AMP2017

www.publicsectordigest.com

The 2017 Asset Management Plan for

Haldimand County

SUBMITTED BY THE PUBLIC SECTOR DIGEST INC. (PSD)
WWW.PUBLICSECTORDIGEST.COM
2017

Contents

List of Figures

List of Tables

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 Haldimand County's infrastructure portfolio comprises the following asset classes: buildings, machinery & equipment, land improvements and vehicles. The asset classes analyzed in this asset management plan for the municipality had a total 2016 valuation of $296 million, of which buildings comprised 65%, followed by land improvements at 14%.

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.

In addition to observed field conditions, historical capital expenditures can assist the municipality in identifying impending infrastructure needs, and guide its medium- and long-term capital programs. Investments in the municipalities asset inventory have fluctuated over the decades. Large investments were made starting in the early 2000s and then peaked between 2010-2014. During this time, $54.8 million was invested with $22 million put into buildings. Since 2015, $23.9 million has been invested with a focus on buildings.

Based on 2016 replacement cost, and primarily condition data, 58% of assets, with a valuation of $171.5 million, are in good to very good condition; 21% are in poor to very poor condition. The municipality has provided condition information for 0% of assets based on 2016 replacement cost. 80% of the assets analyzed in this AMP have at least 10 years of useful life remaining. However, 17%, with a valuation of $50.6 million, remain in operation beyond their established useful life. An additional 1% will reach the end of their useful life within the next five years

In order for an AMP to be effective, 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 the above categories is $10,067,000. Annual revenue currently allocated to these assets for capital purposes is $5,474,000 leaving an annual deficit of $4,593,000. To put it another way, these infrastructure categories are currently funded at 54% of their long-term requirements. In 2017, Haldimand County has annual tax revenues of $61,269,000. Our strategy includes full funding being achieved over 15 years by:

- when realized, reallocating the debt cost reductions of $2,465,000 to the infrastructure deficit.
- increasing tax revenues by 0.2% each year for the next 15 years solely for the purpose of phasing in full funding to the tax funded asset classes covered in this AMP.
- reallocating appropriate revenue from categories in a surplus position to those in a deficit position.
- increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

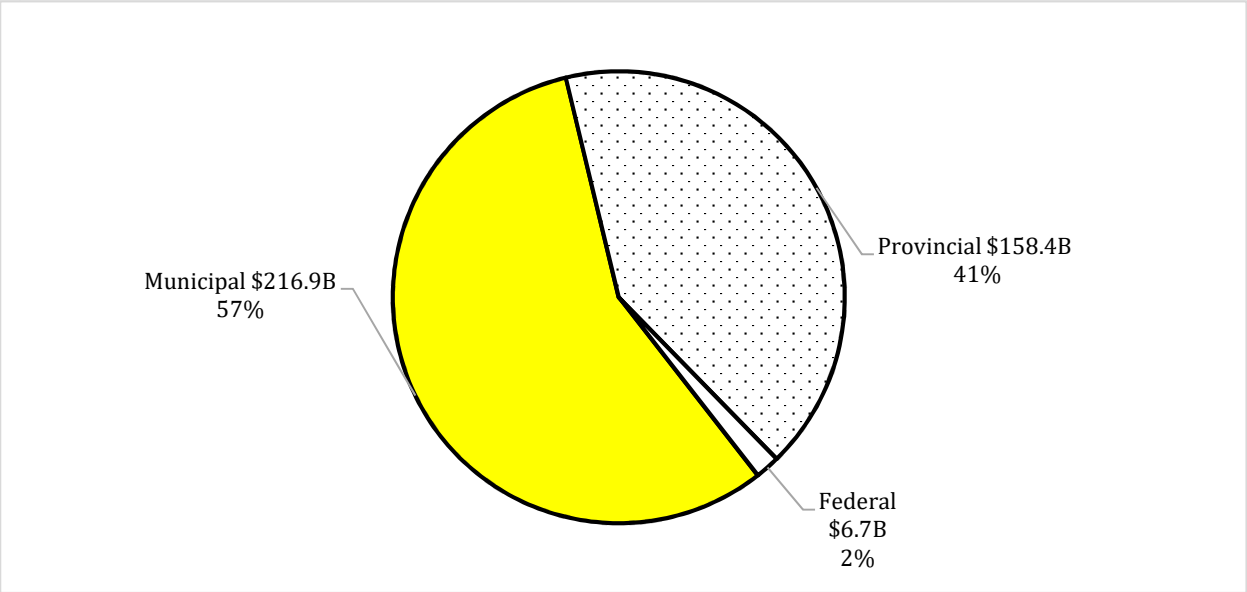
Although our financial strategies allow the municipalities to meet its long-term funding requirements and reach fiscal sustainability, injection of additional revenues will be required to mitigate existing infrastructure backlogs.

Please note this asset management plan only includes assets that Haldimand County is currently intending to replace.

I. Introduction & Context

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

Figure 1 Distribution of Net Stock of Core Public Infrastructure



Ontario's municipalities own more of the province's infrastructure assets than both the provincial and federal government. The asset portfolios managed by Ontario's municipalities are also highly diverse. The Municipality of Haldimand County's capital assets portfolio, as analyzed in this asset management plan (AMP) is valued at $296 million using 2016 replacement costs. 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.
Lifecycle Analysis	Identify Maintenance and Renewal Strategies & Lifecycle 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 lifecycles, 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 Haldimand County'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, replacement costs, useful life etc., summarizes the physical health of the capital assets, enumerates 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 (GTF) stipulating the inclusion of all eligible asset classes. The following asset classes are analysed in this document: buildings; machinery & equipment; land improvements; and vehicles.

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, such as historical costs, in-service dates, field inspection data (as available), asset health, and replacement costs.

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 prior to aggregation and reporting; therefore, many imprecisions that may be highlighted at the individual asset level are attenuated at the class level.

As available, actual field condition data was used to make recommendations more meaningful and representative of the municipality's state of infrastructure. 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 municipalities should set aside annually for each infrastructure class so that assets can be replaced upon reaching the end of their lifecycle.

To determine current funding capacity, all existing sources of funding are identified and combined to enumerate the total available funding; funding 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 bring the assets to a state of good repair. This amount is identified for each asset class.

Only predictable sources of funding are used, e.g., tax and rate revenues, user fees, and other streams of income the municipality can rely on with a high degree of certainty. Government grants and other ad-hoc injections of capital are not included 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 make communications more meaningful and the AMP more accessible, we've developed an Infrastructure Report Card that summarizes our findings in common language that municipalities can use for internal and external distribution. The report card is developed using two key, equally weighted factors: Financial Capacity and Asset Health.

Table 3 Infrastructure Report Card Description

Financial Capacity		A municipality's financial capacity grade is determined by the level of funding available (0-100%) for each asset class for the purpose of meeting the average annual investment requirements.
Asset Health		Using either field inspection data as available or age-based data, the asset health component of the report card uses condition (0-100%) to estimate how capable assets are in performing their required functions. 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.

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

- 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.

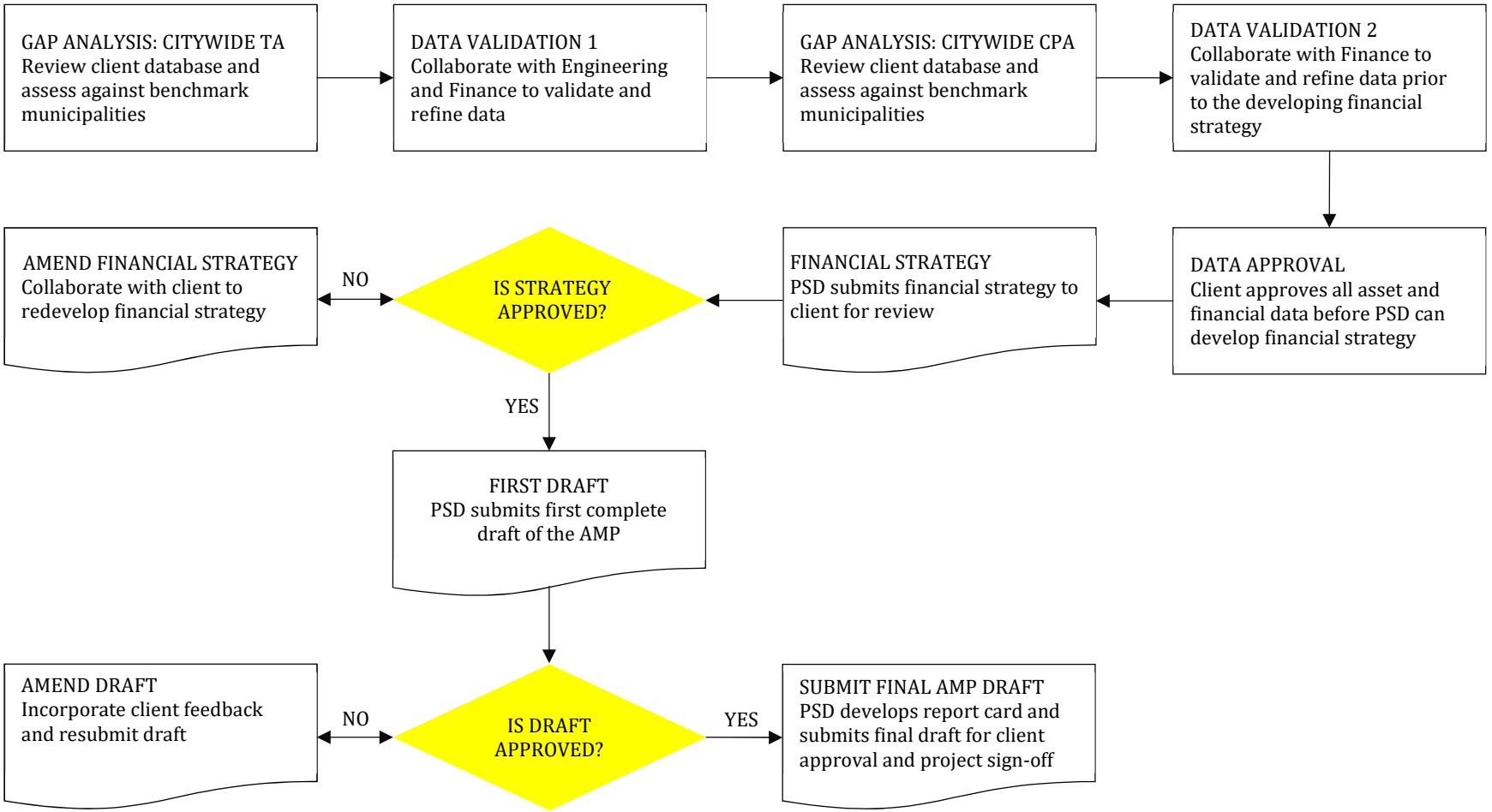
- Our calculations and recommendations will reflect the best available data at the time this AMP was developed.

- 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 $296 million, of which buildings comprised 65%, followed by land improvements at 14%. The ownership per household (Figure 4) totaled $14,000 based on 20,169 households for all asset categories.

Figure 3 Asset Valuation by Class

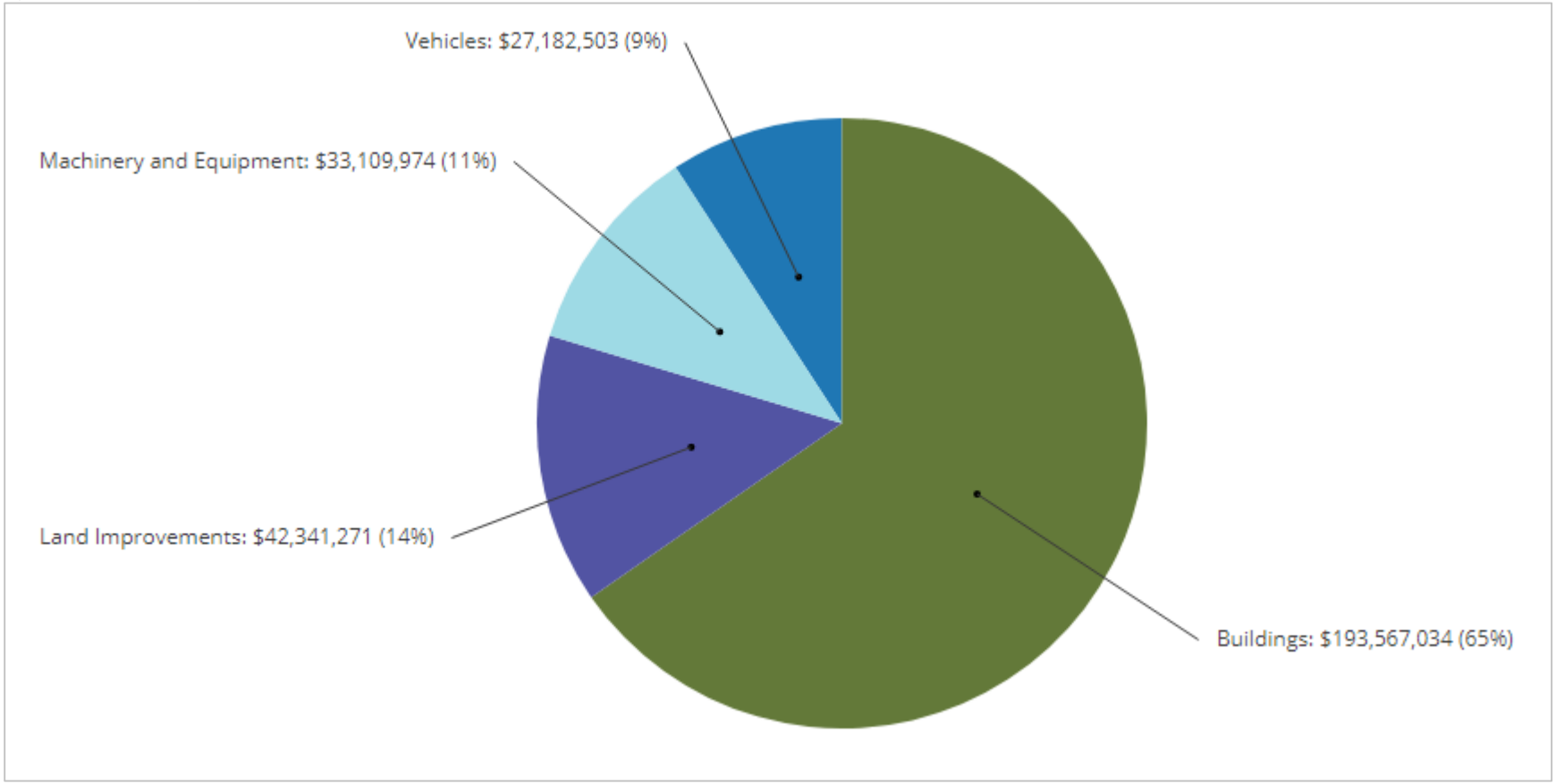
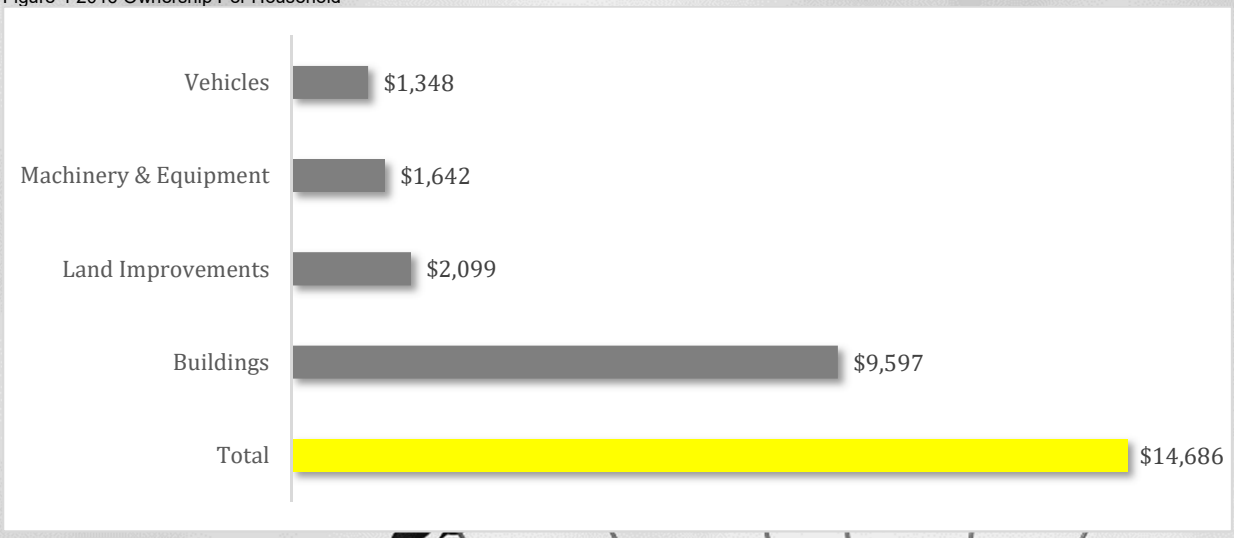


Figure 4 2016 Ownership Per Household



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, the 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 the various asset classes in this AMP. The municipality has condition data for 0% of all assets based on 2016 replacement cost.

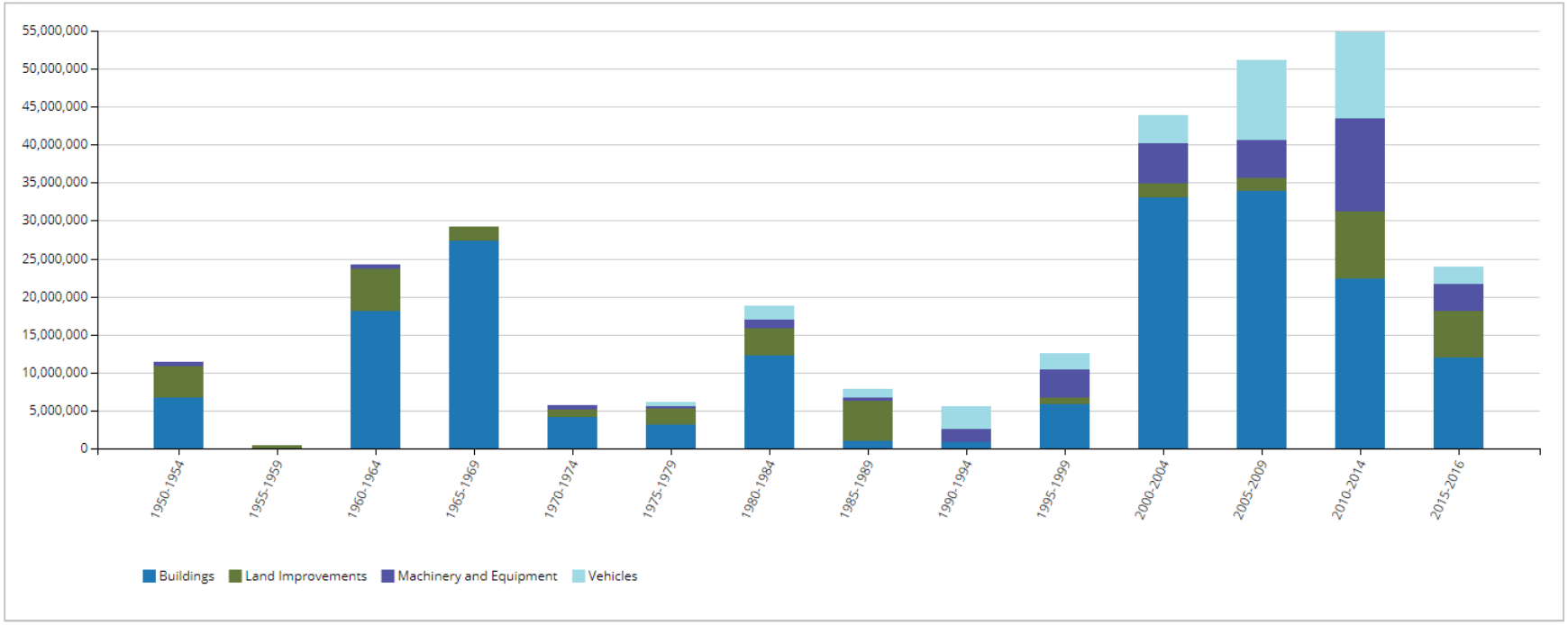
Table 4 Source of Condition Data by Asset Class

Asset class	Component	Source of Condition Data
Vehicles	All	Age-based
Buildings	All	Age-based
Land Improvements	All	Age-based
Machinery & Equipment	All	Age-based

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 infrastucture needs: installation year profile, and useful life remaining. Using 2016 replacement costs, Figure 5 illustrates the historical invesments made in the asset classes analyzed in this AMP since 1950. Often, investment in critical infrastructure parallels population growth or other significant shifts in demographics; they can also fluctuate with provincial and federal stimulus programs. Note that this graph only includes the active asset inventory as of December 31, 2016.

Figure 5 Historical Investment in Infrastructure – All Asset Classes

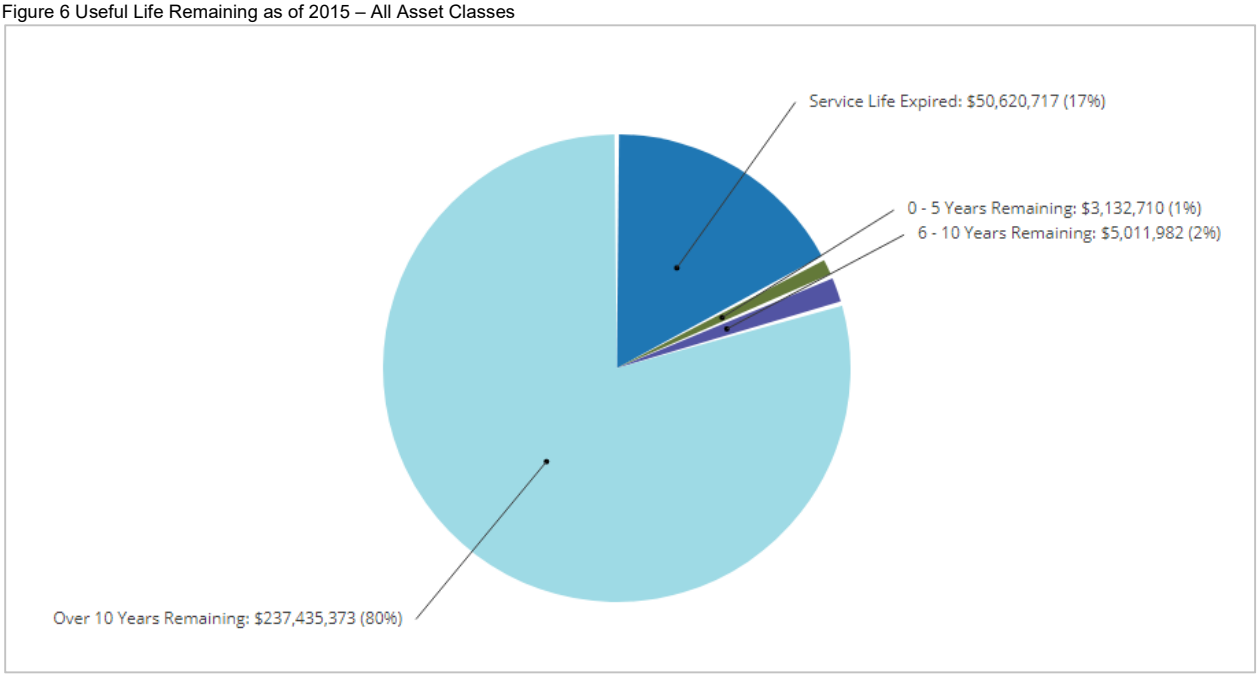


Investments in the municipalities asset inventory have fluctuated over the decades. Large investments were made starting in the early 2000s and then peaked between 2010-2014. During this time, $54.8 million was invested with $22 million put into buildings. Since 2015, $23.9 million has been invested with a focus on buildings.

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 approximation and help guide replacement needs and facilitate strategic budgeting. Figure 6 shows the distribution of assets based on the percentage of useful life already consumed.

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

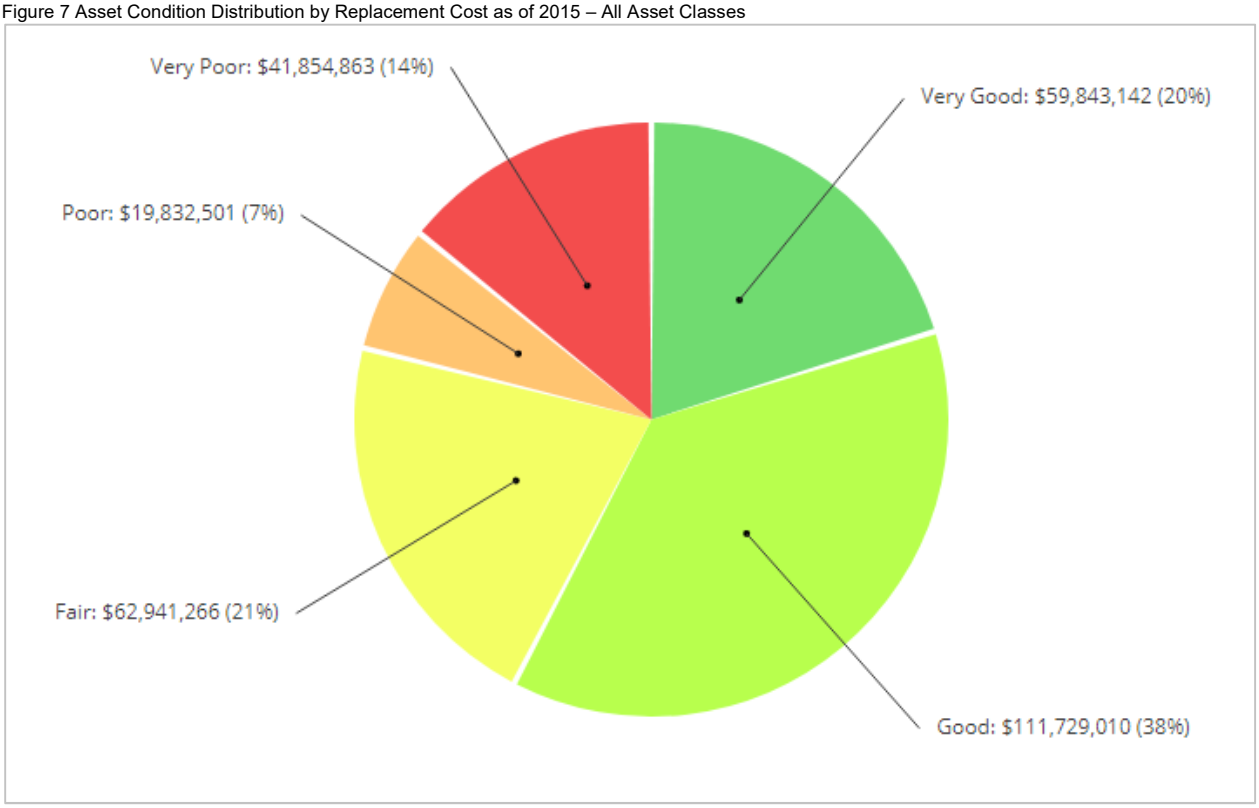


80% of the assets analyzed in this AMP have at least 10 years of useful life remaining. However, 17%, with a valuation of $50.6 million, remain in operation beyond their established useful life. An additional 1% will reach the end of their useful life within the next five years.

5. Overall Condition – All Asset Classes

Based on 2016 replacement cost, and age-based data, 58% of assets, with a valuation of $171.5 million, are in good to very good condition; 21% are in poor to very poor condition.

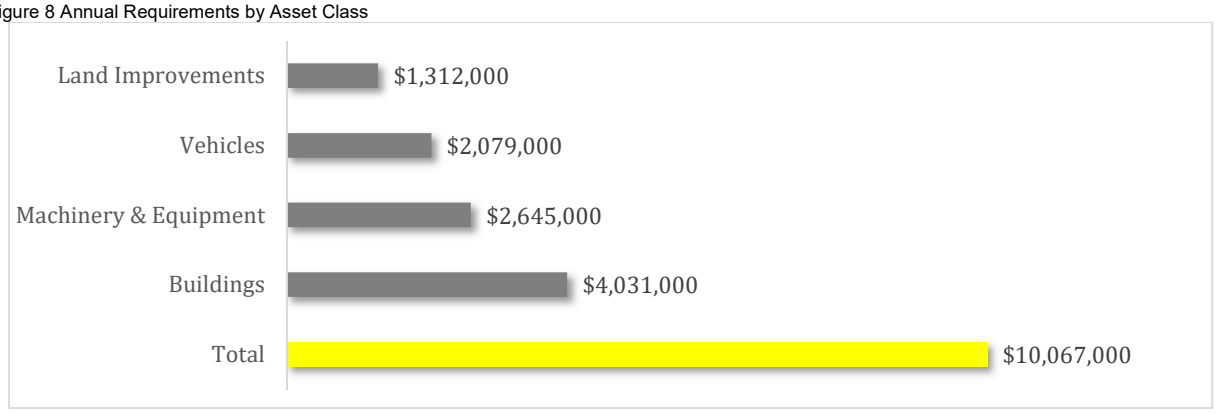
Figure 7 Asset Condition Distribution by Replacement Cost as of 2015 – All Asset Classes



6. Financial Profile

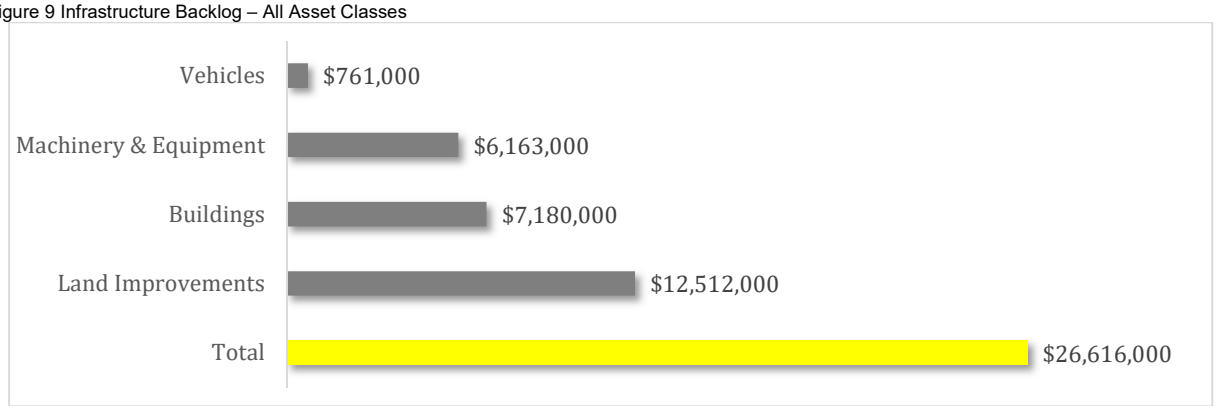
This section details key high-level financial indicators for the municipality's asset classes.

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 needs as they arise, prevent infrastructure backlogs and achieve long-term sustainability. In total, the municipality must allocate $10 million annually for the assets covered in this AMP.

Figure 9 Infrastructure Backlog – All Asset Classes

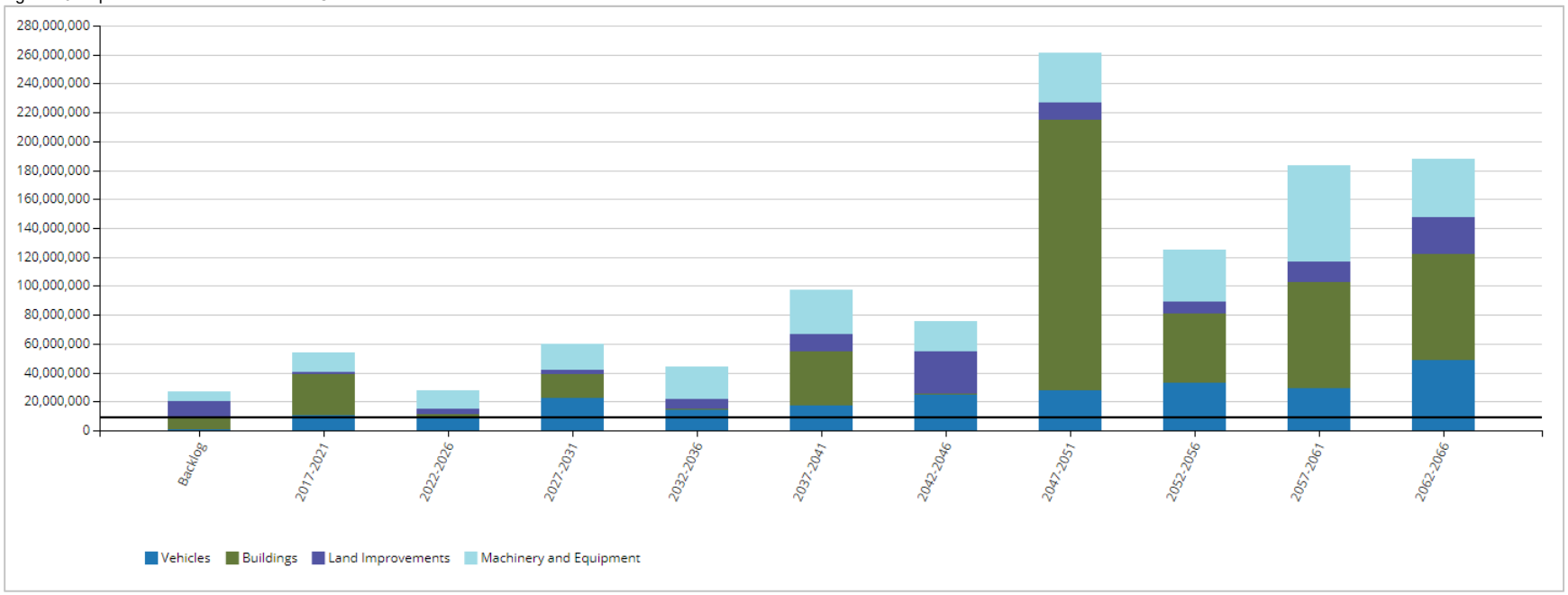


The municipality has a combined infrastructure backlog of $26.6 million, with land improvements comprising 47%. The backlog represents the investment needed today to meet previously deferred replacement needs. In the absence of assessed data, the backlog represents the value of assets still in operation 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. The backlog is the total investment in infrastructure that was deferred over previous years or decades. The backlog of assets to be replaced may not represent a true backlog as asset useful lives may have expired but are still functioning as intended based on the actual conditions of the assets.

Figure 10 Replacement Profile – All Asset Classes



Based primarily on condition data, the municipality has a combined backlog of $26.6 million, of which land improvements comprises $12.5 million. Aggregate replacement needs will total $53.5 million over the next five years. An additional $27.9 million will be required between 2021 and 2025. The municipality's aggregate annual requirements (indicated by the black line) total $10 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 54% of the annual requirements for assets included in this plan. 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

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. Buildings & Facilities

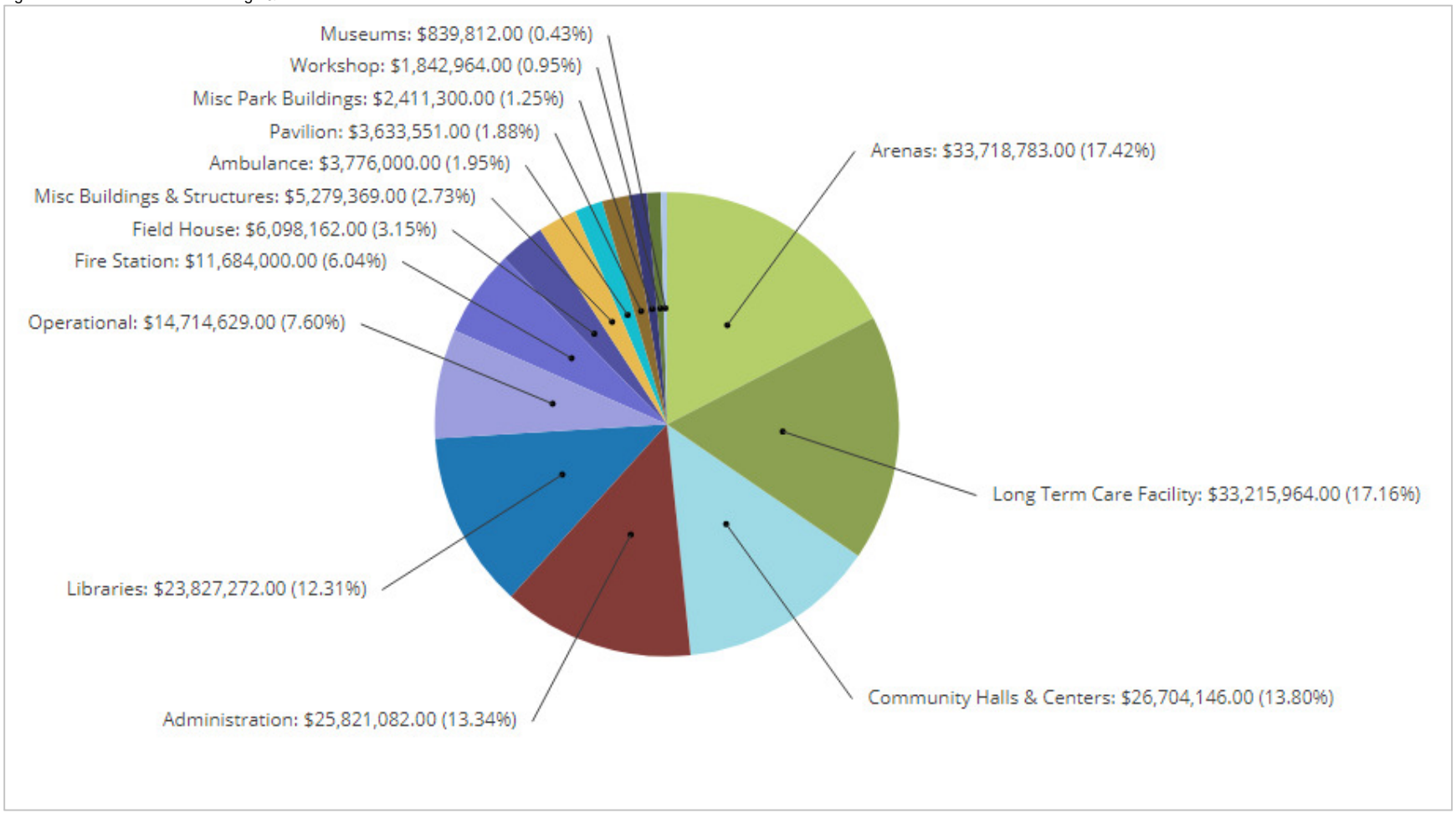
1.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 5 illustrates key asset attributes for the municipality's buildings & facilities, 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 buildings assets are valued at $193.5 million based on 2016 replacement costs. The useful life indicated for each asset type below was assigned by the municipality.

Table 5 Key Asset Attributes – Buildings & Facilities

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Buildings & Facilities	Administration Buildings	2	40, 50	CPI Monthly (ON)/User-Defined	$25,821,082
	Ambulance Buildings	4	50	User-Defined	$3,776,000
	Arenas	4	40, 50	User-Defined	$33,718,783
	Community Halls & Centers	15	20, 25, 50	CPI Monthly (ON)/User-Defined	$26,704,146
	Field Houses	19	15, 18, 20, 25, 50	CPI Monthly (ON)/User-Defined	$6,098,162
	Fire Stations	11	20, 50	User-Defined	$11,684,000
	Libraries	6	50	Libraries	$23,827,272
	Long Term Care Facility	1	50	CPI Monthly (ON)	$33,215,964
	Misc Buildings & Structures	48	25, 50	CPI Monthly (ON)/User-Defined	$5,279,369
	Park Buildings	17	15, 25, 50	CPI Monthly (ON)/User-Defined	$2,411,300
	Museums	3	25, 50	CPI Monthly (ON)/User-Defined	$839,812
	Operational	8	50	CPI Monthly (ON)	$14,714,629
	Pavilion	21	20, 25, 30	CPI Monthly (ON)/User-Defined	$3,633,551
	Workshops	4	50	User-Defined	$1,842,964
				Total	$193,567,034

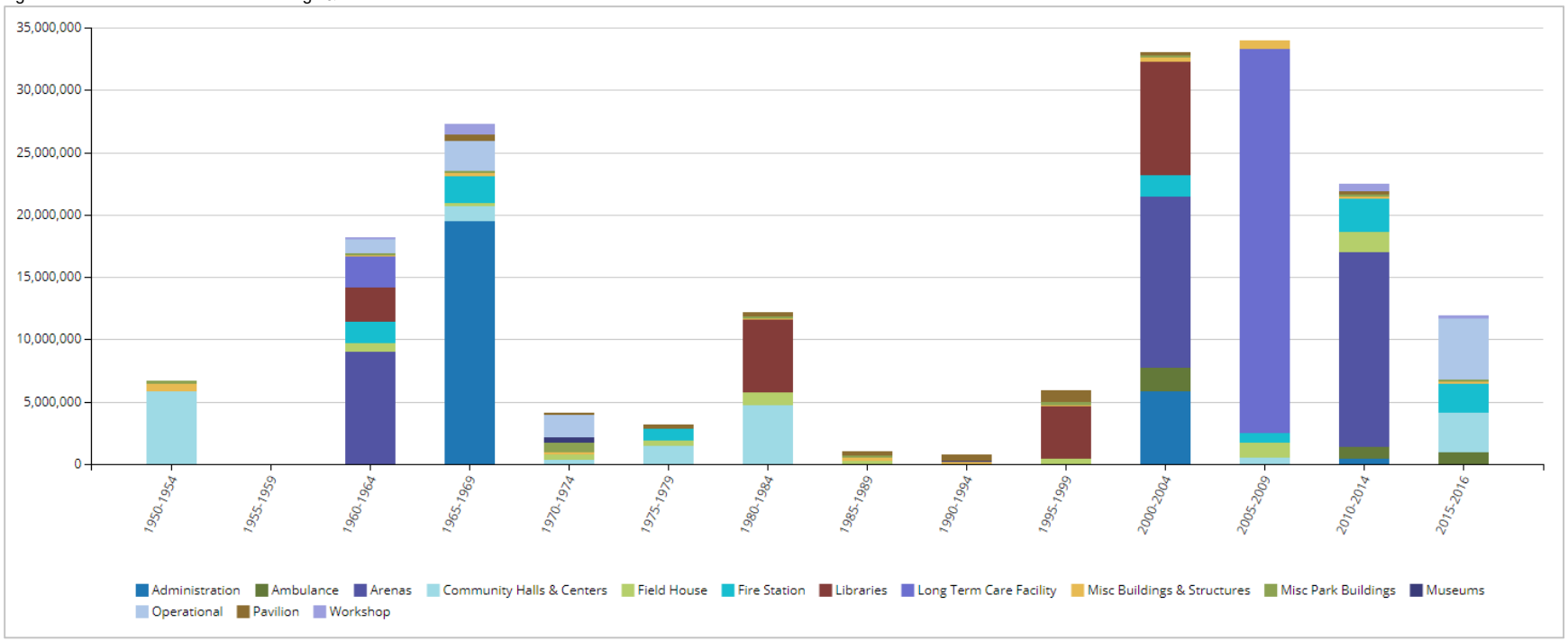
Figure 11 Asset Valuation – Buildings & Facilities



1.2 Historical Investment in Infrastructure

Figure 12 shows the municipality's historical investments in its buildings & 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 1.3) can inform the forecasting and planning of infrastructure needs and in the development of a capital program. Note that this graph only includes the active asset inventory as of December 31, 2016.

Figure 12 Historical Investment – Buildings & Facilities

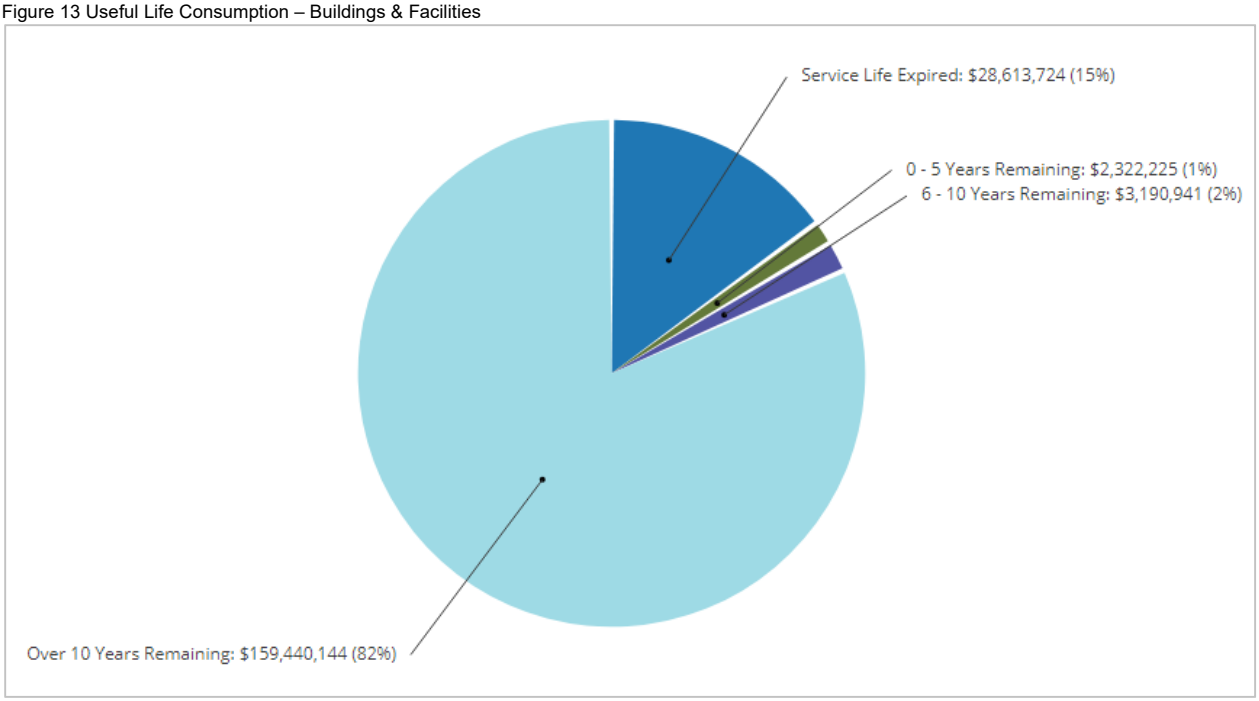


Investments in the municipalities building assets have fluctuated over the decades starting in the early 1950s. Between 2005 and 2009, the period of largest investment, $33.9 million was invested into the building assets with a focus on the long-term care facility.

1.3 Useful Life Consumption

In conjunction with historical spending patterns and observed condition data, understanding the consumption rate of assets based on industry established useful life standards provides a more complete profile of the state of a community's infrastructure. Figure 13 illustrates the useful life consumption levels as of 2016 for the municipality's buildings assets.

Figure 13 Useful Life Consumption – Buildings & Facilities

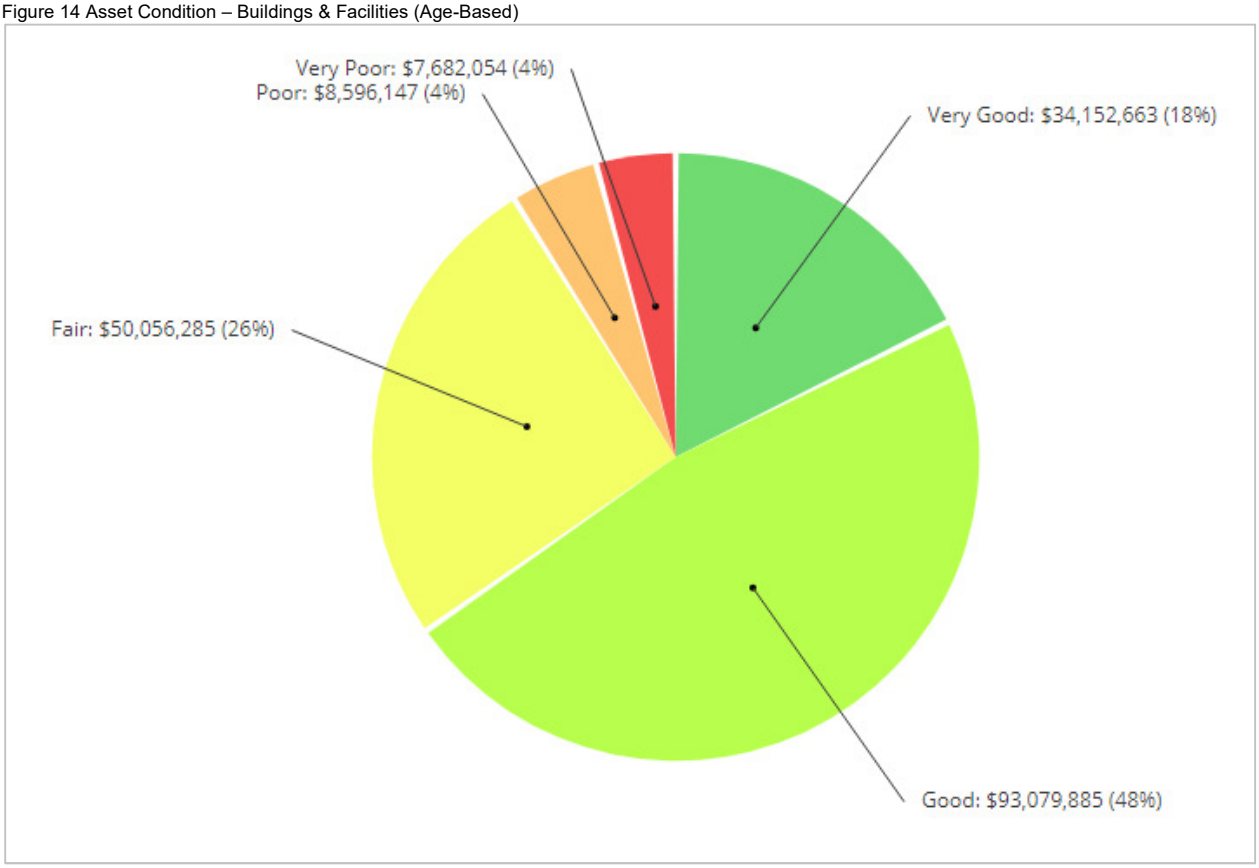


While 82% of assets have at least 10 years of useful life remaining, 15%, with a valuation of $28.6 million, remain in operation beyond their useful life. An additional 1% will reach the end of their useful life within the next five years.

1.4 Current Asset Condition

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

Figure 14 Asset Condition – Buildings & Facilities (Age-Based)

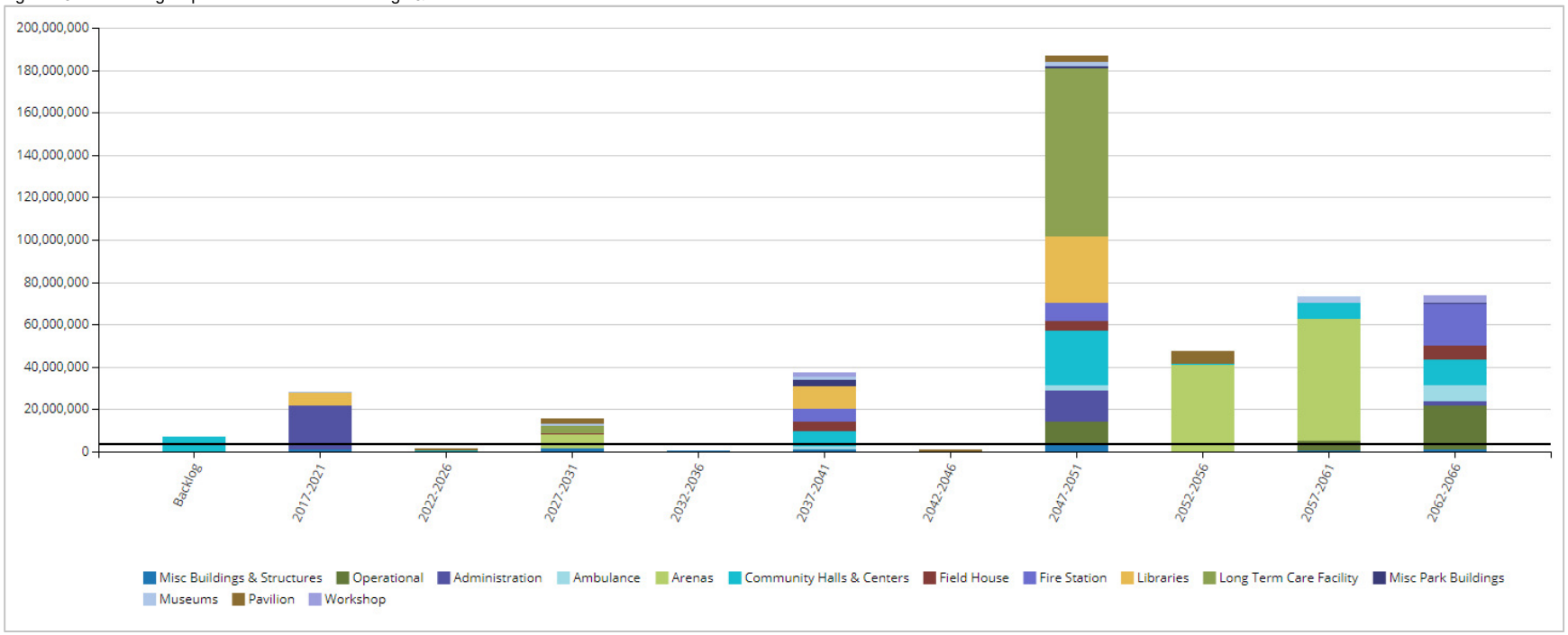


66% of buildings assets, with a valuation of $127 million, are in good to very good condition; 8% are in poor to very poor condition.

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 buildings assets. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. The backlog of assets to be replaced may not represent a true backlog as asset useful lives may have expired but are still functioning as intended based on the actual conditions of the assets.

Figure 15 Forecasting Replacement Needs – Buildings & Facilities



Primarily condition data indicates a backlog of $7 million and minimal five-year replacement needs of $28 million. The municipality's annual requirements (indicated by the black line) for its buildings total $4 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. The municipality is currently allocating approximately $1.1 million, leaving an annual deficit of $2.8 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 – Buildings & Facilities

- The municipality should start a condition inspection program for its buildings & facilities to precisely estimate future financial 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 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 lifecycle activity framework should be developed to promote standard lifecycle management of buildings & facilities as outlined further within the "Asset Management Strategy" section of this AMP.

- 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 29% of its long-term requirements on an annual basis. See the 'Financial Strategy' section on how to achieve more sustainable and optimal funding levels.

2. Machinery & Equipment

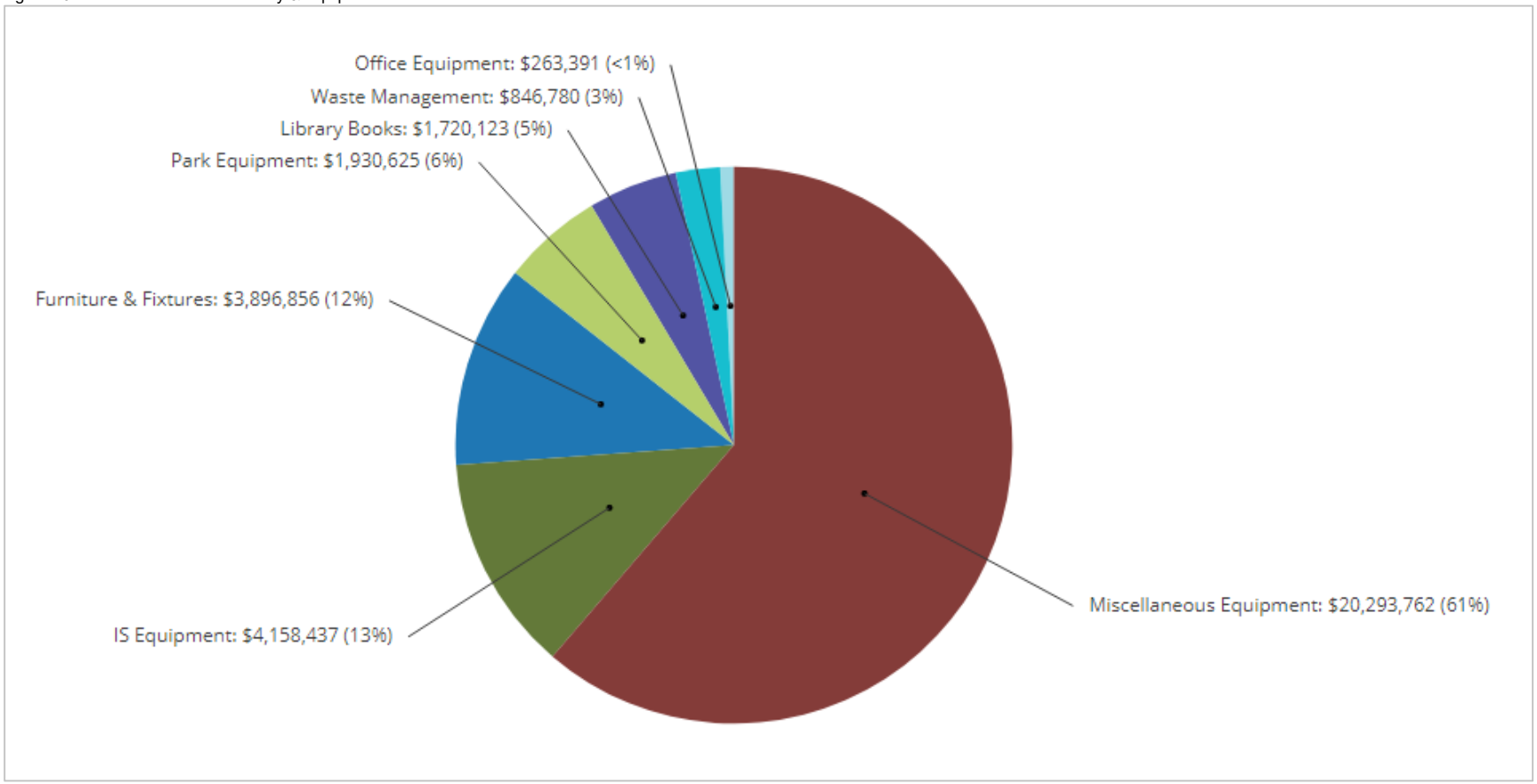
2.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 6 illustrates key asset attributes for the municipality's machinery & equipment, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's machinery & equipment assets are valued at $33 million based on 2016 replacement costs. The useful life indicated for each asset type below was assigned by the municipality.

Table 6 Asset Inventory – Machinery & Equipment

Asset Type	Components	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Machinery & Equipment	Furniture & Fixtures	5186	5, 6, 7, 8 ,9 10, 12, 15, 20, 25, 50	CPI Monthly (ON)/User-Defined	$3,896,856
	IS Equipment	993	1, 2, 5, 6, 7, 10	CPI Monthly (ON)/User-Defined	$4,158,347
	Library Books	127826	6	CPI Monthly (ON)/User-Defined	$1,720,123
	Office Equipment	229	2, 5, 6, 10, 15	CPI Monthly (ON)/User-Defined	$263,391
	Park Equipment	64	15, 20, 30	CPI Monthly (ON)/User-Defined	$1,930,625
	Waste Management	21	5, 7, 10, 15, 20, 30, 75	CPI Monthly (ON)	$846,780
	Miscellaneous Equipment	13286	2, 3, 5, 6, 7, 8, 9, 10, 12, 13, 15, 20, 25, 50	CPI Monthly (ON)/User-Defined	$20,293,762
				Total	$33,109,884

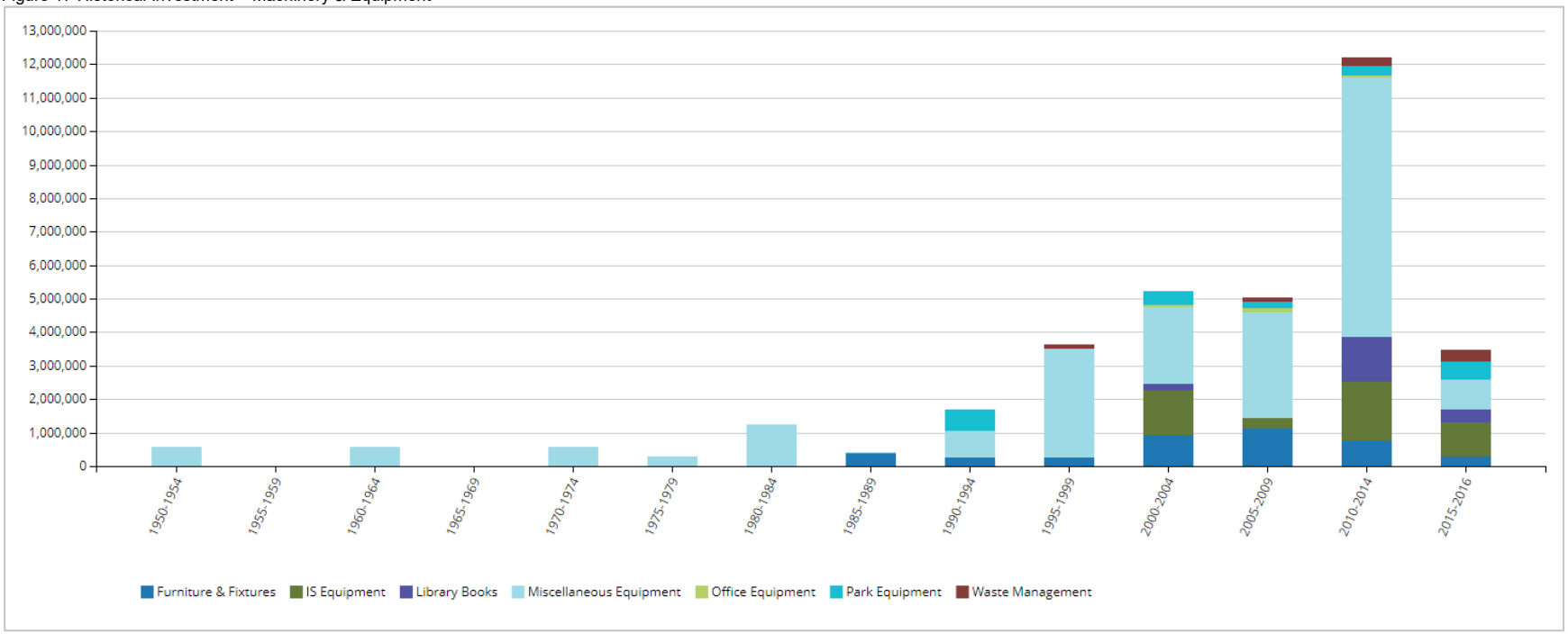
Figure 16 Asset Valuation – Machinery & Equipment



2.2 Historical Investment in Machinery & Equipment

Figure 17 shows the municipality's historical investments in its machinery & equipment 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 2.3) can inform the forecasting and planning of infrastructure needs and in the development of a capital program. Note that this graph only includes the active asset inventory as of December 31, 2016.

Figure 17 Historical Investment – Machinery & Equipment

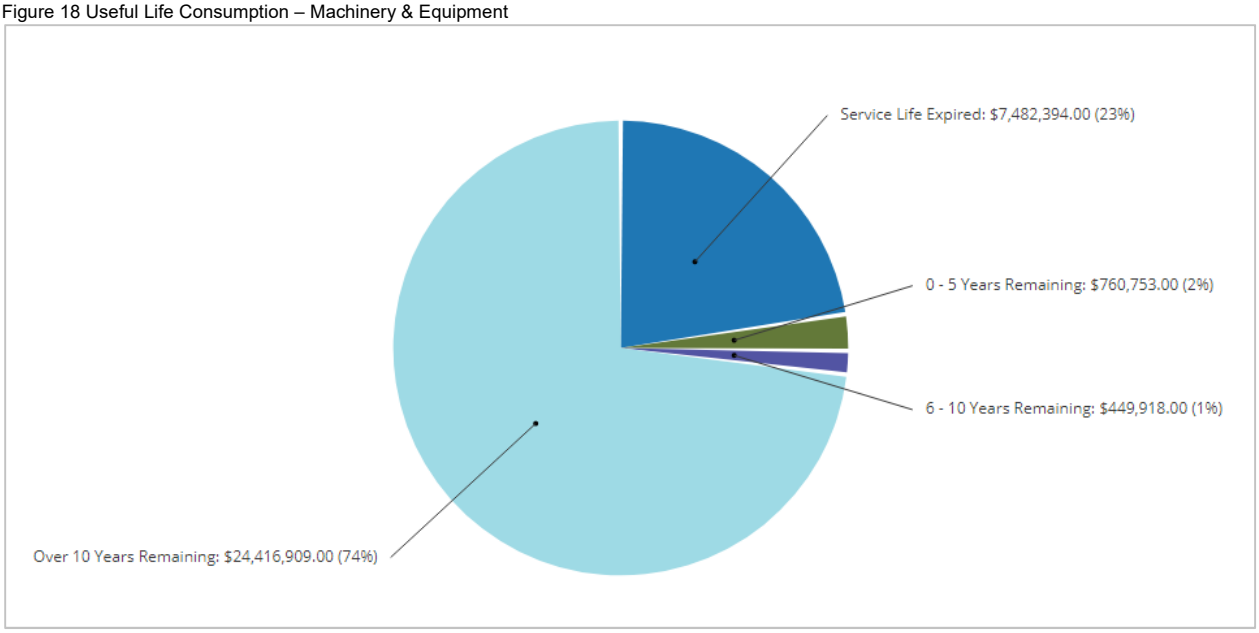


The municipality rapidly expanded its machinery & equipment portfolio beginning in the early 1990s. Between 2010 and 2014, the period of largest investment, $12 million was invested in the machinery and equipment category.

2.3 Useful Life Consumption

In conjunction with historical spending patterns and observed condition data, understanding the consumption rate of assets based on industry established useful life standards provides a more complete profile of the state of a community's infrastructure. Figure 18 illustrates the useful life consumption levels as of 2016 for the municipality's machinery & equipment assets.

Figure 18 Useful Life Consumption – Machinery & Equipment

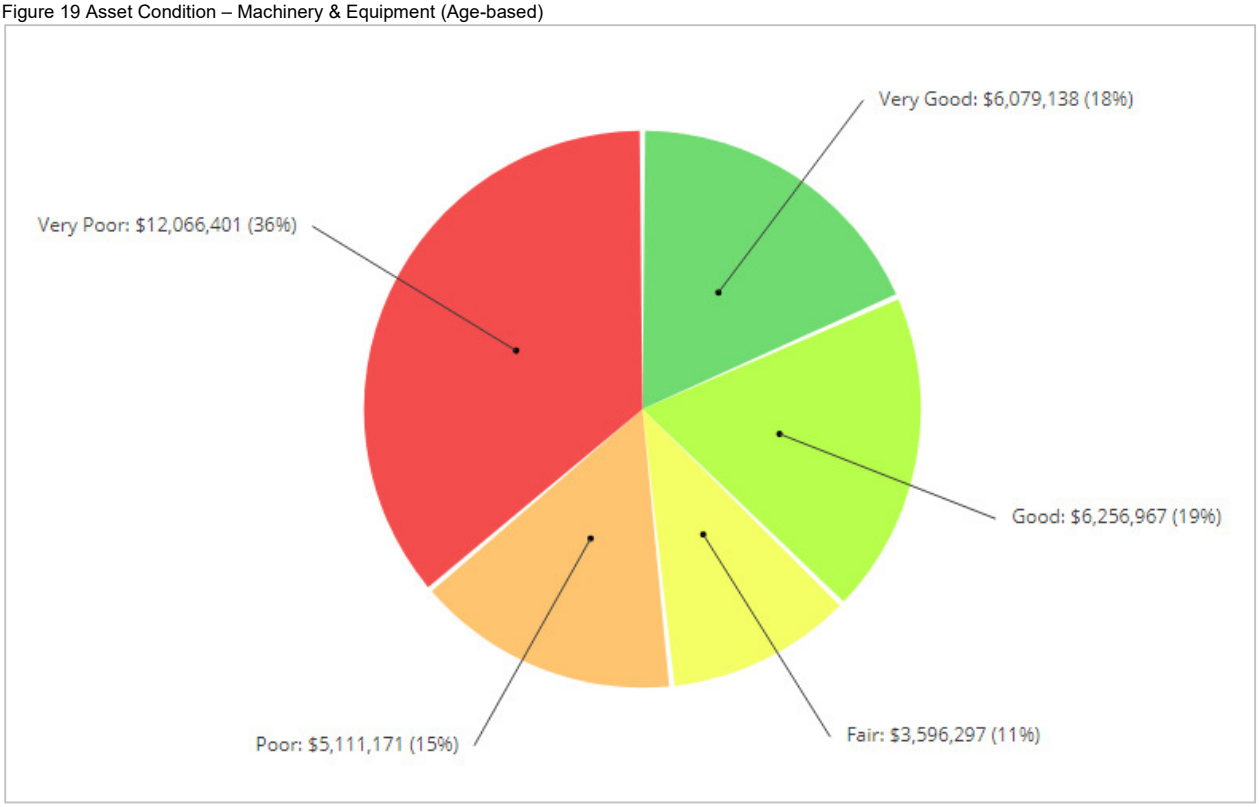


While 23% of assets have at least 10 years of useful life remaining, 12%, with a valuation of $835,000, remain in operation beyond their useful life. An additional 41% will reach the end of their useful life within the next five years.

2.4 Current Asset Condition

Using replacement cost, in this section we summarize the condition of the municipality's machinery & equipment assets as of 2016. 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 machinery & equipment assets.

Figure 19 Asset Condition – Machinery & Equipment (Age-based)

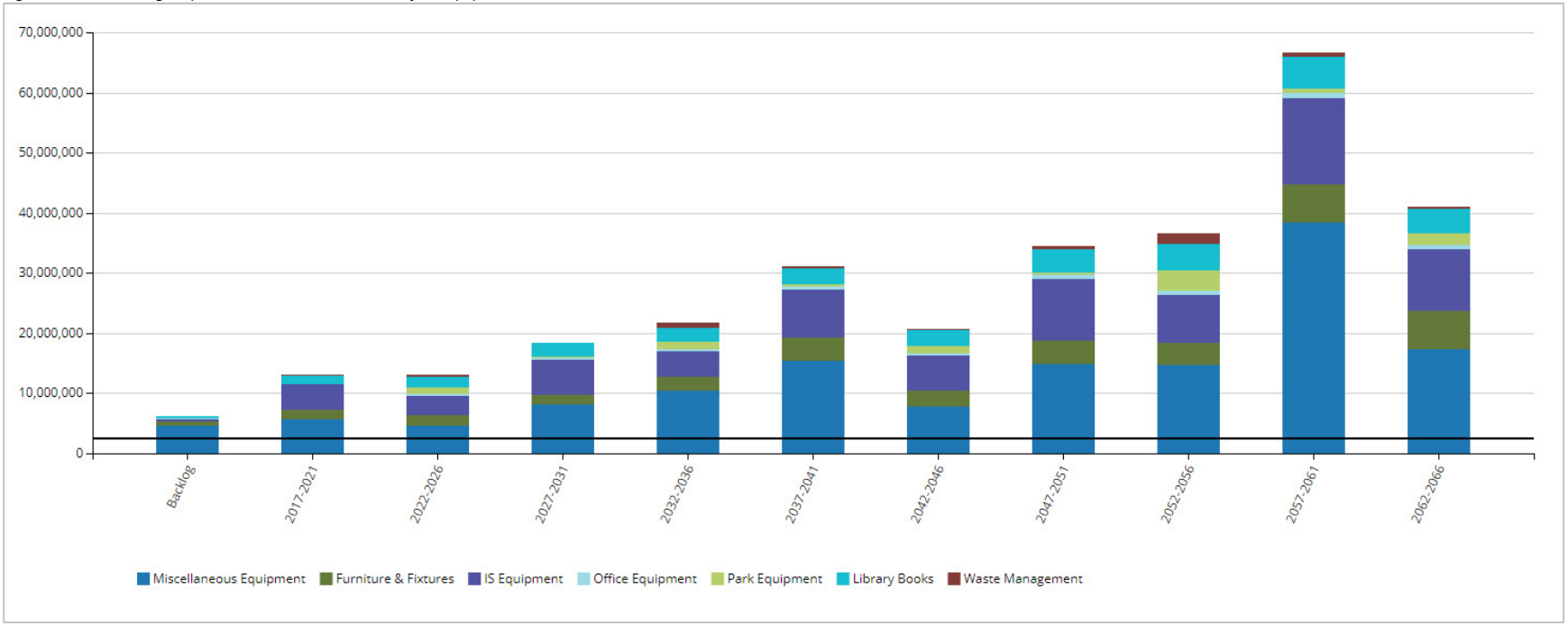


Based on a age data, 51% of assets, with a valuation of $17 million, are in poor to very poor condition; 37% are in good to very good condition.

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 machinery & equipment assets. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. The backlog of assets to be replaced may not represent a true backlog as asset useful lives may have expired but are still functioning as intended based on the actual conditions of the assets.

Figure 20 Forecasting Replacement Needs – Machinery & Equipment



In addition to a backlog of $6 million, the municipality's replacement needs total $13 million in the next five years. An additional $13 million will be required between 2021-2025. The municipality's annual requirements (indicated by the black line) for its machinery & equipment total $2,645,000. 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 $1.4 million, leaving an annual deficit of $1.1 million. 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.

2.6 Recommendations – Machinery & Equipment

- The municipality should implement a component based condition inspection program for all machinery & equipment assets to better define financial requirements for its 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 56% of its long-term requirements on an annual basis. See the 'Financial Strategy' section on how to maintain sustainable and optimal funding levels.

3. Land Improvements

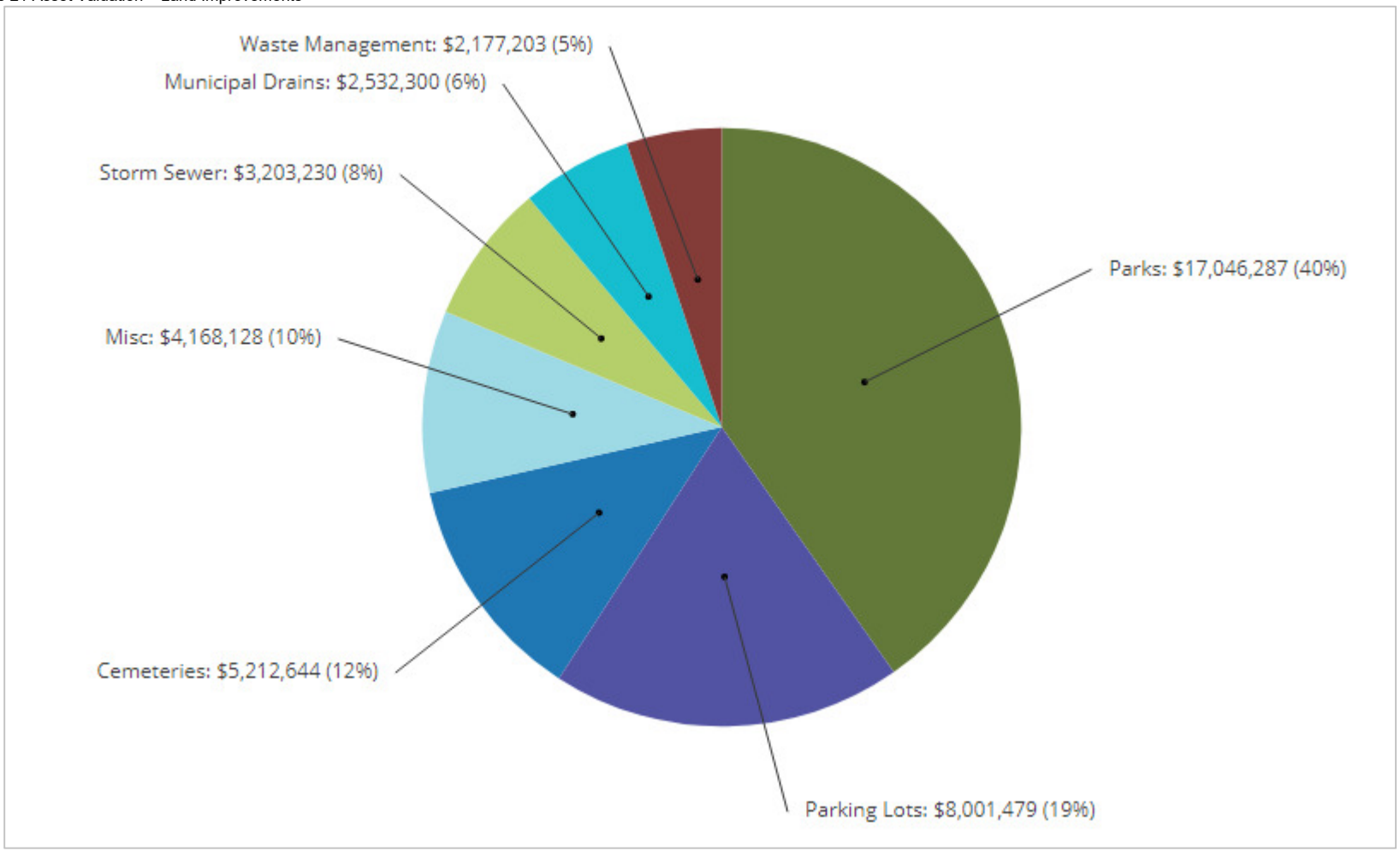
3.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 7 illustrates key asset attributes for the municipality's land improvements, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's land improvements assets are valued at $42 million based on 2016 replacement costs. The useful life indicated for each asset type below was assigned by the municipality.

Table 7 Asset Inventory – Land Improvements

Asset Type	Components	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Land Improvements	Cemeteries	45	15, 20, 30, 61, 73, 78, 79, 85, 86, 90, 100, 110, 173, 206	CPI Monthly (ON)	$5,212,644
	Municipal Drains	232871m	100	User-Defined	$2,532,300
	Parking Lots	2433723sqft	15, 25, 28, 30, 40	NRBCPI / Cost/Unit	$8,001,479
	Parks	148	7, 10, 15, 20, 25, 28, 30, 50	CPI/NRBCPI/User-Defined	$17,046,287
	Storm Sewer	21	30, 50	CPI/NRBCPI	$3,203,230
	Waste Management	16	4, 5, 10, 28, 30, 50, 75	NRBCPI/User-Defined	$2,177,203
	Miscellaneous	54	10, 28, 30, 50	CPI/NRBCPI/User-Defined	$4,168,128
				Total	**$42,341,271**

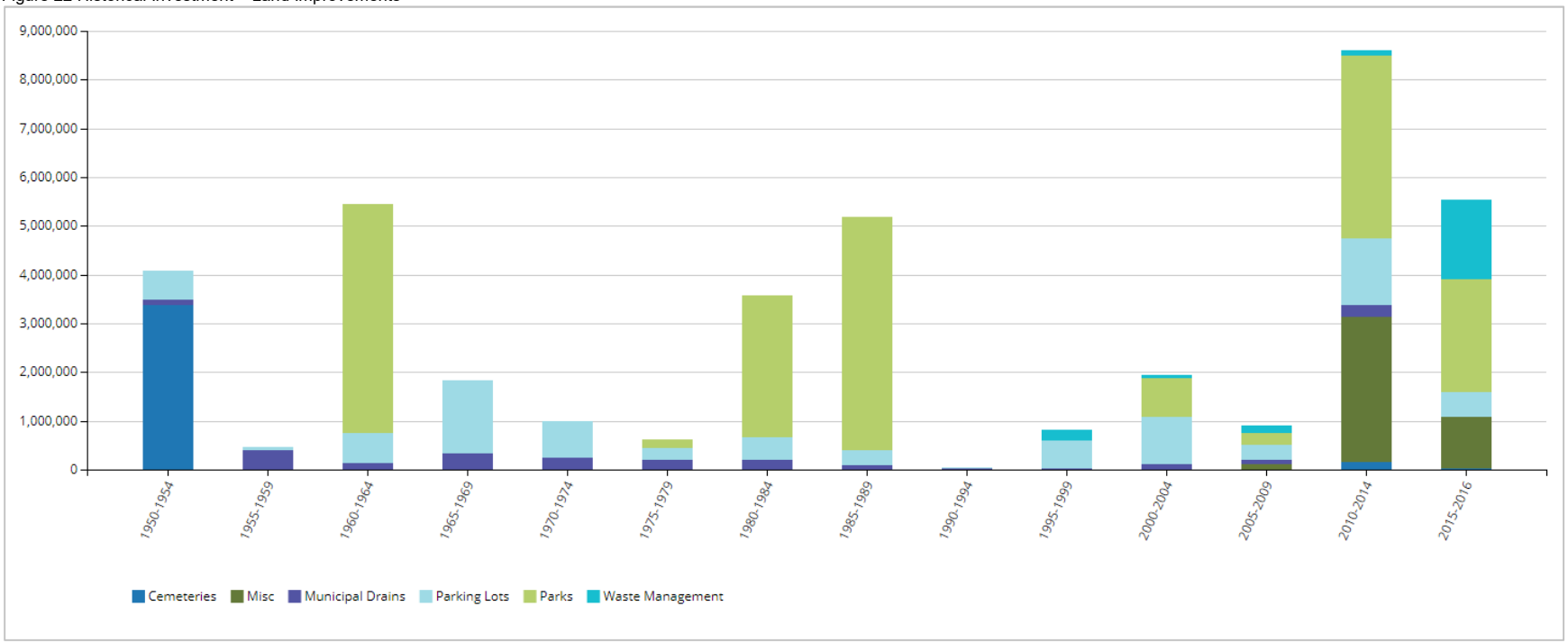
Figure 21 Asset Valuation – Land Improvements



3.2 Historical Investment in Infrastructure

Figure 22 shows the municipality's historical investments in its land improvements 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 infrastructure needs and in the development of a capital program. Note that this graph only includes the active asset inventory as of December 31, 2016.

Figure 22 Historical Investment – Land Improvements

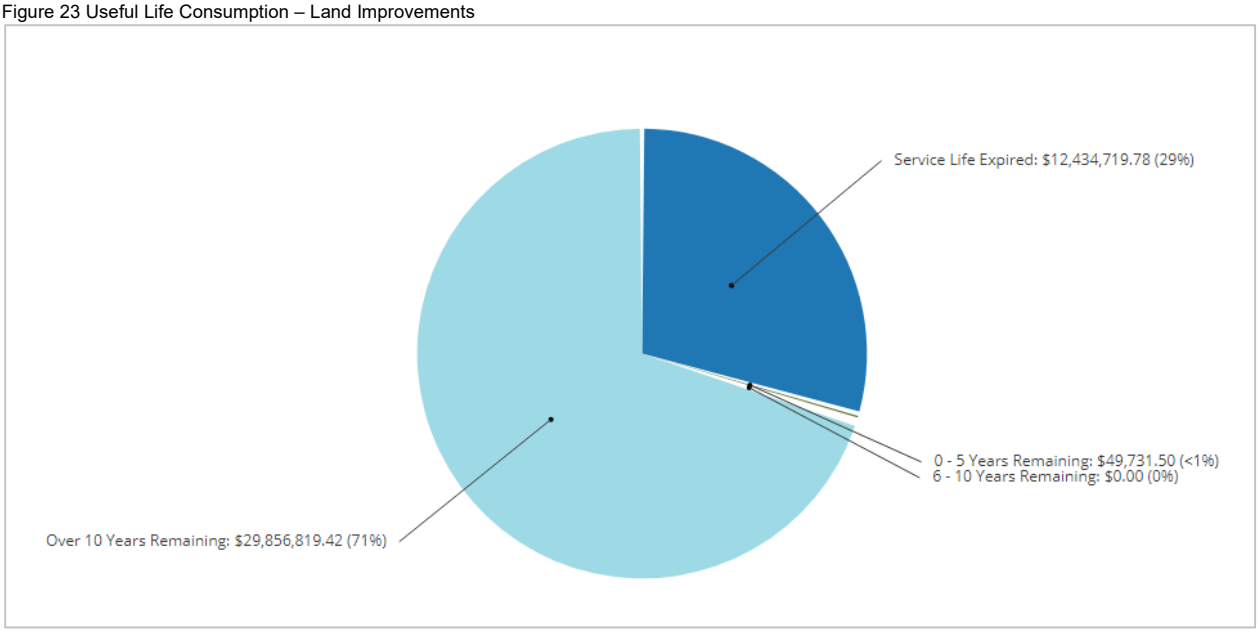


Expenditures in land improvements have fluctuated across the decades. Between 2010 and 2014, the period of the largest investment, $8.6 million was invested with a focus on parks and miscellaneous.

3.3 Useful Life Consumption

In conjunction with historical spending patterns and observed condition data, understanding the consumption rate of assets based on industry established useful life standards provides a more complete profile of the state of a community's infrastructure. Figure 23 illustrates the useful life consumption levels as of 2016 for the municipality's land improvement assets.

Figure 23 Useful Life Consumption – Land Improvements

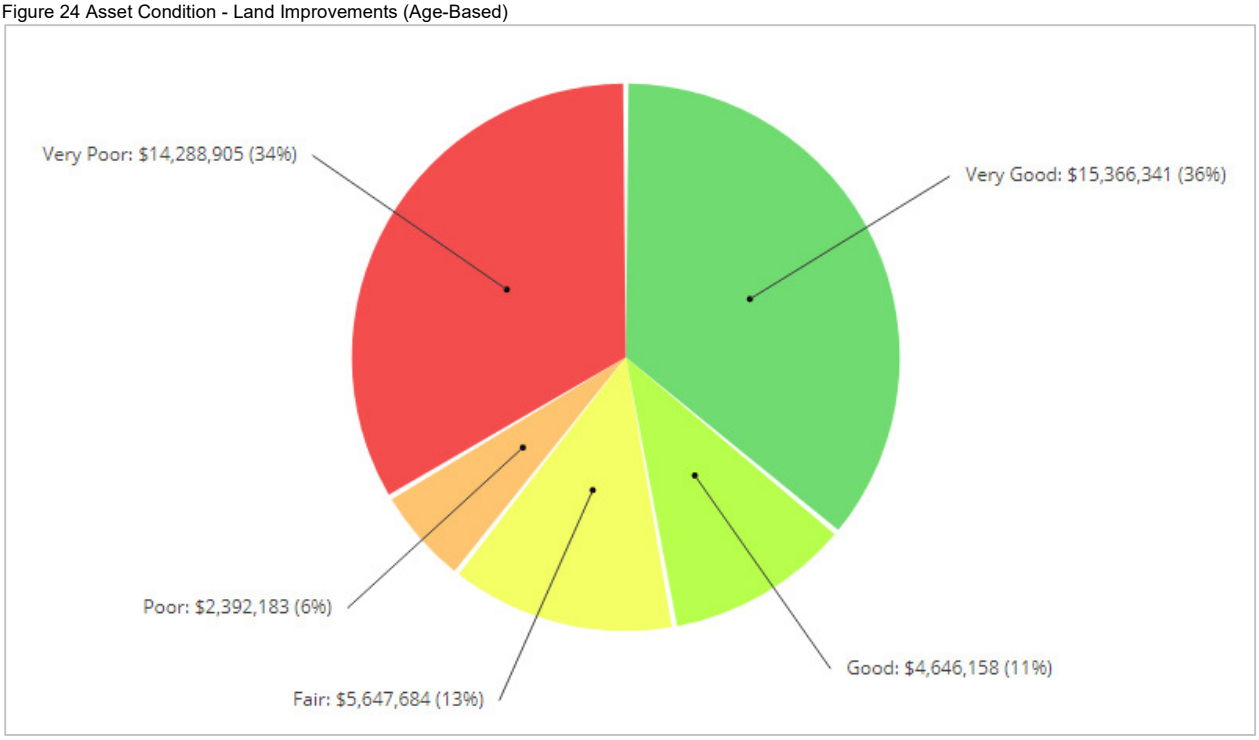


While 71% of assets have at least 10 years of useful life remaining, 29%, with a valuation of $12, remain in operation beyond their useful life. Less than 1% will reach the end of their useful life within the next five years.

3.4 Current Asset Condition

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

Figure 24 Asset Condition - Land Improvements (Age-Based)

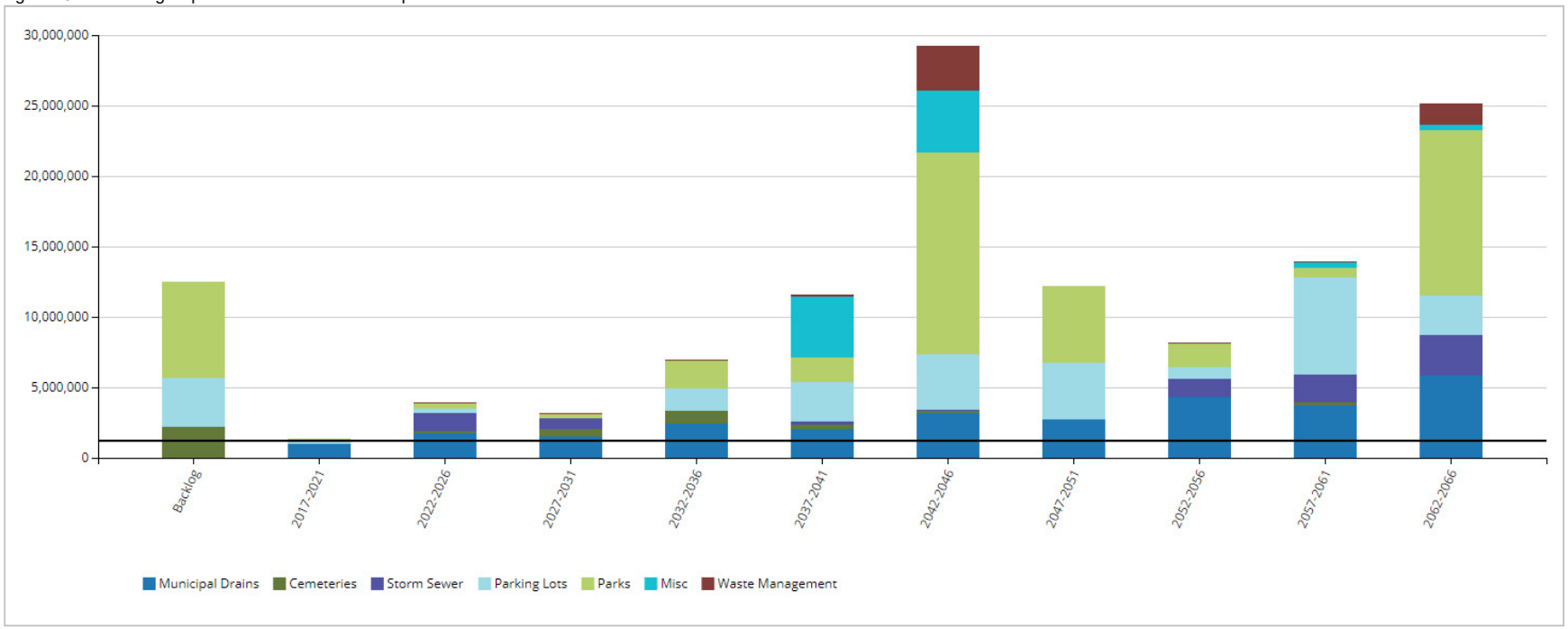


Based age-based data, 47% of the municipality's land improvement assets, with a valuation of $20 million, are in good to very good condition; 40% are in poor to very poor condition.

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 land improvements assets. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. The backlog of assets to be replaced may not represent a true backlog as asset useful lives may have expired but are still functioning as intended based on the actual conditions of the assets.

Figure 25 Forecasting Replacement Needs – Land Improvements



In addition to a backlog of $12.5 million, the municipality's replacement needs total $1.3 million in the next five years. An additional $3.9 million will be required between 2021-2025. The municipality's annual requirements (indicated by the black line) for its land improvements total $1,312,000. 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 $616,000, leaving an annual deficit of $696,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level.

3.6 Recommendations – Land Improvements

- The municipality should start a condition assessment program for its land improvement assets to precisely estimate financial 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 short, medium, and long term replacement needs. See Section 4, 'Risk' in the 'Asset Management Strategies' chapter for more information.

- 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 47% 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

4. Vehicles

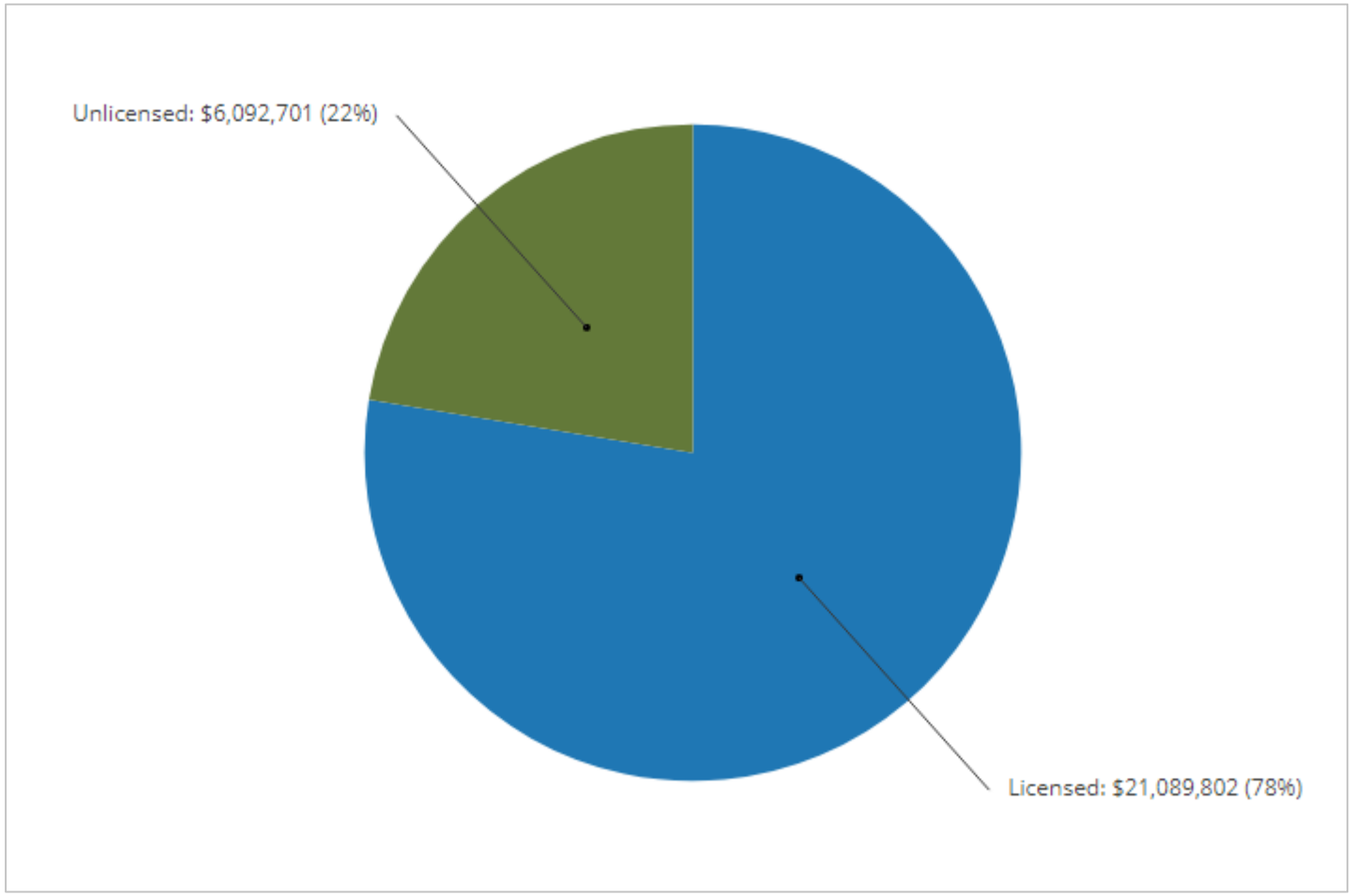
4.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 8 illustrates key asset attributes for the municipality's vehicles portfolio, 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 vehicles assets are valued at $27 million based on 2016 replacement costs. The useful life indicated for each asset type below was assigned by the municipality.

Table 8 Asset Inventory – Vehicles

Asset Type	Components	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Vehicles	Licensed	149	4, 5, 6, 8, 9, 10, 11 ,12, 15, 16, 17, 18, 20	CPI Monthly (ON)/User-Defined	$21,089,802
	Unlicensed	56	5, 8, 10, 12, 15, 20, 25	CPI Monthly (ON)/User-Defined	$6,092,701
				Total	$27,182,503

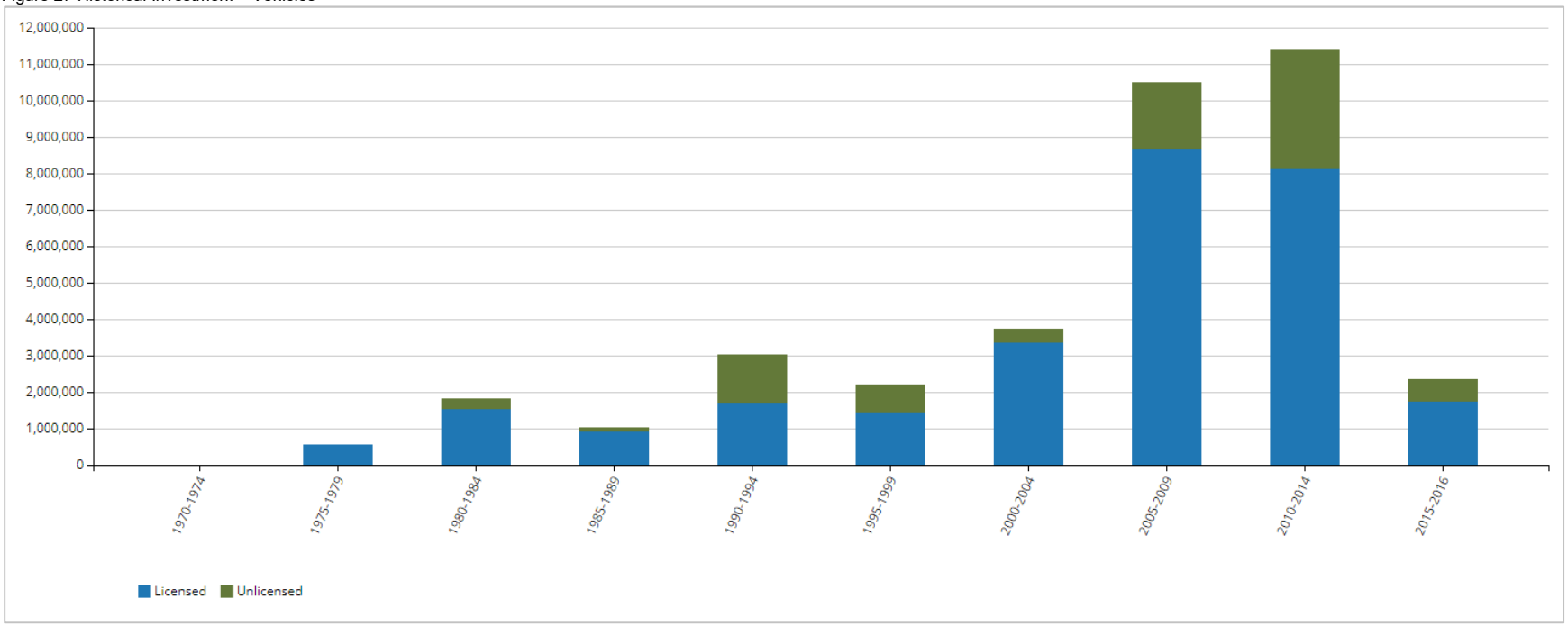
Figure 26 Asset Valuation – Vehicles



4.2 Historical Investment in Infrastructure

Figure 27 shows the municipality's historical investments in its vehicles portfolio since 1970. 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 infrastructure needs and in the development of a capital program. Note that this graph only includes the active asset inventory as of December 31, 2016.

Figure 27 Historical Investment – Vehicles

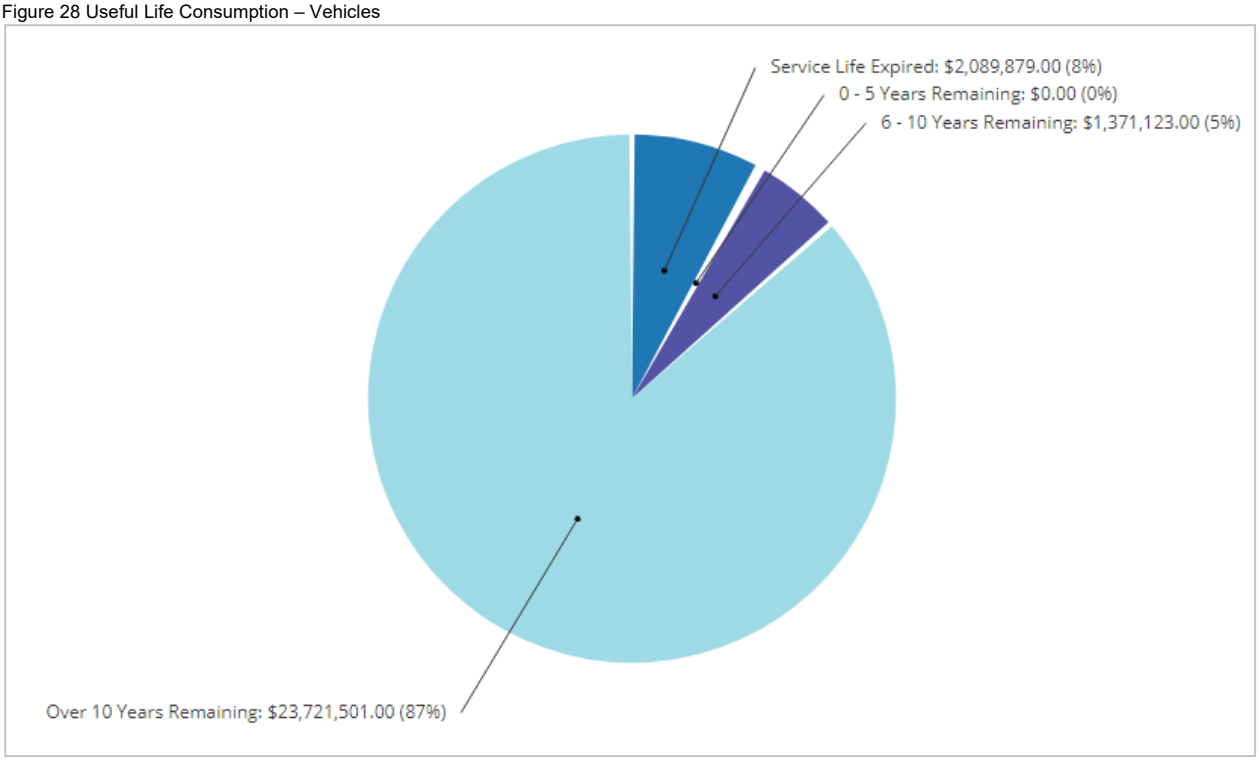


Investments in vehicles quickly increased starting in the 2000s. In 2010-2014, the period of largest investment, $11 million was invested with $8 million put into licensed vehicles.

4.3 Useful Life Consumption

In conjunction with historical spending patterns and observed condition data, understanding the consumption rate of assets based on industry established useful life standards provides a more complete profile of the state of a community's infrastructure. Figure 28 illustrates the useful life consumption levels as of 2016 for the municipality's vehicles.

Figure 28 Useful Life Consumption – Vehicles

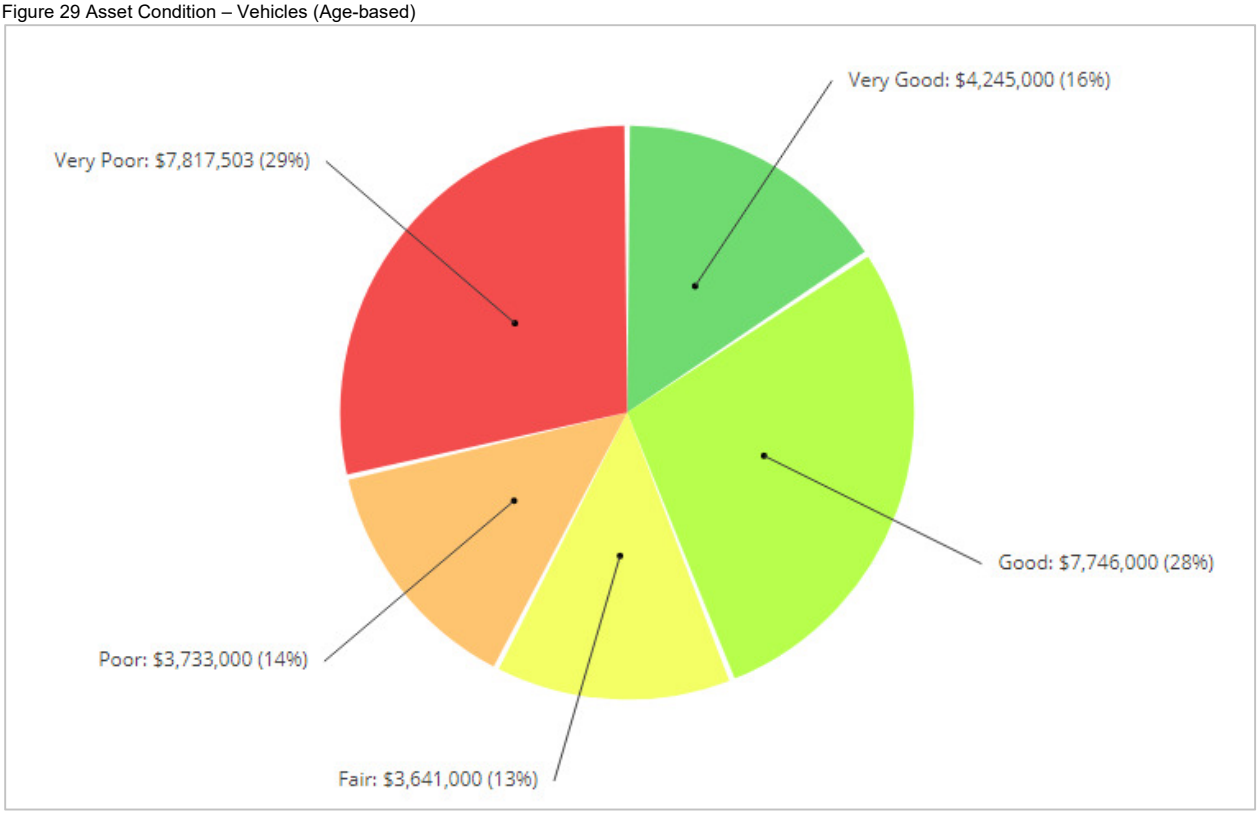


87% of assets have at least 10 years of useful life remaining; 8%, with a valuation of $2 million remain in operation beyond their useful life.

4.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the municipality's vehicles assets as of 2016. 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 fire vehicles while the remaining assets rely on age-based data.

Figure 29 Asset Condition – Vehicles (Age-based)

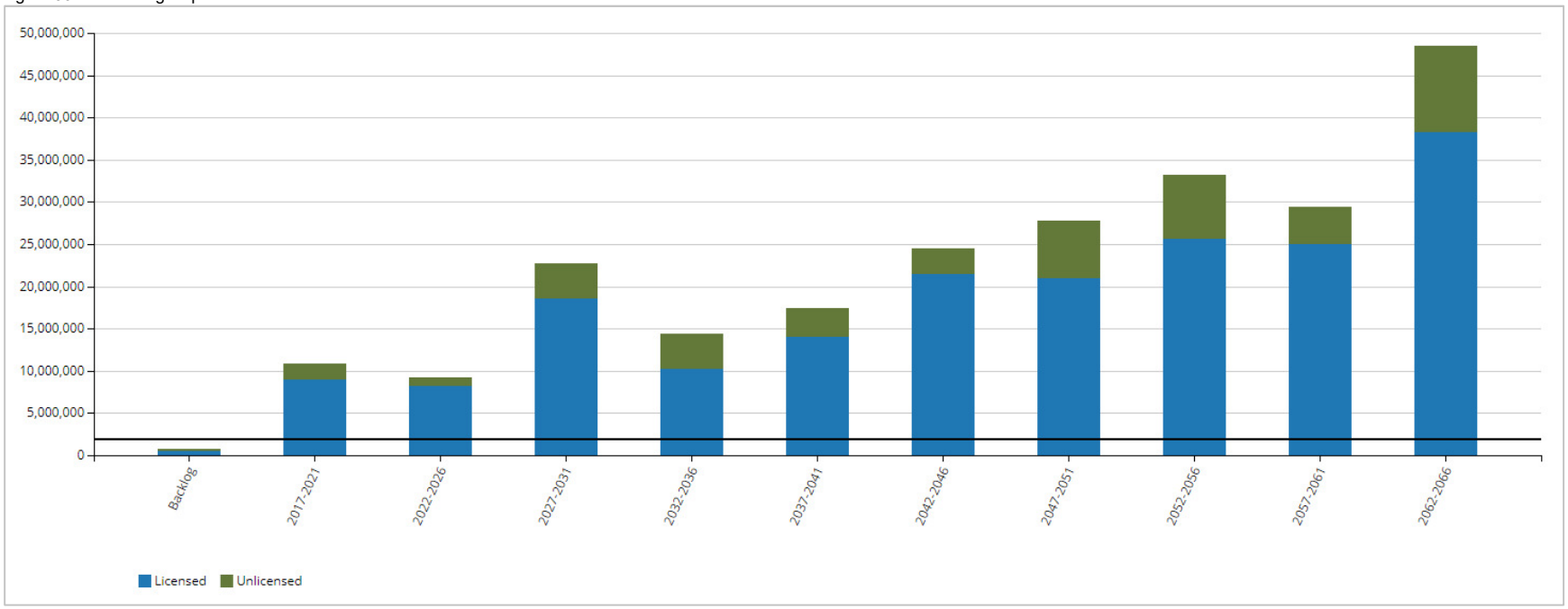


Age-based data shows that 43% of the municipality's vehicle assets are in poor to very poor condition; 44%, with a valuation of $11.9 million are in good to very good condition.

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 vehicles assets. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. The backlog of assets to be replaced may not represent a true backlog as asset useful lives may have expired but are still functioning as intended based on the actual conditions of the assets.

Figure 30 Forecasting Replacement Needs – Vehicles



In addition to a backlog of $760,000, replacement needs will total over $10.8 million over the next five years; an additional $9 million will be required between 2021-2025. The municipality's annual requirements (indicated by the black line) for its vehicles total $2,079,000. 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 $2.19 million, leaving an annual surplus of $113,000. 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 – Vehicles

- A preventative maintenance and lifecycle assessment program should be established for all 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 funding 105% 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.

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 9 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.

2. Key Performance Indicators and Targets

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

Table 10 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 to buildings & 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 – Percent of facilities rated poor or critical – Percentage of facilities replacement value spent on O&M – Facility utilization rate – $Utilization\ Rate = \frac{Occupied\ Space}{Facility\ Usable\ Area}$
Operational Indicators	– Percentage of facilities inspected within the last five years – Number/type of service requests – Percentage of customer requests addressed within 24 hours

Table 11 Key Performance Indicators – Vehicles

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

Table 12 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 13 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 a municipality's financial capacity and legislative requirements, many factors, internal and external, can influence the establishment of LOS and their associated KPI. These can include the municipality's overarching mission as an organization, the current state of its infrastructure and the wider social, political and macroeconomic context. The following factors should inform the development of most levels of service targets and their associated KPIs:

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 services 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 insights regarding the levels of service a particular asset or a network of assets 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 accelerate any planned growth in infrastructure services.

Demographic Changes
The composition of residents in a municipality can also serve as an infrastructure demand driver, 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 section will outline an implementation process that can be used to identify and prioritize renewal, rehabilitation and maintenance activities. This will assist in the development of a 10-year capital 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 lifecycle interventions required, and prioritization techniques, including risk, to determine which capital 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 a clearer path of what is required to achieve sustainable infrastructure programs.

2. Condition Assessment Programs

The foundation of an intelligent 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 the 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 of an asset may lead to its untimely 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

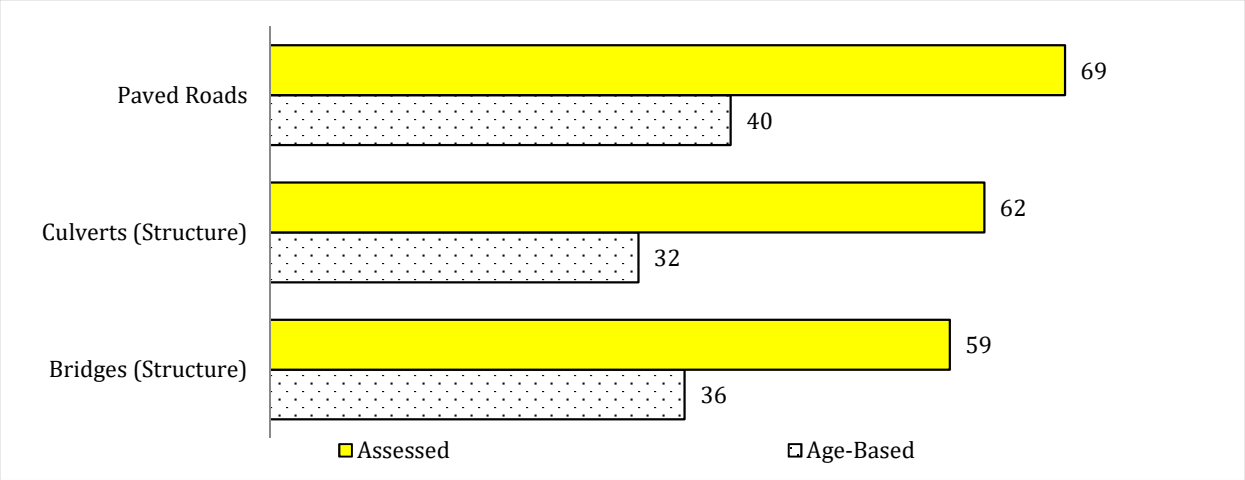
Condition assessment can involve different forms of analysis such as subjective opinion, mathematical models, or variations thereof, and can be completed through a very detailed or very cursory approach. When establishing the condition assessment for an entire asset class, a cursory approach (metrics such as good, fair, poor, very poor) is used. This is an economical strategy that 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 31 Comparing Age-based and Assessed Condition Dat



2.1 Buildings & Facilities

The most popular and practical type of buildings & facilities 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 (the most accurate approach), mathematical modeling or a combination of both. The following asset classifications are typically inspected:

- **Site Components** – property around the facility and 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 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 conduct an inspection of its structures and expand its condition assessment program for other segments. It is also recommended that a portion of capital funding is dedicated to this.

2.2 Vehicles 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.

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 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.

3.2 Vehicles 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 regard 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.

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 for Haldimand County has increased 1.6% since 2011 to reach 45.608. Population changes will require the municipality to determine the impact to expected levels of service and if any changes to the existing asset inventory may be required.

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 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.

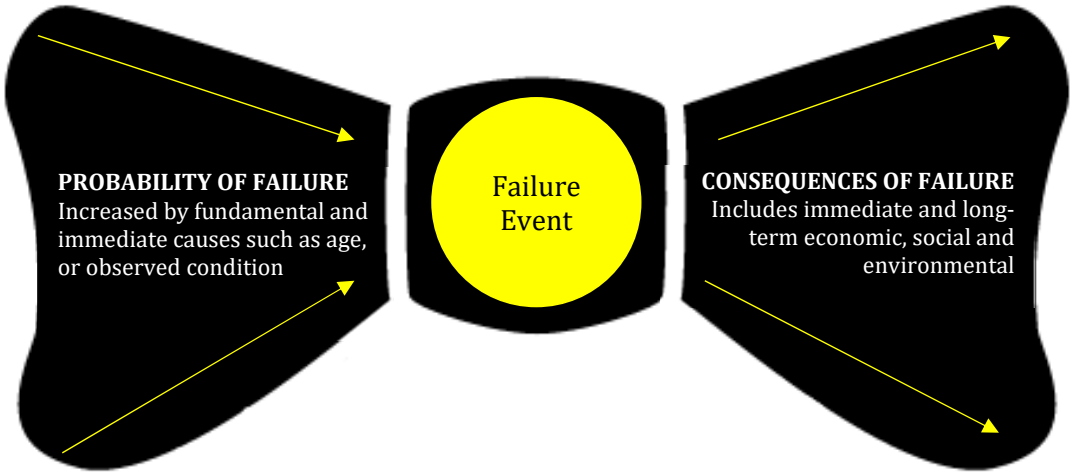
Risk mitigation is traditionally thought of in terms of safety and liability factors. In asset management, the definition of risk should heavily emphasize these factors but should be expanded to consider the risks to the municipality's ability to deliver targeted levels of service

- 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 that follow. 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. Figure 32 (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 32 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 14 Probability 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 other attributes as relevant. These attributes include material types, classifications, or size. Asset classes for which replacement cost is used include: buildings & facilities, land improvements, vehicles, and machinery & equipment. This approach is premised on the assumption that the higher the replacement cost, the larger (and likely more important) the asset, requiring a higher risk scoring.

Table 15 Consequence of Failure – Buildings

Road Classification	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 16 Consequence of Failure – Machinery & Equipment

Replacement Value	Consequence of failure
Up to $10k	Score of 1
$11k to $20k	Score of 2
$21k to $50k	Score of 3
$51k to $100k	Score of 4
Over $100k	Score of 5

Table 17 Consequence of Failure – Land Improvements

Pipe Diameter	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 18 Consequence of Failure – Vehicles

Pipe Diameter	Consequence of failure
Up to $25k	Score of 1
$26k to $50k	Score of 2
$51k to $100k	Score of 3
$101k to $250k	Score of 4
Over $250k	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 33 Distribution of Assets Based on Risk – All Asset Classes

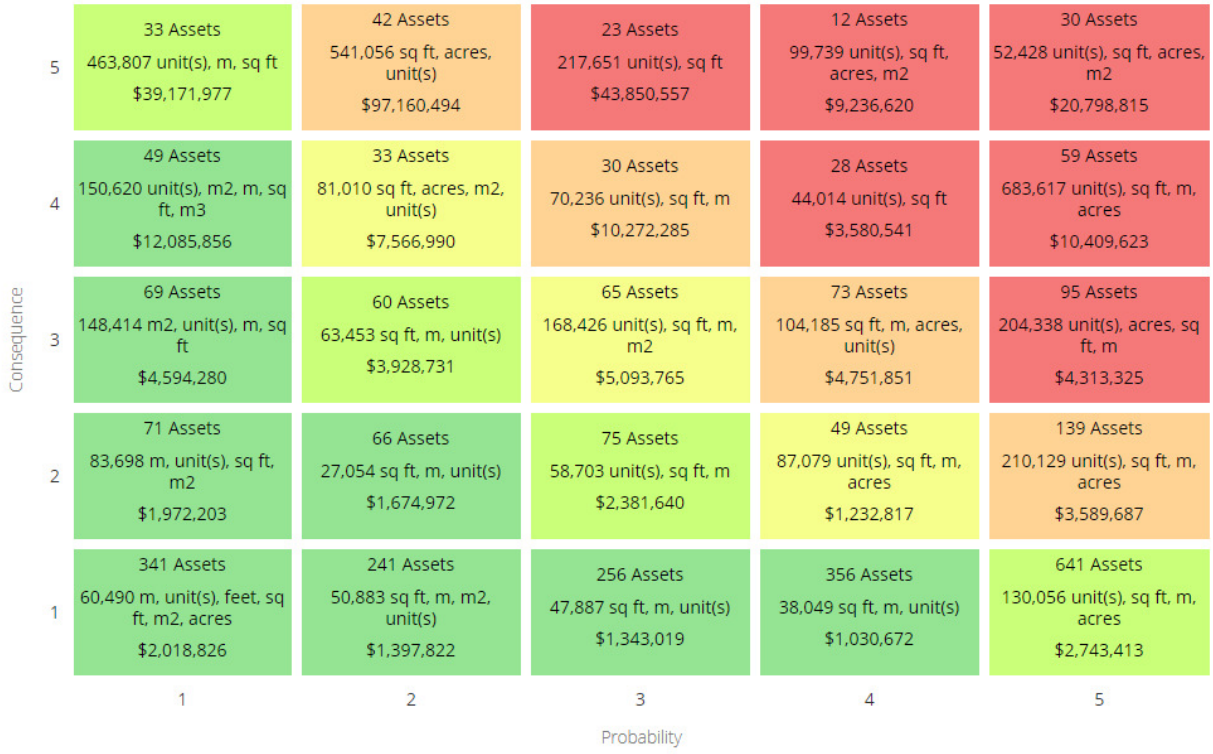


Figure 34 Distribution of Assets Based on Risk – Buildings

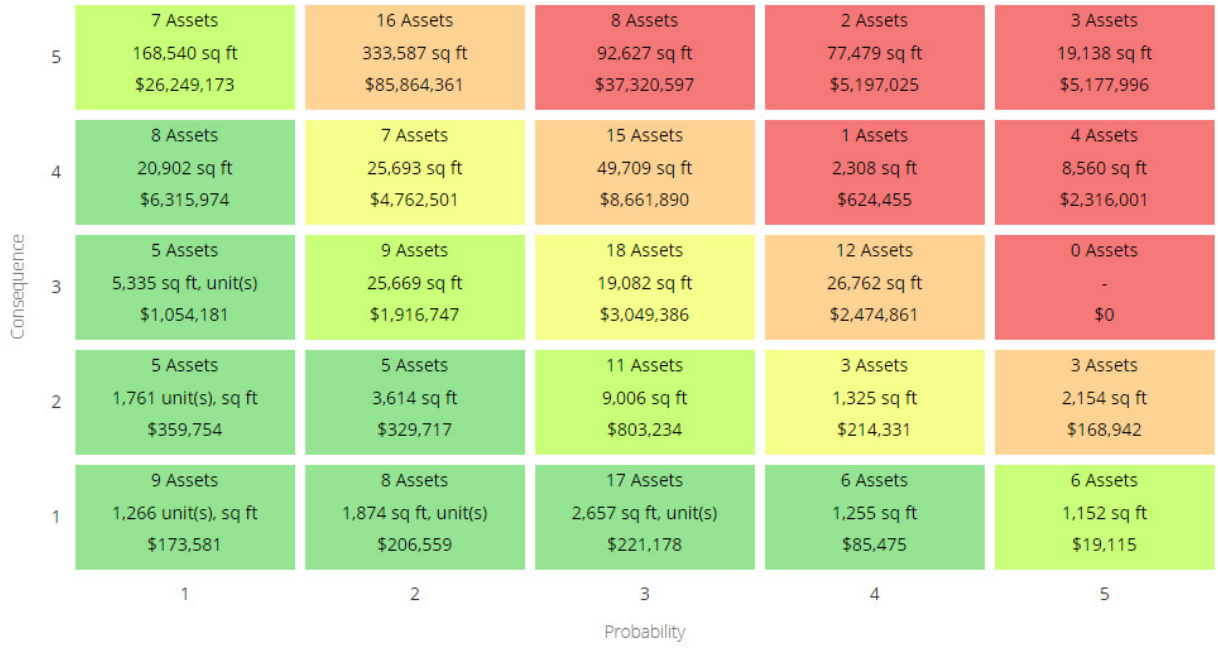


Figure 35 Distribution of Assets Based on Risk – Machinery & Equipment

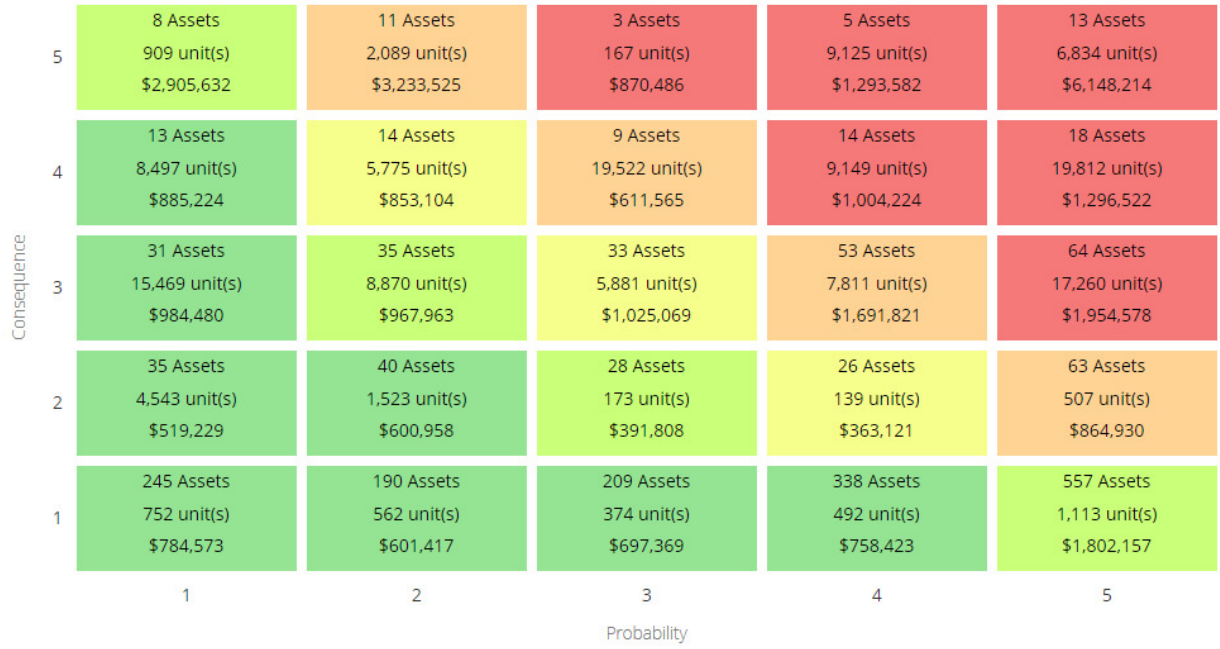


Figure 36 Distribution of Assets Based on Risk – Land Improvements

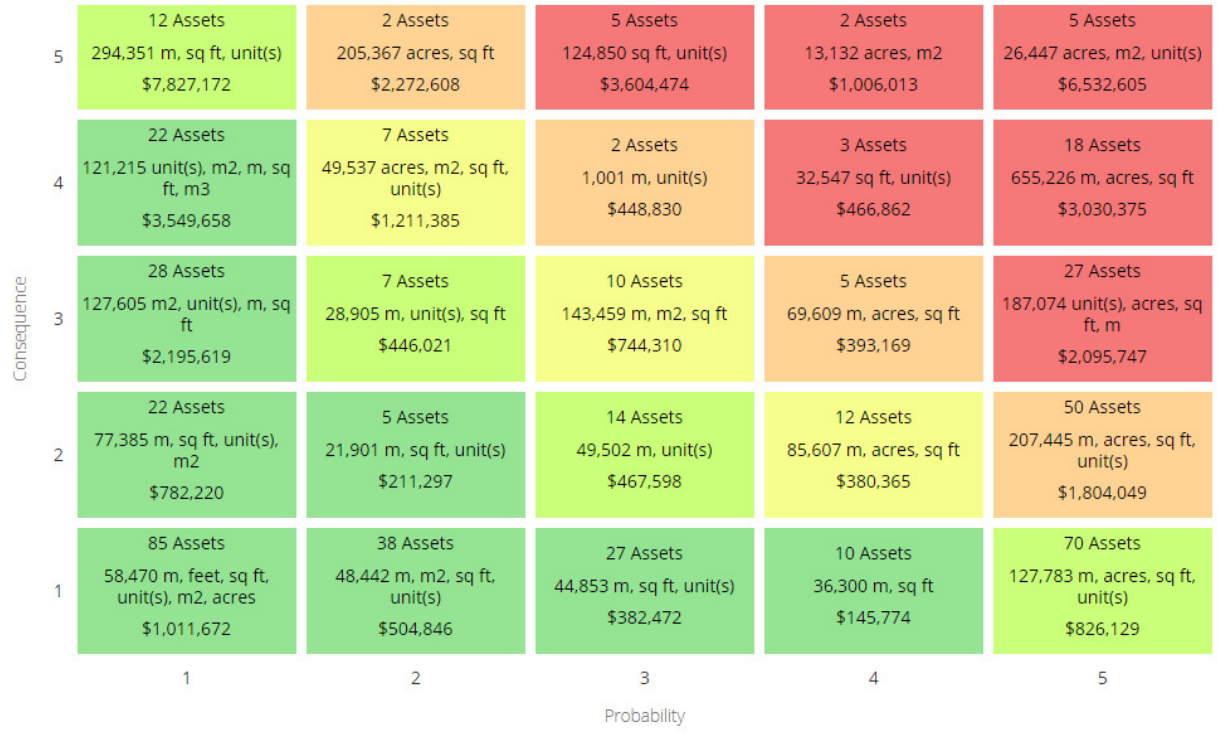


Figure 37 Distribution of Assets Based on Risk – Vehicles

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 38 Cost Elements

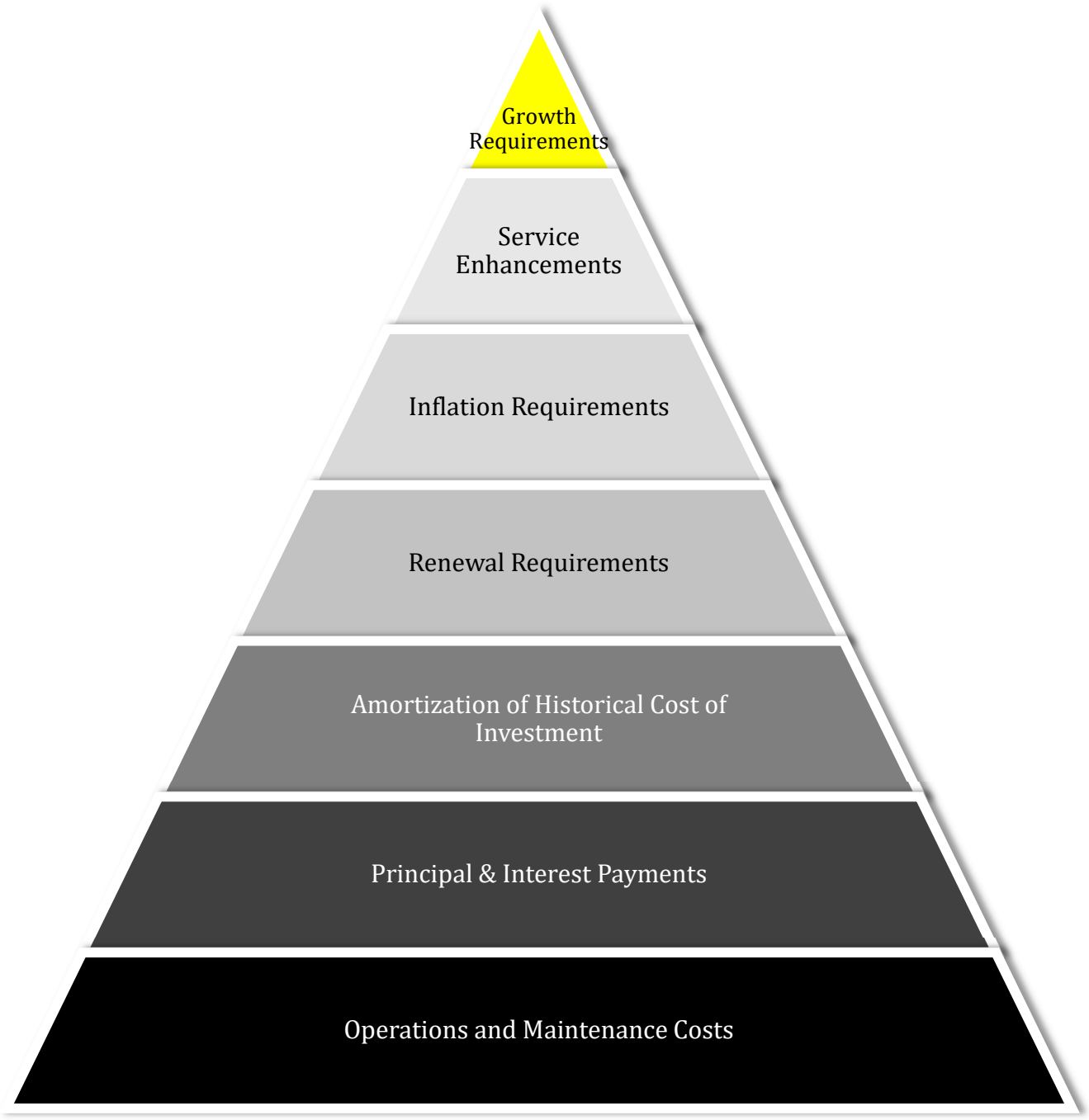


Figure 38 depicts the various cost elements and resulting funding levels that should be incorporated into AMPs that are based on best practices. Municipalities meeting their operational and maintenance needs, and debt obligations are funding only their cash cost. Funding at this level is severely deficient 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: buildings & facilities; machinery & equipment; land improvement; 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 19 and Table 20 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. Please note that the average annual investment required does not take into consideration studies/other non-asset related capital projects, growth related projects components, or new initiatives.

Table 19 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	Taxes to Reserves	Total Funding Available	
Machinery & Equipment	2,645,000	0	0	0	1,487,000	1,487,000	1,158,000
Facilities	4,031,000	0	0	0	1,179,000	1,179,000	2,852,000
Land Improvements	1,312,000	0	0	0	616,000	616,000	696,000
Vehicles	2,079,000	0	0	0	2,192,000	2,192,000	-113,000
Total	10,067,000	0	0	0	5,474,000	5,474,000	4,593,000

2.3 Recommendations for Full Funding

The average annual investment requirement for the above categories is $10,067,000. Annual revenue currently allocated to these assets for capital purposes is $5,474,000 leaving an annual deficit of $4,593,000. To put it another way, these infrastructure categories are currently funded at 54% of their long-term requirements.

In 2017, Haldimand County has annual tax revenues of $61,269,000. As illustrated in Table 20, without consideration of any other sources of revenue, full funding would require the following tax change over time:

Table 20 Tax Change Required for Full Funding

Asset class	Tax Change Required for Full Funding
Machinery & Equipment	1.9%
Facilities	4.7%
Land Improvements	1.1%
Vehicles	-0.2%
Total	7.5%

As illustrated in Table 24, Haldimand County's debt payments for these asset categories will be decreasing by $176,000 over the next 5 years and by $1,407,000 over the next 10 years. Although not shown in the table, debt payment decreases will be $2,465,000 and $2,752,000 over the next 15 and 20 years respectively.

Our recommendations include capturing the above changes and allocating them to the infrastructure deficit. Table 21 outlines this concept and presents a number of options.

Table 21 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	4,593,000	4,593,000	4,593,000	4,593,000	4,593,000	4,593,000	4,593,000	4,593,000
Change in OCIF Grant	N/A	N/A	N/A	N/A	0	0	0	0
Changes in Debt Costs	N/A	N/A	N/A	N/A	-176,000	-1,407,000	-2,465,000	-2,752,000
Resulting Infrastructure Deficit	4,593,000	4,593,000	4,593,000	4,593,000	4,417,000	3,186,000	2,128,000	1,841,000
Resulting Tax Increase Required:								
Total Over Time	**7.5%**	**7.5%**	**7.5%**	**7.5%**	**7.2%**	**5.2%**	**3.5%**	**3.0%**
Annually	1.5%	0.8%	0.5%	0.4%	1.4%	0.5%	0.2%	0.2%

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:

- when realized, reallocating the debt cost reductions of $2,465,000 to the infrastructure deficit as outlined above.
- increasing tax revenues by 0.2% 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.
- reallocating appropriate revenue from categories in a surplus position to those in a deficit position.
- 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 $6,163,000 for machinery & equipment, $7,180,000 for facilities, $12,512,000 for land improvements and $761,000 for vehicles. Prioritizing future projects will require the current data to be replaced by condition based data. Although our recommendations include no further use of debt, the results of the condition based analysis may require otherwise.

4. Use of Debt

For reference purposes, Table 22 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.

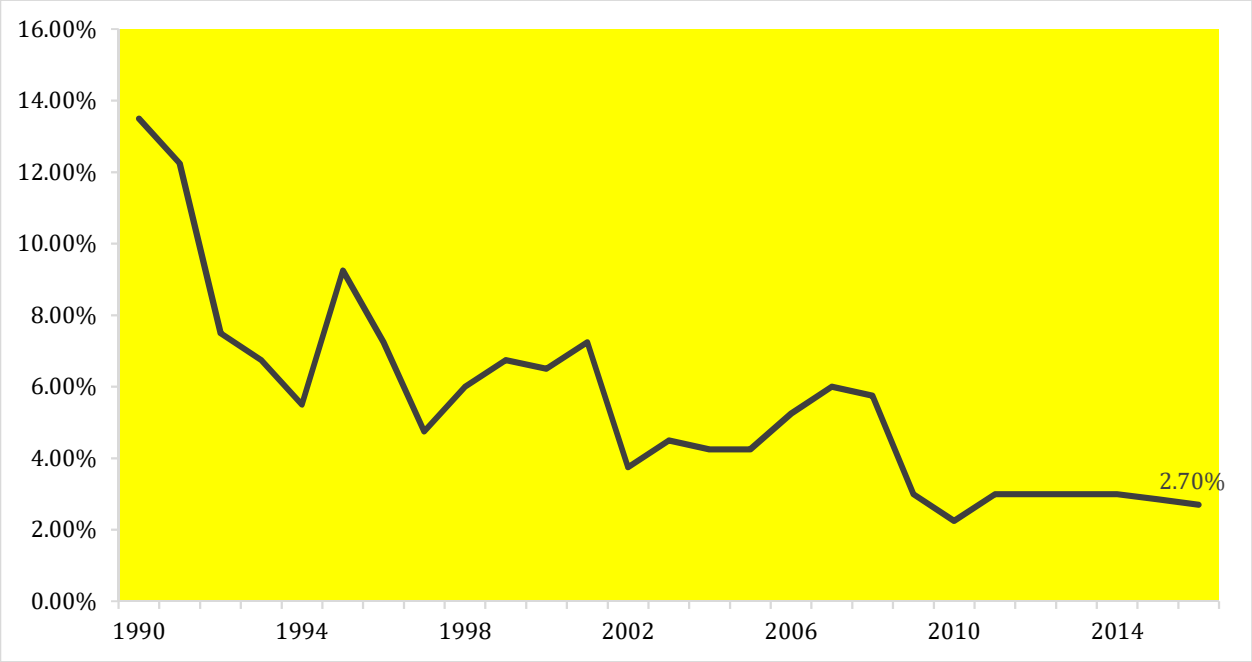
Table 22 Total Interest Paid as a Percentage of Project Costs

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 were at 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 39 Historical Prime Business Interest Rates



As illustrated in Table 22 , 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 23 and Table 24 outline how Haldimand County has historically used debt for investing in the asset categories as listed. There is currently $22,912,000 of debt outstanding for the assets covered by this AMP with corresponding principal and interest payments of $2,752,000. In terms of overall debt capacity, Haldimand County has a provincially prescribed maximum for debt payments of $31,623,000.

Table 23 Overview of Use of Debt

Asset class	Debt at December 31st, 2016	Use of Debt in Last Five Years				
		2012	2013	2014	2015	2016
Machinery & Equipment	0	0	0	0	0	0
Facilities	22,912,000	0	10,096,000	0	0	0
Land Improvements	0	0	0	0	0	0
Vehicles	0	0	0	0	0	0
Total Tax Funded	22,912,000	0	10,096,000	0	0	0

Table 24 Overview of Debt Costs

Asset class	Principal & Interest Payments in Next Ten Years						
	2017	2018	2019	2020	2021	2022	2027
Machinery & Equipment	0	0	0	0	0	0	0
Facilities	2,752,000	2,903,000	2,822,000	2,742,000	2,658,000	2,576,000	1,345,000
Land Improvements	0	0	0	0	0	0	0
Vehicles	0	0	0	0	0	0	0
Total Tax Funded	2,752,000	2,903,000	2,822,000	2,742,000	2,658,000	2,576,000	1,345,000

The revenue options outlined in this plan allow Haldimand County 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 25 outlines the details of the reserves currently available to Haldimand County.

Table 25 Summary of Reserves Available

Asset class	Balance at December 31st, 2016
Machinery & Equipment	5,977,000
Facilities	4,878,000
Land Improvements	3,103,000
Vehicles	6,788,000
Total Tax Funded	**20,746,000**

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 25 are available for use by applicable asset classes during the phase-in period to full funding. This, coupled with Haldimand County'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 Haldimand County updates its AMP, we recommend that future planning should include determining what its long-term reserve balance requirements are and a plan to achieve such balances.

X. 2017 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 26 2016 Infrastructure Report Card

Asset class	Asset Health Grade	Funding Percentage	Financial Capacity Grade	Average Asset Class Grade	Comments
Buildings & Facilities	C	29%	F	D	Based on 2016 replacement cost, and age-based data, 58% of assets, with a valuation of $171.5 million, are in good to very good condition; 21% are in poor to very poor condition. The municipality is underfunding its assets. Tax-funded categories are funded at 54%
Machinery & Equipment	D	56%	D	D	
Land Improvements	C	47%	D	D	
Vehicles	D	105%	A	C	
		Average Asset Health Grade	C		
		Average Financial Capacity Grade	F		
		Overall Grade for the Municipality	D		

XI. Appendix: Grading and Conversion Scales

Table 27 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 28 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 underprepared 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.