IMPROVING ASSET MANAGEMENT PLANNING AT THE VILLAGE OF VALEMOUNT

SUMMARY OF FINDINGS & RECOMMENDATIONS

FINAL REPORT – MARCH 2020

PREPARED FOR:

VILLAGE OF VALEMOUNT
Let the mountains move you

PREPARED BY:

URBAN SYSTEMS

EXECUTIVE SUMMARY

The Village of Valemount (the Village) owns and operates tens of millions of dollars' worth of civil infrastructure. As this infrastructure reaches the end of its useful life, it will need to be replaced or rehabilitated at significant expense to the Village. In response to this reality the Village initiated this project to improve asset management planning for the Municipality's infrastructure. A robust asset management program will help the Village 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.

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.

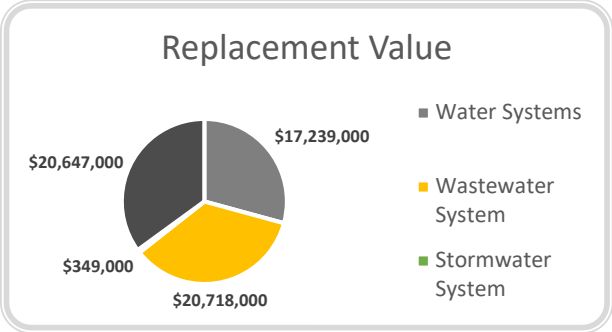
The scope of this project included the following components:

- An investment plan that defines the level of funding required to sustain the Village's assets over the long term
- A framework to objectively assess the risk of asset failure and help prioritize investment decisions
- A financial policy to guide investment decision making and funding decisions
- A review of future growth potential within the Village boundary and the associated impacts to infrastructure
- An assessment of the potential impacts to Village infrastructure due to climate change
- A condition assessment of the Village's facilities
- A capital plan and a review of future funding requirements
- An integrated tool to help the Village visualize the information that has resulted from this project and aid in future decision making

Value of The Villages Assets

This project determined that the Village owns and operates approximately $60 million of water, sewer, roads and drainage infrastructure.

While some of this infrastructure is relatively new the majority of these assets were installed during the 1970's and 1980's and will require replacement in the coming decades.



The Risk of Asset Failure

To help prioritize future asset replacements, a risk assessment was undertaken for all of the linear water, sewer and roads assets. This assessment considered the financial, social and environmental consequences of asset failure together with the likelihood of a failure occurring.

The Village's water and sewer systems have adequate capacity to accommodate growth over the next 20 years

The analysis determined that the majority of the Villages linear infrastructure was considered to be low risk. Approximately 22% of water, 15% of sewer and 45% of roads were considered to be in the medium risk category. The only assets considered to a high risk were a small number of sewer pipes (less than 1% of the total). The results of the risk assessment can be viewed using the visualization tool that was developed for this project.

Ability to Accommodate Growth

To better understand the impacts of growth on the Village's critical infrastructure a review of potential development was undertaken and low, medium and high growth scenarios were developed. It was determined that the Village's water and sewer infrastructure (treatment and conveyance) is adequately sized to accommodate all growth scenarios with no requirement to add capacity over the next 20 years.

Vulnerability to Climate Change

Climate change presents one of the greatest challenges of our time. Current trends and future projections indicate that the impacts we are experiencing to the natural environment and the communities we live in will continue to intensify. Of particular concern is the ability of communities to continue to provide high levels of service to local residents.

Our climate model predicts that:

- Average daytime high and night time low temperatures will increase for all seasons
- Total precipitation will increase for all seasons except for some summer months
- Snowfall will decrease in the fall, winter and spring

To better understand how a changing climate might impact the Village's infrastructure a climate vulnerability study was undertaken. The assessment utilized a climate model to project future climate trends in the Village. This information was then used to assess potential negative impacts to Village infrastructure.

The most significant vulnerabilities were related to power outages from more frequent storms and potential flooding risk from higher intensity storms.

Long Term Funding Requirements

The Village of Valemount, like many communities in BC, is challenged to fund the replacement of it's aging infrastructure. Traditionally communities have only funded operating expenses and minor upgrades. This approach seemed to work well when infrastructure was mostly new and replacements were decades away. However, as major infrastructure reaches the end of its useful life and grant

funding from higher levels of government becomes scarce, communities are now being forced to evaluate their long-term funding strategies.

To accomplish the 10-year capital plan and to ensure the long-term financial sustainability of its water, sewer, and roads systems the Village will have little choice but to increase its revenues from taxation and user fees. The financial model prepared for this project has identified that the following increases would be financially prudent:

- General Taxation – 2.5% annually for the next 10 years dedicated for capital replacements plus 3% inflation (COLA).
- Water User Fees - 4% annually for the next 10 years dedicated for capital replacements plus 3% inflation (COLA).
- Sewer User Fees - 5% annually for the next 10 years dedicated for capital replacements plus 3% inflation (COLA).

In addition, this review has identified that the current DCC levels are not sufficient to recover the growth-related costs identified in the 10-year capital plan. An update to these charges is recommended.

TABLE OF CONTENTS

Appendices

INTRODUCTION

Overview of this Plan

What it is

In 2018, the Village of Valemount (the Village) initiated a project to improve asset management planning for the Municipality's 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 Village owns a significant amount of infrastructure. As this infrastructure reaches the end of its useful life, it will need to be replaced or rehabilitated at significant expense to the Village. A robust asset management program will help the Village 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 include recommendations for the following:

- Improvements to the Village's geographic information system (GIS)
- A framework to objectively assess risk to the Village from asset failure
- A financial policy to guide investment decision making and funding decisions
- An investment plan that defines the level of funding required to sustain the Village's assets over the long term
- A long-term capital and financial plan
- An integrated tool to help the Village 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, Public Works and Planning. The consulting team worked collaboratively with the Village'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 Appendices A through H, which are useful standalone documents that were prepared throughout the project. These appendices include:

- Appendix A: Asset Management Investment Plan
- Appendix B: Risk Assessment Framework and Analysis
- Appendix C: Growth Related Infrastructure Requirements
- Appendix D: Climate Change Vulnerability Assessment
- Appendix E: Condition Assessments
- Appendix F: Financial Policy
- Appendix G: Capital Plan and Funding Review
- Appendix H: Visualization Tool

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

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

Asset Management Investment Plan

Overview

This Asset Management Investment Plan (AMIP) was developed to determine future investment requirements for the Village of Valemount's (the Village) water, sewer, and roads 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 the Village own?
- What is the cost to replace these assets?
- What is the age of these assets and what is the estimated remaining service life?
- How much money needs to be invested annually to maintain the Village'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 a 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 Village to consider this information when making major investment decisions.

The AMIP does not consider the Village'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 the Village has been completed as a separate project task.

Results

WHAT ASSETS DOES THE VILLAGE OWN?

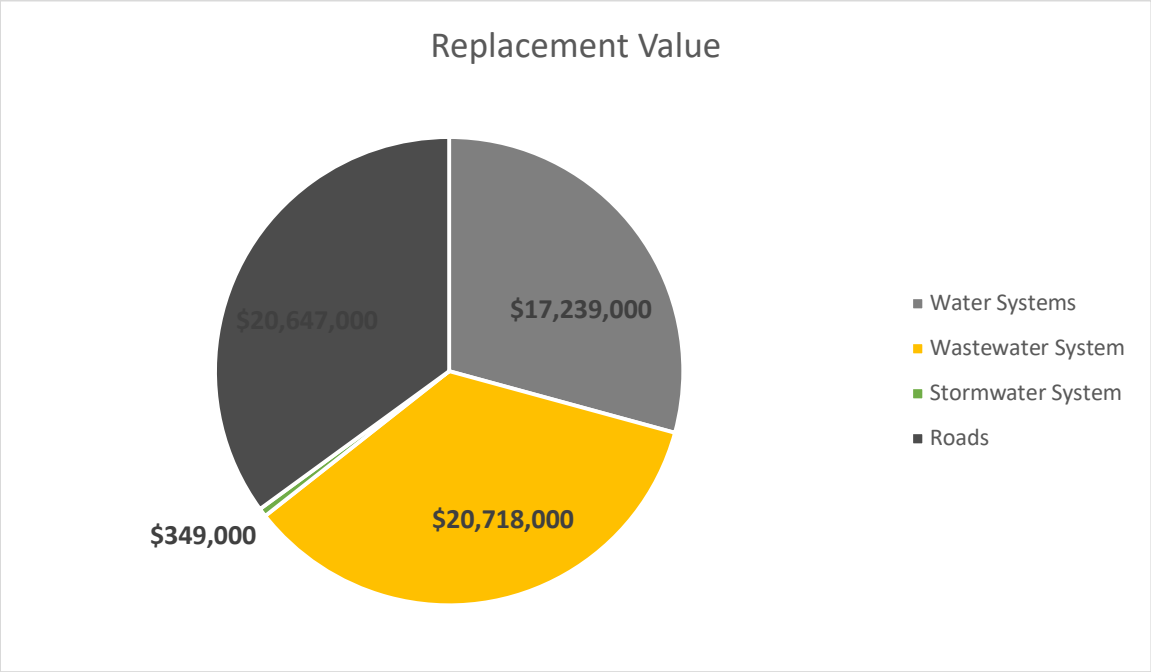
Using the information provided, the asset inventory was organized into 4 categories representing the service provided. These categories, and the quantity of infrastructure within each, are as follows:

- Water Mains – Approximately 24 km of mostly PVC and asbestos cement, ranging in size from 38 to 350 mm in diameter
- Water Services – Approximately 5 km of PVC and steel services, ranging in size from 19 to 150 mm in diameter
- Fire hydrants – a total of 86 fire hydrants
- Water valves – a total of 257 water valves
- Water Lift Station – 1 lift station
- Reservoir – 2 reservoirs
- Water Treatment Plant – Various components

- Sanitary Mains – Approximately 4 km of pressurized and 15 km of gravity PVC sanitary mains, ranging in size from 75 to 250 mm in diameter
- Sanitary Services – Approximately 7 km of PVC services
- Sanitary Manholes – 167 manholes
- Sanitary Lift Station – 8 lift stations
- Sewage Treatment Plant – Various components
- Storm Mains – Approximately 0.6 km of PVC and steel storm mains, ranging in size from 150 to 350 mm in diameter
- Roads – Approximately 32 km of road

WHAT IS THE VALUE OF THESE ASSETS?

The total replacement value of the Village of Valemount's assets is estimated to be $54 million, expressed in 2019 dollars. A breakdown of these values is provided in the following chart.



WHAT IS THE ESTIMATED REMAINING LIFE OF THE ASSETS?

The table below summarizes the overall expected average remaining life of each asset category based on its overall service life and install or renewal year.

Asset Category	Expected Percent Remaining Life	Estimated Average Life Remaining (Years)
Water Mains	83%	53
Water Services	84%	68
Fire Hydrants	83%	27
Water Valves	48%	48
Water Lift Stations	14%	4
Reservoirs	52%	20
Water Treatment Plant	66%	22
Sanitary Gravity Mains	51%	41
Sanitary Forcemains	51%	40
Sanitary Services	51%	41
Sanitary Manholes	35%	21
Sanitary Lift Stations	38%	11
Sewage Treatment Plant	41%	11
Storm Mains	87%	76
Roads (surface and base)	76%	45

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.

Asset Category	AALCI	AALCI Assets Last 50% Longer
Water Mains	$114,000	$76,000
Water Services	$14,000	$9,000
Fire Hydrants	$10,000	$7,000
Water Valves	$17,000	$11,000
Water Lift Stations	$30,000	$20,000
Reservoirs	$38,000	$25,000
Water Treatment Plant	$94,000	$63,000
Water System Total	**$317,000**	**$211,000**
Sanitary Gravity Mains	$88,000	$59,000
Sanitary Forcemains	$17,000	$11,000
Sanitary Services	$49,000	$33,000
Sanitary Manholes	$15,000	$10,000
Sanitary Lift Stations	$155,000	$103,000
Sewage Treatment Plant	$105,000	$70,000
Sewer System Total	**$429,000**	**$286,000**
Stormwater Mains	$4,000	$3,000
Roads	$397,000	$265,000
Roads and Drainage Total	**$401,000**	**$268,000**
Grand Total	**$1,147,000**	**$765,000**

The majority of the Village's AALCI is for replacement needs of roads (35%), sanitary lift stations (14%), and watermains (10%). The total AALCI for all assets is estimated to be $1.15 million.

The Village may experience prolonged service from some of its assets, especially those which have already surpassed their useful life but are still functioning (backlogged infrastructure). The third column in the Table above presents an adjusted AALCI based on the assets lasting 50% longer than the base assumption. Assuming that assets may consistently outlast their expected service life is a risk that may be accepted by the Village, if they wish to take a less conservative approach to asset management.

Recommendations

On a long-term outlook, the AALCI results suggest that the water system will require $211k to $317k annually on average, the sewer system will require $286 to $429k and $268k to $401k for roads and drainage.

To achieve the best results from capital that is allocated to this infrastructure, the Village would benefit from an ongoing inspection program to identify specific high-risk infrastructure that should be targeted for renewal or replacement, as well as to refine the service life assumptions used in this assessment.

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

RISK FRAMEWORK 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 Village can protect its residents and manage its liability.

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

- 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 Village 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 Village has assessed risk, it will identify the risks it chooses to address based on risk tolerance.
- Once unacceptable risks have been identified, the Village will identify the root cause of the risk.
- The Village will then identify actions to reduce risk to an acceptable level.
- 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.

Analysis Results

The framework criteria (Appendix B) was applied to the Village's linear water and sewer assets. In general, most of the pipes were categorized as low risk. Approximately 22% of water pipes were categorized as medium risk. These are primarily asbestos cement pipes that were installed in the early 1970's and are approaching the end of their useful life.

Approximately 15% of the gravity sewer pipes were categorized as medium risk. These are primarily larger diameter sewer pipes where CCTV assessments have indicated that the condition is poor or very poor.

Only a small amount of infrastructure (99m of gravity sewer) was deemed to be high risk.

Asset Category	meters of pipe/road		
	low	med	high
Water Pipes	18,588	5,192	-
Wastewater Pressure	3,872	65	-
Wastewater Gravity	12,853	2,083	99
Roads	17,768	14,715	-

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

GROWTH RELATED INFRASTRUCTURE NEEDS

Three residential growth projections have been prepared and expressed as additional units which could be expected within the community over the next 20 years. In each case, it is anticipated that this residential growth would be supplemented by additional tourism-related commercial development (accommodations, restaurants, retail and related services).

These projections are summarized as follows:

Low Growth

- Assumes no permanent population growth and limited non-permanent / second home development
- Growth projection = 50 residential units over the next 20 years, plus additional tourism-related commercial development

Medium Growth

- Assumes no permanent population growth and modest non-permanent / second home development
- Growth projection = 75 residential units over the next 20 years, plus additional tourism-related commercial development

High Growth

- Assumes limited permanent population growth and more extensive non-permanent / second home development
- Growth projection = 100 residential units over the next 20 years, plus additional tourism-related commercial development

Impacts on Infrastructure

When considering the historical permanent population growth (decline) in combination with the "High Growth" projection we don't see a need to increase capacity at the water and sewer treatment plants since the decline in population over the past years has freed adequate capacity to accommodate even the high growth scenario.

With respect to new developments that are in progress, the number of lots that will be available in the next few years closely match the high growth projection. It should be noted that a 62 unit hotel was recently constructed and a 64 unit hotel has been proposed near the Village office. These hotels have been included with respect to impact on water and sewer infrastructure.

WATER TREATMENT PLANT

The total of all growth/development is estimated to be 44 L/s (2019 maximum day was 32 L/s). The existing plant capacity is 57 L/s and therefore is sufficient capacity to accommodate the high growth scenario.

SEWAGE TREATMENT PLANT

The total of all growth/development is 1,232 m^3/day. The existing plant capacity is 1,500 m3/d and therefore is sufficient capacity to accommodate the high growth scenario.

WATERMAINS

Watermain extensions will be driven by development. Those costs will be borne by the developers to service their subdivisions. Based on our knowledge the Village doesn't require need any trunk main capacity upgrades.

SANITARY SEWER

The Dogwood lift station and forcemains are currently being planned for replacement/upgrades in order to provide better service to the Village. Class C cost for that is $1.8M. Approximately 75% of this cost could be attributed to asset renewal and 25% due to future capacity.

In the medium term, the 17th Ave lift station will need to be replaced (or reconfigured to allow for gravity flow to the Dogwood Station). While this could be thought of as an infrastructure renewal piece, the development that has happened in the south of the Village also reinforces that this station will need to be upgraded in the next few years. We suggest an allowance of $900,000 for station replacement for now based on the costs of the recently replaced 5th Avenue lift station. Approximately 75% of this cost could be attributed to asset renewal and 25% due to future capacity.

Conclusions

The Village's water and sewer infrastructure should be able to accommodate the high growth scenario as defined in this memo. The 17th Avenue lift station should be planned for replacement in the medium term, and Dogwood in the near term, both these projects are primarily driven by asset condition as opposed to growth.

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

CLIMATE CHANGE VULNERABILITY ASSESSMENT

Climate change presents one of the greatest challenges of our time. Current trends and future projections indicate that the impacts to the natural environment and the communities we live in will continue to intensify. Of particular concern is the ability of communities to continue to provide high levels of service to local residents. Asset management presents an opportunity to assess the impacts of climate change on key community infrastructure, providing community leaders with the information needed to implement actions that support community resilience.

Through the Village of Valemount Asset Management Project, the community is integrating a climate change vulnerability assessment into their asset management planning. Climate change will likely have minor to significant impacts on assets and service delivery, such as:

- Increased levels of risk for delivering target levels of service
- Increased costs associated with managing risks and delivering target levels of service
- Decreased asset lifecycle associated with changes in loads and stresses

The purpose of this element of the asset management process is to systematically assess the vulnerability of the community's key assets to a changing climate drawing on the knowledge of Village staff and available desktop information.

This assessment focused on the Village's water, wastewater, drainage and road systems and will provide the Village with climate change vulnerability information to consider in capital projects and operations and maintenance planning for key asset systems.

The following table summarizes the highest vulnerabilities for each asset system. The full report has been included in Appendix D.

Asset System	Projected Climatic Change	Predicted Direct Impacts	Anticipated Outcome of Direct Impact	Notes
Roads	Longer and More Intense Storms	Damage to infrastructure due to increased frequency and severity of storm events	Increased erosion and degraded condition of roads and frequency of washouts, temporary road closures and	Of particular concern are potentially undersized culverts and dirt and gravel roads that are susceptible to erosion.

			increased risk of accidents	
Water Systems	Drier Summers	Less stream flow due to decreased precipitation and increased evapotranspiration	More frequent drought conditions and reduced amount of raw water supply from Swift Creek	The intake structure on Swift Creek acts as a small reservoir that can collect and maintain sufficient amounts of water even in low flow conditions. However, with increased population growth, water demands will increase and combined with drought conditions, could put the community in a water shortage situation.
		Damage of infrastructure and interruption of services due to increased risk of wildfire	Damage to the high lift station, water treatment plant and reservoir	It is unknown whether there is sufficient buffer zone from the surrounding forest around the water system buildings to reduce the risk of wildfire damage. If facilities sustain fire damage, there will be disruption to the service and costly repairs will be required.
	Warmer and Wetter Winters and Springs	Damage to infrastructure due to stream/river flooding	Damage to the Swift Creek intake structure and the high lift station	Previous flood events have resulted in damage to the high lift station and a major flood in Swift Creek could result in loss of the high lift station resulting in disruption of service and costly repair/replacement.
Wastewater Systems	Drier Summers	Damage of infrastructure and interruption of services due to increased risk of wildfire	Damage to wastewater treatment facilities and lift stations	It is unknown whether there is sufficient buffer zone from the surrounding forest around the wastewater treatment facilities and lift stations to reduce the risk of wildfire damage. If facilities sustain fire damage, there will be disruption to the service and costly repairs will be required.
	Hotter Summers	Increase in nuisance odours emitted from wastewater facilities	Wastewater treatment plant and lift station odours may increase in frequency and potency	There is a history of complaints from the public who live near the wastewater treatment plant regarding odours in the summer months. To address this, costly odour reduction upgrades will be required.

Drainage Systems	Warmer and Wetter Winters and Springs	Damage to infrastructure due to local drainage system flooding	Pipes, culverts, ditches, catch basins and drywells may be subject to overflow resulting in damage to the drainage components and surrounding infrastructure	Of particular concern are areas in which privately owned drainage systems feed into the Village system or areas of the Village system itself where drainage is inadequate. Known issues include contaminated run off from gas stations, flooding of the daycare centre in the basement of the community hall and pooling of water at various location on second avenue and the north end of Dogwood Street. Site grading and drainage system upgrades can help alleviate known issues in the Village, however this could be costly.
	Longer and More Intense Storms	Damage to infrastructure due to increased frequency and severity of storm events		

CONDITION ASSESSMENTS AND LEAK DETECTION

As a component of this project a visual inspection of the Villages non-linear water and sewer assets was undertaken. In addition, a leak detection survey was also conducted on the older sections of the Village water system.

Condition Assessments

The following table provides a listing of those assets that were deemed to be in very poor or poor condition (condition rating 1 or 2).

Category	Sub Category	Location	Description	Condition (1=Excellent, 5=Poor)
Wastewater	Electrical	Dogwood Lift Station	Control Panel	1
Wastewater	Mechanical	Ash Street Lift Station	Pump 1 and Valves	2
Wastewater	Mechanical	Ash Street Lift Station	Pump 2 and Valves	2
Wastewater	Structural	Dogwood Lift Station	Shell and Base	2
Wastewater	Electrical	Elm Street Lift Station	Electrical Kiosk and Controls	2
Water	Civil	High Lift Pump Station	Roof	2

A complete listing of the assets that were assessed including photographs is attached.

Leak Detection

The leak detection program was undertaken by J&D Consultants and focused on the older areas of the Village. The consultant utilized a sonic device that would detect the sound of water escaping from a pipe or water service. The results were captured within the GIS data set.

A small number of minor leaks were found and these have been addressed by Village staff.

FINANCIAL POLICY

As a component of this project a financial policy was developed together with staff. 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 Village of Valemount's infrastructure assets.

Financial management policy statements were developed for six (6) key areas that influence the sustainable funding and financing of the Village'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

A summary of the policy statements is provided below. The complete policy can be found in Appendix F.

PROPERTY TAXES AND USER FEES

Policy Statements

(a) The setting of annual budgets will be informed by the full cost of delivering the desired levels of service, including, 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.

SURPLUS FUNDS

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 Council and management.

(c) The use of accumulated surplus funds shall be reserved for unforeseen expenses and/or to leverage emergent opportunities.

RESERVE FUNDS

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 Village'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

Policy Statements

(a) The use of long-term debt will be focused on major projects with a life greater than 10 years.

(b) Target planned debt servicing costs (including leases >10 years) to be no more than a maximum of 50% of the Village'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 projects1.7

GRANTS

Policy Statements

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

(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 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%, there is a clear benefit to the community and a strong alignment with longer term goals

ASSET RENEWAL AND REPLACEMENT

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, capacity and level of service.

CAPITAL PLAN AND FUNDING REVIEW

The Village of Valemount, like many communities in BC, is challenged to fund the replacement of it's aging infrastructure. Traditionally communities have only funded operating expenses and minor upgrades. This approach seemed to work well when infrastructure was mostly new and replacements were decades away. However, as major infrastructure reaches the end of its useful life and grant funding from higher levels of government becomes scarce, communities are now being forced to evaluate their long-term funding strategies.

The Village of Valemount has identified approximately $9M of capital projects that need to completed over the next decade. This level of funding is likely to be the new normal for the Village as its infrastructure continues to age and requires replacement. To accomplish the 10-year capital plan and to ensure the long-term financial sustainability of its water, sewer, and roads systems the Village will have little choice but to increase its revenues from taxation and user fees. The financial model prepared for this project has identified that the following increases would be financially prudent:

General Taxation – 2% annually for the next 10 years dedicated for capital replacements

Water User Fees - 4% annually for the next 10 years dedicated for capital replacements

Sewer User Fees - 6% annually for the next 10 years dedicated for capital replacements

In addition, this review has identified that the current DCC levels are not sufficient to recover the growth-related costs identified in the 10-year capital plan. An update to these charges is recommended.

The full report is attached in Appendix G.

VISUALIZATION TOOL

Overview

As an added component of the project, a visualization tool was developed to improve the capability of Village 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 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 Village 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 H.

APPENDIX A

ASSET MANAGEMENT INVESTMENT PLAN

Prepared by Urban Systems LTD. | March 2020

URBAN systems

Contents

Overview of the AMIP

This Asset Management Investment Plan (AMIP) was developed to determine future investment requirements for the Village of Valemount's water, sewer, and roads infrastructure. The AMIP presents annual investment requirements based on current renewal cost and estimated remaining service lives of the Village's 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 the Village 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 the Village's assets?

What doesn't the AMIP tell us?

It is important to note that despite its name, the Asset Management Investment Plan 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 us up to those that make decisions within the Village to consider this information when making major investment decisions.

The AMIP does not consider the Village'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 Valemount 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 the Village 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 2020 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.

REPLACEMENT VALUE: The estimated cost to replace the asset, in 2020 dollars.

SERVICE LIFE (THEORETICAL AGE*):* The number of serviceable years an asset is expected to provide.

Methodology

Information Gathering

Urban Systems compiled an asset inventory using the following:

- GIS data (provided by the Village and open source data)
- Site inspection observation
- Anecdotal information
- Assumptions where necessary based on local knowledge.

The asset inventory is the foundation of the AMIP, so it is important that the compiled inventory represents the best currently available information. Geographic Information System (GIS) data was collected and compiled to develop the majority of the asset inventory and to support many of the assumptions made to address data gaps.

It is important to emphasize that inventory development and maintenance is an ongoing process for which there is no "final" version. However, in order to conduct a current asset replacement forecast that complemented the AMIP, the inventory was captured in early 2019.

Asset Management Investment Plan Spreadsheet

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

Assumptions & Data Gaps

The majority of the AMIP inventory was compiled from the Village's GIS database and site inspection, but several assumptions were required to fill remaining data gaps in support of providing the most accurate representation of current assets.

For the purposes of the AMIP, data gaps are considered areas of missing asset information. Based on the collected information, data gaps ultimately included asset sizes, material, and installation or renewal years. Identifying these data gaps and updating the asset inventory should be a focus of future efforts.

To address current remaining data gaps, the following key assumptions were made:

- AC Water mains missing installation dates were assumed to be installed in 1972
- Water service connections are PVC and 25mm diameter.
- Water valves are 150mm in diameter.

- All water infrastructure (mains, services, hydrants, valves) with missing years was installed in 2006.
- Sanitary service connections are 100mm in diameter.
- All sanitary infrastructure (mains, services, manholes) with missing years were installed in 1980.
- Stormwater mains with missing information were assumed to be PVC, 300mm in diameter, and installed in 2009.
- Alleyway /lanes which were assumed to be 6.0m wide, local roads to be 7.5m and arterial/collectors 12.0m wide.

AMIP Results

What Assets Does the Village Own?

To develop a useful AMIP, it was necessary to assemble a complete and accurate inventory of the Village's infrastructure, based on available information. Understanding the Village's assets not only benefits the AMIP, but is necessary to develop successful asset management strategies moving forward.

Using the information gathering methods previously described, the asset inventory was organized into 12 categories. These categories, and the quantity of infrastructure within each, are as follows:

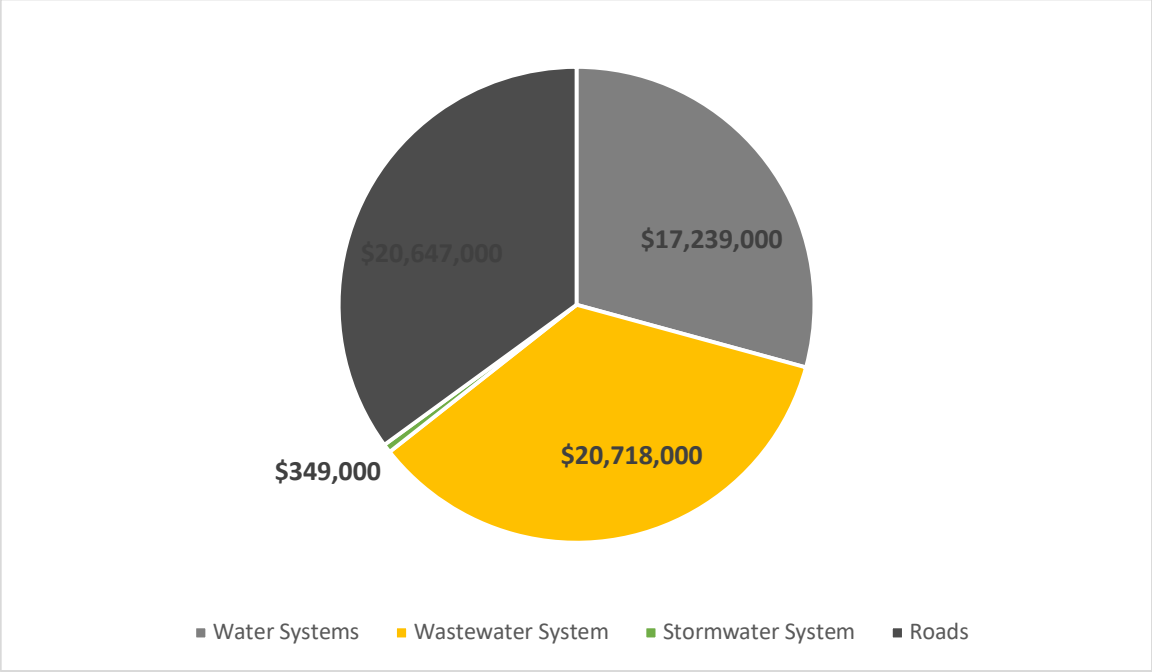
- **Water Mains** – Approximately 24 km of mostly PVC and asbestos cement, ranging in size from 38 to 350 mm in diameter
- **Water Services** – Approximately 5 km of PVC and steel services, ranging in size from 19 to 150 mm in diameter
- **Fire hydrants** – a total of 86 fire hydrants
- **Water valves** – a total of 257 water valves
- **Water Lift Station** – 1 lift station
- **Reservoir** – 2 reservoirs
- **Water Treatment Plant –** Various components
- **Sanitary Mains** – Approximately 4 km of pressurized and 15 km of gravity PVC sanitary mains, ranging in size from 75 to 250 mm diameter
- **Sanitary Services** – Approximately 7 km of PVC services
- **Sanitary Manholes** – 167 manholes
- **Sanitary Lift Station** – 8 lift stations
- **Sewage Treatment Plant –** Various components
- **Storm Mains** – Approximately 0.6 km of PVC and steel storm mains, ranging in size from 150 to 350 mm in diameter
- **Roads** – Approximately 32 km of road

The values above do not account for infrastructure belonging to the water treatment plant and sewage treatment plant.

What is the Cost to Replace the Assets?

The total replacement value of the Village of Valemount's assets is estimated to be $59 million, expressed in 2020 dollars. The replacement cost of each asset was determined either through estimates provided by the Village or using unit costs shown in the AMIP spreadsheet. Included in the costs is a 20% increase to account for engineering and design fees associated with infrastructure replacement and 20% contingency. **Figure 1** shows the breakdown of each category's replacement value.

Figure 1: Total Replacement Value for Each Asset Category



The highest-value asset categories are roads and wastewater each representing 35% of the total replacement value, followed by the water system at 29% and stormwater at 1%.

The replacement values used in the AMIP and the pie chart above, specifically for underground pipe, assume open-cut construction. Rehabilitation methods for underground pipe is challenging to forecast in the current absence of condition information which would be used to evaluate an individual pipe's candidacy for alternative and less expensive rehabilitation methods like pipe relining. Without this information, it is not suitable to apply a universal renewal approach, and therefore the conservative assumption of open-cut construction was used.

What is the Age of the Assets?

The current age and 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 anecdotal information from the Village and industry-standard values were used and are a critical aspect of the AMIP. They are applied to each asset category and material type where necessary to determine timing of overall asset replacement needs based on each asset's installation or renewal date. The service lives applied to each asset are presented in Table 1 and in the AMIP spreadsheet.

Table 1: Service Lives

Item	Service Life
Pipe Material	
Asbestos Cement	60
Concrete	60
Polyvinyl Chloride	80
Water and Sewer Non-Linear Assets	
Hydrants	75
Manhole	60
Valves	25
Lift Station Components	20-50
Treatment Plant Components	20-50
Roads	
Surface	40
Base	100

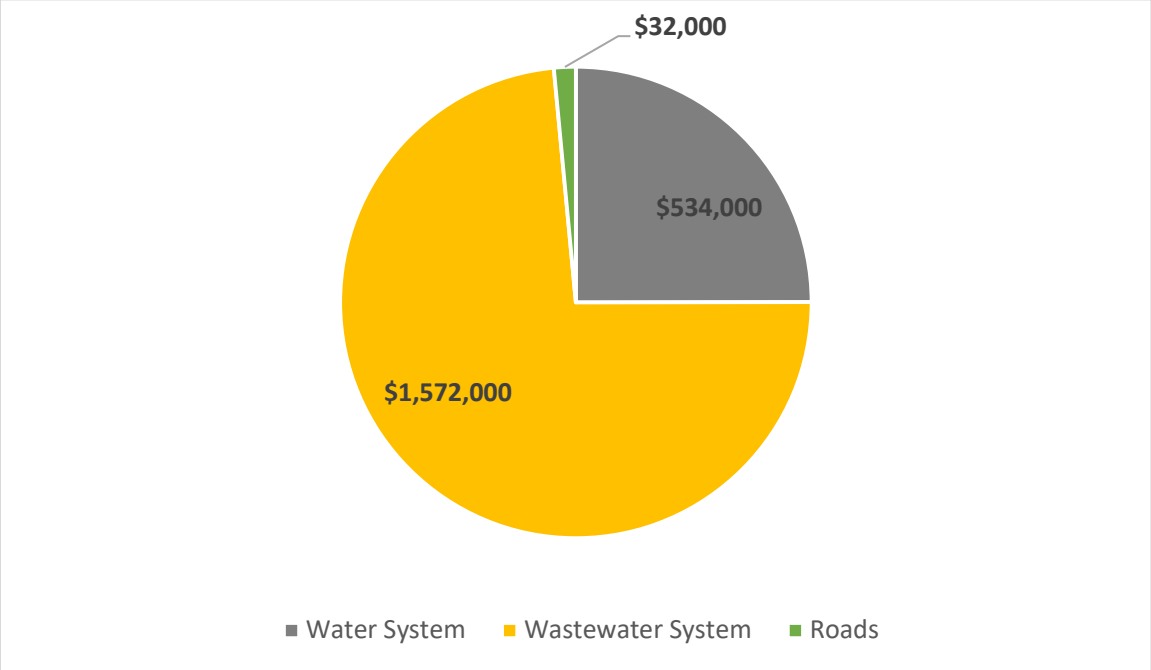
Table 2 below summarizes the overall expected remaining life of each asset category based on its overall service life and install or renewal year.

Table 2: Expected Remaining Life for Each Asset Category

Asset Category	Expected Percent Remaining Life	Estimated Average Life Remaining (Years)
Water Mains	83%	53
Water Services	84%	68
Fire Hydrants	83%	27
Water Valves	48%	48
Water Lift Stations	14%	4
Reservoirs	52%	20
Water Treatment Plant	66%	22
Sanitary Gravity Mains	51%	41
Sanitary Forcemains	51%	40
Sanitary Services	51%	41
Sanitary Manholes	35%	21
Sanitary Lift Stations	38%	11
Sewage Treatment Plant	41%	11
Storm Mains	87%	76
Roads (surface and base)	76%	45

A key component to understanding the overall age and replacement forecast of the Village's assets is the "infrastructure backlog". This represents existing infrastructure that has surpassed its theoretical useful life. As determined through the AMIP, the assets with a noteworthy backlog are certain components of the water and sanitary lift stations, and the sewage treatment plant. Thus, it is not long before a large value of infrastructure will be considered backlogged if it is not renewed before the end of its expected service life.

Figure 2: Backlog by Asset Category



How Much Money Needs to be Invested Annually?

The AMIP aims to determine the annual investment that is required to provide ongoing support of the Village's existing assets. The two concepts that inform this are the 20-year Asset Replacement Forecast and the Average Annual Life Cycle Investment (AALCI).

The AALCI is a long-term planning tool that can be used to determine the required 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 is sensitive to service life changes, so it is important to understand how the investment level could vary based on predicted versus actual years of service. Understanding this sensitivity will help when deciding what investment level is best for the Village.

The AALCI also assumes replacing "like with like" - it does not consider potential changes in technology or service delivery that could be utilized in the future to adapt to changing circumstances such as climate change, or to better meet servicing needs. The AALCI for each of Valemount's asset categories, with service life scenarios, is outlined in **Error! Reference source not found.**.

Table 3: Average Annual Lifecycle Investment for Each Asset Category

Asset Category	AALCI	AALCI Assets Last 50% Longer
Water Mains	$114,000	$76,000
Water Services	$14,000	$9,000
Fire Hydrants	$10,000	$7,000
Water Valves	$17,000	$11,000
Water Lift Stations	$30,000	$20,000
Reservoirs	$38,000	$25,000
Water Treatment Plant	$94,000	$63,000
Water System Total	**$317,000**	**$211,000**
Sanitary Gravity Mains	$88,000	$59,000
Sanitary Forcemains	$17,000	$11,000
Sanitary Services	$49,000	$33,000
Sanitary Manholes	$15,000	$10,000
Sanitary Lift Stations	$155,000	$103,000
Sewage Treatment Plant	$105,000	$70,000
Sewer System Total	**$429,000**	**$286,000**
Stormwater Mains	$4,000	$3,000
Roads	$397,000	$265,000
Roads and Drainage Total	**$401,000**	**$268,000**
Grand Total	**$1,147,000**	**$765,000**

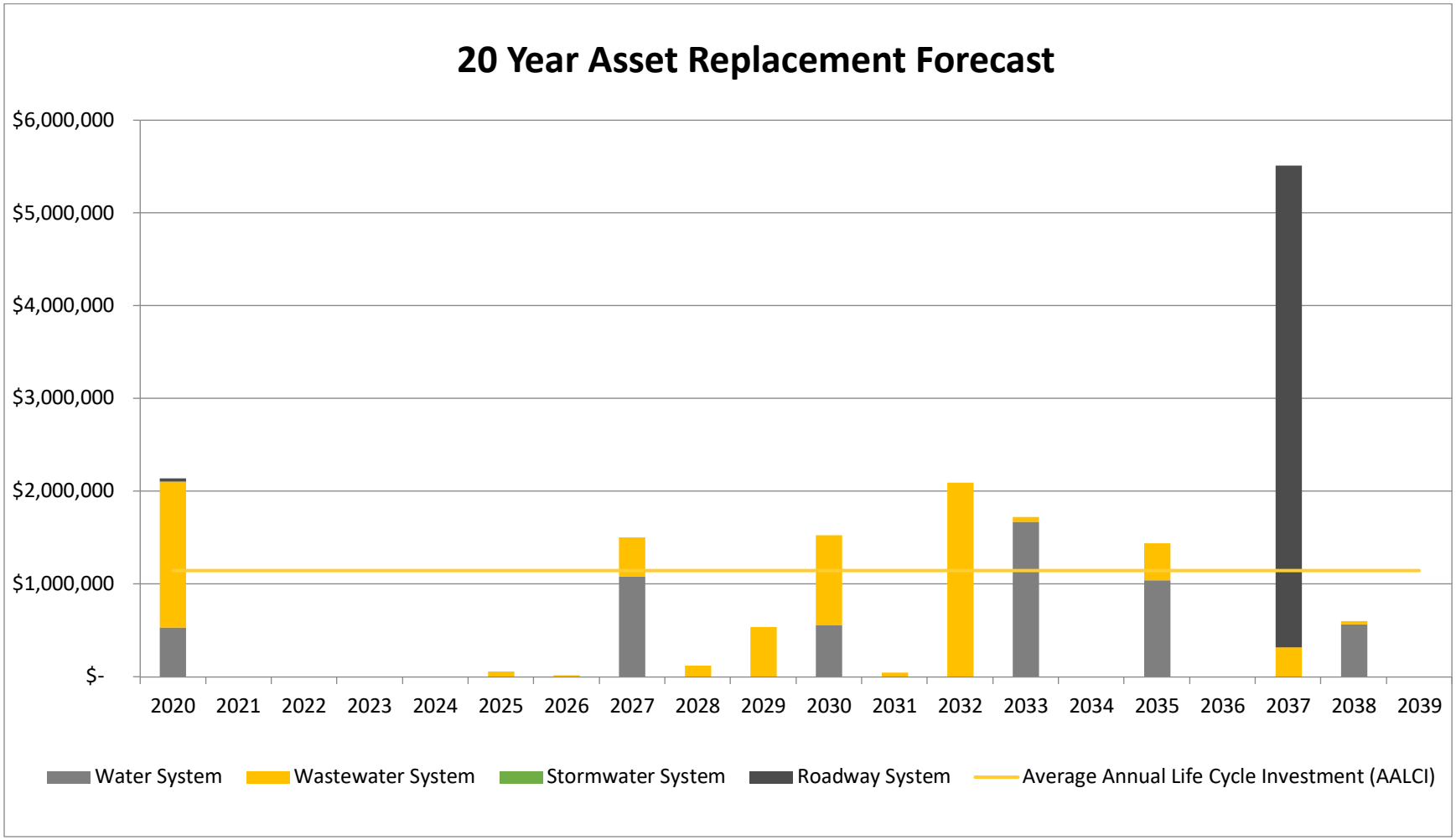
The majority of the Village's AALCI is for replacement needs of roads (35%), sanitary lift stations (14%), and watermains (10%). The total AALCI for all assets is estimated to be $1.15 million.

The Village may experience prolonged service from some of its assets, especially those which have already surpassed their useful life but are still functioning (backlogged infrastructure). The third column in Table 3 presents an adjusted AALCI based on the assets lasting 50% longer than the base assumption. Assuming that assets will consistently outlast their expected service life is a risk that may be accepted by the Village if they wish to take a less conservative approach to asset management.

The 20-year asset replacement forecast (Figure 33) is a valuable tool to prepare for more immediate infrastructure replacement needs. By understanding which assets will soon reach the end of their useful lives, the Village can plan and prioritize projects and funding to address upcoming needs.

The 20-year replacement forecast predicts significant replacement needs in the years 2030 and 2037. Note that service lives are an assumed indicator of the asset's condition and replacement timing needs, and not a guaranteed serviceable end date. Older assets will inherently possess a higher probability of inadequate performance or failure.

Figure 3: 20-Year Asset Replacement Forecast



Observations & Recommendations

The Asset Management Investment Plan has identified several focus areas within the asset inventory, replacement forecast, and investment requirements of the Village's infrastructure.

On a long-term outlook, the AALCI results suggest that the water system will require $211k to $317k annually, the sewer system will require $286 to $429k and $268k to $401k for roads and drainage.

To achieve the best results from capital that is allocated to this infrastructure, the Village would benefit from an ongoing inspection program to identify specific high-risk infrastructure that should be targeted for renewal or replacement, as well as to refine the service life assumptions used in this assessment.

The iterative process which involves identifying future needs, evaluating assets, and considering the asset replacement forecast will ensure that the AMIP continues to be a valuable tool for asset management decisions.

A complete list of recommendations is as follows:

1. **Address data gaps within existing infrastructure and re-evaluate prioritization of replacement needs.**

   Many of the assumptions outlined have been broadly applied to complete the AMIP, but may not be representative of the actual characteristics of individual assets. For example, most of the sanitary manholes and linear infrastructure is assumed to have been installed alongside the known installation year of 1980 for a few sanitary assets. This results in sanitary manholes of 40 years old (as of 2020), and with only 35% remaining of their 60 year predicted services life. Similar estimates applied to data gaps in different asset categories could contribute to misinformed decisions when prioritizing renewal and replacement needs. The main data gaps observed were:

   - Water pipes missing installation date
   - Hydrants missing installation date
   - Sewer pipes missing installation date and/or diameter
   - Sewer manholes missing installation date

2. **Implement a condition assessment program to inform ongoing replacement needs. Determine a strategy to fund replacement needs.**

   The Village should review current inspection practices and establish a strategy to identify specific infratructure replacement needs. Currently, the only condition data available is CCTV inspection of approximately a quarter of sanitary mains, leak test results from about a third of hydrants, and a road structure assessment with limited condition information. An ongoing inspection program, such as an annual cycle of specific infrastructure regions, would ensure upcoming replacement needs are continuously up-to-date.

   It is estimated that $17 million in assets will require replacement in the next 20 years, as per the 20-year asset replacement forecast in Figure 3. While the majority is not expected to be imminent, the foresight suggests that proper planning should be conducted to avoid costly

emergency replacements. Results of the 20-year asset replacement forecast in particular are subject to change depending on the actual condition of individual assets, and should be interconnected with a condition inspection strategy.

3. **Refine the AALCI by adjusting service lives based on actual condition assessments, and adjusting replacement timing based on risk tolerance.**

   The total AALCI of $1.15 million is presented as the conservative funding target for sustaining the Village's infrastructure assets at current service levels. The Village should work to refine the AALCI over time using updated condition assessments to support decisions to defer replacement of lower risk assets. The Risk Framework (presented as a separate deliverable) could also be used to assess the Village's risk tolerance. Both of these strategies could lead to a less conservative, but justified, approach to extending the predicted useful life of some assets, thereby reducing the annual funding requirements.

APPENDIX B

RISK FRAMEWORK AND ANALYSIS

Contents

Introduction

Why a Risk Framework is Important

The Village of Valemount (the Village) strives to continuously improve in asset management to provide sustainable community service, and ensure the use of public funds is utilized in the most effective manner. An important factor in asset management best practice is the consideration of risk and making informed risk-based decisions. By understanding risk and addressing higher-risk assets with critical replacement needs, the Village can minimize the liklihood and impact of asset failure while protecting its residents and managing liability.

With the objective of improving its asset management practices, the Village engaged Urban Systems Ltd. to developed this Risk Framework (the Framework) as a strategy to prioritize higher-risk sewer, water, and road infrastructure. The framework is based upon two components of risk: the Likelihood of Failure (LoF) and Consequence of Failure (CoF). Through a workshop with Valemount in September 2018, Urban Systems established the overall risk approach, including failure evaluation proxies and current conditions of Valemount's assets.

The Framework will help the Village:

- Prioritize limited resources for inspection, rehabilitiation, 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 recommends how the Village can assess the risk of their sewer, water, and road infrastructure based on simple and consistant criteria. It is intended to be implemented as an overall plan to identify relative priorities among Village assets, but is not meant to be an exact statement on each asset's individual risk. It addresses the following questions:

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

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, sanitary, and stormwater assets
- Water and sanitary facilities
- Roads assets

The Framework has been developed based upon existing infrastructure and condition data to represent the current snapshot in time (2019). It may be updated over time as improved data becomes available, which will allow the Village to conduct more detailed risk assessments.

It should be noted that the Framework only describes *how* risk ratings will be assigned but does not inform the Village of their risk tolerance levels or specific methods of addressing risk. These aspects of asset management should be discussed by the Village to establish realistic strategies that can be implemented based on the Framework results.

Important Concepts

What Risk Is – And What It Isn't

Risk is a function of the likelihood of a negative event happening and the consequence of that negative event happening. In the context of asset management, we are interested in assessing risks related to asset failure. Asset failure may occur by either condition failure due to asset deterioration, capacity failure due to surchagring, or physical failure due to physical impact. The Framework focuses on asset deteriotion and condition-based failure.

How Risk is Assessed

Risk in this context is assessed by:

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

Risk = Likelihood x Consequence

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

Age may be used as a proxy for assessing the condition of an asset, 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.

The Framework aims to provide a consistent and quantifiable strategy for assessing the risk of Valemount infrastructure failure. In order to quantify current and future condition data and support the asset conditions and CoF proxies have been assigned risk ratings from low to high. The rational behind ratings for LoF and CoF are discussed in the following sections. The total risk, on a scale of low, med, and high, is demonstrated in **Table 1**.

Table 1: Risk Rating

COF	5 – Very High	Low	Med	Med	High	High
	4 - High	Low	Med	Med	High	High
	3 - Medium	Low	Low	Med	Med	Med
	2 - Low	Low	Low	Low	Med	Med
	1 – Very Low	Low	Low	Low	Low	Low
		1 – Very Low	2 – Low	3 – Medium	4 – High	5 – Very High
	LOF					

How Risk Assessment Fits Within a Broader Risk Management Process

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

- Once the Village has assessed risk, it will identify the risks it chooses to address based on the Village's risk tolerance: what the Village considers to be acceptable versus unacceptable risk.
- Once unacceptable risks have been identified, the Village will identify the root cause of the risk. This is typically done through a process of asking "why" until the source is identified.
- The Village 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.

the hydrants with reported leaks were all within close proximity of Dogwood Street on either 5th or 6th Avenue, and in the middle of the distribution network. However, most hydrants in this area were assessed and did not report leakage, so the cluster of leaking hydrants may not reflect the condition of those in other areas of the Village.

Water mains, pump stations, and other assets without condition assessments were applied LoF scores based on asset age from **Table 2.**

Roads

The only roads information available is a strength assessment conducted in 2014. This was accompanied by an email from the BC Ministry of Transportation & Infrastructure, which stated that the roads were generally in very good condition and only required mill and overlay as treatment. The data from this test is of limited value to the risk framework, both due to its timing and high-level results, so a more comprehensive inventory of all the roads has been compiled in GIS, and condition and level of service information should be confirmed by Valemount's public works crew.

Roads were also assigned LoS scores based on age and the approach in **Table 2.**

Consequence of Failure

An overview of the consequence of failure strategy for each asset type is provided in this section. The CoF refers to the impact of an asset failure relative other assets, and may be measured based on a number of Social, Financial, and Environmental impacts as shown in Table 3.

Table 3: Potenital 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 • Location within the sewer network
Environmental	• Environmental contamination (sewer assets in particular)	• Proximity to environmentally sensitive features

Table 4: Potential Consequences of Failure

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	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

The following Consequence of Failure sections describe the approaches that were applied to each asset type.

Sewer

Several proxies are available to evaluate the consequence of failure for sewer infrastructure, and their individual CoF ratings may be averaged to determine an overall CoF for Valemount sewers (similarly for water, which will be discussed separately). The most appropriate CoF metrics that have been considered for Valemount are as follows:

TYPE OF ROAD

The road classification (lane, local, collector etc.) is typically representative of a road's value to a community, as roads may support transportation of residents, transportation of goods, or emergency response. Failure and replacement of infrastructure within critical roads is likely to have the greatest consequence, and thus places a higher priority on reducing risk for these sewer mains. Sewer mains have been assigned the same GIS classification as the road they are under or nearest to, and have been converted to a CoF rating from 1 to 5.

LOCATION OF PIPE

The position of each sewer main within the sewer network provides context of how critical the pipe is to the overall system performance. If a pipe servicing several upstream network branches were to fail, the failure and loss of service could have a "domino" effect on many upstream pipes, potentially resulting in additional and more costly failures. The most feasible way to assign location rankings in GIS was to assign each pipe with the number of "branches" (not individual pipes) that are upstream. This resulted in gravity mains with the number of upstream branches ranging from 1 to 33, which have been converted to a CoF rating from 1 to 5.

PROXIMITY TO ENVIRONMENTAL FEATURES

The proximity to environmental features was a challenging metric given the limited GIS data available in Valemount. The only relevant features with data were creeks and waterbodies, a number of which surround the Village. Each pipe was assigned a value in GIS based on their linear distance to the nearest creek or waterbody. The majority of pipes are a few hundred metres from any creek, so consideration of this metric may be most valuable in predicting the limited environmental impact of failure. This will also be applied a CoF rating from 1 to 5 based on the proximities established. This proxy represents the "Environmental" category in Table 3.

Water

Water assets present many consequences of failure that are similar to the sewer system. While pressure pipes and chlorinated water contrast the primarily gravity pipes with wastewater, failure of water assets would still impact other assets within the water network, nearby road assets, and creeks and waterbodies within the proximity. The following CoF metrics for Valemount's water system are consistent with sewer except where stated:

LOCATION OF PIPE

The importance of a water main based on its position in the network is more difficult to establish than sewer mains as the water system is inherently "looped" and possesses fewer distinct branches than the sewer system. This also makes it far more difficult to automate attributes in GIS. As such, the relatively small Valemount water system was assessed manually and assigned rating based on intuition from engineering experience. Water mains were applied a 1 to 5 rating based on the following Valemount-specific rational:

1. Dead ends serving small areas and East-West mains where there is plenty of redundancy
2. North-South mains which convery fire flow to far south of Village
3. Highway crossings
4. Creek crossings and trunk mains in looped areas
5. Distribution from reservoirs with no alternative looping

While this method requires additional user-input, the rational can be applied to future water main infrastructure within the Village of Valemount, and is suitable for updating the consequence of failure ratings.

TYPE OF ROAD

The same proxy described for sewer system has been applied to the water system, as service disruption based on road classification would likely be similar for both types of underground infrastructure.

PROXIMITY TO ENVIRONMENTAL FEATURES

The proximity of water mains to creeks near Valemount has also been assigned similar to the sewer network. While water may not be quite as invasive as wastewater, chlorinated water would still have an impact on natural waterbodies.

Roads

Roads have been assigned fewer proxies than the water and sewer assets, due to the nature of road infrastructure and limited available data in Valemount. The same road classification that has been used to assign CoF ratings to water and sewer mains has been applied to roads, with **Table 5** presenting the CoF ratings applied to each road classification.

Table 5: Road Classification CoF Scores

Road Classification	Rating
Alleyway / Lane	1
Local / Strata	2
Local / Street	3
Collector	4
Arterial	5

Results

Analysis Results

The framework criteria (Appendix B) was applied to the Village's linear water and sewer assets. In general, most of the pipes were categorized as low risk. Approximately 22% of water pipes were categorized as medium risk. These are primarily asbestos cement pipes that were installed in the early 1970's and are approaching the end of their useful life.

Approximately 15% of the gravity sewer pipes were categorized as medium risk. These are primarily larger diameter sewer pipes where CCTV assessments have indicated that the condition is poor or very poor.

Only a small amount of infrastructure (99m of gravity sewer) was deemed to be high risk.

Asset Category	meters of pipe/road		
Water Pipes	18,588	5,192	-
Wastewater Pressure	3,872	65	-
Wastewater Gravity	12,853	2,083	99
Roads	17,768	14,715	-

The Risk Framework outlined for the Village of Valemount has been conducted based on our review of the Village's sewer, water, and roads assets as of February, 2019. However, the ratings and risk strategy can, and should be applied to future infrastructure, or as new condition information becomes available. The current 1-5 rating scale is well suited for integration into the risk analysis and capital planning processes, and is consistent with best practices such as the National Association of Sewer Service Companies (NASSCO) guidelines .

One of the greatest challenges was the limited relevant data that was available at the time of this study, but the same principles still apply regardless of the information at hand. The Village would see great benefit from collecting additional condition data on an ongoing basis, and applying the approach in this risk framework to prioritize asset management decisions. This could include developing a strategy to inspect certain assets on a cyclical basis, or by using existing condition data and risk results to identify upcoming inspection needs.

Further recommendations are included as follows:

1. Consider inspecting of manholes concurrently with the collection of the CCTV for the mains
2. Begin to collect watermain break history, including failure attributes and location.
3. Identify existing operations & maintenance activities/programs that would provide additional opportunity for collecting condition information about assets (eg. Uni-directional flushing program).

APPENDIX C

GROWTH PROJECTIONS AND INFRASTRUCTURE IMPACTS

Contents

Introduction

Overview

The Village of Valemount is undertaking an asset management plan to assist in ensuring the long-term sustainability of the community's assets. As part of this work, a projection of the Village's future growth is warranted to gauge additional demands on assets which will arise in the future. The purpose of this memo is to provide context for these growth projections and the impacts on the Village's water and sewer infrastructure.

Growth Projections

Documents Reviewed

There are a number of documents which are relevant to growth projections for Valemount and were reviewed as part of the asset management plan. These include:

- Village of Valemount – Official Community Plan (consolidated to July 2017)
- Housing Strategies Inc. – Valemount Housing Needs and Demands Assessment (2016)
- Oberti Resort Design / Pheidias – Valemount Glacier Destination Master Plan (2016)
- Census of Canada (1996 through 2016)
- BC Stats - Sub-Provincial Population Projections for North Thompson Region (2018)
- BC Ministry of Municipal Affairs and Housing – Local Government Statistics for the Village of Valemount, Building Permits (2008 through 2017)

Key Findings

Review of the documents noted above revealed the following key findings.

- The Village's Census-recorded population decreased from 1,303 in 1996 to 1,021 in 2016 (the most recent Census). This represents a population reduction of 282 people, or 22%, over the past 20 years.
- None of the documents contained numeric population growth projections for the Village over the next 20 year period.
- The population of the North Thompson Region is projected by BC Stats to decline over the next 20 years from approximately 4,400 to 4,300. The Village's population currently comprises about 25% of the total for the North Thompson Region.
- The Valemount Glacier Tourism Destination Master Plan notes that, with respect to employee housing, 298 beds will be provided. Half of these will be built in the resort core village, and the other half at the future airport gondola base. Neither of these locations are within current Village municipal boundaries. It should be noted that this project is only proposed and it is likely it will never be completed.

- Valemount has seen an increase in recreation activity-related second home ownership over the last number of years, such as the Fowler Subdivision located on Fowler Place and 18th Ave. In addition, further commercial accommodation has been added to the inventory within Village boundaries. These trends are consistent with other resort communities in BC such as Fernie, Revelstoke and Golden. It is likely that these trends will continue if the Valemount Glacier Destination moves to construction and operation, even in the absence of employee housing within Village boundaries.
- Housing statistics from the 2016 Census indicate that an average of 3 residential dwellings were constructed on an annual basis in Valemount over the ten year period from 2006 to 2016.
- One of the manifestations of recreation-related home and tourist accommodation construction within the Village is the increased value of building permits issued over the last 5 years. From the period 2008 to 2012, the average annual value of building permits issued by the Village was $1.2 million. Over the last 5 years (2014 to 2018), this average annual value increased to $3.0 million annually. In 2018, over $6.5 million in building permits were issued.
- The Valemount Housing Needs and Demands Assessment also noted the trends summarized above, including decline / stagnation in the Village's permanent population, and increased presence of the Village's 'non-permanent population including recreational/seasonal property investors and second home buyers.' (Final Report, p.3).

Growth Scenarios

Taking the above key findings into consideration, three residential growth projections have been prepared and expressed as additional units which could be expected within the community over the next 20 years. In each case, it is anticipated that this residential growth would be supplemented by additional tourism-related commercial development (accommodations, restaurants, retail and related services).

These projections are summarized as follows:

Low Growth

- Assumes no permanent population growth and limited non-permanent / second home development
- Growth projection = 50 residential units over the next 20 years, plus additional tourism-related commercial development

Medium Growth

- Assumes no permanent population growth and modest non-permanent / second home development
- Growth projection = 75 residential units over the next 20 years, plus additional tourism-related commercial development

High Growth

- Assumes limited permanent population growth and more extensive non-permanent / second home development
- Growth projection = 100 residential units over the next 20 years, plus additional tourism-related commercial development

Impacts on Infrastructure

Overview

When considering the historical permanent population growth (decline) in combination with the "High Growth" projection we don't see a need to increase capacity at the water and sewer treatment plants since the decline in population over the past years has freed adequate capacity to accommodate even the high growth scenario.

With respect to new developments that are in progress, the number of lots that will be available in the next few years closely match the high growth projection. It should be noted that a 62 unit hotel was recently constructed and a 64 unit hotel has been proposed near the Village office. These hotels have been included with respect to impact on water and sewer infrastructure.

Water Treatment Plant

Current Plant design capacity:	57 L/s
Per capita MDD:	2,360 L/d – (from subdivision development servicing bylaw – used for the purposes of this analysis)
2019 MDD:	2839 m3 = 32 L/s (from Village records)
Residential growth:	100 lots x 2.5 people/lot = 250 people x 2,360 L/d = 6.8 L/s – based on the number of lots in Fowler and Krupinski subdivisions
Additional hotel population:	126 rooms x 1.5 people per room x 2,360 L/d = 5.2 L/s – based on new 62 room and proposed 64 unit hotels
Total	**44.0 L/s**

The total of all growth/development is 44.0 L/s. If the plant capacity is 57 L/s then there is sufficient capacity to accommodate the high growth scenario.

Sewage Treatment Plant

Plant design flow:	1,500 m^3/d
Per capita flow:	700 L/d
2019 Maximum inflow:	990 m^3/d
Residential growth:	100 lots x 2.5 people/lot = 250 people x 700 L/d = 175 m^3/d
New hotel rooms:	64 rooms x 1.5 people x 700 L/d = 67 m3/d
High growth flow:	1232 m^3/day

The total of all growth/development is 1232 m^3/day. If the plant capacity is 1,500 m3/d then there is sufficient capacity to accommodate the high growth scenario.

Watermains

Watermain extensions will be driven by development. Those costs will be borne by the developers to service their subdivisions. Based on our knowledge, the Village doesn't require any trunkmain capacity upgrades.

Sanitary Sewer

The Dogwood lift station and forcemains are currently being planned for replacement/upgrades in order to provide better service to the Village. Class C cost for that is $1.8M. Approximately 75% of this cost could be attributed to asset renewal and 25% due to future capacity.

In the medium term, the 17th Ave lift station will need to be replaced (or reconfigured to allow for gravity flow to the Dogwood Station). While this could be thought of as an infrastructure renewal piece, the development that has happened in the south of the Village also reinforces that this station will need to be upgraded in the next few years. We suggest an allowance of $900,000 for station replacement for now based on the costs of the recently replaced 5th Avenue lift station. Approximately 75% of this cost could be attributed to asset renewal and 25% due to future capacity.

Conclusions

The Village's water and sewer infrastructure should be able to accommodate the high growth scenario as defined in this memo. The 17th Avenue lift station should be planned for replacement in the medium term, and Dogwood in the near term, both these projects are primarily driven by asset condition as opposed to growth.

APPENDIX D

Asset Management Climate Change Vulnerability Assessment

Prepared by Urban Systems LTD. | March 2020

URBAN systems

Contents

Appendices

Introduction

Climate change presents one of the greatest challenges of our time. Current trends and future projections indicate that the impacts we are experiencing to the natural environment and the communities we live in will continue to intensify. Of particular concern is the ability of communities to continue to provide high levels of service to local residents. Asset management presents an opportunity to assess the impacts of climate change on key community infrastructure, providing community leaders with the information needed to implement actions that support community resilience.

Through the Village of Valemount Asset Management Project, the community is integrating a climate change vulnerability assessment into their asset management plan. Climate change will likely have minor to significant impacts on assets and service delivery, such as:

- Increased levels of risk for delivering target levels of service
- Increased costs associated with managing risks and delivering target levels of service
- Decre*ased asset lifecycle associated with changes in loads and stresses*

The purpose of this element of the asset management process is to systematically assess the vulnerability of the community's key assets to a changing climate drawing on the knowledge of Village staff and available desktop information. This assessment focuses on the Village's water, wastewater, drainage and road systems. This process will provide the Village with climate change vulnerability information to consider in capital projects, operations and maintenance planning for key asset systems.

If desired, this assessment can be further refined, through a risk assessment and prioritization process that would involve engagement with owners and operators of the asset systems and other stakeholders, to inform the planning and implementation of risk management actions.

Asset Systems

Data on assets for the Village were gathered as part of the Integrated Asset Management Plan process and through correspondence with Village staff[1].

Table 1 provides an overview of the Village of Valemount's assets. Note that the climate change vulnerability assessment will focus on critical asset categories and those likely to be impacted by climate change, namely water, wastewater, drainage and road assets. Consideration will be given to the assets in other categories if there is a current known vulnerability to climate related events and conditions.

Risk assessment maps from the Integrated Asset Management Plan for water, wastewater and roads can be found in **Appendix A.**

[1] Trevor Pelletier, Public Works Superintendent

Table 1: Community Asset Summary

Asset Category	Assets
Water	Water intake, high lift pump station, water treatment plant (filtration and chlorination), 2 potable water reservoirs, distribution system
Wastewater	Gravity sewer mains, manholes, lift stations, forcemain, treatment plant (screw screen, clarifiers, 2 aerated lagoons, septage receiving station, UV disinfection), effluent discharge to Cranberry Marsh (as reclaimed water)
Drainage	0.6 km of PVC and steel storm mains ranging in size from 150 – 350 mm, ditching, grass swales, natural water courses and wetlands, curbs and gutters, drywells
Roads	Gravel, dirt and paved roads, sidewalks and Big Foot Trail
Recreation	Centennial Park (5th Avenue and Dogwood Street; playground and shelter), John Osadchuk Memorial Park, (13th Avenue and Dogwood Street; building and concession), SportsPlex (Elm Street and 9th Avenue; ball diamonds, beer garden, concession); Cemetery; Village Office & Visitor Centre
Transportation	Airport
Buildings and Fleet	Public Works Building, Grader, Backhoe, gravel/Plow truck, trackless (skid steer), pickup trucks (gas), Community Hall, Daycare (basement of community hall)

Localized Climate Change Projections

Climate change data and summaries were prepared using online tools provided by the Pacific Climate Impacts Consortium (PCIC) and Western University. The tools used include:

- PCIC Data Portal2 – Provides statistically downscaled climate data for individual General Circulation Models (GCM) for specific areas of interest with annual, seasonal and monthly time resolution.
- Western University IDF_CC Tool[3] – Provides local climate change projections for the intensity, duration and frequency of precipitation events.

Data analysis and summaries for each tool focused on the 2050-time horizon. To identify significant asset risks within a standard long-term capital planning time frame, 2050 was selected as the horizon for the asset risk screening purposes. The 2050 horizon was selected to identify risks that may arise within the remaining useful life of existing infrastructure. Note that the design of any new long-life infrastructure should consider climatic changes projected for the 2100 horizon.

[2] Pacific Climate Impacts Consortium. 2019. https://www.pacificclimate.org/. Accessed on June 18th, 2019.
[3] Western University. 2019. https://www.idf-cc-uwo.ca/home. Accessed on June 18th, 2019.

The PCIC Data Portal was used to generate climate change projections on monthly and seasonal time steps for the Village of Valemount through custom selection of points within the community. Data was generated for various climate indicators including total precipitation, precipitation as snow, daily maximum temperature and daily minimum temperature. Data was retrieved for three GCMs representing high, low and midrange climate change scenarios from the twelve-model ensemble recommended for Western North America[4].

Table 2 summarizes the PCIC Data Portal data including the modelled baseline data and mean, high and low projections associated with the three GCMs. All values reflect the change from the baseline historical period (1981-2010) to the 2050s.

Table 2: Summary of Climate Change Indicators for the Village of Valemount for the 2050s

Climate Variable	Season	Modelled 1981 – 2010 Baseline	Projected Change from 1981 – 2010 Baseline	
Average Daytime High (°C)	Annual	8.8	2.7	1.6 to 3.4
	Spring	10.0	2.7	2.0 to 3.7
	Summer	21.2	3.2	0.8 to 5.2
	Fall	7.9	2.5	1.2 to 3.2
	Winter	-4.1	2.4	1.9 to 3.1
Average Nighttime Low (°C)	Annual	-2.1	3.1	2.3 to 3.9
	Spring	-2.3	3.4	3.4 to 3.4
	Summer	6.7	2.7	0.6 to 4.5
	Fall	-1.3	2.8	1.9 to 3.6
	Winter	-11.8	3.6	3.0 to 4.2
Total Precipitation (%)	Annual	720 mm	+11	+2 to +19
	Spring	134 mm	+16	+1 to +33
	Summer	185 mm	-1	-4 to +4
	Fall	201 mm	+15	+7 to +22
	Winter	200 mm	+13	+4 to +20
Snowfall (%)	Annual	248 cm	-21	-13 to -27
	Spring	27 cm	-65	-53 to -86
	Fall	52 cm	-45	-39 to -54
	Winter	169 cm	-7	-14 to +1

Note that the seasonal data indicate a range of projected changes in summer precipitation from a decrease of 4% to an increase of 4%. Therefore, data for individual summer months was investigated (see **Table 3**). The monthly data indicate decreases in precipitation in July and August, with the largest decrease expected in July and an increase in precipitation in June.

[4] Cannon, A.J., 2015: Selecting GCM scenarios that span the range of changes in a multimodel ensemble: application to

Table 3: Summer Precipitation Projections for the Village of Valemount in the 2050s

Climate Variable	Season	Modelled 1981 – 2010 Baseline	Projected Change from 1981 – 2010 Baseline	
Precipitation (%)	June	61 mm	+14%	10% to +24%
	July	61 mm	-15%	-18% to -12%
	August	63 mm	-3%	-8% to +6%

The data in Table 2 and Table 3 indicate the following climate trends for the Village of Valemount:

- Average daytime high and nighttime low temperatures will increase for all seasons
- Total precipitation will increase for all seasons except for summer in which decreases are expected in July and August and increases are expected in June
- Snowfall will decrease in the fall, winter and spring
- Shift in *hydrologic regime from less snow to more rain*

The PCIC Data Portal data indicate an increase in precipitation annually and for the majority of the seasons and months but do not provide information related to the frequency and severity of storm events. Therefore, the IDF_CC Tool was used to determine the projected changes in the intensity, duration and frequency of storms relative to baseline data from the Valemount North weather station (ID: 1178CL9). The data from the IDF_CC Tool indicates an increase in intensity for storm events of all durations (5 min to 24 hr) and return periods (2 year to 100 year). Therefore, longer and more intense storms can be expected in the Village of Valemount.

The range of uncertainty in projections between model and natural climate variability is indicated by the range of values in **Table 2.** For purposes of infrastructure planning (including this vulnerability assessment), it is prudent to consider the projection that allows for conservative planning (i.e. either the maximum or minimum of the range depending on which value would have the greatest impact on the asset system).

Based on the local climate change investigations, and considering a conservative approach, the following changes are expected for the Village of Valemount for the 2050s time period:

- Hotter Summers – Average daytime high temperature increase in the order of 5°C
- Drier Summers – Total precipitation decrease in July and August in the order of 20 and 10%, respectively
- Warmer and Wetter Winters – Average nighttime low temperature increase in the order of 4°C and total precipitation increase in the order of 20% with less snow and more rain
- Warmer and Wetter Springs – Average daytime high temperature increase in the order of 4°C and total precipitation increase in the order of 30% with less snow and more rain
- Longer and More Intense Storms – Increase in the intensity of storm events for all durations and return periods

These expected climate changes are used in the vulnerability assessment process described in Section 4. Note that changes in the summer, winter and spring seasons are expected to have the largest impact on hydrologic processes and frequency of extreme events and therefore take priority in the vulnerability assessment relative to fall changes. However, the increase in precipitation in the fall is expected to have impacts on asset systems related to the intensity, duration and frequency of storm events, which is covered in the expected changes list above in the form of more frequent and intense storms.

Vulnerability Assessment

To guide strategic planning, operations and maintenance, financial management of assets and to ensure the delivery of sustainable services, the Village of Valemount has prepared an Integrated Asset Management Plan. To strengthen the community's response to climate change impacts, climate change considerations are being integrated into the asset management plan. The first step towards taking meaningful action to respond to climate change through asset management is to conduct a screening level assessment to identify asset vulnerabilities.

The following outlines the approach and results of the vulnerability assessment process.

Approach

The approach to the vulnerability assessment is based on a process that has been developed using elements of existing frameworks from the Public Infrastructure Engineering Vulnerability Committee (PIEVC), Changing Climate, Changing Communities – Guide and Workbook – ICLEI, and MRAT Insurance Bureau of Canada.

Note that a risk assessment process typically follows the vulnerability assessment, however, the risk assessment phase is beyond the scope of the current project.

Figure 1 outlines the process used in this assessment and includes optional next steps which can be implemented in subsequent phases, as deemed necessary.

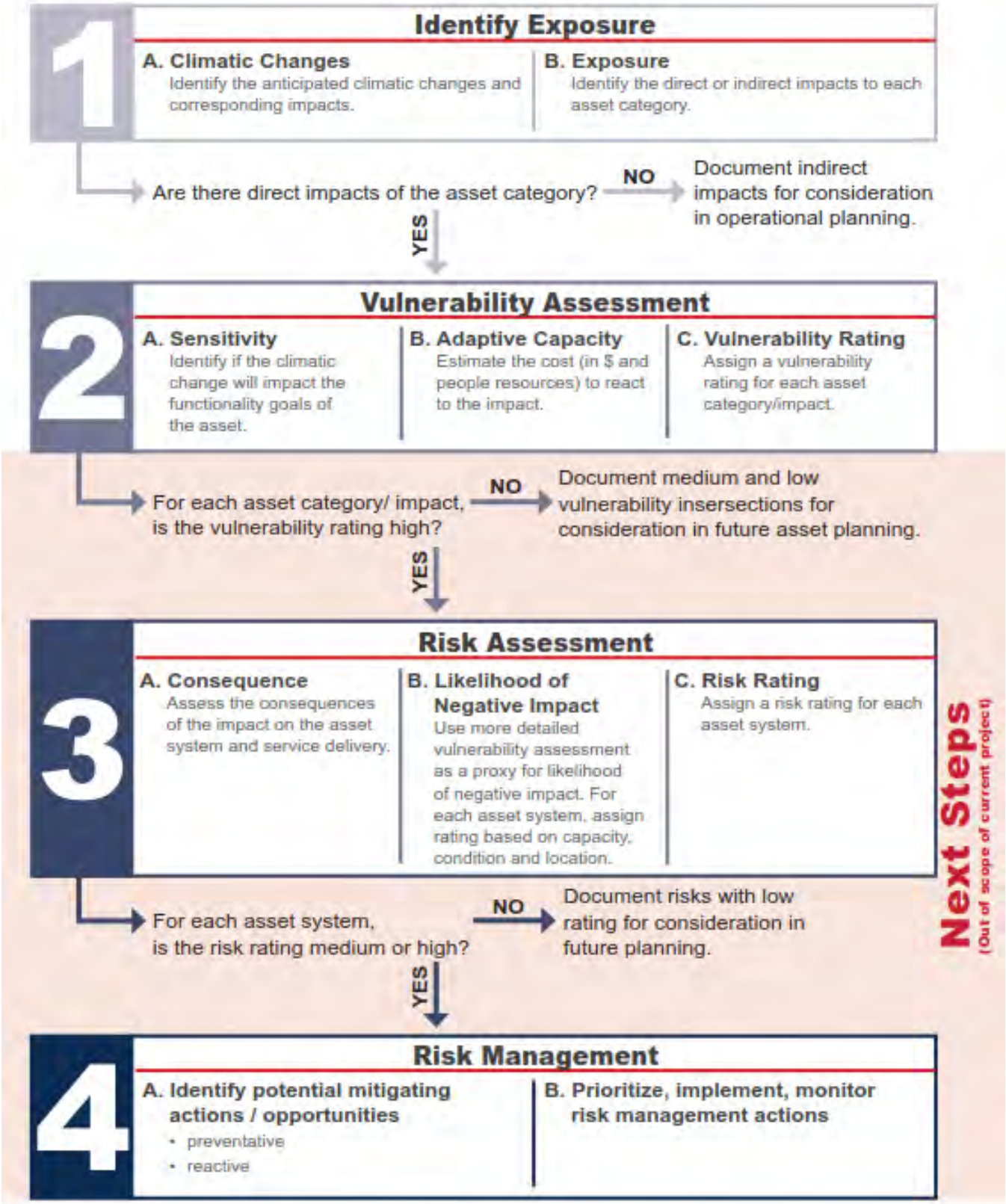
IDENTIFYING EXPOSURE

Based on the projected climate change conditions (warmer and drier summers, warmer and wetter winters, warmer and wetter springs and longer and more intense storms) for Valemount the potential exposure to asset systems was identified.

Exposure was assessed by considering the question, "Will the climatic change impact the asset system?" The potential for direct and indirect impacts between each climatic change and each asset system was assessed to identify exposures. Direct impacts influence the functionality of the asset while indirect Impacts will impact the service, but not the functionality of the assets.

Example of Direct Impact
Increased inflow and infiltration in sewer systems due to increased winter precipitation.

Figure 1: Asset Management Climate Change Vulnerability and Risk Assessment Process



EVALUATING VULNERABILITY

The vulnerability of an asset system was assessed as a function of the sensitivity and the adaptive capacity of the asset system to each of the direct impacts identified. Information for the vulnerability assessment is based on professional judgement and asset condition information, where available. Where additional information is needed, the intent is to review the assessment with community staff to refine the results based on local knowledge.

SENSITIVITY: WILL THE CLIMATIC CHANGE IMPACT THE FUNCTIONALITY GOALS OF THE ASSET SYSTEM?

A sensitivity rating was assigned to each direct impact on the asset system, based on the extent that the functionality goals of the asset system would be affected by the direct impact. **Table 4** summarizes the sensitivity rating scale.

Table 4: Sensitivity Rating Scale

Sensitivity Rating				
If the impact occurs, will it impact the functionality goals of the asset system?				
S1	**S2**	**S3**	**S4**	**S5**
No - functionality will stay the same.	Possibly - functionality may get worse.	Yes - functionality will get worse on a temporary basis.	Yes - functionality will get worse permanently, or unmanageable temporarily.	Yes - functionality will become permanently unmanageable.

ADAPTIVE CAPACITY: CAN THE ASSET SYSTEM EASILY ADJUST TO THE IMPACT?

Adaptive capacity of the asset system reflects whether the asset system or service can adjust to the direct impact with minimal cost or disruption. The adaptive capacity rating was determined by estimating the cost and staff intervention required to react to the impact**. Table 5** summarizes the adaptive capacity rating scale.

Table 5: Adaptive Capacity Rating Scale

Adaptive Capacity Rating				
Can the asset system/service adjust to the projected impact with minimal cost and disruption?				
AC1	**AC2**	**AC3**	**AC4**	**AC5**
No, will require substantial costs ($$$$$) and staff intervention.	No, will require substantial costs ($$$$) and staff intervention.	Maybe, will require some costs ($$$) and staff intervention.	Yes, but will require some costs ($$) and staff intervention.	Yes, will require minimal costs ($) and staff intervention.

Vulnerability: Is the impact of the climatic change a concern for the asset system?

The sensitivity rating together with the adaptive capacity rating results in the vulnerability rating. **Figure 2** summarizes the vulnerability rating scale.

Figure 2: Vulnerability Rating Scale

Asset System Vulnerability Rating					
	S1	S2	S3	S4	S5
AC1	V1	V2	V4	V5	V5
AC2	V1	V2	V4	V5	V5
AC3	V1	V2	V4	V4	V4
AC4	V1	V2	V3	V3	V3
AC5	V1	V1	V3	V3	V3

V5	Risk assessment to prioritize implementation of actions.
V4	Risk assessment to prioritize implementation of actions.
V3	Actions to be implemented, prioritized based on S rating.
V2	Monitor changes in functionality or adaptive capacity.
V1	No action required at this time.

Each direct impact that resulted in a high vulnerability rating (V4 or V5) was flagged for attention by Village staff. Direct impacts with medium to low vulnerability rating for each asset system are noted for consideration in future planning.

Results

The results of the vulnerability assessment are based on a desktop review of available asset information and input from Village staff. These results can be used to engage staff in discussions about the impacts of climate change on asset systems, and used to verify and refine the results. The vulnerability assessment process used in this project provides a robust and systematic approach to assessing vulnerability; one that can be modified and updated based on new and improved information.

The following results summarize the potential direct and indirect climate change impacts and the highest vulnerabilities for the water system, wastewater system, drainage system and roads.

EXPOSURE: DIRECT AND INDIRECT IMPACTS

The potential direct and indirect climate impacts to key asset systems and operations were identified. For example, less groundwater recharge and stream flow would directly impact the functionality of water systems. Whereas, population displacement due to regional wildfires and flooding would indirectly impact the service, but not the functionality of the water systems. For a full list of direct and indirect impacts, refer to **Appendix B**.

VULNERABILITY ASSESSMENT

The vulnerability assessment identified services and operations that will likely be impacted by the climate changes identified for the Village of Valemount. The highest vulnerabilities for each asset system are summarized in **Table 6**. For the full, detailed vulnerability assessments, refer to **Appendix C.**

Table 6: Summary of Highest Vulnerabilities by Asset System

Asset System	Projected Climatic Change	Predicted Direct Impacts	Anticipated Outcome of Direct Impact	Notes
Roads	Longer and More Intense Storms	Damage to infrastructure due to increased frequency and severity of storm events	Increased erosion and degraded condition of roads and frequency of washouts, temporary road closures and increased risk of accidents	Of particular concern are potentially undersized culverts and dirt and gravel roads that are susceptible to erosion.
Water Systems	Drier Summers	Less stream flow due to decreased precipitation and increased evapotranspiration	More frequent drought conditions and reduced amount of raw water supply from Swift Creek	The intake structure on Swift Creek acts as a small reservoir that can collect and maintain sufficient amounts of water even in low flow conditions. However, with increased population growth, water demands will increase and combined with drought conditions, could put the community in a water shortage situation.
		Damage of infrastructure and interruption of services due to increased risk of wildfire	Damage to the high lift station, water treatment plant and reservoir	It is unknown whether there is sufficient buffer zone from the surrounding forest around the water system buildings to reduce the risk of wildfire damage. If facilities sustain fire damage, there will be disruption to the service and costly repairs will be required.
	Warmer and Wetter Winters and Springs	Damage to infrastructure due to stream/river flooding	Damage to the Swift Creek intake structure and the high lift station	Previous flood events have resulted in damage to the high lift station and a major flood in Swift Creek could result in loss of the high lift station resulting in disruption of service and costly repair/replacement.

Wastewater Systems	Drier Summers	Damage of infrastructure and interruption of services due to increased risk of wildfire	Damage to wastewater treatment facilities and lift stations	It is unknown whether there is sufficient buffer zone from the surrounding forest around the wastewater treatment facilities and lift stations to reduce the risk of wildfire damage. If facilities sustain fire damage, there will be disruption to the service and costly repairs will be required.
	Hotter Summers	Increase in nuisance odours emitted from wastewater facilities	Wastewater treatment plant and lift station odours may increase in frequency and potency	There is a history of complaints from the public who live near the wastewater treatment plant regarding odours in the summer months. To address this, costly odour reduction upgrades will be required.
Drainage Systems	Warmer and Wetter Winters and Springs	Damage to infrastructure due to local drainage system flooding	Pipes, culverts, ditches, catch basins and drywells may be subject to overflow resulting in damage to the drainage components and surrounding infrastructure	Of particular concern are areas in which privately owned drainage systems feed into the Village system or areas of the Village system itself where drainage is inadequate. Known issues include contaminated run off from gas stations, flooding of the daycare centre in the basement of the community hall and pooling of water at various locations on 2nd avenue and the north end of Dogwood Street. Site grading and drainage system upgrades can help alleviate known issues in the Village, however this could be costly.
	Longer and More Intense Storms	Damage to infrastructure due to increased frequency and severity of storm events		

In addition to bringing forward the highest vulnerabilities resulting from the assessment it is important to address lesser ranked impacts that could progress into areas of concern. The following considerations are presented for each asset system:

- Roads
    - With wetter and warmer winters, the average winter temperature is expected to increase and icing days (days when the temperature never goes above 0°C) will decrease. The potential for more winter freeze-thaw cycles is greater which is known to damage paved roads. When temperatures are above freezing, rainwater or snowmelt will make its way into any small crack in the pavement. Then, as temperatures drop below freezing, the water within the cracked pavement begins to freeze and expand, causing the crack to expand and grow as well.
- Water System
    - With wetter and warmer winters and springs and more frequent and intense storms, higher winter flows and more frequent high flow events are expected in Swift Creek. High flow events will transport sediment and debris which will deposit in the water system intake. Debris flow could be further exacerbated with hot and dry summers resulting in insect disease and loss of vegetation in the watershed. Currently, the Village cleans out the intake every 5 – 7 years and divers clean the intake screen once per year. It is likely that the intake will need to be serviced more frequently.
    - With more frequent and intense storms, the number of power outages will increase. The water treatment plant has back up power, but the high lift station does not. During power outages the Village uses a portable back up power supply with the priority often being the wastewater system lift stations. The treated water reservoirs typically have enough capacity to supply water during power outages. However, as water demands in the Village increase with population growth and development initiatives it will be important to monitor reservoir levels, particularly during prolonged power outages.
    - Hotter and drier summers could result in increased water demands for irrigation and firefighting. Combined with population growth and development initiatives there could be stress on the capacity of the water system to meet demands.
- Wastewater System
    - With wetter and warmer winters and springs and more frequent and intense storms the potential for inflow and infiltration (I&I) issues my increase. The Village recently inspected several sewer mains and they are in relatively good condition and in general the Village has not experienced major issues with I&I. However, as the sewer mains age and precipitation increases it will be important to monitor I&I for impacts on lift stations (backups) and the wastewater treatment plant (capacity).
    - With more frequent and intense storms, the number of power outages will increase. The wastewater treatment plant and some of the lift stations have back up power, but some lift stations do not. During power outages the Village uses a portable back up power supply to cycle through the lift stations without back up power to keep up with wastewater flows. The need to employ this operational solution may increase with more frequent power outages.
- Drainage System
    - With wetter and warmer winters and springs and more frequent and intense storms, debris accumulation in drainage courses may become more frequent. In general, drainage is not a major concern in the Village as the underlying soils have high drainage

capacity. However, debris accumulation may result in localized issues resulting in the need for more frequent maintenance of culverts, ditches, catch basins and drywells.

The information presented here can be used by Village staff in capital, operational and maintenance planning to improve the resilience of the Village's asset systems and mitigate the potential impacts of climate change.

Considerations for Next Steps

A high-level screening of the vulnerability for the Village of Valemount asset systems to climate change is complete. This important first step provides an indication of the highest vulnerabilities for four key asset systems (water, wastewater, drainage and roads).

As indicated in Figure 4.1, the vulnerability assessment is typically followed by a risk assessment to prioritize areas of focus for development and implementation of risk management strategies. Therefore, the following next steps are recommended for consideration by the Village to refine the vulnerability assessment, complete a risk assessment, and develop and implement risk management actions to fully integrate climate change considerations into the overall asset management strategy.

1. Host a workshop with Village staff to discuss the vulnerabilities and risks of specific assets and refine the vulnerability assessment initiate the risk assessment process.

Key actions for the workshops include:

- Integrating local knowledge (history of past events, current condition and known vulnerabilities of specific assets).
- Developing custom weighted consequence scales that align with the community's priorities and values to prioritize risks.
- Establishing risk assessment scores that are based on the consensus of owners/operators of the assets and infrastructure and climate change professionals

2. Integrate climate change vulnerability and risk assessment results into the asset management plan

Rank climate change risks alongside other asset risks to support prioritization of risk management actions such as capital and operational improvements. Identify these actions and corresponding financial strategies in the asset management plan.

3. Integrate results into operations and planning

At the operation and planning level, the following steps should be considered:

a) Check existing plans for potential gaps (e.g. emergency response plans, etc.)

b) Update operation plans to reduce vulnerabilities where appropriate

c) Improve data confidence to refine risk ratings (e.g. groundwater information, monitoring operations and maintenance activities, incident reporting - including incidents related to climatic variables).

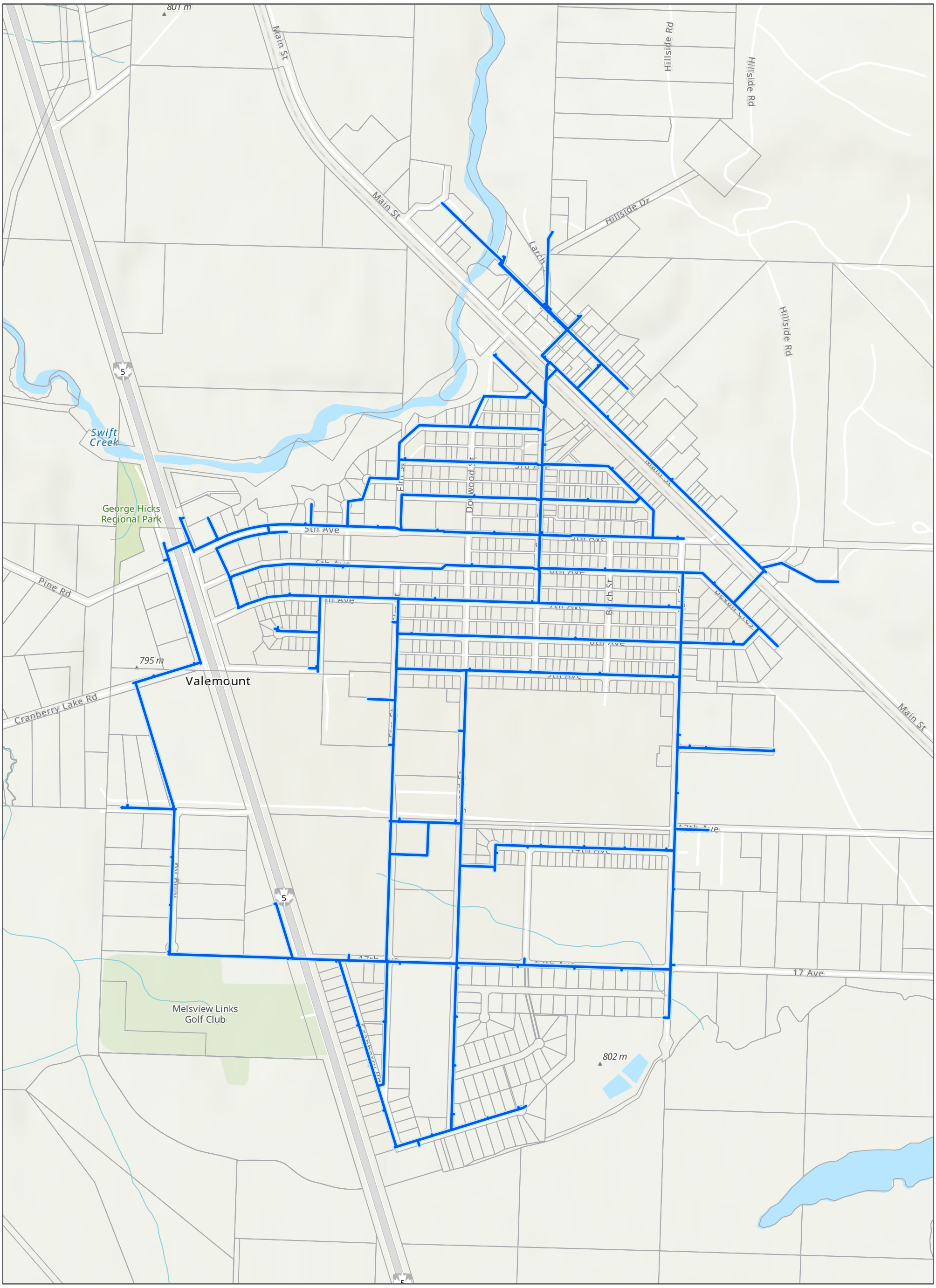
Ensuring operations and planning staff have the appropriate background context and time allowance to incorporate these steps will be key to successfully integrating the results.

4. Review, refine and update the vulnerability and risk assessment framework as required

Using the framework together with staff will not only provide useful information about vulnerabilities and risks, but it will also build staff's understanding with respect to the impacts of climate change on assets and services, and how to take a systematic approach to risk management. The inputs to the framework should be refined and improved as new information becomes available.

Appendix A

Community Asset Maps



URBAN SYSTEMS

Project #:	0433.0050.01
Author:	SF
Checked:	JW
Status:	Draft
Revision:	A
Date:	2020 / 3 / 4

0 100 200 300
Meters

Coordinate System:
NAD 1983 UTM Zone 11N

Scale: 1:10,000
(When plotted at 11"x17")

Data Sources:
- Village of Valemount, Jan 2019

The accuracy & completeness of information shown on his drawing is not guaranteed. It will be the responsibility of the user of the information shown on this drawing to locate & establish the precise location of all existing information whether shown or not.

Legend

Water System

VILLAGE OF VALEMOUNT

Integrated Asset Management Plan

FIGURE 1

Water System

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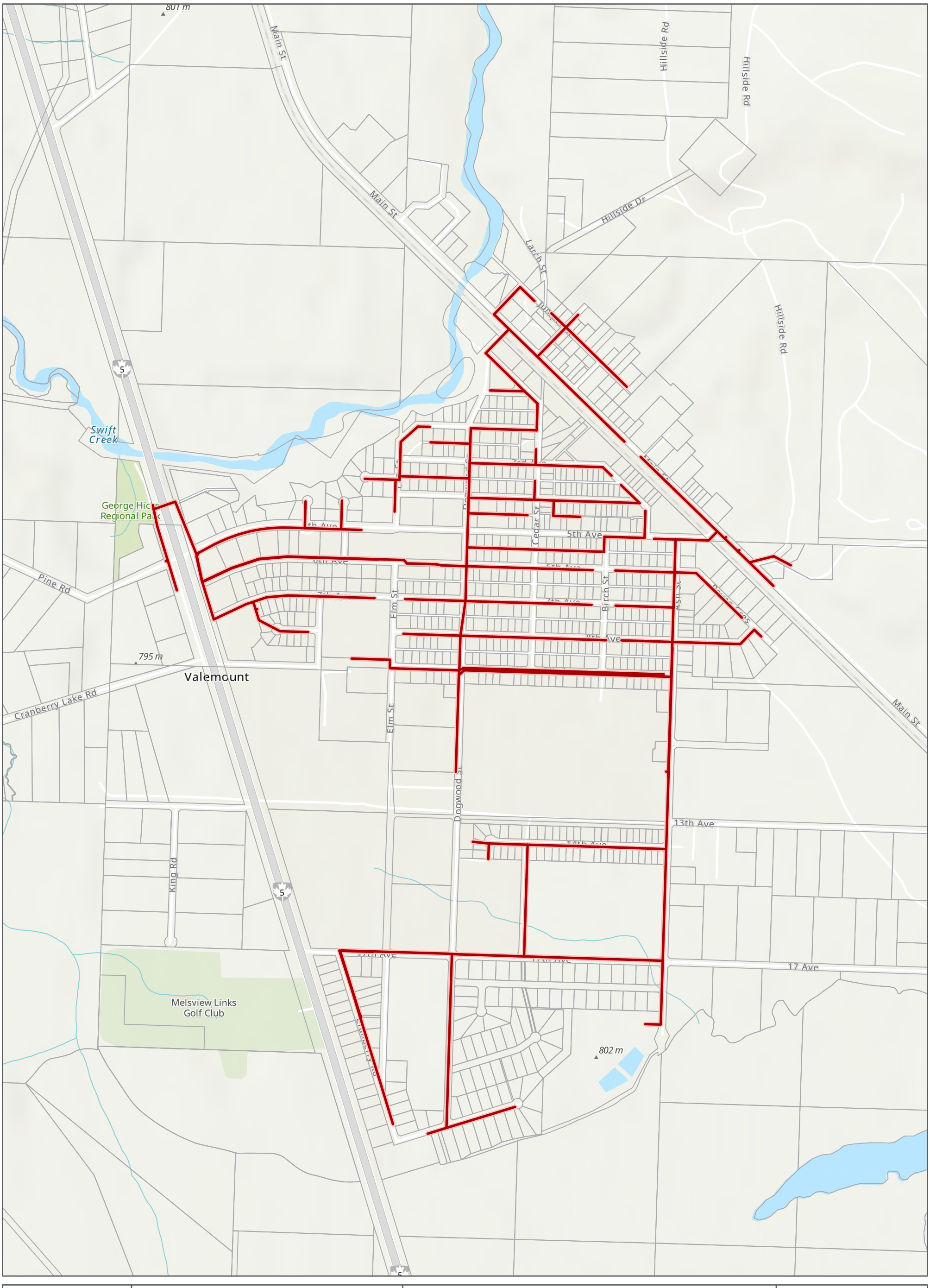

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Data Sources:
- Village of Valemount, Jan 2019

Legend

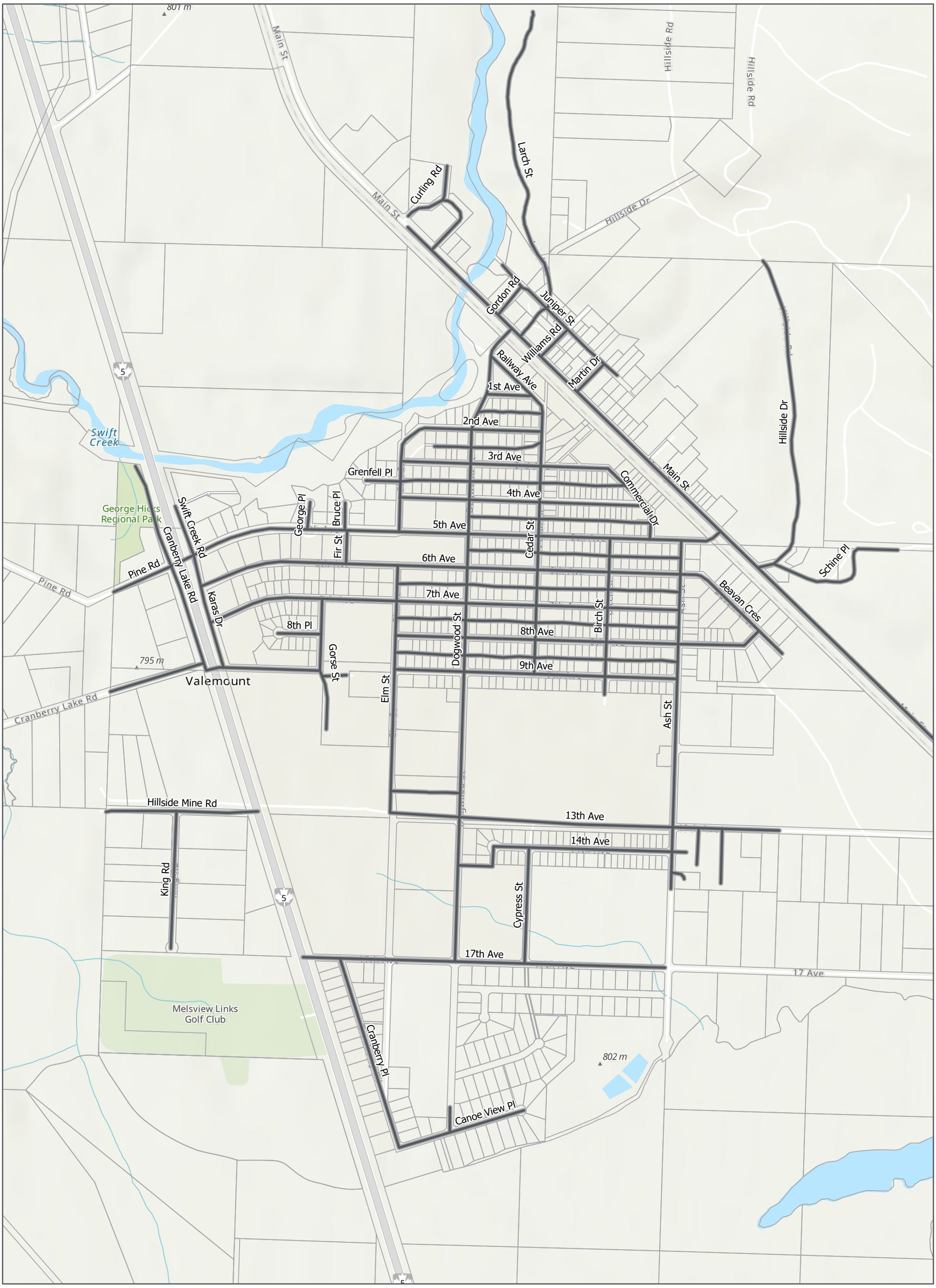
Sanitary System

VILLAGE OF VALEMOUNT

Integrated Asset Management Plan

FIGURE 2

Sanitary System



URBAN SYSTEMS

Project #:	0433.0050.01
Author:	SF
Checked:	JW
Status:	Draft
Revision:	A
Date:	2020 / 3 / 4

0 100 200 300
Meters

Coordinate System: NAD 1983 UTM Zone 11N

Scale: 1:10,000 (When plotted at 11"x17")

Data Sources:
- Village of Valemount, Jan 2019

The accuracy & completeness of information shown on his drawing is not guaranteed. It will be the responsibility of the user of the information shown on this drawing to locate & establish the precise location of all existing information whether shown or not.

Legend

Road System

VILLAGE OF VALEMOUNT

Integrated Asset Management Plan

FIGURE 3

Road System

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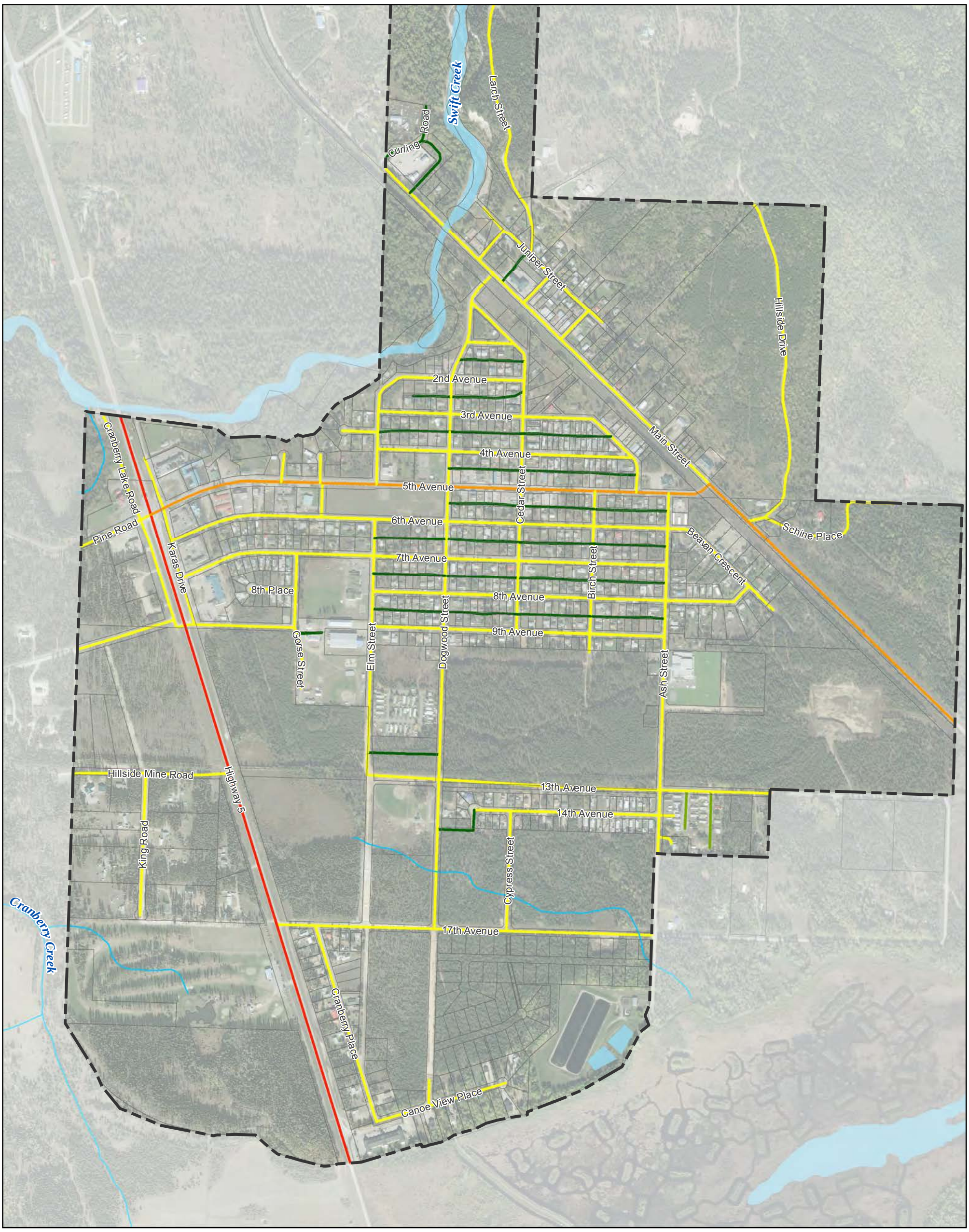
Appendix B

Direct and Indirect Impacts



VILLAGE OF VALEMOUNT

Let the mountains move you

Integrated Asset Management Plan

Road Network Risk Assessment

Legend

Municipal Boundary

Road Risk Rating

- 1
- 2
- 3
- 4
- 5

The accuracy & completeness of information shown on this drawing is not guaranteed. It will be the responsibility of the user of the information shown on this drawing to locate & establish the precise location of all existing information whether shown or not.

0 65 130 260 390

Metres

N

Coordinate System: NAD 1983 UTM Zone 11N

Scale: 1:10,000

Data Sources:

Data provided by Village of Valemount, NRCAN, ParcelMapBC

Project #:	0433.0050.1
Author:	AK
Checked:	KR
Status:	~ DRAFT ~
Revision:	A
Date:	2019 / 2 / 28

URBAN systems

FIGURE 3

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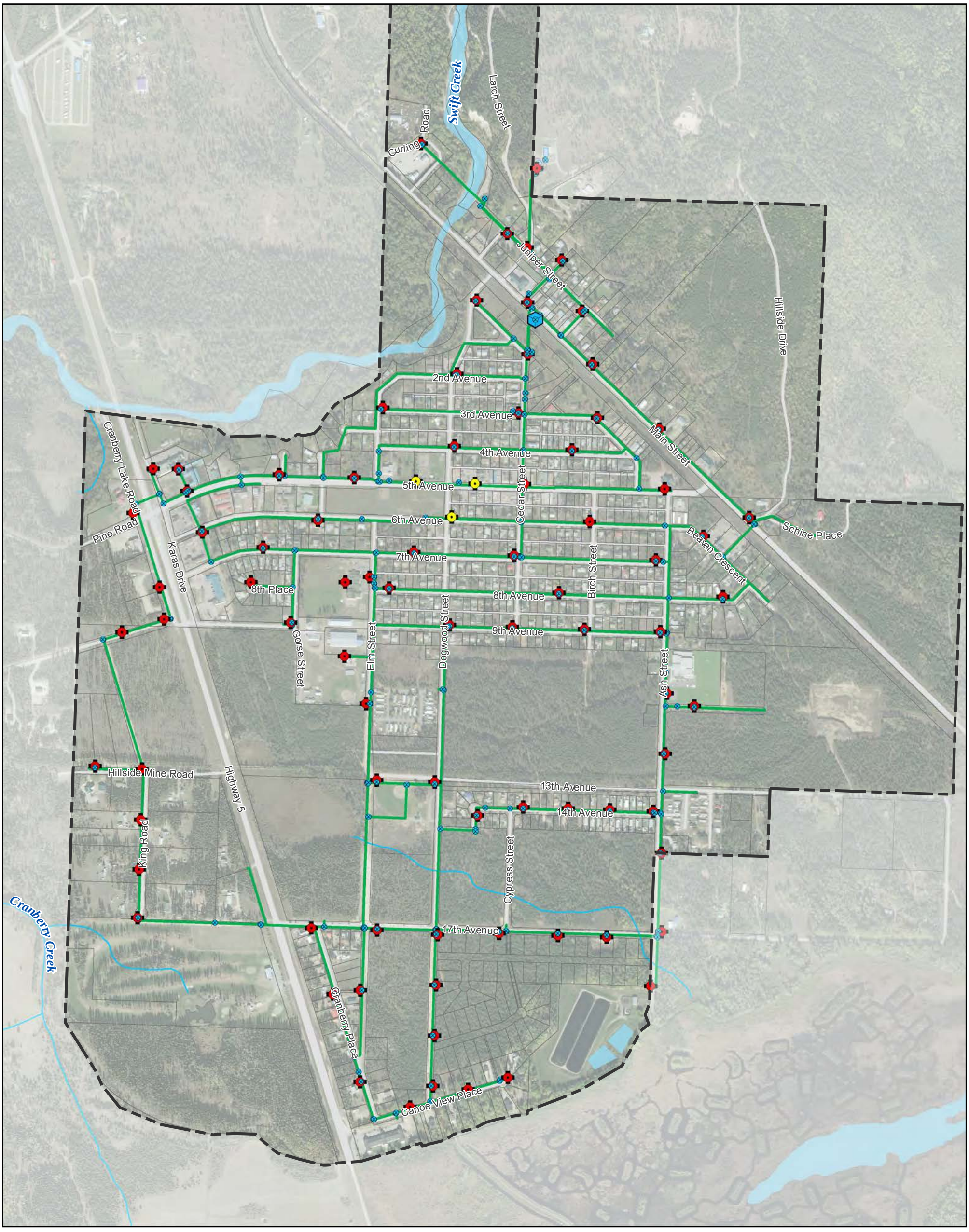

VILLAGE OF VALEMOUNT

Let the mountains move you

Integrated Asset Management Plan

Water System Risk Assessment

Legend

- Municipal Boundary
- Valve
- Valve chamber
- Hydrant
- Hydrant Leaking
- Water System Facility

Water Main Risk Rating

- 1
- 2
- 3
- 4
- 5

The accuracy & completeness of information shown on this drawing is not guaranteed. It will be the responsibility of the user of the information shown on this drawing to locate & establish the precise location of all existing information whether shown or not.

0 65 130 260 390
Metres

N

Coordinate System:
NAD 1983 UTM Zone 11N

Scale:
1:10,000

Data Sources:
Data provided by Village of Valemount, NRCAN, ParcelMapBC

Project #:	0433.0050.1
Author:	AK
Checked:	KR
Status:	~ DRAFT ~
Revision:	A
Date:	2019 / 3 / 6

URBAN systems

FIGURE 1

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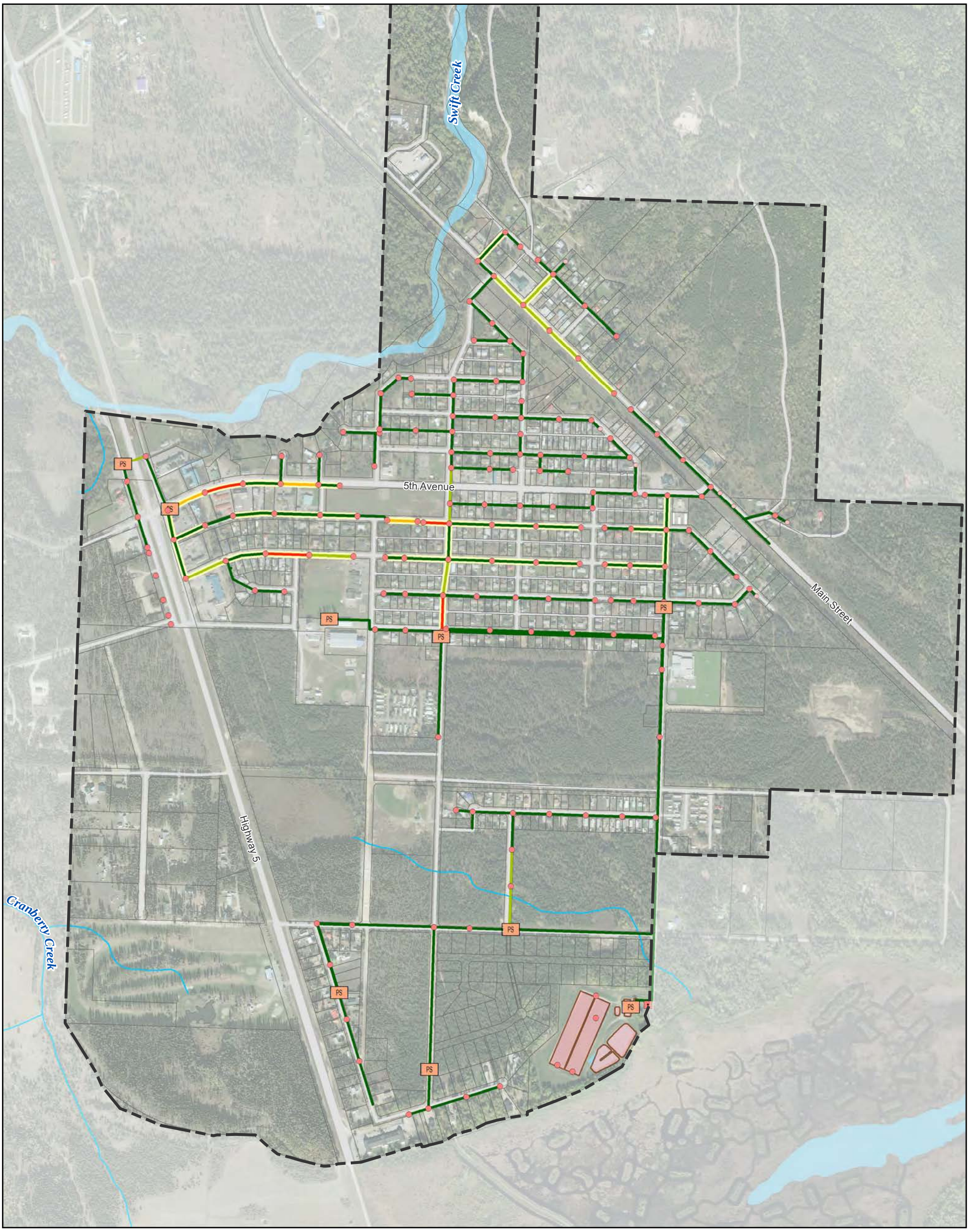

VILLAGE OF
VALEMOUNT
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Integrated Asset Management Plan

Sewer System Risk Assessment

Legend

- Municipal Boundary
- Manhole
- Cleanout
- Well
- Lift Station
- Sanitary Facility
- Inspected Sanitary Mains

Sanitary Mains Risk

- < 3
- 3 - 5
- 5 - 8
- 8 - 11

The accuracy & completeness of information shown on this drawing is not guaranteed. It will be the responsibility of the user of the information shown on this drawing to locate & establish the precise location of all existing information whether shown or not.

0 65 130 260 390
Metres

N

Coordinate System:
NAD 1983 UTM Zone 11N

Scale:
1:10,000

Data Sources:
Data provided by Village of Valemount, NRCAN, ParcelMapBC

Project #:	0433.0050.1
Author:	AK
Checked:	KR
Status:	~ DRAFT ~
Revision:	A
Date:	2019 / 2 / 28

URBAN systems

FIGURE 3

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Appendix C

Vulnerability Assessments

Valemount - Asset Climate Risk

2. Risk Assessment - Roads

Timeline: 2050

Asset System	**Roads**				
Asset System Description	Community roads (dirt, gravel and paved roads)				
Asset System Functionality Goals	Provide transportation routes throughout the community and access to health services and emergency services				
Sensitivity					
Climactic change	**Drier Summers**		**Warmer and Wetter Winters and Springs**		**More Frequent and Intense Storms**
Indicator	*Total precipitation decrease in July and August in the order of 20% and 10%, respectively*		*Winter total precipitation increase in the order of 20% with less snow and more rain and increase in average nighttime low temperature in the order of 4°C . Spring average daytime high temperature increase in the order of 4°C and total precipitation increase in the order of 30% with less snow and more rain*		*Increase in the intensity of storm events for all durations and return periods*
Identified direct impact	**Increase in erosion and/or decrease in slope stability due to insect disease and loss of vegetation**	**Increased dust production from roads (dirt and gravel roadways)**	**Damage to infrastructure caused by more frequent thawing and freezing of soil (weather fluctuates from above to below zero more frequently)**	**Increased demand on road maintenance services**	**Damage to infrastructure due to increased frequency and severity of storms**
Anticipated impacts to assets	Increased stress on road side vegetation leading to increased erosion. Landslides and road blockages. Slope failure and road damage.	Increased demand for road maintenance services to control dust in dry summer months	Damage to paved roads	Increased frequency of icy conditions on local roads.	Increased erosion and degraded condition of roads, possible washout
Potential anticipated impacts to the functionality goals of the asset category	Temporary road closure	Temporary road closure as maintenance is being performed	More potholes and road maintenance services required.	Increased application of ice control measures	Temporary road closuure. Reduced functionality of roads. Increased risk of accidents.
Within the asset category, will there be greater impact on a specific asset?	Yes	Yes	Yes	Yes	No
If yes, which locations or specific assets will be impacted?	Roads near steep slopes, gravel and dirt roads	Dirt and gravel roadways	Paved roads	All, particularly paved roads	All roads
Asset System Sensitivity Rating	**S3**	**S2**	**S3**	**S2**	**S4**
Adaptive Capacity					
What types of actions would be required to adjust the asset category to the anticipated impact, after it has happened? *(Actions may be O&M or capital responses.)*	Minor to major repairs.	Higher costs or budget allocation for roadway maintenance.	Repair roads, inspect for potholes, cracks or damage	Higher costs or budget allocation for roadway maintenance.	Repair damaged roads and improve drainage and flash flood control.
Can the asset system adjust to the projected impact with minimal cost and disruption?	Yes	Yes	Yes	Yes	No
Explain response	The majority of the Village is relatively flat and slope stability issues are relevant for only a few roads on the North side of the community, particularly the road to the water treatment plant and reservoir.	The Village currently uses a chemical application for dust control in the Village. There may be a need to purchase additional chemical and apply it more frequently, however this will be a minimal cost and disruption	Paved roads are at risk of these impacts but managing additional cracks and potholes will have minimal disruption and cost	The Village applies brined sand for ice control on local roads. Managing the need for additional application of brined sand will have minimal disruption and cost	Repairs and flash flood drainage improvements will be costly
Adaptive Capacity Rating	**AC4**	**AC4**	**AC4**	**AC4**	**AC3**
Vulnerability					
Vulnerability Rating	**V3**	**V2**	**V3**	**V2**	**V4**

Valemount - Asset Climate Risk

2. Risk Assessment - Water System

Timeline: 2050

Asset System	**Water System**											
Asset System Description	Water intake, high lift pump station, water treatment plant (filtration and chlorination), 2 potable water reservoirs, distribution system.											
Asset System Functionality Goals	Supply water to Canadian Water Quality Guidelines and Standards. Meet system user demands.											
Sensitivity												
Climactic change	**Drier Summers**					**Hotter Summers**		**Warmer and Wetter Winters and Springs**			**More Frequent and Intense Storms**	
Indicator	*Total precipitation decrease in July and August in the order of 20% and 10%, respectively*					*Average daytime high temperature increase in the order of 5°C*		*Winter total precipitation increase in the order of 20% with less snow and more rain and increase in average nighttime low temperature in the order of 4°C . Spring average daytime high temperature increase in the order of 4°C and total precipitation increase in the order of 30% with less snow and more rain*			*Increase in the intensity of storm events for all durations and return periods*	
Identified direct impact	**Less stream flow due to decreased precipitation and increased evapotranspiration**	**Increase in watering and irrigation needs due to decreased precipitation and drought**	**Increase in erosion and/or decrease in slope stability due to insect disease and loss of vegetation**	**Damage of infrastructure and interruption of services due to increased risk of wildfire**	**Increased demand on fire services due to drier conditions**	**Increased demand on services due to potential extension of summer and growing season.**	**Changes in river/lake ecosystems, including change in temperature, chemical composition, habitat/species, and increase in algal blooms.**	**Damage to infrastructure due to stream/river flooding**	**Damage to infrastructure due to local drainage system flooding**	**Damage to infrastructure due to excess debris and flow in watercourses and drainage systems**	**Damage to infrastructure due to increased frequency and severity of storms**	**Increased damage to energy transmission networks due to severe wind storms**
Anticipated impacts to assets	More frequent drought conditions and reduced amount of raw water supply from Swift Creek	Increased demand on water source, increased pumping and treatment requirements, faster depletion of water storage	Damage to water infrastructure from land slides, increase in surface water turbdity	Damage to buildings that support water supply and treatment	Higher demand on water system during wildfire activity	Increased demand on water source, increased pumping and treatment requirements, faster depletion of water storage	Higher maintenance demand on intake and treatment system	Damage to water system buildings and underground infrastructure	Damage to facilities due to chronic local drainage system issues	Potential build up of debris and damage to surface water intake	Signficant damage to buildings or loss of system components	Loss of power to treatment systems and pump stations, triggering backup generators where available.
Potential anticipated impacts to the functionality goals of the asset category	Inability to meet community water demands	May deplete water supply for other system uses resulting in an inability to meet community water demands	Inability to meet quality standards. Reduced ability to access source water.	Inability to meet water demands and quality standards	Inability to meet community water demands	Inability to meet water demands	Inability to meet water quality standards, increased maintenance of intake screen and treatment components to manage organic material	Inability to meet water demands or quality standards	Inability to meet water demand or quality standards	Inability to meet water demands or quality standards	Inability to meet demand and quality standards	Inability to meet demand and water quality standards.
Within the asset category, will there be greater impact on a specific asset?	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
If yes, which locations or specific assets will be impacted?			Build up of sediment and debris in the intake structure, increased wear and tear on high lift station pumps, increased load on treatment components	The high lift station, water treatment plant and above ground reservoir			Swift Creek intake, water filtration system	The high lift station is at high risk of flood damage	The high lift station and water treatment plant	Swift creek intake	High lift station is of particular concern as the roof is aging and in poor condition	Water treatment plant and high lift station.
Asset System Sensitivity Rating	**S3**	**S3**	**S3**	**S4**	**S3**	**S2**	**S2**	**S4**	**S2**	**S3**	**S2**	**S3**
Adaptive Capacity												
What types of actions would be required to adjust the asset category to the anticipated impact, after it has happened? *(Actions may be O&M or capital responses.)*	Use water from reservoirs. Follow DroughtSmart restrictions, implement water conservation incentives. Increase water storage capacity on an individual level, including rain barrel collection systems. Identify and connect to additional water sources if necessary.	Implement water and irrigation restrictions. Create incentives for xeriscaping and sustainable storage practices. Identify and connect to additional water sources if necessary. Rely on water reservoir sources.	Issue boil water advisory if necessary, increase maintenance of filters (backwash frequency), clean out intake structure and screens more regularly	Suppress fires to minimize damage. Implement boil water advisories. Implement water restrictions to reduce demand. Repair damaged facilities. Provide temporary water source.	Provide temporary water supply to supplement local supply. Implement water restrictions. Identify and connect to additional water sources.	Water conservation practices. Adjust water rates. Increase water storage capacity on a regional and individual level, including rain barrel collection systems. Identify and connect to additional water sources, rely more heavily on reservoirs if necessary	Clear blockages from surface water intake structures and increase frequency of filterbackwash and replacement.	Implement boil water advisory and water restrictions. Remediate damaged facilities. Build flood protection systems around at-risk facilities. Provide temporary water supply.	Deploy operations crews to address drainage system issues and pump water. Remediate damaged facilities. Improve drainage and grading around facilities.	Clean out intake structure and screen, repair damage to intake	Implement temporary flood protection (e.g. sandbags and pumping). Provide temporary potable water supply if water quality is compromised. Remediate degraded infrastructure.	Switch to backup power supply, where available. Mobilize portable back up power supply.
Can the asset system adjust to the projected impact with minimal cost and disruption?	Maybe	Yes	Yes	Maybe	Yes	Yes	Yes	No	Yes	Yes	Maybe	Yes
Explain response	The intake structure on Swift Creek acts as a small reservoir that can collect and maintain sufficient amounts of water even in low flow conditions. However, with increased population growth water demands will increase. Increased demands combined with drought conditions and potential need to leverage fire flows could put the community in a water shortage situation	Implement irrigation restrictions for during periods of drought	Operations and maintenance costs may increase but minimal disruption to service is expected	There is a treeless buffer zone around the water system buildings that may reduce the risk of wildifre damage. However, if facilities sustain fire damages there will be disruption to the service and costly repairs will be required	Depends on Emergency management plans and practices and design capacity for fire flows	The current treatment system and storage capacity is likely sufficient to meet temporariliy increased demands	Minor adjustments to operations and maintenance required	If there is a major flood in Swift Creek it likely that the high lift station will be damaged resulting in disruption of service and costly repair	Likely minor staff intervention and a low cost to improve local drainage	Freshet debris flow is an annual occurrence in Swift Creek and is managed by cleaning out the intake and the screen. This may be required more often if debris flow is more frequent, however, there should be little to no disruption in service and relatively low adjustments to maintenance costs	Most buildings are capable of withstanding storm events. However, the highlift station building is known to be in less than optimal condition.	The water treatment plant has a back up power system. The village has a portable back up power system that can be movilized to the high lift station in a situation where reservoir supply is low and the power is out for an extended period of time.
Adaptive Capacity Rating	**AC3**	**AC4**	**AC4**	**AC2**	**AC4**	**AC4**	**AC4**	**AC1**	**AC4**	**AC4**	**AC3**	**AC4**
Vulnerability												
Vulnerability Rating	**V4**	**V3**	**V3**	**V5**	**V3**	**V2**	**V2**	**V5**	**V2**	**V3**	**V2**	**V3**

Valemount - Asset Climate Risk

2. Risk Assessment - Wastewater System

Timeline: 2050

Asset System	**Sewer System**						
Asset System Description	Gravity sewer mains, manholes, lift stations, forcemain, treatment facilities (includes screw screen, clarifiers, 2 aerated lagoons, septage receiving station, UV disinfection, effluent discharge to adjacent marsh (as reclaimed water).						
Asset System Functionality Goals	Safe, reliable sewer services that safely treat and dispose sewage, meeting the quality and operating needs of users; compliance with required rules, standards, guidelines, and regulations; and, system discharges are treated appropriately and do not impact the natural environment or water quality of receiving watersheds or water bodies.						
Sensitivity							
Climactic change	**Drier Summers**	**Hotter Summers**		**Warmer and Wetter Winters and Springs**		**More Frequent and Intense Storms**	
Indicator	*Total precipitation decrease in July and August in the order of 20% and 10%, respectively*	*Average daytime high temperature increase in the order of 5°C*		*Winter total precipitation increase in the order of 20% with less snow and more rain and increase in average nighttime low temperature in the order of 4°C . Spring average daytime high temperature increase in the order of 4°C and total precipitation increase in the order of 30% with less snow and more rain*		*Increase in the intensity of storm events for all durations and return periods*	
Identified direct impact	**Damage of infrastructure and interruption of services due to increased risk of wildfire**	**Changes in river/lake ecosystems, including change in temperature, chemical composition, habitat/species, and increase in algal blooms.**	**Increase in nuisance odour emitted from waste facilities**	**Increased lift station pumping requirements**	**Damage to infrastructure due to local drainage system flooding**	**Damage to infrastructure due to increased frequency and severity of storms**	**Increased damage to energy transmission networks due to severe wind storms**
Anticipated impacts to assets	Damage to wastewater buildings/facilities	Change in background water quality prior to effluent discharge	Wastewater treatment plant and lift station odours may increase in frequency and potency	Increased wear on lift stations, increased energy costs from higher levels of pumping	Above ground sewer structures may experience some flooding. Potential for restricted access to facilities if roads are flooded. Potential increased inflow and infiltration.	Restricted access to facilities, temporary flooding of facilities, increased inflow and infiltration.	Loss of power to treatment systems and lift stations, triggering backup generators where available.
Potential anticipated impacts to the functionality goals of the asset category	Inability to meet environmental and public health requirements.	Surface water polution with water quality parameters exceeding permit and/or guideline values.	Negatively impact reputation and public opinion	Inability to meet conveyance and treatment demands	Temporary inability to meet local conveyance and treatment demands. Potential surcharging or overflows.	Temporary inability to meet local conveyance and treatment demands. Potential surcharging or overflows.	Temporary inability to meet local conveyance and treatment demands, surcharging or overflows.
Within the asset category, will there be greater impact on a specific asset?	Yes	No	Yes	Yes	Yes	No	Yes
If yes, which locations or specific assets will be impacted?	Liftstations, treatment building		Wastewater treatment plant	Older lift stations more susceptible to failure	Liftstations, treatment building	All structures which are outdoors	Lift stations and treatment process rely on power
Asset System Sensitivity Rating	**S4**	**S2**	**S3**	**S2**	**S2**	**S2**	**S4**
Adaptive Capacity							
What types of actions would be required to adjust the asset category to the anticipated impact, after it has happened? *(Actions may be O&M or capital responses.)*	Minor to major repairs. Prevent with Fire Smart practices.	Limited discharge during summer months and store effluent.	Operational and capital improvements to reduce odours.	Temporary pumping and diversion solutions. Rehabilitate any damaged infrastructure or replace any failing lift stations	Temporary pumping and diversion solutions. Operations and maintenance resources to support flooding issues.	Temporary pumping and diversion solutions. Operations and maintenance resources to support flooding issues.	Switch to backup power supply, if available. Mobilized portable back up power supply
Can the asset system adjust to the projected impact with minimal cost and disruption?	Maybe	Yes	No	Maybe	Yes	Yes	Yes
Explain response	Some of the wastewater buildings/facilites have a treeless buffer zone that may reduce the risk of wildifre damage. However, if facilities sustain fire damages there will be disruption to the service and costly repairs will be required.	The wastewater discharged from the wastewater treatment plant is high quality reclaimed water. Cranberry Marsh is a wetland that is known to produce algal blooms in the summer. It is unlikely that an increased frequency or magnitude of algal blooms would result in a water quality concern that would prevent the discharge of effluent	There is a history of complaints from the public who live near the wastewater treatment plant regarding odours in the summer months. To address this, costly upgrades will be required	Depends on if lift stations can be fixed through maintenance or if they should be replaced.	The Village recently inspected a portion of the sewer mains and they are in relatively good condition. The Village does not have any major issues with inflow and infiltration. Adaptive actions require minimal cost.	The Village recently inspected a portion of the sewer mains and they are in relatively good condition. The Village does not have any major issues with inflow and infiltration. However, major storm events could overwhelm certain locations that do have I&I and localized drainage issues.	The treatment plant and some of the liftstations have a back up power supply. For the stations without back up power the Village uses their portable back up power supply to cycle through the liftstations during power outages.
Adaptive Capacity Rating	**AC2**	**AC5**	**AC2**	**AC3**	**AC4**	**AC3**	**AC4**
Vulnerability							
Vulnerability Rating	**V5**	**V1**	**V4**	**V2**	**V2**	**V3**	**V3**

Valemount - Asset Climate Risk

2. Risk Assessment - Drainage System

Timeline: 2050

Asset System	**Drainage Systems**		
Asset System Description	0.6 km of PVC and steel storm mains ranging in size from 150 – 350 mm, ditching, grass swales, natural water courses and wetlands, curb and gutter, drywells		
Asset System Functionality Goals	Protection of infrastructure and private property from flooding. Attenuate and treat stormwater flows to protect the health of natural drainage systems.		
Sensitivity			
Climactic change	**Warmer and Wetter Winters and Springs**		**More Frequent and Intense Storms**
Indicator	*Winter total precipitation increase in the order of 20% with less snow and more rain and increase in average nighttime low temperature in the order of 4°C . Spring average daytime high temperature increase in the order of 4°C and total precipitation increase in the order of 30% with less snow and more rain*		*Increase in the intensity of storm events for all durations and return periods*
Identified direct impact	**Damage to infrastructure due to local drainage system flooding**	**Damage to infrastructure due to excess debris and flow in watercourses and drainage systems**	**Damage to infrastructure due to increased frequency and severity of storms**
Anticipated impacts to assets	Pipes, culverts, ditches and catch basins will be subject to overflow and may experience washout or damage.	Sediment and debris may create blockages in drainage systems, leading to overflows and potential washout.	System overflows and potential damage or washout, clogging of drains and catch basins during hail storms
Potential anticipated impacts to the functionality goals of the asset category	Chronic issues with propoerties and infrastructure that are meant to be protected by the drainage system	Flooding of property and damage or washout of infrastructure that is meant to be protected by the drainage system	Acute flooding of property and damage or washout of infrastructure that is meant to be protected by the drainage system
Within the asset category, will there be greater impact on a specific asset?	Yes	No	Yes
If yes, which locations or specific assets will be impacted?	Areas in which privately owned drainage systems feed into the Village system or areas of the Village system itself where drainage is inadequate. Contaminated run off from gas stations. Flooding of daycare center in the basement of the community hall. Pooling of water at various location on second avenue and the north end of Dogwood Street		Areas in which privately owned drainage systems feed into the Village system or areas of the Village system itself where drainage is inadequate. Contaminated run off from gas stations. Flooding of daycare center in the basement of the community hall. Pooling of water at various location on second avenue and the north end of Dogwood Street
Asset System Sensitivity Rating	**S3**	**S2**	**S3**
Adaptive Capacity			
What types of actions would be required to adjust the asset category to the anticipated impact, after it has happened? *(Actions may be O&M or capital responses.)*	Temporary pumping and diversion measures, replace or ugrade drainage components	Clear system blockage, repair or replace damaged infrastructure.	Temporary pumping and diversion measures, repair or replace damaged infrastructure.
Can the asset system adjust to the projected impact with minimal cost and disruption?	Maybe	Maybe	Maybe
Explain response	Site grading and drainage system upgrades can help alleviate known issues in the Village, however this could be costly.	Depends on system capacity and local drainage conditions.	Site grading and drainage system upgrades can help alleviate known issues in the Village, however this could be costly.
Adaptive Capacity Rating	**AC3**	**AC3**	**AC3**
Vulnerability			
Vulnerability Rating	**V4**	**V2**	**V4**

APPENDIX E

Asset Condition Assessments

Contents

INTRODUCTION

On November 15 and 16, 2018, a site visit to the Village of Valemount was completed for the purpose of evaluating the non-linear assets. This Inspection report provides additional context of the photos for each of the sites visited. Enclosed is the summary sheet table that was prepared for the purpose of completing the asset management inventory, for which additional comments on the condition of assets is provided. Information on condition of assets was completed through visual site assessment and discussion with the Public Works Superintendent (Trevor Pelletier) and WWTP Operator (Sandy Janum).

5th Avenue Lift Station

Photo shows the inside of the lift station wetwell, shows in good condition, and is the newest lift station in Valemount.

Ash Street Lift Station

Photo of site plan at Ash Street Lift Station shows wet well, generator and kiosk.

Photo of controls at Ash Street Lift Station.

Canoe View Lift Station

Photo shows the inside of the wetwell

Photo of auto dialer at Canoe View Lift Station

Photo of Controls Kiosk at Canoe View Lift Station.

Photo of Electrical Service at Canoe View Lift Station

Cedar and 17th Ave Lift Station

General Site plan of the lift station at 17th Avenue.

Photo shows the internal piping and valves.

Photo of Controls at 17th Ave Lift Station

Cranberry Place Lift Station

Photo of internal wetwell at Cranberry Place Lift Station.

Photo of Control Kiosk at Cranberry Place Lift Station

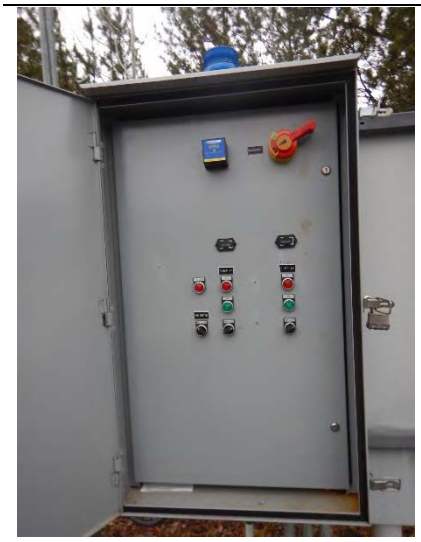


Photo of Control Kiosk at Cranberry Place Lift Station

Dogwood Lift Station

Photo of wetwell and internal piping at Dogwood Lift Station.

Photo of Controls at Dogwood Lift Station

Photo of general site arrangement at Dogwood Lift Station.

Elm Street Lift Station

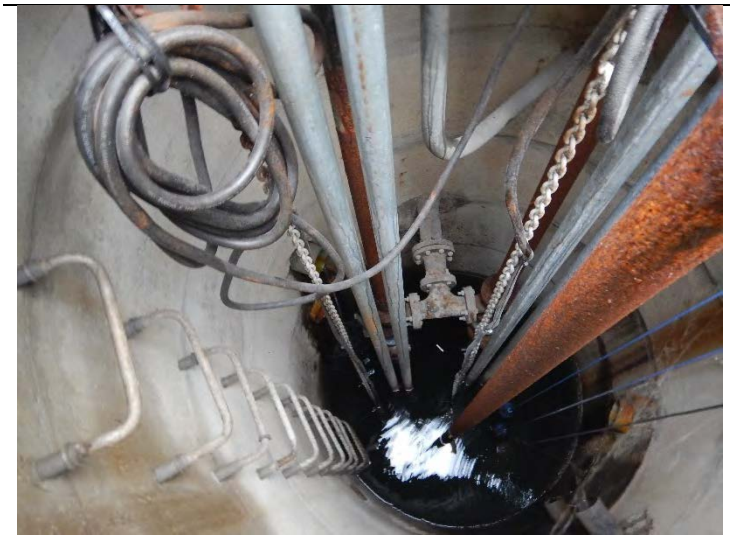


Photo showing wetwell and valves and internal piping at Elm Street Lift Station

Controls at Elm Street Lift Station

Village Office Lift Station

Site layout photo for Village Office Lift Station

Electrical Controls kiosk.

Photo of inside wetwell for Village Office Lift Station.

Sewage Treatment Plant

	WWTP Building
	WWTP Building, also shows portable generator on trailer.

Screening equipment

Concrete Aeration Tank.

Inside of wetwell for High Lift Station

High Lift Station – Controls kiosk

Blowers 1 2 and 3

Controls Panel at WWTP

Photo shows the configuration of the flow meter piping

Photo shows the UV Disinfection unit

Secondary Clarifier

Aerated Lagoon 1

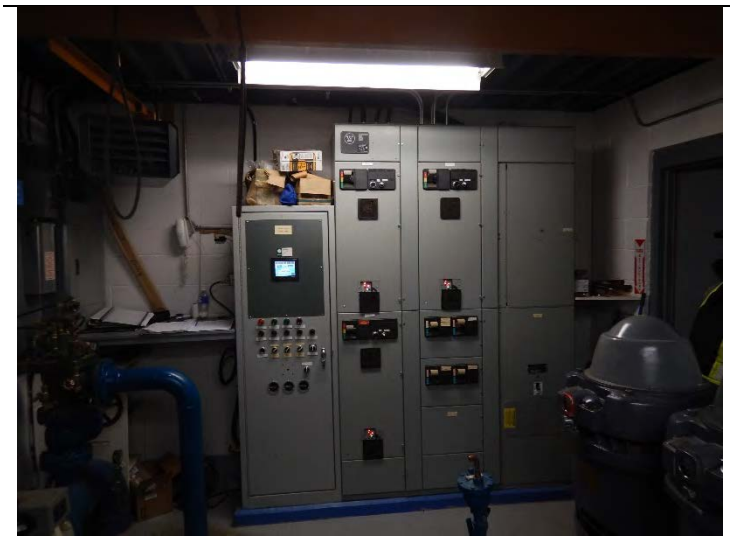
Location of sewage outfall location to wetlands.

Water Treatment Plant

Water system intake structure

High lift pump station building

High lift pump station – pumps 1, 2, and 3



High lift pump station – controls panel

Drainage/overflow pond next to high lift station

Chlorine storage tank

Building water tanks

	Internal piping and pumps at water treatment plant
	Outside view of building for water treatment plant and Reservoir No. 2

Water Reservoir 1

Photo of Water Reservoir No. 1

Water Reservoir 2

Look from WTP down into the reservoir #2 access.

Park at Dogwood and 14th; Kinnikinnick Park; John Osadchuk Memorial Park

	Photo of concession building at park
	Photo of concession building at park

Park at Elm Street and 9th

Photo of concession building and washrooms.

Photo of concession building windows.

Photo of second building at park.

Airport

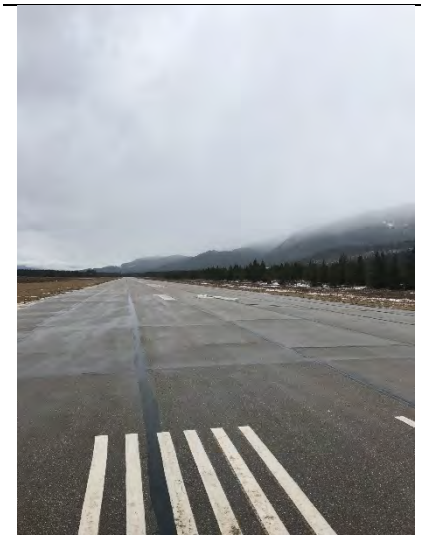


Photo of airport runway

Photo of airport building

PAPI lighting controls

Runway/taxiway/apron edge light regulator

Asset ID	Category	Sub Category	Location	Description	Details	Comments from Site Visit	Year Installed	Condition (1=good, 5=poor)	Expected Useful Life	Useful Life Remaining	Replacement Value (estimate)
LS_005.07	Wastewater	Mechanical	5th Avenue Lift Station	Flow Meter Manhole	Siemens Mag 5100W	manhole still has some condensation/water inflow into the manhole. They may consider doing some injection grouting in the future to try and fix this. Currently the pump the water out monthly, and the chamber has a float switch for whether water is in the chamber.	2017	2	20	17	$20,000.00
LS_005.04	Wastewater	Electrical	5th Avenue Lift Station	Generator	Blue Start JD40-03, 40kW, 600V		2017	1	20	17	$95,000.00
LS_005.05	Wastewater	Electrical	5th Avenue Lift Station	Electrical Kiosk and Controls	Interior Instruments Electrical Kiosk; VFD,	Need to follow up with Linda Bie about the exhaust fans - they are having issues controling them with temperature controls	2017	1	20	17	$150,000.00
LS_005.01	Wastewater	Mechanical	5th Avenue Lift Station	Pump 1 and Valves	FLYGT NP3127 SH 248 DN 80, 11hp, 3500RPM, 60 Hz (ADD SERIAL NUMBER)	One of the pumps (Pump 1) was rebuilt - there were issues with the low level alarm taking too long of a delay between alarm and pump shut off, that the pump was experiencing cavitation. The controls were adjusted and it all works well now.	2017	1	25	22	$50,000.00
LS_005.02	Wastewater	Mechanical	5th Avenue Lift Station	Pump 2 and Valves	FLYGT NP3127 SH 248 DN 80, 11hp, 3500RPM, 60 Hz (ADD SERIAL NUMBER)		2017	1	25	22	$50,000.00
LS_005.06	Wastewater	Civil	5th Avenue Lift Station	Oil Separator Manhole	Langely Concrete Type I Oil Interceptor		2017	1	25	22	$20,000.00
LS_005.03	Wastewater	Structural	5th Avenue Lift Station	Shell and Base	2.438m diameter, 4.1m height FRP tank		2017	1	50	47	$230,000.00

Asset ID	Category	Sub Category	Location	Description	Details	Comments from Site Visit	Year Installed	Condition (1=good, 5=poor)	Expected Useful Life	Useful Life Remaining	Replacement Value (estimate)
AIR_001.01	Airport	Structural	Airport	Airport Building and Roof		Good condition		1			
AIR_001.03	Airport	Civil	Airport	Asphalt Area				1			
AIR_001.04	Airport	Electrical	Airport	Electrical Building				1			
AIR_001.05	Airport	Mechanical	Airport	Fuel Storage and Supply				1			
AIR_001.02	Airport	Electrical	Airport	PADI Lights				1			
LS_002.01	Wastewater	Mechanical	Ash Street Lift Station	Pump 1 and Valves	FLYGT CP 3100 MT 432 IMP 5.0 HP		1980	4	25		$50,000.00
LS_002.02	Wastewater	Mechanical	Ash Street Lift Station	Pump 2 and Valves	FLYGT CP 3100 MT 432 IMP 5.0 HP		1980	4	25		$50,000.00

Asset ID	Category	Sub Category	Location	Description	Details	Comments from Site Visit	Year Installed	Condition (1=good, 5=poor)	Expected Useful Life	Useful Life Remaining	Replacement Value (estimate)
LS_002.03	Wastewater	Structural	Ash Street Lift Station	Shell and Base	Concrete (1.829m ID diameter)	Top ring is shifted from a truck accident - could be worse but cannot comment on actual structural	1980	3	50		$300,000.00
LS_002.05	Wastewater	Electrical	Ash Street Lift Station	Generator		Generator is newer - need to get an install date and cost from the Village		1			$100,000.00
LS_002.04	Wastewater	Electrical	Ash Street Lift Station	Electrical Kiosk and Controls		new controls - village to provide install date and cost		1	20		$250,000.00
LS_003.04	Wastewater	Electrical	Canoe View Lift Station	Control Panel	Float switches and alternator relay. Fibreglass junction box	simple controls (pump on/off)- some rust in the control panel enclosure	2005	2	20	5	$50,000.00
LS_003.01	Wastewater	Mechanical	Canoe View Lift Station	Pump 1 and Valves	FLYGT NP 3102.180 MT 152 IMP, 3.9HP (PUMP TAG: 3102.181 60Hz, 3.9hp 1755 RPM)	Flows are low (i.e. 0.1 hours every 3 days)	2005	1	25	10	$40,000.00
LS_003.02	Wastewater	Mechanical	Canoe View Lift Station	Pump 2 and Valves	FLYGT NP 3102.180 MT 152 IMP, 3.9HP (PUMP TAG: 3102.181 60Hz, 3.9hp 1755 RPM)	Flows are low (i.e. 0.1 hours every 3 days)	2005	1	25	10	$40,000.00
LS_003.03	Wastewater	Structural	Canoe View Lift Station	Shell and Base	FRP Tank + separate valve chamber		2005	1	50	35	$200,000.00

Asset ID	Category	Sub Category	Location	Description	Details	Comments from Site Visit	Year Installed	Condition (1=good, 5=poor)	Expected Useful Life	Useful Life Remaining	Replacement Value (estimate)
LS_001.01	Wastewater	Mechanical	Cedar and 17th Avenue Lift Station	Pump 1 and Valves	FLYGT C3126 HT 461 IMP, 9.4 HP		1980	3	25	-15	$50,000.00
LS_001.02	Wastewater	Mechanical	Cedar and 17th Avenue Lift Station	Pump 2 and Valves	FLYGT C3126 HT 461 IMP, 9.4 HP		1980	3	25	-15	$50,000.00
LS_001.04	Wastewater	Electrical	Cedar and 17th Avenue Lift Station	Controls	Cell phone auto dialer, no SCADA	Old and rusting - cellular dialer is from 2017	2008	3	20	8	$100,000.00
LS_001.03	Wastewater	Structural	Cedar and 17th Avenue Lift Station	Shell and Base	Concrete (1.829m ID diameter)	Inflow point/groundwater (1inch diameter gusher flowing steady above)	1980	3	50	10	$230,000.00
LS_004.04	Wastewater	Electrical	Cranberry Place Lift Station	Control Panel	Float Switches, and remote control panel		Unknown	3	20		$75,000.00
LS_004.01	Wastewater	Mechanical	Cranberry Place Lift Station	Pump 1 and Valves	FLYGT C3085 MT 436 IMP, 5 HP		Unknown	2	25		$50,000.00
LS_004.02	Wastewater	Mechanical	Cranberry Place Lift Station	Pump 2 and Valves	FLYGT C3085 MT 436 IMP, 5 HP		Unknown	2	25		$50,000.00

Asset ID	Category	Sub Category	Location	Description	Details	Comments from Site Visit	Year Installed	Condition (1=good, 5=poor)	Expected Useful Life	Useful Life Remaining	Replacement Value (estimate)
LS_004.03	Wastewater	Structural	Cranberry Place Lift Station	Shell and Base	FRP Tank		Unknown	2	50		$250,000.00
LS_006.03	Wastewater	Structural	Dogwood Lift Station	Shell and Base	Rectangular concrete tank	poor condition	1979	4	50	9	$450,000.00
LS_006.05	Wastewater	Structural	Dogwood Lift Station	Rails		Replaced recently -	2008	1		-12	$25,000.00
LS_006.06	Wastewater	Electrical	Dogwood Lift Station	Control Panel		Cellular dialer controls to SCADA at WTP; there is also a switch lag for the generator that is from around 2015	2015	1		-5	$250,000.00
LS_006.07	Wastewater	Mechanical	Dogwood Lift Station	Pump 1 and Valves		New pumps	2016	1	30	26	$85,000.00
LS_006.08	Wastewater	Mechanical	Dogwood Lift Station	Pump 2 and Valves		New pumps	2016	1	30	26	$85,000.00
LS_007.04	Wastewater	Electrical	Elm Street Lift Station	Electrical Kiosk and Controls	Float switches and alternator relay, mounted control panel	original controls - aging and old condition	1980	4	20	-20	$75,000.00

Asset ID	Category	Sub Category	Location	Description	Details	Comments from Site Visit	Year Installed	Condition (1=good, 5=poor)	Expected Useful Life	Useful Life Remaining	Replacement Value (estimate)
LS_007.01	Wastewater	Mechanical	Elm Street Lift Station	Pump 1 and Valves	FLYGT CP 3085 MT 440 IMP 5 HP	need pump tag photos from Village	1980	3	25	-15	$50,000.00

Asset ID	Category	Sub Category	Location	Description	Details	Comments from Site Visit	Year Installed	Condition (1=good, 5=poor)	Expected Useful Life	Useful Life Remaining	Replacement Value (estimate)
LS_007.02	Wastewater	Mechanical	Elm Street Lift Station	Pump 2 and Valves	FLYGT CP 3085 MT 440 IMP 5 HP	need pump tag photos from Village	1980	3	25	-15	$50,000.00
LS_007.03	Wastewater	Structural	Elm Street Lift Station	Shell and Base	Concrete (1.829m ID diameter)	looks visually in good condition	1980	2	50	10	$200,000.00
WAT_001.08	Water	Civil	High Lift Pump Station	Roof		roof is not in good condition. Roof has an access hatch for removing pumps.	1988	4	30	-2	$20,000.00
WAT_001.05	Water		High Lift Pump Station	Building and Wetwell		older building	1988	3	50	18	$125,000.00
WAT_001.07	Water	Civil	High Lift Pump Station	Overflow pond area		No liner, just an area with retention pond and discharge to ground; requires some sediment removal	Unknown	2			$150,000.00
WAT_001.06	Water	Electrical	High Lift Pump Station	Controls		Controls were upgraded in recent years for SCADA upgrades		1	20	-2000	$200,000.00
WAT_001.01	Water	Mechanical	High Lift Pump Station	Pump 1 and Valves	50 HP Vertical Turbine Pump (600V, 50HP, 60 Hz, 3phase)	replaced in 2013 - motors are original	1988	1	25	-7	$75,000.00

Asset ID	Category	Sub Category	Location	Description	Details	Comments from Site Visit	Year Installed	Condition (1=good, 5=poor)	Expected Useful Life	Useful Life Remaining	Replacement Value (estimate)
WAT_001.02	Water	Mechanical	High Lift Pump Station	Pump 2 and Valves	50 HP Vertical Turbine Pump (600V, 50HP, 60 Hz, 3phase)	replaced in 2013 - motors are original	1988	1	25	-7	$75,000.00
WAT_001.03	Water	Mechanical	High Lift Pump Station	Pump 3 and Valves	50 HP Vertical Turbine Pump (600V, 50HP, 60 Hz, 3phase)	replaced in 2013 - motors are original	1988	1	25	-7	$75,000.00
WTP_001.01	Water	Civil	Intake Structure	Weir	Lock Block constructed weir, bar and mesh screens		1995	1	35	10	$250,000.00
WTP_001.02	Water	Structural	Intake Structure	Wet Well	Concrete - 15ft deep	the Village does have divers look at this as part of their maintenance every year	1988	1	50	18	$200,000.00
PARK_001.01	Parks	Structural	Park at Dogwood and 14th; Kinnikinnick Park; John Osadchuck Memorial Park	Building		The inside of this building is not completed, it has kitchen equipment					$300,000.00
PARK_001.02	Parks	Structural	Park at Elm Street and 9th	Sports Ground Ball Diamonds							$280,000.00
RES_001.01	Water	Structural	Reservoir 1	Reservoir Structure	Above Ground - 841m3 Bolted Steel Tank	inspected in 2009/2010 - no issues reported	1977	2	50	7	$900,000.00

Asset ID	Category	Sub Category	Location	Description	Details	Comments from Site Visit	Year Installed	Condition (1=good, 5=poor)	Expected Useful Life	Useful Life Remaining	Replacement Value (estimate)
RES_002.01	Water	Structural	Reservoir 2	Reservoir Structure	In Ground - 1140m3 Cast-in-Place concrete reservoir	2 cells within the single unit.	2004	1	50	34	$690,000.00
WWTP_001.20	Wastewater	Civil	Sewage Treatment Plant	Screen	IPEC ATT 4000	Maintenance of this piece of equipment is diffucult and without proper maintenance it could fail - the room it is located in doesn't have much clearance. High maintenance costs for replacing every 3-5 (screen) and 3 years (auger) at about $5000 per year. They are trying to line it up so both are replaced at the same time	2007	3		-13	$211,900.00
WWTP_001.21	Wastewater	Civil	Sewage Treatment Plant	Misc- Sitework and piping		Some piping is not in the best shape - especially in the clarifier room	2007	3		-13	$735,000.00
WWTP_001.	Wastewater	Civil	Sewage Treatment Plant	Access Road to Outfall Structure		Some erosion has occurred over the years	1982	3	40	2	
WWTP_001.11	Wastewater	Process Mechanical	Sewage Treatment Plant	UV Disinfection	Trojan UV Disinfection Unit	Operator is having issues with UV disinfection unit achieving design UV intensity - may be related to build up on quartz or sensor	2007	3	25	12	$80,000.00
WWTP_001.14	Wastewater	Structural	Sewage Treatment Plant	Treatment Building		aging building - but otherwise no issues with the structure	1982	2		-38	
WWTP_001.21	Wastewater	Structural	Sewage Treatment Plant	Roof		fair condition - some work is needed. They have completed some repair work to date	1982	2		-38	$20,000.00

Asset ID	Category	Sub Category	Location	Description	Details	Comments from Site Visit	Year Installed	Condition (1=good, 5=poor)	Expected Useful Life	Useful Life Remaining	Replacement Value (estimate)
WWTP_001.03	Wastewater	Process Mechanical	Sewage Treatment Plant	Secondary Clarifier - Mechanical	Lakeside Spiraflo (7315mm diameter)		1982	2	25	-13	
WWTP_001.05	Wastewater	Civil	Sewage Treatment Plant	Aerated Lagoon 1	Lagoon, liner, air hearder and laterals, diffusers	difussers in aerated lagoon 1 need fixing with one of the plates/fittings having popped off and the Village can't access it to fix it (they are weighed down with concrete)	2007	2		-13	$160,000.00
WWTP_001.12	Wastewater	Electrical	Sewage Treatment Plant	Generator	Kohler 100, 1800 RPM, Diesel, (s/n 2178901)	the Village has plans to install this permanently at this site - current location is located under a 'car port' area and close to roof.	2007	2		-13	$90,000.00
WWTP_001.	Wastewater	Civil	Sewage Treatment Plant	Outfall Piping/Structure		The piping has been damaged over the years. May need some repair	1982	2	40	2	
WWTP_001.02	Wastewater	Structural	Sewage Treatment Plant	Secondary Clarifier - Structural	Lakeside Spiraflo (7315mm diameter)		1982	2	40	2	
WWTP_001.18	Wastewater	Mechanical	Sewage Treatment Plant	Sludge Return Pump #2	FLYGT 3102-181 5hp, 1745 rpm, 600 V	rebuilt in 2008	2008	2	25	13	$20,000.00
WWTP_001.06	Wastewater	Civil	Sewage Treatment Plant	Aerated Lagoon 2	Lagoon, liner, air hearder and laterals, diffusers		2007	1		-13	$160,000.00

Asset ID	Category	Sub Category	Location	Description	Details	Comments from Site Visit	Year Installed	Condition (1=good, 5=poor)	Expected Useful Life	Useful Life Remaining	Replacement Value (estimate)
WWTP_001.19	Wastewater	Electrical	Sewage Treatment Plant	Electrical	Controls	minor maintenance over the years	2007	1		-13	$30,000.00
WWTP_001.10	Wastewater	Electrical	Sewage Treatment Plant	Lift Station Controls	Control Panel	minor maintenance over the years	2007	1	20	7	$20,000.00
WWTP_001.07	Wastewater	Mechanical	Sewage Treatment Plant	Lift Station Pump 1	FLYGT NP3102MT	rebuilt in 2016	2007	1	25	12	$20,000.00
WWTP_001.08	Wastewater	Mechanical	Sewage Treatment Plant	Lift Station Pump 2	FLYGT NP3102MT	rebuilt in 2016	2007	1	25	12	$20,000.00
WWTP_001.17	Wastewater	Mechanical	Sewage Treatment Plant	Sludge Return Pump #1	FLYGT 3102-181 5hp, 1745 rpm, 600 V	rebuilt in 2008	2008	1	25	13	$20,000.00
WWTP_001.13	Wastewater	Mechanical	Sewage Treatment Plant	Blower #3 and valves	Kaeser DB 130 Blower	this blower doesn’t have a back up - therefore higher risk if failure occurs	2010	1	25	15	$80,000.00
WWTP_001.09	Wastewater	Structural	Sewage Treatment Plant	Lift Station Tank	Concrete (1.829m ID diameter)		2007	1	50	37	$20,000.00

Asset ID	Category	Sub Category	Location	Description	Details	Comments from Site Visit	Year Installed	Condition (1=good, 5=poor)	Expected Useful Life	Useful Life Remaining	Replacement Value (estimate)
WWTP_001.01	Wastewater	Structural	Sewage Treatment Plant	Building			1982			-38	$550,000.00
WWTP_001.15	Wastewater	Mechanical	Sewage Treatment Plant	Blower #1	Gardener Denver 5 PDR10 Rotary Blower		1982		25	-13	$80,000.00
WWTP_001.16	Wastewater	Mechanical	Sewage Treatment Plant	Blower #2	Gardener Denver 5 PDR10 Rotary Blower	blower #2 was rebuilt (2004?)	1982		25	-13	$80,000.00
LS_008.04	Wastewater	Electrical	Village Office Lift Station	Controls	Float switches and alternator relay, fibreglass junction box		2006	1	20	6	$15,000.00
LS_008.05	Wastewater	Mechanical	Village Office Lift Station	Pump 1 and Valves			2016	1	25	21	
LS_008.06	Wastewater	Mechanical	Village Office Lift Station	Pump 2 and Valves			2016	1	25	21	
LS_008.03	Wastewater	Structural	Village Office Lift Station	Shell and Base	FRP Tank - 2.133m diameter		2006	1	50	36	$30,000.00

Asset ID	Category	Sub Category	Location	Description	Details	Comments from Site Visit	Year Installed	Condition (1=good, 5=poor)	Expected Useful Life	Useful Life Remaining	Replacement Value (estimate)
WTP_001.06	Water	Electrical	Water Treatment Plant	Electrical and Controls			2010		20	10	$215,000.00
WTP_001.04	Water	Mechanical	Water Treatment Plant	Treatment Equipment and Process Piping			2010		25	15	$870,000.00
WTP_001.03	Water	Structural	Water Treatment Plant	Structure and building mechanical			2010		50	40	$1,070,000.00

APPENDIX F

FINANCIAL POLICY

1.1 SCOPE OF POLICY

Financial management policy statements have been developed for six (6) key areas that influence the sustainable funding and financing of the Village'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

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 Village of Valemount'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 Village'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 Village. Taxes levied by other government agencies are also included on the Village's tax notice and are not controlled by the Village. These agencies include the Municipal Finance Authority, BC Assessment, Regional District, School Taxes, and the Hospital District.

Policy Statements

(a) The setting of annual budgets will be informed by the full cost of delivering the desired levels of service including, 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.

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 the Village of Valemount) 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 Council and management.

(c) The use of accumulated surplus funds shall be reserved for unforeseen expenses and/or to leverage emergent opportunities.

1.5 RESERVE FUNDS

Saving money for future projects and unexpected expenditures is an important planning consideration for the Village. 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 Village'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.

1.6 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 capital projects with a life of greater than 10 years.

(b) Target planned debt servicing costs (including leases >10 years) to be no more than a maximum of 50% of the Village'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.

1.7 GRANTS

A grant is a transfer of money to the Village 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 Village 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 Village's 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 Village of Valemount's capital plan.

(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 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%, there is a clear benefit to the community and a strong alignment with longer term goals.

1.8 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 Village maintains its financial sustainability over the long term. The timing and funding requirements for asset renewal and replacement are identified within the Village's Asset Management Plan and long-term capital plan.

The Village's capital plans set out priorities for capital infrastructure upgrades in order to provide appropriate levels of service to the community. Deviations from the plan that defer needed asset renewal or replacement projects add to the Village's infrastructure deficit and this 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, capacity and level of service.

APPENDIX G

CAPITAL PLAN AND FUNDING REVIEW

Contents

INTRODUCTION

As part of the project a funding review was undertaken. The objective of the funding review was to provide recommendations on future taxation and user fee levels that will be required to fund the long-term funding levels identified in the Asset Management Investment Plan. In addition, the funding review examines the 10 Year Capital Plan and provides recommendations on the funding strategies for accomplishing the plan within the 10-year time frame.

As part of the funding review a financial model was developed. The key assumptions for this model were developed with Village staff and are summarized in the table below.

Assumption	Value
Borrowing Cost ($/million borrowed)	$60,000
General Fund	
Current Annual Transfers Available to Capital	$37,000
Number of Parcels	805
Revenue per 1% Tax Increase	$7,800
Un-Restricted Reserves Starting Balance (Includes Northern Asset Grant)	$2,530,000
Roads DCC Reserves Starting Balance	$103,000
Sewer Fund	
Current Annual Transfers Available to Capital	$18,000
Revenue per 1% User Fee Increase	$3,700
Un-Restricted Reserves Starting Balance	$135,750
DCC Reserves Starting Balance	$186,000
Water Fund	
Current Annual Transfers Available to Capital	$18,000
Revenue per 1% User Fee Increase	$3,200
Un-Restricted Reserves Starting Balance	$106,000
DCC Reserves Starting Balance	$67,000

FUTURE CAPITAL INVESTMENT NEEDS

The future investment requirements of the Village are mostly related to the rehabilitation of existing infrastructure (asset management). A lesser component of future capital needs is related to accommodating future development. The long-term rehabilitation investment needs are defined with the Asset Management Investment Plan (AMIP). The AMIP addresses the full lifecycle capital costs. To better understand the near-term requirements a 10 Year Capital Plan was developed.

Asset Management

The Asset Management Investment Plan (AMIP) identified the Average Annual Lifecycle Investment (AALCI) for water, sewer and roads and drainage infrastructure. The funding levels were provided as a range based on how conservative the Village would like to be with respect to the funding of the infrastructure.

The AALCI range identified for water infrastructure will require funding of between $238k and $357k annually on average. Sewer will require between $286k and $429k annually on average. Roads and drainage will require between $190k and $285k annually on average.

10 Year Capital Plan

A 10-Year Capital Plan was developed based on discussion with Village staff. The costs for each project were separated according to where the funding would be derived (water, sewer or general). In addition, the component of each project that could be attributed to growth was identified.

The following table summarizes the projects identified and the associated costs.

Project Description	Year Planned	Project Cost	General	Sewer	Water	DCC Potential
9th and Dogwood LS	2020	$ 2,000,000		$ 2,000,000	$ -	$ 490,000
Hwy 5 & Cranberry LS (upgraded to higher capacity)	2021	$ 50,000	$ -	$ 50,000	$ -	
Main Street - Seal Coat from Village Bdy to 800m south of bike park access	2022	$ 240,000	$ 240,000	$ -	$ -	
Cranberry Lake Road – Overlay	2023	$ 135,000	$ 135,000	$ -	$ -	
17th Ave LS	2023	$ 900,000	$ -	$ 900,000	$ -	$ 675,000
Replace wood building at works yard	2024	$ 75,000	$ 75,000	$ -	$ -	
Replace steel reservoir (750 m3)	2025	$ 750,000	$ -	$ -	$ 750,000	$ 185,000
New play equipment at site to be determined	2025	$ 200,000	$ 200,000	$ -	$ -	

Pump House - Replace Building (taller/bigger)	2026	$	280,000	$	-	$	-	$	280,000
STP Roof	2029	$	20,000	$	-	$	20,000	$	-

The average annual funding related to the above capital plan is $65k for roads and drainage, $300k for sewer and $100k for water.

A comparison of the ALLCI and the 10 year capital requirements shows that the 10 year needs are lower than the longer-term requirements for the General and Water Funds, and similar for the sewer Fund. This is important to note since taxation and user fees shouldn't be increased above the ALLCI requirements. This will help inform the strategy for the funding of these projects.

Fund	ALLCI	10 Year Capital Plan
General	$268-401k	$65k
Water	$211-317k	$100k
Sewer	$286-429k	$300k

Current Funding Levels

A review of the Village's recent financial plan was undertaken to review the projected funding available for capital investment based on current tax and user fee levels.

The funds available for capital are compared with the ALLCI to determine the shortfall.

Fund	Funds Available for Capital Annually	ALLCI	Shortfall	% Adjustment to User Fees/ Taxation
General	$37,000	$268-401k	$231-364k	30-45%
Water	$18,000	$211-317k	$193-299k	60-95%
Sewer	$18,000	$286-429k	$268-411k	84-128%

Growth Related Infrastructure

Of the total $4.7M of capital projects identified in the 10 Year Plan approximately $900k was identified as being attributed to growth. This compares to the approximately $350k that are currently available in the DCC reserve. Approximately $715k of the $900k is related to sewer infrastructure (Dogwood and 17th Ave lift stations) and the remaining $185k is related to a water reservoir replacement.

The existing DCC bylaw (2004) currently identifies the following charges for single family residential.

Roads – $571 per dwelling

Water – $607 per dwelling

Sewer - $1541 per dwelling

The growth review undertaken as part of this project identified potential development of between 25 to 50 dwellings over the next 10 years. This would yield approximately $40-$80k for the sewer fund and $15k-30k to the water fund over the 10 years is well short of the growth-related capital identified in the 10-Year Capital Plan.

Since the replacement of both the Dogwood and the 17th Ave lift stations is primarily due to condition the Village has little choice but to replace these assets regardless of whether future growth occurs. The Village should consider an update to their DCC rates to ensure that the growth-related costs are eventually recovered.

If a large development is proposed that triggers infrastructure upgrades to be completed sooner than scheduled in the 10-Year Capital Plan then the Village could explore the possibility of a late comer agreement or a comprehensive development agreement with that specific developer.

FINANCIAL MODEL

Using the base assumptions provided and the 10-Year Capital Plan, a financial model was developed and 2 scenarios were considered. Scenario 1 assumed that no increases would be applied to taxation or user fees other than to meet inflation. Scenario 2 assumed that revenues would be increased over the next 10 years to target the lower ranges to sustainably fund asset management as identified in the AMIP.

Scenario 1 – No Increases to User Fees or Taxation

General Fund

The 10-Year Capital Plan identifies approximately $650k in projects attributed to the General Fund. The Village currently has an un-restricted reserve balance of $2.53M. Under the scenario of no taxation increases to fund asset management the Village could choose to rely on their reserves funds to accomplish the projects identified. The reserve balance would be reduced to $2.25 at the end of the 10 years.

Sewer Fund

The 10-Year Capital Plan identifies approximately $3.0M in projects attributed to the Sewer Fund. The Village currently has an un-restricted reserve balance of $135k. Under the scenario of no increases to user fees (other than inflation) and assuming that the grant application for the Dogwood L/S is successful the Village would be deplete their reserves funds and would still require about $800k in new debt to accomplish the projects identified and would have insufficient revenues to cover the debt servicing costs. If the Dogwood application is unsuccessful the amount of debt required would increase to approximately $2.6M.

Water Fund

The 10-Year Capital Plan identifies approximately $1.0M in projects attributed to the Water Fund. The Village currently has an un-restricted reserve balance of $106k. Under the scenario of no increases to user fees (other than inflation) the Village would deplete their reserves and require an additional $850k in borrowing to complete the projects identified and would have insufficient revenues to cover the new debt servicing costs..

A detailed printout of the model results for scenario 1 is attached.

Scenario 2 – Increase Taxation and User Fees to Fund Asset Management

General Fund

The 10-Year Capital Plan identifies approximately $650k in projects attributed to the General Fund. The Village currently has an un-restricted reserve balance of $2.53M. Under the scenario of increasing taxation to meet the minimum sustainable asset management levels the Village would require an annual tax increase dedicated to capital of approximately 2.5% per year for the next 10 years.

Sewer Fund

The 10-Year Capital Plan identifies approximately $3.0M in projects attributed to the Sewer Fund. The Village currently has an un-restricted reserve balance of $135k. Under the scenario of user fee increases to meet the minimum sustainable asset management levels and assuming that the grant application for the Dogwood L/S is successful the Village would require annual user fee increases of approximately 5% per year over the next 10 years. Under this new debt of approximately $600k would still be required. If the Dogwood L/S grant is unsuccessful new debt of approximately $2.4M would be required.

Water Fund

The 10-Year Capital Plan identifies approximately $1.0M in projects attributed to the Water Fund. The Village currently has an un-restricted reserve balance of $106k. Under the scenario of user fee increases to meet the minimum sustainable asset management levels the Village would require annual user fee increases of approximately 4% per year over the next 10 years. Under this scenario approximately $400k of new debt would be required to complete the identified projects.

A detailed printout of the model results for scenario 2 is attached.

CONCLUSIONS

The Village of Valemount, like many communities in BC, is challenged to fund the replacement of it's aging infrastructure. Traditionally communities have only funded operating expenses and minor upgrades. This approach seemed to work well when infrastructure was mostly new and replacements were decades away. However, as major infrastructure reaches the end of its useful life and grant funding from higher levels of government becomes scarce, communities are now being forced to evaluate their long-term funding strategies.

The Village of Valemount has identified approximately $4.65M of capital projects that need to completed over the next decade. This level of funding is likely to be the new normal for the Village as its infrastructure continues to age and requires replacement.

To accomplish the 10-Year Capital Plan and to ensure the long-term financial sustainability of its water, sewer, and roads systems the Village will have little choice but to increase its revenues from taxation and user fees. The financial model prepared for this project has identified that the following increases would be financially prudent:

General Taxation – 2.5% annually for the next 10 years dedicated for capital replacements plus 3% inflation (COLA).

Water User Fees - 4% annually for the next 10 years dedicated for capital replacements plus 3% inflation (COLA).

Sewer User Fees - 5% annually for the next 10 years dedicated for capital replacements plus 3% inflation (COLA).

In addition, this review has identified that the current DCC levels are not sufficient to recover the growth-related costs identified in the 10-Year Capital Plan. An update to these charges is recommended.

General Fund	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Choose Projects Scenario											
Scenario 1	$ -	$ -	$ 240,000	$ 135,000	$ 75,000	$ 200,000	$ -	$ -	$ -	$ -	$ -
Current Year Revenues											
Available Transfers from Operating to Capital	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000
Additional Revenue From Dedicated Tax Increase	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
AM Parcel Tax	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
New Debt Servicing	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Other Adjustments (+/-)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Available for Capital	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000
Financing Activities											
Current Revenues	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000
New Debt		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
DCC reserves	$ -	$ -		$ -	$ -	$ -		$ -	$ -	$ -	$ -
Grants	$ -	$ -	$ -			$ -	$ -	$ -	$ -	$ -	$ -
Total Financing	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000
Transfers											
Transfer to/from Reserves	37,000	37,000	(203,000)	(98,000)	(38,000)	(163,000)	37,000	37,000	37,000	37,000	37,000
Starting DCC Reserve Balance	101,000	101,000	101,000	101,000	101,000	101,000	101,000	101,000	101,000	101,000	101,000
Starting Un-Restricted Reserve Balance	2,530,000	2,567,000	2,604,000	2,401,000	2,303,000	2,265,000	2,102,000	2,139,000	2,176,000	2,213,000	2,250,000

Sewer Fund	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Choose Projects Scenario											
Scenario 1	$ 2,000,000	$ 50,000	$ -	$ 900,000	$ -	$ -	$ -	$ -	$ -	$ 20,000	$ -
Current Year Revenues											
Available Transfers from Operating to Capital	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000
Additional Revenue From Dedicated Tax Increase	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
AM Parcel Tax	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
New Debt Servicing	$ -	$ -	$ -	$ (48,000)	$ (48,000)	$ (48,000)	$ (48,000)	$ (48,000)	$ (48,000)	$ (48,000)	$ (48,000)
Other Adjustments (+/-)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Available for Capital	$ 18,000	$ 18,000	$ 18,000	$ (30,000)	$ (30,000)	$ (30,000)	$ (30,000)	$ (30,000)	$ (30,000)	$ (30,000)	$ (30,000)
Financing Activities											
Current Revenues	$ 18,000	$ 18,000	$ 18,000	$ (30,000)	$ (30,000)	$ (30,000)	$ (30,000)	$ (30,000)	$ (30,000)	$ (30,000)	$ (30,000)
New Debt	$ -	$ -	$ -	$ 800,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -
DCC reserves	$ 182,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Grants	$ 1,800,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Financing	$ 2,000,000	$ 18,000	$ 18,000	$ 770,000	$ (30,000)	$ (30,000)	$ (30,000)	$ (30,000)	$ (30,000)	$ (30,000)	$ (30,000)
Transfers											
Transfer to/from Reserves	0	(32,000)	18,000	(130,000)	(30,000)	(30,000)	(30,000)	(30,000)	(30,000)	(50,000)	(30,000)
Starting DCC Reserve Balance	$ 182,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Starting Un-Restricted Reserve Balance	135,000	135,000	103,000	121,000	(9,000)	(39,000)	(69,000)	(99,000)	(129,000)	(159,000)	(209,000)

Water Fund	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Choose Projects Scenario											
Scenario 1	$ -	$ -	$ -	$ -	$ -	$ 750,000	$ 280,000	$ -	$ -	$ -	$ -
Current Year Revenues											
Available Transfers from Operating to Capital	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000
Additional Revenue From Dedicated Tax Increase	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
AM Parcel Tax	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
New Debt Servicing	$ -	$ -	$ -	$ -	$ -	$ (30,000)	$ (51,000)	$ (51,000)	$ (51,000)	$ (51,000)	$ (51,000)
Other Adjustments (+/-)	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 22,000**	**$ 22,000**	**$ 22,000**	**$ 22,000**
Total Available for Capital	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ (12,000)	$ (33,000)	$ (11,000)	$ (11,000)	$ (11,000)	$ (11,000)
Financing Activities											
Current Revenues	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ (12,000)	$ (33,000)	$ (11,000)	$ (11,000)	$ (11,000)	$ (11,000)
New Debt	**$ -**	**$ -**		**$ -**	**$ -**	**$ 500,000**	**$ 350,000**	**$ -**	**$ -**	**$ -**	**$ -**
DCC reserves	**$ -**	**$ -**		**$ -**	**$ -**	**$ 65,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Grants	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Total Financing	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 553,000	$ 317,000	$ (11,000)	$ (11,000)	$ (11,000)	$ (11,000)
Transfers											
Transfer to/from Reserves	18,000	18,000	18,000	18,000	18,000	(197,000)	37,000	(11,000)	(11,000)	(11,000)	(11,000)
Starting DCC Reserve Balance	$ 65,000	$ 65,000	$ 65,000	$ 65,000	$ 65,000	$ 65,000	$ -	$ -	$ -	$ -	$ -
Starting Un-Restricted Reserve Balance	106,000	124,000	142,000	160,000	178,000	196,000	(1,000)	36,000	25,000	14,000	3,000

General Fund	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Choose Projects Scenario											
Scenario 2	$ -	$ -	$ 240,000	$ 135,000	$ 75,000	$ 200,000	$ -	$ -	$ -	$ -	$ -
Current Year Revenues											
Available Transfers from Operating to Capital	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000	$ 37,000
Additional Revenue From Dedicated Tax Increase	$ 19,500	$ 39,488	$ 59,975	$ 80,974	$ 102,498	$ 124,561	$ 147,175	$ 170,354	$ 194,113	$ 218,466	$ 243,428
AM Parcel Tax	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
New Debt Servicing	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Other Adjustments (+/-)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Available for Capital	$ 56,500	$ 76,488	$ 96,975	$ 117,974	$ 139,498	$ 161,561	$ 184,175	$ 207,354	$ 231,113	$ 255,466	$ 280,428
Financing Activities											
Current Revenues	$ 56,500	$ 76,488	$ 96,975	$ 117,974	$ 139,498	$ 161,561	$ 184,175	$ 207,354	$ 231,113	$ 255,466	$ 280,428
New Debt		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
DCC reserves	$ -	$ -		$ -	$ -	$ -		$ -	$ -	$ -	$ -
Grants	$ -	$ -	$ -			$ -	$ -	$ -	$ -	$ -	$ -
Total Financing	$ 56,500	$ 76,488	$ 96,975	$ 117,974	$ 139,498	$ 161,561	$ 184,175	$ 207,354	$ 231,113	$ 255,466	$ 280,428
Transfers											
Transfer to/from Reserves	56,500	76,488	(143,025)	(17,026)	64,498	(38,439)	184,175	207,354	231,113	255,466	280,428
Starting DCC Reserve Balance	101,000	101,000	101,000	101,000	101,000	101,000	101,000	101,000	101,000	101,000	101,000
Starting Un-Restricted Reserve Balance	2,530,000	2,586,500	2,662,988	2,519,962	2,502,936	2,567,435	2,528,996	2,713,170	2,920,525	3,151,638	3,407,104

Sewer Fund	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Choose Projects Scenario											
Scenario 2	$ 2,000,000	$ 50,000	$ -	$ 900,000	$ -	$ -	$ -	$ -	$ -	$ 20,000	$ -
Current Year Revenues											
Available Transfers from Operating to Capital	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000
Additional Revenue From Dedicated Tax Increase	$ 18,500	$ 37,925	$ 58,321	$ 79,737	$ 102,224	$ 125,835	$ 150,627	$ 176,659	$ 203,991	$ 232,691	$ 262,826
AM Parcel Tax	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
New Debt Servicing	$ -	$ -	$ -	$ (36,000)	$ (36,000)	$ (36,000)	$ (36,000)	$ (36,000)	$ (36,000)	$ (36,000)	$ (36,000)
Other Adjustments (+/-)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Available for Capital	$ 36,500	$ 55,925	$ 76,321	$ 61,737	$ 84,224	$ 107,835	$ 132,627	$ 158,659	$ 185,991	$ 214,691	$ 244,826
Financing Activities											
Current Revenues	$ 36,500	$ 55,925	$ 76,321	$ 61,737	$ 84,224	$ 107,835	$ 132,627	$ 158,659	$ 185,991	$ 214,691	$ 244,826
New Debt	$ -	$ -	$ -	$ 600,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -
DCC reserves	$ 182,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Grants	$ 1,800,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Financing	$ 2,018,500	$ 55,925	$ 76,321	$ 661,737	$ 84,224	$ 107,835	$ 132,627	$ 158,659	$ 185,991	$ 214,691	$ 244,826
Transfers											
Transfer to/from Reserves	18,500	5,925	76,321	(238,263)	84,224	107,835	132,627	158,659	185,991	194,691	244,826
Starting DCC Reserve Balance	$ 182,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Starting Un-Restricted Reserve Balance	135,000	153,500	159,425	235,746	(2,516)	81,708	189,543	322,170	480,829	666,820	861,511

Water Fund	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Choose Projects Scenario											
Scenario 2	$ -	$ -	$ -	$ -	$ -	$ 750,000	$ 280,000	$ -	$ -	$ -	$ -
Current Year Revenues											
Available Transfers from Operating to Capital	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000
Additional Revenue From Dedicated Tax Increase	$ 12,800	$ 26,112	$ 39,956	$ 54,355	$ 69,329	$ 84,902	$ 101,098	$ 117,942	$ 135,460	$ 153,678	$ 172,625
AM Parcel Tax	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
New Debt Servicing	$ -	$ -	$ -	$ -	$ -	$ (12,000)	$ (24,000)	$ (24,000)	$ (24,000)	$ (24,000)	$ (24,000)
Other Adjustments (+/-)	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 22,000**	**$ 22,000**	**$ 22,000**	**$ 22,000**
Total Available for Capital	$ 30,800	$ 44,112	$ 57,956	$ 72,355	$ 87,329	$ 90,902	$ 95,098	$ 133,942	$ 151,460	$ 169,678	$ 188,625
Financing Activities											
Current Revenues	$ 30,800	$ 44,112	$ 57,956	$ 72,355	$ 87,329	$ 90,902	$ 95,098	$ 133,942	$ 151,460	$ 169,678	$ 188,625
New Debt	**$ -**	**$ -**		**$ -**	**$ -**	**$ 200,000**	**$ 200,000**	**$ -**	**$ -**	**$ -**	**$ -**
DCC reserves	**$ -**	**$ -**		**$ -**	**$ -**	**$ 65,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Grants	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Total Financing	$ 30,800	$ 44,112	$ 57,956	$ 72,355	$ 87,329	$ 355,902	$ 295,098	$ 133,942	$ 151,460	$ 169,678	$ 188,625
Transfers											
Transfer to/from Reserves	30,800	44,112	57,956	72,355	87,329	(394,098)	15,098	133,942	151,460	169,678	188,625
Starting DCC Reserve Balance	$ 65,000	$ 65,000	$ 65,000	$ 65,000	$ 65,000	$ 65,000	$ -	$ -	$ -	$ -	$ -
Starting Un-Restricted Reserve Balance	106,000	136,800	180,912	238,868	311,223	398,552	4,454	19,552	153,494	304,954	474,632

APPENDIX H

VISUALIZATION TOOL

Risk Assessment & Asset Replacement Forecast

Risk Rating
High Medium Low N/A

Length By Risk Class

Asset System	Risk Rating	
Roadway	N/A	32,483m
Wastewater	High	207m
	Medium	705m
	Low	18,061m
Water	Medium	5,192m
	Low	18,588m

NOTES:

- Replacement costs listed for roadways only includes surface costs.
- Water replacement costs include the cost of the mains as well as services, hydrants and valves.
- Wastewater replacement costs include the cost gravity / pressure mains as well as services and manholes.

Filter by asset system:
(All)

Overall Replacement Forecast *(Hover over any of the points in the chart for detailed asset costs. **Red points** indicate years replacment costs exceed the Average Annual Life Cycle Investment (AALCI).)*