Asset Management Plan – Core Assets

Village of Merrickville-Wolford

Watson & Associates Economists Ltd.
905-272-3600
info@watsonecon.ca

December 7, 2021

The preparation of this project was carried out with assistance from the Government of Canada and the Federation of Canadian Municipalities. Notwithstanding this support, the views expressed are the personal views of the authors, and the Federation of Canadian Municipalities and the Government of Canada accept no responsibility for them.

Table of Contents

Page

1. Introduction 1-1
1.1 Overview 1-1
1.2 Legislative Context for the Asset Management Plan 1-3
1.3 Asset Management Plan Development 1-4
1.4 Maintaining and Integrating the Asset Management Plan 1-5

2. State of Local Infrastructure and Levels of Service 2-1
2.1 Introduction 2-1
2.2 Transportation Services 2-1
2.2.1 State of Local Infrastructure 2-1
2.2.2 Condition 2-7
2.2.3 Current Levels of Service 2-15
2.3 Water Service 2-19
2.3.1 State of Local Infrastructure 2-19
2.3.2 Condition 2-20
2.3.3 Current Levels of Service 2-22
2.4 Wastewater Service 2-24
2.4.1 State of Local Infrastructure 2-24
2.4.2 Condition 2-25
2.4.3 Current Levels of Service 2-27
2.5 Stormwater Service 2-29
2.5.1 State of Local Infrastructure 2-29
2.5.2 Condition 2-30
2.5.3 Current Levels of Service 2-30
2.6 Population and Employment Growth 2-32

3. Lifecycle Management Strategy 3-1
3.1 Introduction 3-1
3.2 Transportation Services 3-1
3.2.1 Managing Roads, Bridges, and Structural Culverts 3-1

Table of Contents (Cont'd)

Page

3.2.2 Estimating Long-run Needs 3-2
3.2.3 Average Annual Lifecycle Costs and Long-run Forecast 3-4
3.3 Water 3-7
3.3.1 Managing Water Assets 3-7
3.3.2 Estimating Long-run Needs 3-8
3.3.3 Average Annual Lifecycle Costs and Long-run Forecast 3-9
3.4 Wastewater 3-10
3.4.1 Managing Wastewater Assets 3-10
3.4.2 Estimating Long-run Needs 3-11
3.4.3 Average Annual Lifecycle Costs and Long-run Forecast 3-11
3.5 Stormwater 3-13
3.5.1 Managing Stormwater Assets 3-13
3.5.2 Estimating Long-run Needs 3-13
3.5.3 Average Annual Lifecycle Costs and Long-run Forecast 3-13

4. Financial Summary 4-1
4.1 Introduction 4-1
4.2 Annual Contribution and Lifecycle Funding Target 4-1
4.3 Future Improvements 4-3

Appendix A Technical Appendix A-1

List of Acronyms and Abbreviations

Acronym	Full Description of Acronym
AC	Asbestos Cement
BCI	Bridge Condition Index
CCTV	Closed-circuit Television
C.I.R.C.	Canadian Infrastructure Report Card
G/S	Gravel
HCB	High-class Bituminous
IJPA	Infrastructure for Jobs and Prosperity Act, 2015
LCB	Low-class Bituminous
OCWA	Ontario Clean Water Agency
O. Reg.	Ontario Regulation
OSIM	Ontario Structure Inspection Manual
PCI	Pavement Condition Index
PSAB	Public Sector Accounting Board
ULC%	Useful Life Consumption Percentage
VFD	Variable Frequency Drive

Report

Chapter 1
Introduction

1. Introduction

1.1 Overview

The main objective of an asset management plan is to use a municipality's best available information to develop a comprehensive long-term plan for capital assets. In addition, the plan should provide a sufficiently documented framework that will enable continuous improvement and updates of the plan, to ensure its relevancy over the long term.

The Village of Merrickville-Wolford (Municipality) retained Watson & Associates Economists Ltd. (Watson) to update the Municipality's 2014 Asset Management Plan. With this update, the intent is to bring the Municipality's asset management plan into compliance with the July 1, 2022 requirements of Ontario Regulation (O. Reg.) 588/17. It is intended to be a tool for the Municipal's staff and Council to use during various decision-making processes, including the annual budgeting process and future capital grant application processes.

The assets included in this iteration of the asset management plan are the core municipal assets which fall into the following broad asset categories:

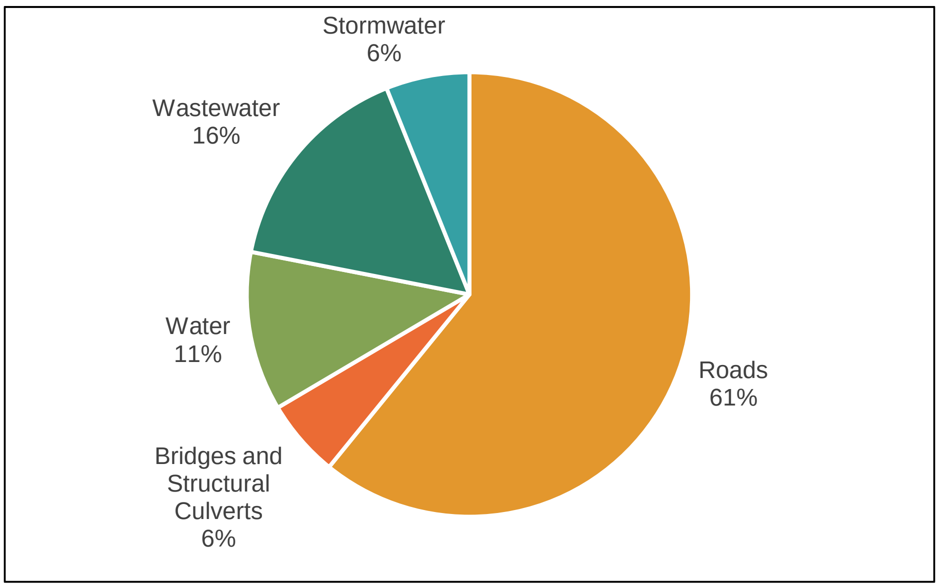
- Roads;
- Bridges and structural culverts;
- Water treatment, pumping, and distribution;
- Wastewater treatment, pumping, and collection; and
- Stormwater collection.

Core assets and their replacement costs are shown in Table 1-1. Figure 1-1 shows the distribution of replacement value by asset class. Roads account for well over half the replacement value (61%), followed by wastewater (16%), water (11%), stormwater (6%), and lastly bridges and structural culverts (6%).

Table 1-1: Asset Classes and Replacement Cost (2021$)

Asset Class	Replacement Cost
Roads	$54,310,000
Bridges and Structural Culverts	$5,040,000
Water	$10,120,000
Wastewater	$14,150,000
Stormwater	$5,420,000
Total	**$89,030,000**

Figure 1-1: Distribution of Replacement Value by Asset Class



The Municipality's goals and objectives with respect to asset management are identified in the Municipality's Strategic Asset Management Policy, which was adopted by Council on May 27, 2019 via By-law No. 31-2019. A major theme within that policy is for the Municipality's physical assets to be managed in a manner that will support the sustainable provision of municipal services to residents. Through the implementation of the asset management plan, the Municipality's practice should evolve to be responsive to the levels of service that are being achieved. Moreover, infrastructure and other capital assets should be maintained at condition levels that provide a safe and functional environment for the Municipality's residents. Therefore, the asset management plan and the progress with respect to its implementation will be evaluated based on the Municipality's ability to meet these goals and objectives.

1.2 Legislative Context for the Asset Management Plan

Asset management planning in Ontario has evolved significantly over the past decade.

Before 2009, capital assets were recorded by municipalities as expenditures in the year of acquisition or construction. The long-term issue with this approach was the lack of a capital asset inventory, both in the municipality's accounting system and financial statements. As a result of revisions to section 3150 of the Public Sector Accounting Board (PSAB) handbook, effective for the 2009 fiscal year, municipalities were required to capitalize tangible capital assets, thus creating an inventory of assets.

In 2012, the Province launched the Municipal Infrastructure Strategy. As part of that initiative, municipalities and local service boards seeking provincial funding were required to demonstrate how any proposed project fits within a detailed asset management plan. In addition, asset management plans encompassing all municipal assets needed to be prepared by the end of 2016 to meet Federal Gas Tax agreement requirements. To help define the components of an asset management plan, the Province produced a document entitled Building Together: Guide for Municipal Asset Management Plans. This guide documented the components, information, and analysis that were required to be included in municipal asset management plans under this initiative.

The Province's *Infrastructure for Jobs and Prosperity Act, 2015* (IJPA) was proclaimed on May 1, 2016. This legislation detailed principles for evidence-based and sustainable long-term infrastructure planning. IJPA also gave the Province the authority to guide municipal asset management planning by way of regulation. In late 2017, the Province introduced O. Reg. 588/17 under IJPA. The intent of O. Reg. 588/17 is to establish standard content for municipal asset management plans. Specifically, the regulations require that asset management plans be developed that define the current levels of service, identify the lifecycle activities that would be undertaken to achieve these levels of service, and provide a financial strategy to support the levels of service and lifecycle activities.

This plan has been developed to address the July 1, 2022 requirements of O. Reg. 588/17. It utilizes the best information available to the Municipality at this time.

1.3 Asset Management Plan Development

This asset management plan was developed using an approach that leverages the Municipality's asset management principles as identified within its strategic asset management policy, capital asset database information, and staff input.

The development of the Municipality's asset management plan is based on the steps summarized below:

1. Compile available information pertaining to the Municipality's capital assets to be included in the plan, including attributes such as size, material type, useful life, age, and current replacement cost valuation. Update the current replacement cost valuation, where required, using benchmark costing data or applicable inflationary indices.

2. Define and assess current asset conditions, based on a combination of input from the Municipality's staff, existing background reports and studies (e.g., 2021 Bridge Inspection Report, 2021 Road Needs Study), and an asset age-based condition analysis.

3. Define and document current levels of service based on analysis of available data and consideration of various background reports.

4. Develop lifecycle management strategies that identify the activities required to sustain the levels of service discussed above. The outputs of these strategies are summarized in the forecast of annual capital and operating expenditures required to achieve these levels of service outcomes.

5. Develop a financial summary of the expected costs arising from the lifecycle management strategy. The financial summary compares expected capital expenses to current capital funding.

6. Document the asset management plan in a formal report to inform future decision-making and to communicate planning to municipal stakeholders.

1.4 Maintaining and Integrating the Asset Management Plan

To comply with the July 1, 2024 and July 1, 2025 requirements of O. Reg. 588/17, this plan will need to be expanded to cover all assets, to have targets set for levels of service performance measures, and to include a detailed financial strategy. Further integration into other municipal financial and planning documents would assist in ensuring the ongoing accuracy of the asset management plan, as well as the integrated financial and planning documents.

The asset management plan is a snapshot in time and is based on a number of assumptions regarding expected lifecycles and future performance of assets, lifecycle intervention costs, among others. The Municipality will need to establish processes for reviewing and updating these assumptions on a regular basis to keep the plan relevant.

Chapter 2

State of Local Infrastructure and Levels of Service

2. State of Local Infrastructure and Levels of Service

2.1 Introduction

This chapter provides an analysis of the Municipality's assets and the current service levels provided by those assets.

O. Reg. 588/17 requires that for each asset category included in the asset management plan, the following information must be identified:

- Summary of the assets;
- Replacement cost of the assets;
- Average age of the assets (it is noted that the regulation specifically requires average age to be determined by assessing the age of asset components);
- Information available on condition of assets; and
- Approach to condition assessments (based on recognized and generally accepted good engineering practices where appropriate).

Asset management plans must identify the current levels of service being provided for each asset category. For core municipal infrastructure assets, both the qualitative descriptions pertaining to community levels of service and metrics pertaining to technical levels of service are prescribed by O. Reg. 588/17.

The rest of this chapter addresses the requirements identified above, with each section focusing on a service.

2.2 Transportation Services

2.2.1 State of Local Infrastructure

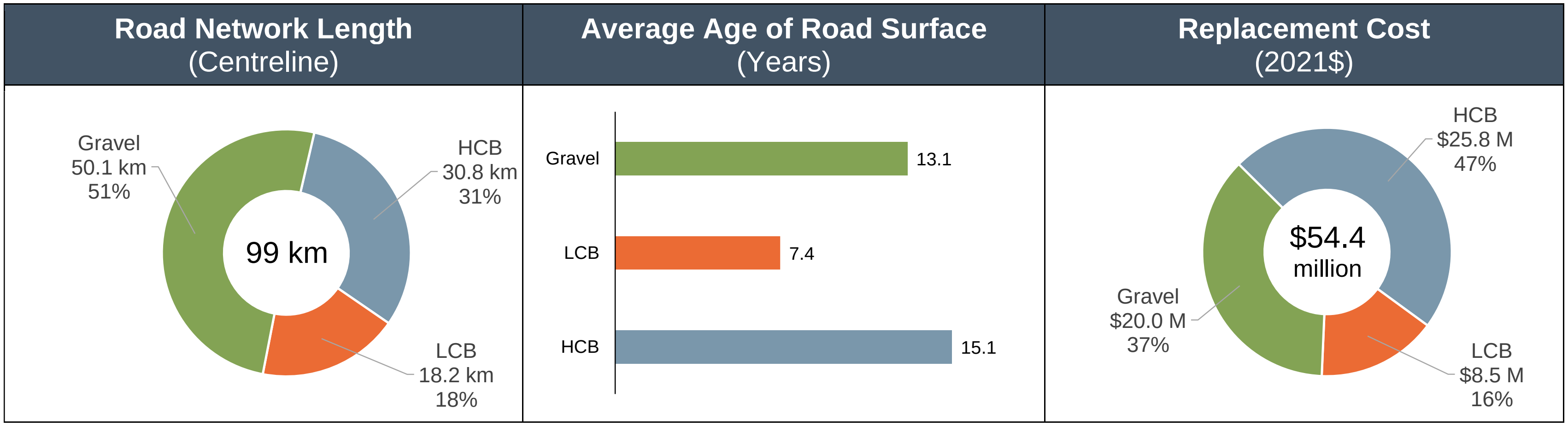
The core assets that support the Municipality's transportation services are roads, bridges, and structural culverts. Other transportation assets such as signs and streetlights are not included in this plan because they are not considered core assets in O. Reg. 588/17.

The road network consists of roads with various surface types, including high-class bituminous (HCB), low-class bituminous (LCB), and gravel (G/S). The estimated replacement cost of roads is $54.3 million. Table 2-1 provides a breakdown of the road network by surface type showing centreline length, average ages of the surface, and replacement cost. Figure 2-1 illustrates the data in Table 2-1 visually. Map 2-1 provides a spatial illustration of the Municipality's road network and its extent.

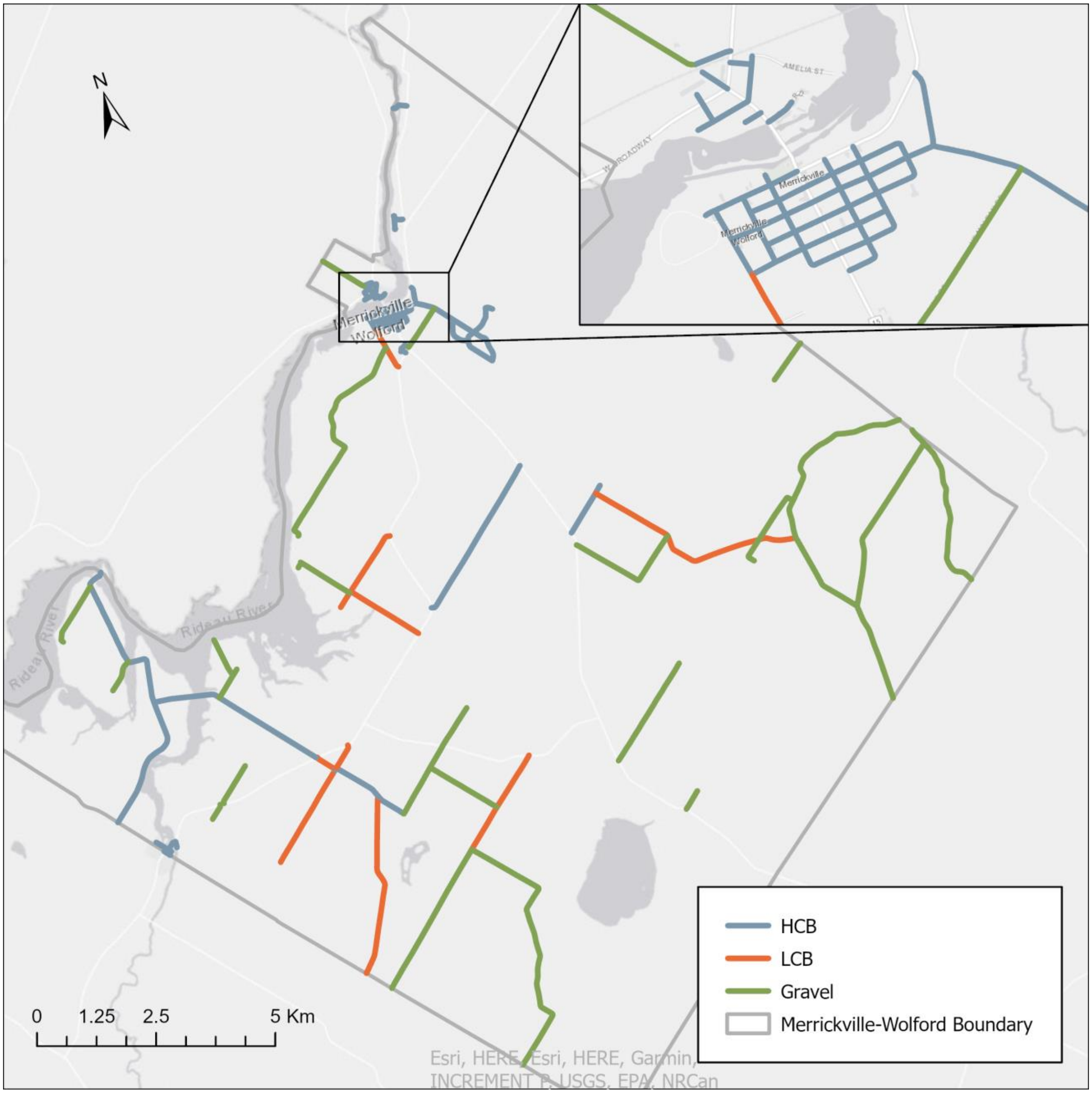
Table 2-1: Road Network – Summary of Length, Age, and Replacement Cost by Surface Type

Surface Type	Centreline-Kilometres	Average Age – Surface	Replacement Cost (2021$)
HCB	30.8	15.1	$25,840,000
LCB	18.2	7.4	$8,470,000
Gravel	50.1	13.1	$20,000,000
Total	**99.1**	**12.4**	**$54,310,000**

Figure 2-1: Road Network Asset Summary Information



Map 2-1: Roads by Surface Type

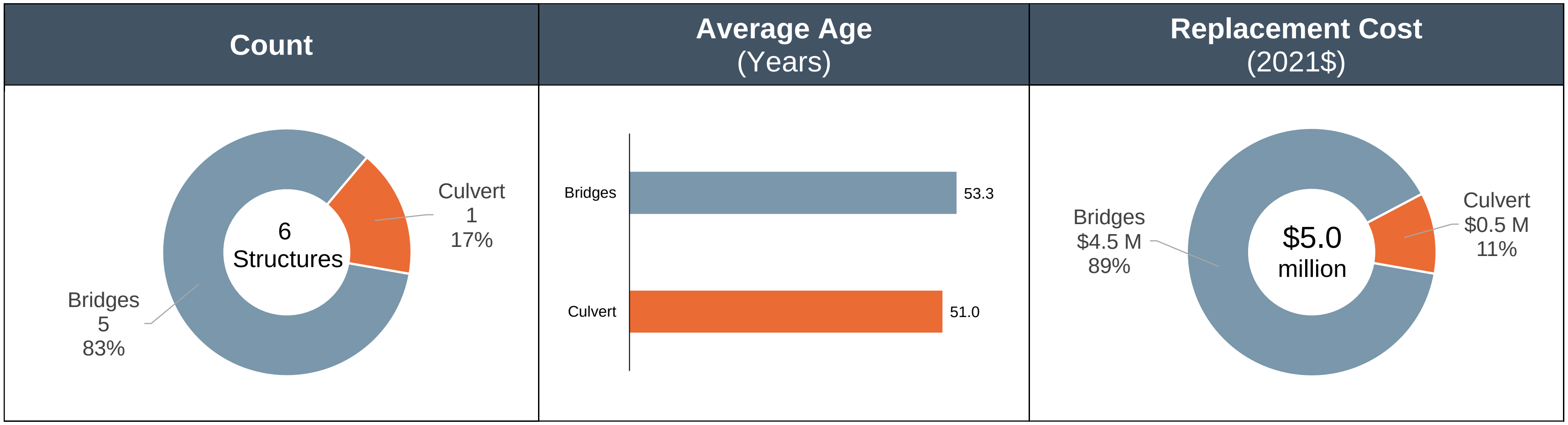


The Municipality has five bridges and one structural culvert, with an estimated combined replacement cost of $5.0 million. The average age of the bridges is 53 years, and the age of the one structural culvert is 51 years. Table 2-2 provides counts, average ages, and replacement costs for bridges and structural culverts. Figure 2-2 illustrates the data in Table 2-1 visually. Map 2-2 provides a spatial illustration of the Municipality's bridges and structural culverts.

Table 2-2: Bridges and Structural Culverts - Summary of Counts, Age, and Replacement Cost by Structure Type

Structure Type	Count	Average Age	Replacement Cost (2021$)
Bridges	5	53.3	$4,510,000
Culvert	1	51.0	$530,000
Total	**6**	**53.0**	**$5,040,000**

Figure 2-2: Bridge and Structural Culvert Summary Information



Map 2-2: Bridges and Structural Culverts

2.2.2 Condition

The condition of the Municipality's paved roads was assessed by StreetScan Inc. in 2020. Each road segment was assigned a condition rating using the Pavement Condition Index (PCI). It is a scale from 0 to 100, with 100 being an asset in as-new condition and 0 being a failed asset.

To better communicate the condition of the paved road network, the numeric condition ratings for paved roads have been segmented into qualitative condition states. Moreover, descriptions and photos of roads in these condition states are provided to better communicate the condition to the reader. Table 2-3 summarizes the various physical condition ratings and the condition state they represent for road assets.

Table 2-3: Road Condition States Defined with Respect to Pavement Condition Index

PCI Ranges	Condition State	Example Photo	Description[1]
85 < PCI ≤ 100	**Excellent**		A very smooth ride. Pavement is in excellent condition with few cracks.
70 < PCI ≤ 85	**Good**		A smooth ride with just a few bumps or depressions. The pavement is in good condition with frequent very slight or slight cracking.
55 < PCI ≤ 70	**Fair**		A comfortable ride with intermittent bumps or depressions. The pavement is in fair condition with intermittent moderate and frequent slight cracking, and with intermittent slight or moderate alligatoring and distortion.
40 < PCI ≤ 55	**Poor**		An uncomfortable ride with frequent to extensive bumps or depressions. Cannot maintain the posted speed at the lower end of the scale. The pavement is in poor to fair condition with frequent moderate cracking and distortion, and intermittent moderate alligatoring.

[1] Descriptions are from "SP-024 Manual for Condition Rating of Flexible Pavements" (Ontario Ministry of Transportation, 2016).

PCI Ranges	Condition State	Example Photo	Description[1]
25 < PCI ≤ 40	**Very Poor**		A very uncomfortable ride with constant jarring bumps and depressions. Cannot maintain the posted speed and must steer constantly to avoid bumps and depressions. The pavement is in poor condition with moderate alligatoring and extensive severe cracking and distortion.
10 < PCI ≤ 25	**Serious**		The pavement is in poor to very poor condition with extensive severe cracking, alligatoring and distortion.
0 ≤ PCI ≤ 10	**Failed**	No Municipality roads in this condition state	

The condition of the Municipality's gravel roads was assessed by the Municipality's staff based on their experience and observations. Each segment of gravel roads was assigned a rating on a three-point scale: good (3), fair (2), poor (1).

Table 2-4 shows the average condition of roads by surface type, with averages weighted based on centreline-kilometres. On average, each road surface type is in the Fair condition state. Figure 2-3 and Figure 2-4 show the overall distribution of road condition for the Municipality. Map 2-3 provides a spatial illustration of the condition of the Municipality's roads.

Table 2-4: Road Condition Analysis – Paved Roads

Road Surface	Centreline Kilometres	Condition (Weighted Average)	Average Condition State
HCB	30.8	58	**Fair**
LCB	18.2	67	**Fair**
Gravel	50.1	2.2	**Fair**
Total	**99.1**	**Not Applicable**	**Not Applicable**

Figure 2-3: Distribution of Paved Road Centreline Length by Condition State

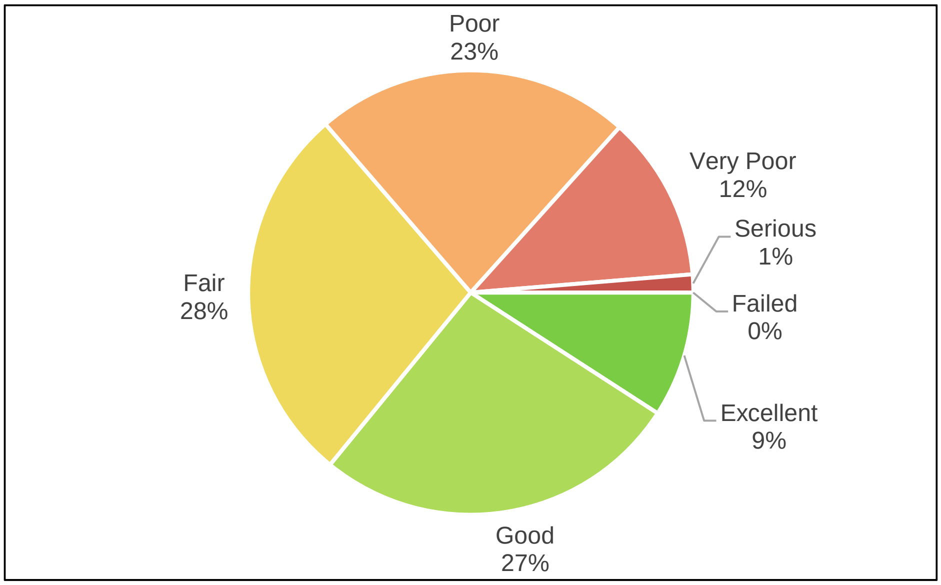
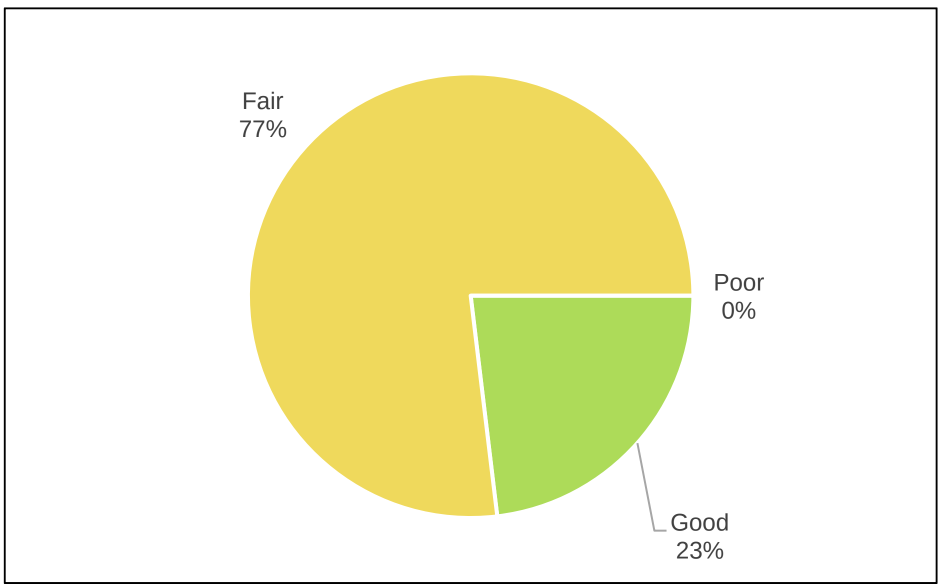
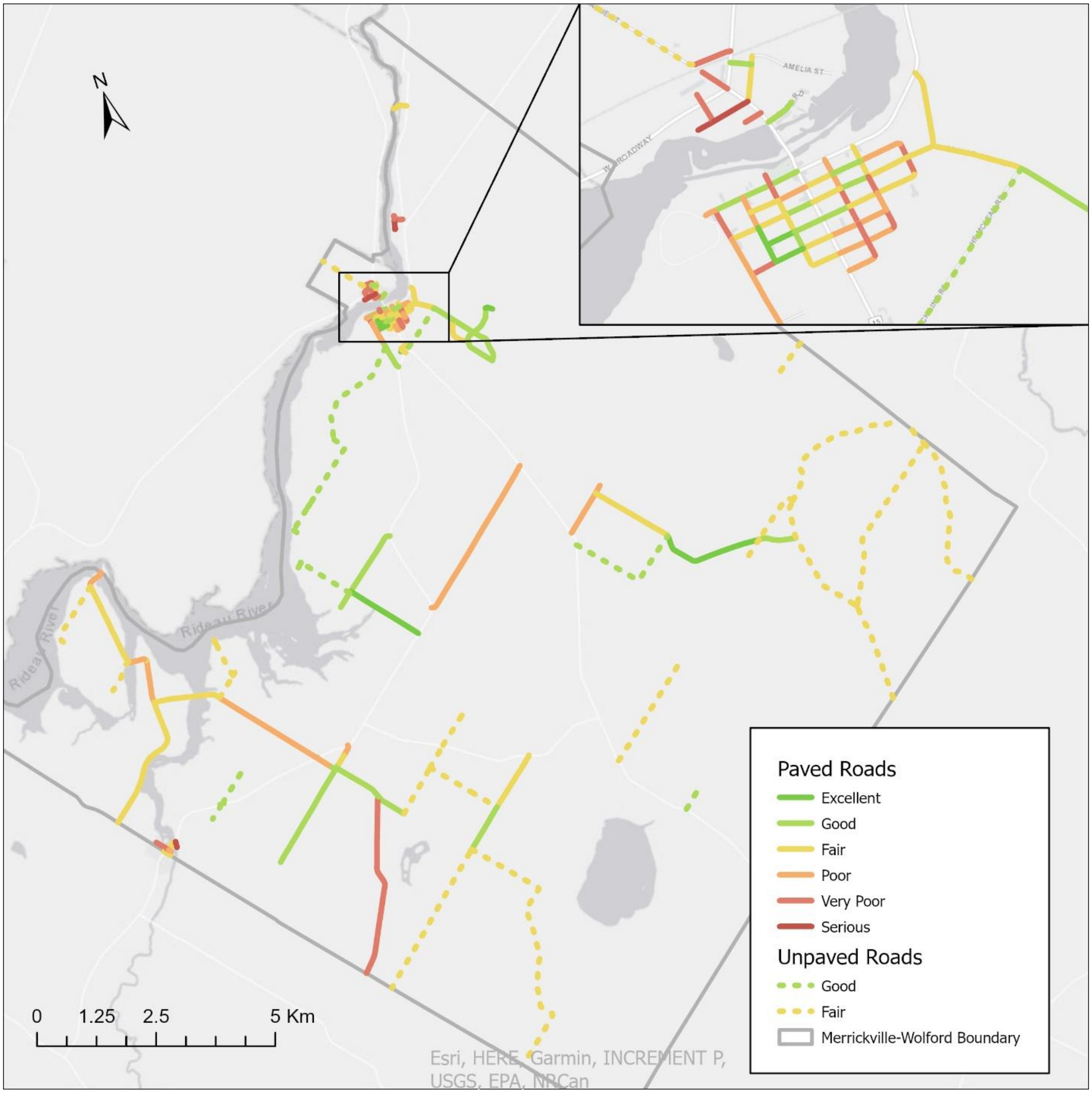


Figure 2-4: Distribution of Gravel Road Centreline Length by Condition State



Map 2-3: Roads by Condition State



The condition of the Municipality's bridges and structural culverts was assessed by Keystone Bridge Management Corp in 2021. The assessment was completed as part of the biennial inspections required by O. Reg. 104/97, following the Ontario Structure Inspection Manual (OSIM). Each bridge and structural culvert was assigned a Bridge Condition Index (BCI). The BCI is on a scale of 0 to 100, with 100 being an asset in as-new condition and 0 being a failed asset. Similar to the analysis for roads described above, the numeric condition ratings for bridges and structural culverts have been segmented into qualitative condition states. Photographs and descriptions of these condition states are provided to better communicate the condition to the reader. Table 2-5 summarizes the BCI ratings and the condition state they represent.

Table 2-5: Examples and Descriptions of Bridge and Culvert Condition States

Condition State	Bridge Photos	Culvert Photos	Description[1]
Good 70 < BCI ≤ 100		No Municipality culverts in this condition state	Maintenance is not usually required within the next five years.
Fair 60 < BCI ≤ 70	No Municipality bridges in this condition state		Maintenance work is usually scheduled within the next five years. This is the ideal time to schedule major bridge repairs to get the most out of bridge spending.
Poor 0 < BCI ≤ 60	No Municipality bridges in this condition state	No Municipality culverts in this condition state	Maintenance work is usually scheduled within one year. Structure may be at increased risk of requiring a loading restriction to be posted.

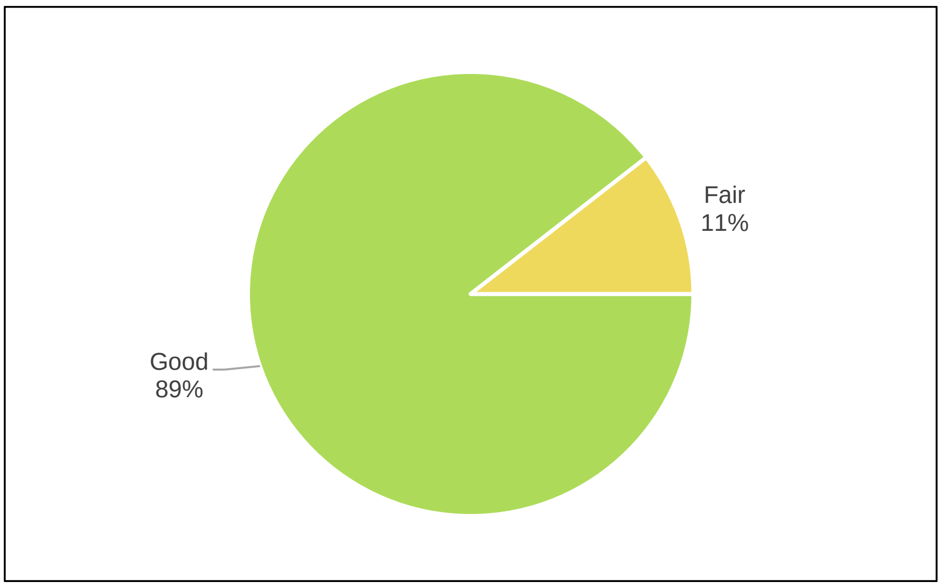
[1] Descriptions are based on descriptions in "Ontario Structure Inspection Manual" (Ontario Ministry of Transportation, 2008).

The average BCI ratings and corresponding condition states for bridges and structural culverts are summarized in Table 2-6 below. On average, the bridges are in the Good condition state and the one culvert is in the Fair condition state. Combined, bridges and structural culverts are in the Good condition state on average. Figure 2-5 shows the overall distribution of condition for the Municipality. Map 2-4 provides a spatial illustration of the condition of the Municipality's bridges and structural culverts.

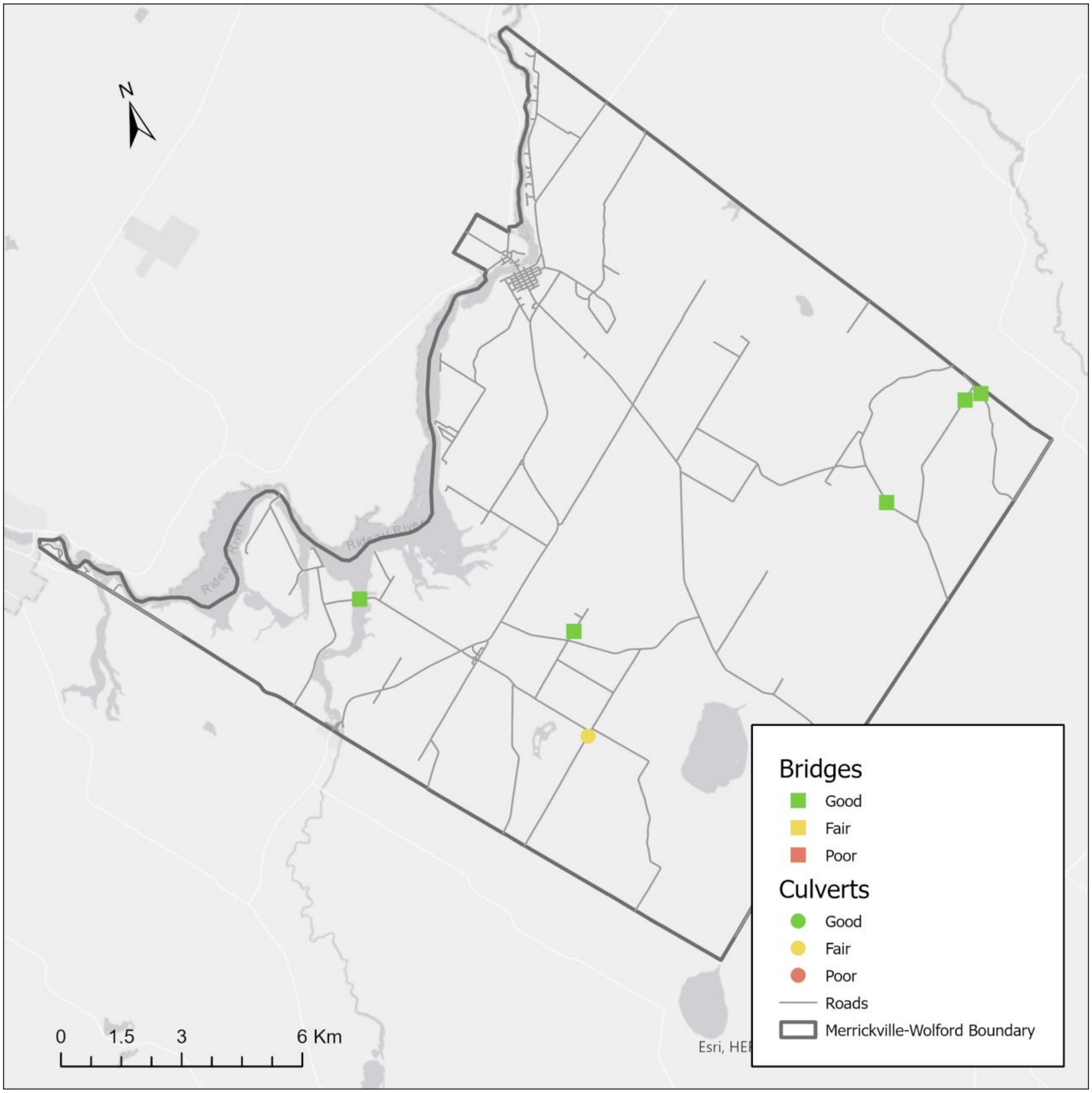
Table 2-6: Bridges and Structural Culverts Condition Analysis

Structure Type	Count	Average Condition	Average Condition State
Bridges	5	72.1	**Good**
Culverts	1	62.9	**Fair**
Total	**6**	**71.1**	**Good**

Figure 2-5: Distribution of Bridges and Structural Culverts Replacement Cost by Condition State



Map 2-4: Bridges and Structural Culverts by Condition



2.2.3 *Current Levels of Service*

The levels of service currently provided by the Municipality's transportation system are, in part, a result of the state of local infrastructure identified above. A levels of service analysis defines the current levels of service that will be tracked over time. In future iterations of the asset management plan, targets will be set for the technical levels of service.

There are prescribed levels of service reporting requirements under O. Reg. 588/17 for some transportation assets (i.e., roads, bridges and culverts). Table 2-7 and Table 2-8 include the prescribed technical levels of service along with additional levels of service developed by the Municipality. The levels of service measures were developed through identification of service aspects that are of interest to the users of transportation assets.

The tables are structured as follows:

- The Service Attribute headings and columns indicate the high-level attribute being addressed;
- The Community Levels of Service column in Table 2-7 explains the Municipality’s intent in plain language;
- The Performance Measure column in Table 2-8 describes a performance measure connected to the identified service attribute; and
- The 2020 Performance column in Table 2-8 reports current performance for the performance measure.

Table 2-7: Community Levels of Service – Transportation

Service Attribute	Community Levels of Service
Scope	The Municipality’s transportation assets enable the movement of people and goods within the Municipality and provide connectivity to regional roads. The Municipality’s transportation assets also support tourism and through traffic from neighbouring municipalities. In addition to passenger traffic, the Municipality’s transportation assets also support commercial and industrial truck traffic, movement of agricultural equipment, shipping and receiving of agricultural products, and provide reliable emergency vehicle access to all areas of the Municipality. Transportation assets also support other transportation modes such as walking and cycling.
	The scope of the Municipality’s transportation assets is illustrated in Map 2-1 and Map 2-2. The maps show the geographical distribution of roads and identify locations of the Municipality’s bridges and structural culverts.
Quality	The Municipality strives to maintain road and bridge surfaces to a level such that they support an adequate travel experience for road users.
	Photos of roads, bridges and structural culverts in different condition states are shown in Table 2-3 and Table 2-5. A general description of how each condition state may affect the use of these assets is also provided in these tables.
Affordability/ Cost	The Municipality strives to deliver transportation services efficiently and at a cost that is acceptable to Municipality taxpayers.
Reliability	The Municipality endeavours to provide transportation services with minimal interruptions.

Table 2-8: Technical Levels of Service – Transportation

Service Attribute	Performance Measure	2020 Performance
Scope	Number of lane-kilometres of arterial roads as a proportion of square kilometres of land area of the Municipality.	Not applicable
	Number of lane-kilometres of collector roads as a proportion of square kilometres of land area of the Municipality.	Not applicable
	Number of lane-kilometres of local roads as a proportion of square kilometres of land area of the Municipality.	0.92 lane-km/km²
	Percentage of bridges in the Municipality with loading or dimensional restrictions.	20%
Quality	For paved roads in the Municipality, the average pavement condition index value.	61
	Centreline-kilometres of paved roads in condition state of Poor or worse (PCI less than 40).	6.2 km
	For unpaved roads in the Municipality, the average surface condition.	Fair
	Centreline kilometres of gravel roads in Poor condition state.	0 km
	For bridges in the Municipality, the average bridge condition index value.	73.3
	For structural culverts in the Municipality, the average bridge condition index value.	62.9
Affordability/ Cost	For paved roads, average annual lifecycle capital cost per centreline-kilometre.	$16,123
	For paved roads, average annual lifecycle capital cost per household.	$568
	Maintenance cost per centreline-kilometre.	
Reliability	Number of unplanned road closures.	0

2.3 Water Service

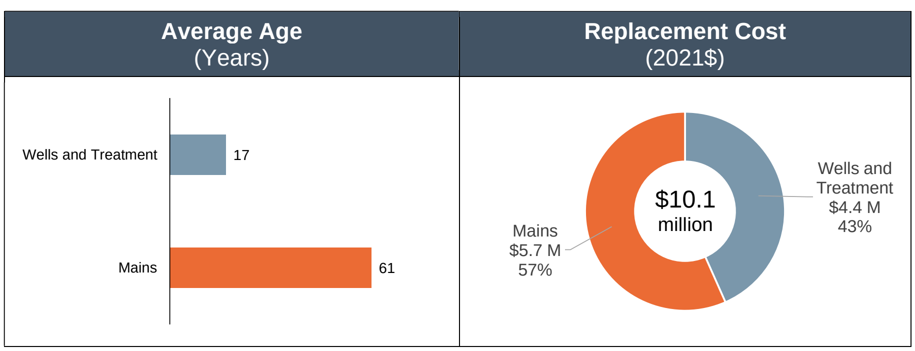
2.3.1 State of Local Infrastructure

The Municipality's water system serves the Village of Merrickville. It is comprised of three wells with associated treatment and pumping and approximately 5.8 km of water mains. The current replacement cost of the system is approximately $10.1 million. Table 2-9 provides a summary of the assets with quantity, average age where available, and replacement cost. Figure 2-6 illustrates the data in Table 2-9 visually.

Table 2-9: Water System – Summary of Quantities, Age, and Replacement Cost by Asset Type

Asset Type	Quantity	Average Age	Replacement Cost (2021$)
Wells and Treatment	1 facility	Approximately 17 years[1]	$4,390,000
Water Mains	8.2 km	61 years	$5,730,000
Total		**42**	**$10,120,000**

Figure 2-6: Water System Summary Information



[1] The age estimate for wells and treatment is based on the Municipality's 2019 Tangible Capital Asset schedule. This data captures the date of initial construction of the wells and treatment assets but does not account for components that have been replaced since construction.

2.3.2 Condition

The condition of the Municipality's water mains has not been directly assessed through a physical condition assessment. For the purposes of this asset management plan, water main age has been used as a proxy for the condition state. The measure used is the Useful Life Consumption Percentage (ULC%) based on each water main's age and the average life expectancy for the water main, based on industry best practices and discussions with the Municipality's staff. A brand-new water main would have a ULC% of 0%, indicating that zero per cent of the water main's life expectancy has been utilized. On the other hand, a water main that has reached its life expectancy would have a ULC% of 100%. It is possible for water mains to have a ULC% greater than 100%, which occurs if a water main has exceeded its typical life expectancy but continues to be in service. This is not necessarily a cause for concern; however, it must be recognized that water mains that are near or beyond their typical life expectancy are expected to require replacement in the near term.

To better communicate the condition of the network, the ULC% ratings have been segmented into qualitative condition states as summarized in Table 2-10. The scale is designed such that if water mains are replaced around the expected useful life, they would have a rating of Fair at time of replacement.[1] The rating of Fair extends to 140% of useful life consumption. If an asset is allowed to age beyond 140% of its typical life expectancy, the probability of failure is assumed to have increased to a point where performance would be characterized as Poor and eventually Very Poor.

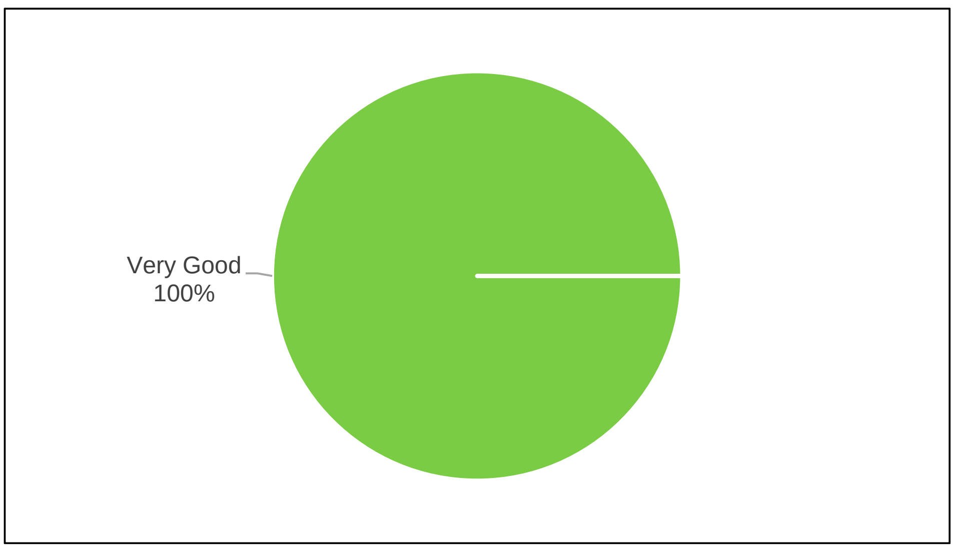
[1] Scale is based on guidance in the International Infrastructure Management Manual (Institute of Public Works Engineering Australasia, 2015).

Table 2-10: Water Asset Condition States Defined with Respect to ULC%

ULC%	Condition State
0% ≤ ULC% ≤ 45%	**Very Good**
45% < ULC% ≤ 90%	**Good**
90% < ULC% ≤ 140%	**Fair**
140% < ULC% ≤ 200%	**Poor**
200% < ULC%	**Very Poor**

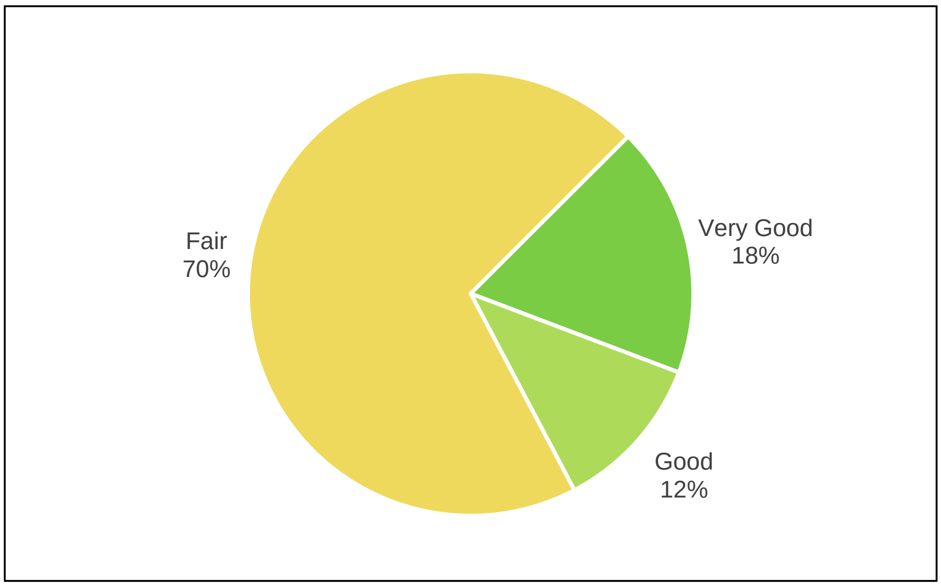
Data on component ages of wells and treatment assets is incomplete. It is known, however, that no components are older than 17 years because the facilities were installed on or after 2004. As a preliminary estimate, these assets will be assessed as being in the Very Good condition state by comparing the maximum age of 17 years to the accounting lifespan of 40 years currently being used by the Municipality. This gives the assets a maximum ULC% of 43%, which is in the Very Good condition state. Figure 2-7 illustrates this result, showing the full replacement cost being in the Very Good condition state. The use of the facility average lifespan of 40 years could result in shorter lived assets being evaluated as being in better condition than they actually are, making this assessment overly optimistic.

Figure 2-7: Distribution of Wells and Treatment Asset Replacement Costs by Condition State



Data on the installation dates of water mains is complete. On average, the distribution system has a ULC% of 76% which corresponds with the Good condition state. The distribution of water main length by condition state is presented in Figure 2-8 below. A majority of the Municipality's water distribution system dates back to the late 1940s. Based on an estimated useful life of 80 years, over two-thirds of the water distribution system (70% or 5.8 km) is nearing the end of its useful life, with a corresponding condition rating of Fair. Approximately 12% (0.9 km) of the water distribution system dates back to the 1960s and therefore has been assigned a condition rating of Good. The remaining 18% (1.5 km) of the water distribution system is rated as Very Good, largely due to replacements of water mains that occurred around 1995, 1998 and more recently 2008 and 2009.

Figure 2-8: Distribution of Water Main Length by Condition State



2.3.3 Current Levels of Service

The levels of service currently provided by the Municipality's water system are, in part, a result of the state of local infrastructure identified above. A levels of service analysis defines the current levels of service that will be tracked over time. In future iterations of the asset management plan, targets will be set for the technical levels of service.

Water assets have prescribed levels of service reporting requirements under O. Reg. 588/17. These requirements include levels of service reporting at two different levels, i.e., community levels of service and technical levels of service. Community levels of service objectives describe service levels in terms that customers understand and reflect customers' expectations with respect to the scope, reliability, affordability, and efficiency of the water system. Technical levels of service describe these aspects of the Municipality's water system through performance measures that can be quantified and evaluated. These performance measures can be used to assess how effectively a municipality is achieving its established targets.

Table 2-11 and Table 2-12 present the current levels of service for water. They include the requirements mandated by O. Reg. 588/17 and additional performance measures of interest to the Municipality.

Table 2-11: Community Levels of Service – Water

Service Attribute	Community Levels of Service
Scope	The water system provides potable water for residential, business, and institutional consumption, as well as maintenance operations, and firefighting in the urban area.
	The water system serves the urban areas of the Village of Merrickville both north and south of the Rideau River.
Reliability	The water system is managed with the goal of providing safe and reliable delivery of water, minimizing service interruptions and occurrences of adverse water quality events (measured by occurrences of boil water advisories).
Affordability	The Municipality aims to deliver water services to customers at a reasonable cost while ensuring long-term financial sustainability of the water system.
Efficiency	The Municipality strives to deliver water services efficiently and sustainably.

Table 2-12: Technical Levels of Service – Water Service

Service Attribute	Performance Measure	2020 Performance
Scope	Percentage of properties connected to the municipal water system.	23%
	Percentage of properties where fire flow is available.	23%
Reliability	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.	0 connection-days/ connection
	The number of connection-days per year lost due to water main breaks compared to the total number of properties connected to the municipal water system.	0.043 connection-days/ connection
Affordability	Typical annual residential water bill, based on annual water consumption of 150 cubic metres.	$740
	Typical annual residential water bill as percentage of median after tax household income.	1.1%
	Percentage of water accounts three months or more in arrears.	3%
Efficiency	Kilowatt-hours of electricity consumption for water treatment and pumping per cubic metre of water produced.	1.35 kWh/m^3

2.4 Wastewater Service

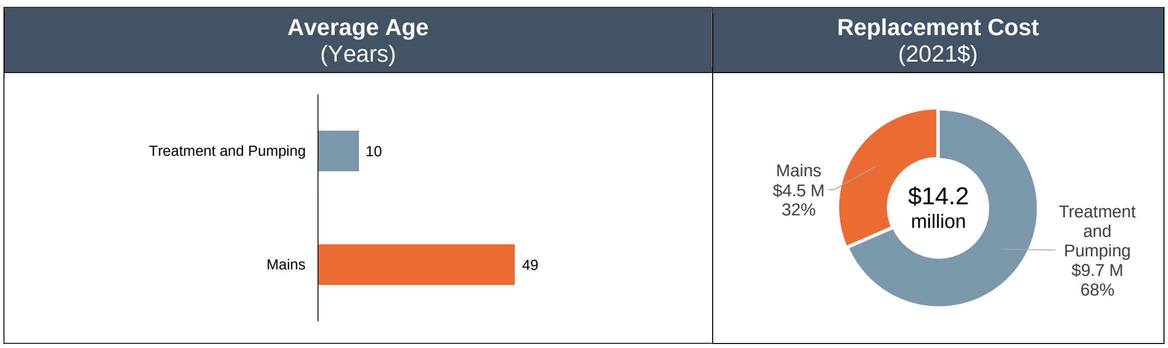
2.4.1 State of Local Infrastructure

The Municipality’s wastewater system serves the urban areas in Village of Merrickville that are south of the Rideau River. It is comprised of a treatment plant, a pumping station, and approximately 5.6 km of mains. The replacement cost of the system is approximately $14.2 million. Asset summary information for the Municipality’s wastewater system, including quantities, average age, and replacement cost by asset type, is presented in Table 2-13 below. Figure 2-9 illustrates the data in Table 2-13 visually.

Table 2-13: Wastewater System - Summary of Quantities, Age, and Replacement Cost by Asset Type

Asset Type	Quantity	Average Age	Replacement Cost (2021$)
Treatment and Pumping	1 treatment facility 1 pumping station	10 years[1]	$9,690,000
Wastewater Mains	5.6 km	49 years	$4,460,000
Total		**22**	**$14,150,000**

Figure 2-9: Wastewater System Summary Information



2.4.2 Condition

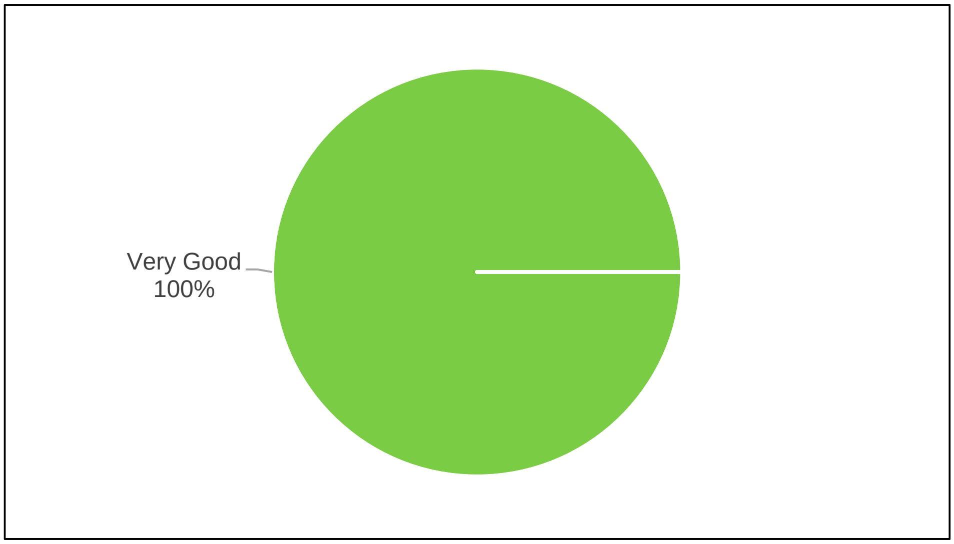
The condition of the Municipality's wastewater mains has not been directly assessed through a physical condition assessment. For the purposes of this asset management plan, wastewater main age has been used as a proxy for the condition state as was done for water mains. The measure used is the ULC% as defined in the water condition section, 2.3.2.

Data on component ages of treatment and pumping assets is incomplete. It is known, however, that no components are older than 10 years because the wastewater treatment plant was replaced in 2011. As a preliminary estimate, these assets will be assessed as being in the Very Good condition state based on the same analysis as was done for water wells and treatment assets. The accounting useful life of 40 years

[1] The wastewater treatment plant was replaced in 2011. Data on replacement dates for facility components replaced over the past 10 years is incomplete.

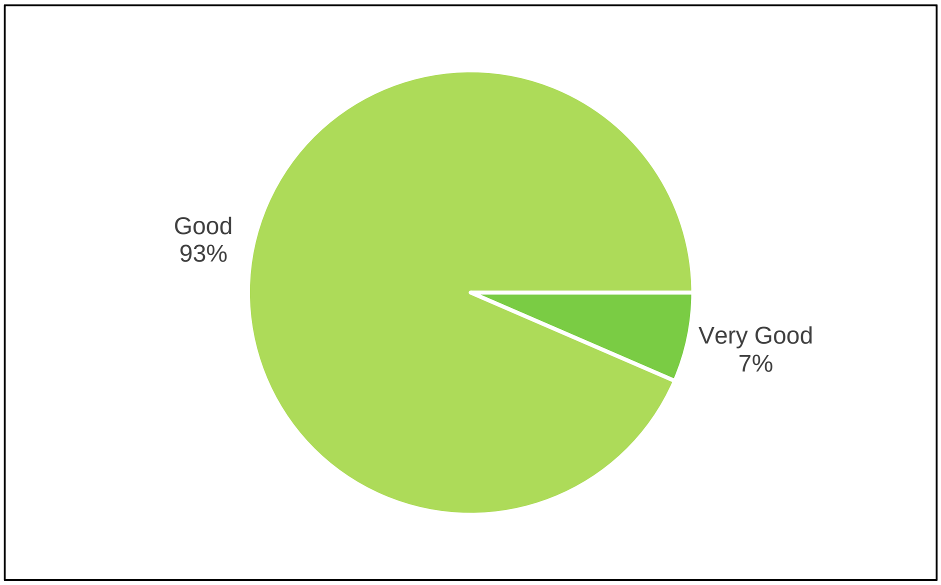
indicates that the wastewater treatment assets are in the first half of their life. Figure 2-10 illustrates this result, showing the full replacement cost being in the Very Good condition state. The use of the facility average lifespan of 40 years could result in shorter lived assets being evaluated as being in better condition than they actually are, making this assessment overly optimistic.

Figure 2-10: Distribution of Treatment and Pumping Asset Replacement Costs by Condition State



Data on the installation dates of wastewater mains is complete. On average, wastewater mains have a ULC% of 61% which is in the Good condition state. Figure 2-11 shows the distribution of wastewater main length by condition state. Most of the Municipality's wastewater collection system was installed in 1970. Based on an estimated useful life of 80 years, most of the water distribution system (93% or 5.3 km) is about two-thirds of the way through its useful life, with a corresponding condition rating of Good. The remaining 7% (0.4 km) of the wastewater collection system is rated as Very Good, largely due to the replacement of wastewater mains that occurred in 2008 and 2010.

Figure 2-11: Distribution of Wastewater Main Length by Condition State



2.4.3 Current Levels of Service

The levels of service currently provided by the Municipality's wastewater system are, in part, a result of the state of local infrastructure identified above. A levels of service analysis defines the current levels of service that will be tracked over time. In future iterations of the asset management plan, targets will be set for the technical levels of service.

Wastewater assets have prescribed levels of service reporting requirements under O. Reg. 588/17. These requirements include levels of service reporting at two different levels, i.e., community levels of service and technical levels of service. Community levels of service objectives describe service levels in terms that customers understand and reflect customers' expectations with respect to the scope, reliability, affordability, and efficiency of the wastewater system. Technical levels of service describe these aspects of the Municipality's wastewater system through performance measures that can be quantified and evaluated. These performance measures can be used to assess how effectively a municipality is achieving its established targets.

Table 2-14 and Table 2-15 present the current levels of service for wastewater. They include the requirements mandated by O. Reg. 588/17 and additional performance measures of interest to the Municipality.

Table 2-14: Community Levels of Service – Wastewater Service

Service Attribute	Community Levels of Service
Scope	The Municipality provides wastewater services to residential, business, and institutional customers in the urban areas of the Village of Merrickville that are south of the Rideau River.
Reliability	The wastewater system is separated, meaning that sanitary and stormwater flows are carried in different pipes with different destinations. Despite this, stormwater can enter the wastewater system through numerous sources. For example, stormwater can enter wastewater mains through cracks in pipe joins.
	The Municipality's Wastewater Treatment Plant discharges effluent into the Rideau River. The Municipality strives to operate the plant at maximum removal efficiencies and within the rated capacity of the facility. The final effluent design objectives are identified in the facility's Environmental Compliance Approval (1121-7YRQLF).
Affordability	The Municipality aims to deliver wastewater services to customers at a reasonable cost while ensuring long-term financial sustainability of the wastewater system.
Efficiency	The Municipality strives to deliver wastewater services efficiently and sustainably.

Table 2-15: Technical Levels of Service – Wastewater Service

Service Attribute	Performance Measure	2020 Performance
Scope	Percentage of properties connected to the municipal wastewater system.	20%
	Septage receiving capacity measured in cubic metres per day.	6.5 m^3/day
Reliability	The number of connection-days lost per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system.	0 connection-days/ connection
	The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system.	0.0025 violations/ connection
	Average annual daily flow as a percentage of treatment capacity.	77%
Affordability	Typical annual residential wastewater bill, based on annual water consumption of 150 cubic metres.	$1,482
	Typical annual residential wastewater bill as a percentage of median after tax household income.	2.1%
	Percentage of wastewater accounts that are in arrears.	2.5%
Efficiency	Kilowatt-hours of electricity consumption for wastewater treatment and pumping per cubic metre of wastewater treated.	1.50 kWh/m^3

2.5 Stormwater Service

2.5.1 State of Local Infrastructure

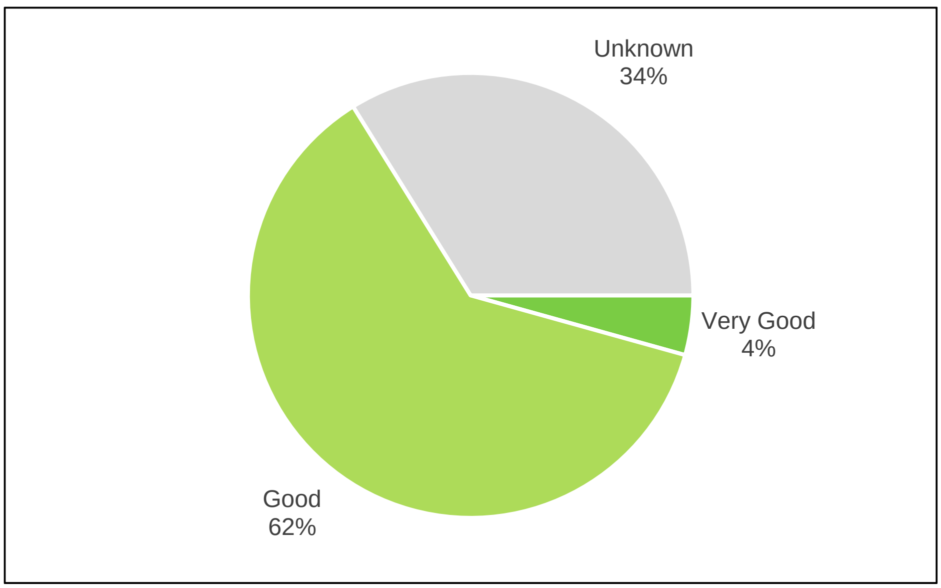
The Municipality's stormwater system serves the Village of Merrickville. It is comprised of 8.5 km of mains and associated catch basins and manholes. The replacement value of the system is approximately $5.4 million. Age data is only available for 65% of the stormwater mains. The average age for mains where the age is known is 48 years.

2.5.2 Condition

The condition of the Municipality's stormwater mains has not been directly assessed through a physical condition assessment. For the purposes of this asset management plan, stormwater main age has been used as a proxy for the condition state as was done for water mains when age is known. The measure used is the (ULC%) as defined in the water condition section, 2.3.2.

On average, stormwater mains with known ages have a ULC% of 48% which is in the Good condition state. Figure 2-12 shows the distribution of stormwater main length by condition state.

Figure 2-12: Distribution of Stormwater Main Length by Condition State



2.5.3 Current Levels of Service

The levels of service currently provided by the Municipality's stormwater system are, in part, a result of the state of local infrastructure identified above. A levels of service analysis defines the current levels of service that will be tracked over time. In future iterations of the asset management plan, targets will be set for the technical levels of service.

Stormwater assets have prescribed levels of service reporting requirements under O. Reg. 588/17. These requirements include levels of service reporting at two different levels, i.e., community levels of service and technical levels of service. Community levels of service objectives describe service levels in terms that customers understand and reflect customers' expectations with respect to the scope and reliability of the stormwater system. Technical levels of service describe these aspects of the Municipality's stormwater system through performance measures that can be quantified and evaluated. These performance measures can be used to assess how effectively a municipality is achieving its established targets.

Table 2-16 and Table 2-17 present the current levels of service for stormwater. They include the requirements mandated by O. Reg. 588/17 and an additional performance measure of interest to the Municipality.

Table 2-16: Community Levels of Service – Stormwater Service

Service Attribute	Community Levels of Service
Scope	The stormwater management system provides for the collection of stormwater in order to protect properties and roads from flooding.
	The stormwater system serves the urban areas of the Village of Merrickville both north and south of the Rideau River.
	The stormwater management system is resilient to 5-year storms and ensures most properties in serviced areas are resilient to 100-year storms.
Reliability	The stormwater system performs as intended most of the time.

Table 2-17: Technical Levels of Service – Stormwater Service

Service Attribute	Performance Measure	2020 Performance
Scope	Percentage of properties in the Municipality resilient to a 100-year storm.	98.4%
	Percentage of the municipal stormwater management system resilient to a 5-year storm.	100%
Reliability	Percentage of catch basins inspected and cleaned out annually.	100%

2.6 Population and Employment Growth

Based on the 2021 Official Plan for the United Counties of Leeds and Grenville, the Municipality had a population of approximately 3,010 in 2021 and the Municipality's population is anticipated to reach 3,100 by 2031. This represents a growth rate of 0.3% per year.

Continued population growth may result in incremental service demands that would impact levels of service. If needed, the Municipality would address these pressures through established planning processes such as development of master plans for specific services. If future master planning studies identify the need for new infrastructure and/or upgrades of existing infrastructure to accommodate future population growth, the Municipality should consider the option of imposing development charges. Utilizing development charges would ensure that the effects of future population growth do not increase the cost of maintaining levels of service for existing taxpayers.

Chapter 3
Lifecycle Management Strategy

3. Lifecycle Management Strategy

3.1 Introduction

This chapter details the lifecycle management strategies required to maintain the current levels of service presented in Chapter 2. Within the context of this asset management plan, lifecycle activities are the specified actions that can be performed on an asset in order to ensure it is performing at an appropriate level, and/or to extend its service life.[1] These actions can be carried out on a planned schedule in a prescriptive manner, or through a dynamic approach where the lifecycle activities are only carried out when specified conditions are met.

O. Reg. 588/17 requires that all potential lifecycle activity options be presented, with the aim of analyzing these options in search of identifying the set of lifecycle activities that can be undertaken at the lowest cost to maintain current levels of service. What follows are the lifecycle management strategies for all assets contained within this asset management plan, with each section focusing on a service area.

3.2 Transportation Services

3.2.1 Managing Roads, Bridges, and Structural Culverts

The Municipality is currently building its understanding of the lifecycle funding needs of roads. It will use the information from the condition assessment done by StreetScan Inc. in 2020 and the analysis of road lifecycle needs in this asset management plan as a starting point for building a systematic approach to addressing short- and medium-term needs. The Municipality will prioritize the needs that have been identified and address the highest priority needs with available funding.

For bridges and structural culverts, O. Reg. 104/97 requires inspections to be done every two years by professional engineers. The Municipality plans to manage bridges and culverts by completing the work recommended in the inspection reports. By

[1] The full lifecycle of an asset includes activities such as initial planning and maintenance which are typically addressed through master planning studies and maintenance management, respectively.

following the engineering recommendations, the Municipality believes it can continue to operate the bridges safely on an ongoing basis.

The most recent inspection was done in 2021. In the 2021 OSIM report, one project was identified for 2022 for the concrete culvert on Weedmark Road. The cost of the project was estimated to be $104,000. Averaging this over the next 10 years, the typical period covered by OSIM report forecasts, results in an estimate of average annual funding needs of $10,400 in the medium term.

3.2.2 Estimating Long-run Needs

A generalized lifecycle model for paved roads was developed through discussions with the Municipality's staff, incorporating local knowledge and costing information. Gravel roads do not require capital investments because they are maintained indefinitely by operating activities alone.

Table 3-1 shows the parameters of the generalized lifecycle model for HCB roads. Average annual lifecycle capital costs are $18,950 per centreline-kilometre. With 30.8 centreline-kilometres of roads in this category, the total average annual lifecycle capital cost is $583,000.

Table 3-1: Generalized Lifecycle Model for HCB Roads: Capital

Activity Description	Cost per Centreline-kilometre	Average Annual Cost per Centreline-kilometre	Age	Condition/ Performance
Microsurfacing	$70,000	$930	25	PCI ~ 55
Overlay	$441,000	$5,880	45	PCI ~ 55
Microsurfacing	$70,000	$930	60	PCI ~ 55
Full-depth Reconstruction	$840,000	$11,200	75	PCI ~ 40
Total	**$1,421,000**	**$18,950**	-	-

Figure 3-3 shows the parameters of the generalized lifecycle model for LCB roads. Average annual lifecycle capital costs are $11,360 per centreline-kilometre. With 18.2 centreline-kilometres of roads in this category, the total average annual lifecycle capital cost is $207,000.

Table 3-2: Generalized Lifecycle Model for HCB Roads: Capital

Activity Description	Cost per Centreline-kilometre	Average Annual Cost per Centreline-kilometre	Age	Condition/ Performance
Single surface treatment + fog seal	$32,550	$1,360	6	PCI ~ 55
Single surface treatment + fog seal	$32,550	$1,360	12	PCI ~ 55
Single surface treatment + fog seal	$32,550	$1,360	18	PCI ~ 55
Pulverize, add gravel, spot base repairs, and resurface double surface treatment + fog seal	$175,000	$7,290	24	PCI ~ 40
Total	**$272,650**	**$11,360**	-	-

Table 3-3 shows the parameters of the lifecycle model for bridges. Average annual lifecycle capital costs are 1.67% of replacement cost. With a total replacement cost of $4,510,000 for four bridges, the total average annual lifecycle capital cost is $75,000.

Table 3-3: Generalized Lifecycle Model for Bridges: Capital

Activity Description	Percentage of Replacement Cost	Average Annual Cost	Age
Minor Rehabilitation	15%	0.17%	30
Major Rehabilitation	35%	0.39%	60
Replacement	100%	1.11%	90[1]
Total	**150%**	**1.67%**	-

Table 3-4 shows the parameters of the lifecycle model for the concrete culvert. Average annual lifecycle capital costs are estimated to represent approximately 1.5% of

[1] Lifespans for bridges were estimated based on current age and remaining useful life in the 2021 Bridge Inspection Report. These ranged from 90 years to 102 years. For the purposes of this asset management plan, the expected useful life for bridges was assumed to be 90 years to be conservative.

replacement cost. With a replacement cost of $530,000 for the concrete culvert, the average annual lifecycle capital cost is approximately $8,000.

Table 3-4: Generalized Lifecycle Model for Concrete Culverts: Capital

Activity Description	Percentage of Replacement Cost	Average Annual Cost	Age
Major Rehabilitation	35%	0.39%	45
Replacement	100%	1.11%	90
Total	**135%**	**1.50%**	-

3.2.3 Average Annual Lifecycle Costs and Long-run Forecast

Table 3-5 summarizes the analysis in the previous section. The average annual lifecycle cost for transportation assets is estimated to be $873,000.

Table 3-5: Average Annual Lifecycle Costs – Transportation Assets

Asset Class	Average Annual Lifecycle Cost (Capital)
HCB Roads	$583,000
LCB Roads	$207,000
Bridges	$75,000
Structural Culvert	$8,000
Total	**$873,000**

The long-run forecast for roads was produced in Assetic Predictor, asset management software by Dude Solutions, using the assumptions in the Estimating Long-run Needs section for HCB and LCB roads. Figure 3-1 shows the cost of forecast lifecycle activities over the next 100 years assuming no funding constraint. The forecast expenditure of $9.4 million in the first year indicates that there is a significant backlog of renewal needs that should be done immediately.

Figure 3-1: Distribution of Costs of Forecast Lifecycle Activities for Roads – No Funding Constraint (2021$)

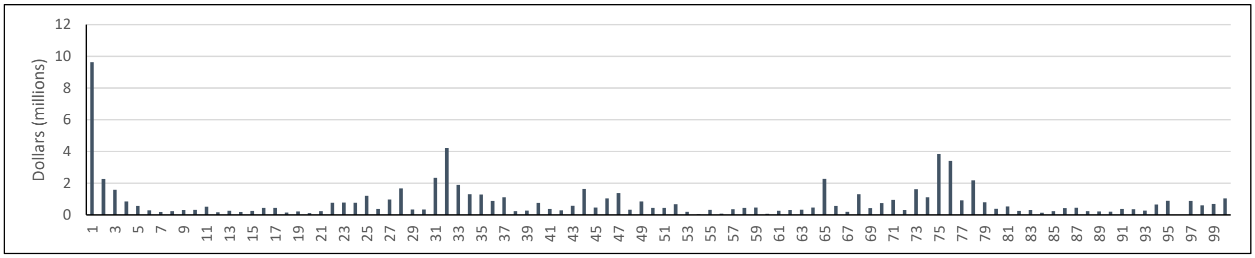


Figure 3-2 shows the cost of forecast lifecycle activities over the next 100 years assuming funding ramps up from 2021 funding of $284,000 to the average annual lifecycle cost of $790,000 per year over five years (2021$). In this scenario, all available funding is used annually for the first 45 to 50 years. This is how long it would take to fully clear the backlog in this scenario. After that, the costs of forecast lifecycle activities fluctuate from year to year with savings from years with low needs funding costs in years with high needs.

Figure 3-2: Distribution of Costs of Forecast Lifecycle Activities for Roads – Ramp Up from $284,000 to $790,000 (2021$)

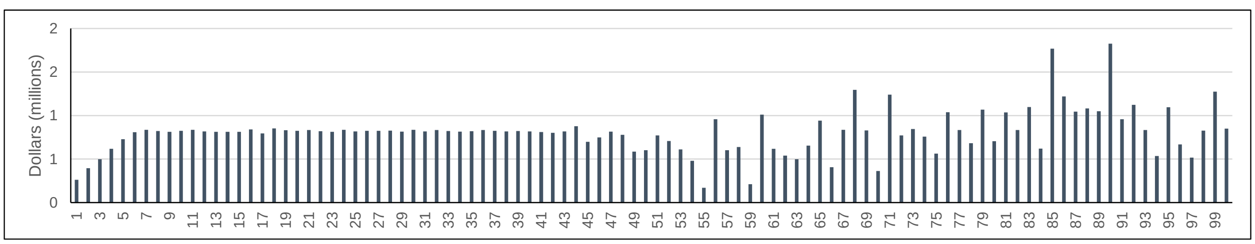


Figure 3-3 and Figure 3-4 show how condition evolves over time in the scenario shown in Figure 3-2. With this funding scenario, average PCI increases from 61 to fluctuate between 70 and 75 over the second half of the forecast period.

Figure 3-3: Condition Profile Forecast for Roads (Constrained) – Ramp up from $284,000 to $790,000 (2021$)

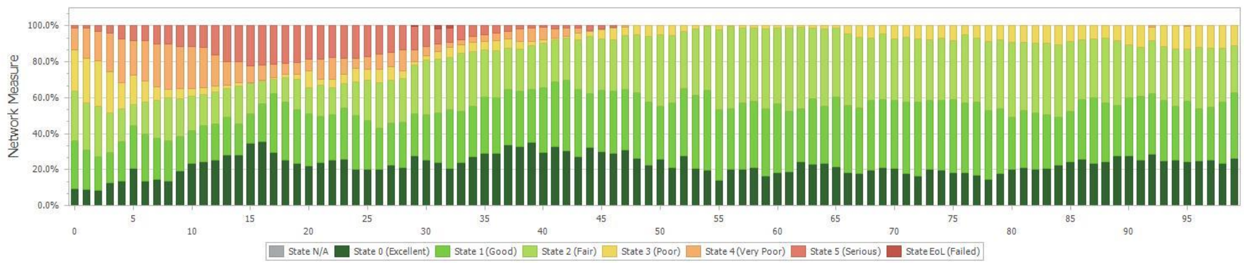
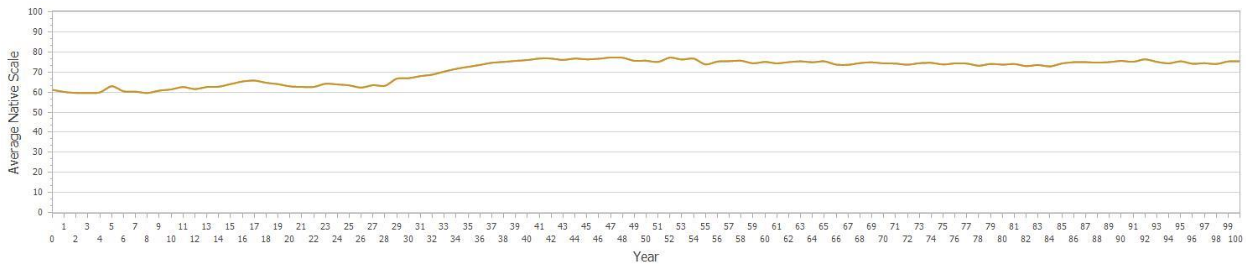


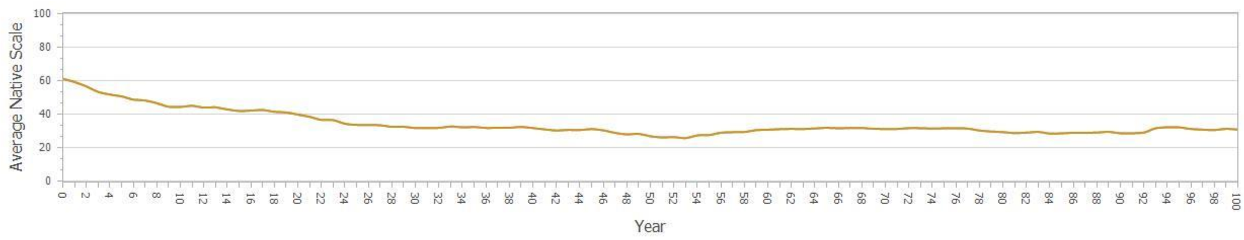
Figure 3-4: Forecast of Average PCI for Roads (Constrained) – Ramp up from $284,000 to $790,000 (2021$)



Funding for roads in the Municipality's current budget is $284,000. Figure 3-5 and Figure 3-6 show how condition evolves over time if funding is constrained to this level over the next 100 years, adjusting only for inflation. Average PCI falls and fluctuates between 25 and 35 for most of the forecast period.

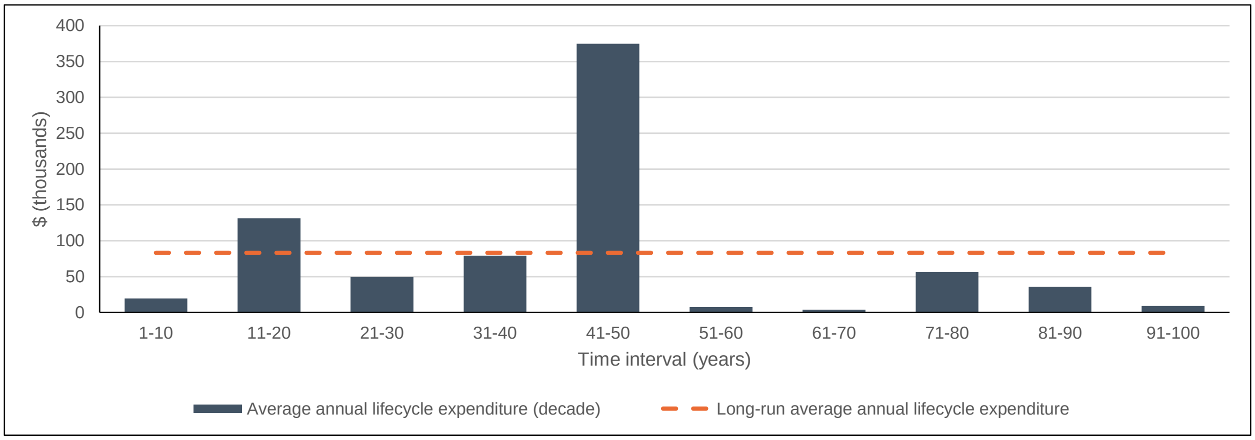
Figure 3-5: Condition Profile Forecast for Roads (Constrained) - $284,000 (2021$)

Figure 3-6: Forecast of Average PCI for Roads (Constrained) - $284,000 (2021$)



Moving to bridges and structural culverts, combining the average annual lifecycle cost estimates for the Municipality's bridges and structural culvert results in an estimate of the total average annual funding need of $83,000. A 100-year forecast of funding needs was produced in Excel using the assumptions in the Estimating Long-run Needs section and the cost of the project identified in the 2021 OSIM report. Figure 3-7 shows average annual funding needs by decade for bridges and structural culverts. The dotted horizontal line shows the long-run average annual lifecycle cost of $83,000.

Figure 3-7: Bridges and Structural Culverts – Average Annual Lifecycle Funding Needs



3.3 Water

3.3.1 Managing Water Assets

Water mains are typically replaced at the end of their useful life. The Municipality does not have a long-term plan to replace aging water mains. Treatment facilities are managed by the Ontario Clean Water Agency (OCWA). OCWA provides the Municipality with a 10-year forecast of capital needs. The forecast identifies lifecycle activities such as replacing component parts – e.g., fire pump Variable Frequency Drive

(VFD) control, well pumps, high lift/distribution pump, etc. The Municipality prioritizes the identified projects and allocates available funding to them.

3.3.2 Estimating Long-run Needs

Data on the lifespans of components of water facilities was not available. In order to establish a sustainable level of annual lifecycle funding for water facilities, the 2016 Canadian Infrastructure Report Card[1] (2016 C.I.R.C.) was consulted. The 2016 C.I.R.C. identifies ranges of annual reinvestment rates by infrastructure category, based on targets recommended by asset management practitioners. These annual reinvestment rates are expressed as a percentage of asset replacement value. For water facility assets, the suggested reinvestment rates range from 1.7% to 2.5% of asset replacement value. For the purposes of this asset management plan, the average reinvestment rate of 2.1% was utilized to establish a sustainable level of lifecycle funding for water facilities. Applying this reinvestment rate to the estimated replacement cost of the Municipality's water treatment assets (i.e., $4.39 million) results in an estimated average annual lifecycle cost of $92,000. The 2020 10-year capital forecast from OCWA identifies $94,500 in capital projects. This represents slightly over one year of average annual lifecycle costs.

The average annual lifecycle cost for water mains is based on replacement cost and life expectancy of the mains. The useful life of a water main is assumed to be 80 years. The cost of replacing mains is broken down by component as shown in Table 3-6.

[1] Canadian Infrastructure Report Card: Informing the Future. (The Canadian Council for Public-Private Partnerships, 2016). Accessed from https://www.pppcouncil.ca/web/pdf/infra_report_card_2016.pdf

Table 3-6: Costs - Water Linear Infrastructure

Asset	Cost (2021$)	Units	Notes and Size Adjustment Factor
Water Main	$400	Metre	Cost is for 150 mm main. Cost increases by $22 for every 50 mm increase in diameter.
Valve	$1,563	Each	Cost is for 150 mm valve. Cost increases by $521 for every 50 mm increase in diameter.
Hydrant	$6,862	Each	-
Service Connection	$2,418	Each	-
Miscellaneous	20% mark up		This is an allowance for miscellaneous costs. It is 20% of the cost of the mains, valves, and hydrants.

Based on these assumptions, the replacement cost of water mains is $5.7 million, and the average annual lifecycle cost is $72,000.

3.3.3 Average Annual Lifecycle Costs and Long-run Forecast

Table 3-5 summarizes the analysis in the previous section. The average annual lifecycle cost for water assets is estimated to be $164,000.

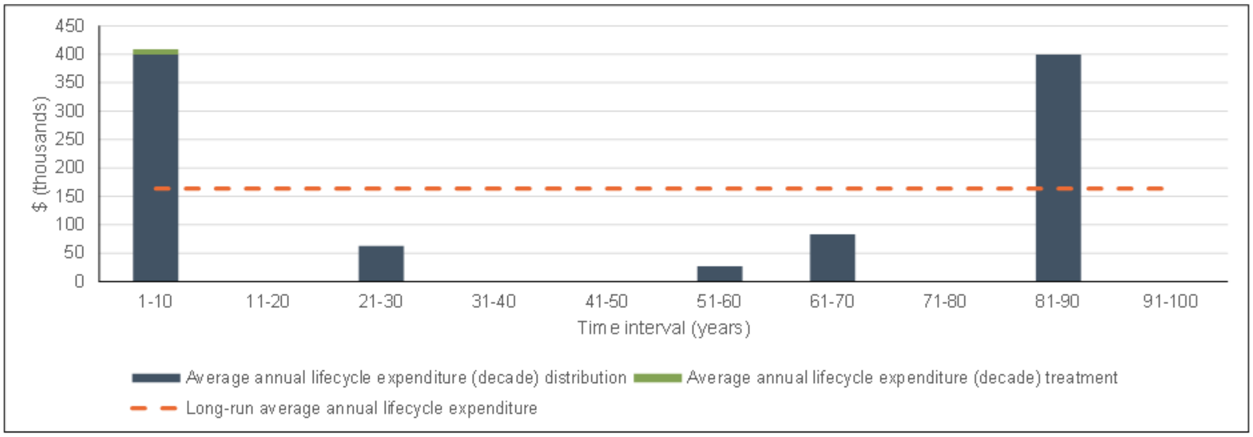
Table 3-7: Average Annual Lifecycle Costs – Water Assets

Asset Class	Average Annual Lifecycle Cost (Capital)
Water Facilities	$92,000
Water Mains	$72,000
Total	**$164,000**

A 100-year forecast could not be produced for water treatment facilities. Figure 3-8 shows the amount identified in OCWA's 10-year water capital forecast.

A 100-year forecast of funding needs for water mains was produced in Excel using the assumptions in the Estimating Long-run Needs section. Figure 3-8 shows average annual funding needs by decade for water assets. The dotted horizontal line shows the long-run average annual lifecycle cost of $72,000.

Figure 3-8: Water Assets – Average Annual Lifecycle Funding Needs



As can be seen from this age-based forecast of water main replacements, the Municipality may need to replace approximately $4 million (5.8 km) of water mains over the next decade. The Municipality should consider retaining the expertise of an engineering consultant, or working with its system operator (OCWA), to develop a specific plan for the replacement of water mains before failures start to affect service delivery and costs (e.g., increased number of water main breaks, water loss, and costly emergency repairs). This process may begin with a comprehensive assessment of water main condition and performance, including a thorough analysis of watermain break history to identify potential areas of concern.

3.4 Wastewater

3.4.1 Managing Wastewater Assets

Wastewater mains are typically replaced at the end of their useful life. The Municipality does not have a long-term plan to replace wastewater mains. Treatment facilities are managed by OCWA. OCWA provides the Municipality with a 10-year forecast of capital needs. The forecast identifies lifecycle activities such as replacing component parts – e.g., fire pump VFD control, well pumps, high lift/distribution pump, etc. The Municipality prioritizes the identified projects and allocates available funding to them.

3.4.2 Estimating Long-run Needs

Data on the lifespans of components of wastewater facilities was not available. In order to establish a sustainable level of annual lifecycle funding for wastewater facilities, the 2016 C.I.R.C. was consulted as was done for water treatment. For wastewater facility assets, the suggested reinvestment rates range from 1.7% to 2.5% of asset replacement value. For the purposes of this asset management plan, the average reinvestment rate of 2.1% was utilized to establish a sustainable level of lifecycle funding for wastewater facilities. Applying this reinvestment rate to the estimated replacement cost of the Municipality's wastewater facility assets (i.e., $9.69 million) results in an estimated average annual lifecycle cost of $204,000. The 2020 10-year wastewater capital forecast from OCWA identifies $5,000 in capital projects.

The average annual lifecycle cost for wastewater mains is based on the replacement cost and life expectancy of the mains. The useful life of a wastewater main is assumed to be 80 years. The cost of replacing mains is broken down by component as shown in Table 3-8.

Table 3-8: Costs - Wastewater Linear Infrastructure

Asset	Cost (2021$)	Units	Notes and Size Adjustment Factor
Wastewater Main	$387	Metre	Cost is for 200 mm main. Cost increases by $10 for every 50 mm increase in diameter.
Manholes	$7,945	Each	-
Service Connection	$1,648	Each	-
Miscellaneous	20% mark up		This is an allowance for other components of the system not listed. It is 20% of the cost of the mains and manholes.

Based on these assumptions, the replacement cost of wastewater mains is $4.46 million, and the average annual lifecycle cost is $56,000.

3.4.3 Average Annual Lifecycle Costs and Long-run Forecast

Table 3-5 summarizes the analysis in the previous section. The average annual lifecycle cost for wastewater assets is estimated to be $259,000.

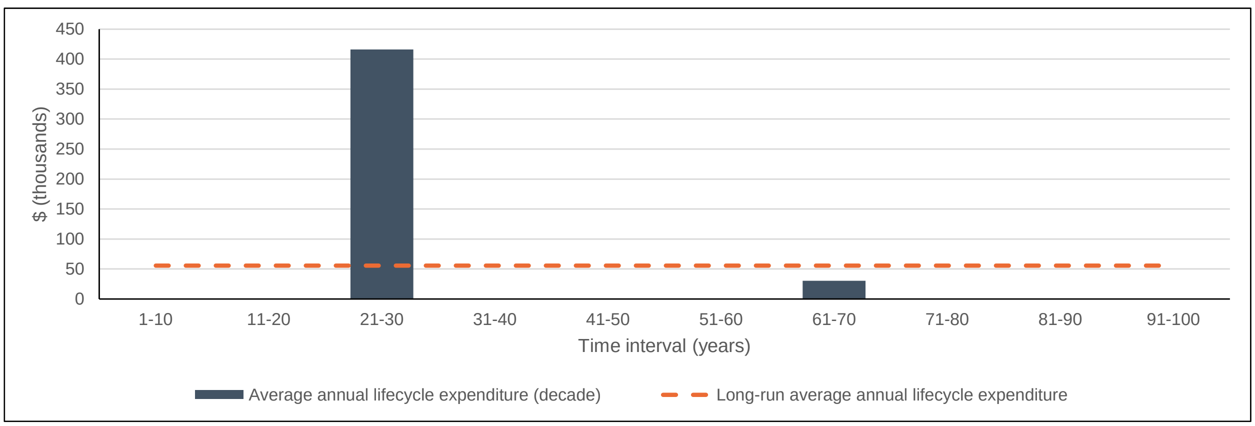
Table 3-9: Average Annual Lifecycle Costs – Wastewater Assets

Asset Class	Average Annual Lifecycle Cost (Capital)
Wastewater Facilities	$204,000
Wastewater Mains	$56,000
Total	**$259,000**

A 100-year forecast could not be produced for wastewater treatment facilities. Figure 3-8 shows the amount identified in OCWA's 10-year wastewater capital forecast.

A 100-year forecast of funding needs for wastewater mains was produced in Excel using the assumptions in the Estimating Long-run Needs section. Figure 3-9 shows average annual funding needs by decade for wastewater assets. The dotted horizontal line shows the long-run average annual lifecycle cost of $56,000.

Figure 3-9: Wastewater Distribution Assets – Average Annual Lifecycle Funding Needs



As can be seen from this age-based forecast of water main replacements, the Municipality may need to replace approximately $4.2 million (5.3 km) of wastewater mains in 20 to 30 years. The Municipality should consider developing a financial plan to address these future replacement needs so that wastewater rates can remain stable over time.

3.5 Stormwater

3.5.1 Managing Stormwater Assets

The Municipality's current plan is to replace stormwater mains at the end of their useful lives. The Municipality does not have a long-term plan to replace stormwater mains.

3.5.2 Estimating Long-run Needs

The useful life of a stormwater main is assumed to be 100 years. The cost of replacing mains is broken down by component as shown in Table 3-10.

Table 3-10: Costs - Stormwater Linear Infrastructure

Asset	Cost (2021$)	Units	Notes and Size Adjustment Factor
Wastewater Main	$380	Metre	Cost is for 200 mm main. Cost increases by $10 for every 50 mm increase in diameter.
Manholes	$7,427	Each	-
Catch Basins	$3,431	Each	-
Miscellaneous	20% mark up		This is an allowance for other components of the system not listed. It is 20% of the cost of the mains, manholes, and catch basins.

Based on these assumptions, the replacement cost of stormwater mains is $5.42 million, and the average annual lifecycle cost is $54,000.

3.5.3 Average Annual Lifecycle Costs and Long-run Forecast

Without good condition or age data, it is not possible to forecast long-run needs. The Municipality should consider doing a Closed-circuit Television (CCTV) inspection of its stormwater mains to identify current condition and to get a better understanding of the timing of future replacement needs.

Chapter 4
Financial Summary

4. Financial Summary

4.1 Introduction

This chapter details the forecast funding necessary to sustainably finance the lifecycle management strategies presented in Chapter 3 and examines the relationship between these needs and the Municipality's current capital funding capacity.

An annual lifecycle funding target describes the amount of funding that would be required annually to fully finance a lifecycle management strategy over the long term. By planning to achieve this annual funding level, the Municipality would theoretically be able to fully fund capital works as they arise. In practice, capital needs are often "lumpy" in nature due to the value of works being undertaken changing year to year. By planning to achieve this level of funding over the long term, however, the periods of relatively low capital needs would allow for the building up of lifecycle reserve funds that could be drawn upon in times of relatively high capital needs.

4.2 Annual Contribution and Lifecycle Funding Target

Figure 4-1 presents the Municipality's current annual contributions towards capital-related needs – as detailed in the Municipality's 2021 Operating Budget – as well as the annual lifecycle funding target that arises from implementing the previously discussed lifecycle management strategies. For the purposes of the financial analysis, tax-supported (i.e., transportation and stormwater) and rate-supported (i.e., water and wastewater) assets have been aggregated due to the Municipality's operating budget structure.

In total, the Municipality has budgeted to contribute approximately $786,100 towards capital-related needs in 2021. Included in this are budgeted contributions to capital-related reserve funds, reliable and long-term federal and provincial grants, annual capital-related programs funded through the operating budget (i.e., tar and chip road resurfacings), and the repayment of infrastructure-related debt. The sum of these components comprises the amount of funding the Municipality contributed in 2021 to the provision of capital-related needs.

The annual lifecycle funding target for the Municipality's core infrastructure assets has been estimated to total approximately $1.44 million. The difference between the annual lifecycle funding target and the current capital budget, referred to as the lifecycle funding gap, indicates that the Municipality is currently underfunding its core infrastructure by approximately $652,900 annually. While the difference between current contributions and annual targets are balanced for water and wastewater assets, the lifecycle funding gap is a result of underfunding transportation and stormwater assets.

Figure 4-1
Contribution Towards Capital-related Needs and Lifecycle Target (2021$)

Department	Current Annual Contribution	Annual Lifecycle Funding Target
Transportation & Stormwater		
Capital Works[1]	$0	
Gas Tax	$93,041	
OCIF	$69,742	
Debt Repayments	$121,345	
Subtotal - Transportation & Stormwater	**$284,128**	**$969,000**
Water & Wastewater		
Capital Works[1]	$152,245	
Debt Repayments	$230,751	
Transfer to Capital Reserve	$119,000	
Subtotal - Water & Wastewater	**$501,996**	**$470,000**
Total	**$786,124**	**$1,439,000**

[1] Net of Transfers from Reserves/Reserve Funds and Grants

The lifecycle funding gap could be mitigated by increasing contributions to capital reserve funds over time and utilizing external debt financing to cover periods where built-up reserves have not accumulated enough funding. The use of external debt financing may be necessary as the capital expenditures forecast for the next decade exceed the Municipality's capacity to fully fund them from its own sources.

4.3 Future Improvements

The analysis presented herein does not attempt to quantify the increases to the lifecycle funding target that naturally arises due to the acquisition of growth-related capital. These costs should be explored and implemented into the financing strategy in the future. Examining these growth-related capital needs and their impacts on the financing strategy will provide for a comprehensive assessment of the sustainability of the Municipality's overall asset management system.

Once a comprehensive capital needs forecast, including all of the Municipality's assets, has been developed through future expansions of this asset management plan, a full financing strategy can be developed. The future financing strategy should examine how to fund capital needs in the short term while ensuring long-term sustainability. As discussed above, this can be accomplished by exploring strategies to fund any shortfalls as they arise (e.g., through debt or grant funding) while increasing annual contributions towards capital-related needs to lifecycle funding targets.

Appendices

Appendix A

Technical Appendix

Appendix A: Technical Appendix

This appendix documents the source of data and assumptions used in the report.

Asset Class	Notes
Roads	The source of the inventory of paved roads with length, surface type, and condition was the preliminary data from StreetScan's November 2020 road needs study. The inventory of gravel roads was created as follows. The Ontario Road Network GIS file (https://data.ontario.ca/en/dataset/ontario-road-network-road-net-element) was used as a starting point. Paved roads in the StreetScan data and regional and provincial roads were eliminated from the data. The remaining roads were reviewed against a list of gravel roads provided by the Municipality to remove any remaining roads that were not owned by the Municipality. The condition of gravel roads was assessed by the Municipality's staff based on their experience and observations. The average age of road surfaces was calculated using a file provided by the Municipality's staff. When ranges were provided, the mid-point of the range was used. Lifecycle activities, timing, and unit costs were based on discussions with the Municipality's staff. • LCB road replacement cost was estimated as the cost of HCB full depth reconstruction less the cost of HCB overlay plus two times the cost of a single surface treatment + fog seal. • Gravel replacement cost was estimated as cost of HCB full depth reconstruction less the cost of an HCB overlay.
Bridges	The source of inventory data – structure type, age, condition, and replacement value – was the Municipality's 2021 OSIM Bridge Inspection Report.

Asset Class	Notes
	Lifecycle activities, timing, and percentages of replacement costs were based on discussions with the Municipality's staff.
Water, Wastewater, and Stormwater Linear Assets	The source of inventory data – length, age, and replacement costs - was a file from the Municipality's staff. Unit costs were inflated to 2021$ using the NRBCPI. Lifespans were based on discussions with the Municipality's staff.
Water and Wastewater Treatment	The source of inventory data – components and replacement costs - was OCWA.