The Asset Management Plan for the Municipality of Clearview

November 2016

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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 Clearview's infrastructure portfolio comprises seven distinct infrastructure categories: road network, bridges & culverts, buildings, storm, water, wastewater, land improvements, vehicles, and machinery & equipment. The nine asset classes analyzed in this asset management plan for the municipality had a total 2016 valuation of $240 million, of which the road network, sanitary services, and water services each comprised 23%.

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.

Similar to other municipalities in Ontario, the Clearview experienced a period of increasing levels of investment beginning in the 1960s and 1980s. The municipality also experienced rapid investments in the early 1990s, which have remained relatively stable since. Between 1990-1999, and again between 2000-and 2004, the municipality made its largest infrastructure investments, totaling more than $27 million in each year, with water, roads and wastewater comprising the largest shares. Since 2010, expenditures have totaled more than $43 million. Roads, buildings and wastewater have comprised the largest share of expenditures since 2010.

Based on 2016 replacement cost, and a blend of age-based and observed data, while 67% of the municipality's total asset portfolio as analysed in this AMP is in very good or good condition, nearly 20% of the assets, with a valuation of $41 million, is in poor to very poor condition. While age is not a precise indicator of the health of assets, it can serve as a useful approximation of asset deterioration. Approximately 80% of the municipality's assets , with a valuation of $189 million, have at least 10 years of useful life remaining. However, a significant portion, with a valuation of $16 million, remain in operation beyond their useful life. An additional 8% of assets valued at $19 million will reach the end of their useful life in the next five years.

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. This AMP provides financial strategies to achieve fiscal sustainability for the municipality's tax and rate funded assets.

The average annual investment requirement for the municipality's tax categories is $4,353,000. Annual revenue currently allocated to these assets for capital purposes is $3,934,000 leaving an annual deficit of $419,000. To put it another way, these infrastructure categories are currently funded at 90% of their long-term requirements. In 2016, the municipality has annual tax revenues of $13,618,000. We recommend a 10 year option in for phasing in full funding, including reallocations of decreasing debt repayments. This involves full funding being achieved over 20 years by:

- when realized, reallocating the debt cost reductions of $115,000 to the infrastructure deficit as outlined above.
- increasing tax revenues by 0.2% each year for the next 10 years solely for the purpose of phasing in full funding to the tax funded asset categories covered in this AMP.
- allocating the gas tax revenue and OCIF revenue as outlined in table 1.

The average annual investment requirement for the municipality's rate funded categories is $1,732,000. Annual revenue currently allocated to these assets for capital purposes is $889,000, leaving an annual deficit of $843,000. To put it another way, these infrastructure categories are currently funded at 51% of their long-term requirements. In 2016, Clearview has annual wastewater revenues of $1,183,000 and annual water revenues of $2,190,000. We recommend a 15 year option for phasing in full funding, including the reallocations of debt repayment. This involves full funding being achieved over 15 years by:

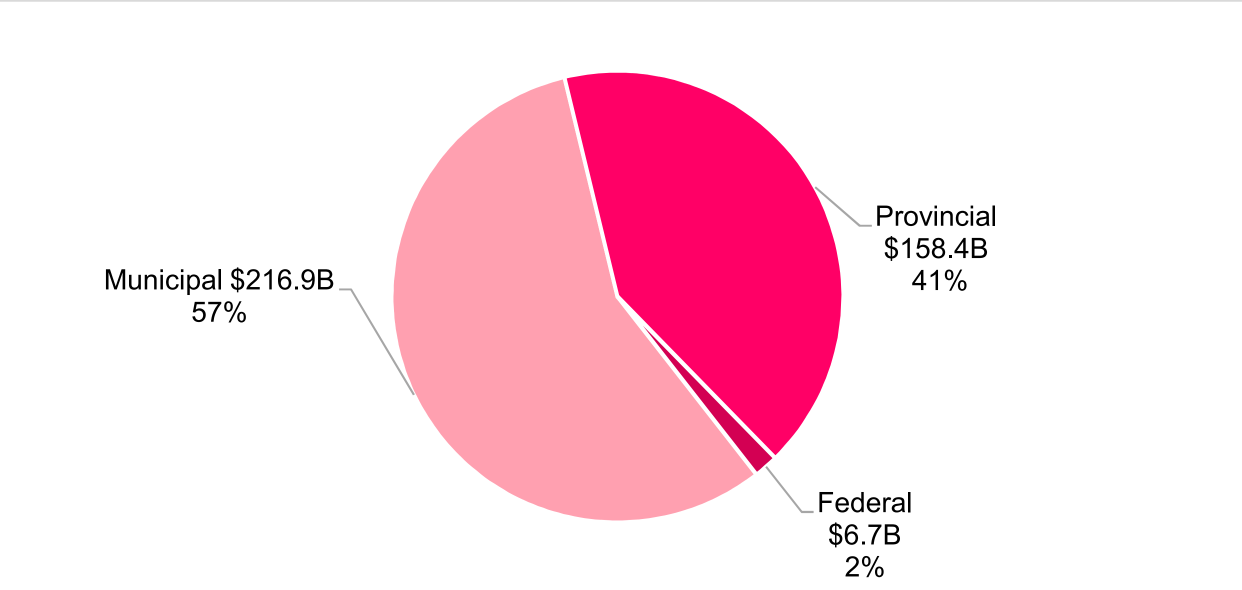
- no change in water rates for AMP purposes.
- when realized, reallocating the debt cost reductions of $185,000 for sanitary services to the applicable infrastructure deficit.
- increasing rate revenues by 3.8% for sanitary services each year for the next 15 years solely for the purpose of phasing in full funding to the asset categories covered in this section of the AMP.
- increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

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 very high 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 total replacement cost of capital assets analyzed in this document. 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*

III. AMP Objectives and Content

This AMP is one component of the Municipality of Clearview'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 land 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 3 INFRASTRUCTURE REPORT CARD DESCRIPTION

<table>
<tr><td colspan="2">Financial Capacity</td><td colspan="2">A municipality's financial capacity is determined by how well it's meeting the average annual investment requirements (0-100%) for each infrastructure class.</td></tr>
<tr><td colspan="2">Asset Health</td><td colspan="2">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.</td></tr>
<tr><td>Letter Grade</td><td>Rating</td><td>Performance and Financial Capacity</td><td>Description</td></tr>
<tr><td>A</td><td>Very Good</td><td>Assets are fit for the future and the municipality is funding at least 90% of its annual needs.</td><td>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.</td></tr>
<tr><td>B</td><td>Good</td><td>Assets are adequate for now and the municipality is meeting 70-89% of its annual needs.</td><td>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.</td></tr>
<tr><td>C</td><td>Fair</td><td>Assets require intervention and the municipality is meeting 60-69% of its annual needs.</td><td>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.</td></tr>
<tr><td>D</td><td>Poor</td><td>Assets are at risk and the municipality is meeting between 40-59% of its annual needs.</td><td>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.</td></tr>
<tr><td>F</td><td>Very Poor</td><td>Assets unfit for sustained service and the municipality is meeting less than 40% of its annual needs.</td><td>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.</td></tr>
</table>

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.

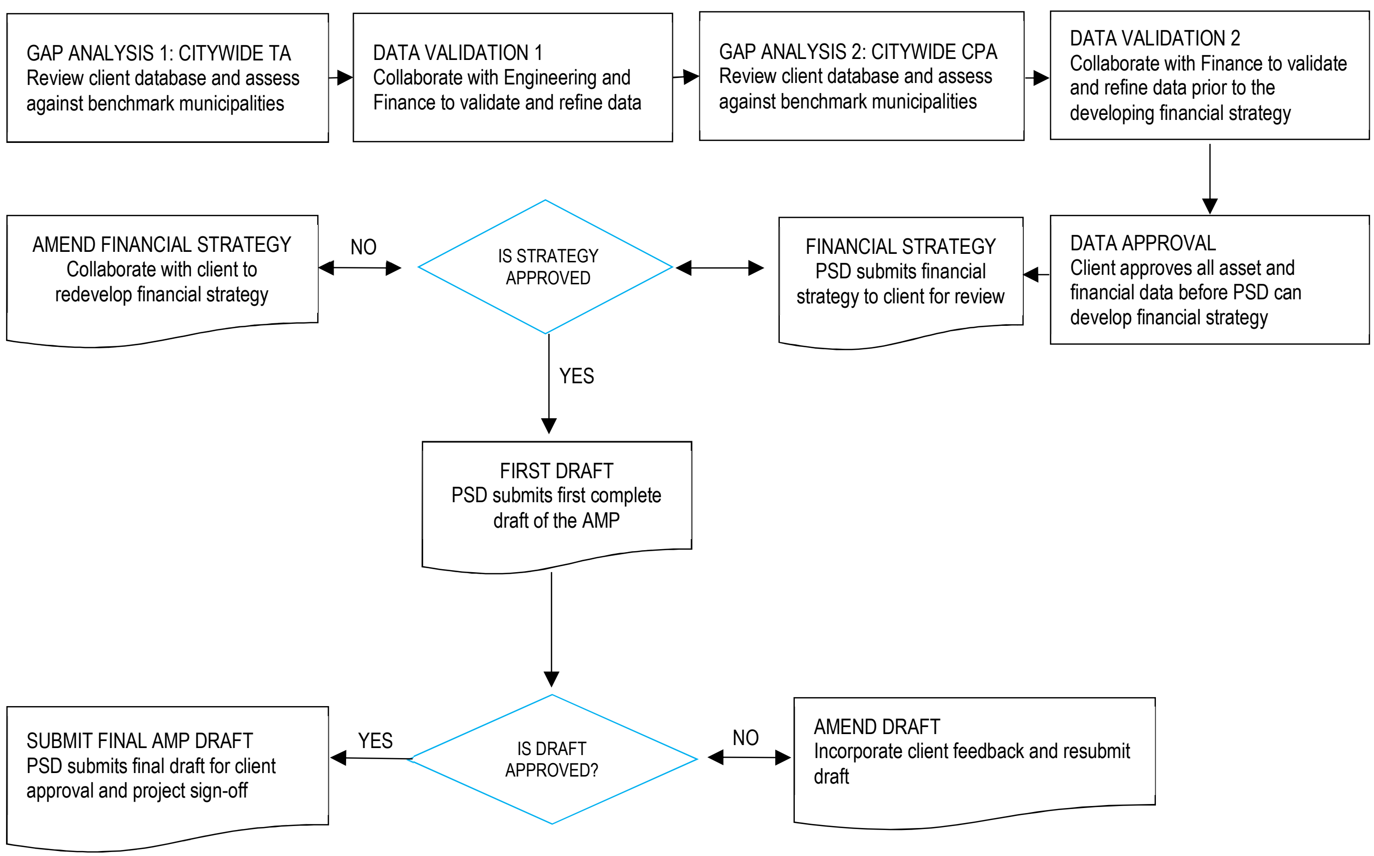
3. Our calculations and recommendations will reflect the best available data at the time this AMP was developed.

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.

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

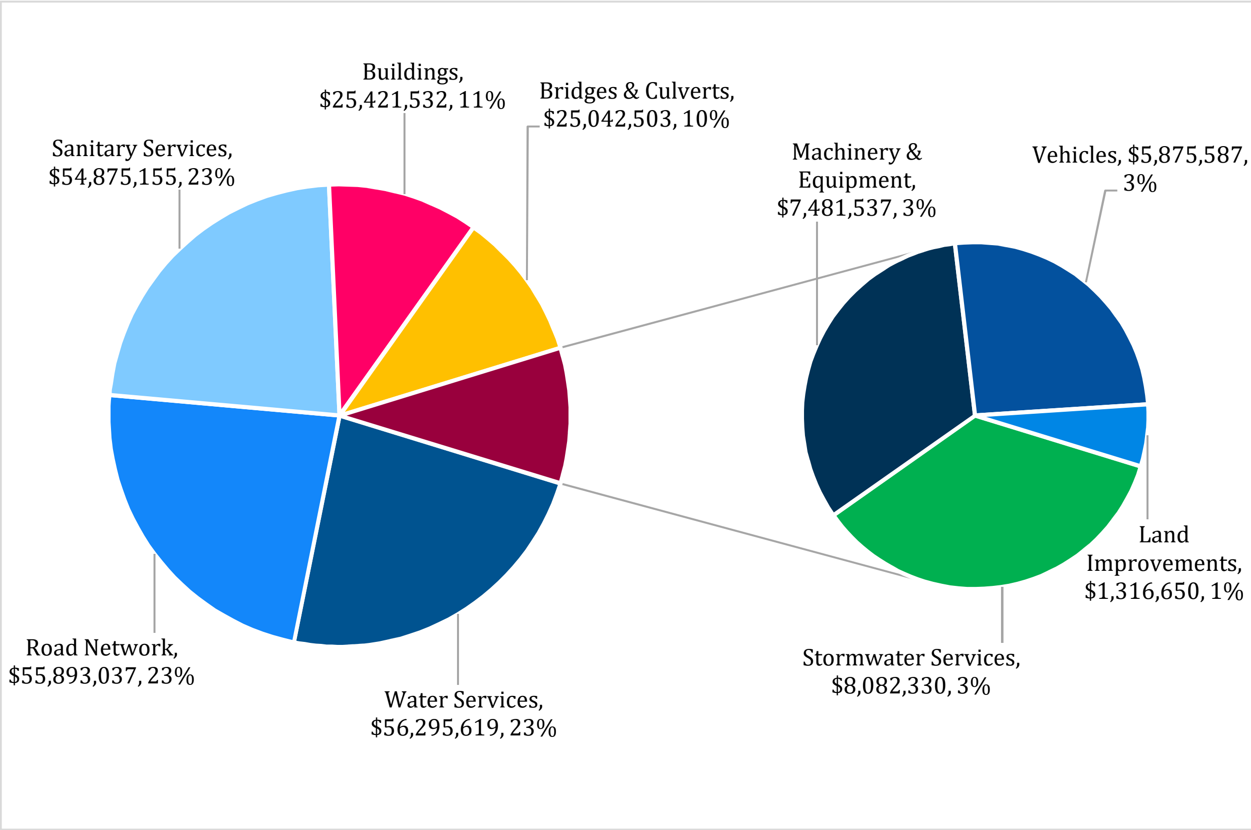
V. Key Stats

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

1 Asset Valuation

The seven asset classes analyzed in this asset management plan for the municipality had a total 2016 valuation of $240 million, of which the road network, sanitary services, and water services each comprised 23%.

FIGURE 3 2016 ASSET VALUATION BY CLASS



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 5 indicates the source of condition data used for each of the nine asset classes in this AMP.

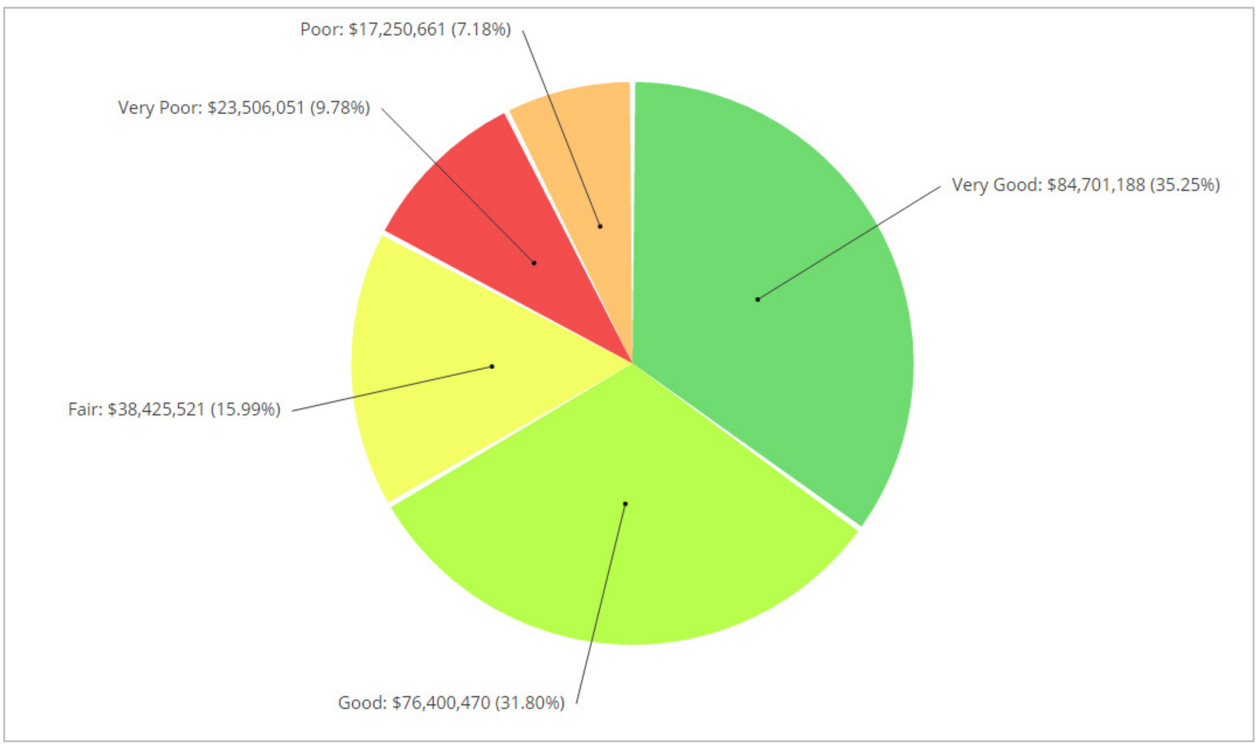
TABLE 4 SOURCE OF CONDITION DATA BY ASSET CLASS

Asset Class	Source of Condition Data
Road Network	Assessed – RJ Burnside Roads Needs Study
Bridges & Culverts	Assessed – RJ Burnside Roads Needs Study
Wastewater	Assessed
Water Mains	Age-based
Storm	Age-based
Vehicles	Age-based
Machinery & Equipment	Assessed
Facilities	
Water & Wastewater	Assessed upon request
Other/Buildings	Age-based and Assessed
Land improvements	Age-based

3 Overall Condition – All Asset Classes

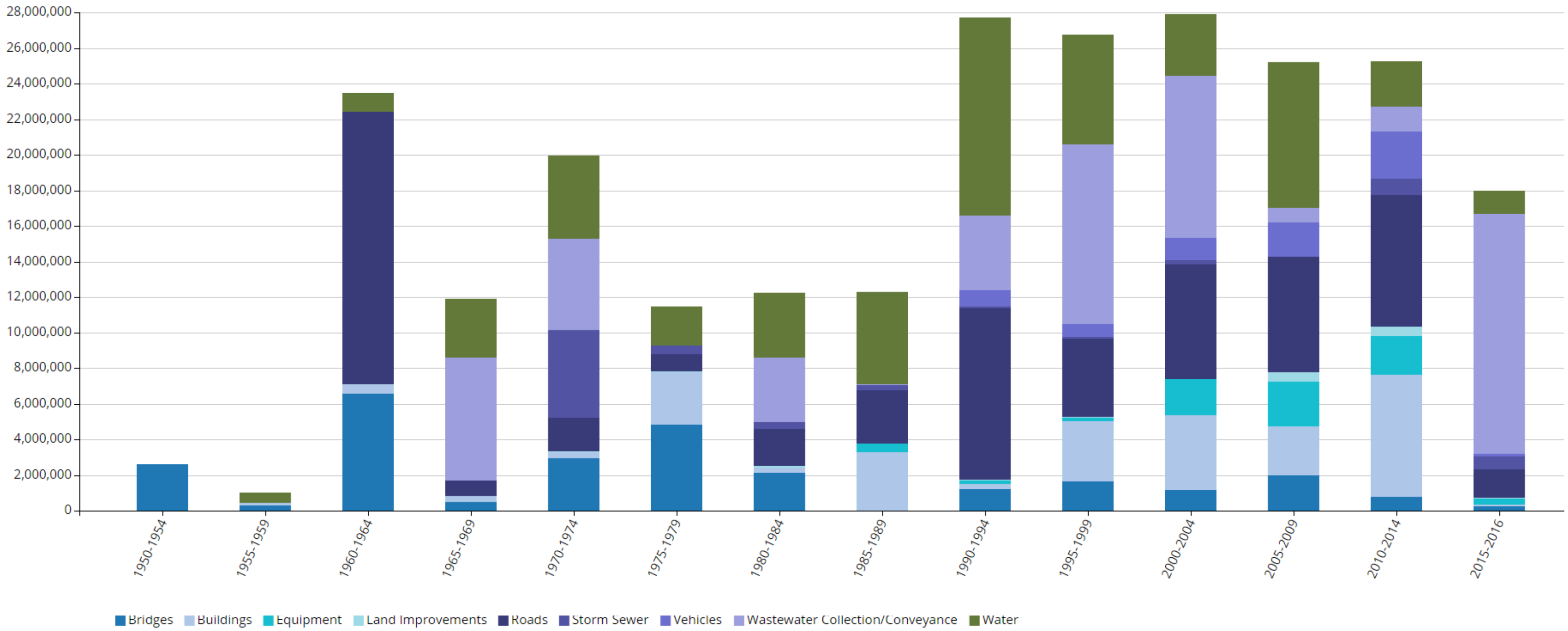
Based on 2016 replacement cost, and a blend of age-based and observed data, while 67% of the municipality's total asset portfolio as analysed in this AMP is in very good or good condition, nearly 20% of the assets, with a valuation of $41 million, is in poor to very poor condition.

FIGURE 4 ASSET CONDITION DISTRIBUTION BY REPLACEMENT COST - ALL 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 illusrates the historical invesments in infrastructure across key asset classes. Often, investment in critical infrastructure parallels population growth or other significant shifts in demographics.

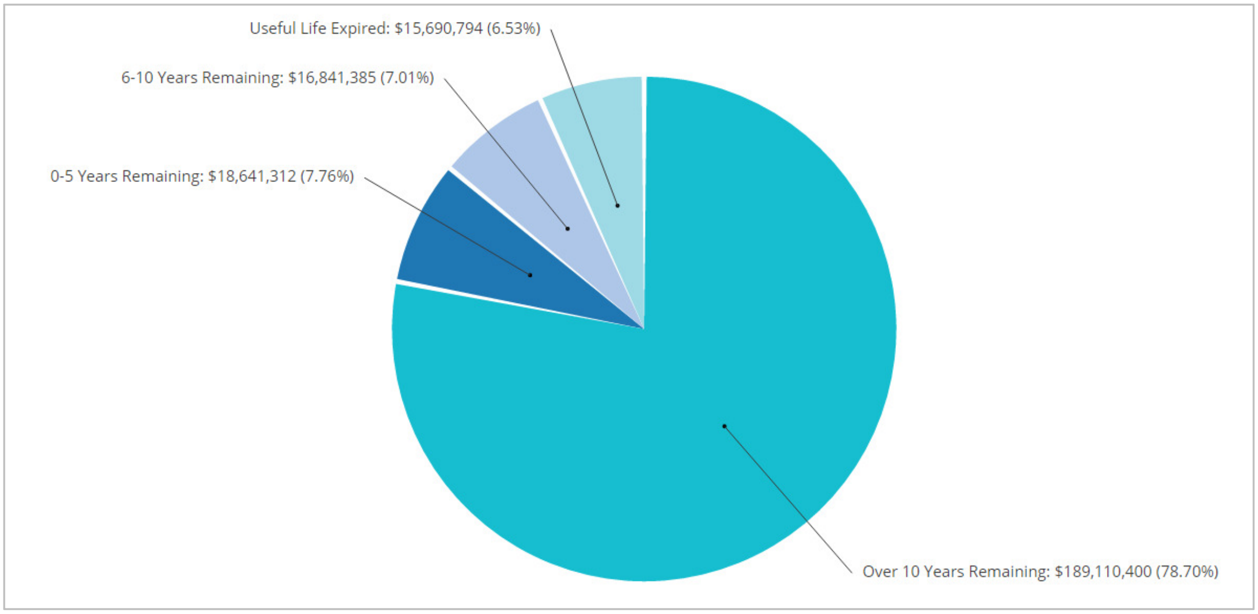
FIGURE 5 HISTORICAL INVESTMENT IN INFRASTRUCTURE - ALL ASSET CLASSES



Similar to other municipalities in Ontario, the Clearview experienced a period of increasing levels of investment beginning in the 1960s and 1980s. The municipality also experienced rapid investments in the early 1990s, which have remained relatively stable since. Between 1990-1999, and again between 2000-and 2004, the municipality made its largest infrastructure investments, totaling more than $27 million in each year, with water, roads and wastewater comprising the largest shares. Since 2010, expenditures have totaled more than $43 million. Roads, buildings and wastewater have comprised the largest share of expenditures since 2010.

While age is not a precise indicator of an asset's health, it can serve as a meaningful approxmiation 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



Approximately 80% of the municipality's assets , with a valuation of $189 million, have at least 10 years of useful life remaining. However, a significant portion, with a valuation of $16 million, remain in operation beyond their useful life. An additional 8% of assets valued at $19 million will reach the end of their useful life in the next five years.

3 Data Confidence

With the exception of its stormwater services for which data gathering was completed by a student, the municipality has a very high degree of confidence in the data used to develop this AMP, receiving a weighted confidence rating of 97%. This is indicative of significant effort in collecting and refining its data set. The lowest data confidence rating was assigned to the municipality's storm assets.

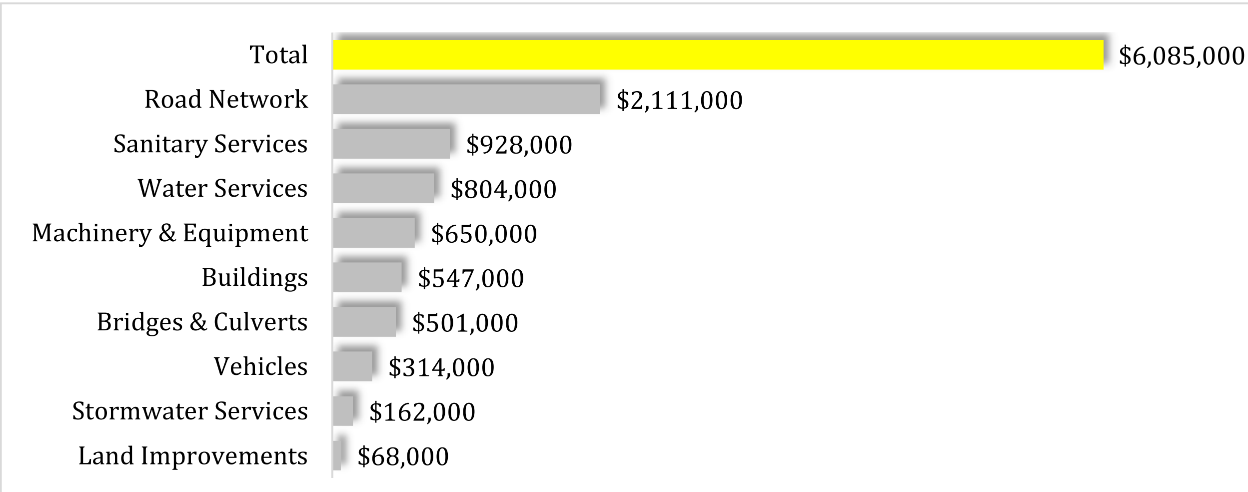
TABLE 5 DATA CONFIDENCE RATINGS

Asset Class	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.	Average Data Confidence Rating
Road Network	100%	100%	100%	100%	100%	100%
Bridges & Culverts	100%	100%	100%	100%	100%	100%
Water	100%	100%	100%	100%	100%	100%
Wastewater	100%	90%	100%	90%	100%	96%
Storm	50%	50%	50%	50%	80%	56%
Facilities	100%	100%	100%	90%	80%	94%
Land Improvements	70%	70%	70%	70%	80%	72%
Vehicles	100%	100%	100%	100%	100%	100%
Machinery & Equipment	100%	90%	90%	90%	80%	90%
					Weighted Data Confidence Rating	97%

4 Financial Profile

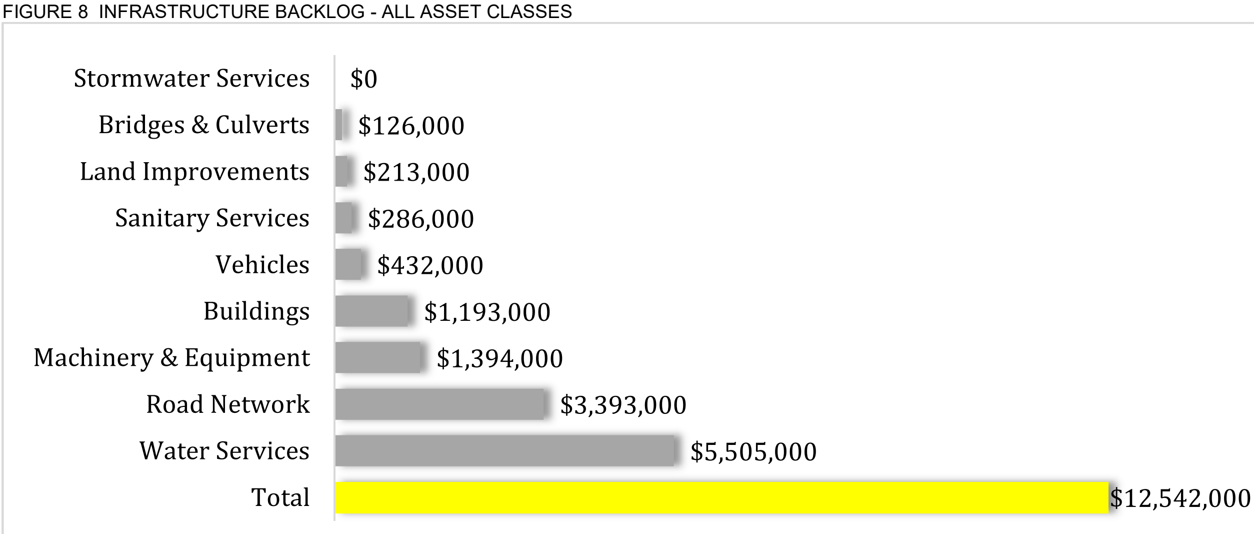
This section details key financial indicators related to the municipality's asset classes as analyzed in this asset management plan.

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 $6.1 million annually for the assets covered in this AMP.

FIGURE 8 INFRASTRUCTURE BACKLOG - ALL ASSET CLASSES



The municipality has a combined infrastructure backlog of $12.5 million, with water comprising 44%, followed by roads at 27%. The backlog represents 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 Inventory

Table 1 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 $56 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.

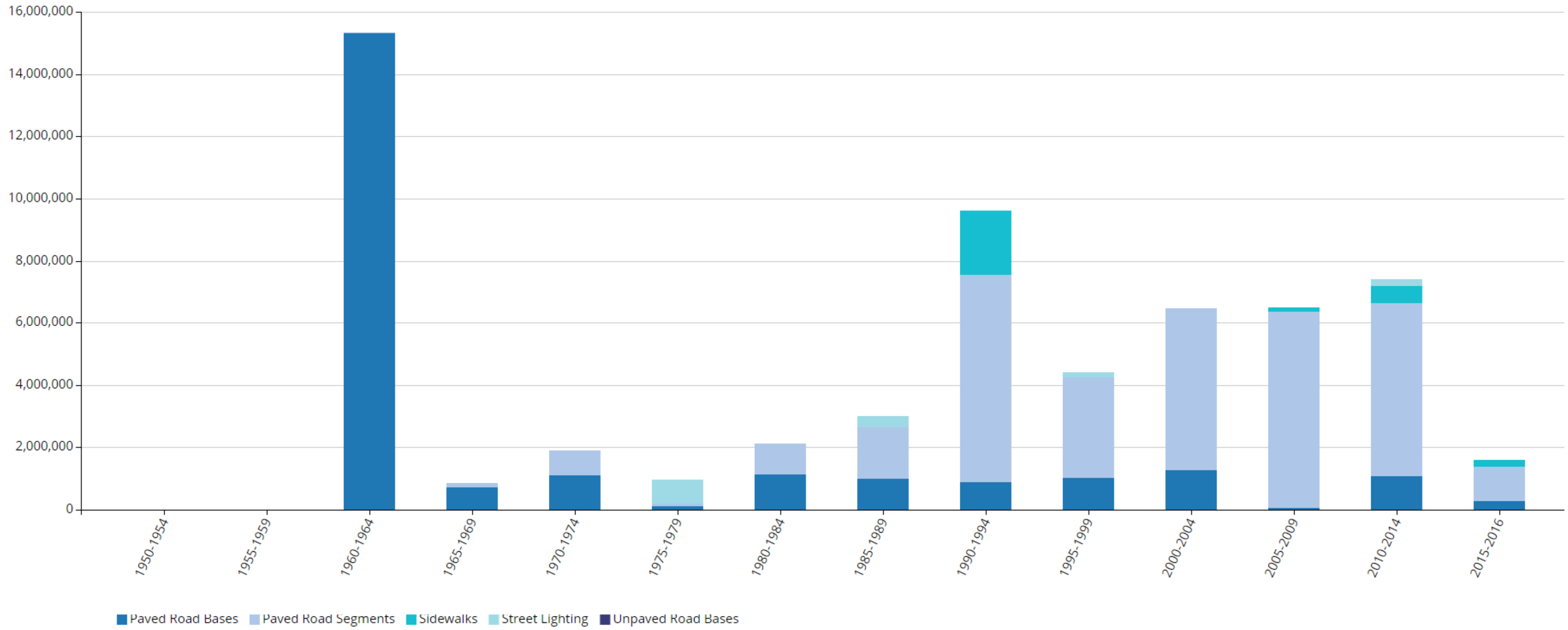
TABLE 6 KEY ASSET ATTRIBUTES – ROADS

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Overall Replacement Cost
Road Network	Paved Road Bases	272,505m	40	NRBCPI	$23,846,683
	Unpaved Road Bases	264,799m	40	Not Planned for Replacement	$0
	Paved Road Segments	289,028m	5, 6, 20, 40	NRBCPI	$27,564,861
	Street lights	877	40	NRBCPI	$1,534,818
	Sidewalks	171	30	NRBCPI	$2,946,675
				Total	$55,893,037

1.4 Historical Investment in Infrastructure

In these sections, we provide the installation profile and useful life consumption levels using in-service data obtained from CityWide® Tangible Assets. Together, these graphs can illustrate infrastructure investment trends and upcoming needs at Clearview. The chart below illustrates the historical levels of investment in roads at the municipality of Clearview.

FIGURE 9 HISTORICAL INVESTMENT – ROAD NETWORK

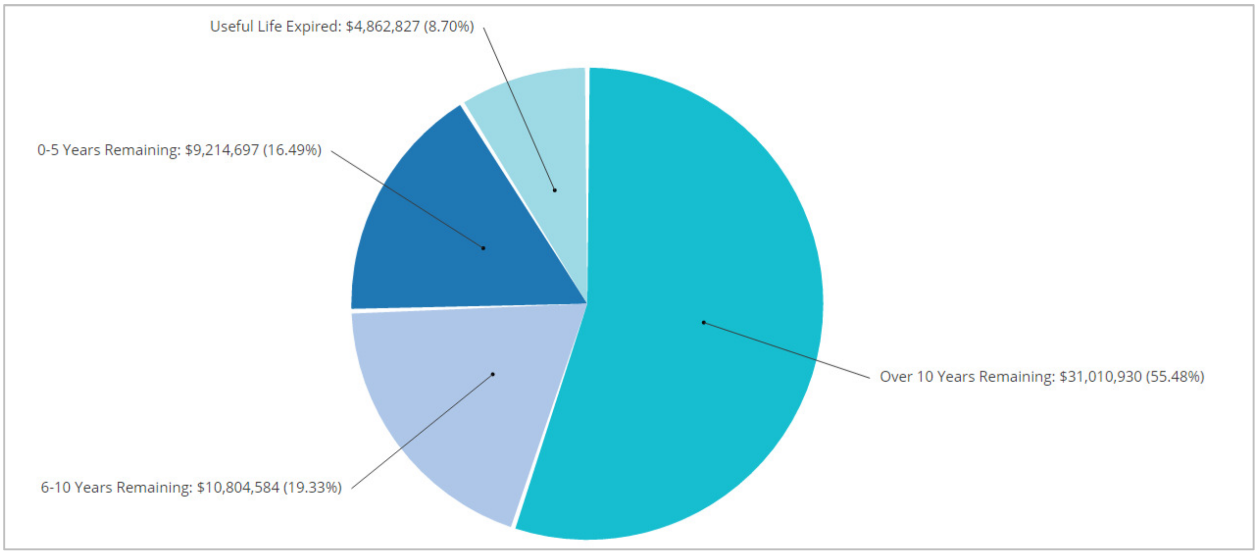


Following significant investments in paved roads in the 1960s, the municipality's expenditures declined. Investments began to increase again beginning in the 1980s, paralleling other municipalities. In a second wave, the municipality's investments in roads totaled $10 million between 1995 and 1999, with paved roads comprising approximately $7 million. Since 2010, investments have totaled more than $9 million.

1.5 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their 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 road network.

FIGURE 10 USEFUL LIFE CONSUMPTION - ROAD NETWORK

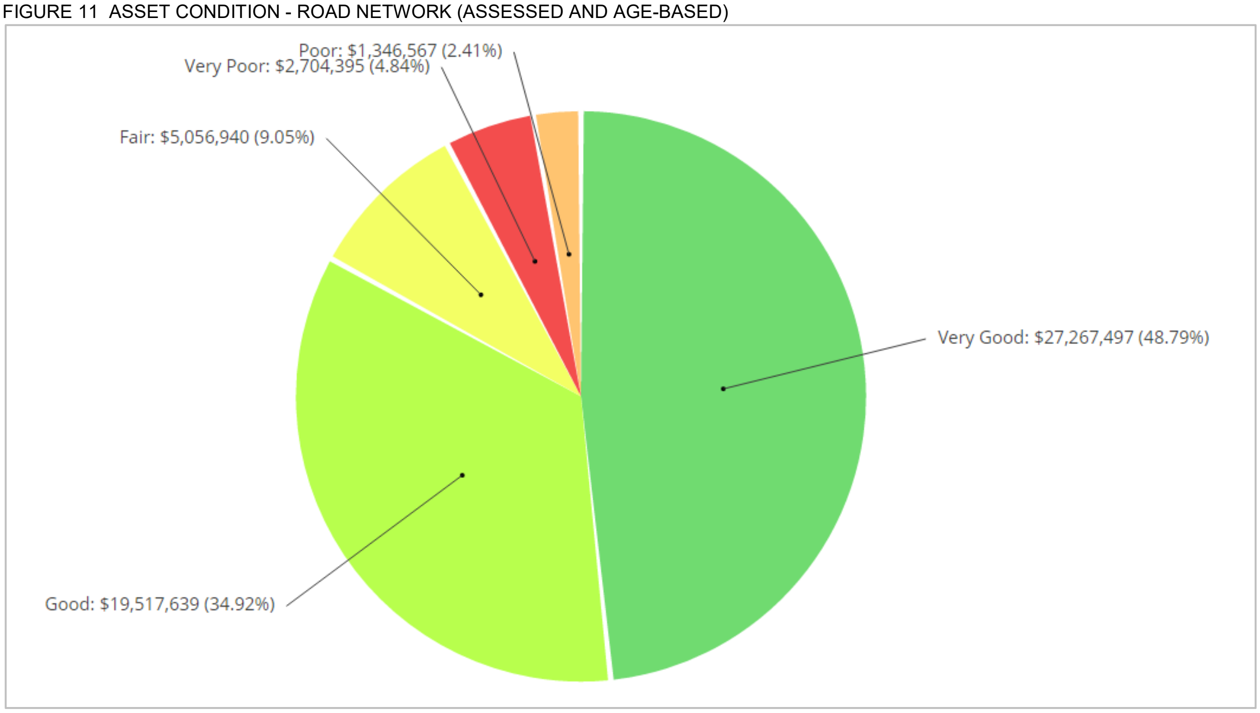


While nearly 60% of the municipality's road network assets have at least 10 years remaining, 9% with a valuation of $4.9 million, remain in operation beyond their useful life. An additional 16% of assets valued at $9 million will reach the end of their useful life in the next five years.

1.6 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.

FIGURE 11 ASSET CONDITION - ROAD NETWORK (ASSESSED AND AGE-BASED)

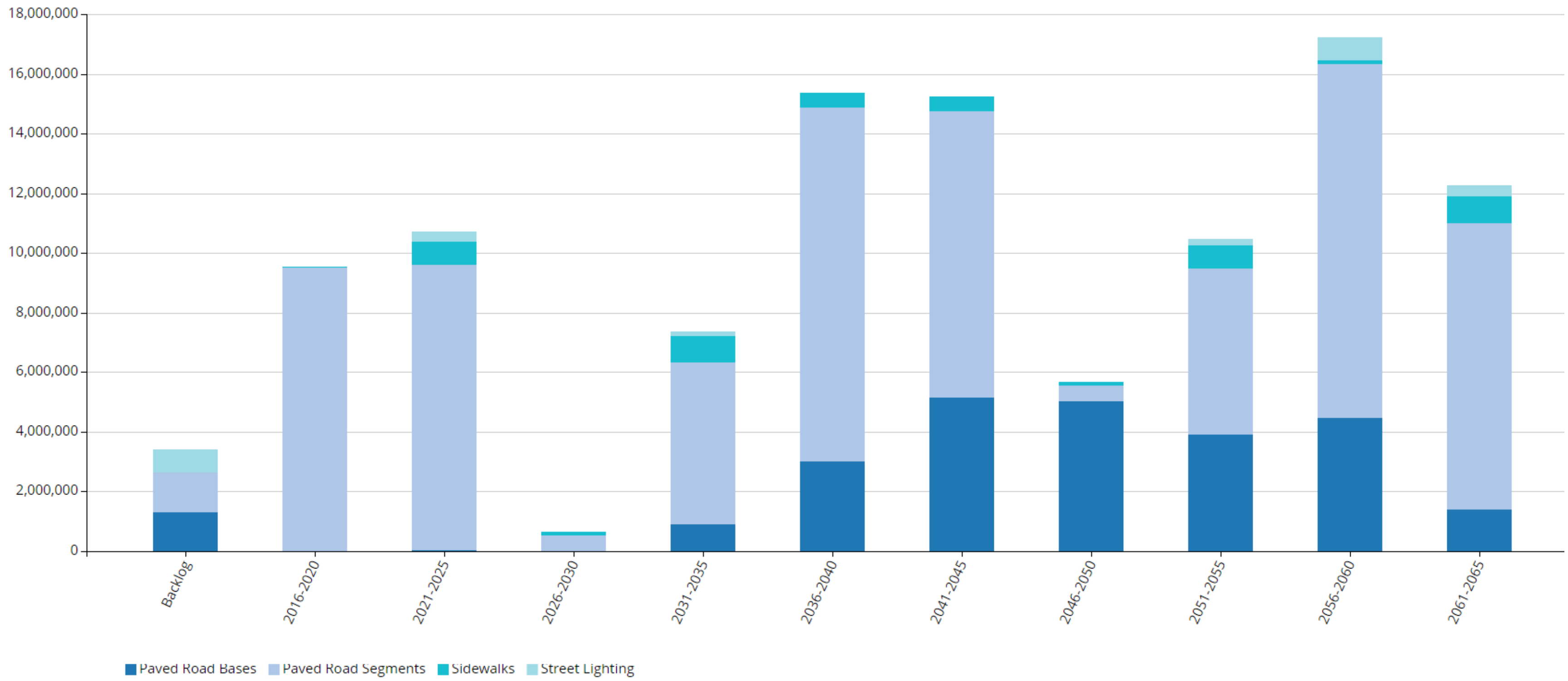


Based on assessed condition, more than 80% of the municipality's roads assets are in good to very good condition; less than 8%, with a valuation of $4 million, are in poor to very poor condition.

1.7 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



In addition to the backlog of $3.4 million, investments needs for the road network assets are forecasted to be $9.5 million over the next five years. An additional $10.8 million will be required between 2021 and 2025. The period of largest investment requirements will be 2056-2060, when more than $17 million will be required. The municipality's annual requirements for its road network total $2.1 million. At this level, funding is sustainable and replacement needs can be met as they arise without the need for deferring projects. However, the municipality is currently allocating $1.7 million, leaving an annual deficit of $403,000.

1.8 Recommendations – Roads

- There are significant needs to be addressed in the next 10 years, therefore, the condition assessment data, along with risk management strategies, should be reviewed together to aid in prioritizing overall needs for rehabilitation and replacement.

- In addition to the above, a tailored life cycle activity framework should also be developed to promote standard life cycle management of the road network as outlined further within the “Asset Management Strategy” section of this AMP.

- 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.

- 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 7 illustrates 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 $25 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.

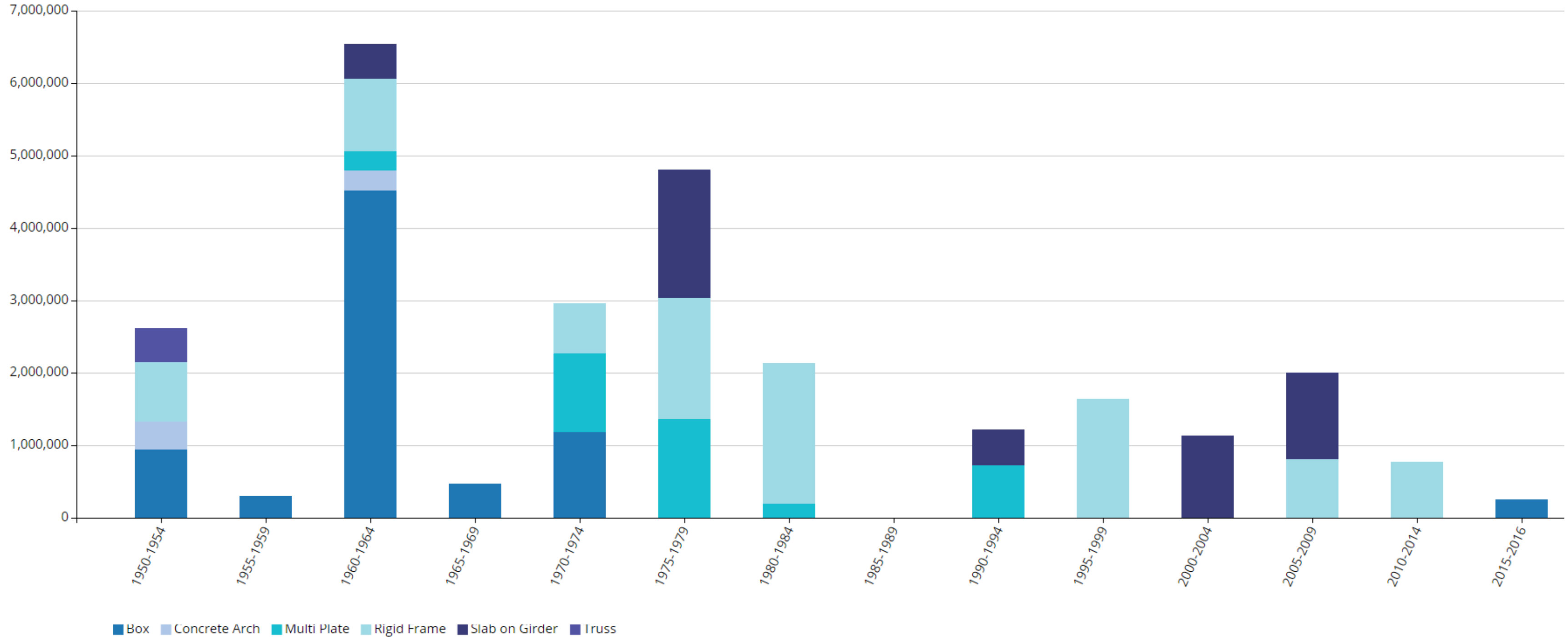
TABLE 7 KEY ASSET ATTRIBUTES – BRIDGES & CULVERTS

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Overall Replacement Cost
Bridges & Culverts	Bridges - Box	32	50	NRBCPI	$7,373,319
	Bridges - Concrete Arch	1	50	NRBCPI	$282,404
	Bridges - Multi Plate	11	50	NRBCPI	$3,635,633
	Bridges - Rigid Frame	16	50	NRBCPI	$8,882,446
	Bridges - Slab on Girder	7	50	NRBCPI	$4,388,200
	Bridges - Truss	1	50	NRBCPI	$480,501
				Total	$25,042,503

2.4 Historical Investment in Infrastructure

In this section, we provide the installation profile and useful life consumption levels using in-service data obtained from CityWide® Tangible Assets. Together, these graphs can illustrate infrastructure investment trends and upcoming needs at the municipality. Figure 13 illustrates the historical levels of investment in the municipality's bridges & culverts.

FIGURE 13 HISTORICAL INVESTMENT - BRIDGES & CULVERTS

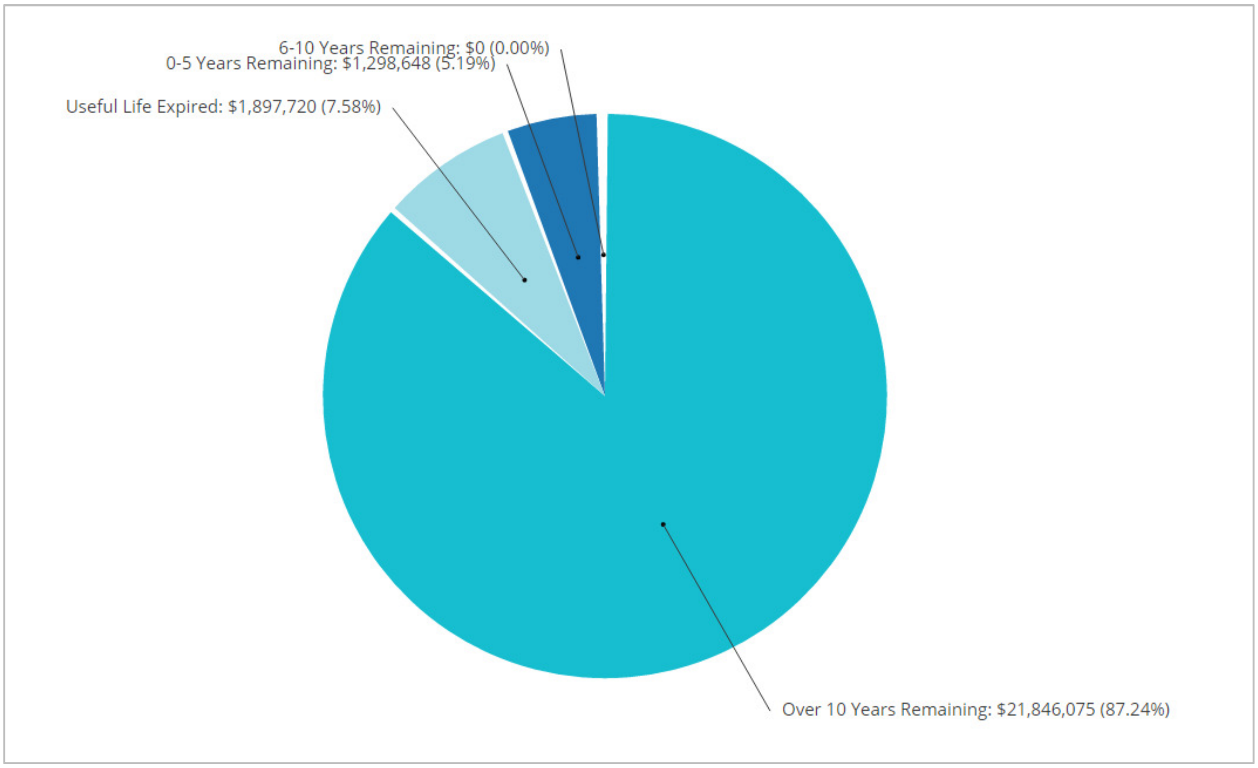


Mirroring its investments in roads during the 1960s, the municipality's expenditures on bridges totalled $6.5 million between 1960 and 1964. Investment have fluctuated since, although they have generally declined. Since 2000, expenditures on bridges have totalled approximately $4 million.

2.5 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their 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

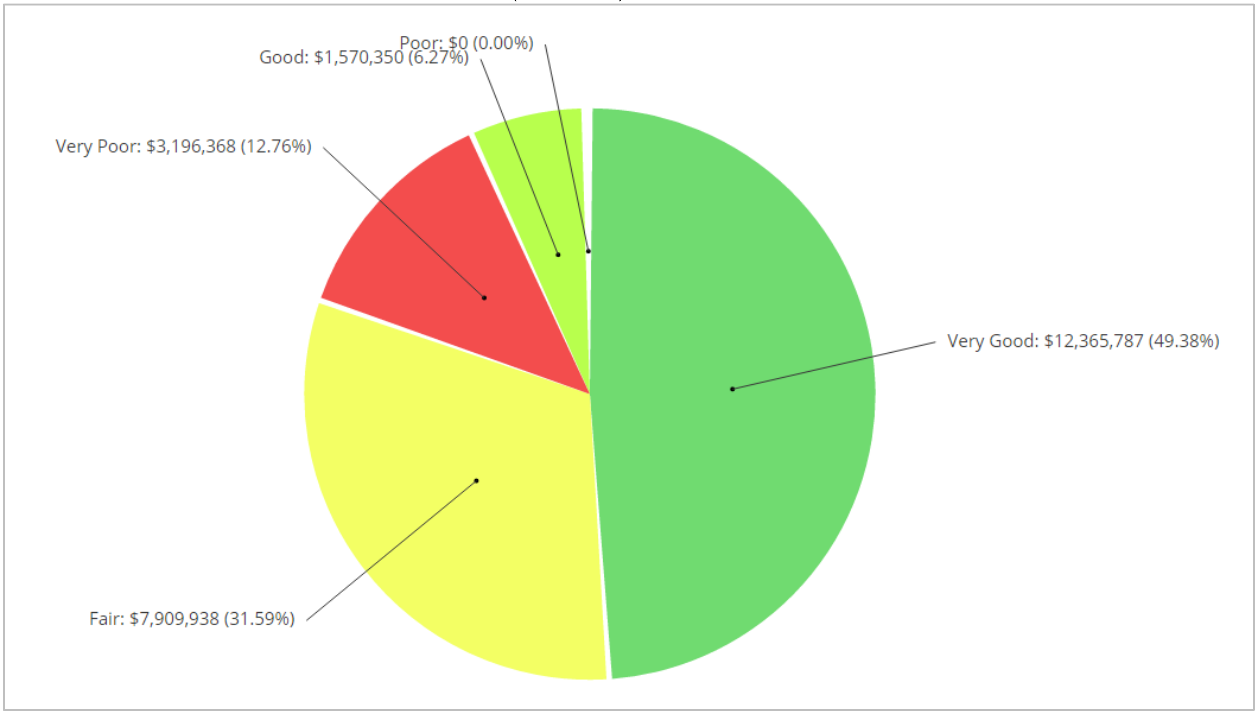


Nearly 90% of the municipality's bridges & culverts have at least 10 years of useful life remaining. However, 8% of assets, with a valuation of $1.9 million remain in operation beyond their established useful life. An additional 5% will reach the end of their useful life in the next five years.

2.6 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)

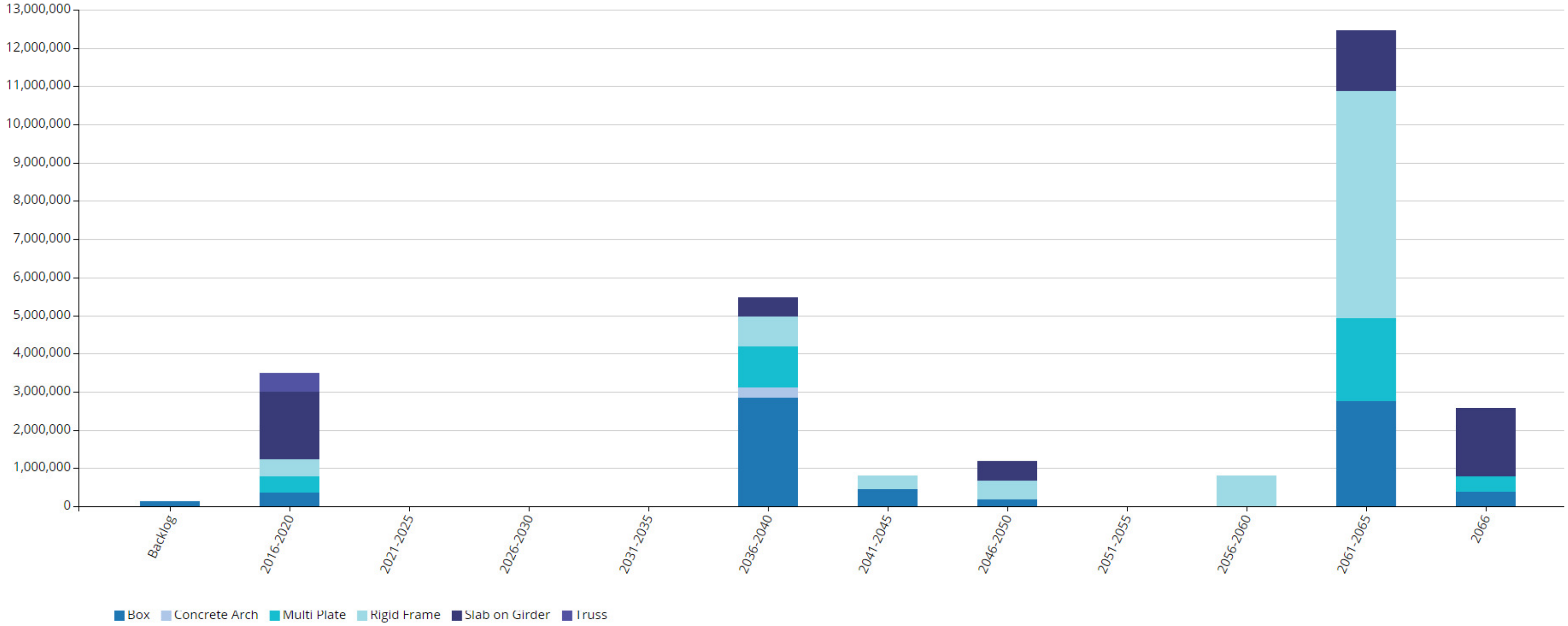


Based on assessed condition, 13% of the bridges and culverts assets are in very poor condition. While a relatively small percentage, these assets have a valuation of $3.2 million. Given the critical nature of bridges and culverts, these assets should be prioritized for further review.

2.7 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's bridges & culverts. 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 16 FORECASTING REPLACEMENT NEEDS - BRIDGES & CULVERTS



While there is a minimal backlog of $126,000, the municipality's short-term replacement needs will total $3.5 million between 2016 and 2020. As assets reach the end of their useful life, replacement needs will rise rapidly to more than $5 million between 2036-2040, and $12 million between 2061-2065. The municipality's annual requirements for its bridges & culverts total $501,000. At this level, funding is sustainable and replacement needs can be met as they arise without the need for deferring projects. However, the municipality is currently allocating $376,000, leaving an annual deficit of $125,000.

2.8 Recommendations – Bridges & Culverts

- The majority of the municipality's bridges & culverts are in good to very good condition. To address the backlog of $675,000, the municipality should integrate a risk management framework with its OSIM 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.

- In addition, to maintain the overall good condition of structures, the municipality should continue to address both the capital and maintenance requirements of the bridge and culvert structures as outlined and listed within the OSIM engineering reports. The short and long term budgets should be based on these listings.

- 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 8 illustrates key asset attributes for the municipality's water services assets, including quantities of various assets, their useful life, replacement costs, and the valuation method by which the replacement costs were derived. In total, the municipality's water services assets are valued at $56 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.

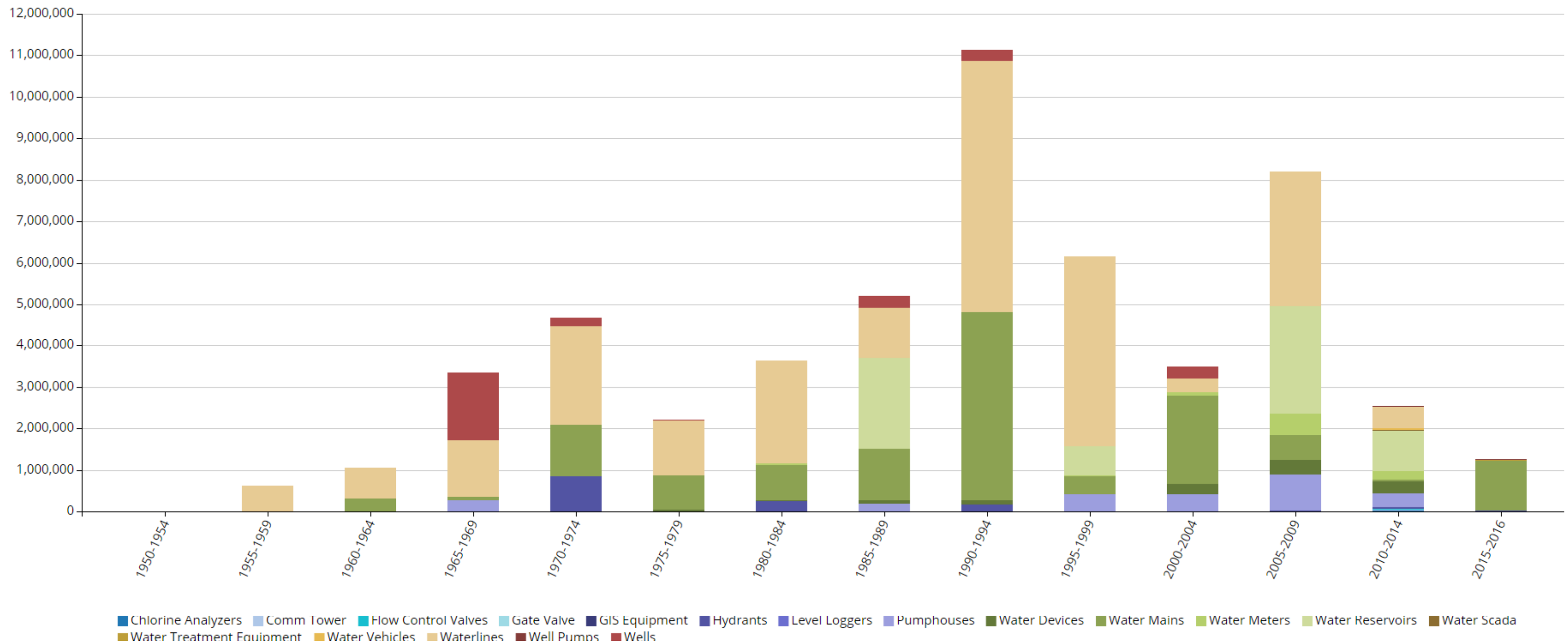
TABLE 8 KEY ASSET ATTRIBUTES – WATER

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Overall Replacement Cost
Water Services	Hydrants	363	40	NRBCPI	$1,285,199
	Pumphouses	10	80	NRBCPI	$2,508,349
	Wells	18	40	NRBCPI	$2,716,376
	Chlorine Analyzer	7	10	NRBCPI	$33,714
	Portable Chlorine Analyzer	1	30	NRBCPI	$1,392
	Water Scada	2	30	NRBCPI	$28,746
	Well Pumps	5	30	NRBCPI	$42,413
	Flow Control Valves	4	20	NRBCPI	$22,439
	GIS Equipment	5	4	NRBCPI	$10,733
	Level Loggers	2	30	NRBCPI	$6,500
	Communications Tower	1	10	NRBCPI	$10,982
	Water Devices	32	30	NRBCPI	$1,135,755
	Water Reservoirs	8	80	NRBCPI	$6,493,396
	Water Treatment Equipment	8	4, 15, 25, 40, 60, 100	NRBCPI	$26,779
	Waterlines	46499m	80	NRBCPI	$25,517,100
	Water Mains (50mm)	185m	80	NRBCPI	$66,350
	Water Mains (100mm)	3382m	80	NRBCPI	$1,047,763
	Water Mains (150mm)	18135m	80	NRBCPI	$8,713,331
	Water Mains (200mm)	3510m	80	NRBCPI	$1,642,567
	Water Mains (250mm)	845m	80	NRBCPI	$373,891
	Water Mains (300mm)	4955m	80	NRBCPI	$3,619,903
	Water Mains (Unknown)	635m	80	NRBCPI	$95,460
	Gate Valve	1	20	NRBCPI	$1,296
	Water Meters	19	30	NRBCPI	$860,878
	Water Services Vehicles	2	5, 15	CPI	$34,307
				Total	**$56,295,619**

3.2 Historical Investment in Infrastructure

In this section, we provide the installation profile and useful life consumption levels using in-service data obtained from CityWide® Tangible Assets. Together, these graphs can illustrate infrastructure investment trends and upcoming needs at the municipality. Figure 17 illustrates the historical levels of investment in the municipality's water services assets.

FIGURE 17 HISTORICAL INVES TMENT – WATER NETWORK

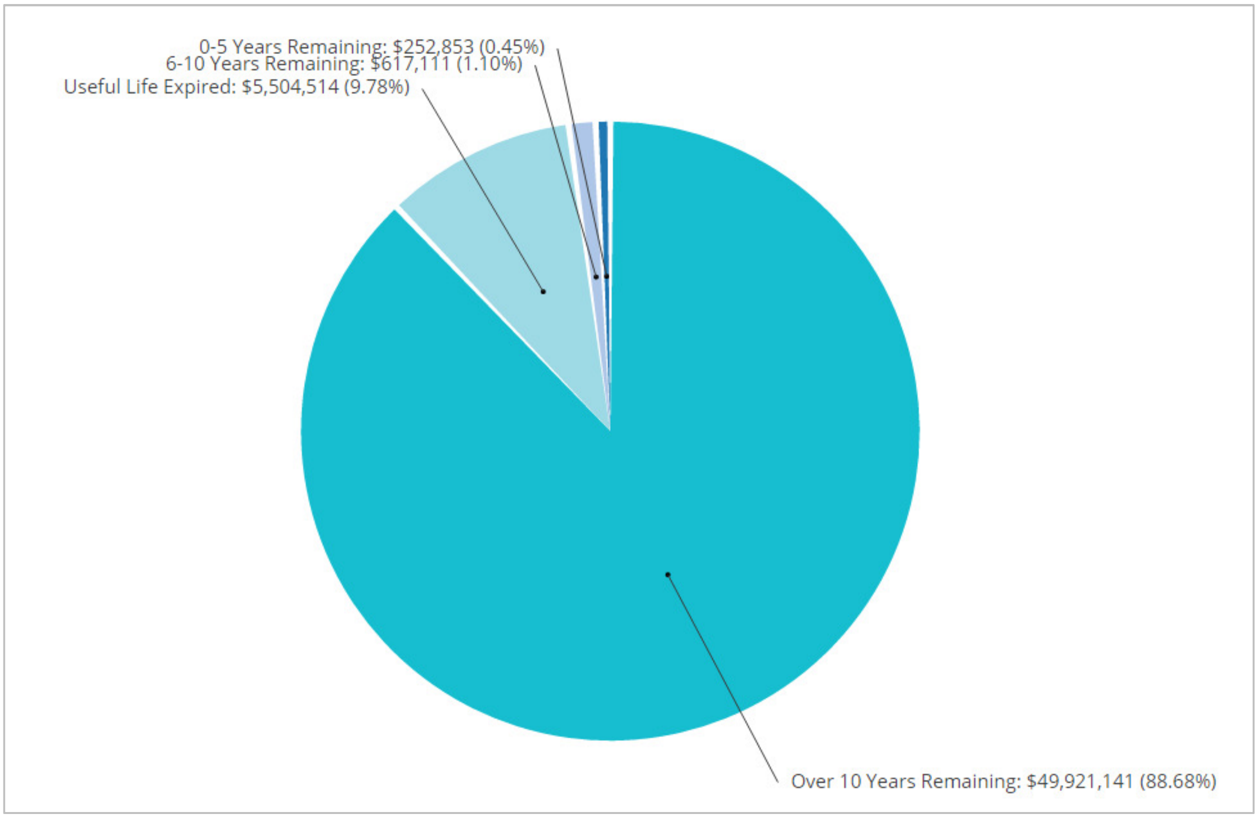


The early 1990s represented the period of largest investments in the municipality's water services, with expenditures totaling more than $11 million, with waterlines and mains comprising the vast majority. Since 2005, the period of second largest investments, investments have totaled more than $12 million, primarily in the municipality's water reservoir and water lines.

3.3 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their 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 water services.

FIGURE 18 USEFUL LIFE CONSUMPTION – WATER NETWORK

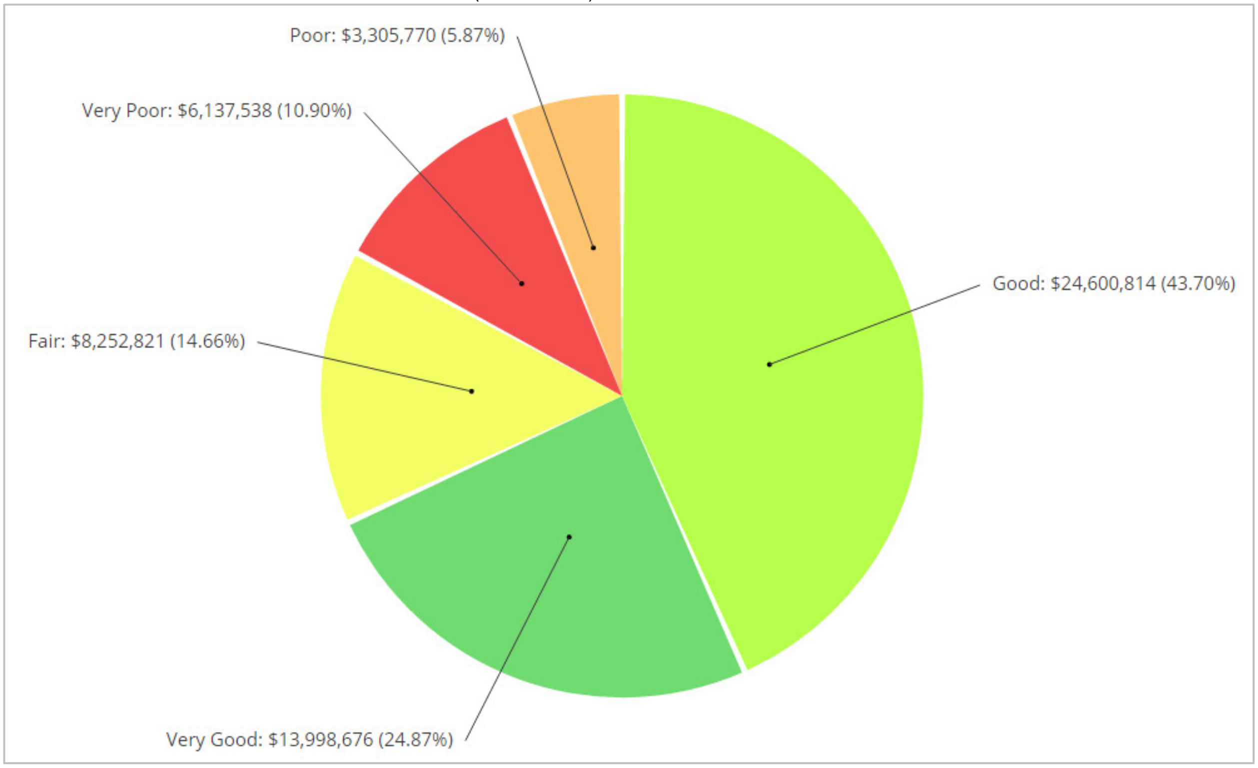


Nearly 90% of the municipality's water services assets have at least 10 years of useful life remaining. However, 10%, with a valuation of more than $5.5 million remain in operation beyond their useful life.

3.6 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.

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

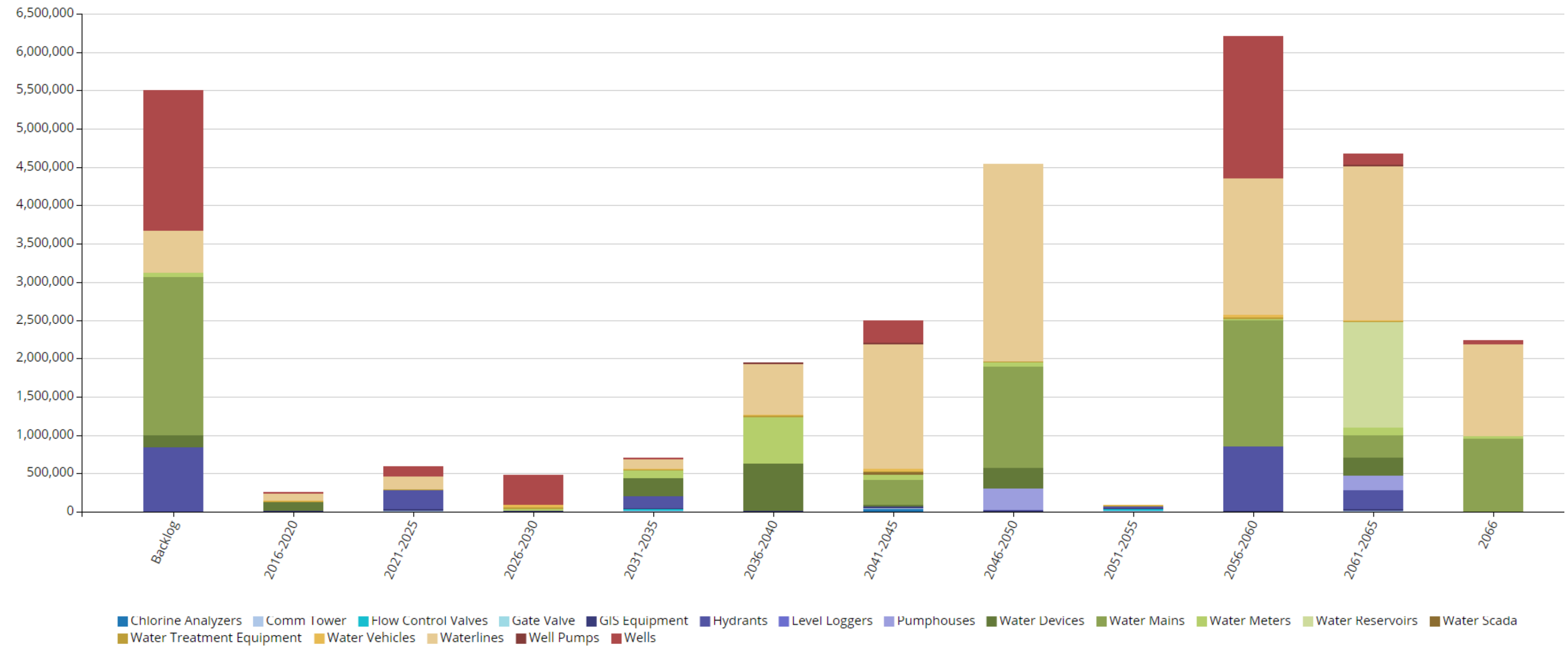


Based on age data, while nearly 70% of water assets, valued at $48 million, are in good to very good condition, more than 16%, with a valuation of $9.4 million are in poor to very poor condition.

3.7 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's water services 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 20 FORECASTING REPLACEMENT NEEDS – WATER NETWORK



In addition to a significant backlog totaling $5.5 million, the municipality's replacement needs will total less than $300,000 over the next five years. Between 2021 and 2025, replacement needs will be less than $600,000. Generally, these replacement needs are forecasted to increase over the next 30 years, peaking at more than $4.5 million between 2046-2050. The municipality's annual requirements for its water network total $804,000. At this level, funding is sustainable and replacement needs can be met as they arise without the need for deferring projects. The municipality is currently allocating $820,000, leaving an annual surplus of $16,000. While meeting its annual requirements may eliminate the need defer replacement projects in the pipeline, significant additional resources will be required to eliminate existing backlogs.

3.8 Recommendations – Water

- Similar to bridges & culverts, water services are uniquely consequential to a community's wellbeing. In Clearview, water services also comprise the largest share of the overall asset portfolio. While age-based data indicates that the majority of water assets are in good to very good condition, field inspection may suggest otherwise. Field inspections also will provide a more accurate estimate of the asset conditions and their minimum sustainable funding levels. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- While water facilities undergo visual inspections by structural engineer upon request, the municipality should establish a more strategic and systematic assessment schedule. 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 $5.5 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 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. These activities should be designed to maintain existing LOS, and should reflect the overarching priorities of the municipality. 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.

- This AMP and any LOS and KPIs established should be updated annually to gauge the performance of the municipality against quantified targets.

4 Wastewater Services

4.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 9 Table 1illustrate key asset attributes for the municipality's wastewater assets, including quantities of various assets, their useful life, replacement costs, and the valuation method by which the replacement costs were derived. In total, the municipality's wastewater services assets are valued at $55 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.

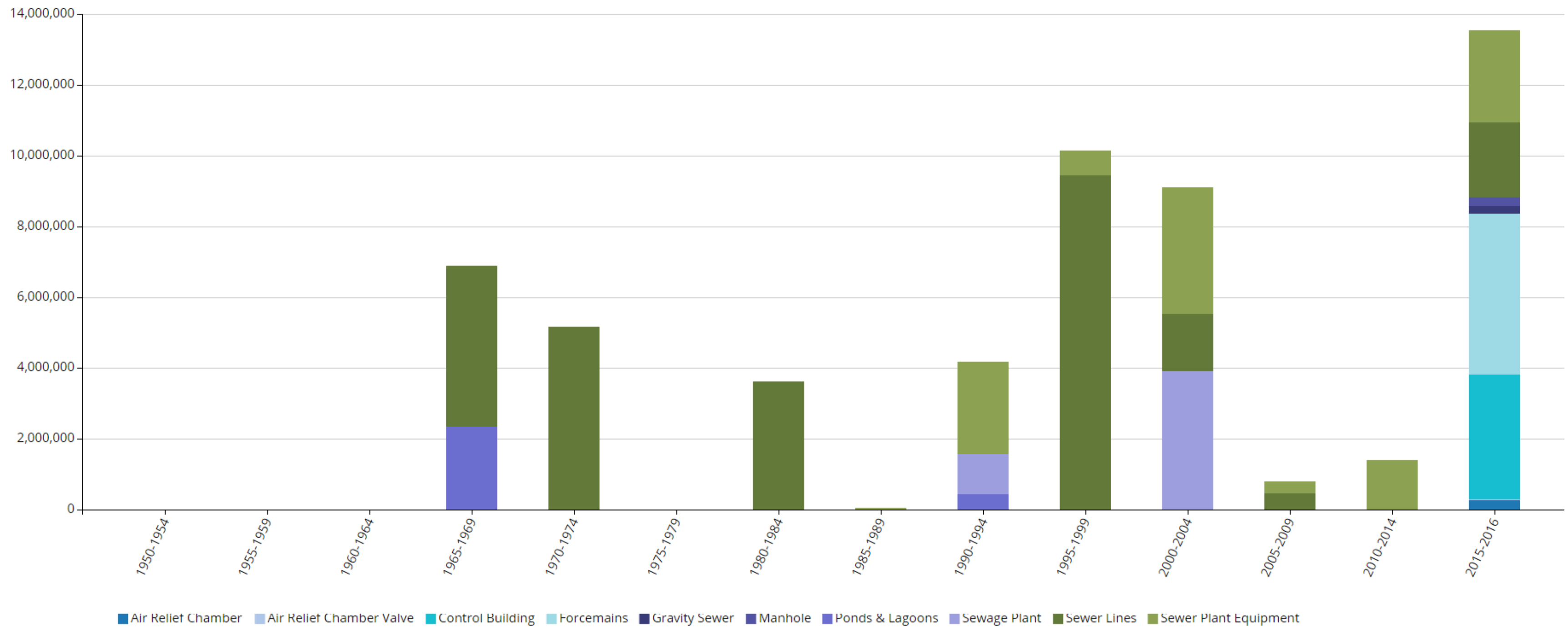
TABLE 9 KEY ASSET ATTRIBUTES – WASTEWATER SERVICES

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Overall Replacement Cost
Wastewater Services	Ponds and Lagoons	6	75	NRBCPI	$2,774,529
	Air Relief Chamber	4	75	NRBCPI	$257,872
	Air Relief Chamber Valve	8	25	NRBCPI	$21,780
	Sewer Lines	36234m	75	NRBCPI	$26,982,213
	Manholes	23	75	NRBCPI	$227,542
	Machinery & Equipment	84	8, 10, 15, 20, 25, 30, 40, 45, 75	NRBCPI	$11,278,697
	Forcemains	13300m	75	NRBCPI	$4,541,714
	Sewage Plant (Mechanical & Electrical)	1	60	NRBCPI	$5,029,949
	Sewage Plant (Structure)	1	60	NRBCPI	
	Sewage Plant (Headworks)	1	60	NRBCPI	
	Sewer Plant Control Building	1	80	NRBCPI	$3,532,869
	Gravity Sewer	200m	75	NRBCPI	$227,990
				Total	$54,875,155

4.2 Historical Investment in Infrastructure

In this section, we provide the installation profile and useful life consumption levels using in-service data obtained from CityWide® Tangible Assets. Together, these graphs can illustrate infrastructure investment trends and upcoming needs at the municipality. Figure 21 illustrates the historical levels of investment in the municipality's wastewater assets.

FIGURE 21 HISTORICAL INVESTMENT – WASTEWATER SERVICES

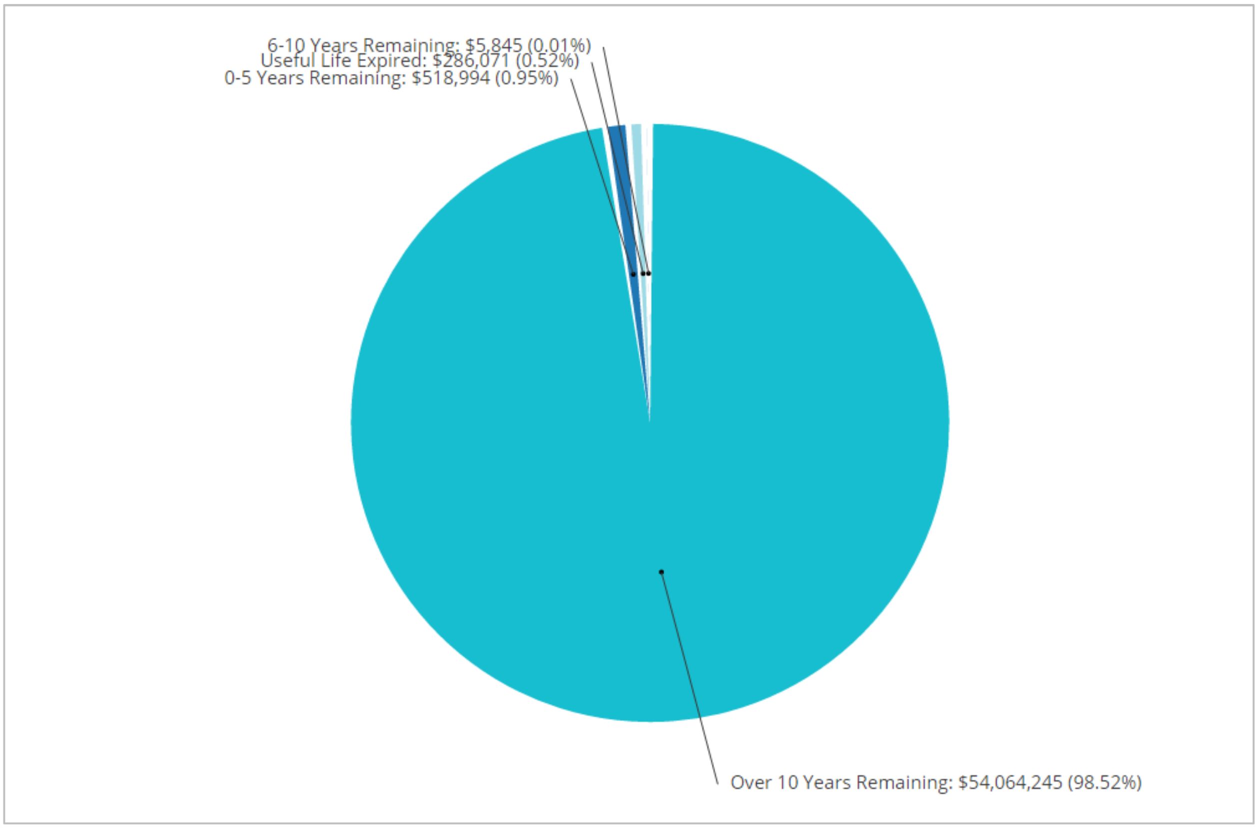


The municipality's investments in wastewater have fluctuated over the decades, with major expenditures occurring in the late 1960s and 1990s. Since 2000, investments in wastewater have totaled approximately $25 million. Since 2015, the municipality has made its largest investments in wastewater assets, totaling nearly $14 million, with forcemains and control building comprising the majority portion of expenditures.

4.5 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their 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 wastewater services .

FIGURE 22 USEFUL LIFE CONSUMPTION – WASTEWATER SERVICES

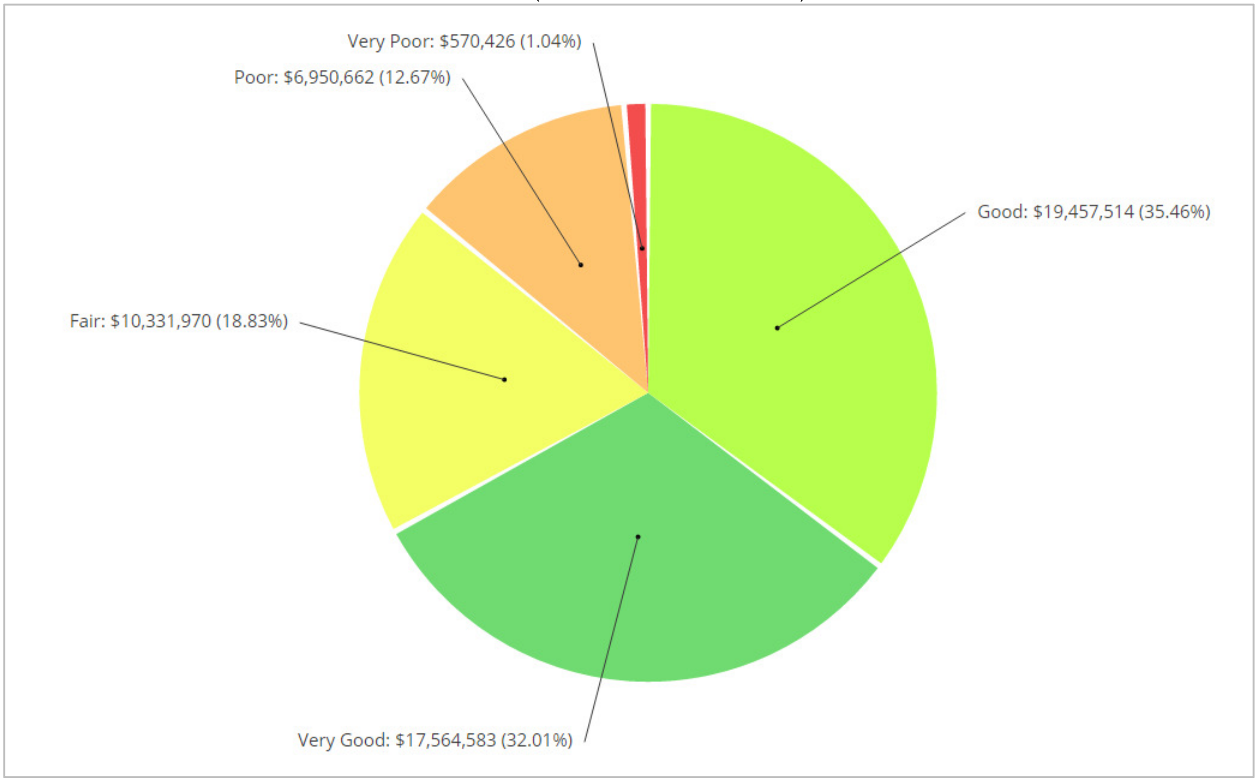


Nearly 100% of wastewater assets have at least 10 years of useful life remaining. Less than 1% remain in operation beyond their established useful life.

4.6 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's wastewater 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.

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

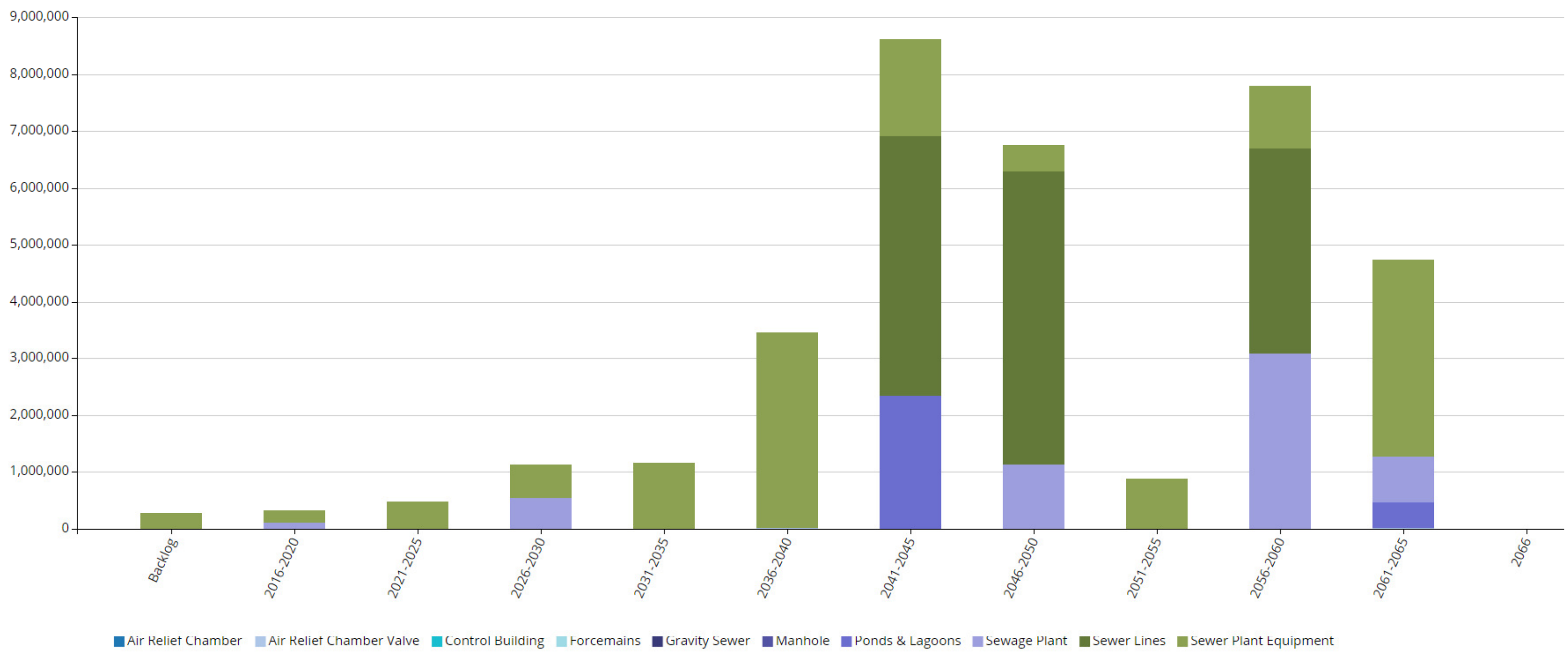


Based on assessed condition, while nearly 70% of wastewater assets are in good to very good condition, 13%, with a valuation of $7.6 million are poor to very poor condition.

4.7 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's wastewater services 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 24 FORECASTING REPLACEMENT NEEDS – WASTEWATER SERVICES



The current backlog for the municipality's wastewater services is $286,000. While replacements needs will be relatively small over the next 15 years, they will begin to rise rapidly in 20 years. Investment needs will total $3.5 million between 2036 and 2040, and nearly $9 million between 2041 and 2045. The municipality's annual requirements for its wastewater services total $928,000. At this level, funding is sustainable and replacement needs can be met as they arise without the need for deferring projects. However, the municipality is currently allocating only $69,000, leaving an annual surplus of $859,000.

4.8 Recommendations – Wastewater

- The majority of the municipality's wastewater mains have condition data available. The municipality should continue its assessment program and dedicate a portion of capital funding to this initiative.

- While wastewater facilities undergo visual inspections by structural engineers upon request, the municipality should establish a more strategic and systematic assessment schedule. 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 should establish technical and customer-oriented levels of service (LOS) and their associated KPIs. The performance of the municipality's wastewater 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 wastewater assets. These activities should be designed to maintain existing levels of service, and should reflect the overarching priorities of the municipality. 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.

- This AMP and any LOS and KPIs established should be updated annually to gauge the performance of the municipality against quantified targets.

5 Stormwater Services

5.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 10 Table 1illustrates key asset attributes for the municipality's stormwater assets, including quantities of various assets, their useful life, replacement costs, and the valuation method by which the replacement costs were derived. In total, the municipality's stormwater services assets are valued at $8.1 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.

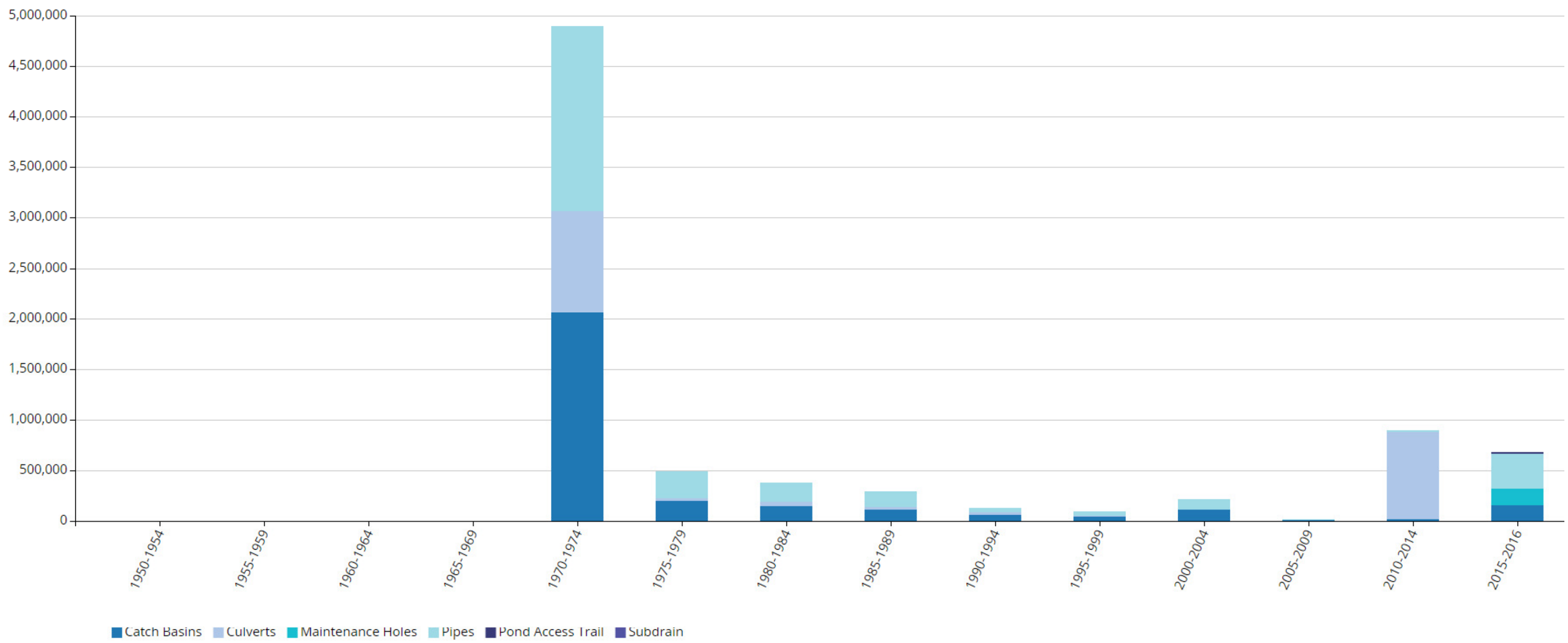
TABLE 10 KEY ASSET ATTRIBUTES – STORMWATER SERVICES

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Overall Replacement Cost
Stormwater Services	Catch Basins	280	50	NRBCPI	$2,912,367
	Culverts	208	50	NRBCPI	$1,989,204
	Pipes	409	50	NRBCPI	$2,997,101
	Maintenance Holes	40	50	NRBCPI	$163,334
	Subdrain	47m	50	NRBCPI	$696
	Pond Access Trail	1020m	20	NRBCPI	$19,628
				Total	$8,082,330

5.4 Historical Investment in Infrastructure

In this section, we provide the installation profile and useful life consumption levels using in-service data obtained from CityWide® Tangible Assets. Together, these graphs can illustrate infrastructure investment trends and upcoming needs at the municipality. Figure 21 illustrates the historical levels of investment in the municipality's stormwater assets.

FIGURE 25 HISTORICAL INVESTMENT - STORM

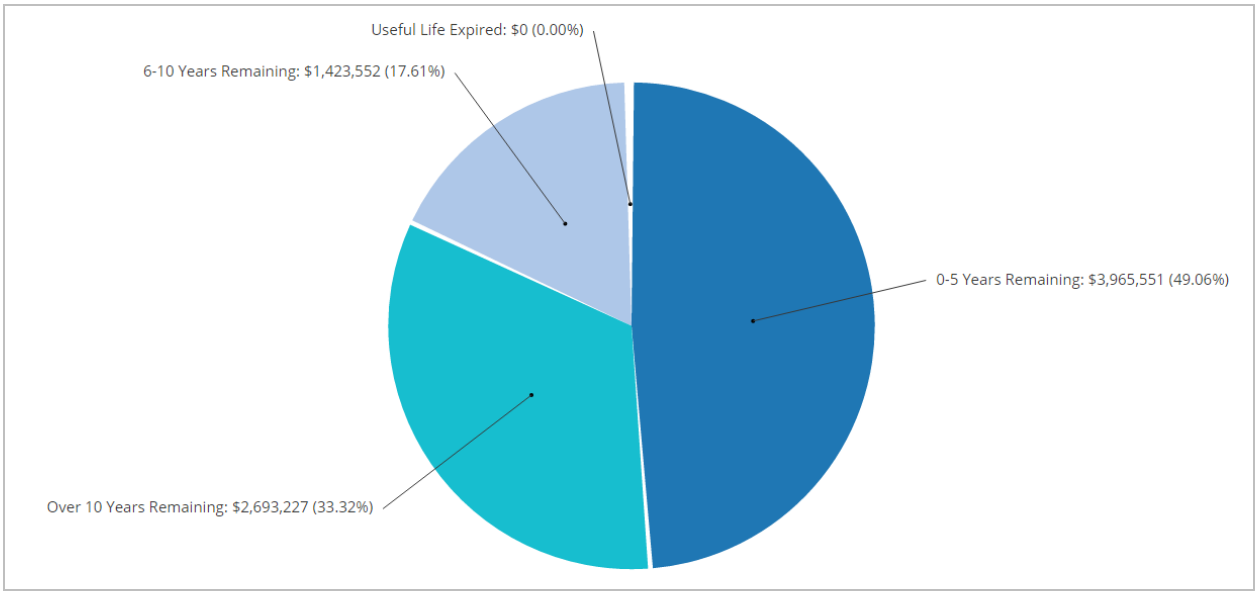


The largest expenditures in the municipality's stormwater services, totaling nearly $5 million, occurred in the early 1970s, with investments rapidly declining over the proceeding decades. Since 2010, investments have told $1.6 million.

5.5 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their 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 stormwater services .

FIGURE 26 USEFUL LIFE CONSUMPTION – STORMWATER SERVICES

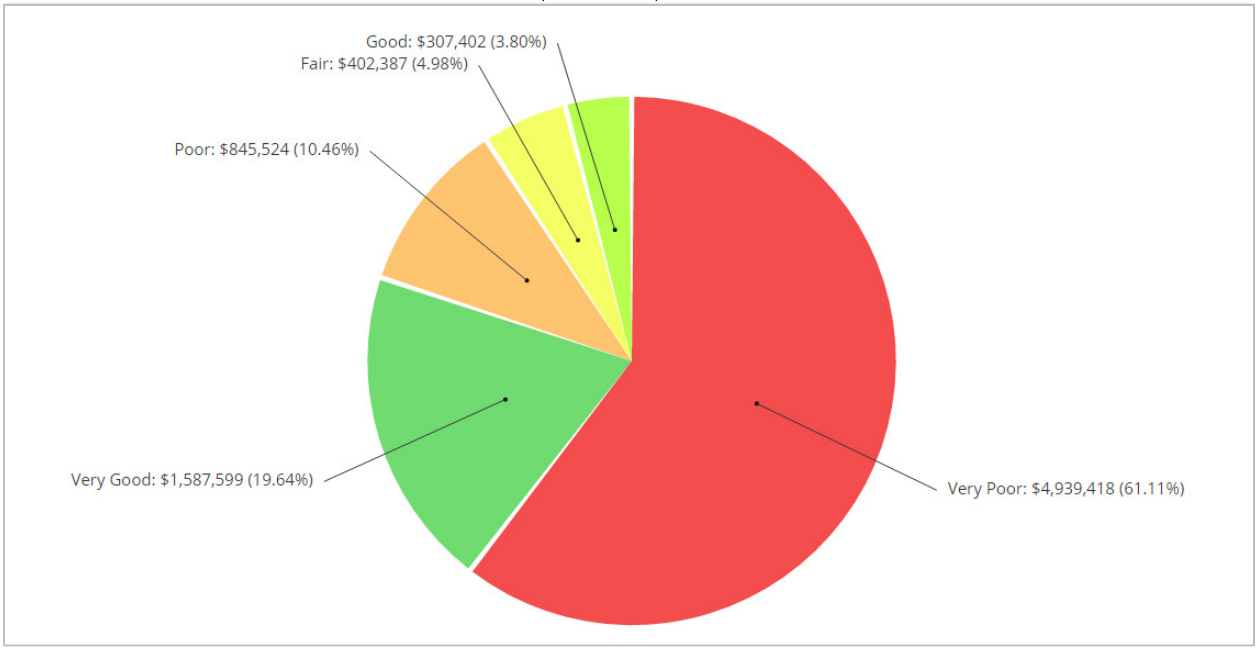


While 33% of stormwater service has at least 10 years remaining, 50%, with a valuation of $4 million will reach the end of their useful life in the next five years.

5.6 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's stormwater services. As no observed condition data was provided, age-based data is used to approximate condition levels.

FIGURE 27 ASSET CONDITION – STORMWATER SERVICES (AGE-BASED)

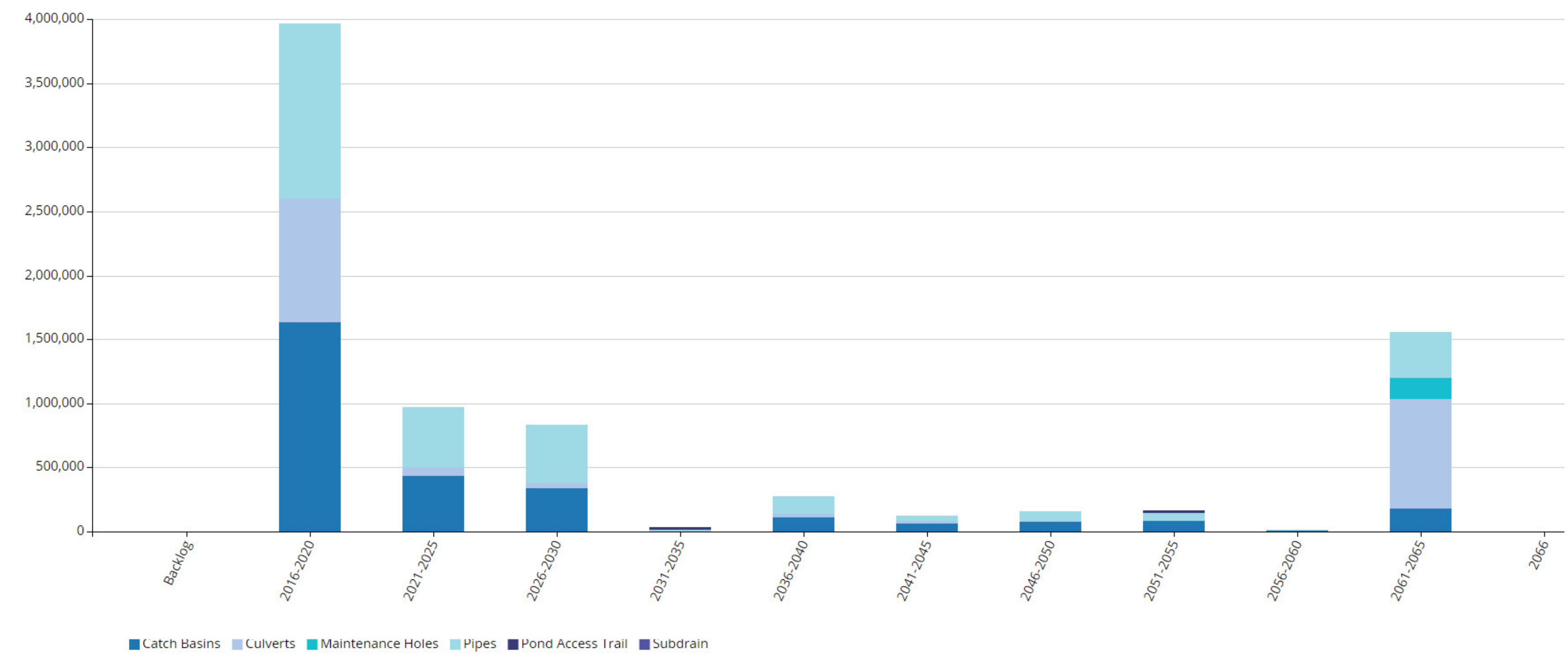


Based on age data, more than 70% of the municipality's stormwater assets, valued at $5 million, are in poor to very poor condition. Approximately 20% are in good to very good condition.

5.7 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's stormwater services 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 28 FORECASTING REPLACEMENT NEEDS – STORMWATER SERVICES



While there is no backlog associated with stormwater services, as assets near the end of their useful life, the municipality's five year replacement needs will total $4 million, as indicated by age-based data. An additional $1.6 million will be required between 2021 and 2030. The municipality's annual requirements for its stormwater services total $162,000. At this level, funding is sustainable and replacement needs can be met as they arise without the need for deferring projects. However, the municipality is allocating $0, leaving an annual deficit of $162,000.

5.8 Recommendations – Storm

- Based on age data, a significant majority of stormwater services is in poor to very poor condition. Further, nearly $4 million will be required in replacement expenditures in the next five years. The municipality should establish a condition assessment program which will provide a more accurate estimate of the condition of assets and the minimum sustainable funding levels required. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- Age-based data indicates that there is no backlog associated with stormwater services. 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.

- 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 wastewater assets.

- The municipality should establish a systematic lifecycle activity framework that reflects the consumption of its storm assets. These activities should be designed to maintain existing levels of service, and should reflect the overarching priorities of the municipality. See Section 3, 'Lifecycle Framework' in the 'Asset Management Strategies' chapter.

- The municipality's confidence in its stormwater services data is very low, indicative of issues with its credibility and accuracy. A data verification policy, when implemented, can mitigate these issues over time.

- 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

Tables 11 and 12 Table 1illustrate key asset attributes for the municipality's buildings assets, including quantities of various assets, their useful life, replacement costs, and the valuation method by which the replacement costs were derived. In total, the municipality's buildings assets are valued at $8 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 KEY ASSET ATTRIBUTES - INVENTORY AND REPLACEMENT COSTS: BUILDINGS

Asset Type	Asset Component	Quantity	Valuation Method	2016 Overall Replacement Cost
Buildings	Administration Building (Structure, HVAC, Roof)	2	NRBCPI	$4,005,373
	Arena (Structure, Roof, HVAC, Flooring, Solar Panels)	2	NRBCPI	$6,115,506
	Chapel	1	NRBCPI	$297,836
	Fire Hall (Structure, Roof, HVAC)	5	NRBCPI	$5,428,052
	Halls (Structure, HVAC, Roof, Solar Panels)	8	NRBCPI	$1,295,345
	Huron Street Buildings (HVAC, Roof, Structure, Solar Panels, Storage Facility)	3	NRBCPI	$261,350
	Library (HVAC, Roof, Structure)	3	NRBCPI	$1,433,975
	Medical Centre (Roof, Fixtures, Electrical, Structure, HVAC, Solar Panels)	1	NRBCPI	$1,267,629
	Public Works Buildings (Structure, HVAC, Roof)	2	NRBCPI	$2,796,671
	Sheds (Structure, Roof, HVAC, Solar Panels)	3	NRBCPI	$978,382
	Community/Recreation Buildings (Structure, Roof, HVAC, Log Cabin)	4	NRBCPI	$1,541,413
			Total	$25,421,532

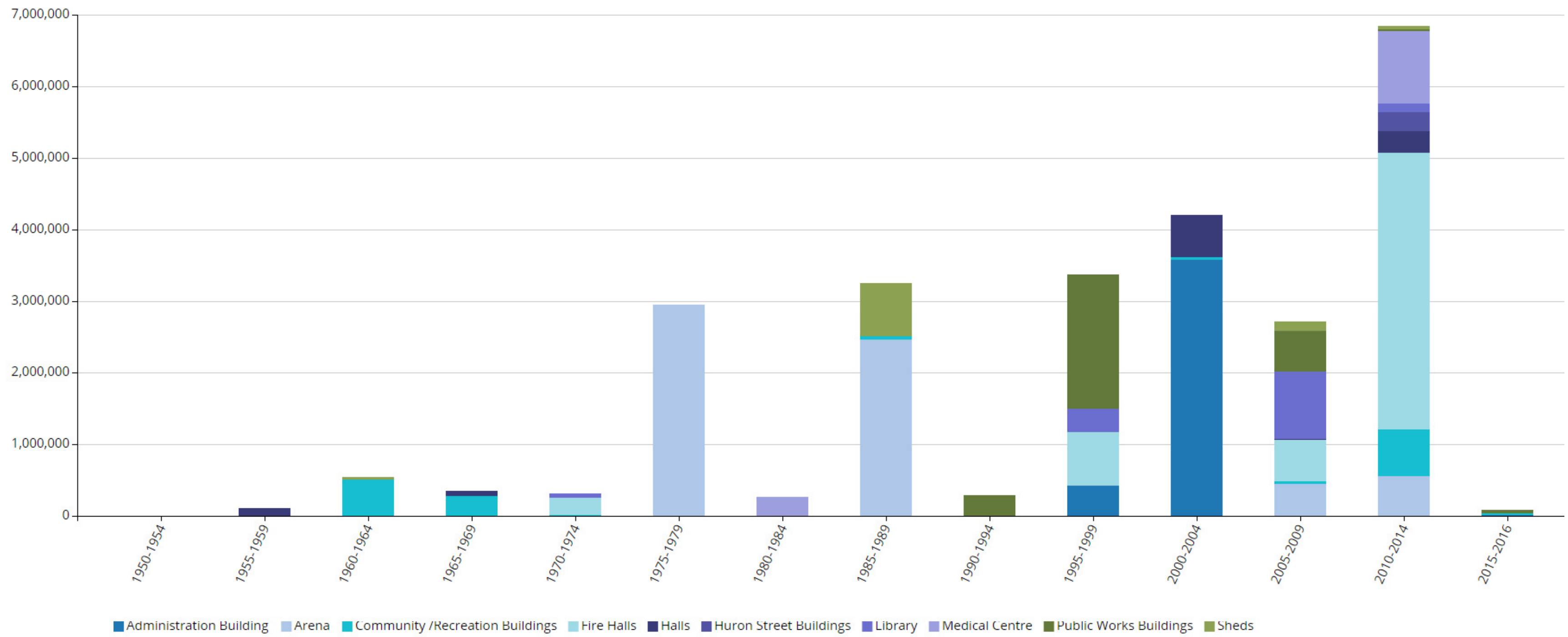
TABLE 12 KEY ASSET ATTRIBUTES - USEFUL LIFE: BUILDINGS

Asset Type	Asset Component	Quantity	Useful Life in Years
Buildings	Structure	25	40, 60
	HVAC	23	30
	Roof	25	20
	Solar Panels	7	20
	Chapel	1	50
	Log Cabin	1	40
	Siding	1	20
	Bandstand	1	40
	Washroom	1	60
	Pavilion	1	40
	Pool	1	50
	Storage Facility	1	60
	Fixtures	1	10
	Maintenance Shed	1	50

6.4 Historical Investment in Infrastructure

In this section, we provide the installation profile and useful life consumption levels using in-service data obtained from CityWide® Tangible Assets. Together, these graphs can illustrate infrastructure investment trends and upcoming needs at the municipality. The chart below illustrates the historical levels of investment in the municipality's buildings assets.

FIGURE 29 HISTORICAL INVESTMENT - BUILDINGS

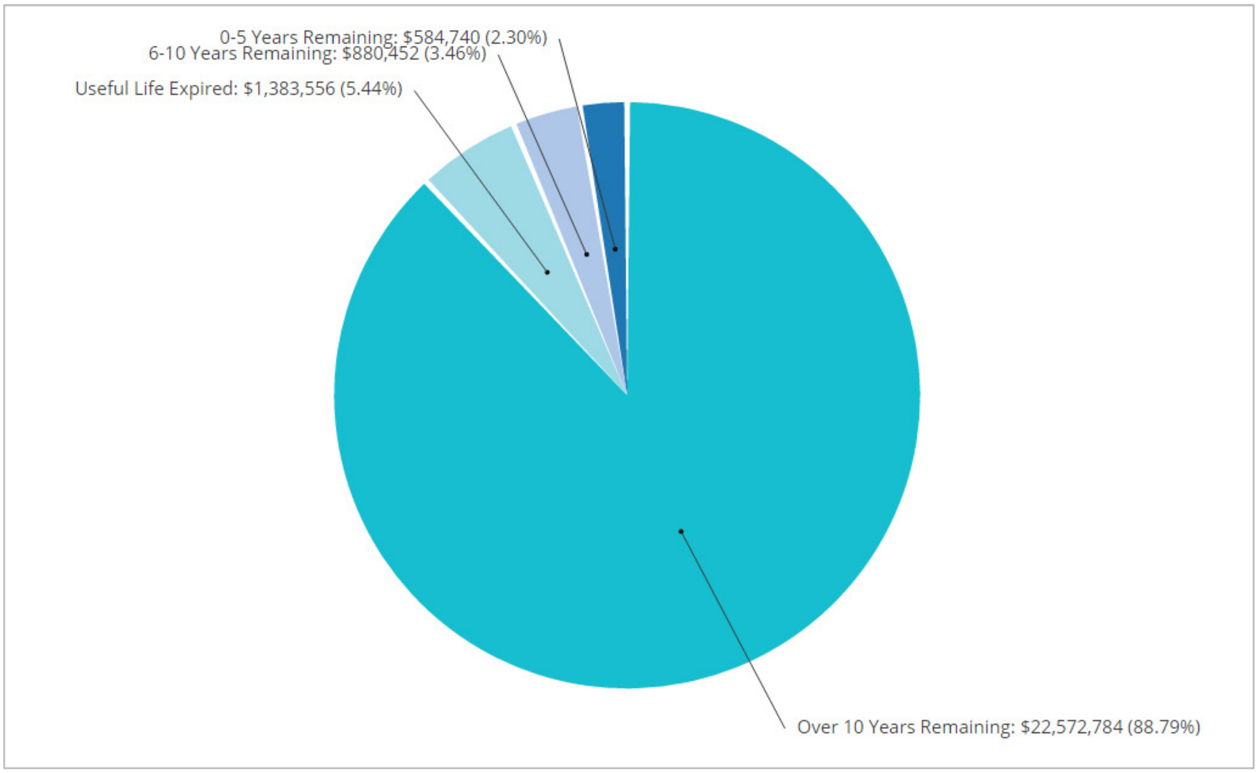


While investments have fluctuated since the 1950s, in general, they have increased. Major investments in buildings have occurred over the last four decades, with arenas, public works, administration buildings, libraries and fire halls comprising the largest shares. Since 2000, investments have totaled $14 million.

6.5 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their 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

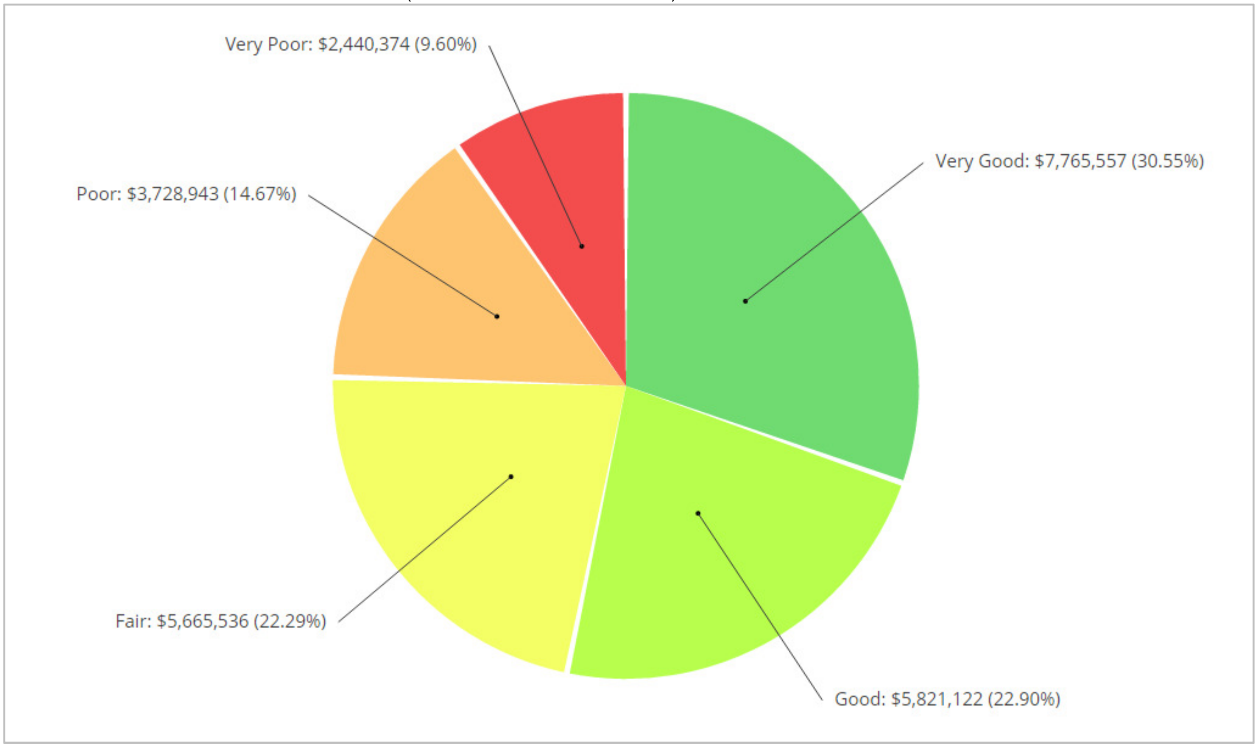


Nearly 90% of the buildings assets have at least 10 years of useful life remaining. However, 5%, valued at $1.4 million, remain in service beyond their established useful life.

6.6 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's wastewater 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.

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

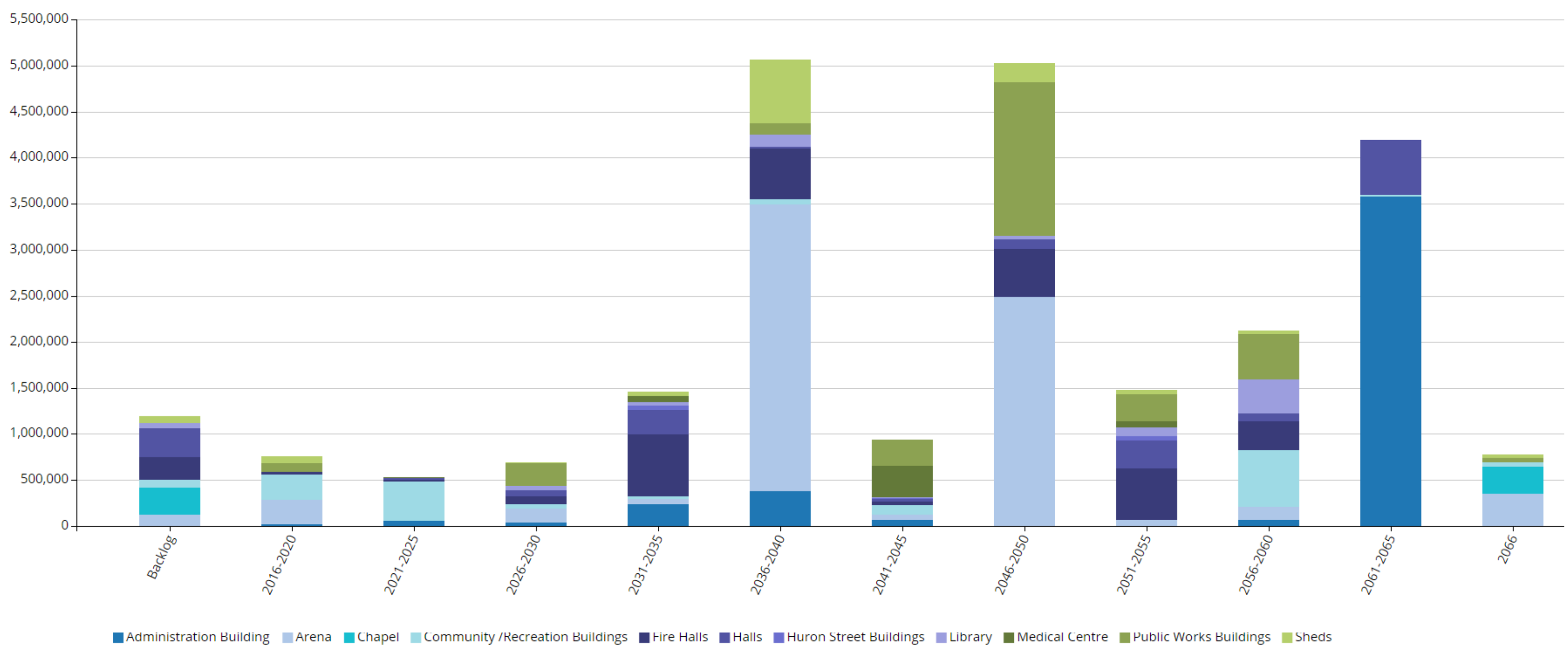


While nearly 60% of the municipality's buildings assets are in good to very good condition, nearly 25%, with a valuation of more than $6 million are in poor to very poor condition.

6.7 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's buildings 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 32 FORECASTING REPLACEMENT NEEDS – BUILDINGS



In addition to an infrastructure backlog totalling nearly $1.2 million, the municipality will need to invest $1.3 million within the next 10 years to meet replacement needs. Community, recreation buildings and fire halls will comprise the majority of replacement related expenditures. These requirements will continue to rise rapidly, peaking at more than $5 million between 2036 and 2040, of which more than $3 million will be allocated to arenas. The municipality's annual requirements for its buildings total $547,000. At this level, funding is sustainable and replacement needs can be met as they arise without the need for deferring projects. The municipality is allocating $799,000, leaving an annual surplus of $252,000. However, existing backlogs will require additional funding to be injected in to the municipality's buildings assets to bring the infrastructure to a state of good repair.

6.8 Recommendations – Buildings

- While the municipality is fully funding its buildings assets, there is a backlog totaling $1.2 million. Conducting comprehensive condition assessments and integrating this data with a risk management framework will help the municipality obtain a more accurate indication of the backlog, and allow the municipality to prioritize its buildings related capital expenditures 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 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. These activities should be designed to maintain existing levels of service, and should reflect the overarching priorities of the municipality. 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.

- 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 13 illustrates key asset attributes for the municipality's machinery & equipment assets, including quantities of various assets, their useful life, replacement costs, and the valuation method by which the replacement costs were derived. In total, the municipality's machinery & equipment assets are valued at $7.5 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.

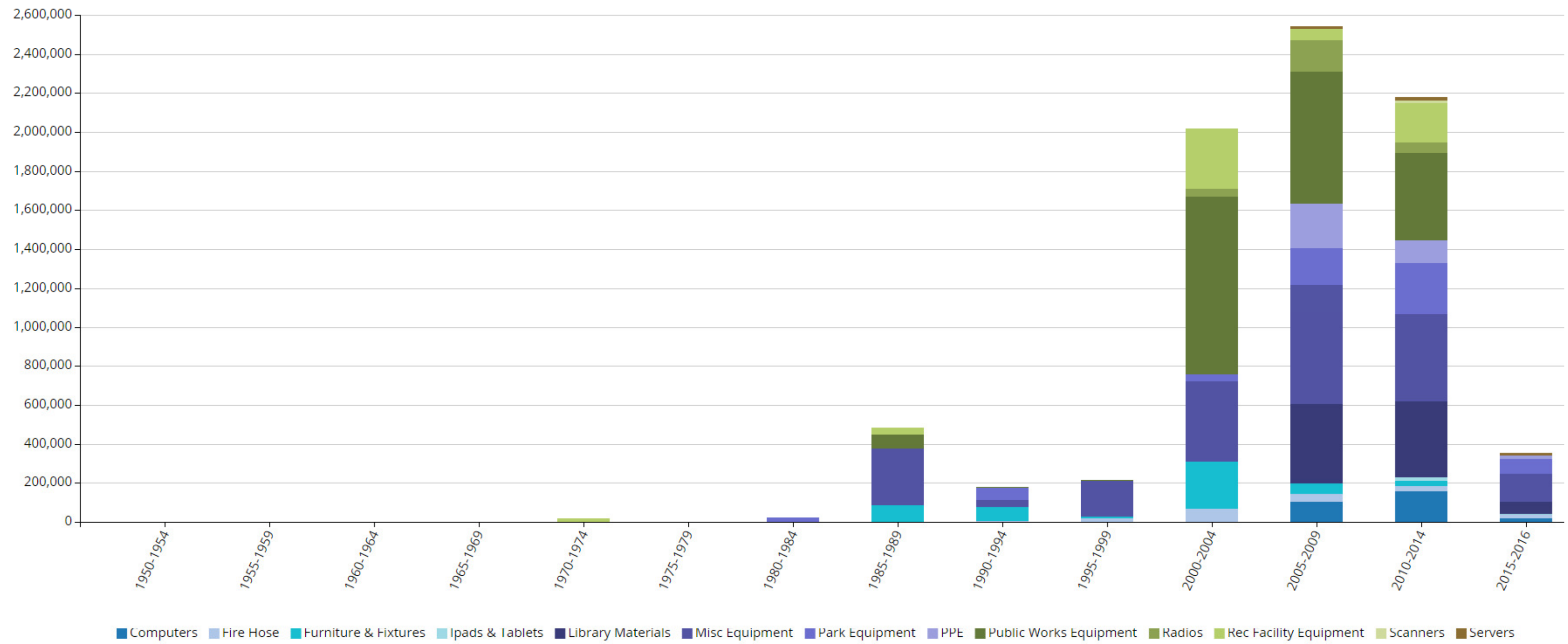
TABLE 13 KEY ASSET ATTRIBUTES – MACHINERY & EQUIPMENT

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Overall Replacement Cost
Machinery & Equipment	Computers	120	4, 20	CPI	$238,793
	Furniture & Fixtures	144	10, 20, 40	CPI	$685,239
	Fire Hose	61	20	CPI	$179,314
	IPads & Tablets	18	4	CPI	$21,592
	Library Materials	9	7	CPI	$703,761
	Park Equipment	48	8, 10, 20, 25, 40	CPI	$668,596
	PPE	9	10	CPI	$358,838
	Public Works Equipment	25	8, 10, 12, 15, 20	CPI	$1,656,606
	Radios	30	10	CPI	$254,179
	Rec Facility Equipment	23	10, 15, 20, 25, 30, 40	CPI	$551,213
	Scanners	8	4	CPI	$10,595
	Servers	4	4	CPI	$33,003
	Miscellaneous Equipment	198	4, 5, 10, 12, 15, 20, 25, 30	CPI	$2,119,808
				Total	$7,481,537

7.4 Historical Investment in Infrastructure

In this section, we provide the installation profile and useful life consumption levels using in-service data obtained from CityWide® Tangible Assets. Together, these graphs can illustrate infrastructure investment trends and upcoming needs at the municipality. The chart below illustrates the historical levels of investment in the municipality's machinery & equipment.

FIGURE 33 HISTORICAL INVESTMENT – MACHINERY & EQUIPMENT

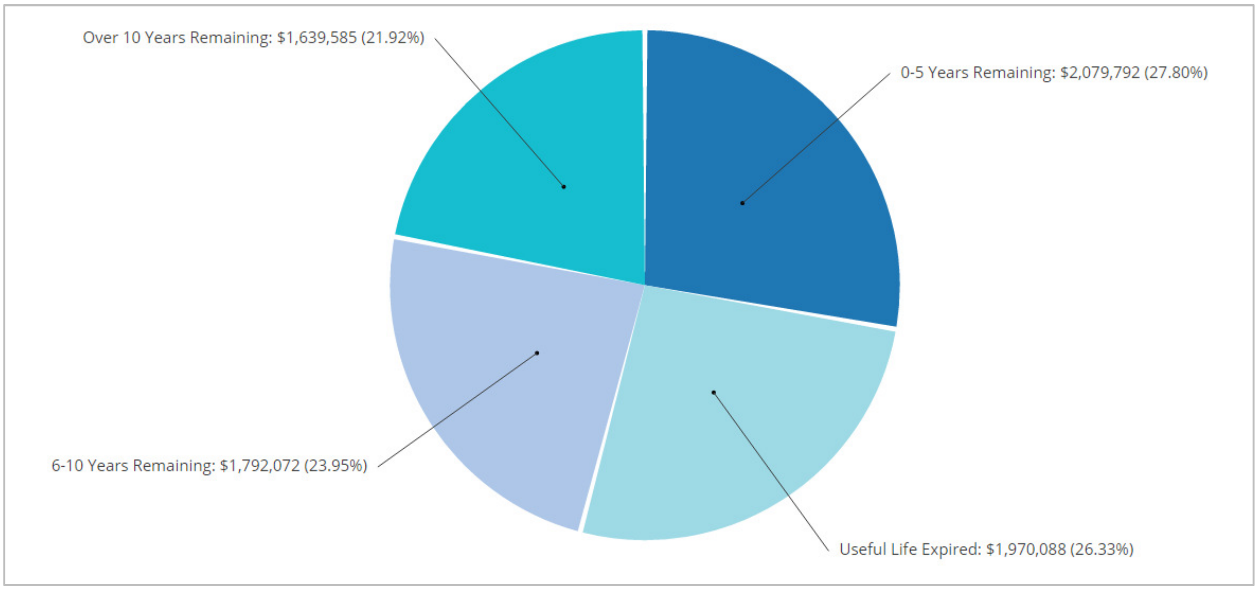


The vast majority of investments in machinery & equipment has taken place in the last 10 years, with expenditures totaling approximately $7 million. Since 2015, investments have totalled $356,000.

7.5 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their 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 & equipment assets.

FIGURE 34 USEFUL LIFE CONSUMPTION – MACHINERY & EQUIPMENT

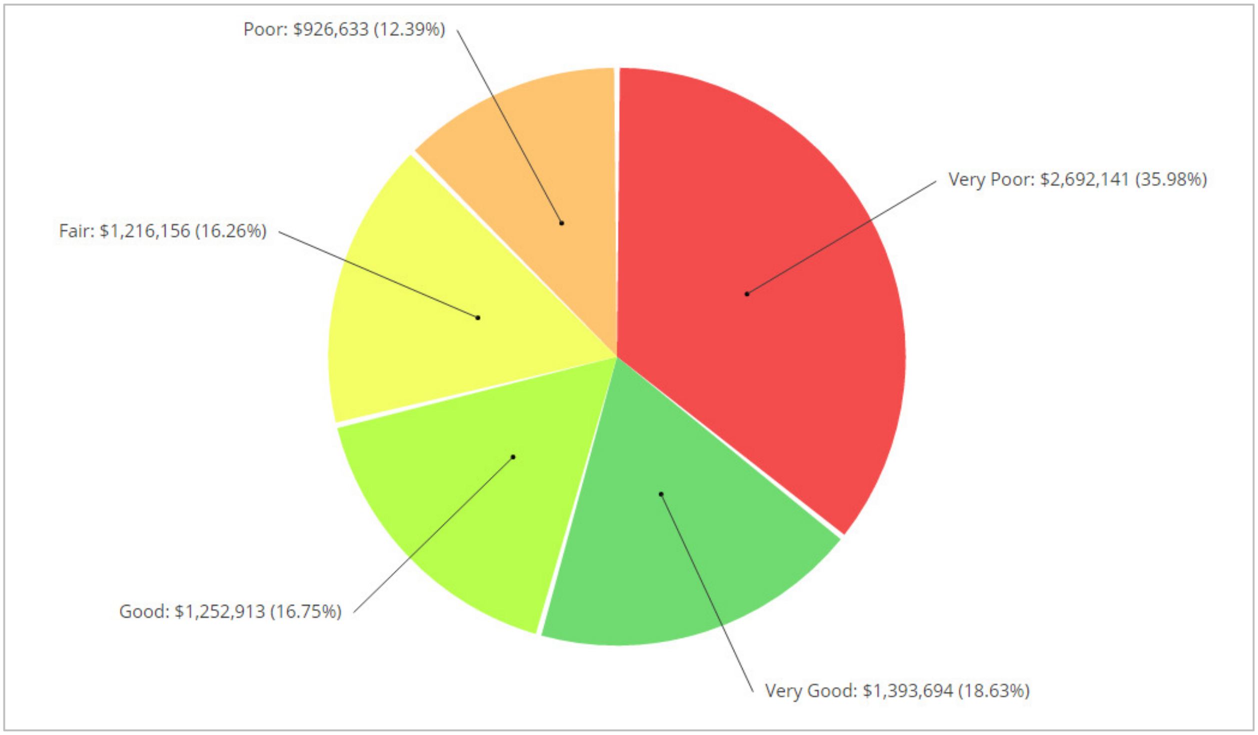


While 24% of the machinery & equipment assets have at least 10 years of useful life remaining, more than 26%, valued at $2 million remain in operation beyond their useful life. Further, 28% of assets will reach the end of their useful life in the next five years.

7.6 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's machinery & equipment assets. By default, we rely on observed field data, e.g., mileage and hours, as provided by the municipality. In the absence of such information, age-based data is used as a proxy.

FIGURE 35 ASSET CONDITION – MACHINERY & EQUIPMENT

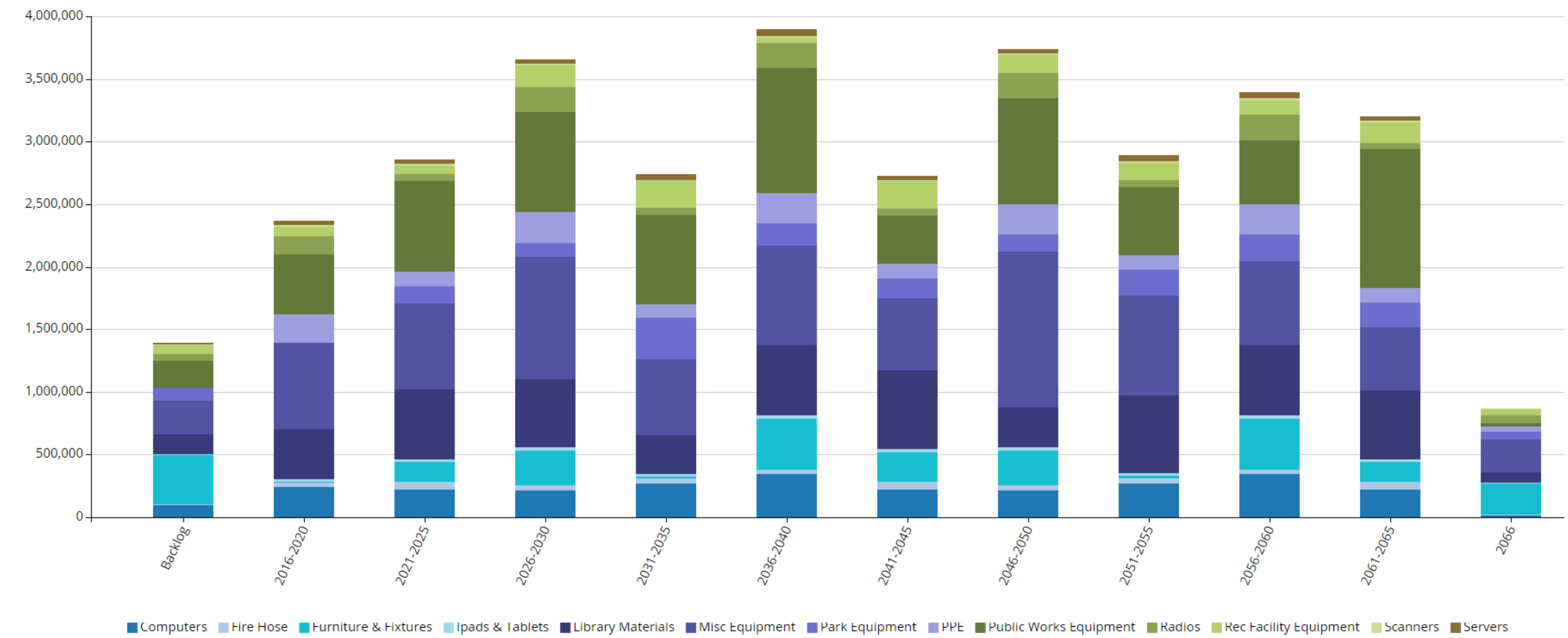


Based on age, mileage and hours data, while 35% of machinery & equipment assets are in good to very good condition, nearly 50% are in poor to very poor condition.

7.7 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's machinery & equipment 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 36 FORECASTING REPLACEMENT NEEDS – MACHINERY & EQUIPMENT



In addition a backlog of $1.4 million, the municipality's replacement needs total approximately $2.4 million in the next five years. An additional $2.9 will be required between 2021 and 2025. The municipality's annual requirements for its buildings total $650,000. At this level, funding is sustainable and replacement needs can be met as they arise without the need for deferring projects. The municipality is allocating $857,000, leaving an annual surplus of $207,000. While maintaining this funding level can ensure that replacement projects are not deferred, eliminating the existing backlog from previous deferrals of replacement needs require additional funding.

7.8 Recommendations – Machinery & Equipment

- Age-based data indicates a backlog of $1.4 million. Further, a significant majority of the machinery & equipment assets are in poor to very poor condition. 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.

- 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 machinery & equipment 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.

- This AMP and any LOS and KPIs established should be updated annually to gauge the performance of the municipality against quantified targets.

8 Land improvements

8.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 14 illustrates key asset attributes for the municipality's land improvement assets, including quantities of various assets, their useful life, replacement costs, and the valuation method by which the replacement costs were derived. In total, the municipality's land improvement assets are valued at $1.3 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.

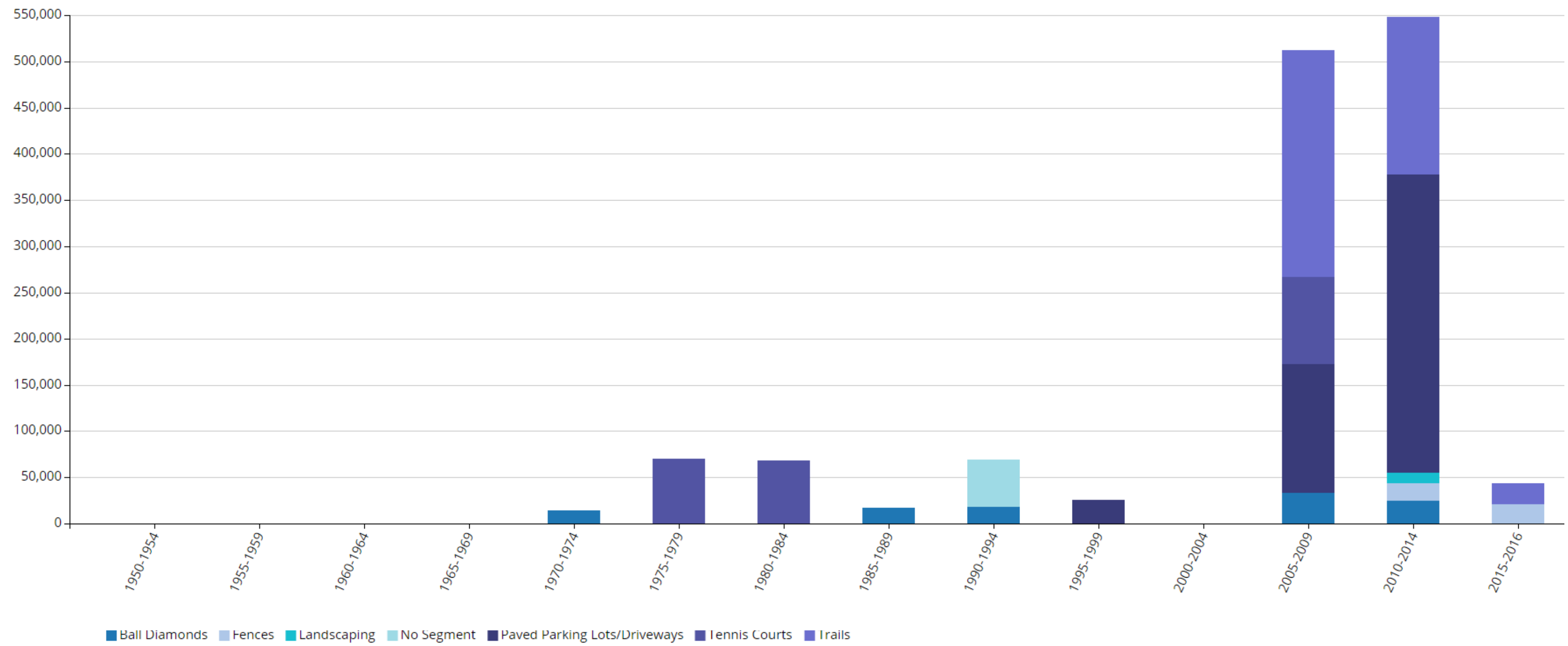
TABLE 14 KEY ASSET ATTRIBUTES – LAND IMPROVEMENTS

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Overall Replacement Cost
Land Improvements	Parking Lots & Driveways	10	20	NRBCPI	$485,694
	Fence	5	10, 20	NRBCPI	$39,381
	Trails	8	20	NRBCPI	$438,478
	Tennis Courts	3	20	NRBCPI	$233,624
	Landscaping	1	10	NRBCPI	$11,877
	Ball Diamond (Backstop, Fencing, Lights)	9	20	NRBCPI	$107,596
				Total	$1,316,650

8.4 Historical Investment in Infrastructure

In this section, we provide the installation profile and useful life consumption levels using in-service data obtained from CityWide® Tangible Assets. Together, these graphs can illustrate infrastructure investment trends and upcoming needs at the municipality. The chart below illustrates the historical levels of investment in the municipality's land improvements.

FIGURE 37 HISTORICAL INVESTMENT - LAND IMPROVEMENTS

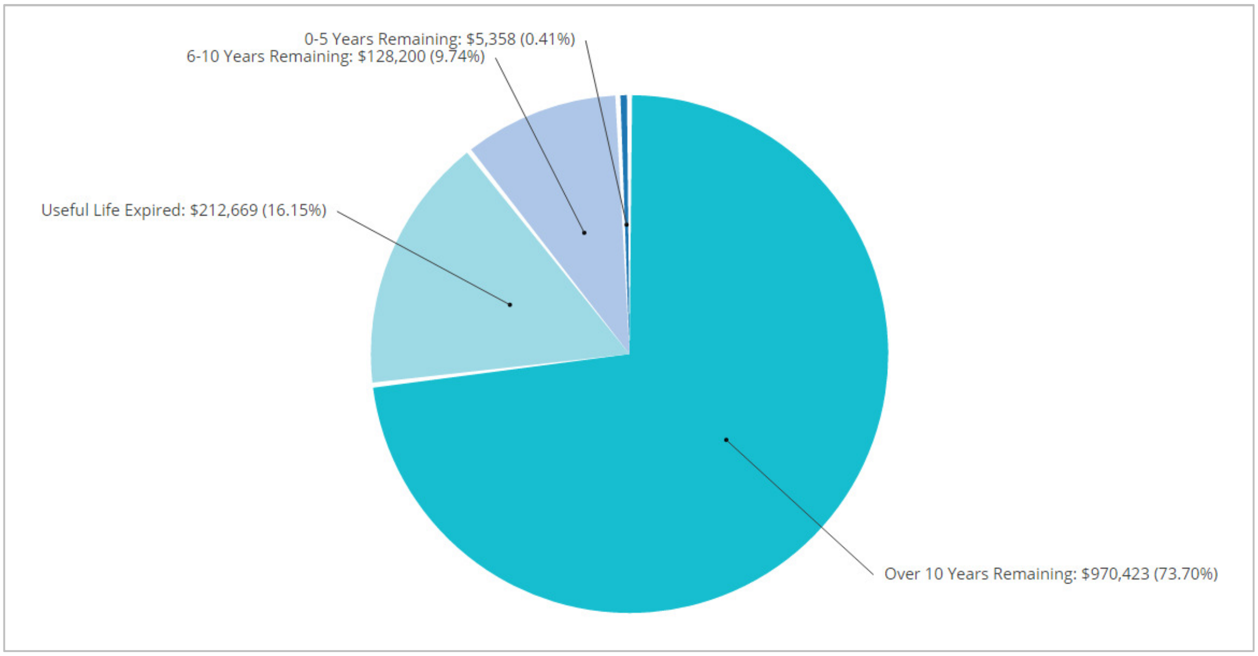


While sporadic investments have taken place in land improvements since the 1970s, the vast majority of expenditures have taken place in the last 10 years. Since 2005, the municipality has made $1.1 million in land improvement expenditures.

8.5 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their 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 - LAND IMPROVEMENTS

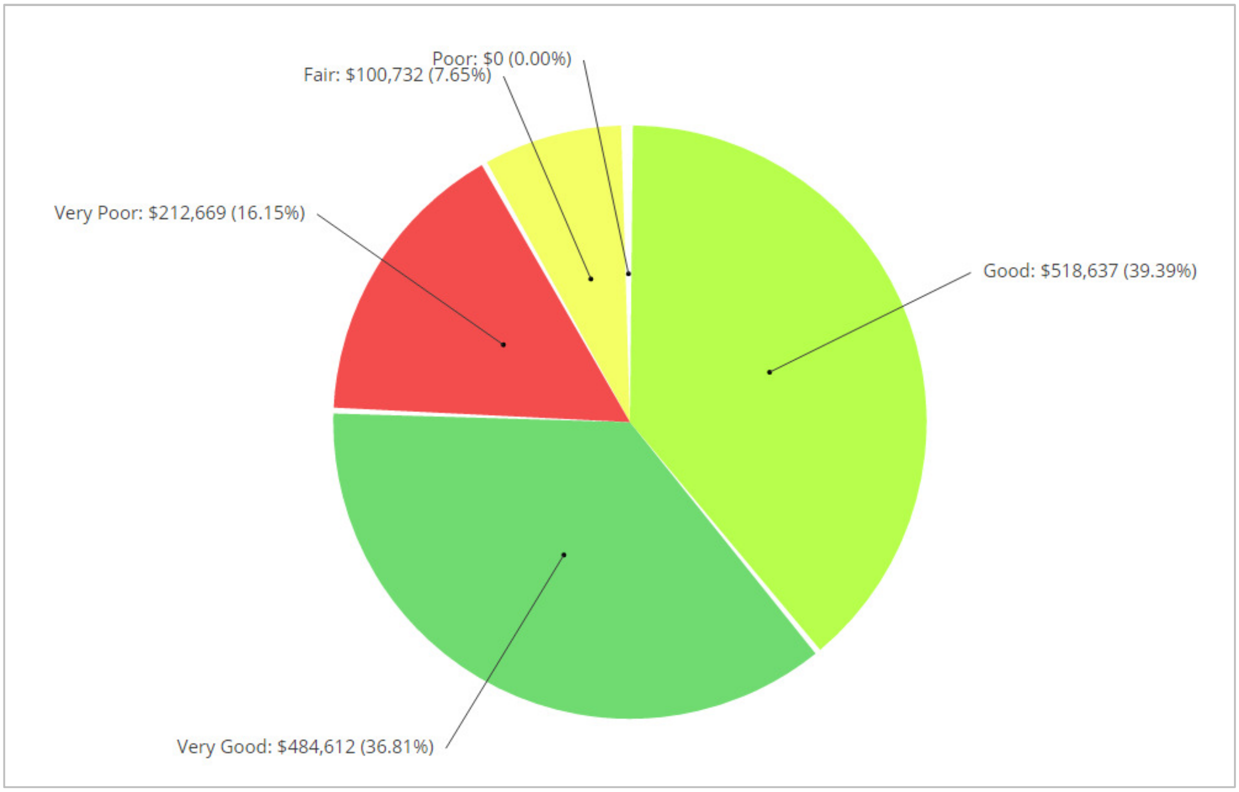


While approximately 75% of assets have at least 10 years of useful life remaining, more than 16%, valued at $213,000 remain in service beyond their useful life.

8.6 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's machinery & equipment assets. In the absence of such information, age-based data is used as a proxy.

FIGURE 39 ASSET CONDITION - LAND IMPROVEMENTS

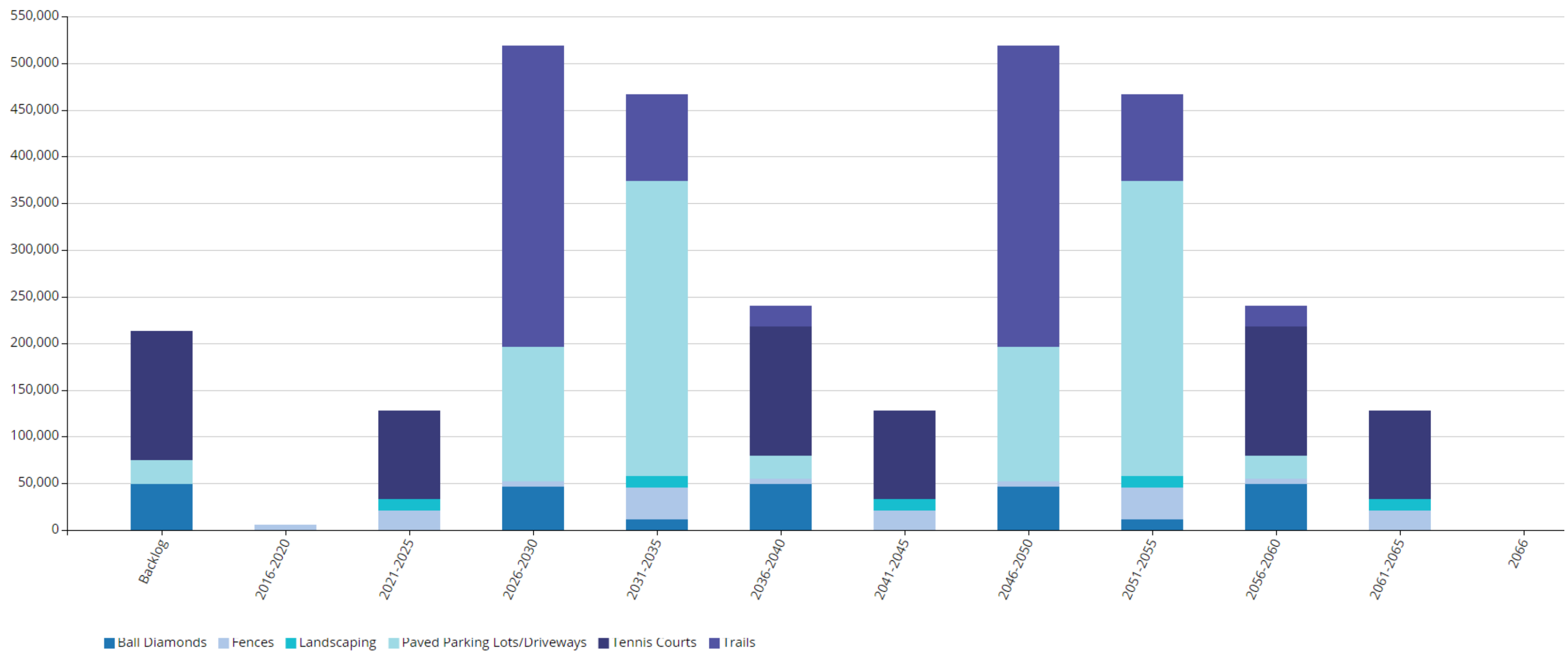


Based on age data, more than 75% of assets are in good to very good condition, more than 30%. Less than 20%, with a valuation of $213,000 are in poor to very poor condition.

8.7 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's land improvement 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 40 FORECASTING REPLACEMENT NEEDS - LAND IMPROVEMENTS



Based on age data, the backlog for land improvements totaled $213,000. While 10 year replacement needs total $133,000, requirements will rise sharply to $520,000 between 2026-2030. The municipality's annual requirements for its land improvement assets total $68,000. At this level, funding is sustainable and replacement needs can be met as they arise without the need for deferring projects. The municipality is allocating $70,000, leaving an annual surplus of $2,000.

8.8 Recommendations – Land improvements

- Age-based data shows that vast majority of the municipality's land improvement assets are in good to very good condition. The municipality should establish a condition assessment program and dedicate a portion of its capital funding to this initiative. Observed data will provide a more accurate estimate of asset condition and the minimum sustainable funding level required. 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.

- The municipality's confidence in its data is medium, suggesting deficiencies in its accuracy and reliability. To develop a high degree of data confidence over time and minimize deficiencies, the municipality should establish a systematic data verification policy.

- The municipality should establish a systematic lifecycle activity framework that reflects the consumption of its yard improvement assets. These activities should be designed to maintain existing levels of service, and should reflect the overarching priorities of the municipality. See Section 3, 'Lifecycle Framework' in the 'Asset Management Strategies' chapter.

- 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 15Table 13 illustrates key asset attributes for the municipality's vehicles assets, including quantities of various assets, their useful life, replacement costs, and the valuation method by which the replacement costs were derived. In total, the municipality's vehicles assets are valued at $5.9 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.

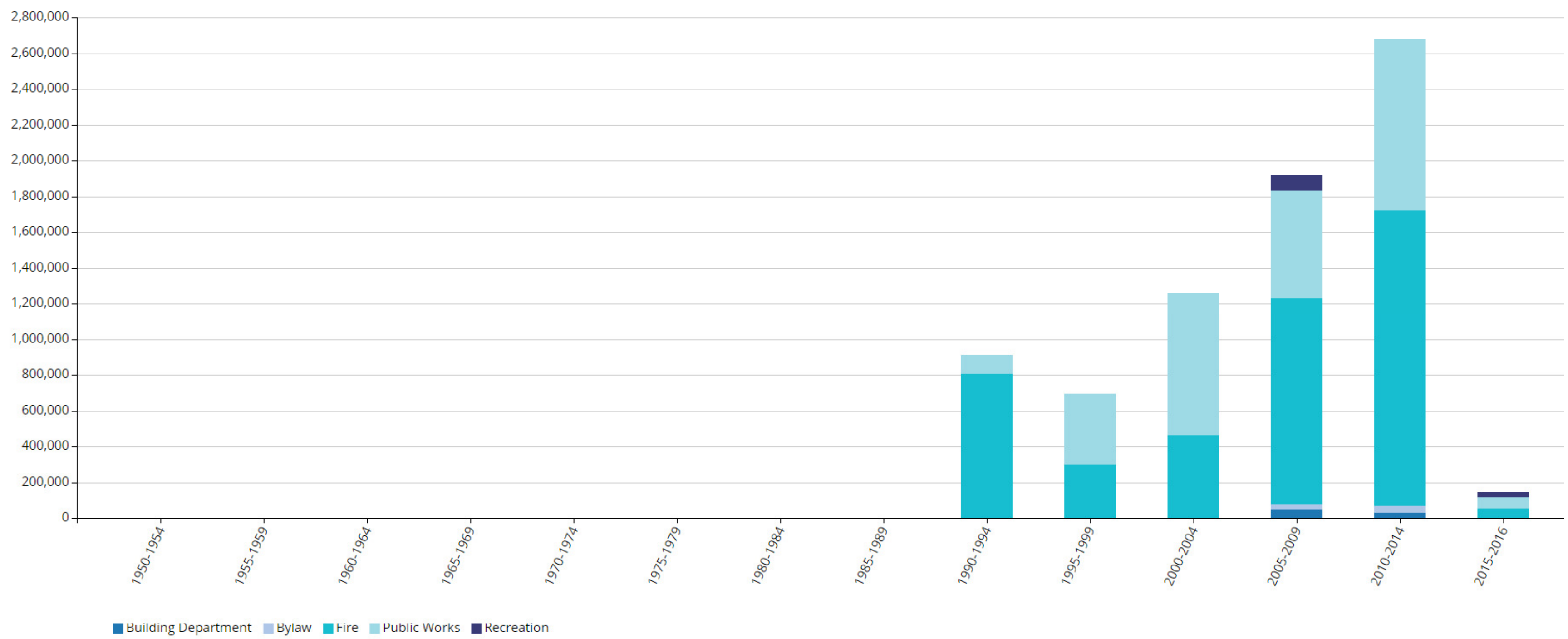
TABLE 15 KEY ASSET ATTRIBUTES - VEHICLES

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Overall Replacement Cost
Vehicles	Building	2	15	CPI	$56,667
	Bylaw	1	15	CPI	$37,596
	Fire	18	10, 15, 20	CPI	$3,474,727
	Recreation	3	15	CPI	$81,603
	Public Works Vehicles	24	15, 25	CPI	$2,224,994
				Total	$5,875,587

9.4 Historical Investment in Infrastructure

In this section, we provide the installation profile and useful life consumption levels using in-service data obtained from CityWide® Tangible Assets. Together, these graphs can illustrate infrastructure investment trends and upcoming needs at the municipality. The chart below illustrates the historical levels of investment in the municipality's vehicles.

FIGURE 41 HISTORICAL INVESTMENT – VEHICLES

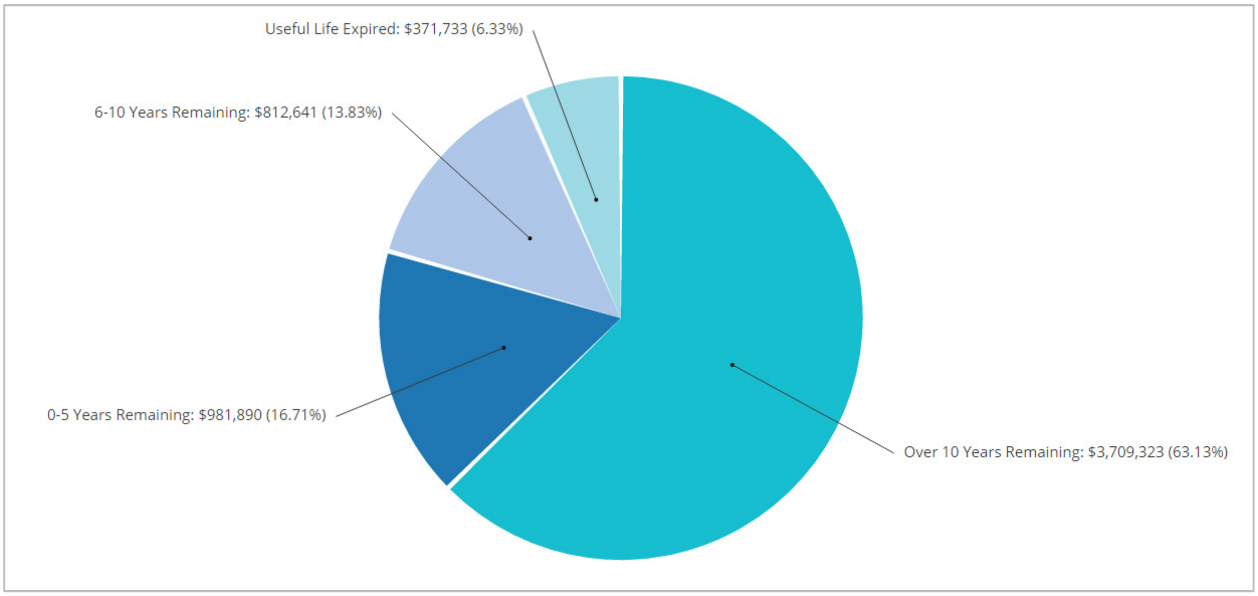


The municipality 's investments increased consistently from 1990 until 2014. Since 2014, expenditures for vehicles assets have totaled nearly $3 million, with public works and fire vehicles comprising the overwhelming majority.

9.5 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their 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 assets.

FIGURE 42 USEFUL LIFE CONSUMPTION – VEHICLES

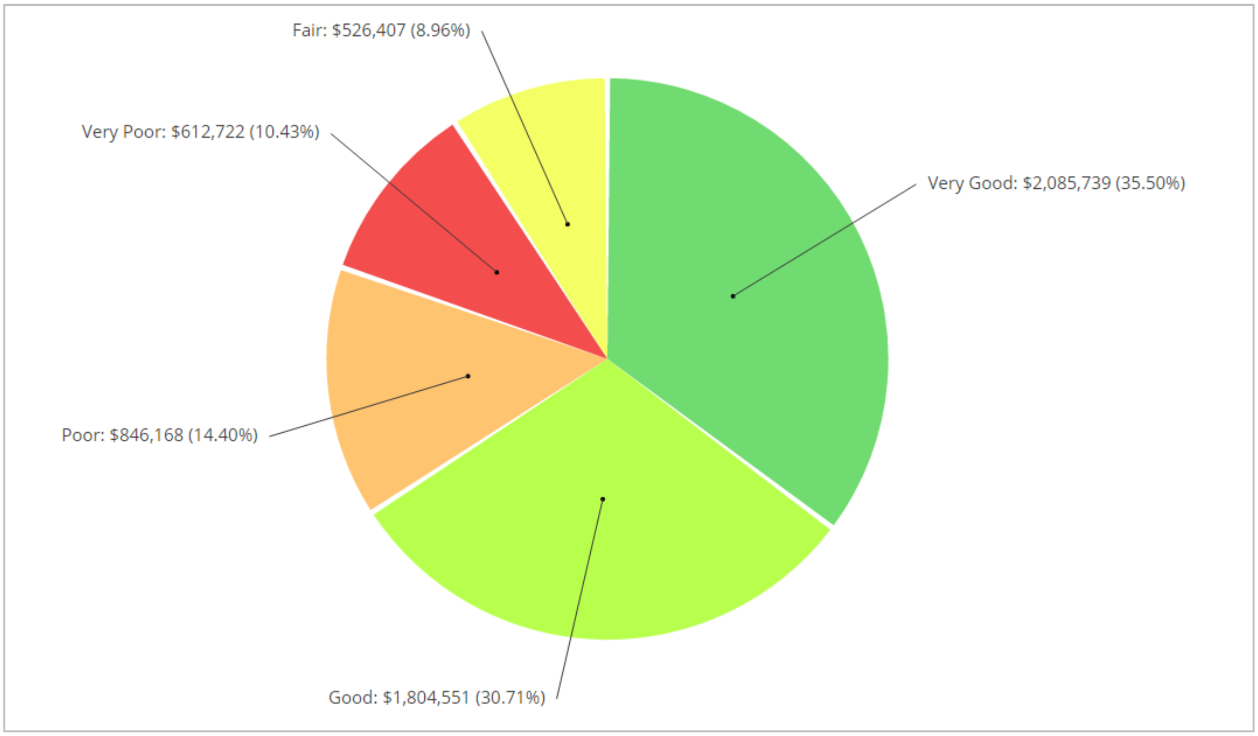


While 63% of the municipality's vehicles have at least 10 years of useful life remaining, 17%, valued at nearly $1 million, will reach the end of their useful life in the next five years. Further, more than 6% remain in service beyond their useful life.

9.6 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's vehicles assets. In the absence of such information, age-based data is used as a proxy.

FIGURE 43 ASSET CONDITION – VEHICLES

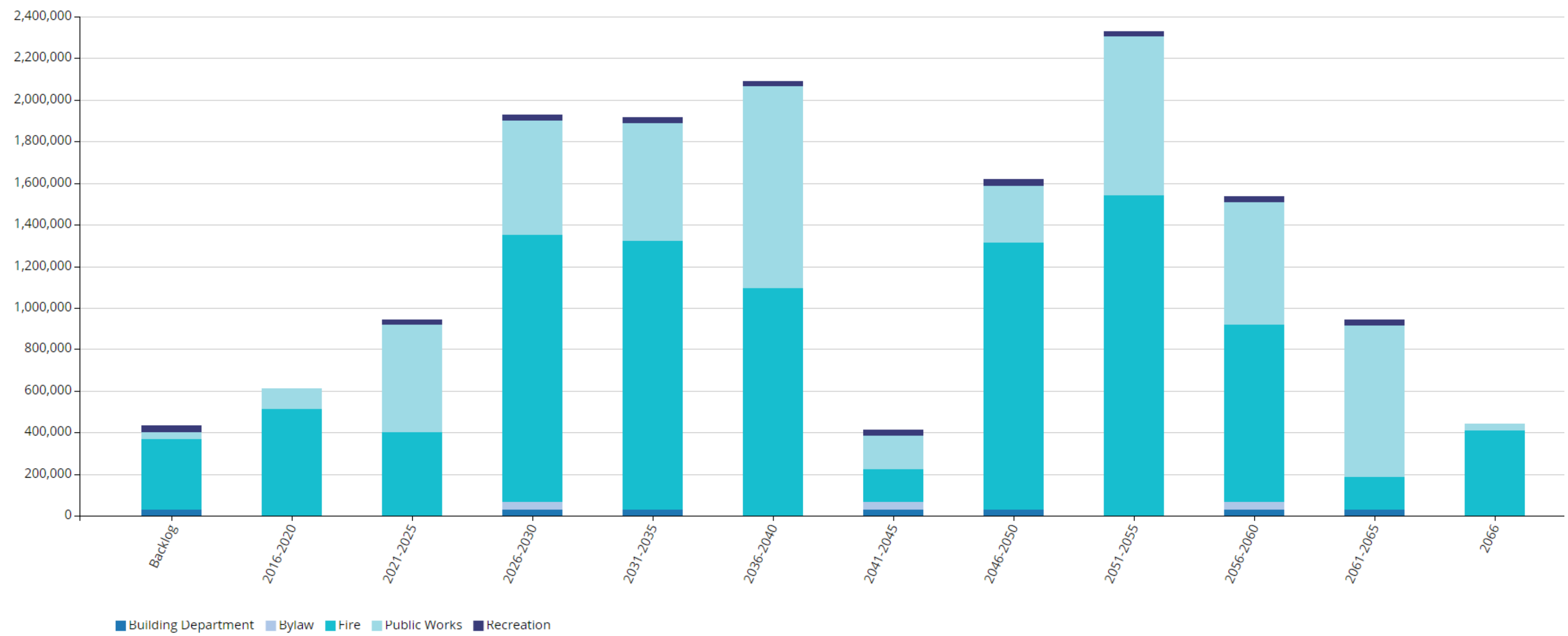


While 67% of the assets are in good to very good condition, nearly 25%, valued at more than $1.4 million, are in poor to very poor condition.

9.7 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's vehicles 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 44 FORECASTING REPLACEMENT NEEDS - VEHICLES



In addition to a backlog of $432,000, the municipality's replacements needs will continue to escalate over the next several decades. Five year replacement needs total $611,000 as indicated by age-based data. Between 2021 and 2025, replacement expenditures will total $942,000. The municipality's annual requirements for its vehicles total $314,000. At this level, funding is sustainable and replacement needs can be met as they arise without the need for deferring projects. The municipality is allocating $124,000, leaving an annual deficit of $190,000.

9.8 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.

- 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.

- 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 16 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 17 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 18 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 19 KEY PERFORMANCE INDICATORS – WATER, WASTEWATER AND STORM NETWORKS

Level	KPI (Reported Annually)
Strategic	• Percentage of total reinvestment compared to asset replacement value • Completion of strategic plan objectives (related water / wastewater / 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 / wastewater / storm network rehabilitated / reconstructed • Overall water / wastewater / storm network condition index as a percentage of desired condition index • Annual adjustment in condition indexes • Annual percentage of growth in water / wastewater / storm network • Percentage of mains where the condition is rated poor or critical for each network • Percentage of water / wastewater / storm network replacement value spent on operations and maintenance
Operational Indicators	• Percentage of water / wastewater / 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 / wastewater / storm networks • Percentage of customer requests responded to within 24 hours per water / wastewater / 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

It is recommended that through the results of the OSIM inspections and additional detailed investigations, a 10-year needs list should be developed for the municipality's structures.

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.

The municipality relies on age, mileage and hours consumed to gauge the condition of its fleet. 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.

2.4 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.

2.4 Sewer network inspection (Wastewater and Storm)

The most popular and practical type of wastewater 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

The municipality has indicated it conducts video inspections of its sanitary sewers. It is recommended that the municipality continue this program and establish a sewer condition assessment program, capturing the data and overall pipe condition scores within a database, for its sanitary and storm sewers, and that a portion of capital funding is dedicated to this.

2.5 Parks and open spaces

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.

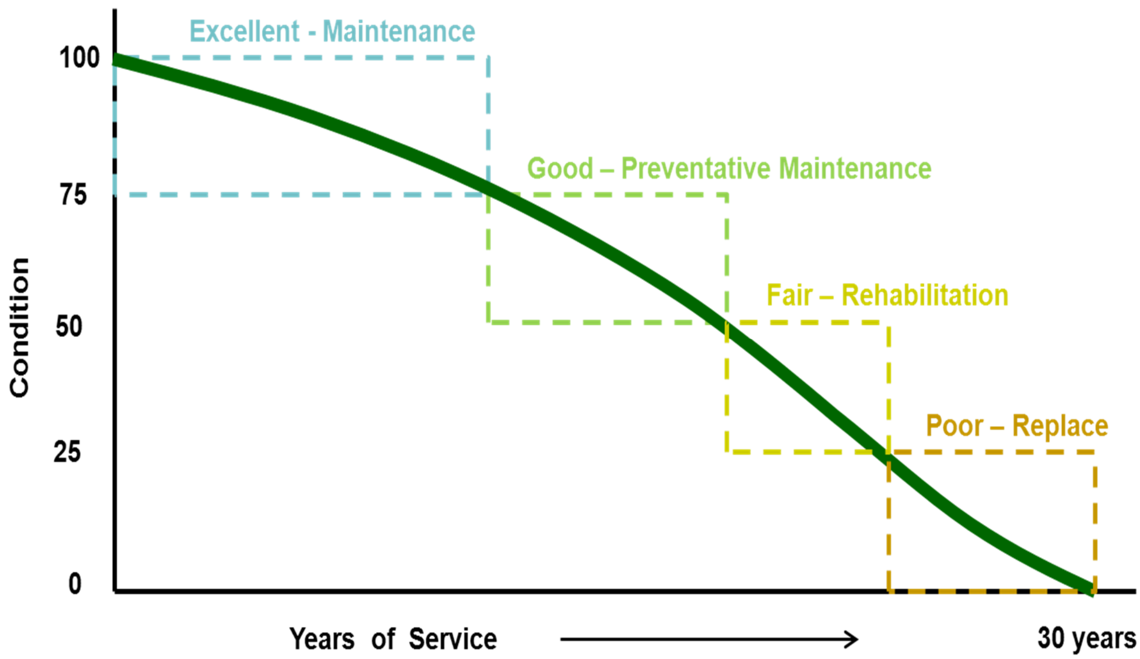
3 Life Cycle Analysis Framework

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 20 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 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.

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

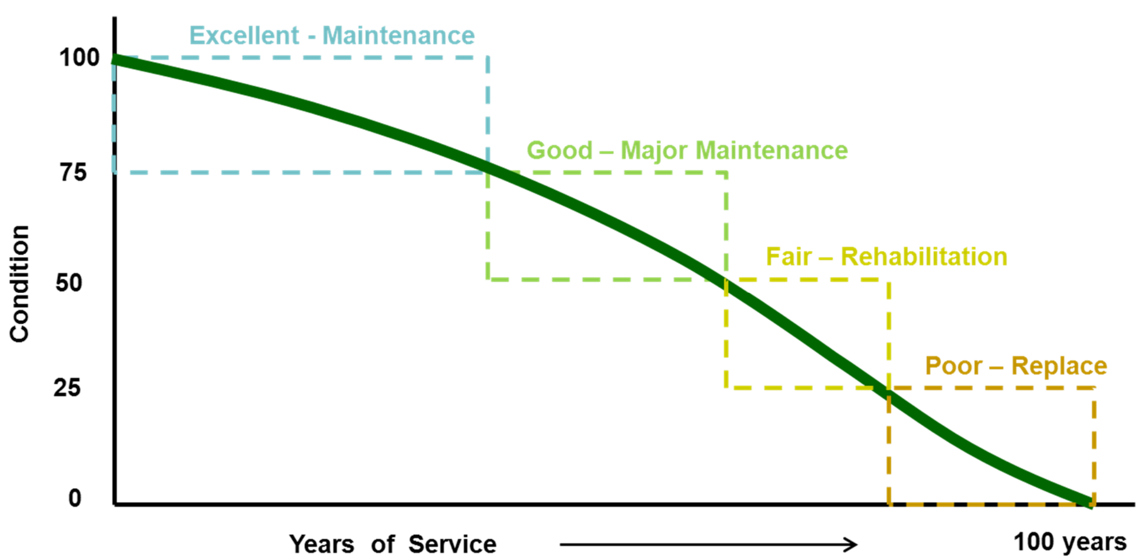
The best approach to develop a 10-year needs list for the municipality's fleet and vehicle portfolio would first be through a defined preventative maintenance program, and secondly, through an optimized life cycle vehicle replacement schedule. The preventative maintenance program would serve to determine 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 Wastewater and storm sewers

The following analysis has been conducted at a fairly high level, using industry standard activities and costs for wastewater 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 21 ASSET CONDITION AND RELATED WORK ACTIVITY FOR SEWER MAINS

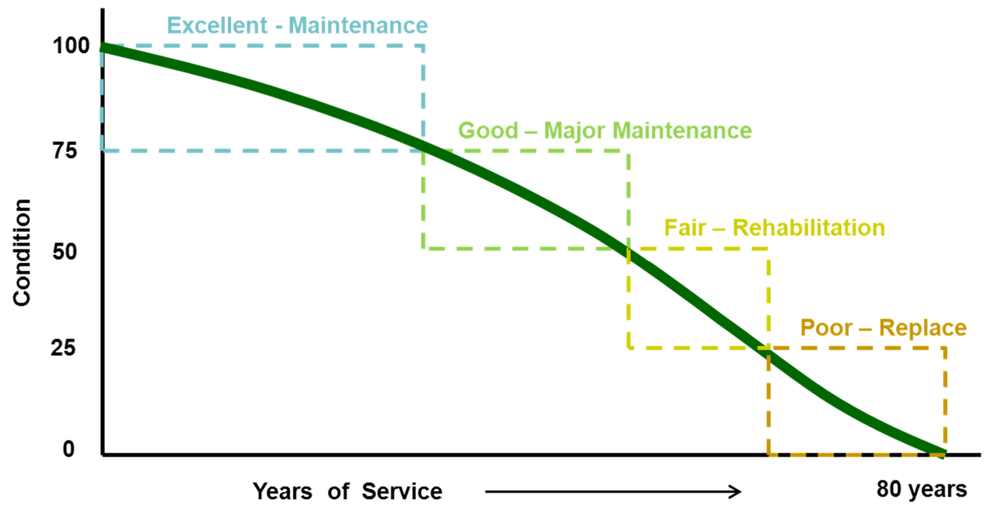
Condition	Condition Range	Work Activity
Excellent condition (Maintenance only phase)	100-76	■ maintenance only (cleaning & flushing etc.)
Good Condition (Preventative maintenance phase)	75 - 51	■ mahhole repairs ■ small pipe section repairs
Fair Condition (Rehabilitation phase)	50 -26	■ structural relining
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 22 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. According to the 2011 census, Clearview's population was 13,734, a decline of 2.5% from its 2006 population of 14,088.

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.

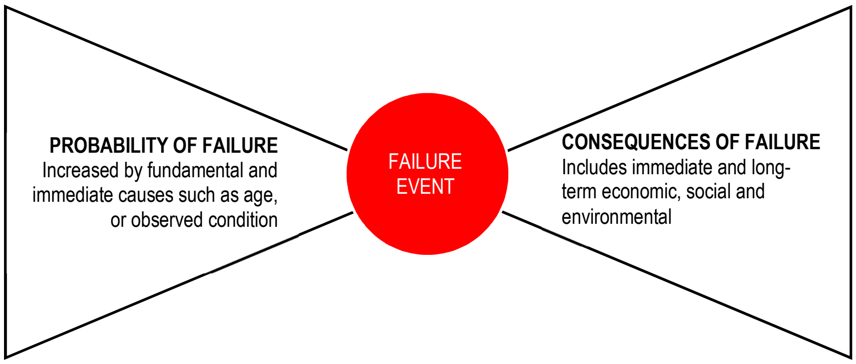
Risk mitigation is traditionally thought of in terms of safety and liability factors. In asset management, the definition of risk should heavily emphasize these factors but should be expanded to consider the risks to the municipality's ability to deliver targeted levels of service

- 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 tables 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.

Probability of Failure

In this AMP, the probability of a failure event is predicted by the condition of the asset.

TABLE 23 PROBABILITIY OF FAILURE – ALL ASSETS

Asset Classes	Condition Rating	Probability of Failure
ALL	0-20 Very Poor	5 – Very High
	21-40 Poor	4 – High
	41-60 Fair	3 – Moderate
	61-80 Good	2 – Low
	81-100 Excellent	1 – Very Low

Consequence of Failure

Bridges (based on valuation):
The consequence of failure score for this initial AMP is based upon the replacement value of the structure. The higher the value, probably the larger the structure and therefore probably the higher the consequential risk of failure:

TABLE 24 CONSEQUENCE OF FAILURE - BRIDGES

Replacement Value	Consequence of failure
Up to $100k	Score of 1
$101 to $300k	Score of 2
$301 to $500k	Score of 3
$501 to $800k	Score of 4
$801k and over	Score of 5

Roads (based on classification):
The consequence of failure score for this initial AMP is based upon the road classification as this will reflect traffic volumes and number of people affected. Currently Clearview does not capture road classification within their database, it is therefore recommended this is added in the future.

TABLE 25 CONSEQUENCE OF FAILURE - ROADS

Road Classification	Consequence of failure
Gravel	Score of 1
LCB(Rural)	Score of 2
LCB (Urban)	Score of 3
HCB (Rural)	Score of 4
HCB (Urban)	Score of 5

Sanitary Sewer (based on diameter):
We recommend the consequence of failure score for this AMP is based upon pipe diameter as this will reflect potential upstream service area affected. Currently Clearview's inventory of this asset class is pooled, therefore it is recommended that individual pipes are listed separately in the database with the appropriate diameter listings in the future.

TABLE 26 CONSEQUENCE OF FAILURE – SANITARY SEWERS

Pipe Diameter	Consequence of failure
Less than 199mm	Score of 1
200-249mm	Score of 2
250-299mm	Score of 3
300-349mm	Score of 4
350mm and over	Score of 5

Water (based on diameter):
The consequence of failure score for this initial AMP is based upon pipe diameter as this will reflect potential service area affected.

TABLE 27 CONSEQUENCE OF FAILURE – WATER MAINS

Pipe Diameter	***Consequence of Failure***
Less than 100mm	Score of 1
101–150mm	Score of 2
151–200mm	Score of 3
201–299mm	Score of 4
300 and over	Score of 5

Storm Sewer (based on diameter):
The consequence of failure score for this initial AMP is based upon pipe diameter as this will reflect potential upstream service area affected. Currently Clearview's inventory of this asset class does not include diameter of pipe, therefore it is recommended that individual pipes are listed separately in the database with the appropriate diameter listings in the future.

TABLE 28 CONSEQUENCE OF FAILURE – STORM SEWERS

Replacement Value	Consequence of failure
Less than 250mm	Score of 1
251-500mm	Score of 2
501-700mm	Score of 3
751-1,000mm	Score of 4
1,001mm and over	Score of 5

Facilities: (based on valuation):
The consequence of failure score for this initial AMP is based upon the replacement value of the facility component. The higher the value, probably the larger and more important the component to the overall function of the facility and therefore probably the higher the consequential risk of failure:

TABLE 29 CONSEQUENCE OF FAILURE - FACILITIES

Replacement Value	**Consequence of failure**
Up to $50k	Score of 1
$51k to $100k	Score of 2
$101k to $300k	Score of 3
$301k to $1 million	Score of 4
Over $1 million	Score of 5

Land Improvements: (based on valuation):
The consequence of failure score for this initial AMP is based upon the replacement value of the asset or component. The higher the value, probably the larger and more important the component and therefore probably the higher the consequential risk of failure:

TABLE 30 CONSEQUENCE OF FAILURE – LAND IMPROVEMENTS

Replacement Value	Consequence of failure
Up to $50k	Score of 1
$51k to $100k	Score of 2
$101k to $300k	Score of 3
$301k to $1 million	Score of 4
Over $1 million	Score of 5

Equipment: (based on valuation):
The consequence of failure score for this initial AMP is based upon the replacement value of the asset or component. The higher the value, probably the larger and more important the component and therefore probably the higher the consequential risk of failure:

TABLE 31 CONSEQUENCE OF FAILURE - ROADS

Consequence of Failure: Equipment	
Replacement Value	Consequence of failure
Up to $10k	Score of 1
$10k to $20k	Score of 2
$20k to $40k	Score of 3
$40k to $80k	Score of 4
Over $80k	Score of 5

Rolling Stock: (based on valuation):
The consequence of failure score for this initial AMP is based upon the replacement value of the asset or component. The higher the value, probably the larger and more important the component and therefore probably the higher the consequential risk of failure:

TABLE 32 CONSEQUENCE OF FAILURE – ROLLING STOCK

Replacement Value	Consequence of failure
Up to $20k	Score of 1
$21k to $75k	Score of 2
$76k to $150k	Score of 3
$151k to $300k	Score of 4
Over $300k	Score of 5

FIGURE 49 DISTRIBUTION OF ASSETS BASED ON RISK - ALL ASSETS

Consequence \ Probability	1	2	3	4	5
5	218 Assets 146,972.00 m, unit(s) $24,248,437.00	265 Assets 130,577.00 unit(s), m $16,395,806.00	34 Assets 29,464.00 unit(s), m $6,632,919.00	4 Assets 4.00 unit(s) $3,219,469.00	10 Assets 10.00 unit(s) $3,127,875.00
4	227 Assets 39,025.00 unit(s), m $12,116,933.00	295 Assets 57,466.00 unit(s), m $12,058,151.00	44 Assets 11,604.00 unit(s), m $5,663,192.00	6 Assets 6.00 unit(s) $1,115,490.00	14 Assets 14.00 unit(s) $1,800,367.00
3	80 Assets 50,964.00 unit(s), m $9,024,383.00	58 Assets 30,906.00 unit(s), m $7,873,803.00	29 Assets 5,955.02 unit(s), m $3,406,901.00	29 Assets 1,745.82 unit(s), m $1,542,070.00	22 Assets 5,886.00 unit(s), m $3,192,450.20
2	151 Assets 39,340.40 unit(s), m $13,318,011.00	209 Assets 37,309.15 unit(s), m $19,314,767.00	262 Assets 34,241.64 unit(s), m $21,156,951.00	129 Assets 14,871.28 unit(s), m $6,310,225.00	120 Assets 29,856.00 unit(s), m $6,049,248.00
1	121 Assets 803.00 unit(s), m, feet $1,313,609.00	160 Assets 2,483.50 unit(s), m $2,239,119.00	113 Assets 2,938.50 unit(s), m $1,934,363.00	130 Assets 2,361.00 unit(s), m $1,256,825.00	456 Assets 4,221.00 unit(s), m $3,955,623.29

FIGURE 50 DISTRIBUTION OF ASSETS BASED ON RISK – ROAD NETWORK

Consequence \ Probability	1	2	3	4	5
5	205 Assets 144,594.00 m $13,370,147.00	258 Assets 130,570.00 m $11,727,942.00	30 Assets 29,460.00 m $2,717,595.00	0 Assets - $0.00	0 Assets - $0.00
4	208 Assets 38,286.00 m $4,839,881.00	278 Assets 52,567.00 m $5,876,191.00	28 Assets 9,901.00 m $1,144,117.00	0 Assets - $0.00	0 Assets - $0.00
3	50 Assets 46,222.00 m $3,013,272.00	16 Assets 24,163.00 m $1,580,379.00	7 Assets 5,237.00 m $355,836.00	0 Assets - $0.00	3 Assets 4,698.00 m $131,375.00
2	46 Assets 30,875.00 m $2,787,977.00	25 Assets 12,434.00 m $998,083.00	6 Assets 3,532.00 m $358,474.00	10 Assets 3,586.00 m $391,584.00	48 Assets 25,408.00 m $2,118,691.00
1	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00

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

Consequence \ Probability	1	2	3	4	5
5	4 Assets 4.00 unit(s) $4,632,931.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	1 Assets 1.00 unit(s) $1,772,207.00
4	4 Assets 4.00 unit(s) $2,851,433.00	0 Assets - $0.00	3 Assets 3.00 unit(s) $1,585,085.00	0 Assets - $0.00	0 Assets - $0.00
3	8 Assets 8.00 unit(s) $2,995,575.00	0 Assets - $0.00	4 Assets 4.00 unit(s) $1,484,300.00	0 Assets - $0.00	3 Assets 3.00 unit(s) $1,298,648.00
2	17 Assets 17.00 unit(s) $3,456,198.00	0 Assets - $0.00	21 Assets 21.00 unit(s) $4,677,752.00	0 Assets - $0.00	1 Assets 1.00 unit(s) $125,513.00
1	0 Assets - $0.00	0 Assets - $0.00	2 Assets 2.00 unit(s) $162,801.00	0 Assets - $0.00	0 Assets - $0.00

FIGURE 52 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	1 Assets 440.00 m $61,371.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	1 Assets 1.00 unit(s) $75,505.00
3	3 Assets 1,029.00 m $143,248.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
2	3 Assets 434.00 m $110,229.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	21 Assets 21.00 unit(s) $662,758.00
1	34 Assets 182.00 unit(s), m $51,071.00	56 Assets 56.00 unit(s) $143,763.00	22 Assets 22.00 unit(s) $59,606.00	59 Assets 59.00 unit(s) $329,939.00	209 Assets 209.00 unit(s) $1,359,611.00

The consequence of failure for the storm pipes was calculated by replacement cost due to the lack of measurement data.

FIGURE 53 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	0 Assets - $0.00	0 Assets - $0.00
4	1 Assets 282.00 m $224,715.00	6 Assets 4,888.00 m $3,821,448.00	2 Assets 1,689.00 m $747,995.00	0 Assets - $0.00	0 Assets - $0.00
3	13 Assets 3,699.00 m $2,243,495.00	13 Assets 5,140.00 m $3,893,341.00	1 Assets 15.00 m $5,850.00	0 Assets - $0.00	3 Assets 1,172.00 m $391,435.00
2	26 Assets 5,495.00 m $3,978,667.00	39 Assets 14,906.00 m $9,744,178.00	74 Assets 19,107.00 m $7,352,463.00	24 Assets 5,423.00 m $2,093,036.00	11 Assets 4,204.00 m $1,354,046.00
1	2 Assets 237.00 m $157,311.00	9 Assets 2,277.50 m $1,467,432.00	14 Assets 2,813.50 m $1,186,187.00	13 Assets 2,244.00 m $664,340.00	10 Assets 3,655.00 m $1,127,242.00

FIGURE 54 DISTRIBUTION OF ASSETS BASED ON RISK – WASTEWATER

Consequence \ Probability	1	2	3	4	5
5	5 Assets 2,370.00 m $2,118,226.00	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	16 Assets 1,590.00 m $1,364,633.00	7 Assets 689.02 m $494,516.00	23 Assets 1,739.82 m $1,101,495.00	0 Assets - $0.00
2	36 Assets 2,495.40 m $2,079,316.00	129 Assets 9,939.15 m $8,082,230.00	142 Assets 11,562.64 m $8,279,541.00	81 Assets 5,848.28 m $3,462,256.00	0 Assets - $0.00
1	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00

FIGURE 55 DISTRIBUTION OF ASSETS BASED ON RISK – BUILDINGS

Consequence	1	2	3	4	5
5	1 Assets 1.00 unit(s) $3,285,564.00	1 Assets 1.00 unit(s) $3,283,996.00	2 Assets 2.00 unit(s) $3,672,370.00	1 Assets 1.00 unit(s) $2,645,304.00	0 Assets - $0.00
4	5 Assets 5.00 unit(s) $2,863,344.00	4 Assets 4.00 unit(s) $1,636,835.00	2 Assets 2.00 unit(s) $846,079.00	1 Assets 1.00 unit(s) $642,043.00	1 Assets 1.00 unit(s) $425,388.00
3	2 Assets 2.00 unit(s) $411,955.00	2 Assets 2.00 unit(s) $406,956.00	4 Assets 4.00 unit(s) $919,890.00	1 Assets 1.00 unit(s) $188,301.00	5 Assets 5.00 unit(s) $1,166,561.20
2	7 Assets 7.00 unit(s) $442,924.00	2 Assets 2.00 unit(s) $144,604.00	1 Assets 1.00 unit(s) $60,030.00	2 Assets 2.00 unit(s) $116,550.00	7 Assets 7.00 unit(s) $526,713.00
1	35 Assets 35.00 unit(s) $761,770.00	17 Assets 17.00 unit(s) $348,731.00	7 Assets 7.00 unit(s) $167,167.00	5 Assets 5.00 unit(s) $136,745.00	22 Assets 22.00 unit(s) $321,712.29
	Probability				

FIGURE 56 DISTRIBUTION OF ASSETS BASED ON RISK – LAND IMPROVEMENTS

Consequence	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	1 Assets 1.00 unit(s) $121,141.00	2 Assets 2.00 unit(s) $363,447.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
2	2 Assets 2.00 unit(s) $119,902.00	1 Assets 1.00 unit(s) $77,976.00	1 Assets 1.00 unit(s) $95,374.00	0 Assets - $0.00	2 Assets 2.00 unit(s) $138,250.00
1	12 Assets 222.00 unit(s), feet $196,922.00	6 Assets 6.00 unit(s) $70,461.00	4 Assets 4.00 unit(s) $53,400.00	1 Assets 1.00 unit(s) $5,358.00	4 Assets 4.00 unit(s) $74,419.00
	Probability				

FIGURE 57 DISTRIBUTION OF ASSETS BASED ON RISK – EQUIPMENT

Consequence \ Probability	1	2	3	4	5
5	2 Assets 2.00 unit(s) $428,334.00	4 Assets 4.00 unit(s) $555,596.00	2 Assets 2.00 unit(s) $242,954.00	3 Assets 3.00 unit(s) $574,165.00	9 Assets 9.00 unit(s) $1,355,668.00
4	3 Assets 3.00 unit(s) $157,862.00	5 Assets 5.00 unit(s) $305,869.00	4 Assets 4.00 unit(s) $265,820.00	4 Assets 4.00 unit(s) $230,832.00	8 Assets 8.00 unit(s) $482,998.00
3	3 Assets 3.00 unit(s) $95,697.00	9 Assets 9.00 unit(s) $265,047.00	6 Assets 6.00 unit(s) $146,509.00	4 Assets 4.00 unit(s) $111,281.00	8 Assets 8.00 unit(s) $204,431.00
2	6 Assets 7.00 unit(s) $84,020.00	9 Assets 23.00 unit(s) $150,716.00	11 Assets 11.00 unit(s) $175,367.00	7 Assets 7.00 unit(s) $94,449.00	26 Assets 26.00 unit(s) $358,696.00
1	33 Assets 91.00 unit(s) $118,154.00	71 Assets 126.00 unit(s) $192,859.00	61 Assets 68.00 unit(s) $145,786.00	52 Assets 52.00 unit(s) $120,443.00	209 Assets 210.00 unit(s) $617,984.00

FIGURE 58 DISTRIBUTION OF ASSETS BASED ON RISK – VEHICLES

Consequence \ Probability	1	2	3	4	5
5	2 Assets 2.00 unit(s) $428,334.00	4 Assets 4.00 unit(s) $555,596.00	2 Assets 2.00 unit(s) $242,954.00	3 Assets 3.00 unit(s) $574,165.00	9 Assets 9.00 unit(s) $1,355,668.00
4	3 Assets 3.00 unit(s) $157,862.00	5 Assets 5.00 unit(s) $305,869.00	4 Assets 4.00 unit(s) $265,820.00	4 Assets 4.00 unit(s) $230,832.00	8 Assets 8.00 unit(s) $482,998.00
3	3 Assets 3.00 unit(s) $95,697.00	9 Assets 9.00 unit(s) $265,047.00	6 Assets 6.00 unit(s) $146,509.00	4 Assets 4.00 unit(s) $111,281.00	8 Assets 8.00 unit(s) $204,431.00
2	6 Assets 7.00 unit(s) $84,020.00	9 Assets 23.00 unit(s) $150,716.00	11 Assets 11.00 unit(s) $175,367.00	7 Assets 7.00 unit(s) $94,449.00	26 Assets 26.00 unit(s) $358,696.00
1	33 Assets 91.00 unit(s) $118,154.00	71 Assets 126.00 unit(s) $192,859.00	61 Assets 68.00 unit(s) $145,786.00	52 Assets 52.00 unit(s) $120,443.00	209 Assets 210.00 unit(s) $617,984.00

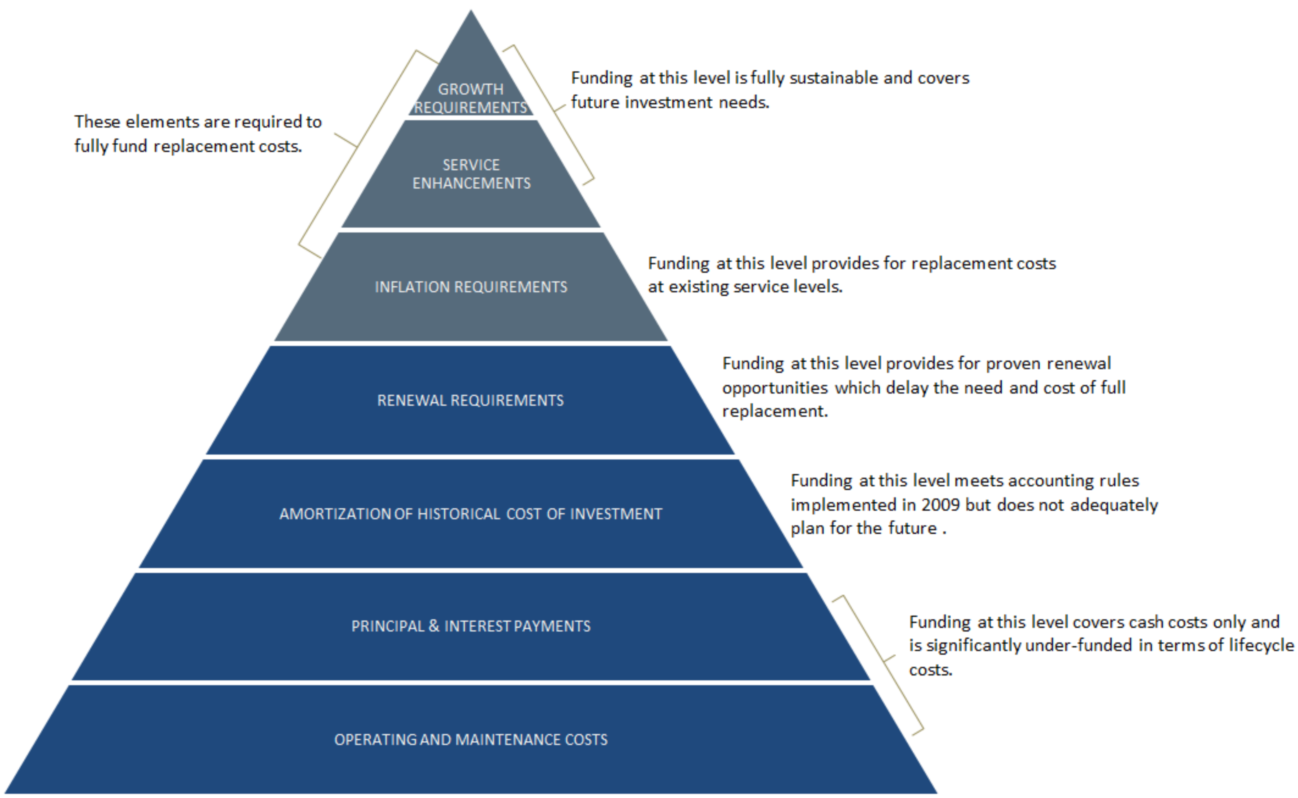
IX. Financial Strategy

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 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 59 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 33 and 34 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 33 SUMMARY OF INFRASTRUCTURE REQUIREMENTS AND CURRENT FUNDING AVAILABLE

Asset Category	Average Annual Investment Required	2016 Funding Available					Annual Deficit
		Taxes	Gas Tax	OCIF	Taxes to Reserves	Total Funding Available	
Road Network	2,111,000	1,082,000	418,000	208,000	0	3,318,000	125,000
Bridges & Culverts	501,000	0	0	0	376,000	715,000	162,000
Storm Sewer System	162,000	0	0	0	0	-488,000	-207,000
Equipment	650,000	317,000	0	0	540,000	960,000	-252,000
Facilities	547,000	115,000	0	0	684,000	1,278,000	-2,000
Land Improvements	68,000	70,000	0	0	0	-176,000	190,000
Vehicles	314,000	0	0	0	124,000	-3,915,000	419,000
Total	**4,353,000**	**1,584,000**	**418,000**	**208,000**	**1,724,000**	**1,692,000**	**435,000**

Over time, the appropriate funding for asset categories with surpluses in Table 33 should be reallocated to categories with deficits. This will not change the recommendations as they are based on the bottom line deficit.

2.3 Recommendations for full funding

The average annual investment requirement for the above categories is $4,353,000. Annual revenue currently allocated to these assets for capital purposes is $3,934,000 leaving an annual deficit of $419,000. To put it another way, these infrastructure categories are currently funded at 90% of their long-term requirements. In 2016, The municipality has annual tax revenues of $13,618,000. As illustrated in Table 34, without consideration of any other sources of revenue, full funding would require the following tax change over time:

TABLE 34 TAX CHANGE REQUIRED FOR FULL FUNDING

Asset Category	Tax Increase Required for Full Funding
Road Network	3.0%
Bridges & Culverts	0.9%
Storm Sewer Network	1.2%
Equipment	-1.5%
Facilities	-1.9%
Land Improvements	0.0%
Vehicles	1.4%
Total	**3.1%**

As illustrated in the Table 35, Clearview's debt payments for these asset categories will be decreasing by $39,000 over the next five years and by $115,000 over the next 10 years. Although not shown in the table, debt payment decreases will be $1115,000 and $115,000 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 35 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	419,000	419,000	419,000	419,000	419,000	419,000	419,000	419,000
Change in Debt Costs	N/A	N/A	N/A	N/A	-39,000	-115,000	-115,000	-115,000
Resulting Infrastructure Deficit	**419,000**	**419,000**	**419,000**	**419,000**	**380,000**	**304,000**	**304,000**	**304,000**
Resulting Tax Increase Required:								
Total Over Time	**3.1%**	**3.1%**	**3.1%**	**3.1%**	**2.8%**	**2.2%**	**2.2%**	**2.2%**
Annually	0.6%	0.3%	0.2%	0.2%	0.6%	0.2%	0.1%	0.1%

Considering all of the above information, we recommend the 10 year option in Table 35 that includes the reallocations. This involves full funding being achieved over 10 years by:

- when realized, reallocating the debt cost reductions of $115,000 to the infrastructure deficit as outlined above.
- increasing tax revenues by 0.2% 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.
- allocating the gas tax revenue and OCIF revenue as outlined in Table 33.
- increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

Notes:

1. As in the past, **periodic** senior government infrastructure funding will most likely be available during the phase-in period. By Provincial AMP rules, this periodic funding cannot be incorporated into an AMP unless there are firm commitments in place. We have included OCIF formula based funding, if applicable, since this funding is a multi-year commitment.
2. We realize that raising tax revenues by the amounts recommended above for infrastructure purposes may be 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 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 $3,393,000 for paved roads, $126,000 for bridges & culverts, $0 for storm sewers, $1,394,000 for machinery & equipment, $1,193,000 for facilities, $213,000 for land improvements and $432,000 for vehicles. 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 wastewater. 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 36 and 37 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 36 SUMMARY OF INFRASTRUCTURE REQUIREMENTS AND CURRENT FUNDING AVAILABLE

Asset Category	Average Annual Investment Required	2014 Annual Funding Available				Annual Deficit
		Rates	To Operations	Other	Total	
Wastewater services	928,000	1,183,000	-1,114,000	0	193,000	-16,000
Water services	804,000	2,190,000	-1,370,000	0	-108,000	843,000
Total	1,732,000	3,373,000	-2,484,000	0	85,000	827,000

The water network surplus position of $16,000 is immaterial so we would recommend no change in water rates for AMP purposes. Having said that, as outlined in the reserve section of the financial strategy, the water services reserve is currently in a deficit position. The plan required to bring this reserve to an adequate level may require rate increases.

3.3 Recommendations for full funding

The average annual investment requirement for the above categories is $1,732,000. Annual revenue currently allocated to these assets for capital purposes is $889,000, leaving an annual deficit of $843,000. To put it another way, these infrastructure categories are currently funded at 51% of their long-term requirements. In 2016, Clearview has annual wastewater revenues of $1,183,000 and annual water revenues of $2,190,000. As illustrated in the table below, without consideration of any other sources of revenue, full funding would require the following increases over time:

TABLE 37 RATE CHANGE REQUIRED FOR FULL FUNDING

Asset Category	Rate Increase Required for Full Funding
Wastewater	72.6%
Water	-0.7%

Clearview Township's debt payments for sanitary services will be decreasing by $185,000 over the next five years and by the same amount over the next 10 years. Although not shown in the table, debt payment decreases will also be $185,000 over the next 15 years. Our recommendations include capturing those decreases in cost and allocating them to the applicable infrastructure deficit. For water services, the amounts are $0, $65,000 and $65,000 respectively but these decreases are irrelevant since water services is fully funded.

TABLE 38 EFFECT OF REALLOCATING DECREASES IN DEBT COSTS – WITHOUT CHANGE IN DEBT COSTS: RATE FUNDED ASSETS

	Sanitary Sewer Network			Water Network		
	5 Years	10 Years	15 Years	5 Years	10 Years	15 Years
Infrastructure Deficit as Outlined in Table 4	859,000	859,000	859,000	N/A	N/A	N/A
Change in Debt Costs	N/a	N/a	n/a	N/A	N/a	n/a
Resulting Infrastructure Deficit	859,000	859,000	859,000	0	0	0
Resulting Rate Increase Required:						
Total Over Time	72.6%	72.6%	72.6%	0.0%	0.0%	0.0%
Annually	14.5%	7.3%	4.8%	0.0%	0.0%	0.0%

TABLE 39 EFFECT OF REALLOCATING DECREASES IN DEBT COSTS – WITH CHANGE IN DEBT COSTS: RATE FUNDED ASSETS

	Sanitary Sewer Network			Water Network		
	5 Years	10 Years	15 Years	5 Years	10 Years	15 Years
Infrastructure Deficit as Outlined in Table 4	859,000	859,000	859,000	N/A	N/A	N/A
Change in Debt Costs	-185,000	-185,000	-185,000	N/A	N/a	n/a
Resulting Infrastructure Deficit	674,000	674,000	674,000	0	0	0
Resulting Rate Increase Required:						
Total Over Time	57.0%	57.0%	57.0%	0.0%	0.0%	0.0%
Annually	11.4%	5.7%	3.8%	0.0%	0.0%	0.0%

Considering all of the above information, we recommend the 15 year option which includes reallocations. This involves full funding being achieved over 15 years by:

- As stated above, the water network surplus position of $16,000 is immaterial so we recommend no change in water rates for AMP purposes.
- when realized, reallocating the debt cost reductions of $185,000 for sanitary services to the applicable infrastructure deficit.
- increasing rate revenues by 3.8% for sanitary services each year for the next 15 years solely for the purpose of phasing in full funding to the asset categories covered in this section of the AMP.
- increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

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.

Although this option achieves full funding on an annual basis in 15 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 $286,000 for sanitary services and $5,505,000 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 40 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.

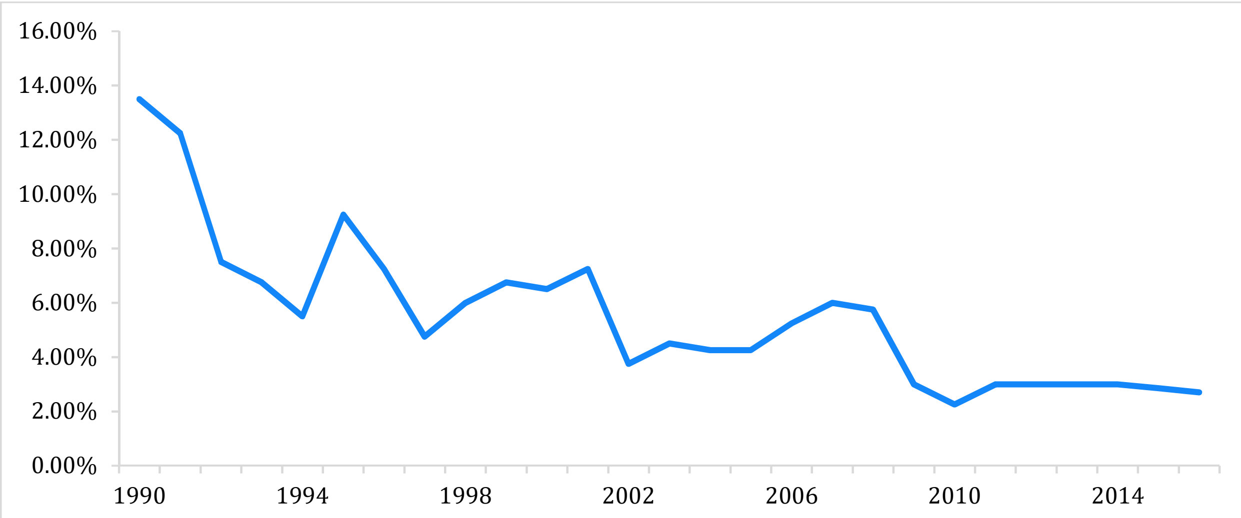
TABLE 40 TOTAL INTEREST PAID AS A % OF PROJECT COSTS

	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 60 HISTORICAL PRIME BUSINESS INTEREST RATES



As illustrated in Table 40, 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 41 and 42 outline how Clearview Township has historically used debt for investing in the asset categories as listed. There is currently $4,465,000 of debt outstanding for the assets covered by this AMP with corresponding principal and interest payments of $369,000. In terms of overall debt capacity, in 2015 Clearview Township had $422,000 in total annual principal and interest payment commitments, well within its provincially prescribed maximum of $5,072,000.

TABLE 41 OVERVIEW OF USE OF DEBT

Asset Category	Debt Outstanding	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	1,613,000	257,000	3,326,000	0	0	138,000
Land Improvements	0	0	0	0	0	0
Vehicles	0	0	0	0	0	0
Total tax funded	3,226,000	514,000	6,652,000	0	0	276,000
Wastewater services	1,366,000	1,327,000	0	0	0	223,000
Water services	1,486,000	0	0	0	0	0
Total rate funded	4,338,000	1,327,000	0	0	0	223,000

TABLE 42 OVERVIEW OF DEBT COSTS

Asset Category	Principal & Interest Payments in Next Ten Years					
	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	115,000	116,000	116,000	111,000	85,000	76,000
Land Improvements	0	0	0	0	0	0
Vehicles	0	0	0	0	0	0
Total tax funded	230,000	232,000	232,000	222,000	170,000	152,000
Wastewater services	189,000	191,000	191,000	191,000	292,000	4,000
Water services	65,000	65,000	65,000	65,000	65,000	65,000
Total rate funded	319,000	321,000	321,000	321,000	422,000	134,000

The revenue options outlined in this plan allow Clearview 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.

4 Use of reserves

4.1 Available reserves

Reserves play a critical role in long-term financial planning. The benefits of having reserves 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 43 outlines the details of the reserves currently available to Clearview.

TABLE 43 SUMMARY OF RESERVES AVAILABLE

Asset Category	Balance at December 31, 2015
Road Network	1,339,000
Bridges & Culverts	950,000
Storm Sewer Network	42,000
Equipment	1,155,000
Facilities	848,000
Land Improvements	57,000
Vehicles	199,000
Total tax funded	4,590,000
Water Network	-821,000
Wastewater Sewer Network	-1,297,000
Total rate funded	-3,415,000

There is considerable debate in the municipal sector as to the appropriate level of reserves 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 in Table 43 are available for use by applicable asset categories during the phase-in period to full funding. This, coupled with Clearview's judicious use of debt in the past, allows the scenarios to assume that, if required, available reserves and debt capacity can be used for high priority and emergency infrastructure investments in the short to medium-term.

As demonstrated in Table 43, the reserves for sanitary and water services have significant deficits. Our recommendations enable Clearview Township to achieve full funding over a number of years. The phase in plan should not only prioritize capital projects to available funding, it should also ensure that sufficient funds remain unallocated in order for reserves to build to adequate levels over a reasonable period of time. Clearview Township's judicious use of debt in the past, allows the scenarios to assume that, if required, available and debt capacity can be used for high priority and emergency infrastructure investments in the short to medium-term.

4.2 Recommendation

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