FINAL REPORT

PREPARED FOR THE CITY OF FERNIE

Asset Management Investment Plan 2018

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1 Executive Summary

Why practice asset management? Simply put, it's the right thing to do. The residents and businesses in our communities trust and expect us to be good stewards of the services and infrastructure that they rely on every day. Asset management exists to enable good stewardship of infrastructure and services; to deliver services today and prepare for tomorrow in a way that is responsible.

The City of Fernie owns and maintains a large portfolio of infrastructure assets upon which it greatly relies for the delivery of services to the community. This infrastructure includes the City's; water, wastewater, storm, and road systems as well as a wide variety of civic buildings, fleet, and equipment assets.

Some of the City's assets, such as the water system, date back to the 1920's. These assets, and others, have served the community well, however many of these assets are now nearing the end of their lifespans and will eventually need to be replaced or rehabilitated.

The Asset Management Investment Plan (AMIP) provides a review of all of the City's infrastructure assets to answer the following questions;

- *What assets do we own?*
- *What is the estimated replacement value of our assets?*
- *What is the estimated remaining life of our assets?*
- *How much should we invest in asset renewal?*
- *When do our assets need to be replaced?*

By understanding the answer to these questions, the City will be able to budget and plan for the replacement of their infrastructure. Failure to plan would put the community at risk of service disruptions, emergency repairs and the need for sudden and significant tax and user fee increases. By being proactive today, the City can ensure that services are sustainable so that current and future generations can enjoy the same levels of service as well as reasonable tax rates and user fees.

In summary, Fernie owns $286 million in infrastructure that requires significant investment over the next 20 years and beyond in order to ensure that infrastructure and service levels are sustained. Decision makers must determine what level of investment is appropriate for the community to ensure these assets can continue to provide service. Figure 1.1 below summarizes a range of investment levels using three key investment indicators to help the City determine long term funding targets.

What is Asset Management?

The process of bringing together the skills and activities of people; with information about the community's physical infrastructure assets and financial resources to ensure long term sustainable service delivery. Sound asset management practices support sustainable service delivery by considering community priorities, informed by an understanding of the trade-offs between the available resources, risk and the desired services.

Sustainable service delivery ensures that current community services are delivered in a social, economic, and environmentally responsible manner that does not compromise the ability of future generations to meet their own needs.



URBAN systems

Figure 1.1 Investment Level Indicators

Investment Level Indicators				
Asset Category	**Replacement Value**	**Average Annual Life Cycle Investment (AALCI)**	**20 Year Average Annual Investment (AAI)**	**Infrastructure Deficit (Backlog)**
Road	$76,856,000	$1,023,000 - $1,536,000	$564,000 - $1,687,000	$914,000 - $25,469,000
Buildings	$80,257,000	$781,000 – $1,171,000	$330,000 - $2,163,000	$5,414,000 – 19,914,000
Fleet	$12,466,000	$878,000 - $1,317,000	$1,002,000 - $1,400,000	$6,607,000 – $9,256,000
Equipment	$2,529,000	$188,000 - $282,000	$150,000 - $290,000	$830,000 - $955,000
Storm	$27,586,000	$239,000 - $356,000	$0 - $116,000	$0 - $277,000
Sub-Total	**$199,694,000**	**$3,109,000 - $4,662,000**	**$2,046,000 - $5,656,000**	**$13,765,000 - $55,871,000**
Water	$50,349,000	$521,000 - $780,000	$318,000 - $534,000	$4,530,000 – $6,248,000
Wastewater	$35,590,000	$384,000 - $575,000	$266,000 - $524,000	$1,602,000 - $5,362,000
Total	**$285,633,000**	**$4,014,000 - $6,017,000**	**$2,630,000 - $6,714,000**	**$19,897,000 - $67,481,000**

Each of the investment level indicators (AALCI, 20 Year AAI & backlog) is presented as a range (low and high). The lower value represents an investment scenario where the assets last twice as long as their expected service life and the larger value represents an investment scenario where the assets are replaced when they reach their expected service life. The City can use this information to begin understanding long term investment levels required to sustain infrastructure over the long term. Over time, the City should begin to refine these investment level indicators based on risk, level of service and the financing capacity of the organization and the community.

TERMS AND DEFINITIONS

The following commonly used terms and definitions have been described as they relate to the City of Fernie's Asset Management Program:

ANNUAL AVERAGE LIFE CYCLE INVESTMENT (AALCI)

The Average Annual Life Cycle Investment (AALCI) represents the annual investment needed to sustain existing infrastructure over its service life (over the next 20 years and beyond).

Note: AALCI must be considered in conjunction with infrastructure deficit as this is a forward-looking parameter that does not consider the past.

ASSET

A physical component of a system that has value, enables services to be provided, and has an economic life of greater than1 year. It is important to note that natural assets such as dikes, trails, and storm ponds are not accounted for.

% REMAINING LIFE

Asset remaining life is one indicator that can be used as a proxy for condition when the physical condition of the asset is not known. The remaining life of an asset is calculated using the following formula:

% Remaining Life = # of years before replacement / Service Life

The remaining life is then grouped into a condition rating system using the following criteria:

Note: % remaining life is grouped based on what has worked well in other communities and is considered an industry standard.

% Remaining Life	Condition Group
<0	Very Poor
0 – 25	Poor
25 – 50	Average
50 – 75	Good
75 - 100	Very Good

ASSET MANAGEMENT INVESTMENT PLAN (AMIP)

An Asset Management Investment Plan (AMIP) is a long-term cost forecast tool which provides a community with a deeper understanding of their existing infrastructure by answering the following questions:

- *What assets do we own?*
- *What is the replacement value of our assets?*
- *What is the estimated remaining life of our assets?*
- *How much money needs to be invested annually (on average) to sustain our assets?*

It is important to note that the AMIP assumes like for like replacement and does not take into account infrastructure upgrades to accommodate growth.

LEVEL OF SERVICE

A measure of the quality, quantity, and/or reliability of a service from the perspective of residents, businesses, and customers in the community.

REPLACEMENT VALUE

The investment required (in today's dollars) to replace an asset and ensure it provides the same function as it did before. The replacement value used in this report should not be used for capital planning and should only be used for high-level, long-term financial planning.

Refer to **Appendix B** for details on how the replacement value was calculated.

REVENUE

The income received by the City from taxes, user fees, government transfers and other sources. Own-source revenue refers to income received from taxation, user fees, and any interest income.

RISK(S)

Events or occurrences that will have an undesired impact on services (Risk = Impact x Likelihood).

SERVICE LIFE (SL) / INDUSTRY BEST PRACTICE SERVICE LIFE

The length of time an asset will theoretically last before it requires replacement or rehabilitation based on industry standards. Refer to **Appendix C** for more detail.

TANGIBLE CAPITAL ASSETS (TCA) REPORTING

Tangible Capital Asset (TCA) reporting is requirement for local governments under PSAB 3150. TCA reports summarize a community's assets, the cost to purchase them (historical cost) and the annual investment required to replace the asset at the end of its life. The key difference between the TCA report and AMIP report is that the TCA approach uses historical cost and the AMIP uses replacement cost in today's dollars.

20 YEAR AVERAGE ANNUAL INVESTMENT (20 YEAR AAI)

The 20 Year Average Annual Investment (20 Year AAI) is defined as the summation of expenditures over a 20-year planning horizon divided by 20. It represents the annual investment needed to pay for expected infrastructure replacements over the next 20 years (within the 20-year horizon).

2 Why is Asset Management Necessary?

Sustainable service delivery ensures that current community services are delivered in a social, economic, and environmentally responsible manner that does not compromise the ability of future generations to meet their own needs. Communities build and maintain infrastructure to provide services. These services support quality of life, protect health and safety, and promote social, economic and environmental well-being.

Communities may risk degrading - or even losing - the services they enjoy if they fail to manage natural resources, care for infrastructure, and protect the services provided by nature. Sound asset management practices support sustainable service delivery by integrating community priorities, values, and an informed understanding of the trade-offs between risks, costs, and services.

Infrastructure represents a significant investment for every local government, and council members are the stewards of a local government's infrastructure assets. A formal approach to the management of infrastructure assets is essential to support making informed decisions, to provide services in the most cost-effective manner over the entire asset life cycle, and to demonstrate this stewardship to customers, investors, and other stakeholders. Applying asset management best practices ensures that infrastructure continues to provide economically viable levels of service.

These best practices profile and reinforce that:

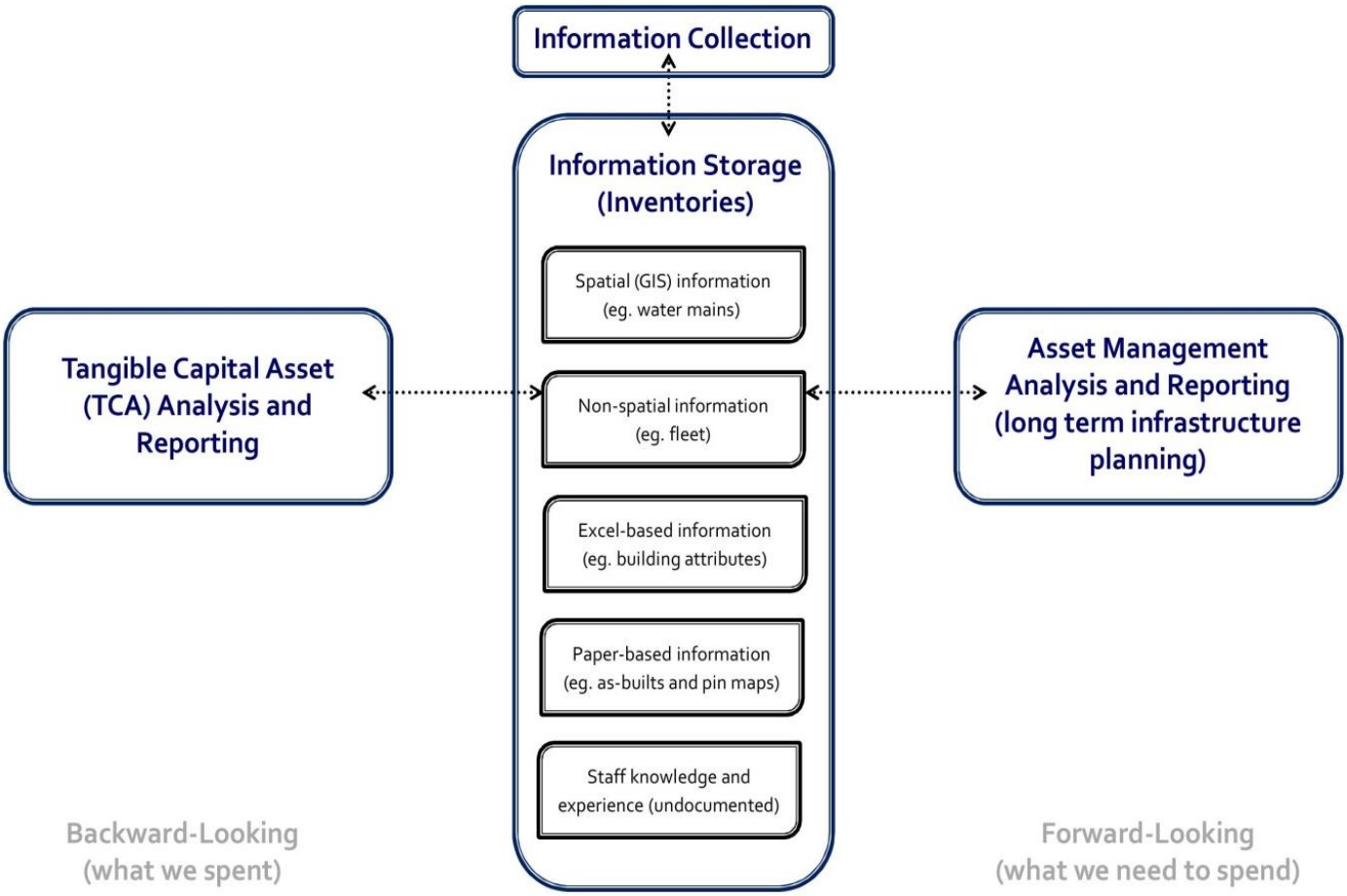
- Community infrastructure is a foundation of sustained growing economic and social development.
- Infrastructure is critical to meeting the recreational, institutional, cultural and other needs of the community.
- Properly built and effectively maintained infrastructure supports public health and safety and mitigates potential adverse environmental impacts of society.
- Financial sustainability (ensuring future financial shocks are minimized) requires strong connections between long-term infrastructure investment needs, long-term funding plans and financial performance measures to track progress over time.
- Well informed decisions contribute to achieving the goals of the community, while balancing the financial capacity of current and future generations.

3 Introduction

Fernie strives to be a sustainable community, with a diverse and affordable infrastructure base to deliver services for its residents. In order to ensure this holds true today and into the future, the City of Fernie has decided to invest in developing an Asset Management Investment Plan (AMIP). This project evolved from a recommendation made in Fernie's 2015 report, "An Assessment of Current Practices for Sustainable Service Delivery."

The key to sustainably delivering services lies in how a community manages its infrastructure. The first step Fernie took was the production of a financial report that provided information on its tangible capital assets (TCAs). The TCA exercise looked at how much Fernie has spent on its infrastructure in the past. This exercise is taking that process a step further, using the AMIP to look at how much needs to be invested in infrastructure in the future. The AMIP is a substantial improvement from the TCA approach because it is forward looking and will help ensure the community is aware of the future cost pressures related to replacing infrastructure when it expires. This relationship can be seen below in Figure 3.1.

Figure 3.1 The TCA vs AMIP Relationship



The AMIP is a 20-year cost forecast which includes the renewal costs, estimated remaining life, deficit, and timing for its major infrastructure categories, including roads, water, storm, wastewater, buildings, fleet and parks. The AMIP also provides a cost profile that shows the revenue requirements needed to manage infrastructure over the long term (life cycle of the assets) and provides three investment level indicators to inform decision-making.

4 Methodology

The AMIP is an ideal launching point for a community's asset management program as it involves all of Fernie's decision-makers, includes nearly all infrastructure assets and presents a long-term cost forecast. The AMIP can be used to inform decision-making regarding the management of, and investment in, community infrastructure. With the completion of the AMIP, Fernie can now identify its infrastructure investment targets and develop a long term financial plan to support asset management.

The two main steps followed to develop the AMIP are detailed below:

Step 1: Inventory Details

Through this project, an asset inventory was developed for the City's major linear and non-linear assets. It is important to note that natural assets such as dikes, storm ponds, tree's and trails were not included. These natural assets perform a service for the community and protection of these assets should be considered in the long-term planning of infrastructure investment. Also, park assets and all infrastructure within the West Fernie service area has not been included as a formal asset inventory has not yet been established.

In order to ensure the results of the AMIP can be replicated in the future, major changes were made to the City's GIS database schema. The information from the AMIP model now needs to be integrated back into the City's GIS System.

Specific assumptions on an asset by asset basis can be found within the excel model and sources detailing how the inventory was established can be found in **Appendix D** – Data sources. Replacement cost and service life assumptions can be found in **Appendices B & C** respectively.

Inventory information was compiled using readily available information. During this exercise, it became apparent where effort should be focused to improve the inventory in the future. The major asset categories that the City should focus on improving are as follows:

- Park Assets
- Natural Assets (ponds, dikes, tree's, trails etc.)
- West Fernie Assets

Step 2: Asset Valuation and Renewal Plan

Once the inventory was developed, it was imported into the Asset Management Investment Plan (AMIP) model so each asset could be evaluated. Key information calculated for each asset category includes:

AMIP Attributes	
Attributes	**Question Addressed**
Asset Service Life	How long will our assets last? (**Appendix C**)
Replacement Value	How much is the estimated replacement value of our assets? (**Appendix B**)
Estimated Remaining Life	When do our assets need to be replaced?
Infrastructure Renewal Deficit (backlog)	Which assets have passed their theoretical service life and need to be inspected for condition?

Total 20 Year Total Investment	How much should theoretically be invested (in total) over the next 20 years to renew existing infrastructure?
20 Year Average Annual Investment (20 Year AAI)	How much are we theoretically expected to invest on average per year to replace our existing assets over the next 20 years?
Average Annual Life Cycle Investment (AALCI)	How much should we invest annually in order to sustain our existing infrastructure over the long-term? *Note: AALCI must be considered in conjunction with infrastructure renewal deficit (backlog) as this is a forward-looking parameter that does not consider historical expenditures.*
Estimated year of replacement	When do our assets theoretically pass their service life?

The attributes above were used to develop the AMIP summary (see Appendix A) which provides decision makers with key information to make more informed decisions about future infrastructure investment level.

5 State of Fernie's Infrastructure – Level 1

This section of the report details the AMIP findings by each of Fernie's major asset categories and will focus on answering the 5 asset management questions:

- What assets do we own?
- What is the replacement value of our assets?
- What is the estimated remaining life of our assets?
- How much money needs to be invested annually (on average) to sustain our assets?
- When do our assets need to be replaced?

Each of these questions are explained in more detail below.

What assets do we own?

The City of Fernie is responsible for replacing and maintaining various assets that provide both essential and non-essential services to their residents. Asset categories include in the study are as follows:

- Water System
- Wastewater System
- Storm Systems
- Road System
- Building System
- Fleet System
- Equipment Systems

Assets not included within this study are as follows:

- Park Assets
- West Fernie
- Natural Assets

Although some asset categories were not included in this version of the AMIP, it is the goal that over time the asset categories are added into the AMIP.

What is the replacement value of our assets?

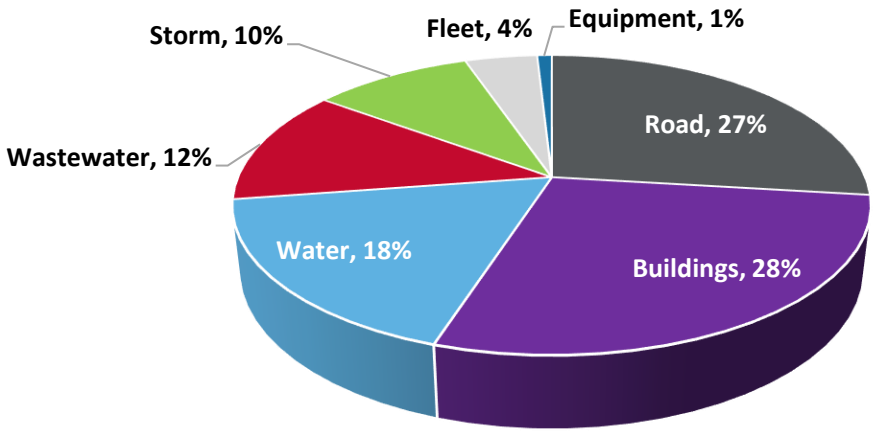
The estimated replacement value of Fernie's major infrastructure assets is approximately $286 million (2017 dollars). The table below provides a summary of the replacement value of existing infrastructure only; it does not include new infrastructure needed to meet regulatory requirements, growth/expansion, safety improvements, and economic development. These infrastructure needs are identified in infrastructure master plans and other bylaws. The results of the AMIP can be combined with those to develop a long-term prioritized capital plan.

The table and chart below illustrate the breakdown of Fernie's infrastructure value.

Figure 5.1 Infrastructure Value by Asset Category

Infrastructure Value	
Asset Category	**Current Value**
General Fund	
Road	$76,856,000
Buildings	$80,257,000
Fleet	$12,466,000
Equipment	$2,529,000
Storm	$27,586,000
Total	**$199,694,000**
Water	$50,349,000
Wastewater	$35,590,000
Total	**$285,633,000**

Figure 5.2 Value Distribution by Asset Category



Over 80% of Fernie's infrastructure is made of up water, wastewater, road, and building assets which means majority of the total long-term expenditures are likely to be focused on these assets.

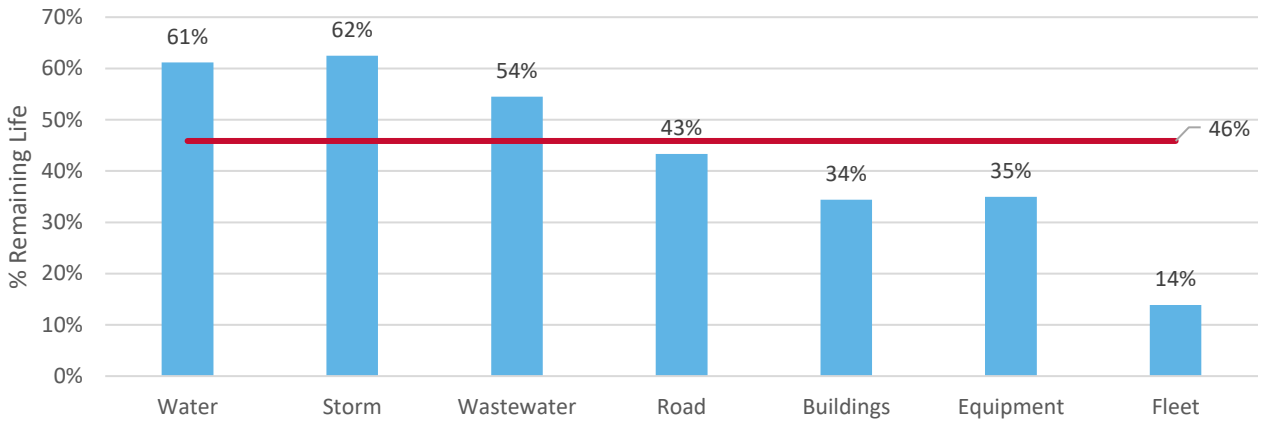
What is the estimated remaining life of our assets?

Asset remaining life is one indicator that can be used as a proxy for condition when the physical condition of the asset is not known. The remaining life of an asset is calculated using the following formula:

% Remaining Life = # of years before replacement / Service Life

Fernie's assets are considered to be generally in good condition with an overall expected remaining life of 46%. The asset remaining life of each asset category is summarized below.

Figure 5.3 System Remaining life by Asset Category



Notes:

- *Results are based on Service Life Scenario #1 (standard service life estimates)*

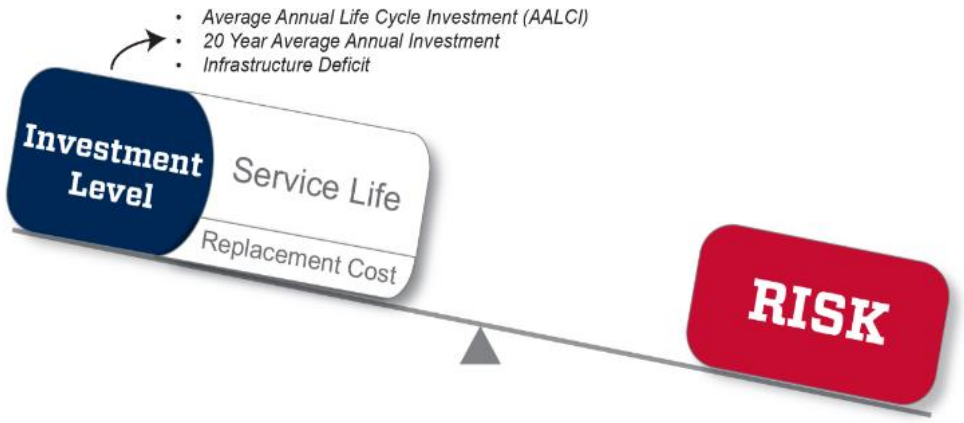
From the results in the graph above, it is clear that water, storm and wastewater assets have more remaining life than other assets (ex. Fleet). The estimated remining life can provide the City some direction on where to invest funds. For example: the City may invest funds in assets that have a lower remaining life to prevent potential asset failures from occurring. In the future, the City could also consider setting policies around the minimum percentage remaining life allowed for any one asset category.

How much money needs to be invested annually (on average) to sustain our assets?

There is a direct tradeoff between risk and investment level in existing infrastructure to sustain services at their current level. The service life estimates utilized in this study are based on industry best practice, and assets may live longer or shorter than this estimate. The longer an asset is left in use past its service life, the higher the risk is for failure (and the cost of repair). By assuming assets may last longer (and assuming more risk), the average annual investment needed to sustain infrastructure is reduced.

This relationship is illustrated further in the figure below.

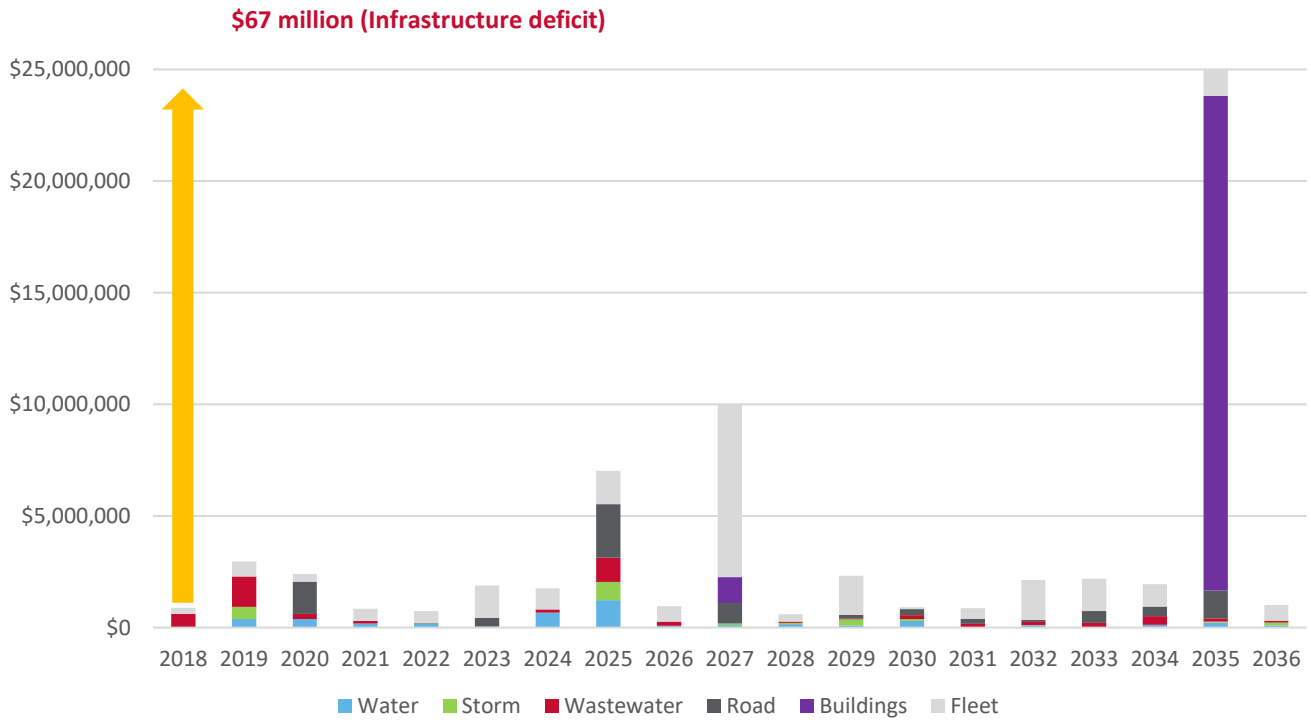
Figure 5.4 The Relationship Between Risk and Investment Level



When do our asset need to be replaced (past their standard service life)?

Anticipated infrastructure investments over the next 20 years is illustrated in the figure below. This figure is based on Service Life Scenario 1.

Figure 5.5 Infrastructure Investment Profile by Asset Category



From the graph, it is apparent that the infrastructure deficit and the Memorial Arena replacement in 2035 will be the largest expenditure in any particular year. It should also be noted that expenditures are trending upwards but are evenly distributed (no large expenditures at the beginning of the planning period

or the end). This means that the City can expect that annual investments may be required over the next 20 years and beyond. It is important to note that assets replacement timing is not exact and can typically be spread out over several years to reduce the magnitude of the financial impacts in any particular year.

This trade-off can be better understood by considering three investment level indicators:

- Average Annual Life Cycle Investment (AALCI)
- 20 Year Average Annual Investment (AAI)
- Infrastructure Deficit

It is important to note that infrastructure investment refers to investing funds in renewal of existing infrastructure (capital expenditure) or investing funds in a protected reserve for future asset replacement. The investment level indicators do not take into account current reserve levels, ability to borrow or grant funding.

Each of these indicators are calculated using replacement costs (Appendix B) and service lives (Appendix C). Service life presents the greatest uncertainty and is the most sensitivity parameter of the two. This uncertainty stems from factors that affect service life such as construction technique, soil type, maintenance demand, material and future investment into asset management. Since there is some uncertainty with this measurement, it's important to understand how each indicator is affected as the service life changes. Three scenarios were analyzed to determine this:

- Service Life Scenario 1: Industry Best Practice Service Lives
- Service Life Scenario 2: Service Life Increased by 25%
- Service Life Scenario 3: Service Life Increased by 50%

Service lives can be extended through focused effort on the maintenance of assets. It is essential to communicate the importance of good maintenance with field staff. Good maintenance increases service life, which in turns reduces annual capital costs.

Based on the previously discussed relationship between risk, service life and investment levels, these scenarios have been created for comparison to assist Fernie in determining its targeted sustainable funding level.

5.1 Infrastructure Deficit

The infrastructure deficit is a measure of the amount of infrastructure that has passed its theoretical service life but is still providing service to the community.

Infrastructure Deficit = Current Year > Year of Asset Replacement

Although the asset is still providing service, it is typically nearing the end of its life and will require field investigation to determine if the asset needs to be replaced or not.

Changes in the asset service life can turn future expenditures to a deficit or vice versa. For example: an asset is scheduled for replacement in 2016 which means the asset has passed its theoretical service life and will be recorded as a deficit. If that asset's service life is extended, the asset is no longer a deficit and instead listed in a future year for replacement.

The table below illustrates the infrastructure renewal deficit for the three Service Life Scenarios.

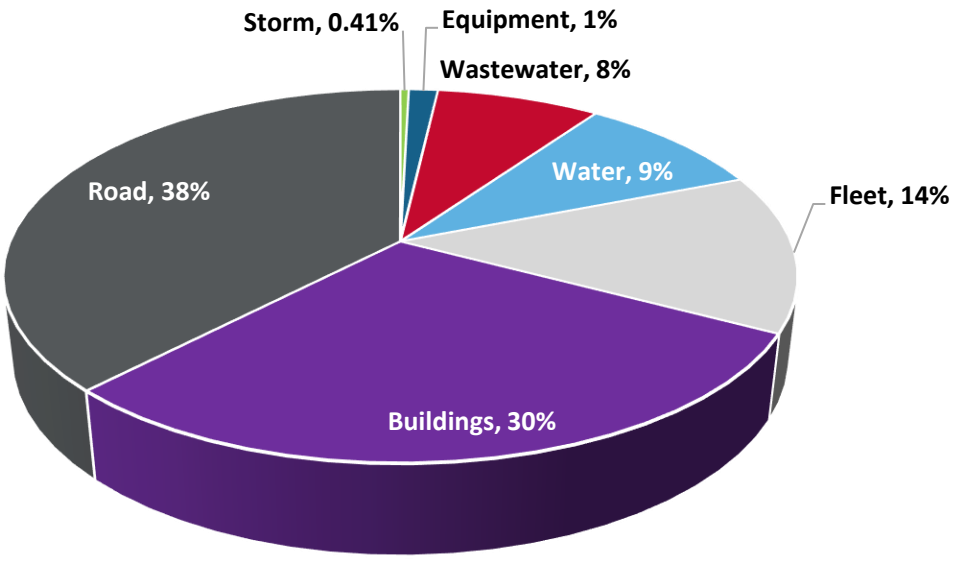
Figure 5.6 Infrastructure Deficit by Asset Category

Infrastructure Deficit			
Asset Category	**Scenario 1: Standard Service Life (SL)**	**Scenario 2: SL Increased by 25%**	**Scenario 3: SL Increased by 50%**
General Fund			
Road	$25,469,000	$4,089,000	$914,000
Buildings	$19,914,000	$19,914,000	$5,414,000
Fleet	$9,256,000	$7,674,000	$6,607,000
Equipment	$955,000	$885,000	$830,000
Storm	$277,000	$0	$0
Total	**$55,871,000**	**$32,562,000**	**$13,765,000**
Water	$6,248,000	$5,744,000	$4,530,000
Wastewater	$5,362,000	$3,615,000	$1,602,000
Total	**$67,481,000**	**$41,921,000**	**$19,897,000**

From the information above, the infrastructure renewal deficit can be reduced from $67.5 million to $19.9 million (71%) if the service life estimates are increased by 50%.

The distribution of the infrastructure renewal deficit between asset categories is summarized below in Figure 5.7. This figure is based on Service Life Scenario 1.

Figure 5.7 Infrastructure Deficit by Asset Category



It should be noted that 80% of the infrastructure renewal deficit is represented by the road, building, and fleet asset categories. The infrastructure deficit provides the City an assessment of which assets may be nearing the end of their life and provides direction on where to focus condition inspections. Our recommendation is that the City develop a field condition inspection program which targets assets that have passed their theoretical service life to determine if the assets require replacement.

5.2 Average Annual Life Cycle Investment (AALCI):

The Average Annual Life Cycle Investment (AALCI) is defined as the summation of each asset's annual depreciation which is based on the assets replacement cost and service life.

$$\sum \frac{\text{Replacement Cost}}{\text{Service Life}}$$

The AALCI is the ideal funding level for sustaining existing infrastructure and should be a long-term target for the community. When planned for appropriately, the AALCI can be used in ensuring revenue stability, preventing unnecessary risk, and enabling a community to apply one-time funding to support new asset needs as opposed to addressing emergency situations. AALCI must be considered in conjunction with infrastructure renewal deficit (backlog) as this is forward looking parameter that does not consider historical expenditures.

AALCI is sensitive to changes in the service life, therefore it's important to understand how the investment level could change based on how long an asset provides service. Understanding this sensitivity will help decision makers when deciding what investment level is best for the community. The table below illustrates the AALCI for Service Life Scenarios 1 to 3.

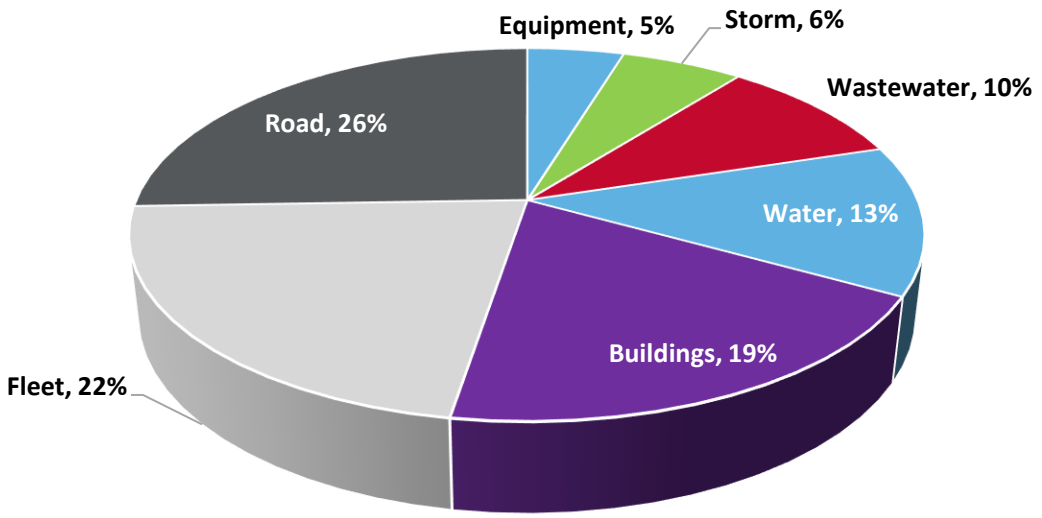
Figure 5.8 Average Annual Life Cycle Investment by Asset Category

Average Annual Life Cycle Investment			
Asset Category	**Scenario 1: Standard Service Life (SL)**	**Scenario 2: SL Increased by 25%**	**Scenario 3: SL Increased by 50%**
General Fund			
Road	$1,536,000	$1,224,000	$1,023,000
Buildings	$1,171,000	$938,000	$781,000
Fleet	$1,317,000	$1,053,000	$878,000
Equipment	$282,000	$226,000	$188,000
Storm	$356,000	$285,000	$239,000
Total	**$4,662,000**	**$3,726,000**	**$3,109,000**
Water	$780,000	$622,000	$521,000
Wastewater	$575,000	$460,000	$384,000
Total	**$6,017,000**	**$4,808,000**	**$4,014,000**

As the service life of the asset increases (Scenario 1 to 3), the average annual investment can be reduced. Based on the results, the average annual investment can be reduced from $6 million to $4 million (33% reduction) if the service life is increased by 50%.

The distribution of the total AALCI between asset categories is summarized below in Figure 5.9. This figure is based on Service Life Scenario 1.

Figure 5.9 AALCI Distribution by Asset Category



It should be noted that 80% of the AALCI is represented by the road, building, fleet, and water asset categories.

5.3 20 Year Average Annual Investment (20 Year AAI)

Another indicator that can be used to determine the trade-off between risk and investment level is the 20 Year Average Annual Investment (20 Year AAI).

$$\frac{\text{20 Year Total Investment}}{\text{20}}$$

This indicator provides insights on how much should be spent on an annual basis to fund asset replacements anticipated over the next 20 years. The 20 Year AAI includes the investments required to address the current infrastructure deficit.

Service life estimates directly affect the 20-year expenditures as they indicate when an asset is scheduled to have no remaining life (needs replacement). For example: If the asset service life is extended, the estimated replacement year might change from 2030 to 2040 which pushes the project outside the 20-year planning horizon and reduces 20 Year AAI. This does not make the expenditure disappear, it simply postpones it. Therefore, the AALCI is a more accurate financial indicator since it accounts for replacements outside the planning horizon. Although the AALCI takes a more long-term view to funding, it does not account for the infrastructure renewal deficit. Therefore, it is important to consider the AALCI and infrastructure renewal deficit together. The table below illustrates the changes in the 20 Year AAI for the three Service Life Scenarios.

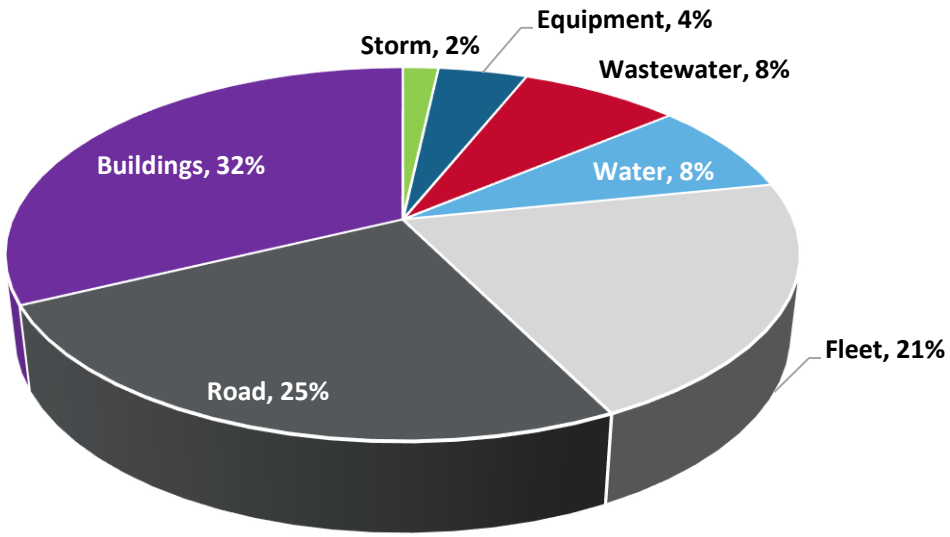
Figure 5.10 20 Year AAI by Asset Category

20 Year AAI			
Asset Category	**Scenario 1: Standard Service Life (SL)**	**Scenario 2: SL Increased by 25%**	**Scenario 3: SL Increased by 50%**
General Fund			
Road	$1,687,000	$970,000	$564,000
Buildings	$2,163,000	$1,055,000	$330,000
Fleet	$1,400,000	$1,146,000	$1,002,000
Equipment	$290,000	$230,000	$150,000
Storm	$116,000	$43,000	$0
Total	**$5,656,000**	**$3,444,000**	**$2,046,000**
Water	$534,000	$397,000	$318,000
Wastewater	$524,000	$403,000	$266,000
Total	**$6,714,000**	**$4,244,000**	**$2,630,000**

From the information above, the 20 Year AAI can be reduced from $6.7 million to $2.6 million (61%) if the service life estimates are increased by 50%.

The distribution of the 20-year AAI between asset categories is summarized below in Figure 5.11. This figure is based on Service Life Scenario 1.

Figure 5.11 20 Year AAI Distribution by Asset Category



It should be noted that 80% of the 20-year AAI is represented by the road, building, and fleet asset categories. This means that majority of the investments over the next 20 years may be focused on these assets. There are large capital expenditures expected over the next 20 years. Before these assets are scheduled for replacement, a condition assessment should be completed to confirm the need to replace the asset. Once the asset is inspected, it can be scheduled for replacement or the service life can be extended.

5.4 Investment Summary

In summary, there is a direct correlation between investment level, risk and willingness to invest in asset management. There are three indicators that can be used to determine the appropriate investment level; AALCI, 20 Year AAI and Infrastructure Deficit. Each of these indicators are directly affected by service life (which is an estimate only). For now, it is important for decision makers to use the investment level indicators to set a long-term funding targets and on-going budgeting. In the meanwhile, the City should consider completing initiatives to contain costs and increase revenues (further defined in the recommendations). **For example:** The City could consider developing a condition assessment program to better understand the actual service lives of assets in the community. If assets are found to be in better condition than expected, the remaining life on each asset can be increased and the annual investment level can be reduced.

5.5 Investment Indicators and Value Further Defined

In order for the public and Council to understand the magnitude of the infrastructure value and the investment level indicators presented, some communities have presented these numbers on a per capita basis. For example, residents can be presented with the information that infrastructure is the foundation needed to deliver the services that everyone enjoys, such as clean drinking water at their tap and roads to move people and goods efficiently around the community. For delivery of these services, there is $58,000 worth of infrastructure for every person in Fernie, which requires $1,200 of capital re-investment annually per person to sustainably deliver the services resulting from this infrastructure. In doing so, the relatively large numbers are presented in a way that is more tangible and understandable to the community. Per capita values are displayed below in Figure 5.12.

Figure 5.12 Per Capita Infrastructure Values

Per Capita Infrastructure Values			
Description	**Scenario 1: Standard Service Life (SL)**	**Scenario 2: SL Increased by 25%**	**Scenario 3: SL Increased by 50%**
Infrastructure Value Per Capita	$58,000	$58,000	$58,000
Infrastructure Deficit Per Capita	$14,000	$9,000	$4,000
AALCI Per Capita	$1,200	$1,000	$830
20 Year AAI Per Capita	$1,400	$875	$550

Notes:

- *These values were derived using the standard Service Life Scenario.*
- *These values should not hold any financial significance.*
- *These values do not take into account the City's ability to borrow, wiliness to take on risk and level of service.*
- *These figures were based on an assumed population of 4,850 people (Stats Canada).*

6 State of Fernie's Infrastructure – Level 2

6.1 Road System

6.1.1 What assets do we own?

- 13.4km of conduit
- 26 km of pedestrian pathway
- 275 Square meters of retaining wall
- 275 Streetlights
- 1 Traffic signal
- 54 km of vehicle surface

6.1.2 What is the replacement value our assets?

Figure 6.1 Road System Replacement Values

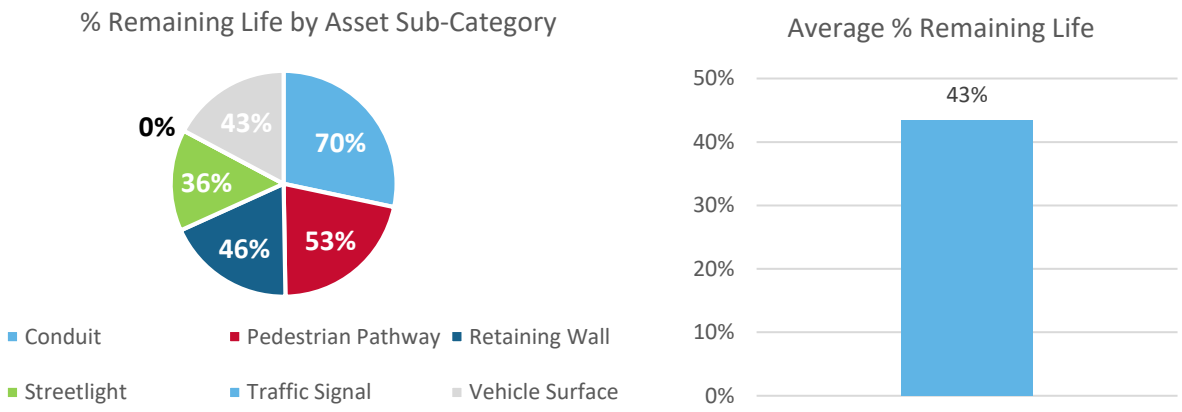
Asset Sub-Category	Replacement Value
Conduit	$2,046,000
Pedestrian Pathway	$2,391,000
Retaining Wall	$202,000
Streetlight	$2,936,000
Traffic Signal	$293,000
Vehicle Surface (includes base and sub-base)	$68,988,000
Total	**$76,856,000**

Notes:

- *90% of the infrastructure value is made up vehicle surfaces*

6.1.3 What is the estimated remaining life of our assets?

Figure 6.2 Road System Remaining Life



Notes:

- *Physical condition of the asset is not known, the age of the asset is used to estimate its remaining life (refer to terms and definitions)*
- *50% are in very good or good condition (>50% remaining life)*
- *On average, the road assets have 43% remaining life*
- *The information is based on Service Life Scenario 1*

6.1.4 How much money needs to be invested annually (on average) to sustain our assets?

Figure 6.3 Road System Average Annual Life Cycle Investment (AALCI)

Average Annual Life Cycle Investment (AALCI)			
Asset Sub-Category	**Scenario 1: Standard Service Life (SL)**	**Scenario 2: SL Increased by 25%**	**Scenario 3: SL Increased by 50%**
Conduit	$21,000	$17,000	$14,000
Pedestrian Pathway	$48,000	$38,000	$32,000
Retaining Wall	$4,100	$13,000	$2,700
Streetlight	$84,000	$67,000	$56,000
Traffic Signal	$9,800	$1,300	$6,500
Vehicle Surface (includes base and sub-base)	$1,369,000	$1,088,000	$912,000
Total	**$1,536,000**	**$1,224,000**	**$1,023,000**

Notes:

- *AACLI can be reduced from $1.5 million to $1.0 million (33%) if service life is increased by 50%*
- *Vehicle surfaces represent 90% of the AALCI*

Figure 6.4 Road System 20 Year Average Annual Investment (20 Year AAI)

20 Year Average Annual Investment (20 Year AAI)			
Asset Category	**Scenario 1: Standard Service Life (SL)**	**Scenario 2: SL Increased by 25%**	**Scenario 3: SL Increased by 50%**
Conduit	$0	$0	$0
Pedestrian Pathway	$46,000	$9,500	$7,500
Retaining Wall	$2,800	$3,300	$2,800
Streetlight	$104,000	$58,000	$51,000
Traffic Signal	$15,000	$7,800	$15,000
Vehicle Surface (includes base and sub-base)	$1,519,000	$891,000	$488,000
Total	**$1,687,000**	**$970,000**	**$564,000**

Notes:

- *20 Year AAI can be reduced from $1.7 million to $564,000 (67%) if service life is increase by 50%. This does not mean the investments disappears but instead they are pushed outside the 20-year planning horizon.*
- *Vehicle surfaces represent 90% of the 20-year AAI (Service Life Scenario 1)*

Figure 6.5 Road System Infrastructure Deficit

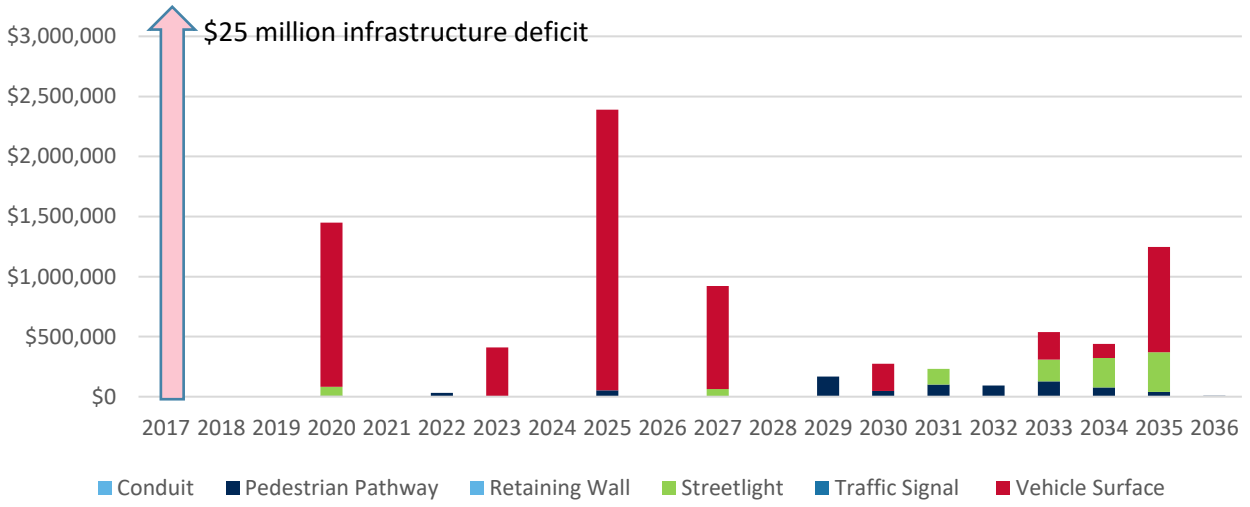
Infrastructure Deficit			
Asset Category	**Scenario 1: Standard Service Life (SL)**	**Scenario 2: SL Increased by 25%**	**Scenario 3: SL Increased by 50%**
Conduit	$0	$0	$0
Pedestrian Pathway	$150,000	$137,000	$40,000
Retaining Wall	$55,000	$55,000	$0
Streetlight	$1,004,000	$662,000	$129,000
Traffic Signal	$293,000	$293,000	$0
Vehicle Surface (includes base and sub-base)	$23,967,000	$2,942,000	$745,000
Total	**$25,469,000**	**$4,089,000**	**$914,000**

Notes:

- *The infrastructure deficit can be reduced from $25.5 million to $914,000 million (96%) if service life is increased by 50%*
- *Vehicle surfaces represent 94% of the Infrastructure deficit (Service Life Scenario 1)*

6.1.5 When do our assets need to be replaced?

Figure 6.6 Road System Investment Profile



Notes:

- *Graph is based on Service Life Scenario 1*

6.2 Buildings

6.2.1 What assets do we own?

- *3 Civic buildings*
- *17 Leisure Services buildings*
- *19 Public Works buildings*
- *Buildings that support water and sanitary assets are accounted for within their respective sections*

6.2.2 What is the replacement value of our assets?

Figure 6.7 Buildings System Replacement Values

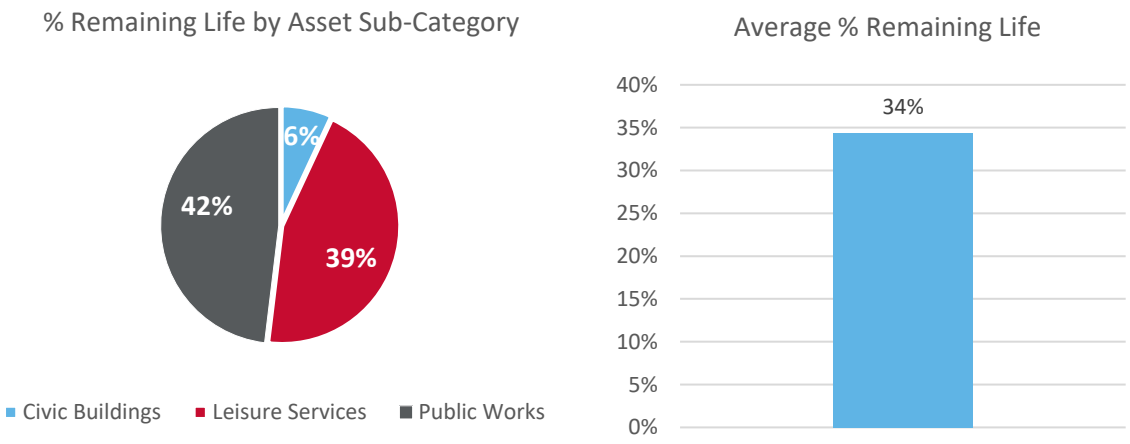
Asset Category	Replacement Value
Civic Buildings	$11,844,000
Leisure Services	$64,342,000
Public Works	$4,071,000
Total	**$80,257,000**

Notes:

- *The replacement value was based on the 2015 insurance value report*
- *80% of the infrastructure value is represented by leisure services*

6.2.3 What is the estimated remaining life of our assets?

Figure 6.8 Buildings System Remaining Life



Notes:

- *Physical condition of the asset is not known, the age of the asset is used to estimate it remaining life (refer to terms and definitions)*
- *36% of the assets are in good condition and 39% of the assets are in poor condition (<25% remaining life)*
- *On average, the building assets have 34% remaining life (Service Life Scenario 1)*
- *Information is based on Service Life Scenario 1*

6.2.4 How much money needs to be invested annually (on average) to sustain our assets?

Figure 6.9 Buildings System Average Annual Life Cycle Investment (AALCI)

Average Annual Life Cycle Investment (AALCI)			
Asset Category	**Scenario 1: Standard Service Life (SL)**	**Scenario 2: SL Increased by 25%**	**Scenario 3: SL Increased by 50%**
Civic Buildings	$158,000	$127,000	$106,000
Leisure Services	$858,000	$687,000	$572,000
Public Works	$155,000	$124,000	$103,000
Total	**$1,171,000**	**$938,000**	**$781,000**

Notes:

- *AACLI can be reduced from $1.2 million to $780,000 (33%) if service life is increased by 50%*
- *75% of the AALCI is represented by leisure services buildings (Service Life Scenario 1)*

Figure 6.10 Buildings System 20 Year Average Annual Investment (20 Year AAI)

20 Year Average Annual Investment (20 Year AAI)			
Asset Category	**Scenario 1: Standard Service Life (SL)**	**Scenario 2: SL Increased by 25%**	**Scenario 3: SL Increased by 50%**
Civic Buildings	$493,000	$493,000	$214,000
Leisure Services	$1,554,000	$446,000	$0
Public Works	$116,000	$116,000	$116,000
Total	**$2,163,000**	**$1,055,000**	**$330,000**

Notes:

- *20 Year AAI can be reduced from $2.2 million to $330,000 (85%) if service life is increase by 50%. This does not mean the investments disappears but instead they are pushed outside the 20-year planning horizon.*
- *72% of the 20 Year AAI is represented by Leisure service buildings*

Figure 6.11 Buildings System Infrastructure Deficit

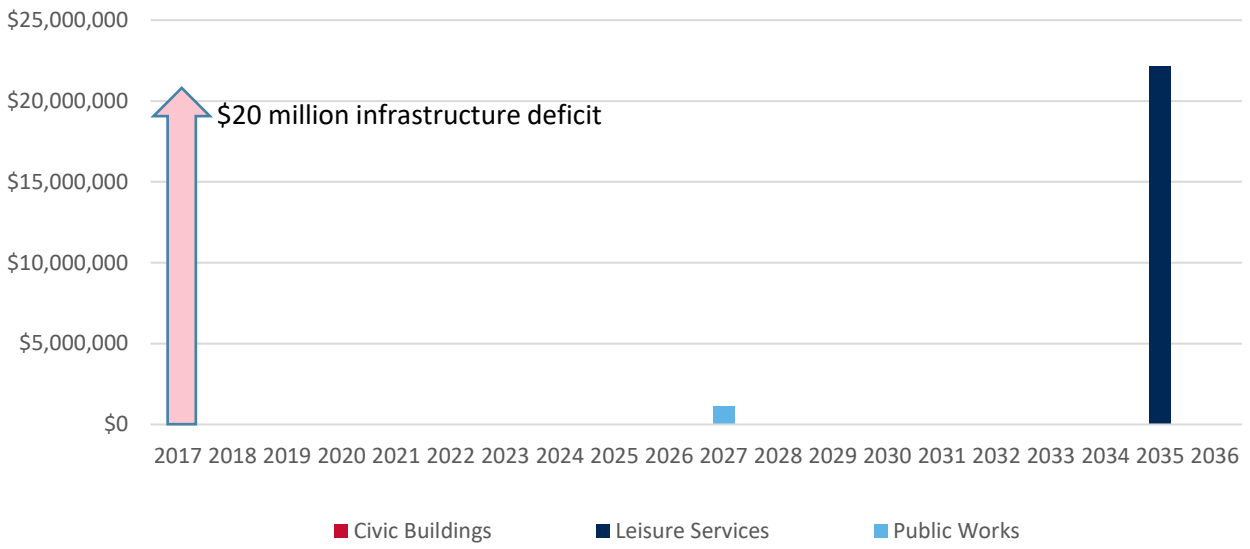
Infrastructure Deficit			
Asset Category	**Scenario 1: Standard Service Life (SL)**	**Scenario 2: SL Increased by 25%**	**Scenario 3: SL Increased by 50%**
Civic Buildings	$9,860,000	$9,860,000	$4,261,000
Leisure Services	$8,901,000	$8,901,000	$0
Public Works	$1,153,000	$1,153,000	$1,153,000
Total	**$19,914,000**	**$19,914,000**	**$5,414,000**

Notes:

- *The infrastructure deficit can be reduced from $19.9 million to $5.4 million (73%) if service life is increased by 50%*
- *95% of the infrastructure deficit is represented by civic and leisure services buildings*

6.2.5 When do our assets need to be replaced?

Figure 6.12 Buildings System Investment Profile



Notes:

- *Graph is based on Service Life Scenario 1*

6.3 Fleet and Equipment

6.3.1 What assets do we own?

- *81 Fleet vehicles*
- *Various pieces of equipment that support municipal operations such as file cabinets, book shelves, desks, chairs etc.*

6.3.2 What is the estimated replacement value of our assets?

Figure 6.13 Fleet and Equipment Replacement Values

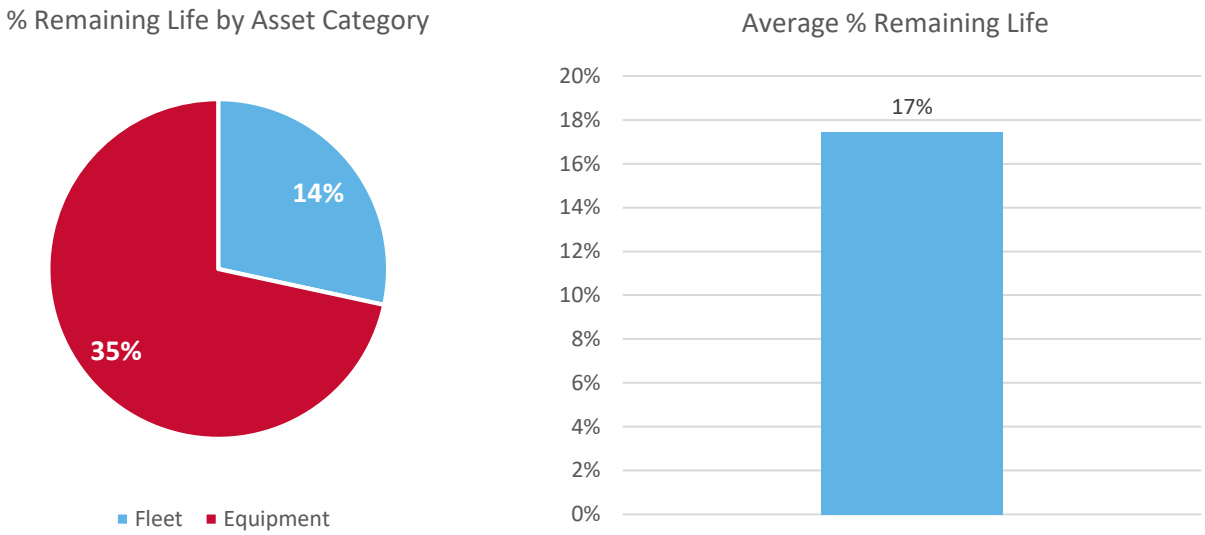
Asset Category	Replacement Value
Fleet	$12,466,000
Equipment	$2,529,000
Total	**$14,995,000**

Notes:

- *80% of the infrastructure value is represented by fleet assets*

6.3.3 What is the estimated remaining life of our assets?

Figure 6.14 Fleet and Equipment Remaining Life



Notes:

- *Physical condition of the asset is not known, the age of the asset is used to estimate its remaining life (refer to terms and definitions)*
- *20% of the assets are in good or very good condition and 68% of the assets are in very poor condition*
- *On average the fleet, equipment and park assets have 17% remaining life*
- *The information is based on Service Life Scenario 1*

6.3.4 How much money needs to be invested annually (on average) to sustain our assets?

Figure 6.15 Fleet and Equipment Average Annual Life Cycle Investment (AALCI)

Average Annual Life Cycle Investment (AALCI)			
Asset Category	**Scenario 1: Standard Service Life (SL)**	**Scenario 2: SL Increased by 25%**	**Scenario 3: SL Increased by 50%**
Fleet	$1,317,000	$1,053,000	$878,000
Equipment	$282,000	$226,000	$188,000
Total	**$1,599,000**	**$1,279,000**	**$1,066,000**

Notes:

- *AACLI can be reduced from $1.6 million to $1.1 million (33%) if service life is increased by 50%*
- *Fleet assets represent 80% of the AALCI*

Figure 6.16 Fleet and Equipment 20 Year Average Annual Investment (20 Year AAI)

20 Year Average Annual Investment (20 Year AAI)			
Asset Category	**Scenario 1: Standard Service Life (SL)**	**Scenario 2: SL Increased by 25%**	**Scenario 3: SL Increased by 50%**
Fleet	$1,400,000	$1,146,000	$1,002,000
Equipment	$290,000	$230,000	$150,000
Total	**$1,690,000**	**$1,376,000**	**$1,152,000**

Notes:

- *20 Year AAI can be reduced from $1.7 million to $1.2 million (32%) if service life is increase by 50%. This does not mean the investments disappears but instead they are pushed outside the 20-year planning horizon.*
- *Fleet assets represent 80% of the 20-year AAI*

Figure 6.17 Fleet and Equipment Infrastructure Deficit

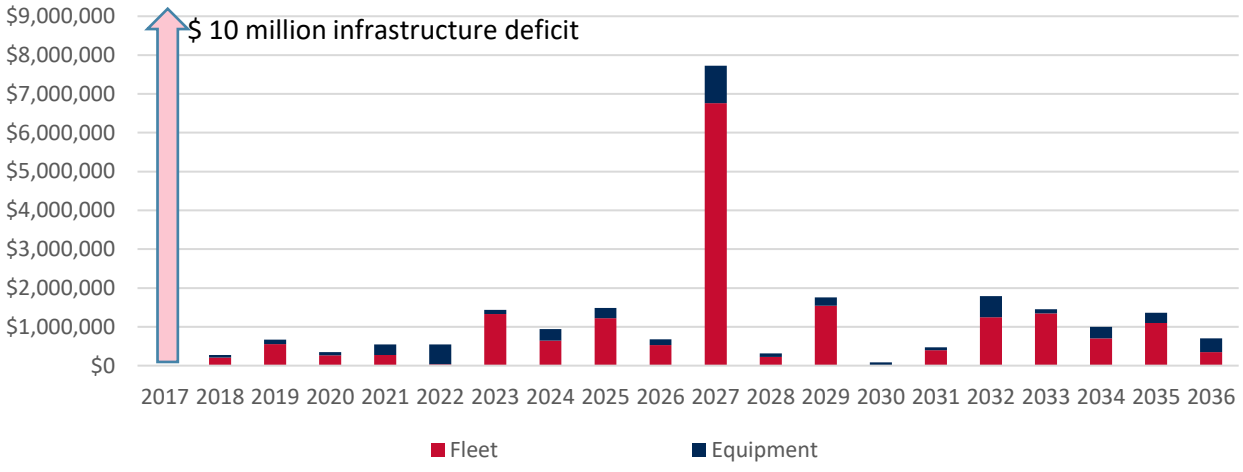
Infrastructure Deficit			
Asset Category	**Scenario 1: Standard Service Life (SL)**	**Scenario 2: SL Increased by 25%**	**Scenario 3: SL Increased by 50%**
Fleet	$9,256,000	$7,674,000	$6,607,000
Equipment	$955,000	$885,000	$830,000
Total	**$10,211,000**	**$8,559,000**	**$7,437,000**

Notes:

- *The infrastructure deficit can be reduced from $10.2 million to $7.4 million (90%) if service life is increased by 50%*
- *Fleet assets represent 91% of the Infrastructure deficit*

6.3.5 When do our assets need to be replaced?

Figure 6.18 Fleet and Equipment Investment Profile



Notes:

- *Graph is based on Service Life Scenario 1*

6.4 Stormwater System

6.4.1 What assets do we own?

- *1,600m2 of bin wall/gabian retaining walls*
- *2km of culverts*
- *29km of mains*
  1,200 manholes

6.4.2 What is the estimated replacement value of our assets?

Figure 6.19 Stormwater System Replacement Values

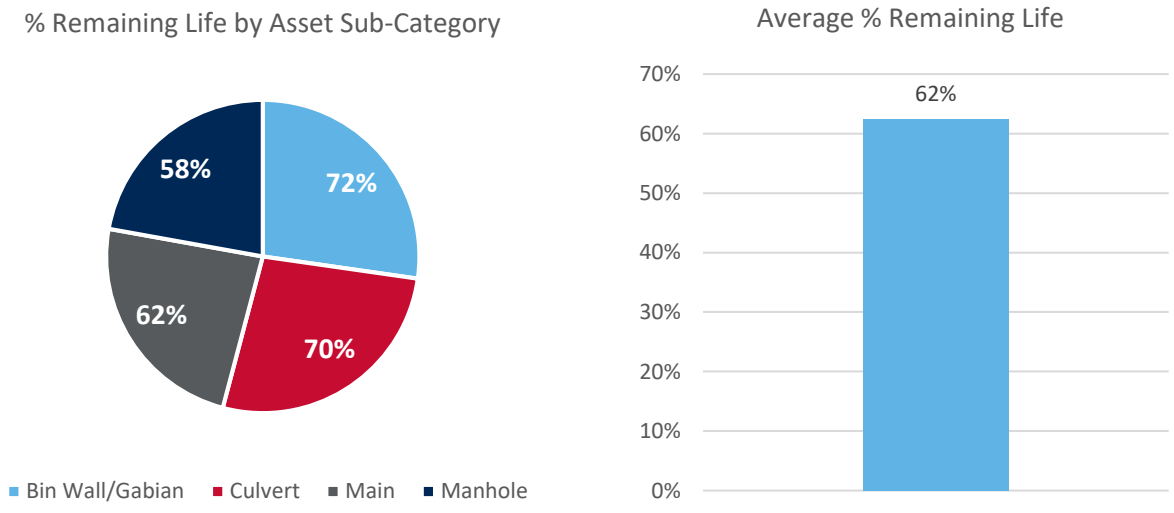
Asset Category	Replacement Value
Bin Wall/Gabian	$1,187,000
Culvert	$2,061,000
Main	$19,185,000
Manhole	$5,153,000
Total	**$27,586,000**

Notes:

- *80% of infrastructure is made up storm pipes (including mains and culverts)*

6.4.3 What is the estimated remaining life of our assets?

Figure 6.20 Stormwater System Remaining Life



Notes:

- *Physical condition of the asset is not known, the age of the asset is used to estimate its remaining life (refer to terms and definitions)*
- *67% of the asset are in good or very good condition but 7% of the assets are in poor condition*
- *On average, the storm system has 62% remaining life*
- *The information is based on Service Life Scenario 1*

6.4.4 How much money needs to be invested annually (on average) to sustain our assets?

Figure 6.21 Stormwater System Average Annual Life Cycle Investment (AALCI)

Average Annual Life Cycle Investment (AALCI)			
Asset Category	**Scenario 1: Standard Service Life (SL)**	**Scenario 2: SL Increased by 25%**	**Scenario 3: SL Increased by 50%**
Bin Wall/Gabian	$16,000	$13,000	$11,000
Culvert	$26,000	$21,000	$18,000
Main	$228,000	$182,000	$152,000
Manhole	$86,000	$69,000	$58,000
Total	**$356,000**	**$285,000**	**$239,000**

Notes:

- *AACLI can be reduced from $356,000 to $239,000 (33%) if service life is increased by 50%.*
- *Mains and manholes represent majority of the AALCI (88% in scenario 1)*

Figure 6.22 Stormwater System 20 Year Average Annual Investment (20 Year AAI)

20 Year Average Annual Investment (20 Year AAI)			
Asset Category	**Scenario 1: Standard Service Life (SL)**	**Scenario 2: SL Increased by 25%**	**Scenario 3: SL Increased by 50%**
Bin Wall/Gabian	$0	$0	$0
Culvert	$0	$0	$0
Main	$70,000	$42,000	$0
Manhole	$46,000	$680	$0
Total	**$116,000**	**$43,000**	**$0**

Notes:

- *The 20-year AAI can be reduced from $116,000 to $0 (100%) if service life is increased by 50%. This means that assets are relatively new and when the service life is increased they simply fall outside the 20-year planning window*
- *100% of the 20-year AAI is represented by mains and manholes*

Figure 6.23 Stormwater System Infrastructure Deficit

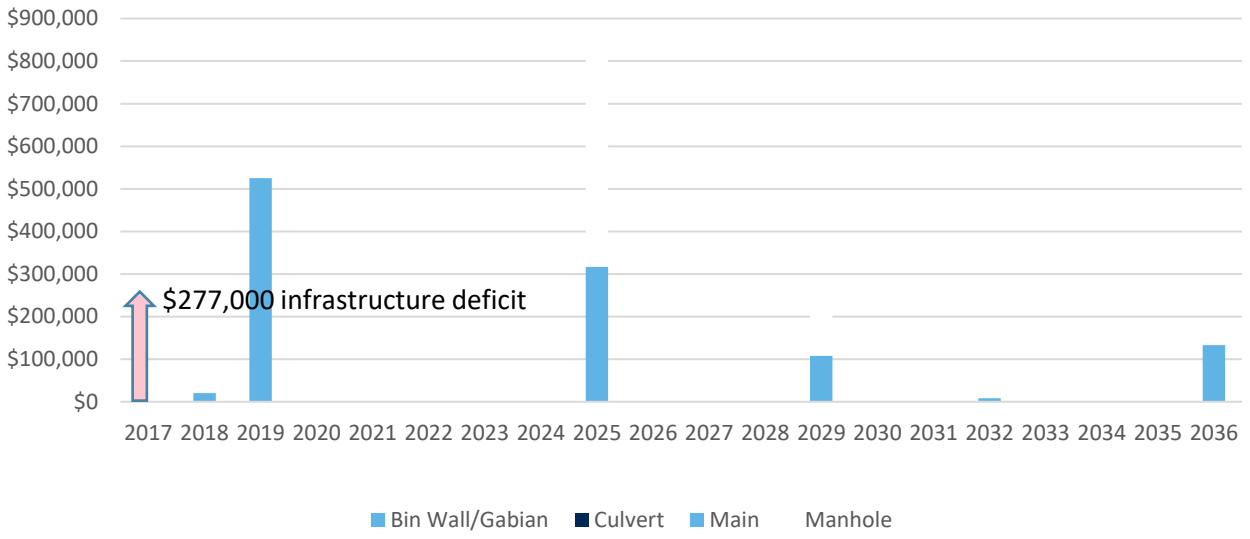
Infrastructure Deficit			
Asset Category	**Scenario 1: Standard Service Life (SL)**	**Scenario 2: SL Increased by 25%**	**Scenario 3: SL Increased by 50%**
Bin Wall/Gabian	$0	$0	$0
Culvert	$0	$0	$0
Main	$277,000	$0	$0
Manhole	$0	$0	$0
Total	**$277,000**	**$0**	**$0**

Notes:

- *Age estimates were based on broad assumptions from staff – needs to be confirmed through field investigation (results may not be reflective of actual deficit)*
- *The infrastructure deficit can be reduced from $277,000 to $0 (100%) if service life is increased by 50%. Mains represent 100% of the Infrastructure deficit*

6.4.5 When do our assets need to be replaced?

Figure 6.24 Stormwater System Investment Profile



Notes:

- *Graph is based on Service Life Scenario 1*

6.5 Water System

6.5.1 What assets do we own?

- *9 Facilities*
- *14 Air Relief Valves*
- *241 hydrants*
- *74 km of main*
- *1000 main and service line valves*
  2 valve with chamber

6.5.2 What is the estimated replacement value of our assets?

Figure 6.25 Water System Replacement Values

Asset Category	Replacement Value
Facility*	**$8,168,000**
Booster Station	$774,000
Intake Station	$446,000
Pressure Reducing Valve	$250,000

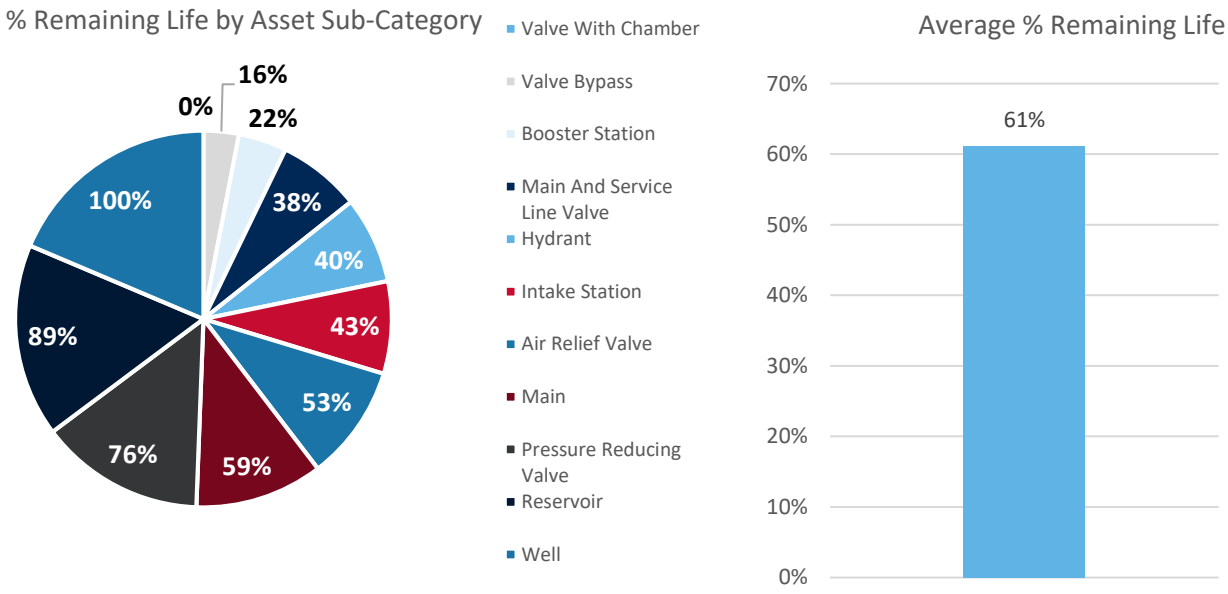
Reservoir	$3,419,000
Well	$3,279,000
Pipe and Features	**$42,181,000**
Air Relief Valve	$254,000
Hydrant	$1,446,000
Main	$37,407,000
Main And Service Line Valve	$2,968,000
Valve Bypass	$87,000
Valve With Chamber	$19,000
Total	**$50,349,000**

Notes:

- *75% of infrastructure value is represented by watermains*
- *Facilities include structures such as the buildings that support booster stations as well as their mechanical and electrical systems.*

6.5.3 What is the estimated remaining life of our assets?

Figure 6.26 Water System Remaining Life



Notes:

- *Physical condition of the asset is not known, the age of the asset is used to estimate its remaining life (refer to terms and definitions)*
- *Approximately 75% of the assets are in good/very good condition (> 50% remaining life)*
- *On average, the water system has approximately 61% remaining life*
- *The information is based on Service Life Scenario 1*

6.5.4 How much money needs to be invested annually (on average) to sustain our assets?

Figure 6.27 Water System Average Annual Life Cycle Investment (AALCI)

Average Annual Life Cycle Investment (AALCI)			
Asset Category	**Scenario 1: Standard Service Life (SL)**	**Scenario 2: SL Increased by 25%**	**Scenario 3: SL Increased by 50%**
Facility	**$190,600**	**$151,900**	**$128,100**
Booster Station	$34,000	$27,000	$23,000
Reservoir	$46,000	$37,000	$31,000
Well	$89,000	$71,000	$60,000
Intake Station	$13,000	$10,000	$8,400
Pressure Reducing Valve	$8,600	$6,900	$5,700
Pipe and Features	**$589,370**	**$470,280**	**$392,910**
Air Relief Valve	$6,400	$5,100	$4,300
Air Relief Valve	$37,000	$29,000	$25,000
Hydrant	$467,000	$373,000	$311,000
Main	$75,000	$60,000	$50,000
Main And Service Line Valve	$3,500	$2,800	$2,300
Valve Bypass	$470	$380	$310
Total	**$780,000**	**$622,000**	**$521,000**

Notes:

- *AACLI can be reduced from $780,000 to $521,000 (33%) if service life is increased by 50%*
  Pipes and Features represent 75% of the AALCI and Facilities represent 25% of the AACLI

Figure 6.28 Water System 20 Year Average Annual Investment (20 Year AAI)

20 Year Average Annual Investment (20 Year AAI)			
Asset Category	**Scenario 1: Standard Service Life (SL)**	**Scenario 2: SL Increased by 25%**	**Scenario 3: SL Increased by 50%**
Facility	**$60,800**	**$15,900**	**$15,900**
Booster Station	$39,000	$13,000	$13,000
Reservoir	$0	$0	$0
Well	$0	$0	$0
Intake Station	$13,000	$2,900	$2,900
Pressure Reducing Valve	$8,800	$0	$0
Pipe and Features	**$472,830**	**$381,230**	**$301,730**
Air Relief Valve	$5,500	$5,500	$0
Hydrant	$44,000	$37,000	$7,800
Main	$332,000	$270,000	$267,000
Main And Service Line Valve	$86,000	$65,000	$26,000
Valve Bypass	$4,400	$2,800	$0
Valve With Chamber	$930	$930	$930
Total	**$534,000**	**$397,000**	**$318,000**

Notes:

- *20 Year AAI can be reduced from $534,000 to $318,000 (40%) if service life is increase by 50%. This does not mean the investments disappears but instead they are pushed outside the 20-year planning horizon.*
- *Pipe and features represent 90% of the 20-year AAI and facilities represent 10% of the 20 Year AAI*

Figure 6.29 Water System Infrastructure Deficit

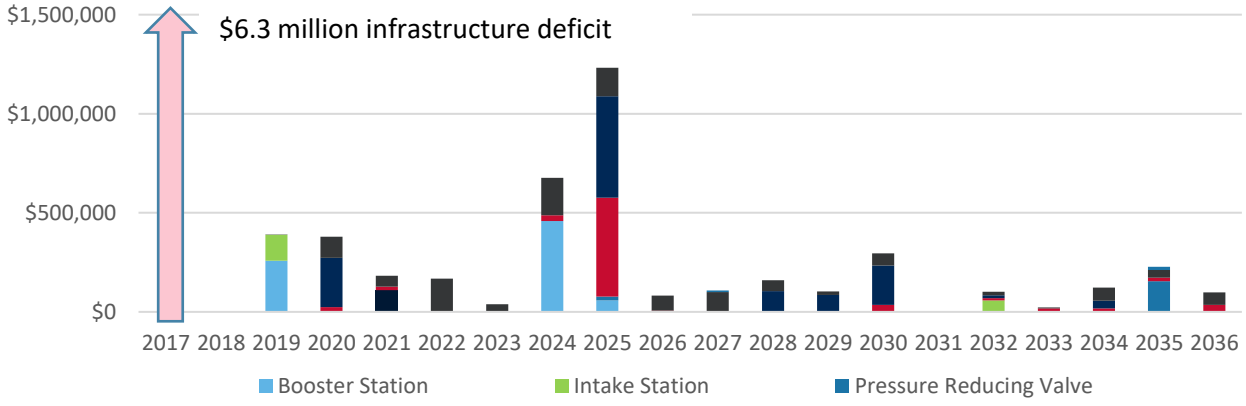
Infrastructure Deficit			
Asset Category	**Scenario 1: Standard Service Life (SL)**	**Scenario 2: SL Increased by 25%**	**Scenario 2: SL Increased by 50%**
Facility	**$58,000**	**$58,000**	**$58,000**
Booster Station	$0	$0	$0
Reservoir	$0	$0	$0
Well	$0	$0	$0
Intake Station	$58,000	$58,000	$58,000
Pressure Reducing Valve	$0	$0	$0
Pipe and Features	**$6,190,000**	**$5,686,000**	**$4,472,000**
Air Relief Valve	$0	$0	$0
Hydrant	$156,000	$0	$0
Main	$5,431,000	$5,338,000	$4,213,000
Main And Service Line Valve	$520,000	$273,000	$240,000
Valve Bypass	$64,000	$56,000	$0
Valve With Chamber	$19,000	$19,000	$19,000
Total	**$6,248,000**	**$5,744,000**	**$4,530,000**

Notes:

- *The infrastructure deficit can be reduced from $6.3 million to $4.5 million (27%) if service life is increased by 50%*
  Pipe and features represent 99% of the Infrastructure deficit and facilities represent 1% of the infrastructure deficit

6.5.5 When do our assets need to be replaced?

Figure 6.30 Water System Investment Profile



Notes:

- *Graph is based on Service Life Scenario 1*

6.6 Wastewater System

6.6.1 What assets do we own?

- *7 lift stations*
- *1 Treatment Facility*
- *5 Air Relief Valves*
- *56 km of mains (includes mains, forcemains, casing & outfalls)*
- *9 Main and service line valves*
- *640 manholes*
- *2 Valves with chambers*

6.6.2 What is the estimated replacement value of our assets?

Figure 6.31 Wastewater System Replacement Values

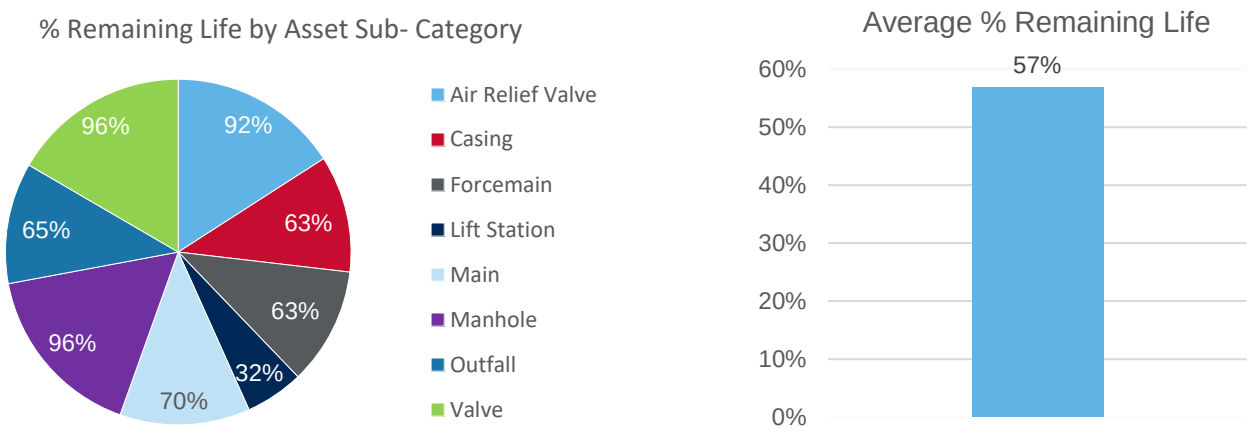
Asset Category	Replacement Value
Facility	**$6,915,000**
Lift Station	$4,058,000
Treatment (incl. Lagoons and all buildings/processes)	$2,857,000
Pipe and Features	**$28,675,000**
Air Relief Valve	$75,000
Main	$25,219,000
Main And Service Line Valves	$17,000
Manhole	$3,345,000
Valve With Chamber	$19,000
Total	$35,590,000

Notes:

- *70% of the infrastructure value is represented by pipes and features and 30% is represented by lift stations*

6.6.3 What is the estimated remaining life of our assets?

Figure 6.32 Wastewater System Remaining Life



Notes:

- *Physical condition of the asset is not known, the age of the asset is used to estimate its remaining life (refer to terms and definitions)*
- *Asses are in in good condition overall with approximately 55% of the assets in good condition*
- *On average the Wastewater system has approximately 57% remaining life*
- *The information is based on Service Life Scenario 1*

6.6.4 How much money needs to be invested annually (on average) to sustain our assets?

Figure 6.33 Wastewater System Average Annual Life Cycle Investment (AALCI)

Average Annual Life Cycle Investment (AALCI)			
Asset Category	**Scenario 1: Standard Service Life (SL)**	**Scenario 2: SL Increased by 25%**	**Scenario 2: SL Increased by 50%**
Air Relief Valve	$3,000	$2,500	$2,000
Lift Station	$130,000	$104,000	$87,000
Main	$311,000	$248,000	$207,000
Main and Service Line Valves	$540	$430	$360
Manhole	$67,000	$54,000	$45,000
Treatment	$63,000	$51,000	$42,000
Valve with Chamber	$380	$300	$250
Total	**$575,000**	**$460,000**	**$384,000**

Notes:

- *AACLI can be reduced from $575,000 to $384,000 (33%) if service life is increased by 50%*
- *Pipes and Features represent 40% of the AALCI and Lift stations represent 60% of the AACLI*

Figure 6.34 Wastewater System 20 Year Average Annual Investment (20 Year AAI)

20 Year Average Annual Investment (20 Year AAI)			
Asset Category	**Scenario 1: Standard Service Life (SL)**	**Scenario 2: SL Increased by 25%**	**Scenario 2: SL Increased by 50%**
Air Relief Valve	$3,800	$3,800	$3,800
Lift Station	$131,000	$117,000	$85,000
Main	$283,000	$209,000	$124,000
Main And Service Line Valves	$720	$360	$180
Manhole	$105,000	$73,000	$53,000
Treatment	$0	$0	$0
Valve With Chamber	$930	$0	$0
Total	**$524,000**	**$403,000**	**$266,000**

Notes:

- *20 Year AAI can be reduced from $524,000 to $266,000 (48%) if service life is increase by 50%. This does not mean the investments disappears but instead they are pushed outside the 20-year planning horizon.*
- *Mains/manholes represent 70% of the 20-year AAI and Lift stations represent 25% of the 20-year AAI*

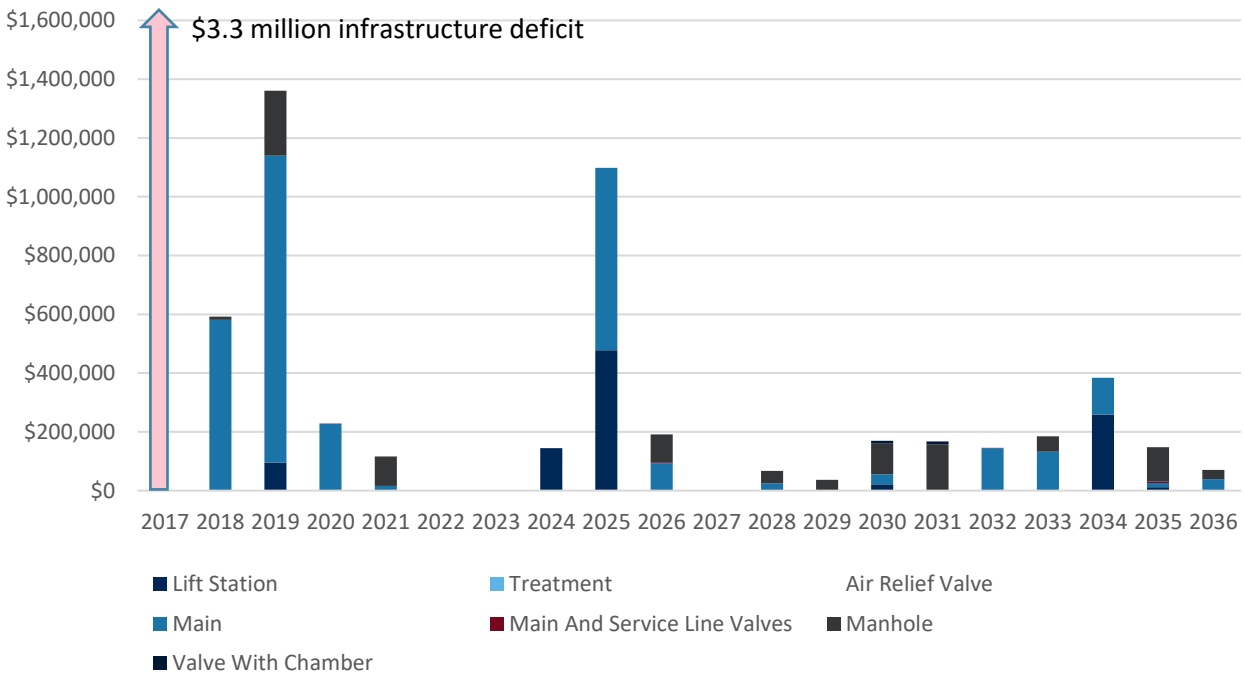
Figure 6.35 Wastewater System Infrastructure Deficit

Infrastructure Deficit			
Asset Category	**Scenario 1: Standard Service Life (SL)**	**Scenario 2: SL Increased by 25%**	**Scenario 2: SL Increased by 50%**
Air Relief Valve	$75,000	$0	$0
Lift Station	$1,602,000	$322,000	$276,000
Main	$2,554,000	$2,237,000	$286,000
Main and Service Line Valves	$1,800	$0	$0
Manhole	$1,129,000	$1,056,000	$1,040,000
Treatment	$0	$0	$0
Valve with Chamber	$0	$0	$0
Total	**$5,362,000**	**$3,615,000**	**$1,602,000**

Notes:

- *The infrastructure deficit can be reduced from $5,330,000 to $1,639,000 (70%) if service life is increased by 50%*
- *Mains represent 70% of the infrastructure deficit, Lift stations represent 30% of the infrastructure deficit*

Figure 6.36 Wastewater System Investment Profile



Notes:

- *Graph is based on Service Life Scenario 1*

7 Summary

In summary, Fernie owns $286 million in infrastructure that requires investment over the next 20 years and beyond to ensure that infrastructure and service levels are sustained. Decision makers must determine what level of investment is appropriate for the community in order to ensure these assets can continue to provide service. The table below summarizes three key investment indicators that can be used to help the City set long term funding targets.

Figure 7.1: Investment Level Indicators by Asset Category

Investment Level Indicators				
Asset Category	**Replacement Value**	**Average Annual Life Cycle Investment (AALCI)**	**20 Year Average Annual Investment (AAI)**	**Infrastructure Deficit (Backlog)**
Road	$76,856,000	$1,023,000 - $1,536,000	$564,000 - $1,687,000	$914,000 - $25,469,000
Buildings	$80,257,000	$781,000 – $1,171,000	$330,000 - $2,163,000	$5,414,000 – 19,914,000
Fleet	$12,466,000	$878,000 - $1,317,000	$1,002,000 - $1,400,000	$6,607,000 – $9,256,000
Equipment	$2,529,000	$188,000 - $282,000	$150,000 - $290,000	$830,000 - $955,000
Storm	$27,586,000	$239,000 - $356,000	$0 - $116,000	$0 - $277,000
Total	**$199,694,000**	**$3,109,000 - $4,662,000**	**$2,046,000 - $5,656,000**	**$13,765,000 - $55,871,000**
Water	$50,349,000	$521,000 - $780,000	$318,000 - $534,000	$4,530,000 – $6,248,000
Wastewater	$35,590,000	$384,000 - $575,000	$266,000 - $524,000	$1,602,000 - $5,362,000
Total	**$285,633,000**	**$4,014,000 - $6,017,000**	**$2,630,000 - $6,714,000**	**$19,897,000 - $67,481,000**

Each of the investment level indicators (AALCI, 20 Year AAI & backlog) is presented as a range (low and high). The lower value represents an investment scenario where the assets last twice as long as their expected service life and the larger value represents an investment scenario where the assets are replaced when they reach their expected service life. The City can use this information to begin understanding long term investment levels required to sustain infrastructure over the long term. Over time, the City should refine these investment level indicators based on risk, level of service and the financing capacity of the organization and the community.

7.1 Funding Level Options

The AMIP provides a comprehensive assessment of the replacement costs and estimated timing of replacement for all the City's water, wastewater, storm, road, building, equipment and fleet assets.

Since it is very difficult (if not impossible) to predict with any certainty when any given asset will fail, the AMIP relies on accepted industry standards for service life estimates combined with valuable input from the City of Fernie's operations staff to establish the best approximation of the expected lifespans. This represents the "base case" life spans as presented in Scenario 1. It is possible that the asset may last

longer than our base case estimates. It is important to understand that investment levels are sensitive to service life estimates. To provide context and illustrate this sensitivity on funding levels, three service life scenarios were presented.

1. Standard Service Life
2. Standard Service Life + 25%
3. Standard Service Life +50%

In addition to the three scenarios described above, we have also provided two separate planning horizons; a full asset lifecycle planning horizon which considers expenditures that are 20 years and beyond (AALCI) and a twenty-year planning horizon (20-year AAI) which only considers investments required in the next 20 years

The City will need to consider the following two key questions for each asset category to set a long-term funding target for each asset category:

1. What is the preferred planning horizon (AALCI or 20 Year AAI)?
2. What is the preferred Service Life Scenario? (Scenario 1, 2 or 3)?

The matrix below outlines benefits and challenges of each of the parameters for both questions.

7.1.1 Question 1: What planning horizon should the community plan for (AALCI or 20 Year AAI)?

Option 1: Fund the AALCI (>20 Years)	
Pros	**Cons**
Lower risk that service levels could be affected	Does not directly consider the infrastructure deficit
Lower risk that financial burdens are placed on future generations	Will require a larger increase to the revenues than funding the 20 Year AAI
	Stakeholders today will be investing in assets they might not get the benefit of enjoying

Option 2: Fund the 20 Year AAI (<20 Years)	
Pros	**Cons**
Considers the infrastructure deficit	Higher risk that service levels could be affected
Will require less revenue increase than funding the AALC	Higher risk that financial burdens could be placed on future generations

7.1.2 Question 2: What Service Life Scenario are we doing to fund (scenario 1, 2 or 3)?

Option 1: Fund Service Life Scenario 1	
Pros	**Cons**
Fiscally conservative	Will require larger revenue increases than in scenario 2 and 3
Lower risk that service levels could be affected	It is possible that the assets will last longer and that users will be over paying
Lower risk that financial burdens are placed on future generations	May accumulate large reserves that could be better used for other purposes

Option 2: Fund Service Life Scenarios 2 or 3 (Assume assets last 25% and 50% longer)	
Pros	**Cons**
It is possible the assets may last this long or longer	Higher risk to future service levels than in scenario 1
As an interim measure it could provide some additional time to further investigate, analyze and refined the expected life spans	Higher risk that financial burdens could be placed on future generations than in scenario 1

For most communities in BC, the AALCI and 20 Year AAI are typically difficult to fund in the short term. Instead communities have used these financial indicators as long-term funding targets that they work towards over the long term. As the community evolves its asset management plan, the long-term funding target can be refined based on better understanding risk (triple bottom line), level of service, ability to borrow and willingness to pay.

8 Recommendations and Next Steps

Based on the results of the AMIP, Fernie's information, and the process outlined in the *Asset Management for Sustainable Service Delivery, A BC Framework*, the following section outlines possible next steps (tools) and priorities for consideration to achieve an advanced level of practicing asset management. The steps outlined below are organized deliberately to promote successful implementation and improve understanding in the four pillars that inform decisions – Cost, Risk, Service and Revenue.



- ✓ Integrate risk and level of service into asset management planning practices and annual budgeting
- ✓ Development of templates for annual reporting, monitoring and measuring asset management activities (state of infrastructure template)
- ✓ Build awareness and create additional engagement tools for both council and the public to assess service level expectations and affordability limits
- ✓ Collect data and information to better understand the remaining life and condition of existing infrastructure
- ✓ Update the AMIP with a risk-based approach to prioritizing investment into a long term prioritized capital plan (Applied for under the SPF grant program) and linking that to long-term financial planning
- ✓ Develop an asset management and financial policy(s)
- ✓ Prepare maintenance management plans to extend service life
- ✓ Collect data around natural capital assets and ensure these assets are being protected and invested in
- ✓ Improve inventory (Parks & West Fernie)

APPENDIX A

AMIP Summary

Investment Summary

The table summary below illustrates when assets pass their estimated service life and the associated investment for each asset category. The table also summarizes the total 20 Year Average Annual Investment (20 Year AAI) and the Average Annual Life Cycle Investment (AALCI).

Figure 8.1 Asset Investment Profile by Asset Category

Asset Category	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Water	$6,248,000	$0	$391,000	$380,000	$183,000	$167,000	$38,000	$677,000	$1,232,000	$82,000	$108,000	$159,000	$103,000
Storm	$277,000	$20,000	$539,000	$1,000	$0	$0	$0	$0	$812,000	$0	$72,000	$50,000	$261,000
Wastewater	$5,362,000	$592,000	$1,361,000	$229,000	$116,000	$0	$0	$144,000	$1,098,000	$192,000	$0	$67,000	$37,000
Road	$25,469,000	$0	$0	$1,448,000	$0	$33,000	$409,000	$0	$2,389,000	$0	$922,000	$0	$167,000
Buildings	$19,914,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,153,000	$0	$0
Fleet/Equipment	$10,211,000	$271,000	$668,000	$349,000	$549,000	$546,000	$1,437,000	$939,000	$1,484,000	$682,000	$7,726,000	$317,000	$1,757,000
Total	**$67,481,000**	**$885,018**	**$2,961,019**	**$2,409,020**	**$850,021**	**$748,022**	**$1,886,023**	**$1,762,024**	**$7,017,025**	**$958,026**	**$9,983,027**	**$595,028**	**$2,327,029**

Asset Category	2030	2031	2032	2033	2034	2035	2036	Total - 20 Year	20 Year AAI	AALCI
Water	$296,000	$0	$102,000	$22,000	$122,000	$227,000	$98,000	$10,623,000	$534,000	$780,000
Storm	$95,000	$0	$8,000	$0	$0	$36,000	$133,000	$2,300,000	$116,000	$356,000
Wastewater	$169,000	$167,000	$146,000	$185,000	$384,000	$147,000	$71,000	$10,456,000	$524,000	$574,920
Road	$275,000	$231,000	$92,000	$538,000	$440,000	$1,246,000	$8,000	$33,657,000	$1,685,000	$1,536,000
Buildings	$0	$0	$0	$0	$0	$22,160,000	$0	$43,226,000	$2,163,000	$1,171,000
Fleet/Equipment	$81,000	$472,000	$1,789,000	$1,449,000	$1,001,000	$1,364,000	$699,000	$33,776,000	$1,690,000	$1,599,000
Total	**$918,030**	**$872,031**	**$2,139,032**	**$2,196,033**	**$1,949,034**	**$25,182,035**	**$1,011,036**	**$134,038,000**	**$6,712,000**	**$6,016,920**

Note: This information is built based on Service Life Scenario 1

APPENDIX B

Replacement Costs

Replacement Costs

Replacement costs were primarily informed by recent local tender prices. Where local tender prices were unavailable the historical cost to purchase the asset was indexed to 2017 dollars using the Engineering New Records (ENR) cost indices. Details on unit replacement costs for each asset category is shown below.

Linear Water Distribution System Costs														
Description	**Units**		**Diameter**											
		750	**600**	**500**	**450**	**400**	**350**	**300**	**250**	**200**	**150**	**100**	**75**	**50**
Pipe	$/m	$700	$600	$550	$500	$450	$400	$325	$230	$200	$175	$150	$150	$150
Gravel	$/m	$130	$120	$110	$100	$100	$100	$100	$50	$50	$50	$50	$50	$50
Total Pipe	**$/m**	**$830**	**$720**	**$660**	**$600**	**$550**	**$500**	**$425**	**$280**	**$250**	**$225**	**$200**	**$200**	**$200**
Valves	each	$7,000	$6,500	$4,900	$4,500	$4,200	$4,000	$3,500	$2,600	$1,700	$1,200	$1,000	$1,000	$1,000
*** Excludes engineering and contingency**														

Non-Linear Water Distribution System Costs			
Description	**Unit**		**Unit Cost***
Meter	each		$500
Hydrant	each		$4,000
Valve with Chamber	each		$6,200
Check Valve (150mm)	each		$3,000
***Excludes contingency and engineering**			

Water Facilities	
Description	**Replacement Cost Notes**
Booster Stations, Pump Houses, Pressure Reducing Stations	Refer to excel model for detailed replacement costs of each facility

Storm System Replacement Costs													
Description	**Units**	**Diameter**											
		600	525	450	400	375	350	300	250	200	150	100	75
Pipe	$/m	$480	$410	$320	$235	$235	$225	$225	$200	$170	$145	$90	$90
Road Gravels	$/m	$78	$76	$75	$75	$73	$73	$72	$71	$71	$70	$69	$69
Total		**$558**	**$486**	**$395**	**$310**	**$308**	**$298**	**$297**	**$271**	**$241**	**$215**	**$159**	**$159**
Manholes	each	$6,000	$6,000	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
Culvert		$400	$350	$325	$325	$285	$265	$245	$165	$125	$100	$60	$45
*** Excludes engineering and contingency**													

Storm System Replacement Costs		
Description	**Unit**	**Unit Cost**
Manhole	each	$3,000
Drywell	each	$6,000
Catch Basin	each	$2,800
***Excludes engineering and contingency**		

Linear Wastewater Sewer System Replacement Costs												
Description	**Units**	**Diameter**										
		525	**450**	**375**	**350**	**300**	**250**	**200**	**150**	**100**	**75**	**50**
Gravity Pipe	$/m	$486	$395	$313	$313	$302	$271	$241	$220	$159	$159	$119
Road Gravel	$/m	$80	$80	$70	$70	$70	$70	$70	$70	$70	$70	$70
Total		**$566**	**$475**	**$383**	**$383**	**$372**	**$341**	**$311**	**$290**	**$229**	**$229**	**$189**
Forcemain	$/m	$386	$315	$253	$253	$242	$221	$201	$180	$139	$139	$107
*** Excludes engineering and contingency**												

Non-Linear Wastewater Sewer System Replacement Costs		
Description	**Units**	**Unit Cost**
Manhole	**each**	**$3,500**
***Excludes engineering and contingency**		

Wastewater Facilities	
Description	**Replacement Cost Notes**
Treatment Plant, Life Stations, Lagoons etc..	Refer to excel model for detailed replacement costs of each facility

Road System Replacement Costs		
Road Surface	**Cost**	**Units**
Asphalt	$45.0	m2
Gravel	$25.0	m2
Curb		
Concrete	$75	l.m.
Asphalt	$75	l.m.
Sidewalks		
Concrete	$60	l.m.
Streetlights	$7,000	LS
Bridges	$5,000	m2
Retaining Walls	$500	m2

Building and Fleet Systems	
Description	**Replacement Cost Source**
Fleet & Equipment	Historical Costs from TCA reports were index'd to 2017 dollars using the Engineering News Records (ENR) cost indices
Buildings	Insurance replacements costs
***Excludes engineering and contingency**	

Asset Category	Planning	Design	CA	Contingency
Water	3%	5%	7%	25%
Storm	3%	5%	7%	25%
Wastewater	3%	5%	7%	25%
Road	5%	5%	7%	25%
Building	Based on insurance documentation			
Fleet, Equipment & Parks	Not applicable (Based on TCA)			

APPENDIX C

Service Lives

Service Lives

Service lives were primarily informed by the local government infrastructure and finance division guide to amortization of tangible capital assets (2008) and adjusted based on feedback from other communities that Urban Systems has worked with. Below is a summary of the generic asset service lives assigned. For details on asset specific service lives, please refer to the excel model.

Water Infrastructure		
Main, Casing Pipe & Intake, Service		
AC		70
AC		70
CI		60
Wood Stave		50
COPP		80
DI		100
GALV		70
HDPE		80
PVC		80
STL		80
Hydrant		40
Meter		20
Main And Service Line Valve		40
Air Relief Valve		40
Check Valve		30
Valve Bypass		25
Valve with Chamber		40
Reservoir		75
Treatment Plant/Pumping Facility- Mechanical		25
Treatment Plant/Pumping Facility- Electrical		25
Treatment Plant/Pumping Facility- Structural		75

Wastewater Infrastructure	
Main, Forcemain, Service	
AC	70
CI	60
Tile	50
GI	80
DI	80
CONC	70
HDPE	100
PVC	100
Steel	80
Manhole	50
Valve With Chamber	50
Air Relief Valve	25
Meter	20
Valves	30
Flow Meter	30
Lift Station - Mechanical	25
Lift Station - Structural	75
Lift Station - Electrical	25

Storm Infrastructure	
Main, Casing Pipe, Service, Culvert, Outfall	
AC	60
CONC	75
VCT	50
PERF	100
CMP	60
HDPE	100
PVC	100
STL	60
UNKN	50
Manhole	60
Catch Basin	80
Lawn Basin	80
Meter	20
Flow Meter	30
Headwall	30

Road System	
Description	Years
Vehicle Surface	
Asphalt	40
Gravel	50
Concrete	60
Base	75
Pedestrian Pathway	
Asphalt	30
Gravel	50
Concrete	50
Traffic Signal	35
Streetlight	35
Retaining Wall	50
Conduit	100

Fleet & Equipment	
Description	**Years**
Fleet	
Light	6
Medium	8
Heavy	10
Equipment	Based on TCA (refer to excel spreadsheet for details)

APPENDIX D

Data Sources

Data Source Schedule

Below is a summary of the data sources that were used to develop the asset inventory used to develop the results of the AMIP. It is important to note that specific assumptions on an asset by asset basis can be found within the excel model provided to the City.

Data Assumptions	
Asset	**Description**
Water Pipes	
Mains	**Replacement Costs:** Estimated **Quantity**: From GIS **Year of Install/Size/Material:** GIS
Valves	**Replacement Costs:** Estimated **Quantity**: From GIS **Year of Install/Size:** GIS
Hydrant	**Replacement Costs:** Estimated **Quantity**: From GIS **Year of Install/Size:** GIS
Meters	**Replacement Cost:** Estimated **Quantity:** GIS **Size:** GIS **Year of Install:** GIS
Water Facilities	
Pumping Stations	**Replacement Cost:** Insurance Records/Estimates **Quantity:** Insurance Records/Estimates **Year of Install/** Insurance Records /Operator Feedback
PRV	**Replacement Cost:** Estimated **Year of Install:** GIS
Reservoir	**Replacement Cost:** Insurance Records **Year of Install**: Insurance Records /Operator Feedback
Wastewater Pipes	
Mains	**Replacement Cost:** Estimated **Quantity**: From GIS **Year of Installation/Size/Material:** GIS
Manholes	**Replacement Cost:** Estimated **Quantity**: GIS **Age/Size/Material:** GIS
Services	**Replacement Cost:** Estimated **Quantity**: From GIS **Age/Size/Material:** GIS
Wastewater Facilities	
Lift Stations	**Replacement Costs:** Estimated **Year of Install:** Insurance Records /Operator Feedback

<table>
<tr><th colspan="2">Data Assumptions</th></tr>
<tr><th>Asset</th><th>Description</th></tr>
<tr><td colspan="2">Storm Pipes</td></tr>
<tr><td>Mains/Culvert/Manhole/Catch Basin’s</td><td>Replacement Costs: Estimated
Quantity: From GIS
Size: GIS
Year of Install: GIS</td></tr>
<tr><td colspan="2">Road Assets</td></tr>
<tr><td>Pavement/Base</td><td>Replacement Costs: Estimated
Quantity: From GIS
Year of Installation : From GIS and EBA Pavement Condition Study
Remaining Life: Based on EBA pavement Condition Study
<table><tr><th>Condition Score Framework</th><th>% Remaining Life</th></tr><tr><td>1</td><td>0%</td></tr><tr><td>2</td><td>25%</td></tr><tr><td>3</td><td>50%</td></tr><tr><td>4</td><td>75%</td></tr><tr><td>5</td><td>100%</td></tr></table>Note: EBA Pavement Inspection report was completed in 2007
Example:
- Year of Installation: 2000
- Service Life: 40 Years
- Theoretical Replacement Year: 2040
- Condition Score 4 (75% remaining life)
- # of Remaining Years: Service Life x Condition Score (40 years x 75% = 37
Replacement Year = Year of the inspection + # of Remaining years (2007 + 30 years = 2037 (adjusted replacement year)</td></tr>
<tr><td>Other Assets (Streetlights, Sidewalks etc.)</td><td>Replacement Costs: Estimated
Quantity: From GIS
Year of Installation : From GIS</td></tr>
<tr><td>Buildings</td><td>Replacement Cost: Insurance records
Quantity: insurance records
Year of Installation: TCA/ Staff Feedback</td></tr>
<tr><td>Fleet & Equipment</td><td>Replacement Costs: TCA (index’d to 2017’s using ENR index)
Quantity: TCA
Year of Installation : TCA</td></tr>
</table>