AMP2017

www.psdrcs.com

The 2017 Asset Management Plan for the

Town of Erin

SUBMITTED BY PSD.
WWW.PSDRCS.COM
February 2019

Contents

Executive Summary 4
I. Introduction & Context 6
II. Asset Management 7
1. Overarching Principles 8
III. AMP Objectives and Content 9
IV. Data and Methodology 10
1. Condition Data 10
2. Financial Data 11
3. Infrastructure Report Card 12
4. Limitations and Assumptions 13
5. Process 14
6. Data Confidence Rating 15
V. Summary Statistics 16
1. Asset Valuation 17
2. Source of Condition Data by Asset Class 19
3. Historical Investment in Infrastructure – All Asset Classes 20
4. Useful Life Consumption – All Asset Classes 21
5. Overall Condition – All Asset Classes 22
6. Financial Profile 23
7. Replacement Profile – All Asset Classes 24
8. Data Confidence 25
VI. State of Local Infrastructure 26
1. Road Network 27
2. Bridges & Culverts 34
3. Water System 41
4. Buildings & Facilities 48
5. Machinery & Equipment 55
6. Land Improvements 63
7. Vehicles 70
VII. Levels of Service 77
1. Guiding Principles for Developing LOS 77
2. Key Performance Indicators and Targets 78
3. Future Performance 82
4. Monitoring, Updating and Actions 83
VIII. Asset Management Strategies 84
1. Non-Infrastructure Solutions & Requirements 85
2. Condition Assessment Programs 85
3. Lifecycle Analysis Framework 90
4. Growth and Demand 95
5. Project Prioritization and Risk Management 95
IX. Financial Strategy 104
1. General Overview 104
2. Financial Profile: Tax Funded Assets 107
3. Financial Profile: Rate Funded Assets 111
4. Use of Debt 114
5. Use of Reserves 117
X. 2017 Infrastructure Report Card 118
XI. Appendix: Grading and Conversion Scales 119

List of Figures

Figure 1 Distribution of Net Stock of Core Public Infrastructure 6
Figure 2 Developing the AMP – Work Flow and Process 14
Figure 3 Asset Valuation by Class 17
Figure 4 2017 Ownership Per Household 18
Figure 5 Historical Investment in Infrastructure – All Asset Classes 20
Figure 6 Useful Life Remaining as of 2017 – All Asset Classes 21
Figure 7 Asset Condition Distribution by Replacement Cost as of 2015 – All Asset Classes 22
Figure 8 Annual Requirements by Asset Class 23
Figure 9 Infrastructure Backlog – All Asset Classes 23
Figure 10 Replacement Profile – All Asset Classes 24
Figure 11 Asset Valuation – Road Network 28
Figure 12 Historical Investment – Road Network 29
Figure 13 Useful Life Consumption - Road Network 30
Figure 14 Asset Condition – Road Network (Age-Based) 31
Figure 15 Forecasting Replacement Needs – Road Network 32
Figure 16 Asset Valuation – Bridges & Culverts 35
Figure 17 Historical Investment – Bridges & Culverts 36
Figure 18 Useful Life Consumption – Bridges & Culverts 37
Figure 19 Asset Condition – Bridges & Culverts (Age-based) 38
Figure 20 Forecasting Replacement Needs – Bridges & Culverts 39
Figure 21 Asset Valuation – Water System 42
Figure 22 Historical Investment – Water System 43
Figure 23 Useful Life Consumption – Water System 44
Figure 24 Asset Condition – Water System (Age-Based) 45
Figure 25 Forecasting Replacement Needs – Water System 46
Figure 26 Asset Valuation – Buildings & Facilities 49
Figure 27 Historical Investment – Buildings & Facilities 50
Figure 28 Useful Life Consumption – Buildings & Facilities 51
Figure 29 Asset Condition – Buildings & Facilities (Age-Based) 52
Figure 30 Forecasting Replacement Needs – Buildings & Facilities 53
Figure 31 Asset Valuation – Machinery & Equipment 56
Figure 32 Historical Investment – Machinery & Equipment 57
Figure 33 Useful Life Consumption – Machinery & Equipment 58
Figure 34 Asset Condition – Machinery & Equipment (Age-based) 59
Figure 35 Forecasting Replacement Needs – Machinery & Equipment 60
Figure 36 Asset Valuation – Land Improvements 64
Figure 37 Historical Investment – Land Improvements 65
Figure 38 Useful Life Consumption – Land Improvements 66
Figure 39 Asset Condition - Land Improvements (Age-Based) 67
Figure 40 Forecasting Replacement Needs – Land Improvements 68
Figure 41 Asset Valuation – Vehicles 71
Figure 42 Historical Investment – Vehicles 72
Figure 43 Useful Life Consumption – Vehicles 73
Figure 44 Asset Condition – Vehicles (Age-based) 74
Figure 45 Forecasting Replacement Needs – Vehicles 75
Figure 46 Comparing Age-based and Assessed Condition Data 86
Figure 47 Paved Road General Deterioration Profile 90
Figure 48 Water Main General Deterioration 93
Figure 49 Bow Tie Risk Model 96
Figure 50 Distribution of Assets Based on Risk – All Asset Classes 100
Figure 51 Distribution of Assets Based on Risk – Road Network 100
Figure 52 Distribution of Assets Based on Risk – Bridges & Culverts 101
Figure 53 Distribution of Assets Based on Risk – Water System 101
Figure 54 Distribution of Assets Based on Risk – Buildings & Facilities 102

Figure 55 Distribution of Assets Based on Risk – Machinery & Equipment....102
Figure 56 Distribution of Assets Based on Risk – Land Improvements....103
Figure 57 Distribution of Assets Based on Risk – Vehicles....103
Figure 58 Cost Elements....105
Figure 59 Historical Prime Business Interest Rates....115

List of Tables

Table 1 Objectives of Asset Management....7
Table 2 Principles of Asset Management....8
Table 3 Infrastructure Report Card Description....12
Table 4 Source of Condition Data by Asset Class....19
Table 5 Data Confidence Ratings....25
Table 6 Key Asset Attributes – Road Network....27
Table 7 Key Asset Attributes – Bridges & Culverts....34
Table 8 Key Asset Attributes – Water....41
Table 9 Key Asset Attributes – Buildings & Facilities....48
Table 10 Asset Inventory – Machinery & Equipment....55
Table 11 Asset Inventory – Land Improvements....63
Table 12 Asset Inventory – Vehicles....70
Table 13 LOS Categories....77
Table 14 Key Performance Indicators – Road Network and Bridges & Culverts....78
Table 15 Key Performance Indicators – Buildings & Facilities....79
Table 16 Key Performance Indicators – Vehicles....79
Table 17 Key Performance Indicators – Water System....80
Table 18 Key Performance Indicators – Machinery & Equipment....81
Table 19 Key Performance Indicators – Land Improvements....81
Table 20 Asset Condition and Related Work Activity for Paved Roads....91
Table 21 Asset Condition and Related Work Activity for Water Mains....94
Table 22 Probability of Failure – All Assets....97
Table 23 Consequence of Failure – Roads....97
Table 24 Consequence of Failure – Bridges & Culverts....97
Table 25 Consequence of Failure – Water Mains....98
Table 26 Consequence of Failure – Buildings & Facilities....98
Table 27 Consequence of Failure – Machinery & Equipment....98
Table 28 Consequence of Failure – Land Improvements....99
Table 29 Consequence of Failure – Vehicles....99
Table 30 Infrastructure Requirements and Current Funding Available: Tax Funded Assets....107
Table 31 Tax Change Required for Full Funding....108
Table 32 Effect of Changes in OCIF Funding and Reallocating Decreases in Debt Costs....109
Table 33 Summary of Infrastructure Requirements and Current Funding Available....111
Table 34 Rate Change Required for Full Funding....112
Table 35 Revenue Options for Full Funding....113
Table 36 Total Interest Paid as a Percentage of Project Costs....114
Table 37 Overview of Use of Debt....116
Table 38 Overview of Debt Costs....116
Table 39 Summary of Reserves Available....117
Table 40 2016 Infrastructure Report Card....118
Table 41 Asset Health Scale....119
Table 42 Financial Capacity Scale....120

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 Town of Erin's infrastructure portfolio comprises the following asset classes: road network, bridges & culverts, buildings, water, machinery & equipment, land improvements and vehicles. The Town of Erin also has 2 dams and a storm sewer network that were not included for the purposes of this AMP. The asset classes analyzed in this asset management plan for the Town had a total 2017 valuation of $140.8 million, of which roads comprised 41%.

Strategic asset management is critical in extracting the highest total value from public assets at the lowest lifecycle cost. This AMP, the town's second following the completion of its first edition in 2013, details the state of infrastructure of the town'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 town in identifying impending infrastructure needs, and guide its medium- and long-term capital programs. The Town invested lightly in its infrastructure until the late 1970s. Investments began to fluctuate during 1980 and then peaked in the early 2000s. During this time, $26 million was invested with $15.8 million put into the road network. Since 2015, $7.4 million has been invested with a focus on roads, machinery & equipment and bridges and culverts.

Based on 2017 replacement cost, and primarily age-based data, over 59% of assets, with a valuation of $82.5 million, are in good to very good condition; 25% are in poor to very poor condition. 70% of the assets analyzed in this AMP have at least 10 years of useful life remaining. However, 7%, with a valuation of $9.9 million, remain in operation beyond their established useful life. An additional 13% 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 town to identify the financial resources required for sustainable asset management based on existing asset inventories, desired levels of service, and projected growth requirements.

The average annual investment requirement for the above categories is $3,627,000. Annual revenue currently allocated to these assets for capital purposes is $1,588,000 leaving an annual deficit of $2,049,000. To put it another way, these infrastructure categories are currently funded at 44% of their long-term requirements in 2018, Erin has annual tax revenues of $6,620,000. Our strategy includes full funding being achieved over 20 years by:

- when realized, reallocating the debt cost reductions of $434,000 to the infrastructure deficit as outlined above.
- increasing tax revenues by 1.2% each year for the next 20 years solely for the purpose of phasing in full funding to the asset categories covered in this section of the AMP.
- allocating the current gas tax and OCIF revenue and scheduled increases to the infrastructure deficit as they occur.

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

The average annual investment requirement for water services is $621,000. Annual revenue currently allocated to these assets for capital purposes is $592,000 leaving an annual deficit of $29,000. To put it another way, these infrastructure categories are currently funded at 95% of their long-term requirements. In the 2018 budget, Erin has annual water revenues of $1,528,000.

To achieve financial sustainability for its rate-based assets, we recommend a 5-year option that achieves full funding by:

- increasing rate revenues by 0.4% for water services each year for the next 5 years solely for the purpose of phasing in full funding to the asset categories covered in this section of the AMP.
- increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

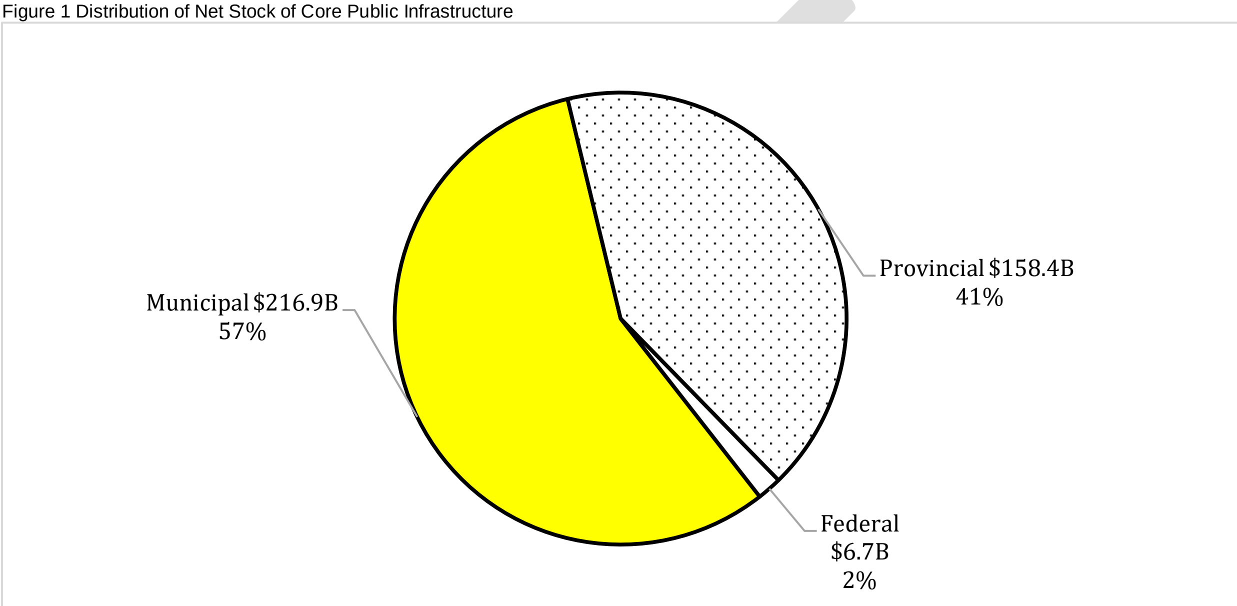
Although our financial strategy allows the Town to meet its long-term funding requirements and reach fiscal sustainability, injection of additional revenues will be required to mitigate existing infrastructure backlogs.

A critical aspect of this asset management plan is the level of confidence the town has in the data used to develop the state of the infrastructure and form the appropriate financial strategies. The town 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 town of Erin's capital assets portfolio, as analyzed in this asset management plan (AMP) is valued at $140.8 million using 2017 replacement costs. The town 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 town manage these assets optimally in order to produce the highest total value for taxpayers. This asset management plan, (AMP) will assist the town 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 Erin's overarching corporate strategy. It was developed to support the Town's vision for its asset management practice and programs. It provides key asset attribute data, including current composition of the Town's infrastructure portfolio, inventory, replacement costs, useful life etc., summarizes the physical health of the capital assets, enumerates the Town's current capital spending framework, and outlines financial strategies to achieve fiscal sustainability in the long-term while reducing and eventually eliminating funding gaps.

As with the first edition of the Town's asset management plan in 2013, this AMP is developed in accordance with provincial standards and guidelines, and new requirements under the Federal Gas Tax Fund (GTF) stipulating the inclusion of all eligible asset classes. The following asset classes are analysed in this document: road network; bridges & culverts; water; facilities; machinery & equipment; land improvements; and vehicles.

IV. Data and Methodology

The Town'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 attenuated at the class level.

As available, actual field condition data was used to make recommendations more meaningful and representative of the Town'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 town 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 town'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 town is fully prepared for its long-term replacement needs based on its existing infrastructure portfolio.
B	Good	The town 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 town 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 town 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 town 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 town 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 town's infrastructure portfolio and the resulting capital requirements.

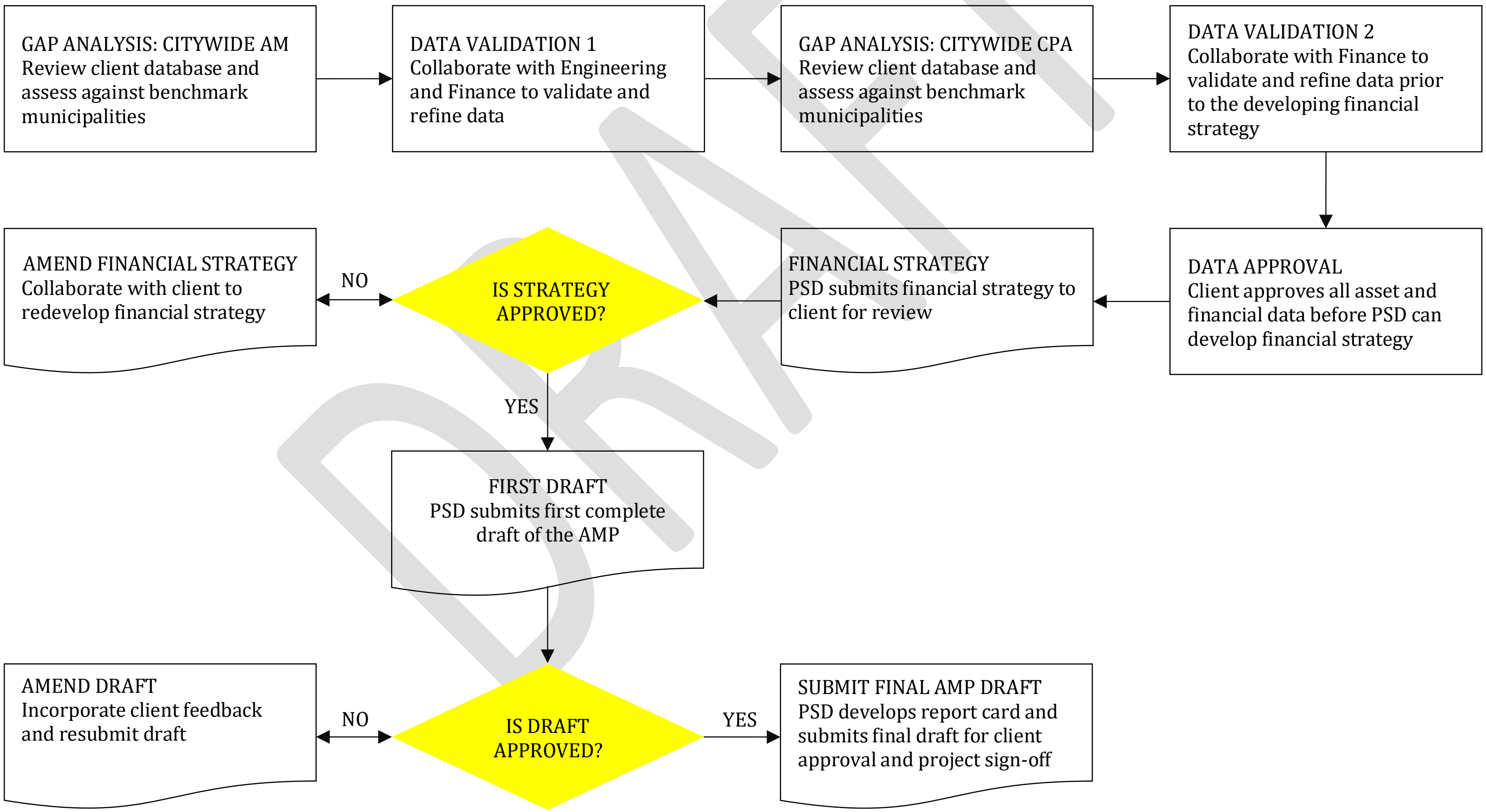
- Our calculations and recommendations will reflect the best available data at the time this AMP was developed.

- 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 Town 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 town 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. Town 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 town'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 Town's self-assessed score in each factor is then used to calculate data confidence in each asset class using Equation 1 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 Town had a total 2017 valuation of $140.8 million, of which roads comprised 41%, followed by the water network at 23%. The ownership per household (Figure 4) totaled $50,000 based on 4,180 households for all asset categories except for water services with 1,346 households.

Figure 3 Asset Valuation by Class

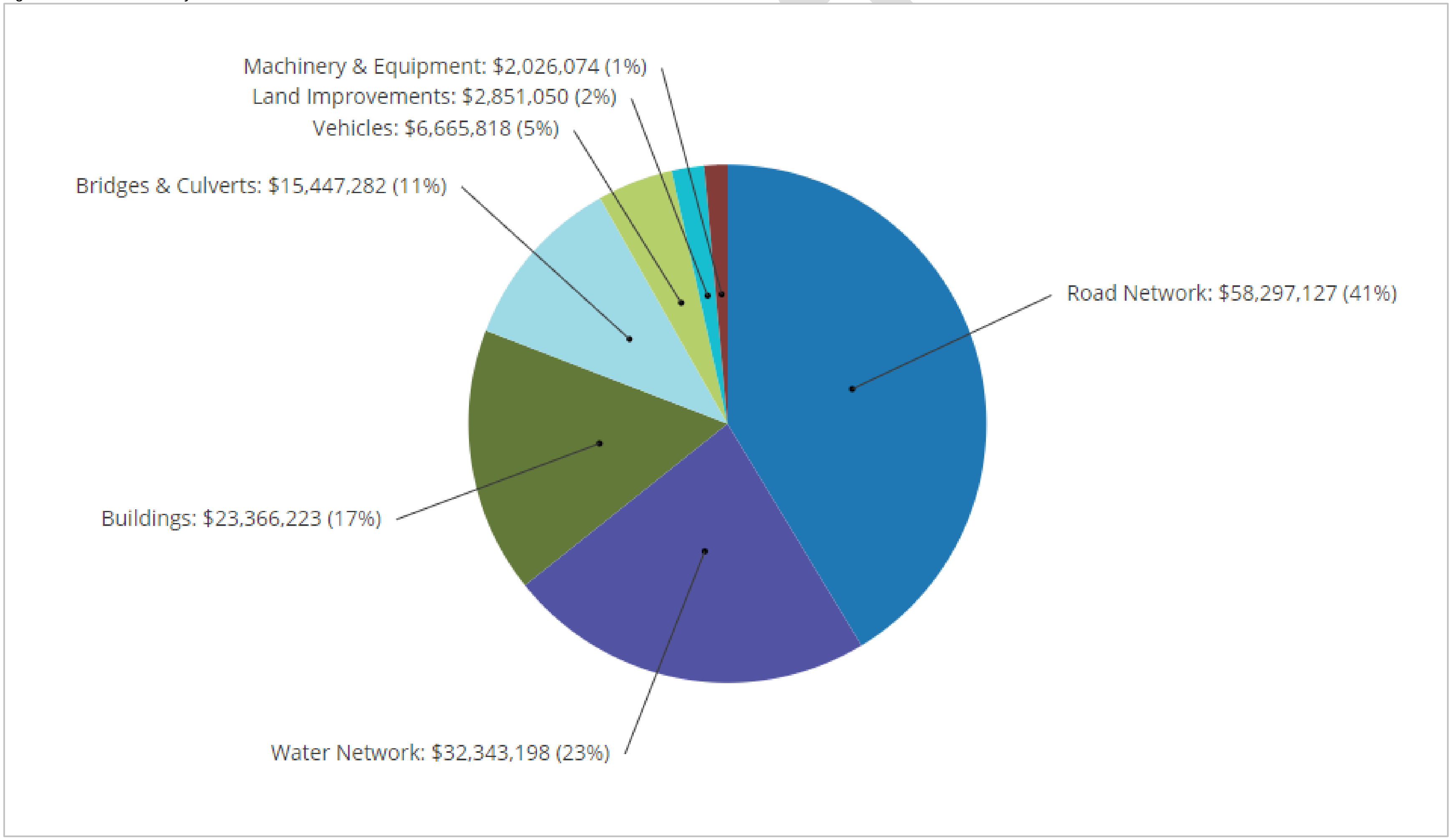
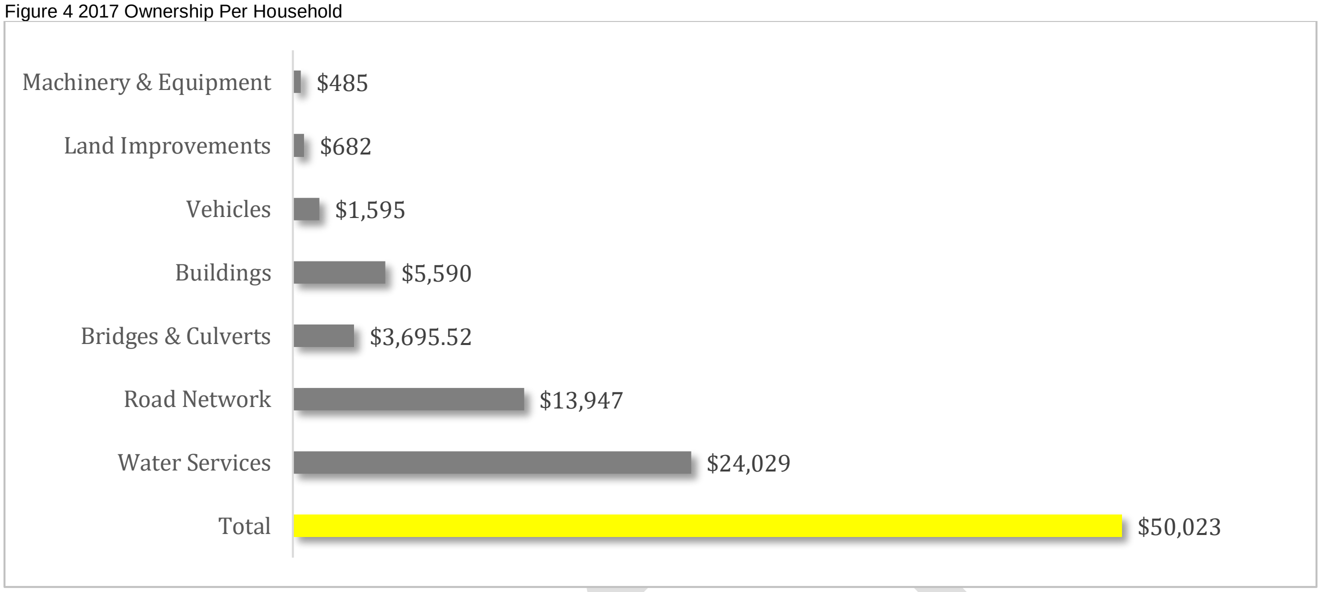


Figure 4 2017 Ownership Per Household



2. Source of Condition Data by Asset Class

Observed data will provide the most precise indication of an asset's physical health. In the absence of such information, the age of capital assets can be used as a meaningful approximation of the asset's condition. Table 4 indicates the source of condition data used for the various asset classes in this AMP. The Town has provided condition data for its bridges & culverts, all other categories are using age-based data.

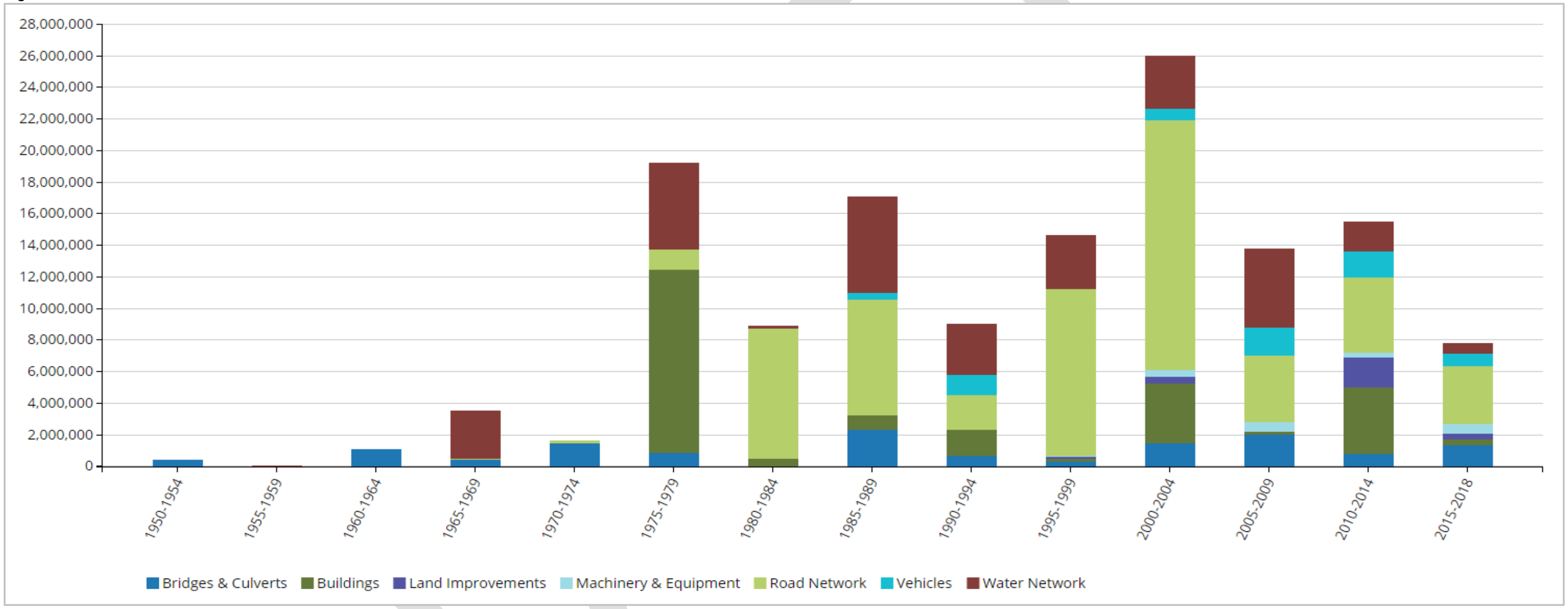
Table 4 Source of Condition Data by Asset Class

Asset class	Component	Source of Condition Data
Roads Network	All	Age-based
Bridges & Culverts	Road Structure - Bridge	82% Assessed
	Road Structure - Culvert	84% Assessed
Water System	All	Age-based
Buildings	All	Age-based
Machinery & Equipment	All	Age-based
Land Improvements	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 infrastucture needs: installation year profile, and useful life remaining. Using 2017 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, 2017.

Figure 5 Historical Investment in Infrastructure – All Asset Classes

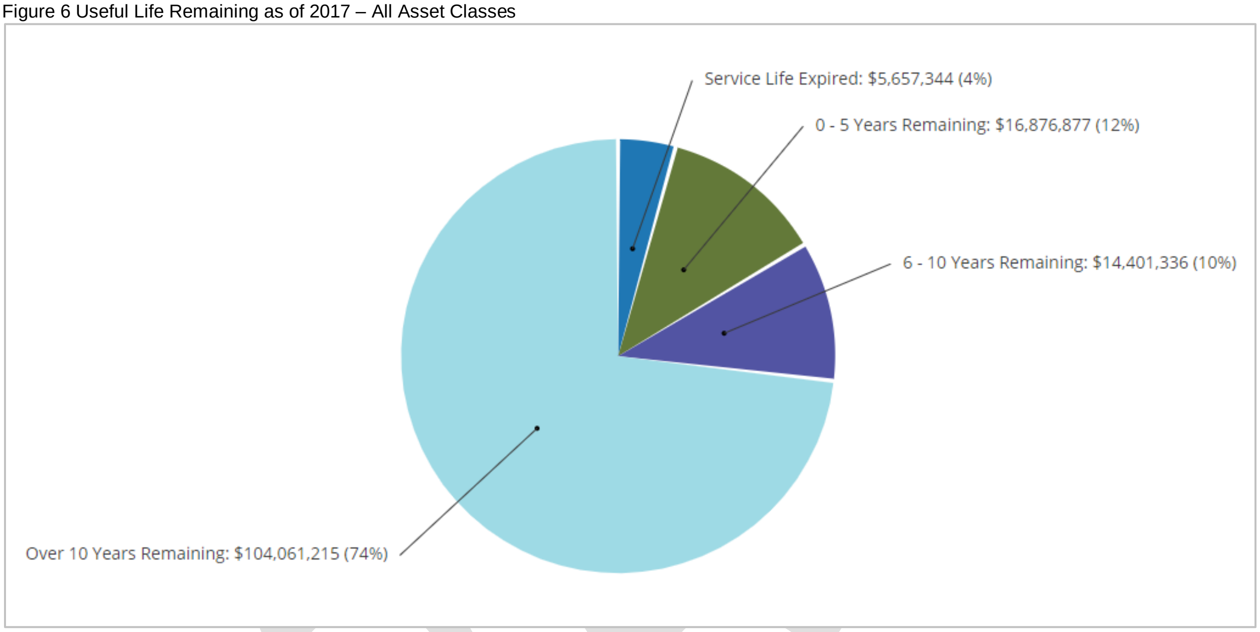


The Town invested lightly into its infrastructure until the late 1970s. Investments began to fluctuate during 1980 and then peaked in the early 2000s. During this time, $26 million was invested with $15.8 million put into the road network. Since 2015, $7.8 million has been invested with a focus on roads, machinery & equipment and bridges and culverts. Continuing past 2017, the Town of Erin completed over 40 capital projects in 2018, which included $1.9 million for roads, bridges and culverts. Assets in land improvements were addressed with the completion of Barbour Fields septic system, the Erin Rotary River Walk and the revitalization of MacMillan Park Holiday celebration lighting. For 2019, there will be delivery of rolling stock valued at approximately $750,000. LED streetlights will be installed in early 2019 as well.

4. Useful Life Consumption – All Asset Classes

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

Figure 6 Useful Life Remaining as of 2017 – All Asset Classes

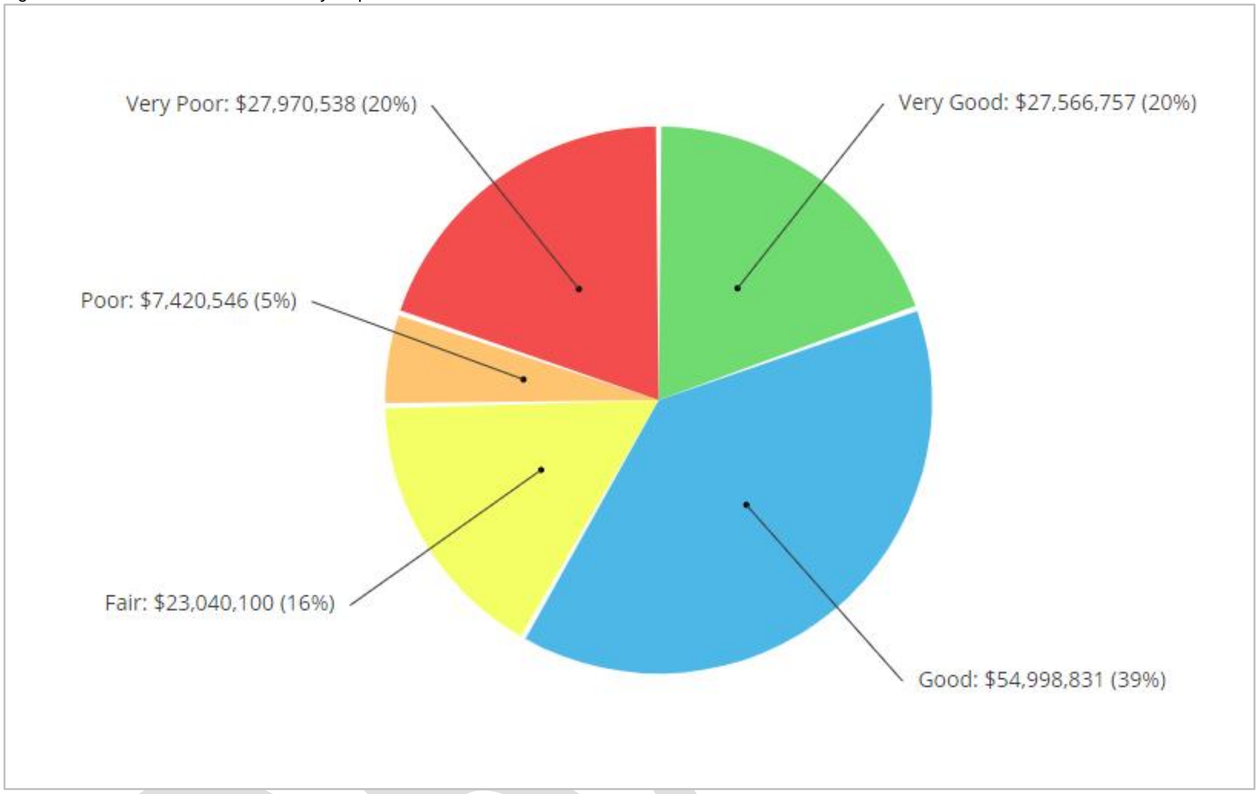


74% of the assets analyzed in this AMP have at least 10 years of useful life remaining. However, 4%, with a valuation of $5.6 million, remain in operation beyond their established useful life. An additional 12% will reach the end of their useful life within the next five years.

5. Overall Condition – All Asset Classes

Based on 2017 replacement cost, and primarily age-based data, over 59% of assets, with a valuation of $82.5 million, are in good to very good condition; 25% are in poor to very poor condition.

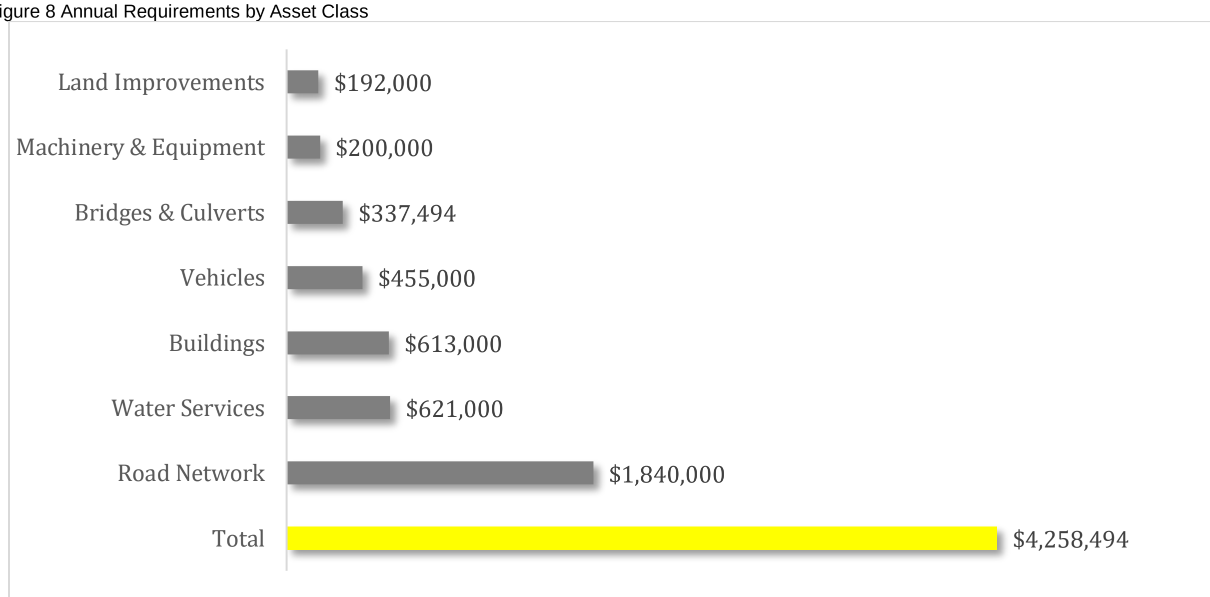
Figure 7 Asset Condition Distribution by Replacement Cost as of 2017 – All Asset Classes



6. Financial Profile

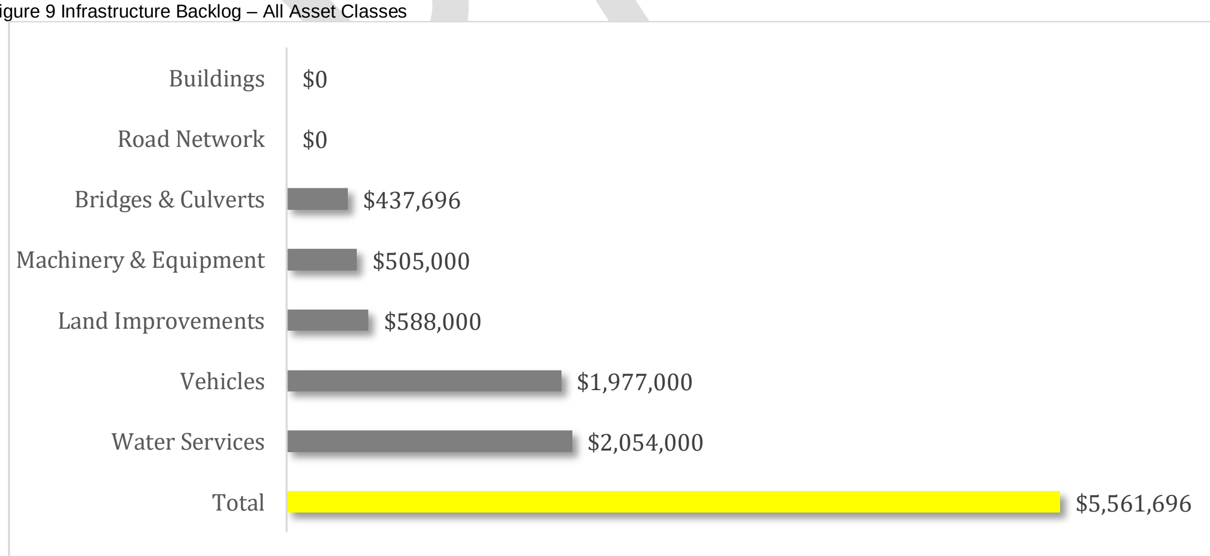
This section details key high-level financial indicators for the Town's asset classes.

Figure 8 Annual Requirements by Asset Class



The annual requirements represent the amount the Town 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 Town must allocate $4.2 million annually for the assets covered in this AMP.

Figure 9 Infrastructure Backlog – All Asset Classes

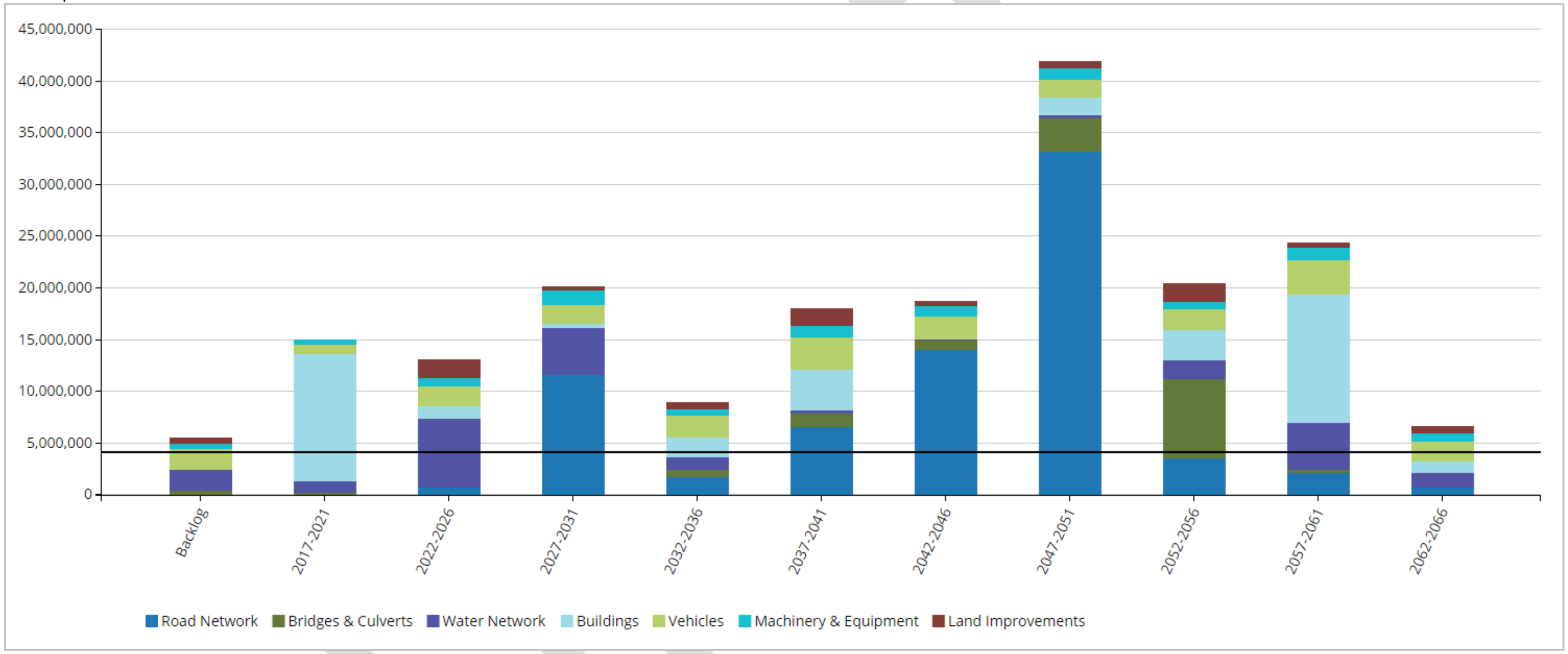


The Town has a combined infrastructure backlog of $5.5 million, with water services comprising 37%. The backlog represents the investment needed today to meet previously deferred replacement needs. In the absence of assessed data, the backlog represents the value of assets still in operation beyond their 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 Town'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 on age data, the town has a combined backlog of $5.5 million, of which vehicles comprises $2 million. Aggregate replacement needs will total $15 million over the next five years. An additional $13 million will be required between 2022 and 2026. The Town's aggregate annual requirements (indicated by the black line) total $4.2 million. At this funding level, the Town 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 Town is funding 44% of the annual requirements for tax-funded assets and 95% 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 Town to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

8. Data Confidence

The Town has a high degree of confidence in the data used to develop this AMP, receiving a weighted confidence rating of 94%. 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	Weighted Confidence Rating
Road Network	100%	100%	100%	80%	100%	96%	40%
Bridges & Culverts	100%	100%	100%	80%	100%	96%	10%
Water Services	100%	100%	100%	80%	100%	96%	22%
Buildings & Facilities	100%	100%	100%	80%	100%	96%	16%
Machinery & Equipment	100%	100%	0%	80%	100%	76%	1%
Land Improvements	100%	100%	0%	80%	100%	76%	2%
Fleet	100%	100%	0%	80%	100%	76%	4%
					Overall Weighted Average Data Confidence Rating	87%	94%

VI. State of Local Infrastructure

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

1. Road Network

1.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

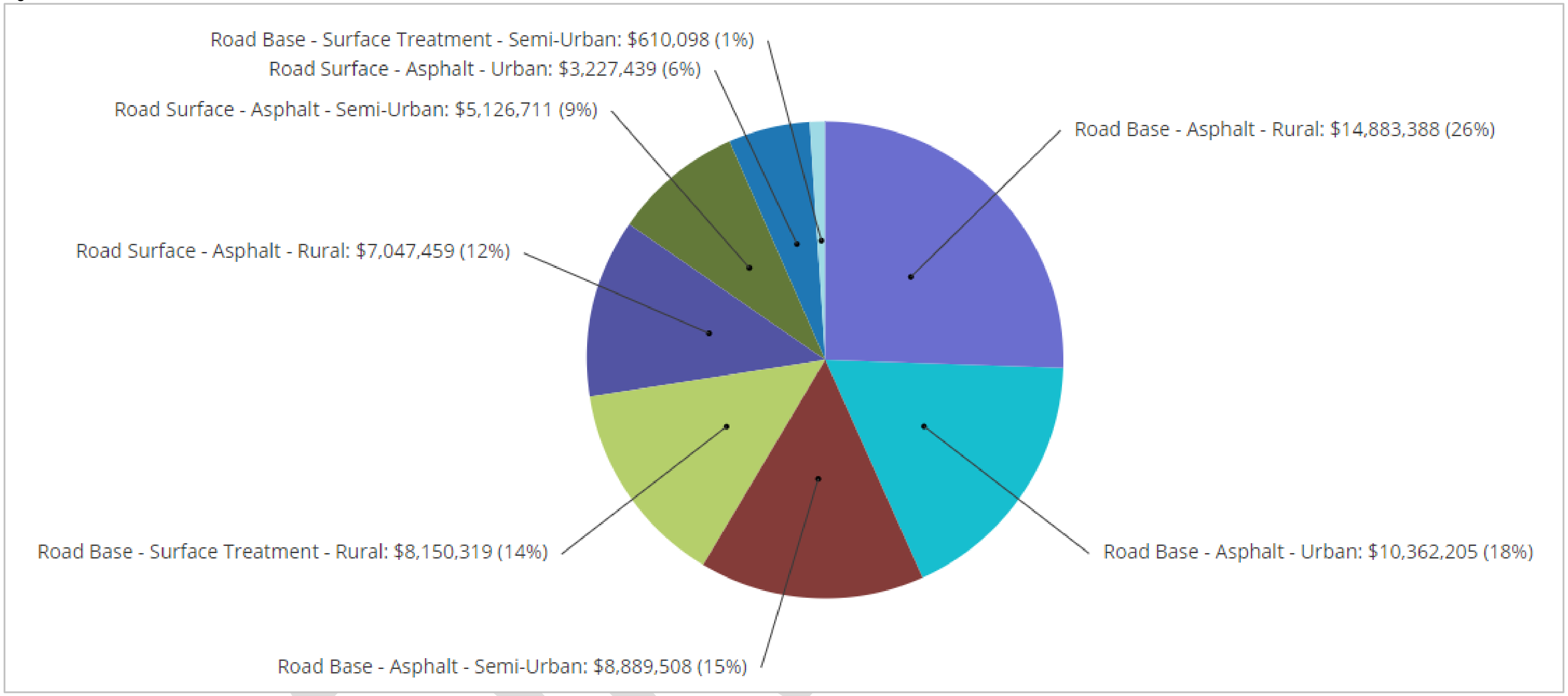
Table 6 illustrates key asset attributes for the Town's road network, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the Town's roads assets are valued at $58 million based on 2017 replacement costs. The useful life indicated for each asset type below was assigned by the Town.

Table 6 Key Asset Attributes – Road Network

Asset Type	Asset Component	Quantity	Useful Life (Years)	Replacement Cost Method	2017 Overall Replacement Cost
Road Network	Road Base – Asphalt – Rural	36km	40	NBRCPI Quarterly (Toronto)[3]	$14,883,388
	Road Base – Asphalt – Semi-Urban	23km	40	NRBCPI Quarterly (Toronto)	$8,889,508
	Road Base – Asphalt – Urban	10km	40	NRBCPI Quarterly (Toronto)	$10,362,205
	Road Base – Earth – Rural	0.32km	40	Not Planned for Replacement	$0
	Road Base – Earth – Semi-Urban	0.25km	40	Not Planned for Replacement	$0
	Road Base – Gravel – Rural	190km	40	Not Planned for Replacement	$0
	Road Base – Gravel – Semi-Urban	2km	40	Not Planned for Replacement	$0
	Road Base – Surface Treatment – Rural	30km	40	NRBCPI Quarterly (Toronto)	$8,150,319
	Road Base – Surface Treatment – Semi-Urban	2km	40	NRBCPI Quarterly (Toronto)	$610,098
	Road Surface – Asphalt – Rural	30km	20	NRBCPI Quarterly (Toronto)	$7,047,459
	Road Surface – Asphalt – Semi-Urban	23km	20	NRBCPI Quarterly (Toronto)	$5,126,711
	Road Surface – Asphalt - Urban	11km	20	NRBCPI Quarterly (Toronto)	$3,227,439
				Total	**$58,297,127**

[3] NBRCPI stands for Non-Residential Building Construction Price Index, this index is used to inflate historical costs to more accurately reflect replacement costs in today's dollars for infrastructure assets.

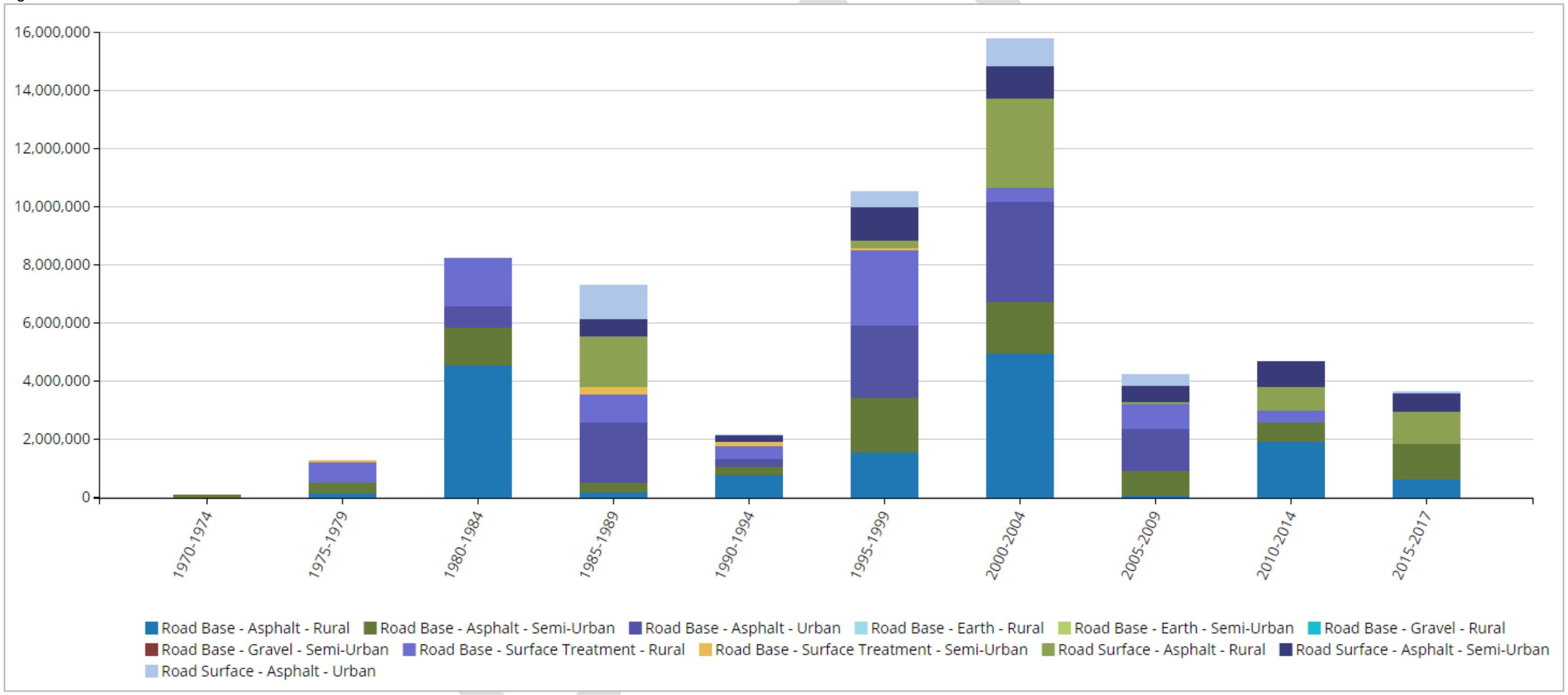
Figure 11 Asset Valuation – Road Network



1.2 Historical Investment in Infrastructure

Figure 12 shows the Town's historical investments in its road network since 1970. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 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, 2017.

Figure 12 Historical Investment – Road Network

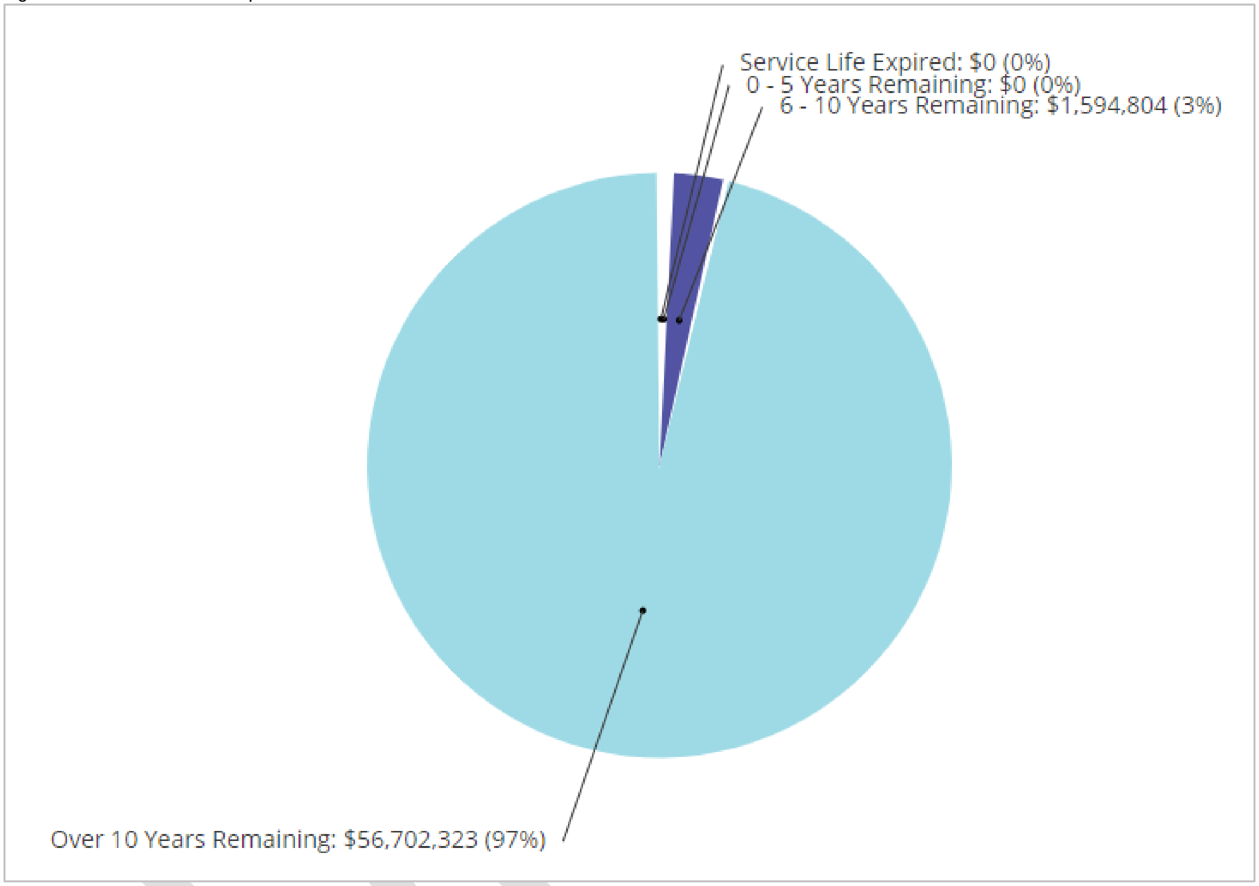


Investments in the Town's road network have grown since 1970 with large increases starting in the early 1980s. In the early 2000s, the period of largest investment, $15.8 million was invested with over $4.9 million put into road base – asphalt- rural. Investment in the road network for 2018 included $336,000 to pulverize and resurface parts of Dundas street, reconstruct Rural Road 27 and reconstruct & surface treat a section of Station Street. For 2019, part of 5th Line Rural Road will be upgraded from gravel to surface treated for $75,000.

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 2017 for the Town's road network.

Figure 13 Useful Life Consumption - Road Network

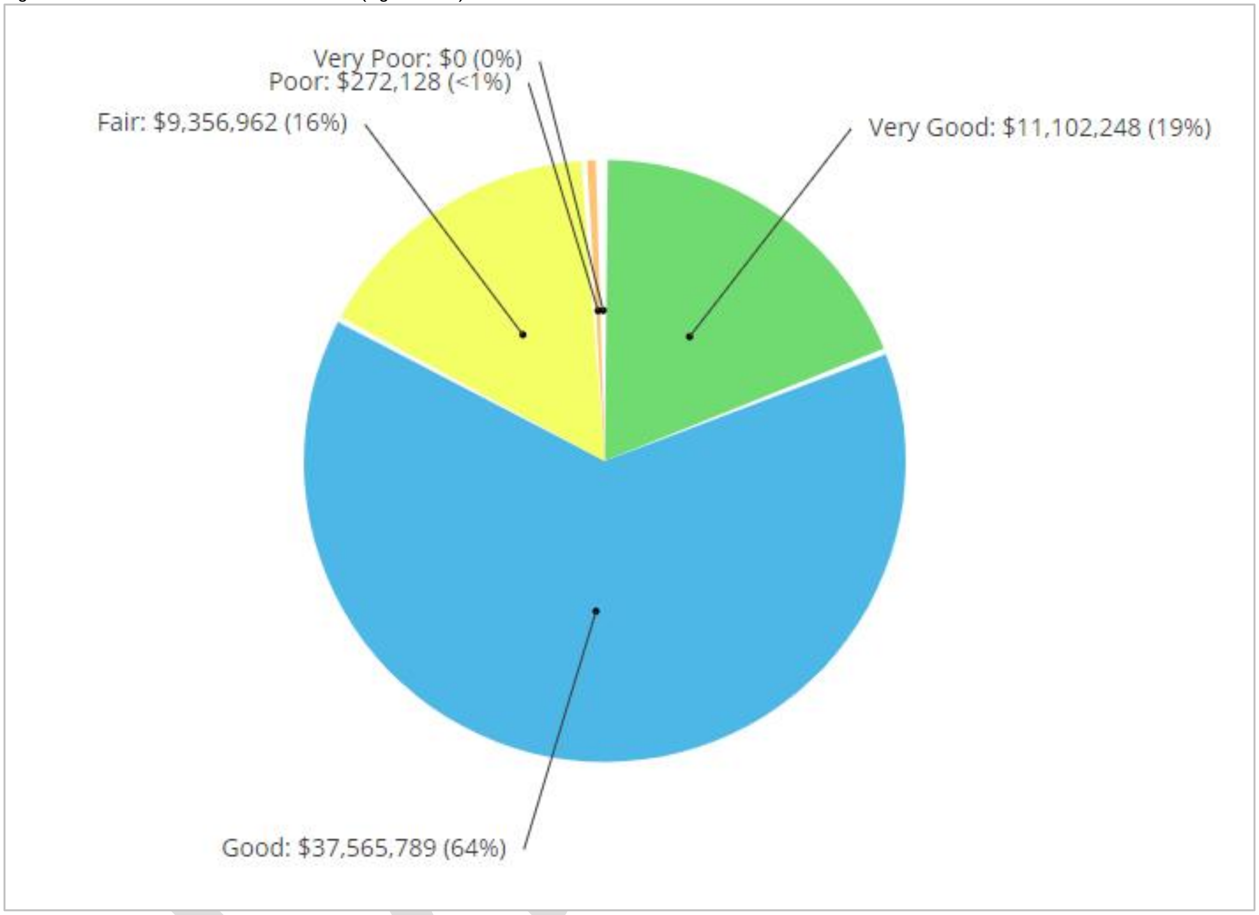


97% of the Town's road network has at least 10 years of useful life remaining, while the remaining 3% has 6-10 years remaining

1.4 Current Asset Condition

Using replacement cost, in this section we summarize the condition of the Town's road network as of 2017. By default, we rely on observed field data as provided by the town. In the absence of such information, age-based data is used as a proxy. The Town has not provided condition data its road assets.

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

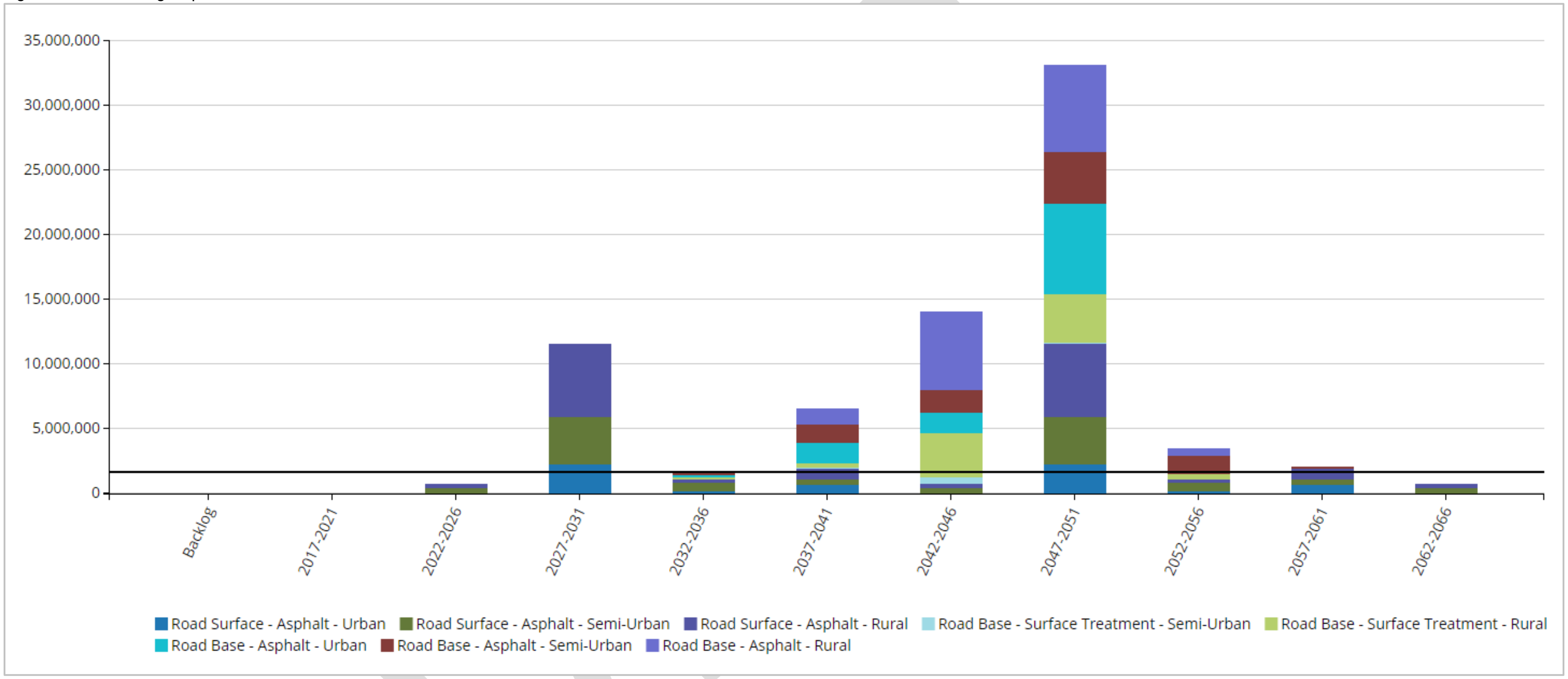


Age-based condition data indicates that 83% of assets, with a valuation of $48.6 million are in good to very good condition; less than 1% are in poor to very poor condition.

1.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the Town'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



Age-based data indicates no backlog and 10-year replacement needs of $769,000. The Town's annual requirements (indicated by the black line) for its road network total $1.8 million. At this funding level, the Town 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 Town is currently allocating $1,115,000, leaving an annual deficit of $725,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level.

1.6 Recommendations – Road Network

- Age-based data indicates no backlog and 10-year replacement needs of $769,000. The Town should conduct condition assessments of road surfaces 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.

- In addition to the above, a tailored lifecycle activity framework should also be developed 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 Town is funding 61% of its long-term requirements for its road network 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

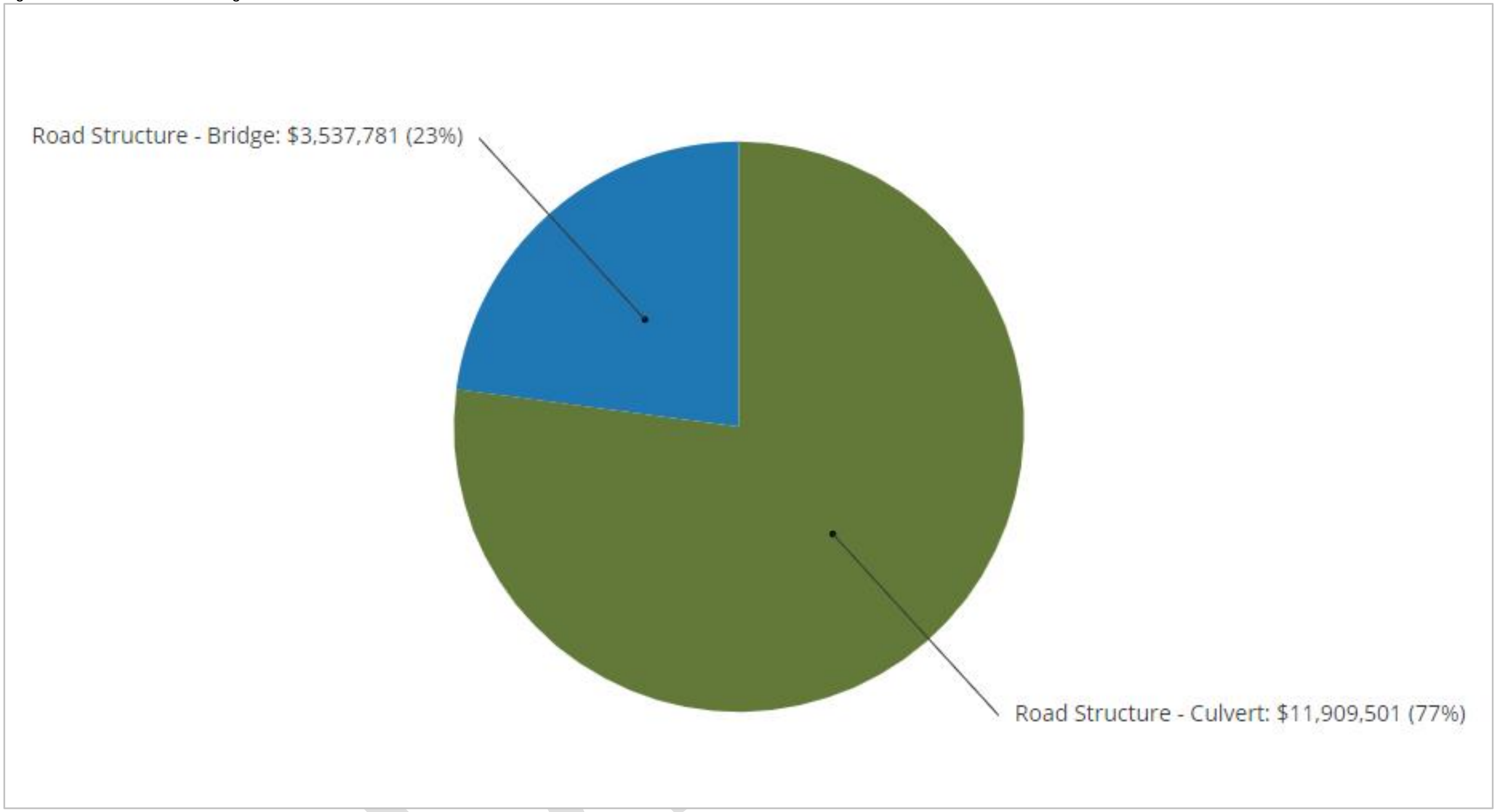
Table 7 illustrates key asset attributes for the Town's bridges & culverts, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the town's bridges & culverts assets are valued at $15 million based on 2017 replacement costs. The useful life indicated for each asset type below was assigned by the Town. Please note the Town also owns and maintains 2 dams that are not included in this inventory.

Table 7 Key Asset Attributes – Bridges & Culverts

Asset Type	Asset Component	Quantity	Useful Life (Years)	Replacement Cost Method	2017 Overall Replacement Cost
Bridges & Culverts	Road Structure – Bridge	11	45, 50	NRBCPI Quarterly (Toronto)[4]	$3,537,781
	Road Structure - Culvert	37	40, 50	NRBCPI Quarterly (Toronto)	$11,909,501
				Total	**$15,447,282**

[4] NBRCPI stands for Non-Residential Building Construction Price Index, this index is used to inflate historical costs to more accurately reflect replacement costs in today's dollars for infrastructure assets.

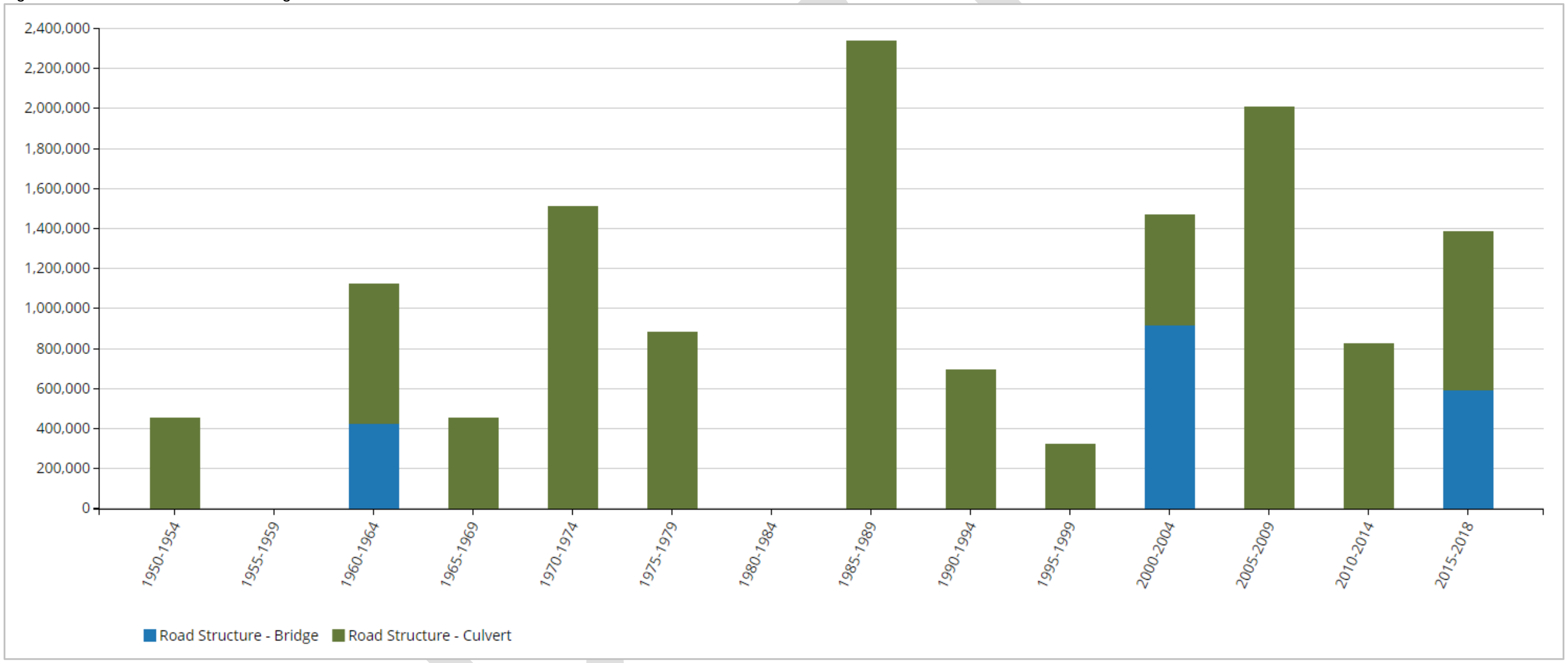
Figure 16 Asset Valuation – Bridges & Culverts



2.2 Historical Investment in Infrastructure

Figure 17 shows the Town'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, 2017.

Figure 17 Historical Investment – Bridges & Culverts

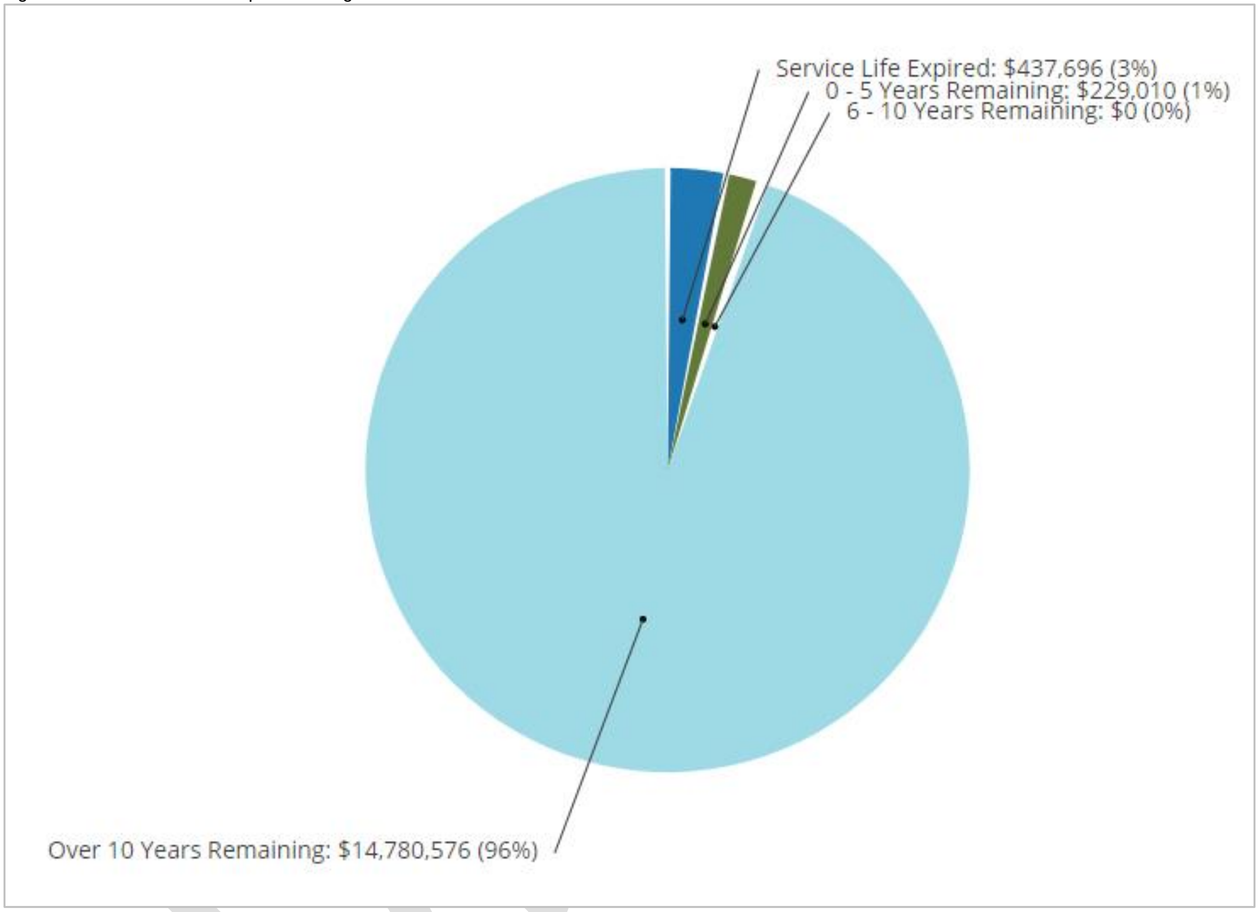


The municipalities investments in its bridges and culverts have fluctuated since 1950. In the late 1980s, the period of largest investment, $2.3 million was invested in culverts. Investment in the bridges & culverts for 2018 included $1.4 million on replacing culvert 2045 on the Fourth Line and major repairs & maintenance of various bridges listing in very poor condition per the OSIM report. For 2019, completion of the replacement of the Station Street Bridge and Dam is planned as well as $600,000 to rehabilitate two additional structures identified in the OSIM report.

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 2017 for the Town's bridges & culverts.

Figure 18 Useful Life Consumption – Bridges & Culverts

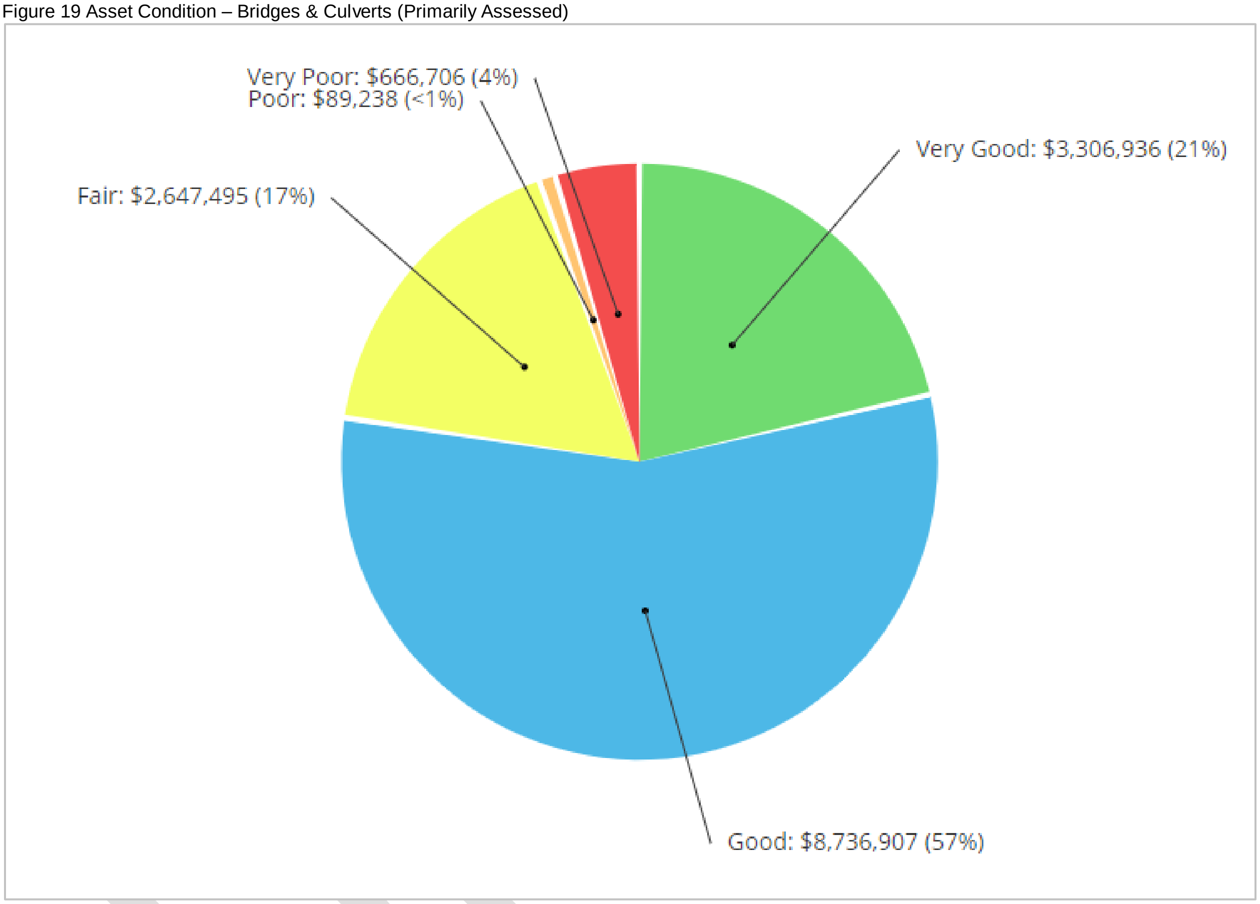


96% of the assets have at least 10 years of useful life remaining while 3%, with a valuation of $438,000, remain in operation beyond their useful life. An additional 1% will reach the end of their useful life within the next five years.

2.4 Current Asset Condition

Using replacement cost, in this section we summarize the condition of the Town's bridges & culverts as of 2017. By default, we rely on observed field data adapted from OSIM inspections as provided by the Town. In the absence of such information, age-based data is used as a proxy. Condition data was provided for 82% of bridges and 84% of culverts.

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

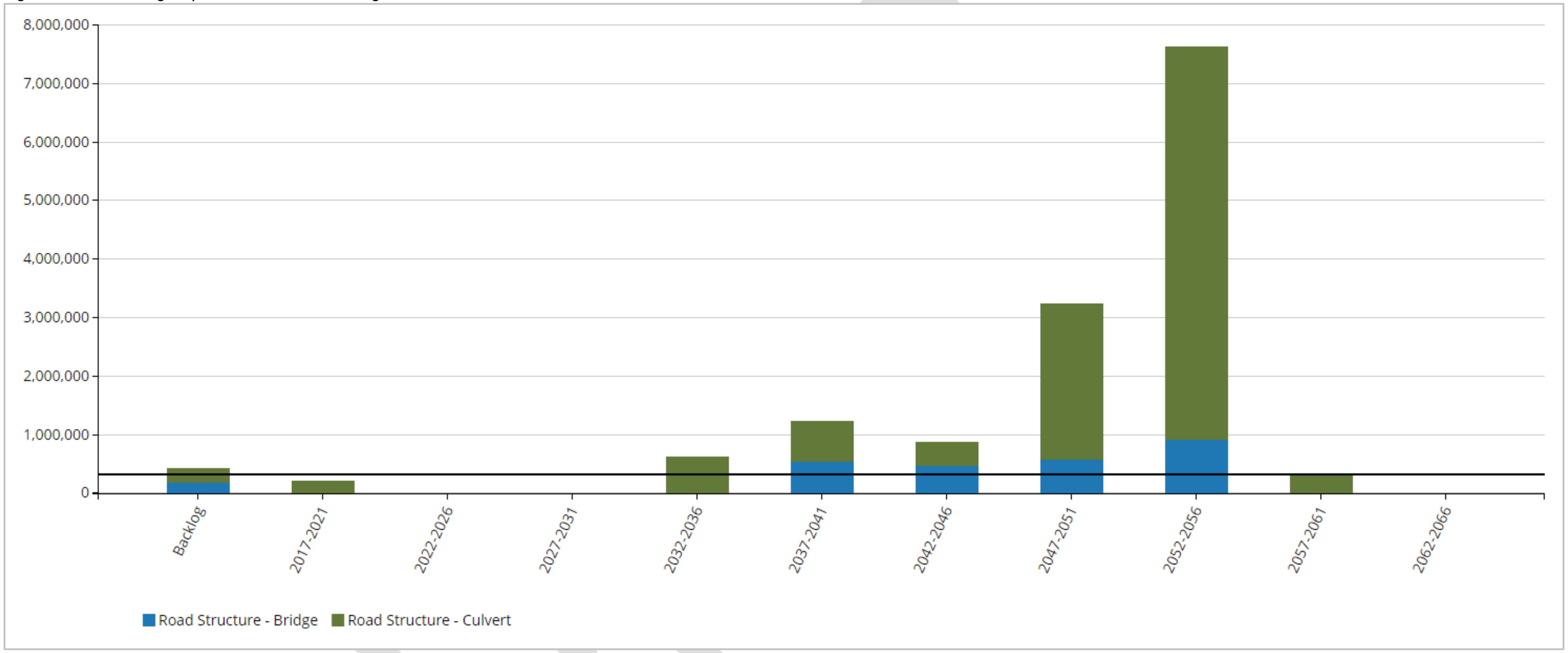


Primarily assessed data indicates that while 5% of the Town's bridges & culverts are in poor to very poor condition, 78%, with a valuation of $12 million, are in good to very good condition.

2.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the Town'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



In addition to a backlog of $438,000, replacement needs will total $229,000 in the next five years. The Town's annual requirements (indicated by the black line) for its bridges & culverts total $337,000. At this funding level, the Town 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 Town is currently allocating $276,000, leaving an annual deficit of $61,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the Town to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

2.6 Recommendations – Bridges & Culverts

- Primarily assessed data indicates a backlog of $438,000 and 5-year replacement needs of $229,000. The town should integrate a risk management framework with its OSIM condition assessment programs to prioritize bridges & culverts capital projects within the short and long term budget. 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 Town is funding 82% of its long-term requirements for its bridges & culverts on an annual basis. See the 'Financial Strategy' section on how to achieve more sustainable and optimal funding levels.

3. Water System

3.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 8 illustrates key asset attributes for the Town's water system, including quantities of various assets, their useful life, replacement costs, and the valuation method by which the replacement costs were derived. In total, the town's water system assets are valued at $32 million based on 2017 replacement costs. The useful life indicated for each asset type below was assigned by the Town.

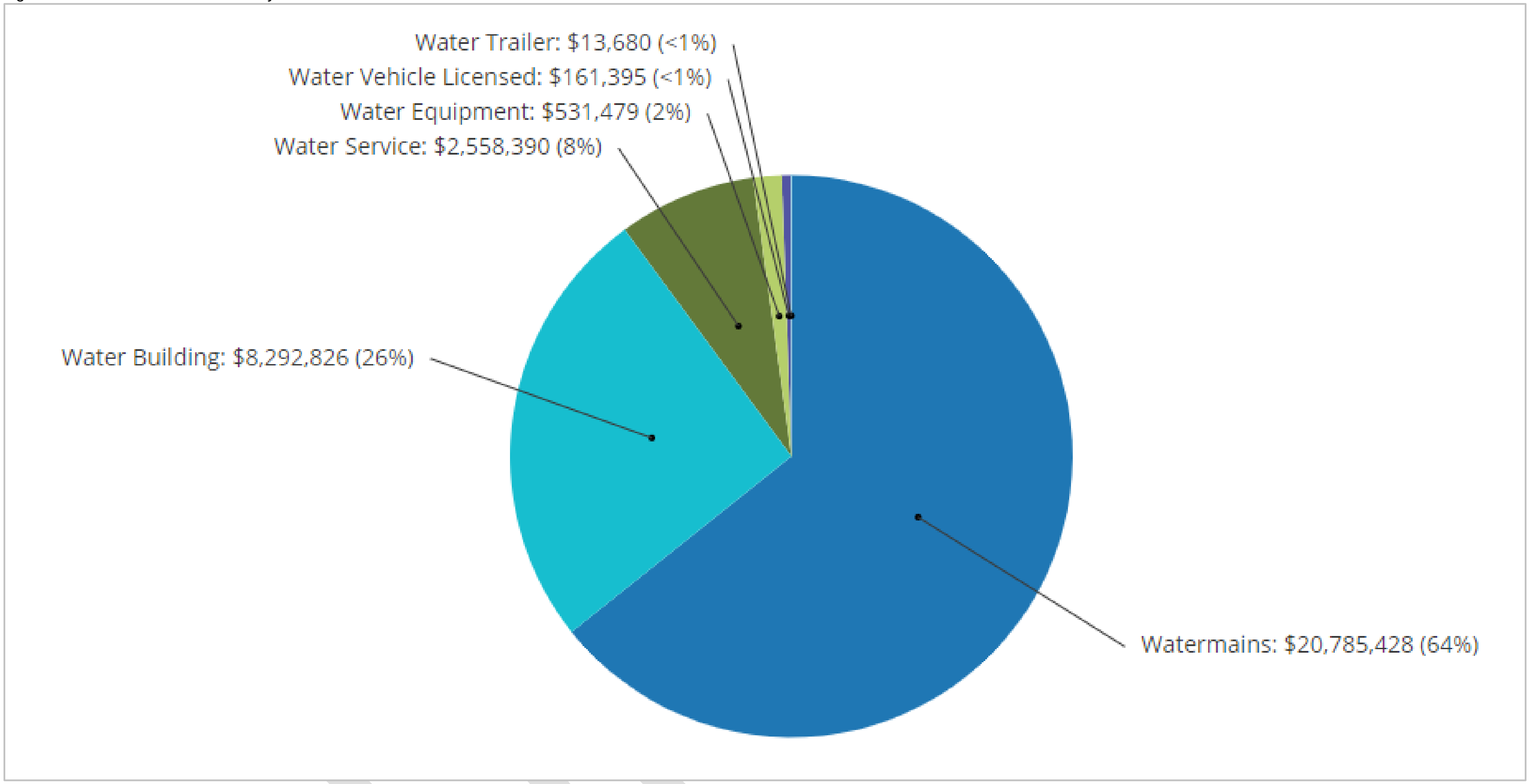
Table 8 Key Asset Attributes – Water

Asset Type	Asset Component	Quantity	Useful Life (Years)	Replacement Cost Method	2017 Overall Replacement Cost
Water System	Water Service	117	50, 75	NRBCPI Quarterly (Toronto)[5]	$2,558,390
	Watermains	113	50, 75	NRBCPI Quarterly (Toronto)	$20,785,428
	Water Buildings	11	20, 40	CPI Monthly (ON)[6]	$8,292,829
	Water Equipment	11	5, 10, 20	CPI Monthly (ON)	$531,479
	Water Trailer	2	15	CPI Monthly (ON)	$13,680
	Water Vehicles Licensed	4	10	CPI Monthly (ON)	$161,395
				Total	**$32,343,198**

[5] NBRCPI stands for Non-Residential Building Construction Price Index, this index is used to inflate historical costs to more accurately reflect replacement costs in today's dollars for infrastructure assets.

[6] CPI stands for Consumer Price Index, this index is used to inflate historical costs to more accurately reflect replacement costs in today's dollars for general capital assets.

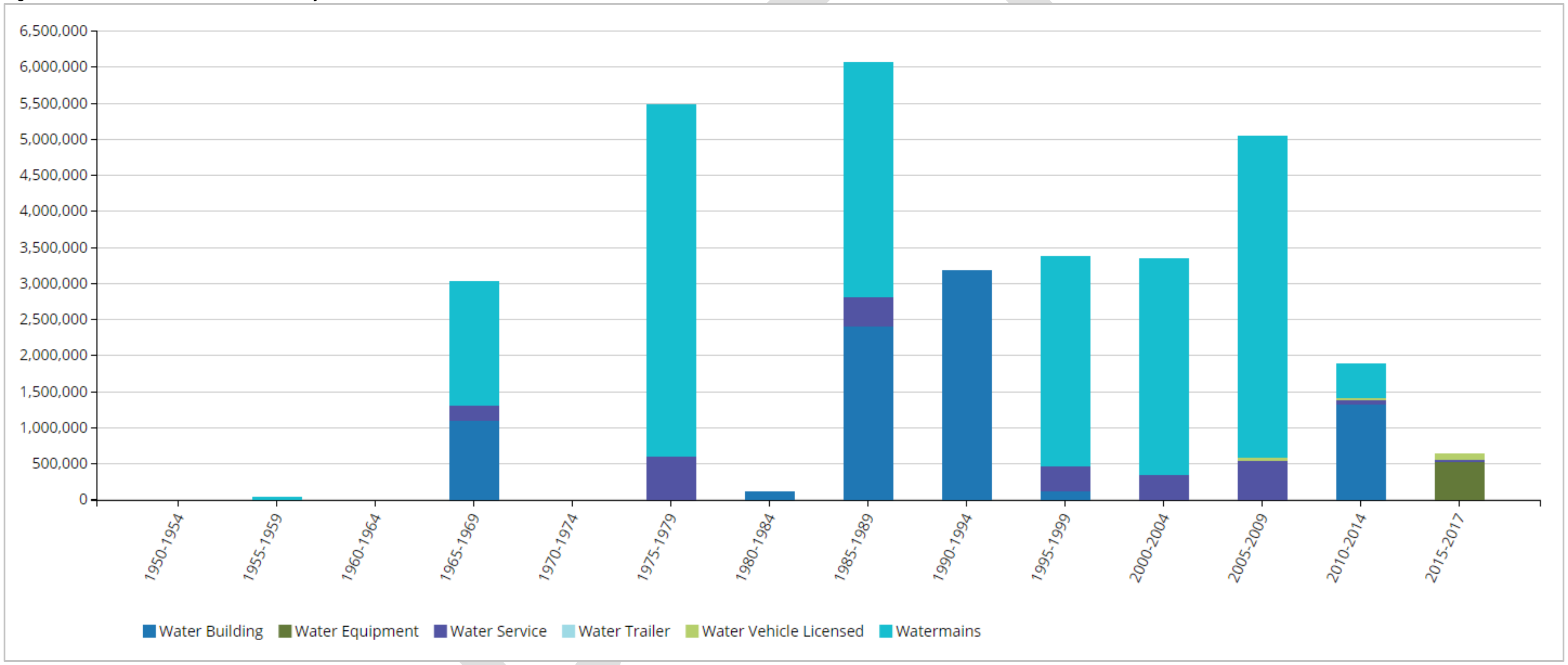
Figure 21 Asset Valuation – Water System



3.2 Historical Investment in Infrastructure

Figure 22 shows the Town's historical investments in its water system 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, 2017.

Figure 22 Historical Investment – Water System

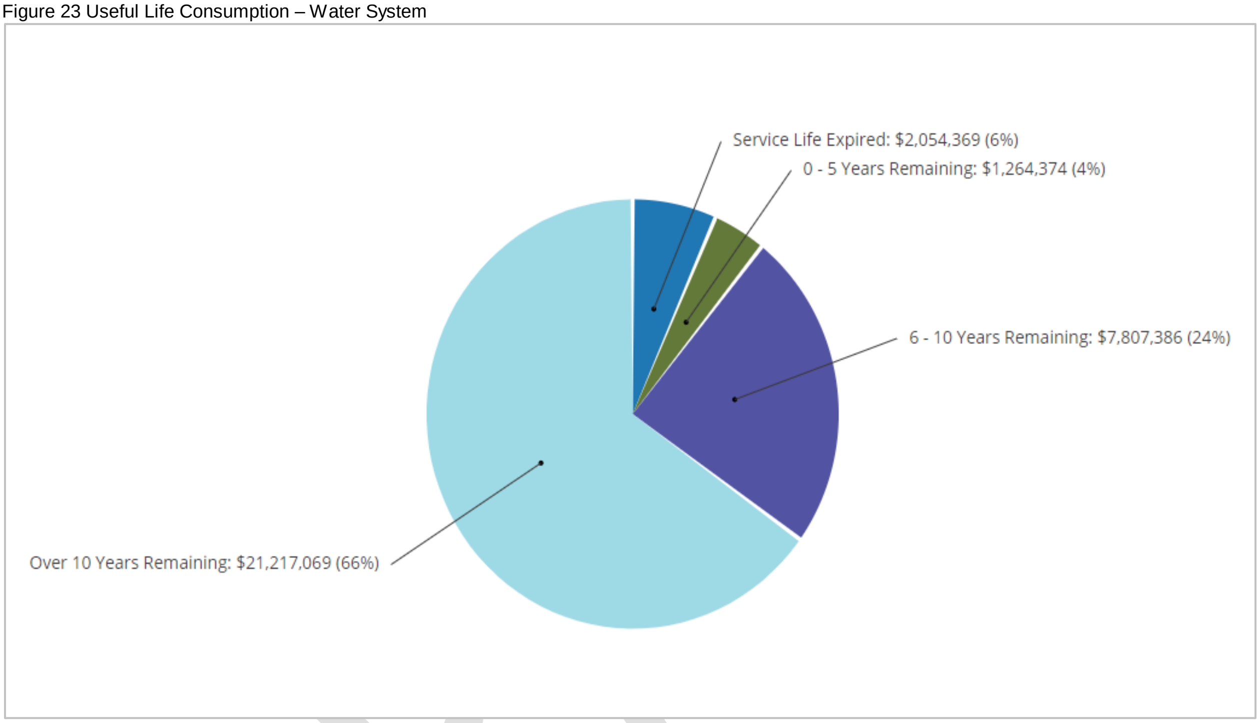


Investments in the water system have fluctuated since the 1950s. In the late 1980s, the period of largest investment, $6 million was invested in the water systems with $3.2 million put into watermains.

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 2017 for the Town's water system.

Figure 23 Useful Life Consumption – Water System

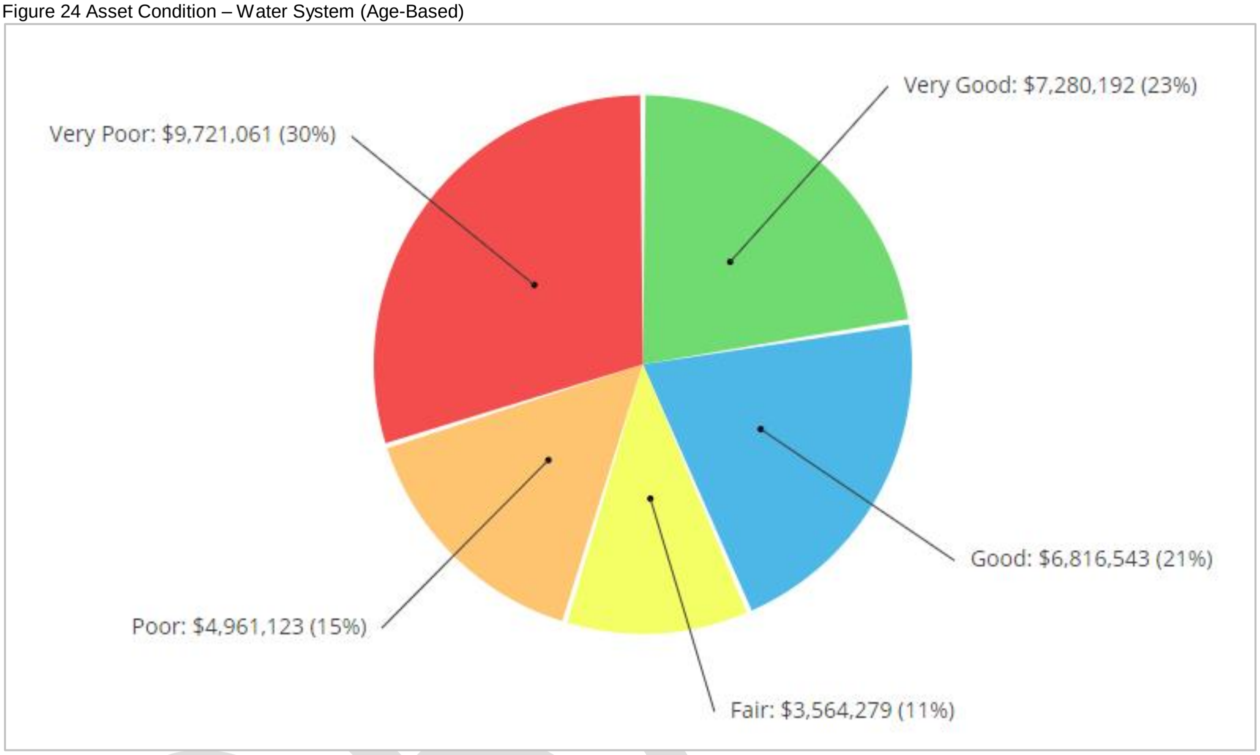


66% of the assets have at least 10 years of useful life remaining while 6%, with a valuation of $2 million, remain in operation beyond their useful life. An additional 4% will reach the end of their useful life within the next five years.

3.4 Current Asset Condition

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

Figure 24 Asset Condition – Water System (Age-Based)

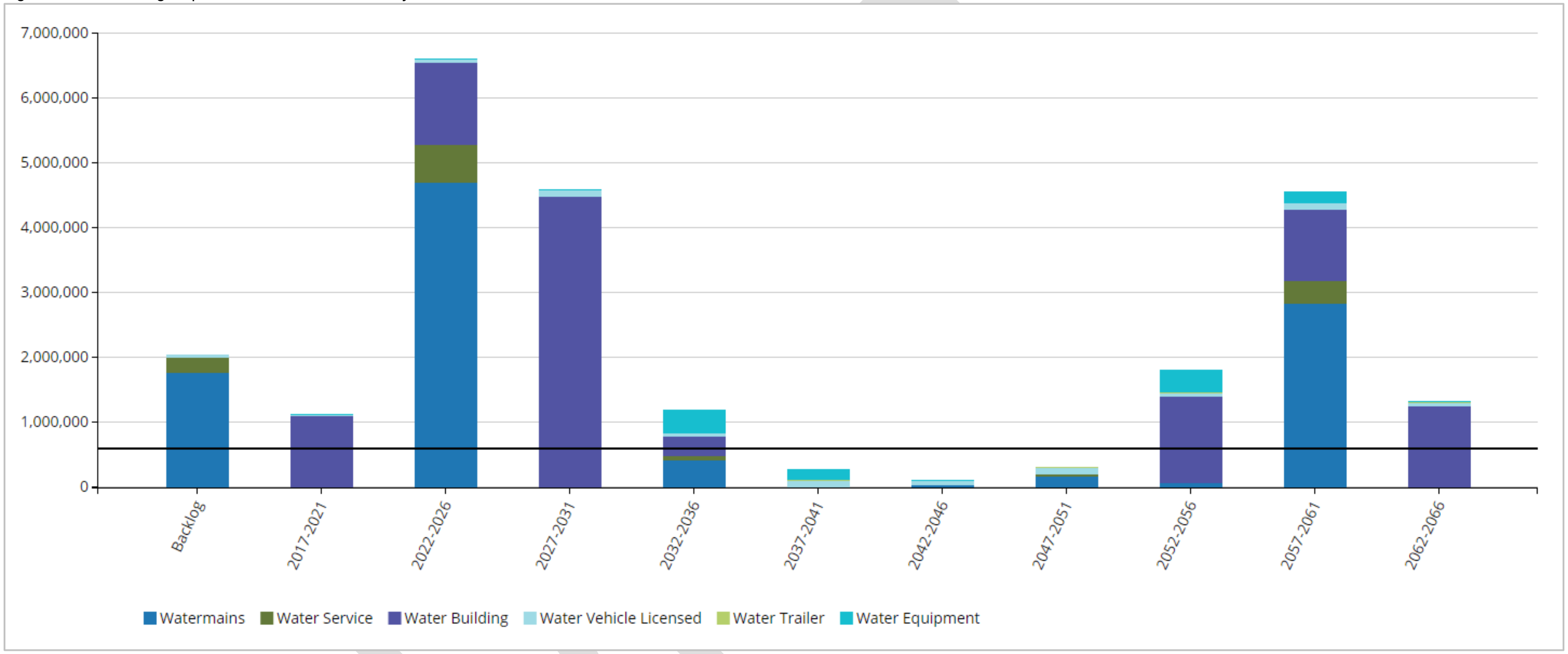


Based on age data, 44% of assets are in good to very good condition while 45%, with a valuation of $14.6 million, are in poor to very poor condition.

3.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the Town's water system 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 System



In addition to a backlog of $2 million, replacement needs will total $1.1 million in the next five years; an additional $6.6 million will be required between 2022 and 2026. The Town's annual requirements (indicated by the black line) for its water system total $621,000. At this funding level, the Town 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 Town is currently allocating $592,000 towards this asset category, leaving an annual deficit of $29,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the Town to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

3.6 Recommendations – Water System

- Age-based data shows a backlog of $2 million and 10-year replacement needs of 7.7 million. The Town should start a condition assessment program for 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 system 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 Town 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 Town's O&M requirements.

- The Town is currently funding 95% of its long-term requirements for its water system on an annual basis. See the 'Financial Strategy' section on how to achieve more sustainable and optimal funding levels.

4. Buildings & Facilities

4.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

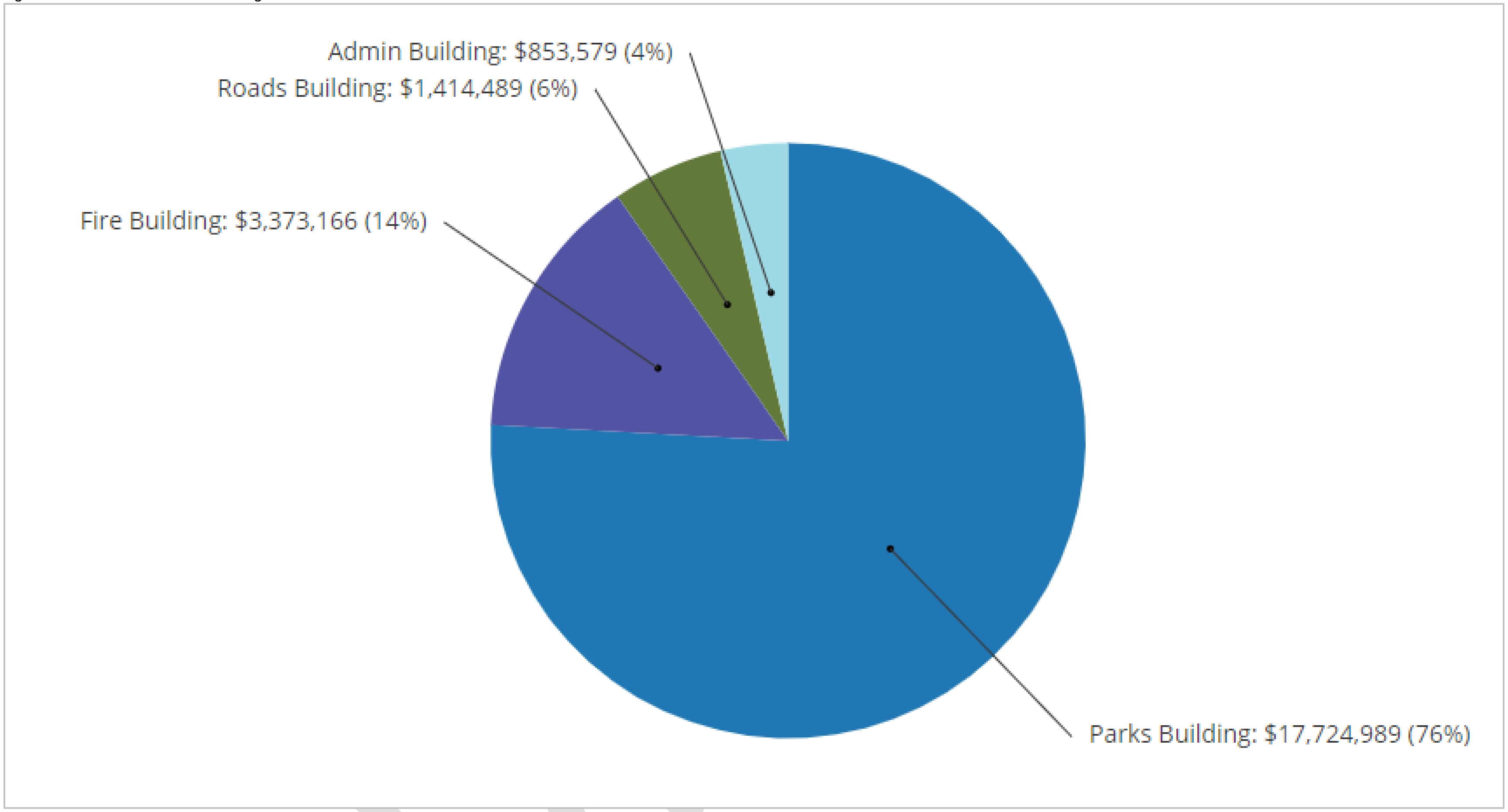
Table 9 illustrates key asset attributes for the Town's buildings & facilities, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the town's buildings assets are valued at $23 million based on 2017 replacement costs. The useful life indicated for each asset type below was assigned by the Town.

Table 9 Key Asset Attributes – Buildings & Facilities

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2017 Replacement Cost
Buildings & Facilities	Admin Building	2	40	CPI Monthly (ON)[7]	$853,579
	Fire Building	3	20, 40	CPI Monthly (ON)	$3,373,166
	Parks Building	24	20, 40	CPI Monthly (ON)	$17,724,989
	Roads building	5	20, 40	CPI Monthly (ON)	$1,414,489
				Total	$23,366,223

[7] CPI stands for Consumer Price Index, this index is used to inflate historical costs to more accurately reflect replacement costs in today's dollars for general capital assets.

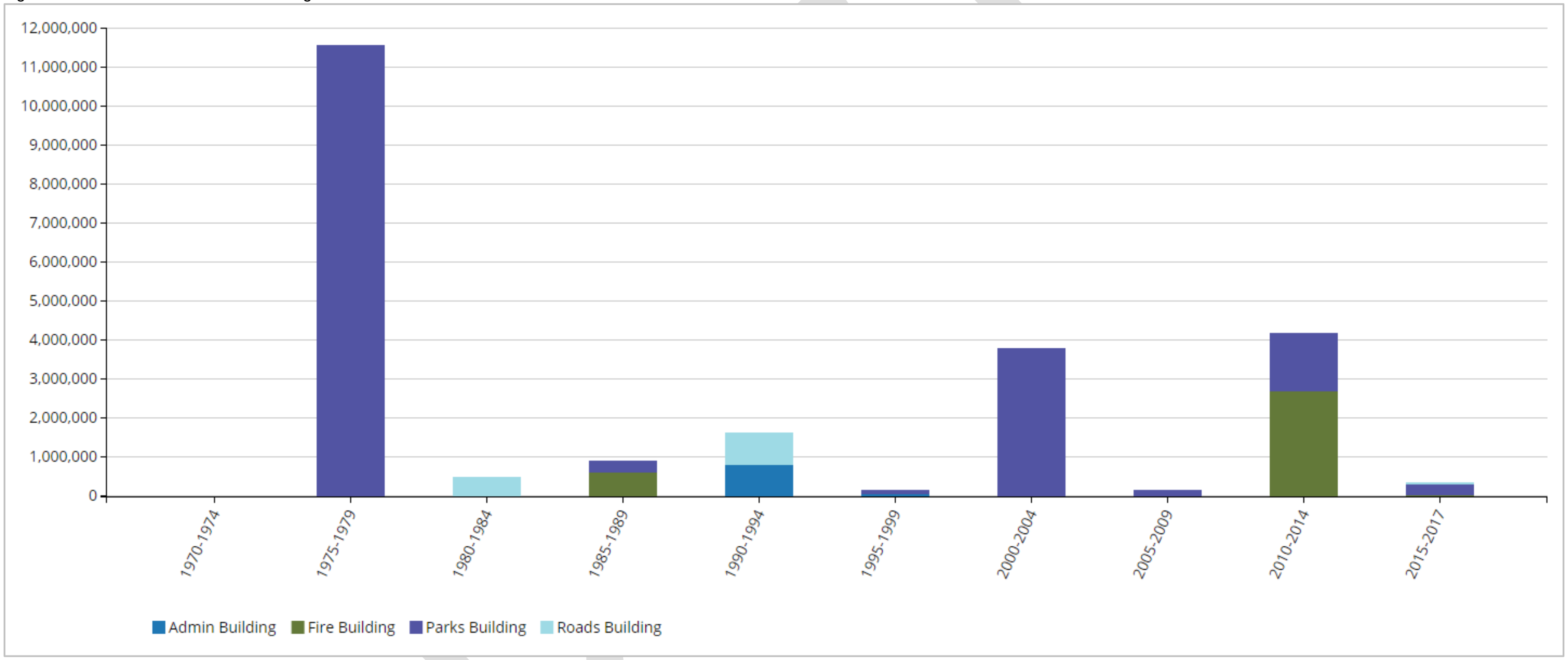
Figure 26 Asset Valuation – Buildings & Facilities



4.2 Historical Investment in Infrastructure

Figure 27 shows the Town's historical investments in its buildings & facilities since 1970. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 4.3) can inform the forecasting and planning of infrastructure needs and in the development of a capital program. Note that this graph only includes the active asset inventory as of December 31, 2017.

Figure 27 Historical Investment – Buildings & Facilities

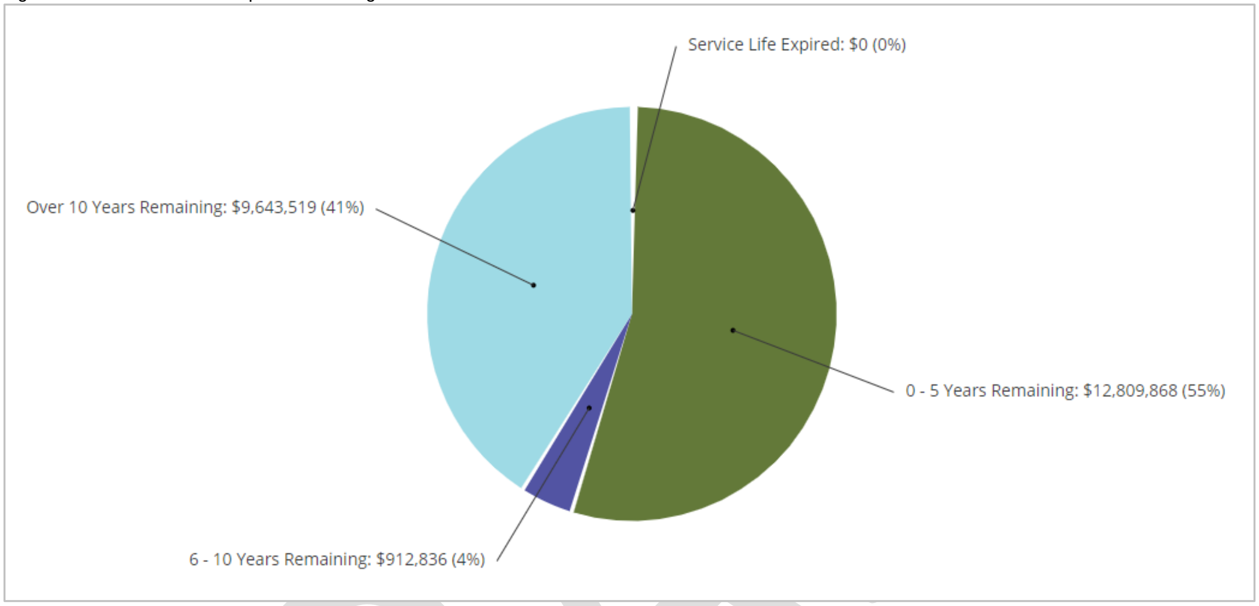


The Town's investments into its buildings & facilities assets were sporadic since the 1970s. Between 1975 and 1979, the period of largest investment, $11.5 million was invested into the buildings & facilities assets with a focus on parks buildings. Most recently, there was a building assessment report that identified over $1 million over the next 2 years be spent for the Erin Community Centre. In 2019, $160,000 was identified for capital spending, however, this will need to be reviewed by Council once the Recreation Masterplan is completed.

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 2017 for the Town's buildings & facilities assets.

Figure 28 Useful Life Consumption – Buildings & Facilities

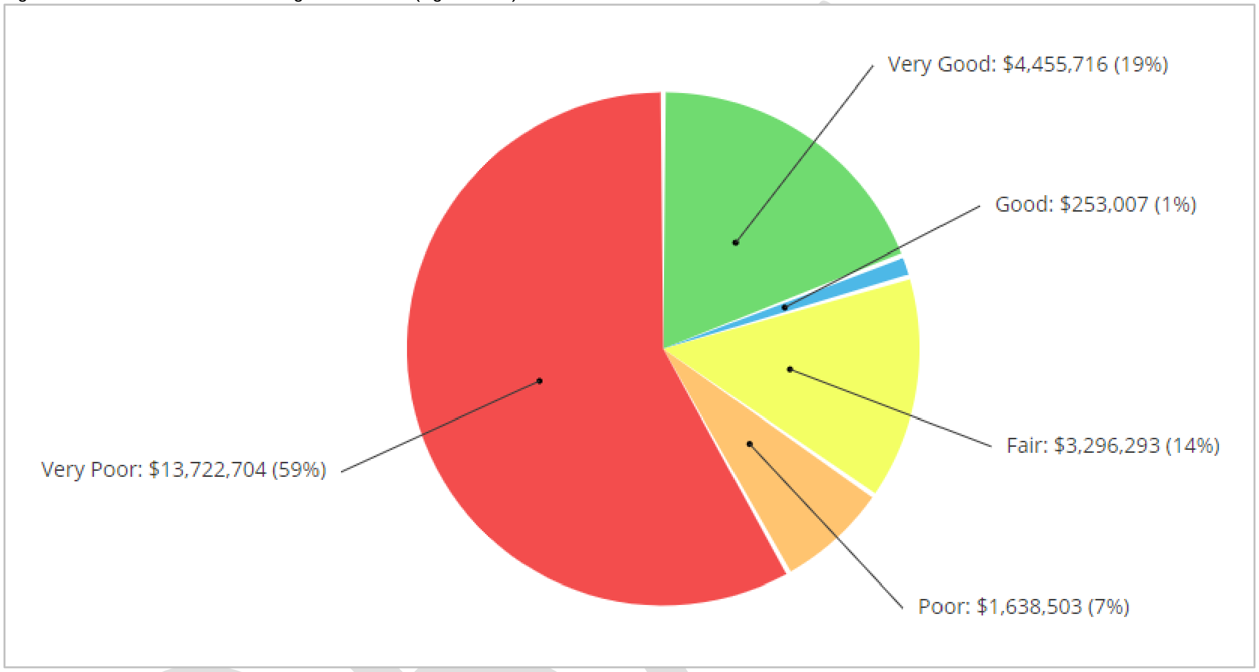


41% of buildings & facilities assets have at least 10 years of useful life remaining; 55%, with a valuation of $12.8 million will reach the end of their established useful life in the next 5 years.

4.4 Current Asset Condition

Using replacement cost, in this section we summarize the condition of the Town's buildings & facilities assets. By default, we rely on observed field data as provided by the Town. In the absence of such information, age-based data is used as a proxy. The Town has completed condition assessments on its buildings & facilities assets, however, the conditions from these assessments have not been included for the purposes of this AMP. The condition data for buildings & facilities in this AMP is age-based.

Figure 29 Asset Condition – Buildings & Facilities (Age-Based)

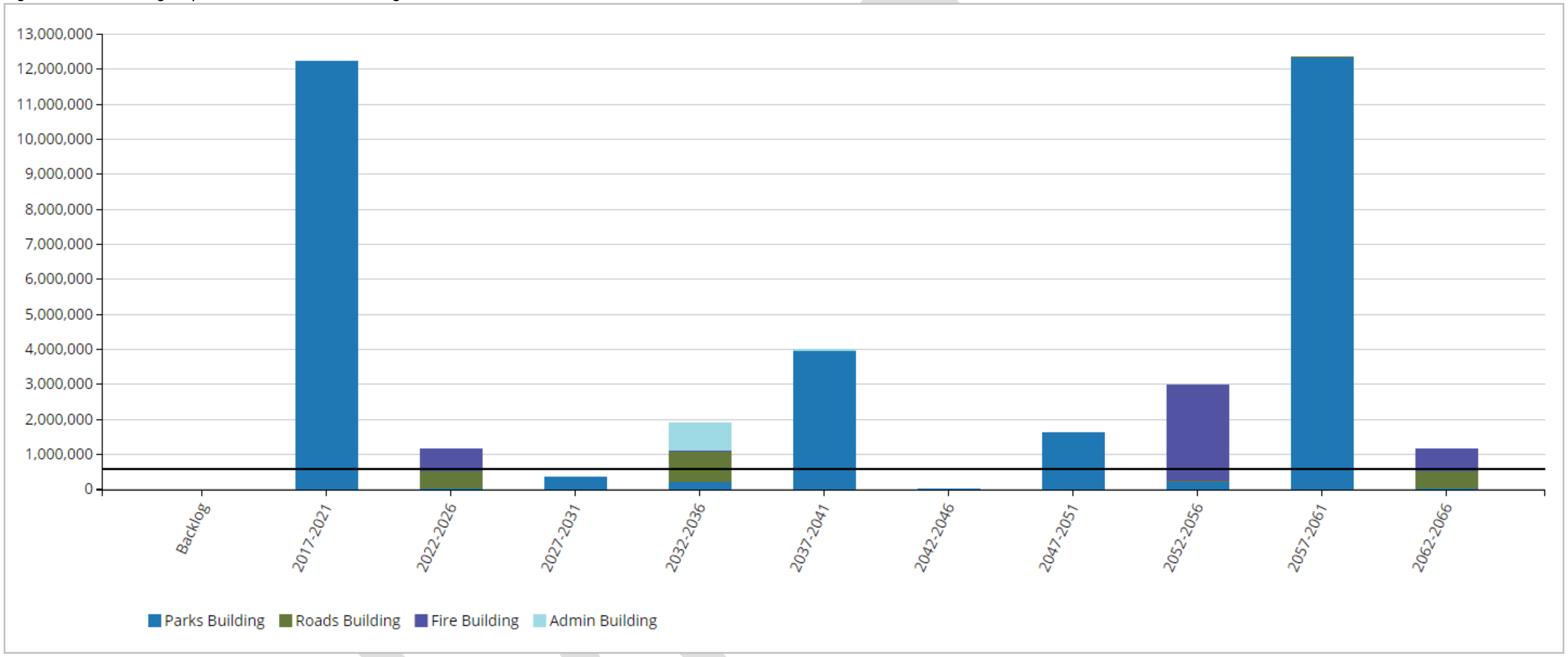


20% of buildings & facilities assets, with a valuation of $4.7 million, are in good to very good condition; 63% are in poor to very poor condition.

4.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the Town'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 30 Forecasting Replacement Needs – Buildings & Facilities



Age-based data indicates no backlog and five-year replacement needs of $12 million. An additional $1.1 million will be required between 2022-2026. The Town's annual requirements (indicated by the black line) for its buildings & facilities total $613,000. At this funding level, the Town 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 Town is currently allocating approximately $143,000, leaving an annual deficit of $470,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level.

4.6 Recommendations – Buildings & Facilities

- The Town should look to incorporate condition data from its condition inspection program into CityWide to more 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 Town 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 Town'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 Town is funding 23% of its long-term requirements for its buildings & facilities on an annual basis. See the 'Financial Strategy' section on how to achieve more sustainable and optimal funding levels.

5. Machinery & Equipment

5.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

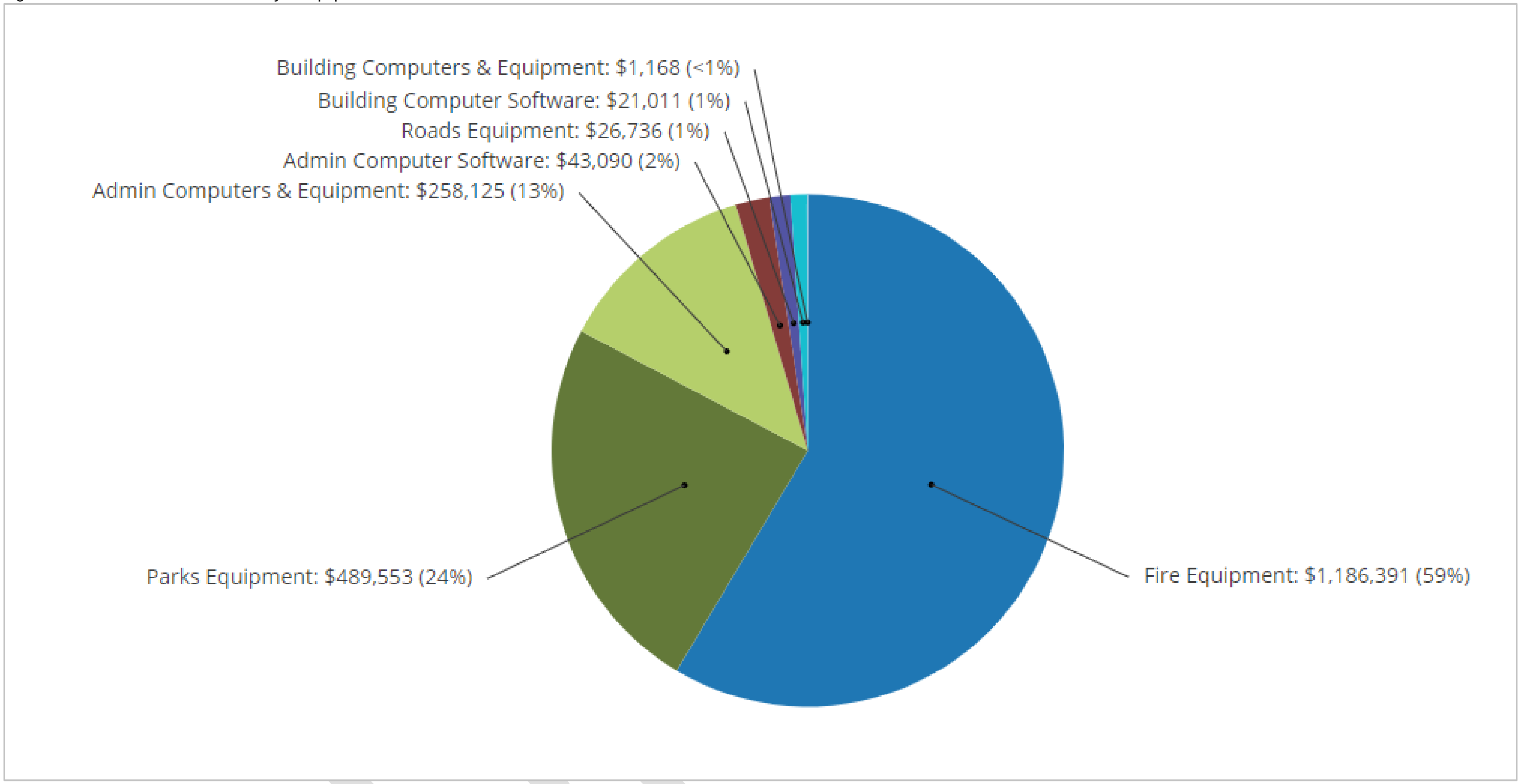
Table 10 illustrates key asset attributes for the Town's machinery & equipment, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the Town's machinery & equipment assets are valued at $2 million based on 2017 replacement costs. The useful life indicated for each asset type below was assigned by the Town. Please note that tracking of equipment began recently, and the Town has committed to continue refining this process going forward. It should also be noted that small machinery & equipment is not included in the inventory for the purposes of this AMP as it is in the operating budget and consumed immediately.

Table 10 Asset Inventory – Machinery & Equipment

Asset Type	Components	Quantity	Useful Life in Years	Valuation Method	2017 Replacement Cost
Machinery & Equipment	Admin Computer Software	1	5	CPI Monthly (ON)[8]	$43,090
	Admin Computers & Equipment	12	5	CPI Monthly (ON)	$258,125
	Building Computer Software	1	5	CPI Monthly (ON)	$21,011
	Building Computers & Equipment	1	5	CPI Monthly (ON)	$1,168
	Fire Equipment	36	5, 7, 10, 15, 20	CPI Monthly (ON)	$1,186,391
	Parks Equipment	11	10, 15, 20	CPI Monthly (ON)	$489,553
	Roads Equipment	1	10	CPI Monthly (ON)	$26,736
				Total	$2,026,074

[8] CPI stands for Consumer Price Index, this index is used to inflate historical costs to more accurately reflect replacement costs in today's dollars for general capital assets.

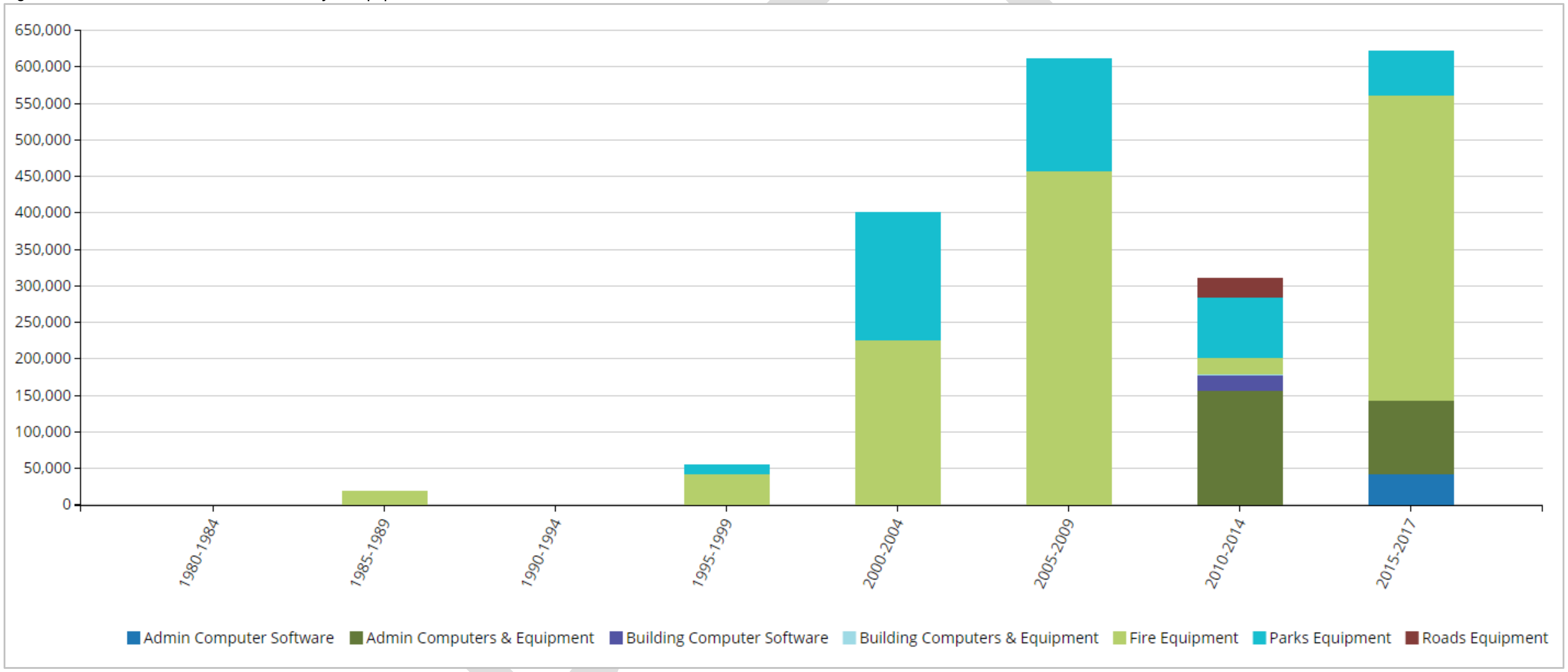
Figure 31 Asset Valuation – Machinery & Equipment



5.2 Historical Investment in Machinery & Equipment

Figure 32 shows the Town's historical investments in its machinery & equipment since 1980. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 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, 2017.

Figure 32 Historical Investment – Machinery & Equipment

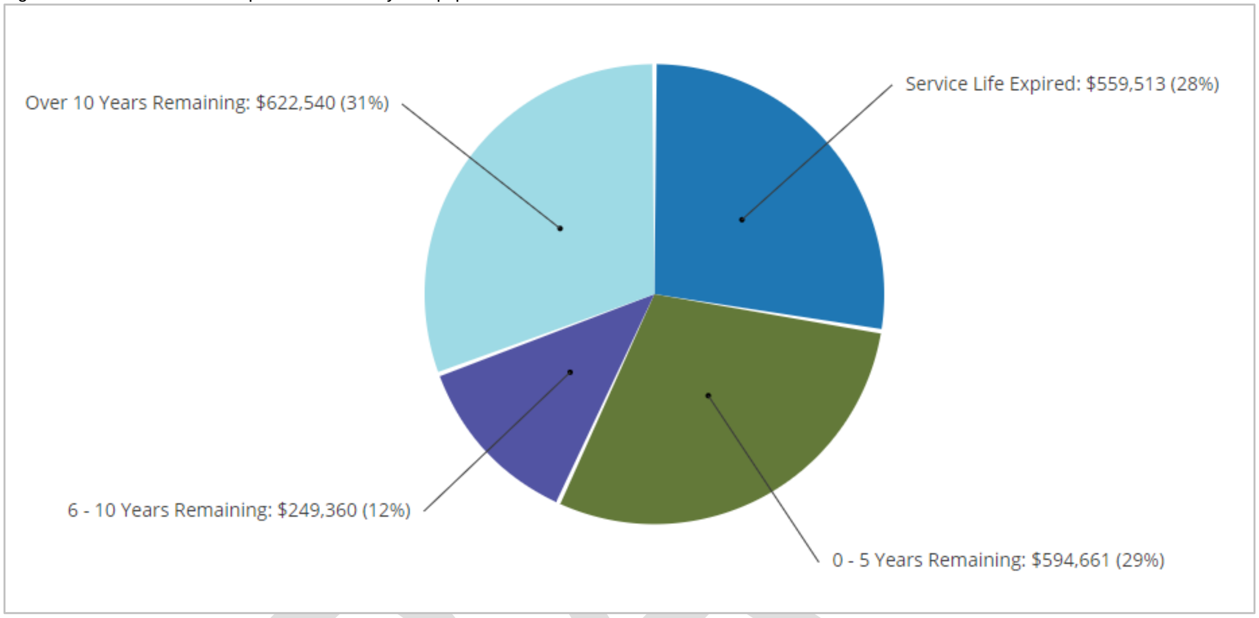


The Town rapidly expanded its machinery & equipment portfolio beginning in the early 2000s. Between 2015 and 2017, the period of largest investment, $622,000 was invested in the machinery and equipment category.

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 2017 for the Town's machinery & equipment assets.

Figure 33 Useful Life Consumption – Machinery & Equipment

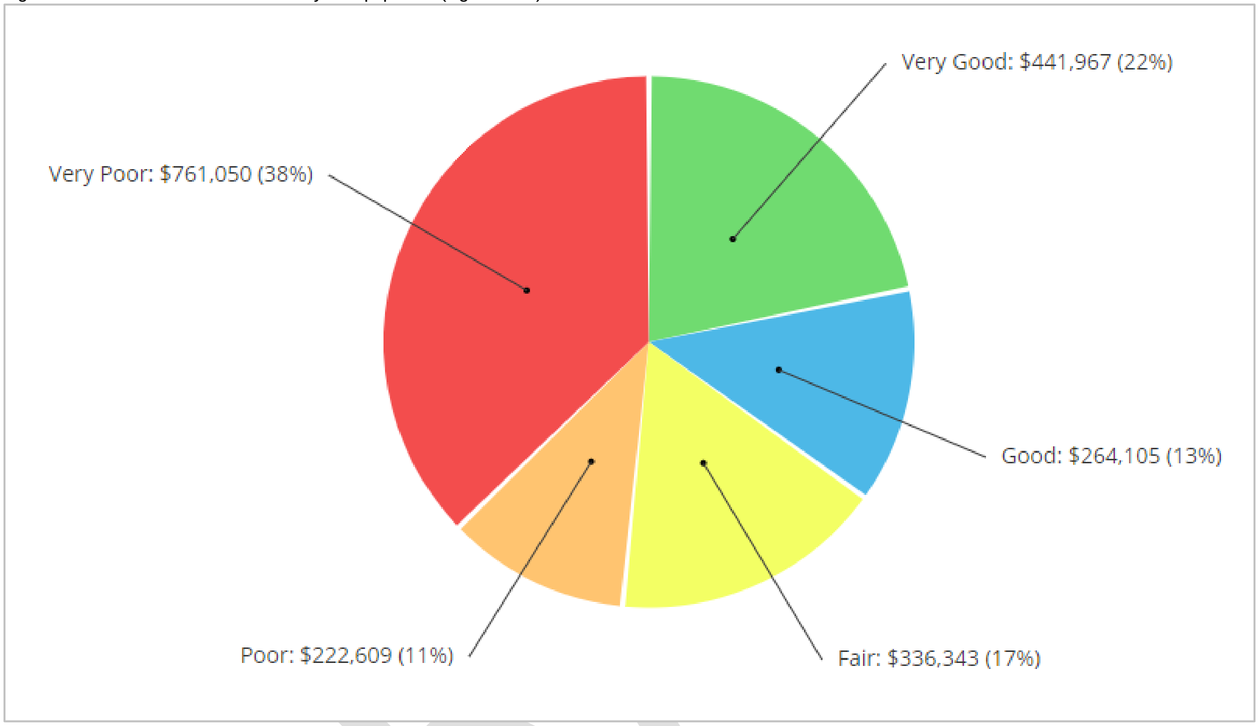


While 31% of machinery & equipment assets have at least 10 years of useful life remaining, 28%, with a valuation of $559,000, remain in operation beyond their useful life. An additional 29% will reach the end of their useful life within the next five years.

5.4 Current Asset Condition

Using replacement cost, in this section we summarize the condition of the Town's machinery & equipment assets as of 2017. By default, we rely on observed field data as provided by the town. In the absence of such information, age-based data is used as a proxy. The Town has not provided condition data for its machinery & equipment.

Figure 34 Asset Condition – Machinery & Equipment (Age-based)

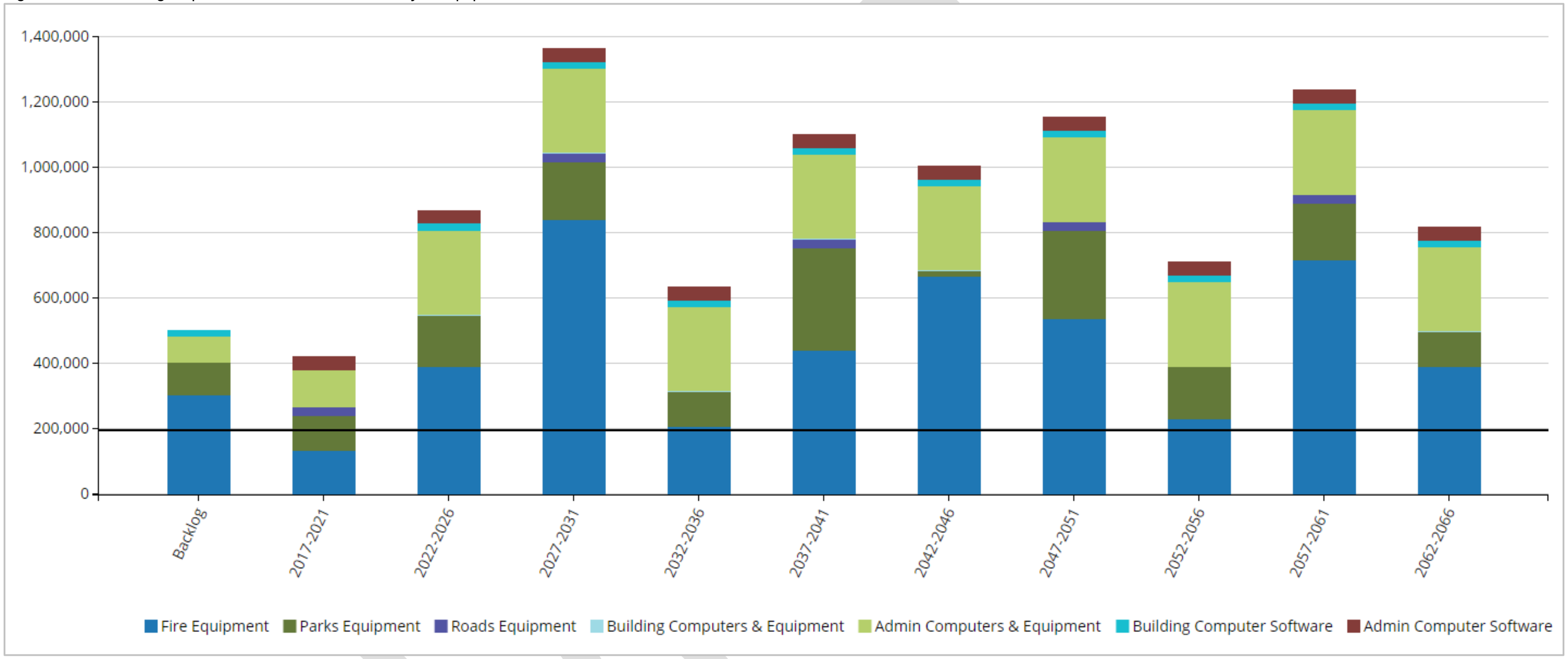


Based on age data, 49% of assets, with a valuation of $983,000, are in poor to very poor condition; 35% are in good to very good condition.

5.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the Town'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 35 Forecasting Replacement Needs – Machinery & Equipment



In addition to a backlog of $505,000, the Town's replacement needs total $424,000 in the next five years. An additional $872,000 will be required between 2022-2026. The Town's annual requirements (indicated by the black line) for its machinery & equipment total $200,000. At this funding level, the Town 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 Town is currently allocating $32,000 to this asset category, leaving an annual deficit of $168,000. The Town does have an Infrastructure Renewal Reserve that is available for any machinery & equipment that is needed, competing with other asset category needs. See the 'Financial Strategy' section for maintaining a sustainable funding level. Further, while fulfilling the annual requirements will position the Town to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

5.6 Recommendations – Machinery & Equipment

- The Town should implement a component-based condition inspection program for all machinery & equipment assets to better define financial requirements for its machinery & equipment. See Section 2, ‘Condition Assessment Programs’ in the ‘Asset Management Strategies’ chapter.

- Using the above information, the Town 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 Town’s O&M requirements.

- The Town is funding 16% of its long-term requirements for its machinery & equipment assets on an annual basis. See the ‘Financial Strategy’ section on how to maintain sustainable and optimal funding levels.

6. Land Improvements

6.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

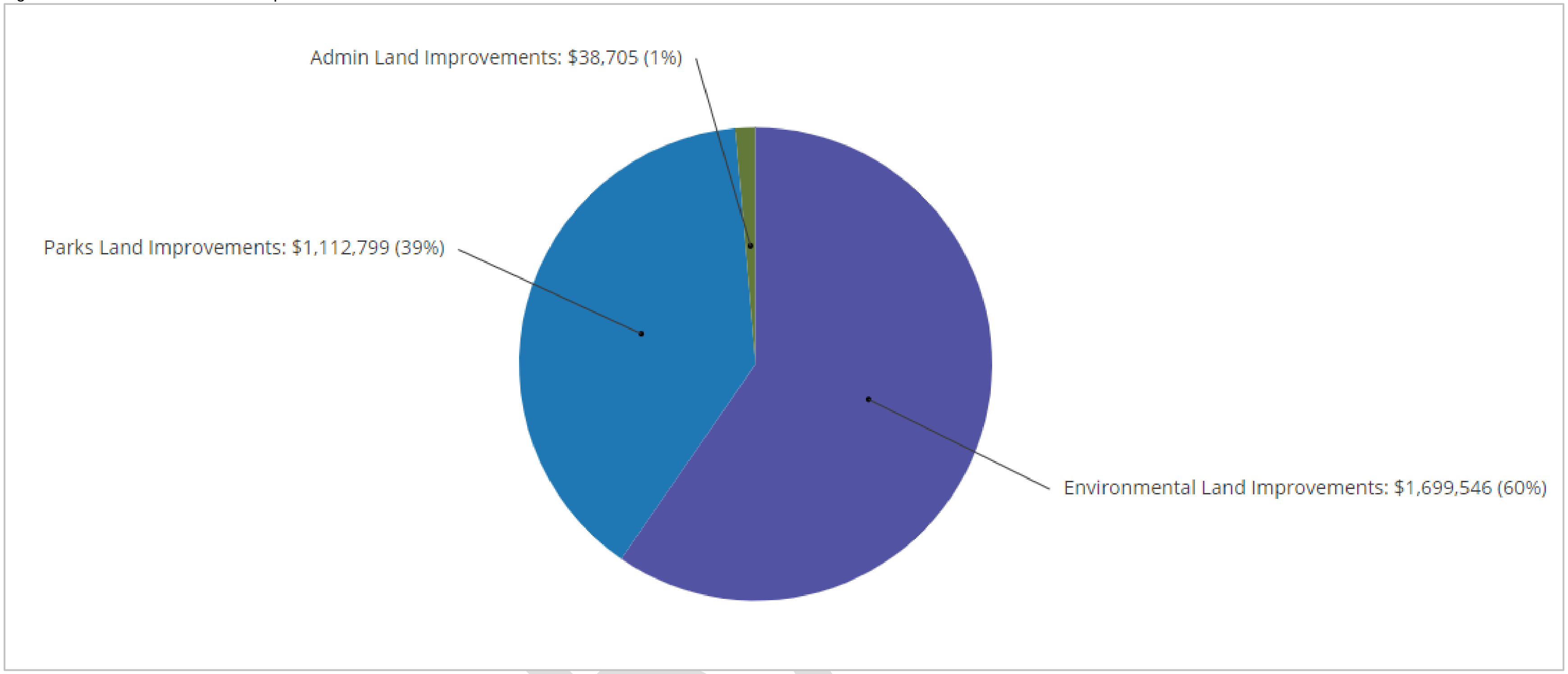
Table 11 illustrates key asset attributes for the town's land improvements, which include parks, tennis courts, playground equipment and other items, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the Town's land improvements assets are valued at $2.8 million based on 2017 replacement costs. The useful life indicated for each asset type below was assigned by the Town.

Table 11 Asset Inventory – Land Improvements

Asset Type	Components	Quantity	Useful Life in Years	Valuation Method	2017 Replacement Cost
Land Improvements	Admin Land Improvements	2	15	CPI Monthly (ON)[9]	$38,705
	Environmental Land Improvements	1	15	CPI Monthly (ON)	$1,699,546
	Parks Land Improvements	16	10, 15	CPI Monthly (ON)	$1,112,799
				Total	**$2,851,050**

[9] CPI stands for Consumer Price Index, this index is used to inflate historical costs to more accurately reflect replacement costs in today's dollars for general capital assets.

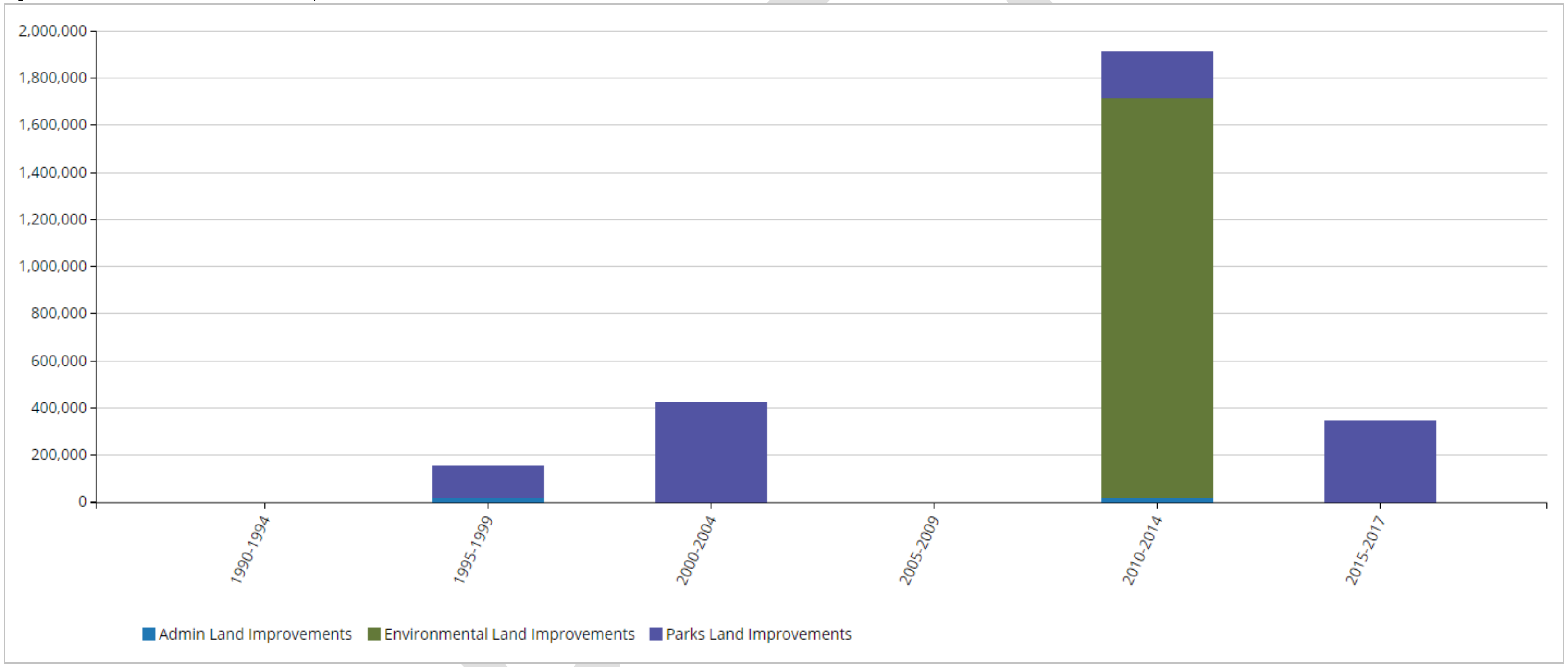
Figure 36 Asset Valuation – Land Improvements



6.2 Historical Investment in Infrastructure

Figure 37 shows the Town's historical investments in its land improvements since 1990. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 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, 2017.

Figure 37 Historical Investment – Land Improvements

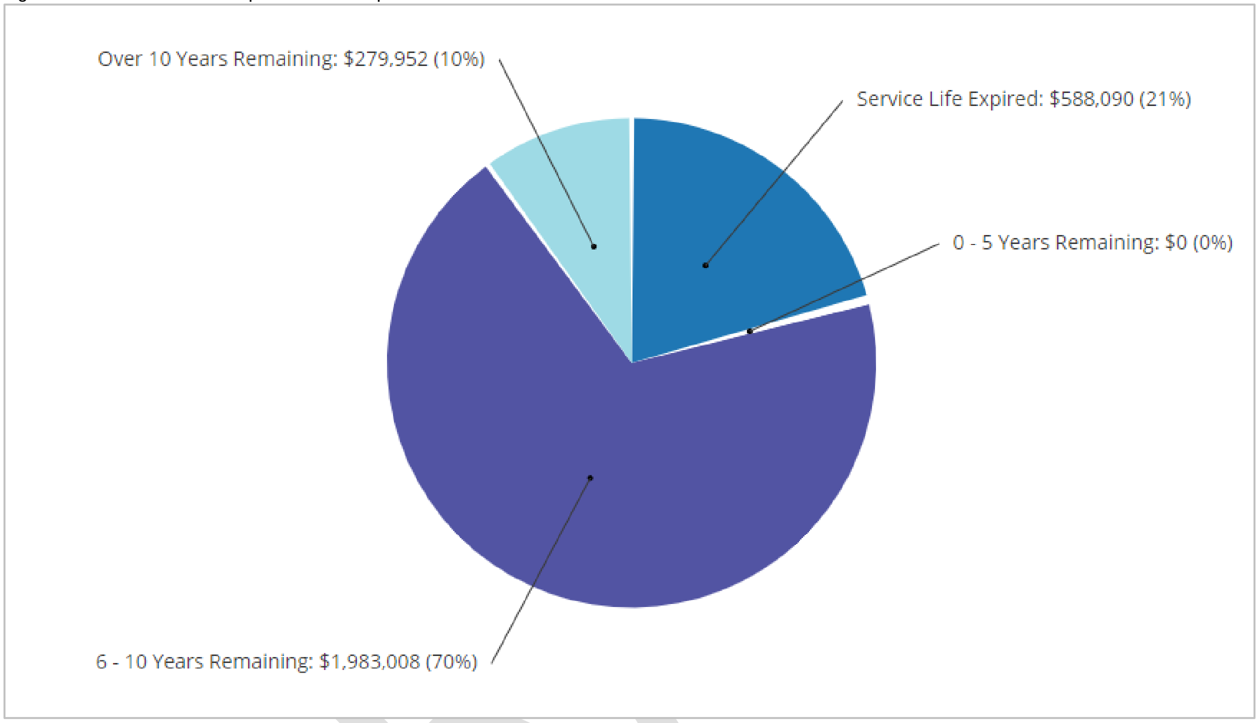


Expenditures in land improvements have been minimal across the decades. Between 2010 and 2014, the period of largest investment, $1.9 million was invested with a focus on environmental land improvements. This investment period included projects such as the skateboard park, Victoria park playground, tennis court resurfacing & the OMWS Deer Pit Storm Water Facility, which on its own accounts for $1.5 of this investment.

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 2017 for the Town's land improvements assets.

Figure 38 Useful Life Consumption – Land Improvements

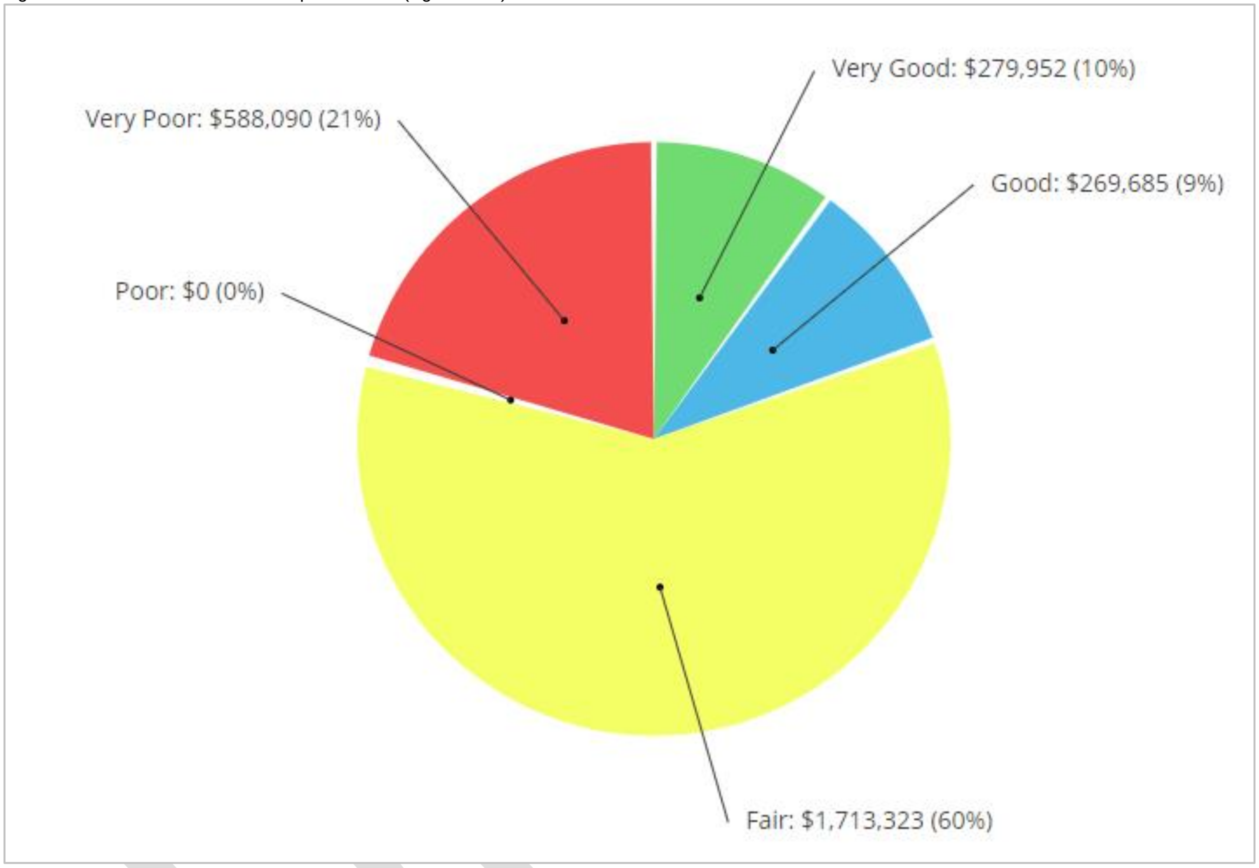


10% of the Town's land improvements assets, with a valuation of $280,000, have at least 10 years of useful life remaining. 21% remain in service past their expected useful life.

6.4 Current Asset Condition

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

Figure 39 Asset Condition - Land Improvements (Age-Based)

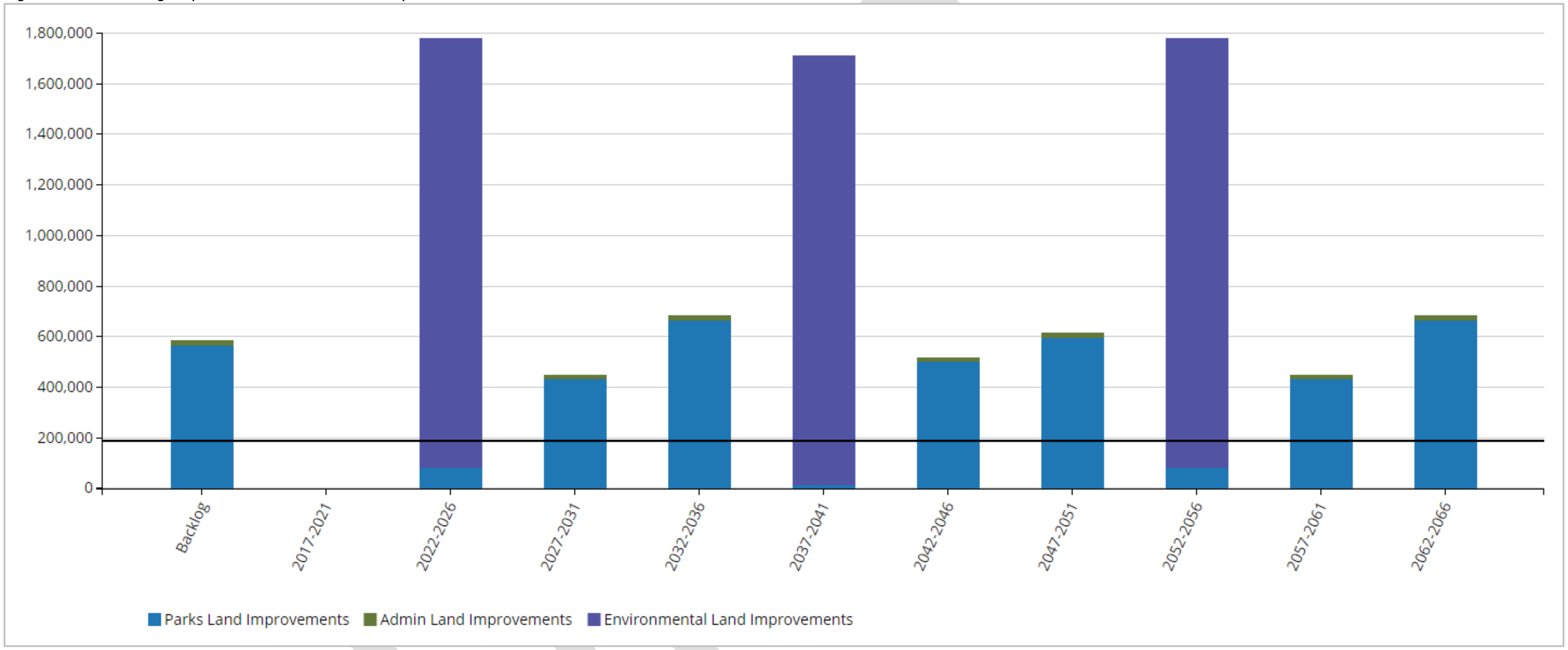


Based on age data, 19% of the Town's land improvements assets, with a valuation of $560,000, are in good to very good condition; 21% are in very poor condition.

6.5 Forecasting Replacement Needs

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

Figure 40 Forecasting Replacement Needs – Land Improvements



Age-based data shows a backlog of $588,000 and no five-year replacement needs. However, replacement needs will total $1.78 million between 2022-2026. The Town's annual requirements (indicated by the black line) for its land improvements total $192,000. At this funding level, the Town 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 Town is currently allocating $22,000, leaving an annual deficit of $170,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the Town to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

6.6 Recommendations – Land Improvements

- The Town should start a condition assessment program for its land improvements assets to precisely estimate financial needs. See Section 2, ‘Condition Assessment Programs’ in the ‘Asset Management Strategies’ chapter.

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

- Using the above information, the Town 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 town’s O&M requirements.

- The Town is funding 11% of its long-term replacement needs for its land improvements on an annual basis. See the ‘Financial Strategy’ section on how to achieve more sustainable and optimal funding levels

7. Vehicles

7.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

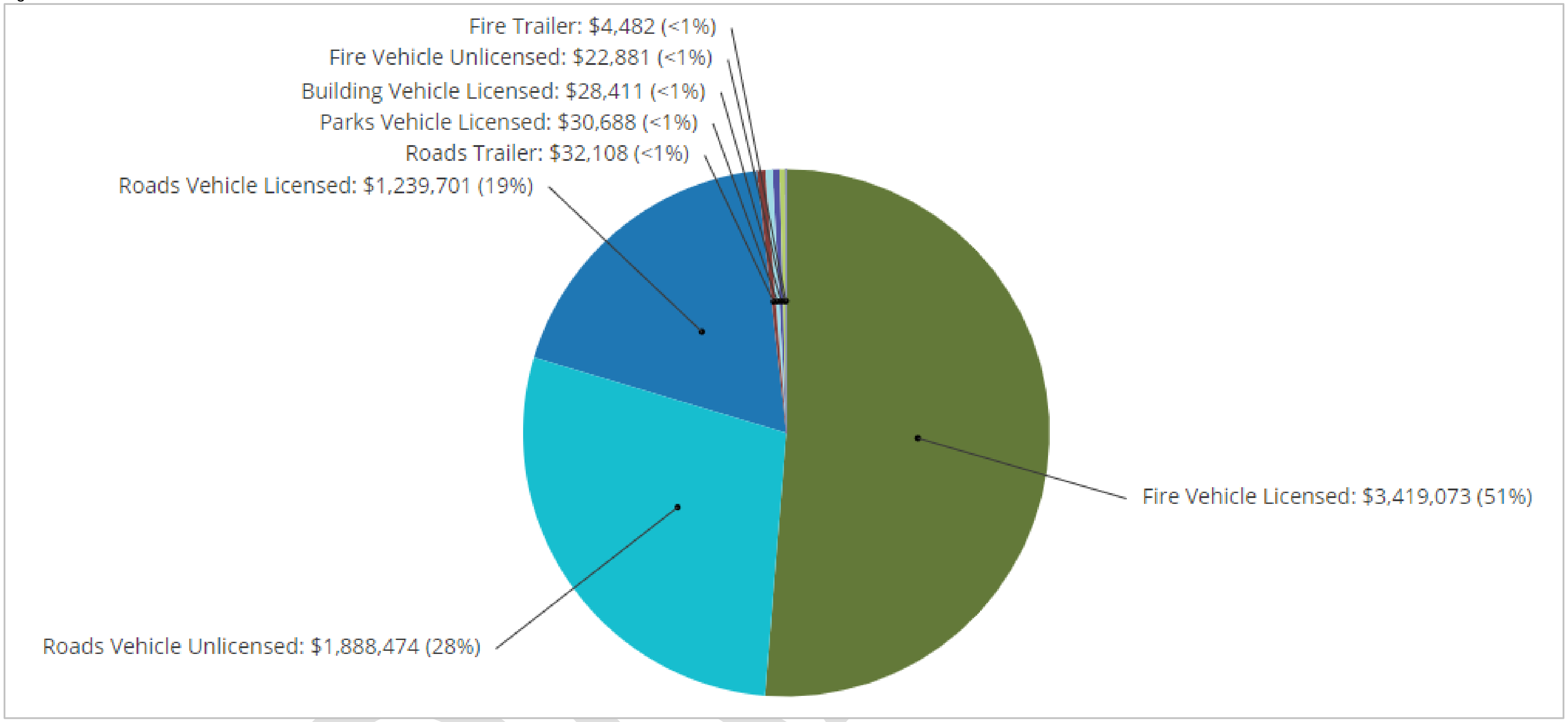
Table 12 illustrates key asset attributes for the Town's vehicles portfolio, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the Town's vehicles assets are valued at $6.6 million based on 2017 replacement costs. The useful life indicated for each asset type below was assigned by the Town.

Table 12 Asset Inventory – Vehicles

Asset Type	Components	Quantity	Useful Life in Years	Valuation Method	2017 Replacement Cost
Vehicles	Building Vehicle Licensed	1	10	CPI Monthly (ON)[10]	$28,411
	Fire Trailer	1	15	CPI Monthly (ON)	$4,482
	Fire Vehicle Licensed	10	10, 20	CPI Monthly (ON)	$3,419,073
	Fire Vehicle Unlicensed	1	10	CPI Monthly (ON)	$22,881
	Parks Vehicle Licensed	1	10	CPI Monthly (ON)	$30,688
	Roads Trailer	1	15	CPI Monthly (ON)	$32,108
	Roads Vehicle Licensed	8	10, 20	CPI Monthly (ON)	$1,239,701
	Roads Vehicle Unlicensed	15	10, 12, 15, 20	CPI Monthly (ON)	$1,888,474
				Total	$6,665,818

[10] CPI stands for Consumer Price Index, this index is used to inflate historical costs to more accurately reflect replacement costs in today's dollars for general capital assets.

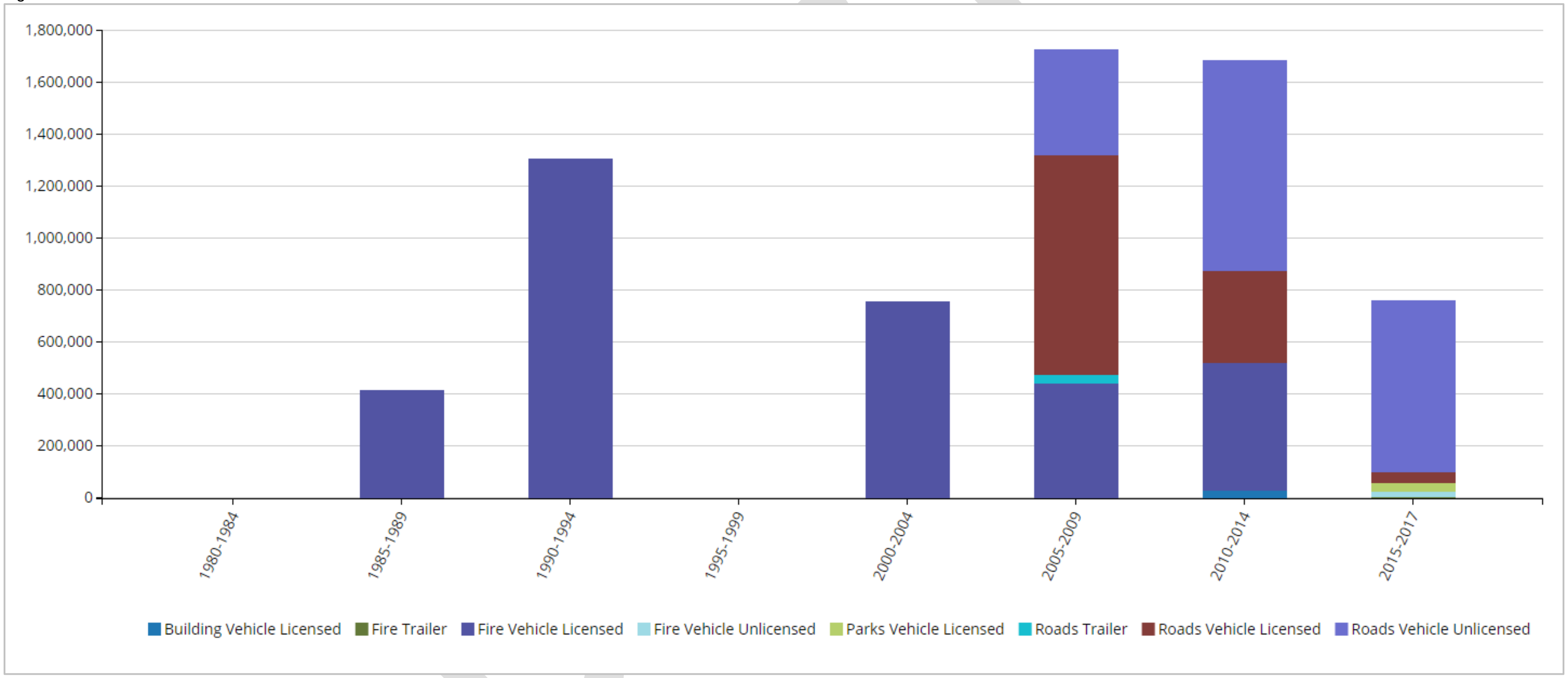
Figure 41 Asset Valuation – Vehicles



7.2 Historical Investment in Infrastructure

Figure 42 shows the Town's historical investments in its vehicles portfolio since 1980. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 7.3) can inform the forecasting and planning of infrastructure needs and in the development of a capital program. Note that this graph only includes the active asset inventory as of December 31, 2017.

Figure 42 Historical Investment – Vehicles

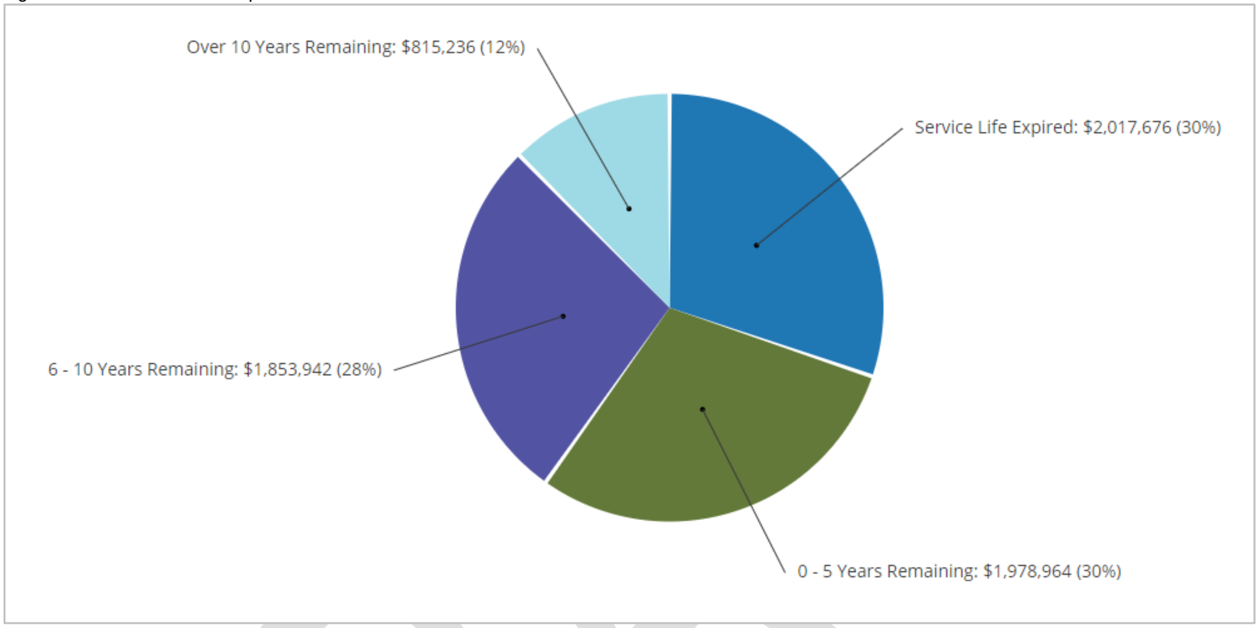


Investments in vehicles quickly increased starting in the late 1980s. In 2005-2009, the period of largest investment, $1.7 million was invested with $844,000 put into roads vehicles licensed.

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 2017 for the Town's vehicles.

Figure 43 Useful Life Consumption – Vehicles

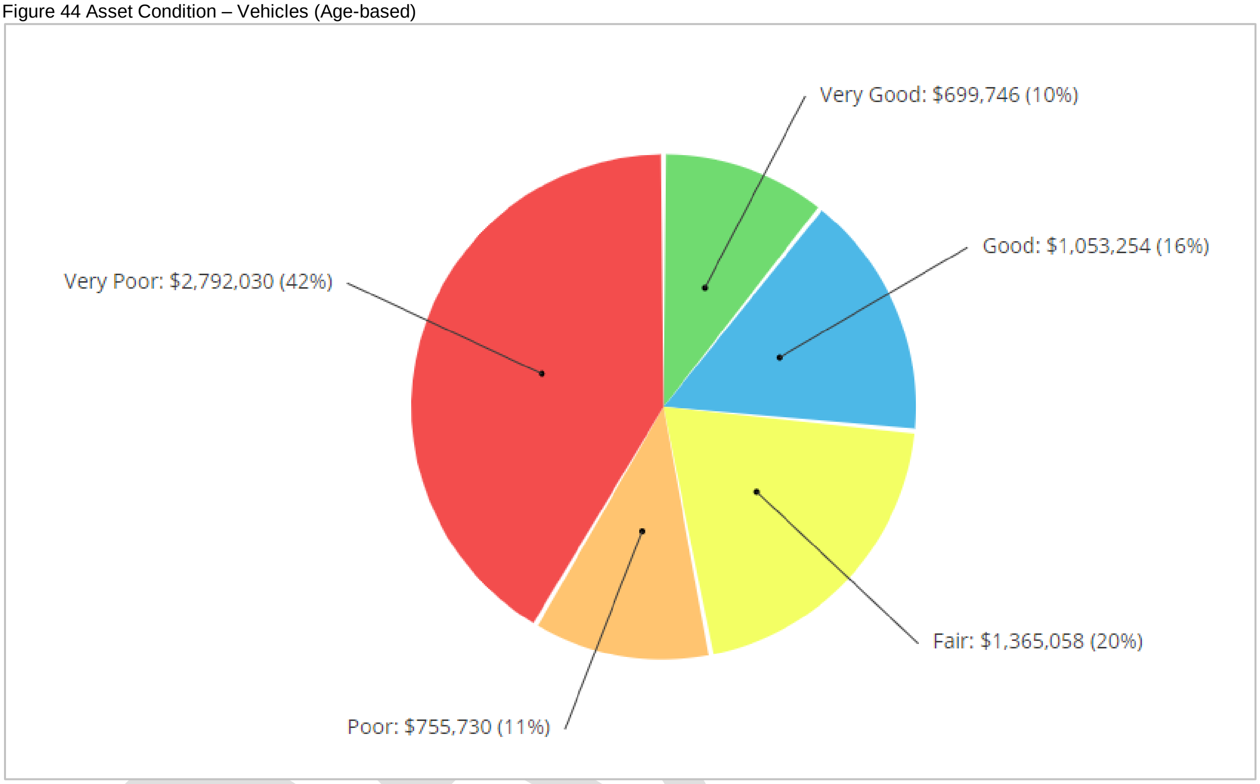


12% of assets have at least 10 years of useful life remaining; 30%, with a valuation of $2 million remain in operation beyond their useful life. An additional 30% will reach the end of their useful life within the next five years.

7.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the Town's vehicles assets as of 2017. By default, we rely on observed field data as provided by the Town. In the absence of such information, age-based data is used as a proxy. The Town has not provided condition data for its vehicles.

Figure 44 Asset Condition – Vehicles (Age-based)

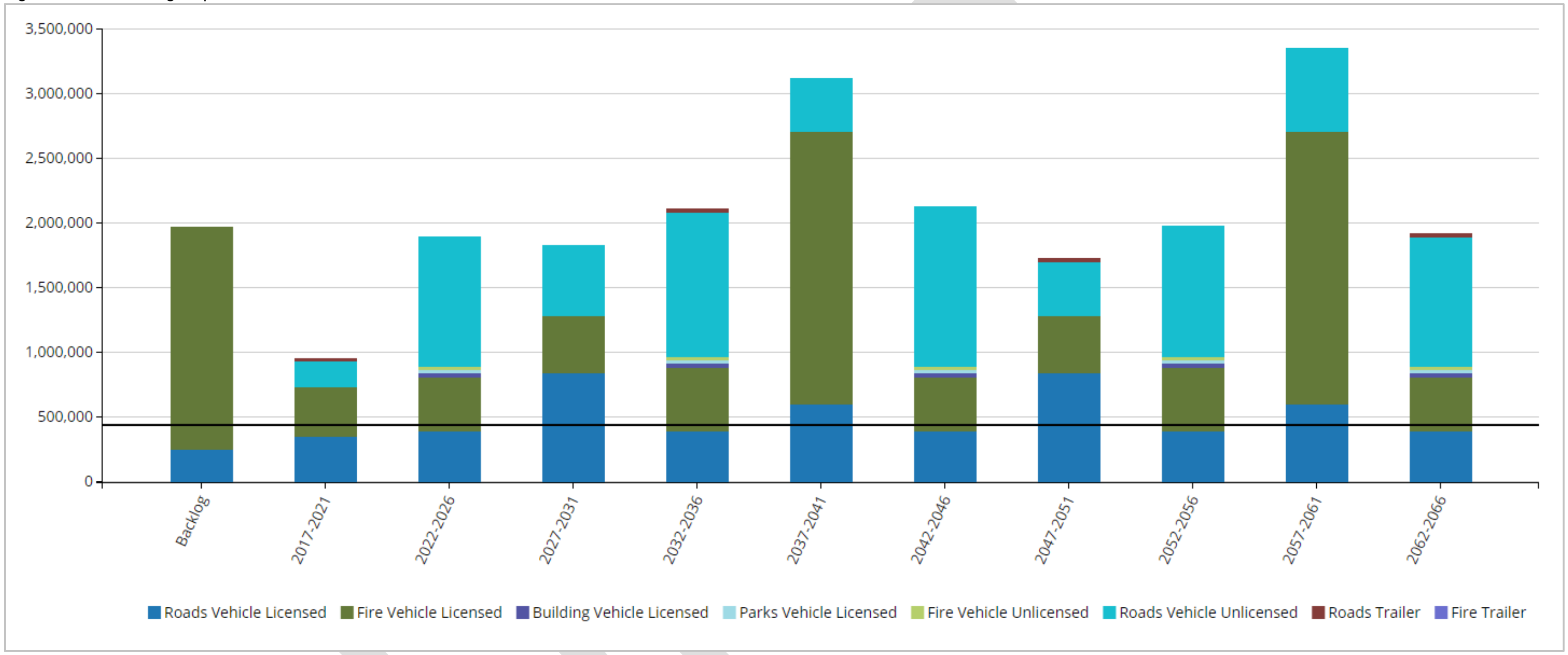


Age-based data shows that 53% of the town's vehicle assets are in poor to very poor condition; 26%, with a valuation of $1.7 million are in good to very good condition.

7.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the Town'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 45 Forecasting Replacement Needs – Vehicles



In addition to a backlog of $1.9 million, replacement needs will total over $963,000 over the next five years; an additional $1.9 million will be required between 2022-2026. The Town's annual requirements (indicated by the black line) for its vehicles total $455,000. At this funding level, the Town 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 Town is not currently allocating anything to this asset category. In 2018, the Town ordered Fire Pumper 11 for Station 10 and a Single Axle Dump Truck/Winter Sander for 2019 delivery, with a combined budget of $761,000. For 2020, a tandem axle snow plow truck is forecasted to be replaced with another one in 2021 – these two items have a combined approximate value of $300,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the Town to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

7.6 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 Town 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 Town’s O&M requirements.

- The Town is funding 0% of its long-term replacement needs for its vehicles on an annual basis. See the ‘Financial Strategy’ section on how to achieve more sustainable and optimal funding levels.

VII. Levels of Service

The two primary risks to a town'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 town.

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 Town. 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 town. The following LOS categories are established as guiding principles for the LOS that each service area in the Town should strive to provide internally to the town and to residents/customers. These are derived from the Town of Whitby's *Guide to Developing Service Area Asset Management Plans*.

Table 13 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 Town can incorporate into its performance measurement and for tracking its progress over future iterations of its AMPs. The Town should develop appropriate and achievable targets that reflect evolving demand on infrastructure, its fiscal capacity and the overall corporate objectives.

Table 14 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 15 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 16 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 17 Key Performance Indicators – Water System

Level	KPI (Reported Annually)
Strategic	– Percentage of total reinvestment compared to asset replacement value – Completion of strategic plan objectives (related to water)
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 network rehabilitated/reconstructed – Annual percentage of growth in water network – Percentage of mains where the condition is rated poor or critical for each network – Percentage of water network replacement value spent on O&M
Operational Indicators	– Percentage of water network inspected – 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 – Percentage of customer requests addressed within 24 hours per water network

Table 18 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 19 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 town'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 town'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 town'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 town 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 town can also serve as an infrastructure demand driver, and as a result, can change how a town 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 town 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 Town should collect data on its current performance against the KPIs listed and establish targets that reflect the current fiscal capacity of the town, 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 town 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 town'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 Town 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 town 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 Town 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 46 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 town begin conducting 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 meters 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 town'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 town'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 the CityWide®, the town'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 town continue conducting inspections 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 town begin a watermain assessment program, and that funds are budgeted for this.

2.6 Parks and Land Improvements

The Canadian Standards Association standards provide guidance on the process and protocols in regard 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 town begin a parks condition assessment program and that a portion of capital funding is dedicated to this.

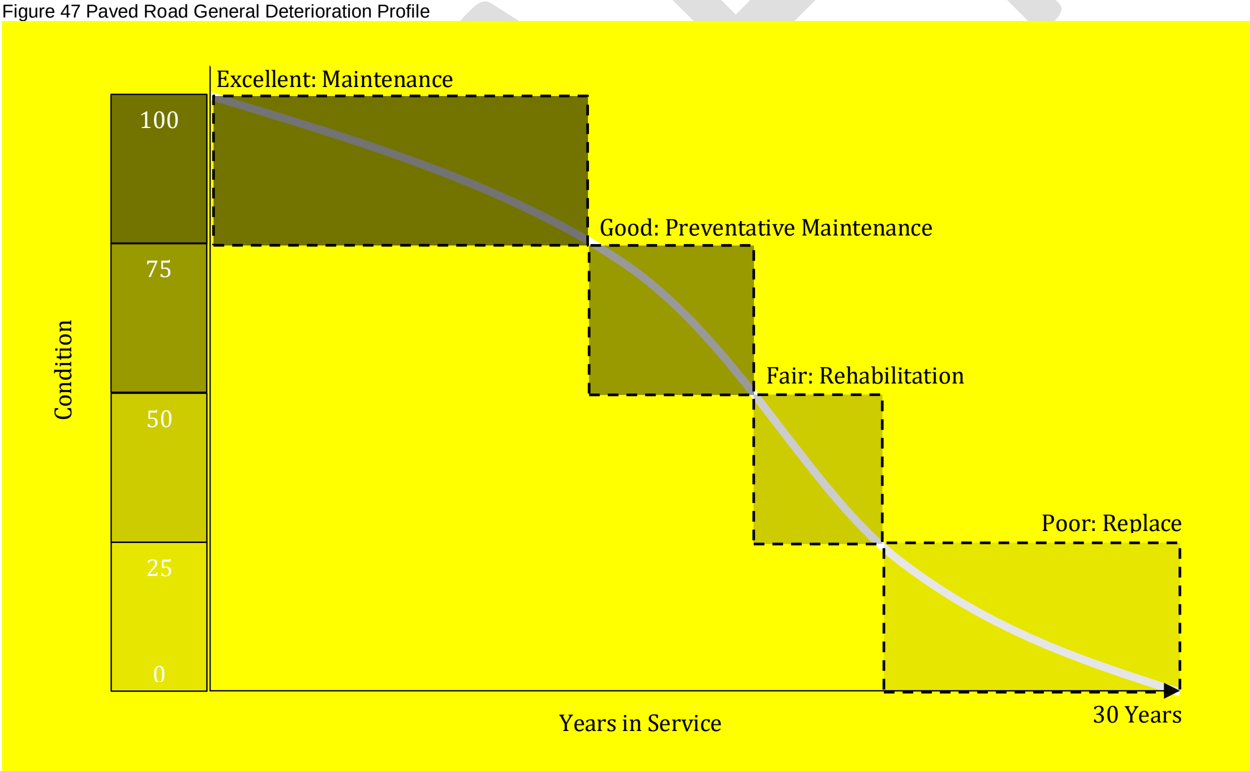
3. Lifecycle Analysis Framework

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 town 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 town may wish to run the same analysis with a detailed review of town 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 47 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 20 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 Town may wish to review the above condition ranges and thresholds for when certain types of work activity occur, and adjust to better suit the Town'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 town to present various management options within the financing plan.

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

3.2 Bridges & Culverts

The best approach to develop a 10-year needs list for the Town'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 Town'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 Town establish a prioritization framework for the facilities asset class that incorporates the key components outlined above.

3.4 Vehicles and Machinery & Equipment

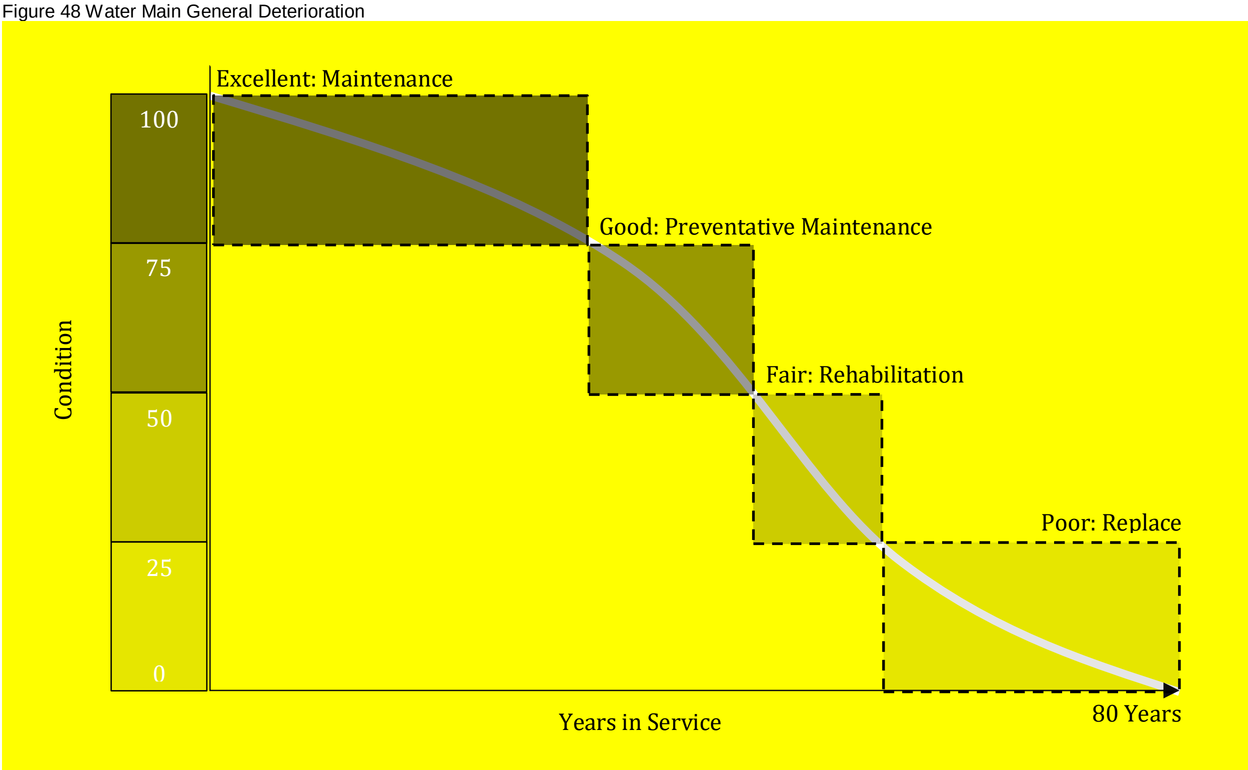
The best approach to develop a 10-year needs list for the Town's vehicles and machinery & equipment portfolio would first be through a defined preventative maintenance program, and secondly, through an optimized lifecycle vehicle replacement schedule. The preventative maintenance program would serve 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 town establish a prioritization framework for the vehicles asset class that incorporates the key components outlined above.

3.5 Water System

As with roads and sewers, 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 48 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 21.

Table 21 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 town 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 Erin has increased 6.2% since 2011 to reach 11,439. Population changes will require the town 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 Town'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.

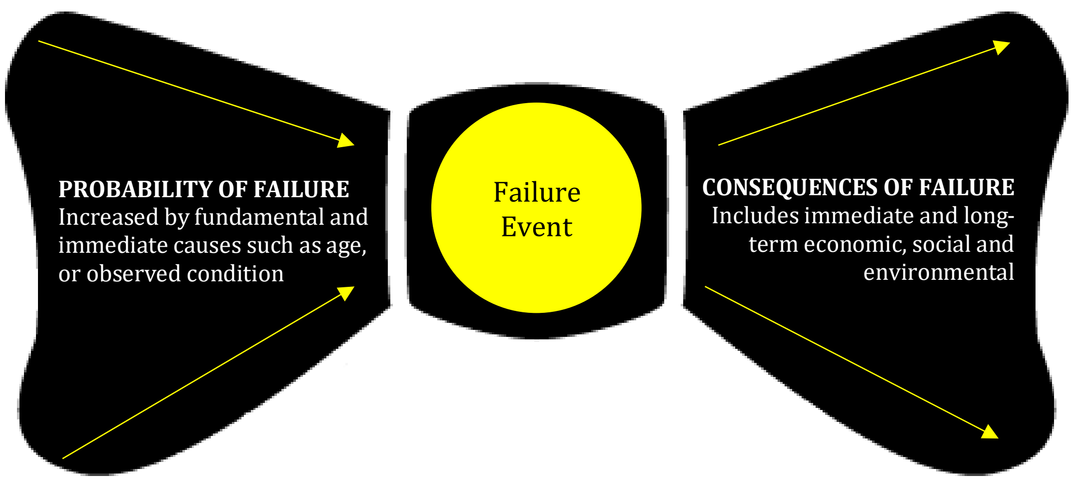
Risk mitigation is traditionally thought of in terms of safety and liability factors. In asset management, the definition of risk should heavily emphasize these factors but should be expanded to consider the risks to the Town's ability to deliver targeted levels of service

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

5.2 Risk Matrices

Using the logic above, a risk matrix will illustrate each asset's overall risk, determined by multiplying the probability of failure (PoF) scores with the consequence of failure (CoF) score, as illustrated in the table that follow. This can be completed as a holistic exercise against any data set by determining which factors (or attributes) are available and will contribute to the PoF or CoF of an asset. Figure 49 (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 49 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 22 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, land improvements, vehicles, and machinery & equipment. This approach is premised on the assumption that the higher the replacement cost, the larger (and likely more important) the asset, requiring a higher risk scoring.

Assets for which other attributes are used include: water and roads. Attributes are selected based on their impact on service delivery. For linear infrastructure, pipe diameter is normally used to estimate a suitable consequence of failure score as it reflects the potential upstream service area affected. Unfortunately, pipe diameter was not available leaving only replacement cost available for determining rick scoring. Scoring for roads, the risk is based on classification as it reflects the traffic volumes and number of people affected.

Table 23 Consequence of Failure – Roads

Road Classification	Consequence of failure
Road Base – Gravel & Earth – Rural & Semi-Urban	Score of 1
Road Base & Surface – Asphalt & Surface Treated - Rural	Score of 3
Road Base & Surface – Asphalt & Surface Treated – Semi-Urban	Score of 4
Road Base & Surface – Asphalt - Urban	Score of 5

Table 24 Consequence of Failure – Bridges & Culverts

Replacement Value	Consequence of failure
Up to $200k	Score of 1
$201 to $300k	Score of 2
$301 to $500k	Score of 3
$501 to $800k	Score of 4
Over $800k	Score of 5

Table 25 Consequence of Failure – Water Mains

Pipe Diameter	Consequence of Failure
Up to $100k	Score of 1
$101k to $200k	Score of 2
$201k to $350k	Score of 3
$351k to $600k	Score of 4
Over $600k	Score of 5

Table 26 Consequence of Failure – Buildings & Facilities

Replacement Value	Consequence of failure
Up to $50k	Score of 1
$51k to $100k	Score of 2
$101k to $600k	Score of 3
$601k to $2 million	Score of 4
Over $2 million	Score of 5

Table 27 Consequence of Failure – Machinery & Equipment

Replacement Value	Consequence of failure
Up to $10k	Score of 1
$11k to $30k	Score of 2
$31k to $50k	Score of 3
$51k to $100k	Score of 4
Over $100k	Score of 5

Table 28 Consequence of Failure – Land Improvements

Replacement Value	Consequence of failure
Up to $25k	Score of 1
$26k to $50k	Score of 2
$51k to $100k	Score of 3
$101k to $250k	Score of 4
Over $250k	Score of 5

Table 29 Consequence of Failure – Vehicles

Replacement Value	Consequence of failure
Up to $25k	Score of 1
$26k to $60k	Score of 2
$61k 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 50 Distribution of Assets Based on Risk – All Asset Classes

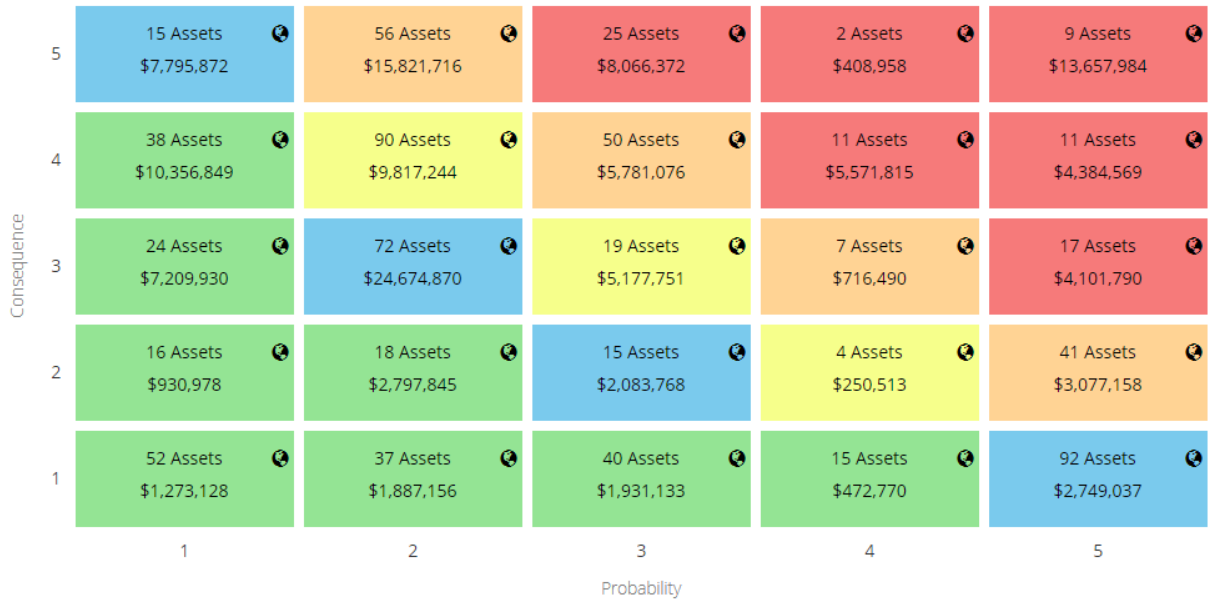


Figure 51 Distribution of Assets Based on Risk – Road Network

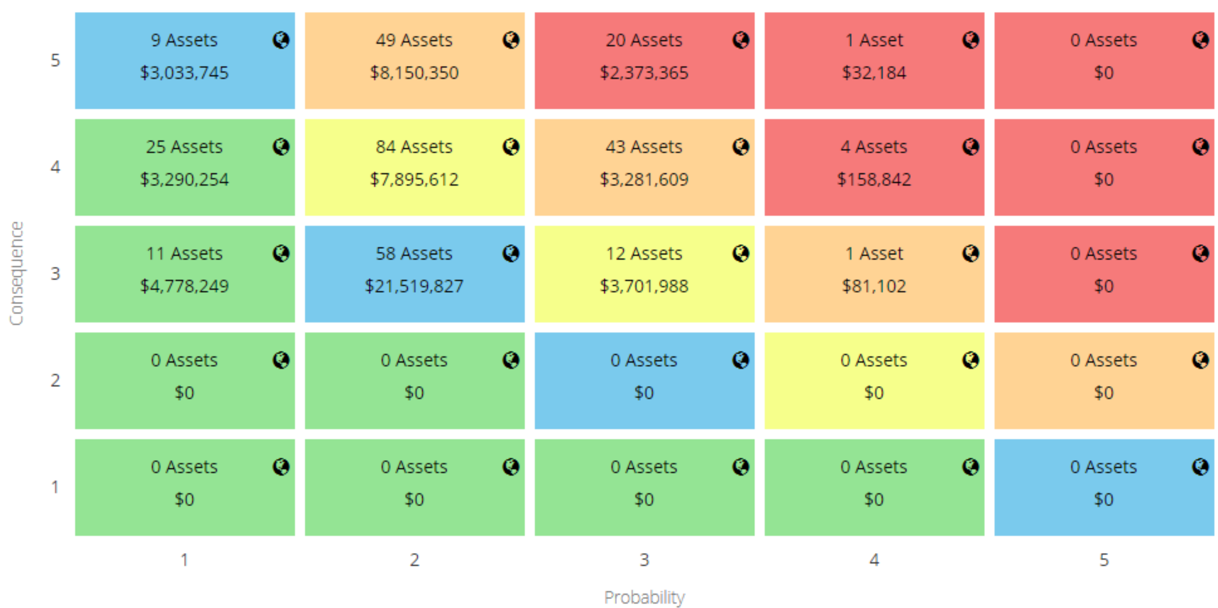


Figure 52 Distribution of Assets Based on Risk – Bridges & Culverts

Consequence \ Probability	1	2	3	4	5
5	1 Asset $830,213	3 Assets $3,757,476	0 Assets $0	0 Assets $0	0 Assets $0
4	3 Assets $2,031,708	0 Assets $0	1 Asset $535,726	0 Assets $0	0 Assets $0
3	1 Asset $445,015	6 Assets $2,144,739	1 Asset $432,896	0 Assets $0	0 Assets $0
2	0 Assets $0	8 Assets $1,923,199	3 Assets $742,897	0 Assets $0	1 Asset $229,010
1	0 Assets $0	8 Assets $911,493	7 Assets $935,976	1 Asset $89,238	3 Assets $437,696

Figure 53 Distribution of Assets Based on Risk – Water System

Consequence \ Probability	1	2	3	4	5
5	1 Asset $606,644	2 Assets $3,071,664	0 Assets $0	0 Assets $0	1 Asset $698,672
4	4 Assets $1,731,698	3 Assets $1,583,662	1 Asset $515,591	0 Assets $0	0 Assets $0
3	6 Assets $1,565,833	2 Assets $432,455	3 Assets $767,393	0 Assets $0	8 Assets $2,166,548
2	5 Assets $653,010	4 Assets $688,191	8 Assets $1,212,041	1 Asset $151,452	16 Assets $2,272,512
1	36 Assets $1,014,367	21 Assets $803,159	28 Assets $932,738	9 Assets $330,718	71 Assets $2,145,470

Figure 54 Distribution of Assets Based on Risk – Buildings & Facilities

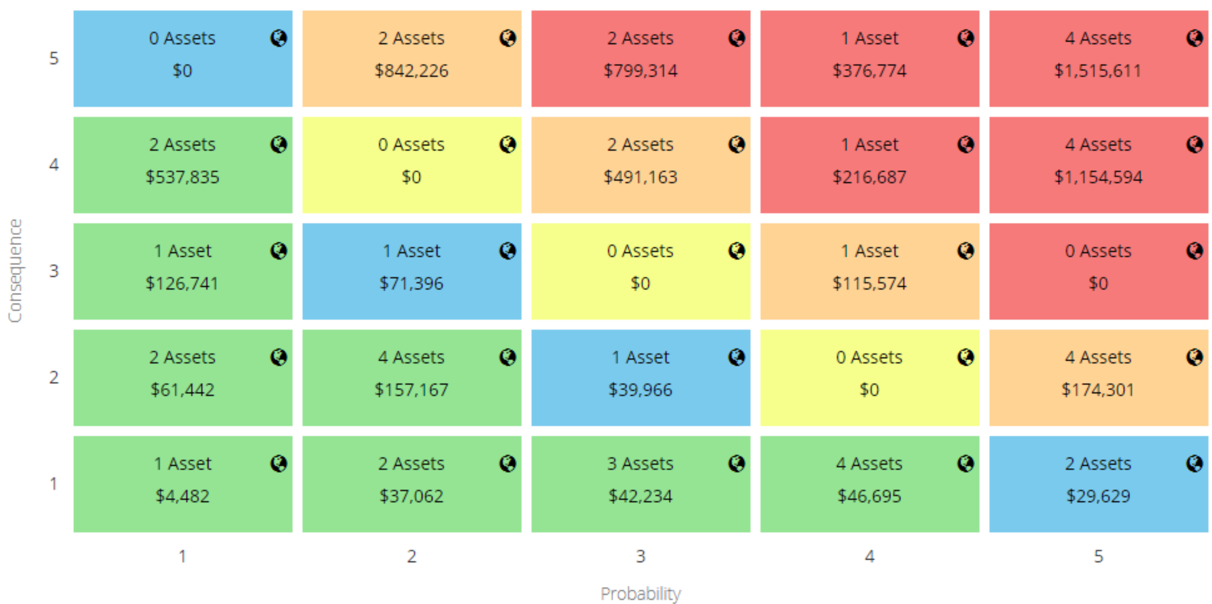
Consequence \ Probability	1	2	3	4	5
5	1 Asset $2,712,766	0 Assets $0	1 Asset $3,091,815	0 Assets $0	3 Assets $11,157,275
4	2 Assets $2,529,314	0 Assets $0	1 Asset $799,888	5 Assets $5,124,461	3 Assets $2,855,459
3	1 Asset $138,495	2 Assets $358,213	2 Assets $240,143	2 Assets $418,168	6 Assets $1,752,901
2	1 Asset $51,478	0 Assets $0	1 Asset $53,691	1 Asset $56,042	0 Assets $0
1	8 Assets $179,030	4 Assets $108,190	0 Assets $0	0 Assets $0	1 Asset $31,720

Figure 55 Distribution of Assets Based on Risk – Machinery & Equipment

Consequence \ Probability	1	2	3	4	5
5	3 Assets $612,504	0 Assets $0	1 Asset $102,332	0 Assets $0	0 Assets $0
4	1 Asset $50,028	2 Assets $154,511	2 Assets $157,099	1 Asset $71,825	3 Assets $235,021
3	4 Assets $155,597	2 Assets $80,306	1 Asset $35,331	3 Assets $101,646	2 Assets $87,250
2	7 Assets $134,906	2 Assets $29,288	2 Assets $35,173	2 Assets $43,019	19 Assets $371,758
1	2 Assets $11,451	1 Asset $8,960	1 Asset $6,408	1 Asset $6,119	12 Assets $67,021

Figure 56 Distribution of Assets Based on Risk – Land Improvements

Figure 57 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 Town to identify the financial resources required for sustainable asset management based on existing asset inventories, desired levels of service and projected growth requirements.

Figure 58 Cost Elements

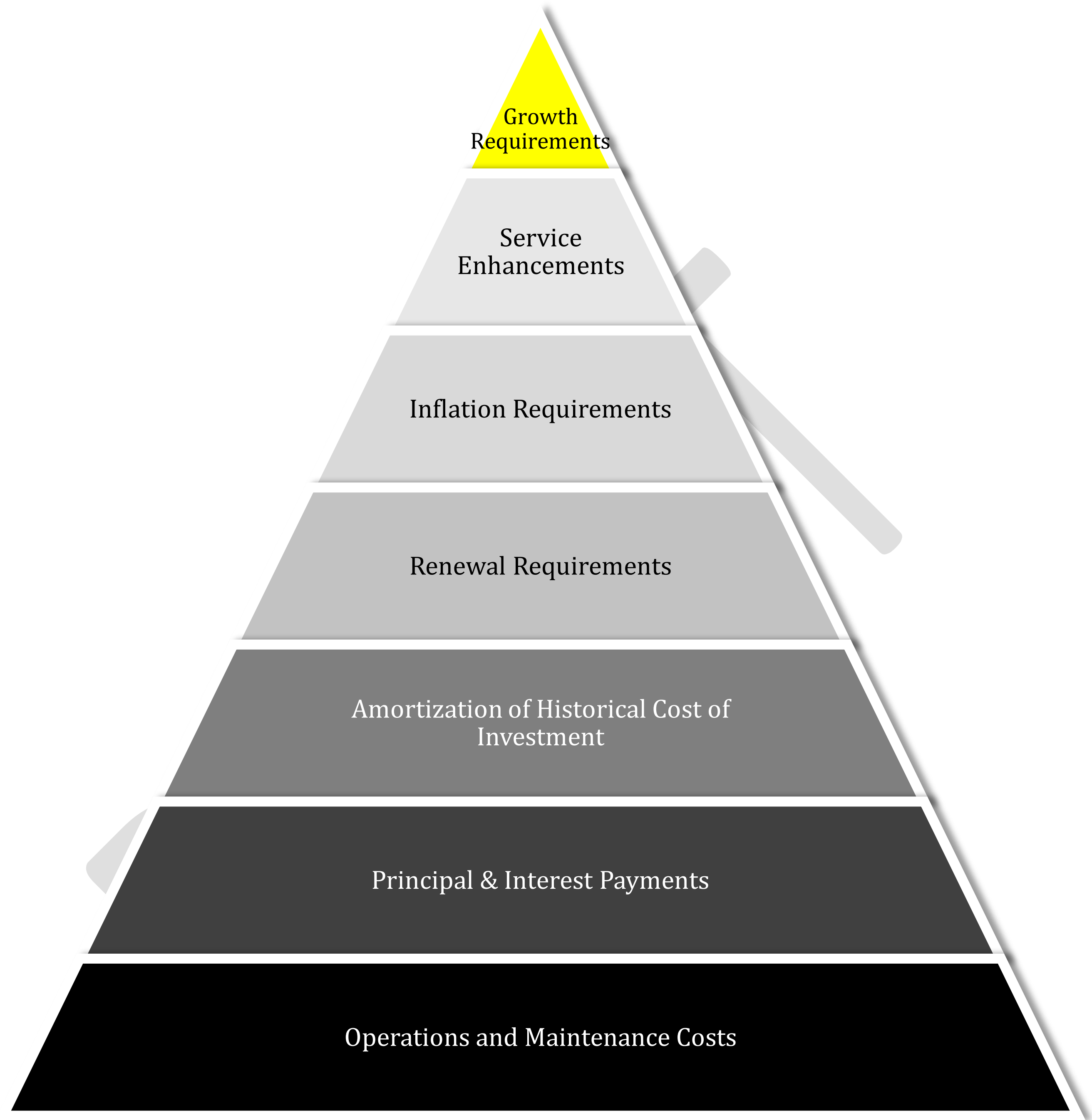


Figure 58 depicts the various cost elements and resulting funding levels that should be incorporated into AMPs that are based on best practices. Municipalities meeting their operational and maintenance needs, and debt obligations are funding only their cash cost. Funding at this level is severely deficient in terms of lifecycle costs.

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

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

- the financial requirements (as documented in the SOTI section of this report) for existing assets, existing service levels, requirements of contemplated changes in service levels (none identified for this plan), and requirements of anticipated growth (none identified for this plan)
- use of traditional sources of municipal funds including tax levies, user fees, reserves, debt, and development charges
- use of non-traditional sources of municipal funds, e.g., reallocated budgets
- use of senior government funds, such as the federal Gas Tax Fund, Ontario Community Infrastructure Fund (OCIF)

If the financial plan component of an AMP results in a funding shortfall, the province requires the inclusion of a specific plan as to how the impact of the shortfall will be managed. In determining the legitimacy of a funding shortfall, the province may evaluate a town'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 Town to achieve full funding within five to 20 years for the following assets: road network; bridges & culverts; buildings & facilities; machinery & equipment; land improvement; and vehicles. For each scenario developed, we have included strategies, where applicable, regarding the use of tax revenues, user fees, reserves and debt.

2.2 Current Funding Position

Table 30 and Table 31 outline, by asset class, the Town's average annual asset investment requirements, current funding positions, and funding increases required to achieve full funding on assets funded by taxes.

Table 30 Infrastructure Requirements and Current Funding Available: Tax Funded Assets

Asset class	Average Annual Investment Required	Total Funding Available in 2018					Annual Deficit/Surplus
		Taxes	Gas Tax	OCIF	Taxes to Reserves	Total Funding Available	
Road Network	1,840,000	324,000	343,000	0	448,000	1,115,000	-725,000
Bridges & Culverts	337,000	0	0	164,000	112,000	276,000	-61,000
Facilities	613,000	143,000	0	0	0	143,000	-470,000
Land Improvements	192,000	22,000	0	0	0	22,000	-170,000
Machinery & Equipment	200,000	32,000	0	0	0	32,000	-168,000
Vehicles	455,000	0	0	0	0	0	-455,000
Total	3,637,000	521,000	343,000	164,000	560,000	1,588,000	-2,049,000

2.3 Recommendations for Full Funding

The average annual investment requirement for the above categories is $3,637,000. Annual revenue currently allocated to these assets for capital purposes is $1,588,000 leaving an annual deficit of $2,049,000. To put it another way, these infrastructure categories are currently funded at 44% of their long-term requirements.

In 2018, the Town had annual tax revenues of $6,620,000. As illustrated in Table 31, without consideration of any other sources of revenue, full funding would require the following tax change over time:

Table 31 Tax Change Required for Full Funding

Asset class	Tax Change Required for Full Funding
Road Network	15.8%
Bridges & Culverts	0.9%
Facilities	4.9%
Land Improvements	2.6%
Machinery & Equipment	3.0%
Vehicles	3.7%
Total	30.9%

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

- Erin’s formula based OCIF grant is scheduled to grow from $164,000 in 2018 to $259,000 in 2019.
- As illustrated in table 39, Erin’s debt payments for these asset categories will be decreasing by $172,000 over the next 5 years and by $333,000 over the next 10 years. Although not shown in the table, debt payment decreases will be $333,000 and $434,000 over the next 15 and 20 years respectively.

Our recommendations include capturing the above changes and allocating them to the infrastructure deficit. Table 32 outlines this concept and presents a number of options.

Table 32 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	2,049,000	2,049,000	2,049,000	2,049,000	2,049,000	2,049,000	2,049,000	2,049,000
Change in OCIF Grant	N/A	N/A	N/A	N/A	-94,000	-94,000	-94,000	-94,000
Changes in Debt Costs	N/A	N/A	N/A	N/A	-172,000	-333,000	-333,000	-434,000
Resulting Infrastructure Deficit	2,049,000	2,049,000	2,049,000	2,049,000	1,783,000	1,612,000	1,622,000	1,521,000
Resulting Tax Increase Required:								
Total Over Time	**31.0%**	**31.0%**	**31.0%**	**31.0%**	**26.9%**	**24.5%**	**24.5%**	**23.0%**
Annually	6.2%	3.1%	2.1%	1.6%	5.4%	2.5%	1.6%	1.2%

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 $434,000 to the infrastructure deficit as outlined above.
- increasing tax revenues by 1.2% 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 30.
- allocating the scheduled OCIF grant increases to the infrastructure deficit as they occur.
- increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

Notes:

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

Although this option achieves full funding on an annual basis in 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 $0 for paved roads, $438,000 for bridges & culverts, $505,000 for machinery & equipment, $0 for facilities, $588,000 for land improvements and $1,977,000 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 Town to achieve full funding within five to 20 years for the following assets: water. 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 33 and Table 34 outline, by asset class, the Town's average annual asset investment requirements, current funding positions, and funding increases required to achieve full funding on assets funded by rates.

Table 33 Summary of Infrastructure Requirements and Current Funding Available

Asset class	Average Annual Investment Required	Total Funding Available in 2018				Annual Deficit/Surplus
		Rates	To Operations	Other	Total Funding Available	
Water Network	621,000	1,528,000	-936,000	0	592,000	-29,000

3.3 Recommendations for Full Funding

The average annual investment requirement for water services is $621,000. Annual revenue currently allocated to these assets for capital purposes is $592,000 leaving an annual deficit of $29,000. To put it another way, these infrastructure categories are currently funded at 95% of their long-term requirements.

In 2018, Erin has annual water revenues of $1,528,000. As illustrated in Table 34, without consideration of any other sources of revenue, full funding would require the following increases over time:

Table 34 Rate Change Required for Full Funding

Asset class	Rate Change Required for Full Funding
Water Network	1.9%

As illustrated in 35, we have expanded the above scenario to present multiple options. Due to the significant increases required, we have provided phase-in options of up to 20 years.

Table 35 Revenue Options for Full Funding

	Water Network			
	5 Years	5 Years	10 Years	15 Years
Annual rate increase required:	**0.4%**	**0.2%**	**0.1%**	**0.1%**

Considering all of the above information, we recommend the 5-year option in the table above. This involves full funding being achieved over 5 years by:

- increasing rate revenues by 0.4% for water services each year for the next 5 years solely for the purpose of phasing in full funding to the asset categories covered in this section of the AMP.
- increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

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

Although this option achieves full funding on an annual basis in 15 years and provides financial sustainability over the period modeled, the recommendations do require prioritizing capital projects to fit the resulting annual funding available. Current data shows a pent-up investment demand of $2,054,000 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 36 outlines the premium paid on a project if financed by debt. For example, a $1M project financed at 3.0%[11] 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.

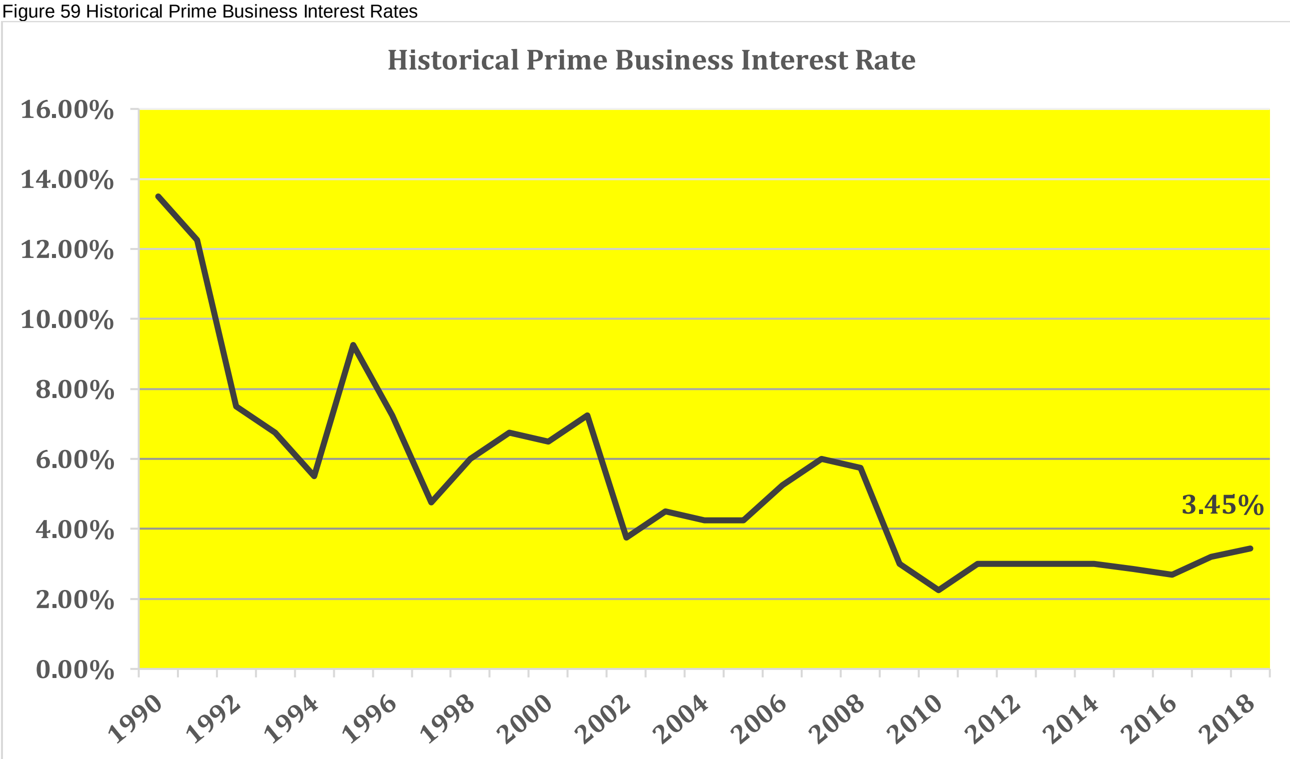
Table 36 Total Interest Paid as a Percentage of Project Costs

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%

[11] 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 59 Historical Prime Business Interest Rates



As illustrated in Table 36 , 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 37 and Table 38 outline how Erin has historically used debt for investing in the asset categories as listed. There is currently $4,245,000 of debt outstanding for the assets covered by this AMP with corresponding principal and interest payments of $434,000, well within its provincially prescribed maximum of $2,414,000.

Table 37 Overview of Use of Debt

Asset class	Current Debt Outstanding	Use of Debt in Last Five Years				
		2013	2014	2015	2016	2017
Road Network	1,595,000	0	0	0	0	1,517,000
Bridges & Culverts	0	0	0	0	0	0
Facilities	1,801,000	0	0	0	0	272,000
Land Improvements	163,000	0	0	0	0	0
Machinery & Equipment	0	0	0	0	0	0
Vehicles	686,000	0	0	0	0	757,000
Total Tax Funded	4,245,000	0	0	0	0	2,546,000
Water Network	4,245,000	0	0	0	0	0

Table 38 Overview of Debt Costs

Asset class	Principal & Interest Payments in Next Ten Years						
	2018	2019	2020	2021	2022	2023	2028
Road Network	137,000	136,000	137,000	137,000	137,000	137,000	83,000
Bridges & Culverts	0	0	0	0	0	0	0
Facilities	185,000	186,000	183,000	183,000	174,000	18,000	17,000
Land Improvements	26,000	26,000	25,000	24,000	23,000	23,000	0
Machinery & Equipment	0	0	0	0	0	0	0
Vehicles	85,000	85,000	84,000	85,000	84,000	84,000	0
Total Tax Funded	433,000	433,000	429,000	429,000	418,000	262,000	100,000
Water Network							

Please note that the Town has a balloon payment of $907,000 due March 31, 2022. The present plan is to refinance this amount in a way that does not materially impact the numbers in the above tables, but this is subject to Council approval.

The revenue options outlined in this plan allow Erin 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 39 outlines the details of the reserves currently available to Erin

Table 39 Summary of Reserves Available

Asset class	Balance at December 31st, 2017
Road Network	1,889,000
Bridges & Culverts	0
Facilities	682,000
Land Improvements	960,000
Machinery & Equipment	377,000
Vehicles	440,000
Total Tax Funded	4,349,000
Water System	2,289,000

There is considerable debate in the municipal sector as to the appropriate level of reserves that a Town 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 39 are available for use by applicable asset classes during the phase-in period to full funding. This, coupled with Erin'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 Erin updates its AMP, we recommend that future planning should include determining what its long-term reserve balance requirements are and a plan to achieve such balances.

X. 2017 Infrastructure Report Card

The following infrastructure report card illustrates the Town'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 40 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>B</td><td>43%</td><td>D</td><td>C</td><td rowspan="10">Based on 2017 replacement cost, and primarily age-based data, over 59% of assets, with a valuation of $82.5 million, are in good to very good condition; 25% are in poor to very poor condition.

The Town is underfunding its assets. Tax-funded categories are funded at 44% while rate-funded categories are funded at 95%.</td></tr>
<tr><td>Bridges & Culverts</td><td>D</td><td>82%</td><td>B</td><td>C</td></tr>
<tr><td>Water System</td><td>D</td><td>95%</td><td>A</td><td>C</td></tr>
<tr><td>Buildings & Facilities</td><td>D</td><td>47%</td><td>F</td><td>F</td></tr>
<tr><td>Machinery & Equipment</td><td>D</td><td>0%</td><td>F</td><td>F</td></tr>
<tr><td>Land Improvements</td><td>D</td><td>11%</td><td>F</td><td>F</td></tr>
<tr><td>Vehicles</td><td>D</td><td>46%</td><td>F</td><td>F</td></tr>
<tr><td colspan="3">Average Asset Health Grade</td><td colspan="2">C</td></tr>
<tr><td colspan="3">Average Financial Capacity Grade</td><td colspan="2">D</td></tr>
<tr><td colspan="3">Overall Grade for the Town</td><td colspan="2">D</td></tr>
</table>

XI. Appendix: Grading and Conversion Scales

Table 41 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 42 Financial Capacity Scale

Letter Grade	Rating	Funding percent	Timing Requirements	Description
A	Excellent	90-100 percent	☑ Short Term ☑Medium Term ☑Long Term	The Town is fully prepared for its short-, medium- and long-term replacement needs based on existing infrastructure portfolio.
B	Good	76-89 percent	☑Short Term ☑Medium Term ☒Long Term	The Town 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	61-75 percent	☑Short Term ☒Medium Term ☒Long Term	The Town 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	46-60 percent	☒/☑ Short Term ☒Medium Term ☒Long Term	The Town 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	0-45 percent	☒Short Term ☒Medium Term ☒Long Term	The Town 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 Town may have to divest some of its assets (e.g., bridge closures, arena closures) and levels of service will be reduced significantly.

The preparation of this project was carried out with assistance from the Government of Canada and the Federation of Canadian Municipalities. Notwithstanding this support, the views expressed are the personal views of the authors, and the Federation of Canadian Municipalities and the Government of Canada accept no responsibility for them.

XII. Appendix: Town of Erin Backlog Assets

Asset Name	Asset Category	Risk Rating	Backlog Amount
Bridge 2064	Bridges & Culverts	5	$190,453.00
Culvert 2027	Bridges & Culverts	5	$105,775.00
Culvert 2068	Bridges & Culverts	5	$141,468.00
Town Office landscaping, parking lot, lighting	Land Improvements	5	$20,413.00
BCC Playground Equipment	Land Improvements	10	$29,577.00
Victoria Park - Fence Replacement	Land Improvements	5	$6,148.00
Barbour Field: additional soccer pitches	Land Improvements	15	$95,091.00
Barbour Field: diamond preparation, fencing, building, septic, lights, well	Land Improvements	20	$139,495.00
Centre 2000 construct 5 tennis courts	Land Improvements	25	$286,426.00
Athenwood Park Playground Equipment	Land Improvements	5	$10,940.00
Computer Upgrades Pooled 2010	Machinery & Equipment	20	$57,663.00
Computer Upgrades Pooled 2011	Machinery & Equipment	10	$22,291.00
Desktops x 6 2012	Machinery & Equipment	5	$6,036.00
Colour Digital Copier	Machinery & Equipment	10	$11,173.00
Keystone Software 2010	Machinery & Equipment	10	$21,011.00
Monitor, Adapter, Keystone Upgrade	Machinery & Equipment	5	$1,168.00
Fire Pagers	Machinery & Equipment	5	$1,341.00
Fire Pagers	Machinery & Equipment	10	$22,600.00
Fire Pagers	Machinery & Equipment	10	$20,501.00
Fire Pagers	Machinery & Equipment	5	$5,394.00
Thermal Cameras	Machinery & Equipment	10	$24,947.00
Defibrillators (AED)	Machinery & Equipment	10	$24,325.00
Dress Uniforms x 11	Machinery & Equipment	5	$6,556.00
Dress Uniforms x 14	Machinery & Equipment	5	$8,218.00
Dress Uniforms x 10	Machinery & Equipment	5	$5,947.00
Dress Uniforms x 10	Machinery & Equipment	5	$5,934.00
Protective Equipment x 7	Machinery & Equipment	10	$17,541.00
Protective Equipment x 7	Machinery & Equipment	10	$17,275.00

Protective Equipment x 7	Machinery & Equipment	10	$17,502.00
Protective Equipment x 15	Machinery & Equipment	15	$37,420.00
Protective Equipment x 20	Machinery & Equipment	15	$49,830.00
Portable Pumps	Machinery & Equipment	10	$23,260.00
Portable Pumps	Machinery & Equipment	10	$16,458.00
Generators	Machinery & Equipment	10	$19,732.00
Generators	Machinery & Equipment	5	$3,730.00
ECC - Score Clock	Machinery & Equipment	10	$13,129.00
HCC - Score Clock	Machinery & Equipment	10	$12,868.00
Centre 2000 - Projector	Machinery & Equipment	20	$85,663.00
Freightliner C - Max Rescue Van, R55, Plate:YK7267	Vehicles	20	$293,899.00
Freightliner Metalfab Tanker, T17, 2300 Gallon Water Tank, Plate YK7296	Vehicles	25	$352,679.00
GMC Sentinal Rescue Van, R15, Plate:JB1816	Vehicles	20	$298,073.00
International Dependable Tanker, T57, 1500 Gallon Water Tank, Plate:DK4960	Vehicles	25	$363,660.00
Chevrolet Fire Pumper, P11, 500 Gallon Water Tank, Plate:NH8479	Vehicles	25	$417,289.00
Dodge Ram Pickup 2008 3/4 Tonne, Plate:4619VN	Vehicles	10	$40,361.00
International Paystar 5500 2005, Plate:5628ZD	Vehicles	20	$251,715.00
JC Trailer Model DBW 1990	Vehicles	5	$6,061.00
Chevrolet Express Cube Van 2007, Plate:2684TL	Vehicles	10	$52,476.00
370	Water Network	5	$5,697.00
2400	Water Network	5	$8,929.00
2450	Water Network	5	$5,868.00
2500	Water Network	5	$6,123.00
2600	Water Network	5	$12,444.00
3100	Water Network	5	$15,250.00
5200	Water Network	5	$8,900.00
5600	Water Network	5	$15,675.00
5610	Water Network	5	$8,277.00
5620	Water Network	5	$19,332.00
6100	Water Network	5	$5,507.00
6300	Water Network	5	$6,775.00
7000	Water Network	5	$6,860.00

	7200	Water Network	5	$9,864.00
	13000	Water Network	5	$22,365.00
	13000	Water Network	5	$3,657.00
	14900	Water Network	5	$6,916.00
	15000	Water Network	5	$16,610.00
	16000	Water Network	5	$13,804.00
	17000	Water Network	5	$7,115.00
	17000	Water Network	5	$13,691.00
	370	Water Network	5	$45,804.00
	2400	Water Network	5	$71,783.00
	2450	Water Network	5	$47,172.00
	2500	Water Network	5	$49,223.00
	2600	Water Network	10	$100,040.00
	3100	Water Network	10	$122,601.00
	5200	Water Network	5	$71,555.00
	5600	Water Network	10	$126,019.00
	5610	Water Network	5	$66,542.00
	5620	Water Network	10	$155,416.00
	6100	Water Network	5	$45,812.00
	6300	Water Network	5	$54,464.00
	7000	Water Network	5	$55,147.00
	7200	Water Network	5	$79,303.00
	13000	Water Network	10	$179,799.00
	13000	Water Network	5	$30,419.00
	14900	Water Network	5	$55,603.00
	15000	Water Network	10	$133,539.00
	16000	Water Network	10	$114,839.00
	17000	Water Network	5	$57,198.00