Schedule 'A' to Bylaw 2022-062

2022 Asset Management Plan

Hastings Highlands

D.M. Wills Project No. 21-4788

D.M. Wills Associates Limited
Partners in Engineering, Planning and Environmental Services
Peterborough

September 2022

Prepared for:
Municipality of Hastings Highlands

Executive Summary

The Municipality of Hastings Highlands (Municipality) is primarily a rural municipality, with the main urban/semi-urban Hamlet of Maynooth. The Asset Management Plan (Plan) was prepared with the intent to maintain and improve the existing inventory of municipal infrastructure consisting of 482 km of roads, 21 bridges and structural culverts, 64 vehicles, other machinery and equipment, 21 buildings or facilities, seven active municipal solid waste landfill sites and two transfer sites.

The estimated current (July 2022) replacement cost of the Municipality's infrastructure, is approximately $183.5M. Roads and Bridges represent $118 M of the total replacement value as detailed in the table below. Stormwater Infrastructure, Roads, Bridges, Buildings, Vehicles and Streetlights are captured under this asset management plan, as are the Municipality's Solid Waste Management Assets (landfills).

Asset	Annual Cost for Identified Needs within 10 Years (2022 $)	Amortized Cost (2022 $)	Replacement Cost (2022 $)
Stormwater Infrastructure	$ 580 K	$ 447 K	$ 17.3 M
Roads	$ 2.5 M	$ 3.7 M	$ 90 M
Bridges	$ 685 K	$ 570 K	$ 28.0 M
Vehicles and Equipment	$ 86 K	$ 859 K	$ 10.3 M
Buildings, Facilities, and Lands	$ 160 K	$ 332 K	$ 13.2 M
Solid Waste Management	-	$ 755 K	$ 24.2 M
Streetlights	-	$ 20 K	$ 500 K
Total	**$ 4.0 M**	**$ 6.7 M**	**$183.5 M**

The Plan provides a detailed inventory of the assets, amortization rates and replacement costs.

The intent of the Plan is to support the Municipality in maintaining prescribed standards for maintenance and repair and provide guidance for initiating and budgeting capital improvement activities.

The Municipality's capital assets will be maintained through a financial strategy that optimizes the application of local financial resources. The Plan targets to address current deficiencies with respect to roads and bridges based on priorities established through the roads management studies and Biennial Structure Inspections with a focus to extending the useful service life of the assets as opposed to a "worst first" replacement strategy. Other capital requirements will be funded on an as needed

basis in order to meet the prescribed Levels of Service with due consideration for available source funding.

This Plan is recognized as a dynamic plan for consideration and implementation with the annual budgeting practices. The Plan will receive a comprehensive review every five years. Furthermore, this plan will need to be updated to include a full financial strategy that is tied to revenue sources, the levels of service, and life cycle management by July 1, 2025 as per O.Reg. 588/17.

Further, updates to the Plan shall be undertaken to incorporate updated infrastructure condition assessments and expenditure requirements.

Table of Contents

List of Tables

List of Figures

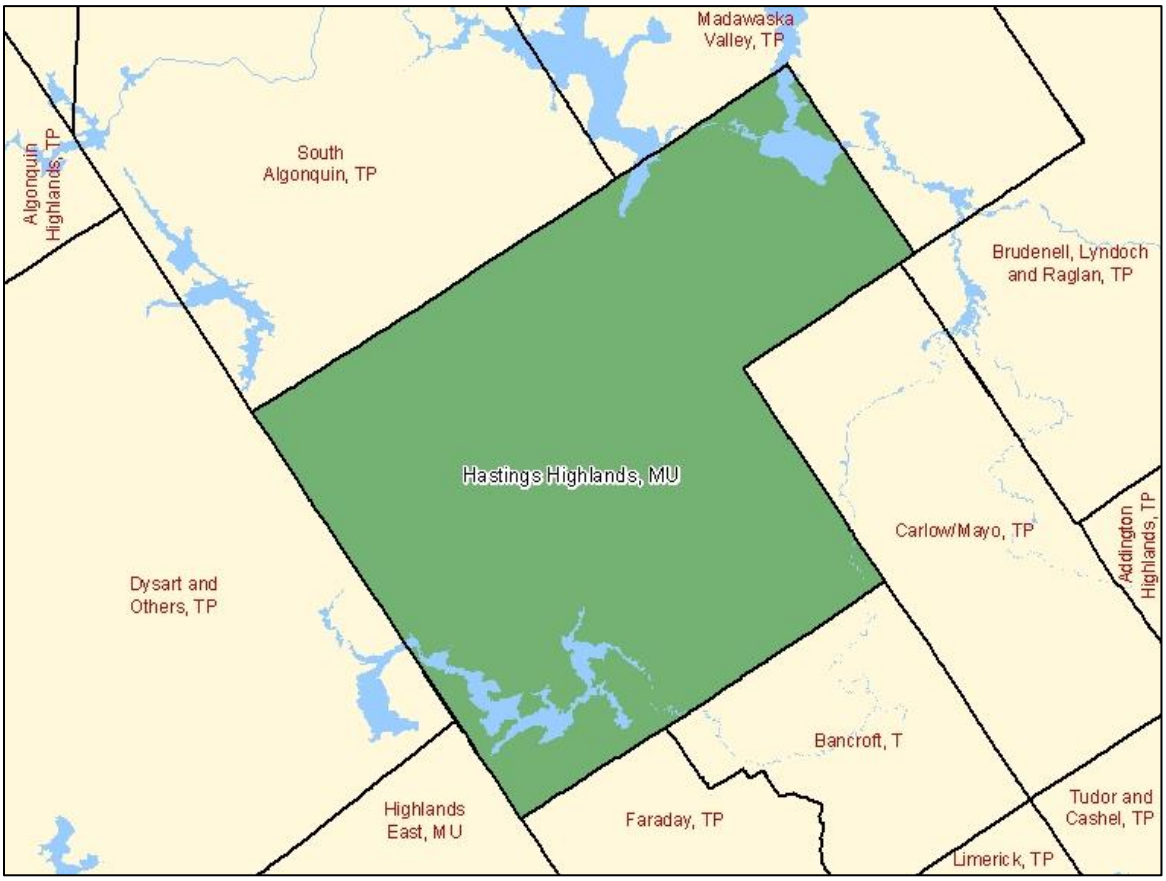
List of Appendices

1.0 Introduction

1.1 Location

The Municipality of Hastings Highlands (Municipality) is located east of Algonquin Park and west of the City of Ottawa, in Hastings County. The Municipality is largely rural with several semiurban and urban settlement areas within the Municipality. A map showing the location of Hastings Highlands is located below.[1]

Figure 1 – Location of Hastings Highlands



[1] Statistics Canada. 2012. GeoSearch. 2011 Census. Statistics Canada Catalogue no. 92-142-XWE. Ottawa, Ontario. Data updated November 27, 2015. https://www12.statcan.gc.ca/nhs-enm/2011/dp pd/prof/details/page.cfm?Lang=EandGeo1=CSDandCode1=3512076andData=CountandSearchText=Has tings%20HighlandsandSearchType=BeginsandSearchPR=01andA1=AllandB1=AllandGeoLevel=PRandGeoC ode=3512076andTABID=1
(accessed 2016-06-28)

1.2 Population

The population has increased over the last 10-year period, as illustrated in **Table 1**.

Table 1 – Population Change

Year	Population and Population Change Percentage
2021 Population	4,385
2016 Population	4,078
2011 Population	4,168
2006 Population	4,033
2001 Population	3,992
2016-2021 Population Change	7.5%
2011-2016 Population Change	-2.1%
2011-2021 Population Change	5.2%
2001-2021 Population Change	9.8%

The census does not capture recent changes within the Municipality. Since the Covid-19 pandemic began, the Municipality has experienced an notable increase in new building activity. In 2021, the Municipality experienced its highest level of construction activity, with the total recorded value 43% higher than 2019 (the most recent non-pandemic year). At the same time, a number of seasonal residents have extended their typical stays, or even become year-round residents – increasing demand for municipal services.

1.3 Purpose of an Asset Management Plan

The quality of life residents enjoy is directly related to the condition of municipal infrastructure. All taxpayers and residents are in fact, shareholders of the assets that make up municipal infrastructure and therefore have an interest in how they are maintained. Asset management planning allows municipalities to inventory and assess the condition of their assets and plan for their long-term maintenance and replacement. The Province has mandated the preparation of asset management plans as a prerequisite to seeking provincial capital funding. This Plan will aid the Municipality in making appropriate financial decisions and investments as part of their annual municipal budget decisions. Financial planning will require municipalities to examine a full range of financing and revenue generation tools including user fees.

This Plan is to serve as a guidance document for the Municipality's use in developing its annual budgets and long-range financing requirements as well as in the development of tax levy rates, and other related revenue generators. This Plan is not intended to replace normal budgeting procedures but rather to support budgeting decisions and assist in ensuring the long-term viability and financing of the Municipality's largest and most costly assets.

Well-maintained infrastructure is important to the growth and development of the Municipality as set out in the vision and policies of the Municipality's strategic plan.

Good roads and bridges facilitate the movement of goods, the provision of services, notably emergency services and the transportation of people to work, school, recreation and other facilities. Good roads and bridges are essential to attracting economic development in the transport of commodities to market or providing access to tourism and other amenities the Municipality has to offer.

Sustainable solid waste management practices are essential to ensure the health of a municipality's residents, now and into the future. Effective waste management is critical to any municipality.

The state of local infrastructure also reflects on the image of the Municipality to its residents and visitors. Poorly maintained infrastructure conjures a negative image and may detract from investment in the Municipality as people question the value for money they receive in the poor quality services.

This Plan appropriately focuses on those assets of the Municipality that represent the greatest financial demand on the Municipality and its residents. The following asset categories are included in this Plan for Hastings Highlands:

- Stormwater infrastructure and flood resiliency;
- Roads;
- Bridges;
- Vehicles, machinery and equipment;
- Buildings and facilities;
- Solid waste sites (landfills); and,
- Streetlights.

The Plan for the Municipality is intended to cover the period 2022 - 2031. The document will be used as a working tool for capital expenditure decisions on an ongoing basis, particularly in the preparation of the municipal capital budget. The Plan identifies key expenditures that are anticipated in each year of the 10-year period of the Plan.

1.4 Evaluation of the Asset Management Plan

As part of the Plan, Levels of Service have been developed for each of the asset groups identified in the Plan. The Levels of Service are considered the 'expectation' or 'target' for management of the various assets. The Levels of Service also provide a measuring stick for which the Municipality can assess the relative success of their management practices, financial investment and overall the suitability and outcomes of the Plan.

A comprehensive review of the Plan shall be undertaken every five years, as a minimum, or on an as required basis. Review of the Plan will include an update to the existing state of infrastructure inventory and condition through such activities as the regular OSIM reporting and Road Needs Studies, or other asset reviews as detailed in the Plan. The updated condition information will be used to both update the Plan's financial forecasts relative to capital expenditure needs as well as assess the assets' condition against the specified Levels of Service.

This Plan is done in accordance with O.Reg. 588/17, *Asset Management Planning for Municipal Infrastructure*. As such it reports on the the "core" assets (bridges, roads, and stormwater) as per Tables 3, 4, and 5 of the regulation, with additional municipally defined standards and metrics for non-core assets.

1.5 Approach

The development of the Plan builds on the policies and practices of the Municipality such as:

- Accounting and Budget Documents;
- General financial policies of the municipality;
- Current practices and technologies used in management and maintenance of capital assets; and,
- The following specific reports:
    - 2021 Road Needs Study;
    - 2021 OSIM Reports by Wills;
    - 2021 OSIM Report by Perspective Engineering Engineering;
    - 2020 Waste Management Optimization Study by Cambium;
    - 2016 Buildings, Lands, and Facilities Study; and,
    - 2016 Solid Waste Maganement Study by Wills.

1.6 Inflation from 2017 to 2022

All costs in this report are in 2022 dollars. The following rates are used to convert costing in previous reports to 2022 dollars.

Table 2 – Inflation Rates Used to Update Prices

Year	Average CPI
2022[2]	7.20%
2021[3]	3.47%
2020[3]	0.65%
2019[3]	1.85%
2018[3]	2.30%
2017[3]	1.56%

2.0 Levels of Service

The Municipality first adopted Levels of Service standards as part of the development of the Plan in 2016. Those Levels of Service standards build from the Minimum Maintenance Standards for Municipal Highways, Ontario Reg. 239/02 and various applicable solid waste site legislation and will guide the program for the maintenance of roads, bridges, buildings, vehicles and solid waste management infrastructure and related facilities in the Municipality. These Levels of Service have been updated to reflect prescribed reporting metrics from O.Reg. 588/17.

The Levels of Service provides a comprehensive approach to the maintenance of municipal infrastructure by setting out the objectives (or expectations) to be achieved and level of service standards for each class of infrastructure (e.g. roads, vehicles, buildings, and solid waste). An overall Level of Service Target has been assigned for each asset group. The target will be used as the measure to assess how the Municipality is doing in meeting the Plan with respect to each of the primary asset groups.

Levels of service provide a measuring stick to ensure that municipal infrastructure is maintained to a standard that protects the municipal investment and sustains or prolongs the life of roads, buildings, vehicles and other infrastructure. By establishing a level of service, the Municipality will be able to identify the condition of all infrastructure on an ongoing basis and undertake measures to repair, upgrade or better all municipal assets over their lifespan. The intent of establishing levels of service is also to ensure that regulatory requirements are met, notably, the minimum maintenance standards for

[2] Bank of Canada Monetary Policy Report, July 2022
[3] Statistics Canada. Table 18-10-0005-01 Consumer Price Index, annual average, not seasonally adjusted

municipal highways (Ontario Regulation 239/02) and relevant Solid Waste Laws such as Environmental Protection Act.

The levels of service set out a written series of procedures that will guide Council in making financial decisions designed to maintain all of the Municipality's capital assets to the level appropriate for the Municipality given its relative priorities and minimum legislated requirements. The service level standards will ensure the delivery of a quality level of services and an appropriate measure of accountability to municipal taxpayers.

The levels of service are organized by the type of asset or infrastructure and a series of objectives to be achieved through adherence to specific standards or levels of service. In a rural Municipality, the most significant assets are typically roads and bridges as they are crucial to the conveyance of people and goods and services. Council has taken measures to improve the condition of the road network through better ditching, brushing, graveling and grading; however, careful capital programming will be required to sustain the road system over the coming years. Performance targets require the Municipality to maintain capital assets by undertaking repairs immediately or on an as needed basis where required and by ditching, brushing and resurfacing roads on a regular cycle. Council intends to provide adequate funding of road and bridge improvements to maintain these facilities. Similarly, Council intends to fund their solid waste management assets to ensure compliance with all related legislative requirements and maintain the existing service to the community.

2.1 Prescribed Reporting Metrics

For core assets, O.Reg. 588/17 prescribes minimum metrics that all Asset Management Plans must report on as follows:

Table 3 – Stormwater Management Assets

Service Attribute	Community Levels of Service (Qualitative Descriptions)	Technical Levels of Service (Technical Metrics)
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 (SWM) system.	1. Percentage of properties in the Municipality resilient to a 100-year storm. 2. Percentage of the municipal SWM system resilient to a 5-year storm.

Table 4 – Roads

Service Attribute	Community Levels of Service (Qualitative Descriptions)	Technical Levels of Service (Technical Metrics)
Scope	Description, which may include maps, of the road network in the Municipality and its level of connectivity.	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.
Quality	Description or images that illustrate the different levels of road class pavement condition.	1. For paved roads in the Municipality, the average pavement condition index value.

Table 5 – Bridges and Culverts

Service Attribute	Community Levels of Service (Qualitative Descriptions)	Technical Levels of Service (Technical Metrics)
Scope	Description of the traffic that is supported by municipal bridges (e.g., heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, cyclists).	Percentage of bridges in the Municipality with loading or dimensional restrictions.
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.	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.

2.2 Updated Levels of Service

The following summarizes the target Levels of Service for each of the Municipality's Primary Assets:

Stormwater (1) – All new and replaced storm sewers meet a five year storm design or better: Hydraulic Design Calculations to be retained as proof of design.

Stormwater (2) – All new development to be resilient to the 100 year Storm: This will ensure that the Municipality's overall resiliency does not decrease, except through the effects of climate change, which may cause currently resilient properties to become susceptible to flooding.

Roads (1) – Minimum Overall System Adequacy Rating of 82%: The Municipality's goal is to maintain, as a minimum, an overall system adequacy rating of 82%. Road Condition ratings are assigned in accordance with the MTO Inventory Condition Manual, 1991.

Roads (2) – Minimum Average PCI of 75 for Hard Top Surfaces: The Municipality's goal is to maintain the existing average Pavement Condition Index (PCI) while addressing the backlog of capital projects.

Bridges – No Additional Load Limited Bridges: The Municipality currently has three load limited bridges in its network. With timely bridge maintenance and rehabilitation, no additional load limits should be required.

Vehicles, Machinery, and Equipment (Utilization Meets or Exceeds Expected Service Life): Vehicles shall be maintained and operated to ensure they are available for use up to and beyond their expected service life. In other words, vehicles will be utilized over their related amortization period, as a minimum.

Buildings – Building Use Exceeds Expected Service Life: Building maintenance and upgrades shall be undertaken to ensure, as a minimum, the expected useful service life of the building is realized, with the goal of using the building beyond is useful service life.

Solid Waste Infrastructure - Meet All Applicable Regulations: Waste Disposal Site investments shall be as required to ensure long-term sustainability (available capacity) of the assets and ensure compliance with the Environmental Protection Act and other applicable legislation.

Streetlights – All Streetlights Remain in Service: Streetlight investments and maintenance shall be undertaken to ensure lighting remains in service.

2.3 Issues and External Trends Affecting Levels of Service

Various potential and real external trends will put pressure on the Municipality in meeting their desired Levels of Service. The following external trends are noted as potentially influencing future decision making with regard to infrastructure investments and Levels of Service. These shall be considered as the Plan is further developed.

Accessibility Standards: Existing and future requirements with respect to accessibility standards may require upgrades to buildings and facilities which are not currently anticipated under the Plan.

Sustained Population Growth: As the population of the Municipality grows and/or seasonal residents are converted to year-long residents, both revenues and demand on municipal services will increase.

Recreational Development: Increased demand and related assessment value for waterfront vacation property within the Municipality could have a positive influence on the overall municipal assessment (tax base). However, with increased recreational demands come an increased demand on maintenance of infrastructure and potentially providing new/upgraded infrastructure.

Also, an increased municipal assessment puts a financial pressure on existing residents as their tax bills continue to rise in the absence of a tax rate increase.

Highway Download: Provincial Highways 62 and 127 run through the Municipality. Hastings Road 62, formerly Highway 62 from Maynooth to the Municipality's eastern border. The Highway was previously downloaded to the Municipality and represents a significant portion of the Municipality's Road Needs. As of 2022, there is no committed county, provincial, or federal funding available to support municipalities with these specific downloaded highways. This puts an increased financial pressure on the Municipality's Plan. Hastings Highlands has plans to continue lobbying senior government partners to assist with funding the former provincial Highway 62 now known as HH Road 62 for funding.

Regulatory Requirements: The Municipality's Level of Service for its solid waste infrastructure is directly related to meeting applicable regulatory requirements. As regulatory requirements are subject to change, so too are the Municipality's Levels of Service for this asset. The costs associated with such changes to regulatory requirements would impose financial pressure on this Plan, both positively or negatively, as the case may be.

3.0 State of Local Infrastructure

The following assets are included in this Plan:

- Culverts and stormwater Sewers;
- Roads;
- Bridges;
- Vehicles, machinery, and equipment;
- Buildings and facilities;
- Solid waste sites;
- Stormwater sewers; and,
- Streetlights.

A summary of the Municipality's primary assets are illustrated in below.

Table 6 – Municipality's Primary Assets

Asset Item	Municipality's Assets	Pictures
Roads	• 79 km Paved • 153 km Surface Treated • 249 km Gravel	 
Bridges	• 11 Bridges • 10 Structural Culverts	 
Buildings and Facilities	• Amenities • Public Works • Emergency Services • Municipal Offices	  
Solid Waste Site	7 Solid Waste Sites • 140,000 m^3 remaining capacity	N/A
Vehicles, Machinery and Equipment	64 pieces including: • Public Works • Emergency Services • Solid Waste	N/A

3.1 Stormwater Infrastructure and Flood Resiliency

3.1.1 Storm Sewers

As per Table 3 of O.Reg. 588/17; the intention of the Level of Service (LOS) assessment is to understand the percentage of the stormwater system that is resilient to the five year storm.

While the term 'resilient' is not clearly defined in the O. Reg, Wills interpreted its meaning to be consistent with typical engineering practices which would, in our experience, include the development of a 'Storm Sewer Design Sheet'. This tool typically demonstrates free-flowing conveyance of the five year storm runoff based on local rainfall, soil, and development characteristics and engineering standards.

To accomplish this task, the Wills team reviewed available satellite imagery throughout the Municipality in order to identify and count all stormwater catchbasins. The quantity of catchbasins was used as an approximation of the total 'SWM system', recognizing that length of sewer would vary from pipe to pipe in reality. In general, the stormwater sewer system appears to be contained primarily within Maynooth and Bird's Creek.

Once the SWM sewer network was identified, Wills collected all available background data in order to identify all sewers with an Engineered capacity that exceeded the five year storm. The only available information was the recent road reconstruction project on Highway 62 through Maynooth. Based on the associated drawings and reports, Wills identified 19 storm sewer structures that have been recently replaced and are suitably sized to convey the five year storm, as a minimum.

The remaining sewers were assumed to be inadequate to convey the five year storm, which is a reasonable assumption given the age of the system relative to the implementation of a five year storm design standard. In total, three catchbasins in Maynooth and three catchbasins in Bird's Creek are outside the above-mentioned reconstruction project; this portion of the storm sewer system was assumed to be inadequate.

Ultimately, Wills estimates that 76% of the storm sewer system in the Municipality is currently resilient to the five year storm, which is contained entirely within the Maynooth area near Highway 62.

This assessment includes numerous assumptions that could be refined based on further study, pertaining to land use, site-specific SWM features, site grading, etc. No provisions were included for impacts due to climate change. We would recommend that the results be treated with a moderate level of confidence.

As Hastings Highlands' storm sewers consist of such a small portion of the Municipal Infrastructure, for the purposes of this report, the financial implications in regards to storm sewers will be grouped with the Municipality's culverts.

3.1.2 Non-Structural Culverts

Non-Structural cross culverts are not considered a "core" asset under O.Reg. 588/17. As such they do not need to be assessed in regards to their capacity. However, like many rural communities, non-structural culverts are much more important and numerous than the storm sewer systems.

Therefore the Municipality is endeavoring to map all of its non-structural culverts and assess them for their condition.

Mapping and inspection work is ongoing and approximately 1/3 of the map area of Hastings Highlands has been covered, capturing over 450 culverts thus far. It is expected that there may be around 1200 non-structural culverts throughout the road network.

3.1.3 100-Year Storm Flood Resiliency

As per Table 3 of O.Reg. 588/17; the intention of the Level of Service assessment is to understand the percentage of properties that are resilient to the 100 year storm.

While the term 'resilient' is not clearly defined in the O. Reg, Wills interpreted its meaning to consider instances where constructed features would be impacted by 100 year flood levels. We anticipate that properties that experience flooding only within undeveloped areas such as lawns or fields during the 100 year flood would be considered to be 'resilient'. One exception to this rule would be docks and boathouses, which would be expected to flood during more regular storm events.

To estimate the number of properties that were not resilient to the 100 year flood, Wills conducted the following tasks:

- Wills counted all structures within a 15 m setback from all watercourses and lakes, as defined by OBM and OLCC data.
- Wills assumed that the number of structures per property would be reasonable consistent for flooded and unflooded lands; and assumed that the percentage of flooded buildings would be representative of the percentage of flooded properties.
- Wills reviewed the LiDAR orthophotography throughout the Municipality to identify any urban streets which do not provide continuous overland drainage (i.e. a 'pocket'). No such locations were identified.

- Wills invited the Municipality to provide any additional locations of known historical surface flooding. No such locations were identified.

Based on the results of our assessment, Wills counted 502 buildings within 15 m of a waterbody. The majority of the properties were adjacent to lakes. The results of this analysis may be particularly sensitive to the assumption that 15 m is a reasonable flood setback during the 100 year storm, which in reality will vary from lake to lake, and on the elevation of the waterfront buildings.

There are 5,350 properties within the Municipality as per tax records. Therefore, the resulting percentage of properties that are resilient to the 100 year storm is approximately 94%. We would recommend that the results be treated with a moderate level of confidence and used as a rough benchmark to compare the Municipality with similar communities or to identify if a more detailed study is required to delineate the limits of flooding during the 100 year storm in some areas.

3.2 Roads

Table 7 and **Table 8** summarize the current state of the road network as per table 4 of the O.Reg. 588/17, based on the 2021 Road Needs Study:

Table 7 – Road System Summary

Class	Lane-Kilometres	Lane-Kilometres / Municipal Area[4]	PCI (Hard Top Only)
Arterial	0	0	0
Collector Roads	429	0.44	76.6
Local Roads	536	0.55	71.8
All	965	0.99	75.2

[4] Municipal area taken as 972.35 km^2 from Statistics Canada. 2017. Hastings Highlands, MU [Census subdivision], Ontario and Ontario [Province] (table). Census Profile. 2016 Census. Statistics Canada Catalogue no. 98-316-X2016001. Ottawa. Released November 29, 2017. https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E (accessed June14, 2022)

Table 8 – Road System Replacement Value and Estimated Age

Road Type	Length (rounded to the nearest km)	Current Replacement Value (2022)	Average Asset Age / Useful Service Life (Years)
Gravel and Earth (Loose Top)	249 km	$43 M	See Note
Low Class Bituminous (LCB)	153 km	$31 M	10.2 / 14
Hot Mix (HCB)	79 km	$26 M	7.0 / 20
Total	**482 km**	**$90 M**	**-**

Note: Gravel surfaces cannot be represented by a simple age. The embankment and base granulars may date to the original construction, while the surface granulars will erode off through traffic and grading. New gravel is added periodically to the surface to replace the lost material, but unlike hard-topped surfaces, there is no straightforward demarciation line between the wearing surface which must be replaced regularly and base material.

An overall road system adequacy, in accordance with the MTO Inventory Manual for Municipal Roads, 1991, has been calculated based on a number of road characteristics including:

- Capacity;
- Geometrics;
- Surface Condition;
- Shoulder and Road Widths;
- Structural Adequacy;
- Drainage; and,
- Maintenance Demand.

The evaluation of the roads is set out in the Road Needs Study Report.

The overall system adequacy for the 2022 Road Needs Assessment is 91%. This compares favourably to the goal of maintaining an adequacy of at least 82% in the 2016 AMP. Stated another way, only 9% of the Municipality's roads are considered deficient in their current state. Work on the Municipality's road system should focus primarily on preventative maintenance and planned replacement/resurfacing to maintain this level of service.

3.3 Bridges

The Municipality has 21 bridges and structural culverts in its network. For contracted bridge work, the replacement cost was taken from the "Five Year Capital Bridge/Culvert Structure Plan" adopted by council in June of 2022. Otherwise, the 2021 OSIMs were used. The replacement cost for the entire bridge network is $28.0 million. Currently three bridges have load limits.

The average known age of the Municipality's Bridges is 34 years, however, the age was often not known and likely older than average. The average BCI is 61.6.

The estimated service life for each bridge varies depending on bridge type and age, with culverts having a much lower expected life than a bridge. Bridges designed and constructed prior to 2000 are anticipated to be designed to a 50-year design life in accordance with the Ontario Highway Bridge Design Code. Newer structures, designed in accordance with the Canadian Highway Bridge Design Code would have a 75-year design life assigned to them.

Table 9 – Bridge Inventory Summary

Bridge Number	Structure	Structure Type	Year Built	Age	Age / Useful Service Life	BCI	Estimated Replacement Cost (K)	Estimated Year of Replacement
BR 01	Boulter Road Bridge	Concrete T-Beam w/ Concrete Deck	1940	82	82/50	22.83	$1,080[5]	2026
CUL 02	Cassidy Creek Bridge	Cast-in-Place Concrete Box Culvert	Unknown	Unknown	NA/50	67.65	$1,099[6]	Unknown
BR 03	Filip Road Bridge	Modular Steel Bridge (Lessard)	2010	12	12/50	61.47	$515[6]	2060
BR 04	Frantz Road Bridge	Precast Concrete Arch	1993	29	29/50	73.55	$1,297[6]	2053
BR 05	Grant Road Bridge	Steel Beams w/ Laminated Timber Deck	Unknown	Unknown	NA/50	68.97	$498[6]	2041
CUL 06	High Falls Trail Culvert	Open Footing SPCSPA	Unknown	Unknown	NA/30	67.32	$361[6]	2041
CUL 07	Kamaniskeg Lake Road Culvert	SPCSPA	2020	2	2/30	75	$295[6]	2050
BR 08	Little Papineau Creek Bridge	Glulam Timber Beams w/ Laminated Timber Deck	Unknown	Unknown	NA/50	65.53	$1,772[6]	2036
BR 09	Mink Lake Road Bridge	Steel Girder, Steel Pan Deck and Timber Wearing Surface	2012	10	10/75	67.32	$1,234[6]	2072
BR 10	Musclow-Greenview Road Bridge	Concrete T-Beam w/ Concrete Deck	1930	92	92/50	54.98	$851[6]	1990
CUL 11	Papineau Creek Bridge	Concrete Arch Bridge	unknown	unknown	NA/50	63	$1,266[6]	2036

[5] Capital Plan
[6] Wills' 2021 OSIM Report

Bridge Number	Structure	Structure Type	Year Built	Age	Age / Useful Service Life	BCI	Estimated Replacement Cost (K)	Estimated Year of Replacement
BR 12	Papineau Lake Road Bridge	Steel Beam w/ Concrete Deck	1956	66	66/50	48.93	$846[6]	2016
CUL 13	South Papineau Lake Road Culvert	Twin Multi-Plate CSPA	Unknown	Unknown	NA/30	51.22	$536[7]	2025
BR 14	Siberia Road Bridge	Steel Girder, w/ Concrete Deck	2009	13	13/75	74.35	$5,543[6]	2069
BR 15	Soble Road Bridge	Steel Beams w/ Laminated Timber Deck	2008	14	14/75	47.82	$870[5]	2022
CUL 16	Williams Lake Road Culvert	Twin CSP	2018	4	4/30	75	$724[7]	2048
BR 17	York River Bridge	Rectangular Culvert	1971	51	51/50	67.65	$6,594[6]	2031
CUL 18	Bird Lake Culvert	SPCSPA	Unknown	Unknown	NA/30	-	$697[7]	2022
CUL 19	Grant Lake Road Culvert	SPCSPA	Unknown	Unknown	NA/30	-	$536[7]	2022
CUL 20	Musclow Greenview Road Culvert	SPCSPA	Unknown	Unknown	NA/30	-	$804[7]	-
CUL 21	North Baptiste Lake Road Culverts	SPCSPA	Unknown	Unknown	NA/30	-	$590[7]	2024
							Total	**$28,001**

[7] Perspective Engineering 2021 OSIMs

3.4 Vehicles, Machinery and Equipment

Hastings Highlands currently maintains 64 vehicles or pieces of equipment in its fleet, as detailed in **Table 10**.

Table 10 – Vehicle Fleet and Equipment

Number	Vehicle / Equipment (Garage)	In Service Year	Original Cost	Years in Use / Expected Useful Life	Replacement Cost	Expected Replacement Year	Net Book Value
Fire Department							
101	2009 Chev. Silverado - Bangor Patrol/Gas	2010	$41,650	12/5	$52,822	2015	-
291	1975 GMC Pumper (Herschel North)	1975	$85,000	47/10	$215,589	1985	-
691	1978 Ford Pumper/Tanker (Bangor)	1978	$38,800	44/10	$92,734	1988	-
391	1980 International Fire Truck (Monteagle)	1980	$160,000	42/10	$367,559	1990	-
281	1983 International Tanker (Herschel Nouth)	1983	$85,000	39/10	$184,003	1993	-
581	1983 International Tanker (Lake St. Peter)	1983	$85,000	39/10	$184,003	1993	-
571	1988 Ford Van (Lake St. Peter)	1988	$38,800	34/10	$76,074	1998	-
161	1989 4X4 - (Herschel South)	1989	-	33/10	-	1999	-
181	1990 International Tanker (Herschel South)	1990	$85,000	32/10	$160,186	2000	-
182	1990 Ford Tanker (Herschel South)	1990	$85,000	32/10	$160,186	2000	-
191	1990 Ford F800 Pumper (Herschel South)	1990	$160,000	32/10	$301,526	2000	-
591	1991 Ford Pumper (Lake St. Peter)	1991	$160,000	31/10	$295,614	2001	-
481	1995 Ford LN-8000 Tanker (Maynooth)	1995	$175,000	27/10	$298,705	2005	-
381	1995 Ford LN-8000 Tanker (Monteagle)	1995	$175,000	27/10	$298,705	2005	-

Number	Vehicle / Equipment (Garage)	In Service Year	Original Cost	Years in Use / Expected Useful Life	Replacement Cost	Expected Replacement Year	Net Book Value
491	2002 GMC C8500 Pumper (Maynooth)	2002	$342,577	20/10	$509,052	2012	-
471	2002 Chevrolet Equipment Van (Maynooth)	2002	$39,349	20/10	$58,470	2012	-
371	2002 GMC Van (Monteagle)	2002	$12,720	20/10	$18,901	2012	-
171	2005 GMC Van (Herschel South)	2005	$38,375	17/10	$53,734	2015	-
151	2010 Ford 4x4 Truck (Herschel South)	2010	$30,564	12/10	$38,763	2020	-
-	2011 Air Compressor	2011	$21,926	11/10	$27,262	2021	-
382	2015 International Pumper M2-106 (Monteagle)	2015	$225,195	7/10	$258,678	2025	$67,558
681	1995 Freightliner (Bangor)	2018	$17,095	4/10	$18,505	2028	$10,257
671	2017 Jeep	2018	$22,385	4/10	$24,231	2028	$13,431
461	ATV Rescue (Maynooth)	-	-	-/10	-	-	-
Public Works, Large Trucks							
310	2006 International Tandem 7600	2005	$192,298	17/10	$269,264	2015	-
203	2007 International 70S	2007	$193,972	15/10	$261,061	2017	-
403	2008 International	2009	$191,727	13/10	$248,019	2019	-
	2010 International 70S	2010	$203,147	12/10	$257,640	2020	-
500	2011 International 70S	2010	$203,147	12/10	$257,640	2020	-
501	2012 International 70S	2011	$173,284	11/10	$215,457	2021	-
502	2012 International – Single Axel	2011	$168,559	11/10	$209,582	2021	-
504	2013 International 70S	2012	$191,942	10/10	$233,976	2022	-
503	2013 International 7600SBA	2013	$202,785	9/10	$242,347	2023	$20,279

Number	Vehicle / Equipment (Garage)	In Service Year	Original Cost	Years in Use / Expected Useful Life	Replacement Cost	Expected Replacement Year	Net Book Value
505	2015 International 7600SBA	2015	$201,336	7/10	$231,272	2025	$60,401
506	2017 International Plow Truck (Winslow Gerolamy)	2017	$232,189	5/10	$256,355	2027	$116,094
507	International Plow Combo	2018	$245,890	4/20	$266,159	2038	$196,712
508	2020 International Plow Truck	2019	$287,617	3/20	$305,221	2039	$244,474
202	2021 Freightliner SD Tandem Plow/Sander	2021	$276,022	1/20	$281,542	2041	$262,221
309	2022 International HV6 Plow/Sander	-	-	-/-	-	-	-
Public Works, Small Trucks							
102	2009 GMC - Sierra - Mechanic Truck	2010	$41,650	12/5	$52,822	2015	-
104	2014 Dodge 1500 - Supervisors Truck - BWM	2014	$26,721	8/10	$31,307	2024	$5,344
105	2014 Dodge1500 - Managers Truck	2014	$26,721	8/10	$31,307	2024	$5,344
106	2014 Dodge 1500 - Supervisors Truck - Mont/Her	2014	$26,721	8/10	$31,307	2024	$5,344
302	2016 Dodge 1 tonne/Gas Plow/Sand (302)	2016	$50,574	6/10	$56,954	2026	$20,229
509	2019 Dodge Ram 3500	2019	$81,624	3/10	$86,620	2029	$57,137
107	2020- BOYER CHEVROLET BUICK GMC	2020	$46,068	2/10	$47,929	2030	$36,854
Public Works, Major Equipment							
205	1985 Champion 740 Grader	1985	$130,300	37/20	$271,113	2005	-

Number	Vehicle / Equipment (Garage)	In Service Year	Original Cost	Years in Use / Expected Useful Life	Replacement Cost	Expected Replacement Year	Net Book Value
303	1989 Case W-20C Loader Maynooth	1989	$117,442	33/20	$225,751	2009	-
304	1990 Champion 740 Series 111 Grader	1990	$168,620	32/20	$317,771	2010	-
306	1990 Case 580K 4 wd Backhoe Herschel	1990	$70,260	32/20	$132,408	2010	-
402	1991 Champion 740 Series 111 Grader	1991	$175,656	31/20	$324,540	2011	-
407	1993 Case Loader Maynooth (407)	1993	$131,300	29/20	$233,168	2013	-
206	1999 John Deere 544H Loader (206)	1999	$143,600	23/20	$226,443	2019	-
311	2007 Volvo Grader	2007	$225,674	15/20	$303,727	2027	$56,419
600	2010 John Deere 544K Loader (600)	2010	$159,662	12/20	$202,490	2030	$63,865
602	2012 John Deere 190 Excavator (601)	2012	$239,637	10/20	$292,116	2032	$119,819
201	Thompson Culvert Steamer	-	-	-/-	-	-	-
307	Thompson Culvert Steamer	-	-	-/-	-	-	-
409	Brush Chipper	-	-	-/-	-	-	-
410	Thompson Culvert Steamer	-	-	-/-	-	-	-
801	T/A Float	2012	$33,283	-/20	$40,572	2032	$16,642
802	Asphalt Hotbox	-	-	-/-	-	-	-
Waste Management							
506	BOMAG	2006	$51,243	16/10	$70,346	2016	-
501	2005 JD 550J Bull Dozer	2012	$61,056	10/20	$74,427	2032	$30,528
	Total	**$10,283,957**				**$1,408,952**	

3.5 Buildings

The Municipality owns several buildings used for the purposes of public works, recreational, and emergency services functions.

In 2016, a visual assessment of all municipal buildings was undertaken in support of development of the Plan. The primary purpose of the assessment was to confirm the previously stated replacement values based on type of building and construction material. For this report, the findings of the 2016 report were updated to reflect disposal of two building assets.

A summary of the Municipality's buildings updated inventory is provided in **Table 11** below.

Table 11 – Buildings and Facilities Inventory

Building (Location)	Replacement Value 2022	Identified Needs[8]	Amoritization (Years)	Amortization Cost
Bangor Community Centre (786 Centreview Road, Combermer, ON, K0J 1L0)	$469,118	$55,524	40	$11,728
Lake St. Peter Community Centre (5 Boulter Lake Road, Lake St. Peter, ON, K0L 2K0)	$397,291	$189,018	40	$9,932
Rink Change House – Herchel (160 South Baptiste Road, Bancroft, ON, K0L 1C0)	$472,544	$502,078	40	$11,814
Fire Hall, Lake St. Peter (2356 Highway 127, Lake St. Peter, ON, K0L 2K0)	$184,647	$330,781	40	$4,616

[8] From 2016 Report, updated to 2022 dollars. Includes both AODA and structural related needs.

Building (Location)	Replacement Value 2022	Identified Needs[8]	Amoritization (Years)	Amortization Cost
Fire Hall, Bangor Twp (785 Centreview Road, Combermer, ON, K0J 1L0)	$362,796	$7,088	40	$9,070
Fire Hall, North Baptiste Road (9 Paradise Landing, North Baptiste Lake Road, Maynooth, ON, K0L 2S0)	$140,700	$14,176	40	$3,518
Fire Hall, South Baptiste Road (573 South Baptiste Lake Road, Bancroft, ON, K0L 1C0)	$298,175	$2,953	40	$7,454
Fire Hall, Maynooth (41 Old Hastings Road, Maynooth, ON, K0L 2S0)	$317,195	$2,953	40	$7,930
Fire Hall, Part Lot 10, Monteagle Valley (3205 Musclow-Greenview Road, Bancroft, ON, K0L 1C0)	$318,140	$3,249	40	$7,954
Municipal Offices/ Council Chambers/ Library (33011 Highway 62 North, Maynooth, ON, K0L 2S0)	$5,977,782	$15,358	40	$149,445
Community Centre – Herschel (168 South Baptiste Lake Road, Bancroft, ON, K0L 1C0)	$417,847	$238,635	40	$10,446

Building (Location)	Replacement Value 2022	Identified Needs[8]	Amoritization (Years)	Amortization Cost
Ball Diamond Bleachers, Herschel (168 South Baptiste Lake Road, Bancroft, ON, K0L 1C0)	$17,720	$8,860	40	$443
New Building - Kitchen, Change Area, washrooms, storage area (6 Young Street, Maynooth, ON, K0L 2S0)	$297,939	$94,509	40	$7,448
HH Road 62 Public Works Yard, Maple Leaf (35523 HH Road 62, Combermere, ON K0J 1L0)	$756,543	$4,725	40	$18,914
Equipment Storage Shed - Bangor (35523 Highway 62, Combermer, ON, K0J 1L0)	$334,325	$3,544	40	$8,358
Y-Road Public Works Yard (334 Y-Road, Bancroft, ON, K0L 1C0)	$865,110	$120,499	40	$21,628
M-G Public Works Yard / Office (3187 Musclow-Greenview Road, Bancroft, ON, K0L 1C0)	$803,798	$4,725	40	$20,095

Building (Location)	Replacement Value 2022	Identified Needs[8]	Amoritization (Years)	Amortization Cost
HH Road 62 Sand Dome (35523 Highway 62, Combermer, ON, K0J 1L0)	$397,410	$2,363	40	$9,935
Y-Road Sand Dome (334 Y-Road, Bancroft, ON, K0L 1C0)	$193,034	$2,363	40	$4,826
M-G Sand Dome and Furnace 3187 (3187 Musclow-Greenview Road, Bancroft, ON, K0L 1C0)	$264,625	$2,363	40	$6,616
Highway 62 Communication Tower	-	-	-	-
Total	**$13,286,740**	**$1,605,764**		**$332,169**

3.6 Solid Waste Sites

The Municipality currently operates seven solid waste landfills. A Waste Optimization Study was undertaken by Cambium in 2020 for Hastings Highlands. The purpose of that report was to:

- Reduce the net cost for waste management;
- Create efficiencies/improve site operations;
- Increase waste diversion; and,
- Reduce the negative environmental impacts associated with waste management.

Two sites have ceased their landfill operations since 2016: Sand Bay and North Baptiste. These sites continue to operate as waste transfer sites.

A summary of the Municipality's landfill inventory is provided in the following table:

Table 12 – Solid Waste Site Summary (as of 2020)

Site	Total Capacity (m^3)	Annual Usage (m^3)	Remaining Capacity (m^3)	Lifespan Remaining, from 2020 (years)
East Lake	147,546	1,054	40,944	39
Hickey Road	74,100	383	40,650	106
Lake St. Peter	20,000	1,038	18,962	36
Musclow Greenview	27,500	346	14,782	42
Papineau Lake	13,600	360	8,548	24
South Baptiste	82,785	1,040	20,913	20
Wolfe Creek	2,580	113	2,580	23
North Baptiste (Tranfer Site)	-	-	-	-
Sand Bay (Transfer Site)	-	-	-	-
Total	**365,531**	**4,221**	**144,799**	**34**

The total closure and post-closure liability for the Municipality's landfill and waste transfer sites is noted as $2.2 M as per 2021's Consolidated Financial Statements.

3.7 Street Lights

The Municipality currently maintains 54 street lights.

3.8 Current Performance Summary

A summary of the Municipality's current performance against the previously noted Levels of Service Targets is included below:

Stormwater (1) – All new and replaced storm sewers meet a 5 year storm design or better: Hydraulic Design Calculations to be retained as proof of design. 76% of the current storm sewer network is known to meet a 5 year design.

Stormwater (2) – All new development to be resilient to the 100 year Storm: The current estimated resiliency of Hastings Highlands is 90%.

Roads (1) – Minimum Overall System Adequacy Rating of 82%: As of 2022 the Municipality's overall roadl system adequacy rating is 91%. This is an improvement compared to 2016. Road adequacy was assessed in accordance with the MTO Inventory Condition Manual, 1991. Although this implies a dramatic increase in service levels, it should be noted that this measurement does not account for road deterioration until a road surface approaches the end of its service life. When general condition ratings are examined, the average condition has modestly increased.

Roads (2) – Minimum Average PCI of 75 for hard top surfaces: The Municipality's goal is to maintain the existing average Pavement Condition Index (PCI) while addressing the backlog of capital projects. As of 2021, the average PCI is 75.2 for the Municipality's hard top network. PCI was was not assessed in 2016.

Bridges – No Additional Load Limited Bridges: The Municipality currently has three load limited bridges in its network. With timely bridge maintenance and rehabilitation, no additional load limits should be required.

Vehicles – Utilization Meets or Exceeds Expected Service Life: The Municipality's fleet is virtually the same size since 2016 (it has increased by one). Some vehicles have been replaced, but a large number of vehicles have already met their estimated service life.

Continual assessment and revision of the expected service life, or modified use or maintenance activities, are required to ensure the expected service life is realized and appropriately accounted for in the Plan.

Buildings – Building Use Exceeds Its Expected Service Life: The Municipality's building infrastructure is currently in fair condition overall; 14 of the Municipality's buildings have reached their theoretical expected life (amortization).

Solid Waste - Meet All Applicable Regulations: The Municipality should continue to engage the Ministry of Environment, Conservation, and Parks (MECP) to ensure that their landfills continue to meet all relevant regulations.

The Municipality has a projected capacity of 32 years based on current demand, and is not anticipated to require investment in capacity over the Plan horizon. The Municipality should begin looking into getting the approvals for a site expansion within the next 10 years.

Streetlights – All streetlights remain in service: There are no known operational issues with Hastings Highlands' streetlights.

4.0 Asset Management Strategy (Best Management Practices)

The asset management strategy is a series of planned actions designed to sustain the prescribed levels of service of the Municipality. The strategy takes into consideration the lifecycle costs of each asset with the intent to ensure that capital funds are available to replace the asset by the end of its lifespan. The strategy also provides measures to increase the lifespan of the asset and to maintain the value of the asset through its lifespan. Best management practices such as a "preservation management approach" for roads form part of the strategy.

4.1 Stormwater and Flood Resilience Best Management Practices

The first step to managing stormwater networks effectively is to maintain accurate records. With accurate records, replacement schedules can be aligned with roadwork and it decreases the chance that pipes fail unexpectedly nessitating an urgent and costly repair.

Whenever a culvert is replaced outside of an emergency situation, it is advised that the pipe is resized and soil and water testing is used to determine the appropriate pipe material.

For storm sewers, ensure that catchbasins and pipes are not plugged with debris. Catchbasins should be inspected annually and cleaned as required. Culverts and sewers should always be assessed and replaced as nesesary prior to adjacent road work.

Flood resilience is best addressed in the planning stage. Retrofit options must be considered on a case by case basis. Although there are no reported flooding concerns in The Municipality.

4.1.1 Capital Expenditure on Stormwater

As the number of storm sewers is very low, and no flood vulnerabilities are known, the cost to maintain the Municipality's stormwater assets and flood resiliency will approximately equal to the cost to maintain the Municipality's culverts.

Estimated 1200 non-structural culvert pipes:

- Estimated 1200 culvert pipes
- Assume that the 'typical' pipe has a 600 mm diameter, not galvanized or protected, and approximately 12 m long.
- **Estimated replacement value: $17,280,000** (1200 pipes x 12m / pipe x $1,200 / m culvert removal, replacement and embankment reinstatement).

- Expected that approximately 400 pipes are in poor condition (based on currently assessed pipes)
- **Estimated current backlog of pipe replacent: $5,760,000** (400 pipes x 12 m/pipe x $1,200/m culvert removal, replacement and embankment reinstatement).
- Average life span of 30 years for a Corrugated Steel Pipe (CSP), 75 years for a properly designed High Density Polyethurane (HDPE) pipe.* Use 39 years as the 'typical' pipe lifespan.
- Annual replacement of 31 pipe cuverts.
- **Annual budget to maintain pipes: $446,700** (31 pipes/year x 12m/pipe x $1,200/m culvert removal, replacement and embankment reinstatement).

*The Actual lifespan of a CSP can be as high as 100 years with the right material selection and soil and water conditions, but this is rare. The Actual lifespan of an HDPE pipe is expected to be over 100 years (some of the first generation HDPE pipes from the 1950's are still in use), but early failure is common if not installed properly.

4.2 Roads Best Management Practices

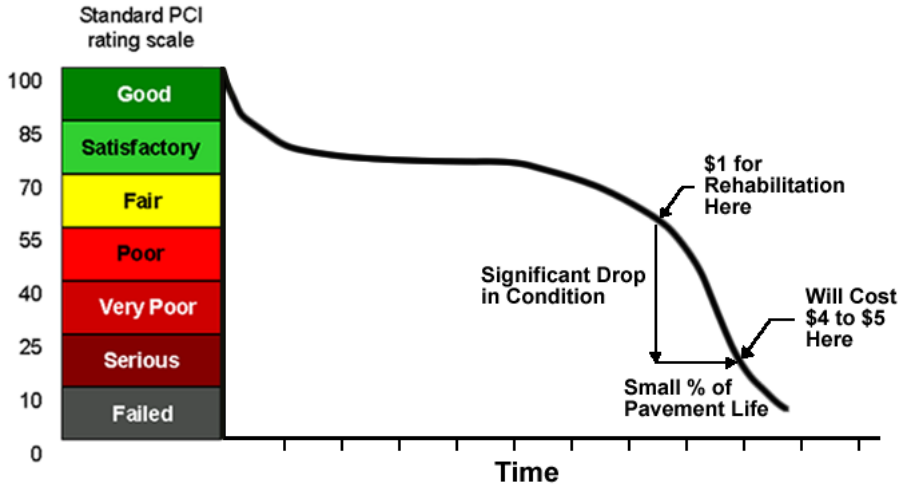
This section summarizes information included in from the 2021 Road Needs Study Report.

The key to managing a pavement network is the timing of maintenance and rehabilitation activities. This idea evolves from the fact that a pavement's structural integrity does not fall constantly with time. A pavement generally provides a constant, acceptable condition for the first part of its service life and then begins to deteriorate very rapidly. In many cases, maintenance and rehabilitation measures are not taken until structural failure or noticeable changes in ride quality become apparent. This is the "fix it once it is already broken" approach.

The unfortunate consequence of this decision is that maintenance and rehabilitation becomes exponentially more expensive over the life of the pavement and is often overlooked until the pavement condition reaches a severe state of distress. There is opportunity for substantial cost savings when intervention is made **before** the pavement becomes severely compromised; i.e. "fix it before it breaks". **Figure 2** illustrates the underlying principle in support of a preservation management approach to pavement infrastructure. The principle also has application to each of the classes of roads maintained by the Municipality. Significant cost savings will result from proactive intervention rather than simply waiting as long as possible before performing maintenance. The Municipality consequently will adopt a preservation management approach as a key component to the asset management plan for each class of road described as follows.

Examples of approaches to road maintenance with their associated cost implications over the lifecycle of a road are set out in **Appendix C** to this report and are provided as an illustration of the benefit of a "preservation management approach".

Figure 2 – Typical Service Life of an Asphalt Pavement



4.2.1 Preservation Management Approach

4.2.1.1 Gravel Roads

Gravel roads are the most significant and visible asset in the Municipality. The proposed preservation management approach for this class of road is outlined in the following Tables.

Table 13 – Preservation Management Approach – Gravel Surface

Action	Frequency
Regrade surfaces to maintain smooth/safe driving surface and proper crossfall.	As needed. Generally five-six times per year for higher volume gravel when able; one-two times minimum.
Add calcium to tighten surface, retain aggregate and reduce dust.	Each spring on all higher volume roads and as needed during summer months.
Ditching and brushing of right-of-ways to improve roadbed drainage and safety.	Complete road network every 10 years.

Table 14 – Capital Activities – Gravel Roads

Action	Frequency
Add layer (75 mm) of granular material to road surface.	Every five years for gravel roads.
Base and sub-base improvements.	As needed or as dictated by traffic volumes.
Reconstruct/convert to hard top.	As dictated by traffic volumes.

4.2.1.2 Surface Treated Roads

Surface treated roads have a hard wearing surface that must be preserved in order to be effective. Unlike gravel roads, a significant investment has been made in the surface and consequently these roads must be managed properly to obtain the longest possible service life from the surface. The Municipality intends on converting its existing LCB network to HCB as its LCB roads reach the end of their service lives.

4.2.1.3 Asphalt Roads

Asphalt surfaces are the smoothest and most durable hard top surface used by the Municipality however; they are also the most expensive. Asphalt provides a constant, acceptable condition for the initial portion of its service life but then begins to deteriorate rapidly as it ages. Surface defects such as cracking and raveling are the first signs of the deterioration. If left untreated, the pavement will rapidly deteriorate to the point where reconstruction is the only option. A preservation management strategy can mitigate this by applying renewal treatments earlier in the pavements life before the conditions begin to deteriorate too far. **Table 15** below summarizes preservation management activities to be considered for asphalt roads:

Table 15 – Rural Asphalt Roads

Activity	Age (Years)	Condition Rating	Service Life Extension (years)
Crack seal	2-6	9	2
Slurry seal*/ Microsurface	4-8	8	4-6
Overlay	12-15	6-7	10
Pulverize and Pave	20-25	<5	20
Reconstruct	30	<4	30

*Slurry seal can be used on lower volume paved roads (less than 1000 vehicles per day). For roads with volumes in excess of 1000 vpd, microsurfacing should be used.

In addition to the above noted preservation approach, the following best management practices will be employed to extend the service life and reduce life cycle costs of asphalt roads:

1. Review the condition of other infrastructure, particularly underground infrastructure prior to implementing any major renewal or rehabilitation of the pavement. Any repairs or capital upgrades to other infrastructure should be coordinated (refer to **Section 4.9**) for discussion on Integrated Capital Planning). This should reduce utility cuts in newer asphalt.
2. Repair potholes in the surface in a timely fashion to prevent saturation and weakening of road base.
3. Undertake regular shouldering program of rural paved roads to promote proper drainage. Poorly maintained shoulders allow surface water to pond and saturate the road base which weakens the base and leads to cracking at the edge of the pavement.
4. Undertake a ditching program to ensure there is adequate drainage for road base on rural roads. This will reduce the likelihood of structural distresses caused by softening of the road base due to poor drainage.
5. Specify the appropriate type of performance graded asphalt cement for the location.
6. Undertake a clearing program to reduce shading of the roadbed and remove roots/vegetation from the road base.

4.2.2 Application of Preservation Management Approach - Roads

The preservation management activities detailed in each of the tables above are not necessarily intended or required to be completed on each and every road. Road deterioration rates and the type of deterioration will dictate when action should be taken and what kind of treatment is most appropriate. The intention of the above is to outline the series of techniques to be considered in an effort to realize and extend the useful service life of the road asset for the lowest overall lifecycle cost while maintaining the highest overall condition. As detailed in the life cycle costs analysis presented in **Appendix B**, the preservation management approach to roads is proven to yield the lowest overall life-cycle costs.

Each of the preservation management activities for gravel, surface treatment and asphalt roads identified above, including route and seal, slurry seal, resurfacing etc. shall be considered as part of the regular Road Needs Study (RNS) every update. In general, the Municipality intends to carry out full RNS every five years to align with the AMP, as well as a smaller update RNS every two years following a full RNS to capture changes to the network. Recommendations on the specific treatments required shall be documented and prioritized in the RNS. A 10-year plan for road expenditures shall be developed as part of the regular RNS updates.

4.2.3 Capital Expenditures for Roads

Prioritization and recommendations for planned capital improvements have been developed based on condition rating and traffic demands on each road. Those roads having a "NOW", "1-5" or "6-10" year capital reconstruction requirement have been included in the 10-year capital requirement. Roads with less than 50 AADT are generally deemed to be acceptable with only regular maintenance activities. However, regardless of traffic volumes, roads with failing structural adequacies (a 14/20 or lower rating) have been considered for improvements within the 10-year plan. The total length of approximately 160 km of road was identified for capital improvement works at an estimated cost of approximately $24.5 M, over the next 10 years.

Expenditure of this nature over a 10-year plan represent a significant commitment of municipal resources, however, it is important to identify the overall need.

The Municipality will endeavor to undertake those activities which it can reasonably finance and will endeavor to partner with senior levels of government wherever possible to offset costs.

The focus of the Municipality will be to "keep the good roads good" by investing in those actions which result in the lowest life-cost and highest overall road network condition. Work has been prioritized within the RNS using the Road Condition Rating and traffic volumes. This means that a road in poor condition with a high traffic volume is prioritized ahead of a road in poor condition with a low traffic volume.

A re-investment of approximately $3.1M per year in capital expenditures is recommended based on the 2021 RNS.

Additionally the RNS recommends an annual investment of approximately $3.7M for the regular resurfacing of roads, as follows:

Based on typical degradation rates for gravel roads, surface treatment, and hot mix, a resurfacing program/budget is recommended as follows:

Hot Mix Paved Roads:

- 232.4 km of paved roads (HCB and LCB).
- Degradation rate 0.25/year (rating drops from 10 to 5, over a 20-year period).
- Annual resurfacing 11.6 km/year.
- Annual budget to maintain existing HCB, $3,062,400: (11.6 km/year x $132,000/ln **RMP1** x two lanes).

Gravel roads require regular maintenance. Maintenance includes regular grading and reapplication of new gravel. Typically, gravel roads should be resurfaced on a three to five year cycle.

Gravel Roads:

- 249 km of gravel and earth roads;
- 75 mm gravel every five years;
- Annual gravelling of 49.9 km;
- Granular A ($13,000 / km)*; and,
- Annual budget $648,700 (49.2 km/year x $13,000).

*Cost based on supply and application of gravel by external forces.

The total resurfacing program, (hot mix, surface treatment and gravel) is estimated at $3.7M per year.

In order to consistently realize the above service lives, it is essential that a proactive preservation program is implemented.

In order to consistently realize the above service lives, it is essential that a proactive preventative maintenance program is implemented.

Route and Seal:

- Applied once for each new double-lift HCB surface.
- Most HCB surfaces within the Municipality are single lift.
- Should be applied to newly redone Hastings Highlands Road 62 shortly initial cracking occurs.

Slurry Seal / Microsurfacing:

- Applied once for every new HCB and LCB surface, on average.
- Can also be applied as a holding strategy to defer more intensive rehabilitation.
- Annual budget to maintain existing hard top surfaces, $255,780: (11.6 km/year x $22,000/SS).

The total preservation management program, (route and seal, slurry seal/microsurfacing, brushing and ditching) is estimated at $486K per year.

The annual roads expenditures required under the Plan are therefore:

- **Identified Needs - $3.1M.**
- **Capital Resurfacing - $3.7M (including $649K for Gravel Resurfacing)**
- **Preservation – $256 K.**

For the purposes of the Plan, the above expenditures are deemed to include all non-maintenance related expenditures and therefore include actions such as routing and sealing, slurry sealing, resurfacing, reconstruction etc. Ditching and brushing are considered strictly maintenance activities which may be completed by Municipality forces or otherwise subcontracted out. It is recommended that an updated RNS be undertaken every five years to further assess the structural adequacy and condition of the roads and update the prioritized plan for road reconstruction and resurfacing activities.

4.2.4 Maintenance Expenditures for Roads

It is recommended that regular maintenance in the form of grading, roadside ditch cleanout and clearing be undertaken in order to extend the useful service life of the existing roads. A commitment of resources is necessary to ensure a viable annual ditching and clearing program. Both activities are considered two of the least expensive and most beneficial preventative maintenance activities to facilitate realizing the full pavement service life.

Brushing and Ditching Recommendations:

- Length of Rural Network 461 km.

- Recommended to brush and ditch entire rural network every ten years, 46.0 km/year.
- Brushing and Ditching ($5,000/km).*
- Annual budget to maintain ditches and clear ROW, $230,500: (46.0 km/year x $5,000/**Brushing and Ditching**).

**Cost based on work performed by contractor, with municipal forces supplying dump trucks and operators as required.

It is assumed that regular road grading activities will be undertaken by Municipality forces and with existing Municipality equipment, as such, a separate road grading maintenance budget has not been prepared.

4.3 Bridges Best Management Practices

4.3.1 Preservation Management Approach for Bridges and Culverts

When infrastructure is built, there becomes a need for maintenance, rehabilitation and eventually replacement. Given the significant cost to rebuilding bridges and culverts, strategic asset management and preservation becomes increasingly important to operating the asset network at a prescribed level of service over its full service life.

Similar to the roads network, it is more economical to manage the structure network rather than simply maintain it. In the case of bridges and culverts, waiting for serious signs of structural failure can lead to substantial costs for maintenance and rehabilitation, and ultimately cost the Municipality and the end users more money.

The key to managing both bridges and culverts is the timing and type of maintenance and rehabilitation activities. This idea evolves from the fact that a bridge's structural integrity does not fall constantly with time. A new bridge or culvert generally provides a constant, acceptable level of service and condition for the first part of its service life and then begins to deteriorate more rapidly as time progresses. In some cases, maintenance and rehabilitation measures are ignored until early signs of structural failure become noticeable.

4.3.2 Best Management Practices for Bridges and Culverts

The Municipality will use a preservation management strategy for managing its bridge assets (including culverts larger than 3 m). The approach will be based on more frequent, less costly treatments applied over the life span of a bridge or culvert. Careful timing of maintenance will extend the service life of the structure significantly versus a more traditional approach.

Bridges and culverts are different types of structures. Generally, bridges transmit live loads directly through their structure to a foundation whereas culverts transmit loads through fill to a foundation. Because these structures are different in construction and maintenance requirements, separate strategies have been identified for each type of infrastructure.

Examples of approaches to bridge maintenance with their associated cost implications over the lifecycle of a bridge are set out in **Appendix C** to this report and are provided as an illustration of the benefit of a "preservation management approach".

4.3.2.1 Bridge Management Strategy

Bridges are complex structures made up of several elements including the foundation, the substructure (abutments or ballast walls) and the superstructure (deck). Bridges are designed with a 75-year service life. However, in order to achieve the life span, intervention at periodic times is required. **Table 16** summarizes the preservation management strategy that will be applied to bridges:

Table 16 – Bridge Preservation Management Strategy

Activity	Age (Years)	Condition Rating	Service Life Extension (Years)
Minor Repairs	10-20	80-90	2-5
Minor Rehabilitation	30	65-70	20
Major Rehabilitation	50-60	50-60	40
Replacement	75	<40	75

4.3.2.2 Structural Culvert Management Strategy

Structural Culverts are typically designed with a 75-year service life similar to a bridge. However, in order to achieve the life span, careful selection of culvert material considering the site chemistry and culvert exposure is required. Intervention at periodic times is also required. **Table 17** summarizes the preservation management strategy that will be applied to culverts.

Table 17 – Culvert Preservation Management Strategy

Activity	Age (Years)	Condition Rating	Service Life Extension (years)
Culvert material/coating Selection	at Design		
Minor Repairs (patching, re-coating - partial or full, cleanout etc.)	10-20	80-90	2-5
Minor Rehabilitation (e.g. waterproofing, coating)	25	65-70	20
Major Rehabilitation (overlay, invert paving, lining etc.)	35 - 50	50-60	40
Replacement	75	<40	75

In addition to the above noted preservation approaches, the following best management practices will be employed to extend the service life and reduce life cycle costs of bridges and culverts:

1. Implement an annual Minor Bridge Repair program via the Operations or Capital budget. Utilize specific recommendations from the OSIM Inspection report to select which repairs on which structures. Minor repairs are critical as they address the problem while it is still small and cost effective to repair. Repairs may include, hand rail repair, pothole patching, concrete patches, repair to joint armouring, tightening steel bridge hardware, regrading of approaches or embankments, erosion prevention, crack sealing, etc.
2. Sweep and clean bridge decks and deck drains each spring. This will allow for inspection of the bridge surface and will promote positive drainage on the deck. This will eliminate standing water that has the potential to penetrate the wearing surface and cause premature deterioration of the deck.
3. Replace expansion joints **as soon as they are damaged or worn**. Expansion joints are flexible joints between the bridge deck and the approach slabs on a large bridge. Once they are damaged, they allow water to penetrate down to the abutments and bearing seats, which causes premature deterioration of these areas. Expansion joints are (relatively) inexpensive and their timely replacement can delay very costly rehabilitation work on the sub-structure.
4. Ensure OSIM inspections are completed on a biennial basis; not only because they are a legislative requirement but because they form the basis of the bridge inventory and contain recommendations for required improvements.
5. Complete Deck Condition Assessments (DCA) on any larger structures as outlined in the OSIM reports. DCA's involve exploratory work to properly assess

the extent of deterioration of the deck. They will help define the extent of rehabilitation required on a bridge deck.

6. Undertake localized or complete painting of steel girders, truss members or other steel members as recommended by OSIM inspections.
7. Cleanout culverts as need to prevent standing water or sediment collection in the culvert.
8. Stabilize embankments and inlet/outlet to prevent erosion and "piping" around the culvert. Ensure appropriate headwall/cutoff walls or clay seals are in place.

4.3.3 Application of Preservation Management Approach – Bridges

The preservation management activities detailed in each of the tables above are not necessarily intended or required to be completed on each and every structure. Bridge deterioration rates and the type of deterioration will dictate when action should be taken and what kind of treatment is most appropriate. The intention of the above is to outline the series of techniques to be considered in an effort to realize and extend the useful service life of the bridge asset for the lowest overall lifecycle cost while maintaining the highest overall condition and **maintaining the bridge in a non-load posted state**. As detailed in the life cycle costs analysis presented in **Appendix C**, the preservation management approach to bridges is proven to yield the lowest overall life-cycle costs, similar to roads.

Each of the preservation management activities identified above shall be considered as part of the biennial structure inspections. Recommendations on the specific treatments required shall be documented and prioritized in the OSIM Inspection. A 10-year plan for bridge expenditures shall be developed as part of the regular OSIM updates.

4.3.4 Capital Expenditures for Bridges

Based on the condition assessment of each structure, a ten-year structures work plan was developed for the Municipality with the goal of maintaining their current bridge network asset. A summary of the work activities and estimated reinvestment costs are provided in the following table.

The overall replacement cost of the Bridge and Structural Culvert assets is estimated to be $28.0M. The amortized cost to maintain these assets, using lifespan estimates for the existing structures is $570K per year.

A total reinvestment cost to maintain the current bridge asset is estimated at $5.3M over the next 10-year period with priorities as identified in the table below. This cost is concenetrated over the first five years.

The Plan should be revisited after each biennial structure inspection and updated every two years. In some cases, through preventative maintenance or rehabilitation activities, structures have outlived their expected useful service life. Given the limited available funding, extending the use of the Municipality's structures beyond their useful services lives is required.

The reinvestment costs are intended to maintain the bridge network asset in its current state and represent near term expenditures while the replacement costs and estimated replacement year are included to facilitate long-range financing plans. The following table lists identified needs over the next 10 years.

Table 18 – Bridge Needs Summary

#	Structure	Recommended Investigation or Rehabilitation	Cost Estimates ($K)		Time of Need
			Planning and Eng.	Construction	
BR 01	Boulter Road Bridge	Replace Bridge	$80[9]	$1,000[9]	2026
BR 08	Little Papineau Creek Bridge	Cap all timber piles and repave surface	$80[9]	$520[9]	2023
BR 10	Musclow-Greenview Road Bridge	Intall rock protection, retaining wall, new barriers, and repave deck and approaches	$5[9]	$25[9]	2023
BR 12	Papineau Lake Road Bridge	Repair wearing surface, replace joint armoring, repair concrete , replace railing, clean and recoat girders and diaphragms, replace curbs, install SBGR on approaches	$60[9]	$365[9]	2024
CUL 13	South Papineau Lake Road Culvert	Replace Culvert	$5[10]	$536[10]	1 – 5 Years
BR 15	Soble Road Bridge	Replace Bridge	$300[9]	$840[9]	2022

[9] Capital Plan
[10] Perspective Engineering 2021 OSIMs

#	Structure	Recommended Investigation or Rehabilitation	Cost Estimates ($K)		Time of Need
			Planning and Eng.	Construction	
BR 17	York River Bridge	Replace curbs, barriers, repair concrete girders, waterproof and pave deck, replace joint seals	$60[9]	$490[9]	2025
CUL 18	Bird Lake Culvert	Replace Culvert	$5[10]	$697[10]	Within 1 Year
CUL 19	Grant Lake Road Culvert	Replace Culvert	$5[10]	$536[10]	Within 1 Year
CUL 20	Musclow Greenview Road Culvert	Repair	$54[10]	$590[10]	6 – 10 Years
CUL 21	North Baptiste Lake Road Culverts	Replace Culvert	$5[10]	$590[10]	1 – 5 Years
		Total	**$659**	**$6,189**	-

4.4 Building Best Management Practices

The Municipality will employ the following best management practices in maintaining their buildings with a view to ensuring and extending the full service life (or more):

- Program the inspection of buildings on a regular basis, preferably no less than once every two years by a qualified professional.
- Maintain exterior sealants and flashing to ensure no water penetration.
- Ensure grading is such that surface water (drainage) is directed away from the building or into soak away pits.
- Repair damaged exterior elements, e.g. steel sheathing, roofing, cladding as soon as the damage occurs to prevent further deterioration.
- Annually inspect and remove debris from roof drains, gutters, downspouts.
- Enact or maintain service contracts for building systems such as HVAC as per manufacturer recommendations or as otherwise deemed necessary.
- Retrofit buildings to enhance energy conservation.

- Pump-out septic tanks on a regular basis.

4.5 Alternative Approaches to Building Management

Discussion of alternatives for management of the Municipality's building assets included:

- Disposal of current building assets and renting of space.
- Transferring ownership of community halls/facilities to local community groups.
- Renting additional space as opposed to building new space.

Risks to the above alternative approaches included the availability of sufficient and appropriate rental space.

For the purposes of the initial Plan, the Municipality has adopted the above best management practices and intends to manage their buildings assets as they have in the past, with consideration for the alternative strategies presented above, as required in the future. Additionally, there are several buildings noted as non-repairable i.e. reconstruction is required as opposed to upgrading. The Municipality shall consider removal of these assets from their inventory altogether i.e. demolition.

It is recognized by the Municipality that given the high costs associated with replacement of their building assets, it is imperative that the Municipality realize building lives in excess of their expected useful service lives. As such, this is reflected in the Municipality's Levels of Service Document.

4.5.1 Capital Expenditures for Buildings

The 2022 replacement cost of the Municipaliy's building assets is estimated at $13.3M. Based on the estimated replacement cost of each building from the 2016 report except those that have been disposed of, and their respective amortization period (or expected useful lives) an annual contribution to reserves of $332K is appropriate to finance replacement of buildings at the end of their amortization period. This of course assumes the Municipality is starting with all new buildings, and also assumes that each building will require replacement immediately upon reaching its theoretical life (amortization). The offsetting effect of these two factors is difficult to estimate.

Where possible, the Municipality shall strive to allocate funds to a building reserve fund for future capital improvements or ultimate replacement of their building assets. **An annual investment of $332K will be used as a guide for contributions.**

Annual allocations of this level represent a significant burden to the municipality financially and may require debt financing. Buildings will be expected to outlive their expected useful lives (amortization) as detailed in the Municipality Level of Service

expectations. Therefore, replacements will be undertaken on a priority needs basis and reserve contributions may be revised (reduced) accordingly.

Furthermore $1.6 M worth of AODA or structural related needs identified in the 2016 report remain outstanding. Note that buildings were not reinspected for the purposes of this report.

4.6 Vehicles, Machinery, and Equipment Best Management Practices

The Municipality shall employ the following best management practices in maintaining their vehicles with a view to ensuring the full service life (or more) from their vehicle assets):

- Vehicles are to be serviced on a regular basis, as per manufacturer recommendations or as otherwise deemed necessary by the manager of the fleet.
- Vehicle failures shall be repaired at the earliest opportunity to prevent undue wear and tear related to faulty equipment in disrepair.
- Vehicles shall be used with care.
- Vehicles will be stored indoors whenever possible.
- Winter sanding/salting equipment will be washed after use to remove salt/sand residue.
- Operators shall be properly trained on the use and care of the equipment.
- Vehicles shall be locked and parked in a safe location, when not parked at its home facility, to prevent the potential for vandalism and theft.
- Vehicles shall be replaced after it has met or surpassed its expected useful life, on a priority needs basis.

Alternative Approaches to Vehicle Management

Discussion of alternatives for management of the Municipality's vehicle assets included:

- Disposal of current vehicle assets and leasing.
- Contract select maintenance tasks to eliminate need for specialized equipment.
- Joint use of infrequently-used equipment with neighboring municipalities.

Risks associated with the above alternative approaches included concern over response time for maintenance given the Municipality's location and geographic size.

For the purposes of the initial Plan, the Municipality has adopted the above best management practices and intends to manage their vehicle assets as they have in the

past, with consideration for the alternative strategies presented above, as required in the future.

As stated previously in the Plan, the Municipality's Level of Service for their vehicle assets is to realize their full expected service lives. It is important that the Municipality assess the historic service lives of their equipment and either revise the expected service life, or modify the use or vehicle maintenance activities to ensure the expected service life documented in the Plan is realized. This should be considered early in the life of this Plan.

4.6.1 Capital Expenditure on Vehicles and Machinery

The replacement cost of the vehicle fleet and machinery is estimated at $10.3M. An amortized annual cost $859K would be needed based on expected service lives. Needs are estimated to correspond to the amortized cost for the purposes of this report.

Note that many vehicles are older than their expected service life and actual needs in the five year horizon may exceed the amortized amount.

4.7 Solid Waste Sites

It is recommended that the Municipality employ the following best management practices in maintaining the seven waste disposal sites and two waste transfer sites with a view to prolonging the life of each existing site, to its full service life and beyond, and to maximize the value of new investments.

- A lockable gate and fencing should be installed at the entrance to all sites (active and closed) to discourage illegal dumping.
- Fencing should extend far enough into the bush to discourage access.
- There may be an opportunity move the entrance gate further back at Hickey Road, and Wolfe Creek to further discourage illegal dumping.
- Additional effort will be required at East Lake, Lake St. Peter, Papineau and Wolfe Creek Sites to block ATV trails.
- All but one site (Papineau) require/have Design and Operation Plans. Design and Operation Plans must be followed.
- With respect to the current available capacity for East Lake, Hickey and Lake St. Peter; there is an opportunity to improve capacities at these sites through submission of an Environmental Compliance Approval application.
- The boundaries of the waste area, as established through the approved Design and Operation Plan, should remain clearly marked in the field.
- The attendant's facilities at all sites should be maintained in good condition.

- Ongoing maintenance of monitoring wells should be a requirement of the Municipality's groundwater monitoring program.
- Illegally dumped hazardous waste at all Waste Disposal Sites should be removed and properly disposed of at an appropriate disposal site as soon as possible.
- Site attendants should take time every day to clean up litter.
- Consideration should be given to using sea containers at all sites for e-waste storage. These containers should be kept closed and locked during off hours.

4.7.1 Alternative Approaches to Waste Management

The Municipality could consider, as an alternative to managing its own waste, to export waste. Based on recent numbers obtained from other local municipal waste management plans, the cost to export waste from the Municipality is estimated to be approximately $600 per tonne. The Municipality currently generates approximately 4,200 cubic metres of waste annually which equates to approximately 1,680 tonnes. Based on the annual waste tonnage, the cost to export waste from the Municipality would be approximately $1.0M annually.

In order to accommodate waste export, the Municipality would be required to convert one or more existing waste disposal sites to a transfer station at a cost of about $250,000 each, including engineering and approvals.

4.7.2 Waste Disposal Site Optimization

As per the 2020 Waste Optimization Study, consideration should be given to closing an additional waste site to active use, given that there are no capacity concerns – this does not necessarily translate into closing a site before its capacity is used. The municipality could divert waste to some of the smaller sites so that they fill up ahead of time.

4.7.3 Waste Disposal Sites Capital Expenditures

Waste Disposal Service Life

The total remaining available waste disposal capacity for the municipality (from all seven sites) has been estimated to be 147,000 cubic metres 2020. The current usage is estimated at 4,200 cubic metres annually. Based on the estimated available capacity and current waste generation rate, the remaining waste disposal service life is estimated to be 32 years. Although it is not anticipated to require investment in capacity over the Plan horizon, the Municipality should begin looking into getting the approvals for a site expansion within the next 10 years should a opportunity arise.

Replacement Cost

Typical landfill replacement costs, based on an average for rural municipalities in Ontario, would equate to approximately $230 per cubic meter. The current waste generation rate for the total municipality has been estimated to be about 4,200 cubic metres annually. Based on provincial requirements, the landfill planning period is 25 years. Therefore, in order to accommodate waste disposal for 25 years, the Municipality would require a site with 105,000 cubic metres capacity.

This equates to a replacement cost of about $24.2M for a site to accept waste generated by the Municipality for the 25 year planning period.

As noted, the Municipality currently has an estimated 32 years of capacity through its existing landfills, or stated differently, the Municipality has 32 years to save/allocate funds for future replacement of their current landfills, representing an annual allocation of $755K.

4.8 Streetlights

Streetlights require regular maintenance to ensure that they continue to operate in a satisfactory fashion. Supplementary reports in regards to streetlights will be provided for the final report. For the purposes of this draft report, it is estimated that a streetlight may cost $9,250 to install and last 25 years. Based on these assumptions, the overal replacement amortization costs of $499,500 and $19,980 for the Municipality's streetlights.

4.9 Prioritization of Projects

The Municipality has developed Levels of Service (LOS) for each of the respective classes of assets included within this Plan. The respective LOS sets the benchmark or expectations of the Municipality and its constituents/ratepayers. The prioritization of projects within each class of asset and across the various classes of assets may still be required where financing limitations or emergency activities are required. In general, project prioritization shall be undertaken using the following criteria:

- User safety;
- Risk management;
- Levels of Service;
- Life-cycle cost and remaining service life;
- Size of User Group (e.g. Volume of traffic for roads, number of bridge users);
- Economic Development;
- Recreation; and,

- Aesthetics.

4.10 Integrated Capital Planning

While it is important to manage each asset group as a system, e.g. road network, bridge network etc., it is also important to understand and implement an integrated capital planning approach to realize maximum value for money and economies of scale, and ensure the full service life is realized from each capital asset investment. As an example, it is not economical or feasible to replace a road in Year one, only to go back and replace services beneath the road, and have to replace the road again five years later. The scheduling and prioritizing of projects should be an integrated approach across related assets.

The following integrated capital planning practices shall be adopted by the Municipality in scheduling work priorities:

- Replacement of underground services beneath a road surface shall be coordinated with renewal of the road base and/or surface, wherever feasible, and vice versa.
- Road rehabilitation work adjacent to structures planned for replacement shall be considered for tender with the structure replacement work or after structure work is complete.
- Culvert replacements shall be done in conjunction with road rehabilitations wherever possible.
- Road priorities shall give due consideration to short and long term development plans. E.g. turning lane requirements, utility cuts etc.

4.11 Procurement Methods

The Municipality has in place and shall adhere to its current Procurement Policy in retaining services to manage, maintain and improve its infrastructure assets under this Plan.

Alternative procurement methods shall be explored as opportunities for such arise including:

- Joint Tendering: E.g. Line painting, gravel/salt bulk purchase to realize potential economies of scale.
- Retainer Services: E.g. Engineering/consultant retainers to minimize procurement costs.
- Shared Services: E.g. Pooled services with other municipalities.

4.12 Risks to the Asset Management Plan

As with the development of any plan there are inherent risks that may jeopardize the partial or full execution of the plan or may challenge the ability of the plan to meets its respective targets. The following summarizes those risks, associated with the Plan, known to exist today.

- Inadequate levels of funding.
- Non-commitment by Municipal Council or Staff to the Plan.
- Emergency activities which direct funds away from the Plan.
- Changes to legislative requirements which may influence Levels of Service.
- Premature failure of an asset.
- Unforeseen development pressures.
- Risk to Public Health and Safety (relating to asset failure due to inadequate funding).

Identification of the above potential risks is an important step in moving forward with the Plan. As is the case in many small rural municipalities, the simple reality is that there is a limited availability of funds, and a related limited ability to grow funding, in order to manage the Municipality's infrastructure. While this Plan sets out to manage the competing infrastructure priorities at the lowest combined lifecycle costs, the plan will be subject to revision and refinement as new approaches/technologies are developed, new funding strategies are found, and the expectations of the Municipality (council, staff, and ratepayers) evolve.

5.0 Financing Strategy

5.1 Overview

In 2011 the province adopted its long-term infrastructure plan for Ontario, "Building Together". One of the guiding principles of this Plan is that those who benefit directly from municipal infrastructure should pay for the service, whenever feasible. While the province appears to be continuing to recognize its obligation to assist municipalities with their infrastructure challenges, it is clear that every municipality is expected to move towards the sustainable management of its own capital assets: to ensure that as assets need to be repaired and replaced, each municipality will be able to finance its own requirements.

5.1.1 Sources of Funding

The Municipality's sources of funding practices include the following:

Hastings Highlands Roads Asset Management Capital Funding Program

The Municipality transfers funds from the operating budgets Roads Asset Management Capital Funding Program annually to fund capital expenditures. The Roads Asset Management Capital Funding Program transfer for 2022 is estimated to be $300,000.

Reserve Funding

Reserve funding used for capital expenditures have averaged $960,655 per year, in the period 2017-2021. Transfers into Reserves over the same period have averaged $1,293,695. The Municipality has a reserves policy that funds reserves annually as part of the operating budget in an effort to manage any current and future operating and capital needs.

Government Funding

In addition to the Asset Management Capital Funding Program and Municipal Reserves, the Municipality directs its Canada Community Building Fund, formerly the Federal Gas Tax funds to eligible capital expenditures. The Federal Gas Tax Funding for 2022 is estimated to be $253,045. The Municipality also uses the Ontario Community Infrastructure Fund formula funding to fund capital expenditures within funding guidelines. The 2022 allocation is estimated to be $312,796.

5.1.2 Funding Amortization Approach

The Municipality, as with many other rural and small urban municipalities, is faced with sustaining a substantial inventory of capital assets. As part of the development of this Plan, a commonly-cited sustainability measure, the annual amortization of the current replacement cost of assets was estimated based on the estimated replacement costs identified in this Plan. Contributions to reserves or re-investment of an equivalent amount was considered as a proposed long-term municipal target.

An overview of Funding Amortization Approach:

- Stormwater: $447K annually for culvert replacements.
- Roads: $3.7M annually to maintain the network at its current size through resurfacing.
- Bridges: $570K annually.
- Buildings: $332K annually.
- Vehicles and Equipment: $859K annually.
- Waste Disposal: $755K annually (to create a 25-years worth of landfill when existing capacity is used).

- **Total: $6.7M/year**

The resulting cost exceeds current potential funding levesl for the Municipality, from increased taxation, debt financing, and all other known funding sources/strategies.

Further, although this approach represents long term sustainability and stable funding, actual costs may fluctuate both in the medium and short term. Currently bridge and culvert needs over the next 10 years are actually greater than the amortization amount – i.e. even greater funding to address identified needs will be required in the short term.

5.1.3 Funding Needs Approach

As a more practical and feasible short term objective, the Municipality may target its identified needs.

An overview of Funding Needs Approach:

- Stormwater: $580K a year for culvert replacements.
- Roads: $2.45M a year for capital improvements.
- Bridges: $684K a year to address all structural needs.
- Vehicles and Equipment: $86K a year to replace aged out vehicles and equipment.
- Buildings: $160K a year to address all needs identified in 2016.
- Waste Disposal: defer all investment as capacity is over 25 years.
- **Total: $4.0 M/year**

5.1.4 Balanced Approach

Although the Funding Amortization Approach is infeasible as an immediate goal, the Funding Needs approach would represent a bare minimum, and in the long term is not sustainable (i.e. would require the disposal of assets or acceptance of low serviceability over time). It would also mean that many assets will miss receiving cost effective treatments that would, in the long term, reduce the Municipality's budget needs.

As such, it is recommended that the Municipality ensures that funding meets its identified needs as minimum, and increases funding over time to approach a truly sustainable level.

5.2 Financial Strategy and Capital Expenditure Notes

1. The useful lifespan of the asset, in particular vehicles, was based on accounting information. Consideration may be given to extending the expected service life

(an amortization period) of vehicles to 12/25 years, where it is currently 10/20 years to reflect actual municipal practice.

2. Capital funding will be drawn from property taxes, committed grants, and transfers from reserves.
3. The Road Needs Study established a list of priority projects to be addressed in a 1-10 year time horizon. The roads management study will be updated every five years as a measure to reassess road conditions and to determine deficiencies. The report will be used as a monitoring tool in assessing past expenditure patterns in the maintenance of the road network. Capital expenitures on roads will be increased at 2% per year, over the 10-year Plan period.

Capital expenditures will be monitored on an annual basis. The Asset Management Plan will be subject to a comprehensive review every five years and shall be updated as updated asset condition/needs information is available.

Respectfully submitted,

Eric St. Pierre, P. Eng.
Transportation Engineer

ESP/af

Appendix A

Supporting Reports:

2021 RNS Report (Wills)
2021 OSIM Report (Perspective Engineering)
2021 OSIM Report (Wills)
2020 Waste Management Optimization Study (Cambium)
2016 Buildings, Lands, and Facilities Study (Wills)
2016 Solid Waste Maganement Study (Wills)

Appendix B

Life Cycle Cost Analysis

Example Life Cycle Cost Analysis

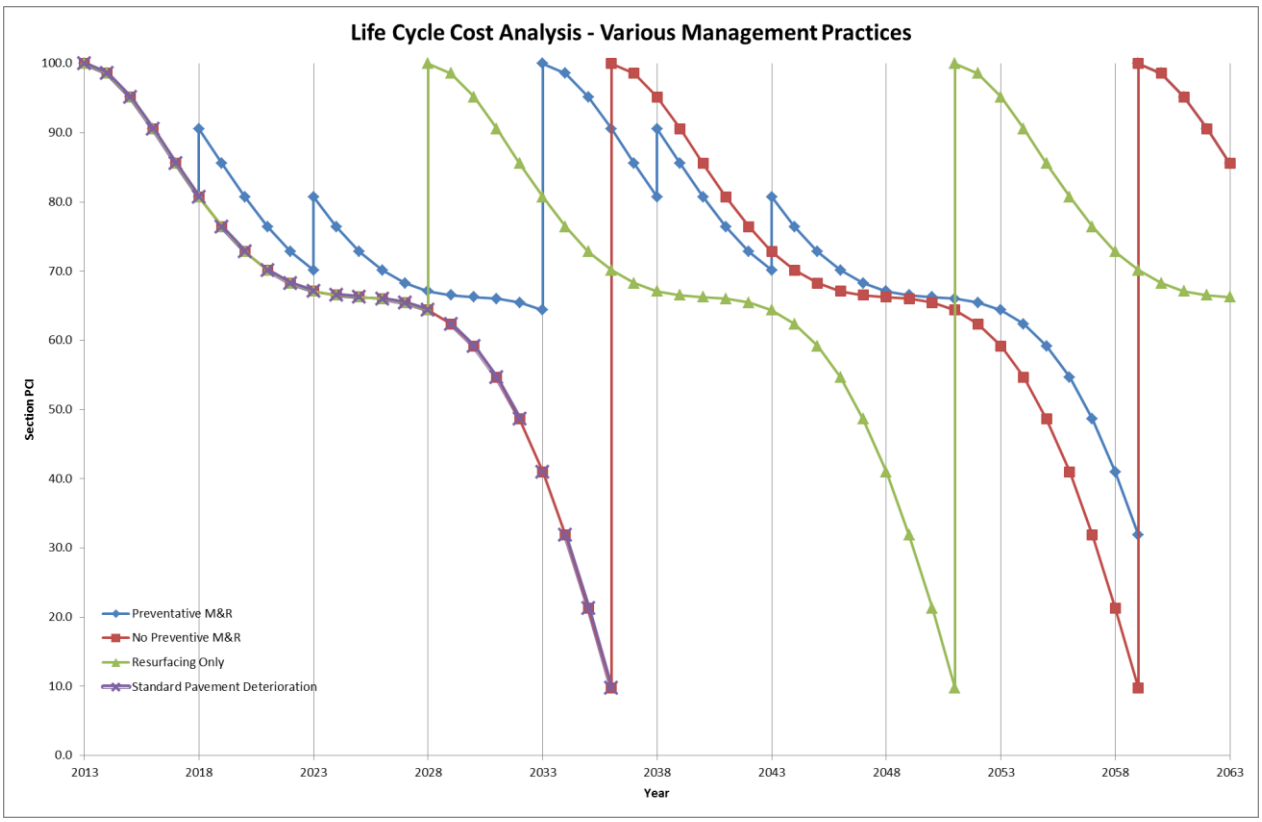
The following life cycle costs analysis compares three different municipalities Municipality 1, Municipality 2 and Municipality 3, each with three distinct approaches to pavement management. For this analysis we will assume each of the three municipalities have 7000 m^2 of pavement i.e. 1km of asphalt paved road that is 7m wide. In each scenario, the road is assumed to have been constructed in 2013 and will operate under normal traffic loading.

The Life Cycle Cost Analysis (LCCA) assumes no user costs and uses a discount rate of 2.5%/year.

The LCCA shows the three different municipalities and tracks their pavement management decisions and related condition over the specified time period. Municipality 1 represents decisions made based on strategic preventive maintenance and rehabilitation, Municipality 2 represents decisions based on no preventive maintenance and rehabilitation and Municipality 3 represents decisions based on resurfacing only.

The figure below illustrates a time- pavement condition plot for each municipality.

Figure B1 - Time-Condition Plot for Three Municipalities



The costs associated with the corresponding maintenance and rehabilitation decisions are outlined in the following tables:

Table B1 - Municipality 1 Policy

Preventive M&R									
Year	**Age**	**Treatment**	**Δ PCI**	**PCI_q**	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**	**Present Worth**
		-- Annual Ditching/Clearing --							
2018	**5**	**Localized Preventive - Rout and Seal**	81-90	Satisfactory-Good	1000	m	$1.50	$1,500.00	**$1,325.78**
2023	**10**	**Global Preventive - Slurry Seal**	70-81	Satisfactory-Good	7000	m^2	$6.50	$45,500.00	**$35,544.53**
2033	**20**	**Surface Course**	64-100	Poor-Good					
		Mill and Dispose of Surface Course			7000	m^2	$12.00	$84,000.00	
		50mm Surface Course			892.5	t	$135.00	$120,487.50	
								$204,487.50	**$124,792.78**
2038	**25**	**Localized Preventive - Rout and Seal**	81-88	Satisfactory-Good	4500	m	$1.50	$6,750.00	**$3,640.89**
2043	**30**	**Global Preventive - Slurry Seal**	68-78	Satisfactory-Good	7000	m^2	$6.50	$45,500.00	**$21,691.79**
2048	**35**	**Safety/Stopgap Maintenance - AC Patching/Leveling**	N/A	N/A	5%	m^2	$30.00	$10,500.00	**$4,424.40**
2053	**40**	**Safety/Stopgap Maintenance - AC Patching/Leveling**	N/A	N/A	10%	m^2	$30.00	$21,000.00	**$7,821.04**
2058	**45**	**Full Reconstruction**	32-100	Serious-Good					
		Remove Asphalt Full Depth			7000	m^2	$15.00	$105,000.00	
		Add and Compact Corrective Aggregate/Correct Crossfall (25mm avg.)			420	t	$35.00	$14,700.00	
		40mm Base Course			686	t	$125.00	$85,750.00	
		50mm Surface Course			892.5	t	$135.00	$120,487.50	
								$325,937.50	**$107,290.28**
2063	**5**	**Localized Preventive - Rout and Seal**	81-90	Satisfactory-Good	1000	m	$1.50	$1,500.00	**$436.41**
		Final PCI in 2063:	**90**	**Good**				**Net:**	**$306,967.90**
								Residual Value:	**$85,346.08**
								Total Cost:	**$221,621.82**

The policy of Municipality 1 is to strategically intervene with preventative maintenance measures over the course of the pavement's service life. Two significant maintenance measures are performed on the pavement at various times and ultimately extend the service life of the pavement, prorating the total cost of the pavement over a longer period of time. Eventually, a full reconstruction is required and this cycle repeats. The total life cycle costs are substantially less when compared to Municipality 2 and 3, at a total of $221,622 over 50 years.

Table B2 - Municipality 2 Policy

No Preventive M&R									
Year	**Age**	**Treatment**	**Δ PCI**	**PCI_q**	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**	**Present Worth**
2023	**10**	**Safety/Stopgap Maintenance - AC Patching/Leveling**	N/A	N/A	5%	m^2	$30.00	$10,500.00	**$8,202.58**
2028	**15**	**Safety/Stopgap Maintenance - AC Patching/Leveling**	N/A	N/A	10%	m^2	$30.00	$21,000.00	**$14,499.78**
2030	**17**	**Safety/Stopgap Maintenance - AC Patching/Leveling**	N/A	N/A	20%	m^2	$30.00	$42,000.00	**$27,602.19**
2036	**23**	**Full Reconstruction**	10-100	Poor-Good					
		Remove Asphalt Full Depth			7000	m^2	$15.00	$105,000.00	
		Add and Compact Corrective Aggregate/Correct Crossfall (25mm avg.)			420	t	$35.00	$14,700.00	
		40mm Base Course			686	t	$125.00	$85,750.00	
		50mm Surface Course			892.5	t	$135.00	$120,487.50	
								$325,937.50	**$184,707.88**
2043	**7**	**Safety/Stopgap Maintenance - AC Patching/Leveling**	N/A	N/A	5%	m^2	$30.00	$10,500.00	**$5,005.80**
2048	**12**	**Safety/Stopgap Maintenance - AC Patching/Leveling**	N/A	N/A	10%	m^2	$30.00	$21,000.00	**$8,848.79**
2053	**17**	**Safety/Stopgap Maintenance - AC Patching/Leveling**	N/A	N/A	20%	m^2	$30.00	$42,000.00	**$15,642.09**
2059	**23**	**Full Reconstruction**	10-100	Poor-Good					
		Remove Asphalt Full Depth			7000	m^2	$15.00	$105,000.00	
		Add and Compact Corrective Aggregate/Correct Crossfall (25mm avg.)			420	t	$35.00	$14,700.00	
		40mm Base Course			686	t	$125.00	$85,750.00	
		50mm Surface Course			892.5	t	$135.00	$120,487.50	
								$325,937.50	**$104,673.45**
		Final PCI in 2063:	**86**	**Good**				**Net:**	**$369,182.56**
								Residiual Value:	**$81,552.92**
								Total Cost:	**$287,629.64**

The policy of Municipality 2 is to simply construct the pavement and wait until serious deficiencies begin to appear before acting. This approach unfortunately remains common still today. Over the last period of the pavement's life, maintenance is required to ensure safety and operation until the pavement is completely destroyed. Once the pavement has failed, a complete reconstruction is carried out restoring the pavement to new condition. This cycle repeats again until a second reconstruction is required. The total costs are substantial and total $287,630 over 50 years.

Table B3 - Municipality 3 Policy

Resurfacing Only									
Year	**Age**	**Treatment**	**Δ PCI**	**PCI_q**	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**	**Present Worth**
2028	**15**	**Surface Course**	64-100	Poor-Good					
		Mill and Dispose of Surface Course			7000	m^2	$12.00	$84,000.00	
		50mm Surface Course			892.5	t	$135.00	$120,487.50	
								$204,487.50	**$141,191.58**
2051	**23**	**Full Reconstruction**	10-100	Serious-Good					
		Remove Asphalt Full Depth			7000	m^2	$15.00	$105,000.00	
		Add and Compact Corrective Aggregate/Correct Crossfall (25mm avg.)			420	t	$35.00	$14,700.00	
		40mm Base Course			686	t	$125.00	$85,750.00	
		50mm Surface Course			892.5	t	$135.00	$120,487.50	
								$325,937.50	**$127,534.43**
2067	**15**	**Surface Course**	64-100	Poor-Good					
		Mill and Dispose of Surface Course			7000	m^2	$12.00	$84,000.00	
		50mm Surface Course			892.5	t	$135.00	$120,487.50	
								$204,487.50	**$53,898.67**
		Final PCI in 2063:	**66**	**Good**				**Net:**	**$322,624.67**
								Residiual Value:	**$62,587.12**
								Total Cost:	**$260,037.55**

The policy of Municipality 3 is periodic resurfacing. The pavement is constructed and time passes until early signs of serious distress are observed. This occurs after the time when preventive maintenance is neither appropriate nor possible, but before the pavement is completely destroyed. Resurfacing is performed and restores the pavement to almost new condition. The pavement then deteriorates for the remainder of its life, requiring significant maintenance in the last years before it is completely destroyed. A full reconstruction is then carried out and the cycle continues. The total costs are in between that of Municipality 1 and 2 at $260,038 over 50 years.

It may be easy to see upfront cost savings by understanding that as long as any costs associated with maintaining the pavement are deferred as long as possible, money will be saved. The reality is that extending a pavements service life prorates the total cost of the pavement over a longer period of time and ultimately becomes more economical in the long run. If preventive maintenance measures are strategically planned and carried out then the service life of the pavement can be maximized and substantial reconstruction costs can be deferred for longer periods of time. In a time when economy and efficiency are becoming more and more important, this type of proactive management is essential in the management of infrastructure.

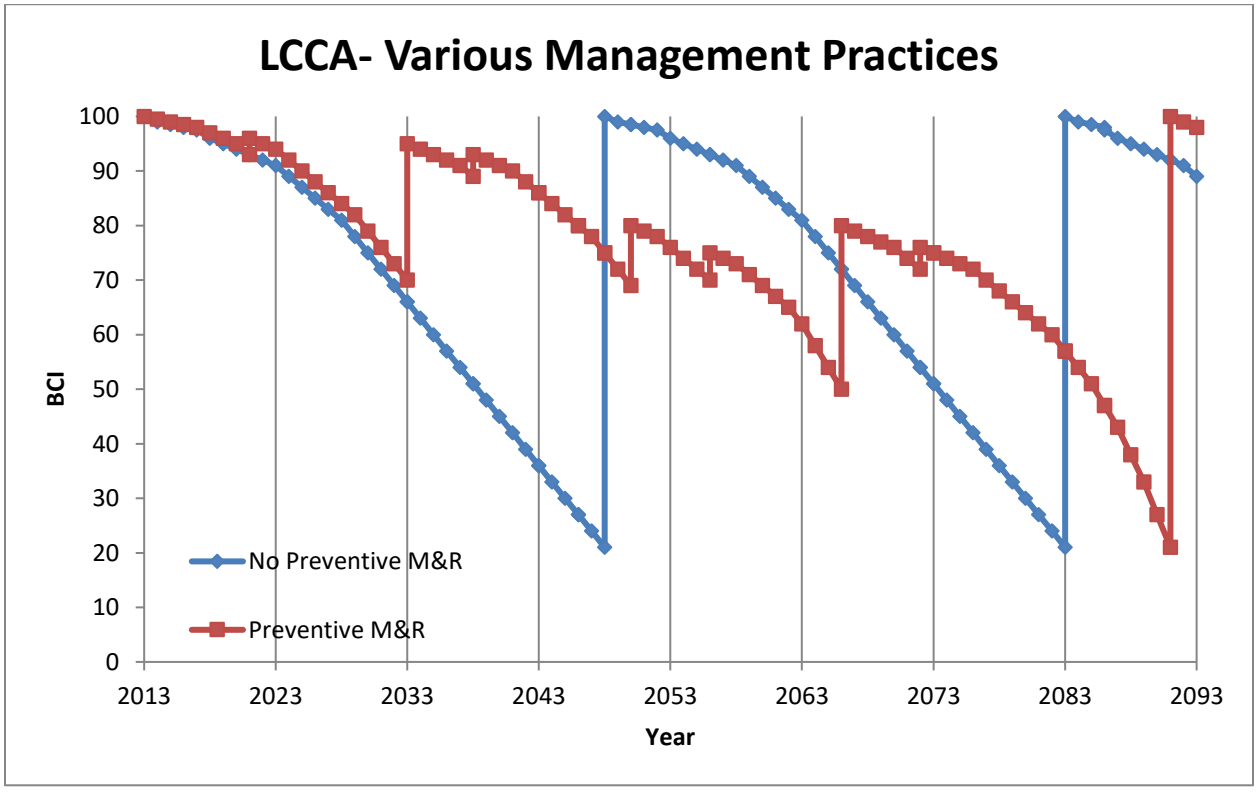
Life Cycle Cost Analysis

The following life cycle costs analysis compares two different management practices for municipalities managing their structure inventory. For the analysis we will assume each of the municipalities have an identical bridge as a part of their inventory. Both bridges have the same initial construction cost, and are identical in terms of structure type and construction.

For the analysis, each municipality has in their inventory a two-lane, single span bridge with concrete barrier walls and deck supported by prestressed concrete girders on concrete abutments. The bridge has expansion joints at either end and a paved deck. The road maintenance policy of each municipality is to use salt as a winter roadway de-icer. The LCCA assumes no user costs.

The LCCA shows the municipalities and tracks their structure management decisions over a 90-year time period. Municipality 1 represents decisions made based on strategic preventive maintenance and rehabilitation and Municipality 2 represents decisions based on no preventive maintenance and rehabilitation. Refer to the figure below for a time-condition plot for each municipality.

Figure B2 - Time-Condition Plot for Two Municipalities



The costs associated with the corresponding maintenance and rehabilitation decisions are outlined in the following tables:

Table B4 - Preventitive Maintenance and Rehabilitation

Year	Treatment	ΔBCI	Quantity	Unit	Unit Cost	Total Cost	Present Worth
2021	**Rout and Seal Cracks**	93-96	250	m	$2.50	$625.00	**$512.97**
2033	**First Rehabilitation**	70-95					
	Patch, Waterproof and Pave Deck		480	m^2	$600.00	$288,000.00	
	Misc. Concrete Patching		50	m^2	$2,000.00	$100,000.00	
						$388,000.00	**$236,785.13**
2038	**Rout and Seal Cracks**	89-93	250	m	$2.50	$625.00	**$337.12**
2050	**Barrier Wall Replacement**	69-80	39	m^3	$2,500.00	$97,500.00	**$39,104.04**
2056	**Rout and Seal Cracks**	70-75	200	m	$2.50	$500.00	**$172.92**
2066	**Second Rehabilitation**	50-80					
	Patch, Waterproof and Pave Deck		480	m^2	$600.00	$288,000.00	
	Misc. Concrete Patching		100	m^2	$2,000.00	$200,000.00	
	Bearing Replacement		10	ea.	$5,000.00	$50,000.00	
	New Barrier Walls		39	m^3	$1,450.00	$56,550.00	
						$594,550.00	**$160,628.84**
2072	**Rout and Seal Cracks**	72-76	350	m	$2.50	$875.00	**$203.84**
2091	**Structure Replacement**	21-100					
	Piles		1500	m	$350.00	$525,000.00	
	Abutments and Wingwalls		300	m^3	$1,100.00	$330,000.00	
	Girders		450	m	$1,000.00	$450,000.00	
	New Concrete Deck		300	m^3	$1,250.00	$375,000.00	
	New Barrier Walls		39	m^3	$1,450.00	$56,550.00	
	Approach Slabs		56	m^3	$575.00	$32,200.00	
						$1,768,750.00	**$257,753.73**
	FinalBClin2093:	**98**				**Net**	**$695,498.58**
						Residual Value	**$240,427.03**
						Total Cost	**$455,071.54**

Table B5 - No Preventitive Maintenance and Rehabilitation

Year	Treatment	ΔBCI	Quantity	Unit	Unit Cost	Total Cost	Present Worth
2048	**Structure Replacement**	21-100					
	Piles		1500	m	$350.00	$525,000.00	
	Abutments and Wingwalls		300	m^3	$1,100.00	$330,000.00	
	Girders		450	m	$1,000.00	$450,000.00	
	New Concrete Deck		300	m^3	$1,250.00	$375,000.00	
	New Barrier Walls		39	m^3	$1,450.00	$56,550.00	
	Approach Slabs		56	m^3	$575.00	$32,200.00	
						$1,768,750.00	**$745,300.07**
2083	**Structure Replacement**	21-100					
	Piles		1500	m	$350.00	$525,000.00	
	Abutments and Wingwalls		300	m^3	$1,100.00	$330,000.00	
	Girders		450	m	$1,000.00	$450,000.00	
	New Concrete Deck		300	m^3	$1,250.00	$375,000.00	
	New Barrier Walls		39	m^3	$1,450.00	$56,550.00	
	Approach Slabs		56	m^3	$575.00	$32,200.00	
						$1,768,750.00	**$314,047.89**
	FinalBClin2093:	**64**				**Net**	**$1,059,347.96**
						ResidualValue	**$157,013.57**
						TotalCost	**$902,334.39**

*Costs are for materials only and do not include construction costs

The policy of Municipality 1 is to strategically intervene with maintenance measures over the course of the structure's service life. Maintenance measures are performed on the structures at various times and ultimately extend the service life of the structure, prorating the total cost of the structure over a longer period of time. Eventually, a full reconstruction is required and this cycle repeats. The total costs are fractional compared to those of Municipality 1. This difference in decision making introduces significant savings throughout the cycle.

The policy of Municipality 2 is to simply build the structure and wait until serious deficiencies become evident. Once the structure condition has deteriorated, a complete reconstruction is carried out restoring the structure to perfect condition. This cycle repeats again until a second reconstruction is required. The total costs are substantial. Unfortunately this approach still remains common today as municipalities are faced with an aged structure network and limited funds for maintenance.

It may be easy to see upfront cost savings by understanding that as long as any costs associated with maintaining the structure are deferred as long as possible, money will be saved. The reality is that extending a bridge or culvert's service life prorates the total cost of the structure over a longer period of time and ultimately becomes more economical in the long run. If preventive maintenance measures are strategically planned and carried out then the service life can be maximized and substantial reconstruction costs can be deferred for longer periods of time. In a time when economy and efficiency are becoming more and more important, this type of proactive management is essential in the management of our resources.

The difficulty faced by most municipalities is related to "breaking the cycle." With an aged infrastructure and many structures with condition beyond the point of preservation management techniques, substantial funds are required to address those most significantly deteriorated structures leaving little funds for keeping the good bridges good.