Elgin County
Progressive by Nature

2019
CORPORATE ASSET MANAGEMENT PLAN
TRANSPORTATION NETWORK

Executive Summary

1.0 Introduction

Public infrastructure is central to our prosperity and our quality of life. The majority of public infrastructure in Canada is the responsibility of municipal government, and most people take for granted the important role of these assets. Adequate municipal infrastructure such as roads, bridges, and underground water and sewage pipes are essential to economic development, citizen safety, and quality of life. Well maintained infrastructure is critical in sustaining a municipality as an attractive place to live and do business.

Asset Management is the process of collecting a variety of data and information regarding municipality assets and infrastructure, and using all of that data and information to make the best long-term decisions in regards to building, operating, maintaining, renewing, replacing, and disposing of those assets.

In December 2017, Ontario became the first Canadian province to pass regulation that requires municipalities to engage in asset management planning. Ontario Regulation 588/17 requires all municipalities prepare Council-endorsed Strategic Asset Management Policies by July 1, 2019, and implement Asset Management Plans using a phased approach from 2021–2024. The County of Elgin (County) is positioned well to comply with this regulation.

The County is now in the midst of a multi-step, multi-year approach to improve its asset management practices and processes. This document is the County's updated Asset Management Plan (AMP) prepared by staff which first focused on the County's road network and structure inventory.

1.1 Purpose of Asset Management Plan (AMP)

The AMP plays an important part by communicating to residents and stakeholders the reasons why new assets, or modifications to existing assets, are required. The AMP also provides further details on why modifications are required, how the County intends on continuing to deliver the services by relying on safe and reliable assets, and how the County intends on funding the required investments in a manner so as to remain financially sustainable.

The County has an array of strategic, long-term planning documents that complement each other and work together to direct Elgin County's future. Some examples include the County's Strategic Plan that outlines Council's priorities, the Official Plan (OP) which sets the vision for the County's future growth as detailed in such documents as the Elgin-St. Thomas Cycling Master Plan and the County of Elgin Roads Plan and Policies.

Historically, these master plans have dealt exclusively with future needs without considering their funding requirements, nor the rehabilitation needs for existing infrastructure.

The AMP captures information prepared for various uses, by a number of different groups within the County, and transforms that information into asset-specific measures or actions that the County is actively taking or pursuing to provide residents, businesses, and visitors the services at levels that correspond to the fees and taxes they pay.

- Demonstrate responsible management of the asset portfolio;
- Communicate and justify funding requirements;

- Demonstrate how Levels of Service (LOS) are being met in an effective and efficient manner;
- Demonstrate that due regard is being given to the long-term stewardship and sustainability of the asset base;
- Demonstrate the commitment that assets will be maintained such that the services are following regulations; and
- Comply with Ontario's Ministry of Infrastructure requirements as detailed in the 'Guide for Municipal Asset Management Plans'.

1.2 Core Service Areas

The County of Elgin is a complex service delivery organization with responsibility for managing public assets that support a very large array of different services.

To fulfill its obligations of service delivery to the municipality, the County must ensure that the assets supporting these services are managed in a way that balances service levels, risk, and affordability. These assets require significant ongoing investment in operation, maintenance, and renewal activities to ensure they are kept safe, structurally sound, and fit-for-purpose to support the delivery of services.

For the purpose of asset management, the County has identified 15 different services provided to residents, businesses, and visitors. These services are well aligned to the provincially defined Financial Information Return (FIR) reporting requirements. The FIR reporting requirements have been established for comparable financial reporting across the province, whereas the services identified below are grouped to facilitate asset management from a service to client perspective.

In several cases, the services identified in Table 1 below are further subdivided into more specific services but generally rely on similar asset types to support the delivery of that service.

The existing County infrastructure within the road network includes 59 roads, which are further divided into a total of 248 unique road classification sections, totaling 689 kilometers. The condition of the road network is important in determining the needs of the overall network. The County maintains a system to determine the condition of the road sections in their network, by means of a Structural Adequacy Rating (SAR) attributed to each road section within the network. An updated overall network condition was determined in the Spring through the consideration of the SAR rating attributed to each section in combination with the length of that section as a portion of the entire network. The generally good condition of the majority of the road sections results in an average current condition of the road network of approximately 14.9 out of 20. This value indicate that the road network currently provides a fair level of service to the residents.

Bridge and culvert infrastructure in the County considered within the AMP are comprised of those structures which are three meters in size or larger. This included analysis of 58 bridge structures, and 84 culvert structures. When a bridge is inspected in detail every 2 years, the trained inspector reviews and rates each bridge component. These ratings are used to determine the bridge's current value on the Bridge Condition Index (BCI). The County uses the BCI to plan maintenance and repairs. Approximately 62% of County's bridge and culvert structures are in good condition. Alternatively, it can also be viewed that County structures have approximately 33% of their lifespan remaining.

Without asset management tools, it is almost impossible to determine the long-term effect of inadequate budget allocations. Yet, it is important for a municipality to determine if the current level of funding is appropriate to continue to provide an adequate level of service to its residents. It is also essential to allocate adequate funding to ensure sustainability of the assets in the future. For the County, the value of the road assets was estimated at approximately $831 million. The value of the bridge and culvert assets was estimated at approximately $122.7 million for bridges, and approximately $56.5 million for culverts, totaling over $179 million.

Current Needs Summary

The current needs for the County road network are mostly based on the condition of the road, or where it is deemed practical and cost-effective, in association with needs or additional requirements. It is estimated that an average annual capital investment of $16,591,976 (including an assumed 2% inflation) will be required to maintain the transportation network (roads, structure, and traffic) in good condition. This annual expenditure represents a total investment of approximately $166 million over the next 10 years (2020-2029).

The current needs for the bridges were determined having taken into consideration the rehabilitation and needs recommendations identified within a biennial OSIM report for each structure, in addition to the year of construction or last replacement of each structure and the life expectancy. It is estimated that $24,221,378 is required over the next 10 years to improve the overall County bridge inventory condition. Continuation of the biennial OSIM inspection is anticipated to result in spreading that amount over a number of years based on actual field inspection.

The County has identified the following bridge projects to be undertaken in 2020.

2020 Bridge Projects			
Network	**Project**	**Location**	**Expenditure**
Bridges	B01 – Bothwell Bridge Rehabilitation – Detailed Design *(partnership with Middlesex County and Chatham-Kent)*	West Elgin	$100,000
Bridges	B18 – St. George Street Bridge Rehabilitation *(partnership with City of St. Thomas)*	Central Elgin	$310,000
Bridges	B19 - Port Bruce Bridge Replacement *(senior government funding in the amount of $4,166,500 has been announced).*	Malahide	$5,150,000
Bridges	B24 – Meeks Bridge Replacement – Municipal Class Environmental Assessment & Detailed Design	Southwold	$250,000
Bridges	B92 - Kimble Bridge Replacement	Southwold	$480,000
Bridges	B99 – King George IV Lift Bridge Rehabilitation	Central Elgin	$6,070,000

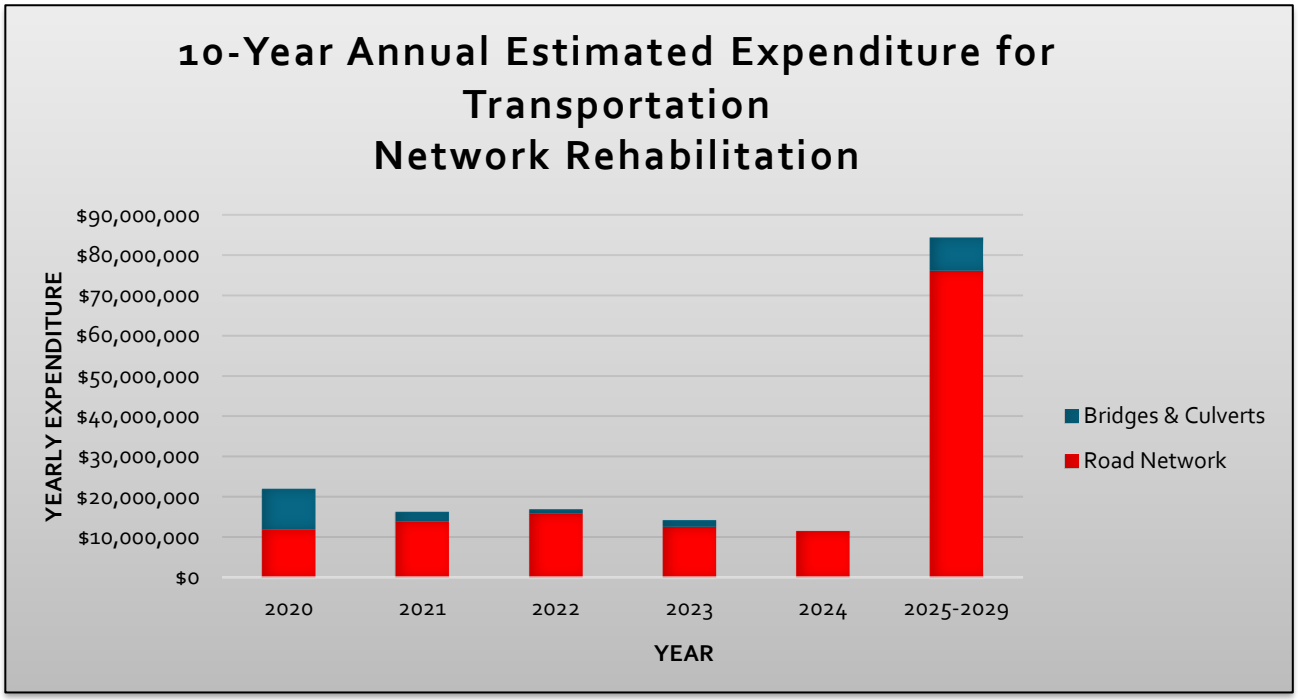
Asset Management Strategy

Road Network

The road network asset management plan was developed using the information and strategies currently in place at the County. The plan provides detailed information regarding the projects planned for the upcoming ten years. The first 5 years of the plan include a breakdown of specific projects attributed to each year.

The sixth to tenth years within the plan do not distinguish between individual project years, instead allotting a lump anticipated expenditure of $86,824,635 for selected projects. The following figure shows the anticipated expenditure anticipated for road rehabilitation for the 10-year scenario, including an assumed even division of the lump expenditure over years 2025-2029, as blue coloured bars.

The red coloured bars are representative of the budgeted expenditures by the County for bridge and culvert works. The total allocated budget is based on a summation of the two values.



The budget allocated for bridges and culverts is shown for visualization of the entire budget breakdown. Further detail regarding the usage of the structures portion of this budget is given in **Section 5.2**. It is anticipated that in each of the upcoming ten years of projected infrastructure expenditures that approximately $11.5 million to $16.9 million will need to be spent to address needs on the transportation network.

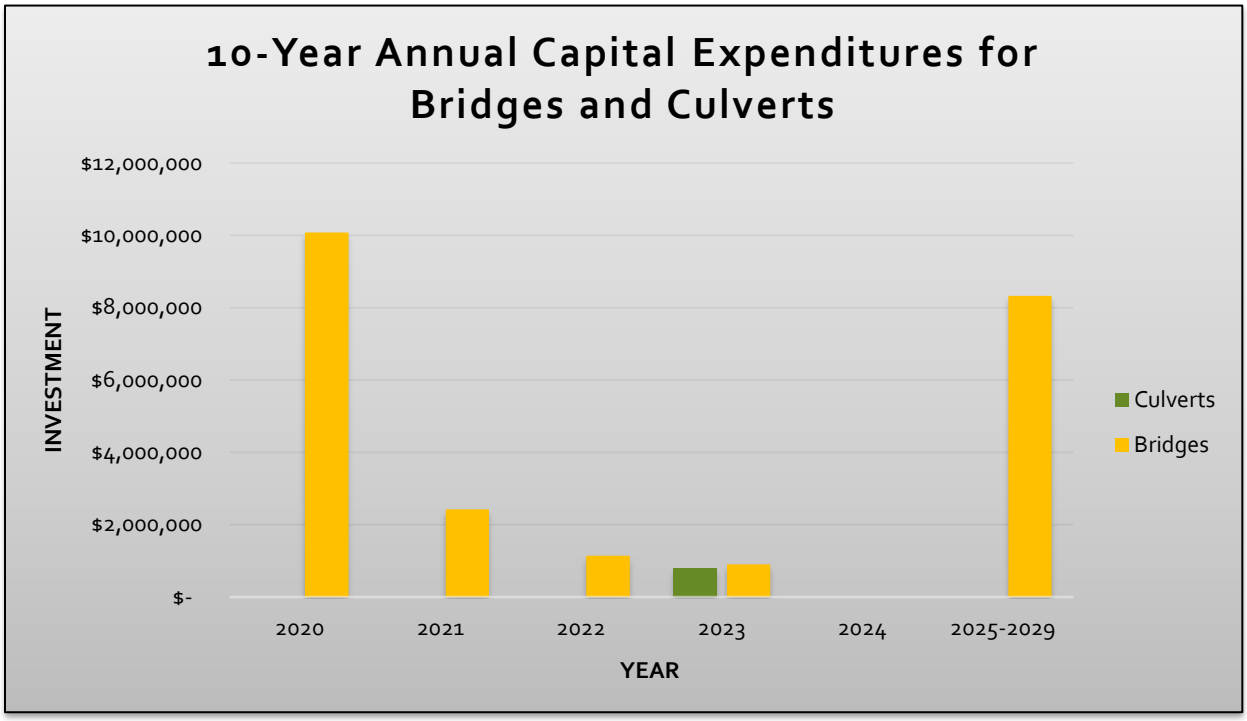
Using future asset management planning software, it will be possible to analyze the infrastructure needs into the future, and the impact of allocated funding on the overall network condition. In the interim, a projected capital plan was developed to ascertain a high-level understanding of the anticipated expenditures and associated overall road network performance. Assumptions were made to simplify the County planning process to create a reasonable representation.

Bridges and Culverts

The short-term asset management plan developed by County staff for the bridges and culverts was done having considered the remaining life, replacement cost, and recommended rehabilitation actions for each structure; and developed a schedule and anticipated yearly expenditure for a ten-year timeframe.

The figure below shows the capital expenditure anticipated for bridges and culverts based upon the age and life expectancy of the structure. Some lower volume, —town line structures have exceeded their service

life and although replacement of these bridges is identified, the plan proposes to continue to rehabilitate as recommended in the OSIM report to extend their service lives rather than complete replacement at a significantly higher cost.



Financing Strategy

The County has identified revenue sources that will support the Asset Management Plan (AMP) developed through this report. The funding sources include:

- Property Tax
- Federal Gas Tax (FGT) and Ontario Community Infrastructure Fund (OCIF) base funding
- Grants and other one-time funding sources
- New Tax Base
- Reserve/Debt Financing

The proposed 2020 ten-year plan is being modified to assume that $1.3 million in OCIF will continue in perpetuity, thereby increasing funding to the plan by $8 million. A one-time top-up of FGT of $1.6 million was received in July 2019 and will be applied to fund the infrastructure plan. The County, where applicable, will also seek Federal and Provincial funding through competitive grant programs, resulting in a potential funding source.

The draft 2020 ten-year plan will allocate a quarter of the incremental tax revenue received from growth resulting in new property assessment (growth assumed to average a conservative 1% annually) to fund infrastructure, providing $1.1 million in funding.

The $46 million increase in investment proposed in Asset Management Plan will only partially be funded by increases in the ten-year plan to OCIF, FGT and assessment growth net of interest payments, leaving a shortfall of approximately $40 million. A gradual increase of property tax by an incremental 1.6 % over

ten years will provided the necessary funding. Debt will need to increase by an estimated $25 million to fund the upfront investment until gradual measured increases in property tax provide ongoing stable funding. These estimates will be refined as part of the development of the 2020 budget expected to be completed by February.

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1.0 INTRODUCTION

1.2. Significance of Municipal Infrastructure

The Corporation of the County of Elgin ("County of Elgin" or "County") infrastructure systems are the backbone of our communities. They support a range of municipal services that enable the quality of life experienced by residents, businesses, and other stakeholders.

The County's Asset Management Program is designed to enable management of infrastructure assets in a way that connects strategic Council and municipality objectives to day-to-day infrastructure investment decisions.

The County's Asset Management Plan (AMP) is a tactical outcome of the Program, setting out the current plan for the County to manage its $831 million worth of core transportation infrastructure. This is accomplished by:

- Aligning with the Provincial regulatory landscape, meeting the requirements of O.Reg 588/17, and positioning the County for grant funding applications.
- Understanding the current state of the infrastructure systems.
- Measuring and monitoring Level of Service (LOS) metrics to quantify how well an infrastructure system is meeting expectations.
- Establishing asset lifecycle management activities (i.e. how infrastructure is operated, maintained, rehabilitated and replaced).
- Determining the optimal costs of the asset lifecycle activities required to ensure the infrastructure systems provide service levels that meet municipality expectations.
- Establishing a financial strategy to fund the expenditures that are required to complete the optimal lifecycle activities for Council's approval.
- Prepare conclusions and provide recommendations resulting from the data analysis performed.

Based on the existing County budget, the infrastructure gap based on existing asset condition of the road network, bridges, and culverts is expected to grow to $47 million within the Plan's 10-year period of analysis.

The County's proposed strategy is to mitigate the annual growth of the infrastructure gap. The strategy is to balance the affordability of municipal taxes with the needs of the County.

Failing to address growing infrastructure needs will result in increased risk of infrastructure failures that will negatively affect the quality of life through more frequent impacts like road closures, structure failures, etc. Failure to take care of a minor repair in the short term can lead to more costly solutions in the future. The County's projected life cycle investment plans currently do not meet the needs of our infrastructure. If nothing is done to address the projected shortfall, the infrastructure gap will continue to grow, resulting in an untenable situation. The most efficient way to manage our assets is through well planned investments; making the right investment at the right time for the right amount.

The Program areas and services that are included in the scope of the 2019 AMP first focuses on the County Road Network and Structures. A future update to the AMP is required to incorporate the following additional County areas and services:

- Stormwater
- Corporate Facilities
- Long Term Care
- Cultural Facilities
- Information Technology
- Fleet

1.3. Ontario Regulation 588/17 (O. Reg 588/17)

PRECURSOR

In 2012, the Province of Ontario published 'Building Together: Guide for Municipal Asset Management Plans' (AMP) to encourage and support municipalities in Ontario to develop AMP(s) in a consistent manner.

In 2015, Ontario passed the Infrastructure for Jobs and Prosperity Act which affirmed the role that municipal infrastructure systems play in supporting the vitality of local economies. After a year-long industry review process, the Province created Ontario Regulation 588/17 – Asset Management Planning for Municipal Infrastructure under the Infrastructure for Jobs and Prosperity Act. O.Reg. 588/17 further expands on the Building Together guide, mandating specific requirements for municipal Asset Management Policies and Asset Management Plans, phased in over a five-year period.

O. Reg 588/17 has a phased approach with three deadlines of July 1, 2021, July 1, 2023, and July 1, 2024. The July 1, 2021 and July 1, 2023 deadline are where 'Core' assets (road, bridges, etc.) and all County infrastructure assets, respectively will have an asset management plan documenting current levels of service. The final deadline (July 1, 2024) is to document proposed levels of service and financial strategies to fund these expenditures.

REQUIREMENTS ACHIEVED FOR THE 2019 AMP

For directly-owned County infrastructure assets, this AMP is compliant with the July 1, 2021 and July 1, 2023 Regulation requirements. Furthermore, it also includes some components of the July 1, 2024 requirements.

1.4. County of Elgin

The County is located in the Province of Ontario. It is an upper-tier municipality, subdivided into seven lower-tier municipalities. The County is located in Southwestern Ontario, south of the City of London, and borders Lake Erie on the south. The County is approximately 1,820 square kilometers in size, and has a population of nearly 50,000. ***Figure 1*** illustrates the location of the County.

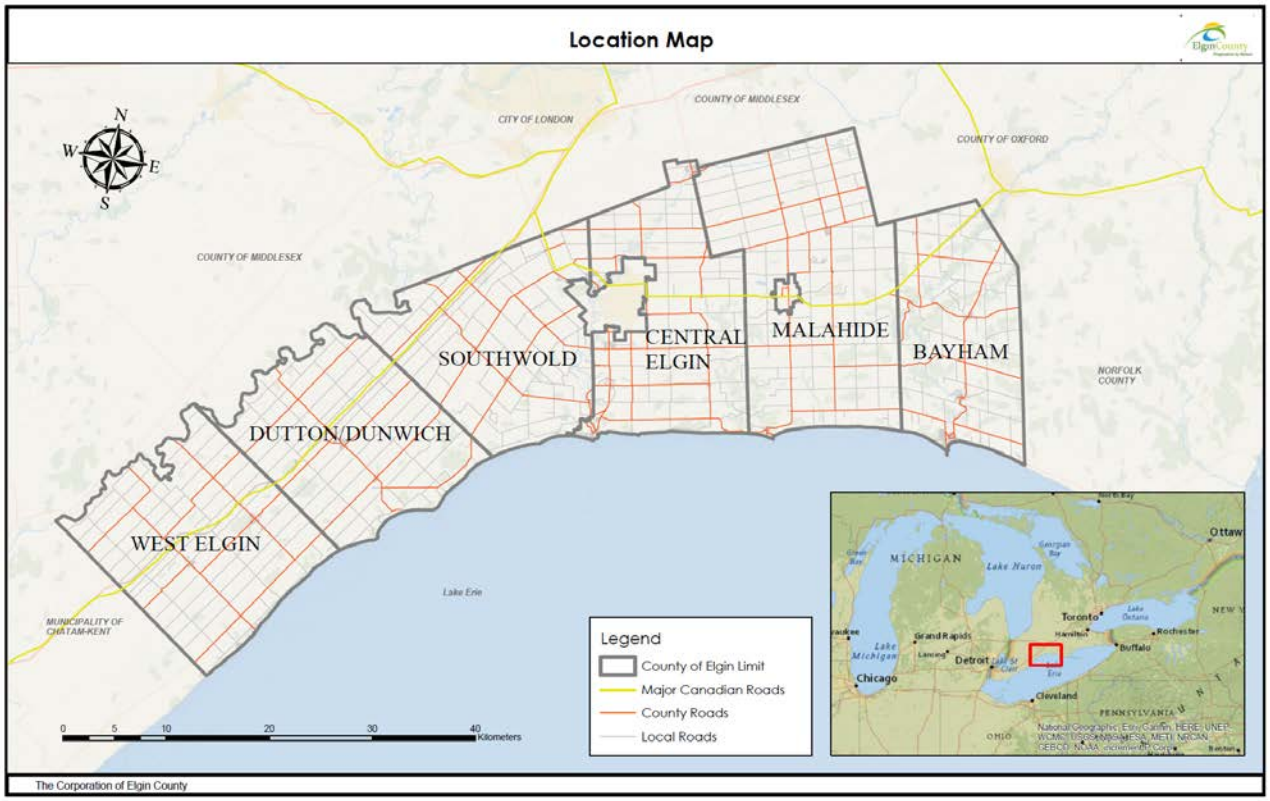


Figure 1: County of Elgin – Location Map

1.5. Development and Continuous Improvement of the AMP

This AMP is the culmination of efforts from staff across our organization who are involved with managing infrastructure assets, including finance staff involved with funding capital projects and operating programs, technical staff involved with planning and executing the construction of infrastructure assets, and on-the-ground staff who operate and maintain infrastructure assets.

Moving forward, their involvement will continue to ensure that future editions of the plan remain relevant and useful in properly managing the County's infrastructure assets.

1.6. Corporate AMP Scope

This Corporate AMP first focuses on the County's road network and structure infrastructure assets that provide services to our communities. The County's approach is to take a service-focused perspective to the Corporate Asset Management Program, and therefore the transportation infrastructure systems are described as follows in terms of services & service areas rather than asset category:

- *Roads & Structures - Roadways include those classified as major arterial, minor arterial, collector, local, or suburban links as defined in the County of Elgin Roads Plan and Policies (February 2009) with the inclusion of road base, asphalt, curb and gutter, storm sewers, and traffic islands. Road structures include bridges, major/minor culverts, pedestrian tunnels, and major retaining walls.*

The County is an upper tier municipality, subdivided into seven lower-tier municipalities. Responsibility for maintenance of infrastructure is divided between the upper- and lower-tier municipalities. The subdivided municipalities are responsible for the majority of the infrastructure within the County. It is the responsibility of the County to maintain major arterial and collector road network and structure

infrastructure belonging to the County. Road and structure (bridges and culverts) infrastructure within the County includes:

- 689 kilometers of paved roads (601 asphalt + 88 surface treated);
- 58 bridge structures;
- 84 culvert structures;
- 2 pedestrian tunnels;
- 4 retaining walls;
- 36 standalone street lights
- ~7,725 traffic signs; and,
- 33 traffic control signals and beacons.

1.7. AMP Limitations

The AMP is a tool which is meant to be used to inform decision making. Other political, social, and environmental considerations should also be considered in planning capital investments. However, the AMP should provide a foundation on which those decisions are made.

In addition, the usefulness of the AMP is directly related to the quality of data used in its analysis. County Staff involved in this AMP were committed to data accuracy, yet some assumptions had to be made in extenuating circumstances. Yet as a whole, the AMP provides an accurate approximation of the County's current and future infrastructure needs.

The following points summarize the assumptions and limitations of this AMP:

- The scope of this Plan covers the assets directly owned by the County.
- This AMP is compliant with the 2021 and 2023 requirement of O. Reg. 588/17 for directly owned County assets. Additional effort will be required by the County to establish the proposed Level of Services (and associated costs impacts) to meet the 2024 requirements.
- The County has not implemented an asset risk management strategy although one has been drafted and is planned for full implementation over the next few years.
- The County addresses condition information in three ways:
    i. Condition may be technically assessed and reported on in a quantifiable technique. This method is the most accurate and most expensive (e.g. Structural Adequacy Rating).
    ii. Condition may be assumed based on age and estimated useful life.
    iii. Finally, condition may be based on the expert opinion of staff using the asset.
- Unexpected events (e.g. climate change, weather patterns) will not disrupt infrastructure replacement and renewal projects over the period of analysis.
- In order to meet the investment requirements identified in this Asset Management Plan, a significant incremental increase in taxes will be required. The double-digit increase, if implemented all within one year would place an undue burden on rate payers. To avoid this, an incremental 1.6% increase in each of the next 10 years is proposed. In the interim, while the gradual escalation of taxes occur, incremental debt will be required to provide the needed cashflow to fund the increased investment in our infrastructure.

2. PROJECT METHODOLOGY

The general methodology we have adopted has been to follow the best practices from the *National Guide to Sustainable Municipal Infrastructure (2002)*, also known as the *InfraGuide*. The approach is described in five steps and was designed to help asset managers assess the level of service currently provided by their tangible assets. It allows asset managers to make fact-supported infrastructure investments decisions, while maximizing the effectiveness of available funds. In developing an AMP for the County, each of the five steps, and their key elements, as presented below, were addressed. Each step is described in detail in the sections below.

1. **Infrastructure Data Inventory -** ***What infrastructure do you own?***

- Analysis of existing data and optimization of data sources;
- Transfer of physical characteristic information into databases; and
- Document inventory of all assets.

2. **Replacement Costs -** ***What is it worth?***

- Define bench-marking unit prices for replacement;
- Calculate replacement costs of all assets; and
- Input information in analytical tools.

3. **Condition Assessment -** ***What is its condition and remaining service life?***

- Review of condition assessment data;
- Transfer of condition data to analytical tools;
- Computing condition assessment indices where appropriate;
- Statistical analysis of defects to assess life expectancy;
- Determination of service life of all infrastructure assets; and
- Comparison with industry standards and definition of acceptable level of service.

4. **State of Local Infrastructure Analysis-** ***What needs to be done to rehabilitate, replace, operate and maintain these assets?***

- Upload condition data in asset management tools and process information;
- Review the effect of different repair alternatives;
- Consideration of lifecycle costs and extension of service life; and
- Determine financial requirements to address needs identified.

5. **Asset Management Strategy -** ***What should be done first and how much will it cost?***

- Consideration of selected "what if" expenditure scenarios; and
- Production of a prioritized short and long-term AMP.

The final part of this report which could be incorporated as an additional question to the list above is — How will you finance your plan? To answer that question, we have reviewed a variety of financing strategies which could be implemented to address the needs of all assets while maintaining an acceptable level of service to the residents.

2.1. Infrastructure Data Inventory

The County already possesses a large amount of inventory and condition assessment data in a variety of formats. ***Table 2.1*** below summarizes the asset inventory and valuation for the roads, structures, and traffic assets.

Asset Type	Asset	Inventory	Unit	Replacement Value
Roads	Major Arterial	31.3	km	$ 26,300,606.30
	Minor Arterial	274.94	km	$ 271,974,721.19
	Collector	354.24	km	$ 321,034,428.00
	Local Road	15.93	km	$ 12,188,701.29
	Suburban Link	12.34	km	$ 12,206,910.81
Structures	Bridges	58	Ea.	$ 122,732,694.00
	Culverts (greater than 3m span)	84	Ea.	$ 56,496,425.00
	Pedestrian Tunnel	2	Ea.	$ 300,000.00
	Retaining Walls	4	Ea.	$ 3,500,000.00
Traffic	Street Lighting	36	Ea.	$ 140,883.84
	Traffic Signs	~7,725	Ea.	$ 1,737,112.49
	Signals & Beacons	33	Ea.	$ 2,200,000.00
TOTAL				**$ 830,812,482.92**

Table 2.1: Inventory and Valuation

2.1.1. Road Network Inventory

Prior to preparation of the AMP, County staff had created a digitized road network database. Information such as year of construction, surface type, and pavement widths were some of the attribute information that was required in the development of the AMP.

2.1.2. Structures Inventory

The point assets considered within this AMP include bridge and culvert structures three meters or larger in span. The main source of information for these point assets were reports created to respond to Ontario Structure Inspection Manual (OSIM) requirements. To meet the requirements set out in OSIM, all structures on Ontario highways must be inspected at systemic intervals, based on defined technical and material standards. Full reports were developed for the structures within the County, providing detail on condition, physical attributes and recommendations for future needs and rehabilitation.

County staff, reviewed all OSIM and PSAB data and made appropriate adjustments to parameters such as service lives and replacement cost of an asset. The goal was to cater the existing information on current infrastructure conditions to the AMP development process.

2.1.3. Traffic Asset Inventory

To meet transportation needs, the County owns and operates an extensive inventory of static, electrical and electronic Traffic infrastructure valued at over $4 million. Assets range from street lighting units, to regulatory and informative signage, and road line markings. ***Table 2.1*** above summarizes the asset inventory and valuation for the Traffic assets.

Traffic infrastructure is broken down into three categories: Street Lighting, Signals & Beacons, and Traffic Signage. Maintenance and upkeep of Lighting and Signals assets are contracted out to a third party. However, operating activities are undertaken by County staff. The contracts and Provincial standards govern asset performance and the timing of work. The County also maintains road signage and line markings. Major and minor regulatory signage is governed by the Highway Traffic Act, and local bylaws, respectively. Guidance or Information signs are posted as defined in the Ontario Traffic Manual.

2.2. Replacement Costs

Calculating the replacement costs of infrastructure assets provides insight on the existing financial investments on municipal infrastructure networks. To calculate overall replacement costs, County staff utilized unit construction costs based on recent construction activities completed in the area. Calculation of replacement costs for point assets involved assigning an average unit cost per square meter of deck area to each bridge, and per meter of length for culverts. The replacement costs were dependent on the construction type and overall size of each structure. The replacement costs calculated by County staff were developed from previous project experience.

2.3. Condition Assessment

The generation of condition indices, using consistent and repeatable techniques, is essential in comparing assets and identifying needs in all types of infrastructure. These indices are used to track improvements to the level of service in the condition of the asset network in the form of financial investment. The County already has performance data on their road network which was summarized using an index called Structural Adequacy Rating (SAR). That index was correlated to a Performance Index (PI) the road network ranging from 0 to 1, with 1 representing an asset in perfect condition. This conversion was required for processing of the data in the asset management tool. Once all assets were assigned a condition rating, knowledge of assets and technical expertise were used to determine rating level which represented the minimal level of service that can be provided to the residents. Any components of infrastructure rated below the minimal rating are considered in needs of repair to improve the level of service. The minimum rating, or level of service, is called the –Threshold of Acceptability of an asset.

The following ***Figure 2*** illustrates graphically an example of performance thresholds and deterioration model used for road networks.

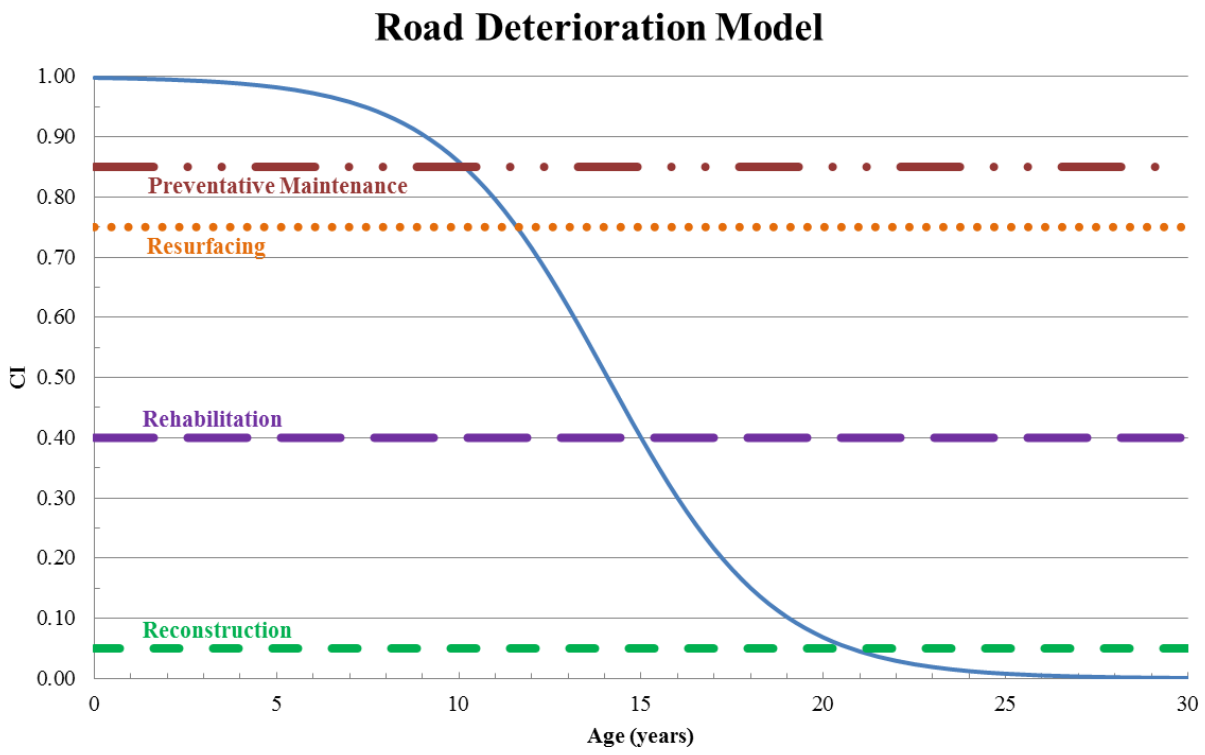


Figure 2: Deterioration Model and Threshold of Acceptability

2.3.1. Road Network Condition Assessment Process

The County has a highly developed Structural Adequacy Rating system which is used to summarize the results of condition assessment surveys carried out on all the roadway sections in the network on a regular basis. This survey provides a more accurate indication of the condition of the road surfaces, and better prediction of roadway deterioration. This information was used to analyze the road network over time.

2.3.2. Bridge and Culvert Condition Assessment Process

Condition assessment surveys have been carried out on the bridge and culvert point assets earlier this year through the OSIM report program. The detailed condition assessment evaluated the condition of the elements of each structure, and identified elements requiring repair, however did not attribute condition indices to the structures. Therefore, it was decided to take an approach based on year of construction and remaining service life in determining condition indices. The OSIM and PSAB databases contained information on year of construction, service lives and replacement costs, which were used to approximate timing for rehabilitation and replacement of those assets. The approximations were reviewed and adjusted in some cases to better reflect actual condition of some assets.

3. DESIRED LEVELS OF SERVICE

3.1. Municipality Objectives

Every municipality must develop objectives on the expected quality of life desired in their municipality and a vision for the future. These are established either through a structured process (such as a comprehensive municipality plan) or by other means. The objectives and vision usually include elements of health and safety, social wellbeing, economic and cultural development, and other factors. Municipality objectives rely heavily on the ability of the existing infrastructure to support such plans. In many instances, the objectives call for new infrastructure that the municipality will have to operate and maintain for generations.

Levels of service have to be aligned to the strategic direction of the municipality. Appropriate levels of service must consider the municipality's ability and willingness to tolerate risk. The costs associated with the levels of service need to be established and evaluated in view of the capacity of the municipality to support them.

Ideally, each municipality should use this process to define their acceptable level of service. Once determined, all assets would need to be reviewed and compared to the municipality's expectations. Action plans on remedial measures would have to be developed to close the gap between expectations and reality, if physically and financially possible.

3.2. O.Reg 588/17 Requirements

O. Reg. 588/17 requires legislated municipality levels of service for core assets. Municipality levels of service use qualitative descriptions to describe the scope or quality of service delivered by an asset category. Examples of legislated municipality levels of service include a map showing the different levels of road class pavement conditions or images that illustrate the different condition of bridges and how this would affect use of the bridges.

O. Reg. 588/17 also requires legislated technical levels of service for core assets. Technical levels of service use metrics to measure the scope or quality of service being delivered by an asset category. Examples of technical levels of service include average surface condition for paved roads based on the Structural Adequacy Rating Value or the average bridges conditions based on Bridge Condition Index value.

The following ***Table 3.1*** below lists the performance measures that are included in the O.Reg 588/17 requirements for Roads and Structures assets. References are provided to show where O. Reg 588/17 requirements have been attained:

Table 3.1 O. Reg 588/17 Levels of Service Metrics for Roads and Structures Assets

Customer Level of Service	Technical Level of Service
• Description or images that illustrate the different levels of road class pavement condition.	• Average surface condition (e.g. excellent, good, fair or poor) for unpaved roads. **(Table 3.2)**
• Description or images of the condition of bridges and how this would affect use of the bridges. **(Figure 3.3)**	• For bridges in the County, average bridge condition index value. **(Table 3.2)**
• Description or images of the condition of culverts and how this would affect use of the culverts. **(Figure 3.4)**	• For structural culverts in the County, average bridge condition index value. **(Table 3.2)**
• Description, which may include maps, of the road network in the County and its level of connectivity. **(Figure 3.1 and 3.2)**	• Average surface condition (e.g. excellent, good, fair or poor) for paved roads. **(Table 3.2)**
• Description of the traffic that is supported by County bridges (e.g., heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, cyclists). **(Table 3.2)**	• # of lane-kilometres of major arterial roads as a proportion of square kilometres of land area of the County. **(Table 3.2)** • # of lane-kilometres of minor arterial roads as a proportion of square kilometres of land area of the County. **(Table 3.2)** • # of lane-kilometres of collector roads as a proportion of square kilometres of land area of the County. **(Table 3.2)** • # of lane-kilometres of local roads as a proportion of square kilometres of land area of the County. **(Table 3.2)** • # of lane-kilometres of suburban link roads as a proportion of square kilometres of land area of the County. **(Table 3.2)** • % of bridges and culverts in the County with loading or dimensional restrictions. **(Table 3.2)**

Other level of service performance measures are related to Corporate Values of Cost Efficiency, Scope, Operational, Accessibility, and Environmental Stewardship. The metrics that go beyond the foundational or regulation required metrics are considered advanced. They indicate service areas have documented planned approaches for operation and maintenance of infrastructure, and have considered trending indicators if the result is planned to be decreased, increased, or to be approximately equal in future years. Foundational and advanced metrics are listed in **Table 3.3**.

Table 3.2 O. Reg 588/17 Required Levels of Service Metrics (Transportation Services)

Table 3.2 O. Reg 588/17 Required Levels of Service metrics (Engineering Services)
Performance Measure: Customer / Council Focused

CUSTOMER VALUE	CORPORATE LOS OBJECTIVE	CUSTOMER LOS MEASURE	CUSTOMER LOS PERFORMANCE	CUSTOMER LOS TARGET
Scope	Providing a transportation network with a reasonable level of connectivity.	Include description, which may include maps, of the road network in the county and its level connectivity.	Maps are included in Figures 3.1 and 3.2	Not Applicable
		Description of the traffic that is supported by county bridges (e.g., heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, cyclists).	The County of Elgin bridges have been designed in accordance with the standard and requirements of the Bridge Design Code at the time of construction. The bridges have been designed to carry heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, and cyclists.	Not Applicable
Operational	Providing an operational road network that is safe for drivers, pedestrians and cyclists.	Include description or images that illustrate the different levels of road class pavement condition.	Images included in Figure 3.1	Not Applicable
		Include description or images of the condition of bridges and how this would affect use of the bridges.	Images included in Figure 3.3	Not Applicable
		Include description or images of the condition of culverts and how this would affect the use of the culverts.	Images included in 3.4	Not Applicable

No Change	Positive Upward	Positive Downward

Table 3.2 (Continued) O. Reg 588/17 Required Levels of Service metrics (Engineering Services)
Performance Measure: Technical Focused

CUSTOMER VALUE	CORPORATE LOS OBJECTIVE	CUSTOMER LOS MEASURE	TECHNICAL LOS PERFORMANCE	TECHNICAL LOS TARGET
Scope	Providing a transportation network with a reasonable level of connectivity.	# of lane-kilometers of Major and Minor Arterial roads as a proportion of square kilometres of land area of the county.	0.34 km	↔
		# of lane-kilometers of Collector roads as a proportion of square kilometres of land area of the county.	0.39 km	↔
		# of lane-kilometers of Suburban Link and Local roads as a percentage of square kilometres of land area of the county.	0.03 km	↔
		% of bridges in the county with loading or dimensional restrictions	3.5 %	↓
Operational	Providing an operational road network that is safe for drivers, pedestrians and cyclists.	Average surface condition (e.g. excellent, good, fair, or poor) for paved roads.	SAR 14.9 (Good)	↑
		For bridges in the county average lifecycle value.	0.33	↑
		For structural culverts in the county, average lifecycle value.	0.25	↑

↔	↑	↓
No Change	**Positive Upward**	**Positive Downward**

Figure 3.1 Images of Pavement Quality Index Inspections Compared to Asset Management Condition Rating

Condition	Images that illustrate the different Pavement Quality Index
Very Good 1 (SAR Value 20)	SAR = 20 
Good Condition 2 (SAR Value 15-19)	SAR = 17 
Fair Condition 3 (SAR Value 12-14)	SAR = 14 

Condition	Images that illustrate the different Pavement Quality Index
Poor Condition 4 (SAR Value 7-11)	SAR = 11 
Very Poor Condition (SAR Value 0-7)	SAR = 4 

Figure 3.2 Map of County Road Network SAR Condition and Level of Connectivity

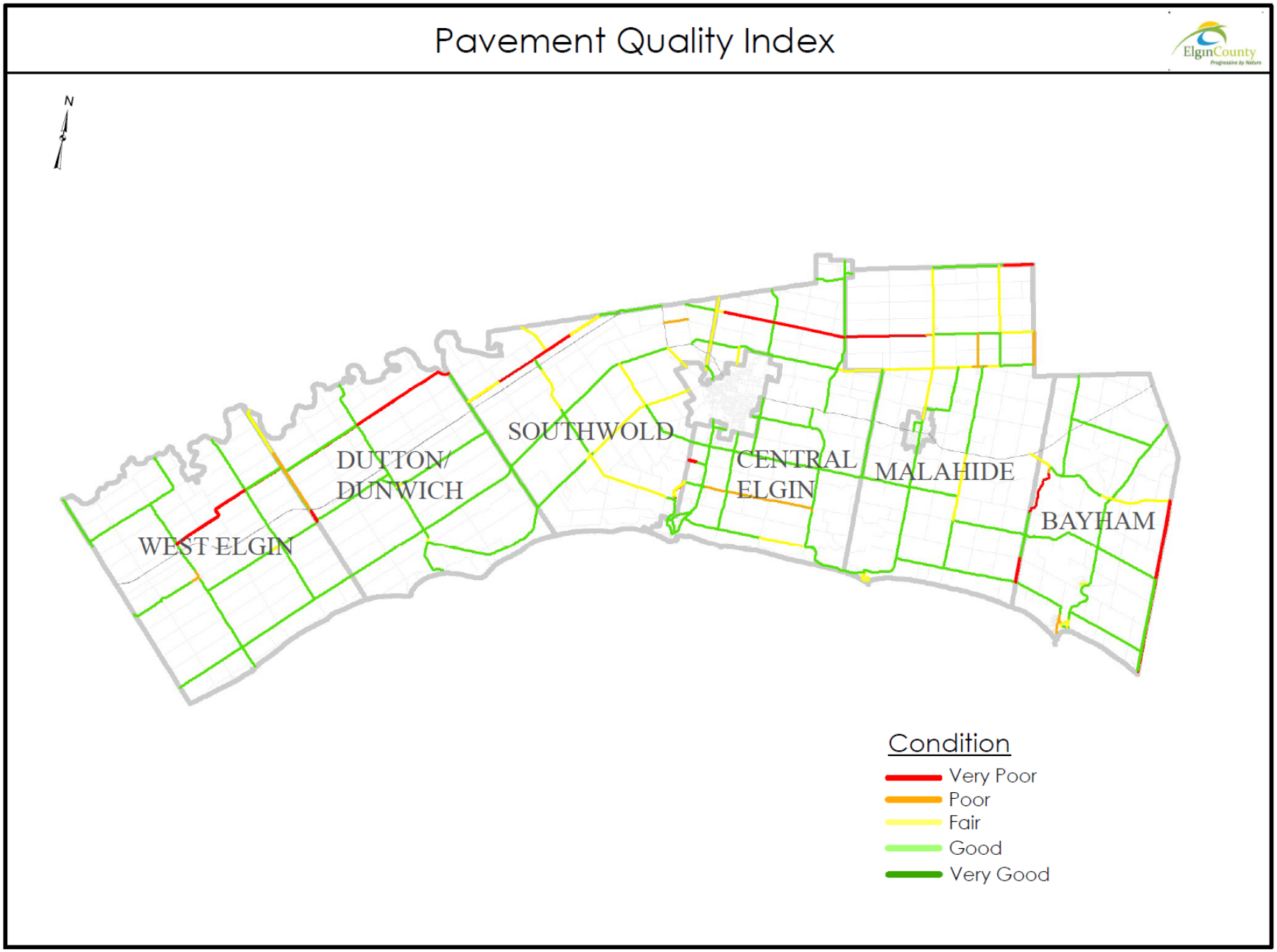


Figure 3.3 Images of Bridge Condition Inspections

Condition	Images of the condition of bridges and how this would affect use of the bridges		
Very Good Condition (BCI 100)	 B43 Glen Colin (BCI 97) – Glen Colin Line (CR40)	**Poor Condition (BCI 30-65)**	 B24 Meeks Bridge (BCI 42) – Sparta Line (CR27)
Good Condition (BCI 80-99)	 B03 Walkers Bridge (BCI 91) – Dunborough Road (CR5)	**Very Poor Condition (BCI 1-29)**	None
Fair Condition (BCI 66-79)	 B32 Belmont West (BCI 66) – Willsie Bourne (CR34)		

Figure 3.4 Images of Culvert Condition Inspections

Condition	Images of the condition of culverts and how this would affect use of the culverts		
Very Good Condition (BCI 100)	 C08A Campbell West (BCI 100) – Duff Line (CR9)	**Poor Condition (BCI 30-65)**	 C61 Clapton Farrow (BCI 61) – Putnam Road (CR47)
Good Condition (BCI 80-99)	 C59 Pettman Moore (BCI 91) – Ron McNeil Line (CR52)	**Very Poor Condition (BCI 1-29)**	None
Fair Condition (BCI 66-79)	 C54 Baird Drain (BCI 73) – Talbot Line (CR3)		

Table 3.3 Levels of Service Metrics – Foundational and Advanced (Transportation)

Table 3.3 Levels of Service Metrics – Foundational and Advanced (Engineering Services)
Performance Measure: Customer / Council Focused

CUSTOMER VALUE	CORPORATE LOS OBJECTIVE	CUSTOMER LOS MEASURE	CUSTOMER LOS PERFORMANCE	CUSTOMER LOS TARGET
Cost Efficient	Providing an efficient transportation network for all modes	Operating cost to provide transportation services (Roadway, Structure, Street Lighting and Traffic Signals) ($/household)	$167.50	↔
Operational	Providing an operational road network that is safe for drivers, pedestrians and cyclists.	% of paved lane km where the condition is rated in fair to adequate condition	34 %	↑
		% of paved lane km where the condition is rated as good	41%	↑
	To provide pedestrian/vehicular traffic control, appropriate lighting, signage and pavement markings for the safe and effective mobility needs of the public in a cost-effective manner	% of signage with visibility that meets (check)	98%	Clear obstructed signage as soon as practicable
		% of street light repairs that meet or exceed county road maintenance timeline standards	100%	100%
		% of traffic signal repairs that meet or exceed county road maintenance timeline standards	100%	100%
Accessibility	Provide an adequate/accessible road network and adequate pedestrian access	% of linear bike facility (i.e. bike lanes) completed vs total in cycling master plan	9.97%	100%
Environmental Stewardship	Providing a transportation network that is environmentally conscious	% of streetlights that are energy efficient	75%	100%
		Volume of salt tonnes applied to road per lane km	10.75	N/A

↔ No Change	↑ Positive Upward	↓ Positive Downward

Table 3.3 (Continued) Levels of Service Metrics – Foundational and Advanced (Engineering Services) Performance Measure: Technical Focused

CUSTOMER VALUE	CORPORATE LOS OBJECTIVE	TECHNICAL LOS MEASURE	TECHNICAL LOS PERFORMANCE	TECHNICAL LOS TARGET
Cost Efficient	Providing an efficient transportation network for all modes	Operating cost for transportation services (Roadway, Structure, Street Lighting and Traffic Signals)	$3,350,000	↔
		Roadway and Structure Reinvestment Rate	1.6%	↑
Operational	Providing an operational road network that is safe for drivers, pedestrians and cyclists.	% of Permitted Approved Woks site inspections	90%	100%
		# of bridges and culverts with reduced load limits	4	0
		% of reduction in injury and fatality collisions over 5 years	Awaiting unredacted ARIS approval	TBD
		% of compliance with Minimum Maintenance Standards	CMMS to be established in future to quantify	100%

↔ No Change	↑ Positive Upward	↓ Positive Downward

Table 3.2 (Continued) Levels of Service Metrics – Foundational and Advanced (Engineering Services) Performance Measure: Technical Focused

CUSTOMER VALUE	CORPORATE LOS OBJECTIVE	TECHNICAL LOS MEASURE	TECHNICAL LOS PERFORMANCE	TECHNICAL LOS TARGET
Operational	Providing an operational road network that is safe for drivers, pedestrians and cyclists.	% compliance with Bridge Inspection Standard	100%	100%
		% compliance of winter maintenance (sand, salt and plowing) with policies, road patrol and maintenance standards.	100%	100%
		% compliance of spring/summer maintenance (sweeping and debris removal) with policies, road patrol and maintenance standards.	100%	100%
		% of roads in poor condition	25%	↓
		% of structures in poor condition	8.4%	↓
		% of signage assets in poor and critical conditions	2%	↓

↔ No Change	↑ Positive Upward	↓ Positive Downward

Table 3.2 (Continued) Levels of Service Metrics – Foundational and Advanced (Engineering Services) Performance Measure: Technical Focused

CUSTOMER VALUE	CORPORATE LOS OBJECTIVE	TECHNICAL LOS MEASURE	TECHNICAL LOS PERFORMANCE	TECHNICAL LOS TARGET
Operational	To provide pedestrian/vehicular traffic control, appropriate lighting, signage and pavement markings for the safe and effective mobility needs of the public in a cost-effective manner	Sign Reflectivity Testing - % Pass	98% Pass Reflectivity Test, ones that don't are replaced as soon as practicable	99%
		% of street light repairs that do not meet county road maintenance timeline standards	CMMS to be established in future to quantify	0%
		% of traffic signal repairs that do not meet road maintenance timeline standards	CMMS to be established in future to quantify	0%
Accessibility	Provide an adequate/accessible road network and adequate pedestrian access	% of linear bike facility (i.e. bike lanes) completed vs total in cycling master plan	9.97%	100%
Environmental Stewardship	Providing a transportation network that is environmentally conscious	% of streetlights with LED or low energy fixtures	75%	100%
		Volume of salt applied to road/lane km (just km that are salted, not all km in the county)	130	N/A

No Change	Positive Upward	Positive Downward

3.3. Determining Appropriate Levels of Service for Elgin County

For this project, a full municipality consultation process for establishing levels of service has not yet been conducted. The process followed was mostly based on the *Asset Understanding*, which considered the physical and functional characteristics of an asset to define a measurable index that can be monitored over time.

Condition indices were determined as described in **Section 2.3: Condition Assessment.** By combining this information with staff knowledge, it was possible to determine if the current levels of service provided to the residents were appropriate. Once acceptable levels of service were established, the information was used to identify current and future infrastructure investment requirements.

4. STATE OF LOCAL INFRASTRUCTURE

Transportation infrastructure is such a crucial part of daily life that it is often taken for granted. When somebody leaves their home, they use a transportation service. Good roads and structures promote business, create employment, provide social opportunities, create markets, and save lives. When transportation infrastructure is deficient, congestion escalates, the frequency of accidents increases, wear and tear on vehicles worsens, emergency response deteriorates, the environment is negatively impacted, business suffers and opportunities are lost.

The importance of efficient transportation is essential to building a strong economy and improving the quality of life for our citizens. The County contributes to the local economy and quality of life by supporting the safe and efficient movement of people and goods using transportation infrastructure, while managing the growing cost of transportation.

Traffic assets are used to support reliable, efficient, and safe transportation through pedestrian/vehicular traffic control, appropriate lighting, signage, and pavement markings.

Each of the County of Elgin's member municipalities operates and maintains County roadways, bridges and traffic infrastructure within their respective jurisdiction, thus enabling safe and effective travel. The County's Engineering Services Department is responsible for planning and operational management of this critical infrastructure. In addition, the County owns and maintains different types of cycling facilities whether they are shared, designated or separated facilities.

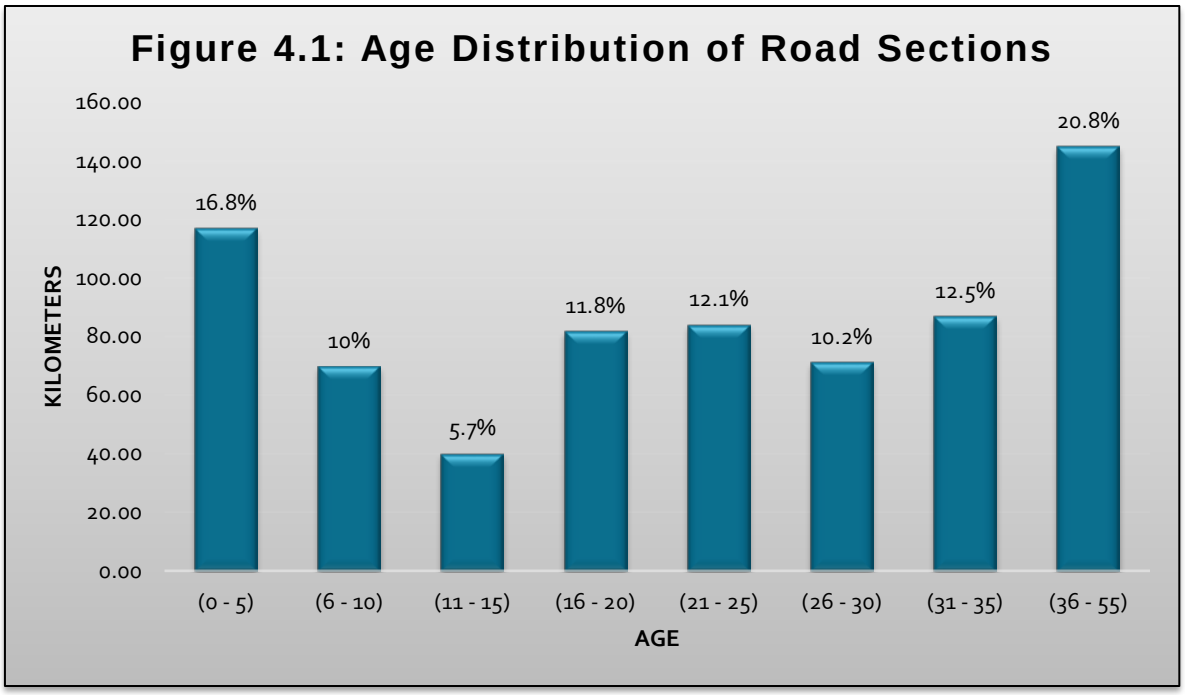
The County has a detailed infrastructure database, which was used to provide detail for the state of the local infrastructure.

4.1 Road Network

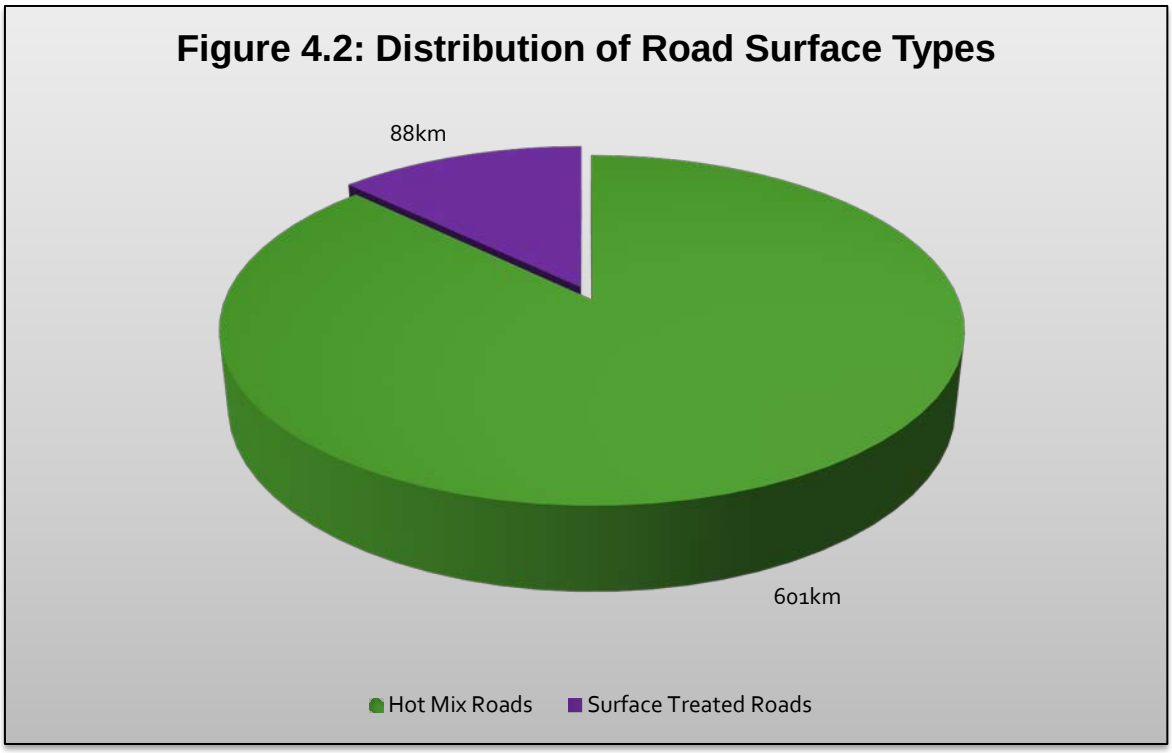
4.1.1 Asset Inventory

The County road network includes 59 roads, which are further divided into a total of 248 unique road classification sections, totaling 689 kilometers.

The characteristics of road sections within the network vary, including variations in the age of surface and surface type of each. The age of the surface for each section was determined using the date of last rehabilitation or resurfacing. The following ***Figure 4.1*** illustrates the distribution of the age of surfaces of the road sections within the network.



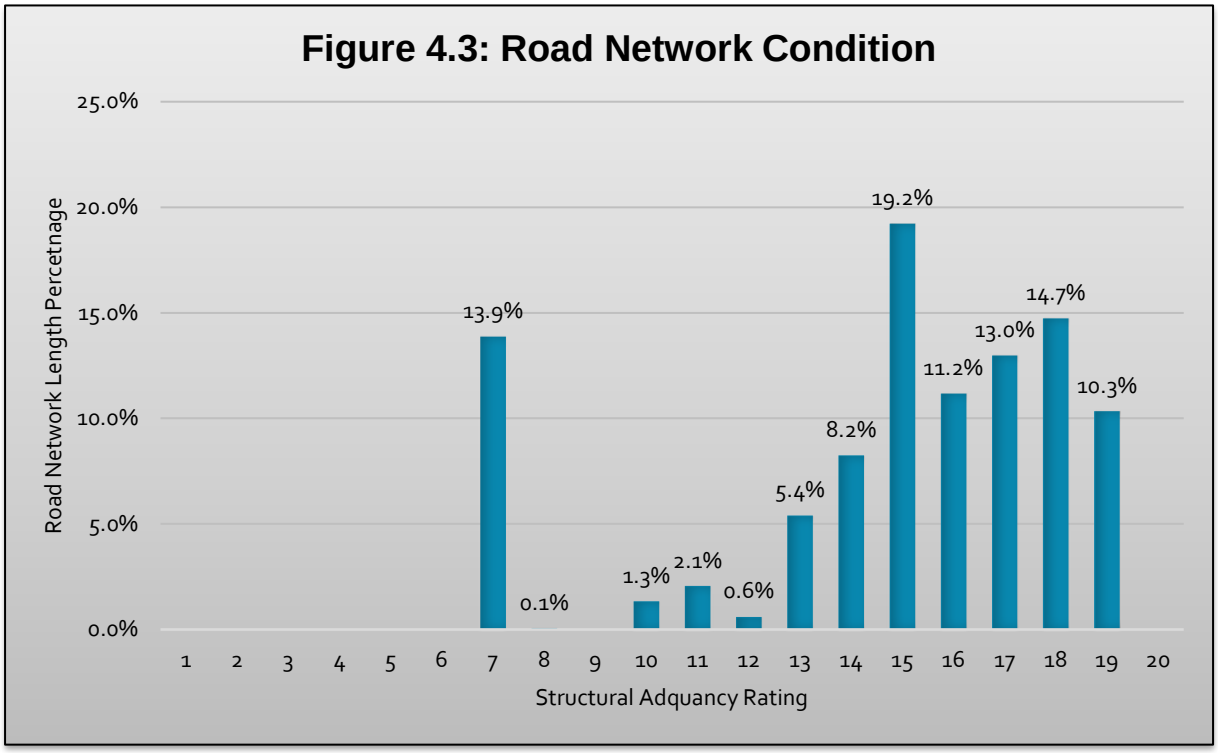
The road sections which make up the road network are varied in surface type. Some roads remain in their original constructed state, while others have been resurfaced, or entirely reconstructed. Based on the level of distress of the road surface, the County employs one of multiple available methods to rehabilitate the road segment, resulting in a network consisting of various surface types. ***Figure 4.2*** shows the distribution of road surface type of the County road network.



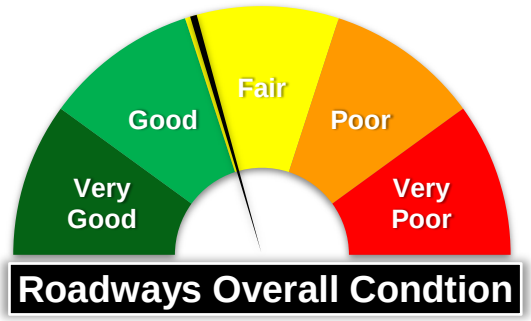
4.1.2 Infrastructure Condition

The condition of the County's road network is important in determining the needs of the overall network and is evaluated based on condition on an annual basis utilizing a system to determine the condition of the road sections in their network, by means of a Structural Adequacy Rating (SAR) attributed to each road section within the network. The SAR is determined using a combination of visual rating with surface distress and longitudinal profile (wheel path roughness) data collection for each road section, and is defined on a scale from 1 to 20, with 1 representing the highest level of distress, and 20 the lowest. The SAR is indicative of the necessity for rehabilitation of the road section and the anticipated remaining lifespan.

Results are analyzed and used to establish the pavement quality for each road segment in the County. The overall network condition was determined through the consideration of the SAR rating attributed to each section in combination with the length of that section as a portion of the entire network. ***Figure 4.3*** below illustrates the percentage of the road network at each SAR, based on the combined section lengths for each rating.



The road network overall is relatively in fair condition, resulting in an average current condition of the road network of approximately 14.9 out of 20. These values indicate that the road network currently provides an adequate level of service to the residents.

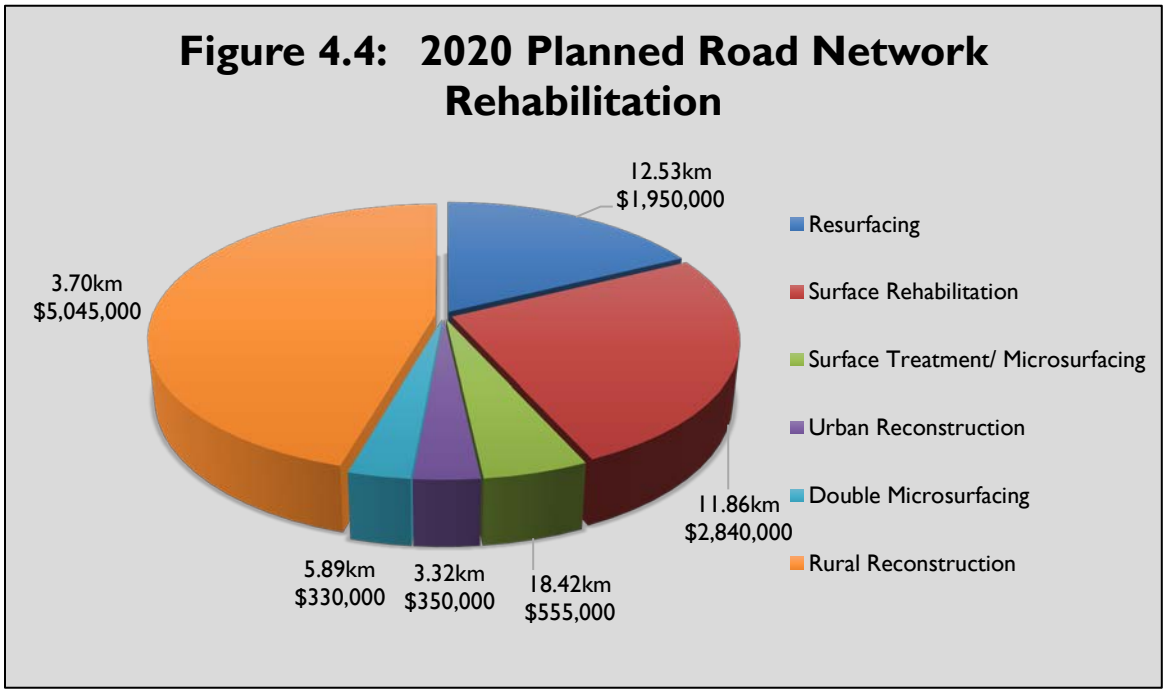


4.1.3 Estimated Asset Value

Without asset management tools, it is almost impossible to determine the long-term effect of inadequate budget allocations. Yet, it is important for a municipality to determine if the current level of funding is appropriate to continue to provide an adequate level of service to its residents. It is also essential to allocate adequate funding to ensure sustainability of the assets in the future. For the County, the replacement value of the road assets was estimated at over $643 million.

4.1.4 Current Needs Summary

The current needs for the County road network are mostly based on the condition of the road. In addition, there may be instances where a road section is considered for rehabilitation prior to incurring a needs-based requirement, where it is deemed practical and cost-effective, or additional requirements. In 2020, it is expected that $11,900,000 will be required for 14 road rehabilitation and reconstruction projects. This road network improvement total is further organized into six categories of needs, including microsurfacing, single lift resurfacing (Asphalt R1), recycling then resurfacing (Recycling + R1), full reconstruction (Construction), and others. The distribution of needs for each of these categories is shown in ***Figure 4.4***.



The majority of the needs currently incurred by the road network can be remedied through resurfacing. The majority work required for 2020 consists primarily of recycling then resurfacing the existing pavement surface.

4.2 Bridges and Culverts

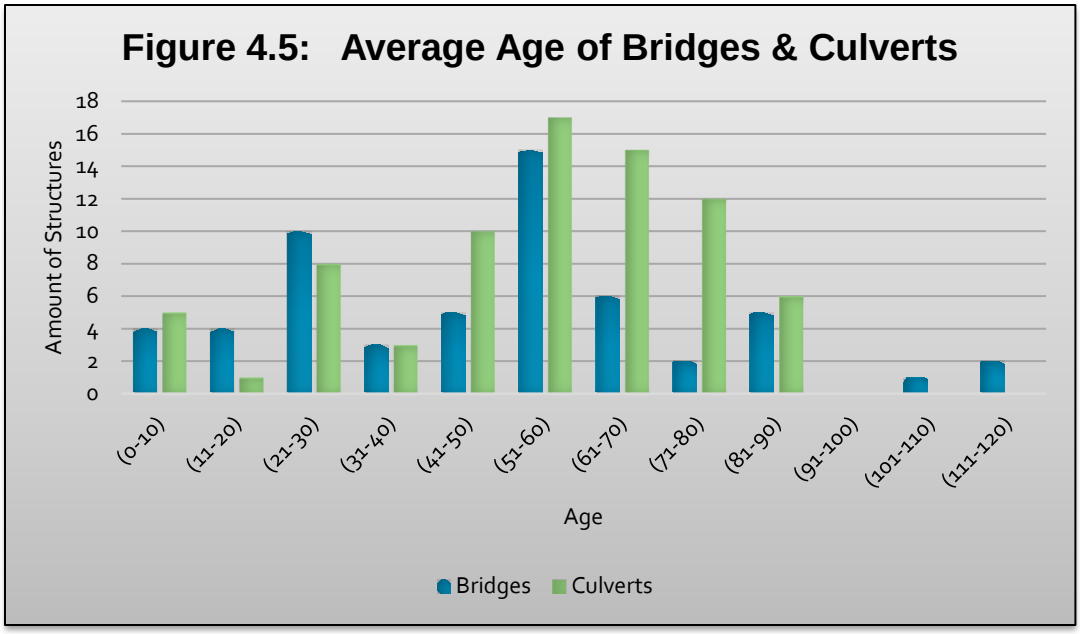
Assets falling under the Structures category are classified based on purpose. Bridges and Culverts are vehicle crossing structures; Pedestrian Tunnels are underground structures that support pedestrian movement under roadways; and Retaining Walls are engineered structures used to stabilize large embankments. Bridges, Culverts and Pedestrian Tunnels are inspected in accordance with Provincial Legislation (Reg. 104/97 Public Transportation and Highway Improvement Act) and are maintained as needs dictate within budget allowances.

In fulfilling this regulated requirement, the County retained the inspection services of Spriet Associates to prepare the most recent Bridge and Culvert 2019 Inspection and Assessment Report which contains the individual bridge and culvert inspection reports having following the Ontario Structure Inspection Manual (OSIM) format. Bridge and culvert inspections were completed from March to August 2019 and were generally limited to ground level visual reviews, and do not include subsurface geotechnical investigations or any materials analysis of bridge components.

4.2.1 Asset Inventory

Bridge and culvert infrastructure in the County are considered within the AMP as being structures three meters in size or larger. This included analysis of 58 bridge structures, and 84 culvert structures.

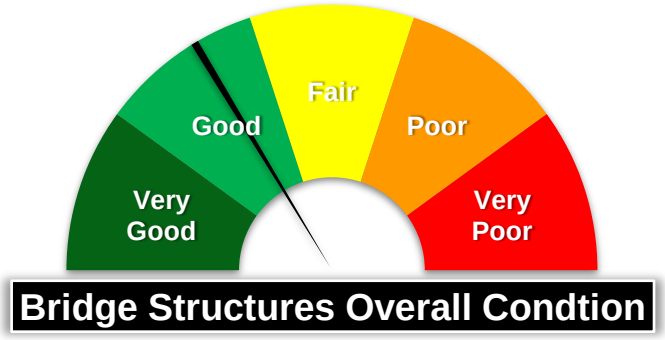
The County's bridge infrastructure varies in construction type, but includes mostly concrete and steel I-beam structures. The average life expectancy for a concrete bridge structure is 75 years, and 50 years for steel. The following ***Figure 4.5*** illustrates the distribution of the age of bridge and culvert structures within the network.



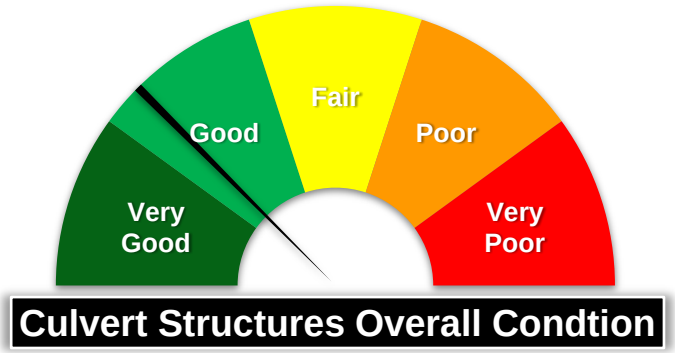
4.2.2 Infrastructure Condition

By law, the County conducts detailed inspections of all of their bridge and culvert structure every two years. Bridge inspectors are trained engineers and technicians with several years of bridge-related experience, and must also follow the guidelines in Ontario's Structure Inspection Manual (OSIM). This manual provides inspectors with specific inspection procedures that must be followed during all structure inspections. When a structure is inspected in detail every 2 years, the trained inspector reviews and rates each structure component. These ratings are used to determine the structure's current value using the Ministry of Transportation's Bridge Condition Index (BCI) weighted average simplified method. Such method for bridges only considers the deck, beams, barrier, and sub-structure elements, while for culverts simply considers barrel and the inlet/outlet treatment elements.

The County uses the BCI to plan maintenance and repairs. The index does not indicate the safety of a structure. The average BCI rating of all County bridges is 86, thus meaning the bridge structure inventory is in good condition. Conversely, the County's bridge inventory average age was determined only to have 33% of its lifespan remaining.



The County's culvert infrastructure includes structures typically constructed of steel and/or concrete. The network includes primarily precast box culverts and corrugated plate steel culverts. The average life expectancy for concrete culverts is 75 years, and 50 years for steel. The County uses the same BCI evaluation system to plan maintenance and repairs for culverts. Through such process it was determined that the average BCI rating of all County culverts is 92, thus meaning the bridge structure inventory is also in good condition. Here again conversely based on the County's culvert inventory average age, it was determined that only 25% of its lifespan remains.



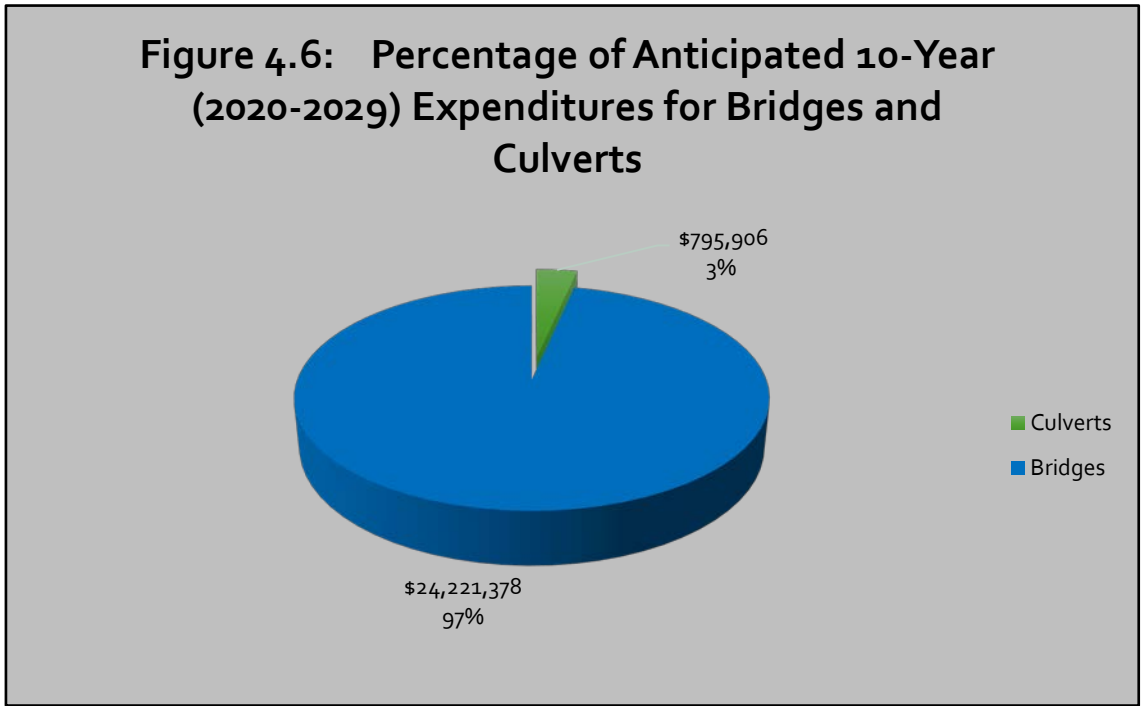
4.2.3 Estimated Asset Value

Without the appropriate asset management tools implemented, it is almost impossible to determine the long-term effect of inadequate budget allocations. Yet, it is important for a municipality to determine if the current level of funding is appropriate to continue to provide an adequate level of service to its residents. It is also essential to allocate adequate funding to ensure sustainability of the assets in the future. For the County, the value of the bridge and culvert assets was estimated at approximately $122.7 million for bridges, and approximately $56.5 million for culverts, totaling over $179 million.

4.2.4 Current Needs Summary

The current needs for County bridges was determined based on the rehabilitation and needs recommendations identified by Spriet Associates and detailed within the OSIM report for each structure, in addition to the year of construction or last replacement of each structure and the life expectancy. A full replacement of the structure is typically recommended at the end of a structures anticipated service life. Additional costs to be incurred prior to full replacement are rehabilitation items identified within the OSIM reports, each of which has a timeline for completion and associated costs.

Based on the results of the current needs analysis, it's estimated that bridge and culvert needs over the next 10 years (2020-2029) will total $25,017,284, broken down in ***Figure 4.6***.



The large expenditure is mostly for assets that have theoretically reached the end of their service life. Continued biennial OSIM inspection of structures will likely result in spreading that amount over a number of years based on actual further field inspection.

It is evident that the majority of expenditures anticipated over the next 10 years will be required to replace several bridge structures, whereas approximately only 3% of the cost for bridges will be required for culvert replacement and rehabilitation.

The results of the analysis for work required on bridges in 2020 identified 3 rehabilitations and 1 full bridge replacement as per OSIM surveys, in addition to ongoing efforts to replace both the Port Bruce Bridge (B19) and Meeks Bridge (B24). The total value of this capital investment is estimated at $10.1 million. The balance of rehabilitation work identified within the OSIM surveys for 2020 generally consist of minor repairs, and do not carry high costs.

The total work for culverts generally only involves minor repairs works as per OSIM surveys. The total investment planned for culvert project over the next 10-years is $795,906.

In addition to the analysis results presented above, the County has identified the following bridge projects to be undertaken in 2020. ***Table 4.1*** lists those projects:

Table 4.1 - 2020 Bridge Projects

Network	Project	Location	Expenditure
Bridges	B01 – Bothwell Bridge Rehabilitation – Detailed Design *(partnership with Middlesex County and Chatham-Kent)*	West Elgin	$100,000
Bridges	B18 – St. George Street Bridge Rehabilitation *(partnership with City of St. Thomas)*	Central Elgin	$310,000
Bridges	B19 - Port Bruce Bridge Replacement *(senior government funding in the amount of $4,166,500 has been announced).*	Malahide	$5,150,000
Bridges	B24 – Meeks Bridge Replacement – Municipal Class Environmental Assessment & Detailed Design	Southwold	$250,000
Bridges	B92 - Kimble Bridge Replacement	Southwold	$480,000
Bridges	B99 – King George IV Lift Bridge Rehabilitation	Central Elgin	$6,070,000

5. ASSET LIFECYCLE MANAGEMENT STRATEGY

5.1 Road Network

5.1.1. Condition Assessment

The County currently maintains a comprehensive MS Excel-based asset road network segmented database. The database was used, in conjunction with details regarding the processes and requirements, for road network rehabilitation and replacement to develop a system through which road improvements are managed. The processes through which a road segment is selected for rehabilitation take into consideration factors in addition to the condition, including:

- Capacity / growth
- Drainage requirements
- Roadside environment
- Construction history
- Planned work by others

The most reproducible technique for determining which road segment requires rehabilitation is through analysis of the structural adequacy rating (SAR), which corresponds to a level of distress of the road surface, as described in **Section 4.1.2**. The County has defined a prioritized list of actions to be undertaken at varying degrees of distress, as detailed in **Table 5.1.**

Table 5.1 – Structural Adequacy Rating

Value	**Distress**	Actions
20	Distress <5%	**None**
19 - 15	Distress 5 - 15 %	**Crack Sealing, Patching, Microsurfacing, R1, MR1**
14 - 12	Distress 16 - 25%	**R1, MR1, PR1, CIREAM/R1**
11 - 8	Distress 26 - 35%	**PR1, CIREAM/R1, MR2, PR2, Reconstruction**
7 - 1	Distress > 35%	Reconstruction, Surface Treated Roads

Each SAR bracket is associated with a list of suggested actions. Additional factors, as listed above, are considered when determining the most appropriate action to be undertaken to a road segment, at the discretion of the County. Further details provided by the County regarding SAR ratings can be found in **Appendix A**.

Because of the high level of intricacy in determining the timing and action type for maintenance of each road segment within the system, it is recommended that the short-term asset management planning, within a timeframe of 10 years from the present, continue in this manner. Retaining the County system to characterize the work to be done allows the system to be inter-connected with additional information and reference to rehabilitation guidelines easily feasible.

The County compiles annual cost information associated with each rehabilitation method used. The cost information provides breakdowns of individual components for each rehabilitation method, and costs per kilometer of road being rehabilitated, details for which can be found in **Appendix A**. These values were used to determine the expenditures for road work in the plan.

5.1.2. Network Condition Lifecycle

Using asset management software, it is possible to analyze the infrastructure needs into the future, and the impact of allocated funding on the overall network condition. Purchase and implementation of asset management software is recommended and will assist County staff in determining what funding levels are required to increase, decrease or maintain the current condition of the network.

As noted in **Section 5.1.1**, the considerations used in the development of the asset management plan as used by the County are intricate and subjective in nature, and dependent on a range of variables. The typical lifecycle of a road segment within the County is illustrated by the grey solid line in ***Figure 5.1.***

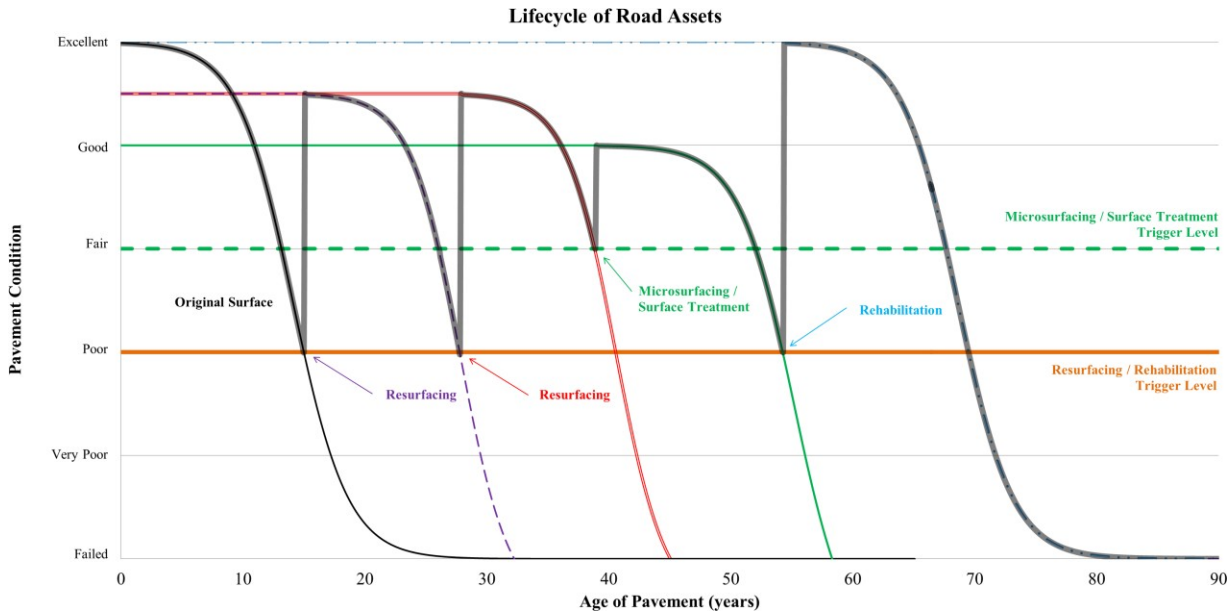


Figure 5.1: Graphical Representation of Lifecycle of an Asset

The figure demonstrates a typical rehabilitation schedule for a road segment, using different rehabilitation options, and their rate of deterioration. As demonstrated in the figure, road network maintenance can be undertaken using a number of rehabilitation options, which are incurred at different road condition levels. The lifecycle presented is considered typical, and the type of rehabilitation, condition level trigger and sequencing of works are all subject to change at the discretion of the County.

5.1.3. Lifecycle Management Approach

The general approach to forecasting the cost of the lifecycle activities that are required to maintain the current performance of the LOS metrics is to ensure that the proportion of assets in poor or very poor condition remains relatively stable. Staff then consider the optimal blend of each lifecycle activity to achieve the lowest lifecycle cost management strategy that balances costs with the forecasted change in the condition profile of each asset type.

5.1.4. Current Budget Condition Profile

The condition profile expected from the current budget can be forecasted with asset management tools by using the same logic related to condition degradation rates and appropriate condition triggers for

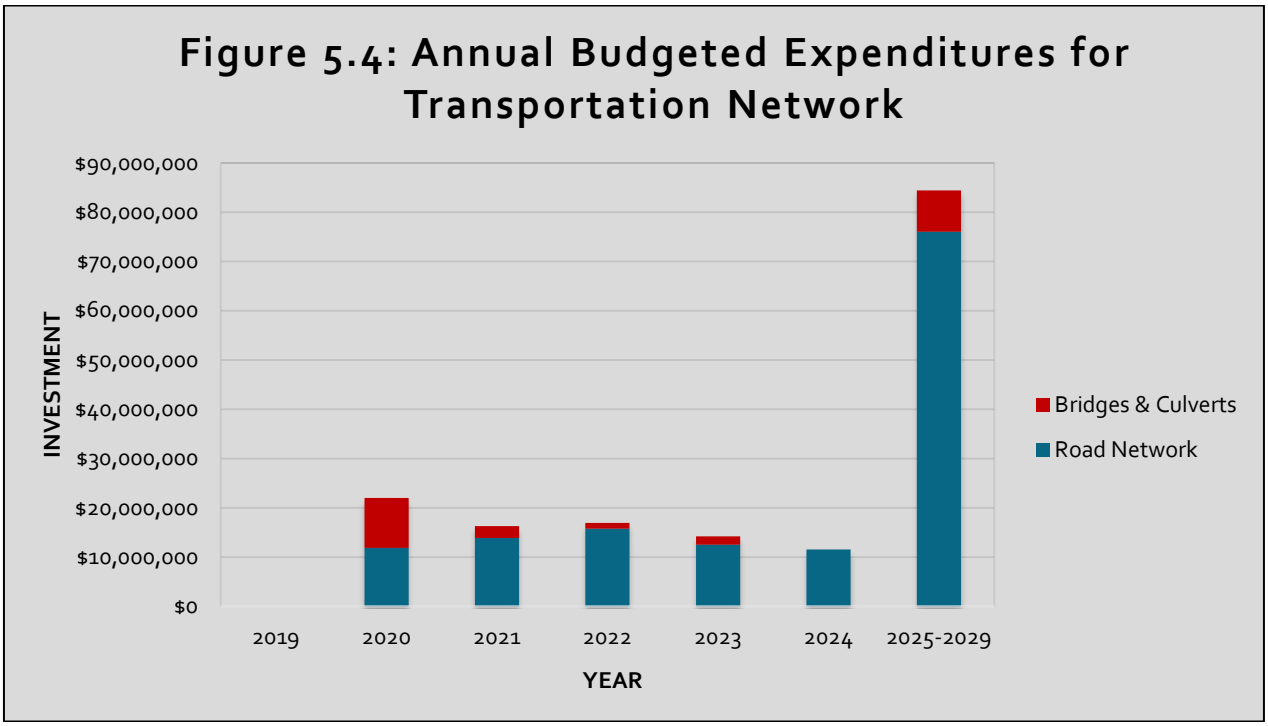
rehabilitation/replacement activities, but the budget is constrained to the current level of planned expenditures. If there is insufficient budget in any particular year to complete a rehabilitation or replacement activity on an asset that has reached its condition trigger, then the asset remains in a Poor or Very Poor condition state until there is sufficient budget in a future year to complete the lifecycle activity.

5.1.5. Optimum Budget Condition Profile

The approach to establishing the optimal budget is to forecast with the appropriate asset management tools the lifecycle activities that are required to maintain the current performance of the LOS metrics. Such analysis would consider the current condition of assets, the rate that the condition is expected to degrade, and appropriate condition triggers for rehabilitation/replacement activities to forecast the condition profile into the future. The variables in such analysis would adjusted until the forecasted condition profile meets the expectation of County staff involved with the management of the assets.

The County currently provides a high level of service to its users of the road network based on the current good condition of the County road network. As a road network in good condition has become the standard for the County, it is recommended that efforts be made to continue to maintain this level of service for its residents.

The AMP developed by County staff utilized the information and strategies currently in place at the County. The plan provides detailed information regarding the projects planned for the upcoming ten years. The first 5 years of the plan includes a breakdown of specific projects attributed to each year. The sixth to tenth years within the plan do not distinguish between individual project years, instead allotting a lump anticipated expenditure of approximately $86.8 million for selected projects. The following ***Figure 5.4*** shows the anticipated expenditure for road rehabilitation for the 10-year scenario, including an assumed even division of the lump expenditure over years 2025-2029, as blue coloured bars. The red coloured bars are representative of the budgeted expenditures for bridge and culvert works.



The budget allocated for bridges and culverts is shown for visualization of the entire budget breakdown. Further detail regarding the usage of the structure portion of this budget is given in **Section 5.3**.

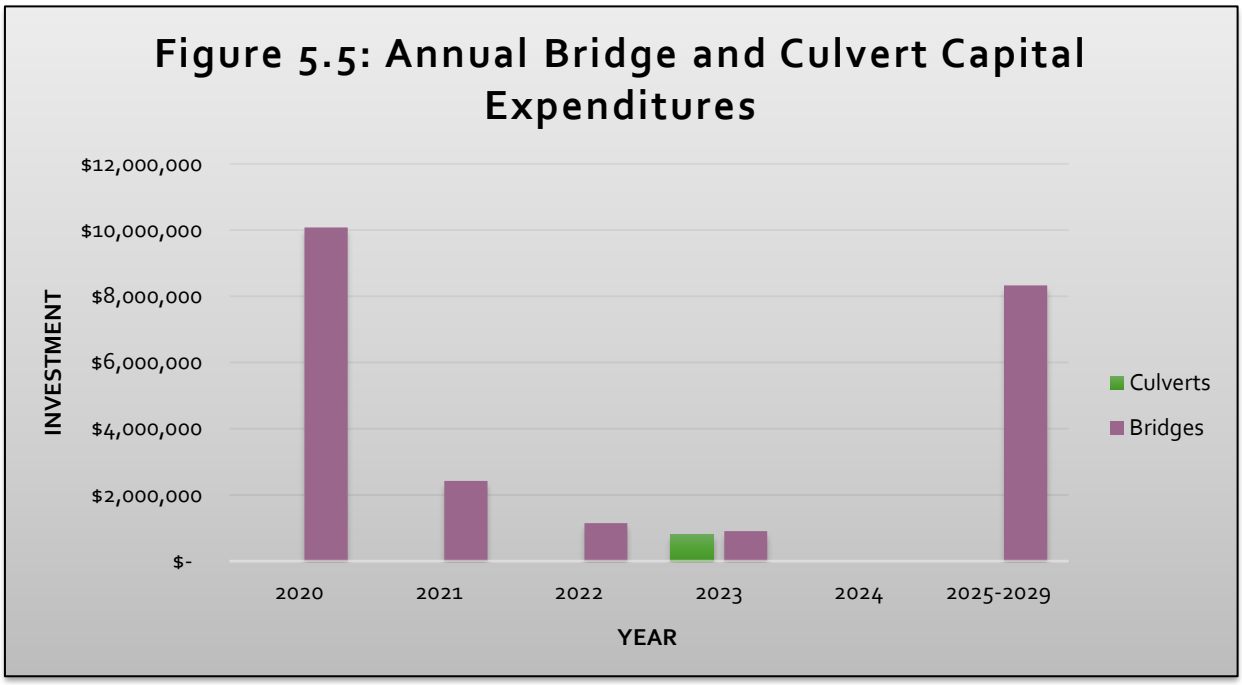
The road network budget allocations for each year within the plan range from approximately $11.5 million to $16.9 million (totaling approximately $145 million over a ten-year period), and were determined to address specific needs identified by the County in an effort to maintain the good quality of the road network. Documents supporting the short-term asset management strategy for the road network as used by the County can be found in **Appendix A**.

5.2. Bridges and Culverts

Network condition indices were not developed for the bridges and culverts. In the case of these structures, a network condition rating is not an accurate way to qualify the condition. The structure network undergoes periodic inspection, through OSIM, which identifies required rehabilitation and condition of structures. Because there are multiple components to each bridge structure, an overall condition index is difficult to determine.

Instead the AMP developed for the bridges and culverts was done having considered the remaining life, replacement cost, and recommended rehabilitation actions for each structure; and developed a schedule and anticipated yearly expenditure for a 10-year timeframe. The plan was developed having predominantly considered the rehabilitation requirements defined in the most recent OSIM reports completed for the structures. These recommendations were included in the plan using the anticipated timeline and cost for each.

Figure 5.5 shows the capital expenditure anticipated for bridges and culverts based upon the age and life expectancy of the structure. Some lower volume, town line structures have exceeded their service lives and although replacement of these bridges is identified, the plan proposes to continue to rehabilitate as recommended in the OSIM report to extend their service lives rather than complete replacement at a significantly higher cost.



The initial year of the asset management plan indicates comparatively large expenditures from the remainder of the plan. These expenditures are primarily in response due to the backlog of rehabilitation and replacement work which exists, as well as the expiration of the 5-year period for repairs identified to be completed within the 1-5 year period in the 2014 OSIM surveys. It should be noted that the OSIM condition surveys have been legislated by the province and must be carried every 2 years. This is a good process to frequently update the plan and accelerate or delay rehabilitation based on the recommendations of the surveys.

5.3. Current and Future Challenges Discussion

5.3.1. Roads

Transportation infrastructure serves a variety of needs from active mobility by walking and cycling, to personal vehicle. Additionally, it supports the economy by enabling the efficient movement of goods and services. An increased transportation infrastructure gap can lower levels of service that are realized in a number of ways including pavement potholes, bridge load reductions, illegible signs, less reliable streetlights and traffic signals, and other distresses. This can result in:

- Lower levels of customer satisfaction
- Lower levels of road safety
- Challenges to personal mobility
- Increased liability and claims
- Longer times to commute to work and school
- Impacts to quality of life

The life expectancy of asphalt is 10-20 years. This is shortened when utility cuts occur. The anticipated time to rehab an urban and rural road is now 37 and 48 years respectively, more than double the life expectancy of the asphalt.

In extreme cases when pavement conditions deteriorate to very poor conditions, road closures may be necessary. Major roadways carrying heavy traffic volumes result in significant congestion and delays for motorists during times of construction and repair. While this work can be planned during off peak and night time hours, there is a cost premium associated with this approach

5.3.2. Structures

Structures form a vital aspect of the County's transportation network creating the connecting links across the various rivers, creeks and tributaries. Maintaining these assets in good, safe condition is important to the prosperity and mobility of our citizens.

Between the late 1940's and the early 1990's, the County constructed 100 of its 143 structures or 70% of its inventory. These structures now range in age from 25 to 75 years. Along with the additional 17% of the inventory that is older than 75 years, the majority of our inventory has reached half of its useful life. With regular routine inspection, regular maintenance and ongoing repairs, the design useful life of these structures can be extended. Regular maintenance includes clearing deck drains and expansion joints, and spot deck delamination repairs. While regular repairs are understood to be major rehabilitations which should be done approximately every 15 to 25 years. These rehabilitations typically may include repairs to all necessary elements including the expansion joints abutments, piers, girders, deck, and parapet walls while ensuring that the structure meets current requirements of the Canadian Bridge Design Code.

Structures are expensive for any municipality to maintain. Replacement costs for a bridge run on average \$4,000/m^2, with major rehabilitation work running on average \$2,175/m^2 depending on the size of the structure and the scope of the required work. These figures do NOT include allowances for service improvements such as widening for bike lanes or geometric improvements, nor do these figures include costs for engineering, environmental assessments or temporary support works necessary to complete the work; all of which are typical requirements for a major structural rehabilitation. These extras requirements result in the above costs being increased by approximately 25%, or \$5,000/m^2 and \$2725/m^2, respectively. In comparison, the cost to reconstruct a two-lane arterial road, including sewer and watermain replacement and engineering runs in the order of \$600/m^2.

Funding levels have been increasing over the last decade but with the majority of the County's structures beyond the 50-year age range and reaching the end of their expected useful life. These funding levels are inadequate to fully address the inventory needs. This means that the need for emergency, temporary repairs (as well as closures) is becoming more prevalent. These emergency repairs normally require unplanned lane closures or posted load limits and result in significant traffic delays, disruption and/or detours. Examples of the County's inventory of aging structures and recent required emergency repairs/replacement include:

- Port Bruce Bridge (B19) - Was constructed in 1964 and was a 3-span reinforced concrete structure. A suspended or "drop in" precast girder centre span (46.6m) was supported by 2 cast in place post-tensioned concrete cantilever spans (22.7m each) that extended from the abutments, over the pier and into the centre span. Total former bridge span was 92m between the centerlines of the abutment bearings, with a total width of 12.9m and total depth of 1.32m. On February 23, 2018, the bridge collapsed as a loaded dump truck was driving across. The structure has been subsequently removed entirely with exception of the south abutment, pier piles and north abutment footings. A temporary single lane panel bridge has been installed 150m downstream to provide vehicular and pedestrian access across Catfish Creek until a new, permanent bridge is constructed.
- Airport Culvert (C09) - Is a 3.1m diameter corrugated steel pipe, installed in 1971 and located on Quaker Road, just north of Elm Line in the Municipality of Central Elgin. During the spring of 2018 a depression formed on the asphalt road surface immediately over the culvert, indicative of a subsurface cavity. Quaker Road was immediately closed to ensure public safety and so that the area could excavated and investigated. It was subsequently determined that fill surrounding the culvert was being washed away from water infiltration at the culvert inlet and holes in the bottom of the culvert. In the fall of 2018 repairs were made to install a concrete apron wall and concrete lining of the culvert floor to eliminate the possibility of water infiltration and fill removal around the culvert barrel.

The age profile of County Structures itemized below in ***Table 5.4*** highlights that this is just the start of a growing need.

Table 5.4 County Structure Age Profile

Ages (Years)	0 - 24	25 - 49	50 – 74	>75
Bridges	9	14	26	9
Culverts	7	26	34	17
Pedestrian Tunnels		1		
TOTAL	**16**	**41**	**60**	**26**

Structure projects are complex, multi-faceted, multi-year projects with many stakeholders. Bridge rehabilitation and reconstruction projects typically require environmental reviews and approvals for water crossings, assessments for the impact to Species at Risk (SARS) and appropriate mitigation measures, railway approvals and flagging when working near CN or CP Rail lines. If the structure is over 40 years old, it has to be evaluated for Cultural Heritage. Often existing servicing and utilities (Bell, Hydro, etc.) are suspended below or attached to the side of a structure. Depending on the scope of work required on the structure, all of these issues require additional effort to coordinate and work around during design and construction. While some structures are small, two lane bridges spanning a small creek, many others need a significant commitment to fund a major rehabilitation or replacement.

B26 Jamestown Bridge – Deterioration and Delamination of Bearing Seat

With current budget allocations and the time it takes to complete the environmental assessments, detailed design and construction work required, multiple years of budget allocation are required to fund any one project.

Another aspect of transportation structure rehabilitations or replacements that needs to be identified are the impacts to mobility. These structures provide a connecting link over or under a natural or manmade barrier. When it is necessary to close the structure to complete the work it often results in significant detours for traffic to find another

route to traverse the barrier (river or rail line). With vehicles, this long detour is annoying but tolerable. For pedestrians or cyclists, this detour may be challenging or excessive. However, the cost of a temporary pedestrian/cyclist crossing can add $1 million to the cost of the project. On already tight budgets, these temporary costs, if not included, result in significant disruption to the active transportation corridors within

the County.

Transportation structures that bridge natural and manmade barriers within our County form the links between communities, support convenient and connected mobility choices, create beautiful places and spaces, and with our heritage structures acknowledge the County's history. Continued strong investment in these assets is necessary to create a safe and accessible County that promotes a connected and vibrant municipality.

5.4. Asset Management Policies

5.4.1. Approach to Data Assembly

The County currently manages a large amount of data and information stored in Excel databases. It is recommended to continue that practice but to incorporate additional information related to all other assets and create what is referred to as an enterprise database. This is critical for ongoing infrastructure management activities within the County organization. The database used in preparation of the AMP encompasses asset information that can support multiple business functions. ***Figure 5.6*** and ***Figure 5.7*** illustrate the concept of going from an ad-hoc data environment to a structured enterprise database.

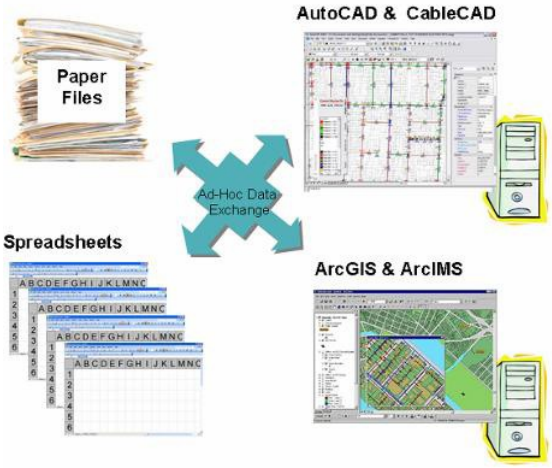


Figure 5.6: Ad Hoc Environment

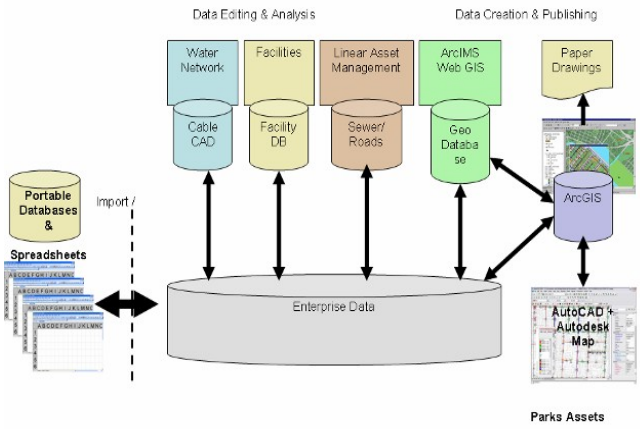


Figure 5.7: Recommended "Enterprise" Environment

The recommendation to use the Corporate GIS as the enterprise database is common practice in many municipalities across Canada. Data is maintained in one environment, and accessible by many users.

Relevant information can be exported in external applications for processing of data. The results can then be imported back in the GIS database and accessed/displayed graphically which add value to the information stored in databases. An enterprise database system reduces data redundancy and increases access to information across the organization, and to County member municipalities. The County currently lacks the required in-house GIS technology hardware and personnel expertise, but staff across the organization support the need to implement GIS more than ever before.

5.4.2. Condition Assessment Strategy

In continuing to maintain a detailed AMP over time, it is highly recommended that the County acquire detailed condition assessment data on all components of their infrastructure assets. It is critical to ensure the data is current and accurate, in order to maintain a useful AMP.

Roads should undergo a full condition assessment every 2-3 years. Given the shorter lifespan of road structures, and high variability in road construction and environment, pavement condition indices are more difficult to estimate over time. Therefore, their condition should be evaluated on a more frequent basis.

The approach for condition assessment of point assets, including bridges and culverts, is to follow the mandated approach of inspection of the assets every 2 years.

5.4.3. Maintenance Activities

It should be understood that most infrastructure assets will usually reach their expected service lives if routine maintenance is carried out on those assets while in service.

Maintenance activities such as crack sealing or slurry sealing a roadway or flushing and cleaning a sewer pipe should be carried out on a regular basis depending on the condition and age of the assets. There are many very good Computerized Maintenance Management Systems (CMMS) in the market that are very helpful and efficient in ensuring sustainability of infrastructure assets.

Responsibility for maintenance of infrastructure is divided between the upper- and lower-tier municipalities by way of respective agreements. Each municipality is responsible for the majority of the day-to-day maintenance of County infrastructure within its jurisdiction in accordance will all applicable provincial regulations. Documenting all maintenance activities associated with such infrastructure through the use of a single global CMMS is highly recommended for implementation.

5.5. AMP Update and Evaluation

The present AMP has been designed for a time span of 10 years. However, as previously mentioned it should be treated as a living document, which is regularly updated to reflect changes in infrastructure condition. It is, therefore, recommended that the AMP be updated every year. This will include incorporating rehabilitations and their associated condition changes, adding newly constructed infrastructure, removing decommissioned infrastructure from the analysis, and updating unit prices for rehabilitation or reconstruction.

The AMP should also be continuously evaluated and improved through clearly defined actions. It is recommended that the County generate a short-term action plan every 2 to 3 years including a timetable for implementation. These actions should include measures to insure data quality, and improve the AMP process.

6. FINANCING STRATEGY

Financing infrastructure needs has become a very serious issue. We need to identify better practices and innovations in infrastructure financing if municipalities and other levels of government want to continue to provide an adequate level of service to tax payers in an affordable manner. It is often thought that municipal infrastructure should be financed, as far as possible, by the residents who benefit from it but, how do you determine who should pay for the rehabilitation of an arterial or collector road going from point A to point B in large cities throughout Canada. In addition, for many years, municipal accounting practices have failed to include replacement costs for depreciating assets, thereby assuring a fiscal shock when replacement time arrives. The Ontario Government has changed that practice, requiring municipalities to realize the extent and magnitude of the infrastructure deficit. Asset managers need to come up with innovative solutions to address that infrastructure deficit. Asset management systems are part of the solution but innovative financing and finding alternate revenue sources are an even bigger part of the solution.

Most municipalities are familiar with a variety of internal and some external revenue sources. The following describes a few of those revenue sources currently being used by municipalities:

- **Internal Revenue Sources:**
  - ***Property Tax***: Property tax will always be the largest source of funding for infrastructure. Although reserves and debt can address the infrastructure deficit in the short-term, infrastructure replacement is an ongoing cost that cannot be funded by ever increasing levels of debt. This means that revenue must ultimately increase to fund the ongoing cost of infrastructure replacement. Revenue increases must be pursued in all its forms: property tax, provincial and federal funding, as well as fees and charges. Even if significant increases in revenue are achieved in provincial/federal funding and in fees/charges, a significant increase in property tax will still be required to make up the shortfall.
  - ***Reserves:*** Recognizing that some infrastructure spending is unpredictable or outside of the normal required investments found within the ten-year capital plan, Council sets aside funds in Capital Reserves in order to have cash available when the need arises. To the extent that cash is not set aside in advance of the need, Council can also use debt as an external funding source. Typically for very large investments, a mix of reserves and debt is required.
  - ***Special Assessments and Local Improvement Charges***: A special assessment is a specific charge added to the existing property tax to pay for improved capital facilities that border them. The charge is based on a specific capital expenditure in a particular year, but may be spread over a number of years.
  - ***Development Charges (DC)*****:** Most large municipalities and many smaller ones impose a specific dollar value per lot on developers to finance the off-site capital costs of new development. Developers are generally responsible for on-site services, such as local roads, sidewalks, and street lighting. Historically, development charges have financed —hard services, such as water supply, sewage treatment, trunk mains and roads. Development Charges can be set by both the lower and upper-tier municipalities. In Elgin, only some lower-tier municipalities use Development Charges. Those that do not have DCs use the lack of such charges as an economic development incentive to attract developers. Those municipalities

without these charges have opposed implementing Development Charges as the county level in both of the two times that DCs have been proposed to County Council.

- **External Revenue Sources**
  - ***Grants:*** Municipalities sometimes rely on provincial and federal government grants for infrastructure. Program such as the MIII is a good example. In the past capital assistance has also been made available for water, sewer, and transportation projects with all three levels of government participating.
  - ***Borrowing:*** Municipalities engage in both short-term and long-term borrowing. Short-term borrowing may be used to finance temporary cashflow shortfalls. For cashflow shortfalls that will extend for years, long-term borrowing is required. The cause of long-term cashflow shortfalls is typically caused by large investments in infrastructure. A good example would be the redevelopment of Terrace Lodge. Such a large investment only happens every couple of decades. For these type of infrastructure investments whose benefits accrue to future residents, it can be argued that these projects should be financed by borrowing with repayment coming from property tax revenues and user fees paid by future beneficiaries. In the case of an investment in roads, which should receive relatively consistent annual funding, debt financing makes sense if there were historical shortfalls in the required investment that require a large investment to address that shortfall.
- **New Financing Instruments**
  - ***A Dedicated Municipal Fuel Tax***: Many American cities levy fuel taxes, but municipalities in Canada do not. In a few Canadian cities and city-regions (Victoria, Vancouver, Edmonton, Calgary, and Montreal), provincial fuel tax revenues are shared between the province and the city or city-region. The federal government‘s recent initiative to provide grants to municipalities from federal gas tax revenue is a form of revenue sharing and not a municipal fuel tax because the municipalities do not set fuel tax rates and have no say over the tax base.
  - ***Public-Private Partnerships (P3)****:* A P3 involves the direct participation of the private sector in a venture controlled by the public sector. The public sector role is to facilitate, regulate, and guarantee provision of an asset and the private sector‘s role is to design, finance, build and operate the asset in a formalized partnership agreement.

6.1. County of Elgin Financing Strategy

The County has identified revenue sources that will support the Asset Management Plan (AMP) developed through this report. The funding sources include:

- Property Tax
- Federal Gas Tax (FGT) and Ontario Community Infrastructure Fund (OCIF) base funding
- Grants and other one-time funding sources
- New Tax Base
- Reserve/Debt Financing

Elgin receives $1.5 in FGT annually and a further $1.3 million in OCIF. Prior to 2016 OCIF funding was $0.3 million. When the province increased funding in 2016, the increase was not deemed to be ongoing.

The three-year commitment has since been renewed, but the County's 2019 ten-year plan assumed that funding would be reduced by $0.9 million in 2021. The proposed 2020 ten-year plan is being modified to assume that $1.3 million in OCIF will continue in perpetuity, thereby increasing funding to the plan by $8 million. Doing so will reduce the need to increase property taxes even further. However, if at some time in the future, the province announces that they will not be fully renewing this funding level, Council will need to reevaluate alternative solutions for funding. A one-time top-up of FGT of $1.6 million was received in July 2019 and will be applied to fund the infrastructure plan. The County, where applicable, will also seek Federal and Provincial funding through competitive grant programs, resulting in a potential funding source.

The draft 2020 ten-year plan will allocate a quarter of the incremental tax revenue received from growth resulting in new property assessment (growth assumed to average a conservative 1% annually) to fund infrastructure, providing $1.1 million in funding. The remaining incremental tax revenue would be used to fund increases in operating costs to fund the increased service demands of the growing population. Council could choose to vary the allocation amount or the assumed growth rate in order to reduce the proposed property tax increase, keeping in mind the potential future implications.

The 2019 ten-year plan assumed that the County would undertake a $10 million loan finance portion of the redevelopment of Terrace Lodge that could not be covered by Reserves. The incremental $46 million of investment recommended in this Asset Management Plan will increase the debt by an estimated $25 million and will result in over $4 million in interest payments over ten years.

The $46 million increase in investment proposed in Asset Management Plan will only partially be funded by increases in the ten-year plan to OCIF, FGT and assessment growth net of interest payments, leaving a shortfall of approximately $40 million. A gradual increase of property tax by an incremental 1.6 % over ten years will provided the necessary funding.

The detailed financial model is being developed as part of the 2020 budgeting process and will be completed with budget approval, anticipated to take place in February. As the model continues to evolve during this time period, the above numbers will be refined as a higher level of accuracy is achieved through the new budget model.

7. CONCLUSION

Valued at approximately $831 million, the County's roads, structures, and traffic infrastructure assets are currently in overall good physical condition. Funding shortfalls in all asset groups will result in a degradation of such assets over the next decade. The infrastructure gap will become visible to County residents through rough roads, potholes, increased vehicle damage claims, reduced road safety, poor pedestrian facilities and increased operating costs, bridge load restrictions, potential closures, and reduced safety. County staff intends to deal with the infrastructure gap through long term strategic planning and continued efforts to lobby senior levels of government for infrastructure funding. As seen in ***Figure 7.1*** below, the total infrastructure gap will grow to approximately $47 million in the next decade derived mainly by the roads which composes about 89% of the Infrastructure Gap.

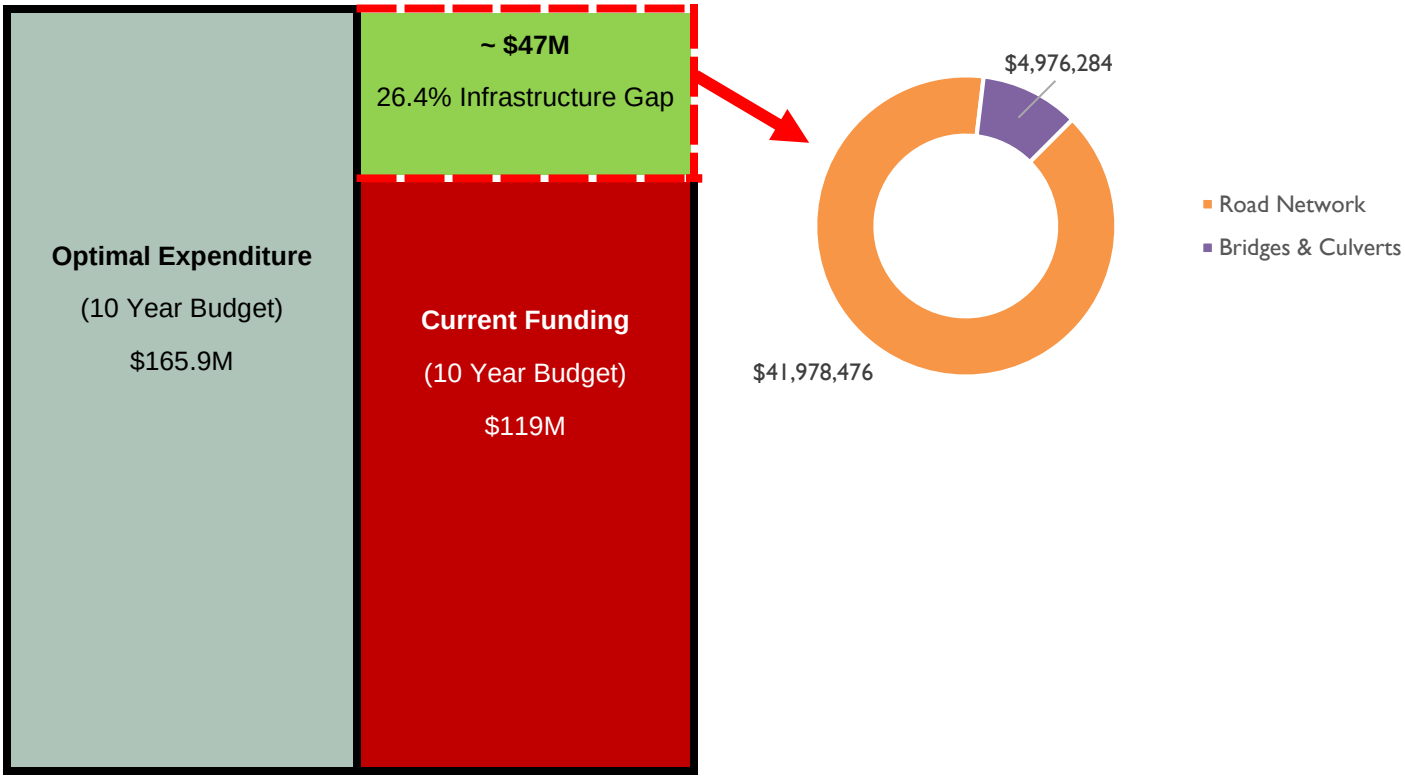


Figure 7.1 Cumulative 10 Year Infrastructure Gap Visual (Transportation Services)

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APPENDIX A

Elgin County Road Network Documents

Structural Adequacy Rating

Structural Adequacy Rating (SAR)		
Value	**Distress*****	**Actions***
20	Distress <5%	None
19 - 15	Distress 5 - 15 %	Crack Sealing, Patching, Microsurfacing, R1, MR1
14 - 12	Distress 16 - 25%	R1, MR1, PR1, CIREAM/R1
11 - 8	Distress 26 - 35%	PR1, CIREAM/R1, MR2, PR2, Reconstruction
7 - 1	Distress > 35%	Reconstruction, Surface Treated Roads**
Notes:	* Actions - are a guide and must also take into account:	
		- Capacity / Growth
		- Drainage Requirements
		- Roadside Environment
		- Construction History
		- Planned work by others
	** Surface Treated Roads are posted at "half load" during spring thaw,	
	and are therefore not "Structurally Adequate" at all times.	
	*** Distresses are deterioration features that affect the pavement's ability	
	to support traffic loads. Surface defects can become "structural distresses"	
	if they are moderate or severe, allowing water to enter the base.	
	Examples of Structural Distresses are:	
		- Moderate to Severe Transverse Cracks
		- Aligator Cracks
		- Moderate to Severe Map/Random Cracks
		- Wheel Track Rutting
		- Moderate to Severe Longituduinal Cracks (CL)
		- Frost Heaving / Boils
		- Surface Ponding
		- Pavement Edge Break up / Creep
	Actions to be scheduled before SAR worsens and changes proposed action.	

NEEDS CODES

		2019 Road Capital Improvement Cost / km	
Surface Treatment	**M**	Single Surface Treatment ($4/m2)	**$ 30,000.00**
Microsurfacing		Single Micro Surfacing w/tack ($4/m2)	
SST or Micro w/Shoulering	**MS**	Single Micro/SST + 400t/km Shouldering at $25/t	**$ 40,000.00**
Double Microsurfacing	**M2**	Double Microsurfacing ($7/m2) + Shouldering	**$ 62,500.00**
		FibreMAT + Shouldering	
		Bonded Wearing Course + Shouldering	
Pulverize Double Surface Tr.	**PDST**	Pulverize / Grade / Water / Compact	**$ 32,000.00**
		50mm Granular A	**$ 20,000.00**
		DST ($6/m2)	**$ 48,000.00**
			$ 100,000.00
Resurfacing	**R1**	50mm Hot Mix Asphalt ($85/t)	$ 95,000.00
	MR1	Granular Shouldering ($25/t)	$ 30,000.00
			$ 125,000.00
Pulverize + R1	**PR1**	Pulverize, Grade and Compact	$ 10,000.00
		50mm Granular A	$ 20,000.00
		50mm Hot Mix Asphalt ($85/t)	$ 95,000.00
		Minor Shouldering (1m wide)	$ 10,000.00
			$ 135,000.00
Surface Rehabilitation	**R2**	Pulverize (milling) / Pack / Water ($3/m2)	$ 35,000.00
	MR2/PR2	100mm Hot Mix Asphalt ($85/t)	$ 175,000.00
	CIP/R1	Granular Shouldering ($25/t)	$ 40,000.00
			$ 250,000.00
Rural Reconstruction	**RREC**	Granular A (0.15mx14mx2.4x$20)	$ 100,000.00
		Granular B (0.45m x 14m x 2.4 x $20)	$ 300,000.00
		Drainage (culverts, ditching, drains)	$ 250,000.00
		Safety	$ 25,000.00
		150mm Hot Mix Asphalt ($85/t)	$ 325,000.00
		Granular Shouldering ($25/t)	$ 50,000.00
		Engineering (15%)	$ 150,000.00
			$ 1,200,000.00
Urban Reconstruction	**UREC**	Excavation / Road Base	$ 450,000.00
*updated with Sparta		Milling / Asphalt	$ 450,000.00
tender results Nov. 2019		Drainage (Storm Sewers, Curb and Gutter)	$ 650,000.00
		Eng. / Restoration / Utilities / Misc.	$ 400,000.00
		Culverts - Page 3 of 2	**$ 1,950,000.00**
	CULV	Road Crossing Culvert Replacement/Lining	**$ 100,000.00**
Widening Rural Recon.	**WRREC**	Land / Utilities	$ 300,000.00
		Granular A (0.15mx14mx2.4x$20)	$ 100,000.00
		Granular B (0.45m x 14m x 2.4 x $20)	$ 300,000.00
		Drainage (culverts, ditching, drains)	$ 250,000.00
		Safety	$ 25,000.00
		150mm Hot Mix Asphalt ($85/t)	$ 325,000.00
		Granular Shouldering ($25/t)	$ 50,000.00
		Engineering (15%)	$ 200,000.00
			$ 1,550,000.00

Desired Level of Service

ROAD DESIGN STANDARDS				
	Class 1	Class 2	Class 3	Class 4
Lane Width (m)	3.75	3.75	3.25	3
Shoulder Width (m)	2.5	2.5	2	1*
* farm entrances 45m wide upon reconstruction				
Horizontal and Vertical				
Curves Design Speed				
Over Posted Speed Limit	20km/h	20km/h	10km/h	0km/h
Safe Stopping Sight Distance				
(speed over posted limit)	20km/h	20km/h	20km/h	0km/h
Drainage - Flood Return	100 year	50 year	50 year	2 year
Collision Rating	1			
(Collisions per million km driven)				
System Wide Condition Rating	80%			
"Roads in Good to Very Good				
Condition" - F.I.R.				
SAR > 15				