AMP2016

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The 2016 Asset Management Plan for the

Municipality of North Perth

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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 North Perth's infrastructure portfolio comprises 11 distinct infrastructure categories: road network, bridges & culverts, facilities, Perth Meadows, storm network, landfill, land improvements, fleet, IT, machinery & equipment, water network and wastewater network. The asset classes analyzed in this asset management plan for the municipality had a total 2016 valuation of $250 million, of which wastewater comprised 25%, followed by facilities at 20% and bridges and culverts at 16%.

Major investments in infrastructure began in the early 1950s. Investments gradually increased and saw a jump between 1990 and 1994, at nearly $38 million. After that period, investments decreased and grew again to reach their peak from 2010-2014 at $43 million, with the top three categories of expenditures being facilities at nearly $10 million, wastewater at nearly $9 million, and water at over $6 million.

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

Based on 2016 replacement cost, and a blend of assessed and age-based data, about 16% of assets, with a valuation of $41 million, are in poor to very poor condition. Nearly 60% are in good to very good condition. While the municipality provided condition data for its road surfaces, bridges & culverts, buildings and wastewater treatment plant, all other assets lacked this information. 84% of the assets analyzed in this AMP have at least 10 years of useful life remaining. However, 7%, with a valuation of $17 million, remain in operation beyond their established useful life. An additional 5%, with a valuation of $12 million, will reach the end of their useful life within 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.

The average annual investment requirement for tax funded categories asset is $4,154,000. Annual revenue currently allocated to these assets for capital purposes is $2,028,000, leaving an annual deficit of $2,126,000. To put it another way, these infrastructure categories are currently funded at 49% of their long-term requirements. In 2016, the municipality has annual tax revenues of $11,408,000. Our strategy includes full funding being achieved over 15 years by:

1. when realized, reallocating the debt cost reductions of $26,000 to the infrastructure deficit as outlined above.
2. increasing tax revenues by 1.0% each year for the next 20 years solely for the purpose of phasing in full funding to the asset categories covered in this section of the AMP.
3. allocating the current gas tax and Ontario Community Infrastructure Fund (OCIF) revenue as well as the scheduled increases to the infrastructure deficit as they occur.

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

The average annual investment requirement for water services and wastewater services is $2,185,000. Annual revenue currently allocated to these assets for capital purposes is $936,000 leaving an annual deficit of $1,249,000. To put it another way, these infrastructure categories are currently funded at 43% of their long-term requirements. In 2016, North Perth had annual water revenues of $1,593,000 and annual wastewater revenues of $2,061,000. To achieve financial sustainability for its rate-based assets, we recommend a 15-year option that achieves full funding by:

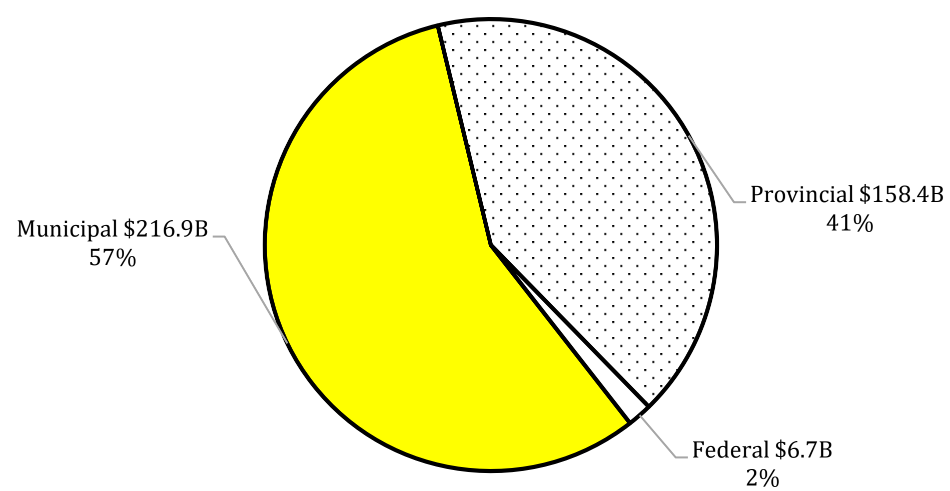
1. when realized, reallocating the debt cost reductions of $125,000 for water services to the applicable infrastructure deficit.
2. increasing rate revenues by 2.7% for wastewater services and 1.2% for water services each year for the next 15 years solely for the purpose of phasing in full funding to this category.
3. Increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

Although our financial strategies allow the municipalities to meet its long-term funding requirements and reach fiscal sustainability, injection of additional revenues will be required to mitigate existing infrastructure backlogs.

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 is $250 million. 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 classes through risk and prioritization strategies.
Sustainable Financing	Identify sustainable Financing Strategies for all asset classes.
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

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 North Perth'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 classes. Previously, only core infrastructure categories were analyzed. The following asset classes are analysed in this document: road network; bridges & culverts; facilities; IT, machinery & equipment; fleet; land improvements; water network; wastewater network; storm network; landfill; and Perth Meadows.

This AMP includes a detailed discussion of the state of local infrastructure and assets for each class; 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 classes 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 present 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. The type of condition data used for each class is indicated in Chapter V, Section 2.

2. Financial Data

In this AMP, the average annual requirement is the amount based on current replacement costs that the municipality should set aside annually for each infrastructure class so that assets can be replaced upon reaching the end of their lifecycle. The replacement cost can be based on an estimate or quote, or can be calculated by inflating the historical cost of the asset.

To determine current funding capacity, all existing sources of funding are identified and aggregated; data for the previous three years is analyzed, 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 replace all assets that remain in service beyond their established useful life. 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

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

4. Limitations and Assumptions

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

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

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

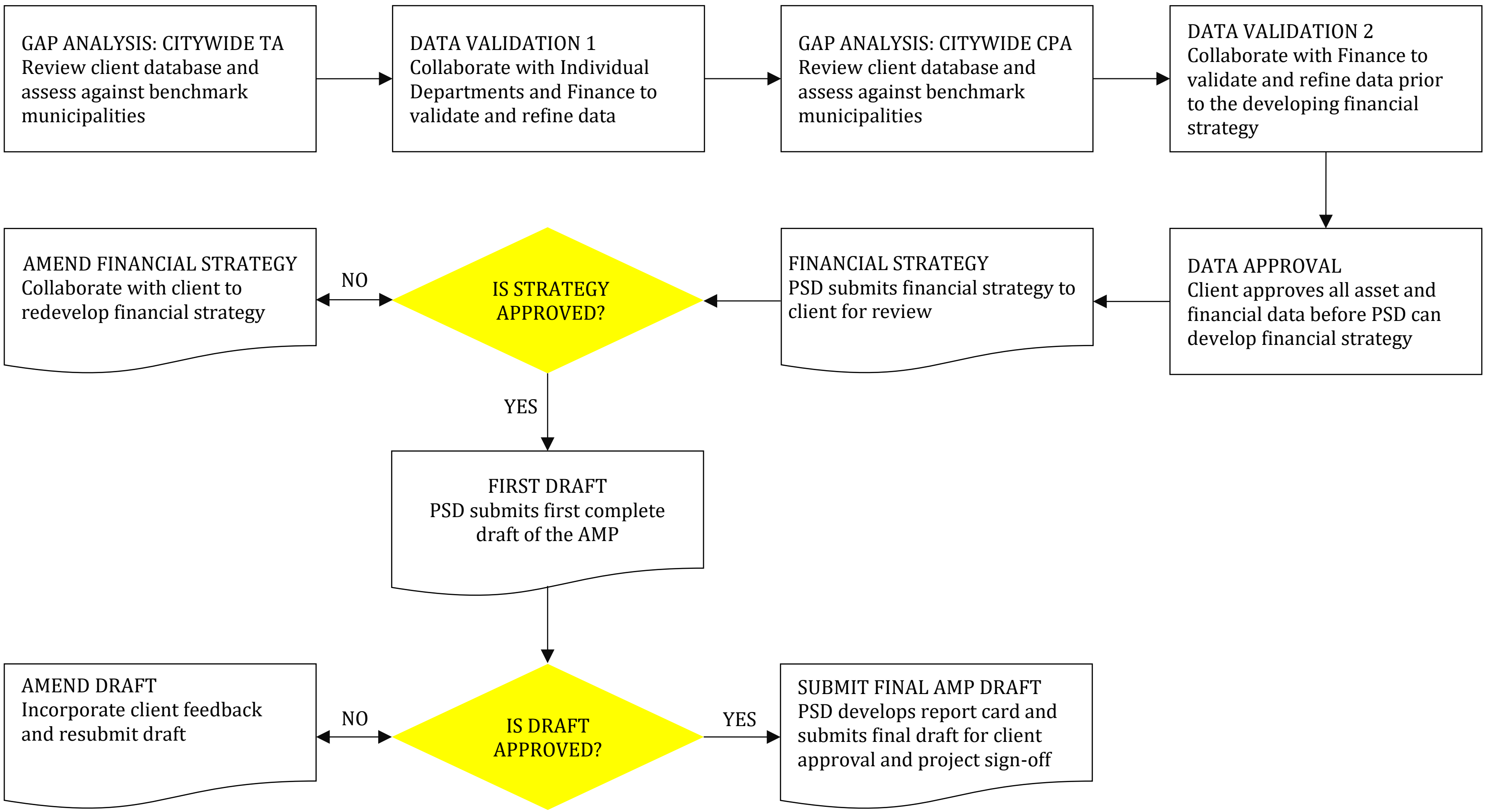
3. Our calculations and recommendations will reflect the best available data at the time this AMP was developed.

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

5. Process

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

Figure 2 Developing the AMP – Work Flow and Process



V. Summary Statistics

In this section, we aggregate technical and financial data across all asset classes analyzed in this AMP, and summarize the state of the infrastructure using key indicators, including asset condition, useful life consumption, and important financial measurements.

1. Asset Valuation

The asset classes analyzed in this asset management plan for the municipality had a total 2016 valuation of $250 million, of which the wastewater network comprised 25%, followed by facilities at 20%. The ownership per household (Figure 4) totaled $64,255 based on 5,185 households within the service area for all assets, except for the storm, wastewater, and water networks that service 2,850, 2,923, and 2,792 households, respectively.

Figure 3 Asset Valuation by Class

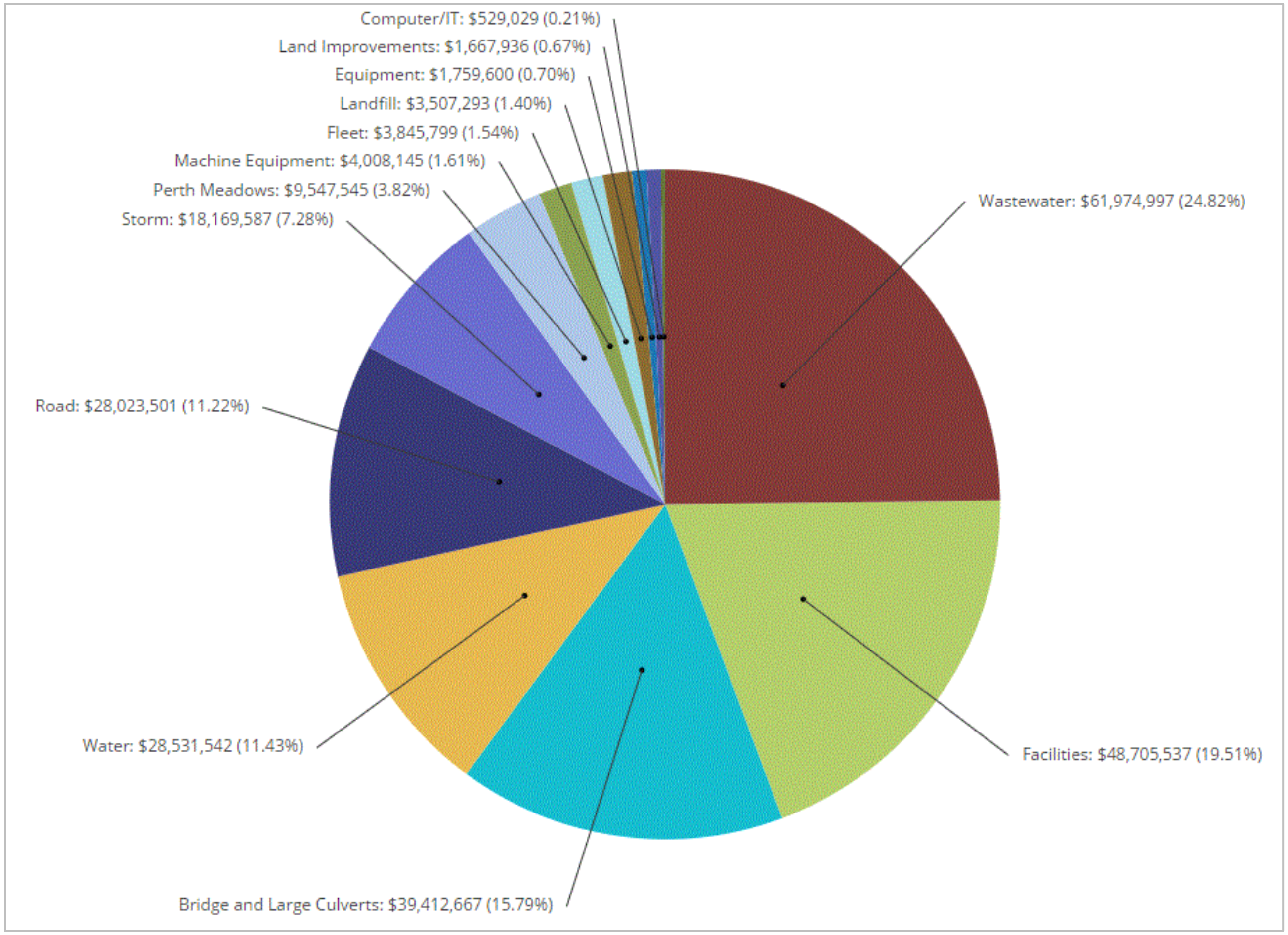
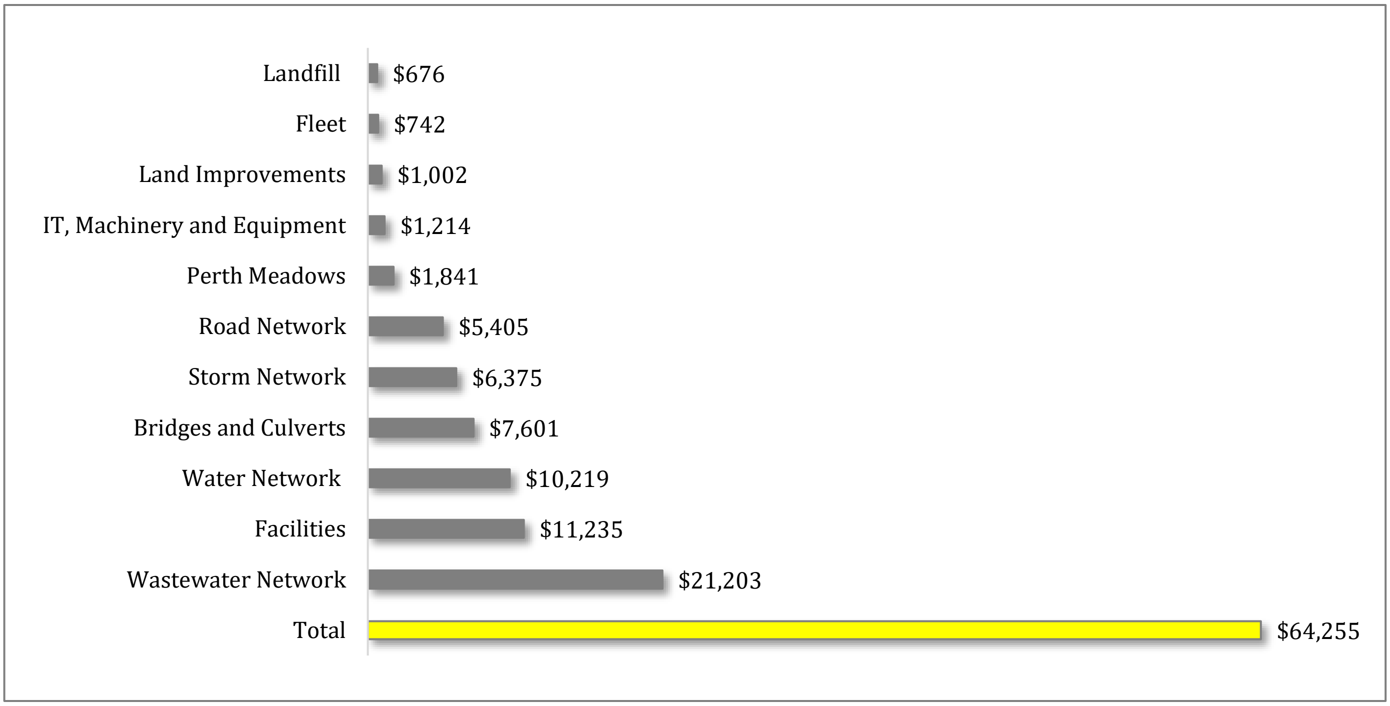


Figure 4 2016 Ownership Per Household



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 4 indicates the source of condition data used for each of the 11 asset classes in this AMP.

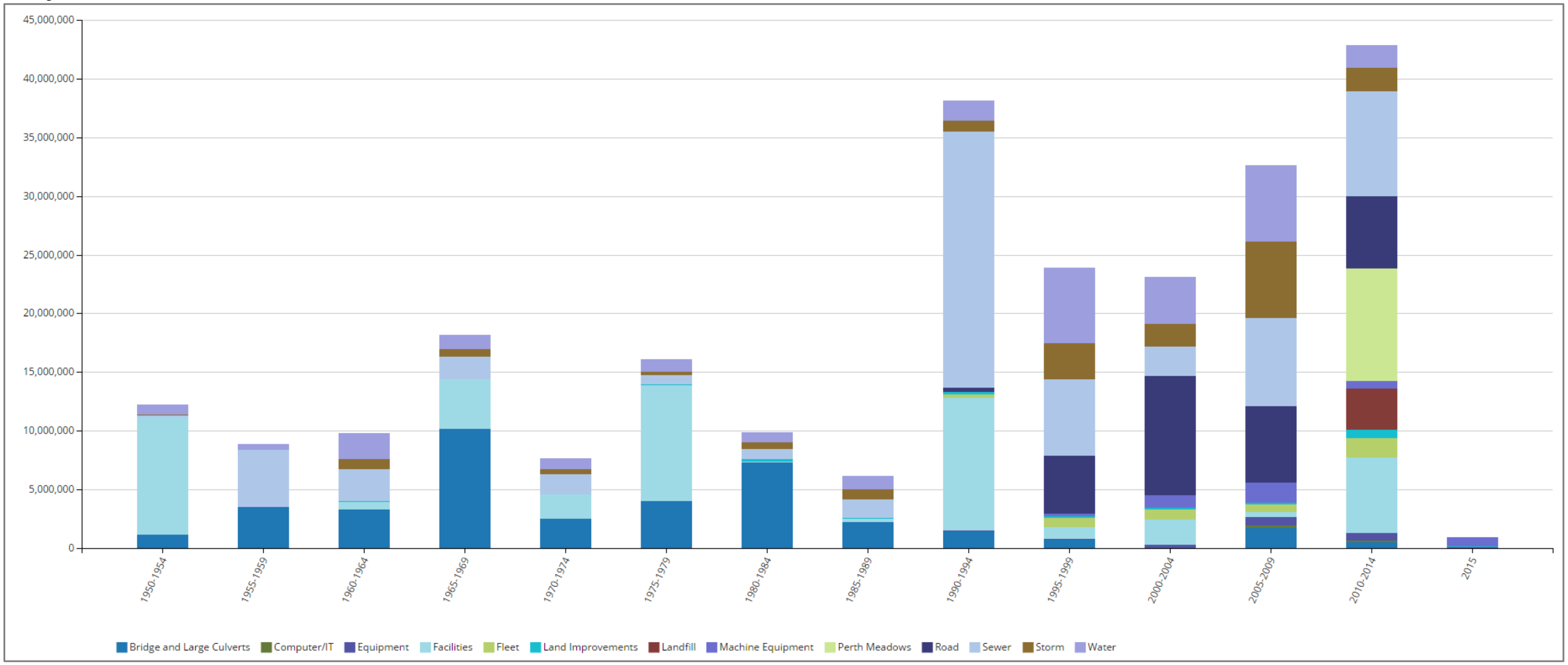
Table 4 Source of Condition Data by Asset Class

Asset class	Component	Source of Condition Data
Bridges and Culverts	Bridges (concrete structures)	100% Assessed – GM Blue Plan
	Large Culverts (CSP structures)	100% Assessed – GM Blue Plan
Road Network	Elma Road Road Surface	100% Assessed - Internal
	Listowel Road Surface	100% Assessed - Internal
	Wallace Road Surface	100% Assessed – Internal
	Sidewalks	Age
	Streetlights	Age
Storm Network	All	Age
Water Network	All	Age
Wastewater Network	Treatment Plant	100% Assessed – Internal
Wastewater Network	All Other	Age
IT, Machinery & Equipment	All	Age
Facilities	All	100% Assessed – Internal
Land Improvements	All	Age
Landfill	All	Age
Perth Meadows	All	Age
Fleet	All	Age

3. Historical Investment in Infrastructure – All Asset Classes

In conjunction with condition data, two other measurements can augment staff understanding of the state of infrastructure and impending and long-term infastructure needs: installation year profile, and useful life remaining. The installation year profile in Figure 5 illustrates the historical invesments in infrastructure across the asset classes analyzed in this AMP since 1950 using 2016 replacement costs. Often, investment in critical infrastructure parallels population growth or other significant shifts in demographics. Note, this graph includes the historical investment for assets within the active inventory as of December 31, 2015.

Figure 5 Historical Investment in Infrastructure – All Asset Classes

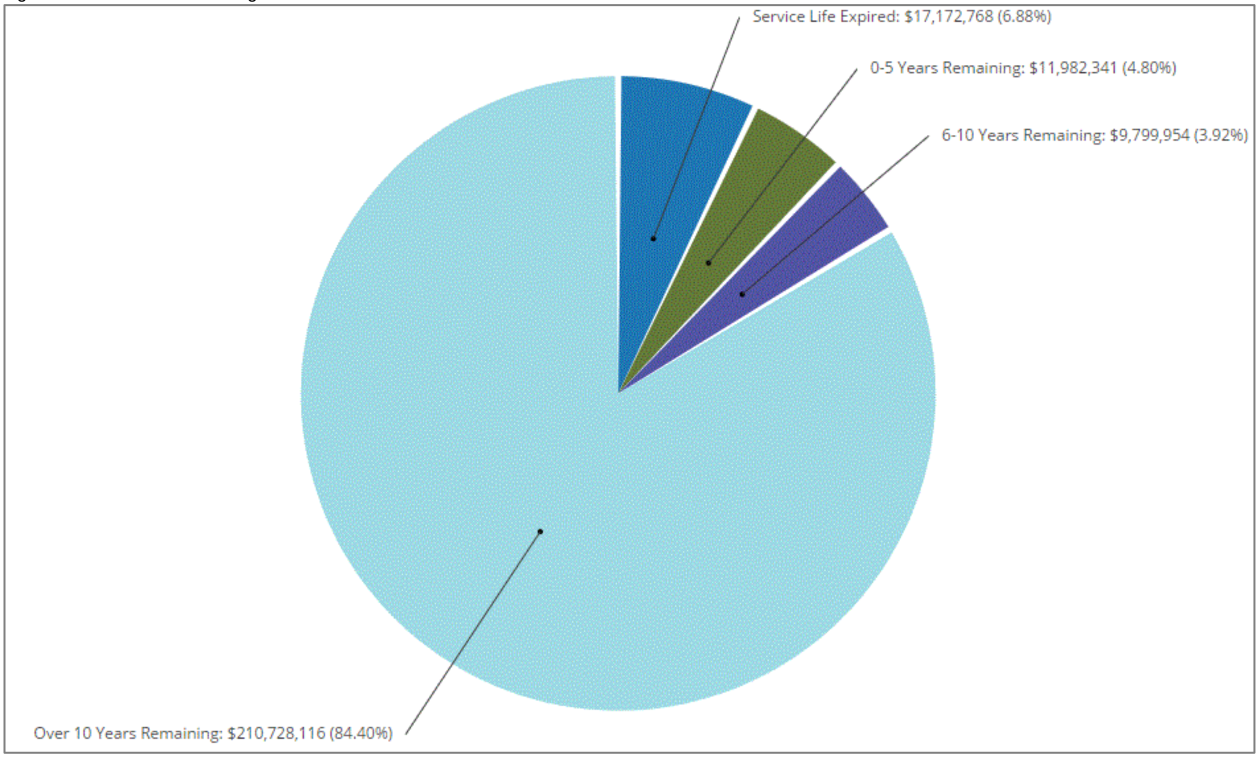


Major investments in infrastructure began in the early 1950s. Investments gradually increased and saw a jump between 1990 and 1994, at nearly $38 million. After that period, investments decreased and grew again to reach their peak from 2010-2014 at $43 million, with the top three categories of expenditures being facilities at nearly $10 million, wastewater at nearly $9 million, and water at over $6 million.

4. Useful Life Consumption – All Asset Classes

While age is not a precise indicator of an asset's health, in the absence of observed condition assessment data, it can serve as a high-level, meaningful approxmiation and help guide replacement needs and facilitate strategic budgeting. Figure 6 shows the distibution of assets based on the percentage of useful life already consumed.

Figure 6 Useful Life Remaining as of 2015 – All Asset Classes

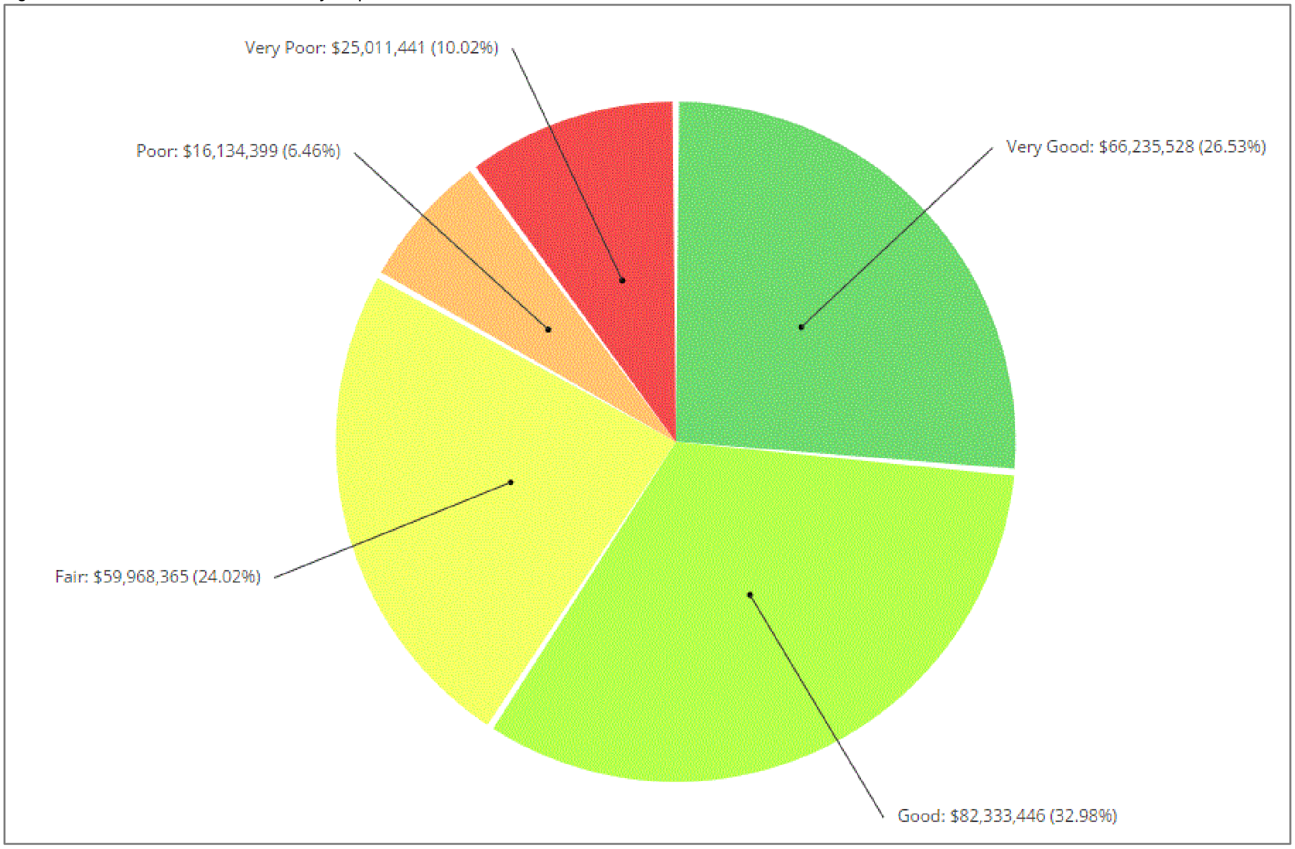


84% of the assets analyzed in this AMP have at least 10 years of useful life remaining. However, 7%, with a valuation of $17 million, remain in operation beyond their established useful life. An additional 5%, with a valuation of $12 million, will reach the end of their useful life within the next five years.

5. Overall Condition – All Asset Classes

Based on 2016 replacement cost, and a blend of assessed and age-based data, the condition of assets as of year-end 2015 is shown in Figure 7. 16% of assets, with a valuation of $41 million, are in poor to very poor condition. Over 60% are in good to very good condition.

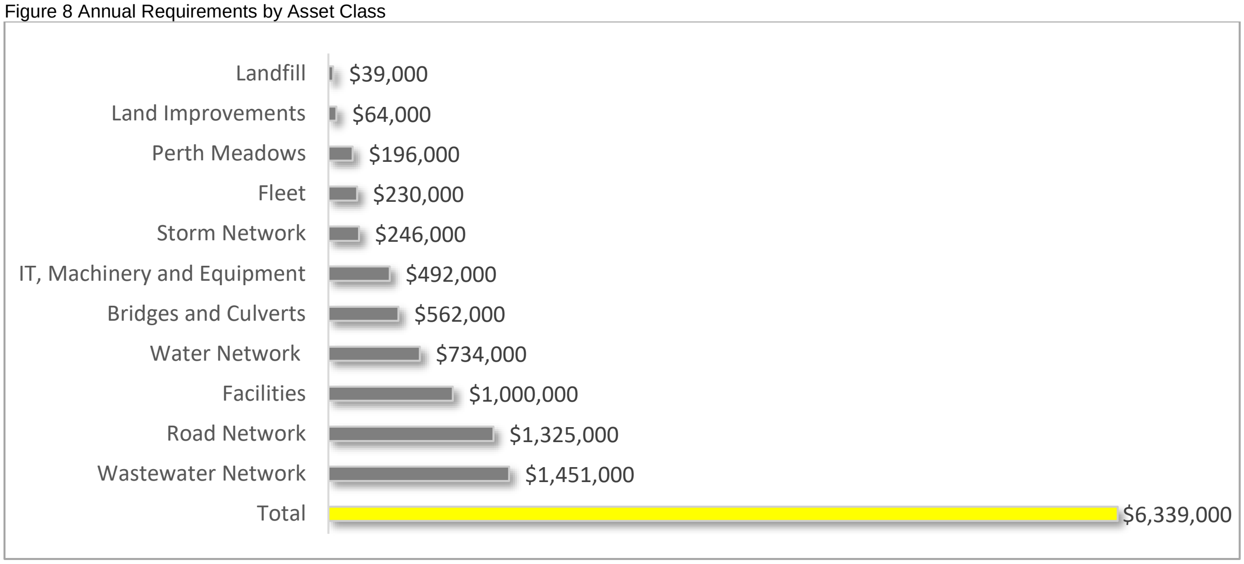
Figure 7 Asset Condition Distribution by Replacement Cost as of 2015 – All Asset Classes



6. Financial Profile

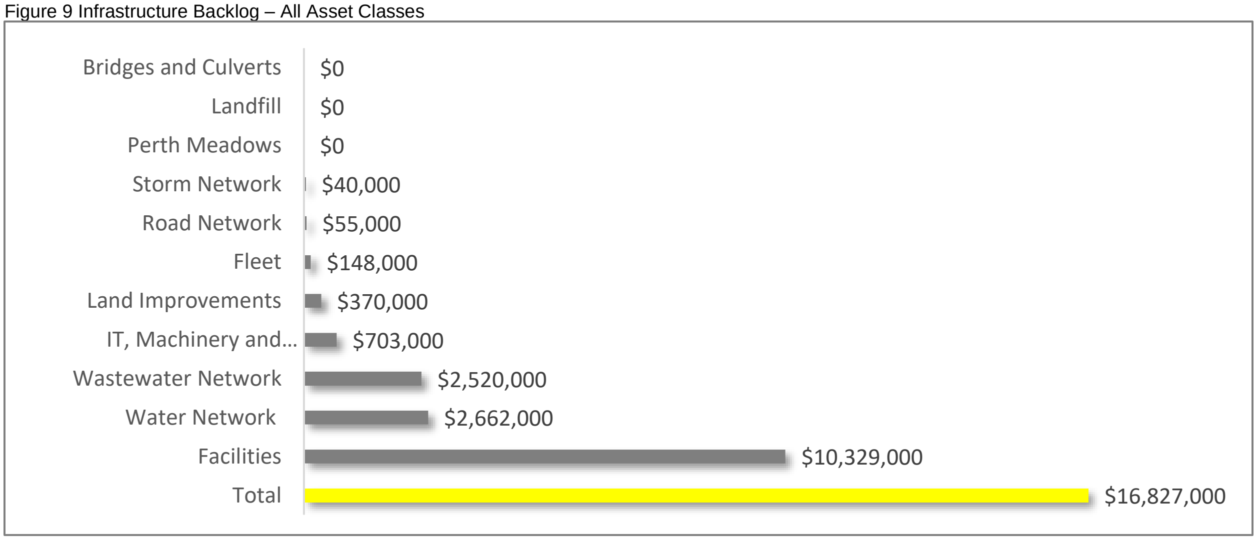
This section details key financial indicators related to the municipality's asset classes as analyzed in this asset management plan.

Figure 8 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, prevent infrastructure back-logs and achieve long-term sustainability. In total, the municipality must allocate $6.3 million annually for the assets covered in this AMP.

Figure 9 Infrastructure Backlog – All Asset Classes

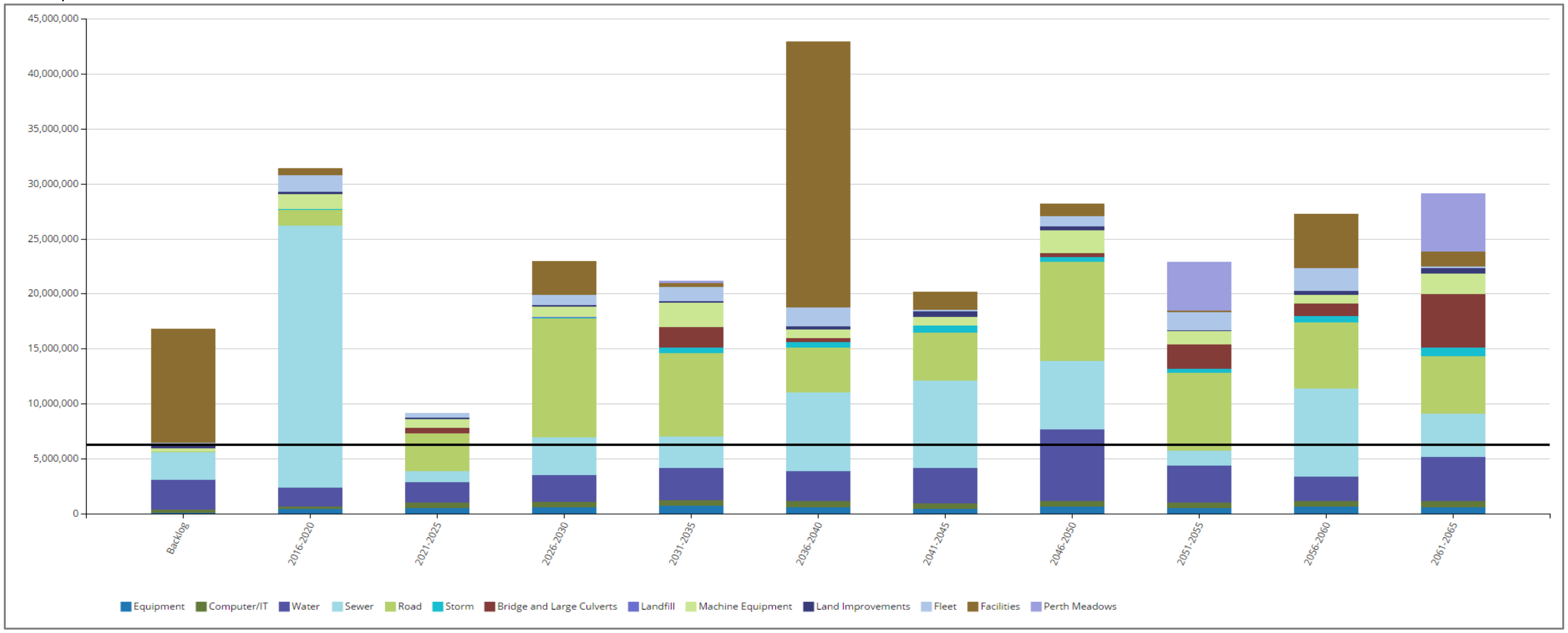


The municipality has a combined infrastructure backlog of $17 million, with the facilities comprising 61%. The back-log represents the investment needed today to meet previously deferred replacement needs. In the absence of assessed data, the backlog represents the value of assets still in operation beyond their established useful life.

7. Replacement Profile – All Asset Classes

In this section, we illustrate the aggregate short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's asset classes as analyzed in this AMP based on 2016 replacement cost. 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 10 Replacement Profile – All Asset Classes



Based on a combination of assessed and age data, the municipality has a combined backlog of $17 million, of which the facilities comprise over $10 million. Aggregate replacement needs will total over $31 million over the next five years. An additional $9 million will be required between 2021 and 2025. The municipality's aggregate annual requirements (indicated by the black line) total $6.3 million. At this funding level, the municipality would be allocating sufficient funds on an annual basis to meet the replacement needs for its various asset classes as they arise without the need for deferring projects and accruing annual infrastructure deficits. Currently, the municipality is funding 47% of the annual requirement for its assets. See the 'Financial Strategy' chapter for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

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. As available, assessed condition data was used to inform the discussion and recommendations; in the absence of such information, age-based data was used as the next best alternative.

1. Road Network

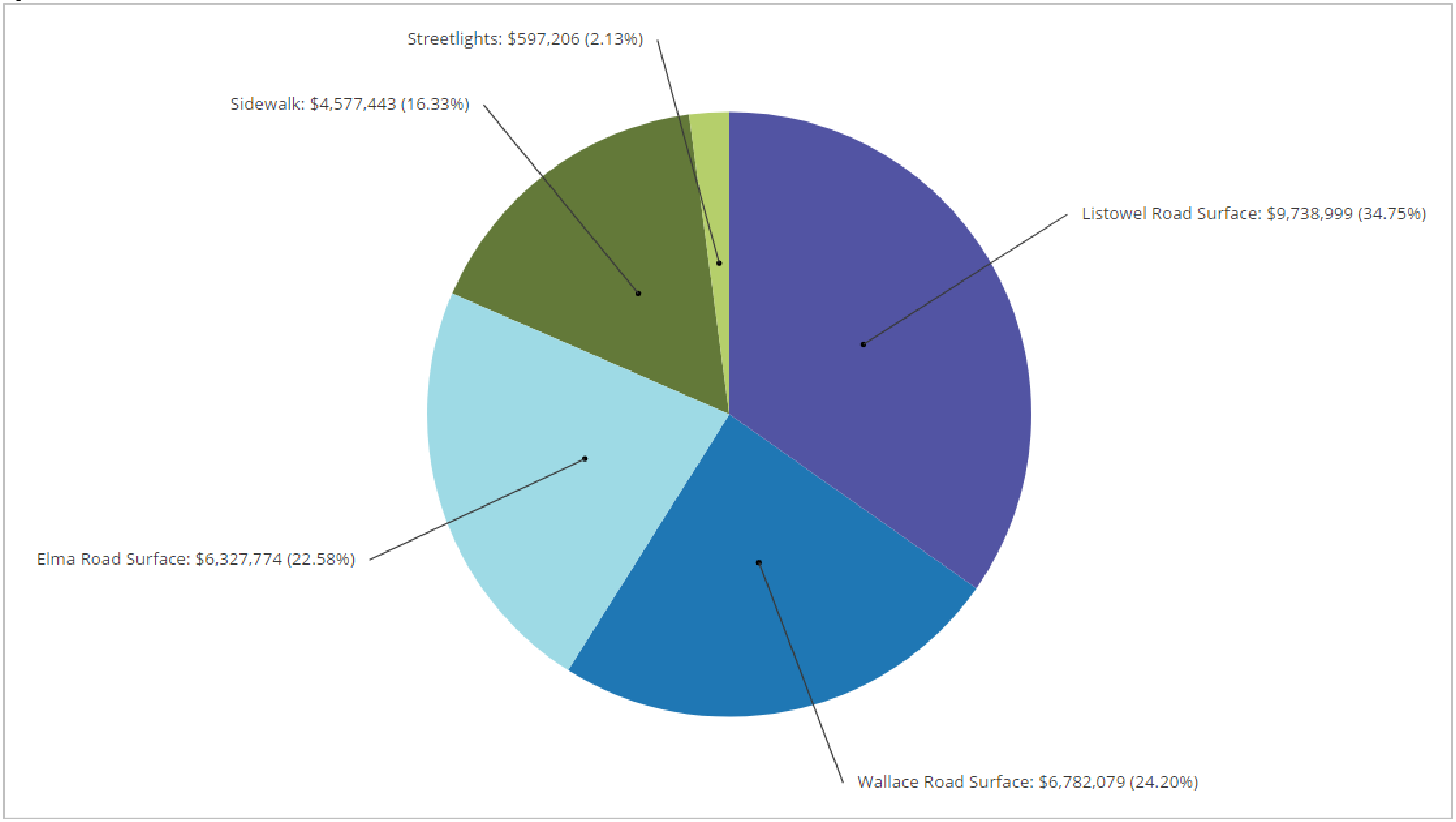
1.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 5 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 $28 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 5 Key Asset Attributes – Road Network

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Road Network	Road Base	Pooled	Non-Amortized	Not Planned for Replacement	-
	Elma Road Road Surface	63.92km	20	NRBCPI (Toronto)	$6,327,774
	Listowel Road Surface	53.71km	20	NRBCPI (Toronto)	$9,738,999
	Wallace Road Surface	64.59km	20	NRBCPI (Toronto)	$6,782,079
	Sidewalks	41km	30	NRBCPI (Toronto)	$4,577,443
	Streetlights	Pooled	17 - 20	NRBCPI (Toronto)	$597,206
				Total	**$28,023,501**

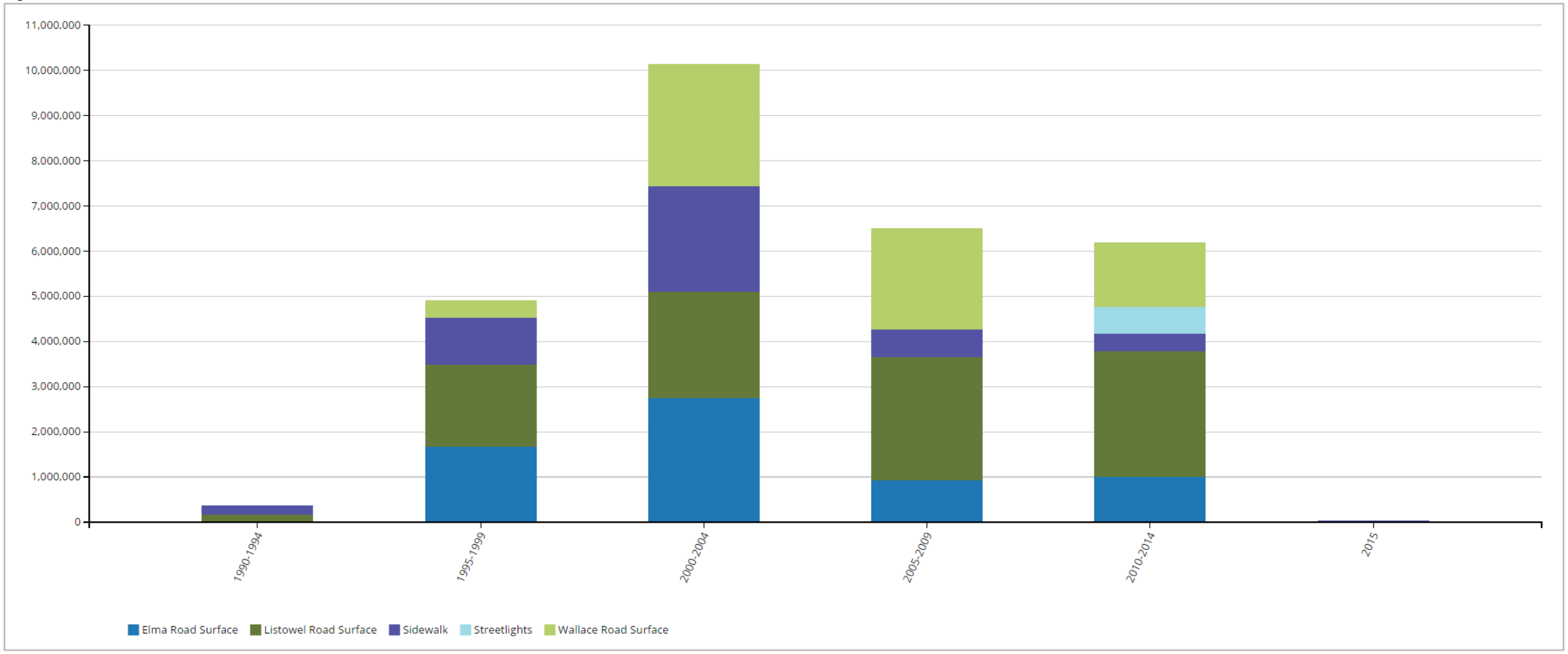
Figure 11 Asset Valuation – Road Network



1.2 Historical Investment in Infrastructure

Figure 12 shows the municipality's historical investments in its road network since 1990. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 1.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs. Note, this graph includes the historical investment for assets within the active inventory as of December 31, 2015.

Figure 12 Historical Investment – Road Network

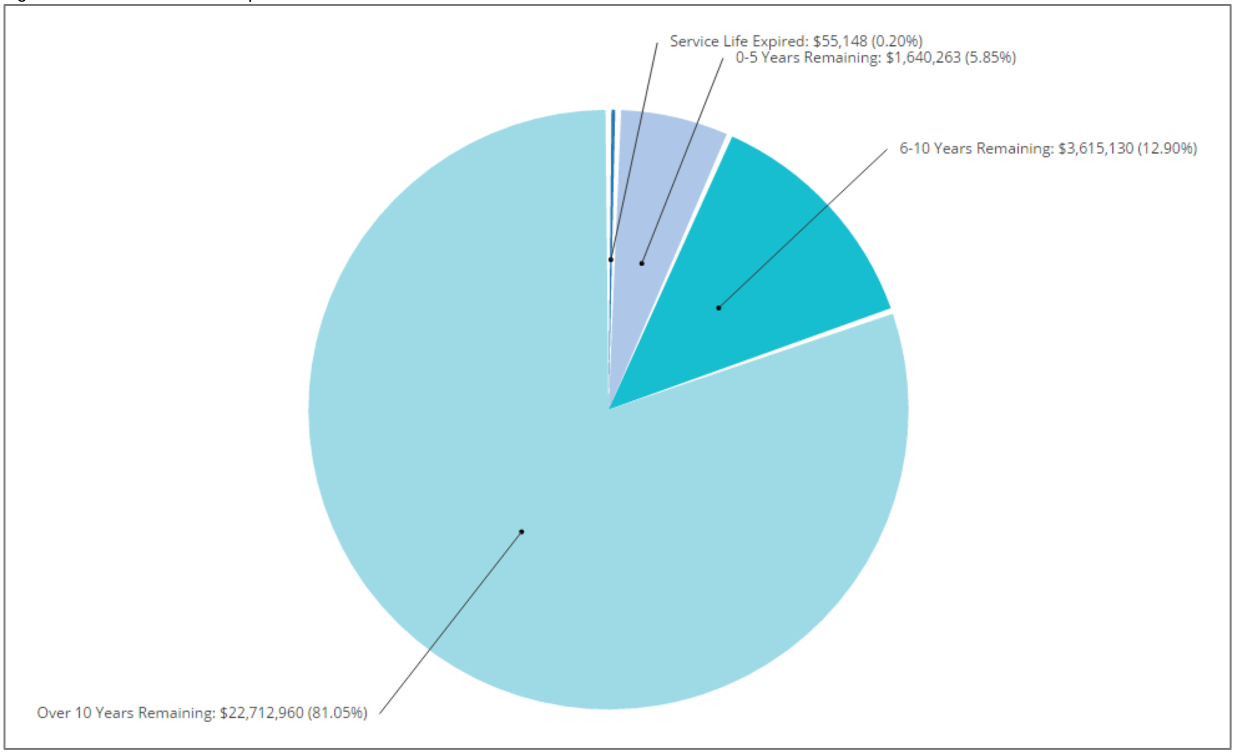


The municipality began investing in its road network in the early 1990s and investments increased quickly through 1995-1999. Expenditures peaked between 2000 and 2004, at a valuation of $10 million, with a relatively equal distribution among the three road surfaces and sidewalks. Since then, investments have decreased, however, between 2010 and 2015, expenditures of over $6 million have been invested into the municipality's road network.

1.3 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 historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 13 illustrates the useful life consumption levels as of 2015 for the municipality's road network.

Figure 13 Useful Life Consumption - Road Network

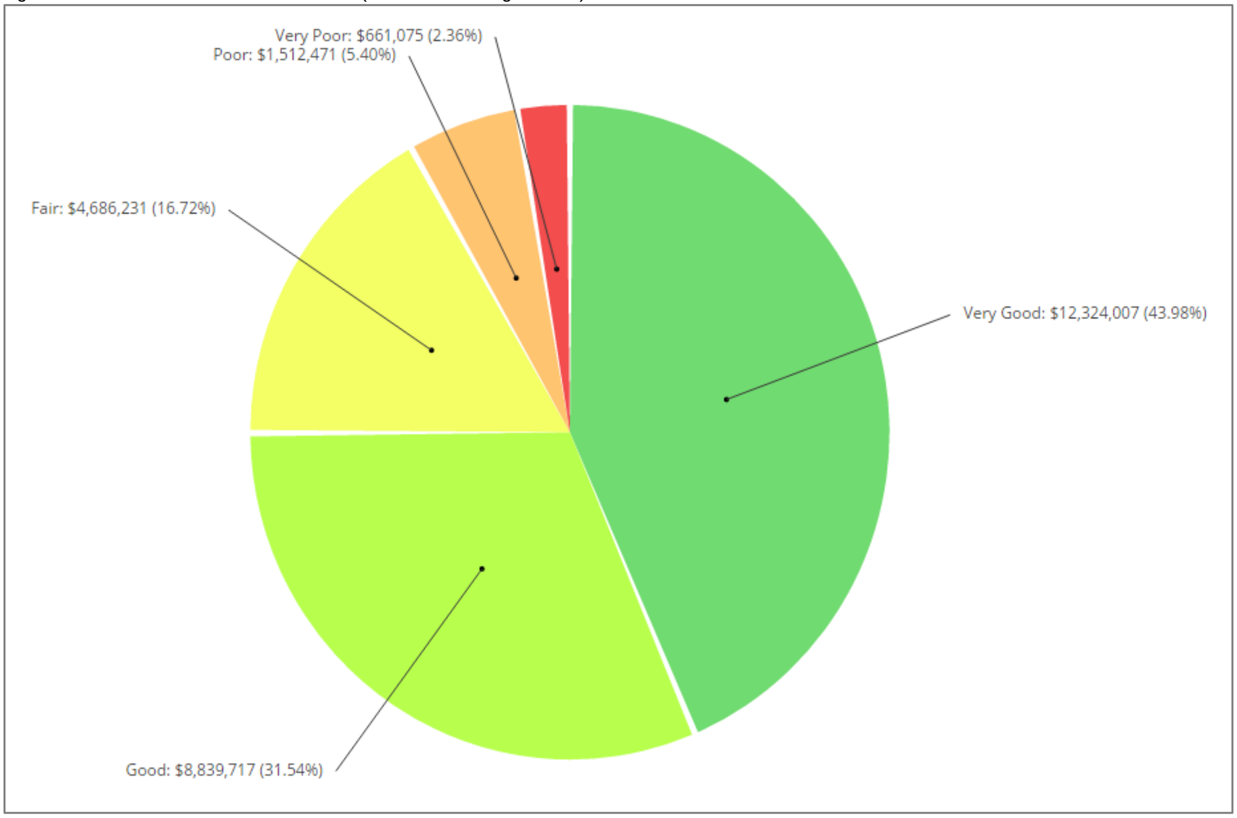


While over 80% of the municipality's road network has at least 10 years of useful life remaining, 0.2%, with a valuation of $55,000, remains in operation beyond its established useful life. An additional 6% will reach the end of it useful life within the next five years.

1.4 Current Asset Condition

Using 2016 replacement cost, in this section, we summarize the condition of the municipality's road network as of year-end 2015. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has provided condition data for its road surfaces. The remaining road components rely on age-based data.

Figure 14 Asset Condition – Road Network (Assessed and Age-based)

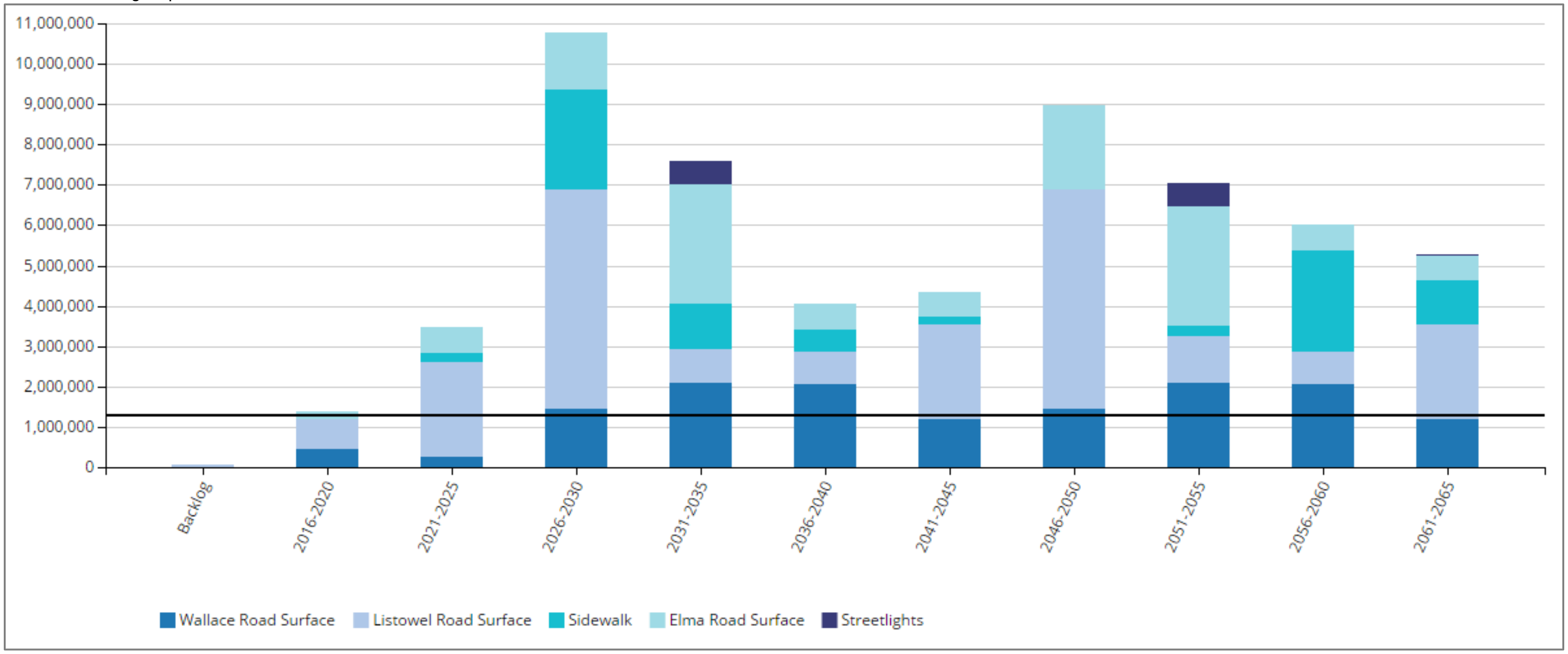


Based on a blend of age and assessed condition data, 76% of assets, with a valuation of $21 million, are in good to very good condition. However, 8%, with a valuation of $2 million, are in poor to very poor condition.

1.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's road network assets based on 2016 replacement cost. 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 15 Forecasting Replacement Needs – Road Network



In addition to a backlog of $55,000, replacement needs are forecasted to be $1.3 million in the next five years while an additional $3.5 million is forecasted in replacement needs between 2021-2025. The municipality's annual requirements (indicated by the black line) for its road network total $1.3 million. At this funding level, the municipality would be allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the municipality is currently allocating approximately $300,000, leaving an annual deficit of over $1 million. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

1.6 Recommendations – Road Network

- A blend of age and field inspection data indicates 10-year replacement needs of $4.8 million. The municipality should continue its condition assessments of road surfaces and expand the program to incorporate additional asset components in order to more precisely estimate its actual financial requirements and field needs. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- The data collected through condition assessment programs should be integrated into a risk management framework which will guide prioritization of the backlog as well as short, medium, and long term replacement needs. See Section 4, 'Risk' in the 'Asset Management Strategies' chapter for more information.

- 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.

- Road network key performance indicators should be established and tracked annually as part of an overall level of service model. See Section 7 'Levels of Service'.

- The municipality is funding 24% of its long-term requirements on an annual basis. See the 'Financial Strategy' section on how to achieve more sustainable funding levels.

2. Bridges & Culverts

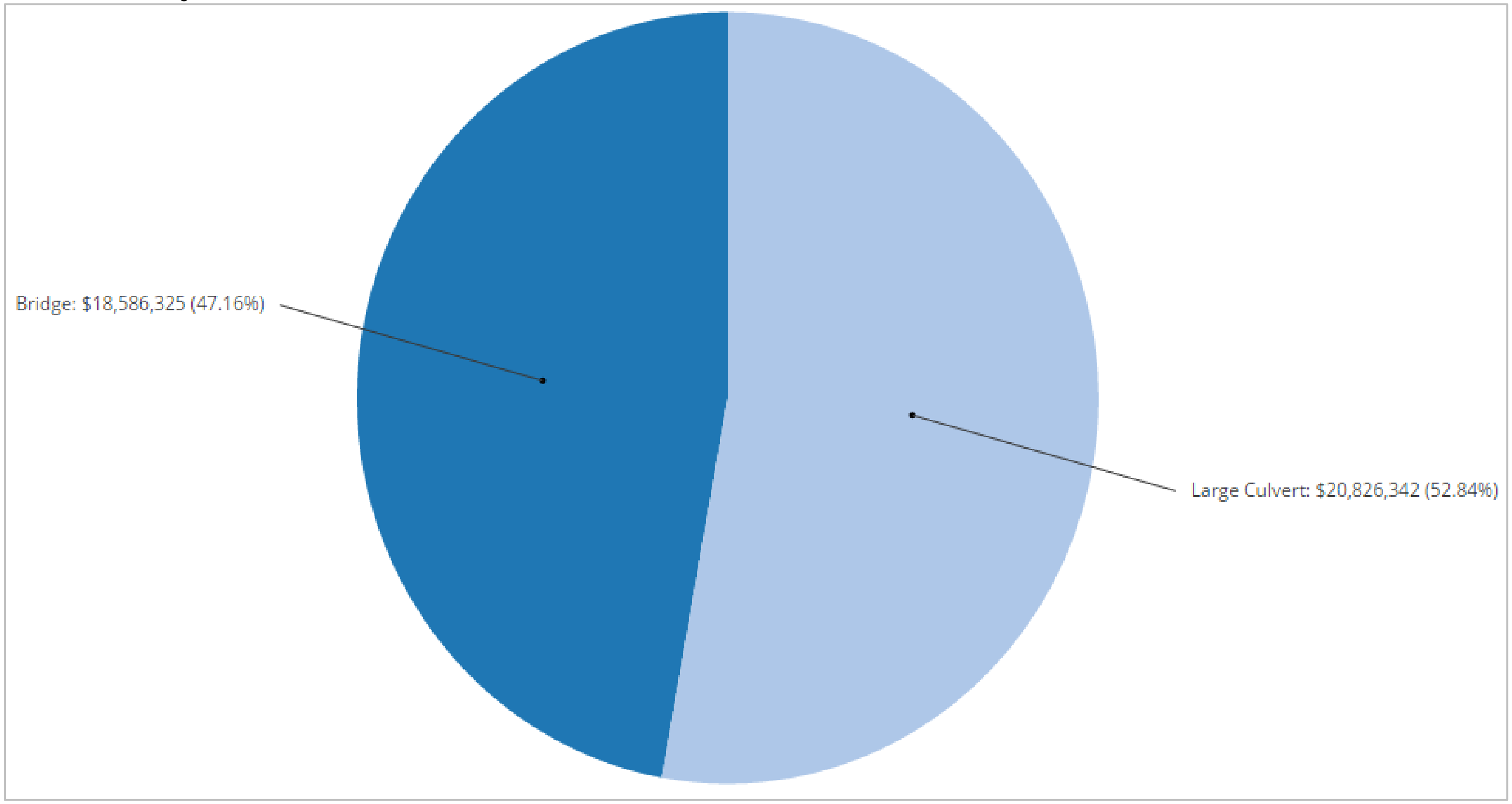
2.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 6 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 $39.4 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality.

Table 6 Key Asset Attributes – Bridges & Culverts

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Overall Replacement Cost
Bridges & Culverts	Bridges	65 units	75	NRBCPI (Toronto)	$18,586,325
	Large Culverts	15 units	30 - 75	NRBCPI (Toronto)	$20,826,342
				Total	$39,412,667

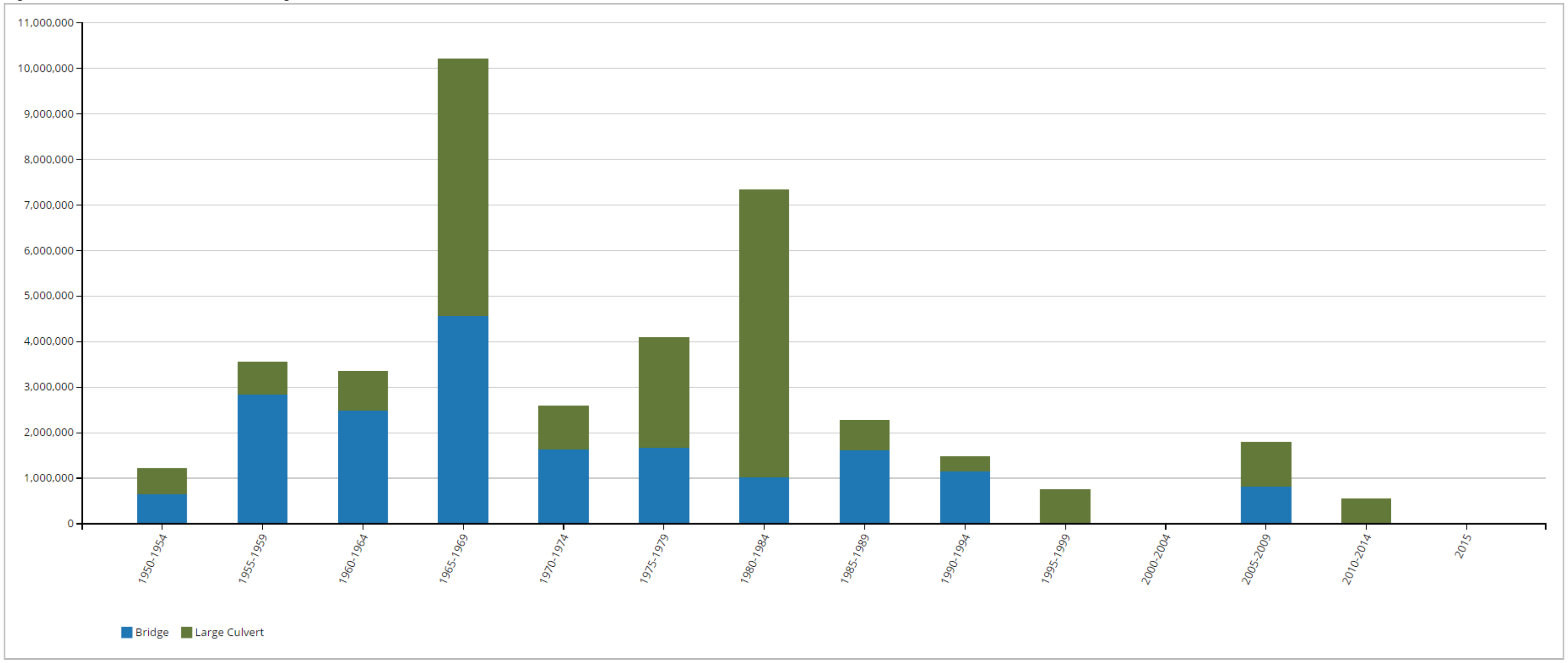
Figure 16 Asset Valuation – Bridges & Culverts



2.2 Historical Investment in Infrastructure

Figure 17 shows the municipality's historical investments in its bridges & culverts since 1950 based on 2016 replacement costs. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 2.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs. Note, this graph includes the historical investment for assets within the active inventory as of December 31, 2015.

Figure 17 Historical Investment – Bridges & Culverts

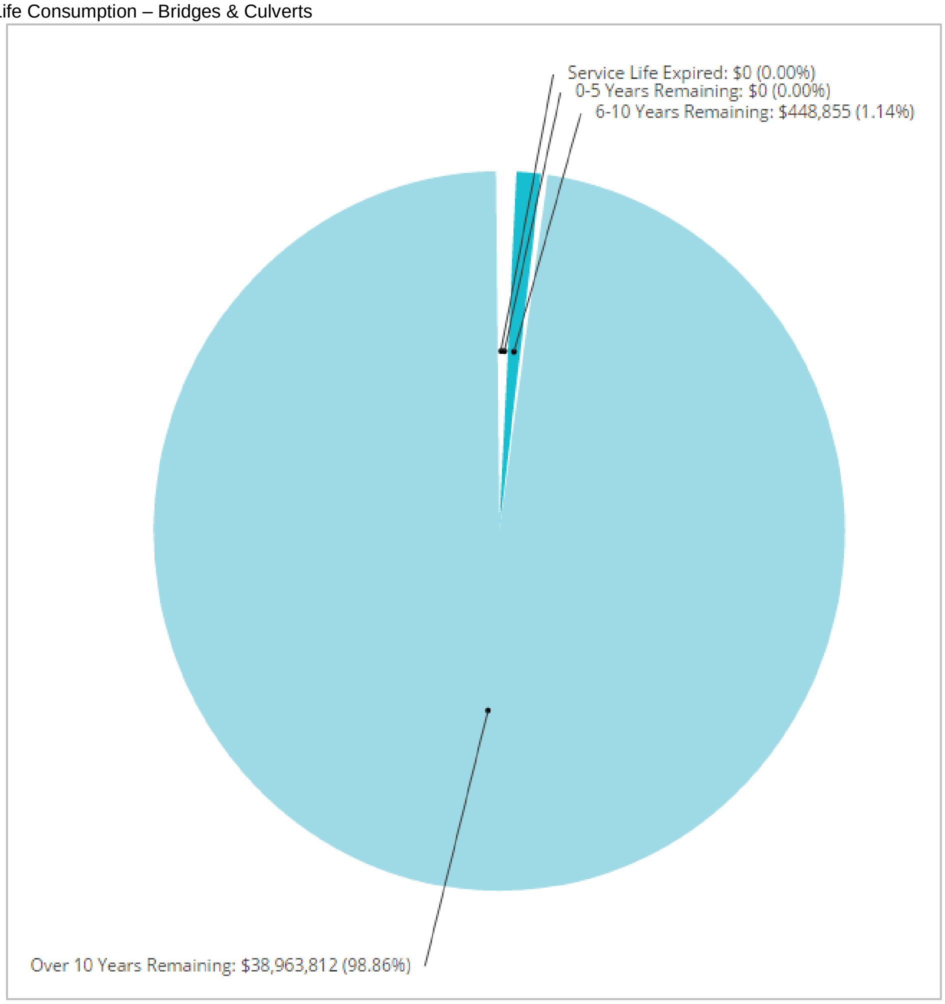


The municipality began investing into its bridges and culverts in the early 1950s. Investments peaked in the period between 1965 and 1969 topping $10 million. Since then, investments have fluctuated and peaked again in the early 1980s at nearly $7.5 million.

2.3 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 historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 18 illustrates the useful life consumption levels as of 2015 for the municipality's bridges & culverts.

Figure 18 Useful Life Consumption – Bridges & Culverts

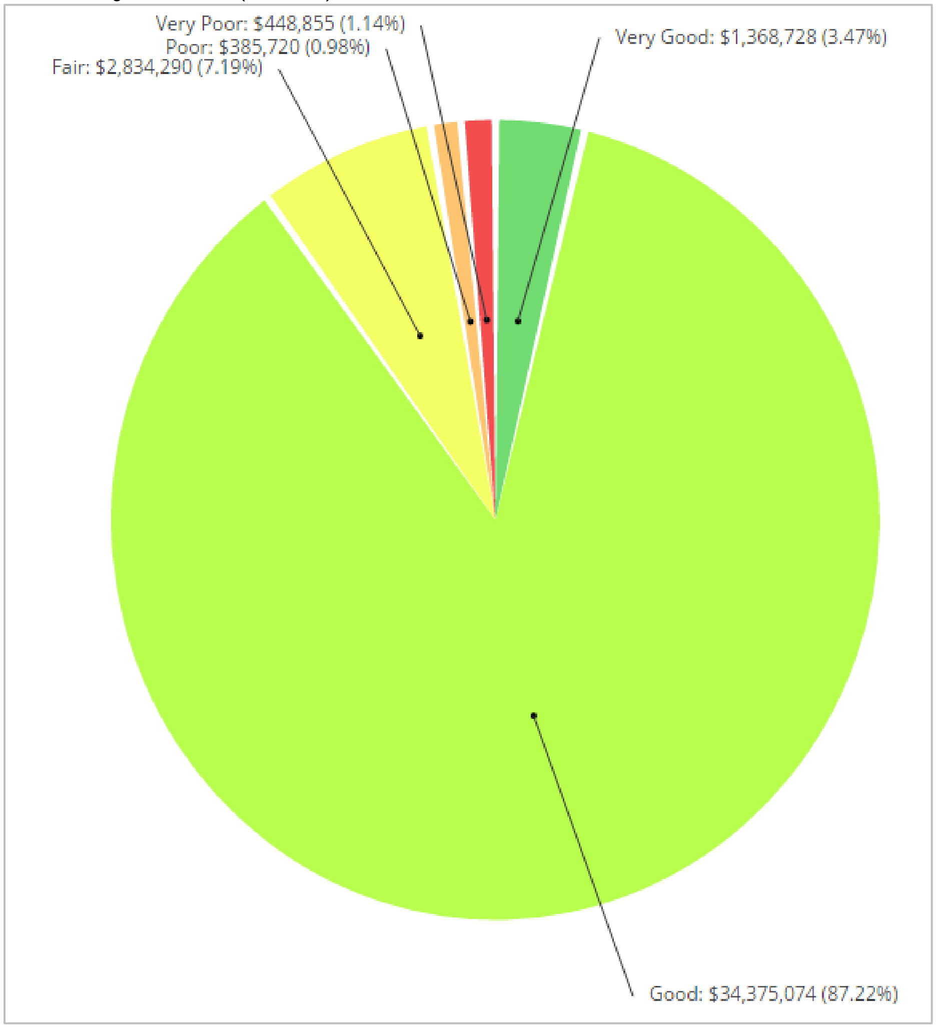


Nearly 100% of bridge and culvert assets have at least 10 years of useful life remaining.

2.4 Current Asset Condition

Using 2016 replacement cost, in this section, we summarize the condition of the municipality's bridges & culverts as of year-end 2015. 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. The municipality has provided inspection data for its bridges & culverts for the purpose of this AMP.

Figure 19 Asset Condition – Bridges & Culverts (Assessed)

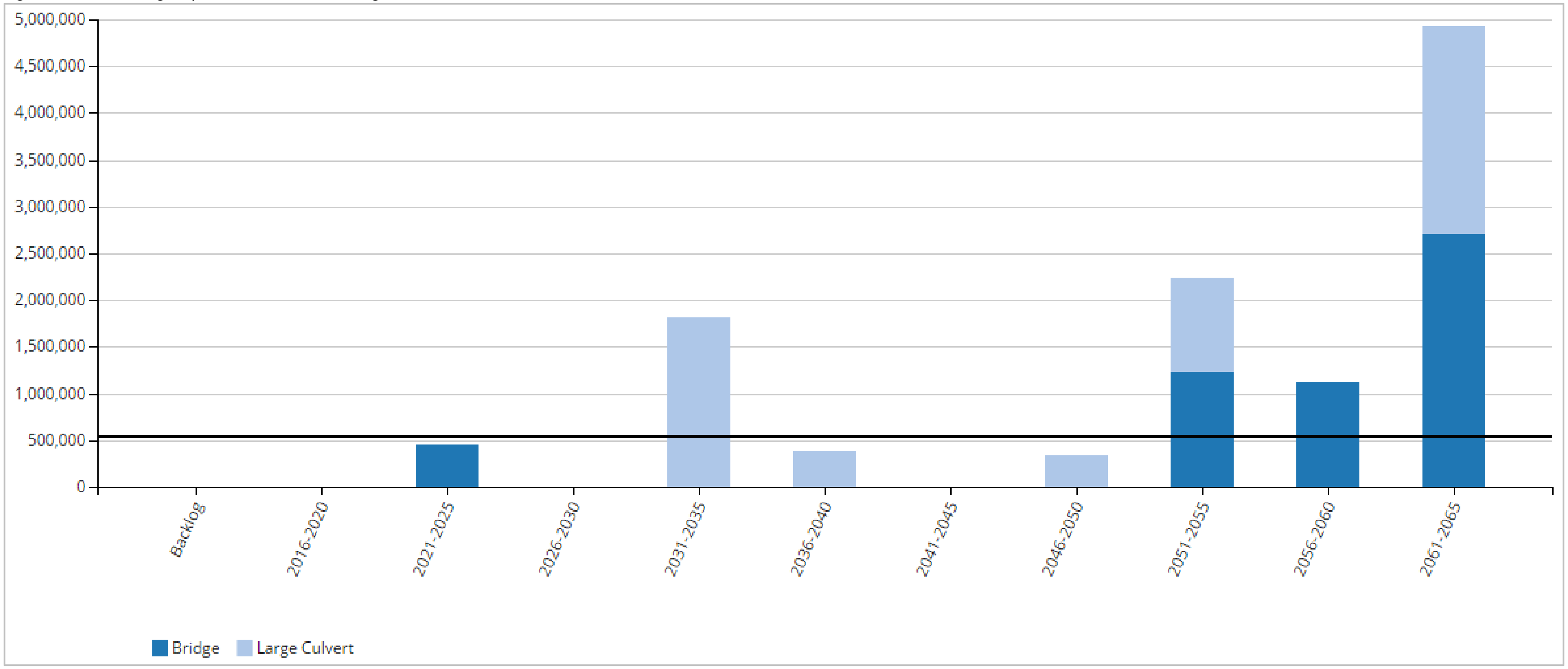


Assessed data indicates that over 90% of assets, with a valuation of $35.7 million are in good to very good condition. Just over 2%, with a valuation of $834,000, are in poor to very poor condition.

2.5 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 based on 2016 replacement cost. 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 – Bridges & Culverts



In addition to no backlog, replacement needs are minimal, totaling nearly $500,000 between 2021-2025. The municipality's annual requirements (indicated by the black line) for its bridges & culverts total $562,000. At this funding level, the municipality would be allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. The municipality is currently allocating $307,000, leaving an annual deficit of $255,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level.

2.6 Recommendations – Bridges & Culverts

- The results and recommendations from the OSIM inspections should be used to generate the short-and long-term capital and maintenance budgets for the bridge and large culvert structures. See Section VIII, ‘Asset Management Strategies’.

- Bridge & culvert structure key performance indicators should be established and tracked annually as part of an overall level of service model. See Section VII ‘Levels of Service’.

- The municipality is funding 55% of its long-term requirements on an annual basis. See the ‘Financial Strategy’ section on how to achieve more sustainable and optimal funding levels.

3. Storm Network

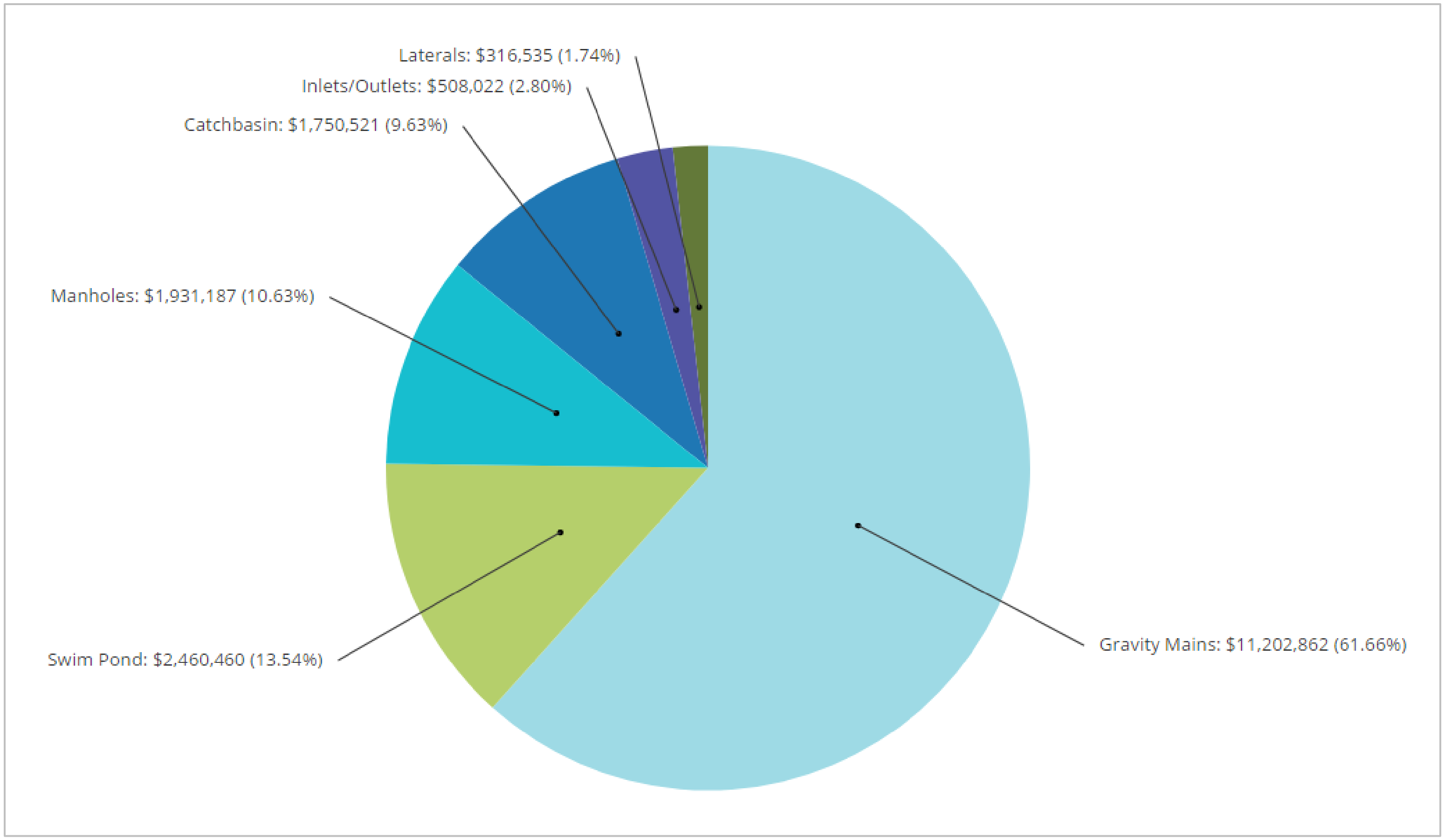
3.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 7 illustrates key asset attributes for the municipality's storm network 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 storm network is valued at $18.2 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 – Storm Network

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Storm Network	Catchbasin	1,087 units	75	NRBCPI (Toronto)	$1,750,521
	Gravity Mains (100mm - 400mm)	24,110m	50 - 75	NRBCPI (Toronto)	$2,713,699
	Gravity Mains (450mm - 965mm)	13,634m	50 – 75	NRBCPI (Toronto)	$4,172,141
	Gravity Mains (1000mm - 1950mm)	3,174m	50 – 75	NRBCPI (Toronto)	$3,924,179
	Gravity Mains (>2000mm)	482m	50 – 75	NRBCPI (Toronto)	$60,116
	Gravity Mains (unknown diameter)	2,383m	50 – 75	NRBCPI (Toronto)	$332,727
	Inlets/Outlets (100mm - 400mm)	116 units	75	NRBCPI (Toronto)	$225,570
	Inlets/Outlets (450mm - 965mm)	78 units	75	NRBCPI (Toronto)	$224,374
	Inlets/Outlets (1000mm - 3000mm)	10 units	75	NRBCPI (Toronto)	$58,078
	Laterals (100mm)	95 units	75	NRBCPI (Toronto)	$81,899
	Laterals (125mm)	135 units	75	NRBCPI (Toronto)	$183,403
	Laterals (150mm)	35 units	75	NRBCPI (Toronto)	$50,155
	Laterals (200mm)	1 unit	75	NRBCPI (Toronto)	$1,078
	Manholes	504 units	60 - 75	NRBCPI (Toronto)	$1,931,187
	Swim Pond	16.7 acres	75	NRBCPI (Toronto)	$2,460,460
				Total	$18,169,587

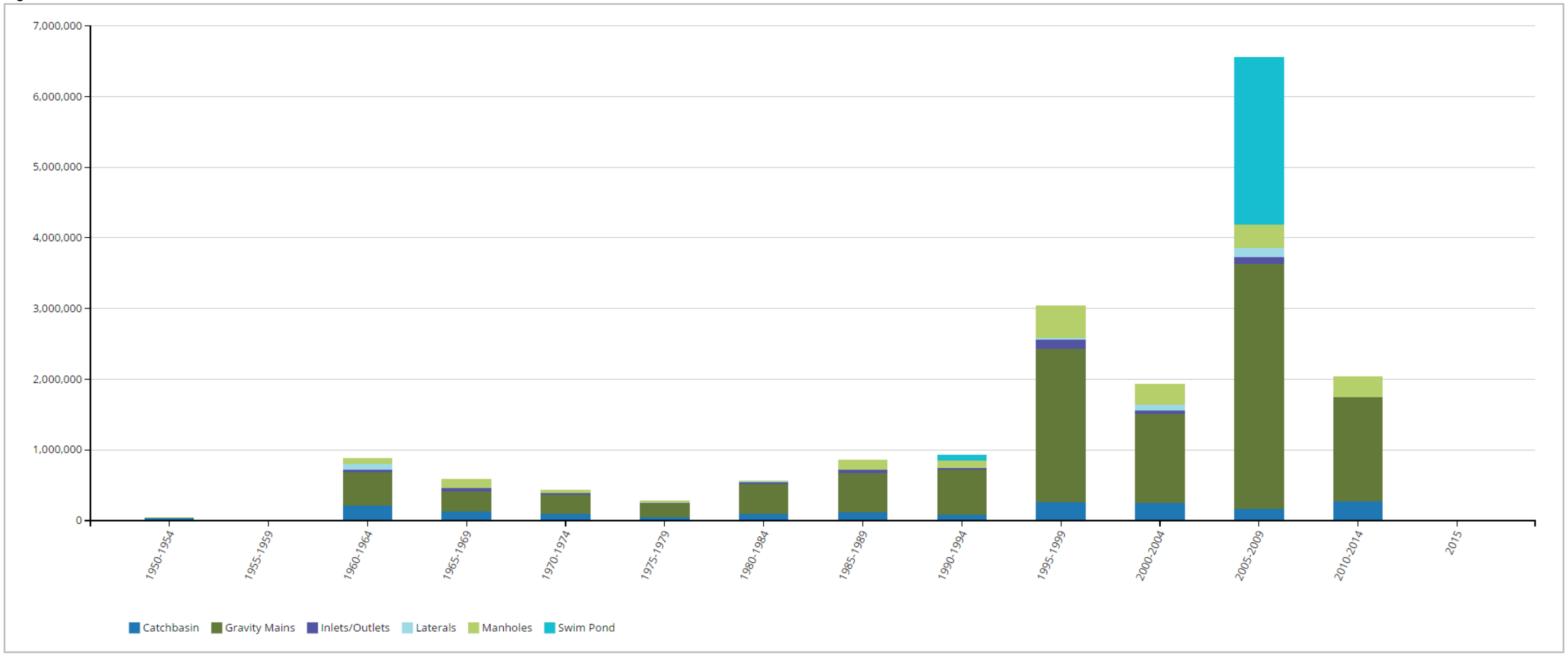
Figure 21 Asset Valuation – Storm Network



3.2 Historical Investment in Infrastructure

Figure 22 shows the municipality's historical investments in its storm network since 1950. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 3.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs. Note, this graph includes the historical investment for assets within the active inventory as of December 31, 2015.

Figure 22 Historical Investment – Storm Network

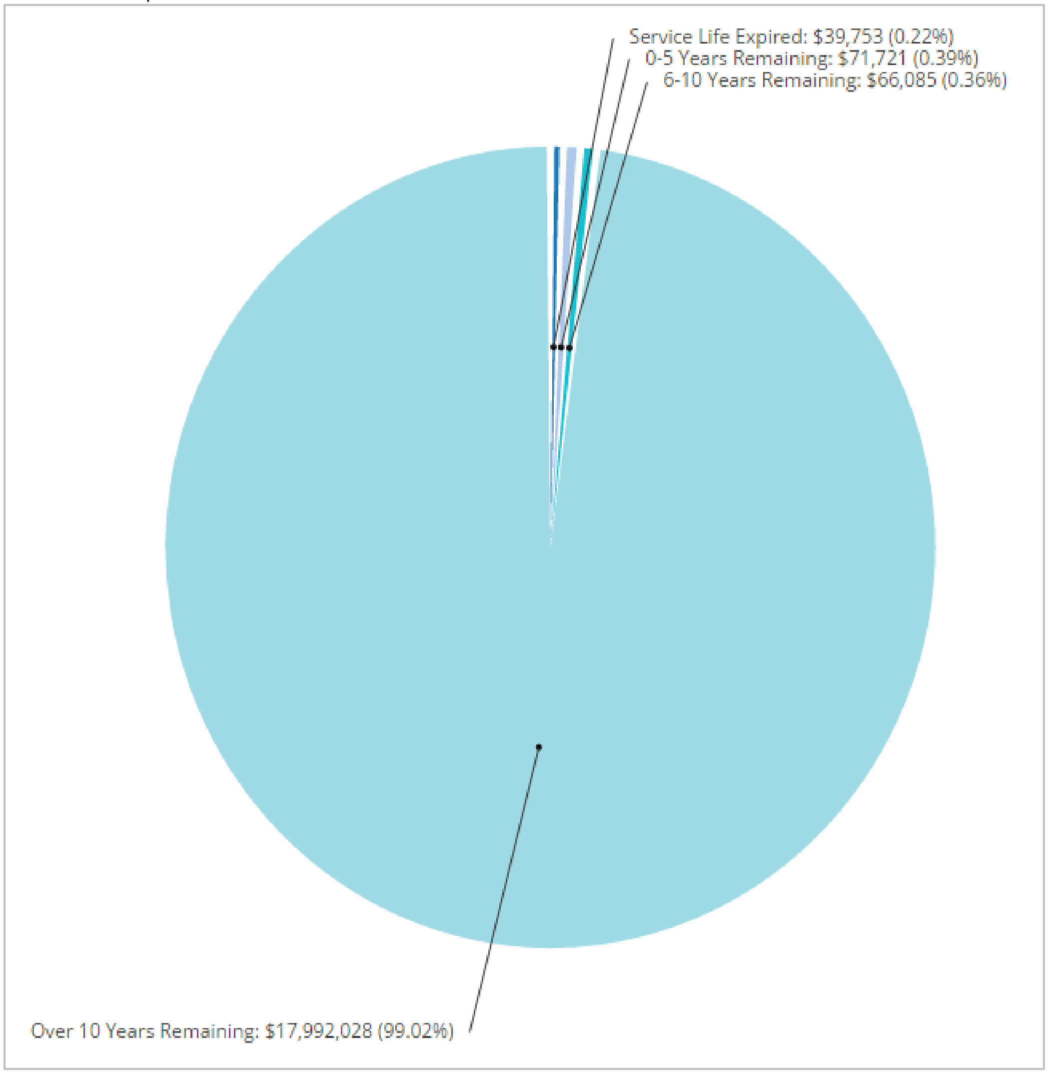


The municipality began heavily investing in its storm network in the early 1960s. Expenditures fluctuated throughout the decades then peaked in the late 2000s, at a valuation of $7.5 million.

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 historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 23 illustrates the useful life consumption levels as of 2015 for the municipality's storm network.

Figure 23 Useful Life Consumption – Storm Network

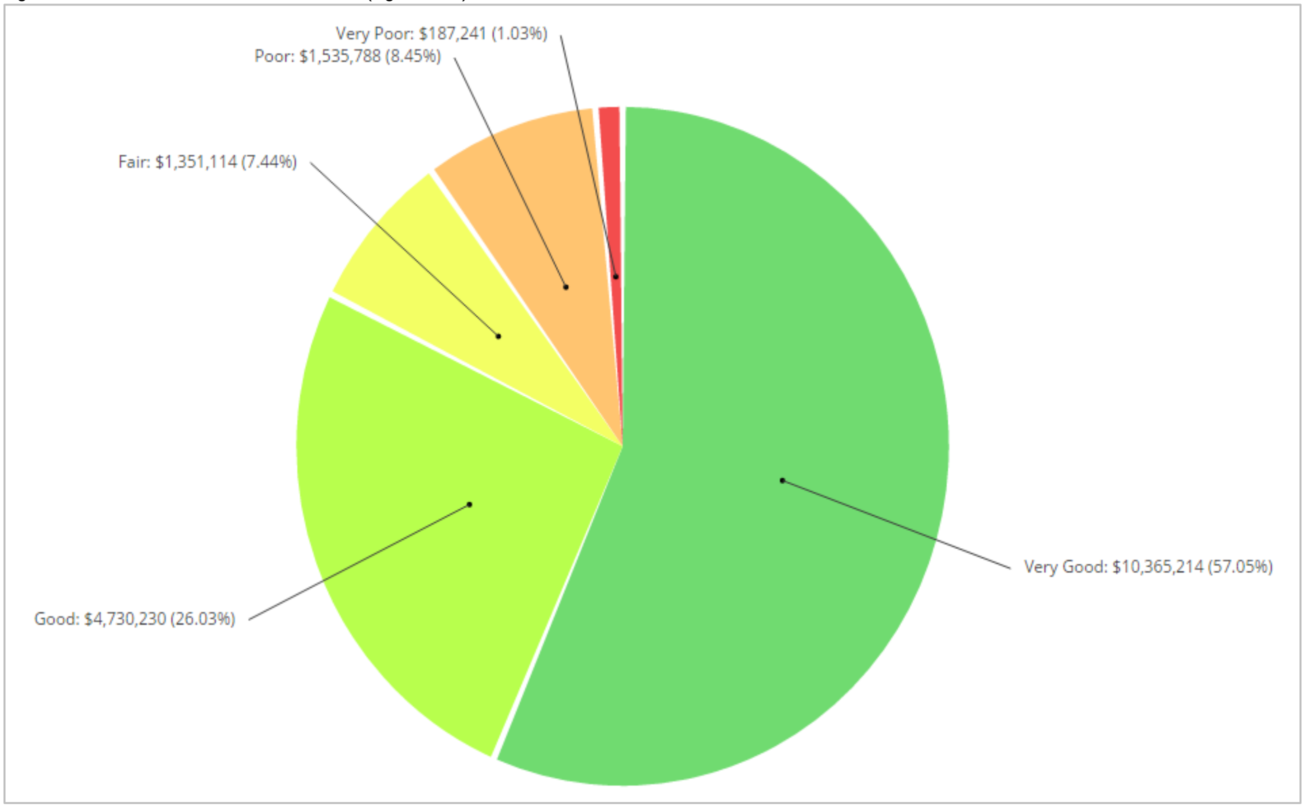


Virtually all storm network assets have over 10 years of useful life remaining.

3.4 Current Asset Condition

Using 2016 replacement cost, in this section, we summarize the condition of the municipality's storm network assets as of year-end 2015. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has not provided condition data for its storm network.

Figure 24 Asset Condition – Storm Network (Age-based)

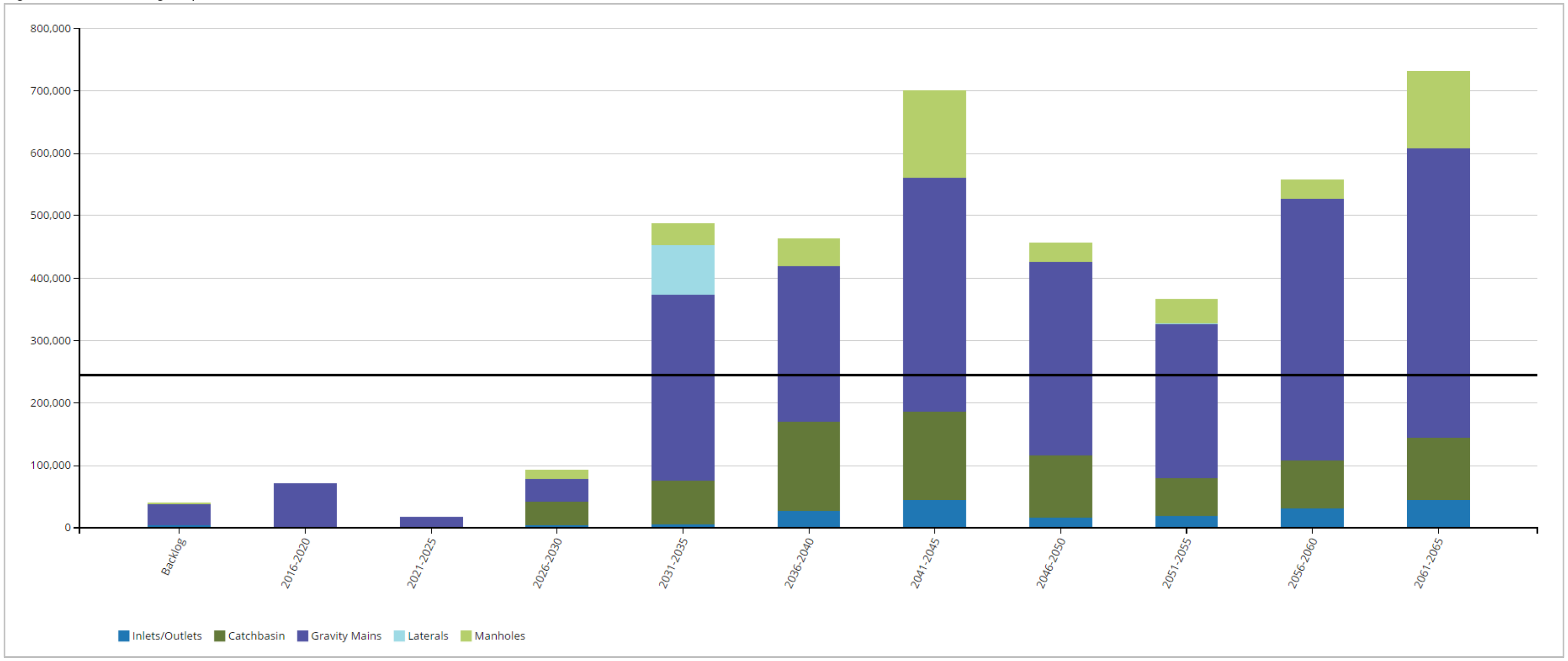


Based on age data, over 80% of the municipality's storm assets, with a valuation of $15 million, are in good to very good condition. Less than 10% are in poor to very poor condition.

3.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's storm network assets based on 2016 replacement cost. 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 25 Forecasting Replacement Needs – Storm Network



In addition to a backlog of $40,000, replacement needs will total $71,000 in the next 5 years with an additional $18,000 required between 2021-2025. The municipality's annual requirements (indicated by the black line) for its storm network total $246,000. At this funding level, the municipality would be allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the municipality is currently allocating $127,000 leaving an annual deficit of $119,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level.

3.6 Recommendations – Storm Network

- The municipality should implement a comprehensive condition assessment program that covers all storm network assets to further define field needs and to assist the prioritization of the short and long term capital budget. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- Using the above information, the municipality should assess its short-, medium- and long-term capital, and operations and maintenance needs.

- An appropriate percentage of the replacement value of the assets should then be allocated for the municipality's O&M requirements.

- Storm network key performance indicators should be established and tracked annually as part of an overall level of service model. See Section VII 'Levels of Service'.

- The municipality is funding 52% of its long-term requirements on an annual basis. See the 'Financial Strategy' section on how to achieve more sustainable and optimal funding levels.

4. Facilities

4.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

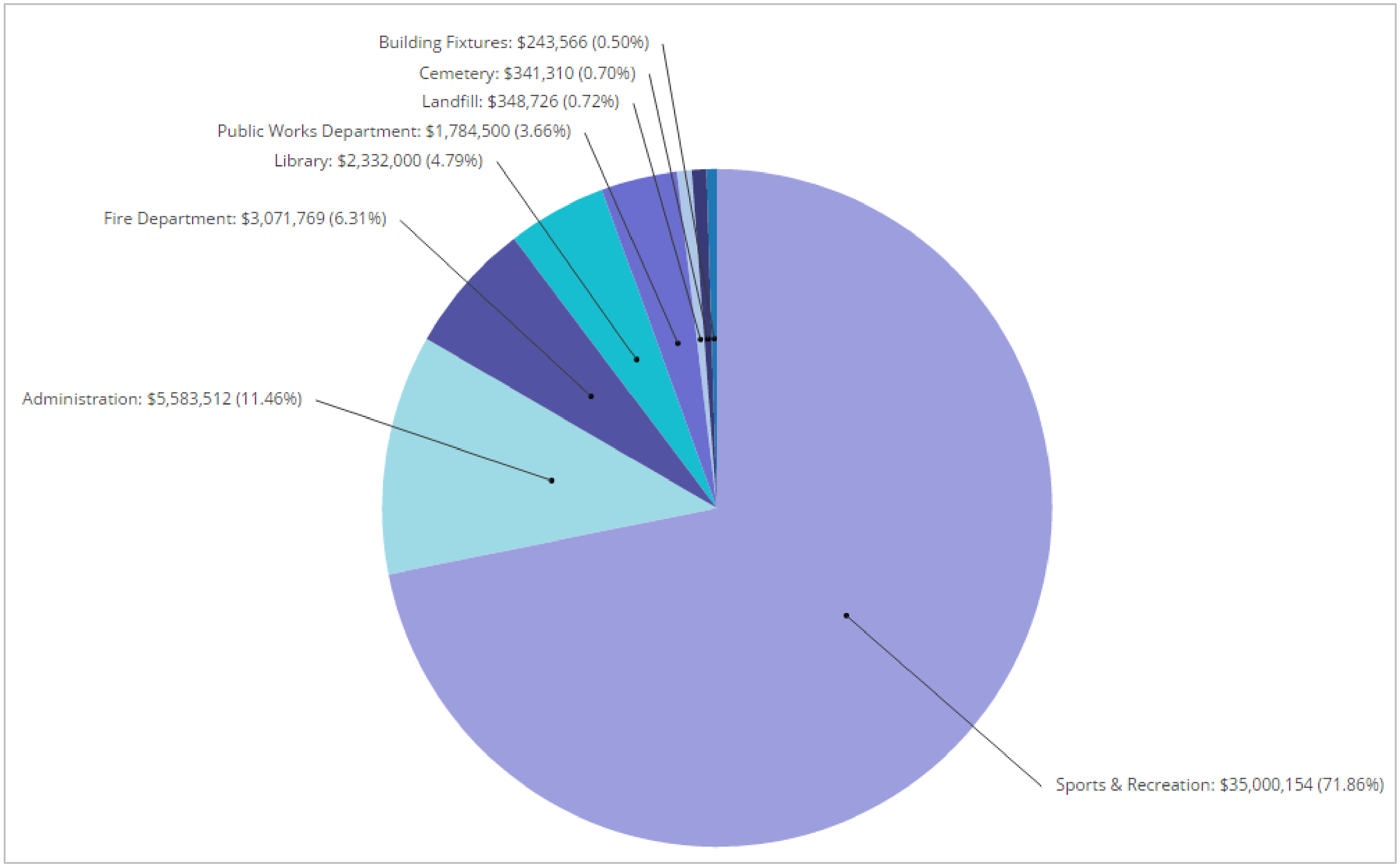
Table 8 illustrates key asset attributes for the municipality's facilities assets, including quantities of various assets, their useful life, replacement costs, and the valuation method by which the replacement costs were derived. In total, the municipality's facilities assets are valued at $48.7 million 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.

Table 8 Key Asset Attributes – Facilities

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Facilities	Administration	3 Facilities	50, 100	CPI (ON)	$5,583,512
	Building Fixtures	Pooled	20	CPI (ON)	$243,566
	Cemetery	16 Structures	30, 100	CPI (ON)	$341,310
	Fire Department	3 Facilities	40 – 50	CPI (ON)	$3,071,769
	Landfill - Scale Building	2 Facilities	100	CPI (ON)	$233,726
	Landfill - Waste Building	2 Facilities	100	CPI (ON)	$95,000
	Landfill - Storage Shed	1 unit	100	CPI (ON)	$20,000
	Library	3 Facilities	100	CPI (ON)	$2,332,000
	Public Works Department - Garage	3 Structures	50	CPI (ON)	$1,784,500
	Sports & Recreation Department	10 Facilities	20 - 50	CPI (ON)	$35,000,154
				Total	$48,705,537

Note: the municipality owned a daycare facility that was sold in 2016 and is therefore not included within this analysis.

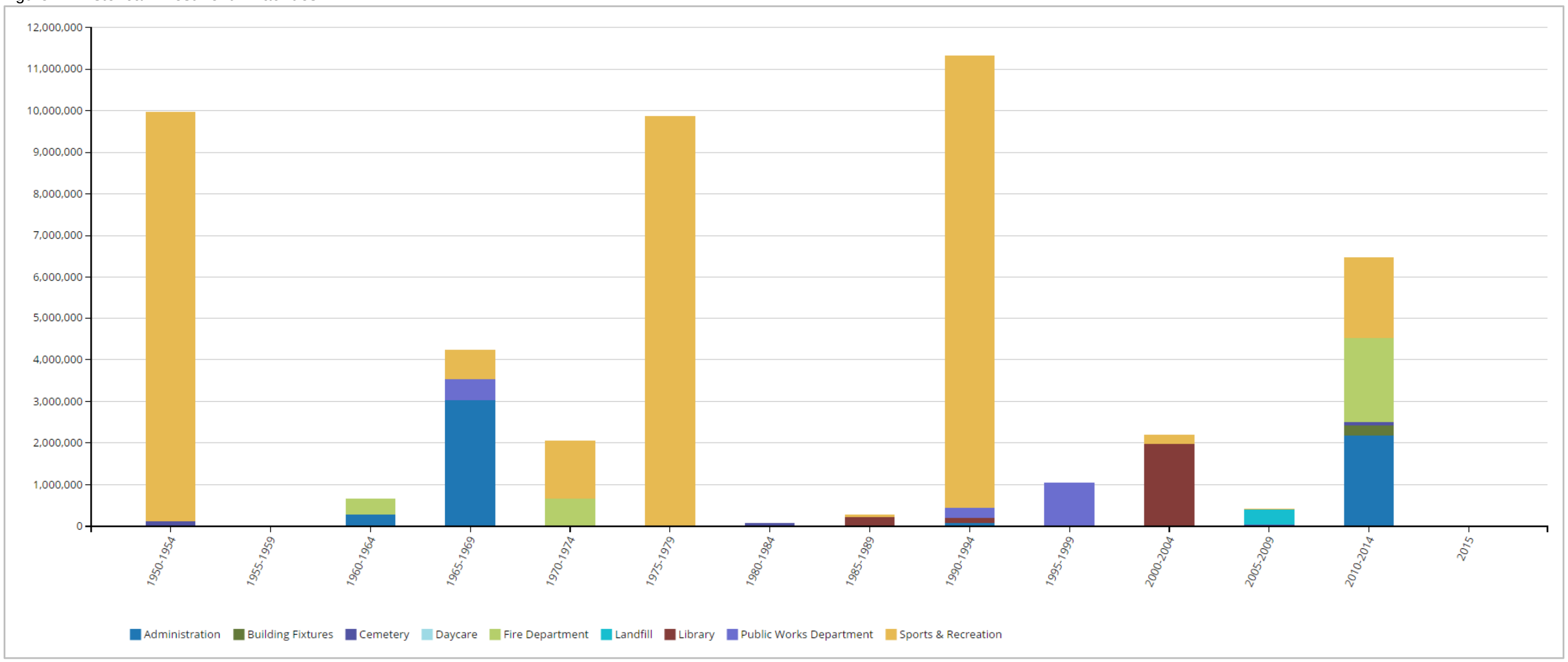
Figure 26 Asset Valuation – Facilities



4.2 Historical Investment in Infrastructure

Figure 27 shows the municipality's historical investments in its facilities since 1950. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 4.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs. Note, this graph includes the historical investment for assets within the active inventory as of December 31, 2015.

Figure 27 Historical Investment – Facilities

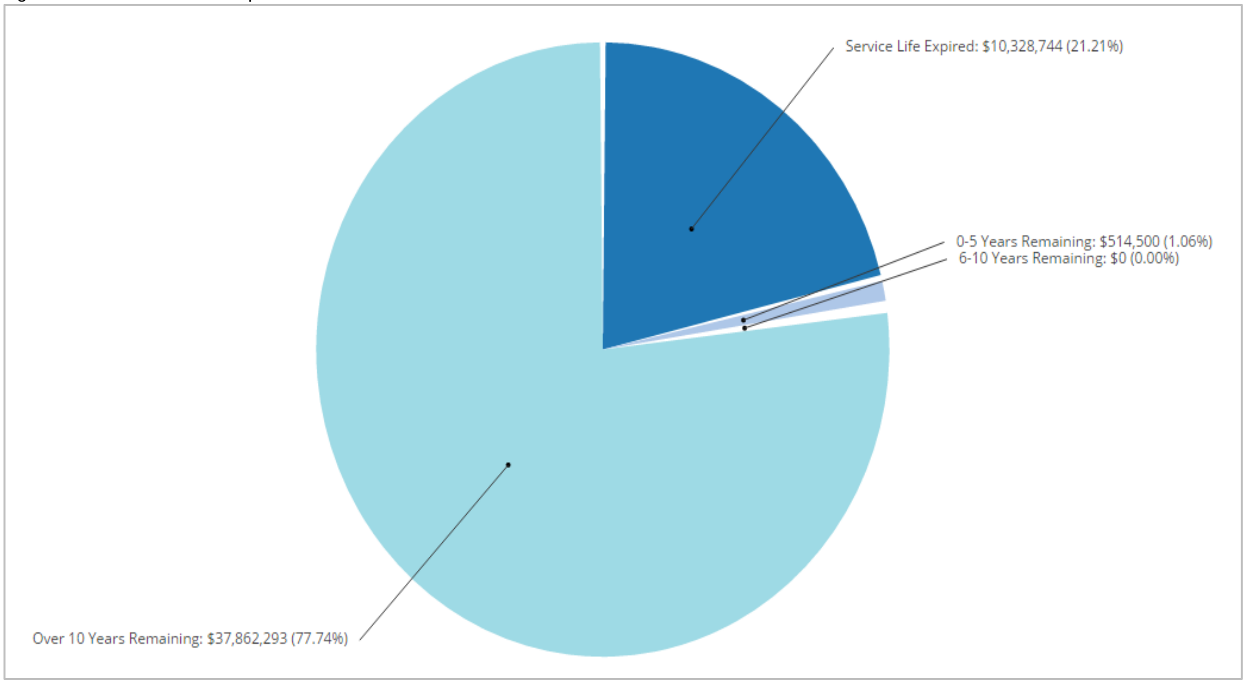


The municipality invested sporadically in its facilities since the early 1950s. Investments peaked between 1990 and 1994 at over $11.3 million with $10.9 million put into sports & recreation facilities. Since then, investments have decreased however peaked again between 2010 and 2014 at $6.4 million.

4.3 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 historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 28 illustrates the useful life consumption levels as of 2015 for the municipality's facilities.

Figure 28 Useful Life Consumption – Facilities

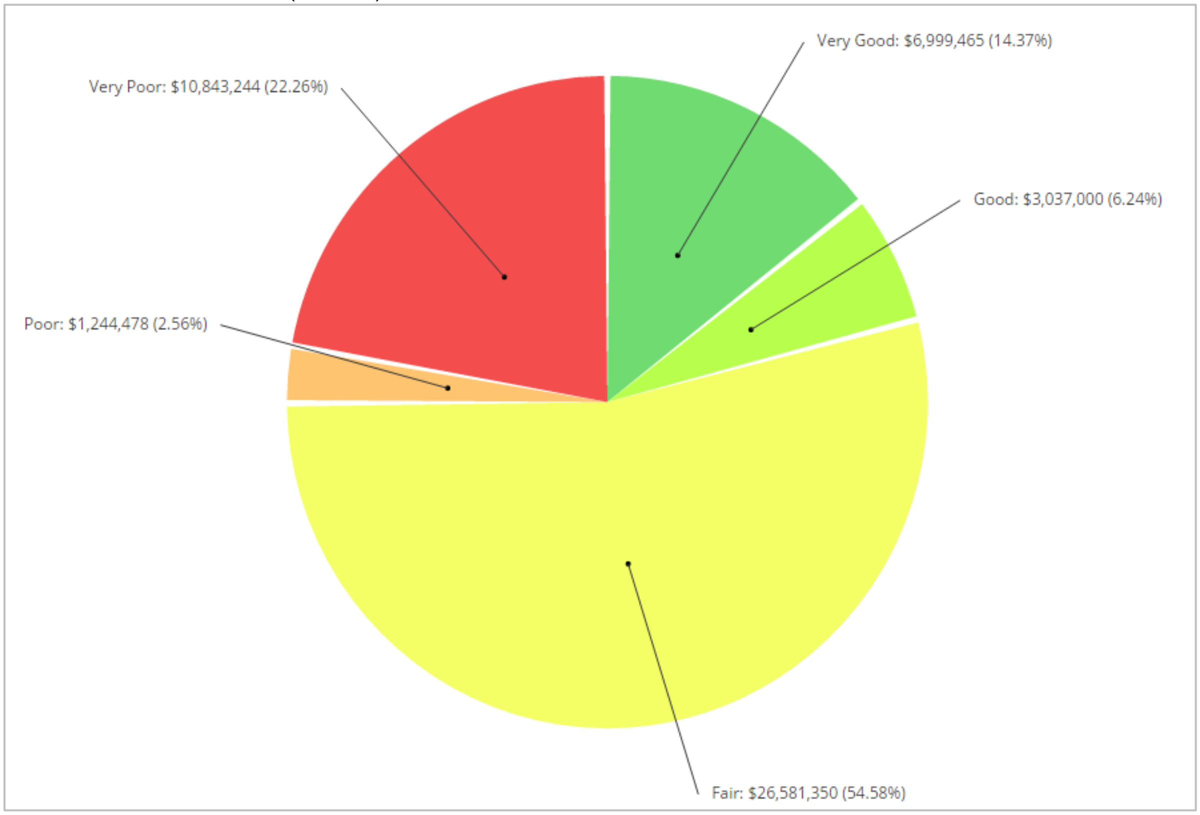


While 78% of assets have at least 10 years of useful life remaining, over 20%, with the valuation of $10.3 million, remain in service beyond their established useful life.

4.4 Current Asset Condition

Using 2016 replacement cost, in this section, we summarize the condition of the municipality's facilities as of year-end 2015. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has provided condition data for all of its facilities.

Figure 29 Asset Condition – Facilities (Assessed)

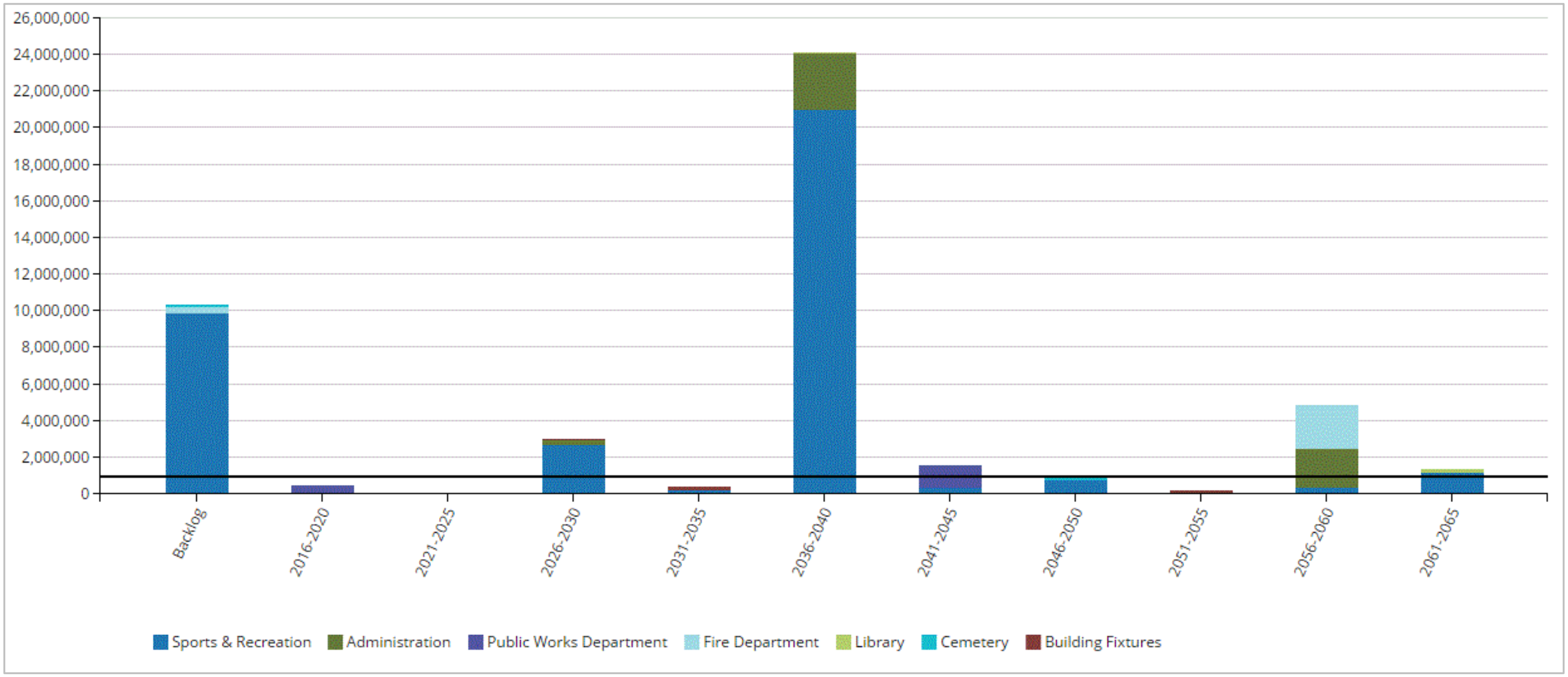


Facilities assessment data indicates that 25% of the assets, with a valuation of $12 million, are in poor to very poor condition. Another 21% are in good to very good condition.

4.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's facilities assets based on 2016 replacement cost. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. The backlog represents the value of assets that remain in operation beyond their useful life.

Figure 30 Forecasting Replacement Needs – Facilities



In addition to a backlog of over $10 million, replacement needs will total $500,000 over the next five years. The municipality's annual requirements (indicated by the black line) for its facilities total $1 million. At this level, funding would be sustainable and replacement needs could be met as they arise without the need for deferring projects. The municipality is currently allocating $798,000, leaving an annual deficit of $202,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

4.6 Recommendations – Facilities

- Condition assessment data indicates a significant backlog of over $10 million. The municipality should implement a component based condition inspection program for all of its facilities to better understand future financial needs. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- Using the above information, the municipality should assess its short-, medium- and long-term capital, and operations and maintenance needs.

- An appropriate percentage of the replacement costs should then be allocated for the municipality's O&M requirements.

- Facility key performance indicators should be established and tracked annually as part of an overall level of service model. See Chapter VII, 'Levels of Service'.

- The municipality is funding 80% of its long-term requirements on an annual basis. See the 'Financial Strategy' section on how to achieve more sustainable and optimal funding levels.

5. Land Improvements

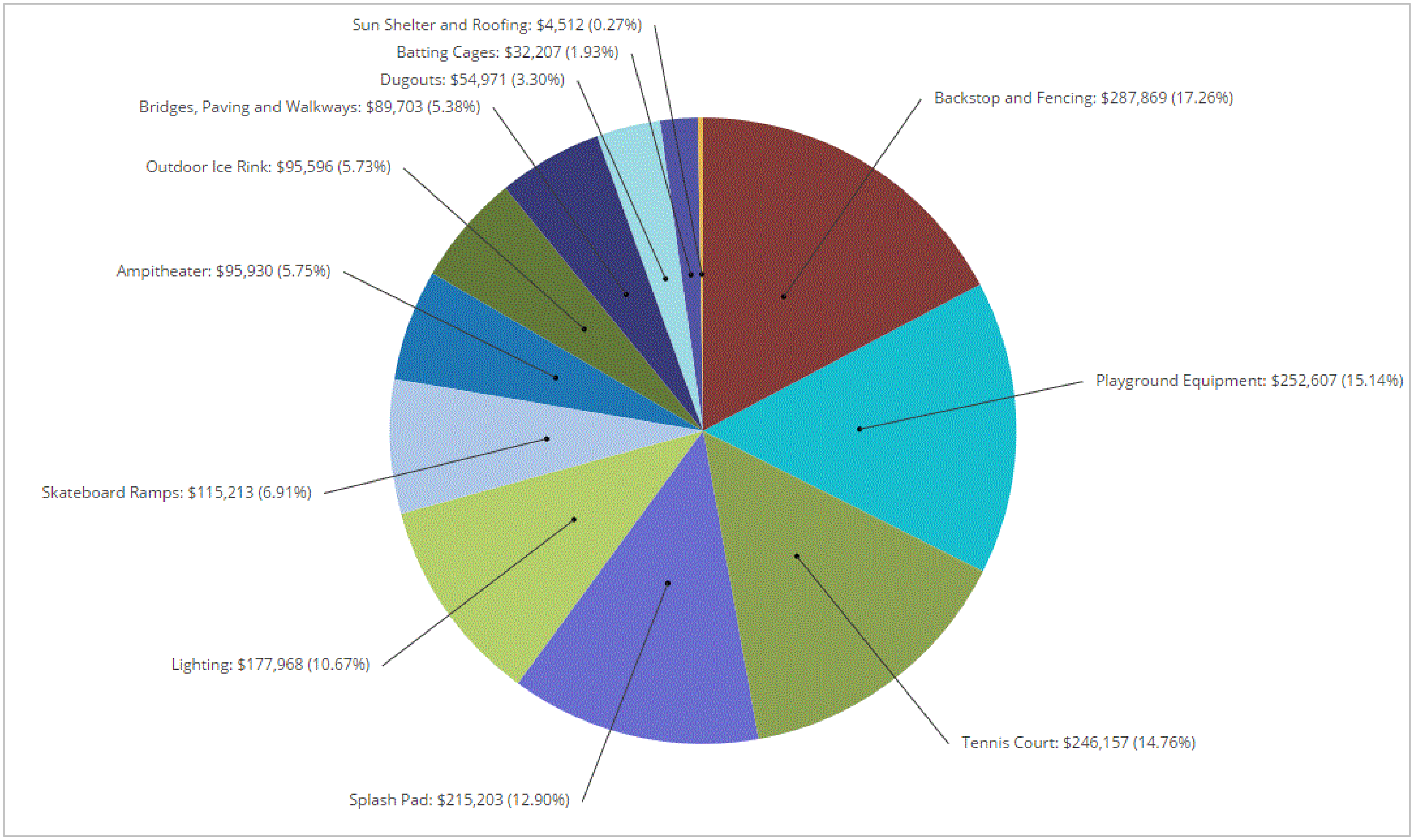
5.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 9 illustrates key asset attributes for the municipality's land improvement assets, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's land improvement assets are valued at $1.7 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality.

Table 9 Key Asset Attributes – Land Improvements

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Land Improvements	Amphitheater	1 unit	30	CPI (ON)	$95,930
	Backstop and Fencing	Pooled	25	CPI (ON)	$287,869
	Batting Cage	1 unit	25	CPI (ON)	$32,207
	Bridges, Paving and Walkways	3 units	20 - 30	NRBCPI (Toronto)	$89,703
	Dugouts	Pooled	50	CPI (ON)	$54,971
	Lights	Pooled	30	CPI (ON)	$177,968
	Outdoor Ice Rink	1 unit	30	CPI (ON)	$95,596
	Playground Equipment	Pooled	20 - 25	CPI (ON)	$252,607
	Skateboard Ramps	1 unit	50	CPI (ON)	$115,213
	Splash Pad	1 unit	30	CPI (ON)	$215,203
	Tennis Court	3 units	20	CPI (ON)	$246,157
				Total	$1,667,936

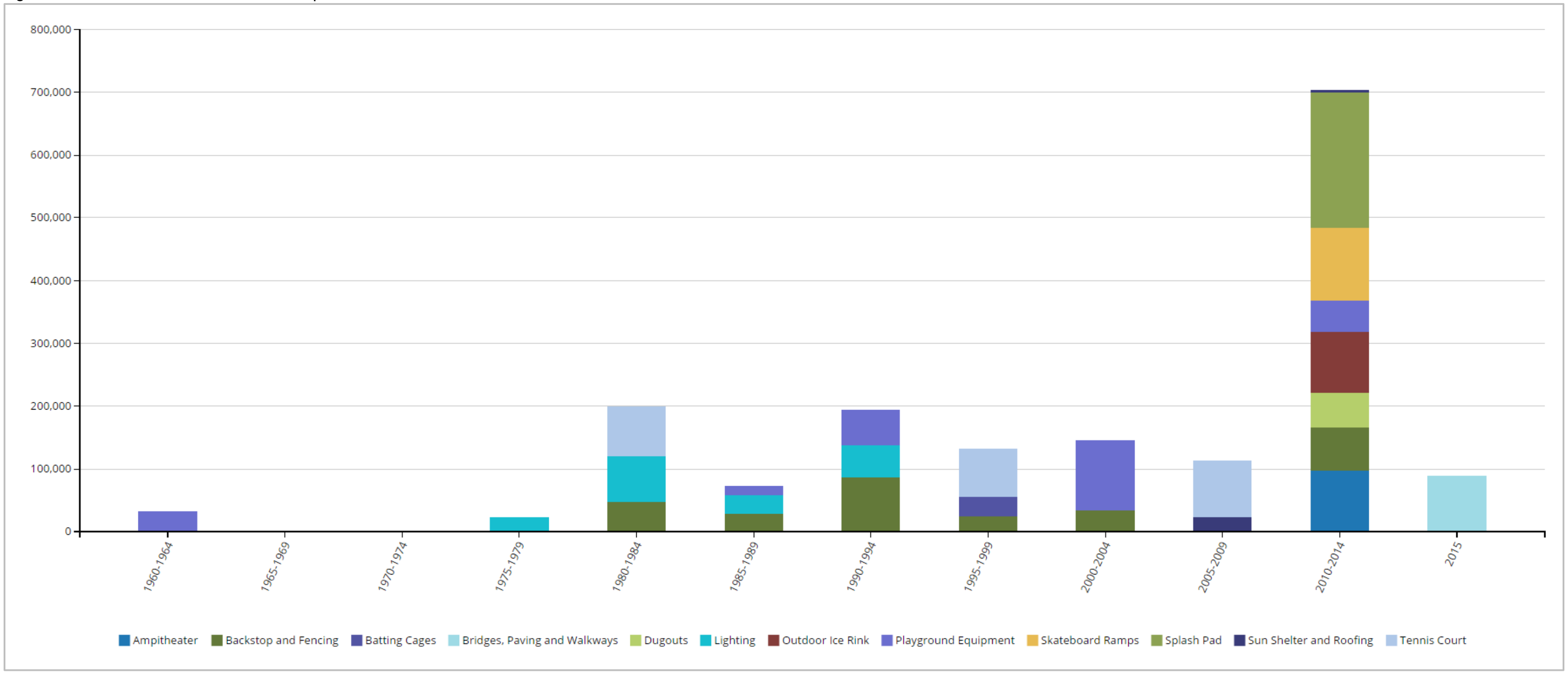
Figure 31 Asset Valuation – Land Improvements



5.2 Historical Investment in Infrastructure

Figure 32 shows the municipality's historical investments in its land improvements since 1960. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 5.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs. Note, this graph includes the historical investment for assets within the active inventory as of December 31, 2015.

Figure 32 Historical Investment – Land Improvements

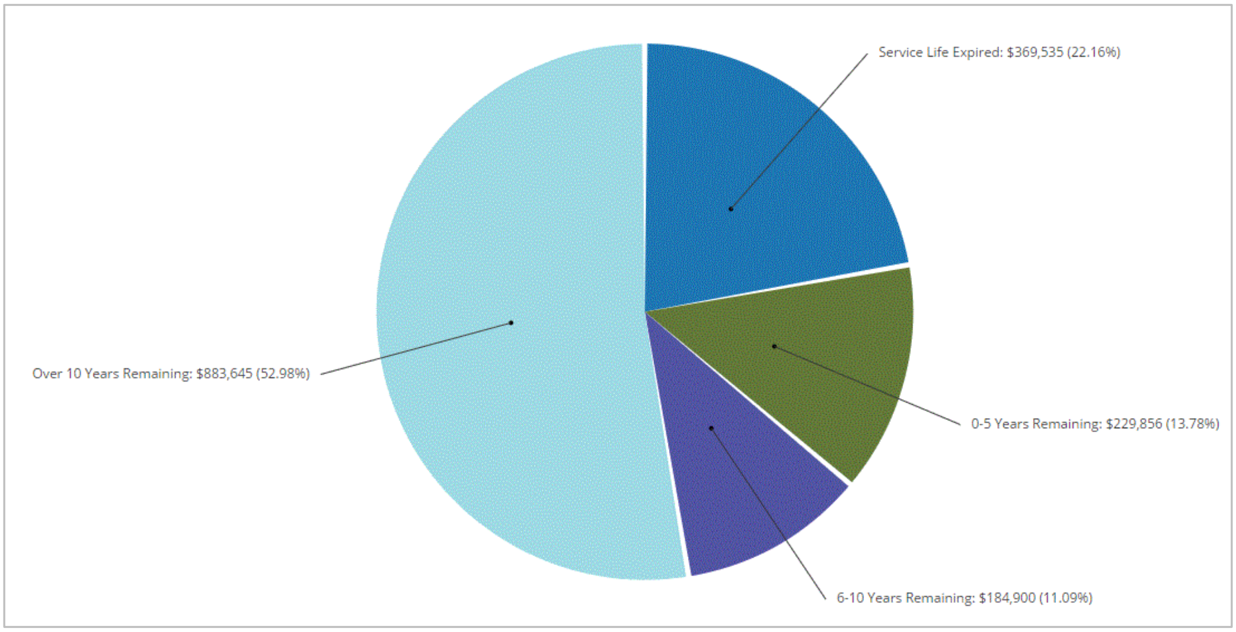


The municipality's investments into land improvements have fluctuated across the decades. Investments peaked between 2010 and 2014 at $700,000.

5.3 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 historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 33 illustrates the useful life consumption levels as of 2015 for the municipality's land improvement assets.

Figure 33 Useful Life Consumption – Land Improvements

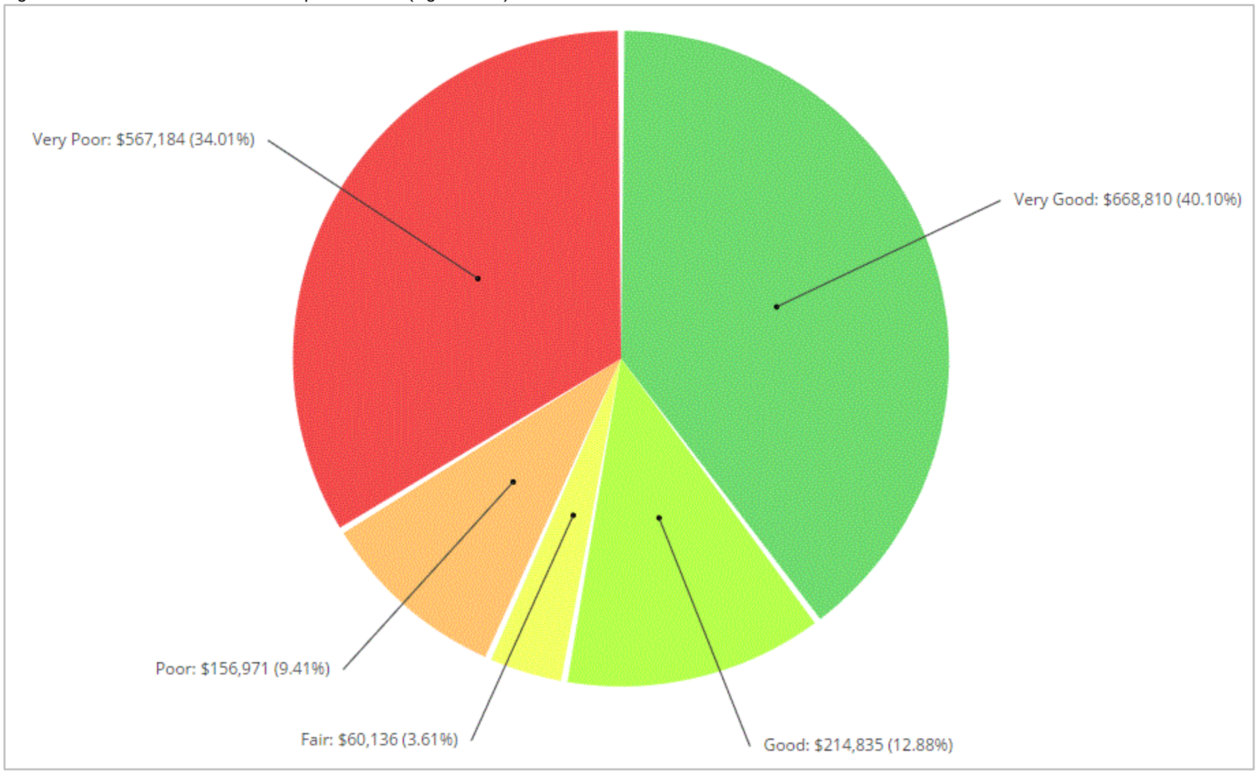


While 53% of assets have at least 10 years of useful life remaining, an additional 22%, at a valuation of $370,000 remain in operation beyond their useful life. An additional 14% will reach the end of their useful life in the next five years.

5.4 Current Asset Condition

Using 2016 replacement cost, in this section, we summarize the condition of the municipality's land improvements as of year-end 2015. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has not provided condition data for its land improvement assets.

Figure 34 Asset Condition – Land Improvements (Age-based)

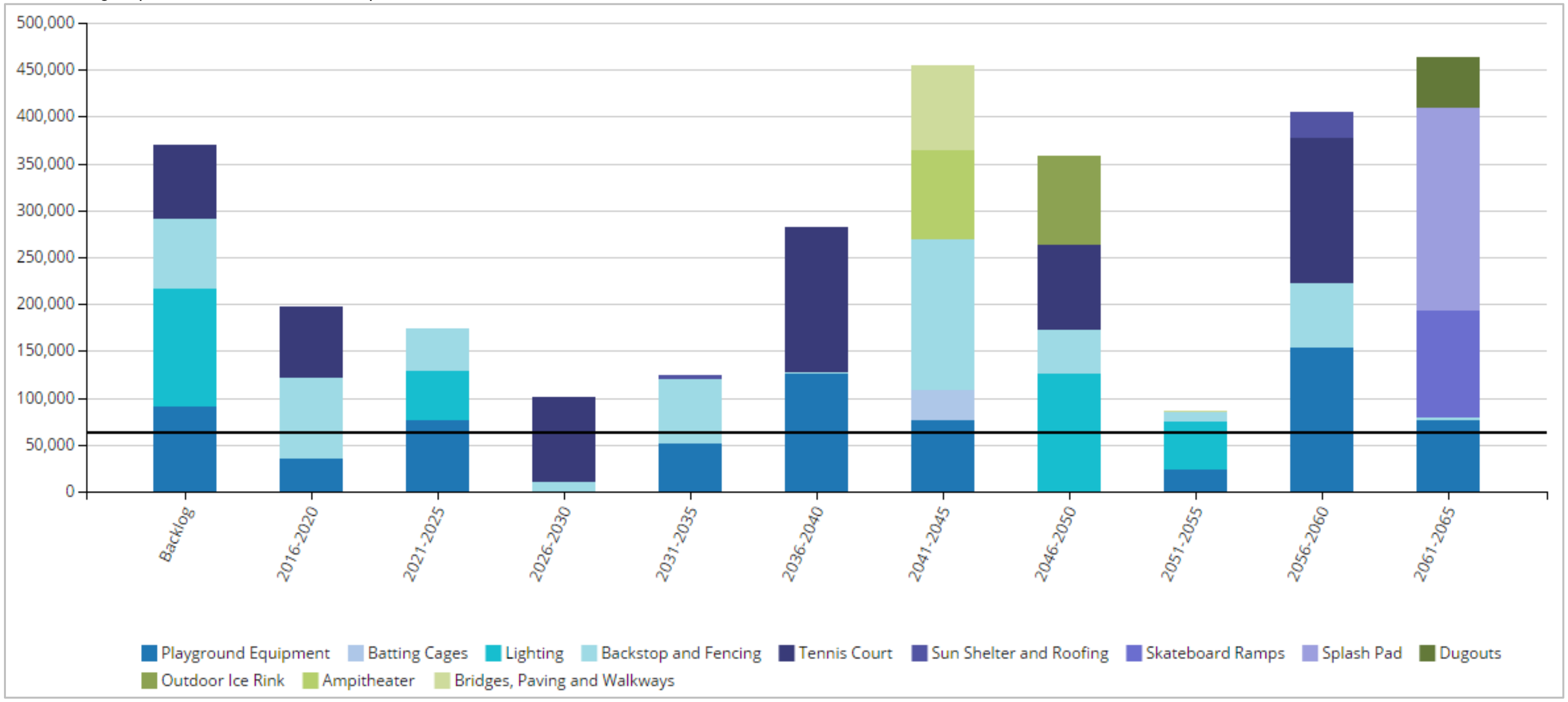


Based on age-based data, 53% of the assets, with a valuation of $884,000, are in good to very good condition. 43% are in poor to very poor condition.

5.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's land improvements assets based on 2016 replacement cost. 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 35 Forecasting Replacement Needs – Land Improvements



In addition to a backlog of $370,000, replacement needs of $200,000 are forecasted for the next five years with an additional $175,000 needed between 2021-2025. The municipality's annual requirements (indicated by the black line) for land improvement assets total $64,000. At this funding level, the municipality would be allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. The municipality is currently allocating $20,000, leaving an annual deficit of $44,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

5.6 Recommendations – Land Improvements

- Age-based data indicates a backlog of $370,000 and 10-year replacement needs of $375,000. The municipality should implement a condition assessment program for its park assets to better estimate actual condition levels. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- Using the above information, the municipality should assess its short-, medium- and long-term capital and operations and maintenance needs.

- An appropriate percentage of the replacement costs should then be allocated for the municipality's O&M requirements.

- The municipality is funding 31% of its long-term replacement needs on an annual basis. See the 'Financial Strategy' section on how to achieve more sustainable and optimal funding levels

6. Landfill

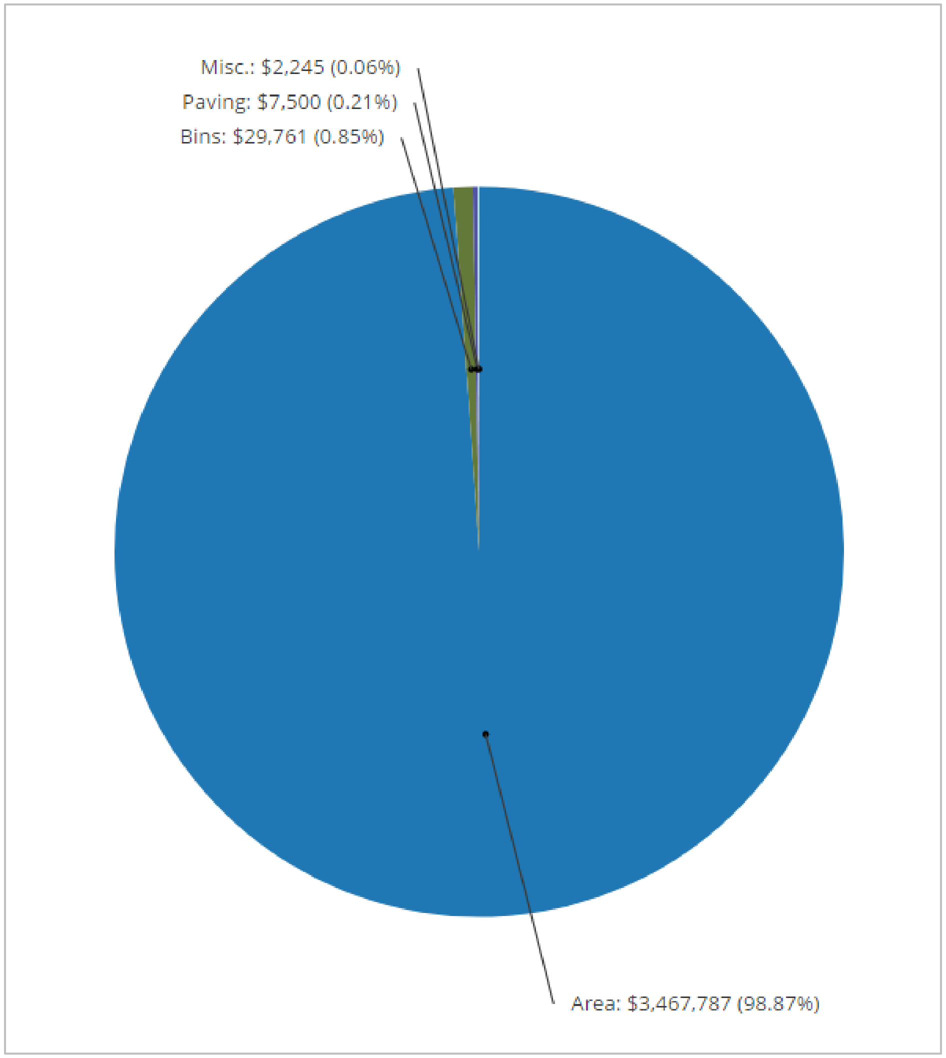
6.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 10 illustrates key asset attributes for the municipality's landfill assets, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's landfill assets are valued at $3.5 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality.

Table 10 Key Asset Attributes – Landfill

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Landfill	Area	6 units	93	User-Defined Cost	$3,467,787
	Bins	1 unit	20	User-Defined Cost	$29,761
	Miscellaneous	1 unit	93	User-Defined Cost	$2,245
	Paving	1 unit	20	User-Defined Cost	$7,500
				Total	$3,507,293

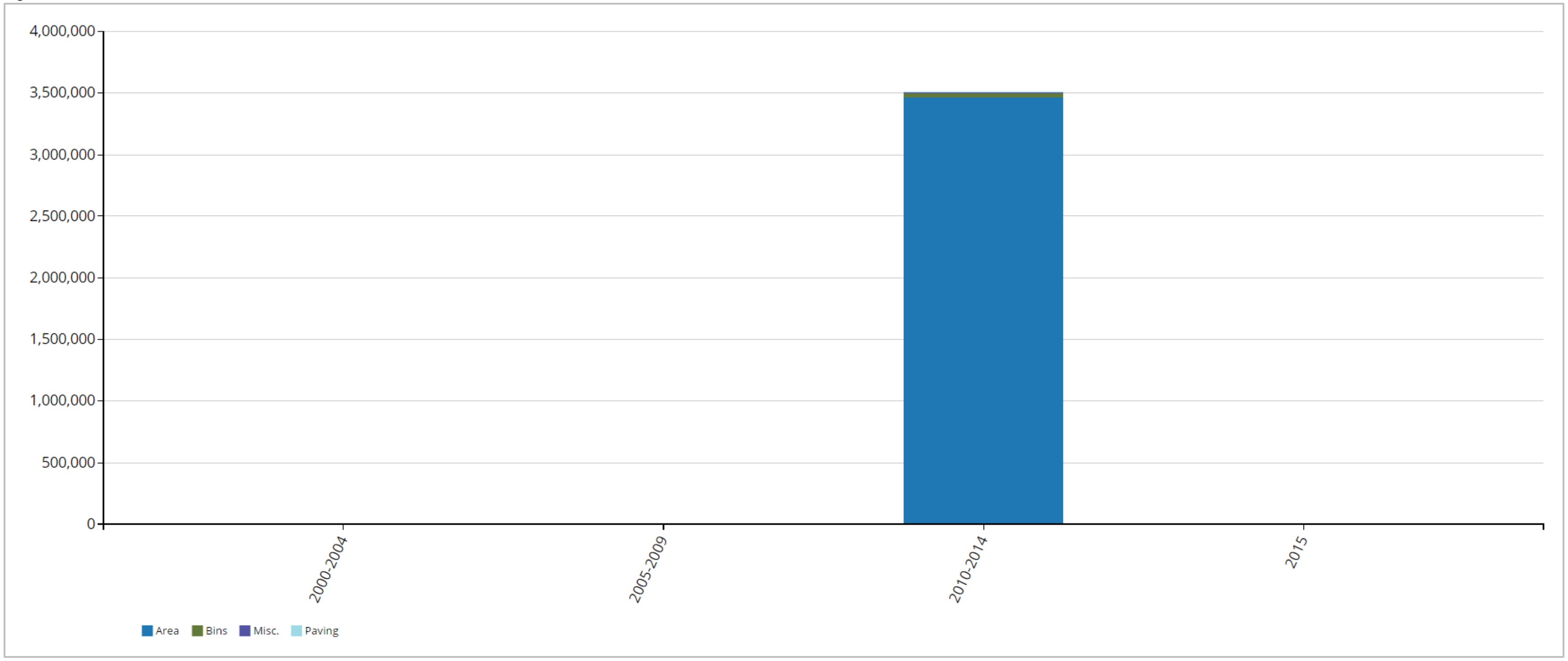
Figure 36 Asset Valuation – Landfill



6.2 Historical Investment in Infrastructure

Figure 37 shows the municipality's historical investments in its landfill assets since 2000. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 6.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs. Note, this graph includes the historical investment for assets within the active inventory as of December 31, 2015.

Figure 37 Historical Investment – Landfill

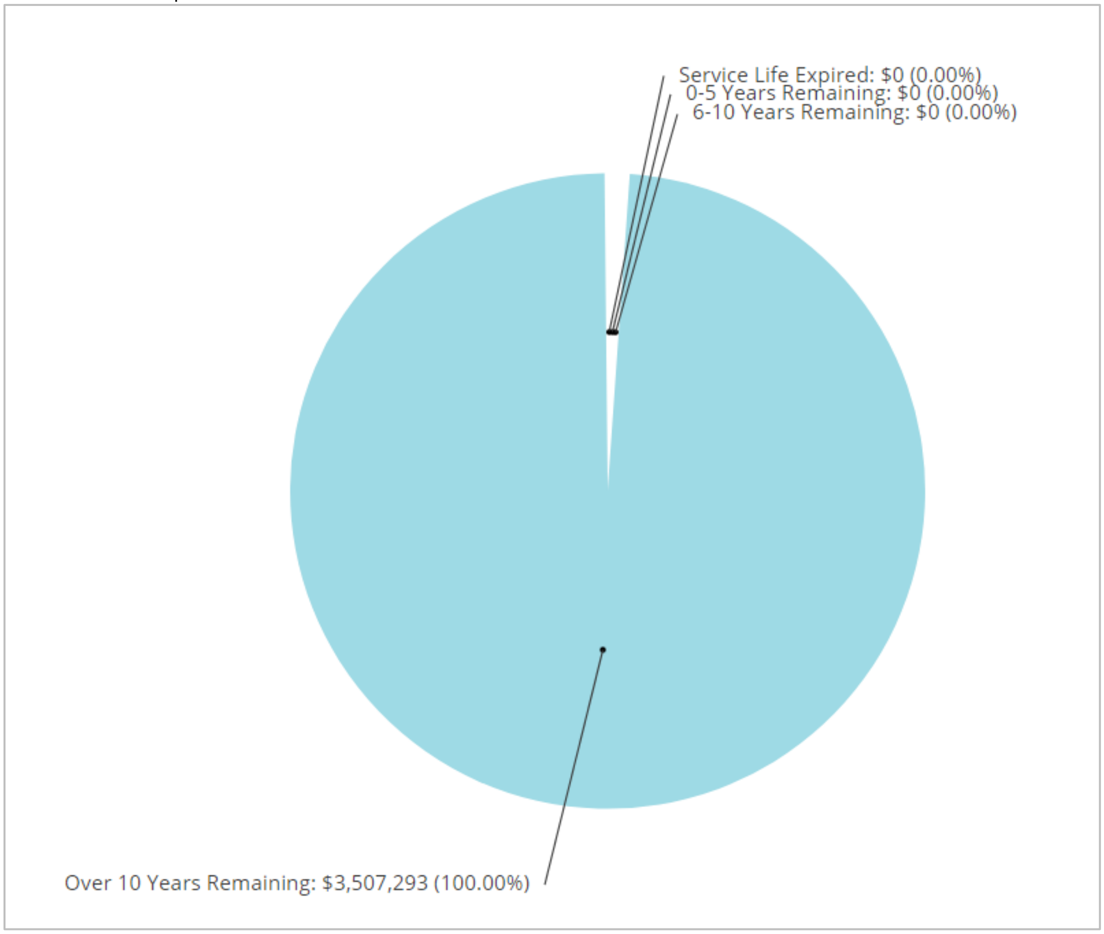


All of the municipality's investments into landfill assets occurred between 2010 and 2014.

6.3 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 historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 38 illustrates the useful life consumption levels as of 2015 for the municipality's landfill assets.

Figure 38 Useful Life Consumption – Landfill

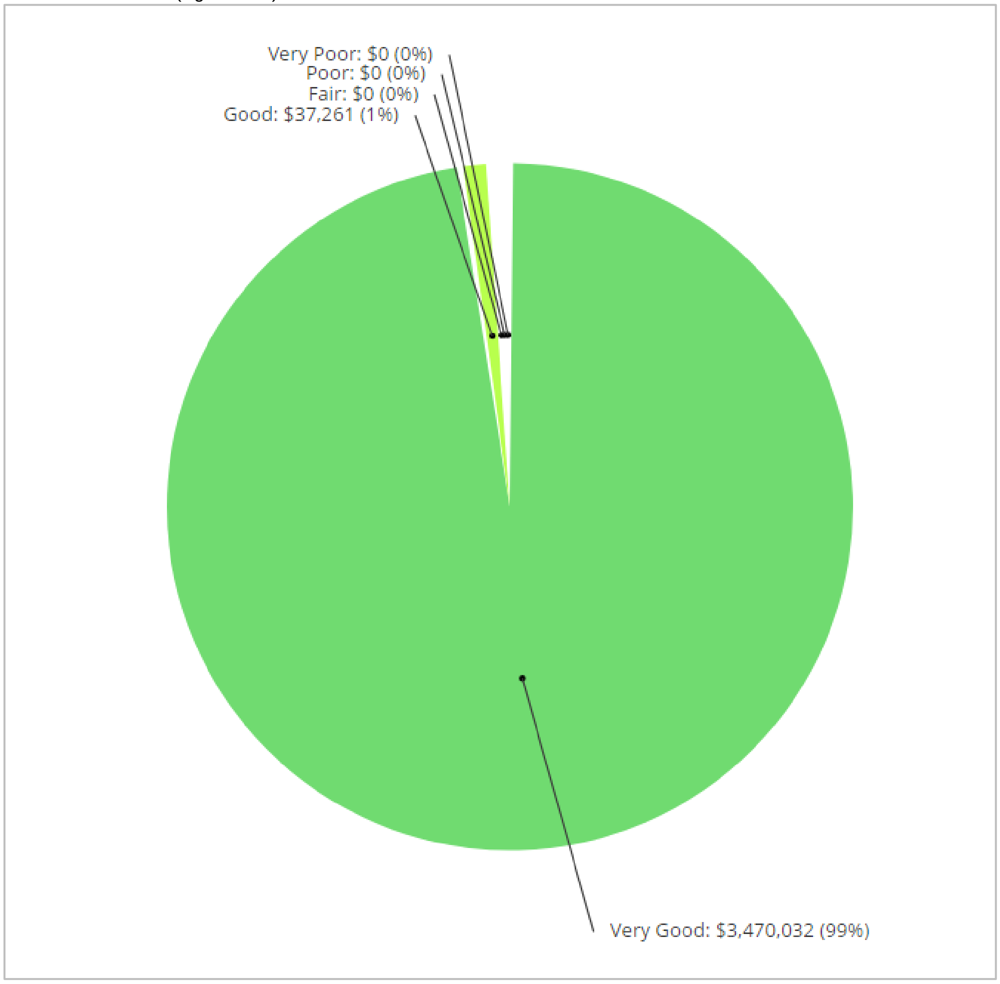


100% of the municipality's landfill assets have at least 10 years of useful life remaining.

6.4 Current Asset Condition

Using 2016 replacement cost, in this section, we summarize the condition of the municipality's landfill assets as of year-end 2015. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has not provided condition data for its landfill assets.

Figure 39 Asset Condition – Landfill (Age-based)

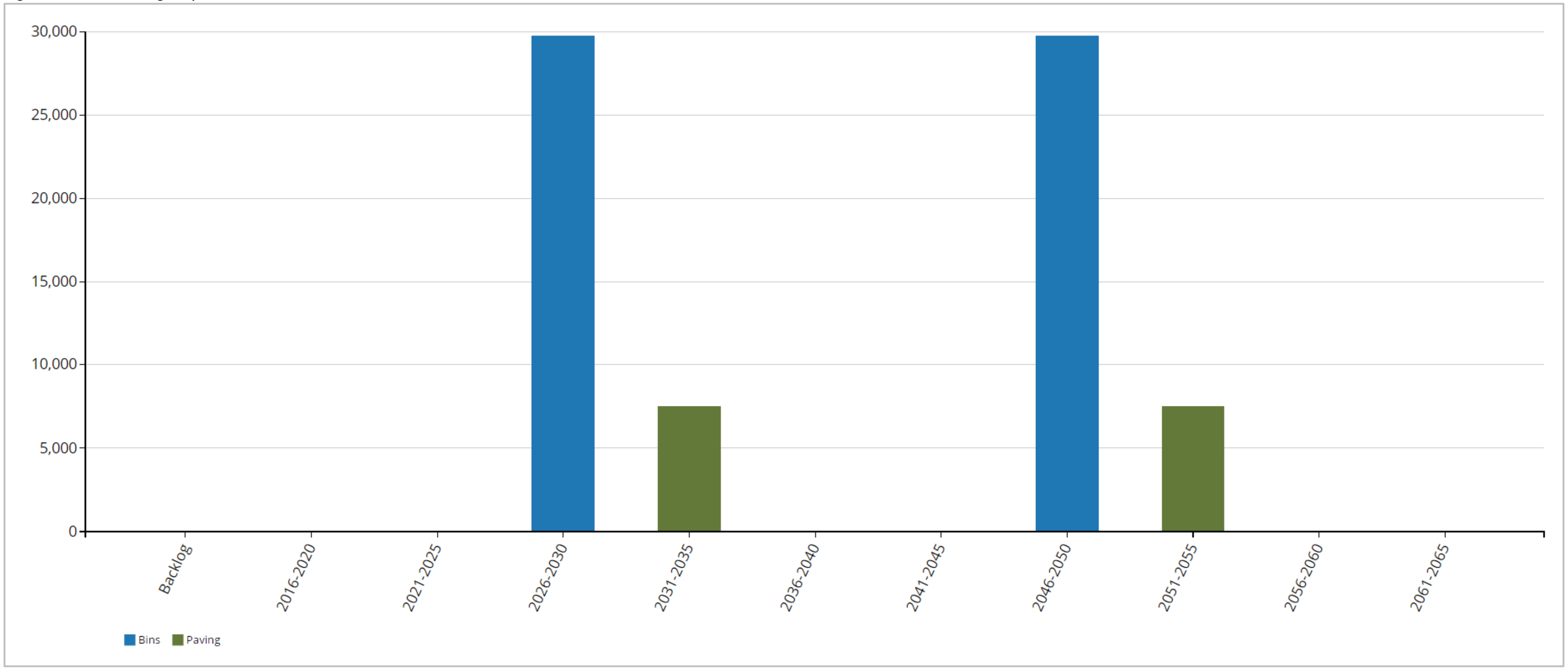


Age-base data indicates that nearly 100% of landfill assets are in very good condition.

6.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's landfill assets based on 2016 replacement cost. 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 – Landfill



In addition to no backlog, there are no replacement needs forecasted over the next 10 years. Replacement needs will increase beyond that as assets reach the end of their useful life. The municipality's annual requirements (not shown on the graph) for its landfill assets total $39,000. At this funding level, the municipality would be allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the municipality is currently not allocating any funding towards this asset category. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level.

6.6 Recommendations – Landfill

- In time, the municipality should establish a component based condition assessment program to more precisely estimate its financial requirements and field needs for its landfill assets. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- Using the above information, the municipality should assess its short-, medium- and long-term capital, and operations and maintenance needs.

- An appropriate percentage of the replacement value of the assets should then be allocated for the municipality's O&M requirements.

- The municipality is not funding any portion of its long-term requirements on an annual basis. See the 'Financial Strategy' section on how to achieve more sustainable and optimal funding levels.

7. IT, Machinery & Equipment

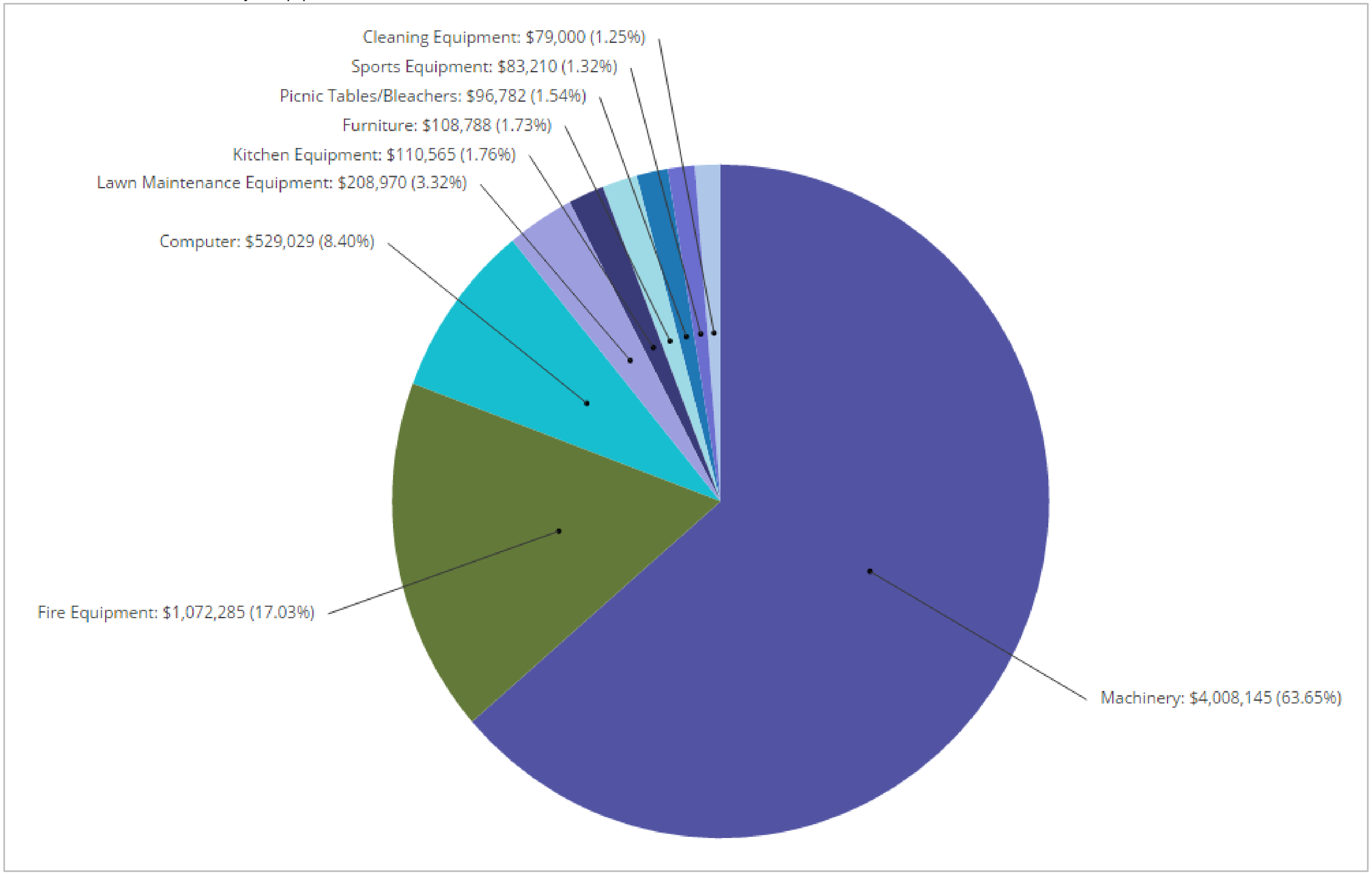
7.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 11 illustrates key asset attributes for the municipality's IT, machinery & equipment assets, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's IT, machinery & equipment assets are valued at $6.3 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 11 Key Asset Attributes – IT, Machinery & Equipment

Asset Type	Components	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
IT, Machinery & Equipment	Cleaning Equipment	22 units	5 - 20	CPI (ON)	$79,000
	Fire Equipment	623 units	5 - 25	CPI (ON)	$1,072,285
	Furniture	45 units	15	CPI (ON)	$108,788
	Kitchen Equipment	17 units	15 - 30	CPI (ON)	$110,565
	Lawn Maintenance Equipment	32 units	3 - 50	CPI (ON)	$208,970
	Picnic Tables/Bleachers	14 units	15 - 25	CPI (ON)	$96,782
	Sports Equipment	Pooled	10 - 25	CPI (ON)	$83,210
	Machine Equipment	28 units	10 - 20	CPI (ON)	$4,008,145
	Computer/IT	89 units	5	CPI (ON)	$529,029
				Total	$6,296,774

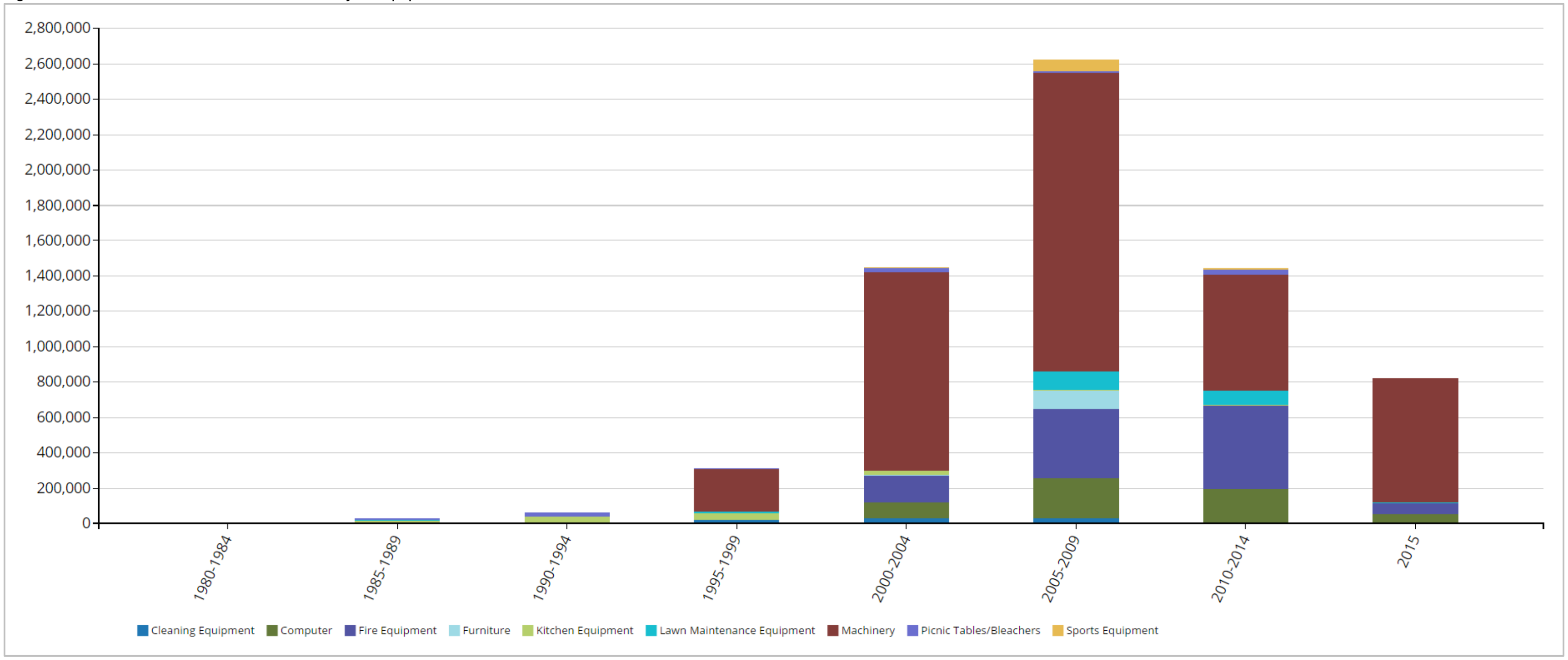
Figure 41 Asset Valuation – IT, Machinery & Equipment



7.2 Historical Investment in Infrastructure

Figure 42 shows the municipality's historical investments in its IT, machinery & equipment since 1980. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 7.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs. Note, this graph includes the historical investment for assets within the active inventory as of December 31, 2015.

Figure 42 Historical Investment – IT, Machinery & Equipment

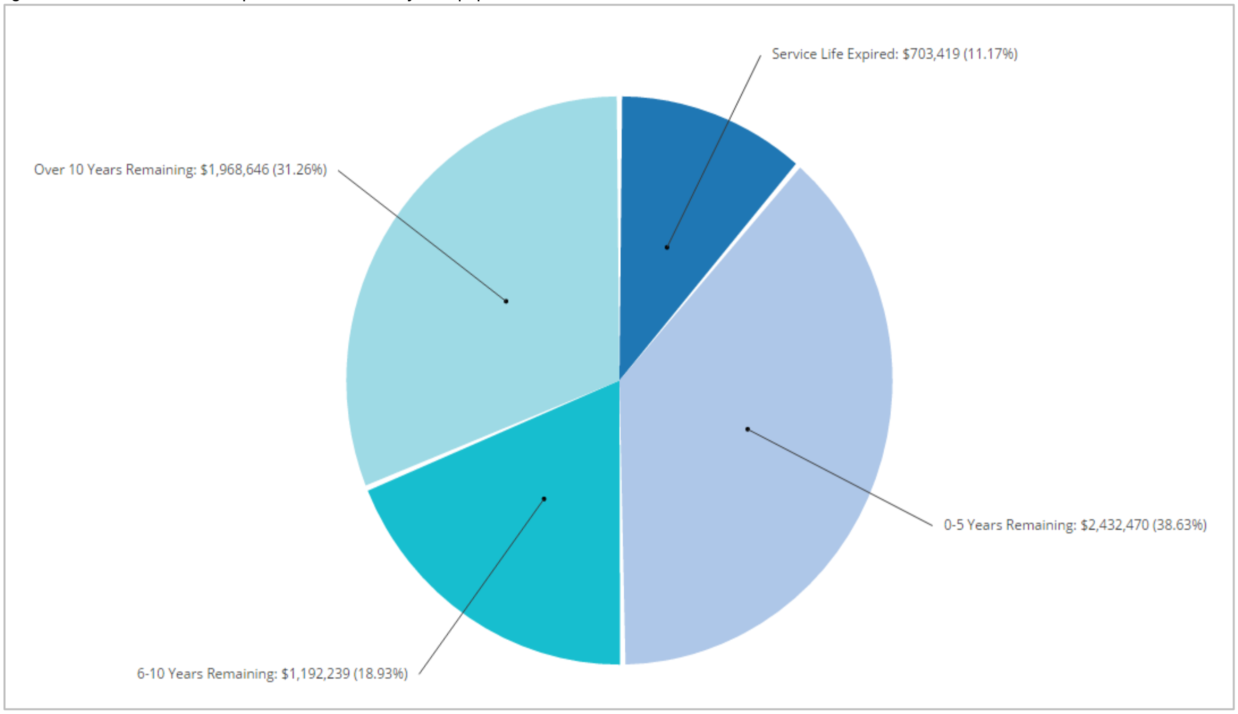


The municipality gradually expanded its IT, machinery & equipment portfolio beginning in the mid-1980s. Expenditures peaked during the period between 2005 and 2009, at a valuation of $2.6 million. In 2015, the municipality invested $800,000 with a focus on machinery.

7.3 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 historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 43 illustrates the useful life consumption levels as of 2015 for the municipality's IT, machinery & equipment assets.

Figure 43 Useful Life Consumption – IT, Machinery & Equipment

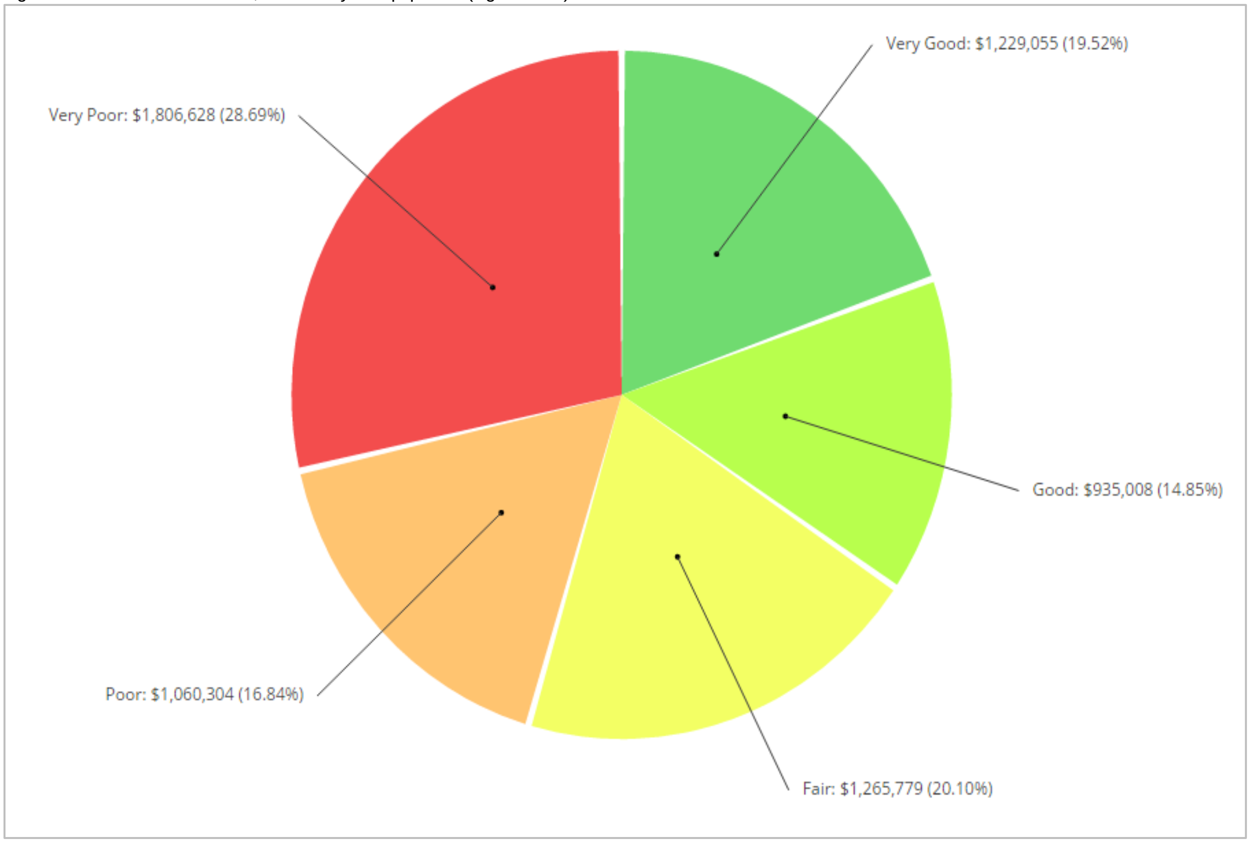


Over 30% of IT, machinery & equipment assets, at a valuation of $2 million, have at least 10 years of useful life remaining, while 11% remain in operation beyond their useful life. An additional 39% will reach the end of their useful life in the next five years.

7.4 Current Asset Condition

Using 2016 replacement cost, in this section, we summarize the condition of the municipality's IT, machinery & equipment assets as of year-end 2015. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has not provided condition data.

Figure 44 Asset Condition – IT, Machinery & Equipment (Age-based)

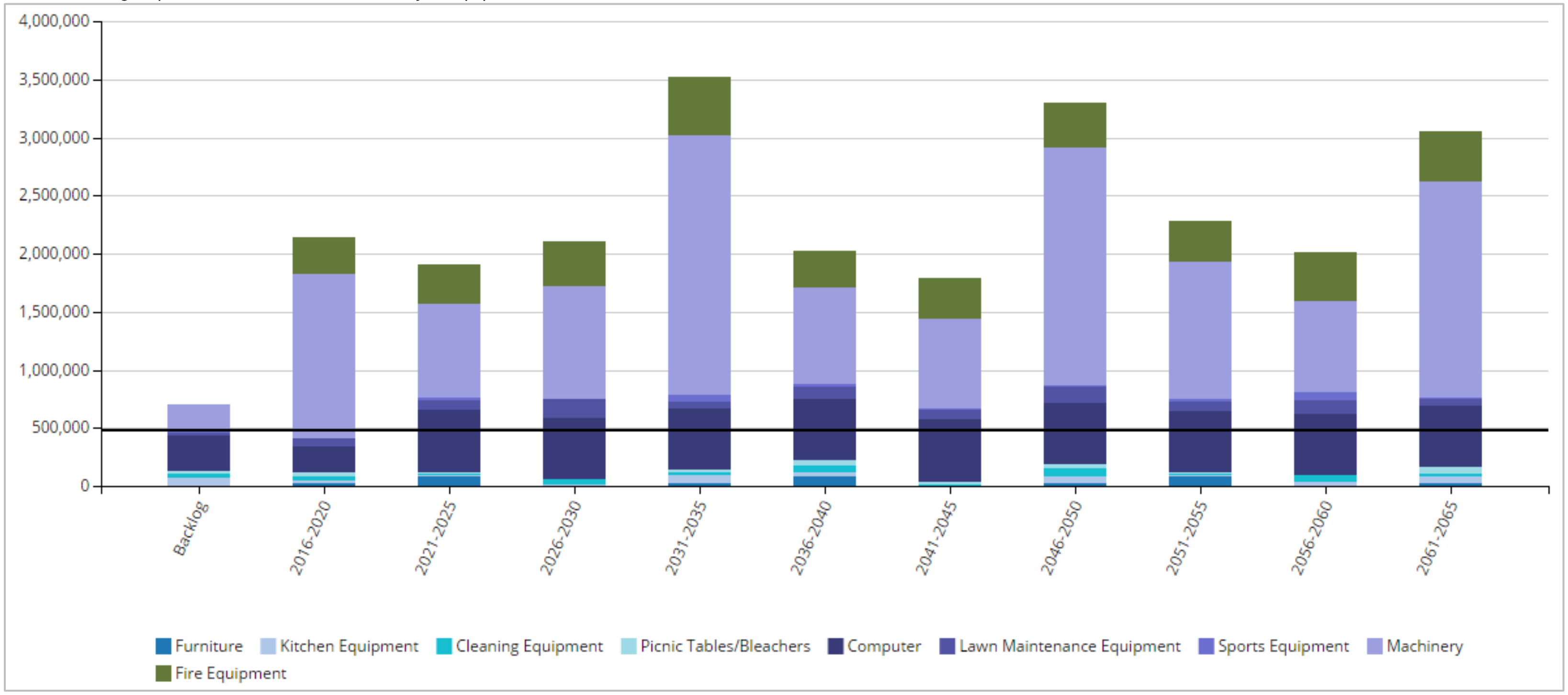


Age-based data indicates that 45% of assets, with a valuation of $2.9 million, are in poor to very poor condition. 34% of assets are in good to very good condition.

7.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's IT, machinery & equipment assets based on 2016 replacement cost. 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 45 Forecasting Replacement Needs – IT, Machinery & Equipment



In addition to an age-based backlog of $703,000, the municipality's replacement needs total $2.1 million in the next five years. An additional $1.9 million will be required between 2021-2025. The municipality's annual requirements (indicated by the black line) for its machinery & equipment total $492,000. At this funding level, the municipality would be allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the municipality is currently allocating $200,000, leaving an annual deficit of $292,000. See the 'Financial Strategy' section for maintaining a sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

7.6 Recommendations – IT, Machinery & Equipment

- The municipality should implement a component based condition inspection program to better define financial requirements for its IT, machinery and equipment. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- Using the above information, the municipality should assess its short-, medium- and long-term capital, and operations and maintenance needs.

- An appropriate percentage of the replacement costs should then be allocated for the municipality's O&M requirements.

- The municipality is funding 41% of its long-term requirements on an annual basis. See the 'Financial Strategy' section on how to maintain sustainable and optimal funding levels.

8. Perth Meadows

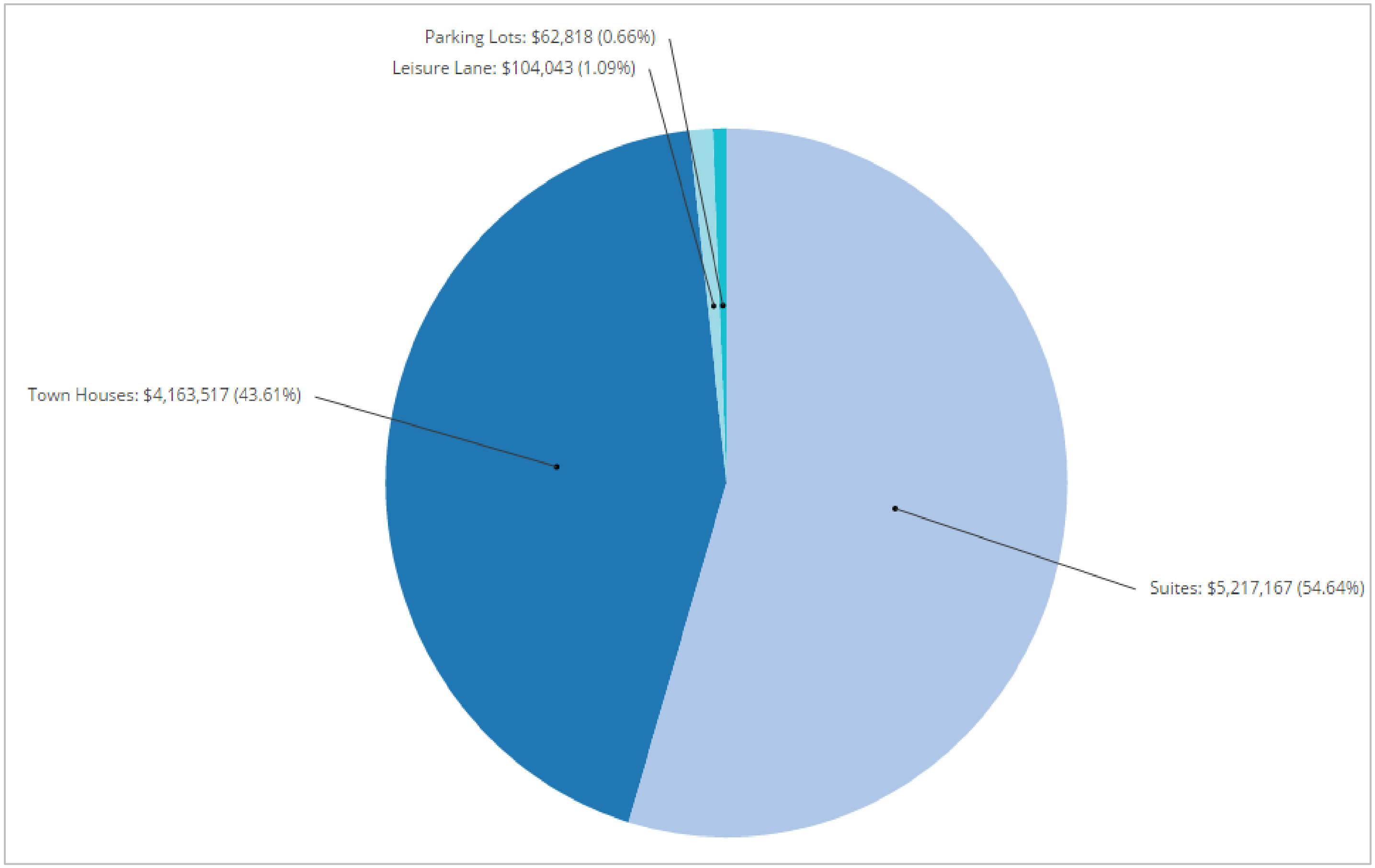
8.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 12 illustrates key asset attributes for the municipality's Perth Meadows assets, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's Perth Meadows assets are valued at $9.5 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality.

Table 12 Key Asset Attributes – Perth Meadows

Asset Type	Components	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Perth Meadows	Town Houses	1 Building	50	NRBCPI (Toronto)	$4,163,517
	Suites	1 Building	50	NRBCPI (Toronto)	$5,217,167
	Parking Lots	1 unit	20	NRBCPI (Toronto)	$62,818
	Leisure Lane	1 unit	20	NRBCPI (Toronto)	$104,043
				Total	$9,547,545

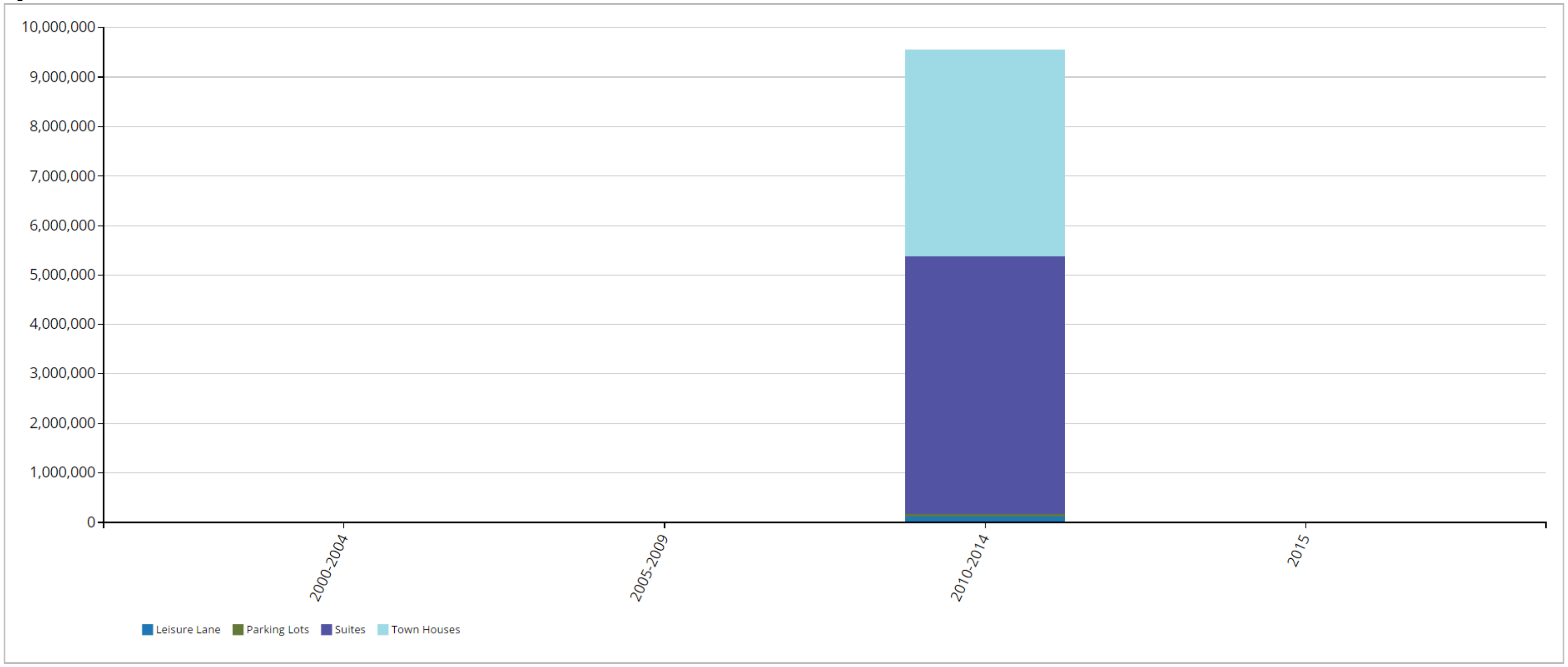
Figure 46 Asset Valuation – Perth Meadows



8.2 Historical Investment in Infrastructure

Figure 47 shows the municipality's historical investments in Perth Meadows since 2000. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 8.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs. Note, this graph includes the historical investment for assets within the active inventory as of December 31, 2015.

Figure 47 Historical Investment – Perth Meadows

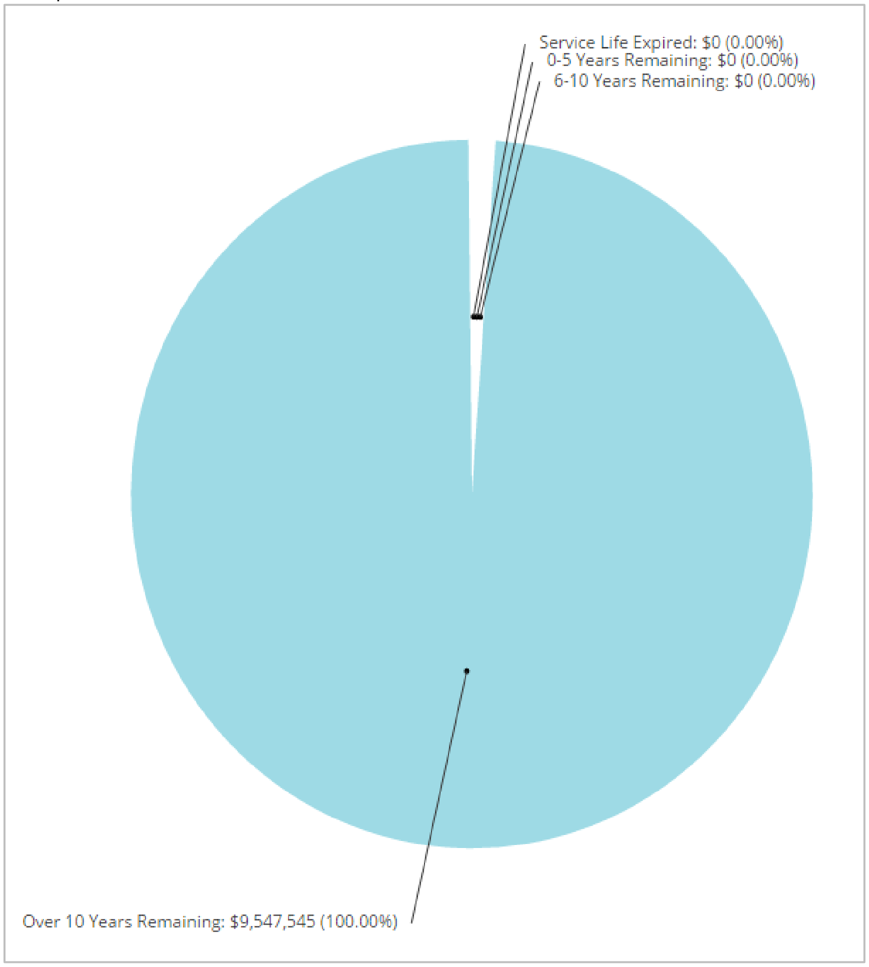


All of the municipality's investments into Perth Meadows occurred between 2010-2014.

8.3 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 historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 48 illustrates the useful life consumption levels as of 2015 for the municipality's Perth Meadows assets.

Figure 48 Useful Life Consumption – Perth Meadows

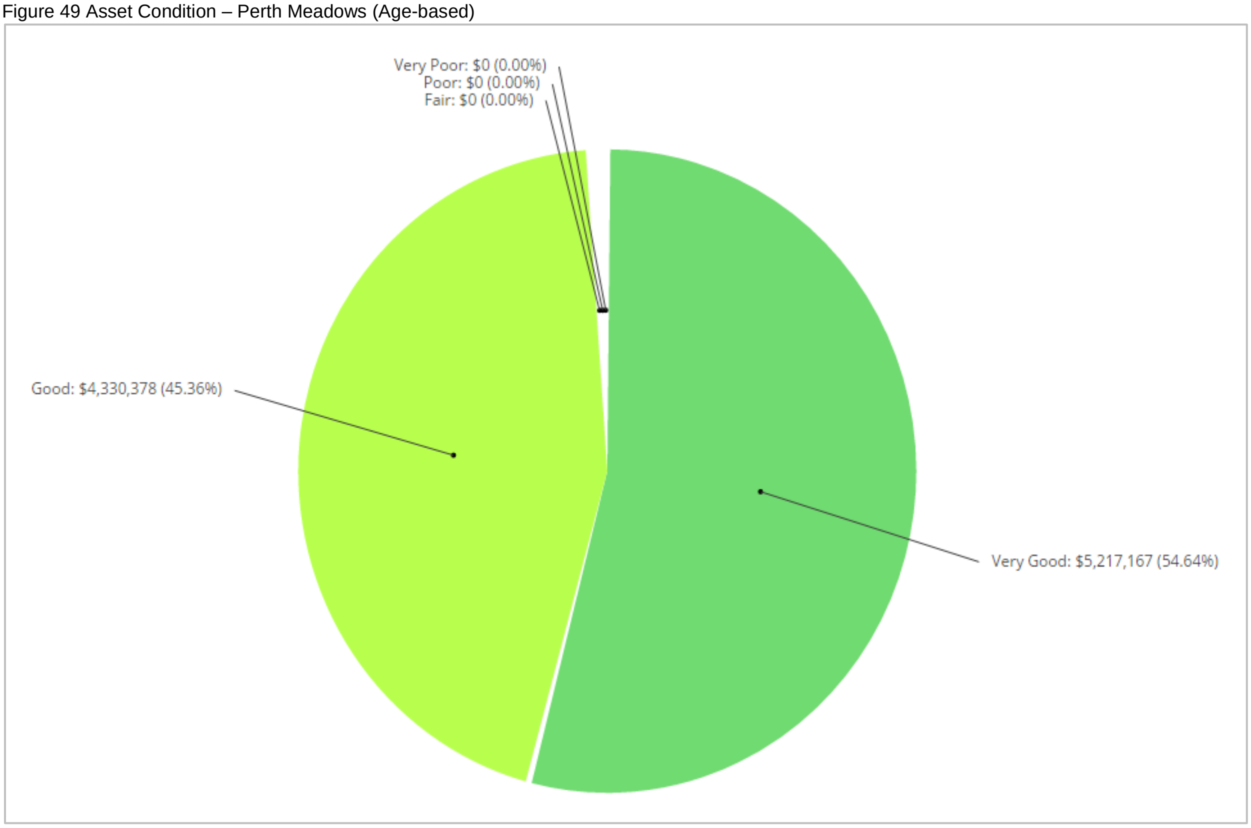


All of Perth Meadows assets have at least 10 years of useful life remaining.

8.4 Current Asset Condition

Using 2016 replacement cost, in this section, we summarize the condition of the municipality's Perth Meadows assets as of year-end 2015. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has not provided condition data for Perth Meadows.

Figure 49 Asset Condition – Perth Meadows (Age-based)

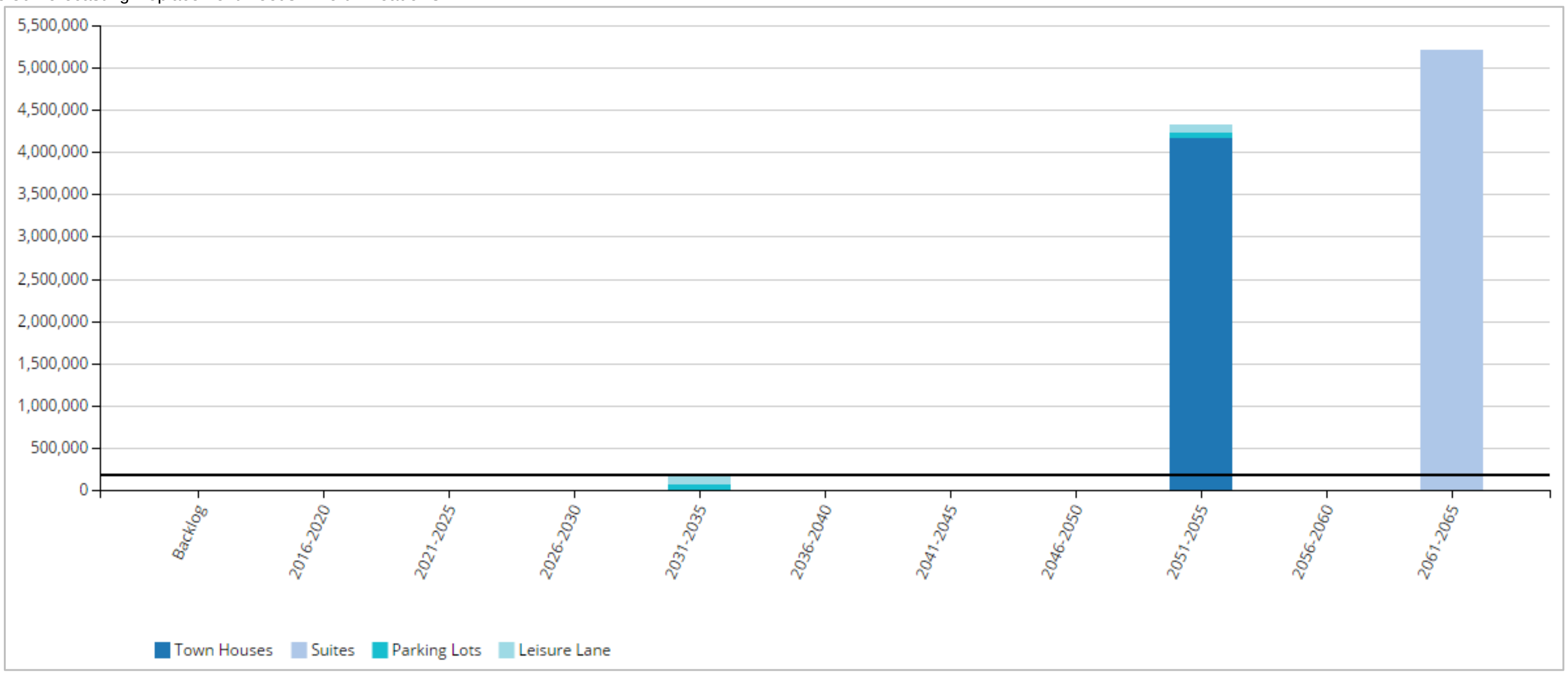


Based on age data, 100% of Perth Meadows assets are in good to very good condition.

8.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's Perth Meadows assets based on 2016 replacement cost. 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 50 Forecasting Replacement Needs – Perth Meadows



In addition to no backlog, there are no replacement needs over the next 10 years. The municipality's annual requirements (indicated by the black line) for Perth Meadows total $196,000. At this funding level, the municipality would be allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the municipality is currently not allocating any funding towards this asset category. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level.

8.6 Recommendations – Perth Meadows

- The municipality should implement a component based condition inspection program to better define financial requirements for Perth Meadows. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- Using the above information, the municipality should assess its short-, medium- and long-term capital and operations and maintenance needs.

- An appropriate percentage of the replacement costs should then be allocated for the municipality's O&M requirements.

- The municipality is not funding any portion of its long-term replacement needs on an annual basis. See the 'Financial Strategy' section on how to achieve more sustainable and optimal funding levels.

9. Fleet

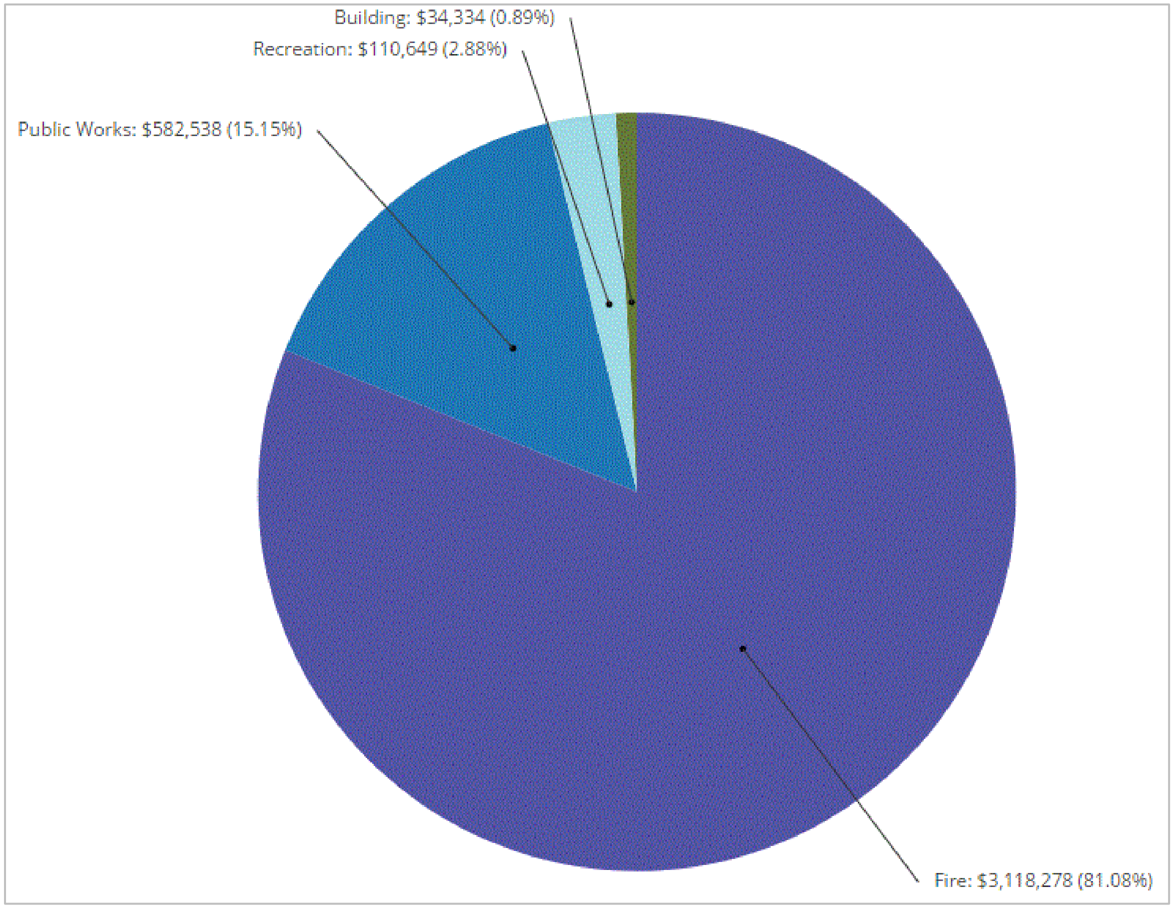
9.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 13 illustrates key asset attributes for the municipality's fleet assets, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's fleet assets are valued at $3.8 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality.

Table 13 Key Asset Attributes - Fleet

Asset Type	Components	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Fleet	Buildings & Planning Department	1 units	10	CPI (ON)	$34,334
	Fire Department	11 units	7 - 25	CPI (ON)	$3,118,278
	Public Works Department	16 units	7 - 10	CPI (ON)	$582,538
	Sports & Recreation Department	4 units	7 - 10	CPI (ON)	$110,649
				Total	$3,845,799

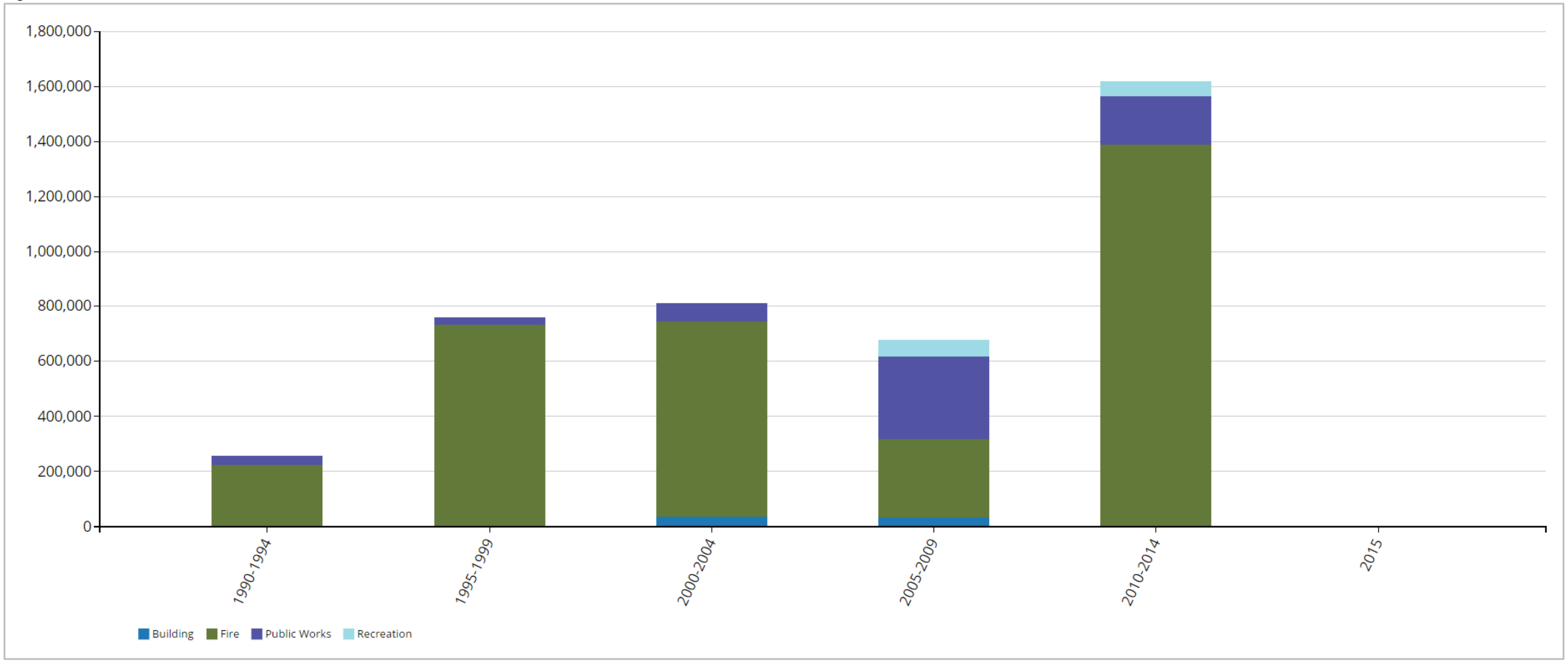
Figure 51 Asset Valuation – Fleet



9.2 Historical Investment in Infrastructure

Figure 52 shows the municipality's historical investments in its fleet since 1990. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 9.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs. Note, this graph includes the historical investment for assets within the active inventory as of December 31, 2015.

Figure 52 Historical Investment – Fleet

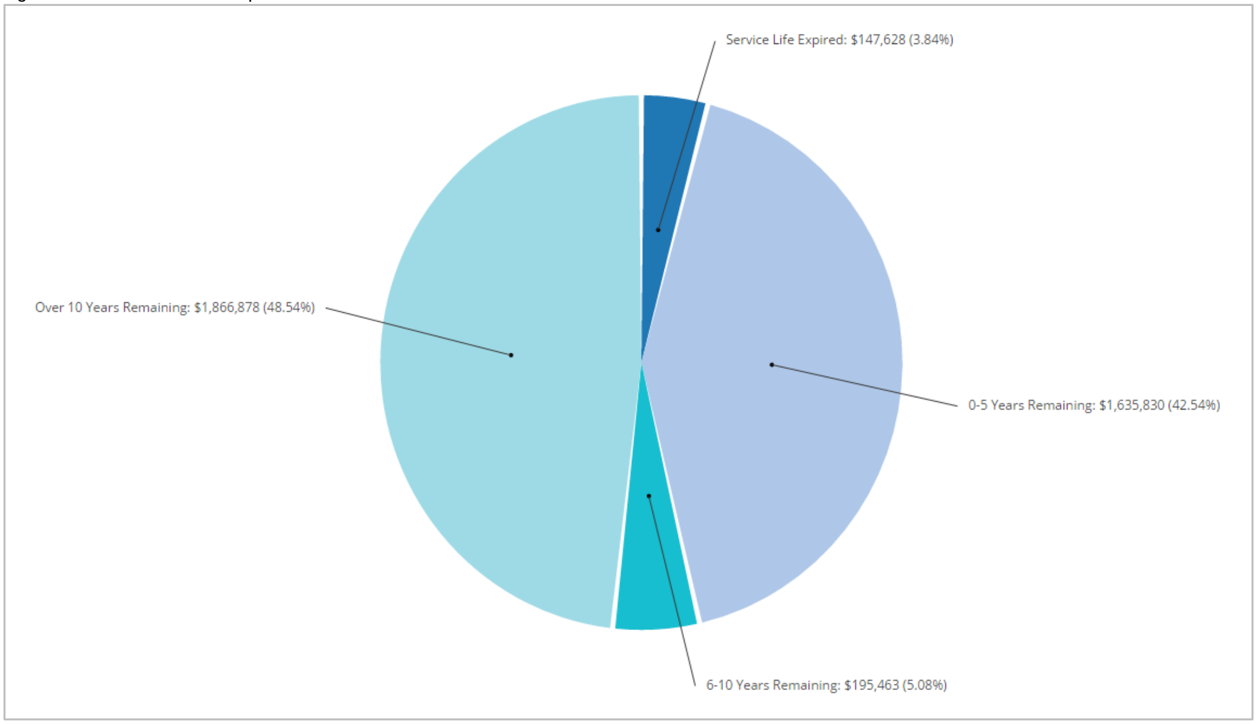


The municipality quickly built its vehicle portfolio starting in the 1990s. Expenditures increased and hit its peak in the period between 2010 and 2014, at a valuation of $1.6 million with a focus on fire vehicles.

9.3 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 historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 53 illustrates the useful life consumption levels as of 2015 for the municipality's fleet.

Figure 53 Useful Life Consumption – Fleet

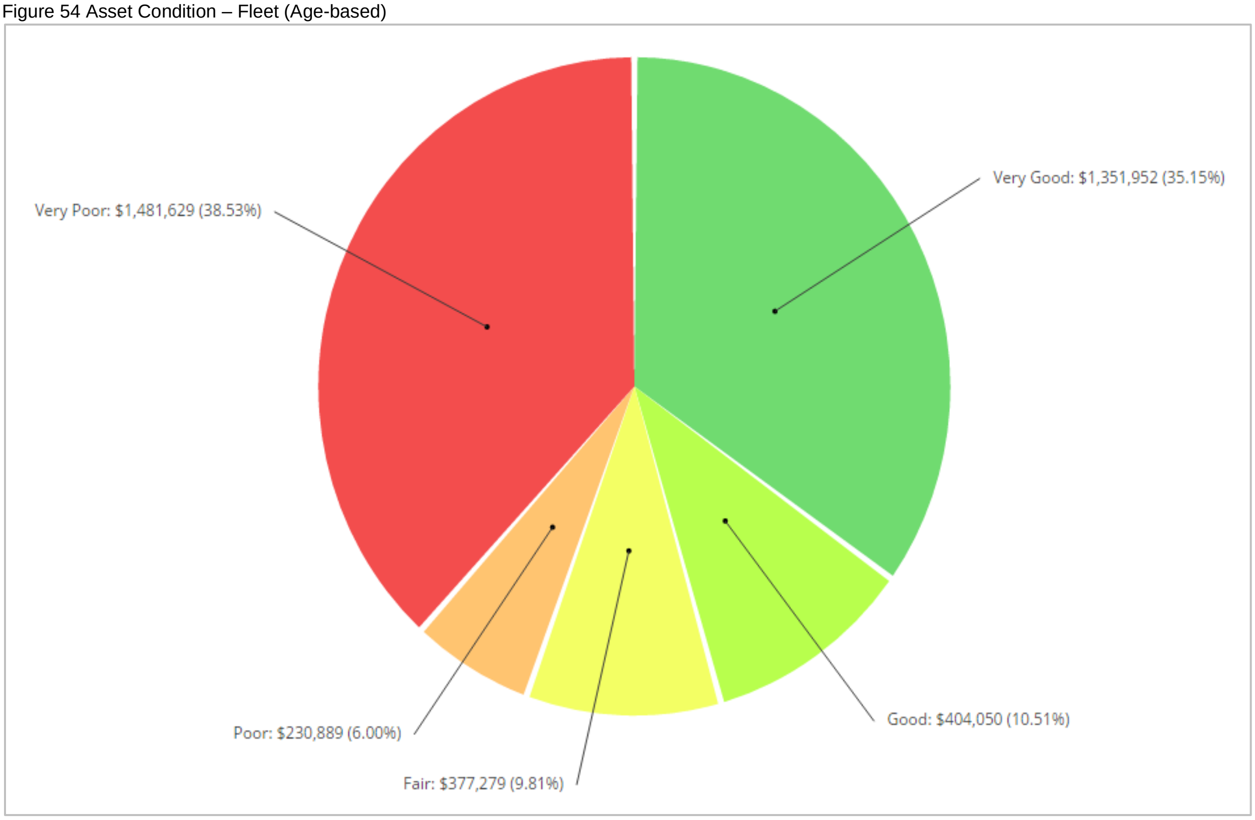


Nearly 50% of fleet assets, with a valuation of $1.9 million have at least 10 years of useful life remaining. 4% remain in operation beyond their useful life while an additional 43% will reach the end of their useful life in the next five years.

9.4 Current Asset Condition

Using 2015 replacement cost, in this section, we summarize the condition of the municipality's fleet assets as of year-end 2015. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has not provided condition data for its fleet assets.

Figure 54 Asset Condition – Fleet (Age-based)

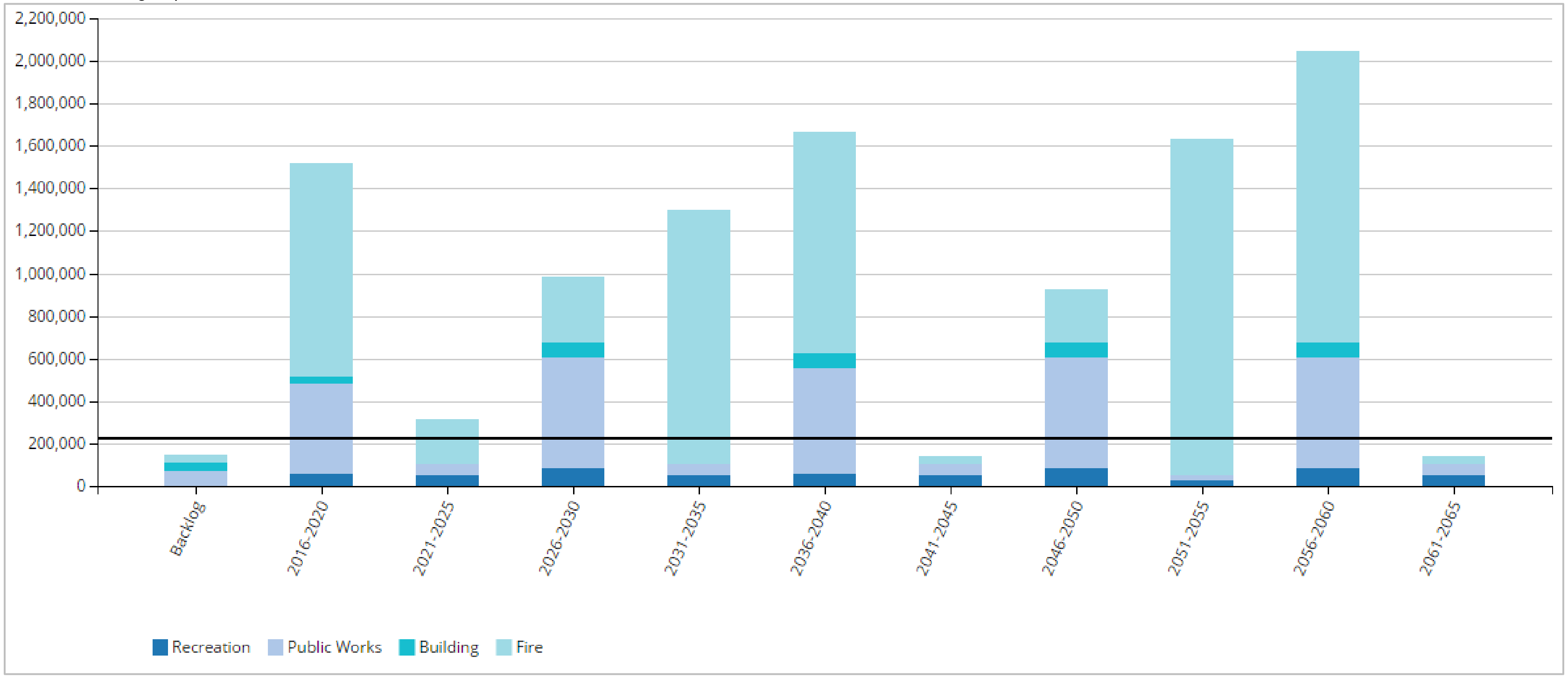


Age-based data shows that 45% of the municipality's fleet assets are in poor to very poor condition. An additional 46%, with a valuation of $1.8 million, are in good to very good condition.

9.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's fleet assets based on 2016 replacement cost. 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 55 Forecasting Replacement Needs – Fleet



In addition to an age-based backlog of $148,000, replacement needs will total $1.5 million over the next five years while an additional $300,000 will be required between 2021-2025. The municipality's annual requirements (indicated by the black line) for its fleet total $230,000. At this funding level, the municipality would be allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the municipality is currently allocating $262,000, leaving an annual surplus of $32,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

9.6 Recommendations – Fleet

- A preventative maintenance and life cycle assessment program should be established for vehicle assets to gain a better understanding of current condition and performance as well as the short- and medium-term replacement needs. See Section 2, ‘Condition Assessment Programs’ in the ‘Asset Management Strategies’ chapter.

- Using the above information, the municipality should assess its short-, medium- and long-term capital and operations and maintenance needs.

- An appropriate percentage of the replacement costs should then be allocated for the municipality’s O&M requirements.

- The municipality is over-funding (114%) its long-term replacement needs on an annual basis. See the ‘Financial Strategy’ section on how to achieve more sustainable and optimal funding levels.

10. Water Network

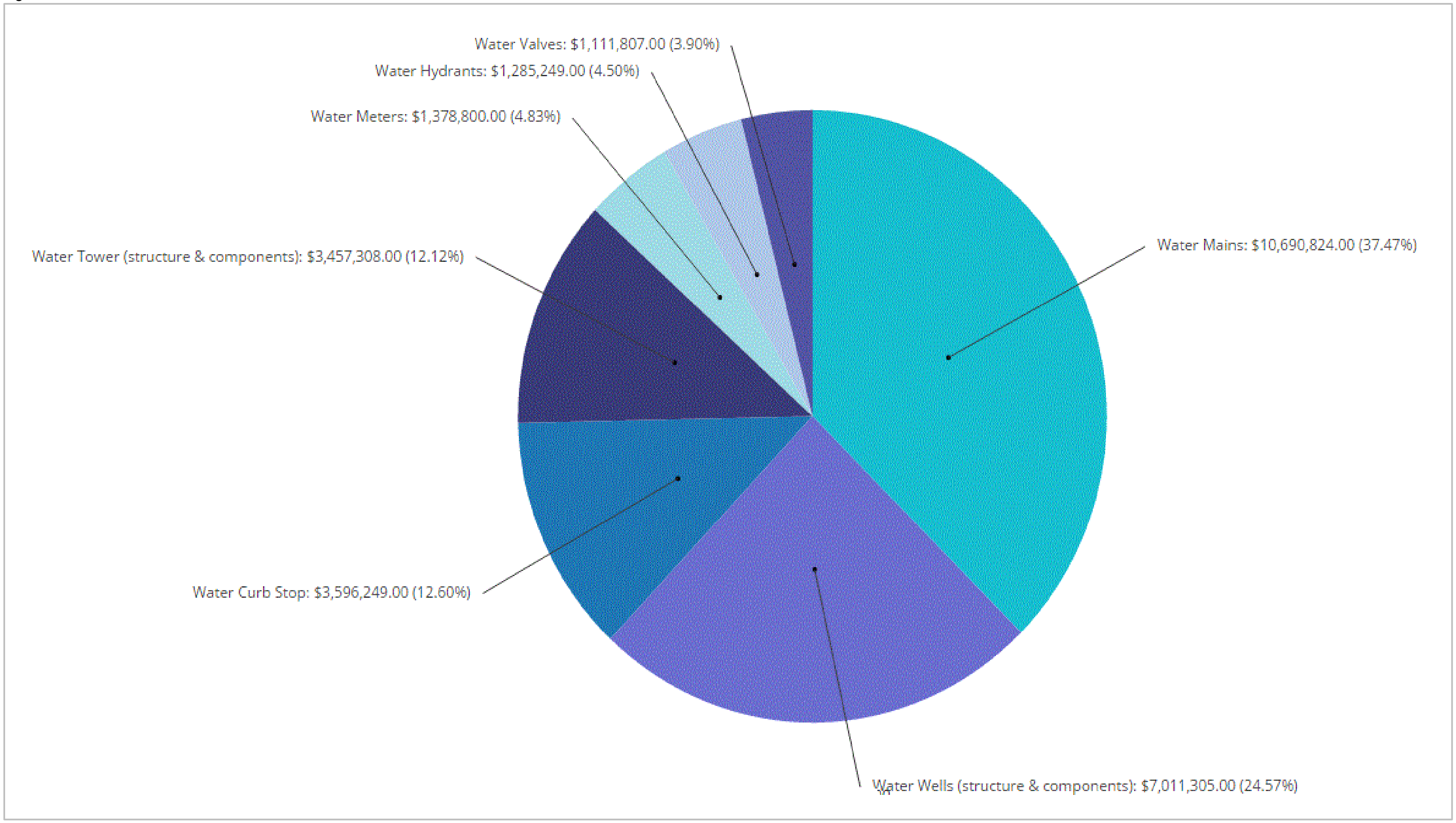
10.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 14 illustrates key asset attributes for the municipality's water network assets, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's water network assets are valued at $28.5 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality.

Table 14 Key Asset Attributes – Water Network

Asset Type	Components	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Water Network	Water Curb Stop	2,362 units	75	NRBCPI (Toronto)	$3,596,249
	Water Hydrants	284 units	60 – 75	NRBCPI (Toronto)	$1,285,249
	Water Mains (19mm - 75mm)	3,069m	60 – 75	$190/unit	$583,110
	Water Mains (100mm)	2,696m	60 – 75	$190/unit	$512,240
	Water Mains (150mm)	28,756.61m	60 – 75	$190/unit	$5,463,755
	Water Mains (200mm)	12,794.50m	60 – 75	$190/unit	$2,430,955
	Water Mains (250mm)	8,107.49m	60 – 75	$190/unit	$1,540,423
	Water Mains (300mm)	563.90m	60 – 75	$190/unit	$107,141
	Water Mains (unknown diameter)	280m	60 – 75	$190/unit	$53,200
	Water Meters	Pooled	4 – 15	NRBCPI (Toronto)	$1,378,800
	Water Tower (structure & componets)	Pooled	5 - 100	NRBCPI (Toronto)	$3,457,308
	Water Valves	834 units	60 – 75	NRBCPI (Toronto)	$1,111,807
	Danbrook Water Well (structure & components)	Pooled	5 - 100	NRBCPI (Toronto)	$1,695,054
	Gowanstown Water Well (structure & components)	Pooled	5 - 100	NRBCPI (Toronto)	$122,022
	Molesworth Water Well (structure & components)	Pooled	5 - 100	NRBCPI (Toronto)	$205,381
	Smith Water Well (structure & components)	Pooled	5 - 100	NRBCPI (Toronto)	$520,663
	Water Well #4 (structure & components)	Pooled	5 - 100	NRBCPI (Toronto)	$1,896,484
	Water Well #5 (structure & components)	Pooled	5 - 100	NRBCPI (Toronto)	$1,359,704
	Water Well #6 (structure & components)	Pooled	5 - 100	NRBCPI (Toronto)	$1,211,997
				Total	$28,531,542

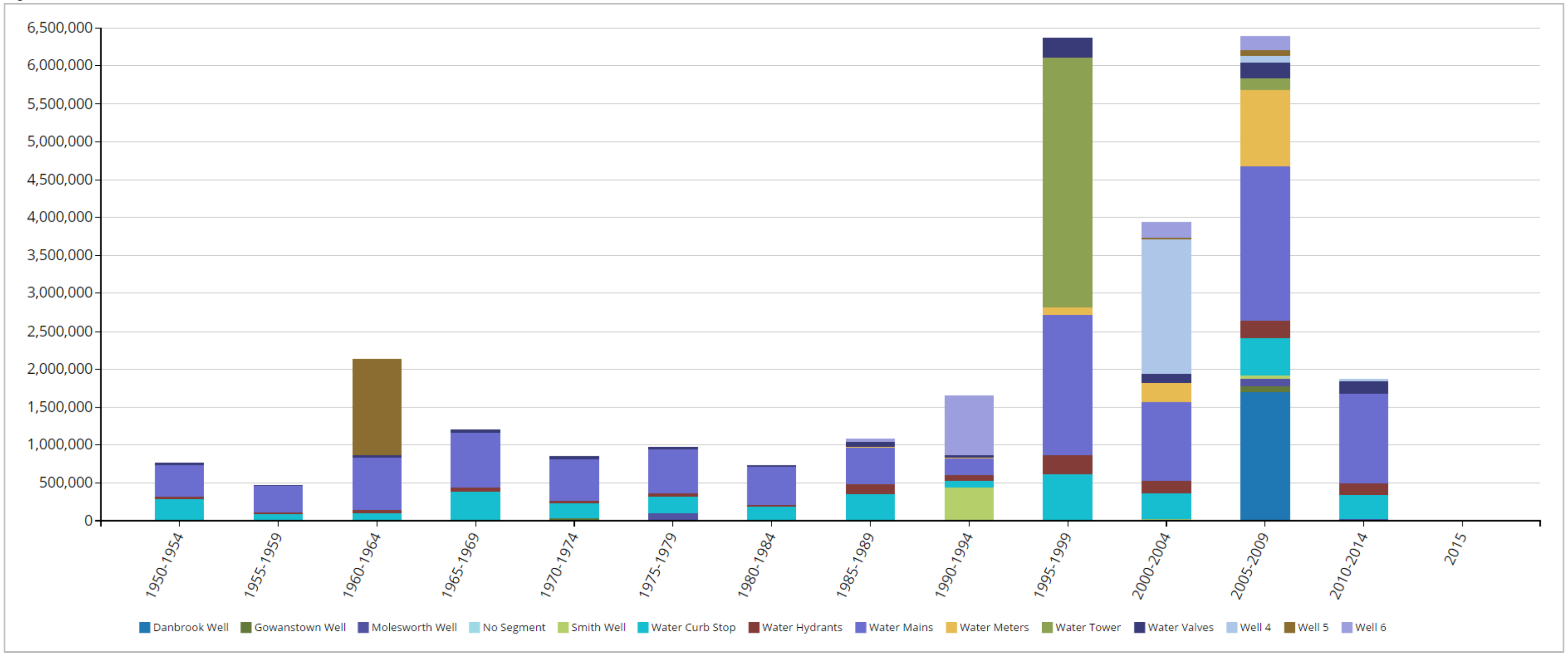
Figure 56 Asset Valuation – Water Network



10.2 Historical Investment in Infrastructure

Figure 57 shows the municipality's historical investments in its water network since 1950. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 10.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs. Note, this graph includes the historical investment for assets within the active inventory as of December 31, 2015.

Figure 57 Historical Investment – Water Network

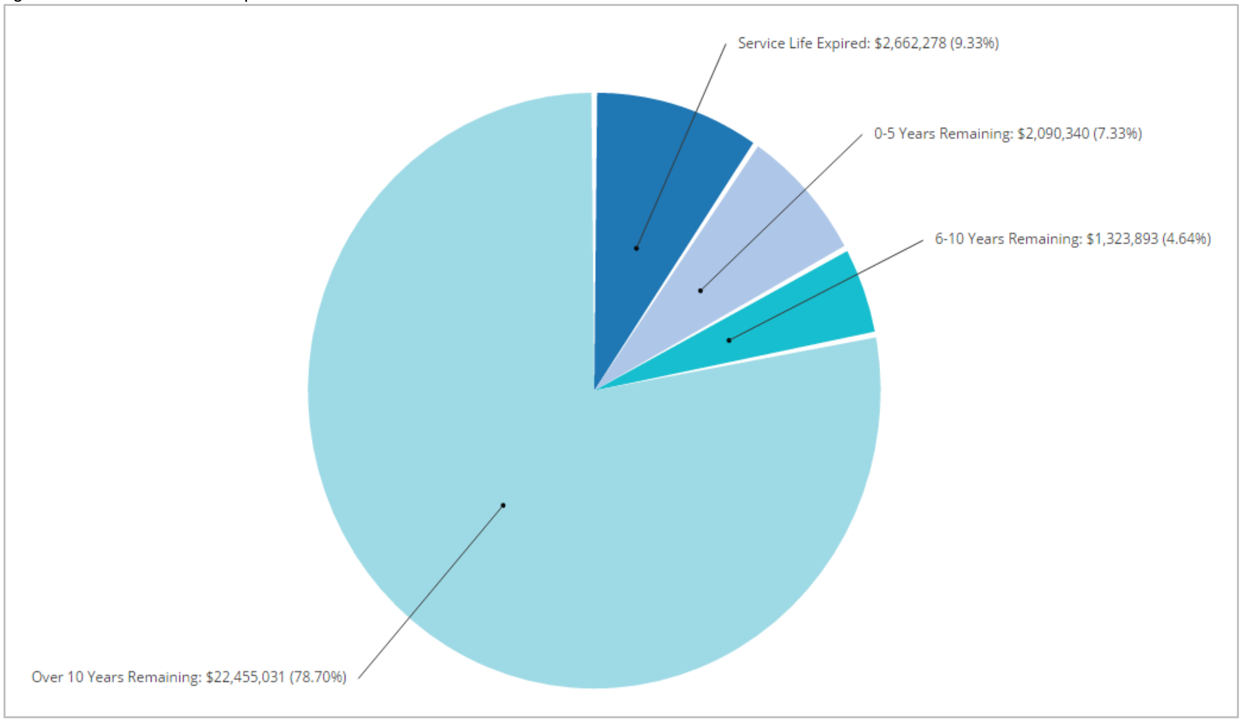


The municipality's investments into its water network began in the 1950s and fluctuated until 1990. Investments then increased and peaked at $6.4 million in the late 1990s and again in the late 2000s.

10.3 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 historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 58 illustrates the useful life consumption levels as of 2015 for the municipality's water network.

Figure 58 Useful Life Consumption – Water Network

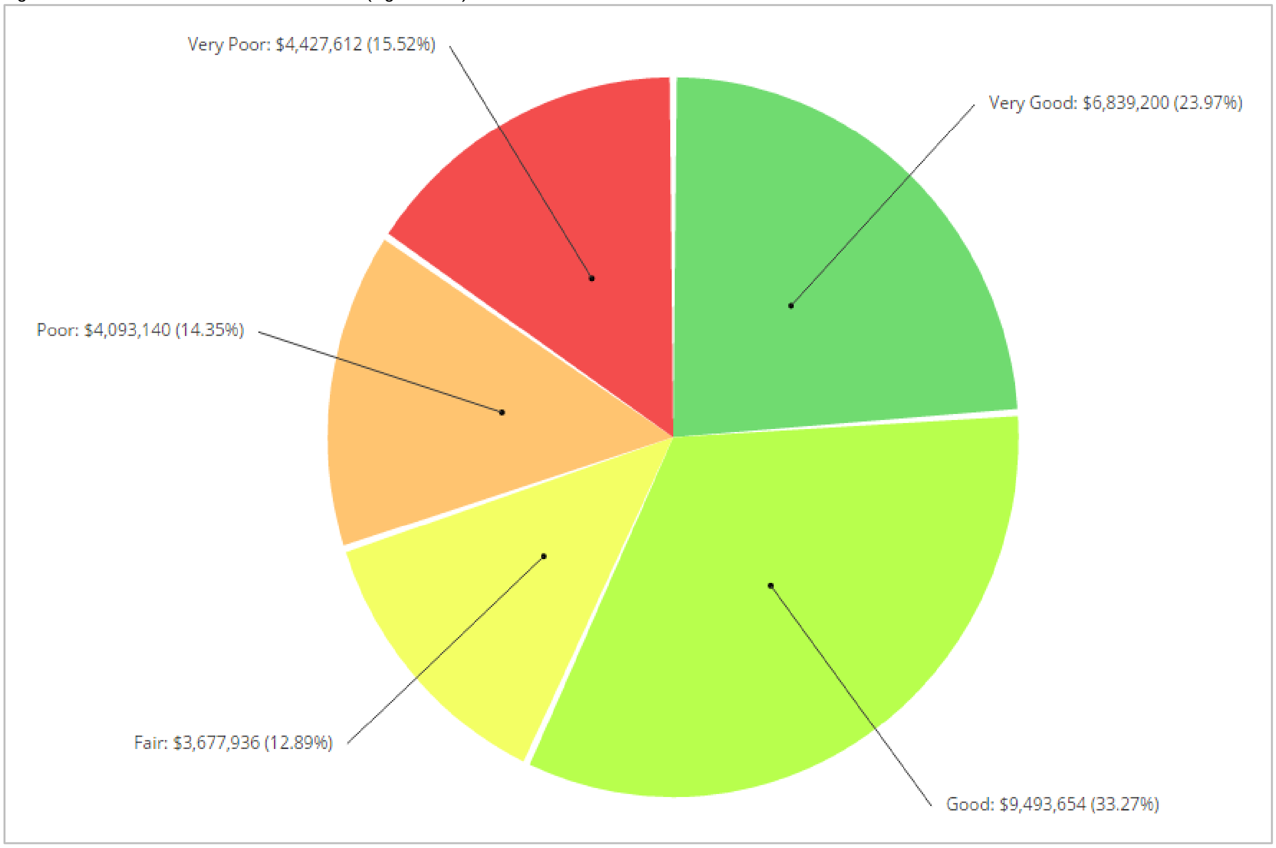


Nearly 80% of assets have over 10 years of useful life remaining while 9%, with a valuation of $2.6 million, remain in operation beyond their established useful life. An additional 7% will reach the end of their useful life in the next five years.

10.4 Current Asset Condition

Using 2015 replacement cost, in this section, we summarize the condition of the municipality's water network assets as of year-end 2015. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has not provided condition data for its water network.

Figure 59 Asset Condition – Water Network (Age-based)

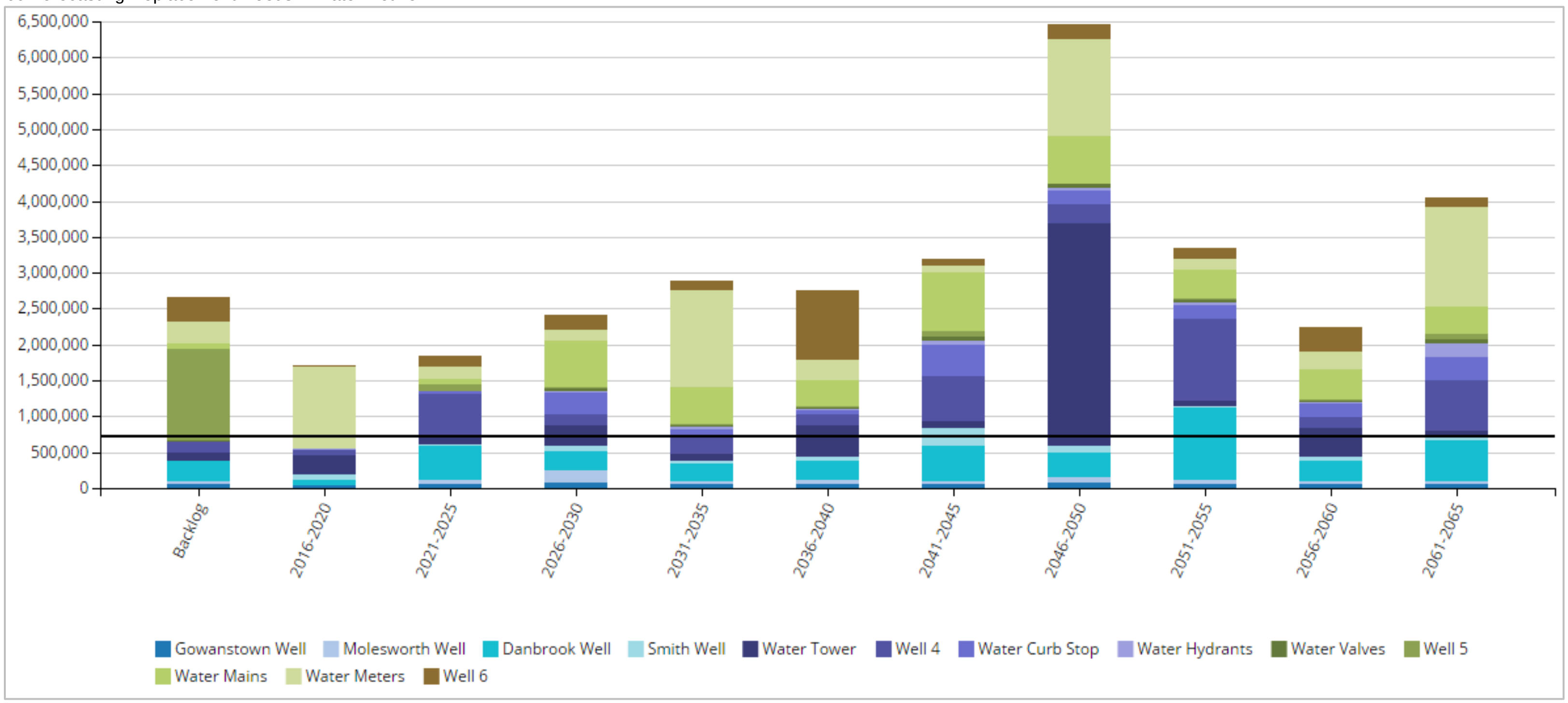


Age-based data shows that nearly 30% of the municipality's water network assets are in poor to very poor condition. 57%, with a valuation of $16.4 million, are in good to very good condition.

10.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's water network assets based on 2016 replacement cost. 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 60 Forecasting Replacement Needs – Water Network



In addition to an age-based backlog of $2.6 million, replacement needs will total $1.7 million over the next five years while an additional $1.9 million will be required between 2021-2025. The municipality's annual requirements (indicated by the black line) for its water network total $734,000. At this funding level, the municipality would be allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the municipality is currently allocating $313,000, leaving an annual deficit of $421,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

10.6 Recommendations – Water Network

- Age-based data shows a backlog of $2.6 million and 10-year replacement needs of $3.6 million. The municipality should establish a condition assessment program of its water assets to more precisely estimate its financial requirements and field needs. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- Water distribution system key performance indicators should be established and tracked annually as part of an overall level of service model. See Section VII 'Levels of Service'.

- The municipality should assess its short-, medium- and long-term capital, and operations and maintenance needs.

- An appropriate percentage of the replacement costs should then be allocated for the municipality's O&M requirements.

- The municipality is funding 43% of its long-term requirements on an annual basis. See the 'Financial Strategy' section on how to achieve more sustainable and optimal funding levels.

11. Wastewater Network

11.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

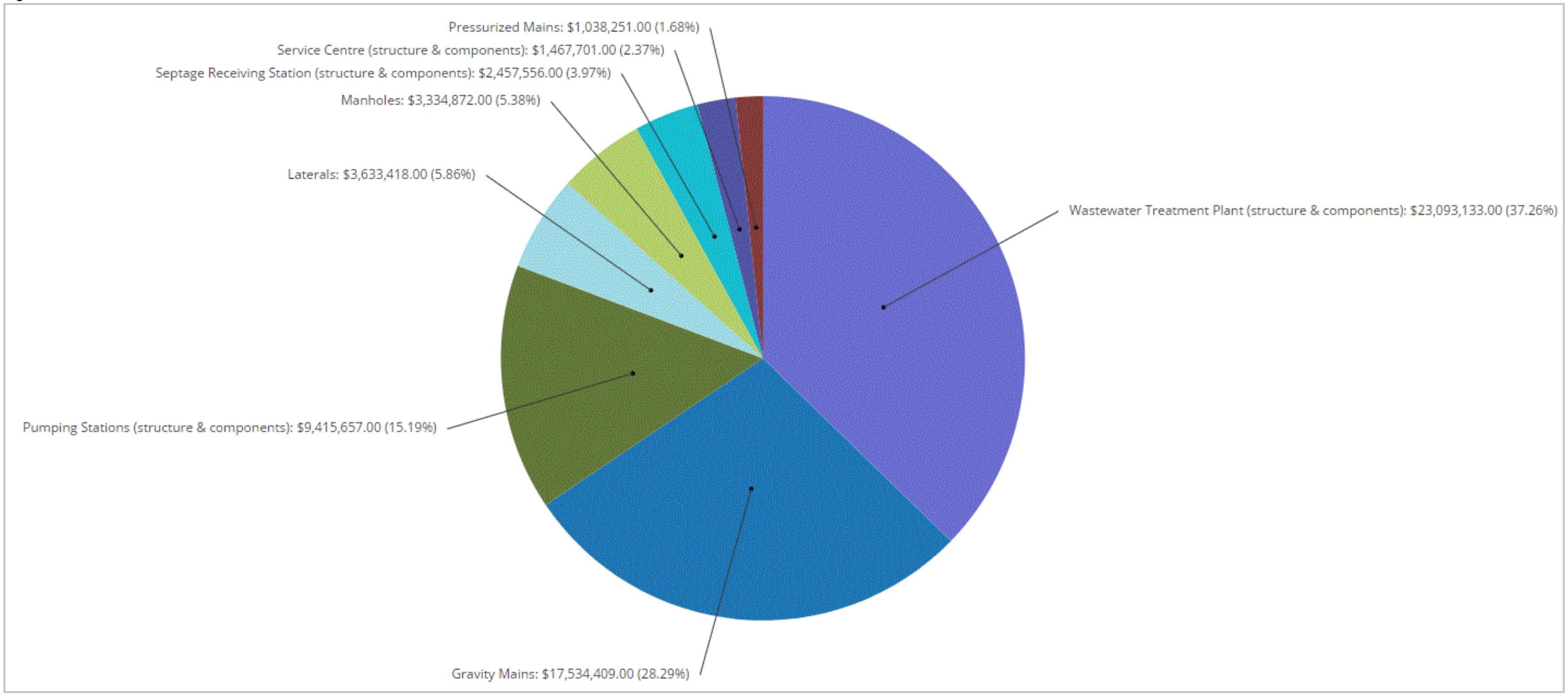
Table 15 illustrates key asset attributes for the municipality's wastewater network assets, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's wastewater network assets are valued at $62 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the municipality.

Table 15 Key Asset Attributes – Wastewater Network

Asset Type	Components	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Wastewater Network	Gravity Mains (150mm)	510.4m	50 - 80	$300/m	$153,120
	Gravity Mains (200mm)	29,822.16m	50 - 80	$300/m	$8,946,648
	Gravity Mains (250mm)	6,420.10m	50 - 80	$300/m	$1,926,030
	Gravity Mains (300mm)	7,157.30m	50 - 80	$300/m	$2,147,187
	Gravity Mains (375mm)	3,569.54m	50 - 80	$300/m	$1,070,862
	Gravity Mains (380mm)	81.30m	50 - 80	$300/m	$24,390
	Gravity Mains (400mm)	351.10m	50 - 80	$300/m	$105,330
	Gravity Mains (450mm)	2,804.40m	50 - 80	$300/m	$841,320
	Gravity Mains (525mm)	493.90m	50 - 80	NRBCPI (Toronto)	$287,830
	Gravity Mains (600mm)	963.40m	50 - 80	NRBCPI (Toronto)	$592,712
	Gravity Mains (825mm)	573m	50 - 80	NRBCPI (Toronto)	$554,959
	Gravity Mains (1200mm)	75.8m	50 - 80	NRBCPI (Toronto)	$18,264
	Gravity Mains (unknown diameter)	3,180.34m	50 - 80	NRBCPI (Toronto)	$865,757
	Atwood Pool Pumping Station (structure & components)	Pooled	10 - 100	NRBCPI (Toronto)	$355,591
	Davidson Pumping Station (structure & components)	Pooled	10 - 100	NRBCPI (Toronto)	$337,699
	Elm Ave Pumping Station (structure & components)	Pooled	10 - 100	NRBCPI (Toronto)	$845,538
	Hwy 23 Pumping Station (structure & components)	Pooled	10 - 100	NRBCPI (Toronto)	$5,956,513
	Inkerman St Pumping Station (structure & components)	Pooled	10 - 100	NRBCPI (Toronto)	$757,755
	Monument Rd Pumping Station (structure & components)	Pooled	10 - 100	NRBCPI (Toronto)	$1,061,285

Winston St Pumping Station (structure & components)	Pooled	10 - 100	NRBCPI (Toronto)	$101,276
Service Centre (structure & components)	Pooled	20 - 50	NRBCPI (Toronto)	$1,467,701
Laterals (100mm)	10,951m	75	NRBCPI (Toronto)	$1,540,022
Laterals (125mm)	12,043m	75	NRBCPI (Toronto)	$1,946,242
Laterals (150mm)	527m	75	NRBCPI (Toronto)	$64,735
Laterals (200mm)	103m	75	NRBCPI (Toronto)	$17,303
Laterals (unknown diameter)	434m	75	NRBCPI (Toronto)	$65,116
Manholes	663 units	75	NRBCPI (Toronto)	$3,334,872
Septage Receiving Station (structure & components)	Pooled	10 - 100	NRBCPI (Toronto)	$2,457,556
Pressurized Mains (100mm)	529.63m	75	NRBCPI (Toronto)	$62,453
Pressurized Mains (200mm)	574.2m	75	NRBCPI (Toronto)	$63,068
Pressurized Mains (250mm)	597.85m	75	NRBCPI (Toronto)	$69,750
Pressurized Mains (300mm)	7,553m	75	NRBCPI (Toronto)	$829,623
Pressurized Mains (unknown diameter)	1 unit	75	NRBCPI (Toronto)	$13,357
Wastewater Treatment Plant (structure & components)	Pooled	5 - 80	NRBCPI (Toronto)	$23,093,133
			Total	$61,974,997

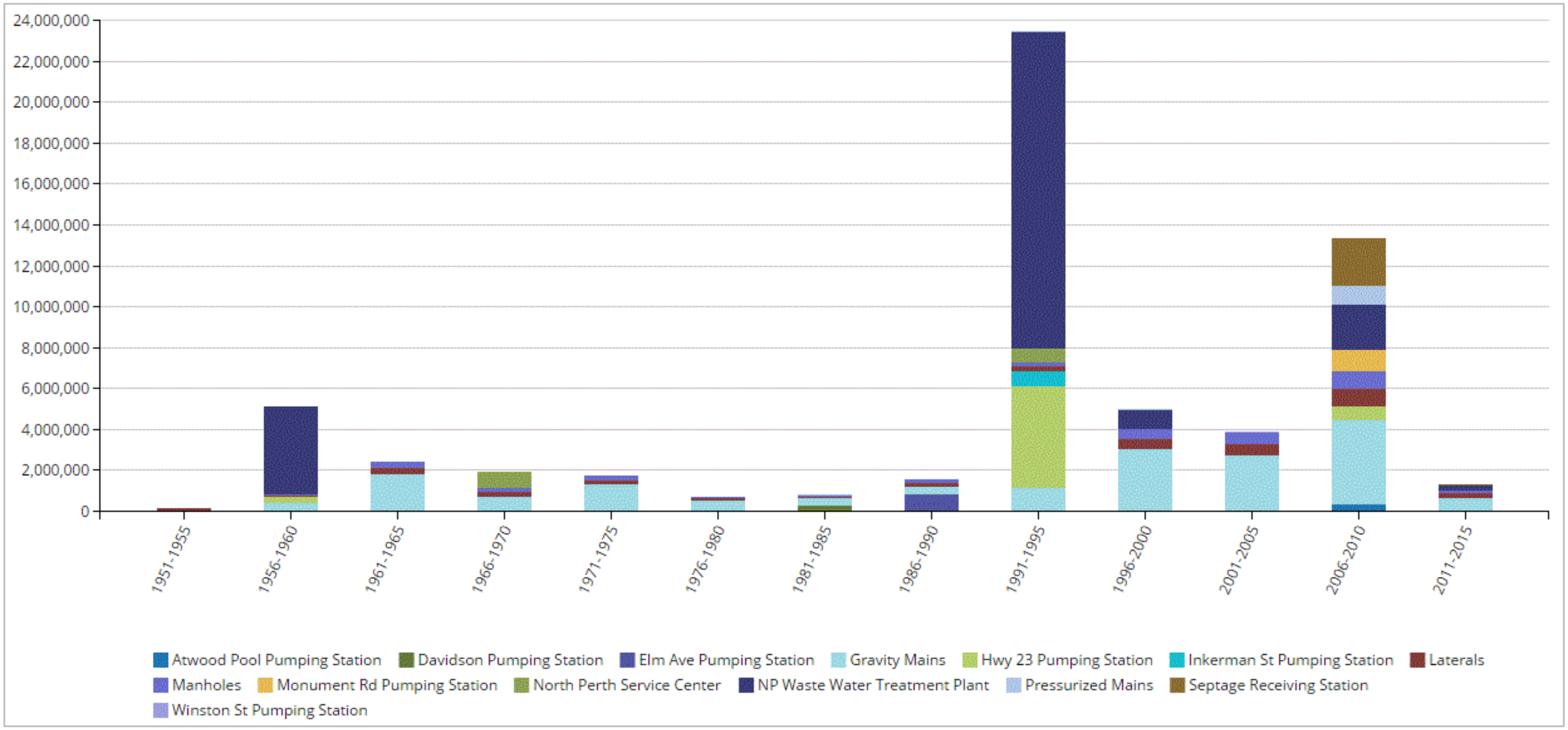
Figure 61 Asset Valuation – Wastewater Network



11.2 Historical Investment in Infrastructure

Figure 62 shows the municipality's historical investments in its wastewater network since 1950. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 11.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs. Note, this graph includes the historical investment for assets within the active inventory as of December 31, 2015.

Figure 62 Historical Investment – Wastewater Network

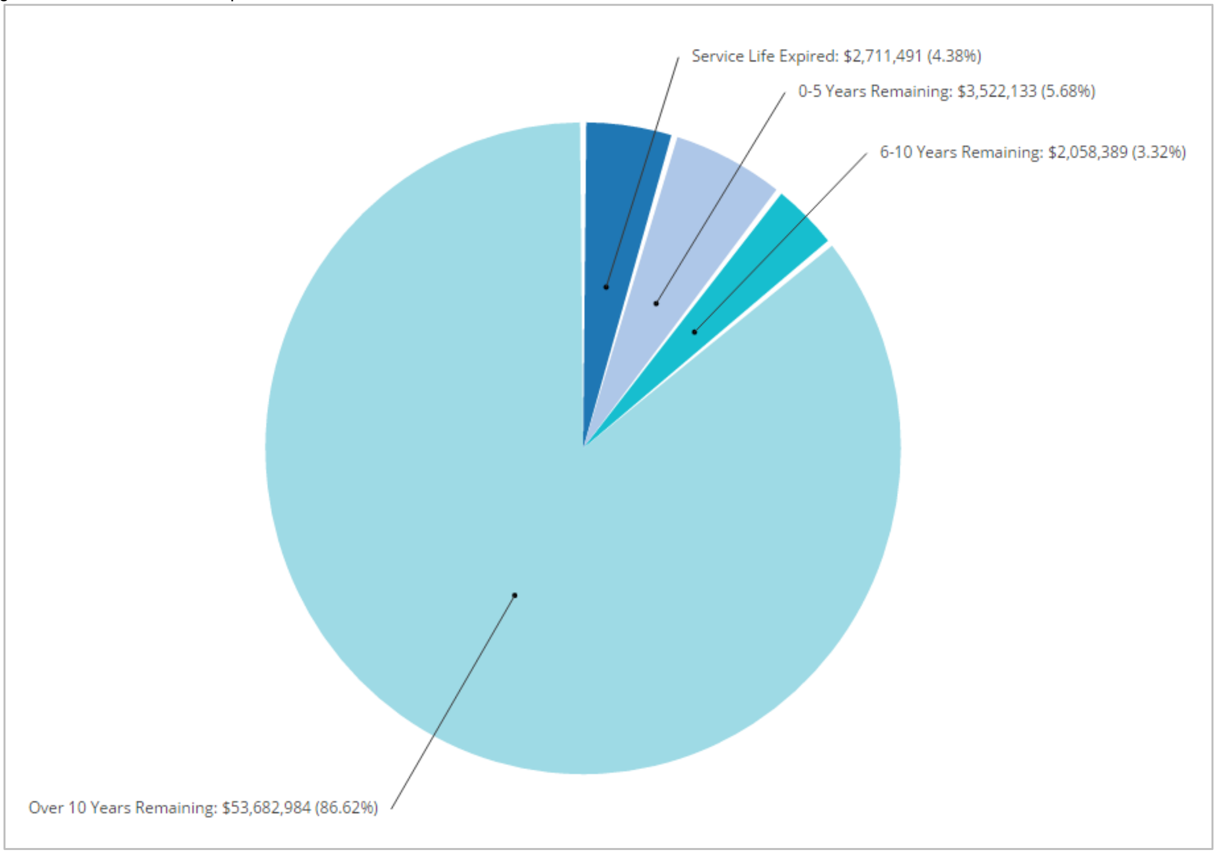


The municipality's investments into its wastewater network began in the 1950s and fluctuated until 1990. Investments then increased and peaked in the period between 1990-1994 at nearly $22 million with a focus on the NP Waste Water Treatment Plant.

11.3 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 historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 63 illustrates the useful life consumption levels as of 2015 for the municipality's wastewater network.

Figure 63 Useful Life Consumption – Wastewater Network

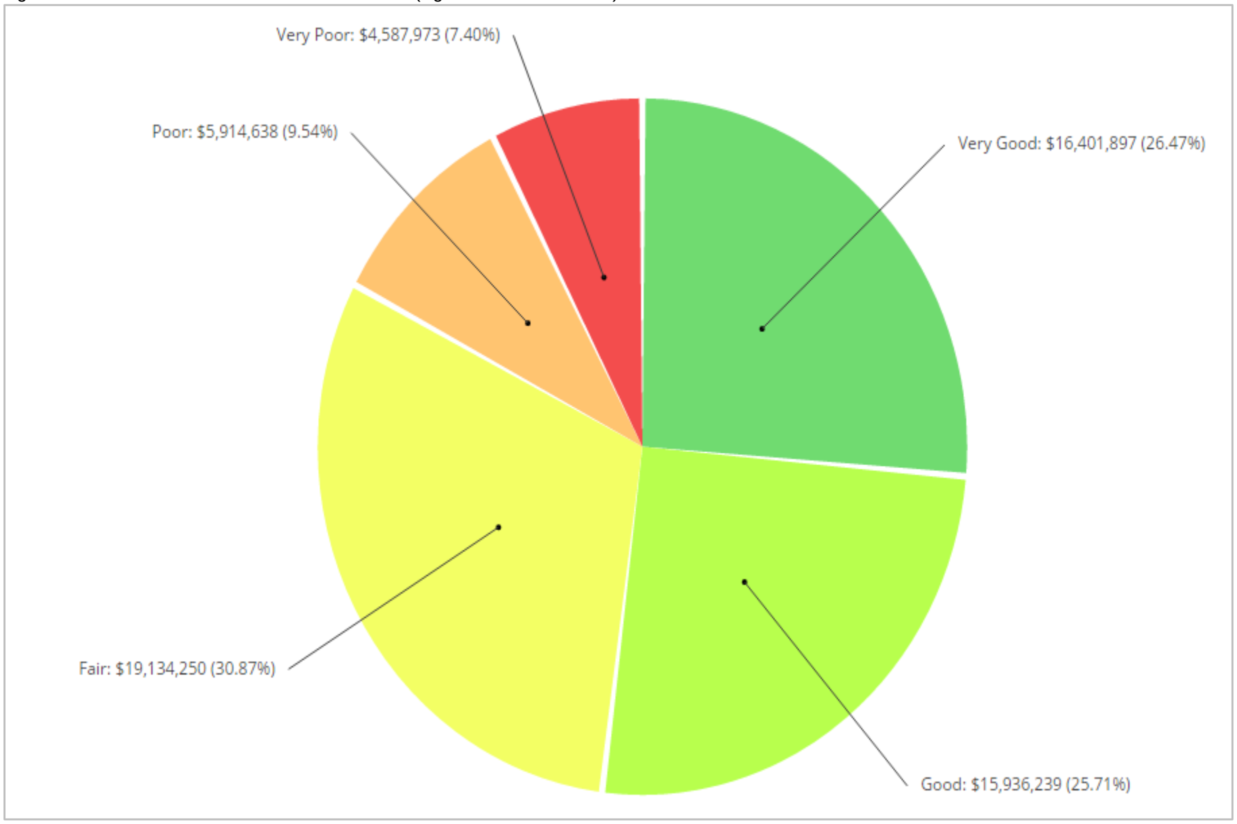


87% of assets have at least 10 years of useful life remaining while 4%, with a valuation of $2.7 million remain in operation beyond their established useful life. An additional 6% will reach the end of their useful life within the next five years.

11.4 Current Asset Condition

Using 2015 replacement cost, in this section, we summarize the condition of the municipality's wastewater network assets as of year-end 2015. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has provided condition data for its wastewater treatment plant assets.

Figure 64 Asset Condition – Wastewater Network (Age-based & assessed)

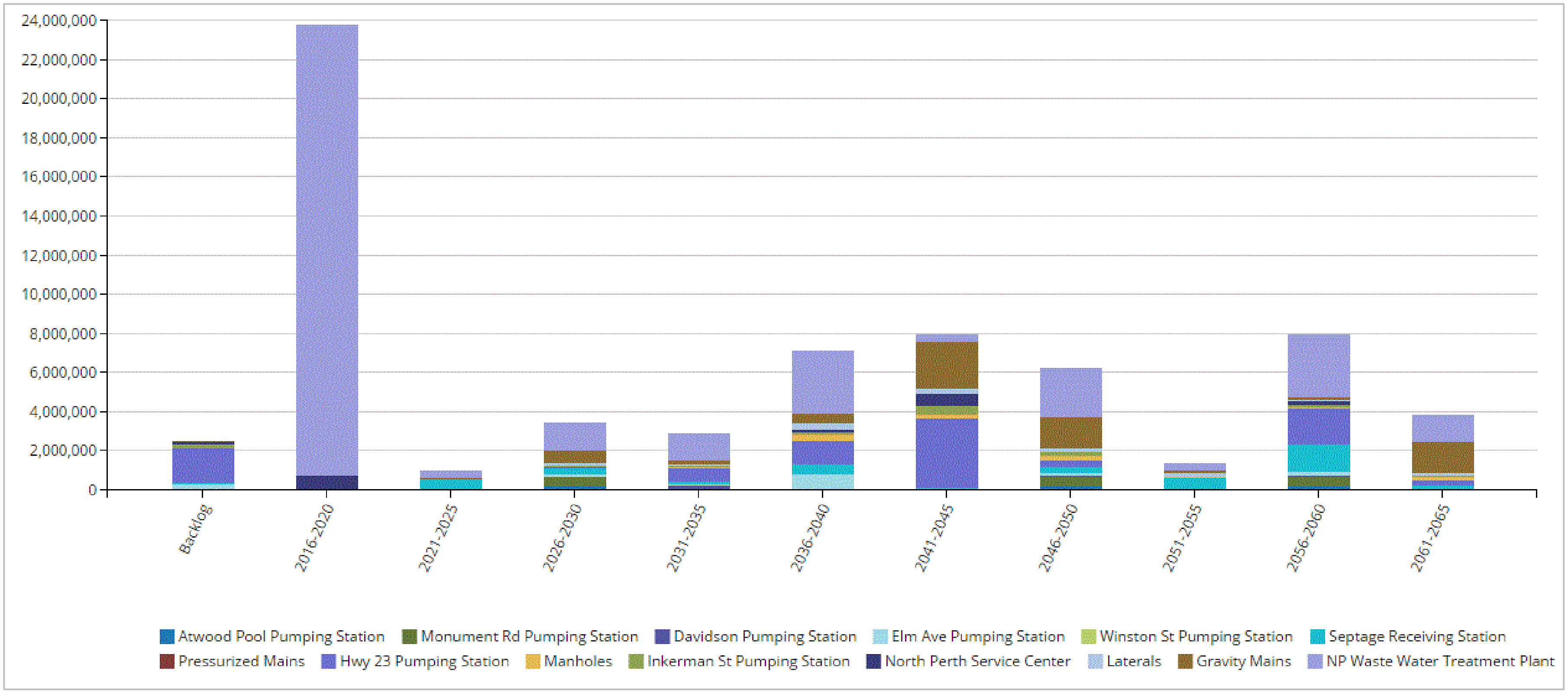


A combination of age-based and assessed condition data shows that 17% of the municipality's wastewater network assets are in poor to very poor condition. About 52% of the network assets with a valuation of $32 million, are in good to very good condition.
Approximately 48% of the wastewater treatment plant assets with a replacement cost of $11 million are in fair condition. Another 45% of the plant assets with a replacement of $10.5 million are in good condition. The remaining assets in the treatment plant are in poor to very poor condition.

11.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's wastewater network assets based on 2016 replacement cost. 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 65 Forecasting Replacement Needs – Wastewater Network



In addition to an age-based backlog of $2.5 million, replacement needs total $24 million within the next five years, with an additional $1 million between 2021-2025. In 2018, North Perth will be updating its wastewater treatment plant with total replacement costs of approximately $23 million. The plant is considered to be a high risk facility due to its lack of capacity and ability to meet emergency backup demand. An additional wastewater main will also be installed in order to meet capacity requirements.
The municipality's annual requirements (indicated by the black line) for its wastewater network total $1.4 million. The municipality is currently allocating $600,000, leaving an annual deficit of $800,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

11.6 Recommendations – Wastewater Network

- Age-based data indicates a backlog of $2.5 million and 10-year replacement needs of $25 million. The municipality should establish a condition assessment program to better define actual asset health and field needs; this will assist in the prioritization of the short- and long-term capital budget. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

- Over time, the municipality should establish a systematic lifecycle activity framework that reflects the consumption of its wastewater assets. See Section 3, 'Lifecycle Analysis Framework' in the 'Asset Management Strategies' chapter.

- Wastewater collection system key performance indicators should be established and tracked annually as part of an overall level of service model. See Section VII 'Levels of Service'.

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

- The municipality is funding 43% of its long-term requirements on an annual basis. See the 'Financial Strategy' section on how to achieve more sustainable and optimal funding levels.

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; under promise 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 LOS 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*.

Table 16 LOS Categories

LOS Category	Description
Reliable	Services are predictable and continuous; 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
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 sample 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 17 Sample 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 household 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 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
Operational Indicators	– Percentage of roads inspected within the last five 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 18 Sample 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 19 Sample Key Performance Indicators – 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 – 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 vehicle – Percent of vehicle rated poor or critical – Percentage of vehicle replacement value spent on operations and maintenance
Operational Indicators	– Average downtime per vehicle category – Average utilization per vehicle category and/or each vehicle – Ratio of preventative maintenance repairs vs. reactive repairs – Percent of vehicle that received preventative maintenance – Number/type of service requests – Percentage of customer requests responded to within 24 hours

Table 20 Sample 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 to water, wastewater and 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
Tactical	– Percentage of water, wastewater and storm network rehabilitated/reconstructed – Annual percentage of growth in water, wastewater and storm network – Percentage of mains where the condition is rated poor or critical for each network – Percentage of water, wastewater and storm network replacement value spent on O&M
Operational Indicators	– Percentage of water, wastewater and 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 and storm – Percentage of customer requests addressed within 24 hours per water, wastewater and storm network

Table 21 Key Performance Indicators – Machinery & Equipment

Level	KPI (Reported Annually)
Strategic	– Percentage of total reinvestment compared to asset replacement value – Completion of strategic plan objectives (related to machinery & equipment)
Financial Indicators	– Annual revenues compared to annual expenditures – Annual replacement value depreciation compared to annual expenditures – Cost per capita for machinery & equipment – Revenue required to maintain annual portfolio growth – Total cost of borrowing vs. total cost of service
Tactical	– Percentage of all machinery & equipment replaced – Average age of machinery & equipment assets – Percent of machinery & equipment rated poor or critical – Percentage of vehicles replacement value spent on O&M
Operational Indicators	– Average downtime per machinery & equipment asset – Ratio of preventative maintenance repairs vs. reactive repairs – Percent of machinery & equipment that received preventative maintenance – Number/type of service requests

Table 22 Key Performance Indicators – Land Improvements

Level	KPI (Reported Annually)
Strategic	– Percentage of total reinvestment compared to asset replacement value – Completion of strategic plan objectives (related to land improvements)
Financial Indicators	– Annual revenues compared to annual expenditures – Annual replacement value depreciation compared to annual expenditures – Cost per capita for supplying parks, playgrounds, etc. – Repair and maintenance costs per square metre
Tactical	– Percent of land improvements rated poor or critical – Percentage of replacement value spent on O&M – Parkland per capita
Operational Indicators	– Percentage of land improvements inspected within the last five years – Number/type of service requests – Percentage of customer requests addressed within 24 hours

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 & 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.

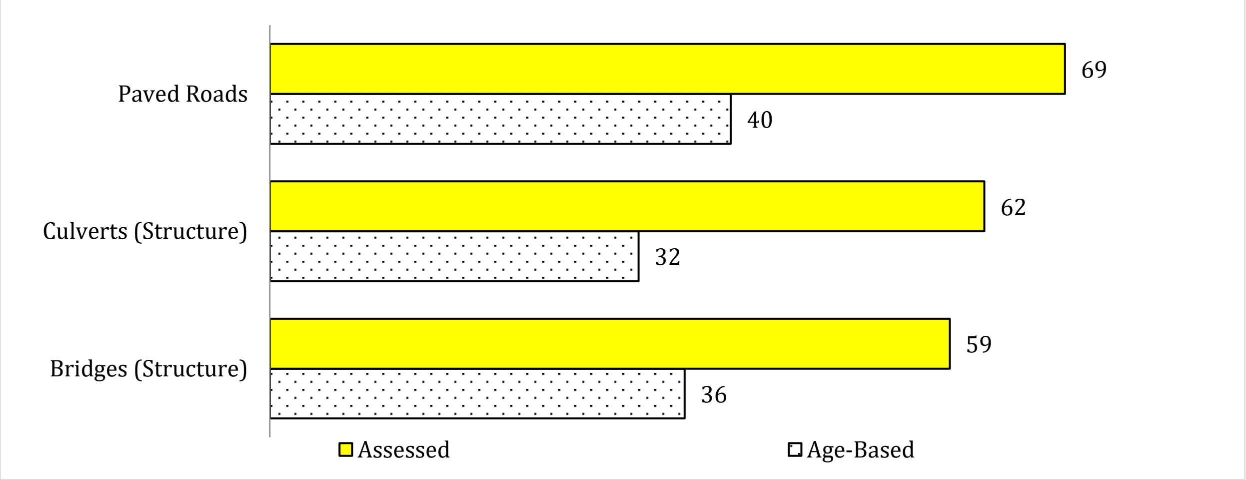
When establishing the condition assessment of an entire asset class, the cursory approach (metrics such as good, fair, poor, very poor) is used. This will be a less expensive approach when applied to thousands of assets, yet will still provide up to date information, and will allow for detailed assessment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

The Impact of Condition Assessments

In 2015, PSD published a study in partnership with the Association of Municipalities of Ontario (AMO). The report, *The State of Ontario's Roads and Bridges: An Analysis of 93 Municipalities*, enumerated the infrastructure deficits, annual investment gaps, and the physical state of roads, bridges and culverts with a 2013 replacement value of $28 billion.

A critical finding of the report was the dramatic difference in the condition profile of the assets when comparing age-based estimates and actual field inspection observations. For each asset group, field data based condition ratings were significantly higher than age-based condition ratings, with paved roads, culverts, and bridges showing an increase in score (0-100) of +29, +30, and +23 points respectively. In other words, age-based measurements maybe underestimating the condition of assets by as much as 30%.

Figure 66 Comparing Age-based and Assessed Condition Data



2.1 Pavement Network

Typical industry pavement inspections are performed by consulting firms using specialized assessment fleet equipped with various electronic sensors and data capture equipment. The fleet 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 its pavement condition assessment program and that a portion of capital funding is dedicated to this. It is also recommended that this program be expanded to incorporate additional components.

2.2 Bridges & Culverts

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

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

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

- Detailed deck condition survey
- Non-destructive delamination survey of asphalt covered decks
- Substructure condition survey
- Detailed coating condition survey
- Underwater investigation
- Fatigue investigation

- Structure evaluation

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

2.3 Buildings & Facilities

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 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 for its water and wastewater facilities, and establish supplementary condition assessment protocols for other buildings & facilities. It is also recommended that a portion of capital funding is dedicated to this.

2.4 Fleet and Machinery & Equipment

The typical approach to optimizing the maintenance expenditures of vehicles and machinery & equipment, is through routine vehicle and component inspections, routine servicing, and a routine preventative maintenance program. Most makes and models of vehicles and machinery assets 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 sound 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 machinery & 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 progressively further away from reactive repairs and instead towards the prevention of all equipment failure before it occurs. It is recommended that a preventative maintenance routine is defined and established for all vehicles and machinery & equipment assets, and that a software application is utilized for the overall management of the program.

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

2.5 Wastewater and Storm Network Inspection

The most popular and practical type of wastewater and storm 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 main to be inspected.

The vehicle and camera then travel 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, wastewater and storm CCTV inspection is an effective tool for locating and evaluating structural defects and general condition of underground pipes.

Even though CCTV is an excellent option for inspection of wastewater and storm, 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. Rather, in its place, a camera is lowered down a maintenance hole attached to a pole like piece of equipment. The camera is then rotated towards each connecting pipe and the operator above progressively zooms in to record all defects and information about each pipe. The downside to this technique is the further down the pipe the image is zoomed, the less clarity is available to accurately record defects and measurement. The upside is the process is far quicker and significantly less expensive and an assessment of the manhole can be provided as well. Also, it is important to note that 80% of pipe deficiencies generally occur within 20 metres of each manhole.

It is recommended that the municipality establish a wastewater and storm mains assessment program and that a portion of capital funding is dedicated to this.

2.6 Water System

Unlike wastewater and storm mains, it is often prohibitively difficult to inspect water mains from the inside due to the constant and high-pressure flow of water. A physical inspection requires a disruption of service to residents and can be an expensive exercise and is time consuming to set up. It is recommended practice that physical inspection of water mains typically occurs only 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 include remote eddy field current (RFEC), ultrasonic and acoustic techniques, impact echo (IE), and 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 may be used, along with weighting factors, to determine an overall condition score include age, material type, breaks, hydrant flow inspections and soil condition.

It is recommended that the municipality establish a watermain assessment program, and that funds are budgeted for this initiative.

2.7 Parks and open spaces

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

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

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

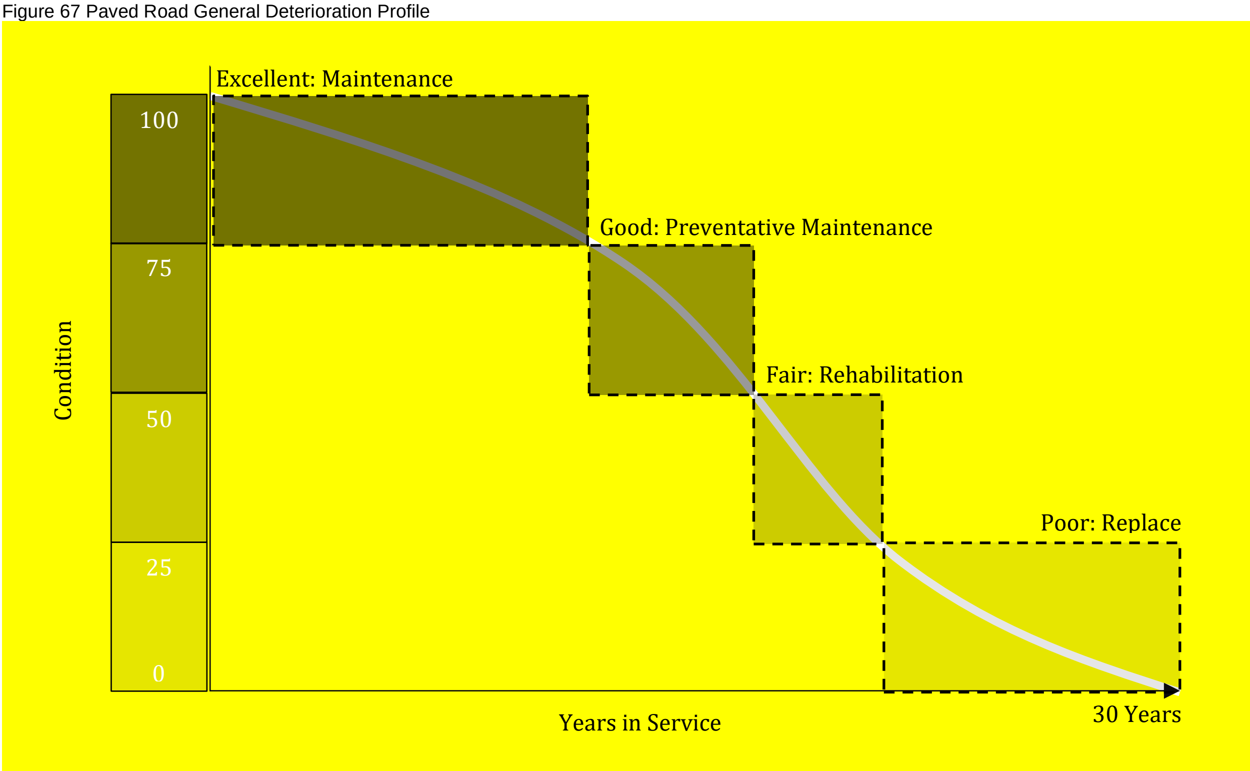
3. Lifecycle Analysis Framework

An industry review was conducted to determine which lifecycle 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 can 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 entered 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 67 Paved Road General Deterioration Profile



As shown above, during the road's lifecycle, 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 23 Asset Condition and Related Work Activity for Paved Roads

Condition	Condition Range	Work Activity
Very Good (Maintenance only phase)	81-100	– Maintenance only
Good (Preventative maintenance phase)	61-80	– Crack sealing – Emulsions
Fair (Rehabilitation phase)	41-60	– Resurface - mill & pave – Resurface - asphalt overlay – Single & double surface treatment (for rural roads)
Poor (Reconstruction phase)	21-40	– Reconstruct - pulverize and pave – Reconstruct - full surface and base reconstruction
Very Poor (Reconstruction phase)	0-20	– 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 thresholds and condition ranges can be 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 lifecycle 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 relies on 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 Buildings & Facilities

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.

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 and legislative requirements, energy conservation programs and upgrades, customer complaints and health and safety concerns, and 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 Machinery & Equipment

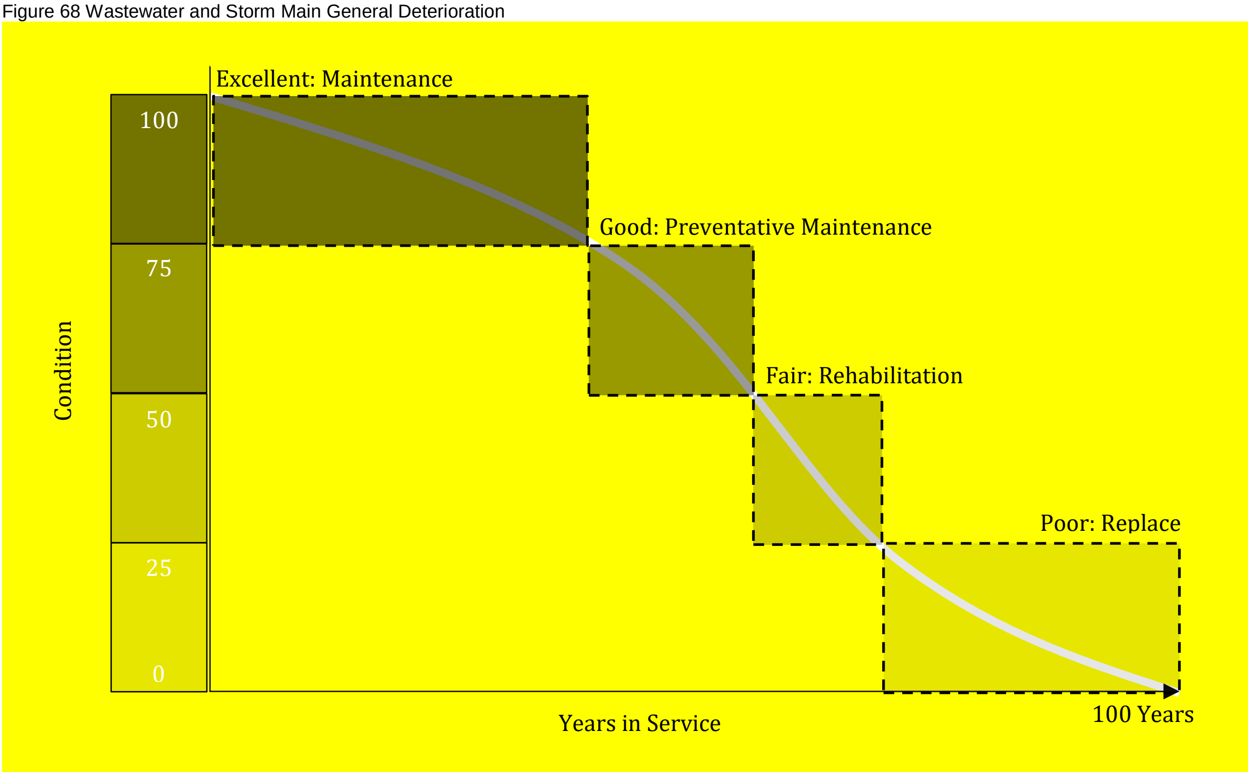
The best approach to develop a 10-year needs list for the municipality's vehicles and machinery & equipment portfolio would first be through a defined preventative maintenance program, and secondly, through an optimized lifecycle vehicle replacement schedule. The preventative maintenance program would serve to determine budget requirements for operating and minor capital expenditures for renewal of parts, and major refurbishments and rehabilitations. An optimized replacement program will ensure a vehicle or equipment asset 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 vehicles industry in regards to vehicle lifecycles 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 vehicles management that should also be examined in further detail as part of the long-term management plan, such as vehicles utilization and incorporating green vehicles, etc. It is recommended that the municipality establish a prioritization framework for the vehicles asset class that incorporates the key components outlined above.

3.5 Wastewater and Storm

The following analysis has been conducted at a fairly high level, using industry standard activities and costs for wastewater and storm 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 activities used for wastewater and storm mains and the associated local costs for those work activities. 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 main with a 100-year life.

Figure 68 Wastewater and Storm Main General Deterioration



As shown above, during the main's lifecycle 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 24 Asset Condition and Related Work Activity for Wastewater and Storm Mains

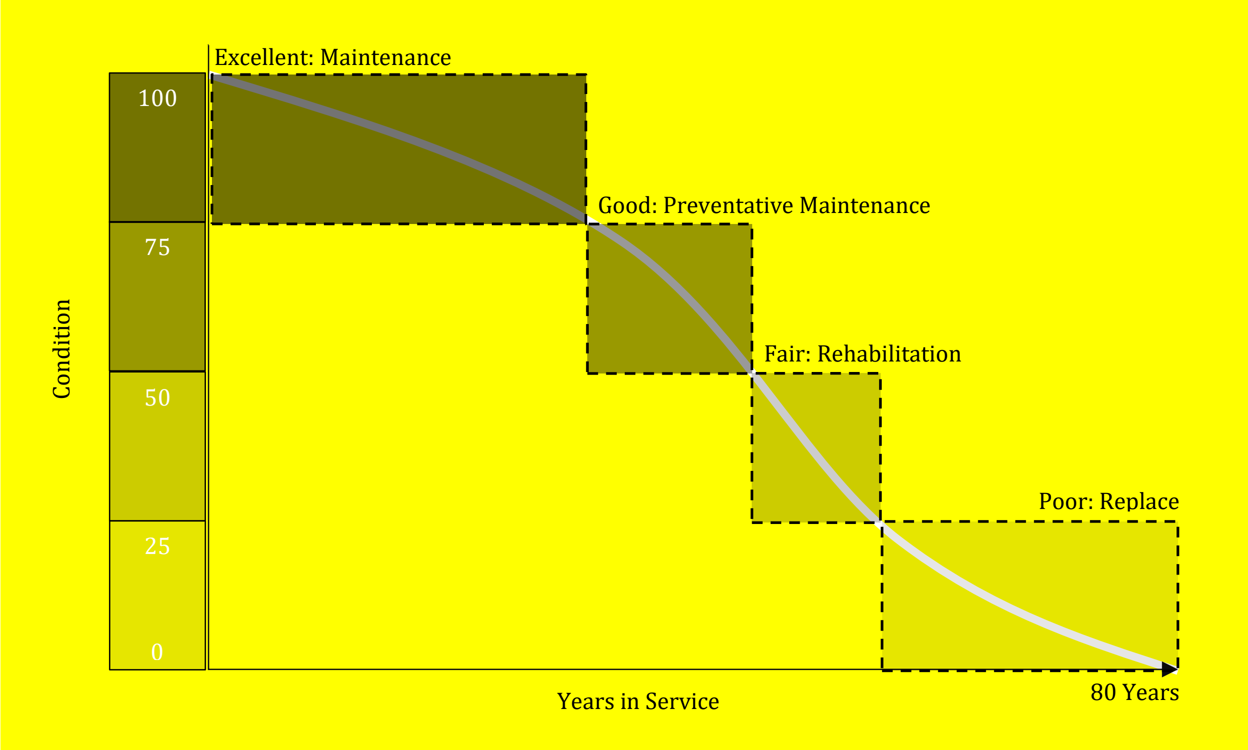
Condition	Condition Range	Work Activity
Very Good (Maintenance only phase)	81-100	– Maintenance only (cleaning & flushing etc.)
Good (Preventative maintenance phase)	61-80	– Manhole repairs – Small pipe section repairs
Fair (Rehabilitation phase)	41-60	– Structural relining
Poor (Reconstruction phase)	21-40	– Pipe replacement
Very Poor (Reconstruction phase)	0-20	– 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 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 System

As with roads wastewater and storm, the following analysis has been conducted at a 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 69 Water Main General Deterioration



As shown above, during the water main's lifecycle, 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 in Table 25.

Table 25 Asset Condition and Related Work Activity for Water Mains

Condition	Condition Range	Work Activity
Very Good (Maintenance only phase)	81-100	– Maintenance only (cleaning & flushing etc.)
Good (Preventative maintenance phase)	61-80	– Water main break repairs – Small pipe section repairs
Fair (Rehabilitation phase)	41-60	– Structural water main relining
Poor (Reconstruction phase)	21-40	– Pipe replacement
Very Poor (Reconstruction phase)	0-20	– 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. Based on the 2016 census, the population of North Perth grew 4% from 2011 to reach 13,130.

In conjunction with raw population growth, the type of shift in demographics can also dictate how municipalities allocate their infrastructure investments. As the demographics change and the Municipality assumes responsibility of new infrastructure, the level of strain on various critical and supplementary infrastructure services will shift to reflect the needs of the residents. Some services, e.g., open spaces, are particularly vulnerable to the dual stress of overuse and underfunding.

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 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.

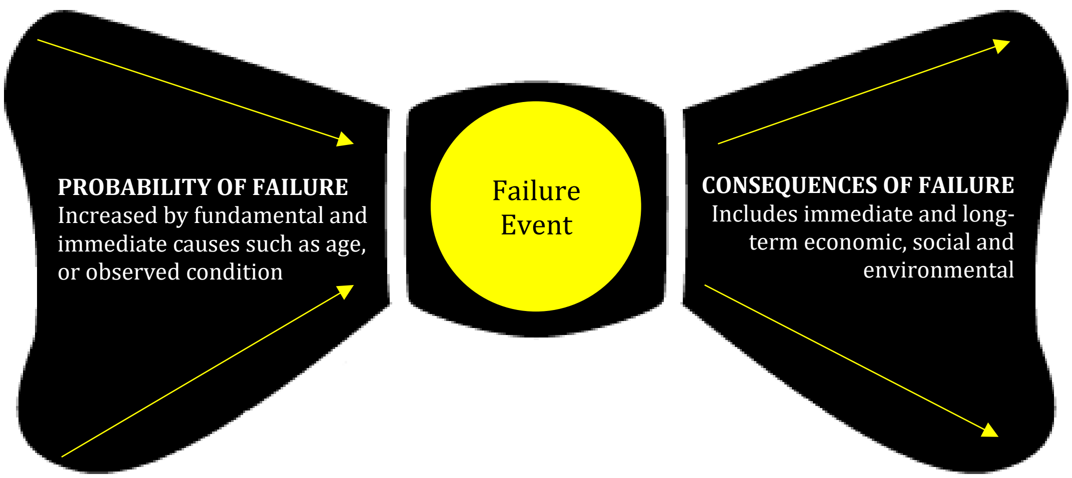
Risk mitigation is traditionally thought of in terms of safety and liability factors. In asset management, the definition of risk should heavily emphasize these factors but should be expanded to consider the risks to the municipality's ability to deliver targeted levels of service

- 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

5.2 Risk Matrices

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

Figure 70 Bow Tie Risk Model



Probability of Failure

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

Table 26 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

The consequence of failure for the asset classes analyzed in this AMP will be determined either by the replacement costs of assets, or their material types, classifications (or other attributes). Asset classes for which replacement cost is used include: bridges & culverts, facilities, land improvements, fleet, IT, machinery & equipment, and landfill. This approach is premised on the assumption that the higher the replacement cost, the larger (and likely more important) the asset, requiring higher risk scoring.

Scoring for roads is based on classification as this reflects traffic volumes and number of people affected. Scoring for storm, water and wastewater networks is based on pipe diameter as this reflects the potential upstream disruption.

Table 27 Consequence of Failure – Roads

Road Classification	Consequence of failure
Gravel (all)	Score of 1
Rural Surface - LCB	Score of 3
Rural Asphalt - HCB	Score of 5

Table 28 Consequence of Failure – Bridges & Culverts

Replacement Value	Consequence of failure
Up to $200k	Score of 1
$201 to $400k	Score of 2
$401 to $800k	Score of 3
$801 to $1Million	Score of 4
$1 Million and over	Score of 5

Table 29 Consequence of Failure – Buildings & 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

Table 30 Consequence of Failure – IT, Machinery & Equipment

Replacement Value	Consequence of failure
Up to $10k	Score of 1
$11k to $25k	Score of 2
$26k to $50k	Score of 3
$51k to $100k	Score of 4
Over $100k	Score of 5

Table 31 Consequence of Failure – Land Improvements

Replacement Value	Consequence of failure
Up to $25k	Score of 1
$26k to $50k	Score of 2
$51k to $80k	Score of 3
$81k to $100k	Score of 4
Over $100k	Score of 5

Table 32 Consequence of Failure – Fleet

Replacement Value	Consequence of failure
Up to $25k	Score of 1
$26k to $50k	Score of 2
$51k to $100k	Score of 3
$101k to $300k	Score of 4
Over $300k	Score of 5

Table 33 Consequence of Failure – Storm

Replacement Value	Consequence of failure
Less than 250mm	Score of 1
251-500mm	Score of 2
501-850mm	Score of 3
851-1,500mm	Score of 4
1,501mm and over (and multi – dimension)	Score of 5

Table 34 Consequence of Failure – Landfill

Replacement Value	Consequence of failure
Up to $25k	Score of 1
$26k to $50k	Score of 2
$51k to $80k	Score of 3
$81k to $100k	Score of 4
Over $100k	Score of 5

Table 35 Consequence of Failure – Water

Replacement Value	Consequence of failure
Less than 100mm	Score of 1
100 –150mm	Score of 2
151–200mm	Score of 3
201–250mm	Score of 4
251mm and over	Score of 5

Table 36 Consequence of Failure – Wastewater

Replacement Value	Consequence of failure
Less than 200mm	Score of 1
200-300mm	Score of 2
301-400mm	Score of 3
401-550mm	Score of 4
551mm and over	Score of 5

The risk matrices that follow show the distribution of assets within each asset class according to the probability and likelihood of failure scores as discussed above.

Figure 71 Distribution of Assets Based on Risk – All Asset Classes

Consequence \ Probability	1	2	3	4	5
5	60 Assets $38,369,705	27 Assets $25,344,838	15 Assets $11,889,440	12 Assets $24,983,159	23 Assets $58,781,162
4	58 Assets $18,100,338	65 Assets $24,420,360	24 Assets $7,389,003	22 Assets $4,518,873	106 Assets $39,153,666
3	166 Assets $21,980,610	141 Assets $23,934,483	65 Assets $12,614,643	16 Assets $4,008,164	147 Assets $20,516,018
2	402 Assets $30,816,889	272 Assets $40,988,130	175 Assets $63,587,593	86 Assets $22,244,272	200 Assets $14,328,874
1	381 Assets $24,931,535	548 Assets $55,646,799	602 Assets $82,327,892	315 Assets $64,897,498	655 Assets $148,472,617

Figure 72 Distribution of Assets Based on Risk – Roads

Consequence \ Probability	1	2	3	4	5
5	45 Assets $3,115,224	11 Assets $459,270	7 Assets $116,214	2 Assets $18,439,056	5 Assets $34,225,410
4	17 Assets $1,718,796	16 Assets $1,480,770	5 Assets $510,663	10 Assets $1,189,908	5 Assets $600,516
3	77 Assets $9,986,277	64 Assets $11,856,496	24 Assets $7,439,232	2 Assets $2,055,130	0 Assets $0
2	308 Assets $25,025,813	201 Assets $29,876,022	139 Assets $61,320,149	33 Assets $19,949,384	6 Assets $3,196,570
1	203 Assets $15,040,890	354 Assets $32,115,041	478 Assets $76,288,293	252 Assets $63,798,890	307 Assets $141,578,186

Figure 73 Distribution of Assets Based on Risk – Bridges & Culverts

Consequence \ Probability	1	2	3	4	5
5	$0	$6,269,754	$1,011,464	$0	$0
4	$0	$4,392,530	$0	$0	$0
3	$750,780	$15,073,835	$1,049,220	$0	$448,855
2	$551,833	$7,048,578	$596,829	$254,508	$0
1	$66,115	$1,590,377	$176,777	$131,212	$0

Figure 74 Distribution of Assets Based on Risk – Facilities & Perth Meadows

Consequence \ Probability	1	2	3	4	5
5	8 Assets $19,709,313	8 Assets $19,179,808	7 Assets $11,645,612	3 Assets $4,035,930	6 Assets $17,356,643
4	27 Assets $12,796,810	37 Assets $18,800,735	8 Assets $4,646,439	3 Assets $1,710,063	54 Assets $27,470,413
3	58 Assets $9,498,713	52 Assets $8,719,493	19 Assets $3,587,102	5 Assets $1,076,054	78 Assets $14,245,906
2	50 Assets $3,816,023	37 Assets $2,567,642	17 Assets $1,179,106	6 Assets $464,014	70 Assets $5,190,211
1	95 Assets $1,992,968	103 Assets $2,022,146	76 Assets $1,726,004	26 Assets $507,151	199 Assets $4,232,558

Figure 75 Distribution of Assets Based on Risk – IT, Machinery & Equipment

Figure 76 Distribution of Assets Based on Risk – Land Improvements

Figure 77 Distribution of Assets Based on Risk – Fleet

Figure 78 Distribution of Assets Based on Risk – Storm

Figure 79 Distribution of Assets Based on Risk – Landfill

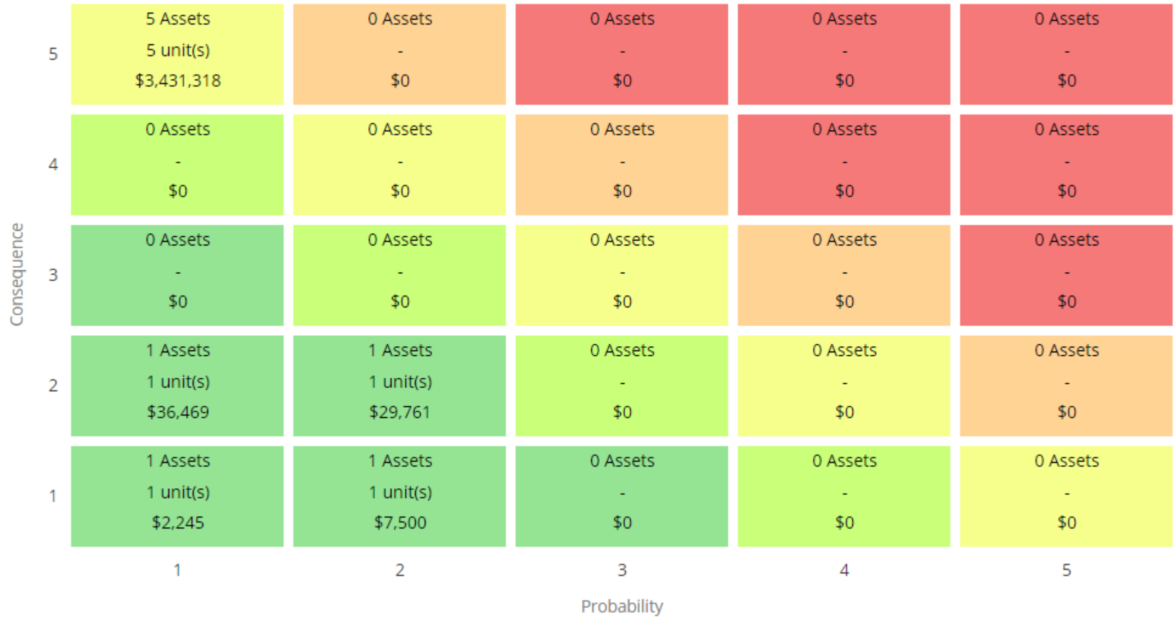
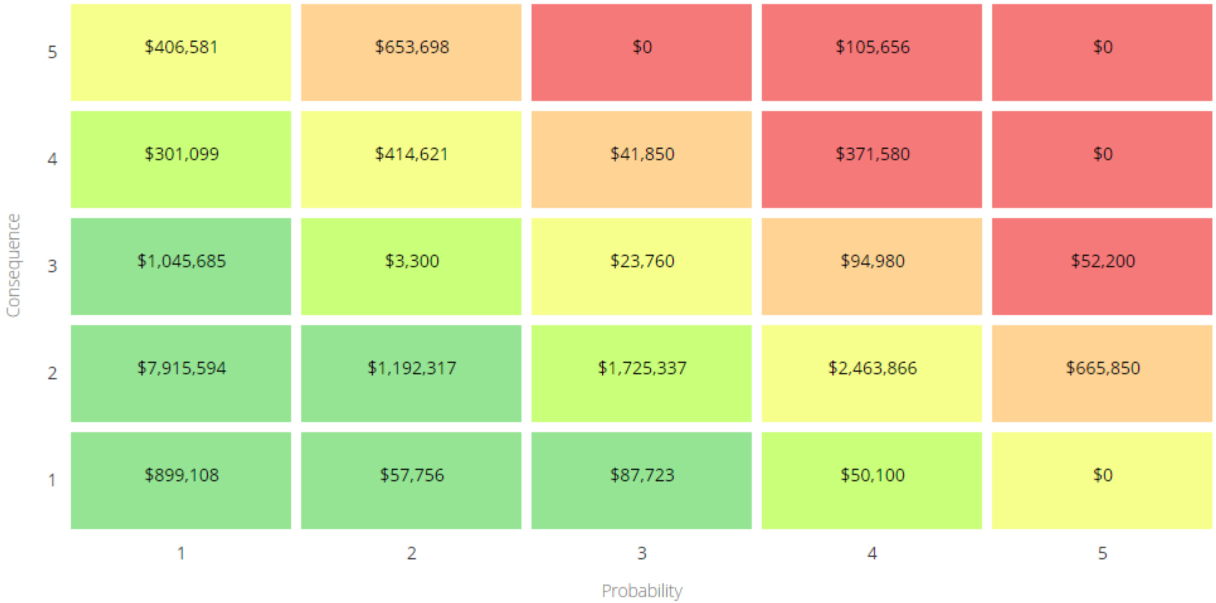


Figure 80 Distribution of Assets Based on Risk – Water

Figure 81 Distribution of Assets Based on Risk – Wastewater



IX. Financial Strategy

1. General Overview

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

Figure 82 Cost Elements

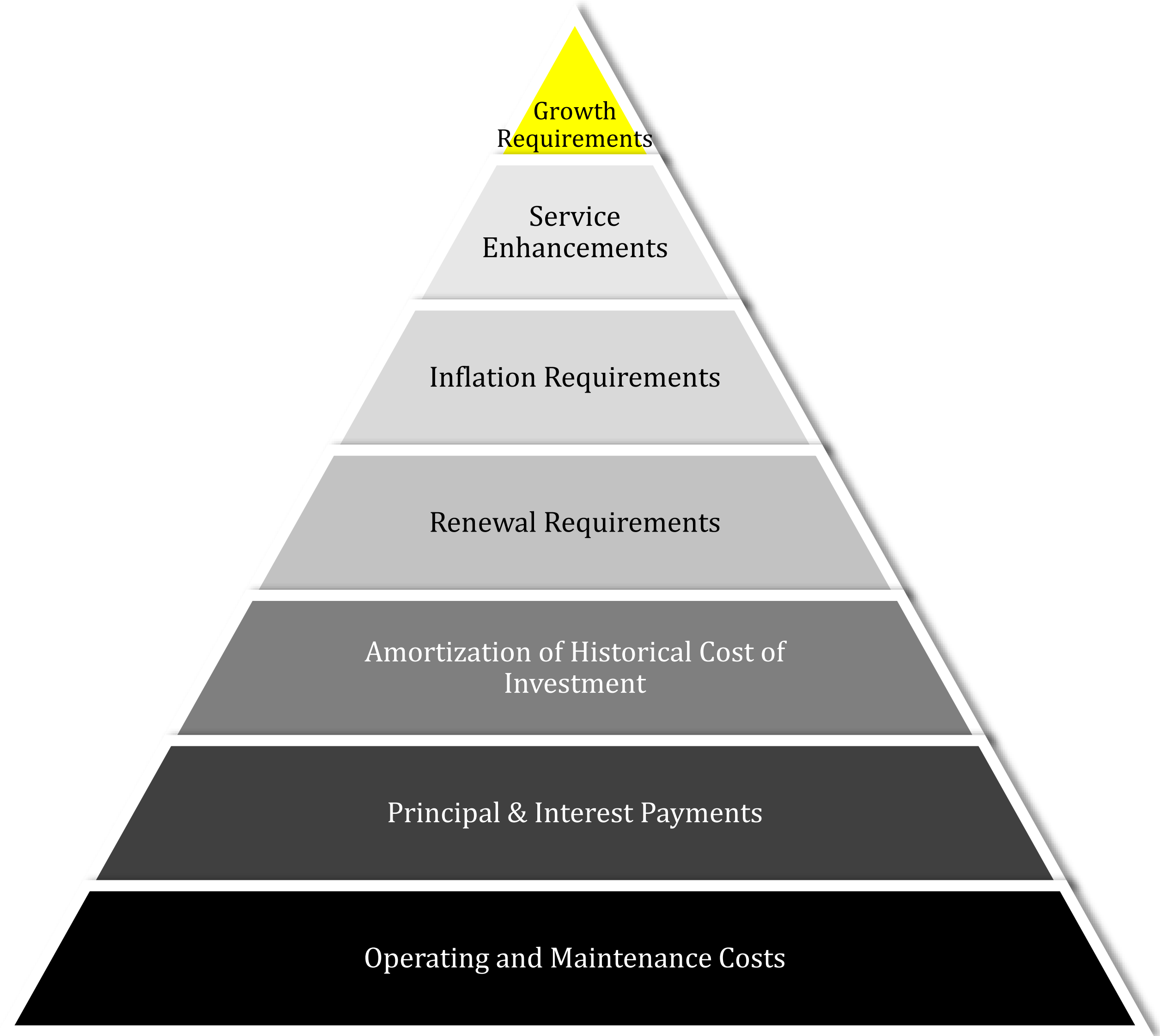


Figure 82 depicts the various cost elements and resulting funding levels that should be incorporated into AMPs that are based on best practices. Municipalities meeting their operational and maintenance needs, and debt obligations are funding only their cash cost. Funding at this level is severely deficient in terms of lifecycle costs.

Meeting the annual amortization expense based on the historical cost of investment will ensure municipalities adhere to accounting rules implemented in 2009; however, funding is still deficient for long-term needs. As municipalities graduate to the next level and meet renewal requirements, funding at this level ensures that need and cost of full replacement is deferred. If municipalities meet inflation requirements, they're positioning themselves to meet replacement needs at existing levels of service. In the final level, municipalities that are funding for service enhancement and growth requirements are fiscally sustainable and cover future investment needs.

This report develops a financial plan by presenting several scenarios for consideration and culminating with final recommendations. It includes recommendations that avoid long-term funding deficits. As outlined below, the scenarios presented model different combinations of the following components:

- 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), and requirements of anticipated growth (none identified for this plan)
- use of traditional sources of municipal funds including tax levies, user fees, reserves, debt, and development charges
- use of non-traditional sources of municipal funds, e.g., reallocated budgets
- use of senior government funds, such as the federal Gas Tax Fund, Ontario Community Infrastructure Fund (OCIF)

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:

- In order to reduce financial requirements, consideration has been given to revising service levels downward.
- 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.

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: road network; bridges & culverts; storm network; facilities; Perth Meadows; IT, machinery & equipment; land improvement; landfill; and vehicles. 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

Table 37 and Table 38 outline, by asset class, 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 37 Infrastructure Requirements and Current Funding Available: Tax Funded Assets

Asset class	Average Annual Investment Required	Total Funding Available in 2016					Annual Deficit/Surplus
		Taxes	Gas Tax	OCIF	Rates to Reserves (see note 1)	Total Funding Available	
Road Network	1,325,000	0	0	0	314,000	314,000	1,011,000
Bridges & Culverts	562,000	0	0	107,000	200,000	307,000	255,000
Storm Network	246,000	0	0	0	127,000	127,000	119,000
Landfill	39,000	0	0	0	0	0	39,000
Facilities	1,000,000	0	384,000	0	414,000	798,000	202,000
Perth Meadows	196,000	0	0	0	0	0	196,000
Land Improvements	64,000	0	0	0	20,000	20,000	44,000
IT, Machinery & Equipment	492,000	0	0	0	200,000	200,000	292,000
Fleet	230,000	0	0	0	262,000	262,000	-32,000
Total	**4,154,000**	**0**	**384,000**	**107,000**	**1,537,000**	**2,028,000**	**2,126,000**

Note 1 re taxes to reserves in above table:
North Perth budgets for depreciation on their capital assets. This depreciation is then grouped with other transfers to reserves and decisions are made annually on what ultimate amounts get transferred to infrastructure reserves. In 2016, depreciation on the above capital assets amounted to $2,298,000. The amount shown in “Taxes to Reserves” funding above is the lesser of depreciation or the actual amount transferred to capital reserves in 2016.

Note 2 re short term and one time funds:
In addition to the Federal Gas Tax and OCIF formula based funding, North Perth has received $679,000 from OCIF application based funding which will be used to fund road network capital projects. Due to the short term, unsustainable nature of these funds, they are not considered as funding available in the analysis above.

2.3 Recommendations for Full Funding

The average annual investment requirement for the above categories is $4,154,000. Annual revenue currently allocated to these assets for capital purposes is $2,028,000 leaving an annual deficit of $2,126,000. To put it another way, these infrastructure categories are currently funded at 49% of their long-term requirements.

In 2016, North Perth has annual tax revenues of $11,408,000. As illustrated in Table 38, without consideration of any other sources of revenue, full funding would require the following tax change over time:

Table 38 Tax Change Required for Full Funding

Asset class	Tax Change Required for Full Funding
Road Network	8.9%
Bridges & Culverts	2.2%
Storm Network	1.0%
Landfill	0.3%
Facilities	1.8%
Perth Meadows	1.7%
Land Improvements	0.4%
Machinery & Equipment	2.6%
Fleet	-0.3%
Total	18.6%

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

- North Perth's formula based OCIF grant is scheduled to grow from $107,000 in 2016 to $417,000 in 2019.
- As illustrated in Table 46, North Perth's debt payments for these asset categories will be decreasing by $0 over the next 5 years and by $0 over the next 10 years. Although not shown in the table, debt payment decreases will be $26,000 and $135,000 over the next 15 and 20 years respectively.

Our recommendations include capturing the above changes and allocating them to the infrastructure deficit. Table 39 outlines this concept and presents a number of options.

Table 39 Effect of Changes in OCIF Funding and Reallocating Decreases in Debt Costs

	Without Capturing Changes				With Capturing Changes			
	5 Years	10 Years	15 Years	20 Years	5 Years	10 Years	15 Years	20 Years
Infrastructure Deficit	2,126,000	2,126,000	2,126,000	2,126,000	2,126,000	2,126,000	2,126,000	2,126,000
Change in OCIF Grant	N/A	N/A	N/A	N/A	-310,000	-310,000	-310,000	-310,000
Changes in Debt Costs	N/A	N/A	N/A	N/A	0	0	-26,000	-135,000
Resulting Infrastructure Deficit	**2,126,000**	**2,126,000**	**2,126,000**	**2,126,000**	**1,816,000**	**1,816,000**	**1,790,000**	**1,681,000**
Resulting Tax Increase Required:								
Total Over Time	**15.9%**	**15.9%**	**15.9%**	**15.9%**	**15.9%**	**15.9%**	**15.7%**	**14.7%**
Annually	3.2%	1.6%	1.1%	0.8%	3.2%	1.6%	1.0%	0.7%

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

- reallocating the debt cost reductions of $26,000 to the infrastructure deficit as outlined above when realized.
- increasing tax revenues by 1.0% 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.
- allocating the current gas tax and OCIF revenue as outlined in Table 37.
- allocating the scheduled OCIF grant increases to the infrastructure deficit as they occur.
- 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 tax revenues by the amounts recommended above for infrastructure purposes will be very difficult to do. However, considering a longer phase-in window may have even greater consequences in terms of infrastructure failure.

Although this option achieves full funding on an annual basis in 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 $55,000 for paved roads, $0 for bridges & culverts, $40,000 for storm, $0 for landfill, $10,329,000 for facilities, $0 for Perth Meadows, $370,000 for land improvements, $703,000 for machinery & equipment and $148,000 for fleet. 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

Table 40 and Table 41 outline, by asset class, 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 40 Summary of Infrastructure Requirements and Current Funding Available

Asset class	Average Annual Investment Required	Total Funding Available in 2016				Annual Deficit/Surplus
		Rates	To Operations	Rates to Reserves (see note 1)	Total Funding Available	
Wastewater Services	1,451,000	2,061,000	-2,061,000	623,000	623,000	828,000
Water System	734,000	1,593,000	-1,593,000	313,000	313,000	421,000
Total	**2,185,000**	**3,654,000**	**-3,654,000**	**936,000**	**936,000**	**1,249,000**

Note 1 re rates to reserves in above table:
North Perth budgets for depreciation on their capital assets. This depreciation is then grouped with other transfers to reserves and decisions are made annually on what ultimate amounts get transferred to infrastructure reserves. In 2016, depreciation on the above capital assets amounted to $936,000. The amount shown in “Taxes to Reserves” funding above is the lesser of depreciation or the actual amount transferred to capital reserves in 2016.

Note 2 re short term and one time funds:
North Perth has also received a total of $3,256,000 from Small Communities Fund which will be used to fund wastewater treatment plant updates in 2017 and 2018. Due to the short term, unsustainable nature of these funds, they are not considered as funding available in the analysis above.

3.3 Recommendations for Full Funding

The average annual investment requirement for wastewater services and water services is $2,185,000. Annual revenue currently allocated to these assets for capital purposes is $936,000 leaving an annual deficit of $1,249,000. To put it another way, these infrastructure categories are currently funded at 43% of their long-term requirements.

In 2016, North Perth has annual wastewater revenues of $2,061,000 and annual water revenues of $1,593,000. As illustrated in Table 41, without consideration of any other sources of revenue, full funding would require the following changes over time:

Table 41 Rate Change Required for Full Funding

Asset class	Rate Change Required for Full Funding
Wastewater Services	40.2%
Water Services	26.4%

As illustrated in Table 46 North Perth's debt payments for wastewater services will be decreasing by $0 over the next 5 years and by $0 over the next 10 years. Although not shown in the table, debt payment decreases will be $0 over the next 15 years. For water services, the amounts are $125,000, $125,000, and $125,000 respectively. Our recommendations include capturing those decreases in cost and allocating them to the applicable infrastructure deficit.

Table 42 and

Table 43 outline the above concept and present a number of options:

Table 42 effects without change in debt cost

	Wastewater Services			Water Services		
	5 Years	10 Years	15 Years	5 Years	10 Years	15 Years
Infrastructure Deficit	828,000	828,000	828,000	421,000	421,000	421,000
Changes in Debt Costs	N/A	N/A	N/A	N/A	N/A	N/A
Resulting Infrastructure Deficit	**828,000**	**828,000**	**828,000**	**421,000**	**421,000**	**421,000**
Resulting Tax Increase Required:						
Total Over Time	**40.2%**	**40.2%**	**40.2%**	**26.4%**	**26.4%**	**26.4%**
Annually	8.0%	4.0%	2.7%	5.3%	2.6%	1.8%

	Wastewater Services			Water Services		
	5 Years	10 Years	15 Years	5 Years	10 Years	15 Years
Infrastructure Deficit	828,000	828,000	828,000	421,000	421,000	421,000
Changes in Debt Costs	0	0	0	-125,000	-125,000	-125,000
Resulting Infrastructure Deficit	**828,000**	**828,000**	**828,000**	**296,000**	**296,000**	**296,000**
Resulting Tax Increase Required:						
Total Over Time	**40.2%**	**40.2%**	**40.2%**	**18.6%**	**18.6%**	**18.6%**
Annually	8.0%	4.0%	2.7%	3.7%	1.9%	1.2%

Table 43 effects with change in debt cost

Considering all of the above information, we recommend the 15 year option in

Table 43 that includes the reallocations. This involves full funding being achieved over 15 years by:

- when realized, reallocating the debt cost reductions of $125,000 for water services to the applicable infrastructure deficit.
- increasing rate revenues by 2.7% for wastewater services and 1.2% for water 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 $2,520,000 for wastewater services and $2,662,000 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 44 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.

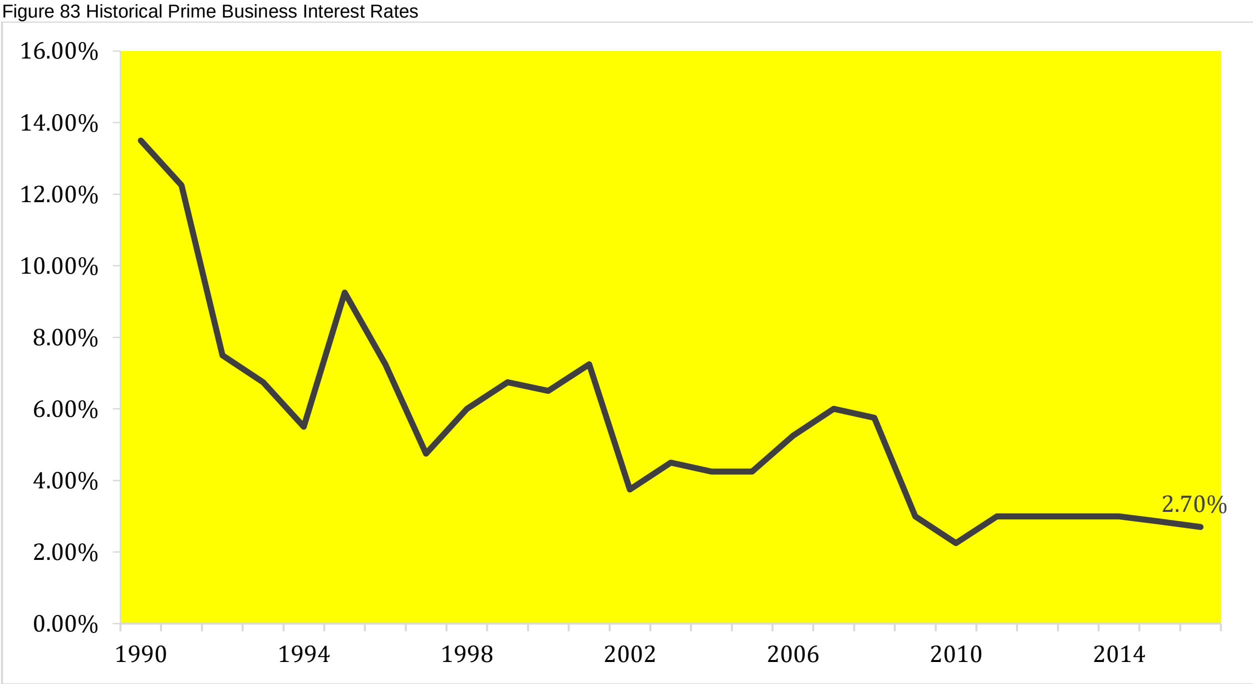
Table 44 Total Interest Paid as a Percentage of Project Costs

Interest Rate	Number of Years Financed					
	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 2.8%.

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 83 Historical Prime Business Interest Rates



As illustrated in Table 44 , 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.

Table 45 and Table 46 outline how North Perth has historically used debt for investing in the asset categories as listed. There is currently $15,550,000 of debt outstanding for the assets covered by this AMP with corresponding principal and interest payments of $1,070,000, well within its provincially prescribed maximum of $3,978,000.

Table 45 Overview of Use of Debt

Asset class	Debt at December 31st, 2015	Use of Debt in Last Five Years				
		2011	2012	2013	2014	2015
Road Network	2,812,000	1,676,000	1,500,000	0	0	0
Bridges & Culverts	0	0	0	0	0	0
Storm Network	5,213,000	0	0	0	0	0
Landfill	2,014,000	2,100,000	0	0	0	0
Buildings & Facilities	0	0	0	0	0	0
Perth Meadows	5,071,000	0	0	5,500,000	0	0
Land Improvements	228,000	0	0	0	0	0
Machinery & Equipment	0	0	0	0	0	0
Fleet	0	0	0	0	0	0
Total Tax Funded	15,338,000	3,776,000	1,500,000	5,500,000	0	0
Wastewater Services	0	0	0	0	0	0
Water Services	212,000	0	0	0	0	0
Total rate funded	212,000	0	0	0	0	0

Table 46 Overview of Debt Costs

Asset class	Principal & Interest Payments in Next Ten Years						
	2016	2017	2018	2019	2020	2021	2026
Road Network	212,000	212,000	212,000	212,000	212,000	212,000	212,000
Bridges & Culverts	0	0	0	0	0	0	0
Storm Network	250,000	250,000	251,000	250,000	250,000	250,000	250,000
Landfill	120,000	121,000	120,000	120,000	120,000	120,000	120,000
Buildings & Facilities	0	254,000	254,000	254,000	254,000	254,000	254,000
Perth Meadows	337,000	83,000	83,000	83,000	83,000	83,000	83,000
Land Improvements	26,000	26,000	26,000	26,000	26,000	26,000	26,000
Machinery & Equipment	0	0	0	0	0	0	0
Fleet	0	0	0	0	0	0	0
Total Tax Funded	945,000	946,000	946,000	945,000	945,000	945,000	945,000
Wastewater Services	0	0	0	0	0	0	0
Water Services	125,000	94,000	0	0	0	0	0
Total rate funded	125,000	94,000	946,000	945,000	945,000	945,000	945,000

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

5. Use of Reserves

5.1 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; and, normalizing infrastructure funding requirements. By infrastructure class, Table 47 outlines the details of the reserves currently available to North Perth.

Table 47 Summary of Reserves Available

Asset class	Balance at December 31st, 2015
Road Network	478,000
Bridges & Culverts	98,000
Storm Network	3,665,000
Landfill	0
Buildings & Facilities	2,034,000
Perth Meadows	0
Land Improvements	172,000
Machinery & Equipment	899,000
Fleet	326,000
Total Tax Funded	**7,672,000**
Wastewater Services	-1,281,000
Water Services	637,000
Total rate funded	**-644,000**

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, and internal reserve and debt policies.

The reserves in Table 47 are available for use by applicable asset classes during the phase-in period to full funding. This, coupled with North Perth'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.

5.2 Recommendation

As North Perth 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.

X. 2016 Infrastructure Report Card

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

Table 48 2016 Infrastructure Report Card

Asset class	Asset Health Grade	Funding Percentage	Financial Capacity Grade	Average Asset class Grade	Comments
Road Network	B	24%	F	D	Based on 2016 replacement cost, and a blend of assessed and age-based data, nearly 16% of assets, with a valuation of $41 million, are in poor to very poor condition. Nearly 60% are in good to very good condition. The municipality is underfunding its assets. Funding for all asset categories is 47% of total annual requirements.
Bridges & Culverts	C	55%	D	D	
Storm System	B	52%	D	C	
Landfill	A	0%	F	D	
Facilities	D	80%	B	C	
Land Improvements	C	31%	F	D	
IT, Machinery & Equipment	D	41%	F	F	
Fleet	D	114%	A	C	
Perth Meadows	B	0%	F	D	
Water	C	43%	F	D	
Wastewater	C	43%	F	D	
		Average Asset Health Grade	C		
		Average Financial Capacity Grade	F		
		Overall Grade for the Municipality	D		

XI. Appendix: Grading and Conversion Scales

Table 49 Asset Health Scale

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

Table 50 Financial Capacity Scale

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