Asset Management Plan

Township of Malahide

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List of Acronyms and Abbreviations

CL	**Centreline**
BCI	**Bridge Condition Index**
G/S	**Gravel**
HCB	**High-Class Bituminous**
HVAC	**Heating, Ventilation, and Air Conditioning**
IJPA	**Infrastructure for Jobs and Prosperity Act**
LCB	**Low-Class Bituminous**
MMS	**Minimum Maintenance Standards**
OCIF	**Ontario Community Infrastructure Fund**
OSIM	**Ontario Structure Inspection Manual**

1. Introduction

1.1 Overview

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

Watson & Associates Economists Ltd. (Watson) was retained by the Township of Malahide (Township) to update the Township's 2013 Asset Management Plan (dated November 29, 2013). With this update, it is the intent to move the Township's asset management practices towards compliance with Ontario Regulation 588/17. It is intended to be a tool for Township staff and Council to use during various decision-making processes, including the annual budgeting process and future capital grant application processes. This plan will serve as a road map for sustainable infrastructure planning going forward.

The following assets are included in this asset management plan:

- Roads;
- Bridges and structural culverts
- Streetlights;
- Sidewalks;
- Guiderails;
- Facilities (buildings, parks, and cemeteries); and
- Vehicles and Equipment.

The Township's goals and objectives with respect to asset management are identified in the Township's Strategic Asset Management Policy. A major theme within that policy is for the Township's physical assets to be managed in a manner that will support the sustainable provision of municipal services to Township residents. Through the implementation of the asset management plan, the Township's practice should evolve to provide services at levels proposed within this document. Moreover, infrastructure and other capital assets should be maintained at condition levels that provide a safe

and functional environment for its residents. Therefore, the asset management plan and the progress with respect to its implementation will be evaluated based on the Township's ability to meet these goals and objectives.

1.2 Legislative Context for the Asset Management Plan

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

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

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

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

This plan has been developed to address the requirements of O. Reg. 588/17 utilizing the best information available to the Township at this time.

1.3 Asset Management Plan Development

The asset management plan was developed using a program that leverages the Township's asset management principles as identified within its strategic asset management policy, capital asset database information, and staff input in identifying current and proposed levels of service, as well as proposed asset management strategies.

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

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

2. Define and assess current asset conditions, based on a combination of Township staff input, existing asset reports, and an asset age-based condition analysis.

3. Define and document current levels of service, as well as proposed levels of service, based on discussions with Township Council and staff, and consideration of various background reports.

4. Develop an asset management strategy that provides the activities required to sustain the levels of service discussed above. The strategy summarizes these activities in the forecast of annual capital and operating expenditures required to achieve these level of service outcomes.

5. Develop a financing strategy to support the lifecycle management strategy. The financing plan informs how the capital and operating expenses arising from the asset management strategy will be funded over the forecast period.

6. Document the comprehensive Asset Management Plan in a formal report to inform future decision-making and to communicate planning to municipal stakeholders.

1.4 Maintaining and Integrating the Asset Management Plan

It should be noted, that while this report covers a forecast period of 20 years, the full lifecycle of the Township's assets were considered in the calculations. In this context, the asset management plan should be updated as the strategic priorities and capital needs of the Township change. This can be accomplished in conjunction with specific legislative requirements (i.e. 5-year review of asset management plan under Infrastructure for Jobs and Prosperity Act), as well as the Township's annual budget process. Further integration into other Township financial/planning documents would assist in ensuring the ongoing accuracy of the asset management plan, as well as the integrated financial/planning documents. The asset management plan has been developed to allow linkages to a number of strategic documents, as identified in the Township's Strategic Asset Management Policy.

Township staff will have the tools available to perform updates to the asset management plan as necessary. In the future, the asset management plan will be further updated by Township staff to more closely integrate with other studies and reports pertaining to the Township's assets. For example, the strategies identified in this asset management plan should be updated to include growth-related assets, as will be documented in the forthcoming Development Charges Background Study, or future updates of the Road Needs Study.

When updating the asset management plan, it should be noted that the state of local infrastructure, proposed levels of service, lifecycle management strategy and financing strategy are integrated and impact each other. For example, the financing strategy outlines how the asset management strategy will be funded. The lifecycle management strategy illustrates the costs required to maintain expected levels of service at a sustainable level. The proposed levels of service component summarizes and links each service area to specific assets contained in the state of local infrastructure section and thus determines how these assets will be used to provide expected service levels.

2. State of Local Infrastructure and Levels of Service

2.1 Introduction

This chapter provides an analysis of the Township's assets, the current service levels provided by those assets, and the service levels the Township intends to deliver into the future.

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

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

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

Asset management plans must also include a 10-year forecast identifying the proposed levels of service for each asset category. The proposed levels of service will be defined using the qualitative descriptions and technical metrics that the municipality uses to define current levels of service.

The rest of this chapter addresses the requirements identified above, with each section focusing on an individual asset category.

2.2 Roads

2.2.1 State of Local Infrastructure

The Township currently owns and manages 273 centreline kilometres of road assets with a 2019 replacement value totaling approximately $116.6 million. The replacement value has been estimated based on the replacement costs, as identified in the Lifecycle Management Strategy section of this report. The road network consists of roads with various surface types, including high-class bituminous (HCB), low-class bituminous (LCB), and gravel (G/S). These assets reside in urban, semi-urban, and rural roadside environments. Table 2-1 and Table 2-2 provide a breakdown of the road network by surface type and roadside environment, respectively, while Figure 2-1 and Figure 2-2 illustrate these breakdowns.

The entirety of the road network, on average, is 22 years old. There are relatively few HCB (< 1%) roads in the network, which are on average younger than the other surface types. The majority of the road network consist of LCB roads (76%), with the remainder of the network consisting of gravel roads (20%) and HCB roads (4%). In the context of roadside environment, the majority of the network is comprised of rural roads (95%).

Figure 2-3 maps the road network by surface material in order to visualize the Township's current circumstances.

Table 2-1
Road Network – Surface Type

Surface Type	Centreline Kilometres	Average Age	Replacement Cost (2019$)
HCB	10.4	17.6	$5,817,375
LCB	208.2	21.7	$95,113,079
G/S	54.5	28.5	$15,701,390
TOTAL	**273.1**	**22.1**	**$116,631,844**

Table 2-2
Road Network – Roadside Environment

Roadside Environment	Centreline Kilometres	Average Age	Replacement Cost (2019$)
Urban	1.2	16.3	$1,663,601
Semi-Urban	12.2	20.3	$5,369,876
Rural	259.8	22.7	$109,598,367
TOTAL	**273.1**	**22.1**	**$116,631,844**

Figure 2-1
Road Network Distribution – Surface Type
Based on Centreline Kilometres

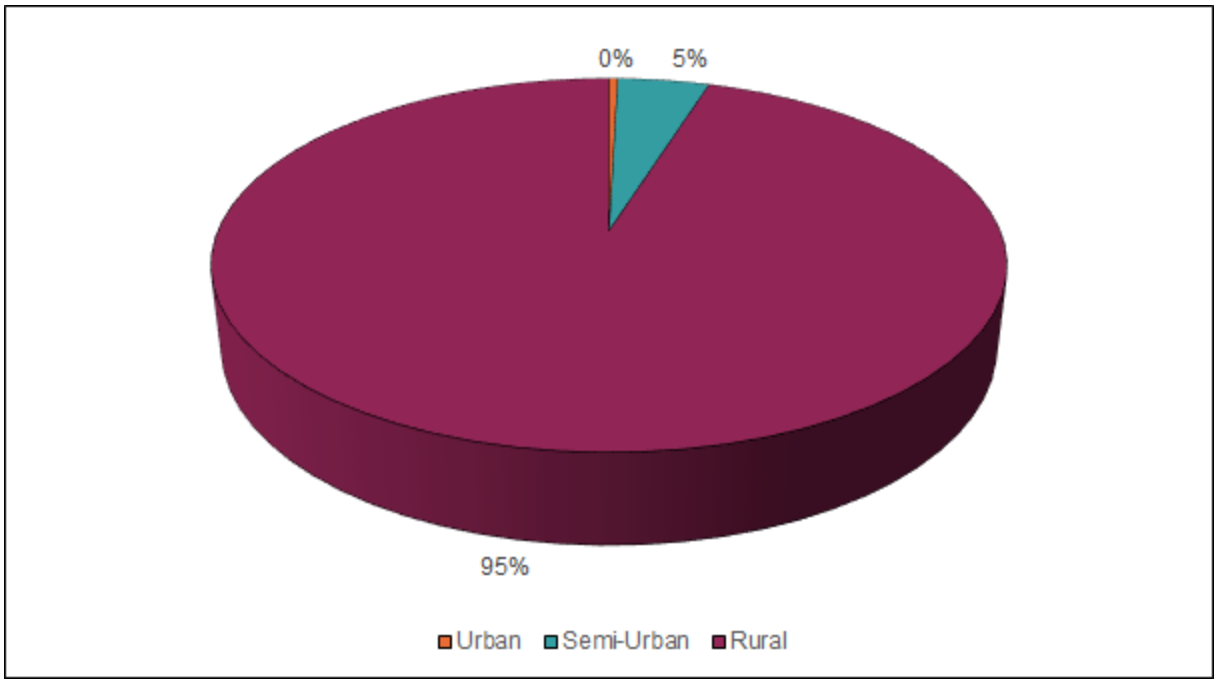


Figure 2-2
Road Network Distribution – Roadside Environment
Based on Centreline Kilometres

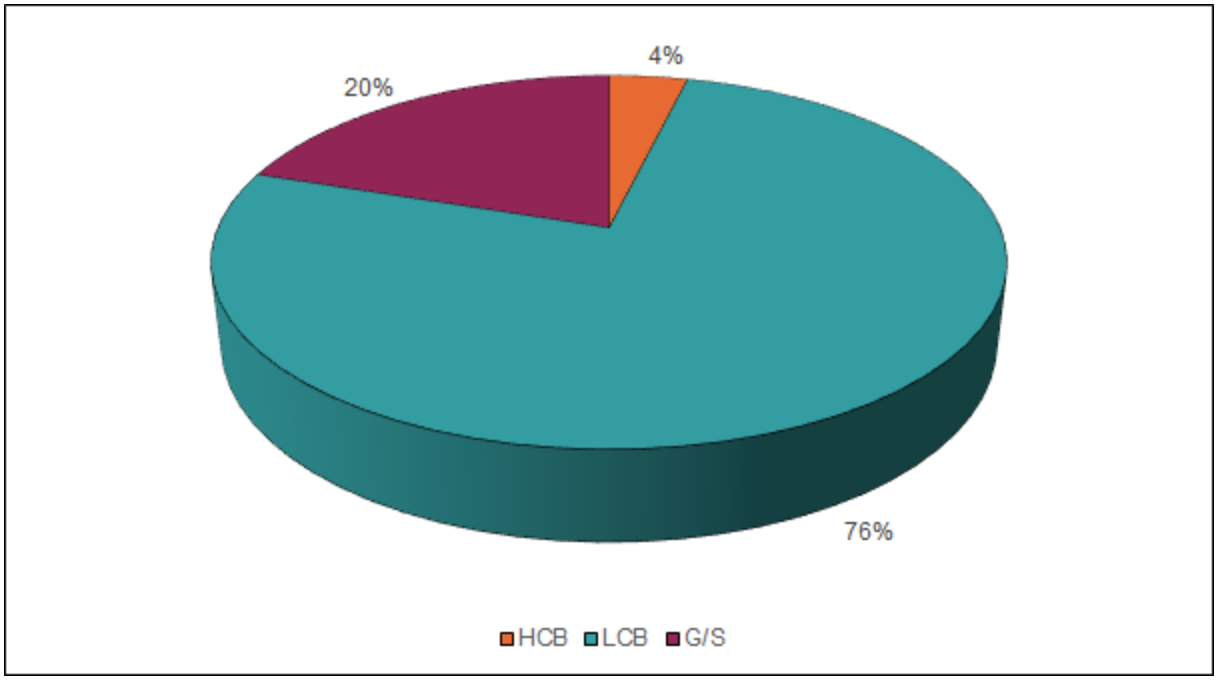
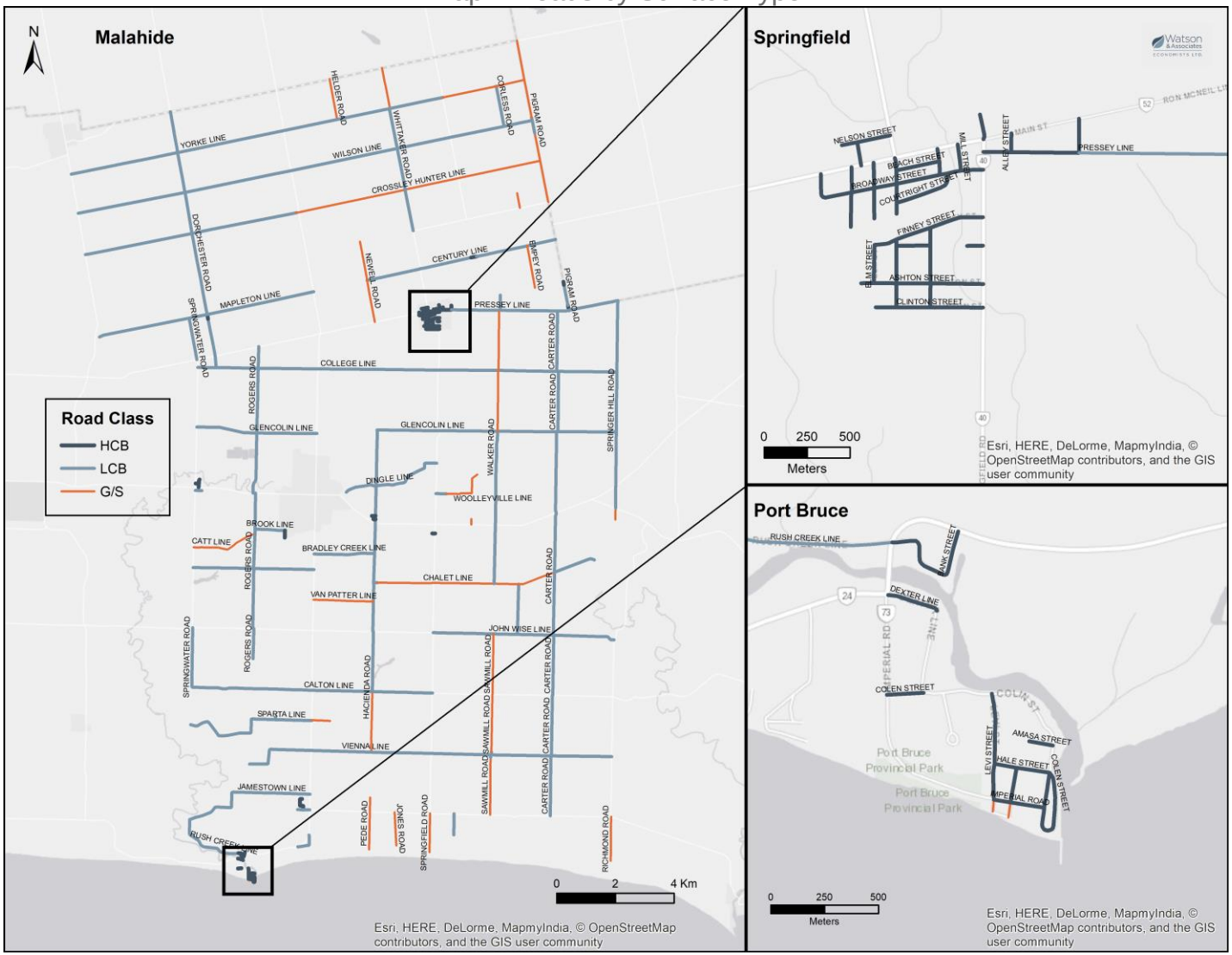


Figure 2-3
Map – Roads by Surface Type



2.2.2 Condition

While asset age may provide some limited context to the functional state of an asset, an assessed physical condition is a better measure of where an asset is in its lifecycle. Physical condition therefore provides a more accurate estimate of an asset's remaining service life. The Township's 2015 Road Needs Study provides a physical condition rating for each road segment in the network. This physical condition rating is provided on a scale of 0-100, with 100 being a perfect condition and 0 indicating an asset at the end of its service life.

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

Table 2-3
Road Condition States Defined with Respect to Physical Condition

Physical Condition	Condition State	Example Photo
100-91	**Brand New**	
90-81	**Very Good**	
80-71	**Good**	
70-51	**Fair**	
50-34	**Poor**	
33-1	**Very Poor**	
0	**End of Life**	

Table 2-4 examines the average condition of the road network by surface type, which is weighted based on centreline kilometres. Adjustments to the physical condition are performed annually based on the lifecycle degradation profiles developed in the Township's Road Needs Study, or set to known values when capital improvements are completed (i.e. rehabilitation or replacement activities being performed). The physical condition ratings utilized in this plan are from mid-2018 and represent the most up-to-date information available to the Township at this time.

As illustrated in Table 2-4, high-class and low-class bituminous roads are in a "Good" condition state on average, while gravel roads are in a "Poor" condition state. Assessed across the entire road network, all road segments are at an average physical condition rating of 70, or currently in a "Fair" condition state.

Table 2-4
Road Condition Analysis

Road Surface	Centreline Kilometres	Physical Condition (Weighted Average)	Average Condition State
HCB	10.4	77	Good
LCB	208.2	75	Good
G/S	54.5	49	Poor
TOTAL	**273.1**	**70**	**Fair**

2.2.2.1 Future Improvements

Table 2-3 includes reference to example photos that demonstrate the various condition states of roads visually. However, this asset management plan does not currently contain any example photos. The township should record examples and include them in this section during a future update to this asset management plan.

2.2.3 Current Levels of Service

The levels of service currently provided by the Township's road network is, in part, a result of the state of local infrastructure identified above. A levels of service analysis defines the current levels of service and enables the Township to periodically evaluate these service level objectives.

Road assets have prescribed levels of service reporting requirements under O. Reg. 588/17. These requirements include levels of service reporting from two different levels, i.e. community levels of service and technical levels of service. Community levels of service objectives describe service levels in terms that customers understand and reflect their scope and quality expectations of the road network. Technical levels of service describe the scope and quality of Township roads through performance measures that can be quantified, evaluated, and detail how effectively a municipality provides services. Table 2-5 presents the current levels of service measures as mandated by O. Reg. 588/17.

Table 2-5
Roads Current Levels of Service – O. Reg. 588/17

Levels of Service Category	Service Attribute	Current Levels of Service
Community Levels of Service	Scope	Figure 2-3 depicts the Township's road network, by surface type
	Quality	Table 2-3 details how road physical condition is segregated into qualitative condition states
Technical Levels of Service	Scope	0.0013 lane-km per km^2 of land
	Quality	Table 2-4 summarizes the average condition of the Township's road network

2.2.4 Proposed Levels of Service

As noted earlier in Section 2.1, municipal asset management plans must identify both the existing and proposed levels of service for each asset category. The previous subsection described the current levels of service being provided by the Township's roads. This subsection will define the proposed levels of service for these assets.

Discussions with Township staff have formalized the proposed levels of service objectives. These technical levels of service are provided in the form of minimum acceptable levels of service for road assets. These minimum technical levels of service criteria have been designed to indicate the lowest physical condition any road in the Township should reach before an intervention or activity is performed to improve the road's condition. Furthermore, the minimum technical levels of service have been stratified into distinct expected levels of service objectives based on the road classifications identified in O. Reg. 239/02: Minimum Maintenance Standards (MMS) for Municipal Highways. O. Reg. 239/02 classifies roads based on their average daily traffic and speed limits and ultimately assigns a numerical score (1 to 6), where a lower number signifies a more heavily travelled road and/or a higher speed limit road. Table 2-6 details the Township's proposed technical levels of service, in terms of minimum expected physical condition, for road classifications as defined in O. Reg. 239/02.

The higher proposed levels of service on class 3 roads signals the relatively higher importance of these roads by the Township.

Table 2-6
Roads Proposed Levels of Service

MMS Road Class	Minimum Physical Condition
3	50
4	35
5	35
6	20

Table 2-7 details what proportion of the road network falls below the proposed technical levels of service objectives, by surface type and MMS road classification. Based on centreline kilometers, approximately 7% of the road network currently fails to meet the proposed levels of service as defined above. However, the only types of roads that fail to meet these minimums are Class 3 LCB roads (26.7%), Class 4 LCB roads (3.8%), Class 6 LCB roads (1.0%), and Class 4 gravel roads (24.1%). All other road assets by surface type and MMS road classification have no roads that fail to meet the proposed technical levels of service objectives.

Table 2-7
Roads Minimum Levels of Service Analysis

Road Surface	MMS Road Class	Centreline (CL) Kilometres	Proposed Levels of Service	Physical Condition (Weighted Average)	% of CL km's Less Than Proposed Levels of Service
HCB	4	1.0	35	74	0.0%
	5	4.6	20	78	0.0%
	6	4.9	20	75	0.0%
LCB	3	18.6	50	59	26.7%
	4	174.8	35	76	3.8%
	5	5.0	20	86	0.0%
	6	9.8	20	78	1.0%
G/S	4	32.5	35	51	24.1%
	5	1.9	20	80	0.0%
	6	20.2	20	43	0.0%
TOTAL		**273.1**	**n/a**	**70**	**7.2%**

2.3 Bridges and Structural Culverts

2.3.1 State of Local Infrastructure

The Township currently owns and manages 12 bridges and 21 major culverts, with a 2019 replacement value totaling approximately $31.1 million. The replacement value has been estimated based on inflating replacement costs from the Township's 2016 Bridge and Culvert Inspection (OSIM) report. Table 2-8 provides a summary of count, age, and replacement value for the current bridge and culvert network. The average age of the Township's bridges and culverts is just over 42 years, with bridges averaging 39.7 years, compared to culverts averaging 44.1 years.

maps the bridge and culvert network in order to visualize the Township's current circumstances.

Figure 2-4
Map – Bridges and Culverts

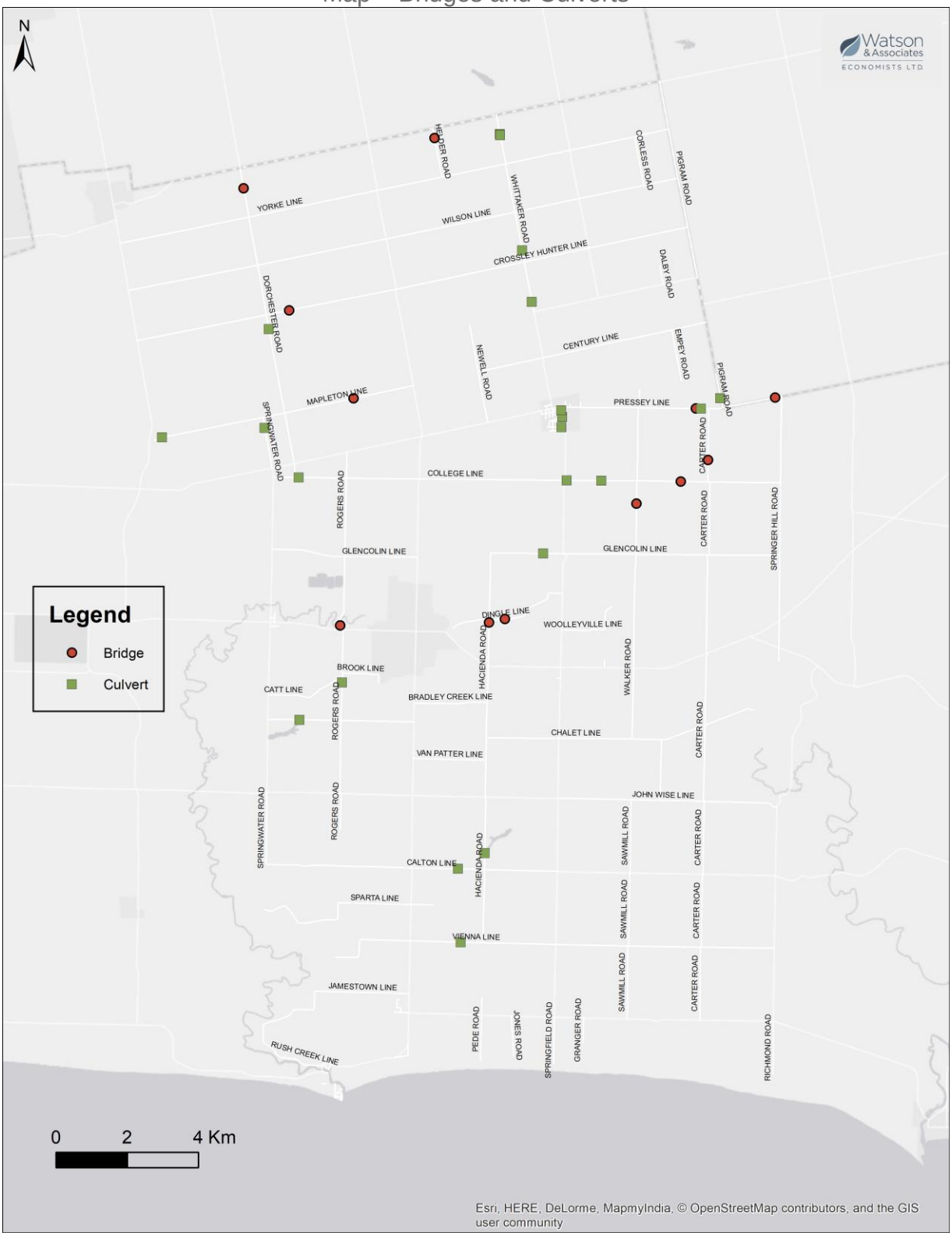


Table 2-8
Bridge and Culvert Infrastructure Summary

Type	Quantity	Average Age	Replacement Cost (2019$)
Bridges	12	39.7	$19,070,547
Culverts	21	44.1	$12,063,766
TOTAL	**33**	**42.2**	**$31,134,313**

2.3.2 Condition

The Township's OSIM report assessed the condition of the bridge and culvert network, applying a bridge condition index (BCI) for asset. A BCI score is provided on a numeric scale of 0-100, and is a measure of the overall condition of the structure based on an evaluation of individual components.

Similar to road assets, to better communicate the condition of the bridge and culvert network, the numeric condition ratings have been segmented into qualitative condition states as summarized in Table 2-9.

Table 2-9
Bridge and Culvert Condition States Defined with Respect to BCI

BCI	Condition State	Example Photo
100-91	**Brand New**	
90-81	**Very Good**	
80-71	**Good**	
70-61	**Fair**	
60-36	**Poor**	
35-1	**Very Poor**	
0	**End of Life**	

Table 2-10 examines the average condition rating of the bridge and culvert network. The condition of the structures comes from the Township's 2016 OSIM report.

As summarized in Table 2-10, bridges are, on average, in a “Very Good” condition state, while culverts are in a “Good” condition state. Assessed for the entire bridge and culvert network, all structures provide an average BCI of 78, representing a “Good” condition state. The lowest observed condition in the bridge network is 70 (Fair), and for culverts is 59 (Poor).

Table 2-10
Bridge and Culvert Condition Analysis

Type	Quantity	Average BCI	Minimum Observed BCI	Average Condition State
Bridge	12	82	70	Very Good
Culvert	21	76	59	Good
TOTAL	**31**	**78**	**59**	**Good**

2.3.2.1 Future Improvements

In December 2018 Council received the Township’s 2018 OSIM report. The findings of this report have not yet been incorporated into this analysis. The Township should incorporate these findings into this asset management plan in a future update to ensure that the most up-to-date data are being utilized.

Table 2-9 includes reference to example photos that demonstrate the various condition states of bridges and culverts visually. However, this asset management plan does not currently contain any example photos. The township should record examples and include them in this section during a future update to this asset management plan.

2.3.3 Current Levels of Service

The levels of service currently provided by the Township’s bridge and culvert network is, in part, a result of the state of local infrastructure identified above. A levels of service analysis defines the current levels of service and enables the Township to periodically evaluate these service level objectives.

Bridge and culvert assets have prescribed levels of service reporting requirements under O. Reg. 588/17. These requirements include levels of service reporting from two different levels, i.e. community levels of service and technical levels of service. Community levels of service objectives describe service levels in terms that customers understand and reflect their scope and quality expectations of the bridge and culvert

network. Technical levels of service describe the scope and quality of Township bridges and culverts through performance measures that can be quantified, evaluated, and detail how effectively a municipality provides services. Table 2-11 presents the current levels of service as mandated by O. Reg. 588/17.

Table 2-11
Bridge's and Culvert's Current Levels of Service – O. Reg. 588/17

Levels of Service Category	Service Attribute	Current Levels of Service
Community Levels of Service	Scope	Bridges and culverts are utilized by passenger vehicles, emergency vehicles, pedestrians, cyclists, and heavy transport vehicles
	Quality	Table 2-9 details how BCI is segregated into qualitative condition states. Bridges or culverts in a Poor, or worse, condition state could face possible load restrictions
Technical Levels of Service	Scope	None of the Township's bridges and culverts currently have load or dimensional restrictions
	Quality	Table 2-10 summarizes the average condition of the Township's bridge and culvert network

2.4 Sidewalks

2.4.1 State of Local Infrastructure

The Township currently owns and manages 4.6 km of sidewalks, with a 2019 replacement value totaling approximately $468,000. The replacement value has been estimated based on inflating historical cost. Table 2-12 provides a summary of quantity, age, and replacement value for the current sidewalk network. The average age of the sidewalk network is 9 years old.

Table 2-12
Sidewalk Infrastructure Summary

Type	Quantity (m)	Average Age	Replacement Cost (2019$)
Sidewalk	4,576	9.0	$467,527

2.4.2 Condition

The Township has assessed a condition for each sidewalk in its network. This condition rating is on a numeric scale of 1-5, and is a measure of the overall condition of the sidewalk.

To better communicate the condition of the sidewalk network, the numeric condition ratings have been segmented into qualitative condition states. Table 2-13 summarizes how the condition ratings are converted to these condition states. While the condition rating is on a 1-5 scale, two endpoints (six and zero) have been added to represent "Brand New" and "End of Life."

Table 2-13
Sidewalk Condition States Defined with Respect to Condition

Condition	Condition State	Example Photo
6	**Brand New**	
5	**Very Good**	
4	**Good**	
3	**Fair**	
2	**Poor**	
1	**Very Poor**	
0	**End of Life**	

Table 2-14 examines the average condition rating of the sidewalk network. The condition of sidewalks was last evaluated in 2018, and represent the most up-to-date information available to the Township at this time.

As summarized in Table 2-14, sidewalks are, on average, in a "Very Good" condition state. The lowest observed sidewalk condition in the network is 2 (Poor).

Table 2-14
Sidewalk Condition Analysis

Type	Quantity (m)	Average Condition	Minimum Observed Condition	Average Condition State
Sidewalk	4,576	5	2	Very Good

2.4.2.1 Future Improvements

Table 2-13 includes reference to example photos that demonstrate the various condition states of sidewalks visually. However, this asset management plan does not currently contain any example photos. The township should record examples and include them in this section during a future update to this asset management plan.

2.4.3 Current Levels of Service

The levels of service currently provided by the Township's sidewalk network is, in part, a result of the state of local infrastructure identified above. A levels of service analysis defines the current levels of service and enables the Township to periodically evaluate these service level objectives.

Table 2-15 summarizes the percentage of the sidewalk network that is in a condition state of "Very Poor" or "End of Life." As presented, 0% of the sidewalk network is currently in a "Very Poor" or worse condition state.

Table 2-15
Sidewalk Current Levels of Service

Type	Quantity (m)	Average Condition	Average Condition State	% of Network in Very Poor or Worse Condition State
Sidewalk	4,576	5	Very Good	0%

2.5 Facilities

2.5.1 State of Local Infrastructure

The Township currently owns and manages 7 buildings, 4 parks, 1 ball diamonds site, and 10 cemeteries, with a 2019 replacement value totaling approximately $13.7 million. The replacement value has been based estimated based on inflating replacement costs from the Township's prior Asset Management Plan or by estimates provided from Township staff. In the case of cemeteries, the only assets that require periodic replacement are furnishings (e.g. fences, benches, etc.), which Township staff have estimated to have a replacement cost of $8,000 for every cemetery that contains furnishings. Table 2-16 summarizes the state of buildings, the ball diamond, parks, and cemeteries. The average age of the components that these assets consist of are just

over 16 years old, with building components averaging 17.3 years, ball diamond components averaging 9.5 years, and park components averaging 13.7 years. The average age of cemetery components is currently unknown.

Table 2-16
Facility Infrastructure Summary

Type	Number of Sites	Average Age	Replacement Cost (2019$)
Building	7	15.5	$12,928,688
Ball Diamond	1	9.5	$506,991
Park	4	13.7	$212,183
Cemetery	10	unknown	$72,000
TOTAL	**22**	**16.3**	**$13,719,862**

Detailed below are the buildings, parks, ball diamond, and cemeteries currently owned by the Township:

- Buildings
    - Firehall #3 & Council Chambers;
    - Firehall #4 & South Dorchester Community Hall;
    - Firehall South Station;
    - Malahide Community Place;
        - Concession Building;
        - Malahide Community Place;
        - Springfield Library;
    - North Public Works Yard;
    - South Public Works Yard;
    - Township Office;
- Ball Diamond:
    - Malahide Community Place Ball Diamonds
- Parks:
    - Cenotaph Park;
    - Mill Street Park;
    - Tracey Street Park;
    - Wonnacott Park;

- Cemeteries:
    - Berean Baptist Cemetery;
    - Burdick Cemetery;
    - Grovesend Cemetery;
    - Jaffa Cemetery;
    - Kilmartin / Stewart Cemetery;
    - Lakeview Cemetery;
    - Pioneer Cemetery;
    - Quaker Cemetery;
    - Rogers Cemetery; and
    - Trinity Cemetery.

Some of the entries listed above include multiple facilities and/or uses on the same site. For the Malahide Community Place, the analysis contained within this plan has been conducted at this expanded level. Additionally, Firehalls #1 and #2 have been sold and were replaced by Firehall South Station in late 2018.

2.5.2 Condition

Township staff have developed methodology to conduct condition assessments of its facilities. The condition assessments consist of visual inspections of several defined components that differ for buildings, ball diamonds, parks, and cemeteries. Each component is assigned a condition rating based on a numeric scale of 1-5, with 5 being "Very Good" and 1 being "Very Poor." For the purposes of this report, the individual components evaluated by Township staff have been aggregated into higher-level groupings to match the treatments that can be modelled. These high-level component groupings are:

- Buildings:
    - Exterior – Lighting;
    - Exterior – Roof;
    - Exterior – Siteworks;
    - Exterior – Water Control;
    - Interior – Doors and Windows;
    - Interior – Flooring;
    - Interior – HVAC;
    - Interior – Lighting;

    - Interior – Water System;
- Ball Diamond:
    - Bleachers;
    - Fencing;
    - Lighting;
    - Pavilion;
- Parks:
    - Curbs & Borders;
    - Furnishings;
    - Play Spaces; and
- Cemeteries:
    - Furnishings.

To better communicate the condition of these assets, the numeric condition ratings have been segmented into qualitative condition states, as summarized in Table 2-17. While the condition ratings are on a 1-5 scale, two endpoints (six and zero) have been added to represent “Brand New” and “End of Life.”

Table 2-17
Facility Condition States Defined with Respect to Condition

Condition	Condition State	Example Photo
6	**Brand New**	
5	**Very Good**	
4	**Good**	
3	**Fair**	
2	**Poor**	
1	**Very Poor**	
0	**End of Life**	

Table 2-18 examines the average condition of these assets. The condition inspections were carried out in the summer of 2018, and represent the most up-to-date information available to the Township at this time. As summarized, facilities and inactive cemeteries are, on average, in a "Good" condition state, while the ball diamond, parks, and active cemeteries are in a "Fair" condition state.

Table 2-18
Facility Condition Analysis

Type	Number of Sites	Average Condition	Average Condition State
Building	7	3.7	Good
Ball Diamond	1	3.0	Fair
Park	4	3.0	Fair
Cemetery (Active)	2	3.0	Fair
Cemetery (Inactive)	8	3.7	Good
TOTAL	**22**	**3.6**	**Good**

2.5.2.1 Future Improvements

As mentioned earlier, Township staff have developed a methodology to conduct condition assessments of Township facilities, and through those assessments collected data that inform this asset management plan. The Township should evaluate available options for recording and storing this data on an ongoing basis. This is especially important since the manner in which facilities have been componentized for the purposes of condition assessments does not align well with the Township's current asset inventory spreadsheets. A specialized asset register would enable the Township to track condition data, along with other asset attributes, in a more efficient manner.

Table 2-17 includes sample images that demonstrate the various condition states of facility components visually. The Township should seek to provide additional images in future iterations of this asset management plan.

2.5.3 Current Levels of Service

The levels of service currently provided by the Township's facilities is, in part, a result of the state of local infrastructure identified above. A levels of service analysis defines the current levels of service and enables the Township to periodically evaluate these service level objectives.

Table 2-19 summarizes the percentage of facility assets that are in a condition state of "Very Poor" or "End of Life." As presented, 0% of the high-level components of these facilities are currently in a "Very Poor" or worse condition state.

Table 2-19
Facilities Current Levels of Service

Type	Number of Sites	Average Condition	Average Condition State	% of Components in Very Poor or Worse Condition State
Building	7	3.7	Good	0%
Ball Diamond	1	3.0	Fair	0%
Park	4	3.0	Fair	0%
Cemetery (Active)	2	3.0	Fair	0%
Cemetery (Inactive)	8	3.7	Good	0%
TOTAL	**22**	**3.6**	**Good**	**0%**

2.5.4 Proposed Levels of Service

Discussions with Township staff has resulted in the setting of expected service levels in the form of minimum acceptable levels of service. These minimum levels of service have been designed to indicate the lowest condition any component of a facility should reach before a treatment or activity is performed to improve the asset's condition.

Table 2-20 details the Township's proposed levels of service, in terms of minimum acceptable condition rating of any component, by asset type.

Table 2-20
Facilities Proposed Levels of Service

Facility Type	Minimum Condition
Building	3
Ball Diamond	3
Park	3
Cemetery (Active)	3
Cemetery (Inactive)	3

Table 2-21 details the percentage of facility components that fall beneath the proposed levels of service. 11% of these facility components currently fail to meet the proposed levels of service as defined above. Approximately 6% of building components, 25% of

ball diamond components, 40% of park components, and 50% of active cemetery components are not meeting these expected service levels.

Table 2-21
Facilities Minimum Levels of Service Analysis

Facility Type	Number of Sites	Average Condition	Average Condition State	% of Components Less Than Minimum Levels of Service
Building	7	3.7	Good	6%
Ball Diamond	1	3.0	Fair	25%
Park	4	3.0	Fair	40%
Cemetery (Active)	2	3.0	Fair	50%
Cemetery (Inactive)	8	3.7	Good	0%
TOTAL	**22**	**3.6**	**Good**	**11%**

2.6 Equipment

2.6.1 State of Local Infrastructure

The Township currently owns and manages 77 pieces of equipment, with a 2019 replacement value totaling approximately $1.8 million. The replacement value has been based on inflating historical cost. Table 2-22 provides a summary of quantity, expected useful life, age, and replacement value of Township equipment assets, by department of ownership. The average age of equipment is 7.2 years, with only Fire equipment averaging 5.6 years, Public Works equipment averaging 9.4 years, and all other equipment averaging 8.2 years.

Table 2-22
Equipment Infrastructure Summary

Type	Quantity	Expected Useful Life (Years)	Average Age	Replacement Cost (2019$)
Fire Equipment	36	10 (All Others) 40 (Dry Hydrant)	5.6	$1,042,000
Public Works Equipment	16	10	9.4	$209,000
Other Equipment	25	5-15	8.2	$541,000
TOTAL	**77**	**n/a**	**7.2**	**$1,792,000**

2.6.2 Current Levels of Service

The Township currently only has the age of its guiderails to inform condition. Table 2-23 details the average percentage of equipment assets that are in a condition state of "End of Life."[1] As presented, the average percent remaining useful life of all equipment assets is currently 31%, or a "Poor" condition state. Fire equipment is averaging a "Fair" condition state, with 47% remaining useful life. Public Works equipment is, on average, in a "Very Poor" condition state, with 16% remaining useful life. Other equipment is, on average, in a "Poor" condition state, with 19% remaining useful life. 14% of fire equipment is past their useful life, while 44% of Public Works and all other equipment are past their useful life. Overall, 30% of the Township's equipment is past its expected useful life.

Table 2-23
Equipment Current Levels of Service

Type	Quantity	% Remaining Useful Life	Average Condition State	% of Equipment Past Useful Life
Fire Equipment	36	47%	Fair	14%
Public Works Equipment	16	16%	Very Poor	44%
Other Equipment	25	19%	Poor	44%
TOTAL	**77**	**31%**	**Poor**	**30%**

[1] Please refer to Section 2.10 which details how condition states were mapped for age-based assets, including equipment.

2.6.2.1 Fire Equipment

There are legislated service lives for several types of firefighting equipment, including bunker gear and self-contained breathing apparatuses. The National Fire Protection Association, Occupational Health & Safety regulations, and the Minister of Labour all set industry-wide best practices on the useful life of firefighting equipment. Therefore, it is imperative that firefighting equipment be replaced as the remaining useful life reaches zero percent.

2.7 Fleet

2.7.1 State of Local Infrastructure

The Township currently owns and manages 44 vehicles, with a 2019 replacement value totaling approximately $9.5 million. The replacement value has been based on inflating historical cost. Table 2-24 provides a summary of quantity, expected useful life, age, and replacement value of the current fleet network, by department of ownership. The average age of the vehicles in the network is 9.2 years old, with Fire vehicles averaging 7.5 years, Public Works vehicles averaging 9.8 years, and all other vehicles averaging 10.0 years.

Table 2-24
Fleet Infrastructure Summary

Type	Quantity	Expected Useful Life (Years)	Average Age	Replacement Cost (2019$)
Fire Vehicles	13	10 (Pickup) 20 (Pumper) 25 (Tanker & Rescue)	7.5	$4,469,000
Public Works Vehicles	27	7-20	9.8	$4,838,000
Other Vehicles	4	7-15	10.0	$162,000
TOTAL	**44**	**n/a**	**9.2**	**$9,469,000**

2.7.2 Current Levels of Service

The Township currently only has the age of its fleet to inform condition. Table 2-25 details the average percentage of the fleet network that is in a condition state of “End of

Life."[1] As presented, the average percent remaining useful life of the fleet network is currently 44%, or a "Fair" condition state. However, vehicles that belong to departments other than Fire or Public Works are averaging 8% remaining useful life, which is due to three of these four vehicles being past their respective useful lives. Fire vehicles are, on average, in a "Good" condition state, with approximately 66% remaining useful life. Public Works vehicles are, on average, in a "Fair" condition state with approximately 39% remaining useful life. None of the fire vehicles are past their useful lives, while 22% of Public Works vehicles are past their useful life. Of note, the 22% of Public Works vehicles that are past their useful life includes three vehicles that are currently in service yet will not be replaced. Overall, 20% of the Township's vehicles are past their expected useful life.

Table 2-25
Fleet Current Levels of Service

Type	Quantity	% Remaining Useful Life	Average Condition State	% of Vehicles Past Useful Life
Fire Vehicles	13	66%	Good	0%
Public Works Vehicles	27	39%	Fair	22%
Other Vehicles	4	8%	Very Poor	75%
TOTAL	**44**	**44%**	**Fair**	**20%**

2.7.2.1 Fire Vehicles

While there are no legislative requirements with respect to service lives of fire vehicles (i.e. tankers, rescue trucks, pumpers, and engines), specific service life schedules are recommended by insurance underwriters. Failure to follow the replacement schedules of fire vehicles as recommended by insurance underwriters can result in increased insurance premiums for the Township and its residents. Therefore, it is imperative that fire vehicles be replaced according to these recommendations. From a level of service perspective, the intent is to ensure that no fire vehicles fall beyond their useful lives.

[1] Please refer to Section 2.10 which details how condition states were mapped for age-based assets, including fleet.

2.8 Guiderails

2.8.1 State of Local Infrastructure

The Township currently owns and manages 5.2 km of guiderails, with a 2019 replacement value totaling approximately $460,000. The replacement value has been based on inflating historical cost. Table 2-26 provides a summary of quantity, expected useful life, age, and replacement value of the current guiderail network, by material type. The average age of the guiderail network is 7 years old, with steel guiderails averaging 6.4 years and cable guiderails averaging 7.4 years.

Table 2-26
Guiderail Infrastructure Summary

Type	Quantity (m)	Expected Useful Life (Years)	Average Age	Replacement Cost (2019$)
Cable Guiderail	3,900	15	7.4	$211,590
Steel Guiderail	1,323	20	6.4	$248,296
TOTAL	**5,223**	**n/a**	**7.0**	**$459,886**

2.8.2 Current Levels of Service

The Township currently only has the age of its guiderails to inform condition. Table 2-27 details the weighted average percentage (based on length) of the guiderail network that is in a condition state of "End of Life."[1] As presented, the average percent remaining useful life of the guiderail network is currently 60%, or in a "Good" condition state. However, while cable guiderail's average of 56% remaining useful life is relatively close to the overall guiderail network, steel guiderails are averaging 72% remaining useful life, a "Very Good" condition state. Zero percent of the guiderail network is past its useful life.

[1] Please refer to Section 2.10 which details how condition states were mapped for age-based assets, including guiderails.

Table 2-27
Guiderail Current Levels of Service

Type	Quantity (m)	% Remaining Useful Life (Weighted Average)	Average Condition State	% of Guiderails Past Useful Life
Cable Guiderail	3,900	56%	Good	0%
Steel Guiderail	1,323	72%	Very Good	0%
TOTAL	**5,223**	**60%**	**Good**	**0%**

2.9 Street Lights

2.9.1 State of Local Infrastructure

The Township currently owns and manages 142 street lights—each consisting of a head and an arm—with a 2019 replacement value totaling approximately $121,000. The replacement value has been based on inflating historical cost. Table 2-28 provides a summary of quantity, expected useful life, age, and replacement value of the current street lights network, by component type. The average age of street lights in the Township are 5 years.

Table 2-28
Street Light Infrastructure Summary

Type	Quantity	Expected Useful Life (Years)	Average Age	Replacement Cost (2019$)
Street Light – Head	142	20	5.0	$98,003
Street Light – Arm	142	20	5.0	$23,187
TOTAL	**142**	**20**	**5.0**	**$121,190**

2.9.2 Current Levels of Service

The Township currently only has the age of its street lights to inform condition. Table 2-29 details the average percentage of the street light network that is in a condition state of "End of Life."[1] As presented, the average percent remaining useful life of the

[1] Please refer to Section 2.10 which details how condition states were mapped for age-based assets, including street lights.

street light network is currently 75%, or a “Very Good” condition state. Zero percent of street lights are past their useful life.

Table 2-29
Street Lights Current Levels of Service

Type	Quantity	% Remaining Useful Life (Weighted Average)	Average Condition State	% of Street Lights Past Useful Life
Street Light – Head	142	75%	Very Good	0%
Street Light – Arm	142	75%	Very Good	0%
TOTAL	**142**	**75%**	**Very Good**	**0%**

2.10 Age-Based Assets

As identified herein, some of the asset classes covered within this plan do not have assessed conditions. For those assets without an assessed condition, the analysis focuses on an asset’s age relative to its theoretical useful life. For purposes relevant to the Lifecycle Management Strategy (please see the following chapter), instead of relying on condition to describe the degradation profiles of these assets, the percentage of remaining useful life has been utilized. To better communicate where these assets are in their lifecycle, the percentage of remaining useful life has been segmented into qualitative condition states. Table 2-30 details how the percentage of remaining useful life is converted to these condition states.

It is important to note that a condition state of “Very Poor” for these types of assets does not necessarily mean that the asset is performing poorly. It simply signals that the “End of Life” is approaching, and a replacement or other corrective treatment will be required soon.

Table 2-30
Age-Based Assets
Condition States Defined with Respect to Percentage of Remaining Useful Life

Percent Remaining Useful Life	Condition State
100% to 84%	**Brand New**
83% to 67%	**Very Good**
66% to 51%	**Good**
50% to 34%	**Fair**
33% to 18%	**Poor**
17% to 1%	**Very Poor**
0%	**End of Life**

2.10.1 Future Improvements

A potential improvement for the Township to consider in the future would be to assign a remaining useful life to these various assets, based not exclusively on asset age, but based on staff's knowledge of these assets. It is possible that a certain asset is past its theoretical useful life, but because it hasn't been used frequently, or because it has been maintained exceptionally well, may last for a number of years still. Assigning a remaining useful life based on staff's understanding of asset's condition would be more akin to assessed condition ratings.

2.11 Future Improvements

This plan includes lifecycle activities associated with the Port Bruce Harbour and associated assets based on what is included in the Township's 4-year budget. Future updates to this plan should endeavour to incorporate these assets more comprehensively into this plan, including an analysis of levels of service and required lifecycle activities over a long-term horizon.

3. Lifecycle Management Strategy

3.1 Introduction

This chapter details the lifecycle management strategies required to maintain the current and proposed levels of service presented in Chapter 2. A lifecycle management strategy identifies the recommended lifecycle activities required to achieve the levels of service discussed in the previous chapter. Lifecycle activities are the specified actions that can be performed on assets in order to increase service level and extend service life. These actions can be carried out on a planned schedule in a prescriptive manner, or through a reactionary approach where the treatments are only carried out when specified conditions are met.

O. Reg. 588/17 requires that all potential lifecycle activity options be presented, with the aim of analyzing these options in search of identifying the set of lifecycle activities that can be undertaken at the lowest cost to maintain current levels of service or to provide proposed levels of service. Asset management plans must include a 10-year capital plan that forecasts the lifecycle activities resulting from the lifecycle management strategy.

What follows are the lifecycle management strategies for all asset classes contained within this asset management plan, with each section focusing on an individual asset category. Although a considerable amount of effort has been spent on developing lifecycle management strategies informed by observed asset conditions, there are still some assets for which the lifecycle management strategy is age-based. The lifecycle management strategy for these age-based assets is presented in the last section of this chapter. The expenditure forecasts resulting from the lifecycle management strategies for each asset category are also included in the following sections, and have been developed for a 20-year forecast period.

3.2 Roads

3.2.1 Lifecycle Activities

This section will detail the lifecycle activities as documented in the Township's 2015 Road Needs Study and through discussions with Township staff. The lifecycle activities that the Township currently employs in the management of its roads include:

- Crack Sealing – CRK (HCB roads);
- Gravel Road Resurfacing – GRR (75mm depth);
- Gravel Road Resurfacing – GRR2 (150mm depth);
- Major Gravel Road Rehabilitation – BSgrav;
- Microsurfacing – MICRO (HCB roads);
- Reconstruction – REC (LCB/HCB roads);
- Reconstruction – RSS (reconstruction including storm sewers, HCB roads);
- Resurfacing – R1 (50mm depth, HCB roads);
- Resurfacing – R2 (100mm depth, HCB roads);
- Single Surface Treatment – SST (LCB roads) and
- Single Surface Treatment – SST+ (includes padding & geometric correction, LCB roads).

Table 3-1 details the costs associated with undertaking these lifecycle activities, by surface type and roadside environment. The costs are presented on a $/surface area ($m^2$) basis. These costs are based on unit costs derived from outputs resulting from the Township's latest WorkTech capital program.

Table 3-1
Road Treatment Costs by Surface Type and Roadside Environment (per m^2)

Treatment	Surface Type	Roadside Environment	Cost/m^2
CRK	HCB	Urban	$0.40
		Semi-Urban	$0.38
		Rural	$0.33
MICRO	HCB	Any	$3.25
R1	HCB	Urban	$44.38
		Semi-Urban	$23.00
		Rural	$22.19
R2	HCB	Urban	$61.66
		Semi-Urban	$30.83
		Rural	$32.68
SST	LCB	Semi-Urban	$4.14
		Rural	$4.10
SST+	LCB	Semi-Urban	$8.30
		Rural	$8.22
REC	HCB	Semi-Urban/Rural	$93.74
	LCB	Semi-Urban/Rural	$79.68
RSS	HCB	Urban	$227.62
GRR	Gravel	Semi-Urban/Rural	$3.14
GRR2			$6.43
BSGrav			$19.48

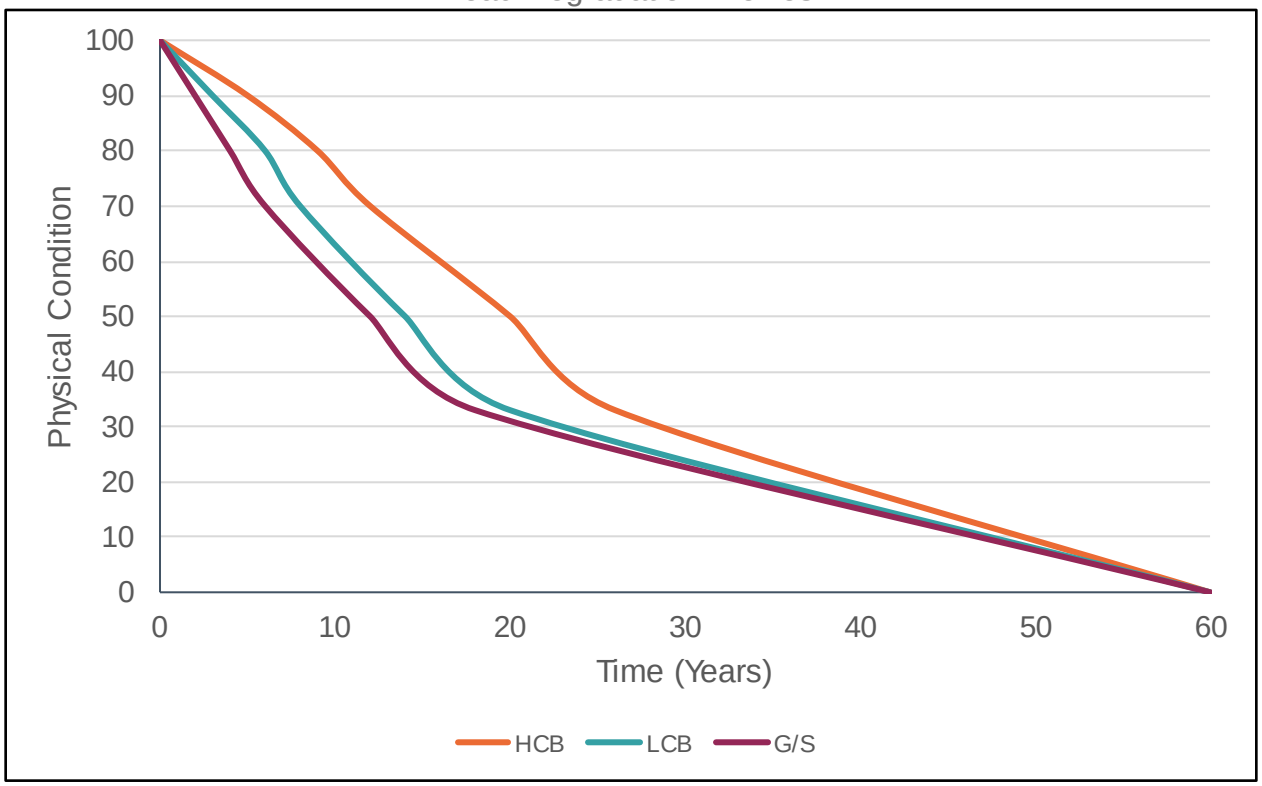
3.2.2 Degradation Profiles

Assets deteriorate over time, eventually reaching a point where they have no remaining service life left. However, the path each asset takes in reaching its end of life differs, even for assets of the same type. A condition rating identifies where along the path any particular asset lays, or in other words, how long an asset has left before it reaches its

end of life. Therefore, condition and service life are linked, and can be plotted graphically to visually represent the degradation curve of an asset.

Figure 3-1 presents the degradation profile of roads (by class) that have been developed based on the Township's 2015 Road Needs Study. Through the process of conducting regular road condition inspections, the Township will be able to further refine these degradation profiles.

Figure 3-1
Road Degradation Profiles



3.2.3 Decision Criteria

Table 3-2 presents the decision criteria—developed by referencing the 2015 Road Needs Study and through discussions with Township staff—for triggering a specific road treatment. When all of the decision criteria for a given road asset are met, the corresponding treatment is eligible to be applied. When a treatment is applied, the physical condition of the asset is improved by the amount specified in the "Gain to Condition" column, but not to exceed the amount listed in the "Maximum Condition Threshold" column.

Table 3-2
Roads Treatment Decision Criteria

Treatment	Road Surface	Roadside Environ.	Condition Range	# of Times Treatment Prev. Applied[1]	Gain to Condition	Maximum Condition Threshold
CRK	HCB	Any	90-80	0	+5	94
MICRO		Any	80-70	0	+12	90
R1		Any	71-55	0	+97	97
R2		Any	54-35	0	+100	100
SST	LCB	Any	77-53	0	+97	97
SST+		Any	52-37	0	+100	100
REC	HCB/LCB	Semi-Urban/ Rural	34-0	n/a	+100	100
RSS	HCB	Urban	34-0	n/a	+100	100
GRR	Gravel	Semi-Urban/ Rural	80-70	0	+15	95
GRR2			69-50	0	+20	90
BSgrav			49-0	n/a	+95	95

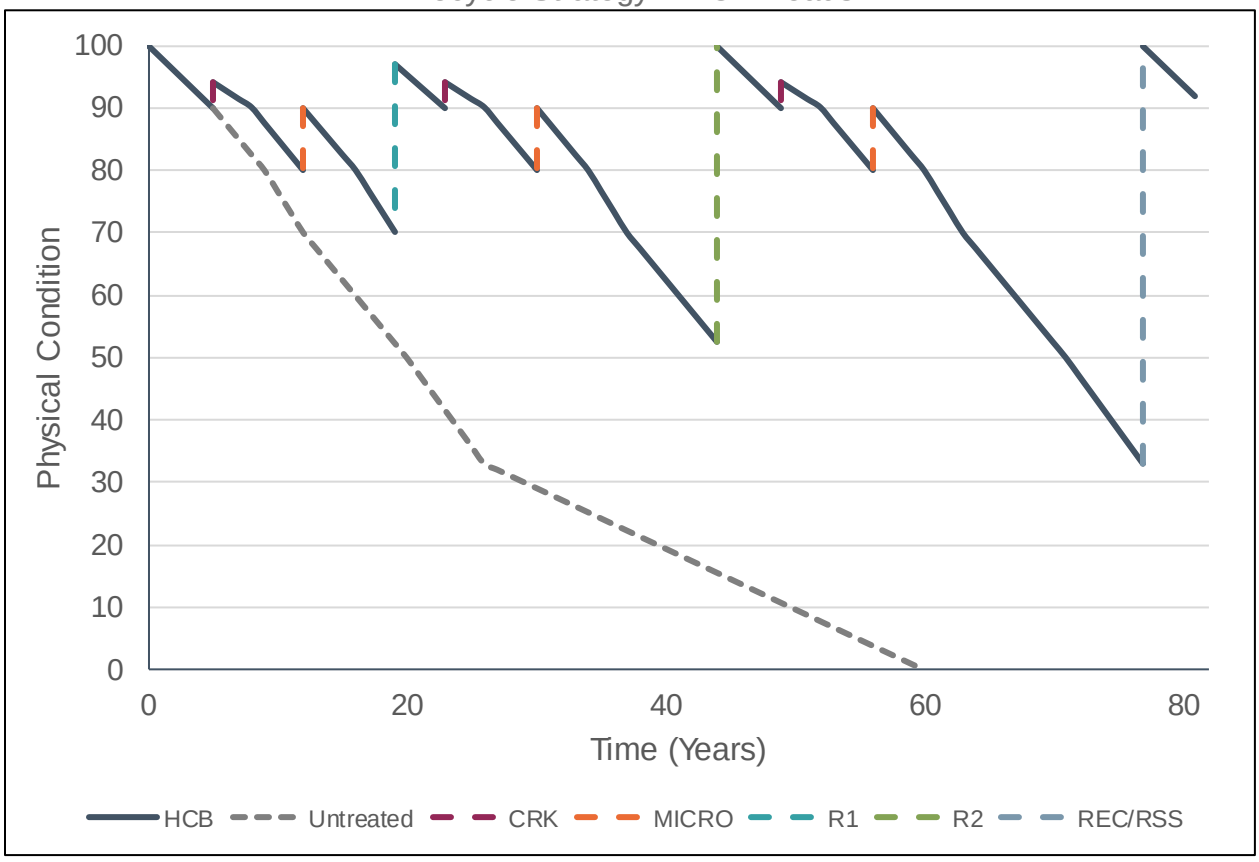
3.2.4 Expected Lifecycle

Combining the treatments, degradation profiles, and decision criteria presented herein results in a complete lifecycle management strategy. Figure 3-2, Figure 3-3, and Figure 3-4 present an illustrative example of the expected lifecycle of HCB, LCB, and gravel roads, respectively. The dashed, vertical lines represent points of intervention in the representative road's expected life. The lifecycle path of the asset is represented by the solid lines, following the degradation profiles presented above. Finally, the grey, dotted line demonstrates the expected lifecycle of a road segment were it to not receive any treatments over the course of its service life.

[1] Number of CRK and MICRO treatments previously applied are reset to 0 upon any Resurfacing/Reconstruction treatment. R1, R2, SST, and SST+ treatments previously applied are reset to 0 upon any Reconstruction treatment. Number of GRR and GRR2 treatments previously performed are reset to 0 upon any BSgrav treatment.

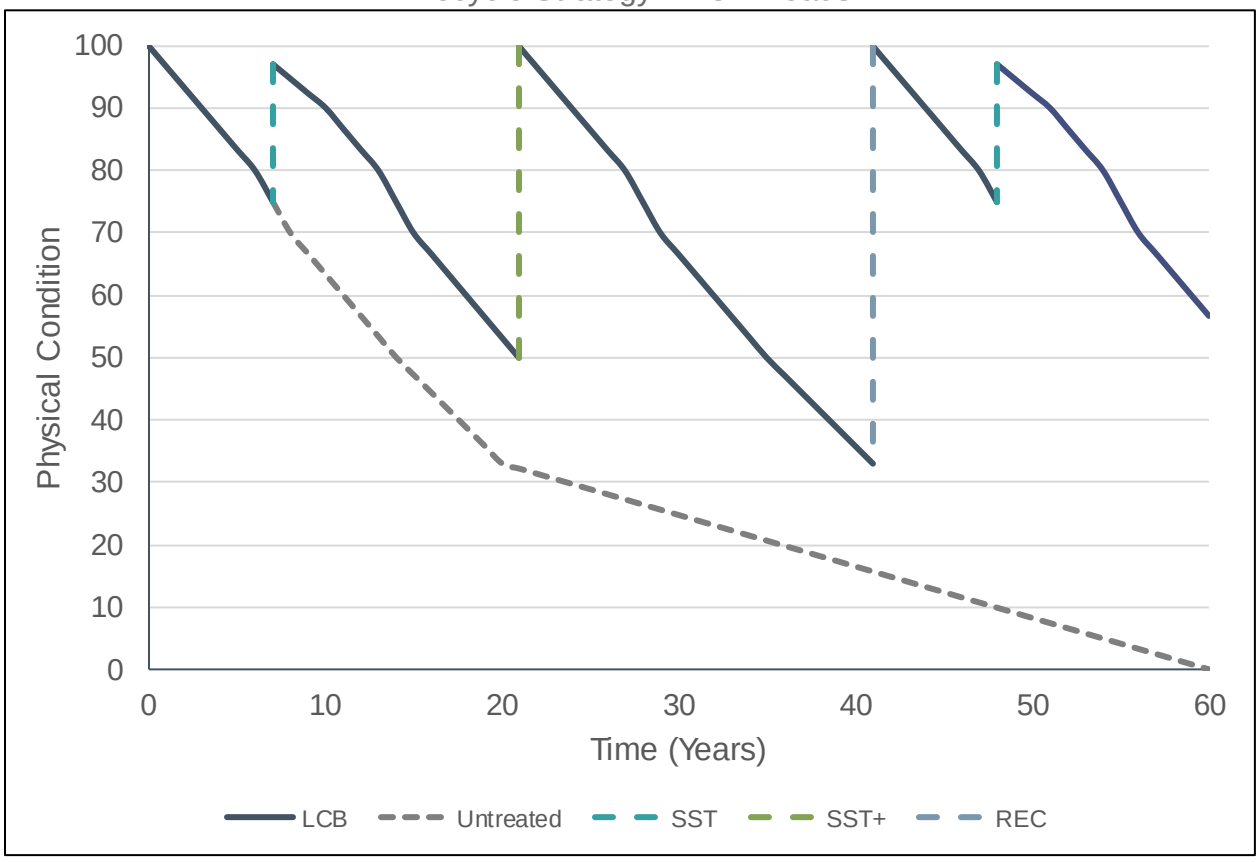
For an HCB road, based on the decision criteria outlined in Table 3-2, one R1 and one R2 resurfacing treatments would be performed on a road segment before a full reconstruction takes place. Further, between the resurfacing cycles, crack sealing and microsurfacing treatments would be carried out as an efficient means of improving the service levels provided. A total of three crack sealing treatments and three microsurfacing treatments would be expected to occur over the lifecycle of an HCB road.

Figure 3-2
Lifecycle Strategy – HCB Roads



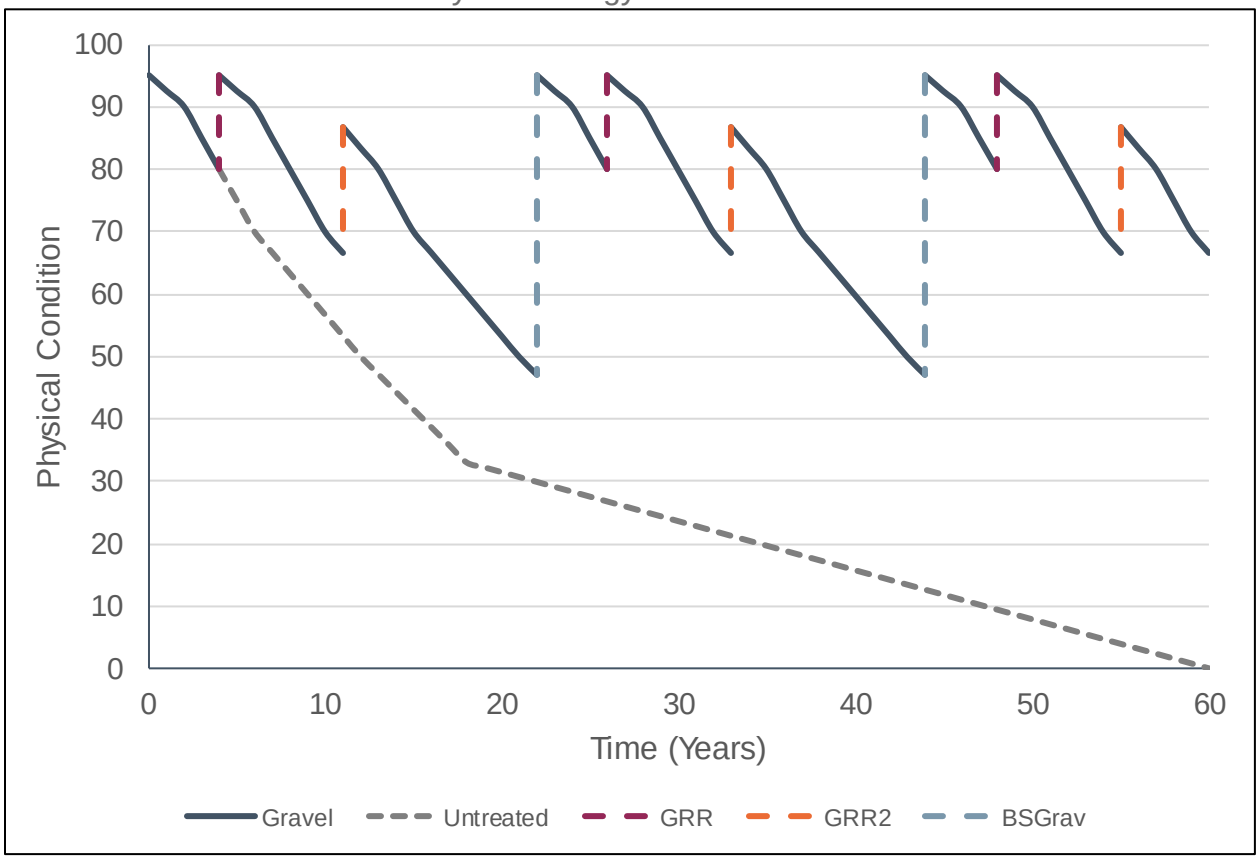
Based on the decision criteria outlined in Table 3-2 for LCB roads, one SST and one SST+ single surface treatment would be performed on a road segment before a full reconstruction took place.

Figure 3-3
Lifecycle Strategy – LCB Roads



Finally, based on the decision criteria outlined in Table 3-2 for gravel roads, one GRR and one GRR2 gravel resurfacing treatment would be performed on a road segment before a BSGrav treatment took place.

Figure 3-4
Lifecycle Strategy – Gravel Roads



The lifecycle strategies presented above would allow for the proposed levels of service introduced in Chapter 2 to be met for almost all roads. Currently, the way the reconstruction treatments have been defined, MMS class 3 roads would fall below the minimum condition score of 50 for a portion of their lifecycle. The only MMS class 3 roads are LCB roads, which make up 6.8% of the network, based on centreline kilometres.

3.2.5 Capital Costs/Forecast

Figure 3-5 presents the 20-year expenditure forecast that results from following the lifecycle management strategy detailed above. This forecast illustrates the annual expenditures without any consideration to budgetary constraints. Over the 20-year

forecast period, the average annual expenditures would be approximately $1.7 million, in 2019 dollars. It is noted that the large expenditure amount shown in year one of the forecast represents the cost of bringing all road segments to their minimum levels of service thresholds, as defined in Table 2-6. Figure 3-6 displays the levels of service that result from executing the lifecycle activities as set forth in the lifecycle management strategy for road assets over the 20-year forecast period.

Figure 3-5
Road Lifecycle Management Strategy – Funding Requirements

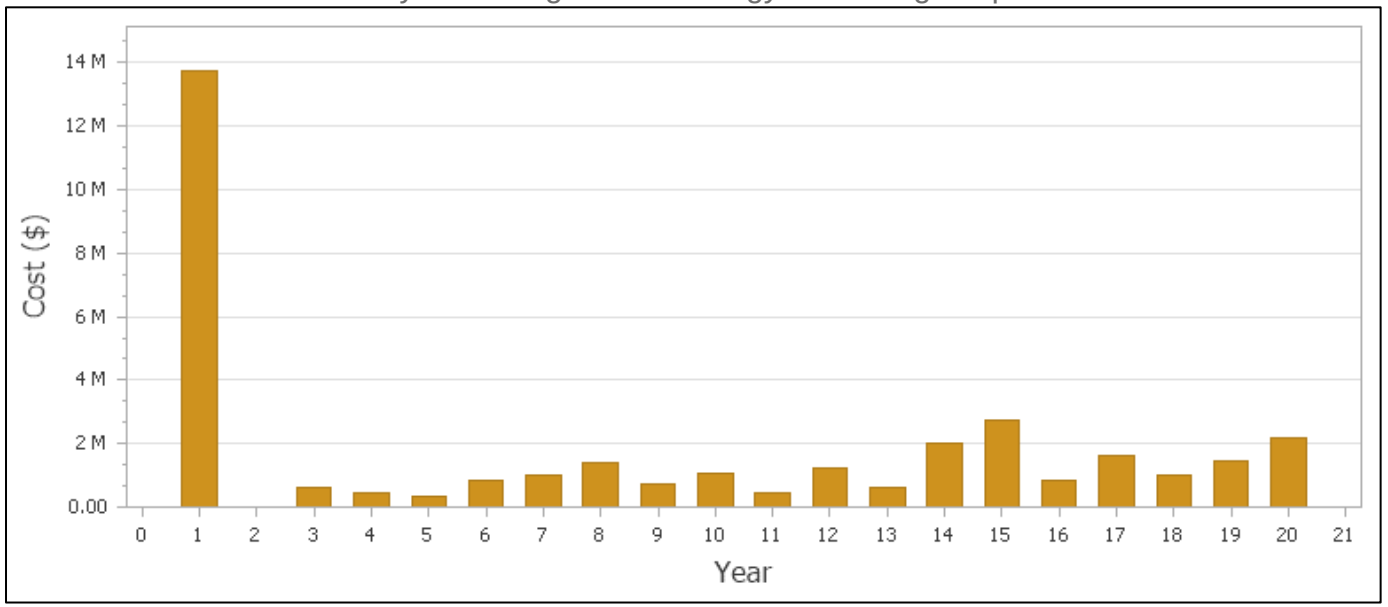
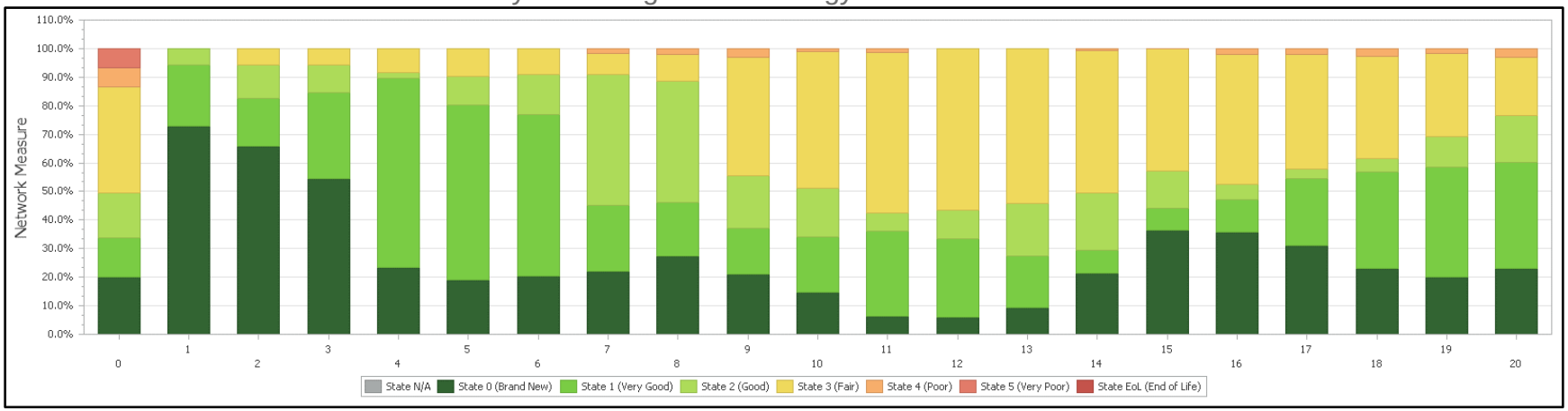


Figure 3-6
Road Lifecycle Management Strategy – Network Service Levels



3.3 Bridges and Structural Culverts

3.3.1 Lifecycle Activities

This section will detail the lifecycle activities (capital treatments) as set forth in the 2016 OSIM report and through discussions with Township staff. The treatments that the Township currently employs in the management of its bridges and culverts include:

- Bridge:
  - Rehabilitation;
    - Standard;
    - Including jacking of the deck;
  - Reconstruction;
- Culvert:
  - Reconstruction.

Table 3-3 details the costs for the lifecycle activities listed above. These costs are presented as a percentage of estimated replacement cost for the entire bridge, which are derived from averages present in the 2016 OSIM report. The "Rehabilitation – Includes Jacking the Deck" treatment is a flag from the 2016 OSIM report, where this treatment is only performed if the recommended rehabilitation treatment for a bridge required jacking of the deck. As this is a costly endeavour, the percent of replacement cost attributed to this treatment is greater than standard rehabilitations. After completing a rehabilitation treatment that includes jacking of the deck, or a reconstruction, this flag is removed, and all subsequent rehabilitations will be standard rehabilitations, until such a time as it is deemed that a jacking of the deck treatment would be necessary again.

Table 3-3
Bridge and Culvert Treatment Costs as Percent of Total Replacement

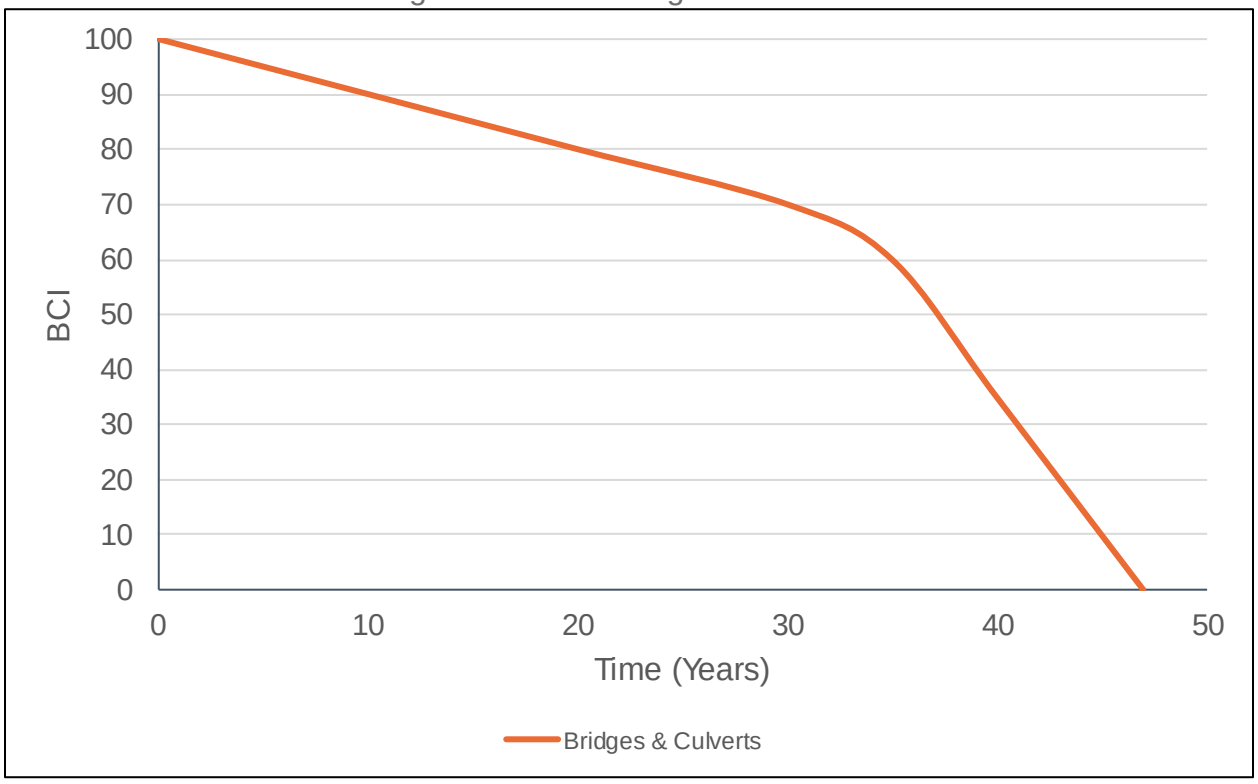
Treatment	Applies To	% of Replacement Cost
Rehabilitation – Standard	Bridge	22%
Rehabilitation – Includes Jacking the Deck	Bridge	43%
Reconstruction	Bridge & Culvert	100%

3.3.2 Degradation Profiles

Assets deteriorate over time, eventually reaching a point where they have no remaining service life left. However, the path each asset takes in reaching its end of life differs, even for assets of the same type. A condition rating identifies where along the path any particular asset lays, or in other words, how long an asset has left before it reaches its end of life. Therefore, condition and service life are linked, and can be plotted graphically to visually represent the degradation curve of an asset.

Figure 3-7 presents the degradation profile of bridges and culverts that has been developed based on information contained in the Township's 2016 OSIM report. Through the process of conducting the required bi-annual bridge and culvert inspections, the Township will be able to further refine the degradation profile associated with these assets.

Figure 3-7
Bridges & Culverts Degradation Profile



3.3.3 Decision Criteria

Figure 3-8 presents the decision criteria—developed by referencing the 2016 OSIM report and through discussions with Township staff—for triggering specific bridge and culvert treatments. When all of the decision criteria for a given asset are met, the corresponding treatment is eligible to be applied. When a treatment is applied, the BCI of the asset is improved by the amount specified in the "Gain to Condition" column, but not to exceed the amount listed in the "Maximum Condition Threshold" column.

Figure 3-8
Bridge and Culvert Treatment Decision Criteria

Asset Type	Treatment	BCI Range	Flag – Requires Jacking of Deck[1]	Gain to Condition	Maximum Condition Threshold
Bridge	Rehabilitation – Incl. Jacking of Deck	45-36	True	+99	99
	Rehabilitation – Standard	45-36	False	+99	99
	Reconstruction	35-0	n/a	+100	100
Culvert	Reconstruction	35-0	n/a	+100	100

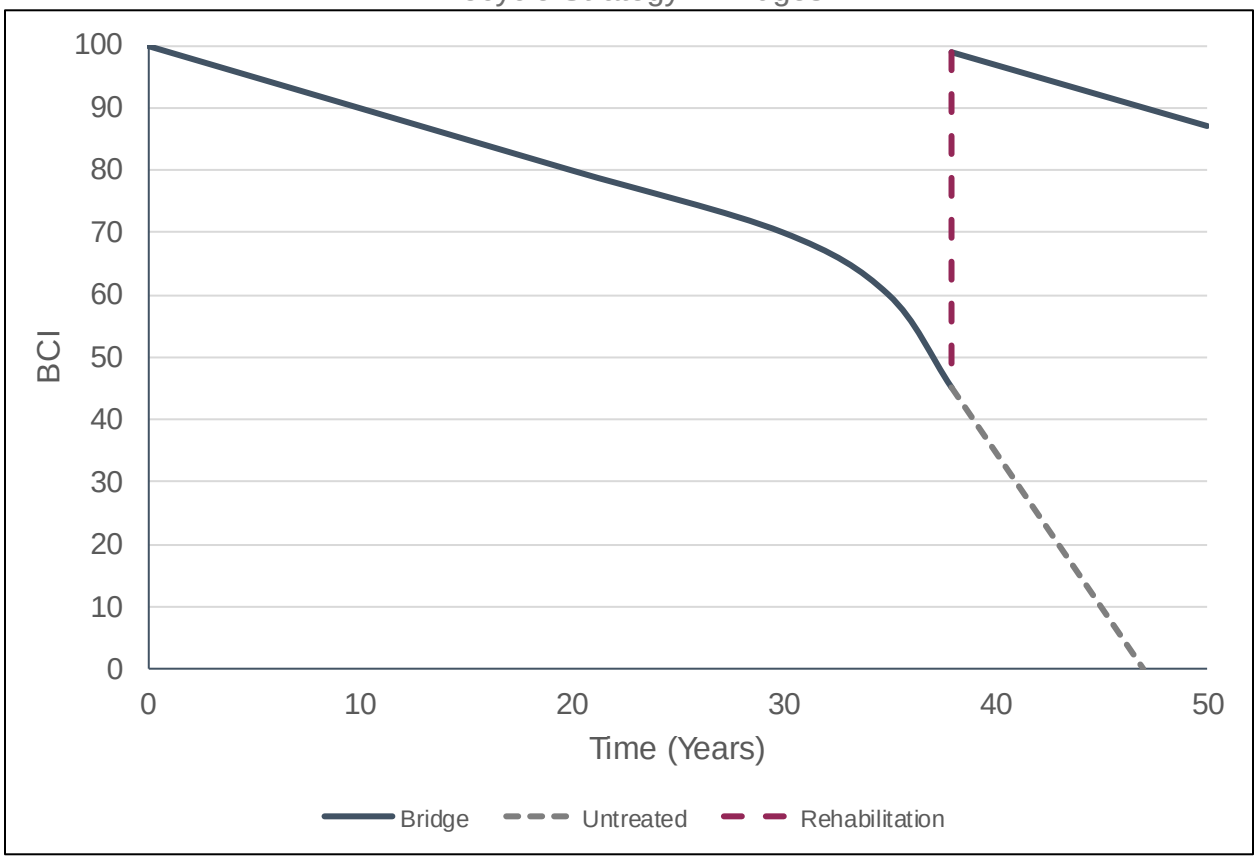
3.3.4 Expected Lifecycle

Combining the treatments, degradation profiles, and decision criteria presented herein results in a complete lifecycle management strategy. Figure 3-9 and Figure 3-10 present an illustrative example of the expected lifecycle for bridges and culverts, respectively. The dashed, vertical lines represent points of intervention in the representative asset's expected life. The lifecycle path of the asset is represented by the solid lines, following the degradation profile presented above. Finally, the grey, dotted line demonstrates the expected lifecycle of an asset were it to not receive any treatments over the course of its service life.

[1] The flag for a bridge needing a jacking of the deck is set to false upon any Rehabilitation or Reconstruction treatment.

The lifecycle strategy as defined for bridges is a preservation strategy, which means that an asset will only receive rehabilitation treatments and not be reconstructed, assuming that the window of opportunity to conduct the rehabilitation treatments has not passed. In other words, as long as budgetary constraints never prevent a bridge rehabilitation from occurring as it becomes due, a bridge will never degrade to a point that it needs to be reconstructed. For example, a representative bridge will degrade from some BCI greater than 45, and upon reaching a BCI of 45, the bridge will be triggered for a rehabilitation, which in turn increases its BCI to 99. This process will loop ad infinitum until such a time as budgetary pressures prevent the rehabilitation from occurring. If the fiscal limits prevent the bridge from being treated for some time period that the bridge's BCI falls to 35 or below, only then will a reconstruction be triggered.

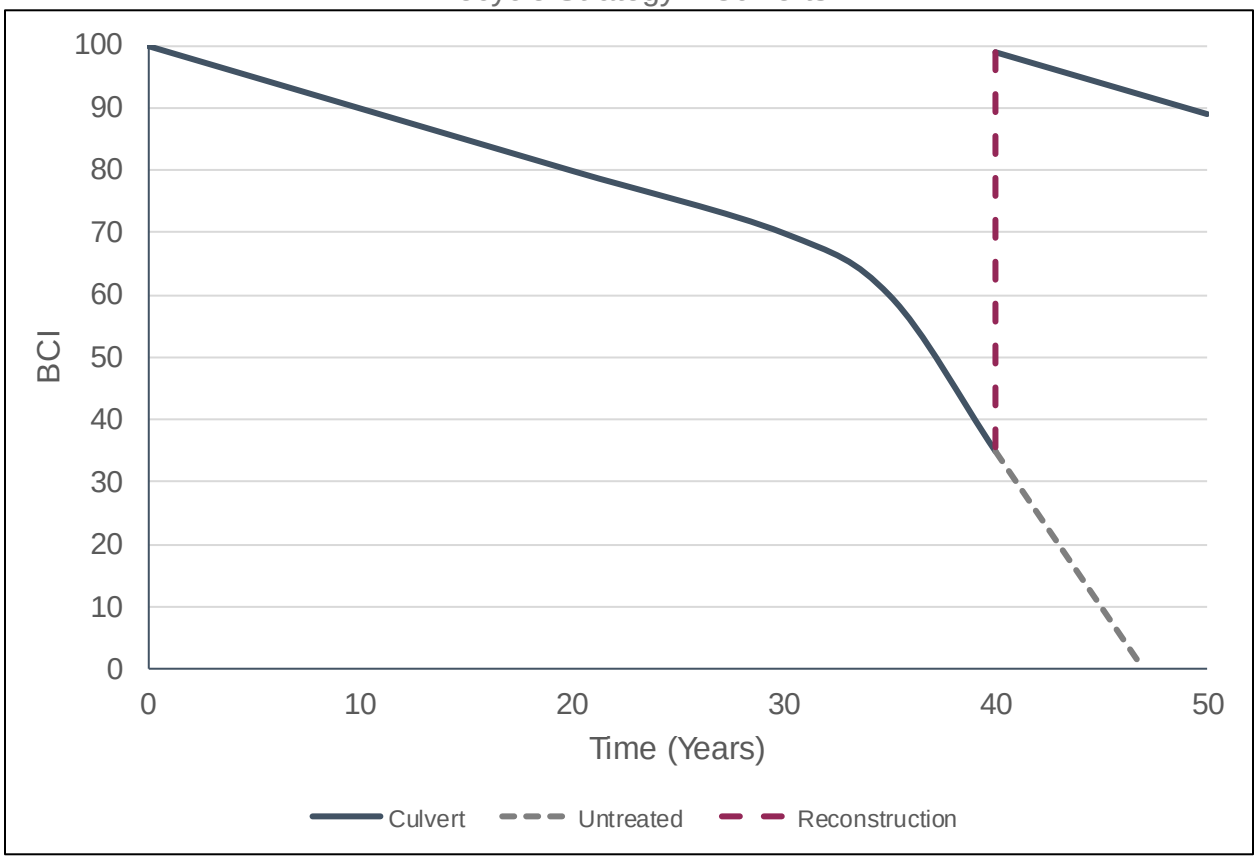
Figure 3-9
Lifecycle Strategy – Bridges



The lifecycle strategy for culverts is to reconstruct (replace) when the designated BCI is reached. While this strategy is simple—and may not appear to be significantly different from an age-based replacement strategy—because it is informed by the assessed

condition this strategy results in more accurate forecasting. As the asset's condition is regularly re-assessed over time, the timing of the eventual reconstruction could vary significantly from an age-based approach. For example, if the environment that the culvert resides in causes it to degrade quicker or slower than the expected average, and the assessed condition rating reflects this, then the eventual replacement will be triggered at a different time than an age-based approach.

Figure 3-10
Lifecycle Strategy – Culverts



3.3.5 Capital Costs/Forecast

Figure 3-11 presents the 20-year expenditure forecast that results from following the lifecycle management strategy detailed above. This forecast illustrates the annual expenditures without any consideration to budgetary constraints. Over the 20-year forecast period, the average annual expenditures would be approximately $735,000, in 2019 dollars. Figure 3-12 displays the levels of service that result from executing the lifecycle activities as set forth in the lifecycle management strategy for bridge and culvert assets over the 20-year forecast period.

Figure 3-11
Bridge & Culvert Lifecycle Management Strategy – Funding Requirements

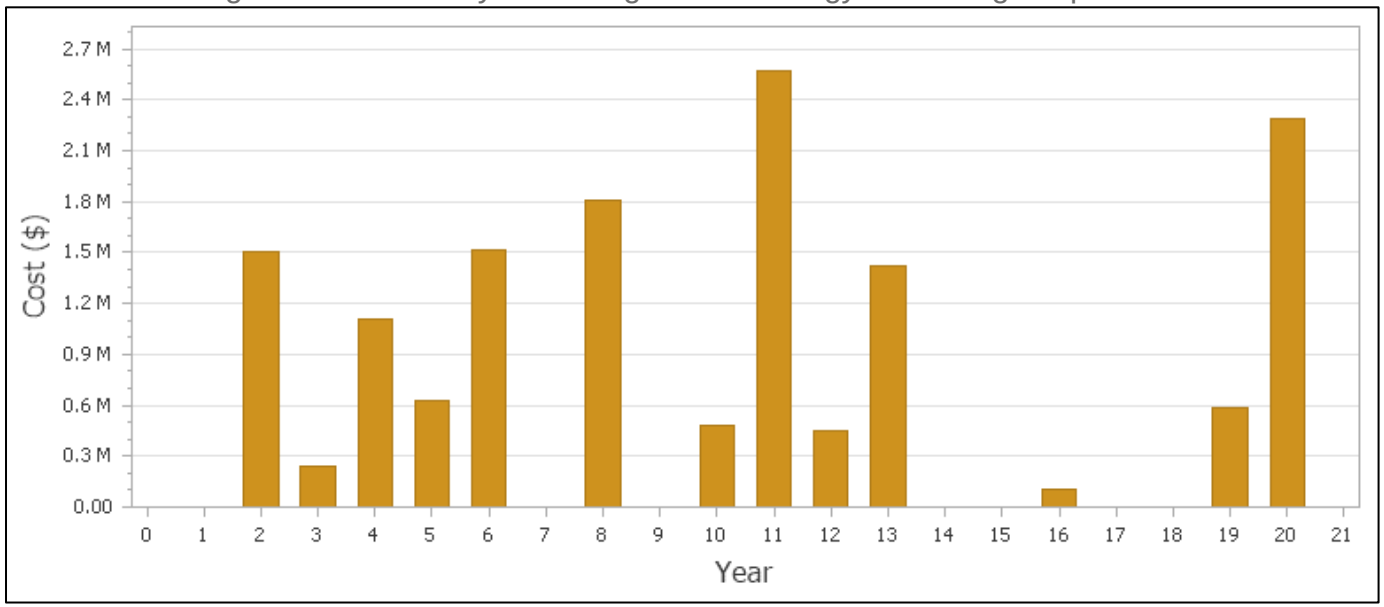
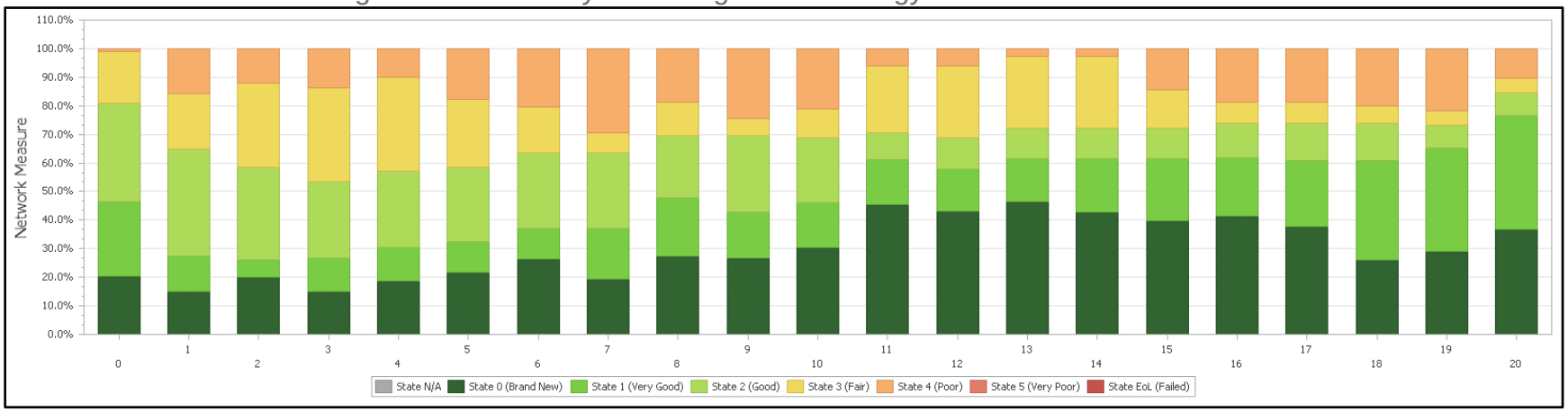


Figure 3-12
Bridge & Culvert Lifecycle Management Strategy – Network Service Levels



3.4 Sidewalks

3.4.1 Lifecycle Activities

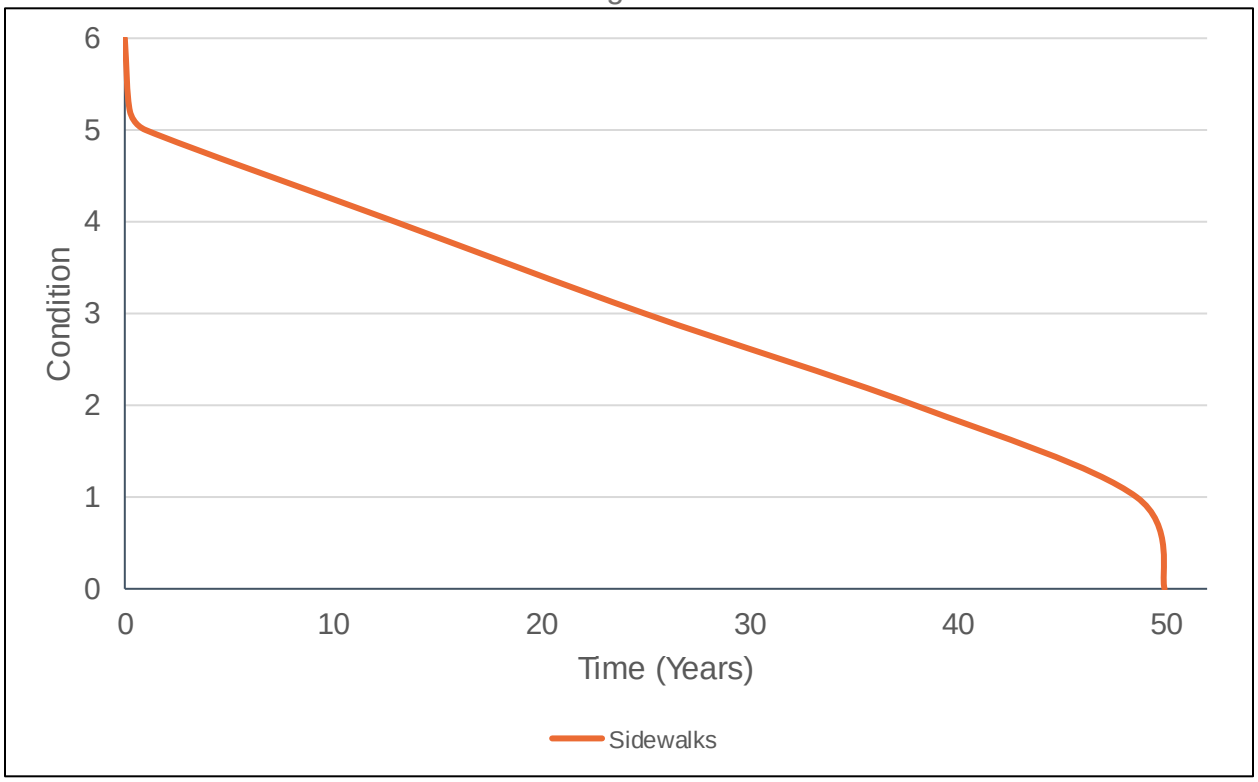
The Township currently only performs reconstruction treatments in the management of its sidewalk assets. The costs to perform a reconstruction treatment is therefore simply the currently evaluated replacement cost, as of 2019.

3.4.2 Degradation Profile

Assets deteriorate over time, eventually reaching a point where they have no remaining service life left. However, the path each asset takes in reaching its end of life differs, even for assets of the same type. A condition rating identifies where along the path any particular asset lays, or in other words, how long an asset has left before it reaches its end of life. Therefore, condition and service life are linked, and can be plotted graphically to visually represent the degradation curve of an asset.

Figure 3-13 presents the degradation profile of sidewalks that has been developed based on a straight-line approach. Through the process of conducting sidewalk condition assessments, the Township will be able to collect data to further refine the degradation profile. As mentioned in Section 2.4.2, the condition assessments are on a 1-5 scale, with “Brand New” (6) and “End of Life” (0) start- and end-points added, respectively. Due to this, a sidewalk will degrade from a condition of 6 to 5 and from a 1 to 0 very rapidly. These points have been added for modelling purposes and for consistency with the six-point reporting system utilized for other assets.

Figure 3-13
Sidewalks Degradation Profile



3.4.3 Decision Criteria

Table 3-4 presents the decision criteria—developed through discussions with Township staff—for triggering sidewalk reconstruction. When all of the decision criteria for a given asset are met, the corresponding treatment is eligible to be applied. When a treatment is applied, the condition of the asset is improved by the amount specified in the "Gain to Condition" column, but not to exceed the amount listed in the "Maximum Condition Threshold" column.

Table 3-4
Sidewalk Treatment Decision Criteria

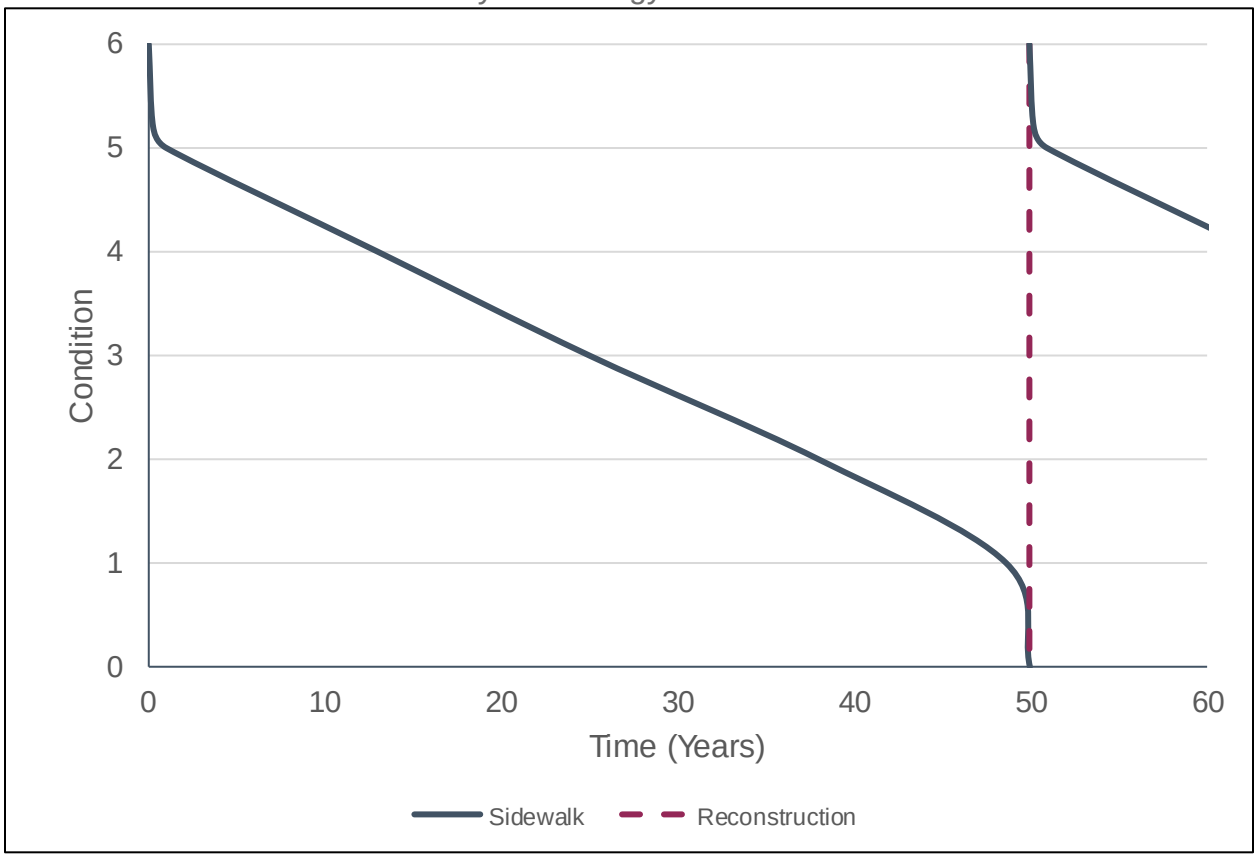
Treatment	Condition Range	Gain to Condition	Maximum Condition Threshold
Reconstruction	1-0	+6	6

3.4.4 Expected Lifecycle

Combining the treatments, degradation profiles, and decision criteria presented herein results in a complete lifecycle management strategy. Figure 3-14 presents an illustrative example of the expected lifecycle for sidewalks. The dashed, vertical line represent points of intervention in the representative asset's expected life. The lifecycle path of the asset is represented by the solid lines, following the degradation profile presented above.

The lifecycle strategy for sidewalks is to reconstruct when a condition 1 ("Very Poor") or condition 0 ("End of Life") is reached. While this strategy is simple, it is informed by the assessed condition and thus results in more accurate forecasting. As the asset's condition is re-assessed over time, the eventual timing of reconstruction could vary significantly from an age-based approach. For example, if the environment that the sidewalk resides in causes it to degrade quicker or slower than the expected average, and the assessed condition rating reflects this, then the eventual replacement will be triggered at a different time than would be indicated by a an age-based approach.

Figure 3-14
Lifecycle Strategy – Sidewalks



3.4.5 Capital Costs/Forecast

Figure 3-15 presents the 20-year expenditure forecast that results from following the lifecycle management strategy detailed above. This forecast illustrates the annual expenditures without any consideration to budgetary constraints. Over the 20-year forecast period, the only expenditures occur in year 11, totaling approximately $8,500, in 2019 dollars. As presented in Table 2-14, the sidewalk network, as a whole, is currently in a "Very Good" condition state. Consequently, only two sidewalk segments are projected to require replacement during the 20-year forecast period. Looking further into the future, significant capital expenditures for sidewalk replacements would not be expected for approximately 50 years. Figure 3-16 displays the levels of service that result from executing the lifecycle activities as set forth in the lifecycle management strategy for sidewalk assets over the 20-year forecast period.

Figure 3-15
Sidewalk Lifecycle Management Strategy – Funding Requirements

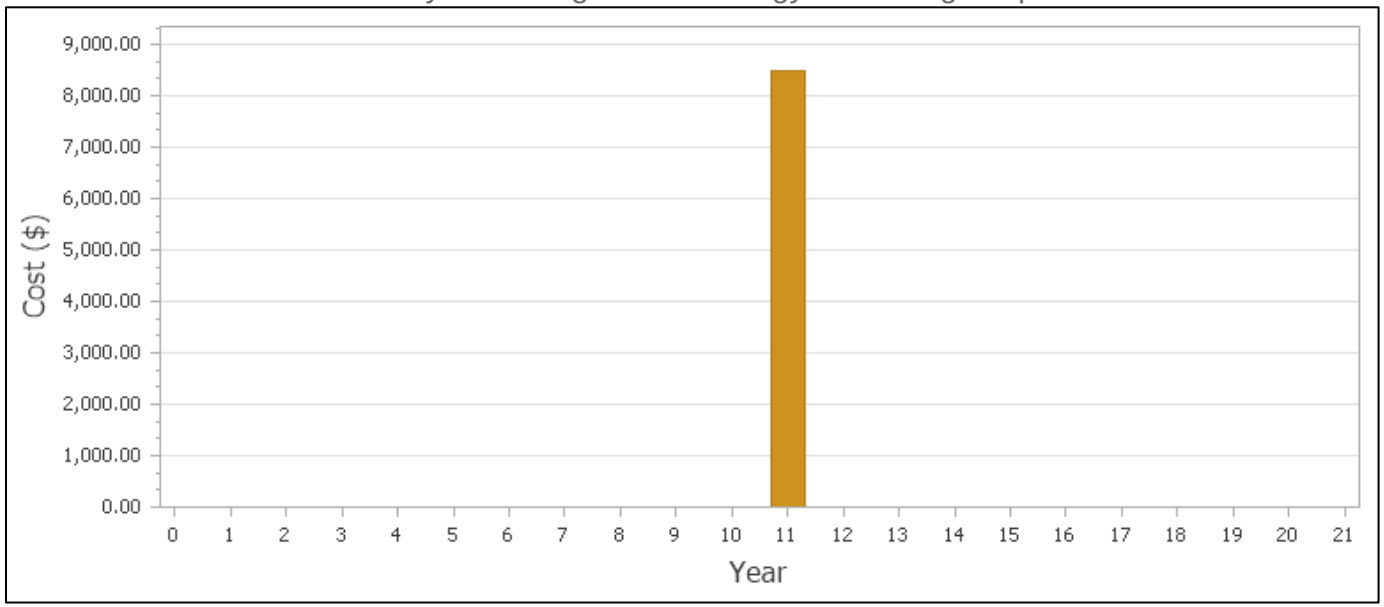
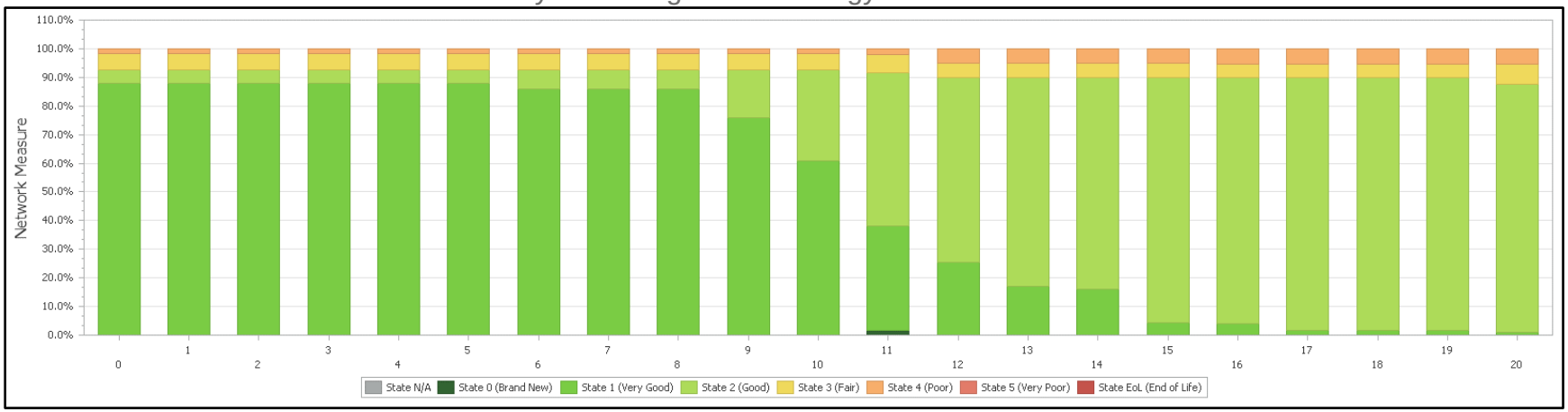


Figure 3-16
Sidewalk Lifecycle Management Strategy – Network Service Levels



3.5 Facilities

3.5.1 Lifecycle Activities

This section will detail the capital treatments as developed through discussions with Township staff. The treatments that the Township currently employs in the management of its facilities consists of the replacement of the high-level facility components described in Section 2.5.2.

This strategy, as it applies to buildings, is intended to replace the common high-level components of a building that deteriorate over time. It is assumed that by replacing these components over time, and through continual maintenance activities of the buildings as a whole, the overall condition of a building will remain in good health. This implies that the core structural and sub-structural components of a building will not degrade appreciably. Therefore, the entire reconstruction of a building has not been modeled within this plan. If circumstances arise that a reconstruction were deemed necessary, then the outputs of this strategy would need to be modified in light of these changes. As some examples, a building's capacity could be deemed to be insufficient for current Township needs or some event could harm the structural or sub-structural elements of a building, both of which could necessitate the reconstruction of a building. In such cases, the existing capital plans for these buildings would need to be readdressed through an update to this asset management plan.

Table 3-5 details the costs of these replacement treatments for buildings, by building type. For all components except for siteworks, these costs are presented as a percentage of the total estimated replacement cost of the entire building. These percentages were estimated from consulting RSMeans 2019, which provides replacement costs of the elements of various building types, and through discussions with Township staff. The siteworks component of buildings and the components of parks and cemeteries were costed based on inflating the costs provided by the inventory of assets contained in the Township's prior Asset Management Plan or figures provided by Township staff.

Table 3-5
Building Component Costs as Percent of Total Building Replacement Cost

Component	% of Total Building Replacement Cost				
	Community Centre	Firehall	Library	Town Hall	Public Works Yard
Exterior – Lighting	1.0%	1.0%	1.0%	1.0%	1.0%
Exterior – Roof	1.9%	1.9%	1.9%	1.9%	1.9%
Exterior – Water Control	0.5%	0.5%	0.5%	0.5%	0.5%
Interior – Doors and Windows	1.1%	1.8%	3.1%	3.2%	0.4%
Interior – Flooring	4.1%	1.8%	3.1%	7.6%	1.2%
Interior – HVAC	3.7%	3.7%	3.7%	3.7%	3.7%
Interior – Lighting	1.0%	1.0%	1.0%	1.0%	1.0%
Interior – Water System	2.2%	2.2%	2.2%	2.2%	2.2%

3.5.2 Degradation Profile

Assets deteriorate over time, eventually reaching a point where they have no remaining service life left. However, the path each asset takes in reaching its end of life differs, even for assets of the same type. A condition rating identifies where along the path any particular asset lays, or in other words, how long an asset has left before it reaches its end of life. Therefore, condition and service life are linked, and can be plotted graphically to visually represent the degradation curve of an asset.

Through discussions with Township staff, expected timelines for each facility component to degrade to a condition state of "Fair" (3) were developed. This is a deviation from setting expected useful life in that instead of determining how long on average it takes for an asset to reach its "End of Life," a determination is made as to how long on average it takes to reach the condition state at which an intervention will be triggered. As some of these high-level components consist of a variety of elements, of which there may be differing timeframes to reach this "Fair" condition state, some assumptions had to be made. For example, the Interior – Flooring component of buildings can consist of many different flooring types (i.e. tile, vinyl, carpets, etc.) which may have different expected useful lives. In these cases, an attempt was made to set the expected time to

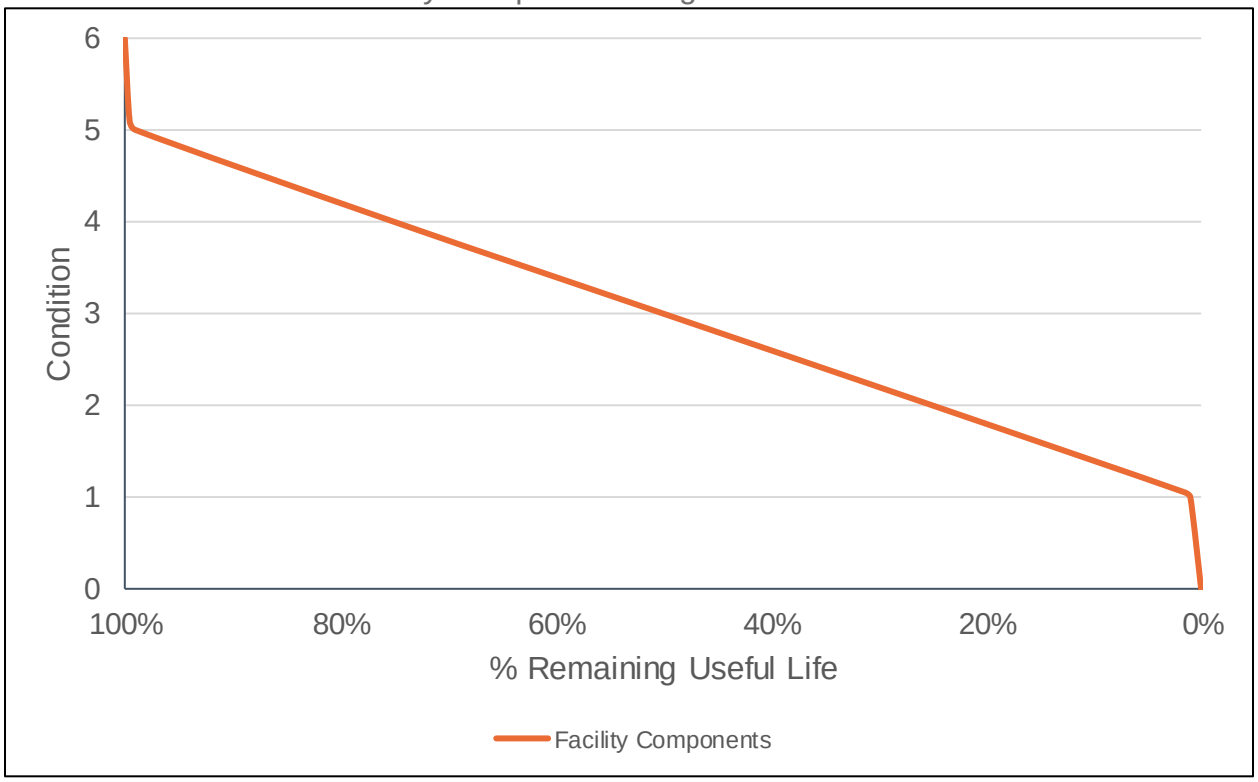
the predominant type. Table 3-6 presents the time for each facility component to reach a condition state of “Fair.”

Figure 3-17 presents the degradation profile of all facility components that have been developed based on a straight-line approach. Through the process of conducting subsequent facility condition assessments, the Township will be able to further refine these degradation profiles. As mentioned in Section 2.5.2, the condition assessments are on a 1-5 scale, with “Brand New” (6) and “End of Life” (0) start- and end-points added, respectively. Due to this, a component will degrade from a condition of 6 to 5 and from a 1 to 0 very rapidly. These points have been added for modelling purposes and for consistency with the six-point reporting system utilized for other assets.

Table 3-6
Facility Components Expected Time to "Fair" Condition

Facility Type	Component Type	Expected Time (Years) to "Fair" Condition
Building	Exterior – Lighting	20
	Exterior – Roof	25
	Exterior – Siteworks	30
	Exterior – Water Control	25
	Interior – Doors and Windows	60
	Interior – Flooring	60
	Interior – HVAC	25
	Interior – Lighting	20
	Interior – Water System	45
Ball Diamond	Bleachers	25
	Fencing	25
	Lighting	20
	Pavilion	25
Park	Curbs & Borders	30
	Furnishings	25
	Play Spaces	25
Cemetery	Furnishings	25

Figure 3-17
Facility Components Degradation Profile



3.5.3 Decision Criteria

Table 3-7 presents the decision criteria—developed through discussions with Township staff—for triggering facility component reconstruction. When all of the decision criteria for a given asset are met, the corresponding treatment is eligible to be applied. When a treatment is applied, the condition of the asset is improved by the amount specified in the "Gain to Condition" column, but not to exceed the amount listed in the "Maximum Condition Threshold" column.

Table 3-7
Facility Component Treatment Decision Criteria

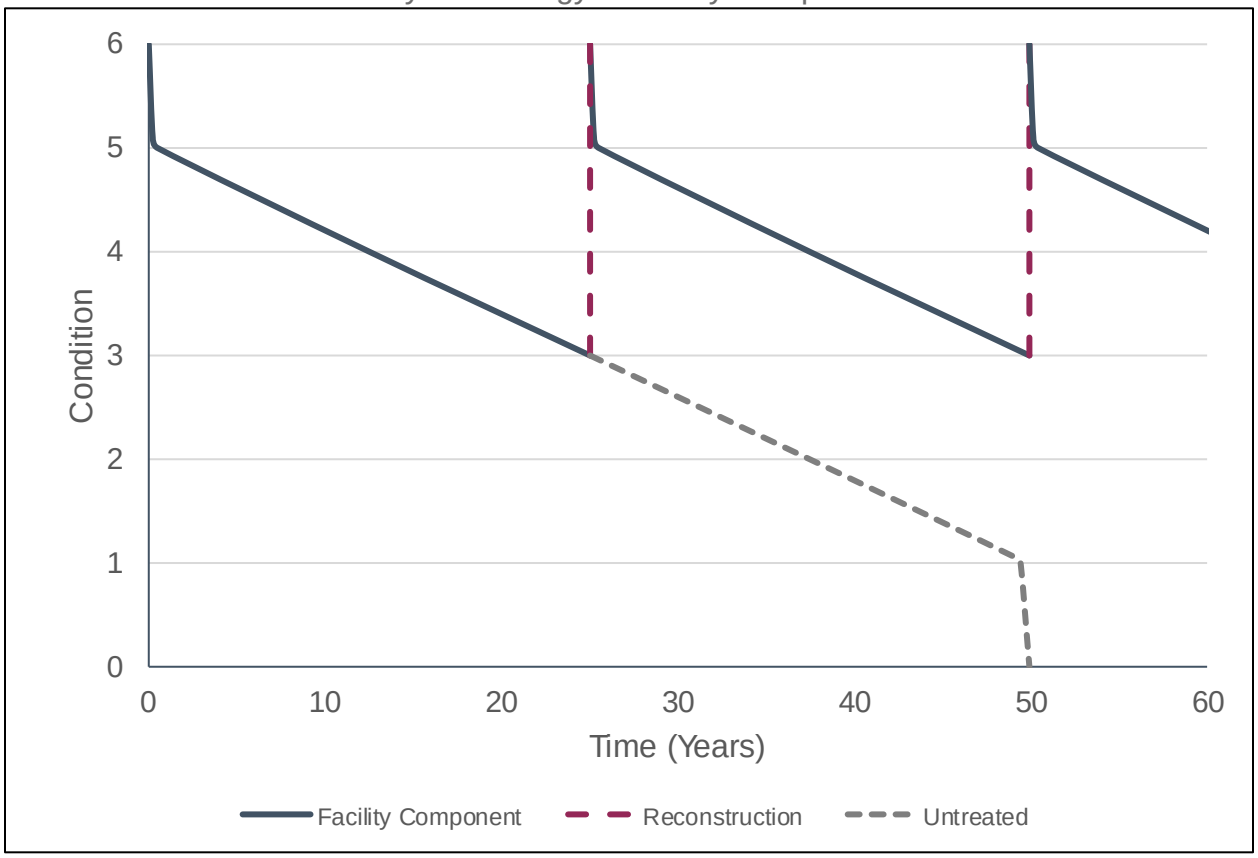
Treatment	Condition Range	Gain to Condition	Maximum Condition Threshold
Reconstruction	3-0	+6	6

3.5.4 Expected Lifecycle

Combining the treatments, degradation profiles, and decision criteria presented herein results in a complete lifecycle management strategy. Figure 3-18 presents an illustrative example of the expected lifecycle of a facility component that takes 25 years to reach a condition 3 (“Fair”). The dashed, vertical line represent points of intervention in the representative asset’s expected life. The lifecycle path of the asset is represented by the solid lines, following the degradation profile presented above. Finally, the grey, dotted line demonstrates the expected lifecycle of an asset were it to not receive any treatments over the course of its service life.

The lifecycle strategy for facility components is to reconstruct when a condition 3 (“Fair”) to condition 0 (“End of Life”) is reached. While this strategy is simple, it is informed by the assessed condition and thus results in more accurate forecasting. As the asset’s condition is assessed over time, the eventual reconstruction could vary significantly from an age-based approach. For example, if the environment that the component resides in causes it to degrade quicker or slower than the expected average, and the assessed condition rating reflects this reality, then the timing of an eventual replacement will be different time than would be indicated by a an age-based approach.

Figure 3-18
Lifecycle Strategy – Facility Components



3.5.5 Capital Costs/Forecasts

Figure 3-19 presents the 20-year expenditure forecast that results from following the lifecycle management strategy detailed above. This forecast illustrates the annual expenditures without any consideration to budgetary constraints. Over the 20-year forecast period, the average annual expenditures would be approximately $116,000, in 2019 dollars. It is noted that the large expenditure amount shown in year one of the forecast represents the cost of bringing all facility components to their minimum levels of service thresholds, as defined in Table 2-20. Figure 3-20 displays the levels of service that result from executing the lifecycle activities as set forth in the lifecycle management strategy for facility assets over the 20-year forecast period.

Figure 3-19
Facility Management Strategy – Funding Requirements

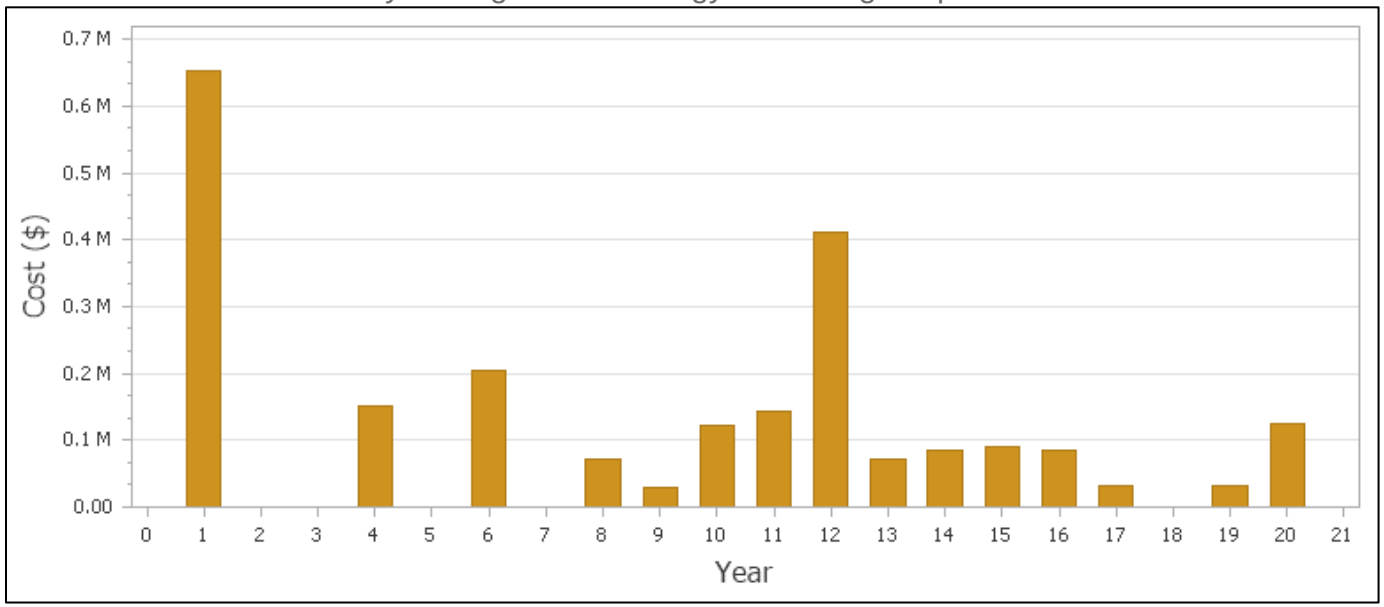
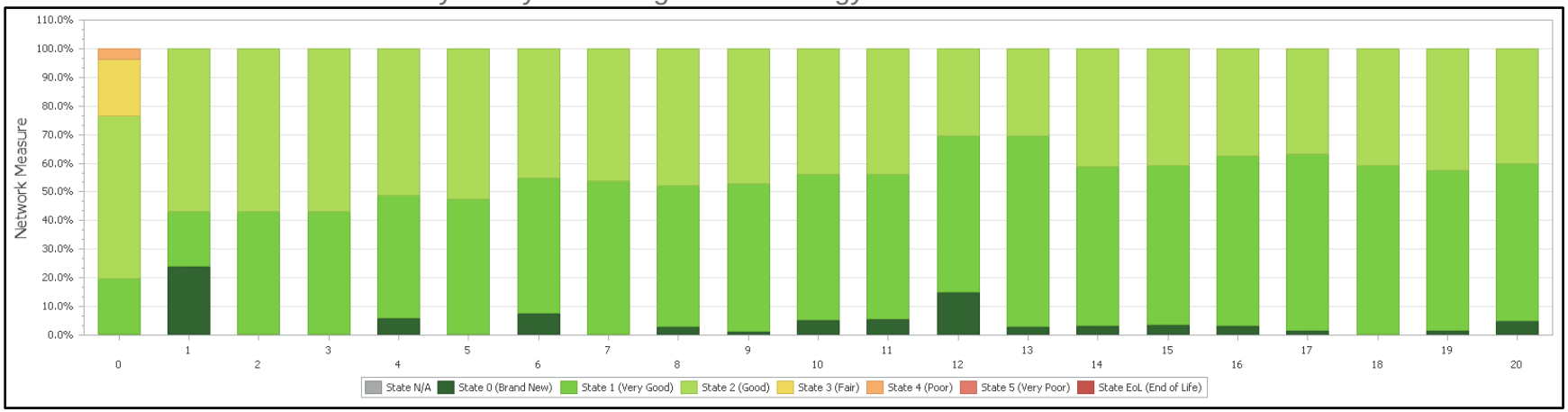


Figure 3-20
Facility Lifecycle Management Strategy – Network Service Levels



3.6 Age-Based Assets

The remainder of the Township's assets do not presently have an assessed condition, and as such will all be subject to the same age-based lifecycle management strategy. The following subsections will apply to the following asset classes:

- Equipment;
- Fleet;
- Guiderails; and
- Street Lights.

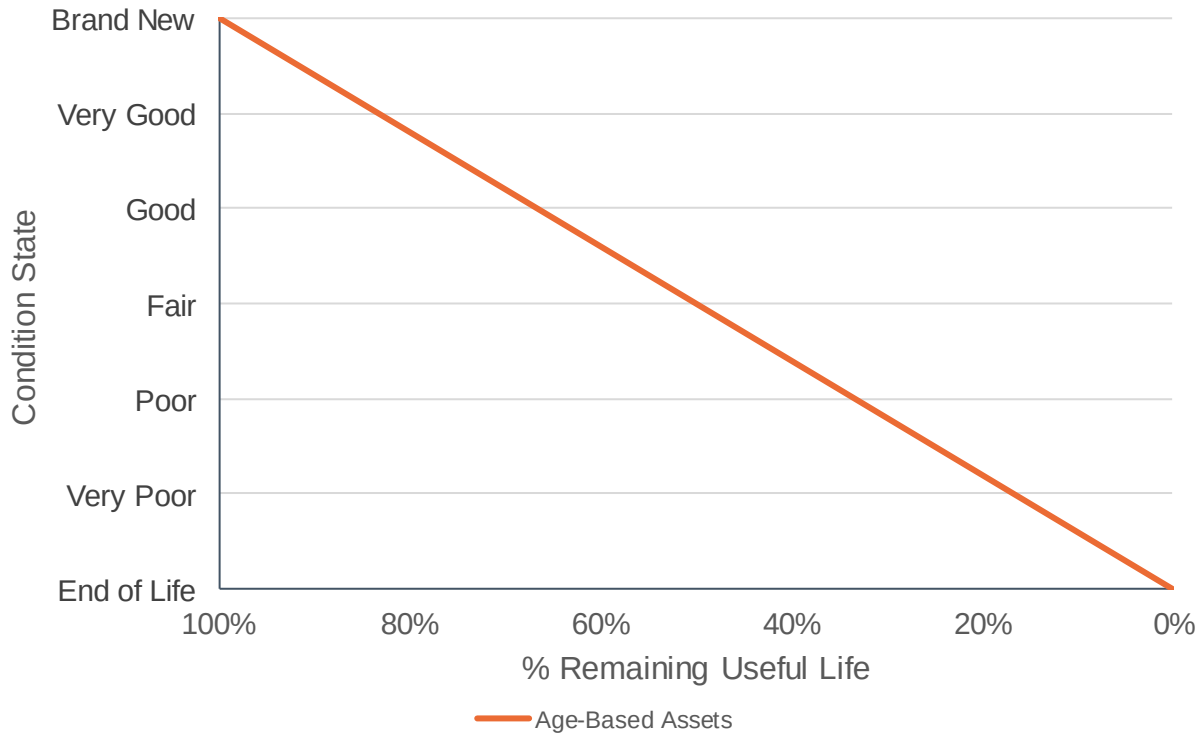
3.6.1 Lifecycle Activities

The Township currently only performs replacement treatments in the management of its age-based assets. The costs to perform a replacement treatment is therefore simply the currently evaluated replacement cost, as of 2019.

3.6.2 Degradation Profile

For age-based assets, a straight-line degradation profile simply details what percentage of service life is left in light of an expected useful life. Figure 3-21 depicts the degradation profile that applies to all assets covered in this section (i.e. age-based assets).

Figure 3-21
Age-Based Asset Degradation Profile



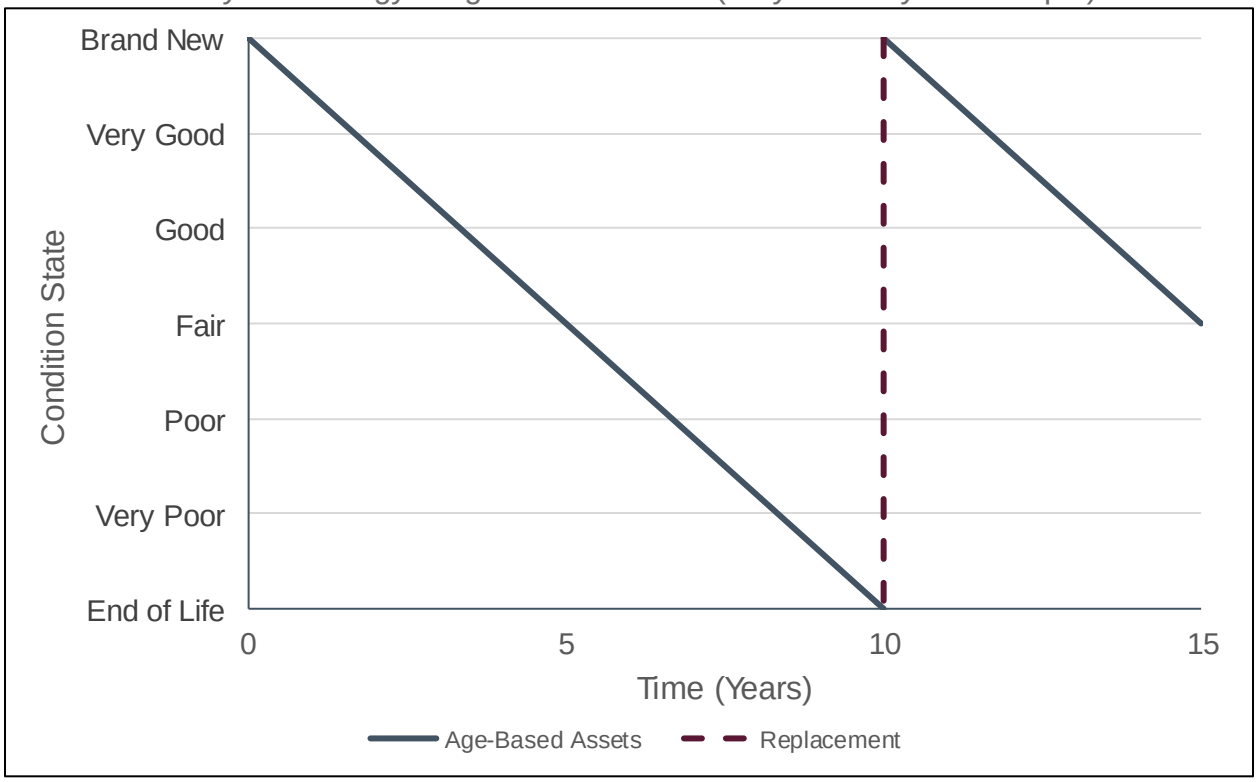
3.6.3 Decision Criteria

For age-based assets, when an asset reaches the end of its service life a replacement treatment is triggered, resulting in the reconstruction or acquisition of a new asset.

3.6.4 Expected Lifecycle

Combining the treatments, degradation profiles, and decision criteria presented herein results in a complete lifecycle management strategy. Figure 3-22 presents an illustrative example of the expected lifecycle for age-based assets with an expected useful life of 10 years. The dashed, vertical line represent points of intervention in the representative asset's expected life. The lifecycle path of the asset is represented by the solid lines, following the degradation profile presented above.

Figure 3-22
Lifecycle Strategy – Age-Based Assets (10-year lifecycle example)



3.6.5 Capital Costs/Forecasts

3.6.5.1 Equipment

Figure 3-23 presents the 20-year expenditure forecast that results from following the lifecycle management strategy detailed above. This forecast illustrates the annual expenditures without any consideration to budgetary constraints. Over the 20-year forecast period, the average annual expenditures would be approximately $204,000, in 2019 dollars. Figure 3-24 displays the levels of service that result from executing the lifecycle activities as set forth in the lifecycle management strategy for equipment assets over the 20-year forecast period. As mentioned in Section 2.10, a condition state of "Very Poor" for age-based assets does not necessarily mean that an asset is performing poorly, it only signifies that the asset is nearing the end of its useful life.

3.6.5.2 Fleet

Figure 3-25 presents the 20-year expenditure forecast that results from following the lifecycle management strategy detailed above. This forecast illustrates the annual

expenditures without any consideration to budgetary constraints. Over the 20-year forecast period, the average annual expenditures would be approximately $455,000, in 2019 dollars. Figure 3-26 displays the levels of service that result from executing the lifecycle activities as set forth in the lifecycle management strategy for fleet assets over the 20-year forecast period. As mentioned in Section 2.10, a condition state of "Very Poor" for age-based assets does not necessarily mean that an asset is performing poorly, it only signifies that the asset is nearing the end of its useful life.

3.6.5.3 Guiderails

Figure 3-27 presents the 20-year expenditure forecast that results from following the lifecycle management strategy detailed above. This forecast illustrates the annual expenditures without any consideration to budgetary constraints. Over the 20-year forecast period, the average annual expenditures would be approximately $26,000, in 2019 dollars. Figure 3-28 displays the levels of service that result from executing the lifecycle activities as set forth in the lifecycle management strategy for guiderail assets over the 20-year forecast period. As mentioned in Section 2.10, a condition state of "Very Poor" for age-based assets does not necessarily mean that an asset is performing poorly, it only signifies that the asset is nearing the end of its useful life.

3.6.5.4 Street Lights

Figure 3-29 presents the 20-year expenditure forecast that results from following the lifecycle management strategy detailed above. This forecast illustrates the annual expenditures without any consideration to budgetary constraints. Over the 20-year forecast period, the only expenditures occur in years 14 through 16, totaling approximately $121,000, in 2019 dollars. As presented in Table 2-29, the entire street light network is in a "Very Good" condition state, resulting in a cohort effect, meaning all street light assets are expected to be in need of replacement at the same time. Figure 3-30 displays the levels of service that result from executing the lifecycle activities as set forth in the lifecycle management strategy for street light assets over the 20-year forecast period. As mentioned in Section 2.10, a condition state of "Very Poor" for age-based assets does not necessarily mean that an asset is performing poorly, it only signifies that the asset is nearing the end of its useful life.

Figure 3-23
Equipment Management Strategy – Funding Requirements

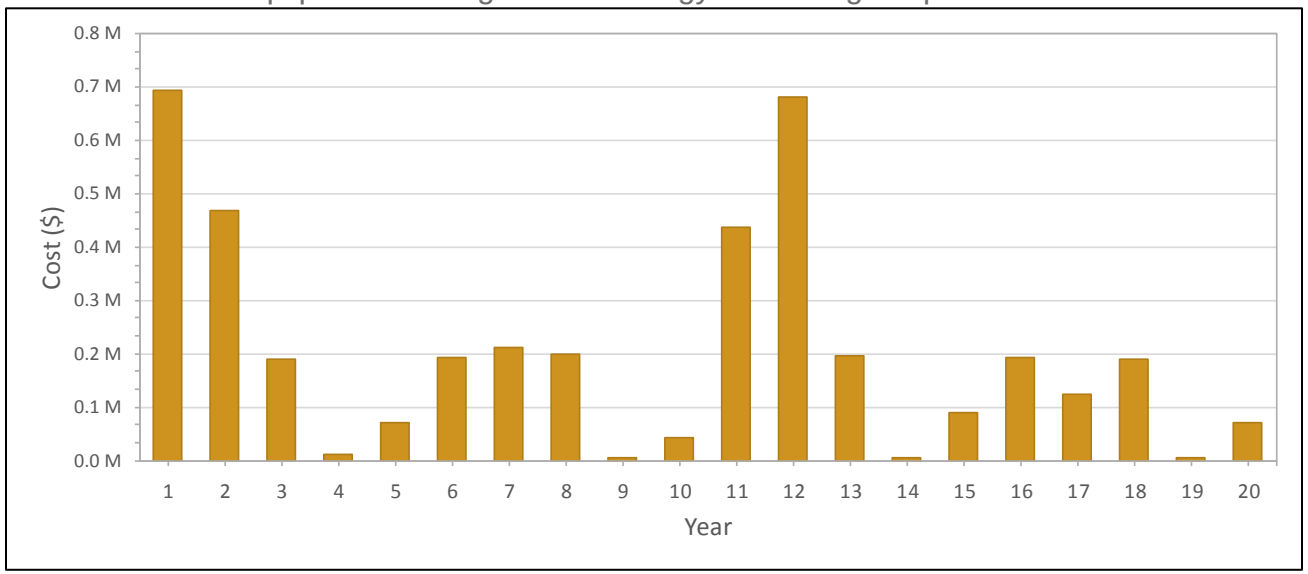


Figure 3-24
Equipment Management Strategy – Network Service Levels

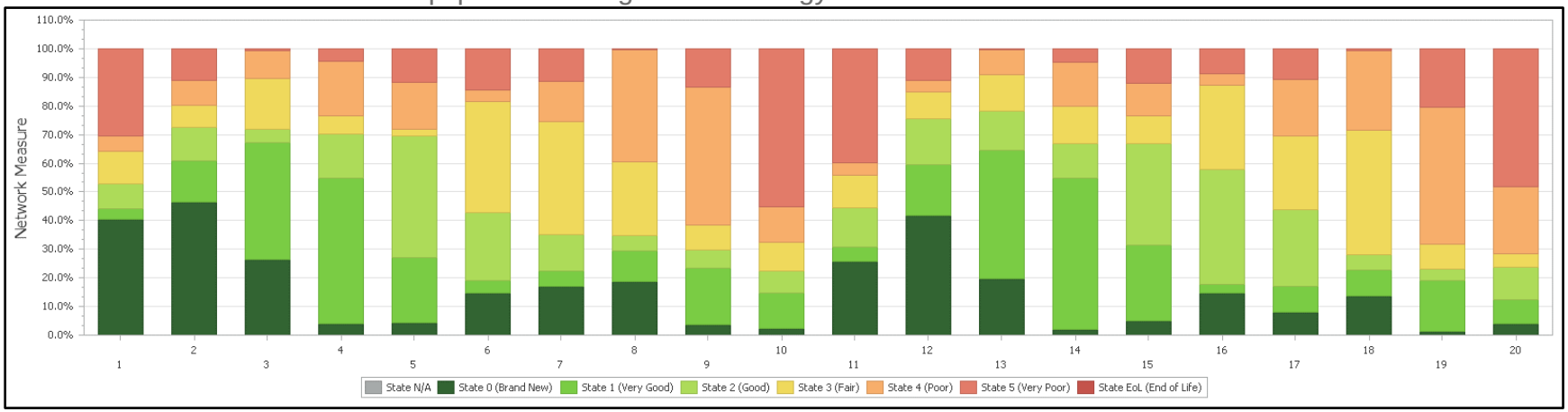


Figure 3-25
Fleet Management Strategy – Funding Requirements

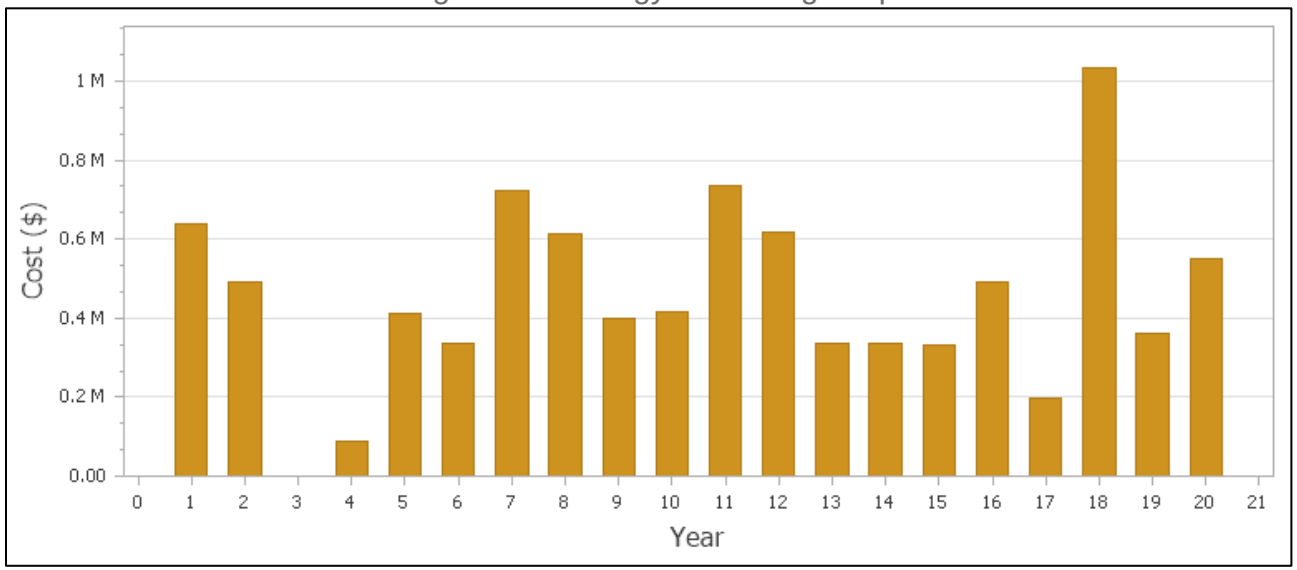


Figure 3-26
Fleet Lifecycle Management Strategy – Network Service Levels

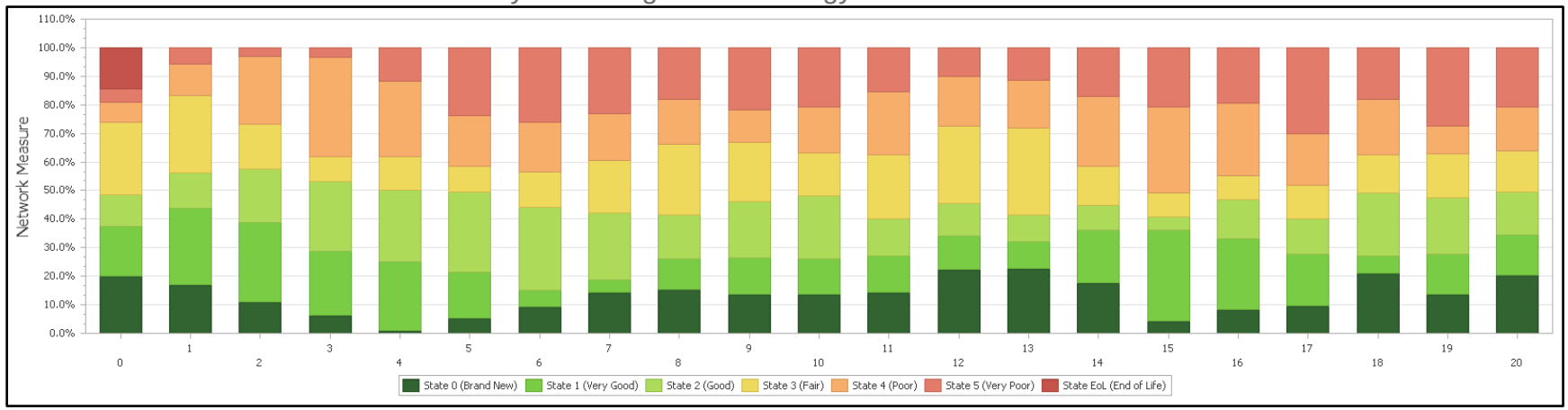


Figure 3-27
Guiderail Management Strategy – Funding Requirements

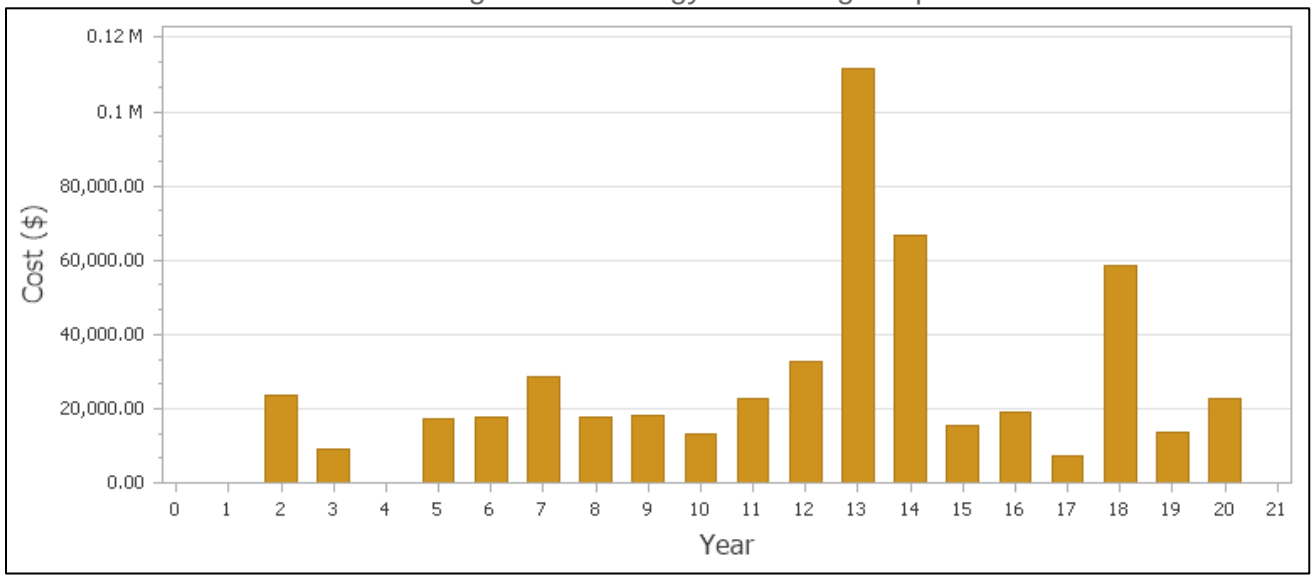


Figure 3-28
Guiderail Lifecycle Management Strategy – Network Service Levels

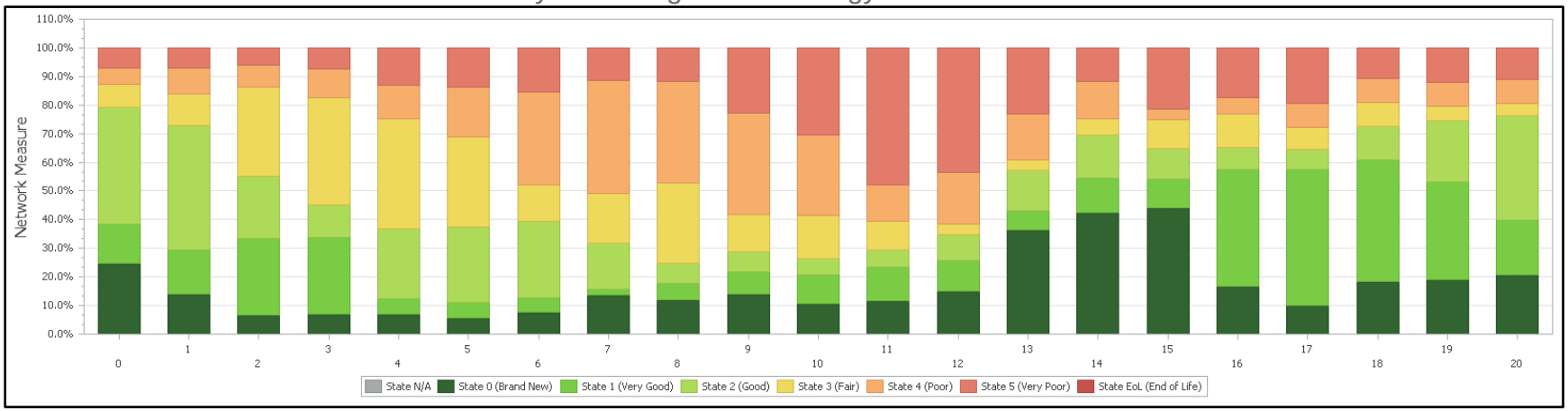


Figure 3-29
Street Light Management Strategy – Funding Requirements

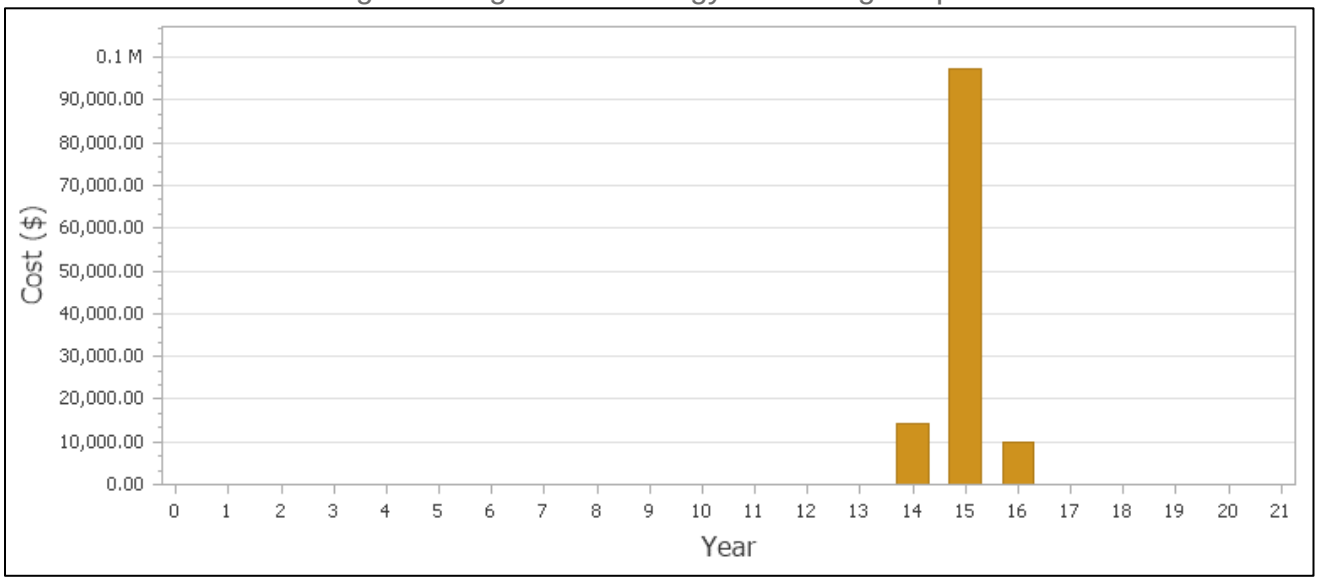
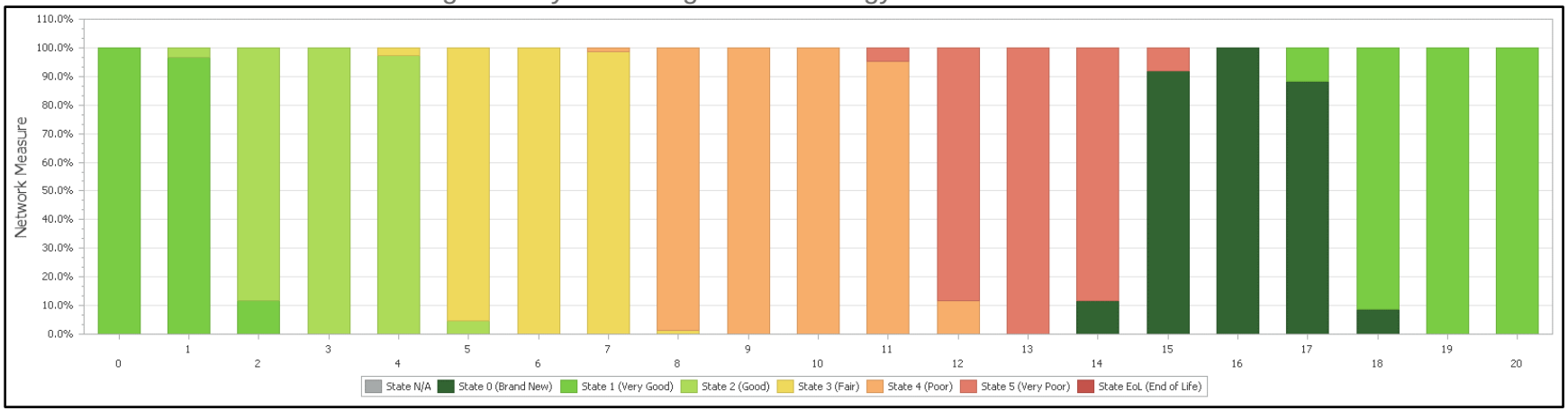


Figure 3-30
Street Light Lifecycle Management Strategy – Network Service Levels



4. Financing Strategy

4.1 Introduction

This chapter details the financing strategy that would sustainably fund the lifecycle management strategies presented in Chapter 3. This financing strategy focuses on examining how the Township can fund the lifecycle activities required to maintain its assets at the current and/or proposed levels of service. The strategy presented is a suggested approach which should be examined and re-evaluated during the annual budgeting processes to ensure the sustainability of the Township's financial position as it relates to its assets.

O. Reg. 588/17 requires a 10-year capital plan that forecasts the costs of implementing the lifecycle management strategy and the lifecycle activities required therein. The financing strategy in this asset management plan has been developed for a 20-year forecast period to enable the Township to evaluate the sustainability of its assets over a longer-term horizon.

The financing strategy forecast (including both expenditure and revenue sources) was prepared consistent with the Township's departmental budget structure so that it can be used in conjunction with the annual budget process. Various financing options, including reserve funds, debt, and grants were considered and discussed with Township staff during the process. The recommended financing strategy identifies rehabilitation and replacement activities required over the forecast period, as described in preceding sections of this plan.

4.1.1 Future Improvements

This plan does not incorporate the costs associated with the lifecycle activities and maintenance of growth-related capital. These costs should be explored and implemented into the financing strategy in the future, once the Township completes its development charges background study (currently underway). Examining these growth-related capital needs and their impacts on the financing strategy will provide for a comprehensive assessment of the sustainability of the Township's overall asset management system.

4.2 Annual Costs

Table A-1 presents the capital expenditure forecast for each asset class over the 2019-2038 forecast period. This expenditure forecast is based on the lifecycle activities identified in preceding sections of this plan. It is noted that in the early years of the forecast, certain assets may fall below their respective level of service targets, as the Township gradually increases available capital funding. The capital expenditures identified in the financing strategy for 2019 are aligned with the Township's 4-year capital forecast.

Figure 4-1 to Figure 4-8 demonstrate the network service levels over the forecast period, for each asset class, as a result of implementing these modified lifecycle management strategies. In all cases, the financing strategy will enable the Township to move towards a sustainable position of maintaining current levels of service, or moving towards proposed levels of service, as identified in Chapter 2.

The expenditure forecast includes a capital inflation factor of 3.5% annually, which aligns closely with the historical 20-year annual average rate of inflation as witnessed in Statistics Canada's Building Construction Price Index[1].

4.2.1 Roads

The capital forecast estimates that an average of approximately $1.3 million (inflated dollars) will be spent annually on the reconstruction of roads over the first 13 years of the forecast period, with no reconstruction projects forecast for the remaining seven. Rehabilitation of roads will require an average annual spend of approximately $1.5 million over the entire 20-year forecast period.

4.2.2 Bridges and Structural Culverts

The lifecycle rehabilitation and renewal activities planned for bridges and culverts are projected to cost, on average, approximately $1.0 million per year over the forecast period.

[1] Statistics Canada. Table 18-10-0135-01 Building construction price indexes, by type of building. Toronto series, Non-residential buildings [2362], Q1-1998 to Q1-2018.

4.2.3 Sidewalks

Due to the overall "Very Good" condition of the sidewalk network, approximately $82,000 in total is projected for the entire forecast period, with expenditures in only two years (2019 and 2029).

4.2.4 Facilities

Lifecycle activities associated with facilities are projected to cost on average approximately $160,000 annually over the forecast period.

4.2.5 Equipment

The lifecycle replacement activities planned for equipment are projected to cost an average of approximately $276,000 per year over the forecast period.

4.2.6 Fleet

It is projected that approximately $662,000 annually will be required, over the forecast period, to replace the Township's fleet assets.

4.2.7 Guiderails

The lifecycle replacement activities planned for guiderails are projected to cost an average of approximately $44,000 per year over the forecast period.

4.2.8 Street Lights

The lifecycle replacement needs of street lights are relatively low due to the overall "Very Good" condition of these assets. The forecast identifies a total of approximately $65,000 over the entire forecast period, with expenditures not expected until late in the forecast period (i.e. 2032-2034).

Figure 4-1
Road Financing Strategy – Network Service Levels

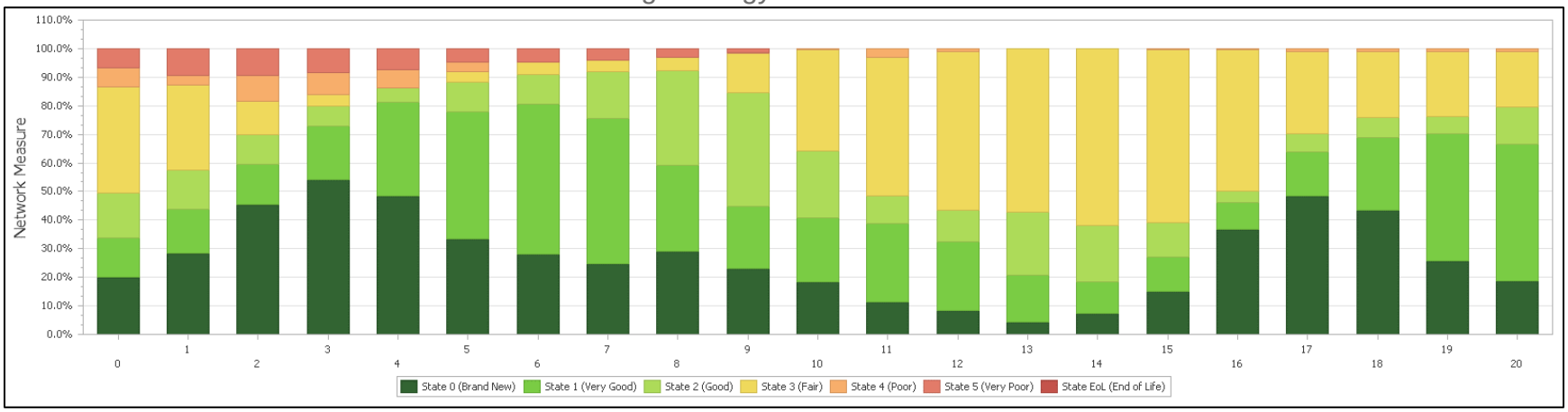


Figure 4-2
Bridge & Culvert Financing Strategy – Network Service Levels

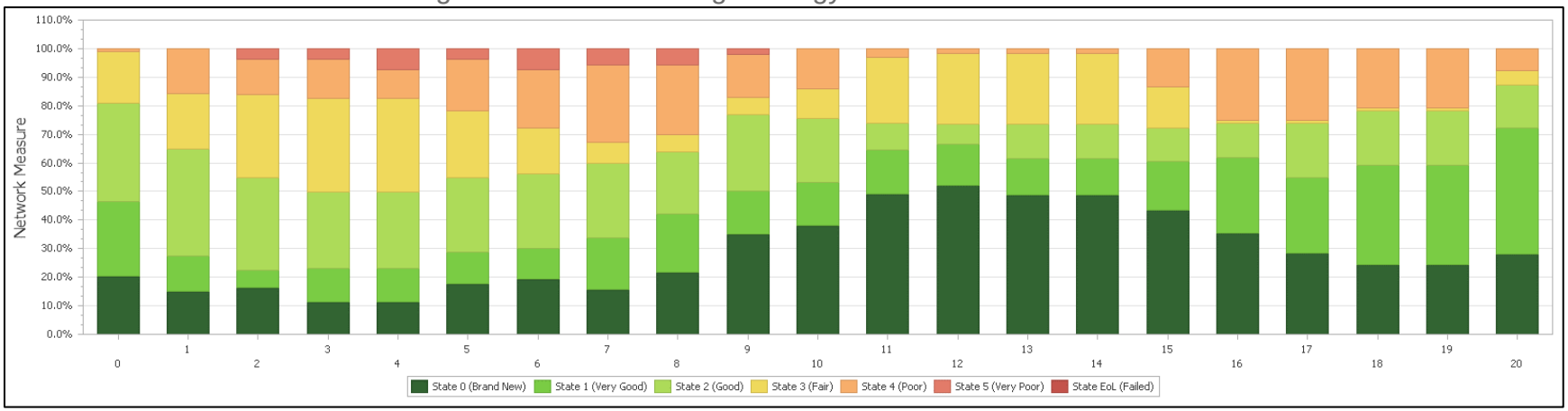


Figure 4-3
Sidewalk Financing Strategy – Network Service Levels

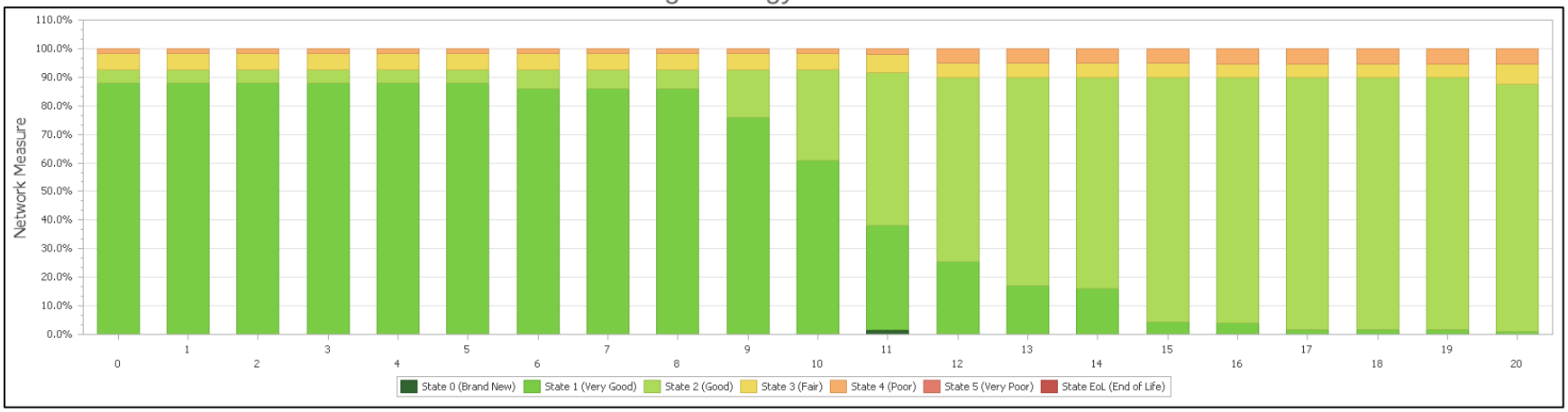


Figure 4-4
Facility Financing Strategy – Network Service Levels

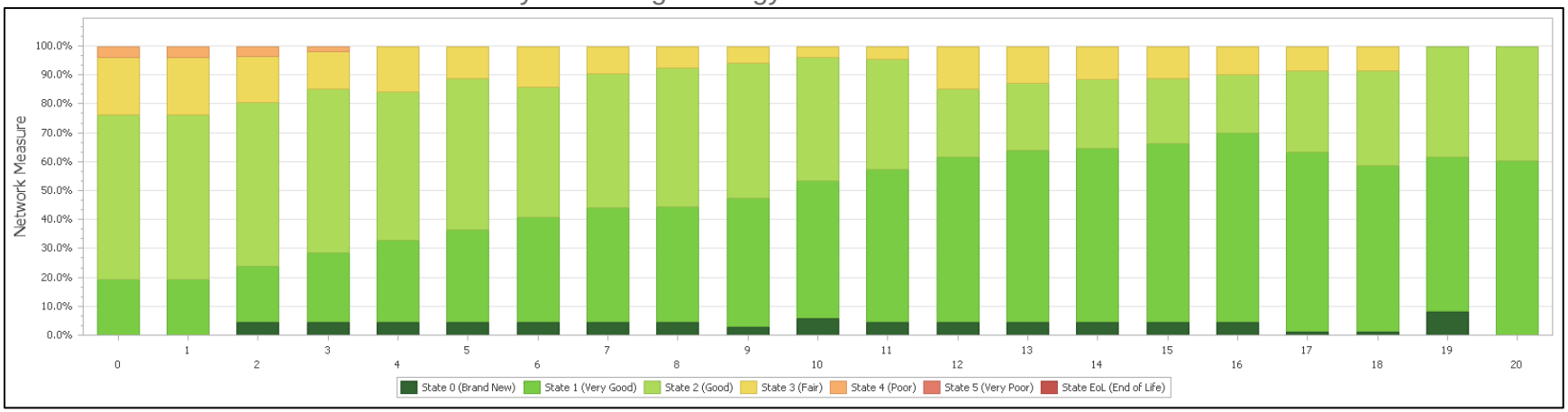


Figure 4-5
Equipment Financing Strategy – Network Service Levels

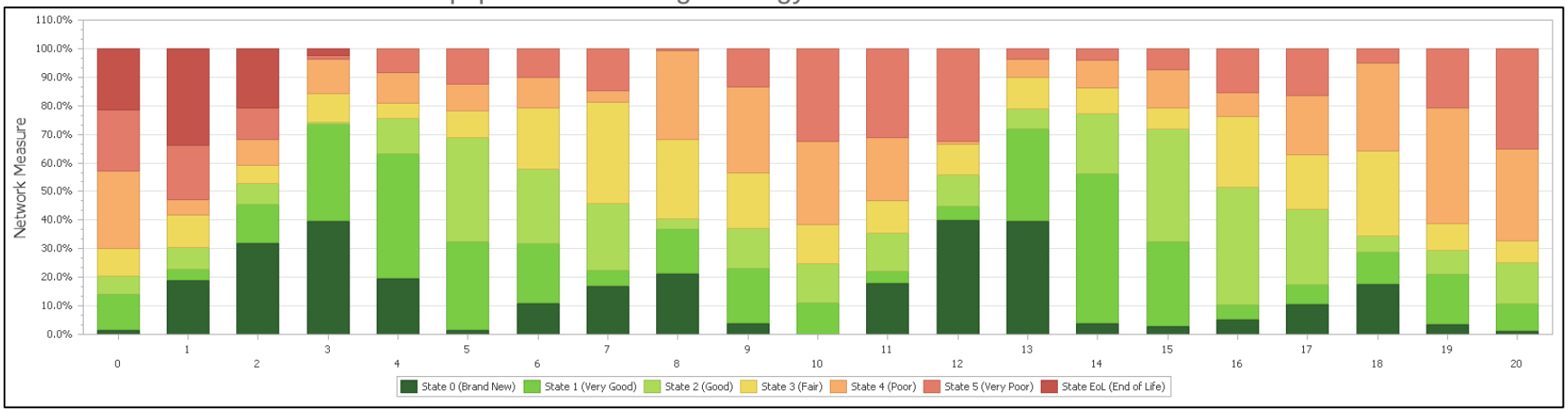


Figure 4-6
Fleet Financing Strategy – Network Service Levels

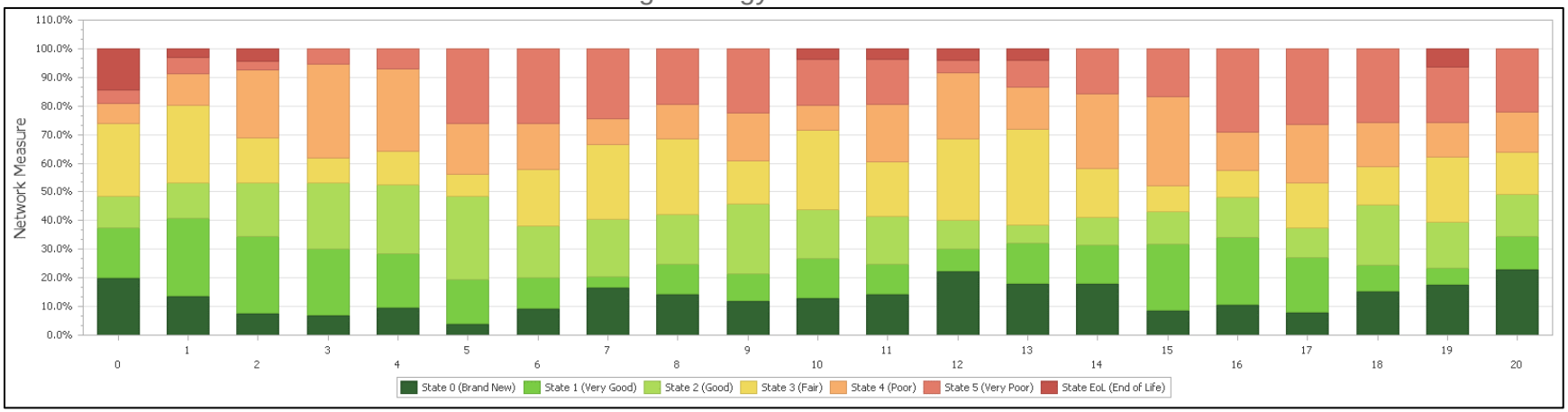


Figure 4-7
Guiderail Financing Strategy – Network Service Levels

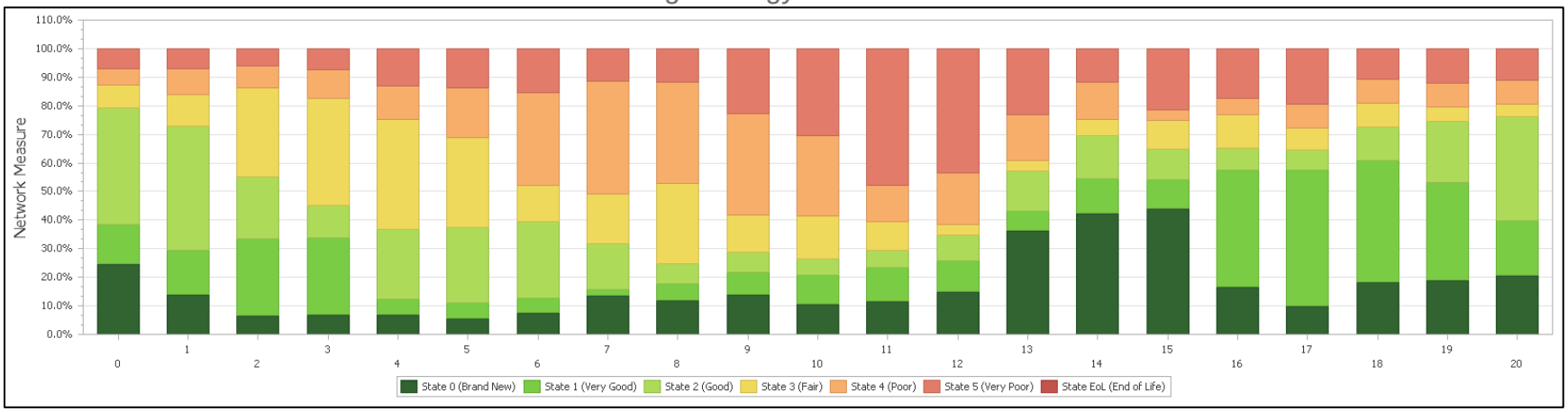
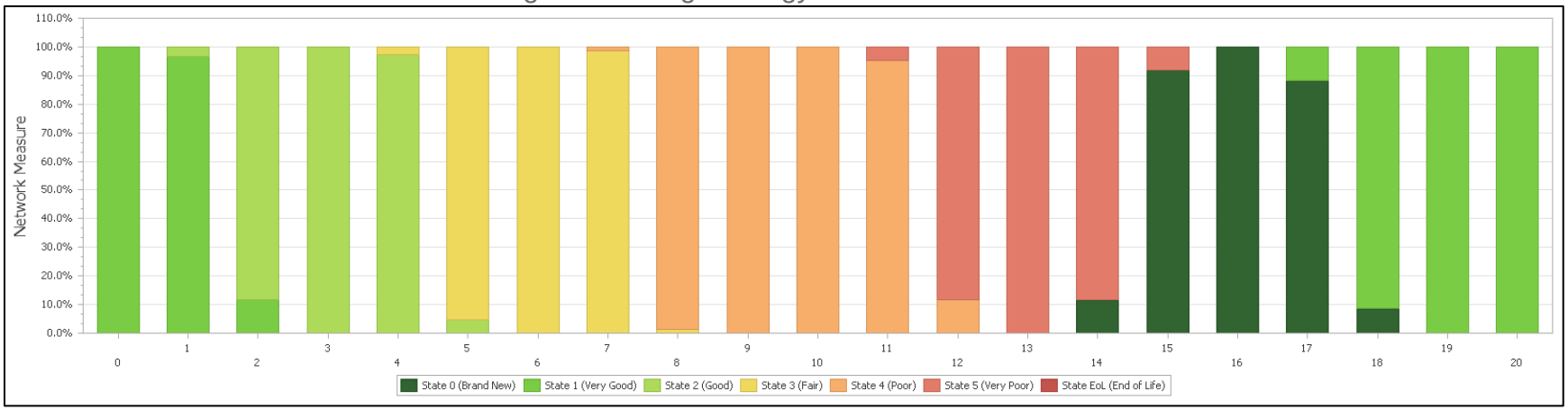


Figure 4-8
Street Light Financing Strategy – Network Service Levels



4.3 Funding

Table A-4 summarizes the recommended strategy to finance the asset lifecycle costs identified in Table A-1. This funding forecast was based on the funding sources identified in the Township's 2019 budget.

The lifecycle costs required to sustain established level of service targets are being recovered through several methods:

- Ontario Community Infrastructure Fund (OCIF) formula-based funding is identified for years in which the funding amount is known (2019-2020). The 2020 level of OCIF funding is then maintained for the remaining years of the forecast, recognizing the OCIF as a stable and long-term funding source for capital projects.
- Gas tax funding has been shown as a stable and long-term funding source for eligible capital projects. Annual funding estimates are based on Township's 2019 budget for 2019-2021. The funding in subsequent years has been maintained at the 2021 level.
- Provincial/Federal grant funding has been included in the forecast for works in 2019, totaling $118,000. This grant funding is included as a necessary source of funding to ensure the Township can complete these projects.
- Debt financing is shown as required, specifically in years where significant capital needs are identified. The financing strategy includes total debt financing of $3.1 million over the forecast period, representing approximately 3.4% of total lifecycle costs over the period.
- The Township will be dependent upon maintaining healthy capital reserves/reserve funds in order to provide the remainder of the required lifecycle funding over the forecast period. This will require the Township to proactively increase amounts being transferred to these capital reserves during the annual budget process.

4.3.1 Funding Shortfall

This financing strategy has been developed to be fully funded, and therefore no funding shortfall has been identified. However, this means that if identified grants and debt financing are not received at expected amounts then shortfalls may present themselves.

In such an event, the difference could be made up through increases to the tax levy over-and-above those presented hereafter.

4.4 Tax Levy Impact

While the annual funding requirement may fluctuate, it is important for the Township to implement a consistent, yet increasing, annual investment in capital so that the excess annual funds can accrue in capital reserve funds. Table A-4 presents a summary of the impacts on the tax levy as a result of this financing strategy.

In order to fund the recommended asset lifecycle activities over the forecast period using the Township's own available funding sources (i.e. using taxation, Gas Tax funding, OCIF funding, and debentures), an increase in the Township' taxation levy would be required as follows:

- 3.97% increases annually for 2020-2028
- 3.57% increases annually for 2029-2038

Consideration for cash-flow and positive reserve fund balances has been included in setting the capital reserve transfer amounts. A detailed schedule of all capital-related reserves can be viewed in Table A-3.

These impacts layer on assessment increases resulting from new assessment growth, assumed to be approximately 1.1% annually.

The taxation impacts identified above include inflationary adjustments to the Township's operating costs and revenues as identified in its 2019 budget (e.g. general operating inflation of 2% annually, with 5% increases annually for utility, fuel, and several miscellaneous items). However, if other funding sources become available (as mentioned above) or if maintenance practices allow for the deferral of capital works, then the impact on the Township's taxation levy would potentially decrease.

Further detail on the Financing Strategy is presented in Appendix A.

5. Recommendations

The following recommendations have been provided for consideration:

- That the Township of Malahide Asset Management Plan be received and approved by Council;
- That consideration of this Asset Management Plan be made as part of the annual budgeting process to ensure sufficient capital funds are available to fund the Asset Management Plan; and
- That this Asset Management plan be updated as needed over time to reflect the current priorities of the Township.

Substantial investment in capital needs will be required over the forecast period, and through the recommendations provided through the financing strategy, proactive steps would be taken to sustainably fund the Township's network of assets. Additional funding has been recommended to meet the annual lifecycle funding target, which identifies the long-term annual investment level necessary to meet the levels of service identified in Chapter 2. This additional funding takes the form of transfers to capital reserves, and is reflected in the sizeable positive balances reached in the final years of the forecast period. Through these recommendations, the Township would have saved approximately ##% as a percentage of the total value of Township owned assets (inflated) by 2038.

5.1 Future Improvements

Areas of future enhancement to the Township's asset management plan have been noted in relevant sections. A summary of these improvements has been listed below to provide a consolidated listing.

- Community Levels of Service - Images: Chapter 2 introduces the concept of levels of service and the closely related concept of asset condition states. Images that illustrate the different condition states of assets can be helpful in communicating levels of service to stakeholders. A number of sample images have been provided in Chapter 2. The Township should seek to provide additional images in future iterations of this asset management plan.

- Bridges and Culverts – 2018 OSIM Report: The analysis presented in this report in respect of the Township's bridges and culverts has been based on information contained in the Township's 2016 OSIM report. The next update to this plan should incorporate the findings of the Township's latest OSIM report.
- Facility Condition Assessments – Data Registry: The Township developed methodologies and standardized forms to conduct inspections of its facilities, which include the assessment of numerous facility components. The Township should evaluate available options for recording and storing this data on an ongoing basis. This is especially important since the manner in which facilities have been componentized for the purposes of condition assessments does not align well with the Township's current asset inventory spreadsheets. A specialized asset register would enable the Township to track condition data, along with other asset attributes, in a more efficient manner.
- Age-Based Assets – Modified Remaining Useful Life: The lifecycle needs for a number of the Township's asset categories (i.e. equipment, fleet, guiderails, and streetlights) are currently assessed based on asset age. In the future, it would be beneficial for the Township to assign a remaining useful life to these various assets, based on observed condition and performance. This would enable the Township to more accurately plan for required interventions, such as replacements, based on observed asset characteristics.
- Growth-Related Capital: This plan does not currently include the costs associated with expansionary capital. Future updates to this plan should incorporate the expected costs of the acquisition, rehabilitation, and replacement of these assets to more fully explore the sustainability of the Township's network of assets. The Township is currently undertaking a development charges background study. The capital needs that will be identified in that study should be incorporated into this plan.

Appendix A
Financing Strategy Tables

Table A-1 Capital Budget Forecast (Inflated $)

Description	Budget	Forecast																		
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Capital Expenditures																				
Roads (Reconstruction)	1,218,000	-	383,544	1,034,536	2,254,867	1,340,739	1,137,843	2,142,115	2,680,548	2,967,665	117,498	1,477,327	475,091	-	-	-	-	-	-	-
Bridges & Culverts	113,500	350,677	254,045	-	1,995,288	513,570	1,433,510	1,427,318	3,145,439	1,275,503	3,480,080	1,314,228	-	-	-	177,537	-	1,049,270	-	4,006,888
Sidewalks	70,000	-	-	-	-	-	-	-	-	-	11,992	-	-	-	-	-	-	-	-	-
Facilities	125,700	128,785	135,302	140,803	144,586	148,155	156,130	159,618	105,622	230,989	179,509	185,026	192,407	196,881	203,189	210,001	62,649	58,657	424,244	-
Equipment	501,000	514,395	538,826	74,284	81,474	153,212	204,056	377,867	-	-	461,266	700,785	630,116	243,977	129,496	65,339	268,768	333,810	226,614	23,070
Fleet	389,000	391,230	408,137	335,942	-	633,037	722,802	736,650	657,088	665,094	600,915	899,341	521,319	525,489	602,154	881,233	384,945	1,134,235	1,114,494	1,632,204
Guiderails	100,000	24,615	9,674	-	19,706	20,775	35,331	22,424	23,940	17,789	32,193	47,925	168,882	103,956	24,716	31,666	12,790	104,757	25,678	43,608
Street Lights	-	-	-	-	-	-	-	-	-	-	-	-	-	21,963	157,748	16,239	-	-	-	-
Pier	139,300	199,238	188,536																	
Capital-Related Operating																				
Roads (Rehab. & Major Maint.)	685,000	1,812,762	1,568,484	1,038,814	36,426	1,069,885	1,501,900	674,742	368,855	291,996	50,597	18,174	119,180	1,501,175	2,765,074	5,267,906	5,423,853	2,670,060	1,384,652	1,859,187
Total Expenditures	**3,341,500**	**3,421,702**	**3,486,548**	**2,624,379**	**4,532,347**	**3,879,372**	**5,191,572**	**5,540,733**	**6,981,492**	**5,449,036**	**4,934,050**	**4,642,807**	**2,106,994**	**2,593,440**	**3,882,377**	**6,649,920**	**6,153,005**	**5,350,788**	**3,175,680**	**7,564,957**
Capital Financing																				
Gas Tax (Gas Tax Reserve Fund)	437,517	281,884	294,697	294,697	294,697	294,697	294,697	294,697	294,697	294,697	294,697	294,697	186,697	403,777	294,697	294,697	294,697	294,697	294,697	294,697
OCIF (OCIF Reserve)	88,926	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268
Provincial/Federal Grants	118,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Debenture Requirements	-	-	-	-	-	-	-	600,000	2,500,000	-	-	-	-	-	-	-	-	-	-	-
Transfer from Operating	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Transfer from Capital-Related Reserves	2,697,057	2,901,550	2,953,583	2,091,414	3,999,382	3,346,407	4,658,607	4,407,768	3,948,527	4,916,071	4,401,084	4,109,842	1,682,029	1,951,395	3,349,412	6,116,955	5,620,040	4,817,823	2,642,715	7,031,992
Total Capital Financing	**3,341,500**	**3,421,702**	**3,486,548**	**2,624,379**	**4,532,347**	**3,879,372**	**5,191,572**	**5,540,733**	**6,981,492**	**5,449,036**	**4,934,050**	**4,642,807**	**2,106,994**	**2,593,440**	**3,882,377**	**6,649,920**	**6,153,005**	**5,350,788**	**3,175,680**	**7,564,957**
Total Capital Expenses less Financing	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Table A-2 Debt Requirements

Year	Principal	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2024	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2026	600,000	-	-	-	-	-	-	-	44,149	44,149	44,149	44,149	44,149	44,149	44,149	44,149	44,149	44,149	44,149	44,149
2027	2,500,000	-	-	-	-	-	-	-	-	183,954	183,954	183,954	183,954	183,954	183,954	183,954	183,954	183,954	183,954	183,954
2028	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2029	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2031	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2032	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2033	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2034	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2035	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2036	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2037	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2038	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Annual Payment		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**44,149**	**228,103**	**228,103**	**228,103**	**228,103**	**228,103**	**228,103**	**228,103**	**228,103**	**228,103**	**228,103**	**228,103**

Table A-3 Reserves and Reserve Fund Continuity Schedules

Gas Tax Reserve Fund	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Opening Balance	155,632	-	-	-	-	-	-	-	-	-	-	-	-	109,080	-	-	-	-	-	-
Transfer from Operating	281,884	281,884	294,697	294,697	294,697	294,697	294,697	294,697	294,697	294,697	294,697	294,697	294,697	294,697	294,697	294,697	294,697	294,697	294,697	294,697
Transfer to Capital	437,517	281,884	294,697	294,697	294,697	294,697	294,697	294,697	294,697	294,697	294,697	294,697	186,697	403,777	294,697	294,697	294,697	294,697	294,697	294,697
Interest	-	-	-	-	-	-	-	-	-	-	-	-	1,080	-	-	-	-	-	-	-
Closing Balance	-	-	-	-	-	-	-	-	-	-	-	-	109,080	-	-	-	-	-	-	-

OCIF Reserve	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Opening Balance	(145,113)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Transfer from Operating	234,039	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268
Transfer to Capital	88,926	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268	238,268
Closing Balance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Capital-Related Reserves	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Opening Balance	3,043,752	2,496,765	1,941,355	1,579,322	2,319,297	1,399,539	1,354,222	362,641	2,992	410,767	8,103	445,457	1,475,626	5,319,475	9,265,503	12,214,549	12,773,940	14,301,733	17,090,183	22,546,677
Transfer from Operating	1,465,070	1,558,390	1,685,637	1,789,590	1,881,555	1,923,310	2,082,579	2,408,217	2,659,003	2,756,702	3,020,250	3,258,185	3,578,189	3,881,564	4,212,044	4,516,908	4,912,814	5,293,029	5,705,001	6,091,775
Transfer from Operating (Roads Rehab. & Major Maint.)	685,000	787,750	905,913	1,041,799	1,198,069	1,377,780	1,584,447	1,639,902	1,697,299	1,756,704	1,818,189	1,881,826	1,947,689	2,015,859	2,086,414	2,159,438	2,235,018	2,313,244	2,394,208	2,478,005
Transfer to Capital	2,697,057	2,901,550	2,953,583	2,091,414	3,999,382	3,346,407	4,658,607	4,407,768	3,948,527	4,916,071	4,401,084	4,109,842	1,682,029	1,951,395	3,349,412	6,116,955	5,620,040	4,817,823	2,642,715	7,031,992
Closing Balance	2,496,765	1,941,355	1,579,322	2,319,297	1,399,539	1,354,222	362,641	2,992	410,767	8,103	445,457	1,475,626	5,319,475	9,265,503	12,214,549	12,773,940	14,301,733	17,090,183	22,546,677	24,084,464
Reserve Balance as % of Total Asset Value	**1.4%**	**1.1%**	**0.8%**	**1.2%**	**0.7%**	**0.7%**	**0.2%**	**0.0%**	**0.2%**	**0.0%**	**0.2%**	**0.6%**	**2.0%**	**3.4%**	**4.3%**	**4.4%**	**4.7%**	**5.5%**	**7.0%**	**7.2%**

Table A-4 Operating Budget Forecast (Inflated $)

Description	Budget	Forecast																		
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Net Impact on Taxation																				
Net Operating Expenditures	4,754,498	4,926,089	5,065,485	5,230,093	5,415,175	5,647,099	5,751,318	5,972,607	6,139,468	6,344,109	6,547,204	6,798,586	6,991,667	7,226,286	7,459,910	7,746,514	7,970,758	8,240,752	8,510,495	8,838,455
Transfers to Capital-Related Reserves	1,465,070	1,558,390	1,685,637	1,789,590	1,873,671	1,909,188	2,068,283	2,285,512	2,536,298	2,633,996	2,897,544	3,135,479	3,455,483	3,758,858	4,089,338	4,394,203	4,790,108	5,170,324	5,582,295	5,969,069
Transfers to Capital-Related Reserves - Debt Re-Investment	-	-	-	-	7,884	14,122	14,297	122,706	122,706	122,706	122,706	122,706	122,706	122,706	122,706	122,706	122,706	122,706	122,706	122,706
Transfers to Capital-Related Reserves - Roads Rehab. & Major Maint.	685,000	787,750	905,913	1,041,799	1,198,069	1,377,780	1,584,447	1,639,902	1,697,299	1,756,704	1,818,189	1,881,826	1,947,689	2,015,859	2,086,414	2,159,438	2,235,018	2,313,244	2,394,208	2,478,005
Existing Debt Payments	272,397	271,138	271,441	271,762	263,878	257,639	257,465	149,056	149,056	149,056	149,056	149,056	149,056	149,056	149,056	149,056	149,056	149,056	149,056	149,056
New Debt Payments	-	-	-	-	-	-	-	-	44,149	228,103	228,103	228,103	228,103	228,103	228,103	228,103	228,103	228,103	228,103	228,103
Total Net Impact on Taxation	**7,176,966**	**7,543,367**	**7,928,475**	**8,333,243**	**8,758,676**	**9,205,828**	**9,675,809**	**10,169,783**	**10,688,976**	**11,234,674**	**11,762,802**	**12,315,756**	**12,894,704**	**13,500,868**	**14,135,527**	**14,800,020**	**15,495,750**	**16,224,185**	**16,986,863**	**17,785,394**
Taxation Levy Analysis																				
Prior Year Taxation Levy		7,176,966	7,543,367	7,928,475	8,333,243	8,758,676	9,205,828	9,675,809	10,169,783	10,688,976	11,234,674	11,762,802	12,315,756	12,894,704	13,500,868	14,135,527	14,800,020	15,495,750	16,224,185	16,986,863
Add: Provision for Assessment Increases (CVA phase-in and Growth)		78,518	82,527	86,740	91,168	95,822	100,714	105,856	111,260	116,940	122,911	128,688	134,738	141,072	147,703	154,647	161,916	169,528	177,497	185,841
Current Year Taxation Levy at 0.0% Increase		**7,255,484**	**7,625,894**	**8,015,215**	**8,424,412**	**8,854,499**	**9,306,543**	**9,781,665**	**10,281,043**	**10,805,916**	**11,357,585**	**11,891,490**	**12,450,494**	**13,035,776**	**13,648,571**	**14,290,173**	**14,961,936**	**15,665,278**	**16,401,682**	**17,172,704**
Additional Increase in Taxation Levy for the Year		**287,884**	**302,581**	**318,029**	**334,265**	**351,330**	**369,266**	**388,118**	**407,932**	**428,758**	**405,217**	**424,266**	**444,210**	**465,092**	**486,955**	**509,846**	**533,814**	**558,907**	**585,181**	**612,690**
Total Taxation Levy		**7,543,367**	**7,928,475**	**8,333,243**	**8,758,676**	**9,205,828**	**9,675,809**	**10,169,783**	**10,688,976**	**11,234,674**	**11,762,802**	**12,315,756**	**12,894,704**	**13,500,868**	**14,135,527**	**14,800,020**	**15,495,750**	**16,224,185**	**16,986,863**	**17,785,394**
Percentage Increase (Factoring in Assessment Growth)		**3.97%**	**3.97%**	**3.97%**	**3.97%**	**3.97%**	**3.97%**	**3.97%**	**3.97%**	**3.97%**	**3.57%**	**3.57%**	**3.57%**	**3.57%**	**3.57%**	**3.57%**	**3.57%**	**3.57%**	**3.57%**	**3.57%**