Municipality of North Cowichan
Committee of the Whole
AGENDA

Wednesday, January 29, 2020, 10:30 a.m.
Municipal Hall - Maple Bay Meeting Room

Pages

1. CALL TO ORDER

2. APPROVAL OF AGENDA

Recommendation:
That the January 29, 2020 Committee of the Whole agenda be adopted as circulated [or as amended].

3. CLOSED SESSION

Recommendation:
That the Committee close the January 29, 2020 Committee of the Whole meeting at _____ a.m. to the public on the basis of the following section of the *Community Charter*:

- **90(2)(b) - the consideration of information received and held in confidence relating to negotiations between the municipality and a provincial government or the federal government or both, or between a provincial government or the federal government or both and a third party.**

4. RESUME OPEN MEETING

5. PUBLIC INPUT

Brief public input from registered speakers regarding items on this agenda.

6. BUSINESS

6.1 **PRESENTATION: John Weninger, Consultant, Urban Systems - Asset Management** 2 - 76

Purpose: To hear from John Weninger regarding his summary of findings and recommendations for improving asset management planning at North Cowichan.

7. NEW BUSINESS

8. QUESTION PERIOD

Public opportunity to ask brief questions regarding the business of this meeting.

9. ADJOURNMENT

Recommendation:
That the Committee of the Whole meeting be adjourn at _____ p.m.

Improving Asset Management Planning at the Municipality of North Cowichan

Summary of Findings and Recommendations

FINAL REPORT – November 2019

URBAN systems

Table of Contents

Appendices

Introduction

Overview of this Plan

What it is

In 2018, the District Municipality of North Cowichan (the District) initiated a project to improve asset management planning for the Municipalities linear water, sewer, storm and roads infrastructure. This report summarizes the key outcomes and recommendations of the project. It will help ensure that the delivery of these services is more sustainable over the long term.

Asset management is an integrated and continuous process that combines the skills, expertise, and activities of people with information about a community's infrastructure assets and finances, so that decisions are informed by cost, risk, and level of service. Sustainable service delivery is the goal of asset management.

Why it is important

The District owns a significant amount of water, sewer, roads and stormwater infrastructure. As this infrastructure reached the end of its useful life it will need to be replaced or rehabilitated at significant expense to the District. A robust asset management program will help the District plan for and prioritize the replacement of these assets such that the best value is received from future capital investment and that the impact to user fees and taxes is minimized.

Desired outcomes

Desired outcomes of the project included recommendations for the following:

- Improvements to the District's geographic information system (GIS)
- A framework to objectively assess risk to the District from asset failure
- A financial policy to guide investment decision making and funding decisions
- Improvements to the processes that determine asset valuations
- Improvements to the processes that guide the classification of asset condition
- An investment plan that defines the level of funding required to sustain the District's linear water, sewer, stormwater and roads assets over the long term
- An integrated tool to help the District visualize the information that has resulted from this project and aid in future decision making

How it was developed

The process was carried out throughout late 2018 and 2019 and was led by staff from Finance, Engineering and, IT and GIS Services. The consulting team worked collaboratively with the District's team to define the desired deliverables from each stage of the project.

Using this Document

This document summarizes the key findings and recommendations of the project.

Details of each component of the project are contained in Attachments A through H, which are useful standalone documents that were prepared throughout the project. These appendices include:

- Appendix A: Data Review
- Appendix B: Asset Replacement Cost Framework
- Appendix C: Condition Assessment Framework
- Appendix D: Asset Management Investment Plan
- Appendix E: Financial Policy
- Appendix F: Risk Assessment Framework and Analysis
- Appendix G: Visualization Tool

This summary document should be used by staff along with the attachments to:

- Make improvements to asset management practices
- Inform the annual budget
- Guide annual departmental work planning
- Inform communications with Council and the public

Data Review

As part of the Asset Management Planning project that is currently in progress, Urban Systems undertook a high-level review of the District's GIS information to identify any gaps that would need to be addressed so as to allow the next stages of the project to proceed successfully.

General Observations

Available data looks well populated with core Asset Management values but does have some discrepancies, anomalies, data gaps and redundancy that should be rectified. Data redundancy needs to be further explored with staff since provided datasets indicate a need to reconcile redundant information in order to make it most useable to support important decision making. North Cowichan staff should be able to provide clarity on data redundancy and be able to address the identified data issues. Staff noted that data is centralized (in SDE) and feeds other systems that support decision-making

Below are key observations from our review of North Cowichan's Asset Data. More detailed information can be found in the attached spreadsheet.

- Overall readiness of data is approximately 90%
- Data is mostly well prepared and populated with key attributes
- Data gaps exist in key attributes (for example road width information)
- There are some non-unique asset ID's

Recommendations

- Data gaps should be populated
- Non-unique Asset Identifiers should be rectified
- A review data handling practices and the alignment with a consistent data structure (potentially MMCD) should be initiated
- Data for relevant assets should be consolidated from peripheral datasets (for example PRV assets in Water Appurtenances layer should be migrated to Water Facility or Water Valve layer and Cleanouts in Sewer Appurtenances layer should be migrated to Sewer Manhole layer with other Cleanouts)

More specific information can be found in **Appendix A.**

Asset Replacement Cost Framework

Overview

As part of this project the District wanted to assess its current approach to asset valuation for water, sewer and stormwater infrastructure. Establishing replacement values for infrastructure is a critical aspect of asset management planning. If estimated replacement values are too low, the community runs the risk of a fiscal shortfall in the future. On the other hand, if these estimates are too high (i.e., too conservative), the community runs the risk of increasing taxes and user fees unnecessarily.

While having accurate replacement costs is important, the District will need to choose a level of accuracy that makes sense in terms of administrative effort. The amount of effort required to establish and maintain replacement costs needs to match how the data will be used and the level of accuracy required.

This component of the work reviewed how asset valuations were developed for both financial reporting purposes and for asset management planning purposes.

Recommendations

The recommendations from this component of the project were:

1. Maintain the current approach of including an allowance for non-linear assets in the unit costs of the linear water, sewer and stormwater assets, however; the unit costs build up should be revised so that the assumptions that are used are clear and simple to adjust.
2. Begin to track unit costs from tenders and contracts to understand local market conditions and apply this knowledge when updating the unit costs. The update the unit rates annually using a CPI adjustment plus/minus any adjustment that might be required to reflect any notable changes in the local construction market. The District may want to engage a consultant every 5-years to do a complete update to the unit costs.
3. Transition from the manual spreadsheet approach to asset valuation to a more automated database approach. One potential solution would be a geodatabase data model using a script(s) developed for ARCGIS or using the FME desktop. The use of GIS/FME based model approach is recommended only because the District has strong in-house GIS/FME capabilities that could develop and/or maintain this approach.

Refer to **Appendix B** for a complete description of this project component.

Condition Assessment Framework

Overview

Maintenance and rehabilitation of water, sewer and storm water systems pose a major challenge for most municipalities in North America given their budgetary constraints AND demand for quality service. Neglecting regular maintenance and rehabilitation of these systems leads to increased life-cycle costs and liabilities, and in some cases un-planned service disruptions.

Condition assessment is the procedure that allows utility managers to identify the condition of their infrastructure assets. It is a process of understanding the level of asset deterioration and the impact it has on the probability of failure.

- The benefits of condition assessment include:
- Improved decision making for asset replacements
- Risk management
- Reduction in operational expenses
- Better informed long-term capital and financial plans

While larger assets and more critical assets are often subject to formal periodic assessments, there are many smaller assets that in aggregate make up a significant part of the District's infrastructure. Often these smaller assets are assessed by operations staff.

In the absence of guidance, these operations staff are often left to their own devices to determine the condition grade and style of reporting. Even where individuals have sufficient experience to make a useful judgement of condition, the absence of supporting guidance leads to substantial variability.

As part of this project the District wanted to assess its current approach to condition assessment for water, sewer and stormwater infrastructure. Infrastructure condition information underpins a wide range of asset management activities ranging from asset valuations through to managing asset replacement planning and setting investment programmes.

Recommendations

1. Standardize the definitions for the likelihood of failure based on age for long-lived and short-lived assets.
2. Standardize the collection of water main break history information using a standard template.
3. Develop definitions for each of the condition categories for water mains based on break history and implement a process to upload key failure attributes and corresponding condition ratings into the GIS.
    - Example provided for discussion
4. Standardize the collection of water main break history information using a standard form.

5. Prioritize the CCTV assessment of sewer mains based on the consequences of failure and the likelihood of failure (Risk).
6. Consider inspecting of manholes concurrently with the collection of the CCTV for the mains.
7. Expand the use of CCTV assessment to include high risk stormwater mains.
8. Identify existing operations & maintenance activities/programs that would provide additional opportunity for collecting condition information about assets (e.g. Uni-directional flushing program).
9. Develop a plan for implementation the condition assessment framework. This could consider:
    - Completeness of condition information (both information collected, as well as information stored in the GIS database)
    - Degree of use of condition information in risk assessments and capital planning processes

A more comprehensive description of the work completed in this component is contained in **Appendix C**.

Asset Management Investment Plan

Overview

This Asset Management Investment Plan (AMIP) was developed to determine future investment requirements for the Municipality of North Cowichan (the District)'s linear water, sewer, stormwater, and roads (surface) infrastructure. The AMIP presents annual investment requirements based on current renewal cost and estimated remaining service lives of these assets. The purpose of the AMIP is to support long-term financial planning decisions and provide information on strategic risks related to aging infrastructure.

What does the AMIP tell us?

- The AMIP aims to answer the following core questions:
- What assets does District own?
- What is the cost to replace these assets?
- What is the age of the assets and what is the estimated remaining service life?
- How much money needs to be invested annually to maintain District's assets?

It is important to note that the AMIP is not a tailored maintenance plan, budget, or capital plan, and should not be solely relied upon for investment decisions. The AMIP does not consider the optimal replacement or refurbishment method for infrastructure and more detailed review may allow for reduction of costs. The AMIP does not make decisions about infrastructure – it is up to those that make decisions within the District to consider this information when making major investment decisions.

The AMIP does not consider District's definition and tolerance of risk, or current and desired levels of service, which are both necessary aspects of capital plans, budgets, and maintenance plans. A Risk Framework specific to District has been completed as a separate project task.

Results

WHAT ASSETS DOES THE DISTRICT OWN?

Using the information provided, the asset inventory was organized into 4 categories representing the service provided. These categories, and the quantity of infrastructure within each, are as follows:

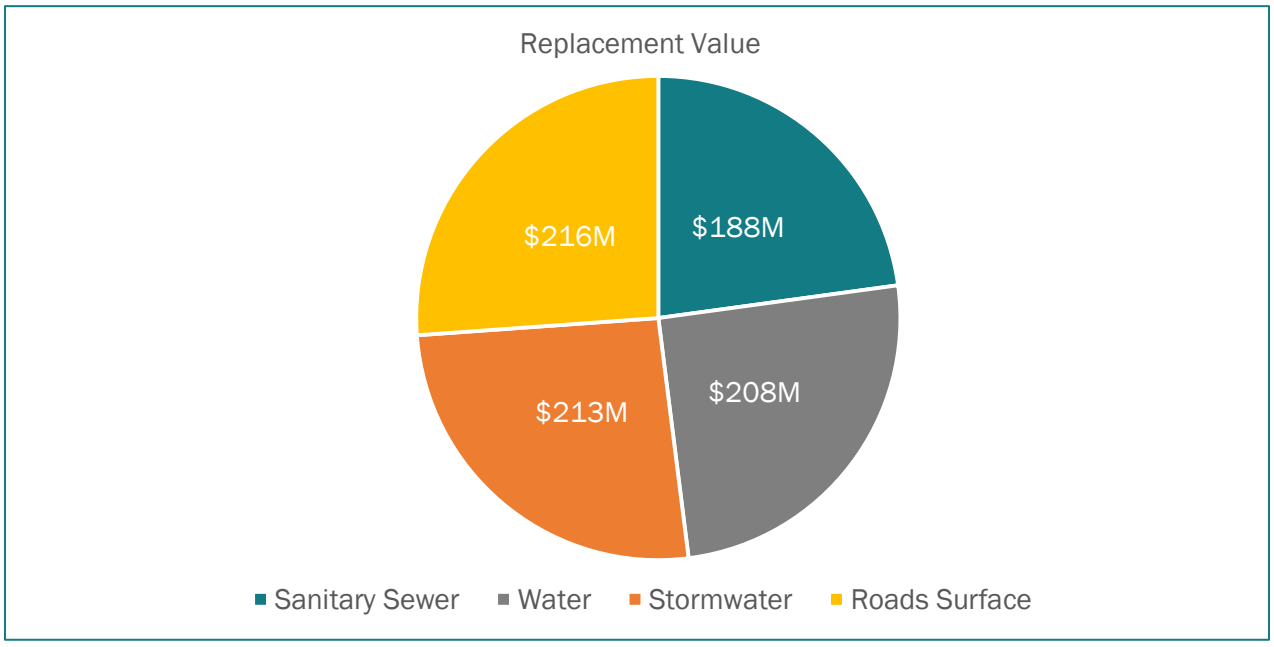
- Water
  - Mains – Approximately 240 km of mostly PVC and asbestos cement, ranging in size from 100 to 600 mm in diameter
  - Valves – 3090
  - Hydrants - 892
- Sanitary
  - Mains – Approximately 150 km of primarily PVC and AC sanitary mains, ranging in size from 150 to 900 mm diameter

  - **Manholes** - 2694
- **Stormwater**
  - **Mains** – Approximately 160 km of mostly PVC mains, ranging in size from 100 to 2500 mm diameter
  - **Manholes** - 2588
- **Roads** – Approximately 300 km of roads

WHAT IS THE VALUE OF THESE ASSETS?

The AMIP determined that total replacement value of District's linear water, sewer, stormwater and roads assets is estimated to be $825 million, expressed in 2019 dollars. It should be noted that the value of the road base ($290 million) has not been included in this number.

In theory road base should be restored adequately during resurfacing and therefore should only need replacement in instances where complete road failure has occurred.



WHAT IS THE ESTIMATED REMAINING LIFE OF THE ASSETS?

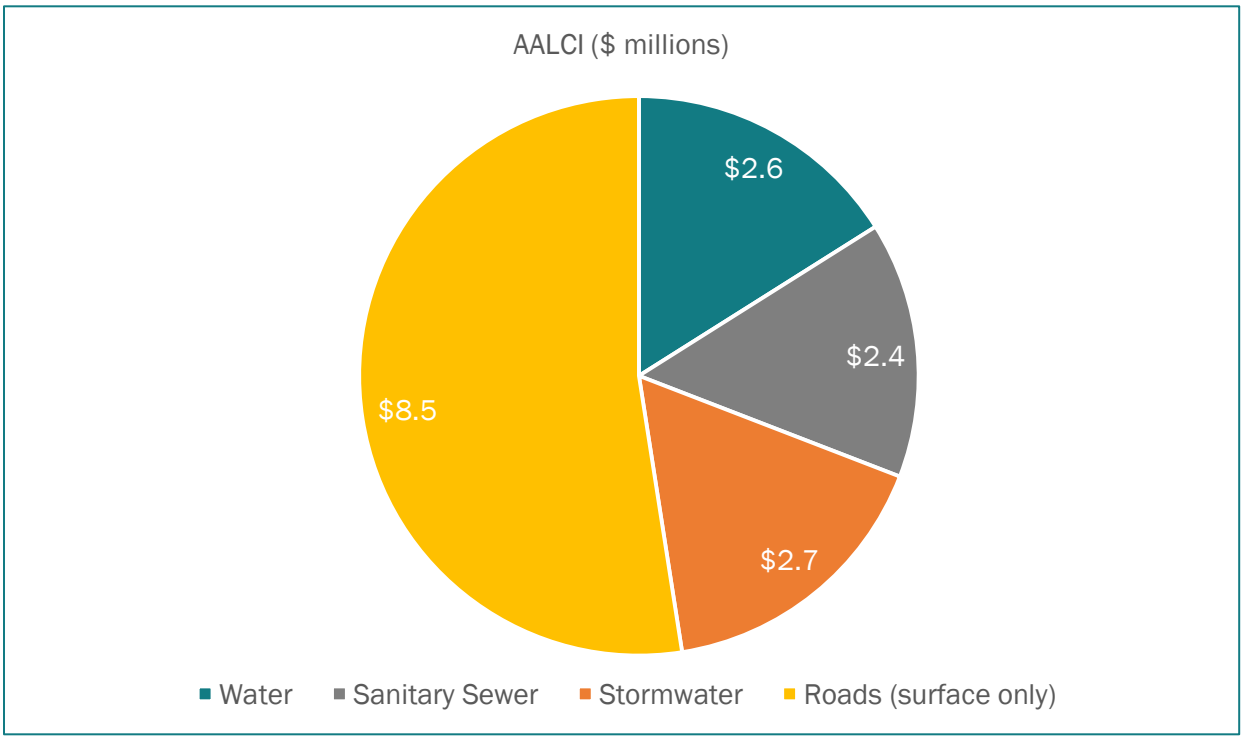
The table below summarizes the overall expected remaining life of each asset category based on its overall service life and install or renewal year. The remaining life for roads was estimated using the recent pavement condition assessment.

Asset Category	Expected Percent Remaining Life
Water Mains	63%
Sanitary Mains	60%
Storm Mains	71%
Roads Surface	64%

Based on the age of the assets, sanitary mains have the lowest expected remaining life with overall expected remaining life of 60%. Given its 100 years average life, road base has not been included in the above table and the remaining life reflects the surface only.

HOW MUCH MONEY NEEDS TO BE INVESTED ANNUALLY?

The average annual lifecycle investment (AALCI) is a long-term indicator that can be used to inform the average ongoing levels of infrastructure investment. This is the conservative funding level for sustaining infrastructure indefinitely and can be used to ensure revenue is stable enough to provide consistent support for asset replacement requirements. The AALCI for the District's linear water, sanitary sewer, stormwater and roads assets is approximately $16 million per year.



CURRENT FUNDING LEVELS

Water Fund
The Crofton and Chemainus water distribution systems are currently funded within the stated AALCI ranges. Revenues in the Crofton system could be increased to get funding more at the higher (i.e. more conservative) end of the range and to increase the available reserve funds. The South End system is currently under funded by approximately $600k to $1.1M annually.

Sewer Fund
The Crofton and Chemainus sewer collection systems are currently funded within the stated AALCI ranges. Revenues in the Crofton system could be increased to get funding more at the higher (i.e. more conservative) end of the range. The South End sewer system is currently underfunded by approximately $170k to $670k annually.

General Fund – Roads
Based on the expected life of the various road surfaces (local, arterial, collector) as stated in Appendix A the road network is underfunded by approximately $1.8M to $4.7M annually depending on how conservative an approach the District choose to take. When actual condition information is considered the expected required spend over the next 20 years is in the order of $7.4M which suggests a funding gap of around $2.5M annually. This is based on the assumption that roads determined to be in "good" condition have on average 80% of their useful life remaining, "fair" condition roads have 50% and "poor" condition roads have 20%. Roads that were determined to be in "poor" condition were assumed to be backlog.

The District will be developing a more comprehensive capital plan that will include the results of a new transportation master plan and the recent condition assessment. This capital plan will provide more clarity on what the annual spending should be over the next 10 to 20 years,

General Fund – Stormwater
Based on the expected life of the assets the stormwater collection system is currently underfunded by approximately $1.3M to $2.2M over the long term. In the near term the expected 20-year investment level based on age only is in the order of $1.0M annually which would suggest a short-term gap of approximately $500k annually.

Recommendations

- In general, the municipality has done a good job of keeping revenues at a sustainable level, however a few areas could benefit from increased funding, in particular the South End water system and the overall stormwater system.
- The South End water system revenue short fall could be addressed through incremental increases to user fees over a number of years.
- The City may want to consider the establishment of a dedicated funding source for stormwater such as a dedicated levy or parcel tax.

A more comprehensive description of the work completed in this component is contained in **Appendix D**.

Financial Policy

Overview

The Financial Policy aims to provide clarity to staff, Council and the community on how decisions are made with respect to the sustainable funding and financing of the District's infrastructure assets.

Financial management policy statements have been developed for seven (7) key areas that influence the sustainable funding and financing of the Municipality's infrastructure assets. They are intended to work together cohesively to guide financial planning and decision-making.

The policy areas included are:

- Property Taxes and User Fees
- Surplus Funds
- Reserve Funds
- Debt
- Grants
- Asset Renewal
- New Infrastructure

Policy Statements

PROPERTY TAXES AND USER FEES

a) The setting of annual budgets will be informed by the full cost of delivering the desired levels of service (including resource planning), lifecycle costs, risk, and the long-term priorities of the community.
b) Annual property tax and user fees adjustments will be reflective of inflation and of year to year changes in service levels and operating expenses.
c) Adjustments to annual property taxes and user fees will be as stable and predictable as feasible to enable accurate long-term financial planning and to avoid the need for future large one-time adjustments.
d) Everyone pays a fair amount for the services they benefit from with consideration for their ability to pay.

SURPLUS FUNDS

a) Unallocated annual surplus will be directed towards capital reserves annually after a base unallocated surplus target is met.
b) The base allocation remaining in unallocated surplus will be used for unplanned emergencies or budget short falls. The amount of the allocation will be determined by management and will not exceed 20% of the operating budget of each fund.
c) The use of accumulated surplus funds shall be reserved for unforeseen expenses and/or to leverage emergent opportunities.

RESERVE FUNDS

a) Annual contributions to capital reserves will be budgeted for based on the capital plan and the amounts will be informed by the Municipality's Asset Management Plan.
b) The annual contribution to capital reserves shall be kept as stable as possible from year to year.
c) Operating reserves should be maintained for non-recurring or unexpected expenses, recurring expenses shall be included within the annual budget and funded through operating revenues.

DEBT

a) The use of long-term debt will be focused on major projects with a value of $5M or greater with a life of greater than 10 years
b) Target tax supported debt servicing costs (including leases >10 years) to be no more than a maximum of 50% of the municipality's liability servicing limit to reserve borrowing capacity to leverage emergent opportunities and/or emergency situations
c) The servicing of debt shall be budgeted for and funded from on-going operating revenues
d) The use of debt will be considered to leverage available grant funding for priority projects

GRANTS

a) Focus the pursuit of conditional grants on large one-time projects that have been previously identified in the District's capital plans.
b) Advance priority projects to a "shelf-ready" status to ensure emergent grant opportunities can be fully leveraged
c) Conditional grants will not be considered for the purposes of long-term financial planning
d) If advantageous adjust the timing of capital and operating projects to align with anticipated grant funding opportunities
e) Grants for projects and programs that were not previously identified in capital/operating plans may be considered where the municipal share is <20% and there is a clear benefit to the community and a strong alignment with longer term goals

ASSET RENEWAL AND REPLACEMENT

a) Whenever possible, the renewal of linear assets will be financed on a pay as you go basis (i.e. reserves or current operating revenues rather than debt)
b) Replacement and renewal projects will be prioritized using a consistent and structured decision-making process that considers risk, life cycle cost and level of service

NEW INFRASTRUCTURE

a) Decisions to invest in new infrastructure will consider the full life cycle costs including operating, maintenance, and the eventual replacement of the asset(s)
b) In general, new infrastructure should be financed from sources other than the reserve funds purposed for capital renewal
c) The scope of planned capital projects that are in progress should not be expanded to include new assets without first identifying the impacts to the operating budget

The complete draft Financial Policy is attached in **Appendix E.**

Risk Assessment and Analysis

OVERVIEW

It is considered a best practice in asset management to make **risk-based decisions**. When decisions are based on risk, scarce resources can be allocated to where they are most needed; service interruptions can be avoided; and the District can protect its residents and manage its liability.

As part of this project Urban Systems worked closely with District staff to develop this Risk Framework (the Framework) for the District's water, sewer, stormwater, and roads assets. The Framework will help the District:

- Prioritize limited resources for inspection, rehabilitation, and replacement of assets
- Ensure that everyone is using a consistent definition of risk
- Make decisions based on risk, not risk perception
- Allow for open discussion about risk tolerance

WHAT A RISK FRAMEWORK IS

The Framework describes how the District will go about assessing risk for water, sewer, stormwater, and roads assets. Specifically, the Framework defines:

- What risk is and how it is assessed
- What types of hazards will be considered?
- How likelihood and consequence will be defined
- How risk ratings will be assigned to assets

Assessing risk happens as part of a broader risk management process:

- Once the District has assessed risk, it will identify the risks it chooses to address. The choices that are made about which risks to address will be based on the District's risk tolerance: what the District considers to be acceptable versus unacceptable risk.
- Once unacceptable risks have been identified, the District will identify the root cause of the risk. This is typically done through a process of asking "why" until the source is identified.
- The District will then identify actions to reduce risk to an acceptable level. Actions will focus on reducing the likelihood and/or consequence of asset failure and may be capital and/or operational.
- Actions are then prioritized through the capital and operational plans and then implemented.
- Risk is iteratively assessed to determine if the risk has been reduced to an acceptable level and if there are any new risks, and the cycle continues.

RESULTS

Using a GIS analysis tool developed for the District the Framework criteria was applied and a risk ranking was assigned to each segment of water main, sewer main, stormwater main and road. The ranking categories ranged from high down to low. The results of the analysis are contained in the summary table below:

Summary of Risk Rankings

Asset System	Risk Ranking	Length	Replacement Value
Roads	High	-	-
	Med. / High	10,896	$8,800,000
	Medium	166,661	$131,200,000
	Low / Med.	125,653	$75,600,000
	Low	124	$100,000
Sanitary	High	409	$500,000
	Med. / High	809	$1,000,000
	Medium	7,868	$9,700,000
	Low / Med.	48,867	$61,400,000
	Low	93,236	$115,800,000
Stormwater	High	385	$500,000
	Med. / High	6,502	$9,300,000
	Medium	10,252	$14,200,000
	Low / Med.	82,683	$112,600,000
	Low	61,524	$76,700,000
Water	High	-	-
	Med. / High	-	-
	Medium	16,237	$13,800,000
	Low / Med.	124,140	$110,700,000
	Low	98,463	$83,100,000

In general, the majority of the District's assets would be in the medium to low risk categories, however, there is approximately $10 million of stormwater assets that fall into the high and medium/high categories. There are also approximately $1.5 million of sewer assets falling into these upper risk categories. It would be prudent of the District to assess these assets and determine if replacement in the near term is warranted.

Visualization Tool

Overview

As an added component of the project a visualization tool was developed to improve the capability of City staff to make use of the information that was developed. The typical outputs from asset management analysis are generally in tabular form and can be cumbersome to apply in day to day infrastructure planning. The visualization tool allows all the information developed as part of this project to be viewed in a dashboard type map.

Some key features of the visualization tool include:

Interactive Map

The central component of the dashboard is the map which displays all of the linear water, sewer, stormwater and roads assets. The map is interactive, and the user can zoom into particular areas and select the one or all of the asset systems to view.

20 Year Replacement Forecast

A 20-year replacement forecast chart is provide at the bottom of the dashboard and it updates as different areas are selected on the map. The chart also shows the AALCI for the assets selected.

Risk Chart

To the right side of the map is a breakdown of all the assets selected by risk category. The chart also shows the total length of the assets for each risk category. By drilling down into this chart, the map will also update to reflect what has been selected on the chart.

Replacement Value and Remaining Life Dials

On the far right of the dashboard are dials that display the replacement value of the assets currently selected as well as the percent remaining life. These dials will update as different areas of the District are selected

Export Tools

The tool also includes tools to export the selected information in the form of an excel spreadsheet or as an image.

A screenshot of the visualization tool dashboard has been provided in Appendix G.

Appendix A

GIS Data Review

Introduction

The District Municipality of North Cowichan (the District) strives to continuously improve in asset management. This will allow the District to sustainably provide services to the community and ensure public funds are utilized in the most effective manner.

As part of the Asset Management Planning project that is currently in progress, Urban Systems undertook a high-level review of the District's GIS information to identify any gaps that would need to be addressed so as to allow the next stages of the project to proceed successfully.

This memo documents the observations and recommendations from our review.

General Observations

Available data looks well populated with core Asset Management values but does have some discrepancies, anomalies, data gaps and redundancy that should be rectified. Data redundancy needs to be further explored with staff since provided datasets indicate a need to reconcile redundant information in order to make it most useable to support important decision making. North Cowichan staff should be able to provide clarity on data redundancy and be able to address the identified data issues. Staff noted that data is centralized (in SDE) and feeds other systems that support decision-making

Below are key observations from our review of North Cowichan's Asset Data. More detailed information can be found in the attached spreadsheet.

- Overall readiness of data is approximately 90%
- Data is mostly well prepared and populated with key attributes
- Data gaps exist in key attributes (for example road width information)
- There are some non-unique asset ID's

Recommendations

- Data gaps should be populated
- Non-unique Asset Identifiers should be rectified
- A review data handling practices and the alignment with a consistent data structure (potentially MMCD) should be initiated
- Data for relevant assets should be consolidated from peripheral datasets (for example PRV assets in Water Appurtenances layer should be migrated to Water Facility or Water Valve layer and Cleanouts in Sewer Appurtenances layer should be migrated to Sewer Manhole layer with other Cleanouts)

More specific information can be found in the attached spreadsheet.

GIS Data	# of Records	Asset ID	Description	Diameter/Size	Material	Date of Installation	Consequence	Inverts/Elevations	Inspected	Condition Score	Useful Life Factor	Useful Life Condition Factor	Replacement Cost	Replacement Year/Timing	Data Comment	Asset Management Comment
Water Appurtenances	4532	99%	65%	N/A	N/A	82%	Unk	90%	Unk	Unk	1%	1%	Unk	Unk	Asset ID is not unique and should be rectified. Assets that owned by FN are currently included in dataset. Asset Type includes Dummy nodes which may have been added to support modeling but need to be filtered out to support AM otherwise values will be inaccurate. Significant data gap exists for installation date.	Recommend splitting dataset to separative out minor assets from larger asset that should be included in Asset Management reporting i.e. Chlorination Point, Pressure Reducing Station, UV Purifier, Outlet/Inlet. Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Water Facilities	61	100%	99%	N/A	N/A	32%	Unk	N/A	Unk	Unk	N/A	N/A	Unk	Unk	Dataset included "Unknown" asset type. All assets should have a type value to ensure it is appropriately captured.	Significant data gap exists for installation date. This value will be needed to support AM planning. Recommend splitting dataset to separative out minor assets from larger asset that should be included in Asset Management reporting. Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Water Mains	8102	100%	99%	99%	99%	99%	Unk	0%	Unk	Unk	99%	99%	100% (See Excel Water Audit)	100% (See Excel Water Audit)	Assets that owned by FN are currently included in dataset. Asset Type includes Dummy pipe which may have been added to support modeling but need to be filtered out to support AM otherwise values will be inaccurate.	Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations. Small data gap exists for installation date, diameter and material which should be rectified.
Water Meters	6659	99%	99%	N/A	N/A	99%	Unk	N/A	Unk	Unk	N/A	N/A	Unk	Unk	Asset ID is not unique and should be rectified. Assets that are flagged as owned by FN are currently included in dataset.	Need to finish populating the date of installation to help with AM reporting. Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Water Services	7271	100%	99%	99%	99%	99%	Unk	N/A	Unk	Unk	98%	98%	100% (See Excel Water Audit)	100% (See Excel Water Audit)	Recommend populating Asset Type from Unknown, Other or NULL to avoid confusion and ensure assets are captured appropriately.	Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations. Small data gap exists for installation date, diameter and material which should be rectified.
Water Storage	16	100%	100%	100%	99%	100%	Unk	0%	Unk	Unk	100%	100%	Unk	Unk		Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Water Valves	3090	99%	61%	82%	N/A	99%	Unk	97%	Unk	Unk	88%	87%	Unk	Unk	Assets that are flagged as owned by FN are currently included in dataset. Assets IDs are not unique and should be rectified. Dataset included "Unknown" and "Other" asset types. All assets should have a type value to ensure it is appropriately captured.	Small data gap exists for installation date. This value will be needed to support AM planning. Recommend splitting dataset to separative out minor assets from larger asset that should be included in Asset Management reporting. Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations. Recommend fully populating the valve diameter field so valve replacement cost can be more accurately calculated
Hydrants	892	100%	100%	N/A	N/A	99%	Unk	99%	Unk	Unk	98%	98%	Unk	Unk		Recommend changing the INSTALLATION field to a year vs a date for ease of useful life calculation. Small data gap exists for installation date and elevation which is valuable for calculating fire flow.
Watermain Estimated Useful Life Table (tbl_WPP_EUL)	10409	100%	N/A	N/A	N/A	N/A	Unk	Unk	Unk	83%	0%	0%	N/A	N/A		Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations. Recommend changes to how useful life, replacement cost and calculations are set up to avoid duplication of data and increase the efficiency of reporting. Currently multiple data redundancies exist.
Watermain Estimated Useful Life With Condition Score Table (tbl_WPP_EUL_Con)	7916	100%	99%	N/A	99%	99%	Unk	0%	Unk	99%	99%	99%	N/A	N/A		Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations. Recommend changes to how useful life, replacement cost and calculations are set up to avoid duplication of data and increase the efficiency of reporting. Currently multiple data redundancies exist.

GIS Data	# of Records	Asset ID	Description	Diameter	Material	Date of Installation	Consequence	Inverts/Elevation	Inspected	Condition Score	Useful Life Factor	Useful Life Condition Factor	Replacement Cost	Replacement Year/Timing	Data Comment	Asset Management Comment
Sanitary Appurtenances (SAP)	5227	99%	99%	N/A	N/A	97%	Unk	0%	Unk	Unk	47%	47%	Unk	Unk	Asset ID is not unique and should be rectified. Assets that owned by FN are currently included in dataset. Asset Type includes Dummy nodes which may have been added to support modeling but need to be filtered out to support AM otherwise values will be inaccurate. Small data gap exists for installation date.	Recommend splitting dataset to separative out minor assets from larger asset that should be included in Asset Management reporting i.e. Air Valves and Cleanouts. Cleanouts are currently in both this later and in the manhole layer. Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Sanitary Facilities (SFA)	27	100%	100%	N/A	N/A	96%	Unk	0%	Unk	Unk	96%	96%	Unk	Unk	Small data gap exists for installation date that should be populated. Small data gap exists for installation date, diameter, material.	Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Sanitary Service Lines (SLP)	5234	99%	99%	99%	99%	98%	Unk	0%	Unk	Unk	98%	98%	96% (See Excel Sewer Audit)	96% (See Excel Sewer Audit)	Asset ID is not unique and should be rectified. Small data gap exists for installation date, diameter, material.	Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Sanitary Manholes (SMH)	2303	100%	98%	N/A	N/A	99%	Unk	0%	Unk	Unk	98%	Unk	Unk	Unk		Cleanouts are currently in both this later and in the Sanitary Appurtenance layer. Recommend compiling all cleanouts into one layer for ease of reporting. Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Sanitary Mains (SPP)	2694	100%	99%	100%	99%	99%	Unk	98%	Unk	Unk	98%	98%	97% (See Excel Sewer Audit)	97% (See Excel Sewer Audit)	Assets that owned by FN are currently included in dataset. Asset Type includes Dummy pipes which may have been added to support modeling but need to be filtered out to support AM otherwise values will be inaccurate. Small data gap exists for installation date.	Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Sewer Main Estimated Useful Life Table (tbl_SPP_EUL)	2945	100%	0%	N/A	0%	0%	Unk	0%	Unk	90%	0%	0%	N/A	N/A	Ratings entries are only from 0-3. 277 records are scored 0. Value should be reviewed and confirmed if accurate.	Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Sewer Main Estimated Useful Life With Condition Score Table (tbl_SPP_EUL_Con)	7916	100%	0%	N/A	0%	0%	Unk	0%	Unk	33%	0%	33%	N/A	33%	Significant data gaps existing in condition records. COND (1-5) – 5300 = NULL, 23 = 0 (1 = Very Good, 5 = Very Poor), EST_RL (0-90) – 5300 = NULL, 39 = 0, Y_R_Scale (1-5) – All NULL values set = 1	Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.

GIS Data	# of Records	Asset ID	Description	Diameter	Material	Date of Installation	Consequence	Inverts	Inspected	Condition Score	Useful Life Factor	Useful Life Condition Factor	Replacement Cost	Replacement Year/Timing	Data Comment	Asset Management Comment
Ditches	3273	0%	100%	N/A	0%	0%	N/A	0%	Unk	Unk	0%	0%	Unk	Unk	Ditches do have have any unique ID or installation dates.	Recommend adding a unique ID to enable the tracking of these assets to support Asset Management. Ditches would be useful for inclusion as Natural Assets.
Drainage Appurtenances	5289	99%	99%	N/A	11%	69%	N/A	0%	Unk	Unk	93%	93%	Unk	Unk	Asset ID is not unique and should be rectified. Asset Type includes Dummy nodes which may have been added to support modeling but need to be filtered out to support AM otherwise values will be inaccurate. Significant data gap exists for installation date and material.	Recommend splitting dataset to separative out minor assets from larger asset that should be included in Asset Management reporting i.e. Inlet Headwalls, Cleanouts, etc... Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Drainage Basins	39	100%	99%	N/A	N/A	61%	N/A	0%	Unk	Unk	0%	Unk	Unk	Unk	Significant data gap exists for installation date. Recommend populating these values to improve accuracy of reporting.	Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations. Drainage basins may be useful for Natural Asset Management planning.
Drainage Catchbasins	3861	100%	99%	N/A	99%	99%	N/A	0%	Unk	Unk	98%	98%	Unk	Unk	Ensure all CBs are owned by MNC. Currently 6 of 3861 show owned by "Other". Small data gap exists for installation date and Estimate Useful Life values.	Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Drainage Culverts	1897	100%	99%	99%	99%	93%	N/A	0%	29% See tbl_DCV_Condition	29% See tbl_DCV_Condition	99%	Unk	77% (See Excel Storm Audit)	78% (See Excel Storm Audit)	There appears to be a duplication of data between the primary drainage culvert layer and other tables in the MNC datasets. Recommend eliminating redundant data. Data in primary culvert layer, culvert condition table and finance culvert table should be consolidated to eliminate redundancy.	Data gaps exist in asset description, diameter, materials and date of installation. Data from condition table and finance table should be compiled to create on dataset for Asset Management. Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Drainage Facilities	5	100%	100%	N/A	N/A	Unk	N/A	N/A	Unk	Unk	Unk	Unk	Unk	Unk	No installation data exists. Recommend adding this information for AM reporting.	Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Drainage Laterals	8098	100%	99%	99%	99%	99%	N/A	0%	Unk	Unk	98%	98%	52% (See Excel Storm Audit)	52% (See Excel Storm Audit)	Useful life factors all set at 1. Ensure all laterals are owned by MNC. Currently some show owned by "Other". Small data gap exists for Asset Type, installation date, diameter and material.	Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations. Recommend moving CB leads to mains layer since it is part of the core drainage system within the road corridor that is owned by MNC.
Drainage Mains	3758	99%	99%	99%	99%	99%	N/A	0%	Unk	Unk	99%	99%	95% (See Excel Storm Audit)	95% (See Excel Storm Audit)	Useful life factors all set at 1, Asset ID is not unique and should be rectified. Confirm ownership. Currently 20 mains shown owned by "Other". Small data gap exists for diameter, material and installation date.	Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Drainage Manholes	2588	100%	99%	N/A	Unk	98%	N/A	0%	Unk	Unk	98%	98%	Unk	Unk	Small data gap exists for installation date.	Ensure different asset types are costed separately i.e. CBMH, Cleanout, Manhole, Vault Manhole. Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Culvert Condition Table (tbl_DCV_Condition)	1265	33% of total culverts	0%	0%	0%	0%	N/A	0%	Unk	33% of Total Culverts	N/A	N/A	N/A	N/A	Data appears to be the only condition table for Drainage Culverts	Significant data gaps in the condition data. Many culverts do not have a condition rating. Current 29% of total culverts have rating value. Recommend prioritizing and capturing this inforamtion as time permits. Condition helps to ground truth replacement timing vs age base assessment.
Drainage Main Estimated Useful Life Table (tbl_DPP_EUL)	3969	94% of total Drainage Mains	0%	0%	0%	0%	N/A	0%	Unk	94% of Total Drainage Mains	98%	98%	N/A	N/A	Table only includes the pipe ID and the Condition Rating. Small data gaps exists on condition rating. It is ideal to get this gap populated to help ensure accurate Asset Management reporting.	Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Drainage Main Estimated Useful Life Table with Condition (tbl_DPP_EUL_Con)	3654	94% of Total Drainage Mains	0%	0%	0%	0%	N/A	0%	Unk	94% of Total Drainage Mains	N/A	N/A	N/A	86% of Total Drainage Mains	Table only includes the pipe ID, Condition Rating, Estimated Remaining Life and YR_Scale. Currently unsure of the YR_Scale and how it is to be used. Some data gaps currently exist on the Estimated Remaining Life.	Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.

GIS Data	# of Records	Asset ID	Description	Diameter	Material	Date of Installation	Inverts	Inspected/Elevations	Condition Score	Useful Life Factor	Useful Life Condition Factor	Replacement Cost	Replacement Year/Timing	Data Comment	Asset Management Comment
Road Centreline	1390	100%	99%	N/A	99%	99%	0%	Unk	Unk	98%	98%	Unk	Unk	Dataset is missing key information need to support Asset Management. I.e. surface material, data of surface and base installation, last overlay, etc.…	Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Road Condition Table (Condition)	1248	100%	99%	N/A	99%	99%	0%	Unk	Unk	98%	98%	Unk	Unk	Dataset includes condition rating from inspection completed in 2017. Some tracking of overlay exists but significant gaps exist. No data of installation exist. Recommend consulting TCA records for date and surface material values.	Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Utility Finances Table Drainage Culverts (DCV)	1559	99%	99%	99%	99%	99%	0%	Unk	Unk	98%	98%	See Utility Finances Table UTILITY	See Utility Finances Table UTILITY	There appears to be a duplication of data in the primary drainage culvert layer. Recommend eliminating redundant data. Data in primary culvert layer, culvert condition table and finance culvert table should be consolidated to eliminate redundancy.	Data gaps exist in asset description, diameter, materials and date of installation. Data from condition table and finance table should be compiled to create on dataset for Asset Management. Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Utility Finances Table Drainage Service Lines (DLP)	4240	100%	99%	99%	99%	99%	0%	Unk	Unk	98%	98%	See Utility Finances Table UTILITY	See Utility Finances Table UTILITY	There appears to be a duplication of data in the primary drainage services layer. Recommend eliminating redundant data.	Confirm purpose of this Utility Finance dataset as it appears to be redundant. Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Utility Finances Table Drainage Pipe (DPP)	3603	100%	99%	99%	99%	99%	0%	Unk	Unk	98%	98%	See Utility Finances Table UTILITY	See Utility Finances Table UTILITY	There appears to be a duplication of data in the primary drainage pipe layer. Recommend eliminating redundant data.	Confirm purpose of this Utility Finance dataset as it appears to be redundant. Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Utility Finances Table Replacement Cost (Water, Sanitary, Drainage)	906	0%	99%	86%	99%	99%	N/A	Unk	Unk	0%	0%	100% (Unit Rates)	See Comment	This is a look up table that provides the useful life and replacement unit cost values for the AM program. Current data has redundant information and should be simplified to just look up values.	This is a look up table that provides the useful life and replacement unit cost values for the AM program. Recommend changing how look up values are accomplished to reduce redundancy and increase ability to refine values and re-run calculations.
Utility Finances Table Sanitary Services Lines Table (SLP)	5079	100%	99%	99%	99%	99%	0%	Unk	Unk	98%	98%	See Utility Cost Table	See AM Comment	Appears to be a duplication of primary sanitary services layer, Recommend eliminating redundant information.	Confirm purpose of this Utility Finance dataset as it appears to be redundant. Replacement year appears to be expected useful life not replacement year. Recommend updating field to Expected Useful Life and Calculating the Recommended Replacement Year or taking value from TCA or Asset Management calculations. Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Utility Finances Table Sanitary Mains Table (SPP)	2622	100%	99%	100%	99%	99%	0%	Unk	Unk	98%	98%	See Utility Finances Table UTILITY	See Utility Finances Table UTILITY	Appears to be a duplication of primary sanitary mains layer. Recommend eliminating redundant information.	20 Assets are listed as FN jurisdiction. Recommend ensuing that only assets owned by MNC are included in AM dataset. Replacement year appears to be expected useful life not replacement year. Recommend updating field to Expected Useful Life and Calculating the Recommended Replacement Year or taking value from TCA or Asset Management calculations. Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Utility Finances Table UTILITY	31824	99%	99%	99%	98%	98%	Unk	Unk	Unk	0%	0%	98%	98%	There are a few non-unique Asset IDs.	Replacement year appears to be expected useful life not replacement year. Recommend updating field to Expected Useful Life and Calculating the Recommended Replacement Year or taking value from TCA or Asset Management calculations. Recommend changing how look up values are accomplished to reduce redundancy and increase ability to refine values and re-run calculations. Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Utility Finances Table Utility Estimated Useful Life (UTILITY_EUL)	48	0%	99%	N/A	99%	N/A	N/A	N/A	N/A	N/A	N/A	See Utility Finances Table UTILITY	See Utility Finances Table UTILITY	This table is a potential look up table for useful life by pipe material. Table has values that are duplicated in the Utility Finances Table. Recommend consolidating values and having a single look up table that feed the AM calculations.	Recommend changing how look up values are accomplished to reduce redundancy and increase ability to refine values and re-run calculations. Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Utility Finances Table Water Service Lines (WLP)	6763	100%	99%	99%	99%	99%	N/A	Unk	Unk	98%	98%	See Utility Finances Table UTILITY	See Utility Finances Table UTILITY	This Utility Finances Table Water Service Lines (WLP) table appears to be a duplicate of primary water service lines layer. Recommend disposing of duplicate layer to reduce confusion.	Recommend disposing of duplicate layer. Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.
Utility Finances Table Water Mains (WPP	7958	100%	99%	99%	99%	99%	N/A	Unk	Unk	99%	99%	See Utility Finances Table UTILITY	See Utility Finances Table UTILITY	This Utility Finances Table Water Mains (WPP) table appears to be a duplicate of primary water service lines layer. Recommend disposing of duplicate layer to reduce confusion.	Ensure EUL values are reconciled between this table and the primary water main layer prior to disposing of this table. It appears the values in this table may be more complete. Recommend changing the INSTALLED field to a year vs a date for ease of useful life calculations.

Appendix B

Asset Replacement Cost Framework

Introduction

The District Municipality of North Cowichan (the District) strives to continuously improve in asset management. This will allow the District to sustainably provide services to the community and ensure public funds are utilized in the most effective manner.

As part of the Asset Management Planning project that is currently in progress, the District would like to assess its current approach to asset valuation for water, sewer and stormwater infrastructure. Establishing replacement values for infrastructure is a critical aspect of asset management planning. If estimated replacement values are too low, the community runs the risk of a fiscal shortfall in the future. On the other hand, If these estimates are too high (i.e., too conservative), the community runs the risk of increasing taxes and user fees unnecessarily.

While having accurate replacement costs is important, the District will need to choose a level of accuracy that makes sense in terms of administrative effort. The amount of effort required to establish and maintain replacement costs needs to match how the data will be used and the level of accuracy required.

Purpose of Asset Valuation

All local governments value assets for the following two purposes: 1) external financial reporting, and 2) asset management planning.

External Financial Reporting

In 2009 all local governments in Canada were required to transition from a cash-based accounting approach to accrual accounting in accordance with the newly established public accounting standard PS3150. This transition required local governments to record and report on the cost of their infrastructure and to amortize each asset over its expected lifespan.

The Local Government Act and the Community Charter require that every local government in British Columbia prepare consolidated financial statements each fiscal year (local governments in B.C. use the calendar year as their fiscal year). The consolidated financial statements must be prepared by a local government's financial officer in accordance with generally accepted accounting principles for local government.

The statements must be audited by a qualified auditor and the audited statements must be presented to council and be available for public viewing before June 30. A copy of the audited financial statements must also be submitted to the Ministry of Municipal Affairs & Housing by May 15 each year.

For financial reporting purposes, the asset values must reflect the actual *cost* of the assets. The reported values must also satisfy the community's auditor and be supported by sufficient documentation. Generally, auditors like to see the assets grouped into categories with the same life spans so that the annual amortization is relatively accurate. The level of granularity required varies widely depending on the particular auditor.

Asset Management Planning

A second purpose for asset valuation is to support asset management planning. Whereas asset valuation for financial reporting is focused on what an asset cost to acquire (*historical cost*) the valuation for asset management planning is focused on what the asset will cost to replace at the end of its useful life.

By understanding the replacement value and useful life of the various assets, a current lifecycle cost can be established to inform tax levels and the setting of user fees. In addition, replacement schedules can be developed that inform the timing and levels of investment to enable capital and financial planning.

Since asset management is focussed on future replacement costs, the historical cost of the asset is of little importance, other than to provide some guidance on the future replacement value when actual replacement cost estimates are not available. However, the connection between replacement values and historical costs can be quite loose, particularly when the assets acquired resulted from a

greenfield development where existing roads didn't need to be excavated, traffic controlled and other utilities worked around.

Current Processes

For financial reporting, the valuation approach is different depending on whether the asset was contributed or acquired directly by the District. The valuation for asset management planning is a separate process that is undertaken on an annual basis.

Financial Reporting – All Assets

- **Contributed Assets** - A contributed asset is an asset that was constructed by a party other than the District and then "gifted" to the District to maintain. The on-site services (roads, water, sewer, etc.) for most land development projects (other than strata developments) generally result in the developer gifting those assets to the District at the completion of the project.

  When a third party contributes infrastructure to the District the developer or the developer's engineer is required to complete a form which details the type of assets being acquired, the quantity of each type of asset, the unit of measurement, a unit cost for the asset and a total value. The Finance department will use this information to update the District's accounting system.

  As part of a separate process, the developer's engineer will provide the District with the as-built information so that the District's GIS system can be updated. The as-built information will include the asset locations and other attributes, but will not include any costs.

- **Directly Acquired Assets** - When the District acquires an asset directly the process is slightly different. In this case the as-built information is first input into the GIS by District staff. The information is then exported to a spreadsheet where engineering staff distribute the project costs from the G/L across the relevant infrastructure. A rolled-up version of this spreadsheet is provided to the Finance department for input into the accounting system.

Asset Management Planning – Water, Sewer and Storm Assets

On an annual basis the District's GIS staff will export the latest information on the linear water, sewer and storm assets (i.e., mains and laterals) to an Excel spreadsheet. The spreadsheet contains a set of unit rates for the various pipe sizes and materials. These unit rates are used to assign values to the assets using a "lookup" function.

The unit costs are for the mains and laterals and include an allowance for valves, fittings, installation, road repairs and indirect costs. It is not clear from the spreadsheet what assumptions have been made to develop the unit rates (e.g., hydrant or manhole costs and the assumed spacing).

The spreadsheet and the unit costs originated from a consultant's work that was completed back in 2015. The City has been able to continue using the original spreadsheet and adjust the unit cost records annually using CPI.

The spreadsheet is also able to produce a "dashboard" snapshot of the District's assets that provides the total replacement values, the average age, the expected life spans and other information regarding the state of system.

Opportunities for Investment

Financial Reporting Valuation

The current valuation process employed by the finance department is straight forward and relatively easy to administer. The level of detail and documentation is satisfactory to the auditor and the confidence in the quality of the financial statements is high. Currently the breakdown of how assets are captured and accounted for by the Finance department is defined by the District's *Capital Asset Policy*.

Although there is currently no direct link between the asset management planning valuations and the financial system this is not seen as a problem. Our experience has shown that communities that try to match the granularity of their financial system data with that of the GIS creates an additional administrative burden that yields little value to the organization. However; if in the future the District implements an *enterprise* software system that integrates asset management and TCA accounting they want to consider closer linkages where it makes sense.

At this time, no changes are suggested with respect to how assets are valued for input into the financial system or with respect to the granularity of the financial data.

Asset Management Planning Valuation

District staff has done a very good job in updating the asset management "dashboards" on an annual basis using the existing spreadsheet. However, there are a number of weaknesses with the current approach that may hamper the development of a more robust asset management planning approach:

COSTING DATA GRANULARITY

The District has a very robust GIS inventory that contains most of the core asset types and related attributes. The current valuation approach undertaken with the spreadsheet costs out only the linear assets (mains and laterals) and makes some general allowances for other non-linear asset types (e.g., valves, hydrants, fittings, manholes, etc.). This approach is acceptable for providing general high-level information about the value a section of pipe including all non-linear components but this may be limiting in the future should the District want to report out on the values and lifespans of the non-linear components on an individual basis.

Through discussions with staff it is understood that they are happy with the simplicity of the current approach and would prefer to keep the costing simple until their asset management capabilities reach the stage where the vale of more granular costing would exceed the additional complexity.

SPREADSHEET BASIS

The current process requires an export of the GIS data to an Excel spreadsheet where it is costed, and the reports are created. Excel is a great tool since it is very accessible by most people and is great for dynamic type modeling of various "what-if" scenarios. The current process requires that the updated cost information be imported back into the GIS database.

UNIT COSTS UPDATES FREQUENCY AND ACCURACY

The current costing records used in the Excel spreadsheet were provided by the District's consultant in 2015. The unit costs are updated based on CPI on an annual basis. This approach is acceptable providing there hasn't been a significant shift in the local construction market and that the valuations are used for high level and system wide purposes,

As the District begins to utilize the information for shorter range capital planning purposes at the project or corridor level the replacement values should be adjusted to better reflect the current local construction market conditions. In many years an adjustment based on CPI will be adequate, in other years a larger scale adjustment may be required.

Recommendations

1. Maintain the current approach of including an allowance for non-linear assets in the unit costs of the linear water, sewer and stormwater assets, however; the unit costs build up should be revised so that the assumptions that are used are clear and simple to adjust.

2. Begin to track unit costs from tenders and contracts to understand local market conditions, and apply this knowledge when updating the unit costs. The unit costs can be updated annually using a CPI adjustment plus/minus any adjustment that might be required to reflect any notable changes in the local construction market. The District may want to engage a consultant every 5-years to do a complete update to the unit costs.

3. Transition from the manual spreadsheet approach to asset valuation to a more automated database approach. One potential solution would be a geodatabase data model using a script(s) developed for ARCGIS or using the FME desktop. The use of GIS/FME based model approach is recommended only because the District has strong in-house GIS/FME capabilities that could develop and/or maintain this approach.

Appendix C

Condition Assessment Framework

Introduction

The District Municipality of North Cowichan (the District) strives to continuously improve in asset management. This will allow the District to sustainably provide services to the community and ensure that the use of public funds is utilized in the most effective manner.

While larger assets and more critical assets are often subject to formal periodic assessments, there are many smaller assets that in aggregate make up a significant part of the District's infrastructure. Often these smaller assets are assessed by operations staff. In the absence of guidance, these operations staff are often left to their own devices to determine the condition grade and style of reporting. Even where individuals have sufficient experience to make a useful judgement of condition, the absence of supporting guidance leads to substantial variability.

As part of the Asset Management Planning project that is currently in progress the District would like to assess its current approach to condition assessment for water, sewer and stormwater infrastructure. Infrastructure condition information underpins a wide range of asset management activities ranging from asset valuations through to managing asset replacement planning and setting investment programmes.

Purpose of Condition Assessment

Maintenance and rehabilitation of water, sewer and storm water systems pose a major challenge for most municipalities in North America given their budgetary constraints AND demand for quality service. Neglecting regular maintenance and rehabilitation of these systems leads to increased life-cycle costs and liabilities, and in some cases un-planned service disruptions.

What are condition assessments, and why are they important?

Condition assessment is the procedure that allows utility managers to identify the condition of their infrastructure assets. It is a process of understanding the level of asset deterioration and the impact it has on the probability of failure.

The benefits of condition assessment include:

- Improved decision making for asset replacements
- Risk management
- Reduction in operational expenses
- Better informed long-term capital and financial plans

Who does condition assessments, and how are they done?

It is anticipated that virtually all condition assessments conducted by District staff will be visual inspections. Visual assessment involves determining the present state of an asset by observing visible features. Visual assessments are undertaken to provide a rapid and cost-effective check on the condition of an asset. This can be done as part of an ongoing programme of inspections or as a one-off standalone exercise.

How is condition data used?

Data obtained by visual condition assessment can be used to:

- categorize the condition of assets;
- identify visible faults, especially those that need urgent action;
- identify the need for a specialist assessment;
- assist in risk analysis

Visual assessments can also be used to confirm inventory information and to validate as-built drawings and GIS data.

Source: NZWWA Visual Assessment Manual

Current Processes

An overview of the current condition assessment processes is provided in this section.

Water

In most cases the condition of water mains and laterals is derived from the age of the asset using the same Excel spreadsheet that is used for asset valuation. The spreadsheet uses the age of the asset and then applies that to a deterioration curve to determine a 1 to 5 condition rating. This condition rating can then be uploaded into a table within the GIS which links the asset ID to the condition score.

Over the last few years the District has also begun to track water main breaks. The specific circumstances regarding the break and its root cause are not currently being codified for use in the GIS system.

Water valves are exercised on a regular basis as part of the unidirectional flushing program. This process is exception based where faulty valves are flagged for replacement. The confirmation that a valve was successfully exercised on a certain date is currently not being captured within the GIS.

The assessment of larger facilities such as reservoirs and pump stations is undertaken by specialist consultants on an as required basis.

Sanitary and Storm Sewer

The District is using video inspection (CCTV) for the sanitary system and intends to camera the entire system every 5 years. The pipes are classified using the Pipeline Assessment Certification Program (PACP) protocol.

The storm sewers are currently not included in the CCTV program and similar to water the condition is derived from the age of the asset using the same Excel spreadsheet that is used for asset valuation. The spreadsheet uses the age of the asset and then applies that to a deterioration curve to determine a 1 to 5 condition rating. This condition rating can then be uploaded into a table within the GIS which links the asset ID to the condition score.

Storm drainage culverts that cross roads also inspected as far as can be seen inside using a flashlight and then graded using a 1 to 5 scale. The condition score is recorded in the GIS system.

Opportunities for Improvement

Consistent Terminology and Definitions

The current approach for determining a condition score ranging from 1-5 using the age of the asset is consistent with best practice where actual condition information does not exist. The additional use of a deterioration curve to provide greater accuracy is an interesting capability of the Excel spreadsheet that is currently utilized to assign the condition scores. Since the condition score is interpolated from the age of the asset the use of the term "condition" may be misleading when being communicated within and outside the organization. A more typical term when only age is known would be "likelihood of failure".

The current 1-5 rating scale is well suited for integration into the risk analysis and capital planning processes. Currently however there is not a clear definition of what each category means with respect to the actual condition of the asset.

Use of Deterioration Curves

The use of deterioration curves generally requires some degree of calibration, and ideally some confirmed initial condition status so that the transition between condition states can be modeled statistically using a Markov Chain analysis (or other method). Since there are so many localized factors that influence pipe failures (bedding, installation, soils, location, etc) the effort to calibrate the deterioration curves and achieve any additional accuracy needs to be considered against the level of effort required and the benefit that would be derived from any additional accuracy.

Frequency of CCTV

The use of CCTV to assess the sewer lines and having the information codified using PACP also aligns well with best practice. The desire to CCTV every segment in 5-year intervals is commendable, however there is likely a more economical approach that prioritizes assessment based on risk or some other factors. The results of the CCTV evaluation will need to be normalized to the 1-5 scale and updated to the GIS system for use in the capital planning process.

Recommendations

1. Standardize definitions for the likelihood of failure based on age for long-lived and short-lived assets.
    - Example provided for discussion
2. Standardize the collection of water main break history information using a standard template.
    - Example check list provided
3. Develop definitions for each of the condition categories for water mains based on break history and implement a process to upload key failure attributes and corresponding condition ratings into the GIS.

- Example provided for discussion

4. Standardize the collection of water main break history information using a standard form.
    - Example provided
5. Prioritize the CCTV assessment of sewer mains based on the consequences of failure and the likelihood of failure (Risk).
6. Consider inspecting of manholes concurrently with the collection of the CCTV for the mains.
7. Expand the use of CCTV assessment to include high risk stormwater mains.
8. Identify existing operations & maintenance activities/programs that would provide additional opportunity for collecting condition information about assets (eg. Uni-directional flushing program).
9. Develop a plan for implementation the condition assessment framework. This could consider:
    - Completeness of condition information (both information collected, as well as information stored in the GIS database)
    - Degree of use of condition information in risk assessments and capital planning processes

LIKELIHOOD OF FAILURE BASED ON AGE

LOF Score	Estimated Remaining Life	Timescale Long Lived Assets	Timescale Short Lived Assets
1	75% to 100%	Failure is unlikely in foreseeable future	Failure is unlikely in foreseeable future
2	50% to 85%	Failure is unlikely for at least 20 years	Failure is unlikely for at least 5 years
3	25% to 50%	Failure is possible within 10-20 years	Failure is possible within 3-5 years
4	0% TO 25 %	Failure is possible within 5-10 years	Failure is possible within 1-3 years
5	<0%	Failure is imminent	Failure is imminent

Source: Urban Systems Ltd.

CONDITION RATING FOR WATER MAINS BASED ON BREAK HISTORY

Rating	Description
1- Excellent	No failures.
2 - Good	Few failures.
3 - Fair	Failures beginning to occur. Some corrosion evident.
4 - Poor	Regular failures occurring and significant corrosion. Increases in operating costs resulting. Many segments must be replaced.
5 - Failing	Significant failures and should be substantially reconstructed.

Source: Guide to Accounting for and Reporting Tangible Capital Assets

Financial Reporting and Assurance Standards Canada

FIELD DATA FOR MAIN BREAK EVALUATION: PROJECT NUMBER _____

Date of Break: _____ Time: _____ ☐ A.M. ☐ P.M.

Type of Main: _____

Size (OD): _____ mm. Joint: _____ Cover: ____ m ____mm

Wall Thickness at Failure: _____ mm.

Nature of Break:

☐ Circumferential ☐ Longitudinal ☐ Both

☐ Blowout ☐ Joint ☐ Sleeve ☐ Split at Corporation ☐ Other

Apparent Cause of Break:

☐ Water Hammer (Surge) ☐ Defective Pipe ☐ Deterioration

☐ Corrosion ☐ Improper Bedding ☐ Operating Pressure

☐ Temperature Change ☐ Differential Settlement ☐ Contractor

☐ Other: _____

Pipe Location Information:

☐ Paved ☐ Unpaved Traffic: ☐ Heavy ☐ Medium ☐ Light

Type of Street Surface: _____ Side of Street: ☐ Sunny ☐ Shady

Type of Soil: _____ Resistivity: _____ ohms/cm

Electrolysis? ☐ Yes ☐ No Corrosion? ☐ Inside ☐ Outside

Other: ☐ Rocks ☐ Voids Proximity to Other Utilities: _____

Depth of Frost: _____ mm. Depth of Snow: _____mm.

Comments: _____

_____

_____

Source: *American Water Works Association*

Appendix D

Asset Management Investment Plan

Contents

Overview of the AMIP

This Asset Management Investment Plan (AMIP) was developed to determine future investment requirements for the Municipality of North Cowichan (MNC)'s linear water, sewer, stormwater, and roads (surface) infrastructure. The AMIP presents annual investment requirements based on current renewal cost and estimated remaining service lives of these assets. The purpose of the AMIP is to support long-term financial planning decisions and provide information on strategic risks related to aging infrastructure.

What does the AMIP tell us?

The AMIP aims to answer the following core questions:

- What assets does MNC own?
- What is the cost to replace these assets?
- What is the age of the assets and what is the estimated remaining service life?
- How much money needs to be invested annually to maintain MNC's assets?

It is important to note that the AMIP is not a tailored maintenance plan, budget, or capital plan, and should not be solely relied upon for investment decisions. The AMIP does not consider the optimal replacement or refurbishment method for infrastructure and more detailed review may allow for reduction of costs. The AMIP does not make decisions about infrastructure – it is up to those that make decisions within the MNC to consider this information when making major investment decisions.

The AMIP does not consider MNC's definition and tolerance of risk, or current and desired levels of service, which are both necessary aspects of capital plans, budgets, and maintenance plans. A Risk Framework specific to MNC has been completed as a separate project task.

How often should the AMIP be updated?

The AMIP should be kept relevant and useful by updating it approximately every 5 years. This will help ensure that the AMIP continues to support ongoing decisions regarding capital plans and financial operating budgets.

Key Definitions

AVERAGE ANNUAL LIFE CYCLE INVESTMENT (AALCI): The replacement value of an asset divided by its service life. The summation of this value for all the infrastructure serves as a tool for assessing the financial capacity of MNC for infrastructure investment. For example, an asset valued at $100 with an expected service life of 10 years would be considered to have an AALCI of $10.

INFRASTRUCTURE BACKLOG: The value of assets that have reached their theoretical service life before 2019 and have not yet been replaced.

REMAINING LIFE: The number of years remaining until an asset reaches its theoretical service life, measured from the year of installation or previous renewal.

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.

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).

REPLACEMENT VALUE: The estimated cost to replace the asset, in 2019 dollars.

SERVICE LIFE: The number of serviceable years an asset is expected to provide before requiring replacement.

Methodology

The overall approach to developing the AMIP is described below with some additional context on the topic provided.

Develop Asset Inventory

The asset inventory is the foundation of the AMIP, so it is important that the compiled inventory represents the best currently available information. The Municipality provided Urban Systems with a copy of their Geographic Information System (GIS) data. Urban Systems completed a thorough review of the GIS data for completeness and a report card was developed as a separate component of this project. In general the information was found to be 90% complete overall. Where attribute information was missing, such as installation date or material, assumptions were made based on the age and/or material of the adjacent infrastructure.

It is important to emphasize that inventory development and maintenance is an ongoing process for which there is no "final" version since new assets are always being added or deleted. However, in order to conduct a current asset replacement, forecast that complemented the AMIP, the inventory was captured at the most current point in time that was available.

Determine Replacement Values

The development of the AMIP requires that the replacement values of the infrastructure be established. An *Asset Replacement Cost Framework* was developed as a separate component of this project. This framework examined how assets are currently costed and provided recommendations for asset valuation moving forward. The framework recommended that asset valuation be calculated using lineal unit rates that include an allowance for the related non-linear components such as valves, hydrants and manholes.

In accordance with the replacement costing framework Urban Systems developed unit rates for linear water, sanitary, stormwater and roads assets using recent construction data from Southern Vancouver Island. The unit rates also include a 15% allowance for engineering and a 25% contingency allowance. Appendix B provides a summary of the unit rates that were developed for this project.

Establish Asset Useful Lives

In order to develop the asset replacement forecast (ARF) the average useful lifespans of the various assets need to be established. The remaining service life of each asset is impossible to predict from an asset inventory without physical inspection of individual assets. However, typical service lives based on industry-standard values and input from MNC staff were developed and are an important aspect of the AMIP. The useful lifespans together with each asset's installation date are used to forecast the theoretical replacement date for each asset. Appendix A provides a summary of the unit rates used for this project.

Develop Asset Replacement Forecast

The core of the AMIP is based on an asset replacement forecast. The ARF for this project was developed using the *FME* data integration platform to complete the required computations. The results were then exported to an Excel Table that was used to develop the charts and tables contained within this report. The exported Excel Table also serves as the information source for a visualization tool that was developed using the software *Tableau*. This visualization tool was provided to MNC as a separate component of the project.

One of the main objectives of the ARF is to forecast a timeline of replacement needs, alongside the overarching strategy which places long-term focus on financial requirements. The ARF also includes a 20-year replacement forecast, which provides planning-level insight into MNC's more imminent replacement requirements. Understanding asset replacement timing can help MNC prepare for the end of asset service lives before this happens, rather than approaching replacements on a potentially costly emergency basis.

Review Long Term Funding Requirements

The AMIP provides a high level indication of the Municipality's long term funding requirements for asset replacement. The funding requirement level are largely dependent on the average useful lifespans that were assigned as well as the replacement value unit rates that were applied. Variations in either of these parameters results in a proportionate change to the long term funding requirements. For this reason, the AMIP values should not be considered a definitive answer, but rather an input into a broader conversation that considers risk and service level requirements and balances these with the historical funding levels and the potential for increasing user fees and/or taxation. To assist in this decision a risk framework was developed as a separate component of this project. The risk framework was used to assign risk scores to all of the Municipality's linear assets.

AMIP Results

What Assets Does MNC Own?

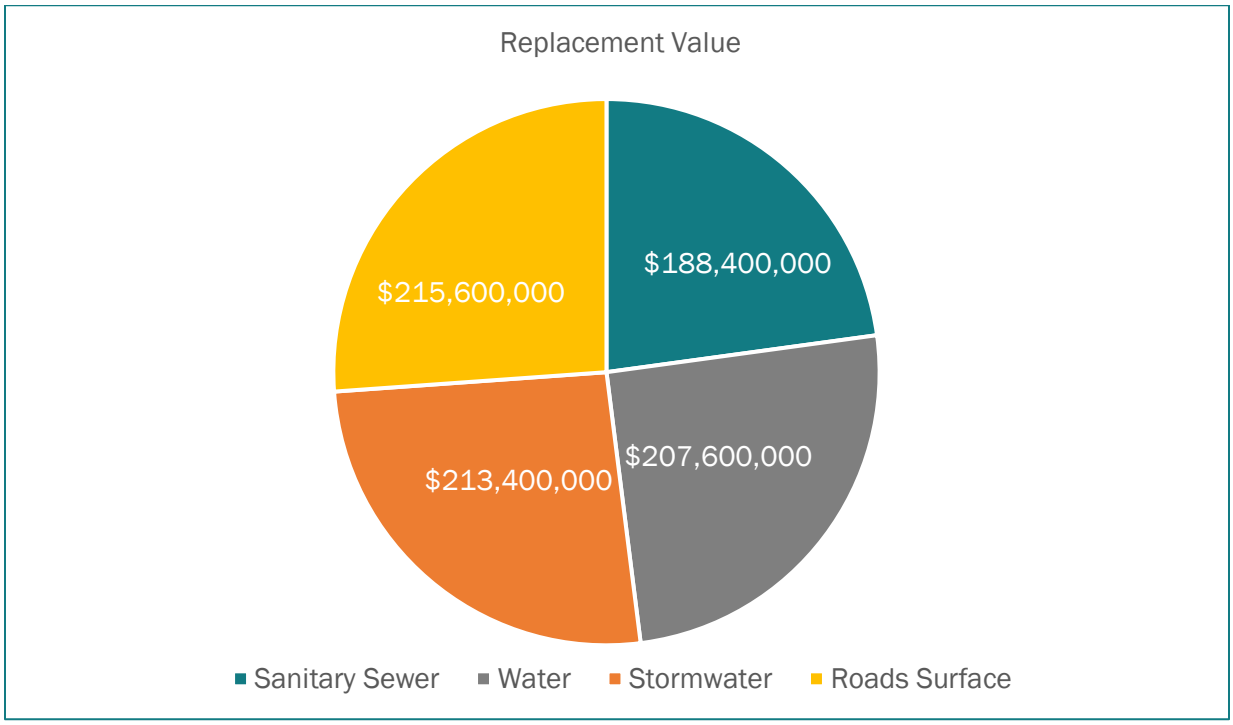
Using the information provided, the asset inventory was organized into 4 categories representing the service provided. These categories, and the quantity of infrastructure within each, are as follows:

- Water
  - Mains – Approximately 240 km of mostly PVC and asbestos cement, ranging in size from 100 to 600 mm in diameter
  - Valves – 3090
  - Hydrants - 892
- Sanitary
  - Mains – Approximately 150 km of primarily PVC and AC sanitary mains, ranging in size from 150 to 900 mm diameter
  - Manholes - 2694
- Stormwater
  - Mains – Approximately 160 km of mostly PVC mains, ranging in size from 100 to 2500 mm diameter
  - Manholes - 2588
- Roads – Approximately 300 km of roads

What is the Cost to Replace the Assets?

The total replacement value of MNC's assets is estimated to be $825 million, expressed in 2019 dollars. The replacement cost of each asset was determined using unit costs that were developed based on local construction costs (see **Appendix B**). Included in the unit costs is a 40% allowance to account for engineering fees and contingency associated with infrastructure replacement. It should be noted that the value of the road base ($290 million) has not been included in this number. In theory road base should be restored adequately during resurfacing and therefore should only need replacement in instances where complete road failure has occurred. **Figure 1** illustrates the breakdown of each category's replacement value.

Figure 1: Total Replacement Value for Each Asset Category



	Replacement Value
Crofton	
Roads	$14,700,000
Sanitary	$22,000,000
Stormwater	$20,000,000
Water	$20,200,000
Total	**$76,900,000**
Chemainus	
Roads	$23,800,000
Sanitary	$37,400,000
Stormwater	$32,100,000
Water	$30,900,000
Total	**$124,200,000**
Southside	
Roads	$177,100,000
Sanitary	$129,000,000
Stormwater	$161,300,000
Water	$156,500,000
Total	**$623,900,000**

What is the Age of the Assets?

Table 1 below summarizes the overall expected remaining life of each asset category based on its overall service life and install or renewal year. The remaining life for roads was estimated using the recent pavement condition assessment.

Table 1: Expected Remaining Life for Each Asset Category

Asset Category	Expected Percent Remaining Life
Water Mains	63%
Sanitary Mains	60%
Storm Mains	71%
Roads Surface	64%

As shown in Table 1, based on the age of the assets, sanitary mains have the lowest expected remaining life with overall expected remaining life of 60%. Given its 100 years average life, road base has not been included in the above table and the remaining life reflects the surface only.

How Much Money Needs to be Invested Annually?

The average annual lifecycle investment (AALCI) is a long-term indicator that can be used to inform the average ongoing levels of infrastructure investment. This is the conservative funding level for sustaining infrastructure indefinitely and can be used to ensure revenue is stable enough to provide consistent support for asset replacement requirements. The AALCI for the MNC's linear water, sanitary sewer, stormwater and roads assets is approximately $16 million per year broken down by category as shown in **Figure 2.**

Figure 2: Average Annual Lifecycle Investment (AALCI)

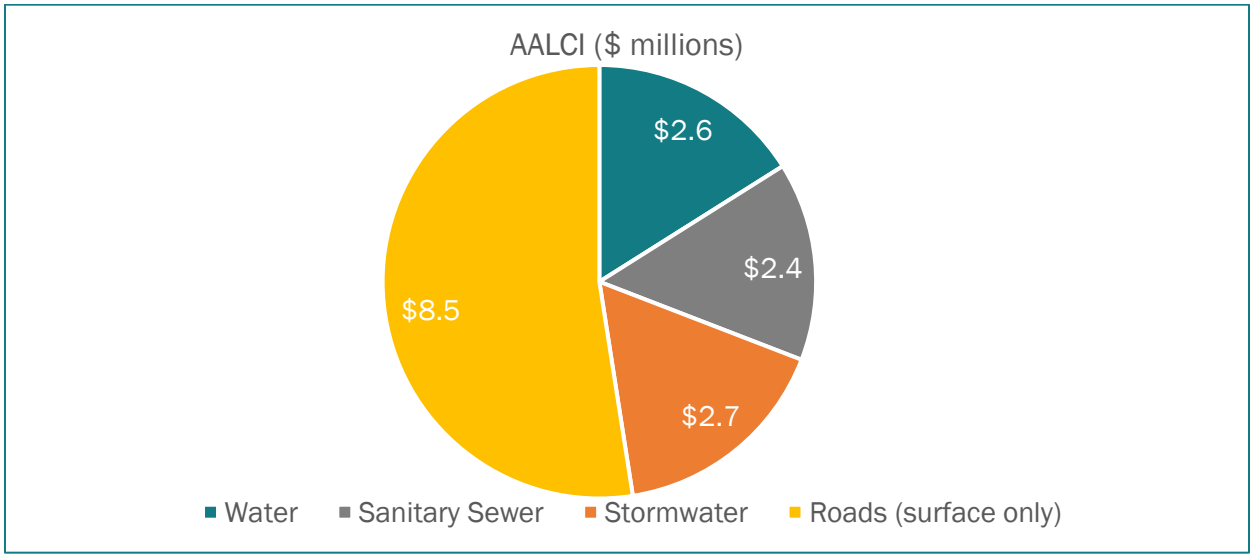


Table 2: AALCI by Area

	Crofton	Chemainus	South End	Total
Water	$ 300,000	$ 400,000	$ 1,900,000	$ 2,600,000
Sanitary	$ 300,000	$ 400,000	$ 1,600,000	$ 2,300,000
Stormwater	$ 300,000	$ 400,000	$ 2,000,000	$ 2,700,000
Roads	$ 600,000	$ 900,000	$ 7,000,000	$ 8,500,000
Total	**$ 1,500,000**	**$ 2,100,000**	**$12,500,000**	**$16,100,000**

The AALCI is sensitive to the assumed service life that is used in the calculations. so, it is important to understand how the investment level could vary based on what service lives are assumed. Understanding this sensitivity will help when deciding what investment level is best for MNC. For example, if assets last 25% longer than what has currently been assumed then the AALCI would be reduced by approximately 20%. If the assets last 50% longer the AALCI would be reduced by one third.

Table 3 provides a range of potential funding levels with the higher value being based on the average lifespans assumed being as per Appendix A, and the lower value assuming the assets last 50% longer.

Table 3: AALCI Range by Area

	Crofton	Chemainus	South End	Total
Water	$200k to $300k	$300k to $400k	$1300k to $1900k	$1800k to $2600k
Sanitary	$200k to $300k	$300k to $400k	$1100k to $1600k	$1600k to $2300k
Stormwater	N/A	N/A	N/A	$1800k to $2700k
Roads	N/A	N/A	N/A	$5600k to $8500k
				$10.8M to $16.1M

The AALCI also assumes replacing “like with like” - it does not consider potential changes in technology or construction methods that could result in cost savings.

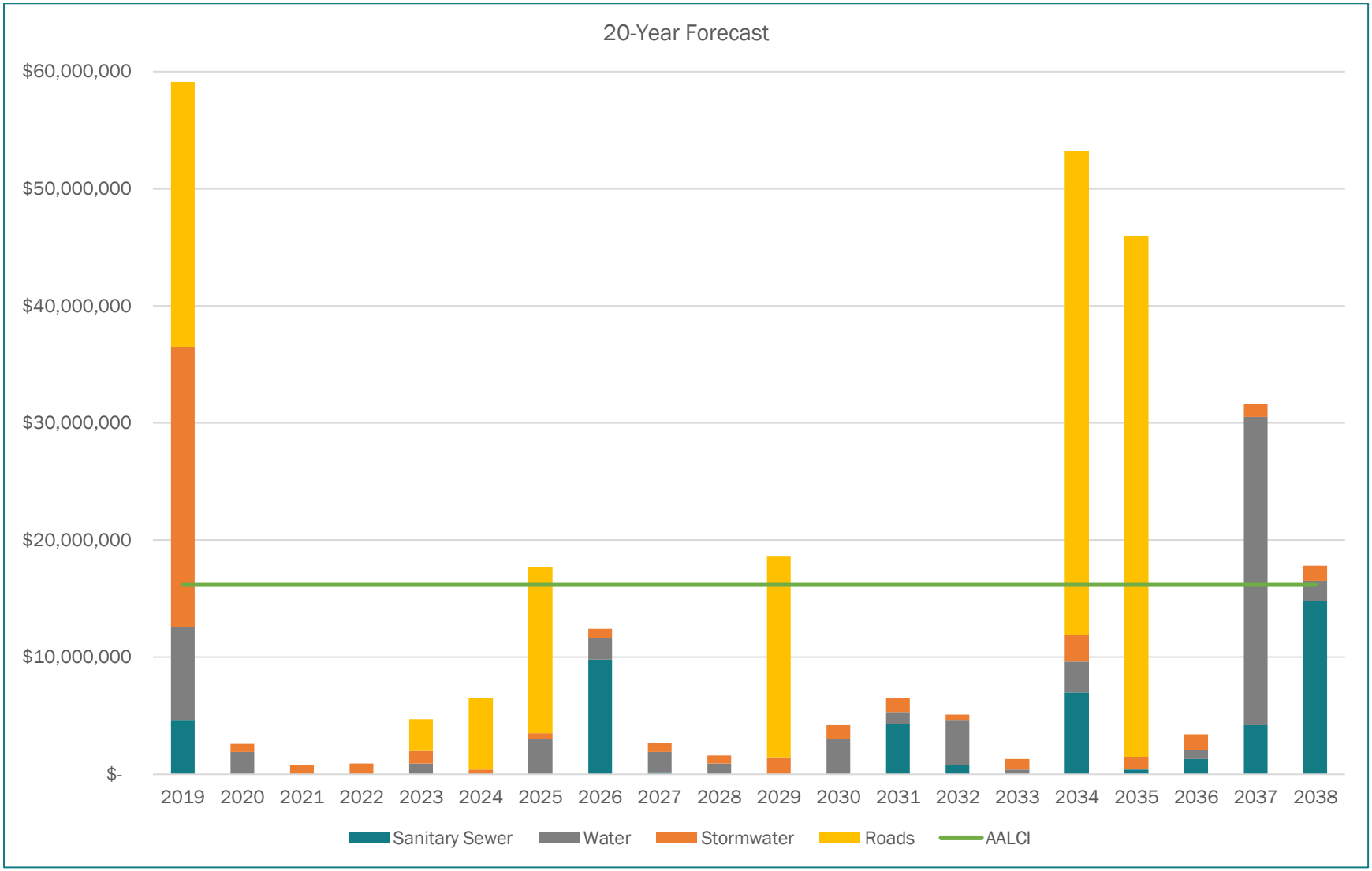
Another consideration is the 20-year asset replacement forecast. This forecast is helpful in understanding the extent of more immediate infrastructure replacement needs. By understanding the value of the infrastructure that could reach the end of its useful life (in theory) within the next 20 years MNC can begin to plan and prioritize projects and funding to address these near term needs.

In addition to the AALCI and the 20 year replacement forecast, the risk assessment is also an important input that helps to inform decisions regarding the near term and long-term funding requirements. The total 20 year asset replacement forecast based on the assumed service lives is approximately $274 million. This includes the infrastructure backlog of $59.1 million which appears in 2019 (year 1). The infrastructure backlog is simply the total of the infrastructure that has already reached it’s expected service life. This infrastructure is still in service and is still operating so a very high backlog could indicate that the assumed lifespans were too conservative.

Table 4: Backlog and 20 Year Forecast by Asset Category

Asset Category	Backlog	Remaining 20 Year Forecast	Total	Average Annual Spend (Next 20 Years)
Water	$4,600,000	$42,700,000	$47,300,000	$2,400,000
Sanitary Sewer	$8,000,000	$50,000,000	$58,000,000	$2,900,000
Stormwater	$23,900,000	$18,900,000	$42,800,000	$2,100,000
Roads (surface)	$22,600,000	$126,000,000	$148,600,000	$7,400,000
Totals	**$59,100,000**	**$237,600,000**	**$296,700,000**	**$14,800,000**

Figure 3: 20-Year Asset Replacement Forecast



Funding Review

City staff has provided the average annual capital spending levels by asset category and area. Tables 5,6 and 7 compare the annual capital spending to the AALCI range where the lower value assumes the assets will last 50% longer than the lifespans listed in **Appendix A**. It should be noted that these values are for the linear components only and that any major upgrades or additions needed for facilities would need to be considered separately.

Table 5: Water Funding Range by Area

Water Fund	Crofton	Chemainus	South End	Total
Average Annual Capital Spending	$200k	$400k	$800k	$1400k
AALCI Range	$200k to $300k	$300k to $400k	$1300k to $1900k	$1800k to $2600k
Available Reserve Funds	-	$550k	$3,360k	$3,910k

Table 6: Sewer Funding Range by Area

Sewer Fund	Crofton	Chemainus	South End	Total
Average Annual Capital Spending	$200k	$400k	$930k	$1530k
AALCI Range	$200k to $300k	$300k to $400k	$1100k to $1600k	$1600k to $2300k
Available Reserve Funds	$1,570k	$2,870k	$9,520k	$13,960k

Table 7: Roads and Stormwater Funding Range

General Fund (Roads)	
Average Annual Capital Spending	$3.8M
AALCI	$5.6 to $8.5M
General Fund (Stormwater)	
Average Annual Capital Spending	$500k
AALCI Range	$1.8M to $2.7M

WATER FUND

The Crofton and Chemainus water distribution systems are currently funded within the stated AALCI ranges. Revenues in the Crofton system could be increased to get funding more at the higher (i.e. more conservative) end of the range and to increase the available reserve funds. The South End system is currently under funded by approximately $600k to $1.1M annually.

SEWER FUND

The Crofton and Chemainus sewer collection systems are currently funded within the stated AALCI ranges. Revenues in the Crofton system could be increased to get funding more at the higher (i.e. more conservative) end of the range. The South End sewer system is currently underfunded by approximately $170k to $670k annually.

GENERAL FUND – ROADS

Based on the expected life of the various road surfaces (local, arterial, collector) as stated in Appendix A the road network is underfunded by approximately $1.8M to $4.7M annually depending on how conservative an approach the MNC choose to take. When actual condition information is considered the expected required spend over the next 20 years is in the order of $7.4M which suggests a funding gap of around $2.5M annually. This is based on the assumption that roads determined to be in “good” condition have on average 80% of their usefule life remaining, “fair” condition roads have 50% and “poor” condition roads have 20%. Roads that were determined to be in “poor” condition were assumed to be backlog.

The MNC will be developing a more comprehensive capital plan that will include the results of a new transportation master plan and the recent condition assessment. This capital plan will provide more clarity on what the annual spending should be over the next 10 to 20 years,

GENERAL FUND – STORMWATER

Based on the expected life of the assets the stormwater collection system is currently underfunded by approximately $1.3M to $2.2M over the long term. In the near term the expected 20 year investment level based on age only is in the order of $1.0M annually which would suggest a short term gap of approximately $500k annually.

Conclusions

The Municipality of North Cowichan are the stewards of water, sewer and roads infrastructure valued at more than $800M. Much of this infrastructure is approaching the end of it’s useful lifespan and will need to be replaced or rehabilitated in the coming years. The majority of the cost for this work will be paid for by the tax and rate payers of the municipality.

In general the municipality has done a good job of keeping revenues at a sustainable level, however a few areas could benefit from increased funding, in particular the South End water system and the overall stormwater system.

The South End water system revenue short fall could be addressed through incremental increases to user fees over a number of years. The shortfall for stormwater will be more difficuklt to address since stormwater is funded through general taxation and competition for funding by other services is intense. The City may want to consider the establishment of a dedicated funding source for stormwater such as levy or parcel tax. This approach has been used successfully by other communities in British Columbia such as the City of Surrey and the City fo Whiterock.

APPENDIX A

EXPECTED ASSET LIFESPANS

Pipe Materials	Average Expected Lifespan
AC	70
CI	60
CMP	30
CONC	60
DI	60
HDPE	60
PE	60
PVC	80
RCP	50
STEEL	60
VC	60
Hyprescon	50
Road Surface	
Local Roads	25 years
Collector Roads	15 years
Arterial Roads	10 years
Road Base	100 years

APPENDIX B

UNIT COSTS

	DESCRIPTION	UNIT COST	CONTINGENCY 25%	ENGINEERING 15%	TOTALS
	SANITARY (Including Manholes and Service Connections)				
200	Sanitary	$868	$217	$130	$1,215
250	Sanitary	$918	$229	$138	$1,285
300	Sanitary	$968	$242	$145	$1,355
375	Sanitary	$1,018	$254	$153	$1,425
450	Sanitary	$1,068	$267	$160	$1,495
525	Sanitary	$1,118	$279	$168	$1,565
600	Sanitary	$1,168	$292	$175	$1,635
675	Sanitary	$1,268	$317	$190	$1,775
750	Sanitary	$1,318	$329	$198	$1,845
900	Sanitary	$1,368	$342	$205	$1,915
1050	Sanitary	$1,568	$392	$235	$2,195
1200	Sanitary	$1,668	$417	$250	$2,335
	WATER (Including Valves, Fittings and Service Connections)				
150	Watermain	$571	$143	$86	$799
200	Watermain	$621	$155	$93	$869
250	Watermain	$671	$168	$101	$939
300	Watermain	$721	$180	$108	$1,009
350	Watermain	$771	$193	$116	$1,079
400	Watermain	$821	$205	$123	$1,149
450	Watermain	$871	$218	$131	$1,219
	STORM				
200	Storm Sewer	$827	$207	$124	$1,158
250	Storm Sewer	$877	$219	$132	$1,228
300	Storm Sewer	$927	$232	$139	$1,298
375	Storm Sewer	$977	$244	$147	$1,368
450	Storm Sewer	$1,027	$257	$154	$1,438
525	Storm Sewer	$1,077	$269	$162	$1,508
600	Storm Sewer	$1,127	$282	$169	$1,578
675	Storm Sewer	$1,227	$307	$184	$1,718
750	Storm Sewer	$1,277	$319	$192	$1,788
900	Storm Sewer	$1,327	$332	$199	$1,858
1050	Storm Sewer	$1,527	$382	$229	$2,138
1200	Storm Sewer	$1,627	$407	$244	$2,278
	ROADS - RURAL STANDARD (per lm)				
	Local - Surface	$420	$105	$63	$588
	Local - Base	$541	$135	$81	$757
	Collector - Surface	$504	$126	$76	$706
	Collector - Base	$674	$169	$101	$944
	Arterial - Surface	$840	$210	$126	$1,176
	Arterial Base	$1,208	$302	$181	$1,691

Appendix E

Financial Policy

1.1 SCOPE OF POLICY

Financial management policy statements have been developed for seven (7) key areas that influence the sustainable funding and financing of the Municipality's infrastructure assets. They are intended to work together cohesively to guide financial planning and decision-making.

The policy areas included are:

Property Taxes and User Fees
Surplus Funds
Reserve Funds
Debt
Grants
Asset Renewal
New Infrastructure

1.2 OBJECTIVE

This Policy aims to provide clarity to staff, Council and the community on how decisions are made with respect to the sustainable funding and financing of the District's infrastructure assets.

1.3 PROPERTY TAXES AND USER FEES

Property taxes are generally used to fund services that are provided broadly to the whole community (e.g., roads, policing, fire protection, parks, etc.) and where a separate user fee wouldn't be practical or desirable.

Property tax is based on the assessed value of a property (i.e., land and improvements/buildings). Property is assessed on an annual basis by BC Assessment, and the assessed value of the property is then multiplied by the Municipality's tax rate (expressed as the amount of tax per thousand dollars of assessed property value) to compute the annual property tax. There is a different tax rate for each of the nine property classes.

Property owners receive a tax notice annually from the Municipality. Taxes levied by other government agencies are also included on the Municipality's tax notice and are not controlled by the municipality. These agencies include the Municipal Finance Authority, BC Assessment, Cowichan Valley Regional District, Hospitals, and the Provincial Government (school tax).

Policy Statements

(a) The setting of annual budgets will be informed by the full cost of delivering the desired levels of service (including resource planning), lifecycle costs, risk, and the long-term priorities of the community.
(b) Annual property tax and user fees adjustments will be reflective of inflation and of year to year changes in service levels and operating expenses.
(c) Adjustments to annual property taxes and user fees will be as stable and predictable as feasible to enable accurate long-term financial planning and to avoid the need for future large one-time adjustments.
(d) Everyone pays a fair amount for the services they benefit from with consideration for their ability to pay.

1.4 SURPLUS FUNDS

Unlike the Federal or Provincial Government, local governments in British Columbia are not able to borrow money to cover operating expenses and therefore must have balanced annual budgets. This requires that the Municipal staff be conservative when setting annual budgets to avoid ending the year with a deficit. For this reason, it is normal for local governments (including District) to have a small surplus at the end of the fiscal year. It is at the discretion of Council to provide direction as to where the surplus funds are to be directed.

Policy Statements

(a) Unallocated annual surplus will be directed towards capital reserves annually after a base unallocated surplus target is met.
(b) The base allocation remaining in unallocated surplus will be used for unplanned emergencies or budget short falls. The amount of the allocation will be determined by management and will not exceed 20% of the operating budget of each fund.
(c) The use of accumulated surplus funds shall be reserved for unforeseen expenses and/or to leverage emergent opportunities.

1.6 RESERVE FUNDS

Saving money for future projects and unexpected expenditures is an important planning consideration for the Municipality. Reserves provide a financial mechanism for saving money to finance all or part of future infrastructure and equipment, or to smooth out fluctuations in operating expenses plus other purposes. Reserve funds provide a degree of financial stability and flexibility, by reducing reliance on grants or borrowing to finance capital projects or to leverage emergent opportunities.

Policy Statements

(a) Annual contributions to capital reserves will be budgeted for based on the capital plan and the amounts will be informed by the Municipality's Asset Management Plan.

(b) The annual contribution to capital reserves shall be kept as stable as possible from year to year.

(c) Operating reserves should be maintained for non-recurring or unexpected expenses, recurring expenses shall be included within the annual budget and funded through operating revenues.

1.7 DEBT

Borrowing is a common tool that local governments use to finance capital expenditures over both the medium and long terms. Debt is viewed as an equitable way of financing certain types of projects since those who are paying the principal and interest charges are able to benefit from the service immediately. This is different than having a "pay as you go" strategy, which requires some or all of the funds to be built up over time before completing the project.

When interest rates are low, the use of debt to deliver projects can be very attractive; however, local governments need to carefully consider the long-term financial impacts. Generally, a local government may not commit more than 25 per cent of its total own-purpose revenues to service debt and other long-term obligations without requesting permission from the Province.

Policy Statements

(a) The use of long-term debt will be focused on major projects with a value of $5M or greater with a life of greater than 10 years

(b) Target tax supported debt servicing costs (including leases >10 years) to be no more than a maximum of 50% of the municipality's liability servicing limit to reserve borrowing capacity to leverage emergent opportunities and/or emergency situations

(c) The servicing of debt shall be budgeted for and funded from on-going operating revenues

(d) The use of debt will be considered to leverage available grant funding for priority projects

1.8 GRANTS

A grant is a transfer of money to the Municipality from another entity (generally a higher level of government). Grants are a useful tool for local governments, and when used strategically they are able to offset costs to taxpayers. However, the availability of Grants is outside of the control of the Municipality and therefore an over reliance on grants to fund core infrastructures and services will undermine a community's ability to attain financial sustainability.

Most grants also require that the beneficiary covers a portion of the cost to deliver the project (often 1/4 to 1/3 of the project cost) this can lead to funds being diverted from previously identified priority projects to cover the Municipalities portion of the project, and highlights the need for grants to be primarily leveraged for projects that are a local priority.

Policy Statements

(a) Focus the pursuit of conditional grants on large one-time projects that have been previously identified in the District's capital plans.

(b) Advance priority projects to a "shelf-ready" status to ensure emergent grant opportunities can be fully leveraged

(c) Conditional grants will not be considered for the purposes of long-term financial planning

(d) If advantageous adjust the timing of capital and operating projects to align with anticipated grant funding opportunities

(e) Grants for projects and programs that were not previously identified in capital/operating plans may be considered where the municipal share is <20% and there is a clear benefit to the community and a strong alignment with longer term goals

1.9 ASSET RENEWAL AND REPLACEMENT

The delivery of local services greatly depends on a wide variety of infrastructure, such as roads, facilities and water and sewer systems. While much of this infrastructure lasts a long time, it does eventually need to be renewed or replaced. The replacement of these assets is expensive and therefore needs to be carefully planned for so that the Municipality maintains its financial sustainability over the long term. The timing

and funding requirements for asset renewal and replacement are identified within the Municipality's Asset Management Plan and long-term capital plan.

The Asset Management Plan sets out priorities for capital infrastructure upgrades in order to provide appropriate levels of service to the community over the long term. Deviations from the plan that defer needed asset renewal or replacement projects add to the Municipality's infrastructure deficit and can jeopardize future service levels and lead to unexpected asset failures which can be costly and potentially pose a risk to public health and safety.

Policy Statements

(a) Whenever possible, the renewal of linear assets will be financed on a pay as you go basis (i.e. reserves or current operating revenues rather than debt)

(b) Replacement and renewal projects will be prioritized using a consistent and structured decision-making process that considers risk, life cycle cost and level of service

1.10 NEW INFRASTRUCTURE

While the majority of the District's annual capital program is focused on the replacement and/or rehabilitation of existing infrastructure the Municipality also invests in new infrastructure to add to or improve the level of service provided within the community.

Whereas the renewal of existing infrastructure also results in lower operating costs due to a reduction in maintenance needs, the addition of new assets generally results in increased operating costs. For this reason, the financial impacts of investing in new assets needs to be carefully evaluated.

(a) Decisions to invest in new infrastructure will consider the full life cycle costs including operating, maintenance, and the eventual replacement of the asset(s)

(b) In general, new infrastructure should be financed from sources other than the reserve funds purposed for capital renewal

(c) The scope of planned capital projects that are in progress should not be expanded to include new assets without first identifying the impacts to the operating budget

Appendix F

Risk Framework

To Guide the Inspection, Rehabilitation, and Replacement of Water, Sewer, Stormwater and Roads Assets

Contents

Introduction

Why a Risk Framework is Important

The District Municipality of North Cowichan (the District) strives to continuously improve its asset management processes and practices in support of providing sustainable service delivery. It is considered a best practice in asset management to make **risk-based decisions**. When decisions are based on risk, scarce resources can be allocated to where they are most needed; service interruptions can be avoided; and the District can protect its residents and manage its liability.

As part of a process in 2018 and 2019 to improve its asset management processes and practices, the District engaged Urban Systems Ltd. to develop this **Risk Framework** (the Framework) for the District's water, sewer, stormwater, and roads assets. The Framework will help the District:

- Prioritize limited resources for inspection, rehabilitation, and replacement of assets
- Ensure that everyone is using a consistent definition of risk
- Make decisions based on risk, not risk perception
- Allow for open discussion about risk tolerance

What a Risk Framework Is

The Framework describes how the District will go about assessing risk for water, sewer, stormwater, and roads assets. Specifically, the Framework defines:

- What risk is and how it is assessed
- What types of hazards will be considered
- How likelihood and consequence will be defined
- How risk ratings will be assigned to assets

It is important to note that the Framework is meant to be simple to use and suitable for the purpose of identifying **relative priorities** among District assets. It is meant to help the District answer the question "What assets really require attention?" – it is not meant to be exhaustive in terms of how risk is assessed, and it is not meant to produce an absolute or exact measure of risk for each asset.

Scope of the Risk Framework

The scope of this Risk Framework is limited to the following:

- Risk of failure due to asset condition (deterioration)
- Linear water, sewer, and stormwater assets
- Major roads assets

It does not describe how the District will go about assessing risk of failure due to the capacity of an asset, and it does not include major assets such as pump stations. The methodology for assessing risk reflects the quantity and quality of data that the District currently has on its assets. Over time,

the methodology may be updated as data improves and allows for a more granular approach to assessing risk.

Note that the Framework in and of itself does not tell the District what the risk rating of each asset is, what the District's risk tolerance is, or what to do to address risks. It describes *how* risk ratings will be assigned.

How the Risk Framework Will Be Used

The Framework will be used to:

- **Assign a risk rating to the District's existing water, sewer, stormwater, and roads assets.** This will be done as part of the District's 2018-2019 asset management improvement process with Urban Systems. Once risk ratings are assigned, relative priorities will be identified terms of assets that require inspection, capital upgrades and/or other responses to address risks.
- **Assess and track the risk of assets over time, including new assets.** This will be part of the District's ongoing asset management practices. The Framework will be integrated into the District's GIS systems so that the risk rating of any given asset can readily be identified in GIS and used to support decision-making over time.

Once risk ratings have been assigned, the District will be able to identify priorites based on its risk tolerance, and then make decisions about what to do with the results. This broader process is described in the next section.

Important Concepts

What Risk Is – And What It Isn't

Risk is a function of the **likelihood** (or probability) of a negative event happening and the **consequence** (or impact) of that negative event happening.

In the context of asset management, we are interested in assessing risks related to asset failure.

Risk = Likelihood x Consequence

Asset age does **not** equal risk. Asset condition does **not** equal risk.

Age may be used a proxy for assessing the condition of a pipe, which is an indicator of the likelihood of an asset failing, but it does not speak at all to what the consequence of asset failure may be.

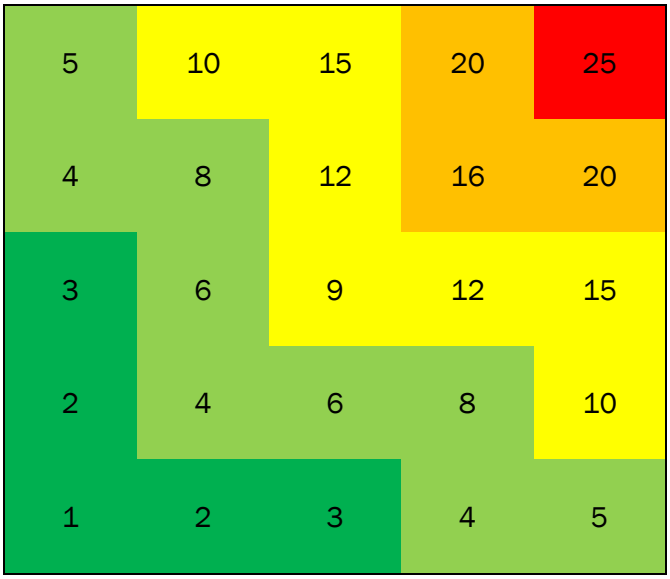
When assessing risk, both likelihood and consequence must be considered to make the most informed decision.

How Risk is Assessed

Risk in this context is assessed by:

1) Identifying potential causes of asset failure (hazards)
2) Assessing the likelihood of that hazard occurring
3) Assessing the consequence of that hazard occurring
4) Multiplying likelihood by consequence to determine risk

To simplify the process, each asset is assigned a **rating** for the likelihood and consequence of asset failure on a scale of 1 to 5. These numbers are then multiplied to determine the risk rating, which is expressed on a scale of 1 to 25, shown graphically as follows.



How Risk Assessment Fits Within a Broader Risk Management Process

Assessing risk happens as part of a broader risk management process:

- Once the District has assessed risk, it will identify the risks it chooses to address. The choices that are made about which risks to address will be based on the District's risk tolerance: what the District considers to be acceptable versus unacceptable risk.
- Once unacceptable risks have been identified, the District will identify the root cause of the risk. This is typically done through a process of asking "why" until the source is identified.
- The District will then identify actions to reduce risk to an acceptable level. Actions will focus on reducing the likelihood and/or consequence of asset failure, and may be capital and/or operational.
- Actions are then prioritized through the capital and operational plans and then implemented.
- Risk is iteratively assessed to determine if the risk has been reduced to an acceptable level and if there are any new risks, and the cycle continues.

Risk Framework

Hazards

Asset failure may occur by one of three modes:

1) **Condition failure –** due to asset deterioration
2) **Capacity failure** – due to surcharging
3) **Physical failure –** due to physical impact

The purpose of this Risk Framework is to identify relative priorities among assets so that inspection, rehabilitation, and renewal to where it is most needed. Therefore, **the hazard that is considered in this Framework is condition-based failure due to asset deterioration.**

Hazards that may cause capacity-related or physical failure of an asset, such as earthquakes, landslides, population growth, flooding, etc. – many of which are worsened with climate change – are important but are not part of the scope of this Framework.

Likelihood of Failure

Likelihood of failure scores are a function of asset condition (if available) or asset age. Likelihood of failure failure will be assessed and scored as described in Table 1.

Table 1: Approach for Assigning Likelihood of Failure Scores

Likelihood of Failure	Description	As Indicated By Condition Rating (if available)	As Indicated by Age (if condition data unavailable)	Assigned LOF Score
Very Low	Unlikely in foreseeable future	Excellent	Asset age is <75% of useful life	1
Low	20+ years	Good	Asset age is >75% to <100% of useful life	2
Medium	10-20 years	Fair	Asset age exceeds useful life by >=0% to <25%	3
High	5-10 years	Poor	Asset age exceeds useful life by >=25% to <50%	4
Very High	<5 years	Immediate Attention	Asset age exceeds useful life by >=50%	5

Consequence of Failure

Potential financial, environmental, and social consequences of asset failure are described below and are based on the factors described in Table 2.

Table 2: Potential Consequences of Failure

Type of Consequence	Potential Impacts	Factors Influencing the Magnitude of Impact
Financial	• Cost to restore service • Third party liability	• Road classification • Pipe size • Depth of pipe
Social	• Service interruptions to downstream customers • Impacts to public health and safety (sewer assets in particular)	• Road classification • Pipe size • Proximity to structures and type of structure
Environmental	• Environmental contamination (sewer assets in particular)	• Proximity to environmentally sensitive area and type of ESA

The District has data to support an assessment of consequence of failure based on all of the factors described in Table 2. As shown in Table 2, the most common factor influencing the magnitude of impact for all types of assets is road classification. Therefore, a preliminary consequence of failure score will be assigned to assets as described in Table 3. Then, the score will be increased by 1 if the asset meets any of the conditions described in Table 4.

Table 3: Approach for Assigning Preliminary Consequence of Failure Scores

Consequence of Failure	Description	As Indicated By Road Classification	Assigned COF Score
Insignificant	• <$500 to restore service and 3rd party liability • Impact to few downstream customers	Lane or Trail	1
Minor	• $500-$5,000 to restore service and 3rd party liability • Impact to some downstream customers	Strata	2
Moderate	• $5,000-$15,000 to restore service and 3rd party liability • Impact to many downstream customers	Local	3
Major	• $15,000-$50,000 to restore service and 3rd party liability • Impact to	Collector	4
Severe	• >$50,000 to restore service and 3rd party liability	Arterial	5

Table 4: Criteria for Modifying Consequence of Failure Scores

Original Score		1	2	3	4	5
Modified Score	>=300mm and <750mm (gravity) or >=200mm and <=250mm (force main) or adjacent to ESA **and** < 6.0m deep (for any of the three conditions above)	2	3	4	5	5
	>=300mm and <750mm (gravity) or >=200mm and <=250mm (force main) or adjacent to ESA **and** >= 6.0m deep (for any of the three conditions above)	3	4	5	5	5
	>=750mm (gravity) or >250mm (force main) or crossing of ESA **and** < 6.0m deep (for any of the three conditions above)	3	4	5	5	5
	>=750mm (gravity) or >250mm (force main) or crossing of ESA **and** >= 6.0m deep (for any of the three conditions above)	4	5	5	5	5

Results

Using a GIS analysis tool developed for the District the Framework criteria was applied and a risk ranking was assigned to each segment of water main, sewer main, stormwater main and road. The ranking categories ranged from high down to low. The results of the analysis are contained in the summary table below:

Summary of Risk Rankings

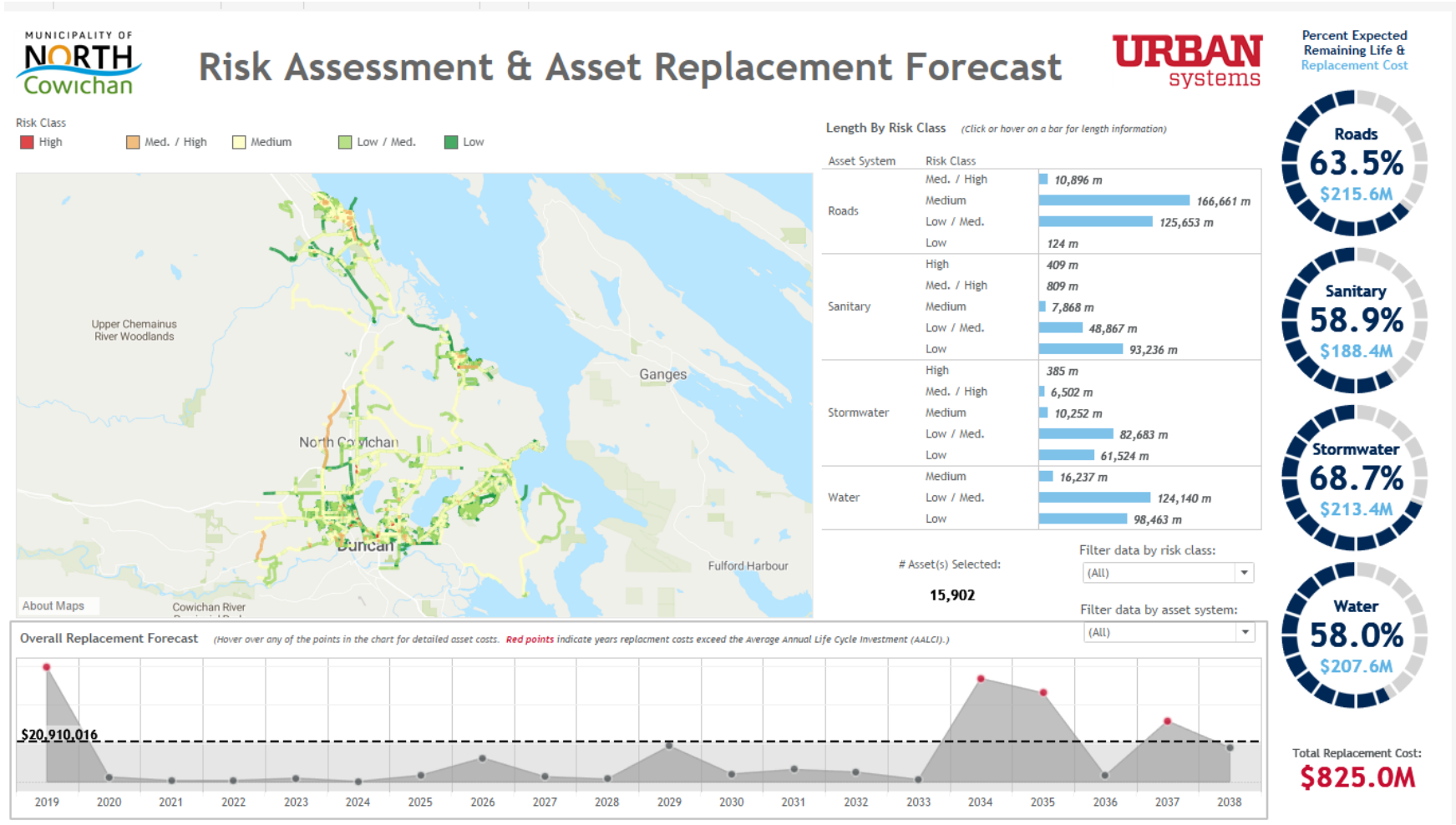
Asset System	Risk Ranking	Length	Replacement Value
Roads	High	-	-
	Med. / High	10,896	$8,800,000
	Medium	166,661	$131,200,000
	Low / Med.	125,653	$75,600,000
	Low	124	$100,000
Sanitary	High	409	$500,000
	Med. / High	809	$1,000,000
	Medium	7,868	$9,700,000
	Low / Med.	48,867	$61,400,000
	Low	93,236	$115,800,000
Stormwater	High	385	$500,000
	Med. / High	6,502	$9,300,000
	Medium	10,252	$14,200,000
	Low / Med.	82,683	$112,600,000
	Low	61,524	$76,700,000
Water	High	-	-
	Med. / High	-	-
	Medium	16,237	$13,800,000
	Low / Med.	124,140	$110,700,000
	Low	98,463	$83,100,000

In general, the majority of the District's assets would be in the medium to low risk categories, however, there is approximately $10 million of stormwater assets that fall into the high and

medium/high categories. There are also approximately $1.5 million of sewer assets falling into these upper risk categories. It would be prudent of the District to assess these assets and determine if replacement in the near term is warranted.

Appendix G

Visualization Tool


MUNICIPALITY OF NORTH Cowichan
Risk Assessment & Asset Replacement Forecast
URBAN systems
Risk Class
High
Med. / High
Medium
Low / Med.
Low
Upper Chemainus River Woodlands
Ganges
North Cowichan
Duncan
Fulford Harbour
Cowichan River
About Maps
Length By Risk Class (Click or hover on a bar for length information)
Asset System
Risk Class
Roads
Med. / High 10,896 m
Medium 166,661 m
Low / Med. 125,653 m
Low 124 m
Sanitary
High 409 m
Med. / High 809 m
Medium 7,868 m
Low / Med. 48,867 m
Low 93,236 m
Stormwater
High 385 m
Med. / High 6,502 m
Medium 10,252 m
Low / Med. 82,683 m
Low 61,524 m
Water
Medium 16,237 m
Low / Med. 124,140 m
Low 98,463 m
Asset(s) Selected:
15,902
Filter data by risk class:
(All)
Filter data by asset system:
(All)
Percent Expected Remaining Life & Replacement Cost
Roads 63.5% $215.6M
Sanitary 58.9% $188.4M
Stormwater 68.7% $213.4M
Water 58.0% $207.6M
Total Replacement Cost:
$825.0M
Overall Replacement Forecast (Hover over any of the points in the chart for detailed asset costs. Red points indicate years replacement costs exceed the Average Annual Life Cycle Investment (AALCI).)
$20,910,016
2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038