AMP2016

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The 2016 Asset Management Plan for the

Municipality of Kincardine

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Executive Summary

Infrastructure is inextricably linked to the economic, social and environmental advancement of a community. Municipalities own and manage nearly 60% of the public infrastructure stock in Canada. As analyzed in this asset management plan (AMP), the Municipality of Kincardine infrastructure portfolio comprises nine distinct infrastructure categories: road network, bridges & culverts, buildings, storm, water, sanitary, yard improvements, vehicles, and machinery & equipment. Together, these assets had a total valuation of $493 million in 2016, with its road network comprising 32% of the portfolio valuation, followed by sanitary services at 17%.

Similar to other municipalities, the municipality experienced a period of noticeable investment beginning in the 1960s, and again increasing in the mid-1980s. The majority of investment was made in roads, water and buildings. The largest investments were made between 1976 and 1980, totalling $67 million. Between 2011 and 2015, the municipality invested more than $30 million, with roads and buildings comprising approximately $14 million.

Strategic asset management is critical in extracting the highest total value from public assets at the lowest lifecycle cost. This AMP, the municipality's second following the completion of its first edition in 2013, details the state of infrastructure of the municipality's service areas and provides asset management and financial strategies designed to facilitate its pursuit of developing an advanced asset management program and mitigate long-term funding gaps.

The majority of the infrastructure analyzed in this AMP does not have condition assessment data available. While age is not a precise indicator of an asset's health, it can serve as a meaningful approximation in the absence of condition data and can serve as a signal. More than 80% of the municipality's assets , with a valuation of more than $400 million, have at least 10 years of useful life remaining. However, a significant portion, with a valuation of $49 million, remain in operation beyond their useful life. Based on 2016 replacement cost, and a blend of age-based and observed data, while more than 50% of the municipality's total asset portfolio as analysed in this AMP is in very good or good condition, more than 25% of the assets, with a valuation of $125 million, is in poor to very poor condition.

In order for an AMP to be effectively put into action, it must be integrated with financial planning and long-term budgeting. The development of a comprehensive financial plan will allow the municipality to identify the financial resources required for sustainable asset management based on existing asset inventories, desired levels of service, and projected growth requirements.

We've developed recommendations and strategies to produce full funding for both tax and rate based asset categories.

The average annual investment requirement for the municipality's tax funded categories is $9,465,000. Annual revenue currently allocated to these assets for capital purposes is $2,237,000 leaving an annual deficit of $7,228,000. To put it another way, these infrastructure categories are currently funded at 24% of their long-term requirements. In 2016, the municipality has annual tax revenues of $14,474,000. the municipality will also see debt reductions of $444,000. Our strategy for full funding requires a 20 year phase-in period.

We recommend the following:

- when realized, reallocating the debt cost reductions of $444,000 to the infrastructure deficit as outlined above.
- increasing tax revenues by 2.3% each year for the next 20 years solely for the purpose of phasing in full funding to the asset categories covered in this section of the AMP.
- allocating the gas tax revenue and OCIF grant as outlined in table 39.

Significant increases are required for the municipality's rate funded assets as well. The average annual investment requirement for water and wastewater categories is $3,393,000. Annual revenue currently allocated to these assets for capital purposes is $2,450,000, leaving an annual deficit of $943,000. To put it another way, these infrastructure categories are currently funded at 72% of their long-term requirements. In 2016, Kincardine has annual sanitary revenues of $1,991,000 and annual water revenues of $2,506,000. Our strategy for full funding requires a 10 year phase-in period.

We recommend the following:

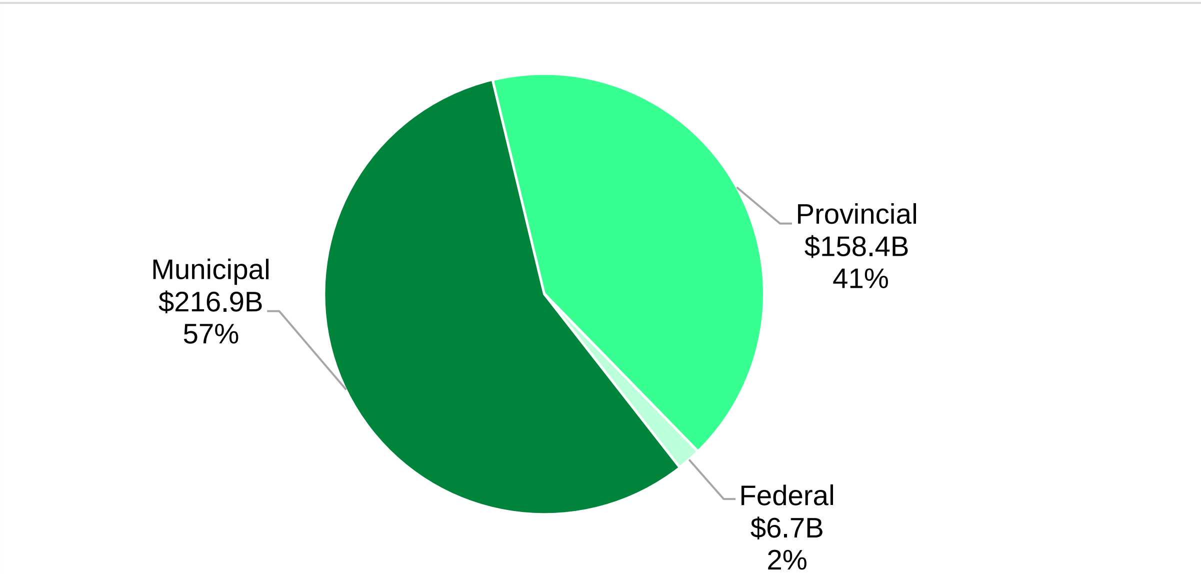
- increasing rate revenues by1.2% for sanitary services and 2.8% for water services each year for the next 10 years solely for the purpose of phasing in full funding to the asset categories covered in this section of the AMP.

A critical aspect of this asset management plan is the level of confidence the municipality has in the data used to develop the state of the infrastructure and form the appropriate financial strategies. the municipality has indicated a good degree of confidence in the accuracy, validity and completeness of the asset data for all categories analyzed in this asset management plan.

I. Introduction & Context

Across Canada, municipal share of public infrastructure increased from 22% in 1955 to nearly 60% in 2013. The federal government's share of critical infrastructure stock, including roads, water and wastewater, declined by nearly 80% in value since 1963.[1]

FIGURE 1 DISTRIBUTION OF NET STOCK OF CORE PUBLIC INFRASTRUCTURE



Ontario's municipalities own more of the province's infrastructure assets than both the provincial and federal government. The asset portfolios managed by Ontario's municipalities are also highly diverse. The municipality relies on these assets to provide residents, businesses, employees and visitors with safe access to important services, such as transportation, recreation, culture, economic development and much more. As such, it is critical that the municipality manage these assets optimally in order to produce the highest total value for taxpayers. This asset management plan, (AMP) will assist the municipality in the pursuit of judicious asset management for its capital assets.

[1] Larry Miller, *Updating Infrastructure In Canada: An Examination of Needs And Investments Report of the Standing Committee on Transport, Infrastructure and Communities, June 2015*

II. Asset Management

Asset management can be best defined as an integrated business approach within an organization with the aim to minimize the lifecycle costs of owning, operating, and maintaining assets, at an acceptable level of risk, while continuously delivering established levels of service for present and future customers. It includes the planning, design, construction, operation and maintenance of infrastructure used to provide services. By implementing asset management processes, infrastructure needs can be prioritized over time, while ensuring timely investments to minimize repair and rehabilitation costs and maintain municipal assets.

TABLE 1 OBJECTIVES OF ASSET MANAGEMENT

Inventory	Capture all asset types, inventories and historical data.
Current Valuation	Calculate current condition ratings and replacement values.
Life Cycle Analysis	Identify Maintenance and Renewal Strategies & Life Cycle Costs.
Service Level Targets	Define measurable Levels of Service Targets
Risk & Prioritization	Integrates all asset categories through risk and prioritization strategies.
Sustainable Financing	Identify sustainable Financing Strategies for all asset categories.
Continuous Processes	Provide continuous processes to ensure asset information is kept current and accurate.
Decision Making & Transparency	Integrate asset management information into all corporate purchases, acquisitions and assumptions.
Monitoring & Reporting	At defined intervals, assess the assets and report on progress and performance.

1. Overarching Principles

The Institute of Asset Management (IAM) recommends the adoption of seven key principles for a sustainable asset management program. According to IAM, asset management must be:[2]

TABLE 2 PRINCIPLES OF ASSET MANAGEMENT – THE INSTITUTE OF ASSET MANAGEMENT (IAM)

Holistic	Asset management must be cross-disciplinary, total value focused
Systematic	Rigorously applied in a structured management system
Systemic	Looking at assets in their systems context, again for net, total value
Risk-based	Incorporating risk appropriately into all decision-making
Optimal	Seeking the best compromise between conflicting objectives, such as costs versus performance versus risks etc.
Sustainable	Plans must deliver optimal asset life cycles, ongoing systems performance, environmental and other long term consequences.
Integrated	At the heart of good asset management lies the need to be joined-up. The total jigsaw puzzle needs to work as a whole - and this is not just the sum of the parts.

[2] "Key Principles", The Institute of Asset Management, *www.iam.org*

2. The Asset Management Policy

While the above principles provide a strong foundation for building a sustainable asset management program, municipalities should adopt asset management policies that reflect the unique profile of the community. In this regard, the Municipality of Kincardine adopted its Asset Management Policy (GG. 2.22) in August 2015. This policy is indicative of council's increasing commitment to establishing a meaningful and measurable asset management program and in guiding the organization's corporate strategy as well as its tactical decision-making. The objectives of the policy is to detail the Asset Management principles with the goals of:

- Improving decision-making accountability and transparency;
- Better demonstrating the long-term consideration of short term decisions;
- Improving customer service;
- Reducing life cycle costs while maintaining acceptable levels of service

This AMP seeks to follow the guiding principles of asset management as recommended by the IAM and as stated within Kincardine's asset management policy. The municipality has outlined its own five principles, many of which parallel those promoted by the IAM. These are:

TABLE 3 PRINCIPLES OF ASSET MANAGEMENT – THE MUNICIPALITY OF KINCARDINE

Forward looking	The municipality will make the appropriate decisions and provisions to better enable its assets to meet future challenges, including changing demographics and populations, customer expectations, legislative requirements, technological and environmental factors.
Service Focused	The municipality will consider all the assets in a service context and taking into account their interrelationships as opposed to optimizing individual assets in isolation.
Risk-based	The Municipality will manage the asset risk associated with attaining the levels of service by focusing resources, expenditures, and priorities based upon risk assessments and the corresponding cost/benefit recognizing that public safety is the priority.
Value-Based/Affordable	The municipality will choose practices, interventions and operations that aim at reducing the life cycle cost of asset ownership, while satisfying levels of service. Decisions are based on balancing service levels, risks and costs.
Holistic	The municipality will take a comprehensive approach that looks at the "big picture" and considers the combined impact of managing all aspects of the asset life cycle.

III. AMP Objectives and Content

This AMP is one component of the Municipality of Kincardine's overarching corporate strategy. It was developed to support the municipality's vision for its asset management practice and programs. It provides key asset attribute data, including current composition of the municipality's infrastructure portfolio, inventory, useful life etc., summarizes the physical health of the capital assets, assess the municipality's current capital spending framework, and outlines financial strategies to achieve fiscal sustainability in the long-term while reducing and eventually eliminating funding gaps.

As with the first edition of the municipality's asset management plan in 2013, this AMP is developed in accordance with provincial standards and guidelines, and new requirements under the federal Gas Tax Fund stipulating the inclusion of all eligible asset categories. Previously, only core infrastructure categories were analyzed. The following asset categories are analysed in this document: road network; bridges & culverts; facilities; computer systems; equipment; fleet; and yard improvements.

This AMP includes a detailed discussion of the state of local infrastructure and assets for each category; outlines industry standards levels of service and key performance indicators (KPIs); outlines asset management renewal strategy for major infrastructure; and provides financial strategy to mitigate funding shortfalls.

IV. Data and Methodology

The municipality's dataset for the asset categories analyzed in this AMP are maintained in PSD's CityWide® Tangible Assets module. This dataset includes key asset attributes and PSAB 3150 data, including historical costs, in-service dates, field inspection data (as available), asset health, replacement costs, etc.

1. Condition Data

Municipalities implement a straight-line amortization schedule approach to depreciate their capital assets. In general, this approach may not be reflective of an asset's actual condition and the true nature of its deterioration, which tends to accelerate toward the end of the asset's lifecycle. However, it is a useful approximation in the absence of standardized decay models and actual field condition data and can provide a benchmark for future requirements. We analyze each asset individually; therefore, while deficiencies may be presents at the individual level, imprecisions are minimized at the asset-class level as the data is aggregated.

As available, actual field condition data was used to make recommendations more precise. The value of condition data cannot be overstated as they provide a more accurate representation of the state of infrastructure.

2. Financial Data

In this AMP, the average annual requirement is the amount based on current replacement costs that municipalities should set aside annually for each infrastructure class so that assets can be replaced upon reaching the end of their lifecycle.

To determine current funding capacity, all existing sources of funding are identified, aggregated, and an average for the previous three years is calculated, as data is available. These figures are then assessed against the average annual requirements, and are used to calculate the annual funding shortfall (surplus) and for forming the financial strategies.

In addition to the annual shortfall, the majority of municipalities face significant infrastructure backlogs. The infrastructure backlog is the accrued financial investment needed in the short-term to bring the assets to a state of good repair. This amount is identified for each asset class.

Only predictable sources of funding are used, e.g., tax and rate revenues, user fees, and other streams of income the municipality can rely on with a high degree of certainty. Government grants and other ad-hoc injections of capital are not enumerated in this asset management plan given their unpredictability. As senior governments make greater, more predictable and permanent commitments to funding municipal infrastructure programs, e.g., the federal Gas Tax Fund, future iterations of this asset management plan will account for such funding sources.

3. Infrastructure Report Card

The asset management plan is a complex document, but one with direct implications on the public, a group with varying degrees of technical knowledge. To facilitate communications, we've developed an Infrastructure Report Card that summarizes our findings in accessible language that municipalities can use for internal and external distribution. The report card is developed using two key, equally weighted factors:

TABLE 4 INFRASTRUCTURE REPORT CARD DESCRIPTION

Financial Capacity		A municipality's financial capacity is determined by how well it's meeting the average annual investment requirements (0-100%) for each infrastructure class.	
Asset Health		Using either field inspection data as available or age-based data, the asset health provide a grades for each infrastructure class based on the portion of assets in poor to excellent condition (0-100%). We use replacement cost to determine the weight of each condition group within the asset class.	
Letter Grade	**Rating**	**Performance and Financial Capacity**	**Description**
A	Very Good	Assets are fit for the future and the municipality is funding at least 90% of its annual needs.	The asset is functioning and performing well, only normal preventative maintenance is required. The municipality is fully prepared for its long-term replacement needs based on existing infrastructure portfolio.
B	Good	Assets are adequate for now and the municipality is meeting 70-89% of its annual needs.	The municipality is well prepared to fund its long-term replacement needs but requires additional funding strategies in the short-term to begin to increase its reserves.
C	Fair	Assets require intervention and the municipality is meeting 60-69% of its annual needs.	The asset's performance or function has started to degrade and repair/rehabilitation is required to minimize lifecycle cost. The municipality is underpreparing to fund its long-term infrastructure needs. The replacement of assets in the short- and medium-term will likely be deferred to future years.
D	Poor	Assets are at risk and the municipality is meeting between 40-59% of its annual needs.	The asset's performance and function is below the desired level and immediate repair/rehabilitation is required. The municipality is not well prepared to fund its replacement needs in the short-, medium- or long-term. Asset replacements will be deferred and levels of service may be reduced.
F	Very Poor	Assets unfit for sustained service and the municipality is meeting less than 40% of its annual needs.	The municipality is significantly underfunding its short-term, medium-term, and long-term infrastructure requirements based on existing funds allocation. Asset replacements will be deferred indefinitely. The municipality may have to divest some of its assets (e.g., bridge closures, arena closures) and levels of service will be reduced significantly.

4. Limitations and Assumptions

Several limitations continue to persist as municipalities advance their asset management practices.

1. As available, we use field condition assessment data to determine both the state of infrastructure and develop the financial strategies. However, in the absence of observed data, we rely on the age of assets to estimate their physical condition.

2. A second limitation is the use of inflation measures, for example using CPI/NRBCPI to inflate historical costs in the absence of actual replacement costs. While a reasonable approximation, the use of such multipliers may not be reflective of market prices and may over- or understate the value of a municipality's infrastructure portfolio and the resulting capital requirements.

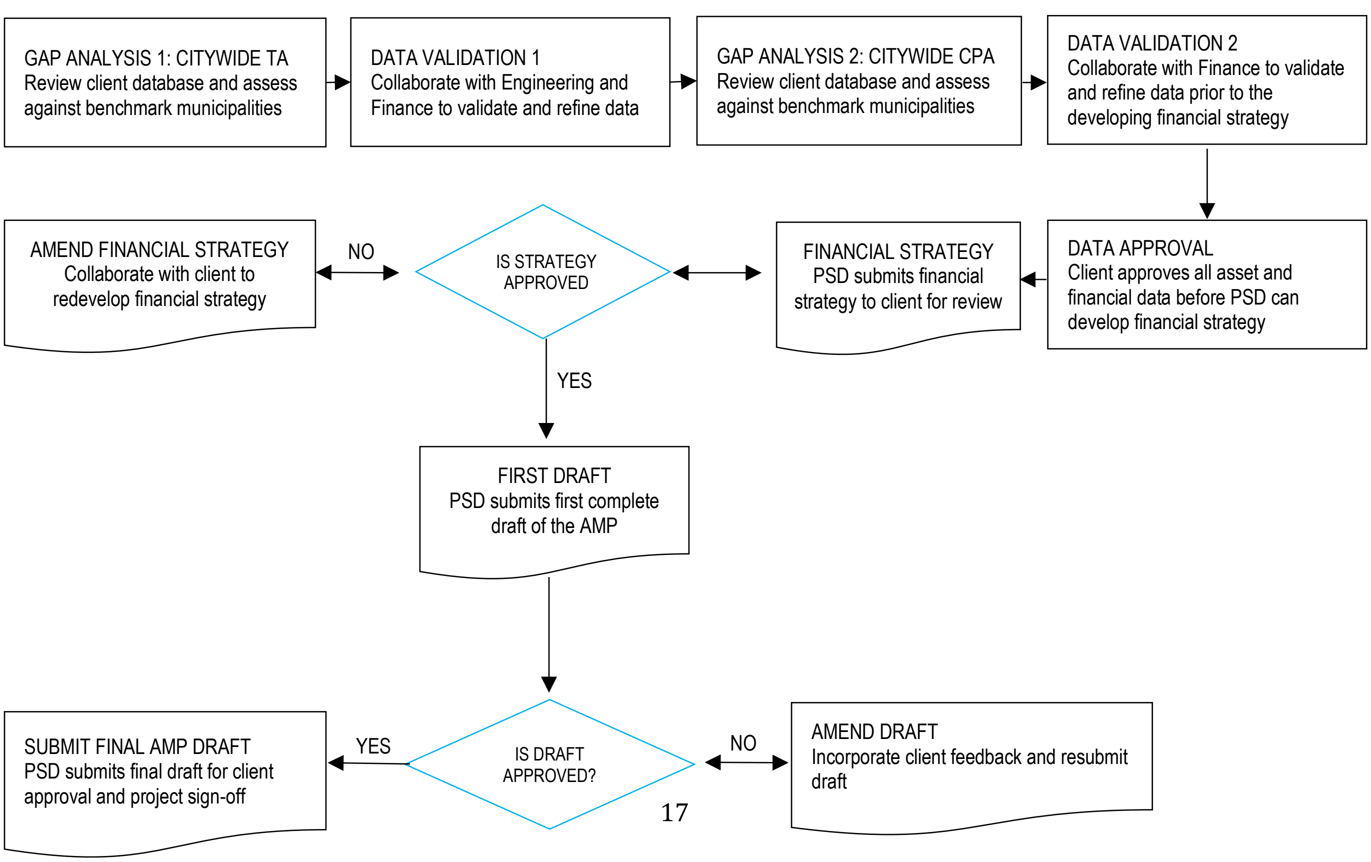
3. Our calculations and recommendations will reflect the best available data at the time this AMP was developed.

4. The focus of this plan is restricted to capital expenditures and does not capture O&M expenditures on infrastructure.

5. Process

High data quality is the foundation of intelligent decision-making. Generally, there are two primary causes of poor decisions: Inaccurate or incomplete data, and the misinterpretation of data used. The figure below illustrates an abbreviated version of our work order/work flow process between PSD and municipal staff. It is designed to ensure maximum confidence in the raw data used to develop the AMP, the interpretation of the AMP by all stakeholders, and ultimately, the application of the strategies outlined in this AMP.

FIGURE 2 DEVELOPING THE AMP - WORK FLOW AND PROCESS



6. Data Confidence Rating

Staff confidence in the data used to develop the AMP can determine the extent to which recommendations are applied. Low confidence suggests uncertainty about the data and can undermine the validity of the analysis. High data confidence endorses the findings and strategies, and the AMP can become an important, reliable reference guide for interdepartmental communication as well as a manual for long-term corporate decision-making. Having a numerical rating for confidence also allows the municipality to track its progress over time and eliminate data gaps.

Data confidence in this AMP is determined using five key factors and is based on the City of Brantford's approach. Municipal staff provide their level of confidence (score) in each factor for major asset classes along a spectrum, ranging from 0, suggesting low confidence in the data, to 100 indicative of high certainty regarding inputs. The five Factors used to calculate the municipality's data confidence ratings are:

F1	F2	F3	F4	F5
The data is up to date.	The data is complete and uniform.	The data comes from an authoritative source	The data is error free.	The data is verified by an authoritative source.

The municipality's self-assessed score in each factor is then used to calculate data confidence in each asset class using Equation 1 below.

$$Data\ Confidence\ Rating = \sum\ Score\ in\ each\ factor \times \frac{1}{5}$$

V. Key Stats

In this section, we provide aggregate indicators to summarize key elements of the municipality's asset classes in this AMP.

1. Asset Valuation

The nine asset classes analyzed in this asset management plan for the municipality had a total 2016 valuation of $493 million, of which the road network comprised nearly 33%. Table 5 outlines the cost per household based on the applicable households for each asset category.

FIGURE 3 2016 ASSET VALUATION BY CLASS

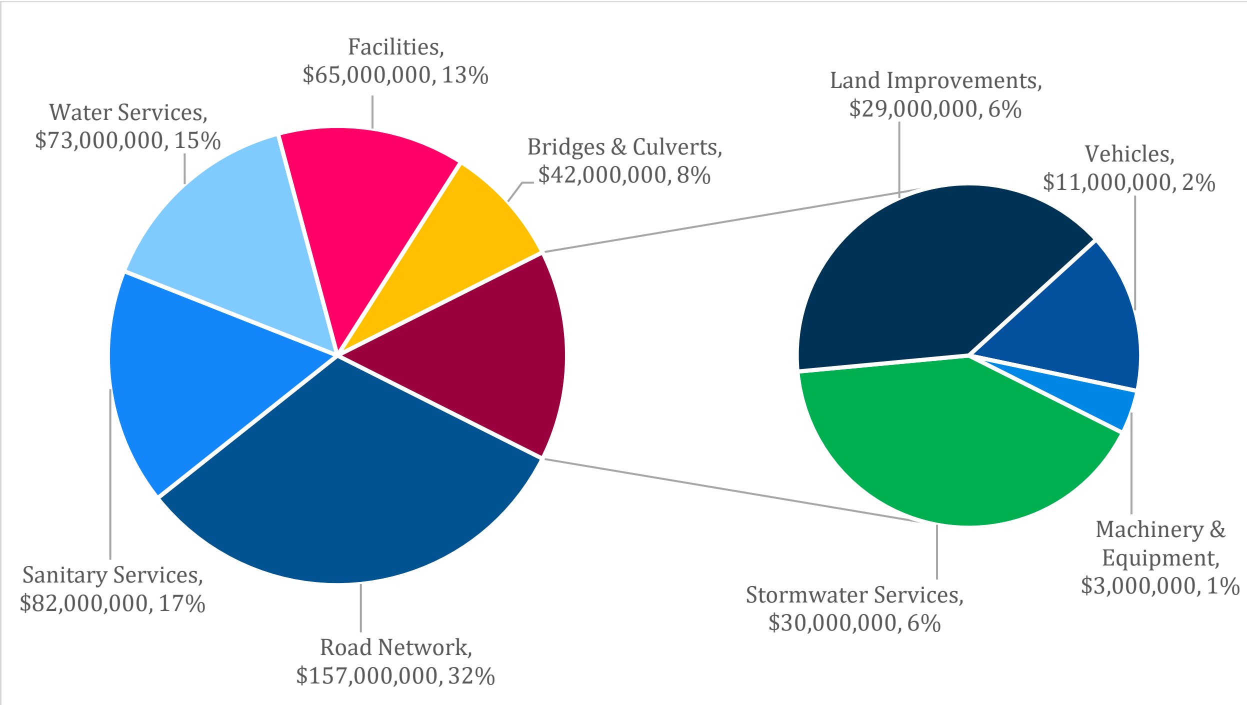


TABLE 5 2015 COST PER HOUSEHOLD

Asset Class	Applicable Number of Households	Cost per Household
Road Network	6,104	$25,721
Sanitary Services	3,813	$21,505
Water Services	4,218	$17,307
Facilities	6,104	$10,649
Bridges & Culverts	6,104	$6,881
Storm water Services	6,104	$4,915
Land Improvements	6,104	$4,751
Vehicles	6,104	$1,802
Machinery & Equipment	6,104	$491
	Total	$94,022

2. Source of Condition Data by Asset Class

Observed data will provide the most precise indication of an asset's physical health. In the absence of such information, age of capital assets can be used as a meaningful approximation of the asset's condition. Table 6 indicates the source of condition data used for each of the nine asset classes in this AMP.

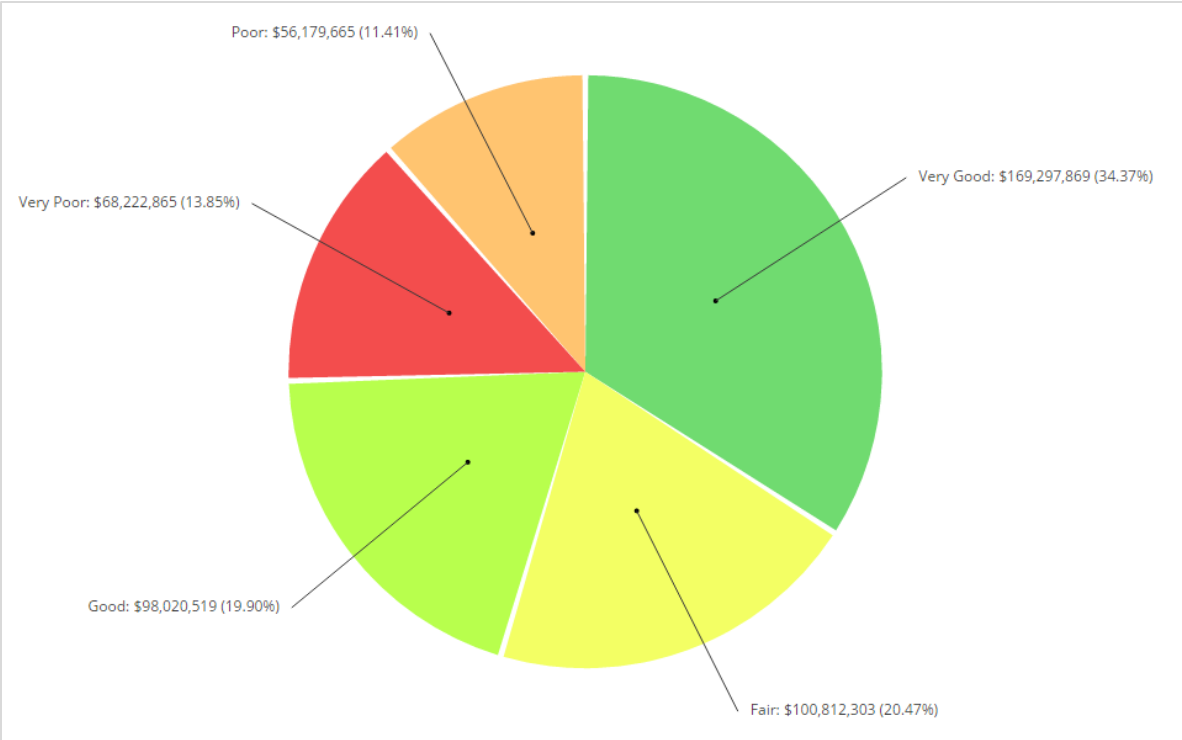
TABLE 6 SOURCE OF CONDITION DATA BY ASSET CLASS

Asset Class	Condition Data Source
Road Network	Assessed (Surface, Paved bases, Sidewalks)
Bridges & Culverts	Assessed
Sanitary	Age-based; partial assessments
Water	Age-based; partial assessments
Storm	Age-based; partial assessments
Vehicles	Age-based; partial assessments
Machinery & Equipment	Age-based; partial assessments
Buildings	Age-based; partial assessments
Yard improvements	Age-based; partial assessments

3. Overall Condition – All Asset Classes

Based on 2016 replacement cost, and a blend of age-based and observed data, while more than 50% of the municipality's total asset portfolio as analysed in this AMP is in very good or good condition, more than 25% of the assets, with a valuation of $125 million, is in poor to very poor condition.

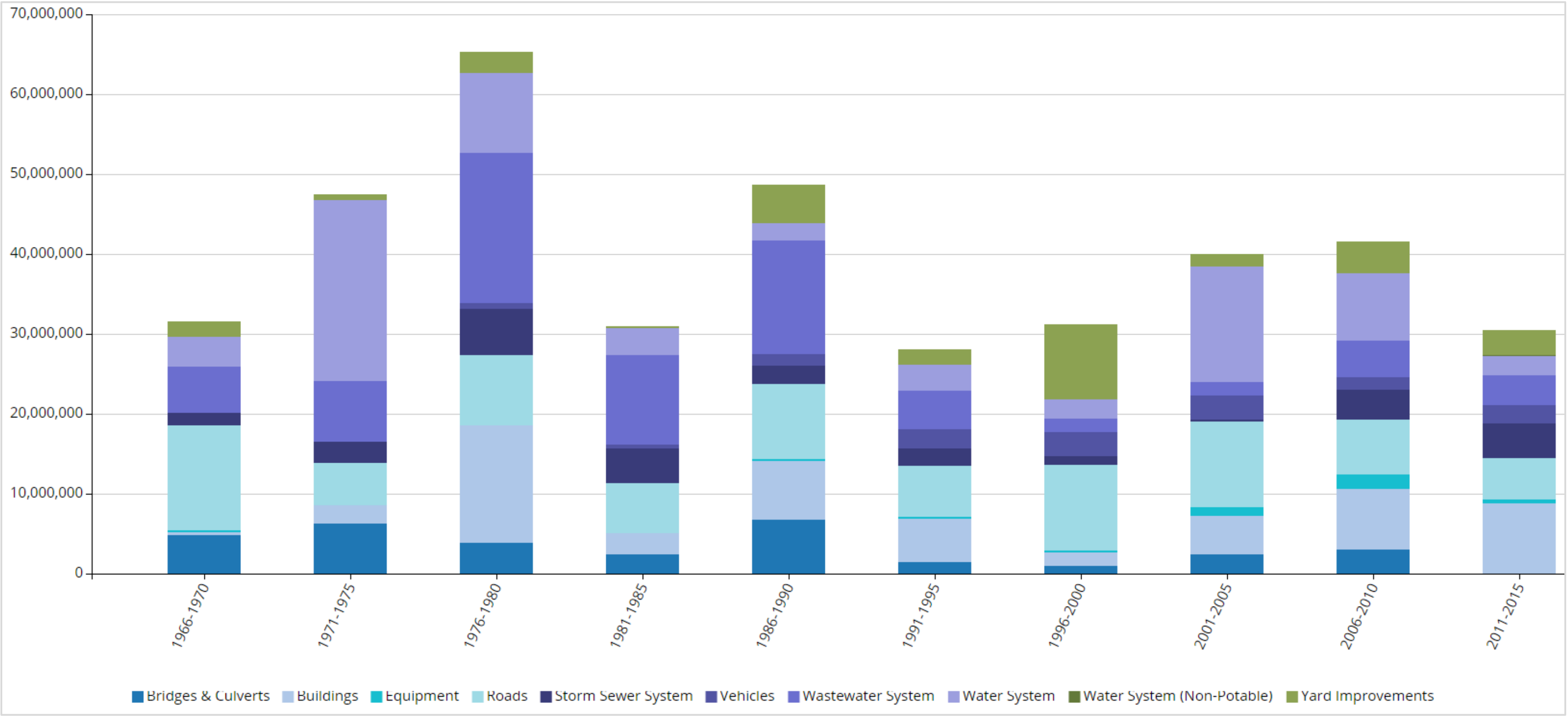
FIGURE 4 ASSET CONDITION DISTRIBUTION BY REPLACEMENT COST - ALL CLASSES



4. Historical Investment in Infrastructure – All Asset Classes

In conjunction with condition data, two other measurements can augment staff understanding of the state of infrastructure and impending and long-term infrastucture needs: installation year profile, and useful life remaining. The installation year profile in the figure below illustrates the historical invesments in infrastructure across key asset classes. Often, investment in critical infrastructure parallels population growth or other significant shifts in demographics.

FIGURE 5 HISTORICAL INVESTMENT IN INFRASTRUCTURE - ALL ASSET CLASSES

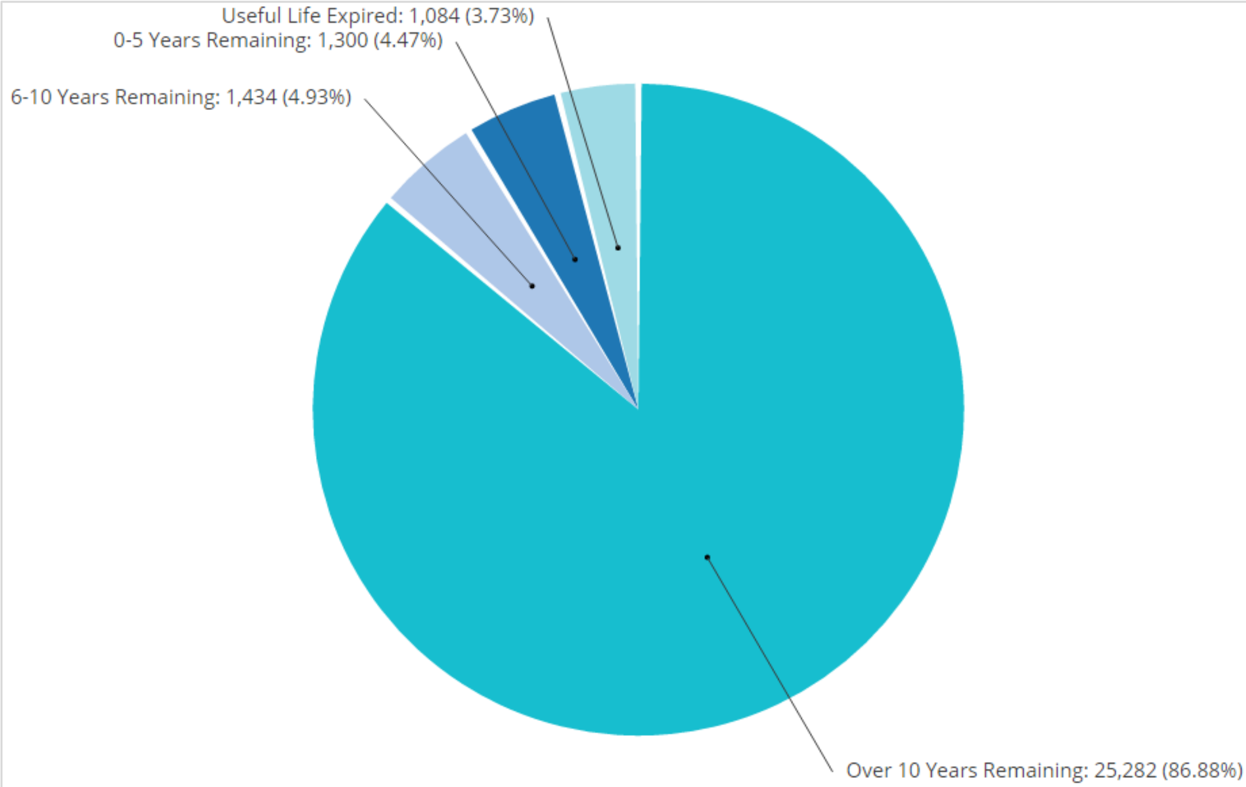


Similar to other municipalities, the municipality experienced a period of noticeable investment beginning in the 1960s, and again increasing in the mid-1980s. The majority of investment was made in roads, water and buildings. The largest investments were made between 1976 and 1980, totalling $67 million. Between 2011 and 2015, the municipality invested more than $30 million, with roads and buildings comprising approximately $14 million.

5. Useful Life Consumption – All Asset Classes

While age is not a precise indicator of an asset's health, it can serve as a meaningful approximation in the absence of condition data and can serve as a signal. The following figure shows the distibution of assets based on the amount of useful life already consumed.

FIGURE 6 USEFUL LIFE REMAINING - ALL ASSET CLASSES



More than 80% of the municipality's assets, with a valuation of more than $400 million, have at least 10 years of useful life remaining. However, a significant portion, with a valuation of $49 million, remain in operation beyond their useful life.

6. Data Confidence

The municipality has a good degree of confidence in the data used to develop this AMP, indicative of significant effort in collecting and refining its data set.

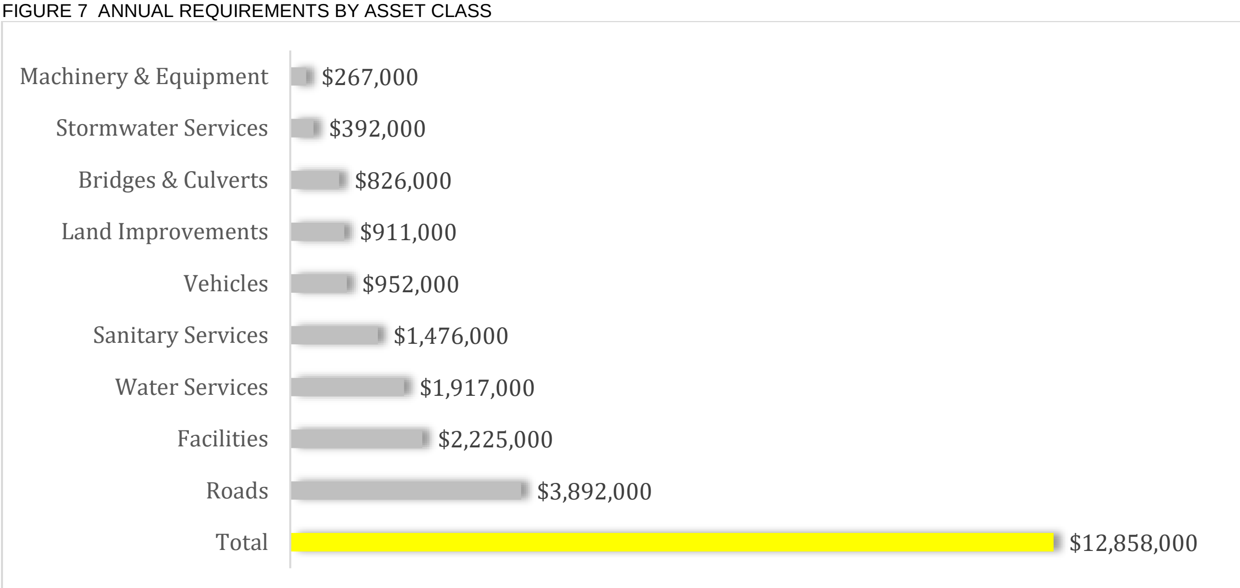
TABLE 7 DATA CONFIDENCE RATINGS

Asset Class	The data is up-to-date.	The data is complete and uniform (for AMP purposes).	The data comes from an authoritative source.	The data is error free.	The data is verified by an authoritative source.	Average Data Confidence Rating
Road Network	80%	80%	80%	80%	80%	80%
Bridges & Culverts	80%	80%	80%	80%	80%	80%
Water (non-potable)	80%	80%	80%	80%	80%	80%
Water	80%	80%	80%	80%	80%	80%
Sanitary	80%	80%	80%	80%	80%	80%
Storm	80%	80%	80%	80%	80%	80%
Facilities	80%	80%	80%	80%	80%	80%
Yard improvements	80%	80%	80%	80%	80%	80%
Vehicles	80%	80%	80%	80%	80%	80%
Equipment	80%	80%	80%	80%	80%	80%
Overall Data Confidence Rating						80%

7. Financial Profile

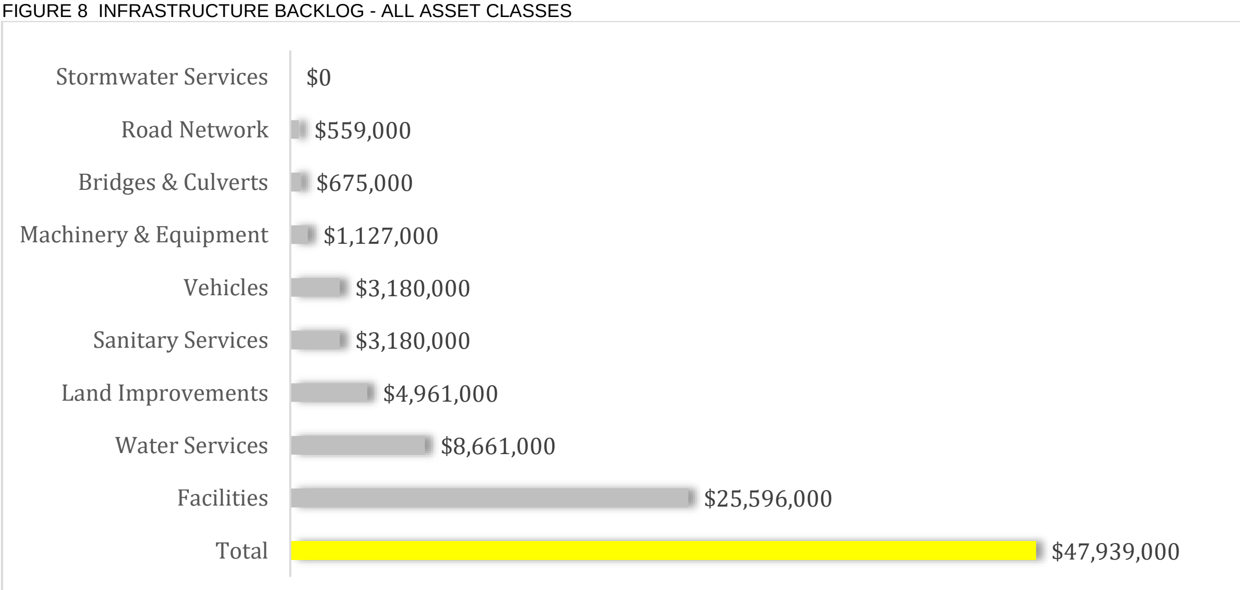
This section details key financial indicators related to the municipality's asset classes as analyzed in this asset management plan.

FIGURE 7 ANNUAL REQUIREMENTS BY ASSET CLASS



The annual requirements represent the amount the municipality should allocate annually to each of its asset classes to meet replacement need as they arise and prevent infrastructure backlogs. In total, the municipality must allocate $13 million annually for the assets covered in this AMP.

FIGURE 8 INFRASTRUCTURE BACKLOG - ALL ASSET CLASSES



The municipality has a combined infrastructure backlog of nearly $50 million. This is the investment needed today to meet previously deferred replacement needs. This data is based on assessed condition as available, and age-based data in the absence of such information.

VI. State of Local Infrastructure

In this section, we detail key indicators for each class discussed in this asset management plan. The state of local infrastructure includes the full inventory, condition ratings, useful life consumption data, and the backlog and upcoming infrastructure needs for each asset class.

1. Road Network

1.1 Asset Portfolio: Quantity, Useful Life, and Replacement Cost

Table 8, Table 9, and Table 10 illustrates key asset attributes for the municipality's road network, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement cost were derived. In total, the municipality's roads assets are valued at $156 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality and obtained from the municipality's accounting data as maintained in the CityWide® Tangible Asset module.

TABLE 8 ASSET INVENTORY - ROAD NETWORK

Asset Type	Asset Component	Quantity
Road Network	Road Bases - Paved	339km
	Roads Bases - Unpaved	149km
	Road Surfaces	396km
	Sidewalks	35,867m
	Curb and Gutter	418km
	Signalized & Pedestrian Intersections	9
	Streetlight Poles	465
	Street Light Fixtures	1,006
	Guide Rails	24,276m
	Decorative Lighting	240
	Signs	2172
	Municipal Drain	8

TABLE 9 REPLACEMENT COST VALUATION AND METHOD – ROAD NETWORK

Asset Type	Asset Component	Valuation Method	2016 Overall Replacement Cost
Road Network	Road Bases - Paved	NRBCPI Quarterly (Toronto)	$113,002,211
	Roads Bases - Unpaved	Not Planned for Replacement	$0
	Road Surfaces	NRBCPI Quarterly (Toronto)	$28,645,284
	Sidewalks	NRBCPI Quarterly (Toronto)	$3,902,445
	Curb and Gutter	NRBCPI Quarterly (Toronto)	$5,870,017
	Signalized & Pedestrian Intersections	NRBCPI Quarterly (Toronto)	$730,939
	Streetlight Poles	NRBCPI Quarterly (Toronto)	$1,661,103
	Street Light Fixtures	NRBCPI Quarterly (Toronto)	$968,778
	Guide Rails	NRBCPI Quarterly (Toronto)	$1,165,613
	Decorative Lighting	NRBCPI Quarterly (Toronto)	$337,508
	Signs	NRBCPI Quarterly (Toronto)	$474,982
	Municipal Drain	NRBCPI Quarterly (Toronto)	$148,066
		Total	$156,906,946

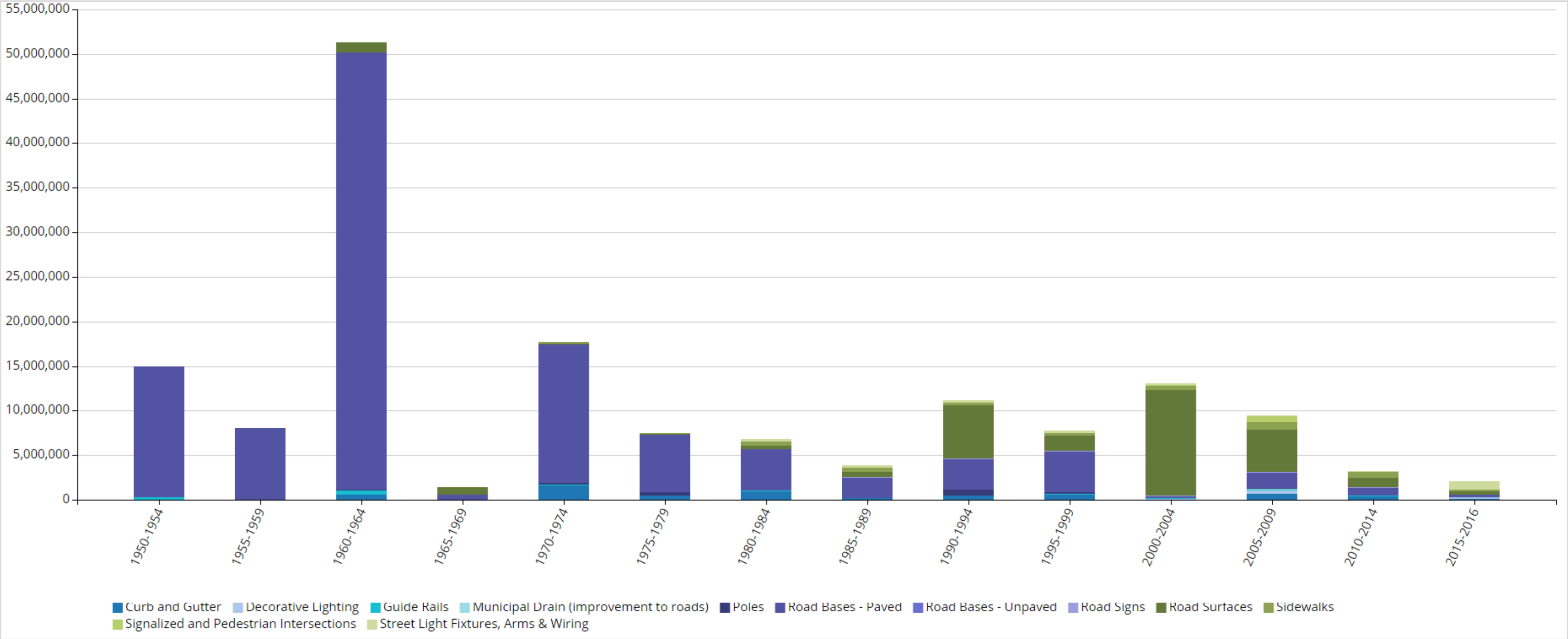
TABLE 10 ASSET USEFUL LIFE IN YEARS – ROAD NETWORK

Asset Type	Asset Component	Quantity	Useful Life (Years)
Road Network	Road Bases - Paved	339km	75
	Roads Bases - Unpaved	149km	75
	Road Surfaces	396km	15
	Sidewalks	35,866m	30
	Curb and Gutter	418km	30
	Signalized Intersection	5	20
	Pedestrian Intersection	4	20
	Street Light Poles - Concrete	244	80
	Street Light Poles - Steel	153	70
	Street Light Poles - Wood	68	30
	Street Light Fixtures	1006	30
	Guide Rails	24,276m	60
	Decorative Lighting	240	30
	Signs	2172	20
	Municipal Drain	8	25,75

1.2 Historical Investment in Infrastructure

In the next two sections, we provide the installation profile and useful life consumption levels of road network assets using in-service data obtained from CityWide® Tangible Assets. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, these graphs illustrate historical infrastructure investment trends and can assist in forecasting short-, medium- and long-term replacement needs.

FIGURE 9 HISTORICAL INVESTMENT – ROAD NETWORK

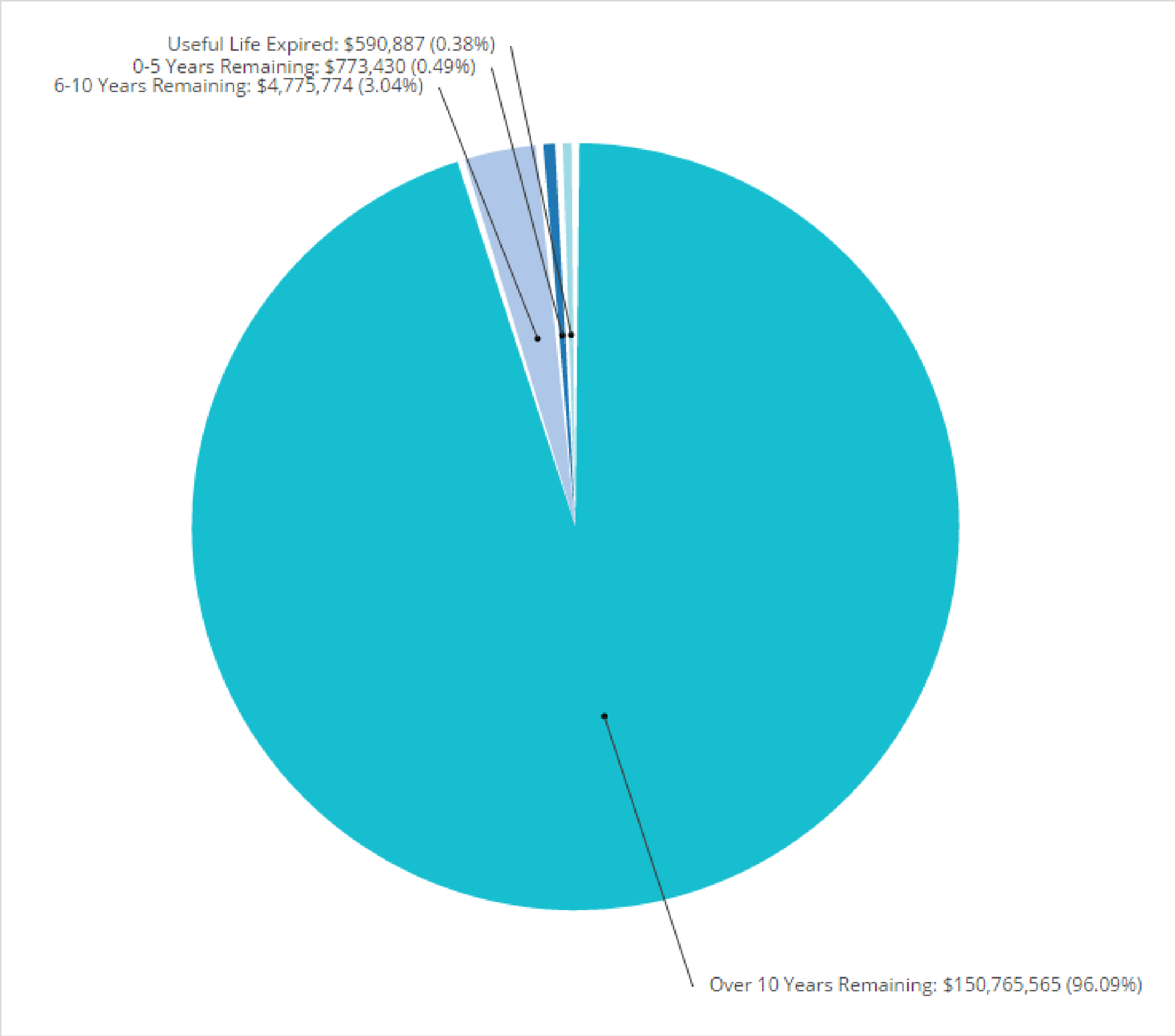


Similar to its overall infrastructure investment, and paralleling many other municipalities in Ontario, the municipality made consistent investment in its roads following WWII. Kincardine's investments in its road network peaked in the early 1960s, totalling $51 million, the overwhelming majority of which was allocated to constructing paved road bases. Since 2000, the municipality has invested heavily in its road surfaces and sidewalks, with expenditures totalling $28 million.

1.3 Useful Life Consumption

In this section, we detail the extent to which the asset class has consumed its useful life based on the above, established useful life standards. In conjunction with asset condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 10 illustrates the useful life consumption levels for the municipality's road network.

FIGURE 10 USEFUL LIFE CONSUMPTION - ROAD NETWORK

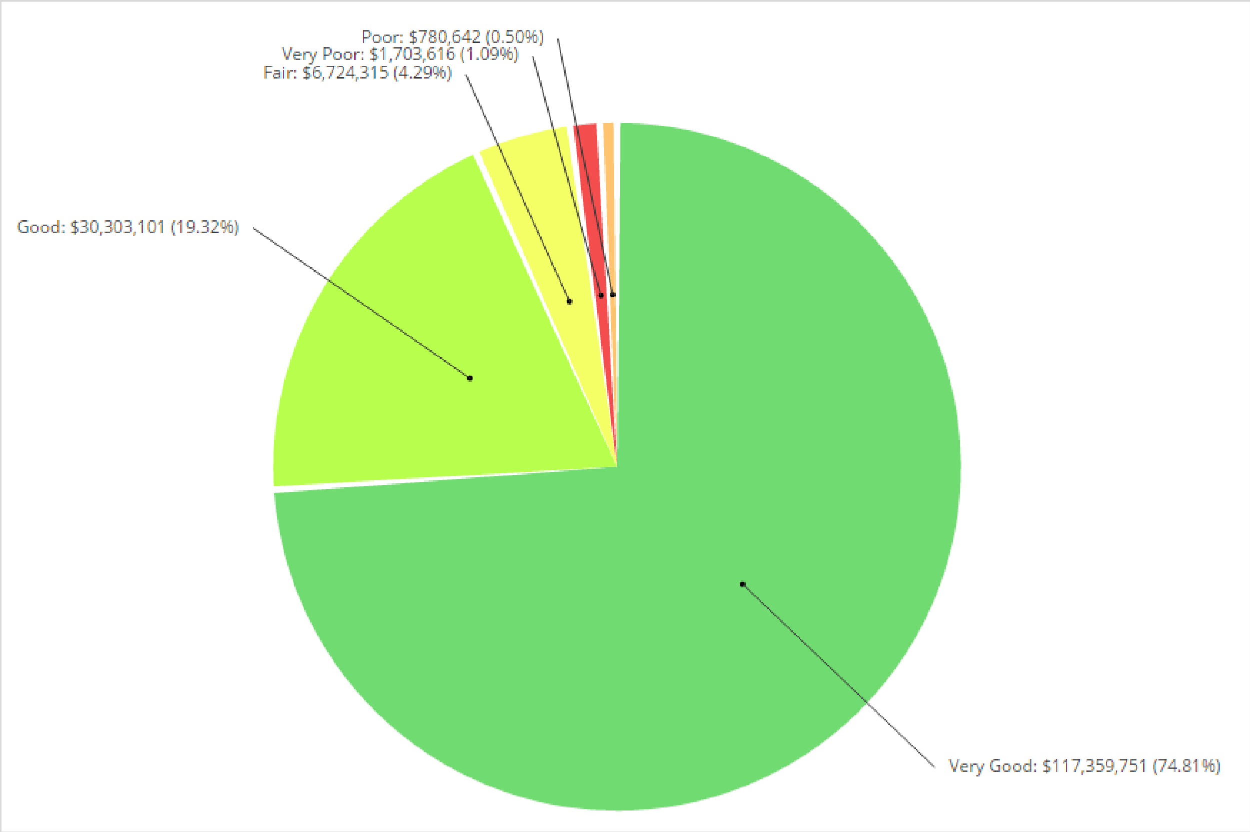


More than 95% of the municipality's road network has at least 10 years of useful life remaining. Less than 1% of the assets remain in operation beyond their useful life. Further, less than 1% of the municipality's roads assets will reach the end of their useful life in the next five years.

1.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's roads network. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has indicated it conducts roads patrol.

FIGURE 11 ASSET CONDITION - ROAD NETWORK (ASSESSED)

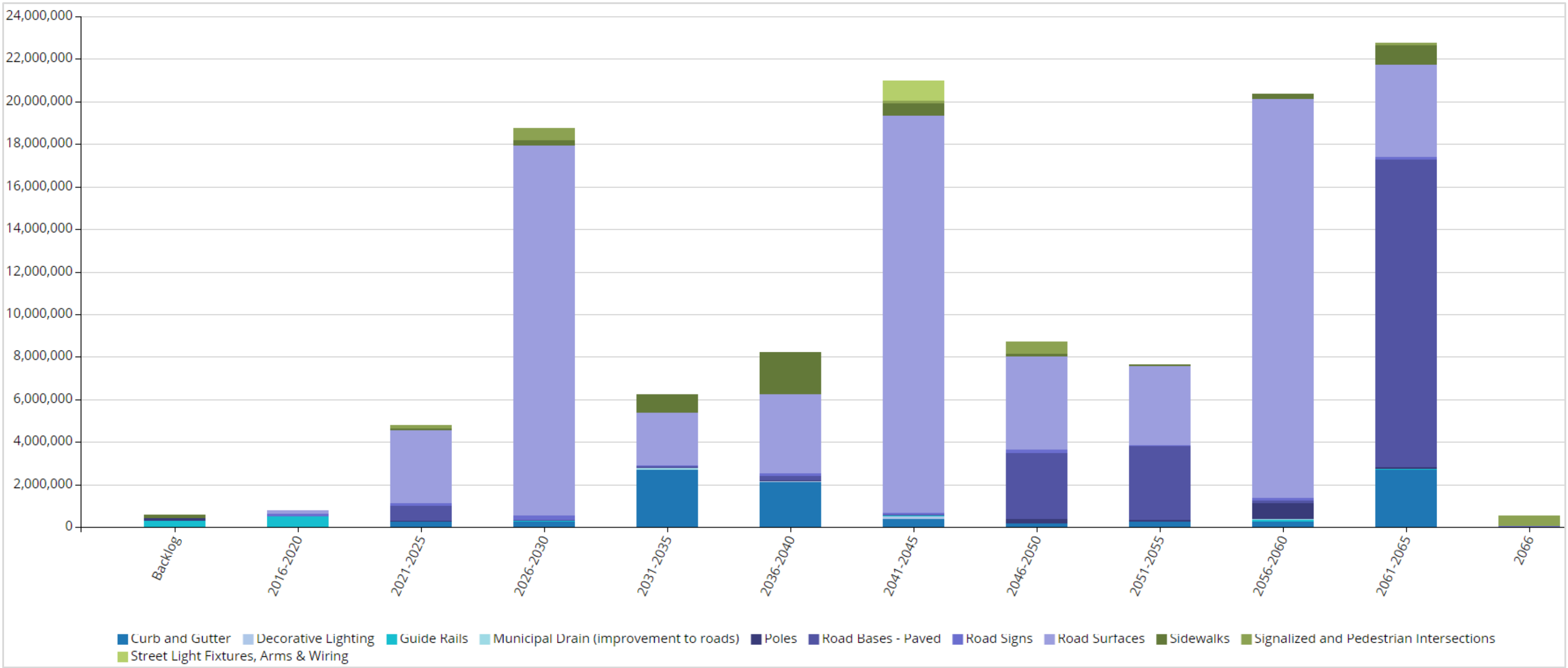


Nearly 95% of the municipality's road assets are in good to very good condition. Approximately 1.6% of the road network portfolio, with a valuation of $2.5 million, is in poor to very poor condition.

1.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's road network assets. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. In the absence of observed data, the backlog represents the value of assets that remain in operation beyond their useful life.

FIGURE 12 FORECASTING REPLACEMENT NEEDS - ROAD NETWORK



While the backlog for the municipality's road network is relatively minimal, totalling $559,000, the municipality will see a rapid increase in replacement investments over the next 15 years. These requirements will total nearly $19 million between 2026 and 2030, more than $17 million of which will be allocated to road surfaces. The municipality's annual requirements for its road network total $3,892,000. At this funding level, the municipality is allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the municipality is currently allocating $840,000, leaving an annual deficit of $3,052,000. See the 'Financial Strategy' section for achieving a sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

1.6 Recommendations – Roads

- The majority of the municipality's roads portfolio is in good to very good condition. To maintain this status, the municipality should continue to implement condition assessments to maintain existing LOS. To further refine its roads data, this assessment program can be expanded to include its appurtenances, e.g., streetlights and guiderails. This will further refine the financial requirements related to the municipality's road network. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- While the municipality's confidence in its data is high, there is no formal data verification policy in place. To maintain a high degree of data confidence over time and minimize deficiencies, the municipality should establish a systematic data verification policy.

- The municipality is funding only 22% of it's annual needs. See the 'Financial Strategy' section on how to achieve more sustainable funding levels.

- In support of the municipality's Asset Management Policy, this AMP and any LOS and KPIs established should be updated annually to gauge the performance of the municipality against quantified targets.

2 Bridges & Culverts

2.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 11, Table 12, and Table 13 illustrate key asset attributes for the municipality's bridges & culverts, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's bridges & culverts assets are valued at $42 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality and obtained from the municipality's accounting data as maintained in the CityWide® Tangible Asset module.

TABLE 11 ASSET INVENTORY - BRIDGES & CULVERTS

Asset Type	Asset Component	Quantity
Bridges & Culverts	Bridges - Structure	5,407m^2
	Bridges - Deck	5,612m^2
	Culverts	5,845m^2

TABLE 12 REPLACEMENT COST VALUATION AND METHOD – BRIDGES & CULVERTS

Asset Type	Asset Component	Valuation Method	2016 Overall Replacement Cost
Bridges & Culverts	Bridges - Structure	NRBCPI Quarterly (Toronto)	$15,512,011
	Bridges - Deck	NRBCPI Quarterly (Toronto)	$4,983,459
	Culverts	NRBCPI Quarterly (Toronto)	$21,527,590
			$42,023,060

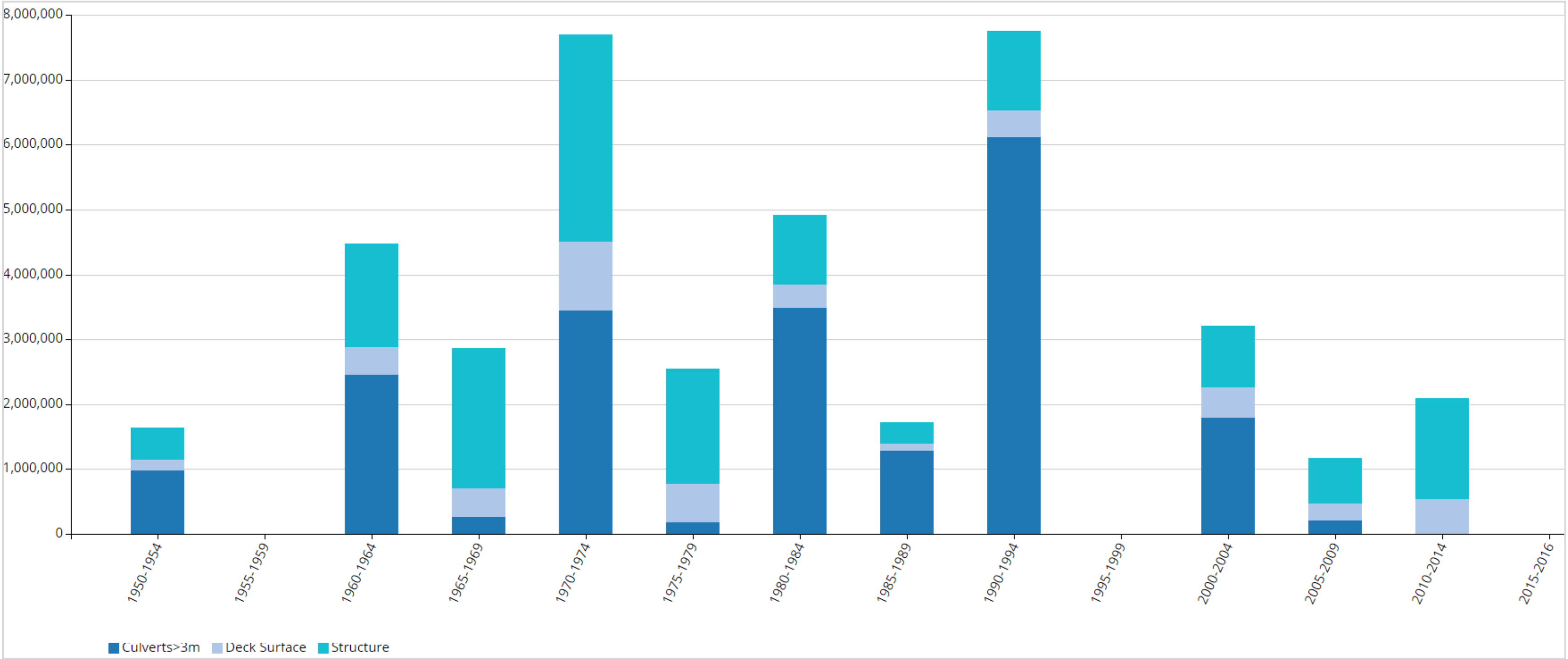
TABLE 13 ASSET USEFUL LIFE IN YEARS - BRIDGES & CULVERTS

Asset Type	Asset Component	Quantity	Useful Life (Years)
Bridges & Culverts	Bridges - Structure	5,407m^2	75
	Bridges - Deck	5,612m^2	15
	Culverts	5,845m^2	75

2.2 Historical Investment in Infrastructure

In the next two sections, we provide the installation profile and useful life consumption levels of bridges & culverts using in-service data obtained from CityWide® Tangible Assets. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, these graphs illustrate historical infrastructure investment trends and can assist in forecasting short-, medium- and long-term replacement needs.

FIGURE 13 HISTORICAL INVESTMENT - BRIDGES & CULVERTS

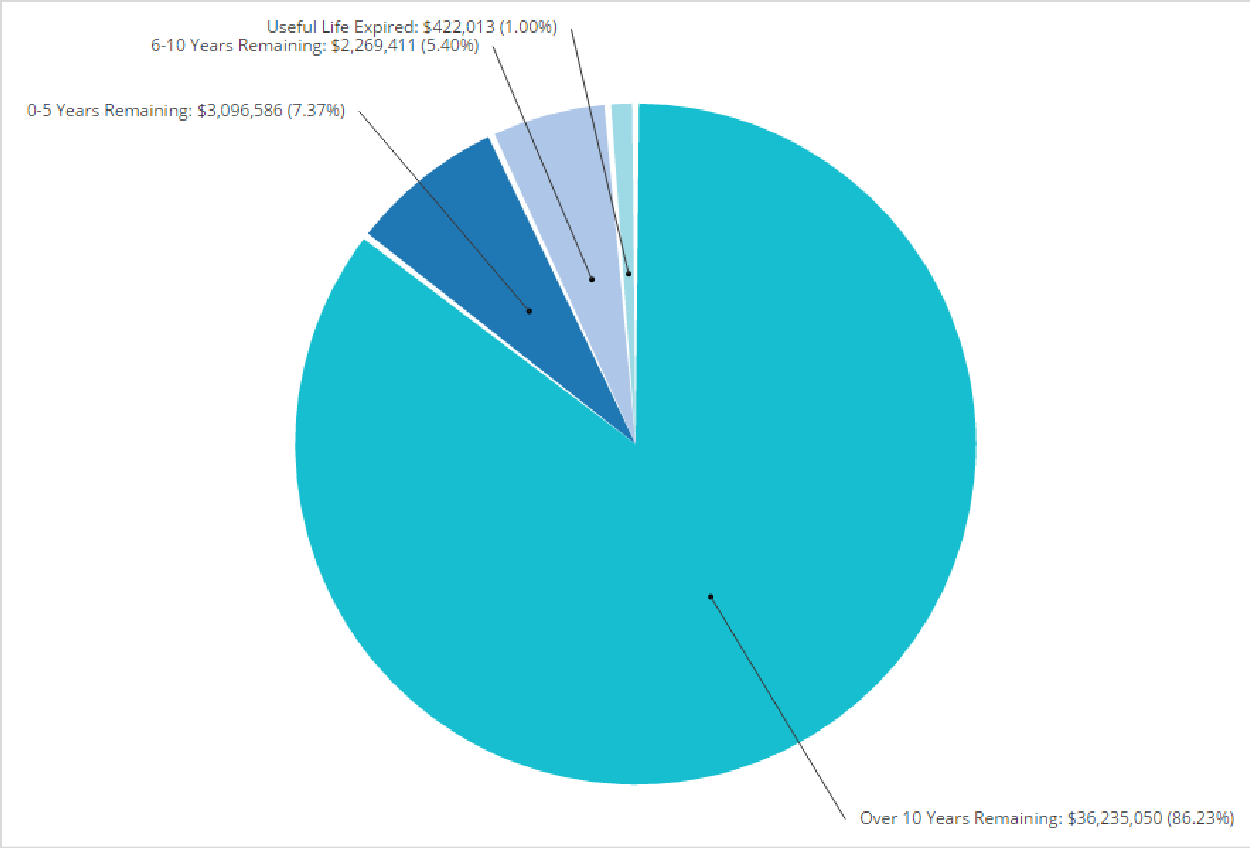


The municipality has invested consistently in its bridges and culvert assets, with investments peaking in the early 1970s, totaling $7.7 million, followed by a second spike in the early 1990s, totalling $7.8 million. Expenditures have declined over the last 20 years, totalling approximately $6.5 million since 2000.

2.3 Useful Life Consumption

In this section, we detail the extent to which the asset class has consumed its useful life based on the above, established useful life standards. In conjunction with asset condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. The figure below illustrates the useful life consumption levels for the municipality's bridges & culverts.

FIGURE 14 USEFUL LIFE CONSUMPTION – BRIDGES & CULVERTS

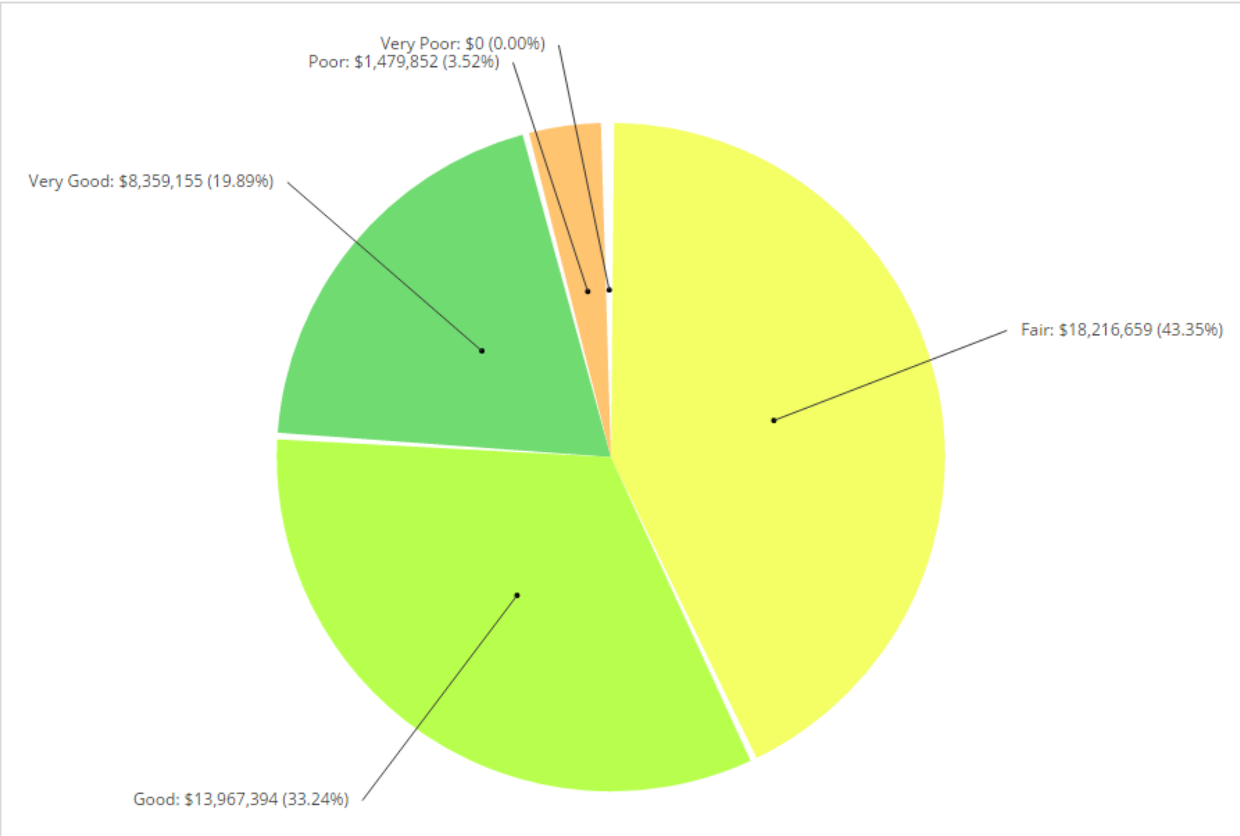


Nearly 90% of the municipality's bridges & culverts have at least 10 years of useful life remaining. However, more than 7% of assets, with a valuation of $3 million will reach the end of their useful life in the next five years.

2.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's bridges & culverts. By default, we rely on observed field data adapted from OSIM inspections as provided by the municipality. In the absence of such information, age-based data is used as a proxy.

FIGURE 15 ASSET CONDITION – BRIDGES & CULVERTS (ASSESSED)

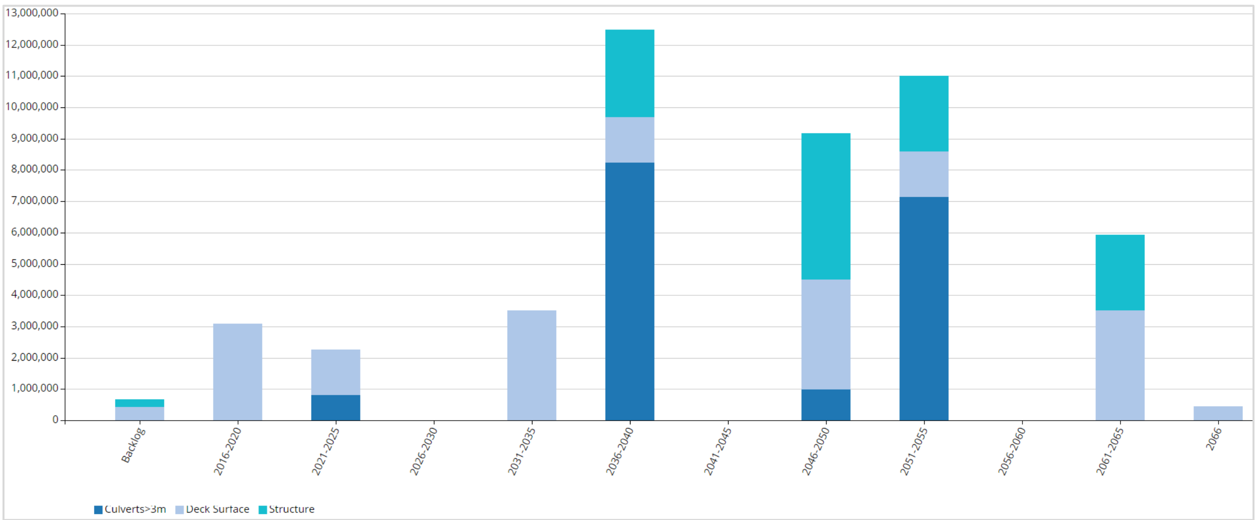


Approximately 50% of the municipality's bridges & culverts are in good to very good condition. Less than 4% of the assets, with a valuation of $1.5 million, are in poor to very poor condition.

2.5 Forecasting Replacement Needs

In the following sections, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's bridges & culverts. The backlog represents the immediate replacement needs that were deferred over previous years or decades.

FIGURE 16 FORECASTING REPLACEMENT NEEDS - BRIDGES & CULVERTS



In addition to a backlog of $675,000, the replacement needs for bridges & culverts will total $3.1 million over the next five years. An additional $2.3 million will be required between 2021 and 2025. The municipality's replacement needs peak between 2036 and 2040, when $12.5 million will be required in expenditures. The municipality's annual requirements for its bridges & culverts total $826,000. At this funding level, the municipality is allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the municipality is currently allocating $233,000, leaving an annual deficit of $593,000. See the 'Financial Strategy' section for achieving a sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

2.6 Recommendations – Bridges & Culverts

- Nearly 100% of the municipality's bridges & culverts are in fair to very good condition. To address the backlog of $675,000, the municipality should integrate a risk management framework with its condition assessment programs to prioritize bridges & culverts capital projects. This data will also generate guidance in prioritizing the short-, medium-, and long-term replacement needs. See Section 2, 'Condition Assessment Programs' and Section 4, 'Risk' in the 'Asset Management Strategies' chapter.

- The municipality should assess its short-, medium- and long-term operations and maintenance needs. An appropriate percentage of the replacement costs should then be allocated for the municipality's O&M requirements.

- The municipality is funding only 28% of it's annual needs. See the 'Financial Strategy' section on how to achieve more sustainable funding levels.

- In support of the municipality's Asset Management Policy, this AMP and any LOS and KPIs established should be updated annually to gauge the performance of the municipality against quantified targets.

3. Water

3.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 14, Table 15, and Table 16illustrate key asset attributes for the municipality's water assets, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's water assets are valued at $73 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality and obtained from the municipality's accounting data as maintained in the CityWide® Tangible Asset module.

TABLE 14 ASSET INVENTORY – WATER

Asset Type	Asset Component	Quantity
Water Services	Mains	101,410m
	Meters	4,180
	Wells (Electrical, Mechanical, Structural)	8
	Water Towers (Structure, Mechanical, Electrical)	5,996m^3
	Chlorine Station (Structure, Mechanical, Electrical)	344ft^2
	Scott's Point Pumphouse (Structure)	385ft^2
	Treatment Plant (Structure, Mechanical, Electrical, etc)	5,640ft^2
	Water Meter Pits	10
	Water Services	44,719m
	Valves	1,249
	Water Valve Chambers	26
	Water Blow Off	61
	Water Curb Stop	4,410
	Hydrants	438
	Water Services Pickup Trucks	2

TABLE 15 REPLACEMENT COST VALUATION AND METHOD - WATER

Asset Type	Asset Component	Quantity	Valuation Method	2016 Overall Replacement Cost
Water Services	Mains - Potable	97,192m	NRBCPI Quarterly (Toronto)	$35,505,396
	Mains - Non-Potable	4,217m	NRBCPI Quarterly (Toronto)	$143,391
	Meters - Potable	4,174	NRBCPI Quarterly (Toronto)	$863,631
	Meters - Non-Potable	6	NRBCPI Quarterly (Toronto)	$3,684
	Wells (Electrical, Mechanical, Structural)	8	CPI Monthly (ON)	$1,569,707
	Water Towers (Structure, Mechanical, Electrical)	5996m^3	NRBCPI Quarterly (Toronto)	$2,961,054
	Chlorine Station (Structure, Mechanical, Electrical)	344ft^2	NRBCPI Quarterly (Toronto)	$1,754,284
	Scott's Point Pumphouse (Structure)	385ft^2	NRBCPI Quarterly (Toronto)	$47,510
	Treatment Plant (Structure, Mechanical, Electrical	5640ft^2	NRBCPI Quarterly (Toronto)	$17,391,510
	Water Meter Pits	9	NRBCPI Quarterly (Toronto)	$45,487
	Water Meter Pits - Non-Potable	1	NRBCPI Quarterly (Toronto)	$1,394
	Water Services - Small (13-25mm)	43,581m	NRBCPI Quarterly (Toronto)	$7,153,450
	Water Services - Medium (38-50mm)	1,112m	NRBCPI Quarterly (Toronto)	$176,954
	Water Services - Large (100mm)	25m	NRBCPI Quarterly (Toronto)	$6,446
	Valves - Potable	1,211	NRBCPI Quarterly (Toronto)	$1,780,072
	Valve - Non-Potable	38	NRBCPI Quarterly (Toronto)	$8,474
	Water Valve Chambers	20	NRBCPI Quarterly (Toronto)	$55,653
	Water Valve Chambers - Non Potable	6	NRBCPI Quarterly (Toronto)	$3,612
	Water Blow Off	61	NRBCPI Quarterly (Toronto)	$50,973
	Water Curb Stop	4,410	NRBCPI Quarterly (Toronto)	$2,338,085
	Hydrants - Potable	427	NRBCPI Quarterly (Toronto)	$1,459,672
	Hydrants - Non-Potable	11	NRBCPI Quarterly (Toronto)	$5,742
	Water Services Pickup Trucks	2	NRBCPI Quarterly (Toronto)	$56,470
			Total	$73,382,651

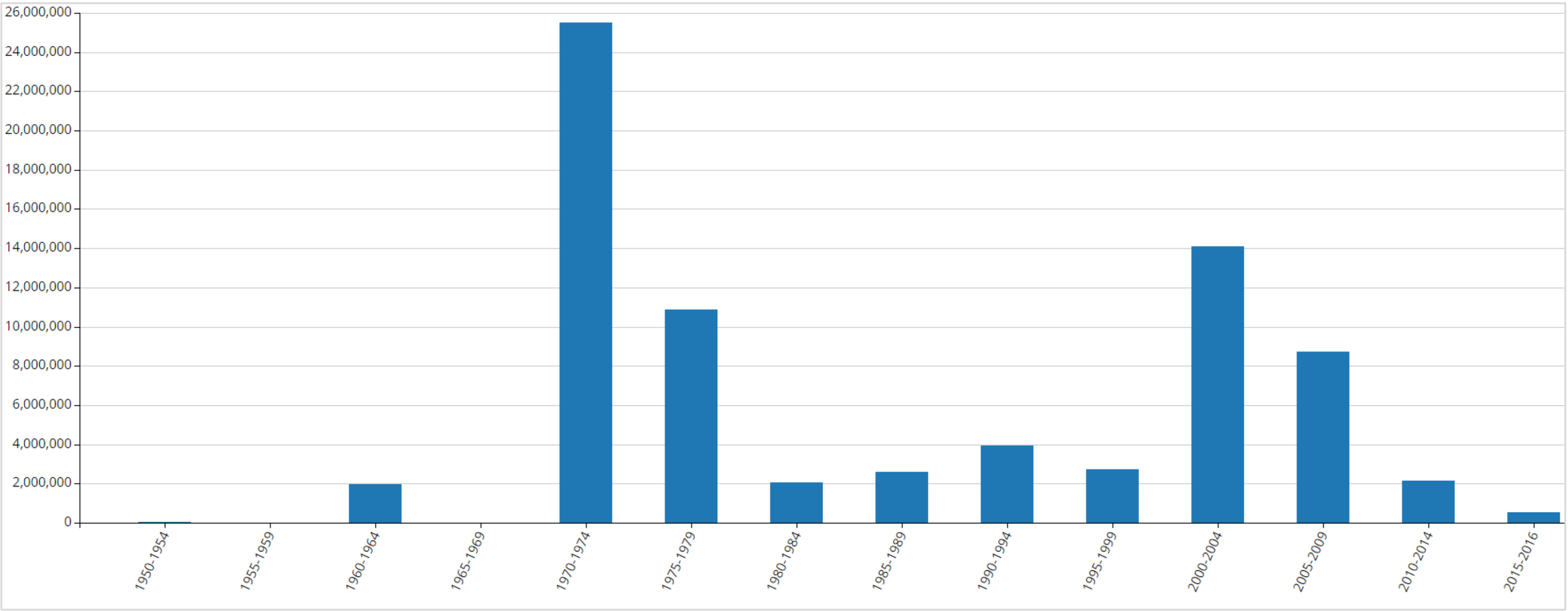
TABLE 16 ASSET USEFUL LIFE - WATER

Asset Type	Asset Component	Quantity	Useful Life (Years)
Water Services	Mains- Local	53,426m	60
	Mains- Local	101,410m	65
	Mains- Local	45,858.21m	70
	Mains- Local	2,126m	80
	Water Meters	4,180	15
	Wells (Electrical)	8	12
	Wells (Mechanical)	8	15
	Wells (Structural)	8	50
	Water Towers (Structure)	5,996m^3	50
	Water Towers (Mechanical)	5,996m^3	15
	Water Towers (Electrical)	5,996m^3	12
	Chlorine Station (Structure)	344ft^2	50
	Chlorine Station (Mechanical)	344ft^2	15
	Chlorine Station (Electrical)	344ft^2	12
	Pumphouse (Structure)	385ft^2	25
	Treatment Plant (Structure)	5,640ft^2	50
	Treatment Plant (Architectural)	5,640ft^2	25
	Treatment Plant (Mechanical)	5,640ft^2	20
	Treatment Plant (Process Piping)	5,640ft^2	25
	Treatment Plant (Electrical)	5,640ft^2	15
	Treatment Plant (Instrumentation)	5,640ft^2	10
	Water Meter Pits	10	60
	Water Services	44,719m	60
	Water Valves	1,247	60
	Water Valve Chambers	26	60
	Water Blow Off	61	60
	Water Curbstop	4,410	60
	Hydrants	438	70
	Water Services Pickup Trucks	2	7

3.2 Historical Investment in Infrastructure

In the next two sections, we provide the installation profile and useful life consumption levels of water assets using in-service data obtained from CityWide® Tangible Assets. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, these graphs illustrate historical infrastructure investment trends and can assist in forecasting short-, medium- and long-term replacement needs.

FIGURE 17 HISTORICAL INVESTMENT – WATER NETWORK

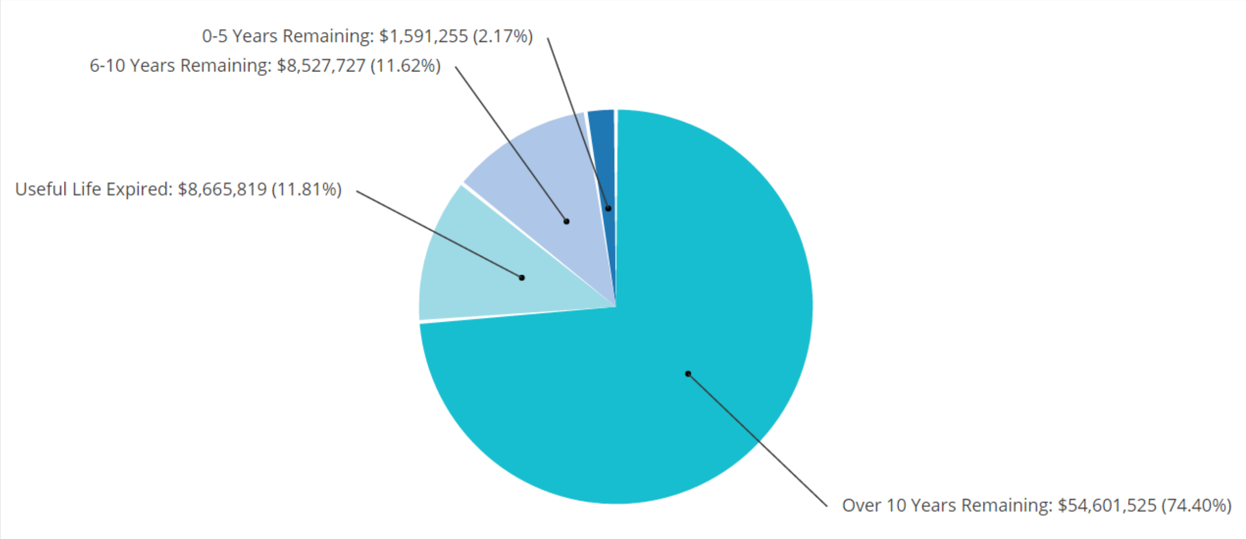


The general trend for the municipality's water assets has been a decline in investment since the mid 1970s. Whereas investments in infrastructure totaled more than $25 million between 1970 and 1974, the municipality has invested a comparable amount over the last 15 years.

3.3 Useful Life Consumption

In this section, we detail the extent to which the asset class has consumed its useful life based on the above, established useful life standards. In conjunction with asset condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 18 illustrates the useful life consumption levels for the municipality's water assets.

FIGURE 18 USEFUL LIFE CONSUMPTION – WATER NETWORK

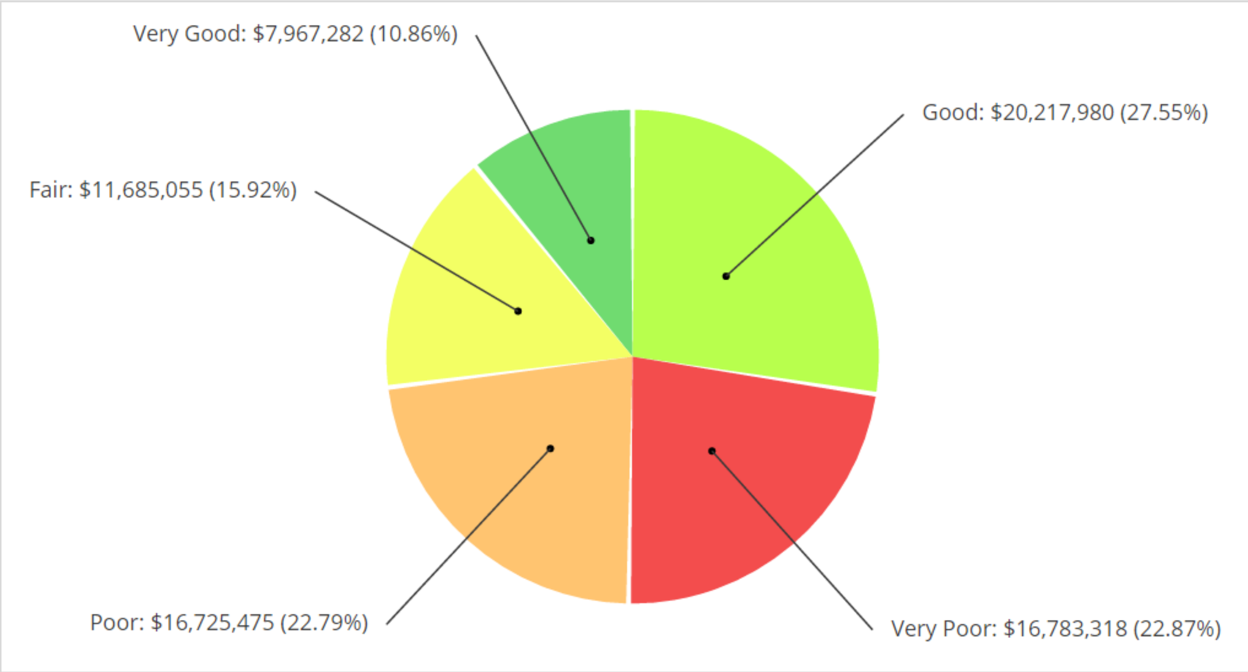


While 74% of the assets have at least 10 years of useful life remaining, nearly 12% of the portfolio with a valuation of nearly $9 million remain in operation beyond their established useful life. An additional $1.6 million will reach the end of their useful life over the next five years.

3.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's water services. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has not provided partial condition data.

FIGURE 19 ASSET CONDITION – WATER NETWORK (AGE-BASED AND ASSESSED)

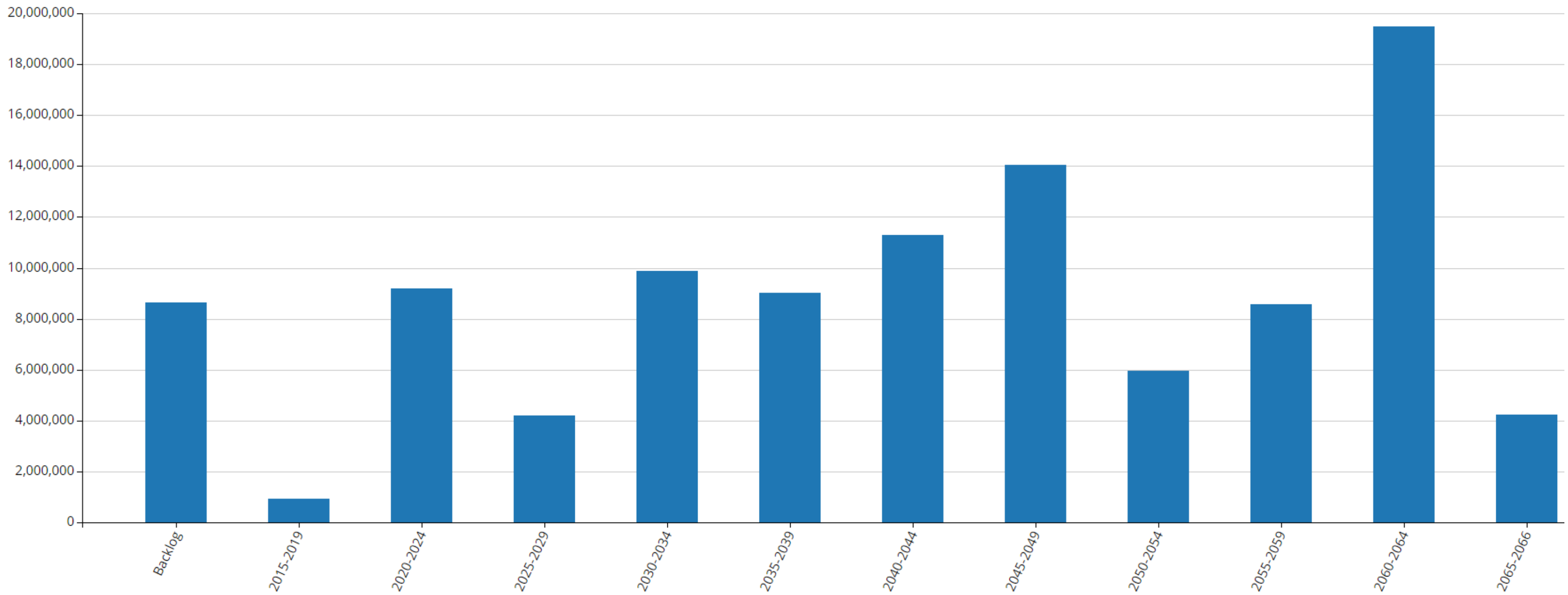


Less than 40% of the municipality's water assets are in good to very good condition. Nearly 50% of assets, with a valuation of nearly $34 million, are in poor to very poor condition, indicative of impending or short-term replacement needs.

3.5 Forecasting Replacement Needs

In the following sections, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's water network. The backlog represents the immediate replacement needs that were deferred over previous years or decades.

FIGURE 20 FORECASTING REPLACEMENT NEEDS – WATER NETWORK



In addition to a significant backlog totaling $8.7 million, the municipality's replacement needs will total more than $10 million over the next 10 years. Generally, these replacement needs are forecasted to continue to rise over the next 50 years, peaking at $19.5 million between 2060 and 2064 when a significant portion of mains will require replacement. The municipality's annual requirements for water assets total $1,917,000. At this funding level, the municipality is allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the municipality is currently allocating $1,206,000, leaving an annual deficit of $711,000. See the 'Financial Strategy' section for achieving a sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

3.6 Recommendations – Water

- Similar to bridges & culverts, water services are uniquely consequential to a community's wellbeing. The majority of the municipality's water services lack observed condition data. As such, the municipality should establish a condition assessment program. This will provide a more accurate assessment of the physical health of the assets and the financial requirements related to the municipality's water network. Segments deemed to require assessments should be selected based on their criticality which can be determined rudimentarily by their replacement cost. The municipality should establish such assessment program and dedicate a portion of its capital funding to this initiative. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- Condition data generated from the above initiative should be integrated with a risk management framework. Together, this data should be used to systematically prioritize short-, medium-, and long-term replacement needs for the municipality's water assets. See Section 4, 'Risk' in the 'Asset Management Strategies' chapter.

- Age-based data indicates an infrastructure backlog of $8.7 million. Comprehensive condition assessment data, once gathered, should be used to provide better estimate of this pent-up demand, and to guide the prioritization of capital projects required to eliminate the backlog.

- The municipality is funding only 63% of it's annual needs. See the 'Financial Strategy' section on how to achieve more sustainable funding levels.

- While the municipality's confidence in its data is high, there is no formal data verification policy in place. To maintain a high degree of data confidence over time and minimize deficiencies, the municipality should establish a systematic data verification policy.

- The municipality should continue to audit its capital assets data and update old data with more current information.

- The municipality should establish technical and customer-oriented levels of service (LOS) and their associated KPIs. The performance of the municipality's water services should be assessed over time against target LOS and KPIs.

- The municipality should establish a systematic lifecycle activity framework that reflects the consumption of its water assets. At the least, these activities should be designed to maintain existing levels of service, and should reflect the overarching priorities of the municipality. More advanced LOS targets reflecting growth requirements or changes in the economic makeup of the municipality can also be established. See Section 3, 'Lifecycle Analysis Framework' in the 'Asset Management Strategies' chapter.

- The municipality should assess its short-, medium- and long-term operations and maintenance needs. An appropriate percentage of the replacement costs should then be allocated for the municipality's O&M requirements.

- In support of the municipality's Asset Management Policy, this AMP and any LOS and KPIs established should be updated annually to gauge the performance of the municipality against quantified targets.

4 Sanitary

4.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 14Table 17, Table 18, and Table 19 illustrate key asset attributes for the municipality's sanitary assets, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's sanitary water assets are valued at $82 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality and obtained from the municipality's accounting data as maintained in the CityWide® Tangible Asset module.

TABLE 17 ASSET INVENTORY - SANITARY

Asset Type	Asset Component	Quantity
Sanitary Sewer Services	Sanitary Cleanouts	25
	Curbstops	22
	Forcemain Pipes	17,252m
	Wastewater Laterals	37,232m
	Mains	64,168m
	Mains Reducer Stub	3m
	Lift Station (Structure, Mechanical, Electrical)	6
	Chlorine Station (Structure, Mechanical, Electrical)	270ft^2
	Pumping Stations (Structure, Mechanical, Electrical)	2,604ft^2
	Wastewater Plant (Structure, Mechanical, Electrical)	23,344ft^2
	UV Disinfection Shelter	1,120ft^2
	Grinder Lines	1,184m
	Manholes	897
	Valves	11
	Lagoons	361,000m^3
	Meters	2
	Sanitary Pickup Trucks	1
	Sanitary Vans	2

TABLE 18 REPLACEMENT COST VALUATION AND METHOD - SANITARY

Asset Type	Asset Component	Valuation Method	2016 Overall Replacement Cost
Sanitary Sewer Services	Sanitary Cleanouts	NRBCPI Quarterly (Toronto)	$1,392
	Curbstops	NRBCPI Quarterly (Toronto)	$4,845
	Forcemain Pipes	NRBCPI Quarterly (Toronto)	$12,872,682
	Wastewater Laterals	NRBCPI Quarterly (Toronto)	$8,668,378
	Mains - Small (50-375mm)	NRBCPI Quarterly (Toronto)	$32,115,729
	Mains - Large (380-600mm)	NRBCPI Quarterly (Toronto)	$3,946,879
	Mains Reducer Stub	NRBCPI Quarterly (Toronto)	$1,170
	Lift Station (Structure, Mechanical, Electrical)	NRBCPI Quarterly (Toronto)	$1,419,647
	Chlorine Station (Structure, Mechanical, Electrical)	NRBCPI Quarterly (Toronto)	$296,934
	Pumping Stations (Structure, Mechanical, Electrical)	NRBCPI Quarterly (Toronto)	$4,409,359
	Wastewater Plant (Structure, Mechanical, Electrical)	NRBCPI Quarterly (Toronto)	$79,181
	UV Disinfection Shelter	NRBCPI Quarterly (Toronto)	$50,820
	Grinder Lines	NRBCPI Quarterly (Toronto)	$228,861
	Manholes	NRBCPI Quarterly (Toronto)	$6,151,015
	Valves	NRBCPI Quarterly (Toronto)	$10,352
	Lagoons	NRBCPI Quarterly (Toronto)	$11,670,872
	Meters	NRBCPI Quarterly (Toronto)	$2
	Sanitary Pickup Trucks	NRBCPI Quarterly (Toronto)	$38,695
	Sanitary Vans	NRBCPI Quarterly (Toronto)	$35,108
		Total	$82,001,921

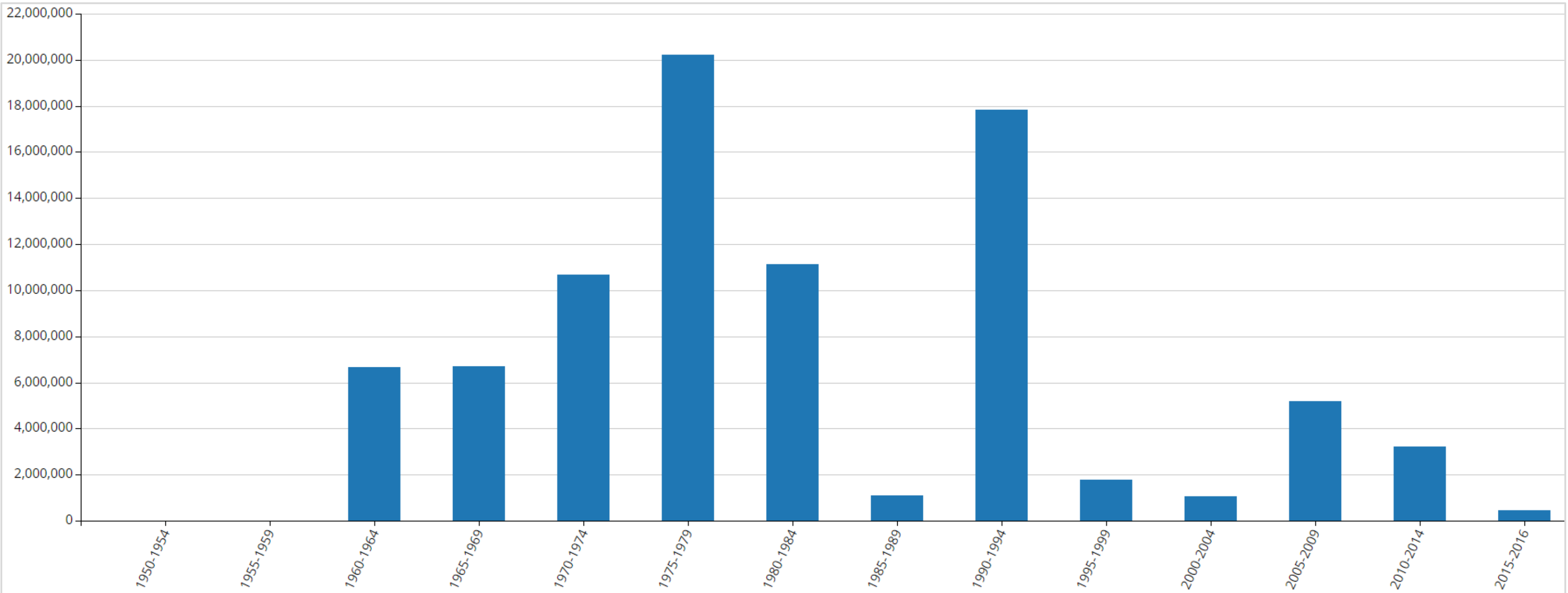
TABLE 19 ASSET USEFUL LIFE - SANITARY

Asset Type	Asset Component	Quantity	Useful Life (Years)
Sanitary Sewer Services	Sanitary Cleanouts	25	30
	Curbstops	22	60
	Forcemain Pipes	17,252m	60, 70, 80
	Wastewater Laterals	37,232m	60, 80
	Mains - Local (Less than or equal to 450mm)	63,078m	60, 80
	Mains - Local (Greater than 450mm)	1,090m	60, 80
	Mains Reducer Stub (250-200mm)	3m	60
	Lift Station (Structure)	6	50
	Lift Station (Mechanical)	6	15
	Lift Station (Electrical)	6	12
	Chlorine Station (Structure)	270ft^2	50
	Chlorine Station (Mechanical)	270ft^2	50
	Chlorine Station (Electrical)	270ft^2	12
	Pumping Stations (Structure)	2604ft^2	50
	Pumping Stations (Mechanical)	2604ft^2	15
	Pumping Stations (Electrical)	2604ft^2	12
	Wastewater Plant (Structure)	23,344ft^2	50
	Wastewater Plant (Mechanical)	23,344ft^2	15
	Wastewater Plant (Electrical)	23,344ft^2	12
	UV Disinfection Shelter	1,120ft^2	35
	Grinder Lines	1,184m	60
	Manholes	897	60
	Valves	11	40
	Lagoons	361,000m^3	50
	Meters	2	15
	Wastewater Curbstops	22	60
	Sanitary Pickup Trucks	1	7
	Sanitary Vans	2	7

4.2 Historical Investment in Infrastructure

In the next two sections, we provide the installation profile and useful life consumption levels of sanitary assets using in-service data obtained from CityWide® Tangible Assets. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, these graphs illustrate historical infrastructure investment trends and can assist in forecasting short-, medium- and long-term replacement needs.

FIGURE 21 HISTORICAL INVESTMENT – SANITARY

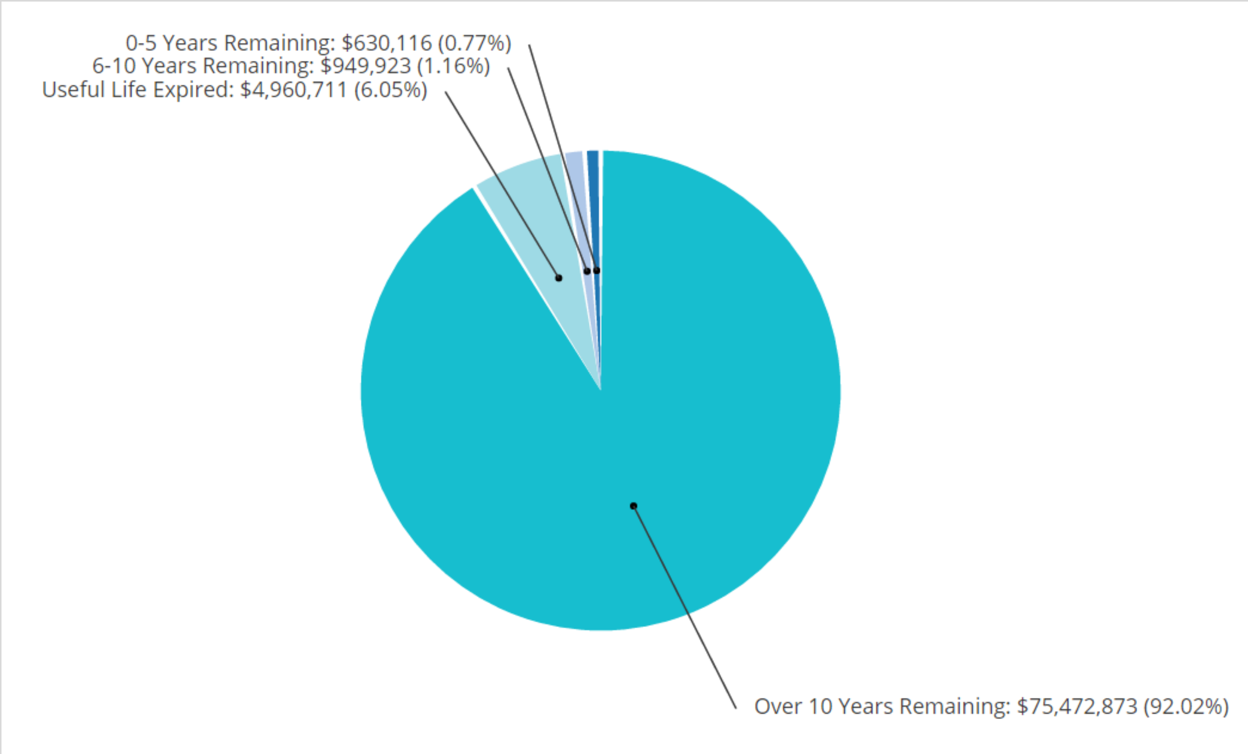


The municipality invested heavily and consistently in its sanitary assets between 1960 and 1980. Following a significant expenditures between 1990 and 1994, totalling $18 million, the majority of which was allocated to mains and pipes, investments declined precipitously over the next two decades, likely reflecting newly constructed infrastructure. Since 2005, the municipality has invested approximately $9 million in its sanitary services.

4.3 Useful Life Consumption

In this section, we detail the extent to which the asset class has consumed its useful life based on the above, established useful life standards. In conjunction with asset condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. The figure below illustrates the useful life consumption levels for the municipality's sanitary assets.

FIGURE 22 USEFUL LIFE CONSUMPTION – SANITARY SERVICES

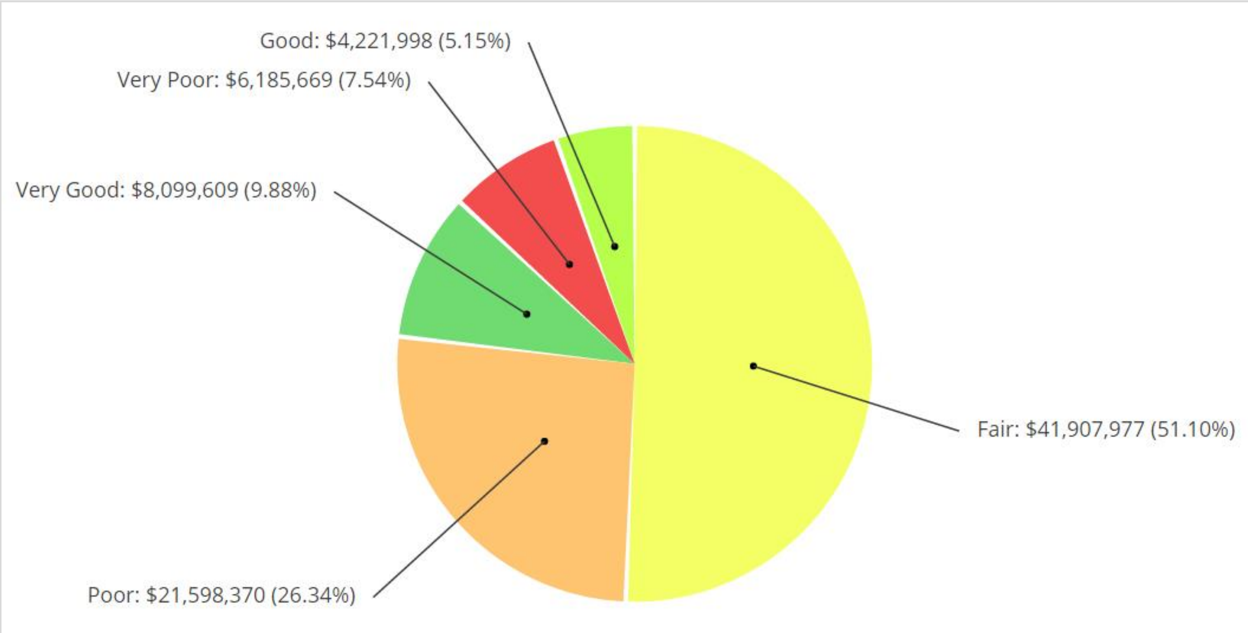


More than 90% of the municipality's sanitary assets have at least 10 years of useful life remaining. In addition to $630,000 of assets that remain in service beyond their useful life, more than 6% of assets, with a valuation of nearly $5 million, will reach the end of their useful life in the next five years.

4.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's sanitary services. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipalities storm assets have been partially assessed.

FIGURE 23 ASSET CONDITION – SANITARY SERVICES (AGE-BASED AND ASSESSED)

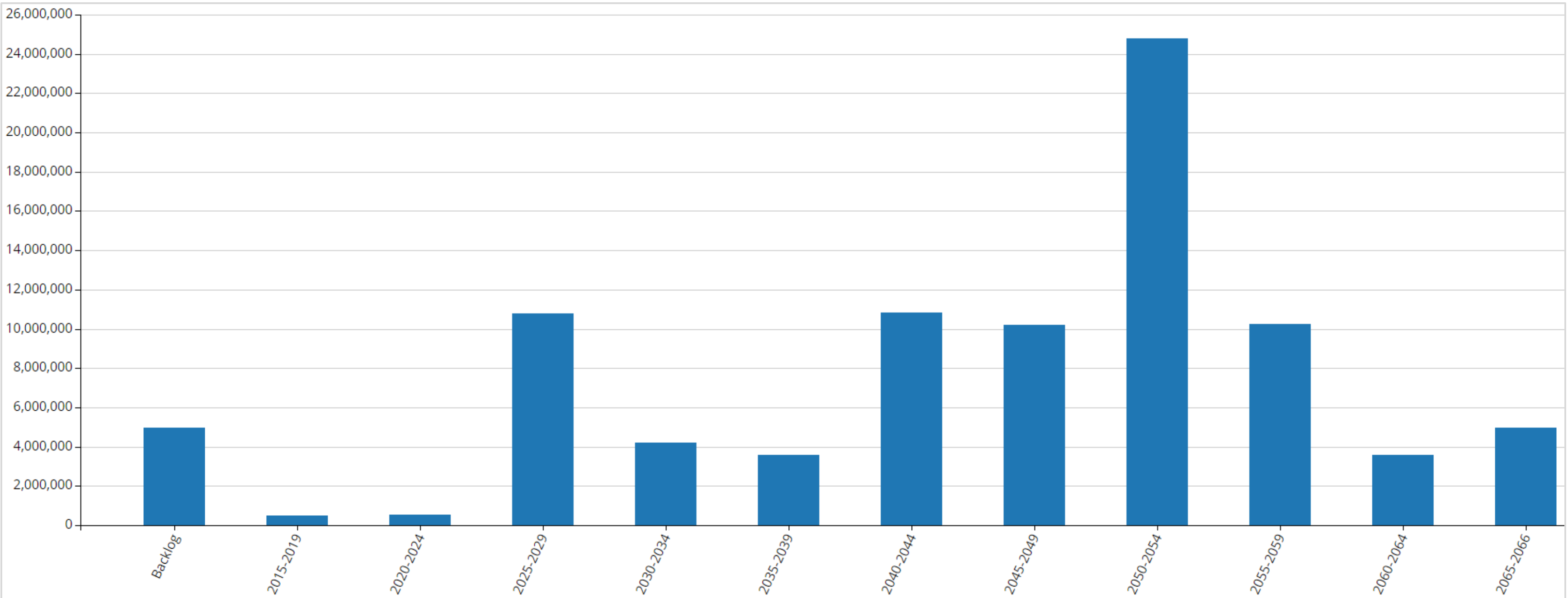


Only 15% of the municipality's sanitary assets are in good to very good condition. While 51%, with a valuation of $42 million are in fair condition, more 33% with a valuation of nearly $28 million are in poor to very poor condition, indicative of significant replacement needs in the short- to medium- terms as well as backlogs.

4.5 Forecasting Replacement Needs

In the following sections, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's sanitary network. The backlog represents the immediate replacement needs that were deferred over previous years or decades.

FIGURE 24 FORECASTING REPLACEMENT NEEDS – SANITARY SERVICES



In addition to a backlog of $5 million, the municipality's replacement expenditures will total nearly $12 million over the next 15 years. Investment requirements will continue to rise until the mid 2050s, requiring $25 million in sewer main replacements between 2050 and 2054. The municipality's annual requirements for sanitary assets total $1,476,000. At this funding level, the municipality is allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the municipality is currently allocating $1,244,000, leaving an annual deficit of $232,000. See the 'Financial Strategy' section for achieving a sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

4.6 Recommendations – Sanitary

- The majority of the municipality's sanitary services lack observed condition data. As such, the municipality should establish a condition assessment program. This will provide a more accurate assessment of the physical health of the assets and the financial requirements related to the municipality's sanitary network. Segments deemed to require assessments should be selected based on their criticality which can be determined rudimentarily by their replacement cost. The municipality should establish such assessment program and dedicate a portion of its capital funding to this initiative. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- Age-based data indicates an infrastructure backlog of $5 million. Comprehensive condition assessment data, once gathered, should be used to provide better estimate of this pent-up demand, and to guide the prioritization of capital projects required to eliminate the backlog.

- While the municipality's confidence in its data is high, there is no formal data verification policy in place. To maintain a high degree of data confidence over time and minimize deficiencies, the municipality should establish a systematic data verification policy.

- The municipality is funding 84% of it's annual needs. See the 'Financial Strategy' section on how to achieve more sustainable funding levels.

- The municipality should continue to audit its capital assets data and update old data with more current information.

- The municipality should establish technical and customer-oriented levels of service (LOS) and their associated KPIs. The performance of the municipality's sanitary services should be assessed over time against target LOS and KPIs.

- The municipality should establish a systematic lifecycle activity framework that reflects the consumption of its sanitary assets. At the least, these activities should be designed to maintain existing levels of service, and should reflect the overarching priorities of the municipality. More advanced LOS targets reflecting growth requirements or changes in the economic makeup of the municipality can also be established. See Section 3, 'Lifecycle Analysis Framework' in the 'Asset Management Strategies' chapter.

- The municipality should assess its short-, medium- and long-term operations and maintenance needs. An appropriate percentage of the replacement costs should then be allocated for the municipality's O&M requirements.

- In support of the municipality's Asset Management Policy, this AMP and any LOS and KPIs established should be updated annually to gauge the performance of the municipality against quantified targets.

5 Storm

5.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Error! Reference source not found., **Error! Reference source not found.** and **Error! Reference source not found.** illustrate key asset attributes for the municipality's storm assets, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's storm assets are valued at $30 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality and obtained from the municipality's accounting data as maintained in the CityWide® Tangible Asset module.

TABLE 20 ASSET INVENTORY - STORM

Asset Type	Asset Component	Quantity
Storm Water Services	Mains - Small (100-450mm)	51,429m
	Mains - Medium (500-900mm)	10,896m
	Mains - Large (1200-1500mm)	609m
	Mains - Other	139m
	Storm Sewer PDC	6,229m
	Storm Sewer Culverts	37
	Storm Sewer Catch Basins	1,448
	Manholes	545
	Storm sewer system	1
	Stormceptor	1

TABLE 21 REPLACEMENT COST VALUATION AND METHOD – STORM

Asset Type	Asset Component	Valuation Method	2016 Overall Replacement Cost
Storm Water Services	Mains - Small (100-450mm)	NRBCPI Quarterly (Toronto)	$15,589,641
	Mains - Medium (500-900mm)	NRBCPI Quarterly (Toronto)	$4,193,447
	Mains - Large (1200-1500mm)	NRBCPI Quarterly (Toronto)	$497,772
	Mains - Other	NRBCPI Quarterly (Toronto)	$39,097
	Storm Sewer PDC	NRBCPI Quarterly (Toronto)	$892,167
	Storm Sewer Culverts	NRBCPI Quarterly (Toronto)	$225,994
	Storm Sewer Catch Basins	NRBCPI Quarterly (Toronto)	$3,376,735
	Manholes	NRBCPI Quarterly (Toronto)	$3,863,311
	Storm sewer system	CPI Monthly (ON)	$899,353
	Stormceptor	NRBCPI Quarterly (Toronto)	$69,105
		Total	$29,646,622

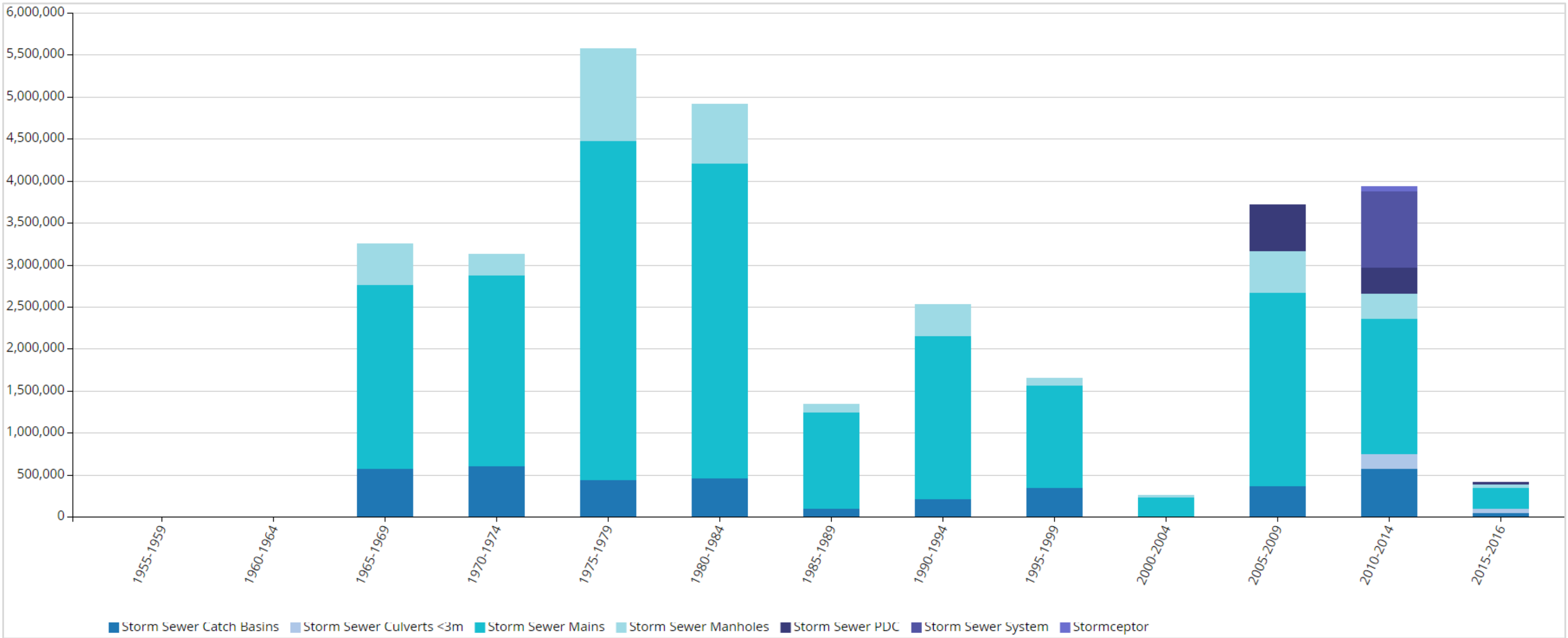
TABLE 22 ASSET USEFUL LIFE – STORM

Asset Type	Asset Component	Quantity	Useful Life (Years)
Storm Water Services	Mains - Local	17,127m	60
	Mains - Local	772m	80
	Mains - Local	45,173m	100
	Storm Sewer PDC	6,229m	60
	Storm Sewer Culverts	37	25
	Storm Sewer Catch Basins	1,448	60
	Manholes	545	60
	Storm sewer system	1	60
	Stormceptor	1	60

5.2 Historical Investment in Infrastructure

In the next two sections, we provide the installation profile and useful life consumption levels of storm assets using in-service data obtained from CityWide® Tangible Assets. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, these graphs illustrate historical infrastructure investment trends and can assist in forecasting short-, medium- and long-term replacement needs.

FIGURE 25 HISTORICAL INVESTMENT - STORM

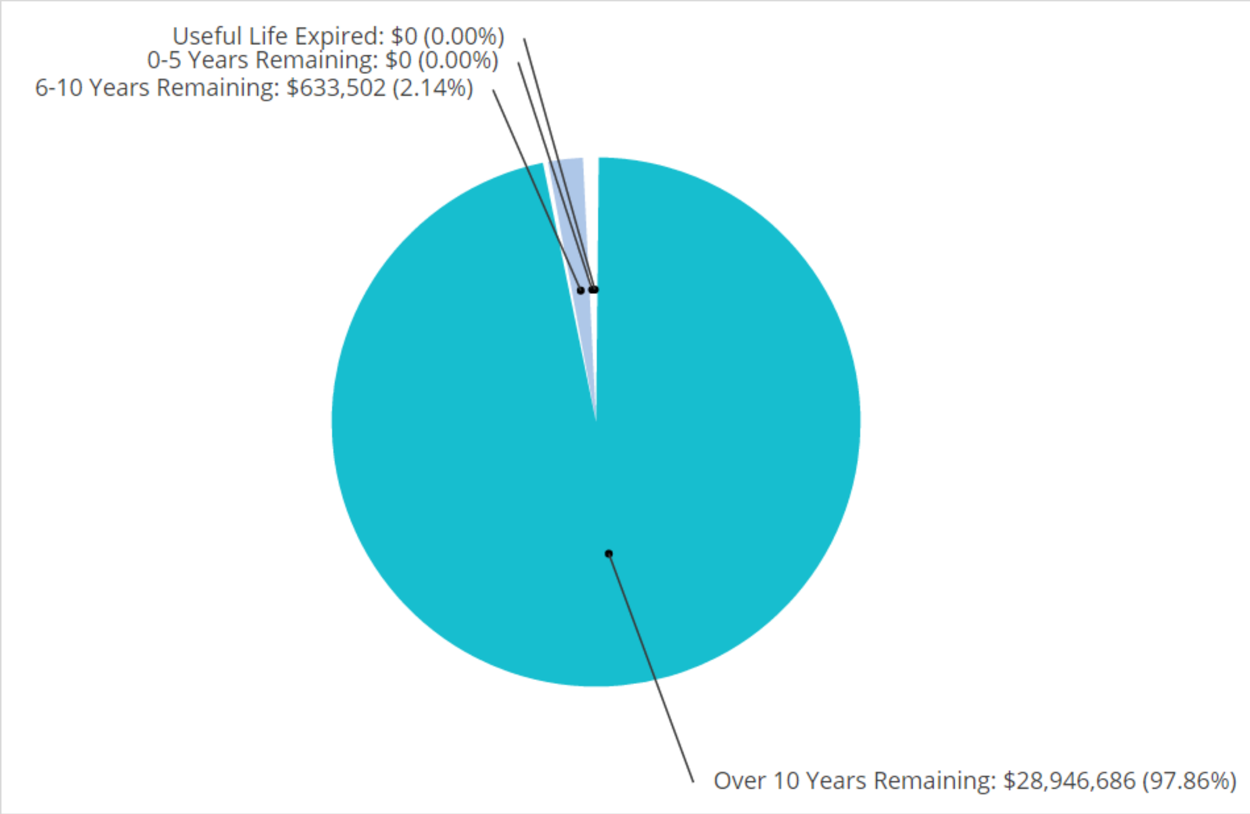


Similar to other asset classes in this AMP, the municipality's investments in its storm assets rose consistently from the mid-1960s, peaking at $5.6 million between 1975 and 1979. Investments then declined rapidly until 2004. Beginning in 2005, expenditures began to rise again, with the municipality investing $8 million in its storm network.

5.3 Useful Life Consumption

In this section, we detail the extent to which the asset class has consumed its useful life based on the above, established useful life standards. In conjunction with asset condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. The figure below illustrates the useful life consumption levels for the municipality's storm assets.

FIGURE 26 USEFUL LIFE CONSUMPTION – STORM

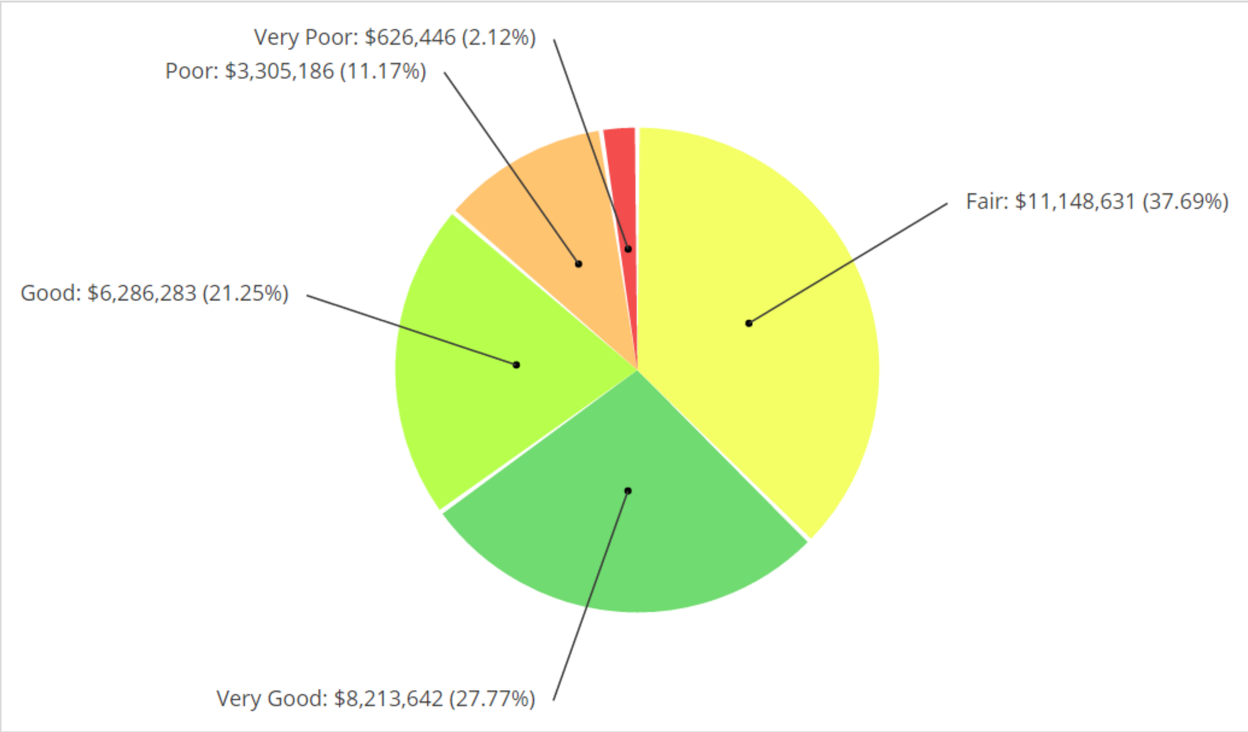


Nearly 100% of the assets have at least 10 years of useful life remaining.

5.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's storm assets. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has partially assessed their storm assets

FIGURE 27 ASSET CONDITION – STORM (AGE-BASED AND ASSESSED)

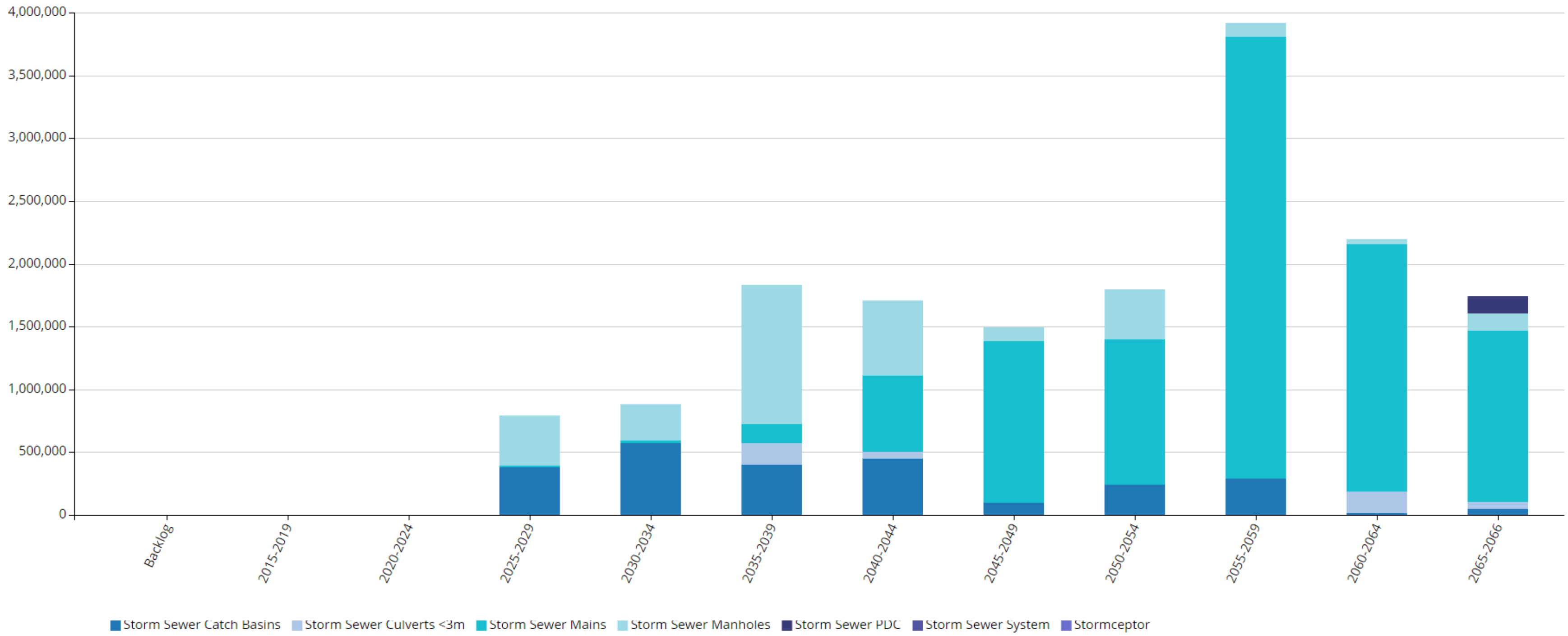


While 50% of the municipality's storm assets are in good to very good condition, 13% , with a valuation of $4 million are in poor to very poor condition.

5.5 Forecasting Replacement Needs

In the following sections, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's storm assets. The backlog represents the immediate replacement needs that were deferred over previous years or decades.

FIGURE 28 FORECASTING REPLACEMENT NEEDS – STORM



The municipality does not have a backlog associated with its storm assets. Further, replacement needs do not arise until 2025, totalling $800,000. As assets reach the end of their useful life, replacement needs will rise steadily over the medium- and long-term, peaking at $4 million between 2055 and 2059. As a note, a number of streets that require reconstruction to urban standards do not currently have existing storm assets, therefore some additional financial resources will be required for the building of these new storm assets.

The municipality's annual requirements for its storm assets total $392,000. At this funding level, the municipality is allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the municipality is currently allocating $233,000, leaving an annual deficit of $159,000. See the 'Financial Strategy' section for achieving a sustainable funding level.

5.6 Recommendations – Storm

- Based on age data, nearly 100% of the storm assets are in fair to very good condition. The municipality should establish a condition assessment program. This will provide a more accurate assessment of the physical health of the assets and the financial requirements related to the municipality's storm network. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- Condition data generated from the above initiative should be integrated with a risk management framework. Together, this data should be used to systematically prioritize short-, medium-, and long-term replacement needs for the municipality's sanitary assets.

- Age-based data indicates that there is no backlog associated with storm. Comprehensive condition assessment data, once gathered, should be used to provide better estimate of any previously unidentified pent-up demand, and to guide the prioritization of capital projects required to eliminate the backlog.

- The municipality is funding 59% of it's annual needs. See the 'Financial Strategy' section on how to achieve more sustainable funding levels.

- The municipality should establish a systematic lifecycle activity framework that reflects the consumption of its storm assets. At the least, these activities should be designed to maintain existing levels of service, and should reflect the overarching priorities of the municipality. More advanced LOS targets reflecting growth requirements or changes in the economic makeup of the municipality can also be established. See Section 3, 'Lifecycle Framework' in the 'Asset Management Strategies' chapter.

- The municipality should assess its short-, medium- and long-term operations and maintenance needs. An appropriate percentage of the replacement costs should then be allocated for the municipality's O&M requirements.

- In support of the municipality's Asset Management Policy, this AMP and any LOS and KPIs established should be updated annually to gauge the performance of the municipality against quantified targets.

6 Buildings

6.1 Asset Portfolio: Quantity, Useful Life, and Replacement Cost

Table 23, Table 24 and Table 25**Error! Reference source not found.** illustrates key asset attributes for the municipality's building assets, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's building assets are valued at $65 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality and obtained from the municipality's accounting data as maintained in the CityWide® Tangible Asset module.

TABLE 23 ASSET INVENTORY - BUILDINGS

Asset Type	Asset Component	Quantity
Buildings	Groundwater Pumping Stations (Structure, Electrical, Mechanical)	2
	Office Buildings (Interior, Roof, Services, Shells, Substructure)	36,140ft^2
	Library (Interior, Roof, Services, Shells, Substructure)	18,094ft^2
	Fire Halls (Interior, Roof, Services, Shells, Substructure)	17,659ft^2
	Washrooms (Interior, Roof, Services, Shells, Substructure)	7,633ft^2
	Sand Dome (Interior, Roof, Services, Shells, Substructure)	6,000ft^2
	Arena (Interior, Roof, Services, Shells, Substructure)	89,252ft^2
	Cemetery Buildings (Interior, Roof, Services, Shells, Substructure)	2,178ft^2
	Recreation Centres (Interior, Roof, Services, Shells, Substructure)	84,681ft^2
	Community Centres (Interior, Roof, Services, Shells, Substructure)	15,300ft^2
	Municipal Administration Centre & Underwood Municipal Office (Interior, Roof, Services, Shells, Substructure)	17,675ft^2
	Pavilions (Interior, Roof, Services, Shells, Substructure)	17,994ft^2
	Medical Clinic (Interior, Roof, Services, Shells, Substructure)	13,638ft^2
	Concession Booth (Interior, Services)	657ft^2
	Fish Cleanup Building (Interior, Roof, Services, Shells, Substructure)	400ft^2
	Lighthouse (Interior, Roof, Services, Shells, Substructure)	1,554ft^2
	Airport (Interior, Roof, Services, Shells, Substructure)	9,400ft^2
	Garages CPI (Interior, Roof, Services, Shells, Substructure)	450ft^2
	Garages (Interior, Roof, Services, Shells, Substructure)	27,533ft^2
	Sheds CPI (Interior, Roof, Services, Shells, Substructure)	20,956ft^2
	Sheds (Interior, Roof, Services, Shells, Substructure)	12,026ft^2

TABLE 24 REPLACEMENT COST VALUATION AND METHOD - BUILDINGS

Asset Type	Asset Component	Valuation Method	2016 Overall Replacement Cost
Buildings	Groundwater Pumping Stations (Structure, Electrical, Mechanical)	CPI Monthly (ON)	$290,944
	Office Buildings (Interior, Roof, Services, Shells, Substructure)	CPI Monthly (ON)	$2,517,114
	Library (Interior, Roof, Services, Shells, Substructure)	CPI Monthly (ON)	$5,496,725
	Fire Halls (Interior, Roof, Services, Shells, Substructure)	CPI Monthly (ON)	$3,226,952
	Washrooms (Interior, Roof, Services, Shells, Substructure)	CPI Monthly (ON)	$1,061,727
	Sand Dome (Interior, Roof, Services, Shells, Substructure)	NRBCPI Quarterly (Toronto)	$321,983
	Arena (Interior, Roof, Services, Shells, Substructure)	CPI Monthly (ON)	$18,310,101
	Cemetery Buildings (Interior, Roof, Services, Shells, Substructure)	CPI Monthly (ON)	$365,137
	Recreation Centres (Interior, Roof, Services, Shells, Substructure)	CPI Monthly (ON)	$11,246,622
	Community Centres (Interior, Roof, Services, Shells, Substructure)	CPI Monthly (ON)	$3,301,873
	Municipal Administration Centre & Underwood Municipal Office (Interior, Roof, Services, Shells, Substructure)	CPI Monthly (ON)	$2,906,493
	Pavilions (Interior, Roof, Services, Shells, Substructure)	CPI Monthly (ON)	$1,667,156
	Medical Clinic (Interior, Roof, Services, Shells, Substructure)	CPI Monthly (ON)	$6,037,510
	Concession Booth (Interior, Services)	CPI Monthly (ON)	$44,650
	Fish Cleanup Building (Interior, Roof, Services, Shells, Substructure)	CPI Monthly (ON)	$96,781
	Lighthouse (Interior, Roof, Services, Shells, Substructure)	CPI Monthly (ON)	$679,816
	Airport (Interior, Roof, Services, Shells, Substructure)	CPI Monthly (ON)	$1,063,714
	Garages CPI (Interior, Roof, Services, Shells, Substructure)	CPI Monthly (ON)	$40,402
	Garages (Interior, Roof, Services, Shells, Substructure)	NRBCPI Quarterly (Toronto)	$4,343,839
	Sheds CPI (Interior, Roof, Services, Shells, Substructure)	CPI Monthly (ON)	$1,569,360
	Sheds (Interior, Roof, Services, Shells, Substructure)	NRBCPI Quarterly (Toronto)	$369,754
		Total	$64,958,653

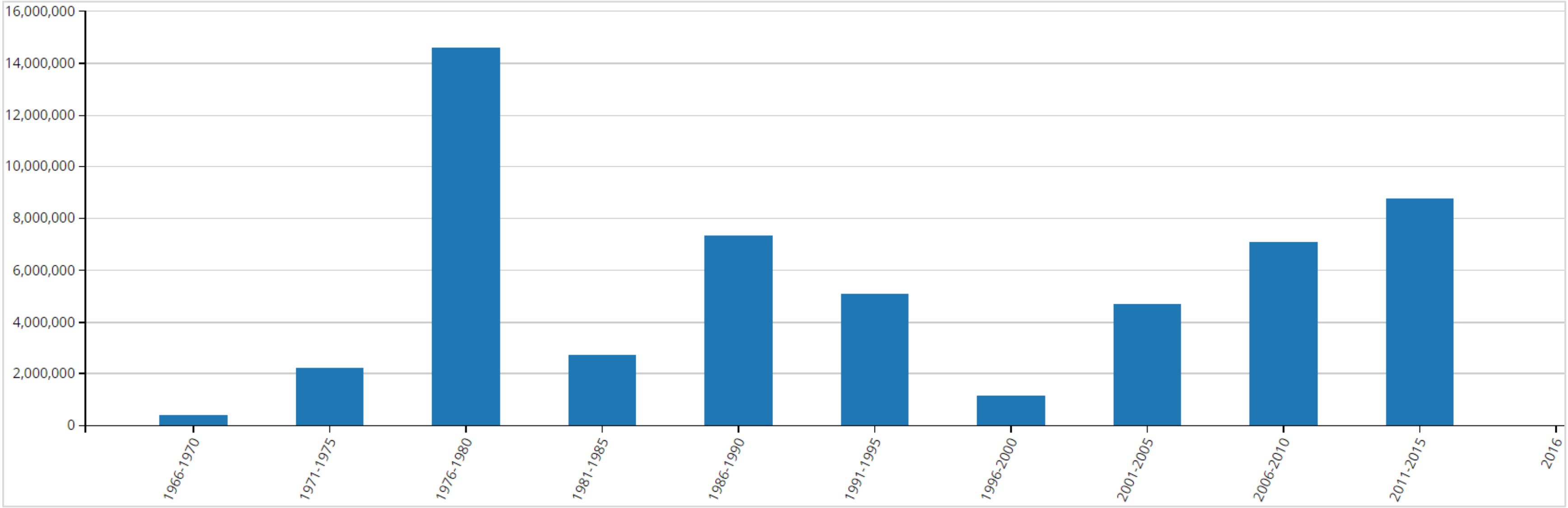
TABLE 25 ASSET USEFUL LIFE – BUILDINGS

Asset Type	Asset Component	Useful Life (Years)
Buildings	Groundwater Pump Stations (Electrical)	12
	Groundwater Pump Stations (Structural)	50
	Groundwater Pump Stations (Mechanical)	15
	Interior	30
	Roof	30
	Services	20
	Shells	40
	Substructure	50

6.2 Historical Investment in Infrastructure

In the next two sections, we provide the installation profile and useful life consumption levels of buildings using in-service data obtained from CityWide® Tangible Assets. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, these graphs illustrate historical infrastructure investment trends and can assist in forecasting short-, medium- and long-term replacement needs.

FIGURE 29 HISTORICAL INVESTMENT - BUILDINGS

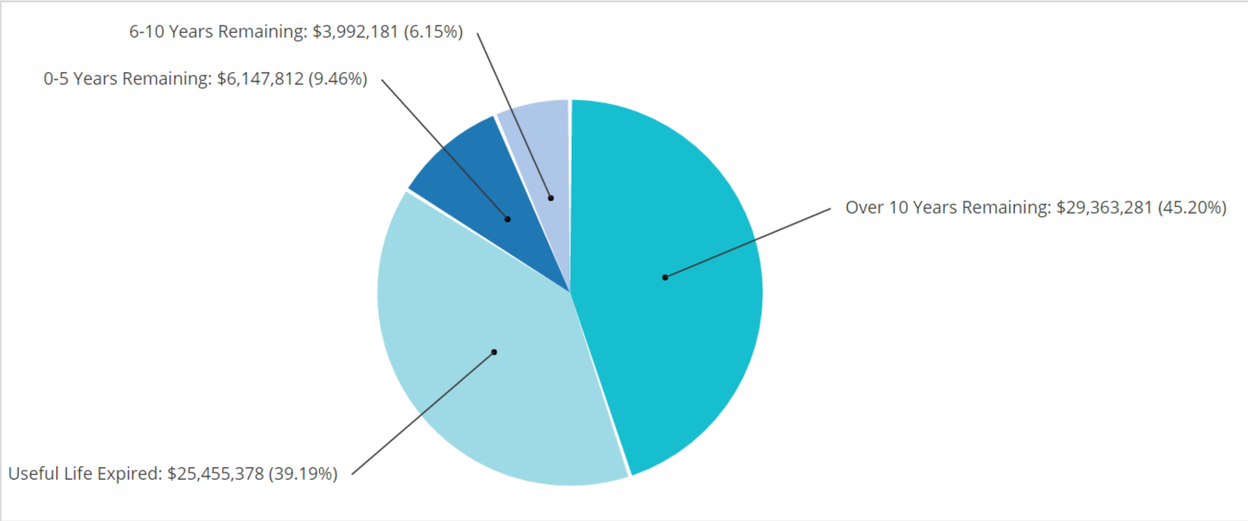


Similar to many other service areas, including water, sanitary and storm, the municipality invested heavily in its buildings assets in the 1970s; expenditures totaled nearly $15 million between 1976 and 1980. Since then, the municipality has continued to invest steadily in buildings, although at lower levels. Since 2001, investments have totaled approximately $21 million, with recreation centres, medical clinics and municipal offices comprising the largest portion at $16 million.

6.3 Useful Life Consumption

In this section, we detail the extent to which the asset class has consumed its useful life based on the above, established useful life standards. In conjunction with asset condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. The figure below illustrates the useful life consumption levels for the municipality's buildings assets.

FIGURE 30 USEFUL LIFE CONSUMPTION – BUILDINGS

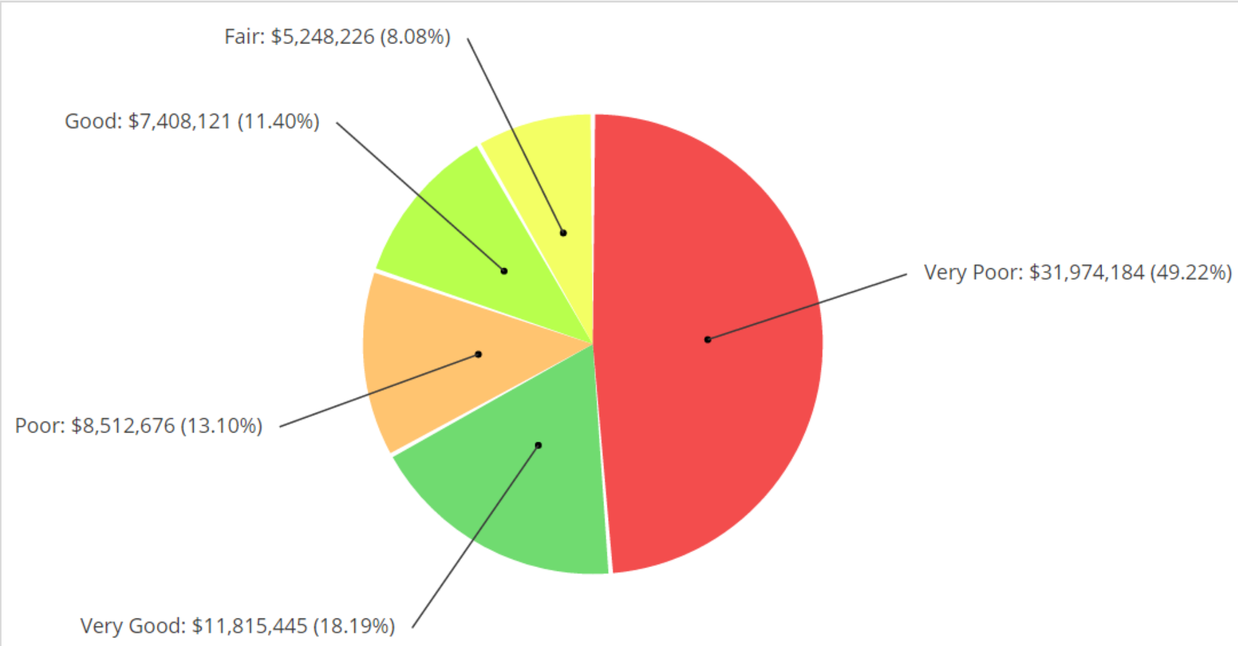


While nearly half of the municipality's assets have at least 10 years of useful life remaining, nearly 40%, with a valuation of more than $25 million remain in operation beyond their useful life. Further, approximately 10%, with a valuation of more than $6 million, will reach the end of their useful life within the next five years.

6.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's building assets. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipalities building assets are partially assessed.

FIGURE 31 ASSET CONDITION – BUILDINGS (AGE-BASED AND ASSESSED)

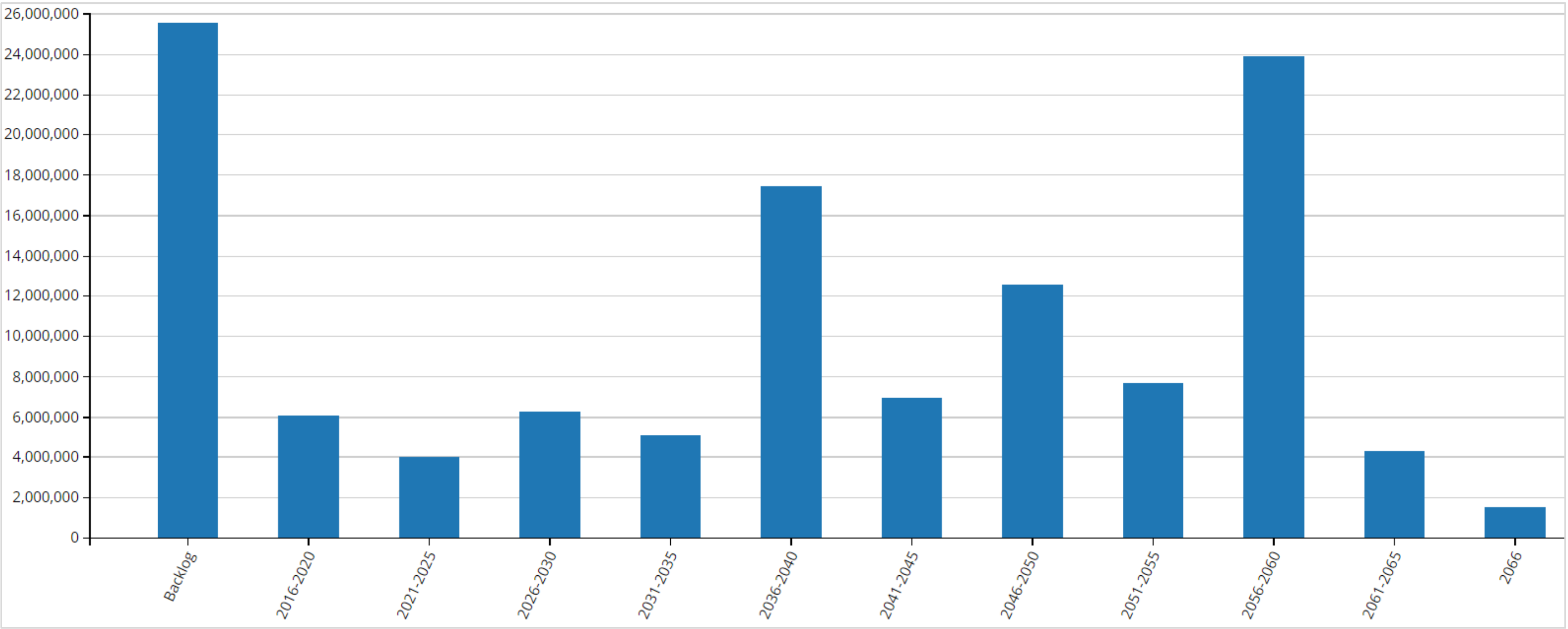


More than 60% of the municipality's buildings assets, with a valuation of nearly $41 million are in poor to very poor condition. Less than 30% are in good to very good condition, indicative not only of backlogs of impending replacement needs.

6.5 Forecasting Replacement Needs

In the following sections, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for buildings assets. The backlog represents the immediate replacement needs that were deferred over previous years or decades.

FIGURE 32 FORECASTING REPLACEMENT NEEDS – BUILDINGS



In addition to a significant infrastructure backlog totalling nearly $26 million, the municipality will need to invest more than $10 million within the next 10 years to meet replacement needs. Between 2036-2040, replacement needs will exceed $17 million. The municipality's annual requirements for its buildings total $2,225,000. At this funding level, the municipality is allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the municipality is currently allocating $233,000, leaving an annual deficit of $1,992,000. See the 'Financial Strategy' section for achieving a sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

6.6 Recommendations – Buildings

- The municipality's buildings and facilities lack observed condition data. Age data shows that buildings have the largest percentage of assets in poor to very poor condition. Many structures and components, including community centres and recreation facilities, can impose unique risks to citizen safety. Others, such as fire halls, have direct impact on critical service delivery. As such, the municipality should establish a comprehensive condition assessment program. This will provide a more accurate assessment of the physical health of the assets and the financial requirements related to the municipality's buildings. Segments deemed to require assessments should be selected based on their criticality which can be determined rudimentarily by their replacement cost. The municipality should establish such assessment program and dedicate a portion of its capital funding to this initiative. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- Age-based data indicates an infrastructure backlog of $26 million. Comprehensive condition assessment data, once gathered, should be used to provide better estimate of this pent-up demand, and to guide the prioritization of capital projects required to eliminate the backlog.

- While the municipality's confidence in its data is high, there is no formal data verification policy in place. To maintain a high degree of data confidence over time and minimize deficiencies, the municipality should establish a systematic data verification policy.

- The municipality is funding 10% of it's annual needs. See the 'Financial Strategy' section on how to achieve more sustainable funding levels.

- The municipality should continue to audit its capital assets data and update old data with more current information.

- The municipality should establish technical and customer-oriented levels of service (LOS) and their associated KPIs. The performance of the municipality's buildings assets should be assessed over time against target LOS and KPIs.

- The municipality should establish a systematic lifecycle activity framework that reflects the consumption of its buildings assets. At the least, these activities should be designed to maintain existing levels of service, and should reflect the overarching priorities of the municipality. More advanced LOS targets reflecting growth requirements or changes in the economic makeup of the municipality can also be established. See Section 3, 'Lifecycle Analysis Framework' in the 'Asset Management Strategies' chapter.

- The municipality should assess its short-, medium- and long-term operations and maintenance needs. An appropriate percentage of the replacement costs should then be allocated for the municipality's O&M requirements.

- In support of the municipality's Asset Management Policy, this AMP and any LOS and KPIs established should be updated annually to gauge the performance of the municipality against quantified targets.

7 Machinery & Equipment

7.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 26, Table 27, and Table 28 illustrate key asset attributes for the municipality's machinery and equipment, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's machinery and equipment assets are valued at $3 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality and obtained from the municipality's accounting data as maintained in the CityWide® Tangible Asset module.

TABLE 26 ASSET INVENTORY – MACHINERY & EQUIPMENT

Asset Type	Asset Component	Quantity
Machinery & Equipment	Bunker Gear	83
	Communication Equipment	177
	Computers	2
	Decorative Street Clocks	2
	Furniture	2102
	Gym Equipment	36
	SCBA	145
	Specialty Equipment	1537

TABLE 27 REPLACEMENT COST VALUATION AND METHOD – MACHINERY & EQUIPMENT

Asset Type	Asset Component	Valuation Method	2016 Overall Replacement Cost
Machinery & Equipment	Bunker Gear	CPI Monthly (ON)	$125,451
	Communication Equipment	CPI Monthly (ON)	$224,031
	Computers	CPI Monthly (ON)	$19,003
	Decorative Street Clocks	CPI Monthly (ON)	$54,842
	Furniture	CPI Monthly (ON)	$697,509
	Gym Equipment	CPI Monthly (ON)	$119,813
	SCBA	CPI Monthly (ON)	$173,064
	Specialty Equipment	CPI Monthly (ON)	$2,084,877
			$3,498,590

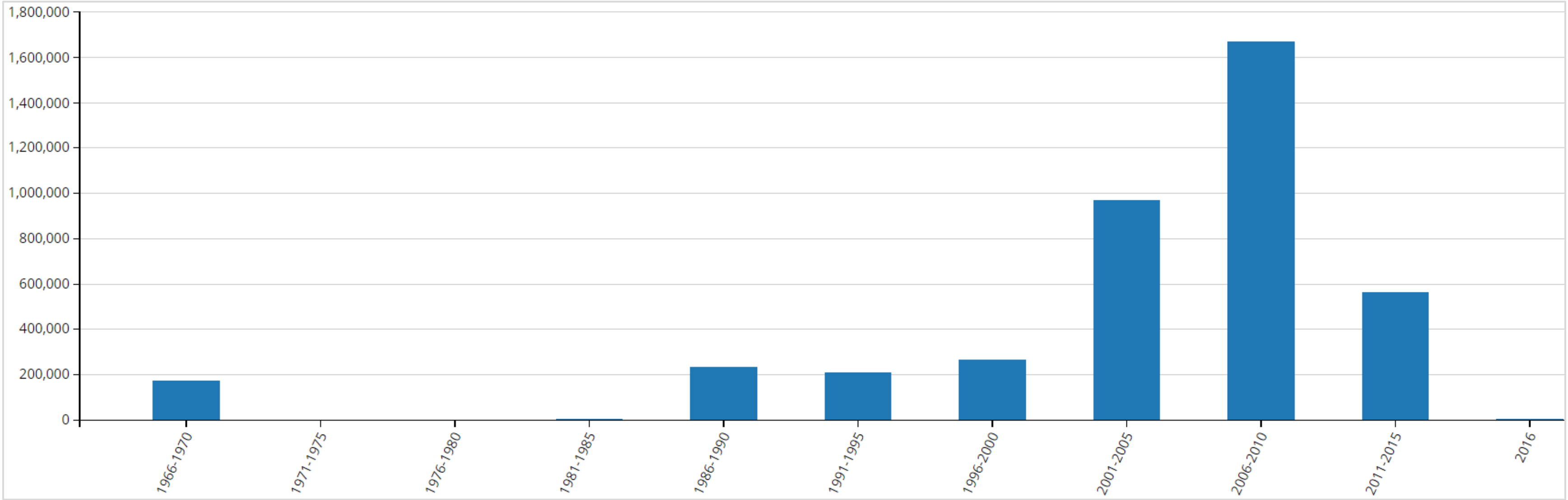
TABLE 28 ASSET USEFUL LIFE – MACHINERY & EQUIPMENT

Asset Type	Asset Component	Quantity	Useful Life (Years)
Machinery & Equipment	Bunker Gear	83	10
	Communication Equipment	177	10
	Computers	2	3
	Decorative Street Clocks	2	10
	Furniture	2102	5, 10, 20
	Gym Equipment	36	15
	SCBA	145	10, 20
	Specialty Equipment	1536	5, 9, 10, 15, 20, 25, 30

7.2 Historical Investment in Infrastructure

In the next two sections, we provide the installation profile and useful life consumption levels machinery & equipment using in-service data obtained from CityWide® Tangible Assets. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, these graphs illustrate historical infrastructure investment trends and can assist in forecasting short-, medium- and long-term replacement needs.

FIGURE 33 HISTORICAL INVESTMENT – MACHINERY & EQUIPMENT

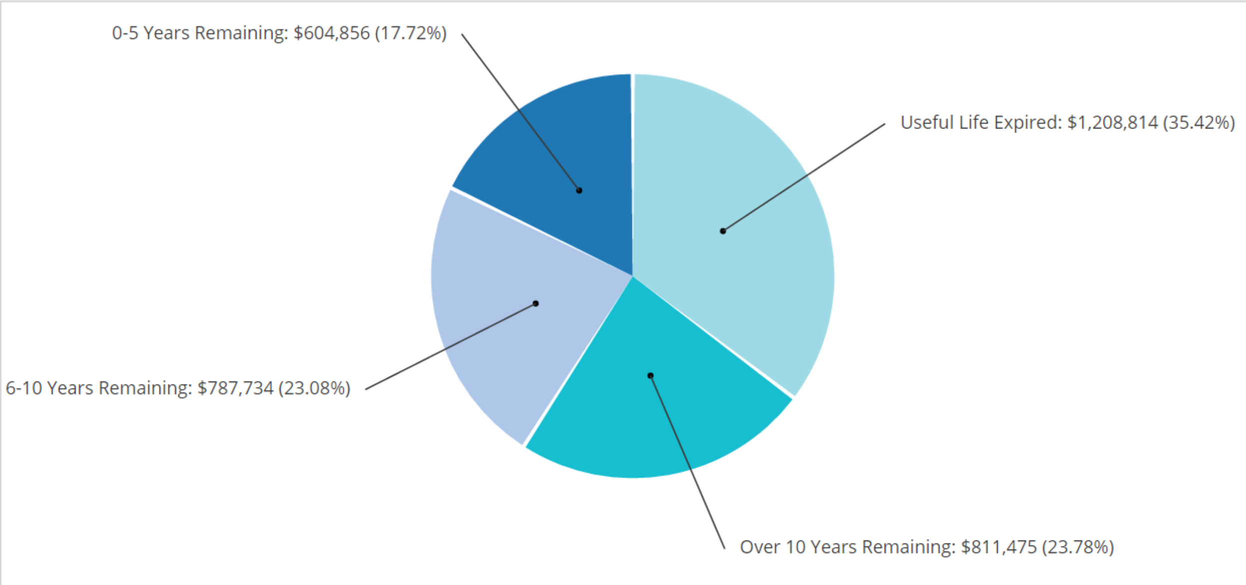


With no measurable investments in equipment taking place between 1970 and the mid 1980s, the municipality gradually increased its expenditures on machinery & equipment. Since 20001, the municipality has invested more than $3.2 million.

7.3 Useful Life Consumption

In this section, we detail the extent to which the asset class has consumed its useful life based on the above, established useful life standards. In conjunction with asset condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. The figure below illustrates the useful life consumption levels for the municipality's machinery and equipment.

FIGURE 34 USEFUL LIFE CONSUMPTION – MACHINERY & EQUIPMENT

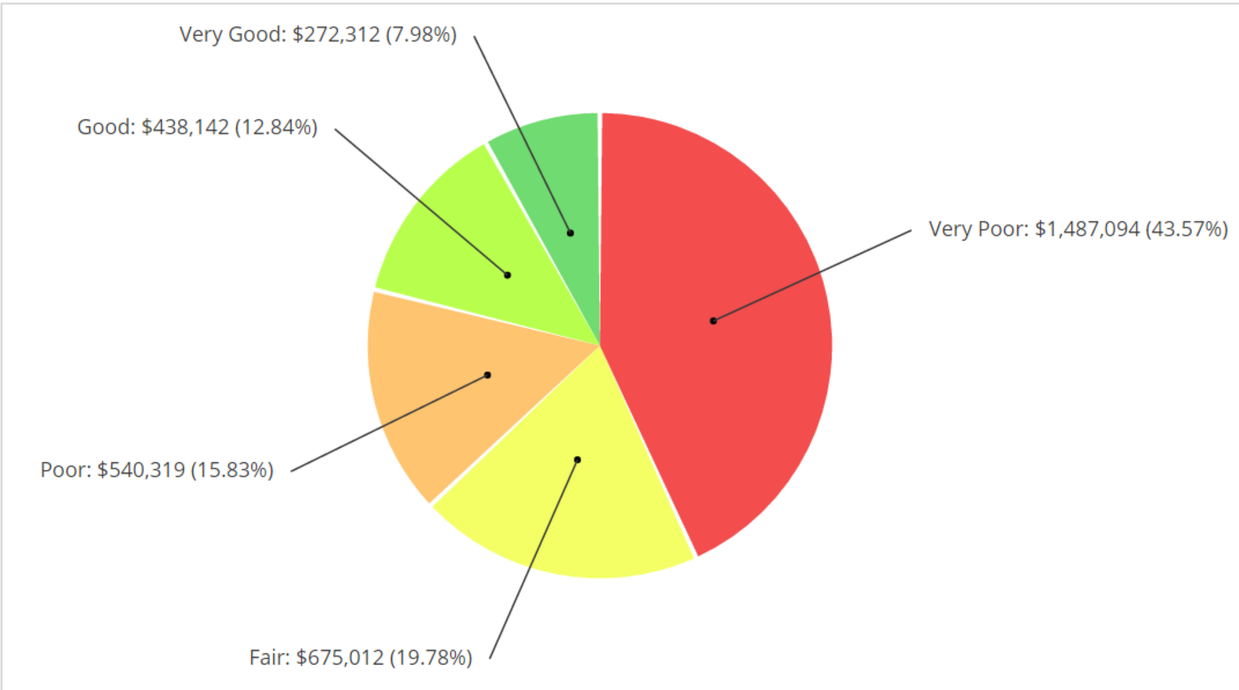


While less than 25% of equipment assets have at least 10 years of useful life remaining, more than 35% of the assets, with a valuation of $1.2 million, remain in operation beyond their established useful life. Further, nearly 18% will reach the end of their useful life within the next five years.

7.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's machinery and equipment. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipalities machinery and equipment are partially assessed.

FIGURE 35 ASSET CONDITION – MACHINERY & EQUIPMENT (AGE-BASED AND ASSESSED)

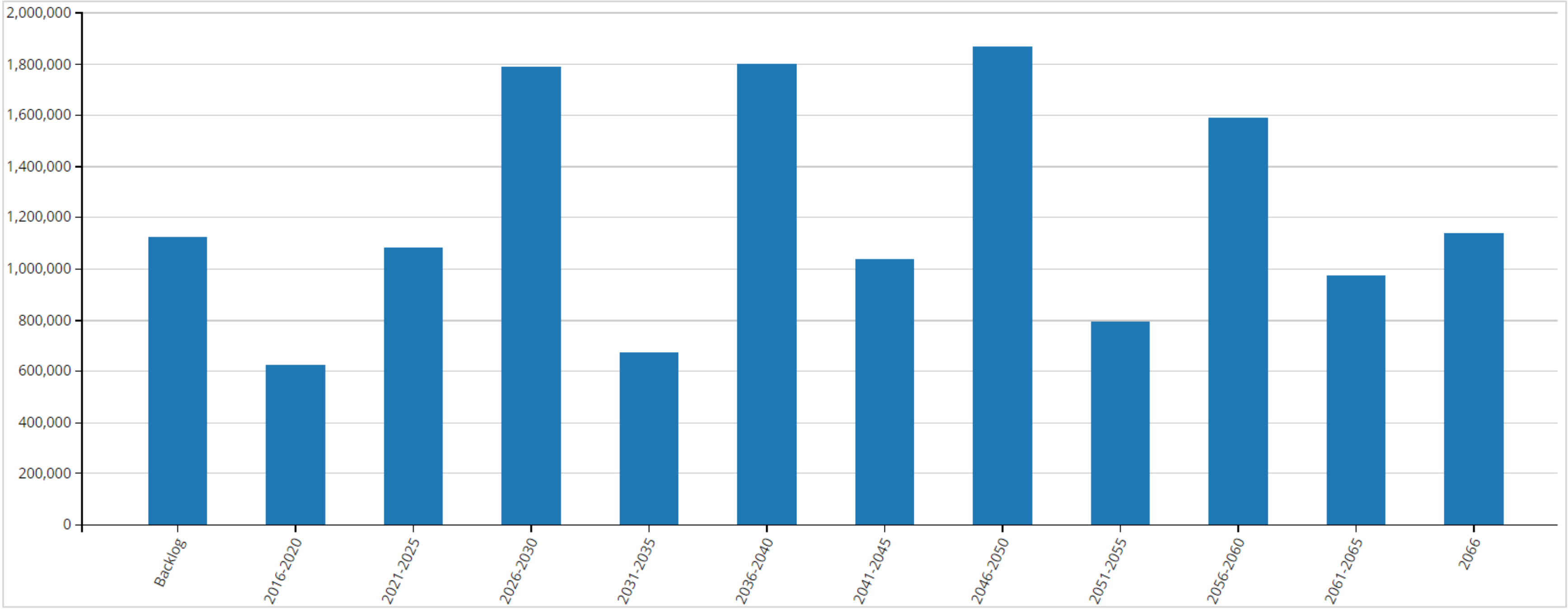


Approximately 60% of machinery & equipment at the municipality, with a valuation of nearly $2 million, are in poor to very poor condition. Less than 25% are in good to very good condition.

7.5 Forecasting Replacement Needs

In the following sections, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's machinery & equipment assets. The backlog represents the immediate replacement needs that were deferred over previous years or decades.

FIGURE 36 FORECASTING REPLACEMENT NEEDS – MACHINERY & EQUIPMENT



In addition a backlog of $1.1 million, the municipality's replacement needs total approximately $1.7 million in the next ten years. These replacement needs will continue to increase and peak at $1.8 million between 2026 and 2030, of which specialty equipment comprise the largest portion. The municipality's annual requirements for its machinery and equipment total $267,000. At this funding level, the municipality is allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the municipality is currently allocating $233,000, providing a deficit of $34,000. An injection of additional revenues will be needed to mitigate the existing infrastructure backlog.

7.6 Recommendations – Machinery & Equipment

- Age-based data indicates a backlog of $1.1 million. Rudimentary condition assessment data, once gathered, should be used to provide better estimate of this pent-up demand, and to guide the prioritization of capital projects required to eliminate the backlog. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- While the municipality's confidence in its data is high, there is no formal data verification policy in place. To maintain a high degree of data confidence over time and minimize deficiencies, the municipality should establish a systematic data verification policy.

- The municipality should continue to audit its capital assets data and update old data with more current information.

- The municipality is funding 87% of it's annual needs. See the 'Financial Strategy' section on how to achieve more sustainable funding levels.

- Given the relatively minor valuation of the machinery & equipment portfolio, rudimentary levels of service (LOS) and KPIs may be established. The performance of the municipality's buildings assets should be assessed over time against target LOS and KPIs.

- The municipality should assess its short-, medium- and long-term operations and maintenance needs. An appropriate percentage of the replacement costs should then be allocated for the municipality's O&M requirements.

- In support of the municipality's Asset Management Policy, this AMP and any LOS and KPIs established should be updated annually to gauge the performance of the municipality against quantified targets.

8 Yard improvements

8.1 Asset Inventory

Table 29, Table 30, and Table 31 illustrate key asset attributes for the municipality's land improvement assets, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's land improvements assets are valued at $29 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality and obtained from the municipality's accounting data as maintained in the CityWide® Tangible Asset module.

TABLE 29 ASSET INVENTORY - YARD IMPROVEMENTS

Asset Type	Asset Component	Quantity
Yard improvements	Baseball Diamond	47,197m^2
	Bike Park	21 acres
	Boardwalk	1,114m
	Boat Ramps	160m^2
	Cemetery Roads	3,090m
	Columbaria	16ft^2
	Signs	39
	Dock Systems	1,077m
	Erosion & Flood Control Systems	1
	Fencing	7,267m
	Monitoring Wells	108
	Lawn Bowling Green	875m^2
	Lighting Systems	126
	Parking Lots	53,021m^2
	Pavement/Walls	1,238
	Pedestrian Bridge	9
	Playground Equipment	95
	Retaining Walls	2,039m
	Runways, Taxiways & Paved Access Roads	2,185m
	Soccer & Rugby Fields	11
	Tennis Courts	1,600m^2
	Tracks	1,240m
	Trail Systems	20km
	Road Base - Unpaved	2070m
	Other	15

TABLE 30 REPLACEMENT COST VALUATION AND METHOD - YARD IMPROVEMENTS

Asset Type	Asset Component	Valuation Method	2016 Overall Replacement Cost
Yard improvements	Baseball Diamond	CPI Monthly (ON)	$1,396,951
	Bike Park	CPI Monthly (ON)	$117,158
	Boardwalk	CPI Monthly (ON)	$407,134
	Boat Ramps	CPI Monthly (ON)	$60,002
	Cemetery Roads	CPI Monthly (ON)	$187,789
	Columbaria	CPI Monthly (ON)	$243,136
	Signs	CPI Monthly (ON)	$390,318
	Dock Systems	CPI Monthly (ON)	$342,589
	Erosion & Flood Control Systems	NRBCPI Quarterly (Toronto)	$18,986
	Fencing	CPI Monthly (ON)	$552,440
	Monitoring Wells	CPI Monthly (ON)	$493,310
	Lawn Bowling Green	CPI Monthly (ON)	$171,293
	Lighting Systems	CPI Monthly (ON)	$1,188,763
	Parking Lots	NRBCPI Quarterly (Toronto)	$3,282,100
	Pavement/Walls	CPI Monthly (ON)	$18,427
	Pedestrian Bridge	CPI Monthly (ON)	$752,711
	Playground Equipment	CPI Monthly (ON)	$509,856
	Retaining Walls	NRBCPI Quarterly (Toronto)	$10,442,880
	Runways, Taxiways & Paved Access Roads	CPI Monthly (ON)	$2,429,274
	Soccer & Rugby Fields	CPI Monthly (ON)	$2,193,377
	Tennis Courts	CPI Monthly (ON)	$145,538
	Tracks	CPI Monthly (ON)	$922,298
	Trail Systems	CPI Monthly (ON)	$372,861
	Road Base - Unpaved	NRBCPI Quarterly (Toronto)	$209,912
	Other	CPI Monthly (ON)	$2,192,107
		Total	$29,041,210

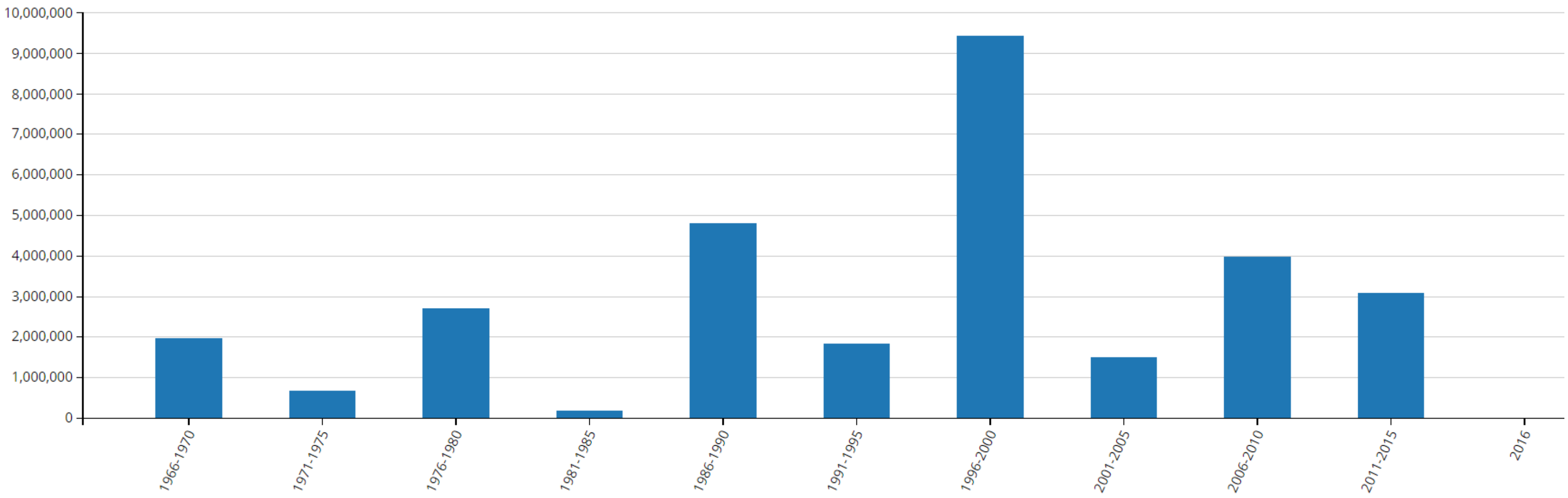
TABLE 31 ASSET USEFUL LIFE - YARD IMPROVEMENTS

Asset Type	Asset Component	Useful Life (Years)
Yard improvements	Baseball Diamond	40
	Bike Park	20
	Boardwalk	15
	Boat Ramps	40
	Cemetery Roads	15, 40, 75
	Columbaria	25
	Decorative Signs	20
	Non Road Signs	20
	Dock Systems	30
	Erosion & Flood Control Systems	40
	Fencing	20
	Monitoring Wells	50
	Non Road Guide Rail	60
	Headstone Foundations	30
	Irrigation System	15
	Landfills	30, 100
	Lawn Bowling Green	40
	Lighting Systems	30
	Parking Lots	15, 75
	Pavement/Walls	25
	Pedestrian Bridge	75
	Playground Equipment	15
	Retaining Walls	15, 40, 50, 75, 100
	Runways, Taxiways & Paved Access Roads	25
	Skate Park	20
	Soccer & Rugby Fields	40
	Splash Pad	40
	Tennis Courts	30
	Tracks	15, 50
	Trail Systems	20
	Weigh Scale	35
	Road Base - Unpaved	40

8.2 Historical Investment in Infrastructure

In the next two sections, we provide the installation profile and useful life consumption levels of land improvements using in-service data obtained from CityWide® Tangible Assets. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, these graphs illustrate historical infrastructure investment trends and can assist in forecasting short-, medium- and long-term replacement needs.

FIGURE 37 HISTORICAL INVESTMENT - YARD IMPROVEMENTS

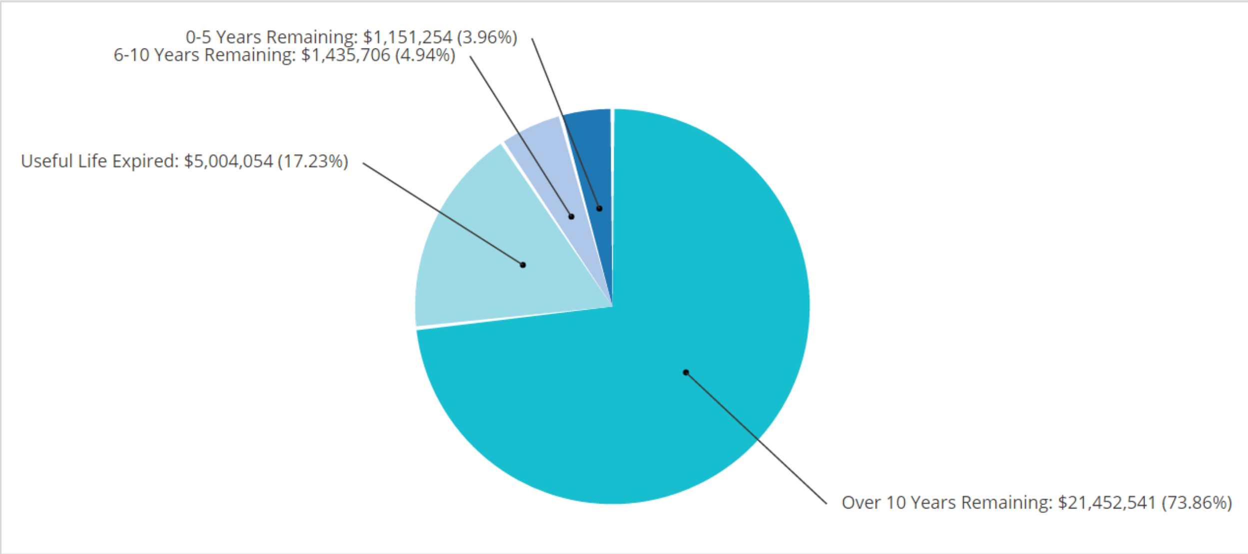


The municipality's investments in yard improvements have fluctuated over the past decades, with the largest expenditures taking placed between 1996 and 2000 when the municipality invested $9.5 million. Since 2001, investments have totaled $8.6 million.

8.3 Useful Life Consumption

In this section, we detail the extent to which the asset class has consumed its useful life based on the above, established useful life standards. In conjunction with asset condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. The figure below illustrates the useful life consumption levels for the municipality's land improvement assets.

FIGURE 38 USEFUL LIFE CONSUMPTION - YARD IMPROVEMENTS

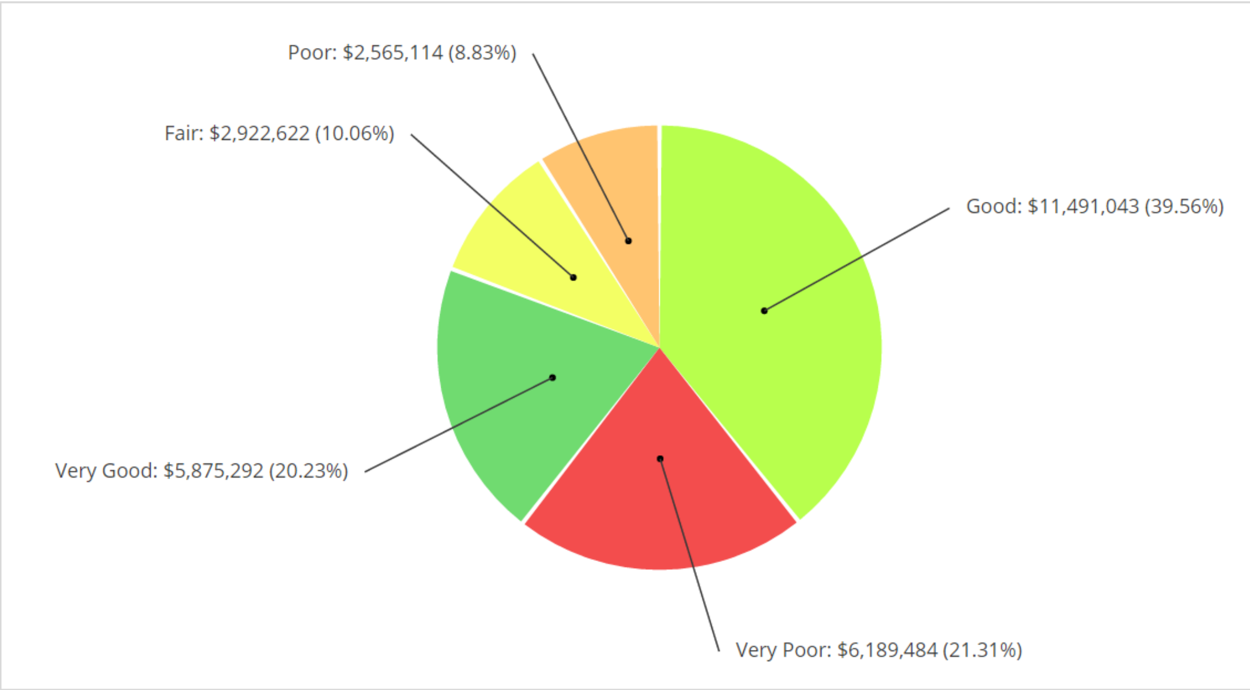


More than 17% of the municipality's land improvement assets, with a valuation of $5 million, remain in operation beyond their useful life. However, approximately 75% have at least 10 years of useful life remaining.

8.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's land improvment assets. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipalities assets are partially assessed.

FIGURE 39 ASSET CONDITION - YARD IMPROVEMENTS (AGE-BASED AND ASSESSED)

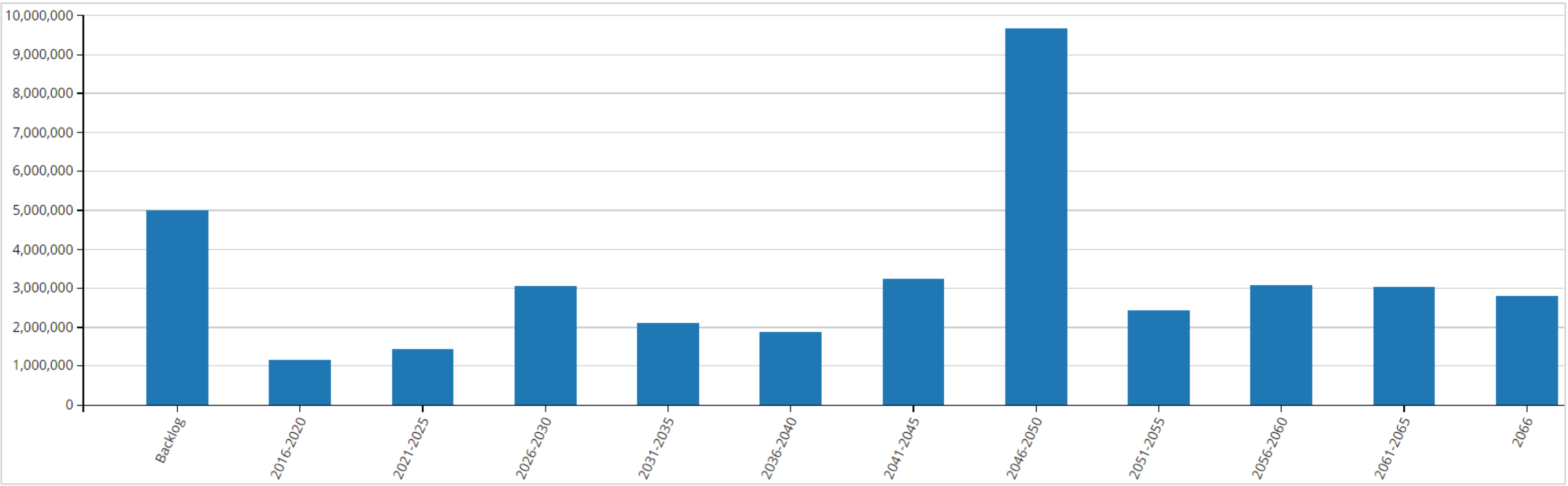


While 60% of the municipality's assets are in good to very good condition, more than 30% , with a valuation of nearly $9 million, are in poor to very poor condition.

8.5 Forecasting Replacement Needs

In the following sections, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's yard improvements. The backlog represents the immediate replacement needs that were deferred over previous years or decades.

FIGURE 40 FORECASTING REPLACEMENT NEEDS - YARD IMPROVEMENTS



In addition to a backlog of $5 million, the municipality will need to meet $2.6 million in replacement needs over the next 10 years. These investment needs will remain relatively steady for 30 years. As assets reach the end of their established useful life, replacements needs will peak to nearly $10 million between 2046 and 2050, with retaining walls comprising $6.3 million. The municipality's annual requirements for land improvements total $911,000. At this funding level, the municipality is allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the municipality is currently allocating only $232,000, leaving an annual deficit of $679,000. See the 'Financial Strategy' section for achieving a sustainable funding level.

8.6 Recommendations – Yard Improvements

- The majority of the municipality's yard improvement assets lack observed condition data. Many such assets, including runways, splash pads, and skate parks can impose unique risks to citizen safety. As such, the municipality should establish a comprehensive condition assessment program. This will provide a more accurate assessment of the physical health of the assets and the financial requirements related to the municipality's yard improvements. Segments deemed to require assessments should be selected based on their criticality which can be determined rudimentarily by their replacement cost. The municipality should establish such assessment program and dedicate a portion of its capital funding to this initiative. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- Age-based data indicates an infrastructure backlog of $5 million. Comprehensive condition assessment data, once gathered, should be used to provide better estimate of this pent-up demand, and to guide the prioritization of capital projects required to eliminate the backlog.

- While the municipality's confidence in its data is high, there is no formal data verification policy in place. To maintain a high degree of data confidence over time and minimize deficiencies, the municipality should establish a systematic data verification policy.

- The municipality is funding 25% of it's annual needs. See the 'Financial Strategy' section on how to achieve more sustainable funding levels.

- The municipality should continue to audit its capital assets data and update old data with more current information.

- The municipality should establish technical and customer-oriented levels of service (LOS) and their associated KPIs. The performance of the municipality's yard improvement assets should be assessed over time against target LOS and KPIs.

- The municipality should establish a systematic lifecycle activity framework that reflects the consumption of its yard improvement assets. At the least, these activities should be designed to maintain existing levels of service, and should reflect the overarching priorities of the municipality. More advanced LOS targets reflecting growth requirements or changes in the economic makeup of the municipality can also be established. See Section 3, 'Lifecycle Framework' in the 'Asset Management Strategies' chapter.

- The municipality should assess its short-, medium- and long-term operations and maintenance needs. An appropriate percentage of the replacement costs should then be allocated for the municipality's O&M requirements.

- In support of the municipality's Asset Management Policy, this AMP and any LOS and KPIs established should be updated annually to gauge the performance of the municipality against quantified targets.

9 Vehicles

9.1 Asset Portfolio: Quantity, Useful Life, and Replacement Cost

Table 32, Table 33, and Table 34**Error! Reference source not found. Error! Reference source not found.**illustrate key asset attributes for the municipality's vehicles assets, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's vehicle assets are valued at $11 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality and obtained from the municipality's accounting data as maintained in the CityWide® Tangible Asset module.

TABLE 32 ASSET INVENTORY - VEHICLES

Asset Type	Asset Component	Quantity
Vehicles	Tractors	10
	Vans	4
	Trailers	2
	Graders	2
	Bombardiers & Trackless Units	4
	Bulldozers	1
	Compactor	1
	Fire Vehicles	12
	Ice Resurfacer	2
	Miscellaneous	2
	Pickups	13
	Self-propelled rotary & reel mowers	8
	Dump Trucks	14

TABLE 33 REPLACEMENT COST VALUATION AND METHOD - VEHICLES

Asset Type	Asset Component	Valuation Method	2016 Overall Replacement Cost
Vehicles	Tractors	CPI Monthly (ON)	$1,803,252
	Vans	CPI Monthly (ON)	$103,048
	Trailers	CPI Monthly (ON)	$45,754
	Graders	CPI Monthly (ON)	$1,021,925
	Bombardiers & Trackless Units	CPI Monthly (ON)	$549,038
	Bulldozers	CPI Monthly (ON)	$108,144
	Compactor	CPI Monthly (ON)	$289,490
	Fire Vehicles	CPI Monthly (ON)	$3,694,015
	Ice Resurfacer	CPI Monthly (ON)	$195,174
	Miscellaneous	CPI Monthly (ON)	$292,039
	Pickups	CPI Monthly (ON)	$410,278
	Self-propelled rotary & reel mowers	CPI Monthly (ON)	$133,593
	Dump Trucks	CPI Monthly (ON)	$2,564,393
		Total	$11,210,143

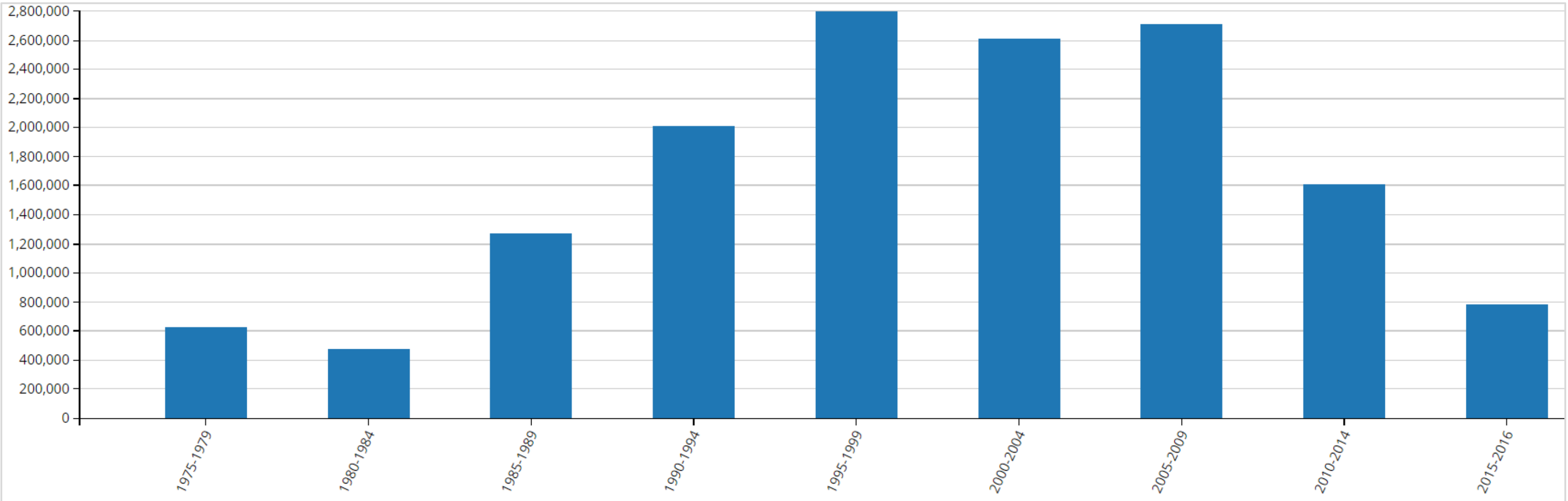
TABLE 34 ASSET USEFUL LIFE - VEHICLES

Asset Type	Asset Component	Useful Life (Years)
Vehicles	Tractors	7, 10, 12, 15
	Vans	7
	Trailers	15
	Graders	15
	Bombardiers & Trackless Units	10
	Bulldozers	15
	Compactor	15
	Fire Vehicles	8, 15, 20
	Ice Resurfacer	15
	Miscellaneous	10
	Pickups	7
	Self-propelled rotary & reel mowers	7
	Dump Trucks	7, 8

9.2 Historical Investment in Infrastructure

In the next two sections, we provide the installation profile and useful life consumption levels of vehicles using in-service data obtained from CityWide® Tangible Assets. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, these graphs illustrate historical infrastructure investment trends and can assist in forecasting short-, medium- and long-term replacement needs.

FIGURE 41 HISTORICAL INVESTMENT – VEHICLES

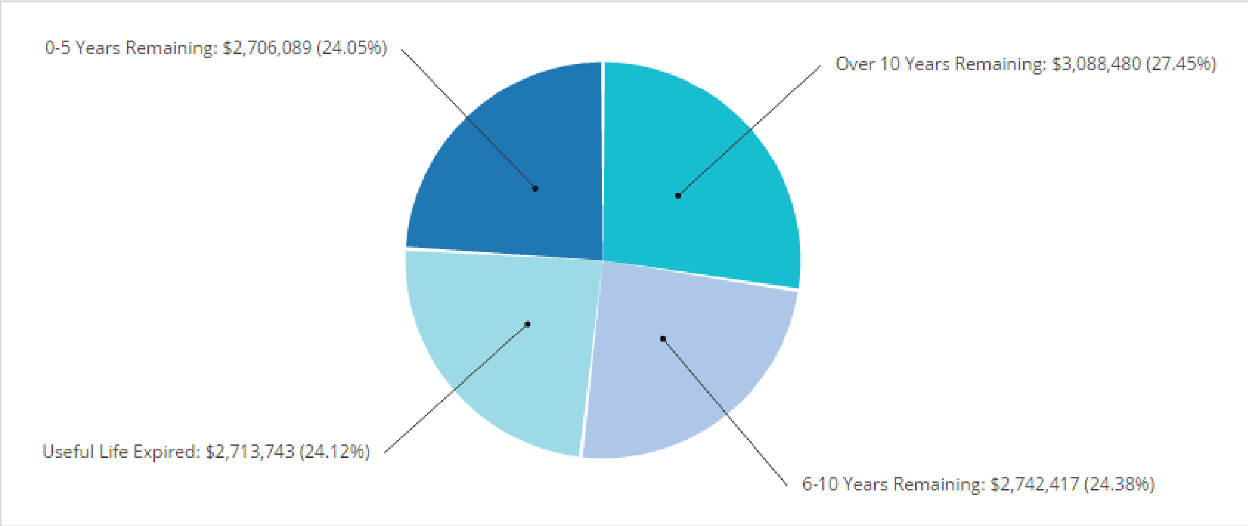


Since 1980, the municipality has invested steadily in its vehicles assets, with expenditures peaking at $2.8 million between 1995 and 1999. Since 2009, investments have declines rapidly, likely reflecting new or recent acquisitions; since 2010, expenditures have totaled $2.4 million.

9.3 Useful Life Consumption

In this section, we detail the extent to which the asset class has consumed its useful life based on the above, established useful life standards. In conjunction with asset condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. The figure below illustrates the useful life consumption levels for the municipality's vehicles.

FIGURE 42 USEFUL LIFE CONSUMPTION – VEHICLES

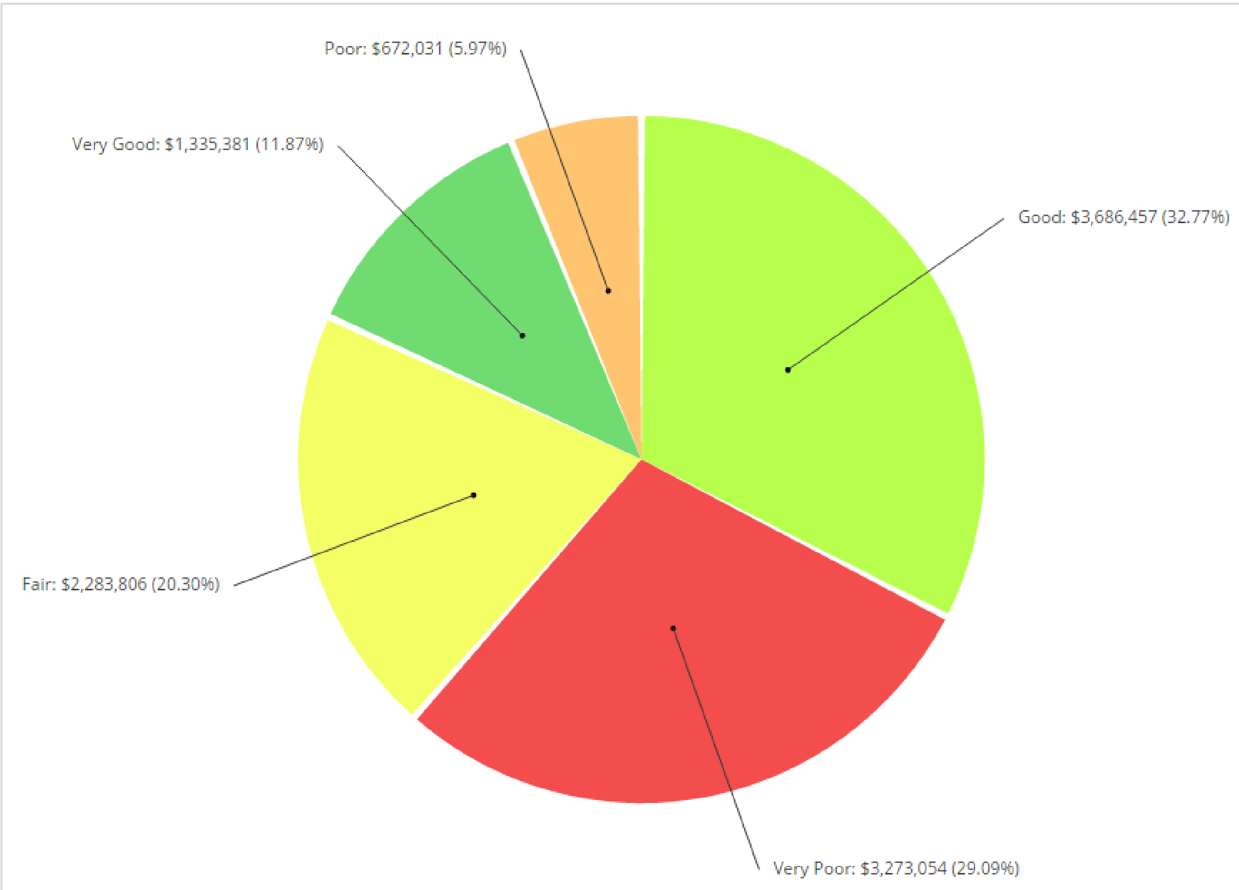


While 27% of the municipality's vehicles have at least 10 years of useful life remaining, 28%, with a valuation of $3.2 million, remain in operation beyond their useful life. Further, 20% will reach the end of their useful life in the next five years.

9.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's vehicles assets. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipalities assets are partially assessed.

FIGURE 43 ASSET CONDITION – VEHICLES (AGE-BASED AND ASSESSED)

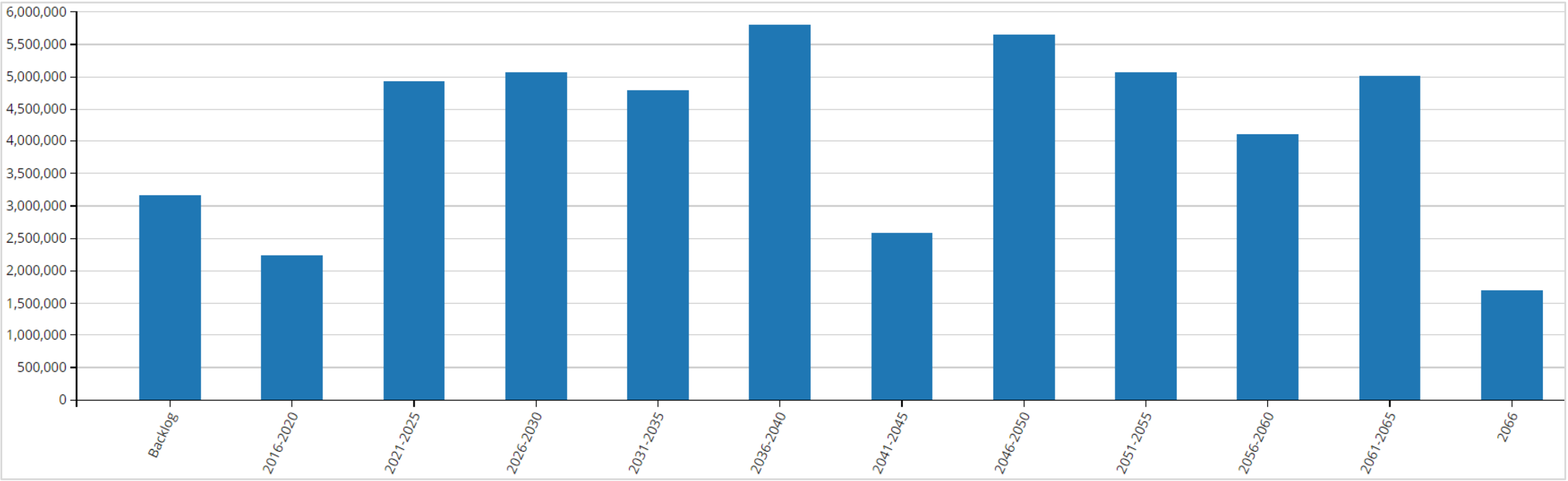


More than 33% of the municipality's vehicles, with a valuation of nearly $4 million, are in poor to very condition. Less than 50% of vehicles are in good to very good condition.

9.5 Forecasting Replacement Needs

In the following sections, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's vehicles assets. The backlog represents the immediate replacement needs that were deferred over previous years or decades.

FIGURE 44 FORECASTING REPLACEMENT NEEDS - VEHICLES



In addition a backlog of $3.2 million, with dump trucks and tractors comprising more than $2.1 million, the municipality will need to address $2.2 million in replacement needs over the next five years. An additional $5 million will be required between 2021 and 2025. Fire trucks and dump trucks comprise the largest share of replacement related expenditures in each time period. The municipality's annual requirements for its vehicles total $952,000. At this funding level, the municipality is allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the municipality is currently allocating only $233,000, leaving an annual deficit of $719,000. See the 'Financial Strategy' section for achieving a sustainable funding level.

9.6 Recommendations – Vehicles

- The majority of the municipality's vehicles and fleet lack observed condition data. Many such assets have direct impact on critical service delivery, e.g., fire trucks and dump trucks. A preventative maintenance and life cycle assessment program should be established for the fleet class to gain a better understanding of current condition and performance. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- Age-based data indicates an infrastructure backlog of $3.2 million. Comprehensive condition assessment data, once gathered, should be used to provide better estimate of this pent-up demand, and to guide the prioritization of capital projects required to eliminate the backlog.

- While the municipality's confidence in its data is high, there is no formal data verification policy in place. To maintain a high degree of data confidence over time and minimize deficiencies, the municipality should establish a systematic data verification policy.

- The municipality is funding 24% of it's annual needs. See the 'Financial Strategy' section on how to achieve more sustainable funding levels.

- The municipality should continue to audit its capital assets data and update old data with more current information.

- The municipality should establish technical and customer-oriented levels of service (LOS) and their associated KPIs. The performance of the municipality's yard improvement assets should be assessed over time against target LOS and KPIs.

- The municipality should establish a systematic lifecycle activity framework, focused on preventative maintenance, that reflects the consumption of its vehicles and fleet. See Section 3, 'Lifecycle Framework' in the 'Asset Management Strategies' chapter.

- The municipality should assess its short-, medium- and long-term operations and maintenance needs. An appropriate percentage of the replacement costs should then be allocated for the municipality's O&M requirements.

- In support of the municipality's Asset Management Policy, this AMP and any LOS and KPIs established should be updated annually to gauge the performance of the municipality against quantified targets.

VII. Levels of Service

The two primary risks to a municipality's financial sustainability are the total lifecycle costs of infrastructure, and establishing levels of service (LOS) that exceed its financial capacity. In this regard, municipalities face a choice: overpromise and underdeliver; underpromise and overdeliver; or promise only that which can be delivered efficiently without placing inequitable burden on taxpayers. In general, there is often a trade-off between political expedience and judicious, long-term fiscal stewardship.

Developing realistic LOS using meaningful key performance indicators (KPIs) can be instrumental in managing citizen expectations, identifying areas requiring higher investments, driving organizational performance and securing the highest value for money from public assets. However, municipalities face diminishing returns with greater granularity in their LOS and KPI framework. That is, the objective should be to track only those KPIs that are relevant and insightful and reflect the priorities of the municipality.

1 Guiding Principles for Developing LOS

Beyond meeting regulatory requirements, levels of service established should support the intended purpose of the asset and its anticipated impact on the community and the municipality. LOS generally have an overarching corporate description, a customer oriented description, and a technical measurement. Many types of LOS, e.g., availability, reliability, safety, responsiveness and cost effectiveness, are applicable across all service areas in a municipality. The following levels of service categories are established as guiding principles for the LOS that each service area in the municipality should strive to provide internally to the municipality and to residents/customers. These are derived from the Town of Whitby's *Guide to Developing Service Area Asset Management Plans*.

- **Available**: Services of sufficient capacity are convenient and accessible to the entire community
- **Cost Effective**: Services are provided at the lowest possible cost for both current and future customers, for a required level of service, and are affordable
- **Reliable**: Services are predictable and continuous
- **Responsive**: Opportunities for community involvement in decision making are provided; and customers are treated fairly and consistently, within acceptable timeframes, demonstrating respect, empathy and integrity
- **Safe**: Services are delivered such that they minimize health, safety and security risks
- **Suitable**: Services are suitable for the intended function (fit for purpose)
- **Sustainable**: Services preserve and protect the natural and heritage environment.

While the above categories provide broad strategic direction to council and staff, specific and measurable KPIs related to each LOS category are needed to ensure the municipality remains steadfast in its pursuit of delivering the highest value for money to various internal and external stakeholders.

2 Key Performance Indicators and Targets

In this section, we identify industry standard KPIs for major infrastructure classes that the municipality can incorporate into its performance measurement and for tracking its progress over future iterations of its AMPs. The municipality should develop appropriate and achievable targets that reflect evolving demand on infrastructure, its fiscal capacity and the overall corporate objectives.

TABLE 35 KEY PERFORMANCE INDICATORS - ROAD NETWORK AND BRIDGES & CULVERTS

Level	KPI (Reported Annually)
Strategic	• Percentage of total reinvestment compared to asset replacement value • Completion of strategic plan objectives (related to right-of-way)
Financial Indicators	• Annual revenues compared to annual expenditures • Annual replacement value depreciation compared to annual expenditures • Cost per capita for roads, and bridges & culverts • Maintenance cost per square metre • Revenue required to maintain annual network growth • Total cost of borrowing vs. total cost of service
Tactical	• Overall Bridge Condition Index (BCI) as a percentage of desired BCI • Percentage of road network rehabilitated/reconstructed • Percentage of paved road lane km rated as poor to very poor • Percentage of bridges and large culverts rated as poor to very poor • Percentage of asset class value spent on O&M • Percentage of signage that pass reflectivity test. The remaining should be replaced
Operational Indicators	• Percentage of roads inspected within the last five years • Percentage of bridges and large culverts inspected within the last two years • Operating costs for paved lane per km • Operating costs for bridge and large culverts per square metre • Percentage of customer requests with a 24-hour response rate

TABLE 36 KEY PERFORMANCE INDICATORS - BUILDINGS & FACILITIES

Level	KPI (Reported Annually)
Strategic	• Percentage of total reinvestment compared to asset replacement value • Completion of strategic plan objectives (related buildings and facilities)
Financial Indicators	• Annual revenues compared to annual expenditures • Annual replacement value depreciation compared to annual expenditures • Revenue required to meet growth related demand • Repair and maintenance costs per square metre • Energy, utility and water cost per square metre
Tactical	• Percentage of component value replaced • Overall facility condition index as a percentage of desired condition index • Annual adjustment in condition indexes • Annual percentage of new facilities (square metre) • Percent of facilities rated poor or critical • Percentage of facilities replacement value spent on operations and maintenance Increase facility utilization rate by [x] percent by 2020. • $Utilization\ Rate = \frac{Occupied\ Space}{Facility\ Usable\ Area}$
Operational Indicators	• [x] sq.ft. of facilities per full-time employee (or equivalent), i.e., maintenance staff • Percentage of facilities inspected within the last five years • Number/type of service requests • Percentage of customer requests responded to within 24 hours

TABLE 37 KEY PERFORMANCE INDICATORS – FLEET AND VEHICLES

Level	KPI (Reported Annually)
Strategic	• Percentage of total reinvestment compared to asset replacement value • Completion of strategic plan objectives
Financial Indicators	• Annual revenues compared to annual expenditures • Annual replacement value depreciation compared to annual expenditures • Cost per capita for roads, and bridges & culverts • Maintenance cost per square metre • Revenue required to maintain annual network growth • Total cost of borrowing vs. total cost of service
Tactical	• Percentage of all vehicles replaced • Average age of fleet vehicles • Percent of vehicles rated poor or critical • Percentage of fleet replacement value spent on operations and maintenance
Operational Indicators	• Average downtime per fleet category • Average utilization per fleet category and/or each vehicle • Ratio of preventative maintenance repairs vs. reactive repairs • Percent of vehicles that received preventative maintenance • Number/type of service requests • Percentage of customer requests responded to within 24 hours

TABLE 38 KEY PERFORMANCE INDICATORS – WATER, SANITARY AND STORM NETWORKS

Level	KPI (Reported Annually)
Strategic	• Percentage of total reinvestment compared to asset replacement value • Completion of strategic plan objectives (related water / sanitary / storm)
Financial Indicators	• Annual revenues compared to annual expenditures • Annual replacement value depreciation compared to annual expenditures • Total cost of borrowing compared to total cost of service • Revenue required to maintain annual network growth • Lost revenue from system outages
Tactical	• Percentage of water / sanitary / storm network rehabilitated / reconstructed • Overall water / sanitary / storm network condition index as a percentage of desired condition index • Annual adjustment in condition indexes • Annual percentage of growth in water / sanitary / storm network • Percentage of mains where the condition is rated poor or critical for each network • Percentage of water / sanitary / storm network replacement value spent on operations and maintenance
Operational Indicators	• Percentage of water / sanitary / storm network inspected • Operating costs for the collection of wastewater per kilometre of main. • Number of wastewater main backups per 100 kilometres of main • Operating costs for storm water management (collection, treatment, and disposal) per kilometre of drainage system. • Operating costs for the distribution/ transmission of drinking water per kilometre of water distribution pipe. • Number of days when a boil water advisory issued by the medical officer of health, applicable to a municipal water supply, was in effect. • Number of water main breaks per 100 kilometres of water distribution pipe in a year. • Number of customer requests received annually per water / sanitary / storm networks • Percentage of customer requests responded to within 24 hours per water / sanitary / storm network

3 Future Performance

In addition to the financial capacity, and legislative requirements, e.g., *Safe Drinking Water Act*, the Minimum Maintenance Standards for municipal highways, building codes and the *Accessibility for Ontarians with Disability Act*, many factors, internal and external, can influence the establishment of LOS and their associated KPIs, both target and actual, including the municipality's overarching mission as an organization, the current state of its infrastructure, and the municipality's financial capacity.

Strategic Objectives and Corporate Goals
The municipality's long-term direction is outlined in its corporate and strategic plans. This direction will dictate the types of services it aims to deliver to its residents and the quality of those services. These high level goals are vital in identifying strategic (long-term) infrastructure priorities and as a result, the investments needed to produce desired levels of service.

State of the Infrastructure
The current state of capital assets will determine the quality of service the municipality can deliver to its residents. As such, levels of service should reflect the existing capacity of assets to deliver those services, and may vary (increase) with planned maintenance, rehabilitation or replacement activities and timelines.

Community Expectations
The general public will often have qualitative and quantitative opinions and insights regarding the levels of service a particular asset should deliver, e.g., what a road in 'good' condition should look like or the travel time between destinations. The public should be consulted in establishing LOS; however, the discussions should be centered on clearly outlining the lifecycle costs associated with delivering any improvements in LOS.

Economic Trends
Macroeconomic trends will have a direct impact on the LOS for most infrastructure services. Fuel costs, fluctuations in interest rates, and the purchasing power of the Canadian dollar can impede or facilitate any planned growth in infrastructure services.

Demographic Changes
The type of residents that dominate a municipality can also serve as infrastructure demand drivers, and as a result, can change how a municipality allocates its resources (e.g., an aging population may require diversion of resources from parks and sports facilities to additional wellbeing centers). Population growth is also a significant demand driver for existing assets (lowering LOS), and may require the municipality to construct new infrastructure to parallel community expectations.

Environmental Change
Forecasting for infrastructure needs based on climate change remains an imprecise science. However, broader environmental and weather patterns have a direct impact on the reliability of critical infrastructure services.

4 Monitoring, Updating and Actions

The municipality should collect data on its current performance against the KPIs listed and establish targets that reflect the current fiscal capacity of the municipality, its corporate and strategic goals, and as feasible, changes in demographics that may place additional demand on its various asset classes. For some asset classes, e.g., minor equipment, furniture, etc. cursory levels of service and their respective KPIs will suffice. For major infrastructure classes, detailed technical and customer-oriented KPIs can be critical. Once this data is collected and targets are established, the progress of the municipality should be tracked annually.

VIII. Asset Management Strategies

The asset management strategy will develop an implementation process that can be applied to the needs identification and prioritization of renewal, rehabilitation, and maintenance activities. This will assist in the production of a 10-year plan, including growth projections, to ensure the best overall health and performance of the municipality's infrastructure.

This section includes an overview of condition assessment; the life cycle interventions required; and prioritization techniques, including risk, to determine which priority projects should move forward into the budget first.

1 Non-Infrastructure Solutions and Requirements

The municipality should explore, as requested through the provincial requirements, which non-infrastructure solutions should be incorporated into the budgets for its infrastructure services. Non-Infrastructure solutions are such items as studies, policies, condition assessments, consultation exercises, etc., that could potentially extend the life of assets or lower total asset program costs in the future without a direct investment into the infrastructure.

Typical solutions for a municipality include linking the asset management plan to the strategic plan, growth and demand management studies, infrastructure master plans, better integrated infrastructure and land use planning, public consultation on levels of service, and condition assessment programs. As part of future asset management plans, a review of these requirements should take place, and a portion of the capital budget should be dedicated for these items in each programs budget.

It is recommended, under this category of solutions, that the municipality should develop and implement holistic condition assessment programs for all asset classes. This will advance the understanding of infrastructure needs, improve budget prioritization methodologies, and provide clearer path of what is required to achieve sustainable infrastructure programs.

2 Condition Assessment Programs

The foundation of good asset management practice is based on having comprehensive and reliable information on the current condition of the infrastructure. Municipalities need to have a clear understanding regarding performance and condition of their assets, as all management decisions regarding future expenditures and field activities should be based on this knowledge. An incomplete understanding about an asset may lead to its premature failure or premature replacement.

Some benefits of holistic condition assessment programs within the overall asset management process are listed below:

- Understanding of overall network condition leads to better management practices
- Allows for the establishment of rehabilitation programs
- Prevents future failures and provides liability protection
- Potential reduction in operation/maintenance costs
- Accurate current asset valuation
- Allows for the establishment of risk assessment programs
- Establishes proactive repair schedules and preventive maintenance programs
- Avoids unnecessary expenditures
- Extends asset service life therefore improving level of service

- Improves financial transparency and accountability
- Enables accurate asset reporting which, in turn, enables better decision making

Condition assessment can involve different forms of analysis such as subjective opinion, mathematical models, or variations thereof, and can be completed through a very detailed or very cursory approach.

When establishing the condition assessment of an entire asset class, the cursory approach (metrics such as good, fair, poor, very poor) is used. This will be a less expensive approach when applied to thousands of assets, yet will still provide up to date information, and will allow for detailed assessment or follow up inspections on those assets captured as poor or critical condition later.

2.1 Pavement Network

Typical industry pavement inspections are performed by consulting firms using specialised assessment vehicles equipped with various electronic sensors and data capture equipment. The vehicles will drive the entire road network and typically collect two different types of inspection data – surface distress data and roughness data.

Surface distress data involves the collection of multiple industry standard surface distresses, which are captured either electronically, using sensing detection equipment mounted on the van, or visually, by the van's inspection crew.

Roughness data capture involves the measurement of the roughness of the road, measured by lasers that are mounted on the inspection van's bumper, calibrated to an international roughness index.

Another option for a cursory level of condition assessment is for municipal road crews to perform simple windshield surveys as part of their regular patrol. Many municipalities have created data collection inspection forms to assist this process and to standardize what presence of defects would constitute a good, fair, poor, or critical score. Lacking any other data for the complete road network, this can still be seen as a good method and will assist greatly with the overall management of the road network. The CityWide Works software has a road patrol component built in that could capture this type of inspection data during road patrols in the field, enabling later analysis of rehabilitation and replacement needs for budget development.

It is recommended that the municipality continue to implement its pavement condition assessment program and that a portion of capital funding is dedicated to this.

2.2 Bridges & Culverts

Ontario municipalities are mandated by the Ministry of Transportation to inspect all structures that have a span of 3 metres or more, according to the OSIM (Ontario Structure Inspection Manual).

Structure inspections must be performed by, or under the guidance of, a structural engineer, must be performed on a biennial basis (once every two years), and include such information as structure type, number of spans, span lengths, other key attribute data, detailed photo images, and structure element by element inspection, rating and recommendations for repair, rehabilitation, and replacement.

The best approach to develop a 10-year needs list for the municipality's structure portfolio would be to have the structural engineer who performs the inspections to develop a maintenance requirements report, and rehabilitation and replacement requirements report as part of the overall assignment. In addition to refining the overall needs requirements, the structural engineer should identify those structures that will require more detailed investigations and non-destructive testing techniques. Examples of these investigations are:

- Detailed deck condition survey
- Non-destructive delamination survey of asphalt covered decks
- Substructure condition survey

- Detailed coating condition survey
- Underwater investigation
- Fatigue investigation
- Structure evaluation

Through the OSIM recommendations and additional detailed investigations, a 10-year needs list will be developed for the municipality's bridges.

2.3 Facilities & Buildings

The most popular and practical type of buildings and facility assessment involves qualified groups of trained industry professionals (engineers or architects) performing an analysis of the condition of a group of facilities, and their components, that may vary in terms of age, design, construction methods, and materials. This analysis can be done by walk-through inspection, mathematical modeling, or a combination of both. But the most accurate way of determining the condition requires a walk-through to collect baseline data.

The following five asset classifications are typically inspected:

- Site Components – property around the facility and includes the outdoor components such as utilities, signs, stairways, walkways, parking lots, fencing, courtyards and landscaping.
- Structural Components – physical components such as the foundations, walls, doors, windows, roofs.
- Electrical Components – all components that use or conduct electricity such as wiring, lighting, electric heaters, and fire alarm systems
- Mechanical Components – components that convey and utilize all non-electrical utilities within a facility such as gas pipes, furnaces, boilers, plumbing, ventilation, and fire extinguishing systems
- Vertical movement – components used for moving people between floors of buildings such as elevators, escalators and stair lifts.

Once collected this type of information can be uploaded into the CityWide®, the municipality's asset management and asset registry software database in order for short- and long-term repair, rehabilitation and replacement reports to be generated to assist with programming the short- and long-term maintenance and capital budgets.

It is recommended that the municipality establish a facilities condition assessment program and that a portion of capital funding is dedicated to this.

2.4 Fleet

The typical approach to optimizing the maintenance expenditures of a corporate fleet of vehicles is through routine vehicle inspections, routine vehicle servicing, and an established routine preventative maintenance program. Most, if not all, makes and models of vehicles are supplied with maintenance manuals that define the appropriate schedules and routines for typical maintenance and servicing and also more detailed restoration or rehabilitation protocols.

The primary goal of good vehicle maintenance is to avoid or mitigate the consequence of failure of equipment or parts. An established preventative maintenance program serves to ensure this, as it will consist of scheduled inspections and follow up repairs of vehicles and equipment in order to decrease breakdowns and excessive downtimes.

A good preventative maintenance program will include partial or complete overhauls of equipment at specific periods, including oil changes, lubrications, fluid changes and so on. In addition, workers can record equipment or part deterioration so they can schedule to replace or repair worn parts before they fail. The ideal preventative maintenance program would move further and further away from reactive repairs and instead towards the prevention of all equipment failure before it occurs.

It is recommended that a preventative maintenance routine is defined and established for all fleet vehicles and that a software application is utilized for the overall management of the program.

2.5 Water

Unlike sewer mains, it is very difficult to inspect water mains from the inside due to the high pressure flow of water constantly underway within the water network. Physical inspections require a disruption of service to residents, can be an expensive exercise, and are time consuming to set up. It is recommended practice that physical inspection of water mains typically only occurs for high risk, large transmission mains within the system, and only when there is a requirement. There are a number of high tech inspection techniques in the industry for large diameter pipes but these should be researched first for applicability as they are quite expensive. Examples are:

- Remote eddy field current (RFEC)
- Ultrasonic and acoustic techniques
- Impact echo (IE)
- Georadar

For the majority of pipes within the distribution network gathering key information in regards to the main and its environment can supply the best method to determine a general condition. Key data that could be used, along with weighting factors, to determine an overall condition score are listed below.

- Age
- Material Type
- Breaks
- Hydrant Flow Inspections
- Soil Condition

It is recommended that the municipality develop a rating system for the mains within the distribution network based on the availability of key data, and that funds are budgeted for this development.

2.6 Sewer network inspection (Sanitary and Storm)

The most popular and practical type of sanitary and storm sewer assessment is the use of Closed Circuit Television Video (CCTV). The process involves a small robotic crawler vehicle with a CCTV camera attached that is lowered down a maintenance hole into the sewer main to be inspected. The vehicle and camera then travels the length of the pipe providing a live video feed to a truck on the road above where a technician / inspector records defects and information regarding the pipe. A wide range of construction or deterioration problems can be captured including open/displaced joints, presence of roots, infiltration & inflow, cracking, fracturing, exfiltration, collapse, deformation of pipe and more. Therefore, sewer CCTV inspection is a very good tool for locating and evaluating structural defects and general condition of underground pipes.

Even though CCTV is an excellent option for inspection of sewers it is a fairly costly process and does take significant time to inspect a large volume of pipes.

Another option in the industry today is the use of Zoom Camera equipment. This is very similar to traditional CCTV, however, a crawler vehicle is not used but in it's a place a camera is lowered down a maintenance hole attached to a pole like piece of equipment. The camera is then rotated towards each connecting pipe and the operator above progressively zooms in to record all defects and information about each pipe. The downside to this technique is the further down the pipe the image is zoomed, the less clarity is available to accurately record defects and measurement. The upside is the process is far quicker and significantly less expensive and an assessment of the manhole can be provided as well. Also, it is important to note that 80% of pipe deficiencies generally occur within 20 metres of each manhole

It is recommended that the municipality establish a sewer condition assessment program and that a portion of capital funding is dedicated to this.

2.7 Parks and open spaces

CSA standards provide guidance on the process and protocols in regards to the inspection of parks and their associated assets, e.g., play spaces and equipment. The park inspection will involve qualified groups of trained industry professionals (operational staff or landscape architects) performing an analysis of the condition of a group of Parks and their components. The most accurate way of determining the condition requires a walk-through to collect baseline data.

The following key asset classifications are typically inspected:

- **Physical Site Components –** physical components on the site of the park such as: fences, utilities, stairways, walkways, parking lots, irrigation systems, monuments, fountains.
- **Recreation Components –** physical components such as: playgrounds, bleachers, back stops, splash pads, and benches.
- **Land Site Components** – land components on the site of the park such as: landscaping, sports fields, trails, natural areas, and associated drainage systems.
- **Minor Park Facilities –** small facilities within the park site such as: sun shelters, washrooms, concession stands, change rooms, storage sheds.

It is recommended that the municipality establish a parks condition assessment program and that a portion of capital funding is dedicated to this.

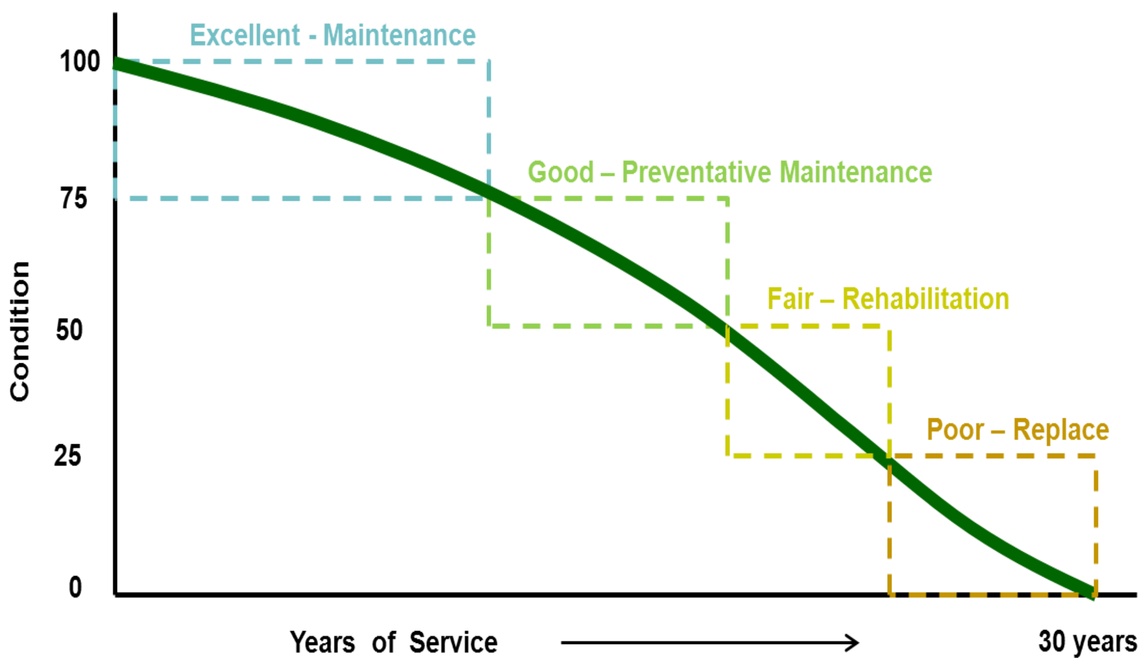
3 Life Cycle Analysis Framework

An industry review was conducted to determine which life cycle activities can be applied at the appropriate time in an asset's life, to provide the greatest additional life at the lowest cost. In the asset management industry, this is simply put as doing the right thing to the right asset at the right time. If these techniques are applied across entire asset networks or portfolios (e.g., the entire road network), the municipality could gain the best overall asset condition while expending the lowest total cost for those programs.

3.1 Paved Roads

The following analysis has been conducted at a fairly high level, using industry standard activities and costs for paved roads. With future updates of this Asset Management Strategy, the municipality may wish to run the same analysis with a detailed review of municipality activities used for roads and the associated local costs for those work activities. All of this information can be input into the CityWide software suite in order to perform updated financial analysis as more detailed information becomes available. The following diagram depicts a general deterioration profile of a road with a 30-year life.

FIGURE 45 PAVED ROAD GENERAL DETERIORATION PROFILE



As shown above, during the road's life cycle there are various windows available for work activity that will maintain or extend the life of the asset. These windows are: maintenance; preventative maintenance; rehabilitation; and replacement or reconstruction.

The windows or thresholds for when certain work activities should be applied to also coincide approximately with the condition state of the asset as shown below:

TABLE 39 ASSET CONDITION AND RELATED WORK ACTIVITY - PAVED ROADS

Condition	Condition Range	Work Activity
Excellent condition (Maintenance only phase)	100-76	■ maintenance only
Good Condition (Preventative maintenance phase)	75 - 51	■ crack sealing ■ emulsions
Fair Condition (Rehabilitation phase)	50 -26	■ resurface - mill & pave ■ resurface - asphalt overlay ■ single & double surface treatment (for rural roads)
Poor Condition (Reconstruction phase)	25 - 1	■ reconstruct - pulverize and pave ■ reconstruct - full surface and base reconstruction
Critical Condition (Reconstruction phase)	0	■ critical includes assets beyond their useful lives which make up the backlog. they require the same interventions as the “poor” category above.

With future updates of this asset management strategy, the municipality may wish to review the above condition ranges and thresholds for when certain types of work activity occur, and adjust to better suit the municipality’s work program. Also note: when adjusting these thresholds, it actually adjusts the level of service provided and ultimately changes the amount of money required. These threshold and condition ranges can be easily updated and a revised financial analysis can be calculated. These adjustments will be an important component of future Asset Management Plans, as the province requires each municipality to present various management options within the financing plan.

It is recommended that the municipality establish a life cycle activity framework for the various classes of paved road within their transportation network.

3.2 Bridges & Culverts

The best industry standard approach to develop a 10 year needs list for the municipality’s bridge structure portfolio would be to have the structural engineer who performs the inspections to develop a maintenance requirements report, a rehabilitation and replacement requirements report and identify additional detailed inspections as required. The Municipality of Kincardine currently uses engineer reviewed bridge condition inspections.

3.3 Facilities & Buildings

The best approach to develop a 10-year needs list for the municipality’s facilities portfolio would be to have the engineers, operational staff or architects who perform the facility inspections to also develop a complete portfolio maintenance requirements report and rehabilitation and replacement requirements report, and also identify additional detailed inspections and follow up studies as required. This may be performed as a separate assignment once all individual facility audits/inspections are complete. Of course, if the inspection data is housed or uploaded into the CityWide software, then these reports can be produced automatically from the system.

The above reports could be considered the beginning of a 10-year maintenance and capital plan, however, within the facilities industry there are other key factors that should be considered to determine over all priorities and future expenditures. Some examples would be functional / legislative requirements, energy conservation programs and upgrades, customer complaints and health and safety concerns, and also customer expectations balanced with willingness to pay initiatives.

It is recommended that the municipality establish a prioritization framework for the facilities asset class that incorporates the key components outlined above.

3.4 Fleet and Vehicles

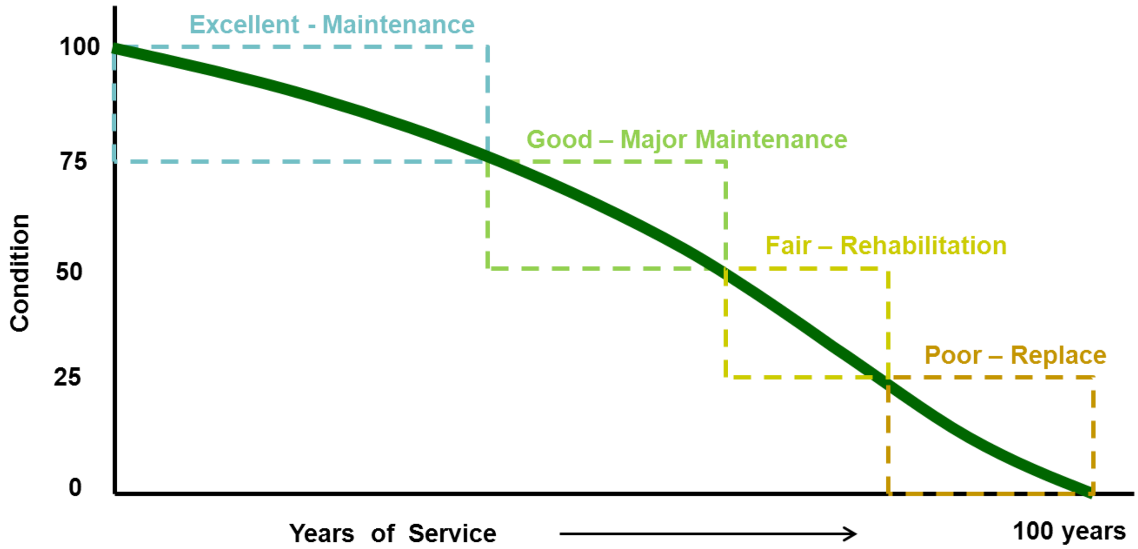
The best approach to develop a 10-year needs list for the municipality's fleet and vehicle portfolio would first be through a defined preventative maintenance program, and secondly, through an optimized life cycle vehicle replacement schedule. The preventative maintenance program would serve to determine budget requirements for operating and minor capital expenditures for part renewal and major refurbishments and rehabilitations. An optimized vehicle replacement program will ensure a vehicle is replaced at the correct point in time in order to minimize overall cost of ownership, minimize costly repairs and downtime, while maximizing potential re-sale value. There is significant benchmarking information available within the fleet industry in regards to vehicle life cycles which can be used to assist in this process. Once appropriate replacement schedules are established the short and long term budgets can be funded accordingly.

There are, of course, functional aspects of fleet management that should also be examined in further detail as part of the long-term management plan, such as fleet utilization and incorporating green fleet, etc. It is recommended that the municipality establish a prioritization framework for the fleet asset class that incorporates the key components outlined above.

3.5 Sanitary and storm sewers

The following analysis has been conducted at a fairly high level, using industry standard activities and costs for sanitary and storm sewer rehabilitation and replacement. With future updates of this asset management strategy, the municipality may wish to run the same analysis with a detailed review of municipality activities used for sewer mains and the associated local costs for those work activities. All of this information can be input into the CityWide software suite in order to perform updated financial analysis as more detailed information becomes available. The following diagram depicts a general deterioration profile of a sewer main with a 100 year life.

FIGURE 46 SEWER MAIN GENERAL DETERIORATION



As shown above, during the sewer main's life cycle there are various windows available for work activity that will maintain or extend the life of the asset. These windows are: maintenance; major maintenance; rehabilitation; and replacement or reconstruction.

The windows or thresholds for when certain work activities should be applied also coincide approximately with the condition state of the asset as shown below:

TABLE 40 ASSET CONDITION AND RELATED WORK ACTIVITY FOR SEWER MAINS

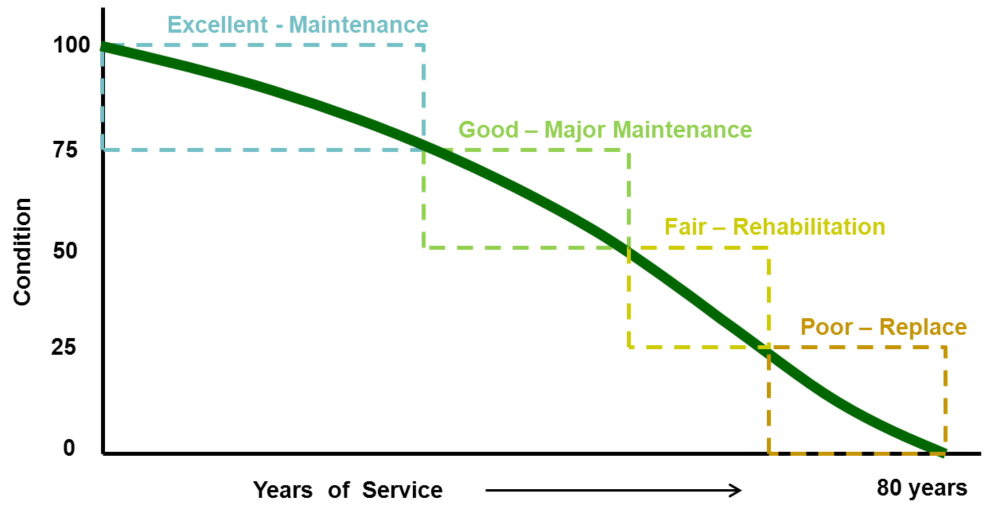
Condition	Condition Range	Work Activity
Excellent condition (Maintenance only phase)	100-76	■ maintenance only (cleaning & flushing etc.)
Good Condition (Preventative maintenance phase)	75 - 51	■ mahhole repairs ■ small pipe section repairs
Fair Condition (Rehabilitation phase)	50 -26	■ structural relining
Poor Condition (Reconstruction phase)	25 - 1	■ pipe replacement
Critical Condition (Reconstruction phase)	0	■ critical includes assets beyond their useful lives which make up the backlog. They require the same interventions as the "poor" category above.

With future updates of this Asset Management Strategy the municipality may wish to review the above condition ranges and thresholds for when certain types of work activity occur, and adjust to better suit the municipality's work program. Also note: when adjusting these thresholds, it actually adjusts the level of service provided and ultimately changes the amount of money required. These threshold and condition ranges can be easily updated with the CityWide software suite and an updated financial analysis can be calculated. These adjustments will be an important component of future Asset Management Plans, as the province requires each municipality to present various management options within the financing plan.

3.6 Water

As with roads and sewers above, the following analysis has been conducted at a fairly high level, using industry standard activities and costs for water main rehabilitation and replacement. The following diagram depicts a general deterioration profile of a water main with an 80 year life.

FIGURE 47 WATER MAIN GENERAL DETERIORATION



As shown above, during the water main's life cycle there are various windows available for work activity that will maintain or extend the life of the asset. These windows are: maintenance; major maintenance; rehabilitation; and replacement or reconstruction.

The windows or thresholds for when certain work activities should be applied also coincide approximately with the condition state of the asset as shown below:

TABLE 41 ASSET CONDITION AND RELATED WORK ACTIVITY FOR WATER MAINS

Condition	Condition Range	Work Activity
excellent condition (Maintenance only phase)	100-76	■ maintenance only (cleaning & flushing etc.)
good Condition (Preventative maintenance phase)	75 - 51	■ water main break repairs ■ small pipe section repairs
fair Condition (Rehabilitation phase)	50 -26	■ structural water main relining
poor Condition (Reconstruction phase)	25 - 1	■ pipe replacement
critical Condition (Reconstruction phase)	0	■ critical includes assets beyond their useful lives which make up the backlog. They require the same interventions as the "poor" category above.

4 Growth and Demand

Growth is a critical infrastructure demand driver for most infrastructure services. As such, the municipality must not only account for the lifecycle cost for its existing asset portfolio, but those of any anticipated and forecasted capital projects associated specifically with growth. Following a decline from 1991 to 1996 (12,134 to 11,908), Kincardine's population stagnated. According to the 2011 census data, the municipality's population is 11,174, a change of 0.0% from 2006

Declining or stagnating populations present a catch-22, placing less demand on infrastructure services, but also reducing existing streams of revenues, which can compromise the capacity of the municipality to maintain existing LOS.

5 Project Prioritization and Risk Management

Generally, infrastructure needs exceed municipal capacity. As such, municipalities rely heavily on provincial and federal programs and grants to finance important capital projects. Fund scarcity means projects and investments must be carefully selected based on the state of infrastructure, economic development goals, and the needs of an evolving and growing community. These factors, along with social and environmental considerations will form the basis of a robust risk management framework.

5.1.1 Defining Risk Management

From an asset management perspective, risk is a function of the consequences of failure (e.g., the negative economic, financial, and social consequences of an asset in the event of a failure); and, the probability of failure (e.g., how likely is the asset to fail in the short- or long-term).

The consequences of failure are typically reflective of:

- An asset's **importance in an overall system**
  For example, the failure of an individual computer workstation for which there are readily available substitutes is much less consequential and detrimental than the failure of a network server or telephone exchange system.

- The **criticality of the function performed**
  For example, a mechanical failure on a piece road construction equipment may delay the progress of a project, but a mechanical failure on a fire pumper truck may lead to immediate life safety concerns for fire fighters, and the public, as well as significant property damage.

- The **exposure of the public and/or staff to injury or loss of life**
  For example, a single sidewalk asset may demand little consideration and carry minimum importance to the municipality's overall pedestrian network and performs a modest function. However, members of the public interact directly with the asset daily and are exposed to potential injury due to any trip hazards or other structural deficiencies that may exist.

The probability of failure is generally a function of an asset's physical condition, which is heavily influenced by the asset's age and the amount of investment that has been made in the maintenance and renewal of the asset throughout its life.

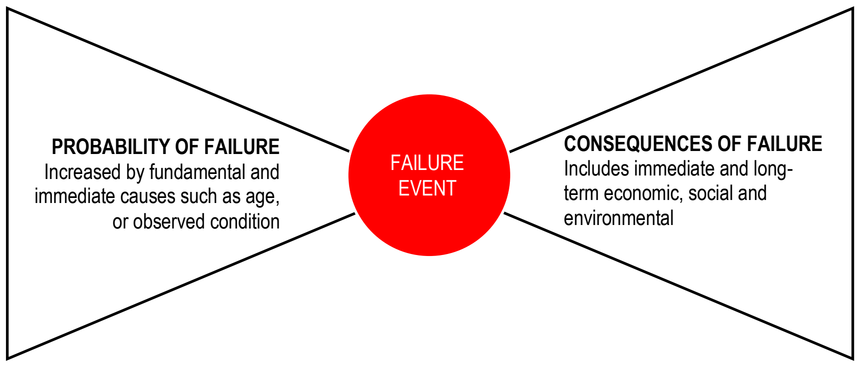
Risk mitigation is traditionally thought of in terms of safety and liability factors. In asset management, the definition of risk should heavily emphasize these factors but should be expanded to consider the risks to the municipality's ability to deliver targeted levels of service

- The impact that actions (or inaction) on one asset will have on other related assets
- The opportunities for economic efficiency (realized or lost) relative to the actions taken

5.1.2 Risk Matrices

Using the logic above, a risk matrix will illustrate each asset's overall risk, determined by multiplying the probability of failure (PoF) scores with the consequence of failure (CoF) score, as illustrated in the table below. This can be completed as a holistic exercise against any data set by determining which factors (or attributes) are available and will contribute to the PoF or CoF of an asset. The following diagram (known as a bowtie model in the risk industry) illustrates this concept. The probability of failure is increased as more and more factors collude to cause asset failure.

FIGURE 48 BOW TIE RISK MODEL



The risk matrices that follow categorize the municipality's nine asset classes as analyzed in this document based on their consequence of failure and the likelihood of failure events. The first risk matrix illustrates the distribution of all assets.

FIGURE 49 DISTRIBUTION OF ASSETS BASED ON RISK - ALL ASSETS

Consequence \ Probability	1	2	3	4	5
5	32 Assets 46,760.03 m, m2, sq ft $6,574,357.00	12 Assets 34,493.68 m, unit(s), m2, sq ft $12,879,889.00	24 Assets 3,618.44 m, m2 $6,260,582.00	1 Assets 777.24 m $615,806.00	2 Assets 321,982.00 m3, sq ft $11,941,597.00
4	686 Assets 223,392.97 sq ft, m, m2, km, unit(s), m3 $121,824,428.00	293 Assets 16,030.18 m, unit(s), m2, sq ft, km $34,335,654.00	140 Assets 7,900.99 m, m2, km $12,534,963.00	17 Assets 38,820.07 m, sq ft, m2, km $4,399,126.00	6 Assets 95,528.79 m, sq ft, km $10,866,743.00
3	148 Assets 88,137.42 m, m2, sq ft, unit(s), hectares $8,438,333.00	187 Assets 177,397.71 m, unit(s), m2, sq ft, m3 $20,608,040.00	224 Assets 71,732.85 m, unit(s), m2, sq ft $19,867,779.00	66 Assets 30,261.83 m, m2, sq ft, m3 $4,070,434.00	19 Assets 444,315.32 m3, m, unit(s), sq ft $19,168,007.00
2	751 Assets 53,209.79 m, unit(s), m2, sq ft, m3 $9,798,918.00	804 Assets 102,264.64 m, unit(s), m2, sq ft, acres $16,398,195.00	1307 Assets 116,627.27 m, unit(s), m2, sq ft $37,244,477.00	434 Assets 74,276.60 m, unit(s), km, m2, sq ft $16,994,043.00	51 Assets 147,760.63 m, unit(s), sq ft, m3 $9,378,735.00
1	5719 Assets 109,354.35 unit(s), m, km, m2, sq ft $20,105,166.00	3481 Assets 231,263.32 unit(s), m, km, sq ft, m2 $13,346,859.00	6182 Assets 218,296.99 unit(s), m, km, m2, sq ft $23,994,737.00	5926 Assets 180,339.06 unit(s), m, km, m2, sq ft $22,218,765.00	2546 Assets 578,097.26 unit(s), m, m2, sq ft, m3 $28,296,994.00

FIGURE 50 DISTRIBUTION OF ASSETS BASED ON RISK – ROAD NETWORK

Consequence \ Probability	1	2	3	4	5
5	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	624 Assets 892.44 km $109,248,670.00	264 Assets 149.53 km $26,460,709.00	53 Assets 29.04 km $4,931,948.00	10 Assets 2.29 km $414,661.00	2 Assets 1.89 km $557,276.00
3	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
2	1 Assets 19.51 m $137,452.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
1	1505 Assets 26,472.49 km, m, unit(s) $7,904,886.00	386 Assets 11,978.33 km, m, unit(s) $3,770,685.00	469 Assets 4,114.87 unit(s), km, m $1,778,317.00	426 Assets 3,356.05 unit(s), m $478,596.00	779 Assets 18,519.32 unit(s), m $1,189,515.00

FIGURE 51 DISTRIBUTION OF ASSETS BASED ON RISK – BRIDGES & CULVERTS

Consequence \ Probability	1	2	3	4	5
5	3 Assets 625.08 m2 $3,414,607.00	2 Assets 881.52 m2 $2,550,269.00	3 Assets 1,713.47 m2 $4,658,190.00	0 Assets - $0.00	0 Assets - $0.00
4	4 Assets 435.09 m2 $2,794,720.00	8 Assets 1,632.46 m2 $5,071,951.00	5 Assets 1,841.64 m2 $3,668,828.00	1 Assets 214.00 m2 $728,556.00	0 Assets - $0.00
3	5 Assets 839.22 m2 $1,992,456.00	12 Assets 2,686.61 m2 $4,618,857.00	20 Assets 2,072.85 m2 $6,540,859.00	1 Assets 99.20 m2 $253,288.00	0 Assets - $0.00
2	1 Assets 184.90 m2 $157,372.00	9 Assets 919.26 m2 $1,574,703.00	15 Assets 1,015.35 m2 $2,660,380.00	2 Assets 267.69 m2 $227,833.00	0 Assets - $0.00
1	0 Assets - $0.00	2 Assets 427.60 m2 $151,614.00	9 Assets 757.56 m2 $688,402.00	4 Assets 250.47 m2 $270,175.00	0 Assets - $0.00

FIGURE 52 DISTRIBUTION OF ASSETS BASED ON RISK – WATER

Consequence \ Probability	1	2	3	4	5
5	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	1 Assets 777.24 m $615,806.00	0 Assets - $0.00
4	1 Assets 3,746.00 sq ft $1,168,870.00	7 Assets 190.56 m $90,683.00	7 Assets 818.33 m $460,772.00	1 Assets 3,746.00 sq ft $779,247.00	1 Assets 5,640.00 sq ft $3,672,216.00
3	27 Assets 1,802.31 m $909,594.00	132 Assets 31,689.75 m, m3, sq ft $10,895,404.00	56 Assets 9,271.90 m, sq ft $3,204,165.00	32 Assets 4,168.02 m, m3 $1,987,953.00	11 Assets 23,194.21 m, sq ft $9,489,657.00
2	235 Assets 10,877.91 m, sq ft, m3 $2,850,812.00	372 Assets 15,256.60 m, sq ft $5,150,925.00	277 Assets 13,073.26 m $4,257,267.00	264 Assets 19,539.37 m $6,170,185.00	29 Assets 19,410.91 m, m3, sq ft $2,445,244.00
1	2072 Assets 10,285.54 m, unit(s) $2,684,113.00	2323 Assets 15,241.80 m, unit(s), sq ft $3,960,900.00	2176 Assets 9,599.90 m, unit(s), sq ft $2,623,184.00	3673 Assets 27,158.60 m, unit(s), sq ft $7,503,718.00	749 Assets 9,405.69 m, unit(s), sq ft, m3 $2,292,489.00

FIGURE 53 DISTRIBUTION OF ASSETS BASED ON RISK – WATER (NON-POTABLE)

Consequence \ Probability	1	2	3	4	5
5	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	6 Assets 1,690.96 m $60,548.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
3	11 Assets 2,139.75 m $70,169.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
2	28 Assets 385.77 m $12,642.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
1	14 Assets 13.98 unit(s), m $10,847.00	44 Assets 44.00 unit(s) $12,086.00	0 Assets - $0.00	5 Assets 5.00 unit(s) $5.00	0 Assets - $0.00

FIGURE 54 DISTRIBUTION OF ASSETS BASED ON RISK – WASTEWATER

Consequence \ Probability	1	2	3	4	5
5	27 Assets 2,334.95 m $836,705.00	6 Assets 609.16 m $545,060.00	21 Assets 1,904.97 m $1,602,392.00	0 Assets - $0.00	1 Assets 260,000.00 m3 $7,637,313.00
4	32 Assets 103,191.70 m, m3 $1,248,737.00	3 Assets 148.50 m $89,479.00	43 Assets 4,377.79 m $3,044,326.00	1 Assets 60.52 m $35,879.00	0 Assets - $0.00
3	30 Assets 1,662.12 m $515,280.00	12 Assets 47,448.19 m, sq ft $459,934.00	83 Assets 9,903.81 m $6,785,592.00	21 Assets 1,680.23 m $996,641.00	1 Assets 260,000.00 m3 $3,273,131.00
2	93 Assets 5,323.78 m $1,959,904.00	28 Assets 2,969.97 m, sq ft $1,651,498.00	429 Assets 33,415.81 m, sq ft $20,329,133.00	89 Assets 8,942.84 m, sq ft $6,498,131.00	3 Assets 175.27 m $103,906.00
1	939 Assets 33,134.49 unit(s), m, sq ft $3,250,717.00	217 Assets 2,161.56 m, unit(s), sq ft $1,165,910.00	2605 Assets 25,607.77 m, unit(s), sq ft $9,579,402.00	874 Assets 11,327.24 m, unit(s), sq ft $7,252,636.00	125 Assets 5,379.00 unit(s), sq ft $3,032,673.00

FIGURE 55 DISTRIBUTION OF ASSETS BASED ON RISK – STORM

Consequence \ Probability	1	2	3	4	5
5	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	11 Assets 358.79 m, unit(s) $1,007,285.00	8 Assets 270.13 m $141,166.00	32 Assets 834.19 m $429,089.00	2 Assets 17.25 m $8,867.00	0 Assets - $0.00
3	63 Assets 2,822.47 m $800,431.00	21 Assets 1,032.16 m $479,548.00	61 Assets 2,590.29 m $1,081,611.00	10 Assets 291.38 m $109,257.00	0 Assets - $0.00
2	382 Assets 10,208.92 m, unit(s) $2,862,914.00	377 Assets 12,726.15 m $4,360,159.00	569 Assets 18,704.85 m $6,486,746.00	64 Assets 1,593.70 m $540,840.00	0 Assets - $0.00
1	1135 Assets 9,500.76 unit(s), m $3,259,785.00	228 Assets 2,261.69 unit(s), m $989,959.00	544 Assets 4,809.54 unit(s), m $3,210,978.00	673 Assets 1,879.18 unit(s), m $2,788,641.00	221 Assets 221.00 unit(s) $765,035.00

FIGURE 56 DISTRIBUTION OF ASSETS BASED ON RISK – BUILDINGS

Consequence \ Probability	1	2	3	4	5
5	2 Assets 43,800.00 sq ft $2,323,045.00	1 Assets 33,000.00 sq ft $1,408,013.00	0 Assets - $0.00	0 Assets - $0.00	1 Assets 61,982.00 sq ft $4,304,284.00
4	6 Assets 113,076.00 sq ft $4,700,047.00	2 Assets 13,638.00 sq ft $1,645,813.00	0 Assets - $0.00	2 Assets 34,780.00 sq ft $2,431,916.00	2 Assets 89,252.00 sq ft $5,510,275.00
3	8 Assets 78,866.56 sq ft, hectares $2,482,368.00	7 Assets 94,538.00 sq ft $2,810,669.00	3 Assets 47,893.00 sq ft $1,609,761.00	2 Assets 24,023.00 sq ft $723,295.00	4 Assets 159,874.00 sq ft $4,776,202.00
2	3 Assets 26,200.00 sq ft $477,618.00	7 Assets 61,817.67 sq ft $1,214,403.00	5 Assets 45,407.00 sq ft $1,160,754.00	5 Assets 35,521.00 sq ft $1,453,384.00	10 Assets 126,322.34 sq ft $3,971,076.00
1	8 Assets 13,569.66 sq ft $525,304.00	31 Assets 185,046.65 sq ft, m2 $1,200,603.00	55 Assets 146,463.00 sq ft, unit(s) $2,750,603.00	45 Assets 117,053.00 sq ft, unit(s) $1,979,798.00	136 Assets 486,575.00 sq ft, unit(s) $15,499,421.00

FIGURE 57 DISTRIBUTION OF ASSETS BASED ON RISK – YARD IMPROVEMENTS

Consequence \ Probability	1	2	3	4	5
5	0 Assets - $0.00	3 Assets 3.00 unit(s) $8,376,547.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	2 Assets 2.00 unit(s) $1,595,551.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	1 Assets 634.90 m $1,126,976.00
3	2 Assets 3.00 unit(s) $837,245.00	1 Assets 1.00 unit(s) $390,872.00	0 Assets - $0.00	0 Assets - $0.00	1 Assets 1,245.11 m $837,503.00
2	5 Assets 5.00 unit(s) $854,639.00	4 Assets 8,568.00 m2, acres, unit(s) $835,462.00	5 Assets 5,004.00 m2, unit(s) $841,701.00	8 Assets 8,410.00 unit(s), km, m2 $1,672,841.00	3 Assets 1,846.11 m, unit(s) $1,575,908.00
1	40 Assets 16,371.42 unit(s), m2, m, km $2,391,952.00	135 Assets 12,162.69 m, unit(s), sq ft, m2 $1,465,745.00	160 Assets 26,424.35 unit(s), m2, m, km $2,419,647.00	50 Assets 18,953.53 unit(s), m, km, m2 $1,171,869.00	86 Assets 56,697.25 unit(s), m2, m $2,649,097.00

FIGURE 58 DISTRIBUTION OF ASSETS BASED ON RISK – EQUIPMENT

Consequence \ Probability	1	2	3	4	5
5	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
3	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
2	1 Assets 2.00 unit(s) $133,087.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
1	6 Assets 6.00 unit(s) $77,562.00	107 Assets 1,931.00 unit(s) $374,032.00	159 Assets 515.00 unit(s) $684,755.00	170 Assets 350.00 unit(s) $563,479.00	427 Assets 1,277.00 unit(s) $1,584,810.00

FIGURE 59 DISTRIBUTION OF ASSETS BASED ON RISK – VEHICLES

Consequence \ Probability	1	2	3	4	5
5	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	0 Assets - $0.00	1 Assets 1.00 unit(s) $835,853.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
3	2 Assets 2.00 unit(s) $830,790.00	2 Assets 2.00 unit(s) $952,756.00	1 Assets 1.00 unit(s) $645,791.00	0 Assets - $0.00	2 Assets 2.00 unit(s) $791,514.00
2	2 Assets 2.00 unit(s) $352,478.00	7 Assets 7.00 unit(s) $1,611,045.00	7 Assets 7.00 unit(s) $1,508,496.00	2 Assets 2.00 unit(s) $430,829.00	6 Assets 6.00 unit(s) $1,282,601.00
1	0 Assets - $0.00	8 Assets 8.00 unit(s) $255,325.00	5 Assets 5.00 unit(s) $259,449.00	6 Assets 6.00 unit(s) $209,848.00	23 Assets 23.00 unit(s) $1,283,954.00

IX. Financial Strategy

1 General overview of financial plan requirements

In order for an AMP to be effectively put into action, it must be integrated with financial planning and long-term budgeting. The Municipality of Kincardine's Asset Management Policy (GG.2.22) considers this integration a critical component of its asset management program. In general, our recommendations rely on allocating reductions in debt repayments to augment a municipality's infrastructure capacity. Kincardine's asset management policy also makes this strategy an important component by requiring the "transitioning [of] retired debt repayments to capital contributions, as the 'spending room' is already incorporated into the operating budget." The development of a comprehensive financial plan will allow the municipality to identify the financial resources required for sustainable asset management based on existing asset inventories, desired levels of service, and projected growth requirements.

The following pyramid depicts the various cost elements and resulting funding levels that should be incorporated into AMPs that are based on best practices.

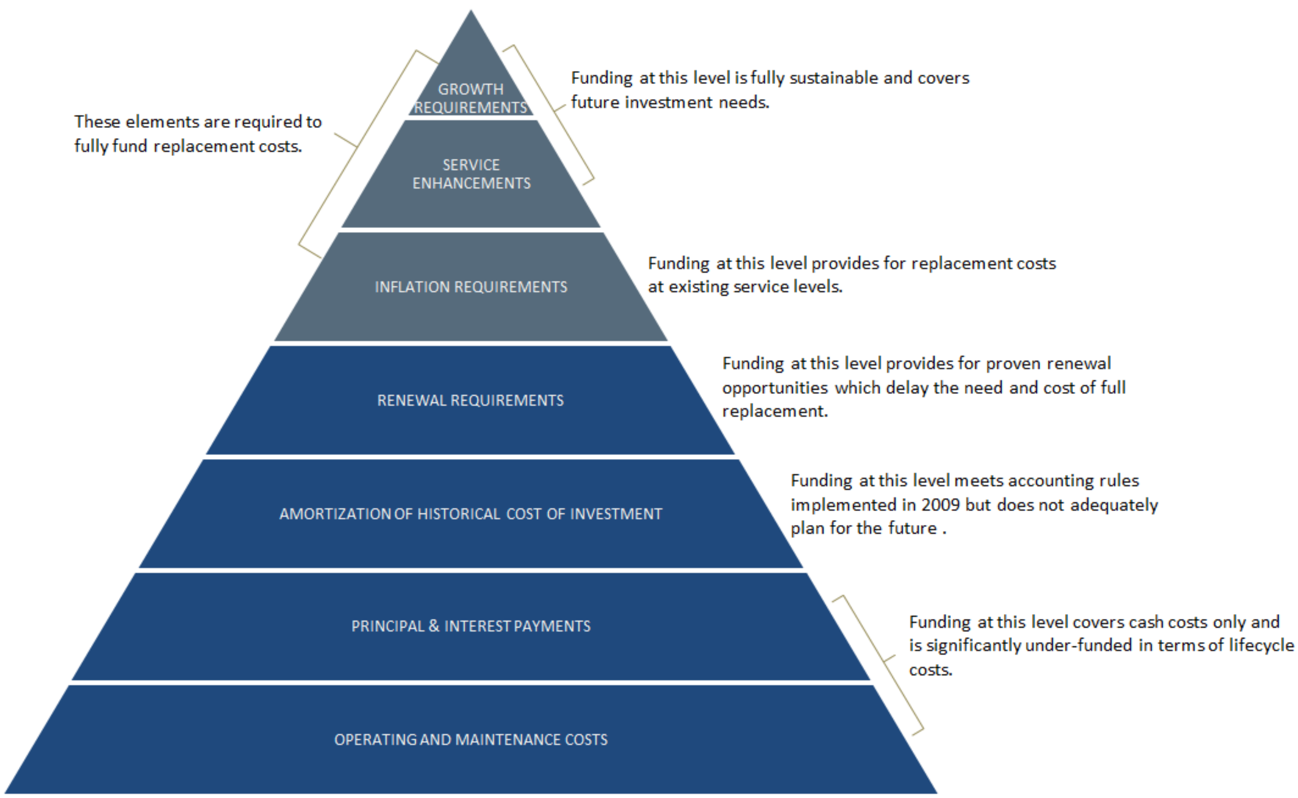


FIGURE 60 COST ELEMENTS

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 (as documented in the SOTI section of this report) for:
   - existing assets
   - existing service levels
   - requirements of contemplated changes in service levels (none identified for this plan)
   - requirements of anticipated growth (none identified for this plan)

2. use of traditional sources of municipal funds:
   - tax levies
   - user fees
   - reserves
   - debt
   - development charges

3. use of non-traditional sources of municipal funds:
   - reallocated budgets
   - partnerships
   - procurement methods

4. use of senior government funds:
   - gas tax
   - grants (not included in this plan due to Provincial requirements for firm commitments)

If the financial plan component of an AMP 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:
   - if a zero debt policy is in place, is it warranted? If not, the use of debt should be considered.
   - do user fees reflect the cost of the applicable service? If not, increased user fees should be considered.

This AMP includes recommendations that avoid long-term funding deficits.

2 Financial Profile: Tax Funded Assets

2.1 Funding objective

We have developed scenarios that would enable the municipality to achieve full funding within five to 20 years for the following assets: roads; bridges & culverts; storm sewers; buildings; machinery & equipment; vehicles; and yard improvement. For each scenario developed we have included strategies, where applicable, regarding the use of tax revenues, user fees, reserves and debt.

2.2 Current funding position

Tables 42 and 43 outline, by asset category, the municipality's average annual asset investment requirements, current funding positions, and funding increases required to achieve full funding on assets funded by taxes.

TABLE 42 SUMMARY OF INFRASTRUCTURE REQUIREMENTS AND CURRENT FUNDING AVAILABLE

Summary of Infrastructure Requirements & Current Funding Available for Tax Funded Assets							
		2016 Funding Available					
Asset Category	Average Annual Investment Required	Taxes	Gas Tax	OCIF	Taxes to Reserves	Total Funding Available	Annual Deficit
Road Network	3,892,000	0	340,000	267,000	233,000	840,000	3,052,000
Bridges & Culverts	826,000	0	0	0	233,000	233,000	593,000
Storm Sewer System	392,000	0	0	0	233,000	233,000	159,000
Equipment	267,000	0	0	0	233,000	233,000	34,000
Facilities	2,225,000	0	0	0	233,000	233,000	1,992,000
Land Improvements	911,000	0	0	0	233,000	233,000	678,000
Vehicles	952,000	0	0	0	232,000	232,000	720,000
Total	**9,465,000**	**0**	**340,000**	**267,000**	**1,630,000**	**2,237,000**	**7,228,000**

2.3 Recommendations for full funding

The average annual investment requirement for the above categories is $9,465,000. Annual revenue currently allocated to these assets for capital purposes is $2,237,000 leaving an annual deficit of $7,228,000. To put it another way, these infrastructure categories are currently funded at 24% of their long-term requirements. In 2016, the municipality has annual tax revenues of $14,474,000. As illustrated in Table 40, without consideration of any other sources of revenue, full funding would require the following tax change over time:

TABLE 43 TAX CHANGE REQUIRED FOR FULL FUNDING

Asset Category	Tax Increase Required for Full Funding
Road Network	21.1%
Bridges & Culverts	4.1%
Storm Sewer Network	1.1%
Equipment	0.2%
Facilities	13.8%
Land Improvements	4.7%
Vehicles	5.0%
Total	**50.0%**

As illustrated in the table below, Kincardine's debt payments for these asset categories will be decreasing by $0 over the next 5 years and by $238,000 over the next 10 years. Although not shown in the table, debt payment decreases will be $444,000 and $444,000 over the next 15 and 20 years respectively. Our recommendations include capturing those decreases in cost and allocating them to the infrastructure deficit outlined above. The table below outlines this concept and presents a number of options:

TABLE 44 EFFECT OF REALLOCATING DECREASES IN DEBT COSTS

	Without Reallocation of Decreasing Debt Costs				With Reallocation of Decreasing Debt Costs			
	5 Years	10 Years	15 Years	20 Years	5 Years	10 Years	15 Years	20 Years
Infrastructure Deficit as Outlined in Table 39	7,228,000	7,228,000	7,228,000	7,228,000	7,228,000	7,228,000	7,228,000	7,228,000
Change in Debt Costs	N/A	N/A	N/A	N/A	0	-238,000	-444,000	-444,000
Resulting Infrastructure Deficit	**7,228,000**	**7,228,000**	**7,228,000**	**7,228,000**	**7,228,000**	**6,990,000**	**6,784,000**	**6,784,000**
Resulting Tax Increase Required:								
Total Over Time	**50.0%**	**50.0%**	**50.0%**	**50.0%**	**50.0%**	**48.3%**	**46.9%**	**46.9%**
Annually	10.0%	5.0%	3.3%	2.5%	10.0%	4.8%	3.1%	2.3%

Considering all of the above information, we recommend the 20 year option in table 41 that includes the reallocations. This involves full funding being achieved over 20 years by:

- when realized, reallocating the debt cost reductions of $444,000 to the infrastructure deficit as outlined above.
- increasing tax revenues by 2.3% each year for the next 20 years solely for the purpose of phasing in full funding to the asset categories covered in this section of the AMP.
- allocating the gas tax revenue and OCIF grant as outlined in table 1.

Notes:
Kincardine receives significant investment income from various sources. In some previous years, a portion of this revenue had been allocated to investment in infrastructure. Putting such a policy in place permanently would significantly improve Kincardine's infrastructure deficit.

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. 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.

Although this option achieves full funding on an annual basis in 20 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 $559,000 for paved roads, $675,000 for bridges & culverts, $0 for storm sewers, $1,127,000 for equipment, $25,596,000 for facilities, $5,004,000 for land improvements and $3,180,000 for rolling stock . 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.

3 Financial Profile: Rate Funded Assets

3.1 Funding objective

We have developed scenarios that would enable the municipality to achieve full funding within five to 20 years for the following assets: water, and sanitary. For each scenario developed we have included strategies, where applicable, regarding the use of tax revenues, user fees, reserves and debt.

3.2 Current funding position

Tables 45 and 46 outline, by asset category, the municipality's average annual asset investment requirements, current funding positions, and funding increases required to achieve full funding on assets funded by rates.

TABLE 45 SUMMARY OF INFRASTRUCTURE REQUIREMENTS AND CURRENT FUNDING AVAILABLE

Asset Category	Average Annual Investment Required	2016 Annual Funding Available				Annual Deficit
		Rates	To Operations	Other	Total	
Sanitary services	1,476,000	1,991,000	-747,000	0	1,244,000	232,000
Water services	1,917,000	2,506,000	-1,300,000	0	1,206,000	711,000
Total	**3,393,000**	**4,497,000**	**-2,047,000**	**0**	**2,450,000**	**943,000**

3.3 Recommendations for full funding

The average annual investment requirement for the above categories is $3,393,000. Annual revenue currently allocated to these assets for capital purposes is $2,450,000, leaving an annual deficit of $943,000. To put it another way, these infrastructure categories are currently funded at 72% of their long-term requirements. In 2016, Kincardine has annual sanitary revenues of $1,991,000 and annual water revenues of $2,506,000. As illustrated in the table below, without consideration of any other sources of revenue, full funding would require the following increases over time:

TABLE 46 RATE CHANGE REQUIRED FOR FULL FUNDING

Asset Category	Rate Increase Required for Full Funding
Sanitary	11.7%
Water	28.4%
Total	40.1%

Through Table 47, we have expanded the above scenario to present multiple options for sanitary and water services.

TABLE 47 RATE INCREASE REQUIRED FOR FULL FUNDING: WATER AND SANITARY

	5 Years	10 Years	15 Years	20 Years
Water	5.7%	2.8%	1.9%	1.4%
Sanitary	2.3%	1.2%	0.8%	0.6%

Considering all of the above information, we recommend the 10 year option in table 44. This involves full funding being achieved over 10 years by:

- increasing rate revenues by1.2% for sanitary services and 2.8% for water services each year for the next 10 years solely for the purpose of phasing in full funding to the asset categories covered in this section of the AMP.

Notes:

- 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.
- We realize that raising rate 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.
- Any increase in rates required for operations would be in addition to the above recommendations.
- Kincardine has been following the recommendations produced from the Hemson financial reate study for water and wastewater and have adopted the full-cost recovery model as a result. Rates have been increased annually in order to contribute to the reserve funds for each year. The Hemson study is not fully incorporated into this financial analysis as that study includes both operations and capital requirements whereas this financial analysis only deals with capital requirements. Also, the time horizons for the two are different, therefore a complete direct comparison is not possible.

Although this option achieves full funding on an annual basis in 10 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 $4,961,000 for sanitary services and $8,661,000 for water 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.

4 Use of debt

For reference purposes, Table 48 outlines the premium paid on a project if financed by debt. For example, a $1M project financed at 3.0%[3] over 15 years would result in a 26% premium or $260,000 of increased costs due to interest payments. For simplicity, the table does not take into account the time value of money or the effect of inflation on delayed projects.

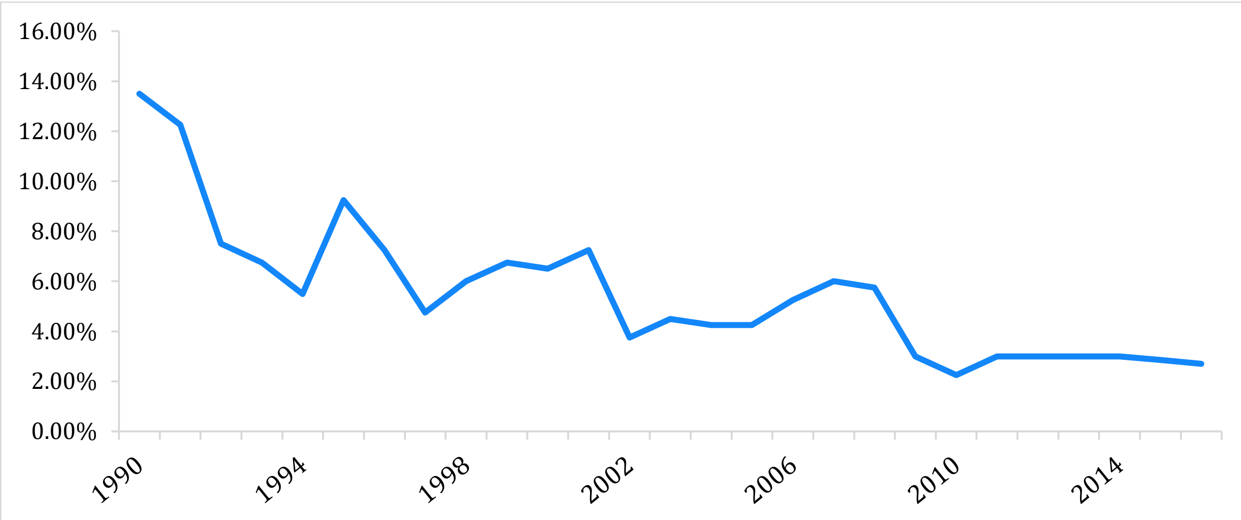
TABLE 48 TOTAL INTEREST PAID AS A % OF PROJECT COSTS

	Number of Years Financed					
Interest Rate	5	10	15	20	25	30
7.0%	22%	42%	65%	89%	115%	142%
6.5%	20%	39%	60%	82%	105%	130%
6.0%	19%	36%	54%	74%	96%	118%
5.5%	17%	33%	49%	67%	86%	106%
5.0%	15%	30%	45%	60%	77%	95%
4.5%	14%	26%	40%	54%	69%	84%
4.0%	12%	23%	35%	47%	60%	73%
3.5%	11%	20%	30%	41%	52%	63%
3.0%	9%	17%	26%	34%	44%	53%
2.5%	8%	14%	21%	28%	36%	43%
2.0%	6%	11%	17%	22%	28%	34%
1.5%	5%	8%	12%	16%	21%	25%
1.0%	3%	6%	8%	11%	14%	16%
0.5%	2%	3%	4%	5%	7%	8%
0.0%	0%	0%	0%	0%	0%	0%

[3] Current municipal Infrastructure Ontario rates for 15 year money is 3.2%.

It should be noted that current interest rates are near all-time lows. Sustainable funding models that include debt need to incorporate the risk of rising interest rates. The following graph shows where historical lending rates have been:

FIGURE 61 HISTORICAL PRIME BUSINESS INTEREST RATES



As illustrated in Table 48, a change in 15 year rates from 3% to 6% would change the premium from 26% to 54%. Such a change would have a significant impact on a financial plan.

Tables 49 and 50 outline how Kincardine has historically used debt for investing in the asset categories as listed. There is currently $4,453,000 of debt outstanding for the assets covered by this AMP with corresponding principal and interest payments of $444,000. In 2015, Kincardine had $843,000 in total P&I payment commitments. These principal and interest payments are well within its provincially prescribed annual maximum of $10,501,000.

TABLE 49 OVERVIEW OF USE OF DEBT

Asset Category	Debt at Dec 31st, 2015	Use of Debt in Last Five Years				
		2011	2012	2013	2014	2015
Road Network	0	0	0	0	0	0
Bridges & Culverts	0	0	0	0	0	0
Storm Sewer Network	0	0	0	0	0	0
Equipment	0	0	0	0	0	0
Facilities	4,128,000	0	0	0	0	1,800,000
Land Improvements	0	0	0	0	0	0
Vehicles	325,000	0	0	0	0	325,000
Total Tax Funded	**4,453,000**	**0**	**0**	**0**	**0**	**2,125,000**
Sanitary services	0	0	0	0	0	0
Water services	0	0	0	0	0	0
Total rate funded	**0**	**0**	**0**	**0**	**0**	**0**
Total AMP	0	0	0	0	0	0
Non AMP debt	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**	**0**

TABLE 50 OVERVIEW OF DEBT COSTS

	Principal & Interest Payments in Next Ten Years					
Asset Category	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Road Network	0	0	0	0	0	0
Bridges & Culverts	0	0	0	0	0	0
Storm Sewer Network	0	0	0	0	0	0
Equipment	0	0	0	0	0	0
Facilities	407,000	407,000	407,000	407,000	407,000	407,000
Land Improvements	0	0	0	0	0	0
Vehicles	37,000	37,000	37,000	37,000	37,000	37,000
Total tax funded	**444,000**	**444,000**	**444,000**	**444,000**	**444,000**	**444,000**
Sanitary services	0	0	0	0	0	0
Water services	0	0	0	0	0	0
Total rate funded	**0**	**0**	**0**	**0**	**0**	**0**

The revenue options outlined in this plan allow Kincardine to fully fund its long-term infrastructure requirements without further use of debt. However, project prioritization based on replacing age-based data with observed data for several tax funded and rate funded classes may require otherwise.

5 Use of reserves and reserve funds

5.1 Available reserves and reserve funds

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

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

By infrastructure category, Table 51 outlines the details of the reserves and reserve funds currently available to Kincardine.

TABLE 51 SUMMARY OF RESERVES AND RESERVE FUNDS AVAILABLE

Asset Category	Balance at December 31, 2015
Road Network	1,002,000
Bridges & Culverts	700,000
Storm Sewer Network	700,000
Equipment	2,033,000
Facilities	1,811,000
Land Improvements	2,540,000
Vehicles	700,000
Total Tax Funded	**9,486,000**
Water Network	7,719,000
Sanitary Sewer Network	7,986,000
Total Rate Funded	**15,705,000**

There is considerable debate in the municipal sector as to the appropriate level of reserves and reserve funds that a municipality 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:

- breadth of services provided
- age and condition of infrastructure
- use and level of debt
- economic conditions and outlook
- internal reserve and debt policies.

The reserves and reserve funds in Table 51 are available for use by applicable asset categories during the phase-in period to full funding. This, coupled with Kincardine's judicious use of debt in the past, allows the scenarios to assume that, if required, available reserves and reserve funds and debt capacity can be used for high priority and emergency infrastructure investments in the short to medium-term.

5.2 Recommendation

As Kincardine updates its AMP, we recommend that future planning should include determining what its long-term reserve balance requirements are and a plan to achieve such balances.

X. 2016 Infrastructure Report Card

The following infrastructure report card illustrates the township's performance on the two key factors: Asset Health and Financial Capacity. Appendix 1 provides the full grading scale and conversion chart, as well as detailed descriptions, for each grading level.

TABLE 52 2016 INFRASTRUCTURE REPORT CARD

Asset class	Asset Health Grade	Funding Percentage	Financial Capacity Grade	Average Asset class Grade	Comments
Roads	B	22%	F	D	Based on 2016 replacement cost, and a blend of age-based and observed data, while more than 50% of the municipality's total asset portfolio as analysed in this AMP is in very good or good condition, more than 25% of the assets, with a valuation of $125 million, is in poor to very poor condition. The municipality is underfunding its assets. The average funding for tax funded categories is 24% and for rate funded categories is 72%.
Bridges & Culverts	C	28%	F	D	
Water	D	63%	C	D	
Sanitary Sewer	D	84%	B	C	
Storm Sewer	C	59%	D	D	
Buildings	D	10%	F	F	
Machinery & Equipment	D	87%	B	C	
Land Improvements	C	26%	F	D	
Vehicles	D	24%	F	F	
		Average Asset Health Grade	C		
		Average Financial Capacity Grade	F		
		Overall Grade for the Township	D		

Appendix 1: Grading and Conversion Scales

TABLE 53 ASSET HEALTH SCALE

Letter Grade	Rating	Description
A	Excellent	Asset is new or recently rehabilitated
B	Good	Asset is no longer new, but is fulfilling its function. Preventative maintenance is beneficial at this stage.
C	Fair	Deterioration is evident but asset continues to full its function. Preventative maintenance is beneficial at this stage.
D	Poor	Significant deterioration is evident and service is at risk.
F	Very Poor	Asset is beyond expected life and has deteriorated to the point that it may no longer be fit to fulfill its function.

TABLE 54 FINANCIAL CAPACITY SCALE

Letter Grade	Rating	Funding percent	Timing Requirements	Description
A	Excellent	90-100 percent	☑ Short Term ☑Medium Term ☑Long Term	The township is fully prepared for its short-, medium- and long-term replacement needs based on existing infrastructure portfolio.
B	Good	70-89 percent	☑Short Term ☑Medium Term ☒Long Term	The township is well prepared to fund its short-term and medium-term replacement needs but requires additional funding strategies in the long-term to begin to increase its reserves.
C	Fair	60-69 percent	☑Short Term ☒Medium Term ☒Long Term	The township is underpreparing to fund its medium- to long-term infrastructure needs. The replacement of assets in the medium-term will likely be deferred to future years.
D	Poor	40-59 percent	☒/☑ Short Term ☒Medium Term ☒Long Term	The township is not well prepared to fund its replacement needs in the short-, medium- or long-term. Asset replacements will be deferred and levels of service may be reduced.
F	Very Poor	0-39 percent	☒Short Term ☒Medium Term ☒Long Term	The township is significantly underfunding its short-term, medium-term, and long-term infrastructure requirements based on existing funds allocation. Asset replacements will be deferred indefinitely. The township may have to divest some of its assets (e.g., bridge closures, arena closures) and levels of service will be reduced significantly.