Asset Management Investment Plan

(An Asset Renewal Forecast)

prepared for:
Regional District of Central Okanagan

NOVEMBER 2018

URBAN systems

TERMS AND DEFINITIONS

The following commonly used terms are defined as they relate to the Asset Management Investment Plan (AMIP).

ANNUAL AVERAGE LIFE CYCLE INVESTMENT (AALCI): Annual budget based on annual average of the total replacement value of an asset over its expected service life determined by the asset management plan

ASSET: A physical component of a system that has value, enables services to be provided, and has an economic life of greater than 12 months

ASSET CONDITION: The state of an asset, particularly regarding its appearance, quality, or working order

ASSET MANAGEMENT: The process of making decisions about the use and care of infrastructure to deliver services in a way that considers current and future needs, manages risks and opportunities, and makes the best use of resources

ASSET MANAGEMENT PLAN: A long term plan to identify asset management needs, establish longer term financing means, and regularly schedule maintenance, rehabilitation and replacement works for the long-term sustainability of the asset

ASSET MANAGEMENT POLICY: Principles and mandated requirements derived from, and consistent with, the organizational strategic plan, providing a framework for the development and implementation of the asset management strategy and the setting of the asset management objectives

ASSET MANAGEMENT STRATEGY: Long-term optimized approach to management of the assets, derived from, and consistent with, the organizational strategic plan and the asset management policy

ASSET RENEWAL: Work on an asset (or component) that brings the asset back to new condition or the complete replacement of the asset (in situ) with a new asset providing the original (intended) level of service

COST: In asset management, the financial and human resources required throughout the lifecycle of the asset

INFRASTRUCTURE RENEWAL DEFICIT (BACKLOG): A measure of the amount of infrastructure that has passed its theoretical service life but is still providing service to the community

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

LIFE CYCLE COSTS: The total costs estimated to be incurred in the design, construction, operation, maintenance, and final disposition of a physical asset or system over its anticipated useful life span

LIFE CYCLE MANAGEMENT: Retaining an asset as near as practicable to its original condition, from the point when a need for it is first established, through its design, construction, acquisition, operation and any maintenance or renewal, to its disposal

REVENUE: The income received by the RDCO from taxes, user fees, government transfers and other sources. Own sources revenues is 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)

Asset Risk – An event where an asset failing to perform as you need it to. Examples of asset risks are a broken sewer pipe or potholed road surface.

Strategic Risk – Events or occurrences that impact your ability to achieve objectives.

REGULATORY REQUIREMENT: Capital works to meet existing or new provincially or federally legislated standards.

SERVICE: A system that fulfills a public need such as transportation and sewage collection

SERVICE LIFE: The estimated lifespan of a depreciable fixed asset, during which it can be expected to contribute to a municipality's operations/service delivery

TANGIBLE CAPITAL ASSET (TCA): An Asset that has a physical form for use in the operations and delivery of services. Tangible assets include fixed assets, such as water, sewer, roadways and buildings (fixed assets are sometimes referred to as 'plant'). Tangible capital assets must be accounted for and reported as assets on the Statement of Financial Position as part of PS 3150.

TRIPLE BOTTOM LINE APPROACH: Utilizing economic, social and environmental metrics (i.e. quantifiable impacts to costs, mobility, and watercourses/habitats) in assessing and/or prioritizing investments.

USEFUL LIFE: The minimum life expectancy commonly used for asset life. This is typically used for TCA reporting (as opposed to for asset management purposes).

INVESTMENT LEVEL INDICATORS

ANNUAL AVERAGE LIFE CYCLE INVESTMENT (AALCI)

The Average Annual Life Cycle Investment (AALCI) is defined as the summation of each asset's annual depreciation. It 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 unfunded liability as this is a forward-looking parameter that does not consider the past.

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).

INFRASTRUCTURE DEFICIT

Unfunded Liability is a measure of the amount of infrastructure that has passed its theoretical service life but still provides service to the community. This infrastructure should be inspected to determine if replacement is necessary or if replacement timing can be adjusted.

Note: The presented indicators do not take into account level of service, existing reserve balances, risk, all future capital needs (water treatment is included), or willingness to take on risk. Over time, as the community gathers more information and further develops their asset management system, these investment figures should be further refined and adjusted.

EXECUTIVE SUMMARY

The Regional District of Central Okanagan (RDCO) Environmental Services Department owns and maintains a large portfolio of infrastructure assets upon which it greatly relies for the delivery of services to the region. This infrastructure includes the ESD's water systems, sewer systems, solid waste assets as well as a wide variety of vehicles.

Some of the RDCO's assets, such as the Killiney Beach water system, date back to the 1960's while the sewer system is relatively young at 1990's. These assets, and others, have served the community well however many of these assets are now nearing the end of their useful lifespans and will eventually need to be replaced or rehabilitated.

The Asset Management Investment Plan (AMIP) provides a review of RDCO's Water, Sanitary, and Solid Waste assets to answer the following questions;

1. What assets does the RDCO own?
2. What is the forecasted cost to replace the asset?
3. How much money needs to be invested annually (on average) to sustain the RDCO's assets?

By understanding the answer to these questions, the RDCO 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 RDCO can ensure that services are sustainable so that current and future generations can enjoy the same levels of service as well as user fees and charges.

Table 1.1: 20 Year Average Annual Invesment and Average Annual Life Cycle Investment

Asset Category	20 Year Average Annual Investment (AAI)	Average Annual Life Cycle Investment (AALCI)
Killiney Water System	$486,783	$324,569
Falcon Ridge Water System	$19,819	$60,523
Star Place Water System	$16,571	$13,965
Sunset Ranch Water System	$41,115	$127,326
Westshore Water System	$793,798	$358,993
Fintry Water System	$17,771	$172,145
Sanitary Sewer System		
Westside Collection	$57,888	$354,808
Treatment	$1,498,799	$1,828,863
Sunset Sanitary	$0	$38,798
Solid Waste	$582,878	$583,828
Total	**$3,515,422**	**$3,863,818**

WHAT ASSETS DOES THE REGIONAL DISTRICT OWN?

For the purposes of the AMIP the RDCO's assets have been separated into 3 categories: water system, sanitary system, and solid waste.

The sanitary sewer is comprised of approximately 20km of sewer pipes in addition to manholes, lift stations, force mains and treatment facilities.

The water system is compromised of six separate water systems which include Killiney Beach, Falcon Ridge, Sunset Ranch, Westshore, Fintry and Star Place, each of which have a series of water pipes, reservoirs, pumps and treatment facilities.

The solid waste category includes the curbside carts and transfer stations.

All of these infrastructure assets are required to deliver the services that are valued by the residents of Central Okanagan.

WHAT IS THE COST TO REPLACE THE ASSETS?

The total replacement value of the RDCO's infrastructure is approximately $140 million, based on current construction costs. Broken down as follows:

Sanitary System $85M

Water Systems $62M

Solid Waste $12M

The water and sewer systems make up the majority of the infrastructure value (91%) with solid waste accounting for 9% of the total value. The Wastewater Treatment Plant is valued at $50M or 36% of the total infrastructure value.

HOW MUCH MONEY NEEDS TO BE INVESTED ANNUALLY?

There is no single "correct" answer to this question. Accurately predicting when infrastructure will need to be replaced is very difficult if not impossible to do. The service life of an asset such as a pipe depends on many factors such as the materials it is constructed from, the properties of the soils that it is buried in, how it was installed and many, many other factors. For this reason lifespan estimates are generally based on "rule of thumb" values. Most rule of thumb lifespans applied by engineers are conservative (on the safe side). In reality many assets could actually last much longer (50% longer or possibly more) than these estimates. For this reason, we have included two indicators for informing the targeted annual investment amount: the annual average life cycle investment (AALCI) and the 20 year average annual investment (AAI). See Table 1.1 for details.

The AALCI is presented at $3.8M/yr using the conservative rule of thumb lifespan. The AAI is $3.5M/yr for the twenty year horizon using the same service life estimates. By assuming the assets will last longer (lower annual investment level) the RDCO assumes more risk. It is at the discretion of the RDCO Board to decide what level of risk they are comfortable with and to revisit those assumptions on a regular basis. The focus of this report supports the conservative measure of funding the AALCI; however, the AAI should be considered if more funds are required in the near term for immediate improvements.

INTRODUCTION

Many governments, like RDCO, are turning toward asset management as a process for making informed infrastructure decisions, build financial capacity to renew, operate and maintain existing infrastructure so that the RDCO can continue to provide services, effectively manage risks, and provide tax payers with the best value for money.

A key next step for RDCO in achieving this outcome is to improve its understanding of costs through completing a detailed asset assessment (cost forecast) of the community's future infrastructure renewal investment requirements. This forecast will provide staff with improved information (cost and timing) and key indicators to inform infrastructure investment decision-making and assist in aligning priorities and setting utility rates. To accomplish this, the RDCO engaged Urban Systems to complete a long term (integrated) Asset Management Investment Plan (AMIP).

The AMIP is based on the BC Framework (see Figure 1.1) and was developed to identify and assess the expected replacement costs and needs for each of RDCO's assets. The AMIP (Appendix A) consolidates all of the long term costs and timing for a community's major infrastructure categories into a long-term asset renewal forecast. This enables the RDCO to see a forecast of their infrastructure's life cycle cost pressures in one place, at a glance. The AMIP is also an ideal tool to engage rate payers by showing how infrastructure performance and age is linked to annual investments (into reserves or renewal projects). The AMIP includes details and summaries of:

- current replacement value
- infrastructure deficit
- looming future costs
- AALCI required for on-going investment planning
- forecasted renewal of public infrastructure (AAI)

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.

Figure 1.1: Asset Management for Sustainable Service Delivery, A BC Framework

CANADIAN'S INFRASTRUCTURE CHALLENGE

Communities across Canada are currently faced with infrastructural and organizational challenges. Many are realizing that the majority of their infrastructure was installed decades ago and has continually provided service to the community with little to no service disruption. These assets, which have provided significant value to the community, are now nearing the end of their useful life; however, many local governments have not fully planned for their replacement.

FCM recently completed a study that concluded that estimates Canada's infrastructure deficit to be 123 billion and growing. A recent study by BCWWA, titled "Are our water systems at risk?" found that the majority of BC water and sewer systems are not recovering the full cost of service delivery through user fees.

With increasing cost pressures and unsustainable funding approaches, communities are beginning to realize they need to change the way they think about managing their assets, recovering revenues, and delivering services. Communities are now embracing the need to integrate asset management principals and thinking into their organization with the goal to:

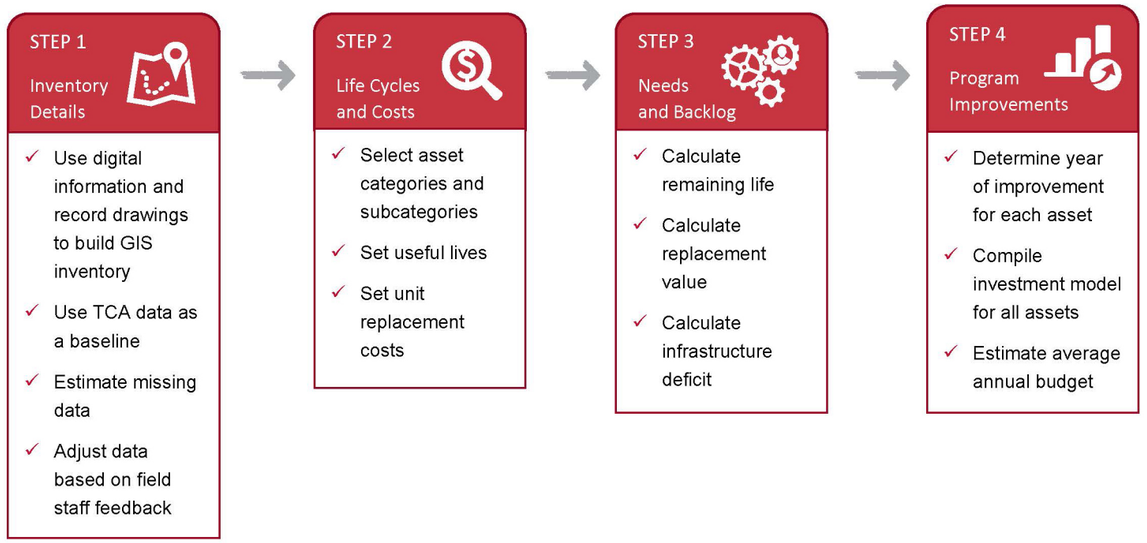
- be financially sustainable over the long term;
- reduce the need to place a large financial burden on future generations;
- increase the likelihood that user fees and rates are stable and consistent and reduce the need to have large 'one-off' increases; and
- increase the likelihood that service levels can be maintained over the long term

With this understanding, the RDCO has invested in developing an Asset Management Investment Plan (AMIP) as the first step in better understanding their own unique infrastructure challenges.

AMIP METHODOLOGY

The AMIP forecast is predominantly based upon infrastructure service lives, but also considers condition assessment information where available. To develop the AMIP, a 4-Step analytical approach was used (see Figure 2.1 below).

Figure 2.1: AMIP Development Steps



RDCO's AMIP for asset renewal was built using the best linear and non-linear asset data available. The most recent digital infrastructure information for RDCO has been reviewed for use in developing the AMIP. This information is primarily based on compiled infrastructure record drawings and GIS datasets received from the RDCO, coupled with information from the Tangible Capital Assets (TCA) inventory. An estimate was made for missing data where possible. The GIS information was the primary source used for the majority of the asset inventory which was cross checked against the operations department's record information and anecdotal knowledge of the systems.

As a next step in the evolution of the RDCO's asset management process, the AMIP inventory should be built upon to develop a prioritized capital plan based on risk, service and cost. It also is suggested that the RDCO continue to undertake an on-going program for improving data collection in order to refine the complete data set for long term asset management purposes.

[1]The expected life remaining is a ratio between remaining life and replacement value. This is based on straight line depreciation of the asset over its service life.

[2]AALCI is the annual depreciation of the replacement value. The AALCI represents the ideal annual budget allocation. Annual surpluses would go into reserves and be drawn upon for renewal of assets. When the annual budget is less than the AALCI, the sustainability gap grows.

The AMIP outlines the following:

- Current replacement value;
- Remaining value;
- Expected life remaining;
- Required improvements;
- Infrastructure deficit (backlog);
- 20 year renewal costs and timing (including future looming costs); and,
- Average Annual Life Cycle Investment (AALCI)

The AMIP is a spreadsheet which is delivered in three (3) inter-connected levels:

1. Summary for investment planning and decision-makers;
2. Detailed data for ongoing reporting, operations and maintenance; and
3. Highly detailed segment by segment information regarding the linear infrastructure such as pipe and roads.

The benefits of the AMIP's Level 1 summary include:

- Presents a complete and concise summary of all infrastructure assets on 1 page;
- Provides a comprehensive focus and format for community infrastructure outreach programs;
- Uses very detailed information from Level 2, which provides invaluable asset details for more credible and defensible decisions on infrastructure re-investment; and
- Encourages exploration of sustainable infrastructure renewal funding levels.

HOW TO USE THE INVESTMENT PLAN MODEL

The forecast model is driven by input tables; however, when sufficient data is not available for the input tables, or asset-specific changes are made, then estimates are done in the excel worksheets. In addition to its financial information, the investment plan database also uses the following asset attributes:

- Location
- Material or Make
- Size or Model
- Dimensions
- Quantity
- Year Built
- Service Life
- Condition rating (where available) and
- Installation cost:
  Recent Tendered Construction costs;
  Construction contingency costs;
  Planning and design costs;
  Project management costs; and
  Construction administration costs.

Figure 2.2 Informed Decision Making

The AMIP model is designed to keep calculating year after year. The AMIP can be updated each year by adjusting the model to the current year (Input Table), updating unit costs and other replacement values to reflect inflation, and updating the asset inventory to include annual project renewals, decommissioning, and new acquisitions.

The power of the AMIP model is that it uses actual replacement costs, service lives based upon healthy maintenance programs, and summarizes all infrastructure information in Level 1 to assist RDCO in better understanding their cost pressures to help inform their budgeting and infrastructure decisions (Figure 2.2).

AMIP RESULTS

The AMIP's Level 1 summary presents a one page overview of asset renewal needs, rolled-up for all asset categories and sub-categories in RDCO. It presents the current renewal investment forecast for RDCO's major asset categories over a 20 year period, using a conservative life span estimate and includes indicators for forecasting a sustainable infrastructure funding level.

This AMIP scenario assumes that an adequate annual operations and maintenance (O&M) budget is in place to optimize asset service lives. Reduced or inadequate O&M budget levels would reduce the service lives. More detailed information regarding each individual asset categories can be seen in the level 2 summaries (section 4). Table 1.2 summarizes the key results of the AMIP.

Table 1.2: AMIP Summary

Asset Category	100% Replacement Value	Expected Remaining Life	Infrastructure Deficit (Backlog)	20 Year Average Annual Investment (AAI)	Average Annual Life Cycle Investment (AALCI)
Killiney Water System	$19,273,855	39%	$0	$486,783	$324,569
Falcon Ridge Water System	$4,206,342	69%	$165,000	$19,819	$60,523
Star Place Water System	$657,710	56%	$0	$16,571	$13,965
Sunset Ranch Water System	$7,964,002	78%	$0	$41,115	$127,326
Westshore Water System	$17,513,365	22%	$1,684,901	$793,798	$358,992
Fintry Water System	$12,752,730	92%	$0	$17,771	$172,145
Sanitary Sewer System					
Westside Collection	$24,315,287	70%	$850,000	$57,888	$354,808
Treatment	$56,381,162	65%	$7,636,441	$1,498,799	$1,828,863
Sunset Sanitary	$3,872,645	87%	$0	$0	$38,798
Solid Waste	$11,682,562	53%	$0	$582,878	$583,828
Total	**$158,619,663**	**60%**	**$10,336,342**	**$3,515,422**	**$3,863,818**

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

20 Year Average Annual Investment (AAI): total forecasted investment needed to replace infrastructure that has passed its theoretical service within the next 20 years.

Infrastructure Deficit (Unfunded Liability): is a measure of the amount of infrastructure that has already passed its theoretical service life but is still providing service to the community. This infrastructure should be inspected to determine if replacement is necessary or not.

Figure 3.2 Infrastucture Value Distribution

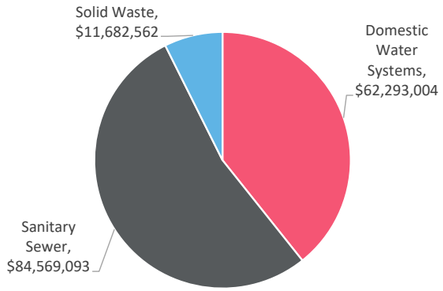
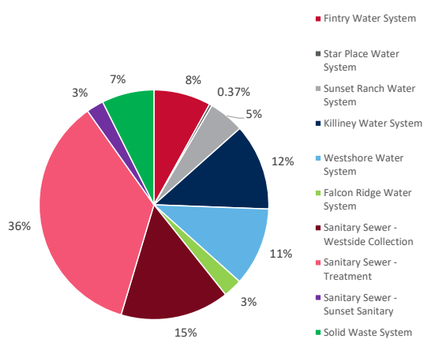


Figure 3.3 AALCI Value Distribution



ASSET REPLACEMENT VALUE

The estimated full replacement value of RDCO's major infrastructure assets is approximately $158 million (2018) based on current tender prices in the BC Interior region and best practices for setting service lives. A copy of the inputs (unit costs and service lives) is located in Appendix B.

Table 1.2 (above) provides a summary of the replacement value of existing infrastructure; with some regulatory requirements for the water system included. The AMIP should be used to inform the development of a comprehensive capital plan so that these items can be integrated together.

Figure 3.2 illustrates the percent breakdown of RDCO's infrastructure value by asset category.

Approximately 90% of RDCO's infrastructure is made of up Water and Sanitary assets which mean majority of the total long term expenditures should be on these assets. On average, RDCO assets are considered to be in fair to good condition with an average expected remaining life of 67% and there are assets ($10.3M) that have passed their theoretical service life which should be inspected in the field prior to investing in their replacement. In the twenty year horizon there is approximately $67M forecasted in assets that may need to be renewed. These results are comparable to other communities of similar size and age to RDCO.

INFRASTRUCTURE DEFICIT (UNFUNDED LIABILITY)

Infrastructure deficit ($10.3M) is a measure of the amount of infrastructure that has passed its theoretical service life but is still providing service to the community.

Current Year > Year of Asset Renewal

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 2018 which means the asset has passed its theoretical service life and will be recorded as a deficit. If that assets service life is extended, the asset is now scheduled in a future year as an asset replacement and not a deficit.

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 ($3.8M) is the forecasted ideal (maximum) funding level for sustaining existing infrastructure over the life cycle of the assets and should be a long term target for the community. When planned for appropriately, the AALCI can be used in ensuring long term revenue stability, preventing unnecessary risk, and enabling a community to apply one-time funding to support new asset/capital needs as opposed to addressing emergency situations.

Ideally RDCO should endeavor, depending on risk tolerance and service levels, to budget for this amount each year, and what is not spent goes into infrastructure reserve accounts for future renewal. Figure 3.3 illustrates the value and percent breakdown of RDCO's AALCI distribution based on the conservative estimate of service life scenario.

20 YEAR AVERAGE ANNUAL INVESTMENT (AAI)

Another indicator that can be used to determine the appropriate investment level is the 20 Year Average Annual Investment (AAI).

$$\frac{\text{Total Anticipated 20 Year Capital Expenditure}}{\text{20 Years}}$$

This indicator provides a value of how much should be invested on an annual basis at a minimum to fund asset replacements anticipated over the next 20 years ($3.5M).

Service life directly affects the timing of the 20 year expenditures as it dictates when an asset is scheduled for replacement. For example: If the asset service life is extended, the replacement year might change from 2035 to 2045 which defers the project outside the 20 year planning horizon and reduces 20 Year AAI. It is important to note that this does not make the expenditure disappear but instead it just postpones it. This is why the AALCI may be better long term financial indicator (target) because it accounts for replacements outside the planning horizon.

RDCO should consider its affordability limits, costs, risk and service in determining the annual investment amount into infrastructure. Later sections of this report provides some considerations and recommendations for RDCO in considering its sustainable infrastructure funding levels.

STATE OF RDCO'S INFRASTRUCTURE

This section details the AMIP findings by each of the RDCO's asset categories (Level 2).

1 What assets do we own?

Taking stock of assets within a community is foundational to the development of an AMIP. The first step in building an inventory is gathering all available data, then collecting important attributes for each asset such as: quantity, diameter, year of installation, material, etc.

The value of this inventory extends well beyond this project as this database can now be used as the central source of asset information moving forward.

The methodology used to compile this inventory is detailed in Appendix A.

2 How much are our assets worth?

Calculating the replacement cost of a community's assets provides the organization with a deeper understanding of the magnitude of infrastructure that it is responsible for managing and replacing. These cost figures directly affect the asset reinvestment level and are a driver for future revenue requirements. Replacement costs presented in this report represents the magnitude of investment required to replace all assets as they exist today. The asset replacement costs typically do not account for new investment required to satisfy; regulatory requirements, growth/ expansion, safety improvements, or economic development.
In this report, we have at the request of RDCO, included cost for future regulatory requirements (ie. UV Treatment)

3 How much life is left in our assets?

Remaining life of an asset is one indicator that can be used to understand the theoretical condition of an asset. The condition of the asset can then inform asset reinvestment and inspection programs.

Since the actual physical condition of the asset is not known, the age of the asset is used to estimate its condition (refer to Terms and Definitions)

4 When will our assets pass their estimated service life?

Accurately predicting when infrastructure will need to be replaced is difficult, if not impossible, to do. The service life (how long an asset will last) is a highly uncertain parameter that is affected by many factors such as material, environment, and construction techniques. Nonetheless, mapping replacement timing is valuable in helping communities begin planning for future expenditures. For example, the investment cost forecast may show a significant expenditure in 2025, representing a large number of watermains that are predicted to need replacing. While it is unlikely that all of these watermains would need to be replaced at the same time, replacement timing estimates provide an indication that a large investment might occur and that further investigation is required to confirm the urgency of these investments.

5 How much do we need to invest in our assets?

Predicting the right investment level needed for infrastructure renewal requires significant thought and discussion amongst stakeholders. To better understand a community's initial long-term investment needs, three indicators have been calculated.

- Investment Level Indicators:
  1) Average Annual Life Cycle Investment (AALCI)
  2) 20 Year Average Annual Investment (20 Year AAI)
  3) Infrastructure Deficit (Unfunded Liability)

  (refer to Terms and Definitions)

- Each of these indicators are calculated using replacement costs and service life estimates. Accurately predicting when infrastructure will need to be replaced is very difficult to do. For this reason, lifespan estimates are generally based on rule of thumb values. Most rule of the thumb lifespans applied by engineers are conservative (on the safe side). In practice, many assets could last much longer (25% longer or possibly more) than these estimates. For these reasons, we have developed three service life scenarios (refer to terms and definitions) which will help highlight how investments level would change depending on the various lifespan assumptions.

- Each of these questions (1 to 5) is graphically presented in the body of this report.
- These investment level indicators do not account for existing reserves balances or future grants. These indicators are to be used as a forecast of costs to inform the RDCO's revenue requirements.

WATER SYSTEMS – KILLINEY

What assets do we own?

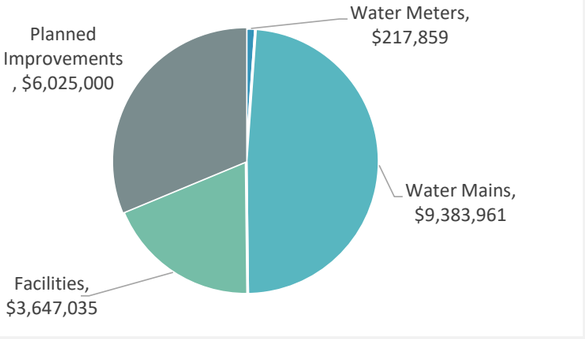
Watermain 14.3 km

Pumps 4

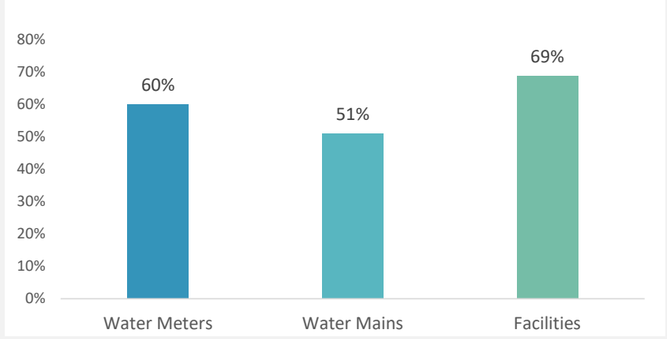
Reservoirs 4

PRVs 2

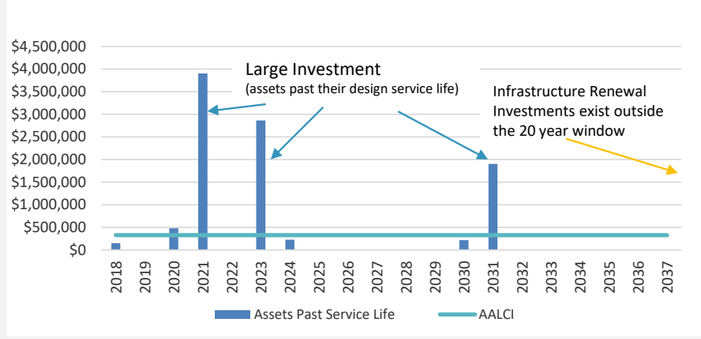
How much are our assets worth?



How much life is left in our assets?



When will our assets pass their estimated service life?



How much do we need to invest in our assets?

Sub-category	Asset Description	100% Replacement Value	Expected Remaining Life	20 Year Average Annual Investment	Average Annual Life Cycle Investment (AALCI)
Water Meters		$217,859	60%	$10,893	$10,893
Water Mains	***Diameter (mm)***				
>= 600	>= 600	$0	0%	$0	$0
500	500	$0	0%	$0	$0
450	450	$0	0%	$0	$0
400	400	$0	0%	$0	$0
350	350	$0	0%	$0	$0
300	300	$0	0%	$0	$0
250	250	$154,400	65%	$0	$1,544
200	200	$1,267,793	62%	$23,930	$12,678
150	150	$3,908,554	62%	$23,932	$39,086
<150	<150	$4,053,216	36%	$89,278	$40,532
		$9,383,961	**51%**	**$137,140**	**$93,840**
Facilities					
Reservoirs		$1,770,035	83%	$0	$22,125
Pumphouse		$1,427,000	62%	$30,000	$35,675
Intakes		$300,000	56%	$0	$3,750
PRV's		$150,000	0%	$7,500	$4,286
		$3,647,035	**69%**	**$37,500**	**$65,836**
Total without Planned Improvements		**$13,248,855**	**56%**	**$185,533**	**$170,569**
Planned Improvements					
Back-up Generator (3)		$225,000	0%	$11,250	$9,000
Treatment		$5,800,000	0%	$290,000	$145,000
		$6,025,000	**0%**	**$301,250**	**$154,000**
Grand Total		**$19,273,855**	**39%**	**$486,783**	**$324,569**

WATER SYSTEMS – FALCON RIDGE

What assets do we own?

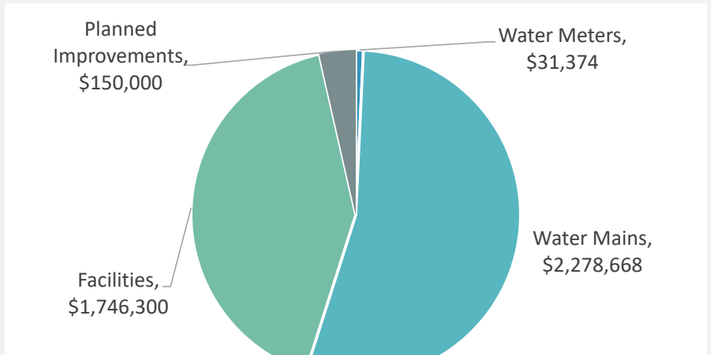
Watermain 3.3 km

Pumps 1

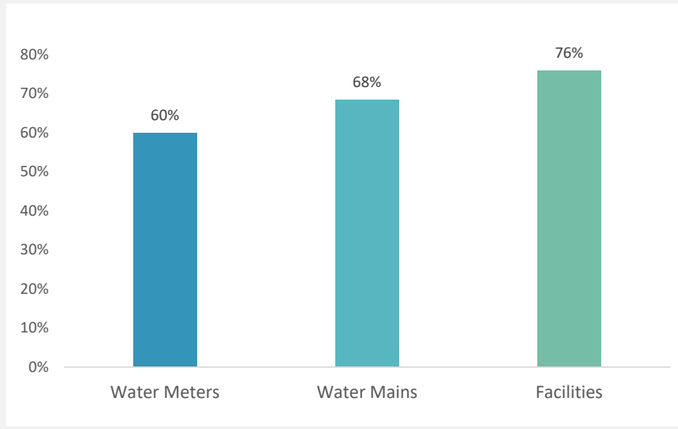
Reservoirs 1

PRVs 0

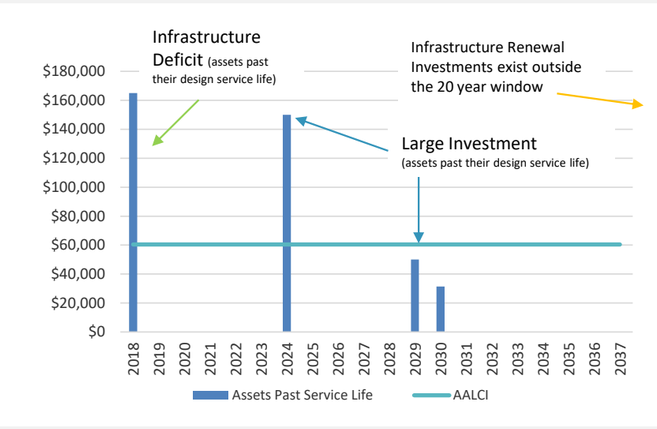
How much are our assets worth?



How much life is left in our assets?



When will our assets pass their estimated service life?



How much do we need to invest in our assets?

Sub-category	Asset Description	100% Replacement Value	Expected Remaining Life	20 Year Average Annual Investment	Average Annual Life Cycle Investment (AALCI)
Water Meters		$31,374	60%	$1,569	$1,569
Water Mains	***Diameter (mm)***				
200	200	$0	0%	$0	$0
150	150	$1,563,690	71%	$0	$15,637
100	100	$714,978	63%	$0	$9,201
		$2,278,668	**68%**	**$0**	**$24,838**
Facilities					
WELL KIOSK		$15,000	0%	$750	$600
WELL		$150,000	0%	$7,500	$6,000
PUMPHOUSE		$50,000	28%	$2,500	$1,250
INTAKE		$150,000	98%	$0	$3,000
RESERVOIRS + UV		$1,381,300	84%	$0	$17,266
		$1,746,300	**76%**	**$10,750**	**$28,116**
Total without Planned Improvements		**$4,056,342**	**72%**	**$12,319**	**$54,523**
Planned Improvements					
Back-up Generator (2)		$150,000	0%	$7,500	$6,000
Grand Total		**$4,206,342**	**69%**	**$19,819**	**$60,523**

WATER SYSTEMS – SUNSET RANCH

What assets do we own?

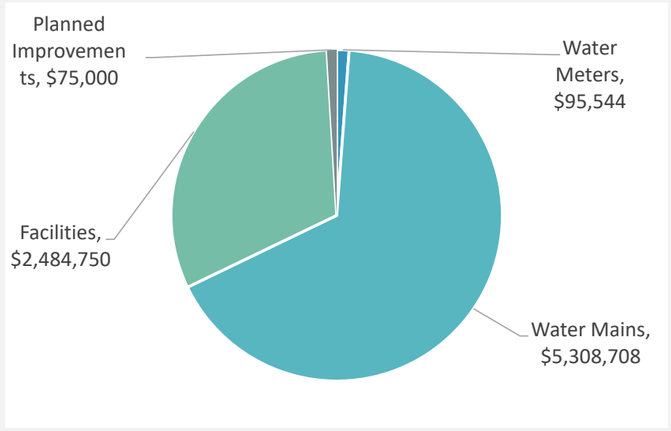
Watermain 7.5 km

Pumps 2

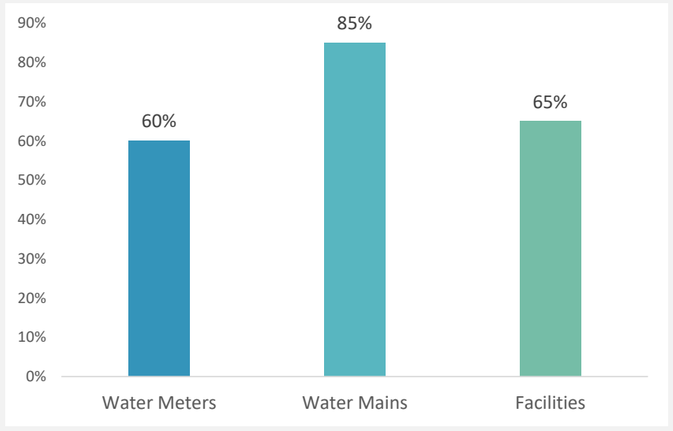
Reservoirs 1

PRVs 1

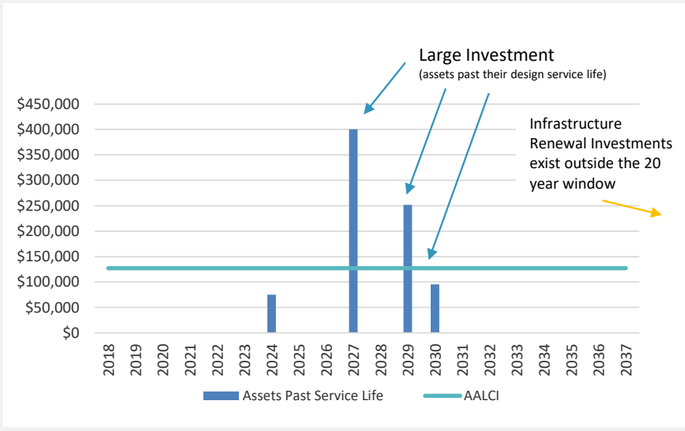
How much are our assets worth?



How much life is left in our assets?



When will our assets pass their estimated service life?



How much do we need to invest in our assets?

Sub-category	Asset Description	100% Replacement Value	Expected Remaining Life	20 Year Average Annual Investment	Average Annual Life Cycle Investment (AALCI)
Water Meters		$95,544	60%	$4,777	$4,777
Water Mains	***Diameter (mm)***				
250	***250***	$220,919	89%	$0	$2,763
200	200	$3,178,960	88%	$0	$31,309
150	150	$1,882,382	80%	$0	$24,868
<150	<150	$26,445	89%	$0	$264
		$5,308,708	**85%**	**$0**	**$59,204**
Facilities					
Manholes, Sampling, Chlorination		$91,750	41%	$3,838	$3,370
PRV		$75,000	36%	$3,750	$3,000
RESERVOIR		$918,000	80%	$0	$11,475
PUMP HOUSE		$900,000	68%	$0	$22,500
WELL		$500,000	40%	$25,000	$20,000
		$2,484,750	**65%**	**$32,588**	**$60,345**
Total without Planned Improvements		$7,889,002	78%	$37,365	$124,326
Planned Improvements					
Planned Back-up Generator (1)		$75,000	0%	$3,750	$3,000
Subtotal		**$7,964,002**	**78%**	**$41,115**	**$127,326**

WATER SYSTEMS – WESTSHORE

What assets do we own?

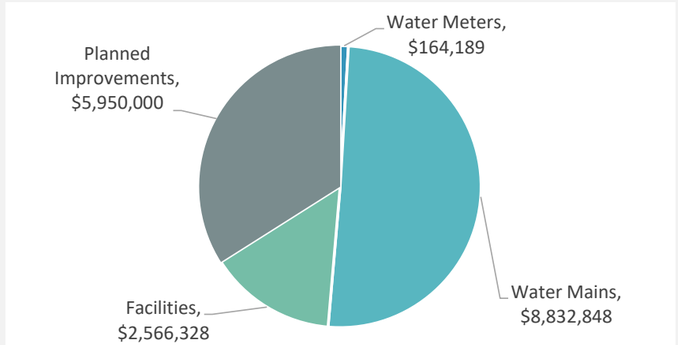
Watermain 14.5 km

Pumps 2

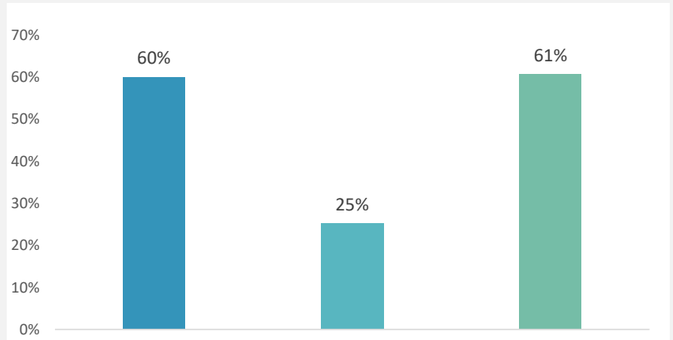
Reservoirs 2

PRVs 3

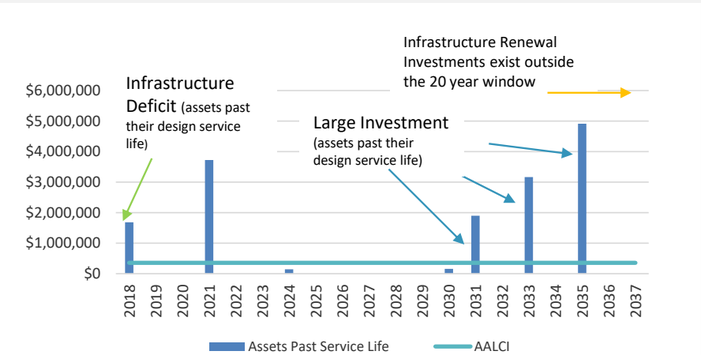
How much are our assets worth?



How much life is left in our assets?



When will our assets pass their estimated service life?



How much do we need to invest in our assets?

Sub-category	Asset Description	100% Replacement Value	Expected Remaining Life	20 Year Average Annual Investment	Average Annual Life Cycle Investment (AALCI)
Water Meters		$164,189	60%	$8,209	$8,209
Water Mains	*Diameter (mm)*				
450	450	$0	0%	$0	$0
400	400	$0	0%	$0	$0
350	350	$0	0%	$0	$0
300	300	$28,507	28%	$1,425	$475
250	250	$1,206,429	28%	$60,321	$20,107
200	200	$1,395,696	27%	$69,671	$23,262
150	150	$5,148,691	27%	$257,435	$85,812
<150	<150	$1,053,525	11%	$50,486	$23,183
		$8,832,848	**25%**	**$439,338**	**$152,838**
Facilities					
Reservoirs		$1,441,328	99%	$0	$18,017
Intake		$300,000	0%	$15,000	$7,500
Pumphouse		$600,000	0%	$30,000	$15,000
PRV's		$225,000	59%	$3,750	$6,429
		$2,566,328	**61%**	**$48,750**	**$46,945**
Total without Planned Improvements		$11,563,365	34%	$496,298	$207,993
Planned Improvements					
Back-up Generator (2)		$150,000	0%	$7,500	$6,000
Treatment		$5,800,000	0%	$290,000	$145,000
		$5,950,000	**0%**	**$297,500**	**$151,000**
Grand Total		$17,513,365	22%	$793,798	$358,993

WATER SYSTEMS – FINTRY

What assets do we own?

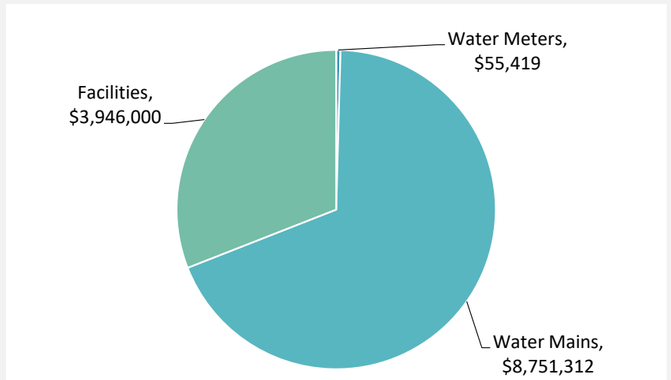
Watermain 11.6 km

Pumps 3

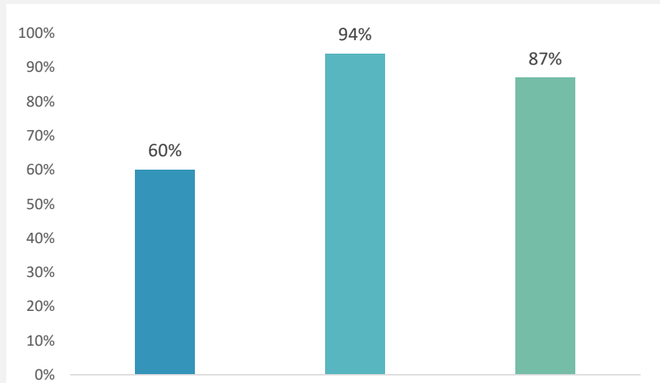
Reservoirs 2

PRVs 2

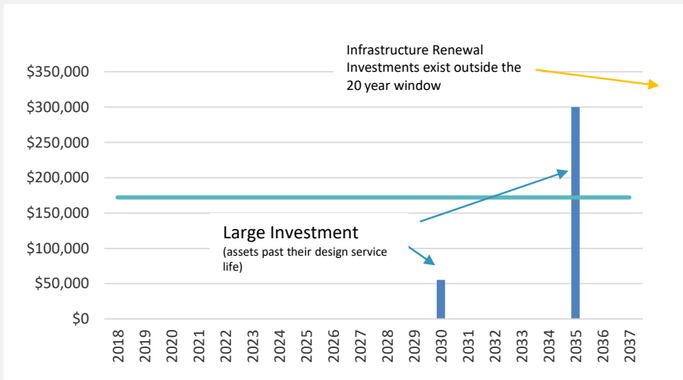
How much are our assets worth?



How much life is left in our assets?



When will our assets pass their estimated service life?



How much do we need to invest in our assets?

Sub-category	Asset Description	100% Replacement Value	Expected Remaining Life	20 Year Average Annual Investment	Average Annual Life Cycle Investment (AALCI)
Water Meters		$55,419	60%	$2,771	**$2,771**
Water Mains	***Diameter (mm)***				
>= 600	>= 600	$0	0%	$0	$0
500	500	$0	0%	$0	$0
450	450	$0	0%	$0	$0
400	400	$0	0%	$0	$0
350	350	$0	0%	$0	$0
300	300	$3,822,416	94%	$0	$38,224
250	250	$902,138	94%	$0	$9,021
200	200	$1,884,976	94%	$0	$18,850
150	150	$1,709,334	94%	$0	$17,093
<150	<150	$432,448	94%	$0	$4,324
		$8,751,312	**94%**	**$0**	**$87,513**
Facilities					
PRESSURE REDUCING		$150,000	**83%**	$0	$4,286
PUMP HOUSE		$1,750,000	**85%**	$0	$43,750
RESERVOIR		$1,746,000	**93%**	$0	$21,825
WELL		$300,000	**68%**	$15,000	$12,000
		$3,946,000	**87%**	**$15,000**	**$81,861**
Total		**$12,752,730**	**92%**	**$17,771**	**$172,145**

WATER SYSTEMS – STAR PLACE

What assets do we own?

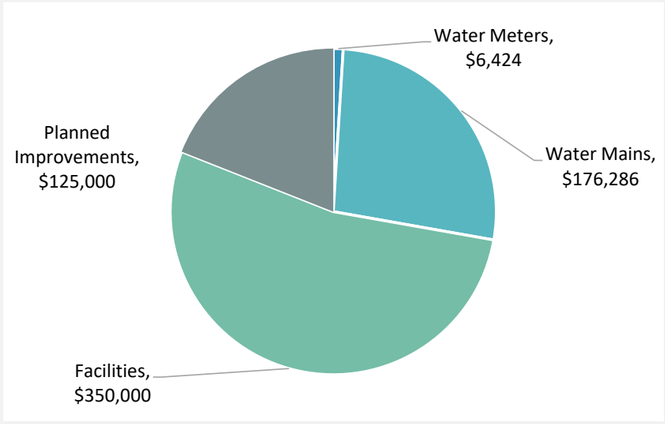
Watermain 300m

Pumps 1

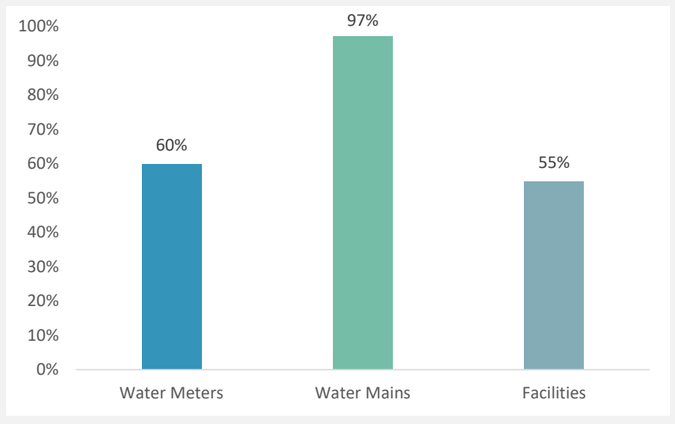
Reservoirs 1

PRVs 0

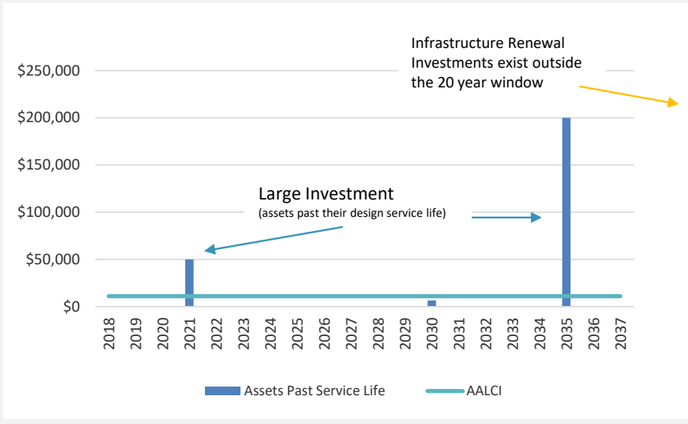
How much are our assets worth?



How much life is left in our assets?



When will our assets pass their estimated service life?



How much do we need to invest in our assets?

Sub-category	Asset Description	100% Replacement Value	Expected Remaining Life	20 Year Average Annual Investment	Average Annual Life Cycle Investment (AALCI)
Water Meters		$6,424	60%	$321	$321
Water Mains	***Diameter (mm)***				
300	300	$0	0%	$0	$0
250	250	$0	0%	$0	$0
200	200	$0	0%	$0	$0
150	150	$0	0%	$0	$0
<150	<150	$176,286	97%	$0	$2,518
		$176,286	**97%**	**$0**	**$2,518**
Facilities					
Reservoir and Pumphouse		$350,000	55%	$10,000	$6,875
Total without Planned Improvements		**$532,710**	**69%**	**$10,321**	**$9,715**
Planned Improvements					
Back-up Generator (1)		$75,000	0%	$3,750	$3,000
Treatment (UV/Filtration)		$50,000	0%	$2,500	$1,250
		$125,000	**0%**	**$6,250**	**$4,250**
Grand Total		**$657,710**	**56%**	**$16,571**	**$13,965**

SANITARY SYSTEM – COLLECTION SYSTEM

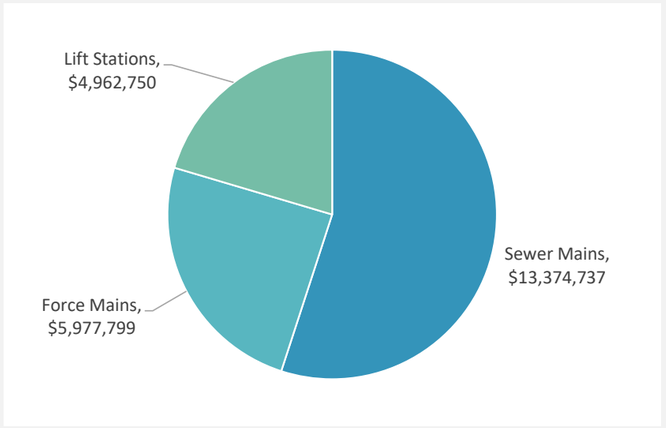
What assets do we own?

Mains
19.4 km

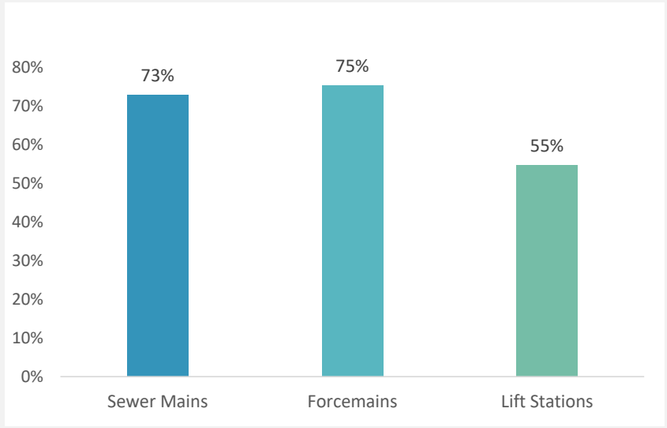
Forcemains
9.9 km

Lift Stations
2

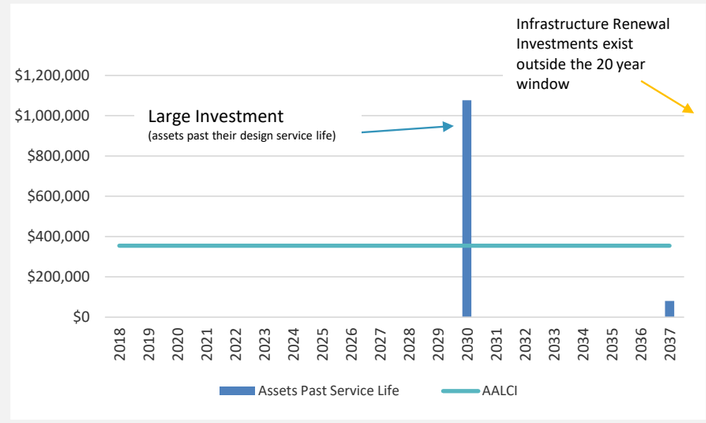
How much are our assets worth?



How much life is left in our assets?



When will our assets pass their estimated service life?



How much do we need to invest in our assets?

Sub-category	Asset Description	100% Replacement Value	Expected Remaining Life	20 Year Average Annual Investment	Average Annual Life Cycle Investment (AALCI)
Gravity Mains					
Sewer Mains	***Diameter***				
>= 600	*>= 600*	$4,737,861	69%	$0	$51,888
525	*525*	$1,099,013	73%	$0	$11,699
450	*450*	$1,682,214	70%	$0	$18,159
375	*375*	$3,978,158	77%	$0	$40,546
300	*300*	$1,005,316	79%	$0	$10,772
250	*250*	$276,116	74%	$0	$2,761
200	*200*	$596,058	76%	$0	$5,961
		$13,374,737	**73%**	**$0**	**$141,785**
Forcemains		**$ 5,977,799**	**75%**	**$ 0**	**$75,698**
Lift Stations					
Casa Loma		$1,944,000	58%	$43,200	$56,700
East Trunk		$3,018,750	53%	$14,688	$80,625
		$4,962,750	**55%**	**$57,888**	**$137,325**

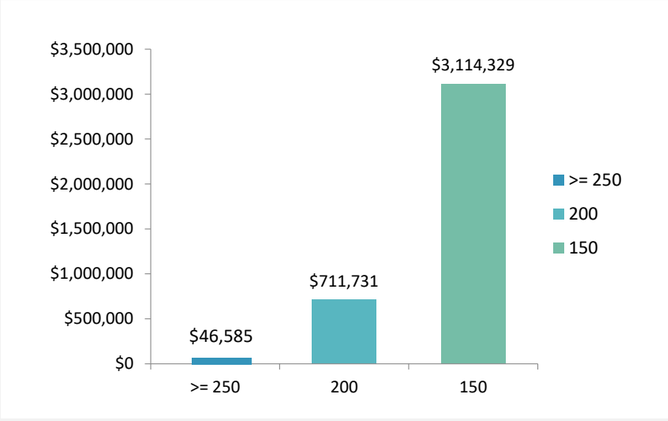
SANITARY SYSTEM – SUNSET SANITARY SYSTEM

What assets do we own?

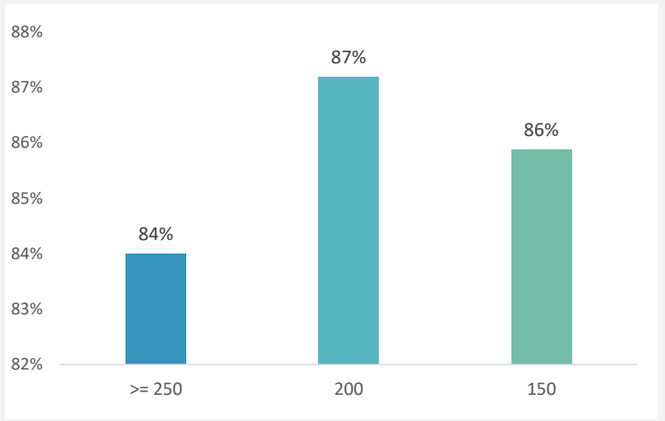
Mains

7.5 km

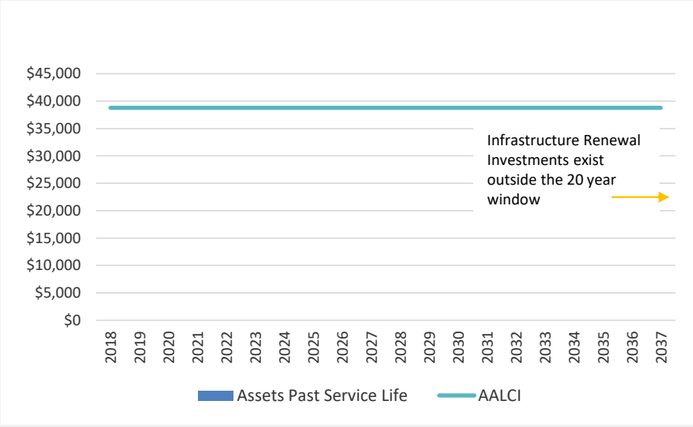
How much are our assets worth?



How much life is left in our assets?



When will our assets pass their estimated service life?



How much do we need to invest in our assets?

Sub-category	Asset Description	100% Replacement Value	Expected Remaining Life	20 Year Average Annual Investment	Average Annual Life Cycle Investment (AALCI)
Sunset Sanitary System					
	Diameter				
>= 250	*>= 250*	$711,731	84%	$0	$7,117
200	*200*	$3,114,329	87%	$0	$31,215
150	*150*	$46,585	86%	$0	$466
		$3,872,645	**87%**	**$0**	**$38,798**

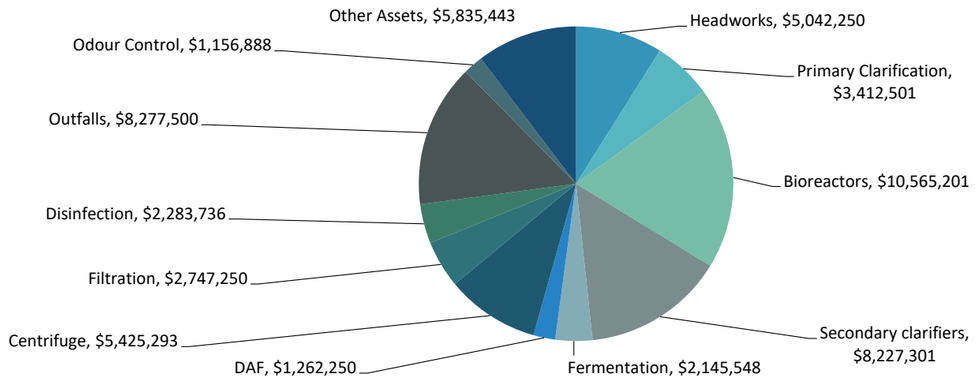
SANITARY SYSTEM - WWTP

What assets do we own?

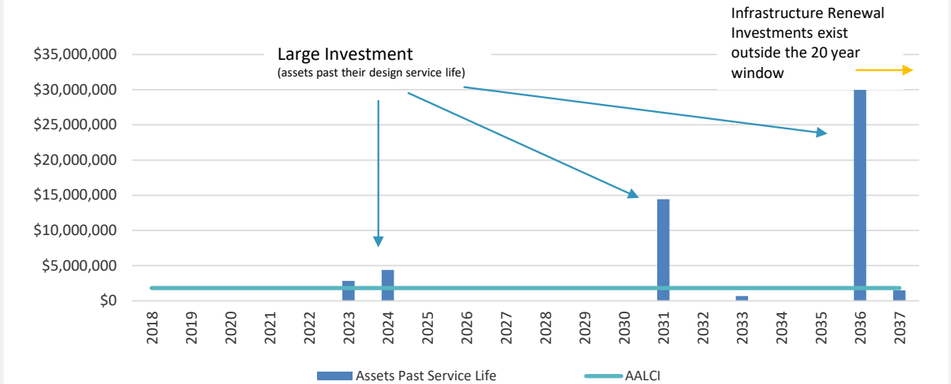
Treatment

1

How much are our assets worth?



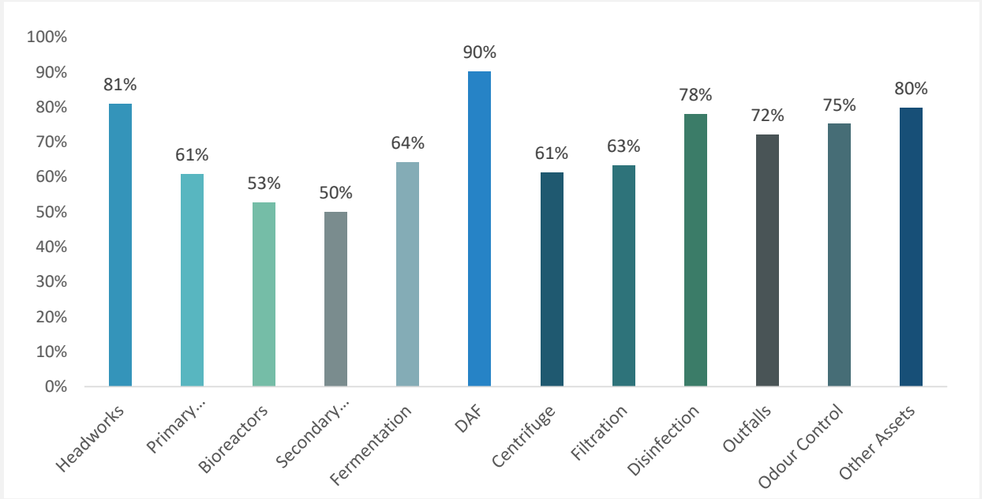
When will our assets pass their estimated service life?



How much do we need to invest in our assets?

Sub-category	Asset Description	100% Replacement Value	Expected Remaining Life	20 Year Average Annual Investment	Average Annual Life Cycle Investment (AALCI)
Treatment					
Headworks		$5,042,250	81%	$139,050	$167,316
Primary Clarification		$3,412,501	61%	$38,813	$71,766
Bioreactors		$10,565,201	53%	$364,500	$405,440
Secondary clarifiers		$8,227,301	50%	$292,941	$322,547
Fermentation		$2,145,548	64%	$54,290	$67,537
DAF		$1,262,250	90%	$33,750	$41,091
Centrifuge		$5,425,293	61%	$162,000	$189,316
Filtration		$2,747,250	63%	$108,000	$115,341
Disinfection		$2,283,736	78%	$78,689	$87,563
Outfalls		$8,277,500	72%	$77,625	$161,688
Odour Control		$1,156,888	75%	$57,237	$57,389
Other Assets		$5,835,443	80%	$91,905	$141,872
		$56,381,162	**65%**	**$1,498,799**	**$1,828,863**

How much life is left in our assets?



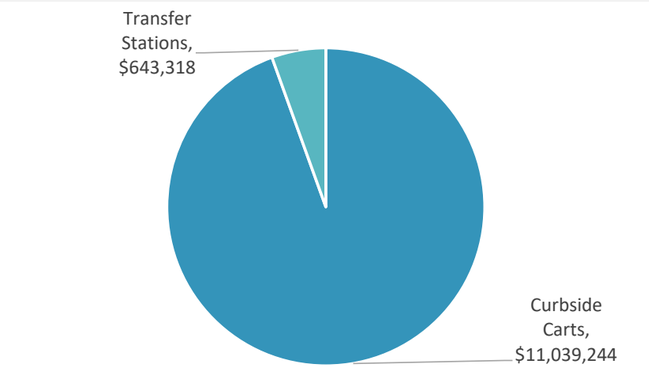
SOLID WASTE SYSTEM

What assets do we own?

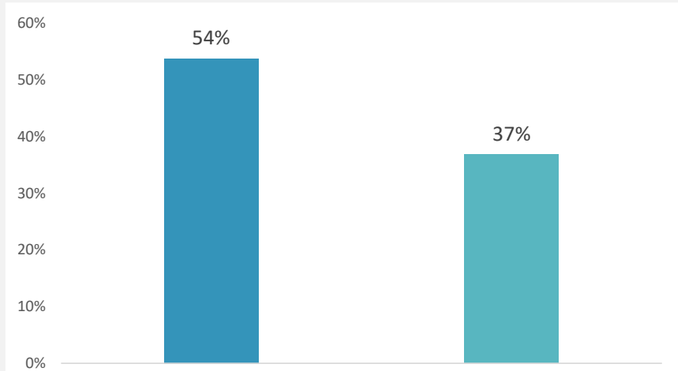
Curbside Carts
178,532

Transfer Stations
3

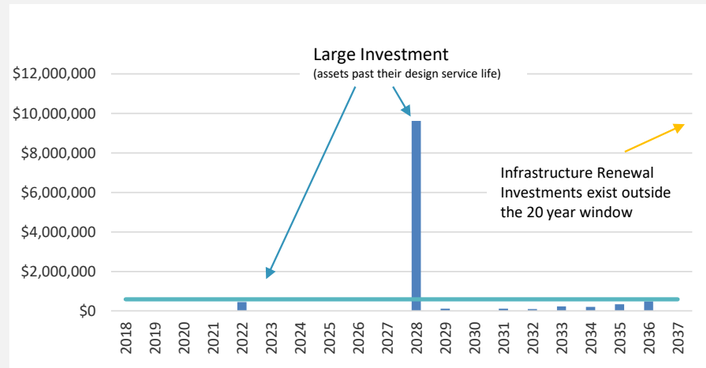
How much are our assets worth?



How much life is left in our assets?



When will our assets pass their estimated service life?



How much do we need to invest in our assets?

Sub-category	Asset Description	100% Replacement Value	Expected Remaining Life	20 Year Average Annual Investment	Average Annual Life Cycle Investment (AALCI)
Curbside Carts					
Kelowna	120L	$ 2,064,480	54%	$ 103,224	$ 103,224
	240L	$ 4,300,956	51%	$ 215,048	$ 215,048
	360L	$ 897,450	69%	$ 44,873	$ 44,873
	Sub-Total	**$ 7,262,886**	**54%**	**$ 363,144**	**$ 363,144**
West Kelowna	120L	$ 547,740	50%	$ 27,387	$ 27,387
	240L	$ 1,312,344	52%	$ 65,617	$ 65,617
	360L	$ 229,125	68%	$ 11,456	$ 11,456
	Sub-Total	**$ 2,089,209**	**53%**	**$ 104,460**	**$ 104,460**
Lake Country	120L	$ 221,799	50%	$ 11,090	$ 11,090
	240L	$ 552,354	54%	$ 27,618	$ 27,618
	360L	$ 125,400	71%	$ 6,270	$ 6,270
	Sub-Total	**$ 899,553**	**55%**	**$ 44,978**	**$ 44,978**
Peachland	120L	$ 133,518	50%	$ 6,676	$ 6,676
	240L	$ 315,678	50%	$ 15,784	$ 15,784
	360L	$ 25,800	50%	$ 1,290	$ 1,290
	Sub-Total	**$ 474,996**	**50%**	**$ 23,750**	**$ 23,750**
RDCO	120L	$ 89,709	52%	$ 4,485	$ 4,485
	240L	$ 206,316	51%	$ 10,316	$ 10,316
	360L	$ 16,575	50%	$ 829	$ 829
	Sub-Total	**$ 312,600**	**51%**	**$ 15,630**	**$ 15,630**
	Total	**$ 11,039,244**	**54%**	**$ 551,962**	**$ 551,962**

Transfer Stations					
092 WESTSIDE TRANSFER STATION	$568,304	31%	$28,415	$29,115
093 WESTSIDE LANDFILL	$25,000	77%	$0	$250
095 SOLID WASTE COLLECTION	$50,014	80%	$2,501	$2,501
Sub-Total	**$ 643,318**	**37%**	**$30,916**	**$31,866**

MOVING FORWARD

Based on the results of the AMIP, the previously completed assessment of current practices, and the process outlined in the Asset Management for Sustainable Service Delivery, A BC Framework, the following section outlines a matrix with a list of steps (tools) and priorities for consideration of an advanced level of practicing asset management.

The steps outlined below are organized deliberately in order to promote successful implementation and improve understanding in the three pillars that inform infrastructure decisions – Cost, Risk and Service.

Number	Priority Name	BC Asset Management Framework Process	Description
1	Cross-Functional Team	People	Create a collaborative cross functional team made up of core departmental representatives to support and mentor on infrastructure decision-making and budgeting within the RDCO and their respective departments.
2	Asset Management/Financial Policy	Plan	Develop an asset management policy that encompasses procedures for data handling/tracking/updating and sharing, project prioritization, risk, and infrastructure investment decisions. The policy could include statements on how infrastructure investment will be funded whether it's through building reserves, debt or taxes, etc.
3	Setting Annual Infrastructure Investment Levels and Update Water and Sewer Rates	Plan	Consider the results of the AMIP, DCC and policy discussions to determine the affordable annual contribution to infrastructure investment (likely somewhere between the AAI and the AALCI amounts depending on risk tolerance and service levels). Update the water and sewer rate bylaws to increase revenues to achieve the desired investment levels for renewal.
5	Maintenance Management Plans	Implement Asset Management Practices	The importance of maintenance in extending service lives of assets and deferring their inevitable replacement (reducing the annual capital investment) is paramount to provide acceptable levels of service with fewer financial resources. Develop plans (including work orders, standard operating procedures, etc) for the O&M of assets to optimize/extend asset service lives.
6	Communications/ Engagement	Core Element	Develop asset management/infrastructure communications with staff and the public (e.g. benefits, requirements, products, progress). Community buy-in will be essential for setting levels of service and achieving financial sustainability/full cost recovery for service delivery.
7	Performance Measures	Measure and Report	Develop performance metrics to measure and report out on the RDCO's service delivery/asset management status to the Board and the community. These would include a set of both "leading" and "lagging" indicators that evaluate the sustainability of services (E.g. number of m of pipe replaced, number of m^2 of pavement replaced or avoided etc).
8	Refine Asset Inventory	Information	Continually update and refine your infrastructure data over time with new spatial and attribute data to improve accuracy as it becomes available through field activities. Consider completing an inventory and valuation of your natural Assets.

APPENDIX A

AMIP LEVEL 1

RDCO
Asset Management Investment Plan (AMIP)
Level 1 - Summary of Water, Sanitary and Solid Waste Infrastructure

Asset Category	Total Replacement Value	Loss in Value	Remaining Value	Expected Remaining Life	Infrastructure Deficit (Backlog)	2018	2019	2020	2021	2022	2023	2024
Domestic Water Systems												
Fintry Water System Renewal												
Water Meters	$55,419	$22,168	$33,251	60%	$0	$0	$0	$0	$0	$0	$0	$0
Water Mains	$8,751,312	$525,079	$8,226,233	94%	$0	$0	$0	$0	$0	$0	$0	$0
Facilities	$3,946,000	$515,164	$3,430,836	87%	$0	$0	$0	$0	$0	$0	$0	$0
Total	**$12,752,730**	**$1,062,410**	**$11,690,320**	**92%**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Star Place Water System Renewal												
Water Meters	$6,424	$2,569	$3,854	60%	$0	$0	$0	$0	$0	$0	$0	$0
Water Mains	$176,286	$4,961	$171,325	97%	$0	$0	$0	$0	$0	$0	$0	$0
Facilities	$350,000	$158,125	$191,875	55%	$0	$0	$0	$0	$0	$0	$0	$0
Planned Improvements	*$125,000*	$0	$0	0%	$0	$0	$0	$0	$50,000	$0	$0	$75,000
Total	**$657,710**	**$165,655**	**$367,054**	**56%**	**$0**	**$0**	**$0**	**$0**	**$50,000**	**$0**	**$0**	**$75,000**
Sunset Ranch Water System Renewal												
Water Meters	$95,544	$38,218	$57,326	60%	$0	$0	$0	$0	$0	$0	$0	$0
Water Mains	$5,308,708	$800,116	$4,508,592	85%	$0	$0	$0	$0	$0	$0	$0	$0
Facilities	$2,484,750	$870,380	$1,614,370	65%	$0	$0	$0	$0	$0	$0	$0	$0
Planned Improvements	*$75,000*	$0	$0	0%	$0	$0	$0	$0	$0	$0	$0	$75,000
Total	**$7,964,002**	**$1,708,714**	**$6,180,288**	**78%**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Killiney Water System Renewal + Treatment												
Water Meters	$217,859	$87,144	$130,715	60%	$0	$0	$0	$0	$0	$0	$0	$0
Water Mains	$9,383,961	$4,596,354	$4,787,607	51%	$0	$0	$0	$478,593	$0	$0	$2,264,210	$0
Facilities	$3,647,035	$1,133,553	$2,513,482	69%	$0	$450,000	$0	$2,392,964	$0	$0	$13,121,049	
Planned Improvements	*$6,025,000*	*$0*	*$0*	0%	$0	$0	$0	$3,900,000	$0	$0	$0	$225,000
Total	**$19,273,855**	**$5,817,051**	**$7,431,804**	**39%**	**$0**	**$450,000**	**$0**	**$6,771,556**	**$0**	**$0**	**$15,385,259**	**$225,000**
Westshore Water System Renewal + Treatment												
Water Meters	$164,189	$65,676	$98,513	60%	$0	$0	$0	$0	$0	$0	$0	$0
Water Mains	$8,832,848	$6,610,130	$2,222,718	25%	$709,901	$0	$0	$0	$0	$0	$0	$0
Facilities	$2,566,328	$1,010,159	$1,556,169	61%	$975,000	$0	$0	$0	$0	$0	$0	$150,000
Planned Improvements	*$5,950,000*	$0	$0	0%	$0	$0	$0	$3,900,000	$0	$0	$0	$0
Total	**$17,513,365**	**$7,685,965**	**$3,877,401**	**22%**	**$1,684,901**	**$0**	**$0**	**$3,900,000**	**$0**	**$0**	**$0**	**$150,000**
Falcon Ridge Water System Renewal												
Water Meters	$31,374	$12,549	$18,824	60%	$0	$0	$0	$0	$0	$0	$0	$0
Water Mains	$2,278,668	$720,306	$1,558,362	68%	$0	$0	$0	$0	$0	$0	$0	$0
Facilities	$1,746,300	$421,016	$1,325,284	84%	$165,000	$0	$0	$0	$0	$0	$0	$0
Planned Improvements	*$150,000*	$0	$0	0%	$0	$0	$0	$0	$0	$0	$0	$150,000
Total	**$4,206,342**	**$1,153,872**	**$2,902,470**	**69%**	**$165,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$150,000**
Total Water	**$62,368,004**	**$17,593,667**	**$32,449,337**	**52%**	**$1,849,901**	**$450,000**	**$0**	**$10,671,556**	**$50,000**	**$0**	**$15,385,259**	**$600,000**
Sanitary Sewer												
Sanitary Sewer System Renewal												
Sewer Mains	$13,374,737	$3,624,483	$9,750,254	73%	$0	$0	$0	$0	$0	$0	$0	$0
Force Mains	$5,977,799	$1,481,081	$4,496,718	75%	$0	$0	$0	$0	$0	$0	$0	$0
Lift Stations	$4,962,750	$2,247,775	$2,714,975	55%	$850,000	$0	$0	$0	$0	$0	$0	$0
Sunset Ranch Sewer Mains	$3,872,645	$519,322	$3,353,323	87%	$0	$0	$0	$0	$0	$0	$0	$0
Treatment	$56,381,162	$19,694,125	$36,687,036	65%	$7,636,441	$0	$0	$0	$0	$0	$0	$0
Total	**$84,569,093**	**$27,566,787**	**$57,002,307**	**67%**	**$8,486,441**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Solid Waste												
Solid Waste Renewal												
Curbside Carts	$11,039,244	$5,102,825	$5,936,419	54%	$0	$0	$0	$0	$0	$0	$0	$0
Transfer Stations	$643,318	$406,612	$236,706	37%	$0	$13,997	$0	$0	$0	$451,247	$0	$0
Total	**$11,682,562**	**$5,509,438**	**$6,173,124**	**53%**	**$0**	**$13,997**	**$0**	**$0**	**$0**	**$451,247**	**$0**	**$0**

Investment Year (Current Dollars)													2017 Reserve Balances	20 Year Total	20 Year Average Annual Investment	Average Annual Life Cycle Investment (AALCI)
2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037				
$0	$0	$0	$0	$0	$55,419	$0	$0	$0	$0	$0	$0	$0		$55,419	$2,771	$2,771
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	$87,513
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$300,000	$0	$0		$300,000	$15,000	$81,861
$0	**$0**	**$0**	**$0**	**$0**	**$55,419**	**$0**	**$0**	**$0**	**$0**	**$300,000**	**$0**	**$0**	**$308,711**	**$355,419**	**$17,771**	**$172,145**
$0	$0	$0	$0	$0	$6,424	$0	$0	$0	$0	$0	$0	$0		$6,424	$321	$321
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	$2,518
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$200,000	$0	$0		$200,000	$10,000	$6,875
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		$50,000	$6,250	$4,250
$0	**$0**	**$0**	**$0**	**$0**	**$6,424**	**$0**	**$0**	**$0**	**$0**	**$200,000**	**$0**	**$0**	**$2,890**	**$256,424**	**$16,571**	**$13,965**
$0	$0	$0	$0	$0	$95,544	$0	$0	$0	$0	$0	$0	$0		$95,544	$4,777	$4,777
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	$59,204
$0	$0	$400,000	$0	$251,750	$0	$0	$0	$0	$0	$0	$0	$0		$651,750	$32,588	$60,345
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$3,750	$3,000
$0	**$0**	**$400,000**	**$0**	**$251,750**	**$95,544**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$328,697**	**$747,294**	**$41,115**	**$127,326**
$0	$0	$0	$0	$0	$217,859	$0	$0	$0	$0	$0	$0	$0		$217,859	$10,893	$10,893
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		$2,742,803	$137,140	$93,840
$0	$0	$0	$0	$0	$217,859	$0	$0	$0	$0	$0	$0	$0		$16,406,872	$37,500	$65,836
$0	$0	$0	$0	$0	$0	$1,900,000	$0	$0	$0	$0	$0	$0		$0	$301,250	$154,000
$0	**$0**	**$0**	**$0**	**$0**	**$435,718**	**$1,900,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$321,550**	**$19,367,533**	**$486,783**	**$324,569**
$0	$0	$0	$0	$0	$164,189	$0	$0	$0	$0	$0	$0	$0		$164,189	$8,209	$8,209
$0	$0	$0	$0	$0	$0	$0	$0	$3,165,744	$0	$4,911,121	$0	$0		$8,786,766	$439,338	$152,838
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		$2,100,000	$48,750	$46,945
$0	$0	$0	$0	$0	$0	$1,900,000	$0	$0	$0	$0	$0	$0	$0	$0	$297,500	$151,000
$0	**$0**	**$0**	**$0**	**$0**	**$164,189**	**$1,900,000**	**$0**	**$3,165,744**	**$0**	**$4,911,121**	**$0**	**$0**	**$893,280**	**$11,050,955**	**$793,798**	**$358,992**
$0	$0	$0	$0	$0	$31,374	$0	$0	$0	$0	$0	$0	$0		$31,374	$1,569	$1,569
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	$24,838
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$10,750	$28,116
$0	$0	$0	$0	$50,000	$0	$0	$0	$0	$0	$0	$0	$0		$215,000	$7,500	$6,000
$0	**$0**	**$0**	**$0**	**$50,000**	**$31,374**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$6,512**	**$246,374**	**$19,819**	**$60,523**
$0	**$0**	**$400,000**	**$0**	**$301,750**	**$788,667**	**$3,800,000**	**$0**	**$3,165,744**	**$0**	**$5,411,121**	**$0**	**$0**		**$32,023,999**	**$1,375,856**	**$1,057,520**
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$452,119	$0	$0	$141,785
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	$75,698
$0	$0	$0	$0	$0	$1,076,750	$0	$0	$0	$0	$0	$0	$81,000		$1,157,750	$57,888	$137,325
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	$38,798
$2,830,441	$4,390,399	$0	$0	$0	$0	$0	$0	$14,443,692	$0	$675,000	$0	$0	$327,918	$29,975,973	$1,498,799	$1,828,863
$2,830,441	**$4,390,399**	**$0**	**$0**	**$0**	**$1,076,750**	**$0**	**$0**	**$14,443,692**	**$0**	**$675,000**	**$0**	**$81,000**	**$780,037**	**$31,133,723**	**$1,556,686**	**$2,222,469**
$0	$0	$0	$9,628,749	$114,750	$0	$114,099	$93,750	$218,700	$152,820	$237,540	$478,836	$0		$11,039,244	$551,962	$551,962
$0	$0	$0	$0	$0	$0	$0	$0	$4,060	$50,014	$99,000	$0	$0	$78,874	$618,318	$30,916	$31,866
$0	**$0**	**$0**	**$9,628,749**	**$114,750**	**$0**	**$114,099**	**$93,750**	**$222,760**	**$202,834**	**$336,540**	**$478,836**	**$0**	**$78,874**	**$11,657,562**	**$582,878**	**$583,828**

APPENDIX B

INPUTS

UNIT COST DERIVATION

The following is intended to outline how the unit costs included in the Asset Management Investment Plan were developed. The primary basis for most unit costs for the water and sewer assets is based on recently tendered projects in the Central Okanagan region.

Sanitary Sewer

Inputs

Pipe, Appurtenances (connection, manholes, services), road restoration, removals, engineering and contingency

In order to determine a per metre price, it was assumed a 100m long segment would include:

- 1 manhole (incl. 1m riser), 1 tie-in connection, 6 services
- 3.5m wide trench wide- asphalt removal, trench restoration, and asphalt restoration
- Soft Costs- engineering and contingency

Pipe

Per metre price:

Diameter (mm)	Unit Cost	Diameter (mm)	Unit Cost
200	$165	525	$410
250	$170	600	$500
300	$205	750	$640
350	$235	900	$790
375	$235	1050	$950
450	$320	1200	$1,350

Appurtenances

6 services (assume 10m long c/w IC) = (6 x $2,600ea) /100m = $156.00/m

1 Connection = (1 x $3,500 ea) /100m = $35.00/m

1 Manhole = (1 x $3,505 ea) /100m = 35.05/m

Total = $226.05/m

Road Restoration (3.5m wide trench per metre of pipe)

Asphalt (assume 75mm thick unit price)
$25.30m2 x 3.5m x 1m = $88.55 /m

Base gravel (assume 100m thick)
$51.28 m3 x 3.5m x 1m x 0.1m = $17.95/m

Total = $106.50/m

Removals (3.5m wide trench per metre of pipe)

Asphalt removal
$4.28 m2 x 3.5m x 1m = $14.98/m

Engineering & Contingency

Design - 7%, CA - 8%, Contingency – 20% = 35%

Total per m = Pipe cost per metre + $226.05 + $106.50 + $14.98 + 40%

Water

Inputs

Pipe, Appurtenances (connection, fittings, services), road restoration, removals, engineering and contingency

In order to determine a per metre price, it was assumed a 100m long segment would include:

- 4 fittings, 2 tie-in connections, 6 services
- 3.5m wide trench wide- asphalt removal, trench restoration, and asphalt restoration
- Soft Costs- engineering and contingency

Pipe

Per metre price:

Diameter (mm)	Unit Cost	Diameter (mm)	Unit Cost
50	$60	350	$250
100	$120	375	$325
150	$140	400	$420
200	$165	450	$470
250	$210	525	$510
300	$240	600	$600

Appurtenances

6 services (assume 10m long c/w IC) = (6 x $2,600 ea) /100m= $156.00/m

2 Connections = (2 x $3,000 ea)/100m = $60.00/m

4 Fittings = (4 x $750 ea) /100m = $30.00/m

Total = $246.00/m

Road Restoration (3.5m wide trench per metre of pipe.)

- Asphalt (assume 75mm thick unit price)
  $25.30m2 x 3.5m x 1m = $88.55 /m
- Base gravel (assume 100m thick)
  $51.28 m3 x 3.5m x 1m x 0.1m = $17.95/m

Total = $106.50/m

Removals (3.5m wide trench per metre of pipe).

- Asphalt removal
  $4.28 m2 x 3.5m x 1m = $14.98/m

Engineering & Contingency

Design -7%, CA-8%, Contingency – 20% = 35%

Total per m = Pipe cost per metre + $246.00 + $106.50 + $14.98 + 40%

APPENDIX B

Service Life Estimates

The service life of an asset such as a pipe depends on many factors such as the materials it is constructed from, the properties of the soils that it is buried in, how it was installed and many, many other factors. For this reason, lifespan estimates are generally based on “rule of thumb” values. Most rule of thumb lifespans applied by engineers are conservative (on the safe side). In reality many assets could actually last much longer (50% longer or possibly more) than these estimates. The following tables summarize the “rule of thumb” values utilized in the AMIP.

The unit costs and service life estimates for the WWTP have been provided under separate cover. Unit costs for solid waste and other assets not included above will be based on historical cost (from invoices or TCA spreadsheets) and increased to 2017 dollars using the Engineering News record (ENR) cost increase factors.

Sanitary Sewer System	
Pipe Material	Life Expectancy (years)
AC	70
CONC	70
VCT	70
STEEL	70
PVC/HDPE	100
Component	
Pump Stations – Short lived	25
Pump Stations – Long Lived	80

Water Distribution System	
Pipe Material	Life Expectancy (years)
AC	80
CI	80
DI	60
COPPER	60
GALV	40
STEEL	60
Polyethylene	80
HDPE	80
PVC	100
Component	
Wells/Pumps/Treatment	25
Reservoirs	80
Flow Meters	30
Appurtenances	20