Town of RENFREW
ONTARIO · CANADA

ASSET MANAGEMENT PLAN

2022

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Executive Summary

The Town of Renfrew is updating its 2014 Asset Management Plan (AMP) in alignment with the Town's Strategic Asset Management Corporate Policy (Policy # C31) and **O. Reg. 588/17: Asset Management Planning for Municipal Infrastructure**.

Overview of the AMP

The Introduction (Section 1) presents an overview of key concepts of asset management such as the State of Local Infrastructure, Levels of Service, Risk Assessment and Lifecycle Activities, concluding with a Roadmap with Next Steps. The next section presents Growth (Section 2) which aligns with related studies that were undertaken concurrently with the AMP update, specifically the Development Charges Study, Water and Wastewater Rate Study and Water Financial Plan.

The core assets included in the AMP are:

- Water Assets (Section 3)
- Water Vertical Assets (Section 4)
- Wastewater Assets (Section 5)
- Wastewater Vertical Assets (Section 6)
- Stormwater Management Assets (Section 7)
- Stormwater Management Culverts (Section 8)
- Road Assets (Section 9)
- Bridges & Culverts (Section 11)

The non-core assets included in the AMP are:

- Sidewalks (Section 10)
- Buildings (Section 12)
- Fleet (Section 13)
- Waste (Section 14)
- Other Assets – Play structures and Natural Assets (Section 15)

Policy Alignment

The AMP update aligns with the Town's Strategic Asset Management Policy (Policy # C31), which includes the asset management vision and strategic alignment.

Asset Management Vision: Our vision is to maintain a safe community with sustainable growth, requires alignment of the many initiatives underway in our organization at any given time in order for it to be achieved.

This alignment is necessary to properly consider whether the level of service provided by our existing and planned assets is congruent and supports our vision.

Strategic Alignment: Asset management planning will not occur in isolation from other goals, plans and policies of the Town of Renfrew.

An integrated approach will be followed to successfully develop practical asset management plans that align with the overarching accountabilities and aspirations of the community.

The elements of our asset management planning approach keep us mindful of the goals described in our Official Plan and Purchasing Policy, as they influence our Asset Management Plan and our long-term financial planning.

Regulatory Alignment

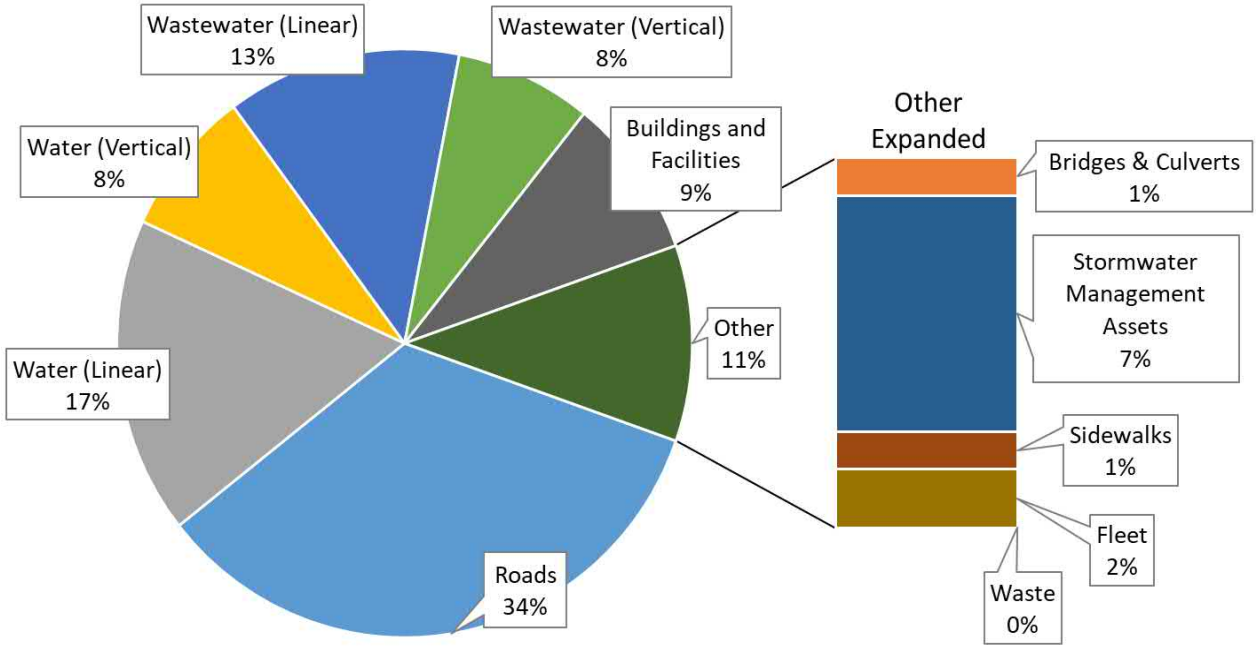
The 2022 AMP update is aligned with the requirements of **O. Reg. 588/17: Asset Management Planning for Municipal Infrastructure** and as amended by O. Reg. 193/21 which requires all core assets to be covered in the asset management plan with current Level of Service (LOS). Core assets include roads, bridges/culverts and stormwater. This update also includes non-core assets such as buildings, fleet and emergency services as well as proposed LOS, lifecycle management and financial strategy for a 10-year period to achieve the proposed LOS.

This AMP includes the requirements for core assets and current levels of service. Underway is the development of proposed (target) levels of service and the financing strategy to meet the proposed levels of service.

Future updates will need to include green infrastructure assets (i.e. natural assets) owned by the Town and further assessment on infrastructure vulnerability to the impacts of climate change.

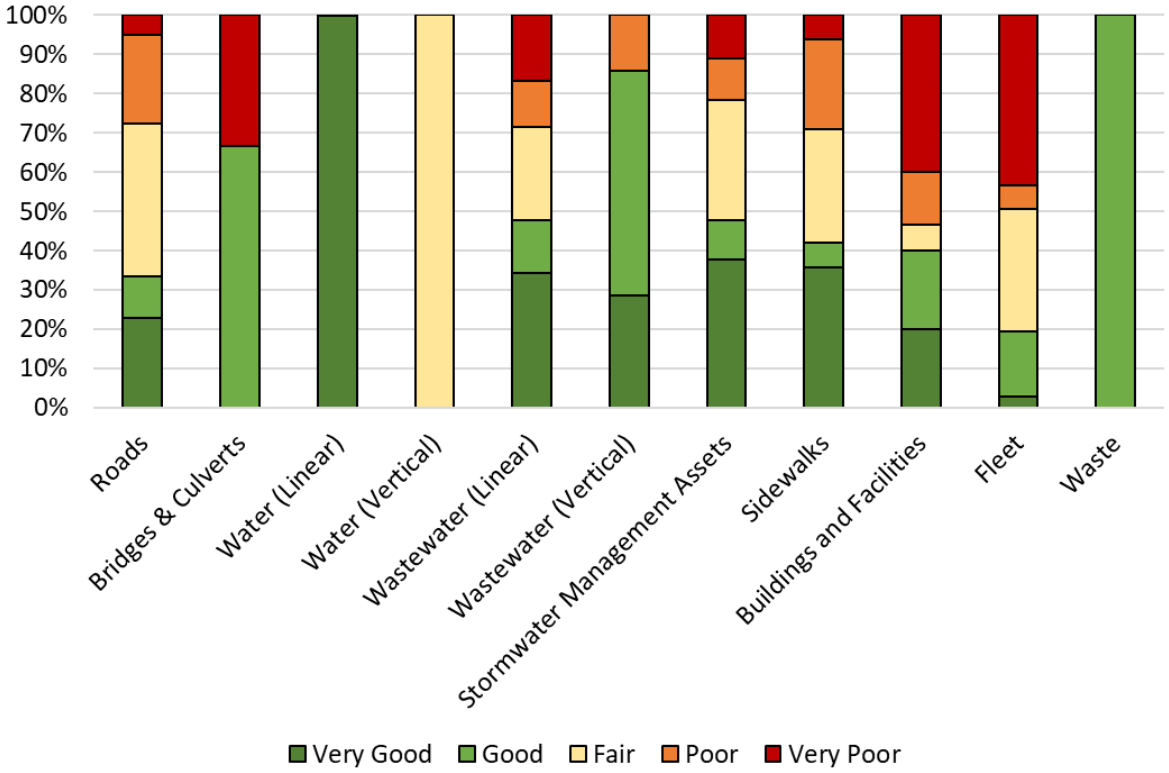
Current Replacement Value and Condition

The total replacement cost for the Town of Renfrew's infrastructure assets is $556 million (in 2022 dollars). The distribution of this replacement cost is shown below.



On average, 28% of the Town's infrastructure assets have a condition rating of Very Good, 29% have a condition rating of Good, 20% have a condition rating of Fair, 11% have a condition rating of Poor, and 18% have a condition rating of Very Poor.

The current condition of each of the asset categories is presented in the figure below.

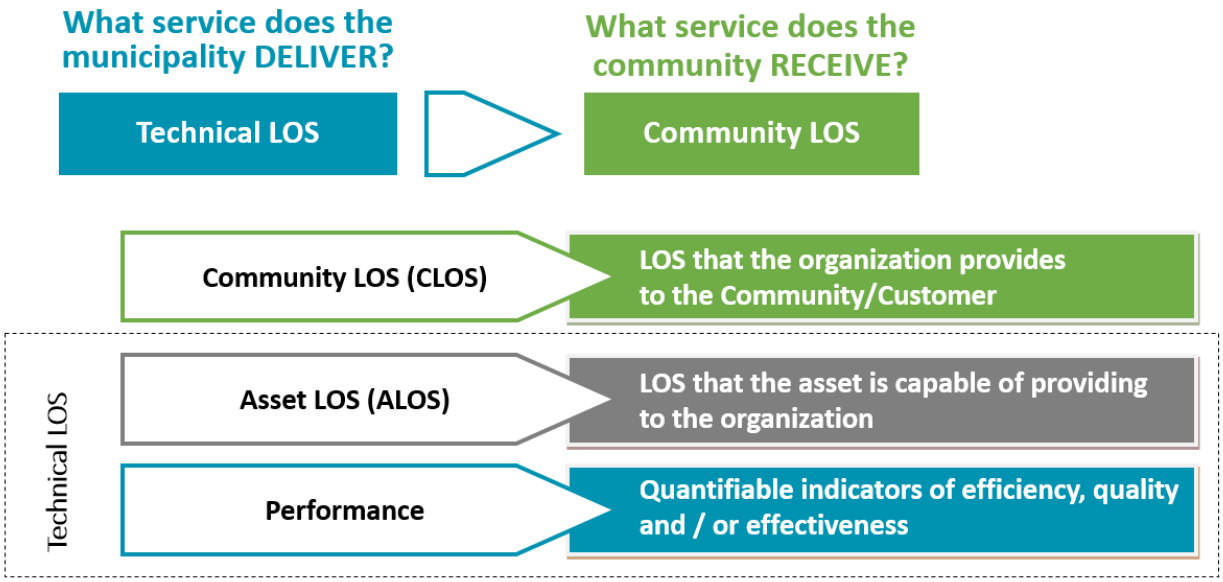


Levels of Service (LOS)

The current and proposed levels of service are described in terms of technical metrics and qualitative descriptions for each asset type. These descriptions are prescribed for core assets (including water, wastewater, stormwater, roads, and bridges and culverts) within Ontario Regulation (O.Reg.) 588/17.

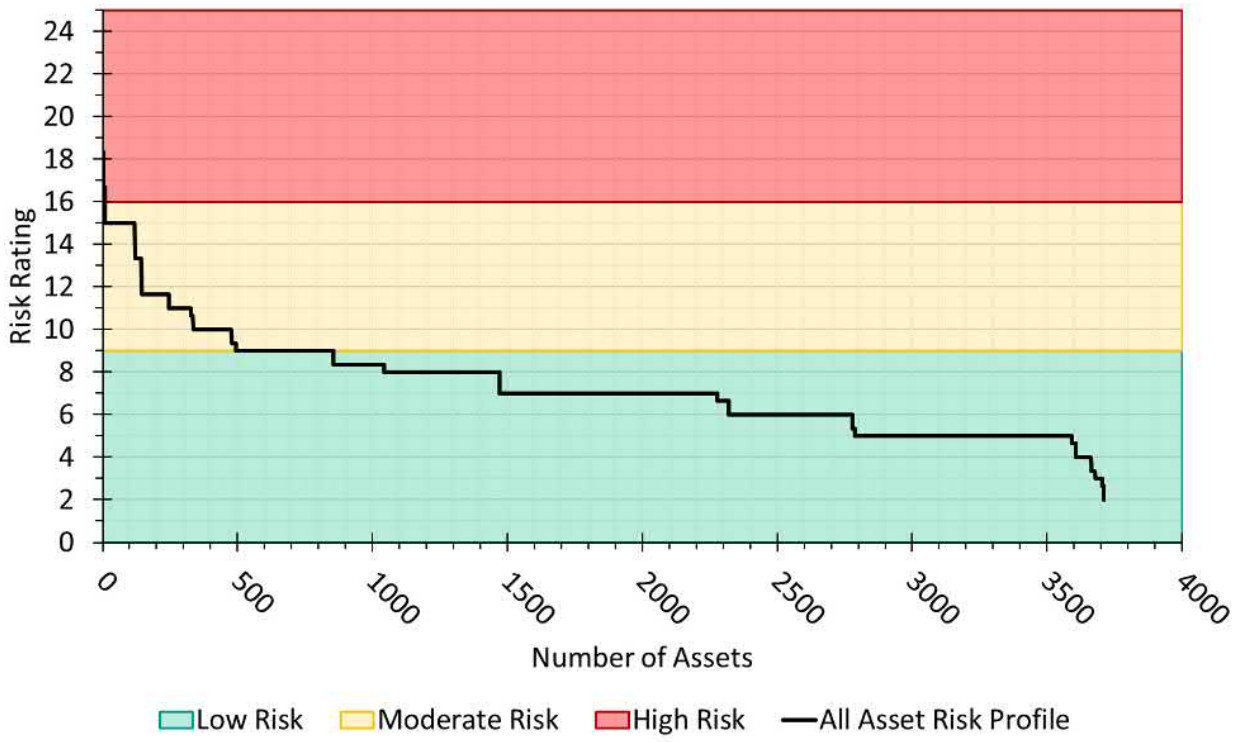
Levels of Service (LOS) are presented in the figure below and defined as follows:

- **Community LOS**: LOS that the organization provides to the community, intended to be customer-focused, providing a qualitative description of scope and quality.
- **Technical LOS**: LOS that the asset is capable of providing to the Town which is further measured by the performance of the asset, providing technical metrics that support the delivery of LOS.



Risk Profile

Of the 3700 assets tracked within the Town, eight assets are considered high risk all of which are Stormwater assets. This represents 0.2% of the total amount of assets. An additional 13% of the assets are within the moderate range, and the majority of assets, 86%, are considered low risk.



Acknowledgements

The consulting team would like to express our appreciation to Renfrew staff and Council for their cooperation and input to this update. We acknowledge their commitment and flexibility to contribute to this project despite the challenges brought into daily operations as a result of the global pandemic.

Asset Management Steering Committee

- Michel Asselin, Director, Infrastructure and Public Works
- Erin Broome, Treasurer
- Mitchell Ferguson, Deputy Treasurer
- Connor Jamieson, Engineering Technician
- Jordan Wall, Director, Parks and Recreation

Project Team

- Tyler Armstrong, Environmental Engineering Officer(to 2022)
- Amanda Springer, Environmental Officer
- Kim Bulmer, Director of Strategic Initiatives
- Jo-anne Caldwell, Recreation Program Developer
- Kevin Hill, Director, Parks and Recreation (to 2022)
- Keray O'Reilly, Treasurer (to 2022)
- Kelly Thompson, CEO Chief Librarian

- Rick Trahan, Foreman (to 2021)
- Bill Butler, Foreman
- Gerard Hanniman, Assistant Foreman
- Kevin Welsh, Fire Chief (to 2022)
- Mike Guest, Director of Fire and Emergency Services
- Eric Withers, Director of Planning and Development

About this Report

Dillon Consulting Limited was retained by the Town of Renfrew to conduct an update to their Asset Management Plan to meet the requirements of **O. Reg. 588/17: Asset Management Planning for Municipal Infrastructure** and as amended by **O. Reg. 193/21**.

Consulting Team

- Darla Campbell, Project Manager
- Kaelee Oxford, Technical Lead
- Jeffrey Tweedle, Analyst
- Jeff Probert, Coordinator
- Nick Larson, Ontario Clean Water Agency, WTP and WPCC
- Byron Tan, Watson and Associates Economists Ltd., Financial Strategy

1.0 Introduction

The Town of Renfrew (Town) is updating its 2014 Asset Management Plan (AMP) in alignment with the Town's Strategic Asset Management Corporate Policy (Policy # C31) and **O. Reg. 588/17: Asset Management Planning for Municipal Infrastructure**.

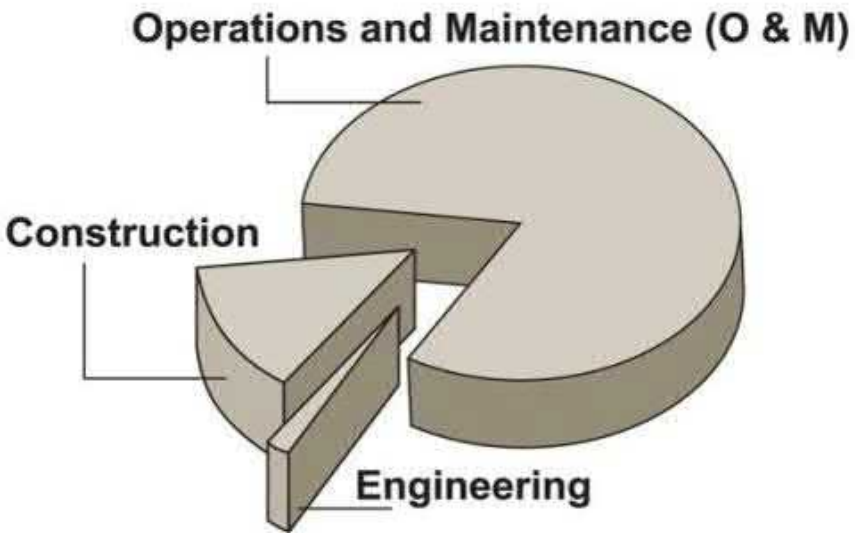
The AMP documents the Town's assets and strategies based on known information at the time of writing the report. It is a snapshot of a period in time, in this case, in 2022. Assets will continue to deteriorate, and investments will be required to improve the condition and extend the useful life of the infrastructure, to meet the "fit for purpose" measure of the assets in delivery of the services and meeting (or moving towards) the proposed levels of service established for the Town.

Asset Management Overview

Asset management is a process of making the best possible decisions regarding the creation, maintenance, renewal, rehabilitation, disposal, expansion, and procurement of infrastructure assets. The objective of asset management is to maximize the benefits of the assets, minimize risk and provide satisfactory levels of service to the public in a sustainable manner. It considers risks related to the lifecycle of the assets and requires a multi-disciplinary team of planning, finance, engineering, technology, maintenance, and operations.

Asset management considers the full lifecycle of the infrastructure, not just the initial cost for designing and constructing the asset (20%), but the operations and maintenance each and every year (80%). See **Figure 1-1**

Figure 1-1: Lifecycle Approach (Infraguide 2005)

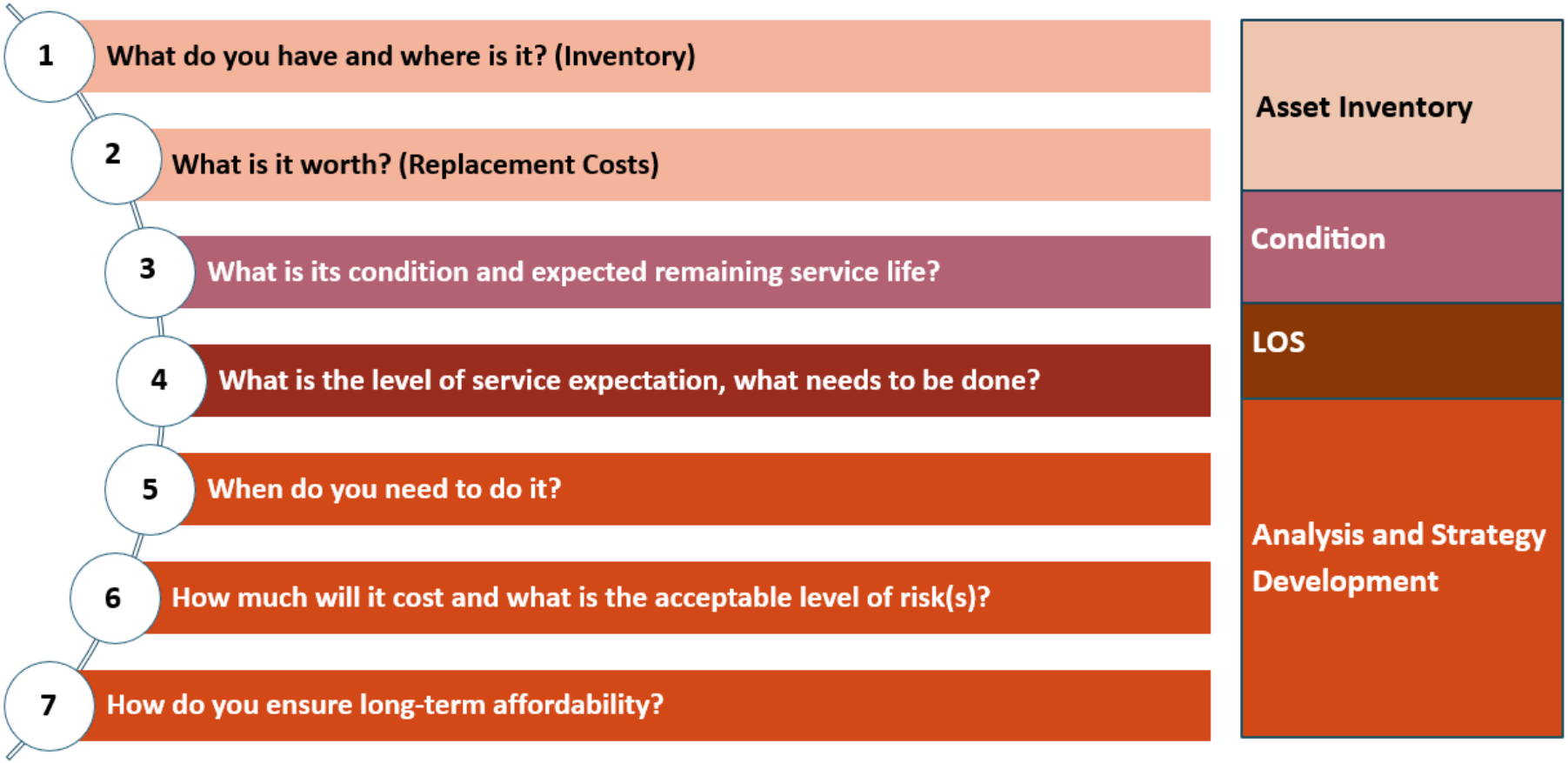


The essential questions for asset management, as described in the *InfraGuide: Managing Infrastructure Assets (Oct 2005)*, are:

1. What do you have and where is it?
2. What is it worth?
3. What is its condition and expected remaining service life?
4. What is the level of service expectation, and what needs to be done?
5. When do you need to do it?
6. How much will it cost and what is the acceptable level of risk(s)?
7. How do you ensure long-term affordability?

These seven essential questions align to four phases of asset management: asset inventory, condition, levels of service (LOS) and analysis and strategy development. See **Figure 1-2**.

Figure 1-2: Essential Questions of Asset Management



Overview of the AMP

This introduction includes an overview of key asset management principles: State of Local Infrastructure, Levels of Service, Risk Assessment and Lifecycle Activities. The introduction concludes with a Roadmap with Next Steps. The next section presents Growth (Section 2) which aligns with related studies that were undertaken concurrently with the AMP update, specifically the Development Charges Study, Water and Wastewater Rate Study and Water Financial Plan.

The core assets included in the AMP are:

- Water (Sections 3 and 4)
- Wastewater (Sections 5 and 6)
- Stormwater (Sections 7 and 8)
- Roads (Section 9)
- Bridges and Culverts (Section 11)

The non-core assets included in the AMP are:

- Sidewalks (Section 10)
- Buildings (Section 12)
- Fleet (Section 13)
- Waste (Section 14)
- Other Assets (Section 15)

Each asset category presents the following topics:

1. State of Local Infrastructure
2. Condition
3. Current Levels of Service
4. Current Performance
5. Risk Assessment
6. Lifecycle Activities
7. Asset Management Strategy

Policy Alignment

The AMP update aligns with the Town's Strategic Asset Management Policy (Policy # C31), which includes the asset management vision and strategic alignment.

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The elements of our asset management planning approach keep us mindful of the goals described in our Official Plan and Purchasing Policy, as they influence our Asset Management Plan and our long term financial planning.

Regulatory Alignment

The 2022 AMP is an update to the 2014 AMP which requires alignment with the new regulation, **O. Reg. 588/17: Asset Management Planning for Municipal Infrastructure**. The regulation requires the following four phases of compliance:

1. By July 2019: Municipalities to have a strategic asset management policy.
2. By July 2022: All core assets to be covered in the asset management plan with current Level of Service (LOS). Core assets include water, wastewater, stormwater, roads, and bridges/culverts.
3. By July 2024: All assets owned by the municipality to be covered in the AMP. Non-core assets include buildings, fleet and equipment as well as green infrastructure assets.
4. By July 2025: Municipalities will have approved proposed LOS and the lifecycle management and financial strategy for 10-year period to achieve the proposed LOS.

This AMP includes the requirements for core assets and current levels of service. Underway is the development of proposed (target) levels of service and the financing strategy to meet the proposed levels of service.

Future updates will need to include green infrastructure assets (i.e. natural assets) owned by the Town and further assessment on infrastructure vulnerability to the impacts of climate change.

1.1 State of Local Infrastructure

Each section on the State of Local Infrastructure sets out the following:

- a summary of the assets in the category
- the replacement cost of the assets in the category

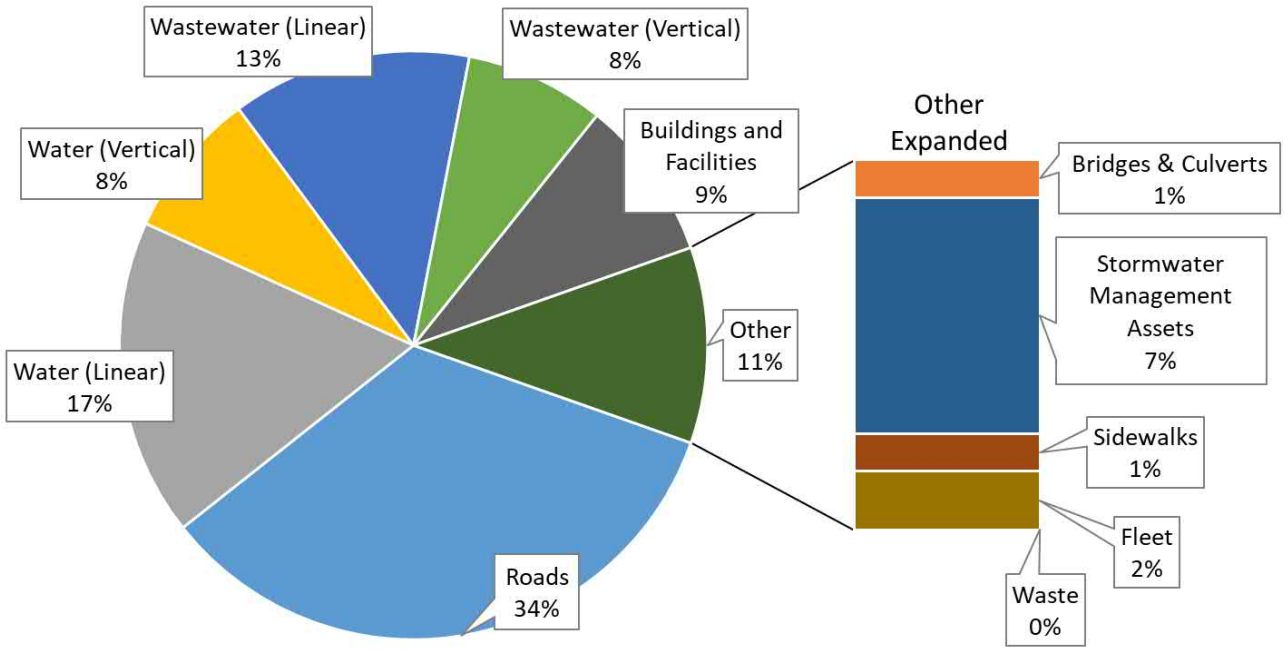
- the average age of the assets in the category, determined by assessing the average age of the components of the assets
- the information available on the condition of the assets in the category
- a description of the Town's approach to assessing the condition of the assets in the category, based on recognized and generally accepted good engineering practices where appropriate

The Town of Renfrew owns infrastructure assets that provide services in the following asset categories: Roads; Bridges and Culverts; Water; Wastewater; Stormwater; Buildings; Fleet; Waste; and Sidewalks.

1.1.1 Asset Replacement Costs

The total replacement cost for the Town of Renfrew's infrastructure assets is $556 million (in 2022 dollars). The distribution of this replacement cost is shown in **Figure 1-3**.

Figure 1-3: Distribution of Replacement Costs

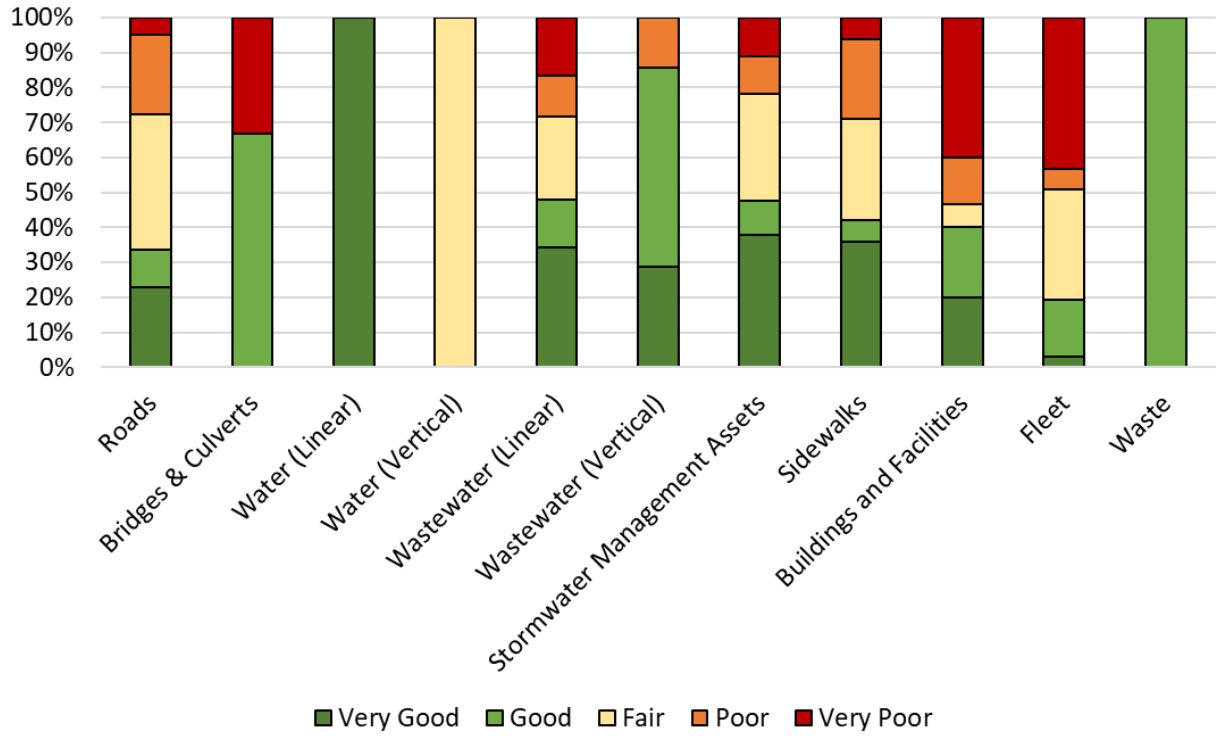


Details regarding estimation of asset replacement costs are provided within the respective asset sections.

1.1.2 Asset Condition Summary

A summary of the condition for each of the Town of Renfrew's infrastructure assets is shown in **Figure 1-4**. On average, 28% of the Town's infrastructure assets have a condition rating of Very Good, 29% have a condition rating of Good, 20% have a condition rating of Fair, 11% have a condition rating of Poor, and 18% have a condition rating of Very Poor.

Figure 1-4: Summary of Condition of All Infrastructure Assets



1.1.3 Asset Hierarchy

The asset hierarchy defines the tiers of asset componentry. Each type of asset, both point and linear, can have its assets defined and inventoried at a high level, or with increased component detail. The data being used for completion of the Asset Management Plan (AMP) is itemized to the 'asset' level. An example of the hierarchy for water linear assets is shown in **Table 1-1**. The assets have been defined with their category, assets, components, and subcomponents.

Table 1-1: Asset Hierarchy Example

Category	Asset	Component	Subcomponent
Water Network	Watermains	Air Relief Chamber Blow-Off Curbstop Blow Off Curbstop Hydrants Meter Pits Meters Services Valve Chambers	
	Watermains	Valves	Butterfly Valve Single Line Drain Valve Combination Air Release and Vacuum Valve

For this Asset Management Plan (AMP), the analysis will focus on assets at the 'asset' level for the linear assets, with the expectation that the condition and replacement of the components and subcomponents will be consistent with the linear mains. This is predicated on the assumption that all other elements included in the system are required componentry that will be replaced in conjunction with the linear components and are expected to have similar lifespans and conditions as the linear components.

Buildings and facilities are considered complex assets. Complex assets are classified as assets which have various components which will be considered within the AMP. The components that will be included in the AMP are described in the buildings and facilities section of this report.

1.1.4 Asset Inventory

The inventory includes assets that are owned by the Town. The Town maintains a comprehensive database of asset information, including GIS integration. The inventory was compiled prior to initiation of this work and was provided by the Town.

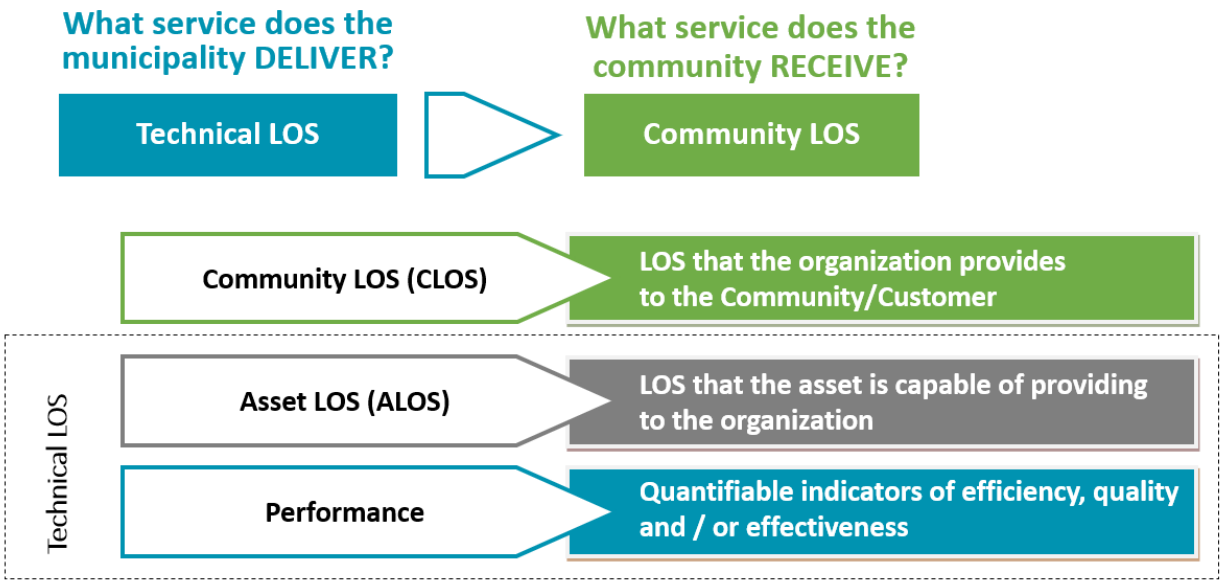
1.2 Levels of Service

The current and proposed levels of service are described in terms of technical metrics and qualitative descriptions for each asset type. These descriptions are prescribed for core assets (including water, wastewater, stormwater, roads, and bridges and culverts) within Ontario Regulation (O.Reg.) 588/17.

Levels of Service (LOS) are presented in **Figure 1-5** and defined as follows:

- **Community LOS**: LOS that the organization provides to the community, intended to be customer-focused, providing a qualitative description of scope and quality.
- **Technical LOS**: LOS that the asset is capable of providing to the Town which is further measured by the performance of the asset, providing technical metrics that support the delivery of LOS.

Figure 1-5: Levels of Service (Community LOS, Technical LOS and Performance)



Through the AMP development, the Town sought to establish current and proposed levels of service (LOS), in accordance with O. Reg. 588/17. As part of this process, the Town undertook education and working sessions with internal stakeholders and provided a survey for public feedback to understand level of service concepts, and gain understanding of public perception of the levels of service.

1.2.1 LOS Workshop

A workshop was held with senior staff from the Town, representing departments including treasury, administration, public works, building and planning, parks and recreation, and emergency services. The workshop was held July 15, 2020, though online delivery.

During the LOS of workshop, the concepts of Levels of Service were discussed, including definition of levels of service, impacts of changes to levels of service, and barriers to delivering the service.

The workshop included discussion regarding current Levels of Service at the Town, conducting individual group discussions to identify important parameters for defining service delivery, and local issues and efficiencies for delivery.

1.2.2 LOS Community Survey

The Town undertook a community survey to receive feedback and information regarding Levels of Service in the community.

The purpose of the community survey was to engage with members of the public about levels of service related to asset management in the Town, such as roads, parks, recreation, buildings, water, sewer, and stormwater. The survey asked the community for input on:

- awareness of the municipal services delivered, and assets used to provide service delivery
- experience with the current levels of service
- preferences for priorities to establish future levels of service

The survey was advertised with a notice in a mail out and was available on the Town's website from March 1, 2022, to March 21, 2022. The community could request a printed copy of the survey or directly participate with the online survey. The survey was completed by 239 respondents.

A summary of the main themes found through the survey results included:

1. **Satisfaction with Services:** The community is generally satisfied with the programs and services provided by the Town.
   The community feels that most of the services listed in this survey do not need improvement at this time. The majority of respondents would like to receive services from the Town at a "family diner" level of service, with medium cost.
2. **Willingness to Pay**: Overall, majority of residents are willing to pay an increase or slight increase in fees to maintain the current levels of services. The respondents indicated a preference to maintain current service (likely pay more).

3. **Priorities for Funding:** Respondents were asked to identify their priorities for funding, as an overall indication of importance of the services. The services that should be prioritized for funding are transportation services, drinking water, winter control, and fire and emergency services.

   The respondents identified quality and energy efficiency as priority attributes for service delivery.

4. **Preferences Identified:** When asked to choose between two options, respondents preferred smoother roads, more recreational facilities, more online resources, and expended recycling/organics pick-up.

The full survey results are presented in a Level of Service Survey Report.

1.2.3 Proposed LOS

The proposed Levels of Service (LOS) is an established target for the Town's LOS, set to guide the Town in their current and future asset management. Proposed Levels of Service are a requirement for compliance with O. Reg. 588/17. The Proposed LOS established within this report relates to the target to be achieved in 10 years, the year 2031.

To establish the proposed Levels of Service, the Town established the current level of service, and sought input from Town staff, public (through levels of service survey), and Council to understand the preferred levels of service targets.

Through the process, three scenarios were generally considered for proposed levels of service, each a considering a different level of investment to the infrastructure, and the corresponding impact it will have on the level of service being provided. The scenarios considered included the following:

- No change in funding – LOS would decrease over time
- Increase in funding – LOS would be maintained over time
- Greater increase in funding – LOS would increase over time (increase would vary depending on funding increase)

Direction received from Town staff indicated that the current Levels of Service were generally found to be sufficient, however there are some parameters that can be considered for improved LOS targets. Accordingly, the proposed Levels of Service targets for 2031 have been identified, maintaining the established LOS values from 2022 or slightly improving (rounding up). Proposed Levels of Service are summarized in **Table 1-2**, and described for each asset category in the sections that follow.

Table 1-2: Proposed Levels of Service for 2031

Asset Service	LOS Parameter	LOS Measure	2022 LOS Delivered	Proposed LOS for 2031
Water Treatment Assets	Reliability	Number of connection-days per year where a boil water advisory notice is in place compared to the total number of properties connected to the municipal water system	Zero (0) connection days with boil water advisories required per 3,404 connected properties.	Zero (0) connection days with boil water advisories required per 3,404 connected properties.
Water Distribution Assets	Reliability	Number of connection-days per year due to water main breaks compared to the total number of properties connected to the municipal water system	Zero (0) connection days. 3 to 5 watermain breaks per year per 3,404 connected properties.	Zero (0) connection days. 3 to 5 watermain breaks per year per 3,404 connected properties.
Wastewater Treatment Assets	Reliability	The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system.	Zero effluent violations per 3,404 connected properties.	Zero effluent violations per 3,404 connected properties.
Wastewater Collection	Reliability	The number of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system.	Approximately 10 backups per 3,404 connected properties.	Approximately 10 backups per 3,404 connected properties.
Stormwater	Reliability	Percentage of the municipal stormwater management system resilient to a 5-year storm	To be determined	To be determined
Roads	Quality	Average pavement condition index (PCI)	Fair, (Equivalent PCI: 54)	Fair, (Equivalent PCI: 54)
Sidewalks	Quality	Average condition index	0.56 out of 1	0.6 out of 1
Bridges & Culverts	Quality	Average bridge condition	Good (to be defined as BCI)	Good (to be defined as BCI)

Asset Service	LOS Parameter	LOS Measure	2022 LOS Delivered	Proposed LOS for 2031
Buildings	Customer Satisfaction	# buildings that meet AODA accessibility standards compared with all buildings in portfolio	TBD	100%
Buildings	Quality	Average building condition value	Fair, 3.1 out of 5	Fair, 3.1 out of 5
Fleet	Quality	Average condition description	Fair to Poor, 3.7 out of 5	Fair to Poor, 3.7 out of 5
Waste	Scope	Annual volume of waste through collection services and material drop-off	Volume within operating targets (8,000 tonnes in 2019)	Volume within operating targets

1.2.3.1 Areas of Consideration for Proposed LOS Increase

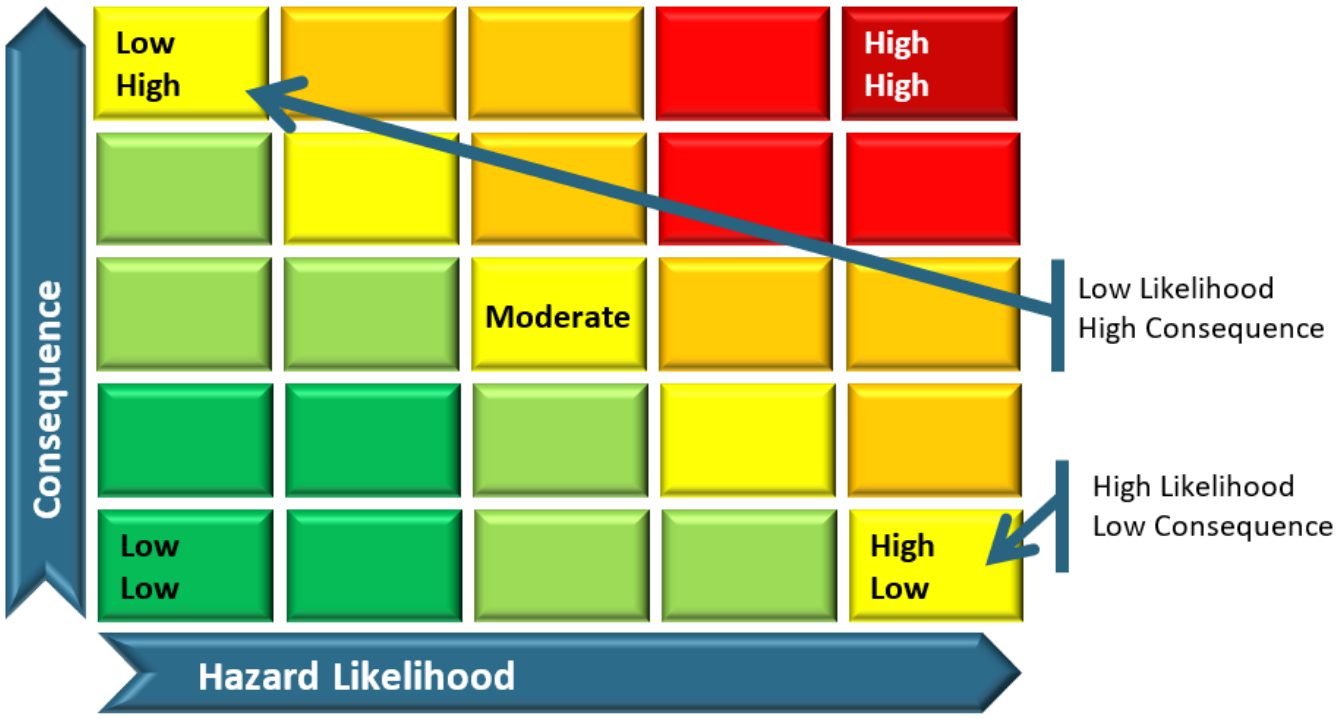
Two areas of service delivery (roads and drinking water) have been identified for consideration of increased proposed LOS, supported by the results of the community LOS survey, and priorities of Council and administration. The proposed LOS would be represented by an increased average condition rating for the roads and would require tracking and improvement on instances of water discolouration for the drinking water treatment and distribution. Additional information related to these are in **Sections 3.9** and **9.9** for roads and water respectively.

1.3 Risk Assessment

In determining the lifecycle activities for each asset category and identifying the priority activities, the risks associated with the options are to be considered. The risk rating for each asset within the asset category generates a risk profile for the entire asset category.

The assets with the highest risk rating identify the priorities for the Town. As part of assessing risk, consider the factors that increase the likelihood of a hazard occurring (or non-delivery of service) and the consequence. **Figure 1-6** presents a risk "heat map" plotting likelihood and consequence.

Figure 1-6: Risk Heat Map



A priority rating has been developed based on the calculated risk rating and displayed in **Figure** 1-6**.** High risks are shown in the red zone (risk rating 17 to 25), Moderate risks are shown in the orange zone (risk ratings of 10 to 16) and Low risks are in the green and yellow zone (risk ratings of 1 to 9).

The approach and methodology to risk assessment is presented in following sections. A risk profile for each asset category is presented in the corresponding sections.

1.3.1 Risk Workshop

A workshop was held with senior staff from the Town, representing all departments including treasury, administration, public works, planning, parks and recreation, and emergency services. The workshop was held April 16, 2021, via online delivery.

The intention of the workshop was to engage with stakeholders and gather qualitative information regarding asset risk within the Town's assets.

During the workshop, the attendees discussed risk topics, as presented within this chapter. The process through which risk is determined was established, followed by examples that related specifically to Town infrastructure.

Discussion included broad discussion of risk related to assets at the Town, determining importance of assets and brainstorming potential hazard scenarios and mitigation.

Discussion occurred centring around the impacts of climate change on risk, and the level of risk imparted on the varying asset categories by the changing climate.

1.3.2 Risk Methodology Approach

Risk assessment was conducted for each of the asset categories within the AMP. The risk ratings for the assets follow the below risk methodology. Specific details and assumptions used in risk calculations by asset category are contained within their respective sections.

Risk is the likelihood and magnitude of a negative scenario (hazard) occurring that limits the ability of the asset to deliver the service. Risk is the consideration of asset failure and the consequence of the failure.

Risk = Likelihood X Consequence

Consequence considers the severity of the impact, vulnerability of the asset and exposure to the negative scenario.

Applying the methodology of a score of 1 to 5 for the hazard and the consequence, the maximum risk rating is 25 (high).

1.3.3 Calculation of Likelihood

The factors that contribute to the likelihood of failure include:

- A – Condition of the asset
- B – Performance (reliability)
- C – Vulnerability to climate change.

See **Table 1-3** for description of these factors.

Table 1-3: Likelihood Factors

Factors	Low (1)	Moderate (3)	High (5)
A – Condition	Very Good (1)	Good (2); Fair (3)	Poor (4); Very Poor (5)
B – Performance	Always Reliable	Usually Reliable	Not Reliable
C – Climate Change	No or limited impact, quick recovery, or mitigation in place	Limited impact with slower recovery; mitigation plan not in place	Moderate or high impact; no or limited mitigation plan

By separating condition and performance as two separate factors, there is an opportunity to consider assets in poor condition that may still be performing well, compared to those that are not performing, as well as good condition assets that may not be reliable. The climate change factor brings into consideration assets that are vulnerable to climate change scenarios such as intense rainfall, increased temperatures, extreme weather, and drought. The climate change rating includes any mitigation activities in the scoring which reduces the risk and lowers the score.

Therefore, the likelihood of failure is (A + B + C)/3 (i.e. the average of the factors, assuming they are equally weighted).

1.3.4 Calculation of Consequence

In calculating consequence, the question to consider is: What increases the impact of non-delivery (or failure of the asset)?

There are two factors that contribute to the consequence which are:

- D – Impact or severity
- E – Importance of the asset in delivering service

Both impact and importance contribute to the consequence and will be multiplied by likelihood. The two ratings will be added together for the consequence maximum score of 5. Consequence will be D + E. See **Table 1-4** for description of consequence factors.

Table 1-4: Consequence Factors

Factors	Low	Moderate	High
D – Impact	Low or no impact (0)	Moderate impact (1)	High impact (2)
E – Importance of the asset in delivering service	Low importance (1)	Moderate importance (2)	High importance (3)

The impact ratings were established by considering these five possible areas of consequence (as discussed in the Risk Workshop) and determining an overall rating of high, moderate or low by taking an average for the impact of:

- Safety/Injury
- Financial Loss
- Reputation with Stakeholders
- Environmental Damage
- Loss of Service

The importance ratings for assets were established in consultation with municipal staff. The ratings established included assumptions and specific importance values for assets.

1.3.5 Calculation of Risk

The risk calculation for each of the assets is determined as follows:

Risk = Hazard X Consequence

Risk = (A + B + C)/3 x (D + E)

Where A = Condition

B = Performance

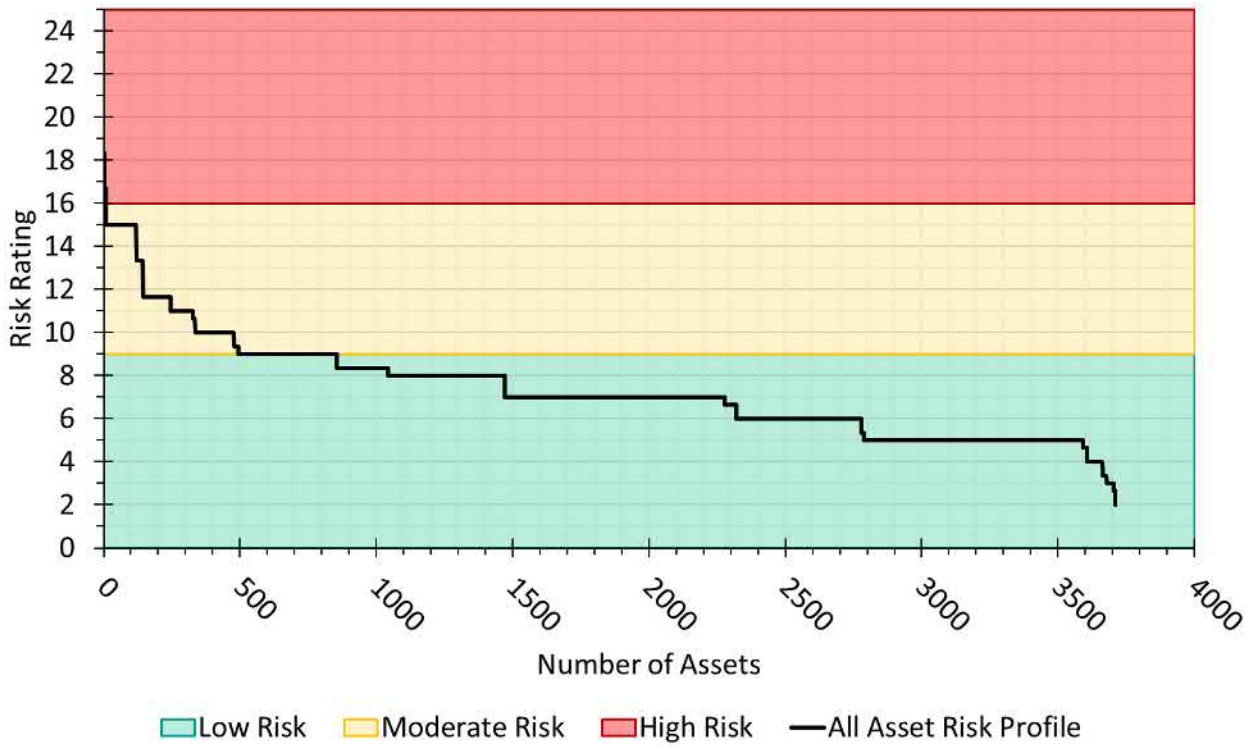
C = Climate Change

D = Impact

E = Importance of the asset

The Risk profile for all the assets can be found in **Figure 1-7**.

Figure 1-7: All Asset Risk Profile



Overall, there are 8 assets that are considered high risk, all Storm assets. This represents 0.2% of the assets. An additional 13% of the assets are within the moderate range, and the majority of assets, 86%, are considered low risk.

Several other factors beyond risk are to be considered in identifying asset investment requirements and any associated projects. The Town must also consider:

- Coordination of projects of similar type or in shared locations
- Changes in community needs and service requirements
- Technological and regulatory changes
- Climate change
- Long and short term cost benefit of investment

1.3.6 Climate Change

In the Risk Workshop, Town staff considered the following climate change scenarios and identified low, moderate or high vulnerability for each asset category:

- Mean Annual Temperature
- Number of Hot Days (> 25 C)
- Heavy Snow Events
- Heavy Rain Events
- Extreme Weather Events
- Occurrence and Magnitude of Flooding.

The climate change scenarios were broadly considered risks across most of the asset categories. Further discussion during the risk workshop identified some mitigation strategies for climate change hazards. Going forward, the impacts of climate change scenarios should continue to be evaluated to enhance resiliency and mitigation strategies for assets.

1.3.7 Limitation and Assumptions – Risk Assessment

Several key limitations and assumptions were made as part of the risk assessment process, which are summarized below:

1. Field condition assessment data was used as available to determine state of infrastructure and risk. In the absence of field condition assessment data, asset age and estimated useful life was used to approximate physical condition.
2. Performance of individual assets was assumed as “Always Reliable” unless otherwise indicated by municipal staff, reviewed reports or provided asset data.

1.4 Lifecycle Activities

The lifecycle activities include activities that can be undertaken over an asset’s useful life. These activities, consistent with O.Reg. 588/17, are defined to include constructing, maintaining, renewing, operating and decommissioning of assets and all engineering and design work

associated with these activities. Typical lifecycle activities have been outlined for each of the asset categories considered within this AMP.

1.5 Asset Management Strategy

The intent of the strategy is to provide guidance for the Town in the management of the assets to achieve the goals of the asset management plan. The strategy for each asset type was devised using current practices at the Town and recommendations for implementation of new or improved practices that may influence the lifecycle of the asset. The asset management strategy for each asset type includes consideration of the lifecycle activities for that asset type, and suggests an overall strategy for the management of the assets over the 20 year timeframe of the AMP.

The asset management strategy for the Town assets will employ the lifecycle activities to maximize the useful life and economy of each asset.

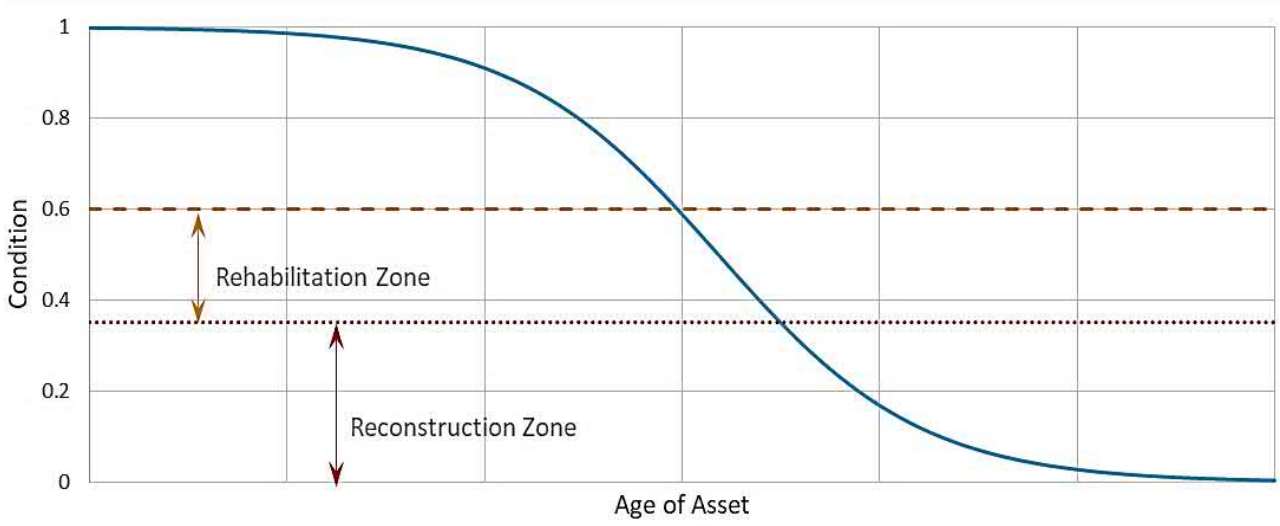
The primary indicator used in the development of a lifecycle strategy is the condition of each asset, as it can often be indicative of likelihood of failure of the asset, performance of the asset, and increased risk. The strategy should also consider other factors, such as:

- Importance of the asset
- Asset risk score
- Condition of adjacent sections (linear assets)
- Replacement requirements for adjacent infrastructure
- Expansion or enhancement requirements
- Maintenance frequency and type

These factors will change throughout the lifecycle of an asset, influenced by age of the asset, usage of the asset, continued development at the Town, and changing climate. These factors may impact the lifecycle of an asset, by changing the optimal solution for improving condition and extending the useful life of the asset. Consideration of these factors should be given when devising capital project outlooks and budgeting, and updating of the asset management plan.

The assets will deteriorate on a non-linear basis, and the lifecycle activities can be implemented at varying stages within an assets deterioration. **Figure 1-8** provides a visualization of the theoretical deterioration curve for an asset, and opportunity windows to conduct lifecycle activities within the expected useful life of an asset.

Figure 1-8: Theoretical Deterioration of Assets and Lifecycle Activity Opportunities



The opportunity windows (rehabilitation zone, reconstruction zone) will vary depending on the asset, and the acceptable condition of the asset.

In general, it is expected that lifecycle activities can be implemented according to the following:

- **Maintenance** activities can be implemented throughout the lifecycle of the asset. These activities can be recommended as part of routine programs or can be driven by assessment or complaints processes.
- **Renewal or rehabilitation** works can be appropriately employed within the rehabilitation zone, where the condition intervention greater than maintenance is required, yet the asset has not reached the requirement for reconstruction; and,
- **Reconstruction** and **decommissioning** will most likely occur within the reconstruction zone where rehabilitation will be insufficient to address issues with the asset.

The utilization of the lifecycle activities should seek to optimize the lifecycle of the assets, therefore the strategy should be reviewed and updated with the AMP according to the changes in practices or goals of the Town and the management of the assets.

Prior to making selection and implementation of a lifecycle activity, the Town asset managers should understand the standard of construction of the asset. The applicability and effectiveness of a lifecycle activity may be impacted if the asset was not constructed properly at the outset of its lifecycle.

With establishment of the strategy, analysis was undertaken to assess the impact of investment on the assets, and recommendations for investment according to the goals of the asset

management plan. The analysis used the inventory information, lifecycle activities, and strategy.

The following information was used in the analysis where available or applicable:

- Asset inventory information
- Lifecycle activities and strategy
- Current detailed assessment reporting and associated investment recommendations (such as OSIMs, BCAs, etc.)
- Current and desired Levels of Service

The analysis was undertaken using different methodologies for linear and vertical assets. Where possible, multiple scenarios were assessed to understand the investment level and overall condition of the assets for establishing feasibility of the goals of the asset management plan.

1.6 Growth

An important component in the asset management strategy across the asset categories is consideration of growth. Growth may impact how or when the Town chooses to implement the lifecycle activities. Additional information on growth is found in **Section 2**.

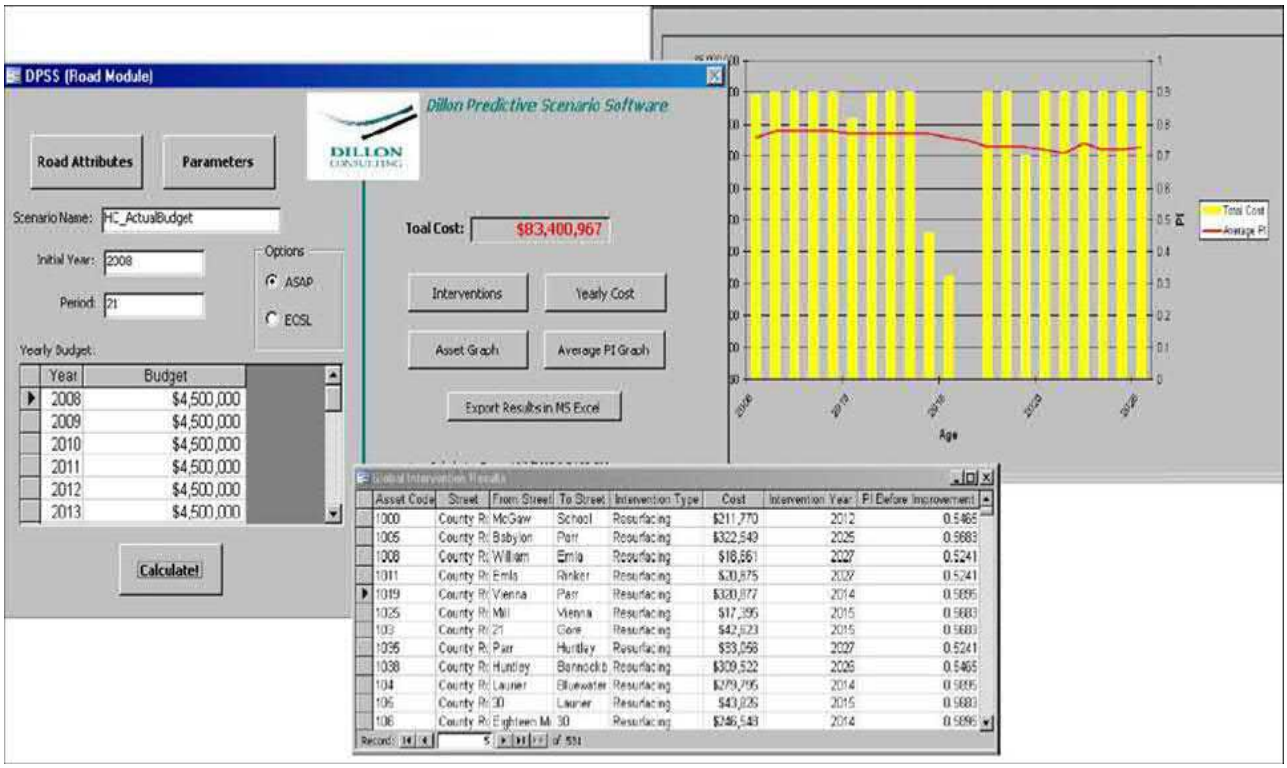
1.7 Analysis and Expenditure Projections

1.7.1 Linear Assets

For the preparation of a replacement and rehabilitation profile for linear assets, the Dillon Predictive Scenario Software (DPSS) was used. This tool is a Microsoft Access application that relies on an overall assessment of the infrastructure condition to produce investment scripts based on degradation curves, which are adjusted to the Town's particular operations and thresholds of acceptability.

The DPSS tool assesses the condition, and puts the Asset Manager in control of the lifecycle of assets. It also allows for planning as to where, when, how and how much to invest in the renewal and replacement of infrastructures for the coming year, or for the next 5, 10, 20 or 50 years. **Figure 1-9** provides a view of a screen capture of the DPSS analytical tool. The tool incorporates known asset information, deterioration data, and unit costs for rehabilitation of assets provided by the Town, to assess the network.

Figure 1-9: Dillon Predictive Scenario Software (DPSS)



Limitations of the program

The DPSS program operates within the bounds of assumptions and limitations in data inputs. The current operational limitations of the program that are relevant to this AMP include:

- The program cannot link adjacent asset segments. If an asset is broken into multiple adjacent components (such as a road from intersection to intersection), the program will view each inventory item as a single asset and cannot connect projections for adjacent sections.
- The program cannot computer concurrent projections with multiple types of assets. Each instance of the program projects works for one asset category only.
- The prioritization of works in the outputs of the program are based on the condition of the asset.

1.7.2 Vertical Assets

The development of scenarios and capital expenditure projections for the vertical assets varied by asset type, due to the existing processes and the types of assets. A description of the process taken for each asset is described within their respective sections, however scenario development generally considered the following:

- Where available, existing reporting on assets was used to generate a prioritization of works. The Town has multiple reports wherein detailed condition assessment was undertaken of assets, and subsequent recommendations made for maintenance and reconstruction works according to findings of the assessment. The projected works in this AMP were assumed to be consistent with recommendations in existing reports. (Reports considered here include OSIMs, Building Condition Reports).
- Where prior information was not available, condition was assumed based on lifespan and age. Projection of works were estimated according to the expected lifespan of an asset. Due to the complexity of vertical assets, detailed assessment of maintenance and reconstruction works of the componentry was not undertaken. As such, individual component replacement costs and maintenance costs have not been projected as part of this AMP.

1.7.3 Limitations of the Asset Management Strategy

The strategy described in each of the asset category sections in this report reflects a typical process that can be implemented according to a number of factors, such as type of infrastructure, condition, importance, etc. The strategy will act as a guideline for the Town to use in asset management, however is not intended to be used as a step-by step plan. During the asset management process, there will be situations where deviation from the proposed strategy is appropriate, according to the specific conditions of the assets and circumstances of the works being undertaken.

As described above, many factors will influence the selection and timing for implementation of lifecycle activities within an asset's useful life.

1.7.4 Other Factors to Consider for Scenarios and Capital Projections

For the understanding and utilization of the scenarios and capital projections within this AMP, the Town must also consider the following:

- The scenarios and capital projections conducted as part of this AMP were completed by asset category individually. As such, the results do not reflect efficiencies in completing works on adjacent infrastructure simultaneously.

- The scenarios and capital projections conducted as part of this AMP were completed by asset segment individually. As such, the results do not reflect efficiencies in completing works on consecutive asset segments simultaneously.

1.8 Roadmap with Next Steps

1.8.1 Next Steps – Regulatory Compliance

Annual Report to Council: As required by O. Reg. 588/17, municipalities will report to their Councils at least once per year on the current progress of asset management in the Town and any barriers to aligning operations with the AMP.

Full Update of AMP: A full update of the AMP will be required within 5 years, i.e. by 2027.

Enhancements to the AMP: The inclusion of green infrastructure assets (i.e. green assets) owned by the Town and assessment of vulnerabilities caused by climate change on the performance of infrastructure.

1.8.2 Next Steps – Recommendations in AMP 2022

Condition Assessments

- Prior to the next update of the AMP, conduct condition assessments of buildings and facilities, as well as roads.

Performance Data

- Expand the collection of performance data to be able to track and report whether the Town is on target to meet the proposed LOS.

1.8.3 Next Steps – Operationalizing Asset Management

In operationalizing asset management practices within the Town, and preparing for the update in 5 years, there are specific steps that can assist with implementation. These steps are presented in the following categories that align with the **Federation of Canadian Municipalities (FCM) Asset Management Readiness Scale**: Policy and Governance, People and Leadership, Data and Information, Planning and Decision-Making and Contribution to Asset Management Practice.

Policy and Governance

- Manage assets and services in accordance with your AMP policy and organizational objectives.
- Develop a roadmap that details the actions for implementing your AM strategy over the next 3 to 5 years.
- Use performance measures to monitor AM progress outcomes and benefits.

People and Leadership

- Develop a mandate for AM Steering Committee, which is outlined in a terms of reference and a roadmap.
- Establish lines of accountability for the AMP to be accountable to senior management and Council.
- Council demonstrates buy-in and support for AM and allocated resources (funding or staff time) to further develop the AM program.

Data and Information

- Update data according to cycles defined in your AM strategy and AM plan.
- Evaluate the lifecycle investment requirements associated with most assets.
- Conduct condition assessment on assets for the next update in the AMP (e.g. roads, bridges, buildings, parks, etc.)
- Now that you have defined proposed LOS targets, communicate the results of LOS measurement program to staff and Council regularly.
- Continually improve how you collect data on LOS performance.
- Continue to evaluate the trade-offs between investment and the LOS we deliver and use this to optimize financial plans.

Planning and Decision-Making

- Employ a consistent structure asset planning approach for each of your service areas.
- Set priorities using criteria that are fully aligned with your organizational goals and objectives.
- Keep AM plans up to date through normal business (e.g. update condition information and performance information). Integrate your AM plan across services.
- Prepare annual needs-based capital and operating business that are based on an annual assessment of risks and current needs.
- Develop a 5-year capital plan and update it annually.
- Develop a long-term financial plan (10-year) annually and understand the risks associated with investment gaps.

Contribution to Asset Management Practice

- Provide all staff with basic AM awareness training.
- Provide some staff with advance AM training specific to their roles and responsibilities.
- Provide Council with AM training. Demonstrate that staff and Council are able to communicate the value of AM.
- Develop a culture of knowledge sharing internally, supported by official initiatives.
- Collect and maintain AM knowledge resources.

- Communicate the benefits of AM internally to staff and Council.
- Provide opportunity for staff to contribute to knowledge sharing with others, through membership in one or more AM organizations.
- Share basic information on our assets, the services we provide and future needs with the public.

2.0 Growth

Growth projections for the Town may influence their strategy for development and infrastructure investment. A study of growth projections has been undertaken by Watson in support of development charges in 2020, as well as by the County of Renfrew as part of their Official Plan, published in 2002.

The Town of Renfrew is approximately 13 square kilometers in land area.

As part of the Development Charge study, population projections for the Town of Renfrew were conducted in 2020 by Watson Economists & Associates. The projections were undertaken considering the census population value from 2016, estimated housing units within the forecasting period including known and projected rate of residential construction, and expected population decline. The projected population for mid-2030 is 9,166 persons, an increase of 866, or 10%, from the mid-2020 population.

This projected population can be compared to the population of Renfrew County, in which the Town of Renfrew is situated. The County encompasses an area of 7,450 square kilometers and supported a population of 102,394 in 2016 according to the most recent census data. Population projections for the County are summarized in **Table 2-1**, excerpted from the County Official Plan.

Table 2-1: Population Projections for the County of Renfrew (County of Renfrew OP)

Municipality	Base Year Population 2011	% Share of County Growth (20 yr)		Projected Population 2016	2021	2026	2031	2036
Renfrew County	**86534**	**100.0%**	**Low**	**88904**	**91360**	**93906**	**96546**	**99282**
			High	**90257**	**94178**	**98308**	**102659**	**107245**

The projections for the County within the Official Plan (OP) are a sum of the individual smaller municipalities. The projections relating to Town of Renfrew as part of the OP are shown in **Table** 2-2.

Table 2-2: Population Projections for the County of Renfrew (County of Renfrew OP)

Municipality	Base Year Population 2011	% Share of County Growth (20 yr)		Projected Population 2016	2021	2026	2031	2036
Renfrew	8218	5.0%	Low	8342	8468	8596	8725	8857
			High	8426	8638	8856	9080	9309

The projections from the Development Charges study in 2020 anticipate a higher population value (10%), however the studies estimates are similar.

The Official Plan for the Town of Renfrew, adopted in 2007, describes some intention and guidance for growth and development within the community:

- Some lands are "Designated Growth Area", for growth and development. These areas are currently vacant, and zoned for existing uses (agriculture, forestry, open space, Conservation Area), but can be used for development with a zoning amendment and municipal servicing.
- The expansion of Highway 417 to Renfrew is expected to promote economic growth in the Town.
- New retail development is expected to occur in the east end of the Town.
- The Town has undertaken multiple studies to guide in growth and development, including:
    - Master Plan for Parks, Recreation and Culture, 2010
    - Includes implementation plan with priority, timeline and estimated costs for recommendations
    - Master Servicing Plan, 2017 (water, wastewater and stormwater servicing)
    - Includes figures and guidance for development planning

Growth-related assumptions are expected to have an impact on the lifecycle of Town assets. A summary of these assumptions and impacts are shown in **Table 2-3**.

Table 2-3: The Lifecycle of Assets related to Growth Assumptions

Asset Classifications	Growth Impact Assumptions	How Assumptions Relate to Lifecycle of the Assets
Roads	• Increased traffic volumes and expansion of network	• Potential increase in capital plan budget due to increase in service network • Potential increase in road maintenance costs due to increase asset usage
Sanitary Sewers	• Increased service demands and expansion of network • Increased loading on wastewater treatment facility and effluent flow • Increased flow to central collection mains directly upstream of wastewater treatment facility	• Potential increase in capital plan budget due to increase in service network • Potential increase in operational costs due to increase in wastewater treatment volume

Asset Classifications	Growth Impact Assumptions	How Assumptions Relate to Lifecycle of the Assets
Storm Sewers	• Increased service demands and expansion of network • Increased storm volumes from urbanization	• Potential increase in capital plan budget due to increase in service network size and capacity
Water	• Increased service demands and expansion of network	• Potential increase in capital plan budget to expand network infrastructure and service requirements • Potential increase in operational costs to operate additional pumping and treatment equipment
Bridges & Culverts	• Increased usage of bridge crossings by vehicles in the area	• Potential traffic volume delays and mitigation required • Load considerations and regularly scheduled maintenance checks.
Buildings	• Increased facility usage • Changing service demands from aging population	• Increase in capital expenditure for facility development in response to development • Increase in operating costs for facility services and maintenance
Fleet	• Increase in service demands - requiring increased operation or capacity at greater distances	• Increased capital costs for purchase of additional assets to meet service needs • Increased operational costs in fleet maintenance and operational consumables

The Town has considered growth-related projects in the development of their capital plan. At this time, the Town expects to construct a wastewater pumping station and forcemain due to growth considerations.

3.0 Water Assets

3.1 State of Local Infrastructure

The Town owns linear pipe and appurtenance assets for the distribution of treated water. The distribution system is operated by the Town. Vertical water assets (e.g. buildings) are reported on in **Section 4.0**. The water distribution system includes:

- approximately 76.5 km of linear pipe
- 403 hydrants

A summary of the quantity of linear assets within the network is provided in **Table 3-1**.

Table 3-1: Inventory of Linear Water Assets by Material Type

Linear Asset Material	Total Length (m)	Percent of Total Inventory
Transite	29,260	38%
Cast Iron	14,669	19%
Ductile Iron	20,313	27%
PVC	12,101	16%
Copper	108	0.1%
HDPE	50	0.1%
Total	**76,501**	**100%**

The analysis of linear water assets within this report will be limited to the pipe assets only, omitting appurtenances such as valves, hydrants, etc. This is predicated on the assumption that all other elements included in the system are required componentry that will be replaced in conjunction with the linear components and are expected to have similar expected useful lives and conditions as the linear components.

3.1.1 Current Data

The information reported in this AMP and the subsequent analysis are based on the current TCA inventory maintained by the Town and current water reports, including the Renfrew Drinking Water System Annual Water Report for 2018, 2019 and 2020.

3.1.2 Replacement Costs

Replacement unit costs for the water linear assets are determined for full reconstruction of a pipe segment, including consideration for trench and surface restoration. It is assumed that reconstruction works on the network will be completed using PVC piping.

Replacement costs for the water assets were determined based on recent tender information and product information.

The unit replacement costs were used to estimate the total replacement cost of the linear assets based on current lengths. The unit and total replacement costs are summarized in **Table** 3-2.

Table 3-2: Replacement Costs for Total Linear Water Assets

Diameter	Total Length Currently Existing in Network (m)	Replacement Unit Cost ($/m)	Total Replacement Cost
Up to 250 mm	64,374	$1,250	$80,467,162.52
251mm to 400 mm	12,077	$1,370	$16,545,873.60
Over 400 mm		$1,750	
Total	**76,451**		**$97,013,036.12**

At time of this report, it is expected that full network replacement cost would slightly exceed $97 million.

3.1.3 Average Age

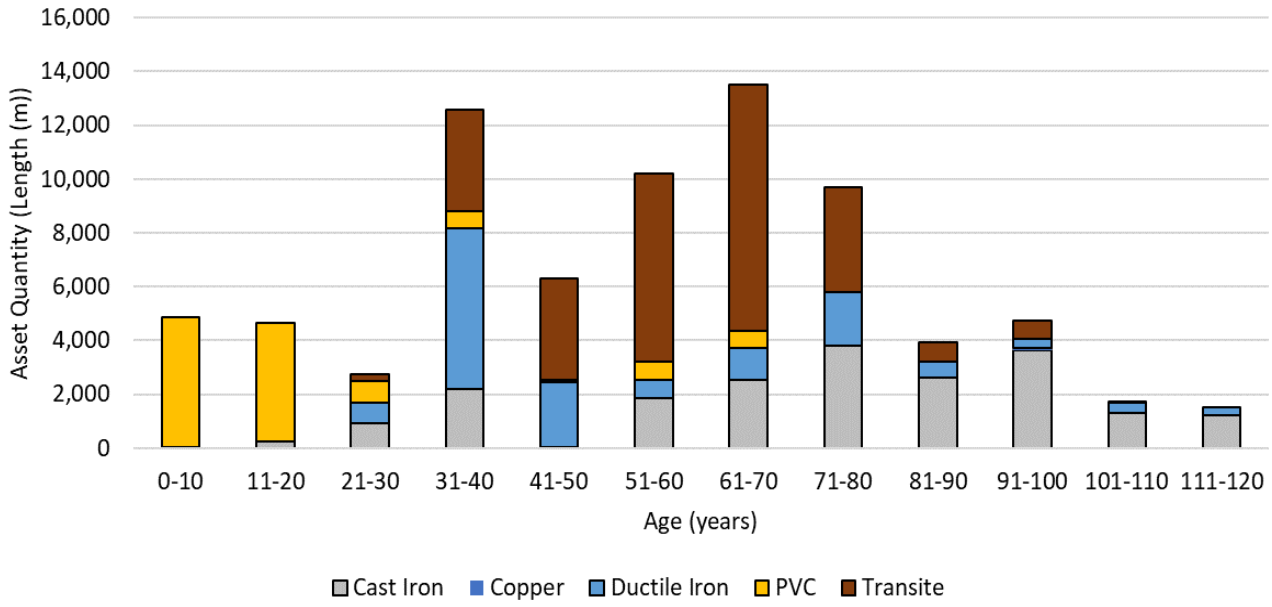
The average age of the linear water assets was categorized by pipe material proportionally by length of asset. A summary of the average age is in **Table 3-3**.

Table 3-3: Average Ages of Linear Water Assets by Material

Pipe Material	Average Age (years)
Cast Iron	74
Copper	71
Ductile Iron	52
PVC	18
Transite	59
Overall Average	**55**

A summary of the age distribution for the linear water assets is shown in **Figure 3-1**.

Figure 3-1: Age Distribution of Linear Water Assets



3.1.4 Expected Useful Life

The expected useful life of the linear water assets is used to estimate the replacement schedule. The expected useful life in years for each type of water pipe material within the network were provided and confirmed by the Town, and are summarized in **Table 3-4**. The average remaining useful life (based on the average age of the assets, by length) is also indicated.

Table 3-4: Expected and Remaining Useful Life for Linear Water Asset Materials

Pipe Material	Expected Useful Life (years)	Average Remaining Useful Life (years)
Cast Iron	80	6
Copper	80	9
Ductile Iron	80	28
PVC	100	82
Transite	80	21

The values presented in the table above are typical of most assets owned by the Town. Expected useful life of individual assets may vary depending on construction, ground conditions and operating conditions of the asset. Some material types are susceptible to particular forms of deterioration or issues that will impact the expected useful life of the asset.

The following conditions have previously been noted in the Town's water system and should be considered in the tracking and estimating of useful life of the assets:

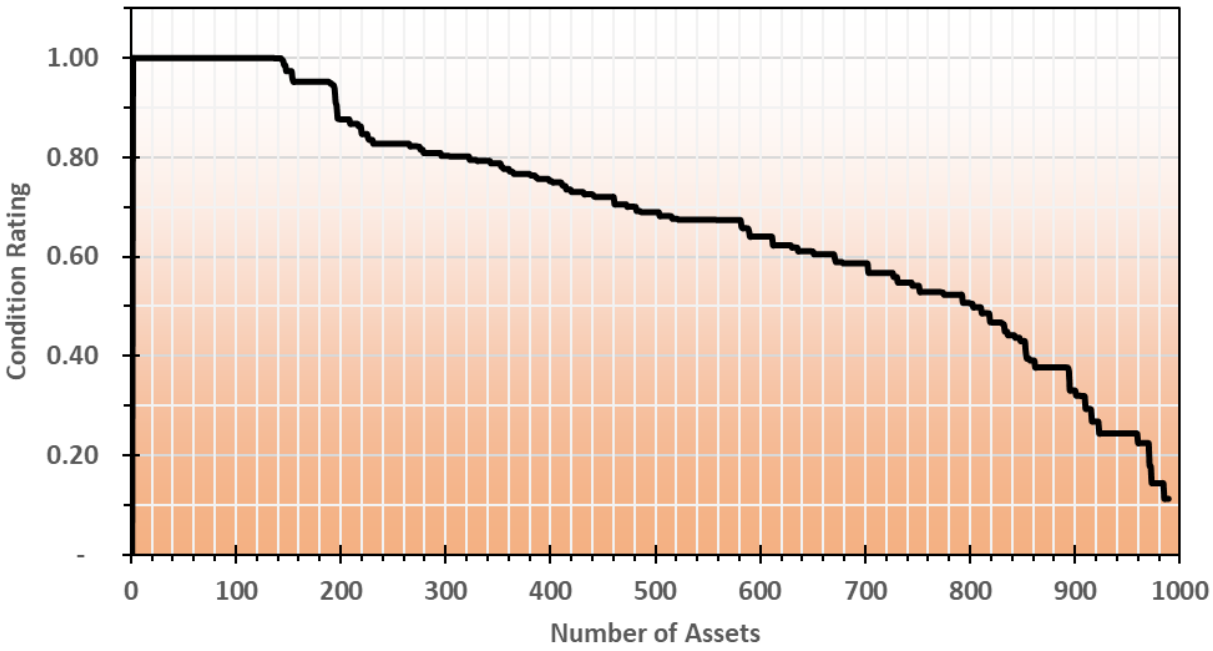
- Cast iron pipe: tuberculation of the pipe, resulting in coloured water and reduced fire flow
- Ductile iron pipe: external corrosion on thin pipe walls
- Transite pipe: brittle material

3.2 Condition – Water

Condition of the water network was determined through a deterioration model, which estimates an asset condition based on the age and construction material of the segment. The condition rating is estimated based on deterioration curves customized to the material and useful life of pipe materials at the Town.

A summary of the condition value of the watermain assets is included in **Figure 3-2**, where 1 represents an asset at its best condition, and 0 represents an asset in worst condition.

Figure 3-2: Condition Ratings of Water Assets



The majority of assets are within the range of 0.6-1, which is considered good to very good condition. This includes 701 assets, or 74% of the network by length. The overall condition average by length is 0.70.

3.3 Current Levels of Service – Water

Levels of service for water assets are outlined in Table 1 of the regulation, O. Reg. 588/17. **Table** 3-5 and **Table 3-6** outline the Town's current community and technical levels of service for water assets.

Table 3-5: Community Levels of Service - Water

LOS Parameter	Community Levels of Service Qualitative Description	Town of Renfrew Community LOS
Scope	1. Description, which may include maps, of the user groups or areas of the Municipality that are connected to the municipal water system.	The water distribution system provides water service to properties across the Town. The extent of the network is shown in **Figure A-1** in **Appendix A**.
Scope	2. Description, which may include maps, of the user groups or areas of the Municipality that have fire flow.	All properties with water service have fire flow.
Reliability	Description of boil water advisories and service interruptions.	• 2018: One partial boil water advisory. • 2019: No boil water advisories required. • 2020: No boil water advisories required. Interruptions to service area short in duration and addressed immediately such that duration of interruption is not significant. Duration of interruption by user is not individually tracked.

Table 3-6: Technical Levels of Service – Water

LOS Parameter	Community Levels of Service Technical Metrics	Town of Renfrew Community LOS
Scope	1. Percentage of properties connected to the municipal water system.	• 2018: 3,036 residential water meters, 307 commercials (3,343 total) • 2019: 3,055 residential water meters, 307 commercials (3,362 total) • 2020: 3,100 residential water meters, 310 commercials (3,410 total)
Scope	2. Percentage of properties where fire flow is available.	98% of properties in the Town (100% of connected properties in 2020)
Reliability	1. The number of connection-days per year where a boil water advisory notice is in place compared to the total number of properties connected to the municipal water system.	• 2018: Zero connection days (no boil water advisories) • 2019: Zero connection days (no boil water advisories) • 2020: Zero connection days (no boil water advisories)
Reliability	2. The number of connection-days per year due to water main breaks compared to the total number of properties connected to the municipal water system.	3 to 5 watermain breaks experienced annually. Response time varies depending on severity and location of break.

3.4 Current Performance – Water

Asset performance measures were determined in consultation with the Town, which provide relevant metrics against which the Town can gauge the performance of their assets. The performance measures for the water network, and their current values are shown in **Table 3-7.**

Table 3-7: Performance Measures – Water

Asset Performances Measure	Current Value
Number of annual non-compliances	To be established
Cost efficiency (operating cost to provide service $/household for water services)	To be established
Number of watermain breaks and repair time	To be established
Service interruptions (duration and number of users impacted)	To be established
Number of customer complaints	To be established

3.5 Risk Assessment – Water

The risk assessment for water linear assets was conducted using the following assumptions and criteria:

Condition: Determined based on estimated condition (using deterioration curve)

Performance: Assumed to be usually reliable (value of 3)

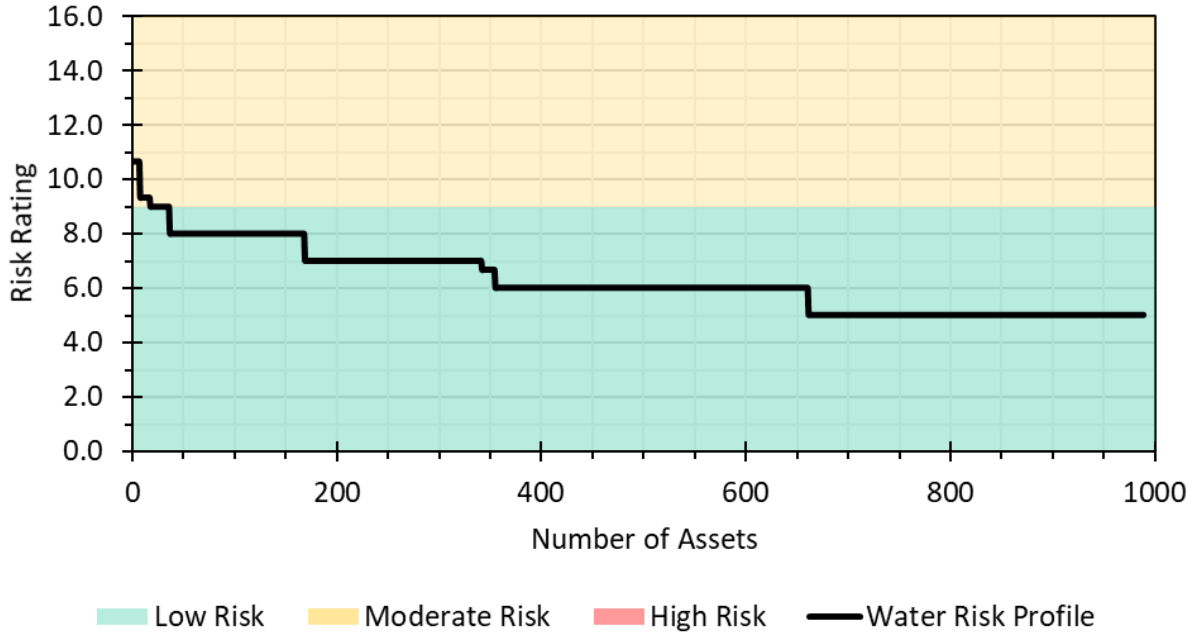
Climate Change: Assumed a value of 1 (No or limited impact, quick recovery or mitigation in place)

Impact: Moderate impact (value of 1)

Importance: High importance (value of 3) attributed to assets of 400 mm diameter or larger
Moderate importance (value of 2) attributed to all other assets

The risk profile for watermains is shown in **Figure 3-3**.

Figure 3-3: Risk Profile for Water Assets



Based on the criteria and assumptions, most assets are within the low-risk range, with 17 assets with the moderate risk range. The assets with moderate risk values (9.3 and 10.7) were for assets 400 mm in diameter with old construction (ranging from 1924 to 1954). The assets are generally localized to two areas: west part of Renfrew in the Ma-Te-Way Park Drive area, and in northwest part of Renfrew (north of the Bonnechere River) in the Hincks Avenue area.

3.6 Lifecycle Activities – Water

The following section describes the lifecycle activities that can be implemented within the asset management strategy for water assets. The lifecycle activities for water assets include construction, maintenance, renewal, and decommissioning/disposal.

Construction Activities

Construction of new assets is recommended to be in line with recommendations as part of growth, master plan, or other municipal strategies. The design of the new assets should be consistent with jurisdictional design requirements, including provincial design guidelines and local requirements. New construction of assets will occur where no previous water servicing is available. The risk associated with new construction includes the high cost of brand new assets relative to ability to recoup costs through user rates or development charges.

Construction can also be the replacement of deteriorated assets. At the end of the useful life of an asset, it can be replaced for continuation of service provision.

At the time of replacement, design should be undertaken to ensure design requirements are met, and adequate capacity is provided for current and growth usage projections.

Maintenance Activities

Maintenance activities are undertaken on the assets throughout their useful life to maintain their operating condition and performance. Maintenance works includes routine maintenance (flushing, cleaning), and minor repairs to assets (localized pipe repair, appurtenance repair). There exists the risk that a maintenance activity may be implemented that does not adequately mitigate a performance or condition issue, and additional costs are then required for further repair or replacement.

Renewal Activities

Renewal of the watermain assets can include pipe lining (structural, semi-structural or non-structural lining). A lining can be used where the condition has deteriorated, however structurally the pipe segment is still sound. A lining can extend the useful life of an asset and improve performance.

A renewal activity specific to ductile iron pipes is the implementation of cathodic protection. This can act to prevent corrosion of the watermain, prolonging the lifespan. Risks associated with these renewal activities include the improper installation of the renewal works, or continued/advanced deterioration of the original watermain such that the renewal works do not perform as expected.

Operating Activities

Operating activities for the watermain assets include those activities that do not directly deal with the physical state of the watermains, but work to extend the asset's useful life. The operating activities can include non-infrastructure policies, and monitoring/inspection of the assets. Condition assessment of watermain pipes is challenging to achieve. It is recommended that reactive maintenance works (watermain repairs, etc.) be reviewed and tracked such that they can provide additional information to the Town regarding condition of the pipe segments (beyond the theoretical condition determined through age of pipe and deterioration rate). Operating activities can be used throughout the useful life of an asset.

Decommissioning Activities

Decommissioning of the watermain assets includes abandonment or replacement of the asset at the end of its useful life. Removal of the expended asset can provide additional space for new underground assets to be constructed within a right-of-way.

A summary of the lifecycle activities and associated risks is in **Table 3-8**.

Table 3-8: Summary of Water Linear Lifecycle Activities

Lifecycle Activity Type	Suggested Activities	Risks
Construction Activities	• New construction of water segments • Water segment reconstruction	Insufficient in design or capacity, unable to provide service as intended.
Maintenance activities	• Flushing • Cleaning • Inspection Activities • Minor repair (localized pipe repair, appurtenance repair)	Allocation of funding could be disproportionate for asset value. Frequency of maintenance could be inadequate.
Renewal activities	• Pipe lining (Structural, semi-structural or non-structural) • Cathodic Protection	Improper repair, resulting in continued poor performance/condition.
Operating and Decommissioning Activities	• Design guidelines • Flow monitoring • Water master planning • Asset management plan • Abandonment of water segment in-situ • Removal of water segment	Does not directly mitigate failure of assets.

3.7 Asset Management Strategy – Water

The asset management strategy for water linear assets (watermains) will maximize the lifecycle of the assets where appropriate, in consideration of specific needs of the Town and existing infrastructure.

The condition of an asset should be established to assist in decision making. Due to the difficulty in undertaking visual inspection of a watermain, the Town should estimate the expected condition of the pipes based on the age, deterioration rate, and tracking of maintenance activities completed for each segment. The Town is currently digitizing records of watermain breaks as a component of the GIS system to assist in identifying locations of common occurrences that will factor into prioritization of works.

Throughout the lifecycle of the water linear assets, the Town flushes and cleans the watermains.

When the condition of the asset has degraded such that an intervention is required, it is recommended that maintenance be reviewed as the first opportunity to extend the useful life. Maintenance works can include localized repair work, or relining of a pipe segment. Relining can be done on an individual pipe segment, or to conduct localized repairs. To access a watermain for relining purposes, excavation of the road is required therefore when considering relining as a lifecycle activity, the additional cost of road restoration and occupation of the traffic lane should be considered.

When the condition of the asset has degraded such that maintenance is no longer an appropriate activity, the segment can and should be reconstructed. The Town should follow best practices and local design guidelines when designing the reconstruction works. Reconstruction of the watermain linear assets will also include replacement of the componentry, such as services, valves, and hydrants within the limits of the right-of-way.

Assets at the end of their useful life should be decommissioned (e.g. abandoned in place or removed).

A summary of the watermain condition and associated lifecycle activity is provided in **Table 3-9**.

Table 3-9: Watermain Lifecycle Activities and Condition Ranges

Condition Range	Lifecycle Category	Lifecycle Activity
1-0.60	Maintenance	Maintenance Works (cleaning, flushing) Small pipe section repairs
0.60-0.35	Rehabilitation	Localized repairs Structural relining
0.35-0	Reconstruction	Pipe replacement or abandonment

Current best practices suggest that that reconstruction and new construction works on the assets will be done using PVC material for all pipe diameters.

There is efficiency in conducting capital reconstruction works where adjacent asset types can be reconstructed simultaneously. Part of the Town's current strategy is to use capital works projects from other linear asset categories to locate and identify any upcoming capital works on adjacent linear infrastructure (such as road works, sewer or storm), and align the timing of the works such that there is efficiency in the design, construction and material costs associated with the project, and reduced disruption to service delivery. The capital works identified may be as a result of end-of-life replacements, growth, changes to standards, or others.

Water quality concerns will factor into the Town's strategy for managing the watermain assets. Where there is a concern in water quality due to a particular construction material or practice, the Town may prioritize correction of this issue and as a result modify the strategy (temporarily or on an on-going basis).

The Town is currently managing water quality (coloration) concerns related to tuberculation in cast iron watermain pipes. Accordingly, the Town's strategy related to cast iron pipes is for their removal, and reconstruction of the watermains using PVC. The cast iron pipes are not candidates for relining. When reached the end of its useful life, the cast iron pipes will be removed from the system. However, due to the ongoing concerns related to these pipes, where the Town is conducting full depth reconstruction on adjacent road infrastructure, cast iron will be replaced regardless of condition or age. The removal of cast iron will reduce water quality concerns and flushing (maintenance) requirements on the network.

3.8 Scenario Analysis

To understand the needs of the water distribution system and overall system condition within a 20 year outlook, replacement and relining activities were reviewed under varying budget scenarios. The current average condition of the assets is 0.70.

The budget scenarios analyzed include:

1. Unlimited budget – To determine backlog of works
2. No budget – To understand the changes in average network condition with no investment
3. 2% of network value – Best practice of investment
4. 4% of network value – Best practice of investment
5. 2014 AMP Funding Level – Consistent investment value from past recommendations

Note that deterioration curves are consistent with previous AMP analyses.

3.8.1 Analysis Results

Multi-year projection scenarios were run using the budgets noted above. In the analysis, reconstruction activities are recommended when a pipe has a condition rating of between 0 and 0.35. Reconstruction of a segment will return the segment to a condition index of 1.

A summary of the analyses is below:

Table 3-10: Budget Scenario Results

Number	Budget Scenarios	Annual Value	Average Annual Investment (2022-2041)	Total Investment (2022-2041)	Average Condition Index (at 2041)
1	Unlimited budget	Unlimited	$921,041	$18,420,828	0.69
2	No budget	$0	$0	$0	0.51
3	2% of network value	$1,945,000	$921,041	$18,420,828	0.69
4	4% of network value	$3,890,000	$921,041	$18,420,828	0.69
5	2014 AMP Funding Level	$400,000	$399,026	$7,980,520	0.61

The annual values of the budget scenarios are maximum investment value per year.

The selection of an investment level for the watermain strategy should consider the current and intended level of service, affordability, effectiveness of the scenario, and backlog of works.

Scenario 1 assumes an unlimited budget available for reconstruction of the watermain assets. In the first year of the scenario, $5.18M in reconstruction works were identified, indicating that there is a backlog of repairs required to improve the condition of the assets. The backlog includes any assets that are currently at a condition rating of 0.35 or less.

Scenario 2 models the impact of no spending on watermain reconstruction during the 20 year timeframe. The average condition rating deteriorates to 0.51.

Scenarios 3 and 4 were found to have the same average annual investment and total investment over the 20 year timeframe, with each of those values being consistent with the Scenario 1 (Unlimited) results. Accordingly, the average condition at the end of the timeframe is also consistent. As the same results are achieved by both scenarios, we can assume that expenditure of 4% annually is greater than required, and to achieve the results in the scenario, the 2% annual investment would be recommended.

Scenario 5 reviewed the investment level recommended as part of the 2014 AMP, and found that while the annual and total expenditures were less than the previous scenarios, the average condition at the end of the timeframe is not significantly lower.

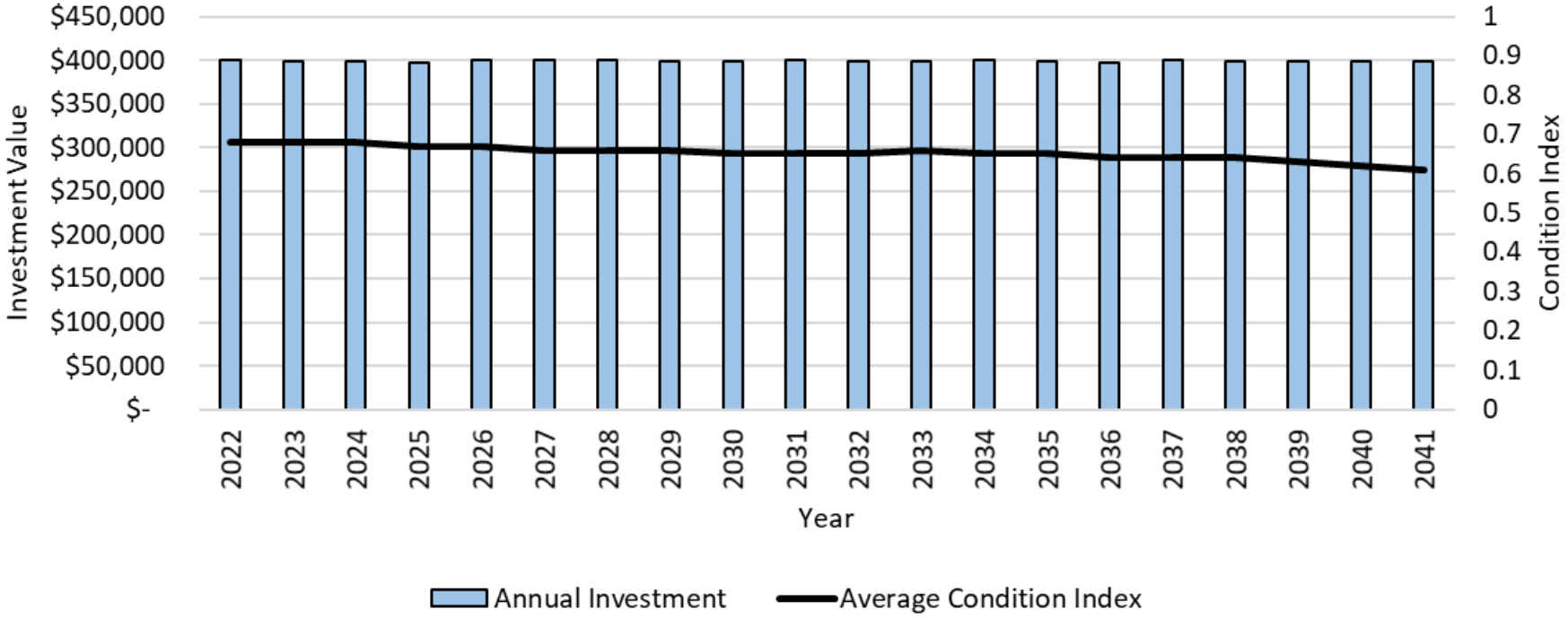
In selecting the recommended investment level, the Town should consider its current and preferred level of service being provided. The LOS is represented in these scenarios as the average condition of the assets. The current average condition is 0.70, and a best practice recommends maintaining a minimum average condition of 0.60 across the system. If the Town's target is to maintain the current LOS, Scenario 3 would be the recommendation, however if the Town was accepting of a decrease in average condition, the more affordable Scenario 5 (2014 AMP value) could allow the average condition to deteriorate yet remain above the best practice threshold (recognizing that allowing the average condition to decrease would increase the number of assets approaching the threshold for asset failure).

The Town should also consider the current backlog of works relative to the investment scenario. As found through Scenario 1, there is approximately $5.18M in outstanding works on the system. Any investment under this threshold may result in some assets deteriorating to the point of failure during the reviewed timeframe. Over the 20 year timeframe, Scenarios 1, 3-5 have a total expenditure that exceeds the backlog, suggesting that it may be sufficient to address current and future needs. As Scenarios 3 and 4 are consistent with the Unlimited scenario, it can be assumed that they will be adequate for addressing the backlog and upcoming infrastructure needs. In Scenario 5, the total investment is greater than the backlog, however the expenditure is incurred over 20 years, which means some assets may deteriorate to the point of failure over that timeframe. However, as the average condition rating at the end of Scenario 5 remains high, it suggests that the remainder of the assets will not incur significant needs over the timeframe.

The annual expenditure under the Scenario 5 budget value and its resulting impact on the average condition of the assets is shown in **Figure 3-4**.

The scenarios discussed below are projected using condition as the primary factor for prioritization and provide information of how the overall condition of the assets will respond at varying levels of investment over the time period. When conducting capital planning and annual capital expenditures, additional factors beyond those in the model must be considered by the Town, as previously described.

Figure 3-4: Investment and Condition Index with 2014 AMP Funding Scenario 5



3.9 Proposed Level of Service

Drinking water services was identified as a service delivery area that could benefit from increase proposed levels of service, through the data collected during the Community Level of Service Survey (as discussed in Section 1.2.2), and priorities of local Council and administration.

Comments received through the survey process indicated some concerns with the aesthetics of the water, particularly with the colour. Colouration in the water can be caused through the treatment or distribution phases of the service delivery.

Drinking water service delivery has defined LOS parameters as set out by the O.Reg. 588/17, however the Town can expand on these parameters to track complaints related to discolouration to help in setting a level of service target and monitoring performance.

4.0 Water Vertical Assets

4.1 State of Local Infrastructure – Water Vertical Assets

For the treatment and distribution of water, the Town owns a low lift pump station, water treatment plant, water booster station and standpipe. The source of the water for treatment and distribution is the Bonnechere River. The treatment and distribution processes utilize the vertical assets in the order they are listed below. The Town contracts operation of the water treatment plant, low lift pump station, and standpipe to a third party, currently the Ontario Clean Water Agency (OCWA).

Low Lift Pump Station (LLPS)

The LLPS pumps raw water from the source (Bonnechere River) to the WTP. The lift station is located adjacent to the Bonnechere River, accessed from McAndrew Avenue.

The lift station was originally constructed in 1950 and has undergone upgrades and rehabilitation since original construction, notably a renovation project that took place in 2005 and included improvements such as roofing systems, exterior staircase, etc.

Water Treatment Plant (WTP)

The WTP treats source water for distribution and usage within the Town. The WTP has a maximum daily capacity of 18,184 cubic meters.

The WTP was originally constructed in 1950, however has had upgrades and additions completed since that time, most notably, significant upgrades completed in 2005.

Kedrosky Water Booster Station

The Kedrosky Water Booster Station is located at Kedrosky Drive, providing increased pressure in this area of the Town.

The booster station was most recently rehabilitated in 2010, which included replacement of booster pumps into the existing underground chamber, and new kiosk and controls.

Standpipe

The standpipe is a vertical steel storage facility for treated water, which has a storage volume of approximately 7.7ML (6,435 cubic meters). The standpipe is located in the east of the Town, at the intersection of O'Brien Road and Gillan Road.

The standpipe was originally constructed in 1972. In 2010, rehabilitation works were done to the standpipe, which included upgrades and replacement of standpipe coatings.

Standpipe coatings were further repaired in 2021. Also, in 2021, the Tideflex mixing system inside the standpipe tower was removed.

A summary of the componentry by category at the water facilities is in **Table 4-1**, noting that a breakdown of the componentry of the Kedrosky Booster Station was not available at the time of reporting.

Table 4-1: Summary of Water Vertical Asset Components

Category	Component Types	Number of Components LLPS	Number of Components WTP	Number of Components Standpipe
Process Equipment	Pumps, Motors, Valves, Screens, Actuators, Blowers, Boiler, Chlorinator, Compressor, Filters, Gear Drive, Media, Mixers, Tanks, Tools, VFD	16	186	2
Process Electrical	MCC, UPS, Switches, Panels	2	12	1
Instrumental & Controls	Panels, Meters, Analyzers, Transmitters	3	68	3
Process Structural	Wet Well, Clear Well	1	8	1
Facility - Mechanical	Heaters, Lifting Device, HVAC, AHU, Piping, Safety Equipment, Tanks, Blowers, Fans, Compressors	3	89	1
Facility - Electrical	Transformer, Router, Electrical Works	2	2	
Facility - Architectural	Doors/Windows, Interior, Roof, Siding	4	4	
Facility - Structural	Structure, Foundation	2	2	
Emergency Power	Generator, Tank, Panel		5	

Additional description of the processes and componentry utilized within the water vertical assets can be found in the separate report Water and Wastewater Facilities Assessment and Capital Investment Plan.

4.1.1 Current Data

The information reported in this AMP and the subsequent analysis are based on the current Building Condition Assessment (BCA) and condition assessment information. The BCA reporting is for the Water Treatment Plant and Low Lift Pumping Station, and was undertaken in 2020 by Morrison Hershfield. The condition assessment for the operational equipment was conducted by OCWA in 2020.

4.1.2 Replacement Costs

The replacement cost for the WTP, LLPS and standpipe were determined through evaluation of the componentry. The estimated replacement costs were inflated by 3% annually to reflect 2022 costs and are as follows:

- WTP – $40,000,000 (value indicated by the Town)
- LLPS – $1,202,000
- Standpipe – $3,663,260

The replacement cost for the Kedrosky Water Booster Station is based on the actual construction price from 2010, inflated by 3% annually to 2022. The estimated replacement cost would be $240,995.

4.1.3 Average Age

The age of each of the vertical water assets is determined either as a single asset age, or as an average of the building components. Where an average was calculated, an equal weighting of all components within the overall asset was assumed. The age of the assets are:

- WTP – 34 years (average, original construction in 1950 with recent upgrades in 2005, 2008)
- LLPS – 50 years (average, original construction in 1950 with recent upgrades in 2005)
- Booster station – 12 years (single asset, constructed in 2010)
- Standpipe – 50 years (single asset, constructed in 1972, coatings replaced in 2010)

The componentry within each of the buildings will have varying ages individually, due to the varying lifespan of the individual components.

4.1.4 Expected Useful Life

Expected useful life was assigned at the component level to reflect the complexity and variation in expected useful life of different systems that comprise the water vertical assets. The typical expected useful life for each component was used to determine approximate replacement timing of assets. **Table 4-2** provides the typical useful life applied to each component.

Table 4-2: Expected Useful Life of Water Vertical Asset Components

Component	Expected Useful Life (years)
Building	95
Solar	20
Mechanical	25
Electrical	25
Misc. Works	25
Pressure Control Upgrades	15
High Lift Pump	20
Chloramination System	15

4.2 Condition – Water Vertical Assets

The condition of the water vertical assets was determined through assessment of the building and operational components, and estimation based on the asset age and lifespan.

Condition assessment of the operational components was undertaken by OCWA in 2020. The inspection was undertaken for the LLPS, WTP and water tower (standpipe), using visual non-destructive methods and discussion with operations staff. The assessment rated asset components on a scale of 'poor' to 'excellent'. The assessment included process, mechanical, electrical and building components.

Building condition assessment was undertaken in 2020 by Morrison Hershfield, for the WTP and LLPS. The building condition assessment rated the assets on a scale of 'very poor' to 'very good'. Ratings were given to subcomponents, categorized under broader asset components. To estimate an overall condition rating for the buildings, an average rating was taken of each of the components.

Using the methodologies above, the condition ratings for the water vertical assets summarized in the following table.

Table 4-3: Summary of Water Vertical Assets Condition Assessment

Vertical Asset	BCA Condition Comments (MH, 2020)	Operational Assessment Comments (OCWA, 2020)
WTP	Average BCA rating of 'Good'	• Average rating of Good • Facility generally Fair to Good • Process electrical, process equipment assessed as Fair • Pumps, blowers, chemical addition, instrumentation and controls assessed as Fair to Good • Process structural assessed as good
LLPS	Average BCA rating of 'Fair' to 'Good'	• Components generally rated Fair to Poor • Most likely location for potential issues is raw water well
Standpipe (water tower):	Not assessed	• Average rating of 'Fair' • Coating is in good condition • Foundation, vale chamber is in Fair to Poor condition

Further detail regarding the condition including discussion and estimation of replacement timelines can be found within the water and wastewater condition report. The Kedrosky Booster Station did not have condition assessment conducted under the previously noted reports. The condition for the station was estimated based on the expected useful life of the asset and its age at time of report. With an estimated useful life of 25 years and an age of 12 years, the booster station has an estimated to have used 48% of its useful life, and to be in 'good' condition.

4.3 Current Levels of Service – Water Vertical Assets

Levels of service for water assets are outlined in Table 1 of the regulation, *O.Reg. 588/17*. The level of service descriptions considers the collection and treatment systems for water assets. The responses to the descriptions can be found in **Section 3.3**.

4.4 Current Performance – Water Vertical Assets

The level of performance measures for the water assets considers the collection and treatment systems. The responses to the descriptions can be found in **Section 3.4**.

4.5 Risk Assessment – Water Vertical Assets

The risk assessment for water vertical assets was conducted using the following assumptions and criteria:

Condition: Determined based on estimated condition

Performance: Assumed to be always reliable (value of 1)

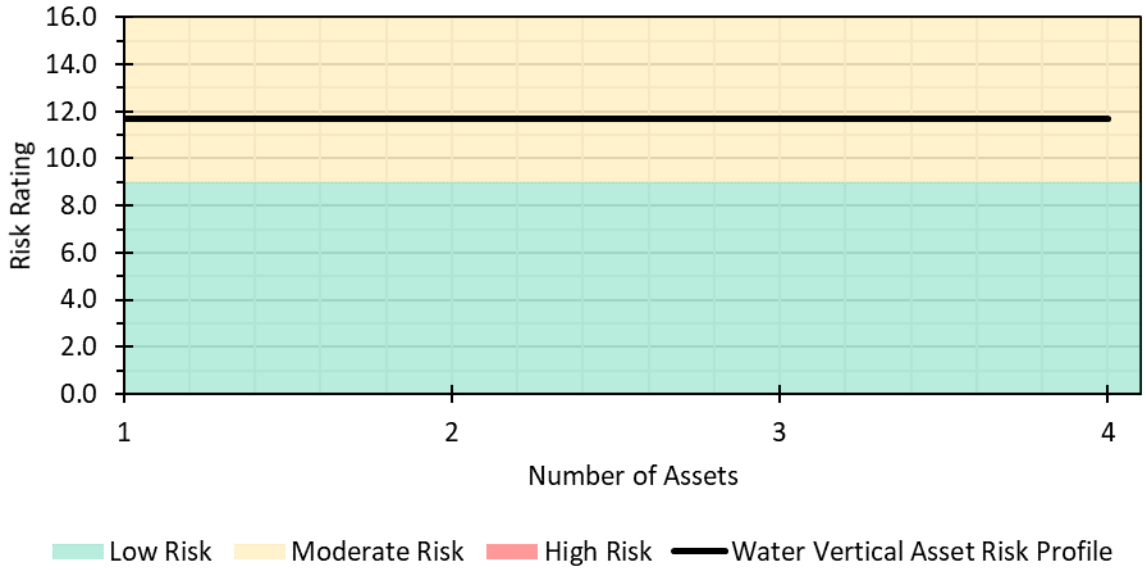
Climate Change: Assumed a value of 3 (Limited impact with slower recovery; mitigation plan not in place)

Impact: High impact (value of 2)

Importance: High importance (value of 3)

The risk profile for water vertical assets is shown in **Figure 4-1**.

Figure 4-1: Risk Profile for Vertical Water Assets



The four water vertical assets are all considered 'moderate' risk according to the assumptions and criteria.

4.6 Lifecycle Activities – Water Vertical Assets

The lifecycle activities for the water vertical (building) assets will be generally consistent with those expected for general municipal buildings presented in **Section 12.0**, which includes:

Construction

Beginning of an asset's lifecycle. To be constructed to adhere to applicable standards and codes.

Maintenance

Types of maintenance include preventative, reactive and major maintenance. These activities are to be done on a routine basis to retain good condition and performance of the assets, and in response to issue or fault in a component or building asset. Maintenance activities will be undertaken throughout the lifecycle of the asset.

Renewal

Addition to or update of existing building component(s) to achieve modernization, compliance with updated codes and requirements, and/or to suit changes to services provided.

Decommissioning/Disposal

Removal from service of a building asset or component. Disposal can be through decommissioning or sale. Activities should comply with applicable health, safety and environmental protocols.

As the water vertical assets are specialized for treatment and distribution services, there are additional factors that must be considered:

- Water treatment and distribution facilities are highly regulated. Any and all lifecycle activities undertaken must be done in compliance with codes and regulations.
- Expansion of existing facilities may be required for additional water treatment and distribution capacity as a result of growth. Expansion activities may encompass multiple lifecycle stages, such as construction for additional infrastructure required, and renewal for expansion of existing infrastructure such as the treatment facility.

Additional detail for the expected lifecycle activities can be found in **Section 11.6** (Lifecycle Activities – Buildings).

4.7 Asset Management Strategy – Water Vertical Assets

The asset management strategy for water vertical assets seeks to maximize the useful life and economy of each asset, using the lifecycle activities. The strategy is generally consistent with what is recommended for buildings, as detailed in **Section 12**.

The primary drivers of lifecycle activities for these assets is the condition and service delivery requirements. The Town water building assets are complex, the componentry for which are expected to have differing rates of degradation and expected useful lives. As such, lifecycle activities will be required to be implemented at varied frequency and timelines.

The expected useful life of the asset components should be used to approximate the timing and frequency of lifecycle activities; however, this is refined by information generated through undertaking detailed condition assessment of the buildings. The Town has completed detailed building condition and equipment assessments for the WTP at the outset of this report and should continue to update this information at a frequency that is achievable.

A maintenance schedule and forecast of asset improvements can be generated based on this detailed review, which should be updated at a frequency suitable to the Town, suggested to be every five years. If it is not possible to complete the condition assessment of all vertical water assets in a specified timeframe, prioritization of the assets for the condition assessment program is suggested, to consider the factors included in the risk assessment, condition, and performance measures. Water vertical assets with high risk or poor condition/performance components should be prioritized in the condition assessment program.

Routine maintenance schedules are assumed to be in place currently and are recommended to continue assuming that they are currently providing sufficient level of maintenance.

Management of water vertical assets should also include climate change considerations in new construction, maintenance, or renewal lifecycle activities. Assessment should be undertaken to understand vulnerability of the water vertical assets to a changing climate, which will inform lifecycle activity requirements, and potential changes to the way lifecycle activities are undertaken.

Works should also be undertaken as required to maintain the treatment efficiency and capacity to meet regulations and user requirements.

4.8 Current Projection of Works

The current projection of works was undertaken through estimation of replacement year considering expected useful life and age for the water vertical assets, and through detailed condition assessment by OCWA.

4.8.1 Capital Investment Plan – Condition Assessment

The capital investment plan for water vertical assets was undertaken by OCWA as part of the separate Water and Wastewater Facilities Assessment and Capital Investment Plan (2021). The following information is summarized from that report.

Based on an assessment of condition and an understanding of the operational components of the water vertical assets, OCWA projected a capital investment plan that includes short-term works (needs incurred in the next 1-5 year), medium-term works (needs incurred in years 6-10), and a longer-term 25 year investment plan to address deficiencies.

The following tables (extracted from the OCWA report) summarize the needs identified in the short and medium-term for the water vertical assets, as excerpted from the report. It should be noted that summaries listed below amalgamate similar components (blowers, pumps, etc.) and systems (Boiler System, SCADA system, etc.) in order to better summarize the recommended works. Likewise, minor assets replacements were not included in order to keep focus on the major works.

Table 4-4: Short-Term Recommended Works for Water Vertical Assets

Short Term Recommended Works (1-5 Years)	Estimated Cost	Year
Water Tower – Valve Chamber Rehabilitation	TBD	2022
VFD replacements	$20,000	2023-2024
UPS replacement (every 4-5 years)	$5,000	Every 4-5 years
Analyzer Replacements	$7,000	2022-2023
Motor Replacements	$41,000	2024-2025
Filter Blower Replacements	$34,000	2025-2027
Boiler Compressor	$18,000	2025-2027
Dehumidifier Replacements	$6,000	2025-2026

Table 4-5: Medium-Term Recommended Works for Water Vertical Assets

Short Term Recommended Works (1-5 Years)	Estimated Cost	Year
ACTIFLOW Rehabilitation and Component Replacement	$80,000	2026
Pump Replacements	$565,000	2026-2029
Chemical Feed and Mixing System Replacements (inc. pumps)	$120,000	2026-2027
Instrumentation Replacement	$16,000	2026-2027
HVAC Replacements (Heaters, Louvres, Fans, etc.)	$57,000	2026-2030
Filter Media Replacement	$150,000	2028
Safety Equipment Replacement (inc. eyewash station)	$30,000	2028
Sampler Replacement	$10,000	2028
PLC Replacement	$20,000	2029

4.8.2 Works Projection

Using the results of the condition assessment and other needs identified by the Town, the projected works were collected and summarized, as in the table below.

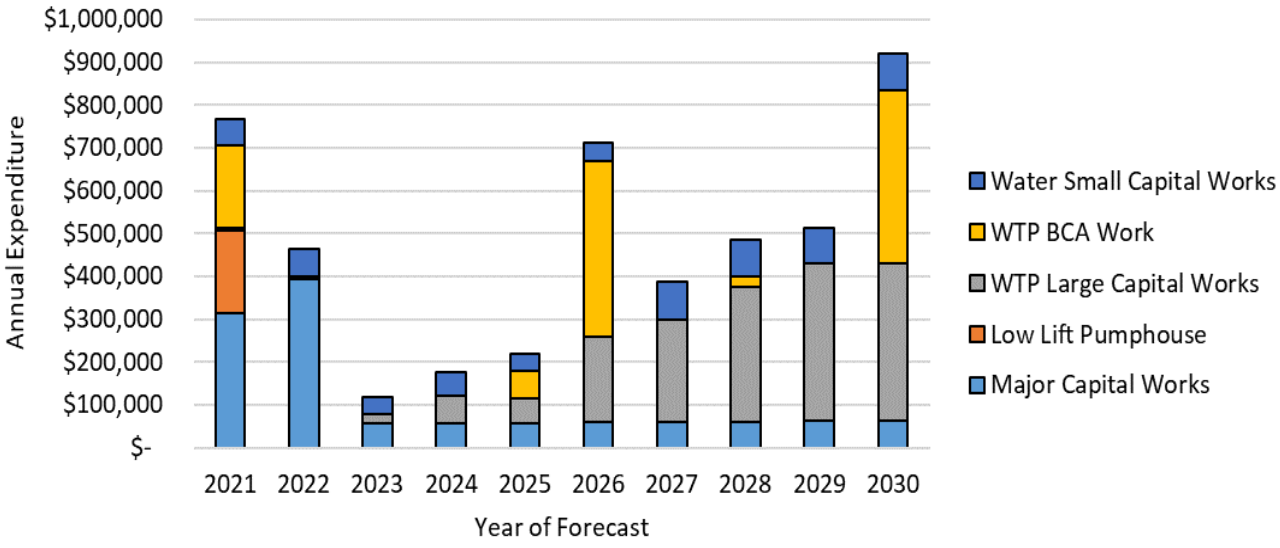
Table 4-6: Capital Forecasts for Water Vertical Assets

Capital Works	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Major Capital Works										
WTP process Manganese Treatment - Construction		40,000								
Filter Wall & Trough Rehab & Clearwell Sealing		300,000								
Water Tower Inspection/Cleaning/touchup	260,000									
Valve Turning Machine (20 yrs)										
Low Lift Pumphouse										
Repairs to Ext Walls	15,000									
Internal Roof Decking Over Actiflow	50,000									
Localized Concrete Detrioration LLPS	30,000									
Windows LLPS	15,000									
Exterior Sealants	10,000									
Replace Makeup Air Unit	60,000									
Replace Rooftop Exhaust Fans (5)	12,500									
Water Treatment Plant Large Capital Works	7,600	6,400	23,000	65,000	56,800	199,680	240,320	314,160	366,960	365,560
WTP BCA Work										
Building Structural Repairs	65,000									
Building Envelope Repairs and Replacements	55,000					410,000		25,000		
Mechanical Systems Replacements	72,500				65,000					100,000
Electrical Systems Replacements										305,000
Water Small Capital Works	60,914	62,098	38,409	54,165	40,086	44,954	87,735	84,240	83,278	84,847
Annual Capital Forecast	713,514	408,498	61,409	119,165	161,886	654,634	328,055	423,400	450,238	855,407

4.8.3 Overall Projection

In consideration of the works identified for the water vertical assets, we can project an overall annual expenditure, as shown in **Figure 4-2**.

Figure 4-2: Forecasted Annual Expenditure for Water Vertical Assets



5.0 Wastewater Assets

5.1 State of Local Infrastructure

The Town owns and operates a wastewater collection system, which uses linear sewer mains and appurtenances to collect and convey sewage flows to the treatment facility. Vertical wastewater assets are reported on in **Section 6.0**. The wastewater collection system includes approximately 61 km of pipe, and 822 maintenance holes. A summary of the quantity of wastewater linear assets within the system is provided in **Table 5-1**.

Table 5-1: Wastewater Linear Asset Quantity Summary

Linear Asset Material	Total Length (m)	Percent of Total Inventory
Cast Iron	112	0.2%
CIPP	1,200	2.0%
Concrete	29,408	48.2%
HDPE	870	1.4%
PVC	17,019	27.9%
Steel	404	0.7%
Transite	1,133	1.9%
Vitrified Clay	10,852	17.8%
Total	60,998	100%

The analysis within this section of the report will be limited to the linear wastewater assets. Vertical wastewater assets will be reported on separately, and asset components, such as maintenance holes and connections are omitted. This is predicated on the assumption that all other elements included in the system are required componentry that will be replaced in conjunction with the linear components, and are expected to have similar expected useful lives and conditions as the linear components.

5.1.1 Current Data

The information reported in this AMP and the subsequent analysis are based on the current TCA inventory maintained by the Town.

5.1.2 Replacement Costs

Replacement costs for the wastewater linear assets were determined based on recent tender information and product information. The replacement costs, in 2022 dollars, include costs necessary for full reconstruction of a segment, including trench and surface restoration. It is assumed that reconstruction works will be completed using PVC piping for pipes that are 600 mm in diameter or less, and concrete piping for sizes larger than 600 mm diameter.

The unit replacement costs were used to estimate the total replacement cost of the linear assets based on current lengths. The unit and total replacement costs are summarized in **Table 5-2**.

Table 5-2: Replacement Costs for Wastewater Linear Assets

Pipe Material	Pipe Diameter (mm)	Total Length Currently Existing in Network (m)	Reconstruction Unit Cost ($/m)	Total Replacement Cost
PVC	Up to 250 mm	43,112	$1,350	$58,201,769
PVC	251 mm to 400 mm	9,583	$1,450	$13,895,033
PVC	401 mm to 600 mm	7,433	$1,750	$13,008,331
Concrete	Over 600 mm	869	$1,950	$1,695,100
Total		60,998		$86,800,232

At time of this report, it is expected that full network replacement would exceed $86 million.

5.1.3 Average Age

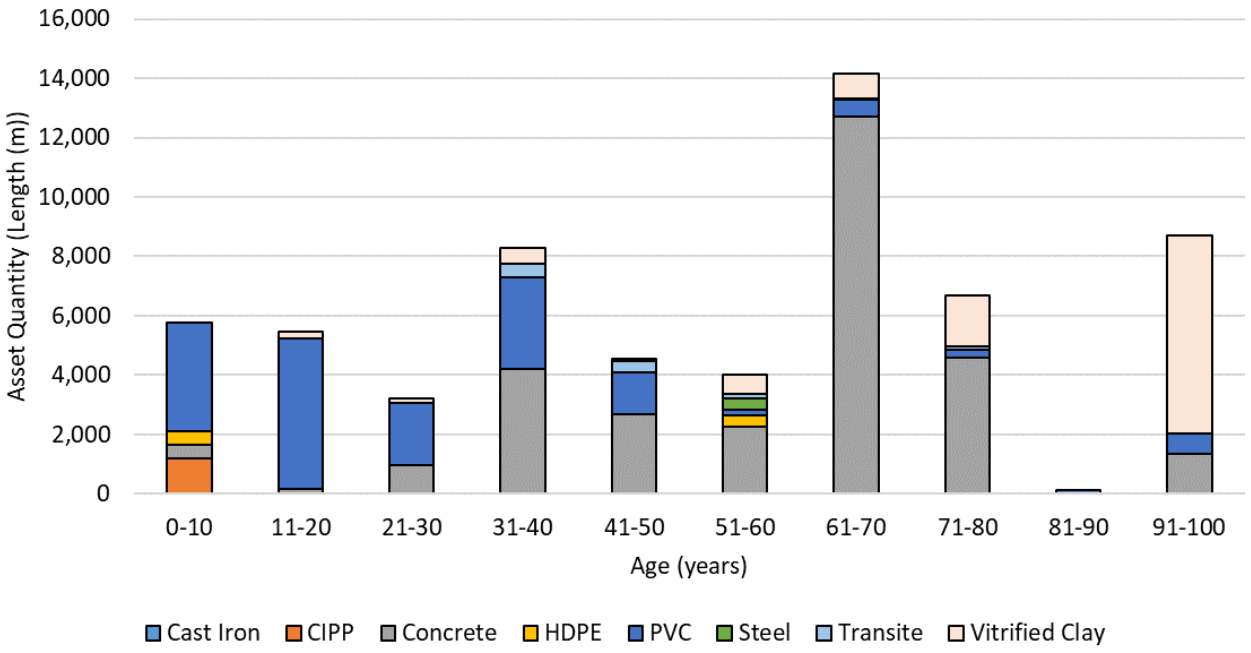
The average age of the wastewater collection assets was calculated by pipe material, proportionally by length of asset. The average age of all wastewater linear assets is 50 years. The average age is summarized in **Table 5-3**.

Table 5-3: Average Ages of Linear Wastewater Assets, by length

Pipe Material	Average Age(years)
Cast Iron	82
CIPP	4
Concrete	57
HDPE	27
PVC	26
Steel	53
Transite	47
Vitrified Clay	79
Average	51

A summary of the age distribution for the linear wastewater assets is shown in **Figure 5-1**.

Figure 5-1: Age Distribution of Linear Wastewater Assets



5.1.4 Expected Useful Life

The expected useful life of the wastewater linear assets is used to estimate the replacement schedule. The expected useful life values for each type of sewer material within the network were provided and confirmed by the Town and are summarized in **Table 5-4**.

Table 5-4: Expected Useful Life for Wastewater Linear Asset Materials

Pipe Material Type	Expected Useful Life (years)	Average Remaining Useful Life (years)
Cast Iron	80	-2
CIPP	90	86
Concrete	90	33
HDPE	100	73
PVC	100	74
Steel	80	27
Transite	80	33
Vitrified Clay	70	-9

The values presented in Table 5-4 are typical of most assets owned by the Town. Expected useful life of individual assets may vary depending on construction, ground conditions and operating conditions of the asset.

5.2 Condition – Wastewater Assets

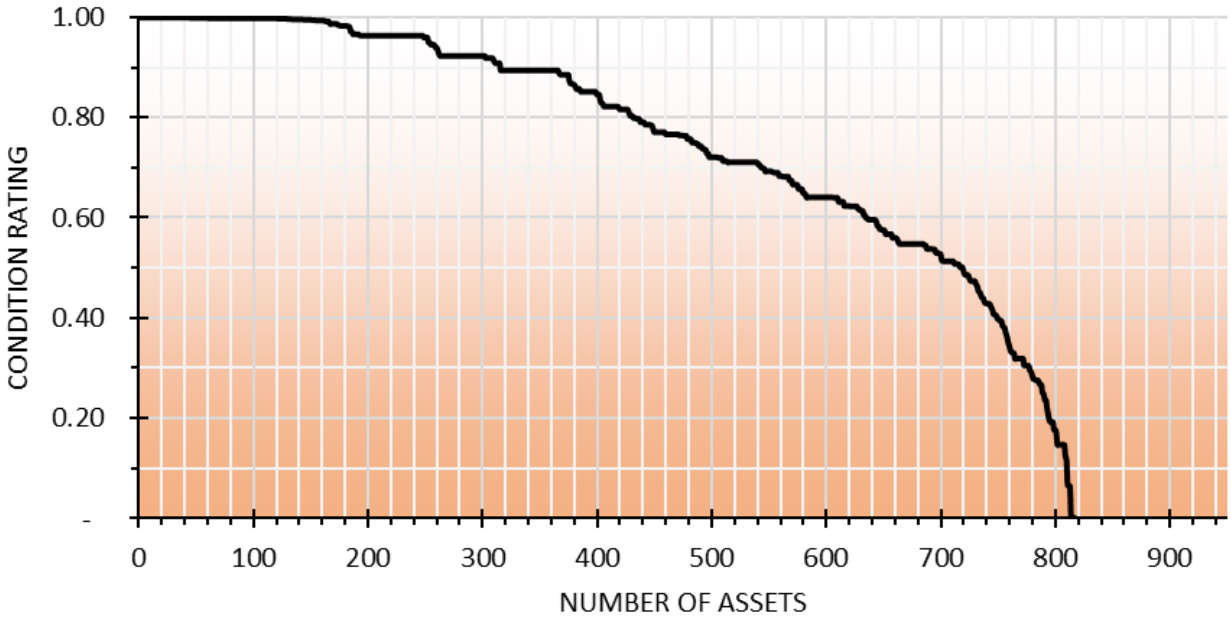
Condition of the wastewater linear assets was determined through condition observation and a deterioration model. The condition observation information was provided by the Town, on a scale from 0 to 1 where 1 represents an asset in its best condition, and 0 represents an asset in worst condition. The observed condition information was further deteriorated form the date of observation using the deterioration curve (customized to the material and useful life of pipe material). The condition ranges are described according to the ranges in **Table 5-5.**

Table 5-5: Condition Rating Descriptions

Condition Range	Condition Description
1-0.60	Very Good to Good
0.60-0.35	Good to Fair
0.35-0	Poor to Very Poor

A summary of the condition value of the wastewater pipe assets is included in **Figure 5-2**.

Figure 5-2: Condition Ratings of Wastewater Linear Assets



A majority of the assets are above a condition rating of 0.6, which can be described as "good" to "very good" as the rating approaches 1. This includes just under 650 assets, with a total length of approximately 44.8 km, or 75% of the assets by length. The average condition rating of all the linear wastewater assets by length is 0.70.

5.3 Current Levels of Service – Wastewater

Levels of service for wastewater assets are outlined in Table 2 of the regulation, O. Reg. 588/17. **Table 5-6** to

Table 5-8 outline the Town's current community and technical levels of service for wastewater assets.

Table 5-6: Wastewater – Community Level of Service

LOS Parameter	Community Levels of Service Qualitative Description	Community LOS
Scope	Description, which may include maps, of the user groups or areas of the Municipality that are connected to the municipal wastewater system.	The Town provides wastewater collection and treatment services for connected properties. A map showing the areas connected to the wastewater system is in **Figure A-2** in **Appendix A**.
Reliability	1. Description of how combined sewers in the municipal wastewater system are designed with overflow structures in place which allow overflow during storm events to prevent backups into homes.	Bypass point located at sewage treatment plant for protection of the treatment system
Reliability	2. Description of the frequency and volume of overflows in combined sewers in the municipal wastewater system that occur in habitable areas or beaches.	0 to 3 minor overflows per year at the sewage plant. No other sewage bypass points in collection system
Reliability	3. Description of how stormwater can get into sanitary sewers in the municipal wastewater system, causing sewage to overflow into streets or backup into homes.	Storm water has the potential to enter into the municipal sanitary sewer system through multiple points of entry, including: • Direct connections from properties, including roof leaders, sump pumps, etc. • Inflow and infiltration within manholes and damaged pipes and joints

LOS Parameter	Community Levels of Service Qualitative Description	Community LOS
Reliability	4. Description of how sanitary sewers in the municipal wastewater system are designed to be resilient to avoid events described in paragraph 3.	• Development guidelines/engineering design standards • Additional capacity created in pipe network from separation of combined sewer • Treatment system designed with a high peaking factor, MECP recommended design increases
Reliability	5. Description of the effluent that is discharged from sewage treatment plants in the municipal wastewater system.	Total annual flow: • 2018: 1,729,973 m^3 • 2019: 2,112,540 m^3 • 2020: 1,792,972 m^3 The Town reports annually on performance of the wastewater treatment system, including description of the effluent discharged from the sewage treatment plants. **Table 5-7** describes the quality parameters of the effluent.

Table 5-7: Annual Effluent Flow 2018-2020

Parameter	2018	2019	2020
CBOD5 (mg/L)	3	3	3
TSS (mg/L)	3.5	6	4
Total Phosphorous (mg/L)	0.07	0.11	0.08
Total Ammonia Nitrogen (mg/L)	0.49	1	0.4
E. coli (geometric mean average (cfu/100mL))	15.6	27.4	27.4
pH	6.71 – 7.6	6.55 – 7.7	6.6 – 7.4

Table 5-8: Wastewater – Technical Level of Service

LOS Parameter	Technical Levels of Service Technical Metrics	Technical LOS
Scope	Percentage of properties connected to the municipal wastewater system.	• 2018: 3,036 residential, 307 commercial (3,343 total) • 2019: 3,055 residential, 307 commercial (3,362 total) • 2020: 3,100 residential, 310 commercial (3,410 total)
Reliability	1. The number of events per year where combined sewer flow in the municipal wastewater system exceeds system capacity compared to the total number of properties connected to the municipal wastewater system.	• 2018: 1 bypass/overflow event occurred. The event (occurring in July) was as a result of heavy rainfall hydraulically overloading the facility. Total volume was 828 m^3 • 2019: 5 bypass/overflow events occurred. All events (occurring between April-October) were as a result of heavy rainfall hydraulically overloading the facility. Total volume was 4,816 m^3 • 2020: 1 bypass/overflow event occurred. The event (occurring in August) was as a result of heavy rainfall hydraulically overloading the facility. Total volume was 0.79 m 98% of properties are connected to the system.
Reliability	2. The number of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system.	• 2018: Greater than 100 backups • 2019: Approximately 10 backups • 2020: Approximately 10 backups
Reliability	3. The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system.	• 2018: no effluent violations • 2019: no effluent violations • 2020: no effluent violations

5.4 Current Performance – Wastewater

Asset performance measures were determined in consultation with the Town, which provide relevant metrics against which the Town can gauge the performance of their assets. The performance measures for Roads, and their current values are shown in **Table 5-9**.

Table 5-9: Wastewater – Performance Measures

Asset Performance Measures	Current Value
Cost efficiency (operating cost to provide service - $/household for wastewater services)	To be established
Number of customers that have experienced a service interruption in the last year	To be established
Percentage of wastewater flows that meet environmental objectives when discharged	To be established
Number of non-compliances and spills	To be established

5.5 Risk Assessment – Wastewater

The risk assessment for wastewater linear assets was conducted using the following assumptions and criteria:

Condition: Determined based on estimated condition (using deterioration curve and observed condition)

Performance: Assumed to be always reliable (value of 1)

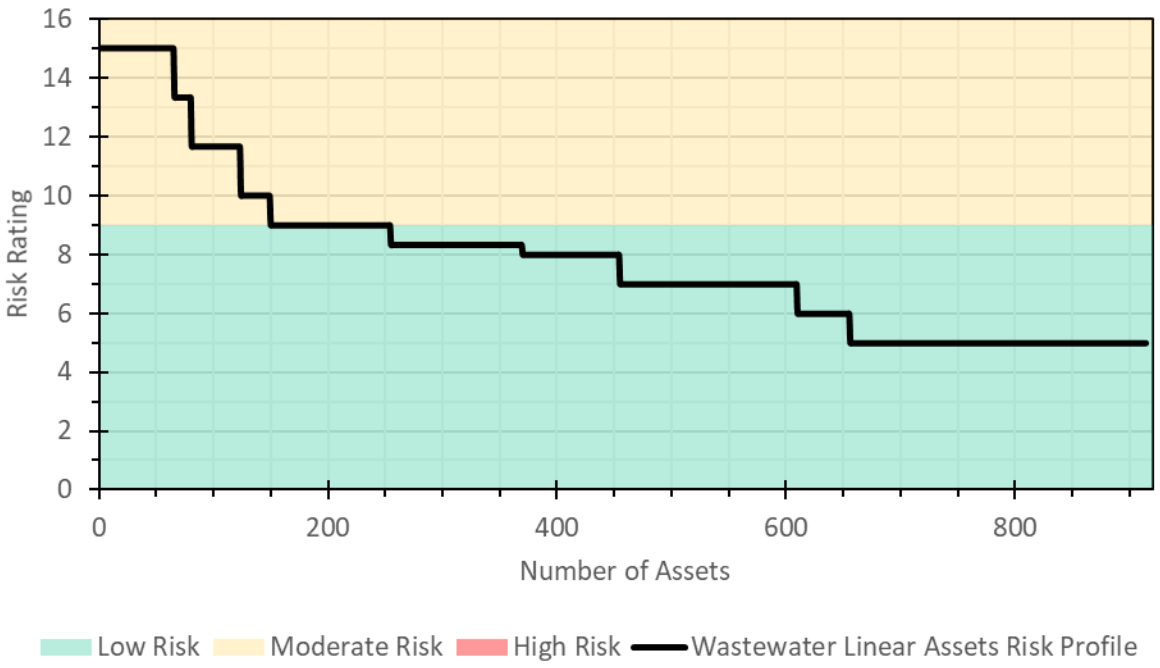
Climate Change: Assumed a value of 3 (Moderate or high impact; no or limited mitigation plan)

Impact: High impact (value of 2) attributed to forcemains and "collector" gravity mains.
Moderate impact (value of 1) attributed to all other gravity "local" sewer mains.

Importance: High importance (value of 3) attributed to forcemains and "collector" gravity mains.
Moderate importance (value of 2) attributed to all other gravity "local" sewer mains.

The risk profile for wastewater sewer is shown in **Figure 5-3**.

Figure 5-3: Risk Profile for Wastewater Linear Assets



There are 149 assets within the 'moderate' risk range. These assets are all either forcemains or categorized as 'collector' assets. The assets range in date of construction from 1930 to 2014. There are two assets of moderate risk that were constructed in 2014. These assets are 600 mm diameter segments, and were observed to have condition ratings of 0.5 and 0.6 (on a scale from 0-1) in 2015.

5.6 Lifecycle Activities – Wastewater

In the lifecycle of a sanitary sewer pipe asset, there are multiple activities that can be taken, depending on the asset attributes. The expected lifecycle activities to be used on the Town assets are as follows:

Construction Activities:

Construction of new assets is recommended to be in line with recommendations as part of growth, master plan, or other municipal strategies. The design of the new assets should be consistent with jurisdictional design requirements, including provincial design guidelines and local requirements. New construction of assets will occur where no previous sanitary servicing is available. The risk associated with new construction includes the high cost of brand new assets relative to ability to recoup costs through user rates or development charges.

Construction can also be the replacement of deteriorated assets. At the end of the useful life of an asset, it can be replaced for continuation of service provision.

At the time of replacement, design should be undertaken to ensure design requirements are met, and adequate capacity is provided for current and future requirements.

Maintenance Activities

Maintenance activities are undertaken on the assets throughout their useful life to maintain their operating condition and performance. Maintenance works includes routine maintenance (flushing, cleaning), and minor repairs to assets. There exists the risk that a maintenance activity may be implemented that does not adequately mitigate a performance or condition issue, and additional costs are then required for further repair or replacement.

Maintenance activities can include condition assessment and inspection of the assets. The inspection of sanitary sewer assets can be undertaken through a condition assessment program, recommended to be visual inspection through CCTV or zoom camera means. CCTV inspection can provide a higher level of detail than zoom camera, therefore zoom may be appropriate while ascertaining high level condition information, and CCTV should be used where more detailed investigation is required. Usage of the zoom camera technology, due to limitations in detail that can be provided, has the risk of insufficient visual detail to make appropriate activity decisions if used as the only visual inspection option.

Renewal Activities

Renewal of the sanitary sewer assets can include structural or non-structural lining. A lining can be used where the condition has deteriorated, however structurally the pipe segment is still sound. A lining can extend the useful life of an asset and improve performance. Risks associated with lining of a pipe include the improper installation of the pipe or continued deterioration of the original pipe such that the lining does not perform as expected.

Operating Activities

Operating activities for the sanitary sewer network include those activities that do not directly deal with the physical state of the pipe, but work to extend the assets useful life. The operating activities can include non-infrastructure policies, and monitoring/inspection of the assets. The inspection of sanitary sewer assets can be undertaken through a condition assessment program, recommended to be visual inspection through CCTV or zoom camera means. Usage of the zoom camera technology has the risk of insufficient visual detail to make appropriate activity decisions.

Decommissioning Activities

Decommissioning activities of the sanitary sewer assets includes abandonment or replacement of the asset at the end of its useful life. While typically assets are abandoned in place, the removal of the expended asset can provide additional space for new underground assets to be constructed.

5.7 Asset Management Strategy – Wastewater

The asset management strategy for wastewater linear assets will maximize the lifecycle of the assets where appropriate, in consideration of specific needs of the Town and existing infrastructure.

Non-infrastructure solutions can be used through the lifecycle of an asset and can be tied to system management on a broad scale, or to assist in understanding specific components of the system. The Town has previously undertaken planning works, established policies and bylaws, developed system models and had specific studies done to provide details and understanding of the wastewater collection system. It is recommended that ongoing, and as required, the Town continue to maintain or undertake these studies. The broader planning and policy documents should be refreshed or maintained current. Specific studies can be implemented on an ad hoc basis where additional information is required to understand possible performance or condition issues within the system.

The condition, a major factor in the asset management strategy, should be established to assist in decision making. The Town intends to establish and maintain a condition assessment program for more diligent understanding and monitoring of the condition of the wastewater assets. The recommendation is to use visual inspection facilitated by CCTV or Zoom camera inspection, from which a condition index can be determined for incorporation into and update of the AMP. A typical practice is to undertake assessment of 1/5 to 1/3 of the assets annually, such that each pipe gets reviewed on a 3 to 5 year basis.

The cost for CCTV and Zoom inspection can vary depending on availability of services and providers. Assuming a unit cost of $15/m for CCTV, and the total length of assets of approximately 61,000 meters, the Town could estimate between $183,000 (for 1/5 of network) to $305,000 (1/3 of network) annually to complete CCTV inspection (acknowledging that this will vary annually). Zoom technology is estimated on a per manhole basis of approximately $150.

A schedule for completing condition assessment should be developed by the Town, with the assumption that a portion of the network will be reviewed annually.

The prioritization for completing reviews should consider location of the sewers, known issues, and current understanding of condition.

When the condition of the asset has degraded such that, an intervention is required, it is recommended that maintenance be reviewed as the first opportunity to extend the useful life. Maintenance works can include localized repair work, flushing or cleaning of the pipe.

When the condition of the asset has degraded such that maintenance is no longer an appropriate activity, a pipe asset may be a candidate for relining. Because of the non-intrusive nature of conducting relining, it can be done on an individual pipe segment at a time, or to localized repairs.

As deterioration continues, the segment can become less reliable as likelihood of failure increases. The appropriate activity for the asset is to be reconstructed. The Town should follow best practices and local design guidelines when designing the reconstruction works.

At the end of the lifecycle of a wastewater linear asset, it can be decommissioned, removed or abandoned in place (where appropriate).

A summary of the pipe condition and recommended associated lifecycle activity is provided in **Table 5-10**. Note that condition assessment should be undertaken on a routine basis throughout the lifecycle of the asset, and other factors should be considered when selecting a lifecycle activity.

Table 5-10: Sanitary Sewer Lifecycle Activities and Condition Ranges

Condition Range	Condition Description	Lifecycle Activity Category	Lifecycle Activity
1 to 0.60	Very Good to Good	Maintenance	Maintenance works (cleaning, flushing) Maintenance hole repairs Small pipe section repairs
0.60 to 0.35	Good to Fair	Rehabilitation	Localized repairs Structural relining Maintenance hole repairs
0.35 to 0	Poor to Very Poor	Reconstruction	Pipe replacement or abandonment

Current construction materials of the wastewater collection assets are varied, however best practice at the Town is for the construction and replacement of assets going forward to be undertaken with PVC material for pipes up to 600 mm in diameter, and concrete for pipes of 600 mm in diameter or larger.

The Town currently has wastewater linear asset sections that act as combined sewers (storm and sanitary flows). These segments should be considered for separation.

The Town considers other specific factors into the prioritization of the works on wastewater liner assets, in addition to those described above. Based on present knowledge of the wastewater system, the Town should consider the following:

- Wastewater collection needs based on growth
  - Informed by growth and development studies, including master plans
- Separation of combined sewer segments
- DC funding sources.

There is efficiency in conducting capital reconstruction works where adjacent asset types can be reconstructed simultaneously. Part of the Town's current strategy is to use capital works projects from other linear asset categories to identify any upcoming capital works on adjacent linear infrastructure (such as road works, watermain or storm), and align the timing of the works such that there is efficiency in the design, construction and material costs associated with the project, and reduced disruption to service delivery.

5.8 Scenario Analysis

To understand the needs of the wastewater collection system and overall system condition within a 20 year outlook, replacement and relining activities were reviewed under varying budget scenarios. The current average condition of the assets is 0.70. The budget scenarios analyzed include:

1. Unlimited budget – To determine backlog of works
2. No budget – To understand the changes in average network condition with no investment
3. 2% of network value – Best practice of investment
4. 4% of network value – Best practice of investment
5. 2014 AMP Funding Level – To understand impact of current recommended allocation
6. Required Funding to Achieve 0.6 – Defining target budget for average network condition of 0.6
7. Maintain Current Condition (0.70) – Defining the target budget to maintain the current average condition across the network

5.8.1 Analysis Results

Multi-year projection scenarios were run using the budgets listed above, including reconstruction and relining works. In the analysis, reconstruction activities are recommended when a pipe has a condition rating of between 0 and 0.35. Reconstruction of a segment will return the segment to a condition index of 1.

Relining is assumed to be an appropriate lifecycle activity when a pipe asset has a condition rating of between 0.35 and 0.6. Thus, relining activities are triggered if a segment is within that range at the outset of the analysis period, or when an asset degrades to a 0.6 condition rating. Further, relining is not expected to return an asset to perfection condition, therefore the condition index reaches only a 0.8 after relining work is completed.

A summary of the analyses is below:

Table 5-11: Budget Scenario Results – Sanitary Sewer

Number	Budget Scenarios	Annual Value	Average Annual Investment (2022-2041)	Total Investment (2022-2041)	Average Condition Index (at 2041)
1	Unlimited budget	Unlimited	$1,028,925	$20,578,497	0.79
2	No Budget	$0	$0	$0	0.56
3	2% of network value	$1,734,000	$1,028,925	$20,578,497	0.79
4	4% of network value	$3,468,000	$1,028,925	$20,578,497	0.79
5	2014 AMP Funding Level	$300,000	$298,928	$5,978,566	0.62
6	Get to 0.6 Over Timeframe	$250,000	$249,368	$4,987,350	0.61
7	Maintain Current Condition (0.70)	$700,000	$697,375	$13,947,496	0.73

The budget values considered in the scenarios are maximum investment per year.

The selection of an investment level for the wastewater strategy should consider the current and intended level of service, affordability, effectiveness of the scenario, and backlog of works.

Scenario 1 assumes an unlimited budget available for reconstruction of the wastewater linear assets. In the first year of the scenario, $12.3M in reconstruction works were identified, indicating that there is a backlog of repairs required to improve the condition of the assets. The backlog includes any assets that are currently at a condition rating of 0.35 or less.

Scenario 2 models the impact of no spending on wastewater reconstruction during the 20 year timeframe. The average condition rating deteriorates to 0.56.

Scenarios 3 and 4 were found to have the same average annual investment and total investment over the 20 year timeframe, with each of those values being consistent with the Scenario 1 (Unlimited) results. Accordingly, the average condition at the end of the timeframe is also consistent. As the same results are achieved by both scenarios, we can assume that expenditure of 4% annually is greater than required, and to achieve the results in the scenario, the 2% annual investment would be recommended.

Scenario 5 reviewed the investment level recommended as part of the 2014 AMP and found that while the annual and total expenditures were less than the previous scenarios, the average condition at the end of the timeframe is not significantly lower.

Scenario 6 reviewed the annual investment requirements when targeting an average condition rating of 0.6 over the 20 year timeframe and was found to be similar to the results of the 2014 AMP funding value, with the annual expenditure being slightly less, and the average condition rating being only slightly below that found through Scenario 5.

Scenario 7 reviewed the annual investment requirements when targeting the current condition rating of 0.7 over the assessed timeframe. At the end of the timeframe, the scenario raises the average condition rating slightly from current. This scenario also increases the annual investment value by $400,000 from the value recommended in the 2014 AMP.

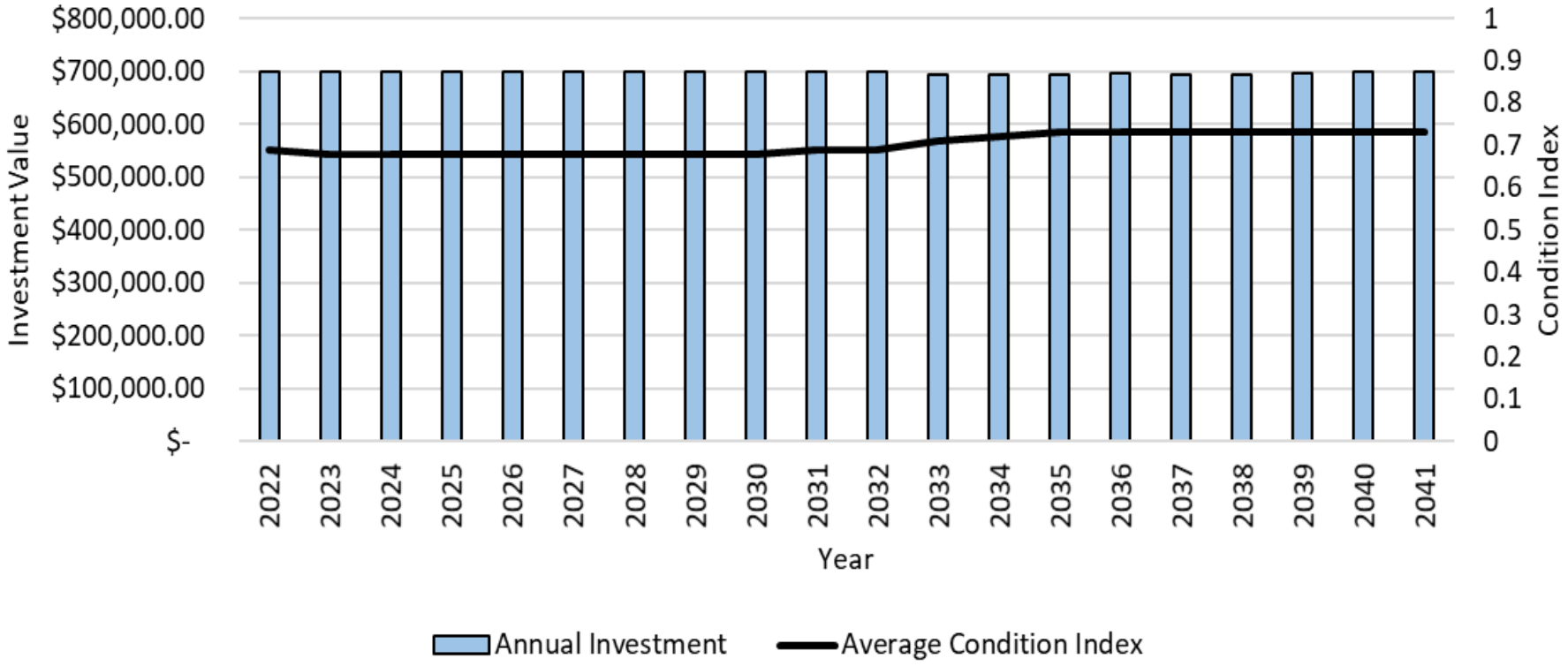
In selecting the recommended investment level, the Town should consider its current and preferred level of service being provided. The LOS is represented in these scenarios as the average condition of the assets. The current average condition is 0.70, and a best practice recommends maintaining a minimum average condition of 0.60 across the system. If the Town's target is to maintain the current LOS, Scenario 7 would be the recommendation, however if the Town was accepting of a decrease in average condition, a more affordable scenario (such as 5 or 6) could allow the average condition to deteriorate yet remain above the best practice threshold. The Town could consider reducing investment in the wastewater collection assets such that the average condition deteriorates to the minimum recommended average, however, must also consider the current backlog of works on the system and the current level of service being provided.

The Town should also consider the current backlog of works relative to the investment scenario. The unlimited scenario identifies a $12 million backlog of works currently outstanding on the system. The total expenditure for the full analyzed timeframe in Scenarios 5 and 6 is less than that, at approximately $5.9 million and $4.9 million respectively.

While these scenarios present annual expenditures that are more achievable for the Town, it may be insufficient to address all required lifecycle activities, thereby risking degradation of some assets to the point of failure. Risk assessment and visual inspection of the pipes should be implemented to assist in determining the optimal prioritization for works to be undertaken, as well as other factors such as sewer separation needs, and growth considerations.

The annual investment in Scenario 7 is relatively consistent, with the majority of the investment being used each year. **Figure 5-4** below illustrates the level of investment for Scenario 7 (maintain current average condition index), and the expected impact in average condition index.

Figure 5-4: Investment and Condition Index with Lifecycle Investment Scenario (No. 7)



The scenarios provide a projection of the overall condition of the system and how it may react to varying levels of investment. The selection of assets and capital projects to be undertaken must consider additional factors.

6.0 Wastewater Vertical Assets

6.1 State of Local Infrastructure

For the collection and treatment of wastewater, the Town owns six wastewater pumping station, and a Water Pollution Control Centre (WPCC). The Town currently operates the pumping stations, and contracts operation of the wastewater treatment plant to a third-party, currently OCWA.

Sewage Pumping Stations (SPS)

The Town has six sewage pumping stations as part of the wastewater collection system:

- Lisgar SPS
- June Street SPS
- Hincks SPS
- O'Brien Road SPS
- Coleraine SPS
- Hunter Gate

The sewage pumping stations are located throughout the Town to facilitate collection and conveyance of the wastewater flows to the treatment plant.

Water Pollution Control Centre (WPCC)

The WPCC (also referred to as the Wastewater Treatment Plant, WWTP) treats collected wastewater from the Town. The plant has a rated capacity of 9,500 cubic meters of flow per day, with a peak hydraulic capacity at 50,000 cubic meters of flow per day, with bypass flows further available.

The WPCC was constructed in 2009, replacing the prior plant, originally constructed in 1968.

A summary of the componentry by category at the water facilities is in **Table 6-1**, noting that a breakdown of the componentry of the pumping stations were not available at the time of reporting.

Table 6-1: Summary of WWTP Asset Components

Category	Component Types	Number of Components
Process Equipment	Actuator, Blower, Centrifuge, Compressor, Conveyor, Gear Drive, Mixer, Motor, Pump, Screen, Separator, UV, Valve, VFD	266
Process Electrical	Panels, MCC, Switches, UPS, Batteries	14
Instrumentation & Controls	Analyzers, Control Panel, Meters, Panels, Sampler, Scale - Electronic	57
Process Structural	Tanks	10
Facility - Mechanical	Pumps, Boiler, Fan, Heater, HVAC, Lifting Device, Piping, Safety – Eyewash, Tanks, Tools, Wash/Dryer	64
Facility - Electrical	Sensors, Electrical Works, Panels, Router, Transformer	8
Facility - Architectural	Doors/Windows, Interior, Roof, Siding	4
Facility - Structural	Foundation, Structure	2
Emergency Power	Generator	3

Additional description of the processes and componentry utilized within the water vertical assets can be found in the Water and Wastewater Facilities Assessment and Capital Investment Plan.

6.1.1 Current Data

The information reported in this AMP and the subsequent analysis are based on the current Building Condition Assessment (BCA) and condition assessment information. The BCA reporting is for the Water Pollution Control Centre and was undertaken in 2020 by Morrison Hershfield. The condition assessment for the operational equipment was conducted by OCWA in 2020.

6.1.2 Replacement Costs

The replacement cost for the WPCC was determined through evaluation of the componentry, with the estimated replacement costs being $40,000,000.

Building Condition Assessment was undertaken for three of the pumping stations (O'Brien Road SPS, June Street SPS, and Hincks SPS), through which an estimated replacement cost was provided based on evaluation of componentry. The assessment was undertaken in 2014.

Since this report, updated estimates have been provided by the Town for replacement of these stations, and are as follows:

- O'Brien SPS – $1,000,000
- June SPS – $250,000
- Hincks SPS – $250,000

The estimated replacement costs for the remaining pumping stations were determined through evaluation of the componentry and are as follows:

- Lisgar SPS – $300,000
- Coleraine SPS – $400,000
- Hunter Gate SPS – $500,000

6.1.3 Average Age

The age of each of the vertical wastewater assets is determined either as a single asset age, or as an average of the asset components. Where an average was used, an equal weighting of all components within the overall asset was assumed. The age of the assets are:

- Lisgar SPS – constructed in 1950s (~70 years)
- June SPS – constructed in 1960s (~60 years), significant upgrade in 2004 (18 years)
- Hincks SPS – constructed in 1960s (~60 years), significant upgrade in 2000 (22 years)
- O'Brien SPS – 45 years (single asset, constructed in 1977)
- Coleraine SPS – 8 years (single asset, constructed in 2014)
- Hunter Gate SPS – 4 years (single asset, constructed in 2018)
- WWTP – 13 years (facility constructed in 2009)

6.1.4 Expected Useful Life

Expected useful life was assigned at the component level to reflect the complexity and variation in expected useful life of different systems that make up the wastewater vertical assets. The typical expected useful life for each component was assigned by the Town and used to determine approximate replacement timing of assets. **Table 6-2** provides the typical useful life applied to each component.

Table 6-2: Expected Useful Life of Wastewater Vertical Asset Components

Component	Expected Useful Life (years)
Building	95
Equipment	15
Conveying Systems	35
Mechanical	25
Electrical	25

6.2 Condition – Wastewater Vertical Assets

The condition of the wastewater vertical assets was determined through assessment of the assets, and estimation based on the asset age and lifespan.

Sewage Pumping Stations (SPS)

Condition assessment was undertaken for three pumping stations in 2014 by J.L. Richards & Associates Limited. The assessment included the June St SPS, Hincks SPS, and O'Brien Road SPS. The assessment identified works to be undertaken to improve condition of the stations. The average assessed condition for the assets are as follows:

- June St SPS: Average assessed rating of 'good'
- Hincks SPS: Average assessed rating of 'good'
- O'Brien Road SPS: Average assessed rating of 'good'

The remaining stations (Lisgar Ave SPS, Coleraine SPS, Hunter Gate SPS) were not assessed as part of the previously noted report. The condition for these assets has been estimated using the expected useful life of the whole asset, and the age of the asset. With an estimated useful life of years, the following conditions have been estimated:

- Lisgar Avenue SPS: Poor (25% of useful life remaining)
- Coleraine SPS: Very Good (93% of useful life remaining)
- Hunter Gate: Very Good (97% of useful life remaining)

WPCC

There are two current reports that provide condition assessment for the WPCC: a building condition assessment conducted in 2020 by Morrison Hershfield which focused on the building components, and an assessment completed in 2020 by OCWA which focused on the operational components.

The operational component assessment undertaken by OCWA in 2020, used visual observation and discussion with operations staff. The assessment rated asset components on a scale of 'poor' to 'excellent'. The assessment included process, mechanical, electrical and building components. The average rating for the WPCC was 'good'. The facility components were rated to be in 'good' to 'excellent' condition. Most process equipment was in good condition, with some components identified as requiring replacement in the short term, such as the VFDs.

Building condition assessment was undertaken in 2020 by Morrison Hershfield, for the WTP and LLPS. The building condition assessment rated the assets on a scale of 'very poor' to 'very good'. Ratings were given to subcomponents, categorized under broader asset components. To estimate an overall condition rating for the buildings, an average rating was taken of each of the components. The OCWA assessment average rating for the WPCC was 'good'.

Further detail regarding the condition including discussion and estimation of replacement timelines can be found within the separate report by OCWA.

6.3 Current Levels of Service – Wastewater Vertical Assets

Levels of service for wastewater assets are outlined in Table 2 of the regulation, *O.Reg. 588/17*. The level of service descriptions considers the collection and treatment systems for wastewater assets. The responses to the descriptions can be found in **Section 5.3**.

6.4 Current Performance – Wastewater Vertical Assets

The level of performance measures for the water assets considers the collection and treatment systems. The responses to the descriptions can be found in **Section 5.4**.

6.5 Risk Assessment – Wastewater Vertical Assets

The risk assessment for wastewater vertical assets was conducted using the following assumptions and criteria:

Condition: Determined based on estimated condition

Performance: Assumed to be always reliable (value of 1)

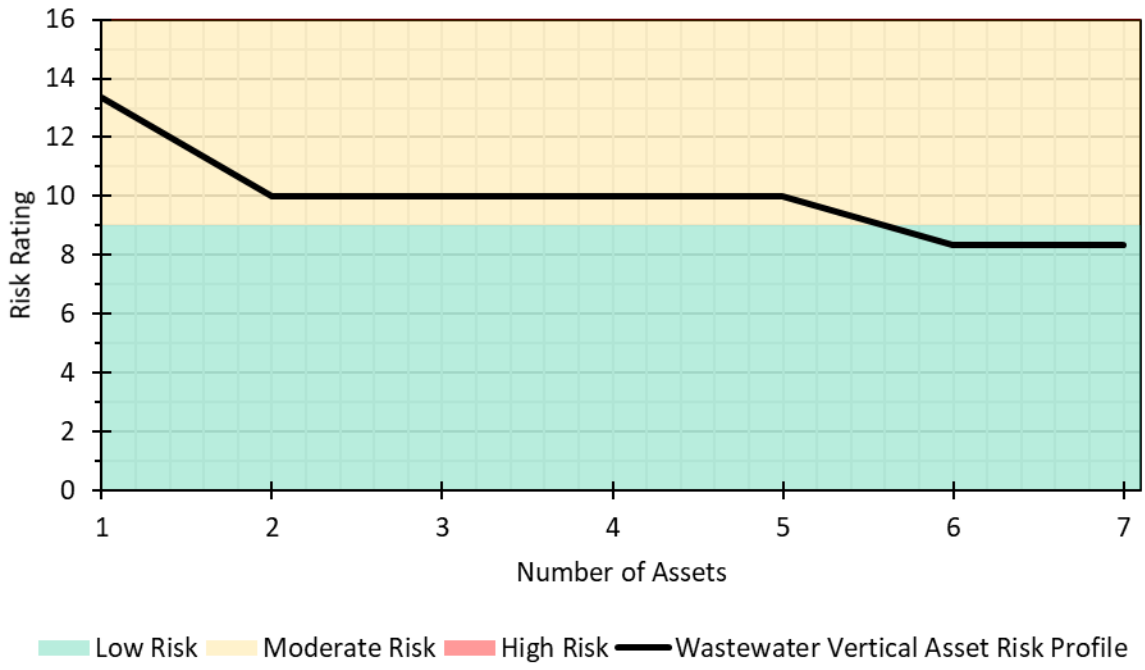
Climate Change: Assumed a value of 3 (Limited impact with slower recovery; mitigation plan not in place)

Impact: High impact (value of 2)

Importance: High importance (value of 3)

The risk profile for wastewater vertical assets is shown in **Figure 6-1**.

Figure 6-1: Risk Profile for Wastewater Vertical Assets



Of the seven assets within this category, two are considered low risk, with the remaining 5 within the moderate risk range. The two low risk assets are the Coleraine and Hunter Gate SPS, for which the very good condition would have factored into the low-risk rating.

6.6 Lifecycle Activities – Wastewater Vertical Assets

The lifecycle activities for the vertical (building) assets will be generally consistent with those expected for buildings, including:

Construction

Beginning of an asset's lifecycle. Construction to adhere to applicable standards and codes.

Maintenance

Types of maintenance include preventative, reactive and major maintenance. These activities are to be done on a routine basis to retain good condition and performance of the assets, and in response to issue or fault in a component or building asset. Maintenance activities will be undertaken throughout the lifecycle of the asset.

Renewal

Addition to or update of existing building component(s) to achieve modernization, compliance with updated codes and requirements, and/or to suit changes to services provided.

Decommissioning/Disposal

Removal from service of a building asset or component. Disposal can be through decommissioning or sale. Activities should comply with applicable health, safety, and environmental protocols.

As the sanitary wastewater vertical assets are specialized for treatment and collection services, there are additional factors that must be considered:

- Wastewater treatment and collection facilities are highly regulated. Any and all lifecycle activities undertaken must be done in compliance with codes and regulations.
- Expansion of existing facilities may be required for additional wastewater treatment and collection capacity as a result of growth. Expansion activities may encompass multiple lifecycle stages, such as construction for additional infrastructure required, and renewal for expansion of existing infrastructure such as the treatment facility.

Additional detail for the expected lifecycle activities can be found in **Section 12.6** (Lifecycle Activities – Buildings).

6.7 Asset Management Strategy – Wastewater Vertical Assets

The asset management strategy for wastewater vertical assets seeks to maximize the useful life and economy of each asset, using the lifecycle activities. The strategy is generally consistent with what is recommended for general municipal buildings, as detailed in **Section 12.7**.

The primary drivers of lifecycle activities for these assets is the condition and service delivery requirements. The Town wastewater building assets are complex, the componentry for which are expected to have differing rates of degradation and expected useful lives. As such, lifecycle activities will be required to be implemented at varied frequency and timelines.

The expected useful life of the asset components should be used to approximate the timing and frequency of lifecycle activities, however this should be refined by undertaking detailed condition assessment of the buildings at regular intervals for an understanding of the actual condition of the assets. The Town has completed detailed building condition and equipment assessments for the wastewater treatment plant at the outset of this report, and should continue to update this information at a frequency that is achievable. Condition information can also be gathered during maintenance works and can be input into the Town's MMS system. A maintenance schedule and forecast of asset improvements should be based on this detailed review, which should be updated at a frequency suitable to the Town, suggested to be every five years.

If it is not possible to complete the condition assessment of all buildings in the near term, priority buildings for the condition assessment program are suggested to be identified by the presented risk assessment, condition, and performance measures. Buildings with high risk or poor condition/performance components should be prioritized in the condition assessment program.

Routine maintenance schedules are assumed to be in place currently and are recommended to continue assuming that they are currently providing sufficient level of maintenance.

Management of wastewater vertical assets should also include climate change considerations, in new construction, maintenance or renewal lifecycle activities. Assessment should be undertaken to understand vulnerability of building assets to a changing climate, which will inform lifecycle activity requirements, and potential changes to the way lifecycle activities are undertaken.

Works should also be undertaken as required to maintain the treatment efficiency and capacity to meet regulations and user requirements.

6.8 Current Projection of Works

The current projection of works was undertaken through estimation of replacement year considering expected useful life and age for the pumping stations, and through detailed condition assessment by OCWA for the treatment plant.

6.8.1 Sewage Pumping Stations

Capital projections and upcoming works were determined for the pumping stations, based on previous work done, assessed condition, and operational knowledge by the Town. The needs were developed in consultation with the Town, OCWA, and has been incorporated into the rates studies. In general, works are attributed to the pumping stations as follows:

- Lisgar SPS – full reconstruction required
- June Street SPS – Recommended replacement of pumps – (estimated life of repairs has elapsed)
- Hincks SPS – full reconstruction required
- O'Brien Road SPS – Full reconstruction required
- Coleraine SPS – Minor upgrades required
- Hunter Gate – full reconstruction projected

Table 6-3 summarizes the expected works in the next nine years.

Table 6-3: Capital Forecasts for Sewage Pumping Stations

Capital Works	2022	2023	2024	2025	2026	2027	2028	2029	2030
Lisgar Ave. Pumping Station *Design*	45,000								
Lisgar Ave. Pumping Station *Construction*		300,000							
O'Brien Rd Pumping Station *Design*	150,000								
O'Brien Rd Pumping Station *Construction*			1,000,000						
Arthur Ave./Hincks Pumping Station *Design*				40,000					
Arthur Ave./Hincks Pumping Station *Construction*					250,000				
Coleraine Pumping Station				25,000					
June St. Pumping Station		10,000 (pumps)							157,000
Hunter Gate Pumping Station							480,000		
Capital Works Annual Forecast	195,000	310,000	1,000,000	65,000	250,000	0	480,000	0	157,000

6.8.2 WPCC

6.8.2.1 Capital Investment Plan – Condition Assessment

The capital investment plan for wastewater vertical assets was undertaken by OCWA as part of the separate Water and Wastewater Facilities Assessment and Capital Investment Plan (2021). The following information is summarized from that report.

Based on an assessment of condition and an understanding of the operational components of the wastewater vertical assets, OCWA projected a capital investment plan that includes short-term works (needs incurred in the next 1-5 year), medium-term works (needs incurred in years 6-10), and a longer-term 25 year investment plan to address deficiencies.

Table 6-4 and **Table 6-5** summarize the needs identified in the short and medium-term for the wastewater vertical assets, as excerpted from the report. It should be noted that summaries listed below amalgamate similar components (blowers, pumps, etc.) and systems (Boiler System, SCADA system, etc.) in order to better summarize the recommended works. Likewise, minor assets replacements were not included in order to keep focus on the major works.

Table 6-4: Short-Term Recommended Works for Wastewater Vertical Assets

SHORT TERM RECOMMENDED WORKS (1-5 YEARS)	ESTIMATED COST	YEAR
UPS replacement (every 4-5 years)	$13,000	Every 4-5 years
Pump rebuilds (2019-2021)	$50,000	2019-2021
Gearbox replacements	$25,000	2020-2021
HVAC Replacements (Heaters, Louvres, Fans, etc.)	$30,000	2025

Table 6-5: Medium-Term Recommended Works for Wastewater Vertical Assets

MEDIUM TERM RECOMMENDED WORKS (6-10 YEARS)	ESTIMATED COST	YEAR
VFD Replacements	$110,000	2026
Boiler System/Parts Replacement	$14,000	2028
Blower Upgrade	$150,000	2028-2029
SCADA Upgrade	$35,000	2029
Pump Rehabilitations/Replacements	$305,000	2028-2030
Lifting Device Replacement (Hoists/Chain/Davit)	$28,000	2028-2030
Centrifuge System Rehabilitation/Part Replacement	$162,000	2030

6.8.2.2 Works Projection

Using the results of the condition assessment and other needs identified by the Town, the projected works were collected and summarized, as in **Table 6-6**.

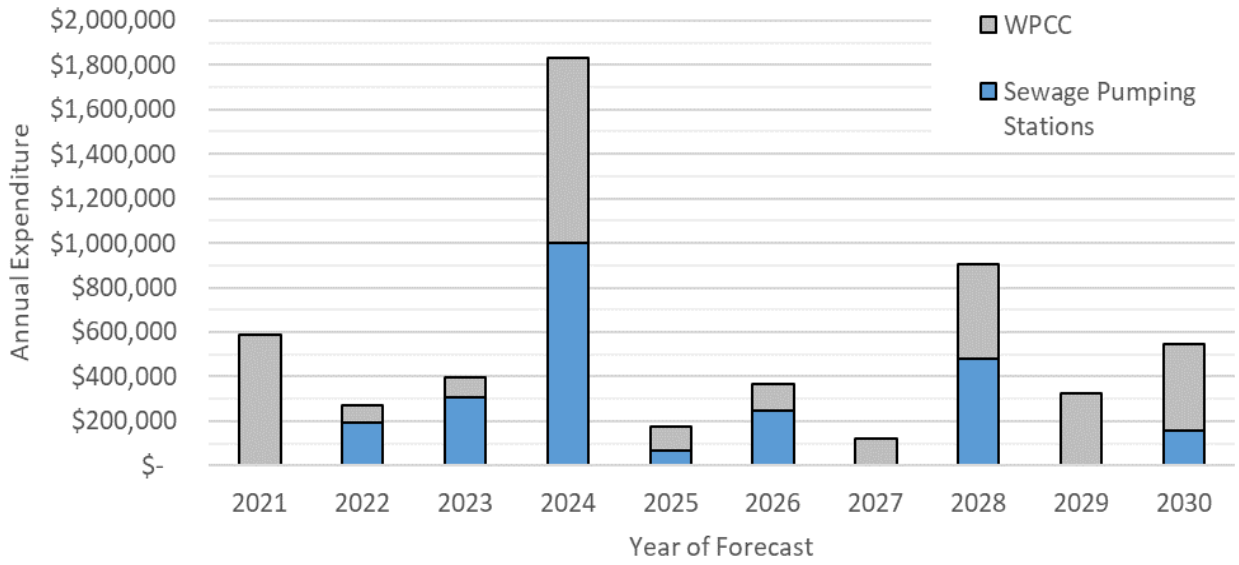
Table 6-6: Capital Forecasts for WPCC

Capital Works	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Demolish Renfrew STP	300,000									
WPCC concrete deck repairs over tunnel	80,000									
Replace WPCC sump pump	17,000									
Mechanical Systems Replacements				747,000					85,000	
Replace WPCC Roofing Membranes								255,000		
Exterior lighting repairs									15,000	
WPCC BCA Study										15,000
Smoke Alarm System to prevent fires	50,000									
Wastewater Small Capital Works	112,728	78,938	84,025	76,252	99,298	88,986	88,399	94,157	97,085	108,786
Capital Works Annual Forecast	559,728	78,938	84,025	823,252	99,298	88,986	88,399	349,157	197,085	123,786

6.8.3 Overall Projection of Works

In consideration of the works identified for the sewage pumping stations and for the WPCC, we can project an overall annual expenditure for the vertical wastewater assets, as shown in **Figure** 6-2.

Figure 6-2: Forecasted Annual Expenditure for Wastewater Vertical Assets



The annual expenditure fluctuates depending on the type of works recommended. Within the plan above, there may be opportunities to adjust the year of expenditure to mitigate some of the years with large expenditure, however due to the nature of the wastewater vertical assets, some recommended works may carry a large price tag and cannot be moved between years. The average expenditure across the analyzed timeframe is as follows:

- Sewage Pumping Stations: $245,700/year
- WPCC: $307,119/year

7.0 Stormwater Management Assets

7.1 State of Local Infrastructure

The Town owns and operates a stormwater system for the conveyance of stormwater to appropriate outlets. The asset inventory includes linear pipes, catch basins and maintenance holes. A summary of the quantity of assets in the system is provided in **Table 7-1.**

Table 7-1: Stormwater Asset Inventory Summary

Asset Type	Quantity of Assets	Unit of Measure
Storm Sewer Catch Basins	770	Quantity
Storm Sewer Maintenance Holes	561	Quantity
Storm Sewer Mains	31,202	Length (m)
Stormwater Ponds	2	Quantity
Storm Treatment Unit	1	Quantity

7.1.1 Stormwater Linear Assets

For the analysis of linear assets, the report will consider the mains, however appurtenances (catchbasins, maintenance holes) will not be individually analyzed. This is predicated on the assumption that all other elements included in the system (catchbasins, maintenance holes, etc.) are required componentry that will be replaced in conjunction with the linear components and are expected to have similar expected useful lives and conditions as the linear components. The linear storm sewer assets are constructed of varying material types, though primarily concrete as summarized in **Table 7-2**.

Table 7-2: Inventory of Storm Water Linear Assets by Material Type

Linear Asset Material	Total Length (m)	Percent of Total Inventory
Boss HDPE	379	1%
Concrete	20,388	65%
CSP	129	0%
HDPE	215	1%
Perforated Subdrain	113	0%
PVC	6,873	22%
Transite	1,755	6%
Vitrified Clay	1,350	4%

Culverts not connected to the stormwater system are reported on in **Section 8**.

7.1.2 Stormwater Management Ponds & Treatment Units

The Town owns and maintains two stormwater retention ponds as part of their stormwater management system. The ponds include Hunter Gate and Ivy ponds. Both stormwater management ponds are wet pond facilities, with concrete structures for operation. The Hunter Gate pond has a stormceptor unit.

Coleraine has a storm treatment unit.

7.1.3 Current Data

The information reported in this AMP and the subsequent analysis are based on the current TCA inventory maintained by the Town.

7.1.4 Replacement Costs

Stormwater Linear Assets

Replacement costs for the stormwater assets were determined based on recent tender information and product information. The replacement costs include costs necessary for full reconstruction of a segment, including trench and surface restoration. It is assumed that reconstruction works on the assets will be done using PVC material for pipes that are 450 mm in diameter or less, and concrete material for sizes larger than 450 mm diameter.

The unit replacement costs were used to estimate the total replacement cost of the linear assets based on current lengths. The unit and total replacement costs are summarized in **Table 7-3**.

Table 7-3: Replacement Unit Costs for Storm Sewer

Pipe Material	Pipe Diameter (mm)	Reconstruction Unit Cost ($/m)
PVC	Up to 250 mm	$1,000
PVC	251 mm – 450 mm	$1,150
Concrete	451 mm – 600 mm	$1,400
Concrete	Over 600 mm	$2,000

Stormwater Management Ponds & Treatment Units

The replacement cost for the stormwater pond and treatment assets has been estimated by the Town, and is as follows:

- Hunter Gate stormwater pond – $200,000
- Ivy stormwater pond – $60,000
- Coleraine Treatment Unit - $80,000

7.1.5 Average Age

Stormwater Linear Assets

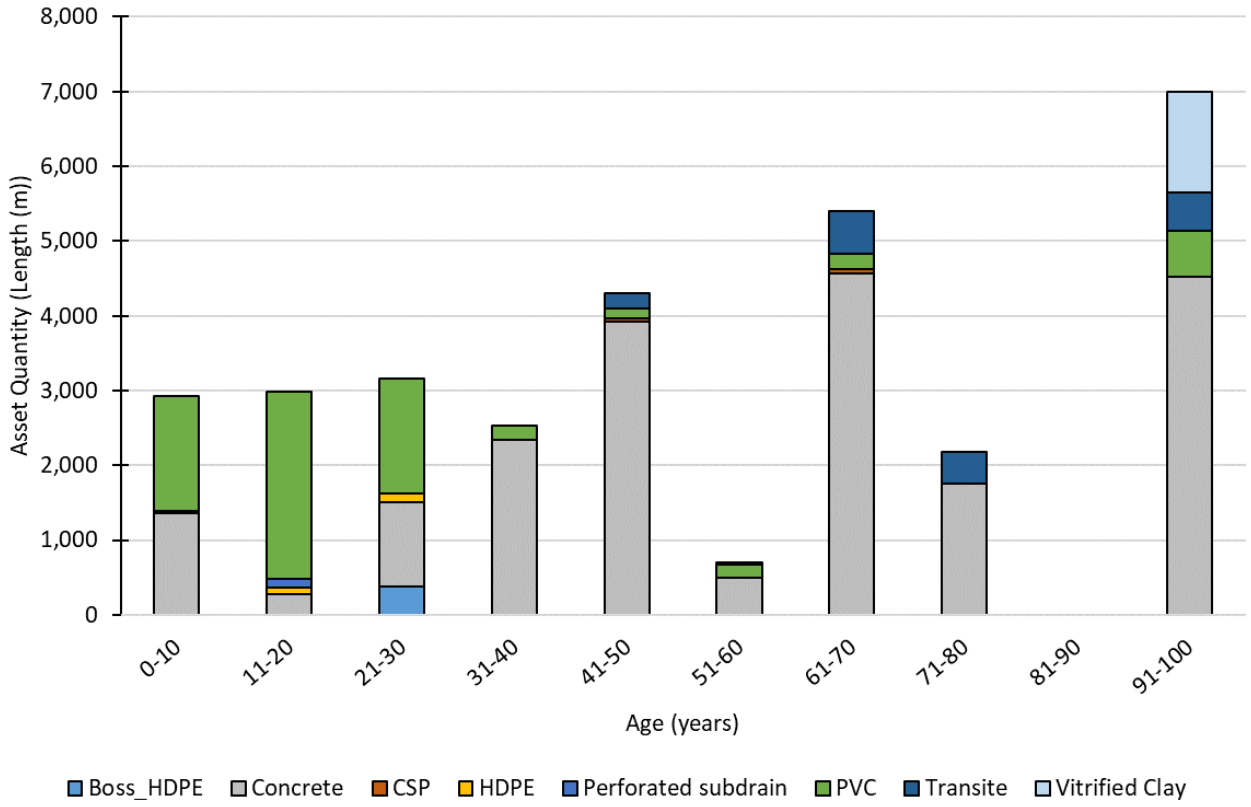
The average age of the stormwater pipes is summarized in **Table 7-4**, determined based on material type and length of each asset.

Table 7-4: Average Age of Stormwater Assets

Material Type	Average Age
Boss_HDPE	22
Concrete	57
CSP	47
HDPE	21
Perforated subdrain	12
PVC	26
Transite	71
Vitrified Clay	92

The distribution of age of assets (by length) is shown in **Figure 7-1**.

Figure 7-1: Age Distribution of Linear Stormwater Assets



Stormwater Management Ponds

The Hunter Gate stormwater management pond is of new construction and has an age of under 5 years. The Ivy stormwater management pond was constructed in the 1990s and has an age of approximately 30 years.

7.1.6 Expected Useful Life

Stormwater Linear Assets

The expected useful life of the stormwater linear assets is used to estimate the replacement schedule. The expected useful life values for each type of sewer material within the network were provided and confirmed by the Town and are summarized in **Table 7-5**. The table also shows the average remaining useful life, determined using the average age for each pipe material.

Table 7-5: Expected Useful Life for Stormwater Pipe Materials

Pipe Material Type	Expected Useful Life (years)	Average Remaining Useful Life (years)
Boss_HDPE	80	58
Concrete	90	33
CSP	25	-22
HDPE	80	59
Perforated subdrain	80	68
PVC	100	74
Transite	80	9
Vitrified Clay	70	-22

The values presented in **Table 7-5** are typical of most assets owned by the Town. Expected useful life of individual assets may vary depending on construction, ground conditions and operating conditions of the asset.

Stormwater Management Ponds

The stormwater management pond components will vary in their expected useful life. The capital works components (including concrete structures) are expected to have a useful life of approximately 70 years. The stormwater pond facility proper does not have an expected useful life, and should continue to operate as intended contingent on factors such as climate, maintenance frequency, adjacent development, etc.

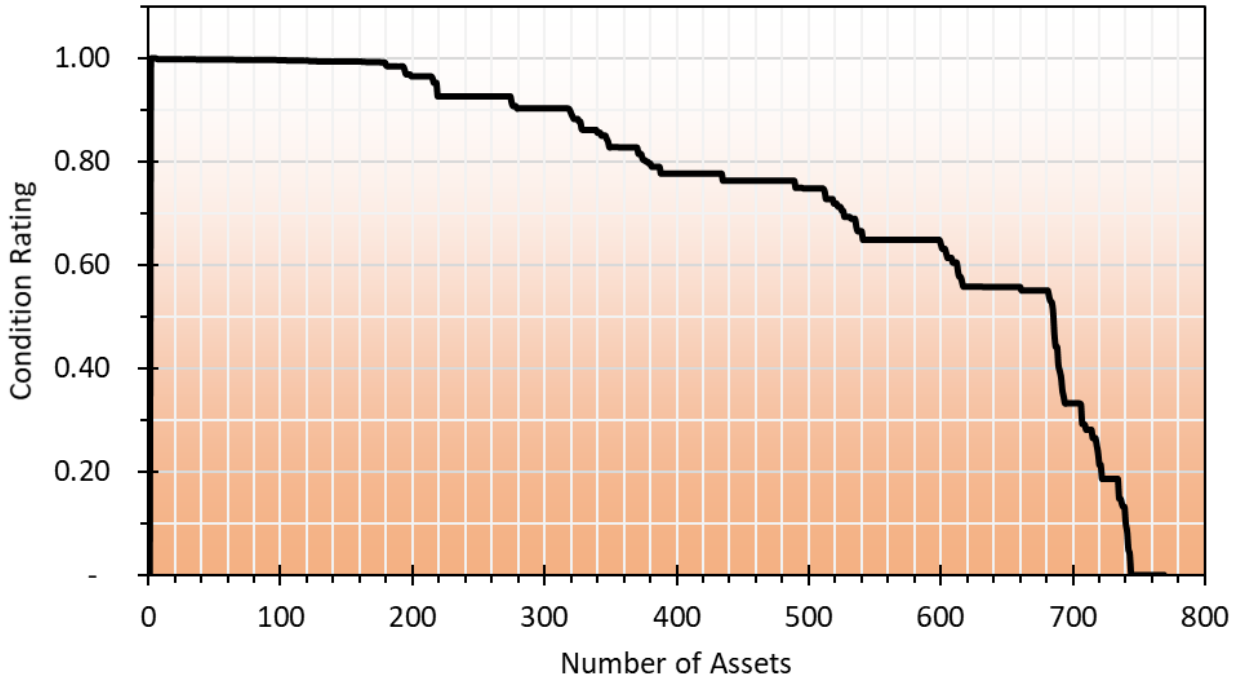
7.2 Condition – Stormwater Management Assets

7.2.1 Stormwater Linear Assets

Condition of the storm sewer assets was determined through condition observation and a deterioration model. The condition observation information was provided by the Town, on a scale from 0 to 1 where 1 represents an asset in its best condition, and 0 represents an asset in worst condition. The observed condition information was further deteriorated form the date of observation using the deterioration curve (customized to the material and useful life of pipe material). The majority of condition observations for the storm sewer were conducted in 2005, with additional ratings having been conducted between 2014 and 2018.

Figure 7-2 provides the distribution of the condition ratings.

Figure 7-2: Condition Ratings of Stormwater Linear Assets



A majority of the assets are above a condition rating of 0.6, which can be described as "good" to "very good" as the rating approaches 1. This includes just over 600 assets, with a total length of approximately 24.4 km, or 78% of the assets by length. The average condition rating of all the linear stormwater assets by length is 0.74.

7.2.2 Stormwater Management Ponds

The condition of the stormwater management ponds can be estimated through a condition assessment of the site elements, or through theoretical estimation using the expected useful life and age of the assets.

The primary indicators for condition will be the capital works components (such as concrete structures), which will deteriorate over its expected 70 year lifespan. Throughout their lifecycle, these assets can be visually assessed to determine their condition. The condition of the stormwater pond facility proper will fluctuate throughout its lifecycle, and will be contingent on factors such as climate, maintenance frequency, adjacent development, etc.

The current estimates of condition for the stormwater management ponds are as follows:

- Hunter Gate stormwater pond – expected to be in very good condition, as it is a new asset constructed within the last 5 years. The asset has used less than 10% of its expected useful life.

- Ivy stormwater pond – expected to be in fair condition, as it has an age of approximately 30 years. The asset has used approximately 45% of its expected useful life.

7.3 Current Levels of Service – Stormwater Management Assets

Levels of service for stormwater assets are defined in O. Reg. 588/17. **Table 7-6** and **Table 7-7** outline the Town's current community and technical levels of service for stormwater assets.

Table 7-6: Community Levels of Service – Stormwater

LOS Parameter	Community Levels of Service Qualitative Description	Community LOS
Scope	Description, which may include maps, of the user groups or areas of the Municipality that are protected from flooding, including the extent of the protection provided by the municipal stormwater management system.	The stormwater management system in the Town is devised of a pipe network and drains, which provide conveyance of stormwater to protect properties. The extent of the network is shown in **Figure A-3** of **Appendix A**.

Table 7-7: Technical Levels of Service – Stormwater

LOS Parameter	Community Levels of Service Technical Metrics	Community LOS
Scope	1. Percentage of properties in Municipality resilient to a 100-year storm.	The percentage of properties in the Town that are resilient to a 100-year storm currently unknown. It is recommended that further studies be completed in the future in order to assess the LOS metric.
Scope	2. Percentage of the municipal stormwater management system resilient to a 5-year storm.	The percentage of properties in the Town that are resilient to a 100-year storm currently unknown. It is recommended that further studies be completed in the future in order to assess the LOS metric.

7.4 Current Performance – Stormwater Management Assets

Asset performance measures were determined in consultation with the Town, which provide relevant metrics against which the Towncan gauge the performance of their assets. The performance measures for storm sewers, and their current values are shown in **Table 7-8**.

Table 7-8: Performance Measures – Stormwater

Asset Performances Measure	Current Value
Total operating costs for stormwater services (2018, 2019)	To be established
Percentage of the community with stormwater quality and quantity control (number of properties, or by area)	To be established
Inspection frequency of stormwater ponds	To be established
Inspection frequency of catch basins	To be established
Number of instances of flooding (customer complaints)	To be established
Instances of flooding	To be established

7.5 Risk Assessment – Stormwater Management Assets

The risk assessment for the stormwater management assets was conducted considering both linear and pond assets. The assumptions for both types of assets was conducted using the following assumptions and criteria:

Condition: Determined based on estimated condition (using deterioration curve)

Assumed condition value of 2 (Good) for stormwater pond assets

Performance: Assumed to be always reliable (value of 1)

Climate Change: Assumed a value of 5 (Moderate or high impact; no or limited mitigation plan)

Impact: High impact (value of 3) for assets of 750 mm diameter and larger

Moderate impact (value of 1) for all other assets

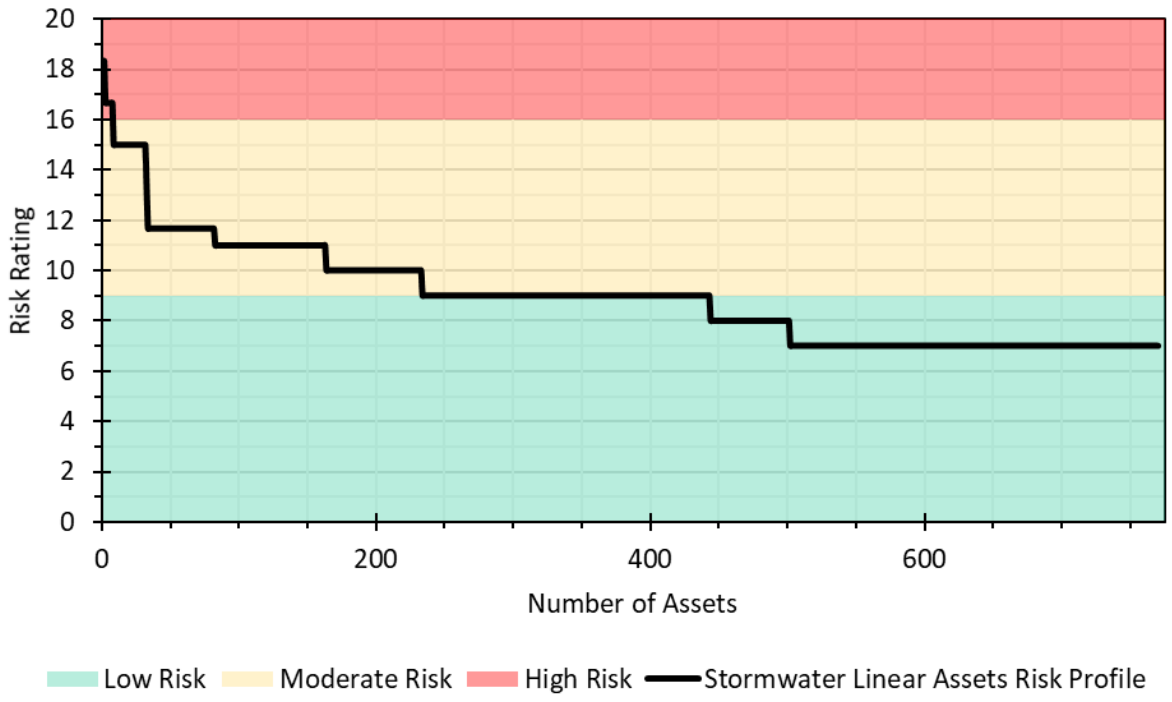
Importance: High importance (value of 3) for assets of 750 mm diameter and larger

High importance (value of 3) for stormwater pond assets

Moderate importance (value of 2) for all other assets

The risk profile for storm sewer is shown in **Figure 7-3**.

Figure 7-3: Risk Profile for Stormwater Linear Assets



There are eight assets that fall within the high risk range, with a total length of 380 m. These assets have a range in construction dates (from 1950-1999), but are all a size of 750 mm in diameter or larger. The two highest risk assets have a score of 18.3, with the remaining 6 at a score of 16.7.

Four of these assets are known to be in the same region, being located on Raglan Street South. One is located on William Ave, and the remainder do not have associated roads.

There are 223 assets that fall within the moderate risk range. The assets within the moderate range have a total length of 10,726 m, or 34% of the network by length. The remainder of the linear assets are within the low risk range.

Using the criteria stated above, both of the stormwater ponds (Hunter Gate and Ivy) fall in the 'moderate' risk range, with risk ratings of 10.7 for both assets.

7.6 Lifecycle Activities – Stormwater Management Assets

7.6.1 Stormwater Linear Assets

In the lifecycle of a storm sewer pipe asset, there are multiple activities that can be taken, depending on the asset attributes. The expected lifecycle activities to be used on the Town assets are as follows.

Construction Activities

Construction of new assets is recommended to be in line with recommendations as part of growth, master plan, or other municipal strategies. The design of the new assets should be consistent with jurisdictional design requirements, including provincial design guidelines, local and conservation authority requirements. New construction of assets will occur where no previous stormwater servicing is available. The risk associated with new construction includes the high cost of brand new assets, and capacity for treatment and outlet of the stormwater flows.

Construction can also be the replacement of deteriorated assets. At the end of the useful life of an asset, it can be replaced for continuation of service provision. At the time of replacement, design should be undertaken to ensure design requirements are met, and adequate capacity is provided for current and future projections.

Maintenance Activities

Maintenance activities are undertaken on the assets throughout their useful life to maintain their operating condition and performance. Maintenance works includes routine maintenance (flushing, cleaning), and minor repairs to assets. There exists the risk that a maintenance activity may be implemented that does not adequately mitigate a performance or condition issue, and additional costs are then required for further repair or replacement.

Renewal Activities

Renewal of the storm sewer assets can include structural or non-structural lining. A lining can be used where the condition has deteriorated, however structurally the pipe segment is still sound. A lining can extend the useful life of an asset and improve performance. Risks associated with lining of a pipe include the improper installation of the pipe or continued deterioration of the original pipe such that the lining does not perform as expected.

Operating Activities

Operating activities for the storm sewer assets include those activities that do not directly deal with the physical state of the pipe, but work to extend the assets useful life. The operating activities can include non-infrastructure policies, and monitoring/inspection of the assets. The inspection of storm sewer assets can be undertaken through a condition assessment program, recommended to be visual inspection through CCTV or zoom camera means. Usage of the zoom camera technology has the risk of insufficient visual detail to make appropriate activity decisions.

Decommissioning Activities

Decommissioning activities of the storm sewer assets includes abandonment or replacement of the asset at the end of its useful life. While typically assets are abandoned in place, the removal of the expended asset can provide additional space for new underground assets to be constructed.

7.6.2 Stormwater Management Pond Assets

The lifecycle activities differ for the stormwater management ponds.

Construction Activities

Construction of a new pond asset is most commonly undertaken as part of development works. The pond should be designed consistent with jurisdictional design requirements, including provincial, local and conservation authority requirements.

Maintenance Activities

Maintenance activities are undertaken on the assets throughout their useful life to maintain their operating condition and performance. Maintenance works can include routine maintenance (such as grass cutting, vegetation maintenance), and repairs to assets.

Renewal Activities

Renewal activities for the stormwater management ponds may be used where the condition or performance of the pond has deteriorated, however can be renewed without undergoing reconstruction works. This most commonly includes cleaning out of the ponds – removal of sediment or debris to allow for the capacity and function of the pond to be regained. Frequency and extents of this work will be determined on a case-by-case basis according to the condition of the ponds.

Renewal can also include replacement or renewal of some of the major components of the ponds, such as inlet and outlet structures, fencing, treatment units, etc. These activities should be done according to the results of inspection, condition of the assets, and any requirements for proper function of the facility.

Operating Activities

Operating activities for the stormwater management ponds include those activities that do not directly deal with the physical state of the asset, but work to extend the useful life. The operating activities can include:

- Non-infrastructure policies
- Pond Inspection
- Inlet Inspection

- Outlet Inspection
- Site Inspection (weeds, roads, etc.)

The inspection can typically be done visually by Town staff, and will occur on a routine basis according to a frequency set out by the Town.

Decommissioning Activities

Decommissioning activities of the stormwater management ponds assets includes abandonment of the asset at the end of its useful life. At the end of the useful life, the Town will require review of the facility to determine the appropriate activity for decommissioning.

7.7 Asset Management Strategy – Stormwater Management Assets

7.7.1 Stormwater Linear Assets

The asset management strategy for stormwater linear assets will maximize the lifecycle of the assets where appropriate, in consideration of specific needs of the Town and existing infrastructure.

The condition, a major factor in the asset management strategy, should be established to assist in decision making. The Town should establish/maintain a condition assessment program for the storm sewers. The recommendation is to use visual inspection facilitated by CCTV or Zoom camera inspection. A typical practice is to undertake assessment of 1/5 to 1/3 of the assets annually, such that each pipe gets reviewed on a 3 to 5 year basis. The timeframe for inspection of the assets can be adjusted to suit the budget available, or as required based on the rate of deterioration of the assets.

The cost for CCTV and Zoom inspection can vary depending on availability of services and providers. Assuming a unit cost of $15/m for CCTV, and the total length of assets of approximately 31,200 meters, the Town could estimate between $93,600 (for 1/5 of network) to $156,000 (1/3 of network) annually to complete CCTV inspection (acknowledging that this will vary annually). Zoom technology is estimated on a per manhole basis of approximately $150.

When the condition of the asset has degraded such that an intervention is required, it is recommended that maintenance be reviewed as the first opportunity to extend the useful life. Maintenance works can include localized repair work, or relining of a pipe segment. Because of the non-intrusive nature of conducting relining, it can be done on an individual pipe segment at a time, or to localized repairs. Relining is an appropriate lifecycle activity when the condition of the pipe is sufficient to receive the liner, and that laterals are in adequate condition. Relining can be used only once in the asset's lifecycle.

When the condition of the asset has degraded such that maintenance is no longer an appropriate activity, the segment can and should be reconstructed. The Town should follow best practices and applicable design guidelines when designing the reconstruction works. Assets at the end of their useful life should be abandoned in place or removed.

There is efficiency in conducting capital reconstruction works where adjacent asset types can be reconstructed simultaneously. Part of the Town's current strategy is to use capital works projects from other linear asset categories to identify any upcoming capital works on adjacent linear infrastructure (such as road works, watermain or storm), and align the timing of the works such that there is efficiency in the design, construction and material costs associated with the project, and reduced disruption to service delivery.

A summary of the pipe condition and associated lifecycle activity is provided in **Table 7-9**. Note that condition assessment should be undertaken on a routine basis throughout the lifecycle of the asset, and other factors should be considered when selecting a lifecycle activity.

Table 7-9: Storm Sewer Lifecycle Activities and Condition Ranges

Condition Range	Lifecycle Activity Category	Lifecycle Activity
1-0.60	Maintenance	Maintenance Works (cleaning, flushing) Manhole repairs Small pipe section repairs
0.60-0.35	Rehabilitation	Localized repairs Structural relining
0.35-0	Reconstruction	Pipe replacement or abandonment

Current best practices suggest that that reconstruction and new construction works on the assets will be done using PVC material for pipes that are 400 mm in diameter or less, and concrete material for sizes larger than 400 mm diameter (acknowledging that the specifics of the works and availability of material will influence the material used in each works project).

Note that storm sewer and culvert assets that are located or are part of a municipal drain may require additional steps or processes for lifecycle management.

7.7.2 Stormwater Management Ponds

The asset management strategy for the ponds will be designed to maximize the economic viability and lifespan of the assets.

The primary drivers of lifecycle activities for these assets is the condition and service delivery requirements.

The stormwater management pond assets are complex, the componentry for which are expected to have differing rates of deterioration and expected useful lives. As such, lifecycle activities will be required to be implemented at varied frequency and timelines.

The timing and frequency of lifecycle activities can be established according to the condition and performance of the components. This can be determined theoretically using the expected useful life and age of the asset components, or through condition assessment/inspection of the assets and components. An inspection or assessment can be undertaken at regular frequency for understanding the actual condition, recommended to be at a minimum of every five years, or according to the preferences and schedule established by the Township. Assets with high risk or poor condition/performance components should be prioritized in the condition assessment program.

Routine maintenance schedules are assumed to be in place currently, and are recommended to continue assuming that they are currently providing sufficient level of maintenance.

Following initial construction, maintenance works can be implemented to maximize the lifespan of the stormwater management ponds. To retain the capacity of the pond throughout its useful life, the Town currently cleans the ponds at 10 year intervals, which is expected to be adequate. The frequency of cleaning can be adjusted according to pond performance. Routine site maintenance will occur at a higher frequency, including inspection, Stormcepter maintenance and grass cutting, etc.

The pond asset will not have a firm replacement date, as it is a passive asset. However, the other capital components such as the inlet structures, etc., have a finite lifespan and will need replacement or renewal when the condition, performance and risk are no longer acceptable to the Town.

7.8 Scenario Analysis and Capital Projections

7.8.1 Stormwater Linear Assets

To understand the needs of the stormwater linear assets and overall system condition within a 25 year outlook, replacement activities were reviewed under varying budget scenarios. The budget scenarios analyzed include:

1. Unlimited budget – To determine backlog of works
2. No budget – To understand the changes in average network condition with no investment
3. 2% of network value – lower limit of best practice of investment
4. 4% of network value – upper limit of best practice of investment
5. 2014 AMP Funding Level – Consistent investment value from past recommendations

6. Maintain Current Condition (0.74) – Defining the target budget to maintain the current average condition across the network

The assets were analyzed using relining and reconstruction activities. Discussion below presents the results as they are analyzed individually and combined. The average condition rating of all the linear stormwater assets by length is 0.74.

Analysis - Reconstruction Only

Multi-year projection scenarios were run using the budgets noted above. In the analysis, reconstruction activities are recommended when a pipe has a condition rating of between 0 and 0.35. Reconstruction of a segment will return the segment to a condition index of 1.

A summary of the analyses is below:

Table 7-10: Budget Scenario Results

Number	Budget Scenarios	Annual Value	Average Annual Investment (2022-2041)	Total Investment (2022-2041)	Average Condition Index (at 2041)
1	Unlimited budget	Unlimited	$408,928	$8,178,557	0.79
2	No budget		$ -	$ -	0.61
3	2% of network value	$766,000	$408,928	$8,178,557	0.78
4	4% of network value	$1,531,000	$408,928	$8,178,557	0.79
5	2014 AMP Funding Level	$75,000	$74,124	$1,482,474	0.68
6	Maintain current condition (0.74)	$300,000	$298,652	$5,973,030	0.74

The annual value of the budget scenarios are maximum investment value per year.

The selection of an investment level for the watermain strategy should consider the current and intended level of service, affordability, effectiveness of the scenario, and backlog of works.

Scenario 1 assumes an unlimited budget available for reconstruction of the wastewater linear assets. In the first year of the scenario, $3.4M in reconstruction works were identified, indicating that there is a backlog of repairs required to improve the condition of the assets. The backlog includes any assets that are currently at a condition rating of 0.35 or less.

Scenario 2 models the impact of no spending on stormwater linear asset reconstruction during the 20 year timeframe. The average condition rating deteriorates to 0.61.

Scenarios 3 and 4 were found to have the same average annual investment and total investment over the 20 year timeframe, with each of those values being consistent with the Scenario 1 (Unlimited) results. Accordingly, the average condition at the end of the timeframe is also consistent. As the same results are achieved by both scenarios, we can assume that expenditure of 4% annually is greater than required, and to achieve the results in the scenario, the 2% annual investment would be recommended.

Scenario 5 reviewed the investment level recommended as part of the 2014 AMP, which is significantly lower than the other scenarios at only $75,000 annually. The In comparison with the other scenarios, the average condition at the end of the timeframe is approximately 0.10 lower.

Scenario 6 reviewed the annual investment requirements when targeting the current condition rating of 0.74 over the assessed timeframe. The investment value is approximately $300,000 annually, with most of the budget being used in every year of the 20 year timeframe.

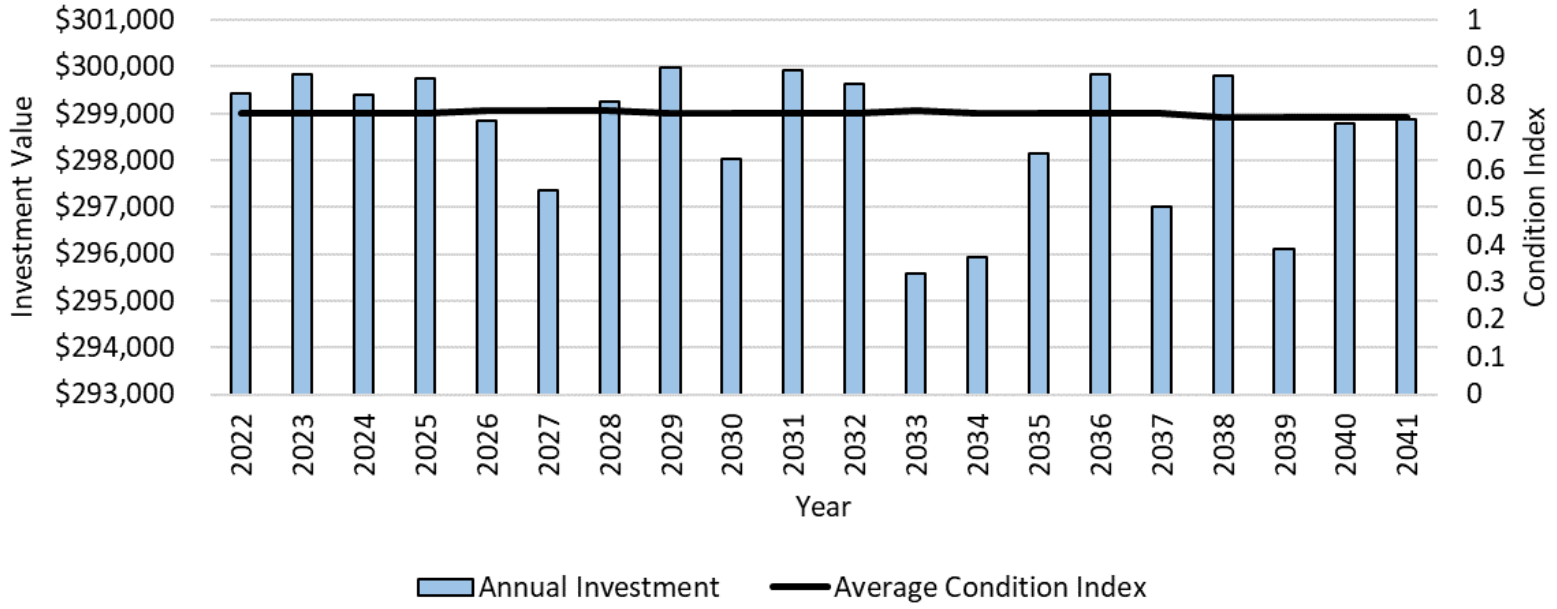
In selecting the recommended investment level, the Town should consider its current and preferred level of service being provided. The LOS is represented in these scenarios as the average condition of the assets. The current average condition is 0.74, and a best practice recommends maintaining a minimum average condition of 0.60 across the system. If the Town's target is to maintain the current LOS, Scenario 6 would be the recommendation, however if the Town was accepting of a decrease in average condition, a more affordable scenario (such as 5) could allow the average condition to deteriorate yet remain above the best practice threshold. The Town could consider reducing investment in the stormwater collection assets such that the average condition deteriorates to the minimum recommended average, however must also consider the current backlog of works on the system and the current level of service being provided.

The Town should also consider the current backlog of works relative to the investment scenario. As found through Scenario 1, there is approximately $3.4M in outstanding works on the system. Any investment under this threshold may result in some assets deteriorating to the point of failure during the reviewed timeframe.

Over the 20 year timeframe, Scenarios 1, 3, 4, and 6 have a total expenditure that exceeds the backlog, suggesting that it may be sufficient to address current and future needs. As Scenarios 3 and 4 are consistent with the Unlimited scenario, it can be assumed that they will be adequate for addressing the backlog and upcoming infrastructure needs. In Scenario 5, the total spent over the timeframe is less than the current backlog of works, suggesting that it may not be adequate to address all of the current needs, and some assets may deteriorate to the point of failure. In Scenario 6, the total investment is greater than the backlog, however the expenditure is incurred over 20 years, which means some assets may deteriorate to the point of failure over that timeframe. However, as the average condition rating at the end of Scenario 6 remains high, it suggests that the remainder of the assets will not incur significant needs over the timeframe.

In consideration of the level of service being provided, overall condition achieved and the value of the backlog, the Town can implement a budget similar to Scenario 6 for the management of the stormwater linear assets. The annual expenditure under this budget value and its resulting impact on the average condition of the assets is shown in **Figure 7-4**.

Figure 7-4: Scenario 6 - Annual Investment and Condition Index for Storm



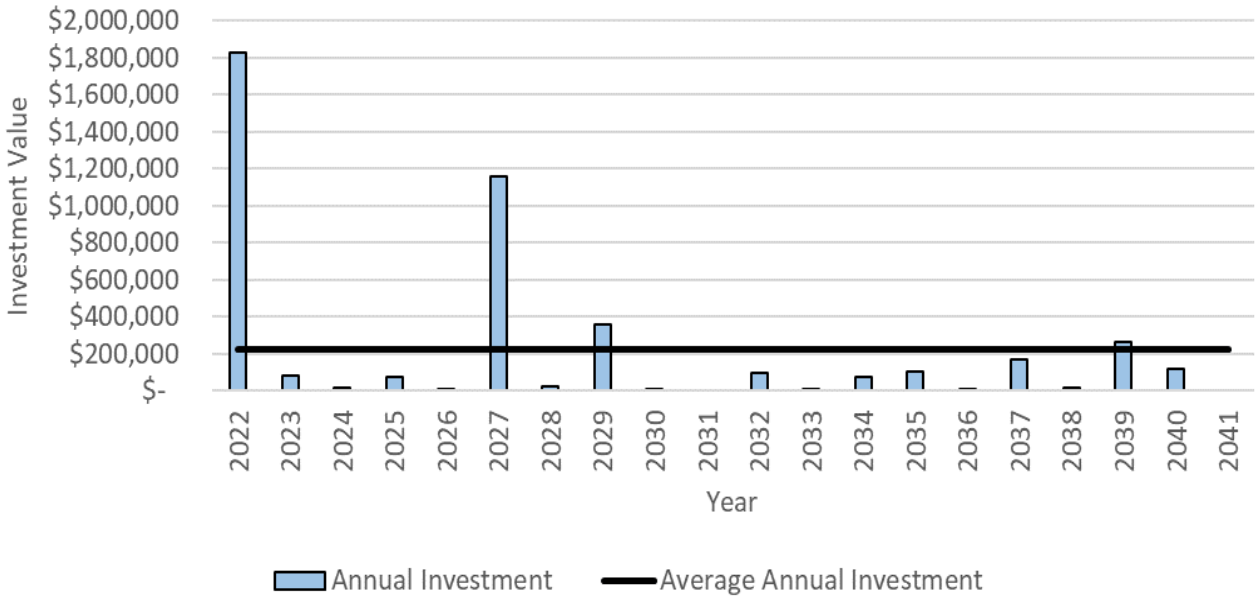
The scenarios discussed above are projected using condition as the primary factor for prioritization, and provide information of how the overall condition of the assets will respond at varying levels of investment over the time period. When conducting capital planning and annual capital expenditures, additional factors beyond those in the model must be considered by the Town, as previously described.

Analysis – Relining Only

The usage of relining activities can improve the condition of an asset, and therefore the average overall condition of the network. Relining works will not improve the condition to perfect, and so for modelling purposes when relining occurs, the asset will return to a condition of 0.8.

Using an unlimited budget scenario, the quantity of relining activities was estimated. During the first year of the scenario, $1.8M in relining works were identified. The sixth year of the plan (2027) also shows a high investment value ($1.1M), however the remainder of the years in the plan are under $400,000 annually, with most being $100,000 or less. The average annual expenditure over the 20 year timeframe is approximately $221,000. The annual expenditure and average are shown in **Figure 7-5**.

Figure 7-5: Relining Annual Expenditure for Storm Sewers



Note that analysis recommends usage of relining as soon as the asset deteriorates to the maximum condition, which is 0.6. If during a particular year, the expenditure is beyond the capability of the Town, usage of relining activities can be flexible the assets can continue to deteriorate to a minimum (approximate) condition rating of 0.35 before it is no longer a candidate for relining.

Further, relining is used to extend an asset's lifecycle, and while an important part of an efficient asset lifecycle, it is not a requirement, and an asset can continue to deteriorate until such time that reconstruction is required.

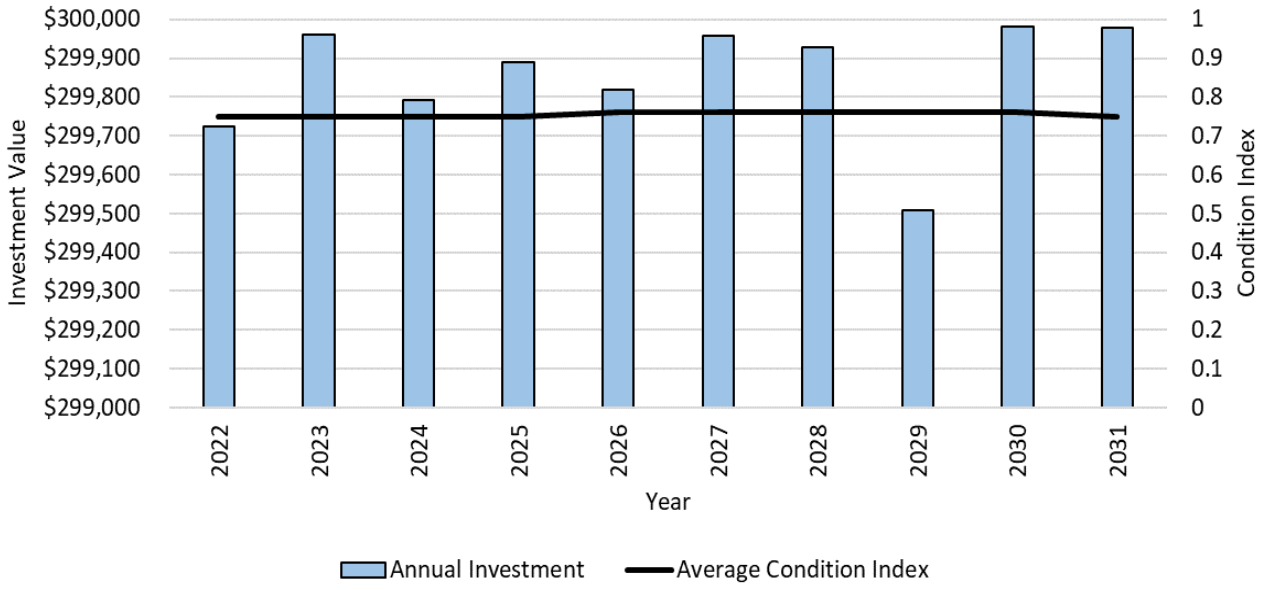
Analysis - Relining and Reconstruction

Scenarios were run modelling lifecycle activities with both relining and reconstruction activities considered. Note that due to the timeframe at which relined assets again reach the threshold to be triggered for relining activities, to remove duplication of activities this scenario was run for a ten year timeframe.

The same scenarios were run as for the reconstruction-only scenarios as discussed in the previous section. In general, incorporation of the relining activities increased the annual investment and the average condition of the assets, however the difference was not significant.

The suggested scenario from the reconstruction-only modelling was usage of a $300,000 annual budget. The same budget value was utilized with both relining and reconstruction to understand the impact on the activities and average condition. The results of the scenario are shown in **Figure 7-6**.

Figure 7-6: Storm Expenditure and Condition Using Relining and Reconstruction



Overall, usage of the relining and construction in combination, an overall average condition rating of 0.75 was achieved through the scenario, which is approximately similar to that from construction only.

7.8.2 Stormwater Management Ponds

Given the good condition and relative newness of the pond assets, it is not expected that capital expenditure will be required within a 10 year timeframe to maintain these assets. Componentry (inlet structures, outlet structures, etc.) will require replacement during the lifecycle of the stormwater pond, however these are anticipated to be completed under maintenance budgets as they are not capital assets. The pond will not need replacement as the pond itself is a passive asset.

8.0 Stormwater Management Culverts

8.1 State of Local Infrastructure

The Town owns a large quantity of culverts; however, the inventory is incomplete and the total number unknown. The current inventory includes 96 culverts, ranging in diameter from 250 mm to 3 m. The culverts vary in material type, including:

- Aluminized CSP
- Cast Cement
- Cement
- Concrete
- Corrugated Steel Pipe (CSP)
- PVC
- Steel
- Transite

At the time of reporting, 84 of the 96 culverts in the inventory were able to be located. Information for these culverts is used in the following section, while the remaining 12 and other unaccounted for culverts are not included. Due to the topography and layout of the Town, there is significant variability in the culvert assets' construction, particularly in depth to structure, size, and adjacent infrastructure.

Driveway culverts are the responsibility of the property owner and as such are not reported in this AMP.

8.1.1 Current Data

The information reported in this AMP and the subsequent analysis are based on the current TCA inventory information maintained by the Town. As noted, the current inventory and dataset for the stormwater management culverts is incomplete, and will be expanded upon by the Town in future. The current data is currently represented in the Town's GIS system.

8.1.2 Replacement Costs

There are limitations in developing a replacement unit cost for valuations, due to the variability in construction conditions in culvert structures. In determining a replacement cost, the size and length of a structure must be considered, as well as the depth of cover and adjacent infrastructure. As these factors vary significantly across the Town's culvert assets, depending on location and topography, similarly the replacement cost will also be variable.

Replacement costs should be determined on a case-by-case basis according to the requirements of the particular structure. With a more comprehensive database of culvert assets, unit replacement costs may be determined based on common construction types. Replacement costs should be based on recent tender information or typical material unit costs in the region. For more refined estimation of replacement cost, information should be gathered regarding field conditions of each of the culverts, including surface conditions (road, driveway, etc.), depth of cover, etc.

Estimating the replacement cost of all culverts in the Town is not possible at this time due to the limitations in inventory.

8.1.3 Average Age

The average age of the culverts was determined for the assets with known construction dates within the inventory. Of 84 inventoried culverts, 25 have unknown year of construction (these culverts being primarily of CSP construction) and have therefore been omitted from the average age calculation. The average age, by length, is shown in **Table 8-1**.

Table 8-1: Average Age of Known Culvert Assets

Material	Total Length (m)	No. of Assets	Average Age, by length (years)
Aluminized CSP	39	1	4
Cast Cement	2.4	1	Unknown
Cement	6.3	1	Unknown
Concrete	218.4	5	14
Corrugated Steel Pipe (CSP)	877.1	40	6
Limestone Block	35	1	11
PVC	12.5	1	11
Steel	629.5	32	11
Transite	18.2	2	Unknown

8.1.4 Expected Useful Life

The expected useful life of culverts is estimated based on the construction material, and considers typical expected useful life of the material, considering the typical expected useful life experienced at the Town. The useful lives are summarized in **Table 8-2**, as well as the average remaining useful life (based on the average age of the assets).

Table 8-2: Average Expected Useful Life of Culvert Assets

Culvert Type	Expected Useful Life (years)	Average Remaining Useful Life (years)
Aluminized CSP	25	21
Cast Cement	90	
Cement	90	
Concrete	90	76
Corrugated Steel Pipe (CSP)	25	19
Limestone Block	80	69
PVC	70	59
Steel	60	49
Transite	80	

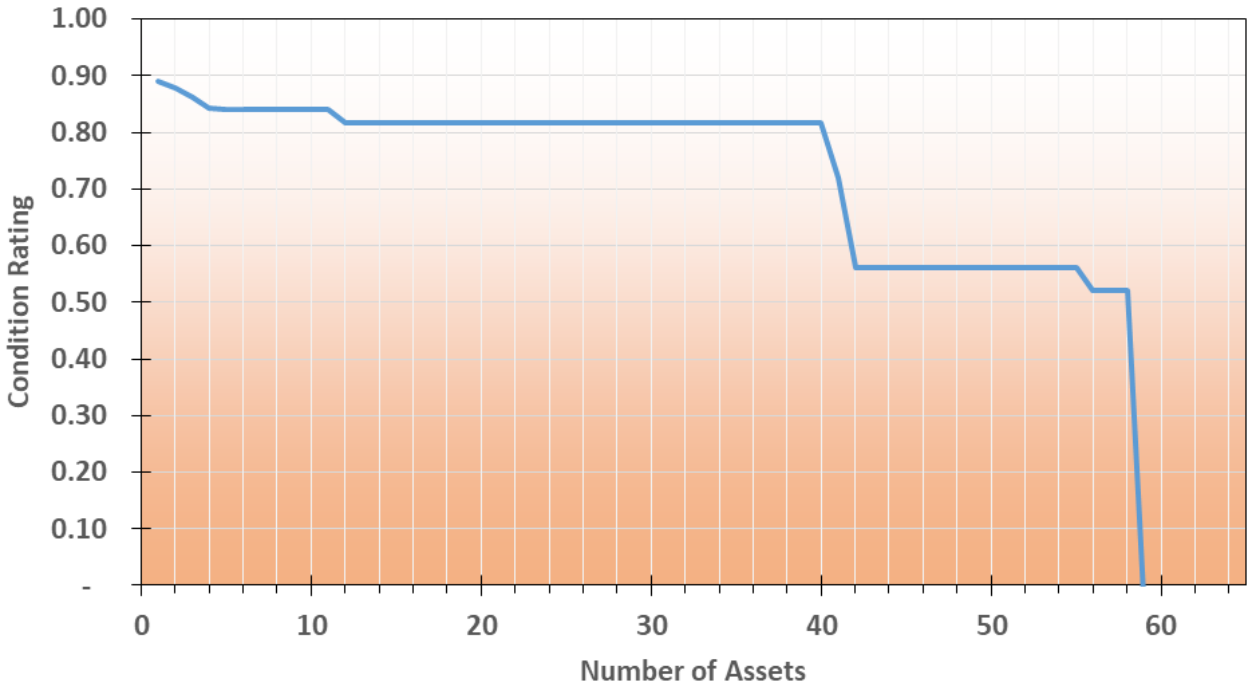
8.2 Condition

The condition of the stormwater management culverts can be estimated for the known assets based on their age and expected useful life.

The condition information reported in this section is an approximation based on known information, and is limited according to the inventory information available, and that there is no existing condition assessment information. To improve the quality of information reported here, the Town can undertake condition assessment of the existing culvert assets.

The condition for the stormwater management culverts has been approximated based on the useful life, and age of the asset. It is assumed (in the absence of condition information) that the remaining useful life percentage is approximately equal to the condition of the asset. This deterioration is assumed to be linear. For the 59 known culvert assets, the condition profile is shown in **Figure 8-1**.

Figure 8-1: Condition Ratings of Stormwater Management Culverts



The condition rating is shown on a 0-1 scale, where a 1 represents an asset in perfect condition. The majority of the known culvert assets are assumed to be in good condition or better (above a 0.6 rating).

8.3 Current Levels of Service – Stormwater Culverts

Levels of service for stormwater assets are outlined in Table 1 of the regulation, *O.Reg. 588/17*. As the culvert assets are part of stormwater management service, the level of service descriptions are expected to considered within that table. The responses to the descriptions can be found in **Section 7.3**.

8.4 Current Performance

The level of performance measures for the stormwater assets considers the culvert assets. The responses to the descriptions can be found in **Section 0**.

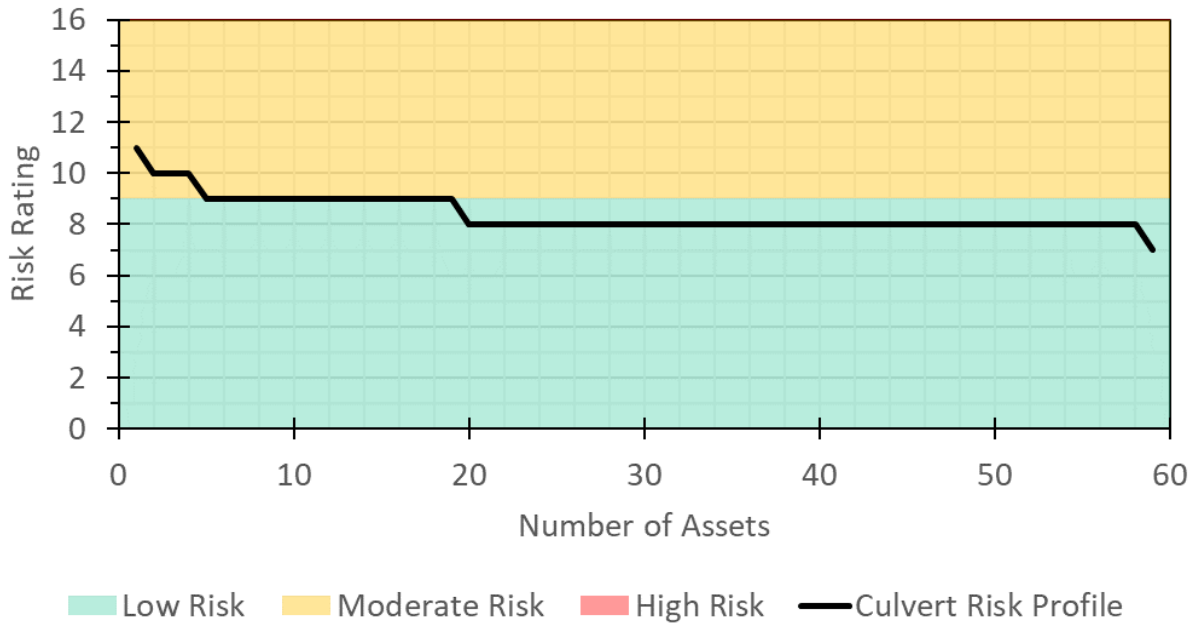
8.5 Risk Assessment

The ability to follow the risk assessment methodology for stormwater management culverts is limited due to the limitations in known asset inventory. Assessment was conducted for the inventoried assets, according to the following assumptions:

Condition:	Determined based on estimated condition (using typical useful and age to calculate remaining life) Based on condition comments were provided
Performance:	Assumed to be always reliable (value of 1)
Climate Change:	Assumed a value of 5 (Moderate or high impact; no or limited mitigation plan)
Impact:	Moderate impact (value of 1)
Importance:	Moderate importance (value of 2)

The risk profile for stormwater management culverts (known assets) is shown in **Figure 8-2**.

Figure 8-2: Risk Profile for Known Stormwater Management Culverts



Of the 59 known culvert assets (with known inventory information), four are within the moderate risk range, with risk scores of 10 and 11. The highest risk score asset, at 11, is a 400 mm diameter steel field access culvert, constructed in 2011, that is noted to have collapsed.

Where the inventory is incomplete the risk assessment methodology cannot be followed to quantify risk, however it is acknowledged that all existing culverts carry a risk. In the absence of a quantified risk value, the Town should endeavour to understand the risk value of the assets.

The following factors may impact risk of a culver structure:

- Depth of structure – the complexity and cost of rehabilitation or repair of an asset increases with the depth of the structure.
- Adjacent infrastructure – where a culvert is located below other infrastructure (roadway, watermain, sewer, utilities, etc.), failure of the asset could have a more severe impact, causing disruption or failure to adjacent assets.

Due to the size and depth of culvert structures known to the town (outside of the inventory), it is known (but not quantified) that some of these structures may have a high level of risk.

8.6 Lifecycle Activities

The following section describes the lifecycle activities that can be implemented within the asset management strategy for stormwater management culvert assets. The primary lifecycle activities include construction, inspections, maintenance and repair, replacement, and decommissioning/disposal.

Construction Activities

The start of an asset's lifecycle is its construction. The design of a culvert structure should be done such that the culver has sufficient capacity to allow for required flows, and has sufficient structural considerations such that whatever is going over top of it is good. It may be pertinent to consider climate change during the design and construction of a culvert asset.

Maintenance Activities

Culvert assets can be long-lived assets with estimated useful lives between 15 to beyond 75 years. Throughout the lifecycle of these assets the majority of expected needs will be maintenance and repair work.

Routine maintenance works are typically used to prolong the lifespan of assets and include both preventative and reactive activities designed to maintain the asset condition and function. Preventative activities are implemented to provide a predictive response to deterioration or possible performance issues by managing the contributing factors prior to an event occurring. Reactive maintenance is conducted in response to a condition or performance issue and designed to correct the issue before it causes asset deterioration and possible deficiencies. The scale of maintenance activities varies widely and is dependent on a variety of factors including the age, asset utilization, environment, and design.

Maintenance should be completed based on in section of the culvert and can include (but is not limited to) cleaning, washing and flushing, and erosion control.

Repair works are driven by the identification and treatment of deficiencies to prevent the continued deterioration of the deficiency which may cause a reduction in asset condition, performance and LOS delivered.

Renewal Activities

Renewal of the stormwater management culvert assets can include structural or non-structural lining. A lining can be used where the condition has deteriorated, however structurally the pipe segment is still sound. A lining can extend the useful life of an asset and improve performance. Risks associated with lining of a culvert include the improper installation of the lining or continued deterioration of the original culvert such that the lining does not perform as expected.

Operating Activities

Operating activities for the stormwater management culvert assets include those activities that do not directly deal with the physical state of the culvert but work to extend the assets useful life. The operating activities can include non-infrastructure policies, and monitoring/inspection of the assets. There is currently not an inspection program for the stormwater management culverts in place, however establishment of a program can include visual inspection at regular intervals, at a frequency that provides sufficient information to the Town. Where culverts are difficult to assess, usage of CCTV or zoom camera can be implemented. Usage of the zoom camera technology has the risk of insufficient visual detail to make appropriate activity decisions.

Decommissioning Activities

Decommissioning activities of the stormwater management culverts includes should be implemented when a culvert has reached the end of its useful life or has degraded to such a state that it can no longer provide the level of service for which it is intended. Decommissioning activities typically include abandonment or replacement of the asset. It is expected that the typical decommissioning practice would be the replacement in-place of the culverts due to the dependency of adjacent infrastructure on the location and proper functioning of the stormwater management culverts (such as the dependency of a road on a culvert crossing a creek).

Disposal activities should be conducted such that health and safety protocols are being followed, and spent materials are disposed of at appropriate or approved facility.

8.7 Asset Management Strategy

The asset management strategy for the stormwater management culverts in the Town focuses on expanding the inventory and utilizing the lifecycle activities.

The initial component of the asset management strategy is to improve the inventory of the stormwater management culverts. The inventory should be expanded to include existing assets and should endeavour to include as much detail as possible, such as the locations of the culvert, size, material, and condition. Field investigations may be required by Town staff or a third party to locate and inventory the culverts.

The condition, a major factor in the asset management strategy, should be established to assist in decision making. The Town should establish a condition assessment or inspection program, wherein the inventory and location of culverts can be established, and condition can be evaluated on a routine basis according to a frequency appropriate to the size and condition of the network.

When the condition of the asset has degraded such that an intervention is required, it is recommended that maintenance be reviewed as the first opportunity to extend the useful life. Maintenance works can include localized repair work or relining of a culvert.

When the condition of the asset has degraded such that maintenance is no longer an appropriate activity, the segment should be reconstructed. The Town should follow best practices and applicable design guidelines when designing the reconstruction works. Assets at the end of their useful life should be removed.

A summary of the culvert condition and associated lifecycle activity is provided in **Table 8-3**. Note that condition assessment should be undertaken on a routine basis throughout the lifecycle of the asset, and other factors should be considered when selecting a lifecycle activity.

Table 8-3: Storm Culvert Lifecycle Activities and Condition Ranges

Condition Range	Condition Description	Lifecycle Activity Category	Lifecycle Activity
1.0-0.60	Very Good to Good	Maintenance	Maintenance Works (cleaning, flushing) Small pipe section repairs
0.60-0.35	Good to Fair	Rehabilitation	Localized repairs Structural relining
0.35-0.0	Poor to Very Poor	Reconstruction	Culvert replacement

8.7.1 Current Priorities

The strategy for management of the culverts should focus at this time on development of an inventory and investigation or condition assessment of the assets. There is noted risk in the assets, due to the size, location, and dependency on the assets of other infrastructure. The Town cannot currently adequately prioritize works to be done with the incomplete inventory and unknown asset conditions.

The current understanding of the network is limited to new culverts, and the Town should endeavour to inventory the remaining Town-owned culverts such that lifecycle forecasting, and management can be estimated for the full inventory of these assets. Condition assessment of the assets can be undertaken during inventory to assist in lifecycle planning.

Note that storm sewer and culvert assets that are located or are part of a municipal drain may require additional steps or processes for lifecycle management.

Within the known inventory of culverts, one asset has utilized its useful life (located on the Ottawa Valley Recreational Trail and constructed in 1930) and should be prioritized for inspection of condition to understand if any needs are required. The remainder of the known assets have 56% of their remaining lifespan left or greater.

Estimation of the projected capital costs for the term of the asset management plan cannot be undertaken in a meaningful way at this time due to the data requirements. With additional data collected, projection of works and needs in the assets can be undertaken for the immediate and longer-term periods.

9.0 Roads Assets

9.1 State of Local Infrastructure

The Town owns and maintains a road network, which in addition to paved road assets, also includes streetlights, signs, and traffic signals at intersections. Linear road assets are considered core assets under **O. Reg. 588/17**. In this report, ancillary assets will be reported within the state of infrastructure, however, will be omitted from detailed asset management reporting.

9.1.1 Current Data

The information reported in this AMP and the subsequent analysis are based on the current TCA inventory maintained by the Town.

9.1.2 Road Assets

The Town owns and maintains a network of paved road assets. This network is made up of local, collector, and arterial roads. All assets have a surface cover of asphalt. A brief summary of the road assets is presented in **Table 9-1**, including total length and classification type.

Table 9-1: Summary of Road Assets

Road Classification	Total Length (km)	Percent of Total Inventory
Local	44.7	65.5%
Collector	12.4	18.2%
Arterial	11.1	16.3%
Total	68.2	100%

There is a total length of 68.2 km of asphalt roads within the Town. The typical widths of the roads range from 9 to 12 m.

The majority of road assets have two lanes, with the exception of O Brien Road and Veterans Memorial Boulevard at 3 and 4 lanes, respectively.

Within the Town boundary, the Town has completed rehabilitation works for the Highway 132 and Highway 60 MTO connecting links.

9.1.2.1 Replacement Costs

The unit replacement costs for the roads were determined based on pricing maintained by the Town and corroborated through review of recent tender costs in similar municipalities. Within the Town's inventory, unit construction costs for road resurfacing were attributed to most assets, estimated for the year 2008. A representative average was selected for each of the road classifications and inflated at a rate of 3% per year to project a unit replacement cost for 2022.

The reconstruction costs are listed for a full depth reconstruction and for surface only. The cost to be used will depend on the condition of the road base. The reconstruction cost (surface only) includes costing to conduct works only on the surface of the road, omitting the road base with the assumption that the road base lifespan greatly exceeds the road surface, and therefore does not require reconstruction at the frequency of the road surface. The inflated cost considers engineering and contingency project costs.

The Town also conducts major maintenance works on the roads as required to extend the useful life, at a projected cost of $100 /square meter.

A summary of the estimated unit costs is shown in **Table 9-2**.

Table 9-2: Road Reconstruction Unit Costs

Asset Class	Major Patching and Overlay ($/sq.m.)	Reconstruction Cost Range (2008) ($/sq.m.)	Reconstruction Unit Cost (2008) ($/sq.m.)	Recommended Reconstruction Unit Cost (2022) ($/sq.m.)	Reconstruction Unit Cost, Surface Only (2022) ($/sq.m.)
Collector	$100	$91 - $ 244	$200	$300	$200
Local	$100	$13 - $ 295	$200	$300	$200
Arterial	$100	$60 - $ 2,000	$200	$380	$220

The 2014 AMP deterioration curves have been maintained for the analysis within this AMP.

9.1.2.2 Average Age

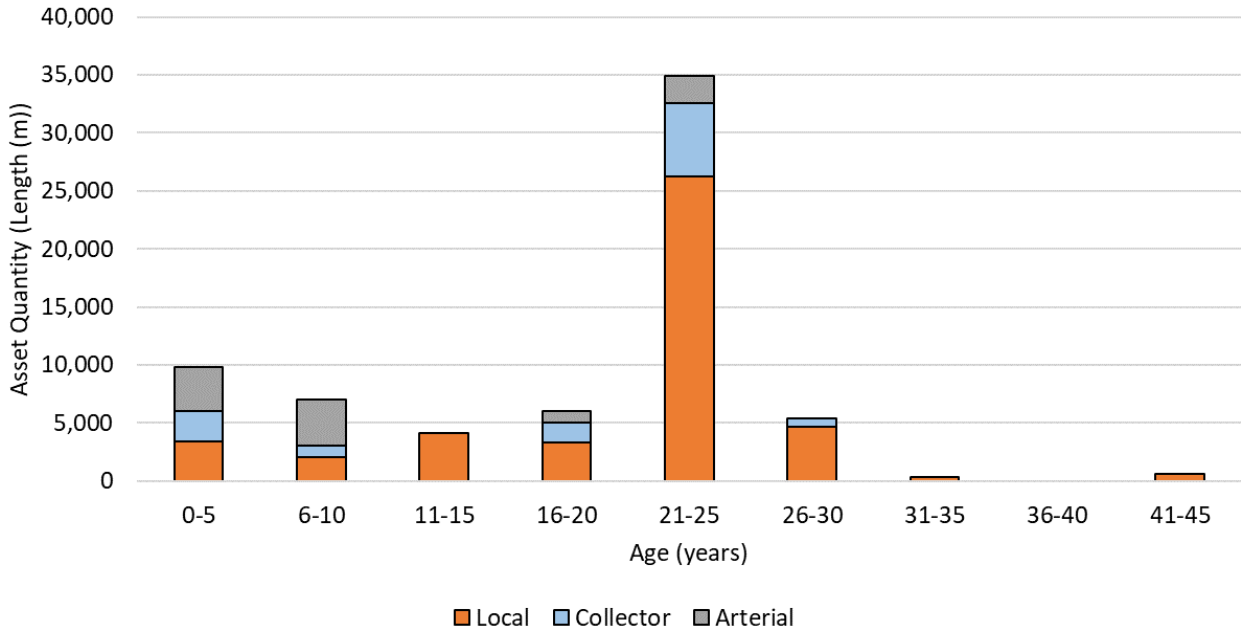
The average age of the road network was calculated by road classification, proportionally by length of asset. The average age overall is 18 years and the average age for each road classification is included in **Table 9-3**.

Table 9-3: Average Ages of Road Assets

Road Classification	Average Age (years)
Local	20
Collector	17
Arterial	9
Average	18

A summary of the age distribution for the road assets is shown in **Figure 9-1.**

Figure 9-1: Age Distribution of Road Assets



9.1.2.3 Expected Useful Life

The expected useful life of the road assets is used to estimate the replacement schedule. The expected useful life values for each type of road classification within the network were provided and confirmed by the Town. The expected useful life for asphalt roads is 30 years. The expected useful life remaining for each road classification is shown in **Table 9-4.**

Table 9-4: Useful Life for Road Assets

Road Classification	Expected Useful Life (years)	Average Remaining Useful Life (years)
Local	30	10
Collector	30	13
Arterial	30	21
Average	30	12

Expected useful life for each asset may be modified based on individual characteristics and differences in timing between the asset construction and acquisition date. The values presented in the table are typical of most assets owned by the Town.

9.1.3 Streetlights

The Town currently owns and maintains streetlight assets, including lamp-only assets, and lamp and pole assets. In 2021, the Town completed a program to update the streetlights to LED, the conversion program including 1,029 fixtures.

The converted fixtures are 50, 150 or 250 watt equivalent LEOTECH fixtures.

A summary of the streetlight assets and expected replacement costs are included in **Table 9-5**.

Table 9-5: Streetlight Assets Summary

Streetlight Asset Type	Quantity	Expected Useful Life (years)	Average Age (years)	Total Expected Replacement Cost
Lamp Only (HPS)	206	30	1	$600,000 (for all)
Lamp and Pole (HPS)	1,026	30	1	$600,000 (for all)

The replacement program included pole replacements, as required. In 2021, the program included LED replacements at a cost of $600,000, and included lamps only. Poles associated with these replacements are expected to have approximately 10-15 years of life remaining.

9.1.4 Signs

The Town owns road signage, including stop signs, yield signs and street signs. The Town maintains an inventory of the signage as part of the TCA works. A summary of the signage is included in **Table 9-6**.

Table 9-6: Signage Asset Summary

Sign	Quantity	Expected Useful Life (years)	Average Age (years)	Unit Replacement Cost (2021$)	Total Expected Replacement Cost
Stop Signs	256	10	10	$125	$31,907
Yield Signs	40	10	15	$125	$4,985
Street Signs	278	10	15	$117	$32,484

The unit replacement cost was determined based on the cost provided by the Town in the TCA information. The cost, noted to be in 2007 dollars, was inflated by 3% annually to current dollars.

The average age of the sign assets (noted to have been acquired in 1998-2007), is 19 years.

To better understand the state of the sign assets, the Town can undertake a detailed inventory, and conduct retro-reflectivity assessment for assessment of compliance and condition.

9.1.5 Intersections

The Town road network includes five intersections with traffic signals, at the following locations:

- O'Brien & Mask
- O'Brien and Froats
- Raglan St South and Renfrew W
- Raglan Street South and Munroe

Further, four pedestrian crossover signals are part of the network, with two having been constructed in 2021, at the following locations:

- Raglan Street South and Patrick
- Raglan Street South and Railway
- Raglan Street South and Prince
- Barnet at Millennium Trail
- Stewart and Arthur (constructed in 2021)
- Raglan Street south at Airth (constructed ion in 2021)

The expected replacement cost for each traffic signal intersection is $140,000, totalling $1,400,000 across all ten intersections (excluding the planned pedestrian crossovers, the total value is $1,120,000).

9.2 Condition – Roads

Condition of the roads network was determined using observed condition ratings undertaken by the Town in 2020, which were then further deteriorated to estimate the 2022 condition. The 2020 condition ratings by the Town are taken on a 0 to 6 scale where 0 represents an asset in excellent condition, 5 indicates an asset in poor condition, and 6 represents an asset slated for works to be undertaken. The ratings are current to 2020.

A summary of the current condition of the road assets is included in **Table 9-7**.

Table 9-7: Condition Summary of Roads

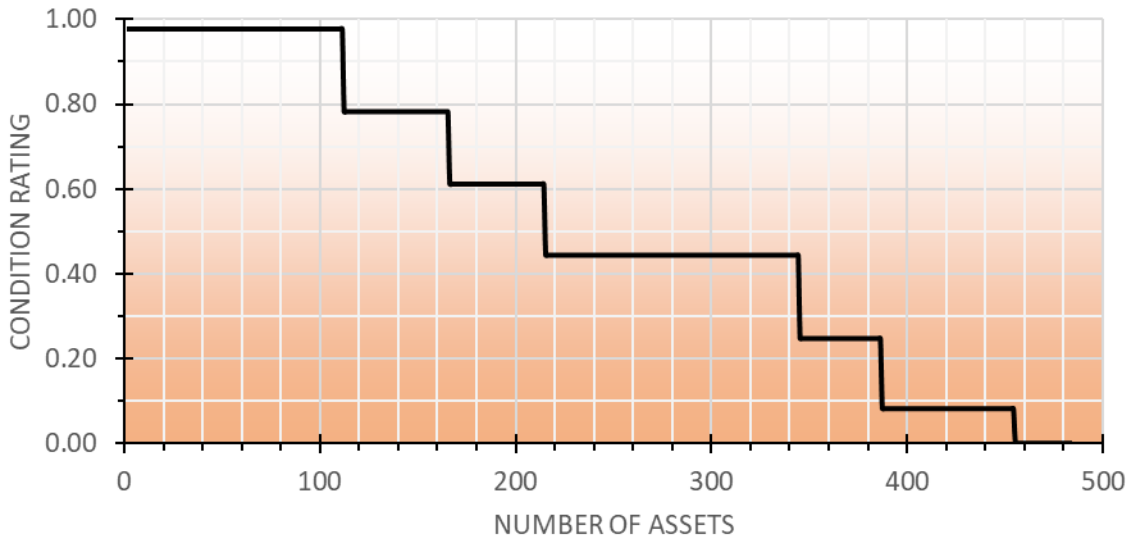
Condition Description	Numerical Condition	2020 Total Length (m)	2020 Percentage of Length	2022 Percentage of Length	2022 Total Length (m)
Excellent (Rebuilt by Town)	0	15,412	23%	15,493	25%
Good	1	7,544	11%	7,544	11%
Fair/Good	2	7,651	11%	7,651	11%
Fair	3	18,704	27%	18,704	27%
Fair/Poor	4	5,499	8%	5,499	8%
Poor	5	9,870	14%	13,355	19%
Proposed 2020	6	3,424	5%		

The average condition rating, by length of asset, is 2.5, in the “Fair” range.

Where condition data was not provided, the condition was estimated using a deterioration curve and the age of the assets. This was required for only 3 assets, which represented only 0.2% of the road assets by length.

The condition value of the road assets is included in **Figure 9-2**.

Figure 9-2: Condition Ratings of Roads Assets



9.3 Current Levels of Service – Roads

Levels of service for road assets are outlined in Table 4 of the regulation, *O. Reg. 588/17*. **Table 9-8** and **Table 9-9** outline the Town's current community and technical levels of service for roads.

Table 9-8: Community Level of Service – Roads

LOS Parameter	Community Levels of Service Qualitative Description	Community LOS
Scope	Description, which may include maps, of the road network in the Municipality and its level of connectivity.	• The roads in the Town are intended to serve local and through traffic throughout the Town. • A map of the road network is shown in **Figure A-4** in **Appendix A.**
Quality	Description or images that illustrate the different levels of road class pavement condition.	Pavement condition was most recently assessed by the Town in 2020. The road segment surfaces were visually assessed and provided a condition rating from 0 to 6, where lower ratings described road segments in the best condition. The rating was assumed to have followed MTO manual guidance.

Table 9-9: Technical Level of Service – Roads

LOS Parameter	Technical Levels of Service Technical Metrics	Technical LOS
Scope	Number of lane-kilometres of each of arterial roads, collector roads and local roads as a proportion of square kilometres of land area of the Municipality.	The number of lane-kilometres of roads as a proportion of square kilometres of land area of the Town is in **Table 9-10**.
Quality	1. For paved roads in the Municipality, the average pavement condition index value.	Avg condition index (2020): 2.5 (Fair) (Equivalent PCI: 0.54)
	2. For unpaved roads in the Municipality, the average surface condition (e.g., excellent, good, Fair or Poor).	No gravel roads within the Town.

Table 9-10: Proportion of Lane Kilometres

Road Type	Length of Lane-Kilometres	Lane kilometres as Proportion of sq. km of Land Area
Local	99.96km (46.8 km asset length)	7.7 km/sq.km
Arterial	27.6km (13.1 km asset length)	2.1 km/sq.km
Collector	27.35km (13.4 km asset length)	2.1 km/sq.km

9.4 Current Performance – Roads

Asset performance measures were determined in consultation with the Town, which provide relevant metrics against which the Town can gauge the performance of their assets. The performance measures for Roads, and their current values are shown in **Table 9-11**.

Table 9-11: Road Performance Measures

Asset Performance Measure	Current Value
Roads with load restrictions	To be established
Percentage of roads in fair or better condition	To be established
Number of accidents	To be established
Wait times	To be established
Number of requests for maintenance	To be established

9.5 Risk Assessment – Roads

The risk assessment for roads assets was conducted using the following assumptions and criteria:

Condition: Determined based on estimated condition (using provided condition data from the Town). **Table 9-12** below provides details regarding the provided ratings from the Town and the corresponding rating used within the risk calculation.

Table 9-12: Road Condition Ratings

Town Condition Rating	Town Condition Rating Description	Corresponding Dillon Condition Description	Corresponding Dillon Risk Condition Rating
0	Excellent (Rebuilt by Town)	Very Good	1
1	Good	Good	2
2	Fair/Good	Fair	3
3	Fair	Fair	3
4	Fair/Poor	Poor	4
5	Poor	Poor	4
6	Proposed 2020	Very Poor	5

Performance: Assumed to be always reliable (value of 1)

Climate Change: Assumed a value of 3 (Limited impact with slower recovery; mitigation plan not in place)

Impact: Moderate impact (value of 1) for local and collector

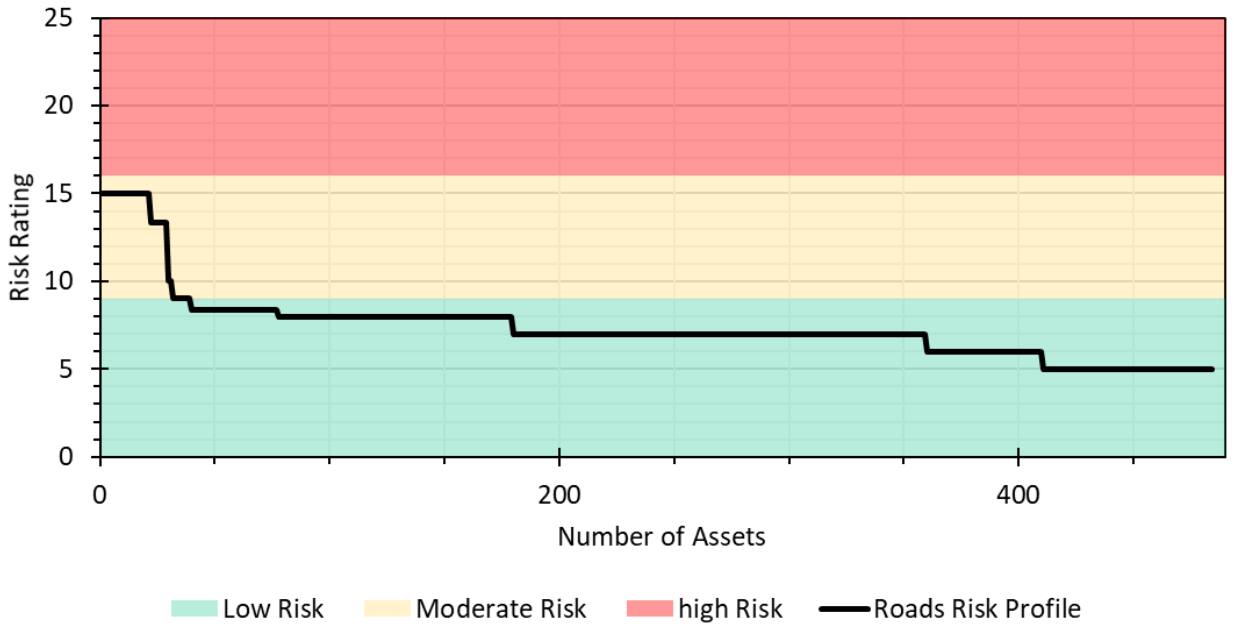
High impact (value of 2) for arterial assets

Importance: Moderate importance (value of 2) for local and collector

High importance (value of 3) for arterial assets

The risk profile for roads assets is shown in **Figure 9-3**.

Figure 9-3: Risk Profile for Roads Assets



The roads assets include 31 segments that are considered within the moderate risk range. The maximum risk score found within these ratings is 15. The moderate risk assets account for 5.2 km of roads, all classified as arterial. The 23 highest risk segments are all identified by the Town as requiring reconstruction in 2021.

9.6 Lifecycle Activities – Roads

The following section describes the lifecycle activities that can be implemented within the asset management strategy for road assets. The primary lifecycle activities include construction, improvement, maintenance, and decommissioning/disposal. The lifecycle activities presented below are consistent with best practices for road asset management and maintenance.

Construction Activities

The initial lifecycle activity of a road asset is its construction. The road asset should be constructed to adhere to applicable requirements, codes, and design guidelines. Construction of new road assets is recommended to be in line with recommendations as part of growth, master plan, or other municipal strategies. Design of the road asset should consider the level of service expected to be provided by that particular road asset, such as the anticipated speed or volume of traffic. Varying factors in construction include: the road classification, surface type, and location.

Construction can also be the replacement of deteriorated assets. At the end of the useful life of an asset, it can be replaced for continuation of service provision. At the time of replacement, design should be undertaken to ensure design requirements are met, and adequate capacity is provided for current and future projections.

Maintenance Activities

Maintenance activities are undertaken on the assets throughout their useful life to maintain their operating condition and performance. There are a variety of maintenance activities available to undertake on road assets, including:

1. Ditch improvements (grubbing/clearing)
2. Crack sealing
3. Microsurfacing
4. Single surface treatment
5. Double surface treatment

Maintenance activities can include the full road surface, or can be used to address localized repairs on the road surface.

The selection of the maintenance activity is dependent on a variety of factors, including road surface type (material, urban/rural classification), condition (surface and road base), road works history, importance, among others.

Renewal/Rehabilitation Activities

Renewal or rehabilitation of the road assets can be undertaken when maintenance works are no longer sufficient to address road surface deficiencies. These replace significant parts of the road but provide large improvements to condition and lifespan. These works can include:

- Resurfacing

The selection of the activity for implementation will require consideration of the same factors listed for maintenance works.

Operating Activities

Operating activities for the road assets include those activities that do not directly deal with the physical state of the road but work to extend the assets useful life. The operating activities can include non-infrastructure solutions (such as policies, limiting truck traffic, planning reports), and monitoring/inspection of the assets. Inspection of the road assets can be completed by Town staff on an as-needed basis, or on a broader portion of the network conducted by a third party. The inspection program can include a combination of the effort types to suit the needs of the Town.

Decommissioning Activities

Decommissioning activities of the road assets includes removal of the road from service. A road may be removed by disposal of the asset components, or establishment of a barricade to prevent continued usage of the asset. Disposal activities should be conducted such that health and safety protocols are being followed, and spent materials are disposed of at an appropriate or approved facility.

A summary of the lifecycle activities and associated risks is in **Table 9-13**.

Table 9-13: Summary of Roads Lifecycle Activities

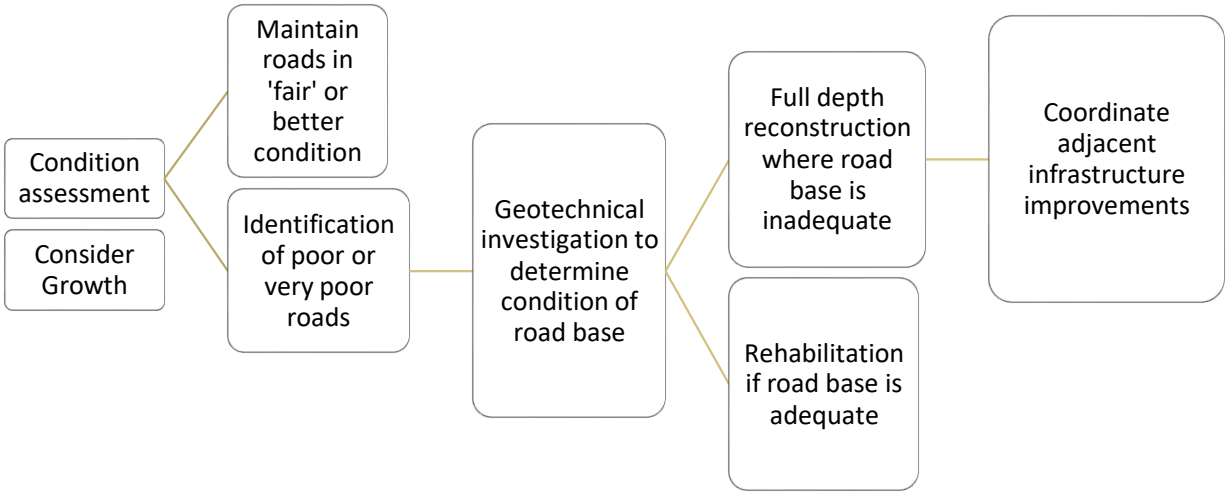
Lifecycle Activity Type	Suggested Activities	Risks
Construction Activities	• New construction of road segment • Full depth road reconstruction	Insufficient in design or capacity, unable to provide service as intended
Maintenance activities	• Ditch improvements (grubbing/clearing) • Crack sealing • Microsurfacing • Single surface treatment • Double surface treatment	• Allocation of funding could be disproportionate for asset value • Frequency of maintenance could be inadequate • Maintenance method selected may be inadequate for address issues
Renewal activities	• Resurfacing • Road surface reconstruction	Improper repair, resulting in continued poor performance/condition
Operating and Decommissioning Activities	• Design guidelines • Road usage limits • Routine inspection • Removal of road segment from service • Roads master planning • Asset management plan	Does not directly mitigate failure of assets

9.7 Asset Management Strategy – Roads

The asset management strategy for the road assets seeks to use the lifecycle activities in a manner that will achieve cost-effective and sustainable management of the road assets.

The road assets will deteriorate on a non-linear basis, and the lifecycle activities can be implemented at varying stages within an assets deterioration. **Figure 9-4** shows a simplified progression through the current roads strategy. Further discussion is provided in the discussion below. The strategy for roads generally follows the following progression (more detail is provided below):

Figure 9-4: Road Asset Strategy General Progression



The condition and usage of the road assets is a key driver in the determination of lifecycle activities to use. The Town has previously assessed the condition of the roads assets, from 2005 to present day, and should continue with the assessment program to monitor and update the overall condition ratings of the assets.

An asset condition assessment program for roads can assess the assets on a regularly scheduled basis wherein the entirety of the network is reviewed in portions over a specified timeframe (for example 1/5 of the network in a 5 year timeframe), or all assets to be done in one assessment year, with assessment recurring every few years. The Town currently undertakes assessment annually on a portion of the network. A condition rating program can also be implemented that considers the importance or risk of a road segment and prioritizes frequency and timing of condition assessments to higher usage or higher importance roads. The current program can continue if the information being generated at a frequency sufficient to allow for the Town to make appropriate and timely decisions on implementation of lifecycle activities, however the Town may consider increased frequency in road condition assessment.

A variety of methods can be implemented for undertaking condition assessment of roads, including visual inspection, and usage of technological systems such as street scan technology. The assessment can be conducted in-house by Town staff or through acquisition of a third-party assessment. The current inspection program includes visual inspection of the assets by staff.

In addition to the condition, prioritization and selection of a road asset for implementation of lifecycle activities can consider the following:

- Importance of the asset
- Asset risk score
- Condition of adjacent sections
- Replacement requirements for adjacent infrastructure (watermain, storm or roadworks)
- Upstream dependency and expansion requirements.

Presently, the Town uses the condition of adjacent sections to assist in determining capital projects and reconstruction works. The Town maintains a graphical database of the road conditions to easily identify sections that are in similar condition, and where there may be efficiencies in conducting works on adjacent sections.

There is efficiency in conducting capital reconstruction works where adjacent asset types can be reconstructed simultaneously. Part of the Town's current strategy is to use capital works projects from other linear asset categories to identify any upcoming capital works on adjacent linear infrastructure (such as watermain, sewer or storm), and align the timing of the works such that there is efficiency in the design, construction and material costs associated with the project, and reduced disruption to service delivery.

The Town conducts an ongoing geotechnical investigation program on the road assets to determine the suitability of the road base material for ongoing use (to support expected traffic loads). During the review of the condition of the assets, the Town will arrange for geotechnical investigation to be conducted on the roads in 'poor' or 'very poor' condition. The results of the investigation will assist the Town in selecting the type of works required on the road (rehabilitation, or surface works, or full-depth reconstruction including road base materials). This program provides valuable information for the Town in prioritizing projects and completing capital plan projections.

Maintenance works should be undertaken throughout the lifecycle of an asset. Selection of the appropriate maintenance activity will depend on the type of deterioration being experienced on the asset, and the condition of the asset. Some activities, such as crack sealing, are best utilized on a road segment that is generally in good condition. As the road segment continues to deteriorate, maintenance activities may become a less preferred option as it may become insufficient to address deficiencies.

Maintenance activities can be undertaken on a road segment multiple times prior to the asset requiring rehabilitation activities, depending on the nature and extents of the maintenance works. The Town undertakes regular maintenance activities (such as catchbasin repair, maintenance hole repair, replacement of curb sections, etc.) to extend the useful life of the road assets.

Rehabilitation activities should be undertaken on an asset when it has deteriorated past the point where maintenance activities would be adequate to address condition issues. Selection of the appropriate rehabilitation activity will depend on the road surface material, stage in lifecycle, and severity and type of deterioration. Due to the current road surface types in the Town (all pavement, no surface treatment), conducting a road overlay will require shaving of the existing surface. During these works, the Town must retain the current grade of road due to the urban cross-section used on the road infrastructure.

At the point where a road asset has deteriorated such that maintenance and rehabilitation options will be inadequate to address condition issues, the road can be a candidate for reconstruction. The depth of reconstruction (either surface or full depth including road base) will need to be identified. This distinction is made through a variety of factors, including condition and performance of the road, traffic count information, and a geotechnical investigation (to determine the quality of the base materials relative to the expected traffic loads). Reconstruction works will result in a road segment being at a very good condition rating.

Reconstruction and rehabilitation works offers the Town an opportunity to integrate other improvements into the road works. This may include active transportation facilities, upgrade of drainage, street lighting, and changes to the road cross-section to accommodate growth demands.

A summary of the lifecycle activities, and condition range recommended for implementation is in **Table 9-14**.

Table 9-14: Road Lifecycle Activities and Condition Ranges

Condition Range	Condition Description	Lifecycle Activity Category	Lifecycle Activity
1.0-0.60	Very Good to Good	Maintenance	Crack sealing Microsurfacing Single surface treatment Double surface treatment Repair of structures, sidewalk sections, curb sections, etc.
0.60-0.35	Good to Fair	Rehabilitation	Mill & Overlay
0.35-0.0	Poor to Very Poor	Reconstruction	Full depth reconstruction

In general, the current strategy for the road assets at the Town is to allow the road surface asset to degrade near to the end of its expected lifecycle and reconstruct the road surface when required. Most commonly the road works undertaken by the Town include reconstruction of the surface and preserving the existing road base. The road base has a much longer expected useful life than the road surface, and can be maintained while the condition is still suitable and it is not contributing to the poor condition of the road surface. The viability of the road base can be assessed through boreholes, or assessment of surface performance by the roads operations team.

As the Town reconstructs the roads, the cross section will vary depending on the location and classification of the road. The width of pavement (number of lanes, presence of on-street pavement), and type of active transportation (sidewalk, multi-use path) will be assessed on a case-by-case basis as roads are identified for reconstruction works.

9.8 Scenario Analysis

To understand the needs of the roads network and overall system condition within a 20 year outlook, replacement and relining activities were reviewed under varying budget scenarios. The budget scenarios analyzed include:

1. Unlimited budget – To determine backlog of works
2. 2% of network value – Best practice of investment (note that the network value used for this calculation was determined using a full depth reconstruction unit cost)
3. 4% of network value – Best practice of investment (note similar to Scenario 2)

4. 2014 AMP Funding Level – To understand impact of current recommended allocation
5. Maintain Current Condition (0.54) – Defining the target budget to maintain the current average condition across the network

The assets were analyzed using reconstruction and overlay activities. Discussion below presents the results as they are analyzed individually and combined.

9.8.1 Analysis Results

Multi-year projection scenarios were run using the budgets noted above. In the analysis, reconstruction activities are recommended when a road has a condition rating of between 0 and 0.35. Reconstruction of a segment will return the segment to a condition index of 1.

A summary of the analyses is presented in **Table 9-15**.

Table 9-15: Budget Scenario Results

Number	Budget Scenarios	Annual Value	Average Annual Investment (2022-2041)	Total Investment (2022-2041)	Average Condition Index (at 2041)
1	Unlimited budget	Unlimited	$4,563,789	$91,275,788	0.61
2	2% of network value	$3,778,000	$3,769,944	$75,398,876	0.59
3	4% of network value	$7,556,000	$4,563,789	$91,275,788	0.68
4	2014 AMP Funding Level	$750,000	$738,790	$14,775,791	0.19
5	Maintain Current Condition (0.54)	$3,350,000	$3,339,849	$66,796,978	0.53

The annual value of the budget scenarios are maximum investment value per year.

The selection of an investment level for the watermain strategy should consider the current and intended level of service, affordability, effectiveness of the scenario, and backlog of works.

Scenario 1 assumes an unlimited budget available for reconstruction of the wastewater linear assets. In the first year of the scenario, $33.5M in reconstruction works were identified, indicating that there is a backlog of repairs required to improve the condition of the assets. The backlog includes any assets that are currently at a condition rating of 0.35 or less.

Scenario 2 achieved an average condition rating of 0.59 at the end of the scenario. Utilizing the full investment in each year of the 20 year timeframe, the total spent is above $75M, which is greater than the current backlog.

Scenario 3 was found to have a consistent average annual investment and total investment over the 20 year timeframe, as with the Scenario 1 (Unlimited) results, however due to the timing of each of the works conducted, the average condition achieved at the end of the timeframe is slightly higher. As similar results are achieved by both scenarios, we can assume that expenditure of 4% annually is sufficient to address the backlog and upcoming works within the 20 year timeframe.

Scenario 4 reviewed the investment level recommended as part of the 2014 AMP, which is significantly lower than the other scenarios at only $750,000 annually. At this investment level, by the end of the 20 year timeframe there has been less than $15M total expenditure. This amounts to only 28% of the current backlog of works. There may be insufficient funds within this scenario to undertake activities prior to assets deteriorating to the point of failure.

Scenario 5 reviewed the annual investment requirements when targeting the current condition rating of 0.54 over the analyzed timeframe. The investment value is approximately $3.35M annually, with most of the budget being used in every year of the 20 year timeframe. The total expenditure at the end of the timeframe nears $67M, which is greater than the current backlog of works.

In selecting the recommended investment level, the Town should consider its current and preferred level of service being provided. The LOS is represented in these scenarios as the average condition of the assets. The current average condition is 0.54, and a best practice recommends maintaining a minimum average condition of 0.60 across the system. If the Town's target is to maintain the current LOS, Scenario 5 would be the recommendation, however this would retain the current level of service just below the best practice threshold.

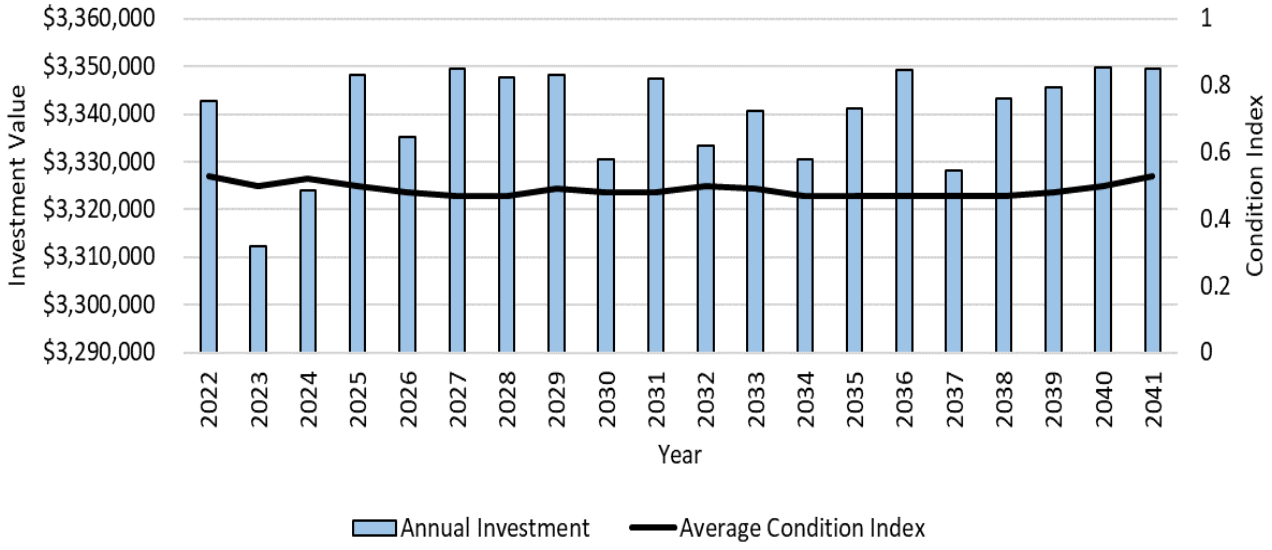
The Town should also consider the current backlog of works relative to the investment scenario. As found through Scenario 1, there is approximately $33.4M in outstanding works on the system. Any investment under this threshold may result in some assets deteriorating to the point of failure during the reviewed timeframe. Over the 20 year timeframe, Scenarios 1, 2, 3, and 5 have a total expenditure that exceeds the backlog, suggesting that it may be sufficient to address current and future needs.

As Scenario 3 is similar to the Unlimited scenario, it can be assumed that it will be adequate for addressing the backlog and upcoming infrastructure needs.

In Scenario 4, the total spent over the timeframe is far less than the current backlog of works, suggesting that it may not be adequate to address all of the current needs, and some assets may deteriorate to the point of failure. In Scenario 5, the total investment is greater than the backlog, however the expenditure is incurred over 20 years, which means some assets may deteriorate to the point of failure over that timeframe.

In consideration of the level of service being provided, overall condition achieved and the value of the backlog, the Town can implement a budget similar to Scenario 5 for the management of the roads assets. The annual expenditure under this budget value and its resulting impact on the average condition of the assets is shown in **Figure 9-5**.

Figure 9-5: Scenario 5 - Annual investment and Condition Index for Roads (Reconstruction)



The scenarios discussed above are projected using condition as the primary factor for prioritization, and provide information of how the overall condition of the assets will respond at varying levels of investment over the time period. When conducting capital planning and annual capital expenditures, additional factors beyond those in the model must be considered by the Town, as previously described.

9.9 Proposed LOS Increase for Roads

The Town has identified roads as a service delivery area that could benefit from an increase in level of service, supported through priorities of local Council and administration, and through data collected during the Community Level of Service Survey (as discussed in Section 1.2.2).

The Town can reflect the intention to improve the roads by establishing an increased proposed level of service target.

The selection of the target will depend on a variety of factors, and should reflect the level of service that the Town expects to provide to the public, and what the public is willing to accept and pay for.

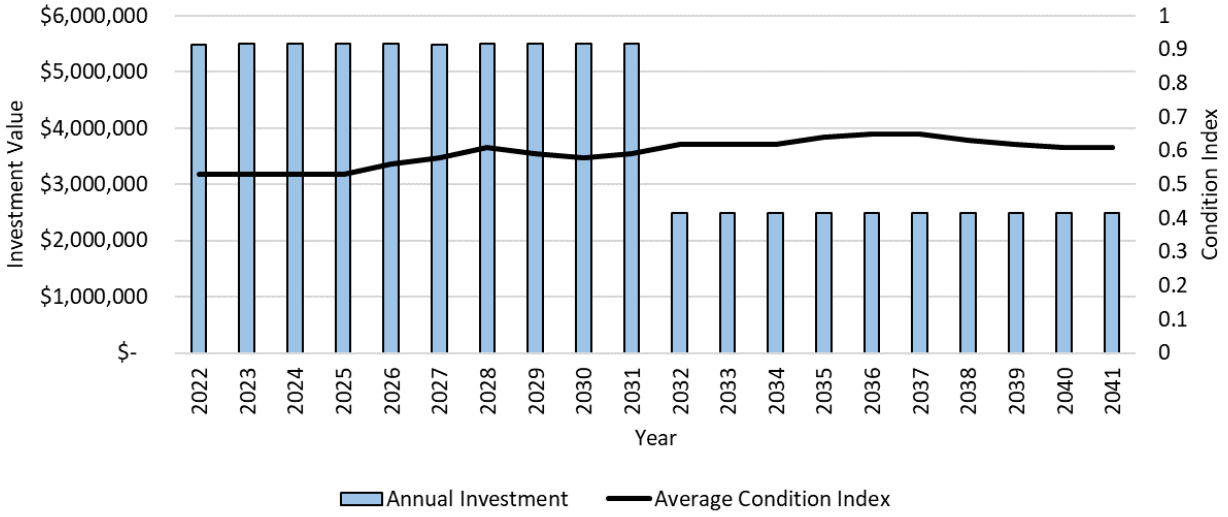
The proposed level of service for roads, similar to current LOS, can be described as a condition rating (PCI). When setting the target for condition, the Town should consider:

- The preferred level of service (or condition)
- Best practices for condition ratings and level of service targets for roads
- Affordability of the preferred level of service, including ability of the Town to achieve the goals of the level of service, and the willingness of the public and availability of funding

Note that timeframe used for the AMP (and therefore the scenarios) is 20 years, and the average condition index achieved at the end of the timeframe. An accelerated improvement schedule can be reviewed, which would impact the annual investment value. The timeframe for the Proposed LOS is 10 years.

As a guide to assist in the decision making, a scenario was run that targets an average condition rating (or PCI value) of 0.6, a value which is consistent with some best management practices (and higher than the Town's current average PCI). In this scenario, the target was set for the end of the Proposed LOS timeframe (2031), which allows the Town ten years to work towards the target, and maintaining the 0.6 PCI for the subsequent ten years (AMP timeframe, to 2041). The scenario required an investment value of $5.5 million for the first ten years, and $2.5 million in the second ten years. The expected annual investment and resulting chance in condition index is shown in **Figure 9-6**.

Figure 9-6: Proposed Roads LOS Increase Scenario



Roads service delivery has defined LOS parameters as set out by O.Reg. 588/17. In establishing proposed LOS targets, the Town can select an increase for any of the required parameters, or expand on those parameters with additional ways to track improved road service delivery and monitor performance.

10.0 Sidewalks

10.1 State of Local Infrastructure

The Town owns and maintains a sidewalk network, adjacent to the road fabric and as walkways. The sidewalk network consists of asphalt, concrete and multi-use path segments. A brief summary of the assets is presented in **Table 10-1**, including total length and classification type.

Table 10-1: Summary of Sidewalk Assets

Sidewalk Classification	Total Length (km)	Percent of Total Inventory
Asphalt	2,595	5%
Concrete	42,521	85%
Multi-Use Path	4,776	10%
Total	49,892	100%

The sidewalks have varying curb types, including barrier, monolithic, or none. There is a total of just under 50 km of sidewalks within the Town.

The Town's sidewalk assets include those adjacent to County Roads within Town limits.

10.1.1 Current Data

The information reported in this AMP and the subsequent analysis are based on the current TCA inventory maintained by the Town.

10.1.2 Replacement Costs

The replacement costs for sidewalk (asphalt multiuse path and concrete surface types) were estimated based on recent tender information, and inflated to account for regional fluctuations in costing, engineering and contingency costs. These values were compared to reconstruction costs provided by the Town as part of the TCA reporting requirements. The values were found to be more conservative than the TCA estimates, and are therefore recommended to be used. Note that these prices reflect the construction of the sidewalk asset only. If a sidewalk asset is constructed in conjunction with other works (for example as part of a road reconstruction project), there may be efficiencies in works, and therefore impacts on replacement costs.

The replacement cost was estimated using a $/sq. m value of $75 for asphalt and paved, and $80 for concrete. These values are reported on a square meter basis to account for the variation in sidewalk width in the Town.

The total estimated replacement costs for sidewalks are shown in **Table 10-2**.

Table 10-2: Replacement Costs for Total Sidewalk Assets

Sidewalk Type	Total Existing Length (m)	Total Area (sq.m.)	Replacement Unit Cost ($/m)	Total Replacement Cost
Asphalt	2,595	3,892	$75	$291,908
Concrete	42,521	63,782	$80	$5,102,563
Paved - Multi Use Path	4,776	7,164	$75	$537,298
Total	**49,892**	**74,838**		**$5,931,769**

10.1.3 Average Age

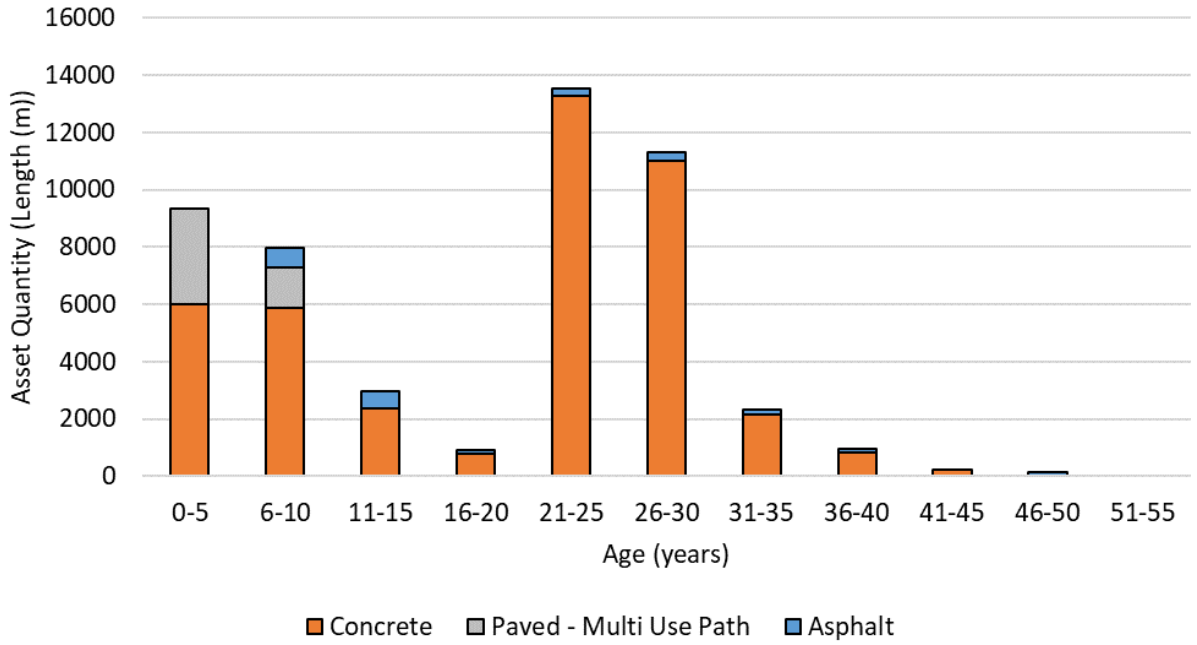
The average age of the sidewalk network was calculated by sidewalk type, weighted by length of each asset. The average age is included in **Table 10-3**.

Table 10-3: Average Ages of Sidewalk Assets

Sidewalk Classification	Average Age (years)
Asphalt	22
Concrete	20
Multi-Use Path	4
Average	18

A summary of the age distribution for the sidewalk assets is highlighted in **Figure 10-1**.

Figure 10-1: Age Distribution of Sidewalk Assets



The average age of the assets is 18 years, the oldest segments having an in-service date of 1966, and the most recent constructions having taken place in 2021.

10.1.4 Expected Useful Life

The expected useful life of the sidewalk assets is used to estimate the replacement schedule. The expected useful life values for each type of sidewalk classification were provided and confirmed by the Town. The expected useful life for sidewalks is 50 years across all classifications. The expected useful life remaining for each sidewalk classification is shown in **Table 10-4.**

Table 10-4: Useful Life for Road Assets

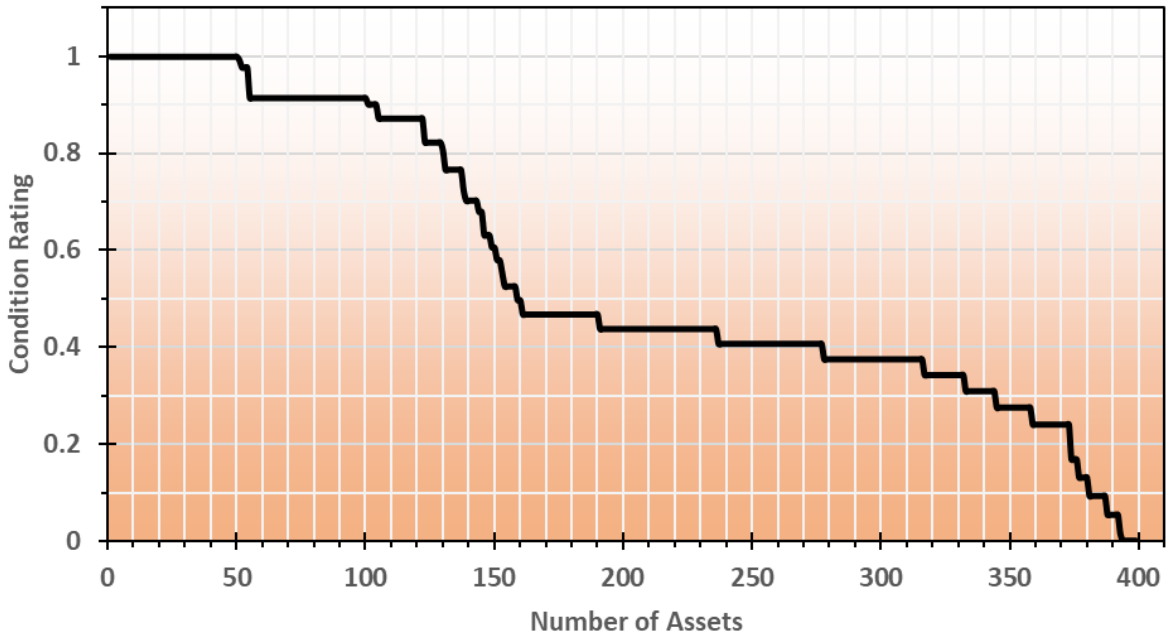
Sidewalk Classification	Expected Useful Life (years)	Average Remaining Useful Life (years)
Asphalt	50	28
Concrete	50	30
Multi-Use Path	50	46

Expected useful life for each asset may be modified based on individual characteristics and differences in timing between the asset construction and acquisition date. The values presented in Table 27 are typical of most assets owned by the Town.

10.2 Condition – Sidewalks

The condition of sidewalk assets is evaluated by the Town using a 0 to 1 scale, where 1 represents the "Best" condition, and 0 represents the "Not Best" condition. Inspection information has been completed for all existing sidewalk segments, occurring between 2005 and 2019. A summary of the condition of the assets is shown in the following figure, by length of asset. Note that the condition assessment values have been further deteriorated from the observed condition to present day expected condition, since the date of observed condition. Where observed condition was not provided, the condition was estimated based on a deterioration curve, and the current age of the assets, however only 24 assets required estimation. The distribution of condition values is shown in **Figure 10-2**.

Figure 10-2: Observed Condition of Sidewalk Assets



The average condition rating (present day) is 0.59 (by length of assets).

10.3 Current Levels of Service – Sidewalks

Levels of service for sidewalk assets are not defined in the regulation, O. Reg. 588/17 as sidewalks are not considered core assets. As such, level of services has been devised based on the content of the regulation, in consultation with the Town. **Table 10-5** and **Table 10-6** outline the Town's current community and technical levels of service for sidewalks.

Table 10-5: Community Levels of Service – Sidewalks

LOS Parameter	Community Levels of Service Qualitative Description	Community LOS
Scope	Description, which may include maps of sidewalk network in the Municipality and its level of connectivity	Sidewalk assets are located throughout the Town. The extent of the network are shown in **Figure A-5** in **Appendix A.**
Quality	Overall condition rating of sidewalks, description or images of levels of sidewalk condition	Condition is determined through inspection. Ratings are provided on a scale of 0 to 1 (where 1 represents an asset in perfect condition). Inspections review for: ditching, tripping hazards, distortion, and cracked panels.

Table 10-6: Technical Levels of Service - Sidewalks

LOS Parameter	Technical Levels of Service Technical Metric Description	Technical LOS
Scope	Total length of sidewalks as a proportion of square kilometers of land area in the Municipality	3.84 km per sq. km. Asphalt: 0.2 km/km² Concrete: 3.3 km/km² Paved - Multi Use Path: 0.4 km/km²
Scope	Percentage of roads with adjacent sidewalks	Sidewalks occur on odd and/or even sides of the road. Even: 35% of roads Odd: 36% of roads
Quality	Average condition index of sidewalks	0.56 (on a scale of 0 to 1, where 1 indicates an asset in perfect condition)
Quality	Percentage of sidewalks that meet AODA requirements	Not currently tracked

Note: Land area of 13 square kilometers determined from Town of Renfrew Official Plan (2007)

10.4 Current Performance – Sidewalks

Asset performance measures were determined in consultation with the Town, which provide relevant metrics against which the Town can gauge the performance of their assets. The performance measures for sidewalk assets, and their current values are shown in **Table 10-7**.

Table 10-7: Current Performance Measures for Sidewalks

Asset Performances Measure	Current Value
Percentage of sidewalks in fair or better condition	To be established
Percentage of sidewalks meeting AODA compliance requirements	To be established
Instances of slip, trip and fall instances (complaints received)	To be established

10.5 Risk Assessment – Sidewalks

The risk assessment for the sidewalk assets was conducted using the following risk assumptions and criteria:

Condition: Determined based on estimated condition (using deterioration curve)

Performance: Assumed to be always reliable (value of 1)

Climate Change: Assumed a value of 1 (No or limited impact, quick recovery or mitigation in place)

Impact: High impact (value of 2)

Importance: Priority rating provided by Town for sidewalk assets

Primary priority assumed to be high importance (value of 3)

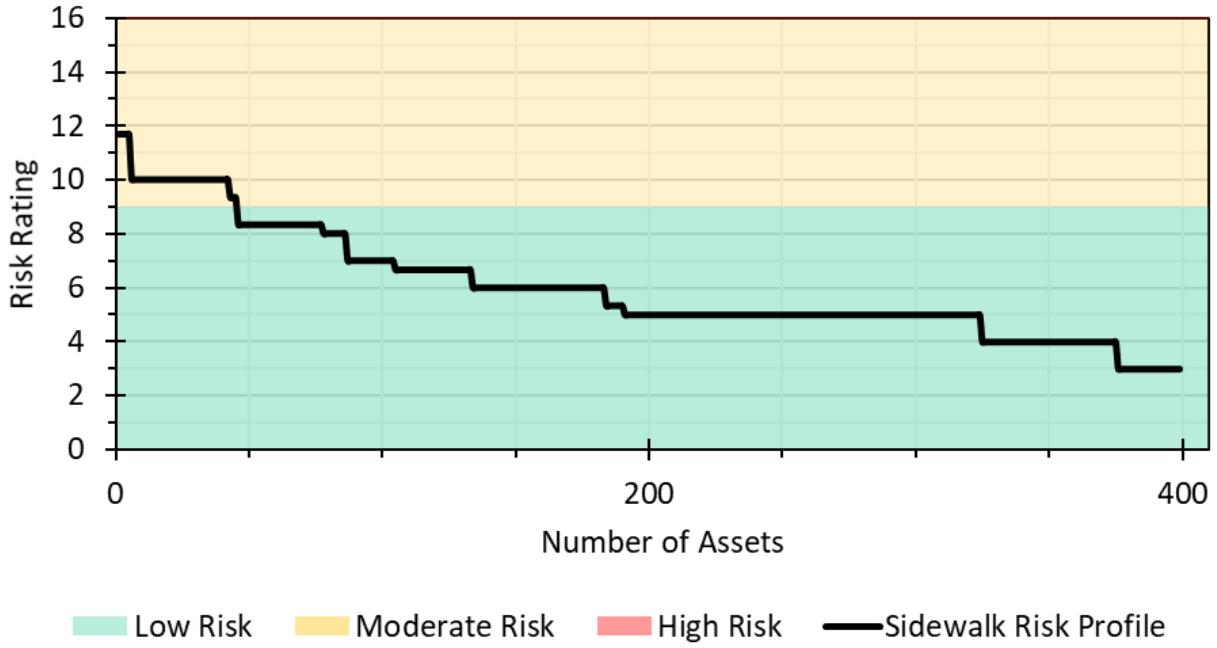
Secondary priority assumed to be moderate importance (value of 2)

Tertiary priority assumed to be low importance (value of 1)

Assumed moderate importance (value of 2) where priority not specified

The risk profile for sidewalk assets is shown in **Figure 10-3**.

Figure 10-3: Risk Profile for Sidewalk Assets



The majority of sidewalk assets were found to be within the 'low' risk range, with only 5 assets considered 'moderate' risk, and no assets being considered 'high' risk. The moderate risk assets were constructed between 1982 and 1990, and include both concrete and asphalt segments. The moderate segments account for 0.94 km of sidewalk.

10.6 Lifecycle Activities – Sidewalks

The following section describes the lifecycle activities that can be implemented within the asset management strategy for sidewalk assets. The primary lifecycle activities include construction, maintenance, and decommissioning/disposal.

Construction Activities

The initial lifecycle activity of a sidewalk asset is its construction. The sidewalk asset should be constructed to adhere to applicable requirements, codes, and design guidelines, particularly AODA standards (which include provision for wider sidewalk assets, and requirements for tactile plates, among other specifications). Design of the sidewalk asset should consider the level of service expected to be provided by that particular asset. Sidewalk construction is often conducted as part of road reconstruction projects.

Maintenance Activities

Maintenance works on sidewalks can be preventative or in response to an issue, and can occur to address localized issues or to larger segments.

Maintenance works can be identified through inspections, complaints or other mechanisms, and can address safety or aesthetic concerns. Maintenance activities and inspections should be undertaken according to best practices and applicable regulation (O. Reg. 239/02, for example). Maintenance works can include the following activities:

- Repair of surface discontinuities
- Repair or replacement of deformed or cracked sections
- Repair or removal of surface encroachments
- Winter control activities (snow removal, salt or sand or surfaces)
- Root and foliage control

Where maintenance works are required for surface issues, it is recommended that the maintenance works seek to address any underlying issues that have attributed to the surface issues, to mitigate against the issue reoccurring.

Decommissioning/Disposal Activities

Disposal activities can include the removal from service of a sidewalk segment. These activities can be implemented when a sidewalk segment has been determined to be no longer required. A sidewalk may be removed from service by removal and disposal of the asset components, or establishment of a barricade to prevent continued usage of the asset. Disposal activities should be conducted such that health and safety protocols are being followed, and spent materials are disposed of at an appropriate or approved facility. Decommissioning or disposal of a sidewalk asset can be done in conjunction with road works, as required.

10.7 Asset Management Strategy – Sidewalks

The strategy for the sidewalks will utilize the lifecycle activities to prolong the lifespan of the sidewalks, minimize safety risks to the users, and maintain overall condition and performance to the preferred service level. The Town recognizes the increased risk related to poor condition or performance of the sidewalk assets, as deteriorated assets can cause issues for the public at a potential cost risk to the Town. The strategy, therefore, must use sufficient inspection frequency as to identify and mitigate any potential issues in a timely manner.

The Town's strategy for sidewalks will include routine inspections of the sidewalk and multi-use path assets, for identification of deficiencies or locals of deteriorated assets.

Through the inspection, the extent and severity of the issue will be identified and can be used to select the appropriate lifecycle activity to mitigate the issue, and identify a timeframe through which works will be undertaken. Inspections will be conducted on a routine basis, and in response to complaints received by the public.

Following initial construction of the sidewalk, the majority of lifecycle activities will be maintenance, which will be informed by inspection and observation of condition and performance of the assets. Selection of the appropriate maintenance activity will depend on the type of deterioration being experienced on the asset, and the condition of the asset.

A sidewalk asset may be replaced once maintenance works no longer provide sufficient means to improve the asset. Replacement can occur on localized or larger sections of sidewalk, and can be done independent of adjacent roadworks. Where a sidewalk (localized or longer section) is replaced, it will be replaced to the existing standard unless determined otherwise by the Town.

If an asset has deteriorated to where it presents a hazard to public safety, the Town should remove the section of sidewalk from service until such time as the issue can be mitigated.

Current construction practice for sidewalks in the Town currently varies, depending on road type (classification), and level of service required. In locations where a higher level of service is required, the Town's current strategy is to construct the road to a full urban cross section, including concrete sidewalk adjacent to a roadside, and asphalt multi-use path adjacent to the opposing roadside. In locations where a lesser level of service is provided, the sidewalk infrastructure can be on one or both sides of the road, and may include standard concrete sidewalks or multi-use paths. Sidewalk assets may not be considered in low-traffic local road settings. The requirement for sidewalks (including type, size and location) is generally determined on a case-by-case basis as the roads are considered for reconstruction.

Where Town-owned sidewalks are located adjacent to County Roads, the same lifecycle activities are implemented, however replacement will require coordination with the County and understanding of the lifecycle and pedestrian requirements of the County's roadways.

New sidewalks being constructed in the Town are to be constructed to meet regulatory and design requirements, such as local design standards and AODA requirements.

10.7.1 Analysis Results

Multi-year projection scenarios were run using the budgets listed above to analyze reconstruction of the sidewalk assets. In the analysis, reconstruction activities are recommended when an asset has a condition rating of between 0 and 0.35. Reconstruction of a segment will return the segment to a condition index of 1.

Note that any sidewalk repairs being conducted as part of road works are not considered in the above scenarios. This accounts for only individual sidewalk replacement works.

A summary of the analyses is below:

Table 10-8: Sidewalk Budget Scenario Results

Number	Budget Scenarios	Annual Value	Average Annual Investment (2022-2041)	Total Investment (2022-2041)	Average Condition Index (at 2041)
1	Unlimited budget	Unlimited	$191,549	$3,830,958	0.79
2	No Budget	$0	$0	$0	0.24
3	2% of network value	$119,000	$117,924	$2,358,471	0.61
4	4% of network value	$238,000	$191,549	$3,830,985	0.84
5	2014 AMP Funding Level	$75,000	$73,917	$1,478,331	0.45
6	Target 0.6 Condition	$115,000	$114,348	$2,286,967	0.6

The annual value of the budget scenarios is maximum investment value per year.

Scenario 1 assumes an unlimited budget available for reconstruction of the sidewalk assets. In the first year of the scenario, $1.7M in reconstruction works were identified, indicating that there is a backlog of repairs required to improve the condition of the assets. The backlog includes any assets that are currently at a condition rating of 0.35 or less. The average condition rating following the initial year of unlimited works is 0.56.

Scenario 2 models the impact of no spending on sidewalk reconstruction during the 20 year timeframe. The average condition rating deteriorates to 0.24.

Scenario 3 achieved an average condition rating of 0.61 at the end of the scenario. Utilizing the full investment in each year of the 20 year timeframe, the total spent is above $2.3M, which is greater than the current backlog.

Scenario 4 was found to have a consistent average annual investment and total investment over the 20 year timeframe, as with the Scenario 1 (Unlimited) results. The average condition at the end of the timeframe is slightly higher under Scenario 4.

We note that the difference in condition achieved through these scenarios differs due to the timing at which the works are completed (can be completed earlier in the timeframe during the unlimited scenario, which allows it to begin to degrade again, resulting in the final condition index being lower than in Scenario 4). As similar results are achieved by both scenarios, we can assume that expenditure of 4% annually is sufficient to address the backlog and upcoming works within the 20 year timeframe.

Scenario 5 reviewed the investment level recommended as part of the 2014 AMP, a value of $75,000 annually. At the end of the timeframe, the average condition value is 0.45, which is outside of the typical recommended best practice condition value. The total spent at the end of the 20 year timeframe is just below $1.5M, which is less than the estimated current backlog.

Scenario 6 reviewed the annual investment requirements when targeting the current condition rating of 0.60 over the assessed timeframe. The investment value is approximately $115,000 annually, with most of the budget being used in every year of the 20 year timeframe. The target budget is similar to 2% of the network, as reviewed in Scenario 3.

In selecting the recommended investment level, the Town should consider its current and preferred level of service being provided. The LOS is represented in these scenarios as the average condition of the assets. The current average condition is 0.60, and a best practice recommends maintaining a minimum average condition of 0.60 across the system. If the Town's target is to maintain the current LOS, Scenario 6 would be the recommendation, however if the Town was accepting of a decrease in average condition, a more affordable scenario (such as 5) could allow the average condition to deteriorate yet remain above the best practice threshold. To proceed with maintaining the current level of service condition average, the annual investment in the range of $115,000 to $119,000 should be implemented. This investment value means an increase in annual investment of the Town by approximately $43,000 from the previously recommended 2014 investment value.

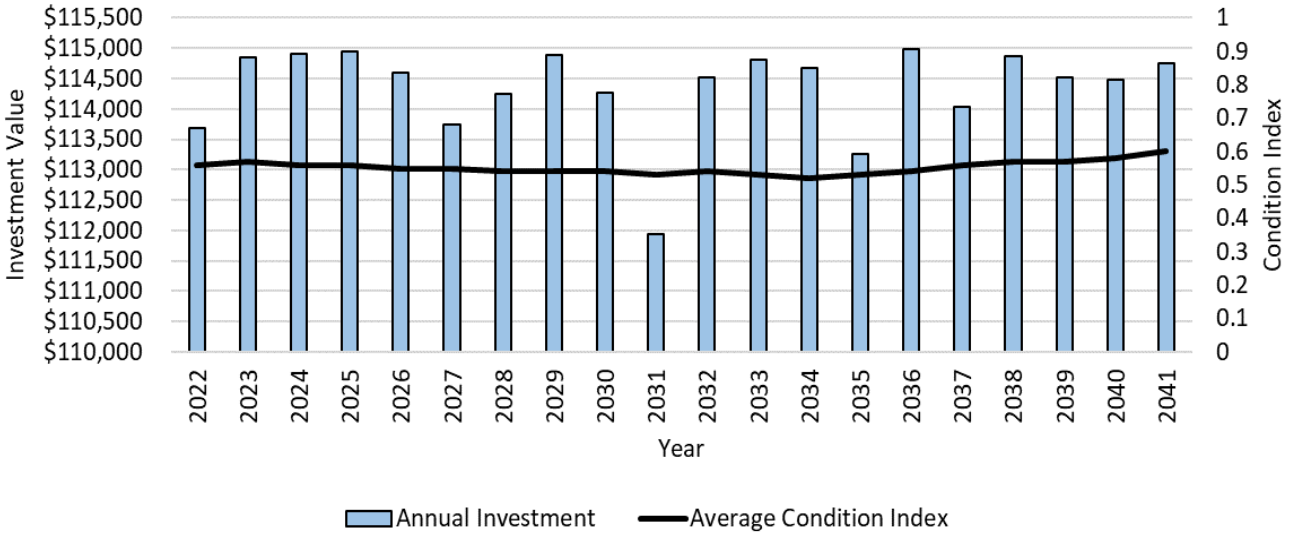
The Town should also consider the current backlog of works relative to the investment scenario. As found through Scenario 1, there is approximately $1.7M in outstanding works on the system. Any investment under this threshold may result in some assets deteriorating to the point of failure during the reviewed timeframe. Over the 20 year timeframe, Scenarios 1, 3, 4, and 6 have a total expenditure that exceeds the backlog, suggesting that it may be sufficient to address current and future needs. As Scenario 4 is consistent with the Unlimited scenario, it can be assumed that it will be adequate for addressing the backlog and upcoming infrastructure needs. In Scenario 5, the total spent over the timeframe is less than the current backlog of works, suggesting that it may not be adequate to address all of the current needs, and some assets may deteriorate to the point of failure.

In Scenario 6, the total investment is greater than the backlog, however the expenditure is incurred over 20 years, which means some assets may deteriorate to the point of failure over that timeframe. However, as the average condition rating at the end of Scenario 6 remains high, it suggests that the remainder of the assets will not incur significant needs over the timeframe.

There are expected to be some additional works done on the sidewalk assets that would be part of road reconstruction works, which would reflect minor improvements in the overall sidewalk asset conditions, however, are unable to be modelled as part of this exercise.

In consideration of the level of service being provided, overall condition achieved and the value of the backlog, the Town can implement a budget similar to **Scenario 6** for the management of the sidewalk assets. The annual expenditure under this budget value and its resulting impact on the average condition of the assets is shown in **Figure 10-4**.

Figure 10-4: Sidewalk Investment and Condition Index with Scenario 6 (Target 0.6 Average Condition)



The scenarios discussed above are projected using condition as the primary factor for prioritization and provide information of how the overall condition of the assets will respond at varying levels of investment over the time period. When conducting capital planning and annual capital expenditures, additional factors beyond those in the model must be considered by the Town, as previously described**.**

11.0 Bridges & Culverts

11.1 State of Local Infrastructure

The Town owns one roadway bridge (Bonnechere River Bridge), and two pedestrian bridges (Swinging Bridge, McConnel Park bridge):

- The Bonnechere River Bridge is a roadway bridge constructed of pre-stressed concrete girders and has a concrete deck. It spans the Bonnechere River, and its roadway is Stewart Street. The bridge is approximately 50 meters in length.
- The Swinging Bridge is a wood suspension bridge spanning the Bonnechere River. The bridge has a length of approximately 85 meters.
- The McConnel Park Bridge is a pedestrian bridge located in McConnel Park. It spans a narrow waterway within the park.

In its inventory, the Town has one structural culvert that is equal to or greater than 3 m in diameter, noting that the inventory for culverts is incomplete. The culvert is located at a railroad crossing, and is constructed of limestone block with a diameter of 3 m.

The bridge assets are composed of multiple components. The componentry will vary between bridge assets based on the type of construction, size, etc. For the purposes of this section, the bridge assets will be reviewed as total assets, however in further sections the componentry will be considered, as detailed within the most recent OSIM bridge reports.

11.1.1 Current Data

The information reported in this AMP and the subsequent analysis are based on the current TCA inventory information maintained by the Town, and the current OSIM reports. OSIM assessments were most recently conducted for the Swinging Bridge and Bonnechere River Bridge in 2020 by WSP Group.

11.1.2 Replacement Costs

Bridge assets have various levels of complexity, including components and major capital improvements. The replacement cost for a bridge can be estimated at varying levels of detail, to consider componentry, or as a bridge asset as a whole.

The replacement costs for the bridge structures are estimated using inventory information provided by the Town, and through estimates by Town staff. As part of the inventory information, the Town had previously estimated a reconstruction cost for the bridges in 2008.

These replacement costs were inflated by 3% annually since the replacement cost date (2008) to estimate the cost in current dollars. In addition to this estimation, the Town provided replacement cost estimates, which were carried in the reporting below. A summary of expected replacement costs are shown in **Table 11-1** and **Table 11-2**.

Table 11-1: Replacement Cost of Vehicle Bridge

Bridge Name	Historical Cost	Year of Construction	Inflated Replacement Cost (2022 $)
Bonnechere River Bridge	$2,995,902	2004	$10,000,000 (estimated by the Town)

Table 11-2: Replacement Cost of Pedestrian Bridges

Bridge Name	Replacement Cost	Replacement Cost Year	Inflated Replacement Cost (2022 $)
Swinging Bridge	$500,000	2008	$500,000 (estimated by the Town)
McConnel Park Pedestrian Bridge	$150,000	2008	$226,888

Rehabilitation work on the Swinging Bridge was undertaken in 2021 with a cost of approximately $300,000.

The replacement cost for the rail road culvert with a diameter of 3 m was estimated based on the unit pricing assumptions detailed in **Section 8.0 Stormwater Management Culverts**. Based on a length of 35 m, the expected replacement cost for the culvert is $89,250.

11.1.3 Average Age

The ages of the bridge structures are summarized in **Table 11-3**. The average age of the pedestrian bridges is 41 years, and the average of all three structures is 33 years.

Table 11-3: Age of Bridge Structures

Bridge Name	Year of Construction	Age (years)
Bonnechere River Bridge	2004	18
Swinging Bridge	1983	37
McConnel Park Pedestrian Bridge	1975	47

Works on the bridge deck of the Bonnechere River Bridge occurred in 2014, and rehabilitation was undertaken to the Swinging Bridge in 2021.

The 3 m diameter rail road culvert was constructed in 2011, and has an age of 10 years.

11.1.4 Expected Useful Life

The expected useful life for the bridge structures is 50 years. While the individual componentry of each bridge asset may vary in expected life, the Town does not currently track the bridge assets to that degree. The expected remaining useful life based on this value and the age for each of the bridge structures is:

- Bonnechere River Bridge – 33 years
- Swinging Bridge – 14 years
  - Further assessment of the swinging bridge suggests that only 7 years remain in the assets useful life.
- McConnel Park Pedestrian Bridge – 4 years

The expected useful life for the 3 m diameter railroad culvert is 80 years. At 10 years in age currently, the majority of the expected useful life (70 years), remains.

11.2 Condition – Bridges & Culverts

The Town has previously undertaken condition for bridge assets, determined through completion of OSIM inspections, the most recent having been completed in 2020 for the Bonnechere River Bridge and Swinging Bridge.

Within the 2020 OSIM reports, the structure components were rated on a four level scale, from “Excellent” to “Poor” by quantity of elements. A summary of the percentage of components under each condition rating for the Bonnechere River Bridge are shown in **Table 11-4.**

Table 11-4: Condition Ratings of Bonnechere River Bridge

Element Group	Element Name	Quantity	Excellent Condition Rating	Good Condition Rating	Fair Condition Rating	Poor Condition Rating
Deck	Wearing Surface	465.5		96%	4%	1%
	Top of Deck	651.7		100%		
	Soffit	651.7		100%		
	Drainage System	10		100%		
Joints	Sealant	26.6			100%	
Sidewalk/ Curb	Sidewalk/ Curb	171.5		48%	52%	1%
Barriers	Parapet Walls	103.6		100%		
	Railing Systems	123.2		100%		
	Posts	53		100%		
	Steel Beam Guiderail	44		100%		
	Posts	36		100%		
Beams	Girders	632.1		100%		
	End Diaphragms	2		100%		
Abutments	Abutment Walls	110.39		95%	5%	0%
	Wingwalls	30		100%		
	Bearings	40		100%		
Piers	Shafts	499.2		96%	4%	0%
	Shafts	135		90%	10%	
	Pier Caps	191.5		100%		
	Bearings	160		100%		
Foundations	Foundations					
Embankments and Streams	Streams and Waterways			100%		
	Embankments	4		100%		
	Slope Protection	1		100%		

Element Group	Element Name	Quantity	Excellent Condition Rating	Good Condition Rating	Fair Condition Rating	Poor Condition Rating
	Slope Protection	1		100%		
Approaches	Wearing Surface	570		74%	18%	9%
	Approach Slabs	152.4		87%	13%	
	Sidewalks/Curbs	42	23%	58%	10%	10%
Accessories	Electrical	5			100%	
	Electrical	5		100%		
	Signs	2		100%		

The majority of bridge components of the Bonnechere River Bridge are in good condition. Subsequent to the OSIM assessment in 2020, the Swinging Bridge was rehabilitated in 2021, bringing the overall condition of the asset back to a 0.75 on a scale of 0-1 (where 1 represents an asset in perfect condition).

The McConnel Park pedestrian bridge was not evaluated under the OSIM program. The condition of this structure can be estimated based on its useful life and age. Having been constructed in 1975, 47 out of its expected 50 years of useful life have been used, or 94%. This could be interpreted as a bridge in poor condition. It is recommended that a field evaluation of the condition of the bridge be undertaken.

11.3 Current Levels of Service – Bridges & Culverts

Levels of service for bridges and culverts are outlined in Table 5 of the regulation, *O.Reg. 588/17*. **Table 11-5** and **Table 11-6** outline the Town's current community and technical levels of service for bridges and culverts.

Table 11-5: Community Levels of Service – Bridges and Culverts

LOS Parameter	Community Levels of Service Qualitative Description	Community LOS
Scope	Description of the traffic that is supported by municipal bridges (e.g., heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, cyclists).	• Bridge St. Vehicular Bridge: all vehicular traffic (heavy transport vehicles, motor vehicles, emergency vehicles), pedestrians • Swinging Bridge: Pedestrian traffic only
Quality	1. Description or images of the condition of bridges and how this would affect use of the bridges. 2. Description or images of the condition of culverts and how this would affect use of the culverts.	• The condition of bridges is evaluated routinely according to the OSIM requirements. For full descriptions and samples images of bridge condition classifications refer to the OSIM 2008 and associated field guide. • Bridges in good condition typically operate as designed and would not receive any additional restrictions or limitations beyond those designed. Bridges in fair to poor condition may receive load restrictions or be subject to closure as deterioration affects asset capacity to safely and reliably deliver the designed level of service. For photos illustrating the condition of bridge components in each category refer to OSIM 2008 and the associated field guide. • Information not available for structural culverts.

Table 11-6: Technical Levels of Service – Bridges and Culverts

LOS Parameter	Technical Levels of Service Technical Metrics	Technical LOS
Scope	Percentage of bridges in the Municipality with loading or dimensional restrictions.	• 0%. No loading or dimensional restrictions on traffic bridge. • Pedestrian bridge limited to pedestrian traffic only.
Quality	1. For bridges in the Municipality, the average bridge condition index value. 2. For structural culverts in the Municipality, the average bridge condition index value.	• BCI not provided in OSIM information, however both bridges (Swinging & Bonnechere River) indicated to be in "good" condition. • Information not available for structural culverts.

11.4 Current Performance – Bridges & Culverts

Asset performance measures were determined in consultation with the Town, which provide relevant metrics against which the Towncan gauge the performance of their assets. The performance measures for the bridges and culverts, and their current values are shown in **Table** 11-7.

Table 11-7: Current Performance Measures for Bridges and Culverts

Asset Performances Measure	Current Value
Traffic counts over bridges to assess usage	To be established
Number of bridge or culvert failures/road closures	To be established
Number of structures with load restrictions	To be established
Percentage of bridges in fair or better condition	To be established
Number of bridge closures	To be established

11.5 Risk Assessment – Bridges & Culverts

The risk assessment for bridge and culvert assets was conducted using the following assumptions and criteria:

Condition: Determined based on estimated condition (using lifespan and expected useful life) for McConnell Park Bridge

Average of OSIM condition ratings for Swinging Bridge and Bonnechere River Bridge

Performance: Assumed to be always reliable (value of 1)

Climate Change: Assumed a value of 5 (Moderate or high impact; no or limited mitigation plan)

Impact: Low impact (value of 0) for McConnell Park Bridge (pedestrian)

Moderate impact (value of 1) for Swinging Bridge (pedestrian)

High impact (value of 2) for Bonnechere River Bridge (vehicle)

Importance: Low importance (value of 1) for McConnell Park Bridge (pedestrian)

Moderate importance (value of 2) for Swinging Bridge (pedestrian)

High importance (value of 3) for Bonnechere River Bridge (vehicle)

Of the three bridge structures, the McConnell Bridge was found to be in the 'low' risk range, while the remaining two were in moderate. The highest risk rating is 15, for the Bonnechere River Bridge.

11.6 Lifecycle Activities – Bridges & Culverts

The following section describes the lifecycle activities that can be implemented within the asset management strategy for bridge and structural culvert assets. The primary lifecycle activities include construction, inspections, maintenance and repair, replacement, and decommissioning/disposal.

Construction Activities

The start of an asset's lifecycle is its construction. The bridge or structural culvert should be constructed to adhere with the requirements of the O.Reg. 160/02: Standards for Bridges, CSA S6 Canadian Highway Bridge Design Code, and any and all other applicable regional codes and requirements for the bridge and its use. Each bridge or structural culvert should be designed and constructed to provide the services for which it is intended.

Inspection Activities

Under O.Reg. 160/02: Standards for Bridges, the Town is required to complete one inspection of all bridges and structural culverts every two years to identify condition and produce a report outlining the recommended work for a 1 to 10 year period. The inspection uses the Ontario Structural Inspection Manual (OSIM) 2008 and is referred to as the OSIM or Bridge Inspection Report. The Town should continue the current biennial OSIM Bridge Inspections along the current schedule. The inspections should include all bridges and culverts with a single or combined span greater than 3 m.

Maintenance and Repair Activities

Bridge and culvert assets are long-lived assets with estimated useful lives between 15 to beyond 90 years. Throughout the lifecycle of these assets the majority of expected needs will be maintenance and repair work.

Routine maintenance works are typically used to prolong the lifespan of assets and include both preventative and reactive activities designed to maintain the asset condition and function. Preventative activities are implemented to provide a predictive response to deterioration or possible performance issues by managing the contributing factors prior to an event occurring. Reactive maintenance is conducted in response to a condition or performance issue and designed to correct the issue before it causes asset deterioration and possible deficiencies. The scale of maintenance activities varies widely and is dependent on a variety of factors including the age, asset utilization, environment, and design. Maintenance should be completed based on recommendations in biennial OSIM reports and industry best practices.

A general summary of bridge and structural culvert maintenance activities include, but are not limited to:

- Cleaning, washing or flushing
- Railing system maintenance
- Painting of steel bridge components
- Bearing maintenance
- Pest control
- Deck drainage maintenance
- Erosion control
- Scaling of loose concrete and ACR Steel.

Repair works are driven by the identification and treatment of deficiencies to prevent the continued deterioration of the deficiency which may cause a reduction in asset condition, performance and LOS delivered.

Timing of repairs varies widely as they may be prescheduled based on estimated deterioration, in response to biennial condition reporting, or on an emergency basis. Repairs to bridges vary widely and can be in relation to structural and deck surface components.

Replacement Activities

Replacement of a structure is based on age, estimated lifespan and recommendations from condition assessments. Replacement can be used when an asset is nearing or has reach the end of its life, repairs are not technically feasible, estimated future repair costs are greater than replacement cost, or increases to capacity or LOS are required. Replacement activities are typically large in scale and involve the issuance of a capital project. Timing of replacement activities must consider the impact on adjacent infrastructure, the impact on near-by asset LOS and replacement or maintenance requirements of connected infrastructure.

Disposal Activities

Disposal activities from bridges and culverts can include the removal from service of a bridge or culvert, through:

- Closure of the bridge from access
- Change in level of service of the bridge to limit access (e.g., vehicular bridge)
- Deconstruction of the bridge

Disposal activities should be implemented when a bridge or culvert structural has reached the end of its useful life, or has degraded to such a state that it can no longer provide the level of service for which it is intended. Removal of a bridge from service without replacement, or decrease in level of service should be undertaken only when it is decided to no longer be required to provide level of service to residents.

Disposal activities should be conducted such that health and safety protocols are being followed, and spent materials are disposed of at appropriate or approved facility.

11.7 Asset Management Strategy – Bridges & Culverts

The asset management strategy for bridges and structural culverts is based on maintaining the structures in sufficient condition and performance to allow for continued access to crossings and adequate service delivery. The strategy considers the requirements set out by applicable regulations, and builds on those to include the lifecycle activities summarized above.

Under O.Reg. 160/02: Standards for Bridges, the Town is required to complete one inspection of all bridges and structural culverts every two years to identify condition and produce a report outlining the recommended work for a 1 to 10 year period. The inspection uses the Ontario

Structural Inspection Manual (OSIM) 2008 and is referred to as the OSIM report. The most recent condition assessment and study was completed in 2020, with the next scheduled assessment planned for 2022.

The Town's current strategy for maintaining the bridges includes procurement of OSIM reports at the required frequency, and completion of the maintenance, rehabilitation and reconstruction works according to the recommendations from the OSIM reports.

Where OSIM reports are not required (pedestrian bridge, smaller culvert structures), the Town will conduct routine inspections to assess the condition and performance of the structure, and to identify any maintenance or repair works required. The frequency of the inspections should be at minimum equivalent to the requirements of the OSIM report (every 2 years), but should be adjusted as required to reflect the rate at which the condition and performance are changing.

Inspections and OSIM reports will identify works to be done at each of the bridge structures – each of the inspection types should recommend maintenance works, rehabilitation works, and reconstruction where necessary, as well as prioritization of the works and an estimation of the overall condition of the structure. It is therefore assumed that by following the results of the inspections/OSIMs, the Town will be following a strategy that prioritizes maintenance works as required to maximize the lifecycle of the bridge assets.

11.7.1 Projection of Works

To understand the needs and projected works on the bridges and culverts within a 10 year period, a summary of the recommendations from the 2020 OSIM reports (prepared by WSP Group) is used as well as recommendations and estimations of works for other structures.

OSIM Recommendations

The results of the OSIM reports are summarized in **Table 11-8**. The costs in the table are reflective of the works required as of the 2020 OSIM reporting, and are listed in 2020 dollars. The total for each timeframe has been inflated to 2022 dollars, by a factor of 3% annually. The costs provided by WSP are presented in 2020 Canadian Dollars, and are reflective of the works required as of 2020.

Table 11-8: Summary of 2020 Bridge OSIM Inspections

Timing of Needs	Estimated Repair Cost (Bonnechere River Bridge)	Estimated Repair Cost (Swinging Bridge)	Total Estimated Repair Cost (2020)	Total Estimated Repair Cost (2022)
Urgent			$25,000	$26,530
Within 1 Year				
1 to 5 Year Period	$42,000	$150,000*	$42,000	$44,600
6 to 10 year Period	$700,000		$700,000	$742,630

* The OSIM also identifies $20,000 in associated works for mobilization/demobilization to facilitate pier replacement

Note that subsequent to the recommendations from the 2020 OSIM reports, the Town undertook rehabilitation to the Swinging Bridge. Therefore, the estimated repair costs quoted in the OSIMs have been omitted from the projection of works, assuming that they have been completed in 2021.

To complete all recommended work within the next 5 years is estimated to cost a total of $71,000 over the 5 year period. To complete all recommended work within the next 10 years is estimated to cost a total of $814,000.

An assessment of the maintenance needs of the two OSIM-assessed bridges was also done. The OSIM reports provide a list of expected maintenance needs and an associated priority, summarized in **Table 11-9**.

Table 11-9: Summary of Maintenance Needs for Bridges (2020 OSIM Findings)

Timing of Needs	Quantity of Maintenance Needs (Bonnechere River Bridge)	Quantity of Maintenance Needs (Swinging Bridge)
Urgent		1
1 Year	8	7
2 Years		

No costing information for maintenance works were provided within the OSIM reports.

Note that the actual maintenance needs for the Swinging Bridge may differ from those stated in the table above due to the rehabilitation in 2021. New recommendations for maintenance can be assessed by the Town or through the next scheduled OSIM assessment.

Other Recommendations

For structures that do not require regular OSIM inspection, it is recommended that a similar regular inspection is undertaken to understand the needs for lifecycle activities.

Based on age of the structure, the pedestrian McConnel Park Bridge has 3 years left in its lifecycle, estimated to need replacement in 2025. The estimated cost (inflated based on cost provided by the Town) is $226,890 in 2022 dollars. A detailed inspection may provide further confirmation of the expected useful life, and may identify any opportunities to extend the useful life through rehabilitation or maintenance activities.

The Town's one structural culvert (with diameter of 3 meters) was reviewed to project the replacement cost and date. According to the age, expected useful life and replacement cost assumptions of the asset, it is estimated that the structure will not require replacement in the next 10 year timeframe.

It is recommended that detailed inspection be undertaken for culverts and the McConnel Park pedestrian bridge for a more accurate estimation of maintenance and replacement works, and associated costing.

12.0 Buildings

12.1 State of Local Infrastructure

Municipal buildings provide a variety of services for the Town. This asset category includes buildings that are both accessible and inaccessible to the public and aid in service delivery related to a number of municipal departments. The Town owns and maintains 18 municipal buildings, including the following building types:

- Fire Station
- Library
- Municipal Administration Building
- Recreation/Activity Centre
- Tourist Booth Building
- Tourist Information Centre
- Millennium Station
- Water Pollution Control Plant
- Water System Buildings
- Salt and Sand Shed
- Public Works Garage
- Recreation Pavilion
- Town Hall
- Innovation Centre

The municipal departments for which each of the buildings provides service is summarized in **Table 12-1**.

Table 12-1: Town Buildings by Department

Department	Number of Buildings
Library	4
Protection Services (Fire)	1
Recreation and Cultural Services	8
Tourism	1
General Government	3
Transportation Services	3
Wastewater	2
Water	1

Analysis of the water and wastewater buildings have been included in their respective chapters, **Sections 3.9** and **Section 6.0** respectively.

A summary of the current state of the building assets is in **Table 12-2**. This table provides detail regarding the replacement cost, age, and expected useful life of building assets, descriptions of which are included in the sections following.

Table 12-2: Building Asset Current State Summary

Building Asset	No. of Components	2022 Replacement Cost	Average Age (years)	Average Expected Useful Life (years)
1 Innovation Drive	5	$19,475,107	42	39
550 Hall Avenue	5	$6,228,734	45	45
Fire Hall	10	$2,804,341	66	33.1
Henry Eady Building	1	$93,478	37	35
Kallies Pavilion	1	$62,319	40	35
Library	7	$3,114,637	75	34.3
Ma-Te-Way Activity Centre	23	$10,909,580	16	22.8
Millennium Station	1	$31,159	22	35
Municipal Administration Building (Town Hall)	7	$3,656,336	38	39
Public Works Garage	5	$7,000,000	64	39
Recreation Centre	7	$2,159,695	99	95
Salt and Sand Shed	11	$158,403	34	39.4
Tourist Booth Building	1	$31,159	29	35
Tourist Information Centre	5	$223,939	5	39
Recreation Storage Garage	1	TBD	2	35

The Town currently has on-going works related to the recreational building assets. The Ma-Te-Way Activity Centre is scheduled for an expansion in 2022-2023, with an addition of 60,000 square footage of area. At the time of completion of the facility, the Recreation Centre will be removed from service and disposed of.

12.1.1 Current Data

The information reported in this AMP and the subsequent analysis are based on the current Building Condition Assessment (BCA) and TCA database. The BCA reporting is for the Library and Firehall, Ma-Te-Way Activity Centre, Municipal Garage, Recreation Centre, Town Hall, and 1 Innovation Drive. All BCA reporting was done by Morrison Hershfield, with 1 Innovation Drive being done in 2018 and all others in 2013.

12.1.2 Replacement Costs

Building assets have various levels of complexity, including components and major capital improvements. The replacement cost for a building can be estimated at varying levels of detail, to consider componentry, or as a building asset as a whole.

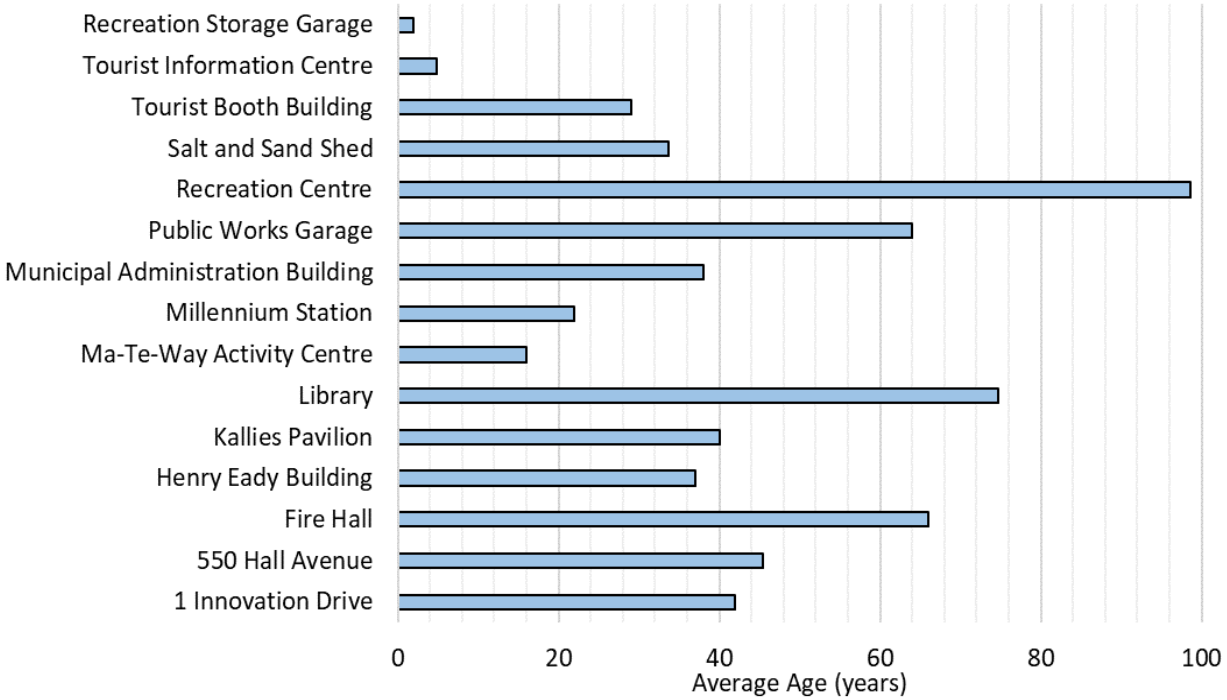
Estimated replacement costs were based on values provided by the Town, either as historical costs or projected replacement costs. Both types of cost were provided on a componentry level, and the replacement cost for each building represents a summation of these componentry costs. The replacement cost was determined through inflation by 3% annually of the historical cost since year of construction, or of the TCA replacement cost since identified year of replacement.

The total replacement cost for all of these buildings is $49,376,905 (excluding the recreation storage garage, for which costing was unavailable at the time of reporting).

12.1.3 Average Age

The average age of each building is determined as the average age of all building components and major capital improvements completed to the facility. The average assumed an equal weighting of all components within the overall asset. The average age of the building assets is shown in **Figure 12-1.**

Figure 12-1: Average Age of Buildings



12.1.4 Expected Useful Life

Expected useful life was assigned at the building component level to reflect the complexity and variation in lifespan of different building systems. The typical expected useful life for each building component was assigned by the Town and used to determine approximate replacement timing of assets. **Table 12-3** provides the typical useful life applied to each building component. The components listed include general and specific components found across the Town buildings.

Table 12-3: Expected Useful Life of Building Components

Building Component Type	Expected Useful Life	Building Component Type	Expected Useful Life
Annex Roof Replacement	25	Rubber matting	10
Dehumidifier	20	Second Brine Pump	15
Hall ceiling & lighting	15	Service upgrade	25
HVAC Upgrade	25	Services	25
Interior	35	Shell	15
Make-up unit & roof top unit	15	Solar	20

Building Component Type	Expected Useful Life	Building Component Type	Expected Useful Life
New Entrance Doors	15	Special Construction	25
New Roof	25	Substructure	95
Rink boards	20	Window Replacement	20

Using the above-noted component expected useful lives, an average expected useful life was determined for each of the Town buildings. The average assumed an equal weighting of all subcomponents within the overall asset.

12.2 Condition – Buildings

The process for determining the condition of the building assets varied by building type – some assets had building condition assessment information which provided detailed condition information, and other assets the condition was estimated based on the age and the expected useful life.

12.2.1 Buildings with Building Condition Assessment

The Town previously had a building condition assessment undertaken for six of their buildings, by Morrison Hershfield in 2013. This included:

- Renfrew Town Hall
- Library & Fire Hall
- Municipal Garage
- Recreation Centre
- Ma-Te-Way Activity Centre
- 1 Innovation Drive

The condition was provided within these reports as a description, which we have attributed a rating on a scale of 1 to 5. The condition data in these reports used 5 as excellent and 1 as very poor. This rating system is inverted to the other assets presented in the AMP so it has been converted for clarity of presentation in the AMP. A summary of the descriptions, ratings and converted ratings are in **Table 12-4**.

Table 12-4: Building Condition Assessment Rating System

BCA Condition Description (Morrison Hershfield Report)	Condition Rating in BCA Report	Converted Rating for AMP
Excellent	5	1
Good	4	2
Fair	3	3
Poor	2	4
Failed	1	5

Using the associated condition ratings, an average condition rating was given for each major component of the building, and an overall rating for the building.

For this review, the sub-components within a major component were expected to be weighted equally, as well as equal weighting of each of the major components within the average rating of the building.

Table 12-5: Building Condition Ratings from BCA Reports (2013)

Building	Site Features	Building Structure	Building Envelope	Building Interior	Mechanical Systems	Electrical Systems	Avg
Renfrew Town Hall	Good	Good	Poor/Fair	Good/Fair	Good/Fair	Good	Good/Fair
Library & Fire Hall	Good	Good/Fair	Good/Fair	Good	Good/Fair	Poor/Fair	Good/Fair
Municipal Garage	Fair	Good	Poor/Fair	Good/Fair	Good/Fair	Good/Fair	Good/Fair
Recreation Centre	Good	Good	Good/Fair	Good/Fair	Good/Fair	Good/Fair	Good/Fair
Ma-Te-Way Activity Centre	Good/Fair	Good	Good/Fair	Good/Fair	Fair	Good/Fair	Good/Fair
1 Innovation Drive	Good	Good	Fair	Good	Good/Fair	Good/Fair	Good/Fair

As the condition assessment and subsequent condition ratings occurred in 2013, the ratings have been further deteriorated, according to the average expected lifespan of the building to estimate the condition in 2022. The revised average condition rating is shown in **Table 12-6**.

Table 12-6: Building Condition Ratings Deteriorated to 2022

Building	Average Condition (2013)	Average Condition (2022)
Renfrew Town Hall	Good/Fair	Fair/Poor
Library & Fire Hall	Good/Fair	Fair/Poor
Municipal Garage	Good/Fair	Fair/Poor
Recreation Centre	Good/Fair	Fair/Poor
Ma-Te-Way Activity Centre	Good/Fair	Poor/Failed
1 Innovation Drive	Good/Fair	Good/Fair

Note that the deterioration is theoretical based on the useful life of the assets, and so the actual condition could be reassessed to refine the overall condition estimates.

With the deteriorated condition, the Ma-te-Way Activity Centre is nearing the end of its useful life, and is approaching a 'failed' condition. 1 Innovation Drive is expected to still be in fair condition, while the remainder of the assets listed in the table above are in the poor range.

The Town has already identified works to replace the Recreation Centre and Municipal Garage in 2022/2023, which will mitigate the poor condition scores.

12.2.2 Other Buildings

The remaining building assets did not have building condition assessments available.

Some assets have undergone recent betterments, which will contribute to improved condition. This includes:

- Henry Eady Building – roof (2008)
- 550 Hall Avenue – electrical update (2009)
- Public Works Garage – washroom upgrades (2011)

Desktop review or detailed inspection is recommended for the remaining buildings to more accurately estimate the condition.

Estimation of the condition of the remaining buildings was undertaken by a comparison of the age of the buildings (or building components) relative to the estimated useful life. **Table 12-7** shows the relation between the condition descriptors and estimated useful life remaining.

Table 12-7: Condition Estimation using Percentage of Expected Useful Life

Condition Text	Condition Rating Value	Percentage of Expected Useful Life Used
Excellent	1	0 to 20
Good	2	21 to 40
Fair	3	41 to 60
Poor	4	61 to 80
Failed	5	81 to 100+

Using the descriptors above, a 1-5 value was approximated for each of the remaining buildings (or building components) that do not have recent building condition assessments. A summary of the remaining building conditions is shown in **Table 12-8**. Where building componentry was available, a condition value was attributed to each, and averaged to find an overall condition rating for the building.

Table 12-8: Building Condition Estimate for Buildings without BCA

Building	Average Condition Rating
Recreation Storage Garage	1.0
Tourist Information Centre	1.2
Henry Eady Building	3.0
Millennium Station	3.0
Salt and Sand Shed	3.6
550 Hall Avenue	3.6
Tourist Booth Building	4.0
Kallies Pavilion	5.0

The averages above include betterments made to building components (where applicable).

The Kallies Pavilion asset is expected to be near the point of failure.

12.3 Current Levels of Service – Buildings

Levels of service for building assets are not defined in the regulation, O. Reg. 588/17. As such, level of services has been established in consultation with the Town. **Table 12-9** to **Table 12-11** outline the Town's current community and technical levels of service for buildings.

Table 12-9: Community Levels of Service – Buildings

LOS Parameter	Community Levels of Qualitative Description	Community LOS
Scope	Description, which may include maps of buildings and facilities	The locations of building assets are shown in **Figure A-6** of **Appendix A.**
Quality	Overall condition rating of buildings and facilities	Shown in table below.
Quality	Description of hours of operation and available services	• Emergency Services are available 365 days a year, 24 hours a day, 7 days a week • Administrative offices are available during business hours Monday-Friday 8:00 am-4:00 pm • Public Works facilities are accessible by staff only • Library facilities are accessible during business hours and Saturdays • Recreation facilities are available seasonally or rental basis

Table 12-10: Quality - Condition Rating Summary of Buildings

Asset	Square Footage	Condition
1 Innovation Drive	156,120	2.3
550 Hall Avenue	52,108	3.6
Fire Hall	8,000	2.5
Henry Eady Building	2,100	3.0
Kallies Pavilion	2,100	5.0
Library	1,500	2.5
Ma-Te-Way Activity Centre	24,960* (currently being expanded to 62,000)	2.4
Millennium Station	350	3.0

Asset	Square Footage	Condition
Municipal Administration Building (Town Hall)	14,465	2.4
Public Works Garage	9,651	2.7
Recreation Centre	5,475	2.4
Salt and Sand Shed	1,675	3.6
Tourist Booth Building	375	4.0
Tourist Information Centre	1,200	1.2

Table 12-11: Technical Levels of Service – Buildings

LOS Parameter	Technical Levels of Service Technical Metrics Description	Technical LOS
Scope	Number of facilities per capita	• Cultural Services (2): 1 per 4,109 • Fire (1): 1 per 8,218 • General Government (5): 1 per 1,643.6 • Library (2): 1 per 4,109 • Recreation (4): 1 per 2,054.5 • Roads (2): 1 per 4,109 • Tourism (2): 1 per 4,109
Scope	Size of buildings (square footage)	Shown in the table above.
Quality	Compliance with legal/regulatory/local standards	The quality of Buildings and Facilities include the following legal, regulatory and local standards for the services provided: • Accessibility (AODA Standards) • Health and safety • Facilities on their own water system must be operated to meet MOE drinking water quality standards • Buildings must be in compliance with Ontario Building Code.

12.4 Current Performance – Buildings

Asset performance measures were determined in consultation with the Town, which provide relevant metrics against which the Town can gauge the performance of their assets. Considering each building as a single asset, the performance measures and corresponding units established for buildings and facilities are shown in **Table 12-12**.

Table 12-12: Current Performance Measures for Buildings

Asset Performances Measure	Units
Water usage	m^3 per year
Energy usage	kWh per year
Square footage per employee	count
Vacancy rates	count
Parking, accessible spaces	
Time spent waiting for service	
Cost per square footage and per operating hour	
Number of emergency maintenance events	

12.5 Risk Assessment – Buildings

The risk assessment for building assets was conducted using the following assumptions and criteria:

Condition: Determined based on estimated condition

Performance: Assumed to be always reliable (value of 1)

Climate Change: Assumed a value of 3 (Limited impact with slower recovery; mitigation plan not in place)

Impact: Moderate impact (value of 1)

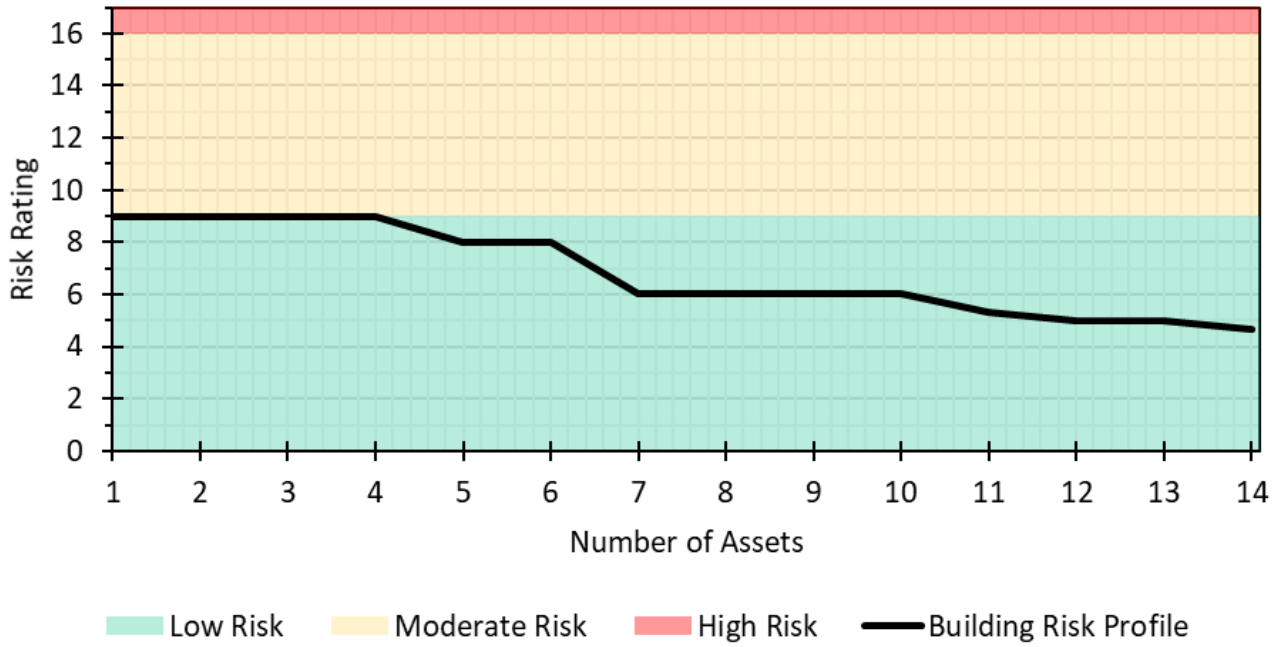
Importance: High importance (value of 3) for Fire Hall

Low importance (value of 1) for Millennium Station, Kallies Pavilion, Henry Eady Bldg, Tourist Booth Building, Recreation Storage Garage

Moderate importance (value of 2) for all other buildings

The risk profile for building assets is shown in **Figure 12-2**.

Figure 12-2: Risk Profile for Building Assets



All of the assessed buildings remained within the 'low' risk zone, with the highest risk value being a 9, found at the Municipal Administration Building (Town Hall), 550 Hall Avenue, Public Works Garage, and Salt and Sand Shed.

12.6 Lifecycle Activities – Buildings

The following section describes the lifecycle activities that can be implemented within the asset management strategy for building assets. Note that, as previously discussed, building assets refers to the entirety of the asset which is made up of varying component systems depending on the use of the building. The primary lifecycle activities include construction, maintenance, renewal, and decommissioning/disposal.

Construction Activities

The start of a building asset lifecycle is its construction. The building should be constructed to adhere with the requirements of the Ontario Building code, and any and all other applicable regional codes and requirements for the building and its use. Each building should be designed and constructed to provide the services for which it is intended.

Maintenance Activities

Throughout the full lifecycle of a building, the majority of the expected lifecycle activities to be undertaken will be maintenance works. Maintenance activities can be used to improve the level of service of an asset (or component), or to maintain it.

Activities that fall under the maintenance category can be varied by response type and scale of maintenance requirements. Activities can be required through routine maintenance works, response to poor condition or performance, or on an emergency basis. In general, the expected types of maintenance activities within the lifecycle of a building include:

- **Preventative maintenance**: This type of maintenance activity is undertaken to prevent failure or poor performance of a building asset component. Preventative maintenance works can be undertaken on an ad-hoc basis based on knowledge of condition, or be undertaken according to a maintenance schedule. Manufacturer directives and condition assessments should assist in determining frequency of preventative maintenance activities.
- **Reactive maintenance:** This type of maintenance activity is undertaken in response to an issue or fault in the building or component systems, on an ad-hoc basis. Scale of reactive maintenance works will be variable depending on the system and type of failure or decrease in level of service.
- **Major maintenance (replacement)**: This type of maintenance activity is undertaken in response to a component which is no longer able to provide adequate level of service. Major maintenance (replacement) will be undertaken for one or more components of a building asset. Major maintenance works can be preventative (in anticipation of end of service life of a component), or in response to a system failure.

Renewal Activities

Renewal works can be used to update a building asset for modernization, to achieve compliance with updated codes and requirements, to expand on an existing building, or to renovate to suit changes to services provided. Renovation works can include:

- Addition of new components to an existing building asset
  - New components can be added to an existing building with the existing building largely unchanged.
- Updating of existing components
  - Updating of existing components can prolong the expected lifespan of a building asset.

Decommissioning/Disposal Activities

Disposal activities can include the removal from service of a building, or a portion of a building and components. Disposal activities should be conducted such that health and safety and environmental protocols are being followed, and spent materials are disposed of at appropriate or approved facility. Disposal activities can also include removal of the building from the Municipal building portfolio through sale of property, if it is no longer required for service delivery.

12.7 Asset Management Strategy – Buildings

The asset management strategy for building assets will maximize the lifecycle of the assets where appropriate, in consideration of specific needs of the Town and existing infrastructure.

The Town's asset management strategy for buildings relies on building condition assessments to establish the current state of the assets (including information such as age, condition and performance), and to establish recommended works and associated timeframes. Recent building condition assessments have been completed by a third-party consultant and have consisted of non-intrusive visual inspection of the buildings and componentry. The usage of such assessments for complex building assets can provide the Town reliable and repeatable condition information and projections that can be used for capital planning and asset management.

The Town should continue to procure detailed building condition assessments at a sufficient frequency to have ongoing understanding of the condition and required works at the building assets, suggested to be every 5 years. These reports can be used to inform a maintenance schedule and capital works schedule, and to understand forecasting of asset improvements. If it is not possible to complete assessment of all buildings on a routine basis, priority buildings for the condition assessment program are suggested to be identified by the presented risk assessment, condition and performance measures. Buildings with high risk or poor condition/performance components should be prioritized in the condition assessment program. Where building assessments have not been conducted (on less complex building assets and structures), the Town could consider adding these to the scope of the building condition assessments, or undertake simplified assessments on a regular basis through visual inspection by Town staff.

In general, the building assets were found to be in good condition and performing adequately to provide the intended services. The Town strategy should maintain (or improve where appropriate) the condition and performance adequately to provide the intended services. An industry standard of 2% of the current portfolio replacement value is recommended as a minimum annual investment into capital projects for major maintenance (replacement) and renewal activities, however specific works recommendations within building condition reports will provide a more tailored understanding of the Town's recommended annual investment.

Implementation of the lifecycle activities for the building assets will vary across the assets, according to the components, condition, and services provided.

Routine maintenance schedules are assumed to be in place currently, and are recommended to continue assuming that they are currently providing sufficient level of maintenance. Maintenance works can include preventative maintenance, reactive maintenance (in the event

that there is an issue), or major maintenance which can include the replacement of a component.

Renewal works are required when routine maintenance is insufficient to address an issue. Renewal can include update of a building asset for modernization, to achieve compliance with updated codes and requirements, to expand on an existing building (in response to service delivery change to accommodate growth), or to renovate to suit changes to services provided.

Reconstruction works are undertaken when an asset has reached the end of its useful life. The Town should consider on a case-by-case basis if the asset is to be reconstructed to a similar level of service as was existing if modifications need to be made to support current and future service delivery. This could include changes to the facility to accommodate new service delivery, accommodate growth requirements, changes to square footage, or changes based on accessibility.

Management of building assets should also include climate change considerations, in new construction, maintenance or renewal lifecycle activities. Assessment should be undertaken to understand vulnerability of building assets to a changing climate, which will inform lifecycle activity requirements, and potential changes to the way lifecycle activities are undertaken.

The Town should continuously audit asset data to ensure information is current. It is suggested that additional classifications be implemented to clearly identify the lifecycle activities implemented for building components.

The Town should provide annual updates to LOS and KPI measures to gauge performance of the Town against quantified targets. Where data is not yet available to LOS or KPI measures, a strategy for collecting, verifying and integrating the data should be developed and implemented.

12.7.1 Current Projection of Works

12.7.1.1 Buildings with Building Condition Assessment

The current building condition assessment reports provide a projection of maintenance and rehabilitation works to be undertaken on the assessed buildings. Completed in 2013, the assessments provide projections out to year 2028 including recommended year of activity, an estimate of cost, and prioritization of the works. For the purposes of this report, it is assumed that all works projected to the 2021 have been completed, and therefore the reporting refers to the outstanding works projected for 2021-2028. The assessments prioritized the projected works from A-C where A represents the highest priority and C is the lowest priority. A summary of the average annual investment and total investment over that timeframe for the six assessed buildings is in **Table 12-13**.

Table 12-13: Building Condition Assessment Works Projections Summary (2021-2028)

Building	Priority A	*Priority A*	Priority B	*Priority B*	Priority C	*Priority C*
	Average Annual Investment (2021-2028)	Total Investment (2021-2028)	Average Annual Investment (2021-2028)	Total Investment (2021-2028)	Average Annual Investment (2021-2028)	Total Investment (2021-2028)
Garage			$3,625	$29,000	$3,813	$30,500
Library/Fire Hall			$84,688	$677,500	$6,688	$53,500
Ma-te-way Activity Centre*			$43,250	$346,000	$21,500	$172,000
Post Office			$33,000	$264,000	$4,188	$33,500
Recreation Centre*			$9,500	$76,000	$2,625	$21,000
Town Hall			$23,500	$188,000	$14,438	$115,500
Capital Projections Total			**$197,563**	**$1,580,500**	**$53,252**	**$426,000**

Note that the Ma-te-Way Activity Centre is undergoing an expansion, therefore the recommendations generated as part of the BCA reports and reported in the table above have not been carried through the current projections and financial analysis sections.

Since the generation of the BCA reports and the above recommendations, the assets have continued to deteriorate, and the Town has identified some works to undertake, both of which would impact the projected works noted in the table above. Some changes include:

- Ma-te-way Activity Centre is undergoing expansion in 2022/2023. The building needs listed within the BCA should be reviewed to identify what will be addressed within these works, and if there are any other recommended improvements that should be done according to the BCA.
- Recreation Centre will be disposed of following completion of the Ma-Te-Way Activity Centre expansion. The improvements recommended for the end of the 2021-2028 timeframe in the BCAs are likely to not be necessary as the asset approaches the end of its lifecycle. The Town should review the recommended works, and the current condition of the building to assess if there are any works that should be carried out, such as to address any issues with safety.
- The Public Works Garage has deteriorated to a poor condition, and has been identified for replacement in 2023. The new Works facility is expected to cost $7M, and will be increased in size from the current facility. Similar to Recreation Centre, as the current garage asset nears the end of its lifecycle, the Town should review the recommended works and current condition of the facility to identify any remaining works to be undertaken to see the asset through the end of its lifecycle. It is not expected that the full cost of works as described in the table above will be required.

Additional information detailing the works included in each of the above summaries can be found within the Building Condition Assessment reports.

Note that it has been observed by the Town that some assets have continued to deteriorate in the time since the building condition assessment, and therefore may require works or rehabilitation in advance of the timeline suggested within the BCA. Additional assessment of the assets may help the Town in prioritizing and further refining the works needing to be undertaken.

Other Buildings

The remaining buildings without condition assessment information will similarly require works, however the works schedule may require refinement as it is based off of approximations rather than actual condition assessment data.

The Town could prioritize completion of detailed building condition assessment for these remaining assets to assist in prioritization of works and improvements.

Without condition assessment, replacement of the building assets or building components is estimated based on the age of the asset/component and its expected useful life. This can be updated when new information is available on current condition of the buildings.

Single Component Buildings

Of the buildings without condition assessment, five do not have breakdowns of componentry, and therefore have only one holistic replacement cost value. These buildings are:

- Tourist Booth Building
- Millennium Station
- Kallies Pavilion
- Henry Eady Building
- Recreation Storage Garage

The estimated replacement cost and replacement years are shown for these buildings in **Table 12-14.** The estimated replacement year was determined based on the age and estimated useful life of the asset. Where the building was identified for replacement prior to the current year, it was adjusted to reflect the upcoming year. The replacement cost was determined using the replacement cost supplied by the Township, inflated by 3% annually since the year for which it was attributed.

Table 12-14: Replacement Costs and Years for Single Component Buildings

Asset	Replacement Cost (2022)	Estimated Replacement Year	Adjusted Replacement Year
Kallies Pavilion	$62,319	2017	2022
Henry Eady Building	$93,478	2020	2022
Tourist Booth Building	$31,159	2028	2028
Millennium Station	$31,159	2035	2035
Recreation Storage Garage	To be determined	2055	2055

The additional buildings have information available as to the componentry of the building, and an indication of the percentage of the building asset they represent. For these buildings (including the Tourist Information Centre, 550 Hall Avenue, and Salt and Sand Shed), the same process of estimating replacement year and replacement cost were followed, however each component has been identified separately. The componentry expected replacement years and replacement costs are summarized in **Table 12-15** to **Table 12-17**.

Table 12-15: Tourist Information Centre Projection of Works

Component Description	Historical Cost	Year of Construction	Useful Life (Yrs)	Estimated Replacement Year	Estimated Replacement Cost
Substructure	$31,179	2017	95	2112	$516,894.78
Shell	$92,040	2017	15	2032	$143,395.29
Interior	$36,481	2017	35	2052	$102,653.30
Services	$33,471	2017	25	2042	$70,081.24

Table 12-16: 550 Hall Avenue Projection of Works

Component Description	% Of Total Costs	Repl. Cost Date (Year)	Estimated Repl. Cost	Year of Construction	Useful Life (Yrs)	Estimated Repl. Year	Estimated Repl. Cost
Substructure	25.3%	2007	$3,997,987	1955	95	2050	$3,601,913
Shell	33.6%	2007		1955	15	2022	$2,091,298
Interior	10.0%	2007		1955	35	2022	$621,316
Services	27.0%	2007		2009	40	2049	$3,732,212
Special Construction	4.2%	2009		2009	40	2049	$544,486

It is noted that the 550 Hall Avenue asset is subject to long term lease – therefore the Town will not be conducting improvements to the asset. At the time of lease renewal, the Town can review the needs of the building. For the purposes of this plan, these improvements have been included in the strategy, however, will not be reflected in the projections and financing sections. If the situation with the long-term lease changes and the Town becomes responsible for improvements, this plan can be updated.

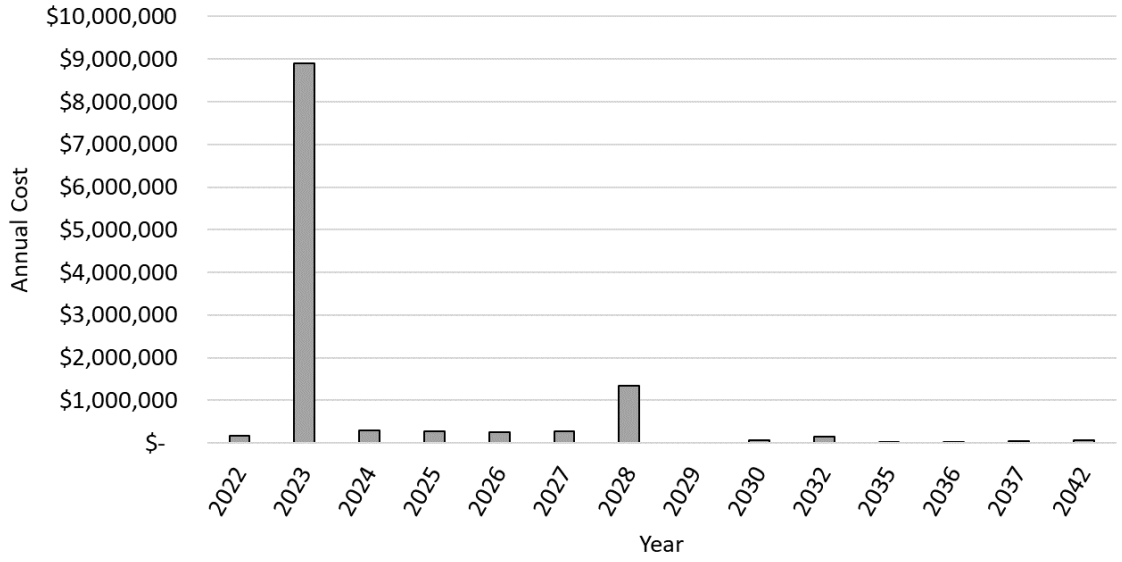
Table 12-17: Salt and Sand Shed Projection of Works

Component Description	Historical Cost	Year of Construction	Useful Life (Yrs)	Estimated Replacement Year	Estimated Replacement Cost
Substructure	$55,467	2011	95	2106	$919,541
Shell	$129,423	2011	15	2026	$201,637
Services	$4,834	2011	25	2036	$10,121
Asphalt floor	$27,015	2012	25	2037	$56,564

12.7.1.2 Projection of Works Summary

Using the methods in the preceding sections, estimates were put together for the projection of works for buildings and building components. An annual summary of the total costs per year for the 20 year period of the AMP is shown in **Figure 12-3**.

Figure 12-3: Projection of Annual Costs for Building Assets



Assumptions for generating the projection of works summary:

- Assumed a $7M investment in 2023 for the replacement of the Works Garage. No additional needs were included. (Once constructed the garage should be added into the condition assessment program to be able to identify potential works within this timeframe).
- Assumed no further investment into the Recreation Centre. As previously stated, until decommissioned the Town should continue to address critical works such as safety issues. It is assumed that there are currently no such needs. The Town should continue to monitor the condition of the building and make updates as required.
- All costs are represented in current day dollars, and inflation should be applied as capital spending projections are determined.

In 2023, just over $1.3 million in costs are attributed to 1 Innovation Drive, for site features and mechanical systems. Works on the 1 Innovation Drive asset are funded through lease revenue. Years 2024-2027 have an annual cost of around $300,000. In 2028, another $1.2 million is recommended for 1 Innovation Drive. For the final years of the plan (2029-2042), the annual cost fluctuates between $10,000 and just under $150,000, with an average annual expenditure of $52,000.

The BCAs pre-date this AMP, and there are works identified for the years leading up to those accounted for in this plan. It is assumed that the specified works were completed in the years as noted in the BCAs, and therefore the costs for those improvements have not been included in this projection.

13.0 Fleet

13.1 State of Local Infrastructure

The Town owns 67 assets within its fleet. The fleet assets are utilized for service delivery within various departments of the Town. A summary of the number of fleet assets by department can be found in **Table 13-1**.

Table 13-1: Summary of Fleet Assets

Department	Number of Assets	Fleet Asset Types
Protection Services (Fire)	5	Fire Service Vehicle, Fire Trucks, Tractor, Platform Truck
Transportation	28	Loaders, Backhoe, Plow Trucks, Mowers, Sander/Salter, Snowblower, Sweeper, Pickup Trucks, Trackless, Dump Truck
Recreation	17	Clippers/Mower, Trucks, Trailer, Tractor Ice Machine, Ice Surfacer, Utility Vehicle, Platform Truck
Environmental - Sewer	1	Dump Truck
Environmental - Water	3	Trucks
Miscellaneous	14	Loader, Compactor, Loader/Plow, Pick Up Dump Truck, Slide in Sanding Unit, Towable Pump, Trailers
TOTAL	**67**	

A summary of the fleet data is in **Table 13-2**.

Table 13-2: Summary of Current State of Fleet Assets

Municipal Department	Number of Assets	Replacement Cost	Average Age (years)
Protection Services (Fire)	5	$2,457,818	21.2
Transportation	24	$3,902,715	9.6
Recreation	21	$794,320	9.8
Environmental - Sewer	1	$172,605	27.0
Environmental - Water	3	$183,413	6.3
Miscellaneous	13	$2,044,698	7.8
Total	67	$9,555,570	13.6

13.1.1 Current Data

The information reported in this AMP and the subsequent analysis are based on the current TCA inventory maintained by the Town.

13.1.2 Replacement Costs

The individual replacement costs per fleet asset will vary due to the variance in types of fleet assets used and maintained by the Town. For an understanding of future replacement costs of the fleet assets the historical cost of each asset has been inflated by a value of 3%, compounded annually since the acquisition date for an expected present day cost. For some assets, the Town has estimated replacement costs as part of capital projections and acquisition planning. Where available, these costs were used. A summary of the replacement costs by department is included in the table above.

The expected replacement cost for all fleet assets is approximately $9.5 million.

13.1.3 Average Age

The age of fleet assets ranges from 2 years (backhoe) to 39 years (fire tractor). The average age of the assets, by department, is summarized in the table above.

The average age of the fleet assets is 10.5 years.

13.1.4 Expected Useful Life

The expected useful life of the assets was provided by the Town, and differs by asset type. A summary of the expected useful life for fleet asset types is included in **Table 13-3**.

Table 13-3: Expected Useful Life of Fleet Assets

Expected Useful Life (years)	Fleet Asset Type
20	Backhoe
15	Clipper
10	Compactor
10 to 15	Dump Truck
20	Fire Truck
15	Ice Machine
15	Ice Resurfacer
5 to 15	Loader
10	Loader/Plow
10 to 15	Mower
7 to 20	Pickup Truck
20 to 25	Platform Truck
5 to 15	Plow Truck
10	RTV
15	Sander/Salter
20	Sanding Unit
10	Service Vehicle
15	Snowblower Head
20	Street Sweeper
10	Towable Pump
15	Trackless
20	Tractor
15	Trailer
15	Utility Vehicle

13.2 Condition – Fleet

The condition of the fleet assets was determined based on the age and useful life of the asset, by determining the percentage of life used, assuming that the deterioration will be linear across the useful life of the asset. A summary of the condition description and how it relates to percentage of life used and numerical condition rating is shown in **Table 13-4**.

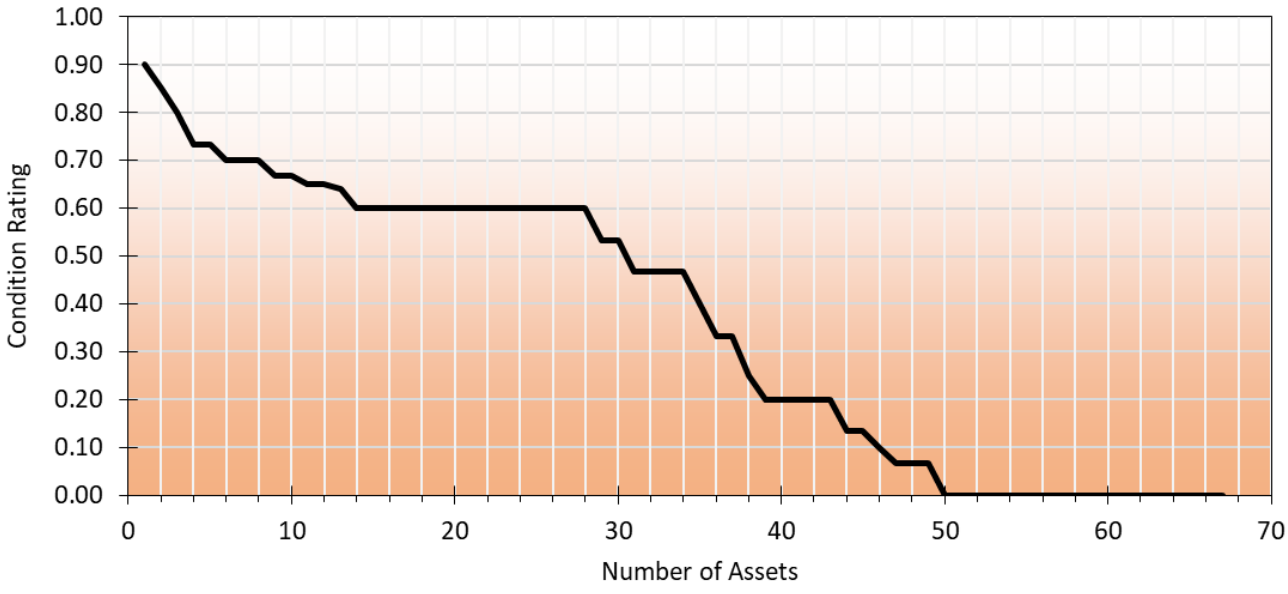
Table 13-4: Fleet Condition Descriptors

Condition Description	Percentage of Life Used	Numerical Condition Rating
Excellent	0 to 20%	1
Good	20 to 40%	2
Fair	40 to 60%	3
Poor	60 to 80%	4
Very Poor	80 to 100%	5

Some assets had condition ratings attributed by the Town prior to assessment. Where available, those rankings were used as the current condition.

The overall range of condition ratings for the fleet assets varied, and is shown in **Figure 13-1**.

Figure 13-1: Condition Summary of Fleet Assets



13.3 Current Levels of Service – Fleet

Levels of service for fleet assets are not defined in the regulation, O. Reg. 588/17 as fleet are not considered core assets. As such, level of services has been devised based on the content of the regulation, in consultation with the Town. **Table 13-5** to **Table 13-7** outline the Town's current community and technical levels of service for fleet.

Table 13-5: Community Levels of Service – Fleet

LOS Parameter	Community Levels of Service Qualitative Description	Community LOS
Scope	Description, which may include maps of locations where fleet is stored	Fleet assets are stored at differing locations across the Town, depending on service delivery requirements. Locations include: • Works Garages • Fire Hall • Landfill • Ma-te-Way Activity Centre • Henry Eady • Garage
Quality	Description of fleet condition (i.e., maintained in 'good' or better condition in order to provide reliability	Average condition is 3.7, or fair to poor

Table 13-6: Technical Levels of Service - Fleet

LOS Parameter	Technical Levels of Service Technical Metric Description	Community LOS
Scope	Provide breakdown of number of fleets by department providing service compared to the size of the community (geography or population)	The number of fleet assets is provided in **Table 13-7** below, by department and as compared to the size of the community.
Quality	Legal, regulatory, local standards	The fleet assets must adhere to applicable legal, regulatory and local standards, including: • Equipment in vehicle must meet Ontario Provincial Equipment Standards • Manufacturer's recommendations or maintenance and life expectancy on equipment • Vehicle/equipment preventative maintenance program • Vehicle maintenance, safety • Driver training, equipment functioning (negligence, risk management)

Table 13-7: Fleet Assets by Department

Department	Number of Assets	Number of Vehicles per km^2	Number of Vehicles per Population
Protection Services (Fire)	5	1 vehicle per 2.6 km^2	1 vehicle per 1,645 persons
Transportation	24	1 vehicle per 0.5 km^2	1 vehicle per 343 persons
Recreation	21	1 vehicle per 0.6 km^2	1 vehicle per 392 persons
Environmental - Sewer	1	1 vehicle per 13 km^2	1 vehicle per 8,223 persons
Environmental - Water	3	1 vehicle per 4.3 km^2	1 vehicle per 2,741 persons
Miscellaneous	13	1 vehicle per 1 km^2	1 vehicle per 633 persons

Note: Land area: 13 square kilometers, population (2016) of 8,223.

13.4 Current Performance – Fleet

Asset performance measures were determined in consultation with the Town, which provide relevant metrics against which the Town can gauge the performance of their assets. The performance measures for fleet assets, and their current values are shown in **Table 13-8**.

Table 13-8: Current Performance Measures for Fleet

Asset Performances Measure	Current Value
Fleet maintenance expenses or annual operating cost to provide service ($/household)	To be established
Emergency services (distance travelled, fuel consumption, calls)	To be established
Maintenance expense per utilization ($/km or hour)	To be established

13.5 Risk Assessment – Fleet

The risk assessment for the fleet assets was conducted using the following risk assumptions and criteria:

Condition: Determined based on estimated condition (using useful life)

Performance: Assumed to be always reliable (value of 1)

Climate Change: Assumed a value of 1 (No or limited impact, quick recovery or mitigation in place)

Impact: Moderate impact (value of 1)

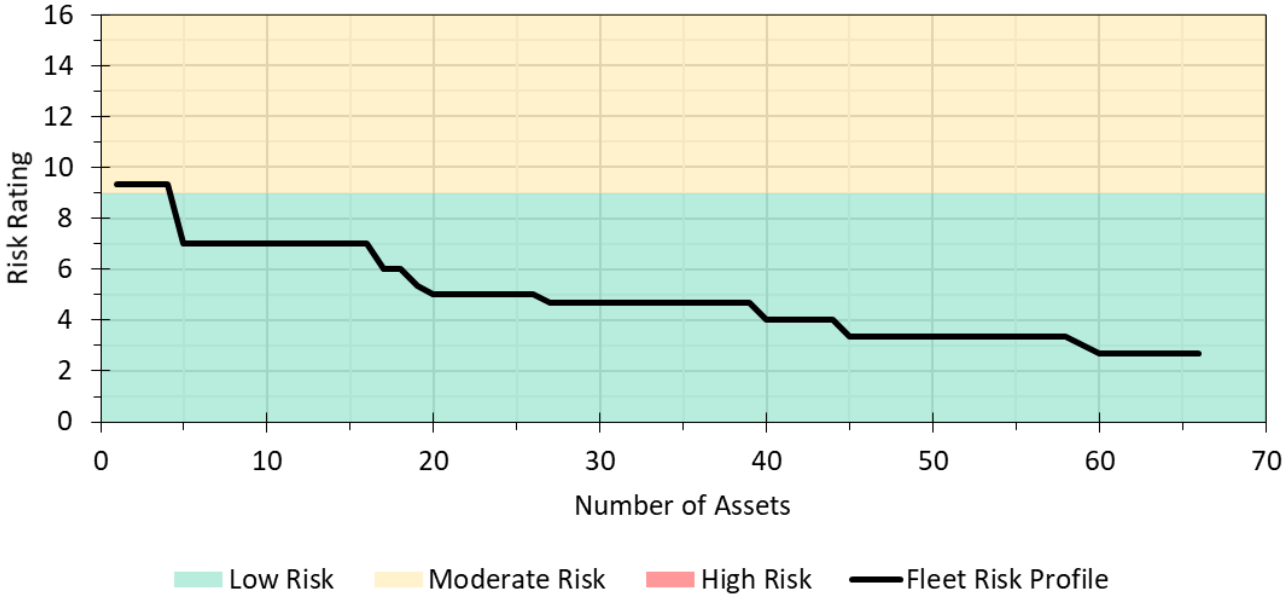
Importance: High importance (value of 3) assumed for fire fleet assets

Medium importance (value of 2) assumed for Roadway assets

Low importance (value of 1) assumed for all other assets.

The risk profile for fleet assets is shown in **Figure 13-2**.

Figure 13-2: Fleet Assets Risk Profile



Four assets are within the moderate risk rating range (rating of 9.3), all four parts of the fire department including two pumping trucks, a pickup truck and a tractor. The remainder of the assets are within the low-risk range.

13.6 Lifecycle Activities – Fleet

In the lifecycle of a fleet asset, there are multiple activities that can be undertaken, depending on the asset attributes. The expected lifecycle activities to be used on the fleet assets include acquisition, maintenance, and operation and decommissioning/disposal.

Acquisition Activities

Acquisition of a fleet asset should consider the intended usage of the asset. Acquisition should be undertaken based on an understanding of the requirements of the asset for providing service delivery and should follow municipal procurement procedures. Acquisition of an asset could be as a new purchase, or purchase of a used asset. Acquisition of a new asset can provide the Town with an asset in Very Good condition; however the condition of a used asset could vary.

Acquisition activities can also include direct replacement of existing fleet assets. When a fleet asset reaches the end of its useful life, and the asset is found to be adequate for providing service delivery required, the acquisition activity may be asset replacement.

Maintenance Activities

Maintenance activities will vary across the fleet assets due to the variability in type and usage of assets. The maintenance activities should be undertaken according to manufacturer specifications and as required to address condition and performance issues that arise through regular usage. Maintenance activities should include regular inspections of vehicle for condition, and recording of maintenance activities undertaken.

Decommissioning/Disposal Activities

Disposal activities can include the removal from service through disposal, sale of asset or transfer of an asset to a different department. Disposal activities should be conducted such that health and safety protocols are being followed, and out of service assets are disposed of at appropriate or approved facility.

13.7 Asset Management Strategy – Fleet

The asset management strategy for the fleet assets would seek to maximize the useful lifespan of the assets, such that they can continue to be used in service delivery across the Town.

The Town's current strategy is driven by the age and performance of the assets. Fleet assets are purchased new, and replaced following the expected useful life, or when it no longer performs satisfactorily. At the end of its lifecycle, the usage is evaluated and if required it is replaced with a new version of the vehicle and disposed of.

The rating system for the performance and condition of the fleet assets is not formalized, and should be documented such that routine inspection and assessment of the fleet assets can be conducted to understand more fully their current state. This can include visual assessment of the vehicles, tracking of maintenance logs, or logging of odometers readings.

Generally, if acquired new, the assets will begin their expected useful life in very good condition and performance. Throughout the lifecycle of the assets, routine maintenance should be conducted. As required, specific maintenance should be conducted. As an asset ages and approaches the end of its useful life, it is expected that the risk and maintenance costs associated with the asset will increase. There will be a point in the lifecycle where the risk and maintenance costs are such that replacement of the asset will be the preferred solution. This point will vary depending on the type of asset, and can be impacted by factors such as build quality, and utilization. At the end of the lifecycle the Town should review the requirement for service delivery for the asset to determine if it requires replacement. It is assumed that the assets will be replaced like for like.

The Town should review usage of fleet assets to confirm if services are being provided adequately. The assets should also be routinely assessed and monitored for condition and performance, to inform any maintenance or replacement works required. The needs and monitoring of asset condition will fall within multiple departments at the Town, due to the varied range of service the assets provide.

13.7.1 Projection of Works

The projection of works for the fleet assets used two methods of projection, including:

- Estimation of replacement date based on useful life and year of acquisition
- Replacement date as estimated by the Town in capital projections

The projection of works for the fleet asset considers the estimated replacement date based on the expected useful life, year of construction, and replacement cost of the assets. The year of replacement was determined assuming a linear deterioration of the assets, for their expected useful life beginning in the year of acquisition. Many of the assets have surpassed their expected useful life, with 14 assets (across all department categories) having been identified for replacement prior to the current year (2022). It is assumed that these assets are all still part of the active fleet inventory. There are some assets with lifespan less than the 20-year timeframe used for projections. Accordingly, the projections below may account for multiple replacements of the same asset, according to its expected useful life.

The capital works projections are shown in **Figure 13-3**.

Figure 13-3: Capital Works Projection for Fleet Assets

There are six years that have an expenditure approximately at or above $1M, for which the number of assets and expenditure by department or service delivery are summarized in **Table** 13-9.

Table 13-9: Estimated Expenditures at or above $1M - Fleet Assets

Department		2022	2024	2026	2034	2037	2038
Protection Services (Fire)	Total Exp. (2022$)	$492,692		$860,000			$1,105,126
Protection Services (Fire)	No. of Assets	2	0	1	0	0	1
Transportation	Total Exp. (2022$)	$1,024,137	$840,000	$140,000	$611,000	$852,897	$275,000
Transportation	No. of Assets	8	4	1	3	3	2
Recreation	Total Exp. (2022$)	$245,240	$50,000	$79,000	$72,212	$173,028	$87,350
Recreation	No. of Assets	4	1	3	1	3	3
Env - Sewer	Total Exp. (2022$)	$172,605					
Env - Sewer	No. of Assets	1	0	0	0	0	0
Env - Water	Total Exp. (2022$)	$38,927			$103,063		$41,423
Env - Water	No. of Assets	1	0	0	1	0	1
Misc	Total Exp. (2022$)		$58,000		$1,215,000		$315,000
Misc	No. of Assets	0	2	0	3	0	2
Total	**Total Exp. (2022$)**	**$1,973,600**	**$948,000**	**$1,079,000**	**$2,001,275**	**$1,025,925**	**$1,823,900**
Total	**No. of Assets**	**16**	**7**	**5**	**8**	**6**	**9**

The average expenditure over the 20 year timeframe is approximately $643,000, however the plan contains 4 years with an expenditure below $100,000. The Town has the opportunity to adjust the replacement year of the assets (where appropriate) to make the plan more affordable on an annual basis.

The Town should undertake a prioritization exercise with the assets to understand the impact of adjusting the projection of works, considering the condition, importance, risk, and usage of the assets to determine if any assets do not require replacement once they reach the end of their service life.

Additional condition assessment can help refine the projections above, as it can help determine whether an asset has exceeded its useful life with sufficient condition, or if it prematurely requires replacement.

Water and Wastewater Fleet Projections

As part of the capital projections works undertaken for the water and wastewater works, the Town has identified multiple vehicle assets that will be acquired for those service deliveries. These assets include:

- Replacement of Water Express Cutaway in 2027, at a cost of $100,000
- Replacement of a Water trailer in 2026, at a cost of $12,000
- Replacement of a Water pickup truck in 2027 at a cost of $50,000
- Replacement of a Water pickup truck in 2028 at a cost of $40,000
- Replacement of a Wastewater sludge truck in 2022 for a cost of $50,000

These acquisitions have been incorporated into the projection (considered under ‘miscellaneous’ expenditure).

14.0 Waste

14.1 State of Local Infrastructure

The Town owns and operates a waste landfill site, located to the northwest of the Town of Renfrew. The landfill site is approximately 40.73 hectares in size, with an operating waste footprint of 10 hectares. The site is approved for the following waste types:

- Domestic
- Industrial, commercial & Institutional
- Tires
- Contaminated Soil
- Wood Waste
- Blue Box Material
- Leaf and Yard Waste
- Hauled Sewage

The landfill site has been in operation since 1955, and has a current age of 67 years in operation.

There are three buildings located on the landfill site to complete landfilling operations, including:

- Household waste depot
- Equipment garage
- Scale/Admin building

In addition to the site, the Town owns other equipment that are used in operations, including:

- Loader (purchased in 2019)
- Compactor (purchased in 2019)

In accordance with the monitoring requirements for the Environmental Compliance Approval (ECA) Certificate of Approval (C of A), monitoring results and operating conditions are reported, most recently in 2019 (2019 Environmental Monitoring and Operations Report – Renfrew Landfill Site, Golder Associates Ltd.).

Operation and filling at the landfill site are done in stages. According to the 2019 reporting, there is 764,856 cubic meters of capacity remaining in the entirety of the landfill. Stage 4, the stage currently under operation, has 336,685 cubic meters of capacity remaining. Based on average filling results from the past five years, it is expected that there is 21 years of capacity remaining within Stage 4 (Golder Associates Ltd.).

14.1.1 On-Site Assets

Located at the landfill site are three specific assets that are involved in waste management service delivery, including:

- Landfill scales
- Estimated remaining useful life: 10 years
- Estimated replacement cost (in 2032): $120,000
- Equipment Building (40’ x 40’ dimensions)
- Estimated remaining useful life: 25 years
- Scalehouse (15’ x 15’ dimensions)
- Estimated remaining useful life 20 years

14.1.2 Current Data

The information reported in this AMP and the subsequent analysis are based on the current TCA inventory maintained by the Town and current waste reports, including:

- Waste Management Bylaw 24-2012
- 2019 Environmental Monitoring and Operations Report (Golder Associates Ltd., Mar 2020)

14.2 Condition – Waste

The condition of the waste facility can be assessed as the physical condition of the landfill, or through an environmental lens according to the monitoring that occurs regularly at the site.

The landfilling activities are tracked on an annual basis and can be used to project the remaining life of the asset. Stage 4, the stage currently under operation, has 336,685 cubic meters of capacity remaining. Based on average filling results from the past five years, it is expected that there is 21 years of capacity remaining within Stage 4 (Golder Associates Ltd.).

The waste facility has ongoing sampling and monitoring programs which review the quality of groundwater and surface water. Note that at the time of the 2019 reporting, the sampling program was recommended to be adjusted including changing of monitors. Exceedances were noted in surface water quality samples; however, it is not attributed to poor condition at the landfill but instead to naturally occurring conditions. Overall, the groundwater impact assessment from 2019 concluded that the site may be operating in compliance with MECP guideline B-7 (Golder Report, 2019). Indoor gas monitoring did report that methane was not present at 0 percent gas by volume of air.

14.3 Current Levels of Service – Waste

Levels of service for waste assets are not defined in the regulation, *O.Reg. 588/17* as they are not considered core assets. As such, level of services has been devised based on the content of the regulation, in consultation with the Town. **Table 14-1** and **Table 14-2** outline the Town's current community and technical levels of service for waste management assets.

Table 14-1: Community Levels of Service – Waste

LOS Parameter	Community Levels of Service Qualitative Description	Community LOS
Scope	Description, which may include maps facility location	• Landfill site located at Part of Lot 14, Concession II in the Town of Renfrew.
Quality	Description of hours of operation and available services	• Landfill site hours: W/Th/F/Sa: 8am-4pm. Extended Th hrs May-August. • Services include household waste, recycling, e-waste, leaf and yard waste, tires.

Table 14-2: Technical Levels of Service – Waste

LOS Parameter	Technical Levels of Service Technical Metric Description	Technical LOS
Scope	Percent of properties serviced by waste collection	• All properties have waste collection services.
Scope	Annual volume of waste through collection services and material drop-off	• 7,978 material received by the landfill in 2019
Quality	Operating budget for waste management services	To be established

14.4 Current Performance – Waste

Asset performance measures were determined in consultation with the Town, which provide relevant metrics against which the Town can gauge the performance of their assets. The performance measures for waste assets, and their current values are shown in **Table 14-3**.

Table 14-3: Current Performance Measures for Waste

Asset Performances Measure	Current Value
Fleet maintenance expenses or annual operating cost to provide service ($/household)	Based on available information, the fleet operating and maintenance expenses in 2019 were as follows: • Public Works fleet: $895,963 • Water and wastewater vehicles: $33,942 Based on 5,632 households, this equates to approximately $165/household for annual operating and maintenance cost for fleet assets (public works and water/wastewater only)
Emergency services (distance travelled, fuel consumption, calls)	Based on 2019 records, the distance travelled by emergency services fleet was 34,102 km, 7,439 L of fuel consumed and 220 calls.
Maintenance expense per utilization ($/km or hour)	Not currently tracked, but it is recommended that the Town should track this performance measure in the future to compare amongst similar vehicles or established standards and identify vehicles which may be costing considerable operating $ for low utilization.

14.5 Risk Assessment – Waste

Risk assessment for the waste assets can be conducted using the methodology described above, however, due to the relative passive nature of the asset, should also consider additional factors and ways of assessing and considering risk.

Through discussion during a risk workshop held with stakeholders at the Town, the landfill has been identified as a key asset within the Town as it is instrumental in the provision of waste collection and disposal services. Interruption of these services as a result of an issue at the landfill could result in high costs to the Town to procure temporary or longer-term alternatives to this service.

Using the risk formula to assess risk of the landfill, we can use the following criteria and assumptions:

Condition: Assumed good condition (value of 2)

Performance: Assumed to be always reliable (value of 1)

Climate Change: Assumed a value of 3 (Limited impact with slower recovery; mitigation plan not in place)

Impact: High impact (value of 2)

Importance: Moderate importance (value of 2)

Using these factors, the risk landfill is considered a low risk asset, with a risk value of 8.

The landfill itself functions as a passive asset, with the risk primarily based on the processes associated with the asset. There are additional risk factors and scenarios that should be considered for the landfill, such as:

- Environmental risk associated with failure of the landfill protection components (immediate and long-term).
- Risk associated with the capacity of the landfill, and the rate of filling. The service life of the landfill will be impacted based on usage, which may occur at a rate greater than intended, thereby introducing risk into the future of the waste collection service delivery.

Some practices are currently in place to mitigate risk at the landfill. This includes, currently, stable leachate mounds and plume geometry, and understanding of seasonal water levels (excerpted from 2019 Environmental Monitoring and Operations Report by Golder Associates Ltd.).

14.6 Lifecycle Activities – Waste

The following section describes the lifecycle activities that can be implemented within the asset management strategy for waste management assets. Due to the variation in types of assets associated with waste management service delivery, the lifecycle activities of some assets may more closely reflect those described in different sections of the report, such as:

- Loader, compactor – lifecycle activities will be similar to Fleet (Section 12.6)
- Scalehouse, garage – lifecycle activities will be similar to Buildings (Section 8.6)

Specific details and recommendations for lifecycle activities should be found within inspection.

The primary lifecycle activities include construction, maintenance, renewal, and decommissioning/disposal.

Construction Activities

The initial stage of an assets lifecycle is acquisition or construction. A disposal site will be constructed or expanded according to detailed design, based on applicable codes and regulations, and landfilling volume requirements. The waste disposal site in the Town is existing, and therefore construction may apply only to the addition of new waste disposal area.

This lifecycle activity can also be extended to include acquisition of any waste assets that support the waste disposal service delivery, such as facilities, fleet, or other specialized equipment. Acquisition of an asset could be as a new purchase, or purchase of a used asset. Acquisition of a new asset can provide the Town with an asset in very good condition, however the condition of a used asset could vary.

Maintenance Activities

Throughout the full lifecycle of a waste asset, the majority of the expected lifecycle activities to be undertaken will be maintenance works. Maintenance activities can be used to improve the level of service of an asset (or component), or to maintain it. Activities that fall under the maintenance category can be varied by response type and scale of maintenance requirements. Activities can be required through routine maintenance works, response to poor condition or performance, or on an emergency basis. Maintenance activities to buildings, fleet or any on-site stormwater management facilities are expected to be consistent with those asset types, described in their respective sections of this report. Service-specific equipment and assets (for delivery of processes such as leachate collection, landfill gas collection, site operations, etc.) may have predefined specialized maintenance processes. Any maintenance works should be done in accordance with specifications and processes outlined by manufacturers or best practices for equipment.

In general, the expected types of maintenance activities within the lifecycle of a waste asset include:

- Preventative maintenance
  - This type of maintenance activity is undertaken to prevent failure or poor performance of a building asset component. Preventative maintenance works can be undertaken on an ad-hoc basis based on knowledge of condition, or be undertaken according to a maintenance schedule. Manufacturer directives and condition assessments should assist in determining frequency of preventative maintenance activities.
- Reactive maintenance
  - This type of maintenance activity is undertaken in response to an issue or fault in the building or component systems, on an ad-hoc basis. Scale of reactive maintenance works will be variable depending on the system and type of failure or decrease in level of service.
- Major maintenance (replacement)
  - This type of maintenance activity is undertaken in response to a component which is no longer able to provide adequate level of service. Major maintenance

(replacement) will be undertaken for one or more components of a building asset. Major maintenance works can be preventative (in anticipation of end of service life of a component), or in response to a system failure.

Renewal Activities

Renewal works can be used to update an asset for modernization, to achieve compliance with updated codes and requirements, or expansion of an existing asset. Renewal works can include:

- Addition of new components to an existing asset
  - Expansion of waste disposal services, requiring alteration or addition to assets
  - New components can be added to an existing on-site facility with the existing building largely unchanged
- Updating of existing components
  - Updating of existing components can prolong the expected lifespan of an asset

Decommissioning/Disposal Activities

Decommissioning and disposal activities can apply differently to the landfill site and the assets that support waste disposal service delivery.

At the end of its lifecycle, the landfill site can be decommissioned. Specific activities and requirements for decommissioning and post-decommissioning are described in applicable regulations and guides set by the Province. In addition, specific reporting may be required and should be followed as required.

Disposal activities will apply to assets that support waste disposal service delivery. Disposal activities can include the removal from service through disposal, sale of asset or transfer of an asset to a different department. Disposal activities should be conducted such that health and safety protocols are being followed, and out of service assets are disposed of at appropriate or approved facility.

14.7 Asset Management Strategy – Waste

The strategy for the landfill site would seek to maximize the operational lifespan of the landfill facility, and continue to provide adequate waste services to the Town.

The strategy for the waste assets should consider the following:

- The strategy should rely on detailed assessment and documentation for the waste facility, completed by waste professionals. Understanding of site operations, waste volumes, site capacity, etc., will influence how the site is managed.

- Services provided as part of landfill and waste service delivery. The Town provides waste collection services, as well as on-site waste disposal services for residents of the Town of Renfrew and adjacent municipalities. These services include refuse disposal beyond household waste. The management strategy for the waste site should consider operation of each stream of service delivery, and understand the utilization, efficiency and adequacy of each service. The quantity and specifications of assets required (landfill site and ancillary) may change according to the services delivered.

Lifecycle activities undertaken at the landfill site should be according to direction in current landfill guidance, regulations and reporting. Through the lifecycle of the site, the Town will have to consider opening of new phases for landfilling activity, and the impacts of closure and maintenance of the facility. The Town anticipates that the site will soon require opening of a new phase of landfilling area, for which the Town will have to go through the regulatory approval process. The cost for going through this process may be substantial, and will be required to be started in advance of the requirement of the new landfilling area due to the timelines of achieving the approval. In anticipation of this timing and cost need, the Town will need to gain a thorough understanding of operations and future requirements of the landfilling site through its current reporting of additional studies. The Town intends to identify the costs related to development a minimum of 10 years in advance of the funding being required to allow for planning.

At the end of the useful life of the landfill asset (capacity has been reached), there are additional costs and liabilities associated with closure of the site. Once operations are no longer possible, the landfilling activities will cease, however there will be remaining costs for managing the landfill asset, as there will be costs associated with closure activities, and ongoing maintenance costs to maintain the condition and safety of the site. The Town's landfill is not yet at the stage where closure is being considered, however the Town must continue to be aware of the risks and costs associated with this lifecycle stage.

Lifecycle activities undertaken on the ancillary waste assets should be undertaken as required to maximize the useful life and sustainability of the asset. Generally, if acquired new, the assets will begin their expected useful life in very good condition and performance. Throughout the lifecycle of the assets, routine maintenance should be conducted. As required, specific maintenance should be conducted. As an asset ages and approaches the end of its useful life, it is expected that the risk and maintenance costs associated with the asset will increase. There will be a point in the lifecycle where the risk and maintenance costs are such that replacement of the asset will be the preferred solution. This point will vary depending on the type of asset and the services delivered by each.

Based on current knowledge of condition, the Town has projected that the landfill scales will need replacement in approximately 10 years. The replacement cost is estimated to be $120,000 (in 2032). The other assets (equipment building, scalehouse) are expected to remain in useable condition beyond the current timeframe (at 25 and 20 years each). Throughout the timeframe of this plan, these assets should continue to undergo routine maintenance and condition assessments to maximize the useful life.

Strategy for the fleet assets related to landfill operations are included within the Fleet section.

15.0 Other Assets

The Town owns and maintains other types of assets which are not currently considered core assets under O.Reg. 588/17, however are of interest for tracking with asset management principles.

15.1 Park Playstructures

Located within the Town parks, the Town owns and maintains playstructure assets, part of recreational and cultural services. The Town currently has an inventory of 11 playstructures at eight park locations.

The playstructures range in age from 5 years to 33 years, with the oldest having been constructed in 1988, and the most recent construction having occurred in 2016. The average age of the structures is 17 years.

The expected useful life of the playstructures, as provided by the Town, is 20 years. On average, the assets are approaching the end of their expected useful life.

The replacement cost of each park playstructure was determined through the inflation of the cost by 3% annually of the historical cost since year of acquisition/construction, or of expected replacement cost and expected year of replacement. The costs and years in both scenarios were provided by the Town. To replace all 11 assets in 2021, the estimated replacement cost would be $457,877.

15.2 Natural Assets

The Town intends to include natural assets in future asset management reporting.

Natural assets may include:

- Trees
- Parks
- Planters
- Naturalized areas

Inclusion of natural assets in asset management will allow the Town to understand the associated value of the natural assets, and to appropriately maintain those assets to deliver the expected level of service. An inventory will be devised by the Town for inclusion in future iterations of this report.

16.0 Financial Strategy

16.1 Introduction

This chapter outlines the financing strategy that would sustainably fund the lifecycle management strategies presented in previous sections. This financing strategy focuses on examining how the Town can fund the lifecycle activities required to maintain its assets at the proposed levels of service. The strategy presented is a suggested approach which should be examined and re-evaluated during the annual budgeting processes to ensure the sustainability of the Town's financial position as it relates to its assets.

O. Reg. 588/17 requires a 10-year capital plan that forecasts the costs of implementing the lifecycle management strategy and the lifecycle activities identified in the asset management plan. The financing strategy in this asset management plan has been developed for a 20-year forecast period to enable the Town to evaluate the sustainability of its assets over a longer-term horizon.

Various financing options, including reserve funds, debt, and grants were considered during the process of developing the financing strategy and are described in more detail in **Section 16.4** below.

16.2 Annual Costs

Table B-1 presents the capital expenditure forecast by asset class for the 2022-2041 forecast period. This expenditure forecast is based on the lifecycle activities identified in preceding sections of this plan and includes anticipated renewal/replacement activities required to achieve desired levels of service.

The capital expenditure forecast includes a capital inflation factor of 4.5% annually, which aligns closely with the historical 20-year annual average rate of inflation as witnessed in Statistics Canada's Building Construction Price Index.

16.3 Funding

Table B-8 summarizes the recommended strategy to finance the asset lifecycle costs identified in **Table B-1**. This funding forecast was based on the funding sources identified in the Town's 2022 budget.

The lifecycle costs required to sustain established level of service targets are being recovered through several methods:

- Ontario Community Infrastructure Fund (OCIF) formula-based funding is identified for years in which the funding amount is known (2022 and 2023). The Ontario Government doubled its annual investment in the OCIF program starting in 2022 as part of a five-year initiative to support small, rural, and northern communities. The province has also announced changes to the OCIF funding formula starting in 2023.
    - The Town's 2023 OCIF funding allocation, as recently announced by the Province, will be 15% lower than its 2022 allocation ($1.3 million in 2023 versus $1.5 million in 2023). It has been assumed that the Town's allocation for 2024-2026 will be consistent with 2023. For subsequent years, it has been assumed that the Town's allocation will be approximately $650,000. The Town should continue to monitor its funding allocations on an annual basis as any further changes to this funding source would have an impact to the required tax levy increases identified later in this section.
- Canada Community-Building Fund (CCBF) funding has been shown as a stable and long-term funding source for eligible capital projects. Annual funding estimates for 2023 to 2031 are based on the Town's forecast and then maintained at 2031 levels for the remainder of the forecast period.
- Dividends that the Town receives annually from the Renfrew Power Generation have been included in the forecast – with the assumption that the full amount of the dividend will be used to fund capital projects.
- The Town will be dependent upon maintaining healthy capital reserves/reserve funds in order to provide the remainder of the required lifecycle funding over the forecast period. This will require the Town to proactively increase amounts being transferred to these capital reserves during the annual budget process.
- Debt financing is shown as required in years where significant capital needs are identified. Specifically, the forecast includes a total of $25.9 million of debt financing for tax and rate supported services over the forecast period. The associated annual carrying costs (principal and interest), together with carrying costs of existing debt, would result in the ratio of carrying costs to own-source revenues to peak at approximately 10.4% by 2026. This is well below the provincially mandated maximum annual repayment limit of 25.

16.3.1 Funding Shortfall and Full Lifecycle Funding

This financing strategy has been developed to be fully funded, and therefore no funding shortfall has been identified. However, this means that if identified grants are not received at expected amounts then shortfalls may present themselves. In such an event, the difference could be made up through increases to the tax levy/user rates over-and-above those presented hereafter.

It is noted that this fully funded financing strategy phases-in annual contributions towards capital such that the Town reaches full lifecycle funding levels by 2032. The full lifecycle funding level for each asset class was established based on the lifecycle management strategies identified in preceding sections of this plan. Under this approach, an annual capital investment amount is calculated where funds are available for short-term needs while establishing a funding plan for long-term needs. Annual contributions in excess of capital costs in a given year would be transferred to a capital-related reserve fund for future capital replacement needs. This approach provides for a stable funding base, eliminating variances in annual funding requirements, particularly in years when capital replacement needs exceed typical capital levy funding.

The annual lifecycle funding targets, by asset category, are presented in **Table 16-1** and compared to the current annual capital funding capacity.

Table 16-1: Contribution Towards Capital-related Needs and Lifecycle Target (2022$)

Asset Category	Annual Lifecycle Cost	Current Capital Funding Capacity
Tax Supported		
Bridges & Culverts	121,670	
Roads	6,296,145	
Sidewalks	118,635	
Stormwater Mains	420,895	
Buildings	1,658,139	
Fleet	631,087	
Total Tax Supported	**9,246,571**	**4,424,771**
Water		
Mains	1,174,687	
Buildings	1,121,632	
Fleet	14,856	
Total Water	**2,311,175**	**857,225**
Wastewater		
Mains	1,002,576	
Buildings	1,067,500	
Fleet	17,261	
Total Wastewater	**2,087,337**	**996,468**
Grand Total	**13,645,083**	**6,278,465**

The annual lifecycle funding target has been estimated to total approximately $13.6 million.

In comparison, the Town budgeted to contribute approximately $6.3 million towards capital-related needs in 2022. Included in this are budgeted contributions to capital-related reserve funds, Federal and Provincial grants, and annual servicing costs (principal and interest) of existing non-growth-related debt. The sum of these components is the amount of funding the Town contributed in 2022 to the provision of capital-related needs.

The difference between the annual lifecycle funding target and current annual contribution is referred to as the lifecycle funding gap. The Town is currently underfunding its infrastructure by approximately $7.4 million annually. As noted earlier, the financial strategy has been designed to reach full lifecycle funding levels, and therefore to eliminate the annual lifecycle funding gap, by 2032.

16.4 Other Potential Funding Sources

While debt, grants, and the tax levy have been projected to fully fund the lifecycle management strategy, other sources of funding could be utilized to lessen the tax levy and rate payer impacts. Specifically, the Town should consider reviewing existing user fees (e.g., parks & recreation fees, building permit fees, etc.) to ensure that they appropriately account for the lifecycle costs of capital assets utilized in the provision of the services. Furthermore, the Town could consider the use of stormwater fees to fund the capital needs associated with stormwater services. A separate stormwater memo is being undertaken to explore alternative funding structures for the Town.

16.5 Tax Levy Impact

While the annual funding requirement may fluctuate, it is important for the Town to implement a consistent, yet increasing, annual investment in capital so that the excess annual funds can accrue in capital reserve funds. Table B-8 presents a summary of the impacts on the tax levy as a result of this financing strategy.

In order to fund the recommended asset lifecycle activities over the forecast period using the Town's own available funding sources (i.e., using taxation, CCBF funding, OCIF funding, and debentures), and to achieve full lifecycle funding by 2032, an increase in the Town's taxation levy would be required as follows:

- 9.4% increases annually from 2023 to 2032
- 3.7% increases annually for from 2033 to 2041

Consideration for cash-flow and positive reserve fund balances has been included in setting the capital reserve transfer amounts. A detailed schedule of all tax supported capital-related reserves can be viewed in **Table B-5**.

Layering on assessment increases resulting from new assessment growth, assumed to be 0.9% annually, the impacts on individual property tax bills resultant from the financial strategy are estimated as follows:

- 8.4% increases annually from 2023 to 2032
- 2.8% increases annually from 2033 to 2041

The taxation impacts identified above include inflationary adjustments to the operating costs and revenues identified in the Town's 2022 budget (i.e., general operating inflation of 2% annually).

It is noted that if other funding sources become available (as mentioned above), or if maintenance practices allow for the deferral of capital works, then the impact on the Town's taxation levy would potentially decrease.

Further detail on the Financing Strategy is presented in **Appendix B**.

16.6 Water & Wastewater User Fee Revenue Impact

Just as for tax supported services, it is important for the Town to implement a consistent, yet increasing, annual investment in water and wastewater capital so that the excess annual funds can accrue in capital reserve funds. Table B-8 presents a summary of the impacts on water and wastewater rates as a result of this financing strategy.

In order to fund the recommended asset lifecycle activities over the forecast period using the Town's own available funding sources (i.e., using user rates, grant funding, and debentures), increases to the Town's annual water and wastewater revenues would be required as follows:

Water

- 8.2% increases annually from 2023 to 2032
- 3.6% increases annually from 2033 to 2041

Wastewater

- 7.1% increases annually from 2023 to 2032
- 3.6% increases annually from 2033 to 2041

The figures presented above represent annual water and wastewater revenue increases required to fully fund the lifecycle strategies identified. It is noted that these increased revenue needs will be partially offset by additional revenue generated from new customers connecting to the water and wastewater systems. Therefore, the net impact on customers' water and wastewater bills may be lower than percentage increases identified above. It is noted that the Town recently undertook a Water and Wastewater Rate Study which incorporated asset management-related capital over a 10-year forecast period. However, it is recommended that the Town revisit the rate study at a future date if it is to include the full lifecycle replacement program as identified in this report.

Consideration for cash-flow and positive reserve fund balances has been included in setting the capital reserve transfer amounts. A detailed schedule of all water and wastewater capital-related reserves can be viewed in **Tables B-6** and **B-7**, respectively.

The revenue increases identified above include inflationary adjustments to the operating costs and revenues identified in the Town's 2022 budget. It is noted that if other funding sources become available (as mentioned above), or if maintenance practices allow for the deferral of capital works, then the impact on the Town's revenue requirements would potentially decrease.

Further detail on the Financing Strategy is presented in **Appendix B**.

17.0 Reference Reports

Town of Renfrew Documents

1. Official Plan of the Town of Renfrew
   Accepted by Town of Renfrew October 15, 2007
2. Renfrew Master Servicing Plan – Final Report
   Prepared by Stantec Consulting Ltd. June 12, 2017
3. Town of Renfrew Development of an Asset Management Plan
   Prepared by Dillon Consulting Limited January 2014
4. Asset Management Levels of Service Survey Summary
   Prepared by Dillon Consulting Limited May 2022

Building Condition Assessments

1. Renfrew Municipal Garage Building Condition Assessment
   Report No. 2130087.00, Prepared by Morrison Hershfield June 3, 2013.
2. Library & Fire Hall Draft Building Condition Assessment
   Report No. 2130087.01, Prepared by Morrison Hershfield December 13, 2013.
3. 1 Innovation Drive Draft Building Condition Assessment
   Report No. 1701562.00, Prepared by Morrison Hershfield March 29, 2018.
4. Recreation Centre Building Condition Assessment
   Report No. 2130087.01, Prepared by Morrison Hershfield December 13, 2013.
5. Renfrew Town Hall Building Condition Assessment
   Report No. 2130087.00, Prepared by Morrison Hershfield June 3, 2013.
6. Ma-te-Way Activity Centre Building Condition Assessment
   Report No. 2130087.00, Prepared by Morrison Hershfield June 3, 2013.
7. Sewage Pumping Station Evaluations – Condition Assessment Report
   Contract #09-2013, Prepared by J.L. Richards & Associates Limited October 2014

Water & Wastewater Reports

1. Renfrew Drinking Water System Annual Water Report (Reporting period of January 1 – December 31, 2018)
   Prepared by OCWA March 8, 2019
2. Renfrew Drinking Water System Annual Water Report (Reporting Period of January 1 – December 31, 2020)
   Prepared by OCWA February 24, 2021

3. Renfrew wastewater System 2020 Annual Report (January 1, 2020 – December 31, 2020)
   Prepared by OCWA March 22, 2020
4. Water and Wastewater Facilities Assessment and Capital Investment Plan
   Prepared by OCWA April 12, 2021

Waste

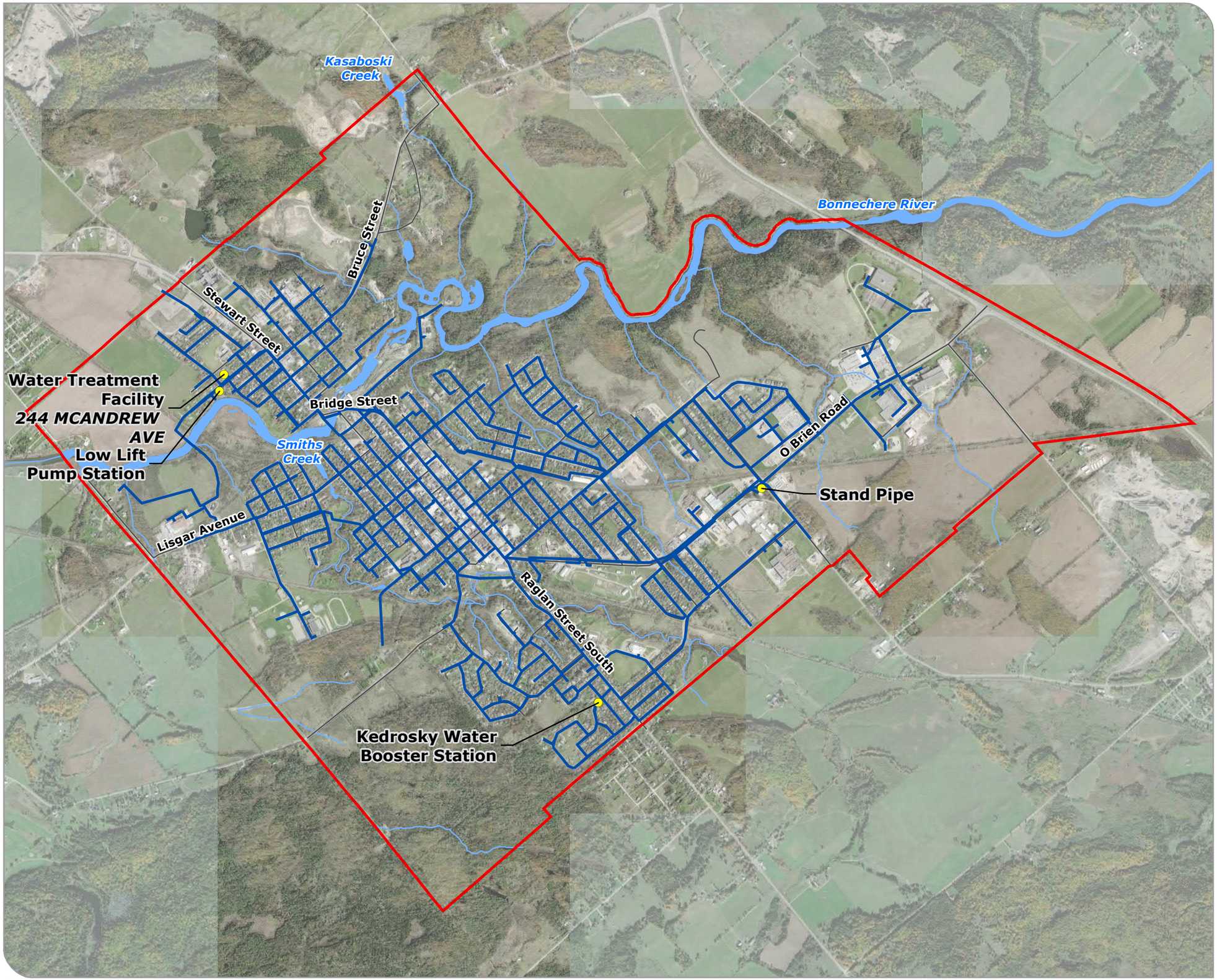
1. 2019 Environmental Monitoring and Operations Report – Renfrew Landfill Site
   Prepared by Golder Associates Ltd March 2020

Bridge OSIM Reports

1. 2020 OSIM Inspection Report – Bonnechere River Bridge
   Prepared by WSP Group August 2020
2. 2020 OSIM Inspection Report – Swinging Bridge
   Prepared by WSP Group August 2020

Appendix A

Level of Service Figures



TOWN OF RENFREW

ASSET MANAGEMENT PLAN

WATER

FIGURE A-1

- Select Building
- Water Pipe
- Town Boundary
- Road
- Watercourse
- Water Body

SCALE 1:21,000

0 250 500 1,000 m

N W E S

MAP DRAWING INFORMATION:
DATA PROVIDED BY Town of Renfrew, Imagery from Town of Renfrew Drape 2 supplemented by ESRI Basemap Imagery

MAP CREATED BY: LMM
MAP CHECKED BY: -
MAP PROJECTION: NAD 1983 UTM Zone 18N

DILLON CONSULTING

PROJECT: 20-2329
STATUS: DRAFT
DATE: 2022-11-28

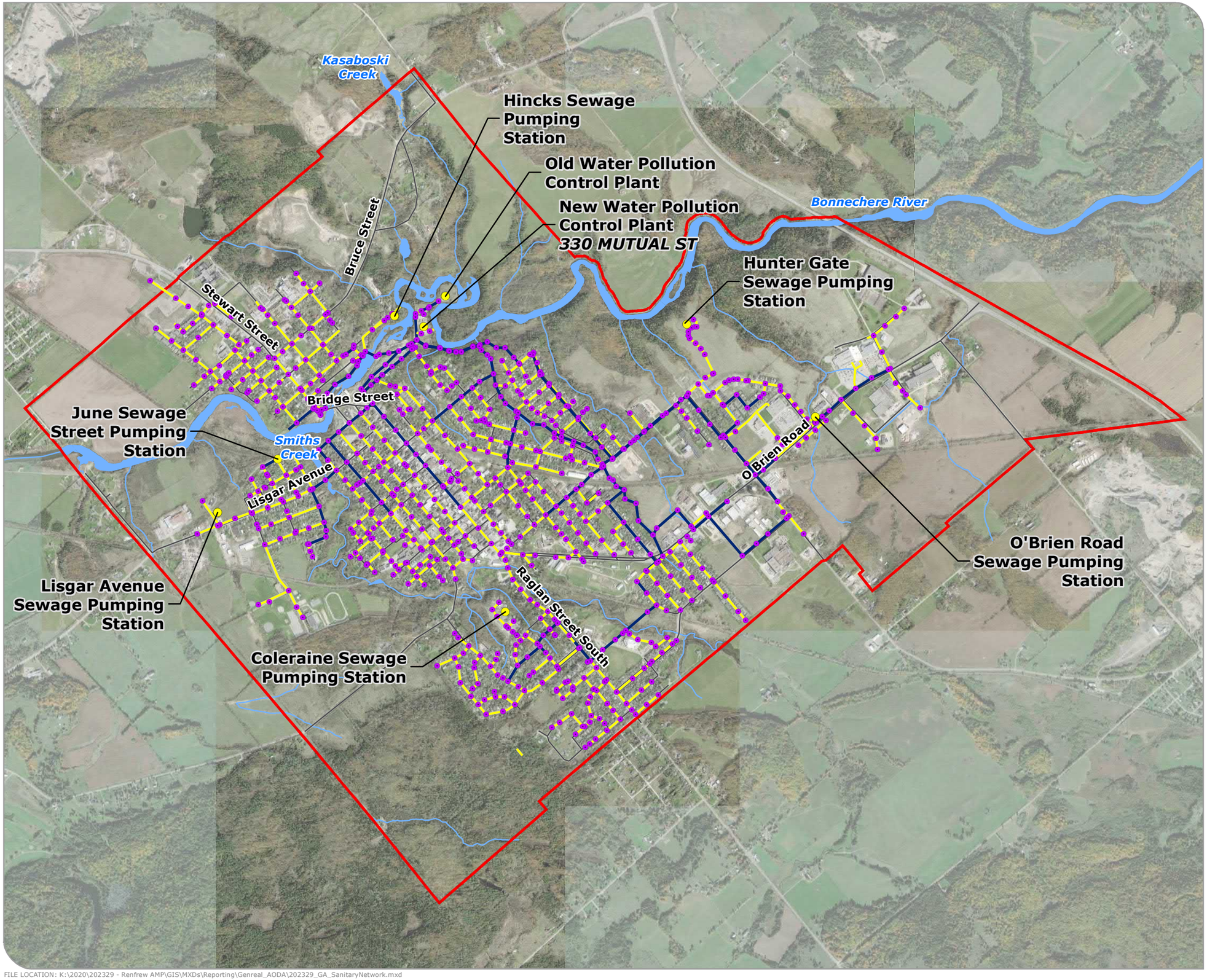
FILE LOCATION: K:\2020\202329 - Renfrew AMP\GIS\MXDs\Reporting\Genreal_AODA\202329_GA_WaterNetwork.mxd

TOWN OF RENFREW

ASSET MANAGEMENT PLAN

WASTEWATER

FIGURE A-2



- Select Building
- Sanitary Manholes

Sanitary Pipe Diameter

- Local Pipe (<300mm)
- Collector Pipe (>300mm)
- Town Boundary
- Road
- Watercourse
- Water Body

SCALE 1:21,000

0 250 500 1,000 m

N W E S

MAP DRAWING INFORMATION:
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PROJECT: 20-2329
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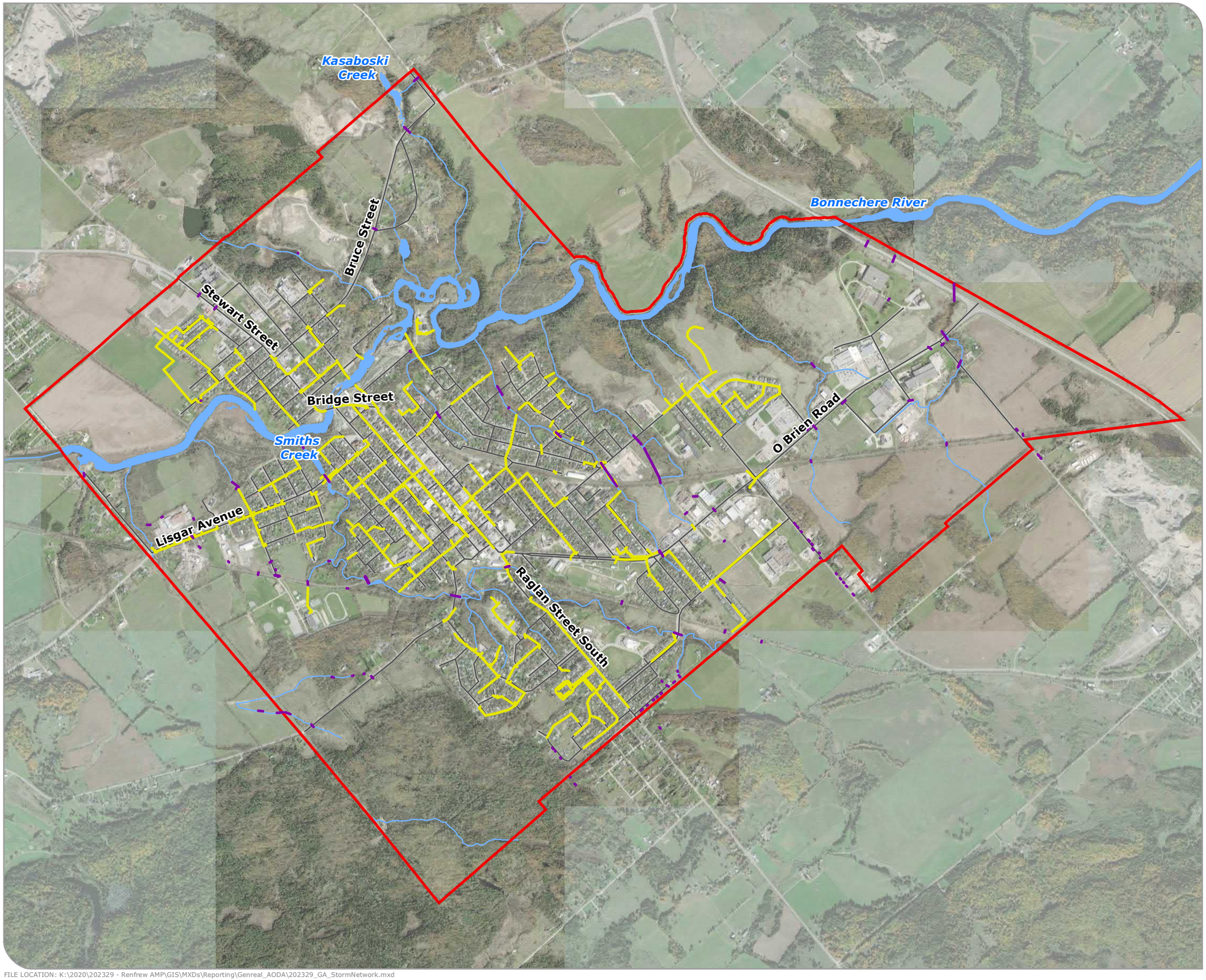

TOWN OF RENFREW

ASSET MANAGEMENT PLAN

STORMWATER

FIGURE A-3

- Culvert
- Storm Pipe
- Town Boundary
- Road
- Watercourse
- Water Body

SCALE 1:21,000

0 250 500 1,000 m

N W E S

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STATUS: DRAFT
DATE: 2022-11-28

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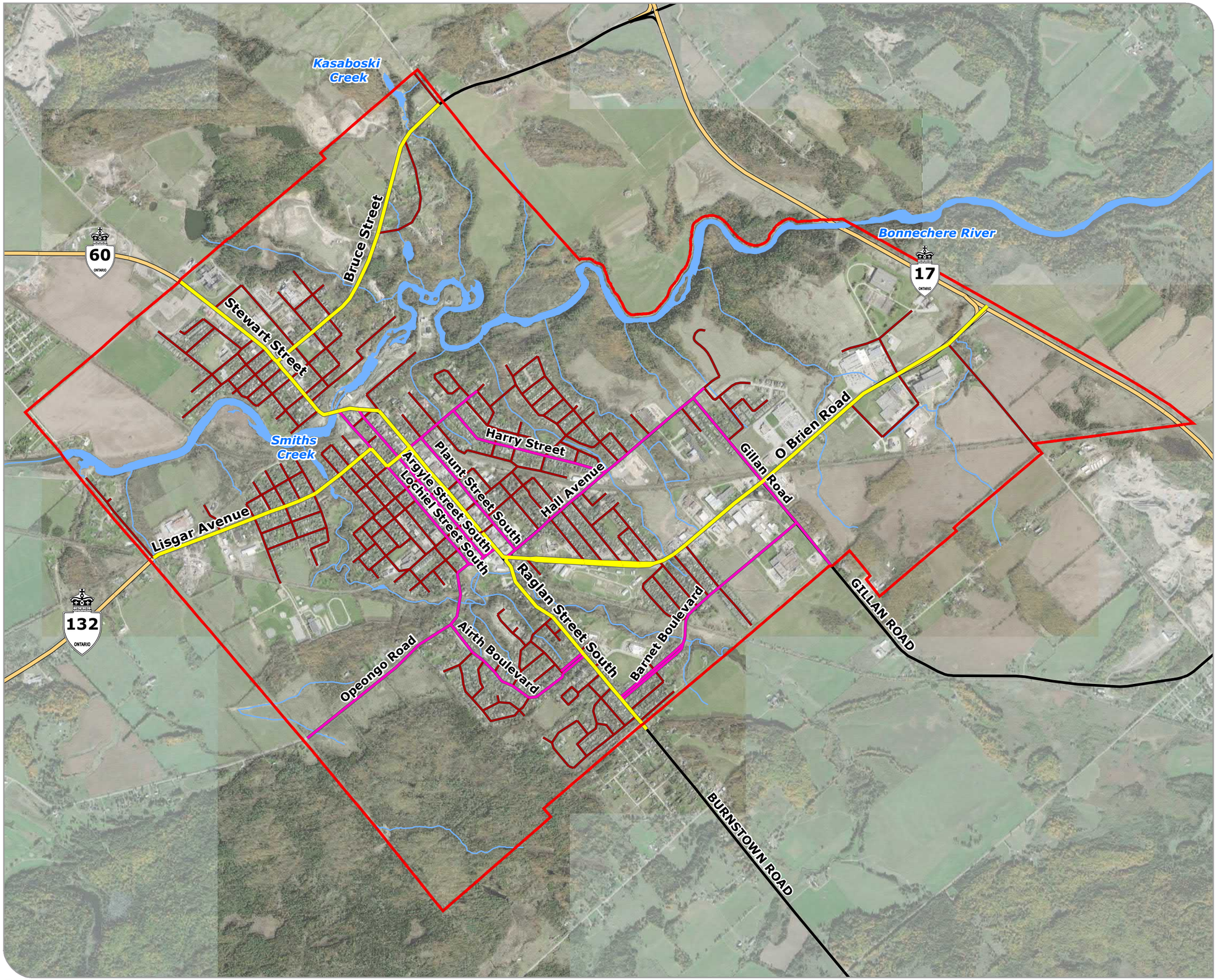
TOWN OF RENFREW
ASSET MANAGEMENT PLAN

ROADS
FIGURE A-4



- Town Boundary
- Major Road
- Highway
- Watercourse
- Water Body

Functional Classification

- Arterial
- Collector
- Local

SCALE 1:21,000

0 250 500 1,000 m

N W E S

MAP DRAWING INFORMATION:
DATA PROVIDED BY Town of Renfrew, Imagery from Town of Renfrew Drape 2 supplemented by ESRI Basemap Imagery

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PROJECT: 20-2329
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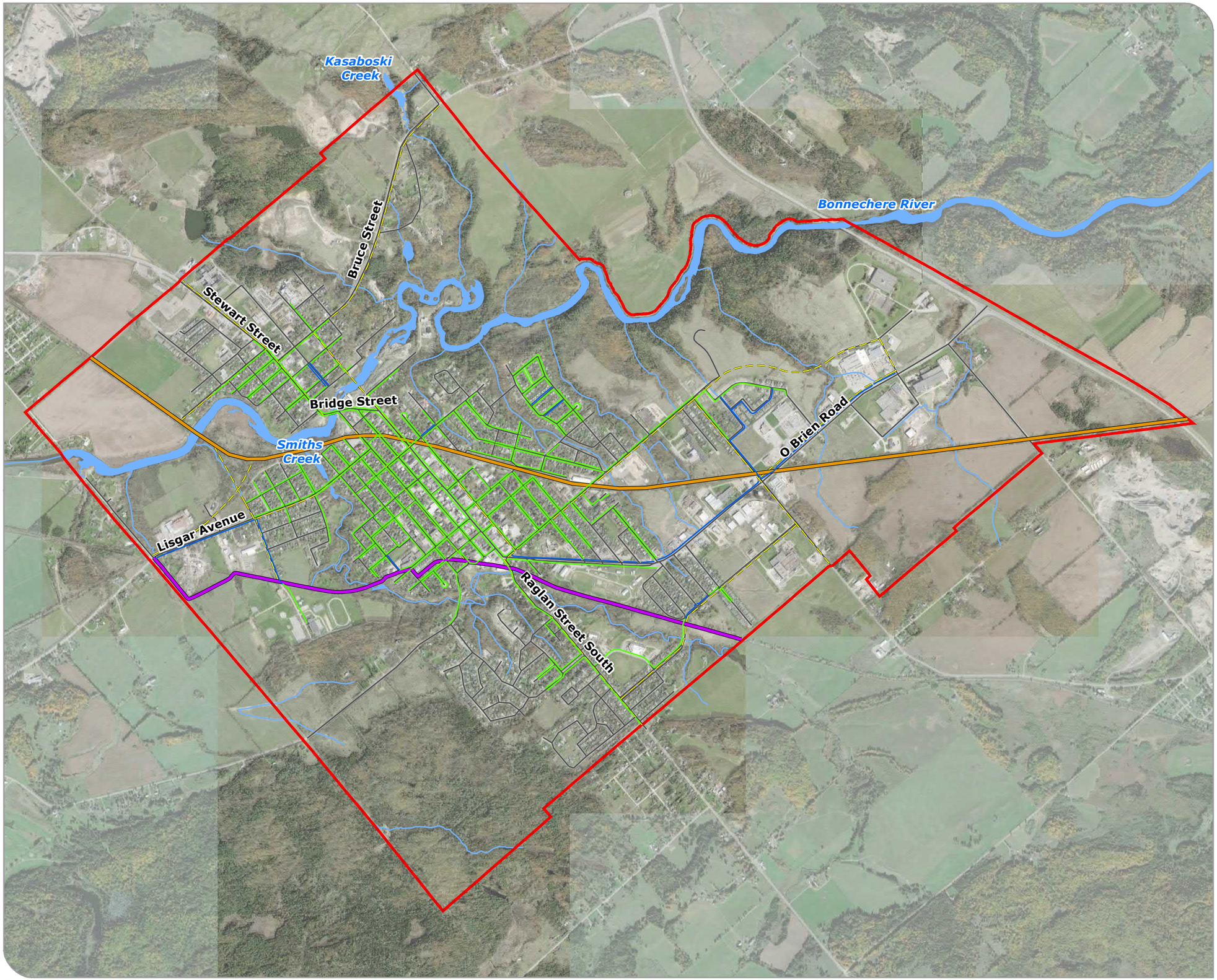

TOWN OF RENFREW

ASSET MANAGEMENT PLAN

SIDEWALKS

FIGURE A-5

- Algonquin Trail
- Millennium Trail
- On-Street Pathway
- Town Boundary
- Road
- Watercourse
- Water Body

Sidewalk Material

- Asphalt
- Concrete

SCALE 1:21,000

0 250 500 1,000 m

N W E S

MAP DRAWING INFORMATION:
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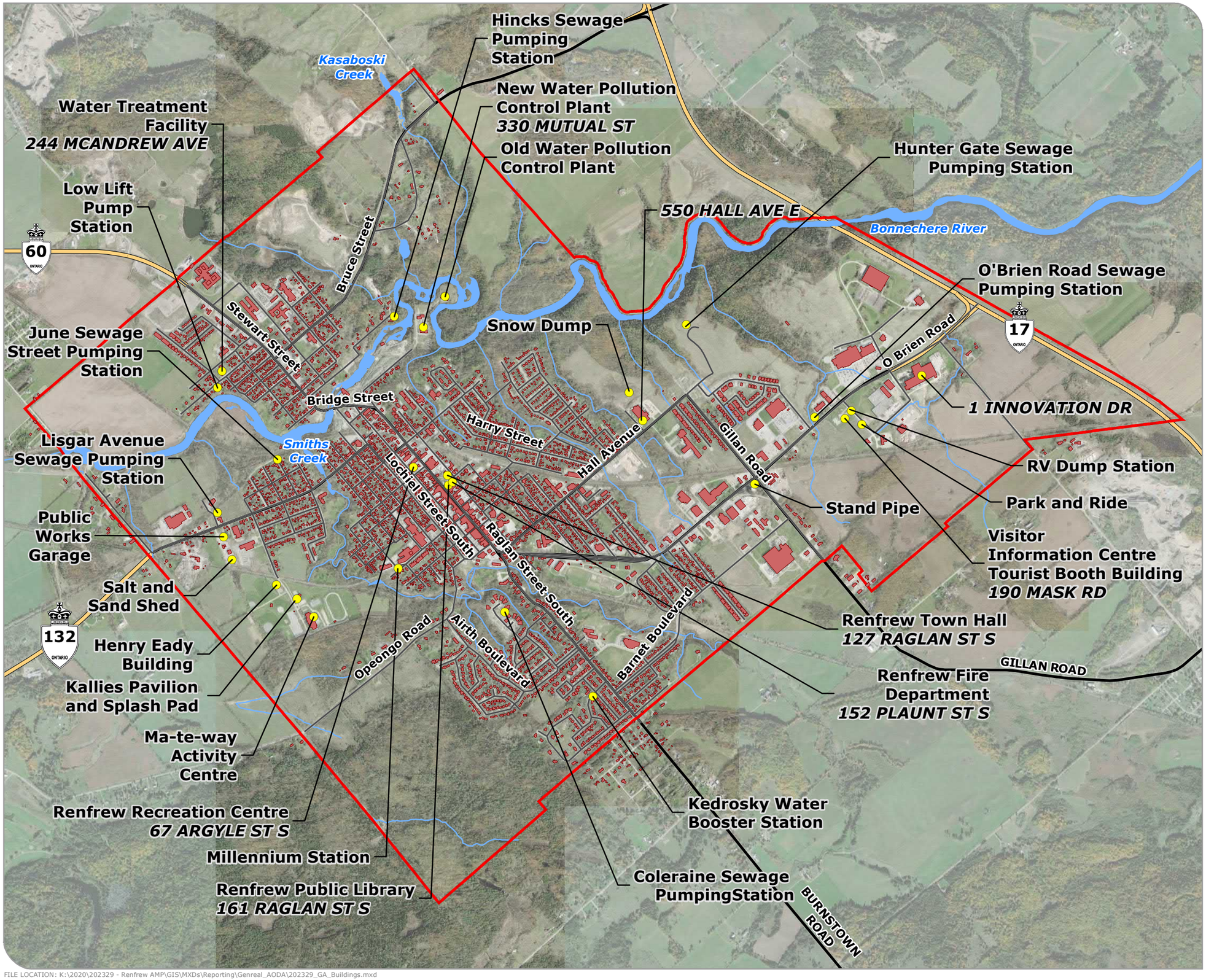

TOWN OF RENFREW

ASSET MANAGEMENT PLAN

BUILDINGS

FIGURE A-6

- Select Building
- Building Footprint
- Town Boundary
- Road
- Major Road
- Highway
- Watercourse
- Water Body

SCALE 1:21,000

0 250 500 1,000 m

N W E S

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DILLON CONSULTING

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DATE: 2022-11-28

FILE LOCATION: K:\2020\202329 - Renfrew AMP\GIS\MXDs\Reporting\Genreal_AODA\202329_GA_Buildings.mxd

Appendix B

Financial Strategy

Appendix B: Financing Strategy Tables

Table B-1 Capital Budget Forecast (Inflated $)

Description	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Capital Expenditures																				
Tax Supported																				
Bridges & Culverts	26,500	22,200	48,700	258,900	-	-	967,100	-	-	-	160,600	167,800	175,400	183,300	191,500	200,100	209,200	218,600	228,400	238,700
Roads and Sidewalks	3,456,500	3,581,500	3,755,400	3,952,000	4,113,800	4,315,900	4,508,400	4,712,900	4,898,800	5,141,100	5,354,600	5,607,700	5,842,700	6,121,800	6,415,500	6,661,500	6,993,500	7,312,300	7,650,500	7,995,000
Stormwater Mains	299,400	313,300	327,000	342,100	356,400	370,600	389,700	408,200	423,800	445,700	465,300	479,700	501,900	528,400	555,300	574,800	606,300	625,800	659,900	689,800
Buildings	179,300	9,297,400	314,500	309,800	307,200	334,000	1,758,400	-	85,300	-	222,700	-	-	53,600	18,700	109,500	-	-	-	-
Fleet	1,762,100	523,700	1,035,200	162,000	1,286,700	361,800	359,700	705,600	936,500	23,800	589,900	-	3,219,100	173,400	313,300	1,985,500	3,604,800	984,200	167,800	378,500
Total Tax Supported	**5,723,800**	**13,738,100**	**5,480,800**	**5,024,800**	**6,064,100**	**5,382,300**	**7,983,300**	**5,826,700**	**6,344,400**	**5,610,600**	**6,793,100**	**6,255,200**	**9,739,100**	**7,060,500**	**7,494,300**	**9,531,400**	**11,413,800**	**9,140,900**	**8,706,600**	**9,302,000**
Water																				
Mains	399,700	416,500	435,800	453,400	476,600	498,000	520,200	542,500	567,700	593,600	619,700	647,500	678,300	707,500	736,500	773,700	806,700	842,500	880,200	921,000
Buildings	713,500	426,900	67,100	136,000	193,100	815,800	427,200	576,200	640,300	1,271,200	1,741,900	1,820,200	1,902,200	1,987,800	2,077,200	2,170,700	2,268,400	2,370,400	2,477,100	2,588,600
Fleet	38,900	-	-	-	-	-	53,900	53,000	-	-	-	-	174,800	-	-	-	83,800	-	-	-
Total Water	**1,152,100**	**843,400**	**502,900**	**589,400**	**669,700**	**1,313,800**	**1,001,300**	**1,171,700**	**1,208,000**	**1,864,800**	**2,361,600**	**2,467,700**	**2,755,300**	**2,695,300**	**2,813,700**	**2,944,400**	**3,158,900**	**3,212,900**	**3,357,300**	**3,509,600**
Wastewater																				
Mains	699,100	730,700	764,300	797,300	833,900	870,700	910,800	950,900	993,100	1,039,000	1,086,400	1,124,700	1,176,500	1,231,100	1,288,600	1,341,400	1,400,800	1,471,600	1,541,500	1,615,400
Buildings	559,700	286,300	430,300	2,080,600	195,900	422,400	115,100	1,128,400	280,300	417,300	1,657,800	1,732,400	1,810,400	1,891,800	1,977,000	2,065,900	2,158,900	2,256,000	2,357,600	2,463,600
Fleet	172,600	-	-	-	-	-	-	-	-	-	268,100	-	-	-	-	-	-	-	-	-
Total Wastewater	**1,431,400**	**1,017,000**	**1,194,600**	**2,877,900**	**1,029,800**	**1,293,100**	**1,025,900**	**2,079,300**	**1,273,400**	**1,456,300**	**3,012,300**	**2,857,100**	**2,986,900**	**3,122,900**	**3,265,600**	**3,407,300**	**3,559,700**	**3,727,600**	**3,899,100**	**4,079,000**
Total Expenditures	**8,307,300**	**15,598,500**	**7,178,300**	**8,492,100**	**7,763,600**	**7,989,200**	**10,010,500**	**9,077,700**	**8,825,800**	**8,931,700**	**12,167,000**	**11,580,000**	**15,481,300**	**12,878,700**	**13,573,600**	**15,883,100**	**18,132,400**	**16,081,400**	**15,963,000**	**16,890,600**
Capital Funding																				
Tax Supported																				
Grants - Canada Community Building Fund	330,300	272,133	272,133	283,018	283,018	294,339	294,339	306,113	306,113	318,357	318,357	318,357	318,357	318,357	318,357	318,357	318,357	318,357	318,357	318,357
Grants - OCIF	1,598,004	2,014,496	1,495,027	1,294,950	1,294,950	647,475	647,475	647,475	647,475	647,475	647,475	647,475	647,475	647,475	647,475	647,475	647,475	647,475	647,475	647,475
Renfrew Power Generation Dividend	155,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
Debenture Issuance	-	7,189,323	870,129	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Transfer from Capital R.F.s	3,640,496	4,192,148	2,773,511	3,376,832	4,416,132	4,370,486	6,971,486	4,803,112	5,320,812	4,574,768	5,757,268	5,219,368	8,703,268	6,024,668	6,458,468	8,495,568	10,377,968	8,105,068	7,670,768	8,266,168
Total Tax Supported	**5,723,800**	**13,738,100**	**5,480,800**	**5,024,800**	**6,064,100**	**5,382,300**	**7,983,300**	**5,826,700**	**6,344,400**	**5,610,600**	**6,793,100**	**6,255,200**	**9,739,100**	**7,060,500**	**7,494,300**	**9,531,400**	**11,413,800**	**9,140,900**	**8,706,600**	**9,302,000**
Water																				
Grants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Debenture Issuance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Transfer from Capital R.F.s	1,152,100	843,400	502,900	589,400	669,700	1,313,800	1,001,300	1,171,700	1,208,000	1,864,800	2,361,600	2,467,700	2,755,300	2,695,300	2,813,700	2,944,400	3,158,900	3,212,900	3,357,300	3,509,600
Total Water	**1,152,100**	**843,400**	**502,900**	**589,400**	**669,700**	**1,313,800**	**1,001,300**	**1,171,700**	**1,208,000**	**1,864,800**	**2,361,600**	**2,467,700**	**2,755,300**	**2,695,300**	**2,813,700**	**2,944,400**	**3,158,900**	**3,212,900**	**3,357,300**	**3,509,600**
Wastewater																				
Grants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Debenture Issuance	1,001,280	700,957	787,455	2,374,976	613,031	729,261	313,506	1,147,217	205,572	112,963	1,360,042	1,090,715	1,104,278	1,108,190	916,892	909,743	890,759	928,012	830,158	770,384
Transfer from Capital R.F.s	430,120	316,043	407,145	502,924	416,769	563,839	712,394	932,083	1,067,828	1,343,337	1,652,258	1,766,385	1,882,622	2,014,710	2,348,708	2,497,557	2,668,941	2,799,588	3,068,942	3,308,616
Total Wastewater	**1,431,400**	**1,017,000**	**1,194,600**	**2,877,900**	**1,029,800**	**1,293,100**	**1,025,900**	**2,079,300**	**1,273,400**	**1,456,300**	**3,012,300**	**2,857,100**	**2,986,900**	**3,122,900**	**3,265,600**	**3,407,300**	**3,559,700**	**3,727,600**	**3,899,100**	**4,079,000**
Total Funding	**8,307,300**	**15,598,500**	**7,178,300**	**8,492,100**	**7,763,600**	**7,989,200**	**10,010,500**	**9,077,700**	**8,825,800**	**8,931,700**	**12,167,000**	**11,580,000**	**15,481,300**	**12,878,700**	**13,573,600**	**15,883,100**	**18,132,400**	**16,081,400**	**15,963,000**	**16,890,600**

Table B-2 Tax Supported Debenture Issuance

Year of Issuance	Principal	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	7,189,323	-	-	886,378	886,378	886,378	886,378	886,378	886,378	886,378	886,378	886,378	886,378	-	-	-	-	-	-	-	-
2024	870,129	-	-	-	107,279	107,279	107,279	107,279	107,279	107,279	107,279	107,279	107,279	107,279	-	-	-	-	-	-	-
2025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2026	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2027	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2028	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2029	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2031	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2032	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2033	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2034	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2035	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2036	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2037	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2038	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2039	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2040	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2041	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	**8,059,452**	**-**	**-**	**886,378**	**993,657**	**993,657**	**993,657**	**993,657**	**993,657**	**993,657**	**993,657**	**993,657**	**993,657**	**107,279**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Table B-3 Water Debenture Issuance

Year of Issuance	Principal	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2024	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2026	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2027	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2028	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2029	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2031	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2032	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2033	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2034	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2035	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2036	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2037	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2038	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2039	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2040	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2041	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Table B-4 Wastewater Debenture Issuance

Year of Issuance	Principal	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
2022	1,001,280	-	123,449	123,449	123,449	123,449	123,449	123,449	123,449	123,449	123,449	123,449	-	-	-	-	-	-	-	-	-
2023	700,957	-	-	86,422	86,422	86,422	86,422	86,422	86,422	86,422	86,422	86,422	86,422	-	-	-	-	-	-	-	-
2024	787,455	-	-	-	97,086	97,086	97,086	97,086	97,086	97,086	97,086	97,086	97,086	97,086	-	-	-	-	-	-	-
2025	2,374,976	-	-	-	-	292,813	292,813	292,813	292,813	292,813	292,813	292,813	292,813	292,813	292,813	-	-	-	-	-	-
2026	613,031	-	-	-	-	-	75,581	75,581	75,581	75,581	75,581	75,581	75,581	75,581	75,581	75,581	-	-	-	-	-
2027	729,261	-	-	-	-	-	-	89,911	89,911	89,911	89,911	89,911	89,911	89,911	89,911	89,911	89,911	-	-	-	-
2028	313,506	-	-	-	-	-	-	-	38,652	38,652	38,652	38,652	38,652	38,652	38,652	38,652	38,652	38,652	-	-	-
2029	1,147,217	-	-	-	-	-	-	-	-	141,441	141,441	141,441	141,441	141,441	141,441	141,441	141,441	141,441	141,441	-	-
2030	205,572	-	-	-	-	-	-	-	-	-	25,345	25,345	25,345	25,345	25,345	25,345	25,345	25,345	25,345	25,345	-
2031	112,963	-	-	-	-	-	-	-	-	-	-	13,927	13,927	13,927	13,927	13,927	13,927	13,927	13,927	13,927	13,927
2032	1,360,042	-	-	-	-	-	-	-	-	-	-	-	167,681	167,681	167,681	167,681	167,681	167,681	167,681	167,681	167,681
2033	1,090,715	-	-	-	-	-	-	-	-	-	-	-	-	134,475	134,475	134,475	134,475	134,475	134,475	134,475	134,475
2034	1,104,278	-	-	-	-	-	-	-	-	-	-	-	-	-	136,148	136,148	136,148	136,148	136,148	136,148	136,148
2035	1,108,190	-	-	-	-	-	-	-	-	-	-	-	-	-	-	136,630	136,630	136,630	136,630	136,630	136,630
2036	916,892	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	113,045	113,045	113,045	113,045	113,045
2037	909,743	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	112,163	112,163	112,163	112,163
2038	890,759	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	109,822	109,822	109,822
2039	928,012	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	114,415	114,415
2040	830,158	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	102,351
2041	770,384	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	**17,895,392**	**-**	**123,449**	**209,870**	**306,956**	**599,769**	**675,351**	**765,262**	**803,914**	**945,356**	**970,701**	**984,628**	**1,028,861**	**1,076,914**	**1,115,976**	**959,792**	**997,256**	**1,019,507**	**1,090,678**	**1,063,651**	**1,140,657**

Table B-5 Tax Supported Capital Reserve Funds

Description	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Opening Balance	3,838,193	2,339,460	1,010,000	1,010,000	1,187,378	1,310,862	2,583,895	2,463,557	5,883,340	10,308,004	17,180,560	24,748,783	33,589,366	40,577,619	51,176,028	62,161,635	72,016,664	80,882,356	92,982,273	106,625,672
Transfer from Operating	2,118,600	2,852,689	2,763,511	3,542,454	4,526,637	5,617,936	6,826,756	8,164,644	9,643,416	11,277,220	13,080,454	13,727,384	15,289,762	16,116,384	16,828,613	17,637,561	18,442,845	19,284,367	20,258,468	21,269,795
Transfer to Capital	3,640,496	4,192,148	2,773,511	3,376,832	4,416,132	4,370,486	6,971,486	4,803,112	5,320,812	4,574,768	5,757,268	5,219,368	8,703,268	6,024,668	6,458,468	8,495,568	10,377,968	8,105,068	7,670,768	8,266,168
Closing Balance	2,316,297	1,000,000	1,000,000	1,175,622	1,297,883	2,558,312	2,439,165	5,825,089	10,205,945	17,010,455	24,503,746	33,256,798	40,175,860	50,669,335	61,546,173	71,303,628	80,081,541	92,061,656	105,569,972	119,629,299
Interest	23,163	10,000	10,000	11,756	12,979	25,583	24,392	58,251	102,059	170,105	245,037	332,568	401,759	506,693	615,462	713,036	800,815	920,617	1,055,700	1,196,293

Table B-6 Water Capital Reserve Funds

Description	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Opening Balance	1,139,929	421,397	173,100	467,361	896,848	1,489,242	1,799,595	2,811,292	3,967,005	5,430,887	6,619,243	7,724,128	8,896,403	9,960,763	11,281,542	12,669,139	14,152,866	15,638,072	17,296,027	19,093,369
Transfer from Operating	429,396	593,389	792,534	1,010,007	1,247,349	1,606,335	1,985,162	2,288,136	2,618,111	2,987,619	3,390,008	3,551,892	3,721,039	3,904,381	4,075,860	4,287,999	4,489,274	4,699,607	4,965,599	5,333,870
Transfer to Capital	1,152,100	843,400	502,900	589,400	669,700	1,313,800	1,001,300	1,171,700	1,208,000	1,864,800	2,361,600	2,467,700	2,755,300	2,695,300	2,813,700	2,944,400	3,158,900	3,212,900	3,357,300	3,509,600
Closing Balance	417,225	171,386	462,734	887,968	1,474,497	1,781,777	2,783,457	3,927,728	5,377,116	6,553,706	7,647,651	8,808,320	9,862,142	11,169,844	12,543,702	14,012,739	15,483,240	17,124,779	18,904,326	20,917,639
Interest	4,172	1,714	4,627	8,880	14,745	17,818	27,835	39,277	53,771	65,537	76,477	88,083	98,621	111,698	125,437	140,127	154,832	171,248	189,043	209,176

Table B-7 Wastewater Capital Reserve Funds

Description	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Opening Balance	257,254	101,000	101,000	101,000	101,000	101,000	101,000	101,000	101,000	101,000	101,000	101,000	101,000	101,000	101,000	101,000	101,000	101,000	101,000	101,000
Transfer from Operating	272,866	315,043	406,145	501,924	415,769	562,839	711,394	931,083	1,066,828	1,342,337	1,651,258	1,765,385	1,881,622	2,013,710	2,347,708	2,496,557	2,667,941	2,798,588	3,067,942	3,307,616
Transfer from Tax Supported	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Transfer to Capital	430,120	316,043	407,145	502,924	416,769	563,839	712,394	932,083	1,067,828	1,343,337	1,652,258	1,766,385	1,882,622	2,014,710	2,348,708	2,497,557	2,668,941	2,799,588	3,068,942	3,308,616
Closing Balance	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Interest	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000

Table B-8 Operating Budget Forecast (Inflated $)

Description	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Expenditures																				
Operating Expenditures																				
Tax Supported																				
Council and CAO	717,530	731,900	746,500	761,500	776,700	792,200	808,100	824,200	840,700	857,500	874,700	892,200	910,000	928,200	946,800	965,700	985,000	1,004,700	1,024,800	1,045,300
Corporate Services	1,710,840	1,745,100	1,780,000	1,815,600	1,851,900	1,889,000	1,926,700	1,965,300	2,004,600	2,044,700	2,085,600	2,127,300	2,169,800	2,213,200	2,257,500	2,302,600	2,348,700	2,395,600	2,443,600	2,492,400
Community Services	2,402,050	2,450,100	2,499,100	2,549,100	2,600,100	2,652,100	2,705,100	2,759,200	2,814,400	2,870,700	2,928,100	2,986,700	3,046,400	3,107,300	3,169,500	3,232,900	3,297,500	3,363,500	3,430,700	3,499,300
Infrastructure & Development	7,429,782	7,578,400	7,730,000	7,884,600	8,042,300	8,203,100	8,367,200	8,534,500	8,705,200	8,879,300	9,056,900	9,238,000	9,422,800	9,611,200	9,803,500	9,999,500	10,199,500	10,403,500	10,611,600	10,823,800
Strategic Initiatives	1,451,960	1,481,000	1,510,600	1,540,800	1,571,600	1,603,100	1,635,100	1,667,800	1,701,200	1,735,200	1,769,900	1,805,300	1,841,400	1,878,300	1,915,800	1,954,100	1,993,200	2,033,100	2,073,800	2,115,200
Water	1,867,480	1,911,600	1,956,620	2,002,940	2,050,460	2,099,180	2,149,200	2,200,620	2,253,940	2,299,000	2,345,000	2,391,900	2,439,700	2,488,500	2,538,300	2,589,100	2,640,900	2,693,700	2,747,600	2,802,600
Wastewater	1,647,700	1,682,800	1,718,600	1,755,300	1,792,800	1,830,900	1,870,200	1,910,200	1,951,000	1,990,000	2,029,800	2,070,400	2,111,800	2,154,000	2,197,100	2,241,000	2,285,800	2,331,500	2,378,100	2,425,700
Capital-related Expenditures																				
Tax Supported																				
Transfers to Capital Res./R.F.s	2,118,600	2,852,689	2,763,511	3,542,454	4,526,637	5,617,936	6,826,756	8,164,644	9,643,416	11,277,220	13,080,454	13,727,384	15,289,762	16,116,384	16,828,613	17,637,561	18,442,845	19,284,367	20,258,468	21,269,795
Existing Debenture Repayments	222,867	222,135	221,426	220,668	219,935	219,200	218,482	217,731	216,995	216,259	215,531	214,785	214,048	200,354	225,528	187,166	187,144	187,122	92,389	-
New Debenture Repayments	-	-	886,378	993,657	993,657	993,657	993,657	993,657	993,657	993,657	993,657	993,657	107,279	-	-	-	-	-	-	-
Transfer to WW Capital R.F.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Transfer to Capital (RPG Dividend)	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
Water																				
Transfers to Capital Res./R.F.s	429,396	593,389	792,534	1,010,007	1,247,349	1,606,335	1,985,162	2,288,136	2,618,111	2,987,619	3,390,008	3,551,892	3,721,039	3,904,381	4,075,860	4,287,999	4,489,274	4,699,607	4,965,599	5,333,870
Existing Debenture Repayments	427,829	422,704	417,630	412,452	407,326	302,201	200,644	200,269	199,904	199,538	199,177	198,806	198,441	191,475	204,310	184,778	184,778	184,778	138,583	-
New Debenture Repayments	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wastewater																				
Transfers to Capital Res./R.F.s	272,866	315,043	406,145	501,924	415,769	562,839	711,394	931,083	1,066,828	1,342,337	1,651,258	1,765,385	1,881,622	2,013,710	2,347,708	2,496,557	2,667,941	2,798,588	3,067,942	3,307,616
Existing Debenture Repayments	723,602	711,747	700,785	688,037	676,181	664,326	653,234	640,616	628,760	616,905	605,683	593,195	581,339	569,484	558,132	545,774	533,918	522,063	478,245	369,008
New Debenture Repayments	-	123,449	209,870	306,956	599,769	675,351	765,262	803,914	945,356	970,701	984,628	1,028,861	1,076,914	1,115,976	959,792	997,256	1,019,507	1,090,678	1,063,651	1,140,657
Total Expenditures	**21,492,503**	**22,892,056**	**24,409,700**	**26,055,995**	**27,842,484**	**29,781,425**	**31,886,192**	**34,171,870**	**36,654,068**	**39,350,636**	**42,280,397**	**43,655,765**	**45,082,343**	**46,562,463**	**48,098,443**	**49,691,990**	**51,346,009**	**53,062,803**	**54,845,077**	**56,695,246**
Revenues																				
Tax Supported																				
Council and CAO	81,380	83,000	84,700	86,400	88,100	89,900	91,600	93,500	95,300	97,300	99,200	101,200	103,200	105,300	107,400	109,500	111,700	114,000	116,200	118,600
Corporate Services	1,264,764	1,290,100	1,315,900	1,342,200	1,369,000	1,396,400	1,424,300	1,452,800	1,481,900	1,511,500	1,541,700	1,572,600	1,604,000	1,636,100	1,668,800	1,702,200	1,736,200	1,771,000	1,806,400	1,842,500
Community Services	585,670	597,400	609,300	621,500	633,900	646,600	659,600	672,800	686,200	699,900	713,900	728,200	742,800	757,600	772,800	788,200	804,000	820,100	836,500	853,200
Infrastructure & Development	943,392	962,300	981,500	1,001,100	1,021,200	1,041,600	1,062,400	1,083,700	1,105,300	1,127,400	1,150,000	1,173,000	1,196,400	1,220,400	1,244,800	1,269,700	1,295,100	1,321,000	1,347,400	1,374,300
Strategic Initiatives	1,151,440	1,174,500	1,198,000	1,221,900	1,246,400	1,271,300	1,296,700	1,322,600	1,349,100	1,376,100	1,403,600	1,431,700	1,460,300	1,489,500	1,519,300	1,549,700	1,580,700	1,612,300	1,644,500	1,677,400
OMPF	2,406,200	2,406,200	2,406,200	2,406,200	2,406,200	2,406,200	2,406,200	2,406,200	2,406,200	2,406,200	2,406,200	2,406,200	2,406,200	2,406,200	2,406,200	2,406,200	2,406,200	2,406,200	2,406,200	2,406,200
Taxation	9,708,835	10,617,823	11,611,916	12,699,080	13,888,029	15,188,294	16,610,296	18,165,433	19,866,169	21,726,136	23,760,243	24,642,426	25,558,589	26,509,838	27,497,941	28,524,027	29,589,990	30,697,289	31,848,156	33,043,595
Water	2,706,654	2,927,693	3,166,783	3,425,399	3,705,135	4,007,715	4,335,006	4,689,025	5,071,955	5,486,157	5,934,185	6,142,598	6,359,179	6,584,356	6,818,470	7,061,877	7,314,952	7,578,084	7,851,782	8,136,470
Wastewater	2,644,169	2,833,039	3,035,401	3,252,217	3,484,519	3,733,416	4,000,090	4,285,813	4,591,944	4,919,943	5,271,370	5,457,840	5,651,675	5,853,170	6,062,732	6,280,586	6,507,167	6,742,829	6,987,938	7,242,981
Total Revenues	**21,492,503**	**22,892,056**	**24,409,700**	**26,055,995**	**27,842,484**	**29,781,425**	**31,886,192**	**34,171,870**	**36,654,068**	**39,350,636**	**42,280,397**	**43,655,765**	**45,082,343**	**46,562,463**	**48,098,443**	**49,691,990**	**51,346,009**	**53,062,803**	**54,845,077**	**56,695,246**
Tax Supported																				
Tax Revenues Required		10,617,823	11,611,916	12,699,080	13,888,029	15,188,294	16,610,296	18,165,433	19,866,169	21,726,136	23,760,243	24,642,426	25,558,589	26,509,838	27,497,941	28,524,027	29,589,990	30,697,289	31,848,156	33,043,595
Prior Year Tax Levy		9,708,835	10,617,823	11,611,916	12,699,080	13,888,029	15,188,294	16,610,296	18,165,433	19,866,169	21,726,136	23,760,243	24,642,426	25,558,589	26,509,838	27,497,941	28,524,027	29,589,990	30,697,289	31,848,156
Add: Tax Revenues from Incremental Assessment		87,380	95,560	104,507	114,292	124,992	136,695	149,493	163,489	178,796	195,535	213,842	221,782	230,027	238,589	247,481	256,716	266,310	276,276	286,633
Tax Revenues at 0% Tax Rate Increase		9,796,215	10,713,384	11,716,423	12,813,371	14,013,021	15,324,989	16,759,789	18,328,921	20,044,964	21,921,671	23,974,085	24,864,208	25,788,616	26,748,426	27,745,422	28,780,743	29,856,300	30,973,565	32,134,790
Additional Increase in Tax Levy		821,609	898,532	982,657	1,074,658	1,175,273	1,285,307	1,405,644	1,537,247	1,681,172	1,838,571	668,342	694,380	721,222	749,515	778,605	809,246	840,990	874,591	908,805
Impact of Additional Increase in Tax Levy on Tax Bills		8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%
Annual % Increase Required																				
Water Revenues		8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	3.5%	3.5%	3.5%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%
Wastewater Revenues		7.1%	7.1%	7.1%	7.1%	7.1%	7.1%	7.1%	7.1%	7.1%	7.1%	3.5%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%