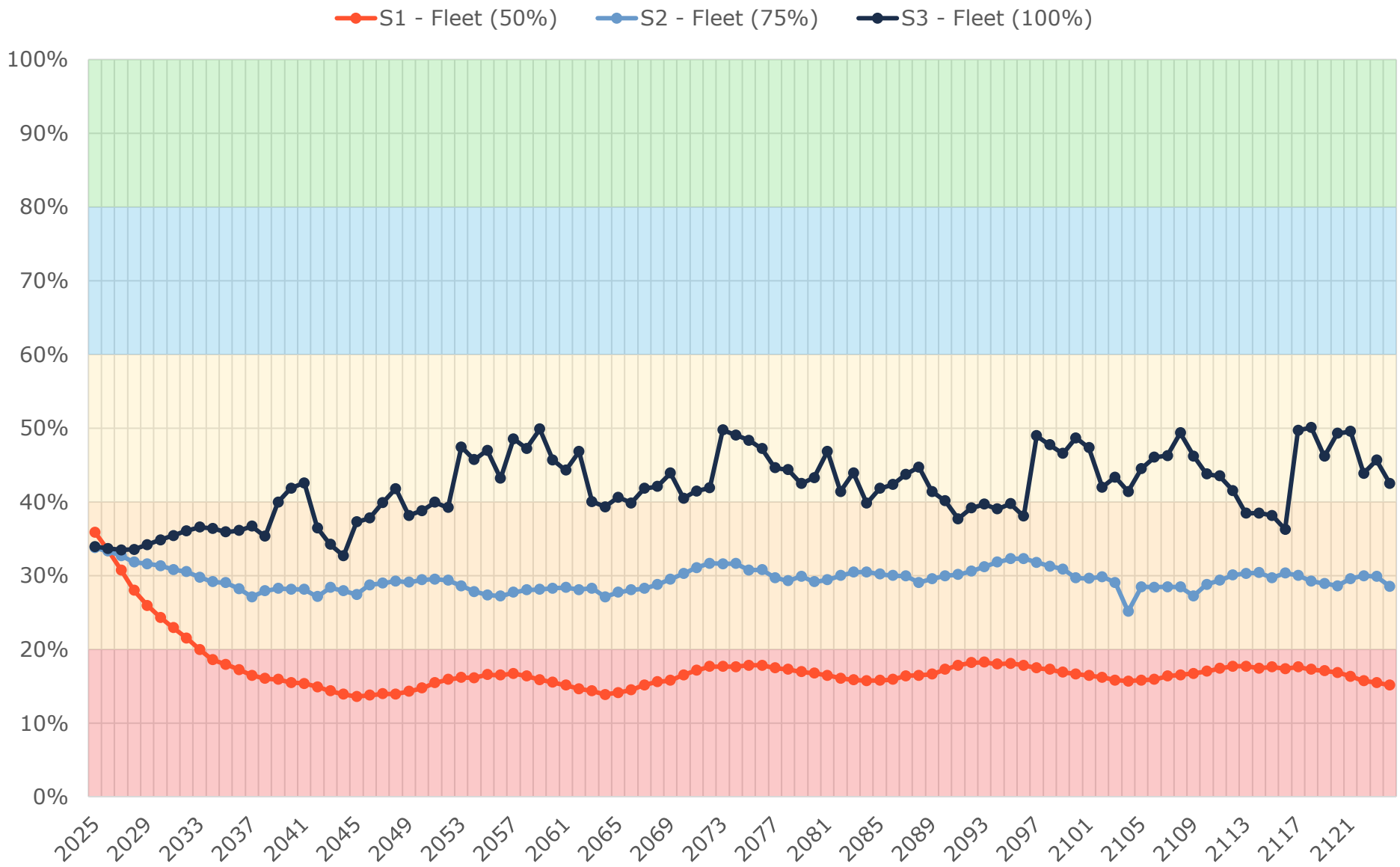


Figure 80 Fleet & Fleet Equipment PLOS Scenario Condition Results

12.8.3 10-Year PLOS Financial Projections

As outlined in Section *4. Proposed Levels of Service Analysis*, the City of Thorold selected Scenario 3 as their preferred proposed levels of service. The main objective is to increase spending gradually to reach a more sustainable funding level to manage the City's current inventory of assets. The following table outlines the funding trajectory over the next 10 years for fleet and fleet equipment if the financial strategy for Scenario 3 is implemented.

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Targeted Capital Spending	**$1.1m**	**$1.1m**	**$1.1m**	**$1.1m**	**$1.1m**	**$1.1m**	**$1.1m**	**$1.1m**	**$1.1m**	**$1.1m**
Projected Capital Spending	$859k	$882k	$902k	$922k	$943k	$965k	$987k	$1.0m	$1.0m	$1.1m
Funding Deficit	$231k	$208k	$188k	$168k	$147k	$125k	$103k	$80k	$56k	$31k
Target Reinvestment Rate	**7.8%**	**7.8%**	**7.8%**	**7.8%**	**7.8%**	**7.8%**	**7.8%**	**7.8%**	**7.8%**	**7.8%**
Projected Reinvestment Rate	6.2%	6.3%	6.5%	6.6%	6.8%	6.9%	7.1%	7.3%	7.4%	7.6%

Table 64 Fleet & Fleet Equipment 10-Year PLOS Financial Projections

13. Machinery & Equipment

The City's machinery and equipment portfolio includes 880 pooled assets that support a variety of general and essential services, including recreation, protection services, and public works. The total current replacement of machinery and equipment is estimated at approximately $7 million.

13.1 Inventory & Valuation

Figure 81 summarizes the quantity and current replacement cost of all machinery and equipment assets available in the City's asset register.

Segment	Quantity	Unit of Measure	Replacement Cost	Primary RC Method
Health & Social Services	34	Quantity	$1,049,442	CPI
Protection Services	752	Quantity	$2,131,129	CPI
Public Works	60	Quantity	$2,305,301	CPI
Recreation & Culture	34	Quantity	$1,648,737	CPI
TOTAL			**$7,134,609**	

Table 65 Detailed Asset Inventory: Machinery & Equipment

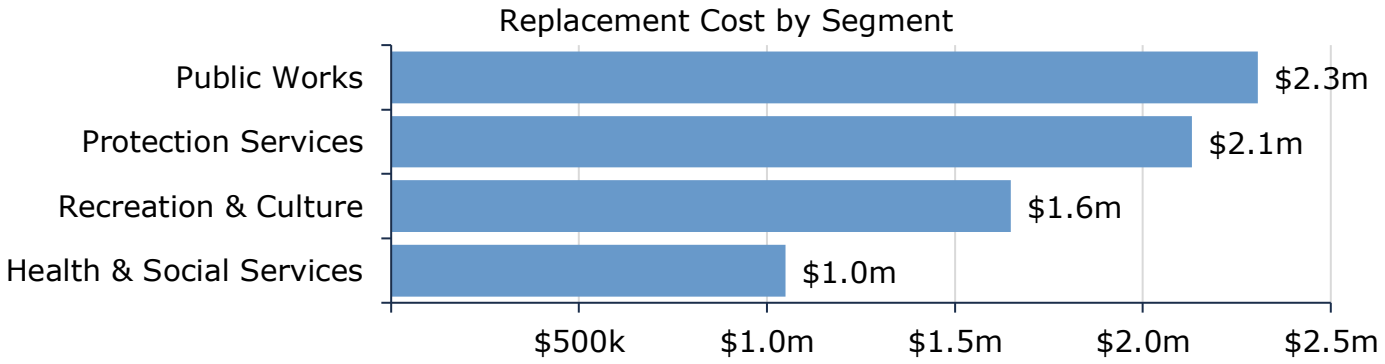


Figure 81 Portfolio Valuation: Machinery & Equipment

13.2 Asset Condition

Figure 82 summarizes the replacement cost-weighted condition of the City's machinery and equipment portfolio. Based on a combination of assessed conditions and age data, 57% of assets are in fair or better condition; the remaining 43% are in poor or worse condition. These assets may be candidates for replacement in the short term; similarly, assets in fair condition may require rehabilitation or replacement in the medium term and should be monitored for further degradation in condition.

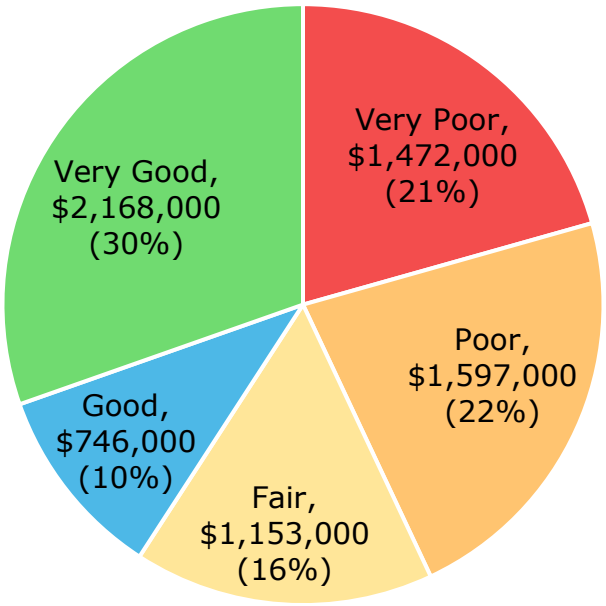


Figure 82 Asset Condition: Machinery & Equipment Overall

Figure 83 summarizes the age-based condition of machinery and equipment by each department. The majority of assets are in fair or better condition with the exception of public works which has 69% of its assets in poor or very poor condition.

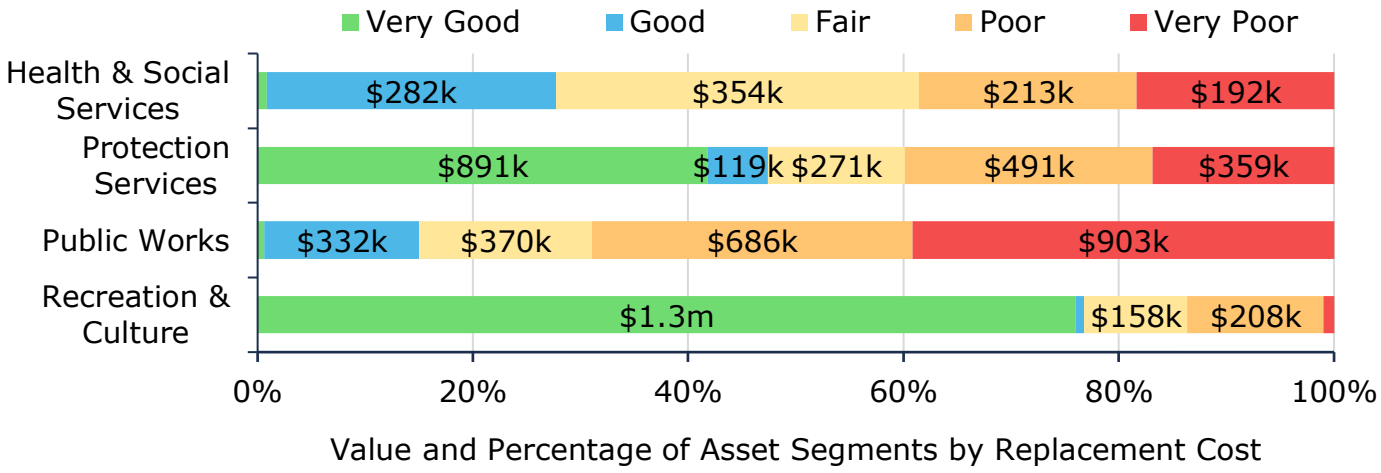


Figure 83 Asset Condition: Machinery & Equipment by Segment

13.3 Age Profile

An asset's age profile comprises two key values: estimated useful life (EUL), or design life; and the percentage of EUL consumed. The EUL is the serviceable lifespan of an asset during which it can continue to fulfil its intended purpose and provide value to users, safely and efficiently. As assets age, their performance diminishes, often more rapidly as they approach the end of their design life.

In conjunction with condition data, an asset's age profile provides a more complete summary of the state of infrastructure. It can help identify assets that may be candidates for further review through condition assessment programs; inform the selection of optimal lifecycle strategies; and improve planning for potential replacement spikes.

Figure 84 illustrates the average current age of each asset type and its estimated useful life. Both values are weighted by the replacement cost of individual assets.

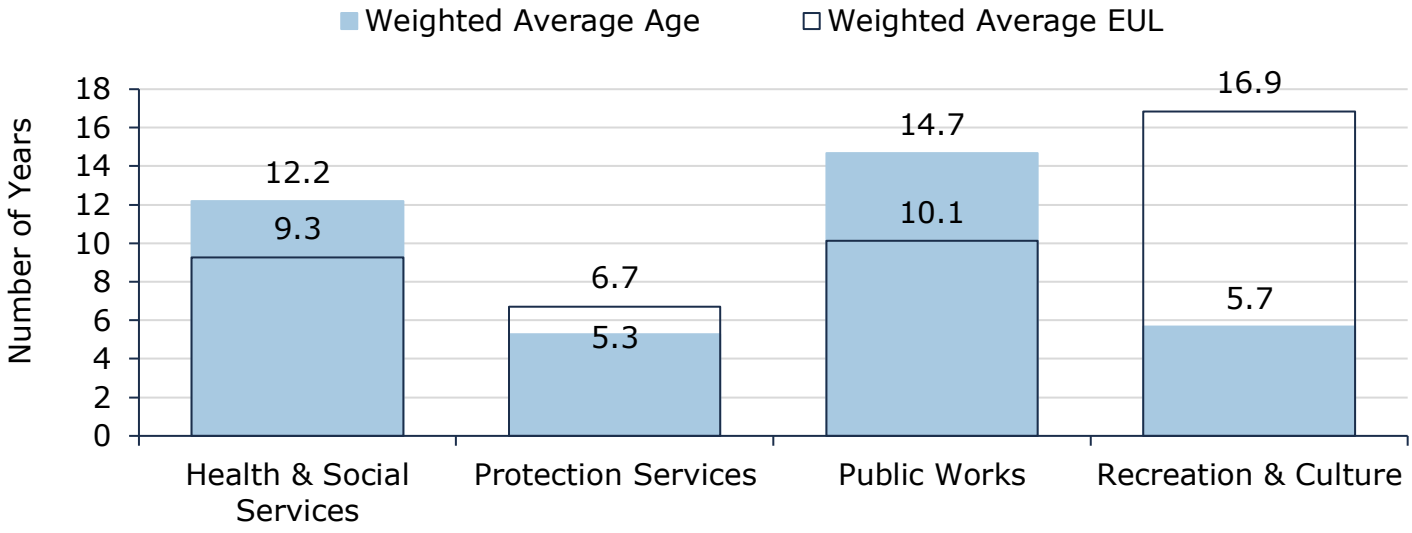


Figure 84 Estimated Useful Life vs. Asset Age: Machinery & Equipment

Age analysis reveals that, on average, assets utilized by health and social services, as well as public works, have significantly exceeded the original expected lifespans.

13.4 Current Approach to Lifecycle Management

The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

The following table outlines the City's current lifecycle management strategy.

Activity Type	Description of Current Strategy
Maintenance/ Inspections	Machinery and equipment assets used in the summertime (i.e., mowers) are inspected each spring.
	All identified repairs are completed in house.
	Staff are required to complete pre-use inspections of all commercial machinery and equipment assets. Any identified issues are escalated to supervisory review and if needed to the mechanic for their inspection and safety determination.
	All staff are trained in Standard Operating Procedures (SOP) for each piece of equipment. Upon use, staff are expected to complete a visual inspection of the assets based on the SOP.
Rehabilitation	Where the asset is in otherwise good repair, failing components may be rehabilitated or replaced.
Replacement	To ensure there are equipment back-ups on hand, the City's replacement schedule seeks to have two assets of the same type with one older and the other newer. This reduces the chances of both assets failing simultaneously and mitigates resultant operational impacts.
	The City maintains a 10-year capital forecast for machinery and equipment asset replacements. Replacement decisions consider the assets age, condition, performance, and if there are alternates available.

Table 66 Lifecycle Management Strategy: Machinery & Equipment

13.5 Forecasted Long-Term Replacement Needs

Figure 85 illustrates the cyclical short-, medium- and long-term infrastructure replacement requirements for the City's machinery and equipment portfolio. This analysis was run until 2043 to capture at least one iteration of replacement for the longest-lived asset in Citywide Assets, the City's primary asset management system and asset register. The City's average annual requirements (red dotted line) total **$813,000 per year** for all machinery and equipment. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

Replacement needs are forecasted to remain consistent over the 20-year projection period, with a peak in 2039 to 2043. These projections and estimates are based on asset replacement costs and age analysis. They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades.

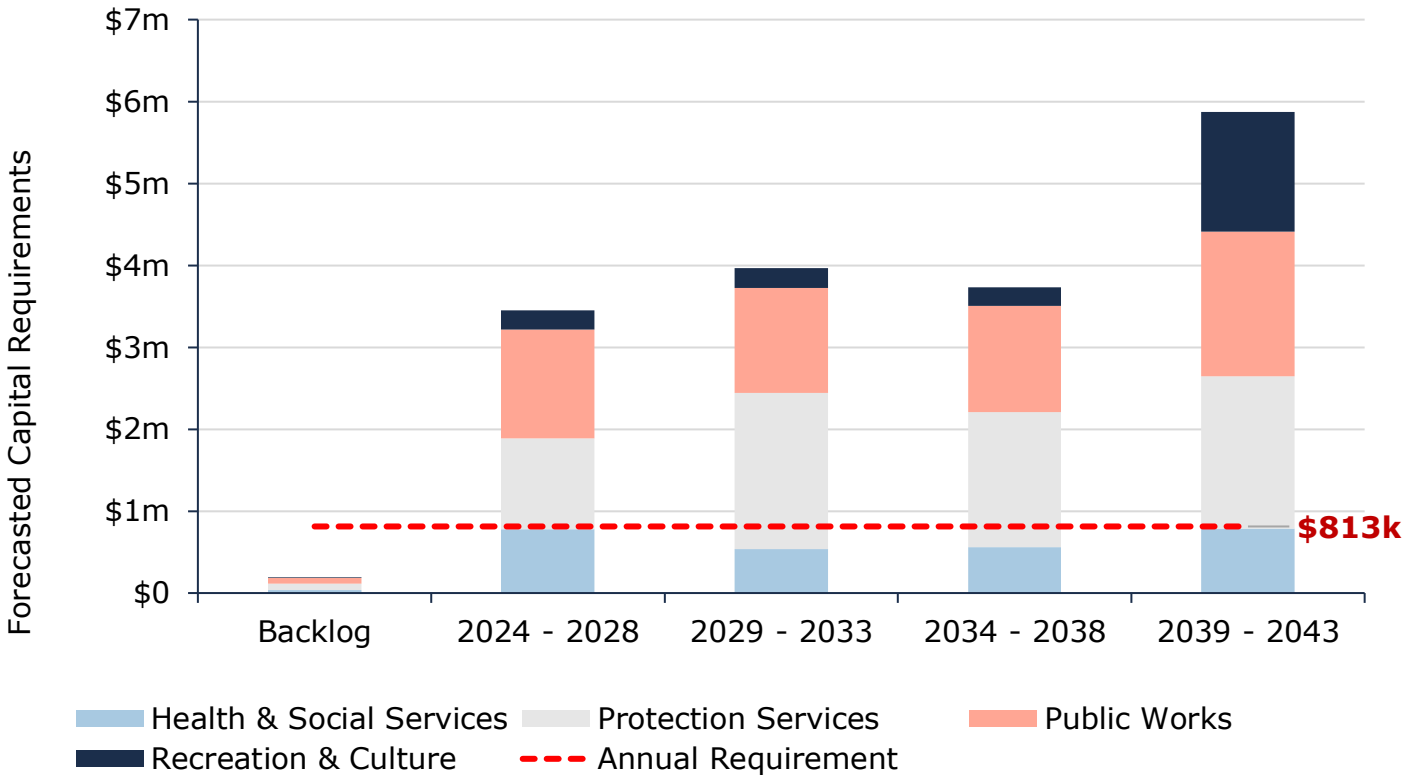


Figure 85 Forecasted Capital Replacement Needs: Machinery & Equipment 2024-2043

Often, the magnitude of replacement needs is substantially higher than most municipalities can afford to fund. In addition, most assets may not need to be replaced. However, quantifying and monitoring these spikes is essential for long-term financial planning, including establishing dedicated reserves. In addition, a robust risk framework will ensure that high-criticality assets receive proper and timely lifecycle intervention, including replacements.

A summary of the 10-year replacement forecast can be found in Appendix B – 10-Year Capital Requirements.

13.6 Risk Analysis

The risk matrix below is generated using available asset data, including condition, service life remaining, replacement costs, and service function. The risk ratings for assets without useful attribute data were calculated using only condition, service life remaining, and their replacement costs.

The matrix stratifies assets based on their individual probability and consequence of failure, each scored from 1 to 5. Their product generates a risk index ranging from 1-25. Assets with the highest criticality and likelihood of failure receive a risk rating of 25; those with lowest probability of failure and lowest criticality carry a risk rating of 1. As new data and information is gathered, the City may consider integrating relevant information that improves confidence in the criteria used to assess asset risk and criticality.

These risk models have been built into the City's Asset Management Database (Citywide Assets). See *Risk & Criticality* section for further details on approach used to determine asset risk ratings and classifications.

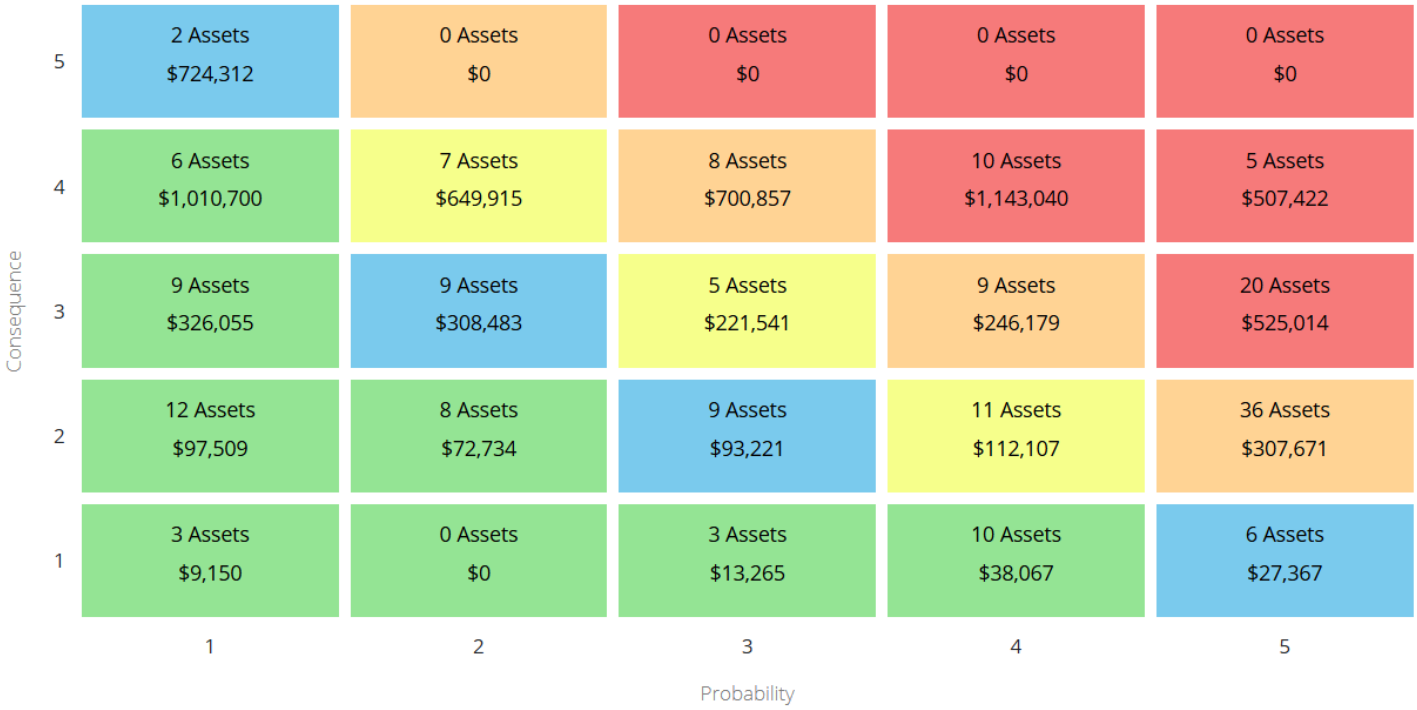


Figure 86 Risk Matrix: Machinery & Equipment

13.6.1 Qualitative Risks

The following section summarizes key trends, challenges, and risks to machinery and equipment assets as identified by the City:

Population Growth & Public Expectations

As noted in other asset categories, the City's population has increased but there has not been an equivalent increase in the number of staff or volume of equipment to service the growing population. These resource constraints are only compounded by the public's expectation for the historic level of service. With more assets to service (i.e., more streets to plough) without an equal increase in staff and equipment to complete the work, maintaining service standards becomes ever more challenging.

Climate Change & Extreme Weather Events

Staff identified the increasing unpredictability of weather as a risk for machinery and equipment assets. For example, heavier and less predictable snowfalls result in increased degradation of ploughs and other equipment. In the case of more extreme events, the City sometimes finds they may not have the necessary equipment or scale of equipment. The city is currently exploring strategies to mitigate this risk (e.g., equipment leasing, regional solutions).

13.7 Levels of Service

The tables that follow summarize the City's current levels of service. There are no specifically prescribed KPIs under Ontario Regulation 588/17 for non-core assets, therefore the KPIs below represent performance measures that the City has selected for this AMP.

13.7.1 Community Levels of Service

Service Attribute	Qualitative Description	Current LOS (2023)
Safe & Reliable	Machinery and equipment assets are safe for operation and all operators have completed a training and evaluation program	Machinery and equipment assets are inspected annually by an on-staff mechanic. All identified repairs and regular maintenance activities are also completed in house. All staff are provided with standard operating procedures (SOP) for each equipment asset. Upon use, staff are expected to complete a visual inspection of the asset based on the SOP.
Sustainable	Machinery and equipment asset conditions are reviewed and there are long-term plans in place for their renewal and replacement.	The City of Thorold's machinery and equipment assets range in condition from very good to very poor and are, on average, in fair condition.

Table 67 Community Levels of Service: Machinery & Equipment

13.7.2 Technical Levels of Service

Service Attribute	Technical Metric	Current LOS (2023)
Safe & Reliable	% of machinery and equipment assets with weekly, monthly, or annual inspections completed	100%
	% of machinery and equipment assets with pre-use inspections completed	100%
	% of machinery beyond its expected service life	44%
Quality	Average condition of machinery and equipment assets	47%
Performance	Actual vs. Target Capital Reinvestment Rate	2.3% vs. 11.4%

Table 68 Technical Levels of Service: Machinery & Equipment

13.8 Proposed Levels of Service

As per O. Reg. 588/17, by July 1, 2025, municipalities are required to consider proposed levels of service (PLOS), discuss the associated risks and long-term sustainability of these service levels, and explain the City's ability to afford the PLOS.

The below tables and graphs explain the proposed levels of service scenarios that were analyzed for machinery and equipment. Further PLOS analysis at the portfolio level can be found in Section *4. Proposed Levels of Service Analysis.*

13.8.1 PLOS Scenarios Analyzed

Scenario	Description
Scenario 1: Achieving 50% Funding in 12 Years	This scenario assumes gradual tax increases of ~0.5%/year, stabilizing at 50% funding across all tax-funded asset categories in 12 years. ♦ Machinery capital funding benefits from 'overfunded' asset category funding being reallocated during early years of implementation and gradually increases from $261k/year to $406k/year over a span of 12 years
Scenario 2: Achieving 75% Funding in 12 Years	This scenario assumes gradual tax increases of ~2.0%/year, stabilizing at 75% funding across all tax-funded asset categories in 12 years. ♦ Machinery capital funding gradually increases from $163k/year to $610k/year over a span of 12 years
Scenario 3: Achieving 100% Funding in 12 Years	This scenario assumes gradual tax increases of ~3.3%/year, stabilizing at 100% funding across all tax-funded asset categories in 12 years. ♦ Machinery capital funding gradually increases from $163k/year to $813k/year over a span of 12 years

Table 69 Machinery & Equipment PLOS Scenario Descriptions

13.8.2 PLOS Analysis Results

Scenario	Technical LOS Outcomes	Initial Value (2025)	15 Year Projection (2039)	30 Year Projection (2054)	Comments
Scenario 1 (50%)	Average Condition	41%	24%	25%	
	Average Asset Risk	13.1	16.6	15.5	
	Average Annual Investment		$406,000		Increase taxes by ~0.5% per year for 12 years
	Average Capital re-investment rate		5.7%		
Scenario 2 (75%)	Average Condition	41%	34%	34%	
	Average Asset Risk	13.1	15.0	14.5	
	Average Annual Investment		$610,000		Increase taxes by ~2.0% per year for 12 years
	Average Capital re-investment rate		8.5%		
Scenario 3 (100%)	Average Condition	41%	40%	44%	
	Average Asset Risk	13.1	13.6	12.8	
	Average Annual Investment		$813,000		Increase taxes by ~3.3% per year for 12 years
	Average Capital re-investment rate		11.4%		

Table 70 Machinery & Equipment PLOS Scenario Analysis

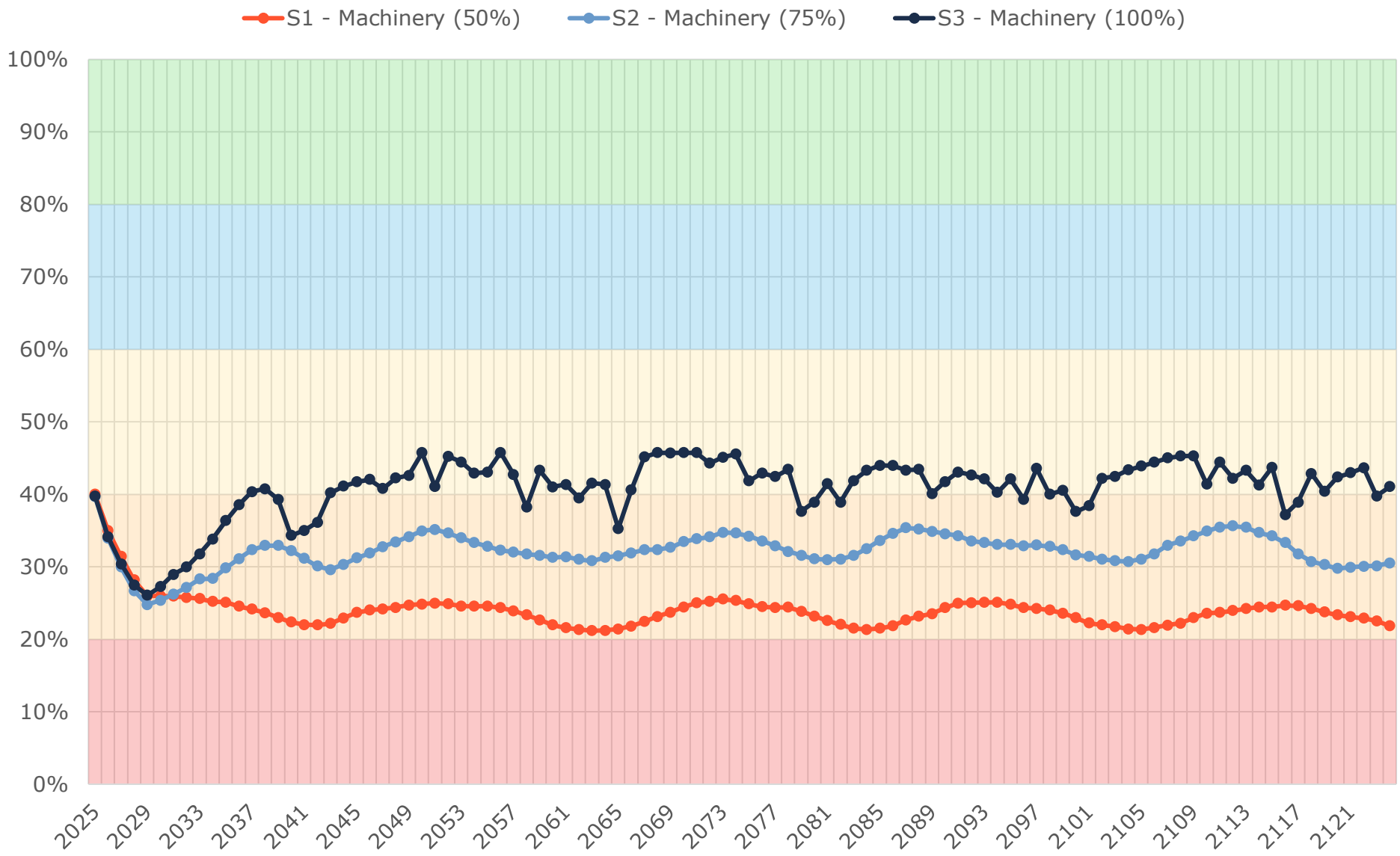


Figure 87 Machinery & Equipment PLOS Scenario Condition Results

13.8.3 10-Year PLOS Financial Projections

As outlined in Section *4. Proposed Levels of Service Analysis*, the City of Thorold selected Scenario 3 as their preferred proposed levels of service. The main objective is to increase spending gradually to reach a more sustainable funding level to manage the City's current inventory of assets. The following table outlines the funding trajectory over the next 10 years for machinery and equipment if the financial strategy for Scenario 3 is implemented.

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Targeted Capital Spending	**$813k**	**$813k**	**$813k**	**$813k**	**$813k**	**$813k**	**$813k**	**$813k**	**$813k**	**$813k**
Projected Capital Spending	$214k	$274k	$325k	$377k	$432k	$488k	$546k	$606k	$668k	$732k
Funding Deficit	$599k	$539k	$488k	$436k	$381k	$325k	$267k	$207k	$145k	$81k
Target Reinvestment Rate	**11.4%**	**11.4%**	**11.4%**	**11.4%**	**11.4%**	**11.4%**	**11.4%**	**11.4%**	**11.4%**	**11.4%**
Projected Reinvestment Rate	3.0%	3.8%	4.5%	5.3%	6.1%	6.8%	7.7%	8.5%	9.4%	10.3%

Table 71 Machinery & Equipment 10-Year PLOS Financial Projections

14. Office Equipment & Furnishings

The City's office equipment and furnishings portfolio includes 868 pooled assets that support a variety of general and essential services. The total current replacement of office equipment and furnishings is estimated at approximately $3 million.

14.1 Inventory & Valuation

Figure 81 summarizes the quantity and current replacement cost of all office equipment and furnishings assets available in the City's asset register.

Segment	Quantity	Unit of Measure	Replacement Cost	Primary RC Method
Communications	298	Quantity	$580,592	CPI
Hardware	408	Quantity	$1,437,862	CPI
Office Equipment	3	Quantity	$46,321	CPI
Office Furnishings	150	Quantity	$280,025	CPI
Software	9	Quantity	$576,204	CPI
TOTAL			**$2,921,004**	

Table 72 Detailed Asset Inventory: Office Equipment & Furnishings

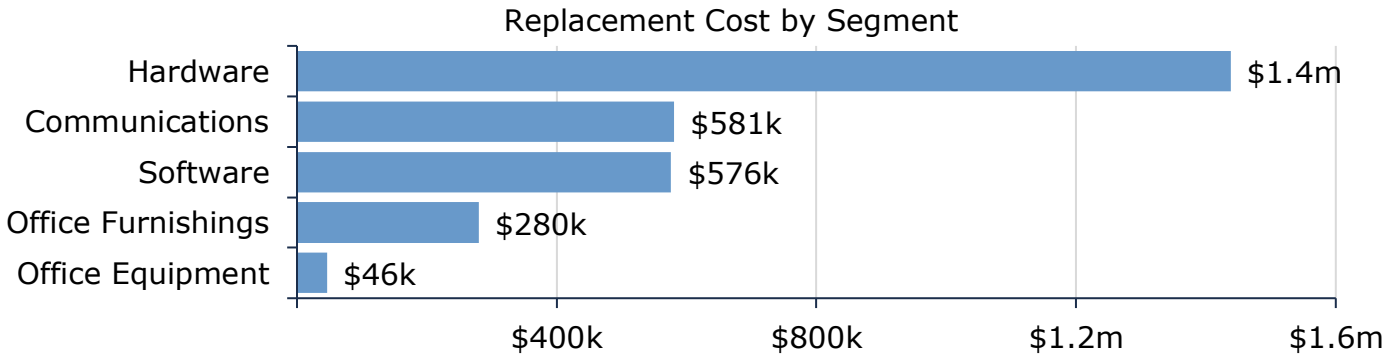


Figure 88 Portfolio Valuation: Office Equipment & Furnishings

14.2 Asset Condition

Figure 82 summarizes the replacement cost-weighted condition of the City's office equipment and furnishings portfolio. Based primarily on age data, 63% of assets are in fair or better condition; the remaining 37% are in poor or worse condition. These assets may be candidates for replacement in the short term; similarly, assets in fair condition may require rehabilitation or replacement in the medium term and should be monitored for further degradation in condition.

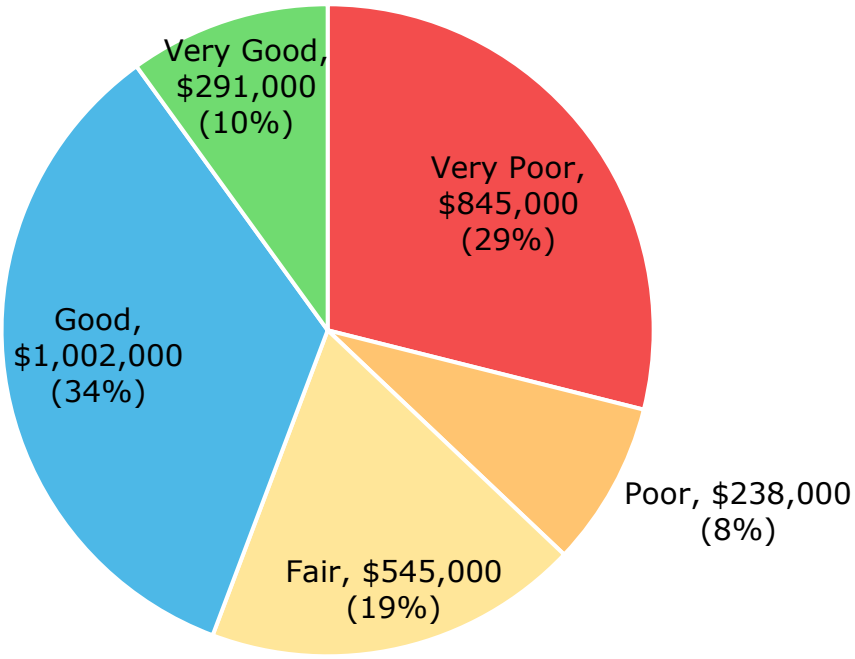


Figure 89 Asset Condition: Office Equipment & Furnishings Overall

Figure 83 summarizes the age-based condition of office equipment and furnishings by segment. While the majority of assets that support fire services are in fair or better condition, the majority of hardware assets as in poor or worse condition.

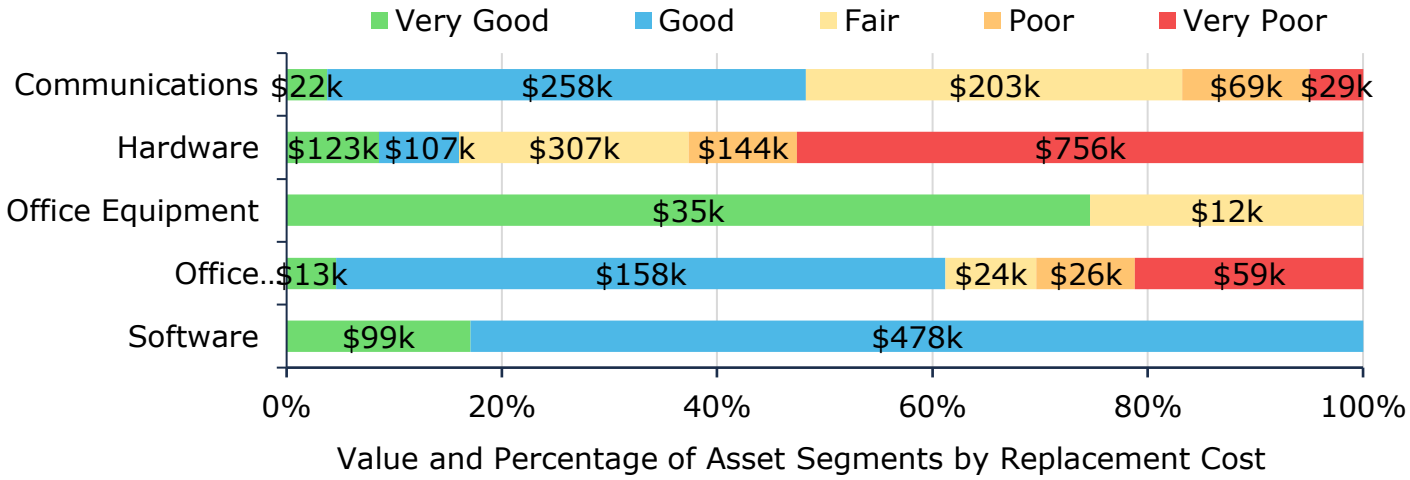


Figure 90 Asset Condition: Office Equipment & Furnishings by Segment

14.3 Age Profile

An asset's age profile comprises two key values: estimated useful life (EUL), or design life; and the percentage of EUL consumed. The EUL is the serviceable lifespan of an asset during which it can continue to fulfil its intended purpose and provide value to users, safely and efficiently. As

assets age, their performance diminishes, often more rapidly as they approach the end of their design life.

In conjunction with condition data, an asset's age profile provides a more complete summary of the state of infrastructure. It can help identify assets that may be candidates for further review through condition assessment programs; inform the selection of optimal lifecycle strategies; and improve planning for potential replacement spikes.

Figure 84 illustrates the average current age of each asset type and its estimated useful life. Both values are weighted by the replacement cost of individual assets.

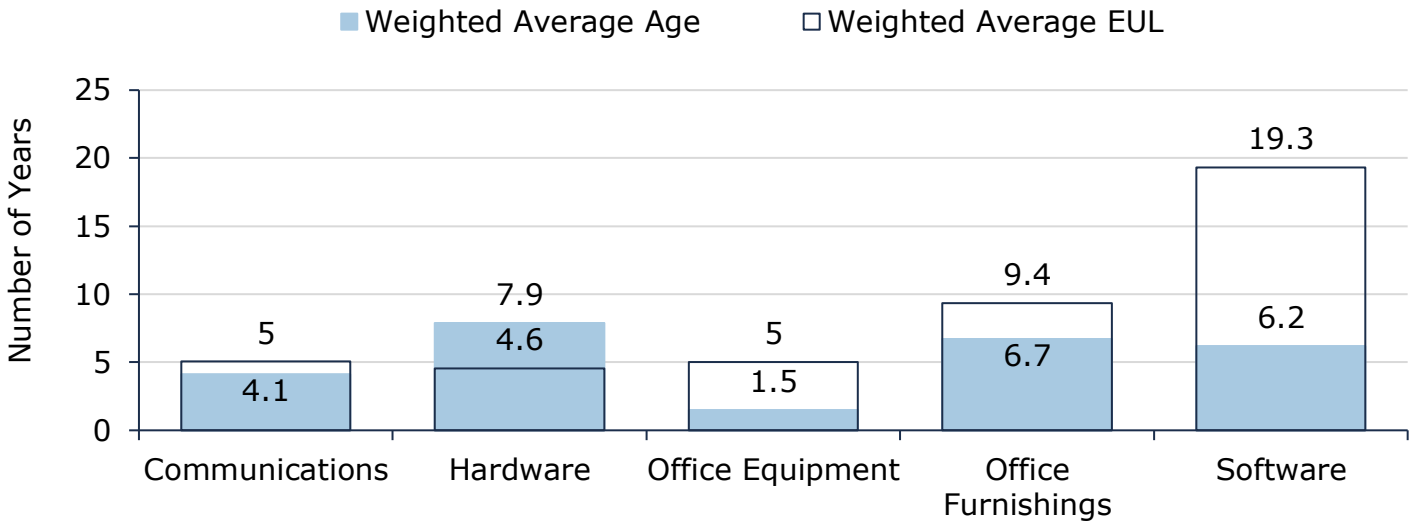


Figure 91 Estimated Useful Life vs. Asset Age: Office Equipment & Furnishings

Age analysis reveals that, on average, with the exception of communications and hardware, most office equipment is in early to moderate stages of the original expected lifespans.

14.4 Current Approach to Lifecycle Management

The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

The following table outlines the City's current lifecycle management strategy.

Activity Type	Description of Current Strategy
Maintenance	This category contains a wide variety of asset types which may require no maintenance (e.g., office furniture). Typically, these assets are run to failure or obsolescence.
Replacement	Asset are replaced on an as needed basis or as part of a larger replacement program. Replacement is generally based on the asset's age relative to its expected useful life or in the event of asset failure. Other considerations also include the users' needs and whether existing assets can meet that need.

Table 73 Lifecycle Management Strategy: Office Equipment & Furnishings

14.5 Forecasted Long-Term Replacement Needs

Figure 85 illustrates the cyclical short-, medium- and long-term infrastructure replacement requirements for the City's office equipment and furnishings portfolio. This analysis was run until 2043 to capture at least one iteration of replacement for the longest-lived asset in Citywide Assets, the City's primary asset management system and asset register. The City's average annual requirements (red dotted line) total **$509,000 per year** for all office equipment and furnishings. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

Replacement needs are forecasted to remain consistent over the 20-year projection period, peaking at $2.7 million between 2034 and 2038. These projections and estimates are based on asset replacement costs and age analysis. They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades.

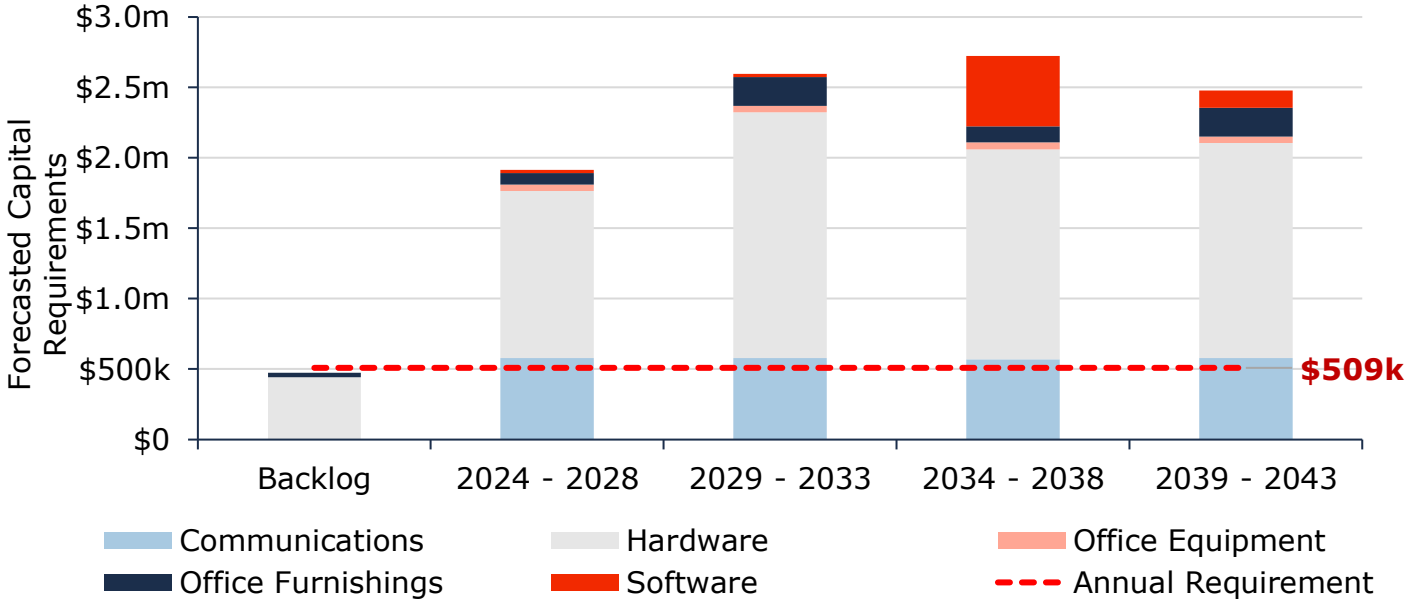


Figure 92 Forecasted Capital Replacement Needs: Office Equipment & Furnishings 2024-2043

Often, the magnitude of replacement needs is substantially higher than most municipalities can afford to fund. In addition, most assets may not need to be replaced. However, quantifying and monitoring these spikes is essential for long-term financial planning, including establishing dedicated reserves. In addition, a robust risk framework will ensure that high-criticality assets receive proper and timely lifecycle intervention, including replacements.

A summary of the 10-year replacement forecast can be found in Appendix B – 10-Year Capital Requirements.

14.6 Risk Analysis

The risk matrix below is generated using available asset data, including condition, service life remaining, replacement costs, and function. The risk ratings for assets without useful attribute data were calculated using only condition, service life remaining, and their replacement costs.

The matrix stratifies assets based on their individual probability and consequence of failure, each scored from 1 to 5. Their product generates a risk index ranging from 1-25. Assets with the highest criticality and likelihood of failure receive a risk rating of 25; those with lowest probability of failure and lowest criticality carry a risk rating of 1. As new data and information is gathered, the City may consider integrating relevant information that improves confidence in the criteria used to assess asset risk and criticality.

These risk models have been built into the City's Asset Management Database (Citywide Assets). See *Risk & Criticality* section for further details on approach used to determine asset risk ratings and classifications.

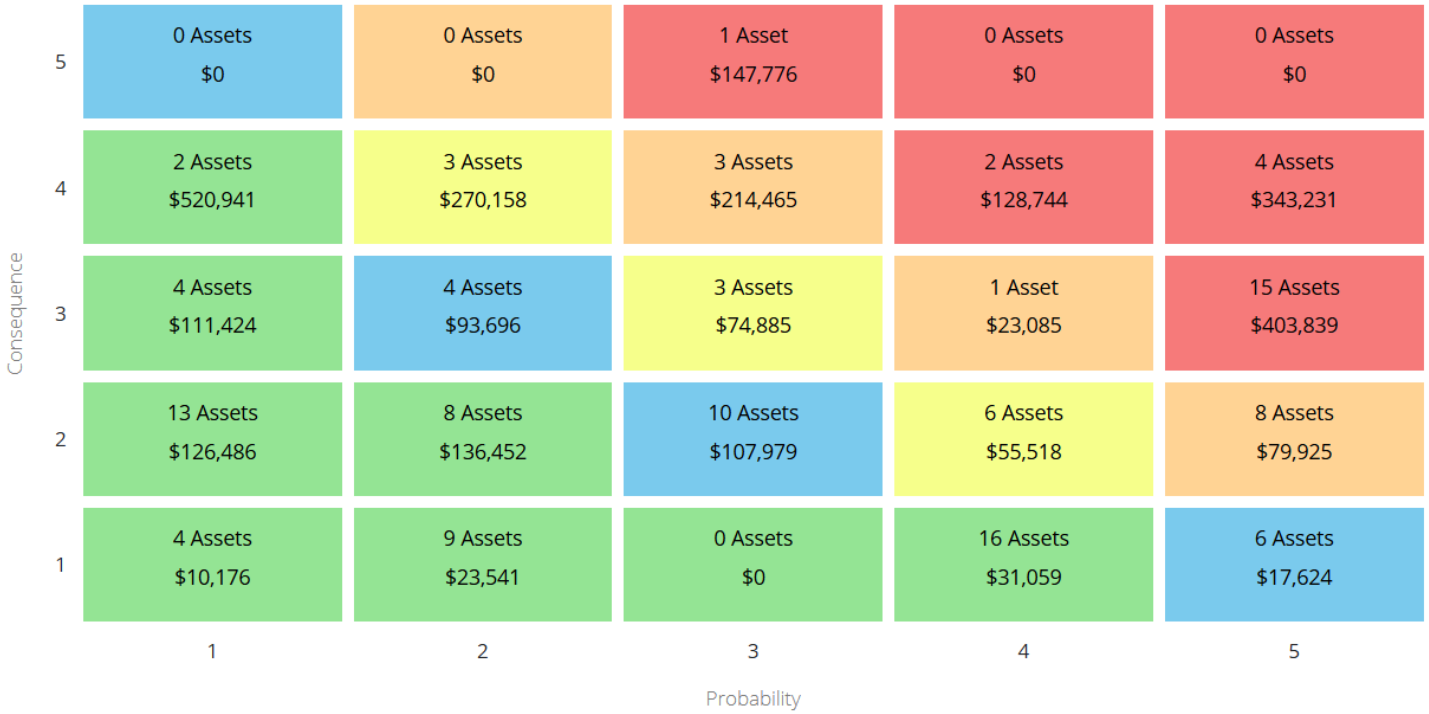


Figure 93 Risk Matrix: Office Equipment & Furnishings

14.6.1 Qualitative Risks

The following section summarizes key trends, challenges, and risks to office equipment and furnishings assets as identified by the City:

Staff Resources
The City of Thorold has increased in population significantly over the last several years. This growth has required substantial resources to facilitate and manage associated infrastructure impacts. In this same period there have been increasing regulatory reporting requirements and emergent issues such as Covid-19 which have created significant pressures and resourcing challenges for the City. These demands have reduced attention and oversight to the less critical asset categories such as office equipment and furnishings. Ongoing and competing demands challenge the City's ability to conduct ongoing review and management of office equipment and furnishings assets.

14.7 Levels of Service

The tables that follow summarize the City's current levels of service. There are no specifically prescribed KPIs under Ontario Regulation 588/17 for non-core assets, therefore the KPIs below represent performance measures that the City has selected for this AMP.

14.7.1 Community Levels of Service

Service Attribute	Qualitative Description	Current LOS (2023)
Accessible & Reliable	Office equipment and furnishing assets meet the needs of users and perform reliably. Assets store and transmit information in a secure manner. Information is backed up on other IT sources and retrievable if needed.	Office equipment assets include a variety of computers, telephones, printers, and servers that are predominately used by City staff to enable the delivery of services throughout the Municipality
Affordable	Office equipment and furnishing assets are managed cost-effectively to meet the established level of service	The City of Thorold ensures that office equipment assets procured are planned, cost effective and easy to maintain.
Sustainable	There are long-term plans in place for the renewal and replacement of office equipment and furnishing assets	Office equipment and furnishing assets range in condition from very good to poor. On average, office equipment and furnishing assets are in Fair (45%) condition.

Table 74 Community Levels of Service: Office Equipment & Furnishings

14.7.2 Technical Levels of Service

Service Attribute	Technical Metric	Current LOS (2023)
Quality	Average condition of office equipment assets	45%
Performance	Actual vs. Target Capital Reinvestment Rate	3.9% vs. 17.4%

Table 75 Technical Levels of Service: Office Equipment & Furnishings

14.8 Proposed Levels of Service

As per O. Reg. 588/17, by July 1, 2025, municipalities are required to consider proposed levels of service (PLOS), discuss the associated risks and long-term sustainability of these service levels, and explain the City's ability to afford the PLOS.

The below tables and graphs explain the proposed levels of service scenarios that were analyzed for office equipment and furnishings. Further PLOS analysis at the portfolio level can be found in Section *4. Proposed Levels of Service Analysis.*

14.8.1 PLOS Scenarios Analyzed

Scenario	Description
Scenario 1: Achieving 50% Funding in 12 Years	This scenario assumes gradual tax increases of ~0.5%/year, stabilizing at 50% funding across all tax-funded asset categories in 12 years. ♦ Office equipment capital funding benefits from 'overfunded' asset category funding being reallocated during early years of implementation and gradually increases from $170k/year to $255k/year over a span of 12 years
Scenario 2: Achieving 75% Funding in 12 Years	This scenario assumes gradual tax increases of ~2.0%/year, stabilizing at 75% funding across all tax-funded asset categories in 12 years. ♦ Office equipment capital funding gradually increases from $114k/year to $382k/year over a span of 12 years
Scenario 3: Achieving 100% Funding in 12 Years	This scenario assumes gradual tax increases of ~3.3%/year, stabilizing at 100% funding across all tax-funded asset categories in 12 years. ♦ Office equipment capital funding gradually increases from $114k/year to $509k/year over a span of 12 years

Table 76 Office Equipment & Furnishings PLOS Scenario Descriptions

14.8.2 PLOS Analysis Results

Scenario	Technical LOS Outcomes	Initial Value (2025)	15 Year Projection (2039)	30 Year Projection (2054)	Comments
Scenario 1 (50%)	Average Condition	25%	18%	18%	
	Average Asset Risk	13.7	12.8	12.8	
	Average Annual Investment		$255,000		Increase taxes by ~0.5% per year for 12 years
	Average Capital re-investment rate		8.7%		
Scenario 2 (75%)	Average Condition	25%	27%	27%	
	Average Asset Risk	13.7	11.1	11.2	
	Average Annual Investment		$382,000		Increase taxes by ~2.0% per year for 12 years
	Average Capital re-investment rate		13.1%		
Scenario 3 (100%)	Average Condition	25%	39%	35%	
	Average Asset Risk	13.7	11.7	10.5	
	Average Annual Investment		$509,000		Increase taxes by ~3.3% per year for 12 years
	Average Capital re-investment rate		17.4%		

Table 77 Office Equipment & Furnishings PLOS Scenario Analysis

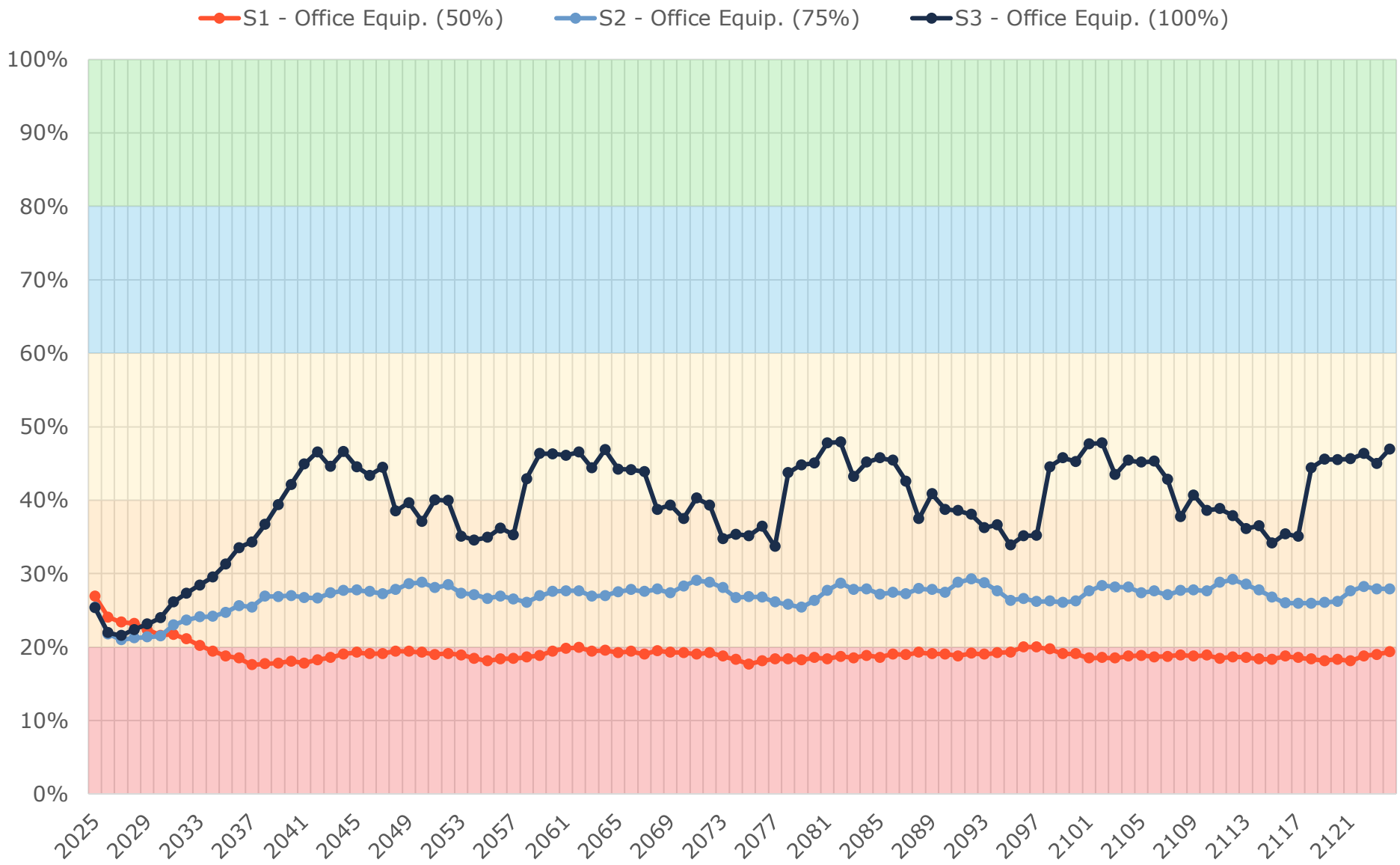


Figure 94 Office Equipment & Furnishings PLOS Scenario Condition Results

14.8.3 10-Year PLOS Financial Projections

As outlined in Section *4. Proposed Levels of Service Analysis*, the City of Thorold selected Scenario 3 as their preferred proposed levels of service. The main objective is to increase spending gradually to reach a more sustainable funding level to manage the City's current inventory of assets. The following table outlines the funding trajectory over the next 10 years for office equipment and furnishings if the financial strategy for Scenario 3 is implemented.

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Targeted Capital Spending	**$509k**	**$509k**	**$509k**	**$509k**	**$509k**	**$509k**	**$509k**	**$509k**	**$509k**	**$509k**
Projected Capital Spending	$145k	$181k	$212k	$244k	$277k	$312k	$347k	$383k	$421k	$460k
Funding Deficit	$364k	$328k	$297k	$265k	$232k	$198k	$162k	$126k	$88k	$49k
Target Reinvestment Rate	**17.4%**	**17.4%**	**17.4%**	**17.4%**	**17.4%**	**17.4%**	**17.4%**	**17.4%**	**17.4%**	**17.4%**
Projected Reinvestment Rate	5.0%	6.2%	7.3%	8.4%	9.5%	10.7%	11.9%	13.1%	14.4%	15.7%

Table 78 Office Equipment & Furnishings 10-Year PLOS Financial Projections

Strategies

15. Growth

The demand for infrastructure and services will change over time based on a combination of internal and external factors. Understanding the key drivers of growth and demand will allow the City to plan for new infrastructure more effectively, and the upgrade or disposal of existing infrastructure. Increases or decreases in demand can affect what assets are needed and what level of service meets the needs of the community.

15.1 Growth Assumptions

15.1.1 Thorold Official Plan and Community Structure and Development Report

The City of Thorold's Official Plan outlines a long-term vision for growth, with a planning horizon extending to 2031. It identifies the Neighborhoods of Rolling Meadows and Port Robinson West as the primary areas for residential expansion, supported by traditional urban areas such as Confederation Heights and Downtown Thorold. The plan anticipates a population increase of 5,186 residents between 2006 and 2031, reflecting an annual growth rate of approximately 1%. The Plan also includes employment projections, estimating an increase of approximately 1,400 new jobs during the same timeframe. Thorold's existing employment land supply includes 100 hectares of serviced land and over 500 hectares of designated rural industrial land.

Thorold's actual population growth has considerably surpassed previous forecasts, particularly those presented in the 2010 Official Plan. Between 2016 and 2021, the City experienced a population increase of 26.7%, bringing the total to approximately 23,700 residents, compared to a projected 1% annual growth rate. This translates to an average annual growth of 4.8% during that period. Recent projections now anticipate a population of 39,690 by 2051—a 62% increase from 2021, highlighting Thorold's emergence as one of the fastest-growing cities in Ontario and Canada.

This variance between past projections and observed growth suggests a need to revisit and update infrastructure planning assumptions. The revised expectations are reflected across several planning instruments, including the Community Structure and Development Report (CSDR), Niagara Region Official Plan (2022), and the Strategic Plan 2024–2027. These documents illustrate Thorold's reclassification as a high-growth urban node and the growing momentum of residential and employment development.

Given the pace of change, previously developed infrastructure plans may require recalibration to ensure alignment with the City's evolving needs. Revisiting planning horizons and capital allocations can help align infrastructure investments with emerging trends.

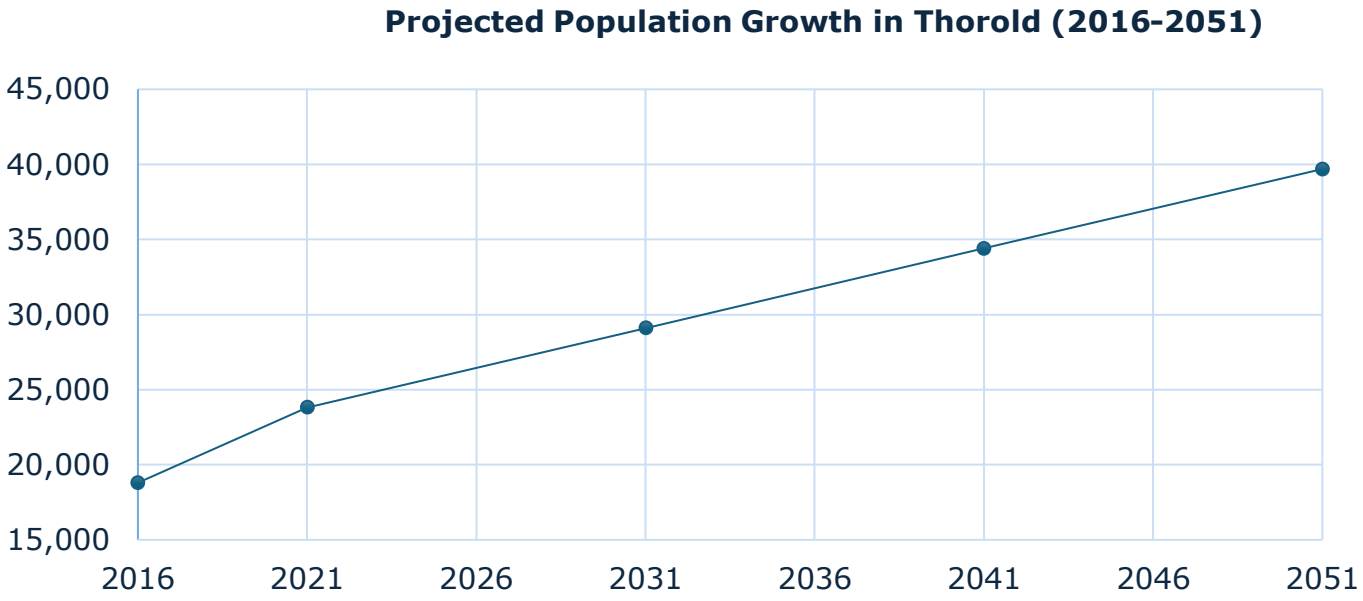


Figure 95 Projected Population Growth in Thorold (2016-2051)

15.1.2 Strategic Plan: 2024–2027

The City of Thorold's Strategic Plan for 2024–2027 identifies growth as both a key challenge and a promising opportunity. It acknowledges that Thorold is currently the fourth fastest growing city in Ontario and the eighth fastest in Canada. Under Theme 3, the Plan notes that the City will likely continue to experience development pressure due to its central location between Niagara Falls and St. Catharines. It encourages proactive collaboration with developers to ensure new neighborhoods incorporate affordable housing, public amenities, and supporting infrastructure. The Strategic Plan also underscores the need to expand and adapt road and active transportation networks to keep pace with increasing demand.

15.1.3 Niagara Region Official Plan (2022)

The Niagara Region Official Plan designates Thorold as a Strategic Growth Area within the Region's urban structure. It assigns Thorold a population target of 39,690 by 2051 and an employment target of 10,660. These figures reflect region-wide modeling and are reinforced by policies supporting higher densities in greenfield and intensification areas. The Plan promotes aligning infrastructure investment with projected growth to support compact, efficient, and sustainable service delivery.

15.1.4 Infrastructure and Demographic Pressures

Recent planning documents emphasize that growth in Thorold is occurring at an accelerated and spatially concentrated pace. The Community Structure and Development Report (2022) and the Parks, Trails and Recreation Master Plan (2020) identify Rolling Meadows and Port Robinson West as primary nodes for future development. Rolling Meadows alone is projected to account for 47% of new population and 35% of residential units by 2031. Port Robinson West is forecasted to absorb approximately 44% of population growth to 2041. These targeted areas will require focused and coordinated infrastructure investment to accommodate new housing, municipal servicing, and community amenities.

The concentration of growth introduces localized infrastructure demands. As new subdivisions are established, there will be corresponding increases in needs for roadways, stormwater systems, parks, water distribution, and active transportation infrastructure. Managing development in a way that aligns with available servicing capacity can help reduce strain and support the delivery of timely services.

Demographic trends are also shaping infrastructure planning needs. According to both the Strategic Plan and Parks, Trails and Recreation Master Plan, by 2029, over 36% of Thorold's population is expected to be over the age of 55. This aging demographic underscores the importance of planning for accessible infrastructure, healthcare, and age-friendly public spaces. These shifts present opportunities to invest in infrastructure that supports inclusive design and evolving community needs.

In parallel, there is an increasing emphasis on the need to support a variety of housing types, such as townhouses and apartments, to better reflect the needs of smaller households, seniors, and newcomers. As noted in the Parks Master Plan, this evolution in housing demand calls for adaptable and diversified infrastructure to support more compact and flexible urban development.

15.2 Impact of Growth on Lifecycle Activities

Planning for forecasted population growth may require the expansion of existing infrastructure and services. As growth-related assets are constructed or acquired, they should be integrated into the City's AMP. While the addition of residential units will add to the existing assessment base and offset some of the costs associated with growth, the City will need to review the lifecycle costs of growth-related infrastructure. These costs should be considered in long-term funding strategies that are designed to, at a minimum, maintain the current level of service.

Thorold's rapid population growth is expected to influence the City's asset portfolio significantly and elevate demands on infrastructure systems. The following growth-related considerations were identified in the Transportation, Water, Parks, and Asset Management Plans:

- **Transportation:** Growth in Port Robinson West and Thorold South is anticipated to increase road usage and result in the need for new connections and expanded capacity. The Transportation Master Plan identifies several new arterial and collector roads, along with realignment of existing corridors. This will extend the road network and necessitate greater investment in operations and maintenance. Emphasis on preventative maintenance will be critical to maximizing asset lifespan.
- **Water and Wastewater:** Growth nodes will require infrastructure upgrades such as reservoir expansions, watermain looping, and enhancements to pressure zones. The Water Servicing Master Plan outlines these interventions as key to supporting reliable service delivery. As the network grows, so too will the long-term responsibilities for system upkeep, monitoring, and renewal.
- **Stormwater:** Increased development will elevate runoff volumes, requiring additional stormwater conveyance systems and management facilities. The Stormwater Management Master Plan (2022) highlights the need for new sewers in Rolling Meadows and upgrades to outfall systems in Port Robinson West. These additions will entail ongoing lifecycle management, including sediment removal, inspections, and repairs.

- **Parks and Recreation:** Projected growth of approximately 2,700 residents by 2029 will generate demand for new parks and trail systems, particularly in Rolling Meadows. The Parks, Trails and Recreation Master Plan recommends prioritizing land acquisition and capital planning in these areas. Expanded recreational infrastructure will bring long-term operational and renewal costs tied to maintenance, accessibility, and safety enhancements.
- **Asset Management and Financial Planning:** The Asset Management Strategic Plan underscores the importance of integrating new infrastructure into lifecycle forecasting and capital budgeting processes. As the City's asset inventory expands, it will be important to maintain updated condition data, risk assessments, and reinvestment strategies to support sustainable service delivery. At the same time, planning for full lifecycle costs will be essential to long-term financial health. The Transportation Master Plan and Asset Management Policy recommend early consideration of maintenance and replacement costs, supported by strategies such as multi-year funding models, reserve planning, and alignment of development charges with anticipated needs.

It is strongly recommended to commission a dedicated infrastructure growth study that encompasses all asset categories to review capacity, funding models, and future levels of service.

16. Financial Strategy

For an asset management plan to be effective and meaningful, it must be integrated with financial planning and long-term budgeting. The development of a comprehensive financial plan will allow the City of Thorold to identify the financial resources required for sustainable asset management based on existing asset inventories, desired levels of service, and projected growth requirements.

This report develops such a financial plan by presenting several scenarios for consideration and culminating with final recommendations. As outlined below, the scenarios presented model different combinations of the following components:

1. The financial requirements for:
    a. Existing assets
    b. Existing service levels
    c. Requirements of contemplated changes in service levels (*refer to Section 4. Proposed Levels of Service Analysis*)
    d. Requirements of anticipated growth (none identified for this plan)
2. Use of traditional sources of municipal funds:
    a. Tax levies
    b. User fees
    c. Debt
    d. Development charges
3. Use of non-traditional sources of municipal funds:
    a. Reallocated budgets
    b. Partnerships
    c. Procurement methods
4. Use of Senior Government Funds:
    a. Canada Community-Building Fund (CCBF)
    b. Ontario Community Infrastructure Fund (OCIF)
    c. Annual grants

Note: Periodic grants are normally not included due to Provincial requirements for firm commitments. However, if moving a specific project forward is wholly dependent on receiving a one-time grant, the replacement cost included in the financial strategy is the net of such grant being received.

If the financial plan component results in a funding shortfall, the Province requires the inclusion of a specific plan as to how the impact of the shortfall will be managed. In determining the legitimacy of a funding shortfall, the Province may evaluate a municipality's approach to the following:

1. In order to reduce financial requirements, consideration has been given to revising service levels downward.
2. All asset management and financial strategies have been considered. For example:

a. If a zero-debt policy is in place, is it warranted? If not the use of debt should be considered.

b. Do user fees reflect the cost of the applicable service? If not, increased user fees should be considered.

16.1 Annual Requirements & Capital Funding

16.1.1 Annual Requirements

The annual requirements represent the amount the City should allocate annually to each asset category to meet replacement needs as they arise, prevent infrastructure backlogs and achieve long-term sustainability based on the proposed levels of service outlined in Section 4. In total, the City must allocate approximately $23.0 million annually to address capital requirements for the assets included in this AMP.

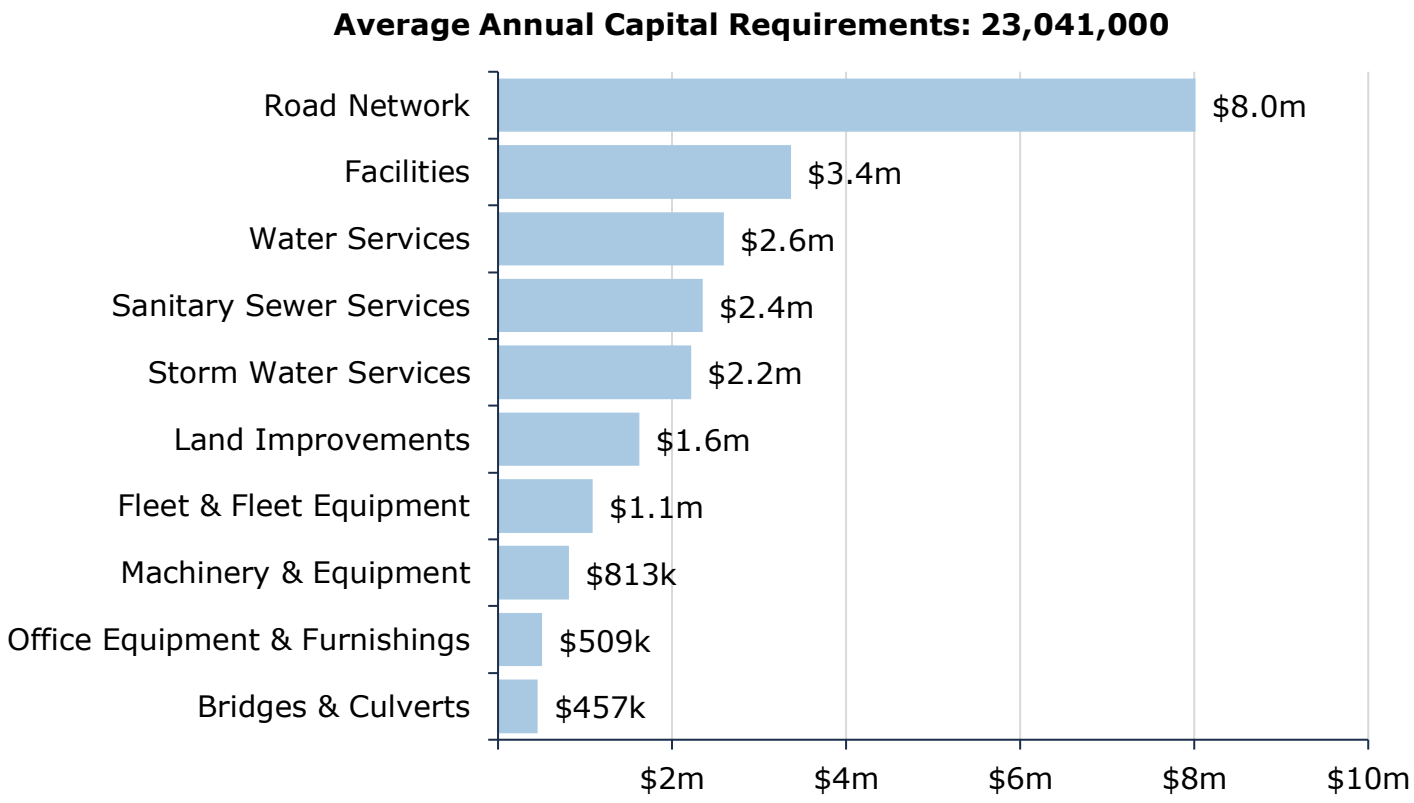


Figure 96 Annual Capital Funding Requirements by Asset Category

For most asset categories the annual requirement has been calculated based on a "replacement only" scenario, in which capital costs are only incurred at the construction and replacement of each asset.

However, for the Road Network, lifecycle management strategies have been developed to identify capital costs that are realized through strategic rehabilitation and renewal of the City's roads. The development of these strategies allows for a comparison of potential cost avoidance if the strategies were to be implemented. The following table compares two scenarios for the Road Network:

1. **Replacement Only Scenario**: Based on the assumption that assets deteriorate and – without regularly scheduled maintenance and rehabilitation – are replaced at the end of their service life.
2. **Lifecycle Strategy Scenario**: Based on the assumption that lifecycle activities are performed at strategic intervals to extend the service life of assets until replacement is required.

Asset Category	Annual Requirements (Replacement Only)	Annual Requirements (Lifecycle Strategy)	Difference
Road Network	$12,529,000	$8,013,000	$4,515,000

Table 79 Lifecycle Strategies Annual Savings

The implementation of a proactive lifecycle strategy for roads leads to a potential annual cost avoidance of $4.5 million for the road network. This represents an overall reduction of the annual requirements of 36%. As the lifecycle strategy scenario represents the lowest cost option available to the City, we have used these annual requirements in the development of the financial strategy.

16.1.2 Annual Funding Available

Based on a historical analysis of sustainable capital funding sources, the City is committing approximately $11.5 million towards capital projects per year. Given the annual capital requirement of $23.0 million, there is currently a funding gap of $11.5 million annually.

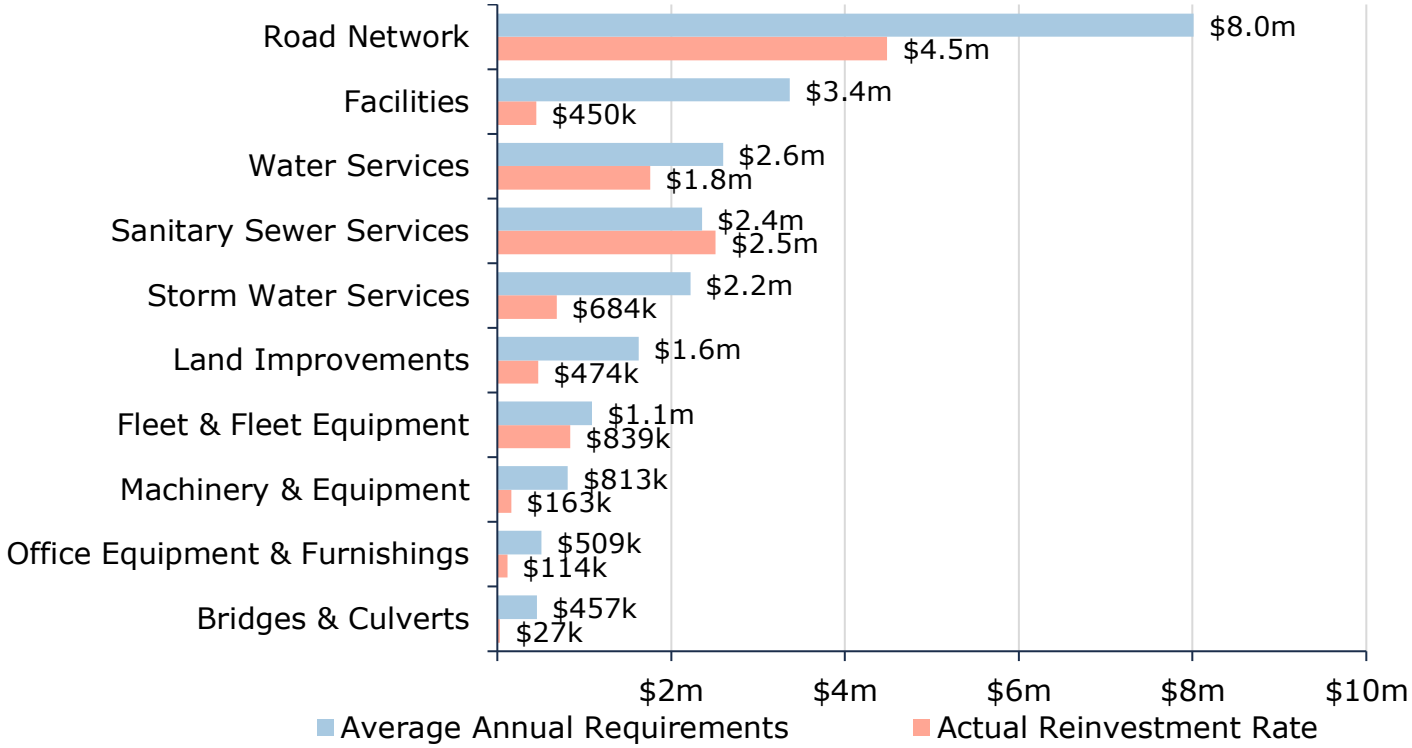


Figure 97 Annual Requirements vs. Capital Funding Available

16.2 Funding Objective

We have developed a scenario that would enable City of Thorold to achieve full funding within 12 years for the following assets:

1. **Tax Funded Assets:** Road Network, Bridges & Culverts, Storm Water Services, Facilities, Land Improvements, Fleet & Fleet Equipment, Machinery & Equipment, Office Equipment & Furnishings

2. **Rate-Funded Assets:** Water Services, Sanitary Sewer Services

Note: For the purposes of this AMP, we have excluded gravel roads since they are a perpetual maintenance asset and end of life replacement calculations do not normally apply. If gravel roads are maintained properly, they can theoretically have a limitless service life.

For each scenario developed we have included strategies, where applicable, regarding the use of cost containment and funding opportunities.

16.3 Financial Profile: Tax Funded Assets

16.3.1 Current Funding Position

The following tables show, by asset category, Thorold's average annual asset investment requirements, current funding positions, and funding increases required to achieve full funding on assets funded by taxes.

Asset Category	Avg. Annual Require-ment	Annual Funding Available					Annual Deficit
		Taxes	USA Tax Levy	CCBF	OCIF	Total Avail.	
Road Network	8,013,159	2,591,732	*Varies* Avg: $790,000[7]	397,000	1,149,000	4,927,732	3,085,427
Bridges & Culverts	456,657	27,000	0	0	0	27,000	429,657
Storm Water Services	2,220,621	245,000	0	352,000	86,500	683,500	1,537,121
Facilities	3,364,925	450,410	0	0	0	450,410	2,914,515
Land Improvements	1,625,113	474,225	0	0	0	474,225	1,150,888
Fleet & Fleet Equipment	1,089,785	839,346	0	0	0	839,346	250,439
Machinery & Equipment	812,989	162,691	0	0	0	162,691	650,298
Office Equipment & Furnishings	509,204	113,668	0	0	0	113,668	395,536
Total	**18,092,453**	**4,904,072**	**790,000**	**749,000**	**1,235,500**	**7,678,572**	**10,413,881**

Table 80 Annual Available Funding for Tax Funded Assets

The average annual investment requirement for the above categories is $18.1 million. Annual revenue currently allocated to these assets for capital purposes is $7.7 million, leaving an annual deficit of $10.4 million. Put differently, these infrastructure categories are currently funded at 42% of their long-term requirements.

16.3.2 Full Funding Requirements

In 2024, the City of Thorold had budgeted annual tax revenues of approximately $22.2 million (excluding the Urban Service Area Levy). As illustrated in the following table, without consideration of any other sources of revenue or cost containment strategies, full funding would require the following tax change over time:

[7] The City currently collects the Urban Service Area (USA) Tax Levy and allocates funds to both Sanitary Sewer Services and the Road Network. However, the City plans to gradually shift the USA Levy to be solely dedicated to the Road Network over the next 12 years. 2024 allocation of the USA levy was $350k Road Network / $880k Sanitary Services.

Asset Category	Tax Change Required for Full Funding
Road Network	13.9%[8]
Bridges & Culverts	1.9%
Storm Water Services	6.9%
Facilities	13.1%
Land Improvements	5.2%
Fleet & Fleet Equipment	1.1%
Machinery & Equipment	2.9%
Office Equipment & Furnishings	1.8%
Total	**46.8%**

Table 81 Tax Increase Requirements for Full Funding

The following changes in costs and/or revenues over the next number of years should also be considered in the financial strategy:

a) Thorold's debt payments for these asset categories will be decreasing $157,000 by 2027.

Our scenario modeling includes capturing the above changes and allocating them to the infrastructure deficit outlined above. The table below outlines this concept and presents several phase-in period lengths for achieving the proposed levels of service:

	5 Years	10 Years	12 Years	15 Years	20 Years
Infrastructure Deficit	10,413,881	10,413,881	10,413,881	10,413,881	10,413,881
Change in Debt Costs	-157,000	-157,000	-157,000	-157,000	-157,000
Resulting Infrastructure Deficit:	**10,256,881**	**10,256,881**	**10,256,881**	**10,256,881**	**10,256,881**
Tax Increase Required	46.2%	46.2%	46.2%	46.2%	46.2%
Annually:	**7.9%**	**3.9%**	**3.3%**	**2.6%**	**2.0%**

Table 82 Tax Increase Options 5-20 Years

[8] This value accounts for the average USA Tax Levy allocation over the implementation period. Based on 2024 contribution levels ($350k of USA Tax Levy allocation), the tax change required for full funding of the Road Network would be 15.9%.

16.3.3 Financial Strategy Recommendations

Considering all the above information, we recommend the 12-year option. This involves full funding being achieved over 12 years by:

a) increasing tax revenues by 3.3% each year for the next 12 years solely for the purpose of phasing in full funding to the asset categories covered in this section of the AMP.
b) allocating the current CCBF and OCIF revenue as outlined previously.
c) adjusting the proportion of the USA Tax Levy which is allocated to tax-funded assets to be $1.23 million (100%) by 2037.
d) increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

Notes:

1. As in the past, periodic senior government infrastructure funding will most likely be available during the phase-in period. By Provincial AMP rules, this periodic funding cannot be incorporated into an AMP unless there are firm commitments in place. We have included OCIF formula-based funding, if applicable, since this funding is a multi-year commitment[9].
2. We realize that raising tax revenues by the amounts recommended above for infrastructure purposes will be very difficult to do. However, considering a longer phase-in window may have even greater consequences in terms of infrastructure failure.
3. The City of Thorold currently collects $1.23 million annually through their Urban Service Area (USA) Tax Levy. As of 2024, the allocation of this levy was $350k towards roads, and $880k towards sanitary sewer services. The intention is to, gradually throughout the implementation period, ensure full allocation to road network assets while relying on rate increases to fund sanitary services without the need for tax subsidization.

Although this option achieves full funding on an annual basis in 12 years and provides financial sustainability over the period modeled, the recommendations do require prioritizing capital projects to fit the resulting annual funding available. Current data shows a pent-up investment demand of $31.0 million, concentrated mainly in storm water services ($15.8 million) and the road network ($9.3 million).

Prioritizing future projects will require the current data to be replaced by condition-based data. Although our recommendations include no further use of debt, the results of the condition-based analysis may require otherwise.

[9] The City should take advantage of all available grant funding programs and transfers from other levels of government. While OCIF has historically been considered a sustainable source of funding, the program is currently undergoing review by the provincial government. Depending on the outcome of this review, there may be changes that impact its availability.

16.4 Financial Profile: Rate Funded Assets

16.4.1 Current Funding Position

The following tables show, by asset category, Thorold's average annual asset investment requirements, current funding positions, and funding increases required to achieve full funding on assets funded by rates.

Asset Category	Avg. Annual Require-ment	Annual Funding Available				Annual Deficit
		Rates (Capital Portion)	USA Tax Levy	CCBF/ OCIF	Total Available	
Water Services	2,595,000	1,760,000	0	0	1,760,000	835,000
Sanitary Sewer Services	2,353,000	1,633,000	*Varies*[10]	0	1,633,000	720,000
Total	**4,948,000**	**3,393,000**	**0**	**0**	**3,393,000**	**1,555,000**

Table 83 Annual Available Funding for Rate Funded Assets

The average annual investment requirement for the above categories is $4.9 million. Annual revenue currently allocated to these assets for capital purposes is $$3.4 million from rates leaving an annual deficit of $1.6 million. Put differently, these infrastructure categories are currently funded at 69% of their long-term requirements.

Note: When considering USA Tax Levy subsidization, sanitary sewer services are currently fully funded. Due to the City's intention to slowly phase-out the subsidization of the sanitary network with tax funds, overall funding levels in sanitary services are expected to be slightly reduced.

16.4.2 Full Funding Requirements

In 2024, Thorold had budgeted annual water revenues of $5.7 million and sanitary revenues of $8.2 million. As illustrated in the table below, without consideration of any other sources of revenue, full funding would require the following changes over time:

Asset Category	Rate Change Required for Full Funding
Water Services	14.6%
Sanitary Sewer Services	8.8%

Table 84 Rate Increase Requirements for Full Funding

[10] The City currently collects the Urban Service Area (USA) Tax Levy and allocates funds to both Sanitary Sewer Services and the Road Network. However, the City plans to gradually shift the USA Levy to be solely dedicated to the Road Network over the next 12 years. 2024 allocation of the USA levy was $350k Road Network / $880k Sanitary Services. For the purpose of calculating full-funding, the USA Tax Levy has been removed from calculations to ensure sufficient funding solely from rate revenue.

In the following tables, we have expanded the above scenario to present multiple options. Due to the significant increases required, we have provided phase-in options of up to 20 years:

Water Network					
	5 Years	**10 Years**	**12 Years**	**15 Years**	**20 Years**
Infrastructure Deficit	835,000	835,000	835,000	835,000	835,000
Rate Increase Required	14.6%	14.6%	14.6%	14.6%	14.6%
Annually:	**2.8%**	**1.4%**	**1.2%**	**1.0%**	**0.7%**

Table 85 Water Rate Increase Options 5-20 Years

Sanitary Sewer Network					
	5 Years	**10 Years**	**12 Years**	**15 Years**	**20 Years**
Infrastructure Deficit	720,000	720,000	720,000	720,000	720,000
Rate Increase Required	8.8%	8.8%	8.8%	8.8%	8.8%
Annually:	**1.8%**	**0.9%**	**0.8%**	**0.6%**	**0.5%**

Table 86 Sanitary Rate Increase Options 5-20 Years

16.4.3 Financial Strategy Recommendations

Considering all of the above information, we recommend the 12-year option. This involves full funding being achieved over 12 years by:

a) increasing rate revenues by 1.2% for water services and 0.8% for sanitary services each year for the next 12 years solely for the purpose of phasing in full funding to the asset categories covered in this section of the AMP.
b) reducing the proportion of the USA Tax Levy which is allocated to rate-funded assets to be $0 by 2037 (currently $880,000 as of 2024).
c) increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

Notes:

1. As in the past, periodic senior government infrastructure funding will most likely be available during the phase-in period. This periodic funding should not be incorporated into an AMP unless there are firm commitments in place.
2. We realize that raising rate revenues for infrastructure purposes will be very difficult to do. However, considering a longer phase-in window may have even greater consequences in terms of infrastructure failure.
3. The City of Thorold currently collects $1.23 million annually through their Urban Service Area (USA) Tax Levy. As of 2024, the allocation of this levy was $350k towards roads, and $880k towards sanitary sewer services. The intention is to, gradually throughout the

implementation period, ensure full allocation to road network assets while relying on rate increases to fund sanitary services without the need for tax subsidization.

4. Any increase in rates required for operations would be in addition to the above recommendations.

Although this option achieves full funding on an annual basis in 12 years and provides financial sustainability over the period modeled, the recommendations do require prioritizing capital projects to fit the resulting annual funding available. Current data shows a pent-up investment demand of $25.4 million for water services and $22.2 million for sanitary services.

Prioritizing future projects will require the current data to be replaced by condition-based data. Although our recommendations include no further use of debt, the results of the condition-based analysis may require otherwise.

16.5 Use of Debt

Debt can be strategically utilized as a funding source with in the long-term financial plan. The benefits of leveraging debt for infrastructure planning include:

a) the ability to stabilize tax & user rates when dealing with variable and sometimes uncontrollable factors
b) equitable distribution of the cost/benefits of infrastructure over its useful life
c) a secure source of funding
d) flexibility in cash flow management

Debt management policies and procedures with limitations and monitoring practices should be considered when reviewing debt as a funding option. In efforts to mitigate increasing commodity prices and inflation, interest rates have been rising. Sustainable funding models that include debt need to incorporate the now current realized risk of rising interest rates. The following graph shows the historical changes to the lending rates:

The following tables outline how Thorold has historically used debt for investing in the asset categories as listed. As of year-end 2024, there is currently $299k of debt outstanding for the assets covered by this AMP with corresponding principal and interest payments of $157,000, well within its provincially prescribed maximum of $11.3 million.

Asset Category	Current Debt Outstanding Dec. '24	Use of Debt in the Last Five Years				
		2020	2021	2022	2023	2024
Road Network	0	0	0	0	0	0
Bridges & Culverts	0	0	0	0	0	0
Storm Water Services	0	0	0	0	0	0
Facilities	298,750	0	0	0	0	0
Land Improvements	0	0	0	0	0	0
Fleet & Fleet Equipment	0	0	0	0	0	0
Machinery & Equipment	0	0	0	0	0	0
Office Equipment & Furnishings	0	0	0	0	0	0
Total Tax Funded	**298,750**	**0**	**0**	**0**	**0**	**0**
Water Services	0	0	0	0	0	0
Sanitary Sewer Services	0	0	0	0	0	0
Total Rate Funded	**0**	**0**	**0**	**0**	**0**	**0**

Table 87 Thorold Use of Debt 2020-2024

Asset Category	Principal & Interest Payments in the Next Five Years				
	2026	2027	2028	2029	2030
Road Network	0	0	0	0	0
Bridges & Culverts	0	0	0	0	0
Storm Water Services	0	0	0	0	0
Facilities	157,000	0	0	0	0
Land Improvements	0	0	0	0	0
Fleet & Fleet Equipment	0	0	0	0	0
Machinery & Equipment	0	0	0	0	0
Office Equipment & Furnishings	0	0	0	0	0
Total Tax Funded	**157,000**	**0**	**0**	**0**	**0**
Water Services	0	0	0	0	0
Sanitary Sewer Services	0	0	0	0	0
Total Rate Funded	**0**	**0**	**0**	**0**	**0**

Table 88 Thorold Principal and Interest Payments

The revenue options outlined in this plan allow the City of Thorold to fully fund its long-term infrastructure requirements without further use of debt.

16.6 Use of Reserves

16.6.1 Available Reserves

Reserves play a critical role in long-term financial planning. The benefits of having reserves available for infrastructure planning include:

a) the ability to stabilize tax rates when dealing with variable and sometimes uncontrollable factors
b) financing one-time or short-term investments
c) accumulating the funding for significant future infrastructure investments
d) managing the use of debt
e) normalizing infrastructure funding requirement

By asset category, the table below outlines the details of the reserves currently available to Thorold.

Asset Category	Balance at December 31, 2023
Total Tax Funded:	**17,491,922**
Water Services	8,806,501
Sanitary Sewer Services	7,244,306
Total Rate Funded:	**16,050,807**
Total Capital Reserves:	**33,542,729**

Table 89 Thorold Reserve Balances

There is considerable debate in the municipal sector as to the appropriate level of reserves that a City should have on hand. There is no clear guideline that has gained wide acceptance. Factors that municipalities should take into account when determining their capital reserve requirements include:

a) breadth of services provided
b) age and condition of infrastructure
c) use and level of debt
d) economic conditions and outlook
e) internal reserve and debt policies.

These reserves are available for use by applicable asset categories during the phase-in period to full funding. This coupled with Thorold's judicious use of debt in the past, allows the scenarios to assume that, if required, available reserves and debt capacity can be used for high priority and emergency infrastructure investments in the short- to medium-term.

17. Recommendations & Key Considerations

17.1 Financial Strategies

1. Review the feasibility of adopting a full-funding scenario to achieve 100% of average annual funding requirement for the asset categories analyzed. This includes:
    a. Increasing taxes by 3.3% per year over a period of 12 years;
    b. Increasing water rates by 1.2% per year over a period of 12 years; and
    c. Increasing sanitary rates by 0.8% per year over a period of 12 years.

2. Continued allocation of OCIF and CCBF funding as previously outlined.

3. Continued collection of Urban Service Area Tax Levy, with gradual redistribution of funds solely to the Road Network by 2037.

4. Increase existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

5. Continue to apply for project specific grant funding to supplement sustainable funding sources.

17.2 Asset Data

1. Continuously review, refine, and calibrate lifecycle and risk profiles to better reflect actual practices and improve capital projections. In particular:
    a. the timing of various lifecycle events, the triggers for treatment, anticipated impacts of each treatment, and costs
    b. the various attributes used to estimate the likelihood and consequence of asset failures, and their respective weightings

2. Asset management planning is highly sensitive to replacement costs. Periodically update replacement costs based on recent projects, invoices, or estimates, as well as condition assessments, or any other technical reports and studies. Material and labour costs can fluctuate due to local, regional, and broader market trends, and substantially so during major world events. Accurately estimating the replacement cost of like-for-like assets can be challenging. Ideally, several recent projects over multiple years should be used. Staff judgement and historical data can help attenuate extreme and temporary fluctuations in cost estimates and keep them realistic.

3. Like replacement costs, an asset's established serviceable life can have dramatic impacts on all projections and analyses, including condition, long-range forecasting, and financial recommendations. Periodically reviewing and updating these values to better reflect in-field performance and staff judgement is recommended.

4. Consider expanding asset tracking to include more granular elements such as sanitary manholes, storm manholes, and storm catch basins. This will aid in maintenance and condition tracking.

17.3 Risk & Levels of Service

1. Risk models and matrices can play an important role in identifying high-value assets, and developing an action plan which may include repair, rehabilitation, replacement, or further evaluation through condition assessments. As a result, project selection and the development of multi-year capital plans can become more strategic and objective. Initial models have been built into Citywide for all asset groups. These models reflect current data, which was limited. As the data evolves and new attribute information is obtained, these models should also be refined and updated.

2. Available data on current performance should be centralized and tracked to support any calibration of service levels in alignment with O. Reg. 588's 2025 requirements on proposed levels of service.

3. Staff should monitor evolving local, regional, and environmental trends to identify factors that may shape the demand and delivery of infrastructure programs. These can include population growth, and the nature of population growth; climate change and extreme weather events; and economic conditions and the local tax base. This data can also be used to review service level targets.

17.4 Growth

1. As Thorold has experienced record growth in the last decade with this trend expected to continue, it is strongly recommended to commission a dedicated growth study relating to infrastructure which would include capacity reviews, funding options, and create alignment with the City's strategic plan.

Appendices

Appendix A – Infrastructure Report Card

Asset Category	Replacement Cost	Average Condition	Financial Capacity		% Funded
Road Network	**$290 m**	**Good**	Annual Requirement:	$8,013,000	**56%**
			Funding Available:	$4,488,000	
			Annual Deficit:	**$3,525,000**	
Bridges & Culverts	**$23 m**	**Fair**	Annual Requirement:	$457,000	**6%**
			Funding Available:	$27,000	
			Annual Deficit:	**$430,000**	
Water Services	**$152 m**	**Good**	Annual Requirement:	$2,595,000	**68%**
			Funding Available:	$1,760,000	
			Annual Deficit:	**$835,000**	
Sanitary Sewer Services	**$161 m**	**Good**	Annual Requirement:	$2,353,000	**107%**
			Funding Available:	$2,513,000[11]	
			Annual Deficit:	**-$160,000**	
Storm Water Services	**$136 m**	**Good**	Annual Requirement:	$2,221,000	**31%**
			Funding Available:	$684,000	
			Annual Deficit:	**$1,537,000**	
Facilities	**$107 m**	**Very Good**	Annual Requirement:	$3,365,000	**13%**
			Funding Available:	$450,000	
			Annual Deficit:	**$2,915,000**	
Land Improvements	**$33 m**	**Fair**	Annual Requirement:	$1,625,000	**29%**
			Funding Available:	$474,000	
			Annual Deficit:	**$1,151,000**	
Fleet & Fleet Equipment	**$14 m**	**Fair**	Annual Requirement:	$1,090,000	**77%**
			Funding Available:	$839,000	
			Annual Deficit:	**$250,000**	
Machinery & Equipment	**$7 m**	**Fair**	Annual Requirement:	$813,000	**20%**
			Funding Available:	$163,000	
			Annual Deficit:	**$650,000**	
Office Equipment & Furnishings	**$3 m**	**Fair**	Annual Requirement:	$509,000	**22%**
			Funding Available:	$114,000	
			Annual Deficit:	**$396,000**	
Total	**$927 m**	**Good**	Annual Requirement:	$23,041,000	**50%**
			Funding Available:	$11,512,000	
			Annual Deficit:	**$11,530,000**	

[11] Current funding available for sanitary services includes the subsidization by taxes via the Urban Service Area Tax Levy.

Appendix B – 10-Year Capital Requirements

Capital Requirements for Current Levels of Service

The tables below summarize the projected cost of lifecycle activities (rehabilitation and replacements) that may be undertaken over the next 10 years to support current levels of service. They do not consider any proposed levels of service, or available funding, and are projected based on ideal conditions. ***Note: These projections do not consider the availability of funding.***

These projections are generated in Citywide and rely on the data available in the asset register. Assessed condition data and replacement costs were used to assist in forecasting replacement needs for roads. For all remaining assets, only age was used to determine forthcoming replacement needs.

The projections can be different from actual capital forecasts. Consistent data updates, particularly condition, replacement costs, and regular upkeep of lifecycle models, will improve the alignment between the system generated expenditure requirements, and the City's capital expenditure forecasts.

Road Network

Segment	Back-log	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
HCB Roads	-	$5.8m	$7.7m	$16.1m	$3.6m	$2.9m	$4.0m	$2.5m	$9.6m	$5.2m	$3.3m
LCB Roads	-	$1.8m	$1.9m	$597k	$1.3m	$171k	$653k	$62k	$750k	$2.4m	$323k
Paved Trails	$6.9m	-	-	-	-	-	-	-	$12k	$45k	-
Railing	-	-	-	-	-	-	-	-	-	$79k	-
Sidewalks	$1.9m	-	-	-	-	-	-	$224k	$196k	-	-
Sound Barrier	-	-	-	-	-	-	-	-	-	-	-
Streetlights	$468k	$12k	-	$11k	-	-	$73k	-	$135k	-	$39k
Traffic Signs	-	$30k	$20k	$24k	$19k	$20k	$11k	$7k	$6k	$9k	$88k
Total	**$9.3m**	**$7.6m**	**$9.6m**	**$16.8m**	**$4.9m**	**$3.1m**	**$4.7m**	**$2.8m**	**$10.7m**	**$7.7m**	**$3.7m**

Table 90 System Generated 10-Year Capital Replacement Forecast: Road Network

Bridges & Culverts

Segment	Back-log	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Bridges	-	$65k	$70k	$26k	$20k	-	-	$518k	-	$25k	-
Structural Culverts	-	$75k	-	-	$200k	-	-	-	-	$15k	-
Total	**-**	**$140k**	**$70k**	**$26k**	**$220k**	**-**	**-**	**$518k**	**-**	**$40k**	**-**

Table 91 System Generated 10-Year Capital Replacement Forecast: Bridges & Culverts

Water Services

Segment	Back-log	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Water Mains (150mm - 200mm)	$17.0m	$710k	$3.2m	$2.8m	$1.0m	$821k	-	$368k	-	$6.3m	-
Water Mains (250mm - 450mm)	$4.2m	-	-	$1.6m	-	$1.3m	-	-	$2.4m	-	-
Water Mains (less than 100mm)	$987k	-	-	$204k	-	-	-	-	-	$111k	-
Water Meters	$3.3m	$39k	$18k	$28k	$24k	$19k	$13k	$22k	$28k	$33k	$35k
Total	**$25.4m**	**$749k**	**$3.2m**	**$4.6m**	**$1.0m**	**$2.2m**	**$13k**	**$390k**	**$2.4m**	**$6.4m**	**$35k**

Table 92 System Generated 10-Year Capital Replacement Forecast: Water Services

Sanitary Sewer Services

Segment	Back-log	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
CSO Tanks	-	-	-	-	-	-	-	-	-	-	-
Sanitary Mains (100mm - 150mm)	$683k	-	-	-	-	-	-	-	-	-	$103k
Sanitary Mains (200mm - 250mm)	$18.4m	$627k	$1.1m	$1.1m	$892k	$1.2m	$102k	$738k	$638k	$688k	$445k
Sanitary Mains (300mm - 350mm)	$2.4m	$292k	$236k	-	$324k	-	-	$49k	$95k	$47k	-
Sanitary Mains (375mm - 600mm)	$677k	-	$184k	-	$18k	-	$128k	-	$7k	-	-
Sanitary Mains (675mm - 900mm)	-	-	-	-	-	-	-	-	-	-	-
Total	**$22.2m**	**$919k**	**$1.5m**	**$1.1m**	**$1.2m**	**$1.2m**	**$230k**	**$787k**	**$740k**	**$734k**	**$548k**

Table 93 System Generated 10-Year Capital Replacement Forecast: Sanitary Sewer Services

Storm Water Services

Segment	Back-log	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Storm Mains (less than 200mm)	$368k	-	-	-	-	-	-	-	-	-	-
Storm Mains (250mm - 450mm)	$8.6m	-	$1.2m	$231k	-	-	-	-	$626k	-	-
Storm Mains (525mm - 800mm)	$5.2m	-	-	-	-	-	-	-	-	-	-
Storm Mains (825mm - 1200mm)	$1.2m	-	-	-	-	-	-	-	-	-	-
Storm Mains (1350mm - 2200mm)	$441k	-	$395k	-	-	-	-	-	-	-	-
Total	**$15.8m**	**-**	**$1.6m**	**$231k**	**-**	**-**	**-**	**-**	**$626k**	**-**	**-**

Table 94 System Generated 10-Year Capital Replacement Forecast: Storm Water Services

Facilities

Segment	Back-log	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Health & Social Services	-	$6k	-	-	$34k	-	$2k	-	$9k	$7k	-
Municipal Offices	-	$68k	-	$44k	$64k	-	$101k	-	$661k	$5k	$1.4m
Protection Services	-	$111k	$168k	$1k	$498k	$233k	$2.8m	$81k	$1.1m	$145k	$786k
Public Works	-	$75k	$85k	$24k	$443k	$19k	$516k	$9k	$690k	$56k	$157k
Recreation	-	$622k	$118k	$49k	$529k	$62k	$1.3m	$206k	$1.3m	$217k	$2.7m
Total	**-**	**$881k**	**$371k**	**$117k**	**$1.6m**	**$315k**	**$4.8m**	**$296k**	**$3.8m**	**$430k**	**$5.0m**

Table 95 System Generated 10-Year Capital Replacement Forecast: Facilities

Land Improvements

Segment	Back-log	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Bus Shelters	-	-	-	-	-	-	$8k	-	-	-	-
Fields & Courts	$523k	-	$1k	$248k	$50k	$143k	$70k	-	$118k	$9k	$35k
Irrigation System	$108k	-	$33k	$70k	$16k	-	-	-	-	-	$11k
Park Fixtures & Others	$251k	$129k	$12k	$261k	$92k	$146k	$229k	$86k	$553k	$704k	$184k
Parking Lots, Drives & Walkways	$2.3m	$10k	$18k	$144k	$587k	$856k	$1.4m	$160k	$443k	$585k	$308k
Play Structures	-	$140k	$397k	$762k	$106k	$1.1m	$1.0m	$339k	-	$333k	$400k
Total	**$3.2m**	**$279k**	**$461k**	**$1.5m**	**$851k**	**$2.3m**	**$2.7m**	**$585k**	**$1.1m**	**$1.6m**	**$938k**

Table 96 System Generated 10-Year Capital Replacement Forecast: Land Improvements

Fleet & Fleet Equipment

Segment	Back-log	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Health & Social Services	-	$57k	$33k	$113k	$144k	-	$228k	$136k	$85k	$33k	$41k
Protection Services	$2.0m	$95k	$1.1m	-	$204k	$10k	$1.1m	$348k	$169k	$42k	$757k
Public Works	$8k	-	$1.1m	$322k	$406k	$990k	$191k	$673k	$8k	$643k	$322k
Recreation & Culture	-	-	-	$78k	-	-	-	-	-	-	$78k
Total	**$2.0m**	**$153k**	**$2.2m**	**$513k**	**$754k**	**$1.0m**	**$1.5m**	**$1.2m**	**$261k**	**$718k**	**$1.2m**

Table 97 System Generated 10-Year Capital Replacement Forecast: Fleet & Fleet Equipment

Machinery & Equipment

Segment	Back-log	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Health & Social Services	$34k	$158k	$104k	$113k	$164k	$238k	$76k	-	$359k	$104k	-
Protection Services	$80k	$279k	$491k	$121k	$155k	$68k	$1.0m	$89k	$311k	$483k	-
Public Works	$69k	$42k	$510k	$193k	$583k	-	$981k	$73k	$70k	$79k	$75k
Recreation & Culture	$11k	-	$69k	$11k	$140k	$12k	$5k	$165k	$30k	$44k	-
Total	**$194k**	**$479k**	**$1.2m**	**$438k**	**$1.0m**	**$319k**	**$2.1m**	**$327k**	**$771k**	**$710k**	**$75k**

Table 98 System Generated 10-Year Capital Replacement Forecast: Machinery & Equipment

Office Equipment & Furnishings

Segment	Back-log	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Communications	-	$28k	$27k	$429k	$75k	$22k	$28k	$14k	$429k	$88k	$22k
Hardware	$442k	$318k	$448k	$56k	$137k	$225k	$876k	$199k	$86k	$239k	$342k
Office Equipment	-	-	-	$12k	-	$35k	-	-	$12k	-	$35k
Office Furnishings	$32k	$27k	$16k	$10k	$28k	-	$32k	$143k	$11k	$4k	$13k
Software	-	-	-	-	$24k	-	-	-	$24k	-	-
Total	**$474k**	**$373k**	**$491k**	**$507k**	**$264k**	**$282k**	**$936k**	**$356k**	**$562k**	**$331k**	**$412k**

Table 99 System Generated 10-Year Capital Replacement Forecast: Office Equipment & Furnishings

Capital Requirements for Proposed Levels of Service

The following capital forecasts are based on gradually increasing funding over 12 years to reach a target of 100% of ideal funding levels. ***Note: These projections do consider the availability of funding.***

Category	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Road Network	$4.5m	$4.8m	$5.1m	$5.4m	$5.7m	$5.9m	$6.3m	$6.6m	$6.9m	$7.2m
Bridges & Culverts	$70k	$26k	$220k	-	-	-	-	$40k	-	-
Water Services	$1.8m	$1.8m	$1.9m	$2.0m	$2.0m	$2.0m	$2.1m	$2.1m	$2.2m	$2.3m
Sanitary Sewer Services	$2.5m	$2.5m	$2.5m	$2.5m	$2.5m	$2.5m	$2.5m	$2.5m	$2.5m	$2.5m
Storm Water Services	$678k	$809k	$942k	$1.1m	$1.2m	$1.3m	$1.4m	$1.6m	$1.7m	$1.9m
Facilities	$403k	$117k	$1.6m	$304k	$3.6m	$1.7m	$2.4m	$1.4m	$3.8m	$1.8m
Land Improvements	$690k	$614k	$726k	$865k	$964k	$950k	$1.1m	$1.3m	$1.3m	$1.4m
Fleet & Fleet Equipment	$218k	$873k	$884k	$901k	$920k	$942k	$967k	$982k	$1.0m	$960k
Machinery & Equipment	$90k	$215k	$274k	$324k	$377k	$432k	$489k	$480k	$592k	$670k
Office Equipment & Furnishings	$111k	$145k	$181k	$212k	$242k	$278k	$312k	$347k	$381k	$419k
Total	**$11.0m**	**$11.9m**	**$14.3m**	**$13.5m**	**$17.4m**	**$16.1m**	**$17.5m**	**$17.3m**	**$20.4m**	**$19.0m**

Table 100 System Generated Proposed LOS 10-Year Capital Replacement Forecast: All Categories

Appendix C – Level of Service Maps & Photos

Bridges & Culverts

Structure Thor231 – South Main Street Bridge

Condition: Poor

Figure 98 Poor Bridge Condition Example

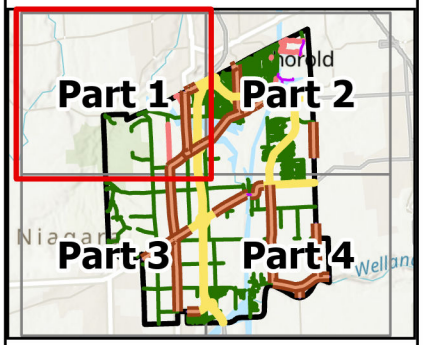
Structure Thor212 – Decew Road Bridge

Condition: Very Good

Figure 99 Very Good Bridge Condition Example

ROAD NETWORK MAP

Part 1



Index Map

Legend

Thorold Roads

Owner

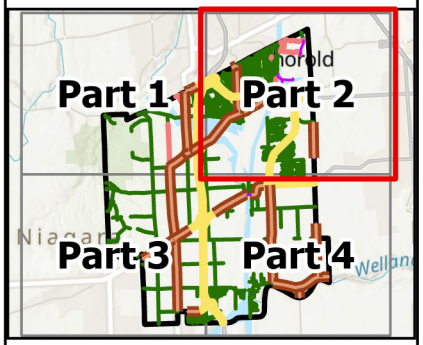
- Municipal
- Private
- Provincial
- Regional
- St. Lawrence Seaway Authority
- Map Index
- Thorold Boundary
- Municipal Boundaries

N

Scale: 1:37,000

ROAD NETWORK MAP

Part 2



Index Map

Legend

Thorold Roads

Owner

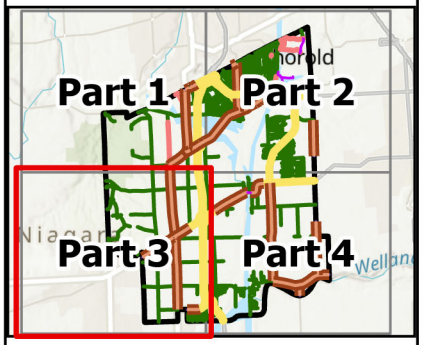
- Municipal
- Private
- Provincial
- Regional
- St. Lawrence Seaway Authority
- Map Index
- Thorold Boundary
- Municipal Boundaries

N

Scale: 1:37,000

ROAD NETWORK MAP

Part 3



Index Map

Legend

Thorold Roads

Owner

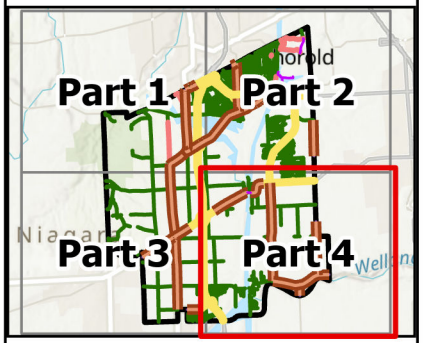
- Municipal
- Private
- Provincial
- Regional
- St. Lawrence Seaway Authority
- Map Index
- Thorold Boundary
- Municipal Boundaries

N

Scale: 1:37,000

ROAD NETWORK MAP

Part 4



Index Map

Legend

Thorold Roads

Owner

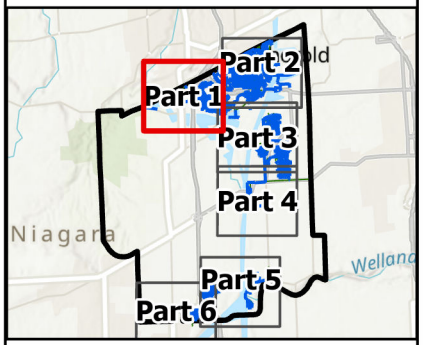
- Municipal
- Private
- Provincial
- Regional
- St. Lawrence Seaway Authority
- Map Index
- Thorold Boundary
- Municipal Boundaries

N

Scale: 1:37,000

WATER SERVICES MAP

Part 1



Index Map

Legend

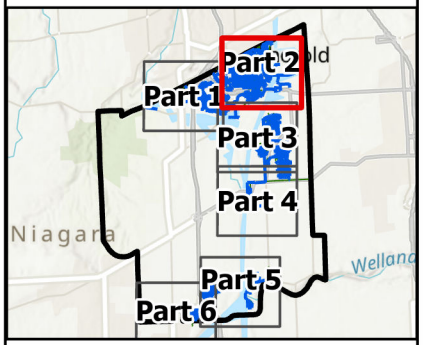
- Hydrants
- Water System Valves
- Water Mains
- Map Index
- Municipal Boundaries
- Thorold Boundary

N

Scale: 1:15,000

WATER SERVICES MAP

Part 2



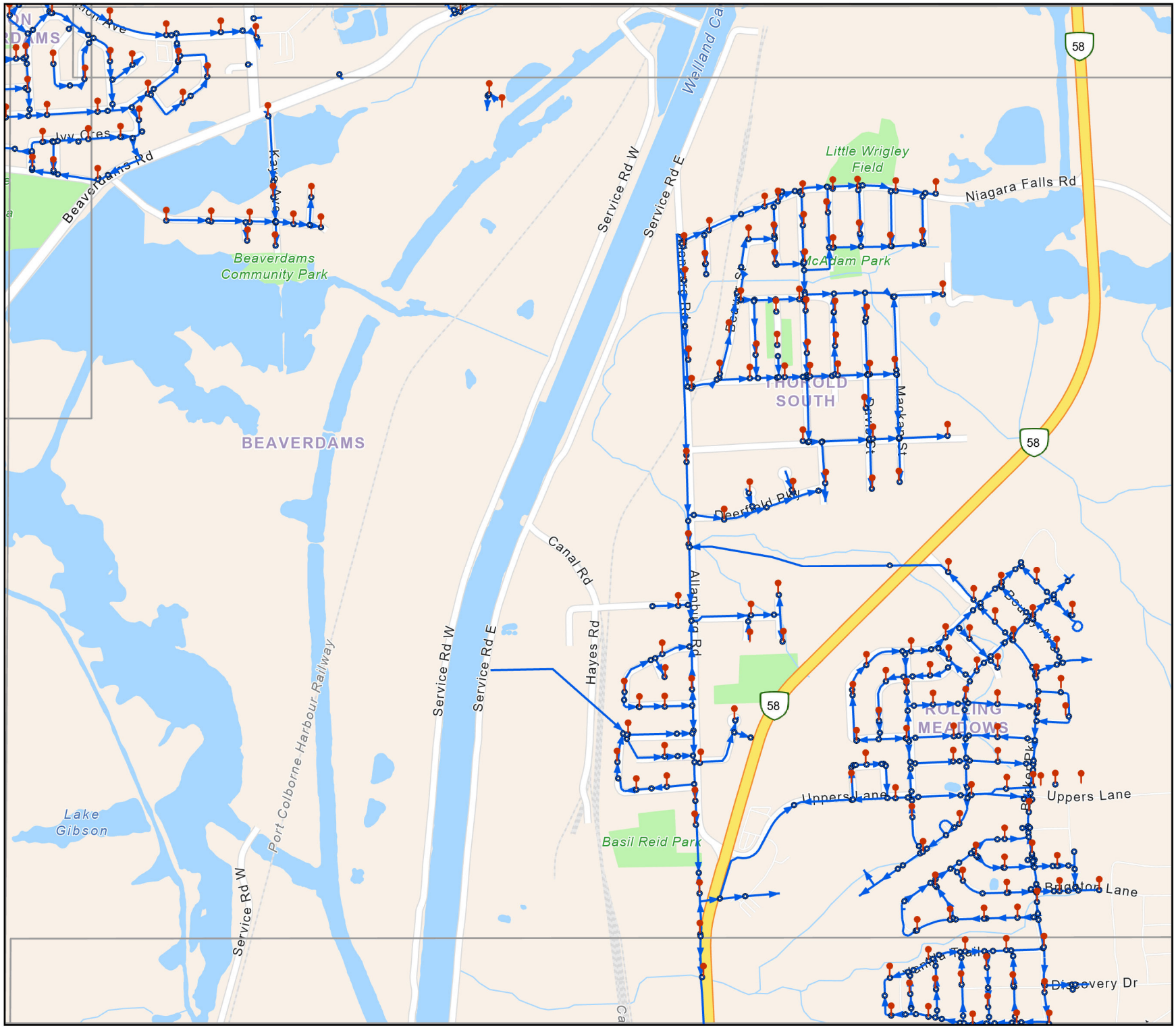
Index Map

Legend

- Hydrants
- Water System Valves
- Water Mains
- Map Index
- Municipal Boundaries
- Thorold Boundary

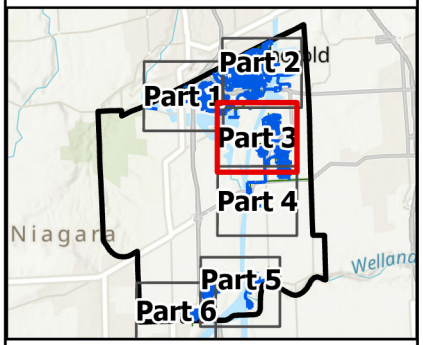
N

Scale: 1:15,000



WATER SERVICES MAP

Part 3



Index Map

Legend

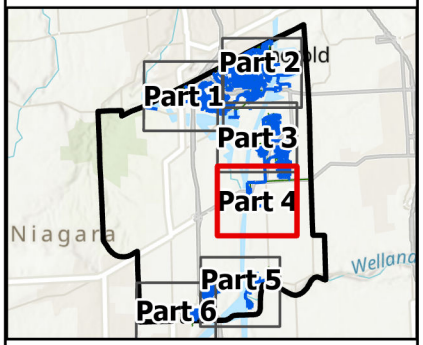
- Hydrants
- Water System Valves
- Water Mains
- Map Index
- Municipal Boundaries
- Thorold Boundary

N

Scale: 1:15,000

WATER SERVICES MAP

Part 4



Index Map

Legend

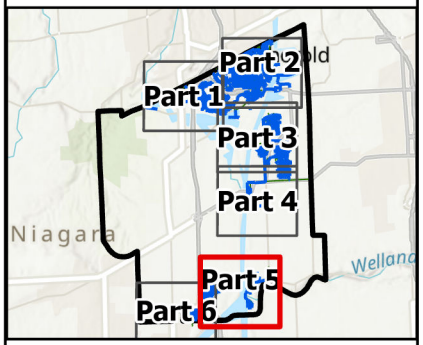
- Hydrants
- Water System Valves
- Water Mains
- Map Index
- Municipal Boundaries
- Thorold Boundary

N

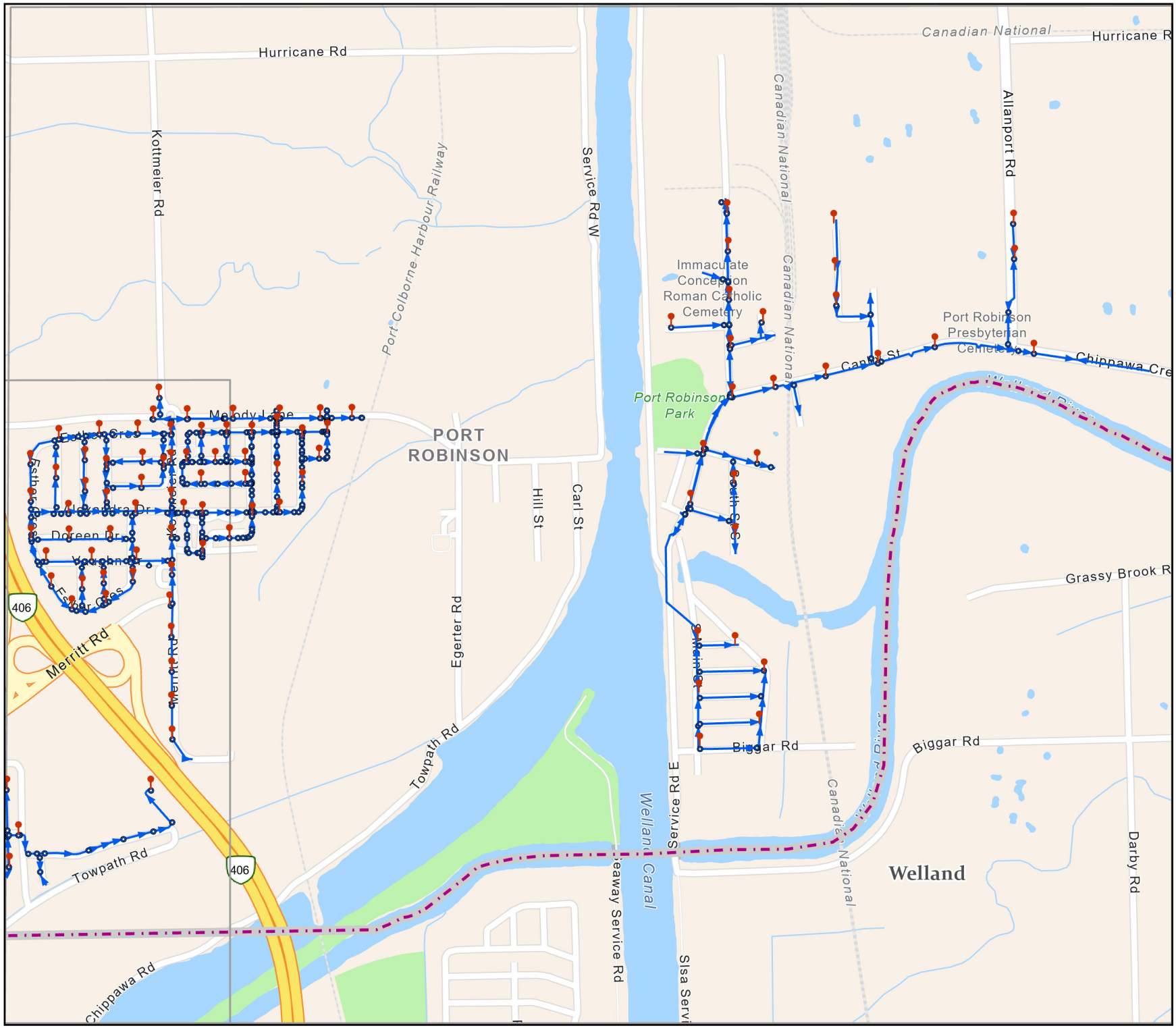
Scale: 1:15,000

WATER SERVICES MAP

Part 5



Index Map

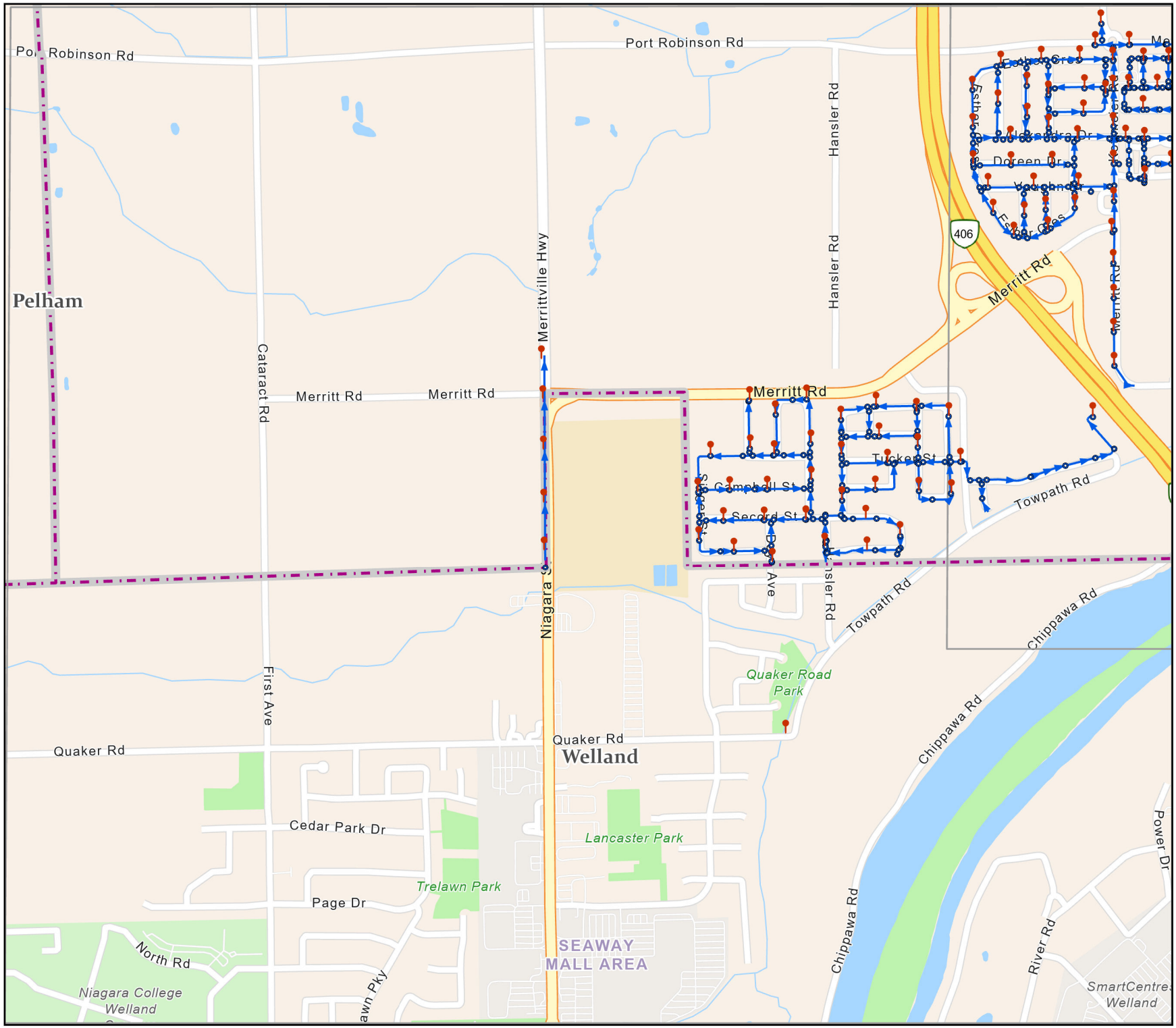


Legend

- Hydrants
- Water System Valves
- Water Mains
- Map Index
- Municipal Boundaries
- Thorold Boundary

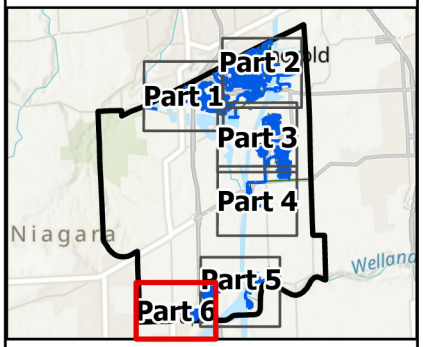
N

Scale: 1:15,000



WATER SERVICES MAP

Part 6



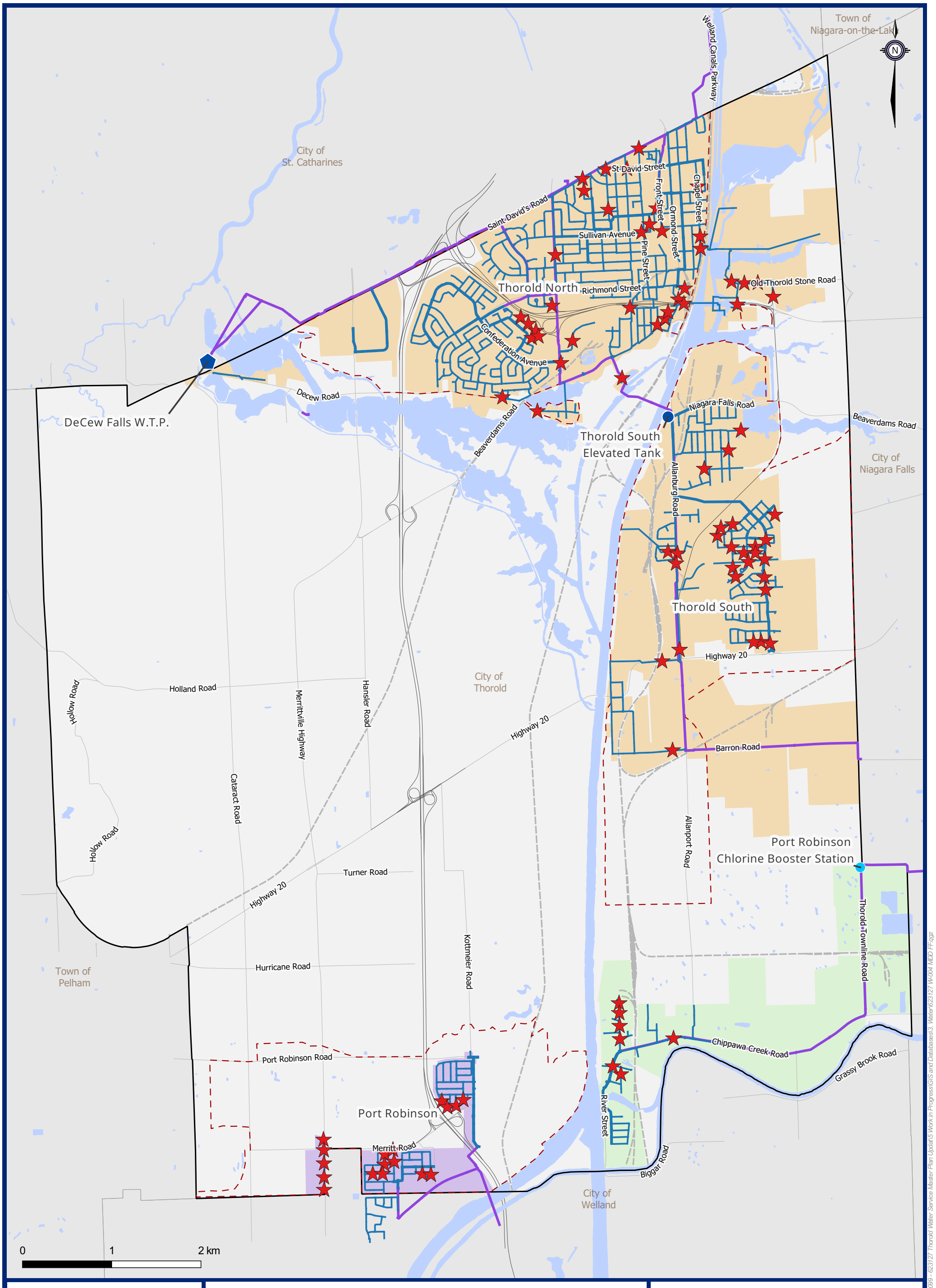
Index Map

Legend

- Hydrants
- Water System Valves
- Water Mains
- Map Index
- Municipal Boundaries
- Thorold Boundary

N

Scale: 1:15,000



City of Thorold
Water and Wastewater Master Plan

Fire Flow
- Existing Deficient Fire Flow

Existing Water Infrastructure
- Chlorine Facility
- Elevated Tank
- Water Treatment Plant
- Regional Watermain
  - >= 300 mm
  - <300 mm

Other
- Thorold Boundary
- Urban Area Boundary
- Waterbodies

Water Pressure Zones
- 227 m HGL
- 250 m HGL
- 220 m HGL

Figure #.#.#

Maximum Day Demand Existing Fire Flow Deficiency

Baseline System and Understanding

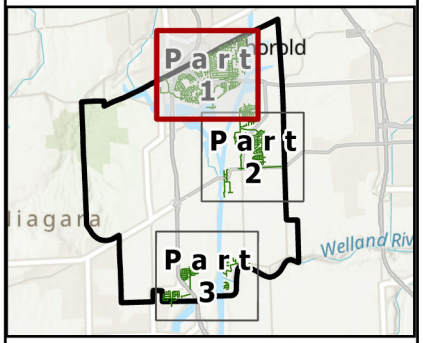
GEI Consultants | BluePlan

July, 2025
2402099
Projection EPSG:26917

Document Path: B:\Working\THOROLD ON, CITY OF\2402099 - 623127 Thorold Water Service Master Plan Updat\5 Work in Progress\GIS and Databases\3. Water\623127 WI-004 MDD FF.qgz

SANITARY SEWER SERVICES MAP

Part 1



Index Map

Legend

- Sanitary Gravity Mains

Sanitary Manholes

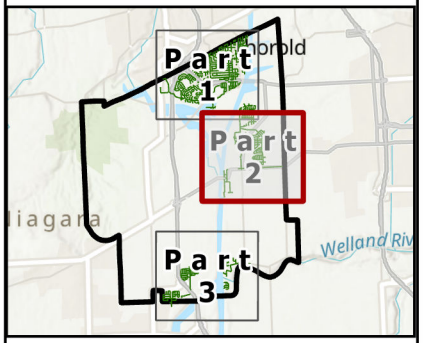
- Sanitary Access Chamber
- Combined Sewer Overflow
- Drop Structure
- Outfall
- Virtual
- Map Index
- Municipal Boundaries
- Thorold Boundary

N

Scale: 1:20,000

SANITARY SEWER SERVICES MAP

Part 2



Index Map

Legend

- Sanitary Gravity Mains

Sanitary Manholes

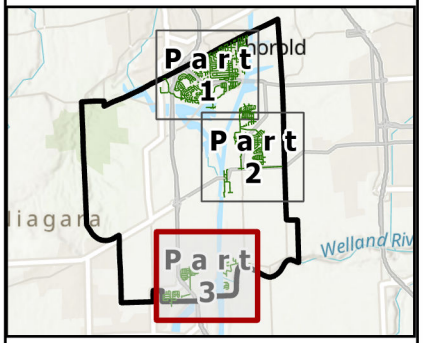
- Sanitary Access Chamber
- Combined Sewer Overflow
- Drop Structure
- Outfall
- Virtual
- Map Index
- Municipal Boundaries
- Thorold Boundary

N

Scale: 1:20,000

SANITARY SEWER SERVICES MAP

Part 3



Index Map

Legend

- Sanitary Gravity Mains

Sanitary Manholes

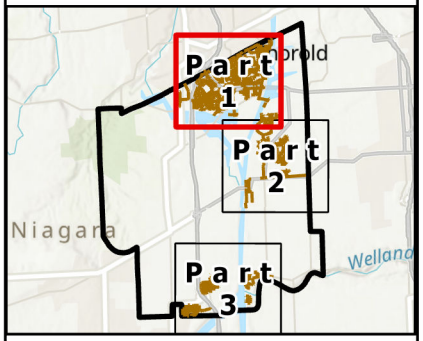
- Sanitary Access Chamber
- Combined Sewer Overflow
- Drop Structure
- Outfall
- Virtual
- Map Index
- Municipal Boundaries
- Thorold Boundary

N

Scale: 1:20,000

STORMWATER SERVICES MAP

Part 1



Index Map

Legend

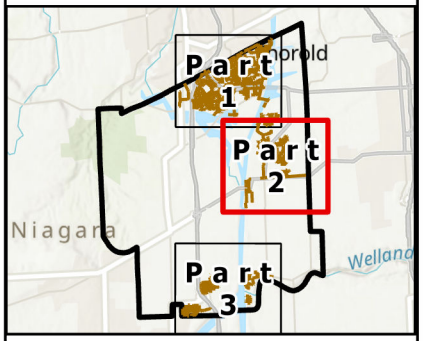
- Storm Mains
- Map Index_Storm
- Municipal Boundaries
- Thorold Boundary

N

Scale: 1:20,000

STORMWATER SERVICES MAP

Part 2



Index Map

BEAVERDAMS
THOROLD SOUTH
ROLLING MEADOWS
BLACK HORSE CORNERS
ALLANBURG
THOROLD SOUTH-ALLANBURG-PORT ROBINSON EAST
Niagara Falls
Welland Canal
Service Rd W
Service Rd E
Allanburg Rd
Allanport Rd
Barker Pky
Crimson Ave
Discovery Dr
Upper's Ln
Nichols Lane
Barron Rd
58
20

Legend

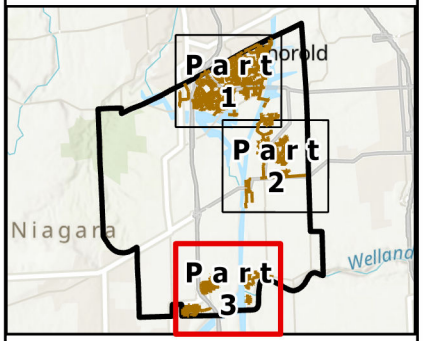
- Storm Mains
- Map Index_Storm
- Municipal Boundaries
- Thorold Boundary

N

Scale: 1:20,000

STORMWATER SERVICES MAP

Part 3



Index Map

Legend

- Storm Mains
- Map Index_Storm
- Municipal Boundaries
- Thorold Boundary

N

Scale: 1:20,000

Appendix D – Risk Rating Criteria

Probability of Failure

Asset Category	Risk Criteria	Criteria Weighting	Value/Range	Probability of Failure Score
Road Network (HCB/LCB Roads)	Condition	100%	85-100	1
			70-84	2
			55-69	3
			40-54	4
			0-39	5
Road Network (excluding roads surfaces) Bridges & Culverts Storm Water Services Land Improvements	Condition	100%	80-100	1
			60-79	2
			40-59	3
			20-39	4
			0-19	5
Sanitary Sewer Services (Sanitary Mains)	Condition	100%	0-1	1
			1.1-2	2
			2.1-3	3
			3.1-4	4
			4.1-5	5
Water Services (Water Mains)	Condition	40%	80-100	1
			60-79	2
			40-59	3
			20-39	4
			0-19	5
	Pipe Material	60%	HDPE, PE, PVC	1
			Cu	3
			DI	4
			AC, CI	5
Facilities	Condition	80%	4.1-5	1
			3.1-4	2

Asset Category	Risk Criteria	Criteria Weighting	Value/Range	Probability of Failure Score
			2.1-3	3
			1.1-2	4
			0-1	5
	Service Life Remaining	20%	>80%	1
			60-79%	2
			40-59%	3
			20-39%	4
			0-19%	5
Fleet & Fleet Equipment	Condition	20%	0-1.1	1
			1.2-2.1	2
			2.2-3.1	3
			3.2-4.1	4
			4.2-5	5
	Service Life Remaining	80%	>80%	1
			60-79%	2
			40-59%	3
			20-39%	4
			0-19%	5
Machinery & Equipment Office Equipment & Furnishings	Condition	80%	0-1.1	1
			1.2-2.1	2
			2.2-3.1	3
			3.2-4.1	4
			4.2-5	5
	Service Life Remaining	20%	>80%	1
			60-79%	2
			40-59%	3
			20-39%	4
			0-19%	5

Table 101 Probability of Failure Risk Scores

Consequence of Failure

Asset Category	Risk Classification	Risk Criteria	Value/Range	Consequence of Failure Score
Road Network (Roads)	Operational (50%)	Surface Material	Unpaved	1
			LCB	2
			HCB	4
	Strategic (50%)	Road Classification	Local	2
			Arterial	4
Bridges & Culverts	Economic (100%)	Replacement Cost	<$200,000	1
			$200,001-$400,000	2
			$400,001-$1,000,000	3
			$1,000,001-$2,000,000	4
			$2,000,001+	5
Storm Water Services	Operational (100%)	Pipe Size (mm)	<300 mm	1
			301-400 mm	2
			401-800 mm	3
			801-1,250 mm	4
			1,251 mm+	5
Water Services (Water Mains)	Operational (100%)	Pipe Size (mm)	<150 mm	1
			151-250 mm	2
			251-300 mm	3
			301-1,050 mm	4
			1,050 mm+	5
Sanitary Sewer Services (Sanitary Mains)	Operational (100%)	Pipe Size (mm)	0-199 mm	1
			200 mm	2
			201-250 mm	3
			251-450 mm	4
			450 mm+	5
Facilities	Economic (80%)	Replacement Cost	<$10,000	1
			$10,001-$25,000	2
			$25,001-$100,000	3
			$100,001-$600,000	4

Asset Category	Risk Classification	Risk Criteria	Value/Range	Consequence of Failure Score
			$600,001+	5
	Health & Safety (20%)	Component Group	Interiors, Furnishings	1
			Foundations, Superstructure, Site Improvement	2
			Exteriors, Equipment, Site Electrical Utilities	3
			Plumbing, HVAC	4
			Stairs, Fire Protection, Electrical, Hazardous Component	5
Land Improvements	Economic (40%)	Replacement Cost	<$10,000	1
			$10,001-$40,000	2
			$40,001-$80,000	3
			$80,001-$150,000	4
			$150,001+	5
	Public Safety (60%)	Segment (100%)	Irrigation Systems	1
			Bleachers and Park Furniture; Fencing; Landscaping; No Segment; Transit Furniture & Shelters	2
			Park Improvements; Paved Improvements; Recreational Lighting	3
			Splash Pads	4
			Playground Structures; Playground Swings; Pools	5
Fleet & Fleet Equipment (Public Works/Community Services)	Economic (20%)	Replacement Cost	<$10,000	1
			$10,001-$40,000	2
			$40,001-$80,000	3
			$80,001-$150,000	4
			$150,001+	5
	Operational (80%)	Redundancy	1	1
			3	3
			5	5

Asset Category	Risk Classification	Risk Criteria	Value/Range	Consequence of Failure Score
Fleet & Fleet Equipment (Protection Services)	Economic (20%)	Replacement Cost	<$50,000	1
			$50,001-$150,000	2
			$150,001-$300,000	3
			$300,001-$600,000	4
			$600,001+	5
	Operational (80%)	Redundancy	1	1
			3	3
			5	5
Machinery & Equipment (Public Works)	Economic (80%)	Replacement Cost	<$5,000	1
			$5,001-$15,000	2
			$15,001-$50,000	3
			$50,001-$80,000	4
			$80,001+	5
	Strategic (20%)	Function	General Government, Rec, Health, Planning and Development, Social and Family Services	3
			Environmental Services, Transportation Services	4
			Protection Services	5
Office Equipment & Furnishings	Economic (80%)	Replacement Cost	<$5,000	1
			$5,001-$15,000	2
			$15,001-$30,000	3
			$30,001-$50,000	4
			$50,001+	5
	Strategic (20%)	Function	General Government, Rec, Health, Planning and Development, Social and Family Services	3
			Environmental Services, Transportation Services	4
			Protection Services	5

Table 102 Consequence of Failure Risk Scores