Asset Management Plan 2016

Township of King

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1. Executive Summary

1.1 Introduction

The Township of King (the Township) is one of nine municipalities that make up the Regional Municipality of York, and is renowned for its scenic beauty, agricultural productivity, and cultural heritage.

As described in the King Township Sustainability Plan, 2012, the Township's vision is:

> ***King Township is an idyllic countryside community of communities, proud of its rural, cultural and agricultural heritage.***
>
> ***We are respected for treasuring nature, encouraging a responsible local economy, and celebrating our vibrant quality of life.***

This Asset Management Plan (AM Plan or Plan) is a medium to long range planning document that supports the Township's vision and immediate priorities by continuing to ***build an inventory of Township assets*** and ***ensuring financial sustainability***, while also balancing other social and environmental goals.

The AM Plan provides a guide to understanding key items such as:

- The size, replacement value and condition of the Township's asset portfolio
- Expected levels of service and the Township's performance relative to them
- Lifecycle management to prolong asset life and minimize whole of life asset costs
- Funding forecasts to sustain the Township's asset portfolio and support decisions
- Key asset management practice improvement actions.

1.2 State of the Local Infrastructure

An important first step to achieving financial, social and environmental sustainability is to understand the status of the physical infrastructure necessary to support the delivery of Township services. The state of infrastructure can be described by answering the following questions:

What do we own?

The Township's physical infrastructure is comprised of the following service areas and asset portfolios which support the delivery of Township services.

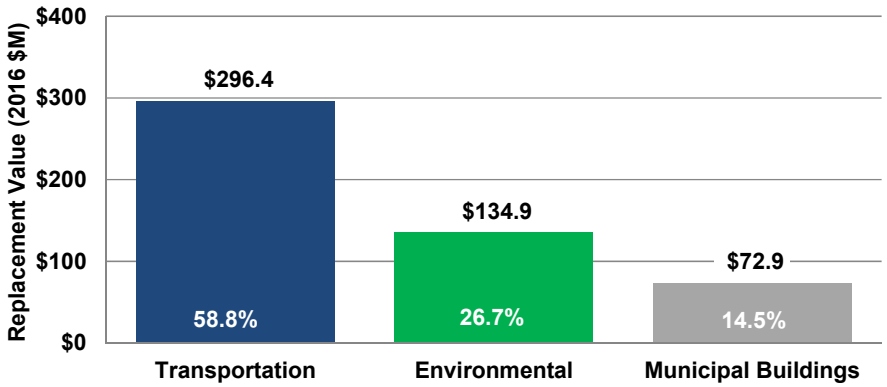
- Transportation
  - Roads: paved and unpaved (gravel)
  - Roads: bridges and major culverts
  - Roadways: sidewalks and roadside amenities*
  - Street lighting*
  - Parking*

- Environmental
  - Potable Water: distribution and transmission pipes
  - Wastewater: collection pipes and conveyance (pumping stations)*
  - Stormwater*: urban and rural sewer (drainage) systems
- Municipal Buildings
  - Recreation and Cultural: recreation, museum, parks*
  - Library
  - Protection: fire facilities
  - Corporate: administrative buildings and works yards
- Municipal Fleet*
  - to support all service areas.

For Township assets marked with an asterisk (*) in the above list, the Township is currently developing an accurate inventory of assets and these asset categories are therefore not included in this AM Plan. In addition to the major asset portfolios listed, the Township also has land holdings, horticultural assets, equipment and furnishings, and information systems and data. Land and horticultural assets do not depreciate like the other assets, and the value of equipment, furnishings, information systems and data are relatively minor. Therefore, these assets are also not included in this AM Plan.

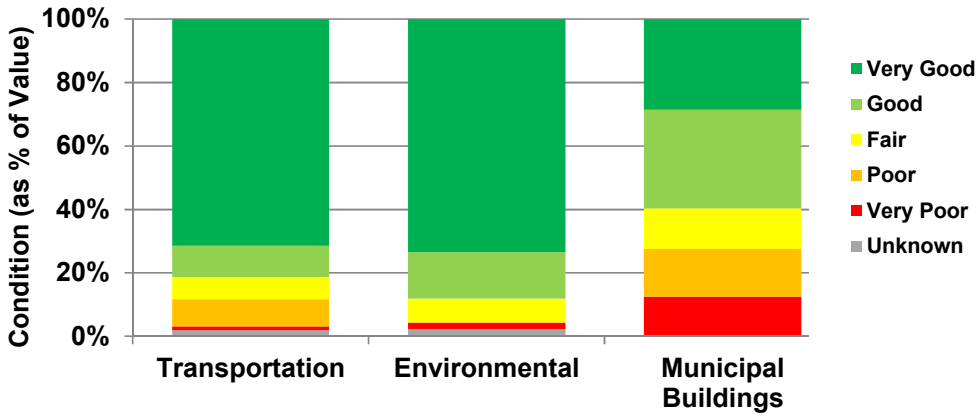
What are the Assets worth?

The total estimated replacement value of the Township's asset portfolio included in this AM Plan is approximately **$504.2 million** in current (2016) dollars, with a breakdown by service area summarized in the following graph and further broken down in the table that follows. Transportation assets comprise approximately 59% of the Township's assets.



What condition are the Assets in?

The Township's assets are generally in good to very good condition. The chart below illustrates the condition based distribution of assets, by asset value, for the service areas.



To adequately meet service levels and manage risk while minimizing whole-of-life costs, most assets should generally be preserved in **FAIR** or better condition. It is clear from the above figure that most of the Township's assets are in fair or better condition. Assets in poor or very poor condition require increased attention and renewal to avoid increasing maintenance costs and risk of failure. Those assets that are currently in poor or very poor condition are generally those that are included in 10-year capital renewal plans.

What is the remaining life?

Roads, watermains, and sewer mains are in relatively good condition overall. The Township reconstructed a significant portion of roads and underground infrastructure in the past ten years.

However 18% of the Township's bridges and major culverts, by replacement value, are in poor or very poor condition. This percentage is comprised of 23 steel culverts and three bridges, namely Old Regional Road 16 (Bridge #23), Graham Sideroad (Bridge #13), and Main Street (0.86 km West of Regional Road 27 (Bridge #22)).

The Township has not invested significantly in its Municipal Buildings in the last five years, and therefore, a higher proportion of these assets are in poor or very poor condition (28%). Approximately half of these poor and very poor assets are roof and mechanical assets, including the King City and Nobleton Arenas which have a full replacement value estimated at $4.95 million. A detailed updated building condition assessment is required to determine the most cost effective rehabilitation and renewal requirements.

1.3 Levels of Service

Another important step to achieving environmental, economic, socio-cultural and financial sustainability is to determine and clearly articulate how the Township's assets must perform to meet corporate strategic goals and broader community objectives.

Levels of Service (LOS) are statements that describe the objectives and associated outputs the Township intends to deliver to a range of citizens and businesses. Developing, monitoring and reporting on LOS are all an integral part of an overall performance management program which is aimed at improving service delivery and demonstrating accountability, including provision of value for money.

LOS are guided by a combination of customer expectations, regulatory and legislated requirements, and internal guidelines, policies and procedures. In many cases, LOS are also implied based on past service delivery and are influenced by availability, suitability and reliability of resources including current asset portfolios. Effective asset management requires that LOS be formalized and supported through a framework of performance measures and timeframes to achieve targets, and that the costs to deliver the documented LOS be understood. LOS are typically organized in a hierarchy under the following categories:

- ***Community, Customer, Regulatory (External Outcomes):*** These objectives are imposed on the Township by customers and other stakeholders, including other levels of government. The Township's customers generally desire available, cost effective, reliable, responsive, safe, suitable, and sustainable services. These service attributes are delivered through Township programs which are supported by assets such as roads, water and wastewater networks, and facilities.
- ***Strategic (Internal Outputs):*** These objectives are developed by the Township internally, and are articulated in corporate strategic planning documents such as King Township's Integrated Community Sustainability Plan, 2012, the Transportation Master Plan, 2015, and the Official Plan, which is currently under review.
- ***Program and Asset (Internal Inputs):*** The Township translates customer expectations, legislative requirements, and corporate goals into program objectives and then to asset objectives, performance measures, and targets.

In the context of LOS, the Township's assets must deliver services that meet customer and legislated LOS. Several key asset sustainability LOS are described below and shown in the table that follows.

As discussed under the What condition are the Assets in? section above, to adequately meet service levels and manage risk while minimizing whole-of-life costs, most assets should generally be preserved in FAIR or better condition – with "most" typically interpreted as more than 90%. The second column in the following table shows that bridges / major culverts and municipal buildings do not meet this requirement.

The Renewal Reinvestment Rate is a standard metric for evaluating the rate at which assets are rehabilitated and/or replaced, with shortfalls potentially shortening asset useful life and likely increasing long-term costs. According to the 2016 Canadian Infrastructure Report Card (CIRC), which provides an assessment of the health of municipal infrastructure as reported by cities and communities across Canada, the reinvestment rates should be as indicated in the last column (Targets) in the following table.

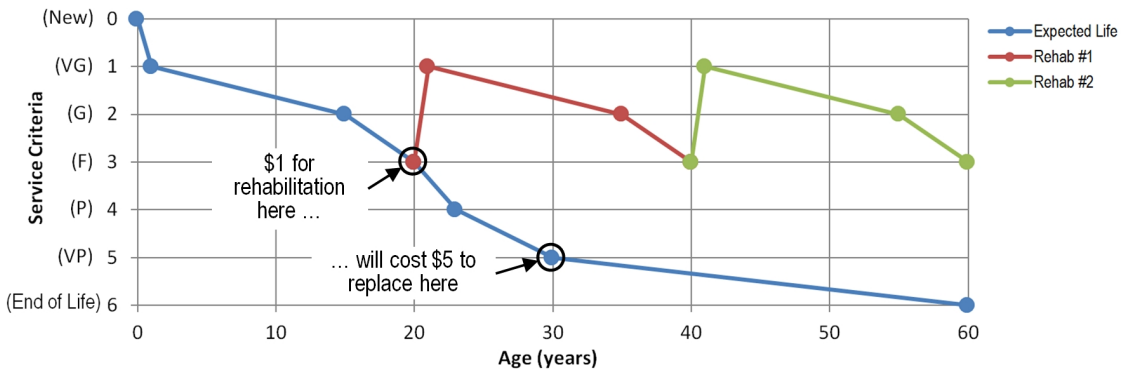
Asset Portfolio	% Fair or Better Condition State	Reinvestment Amount	% Reinvestment Rate	2016 CIRC
		(2011-15)	(2011-15)	Targets
Transportation				
Roads - Paved	90.0%	$2,768,623	1.4%	2.0 to 3.0%
Bridges & Major Culverts	82.1%	$840,757	1.6%	1.0 to 1.5%
Environmental				
Water Distribution	93.5%	$610,616	0.9%	1.0 to 1.5%
Wastewater Collection	97.8%	$103,048	0.2%	1.0 to 1.3%
Municipal Buildings				
All Facilities	72.4%	$273,131	0.4%	1.7 to 2.5%

Although the Township has made substantial investment in bridges and major culverts over the past five years (a 1.6% reinvestment rate from 2011 to 2015), there is still a backlog of these assets in less than Fair condition. The Township's reinvestment rate for municipal buildings over the same five year period of 0.4% compared to the 2016 CIRC Target is insufficient.

1.4 Asset Management Strategy

The Township's ability to achieve environmental, economic, socio-cultural and financial sustainability is impacted by a number of factors, with the key factors at this time being future population and associated asset portfolio growth, and aging infrastructure. The Township's plans to accommodate growth are described in the various master plans which propose new or expanded infrastructure and facilities, while the plans to address aging infrastructure and facilities are described in this AM Plan.

All assets physically deteriorate to eventual failure and loss of ability to deliver the required LOS. Asset condition is a measured assessment of an asset's current position or place on the asset "decay" or deterioration curve – the lifecycle pattern for assets that describes the relationship between the condition and age. Many assets deteriorate slowly at first to a fair condition and, after that, there is more rapid degradation. This typical lifecycle pattern for assets such as pavement and building components is illustrated as "Expected Life" in blue in the figure below.



A key concept is that it is far more cost effective to maintain and rehabilitate assets before they reach a condition where the only option is costly reconstruction. In the figure above, the blue line tracks the deterioration of an asset's condition over time (i.e., the decay curve). A rehabilitation at year 20 (shown in red) improves the condition from 3 (Fair) to 1 (Very Good) and extends the life by 20 years. This is a more cost effective strategy than allowing the asset to deteriorate to condition 5 (Very Poor) at year 30, at which time the LOS is low and the cost to bring the asset back to an acceptable LOS is much more.

For assets where preventive maintenance and rehabilitation activities are technically feasible, understanding the asset's current condition and place on the asset decay curve enables forecasts of future condition and determination of optimal treatment type and timing – key aspects of lowest lifecycle cost renewal decision-making. For each Township asset portfolio included in this AM Plan, asset decay curves and the following asset renewal strategy information are documented:

- What treatments are available (e.g., replace, resurface, rehabilitate, reline)?
- For each available treatment type:
  - What is the cost of the treatment?
  - Under what situations will a treatment be or not be applied?
  - What triggers a treatment to be applied?
  - What is the benefit of the treatment?
  - How many times can a treatment be applied?

The asset renewal treatments considered are as follows.

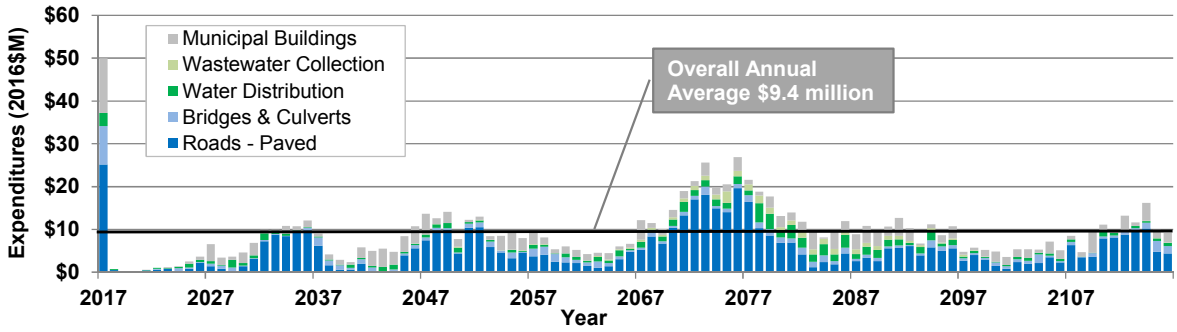
Asset Portfolio	Service Criteria	Available Treatments
Roads - Paved	Structural Adequacy	Replace
		Mill / Resurface
		Pulverize / Resurface
		Bituminous Surface Treatment
		Slurry Seal
Bridges & Major Culverts	Bridge Condition Index	Replace
		Rehab Minor, Major
Water Distribution	Age-Based % Consumed	Replace
		Rehab / Reline
Wastewater Collection	Age-Based % Consumed	Replace
		Rehab / Reline
Facilities	Facility Condition Index	Replace
		Rehab Structure, Roof, etc.

Based on these asset renewal strategy inputs, a predictive modelling and long term financial planning tool (called Predictor) is used to (i) forecast the future condition of the Township's assets (based on the decay curves), (ii) determine the type and timing of treatments to derive the most benefit for the least cost, and then (iii) update the asset condition based on the treatment applied.

The resulting output, for every asset, is the forecast future best value (benefit to cost) asset renewal strategy: the set of renewal treatments that need to be undertaken to sustain the specified service criteria (i.e., condition) over time. The forecasted investments are the associated costs for implementing these future renewal strategies.

1.5 Financing Strategy

The forecast investments to implement the future best value renewal strategies for the assets included in this AM Plan are shown on a 100 year timeline in the following figure. The average annual investment needed to sustain the Township's asset portfolio included in this AM Plan is **$9.4 million**. This annual amount includes a significant backlog of work that is "overdue" in the amount of **$50 million** (shown in the year 2017).



For reference, the Township:

- has historically spent $3.8M on renewing the assets included in this AM Plan (average annual amounts calculated from the 2011 to 2015 capital renewal expenditures)
- currently plans to increase capital renewal spending to $5.6M (average annual amounts calculated from the current budget and business plan).

Details on the past renewal expenditures, currently planned renewal budget, forecast renewal investment needs, and renewal funding shortfalls are provided in the following table. Overall, the Township has a renewal funding **shortfall of $3.8 million per year**, mainly due from insufficient renewal budgets for paved roads and municipal buildings. If the Township continues to underfund the renewal of the asset portfolios, the current backlog of $50 million will continue to increase.

Asset Portfolio	Past Annual Expenditures (millions)	Current Annual Budget (millions)	Forecast Average Annual Need (millions)	Funding Shortfall (millions)
TOTAL	***$3.80***	**$5.60**	**$9.40**	**-$3.80**
Transportation	***$2.81***	**$3.80**	**$6.20**	**-$2.40**
Roads - Paved	*$1.97*	$3.10	**$5.28**	**-$2.18**
Bridges & Major Culverts	*$0.84*	$0.73	**$0.87**	**-$0.14**
Environmental	***$0.71***	**$0.53**	**$1.20**	**-$0.67**
Water Distribution	*$0.61*	$0.53	**$0.92**	**-$0.39**
Wastewater Collection	*$0.10*	$0	**$0.33**	**-$0.33**
Municipal Buildings	***$0.27***	**$1.30**	**$2.00**	**-$0.70**

The AM Plan clearly identifies that current planned capital renewal budgets are not adequate to meet capital renewal funding needs. Note that, on average, historic capital renewal expenditures have also not been adequate and have resulted in a significant backlog of investment needs. Details on the impact of continued underinvestment in asset renewal on the condition of the asset portfolio are provided in section 6 of this AM Plan.

2. Introduction

2.1 Overview

As described in the King Township Sustainability Plan, 2012, the Township's vision is:

> ***King Township is an idyllic countryside community of communities, proud of its rural, cultural and agricultural heritage.***
>
> ***We are respected for treasuring nature, encouraging a responsible local economy, and celebrating our vibrant quality of life.***

This Asset Management Plan (AM Plan or Plan) is a medium to long range planning document that supports the Township's vision and immediate priorities by continuing to ***build an inventory of Township assets*** and ***ensuring financial sustainability through fiscally responsible budgeting, strengthening of reserves, optimizing revenues from Township assets, and practicing cost effective management***, while also balancing other economic, social and environmental goals.

The AM Plan provides a guide to understanding key items such as:

- The size, replacement value, and condition of the Township's asset portfolio
- Expected levels of service and the Township's performance relative to them
- Lifecycle management to prolong asset life and minimize whole of life asset costs
- Funding forecasts to sustain the Township's asset portfolio and support decisions
- Key asset management practice improvement actions.

AM planning is a key tactical (medium term) planning activity that relies on input from strategic (long term) planning activities and informs operational (short term) decision-making. The AM Plan relies on input from the Township's vision and official plan, and provides a framework to assist the Township in developing appropriate budget forecasts and annual capital and operating programs.

Key stakeholders of this AM Plan include:

- External Stakeholders
  - The Township of King community
  - Regulatory agencies (Federal and Province of Ontario)
  - The Region of York
- Internal Stakeholders
  - Township Council
  - Chief Administrative Officer and departmental senior management
  - Departmental staff.

2.2 AM Plan Methodology

The body of the AM Plan is presented in a consistent manner based on the Guide for Municipal Asset Management Plans, 2012, originally issued by the Ontario Ministry of Infrastructure. For ease of benchmarking with other municipalities in Canada, the asset hierarchy breakdown is generally consistent with the Ministry of Municipal Affairs Financial Information Return (FIR) database and the 2016 Canadian Infrastructure Report (CIRC).

The AM Plan was developed by GHD Limited in collaboration with Township staff through:

- Review of background materials available on the Township's web site and provided by the Township's project team
- Workshops with internal stakeholders held from May to October 2016 including kick-off, state of local infrastructure, levels of service, AM strategies, and financing strategies
- Numerous data and information transfers
- Review of interim outputs by the Township's project team and other stakeholders, and incorporation of comments into the AM Plan.

The remainder of this introductory section of the AM Plan outlines the methodology undertaken to develop the various sections of the Plan and the reliability of the outputs.

2.2.1 State of Local Infrastructure

What do we own?

The inventory of roads and structures (bridges & culverts) is based on the inventories developed in the 2015 Roads Needs Study and 2015 Structures Needs Study, respectively. GIS data is used for water and wastewater mains. The facilities inventory is developed based on building condition assessments completed in 2013 and 2014.

These databases are deemed the most accurate inventory listings, and are used in lieu of the fixed asset registry developed for Public Sector Accounting Board (PSAB) reporting.

What are the Assets worth?

Financial accounting valuation uses historical costs and depreciation assumptions to determine the book value of capital assets in accordance with the PSAB. Policies and procedures relating to the development of net book values for accounting purposes have been developed by the Finance Department to comply with PSAB 3150 Tangible Capital Assets reporting.

This AM Plan uses replacement cost valuation presented in current (2016) dollars. This valuation does not account for technology improvements. For the most part, replacement values are benchmark values calculated from actual costs from current and previous construction year contracts. Facility replacement costs are based on the Township's "2016 (June) Schedule – King" facility file based on an Insurance Valuation Report completed for insurance renewal purposes. Costs are assigned to each facility according to the following asset breakdown: Structural, Building Envelope, Interior Finishes, Mechanical, Electrical, Roofing, and Site. For facilities without a building condition assessment, the costs are estimated based on typical proportions of the total building value according to facility type.

What condition are the Assets in?

In this AM Plan, the term "condition" refers to the degree of physical deterioration of a group of assets, an asset or an asset element. "Performance" is a more general term that typically describes an asset's ability to achieve levels of service, and can refer to: (i) the state of physical condition, (ii) the capacity relative to demand, and/or (iii) the ability to perform intended functions.

An ongoing condition assessment program evaluates current physical condition, determines rate of deterioration over time, enables forecasts of future condition, and informs the most beneficial type and timing of treatment. Condition assessment methods and rating systems have become relatively standard for many assets but vary depending on the type of asset. The Township conducts inspections more frequently on more critical assets such as bridges and major culverts, while routine condition assessments are undertaken for less critical assets. The Township conducts road patrols according to Ontario Regulation 239/02 Minimum Maintenance Standards for Municipal Highways.

The condition assessments undertaken by the Township that are used to develop this AM Plan are as follows:

- **2015 Road Needs Study for the Township road network (2 year cycle):** The structural adequacy (SA), which represents the capability of the surface and base course to support a load and resist deformation or rupture, is used as the service criteria.
- **2015 Structure Needs Study for the Township bridges and major culverts (2 year cycle):** The Bridge Condition Index (BCI), which is the current dollar value of the bridge divided by the replacement cost of the bridge, is used as the service criteria.
- **Building Condition Assessments Reports (5 year cycle):** A Facility Condition Index (FCI), an industry standard metric that is the ratio of maintenance and renewal deficiency to the current replacement value, is calculated for each major facility element (structural, building envelope, etc.) based on the deferred maintenance identified for the element in the building condition assessments. The total expenditures identified in the Building Condition Assessments as deferred requirements and needed 2016 to 2020 expenditures are totaled for each facility element and then divided by the element replacement value. Assessments were available for 24 facilities. For ten facilities, condition assessments were not available and the asset condition is estimated based on age, with the facility construction year used as the assumed installation date.

For those assets with no condition data (e.g., water distribution and wastewater collection system and 10 facilities), age-based condition is estimated as % Life Remaining = (Expected Useful Life – Age) / Expected Useful Life. Using age data as a surrogate for condition data is widely used in municipal organizations, but it can be misleading as age does not directly reflect condition. And, the addition of a significant number of new assets to an existing asset portfolio, as is the case in a rapidly growing municipality, can mask the poor condition of older assets.

To enable comparison of condition and condition trends over time between different asset types, a generic condition grading scale is often used to translate detailed engineering data about assets into information that the public and council can compare across asset groups. For this purpose, the Township uses an industry standard general condition grading system

based on the International Infrastructure Management Manual (IIMM), summarized in the table below.

Table 2-1 General Condition Grading System (from IIMM)

Grade	Description	Condition Criteria
VG	Very Good	Asset is physically sound and is performing its function as originally intended. Required maintenance costs are well within standards and norms. Typically, asset is new or recently rehabilitated.
G	Good	Asset is physically sound and is performing its function as originally intended. Required maintenance costs are within acceptable standards and norms but are increasing. Typically, asset has been used for some time but is still within early to mid-stage of its expected life.
F	Fair	Asset is showing signs of deterioration and is performing at a lower level than originally intended. Some components of the asset are becoming physically deficient and component replacement may be necessary. Maintenance requirements and costs are continuing to increase. Typically, asset has been used for a long time and is within the mid- to later stage of its expected life.
P	Poor	Asset is showing significant signs of deterioration and is performing to a much lower level than originally intended. A major portion of the asset is physically deficient. Required maintenance costs exceed acceptable standards and norms. Typically, asset is approaching the end of its expected life.
VP	Very Poor	Asset is physically unsound and/or not performing as originally intended. Asset has higher probability of failure or failure is imminent. Maintenance costs are unacceptable and rehabilitation is not cost effective. Replacement / major refurbishment are required.

Details relating to the condition of each asset are currently maintained in various databases and spreadsheets at the Township. The conversion of industry standard condition rating systems to the above IIMM standard is provided in the table below.

Table 2-2 Conversion of Industry Standard Condition to IIMM

IIMM General Condition Grading System	Pavement Structural Adequacy (PSA)	Bridge Condition Index (BCI)	Facility Condition Index (FCI)	% Life Remaining for Age-Based "Condition"
Very Good	15 to 20	80 to 100	Over 20%	85 to 100
Good	12 to 14	70 to 80	10 to 20%	65 to 85
Fair	8 to 11	60 to 70	5 to 10%	40 to 65
Poor	2 to 7	40 to 60	2 to 5%	10 to 40
Very Poor	0 to 1	0 to 40	0 to 2%	0 to 10

2.2.2 Levels of Service

GHD Limited reviewed the Township's Integrated Community Sustainability Plan, 2012, to guide the establishment of the Township's corporate level objectives and connection to detailed levels of service.

The methodologies for calculating KPIs are described below:

- **Asset Condition State:** The methodology for assigning a physical condition state to the Township's facilities is described in the preceding section (2.2.1 State of Local Infrastructure).
- **Renewal Reinvestment Rate**: The annual Capital Renewal Expenditure is calculated from the Township's "2011 to 2015 Capital Actual" file. Only amounts assumed to be for renewal and rehabilitation (not new construction) were summed to determine the total expenditures for 2016.

2.2.3 Asset Management and Financing Strategies

For assets where preventive maintenance and rehabilitation activities are technically feasible, decay curves are produced from industry standard information. For each asset portfolio, the asset management strategy information is also developed and a predictive modelling and long term financial planning tool (called Predictor) is used.

The resulting output, for every asset, is the forecast future best value (benefit to cost) asset renewal strategy: the set of renewal treatments that need to be undertaken to sustain the specified service criteria (i.e., condition) over time. Associated with these future renewal treatments is a forecast of costs to implement them.

These forecast investments to implement the future best value renewal strategies are compared to past capital renewal expenditures and currently planned renewal budgets. As the planned renewal budgets are not sufficient to meet the forecast renewal needs, the resulting decrease in performance (i.e., condition) is determined.

3. State of the Local Infrastructure

This section of the AM Plan is organized around answering the following questions:

- What do we own?
- What is it worth?
- What condition is it in?
- What is the remaining service life?

3.1 What do we own?

The Township's physical infrastructure is comprised of the following service areas and asset portfolios which support the delivery of Township services.

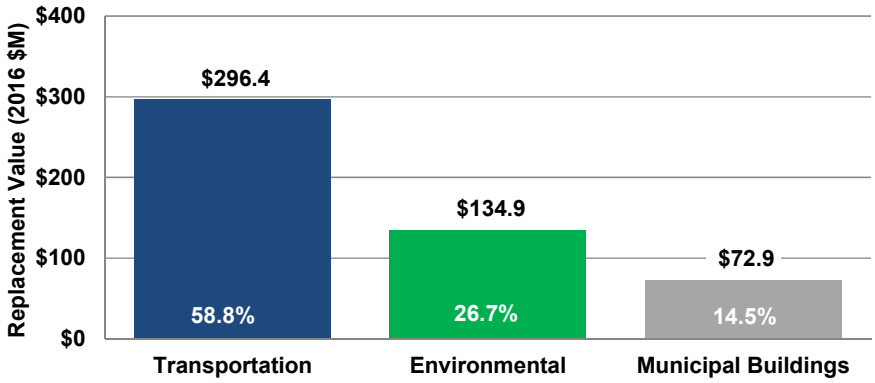
- Transportation
  - Roads: paved and unpaved
  - Roads: bridges and major culverts
  - Roadways: sidewalks and roadside amenities*
  - Roadways: traffic operations*
  - Street lighting*
  - Parking*
- Environmental
  - Potable Water: distribution and transmission pipes
  - Wastewater: collection pipes and conveyance (pumping stations *)
  - Stormwater*: urban and rural sewer (drainage) systems
- Municipal Buildings
  - Recreation and Cultural: recreation, museum, parks*
  - Library
  - Protection: fire facilities
  - Corporate: administrative buildings and works yards
- Municipal Fleet*
  - to support all service areas.

For Township assets marked with an asterisk (*) in the above list, the Township is currently developing an accurate inventory of assets and these assets are therefore not included in this AM Plan. In addition to the major asset portfolios listed, the Township also has land holdings, horticultural assets, equipment and furnishings, and information systems and data. Land and horticultural assets do not depreciate like the other assets, and the value of equipment, furnishings, information systems and data are relatively minor. Therefore, these assets are also not included in this AM Plan.

3.2 What are the Assets worth?

The total estimated replacement value of the Township's asset portfolio is approximately **$504.2 million** in current (2016) dollars, with a breakdown by service area summarized in the following graph and further broken down in the table that follows.

Figure 3-1 Current Replacement Value, by Service Area



Transportation assets comprise approximately 59% of the Township's assets. A breakdown of the replacement value and quantities of the Township's asset portfolio as of January 1, 2016 is summarized in the following table.

Table 3-1 Current Asset Inventory & Replacement Value

Asset Portfolio	Replacement Value ($2016M)	Quantity (Number)	Quantity (Network Measure)
TOTAL	**$504.20**		
Transportation	**$296.40**		
Roads - Paved	$199.39	374 segments	1,527,819 m2
Roads - Unpaved	$38.99	75 segments	708,976 m2
Bridges & Major Culverts	$52.59	78 bridges & culverts	8311 m2 (deck area)
Sidewalks	$5.43	308 segments	42,953 m
Environmental	**$134.86**		
Water Distribution	$67.33	541 segments	96,898 m
Wastewater Collection	$67.53	1406 segments (33 unknown size/value)	95,998 m
Municipal Buildings	**$72.94**		
Corporate Facilities	$8.81	5 facilities/ sheds	-
Fire Facilities	$9.10	3 facilities	-
Recreation Facilities	$46.67	18 facilities	-
Museums Facilities	$2.53	4 facilities	-
Libraries Facilities	$5.82	4 facilities	-

3.3 What condition are the Assets in?

The Township's assets are generally in good to very good condition. The charts below illustrate the condition-based distribution of assets, by asset value, for the service areas.

Figure 3-2 Condition State, by Township Service Area

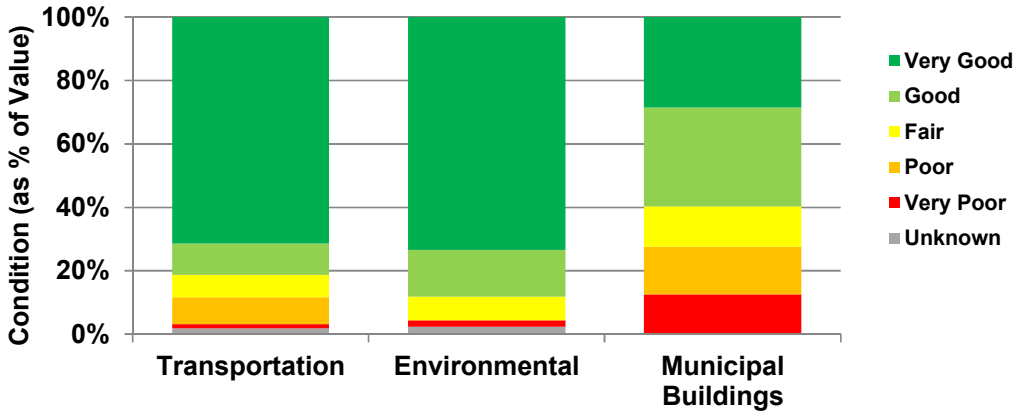


Figure 3-3 Condition State, Transportation Service

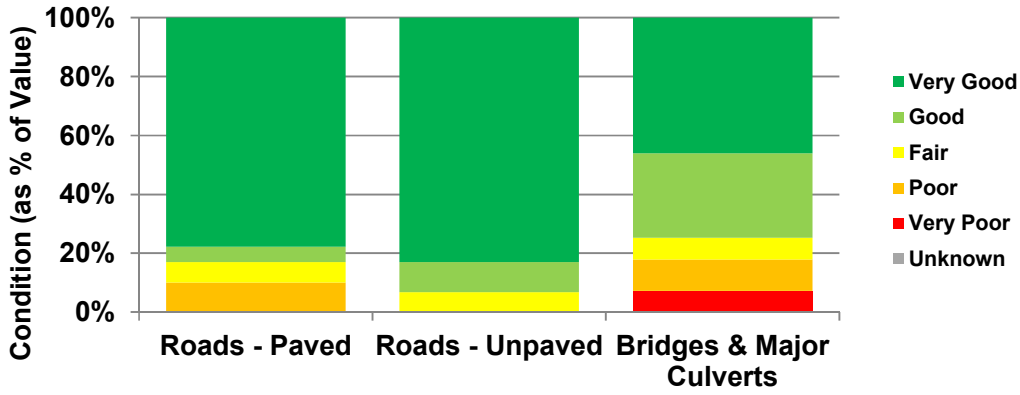


Figure 3-4 Condition State, Environmental Service

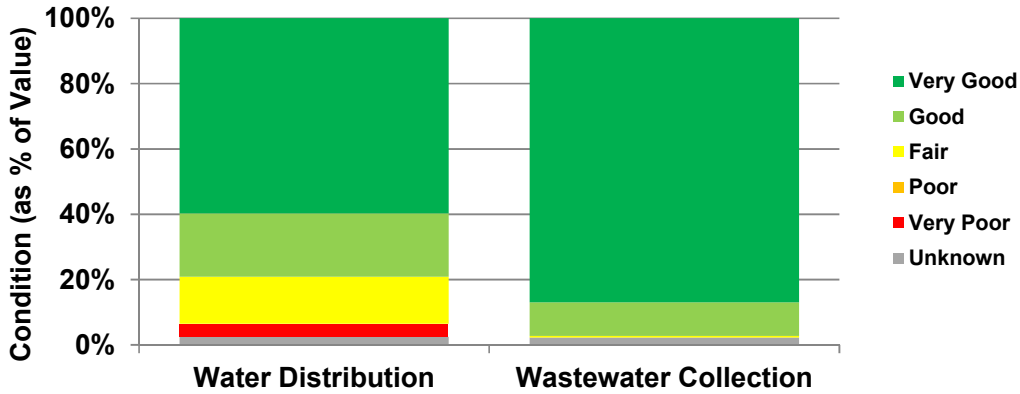
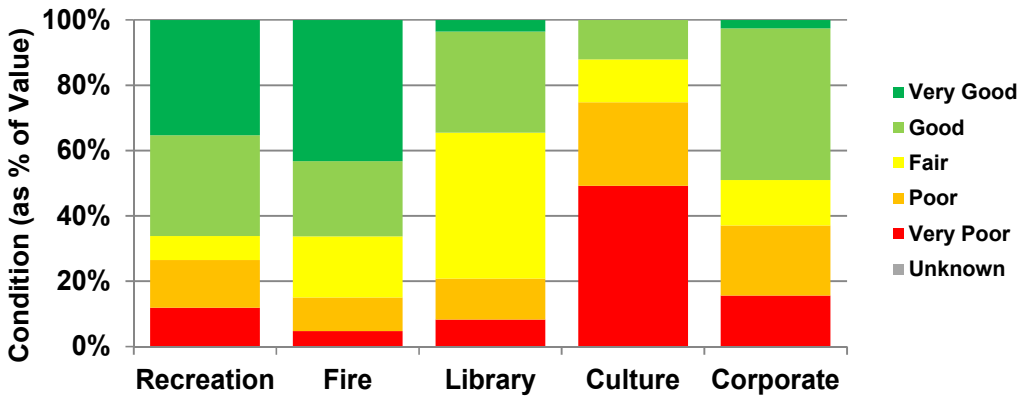


Figure 3-5 Condition State, Municipal Buildings



To adequately meet service levels and manage risk while minimizing whole-of-life costs, most assets should generally be preserved in **FAIR** or better condition. Assets in poor or very poor condition require increased attention and renewal to avoid increasing maintenance costs and risk of failure. Those assets that are currently in poor or very poor condition are generally those that are included in 10-year budget forecasts.

3.4 What is the remaining life?

Roads, watermains, and sewer mains are in relatively good condition overall. The Township reconstructed a significant portion of roads and underground infrastructure in the past ten years. However 18% of the Township's bridges and major culverts, by replacement value, are in poor or very poor condition. This percentage is comprised of 23 steel culverts and three bridges, namely Old Regional Road 16 (Bridge 23), Graham Sideroad (Bridge #13), and Main Street (0.86 km West of Regional Road 27 (Bridge #22)).

The Township has not invested significantly in its Municipal Buildings in the last five years, and therefore, a higher proportion of these assets are in poor or very poor condition (28%). Approximately half of these poor and very poor assets are roof and mechanical assets, including the King City and Nobleton Arenas which have a full replacement value estimated at $4.95 million. A detailed updated building condition assessment is required to determine the most cost effective rehabilitation and renewal requirements.

4. Levels of Service

4.1 Overview

Levels of Service (LOS) are statements that describe the outputs and objectives the Township intends to deliver to a range of citizens, businesses and other stakeholders. Developing, monitoring and reporting on LOS are all an integral part of an overall performance management program which is aimed at improving service delivery and demonstrating accountability to the Township's stakeholders, including provision of value for money.

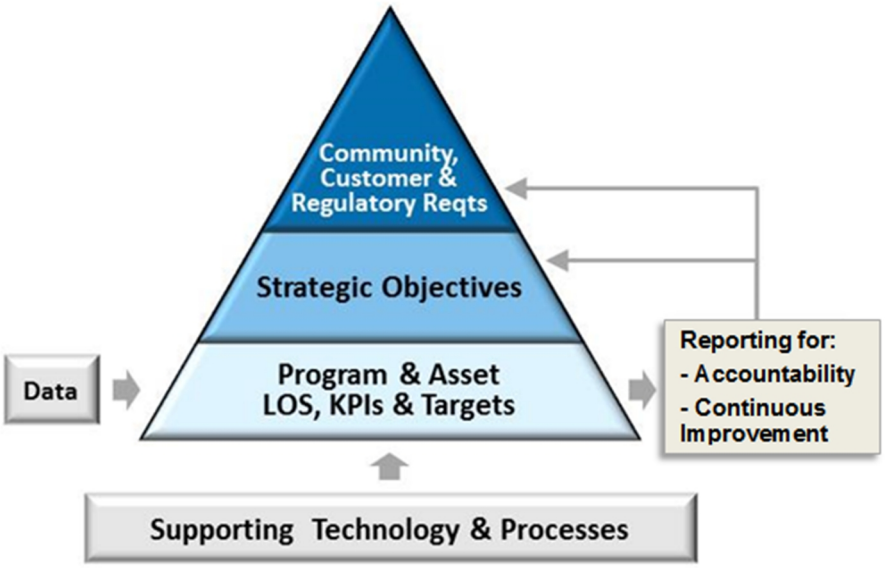
LOS are guided by a combination of customer expectations, regulatory and legislated requirements, and internal guidelines, policies and procedures. In many cases, LOS are also implied based on past service delivery, community expectation, and infrastructure system design. Effective AM requires that LOS be formalized and supported through a framework of performance measures, targets, and timeframes to achieve targets, and that the costs to deliver the documented LOS be understood.

This section describes Township LOS under the following categories:

- ***Community, Customer, Regulatory (External Outcomes):*** These objectives are imposed on the Township by customers and other stakeholders, including other levels of government. The Township's customers generally desire available, cost effective, reliable, responsive, safe, suitable, and sustainable services. These service attributes are delivered through Township programs which are supported by assets such as facilities and other resources. Other levels of government require that the Township meet legislative requirements.
- ***Strategic (Internal Outputs):*** These objectives are developed by the Township internally such as those outlined in corporate strategic planning documents. For example, King Township's Integrated Community Sustainability Plan, 2012, and Official Plan, which is currently under review.
- ***Program and Asset (Internal Inputs):*** The Township translates customer expectations, legislative requirements, and corporate goals into program objectives and then to asset (also known as technical) objectives, performance measures, and targets. These technical LOS define what the Township's assets must do to deliver services that meet customer and legislated LOS.

LOS objectives are often viewed as a hierarchy of objectives with the community, customers and regulators at the top, followed by organisational strategic objectives, programs, and assets. A LOS hierarchy is depicted in the following figure. For the program and asset level objectives, typically one or more key performance indicators (KPIs) track performance against set targets.

Figure 4-1 Levels of Service (LOS) Hierarchy



The LOS framework presented in this section of the AM plan focuses on preserving Township assets in a physical condition state that enables the required function at lowest lifecycle cost and at acceptable level of risk. Therefore, the focus is on the reliability and cost effectiveness service attributes. This AM Plan also focuses on higher cost infrastructure such as roads, bridges, water and wastewater piping, and facilities.

A key role of asset management is to identify costs directly associated with various LOS. More work will be required to understand this relationship fully, including recording and analysing historical costs at the asset level. A general discussion on the relationship between cost of service and level of service is included at the end of this LOS section.

4.2 LOS Framework

4.2.1 Community, Customer and Regulatory LOS

Customer Values

The Township's customers and broader community of stakeholders generally desire available, cost effective, reliable, responsive, safe, suitable and sustainable services. These customer values (also known as service standard attributes) are outlined in Table 4-1 below, and they provide a means with which to categorize objectives.

Table 4-1 Typical Customer Values

Need	Description
Available	• Services of sufficient capacity are convenient and accessible to the entire community
Cost Effective	• Services are provided at the lowest possible cost for both current and future customers, for a required level of service, and are affordable
Reliable	• Services are predictable and continuous
Responsive	• Opportunities for community involvement in decision making are provided; and customers are treated fairly and consistently, within acceptable timeframes, demonstrating respect, empathy and integrity
Safe	• Services are delivered such that they minimize health, safety and security risks
Suitable	• Services are suitable for the intended function (fit for purpose)
Sustainable	• Services preserve and protect the natural and heritage environment

Generally, the services to customers are provided through the Township's program areas, such as recreation, parks, public works, fire, and libraries. Infrastructure and facilities are provided to support the delivery of services to the public through the various program areas.

Regulatory LOS

Legislated requirements define the standards according to which the Township is legally obligated to provide services to the community, and these standards typically relate to asset safety and reliability. Adherence to applicable legislative requirements such as the Electrical Code, Building Code, Accessibility, Fire Protection & Prevention Act, Health Protection and Promotion Act is monitored by regular inspections.

Information on regulatory inspections are contained within various databases and maintained by Township staff at the operational level to ensure legislative compliance. It is typical that details of compliance be held at the operational level, but that reporting that confirms that the Township complies is reported at a higher level.

4.2.2 Strategic LOS

As described in the King Township Sustainability Plan, 2012, the Township's vision is:

King Township is an idyllic countryside community of communities, proud of its rural, cultural and agricultural heritage.

We are respected for treasuring nature, encouraging a responsible local economy, and celebrating our vibrant quality of life.

One of several immediate priorities is as follows:

PRIORITY: Ensure financial sustainability for King Township

Description:
The financial pillar includes a number of specific goals, strategies and actions, all of utmost importance to our long-term future. The immediate priority under the financial pillar includes the following activities that require steps be taken now but recognizes that all are not necessarily achievable immediately and may require longer timelines. The strategies include: achieving a fiscally responsible budget, strengthening our reserves, optimizing revenues from Township assets, practicing cost effective management (using good fiscal management and improved productivity), improving tax assessment equity, and identifying new sources of funding.

THEME: Financial Sustainability

STRATEGY: All

This Asset Management Plan (AM Plan or Plan) is a medium to long range planning document that supports the Township's vision and immediate priorities by:

- Continuing to build an inventory of Township assets, and
- Ensuring financial sustainability through fiscally responsible budgeting, strengthening of reserves, optimizing revenues from Township assets, and practicing cost effective management.

4.2.3 Program and Asset LOS

An asset's performance is important to its role in supporting Township functions and goals. The Township undertakes condition assessments of assets to determine gaps in actual versus desired condition and to guide renewal decisions such as maintenance, rehabilitation and replacement. A key method to assess performance is the KPI approach in which a set of performance metrics are measured against targets, over the portfolio, over time.

Two key metrics are used to measure asset reliability and cost effectiveness – the two service attributes related to preserving Township assets in a physical condition state that enables the required function at the lowest lifecycle cost and at an acceptable level of risk.

Table 4-2 Key Reliability & Cost Effectiveness KPIs

Service Attribute	Performance Objective	Performance Measure	KPI Derivation
Reliable	Assets are maintained in good condition to enable reliable / continuous provision of services	Condition State	Condition State = % of assets in Fair, Good or Very Good Condition, by Current Replacement Value
Cost Effective	Assets are provided at the lowest possible cost for both current & future customers	Renewal Reinvestment Rate	Renewal Reinvestment Rate (%) = Annual Capital Renewal Expenditure* / Current Replacement Value

*Annual Capital Renewal Expenditures are typically not consistent year over year, so an average over several years is sometimes used.

The Canadian Infrastructure Report Card (CIRC) provides an assessment of the health of municipal infrastructure as reported by cities and communities across Canada, including roads, bridges, water and wastewater systems, and buildings. The following table outlines relevant performance indicators listed in the 2016 CIRC. Regarding the Reinvestment Rate, it was noted that many responding municipalities were not able to provide information for both replacement value and annual renewal budget. Those that did provide data for both are included in the results.

Table 4-3 2016 CIRC Performance Indicator Results

Service Area	Asset Portfolio	% Fair or Better Condition	% Renewal Reinvestment Rate	
		CIRC ACTUAL	CIRC ACTUAL	CIRC TARGET
Transportation				
	Roads	84%*	1.1%	2.0 to 3.0%
	Bridges & Major Culverts	96%	0.8%	1.0 to 1.5%
	Sidewalks	89%*	0.9%	1.0 to 1.5%
Environmental				
	Water Distribution	85%*	0.9%	1.0 to 1.5%
	Wastewater Collection	88%*	0.7%	1.0 to 1.3%
Municipal Buildings				
	Corporate**	83%	1.7%	1.7 to 2.5%
	Sport & Recreation***	82%	1.3%	1.7 to 2.5%

* by length (others by replacement cost value)

** includes administrative buildings, service centres, work yards, community centres & cultural facilities, fire stations, libraries, etc.

*** includes community centres, ice arenas, pools, senior centres, sports fields, tennis courts, youth centres, etc.

4.3 Current Performance

A description of the Township's current performance on the reliability and cost effectiveness metrics at the Asset Level is provided in this section. These metrics and associated performance indicators support the Corporate financial sustainability objective. Note that methodologies for calculating the LOS are provided in Section 2 Introduction.

Table 4-4 Asset Performance

Asset Portfolio	% Fair or Better Condition State	Reinvestment Amount (2011-15)	% Reinvestment Rate (2011-15)
Transportation			
Roads - Paved	90.0%	$2,768,623*	1.4%
Bridges & Major Culverts	82.1%	$840,757	1.6%
Environmental			
Water Distribution	93.5%	$610,616	0.9%
Wastewater Collection	97.8%	$103,048	0.2%
Municipal Buildings			
All Facilities	72.4%	$273,131	0.4%

* Includes pavement resurfacing included in the operations budget.

To adequately meet service levels and manage risk while minimizing whole-of-life costs, most assets should generally be preserved in FAIR or better condition. The second column above demonstrates that 17.9% of bridges and major culverts and 27.4% of municipal buildings do not meet this requirement. When compared to other municipalities, the Township is providing a relatively "better" LOS for paved roads, water distribution and wastewater collection, while providing a relatively "worse" LOS for bridges and major culverts and municipal buildings.

The Renewal Reinvestment Rate is a standard metric for evaluating the rate at which assets are rehabilitated and/or replaced, with shortfalls potentially shortening asset useful life and likely increasing long-term costs. According to the 2016 Canadian Infrastructure Report Card (CIRC), which provides an assessment of the health of municipal infrastructure as reported by cities and communities across Canada, the reinvestment rates should be as indicated in the last column in the preceding table. Although the Township has made substantial investment in bridges and major culverts over the past four years (1.6% reinvestment rate), there is still a backlog of these assets in less than Fair condition. The Township's reinvestment rate over the past five years (2011 to 2015) of 0.4% for facilities compared to the 2016 CIRC Target is insufficient.

4.4 External Trends Affecting Levels of Service and Performance

Legislation and Government initiatives will continue to affect the demand for appropriate transportation services, such as the continued emphases on reducing urban sprawl and consideration of multimodal networks. The technology used to construct, maintain and renew assets will likely continue to advance in the future, such as the increased use of permeable pavements and increased construction of High Occupancy Vehicle (HOV) lanes. Climate change is expected to result in more frequent extreme weather events. These weather events will likely increase the rate of asset deterioration, elevating the need for more frequent treatments to maintain the same level of service.

The impact of changes in climate, legislation, and technology were not included in this Plan because the effect of these changes on levels and costs of service cannot be accurately

predicted. Future updates to the AM Plan should consider the effects of these potential trends, as applicable.

4.5 Level of Service and Cost of Service Relationship

To achieve the objectives of the Township's vision, the Township provides services at specific levels of availability, reliability, responsiveness, safety, suitability, and sustainability. The Township strives to provide these specific levels of services cost effectively – at the lowest possible cost for both current and future customers. Willingness to pay and availability of finances will ultimately control the ability of the Township to achieve its target levels of service.

To establish the LOS and Cost of Service (COS) relationship, the Township must understand the current LOS being provided, and determine the full cost to deliver this LOS. Determining the cost to deliver the current LOS will include tracking the following:

- Direct tangible costs (i.e., those costs to the Township that can be directly traced to the specific service) such as program costs and asset lifecycle costs
- Indirect tangible costs (i.e., those costs to the Township that cannot be directly traced to the specific service) such as corporate administration and overhead
- Less tangible community costs such as road user costs and risk of environmental impacts. It is common not to consider these until direct and indirect costs are well understood.

Once the Township understands the full cost to deliver the current LOS, it can determine if current LOS are sustainable over time. This relationship is further discussed in sections 5 and 6 of this AM Plan.

5. Asset Management Strategy

This section provides a general discussion on expected future growth in population and associated need for additional assets, sets out the Township's renewal strategies to meet the required LOS, and discusses how risk assessment is used to prioritize renewal works.

5.1 Future Growth

5.1.1 Population Growth

The Township has experienced significant growth over the past 10 years, and has a current (2016) population of approximately 25,000. Population growth is expected to continue until 2041, with target populations of 34,900 in 2031 and possibly as high as 40,000 in 2041.

5.1.2 Asset Portfolio Growth

The expected growth in Township population will place significant pressure on the capacity of existing assets and create demand for new assets. The Township has updated various master plans that outline current service levels and associated existing assets, recommend future service levels and associated assets, and the actions required to move from the current to future state including requirements for new, expanded and enhanced assets. Current master planning documents include the following.

- **King Township's Integrated Community Sustainability Plan, 2012:** defines the future vision for the Township and broader community, and provides a guide to decision-making that emphasizes a balance between the environmental, economic, socio-cultural and financial priorities
- **Parks, Recreation & Culture Master Plan Update, 2013:** details parks, recreation and cultural opportunities in the Township, gathers feedback to identify gaps, and outlines an action plan to address future needs
- **Museum Strategic Business Plan, 2013:** defines the vision and roadmap for exhibitions, programs, organizational structure and enhancements to the site and facility
- **Transportation Master Plan, 2015:** details opportunities for improvement relating to traffic flows and volumes across multiple transportation modes, and develops an associated staged program of improvement works**Trails Master Plan, 2015:** establishes a strategic approach to develop an integrated and sustainable trails network that joins the growing Villages within and throughout the Township
- **Development Charge Background Study, 2014 and 2015 update:** projects population growth and growth-related capital expenditures from new development based on the Development Charges Act
- **Roads and Structures Needs Study, 2016:** maintains an updated investory of the Road Network and Structures for purposes of identifying maintenance, rehabilitation and replacement needs that are quantified in terms of cost and prioritization of repairs and reconstruction

The Township recently (2015) completed Phase 1 works to construct sanitary sewer infrastructure in Nobleton from private septic systems to municipal sanitary sewer systems. Phase 2 of this project may begin within the next two-three years.

The level of expected population and asset portfolio growth will also place significant pressure on the capacity of existing operations and maintenance. Consequential operational expenditure is the operations and maintenance cost associated with new assets. For example, for a new facility, the costs of electricity, natural gas and routine maintenance all contribute to the consequential operational expenditure associated with that new asset. These costs will be incurred by the Township into the future for as long as the facility is in use. For most assets, a good estimate of the consequential operational expenditure required to operate and maintain the new assets is simply the existing operations and maintenance cost multiplied by the growth factor.

As the focus of this AM Plan is on renewal of assets, and since additions to the Township's asset portfolios proposed in the above master plans have yet to be approved by Township Council and included in the annual Budget and Business Plan, the forecasts of growth assets will not be included in the AM Plan.

5.2 Asset Lifecycle Management Strategies

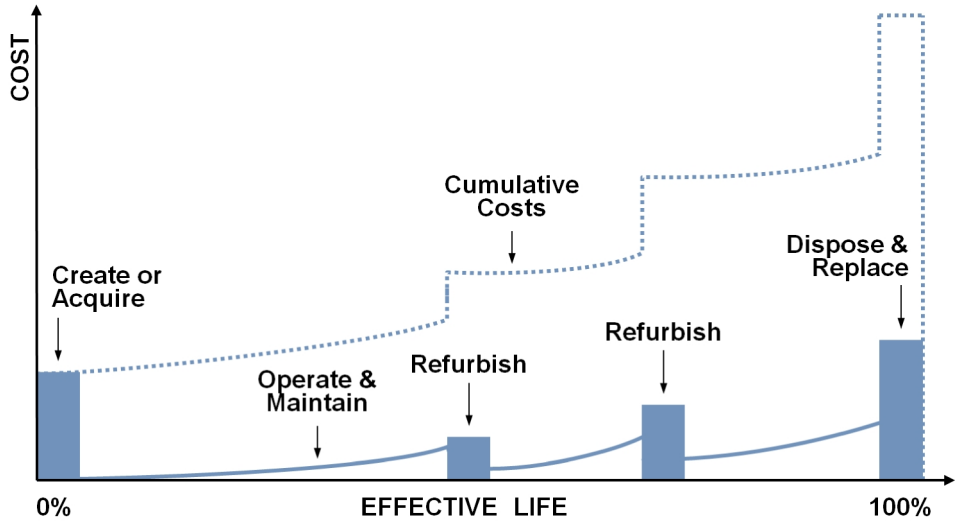
Asset lifecycle management strategies are planned actions that enable assets to provide the desired LOS in a sustainable way, while managing risk, at the lowest lifecycle cost. Asset lifecycle management strategies are typically organized into the following categories:

- **Non-Asset solutions** are developed through the master planning process conducted by each service area and corporately through plans such as the Integrated Community Sustainability Plan.
- **Expansion** of the asset portfolio is developed through the master planning process conducted by each service area.
- **Renewal** of the asset portfolio is based on maintaining assets in condition state fair or better and sustaining the asset portfolio through reinvestment. Renewal activities are prioritized for higher criticality assets (e.g., structural, fire protection and conveyance assets).
- **Operations and maintenance** of the asset portfolio is based on forecast growth by assessing consequential operational and maintenance requirements of significant new infrastructure planned to be added to the asset portfolio, and includes implementation of best practice maintenance management (e.g., reliability centered maintenance) across high criticality assets.

As the master planning processes provide the focus for non-asset solutions and expansion of the asset portfolio, the focus in this AM Plan will be renewal of the assets once in place. The Township preserves assets through maintenance and renewal (i.e., rehabilitation and replacement) activities and investments. Maintenance and renewal activities are timed to reduce the risk of service failure from deterioration in asset condition, and to minimize the total cost of ownership. Sufficient investment, of the right type, at the right time, is crucial.

The conceptual lifecycle model is illustrated in the figure below. This conceptual model plots the cash flow associated with creating and sustaining the asset over time.

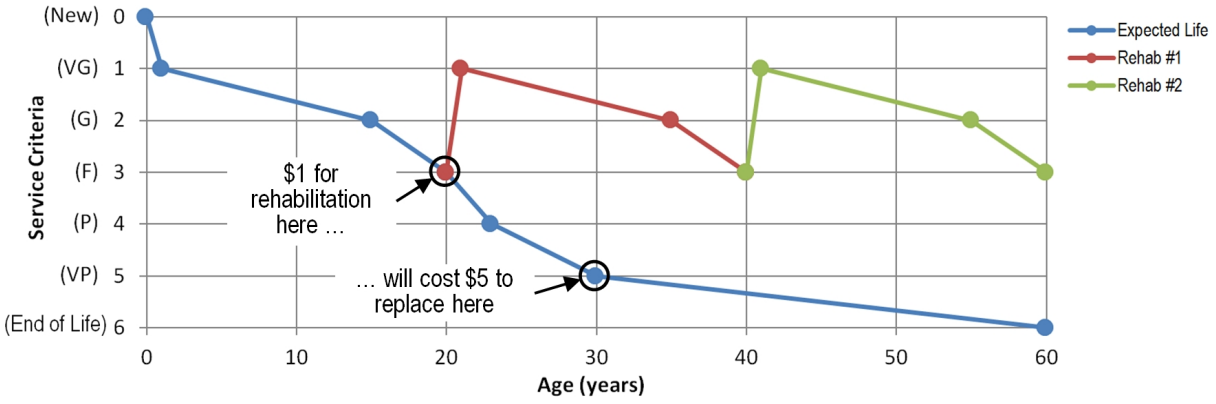
Figure 5-1 Conceptual Lifecycle Cost Model



5.2.1 Renewal Strategies

All assets physically deteriorate at different rates to eventual failure and loss of ability to deliver the required LOS. Asset condition is a measured assessment of an asset's current position or place on the asset "decay" or deterioration curve. Many assets deteriorate slowly at first to a fair condition and, after that, there is more rapid degradation. This typical lifecycle pattern for assets such as pavement and building components is illustrated in the figure below which shows the relationship between the condition and effective life (i.e., age). A key observation is that it is far more cost effective to maintain and rehabilitate assets before they reach a condition where the only option is costly reconstruction. In the figure below, the blue line tracks the deterioration of an asset's condition over time. Rehabilitation at year 20 (shown in red) extends the life by 20 years at a fraction of the cost to replace the asset at year 30.

Figure 5-2 Typical Asset Decay Curve



For assets where preventive maintenance and rehabilitation activities are technically feasible, understanding the asset's current condition and place on the asset decay curve enables forecasts of future condition and determination of optimal treatment type and timing – key aspects of lowest lifecycle cost renewal decision-making. The Township invests in condition assessments to gain the critical knowledge needed to determine the lowest lifecycle strategies.

For each asset type within each asset portfolio, decay curves are produced from industry standard information. The above example is for High Class Bituminous (HCB) pavement and was sourced from work in the United Kingdom under the Highways Maintenance Efficiency Programme (HMEP) and validated against work in Ontario by other municipalities.

For each asset portfolio, the following asset management strategy information is also developed, as summarized in the following table:

- What treatments are available (e.g., replace, resurface, rehabilitate, reline)?
- For each treatment type:
  - What is the cost of the treatment? (e.g., $52/m2 to mill & resurface HCB pavement)
  - Under what situations will a treatment be or not be applied? (e.g., a mill & resurface (R1) treatment will be applied in an Urban or Suburban environment, when the AADT<1000)
  - What triggers a treatment to be applied? (e.g., a mill & resurface is applied when the service criteria of condition (structural adequacy for pavement) reaches 3=Fair)
  - What is the benefit of the treatment? (e.g., maximum gain realized from a mill & resurface treatment is 2 points (from 3 to 1) but cannot exceed the threshold of 1)
  - How many times can a treatment be applied? (e.g., 2 mill & resurface treatments).

Table 5-1 AM Strategy Analysis Inputs – Part 1

Asset Portfolio	Service Criteria	Available Treatments	Unit	Unit Cost	Cost Basis	Cost Variance 1	Cost Variance 2	Cost Variance 3
Roads - Paved	Structural Adequacy	Replace (REC1)	m2	$140	No SHR	SHR -10%		
		Replace (REC2)	m2	$150	No SHR	SHR -10%		
		Mill / Resurface (R1)	m2	$52	No SHR	SHR -50%		
		Mill / Resurface (R2)	m2	$60	No SHR	SHR -50%		
		Pulverize / Resurface (PR1)	m2	$27	No SHR			
		Pulverize / Resurface (PR2)	m2	$35	No SHR			
		Bit Surface Treatment (BST)	m2	$25	No SHR			
		Slurry Seal (SS)	m2	$18	No SHR	SHR -10%		
Bridges & Major Culverts	Bridge Condition Index	Replace	m2	$8,000	Veh Bridge	Ped -65%	Cul -40%	
		Rehab Minor 1	m2	$1,000	Veh Bridge	Ped -50%	Cul -50%	
		Rehab Major	m2	$3,000	Veh Bridge	Ped -50%	Cul -50%	
		Rehab Minor 2	m2	$1,000	Veh Bridge	Ped -50%	Cul -50%	
Water Distribution	Age-Based % Consumed	Replace PVC	m	$1,500	600mm	400mm -27%	150-300mm -53%	<=100mm -77%
		Replace Copper <=50mm	m	$300	<=50mm			
		Rehab / Reline	m	$750	600mm	400mm -40%	150-300mm -60%	
Wastewater Collection	Age-Based % Consumed	Replace Gravity <=450mm	m	$650	<=200	250-300mm +23%	350-375mm +69%	450mm +77%
		Replace Gravity >450mm	m	$1,500	600	675mm +20%		
		Replace Force <=450mm	m	$750	<=200	250-300mm +20%	350-375mm +60%	
		Reline Gravity <=450mm	m	$325	<=200	250-300mm +23%	350-375mm +69%	450mm +77%
		Reline Gravity >450mm	m	$750	600	675mm +20%		
		Reline Force <=450mm	m	$375	<=200	250-300mm +20%	350-375mm +60%	
Facilities	Facility Condition Index	Replace	%CRV	100%				
		Rehab Structure	%CRV	20%				
		Rehab Roof	%CRV	20%				
		Rehab Building Envelope	%CRV	20%				
		Rehab Interior Finishes	%CRV	20%				
		Repair Siteworks	%CRV	10%				

Table 5-2 AM Strategy Analysis Inputs – Part 2

Asset Portfolio	Service Criteria	Available Treatments	Max #	Treatment Filters	Triggers (1=VG, 5=VP)				Max Gain	Threshold
Roads - Paved	Structural Adequacy	Replace (REC1)		AADT<1000			4	5	5	New
		Replace (REC2)		AADT>=1000			4	5	5	New
		Mill / Resurface (R1)	2	Env=UorS, AADT<1000		3			2	1
		Mill / Resurface (R2)	2	Env=UorS, AADT>=1000		3			2	1
		Pulverize / Resurface (PR1)	2	Env=R, AADT<1000		3			2	1
		Pulverize / Resurface (PR2)	2	Env=R, AADT>=1000		3			2	1
		Bit Surface Treatment (BST)		AADT<1000		3	4		1	1
		Slurry Seal (SS)		AADT<1000				5	1	1
Bridges & Major Culverts	Bridge Condition Index	Replace						5	5	New
		Rehab Minor 1	1		2				1	1
		Rehab Major	1	Bridge (veh)		3			1	2
		Rehab Minor 2	1	Bridge (veh)			4		1	3
Water Distribution	Age-Based % Consumed	Replace PVC		AC, CI, DI, HDPE, PVC			4	5	5	New
		Replace Copper <=50mm		COP, <=50MM				5	5	New
		Rehab / Reline	1	AC, CI, DI, HDPE, PVC, >=150mm			4	5	3	1
Wastewater Collection	Age-Based % Consumed	Replace Gravity <=450mm		CONC, HDPE, PVC, UNK, VC				5	5	New
		Replace Gravity >450mm		CONC, HDPE, PVC, UNK, VC				5	5	New
		Replace Force <=450mm		AC, CONC, HDPE, PVC, UNK, VC				5	5	New
		Reline Gravity <=450mm	1	CONC, HDPE, PVC, UNK, VC			4		3	1
		Reline Gravity >450mm	1	CONC, HDPE, PVC, UNK, VC			4		3	1
		Reline Force <=450mm	1	AC, CONC, HDPE, PVC, UNK, VC			4		3	1
Facilities	Facility Condition Index	Replace						5	5	New
		Rehab Structure	2				4		1	2
		Rehab Roof	1				4		1	2
		Rehab Building Envelope	1				4		1	2
		Rehab Interior Finishes	1				4		1	2
		Repair Siteworks	1				4		1	2

5.2.2 Lifecycle Analysis

Based on these asset renewal strategy inputs, a predictive modelling and long term financial planning tool (called Predictor) is used to forecast the future condition of the Township's assets (based on the decay curves), determine the type and timing of treatments to derive the most benefit for the least cost, and then update the asset condition based on the treatment applied.

The resulting output is, for every asset, the forecast best value (benefit to cost) asset renewal strategy: the set of renewal treatments that need to be undertaken to sustain the specified service criteria (i.e., condition) over time. Associated with these future renewal treatments is a forecast of costs to implement them. This cost and available funding for the asset renewal strategies is provided in Section 6, Financing Strategy.

Selecting Road Surface Type

The Township is investigating the whole of life cost of gravel surface compared to paved surface roads. Maintenance of gravel surface roads is currently funded through two operating budgets and has not been included in this AM Plan:

- Grading, Ditching, Gravel Maintenance (ditching applies to all roads)
- Dust Suppressant.

The demand for maintenance of gravel roads and associated costs typically vary by the volume and type of traffic, geometry, and drainage and soil conditions. Traffic volumes at which other jurisdictions make an initial screening decision on road surface type vary from 200 to 500 AADT. To enable the Township to develop a road surfacing policy, the least lifecycle cost of gravel and paved roads must be understood.

The Township is currently gathering data on the activities and associated costs for gravel and paved roads and tracking the costs to individual road segments. This data will enable lifecycle cost analysis of various options. Some current activities are undertaken on all gravel roads, independent of traffic volume and type (e.g., reshaping and re-gravelling, ditching, dust control), while other activities are required much more frequently on higher volume / load roads (spot dust control, grade / blade, spot gravel).

5.3 Procurement Methods

Procurement methods help to ensure the most efficient allocation of resources when executing asset management strategies such as maintenance and renewals works completed by external contractors and suppliers. Procurement is the delegated authority to perform the following functions: sourcing of products/services, issuance of bids, issuance of purchase orders and contracts, monitoring of the bid process, conducting public tender openings, coordination of the evaluation process, participation in evaluating committees, issuance of reports to Council and CAO recommending contract award, vendor disputes, as well as the disposal of surplus goods.

It is the objective of the Township that all goods and services are acquired on a competitive, fair and open basis in a manner that is efficient and accountable. The

Township's Purchasing Bylaw guides all procurement practices and is supported by internal policies and procedures.

6. Financing Strategy

This section presents a financial projection based on the data and assumptions made to support the State of the Infrastructure in Section 3 and asset renewal strategies in Section 5. Historical expenditures are provided and compared to future funding needs.

6.1 Actual Expenditures

The following table provides actual historical capital renewal expenditures for the Township's infrastructure and facility assets. Capital funds for initial construction of assets (i.e., growth related development charge funds) are not included. For paved roads, resurfacing has historically also been funded through the Operations budget.

Table 6-1 Actual Renewal Expenditures

Year	Roads - Paved	Bridges & Culverts	Water	Wastewater	Municipal Buildings
2011	$847,246	$973,389	$371,609	$21,364	$149,118
2012	$2,322,775	$449,501	$1,270,514	$171,670	$36,698
2013	$1,769,344	$73,394	$998,403	$322,206	$737,567
2014	$3,094,472	$2,313,735	$412,554	$-	$40,292
2015	$1,809,276	$393,766	$-	$-	$401,983
Average	**$1,968,623**	**$840,757**	**$610,616**	**$103,048**	**$273,131**
Reinvestment Rate	1.0%	1.6%	0.9%	0.2%	0.4%

The historical Reinvestment Rates, based on these average expenditures and the current replacement value of the assets, are copied from the LOS section, Table 4-4 Asset Performance.

6.2 Future Investment Needs Projections

6.2.1 Overview

This section summarizes the estimated long term renewal investment needs to sustain the Township's existing assets, valued at **$504.2 million** in current (2016) dollars. Over the next 100 years, it is estimated that the Township requires an average annual amount of **$9.4 million** to sustain the assets included in this AM Plan (replacement and major rehabilitations only).

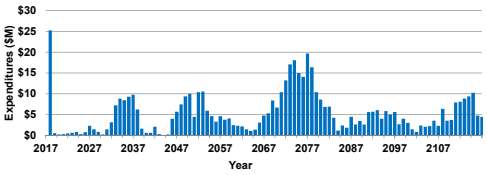
The forecasted amounts do not include the costs of activities related to operating and maintaining the assets throughout the asset lifecycle and do not include the costs of new growth assets. The deterioration curves and service lives used assume that these preventative treatments are performed such that the asset's life is sustained until the specified Service Life. The forecast assumes a LOS equivalent to the replacement of

the asset at end of life defined in Section 5.2.1, as well as the major rehabilitations applied at the network level (refer to Table 5-1 and Table 5-2).

6.2.2 Future Investment Analysis

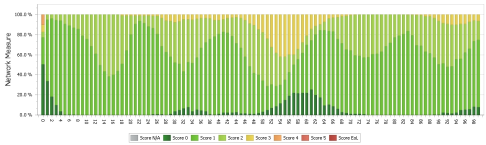
The following pages provide details of the outputs of the future investment analysis over a 100 year period based on the decision logic and inputs outlined in the asset management strategies in Section 5. The following provides a legend for the outputs.

The **Future Investment Forecast** graph shows the investment needs over the 100 year analysis period based on undertaking the most cost effective treatments identified in the asset management strategies to achieve the stipulated service criteria. The amount shown in 2017 is the backlog of work.



The **"unconstrained" budget** is the average annual investment (AAI) amount of the total 100 year future investment forecast amount.

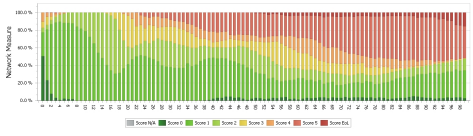
The **Condition Profile Forecast (unconstrained)** graph shows the effect of investing the "unconstrained" amounts in the asset management strategies outlined in Section 5. By definition, the Condition Profile Forecast (unconstrained) will meet the service criteria.



The **"constrained" budget** is the annual amount that the Township plans to invest over the 100 year analysis period, assumed to be the annual amount based on the 2017 to 2026 Capital Budget. These amounts are provided in the following table, along with the past annual expenditures, for comparison.

Asset Portfolio	Past Annual Expenditures (millions)	Current Annual Budget (millions)
TOTAL	***$3.80***	**$5.60**
Transportation	***$2.81***	**$3.80**
Roads - Paved	*$1.97*	$3.10
Bridges & Major Culverts	*$0.84*	$0.73
Environmental	***$0.71***	**$0.53**
Water Distribution	*$0.61*	$0.53
Wastewater Collection	*$0.10*	$0
Municipal Buildings	***$0.27***	**$1.30**

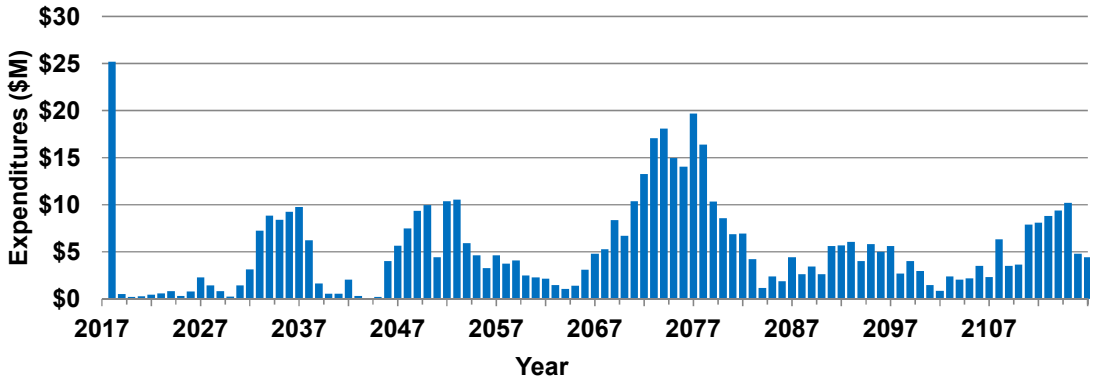
The **Condition Profile Forecast (constrained budget)** graph shows the effect of restricting the investment in the asset management strategies to the "constrained" budgets.



6.2.3 Future Investment Analysis: Roads – Paved

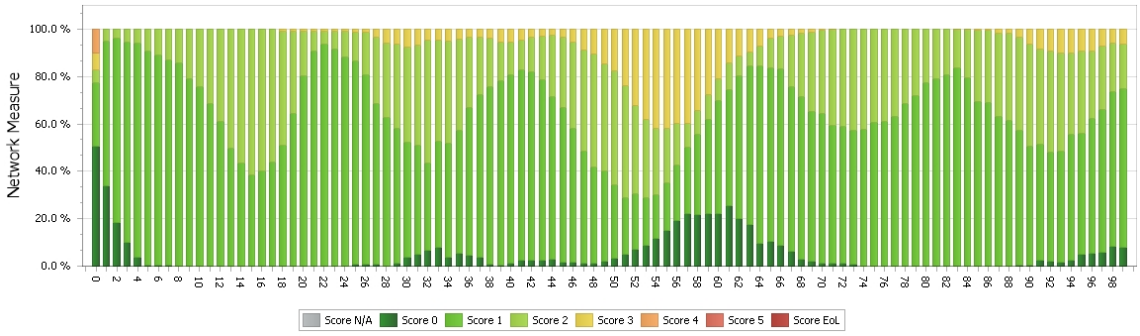
For pavement, the unconstrained budget averages $5.3M per year, with a backlog of $25M in the first year. Note that the 2015 Road Needs Study report identifies: A total of 23.08 km of the road sections requiring improvement are an immediate need, with a total cost of $21,748,100.

Figure 6-1 Roads – Paved: Future Investment Forecast, $5.3M AAI



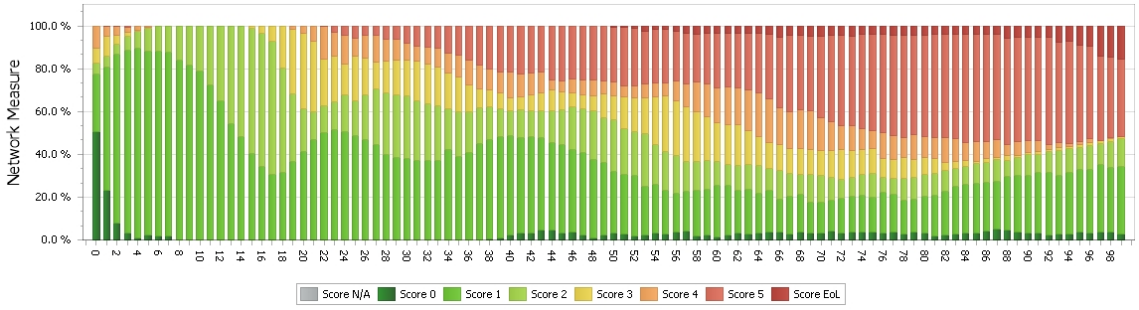
The condition of the paved road network associated with this investment is depicted below over the next 100 years. The level of service (structural adequacy) is maintained over the forecast period.

Figure 6-2 Roads – Paved: Condition Profile Forecast (constrained), $5.3M AAI



The current budget for pavement is estimated to be approximately **$3.1M per year** based on the 2017 to 2026 Capital Budget. With this level of investment, roads will remain in good condition over the next 20 years but this investment is not sustainable in the long-term, with an increasing proportion slipping into disrepair, resulting in even more expensive reconstruction requirements that could have been avoided by intermediate rehabilitation.

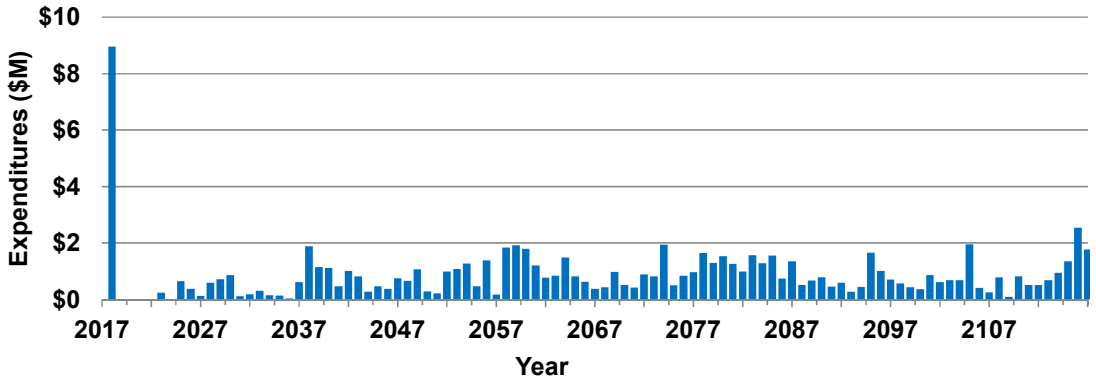
Figure 6-3 Roads-Paved: Condition Profile Forecast (constrained), $3.1M AAI



6.2.4 Future Investment Analysis: Bridges & Major Culverts

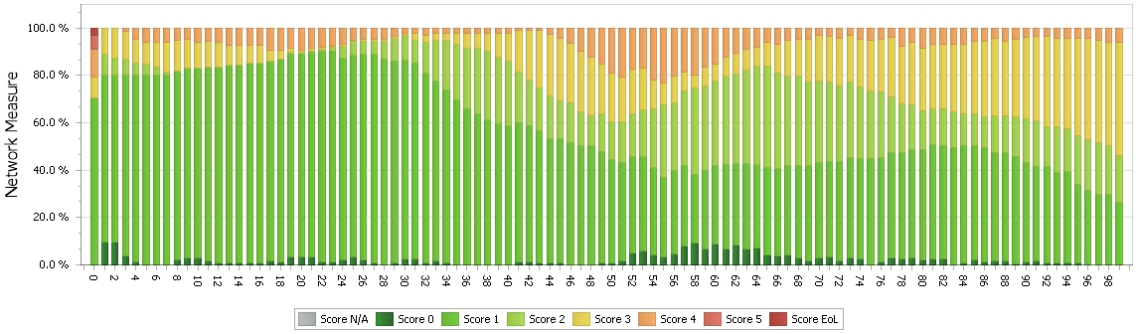
The “unconstrained” budget for bridges and culverts averages **$0.87M per year**, with a **backlog of $9M in the first year**. Note that the 2015 Structures Needs Study report identifies: A total of $4,605,100 of “now” needs and a further **$9,285,000** needs over the next 5 years.

Figure 6-4 Bridges & Culverts: Future Investment Forecast, $0.87M AAI



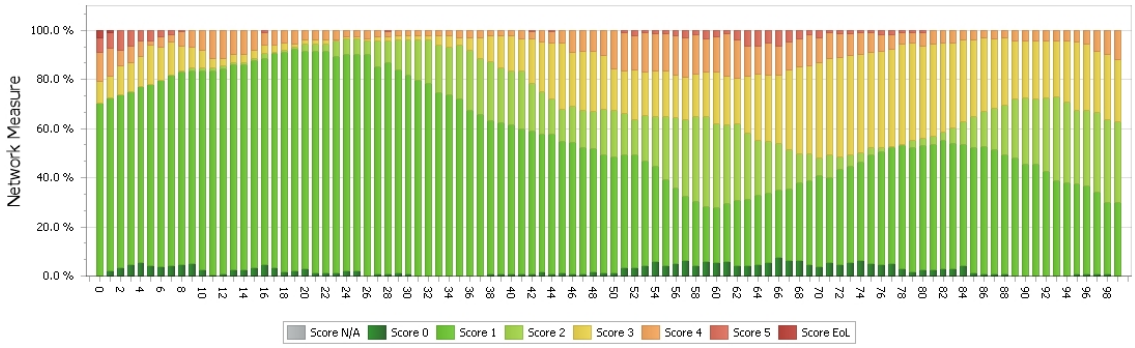
The condition of the bridges and major culverts with this $0.87M annual average investment is depicted below.

Figure 6-5 Bridges & Culverts: Condition Profile Forecast (unconstrained), $0.87M AAI



The current budget for bridges and major culverts is approximately **$0.73M per year**. Though this represents a minor shortfall, assets can be maintained in relatively good condition overall with this investment amount. The following figure shows the effect of an average $0.73 million per year investment in bridges and culverts on asset condition.

Figure 6-6 Bridges & Culverts: Condition Profile Forecast (constrained), $0.73M AAI



6.2.5 Future Investment Analysis: Municipal Buildings

The “unconstrained” budget for facilities averages **$2.0M per year**, with a backlog of over **$12M in the first year.** For the 24 facilities with building condition assessments, it was estimated that almost $7 million in deferred maintenance was required. This forecast includes all existing facilities..

Figure 6-7 Municipal Buildings: Future Investment Forecast, $2.0M AAI

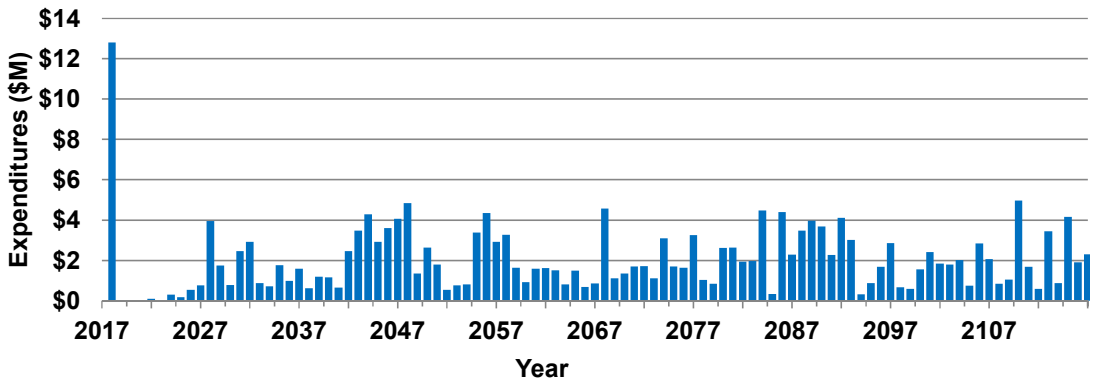
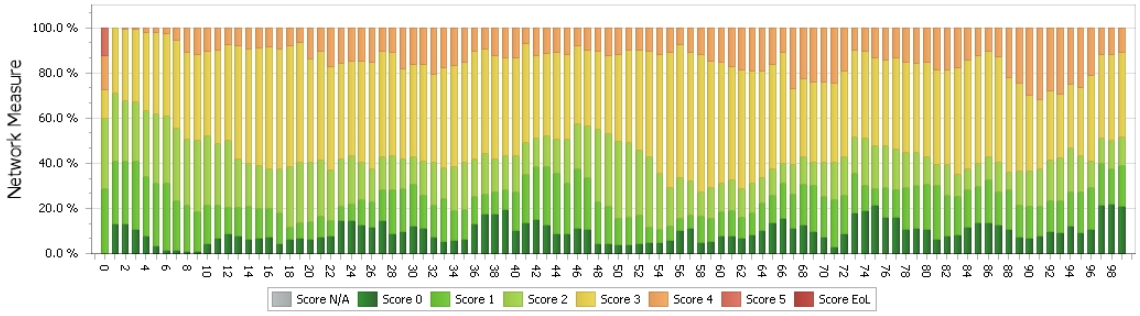
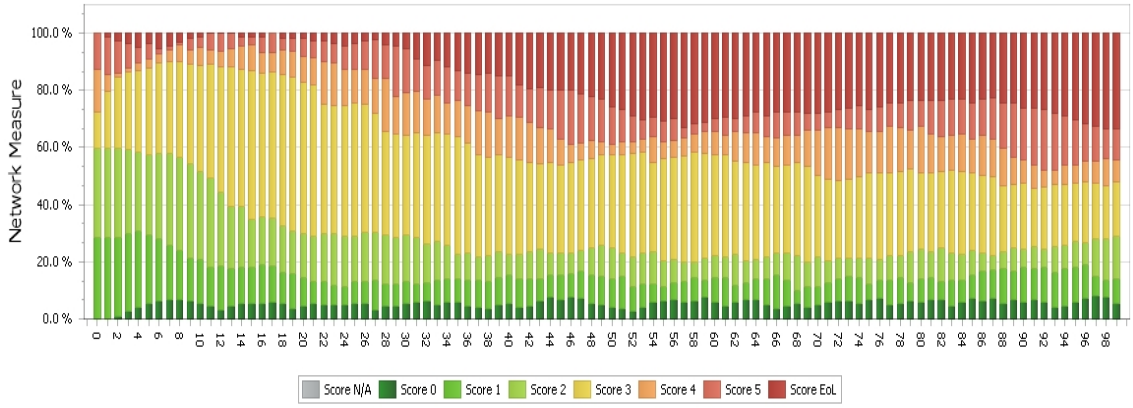


Figure 6-8 Municipal Buildings: Condition Profile Forecast (unconstrained), $2.0M AAI



The current budget for facilities is approximately **$1.3M per year** based on the 2017 to 2026 Capital Budget. Though this budget is higher than historical expenditures, this represents a significant shortfall compared to the unconstrained requirement. The following figure shows the deteriorating effect of an average $1.3 million per year investment in municipal buildings over the next 100 years.

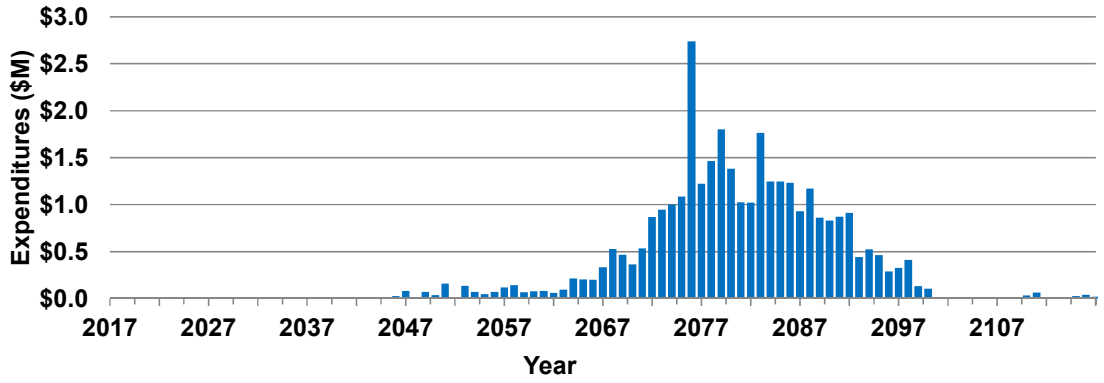
Figure 6-9 Municipal Buildings: Condition Profile Forecast (constrained), $1.3M AAI



6.2.6 Future Investment Analysis: Wastewater

Most of the wastewater collection system is either new or very good condition because over 80% of it was constructed in the past 10 years, and no pipe is over 50 years old. The forecast therefore indicates that no capital work is required until year 2046, gradually increasing through year 2067 and on. Capital budget needs never exceed **$3 million** during the replacement period. The average is **$326.5K** over the 100 year period. If the Township reserves this amount annually, future capital needs for the current inventory of wastewater collection pipes should be sufficient.

Figure 6-10 Wastewater Collection: Future Investment Forecast, $0.33M AAI



6.2.7 Future Investment Analysis: Water

The "unconstrained" budget for the water distribution system averages **$0.92M per year**, with a backlog of **$3M in the first year.** The model suggests that the forecasted peak replacement period for water distribution pipes in years 60 to 80 aligns with the forecasted peak replacement period for wastewater collection pipes. At $0.92 million per year, the condition is maintained at an adequate level over the forecast period.

Figure 6-11 Water Distribution: Future Investment Forecast, $0.92M AAI

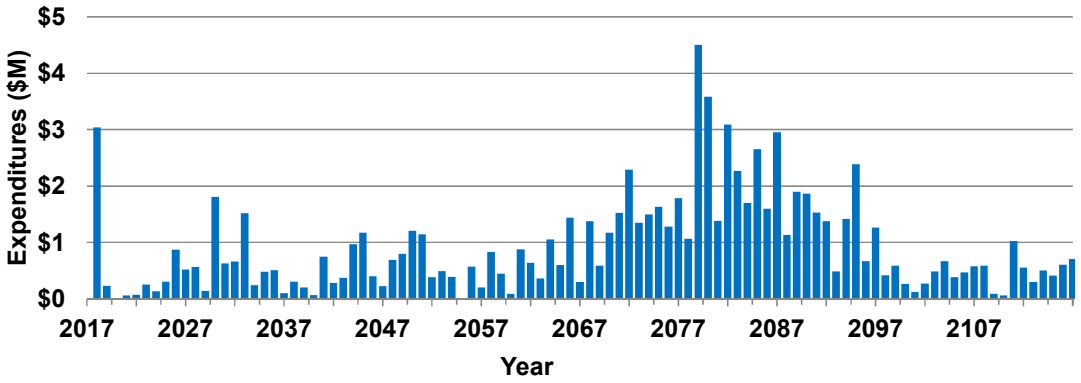
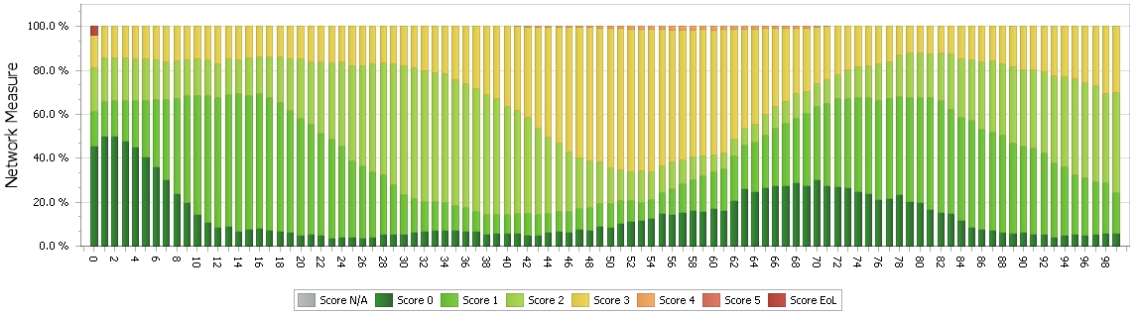
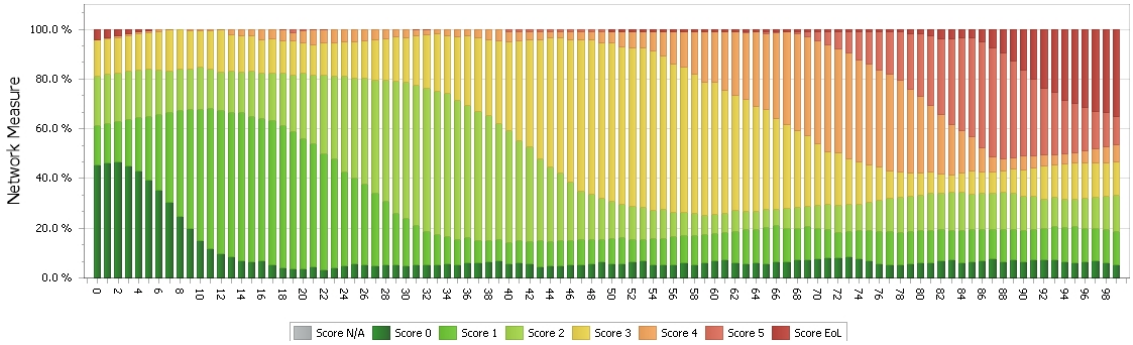


Figure 6-12 Water Distribution: Condition Profile Forecast (unconstrained), $0.92M AAI



The current budget for watermains is estimated at $0.53M per year. This funding shortfall results in significant deterioration of the condition profile in year 60 and onwards.

Figure 6-13 Water Distribution: Condition Profile Forecast (constrained), $0.53M AAI



6.3 Funding Shortfall

The following table summarizes the average annual investment need required to sustain the Township's existing assets, compared to the ship's current annual budget based on its 2017 to 2026 Capital Budget.

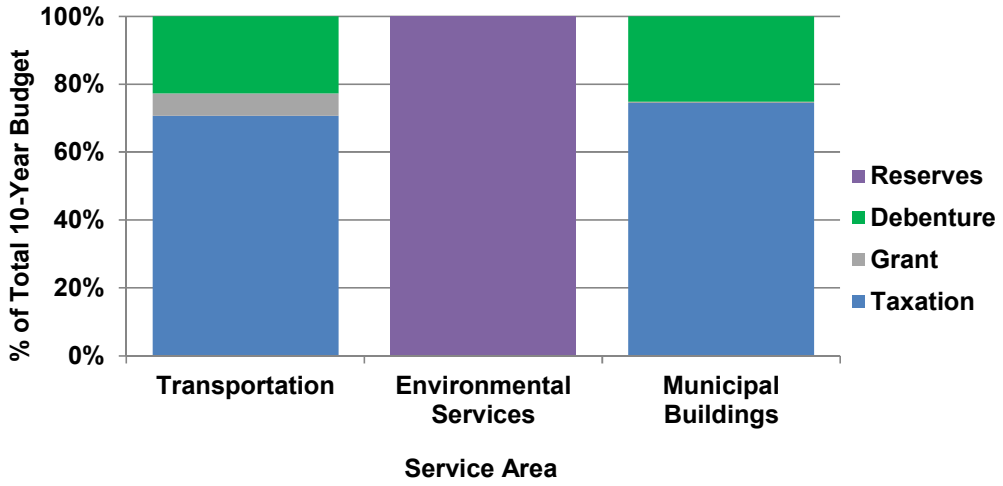
Table 6-2 Average Annual Forecast and Funding Shortfalls by Service Area

Asset Portfolio	Past Annual Expenditures (millions)	Average Annual Investment Need (millions)	Current Annual Budget (millions)	Funding Shortfall (millions)
TOTAL	***$3.80***	**$9.40**	**$5.60**	**-$3.80**
Transportation	***$2.81***	**$6.20**	**$3.80**	**-$2.40**
Roads - Paved	*$1.97*	$5.28	$3.10	-$2.18
Bridges & Major Culverts	*$0.84*	$0.87	$0.73	-$0.14
Environmental	***$0.71***	**$1.20**	**$0.53**	**-$0.67**
Water Distribution	*$0.61*	$0.92	$0.53	-$0.39
Wastewater Collection	*$0.10*	$0.33	$0	-$0.33
Municipal Buildings	***$0.27***	**$2.00**	**$1.30**	**-$0.70**

Overall, the Township has a shortfall of $3.8 million per year, mainly due from insufficient budgets for paved roads and municipal buildings.

Current capital renewal funding sources are provided in the following figure. Grants include ongoing funding agreements such as Gas Tax revenue. In addition, the operating budget is used to fund pavement resurfacing.

Figure 6-14 Capital Renewal Funding Sources



7. Monitoring & Improvement

7.1 Overview

The first version of an AM Plan will not meet all of the long term goals of a fully developed AM Plan due to gaps in data, information and business processes. It is intended that the continual improvement of asset management practices and associated data collection by the Township will result in regular updates to this document. As such, this AM Plan is a living document that will require ongoing refinement to reflect the improvement of asset management maturity within the Township over time.

7.2 Recommended Improvements

Improvements noted for future revisions of the AM Plan include:

- **Tangible Capital Aseet (TCA) Policy**: The Township is currently developing a TCA policy that will formalize the process for creating, maintaining, and disposing of assets in the database. Careful consideration should be given to increasing and decreasing asset value for improvement/upgrade type entries, and policies for updating condition and installation year data. The Township is intended to implement AM software that will enable assets to be maintained in a central repository that links both departmental and financial databases.
- **Municipal Buildings Inventory**: For buildings, it is recommended that an understanding of the asset portfolio is improved through more detailed building condition assessments that assign a condition score and replacement value to each building element, rather than only the required rehabilitation costs.
- **Condition**: For water and wastewater mains, condition is based on age. Actual condition data should be used such that the timing of future investment needs is more accurately determined. For water, watermain break history is recorded. These inspections and breaks, however, are not currently tied to each water segment digitally. Digitizing available data and information will allow Staff to make informed decision based on historical and statistical trends.
- **Addition of Other Assets**: The Township is currently working on developing more accurate databases for all asset areas, including stormwater assets and wastewater pumping stations. As these databases are updated, these other asset areas should be included in the AM Plan.
- **Gravel Versus Pavement Activity Costs**: It is recommended that the Township start to track activity costs against specific assets so that information on resources spent on specific activities can be tracked (example: re-grading, dust suppression on specific gravel roads). This information will enable the Township to make informed decisions on choosing road surface type based on the whole of life cost of gravel surface compared to paved surface roads..
- **Refinements to the estimated service life and treatment strategies**: As the Township establishes the costs and benefits of preventive and maintenance

treatments, asset service life values should be reviewed and updated regularly to reflect observed deterioration rates and incorporate the benefits of maintenance and renewal strategies. The future forecasts will also improve in accuracy through these improved strategies and incorporation of major rehabilitation activities such as major building repairs that need to be funded by the capital budget.