ASSET MANAGEMENT PLAN

2022

Asset Management Plan 2022

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1.0 Executive Summary

Infrastructure plays an integral role in the economic, social and environmental advancement of a community. As the backbone of the region, infrastructure supports the municipal services relied on by local municipalities, residents, businesses and other stakeholders. Municipalities own and manage nearly 60% of the public infrastructure stock in Canada.

The County of Essex is responsible for over $300 million of infrastructure assets that support the economies of 7 local municipalities, over 192,000 residents[1], and various local businesses and industries. The core infrastructure portfolio reported in this Asset Management Plan (AMP) is comprised of the County's road network, bridges, culverts, and stormwater network. Together, these assets have a total historical valuation of just over $220 million as of December 31, 2021. The County's road network comprises 50% of the total portfolio valuation, followed by bridges and culverts at 20%.

Asset management can be best defined as an integrated business approach within an organization with the aim to minimize the lifecycle costs of owning, operating, and maintaining assets, at an acceptable level of risk, while continuously delivering established levels of service for present and future customers. It includes the planning, design, construction, operation and maintenance of infrastructure used to provide services. By implementing asset management processes, infrastructure needs can be prioritized over time, ensuring timely investments to minimize repair and rehabilitation costs supporting the maintenance of municipal assets.

Strategic asset management is critical to delivering the highest total value from public assets at the lowest lifecycle cost. This AMP details the current state of infrastructure of the County's service areas and provides asset management and financial strategies designed to balance the desired levels of service with a cost-effective strategy that mitigates long-term funding gaps. In order for an AMP to be effective, it must be integrated with financial planning and long-term budgeting. The development of the County's comprehensive financial plan allows the municipality to identify the financial resources required for sustainable asset management based on existing asset inventories, desired levels of service, and projected growth requirements.

Based on 2021 replacement cost of core infrastructure assets, and a combination of age-based and assessed condition, more than 69% of assets,

[1] 2021 Census of Canada; Statistics Canada

with a valuation of $807 million, are in good to very good condition. Only 6% are identified as in poor to very poor condition or in use beyond their useful life.

The average annual investment requirement for all core asset categories is $27,092,900. Annual revenue currently allocated for the replacement of these assets is $13,400,201 leaving an annual deficit of $13.7 million. In other words, investment in core infrastructure is currently at 49.5% of the long-term requirements.

The strategy proposed in this plan addresses the current infrastructure gap, while balancing the affordability factor of municipal taxes. Failure to address the infrastructure needs of the region will negatively impact the County's ability to provide a reliable level of service in the future, and will directly impact the quality of life of our residents and businesses. This AMP seeks to manage our assets in a way that ensures investments are optimized, timely, and meet the needs of the community at large.

The updating of the County's AMP at this time, complies with new regulatory reporting requirements and will impact the award of certain provincial grant programs that are directly linked to asset replacement values (i.e. OCIF).

2.0 Scope & Objectives

This AMP is one component of Essex County's overarching corporate strategy. It was developed to support the County's vision for asset management practices and programs. It provides key asset attribute data, including the current composition of the infrastructure portfolio, an assessment of the current capital spending framework, and an outline of financial strategies to achieve fiscal sustainability. The long-term objective is to minimize or ultimately eliminate any funding gaps. This AMP will also identify the maintenance and renewal strategies as well as lifecycle costs associated with core infrastructure assets, and define measurable Levels of Service targets for each asset category.

This iteration of the plan was developed in accordance with provincial standards and guidelines outlined in Ontario Regulation 588/17 and provided an opportunity to improve the level of data accuracy and relevance to today's economic, social and political environment. The primary focus is on the core infrastructure assets, such as road networks, bridges, culverts and stormwater networks.

Included in this AMP is a detailed discussion of the state of local infrastructure and assets for each category; an outline of industry levels of service and key performance indicators (KPIs); an outline of the County's asset management renewal strategy for major infrastructure; and a financial strategy to mitigate funding shortfalls. The data presented in this report, except where otherwise stated, is limited to existing assets requiring replacement at the end of their anticipated useful life. Assets required for expansion of service capacity will be addressed separately.

2.1 Data and Methodology

The County's asset inventory is maintained in PSD's CityWide® Asset Manager module. This database records asset data in accordance with Public Sector Accounting Board (PSAB) Standard 3150, as well as other key asset attributes that facilitate reporting and decision making: historical costs, in-service dates, asset life (for amortization as well as lifecycle useful life), field inspection data (as available), condition assessments, replacement costs, etc. Assets are categorized on a high-level basis (i.e. road network, bridges and culverts, and stormwater network). These categories are further broken down into segments, which provide greater detail on the asset types.

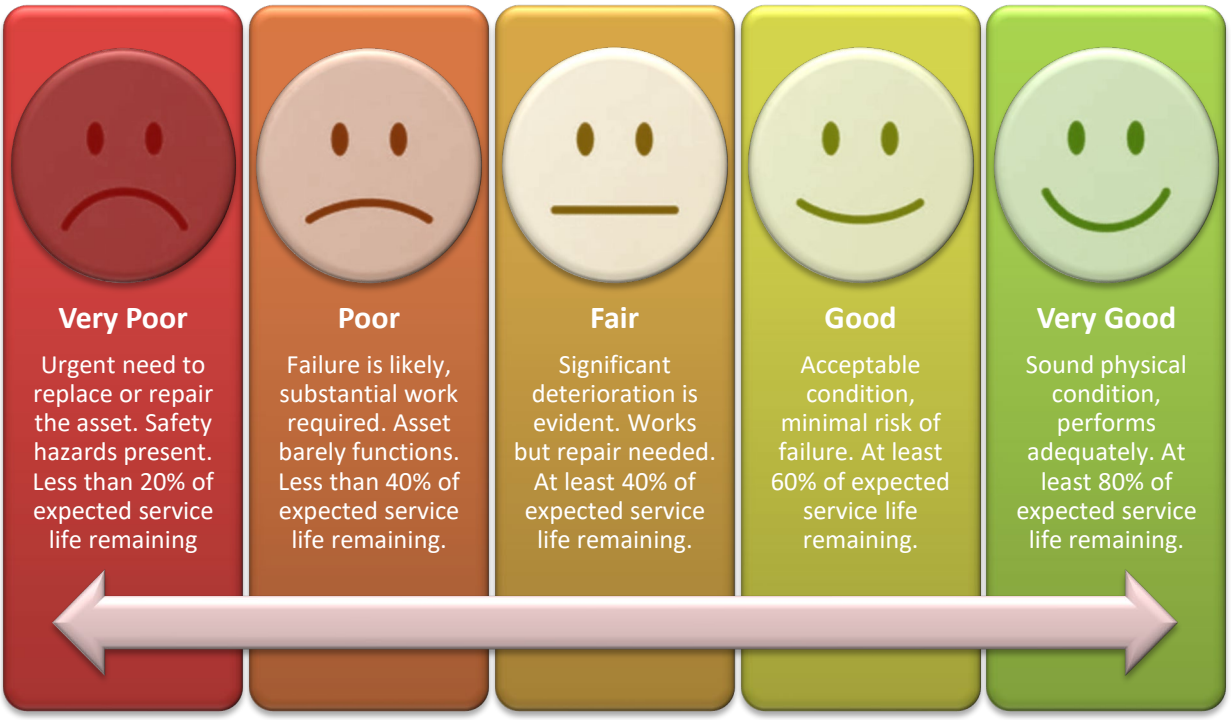
Policy Statement

Capital asset data will be recorded in the tangible capital asset database upon acquisition of the asset. This data will be reviewed and verified annually as part of the year-end audit process to ensure accuracy and completeness.

2.2 Condition Data

For accounting purposes, municipalities implement a straight-line amortization approach to depreciate their capital assets. In general, this approach may not be reflective of an asset's actual condition and the true nature of its deterioration, which tends to accelerate toward the end of the asset's lifecycle. However, it is a useful approximation in the absence actual field condition data and can provide a benchmark for future requirements. We analyze each asset individually; therefore, while deficiencies may be present at the individual level, imprecisions are minimized at the asset-class level when the data is aggregated. A condition scale utilized by Canada's Corp Public Infrastructure Survey is used to assist in determining asset condition, and provides the following ratings:

Figure 2-1: Condition Ratings



Unless otherwise stated, the following condition rating is applied to assets with an assessed condition:

Table 2-1: Condition Rating Scale

Condition Rating	BCI / PCI Rating
Very Good	80 - 100
Good	60 - 80
Fair	40 - 60
Poor	20 - 40
Very Poor	0 – 20

As available, actual field condition data was used to refine recommendations. Observed data will provide the most accurate indication of an asset's physical health. In the absence of such information, the age of capital assets can be used as a meaningful approximation of the asset's condition. The source of condition data used for each asset category is identified below:

Table 2-2: Source of Condition Data

Asset Component	Source of Condition Data
Road network	Assessed 2021 Pavement Condition Index
Bridges	Assessed 2020 Bridge Condition Index
Culverts	Assessed 2021 Culvert Condition Index
Stormwater network	Age-based

Policy Statement

Pursuant to the Public Transportation and Highway Improvement Act, bridges and culverts shall be inspected every two years under the direction of a professional engineer using the Ontario Structure Inspection Manual. Pavement condition indexing shall be performed every two years under the direction of a professional engineer. All other assets shall have condition assessments reviewed every 3 years and updated as necessary.

2.3 Financial Data

The average annual capital requirement is the amount, based on current replacement costs, that municipalities should set aside annually for each infrastructure class so that assets can be replaced when they reach the end of their lifecycle. A municipality that plans for the sufficient funding of capital costs will ensure its reliance on external funding sources is minimized and strengthen its ability to maintain service levels. Determining the appropriate amount of annual funding is complicated by changes in economic conditions affecting replacement cost volatility and the affordability capacity of taxpayers. The reality of asset useful lives may also afford a municipality more or less time to raise replacement funds. Climate change, growth pressures and the quality of raw materials used to construct infrastructure assets, can alter the timing of when funding is needed to replace aged assets. Achievement of 100% funding is the goal; however, few, if any municipalities have achieved this level. It is often more realistic to aim for year over year increases in the overall capital requirement funding percentage.

2.4 Replacement Cost

Replacement cost valuation is based on one of the following methods:

- historical costs inflated to today's dollars using the Consumer Price Index (CPI) tables for Ontario; or
- an estimate of current costs per unit for linear assets, based on an average of costs from the prior year, and tenders awarded in the last 12 months.

2.5 Estimated Useful Life

The estimated useful life (EUL) of an asset represents the average number of years it is expected to be available for use and remain in service before its value is fully depreciated. The EUL for each asset is determined by considering industry standards, practical experience, and consulting with knowledgeable staff.

Expanding on this, the County can determine the anticipated service life remaining by comparing an asset's current age with its EUL, and subsequently provide for a more accurate forecast of future replacement requirements.

2.6 Population and Employment Forecasts

Ontario Regulation 588/17 requires the disclosure of population and employment forecasts as set out in the County's Official Plan. These forecasts are important in understanding the impact on future infrastructure requirements in the region, and ensuring that the asset management plan is aligned with the Official Plan.

The purpose of the County of Essex Official Plan is to establish a policy framework for managing growth, protecting resources and providing direction on land use decisions during the current planning period. The current Official Plan was last updated and approved by the Ministry of Municipal Affairs and Housing in April 2014. In accordance with the Planning Act, municipalities are required to update their Official Plans within 10 years. The development of the new Official Plan will be based on the draft Growth Analysis Report, currently under preparation by Watson and Associates. The results are also intended to guide decision-making and policy development specifically related to long-term growth planning and growth management, municipal finance and infrastructure planning carried out for the County.

Phase 1 of the Official Plan review exercise provides an update to the County's long-term population, household and employment growth forecasts and allocations by Area Municipality to the year 2051. The results of this Phase 1 analysis will be used as part of future phases of the Official Plan Review to assess long-term urban land needs County-wide.

The draft Growth Analysis Background Report identifies that between 2016 and 2021, the County's annual population increased at a rate of 1.2%, fueling steady demand for new housing construction throughout the County. According to the draft report *"looking forward over the next five to 10 years, housing demand across Windsor-Essex Area is anticipated to remain strong relative to recent historical levels fueled by steady immigration as well as positive net migration from elsewhere in Ontario and Canada".*

In contrast to the period between 2016 and 2021, which provided an annual population increase at a rate of 1.2%, the new draft Growth Analysis Report provides a range of low, medium and high population growth scenarios for the planning period to 2051, at 1.0%, 1.3% and 1.5%. By 2051, the County's total population base is forecast to grow to approximately 268,000 to 315,000. This represents an increase of between approximately 69,000 to 116,000 persons between 2021 and 2051. The Watson Report did not provide a recommended scenario as part of the Phase 1 Official Plan Review analysis to allow a detailed assessment of the corresponding urban land needs over the next 25 years associated with each growth scenario.

At the time of the last Official Plan review and associated land needs analysis in 2011 (Essex County Foundation Report, N. Barry Lyon) there was a sufficient supply of designated lands within settlement areas to accommodate urban land needs for the planning horizon to the year 2031. The Official Plan Review 2022-2023, has not yet undertaken the land needs analysis which will be conducted as part of the Phase 2 work program.

According to the draft growth analysis, all of the area municipalities within the County are anticipated to experience higher levels of annual population and housing growth over the 2021 to 2051 forecast period relative to the past 20 years. Under each of the long-term range growth scenarios, the share of population and employment growth by area municipality is anticipated to remain relatively consistent.

It is important to recognize that future population and employment growth within the County strongly correlate with the growth outlook and competitiveness of the broader Windsor-Essex area and surrounding region, specifically the surrounding municipalities which fall within the County's commuter-shed.

Employment growth in the regional economy represents a key driver of population growth to the County. Similar to historical population trends, the County has experienced periods of employment growth and decline over the past 20 years resulting from occasions of economic expansion and contraction across the broader Windsor-Essex Area economy during this time.

Given the competitive position of existing and planned Employment Areas across the County, as measured in terms of location/access to major North American employment markets and large population centres, parcel size, price per acre, and competitive development costs, etc. The County is anticipated to achieve a relatively stronger rate of industrial absorption over the long-term planning horizon under all three growth scenarios.

The three long-term employment forecast scenarios for the County over the 2021 to 2051 forecast period relative to historical employment trends between 2001 to 2021 identify a projected increase under all three growth scenarios. By 2051, the County's employment base is forecast to grow between approximately 108,000 and 124,000. This represents an increase of approximately 36,000 to 52,000 jobs between 2021 and 2051. Under the low scenario the employment annual growth rate is 1.3%, while under the medium and high scenario the employment growth rates are 1.6% and 1.8%.

Steady future economic growth is anticipated across the County, most notably associated with the need for local supply chains to support the planned Stellantis N.V and L.G Energy Solution (L.G.E.S) electric vehicle battery manufacturing facility. The joint venture will invest over $5 billon CAD to create approximately 3,200 direct new jobs and an additional 15,000 indirect jobs within the regional supply chain.

3.0 Asset Portfolio Overview

3.1 Asset Management Report Card

This report focuses on 3 core asset categories: Road Network, Bridges & Culverts, and Stormwater Mains, as required under O.Reg 588/17. Unless disclosed separately, Road Network data is inclusive of road surfaces of all types, as well as roundabouts and CWATS routes. Inventory data is current as of December 31, 2021.

As outlined in the Table below, assets are in good overall condition, however there is an annual funding deficit of $13.7 million that, if not addressed, could lead to decreased levels of service and a deteriorating asset base.

Table 3-1: Asset Portfolio Summary

Asset	Replacement Cost (million)	Weighted Average Condition	Average Annual Requirement	Average Annual Deficit
Road Network	$540.9	Good (68.8%)	$19,618,200	$9,874,900
Bridges & Culverts	$261.8	Good (63.4%)	$7,358,700	$3,720,500
Stormwater Mains	$4.6	Very Good (95.7%)	$116,000	$116,000
Total	**$807.3**	**Good (67.2%)**	**$27,092,900**	**$13,711,400**

3.2 Total Replacement Cost of Asset Portfolio

Total replacement cost of core assets owned by the County is currently estimated at just over $807 million.

The replacement cost of asphalt, concrete and tar & chip roads as well as CWATS routes are calculated based on an estimate of current cost per lane kilometre as determined internally by professional engineers in the Infrastructure Services and Planning Department. These costs are based on an average of historical cost, recently awarded tenders, professional judgement and knowledge of current market pricing.

The replacement cost of the roundabout intersections is determined using historical cost inflated quarterly to today's dollars using the Consumer Price Index (CPI) tables for Non-Residential Business Consumer Price Index (NRBCPI) (Toronto). This formula is deemed to be a reasonable approach given the recent age of the intersections, complex design and construction, and low quantity of these assets.

3.3 Condition of Asset Portfolio

The overall condition of County assets is integral to achieving and maintaining desired levels of service. The portfolio consists of 93.9% of core assets that are in fair or better condition. Further, over 69% of assets are in good to very good condition. The Table below identifies the source of condition data used in this AMP.

Table 3-2: Condition Assessment Status and Source

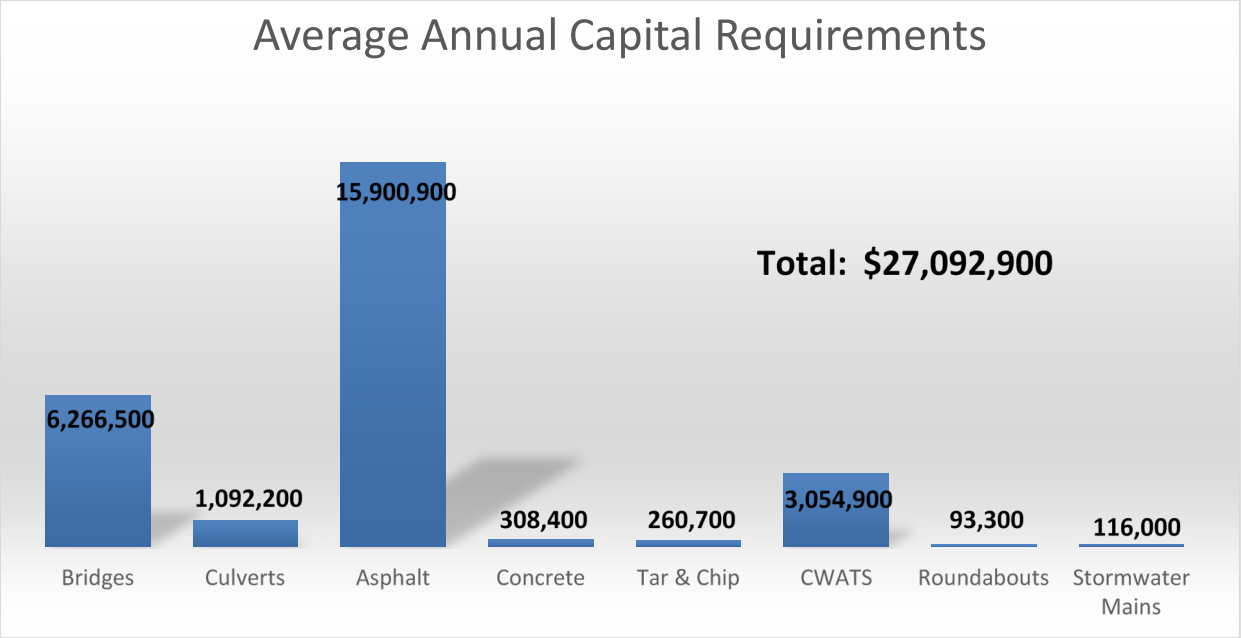
Asset Category	% of Assets with Assessed Condition	Source of Condition Data
Road Network	100%	Internal PCI Assessment
Bridges & Culverts	100%	OSIM Inspection Report (2020 & 2021)
Stormwater Network	0%	Aged based condition

While the majority of assets have a recent condition assessment, the stormwater network currently relies on an aged based condition. Condition assessments are an invaluable measure of the true condition of an asset and its ability to function effectively. Pavement condition assessments are generally performed in-house by qualified staff. The County recently contracted a third-party to perform a condition assessment of its road network. Although the metrics used by the third-party may vary slightly from in-house metrics, the results of the third-party assessment were taken into consideration when finalizing the internal assessment in 2021.

3.4 Capital Requirements

The annual capital requirement represents the amount of funding that should be allocated for lifecycle management and future replacement of an asset category. This allocation is essential to ensuring sustainable service levels. This calculation does not consider amounts required for ongoing operating or maintenance associated with the assets.

Figure 3-1: Average Annual Capital Requirements

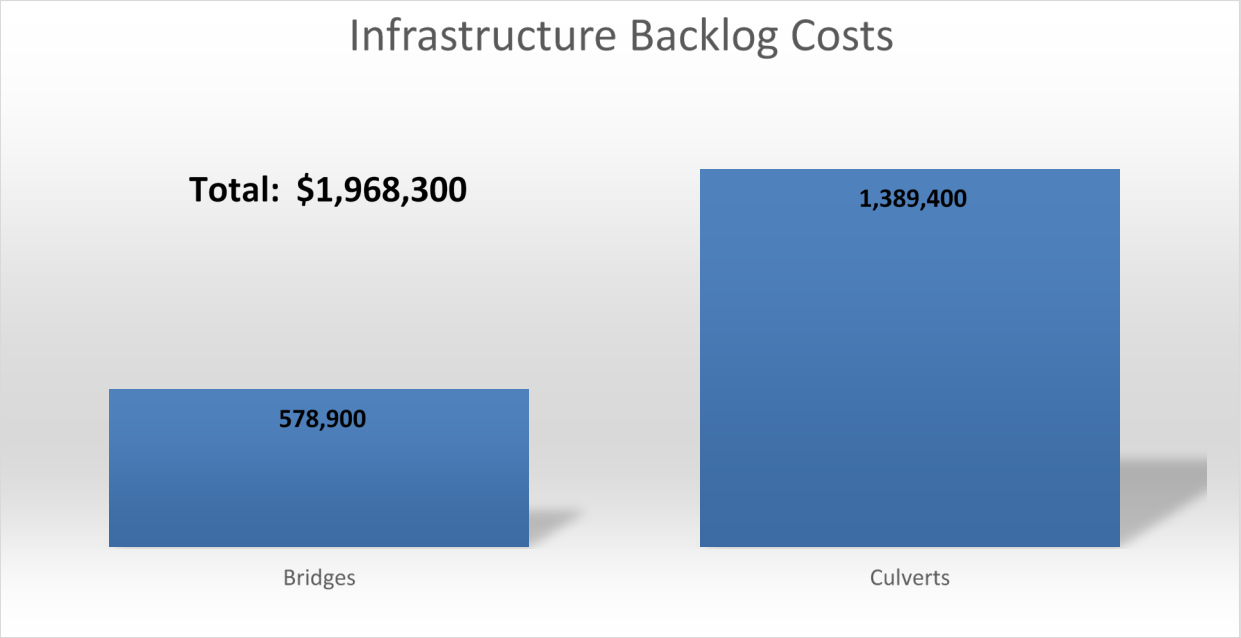


The County must allocate $27 million dollars annually in order to address the ongoing capital requirements for core assets included in this AMP. The annual requirements, however, do not include any backlog costs.

3.5 Backlog

Backlog costs represent the replacement cost of assets which have reached the end of their useful life by the end of 2021 but have not been rehabilitated or replaced. The assets included in this category are often shared with local or neighbouring municipalities who, under agreement, are responsible for performing the condition assessments, and establishing a rehabilitation or replacement schedule. Backlog assets usually have a low probability of failure combined with a minimal risk of consequence, and are often scheduled for replacement within a few years of their original estimated replacement date.

Figure 3-2: Infrastructure Backlog Costs



3.6 Reinvestment Rate

Reinvestment rates are a calculation of the actual and targeted annual expenditures relative to the annual capital expenditures required to meet the plan. Based on an annual capital requirement for core assets of $27 million, and a total replacement cost of just over $807 million, the target reinvestment rate is 3.36%. As of 2021, the current annual capital expenditure level is approximately $13.4 million, which translates to an actual reinvestment rate of just 1.66%. The current funding gap for core assets is $13.7 million per year.

4.0 Road Network

4.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

The County's Infrastructure Services Department maintains 1,356.22 lane kilometres of various classes of roads, plus an additional 126.8 lane kilometres of connecting links. A connecting link is a road segment that is owned by a local municipality but maintained by the County through a cost-sharing agreement. See Section 4.5 Shared Structures for a complete listing of Connecting Links. Connecting Link assets have been included in this report only to the extent of the County's responsibility.

The following Table illustrates the types of segments in the County's road network. Since County assets act as arterial roads to link transportation routes across the region, the majority of the segments are constructed to an asphalt or concrete standard.

Table 4-1: Road Network Portfolio Summary

Asset Segment	Quantity	Historical Cost	Replacement Cost
Asphalt	1,284.52 lane km	$99,481,100	$435,444,000
Concrete	39.70 lane km	$17,652,600	$18,420,800
Tar & Chip	32.0 lane km	$508,800	$4,096,000
CWATS	254.18 lane km	$32,329,500	$75,925,400
Roundabouts	4	$5,897,400	$7,006,300

The replacement cost of roads is presented as a 'worst-case scenario', and is used to illustrate the value of regular maintenance and rehabilitation. Unless a severe natural disaster occurred or a road segment required upgrading to a higher standard, full replacement is unlikely. The County's approach to road network assets is to perform maintenance and rehabilitation work at various points throughout the road asset's life to optimize its longevity.

Replacement costs were based on 2017 AMP data plus an additional 3% per year inflationary factor.

4.2 State of the Local Infrastructure

The following Table outlines the current state of the road network, including the average age, useful life and remaining service life for each asset segment. As expected, the tar & chip roads are nearing end of their useful life, and are planned to be resurfaced with asphalt within the next five years. Three of the four roundabouts have a concrete surface, which provides for a longer useful life and addresses the increasing daily volume of traffic at these intersections.

Table 4-2: Road Network Age and Useful Life

Asset Segment	Average Age	Useful Life	% of Service Life Remaining
Asphalt	7.8 years	12 years	35.3%
Concrete	13.1 years	40 years	67.2%
Tar & Chip	10.5 years	12 years	12.4%
CWATS	4.2 years	12 years	65.3%
Roundabouts	3.2 years	12-40 years	87.1%

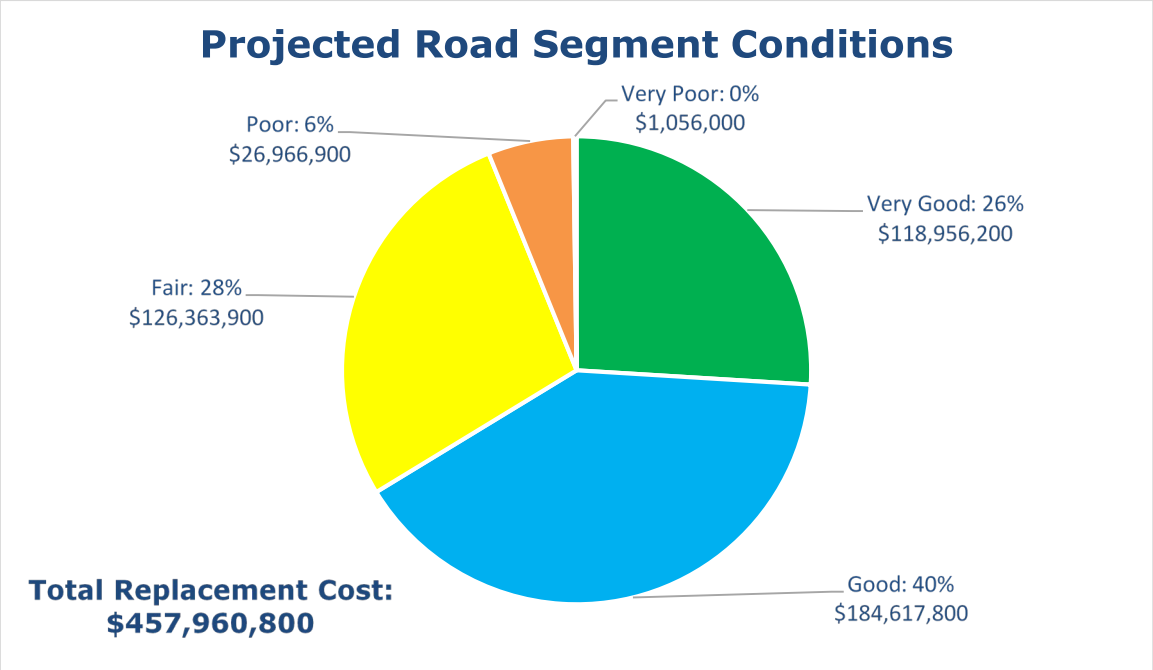
The Table below outlines the average condition (weighted based on replacement cost), and the source of the condition assessment.

Table 4-3: Road Network Condition Rating & Source

Asset Segment	Average Condition (%)	Average Condition Rating	Condition Source
Asphalt	66.7%	Good	PCI (2021)
Concrete	88.4%	Very Good	PCI (2021)
Tar & Chip	72.3%	Good	PCI (2021)
CWATS	73.9%	Good	PCI (2021)
Roundabouts	89.9%	Very Good	PCI (2021)

Overall, 66.3% of County roads are in good to very good condition. The strong condition rating of the majority of the road network is a testament to the County's consistent dedication to a Pay-as-You-Go approach to budgeting. Results of this level are only possible by adhering to a timely maintenance and rehabilitation program. Only one road segment, totaling 3.2 lane km, is in very poor condition, and is scheduled for rehabilitation within the next five years. The Chart below outlines the condition of the road segments (concrete, asphalt and tar & chip), excluding CWATS and roundabout assets.

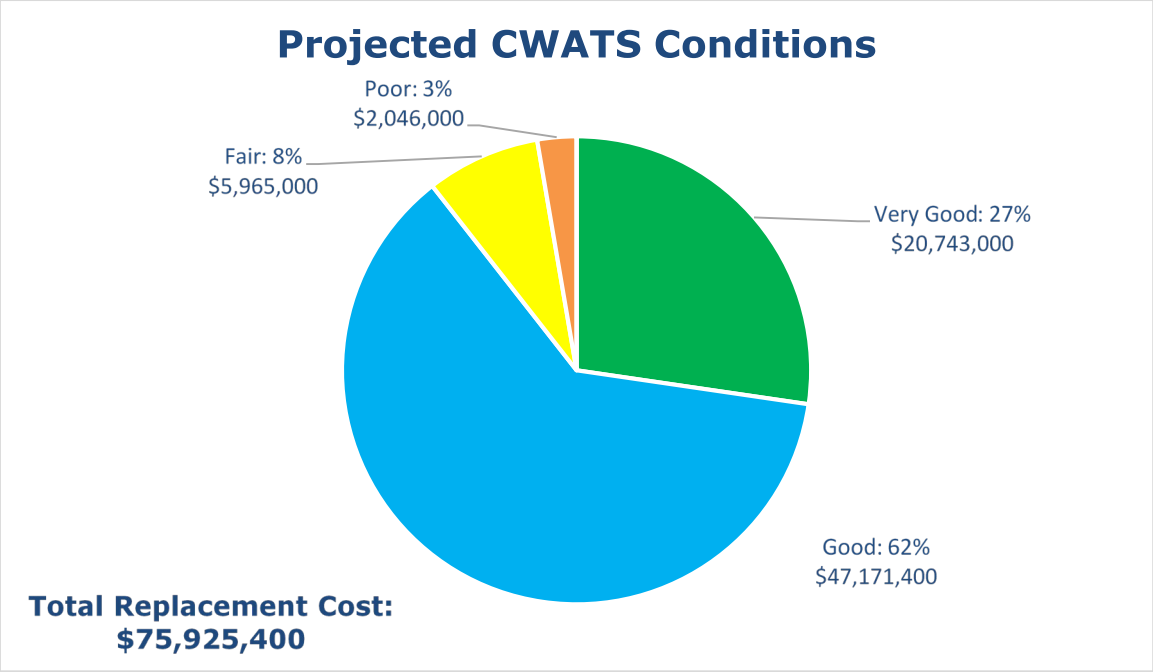
Figure 4-1: Projected Road Segment Conditions



The condition of the CWATS network is reflective of its relatively new construction. The first segment was completed in 2011 (CR19 from CR46 to CR34). The network has grown to over 250km of paved shoulders, cycle paths and multi-use trails.

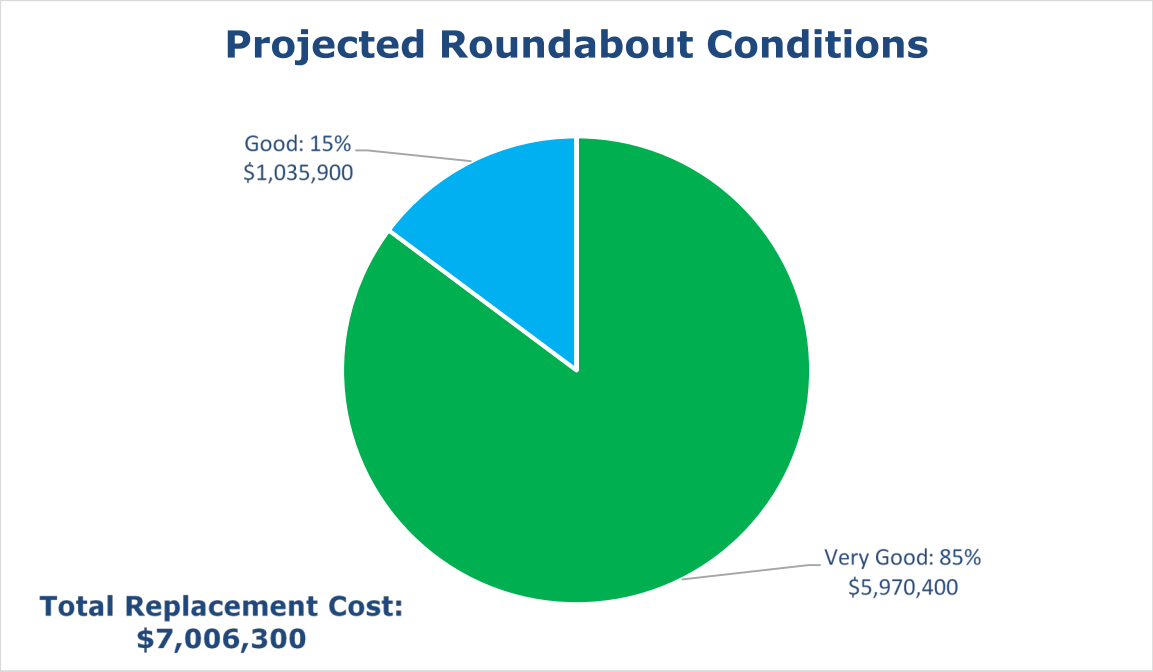
The creation of CWATS assets is governed by the CWATS Master Plan with initial costs to construct shared with the local municipality where the trail/path is located. Despite the cost sharing structure, the County incorporates 100% of CWATS assets into its AMP. This approach ensures CWATS assets are fully captured at a regional level and recognizes the fact that these assets are adjacent to County-owned roads (not connecting links). The financial obligation for future rehabilitation has not been formally established however the full inclusion of replacement cost in the County's AMP represents a conservative approach to future funding decisions.

Figure 4-2: Projected CWATS Conditions



The condition of County roundabouts is also reflective of their relatively new construction. Three of the four roundabouts were constructed with a concrete surface, which supports a longer useful life, and withstands a heavier volume and class of traffic. The projected condition of these roundabouts is outlined in the Chart below:

Figure 4-3: Projected Roundabout Conditions



4.3 Levels of Service (Community & Technical)

The following tables illustrate the current level of service (LOS) for the County's road network. These metrics include the community and technical level of service metrics that are required as part of O. Reg. 588/17 as well as any additional performance measures the County selected for this AMP.

4.3.1 Community Levels of Service

The following Table outlines the qualitative description that determines the community levels of service provided by the road network structures.

Table 4-4: Road Network Community Levels of Service

Service Attribute	Qualitative Description	Current LOS
Availability	Description of the road network that facilitates the flow of traffic across the region	See Appendix A: Map of Road Segments

4.3.2 Technical Levels of Service

The following Table outlines the qualitative descriptions that determine the technical levels of service provided by the road network structures.

Table 4-5: Road Network Technical Levels of Service

Service Attribute	Qualitative Description	Current LOS
Scope	Number of lane-kilometres of roads as a proportion of square kilometres of land area of the municipality	0.74
Quality	For paved roads in the municipality, the average pavement condition index value	67.6%

4.4 Lifecycle Management Strategy

In order to maximize the estimated useful life of an asset, a lifecycle management strategy must be adopted to proactively maintain an asset's condition, and prevent accelerated deterioration. The following lifecycle strategy was developed to provide timely repairs and enhancements to the asset, and extend its service life at a lower total lifecycle cost. Note: tar & chip roads will be replaced with asphalt at their next scheduled rehabilitation. Refer to the Rehabilitation Schedule included in Appendix F: 5-Year Rehabilitation Program.

Table 4-6: Road Network Lifecycle Activities

Activity Type	Description of Strategy
Inspection	Inspections of road segments occur on a weekly basis as part of a routine maintenance program conducted in accordance with the Minimum Maintenance Standards.
Crack Sealing	Preventative maintenance measures are implemented where inspection results show initial signs of deterioration. This program reduces erosion of the base caused by poor drainage and protects the pavement from accelerated deterioration due to freeze/thaw cycles.
Shouldering	Road shouldering is performed on an annual basis to maintain the structural integrity of the road and prevent cracks originating from the sides.

Activity Type	Description of Strategy
Seasonal maintenance	Summer roadside maintenance includes regular ditching, mowing, tree trimming, road sign installation and maintenance, and line painting. Winter maintenance includes salting, snow plowing and snow removal.
Rehabilitation: Overlay	Rehabilitation strategies are applied on a case-by-case basis, and are dependent on the current thickness of road, condition of the base, and rate of deterioration of the surface. Overlay consists of applying a thin layer of asphalt over the existing road surface, and extends the useful life of the road by approximately 5 years.
Rehabilitation: Mill & Pave	Mill & pave strategies are utilized when road conditions deteriorate to a PCI of 60 or less and serve to extend the useful life of the road by approximately 8 years.
Rehabilitation: CIREAM & Pave	The most expensive strategy, the CIREAM (Cold In-Place Recycling with Expanded Asphalt Material) and pave program is utilized when sufficient asphalt thickness is present, and surface conditions are likely to affect the longevity of a new asphalt surface. This strategy is applied once the PCI falls below 40, and is estimated to add 15 years of life to the road.
Rehabilitation: Concrete Panel Repairs	Concrete roads require a much different maintenance and rehabilitation strategy than asphalt roads. Designed to last much longer than asphalt, concrete roads will rarely be rehabilitated or replaced in their entirety. Instead, an approach to repair or replace concrete panels (sections of the road) as necessary is taken. Given the relatively young age of the concrete road network, a routine panel replacement strategy is still under development. It is estimated that panel repairs would be required when the PCI falls below 40, and that, on average, 3.6% of the road network may be subject to panel replacement.

4.5 Shared Structures

The following road segments are shared under separate Connecting Link agreements with each local municipality. The length is indicated in centerline kilometres.

Table 4-7: Road Network Shared Structures

County Road	Local Name	Location	Length (km)	County share
CR5	Meloche Rd.	CR16 (Alma St.) - CR18 (Simcoe St.)	1.18	100%
CR16	Alma St.	CR20 (Sandwich St.) – CR5 (Meloche Rd.)	2.40	92.3%
CR18	Simcoe St.	CR20 (Sandwich St.) – CR5 (Meloche Rd.)	2.13	97.4%
CR20	Sandwich St.	Former North Limit of Amherstburg – Former South Limit of Amherstburg	3.61	59.9%
CR8	Maidstone Ave.	Former West Limit of Essex – Former East Limit of Essex	1.92	91.8%
CR23	Gosfield Townline	Former North Limit of Essex – Former South Limit of Essex	0.74	98.0%
CR34	Talbot Rd.	Former Northwest Limit of Essex – Former Southeast Limit of Essex	3.10	69.5%
CR11	Queen St.	Former North Limit of Harrow (3rd Conc.) – CR20 EP	1.17	80.3%
CR13	Erie St.	CR20 EP – Shepley Drain	0.45	100%
CR20	King St.	Former West Limit of Harrow – Former East Limit of Harrow	1.60	63.7%
CR20	Main St.	Former West Limit of Kingsville – 201m east of centreline of Kratz Road	3.01	70.4%
CR29	Division Rd.	210m North of Kingsville – Road 2 CR 20 (Main St.) EP	1.83	75.7%

County Road	Local Name	Location	Length (km)	County share
CR50	Heritage Rd.	CR20 (Main St.) EP – Former Southwest Limit of Kingsville	0.48	80.6%
CR2	First St. / Broadway St. / Tecumseh Rd.	CR 22 (Notre Dame St.) – Former East Limit of Belle River (Duck Creek)	1.98	95.9%
CR22	Notre Dame St.	Former West Limit of Belle River – Former East Limit of Belle River (Duck Creek)	2.51	60.8%
CR25	East Puce River Rd.	Former East ROW Limit of CR25 – North ROW Limit of CPR	0.15	46.3%
CR27	Belle River Rd./South St.	CR22 EP – Former South Limit of Belle River (CP Railway NPL)	0.93	97.0%
CR6	Todd Lane	CR3 (Malden Rd.) – Highway 3	2.09	86.8%
CR40	Sprucewood Ave.	Matchette Rd (Windsor City Limits) – CR2 (Malden Rd.)	1.45	90.4%
CR7	Huron Church Line	Highway 3 – Sandwich W. Parkway	1.71	84.9%
CR20	Front Rd.	Morton Dr. (Windsor City Limits) – Gary Ave.	3.23	49.3%
CR3	Malden Rd.	Windsor City Limits – Reaume Ave	2.07	60.8%
CR2	Tecumseh Rd.	Windsor City Limits – Former East Limit of St. Clair Beach (Pike Creek CL)	4.33	61.4%
CR19	Manning Rd.	Riverside Dr. – Former South Limit of Tecumseh & St. Clair Beach (Via Railway ROW)	1.68	56.7%
CR21	Brighton Rd.	Former South Limit of St. Clair Beach (Via Railway ROW) – CR2 (Tecumseh Rd.) EP	.33	100%

County Road	Local Name	Location	Length (km)	County share
CR20	Seacliff Dr.	Mun. No. 71 – 432m East of CR33 (Bevel Line Rd)(Mun. No. 929)	2.25	82.9%
CR33	Bevel Line Rd.	CR20 (Seacliff Dr.) to Former Limit of Leamington	.96	100%
CR34	Talbot St.	Former West Limit of Leamington to Former East Limit of Leamington	2.70	56.4%
CR48	Oak St.	Former West Line of Leamington to Erie St.	.77	68.3%

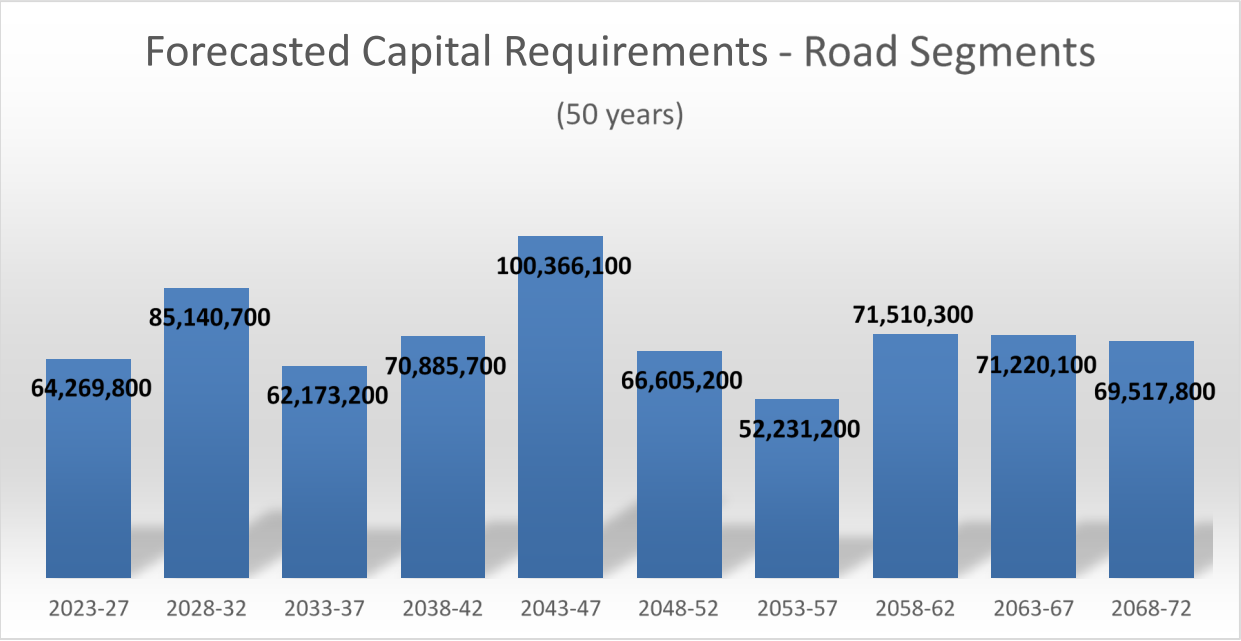
Ownership of Connecting Links is held with the local municipality; therefore, the replacement cost and condition of such assets are considered beyond the scope of this AMP. The individual agreements allow only for cost sharing of operating maintenance activities as per the schedule above. The annual requirement for County contributions to Connecting Links has not been included in the figures presented in this report and instead is factored into the County's annual operating budget requirement.

4.6 Forecasted Capital Requirements

4.6.1 Road Segments

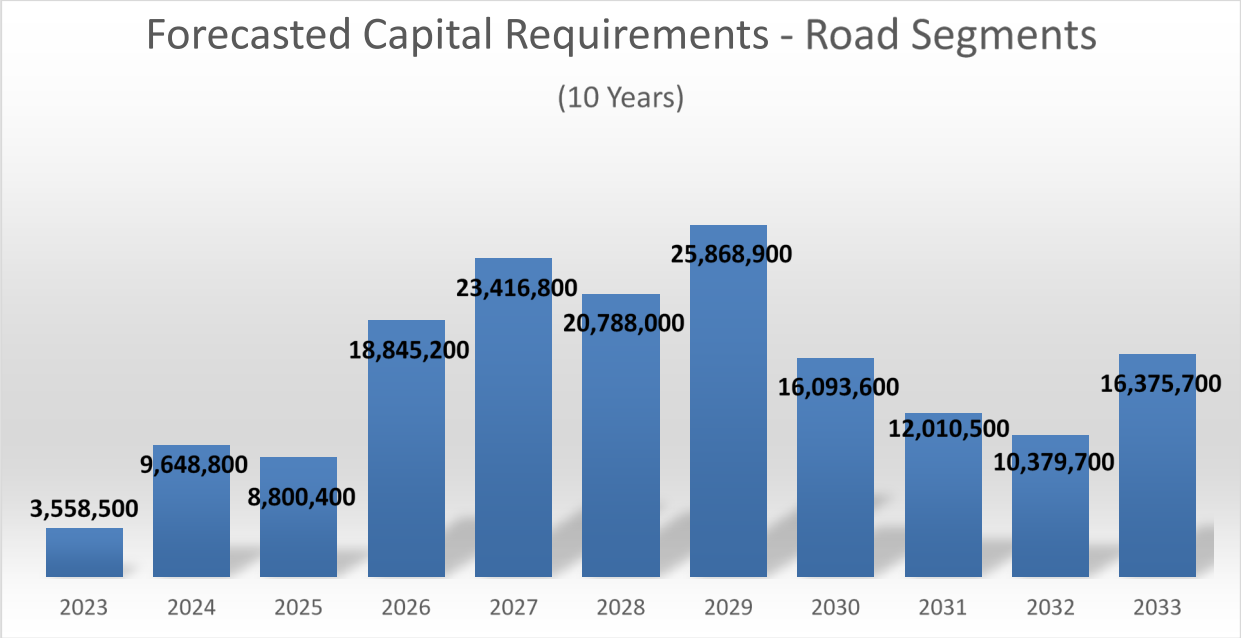
The forecasted capital requirements for road segments are displayed in 5-year increments over the next 50 years in the following Chart. The annual capital requirements represent the average amount of funding per year that the County should allocate towards future rehabilitation and lifecycle management activities to sustain the existing level of service. This does not include capital requirements for CWATS or roundabouts, which are reported on separately.

Figure 4-4: 50-year Forecasted Capital Requirements – Road Segments



The Chart on the next page provides a closer look at the capital requirements for the same road segments on an annual basis over the next 10 years.

Figure 4-5: 10-year Forecasted Capital Requirements – Road Segments



Annual Capital Requirement – Road Segments: $16,470,000

Target Reinvestment Rate: 3.60%

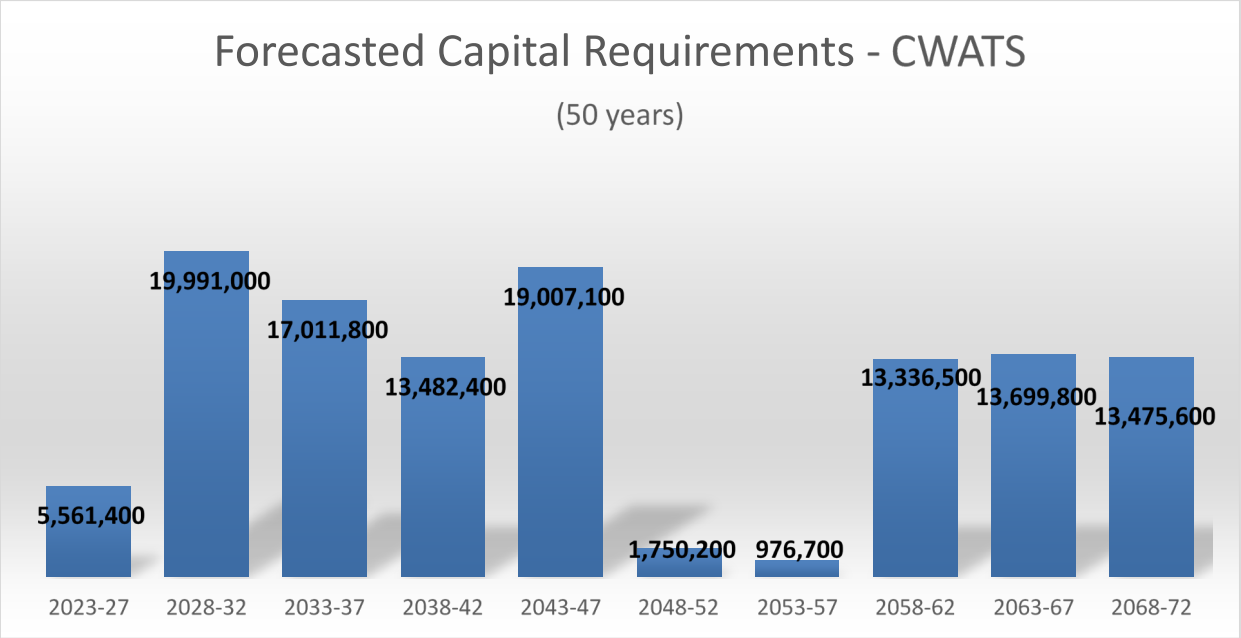
Actual Reinvestment Rate: 2.13%

Funding Shortfall: $6,726,700 per year

4.6.2 CWATS

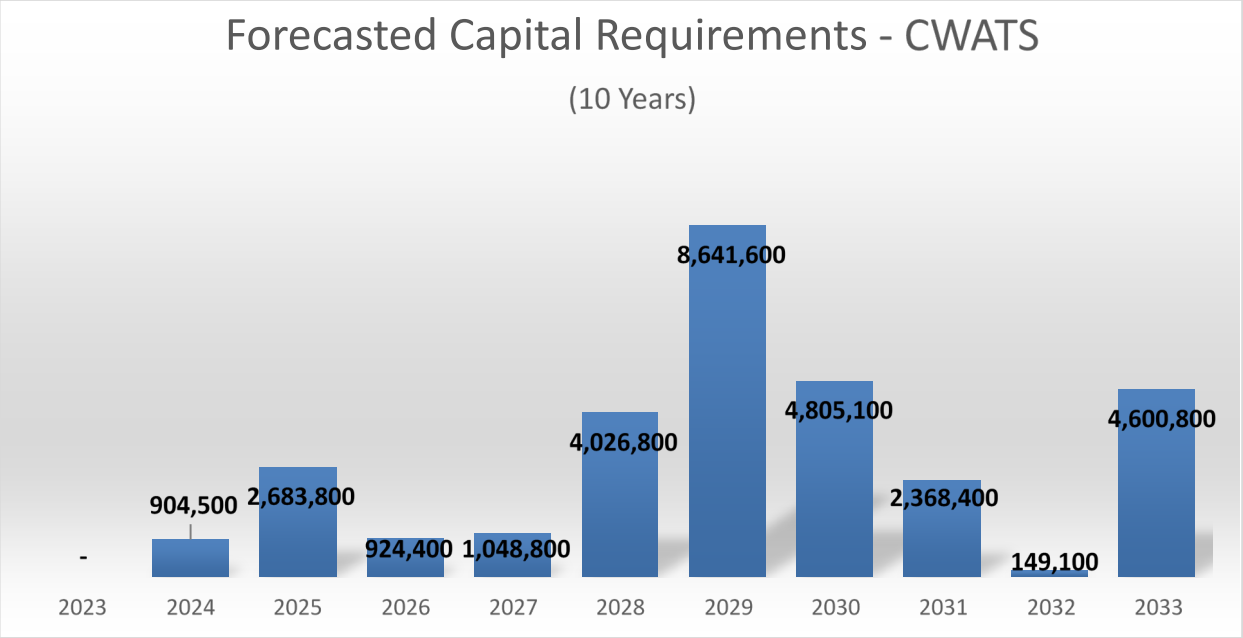
Currently, CWATS spending is focused entirely on expansion. As the network is still relatively young, rehabilitation of existing segments has not been necessary. This AMP focuses on the future requirements needed to sustain the current CWATS network. The Chart on the next page identifies the capital requirement to maintain existing CWATS assets over the next 50 years, in 5-year increments.

Figure 4-6: 50-year Forecasted Capital Requirements - CWATS



The following Chart provides a closer look at the capital requirements for the same CWATS assets on an annual basis over the next 10 years.

Figure 4-7: 10-year Forecasted Capital Requirements - CWATS



Annual Capital Requirements – CWATS: $3,054,900

Target Reinvestment Rate: 4.02%

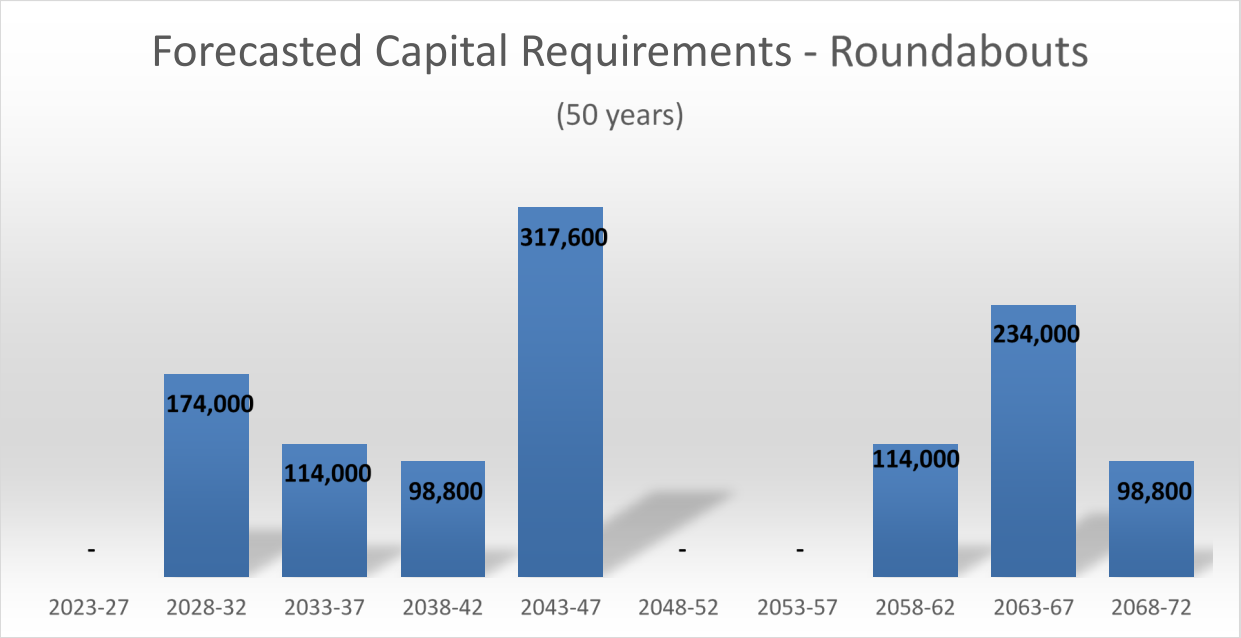
Actual Reinvestment Rate: 0.00%

Funding Shortfall: $3,054,900

4.6.3 Roundabouts

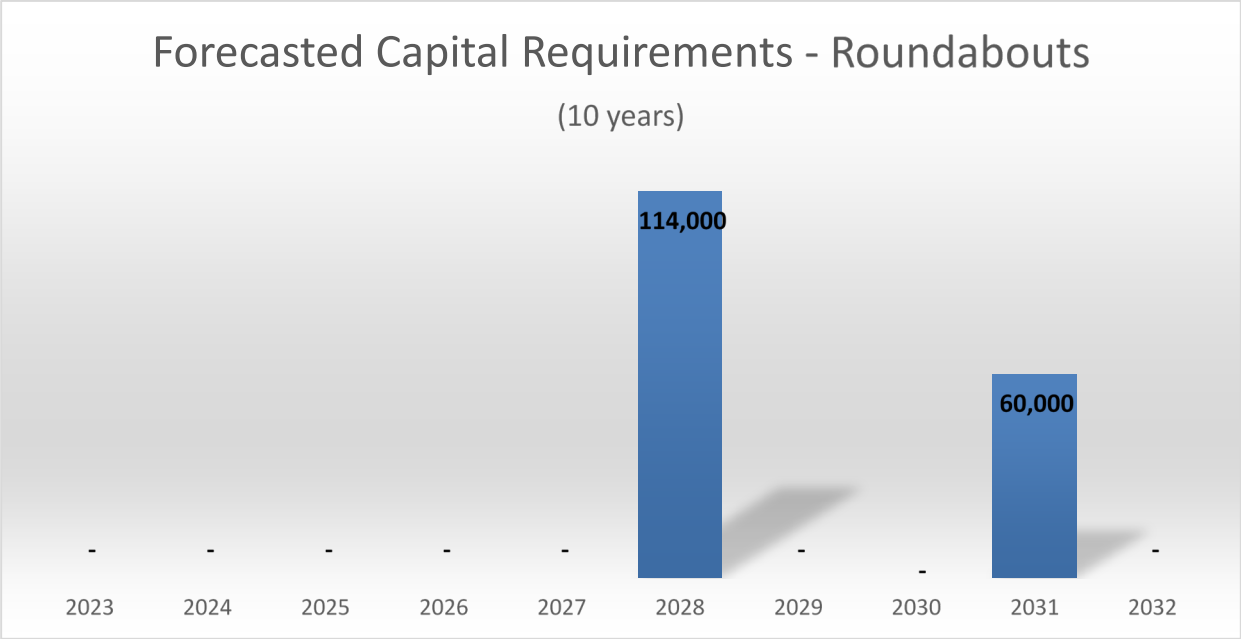
The roundabout network is still relatively new, and as three of the four roundabouts were constructed with concrete surfaces, this pushes out the requirement for capital financing needs much farther into the future than the one constructed with an asphalt surface. These three roundabouts were all constructed in the last 7 years and will only require panel repairs throughout their expected lifespan. The Chart below illustrates the forecasted capital requirements for roundabouts for the next 50 years, in 5-year increments. The actual reinvestment rate is reflective of the relatively new infrastructure, and current expansion activities.

Figure 4-8: 50-year Forecasted Capital Requirements - Roundabouts



The Chart below provides a closer look at the capital requirements for the same roundabouts on an annual basis over the next 10 years.

Figure 4-9: 10-year Forecasted Capital Requirements - Roundabouts



Annual Capital Requirements – Roundabouts: $93,300

Target Reinvestment Rate: 1.33%

Actual Reinvestment Rate: 0.00%

Funding Shortfall: $93,300

4.7 Risk Management

When determining the priority of attention to asset management, the County utilizes a risk-based approach focused on probability and consequence.

The probability of failure is based 100% on the condition (PCI) of the asset, on a scale of 1 to 5, where 1 is a rare likelihood of failure and 5 represents an almost certain failure. The consequence of failure is based 100% on the replacement cost of the asset, on a scale of 1 to 5, where 1 is an insignificant consequence of failure and 5 represents severe consequences.

Table 4-8: Road Network Risk Management Assessment

Condition Range	Probability of Failure Score	Replacement Cost Range	Consequence of Failure Score
0 – 20	5	**$0 – $250,000**	5
20 – 40	4	**$250,000 – 500,000**	4
40 – 60	3	**$500,000 – 750,000**	3
60 – 80	2	**$750,000 – 1,000,000**	2
80 – 100	1	**Over $1,000,000**	1

The following matrices outline the relationships between the probability and consequence of failure for the various road network asset types.

Figure 4-10: Road Segments Risk Matrix (All Surface Types)

Figure 4-11: CWATS Risk Matrix

Figure 4-12: Roundabouts Risk Matrix

4.8 Recommendations

The County's road network plays a critical role in the day to day lives of all residents and businesses. An accurate and clear understanding of the function, condition and replacement cost of these links will ensure the network meets the transportation needs of our region.

In addition to being able to improve core data and update scorecard results, this iteration of the AMP also provided an opportunity for Administration to look ahead to further refinements. The following list summarizes Administration's observations and recommendations arising from this version of the AMP.

- A review of the road segment numbering system should be undertaken to ensure the current segment structure is relevant, accurate, and rational. As capital project costs are recorded against road segments, ensuring accurate allocation to assets is key to understanding asset values and future replacement costs. A clearly defined numbering system will also reduce the likelihood of incorrect data assignment and increase the accuracy of expected useful life determinations.

- A review of the communication channels and documentation levels in place to ensure information about shared assets with other municipalities is adequate. Within the County, regular touch points with local municipalities is improving. For assets shared with regional neighbours and lower tier municipalities, more work could be done to raise the level of awareness with respect to condition assessments and plans for rehabilitation of shared assets.

- To strengthen the principles of the County's Strategic Asset Management Policy, key personnel outside of Financial Services should have greater access and training on the use of the asset management database. Integrating asset management practices and philosophies will be achieved more efficiently if staff directly responsible for linear assets take a more active role in inputting, tracking and managing the data.

- Develop a more robust system of tracking level of service indicators to improve strategic decision making and long-term planning. Examples of additional indicators include: the average time between rehabilitation events, the number of service complaints and comparison of operating and maintenance costs as a percentage of replacement value. Leveraging the functionality or investing in customizing the existing asset management software platform is recommended to eliminate managing multiple information systems and duplicating effort.

- Consider quantifying and summarizing the annual requirements for funding the County's share of Connecting Links and including that figure in the AMP. Identification of connecting link financial obligations will also support ongoing communications between the two levels of government and strengthen coordinated capital planning efforts.

5.0 Bridges & Culverts

5.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

The County of Essex owns 84 bridges and 126 culverts with spans greater than 3m. The Table below illustrates the key asset attributes for these structures, including quantities, average age (weighted average by replacement cost), useful life, and future replacement cost. Bridges are further broken down into three components: deck, structure and foundation. Each of these components has a different estimated useful life, and therefore the timing of the replacement cost varies.

Table 5-1: Bridges & Culverts Portfolio Summary

Asset Segment	Quantity	Historical Cost	Replacement Cost
Bridges - Deck	84	$21,621,800	$87,889,200
Bridges - Structure	84	$13,006,300	$60,127,300
Bridges - Foundation	84	$7,110,300	$48,232,100
Culverts	126	$20,236,000	$65,530,700

The replacement cost of bridges was determined based on an engineering estimate of $9,300/m^2 of deck area, and allocated to the various bridge components based on the historical experience of 45% cost for the deck, 30% for structure and 25% for the foundation of the bridge.

The replacement cost of culverts was also determined based on an engineering estimate of $5,600/m^2 of deck area. Where the deck area is unknown, CPI tables were used to inflate the historical cost of the current structure to approximate the future replacement cost.

5.2 State of the Local Infrastructure

The Table on the next page outlines key details of the current state of infrastructure, including the average condition (weighted based on replacement cost), and the source of the condition information.

Table 5-2: Bridges & Culverts Age and Useful Life

Asset Segment	Average Age	Useful Life	% of Service Life Remaining
Bridges - Deck	12.7 years	20 years	36.4%
Bridges - Structure	19.9 years	40 years	32.8%
Bridges - Foundation	26.9 years	80 years	75.1%
Culverts	36.3 years	60 years	39.6%

A review of the actual useful life of culverts, since the last AMP, suggests the EUL of a culvert far exceeded the previously stated 30 years. The transition to concrete culvert construction is the main driver of this increase in estimated useful life. For this reason, this AMP adjusts the useful life of culverts from 30 to 60 years.

The Table below outlines the average condition (weighted based on replacement cost), and the source of the condition assessment.

Table 5-3: Bridges & Culverts Condition Rating & Source

Asset Segment	Average Condition (%)	Average Condition Rating	Condition Source
Bridges	66.3%	Good	BCI (2020)
Culverts	54.6%	Fair	CCI (2021)

The majority of the County's bridges, 98.6%, are assessed in fair or better condition. Of these, 76.4% are assessed as good to very good condition. Of the County's culvert assets, 74.9% are assessed in fair or better condition. Of these, 40.7% are assessed as good to very good condition.

Bridges and culverts that are in very poor condition are scheduled for replacement within the current 5-year Rehabilitation Program. Similar to the challenges with shared road network assets, information relating to the planned rehabilitation of shared bridges and culverts is increasing the risk that improvements to these assets may not be optimally planned and executed.

Figure 5-1: Projected Bridge Conditions

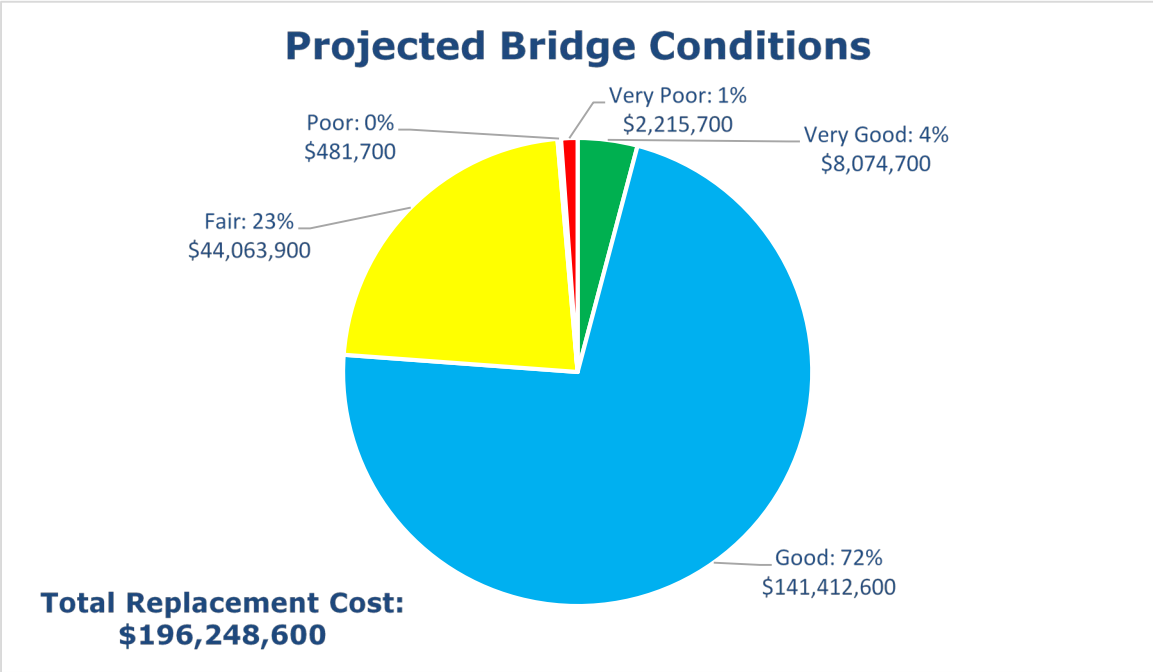
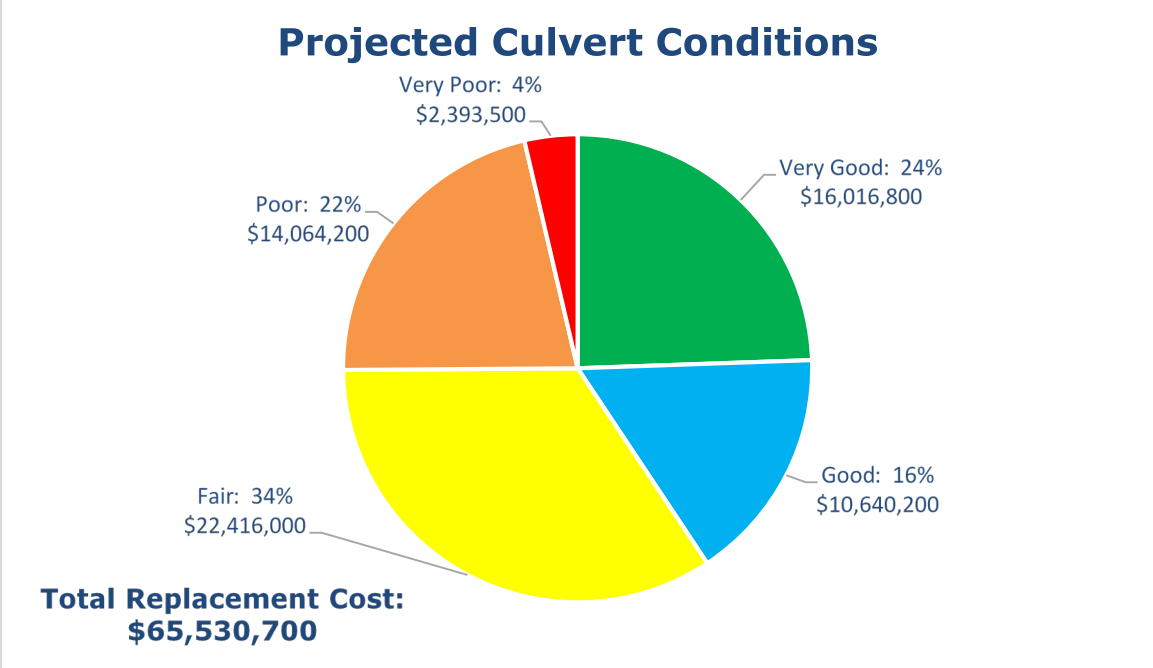


Figure 5-2: Projected Culvert Conditions



Condition assessments are conducted every two years in accordance with the Ontario Structure Inspectional Manual (OSIM). Average conditions presented are based on the weighted average replacement cost of the segment. All structures receive a Bridge Condition Index (BCI) or Culvert Condition Index (CCI) ranging from 0 to 100. Bridge structures were inspected in 2020, while structural culverts greater than 3 metres were inspected in 2021.

5.3 Levels of Service

The following Tables illustrate the current level of service (LOS) for the County's bridges and culverts. These metrics include the community and technical level of service metrics that are required as part of O. Reg. 588/17 as well as any additional performance measures the County selected for this AMP.

5.3.1 Community Levels of Service

The following Table outlines the qualitative descriptions that determine the community levels of service provided by the bridge and culvert structures.

Table 5-4: Bridges & Culverts Community Levels of Service

Service Attribute	Qualitative Description	Current LOS
Availability	Description of the bridge network which facilitates the flow of traffic across the region while managing stormwater	See Appendix B: Map of Bridges
Availability	Description of the culvert network which facilitates the flow of traffic across the region while managing stormwater	See Appendix C: Map of Culverts
Reliability	Description or images that illustrate the different levels of bridge condition	See Appendix D: Conditions Indexes
Reliability	Description or images that illustrate the different levels of culvert condition	See Appendix D: Condition Indexes

Appendix B: Map of Bridges shows the geographic location of each of the County bridges, including those located on Connecting Links with local municipalities and shared structures with neighbouring municipalities. Refer to Section 6.5 *Shared Structures* for a complete listing of shared structures.

Appendix C: Map of Culverts shows the geographic location of each of the County culverts, including those located on Connecting Links with local municipalities and shared structures with neighbouring municipalities. Refer to Section 6.5 *Shared Structures* for a complete listing of shared structures.

5.3.2 Technical Levels of Service

The following Table outlines the qualitative descriptions that determine the technical levels of service provided by the bridge and culvert structures.

Table 5-5: Bridges & Culverts Technical Levels of Service

Service Attribute	Qualitative Description	Current LOS
Availability	Number of bridges in the municipality with loading or dimensional restrictions	1
Reliability	Average bridge condition index value	66.3%
Reliability	Average culvert condition index value	54.6%
Sustainability	Annual capital reinvestment rate – Bridges	0.78%
Sustainability	Annual capital reinvestment rate – Culverts	3.22%

Bridge and culvert condition indexes reported above are based on the median condition of all structures in the inventory, and are not weighted for replacement cost.

There is only one bridge that has load and/or dimension restrictions: the bowstring arch bridge on County Road 8 crossing Canard River. Due to its heritage designation, and the fact that it is the most photographed structure in the region, there are no plans to rehabilitate or replace this bridge to mitigate these restrictions.

Photo courtesy of www.historicbridges.org
Photographer credit: Nathan Holth & Rick McOmber

Bridge over River Canard at Loiselleville, Essex County, Road No. 20. Built in 1937; 120-foot span.

Newly Completed Bridge
Source: Ontario Sessional Papers, Highway Report, 1937
Digitized by Internet Archive and Enhanced By HistoricBridges.org

5.4 Lifecycle Management Strategy

In order to maximize the estimated useful life of an asset, a lifecycle management strategy must be adopted to proactively maintain an asset's condition, and prevent accelerated deterioration. The following lifecycle strategy was developed to provide timely repairs and enhancements to the asset, and extend its service life at a lower total lifecycle cost.

Table 5-6: Bridges & Culverts Lifecycle Activities

Activity Type	Description of Strategy
Inspection	Inspections of bridge and culvert structures are conducted on alternate years, in compliance with the Ontario Structure Inspection Manual (OSIM)
Maintenance, rehabilitation and replacement	Maintenance, rehabilitation and replacement of structures are scheduled according to the results of the OSIM inspections.

5.5 Shared Structures

The following structures are shared between the County and other municipalities and are governed by an agreement with each municipality.

Table 5-7: Bridges & Culverts Shared Structures

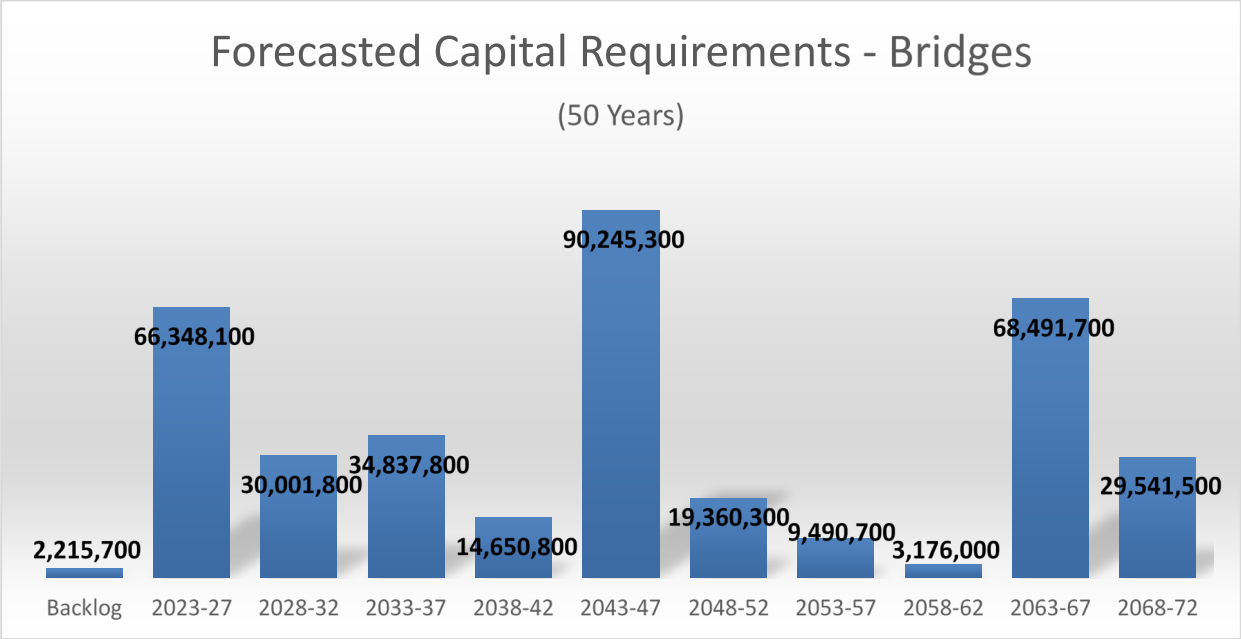
Asset ID	Bridge Name	Other Owner	Share
B-01-09	Tilbury Creek	Municipality of Chatham-Kent	50%
B-01-12A	Government Drain #4	Municipality of Chatham-Kent	50%
B-01-25	West Two Creek	Municipality of Chatham-Kent	50%
B-01-19	Two Creeks Drain	Municipality of Chatham-Kent	50%
B-01-13	Campbell Sideroad Drain	Municipality of Chatham-Kent	50%
B-01-14	Cottingham Drain	Municipality of Chatham-Kent	50%
B-03-01	Grand Marais Drain	Town of Lasalle	50%
B-03-02	Cahill Drain	Town of Lasalle	50%
B-05-04	Big Creek	Town of Amherstburg	50%
B-06-01	Grand Marais Drain	Town of Lasalle	50%
B-16-01	Big Creek	Town of Amherstburg	50%
B-20-01	Turkey Creek	Town of Lasalle	50%
B-22-16	Belle River	Municipality of Lakeshore	50%
B-40-01	South Branch Turkey Creek	Town of Lasalle	50%
C-01-216	South Dales Drain Extension	Municipality of Chatham-Kent	50%
C-29-086	Mill Creek	Town of Kingsville	50%

The County's portion of the shared structures was used to determine the replacement cost of the assets, as well as the condition assessments.

5.6 Forecasted Capital Requirements

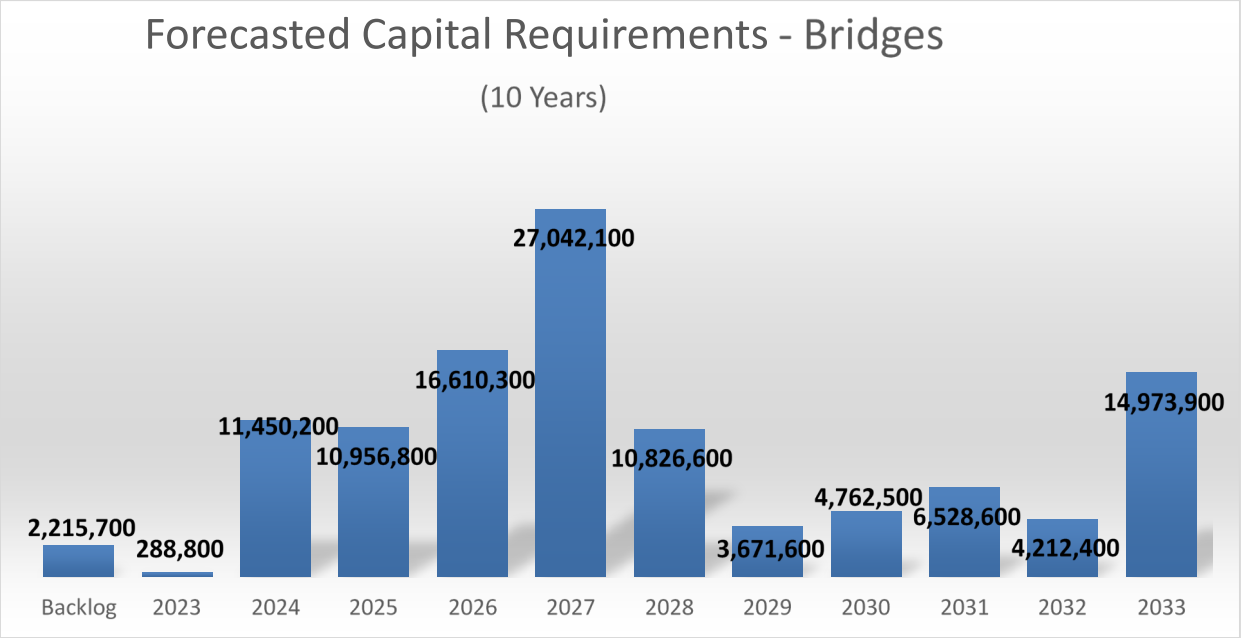
The forecasted capital requirements for bridges are displayed in 5-year increments in the following Chart. The annual capital requirements represent the average amount of funding per year that the County should allocate towards future rehabilitation and replacement needs. These requirements have been forecasted over the next 50 years.

Figure 5-3: 50-year Forecasted Capital Requirements - Bridges



The Chart on the next page provides a more in depth look at the capital requirements projected for bridge rehabilitation and replacement over the next 10 years in accordance with O.Reg 588/17. Projects may include partial rehabilitation of the deck and/or structure, or may require complete replacement including foundation. Due to the complex and varying engineering designs of bridge structures, it is difficult to establish a lifecycle management strategy that applies to all assets. Minor rehabilitation which may fall below the threshold for capitalization, is often undertaken until the eventual full replacement of the bridge component is performed.

Figure 5-4: 10-year Forecasted Capital Requirements - Bridges



Annual Capital Requirement - Bridges: $6,266,500 per year

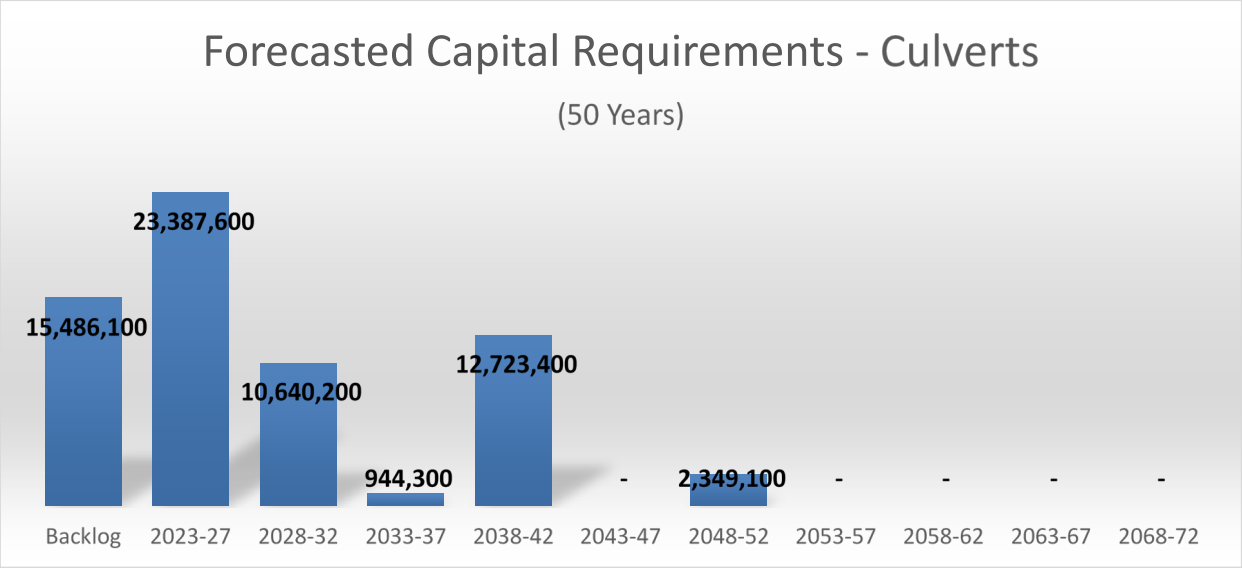
Target Reinvestment Rate: 3.19%

Actual Reinvestment Rate: 0.79%

Funding Shortfall: $4,716,800 per year

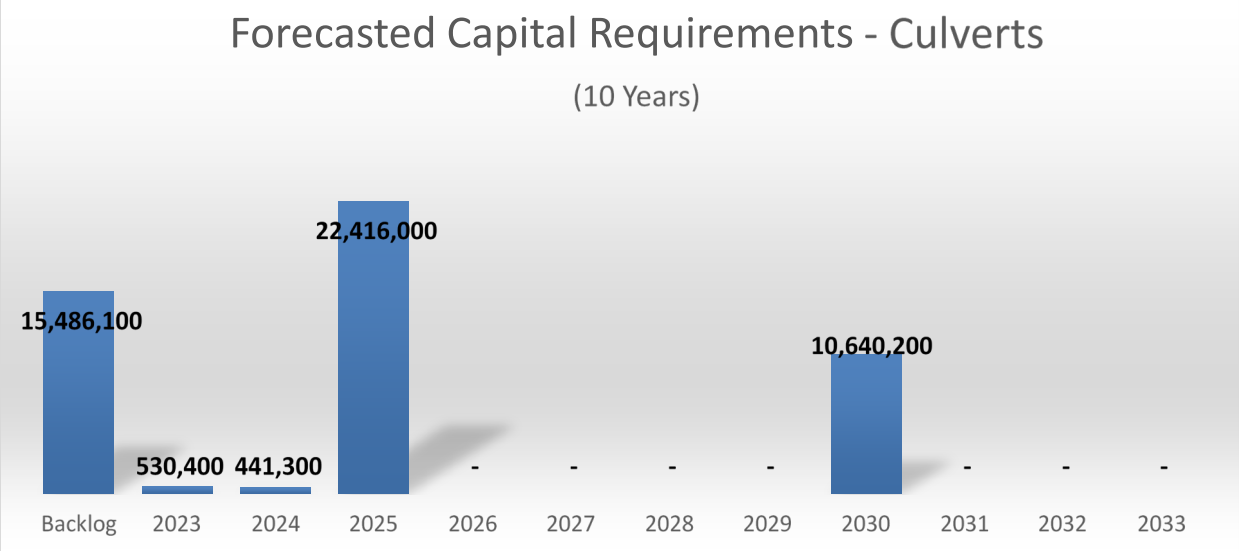
Due to the challenges associated with the rehabilitation, culverts are more often replaced at the end of their useful life. Corrugated Steel Pipe culverts, used historically, are proving to not be as reliable, and due to extreme weather events, have led to unexpected failures in recent years. Moving forward, concrete culverts will be used in higher-risk environments to provide increased capacity, safety and reliability. Forecasted capital requirements for culvert replacement over the next 50 years are outlined in 5-year increments in the Chart on the next page.

Figure 5-5: 50-year Forecasted Capital Requirements - Culverts



To provide greater detail, the forecasted capital requirements for culvert replacements are provided on an annual basis for the next 10 years in the Chart below.

Figure 5-6: 10-year Forecasted Capital Requirements - Culverts



Annual Capital Requirement – Culverts: $1,092,200 per year

Target Reinvestment Rate: 1.67%

Actual Reinvestment Rate: 3.22%

Funding Surplus: $1,015,000 per year

5.7 Risk Management

The following matrices outline the relationships between the probability and consequence of failure for the assets within this category. For bridges, the risk matrix is applied to each component of the bridge (i.e. deck, structure & foundation). For culverts, the risk matrix is applied to the whole asset.

The probability of failure is based 100% on the condition (BCI) of the asset, on a scale of 1 to 5, where 1 is a rare likelihood of failure and 5 represents an almost certain failure. The consequence of failure is based 100% on the replacement cost of the asset, on a scale of 1 to 5, where 1 is an insignificant consequence of failure and 5 represents severe consequences.

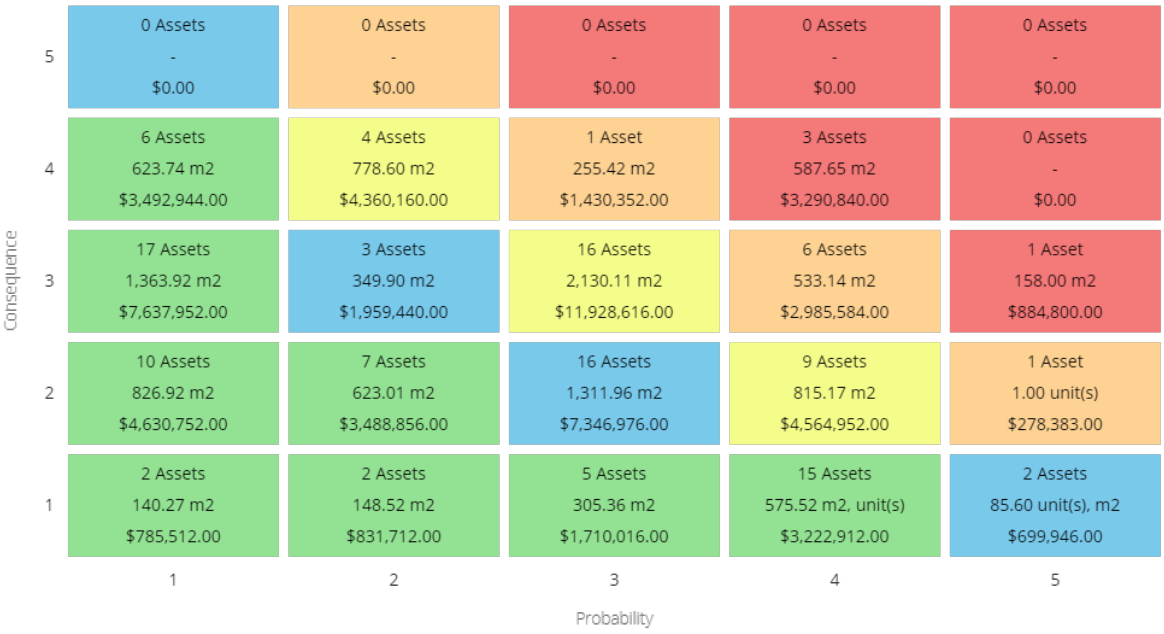
Table 5-8: Bridges & Culverts Risk Management Assessment

Condition Range	Probability of Failure Score	Replacement Cost Range	Consequence of Failure Score
0 – 20	5	**$0 – $250,000**	5
20 – 40	4	**$250,000 – 500,000**	4
40 – 60	3	**$500,000 – 750,000**	3
60 – 80	2	**$750,000 – 1,000,000**	2
80 – 100	1	**Over $1,000,000**	1

The matrices on the following page outline the relationships between the probability and consequence of failure for the various road network asset types.

Figure 5-7: Bridges Risk Matrix

Figure 5-8: Culverts Risk Matrix



5.8 Recommendations

The County's bridges and culverts play a critical role in the day to day lives of all residents and businesses. An accurate and clear understanding of the function, condition and replacement cost of these assets will ensure bridges and culverts meet the transportation needs of our region.

In addition to being able to improve core data and update scorecard results, this iteration of the AMP also provided an opportunity for Administration to look ahead to further refinements. The following list summarizes Administration's observations and recommendations arising from this version of the AMP.

- A review of the bridge component numbering system should be undertaken to ensure the current segment structure is relevant, accurate, and rational. As capital project costs are recorded against bridge components, ensuring accurate allocation to assets is key to understanding asset values and future replacement costs. A clearly defined numbering system will also reduce the likelihood of incorrect data assignment and increase the accuracy of expected useful life determinations.

- A review of the accuracy of bridge deck area, a key factor in estimating replacement cost, should be undertaken to ensure area data reflects actual field data. As bridges are rehabilitated, there may be instances where the overall deck area increases and the asset management database isn't accurately updated.

- A review of the communication channels and documentation levels in place to ensure information about shared assets with other municipalities is adequate. Within the County, regular touch points with local municipalities is improving. For assets shared with regional neighbours and lower tier municipalities, more work could be done to raise the level of awareness with respect to condition assessments and plans for rehabilitation of shared assets.

- To strengthen the principles of the County's Strategic Asset Management Policy, key personnel outside of Financial Services should have greater access and training on the use of the asset management database. Integrating asset management practices and philosophies will be achieved more efficiently if staff directly responsible for linear assets take a more active role in inputting, tracking and managing the data.

- Update the County's Tangible Capital Asset Policy to change the estimated useful life of culverts from 30 to 60 years.
- Leverage software to calculate and track bridge and culvert condition indexes in house.

6.0 Stormwater Network

6.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

The County of Essex owns and maintains 4.8km of stormwater mains. The Table below illustrates the key asset attributes for the County's stormwater network, including quantities, average age (weighted average by replacement cost), useful life and future replacement cost.

Table 6-1: Stormwater Network Portfolio Summary

Asset Segment	Quantity	Historical Cost	Replacement Cost
Stormwater Mains	4.8km	$3,826,900	$4,638,800

The replacement cost of the stormwater network was determined using the historical cost inflated to present value using CPI tables. As the stormwater network is fairly new, and not extensive, this approach was deemed most appropriate.

In addition to stormwater mains, which are located in more urban areas, the County also owns and maintains 3,170km of open drains and ditches which aid in flood prevention and stormwater management. Municipal drains have not historically formed part of the capital asset inventory, and as a land feature, do not have a replacement cost associated with them. An annual operating budget contributes to the maintenance of these drains. Billings to the County to repair and maintain drains constructed under the Drainage Act are received from local municipalities upon completion of the repair/maintenance work. The County is charged a percentage of costs relating to its share of the benefit of the drain (often referred to as the road authority benefit). All other abutting property owners are billed their share. Drainage works are often undertaken at the request of a benefitting landowner adding uncertainty to the County's ability to budget/forecast long-term asset management costs.

6.2 State of the Local Infrastructure

The Table on the following page identifies the current average condition of the stormwater mains, weighted based on replacement cost, and the source of the condition information.

Table 6-2: Stormwater Network Age and Useful Life

Asset Segment	Average Age	Useful Life	% of Service Life Remaining
Stormwater Mains	9.7 years	40 years	75.7%

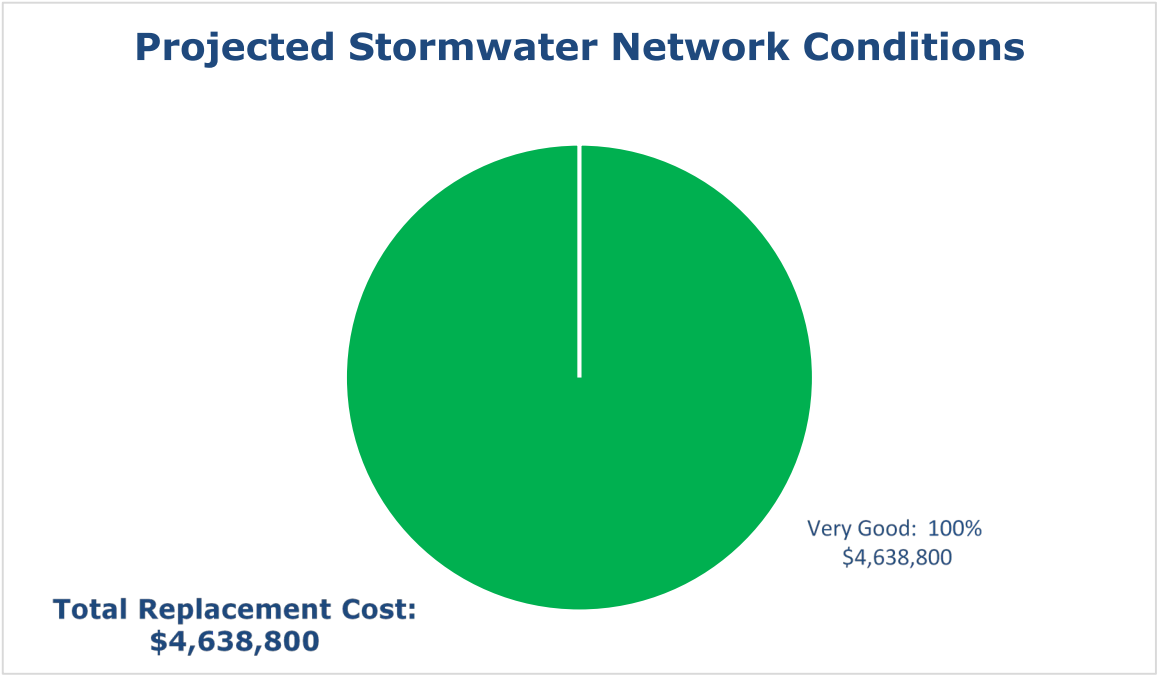
The Table below outlines the average condition (weighted based on replacement cost), and the source of the condition assessment.

Table 6-3: Stormwater Network Condition Rating & Source

Asset Segment	Average Condition (%)	Average Condition Rating	Condition Source
Stormwater Mains	95.7%	Very Good	Age-based

Due to its fairly new construction, the entire stormwater network is assessed in very good condition.

Figure 6-1: Projected Stormwater Network Conditions



The condition of the stormwater network is currently assessed on a deterioration curve using an aged-based rating. As the County's network is relatively small, and fairly new, using an aged-based approach is appropriate at this time. For this reason, CCTV inspections have not been conducted, but will be considered for future condition assessments as the assets age.

6.3 Levels of Service

The following Tables illustrate the current level of service for the County's stormwater network. These metrics include the community and technical level of service metrics that are required as part of O. Reg. 588/17 as well as any additional performance measures the County selected for this AMP.

6.3.1 Community Levels of Service

The following Table outlines the qualitative description that determine the community levels of service provided by the stormwater network.

Table 6-4: Stormwater Network Community Levels of Service

Service Attribute	Qualitative Description	Current LOS
Availability	Description, which may include maps, of the areas serviced by stormwater network	See Appendix D: Map of Stormwater Network

Appendix D: Map of Stormwater Network shows the geographic location of the stormwater mains. As an upper tier municipality, the network is relatively small. Local municipalities are primarily responsible for stormwater management in urban areas and are responsible for responding to construction, repair and maintenance of drains constructed under the Drainage Act in rural areas.

6.3.2 Technical Levels of Service

The following Table outlines the qualitative description that determine the technical levels of service provided by the stormwater network.

Table 6-5: Stormwater Network Technical Levels of Service

Service Attribute	Qualitative Description	Current LOS
Reliability	% of assets in good or very good condition	100%

Due to the relatively new construction date and good condition of the stormwater management network, there have been few complaints from residents, most of which are resolved with simple maintenance procedures.

6.4 Lifecycle Management Strategy

In order to maximize the estimated useful life of an asset, a lifecycle management strategy must be adopted to proactively maintain an asset's condition, and prevent accelerated deterioration. The following lifecycle strategy was developed to provide timely repairs and enhancements to the asset, and extend its service life at a lower total lifecycle cost.

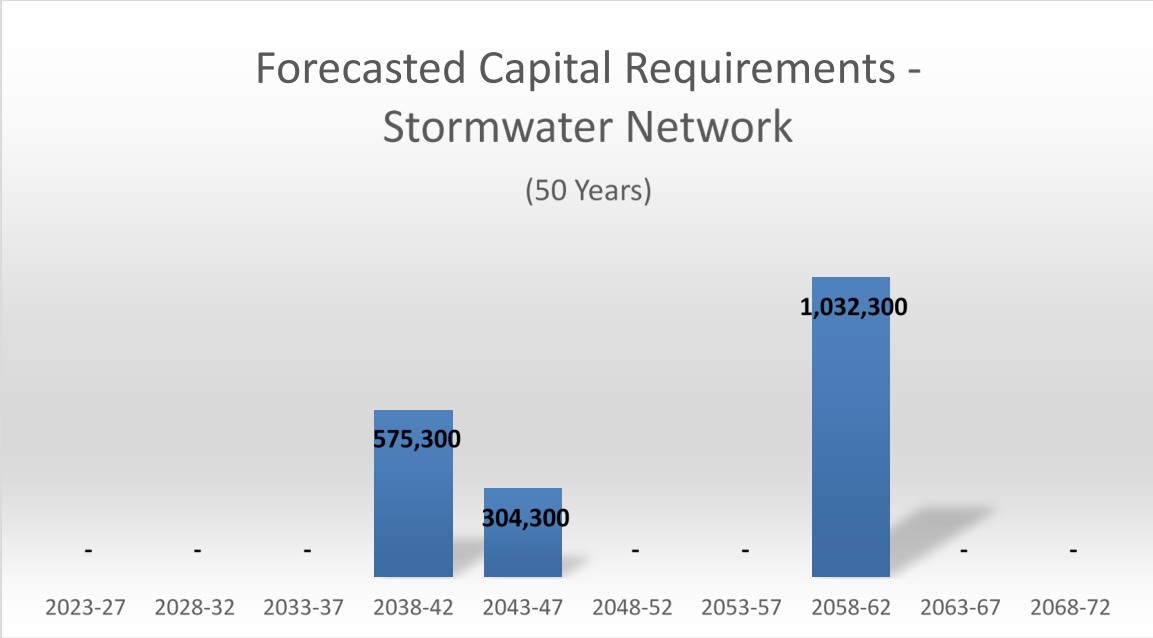
Table 6-6: Stormwater Network Lifecycle Activities

Activity	Description of Current Strategy
Inspection and Maintenance	Drive-by visual inspections are done weekly; catch basins are cleaned regularly and repaired or replaced as needed.
Rehabilitation and Replacement	Capital repairs and replacement are scheduled based on the results of visual inspection. A more structured inspection strategy should be developed to provide a better assessment of condition as the assets age.

6.5 Forecasted Capital Requirements

The forecasted capital requirements for stormwater mains are displayed in 5-year increments in the Chart on the following page. The annual capital requirements represent the average amount of funding per year that the County should allocate towards future rehabilitation and replacement needs. These requirements were forecasted over the next 50 years.

Figure 6-2: 50-year Forecasted Capital Requirements – Stormwater Network



Annual Capital Requirement: $116,000 per year

Target Reinvestment Rate: 2.50%

Actual Reinvestment Rate: 0%

Funding Shortfall: $116,000

Currently there are no lifecycle events identified that would require an annual funding allocation. It is recommended that going forward, Administration establish a maintenance strategy to identify if and when operating funds would be required. The network is relatively small, so at this time, only funding for future replacement after 40 years is recommended.

6.6 Risk Management

The probability of failure is based 100% on the condition of the asset, on a scale of 1 to 5, where 1 is a rare likelihood of failure and 5 represents an almost certain failure. The consequence of failure is based 100% on the replacement cost of the asset, on a scale of 1 to 5, where 1 is an insignificant consequence of failure and 5 represents severe consequences.

Table 6-7: Stormwater Network Risk Management Assessment

Condition Range	Probability of Failure Score	Replacement Cost Range	Consequence of Failure Score
0 – 20	5	**$0 – $100,000**	5
20 – 40	4	**$100,000 – 250,000**	4
40 – 60	3	**$250,000 – 500,000**	3
60 – 80	2	**$500,000 – 1,000,000**	2
80 – 100	1	**Over $1,000,000**	1

The matrix below outlines the relationship between the probability and consequence of failure for the assets within this category.

Figure 6-3: Stormwater Network Risk Matrix

6.7 Recommendations

The County's stormwater network plays a critical role in the flood mitigation strategy for the region and keeping adjacent roadways free of standing water. An accurate and clear understanding of the function, condition and replacement cost of these assets will ensure the stormwater network meets the drainage needs of our region.

In addition to being able to improve core data and update scorecard results, this iteration of the AMP also provided an opportunity for Administration to look ahead to further refinements. The following list summarizes Administration's observations and recommendations arising from this version of the AMP.

- A more comprehensive maintenance strategy should be developed to provide a clearer picture of the future maintenance and capital needs of the stormwater network. Periodic inspections using CCTV technology is recommended in order to proactively safeguard against unforeseen deterioration or unanticipated failure.
- The effect of climate change should be considered when developing a comprehensive maintenance strategy. The intensity and frequency of severe storm events will continue to put pressure on the reliability and effectiveness of stormwater assets. Consultation and collaboration with the local level to better understand these pressures is recommended.

7.0 Acronyms and Definitions

"AMP" means the Asset Management Plan of the Corporation of the County of Essex

"BCI" means Bridge Condition Index, a quantitative valuation of the condition of a bridge or culvert

"CCTV" means Closed Circuit Television, a video surveillance network utilized to monitor the condition of underground infrastructure

"County" means the Corporation of the County of Essex

"CWATS" means the County Wide Active Transportation System, which consists of multi-use paths, multi-use trails, one-way and two-way cycle paths, paved shoulders and buffered paved shoulders

"EUL" means Estimated Useful Life of an asset, or the length of time in which an asset is expected to be used in the ongoing activities of the County

"LOS" means Level of Service provided by the asset

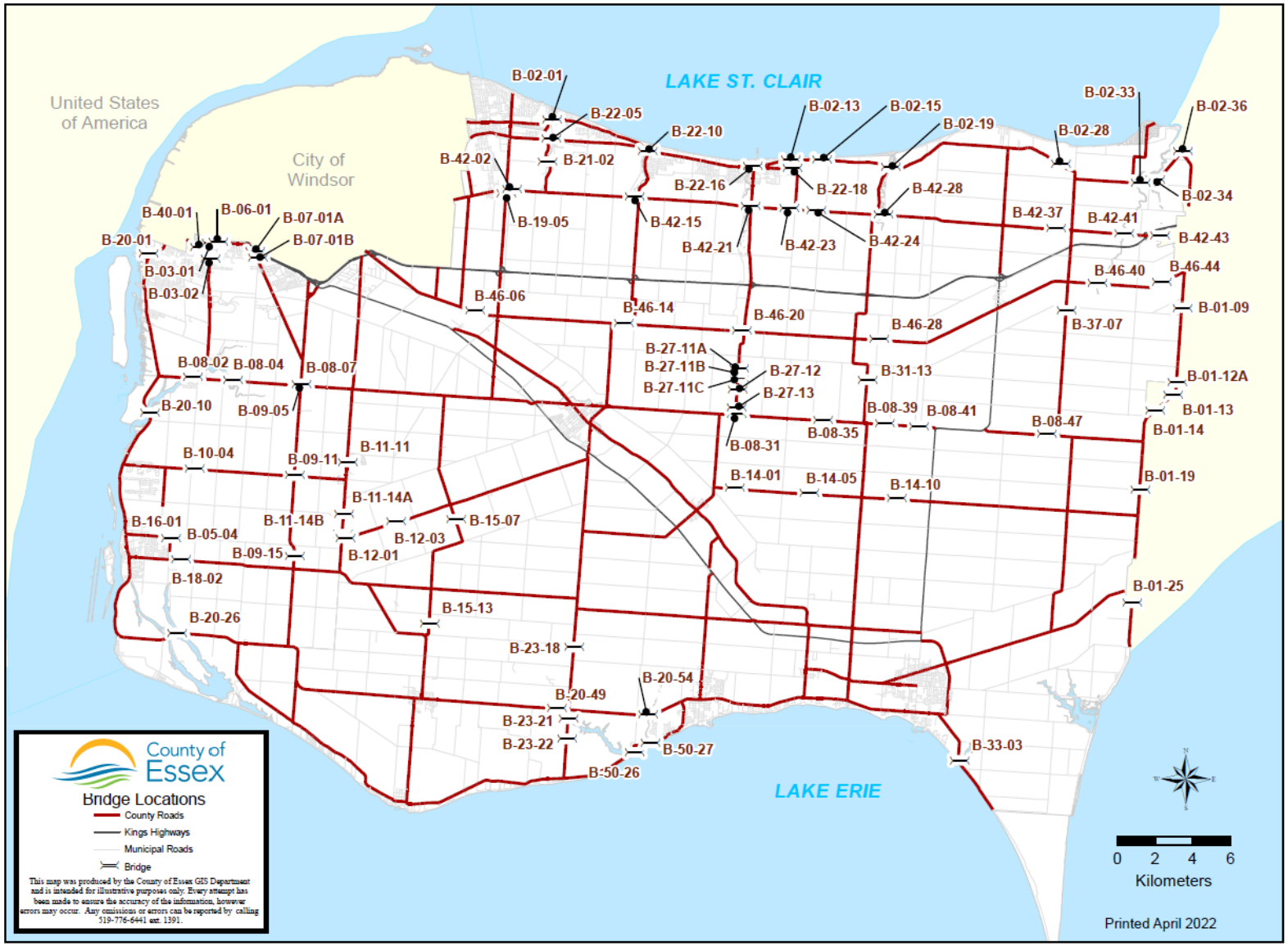
"O.Reg 588/17" means Ontario Regulation 588/17 made under the Infrastructure for Jobs and Prosperity Act, 2015: Asset Management Planning for Municipal Infrastructure

"PCI" means Pavement Condition Index, a quantitative valuation of the condition of a hard road surface based on several factors, including pavement distress and rideability.

"OSIM" means the Ontario Structure Inspection Manual, published by the Ministry of Transportation and dated October 2000 (revised November 2003 and April 2008)

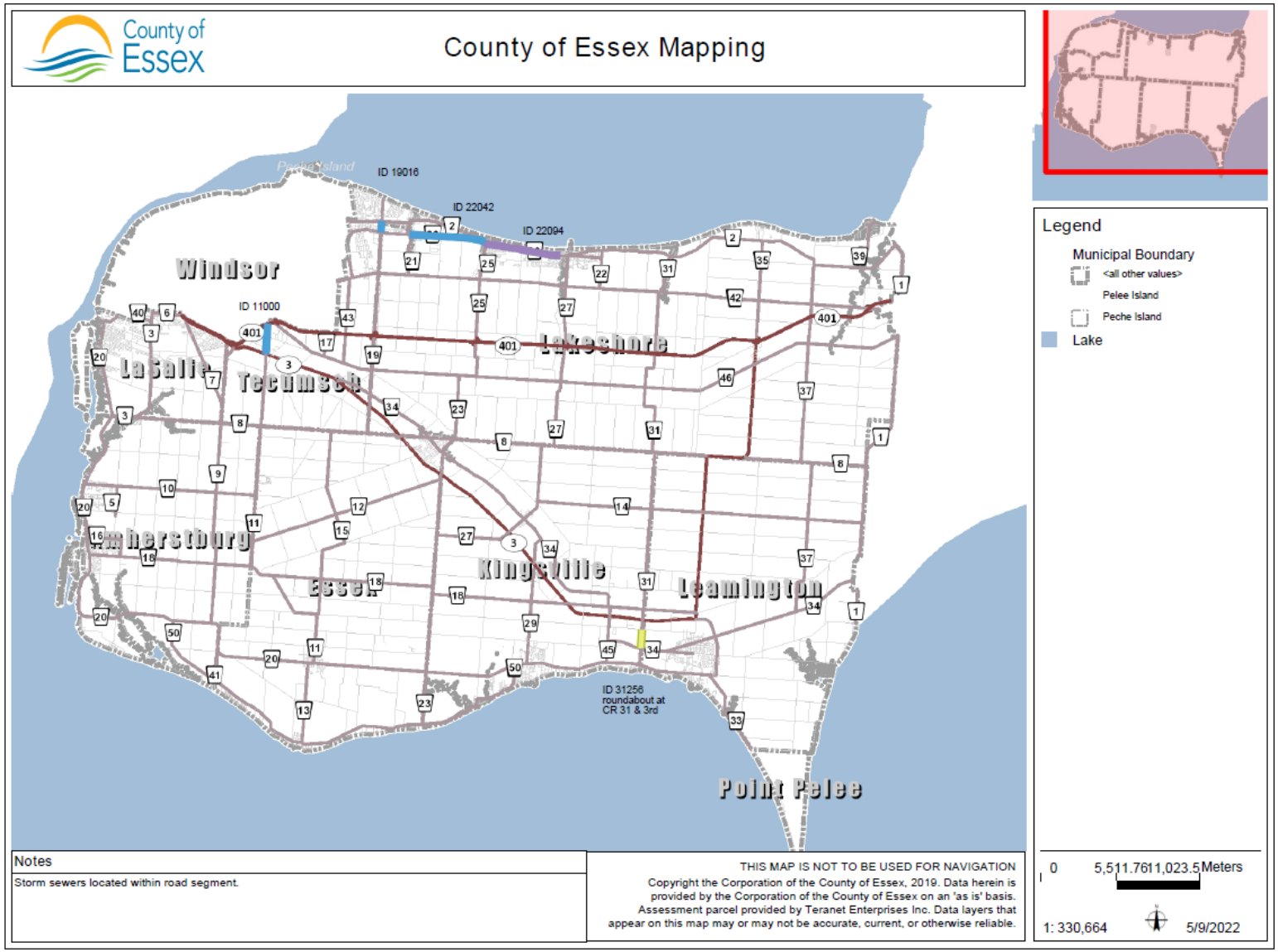
Appendix A: Map of Road Segments

Appendix B: Map of Bridges



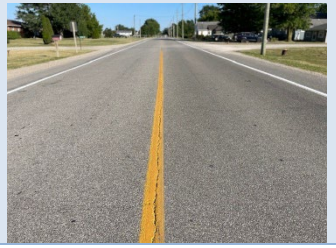
Appendix C: Map of Culverts

Appendix D: Map of Stormwater Network



Appendix E: Condition Indexes

Images of various Road Network Condition Levels

Very Good	Good	Fair	Poor	Very Poor
				
PCI = 80-100	PCI = 60-79	PCI = 40-59	PCI = 20-39	PCI = 0-19

Images of various Bridge Condition Index Levels

Very Good	Good	Fair	Poor	Very Poor
				
BCI = 80-100	BCI = 60-79	BCI = 40-59	BCI = 20-39	BCI = 0-19

Image of various Culvert Condition Index Levels

Very Good	Good	Fair	Poor	Very Poor
				
CCI = 80-100	CCI = 60-79	CCI = 40-59	CCI = 20-39	CCI = 0-19

Appendix F: 5-Year Rehabilitation Program

Acknowledgements

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