



Administrative Report

Office of the Director, Infrastructure & Planning Services

To: Warden MacDonald and Members of Essex County Council

From: Karyn Templin, P.Eng.
Manager, Design and Construction

Date: Wednesday, December 07, 2022

Subject: 2023 State of Good Repair Program Report

Report #: 2022-1207-IPS-R22-KT

Purpose

The purpose of this report is to provide County Council with information and recommendations pertaining to the development of the 2023 Infrastructure Rehabilitation Program and approval of State of Good Repair Program.

Background

The County's Infrastructure and Planning Services Department (IPS) is responsible for a number of construction initiatives including Capacity Expansion, Rehabilitation, Drainage, Engineering, and CWATS, which together provide major improvements to the roads, bridges, railway crossings, active transportation and drainage infrastructure that make up the Essex County Highway Network. The Construction Program, subject to the approval of the 2023 budget, consists of numerous components that are undertaken on an annual basis, including:

- Roadway Expansion;
- Rehabilitation;
- Traffic Operations;
- Engineering, Planning and Design; and
- Transportation Services.

Continuing in 2023, IPS staff evaluate various strategies to optimize the use of capital funding for these programs while considering the complexity of

project scope, opportunities in delivery strategy and coordination of work with local municipalities.

A brief overview of these components is provided herein, however, the focus of this report is to present the 2023 Rehabilitation Program and request approval of the State of Good Repair Program.

Roadway Expansion

The Roadway Expansion program includes a series of projects that support network capacity improvements identified in the Windsor Essex Regional Transportation Master Plan and include the undertaking of Environmental Assessments, Engineering Studies, Preliminary and Detailed Design Assignments, utility works and property acquisition. Construction projects related to highway capacity expansion, rehabilitation, Municipal Drains, County Connecting Links and intersection improvements are also supported through this program.

In recent years, the County has experienced a significant increase in development which in turn puts stress on the road network. The new hospital and EV battery plant are two examples of this development. The County's Roadway Expansion program will continue to grow in an effort to maintain acceptable level of service conditions throughout the Road Network.

Rehabilitation

The Infrastructure and Planning Services Department prepares and delivers and annual rehabilitation program known as the State of Good Repair Program. This Program concentrates mainly on maintaining and improving the condition of the all the assets in the County of Essex Road Network and is the focus of this report. Included in the Program are road pavements, bridge and culverts structures, drainage structures, intersections and guiderails. It utilizes a three-tiered approach of reconstruction, rehabilitation and preventative maintenance to improve our infrastructure and extend the life of our assets.

Much like the Roadway Expansion Program, the influx of development in the area has a direct impact on the level of service values for our roads and structures. As traffic volumes increase, the County's assets see more wear and tear and consequently the rate of deterioration accelerates. The State of Good Repair Program strives each year to meet these demands and maintain the objectives of the County's Asset Management Plan.

Transportation Services

The Countywide Active Transportation System (CWATS) Master Plan is in the process of completing its first full update since its adoption in 2012. The draft report is complete and after a comprehensive review process, is expected to be finalized in early 2023. The updated Plan considers the recommendations of the original study, implementation to date and changes to the active transportation environment, as well as pertinent legislative changes. The CWATS program is developed with local partners to identify, construct and maintain active transportation facilities across the County.

The program also supports numerous initiatives to promote and encourage active transportation. The 2023 CWATS Core Program will be brought forward for County Council's consideration in a separate report.

CWATS is integrated into the County's Rehabilitation Program as IPS strives to maximize the value of our construction efforts. Opportunities to incorporate active transportation facilities such as paved shoulders into scheduled road rehabilitation is a conscious and cooperative departmental initiative.

Discussion

2022 Infrastructure Rehabilitation Highlights

The current construction year has been busy and challenging as society strives to return to pre-pandemic conditions. New policies have been developed and implemented by consultants and contractors alike to ensure the safety of employees on job sites while maintaining schedules and deliverables. Shortages in labour and construction materials wreaked havoc on deadlines and drove unit prices to all-time high levels.

Despite these challenges, the department was very successful in the delivery of our rehabilitation program. Completed works include over 40km of road rehabilitation, the rehabilitation of one bridge and the complete replacement and one bridge and two culverts. Multiple preservation projects were also completed including emergency road crossing culverts, pavement maintenance and structural repairs.

Rehabilitation Program Development

In order to develop the rehabilitation program, IPS annually inspects and evaluates the roads, bridges and culverts that make up the County's infrastructure network. Pavement condition is evaluated based on factors including but not limited to rideability, surface and base conditions, rutting,

drainage and friction. Bridge and culvert structures are inspected on an element-by-element basis, including but not limited to decks, abutments, expansion joints and barrier walls. Similar to the pavement evaluations, structural inspections consider rideability, superstructure and substructure conditions, concrete and steel deterioration and roadside safety. In conjunction with these technical evaluations, the Department evaluates its assets based on factors such as remaining service life, traffic volumes including truck traffic, history of maintenance and rehabilitation, cost-benefit analysis, rate of deterioration and the knowledge and experience of IPS staff.

In developing the rehabilitation program, there are external considerations to be made as well. Operational improvements such as intersection and/or road widening, other roadway components such as drainage, underground utilities, environmental impacts, alignment with municipal works and local development initiatives all play a key role.

Based on the collected assessment data, each pavement section, bridge and culvert, is assigned a rating to indicate the approximate time period in which reconstruction/rehabilitation should be undertaken. These ratings are known as Condition Indices and are typically represented by time categories such as Now, 1-3 Years, 4-6 Years and 7-10 Years.

Closely tied to the development of the rehabilitation program is the County's Asset Management Plan. The Asset Management Plan and its projected expenditure requirements is updated regularly to address changes resulting from updated asset condition ratings, scope of work adjustments and market forces. The Asset Management Plan supports the County's corporate goals which rely upon adequate infrastructure and a defined level of service that the County is committed to providing. The objectives of the process are to establish the value of funds needed to maintain quality infrastructure and identify the means by which this infrastructure is maintained. The quality of this planning process has a significant impact on the condition of the County's infrastructure network and the life cycle cost of maintaining it.

The latest update to the County's Asset Management Plan will be brought forward for County Council's consideration in a separate report.

The intent of the Rehabilitation Program is to ensure a safe and reliable road network while providing for value-added and cost-effective maintenance. Specific objectives put forth in the AMP include:

- To maintain 100% of bridges in the good to fair condition range;
- To maintain 80% of culverts in the good to fair condition range; and
- To maintain 100% of Class 1 and Class 2 roads in the good to very good condition range.

The County's assets are continually inspected to provide defined condition ratings which are used to establish network priorities. Minimum safety related levels of service are typically defined in terms of individual defects (such as potholes, wheel track rutting, cracking of critical elements, and ingress of moisture) and are captured in the overall preservation initiative. Trigger values are usually associated with specific preservation treatments (such as crack sealing and joint seal replacements) and are driven by a need to apply the appropriate preservation treatment at a particular point the service life of a pavement or bridge structure to be considered effective.

Performance prediction is a critical requirement for the identification of future structure preservation needs. There are various types of preservation techniques that the County utilizes to maximize service life and minimize costs. IPS continues to consider environmental concerns and sustainability principles when evaluating rehabilitation alternatives.

Roads

The County of Essex Road Network is made up of almost 1,500 lane kilometres of roads with various classes and composition. The pavement infrastructure has been constructed, maintained and enhanced over many years. As identified in the County's Asset Management Plan, the total replacement value of the Road Network is over \$540,000,000.

The most cost-effective way to maintain the road network is to provide timely, preventative treatments to the pavement. The benefits of this approach are realized in the form of lower overall costs, longer serviceability and less disruption to the travelling public. If pavements are allowed to deteriorate too far, the consequences can be compounding. The rate of deterioration typically accelerates as the end of service life is approached and rehabilitation efforts often becomes unpredictable and sporadic. The result is a pavement that has been cut and repaired in many different locations and by many different methods. In the end, preservation options are no longer applicable and full pavement reconstruction, which is both costly and time consuming, become necessary.

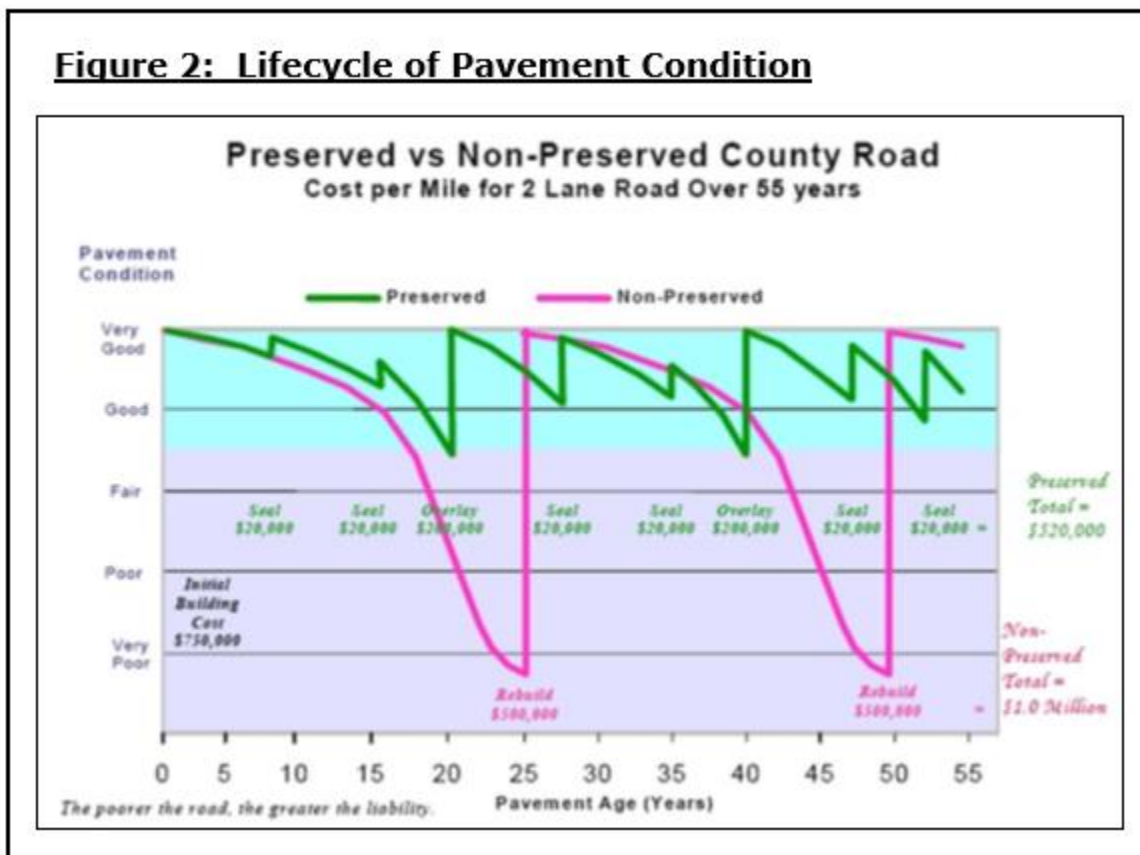
IPS is always looking into new and innovative ways to address pavement deterioration. The objective is to utilize more frequent minor rehabilitation methodologies to allow more kilometers of road to be maintained for the same budgetary values.

In order to optimize the County's position in the development of this rehabilitation program, pavement evaluations are conducted biannually to determine the functional and structural condition of each road segment for the purpose of either routine maintenance or planned corrective action. Pavement Condition Surveys are completed in accordance with the Ministry

of Transportation of Ontario standards in order to determine the Pavement Condition Index (PCI), which then translates into the categories of Very Good, Good, Fair and Poor that are identified in the County's Asset Management Plan. Examples of these conditions can be seen in Figure 1. Road segments found to be in the Poor and Fair categories are then brought forward as potential candidate projects for the Rehabilitation Program. Further review of candidate projects is undertaken to evaluate potential conflicts with other planned construction efforts.



Figure 2 represents sample costs to maintain a road over a set service life through a preserved or non-preserved maintenance strategy. It shows a typical methodology, very similar to what the County employs, that demonstrates how, with the timely application of preservation works, the full life cycle costing can be reduced by up to half of the overall cost throughout a 55-year life cycle for each mile of 2-lane road. Procedures and methodologies such as this one, are reviewed annually by IPS for each road segment in the long-term rehabilitation plan and from this review, the differences between competing pavement design alternatives and subsequent rehabilitation strategies are evaluated.



Bridges

The County's Bridge Inventory currently includes 84 structures that range in age from new to approximately 90 years with an average age of 52 years. The full replacement value of all the County's bridge structures is in the order of \$200,000,000.

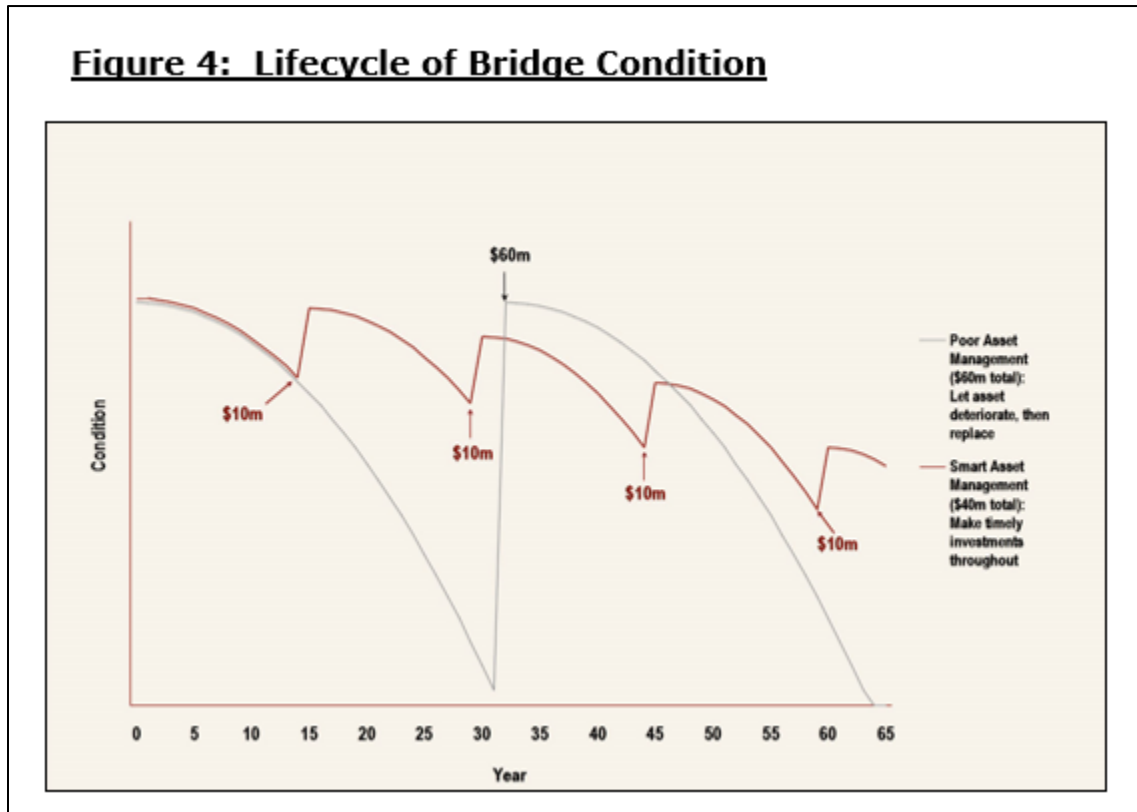
Under the Public Transportation and Highway Improvement Act, 1990 and Ontario Regulation 104/97 and Ontario regulation 472/10 Standards for Bridges, municipalities are required to inspect bridges every 2 years in accordance with the OSIM (Ontario Structure Inspection Manual) procedure established by the Ministry on Transportation of Ontario. Structures are evaluated on an element by element basis and required rehabilitation efforts are categorized as Excellent, Good, Fair and Poor. The individual element ratings are weighted in order to determine a Bridge Condition Index for each structure which is then translated into Now, 1-5 Year and 6-10 Year timeframes. Examples of Good and Poor structural elements can be found in Figure 3.



Based on the OSIM inspections, IPS developed a maintenance and rehabilitation program both for a five-year time frame and for a 30-year time frame. These documents are updated with each new inspection to ensure the programs remain current and reflect the rate of deterioration for the County's inventory. The information included in these rehabilitation programs is based primarily on overall structure conditions, otherwise known as "condition based management", with secondary consideration given to "age based management".

Similar to the lifecycle of pavements, bridges also require regular preventative maintenance initiatives to avoid expensive full replacement projects and extend the service life of the structure (Figure 4).

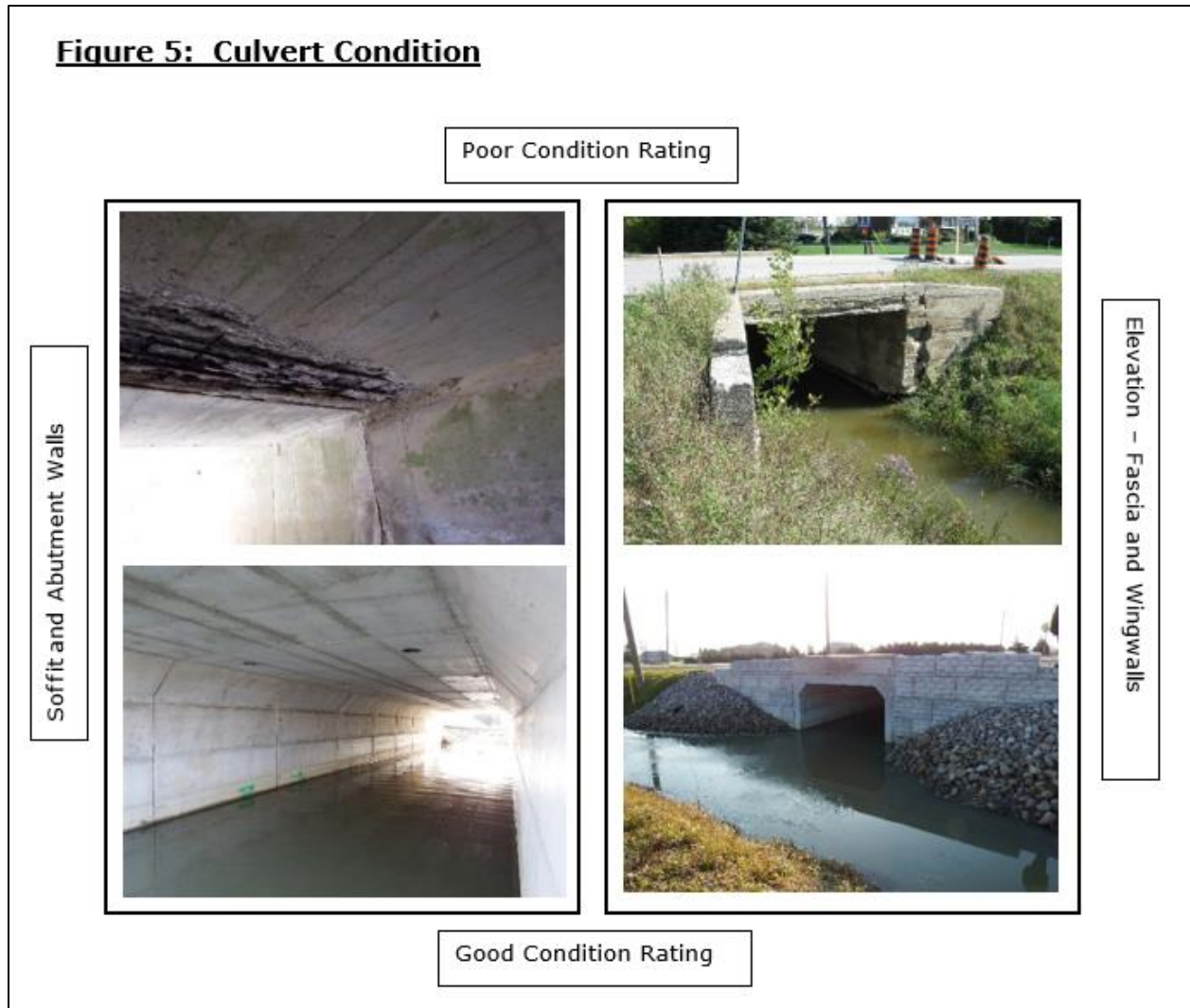
Figure 4: Lifecycle of Bridge Condition



Culverts

The County's Culvert Inventory currently includes 126 structures with spans greater than 3.0m. These structures range in age from new to approximately 90 years with an average age of 46 years. The full replacement value of the County's culvert structures is in the order of \$65,000,000.

Although culverts are not included in the regulations for bridge inspections discussed previously, the County applies the same process for inspecting and evaluating culvert structures. OSIM procedures are followed and Culvert Condition Indices are calculated. Examples of both good and poor culvert conditions can be seen in Figure 5.



A 5 Year Rehabilitation program has been established for culvert structures and based on the number of culverts overall, a 35 Year Program was also created to cycle through the full inventory. The concept of preventative maintenance and lifecycle analysis is the same for culverts as it is for bridges. The objective is to address the deterioration of the structural elements before they reach the end of their service life in order to minimize costly replacement projects. However, because culverts tend to have less complex structural elements than bridges do and because the construction materials are more uniform throughout these elements, culverts are more often replaced at the end of their service life than rehabilitated intermittently.

In addition to the structures with spans greater than 3.0m, the County has in its jurisdiction numerous culverts with spans less than 3.0m. These smaller culverts are typically accounted for in conjunction with road work.

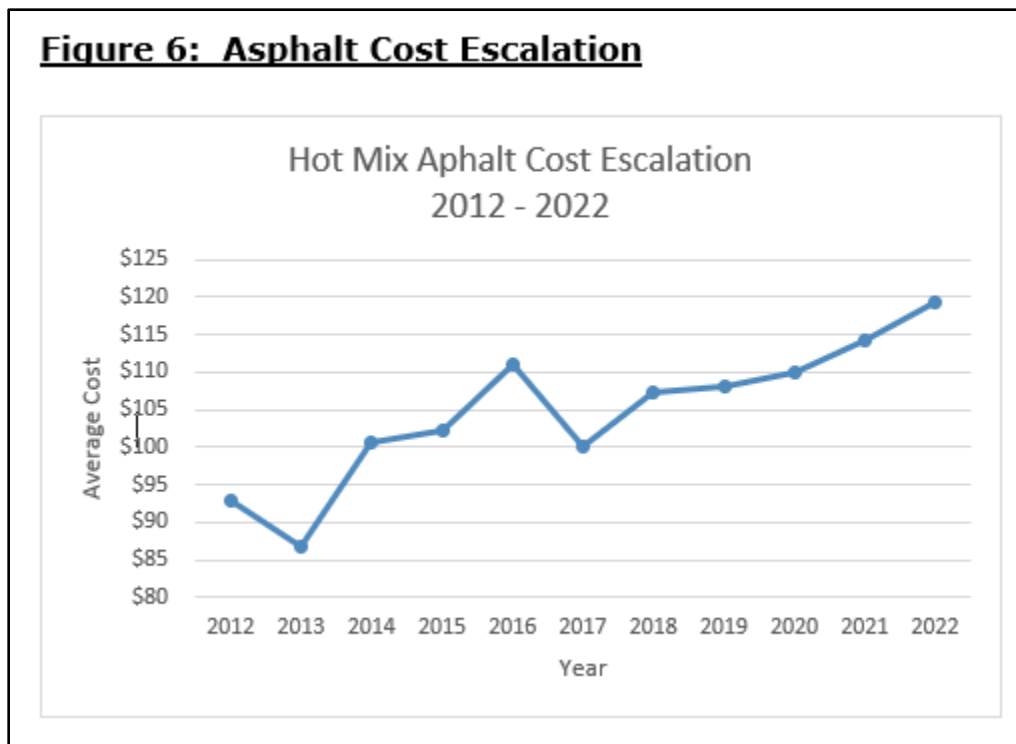
Where possible, the cost to repair or replace these small culverts is incorporated into the overall cost for single-year or multi-year corridor improvements.

In recent years, the IPS Department has established and successfully implemented a Culvert Preservation Program. This program was developed to address the numerous culverts that are in good to very good condition except for a singular element that is in very poor condition. By rehabilitating this singular element, the overall condition of the culvert is improved and the useful life of the asset is extended.

Cost Escalation

The overall condition of the network has been gradually improving over the last several years due to increased annual funding and utilization of funding programs from senior levels of government. Utilization of the Federal Canada Community Building Fund (formerly the Federal/Provincial Gas Tax Fund) has allowed the annual Rehabilitation Program to incrementally increase towards the targeted funding level. But the funding gap identified in the County's Asset Management Plan remains high. Without an increase in annual budget, this funding gap will continue to grow and the overall condition of the County's assets will fall.

Cost escalations have been experienced across all types of construction activities from rehabilitation and preservation of road projects to large bridge projects. Labour, material and equipment costs have all been steadily increasing over the last decade. A good example of this escalation is the unit rate for hot mix asphalt (measured in tonnes). The data shown in Figure 6 illustrates the escalation experienced since 2012.



While the escalation of costs was reasonably steady and predictable over the last decade, 2022 brought unprecedented increases in unit rates for labour, materials and equipment. The rising cost of fuel and diesel, along with construction material shortages on a grand scale, created an uncertainty in the industry that was reflected in tender prices. Unfortunately, there is no way to know what the industry prices will do over the course of the next year, and the 2023 budget values assume 2022 pricing will prevail. What is known however is that the cost of maintaining infrastructure is not decreasing and if the County's commitment to the goals and objectives identified in the Asset Management Plan is not supported, the funding gap will grow and the overall condition of the network will fall to unmanageable levels.

2023 Infrastructure Rehabilitation Program

The 2023 Infrastructure Rehabilitation Program is made up of numerous road, bridge and culvert projects that, based on the comprehensive evaluation methodology discussed in this report, require some type of preservation effort. These preservation efforts are comprised of both major and minor rehabilitation works as well as full replacement projects. The full Program list can be found in Appendix 6 and includes:

- 2 Bridge Rehabilitation Projects;
- 2 Bridge Engineering Assignments;

- 3 Culvert Replacement Projects;
- 3 Culvert Engineering Assignments; and
- 13 Road Rehabilitation Projects.

Also included in the Program are allowances for preservation efforts related to concrete pavements, small and medium sized structures and roadworks.

While road rehabilitation projects are completed within the same year they are initiated, bridge and culvert projects are typically undertaken as multi-year endeavours due to the length of time required to complete the design phase of the project. Engineering design work, environmental approvals and utility relocations are completed in the first year and construction in the following year. As such, the success of the program is dependent upon a consistent delivery of bridge, culvert and road projects.

The total value of the Program is \$18,630,300. This value includes the Canada Community Building Fund (CCBF) and an estimated value for the Ontario Communities Infrastructure Fund (OCIF). While this value is notably higher than previous annual programs, the volume and distribution of work remains the same. The year over year increase is being driven entirely by anticipated market pricing.

Challenges continue to be presented related to the purchasing power of the program as the unit rates for rehabilitation continue to escalate. As a result, the target level of expenditure will require an upward adjustment in future years in order to keep pace with the rate of deterioration experienced across the network.

2023 Paved Shoulder Program

County Council adopted the Paved Shoulder Program in 2016. This program provides for the efficient and cost-effective construction of paved shoulders currently included in the CWATS network. The goal is for the twenty-year implementation plan to be fully integrated with the County Rehabilitation and Capacity Improvement Programs.

The construction of CWATS facilities in conjunction with the road rehabilitation program requires an additional annual budget to fully realize these opportunities. Funding to support this program is provided from the Infrastructure Expansion Reserve with a 2023 construction value of \$2,800,000. The following table highlights the proposed 2023 Paved Shoulder Program. A map of the Program can be found in Appendix 10.

2023 Paved Shoulder Program - Candidate Projects			
CWATS ID	Road Name	Limits	Length
COE-11	CR3	CR20 to CR8	1.6km
COE-4a	CR8	CR27 to 450m West of Graham Sideroad	3.3km
Lake-48a	CR25	CR42 to Highway 401	4.0km
Lake-42	CR31	CR2 to MN#921	2.7km
Kings-2	CR34	CR45 to Road 3	0.8km
Ess-11	CR50	Wright Road to Dahinda Drive	1.6km

Paved Shoulders are built in accordance with Ontario Provincial Standard Specifications (OPSS) and the Ontario Traffic Manual (OTM) Book 18 with desirable measurement of shoulder widths for rural bicycle routes at 1.5m-1.8m, as field conditions allow, on both sides of the road. Buffer separation is included where identified in the CWATS Master Plan and where possible.

Financial Implications

Since 2004, County Council has approved a pre-committed level of expenditure for the early development and release of tendered work associated with bridge, culvert and road projects. This approach has facilitated the completion of critical projects on an expedited schedule with competitive tender results. As we see the strain on the construction industry increase and the economy continue to fluctuate, securing contractual work early in the season is critical to the successful delivery of an elaborate program such as this one. Furthermore, the projects proposed for the 2023 State of Good Repair Program are complicated in nature and rely on precise scheduling in order to be successfully completed in the face of environmental constraints and restrictions.

The projects selected for pre-approval are highlighted in Appendix 6 and total \$18,630,300. Early tendering of these projects will provide the opportunity to take advantage of "off-season" prices, develop and coordinate

work schedules with less conflict and undertake bridge construction outside of environmental restriction windows.

Consultations

This report was prepared in consultation with the following parties:

- Jerry Behl, Manager of Transportation Planning and Development
- Allan Botham, Director of Infrastructure Services
- Hoa Du, Financial Analyst
- Sandra Zwiers, Director of Financial Services / Treasurer

Recommendation

That Essex County Council receive Report Number 2022-1207-IPS-R22-KT, being the State of Good Repair Program Report, and approve the proposed 2023 Rehabilitation Program, having an estimated value of \$18,630,300, with pre -budget approval authorization to release tenders prior to final budget approval; and further that the Paved Shoulder Program as presented herein, having an estimated value of \$2,800,000, be approved to coincide with the 2023 Rehabilitation Program.

Approvals

Respectfully Submitted,

Karyn Templin

Karyn Templin, P. Eng., Manager, Design and Construction

Concurred With,

Allan Botham

Allan Botham, P.Eng., Director, Infrastructure and Planning Services

Concurred With,

Mike Galloway

Mike Galloway, MBA, CMO, Chief Administrative Officer

Appendix Number	Title
1.0	2023 Rehabilitation Program Powerpoint
2.0	County Road Map
3.0	Bridge Location Map
4.0	Culvert (Span over 3m) Location Map
5.0	Pavement Condition Rating Map
6.0	2023 Rehabilitation Program Project Listing
7.0	2023 Rehabilitation Program Location Map
8.0	2023-2027 Rehabilitation Program
9.0	5-Year Rehabilitation Program Map
10.0	2023 Candidate Paved Shoulder Program