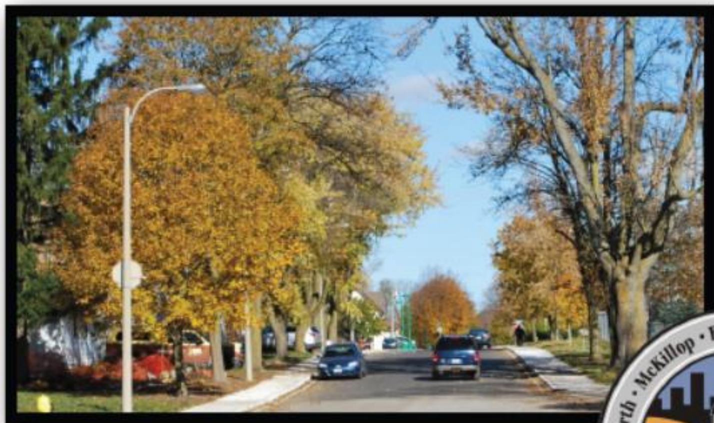


The 2017 Asset Management Plan for the

Municipality of Huron East

SUBMITTED BY THE PUBLIC SECTOR DIGEST INC. (PSD)
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Executive Summary

Infrastructure is inextricably linked to the economic, social and environmental advancement of a community. Municipalities own and manage nearly 60% of the public infrastructure stock in Canada. As analyzed in this asset management plan (AMP), the Municipality of Huron East's infrastructure portfolio comprises the following asset classes: road network, bridges & culverts, buildings & facilities, storm network, water systems, wastewater systems, machinery & equipment, and vehicles. The asset classes analyzed in this asset management plan for the municipality had a total 2016 valuation of $310 million, of which roads comprised 50%.

Strategic asset management is critical in extracting the highest total value from public assets at the lowest lifecycle cost. This AMP, the municipality's third following the completion of its first edition in 2013 and second edition in 2015, 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. The municipality has continuously invested into its infrastructure over the decades. Investments fluctuated during the 1960s and 1970s and then peaked in the late 1990s. During this time, $39 million was invested with $33 million put into the road network. Since 2015, $10 million has been invested with a focus on roads, the water systems and machinery & equipment.

Based on 2016 replacement costs, and primarily condition data, over 27% of assets, with a valuation of $77 million, are in good to very good condition; 46% are in poor to very poor condition. The municipality has provided condition information for 22% of assets based on 2016 replacement costs. Nearly 70% of the assets analyzed in this AMP have at least 10 years of useful life remaining. However, 20%, with a valuation of $53 million, remain in operation beyond their established useful life. An additional 4.5% 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 road network, bridges & culverts, buildings & facilities, storm network, machinery & equipment and vehicles categories is $4,806,000. Annual revenue currently allocated to these assets for capital purposes is $2,694,000 leaving an annual deficit of $2,112,000. To put it another way, these infrastructure categories are currently funded at 56% of their long-term requirements. In 2016, Huron East has annual tax revenues of $4,088,000. Our strategy includes full funding being achieved over 20 years by:

- when realized, reallocating the debt cost reductions of $146,000 to the infrastructure deficit.
- increasing tax revenues by 2.1% each year for the next 20 years solely for the purpose of phasing in full funding to the tax funded asset classes covered in this AMP.
- allocating the current gas tax and OCIF revenue and scheduled increases to the infrastructure deficit as they occur.

- 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.

The average annual investment requirement for wastewater services and water services is $811,000. Annual revenue currently allocated to these assets for capital purposes is $713,000 leaving an annual deficit of $98,000. To put it another way, these infrastructure categories are currently funded at 88% of their long-term requirements. In 2016, Huron East has annual wastewater revenues of $1,103,000 and annual water revenues of $1,384,000.

To achieve financial sustainability for its rate-based assets, we recommend;

For the Wastewater Systems:

We recommend the 20-year option which involves full funding being achieved over 20 years by:

- increasing rate revenues by 1.6% for the wastewater services each year for the next 20 years solely for the purpose of phasing in full funding.
- increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis.
- Aligning this financial strategy with Huron East's Water and Wastewater Financial Plan developed in accordance with Regulation 453/07.

For the Water Systems:

There is currently a capital surplus of $254,000. At least two factors need to be quantified before any rate reductions are considered:

a) Implementing a condition based analysis which may identify different pent up investment requirements. A corresponding financial plan can then be developed taking into account that there are $2,237,000 of reserves available for water infrastructure.

b) 54% of water revenues are currently allocated to operations as opposed to capital. Overall rates should not be decreased until longer term operational requirements are determined and taken into account. This will avoid the complications of lowering rates for capital purposes and then possibly increasing them for operational requirements.

Considering all of the above information, we recommend the following for water services:

- the required work for a) and b) above be completed in order to determine what rate reductions can be achieved and over what period those reductions can be implemented.
- continue to ensure that any surpluses experienced are allocated to the appropriate reserves.
- ensuring that any reductions implemented in the future take into account applicable inflation indexes for the intervening period of time.
- ensuring that, once rates are reduced to the level required for full funding, subsequent rates are adjusted by the applicable inflation index on an annual basis.
- aligning this financial strategy with Huron East's Water and Wastewater Financial Plan developed in accordance with Regulation 453/07.

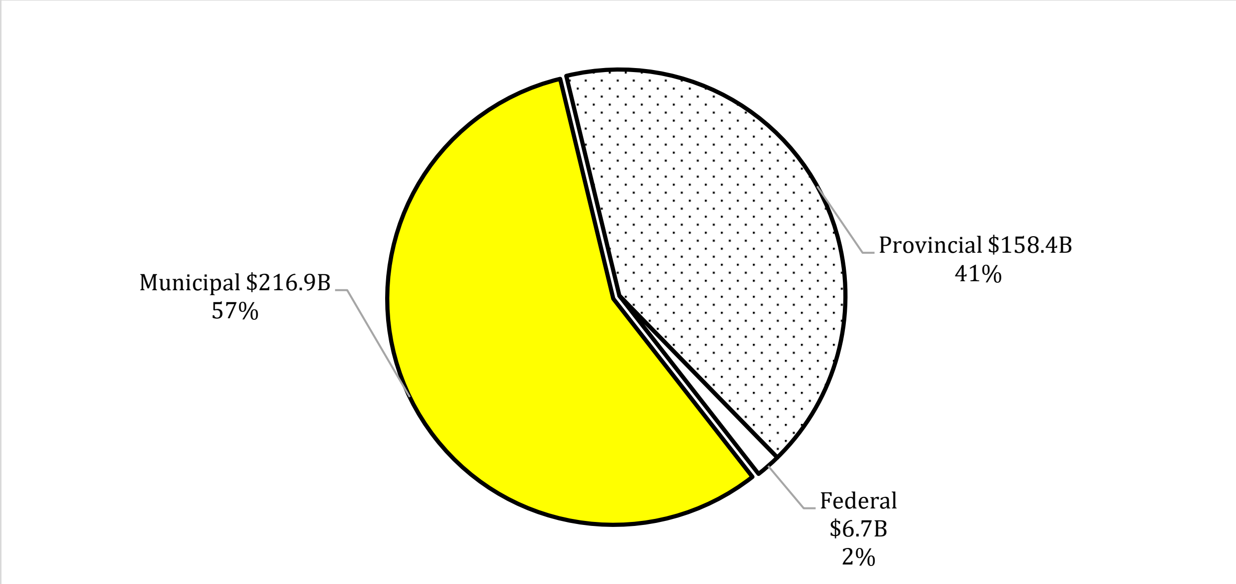
Although our financial strategies allow the municipalities to meet its long-term funding requirements and reach fiscal sustainability, injection of additional revenues will be required to mitigate existing infrastructure backlogs.

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

I. Introduction & Context

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

Figure 1 Distribution of Net Stock of Core Public Infrastructure



Ontario's municipalities own more of the province's infrastructure assets than both the provincial and federal government. The asset portfolios managed by Ontario's municipalities are also highly diverse. The Municipality of Huron East's capital assets portfolio, as analyzed in this asset management plan (AMP) is valued at $310 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 Huron East'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 and second edition of the municipality's asset management plans in 2013 and 2015, 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 analyzed in this document: road network; bridges & culverts; water systems; wastewater systems; storm network; buildings & facilities; machinery & equipment; and vehicles.

IV. Data and Methodology

The municipality's dataset for the asset classes analyzed in this AMP are maintained in PSD's CityWide® Asset Manager 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 diminished 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.

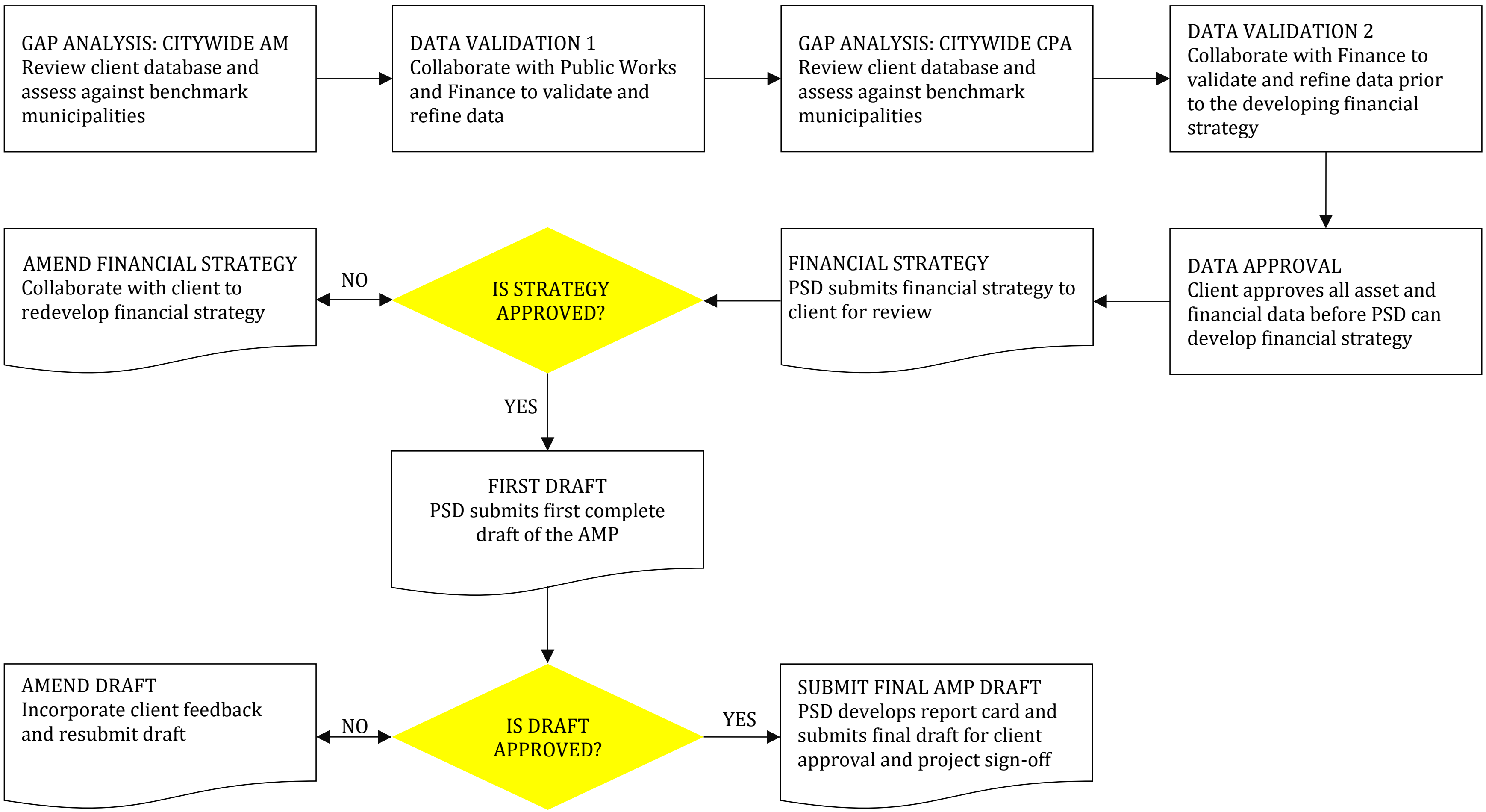
- Our calculations and recommendations will reflect the best available data at the time this AMP was developed.

- 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



6. Data Confidence Rating

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

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

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

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

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

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 $310 million, of which the road network comprised 50%, followed by bridges & culverts at 21%. The ownership per household (Figure 4) totaled $81,074 based on 3,825 households for all asset categories except for water systems with 2,314 households and wastewater systems with 1,839 households.

Figure 3 Asset Valuation by Class

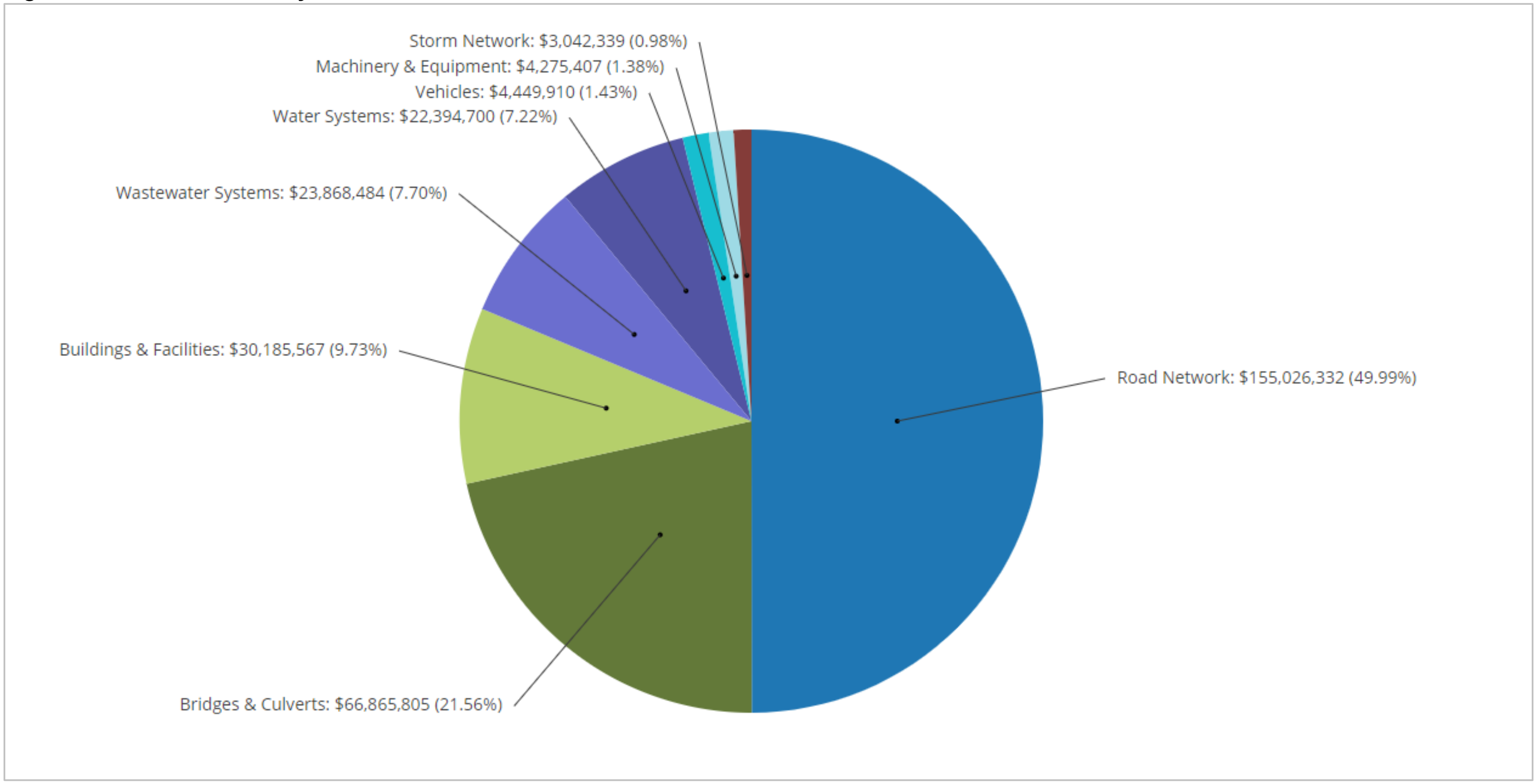
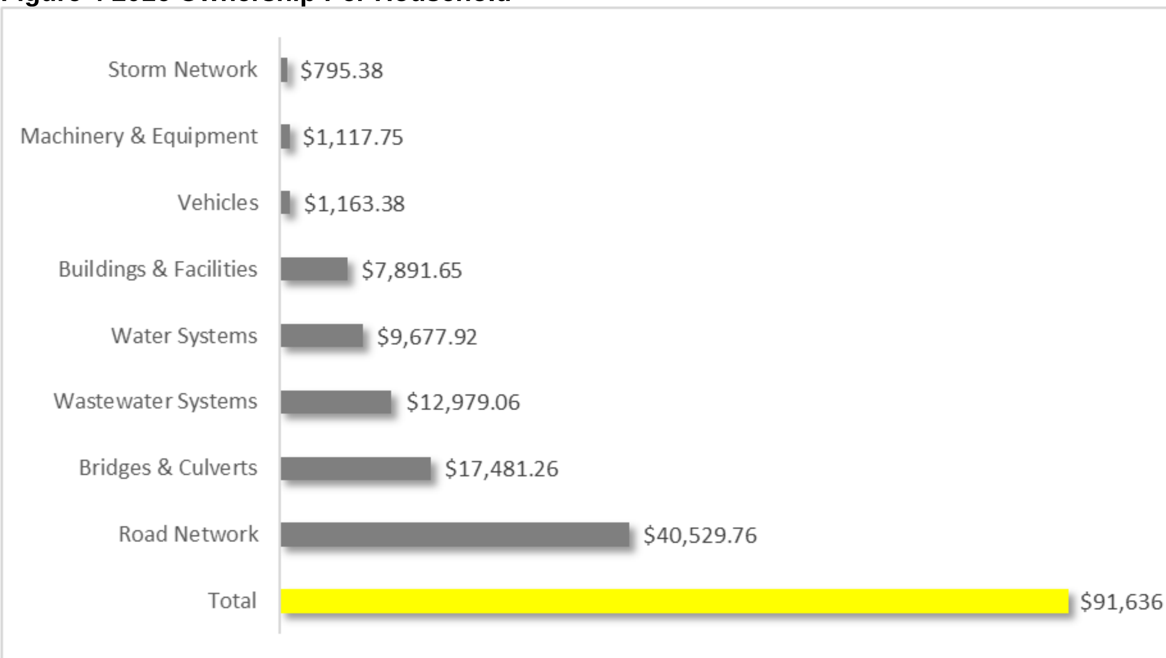
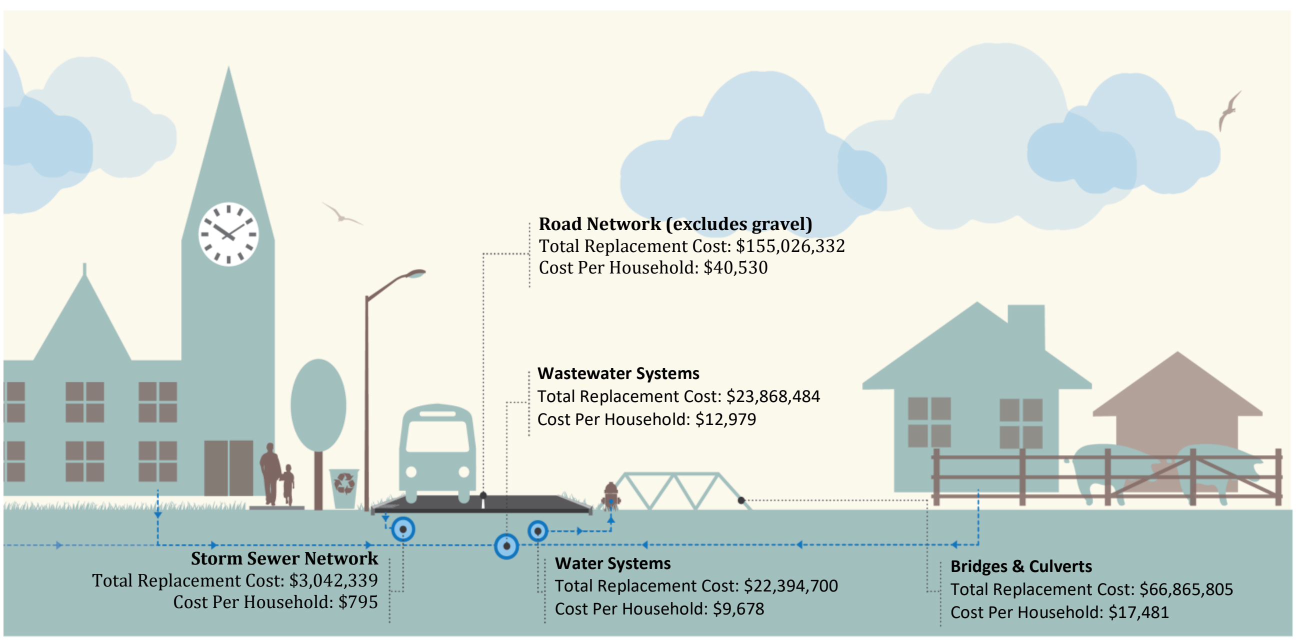


Figure 4 2016 Ownership Per Household



Infrastructure Replacement Cost Per Household

Total: $46,069 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 22% of all assets based on 2016 replacement cost.

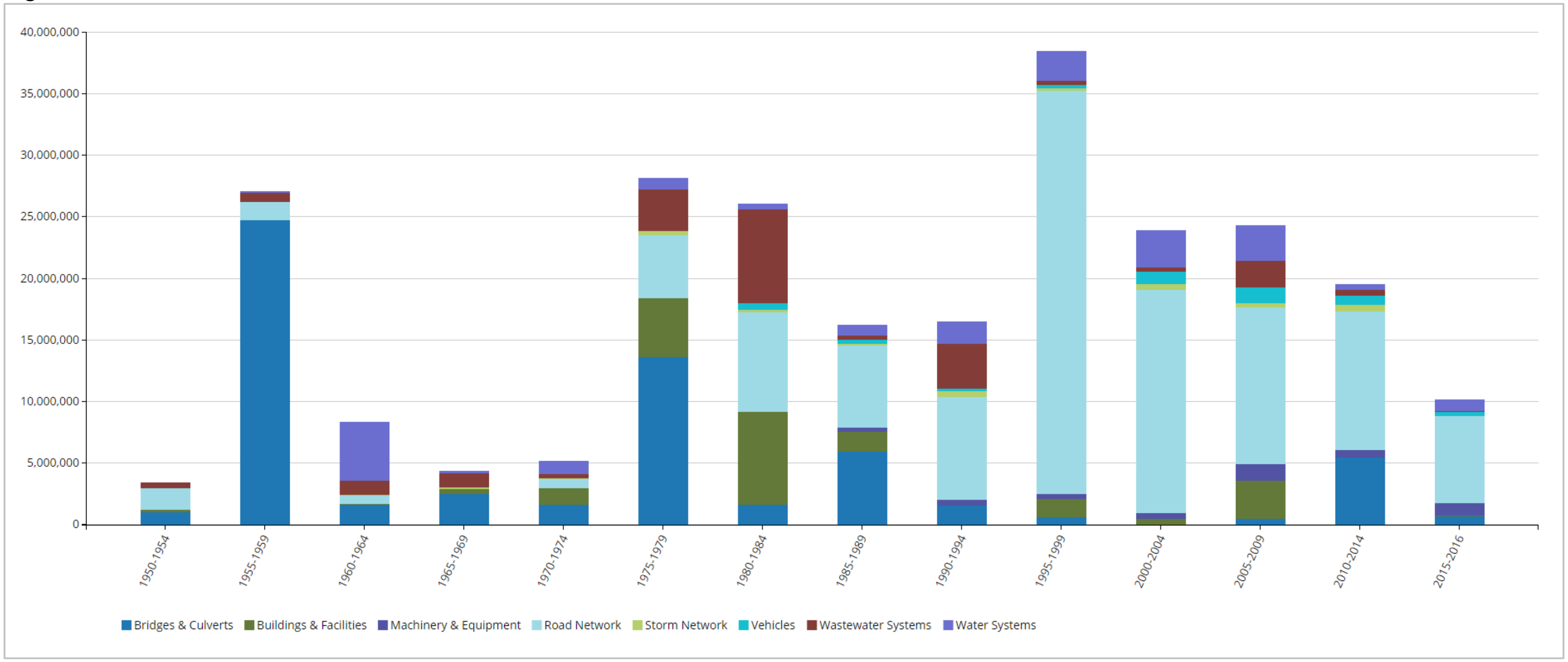
Table 4 Source of Condition Data by Asset Class

Asset class	Component	Source of Condition Data
Roads Network	All	Age-based
Bridges & Culverts	Bridges	100% Assessed - 2016
	Culverts	100% Assessed - 2016
Water Systems	All	Age-based
Wastewater Systems	All	Age-based
Storm Network	All	Age-based
Buildings & Facilities	All	Age-based
Machinery & Equipment	All	Age-based
Vehicles	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 infastructure needs: installation year profile, and useful life remaining. Using 2016 replacement costs, Figure 5 illustrates the historical investments 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

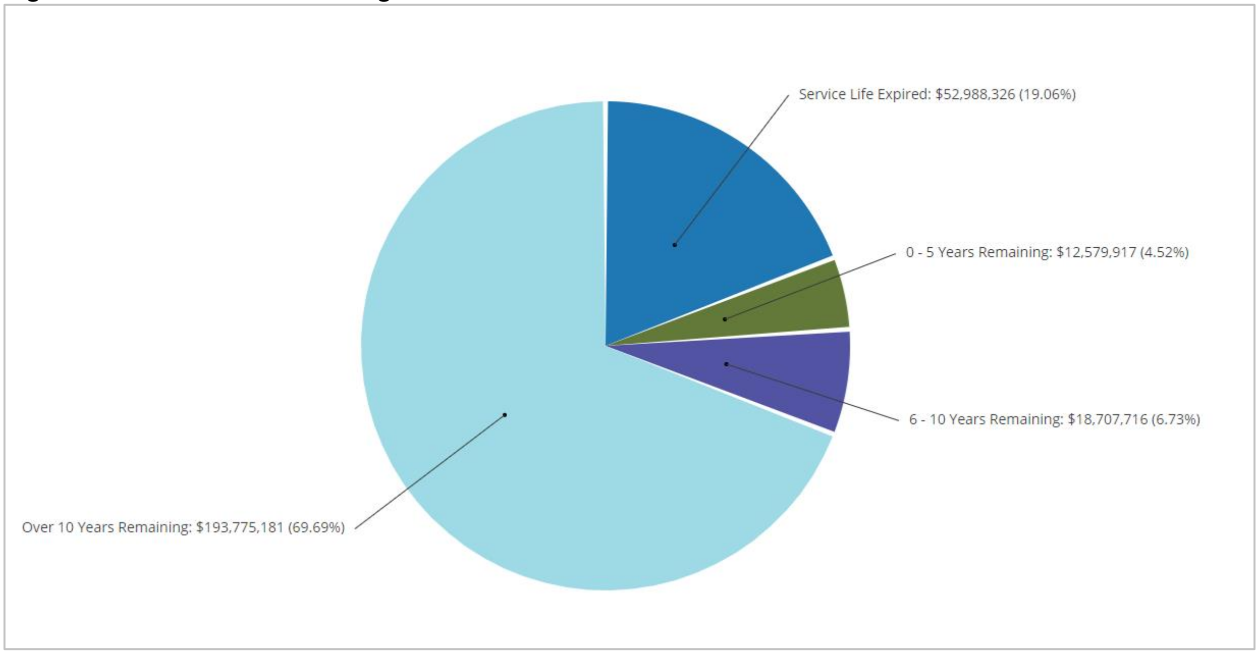


The municipality has continuously invested into its infrastructure continuously over the decades. Investments fluctuated during the 1960s and 1970s and then peaked in the late 1990s. During this time, $39 million was invested with $33 million put into the road network. Since 2015, $10 million has been invested with a focus on road network, water systems and machinery & equipment.

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

Figure 6 Useful Life Remaining as of 2016 – All Asset Classes

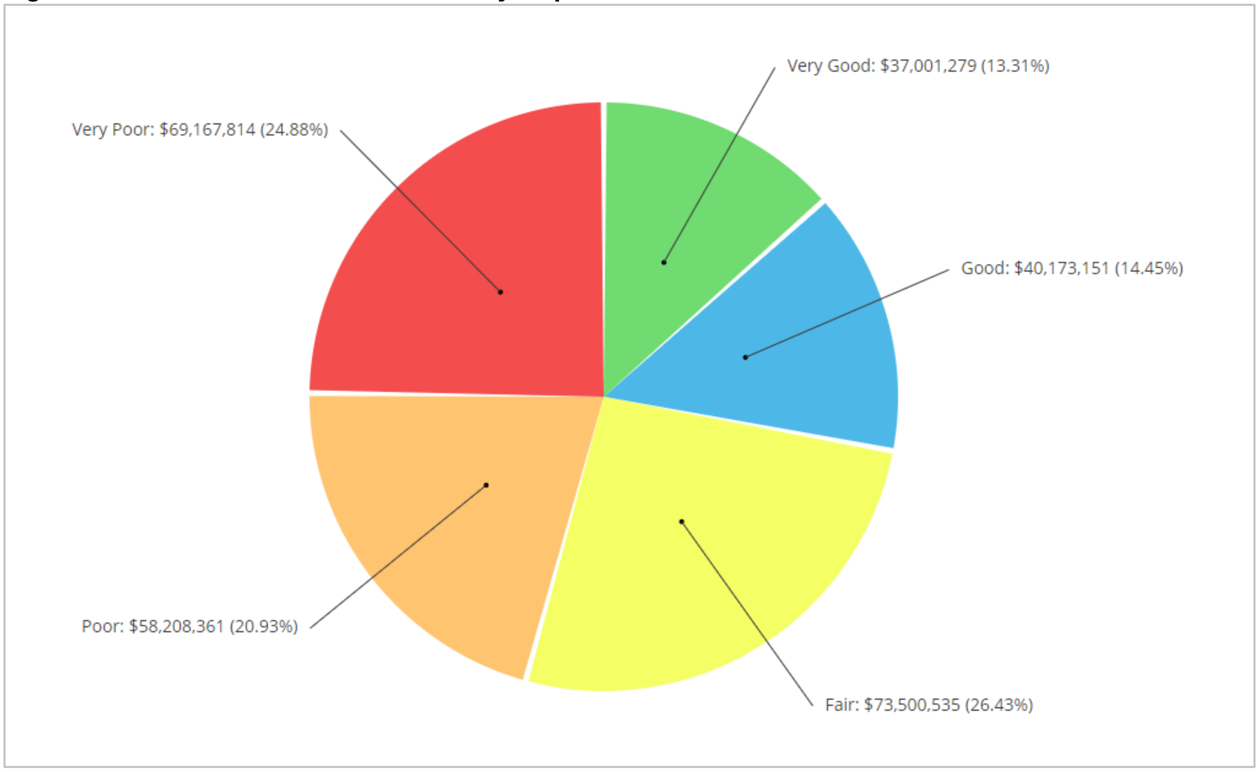


Nearly 70% of the assets analyzed in this AMP have at least 10 years of useful life remaining. However, 20%, with a valuation of $53 million, remain in operation beyond their established useful life. An additional 4.5% will reach the end of their useful life within the next five years.

5. Overall Condition – All Asset Classes

Based on 2016 replacement cost, and primarily condition data, over 28% of assets, with a valuation of $77 million, are in good to very good condition; 46% are in poor to very poor condition.

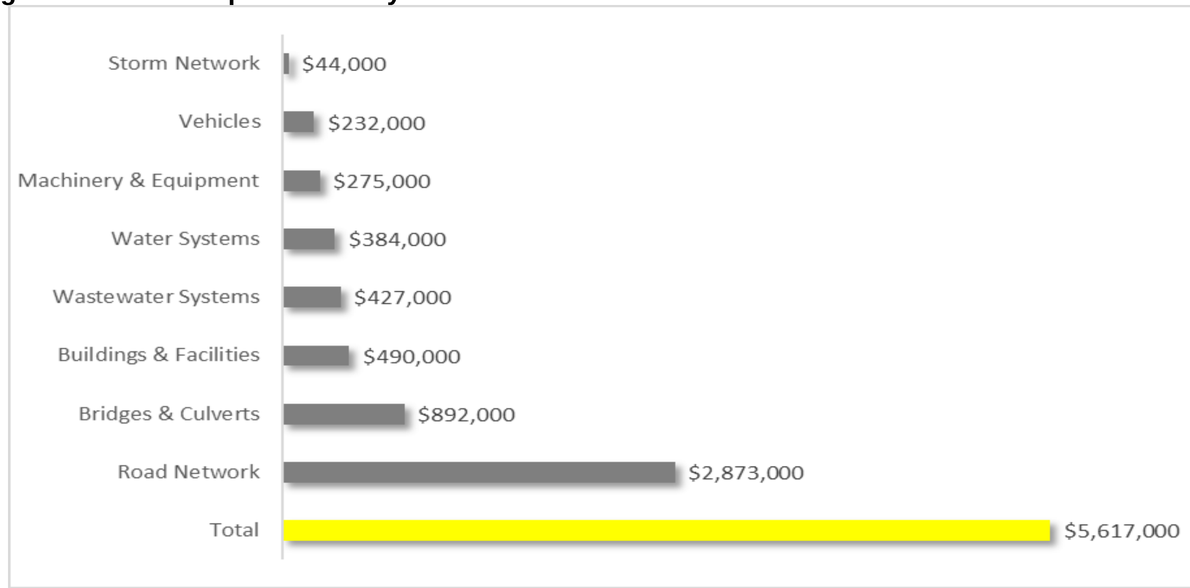
Figure 7 Asset Condition Distribution by Replacement Cost as of 2016 – All Asset Classes



6. Financial Profile

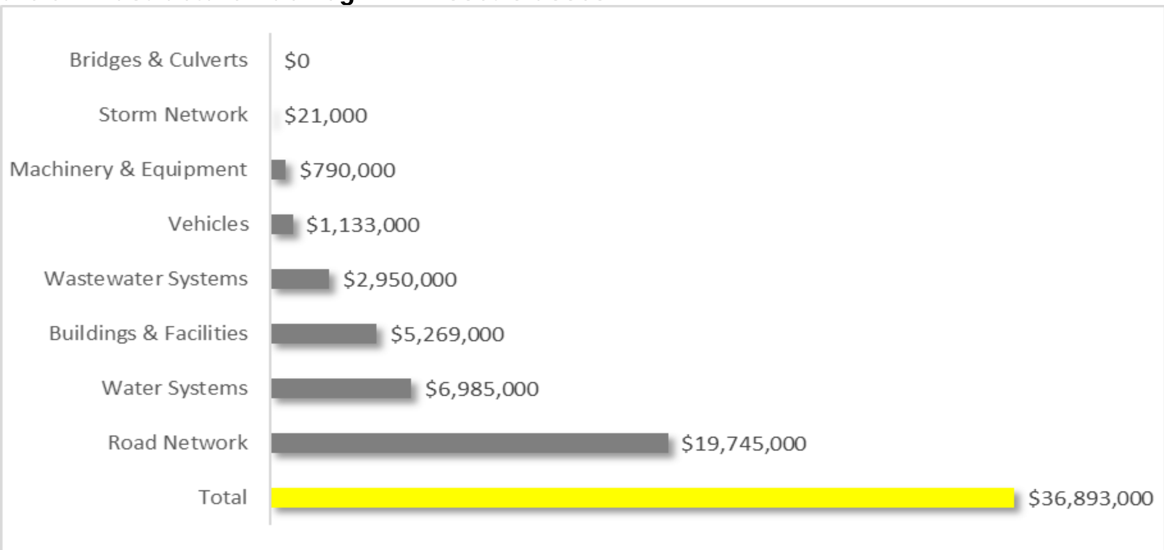
This section details key high-level financial indicators for the municipality's asset classes.

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 $6.4 million annually for the assets covered in this AMP.

Figure 9 Infrastructure Backlog – All Asset Classes

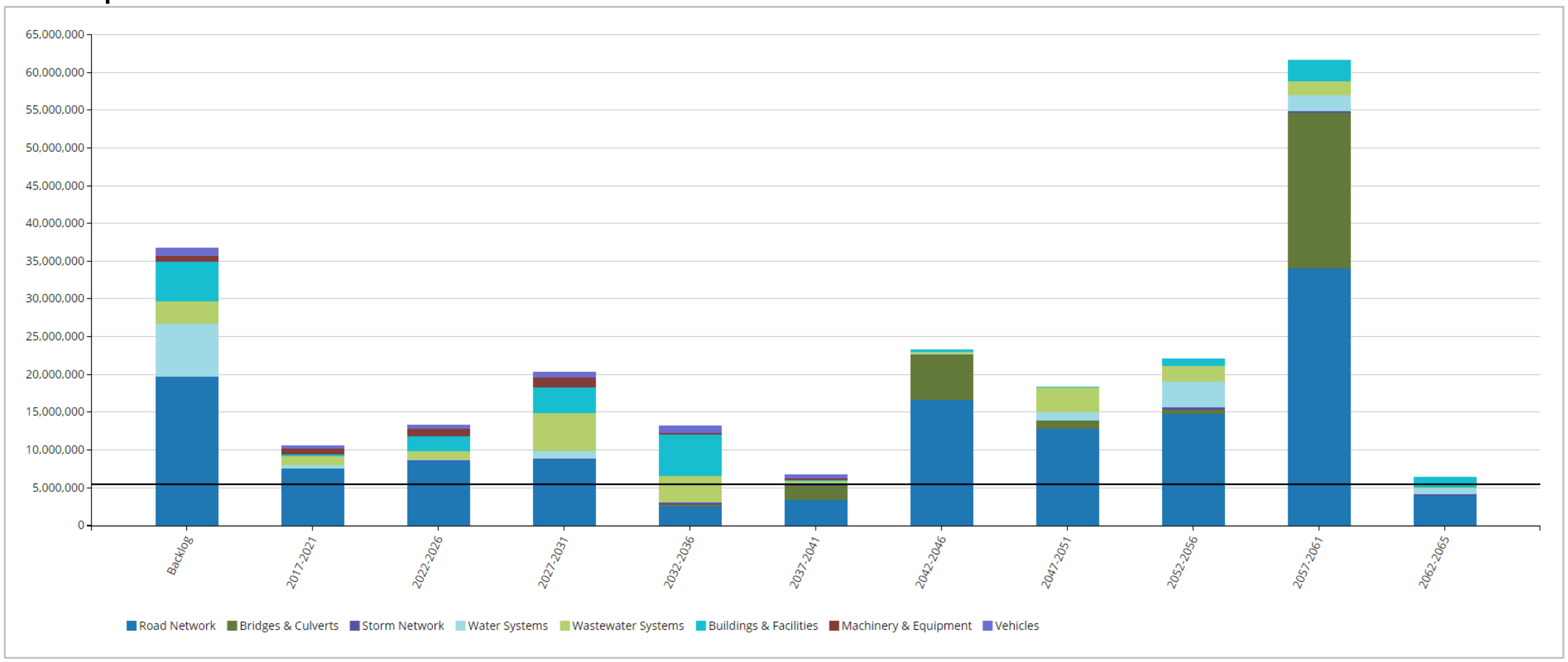


The municipality has a combined infrastructure backlog of $37 million, with roads comprising 54%. The backlog represents the investment needed today to meet previously deferred replacement needs. In the absence of assessed data, the backlog represents the value of assets still in operation beyond their 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. In the absence of observed data, the backlog represents the value of assets that remain in operation beyond their useful life.

Figure 10 Replacement Profile – All Asset Classes



Based primarily on age-based data, the municipality has a combined backlog of $37 million, of which the road network comprises $19.7 million. Aggregate replacement needs will total $10.6 million over the next five years. An additional $13.8 million will be required between 2022 and 2026. The municipality's aggregate annual requirements (indicated by the black line) total $5.6 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 56% of the annual requirements for tax-funded assets and 89% for rate-funded assets. See the 'Financial Strategy' chapter for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

8. Data Confidence

The municipality has a high degree of confidence in the data used to develop this AMP, receiving a average confidence rating of 84%. This is indicative of significant effort in collecting and refining its data set.

Table 5 Data Confidence Ratings

Asset Class	The data is up-to-date.	The data is complete and uniform.	The data comes from an authoritative source.	The data is error free.	The data is verified by an authoritative source.	Average Confidence Rating
Road Network	80%	80%	80%	80%	80%	80%
Bridges & Culverts	90%	90%	90%	90%	90%	90%
Water Systems	80%	80%	80%	80%	80%	80%
Wastewater Systems	80%	80%	80%	80%	80%	80%
Storm Network	80%	80%	80%	80%	80%	80%
Buildings & Facilities	80%	80%	80%	80%	80%	80%
Machinery & Equipment	90%	90%	90%	90%	90%	90%
Vehicles	90%	90%	90%	90%	90%	90%
					Overall Weighted Average Data Confidence Rating	**83.75%**

VI. State of Local Infrastructure

The state of local infrastructure includes the full inventory, condition ratings, useful life consumption data, the backlog and upcoming infrastructure needs for each asset class. As available, assessed condition data was used to inform the discussion and recommendations; in the absence of such information, age-based data was used as the next best alternative.

1. Road Network

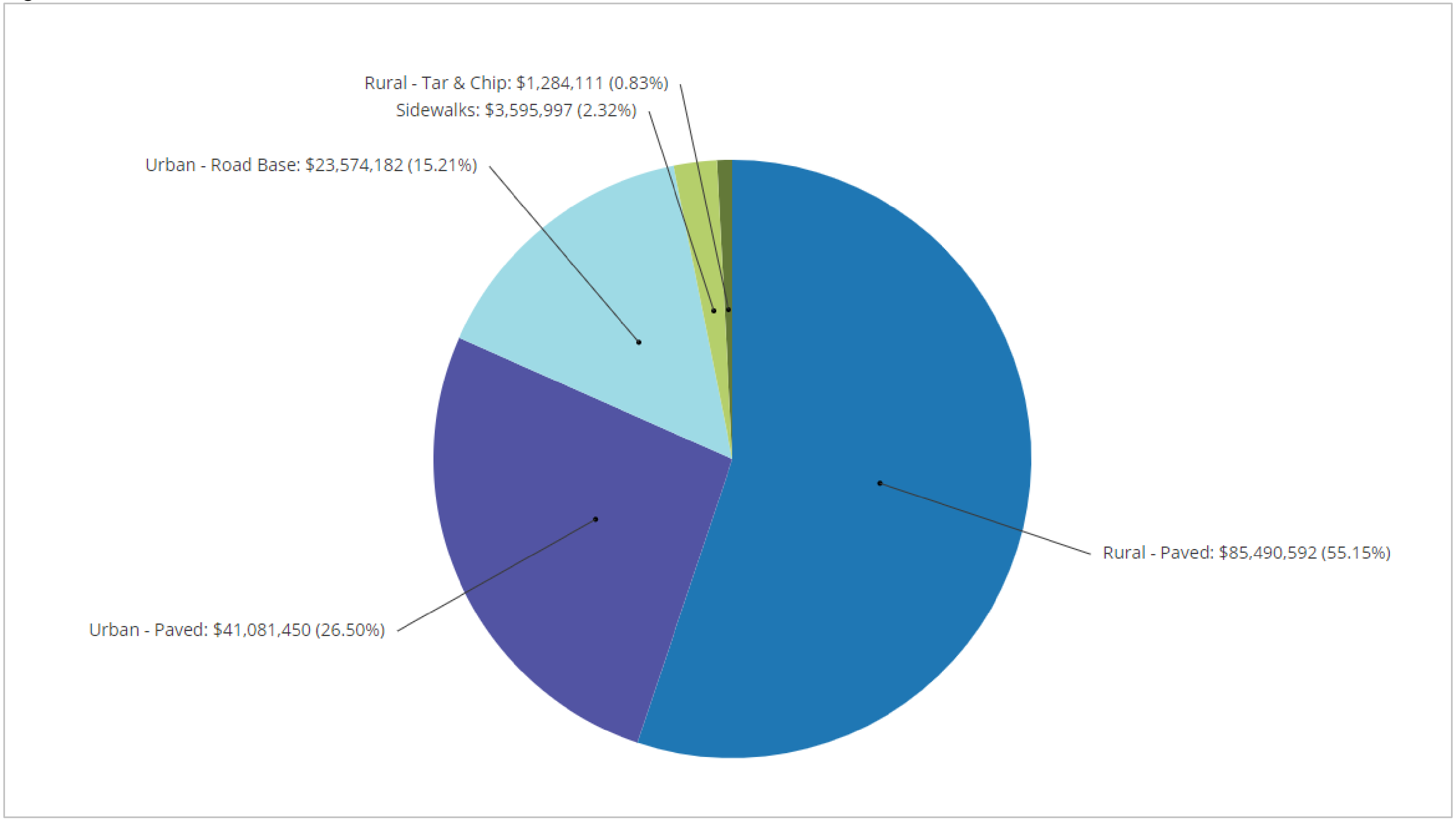
1.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 6 illustrates key asset attributes for the municipality's road network, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's roads assets are valued at $155 million based on 2016 replacement costs. The useful life indicated for each asset type below was assigned by the municipality.

Table 6 Key Asset Attributes – Road Network

Asset Type	Asset Component	Quantity	Useful Life (Years)	Valuation Method	2016 Overall Replacement Cost
Road Network	Rural - Gravel (Base)	343,364m	75	Not Planned for Replacement	-
	Rural - Paved (Surface)	154,176m	25	$409.00 Cost per Unit	$85,490,592
	Rural - Paved (Base)	154,176m	75	Not Planned for Replacement	-
	Rural - Tar & Chip (Surface)	21,051m	15	$45.00 Cost per Unit	$1,284,111
	Rural - Tar & Chip (Base)	21,051m	75	Not Planned for Replacement	-
	Sidewalks	96,639.20m2	30	NRBCPI (Toronto)	$3,595,997
	Urban - Paved	35,723m	30	$890.00 Cost per Unit	$41,081,450
	Urban - Road Base	36,122m	75	NRBCPI (Toronto)	$23,574,182
				Total	**$155,026,332**

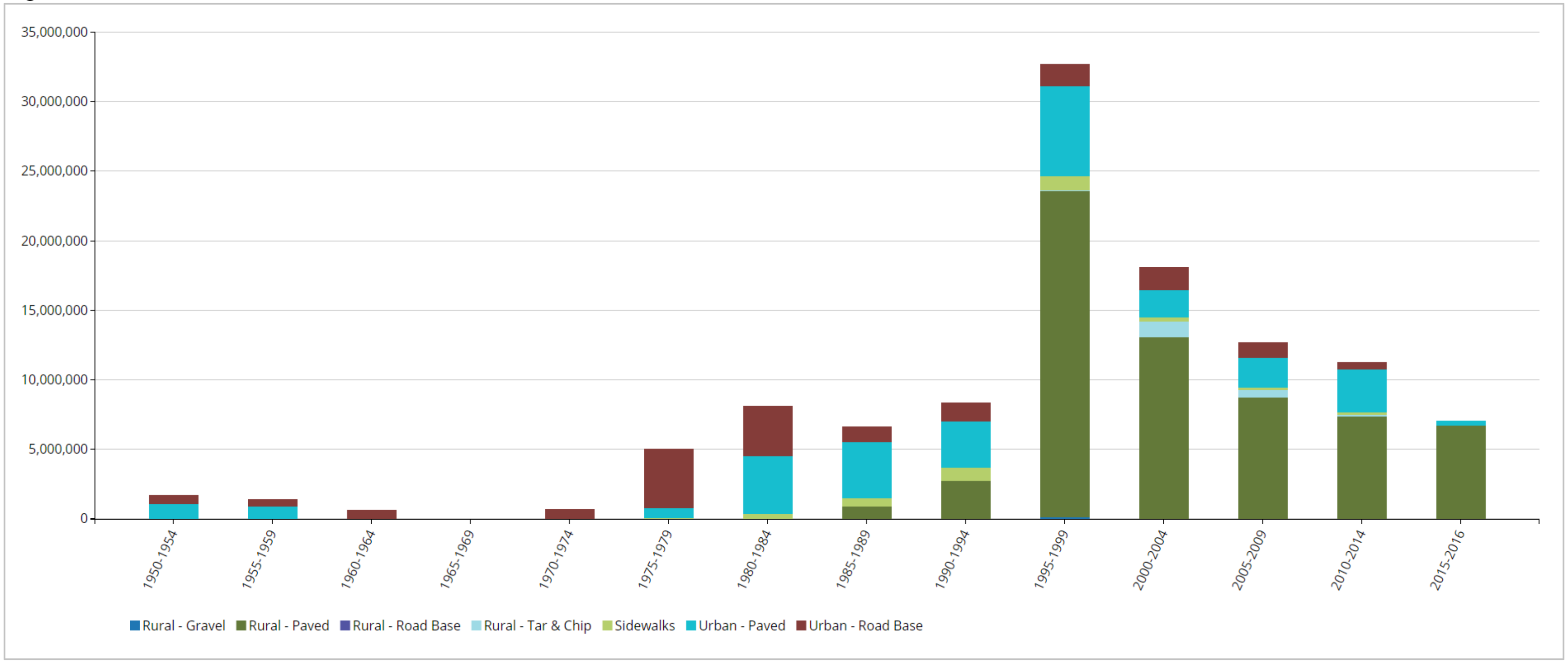
Figure 11 Asset Valuation – Road Network



1.2 Historical Investment in Infrastructure

Figure 12 shows the municipality's historical investments in its road network since 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 – Road Network

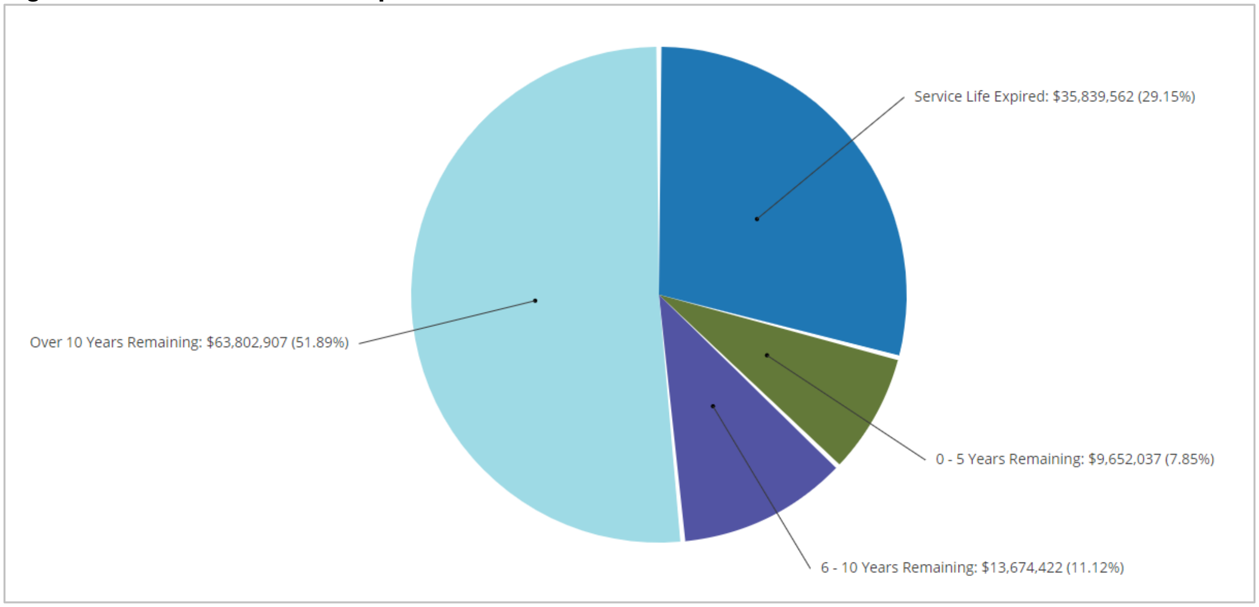


Investments in the municipality's road network have grown since 1950 with a large increase in the late 1990s. Starting in 1995, the period of largest investment, $33 million was invested with over $23 million put into rural paved roads.

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 road network.

Figure 13 Useful Life Consumption - Road Network

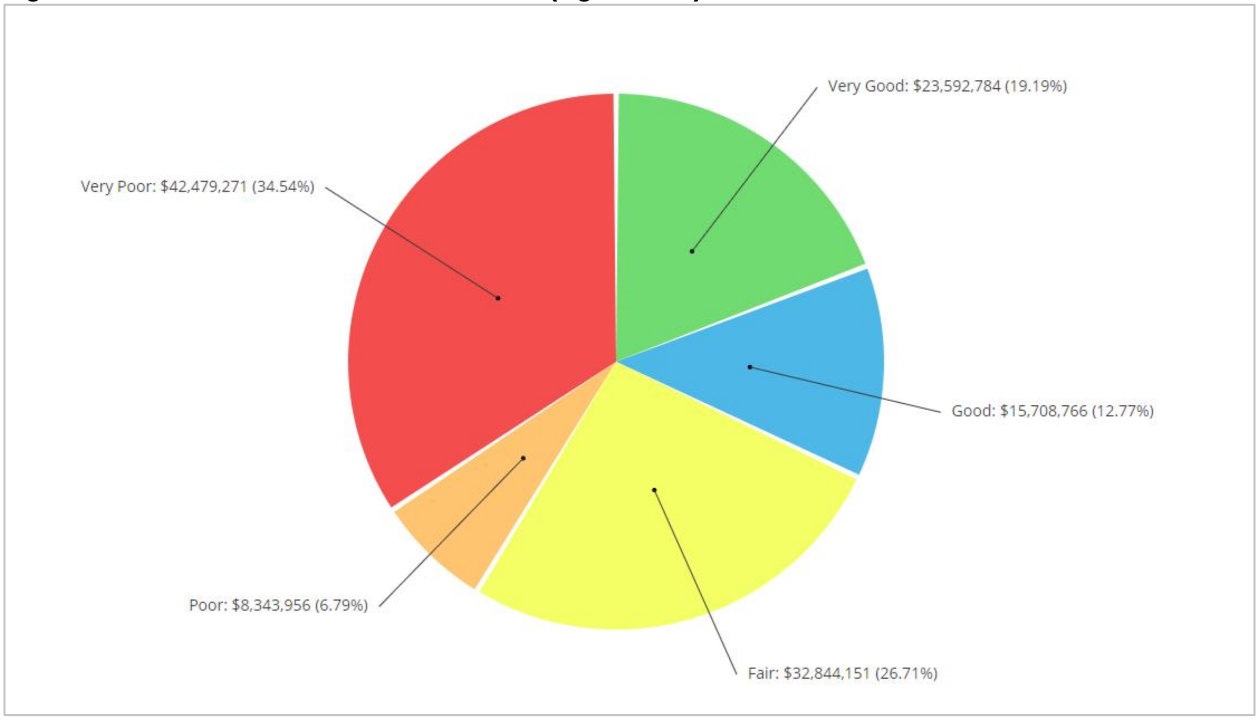


While 52% of the municipality's road network has at least 10 years of useful life remaining, 29%, with a valuation of $36 million, remain in operation beyond their useful life. An additional 8% will reach the end of their useful life within the next five years.

1.4 Current Asset Condition

Using replacement cost, in this section we summarize the condition of the municipality's road network 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. All assets are based on age-based data.

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



Based on age-based condition data, 32% of road network assets, with a valuation of $39 million are in good to very good condition; 41% are in poor to very poor condition.

1.5 Lifecycle Management Framework

There are generally four distinct phases in an asset's life cycle that require specific types of attention and lifecycle activity. These are presented at a high level for the road network below. Further detail is provided in the "Asset Management Strategy" section of this AMP.

Table 7 Key Asset Attributes – Road Network

Addressing Asset Needs		
Phase	**Lifecycle Activity**	**Asset Life Stage**
Minor Maintenance	Activities such as inspections, monitoring, sweeping, winter control, etc.	1st Quarter
Major Maintenance	Activities such as repairing pot holes, grinding out roadway rutting, and patching sections of road.	2nd Quarter
Rehabilitation	Rehabilitation activities such as asphalt overlays, mill and paves, etc.	3rd Quarter
Replacement	Full road construction	4th Quarter

Huron East has developed a lifecycle framework that is currently being applied to the road network. For the purpose of this report the lifecycle events listed in Table 8 are included in replacement costs seen in Table 6 and Figure 15. Addressing the needs of its roads, the municipality has determined when each event should take place to increase the roads' conditions and in turn their overall useful life. The costs associated with these events are derived from Huron East's Public Works Department and are current operational and capital costs incurred during the maintenance of these roads. Adhering to AMP policy, capitals costs will only be recognized in the inventory analysis and financial strategy.

Table 8 Key Asset Attributes – Road Network

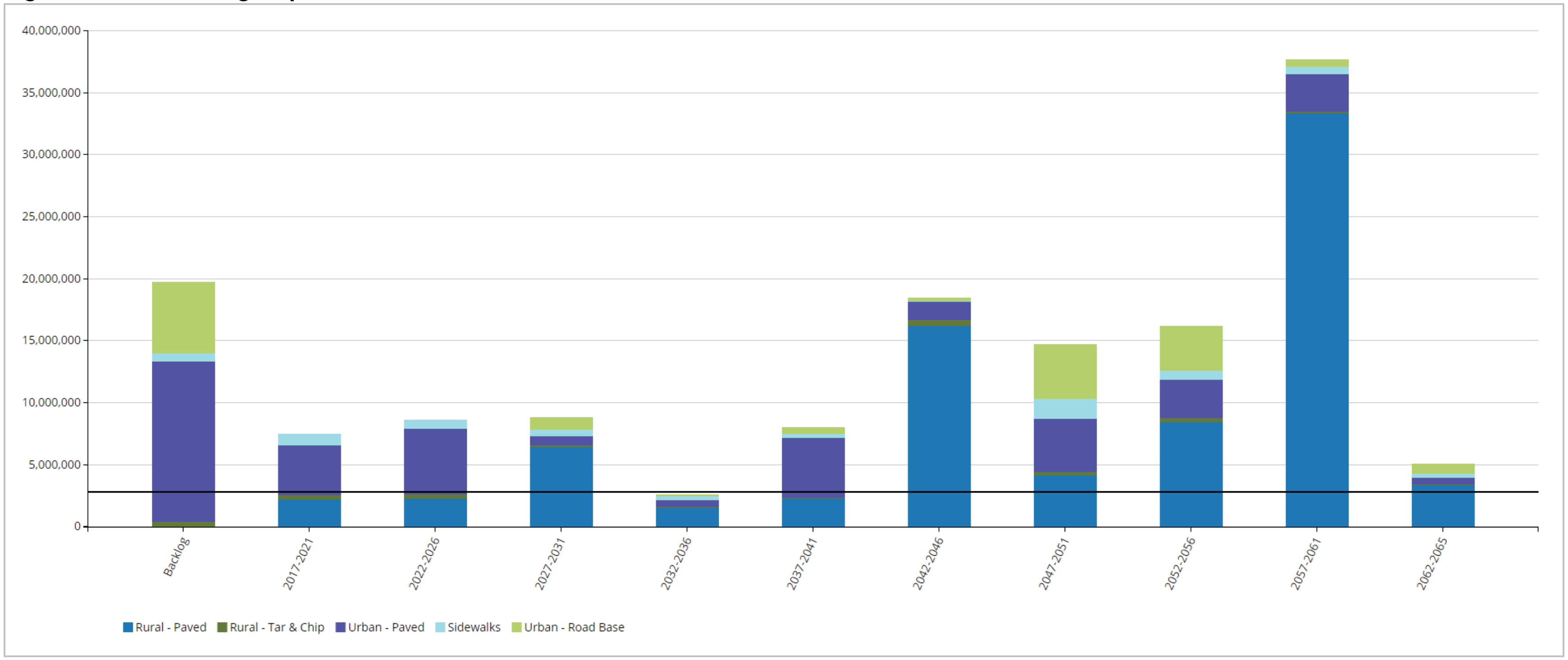
Asset Useful Life in Years				
Asset Type	**Asset Component**	**Event**	**Event Year**	**Event Cost**
Road Network	Rural – Gravel (Surface) Operational	Maintenance - Dust Control	Every (1) Year	$0.44 per m
		Maintenance - Grading	Every (1) Year	$0.55 per m
		Resurfacing	Every (2) Years	$2.72 per m
	Rural – Paved (Surface) Capital	Maintenance - Crack Sealing	Every (5) Years	$1.08 per m
		Resurfacing	15	$83 per m
		Rehabilitation	30	$62.50 per m
		Reconstruction	End of Life	$490 per m
	Urban – Paved (Surface) Capital	Rehabilitation	20	$260 per m
		Reconstruction	End of Life	$890 per m
	Tar & Chip Capital	Resurfacing	7	$4.75 per m2
		Rehabilitation	14	$11.25 per m2

The Municipality of Huron East is currently phasing out its tar & chip roads. During rehabilitation, the roads will become a paved asphalt road. For the purpose of this AMP, these roads are valued as tar & chip.

1.6 Forecasting Replacement Needs

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

Figure 15 Forecasting Replacement Needs – Road Network



In addition to a backlog of $19.7 million, replacement needs are forecasted to be $7.5 million in the next five years; an additional $8.6 million is forecasted in replacement needs between 2022-2026. The municipality's annual requirements (indicated by the black line) for its road network total $2.9 million. At this funding level, the municipality would be allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the municipality is currently allocating $784,000, leaving an annual deficit of $2.1 million. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

1.7 Recommendations – Road Network

- Age-based condition data indicates a backlog of $19.7 million and 10-year replacement needs of $16 million. The municipality should implement condition assessments of road surfaces (tar & chip, rural and urban paved), and expand the program to incorporate all assets in order to more precisely estimate its actual financial requirements and field needs. See Section 2, 'Condition Assessment Programs' in the 'Asset Management Strategies' chapter.

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

- During the condition assessment, assessment of tar & chip roads should project which roads will be phased into asphalt roads. Formulating a plan that fits into the municipality's financial strategy should then be analyzed.

- In addition to the above, the municipality should continue to follow the developed tailored lifecycle activity framework to promote standard lifecycle management of the road network as outlined further within the "Asset Management Strategy" section of this AMP.

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

- The municipality is funding 27% of its long-term requirements on an annual basis. See the 'Financial Strategy' section on how to achieve more sustainable funding levels.

2. Bridges & Culverts

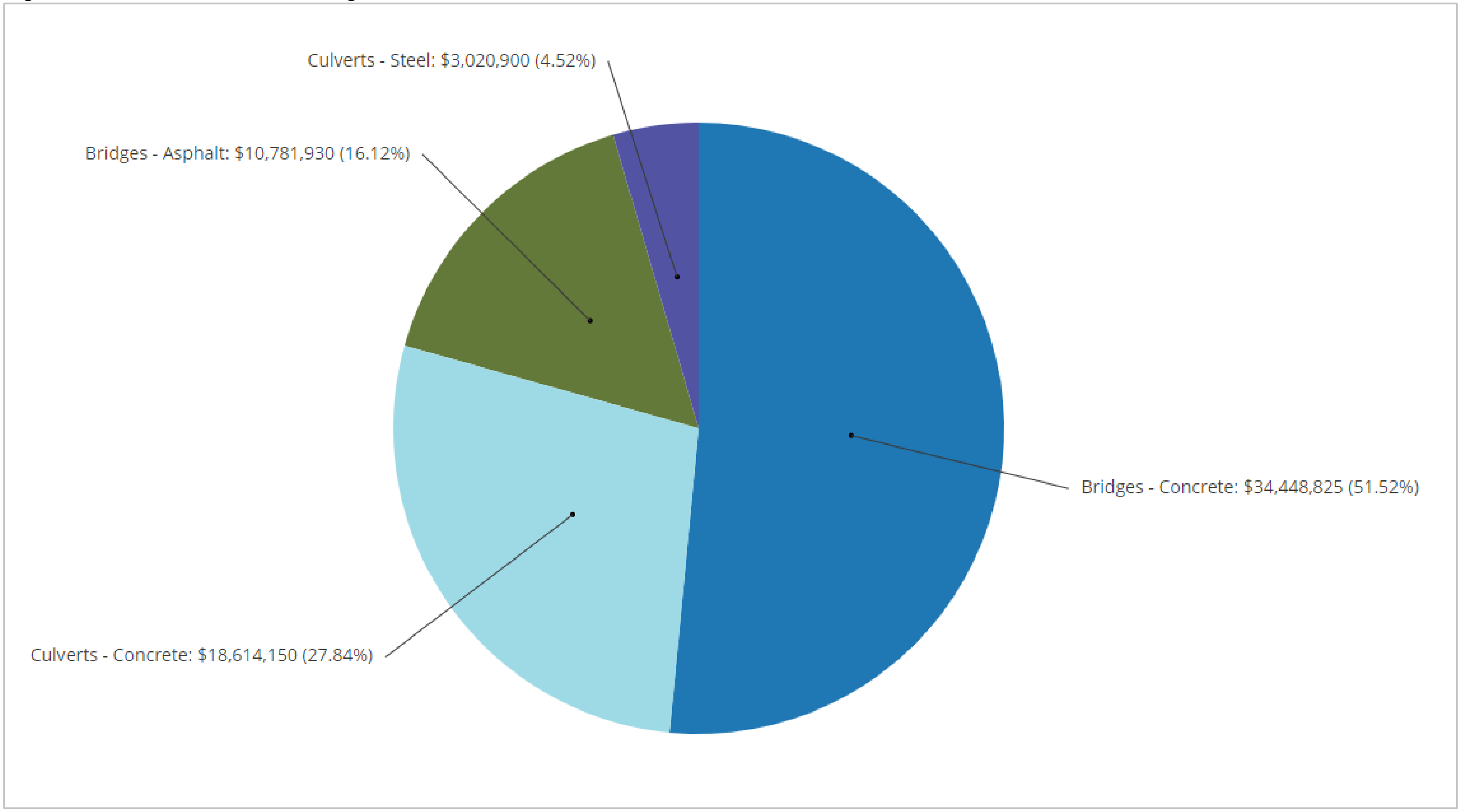
2.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 9 illustrates key asset attributes for the municipality's bridges & culverts, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's bridges & culverts assets are valued at $67 million based on 2016 replacement costs. The useful life indicated for each asset type below was assigned by the municipality.

Table 9 Key Asset Attributes – Bridges & Culverts

Asset Type	Asset Component	Quantity	Useful Life (Years)	Valuation Method	2016 Overall Replacement Cost
Bridges & Culverts	Bridges - Asphalt	17 structures	75	$4,300 Cost per Unit, User Defined	$10,781,930
	Bridges - Concrete	44 structures	75	User Defined	$34,448,825
	Culverts - Concrete	52 units	75	User Defined	$18,614,150
	Culverts - Steel	12 units	40	User Defined	$3,020,900
				Total	**$66,865,805**

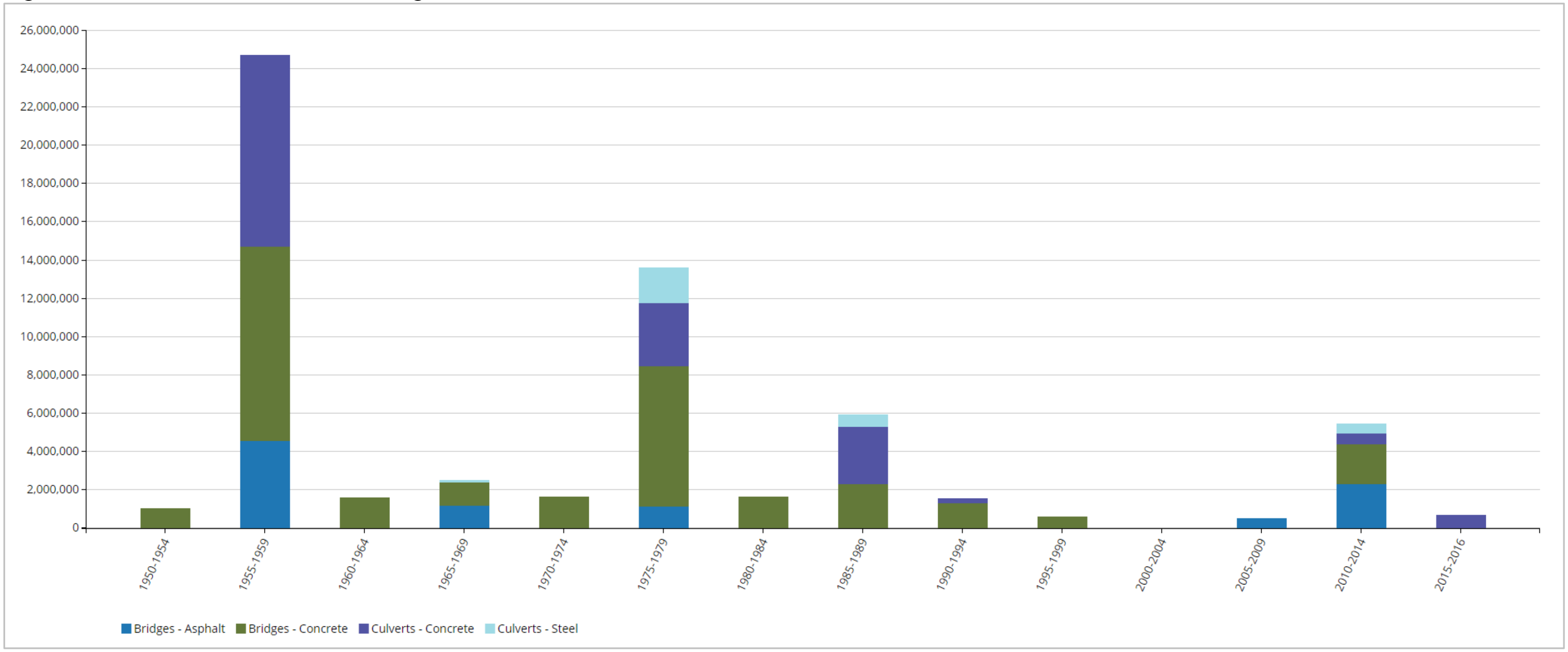
Figure 16 Asset Valuation – Bridges & Culverts



2.2 Historical Investment in Infrastructure

Figure 17 shows the municipality's historical investments in its bridges & culverts since 1950. 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 – Bridges & Culverts

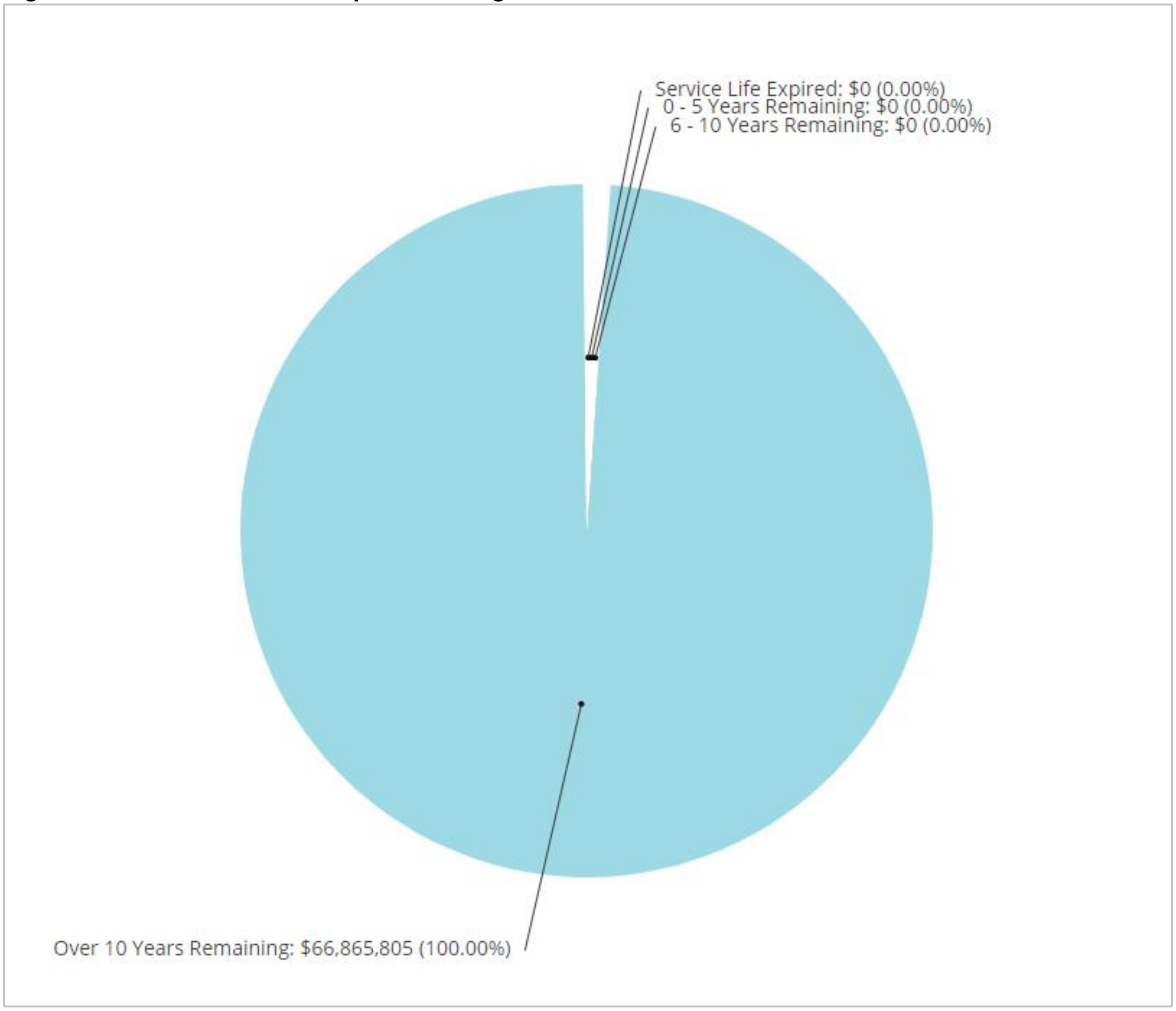


The municipality has invested sporadically in its bridges and culverts since 1950. In the late 1950s, the period of largest investment, $25 million was invested with a focus on concrete bridges and culverts.

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 bridges & culverts.

Figure 18 Useful Life Consumption – Bridges & Culverts

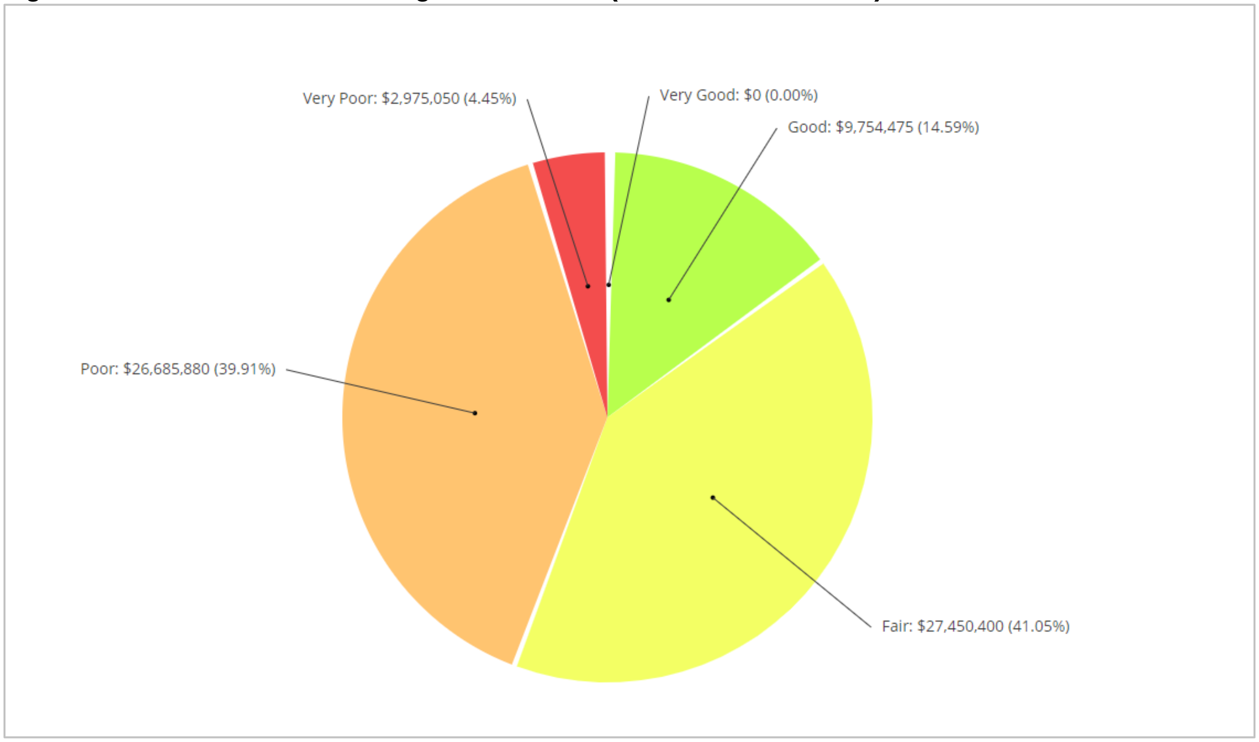


100% of the assets with a value of $67 million, have at least 10 years of useful life remaining.

2.4 Current Asset Condition

Using replacement cost, in this section we summarize the condition of the municipality's bridges & culverts as of 2016. By default, we rely on observed field data adapted from OSIM inspections as provided by the municipality. In the absence of such information, age-based data is used as a proxy. The municipality has provided condition data for 100% of its bridge & culvert assets.

Figure 19 Asset Condition – Bridges & Culverts (Assessed Condition)

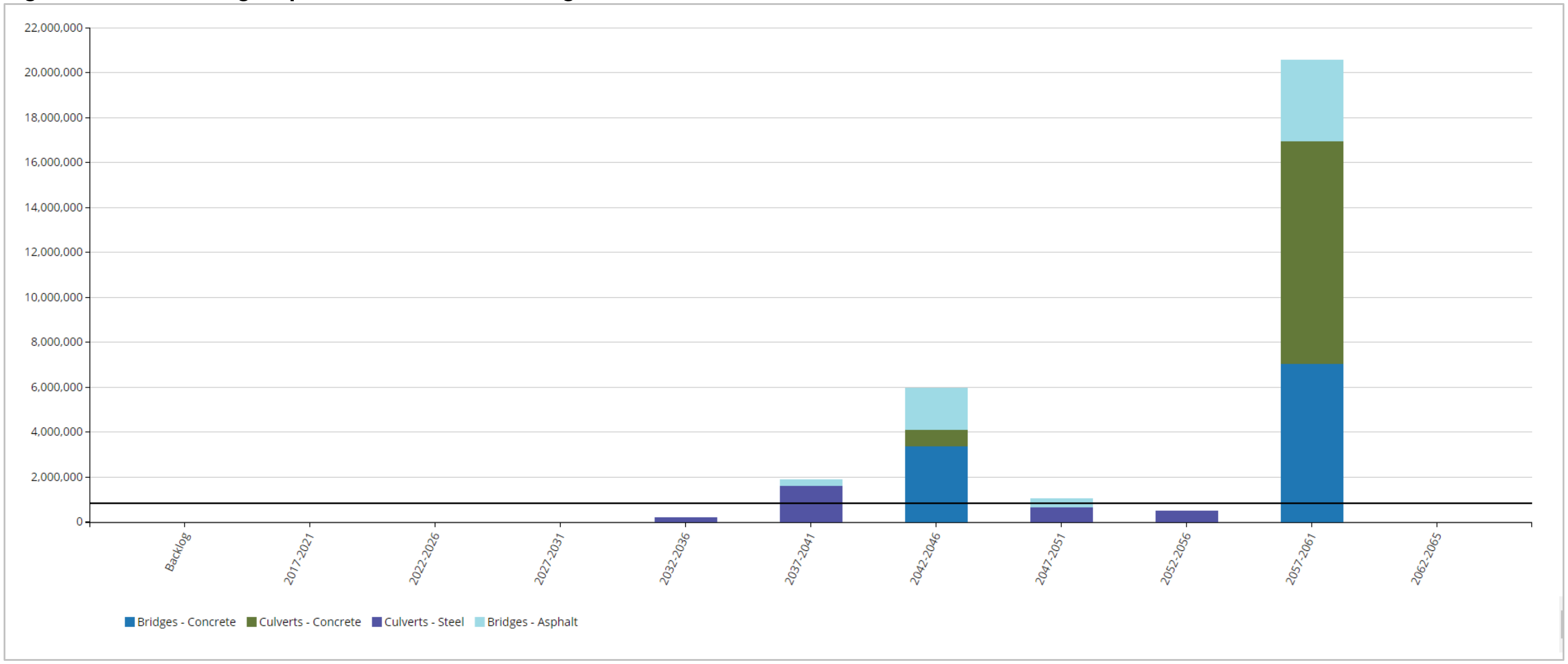


Assessed condition data indicates that while 15% of the municipality's bridges & culverts are in good to very good condition, 44%, with a valuation of $30 million, are in poor to very poor condition.

2.5 Forecasting Replacement Needs

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

Figure 20 Forecasting Replacement Needs – Bridges & Culverts



Assessed condition data shows no backlog and minimal 20-year replacement needs. The municipality's annual requirements (indicated by the black line) for its bridges & culverts total $892,000. At this funding level, the municipality would be allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. The municipality is currently allocating $282,000, leaving an annual deficit of $610,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level.

2.6 Recommendations – Bridges & Culverts

- Age-based data shows no backlog and minimal replacement needs for the 20 years. The results and recommendations from the OSIM inspections should be incorporated into the AMP analysis and used to generate the short-and long-term capital and maintenance budgets for the bridge and large culvert structures. See Section VIII, 'Asset Management Strategies'.

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

- The municipality is funding 70% of its long-term requirements on an annual basis. See the 'Financial Strategy' section on how to achieve more sustainable and optimal funding levels.

3. Water Systems

3.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 10 illustrates key asset attributes for the municipality's water systems, including quantities of various assets, their useful life, replacement costs, and the valuation method by which the replacement costs were derived. In total, the municipality's water systems assets are valued at $22 million based on 2016 replacement costs. The useful life indicated for each asset type below was assigned by the municipality.

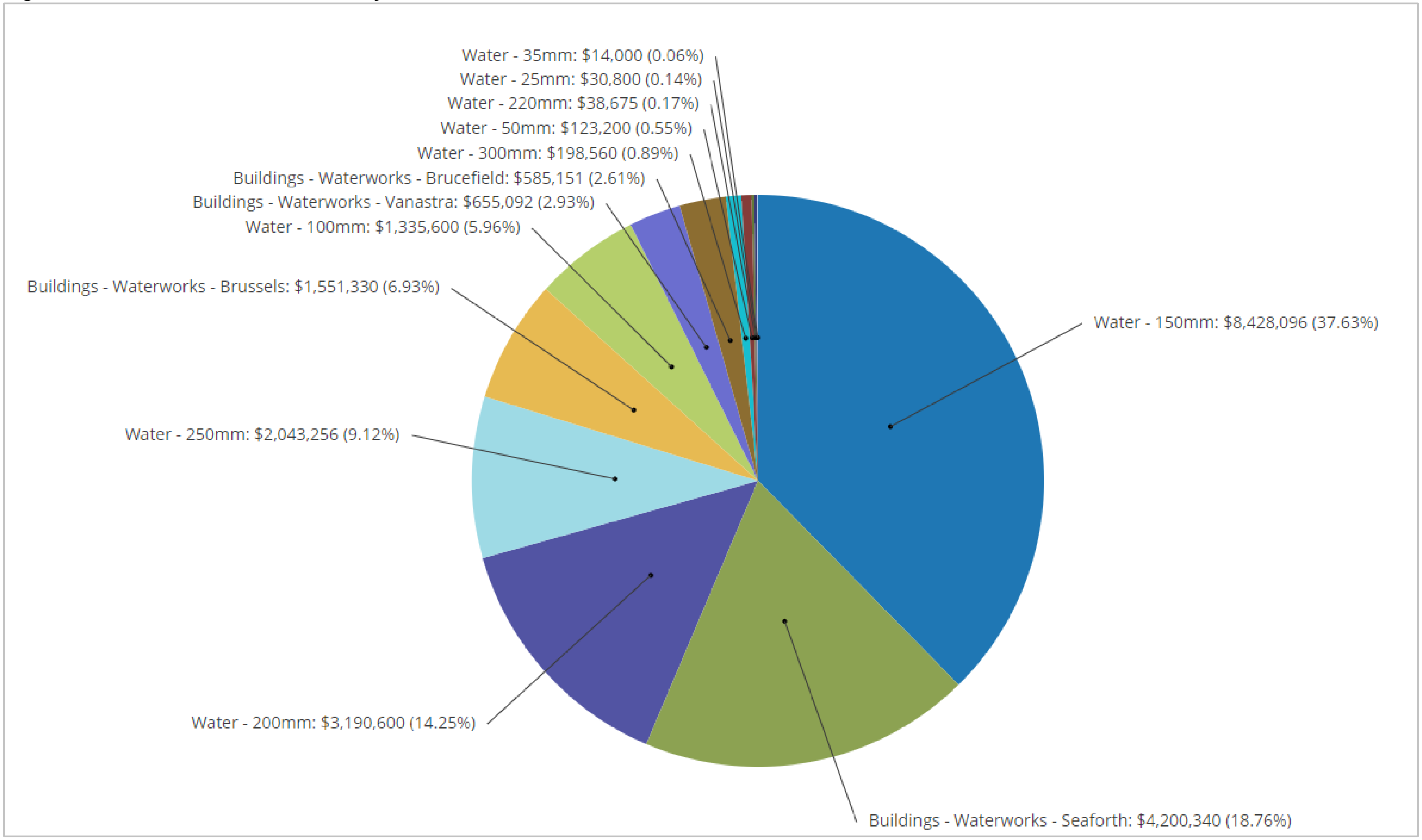
Table 10 Key Asset Attributes – Water Systems

Asset Type	Asset Component	Quantity	Useful Life (Years)	2016 Unit Replacement Cost	2016 Overall Replacement Cost
Water Systems	Buildings - Waterworks - Brucefield Well	1 structure	50	NRBCPI (Toronto)	$585,151
	Buildings - Waterworks - Brussels Well	2 structures	50	User-Defined Cost	$1,551,330
	Buildings - Waterworks - Seaforth Well & Tower	3 structures	50 - 75	NRBCPI (Toronto)	$4,200,340
	Buildings - Waterworks - Vanastra Pump House	1 structure	50	NRBCPI (Toronto)	$655,092
	Water Mains - 100mm	4770m	50 - 90	$280.00 Cost per Unit	$1,335,600
	Water Mains - 150mm	27724m	50 - 90	$304.00 Cost per Unit	$8,428,096
	Water Mains - 200mm	7977m	50 - 90	$400.00 Cost per Unit	$3,190,600
	Water Mains - 220mm	91m	90	$425.00 Cost per Unit	$38,675
	Water Mains - 250mm	4187m	50 - 75	$488.00 Cost per Unit	$2,043,256
	Water Mains - 25mm	110m	75	$280.00 Cost per Unit	$30,800
	Water Mains - 300mm	340m	50	$584.00 Cost per Unit	$198,560
	Water Mains - 35mm	50m	75	$280.00 Cost per Unit	$14,000
	Water Mains - 50mm	440m	60 - 75	$280.00 Cost per Unit	$123,200
				Total	**$22,394,700**

Key Asset Attributes – Water Systems

Asset Type	Asset Component	Quantity	Useful Life (Years)	2016 Unit Replacement Cost	2016 Overall Replacement Cost
Water Systems	Water Mains - Brucefield	2,970m	75	Cost per Unit	$831,600.00
	Water Mains - Brussels	12,341m	50, 60, 75, 90	Cost per Unit	$4,008,152.00
	Water Mains - Seaforth	23,680m	50, 60, 75, 90	Cost per Unit	$8,117,515.00
	Water Mains - Vanastra	6,697m	50, 75	Cost per Unit	$2,445,520.00
	Buildings - Brucefield	1 structure	50	NRBCPI (Toronto)	$585,151.00
	Buildings - Brussels	2 structures	50	User-Defined Cost	$1,551,330.00
	Buildings - Seaforth	3 structures	50, 75	NRBCPI (Toronto)	$4,200,340.00
	Buildings - Vanastra	1 structure	50	NRBCPI (Toronto)	$655,092.00
				Total	**$22,394,700**

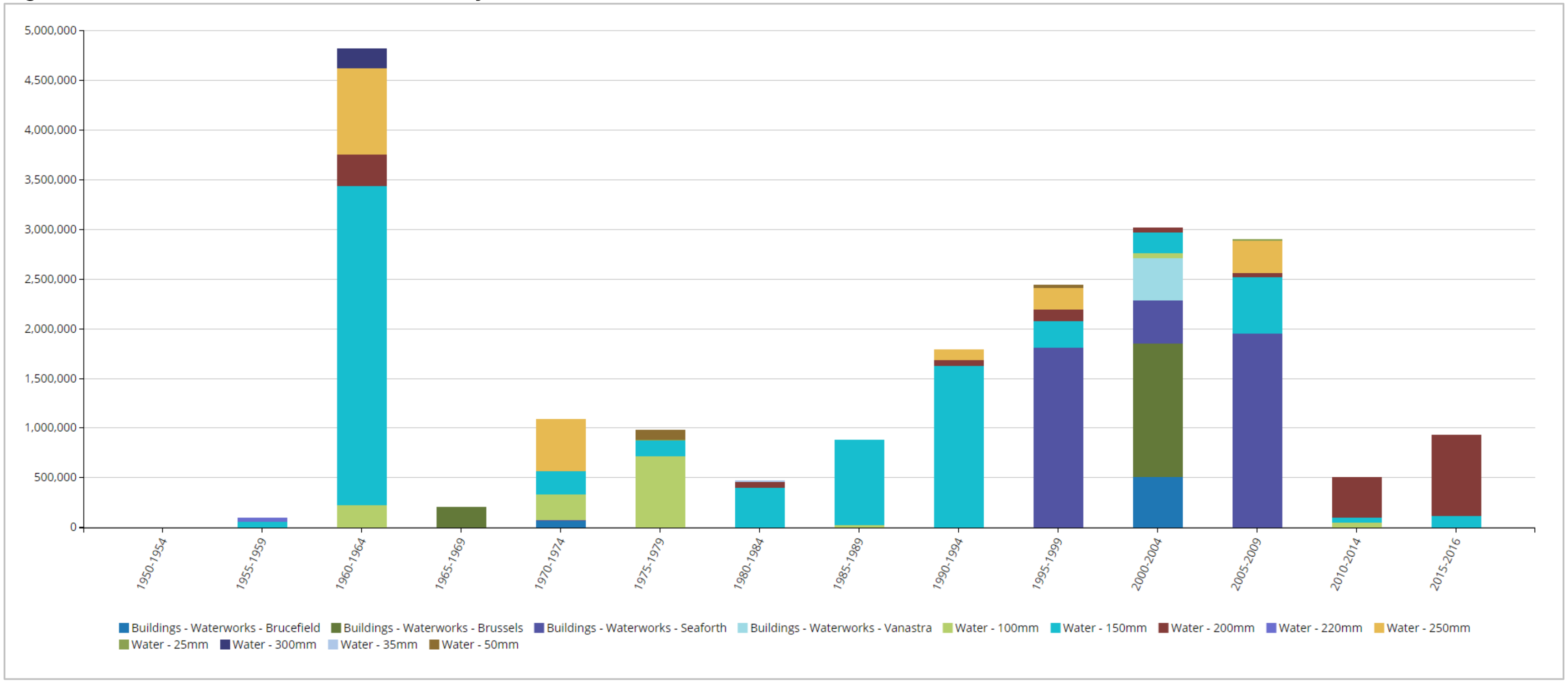
Figure 21 Asset Valuation – Water Systems



3.2 Historical Investment in Infrastructure

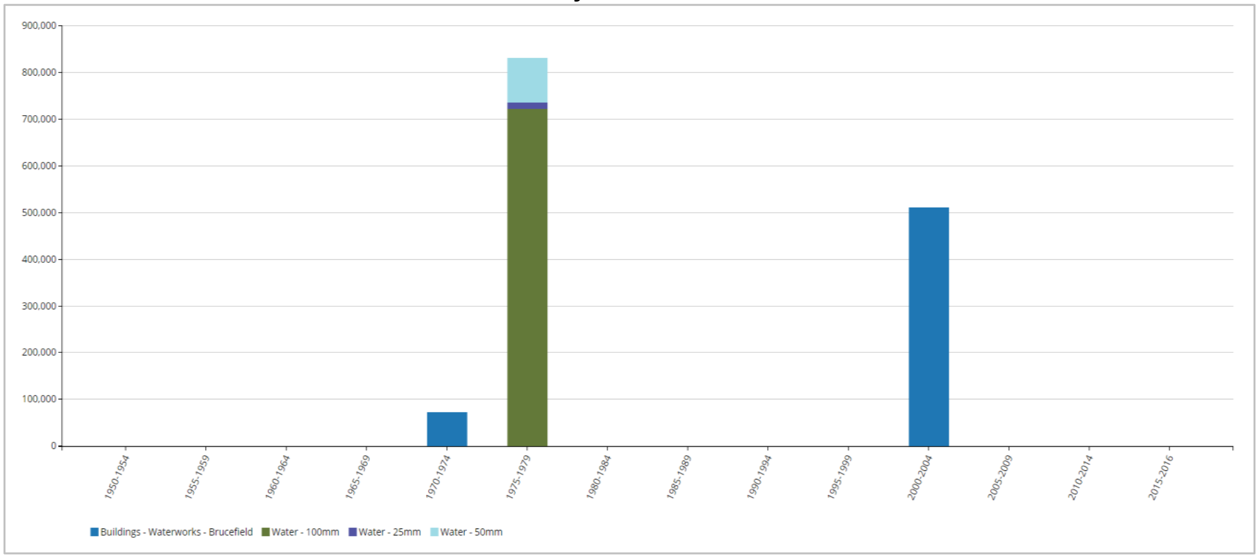
Figure 22 shows the municipality's historical investments in its water systems since 1950. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns 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 – Water Systems

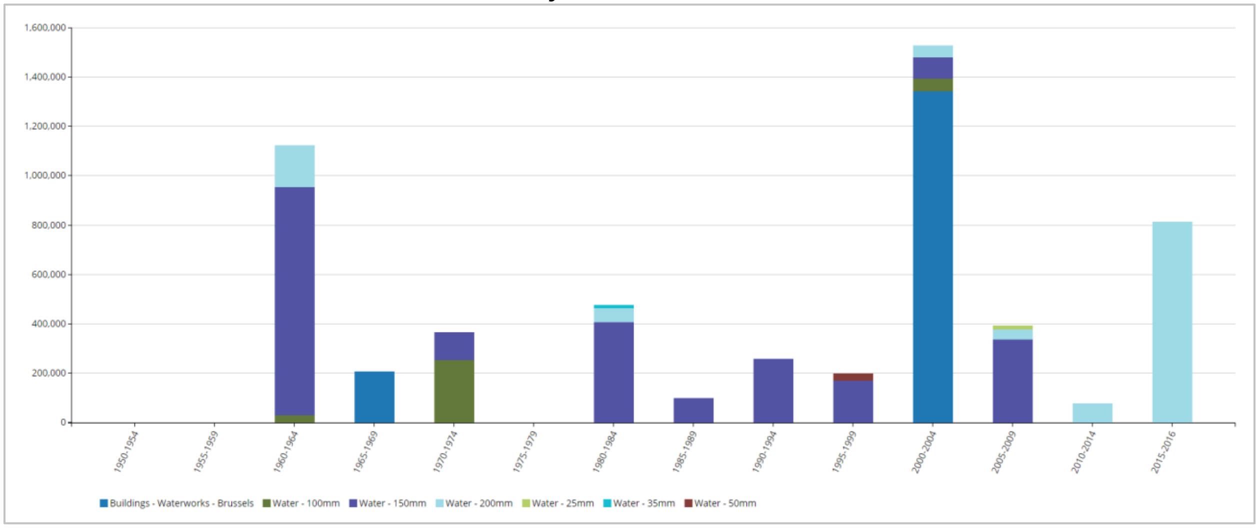


Investments in the water systems have been sporadic since the late 1950s. In the early 1960s, the period of largest investment, $4.8 million was invested in the water systems with 100% being invested in water mains

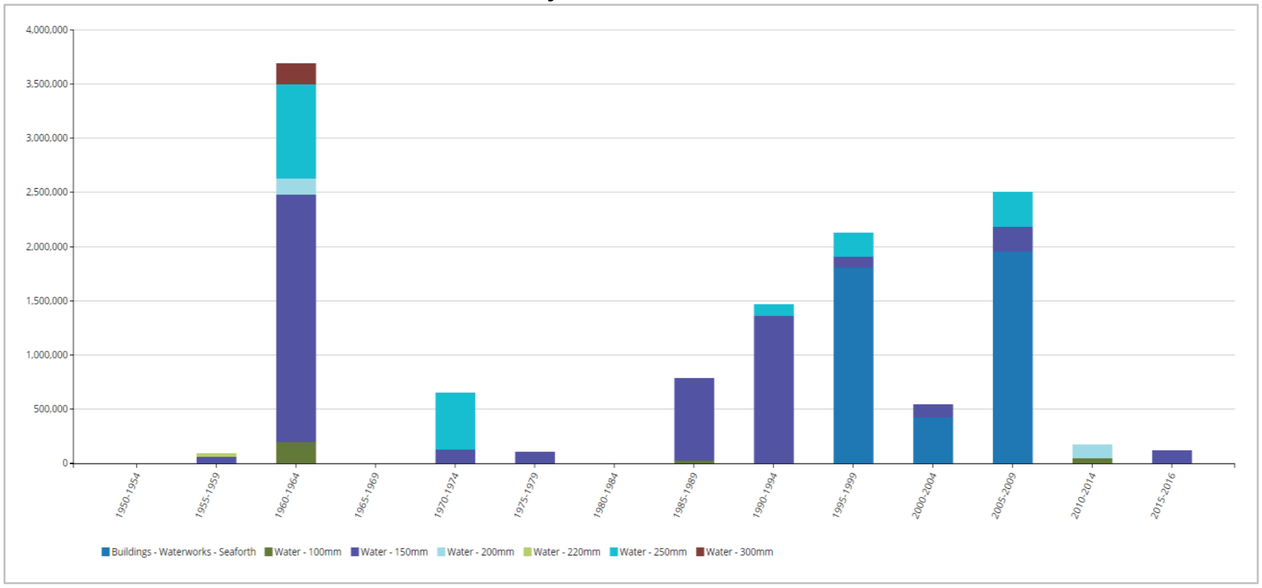
Brucefield Historical Investment – Water System



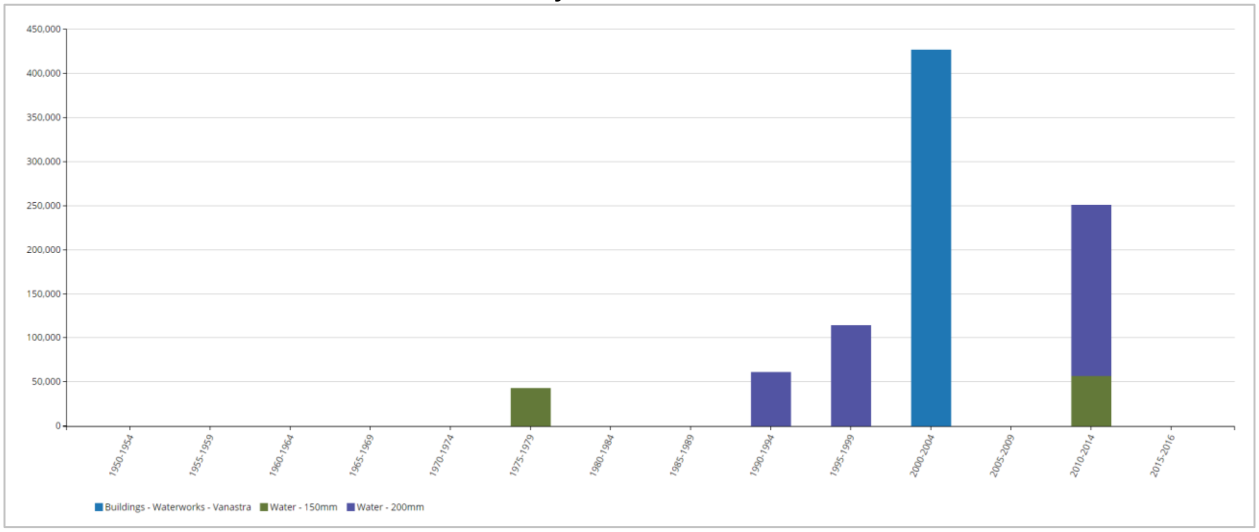
Brussels Historical Investment – Water System



Seaforth Historical Investment – Water System



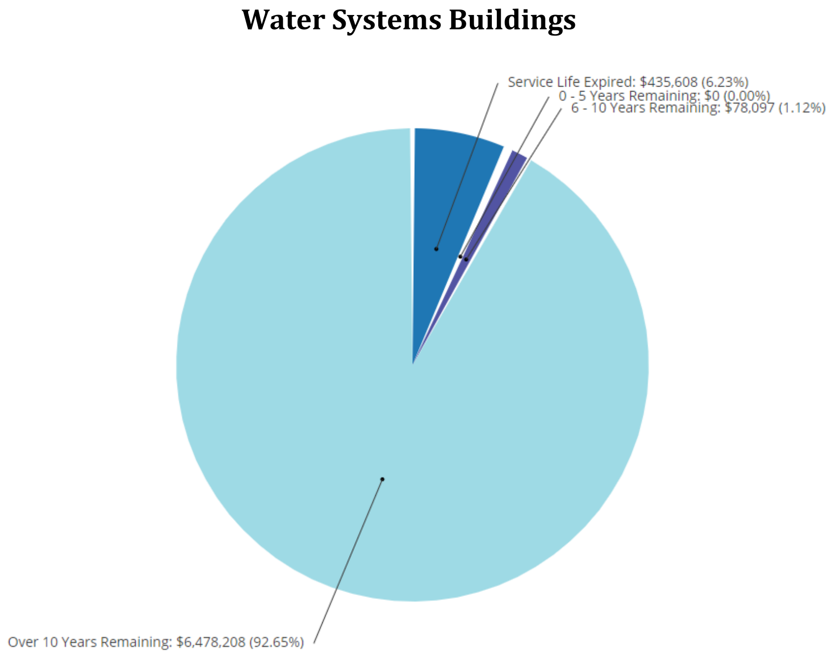
Vanastra Historical Investment – Water System

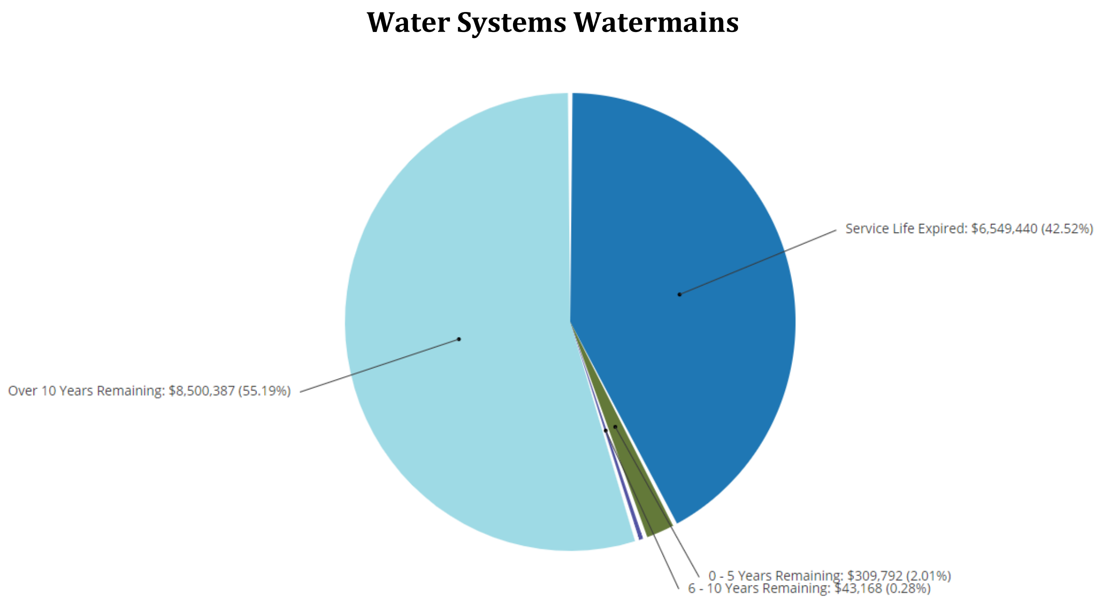


3.3 Useful Life Consumption

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 water systems.

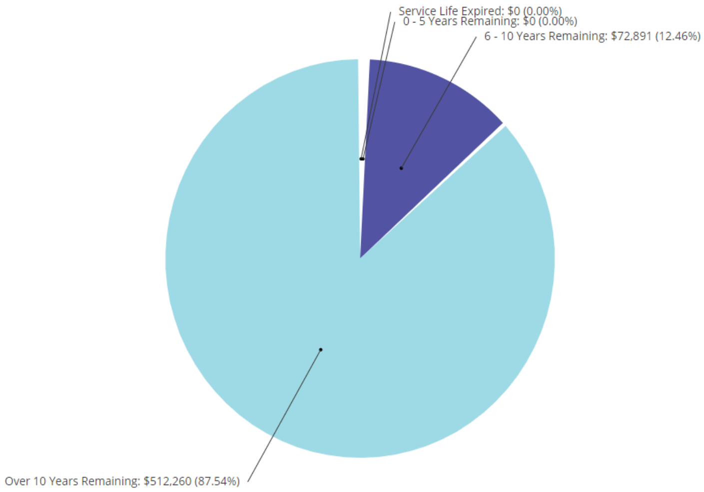
Figure 23 Useful Life Consumption – Water Systems



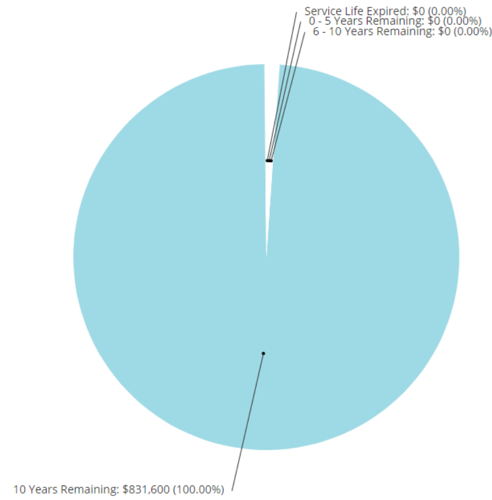


While 93% of water systems buildings and 55% of water mains in the municipality's water systems have at least 10 years of useful life remaining, 6%, with a valuation of $436,000, and 43% with a valuation of $6.5 million, respectively, remain in operation beyond their useful life.

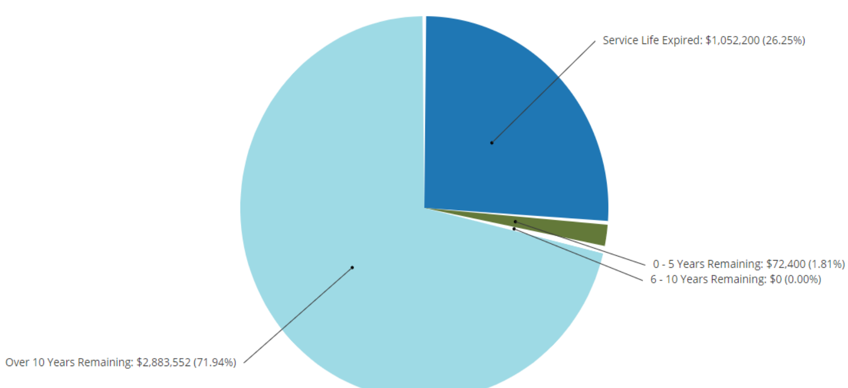
Brucefield Buildings Consumption



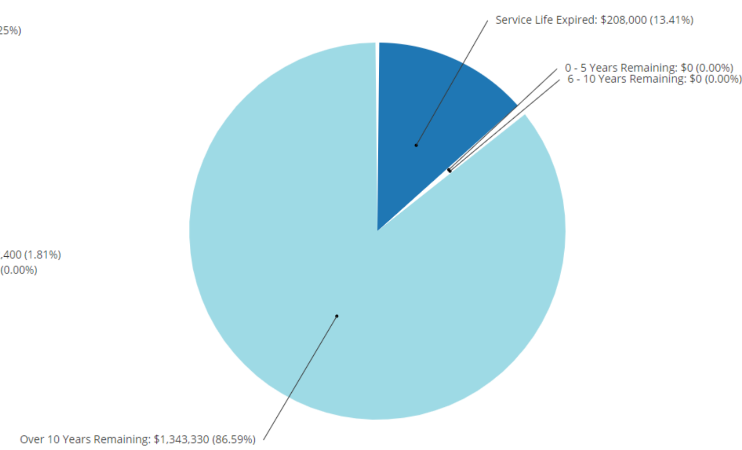
Brucefield Watermains Consumption



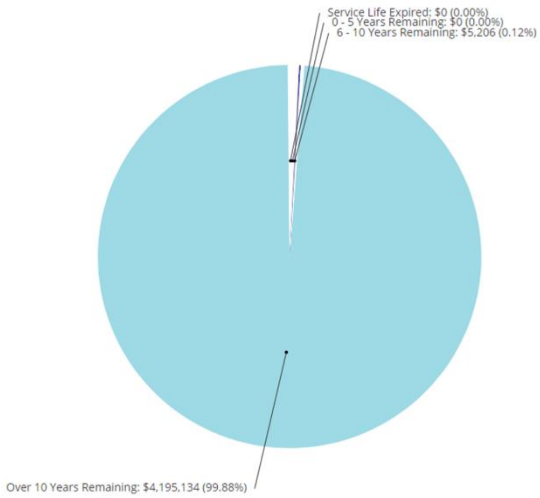
Brussels Buildings Consumption



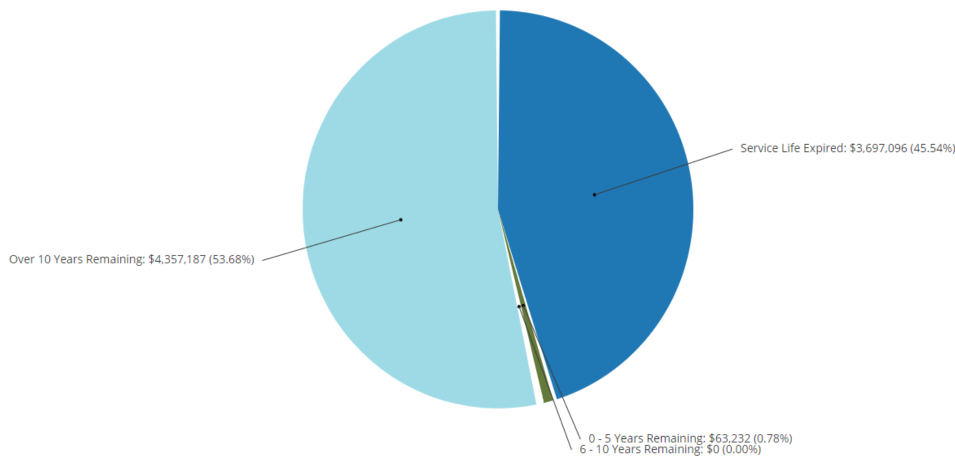
Brussels Watermains Consumption



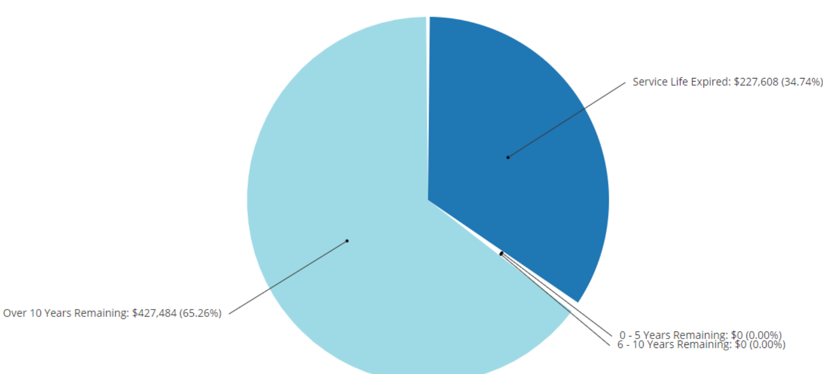
Seaforth Buildings Consumption



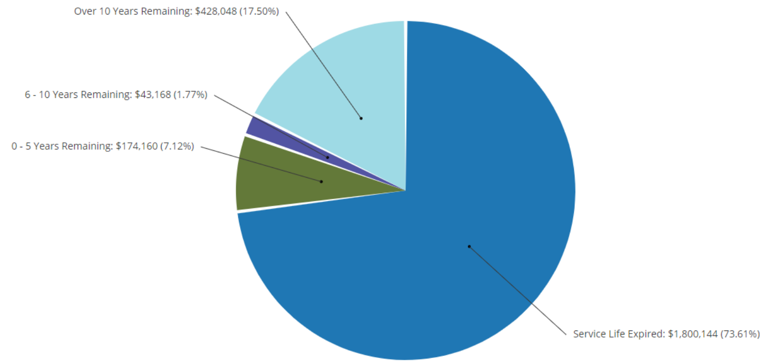
Seaforth Watermains Consumption



Vanastra Buildings Consumption



Vanastra Watermains Consumption

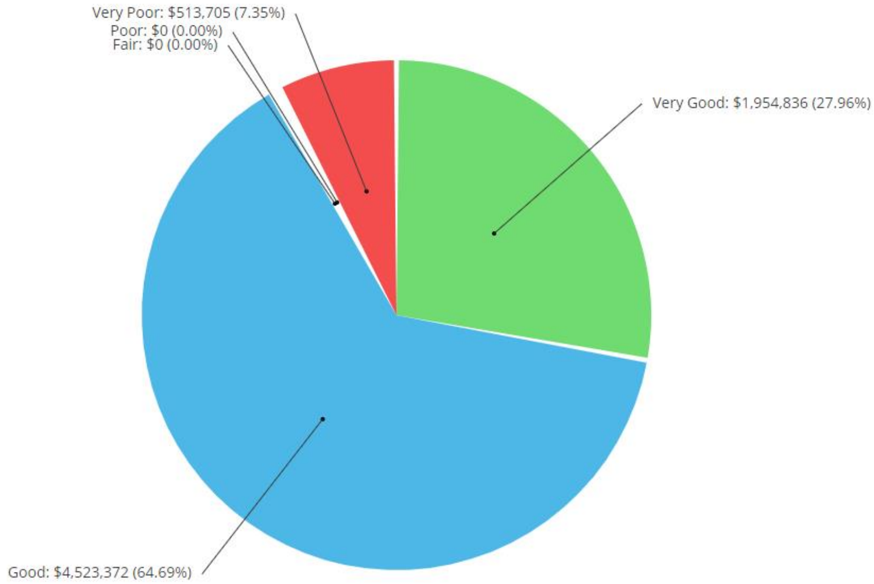


3.4 Current Asset Condition

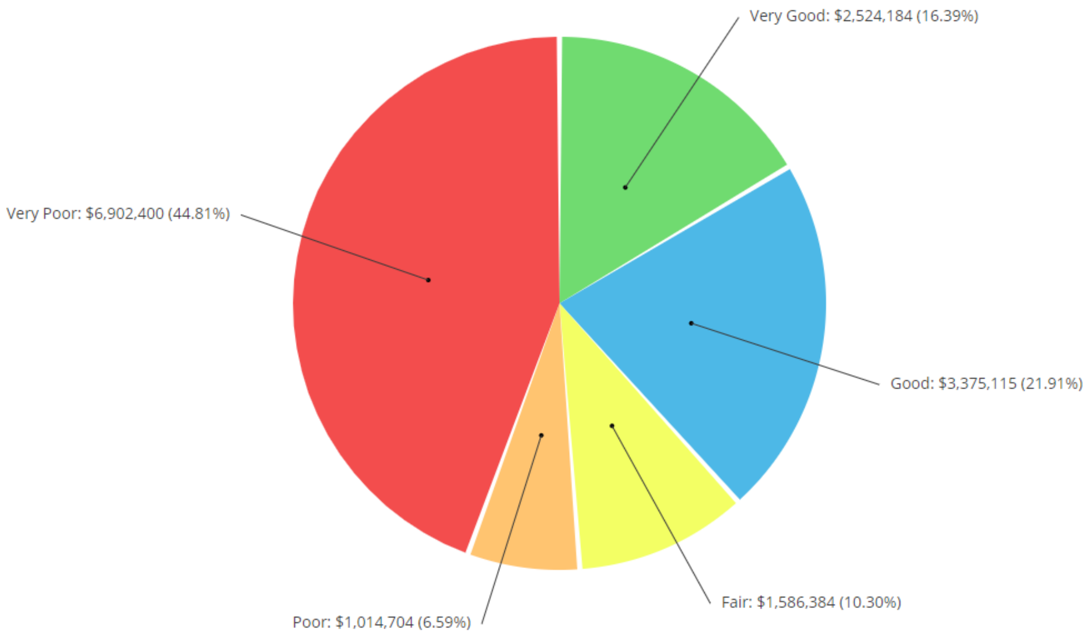
Using replacement cost, in this section we summarize the condition of the municipality's water systems. By default, we rely on observed field data as provided by the municipality. In the absence of such information, age-based data is used as a proxy. All assets are based on age-based data.

Figure 24 Asset Condition – Water Systems (Age-based)

Water Systems Buildings

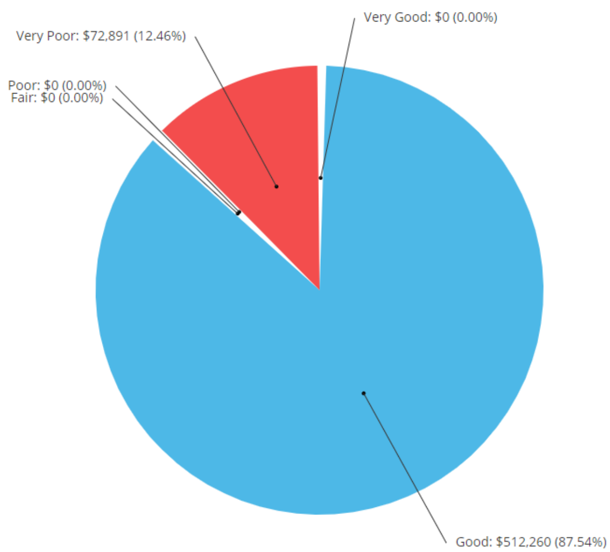


Water Systems Watermains

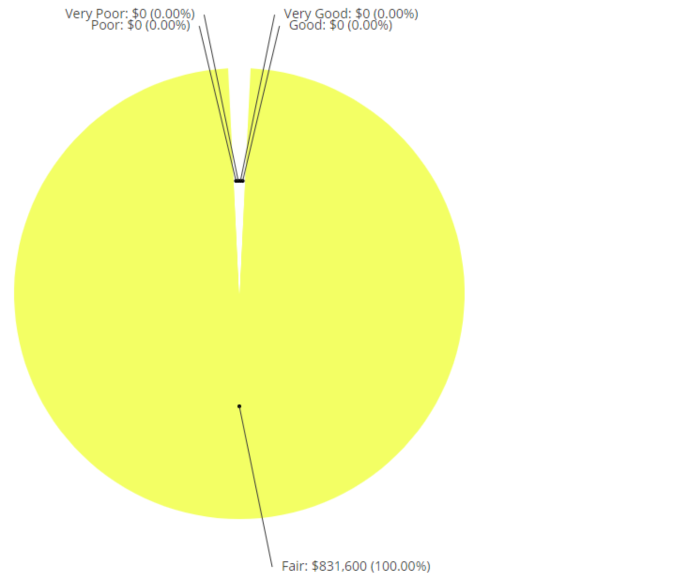


Based on age-based condition data, 64% of water systems building assets and 38% of watermain assets are in good to very good condition while 7%, with a valuation of $514,000, and 51%, with a valuation of $8 million, respectively, are in poor to very poor condition.

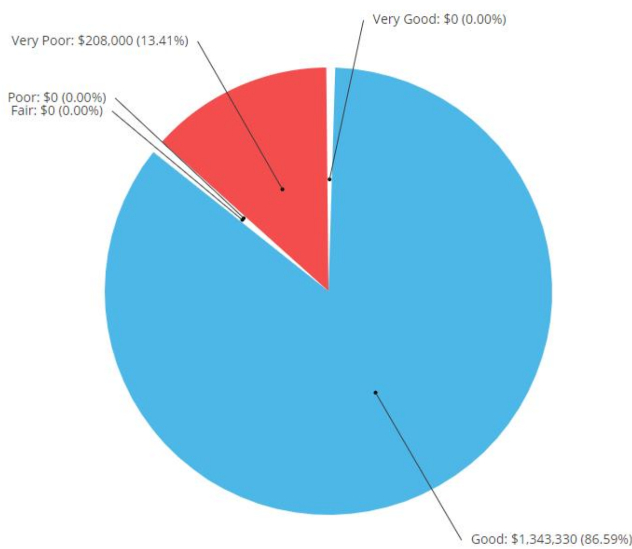
Brucefield Buildings – Asset Condition



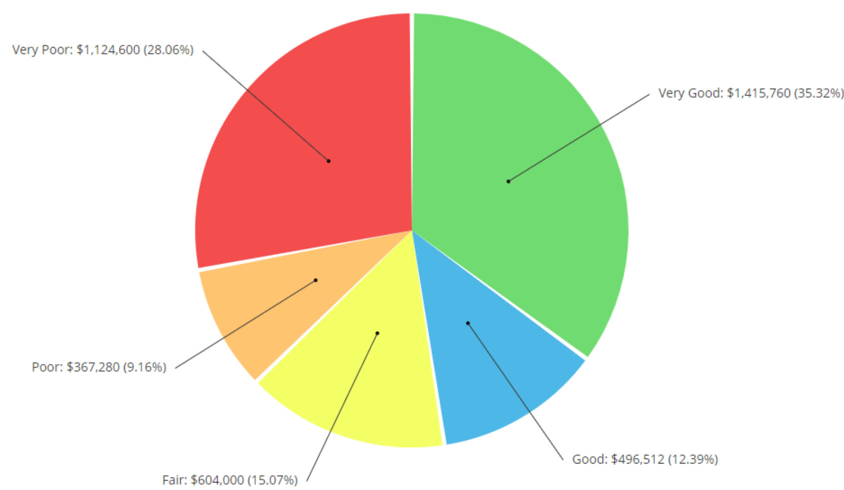
Brucefield Watermains - Asset Condition



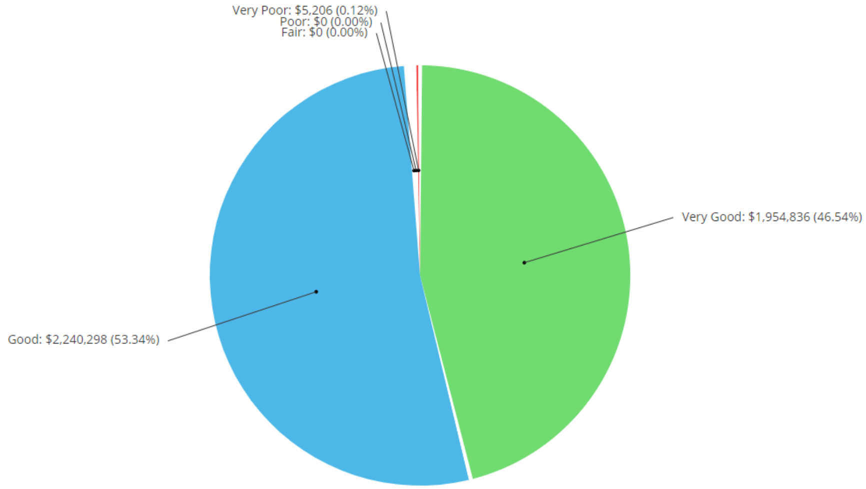
Brussels Buildings – Asset Condition



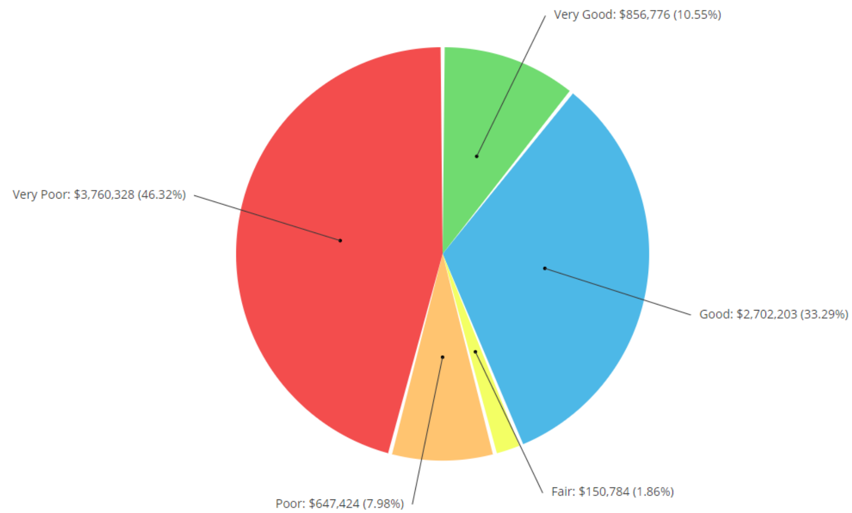
Brussels Watermains – Asset Condition



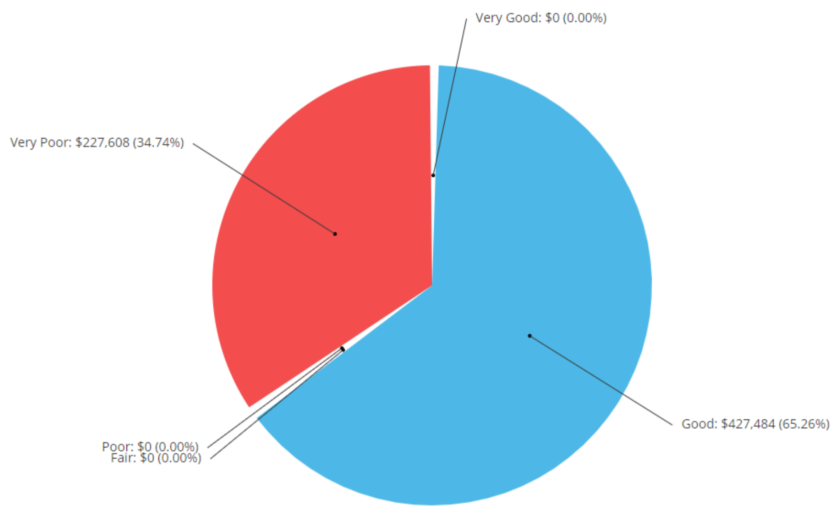
Seaforth Buildings – Asset Condition



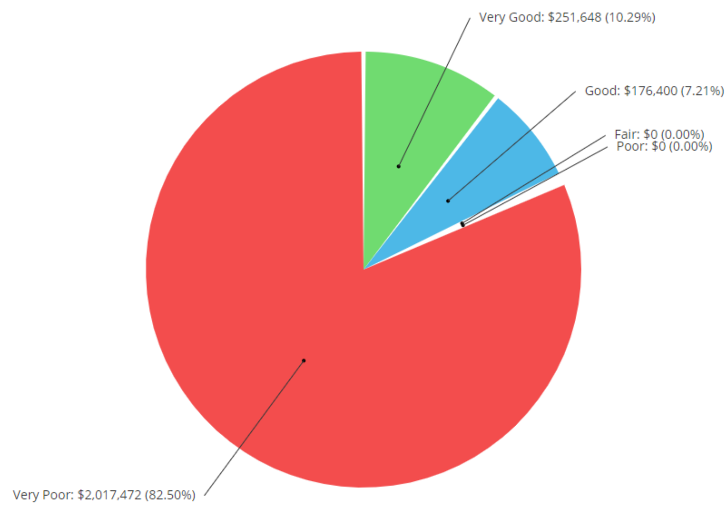
Seaforth Watermains – Asset Condition



Vanastra Buildings – Asset Condition



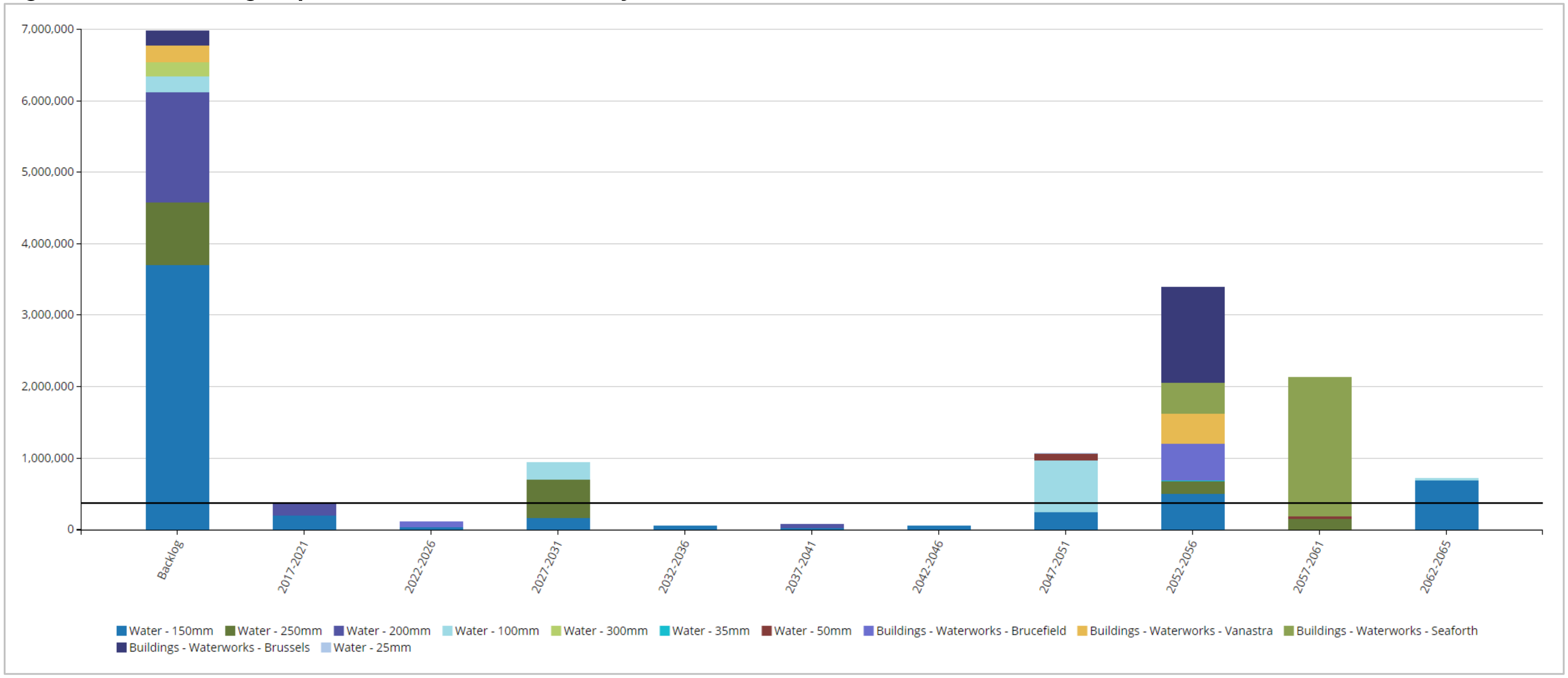
Vanastra Watermains – Asset Condition



3.5 Forecasting Replacement Needs

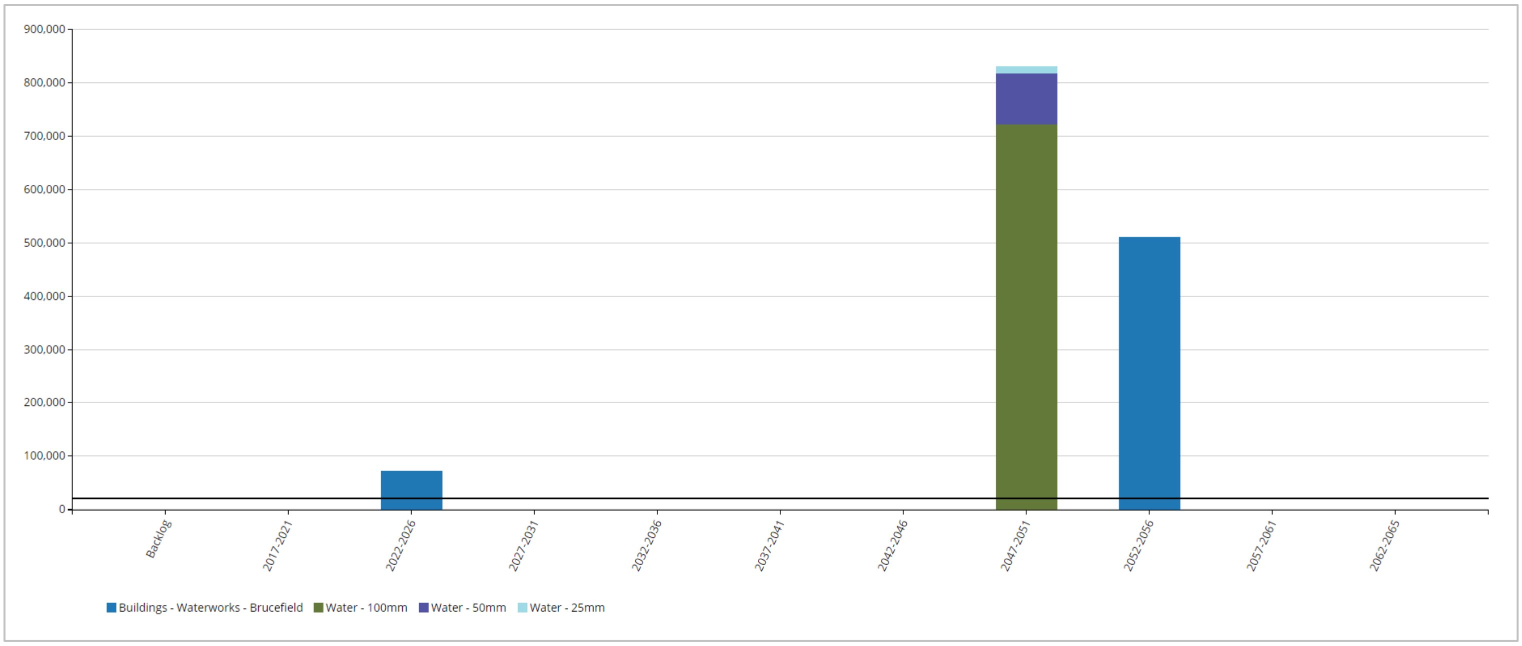
In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's water systems assets. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. In the absence of observed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

Figure 25 Forecasting Replacement Needs – Water Systems

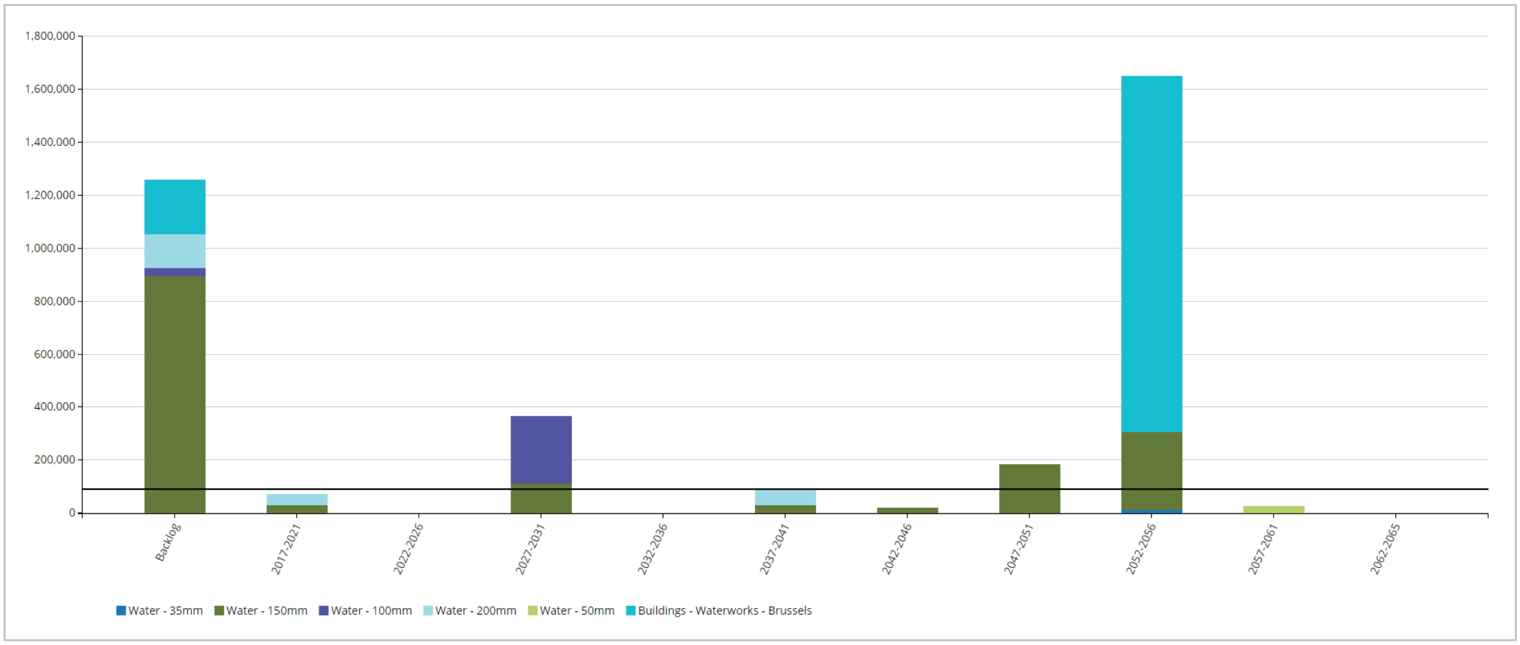


In addition to a backlog of $7 million, replacement needs are forecasted to be $372,000 in the next five years; an additional $1 million is forecasted in replacement needs between 2022-2031. The municipality's annual requirements (indicated by the black line) for its water systems total $384,000. At 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 $638,000, leaving an annual surplus of $254,000. 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.

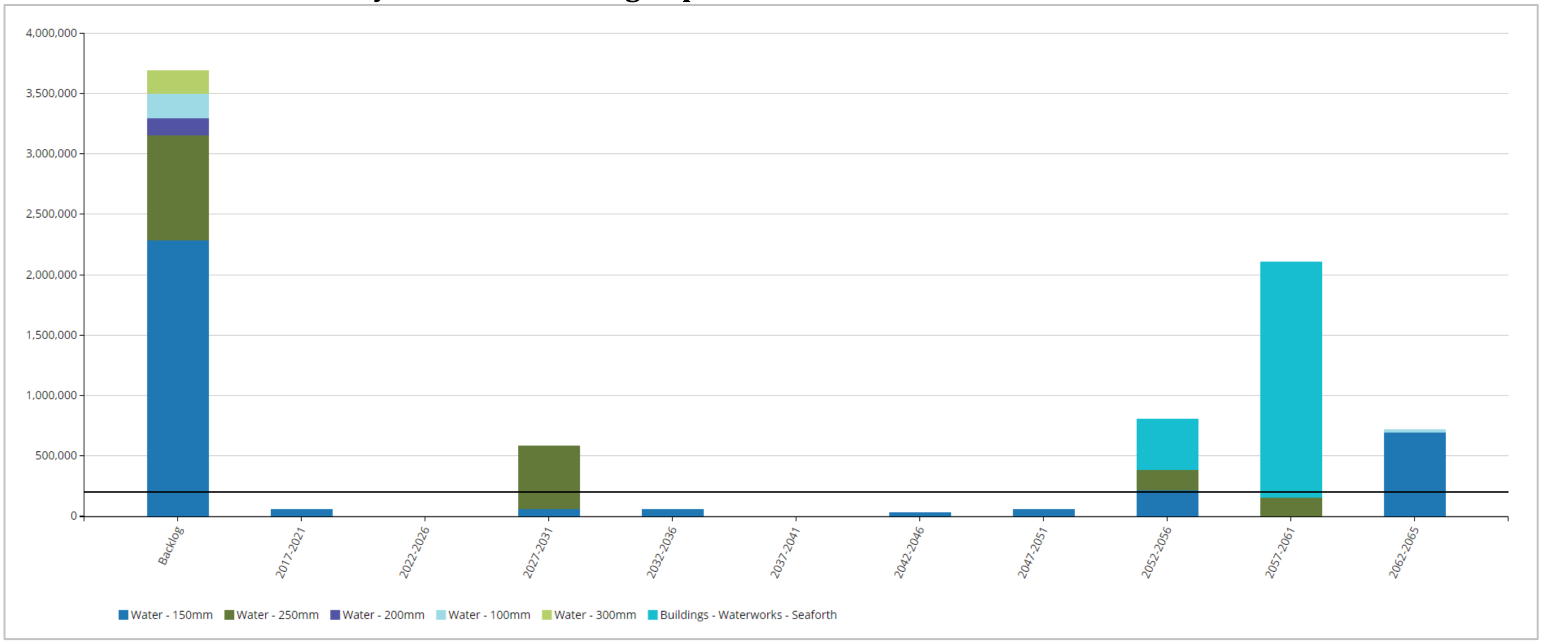
Brucefield Water System – Forecasting Replacement Needs



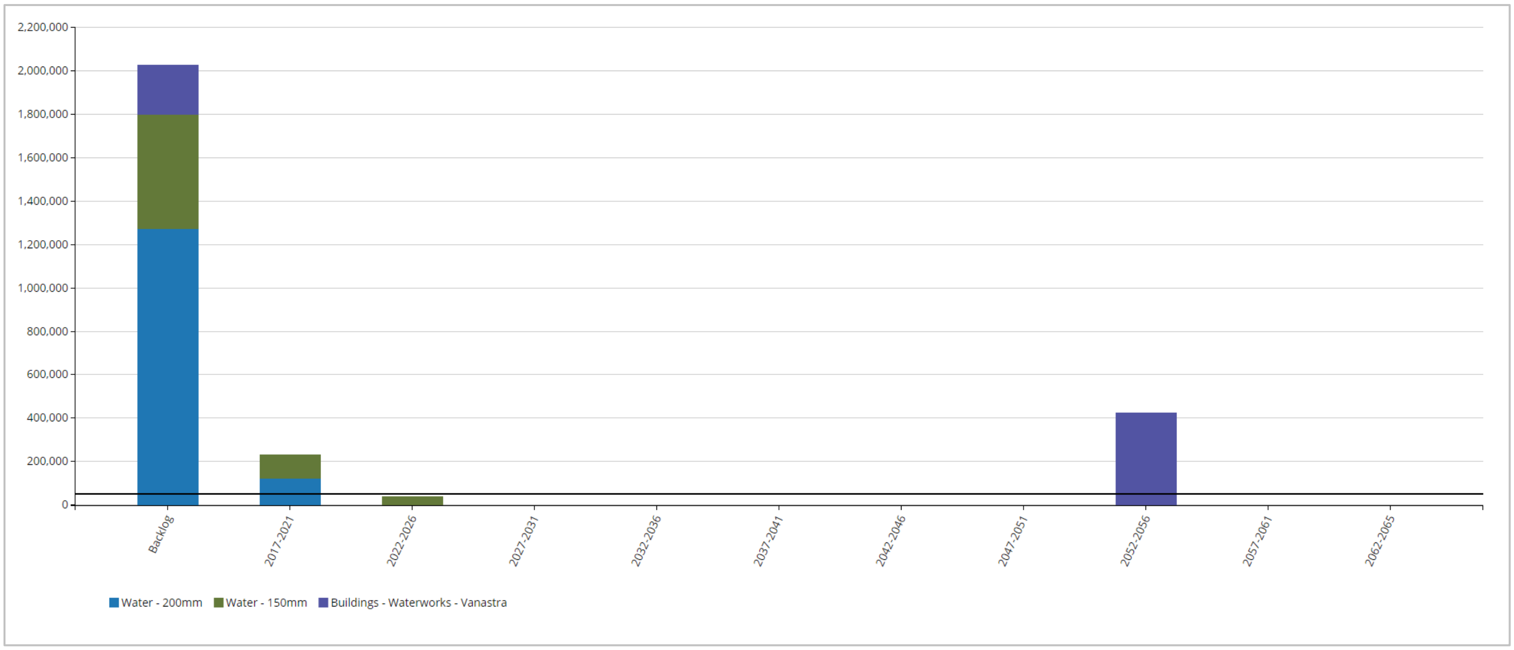
Brussels Water System – Forecasting Replacement Needs



Seaforth Water System – Forecasting Replacement Needs



Vanastra Water System – Forecasting Replacement Needs



3.6 Recommendations – Water Systems

- Age-based condition data shows a significant backlog of $7 million and minimal 10-year replacement needs. The municipality should implement a condition assessment program of its water assets to precisely estimate its financial requirements and field needs. See Section 2, ‘Condition Assessment Programs’ in the ‘Asset Management Strategies’ chapter.

- The data collected through condition assessment programs should be integrated into a risk management framework which will guide prioritization of 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 the water systems as outlined further within the “Asset Management Strategy” section of this AMP.

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

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

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

- The municipality is currently funding 100% of its long-term requirements on an annual basis. See the ‘Financial Strategy’ section on how to achieve sustainable and optimal funding levels.

4. Wastewater Systems

4.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 11 illustrates key asset attributes for the municipality's wastewater systems portfolio, including quantities of various assets, their useful life, replacement costs, and the valuation method by which the replacement costs were derived. In total, the municipality's wastewater systems assets are valued at $23.8 million based on 2016 replacement costs. The useful life indicated for each asset type below was assigned by the municipality.

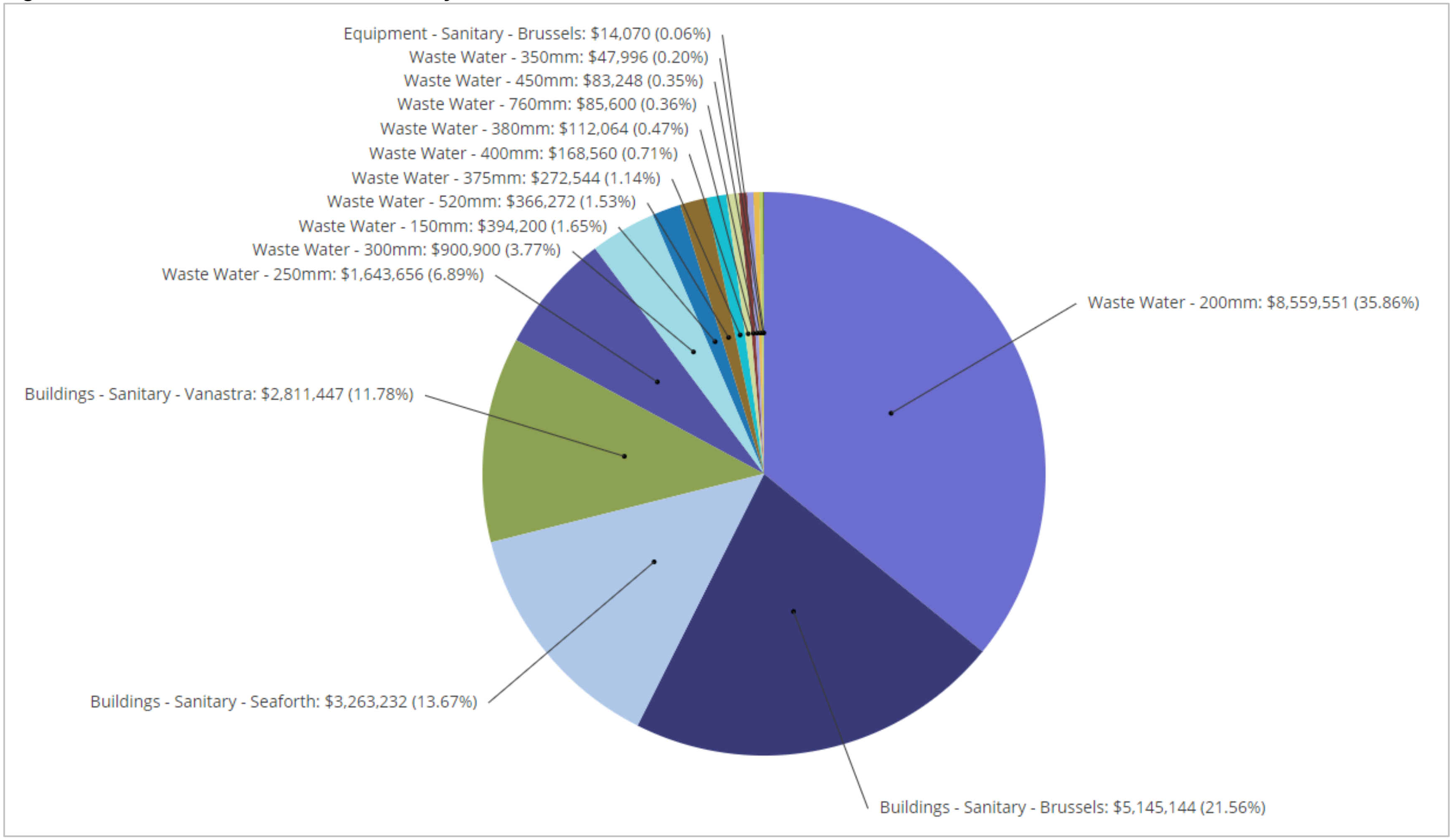
Table 11 Asset Inventory – Wastewater Systems

Asset Type	Asset Component	Quantity	Useful Life (Years)	2016 Unit Replacement Cost	2016 Overall Replacement Cost
Wastewater Systems	Buildings - Sanitary - Bussels Pumping Stations & Treatment Plant	2 structures	50	NRBCPI (Toronto)	$5,145,144
	Buildings - Sanitary - Seaforth Treatment Plant & Lagoon, Pumping Station	2 structures	50	NRBCPI (Toronto)	$3,263,232
	Buildings - Sanitary - Vanastra Treatment Plant	1 structure	50	NRBCPI (Toronto)	$2,811,447
	Equipment - Sanitary - Brussels	1 unit	10	NRBCPI (Toronto)	$14,070
	Sanitary Mains - 150mm	1,095m	50 - 60	$360.00 Cost per Unit	$394,200
	Sanitary Mains - 200mm	23,260m	50 - 90	$368.00 Cost per Unit	$8,559,551
	Sanitary Mains - 250mm	4,193m	50 - 75	$392.00 Cost per Unit	$1,643,656
	Sanitary Mains - 300mm	1,788m	50 - 90	$504.00 Cost per Unit	$900,900
	Sanitary Mains - 350mm	92m	60	$520.00 Cost per Unit	$47,996
	Sanitary Mains - 375mm	501m	60 - 75	$544.00 Cost per Unit	$272,544
	Sanitary Mains - 380mm	206m	60	$544.00 Cost per Unit	$112,064
	Sanitary Mains - 400mm	245m	50	$688.00 Cost per Unit	$168,560
	Sanitary Mains - 450mm	121m	75	$688.00 Cost per Unit	$83,248
	Sanitary Mains - 520mm	472m	75	$776.00 Cost per Unit	$366,272
	Sanitary Mains - 760mm	107m	60	$800.00 Cost per Unit	$85,600
				Total	**$23,868,484**

Key Asset Attributes – Wastewater Systems

Asset Type	Asset Component	Quantity	Useful Life (Years)	2016 Unit Replacement Cost	2016 Overall Replacement Cost
Wastewater Systems	Wastewater Mains - Brussels	8312m	60, 75	Cost per Unit	$3,216,655
	Wastewater Mains - Seaforth	15,481m	50, 60, 75, 90	Cost per Unit	$6,101,608
	Wastewater Mains - Vanastra	8286m	50, 60, 75	Cost per Unit	$3,316,328
	Buildings - Brussels	2 structures	50	NRBCPI (Toronto)	$5,159,214
	Buildings - Seaforth	2 structures	50	NRBCPI (Toronto)	$3,263,232
	Buildings - Vanastra	1 structure	50	NRBCPI (Toronto)	$2,811,447
				Total	**$23,868,484**

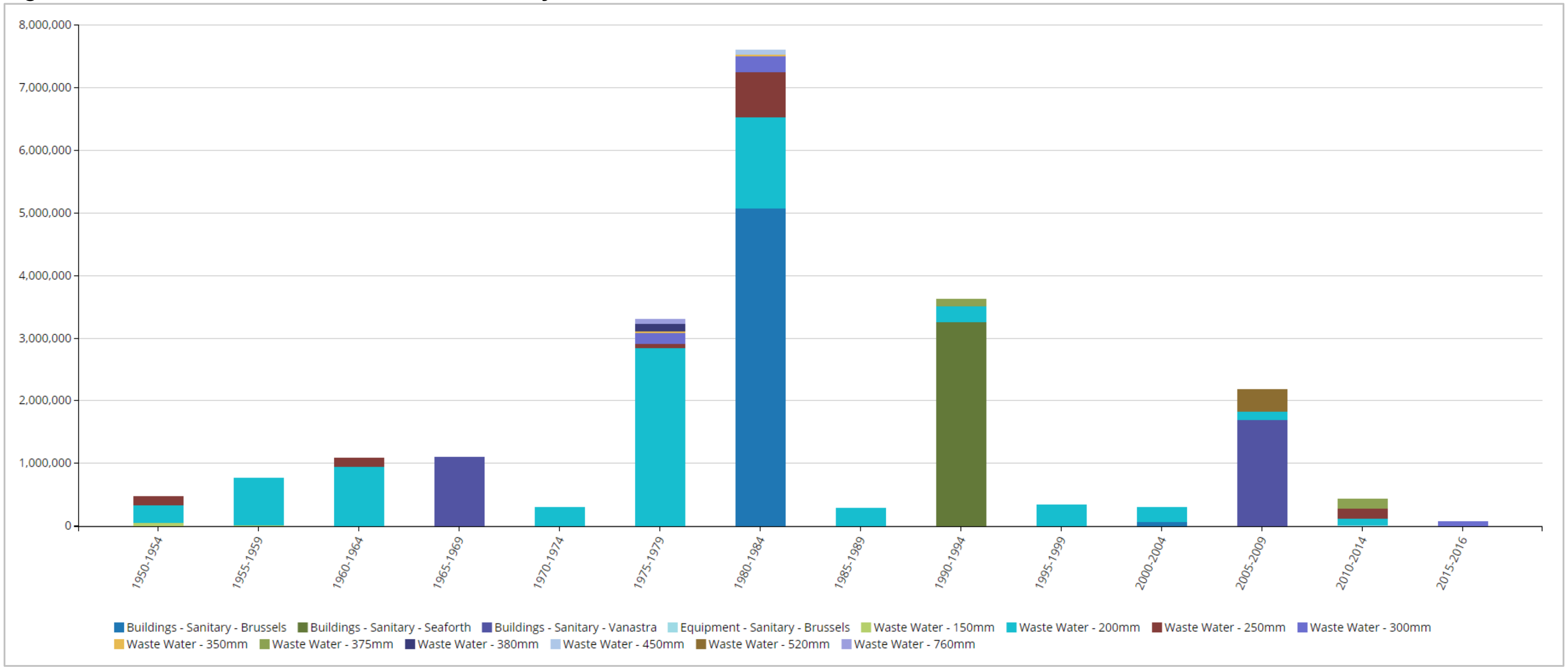
Figure 26 Asset Valuation – Wastewater Systems



4.2 Historical Investment in Infrastructure

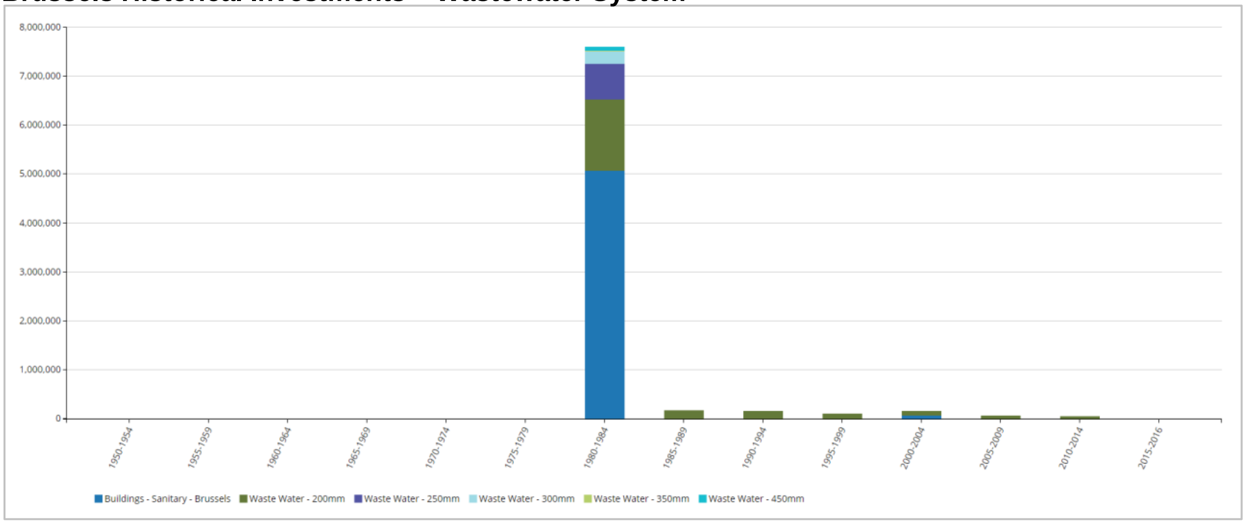
Figure 27 shows the municipality's historical investments in its wastewater systems since 1950. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 4.3) can inform the forecasting and planning of 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 – Wastewater Systems

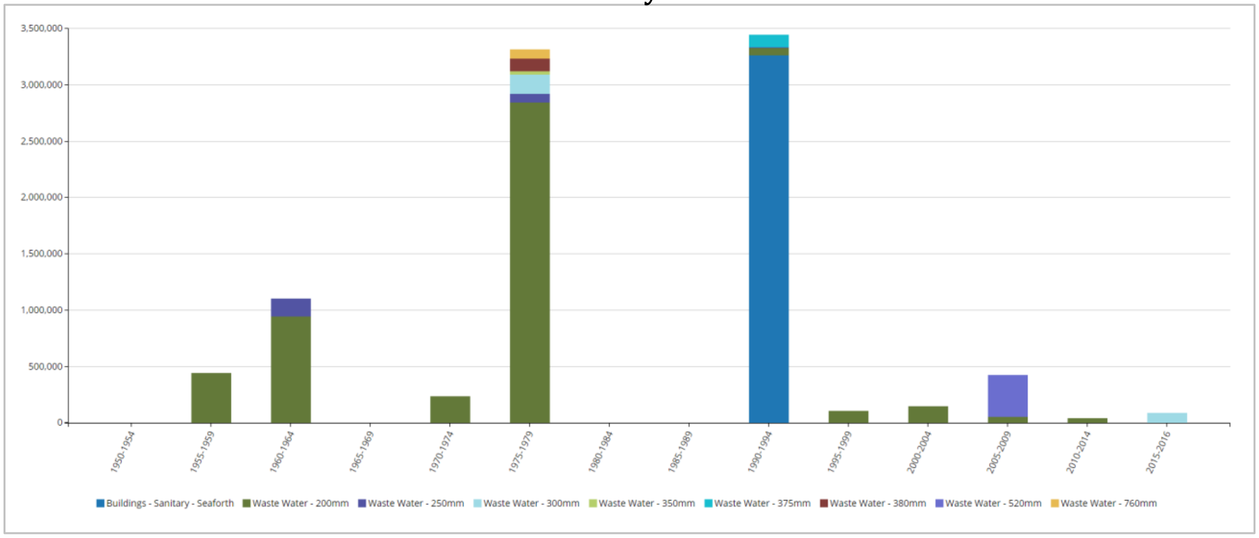


Major investments into the municipality's wastewater systems assets began in the 1950s. Investments then fluctuated and peaked in the early 1980s at $7.6 million. During this time $5 million was put into sanitary buildings.

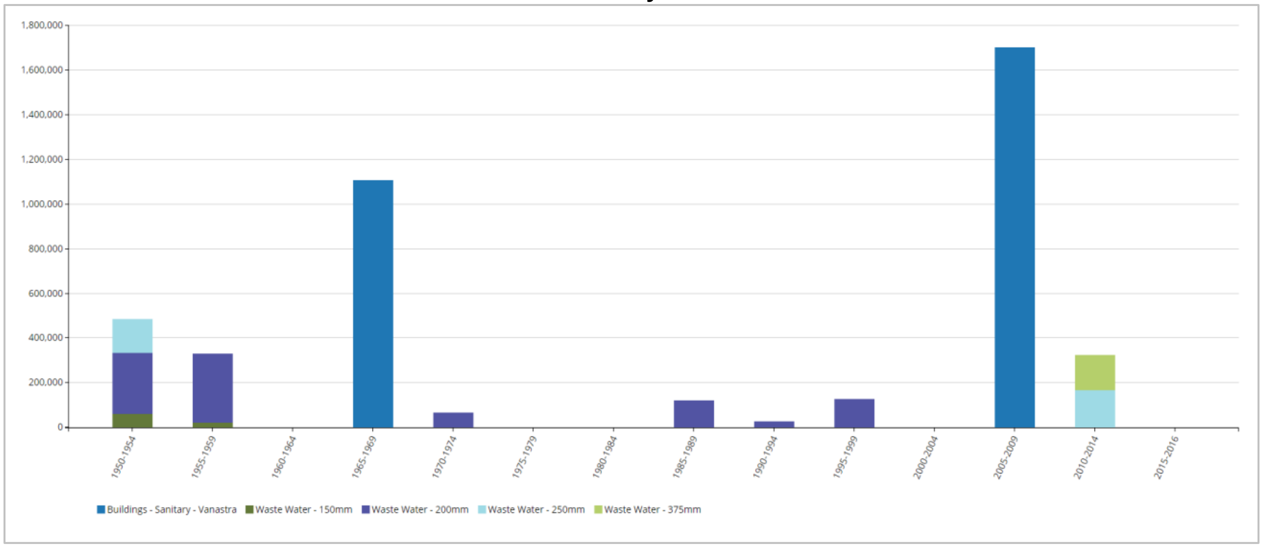
Brussels Historical Investments – Wastewater System



Seaforth Historical Investments – Wastewater System



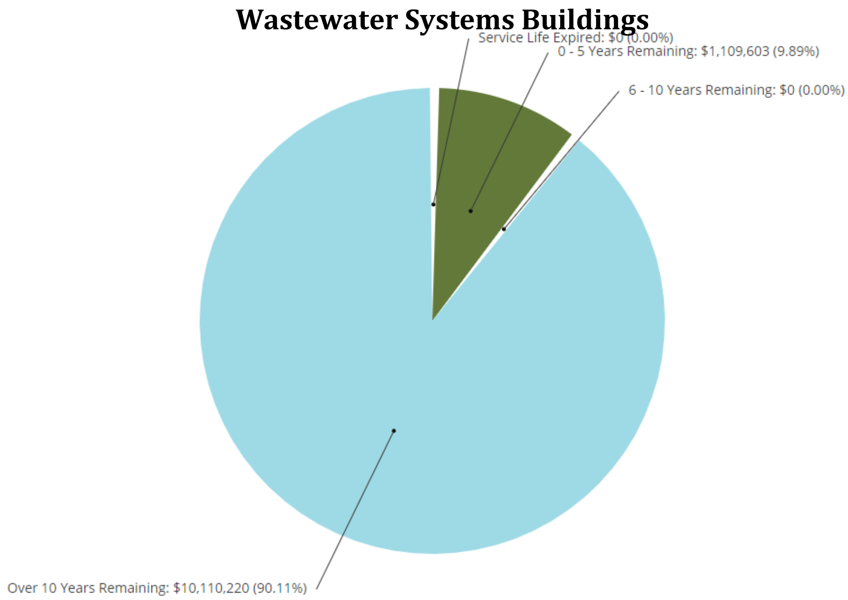
Vanastra Historical Investments – Wastewater System

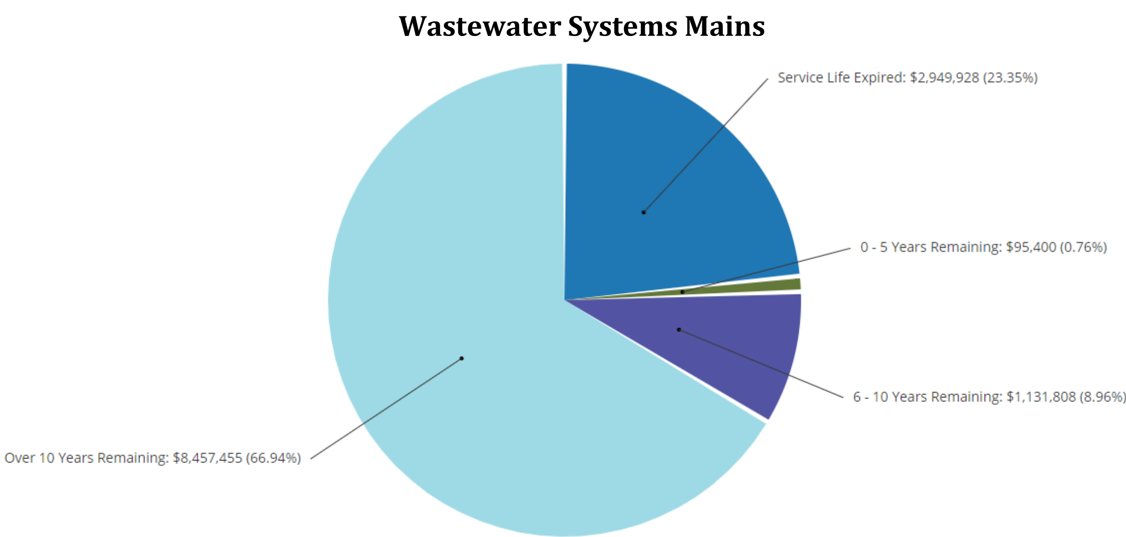


4.3 Useful Life Consumption

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 wastewater systems.

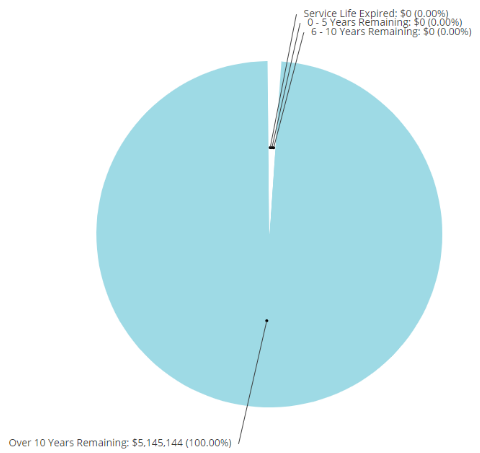
Figure 28 Useful Life Consumption – Wastewater Systems



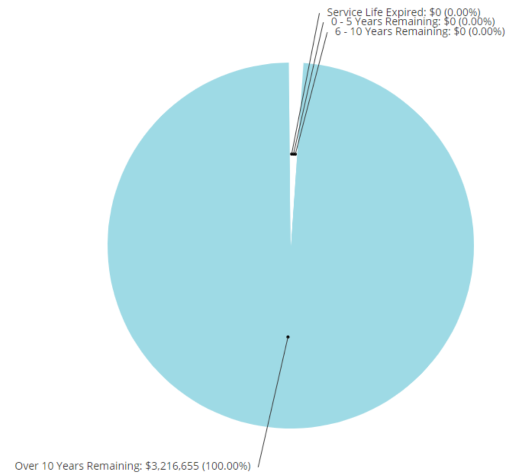


While 90% of buildings and 67% of wastewater mains have at least 10 years of useful life remaining, 23% of mains, with a valuation of $3 million, remain in operation beyond their useful life. An additional 10% of wastewater buildings will reach the end of their useful life within the next five years.

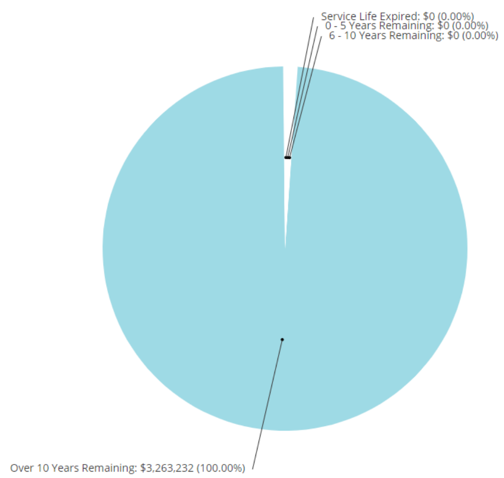
Brussels Buildings Consumption



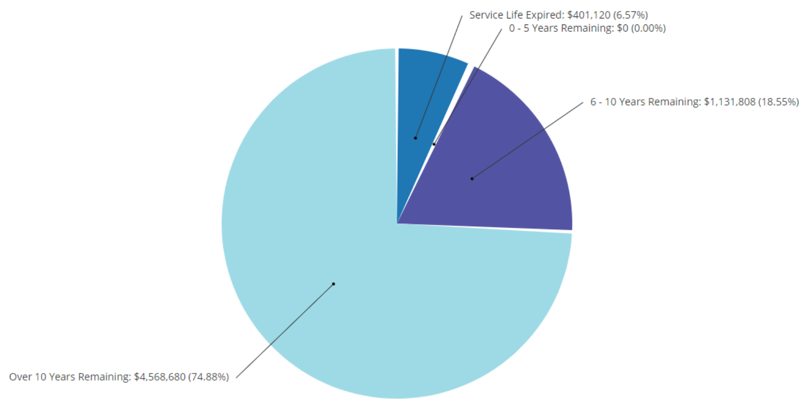
Brussels Wastewater Mains Consumption



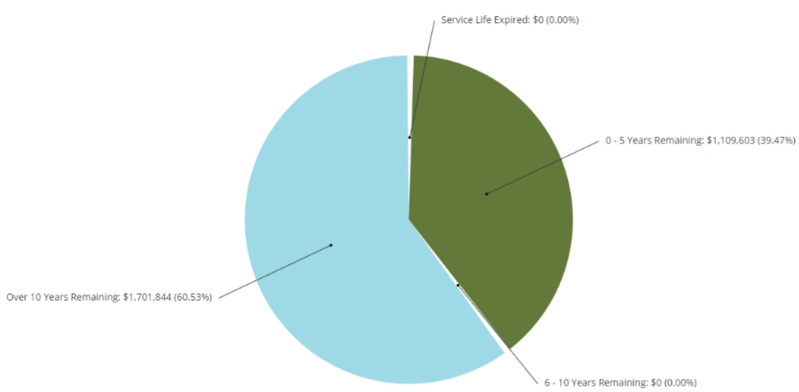
Seaforth Building Consumption



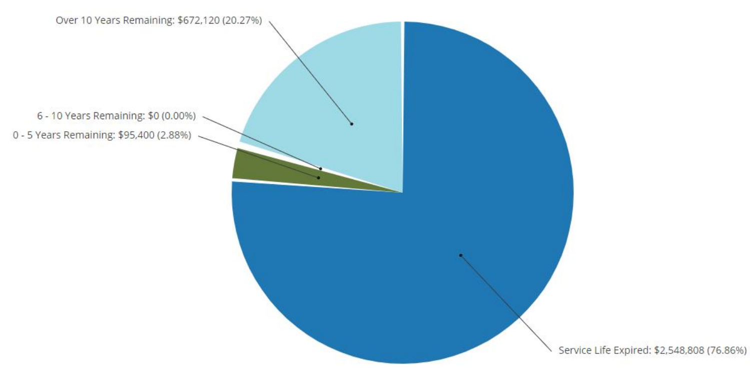
Seaforth Wastewater Mains Consumption



Vanastra Buildings Consumption



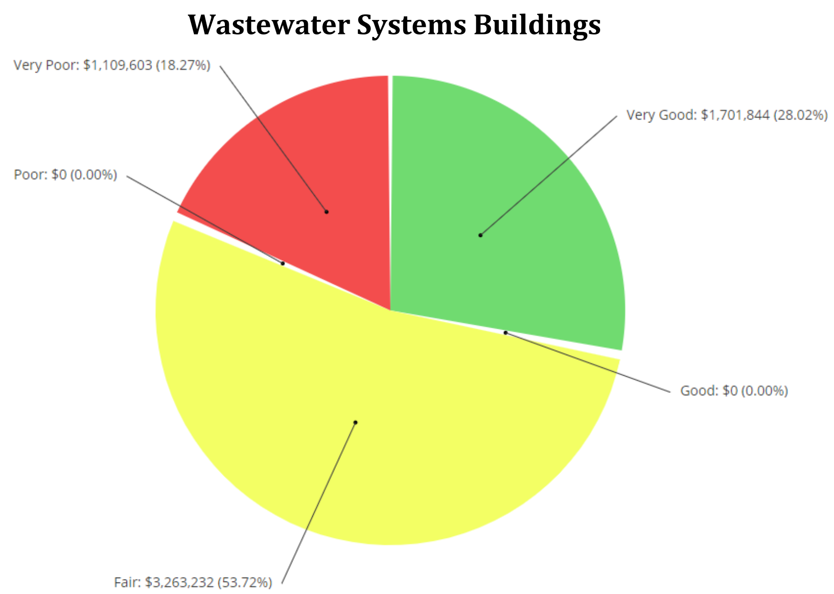
Vanastra Wastewater Mains Consumption

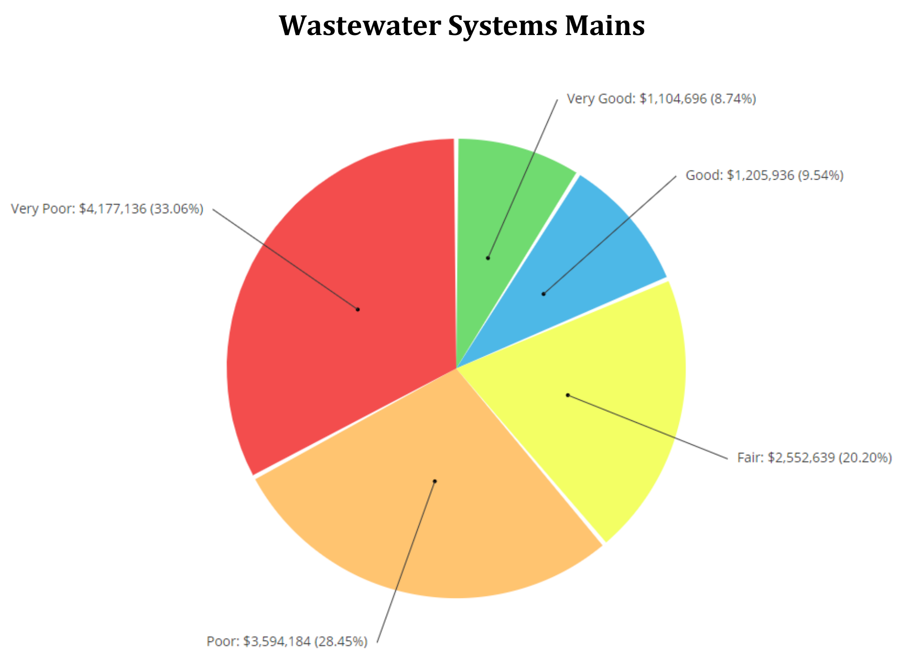


4.4 Current Asset Condition

Using replacement cost, in this section we summarize the condition of the municipality's wastewater systems 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. All assets are based on age-based data.

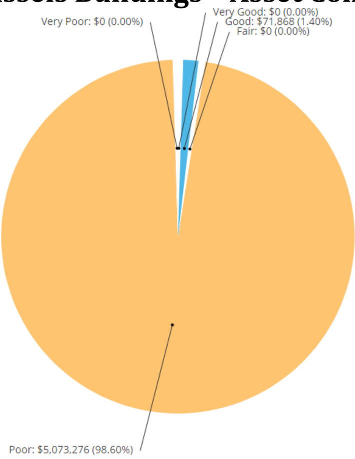
Figure 29 Asset Condition – Wastewater Systems (Age-based)



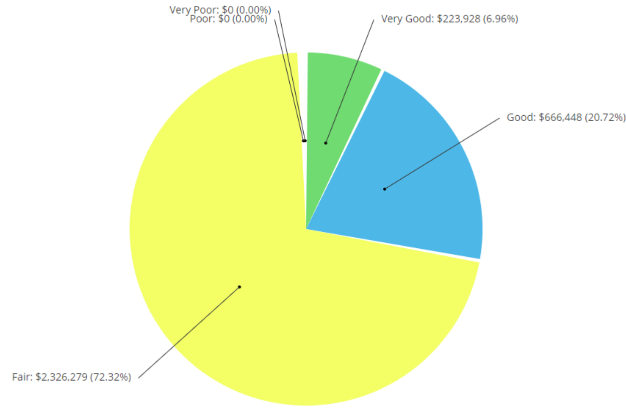


Age-based data indicates that 28% of wastewater building assets and 18% of wastewater mains are in good to very good condition, while 18% of wastewater buildings and 62% of wastewater mains, with a valuation of $8.8 million, are in poor condition.

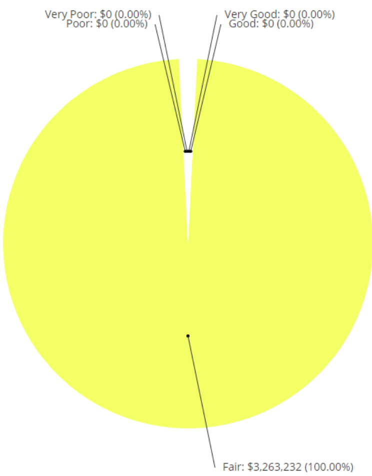
Brussels Buildings – Asset Condition



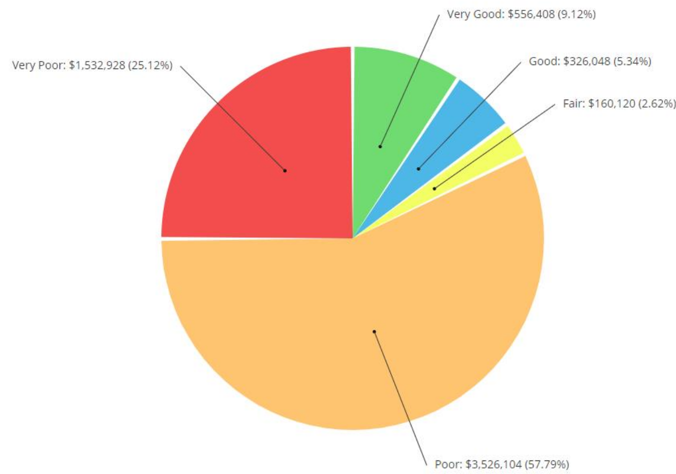
Brussels Mains – Asset Condition



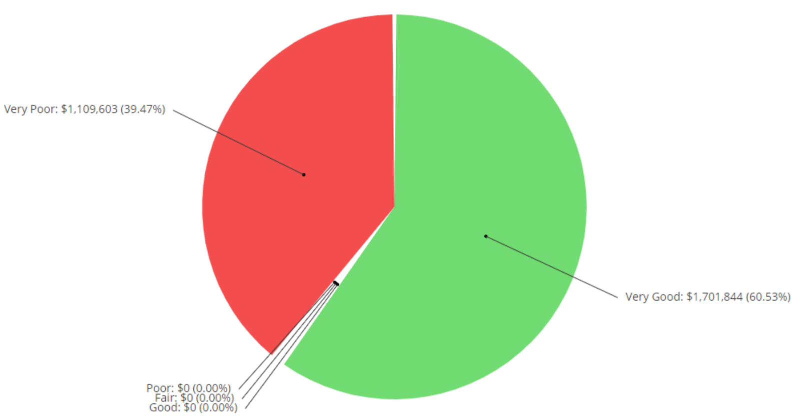
Seaforth Buildings – Asset Condition



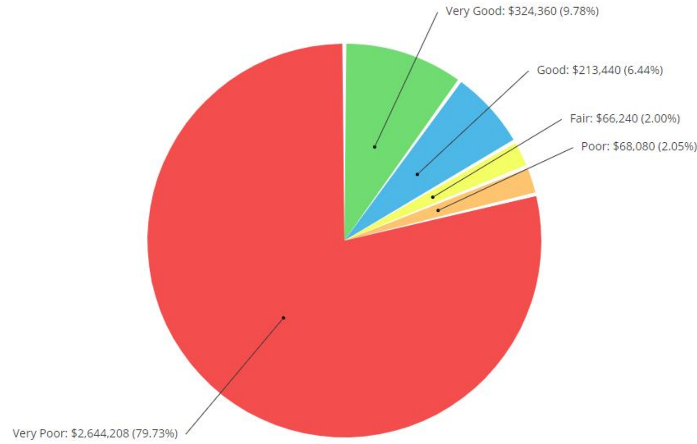
Seaforth Mains – Asset Condition



Vanastra Buildings – Asset Condition



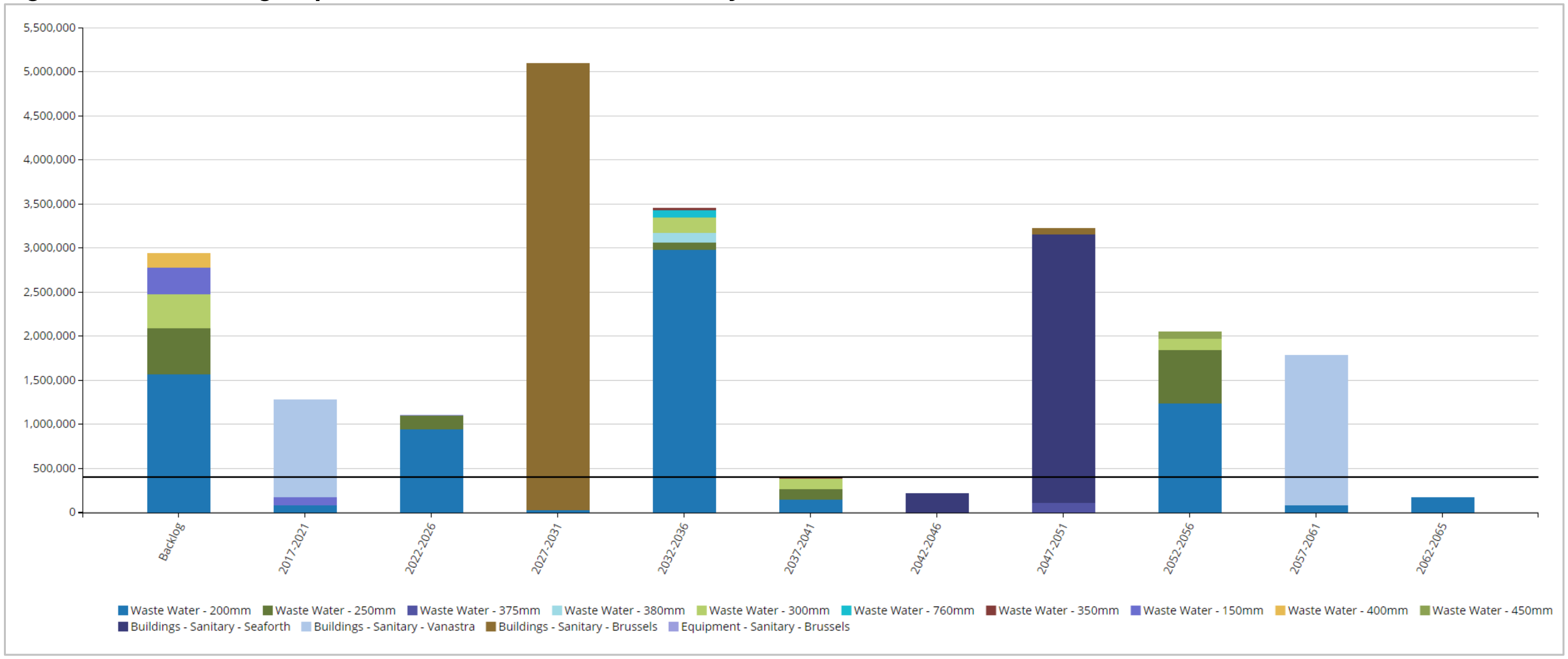
Vanastra Mains – Asset Condition



4.5 Forecasting Replacement Needs

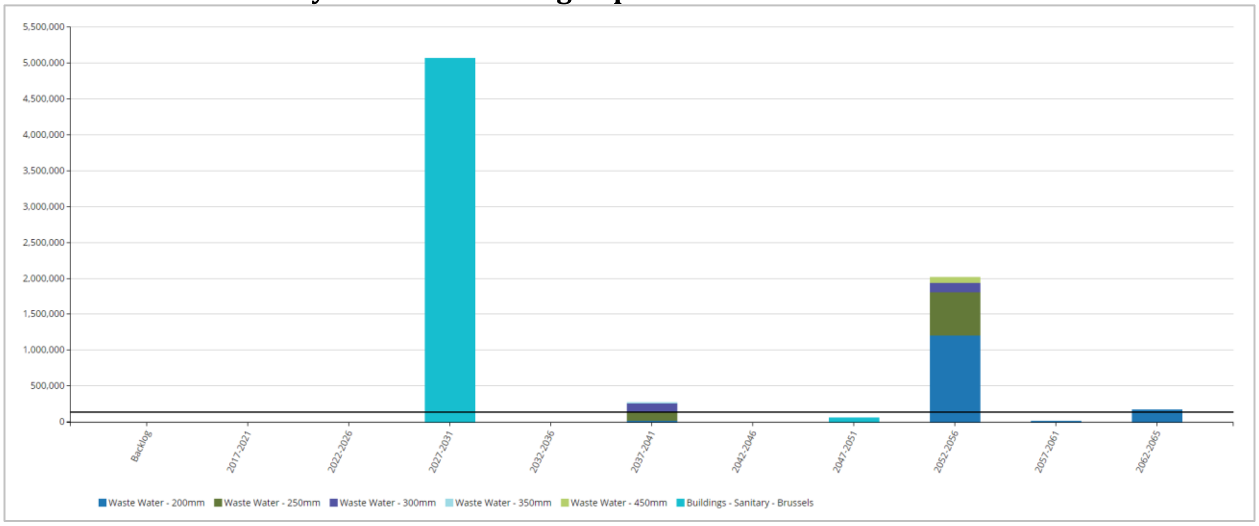
In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the municipality's wastewater systems assets. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. In the absence of observed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

Figure 30 Forecasting Replacement Needs – Wastewater Systems

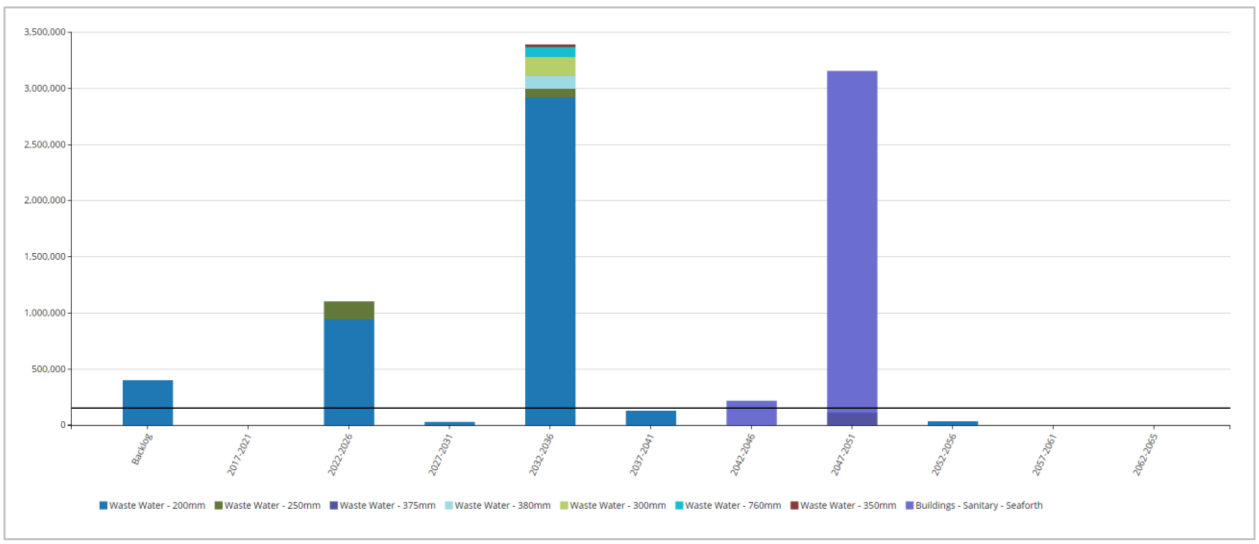


Age-based condition data indicates a backlog of almost $3 million and replacement needs are forecasted to be $1.3 million in the next five years; an additional $1.1 million is forecasted in replacement needs between 2022-2026. The municipality's annual requirements (indicated by the black line) for its wastewater systems total $416,000. 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 $75,000, leaving an annual deficit of $341,000. 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.

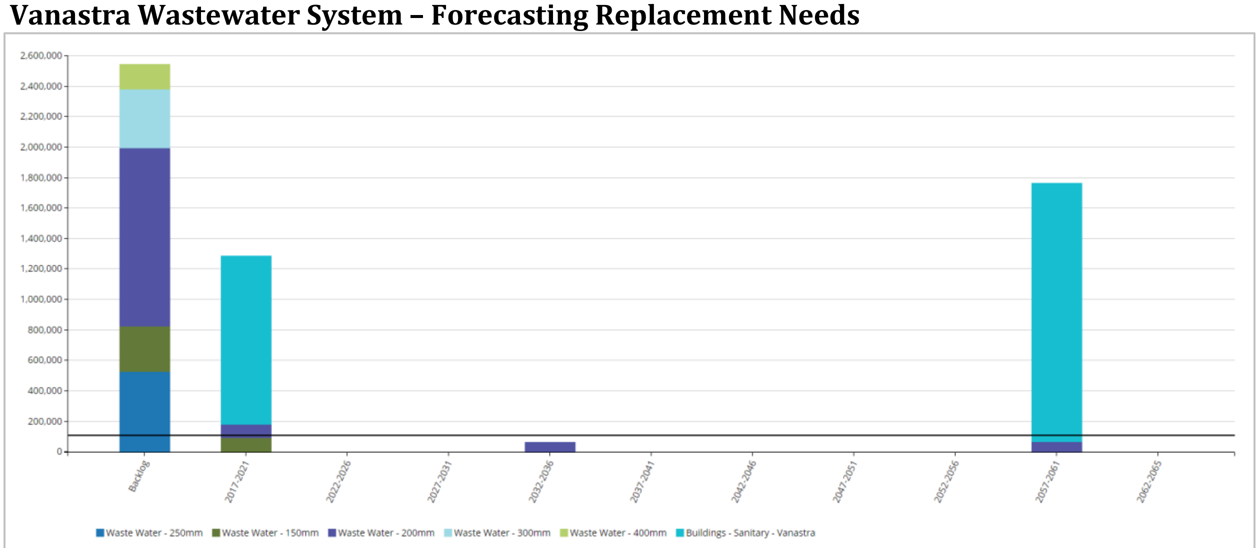
Brussels Wastewater System– Forecasting Replacement Needs



Seaforth Wastewater System– Forecasting Replacement Needs



Vanastra Wastewater System – Forecasting Replacement Needs



4.6 Recommendations – Wastewater Systems

- Age-based condition data shows a backlog of almost $3 million and 10-year replacement needs of $2.4 million. The municipality should implement a condition assessment program of its wastewater systems assets to precisely estimate its financial requirements and field needs. See Section 2, ‘Condition Assessment Programs’ in the ‘Asset Management Strategies’ chapter.

- The data collected through condition assessment programs should be integrated into a risk management framework which will guide prioritization of 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 the wastewater systems as outlined further within the “Asset Management Strategy” section of this AMP.

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

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

- The municipality is funding 18% of its long-term requirements on an annual basis. See the ‘Financial Strategy’ section on how to achieve more sustainable and optimal funding levels.

5. Storm Network

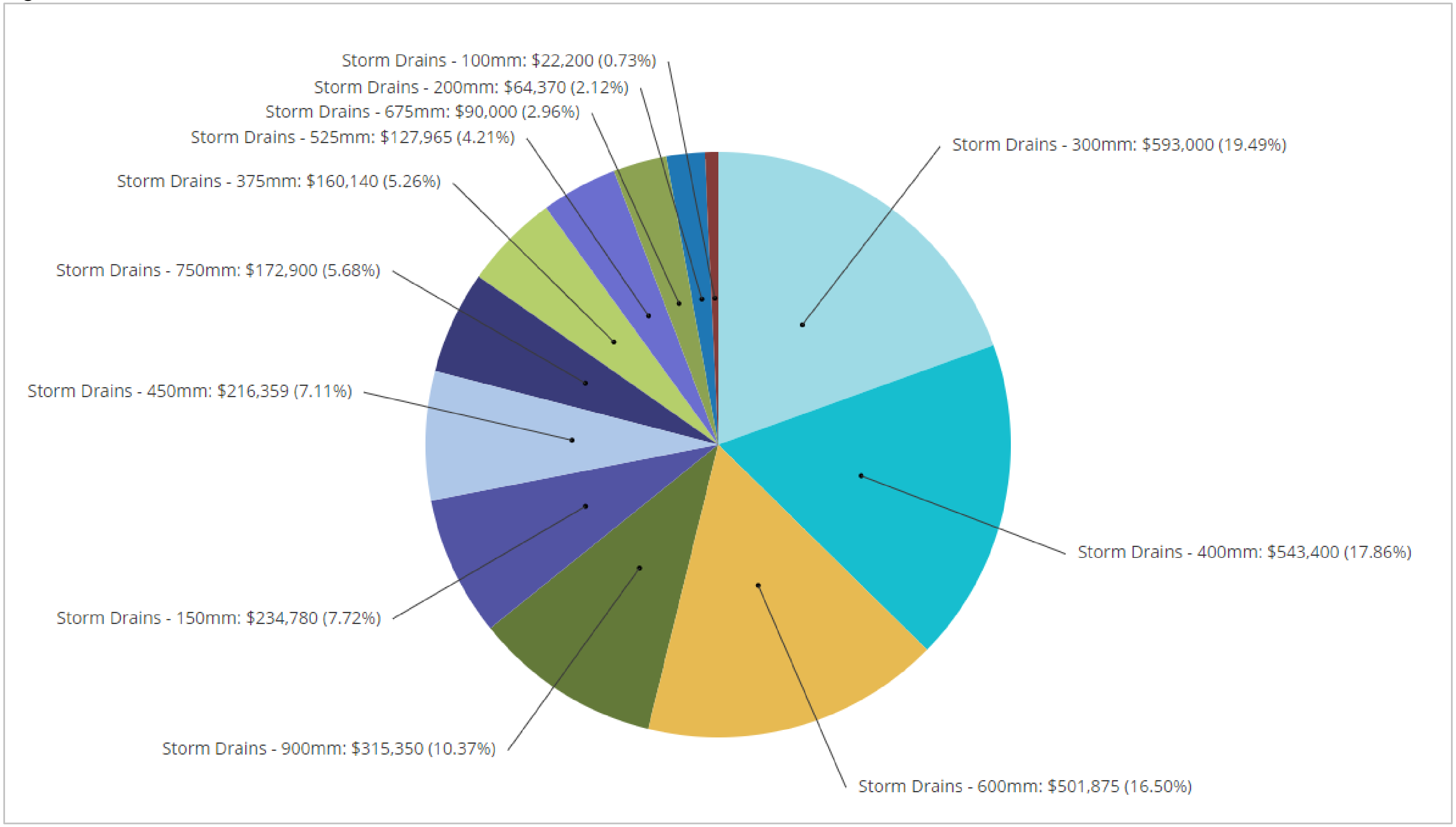
5.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 12 illustrates key asset attributes for the municipality's storm network, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the municipality's storm network assets are valued at $3 million based on 2016 replacement costs. The useful life indicated for each asset type below was assigned by the municipality.

Table 12 Asset Inventory – Storm Network

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Storm Network	Storm Drains - 100mm	120m	75	$185.00 Cost per Unit	$22,200
	Storm Drains - 150mm	1,204m	50 - 75	$195.00 Cost per Unit	$234,780
	Storm Drains - 200mm	314m	60 - 75	$205.00 Cost per Unit	$64,370
	Storm Drains - 300mm	2,372m	60 - 75	$250.00 Cost per Unit	$593,000
	Storm Drains - 375mm	1,015m	60 - 75	$255.00 Cost per Unit	$160,140
	Storm Drains - 400mm	2,090m	60 - 75	$260.00 Cost per Unit	$543,400
	Storm Drains - 450mm	817m	60 - 75	$265.00 Cost per Unit	$216,359
	Storm Drains - 525mm	449m	60 - 75	$285.00 Cost per Unit	$127,965
	Storm Drains - 600mm	1,375m	60 - 75	$365.00 Cost per Unit	$501,875
	Storm Drains - 675mm	240m	60 - 75	$375.00 Cost per Unit	$90,000
	Storm Drains - 750mm	380m	60	$455.00 Cost per Unit	$172,900
	Storm Drains - 900mm	530m	60	$595.00 Cost per Unit	$315,350
				Total	**$3,042,339**

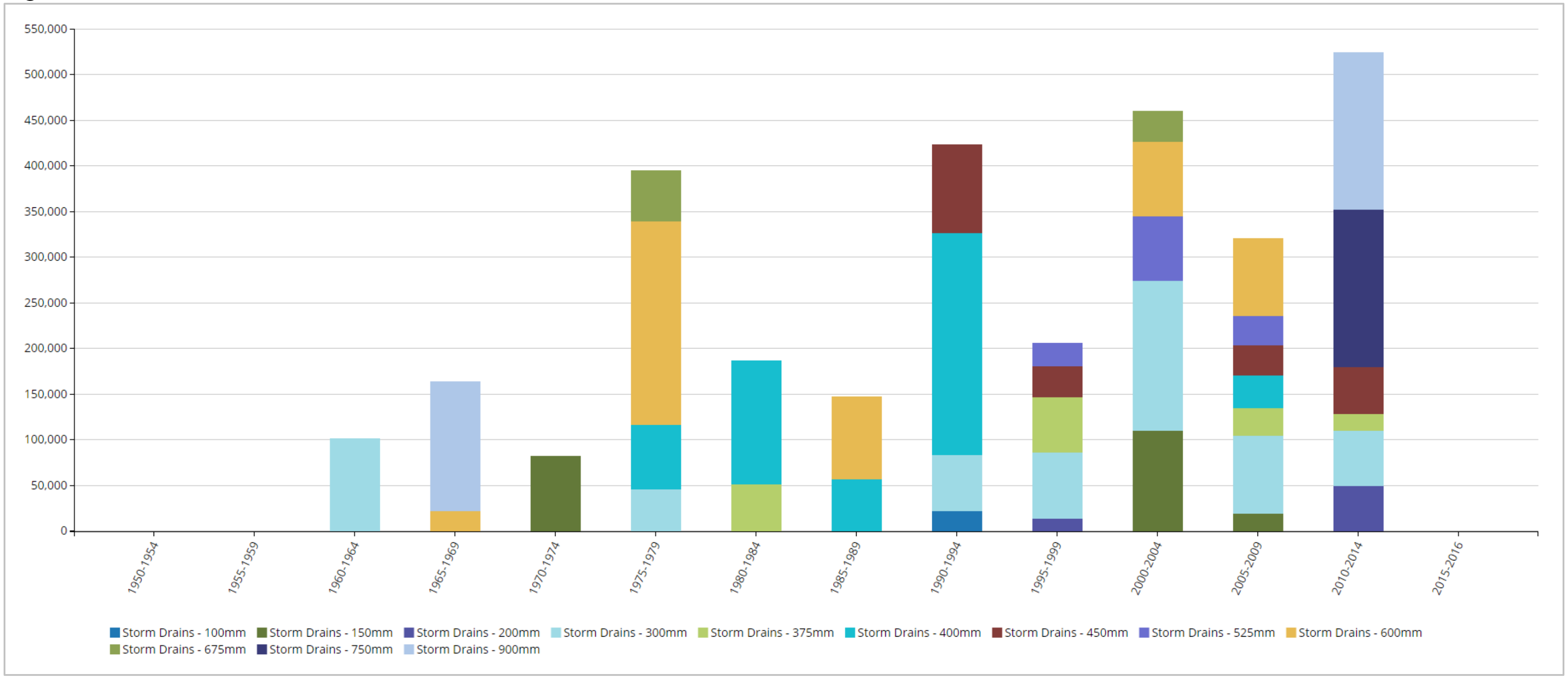
Figure 31 Asset Valuation – Storm Network



5.2 Historical Investment in Infrastructure

Figure 32 shows the municipality's historical investments in its storm network since 1950. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 5.3) 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 32 Historical Investment – Storm Network

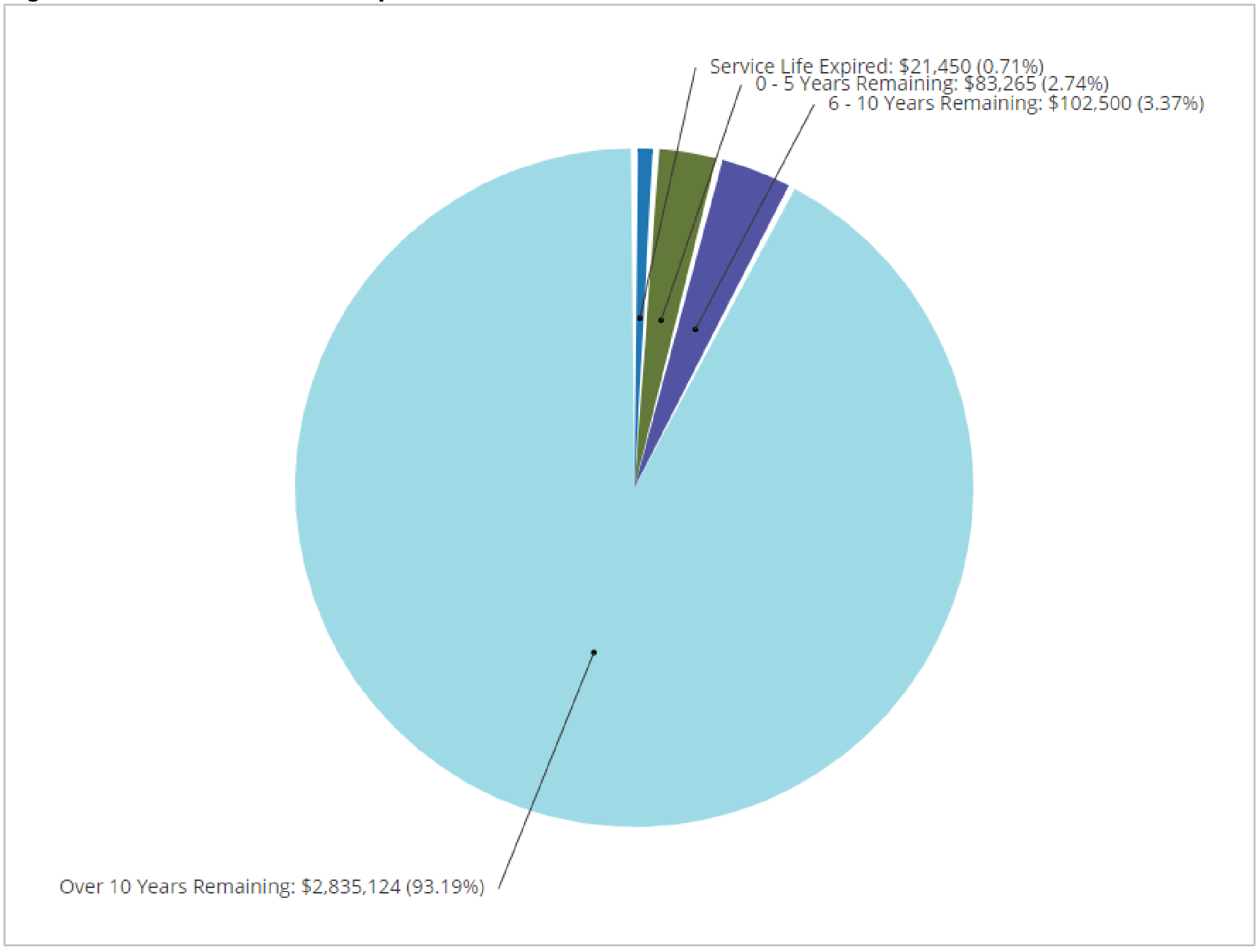


Investments in the storm network began the early 1960s and have fluctuated over the years. In the early 2000s, the period of largest investment, $1.3 million was invested in the storm network with 100% being invested in storm drains.

5.3 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 33 illustrates the useful life consumption levels as of 2016 for the municipality's storm network assets.

Figure 33 Useful Life Consumption – Storm Network

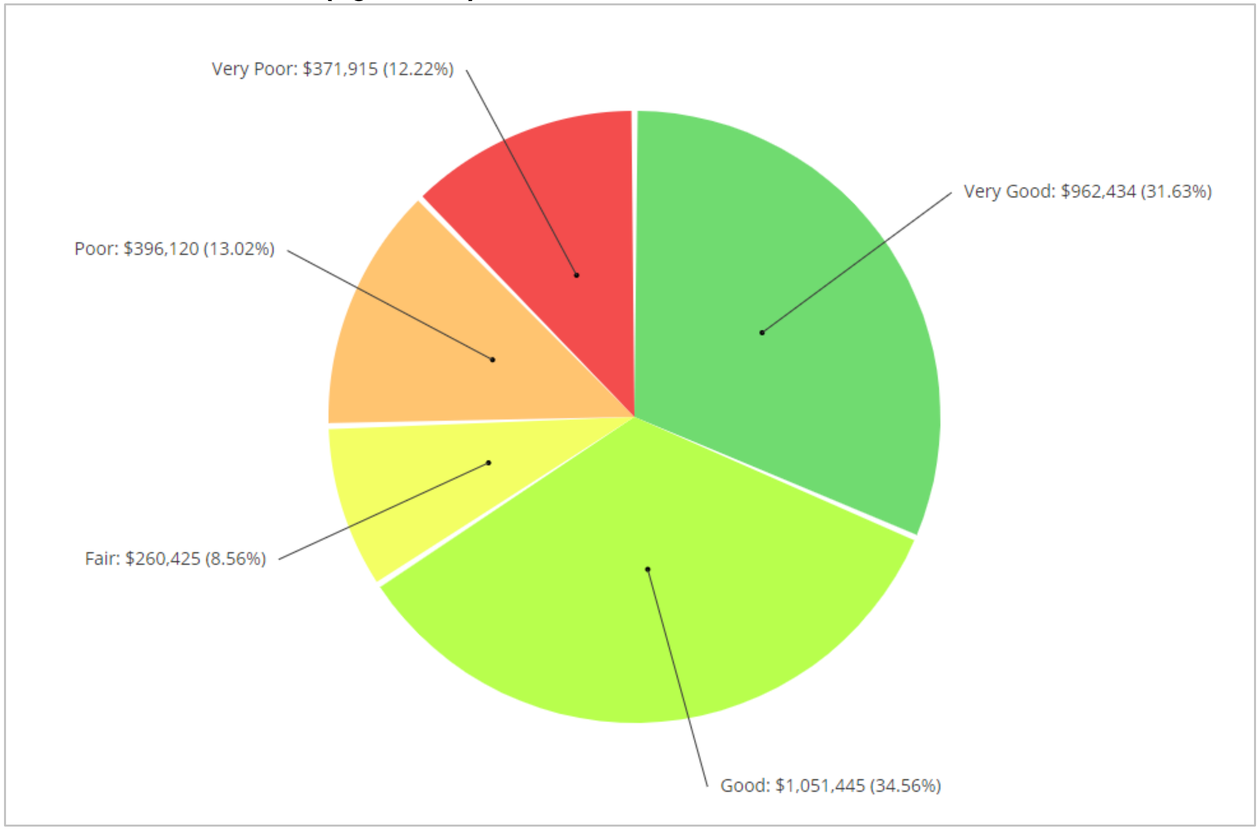


93% of the storm network assets have at least 10 years of useful life remaining while 1%, with a valuation of $21,000, remain in operation beyond their useful life. An additional 3% will reach the end of their useful life within the next five years.

5.4 Current Asset Condition

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

Figure 34 Asset Condition – Storm Network (Age-based)

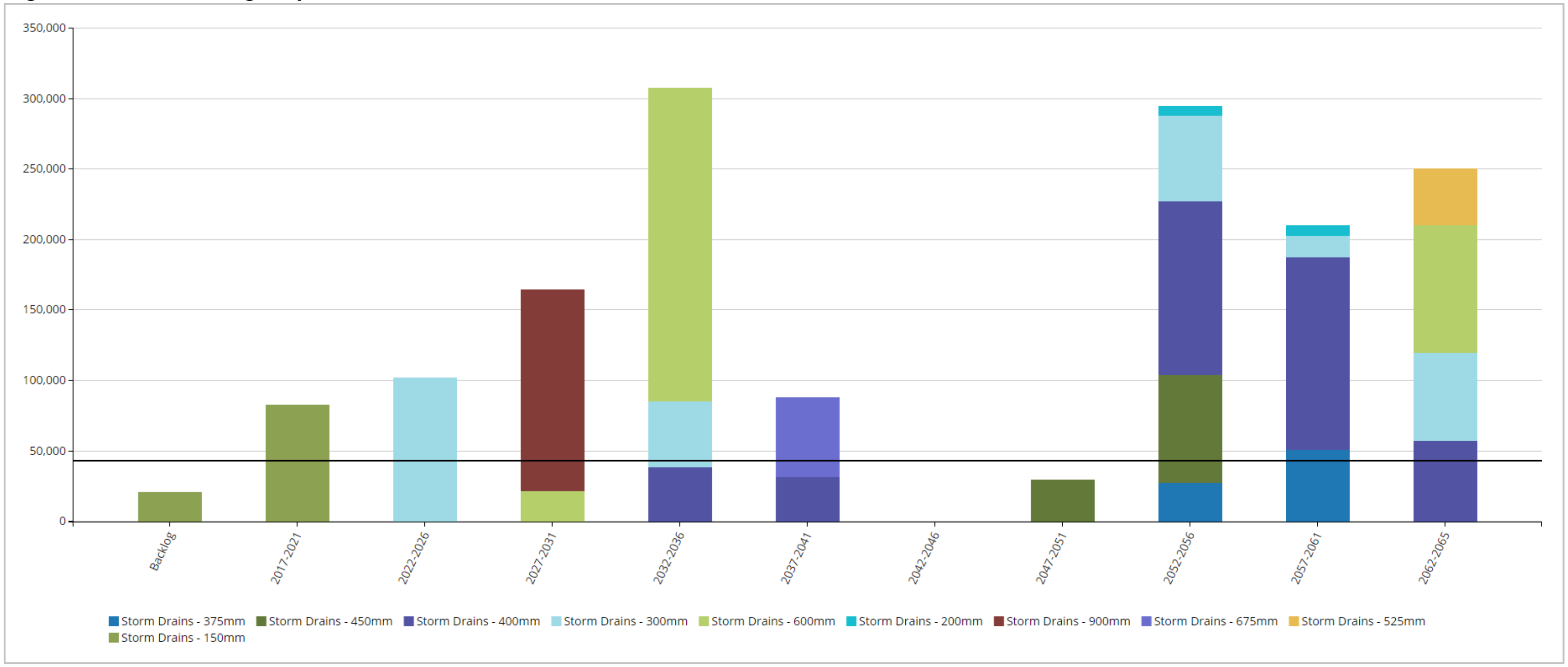


Age-based data indicates that 66% of the storm network assets are in good to very good condition, while 25%, with a valuation of $768,000, are in poor condition.

5.5 Forecasting Replacement Needs

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

Figure 35 Forecasting Replacement Needs – Storm Network



Age-based data shows a backlog of $21,000 and five-year replacement needs of $83,000. An additional $102,000 will be required between 2022-2026. The municipality's annual requirements (indicated by the black line) for storm network assets total $44,000. 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 $99,000, leaving an annual surplus of $55,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs,

5.6 Recommendations – Storm Network

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

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

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

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

- The municipality is funding 100% of it long-term requirements on an annual basis. See the 'Financial Strategy' section on how to achieve sustainable and optimal funding levels.

6. Buildings & Facilities

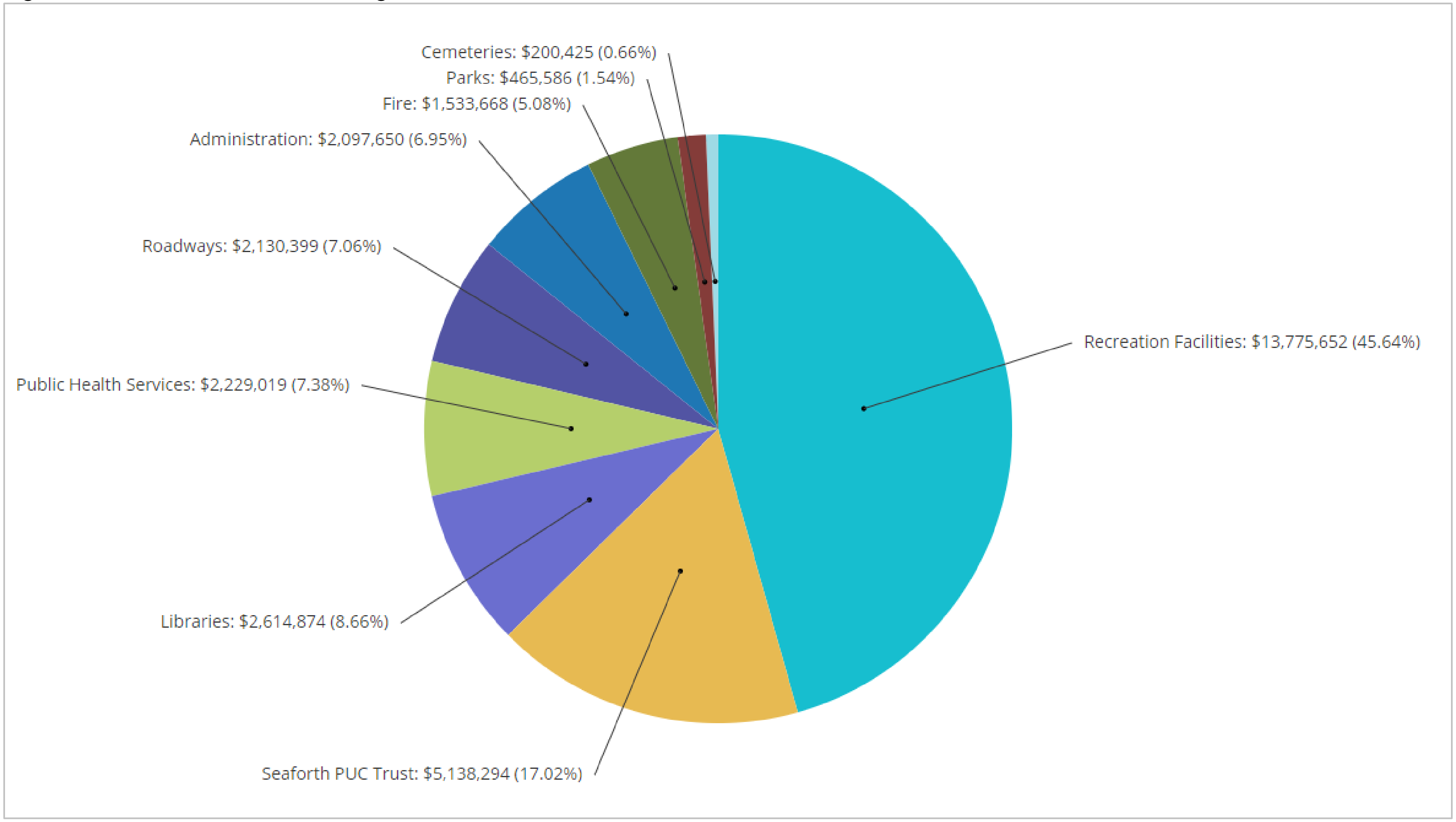
6.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 13 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 & facilities assets are valued at $30 million based on 2016 replacement costs. The useful life indicated for each asset type below was assigned by the municipality.

Table 13 Key Asset Attributes – Buildings & Facilities

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Buildings & Facilities	Administration	3 buildings	75	NRBCPI (Toronto)	$2,097,650
	Cemeteries	3 units, 1 building	75	NRBCPI (Toronto), User-Defined	$200,425
	Fire	3 buildings	75	NRBCPI (Toronto)	$1,533,668
	Libraries	2 buildings	75	NRBCPI (Toronto), User-Defined	$2,614,874
	Parks	5 units, 3 structures	75	NRBCPI (Toronto), User-Defined	$465,586
	Public Health Services	2 buildings	75	NRBCPI (Toronto)	$2,229,019
	Recreation Facilities	14 buildings	20 - 75	NRBCPI (Toronto), User-Defined	$13,775,652
	Roadways	5 buildings	75	NRBCPI (Toronto)	$2,130,399
	Seaforth PUC Trust	2 buildings	75	NRBCPI (Toronto)	$5,138,294
				Total	**$30,185,567**

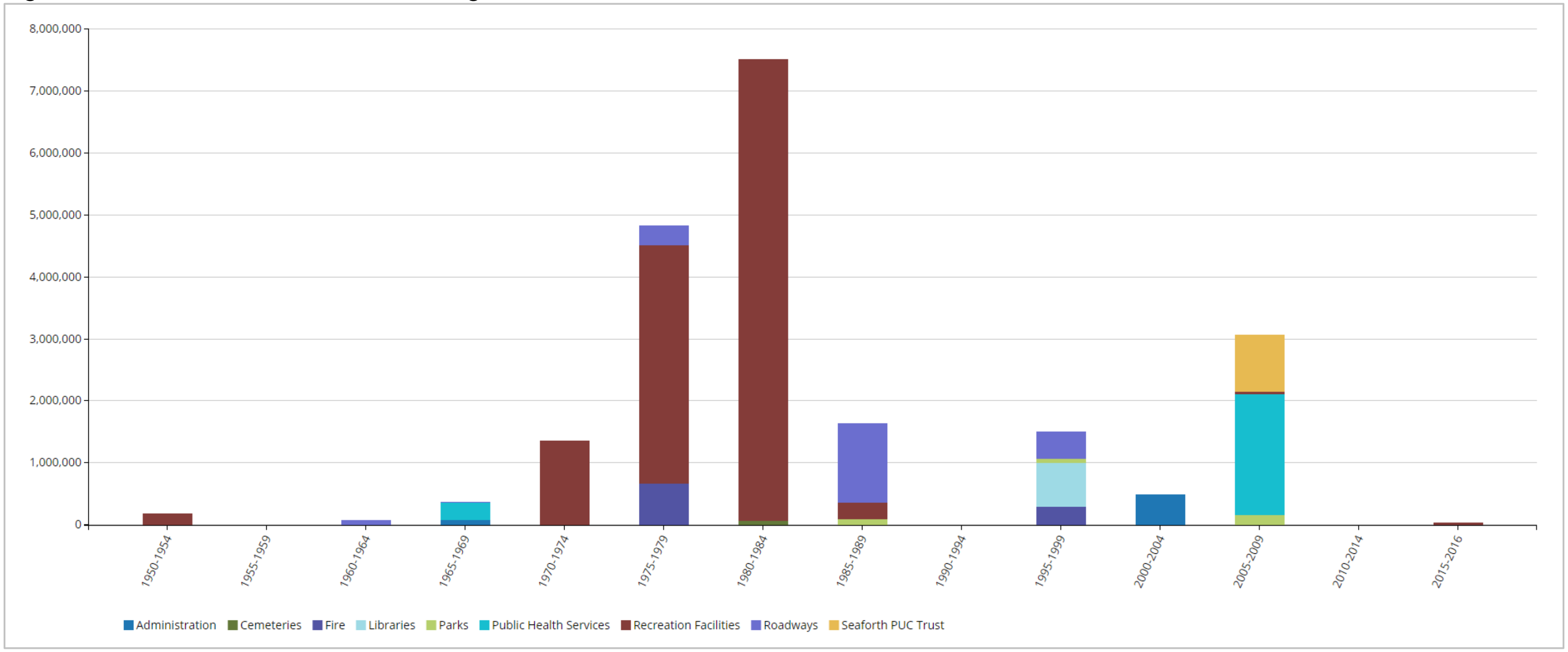
Figure 36 Asset Valuation – Buildings & Facilities



6.2 Historical Investment in Infrastructure

Figure 37 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 6.3) 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 37 Historical Investment – Buildings & Facilities

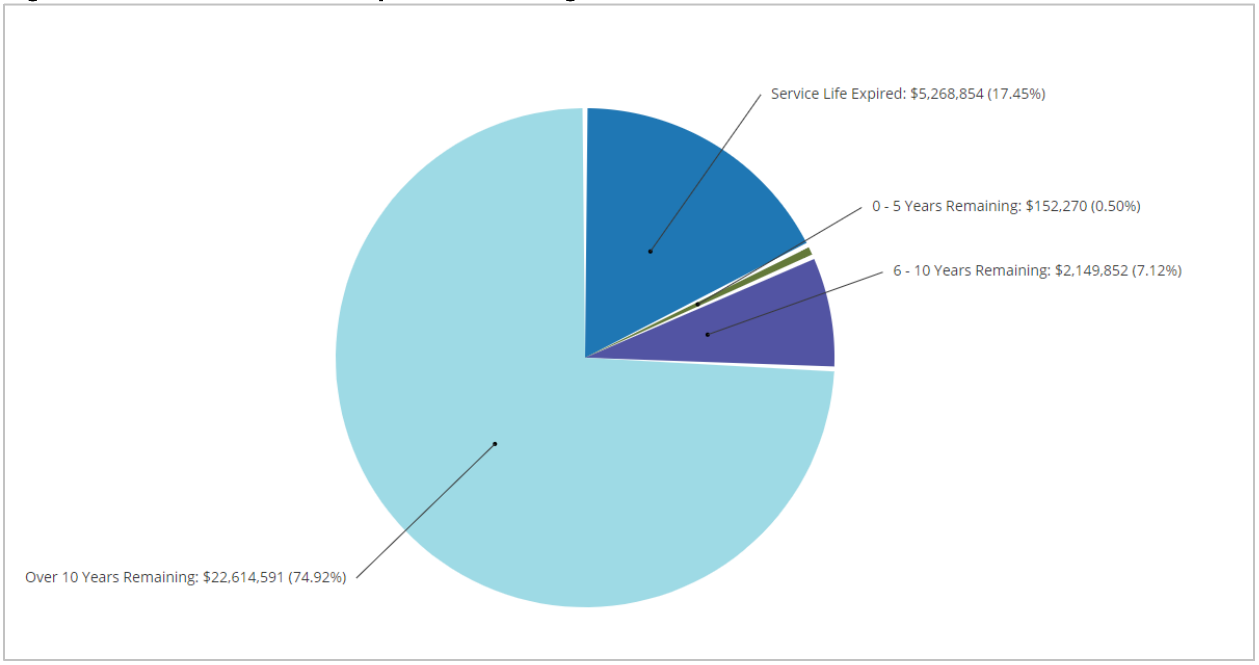


The municipality's investments into its buildings & facilities assets started to grow in 1960s until the late 1980s. Between 1980 and 1984, the period of largest investment, $7.5 million was invested into the buildings & facilities assets with a focus on recreation facilities.

6.3 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 38 illustrates the useful life consumption levels as of 2016 for the municipality's buildings & facilities assets.

Figure 38 Useful Life Consumption – Buildings & Facilities

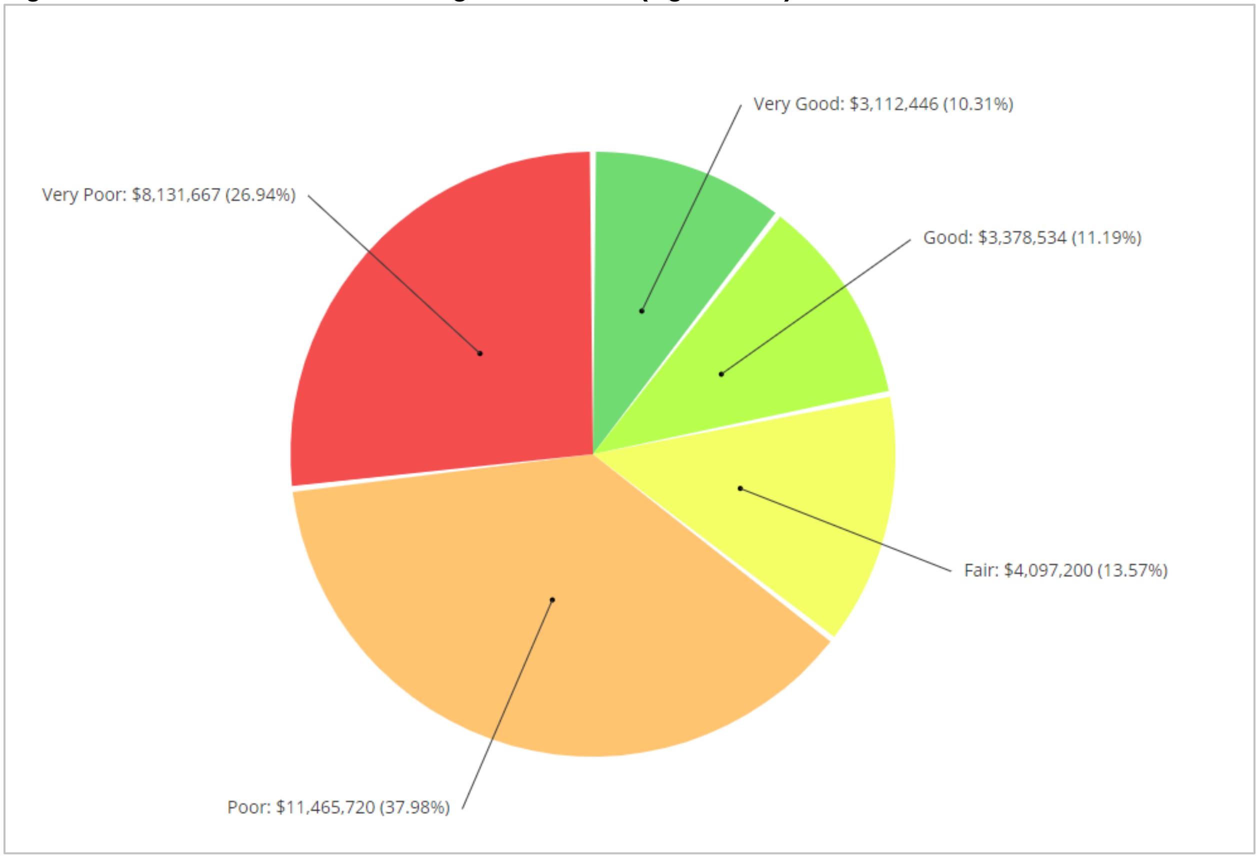


75% of buildings & facilities assets have at least 10 years of useful life remaining; 17%, with a valuation of $5.2 million remain in operation beyond their established useful life.

6.4 Current Asset Condition

Using replacement cost, in this section we summarize the condition of the municipality's buildings & facilities 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. All assets are based on age-based data.

Figure 39 Asset Condition – Buildings & Facilities (Age-based)

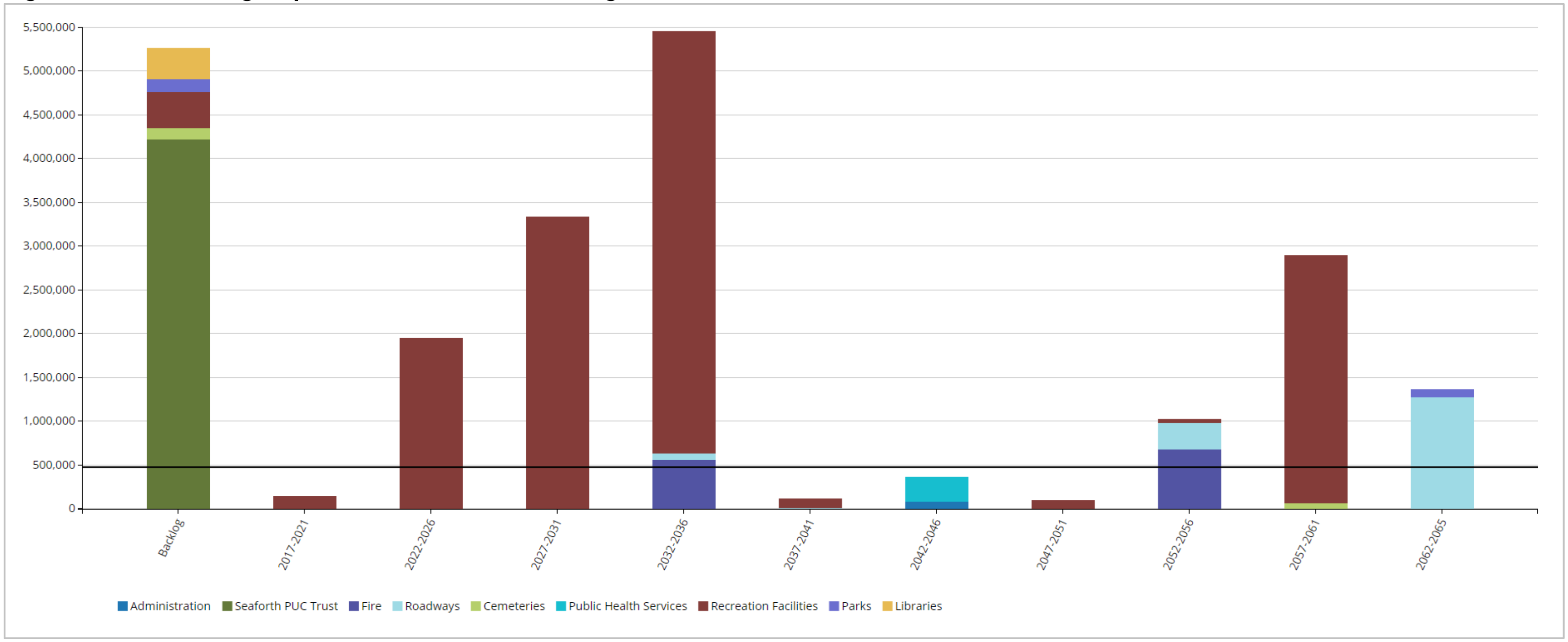


Age-based condition data shows that 22% of buildings & facilities assets, with a valuation of $6.5 million, are in good to very good condition; 65% are in poor to very poor condition.

6.5 Forecasting Replacement Needs

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

Figure 40 Forecasting Replacement Needs – Buildings & Facilities



Age-based condition data indicates a significant backlog of $5.2 million and minimal five-year replacement needs of $152,000. An additional $1.9 million will be required between 2022-2026. The municipality's annual requirements (indicated by the black line) for its buildings & facilities total $490,000. At this funding level, the municipality would be allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. The municipality is currently allocating approximately $350,000, leaving an annual deficit of $140,000. 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.

6.6 Recommendations – Buildings & Facilities

- The municipality should implement a condition inspection program for its buildings & facilities assets 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 71% of its long-term requirements on an annual basis. See the 'Financial Strategy' section on how to achieve more sustainable and optimal funding levels.

7. Machinery & Equipment

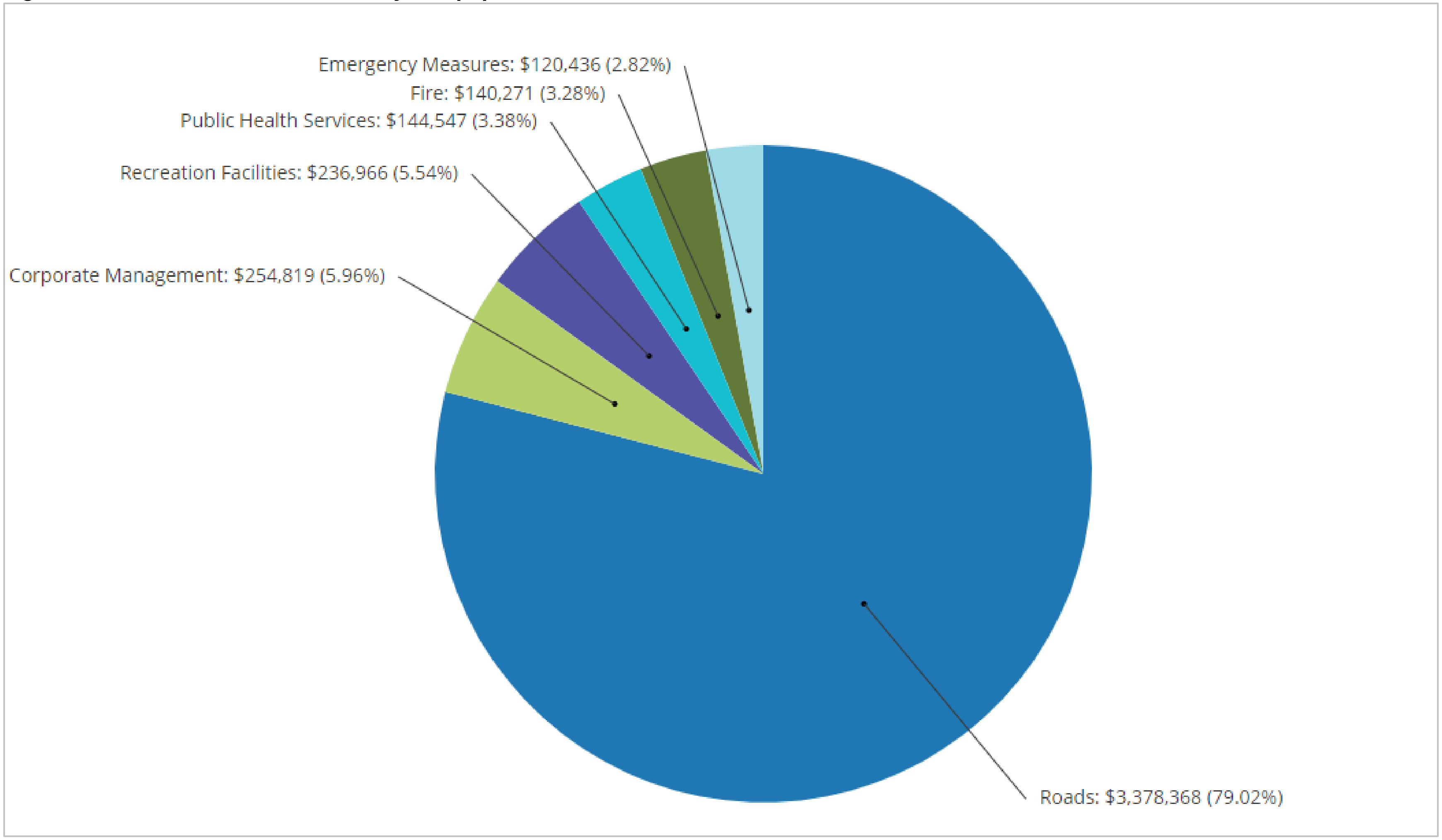
7.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 14 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 $4.2 million based on 2016 replacement costs. The useful life indicated for each asset type below was assigned by the municipality.

Table 14 Asset Inventory – Machinery & Equipment

Asset Type	Components	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Machinery & Equipment	Corporate Management	50 units	4 - 20	CPI (Ontario)	$254,819
	Emergency Measures	3 units	25	CPI (Ontario)	$120,436
	Fire	9 units	25	CPI (Ontario)	$140,271
	Public Health Services	31 units	4 - 20	CPI (Ontario)	$144,547
	Recreation Facilities	6 units	5 - 20	CPI (Ontario)	$236,966
	Roads	19 units	5 - 25	CPI (Ontario), User Defined	$3,378,368
				Total	**$4,275,407**

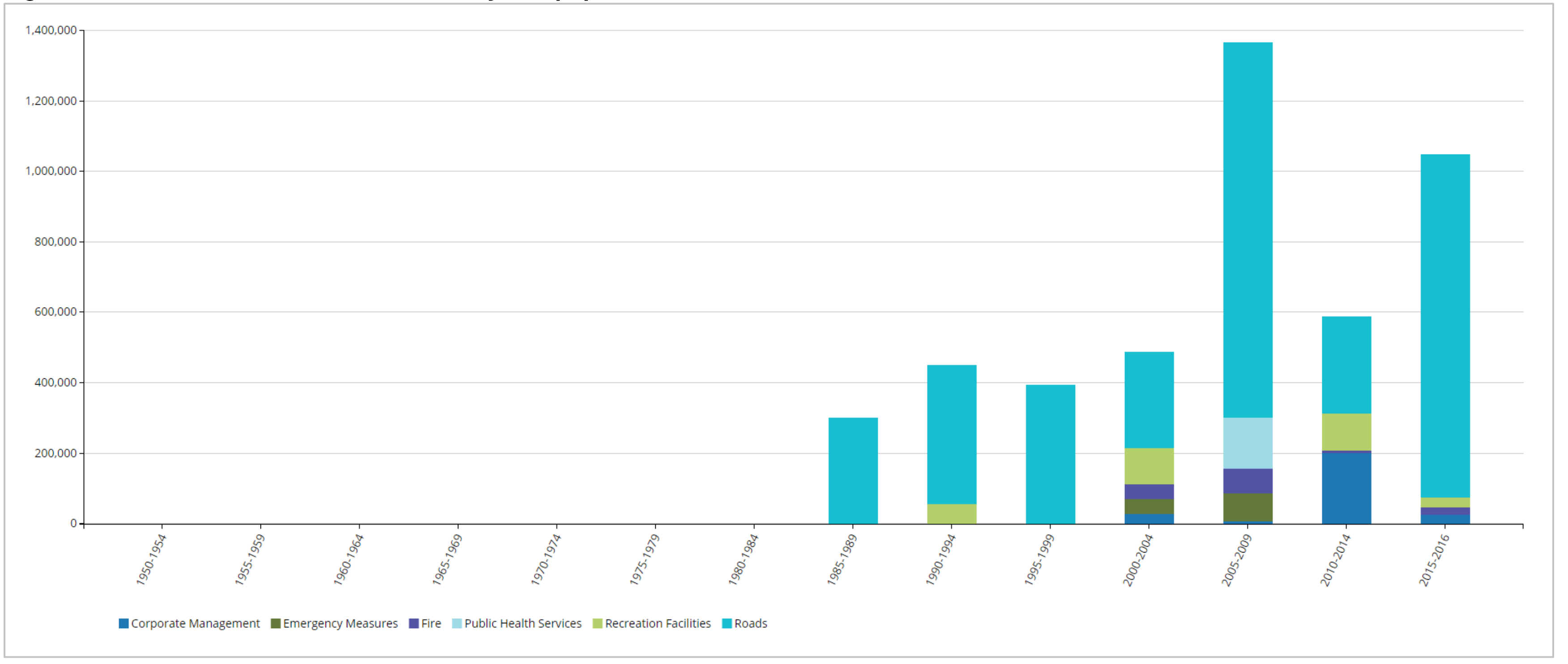
Figure 41 Asset Valuation – Machinery & Equipment



7.2 Historical Investment in Machinery & Equipment

Figure 42 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 7.3) 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 42 Historical Investment – Machinery & Equipment

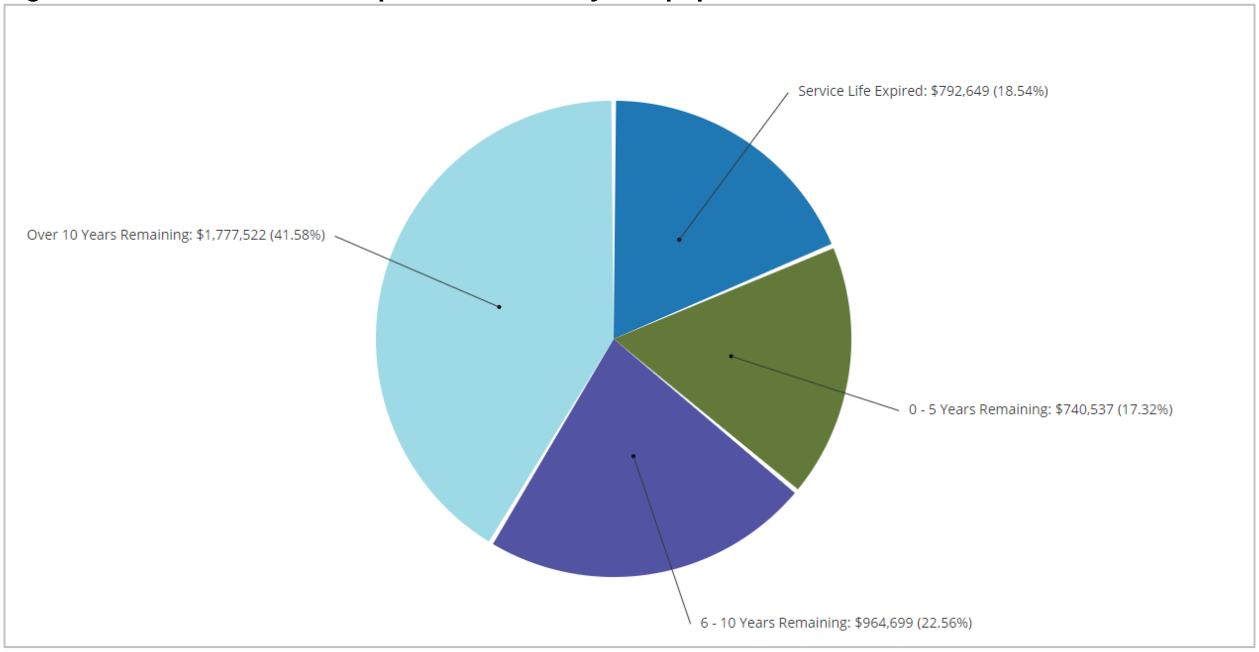


The municipality continued expanded its machinery & equipment portfolio beginning in the late 1980s. Between 2005 and 2009, the period of largest investment, $1.4 million was invested in the machinery & equipment category with a focus on roads.

7.3 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 43 illustrates the useful life consumption levels as of 2016 for the municipality's machinery & equipment assets.

Figure 43 Useful Life Consumption – Machinery & Equipment

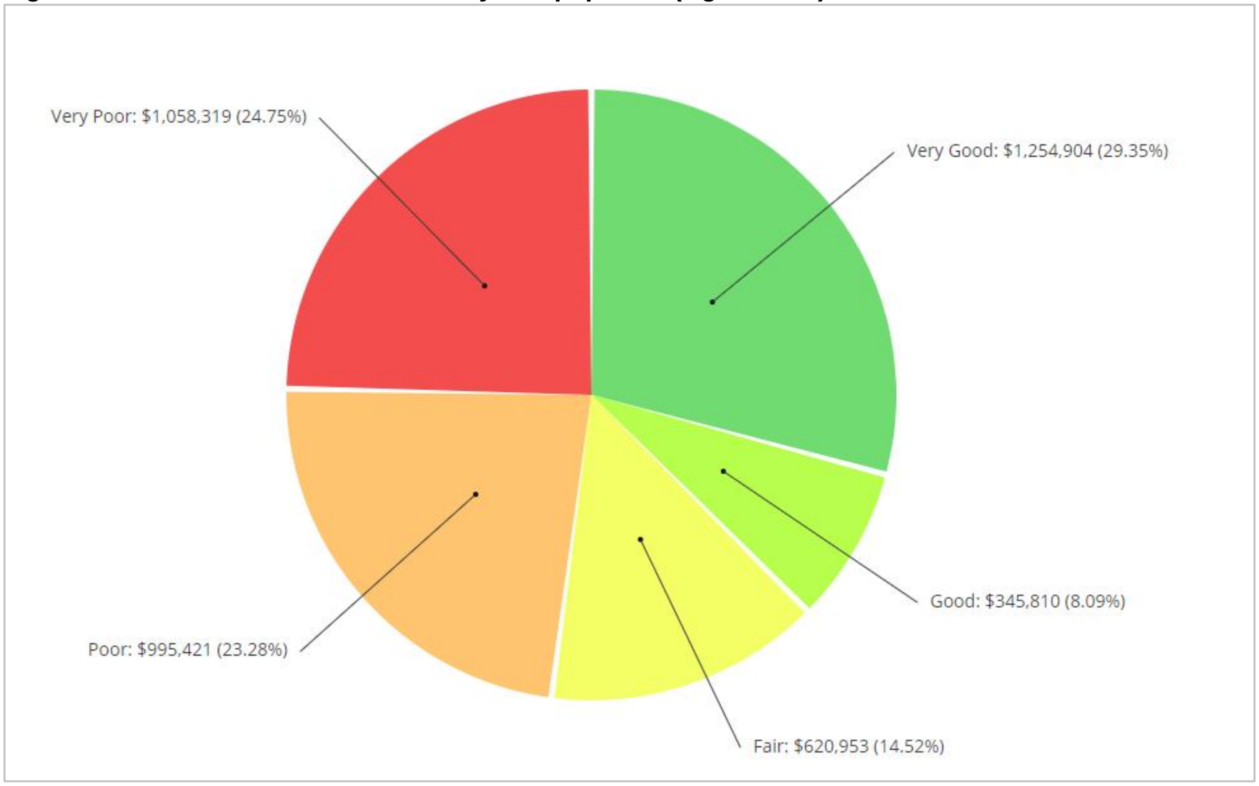


While 42% of machinery & equipment assets have at least 10 years of useful life remaining, 19%, with a valuation of $793,000, remain in operation beyond their useful life. An additional 17% will reach the end of their useful life within the next five years.

7.4 Current Asset Condition

Using replacement cost, in this section we summarize the condition of the municipality's machinery & 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. All assets are based on age-based data.

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

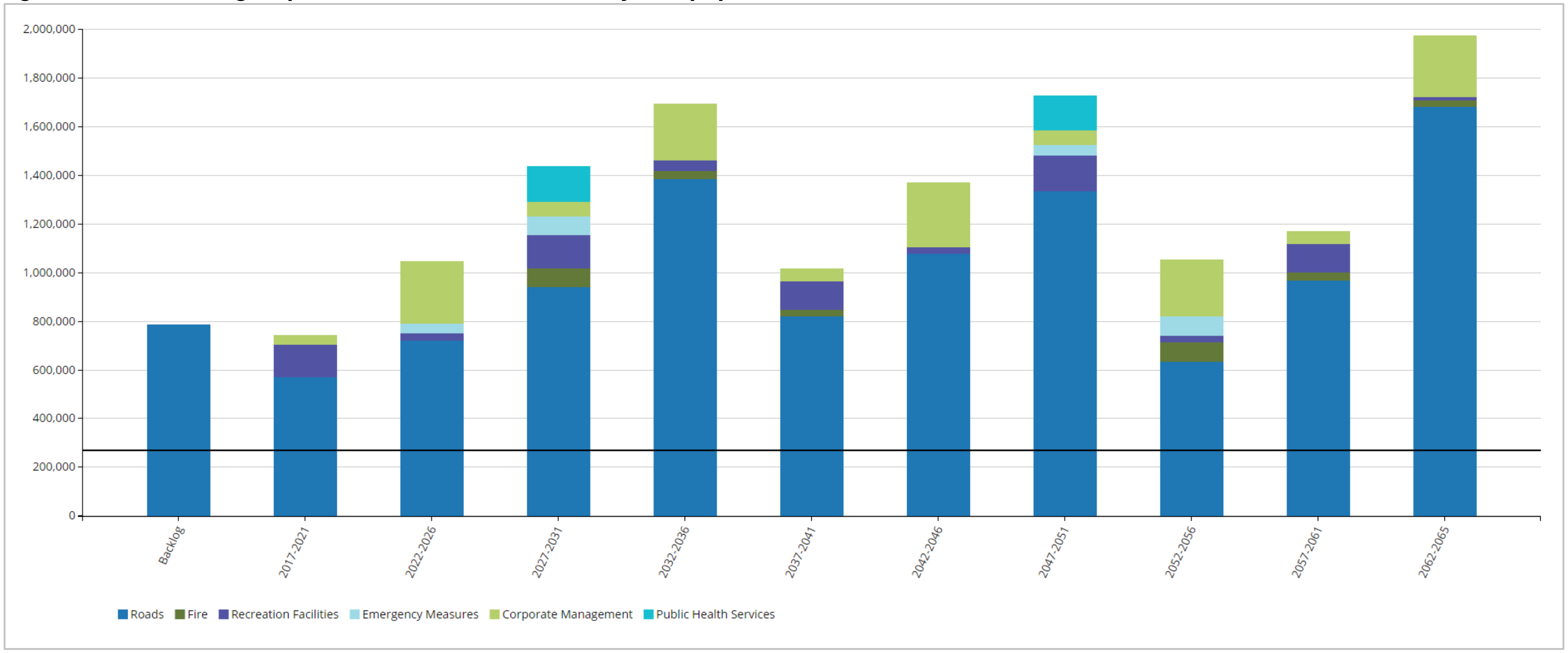


Based on age condition data, 48% of machinery & equipment assets, with a valuation of $2 million, are in poor to very poor condition; 37% are in good to very good condition.

7.5 Forecasting Replacement Needs

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

Figure 45 Forecasting Replacement Needs – Machinery & Equipment



In addition to a backlog of $790,000, the municipality's replacement needs total $746,000 in the next five years. An additional $1 million will be required between 2022-2026. The municipality's annual requirements (indicated by the black line) for its machinery & equipment total $275,000. 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 $229,000, leaving an annual deficit of $46,000. See the 'Financial Strategy' section for maintaining a sustainable funding level. Further, while fulfilling the annual requirements will position the municipality to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

7.6 Recommendations – 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 83% of its long-term requirements on an annual basis. See the 'Financial Strategy' section on how to maintain sustainable and optimal funding levels.

8. Vehicles

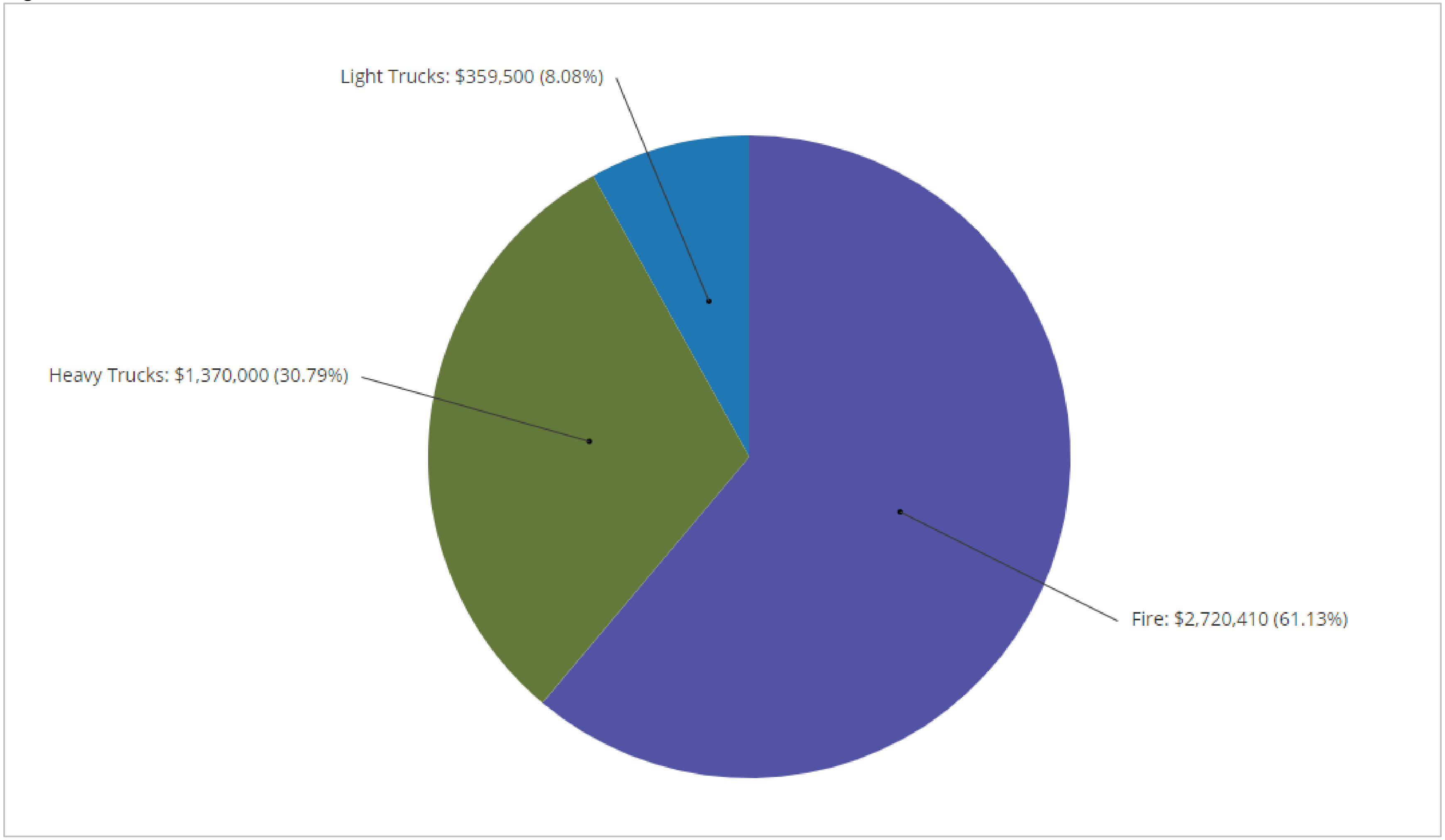
8.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 15 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 $4.4 million based on 2016 replacement costs. The useful life indicated for each asset type below was assigned by the municipality.

Table 15 Asset Inventory – Vehicles

Asset Type	Components	Quantity	Useful Life in Years	Valuation Method	2016 Replacement Cost
Vehicles	Fire	17 units	25	CPI (Ontario)	$2,720,410
	Heavy Trucks	6 units	20	User-Defined Cost	$1,370,000
	Light Trucks	10 units	7	User-Defined Cost	$359,500
				Total	**$4,449,910**

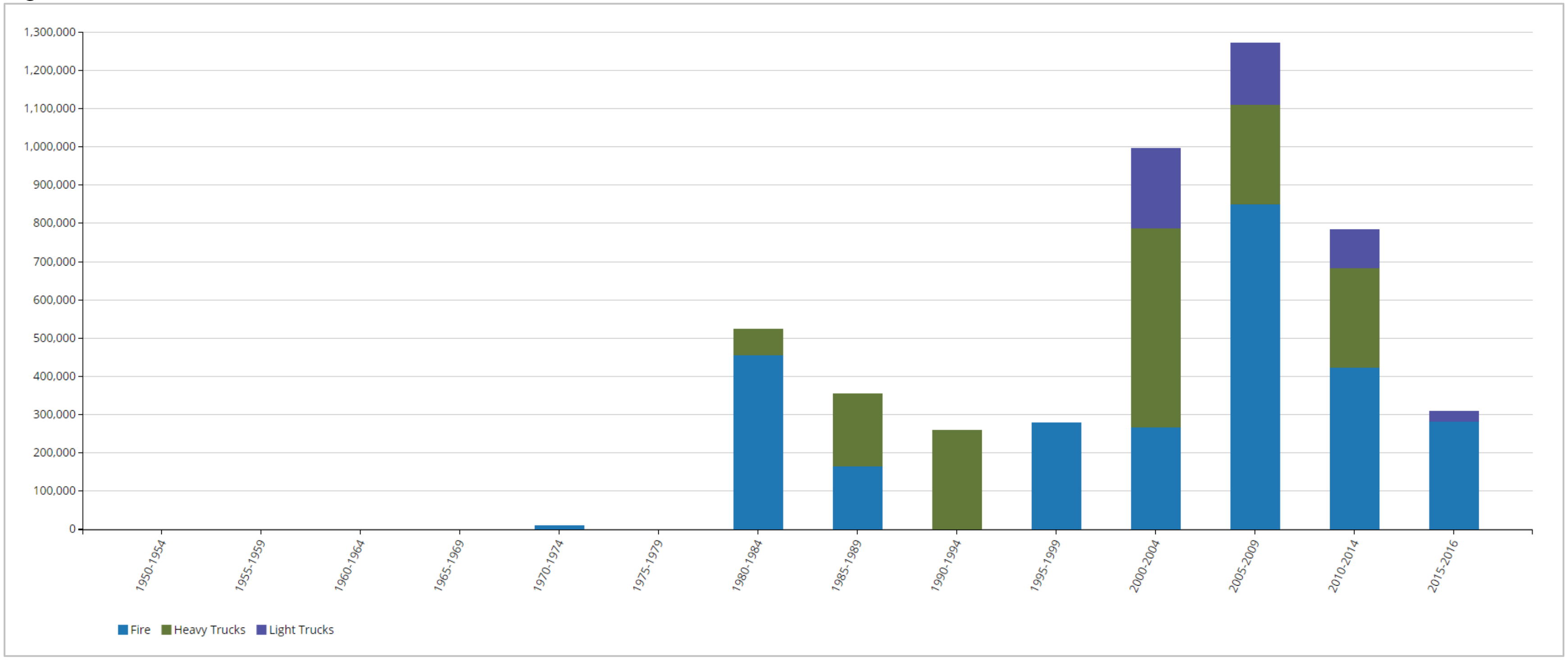
Figure 46 Asset Valuation – Vehicles



8.2 Historical Investment in Infrastructure

Figure 47 shows the municipality's historical investments in its vehicles portfolio 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 9.3) 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 47 Historical Investment – Vehicles

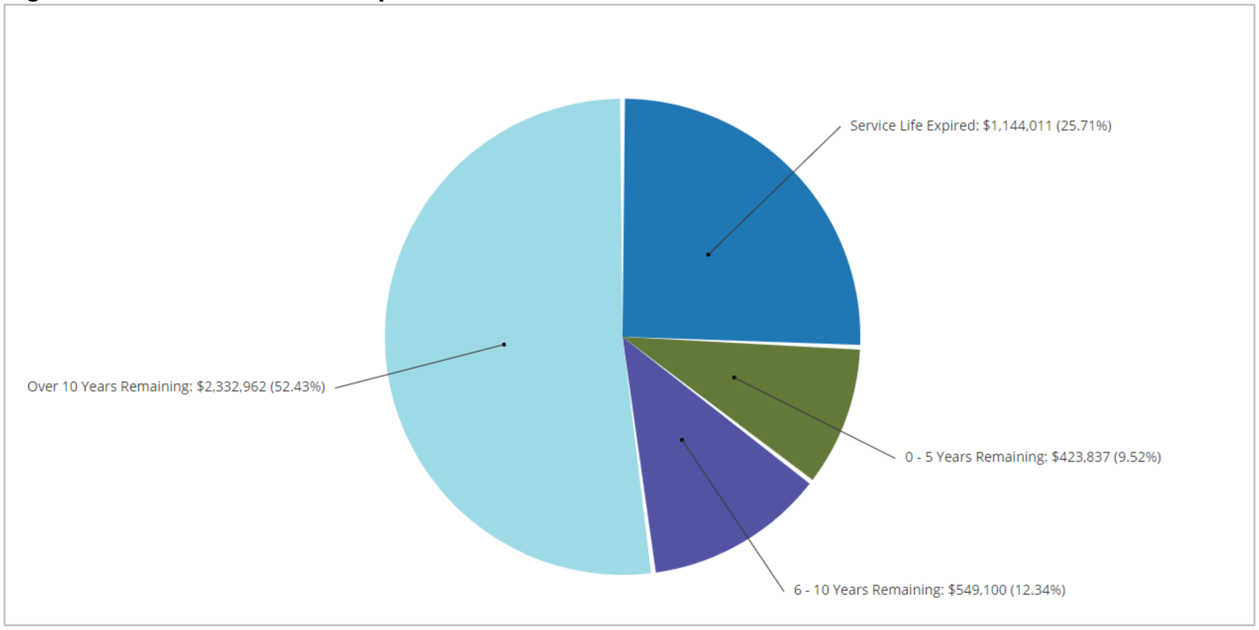


Investments in vehicles quickly increased starting in the 1980s. In 2000-2009, the period of largest investment, $2.3 million was invested with $1.1 million put into fire vehicles.

8.3 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 48 illustrates the useful life consumption levels as of 2016 for the municipality's vehicles.

Figure 48 Useful Life Consumption – Vehicles

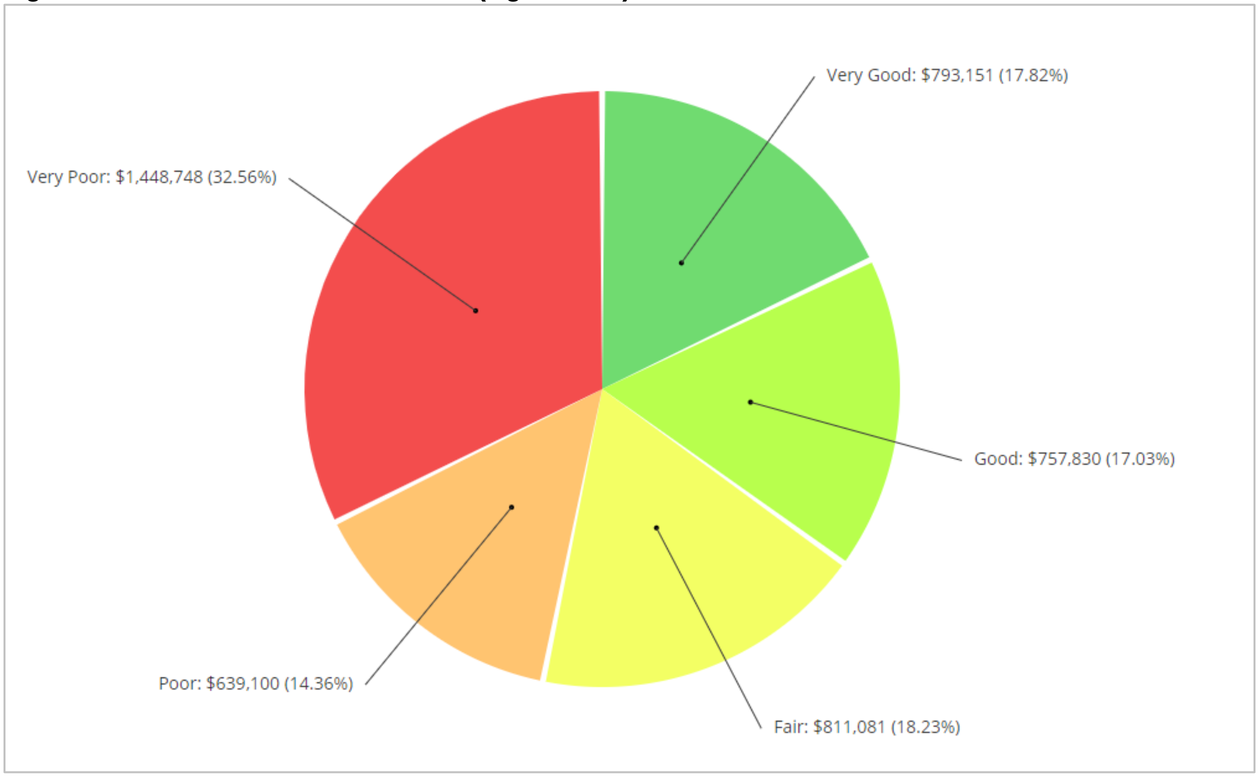


52% of assets have at least 10 years of useful life remaining; 26%, with a valuation of $1.1 million remain in operation beyond their useful life. An additional 10% will reach the end of their useful life within the next five years.

8.4 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. All assets are based on age-based data.

Figure 49 Asset Condition – Vehicles (Age-based)

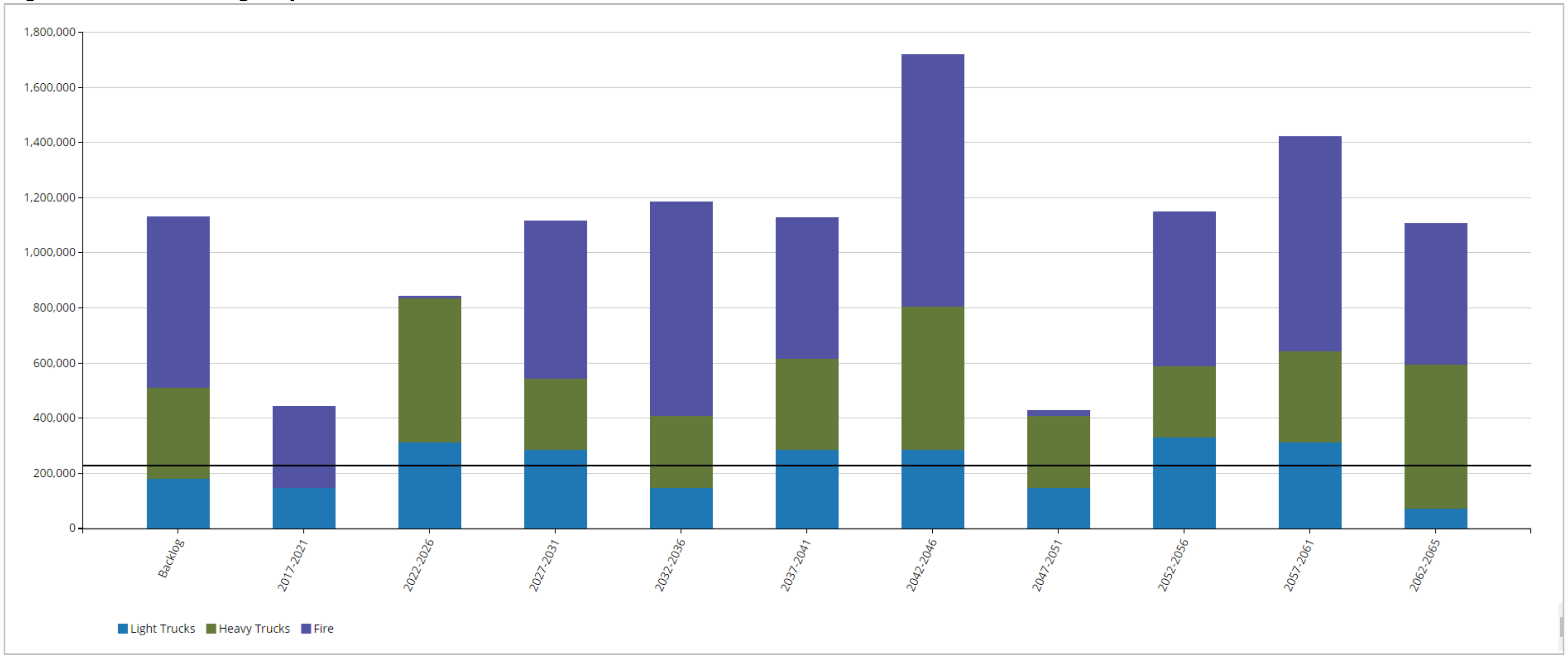


Age-based shows that 47% of the municipality's vehicle assets are in poor to very poor condition; 35%, with a valuation of $1.5 million are in good to very good condition.

8.5 Forecasting Replacement Needs

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

Figure 50 Forecasting Replacement Needs – Vehicles



In addition to a backlog of $1.1 million, replacement needs will total over $444,000 over the next five years; an additional $845,000 will be required between 2022-2026. The municipality's annual requirements (indicated by the black line) for its vehicles total $232,000. 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 $610,000, leaving an annual surplus of $378,000. 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.

8.6 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 100% of its long-term replacement needs on an annual basis. See the 'Financial Strategy' section on how to achieve sustainable and optimal funding levels.

VII. Levels of Service

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

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

1. Guiding Principles for Developing LOS

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

Table 16 LOS Categories

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

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 17 Key Performance Indicators – Road Network and Bridges & Culverts

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

Table 18 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 19 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 20 Key Performance Indicators – Water, Wastewater and Storm Networks

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

Table 21 Key Performance Indicators – Machinery & Equipment

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

Table 22 Key Performance Indicators – Land Improvements

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

3. Future Performance

In addition to 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 51 Comparing Age-based and Assessed Condition Data

2.1 Pavement Network

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

Surface distress data involves the collection of multiple industry standard surface distresses, which are captured either electronically using sensing detection equipment mounted on the van, or visually by the van's inspection crew. Roughness data capture involves the measurement of the roughness of the road, measured by lasers that are mounted on the inspection van's bumper, calibrated to an international roughness index.

Another option for a cursory level of condition assessment is for municipal road crews to perform simple windshield surveys as part of their regular patrol. Many municipalities have created data collection inspection forms to assist this process and to standardize what presence of defects would constitute a good, fair, poor, or critical score. Lacking any other data for the complete road network, this can still be seen as a good method and will assist greatly with the overall management of the road network.

It is recommended that the municipality implement a pavement condition assessment program and that a portion of capital funding is dedicated to this. We also recommend expansion of this program to incorporate additional components.

2.2 Bridges & Culverts

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

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

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

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

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

2.3 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 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 implement an inspection of structures and expand its condition assessment program for other segments. It is also recommended that a portion of capital funding is dedicated to this.

2.4 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.

2.5 Water System

Unlike sewer mains, it is often prohibitively difficult to inspect water mains from the inside due to the constant and high-pressure flow of water. A physical inspection requires a disruption of service to residents, can be an expensive exercise and is time consuming to set up. It is recommended practice that physical inspection of water mains typically occurs only for high-risk, large transmission mains within the system, and only when there is a requirement. There are a number of high tech inspection techniques in the industry for large diameter pipes but these should be researched first for applicability as they are quite expensive. Examples include remote eddy field current (RFEC), ultrasonic and acoustic techniques, impact echo (IE), and Georadar.

For the majority of pipes within the distribution network, gathering key information in regards to the main and its environment can supply the best method to determine a general condition. Key data that may be used, along with weighting factors, to determine an overall condition score include age, material type, breaks, hydrant flow inspections and soil condition.

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

2.6 Sewer Network Inspection (Wastewater and Storm)

The most popular and practical type of sanitary and storm sewer assessment is the use of Closed Circuit Television Video (CCTV). The process involves a small robotic crawler vehicle with a CCTV camera attached that is lowered down a maintenance hole into the sewer main to be inspected.

The vehicle and camera then travel the length of the pipe, providing a live video feed to a truck on the road above where a technician/inspector records defects and information regarding the pipe. A wide range of construction or deterioration problems can be captured, including open/displaced joints, presence of roots, infiltration & inflow, cracking, fracturing, exfiltration, collapse, deformation of pipe and more. Therefore, sewer CCTV inspection is an effective tool for locating and evaluating structural defects and general condition of underground pipes.

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

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

It is recommended that the municipality implement a wastewater main assessment program and expand it to include storm sewer drains. A portion of capital funding should be dedicated to this.

2.7 Parks and Land Improvements

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

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

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

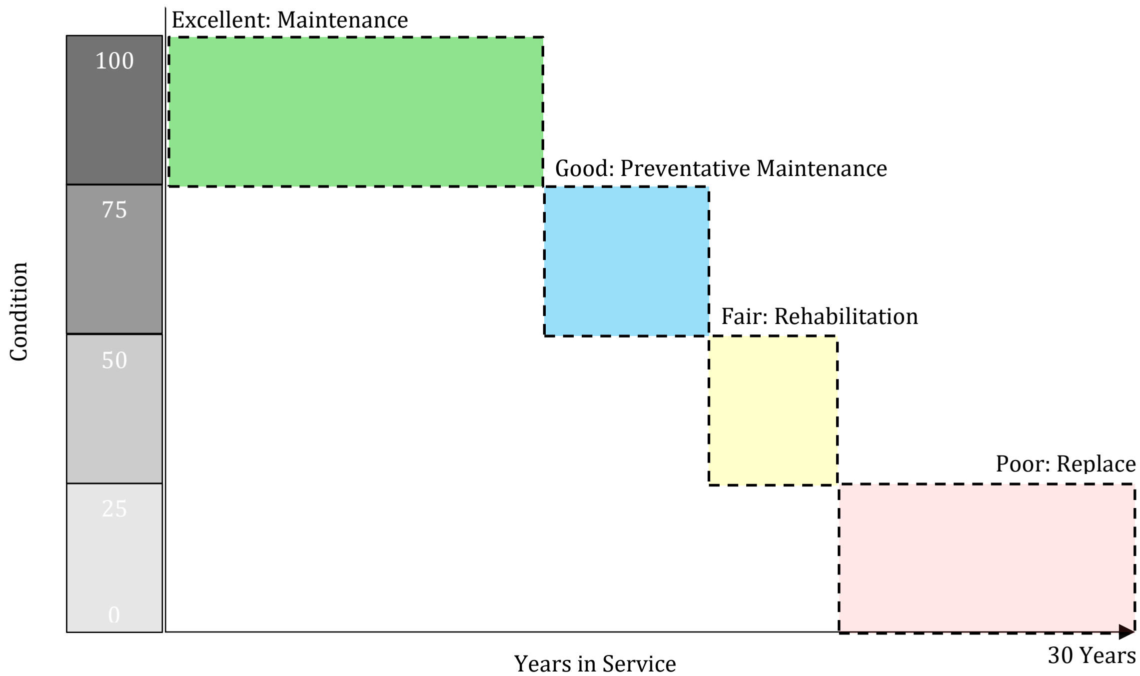
3. Lifecycle Analysis Framework

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

3.1 Paved Roads

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

Figure 52 Paved Road General Deterioration Profile



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

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

Table 23 Asset Condition and Related Work Activity for Paved Roads

Condition	Condition Range	Work Activity
Very Good **(Maintenance only phase)**	81-100	– Maintenance only
Good **(Preventative maintenance phase)**	61-80	– Crack sealing – Emulsions
Fair **(Rehabilitation phase)**	41-60	– Resurface - mill & pave – Resurface - asphalt overlay – Single & double surface treatment (for rural roads)
Poor **(Reconstruction phase)**	21-40	– Reconstruct - pulverize and pave – Reconstruct - full surface and base reconstruction
Very Poor **(Reconstruction phase)**	0-20	– Critical includes assets beyond their useful lives which make up the backlog. They require the same interventions as the 'poor' category above.

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

The table below outlines the costs for various road activities, the added life obtained for each, the condition range at which they should be applied, and the cost of 1 year added life for each (cost of activity / added life) in order to present an apples to apples comparison.

Table 24 Road Lifecycle Activities

Road Lifecycle Activities					
Treatment	**Average Unit Cost**	**Added Life (Years)**	**Condition Range**	**Activity Year**	**Cost Of Activity/Added Life**
Gravel Dust Control (P.M)	$0.44 per m	1	100 - 80	1	$0.44
Gravel Grading (P.M)	$0.55 per m	1	100 - 80	1	$0.55
Gravel Resurfacing (P.M)	$2.72 per m	1	100 - 80	2	$1.36
Urban Reconstruction	$890 per m	30	30 - 10	End of Life	$29.67
Urban Resurfacing	$260 per m	20	60 - 40	20	$13.00
Rural Reconstruction	$490 per m	25	30 - 10	End of Life	$16.36
Rural Resurfacing	$83 per m	15	60 -50	15	$5.53
Rural Milling & Resurfacing	$62.50 per m	15	60 - 50	25	$4.17
Rural Crack Sealing (P.M)	$1.08 per m	1	90 - 70	5	$1.08
Tar & Chip Resurfacing	$11.25 per m2	7	60 – 40	14	$1.61
Tar & Chip Surface Treatment	$4.75 per m2	7	60 - 40	7	$0.68

As can be seen in the table above, preventative maintenance activities such as routing and crack sealing have the lowest associated cost (per sq. m) in order to obtain one year of added life. Of course, preventative maintenance activities can only be applied to a road at a relatively early point in the life cycle. It is recommended that the Municipality continue to apply the active preventative maintenance program for all paved roads and that a portion of the maintenance budget is allocated to this.

Also, rehabilitation activities, such as urban and rural resurfacing or double surface treatments (tar and chip) for rural roads have a lower cost to obtain each year of added life than full reconstruction activities. It is recommended that the Municipality continue its rehabilitation program for urban and rural paved roads and that a portion of the capital budget is dedicated to this.

Of course, in order to apply the above programs, it will be important to also establish a general condition score for each road segment, established through standard condition assessment protocols as previously described.

It is important to note that a “worst first” budget approach, whereby no life cycle activities other than reconstruction at the end of a roads life are applied, will result in the costliest method of managing a road network overall.

Currently, the municipality is phasing out it’s tar & chip roads. Reconstructing the roads into asphalt will provide Huron East with increased durability and structurally sound road foundations and surfaces that will ultimately reduce maintenance costs. Once the road segments have been budgeted for reconstruction the municipality will re-classify them under the appropriate composite. After completion of the roads reconstruction, the appropriate lifecycle activities will be applied. It is recommended that through an established condition assessment program these processes would be demonstrated, and the municipality would then re-evaluate its financial strategy.

Approximately 63% of Huron East's road network comprises gravel roads. The life cycle activities required for these roads are quite different from paved roads. Gravel roads require a cycle of perpetual maintenance, including general re-grading, reshaping of the crown and cross section, gravel spot and section replacement, dust abatement and ditch clearing and cleaning.

Gravel roads can require frequent maintenance, especially after wet periods and when accommodating increased traffic. Wheel motion shoves material to the outside (as well as in-between travelled lanes), leading to rutting, reduced water-runoff, and eventual road destruction if unchecked. This deterioration process is prevented if interrupted early enough, simple re-grading is sufficient, with material being pushed back into the proper profile.

As a high proportion of gravel roads can have a significant impact on the maintenance budget, it is recommended that with further updates of this asset management plan the Municipality study the traffic volumes and maintenance requirements in more detail for its gravel road network.

Similar studies elsewhere have found converting certain roadways to paved roads can be very cost beneficial especially if frequent maintenance is required due to higher traffic volumes. Roads within the gravel network should be ranked and rated using the following criteria:

- Usage - traffic volumes and type of traffic
- Functional importance of the roadway
- Known safety issues
- Frequency of maintenance and overall expenditures required

Through the above type of analysis, a program could be introduced to convert certain gravel roadways into paved roads, reducing overall costs, and be brought forward into the long range budget.

3.2 Bridges & Culverts

The best approach to develop a 10-year needs list for the municipality's bridge structure portfolio relies on the structural engineer who performs the inspections to develop a maintenance requirements report, a rehabilitation and replacement requirements report and identify additional detailed inspections as required.

3.3 Buildings & Facilities

The best approach to develop a 10-year needs list for the municipality's facilities portfolio would be to have the engineers, operational staff or architects who perform the facility inspections to also develop a complete portfolio maintenance requirements report and rehabilitation and replacement requirements report, and also identify additional detailed inspections and follow up studies as required. This may be performed as a separate assignment once all individual facility audits/inspections are complete.

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

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

3.4 Vehicles and Machinery & Equipment

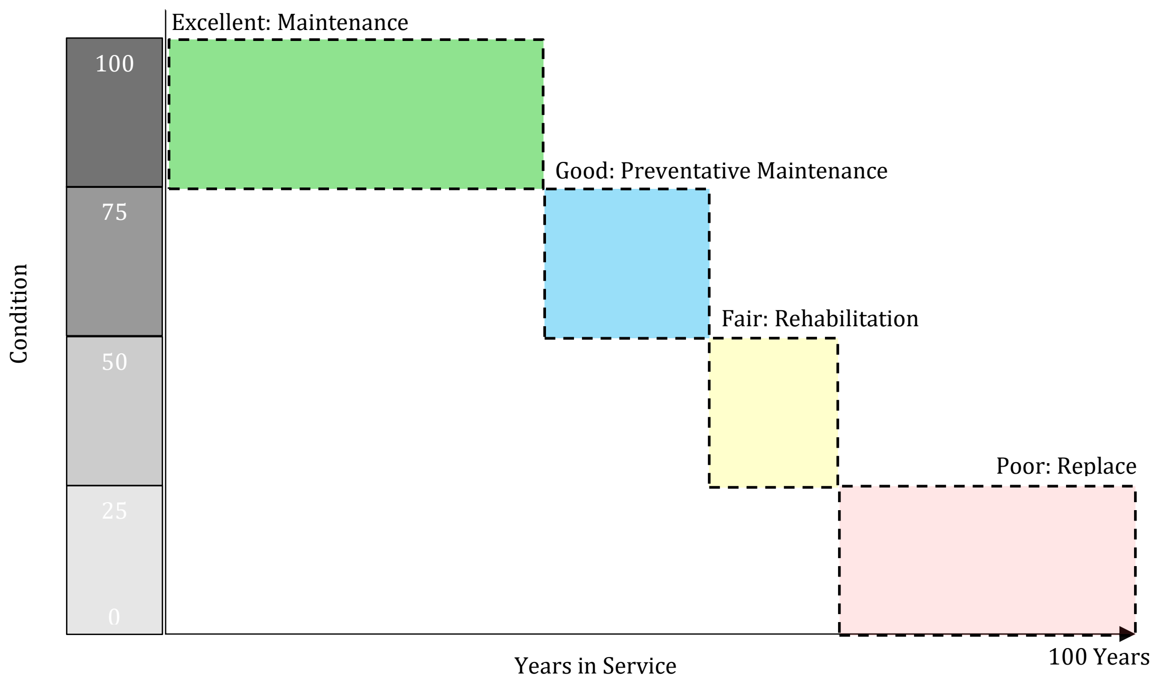
The best approach to develop a 10-year needs list for the municipality's vehicles and machinery & equipment portfolio would first be through a defined preventative maintenance program, and secondly, through an optimized lifecycle vehicle replacement schedule. The preventative maintenance program would 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.

3.5 Wastewater Systems and Storm Network

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

Figure 53 Wastewater Main General Deterioration



As shown above, during the wastewater and storm main's lifecycle there are various windows available for work activity that will maintain or extend the life of the asset. These windows are: maintenance; major maintenance; rehabilitation; and replacement or reconstruction. The windows or thresholds for when certain work activities should be applied also coincide approximately with the condition state of the asset as shown Table 25:

Table 25 Asset Condition and Related Work Activity for Wastewater and Storm Mains

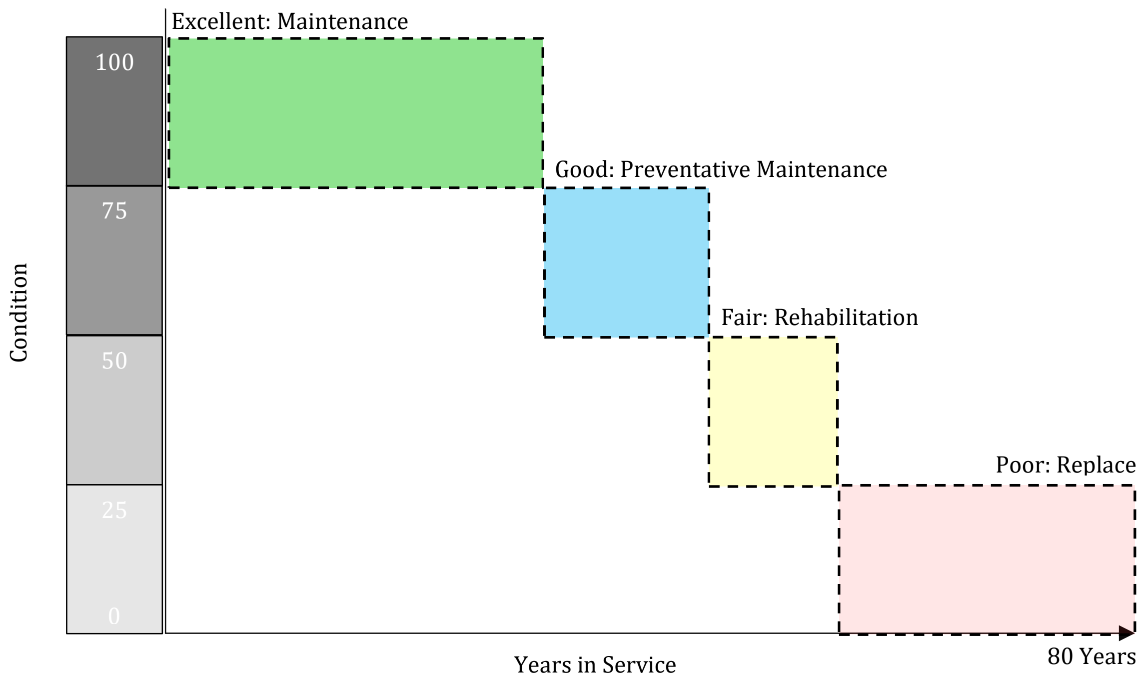
Condition	Condition Range	Work Activity
Very Good (Maintenance only phase)	81-100	– Maintenance only (cleaning & flushing etc.)
Good (Preventative maintenance phase)	61-80	– Mahhole repairs – Small pipe section repairs
Fair (Rehabilitation phase)	41-60	– Structural relining
Poor (Reconstruction phase)	21-40	– Pipe replacement
Very Poor (Reconstruction phase)	0-20	– Critical includes assets beyond their useful lives which make up the backlog. They require the same interventions as the "poor" category above.

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

3.6 Water Systems

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

Figure 54 Water Main General Deterioration



As shown above, during the water main's lifecycle, there are various windows available for work activity that will maintain or extend the life of the asset. These windows are: maintenance; major maintenance; rehabilitation; and replacement or reconstruction. The windows or thresholds for when certain work activities should be applied also coincide approximately with the condition state of the asset as shown in Table 26.

Table 26 Asset Condition and Related Work Activity for Water Mains

Condition	Condition Range	Work Activity
Very Good **(Maintenance only phase)**	81-100	– Maintenance only (cleaning & flushing etc.)
Good **(Preventative maintenance phase)**	61-80	– Water main break repairs – Small pipe section repairs
Fair **(Rehabilitation phase)**	41-60	– Structural water main relining
Poor **(Reconstruction phase)**	21-40	– Pipe replacement
Very Poor **(Reconstruction phase)**	0-20	– Critical includes assets beyond their useful lives which make up the backlog. They require the same interventions as the “poor” category above.

4. Growth and Demand

Growth is a critical infrastructure demand driver for most infrastructure services. As such, the municipality must not only account for the lifecycle cost for its existing asset portfolio, but those of any anticipated and forecasted capital projects associated specifically with growth. Based on the 2016 census, the population for Huron East has decreased 1.4% since 2011 to reach 9,138. 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.

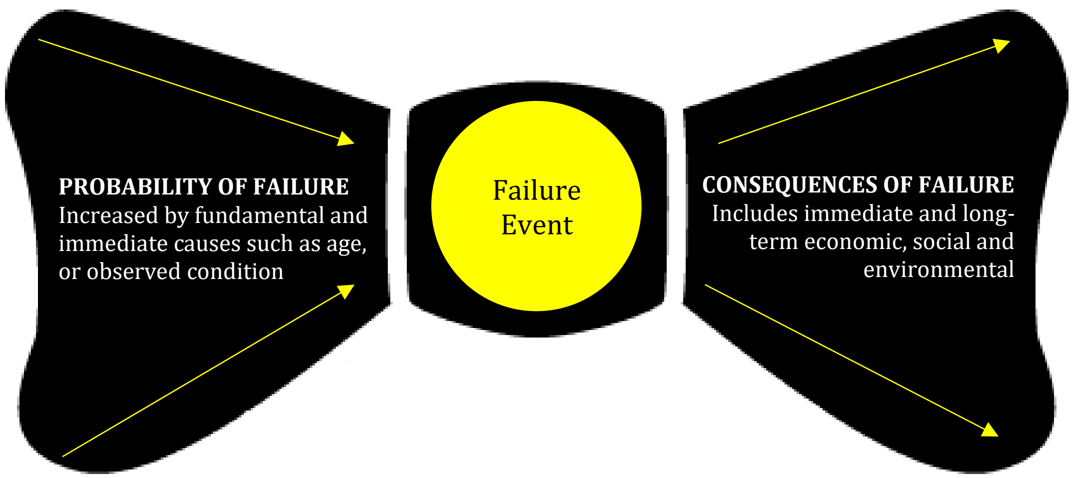
Risk mitigation is traditionally thought of in terms of safety and liability factors. In asset management, the definition of risk should heavily emphasize these factors but should be expanded to consider the risks to the municipality's ability to deliver targeted levels of service

- 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 follows. 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 55 (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 55 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 27 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: bridges & culverts, buildings & facilities, 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.

Assets for which other attributes are used include: water, wastewater, storm and roads. Attributes are selected based on their impact on service delivery. For linear infrastructure, pipe diameter is used to estimate a suitable consequence of failure score as it reflects the potential upstream service area affected. Scoring for roads, the risk is based on classification as it reflects the traffic volumes and number of people affected.

Table 28 Consequence of Failure – Road Network

Road Classification	Consequence of failure
Gravel	Score of 1
Tar & Chip	Score of 2
Rural Paved	Score of 4
Urban Paved	Score of 5

Table 29 Consequence of Failure – Bridges & Culverts

Replacement Value	Consequence of failure
Up to $250k	Score of 1
$251 to $500k	Score of 2
$501 to $750k	Score of 3
$751 to $1 Million	Score of 4
$1 Million and over	Score of 5

Table 30 Consequence of Failure – Water Mains

Pipe Diameter	Consequence of Failure
Less than 50mm	Score of 1
51–150mm	Score of 2
151–200mm	Score of 3
201–250mm	Score of 4
251mm and over	Score of 5

Table 31 Consequence of Failure – Wastewater Mains

Pipe Diameter	Consequence of failure
Less than 150mm	Score of 1
151-250mm	Score of 2
251-350mm	Score of 3
351-450mm	Score of 4
451mm and over	Score of 5

Table 32 Consequence of Failure – Storm Mains

Pipe Diameter	Consequence of Failure
Less than 100mm	Score of 1
101-200mm	Score of 2
201-450mm	Score of 3
451-600mm	Score of 4
601mm and over	Score of 5

Table 33 Consequence of Failure – Buildings & Facilities

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

Table 34 Consequence of Failure – Machinery & Equipment

Replacement Value	Consequence of failure
Up to $10k	Score of 1
$11k to $20k	Score of 2
$21k to $80k	Score of 3
$81k to $300k	Score of 4
Over $300k	Score of 5

Table 35 Consequence of Failure – Vehicles

Replacement Value	Consequence of failure
Up to $25k	Score of 1
$26k to $50k	Score of 2
$51k to $200k	Score of 3
$201k to $350k	Score of 4
Over $350k	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 56 Distribution of Assets Based on Risk – All Asset Classes

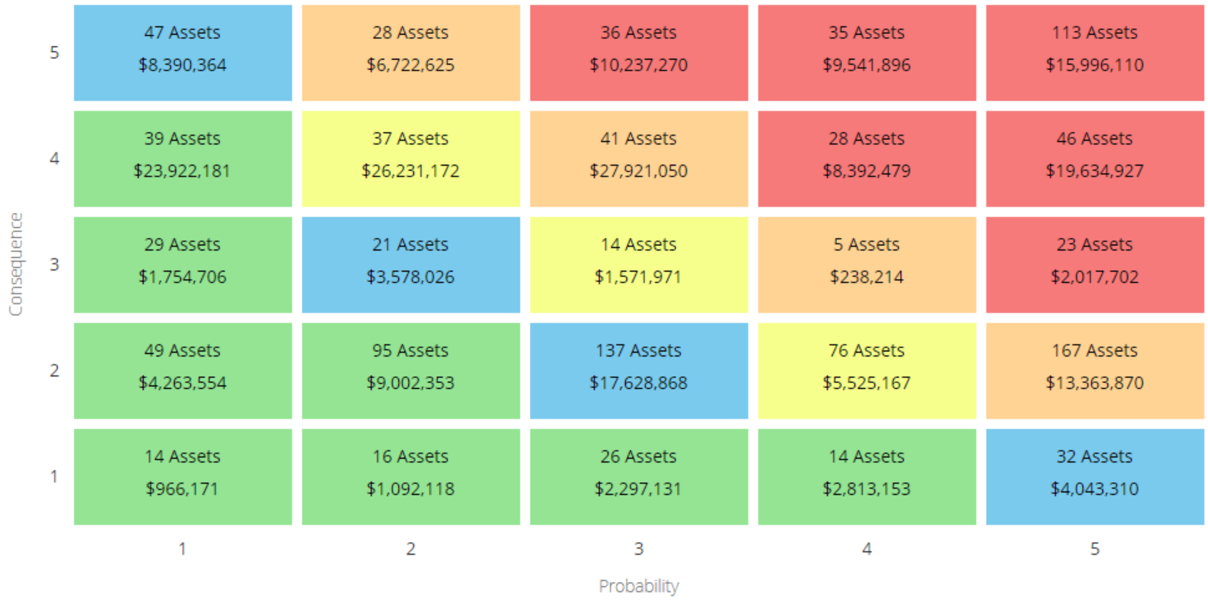


Figure 57 Distribution of Assets Based on Risk – Road Network

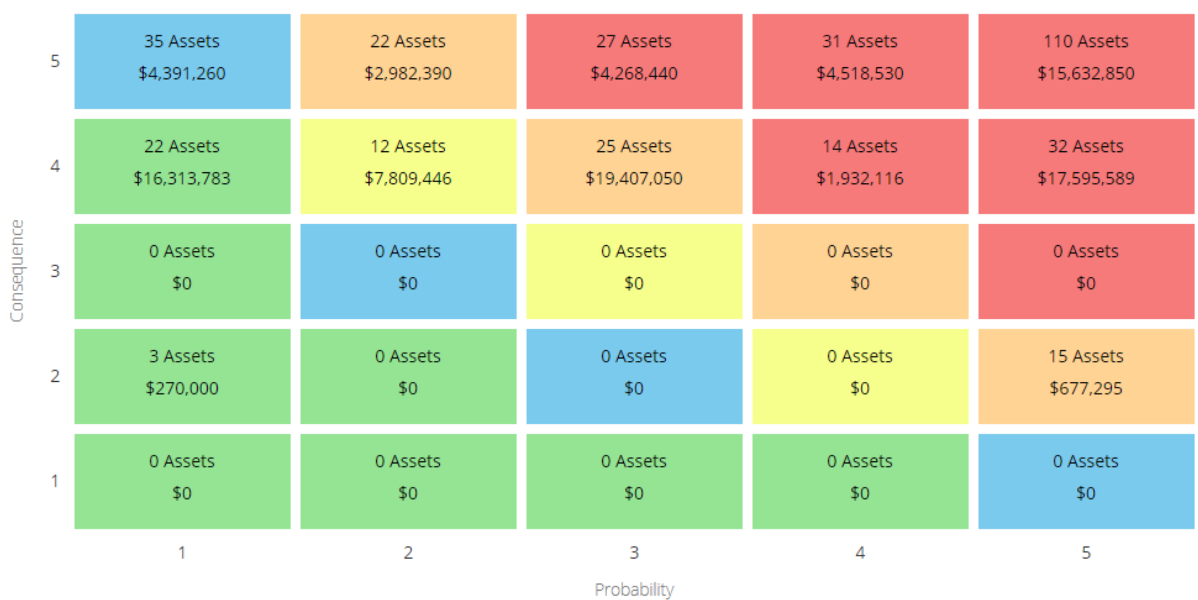


Figure 58 Distribution of Assets Based on Risk – Bridges & Culverts

Consequence \ Probability	1	2	3	4	5
5	3 Assets $1,254,850	4 Assets $3,293,800	9 Assets $5,968,830	1 Asset $264,450	0 Assets $0
4	7 Assets $5,523,925	17 Assets $17,619,250	11 Assets $7,509,950	4 Assets $2,042,500	0 Assets $0
3	0 Assets $0	2 Assets $1,428,000	2 Assets $1,033,350	0 Assets $0	0 Assets $0
2	7 Assets $2,476,400	12 Assets $4,446,350	32 Assets $11,016,050	0 Assets $0	0 Assets $0
1	2 Assets $499,300	3 Assets $663,000	5 Assets $1,157,700	3 Assets $668,100	0 Assets $0

Figure 59 Distribution of Assets Based on Risk – Water Systems

Consequence \ Probability	1	2	3	4	5
5	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	1 Asset $198,560
4	4 Assets $321,592	5 Assets $324,520	0 Assets $0	6 Assets $527,040	8 Assets $870,104
3	20 Assets $1,309,000	3 Assets $215,075	1 Asset $58,000	0 Assets $0	19 Assets $1,647,200
2	20 Assets $827,792	45 Assets $2,726,880	21 Assets $682,784	5 Assets $232,864	80 Assets $3,957,776
1	2 Assets $65,800	3 Assets $108,640	14 Assets $845,600	8 Assets $254,800	5 Assets $228,760

Figure 60 Distribution of Assets Based on Risk – Wastewater Systems

Figure 61 Distribution of Assets Based on Risk – Storm Network

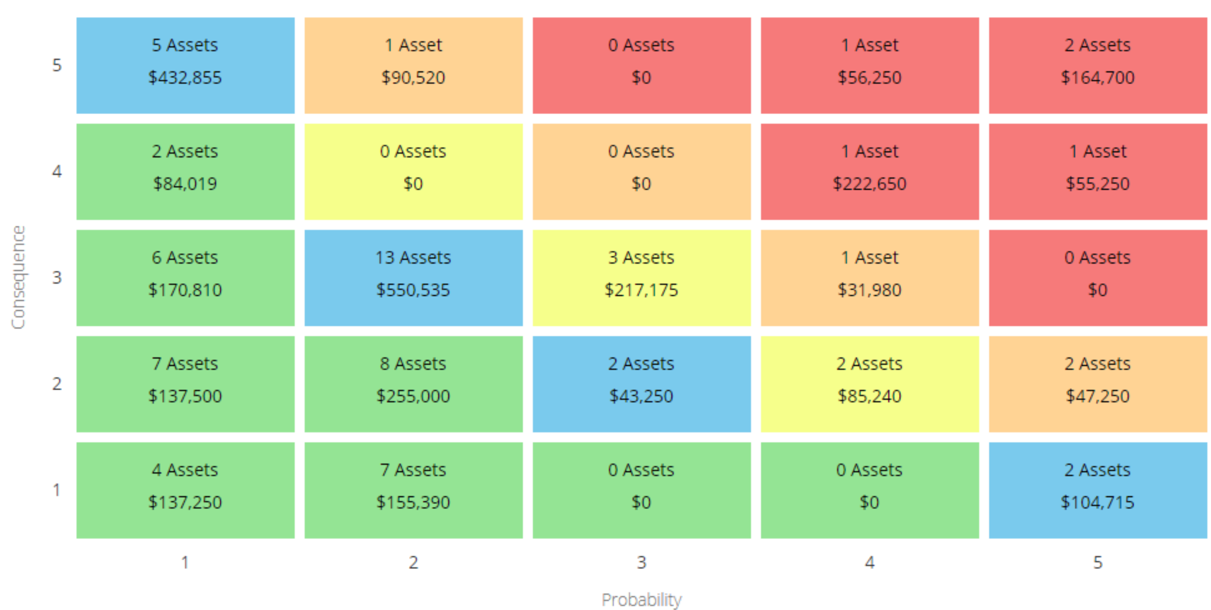


Figure 62 Distribution of Assets Based on Risk – Buildings & Facilities

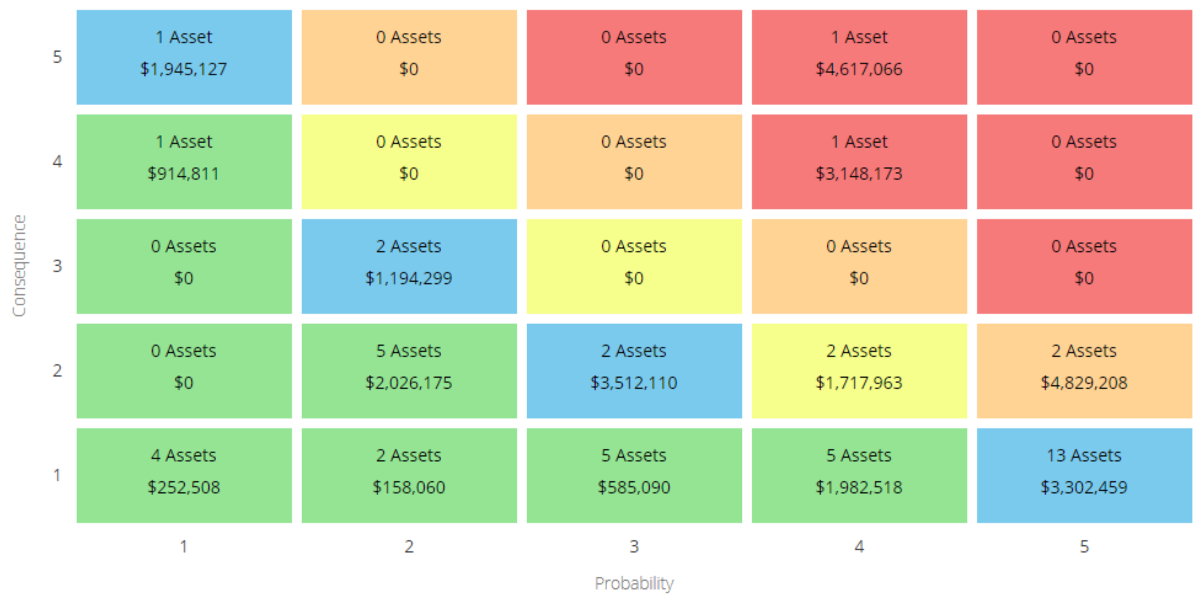


Figure 63 Distribution of Assets Based on Risk – Machinery & Equipment

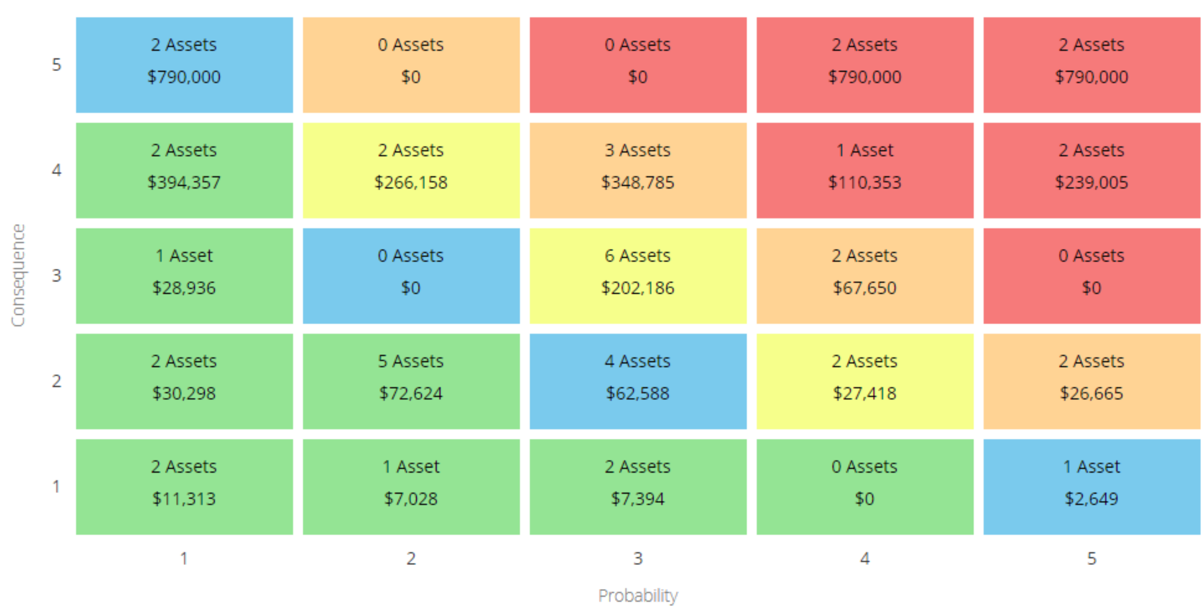


Figure 64 Distribution of Assets Based on Risk – Vehicles

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 65 Cost Elements

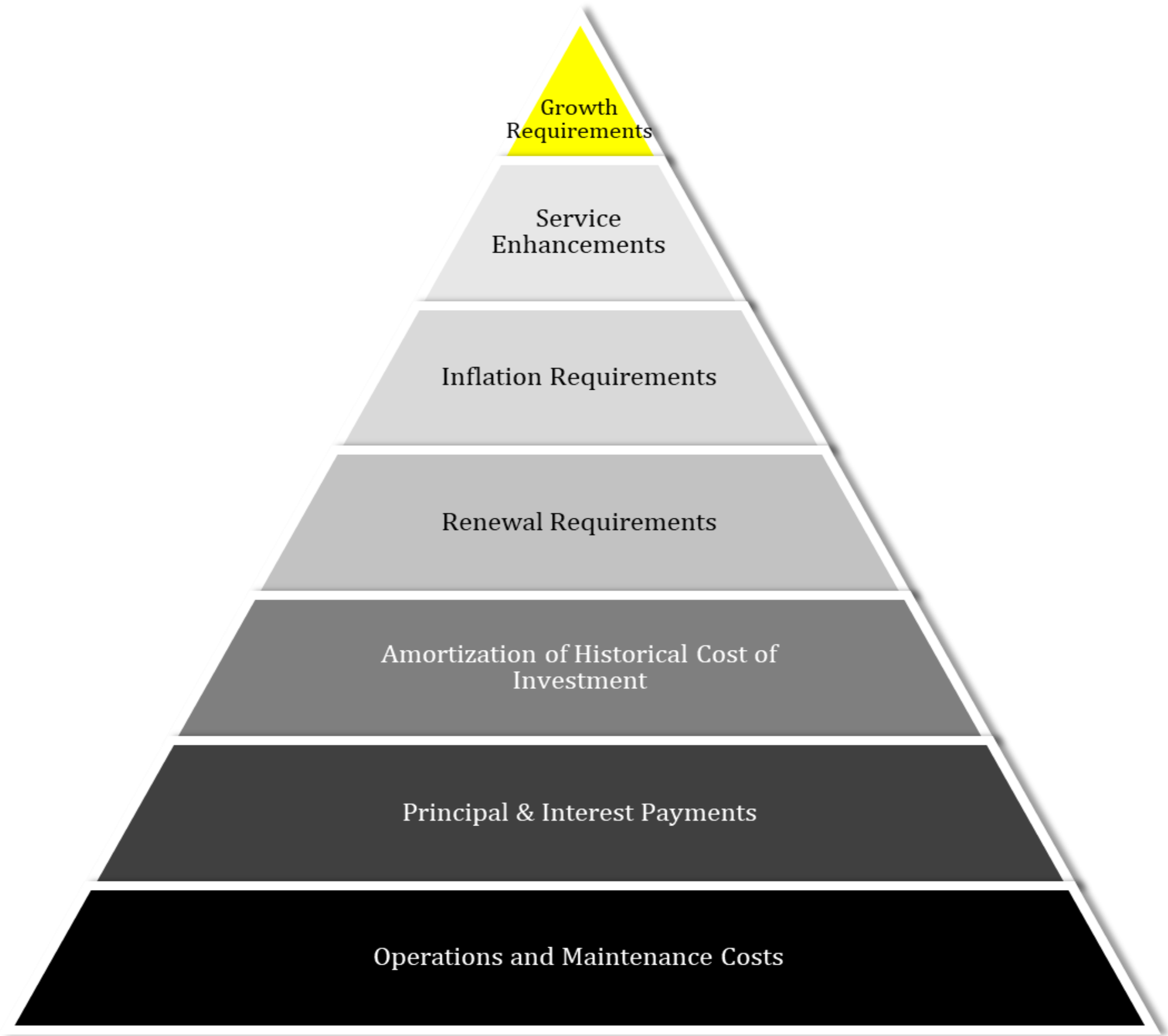


Figure 65 depicts the various cost elements and resulting funding levels that should be incorporated into AMPs that are based on best practices. Municipalities meeting their operational and maintenance needs, and debt obligations are funding only their cash cost. Funding at this level is severely deficient 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 State of the Infrastructure section of this report) for existing assets, existing service levels, requirements of contemplated changes in service levels (none identified for this plan), and requirements of anticipated growth (none identified for this plan)
- use of traditional sources of municipal funds including tax levies, user fees, reserves, debt, and development charges
- use of non-traditional sources of municipal funds, e.g., reallocated budgets
- use of senior government funds, such as the federal Gas Tax Fund, Ontario Community Infrastructure Fund (OCIF)

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

- In order to reduce financial requirements, consideration has been given to revising service levels downward.
- All asset management and financial strategies have been considered. For example:
    - If a zero debt policy is in place, is it warranted? If not, the use of debt should be considered.
    - Do user fees reflect the cost of the applicable service? If not, increased user fees should be considered.

2. Financial Profile: Tax Funded Assets

2.1 Funding Objective

We have developed scenarios that would enable the municipality to achieve full funding within five to 20 years for the following assets: road network; bridges & culverts; storm network; buildings & facilities; machinery & equipment; 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 36 and Table 37 outline, by asset class, the municipality's average annual asset investment requirements, current funding positions, and funding increases required to achieve full funding on assets funded by taxes.

Table 36 Infrastructure Requirements and Current Funding Available: Tax Funded Assets

Asset class	Average Annual Investment Required	Total Funding Available in 2017						Annual Deficit/Surplus
		Taxes	Gas Tax	OCIF	Community Vibrancy Fund	Taxes to Reserves	Total Funding Available	
Bridges & Culverts	892,000	0	282,000	0	0	340,000	622,000	270,000
Storm Network	44,000	99,000	0	0	0	0	99,000	55,000
Road Network	2,873,000	581,000	0	203,000	0	0	784,000	2,089,000
Buildings & Facilities	490,000	77,000	0	0	135,000	138,000	350,000	140,000
Machinery & Equipment	275,000	71,000	0	0	66,000	92,000	229,000	46,000
Fleet	232,000	610,000	0	0	0	0	610,000	378,000
Total	**4,806,000**	**1,438,000**	**282,000**	**203,000**	**201,000**	**570,000**	**2,694,000**	**2,112,000**

2.3 Recommendations for Full Funding

The average annual investment requirement for tax funded categories is $4,806,000. Annual revenue currently allocated to these assets for capital purposes is $2,694,000, leaving an annual deficit of $2,112,000. To put it another way, these infrastructure categories are currently funded at 56% of their long-term requirements.

In 2016, the municipality had annual tax revenues of $4,088,000. As illustrated in Table 37, without consideration of any other sources of revenue, full funding would require the following tax change over time:

Table 37 Tax Change Required for Full Funding

Asset class	Tax Change Required for Full Funding
Bridges & Culverts	6.6%
Storm Network	-1.3%
Road Network	51.1%
Buildings & Facilities	3.4%
Machinery & Equipment	1.1%
Vehicles	-9.2%
Total	**51.7%**

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

- Huron East's formula based OCIF grant is scheduled to grow from $203,000 in 2017 to $431,000 in 2019.
- As shown in Table 45, Huron East's debt payments for these asset categories will be decreasing by $146,000 over the next 5 years and by $146,000 over the next 10 years. Although not shown in the table, debt payment decreases will be $146,000 over the next 15 and 20 years.

Our recommendations include capturing the above changes and allocating them to the infrastructure deficit. Table 38 outlines this concept and presents a number of options.

Table 38 Effect of Changes in OCIF Funding and Reallocating Decreases in Debt Costs

	Without Capturing Changes				With Capturing Changes			
	5 Years	**10 Years**	**15 Years**	**20 Years**	**5 Years**	**10 Years**	**15 Years**	**20 Years**
Infrastructure Deficit	2,112,000	2,112,000	2,112,000	2,112,000	2,112,000	2,112,000	2,112,000	2,112,000
Change in OCIF Grant	N/A	N/A	N/A	N/A	-228,000	-228,000	-228,000	-228,000
Changes in Debt Costs	N/A	N/A	N/A	N/A	-146,000	-146,000	-146,000	-146,000
Resulting Infrastructure Deficit	**2,112,000**	**2,112,000**	**2,112,000**	**2,112,000**	**1,738,000**	**1,738,000**	**1,738,000**	**1,738,000**
Resulting Tax Increase Required:								
Total Over Time	**51.7%**	**51.7%**	**51.7%**	**51.7%**	**42.5%**	**42.5%**	**42.5%**	**42.5%**
Annually	10.3%	5.2%	3.4%	2.6%	8.5%	4.3%	2.8%	2.1%

Considering all of the above information, we recommend the 20-year option that includes capturing the changes. This involves full funding being achieved over 20 years by:

- when realized, reallocating the debt cost reductions of $146,000 to the infrastructure deficit as outlined above.
- increasing tax revenues by 2.1% each year for the next 20 years solely for the purpose of phasing in full funding to the tax funded asset classes covered in this AMP.
- allocating the current gas tax and OCIF revenue as outlined in Table 36.
- allocating the scheduled OCIF grant increases to the infrastructure deficit as they occur.
- 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 20 years and provides financial sustainability over the period modeled, the recommendations do require prioritizing capital projects to fit the resulting annual funding available. Current data shows a pent-up investment demand of $19,745,000 for paved roads, $0 for bridges & culverts, $21,450 for storm sewers, $790,000 for machinery & equipment, $5,267,000 for facilities, and $1,133,000 for vehicles. Prioritizing future projects will require the current data to be replaced by condition based data. Although our recommendations include no further use of debt, the results of the condition based analysis may require otherwise.

3. Financial Profile: Rate Funded Assets

3.1 Funding Objective

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

3.2 Current Funding Position

Table 39 and Table 40 outline, by asset class, the municipality's average annual asset investment requirements, current funding positions, and funding increases required to achieve full funding on assets funded by rates.

Table 39 Summary of Infrastructure Requirements and Current Funding Available

Asset class	Average Annual Investment Required	Total Funding Available in 2017				Annual Deficit/Surplus
		Rates	To Operations	Other	Total Funding Available	
Wastewater System – Brussels	148,000	256,000	-215,000	0	41,000	107,000
Wastewater System – Seaforth	164,000	660,000	-652,000	0	8,000	156,000
Wastewater System – Vanastra	115,000	187,000	-161,000	0	26,000	89,000
Wastewater Systems Total	**427,000**	**1,103,000**	**-1,028,000**	**0**	**75,000**	**352,000**
Water System - Brucefield	23,000	68,000	-68,000	0	0	23,000
Water System – Brussels	94,000	355,000	-280,000	0	75,000	19,000
Water System – Seaforth	209,000	750,000	-300,000	0	450,000	241,000
Water System – Vanastra	58,000	211,000	-98,000	0	113,000	55,000
Water Systems Total	**384,000**	**1,384,000**	**-746,000**	**0**	**638,000**	**254,000**
Total	**811,000**	**2,487,000**	**-1,774,000**	**0**	**713,000**	**98,000**

3.3 Recommendations for Full Funding

The average annual investment requirement for wastewater systems and water systems is $811,000. Annual revenue currently allocated to these assets for capital purposes is $713,000 leaving an annual deficit of $98,000. To put it another way, these infrastructure categories are currently funded at 89% of their long-term requirements.

In 2016, Huron East had annual wastewater revenues of $427,000 and annual water revenues of $384,000. As illustrated in Table 40, without consideration of any other sources of revenue, full funding would require the following increases over time:

Table 40 Rate Change Required for Full Funding

Asset class	Rate Change Required for Full Funding
Wastewater Systems	31.9%
Water Systems	-18.4%

Table 41 Without Change in Debt Costs

	Wastewater Systems				Water Systems			
	5 Years	10 Years	15 Years	20 Years	5 Years	10 Years	15 Years	20 Years
Infrastructure Deficit	352,000	352,000	352,000	352,000	-254,000	-254,000	-254,000	-254,000
Change in Debt Costs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Resulting Infrastructure Deficit/Surplus	**352,000**	**352,000**	**352,000**	**352,000**	**-254,000**	**-254,000**	**-254,000**	**-254,000**
Resulting Rate Increase Required:								
Total Over Time	**31.9%**	**31.9%**	**31.9%**	**31.9%**	**-18.4%**	**-18.4%**	**-18.4%**	**-18.4%**
Annually	6.4%	3.2%	2.1%	1.6%	-3.7%	-1.8%	-1.2%	-0.9%

Table 42 With Change in Debt Costs

	Wastewater Systems				Water Systems			
	5 Years	10 Years	15 Years	20 Years	5 Years	10 Years	15 Years	20 Years
Infrastructure Deficit	352,000	352,000	352,000	352,000	-254,000	-254,000	-254,000	-254,000
Change in Debt Costs	0	0	0	0	0	0	0	0
Resulting Infrastructure Deficit/Surplus	**352,000**	**352,000**	**352,000**	**352,000**	**-254,000**	**-254,000**	**-254,000**	**-254,000**
Resulting Rate Increase Required:								
Total Over Time	**31.9%**	**31.9%**	**31.9%**	**31.9%**	**-18.4%**	**-18.4%**	**-18.4%**	**-18.4%**
Annually	6.4%	3.2%	2.1%	1.6%	-3.7%	-1.8%	-1.2%	-0.9%

Considering all of the above information, we recommend the following;

For Wastewater Systems:

We recommend the 20-year option in Table 42. This involves full funding being achieved over 20 years by:

- increasing rate revenues by 1.6% for wastewater services each year for the next 20 years solely for the purpose of phasing in full funding.
- increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis.
- Aligning this financial strategy with Huron East's Water and Wastewater Financial Plan developed in accordance with Regulation 453/07.

For Water Systems:

There is currently a capital surplus of $254,000. At least two factors need to be quantified before any rate reductions are considered:

a) Age based data shows a pent up investment demand of $6,985,000 for water services. Prioritizing future projects will require the age based data to be replaced by condition based data. The results of the condition based analysis may identify different pent up investment requirements.

   As a result, rates should not be decreased until a detailed work plan is developed for these projects based on their actual condition. A corresponding financial plan can then be developed taking into account that there are $2,237,000 of reserves available for water infrastructure.

b) 54% of water revenues are currently allocated to operations as opposed to capital. Overall rates should not be decreased until longer term operational requirements are determined and taken into account. This will avoid the complications of lowering rates for capital purposes and then possibly increasing them for operational requirements.

We recommend that the required work for a) and b) above be completed in order to determine what rate reductions can be achieved and over what period those reduction can be implemented.

Considering all of the above information, we recommend the following for water services:

- The required work for a) and b) above be completed in order to determine what rate reductions can be achieved and over what period those reduction can be implemented.
- Ensuring that any surpluses experienced are allocated to the appropriate reserves.
- Ensuring that any reductions implemented in the future take into account applicable inflation indexes for the intervening period of time.
- Ensuring that, once rates are reduced to the level required for full funding, subsequent rates are adjusted by the applicable inflation index on an annual basis.
- Aligning this financial strategy with Huron East's Water and Wastewater Financial Plan developed in accordance with Regulation 453/07.

Notes:
- As in the past, periodic senior government infrastructure funding will most likely be available during the phase-in period. By Provincial AMP rules, this periodic funding cannot be incorporated into an AMP unless there are firm commitments in place. We have included OCIF formula based funding, if applicable, since this funding is a multi-year commitment.
- We realize that raising rate revenues by the amounts recommended above for infrastructure purposes will be very difficult to do. However, considering a longer phase-in window may have even greater consequences in terms of infrastructure failure.
- Any increase in rates required for operations would be in addition to the above recommendations.

Although this option achieves full funding on an annual basis and provides financial sustainability over the period modeled, the recommendations do require prioritizing capital projects to fit the resulting annual funding available. Current data shows a pent-up investment demand of $2,950,000 for wastewater services and $6,985,000 for water services. Prioritizing future projects will require the current data to be replaced by condition based data. Although our recommendations include no further use of debt, the results of the condition based analysis may require otherwise.

4. Use of Debt

For reference purposes, Table 43 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.

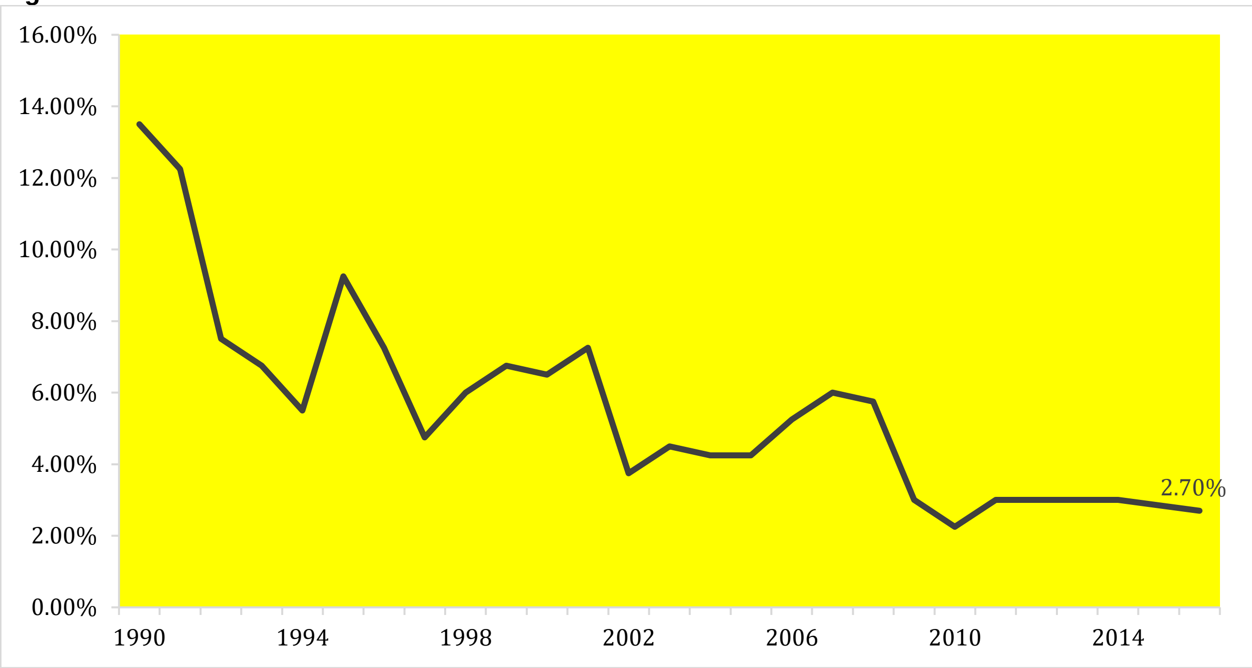
Table 43 Total Interest Paid as a Percentage of Project Costs

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 3.2%.

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

Figure 66 Historical Prime Business Interest Rates



As illustrated in Table 43 , 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 44 and Table 45 outline how Huron East has historically used debt for investing in the asset categories as listed. There is currently $528,000 of debt outstanding for the assets covered by this AMP with corresponding principal and interest payments of $162,000, well within its provincially prescribed maximum of $2,847,000.

Table 44 Overview of Use of Debt

Asset class	Debt at December 31st, 2016	Use of Debt in Last Five Years				
		2012	2013	2014	2015	2016
Bridges & Culverts	0	0	0	0	0	0
Storm Network	0	0	0	0	0	0
Road Network	0	0	0	0	0	0
Buildings & Facilities	92,000	145,000	0	0	0	0
Machinery & Equipment	436,000	0	187,000	0	0	0
Vehicles	0	0	0	0	0	0
Total Tax Funded	**528,000**	**0**	**0**	**0**	**0**	**0**
Wastewater Systems	0	0	0	0	0	0
Water Systems	0	0	0	0	0	0
Total Rate Funded	**0**	**0**	**0**	**0**	**0**	**0**

Table 45 Overview of Debt Costs

Asset class	Principal & Interest Payments in Next Ten Years						
	2017	2018	2019	2020	2021	2022	2027
Bridges & Culverts	0	0	0	0	0	0	0
Storm Sewer System	0	0	0	0	0	0	0
Road Network	0	0	0	0	0	0	0
Buildings	93,000	0	0	0	0	0	0
Machinery & Equipment	69,000	69,000	69,000	69,000	43,000	16,000	16,000
Vehicles	0	0	0	0	0	0	0
Total Tax Funded	**162,000**	**69,000**	**69,000**	**69,000**	**43,000**	**16,000**	**16,000**
Wastewater Systems	0	0	0	0	0	0	0
Water Systems	0	0	0	0	0	0	0
Total Rate Funded	**0**	**0**	**0**	**0**	**0**	**0**	**0**

The revenue options outlined in this plan allow Huron East 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 46 outlines the details of the reserves currently available to Huron East.

Table 46 Summary of Reserves Available

Asset class	Balance at December 31st, 2016
Bridges & Culverts	1,571,000
Storm Network	0
Road Network	0
Buildings & Facilities	682,000
Machinery & Equipment	213,000
Vehicles	95,000
Total Tax Funded	**2,561,000**
Water Systems	2,237,000
Wastewater Systems	2,868,000
Total Rate Funded	**5,105,000**

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

X. 2016 Infrastructure Report Card

The following infrastructure report card illustrates the 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 47 2016 Infrastructure Report Card

<table>
<tr><th>Asset class</th><th>Asset Health Grade</th><th>Funding Percentage</th><th>Financial Capacity Grade</th><th>Average Asset Class Grade</th><th>Comments</th></tr>
<tr><td>Roads</td><td>D</td><td>27%</td><td>F</td><td>F</td><td rowspan="11">Based on 2016 replacement cost, and primarily condition data, over 27% of assets, with a valuation of $77 million, are in good to very good condition; 46% are in poor to very poor condition.

The municipality is underfunding its assets. Tax-funded categories are funded at 56% while rate-funded categories are funded at 89%.</td></tr>
<tr><td>Bridges & Culverts</td><td>D</td><td>70%</td><td>C</td><td>D</td></tr>
<tr><td>Water Systems</td><td>C</td><td>100%</td><td>A</td><td>C</td></tr>
<tr><td>Wastewater Systems</td><td>D</td><td>18%</td><td>F</td><td>F</td></tr>
<tr><td>Storm</td><td>C</td><td>100%</td><td>A</td><td>B</td></tr>
<tr><td>Buildings & Facilities</td><td>D</td><td>71%</td><td>C</td><td>D</td></tr>
<tr><td>Machinery & Equipment</td><td>D</td><td>83%</td><td>B</td><td>C</td></tr>
<tr><td>Vehicles</td><td>D</td><td>100%</td><td>A</td><td>C</td></tr>
<tr><td colspan="3">Average Asset Health Grade</td><td colspan="2">D</td></tr>
<tr><td colspan="3">Average Financial Capacity Grade</td><td colspan="2">F</td></tr>
<tr><td colspan="3">Overall Grade for the Municipality</td><td colspan="2">D</td></tr>
</table>

XI. Appendix: Grading and Conversion Scales

Table 48 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 49 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.