Oxford County
Growing stronger together

Asset Management Plan

June 2022

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1.0 Executive Summary

1.1 Background

The state of the County's assets can be an economic development driver and is a determinant in the wellbeing of our communities. This Asset Management Plan (AMP) supports the County's Strategic Plan, as well as, the Official Plan as it relates to "strategically growing our economy and our community". This plan sets out a strategic framework that will guide future investments that support economic growth and respond to changing needs in a fiscally responsible manner. Complementing the County's Long Term Financial Sustainability Plan, the AMP forms a strong foundation for sound asset management principles well into the future.

The Province is seeking to achieve standardization and consistency in the management of municipal assets. To be eligible for capital grants, municipalities must have an AMP and demonstrate the particular need of a project to the social, economic or environmental priorities of the community.

The Infrastructure for Jobs and Prosperity Act, 2015*,* was proclaimed on May 1, 2016 and was created to establish mechanisms to encourage principled, evidence-based and strategic long-term planning. The Act sets out principles for asset management planning for the broader public sector, including municipalities. Paragraph 12(1)(d) of the Act confers regulatory authority for the government to prescribe how AMPs should be prepared including regulations related to the "form, content and timing" of AMPs.

As a result, Ontario Regulation (O.Reg.) 588/17: Asset Management Planning for Municipal Infrastructure[1] was filed on December 27, 2017. The purpose of O.Reg. 588/17 is to implement best practices throughout the municipal sector and provide a degree of consistency to support collaboration between municipalities and the Province. This regulation aims to help municipalities more clearly identify their asset needs, thus, helping municipalities work towards a more sustainable position regarding long-term asset lifecycle planning. O.Reg. 588/17 requires an updated AMP for core assets (Water, Wastewater, Roads, Stormwater, Bridges and Major Culverts) by July 1, 2022, and for all other assets by July 1, 2024.

This AMP covers the core assets identified under O.Reg. 588/17. The County is presenting the water and wastewater AMPs by system to align with how each system is managed and how rates are calculated. An updated AMP covering the non-core assets will be completed in advance of the July 1, 2024 deadline.

Assets advance the collective interests of our communities, residents and businesses through customer/client-focused services that improve community wellbeing.

In addition to meeting the provincially mandated AMP requirements, the County's AMP establishes a strategic framework for managing these assets, aligning assets with service objectives, documenting core practices and procedures, and guiding the action and investment needed to meet key business goals. The AMP clearly aligns with and supports the

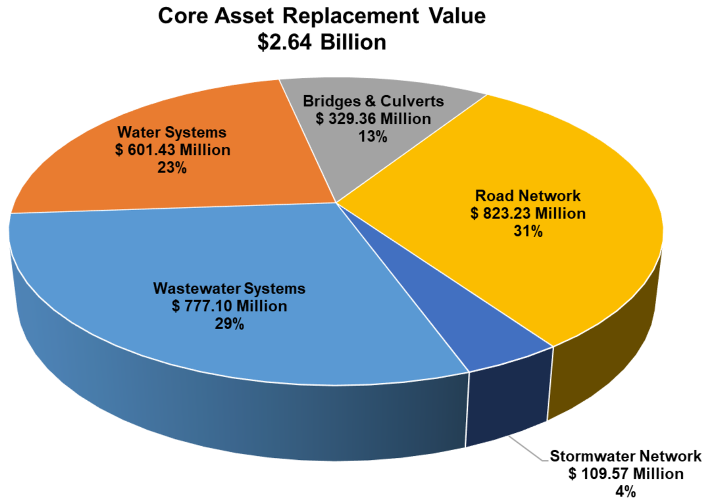
[1] https://www.ontario.ca/laws/regulation/170588?

County's Strategic Plan, Official Plan, By-laws, Policies, Master Plans and Business Plans.

This AMP is based on current information available with a goal to identify plans to address gaps in data and procedures. The AMP is designed to be a living document that will be reviewed annually and revised in response to changing environmental, social and economic needs within our community.

Figure 1.1.1 reflects a summary of the replacement value of the County's core assets.

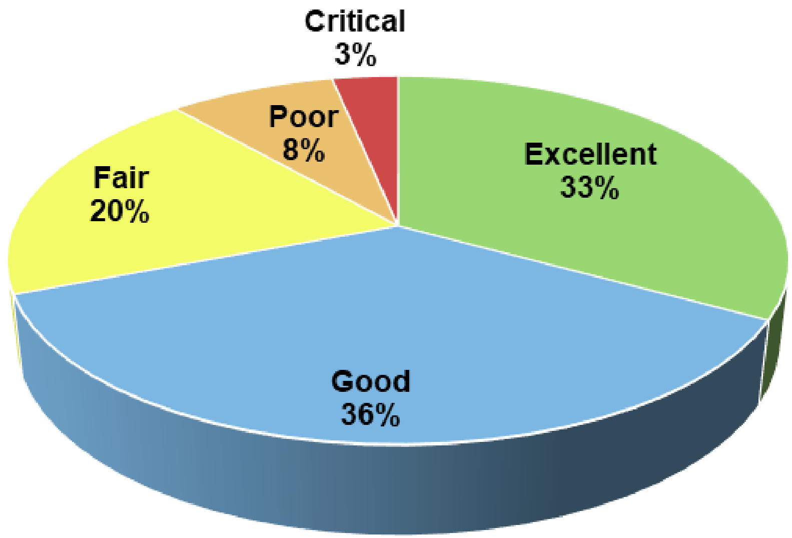
Figure 1.1.1 Consolidated Replacement Value



1.2 State of Infrastructure

The County's core asset inventory is made up of a number of different asset types and components as a result of differing useful lives and lifecycle strategies. Over 88.5% of the County's core asset inventory has condition ratings of fair or better based on the replacement value of the individual assets, as illustrated in figure 1.2.1.

Figure 1.2.1 Consolidated Asset Condition Assessment

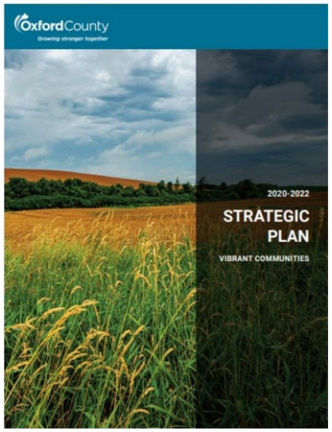


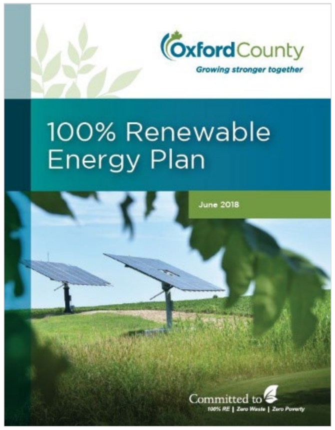
2.0 Introduction

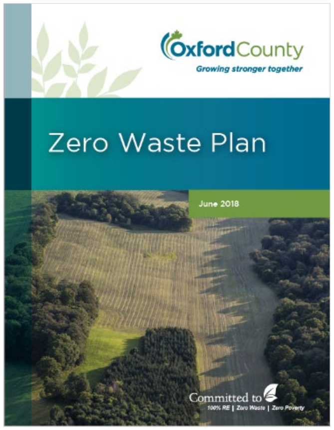
2.1 Importance of Asset Management

Asset Management strives to continually improve the long-term management of assets. The following is a list of goals that asset management programs and processes aim to achieve:

- Reduced lifecycle cost (i.e. total operating, maintenance and capital resources) of providing services to residents.
- Reduced risk exposure to the County by ensuring that assets are managed in a manner that matches the risk that their failure represents to the delivery of services.
- An informed and transparent decision making process that provides Council with the knowledge that they need to make decisions regarding capital expenditures, operating costs and revenue requirements (i.e. rate and tax levels).
- A mechanism to ensure that the services that are delivered, through the use of assets, can be provided at a sustainable level that is affordable to residents.







2.2 Alignment to Strategic Plan

The initiatives contained within this AMP support the values and strategic directions as set out in the Strategic Plan as outlined in table 2.2.1.

2.3 Alignment to Other County Plans and Policies

The comprehensive asset management approach will also review other plans and initiatives in place throughout the County to ensure that asset management activities align with these plans and initiatives, as outlined in table 2.3.1.

Table 2.2.1 Alignment to Strategic Plan

Strategic Plan Statement	Asset Management Plan Alignment
Vision: Vibrant communities, working well and growing stronger together! **Mission Statement:** To serve the needs and advance the collective interests of our partner communities, residents and businesses through services that improve community wellbeing.	The state of the County's assets can be an economic development driver and is a determinant in the quality of life of our communities.
Strategic Direction 1.i: *A County that Works Together* - Enhance community wellbeing by maintaining and strengthening core infrastructure, including affordable housing and broadband.	This AMP will ensure assets will be sustained at the required level that enhances the quality of life for all of our citizens by maintaining and strengthening core assets. A key element of this plan is to ensure good stewardship through proper asset management – well-planned, well-built and well-maintained assets.
Strategic Direction 3.iii: *A County that Thinks Ahead and Wisely Shapes the Future* – Demonstrate a commitment to community wellbeing and sustainability by: Ensuring that all significant decisions are informed by a balanced consideration of community, economic and environmental implications including lifecycle costs and benefits/costs, including debt, tax and reserve levels and implications.	This plan sets out a strategic framework that will guide future investments that support economic growth and respond to changing needs in a fiscally responsible manner. Regular review of the AMP aligns to the County's Strategic Plan. In addition, this AMP meets the provincial government directives as set out in the Ministry of Infrastructure's "*Building Together* Guide for Municipal Asset Management Plans".

Table 2.3.1 Alignment to Other Plans and Policies

County Plans and Policies	Asset Management Plan Alignment
Long Term Financial Sustainability Plan	The AMP is a key component of the Long Term Financial Sustainability Plan, serving the purpose of "the management of infrastructure assets that combines multi-disciplinary management techniques (including technical and financial) over the life cycle of the asset in the most cost effective manner to provide a specific level of service."
Official Plan	Provides the criteria and direction for growth surrounding asset decision-making processes.
Business Plans	The service level and budget set out in this AMP are incorporated into department business plans and budgets, goals and performance measures.
Capital Plan	The capital plan consists of a capital budget and capital implementation program over a 10-year horizon. The plan identifies capital projects, provides a planning schedule and identifies financing sources for the plan.
Infrastructure Master Plans	The AMP utilizes and incorporates various master plans (including, but not limited to, the Transportation Master Plan, Cycling Master Plan, Wastewater Financial Plan, Water Financial Plan, Green Fleet Plan); in turn the AMP may influence future plans and recommendations.
By-Laws, Policies, and Procedures	The AMP will utilize various asset related by-laws, policies and procedures, including the Development Charges Background Study.
Regulations	The AMP will align with senior level government regulations.

2.4 Purpose and Development Methodology

The purpose of the County's AMP is to set out how the County's assets will be managed in accordance with the Strategic Plan; various plans and policies; and legislation, to ensure that the County is capable of providing the levels of service required to improve community wellbeing.

The output from the AMP serves as a framework for the County's long-term capital plan, including reconstruction and rehabilitation strategies, maintenance, repair activities, ongoing operations, and financial planning.

The methodology employed to develop and review the AMP is based on the methodology listed in table 2.4.1.

The County's asset management planning process begins with the Strategic Plan, aligned with the public's expectations and government regulations.

The process evaluates the state of our assets, which is determined by current conditions and performance assessment for each asset type. This assists in forecasting a sustainable funding level and identifies if a funding surplus or deficit exists. Report cards are used to assess and report the state of our assets.

Performance measures are established and tracked to provide an understanding of the current levels of service. This framework guides the development of proposed levels of service and performance measures are used to evaluate progress in achieving the proposed levels of service.

The asset management strategy component of the planning process provides a detailed analysis within each report card. This analysis is based on best practices and industry standards employed to manage the assets. This component includes a comprehensive review based on clearly identified rehabilitation strategies that trigger specific lifecycle events. The ideal lifecycle strategy takes into consideration return on investment, risk assessment and prioritization of projects.

The next step in the planning cycle is developing the financial strategy. This is an integral component of the 10-year capital plan (budget). All possible revenue sources are considered for each of the asset needs, such as, grants (including the Ontario Community Infrastructure Fund and Canada Community Building Fund), reserves, development charges, debt, user fees (rates), and tax levy. This stage of the process is reviewed and developed concurrently with the County's annual operating and capital budget to ensure the overall budget is achievable and manageable, both technically and financially.

The final component of the asset management planning process is performance reporting and evaluating against key performance measures established to assess progress towards achieving the proposed levels of service. This exercise will also identify weaknesses in performance that will trigger re-assessment of the proposed service levels or rehabilitation strategies.

Table 2.4.1 Review Methodology

Stage	Description
Strategic Plan	Strategic Plan goals, public expectations, legislated requirements
State of Infrastructure	Asset inventory, valuation, current condition/performance, sustainable funding
Levels of Service	Key performance indicators, performance measures
Asset Management Strategy	Life cycle analysis, growth requirements, risk management, project priorities
Financing Strategy	Capital budget including revenue source analysis
Performance Reporting	Key performance measures, progress reported in Annual Report

2.5 Plan Content

This AMP complies with the requirements of O.Reg. 588/17 and the provincial government directives as set out in the Ministry of Infrastructure's "Building Together - Guide for Municipal Asset Management Plans".

2.6 Resources

At the organizational level, the County's enterprise asset management process involves collaboration among various divisions and programs – roads, water, wastewater, waste management, facilities, information systems, planning, finance, and more.

The County utilizes software applications for capital asset long-term financial planning and analysis. The systems include:

- Comprehensive asset inventory including condition ratings;
- Replacement costs for the asset inventory items;
- Maintenance management system in order to assess maintenance, operation and replacement activities of existing assets;
- Asset accounting for Public Sector Accounting Board (PSAB) purposes in accordance with PSAB 3150;
- Asset service levels and anticipated useful lives.

2.7 Plan Scope

The 2022 AMP focuses on the core assets as identified in O.Reg. 588/17.

The AMP utilizes a long-term strategic planning window of 100-years. Having a long-term strategic planning window allows the plan to model the exceptionally long service lives of some assets (i.e. underground assets of water, wastewater and stormwater, road bases, etc…). Although the accuracy of a long-term planning window is highly subject to assumptions and estimates, it allows decision makers to better assess the asset funding requirements, and sustainably fund the County's asset lifecycle needs.

2.8 Planning Framework

The County will align asset management planning with the Province of Ontario's land-use planning framework, including any relevant policy statement issued under section 3(1) of the Planning Act and any Provincial Plans that are in effect, as well as with the County's Official Plan. The objective being to ensure that assets and public service facilities are provided in a coordinated, efficient and cost effective manner and that planning for assets and public service facilities is coordinated and integrated with land use planning so that they are financially viable over their lifecycle and available to meet current and projected needs.

The Official Plan is the policy document that establishes the overall land use strategy for both the County and the eight area municipalities that comprise the County.

The policies and land use schedules contained in the Official Plan establish locational and development review requirements for various land uses (residential, commercial, industrial, institutional, parks, etc.), set out how agricultural land and other natural features and cultural heritage resources are to be protected and provide direction on how environmental constraints are to be addressed. The Official Plan also helps to guide municipal decisions with respect to asset management, public services and other investments.

The Official Plan anticipates that the County will continue to experience population growth and economic activity during the course of the planning period. It is the objective of County Council, however, that new development necessary to accommodate growth must be wisely managed to ensure that patterns of development and types of land uses are efficient, environmentally sound, financially responsible and meet the needs of County residents.

In order to establish a basis for designating sufficient lands for settlement and employment purposes, for establishing capital improvement programs for municipal assets and for planning for public services, the County has adopted population, household and employment land projections for the planning period, as illustrated in table 2.8.1. The projections are consistent with those utilized in the latest Development Charges Background Study.

Table 2.8.1 Oxford County Growth Projections

	2026	2031	2036	2041	2046
Population	130,300	138,100	146,060	153,680	161,050
Households	51,330	54,410	57,430	60,070	62,600
Employment	64,570	67,170	70,400	74,110	78,390

2.9 Commitment to Engagement

The County's Strategic Plan commits to informing and engaging with citizens through planned communication, conversation and dialogue. As a County that "thinks ahead and wisely shapes the future," we will provide information and seek input on asset management planning through:

- Opportunities for residents and other stakeholders to provide input across a range of channels (e.g., online, in person, written submissions);

- Coordinated planning between interrelated assets by pursuing collaborative approaches with area and neighbouring municipalities, and other asset owning agencies wherever viable and beneficial; and
- Our partnerships and relationships with external parties are important to maintaining service delivery. We rely on partnerships to aid in the delivery of services and improvements to our assets. We highly value our partnerships and recognize the benefits of working with them to secure safe and effective delivery, incorporate leading practices and techniques, and achieve efficiencies in delivery.

This document is made publicly available on the County's website as required by O. Reg. 588/17. The County will also respond to and facilitate information requests for any background information and reports used in the creation of this plan.

2.10 Improvement Plan

Improved asset management planning is vital to the long-term sustainability of assets throughout the province.

The AMP is intended to be a living document. The County is committed to monitoring the industry and implementing best practices as they evolve. County staff are working with Asset Management Ontario to establish a successful Southwestern Ontario community of practice so that we can continue to evolve our AM practices with the strength of our peers.

The County is also committed to updating its asset management data on a continuous basis as new information is received. (i.e. the Bridge Needs Study is completed every two years providing updated conditions). This continuous improvement to data helps ensure that the right capital projects are targeted with each budget cycle.

Throughout each report card, areas of improvement are identified.

3.0 State of County Assets

3.1 Inventory

Assets are identified within each report card by component and quantity. Included, where available, is a comparison of inventory levels to the 2017 AMP and explanations of significant changes.

3.2 Valuation

Replacement cost valuation is forward-looking and accounts for changes in technology and other factors. Replacement costs are based on current tender prices, where available. Current tender prices are adjusted where County staff feel some cost increases are only temporary due to COVID. Replacement costs provided as part of condition assessments or other studies are also being utilized, where available. The Consumer Price Index tables have also been used to inflate some recent purchases to November 2021 dollars, where other updated cost information was not available.

3.3 Condition Assessment Approach

There are numerous investigative techniques in order to determine and track the physical condition of an asset portfolio.

For instance, the interior of wastewater and stormwater pipes are routinely inspected using closed circuit television (CCTV) inspections. These inspections are guided by standard principles of defect coding and condition rating that allow for a physical condition "score" for the assets to be developed. Other standardized assessment techniques relate to building condition assessments, bridge assessments (Ontario Structure Inspection Manual or OSIM Inspections), and pavement inspections. For assets, without a standardized approach to condition assessment scoring, information from visual inspections, failure records and other maintenance related observations are used in establishing the condition of the asset.

Given the complexities and accessibility of some assets, not all assets allow for a visual or performance-based condition assessment. In these cases, a theoretical age-based condition score can be determined.

The County's condition scale and visual inspection ratings are based on the following approach:

- Excellent - Asset is well maintained with no noticeable defects.
- Good - Asset may show signs of minor deterioration and may require some maintenance.
- Fair - Deterioration evident, function affected. Asset may require on-going monitoring.
- Poor - Serious deterioration, function inadequate. Asset may require ongoing monitoring.
- Critical - No longer functional, general or complete failure. Asset may require extensive monitoring.

3.4 Useful Life

Asset useful lives, for each new build / replacement, are identified within each report card. Assets may undergo a continual process of repair, rehabilitation and refurbishment in order to maintain their intended purpose. By using lifecycle strategies the County is able to extend the overall life of certain assets, ensuring that each asset is maintained in the most sustainable manner.

It should be noted that anticipated useful lives, based purely on age, can provide a misleading view on the asset replacement requirements. In many cases assets that are properly constructed and maintained may outlive their anticipated useful life and continue providing service. In other cases, due to poor workmanship and lack of proactive maintenance, assets may fail before they fulfill their anticipated useful life.

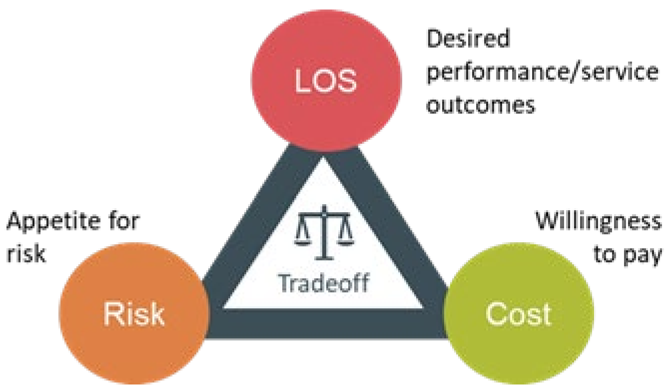
4.0 Expected Levels of Service

4.1 Levels of Service Context

Level of Service is a methodology used to consider affordability of assets against customer needs and expectations.

Identifying levels of service (LOS) ensures that asset management decisions are:

- Based on impact to customers, the community and the environment;
- Focused to deliver the required level of service;
- Aligned with the strategic goals of the County; and
- Considered and optimally balanced with risk and financial cost.



It is important to define and quantify the levels of service within each service area as key indicators of asset needs and the basis for investment decisions. Service levels communicate to Council and the residents the state and trend of the County's assets. Funding scenarios can be created based on different service levels, which allows Council to set priorities on the proposed service level for each asset type.

Levels of service take into consideration:

- Legislative and regulatory requirements: These requirements prevent levels of service from declining below a certain standard. (i.e. Minimum Maintenance Standards for municipal highways, building codes and the Accessibility for Ontarians with Disabilities Act)
- Corporate goals and objectives: These goals and objectives define the County's priorities, and guide future spending.
- Customer needs: The expectations of the general public have a direct impact on the level of service demanded from our assets.
- Industry standards and best management practices

4.2 Framework

The structure of the County's LOS framework was developed to align with international best practices including the International Infrastructure Management Manual (IPWEA, 2015). The framework includes the mandatory measures to meet the requirements of O.Reg. 588/17 by including both Community and Technical Levels of Service. The metrics in this framework may be expanded upon as the County continues to improve its data collection and reporting processes.

4.3 Proposed Levels of Service

Proposed levels of service are not required for reporting until 2025 based on O.Reg. 588/17 requirements. The County will be proactively developing proposed measures for review and consultation as part of our LOS framework to ensure the long-term sustainability of our assets.

4.4 External Trends and Issues

There are always external factors that are beyond the control of the County that can influence the level of service achieved from our assets. Performing an analysis of this will ensure that the performance targets are well-aligned with the environment which the County operates in.

The following are known external trends/issues impacting levels of service:

- Aging assets: older assets may burden the County and may require a higher funding investment to maintain safety and reliability.
- Declines in water consumption: ongoing conservation efforts lead to a decline in revenue generated from rates.
- Enhanced environmental stewardship: an increased demand of accessible alternative fuels requiring new funding; the County's requirement to look at environmental sustainability with each asset lifecycle need could increase timelines and costs.
- Inflation index for construction projects: inflation rates that increase at a rate greater than expected could result in a shortage of funding to complete asset lifecycle needs.
- Environmental factors: unusual weather events can significantly impact the condition of assets, changing the timeframe that maintenance is required.
- Changes in senior level government funding: changes in funding levels or priorities will require the County to take another look at our ability to fund our asset management needs.
- Uncertainty of growth forecasts: may result in increased deterioration, the need for additional assets and growth upgrades quicker than expected.
- Active transportation: increases in the use of alternative transportation results in increased pressure to maintain a safe and reliable transportation network.

5.0 Asset Management Strategy

5.1 Procurement Methods

The County's Purchasing Policy (Policy No. 6.7) sets out guidelines for the County to ensure that all purchases of materials, supplies and services provide the lowest costs, including where appropriate lifecycle costs, consistent with the required quality and levels of service.

The key objectives of the purchasing policy are to:

- Ensure an open and honest process that is fair and impartial;
- Provide clear direction and accountabilities;
- Define the types of procurement processes that shall be used;
- Ensure objectivity and integrity of the procurement process;
- Ensure fairness between bidders; and
- Maximize savings for the taxpayers.

Procurement can include joint contracts with internal divisions and external municipalities/agencies through capital planning or development-related asset planning.

To ensure the most efficient allocation of resources and funds, the County will consider bundling projects when issuing tenders, to realize cost-benefits and economies of scale.

5.2 Risks Associated with the Strategy

Risk management frameworks are developed to assist with the prioritization of investments within the capital planning period. The preferred approach is to implement a triple bottom line analysis approach to evaluate:

- Social impacts of asset failure, including impacts to customers, businesses and the County's reputation;
- Environmental impacts of asset failure; and
- Economic impacts of failure including the cost of remediation.

In the context of asset management, risk is the multiple of the consequence of an asset failing and the probability that the event will occur.

Probability of failure is based on available condition data and deterioration modelling.

Consequence of failure is based on the weighted parameters specific to each asset category based on their financial, social and environmental impact.

The County's Risk Management Plan (Policy No. 6.17) describes how risk and exposure to loss will be managed by the County. The document describes processes that will be used to identify, record, analyze and respond to risks, and the roles and responsibilities of the people involved in projects and services provided by the County. The risk profiles developed for each asset type align with the requirements of this policy.

5.3 Lifecycle Analysis

The lifecycle management strategy is the set of planned actions that should enable the assets to provide the proposed level of service in a sustainable way, while achieving acceptable levels of risk and the lowest lifecycle costs required to provide that level of service.

The goal of this assessment is to capture the deterioration model for each asset component. Understanding the optimal budget at which lifecycle activities sustain the proposed LOS at the lowest lifecycle cost is one of the main objectives of the lifecycle planning component of the AMP.

Lifecycle considerations for assets include analysis of the timing to carry out key asset management activities including inspection, maintenance, repair, and replacement. For some assets, replacement needs are based on a run to failure strategy, as this is the most economical.

Ongoing preventative maintenance activities will be outlined in the County's work management system.

The lifecycle activity types that are considered, as defined by the Building Together Guide for Municipal Asset Management Plans, are provided in table 5.3.1.

Table 5.3.1 Lifecycle Activities

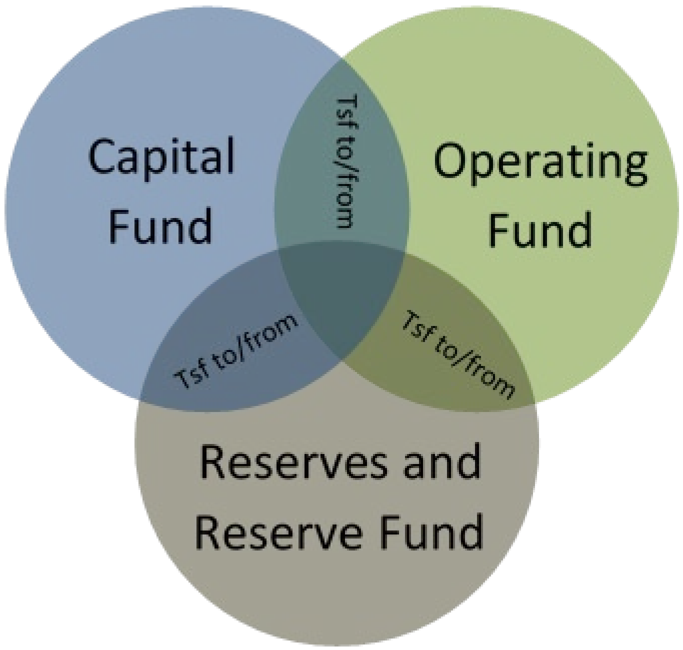
Strategy	Lifecycle Activity
Non-Infrastructure Solutions	Actions or policies that can lower costs or extend useful lives.
Maintenance	Including regularly scheduled inspection and maintenance, or more significant maintenance associated with unexpected events. These activities do not improve the overall condition of the asset, nor increase its useful life.
Rehabilitation / Renewal	Significant treatments designed to extend the useful life of the asset.
Replacement	Occurs at the end of the useful life and/or when rehabilitation is no longer an option.
Disposal	Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the County to provide services.
Expansion / Growth	Planned activities required to extend services to previously un-serviced areas, expand services to meet growth demands, or increase the level of service being provided.

6.0 Financial Strategy

6.1 Financing Strategies

A financial plan is a critical component of the AMP, and brings the AMP into action. A sound financial plan demonstrates that the County has integrated the AMP into financial planning and budgets, and that it has utilized all available funding tools. Figure 6.1.1 illustrates how the different funds work together to help achieve the optimum funding strategy.

Figure 6.1.1 Fund Integration



The AMP is a key component of the County's Long Term Financial Sustainability Plan (Policy No. 6.16), designed to combine multi-disciplinary management techniques (including technical and financial) over the lifecycle of the asset in the most cost effective manner to maintain specific levels of service.

A key component of the asset management strategy is a financial planning tool that will assist in achieving the guidelines as set out in the County's Long Term Financial Sustainability Plan, Risk Management Plan (Policy No. 6.17), Reserve Policy (Policy No. 6.20) and Debt Management Policy (Policy No. 6.19). The financial planning tool will provide a comprehensive asset registry for all asset types and will enable dynamic lifecycle planning, condition assessment, risk analysis, levels of service and project prioritization.

In the event that this AMP identifies funding shortfalls in any of the asset categories, the Building Together Guide indicates that the impacts of the shortfall and how the impact will be managed, are to be included in the plan. The action plan may include any of the following approaches:

1. Reduction in levels of service which will effectively reduce the funding requirement; and
2. Employ asset management and financial strategies, such as:
    a. use of debt; and
    b. increase or introduce user fees.

When evaluating asset funding requirements and shortfalls, it is important to consider intergenerational equity which refers to the fairness between generations. From an asset perspective this speaks to who should pay for assets that have long-term benefits. For assets such as fleet and equipment with short lives, 10 years or less, the current generation receives the full benefit of the asset and should be responsible for the asset's financing. For assets with longer lives, such as water and wastewater assets with a 90-year life, multiple generations will receive the benefit and establishing fairness for the asset financing is more difficult.

The Building Together Guide speaks to a building blocks approach to financial planning for capital assets. Some of the costs related to maintaining assets are classified as operating expenses while others are considered capital costs. The ideal funding level is at the top of the building blocks where assets are fully funded and a sustainable level of funding for service enhancements and future investment needs is achieved. The illustration in figure 6.1.2 was designed specifically for water and wastewater systems, however the concept applies to all asset types. The closer to the bottom of the building blocks a municipality is, the greater the funding gap will be.

6.2 Budget Process

The County will integrate findings from the AMP annually in the creation of the capital and operating budgets, and its long-term financial plan. Sound financial analysis will be encompassed in asset management planning in order for the AMP to be a sought after guide to employees for long-term planning.

The AMP will be referenced in preparation of the capital plan to assist with:

- Identifying all potential revenues, costs and project timing (including operating, maintenance, replacement and decommission) associated with asset lifecycle decisions;
- Evaluating each significant new (growth related) asset, including considering the impact on future operation costs; and
- Incorporating new revenue tools and alternative funding strategies where possible.

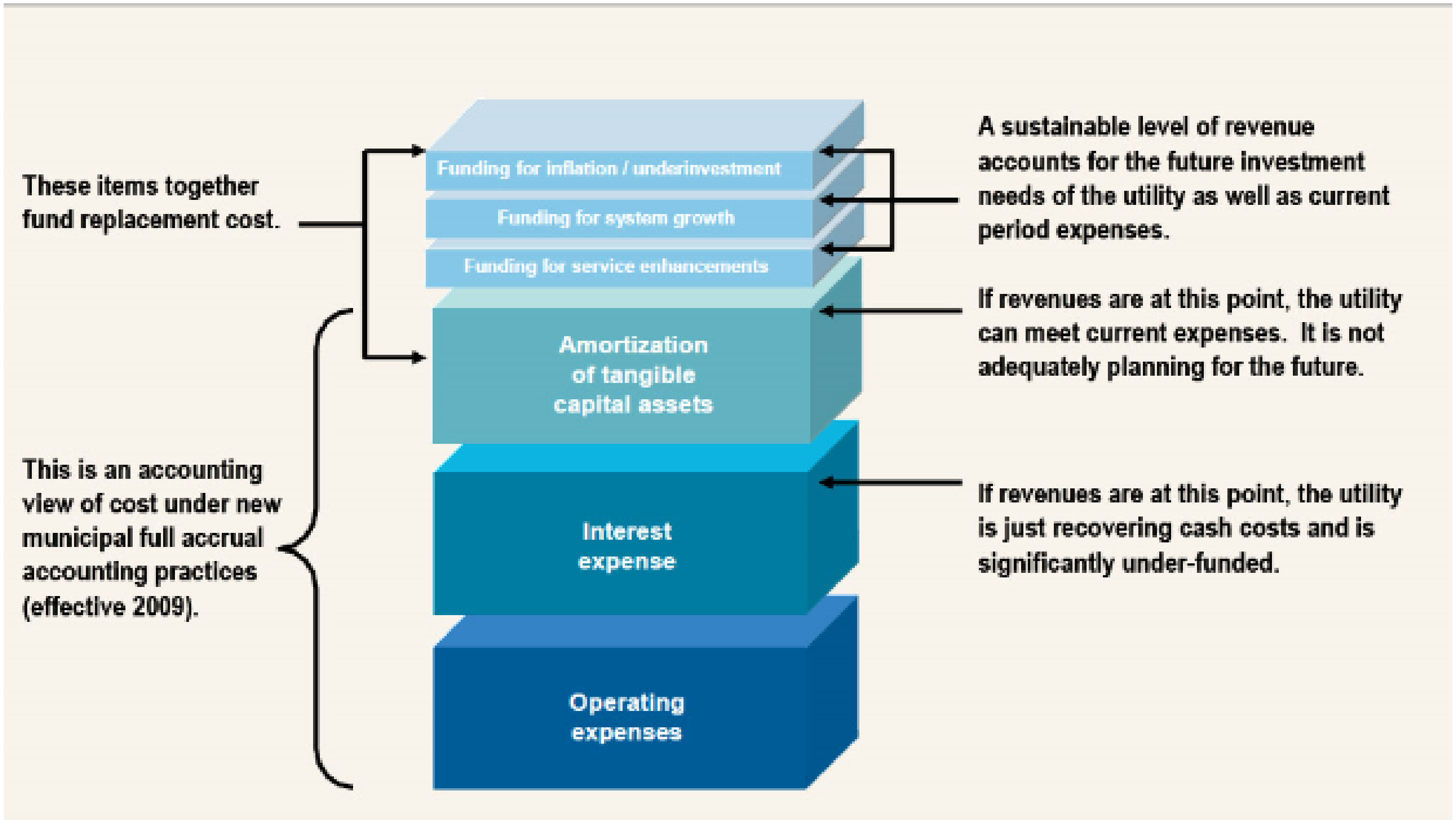
Service area staff will work closely with financial staff in the preparation of the operating and capital budgets to ensure that the lifecycle activities budgeted are necessary to achieve agreed upon levels of service, and accommodate growth over the 10-year capital planning horizon.

6.3 Financial Requirements and Strategies

Each asset report card contains an analysis of the financial requirements to adequately fund the asset needs. Each report card identifies any funding shortfalls based on current asset management strategies. The recommendations consider the impact of the shortfall and how the impact will be managed.

O.Reg. 588/17 requires significant operating costs to be captured, including energy costs for a 10-year period in order to obtain proposed levels of service over the long-term. The requirement for operating costs to be included for a 10-year period is significant. The County currently has a long-term capital plan with a 10-year projection and a 5-year projection of our operating plan. In order to meet this requirement a change to the County's budget process would be necessary. The County will continue to investigate the best process to meet this requirement in advance of the July 1, 2025 deadline.

Figure 6.1.2 A Building Blocks Approach to Determining Cost[2]



[2] https://www.ontario.ca/page/building-together-guide-municipal-asset-management-plans#section-2 Adapted from Toward Financially Sustainable Drinking Water and Wastewater Systems, Ministry of the Environment, August 2007.

Wastewater system

Oxford County

Growing stronger together

WASTEWATER SYSTEM

Woodstock

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1.0 Introduction

The County maintains a diverse portfolio of assets that are required to provide the City of Woodstock with the safe collection and treatment of wastewater. The Woodstock Wastewater Treatment Plant (WWTP) provides wastewater treatment for residential, commercial, and industrial users in the City of Woodstock, as well as, for the communities of Embro and Innerkip. It also provides treatment for septic tank waste, hauled waste, and holding tank waste from within the County.

The Woodstock WWTP is a Class IV rated facility, as defined by Ontario Regulation 129/04. It is a conventional activated sludge system consisting of primary and secondary treatment, and seasonal chlorination/de-chlorination disinfection, with an outfall pipe to the Thames River. The entire treatment process is completed in accordance with strict standards, processes, and limits as regulated by the WWTPs Environmental Compliance Approval (ECA) issued by the Ministry of Environment, Conservation, and Parks (MECP) of the Ontario Provincial Government.

The wastewater collection network transports residential, commercial and industrial waste to the WWTP for treatment. The wastewater collection network consists of a mix of gravity mains, low pressure mains and forcemains. Wastewater flows by gravity wherever possible, where changing elevations require the use of sewage pumping stations (SPS). Other specialized structures such as manholes, valve vaults, meter stations, diversion structures and siphons are required to convey wastewater to the WWTP.

Sound management of our wastewater systems helps us realize our vision of being a vibrant community, working well and growing stronger together!

Like many of our assets, wastewater assets are facing increased challenges as a result of aging assets, climate change, increasing demand due to growth in our communities and regulatory changes. Our investment in these assets must therefore be balanced to optimize investment for renewal with the growing needs of our community. This plan provides information regarding our approach to the management of our wastewater assets over the short (10-year) and long (100-year) term, demonstrating our commitment to assessing and meeting the levels of service valued by our residents and businesses.

1.1 Improvement Plan

The County recognizes that asset management is a continuously evolving process. The following recommendations are based on the review of current management practices, inventory, valuation and condition analysis.

- Document lifecycle history on assets within the asset management systems.
- Continue to work with the City of Woodstock to reduce asset data gaps.
- Refine asset components and maintenance strategies for facilities and associated processes.
- Refine the risk assessment approach at the component level.
- Incorporate findings from the Water and Wastewater Master Plan.

2.0 State of Assets

2.1 Inventory

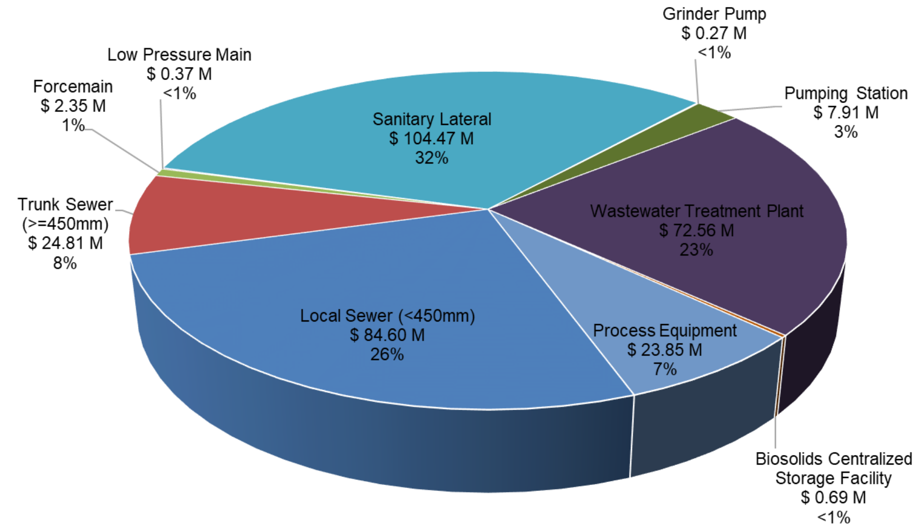
Wastewater assets are those that enable us to live in a clean and safe environment. It includes everything from wastewater mains that service our homes and businesses throughout the County, to the WWTPs, which ensure that effluent is properly treated before being discharged into the natural environment.

We have two different asset classes within the wastewater portfolio in order to effectively collect and treat wastewater from our community:

- Linear, which represent the collection pipe network, including the maintenance holes, connectors and related parts required in such a network.
- Vertical, which represent facilities (including the multiple buildings and structures that the facilities are comprised of), and related process systems and equipment required to perform the needed functions.

Table 2.1.2 displays our current wastewater inventory and the associated replacement costs and average age for each asset component. The County continues to make improvements to increase the integrity of our wastewater data. The inventory figures in table 2.1.2 capture inventory within newly constructed subdivisions which the County is aware of and anticipates assuming ownership of. The County generally assumes ownership of these assets approximately two years after full operation. It is important to include growth assets to ensure that lifecycle activities are planned and funded accordingly.

Figure 2.1.1 Inventory Valuation



2.2 Valuation

The replacement cost valuation for wastewater linear is based on current tender prices, where available. Current tender prices are adjusted where County staff feel some cost increases are only temporary due to COVID.

The replacement cost valuation for wastewater vertical is based on the latest information available, which includes current replacement costs, insurance valuations, and valuations from studies / assessments completed in prior years.

Table 2.1.2 – Woodstock Wastewater System Inventory

Asset Type	Asset Component		2017 Inventory	Current Inventory	Replacement Cost	Average Age
Linear	Local Sewer (<450mm)	m	195,052	203,445	$84,602,069	40 Years
	Trunk Sewer (>=450mm)	m	38,905	39,493	24,813,808	55 Years
	Forcemain	m	3,426	4,833	2,353,527	12 Years
	Low Pressure Main	m	1,105	1,244	373,293	16 Years
	Sanitary Lateral	each	14,553	15,993	104,474,500	46 Years
	Collection Tank	each	-	-	-	-
	STEP Pump	each	-	-	-	-
	Grinder Pump	each	10	18	270,000	6 Years
Vertical	Pumping Station	each	5	5	7,911,593	26 Years
	Wastewater Treatment Plant	each	1	1	72,555,246	32 Years
	Odour Control Facility	each	-	-	-	-
	Biosolids Centralized Storage Facility[1]	each	-	1	692,671	4 Years
	Process Equipment	total	N/A	N/A	23,854,093	34 Years
Total Replacement Cost					**$321,900,800**	

There are several growth / expansion projects planned in Woodstock that are included in the County's 2022 approved Long-Term Capital Plan. This includes 3 new sewage pumping stations (approximately $19 million including related process equipment), linear expansion of both local and trunk sewer (approximately $3 million) and an expansion project at the WWTP (approximately $0.9 million). These growth projects are not included in the figures within table 2.1.2, however their anticipated lifecycle needs are included within this AMP.

[1] The Biosolids Centralized Storage Facility is a shared facility across the County with each system contributing to the costs based on number of customers. The value utilized throughout this report card represents Woodstock's share based on 2021 customers.

2.3 Condition Assessment Approach

The assessment approach for our wastewater assets utilizes a combination of physical assessments, asset attributes, such as material and sizing, as well as established anticipated useful lives.

The County's condition scale and visual inspection ratings are based on the following approach:

- Excellent - Asset is well maintained with no noticeable defects.
- Good - Asset may show signs of minor deterioration and may require some maintenance.
- Fair - Deterioration evident, function affected. Asset may require on-going monitoring.
- Poor - Serious deterioration, function inadequate. Asset may require ongoing monitoring.
- Critical - No longer functional, general or complete failure. Asset may require extensive monitoring.

The Pipeline Assessment Certificate Program (PACP) is the North American Standard for pipeline defect identification and assessment[2]. Closed-circuit television (CCTV) is the principal method of inspecting drains and sewers. In this process, a small robotic crawler vehicle with the CCTV camera attached is lowered into the pipe to complete the inspections. A structural rating, on a scale of 0-5, is then assigned using sewer condition assessment standards, with 0 representing an asset with minimal structural deficiencies and 5 representing assets on the verge of failure.

Table 2.3.1 illustrates how the PACP score ratings align with the County's standard condition scale. Unless otherwise noted, all images are of County assets, and are general representations of the asset condition at the time the photo was taken. Assets may have undergone lifecycle strategies since the date of the image impacting its condition.

Wastewater process assets are inspected by County staff on a regular basis as part the preventative maintenance program. These inspections identify performance and accelerated degradation and will trigger the creation of a reactive work order for repairs and rehabilitation. The County is working towards incorporating these inspections into a formalized condition rating. A visual inspection rating was provided for most process assets as part of the data collection process in 2018 and 2019.

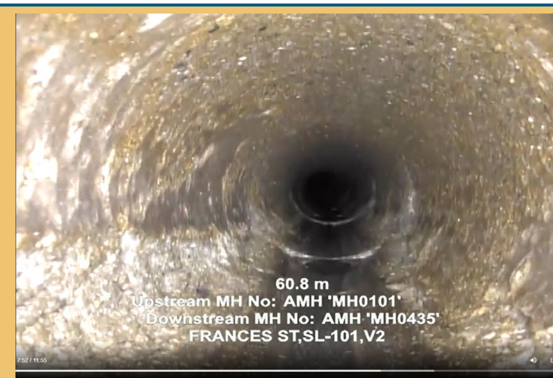
Given the complexities and accessibility of some assets, it is not beneficial to complete a visual or performance based condition assessment on all assets. For assets which are unable to be visually inspected or that have since been replaced, an age-based condition rating is being used based on anticipated useful lives.

[2] https://www.nassco.org/content/pipeline-assessment-pacp

Table 2.3.1 PACP Score Ratings

Excellent
PACP Score of 0 or 1

Poor
PACP Score of 4



Good
PACP Score of 2

Fair
PACP Score of 3

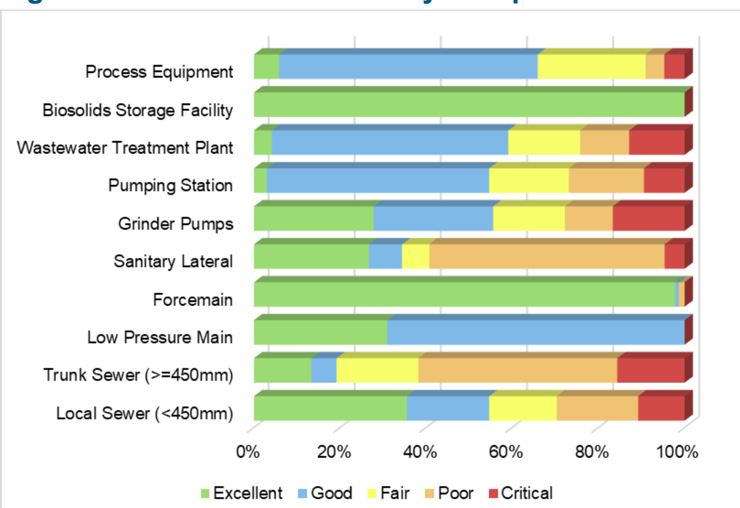
Critical
PACP Score of 5

2.4 Condition Assessment

The condition profile of our Woodstock wastewater system asset components is shown in figure 2.4.1. The % in each condition is based on replacement costs.

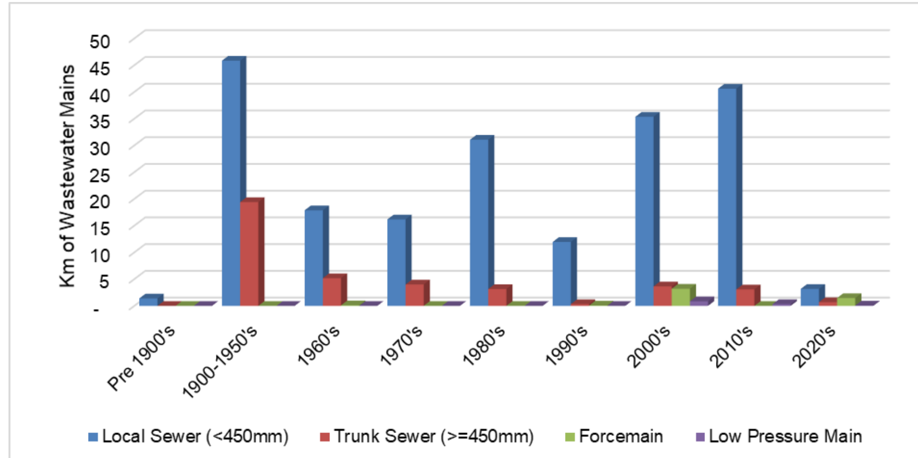
For the Woodstock wastewater system: 38.6% of the assets are in poor or critical condition, and 47.6% in good or excellent condition in comparison to 10-11% and 57-65% respectively for Canadian municipalities reported on the Canadian Infrastructure Report Card[3]. While this may appear that our Woodstock wastewater assets are in worse shape than other Canadian municipalities, the 2019 Canadian Infrastructure Report Card is an aggregate of self reported condition ratings across the Country and are based on a general rating scale which may not match the County's.

Figure 2.4.1 Asset Condition by Component



To better understand our Woodstock wastewater collection assets, an age profile of all our wastewater mains by decade is shown in figure 2.4.2.

Figure 2.4.2 Wastewater Mains by Age



The average age of the majority of linear assets within the Woodstock wastewater system is approximately 41 years, whereas the average age of the vertical assets varies by facility type from 4 to 35 years. This value must be considered in the context of the different asset types in the category, compared to the typical anticipated useful life of each asset type.

[3] http://canadianinfrastructure.ca/en/index.html

Table 2.4.3 outlines the anticipated useful life for each new build/replacement. The anticipated useful lives for our wastewater assets exclude the management strategies that the County utilizes to extend the overall life of our wastewater assets.

Table 2.4.3 Useful Life

Wastewater System Component	Anticipated Useful Life (years)
Forcemain, Low Pressure Main, Trunk Sewer, Local Sewer, Laterals	90
Collection Tanks	30
Grinder Pumps	10
Facilities	10 - 50
Process Equipment	8 - 75

Figure 2.4.4 illustrates the current average age of the Woodstock wastewater system linear components in comparison to their anticipated useful life, based on a run to failure strategy.

As the vertical assets can have a significant variability in age, from both a facility and process standpoint, they are not represented within figure 2.4.4.

There are a number of management strategies that the County may utilize to extend the overall life of our wastewater assets. These strategies allow us to align the needs with those of other assets, resulting in the best overall value for our residents.

Figure 2.4.4 Age and Useful Life Comparison

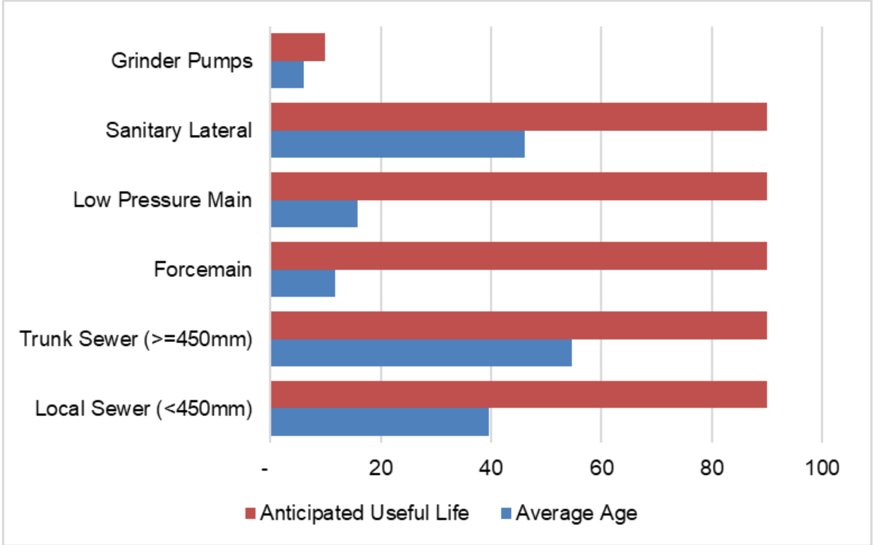


Table 2.4.5 compares the status of our Woodstock wastewater asset components, as identified in our 2017 Asset Management Plan to their current condition. The breakdown by component for vertical assets was not available as of the date the 2017 report was published, so there is no condition comparison available. Work is ongoing to further enhance the asset information at the component level.

The trend shows that the status of wastewater assets for the Woodstock wastewater system is steady to declining. The decline in condition is commiserate with the aging of these assets. As the system continues to age it is expected that condition ratings will continue to decline until targeted lifecycle strategies are implemented.

Table 2.4.5 Wastewater System Condition Assessment

Asset Type	Asset Component	2017 Condition Rating	Current Condition Rating	Trend
Linear	Local Sewer (<450mm)	Good	Fair	↓
	Trunk Sewer (>=450mm)	Fair	Fair	→
	Forcemain	Excellent	Excellent	→
	Low Pressure Main	Excellent	Excellent	→
	Sanitary Lateral	Fair	Fair	→
	Collection Tank	-	-	-
	STEP Pump	-	-	-
	Grinder Pump	Good	Fair	↓
Vertical	Pumping Station	Not assessed	Fair	-
	Wastewater Treatment Plant	Not assessed	Fair	-
	Odour Control Facility	-	-	-
	Biosolids Centralized Storage Facility[4]	-	Excellent	-
	Process Equipment	Not assessed	Fair	-

[4] The Biosolids Centralized Storage Facility is a shared facility across the County with each system contributing to the costs based on number of customers. The value utilized throughout this report card represents Woodstock's share based on 2021 customers.

3.0 Levels of Service

County staff have developed a comprehensive Level of Service (LOS) Framework. This framework will help to establish a relationship between the current LOS being provided by the County's assets, and the associated operating and capital expenditures required to achieve the proposed LOS. The framework puts into perspective the definition and measurement of service performance in alignment with the County's corporate mission and vision.

Corporate Objective

The wastewater collection and treatment service ensures protection of the environment and public health of residents, visitors to the County and downstream users of the receiver (Thames River) and our partners in the watershed.

Legislative Requirements

Each of the County's WWTPs are regulated under the Ontario Water Resources Act, 1990[5] and operated in accordance with an ECA or historical Certificates of Approval (C of A) issued by the MECP.

The ECA for the County's WWTPs require annual reporting of operational and treated effluent discharge parameters into the receiving water bodies. The Annual Wastewater Treatment System Summary Reports are available on the County's website.

Framework

The structure of the County's LOS framework was developed to align with international best practices including the International Infrastructure Management Manual (IPWEA, 2015). The framework includes the mandatory measures to meet the requirements of Ontario Regulation (O.Reg.) 588/17 by including both Community and Technical Levels of Service. The metrics in this framework may be expanded upon as the County continues to improve its data collection and reporting processes.

[5] https://www.ontario.ca/laws/statute/90o40

3.1 Customer Levels of Service

Community or Customer Levels of Service are statements that describe quantifiable metrics of the service delivery outcomes from the perspective of the customer, expressed in non-technical terms. The following statements form our qualitative descriptions of the customer level metrics required under O.Reg. 588/17.

The Woodstock wastewater system connects to most residential, commercial and industrial spaces in the settlement areas of Woodstock, as outlined in figure 3.3.1. The Woodstock wastewater system provides for the safe collection and treatment of wastewater.

The County does not have any combined sewers within the Woodstock wastewater system. The Woodstock wastewater system is a separate wastewater system.

Infiltration and inflow can enter through a variety of sources (cracks in pipes, weeping tile connections, cross connections, etc.). In the case of heavy rainfall events, wastewater mains may experience a volume of water and wastewater that exceeds its designed capacity. In some cases, this can cause water and/or wastewater to overflow into streets or backup into homes or businesses.

To minimize wastewater overflow into streets or backup into homes, the County has established design standards to convey flows under ultimate conditions, design sheets for capacity needs that include infiltration inflow. Newer wastewater mains are made of gasketed PVC piping to reduce potential leaks occurring between fitted pipe segments.

Final Effluent is the treated water that is discharged to the environment through the approved effluent disposal facilities, including all bypasses that are required to meet the compliance limits stipulated in the ECA for the WWTP, at the final effluent sampling points. The effluent criteria includes effluent flow rates, and parameters such as total suspended solids, Biochemical Oxygen Demand (BOD), phosphorous, ammonia, and E. coli. The County produces annual reports summarizing each WWTPs operation and treated effluent discharge quality and these can be found on the County's website at: http://www.oxfordcounty.ca/Services-for-You/Water-Wastewater/Wastewater/Annual-reports.

Table 3.1.1 outlines additional customer focused performance metrics from the County's LOS framework.

3.2 Technical Levels of Service

Technical Levels of Service metrics are quantifiable metrics applied against assets that are subject-matter specific inputs or outputs supported by the day-to-day activities of County staff. Table 3.1.1 includes the technical metrics required under O.Reg. 588/17, as well as, additional metrics the County has included in the framework.

3.3 Levels of Service Maps

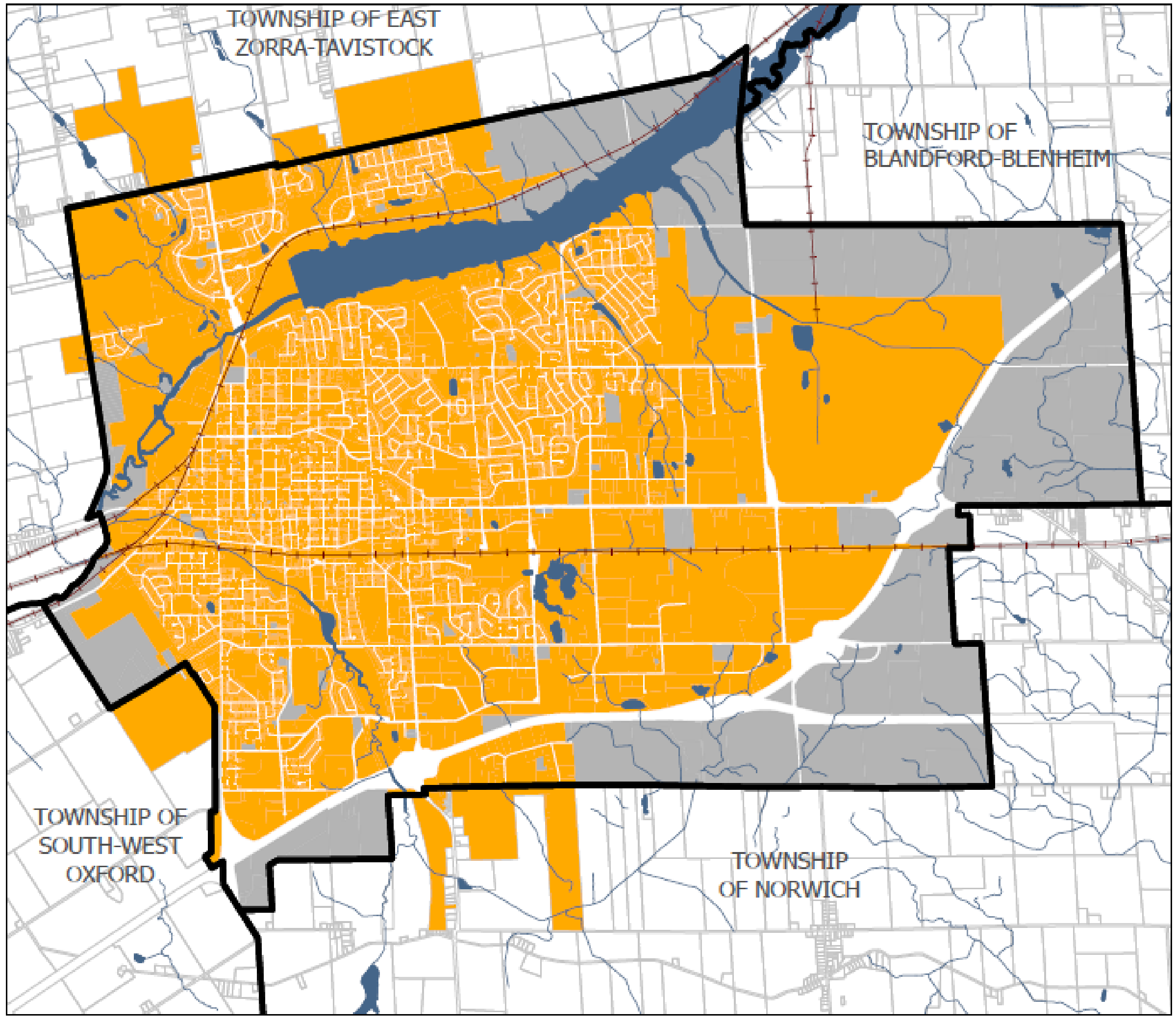
As a further illustrative example of our community levels of service, a map is included as figure 3.3.1 showing areas within the City of Woodstock boundary that are serviced by the Woodstock wastewater system.

Figure 3.3.1 Woodstock sanitary serviced properties

Woodstock

Properties with fronting sewer

- Properties with fronting sewer
- Properties without fronting sewer
- Municipal Boundary
- Railway
- Waterbody



Total # of parcels:	15,590
Without fronting sewer:	359
With fronting sewer:	15,231
Coverage:	98%

N

0 437.5 875 1,750 2,625 m

Parcels with fronting sewer identified as being a distance of 30m from sanitary mains.

Table 3.1.1 Performance Measures

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Customer / Council Focused Performance Measures					
Reliability	Providing wastewater services with minimal interruptions	% of properties within the system boundary connected to the municipal wastewater system	N/A	98%	TBD
		% of wastewater mains designed to be resilient to overflow or flooding during wet weather events	100%	100%	100%
Environmental Stewardship	Providing wastewater services that have minimal impacts on the environment	% of overall facility ECA compliance rate	100%	100%	100%
Cost Efficient	Providing wastewater services in an efficient manner	Operating cost to provide service ($/connection)	$271	$148	TBD
Technical Focused Performance Measures					
Reliability	Providing wastewater services with minimal interruptions	The number of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system.	0 connection-days to 15,202 connections	0.25 connection-days to 15,679 connections	TBD
		% of system inspected (CCTV) annually	9%	10%	7%
		% of wastewater mains flushed annually	13%	10%	20%
		# of overflow or spill occurrences	0	2	0
Environmental Stewardship	Providing wastewater services that have minimal impacts on the environment	% of wastewater estimated to have by-passed treatment	0%	0.0011%	0%
		Volume (cubic meter) of biogas produced	297,544	249,531	TBD

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
		The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system.	0 violations to 15,202 connections	0 violations to 15,679 connections	0
Cost Efficient	Providing wastewater services in an efficient manner	Operating cost per kilometre of wastewater main for collection	N/A	$6,731	TBD
		5 year average capital expenditure for wastewater collection	$3.2M	$3.5M	TBD
		5 year average capital expenditure for wastewater treatment	$0.3M	$0.3M	TBD

4.0 Asset Management Strategy

4.1 Lifecycle Activities and Planned Actions

Wastewater collection assets undergo regular maintenance and inspection. As part of capital works project analysis, determinations of whether wastewater pipe replacement or relining should occur is reviewed. This process is fully integrated with the renewal needs of the roadways and other underground assets, such as drinking water and stormwater. This integrated approach ensures our renewal projects for these service areas are delivered with optimal timing to increase value and minimize disruption to our communities. For example, if a roadway is targeted for renewal, coordination between service areas and area municipalities will determine whether the underlying stormwater, drinking water or wastewater assets are also of an age or condition that requires renewal, to ensure these projects are delivered together to reduce disruption for our communities and deliver enhanced value.

Process assets and equipment undergo extensive operations and maintenance regimes to sustain their reliable operation. Investment needs are identified and coordinated with normal operations to minimize disruptions to service. Major replacements are planned and accommodated using system redundancy and changes to operations, in order to maintain service. It is critical to maintain wastewater service in order to protect public health and the environment.

There are six main lifecycle activities considered in the overall sustainable management of wastewater assets, described in table 4.1.1.

Table 4.1.1 Lifecycle Activities

Strategy	Lifecycle Activity
Non-Infrastructure Solutions	Actions or policies that can lower costs or extend useful lives. **Trigger: Ongoing**
Maintenance	Regularly scheduled maintenance and inspection programs including cleaning and flushing, manhole repairs, CCTV inspections, exercising diesel gen-sets and minor repairs. These activities do not improve the overall condition of the asset, nor increase its useful life. **Trigger: Ongoing**
Rehabilitation / Renewal	One-time events that increase the condition and extend the useful life of the asset; including sewer lining and seal and grout programs. **Trigger: Fair/Poor**
Replacement	Occurs at the end of the useful life and/or when rehabilitation is no longer an option – can vary among assets due to construction material and environmental factors that impact the degree of deterioration and performance. **Trigger: Poor/Critical**
Disposal	Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the County to provide services. County staff coordinate with contractors to ensure safe removal and environmental compliance when disposing of assets. **Trigger: Poor/Critical**
Expansion / Growth	Planned activities required to extend services to previously unserved areas, expand services to meet growth demands, or increase the level of service being provided. **Trigger: Development**

The lifecycle management strategy is the set of planned actions that should enable the assets to provide users with the proposed level of service in a sustainable way, while achieving acceptable levels of risk and the lowest lifecycle costs required to provide that level of service. Lifecycle considerations for assets include analysis of the timing to carry out key asset management activities including inspection, maintenance, repair, and replacement. Ongoing preventative maintenance activities are outlined in the County's work management system. The rehabilitation and replacement activities impacting the asset components condition and useful life are contained within profiles in the County's asset management system. For some assets, replacement needs are based on a run to failure strategy, as this is the most economical. Work is ongoing within the County's asset management systems to build all the component profiles and identify where each asset is within the lifecycle.

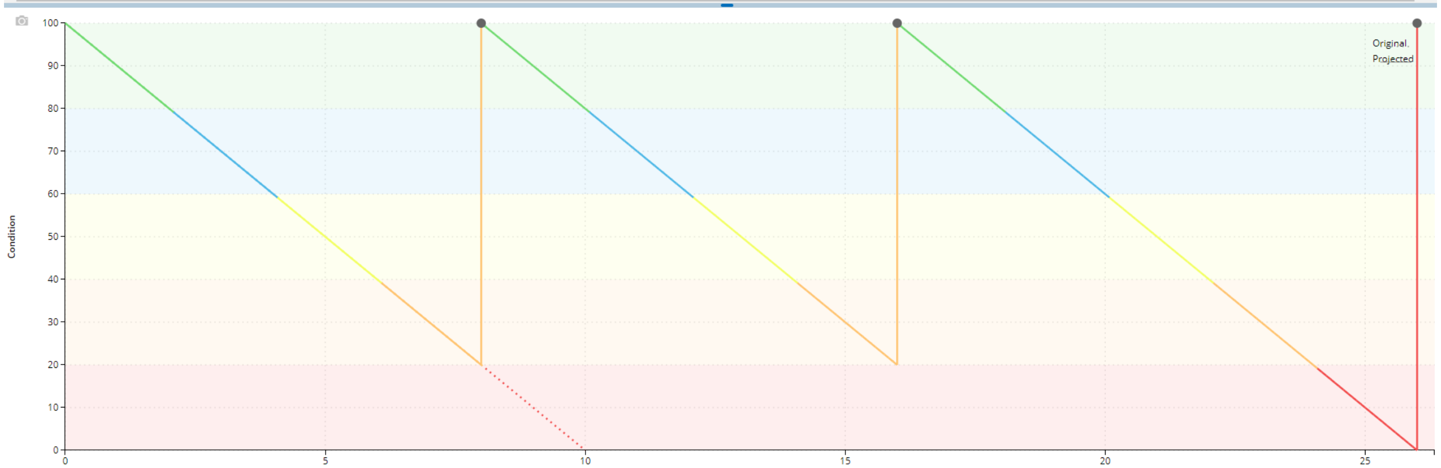
As an example, figure 4.1.2 illustrates the lifecycle strategy of grinder pumps. The pumps are re-built twice, extending the overall useful life from 10 years to approximately 25. The annual cost requirement from a run to failure strategy is $1,500 per year where the annual cost requirement using the rehabilitation strategies decreases to just below $800 per year.

Figure 4.1.2 Grinder Pumps Lifecycle Strategy

Strategy

Age-Based Condition Method	Straight-Line	Lifecycle EUL	10 Year(s) 0 Month(s)
Add Event (Condition Triggered)	Rebuild Pump (Add)	Lifecycle EUL (with events)	26 Year(s) 0 Month(s)

Age at Event	Name	Description	Event Class	Cost	Event Range / Trigger	Impact	Added EUL	Cost per Added Year	Actions
8 Years	Rebuild Pump		Rehabilitation	$2,500.00 (Fixed)	20 to 20 Condition	Adds 8 Years	8 Years	$312.50	
16 Years	Rebuild Pump		Rehabilitation	$2,500.00 (Fixed)	20 to 20 Condition	Adds 8 Years	8 Years	$312.50	
26 Years	<Asset Replacement>	End of life replacement	Replacement	$0.00 (Fixed)	0 to 20 Condition	Set to 100 Condition	10 Years	$0.00	Automatic

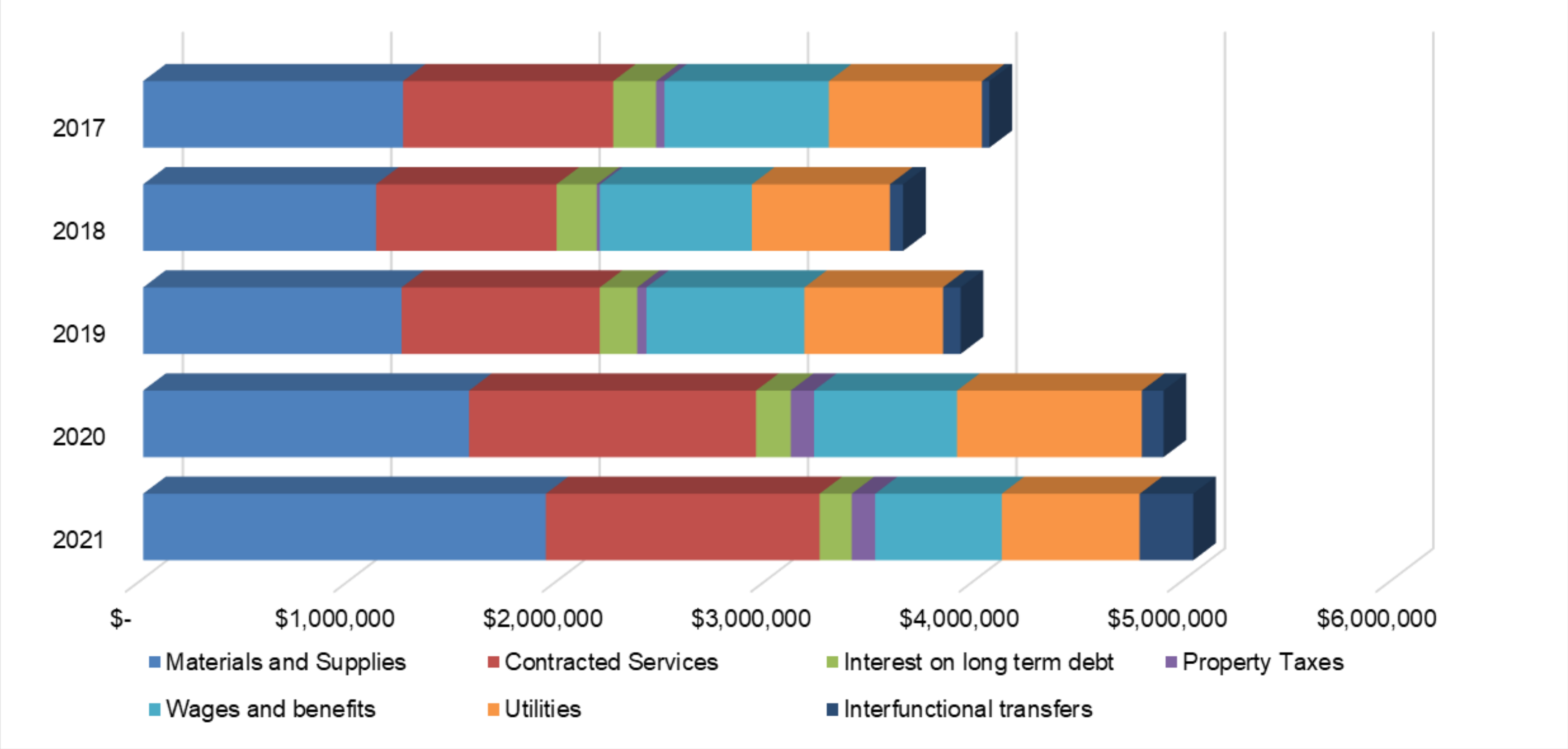


4.2 Significant Operating Expenses

Significant operating expenses are required in order to sustain an asset over its lifecycle. The County is always looking at ways to optimize our operating investment to ensure we are achieving the best value for our residents, and businesses. Essential to this is a strong operations and maintenance plan within our work management system. Operating expenses are incurred through a number of sources – preventative maintenance activities, utility costs, property taxes and more. Despite the fact that minor maintenance is incorporated into planned operations and maintenance programs, there are cases where it is unplanned.

Figure 4.2.1 shows the operating expenses from 2017 through 2021 for the Woodstock wastewater system grouped by expense type. The groupings align with those reported on the County's Financial Information Return (FIR), with further breakdown for property taxes and utility costs as these expenses can be significant.

Figure 4.2.1 Operating Expenses



4.3 Risk Strategy

Risk management frameworks are developed to assist with the prioritization of investments within the capital planning period. The preferred approach is to implement a triple bottom line analysis approach to evaluate:

- Social impacts of asset failure, including impacts to customers, businesses and the County's reputation;
- Environmental impacts of asset failure; and
- Economic impacts of failure including the cost of remediation.

In the context of asset management, risk is the multiple of the consequence of an asset failing and the probability that the event will occur.

Figure 4.3.1 illustrates the risk ratings for the Woodstock wastewater assets at a summary level. The Woodstock WWTP site contains asset components in poor or critical condition based on an age-based condition rating, however is also high consequence due to the replacement cost. County staff will continue to monitor the higher risk assets, review and/or complete physical inspections to further validate the age-based condition ratings and plan for lifecycle strategies accordingly.

Figure 4.3.1 Asset risk profile

Consequence \ Probability	1	2	3	4	5
5	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	0 Assets - $0.00	2 Assets 2.00 unit(s) $2,950,000.00	1 Asset 1.00 unit(s) $1,050,000.00	4 Assets 7,519.57 m $47,114,598.00	0 Assets - $0.00
3	23 Assets 3,388.10 m $2,092,105.00	6 Assets 55.33 m, unit(s) $2,390,264.00	20 Assets 1,300.95 m, unit(s) $4,325,500.00	112 Assets 8,877.64 m $6,356,964.00	44 Assets 4,125.68 m, unit(s) $3,065,500.00
2	925 Assets 21,247.78 m, unit(s) $15,040,720.00	1,502 Assets 12,826.77 m, unit(s) $15,165,236.00	999 Assets 14,752.66 m, unit(s) $14,096,334.00	1,999 Assets 29,413.31 m, unit(s) $24,440,908.00	882 Assets 11,823.32 m, unit(s) $10,428,159.00
1	4,511 Assets 56,931.80 m, unit(s) $44,212,016.00	933 Assets 33,404.36 m, unit(s) $16,857,221.00	797 Assets 23,953.59 m, unit(s) $14,649,574.00	576 Assets 21,566.33 m, unit(s) $10,607,430.00	287 Assets 14,751.02 m, unit(s) $6,185,309.00

5.0 Financial Strategy

5.1 Financing Strategy

Hemson Consulting Ltd. (Hemson) was retained through a competitive process to assist with analyzing and developing the County's water and wastewater rates for a 4-year period from 2021 to 2024. The rate modeling includes all system asset management needs and all sources of funding including Community Servicing Assistance Program (CSAP) funding, development charges, developer and resident contributions. In most cases, the capital replacement component is the average annual required contribution level in order to establish full cost recovery; however, the contribution may vary based on the system's ability to meet full cost recovery for the next 10-years.

Capital work is funded from reserves (based on the capital contribution included in the user rates), development charges (for growth projects), debentures and grant funding when available. The County continually assesses opportunities for additional funding options and revenue streams to address our asset needs.

Where possible, replacement activities are planned in conjunction with the replacement needs of the road network and underlying water and stormwater assets. This requires a co-ordinated effort with area municipalities as the majority of the County owned water and wastewater linear assets falls under the area municipalities' roadways. This collaboration is essential for ensuring a cost effective approach to maintaining assets within the County regardless of ownership.

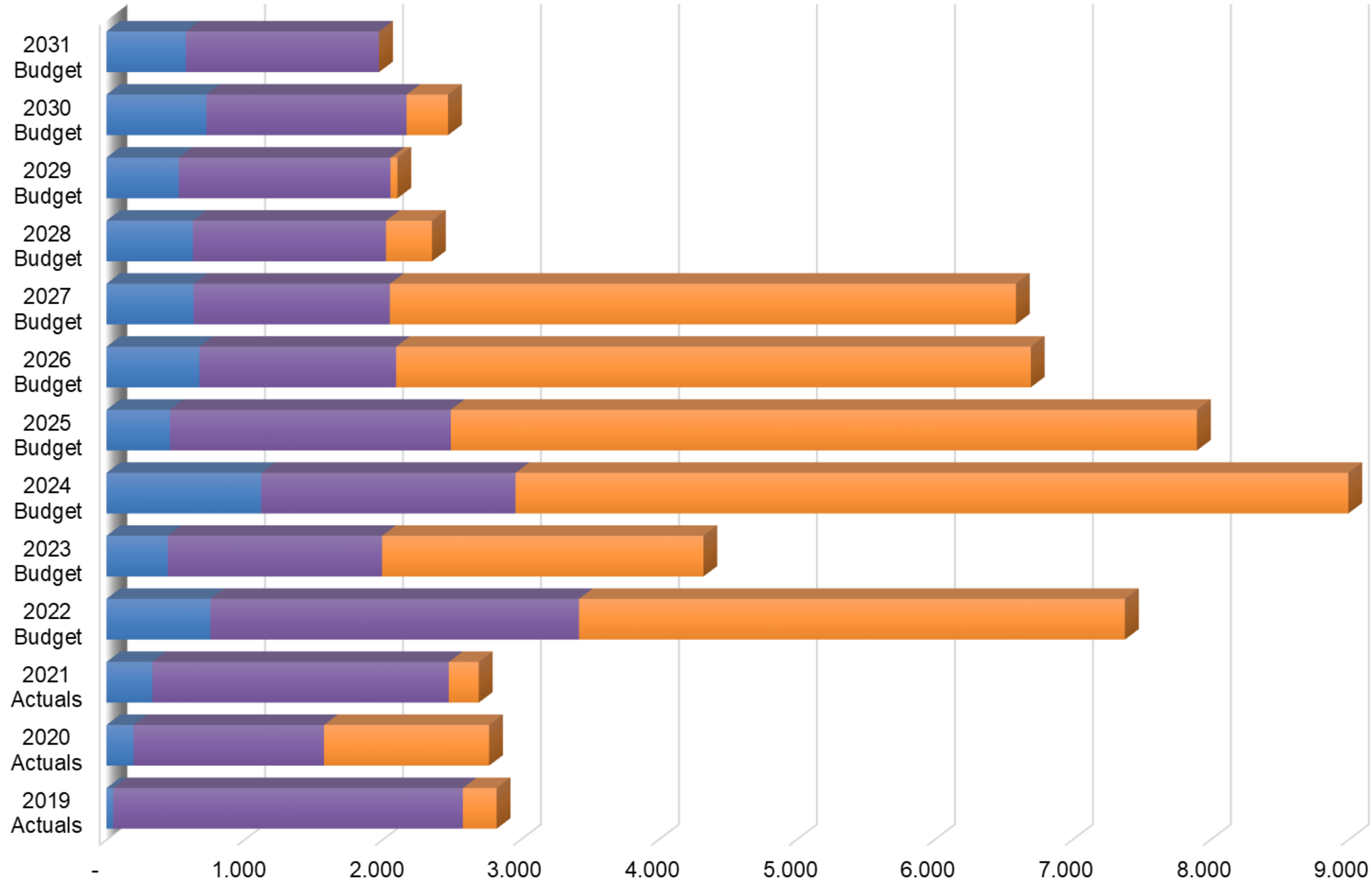
In addition to targeting and prioritizing the investment needed to maintain existing assets, there are also planning processes in place to determine the additional assets needed to meet growing demands through population increases or demand for new services. The projects targeted to meet growth are funded primarily through Development Charges (DC) – the mechanism that enables recovery of growth-related capital expenditures from new development. These charges are governed by the Development Charges Act and are applied in accordance with our Development Charges By-Law. Impacts from the growth activities analyzed in the 2019 DC Background Study are included in this AMP.

5.2 Expenditure History and Forecasts

The Woodstock wastewater system contains significant capital projects within the 10-year approved budget, as illustrated in figure 5.2.1. A large portion of these projects (approximately $25 million) is due to development within the industrial areas of the City of Woodstock. Linear asset replacements are ongoing, in conjunction with the local area municipal roadway construction projects. Minor process equipment replacements were included in the 2020 to 2022 budgets. County staff continue to review anticipated asset management needs with each budget cycle, subject to existing resource limitations.

Non-Infrastructure solution projects include shared projects for condition reviews, studies and implementation of the work management system.

Figure 5.2.1 Expenditures (millions)

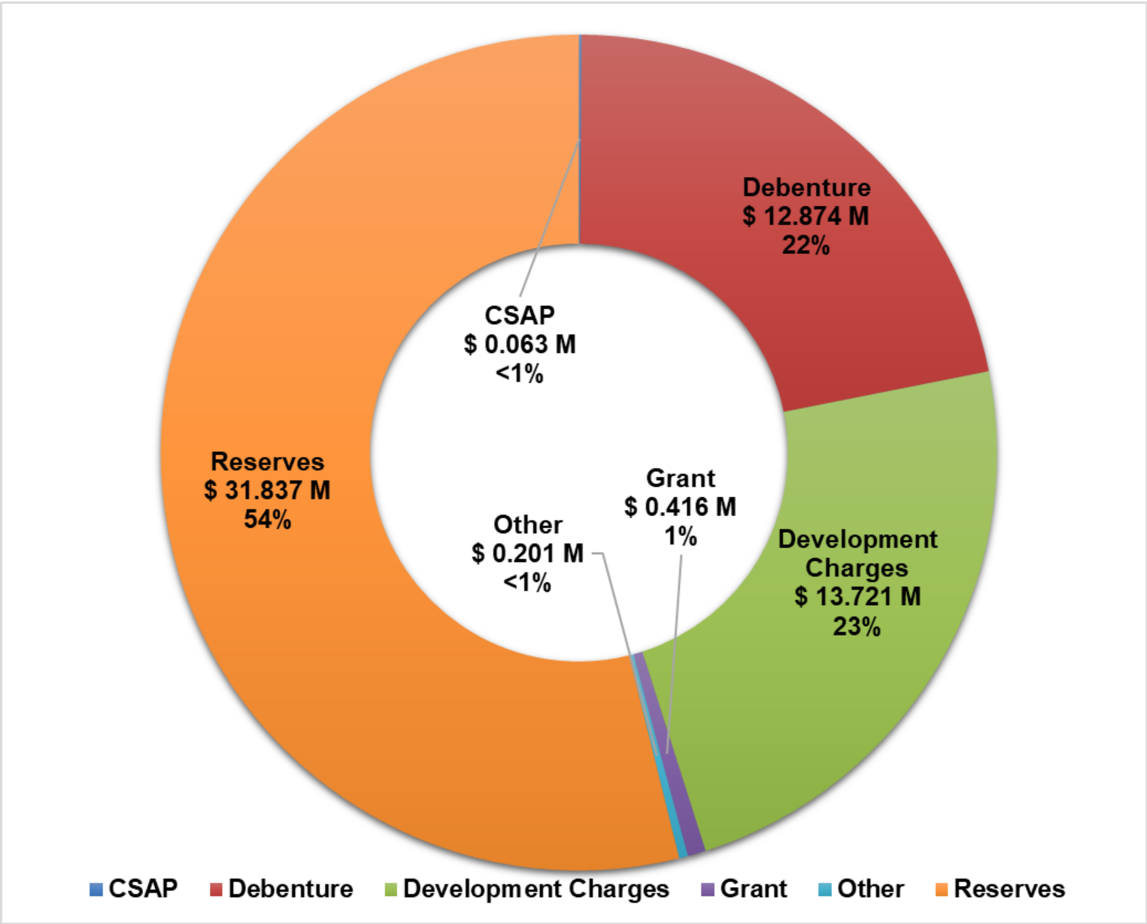


	2019 Actuals	2020 Actuals	2021 Actuals	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Non-Infrastructure Solution	0.048	0.196	0.331	0.752	0.443	1.120	0.460	0.674	0.630	0.625	0.524	0.724	0.575
Maintenance	-	-	-	-	-	-	-	-	-	-	-	-	-
Rehabilitation / Renewal	-	-	-	-	-	-	-	-	-	-	-	-	-
Replacement	2.535	1.380	2.150	2.672	1.554	1.844	2.035	1.425	1.423	1.400	1.535	1.451	1.400
Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-
Expansion / Growth	0.244	1.197	0.217	3.957	2.329	6.036	5.408	4.600	4.537	0.333	0.050	0.300	-

5.3 Capital Revenues

Replacement projects, identified in the County's 10-year capital plan, are anticipated to be funded by the Wastewater – Woodstock Reserve, which is funded by user fees. The Woodstock wastewater system expansion projects into industrial areas are primarily anticipated to be debenture funded. These projects will be included in the next DC Background Study, to determine their eligibility for DC funding. The Wastewater – Woodstock Reserve, including the anticipated capital contributions within the 10-year period, is insufficient to fund the 10-year related asset activities within the approved 2022 Long-Term Capital Plan.

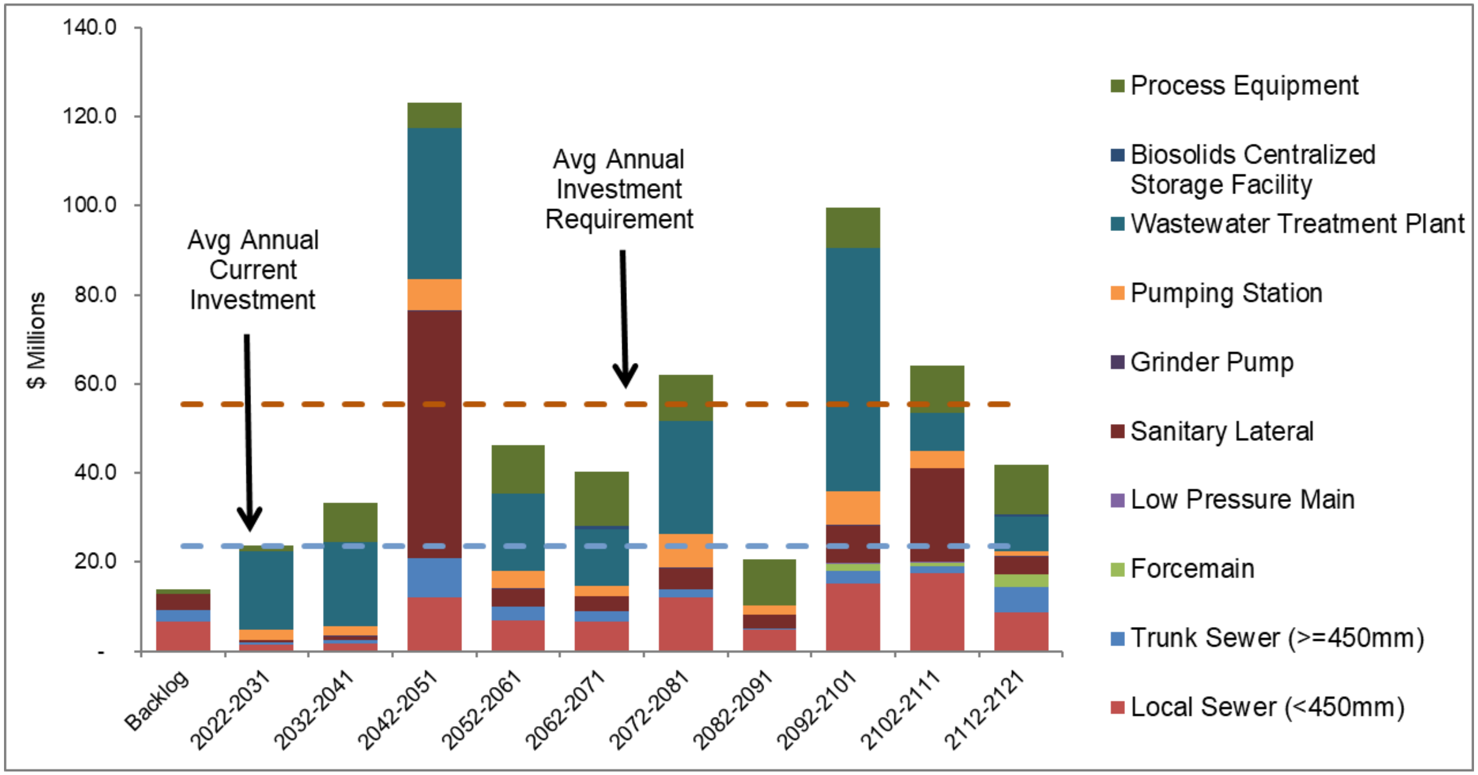
Figure 5.3.1 Sources of Capital Revenues 2019-2031 (millions)



5.4 Capital Investment

Based on the asset management lifecycle strategies identified, the financial requirements over the next 100-years are determined in current dollars. The average annual investment requirement represents the amount of capital funding required to renew and maintain the existing assets on an annual basis so services can continue to be delivered. These estimates assume that all work is able to be completed, as indicated, and does not take into account future changes due to environmental factors, new maintenance techniques, and unidentified growth. The annual requirement has increased from the 2017 AMP, primarily due to significant development and improvements the County has made to the vertical data, resulting in asset useful lives that are more reflective of their actual lifecycle. Further work is ongoing with the vertical data to fully determine lifecycle needs (including maintenance and rehabilitation strategies) which will impact the annual requirement for vertical assets. The data will continue to be reviewed with each budget and business plan cycle.

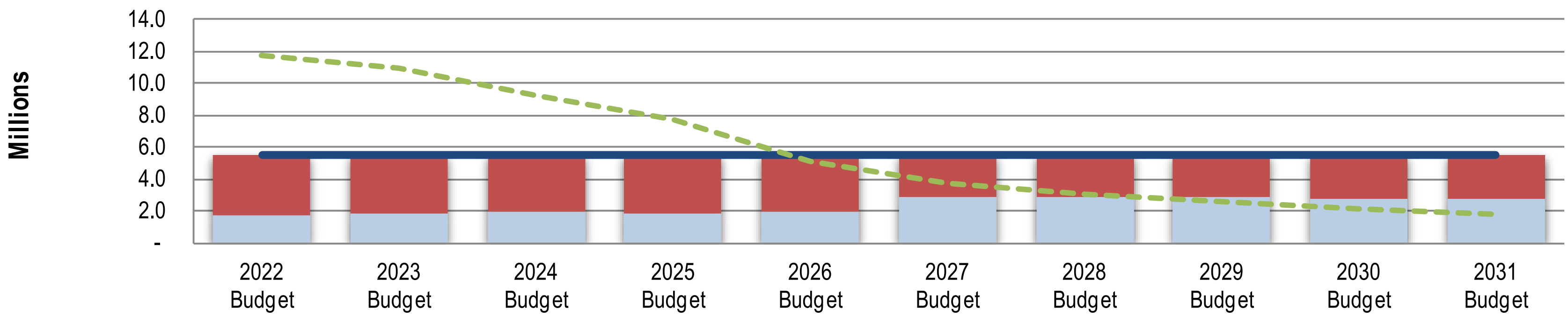
Figure 5.4.1 Average Annual Capital Requirements



The following figure links the annual capital funding needs to the capital investments contained in the budget. The timing of the actual capital projects may vary, however annual investments in capital assets is important for financial sustainability.

Figure 5.4.2 Funding Requirements

	Key	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Annual Required Investment		**5,548,000**	**5,548,000**	**5,548,000**	**5,548,000**	**5,548,000**	**5,548,000**	**5,548,000**	**5,548,000**	**5,548,000**	**5,548,000**
Current Investment		1,740,712	1,894,509	1,912,668	1,901,556	1,977,485	2,854,028	2,836,647	2,822,780	2,809,587	2,796,931
Funding Deficit		*3,807,288*	*3,653,491*	*3,635,332*	*3,646,444*	*3,570,515*	*2,693,972*	*2,711,353*	*2,725,220*	*2,738,413*	*2,751,069*
Funding Surplus		-	-	-	-	-	-	-	-	-	-
Reserve Balance		11,775,444	10,969,172	9,261,350	7,746,144	5,168,050	3,743,443	3,078,738	2,625,639	2,085,267	1,766,716



A portion of the current investment is being utilized for debenture payments and is not available for use on lifecycle activities. As the Woodstock industrial area growth/expansion projects are anticipated to be primarily funded by debt, the amount of the current investment restricted to debt is anticipated to increase. The amount of the current invested that would be restricted to debenture payments is anticipated to be 44% over the 10-year period.

5.5 Funding Gap Analysis

Using the anticipated 10-year asset lifecycle needs, along with the current capital investment level, the County is able to determine if there is an anticipated funding gap for the Woodstock wastewater system. Consideration is then given to the current system reserve balance to determine the residual funding gap. The County would then investigate opportunities for reducing this residual funding gap which, may include increases to the user rates, utilization of grant funding opportunities and further review of lifecycle strategies and proposed levels of service.

Figure 5.5.1 illustrates the anticipated asset management 10-year lifecycle needs (left side of figure 5.5.1) and funding needs, including the projected funding gap (right side of figure 5.5.1) for the Woodstock wastewater system. The system calculates the optimal expenditures based on theoretical asset lifecycle needs. These needs have not yet been reviewed in depth with County operations staff, and incorporated into the 10-year capital budget. This is anticipated to be completed as part of the 2023 Business Plan and Budget process with subsequent review annually.

The anticipated expenditures have been increased for non-infrastructure solution projects; approximately $5.1 million.

While the anticipated expenditure calculation accounts for the lifecycle activities of expansion / growth projects it does not account for the initial investment. It is important to adjust for these projects, where the initial investment is growth related and not projected to be DC funded within the 10-year capital plan. The resulting growth/expansion projects added to the anticipated asset needs is approximately $16.6 million, plus $2 million in anticipated interest costs.

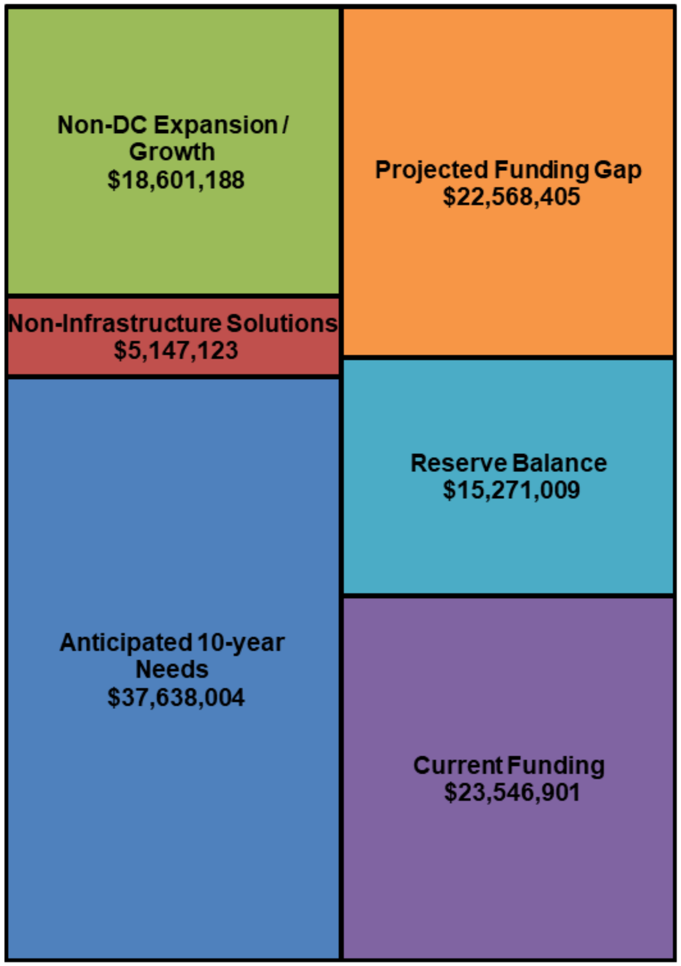
The Woodstock wastewater system is projecting a significant funding gap over the 10-year capital planning period. This gap is partially being addressed through the issuance of debenture funds for the industrial area expansion projects (approximately $12.9 million in debt issuance). Of the debt issued, $4.9 million of the principal is proposed to be repaid within the current 10-year period, along with approximately $2 million in interest charges. Approximately 44% of the current funding is committed to debenture payments over the 10-year horizon. The annual funding requirement will be reviewed holistically as part of the next rate study.

This analysis assumes the full reserve balance is utilized within the current 10-year period. Drawing the reserve balance to zero would likely result in increased user fee requirements in the subsequent 10-year period in order to fund the anticipated asset lifecycle needs.

The reserve is also utilized to fund emergency or unplanned expenses. A minimal or fully committed balance would limit the ability to fund these types of expenses. Consideration needs to be given to a minimum balance the County should maintain based on these risks. Analysis of the reserve target minimum balance, will be completed as part of the annual reserve review process.

Failure to address the long-term asset lifecycle needs could result in significant increases to rates in the future as assets reach end of life; or reductions in localized and/or regional service. This may include blockages, sewer backups, basement flooding, localized service outages, increased maintenance costs on assets past their optimal life, poor quality effluent, damage to the natural environment, fines, increase in insurance claims for property damage and personal injury resulting from poor asset conditions, etc.

Figure 5.5.1 Anticipated Needs (10-Year)



6.0 Climate Change

As part of the asset management planning process, the County will consider the risks and vulnerabilities of capital assets to climate change and the resulting actions that may be required. Commitment will be made to the development of tailored actions that make the best use of our resources to mitigate and adapt to climate change, in accordance with our local reduction targets, financial capacity and stakeholder support.

Optimization of the wastewater treatment process can help reduce the emissions of GHG such as nitrous oxide (N_2O), carbon dioxide (CO_2) and methane (CH_4) from being released into the environment at WWTPs. Optimization requires the correct equipment to ensure conditions can be achieved to reduce GHG emissions, while maintaining WWTP regulatory compliance.

Nitrous oxide (N_2O) is released in the secondary treatment train through the nitrification and denitrification process, which is used to remove nitrogenous components from the wastewater. Nitrifying bacteria oxidize ammonia to nitrites and nitrates. To minimize N_2O emissions, the plant is optimized by running the activated sludge process at a high sludge retention time (SRT) with optimal dissolved oxygen levels, which results in low ammonia and nitrite concentrations. High amounts ammonia and nitrite compounds, especially when there are excessive amounts of dissolved oxygen, can trigger biogenic N_2O emissions. To control this process, an upgrade is underway:

- Blower #2 VFD replacement: new variable frequency drive for Blower #2 to ensure proper modulation of speed to maintain desired dissolved oxygen levels within the aeration tank.

Methane (CH_4) is generated by the anaerobic biological break down of organics or the release of dissolved CH_4 found in the wastewater influent. At the WWTPs, it is mainly generated in anaerobic digesters and used as a fuel source for heating and electricity. Proper operations ensures the organic material is transferred to the anaerobic digesters to be stabilized by bacteria. The biogas produced can be utilized as a fuel source and the excess can be burned off in a waste gas flare stack. Maintaining the equipment involved in anaerobic digestion is important to preventing CH_4 emissions:

- Oxford County's Biosolids Clean out Plan: A 20 year guide to maintaining equipment involved in biosolids stabilization, based on industry best practices. In 2020 Primary Digester 3 was cleaned out, to optimize the anaerobic digestion process.
- Primary Digester 3: gas mixing system was repaired to increase mixing and biogas production.
- New digester recirculation pumps and grinders are being installed to aid in providing constant and consistent mixing of primary biosolids and incoming waste loads.

Carbon Dioxide (CO_2) is produced in biological treatment, where the organic carbon in the wastewater is utilized for biomass growth or oxidized into CO_2. By operating WWTPs at high sludge retention times, endogenous respiration (cell lysis results in biomass growth) is encouraged, which decreases the overall sludge production, which results in a decrease in CO_2 production. Upgrades with this process include:

- Return Activated Sludge Pump #1 replacement: to ensure proper concentrations of bacteria and target sludge retention times are achieved within the aeration basin.

Improving energy efficiency at WWTPs can help to reduce GHG emissions by decreasing consumption of fossil fuel-based energy. Significant energy savings can be realized by increasing the efficiency of plant equipment such as pumps and blowers, and using generated fuel sources:

- New Digester Sludge Recirculation Pumps with VFD installations: Motor brake horse power reduction from 10 to 7.5 on continuous duty pumps, with the addition of variable frequency drives to adjust pump speed to save energy and optimize biogas production.
- Replacement Effluent Service Water Pump #1 with a VFD installation: pump installation with a closed impeller to improve pumping efficiency of service water. Included a variable frequency drive to adjust pump speed and reduce energy usage.
- Maintenance work on primary digester (pumps/grinders/VFDs) to produce biogas (CH_4) more effectively and efficiently.

Climate change risks are considered during the planning phase of each capital project. Increasing resiliency to changing climate conditions through the use of backup power generation, redundancies with critical equipment, use of SCADA to collect accurate information and make informed decisions. By conducting inspections and completing studies, problem areas can be identified and planned to repair.

- I & I study completed on the Woodstock north trunk in 2020, with additional work in 2021 and 2022.
- Northeast trunk sewer upgrade in 2020.
- CCTV sewer inspections for 2021.
- Clearing ditches and catchbasins of debris to direct stormwater runoff to storm sewers. Prevents flooding and conveys runoff away from sanitary sewers.
- All SPS have permanent or mobile standby power generation.
- Ongoing development and implementation of a SCADA Master Plan.

WASTEWATER SYSTEM

Tillsonburg

Table of Contents

1.0 Introduction

The County maintains a diverse portfolio of assets that are required to provide the community of Tillsonburg with the safe collection and treatment of wastewater. The Tillsonburg Wastewater Treatment Plant (WWTP) provides wastewater treatment for residential, commercial, and industrial users in the Town of Tillsonburg.

The Tillsonburg WWTP is a Class III rated facility, as defined by Ontario Regulation 129/04. It is a conventional activated sludge plant consisting of primary and secondary treatment, seasonal UV disinfection, with an outfall pipe to Big Otter Creek. The entire treatment process is completed in accordance with strict standards, processes, and limits as regulated by the WWTPs Environmental Compliance Approval (ECA) issued by the Ministry of Environment, Conservation, and Parks (MECP) of the Ontario Provincial Government.

The wastewater collection network transports residential, commercial and industrial waste to the WWTP for treatment. The wastewater collection network consists of a mix of gravity mains, low pressure mains and forcemains. Wastewater flows by gravity wherever possible, where changing elevations require the use of sewage pumping stations (SPS). Other specialized structures such as manholes, valve vaults, meter stations, diversion structures and siphons are required to convey wastewater to the WWTP.

Sound management of our wastewater systems helps us realize our vision of being a vibrant community, working well and growing stronger together!

Like many of our assets, wastewater assets are facing increased challenges as a result of aging assets, climate change, increasing demand due to growth in our communities and regulatory changes. Our investment in these assets must therefore be balanced to optimize investment for renewal with the growing needs of our community.

This plan provides information regarding our approach to the management of our wastewater assets over the short (10-year) and long (100-year) term, demonstrating our commitment to assessing and meeting the levels of service valued by our residents and businesses.

1.1 Improvement Plan

The County recognizes that asset management is a continuously evolving process. The following recommendations are based on the review of current management practices, inventory, valuation and condition analysis.

- Document lifecycle history on assets within the asset management systems.
- Continue to reduce asset data gaps.
- Refine asset components and maintenance strategies for facilities and associated processes.
- Refine the risk assessment approach at the component level.
- Incorporate findings from the Water and Wastewater Master Plan.

2.0 State of Assets

2.1 Inventory

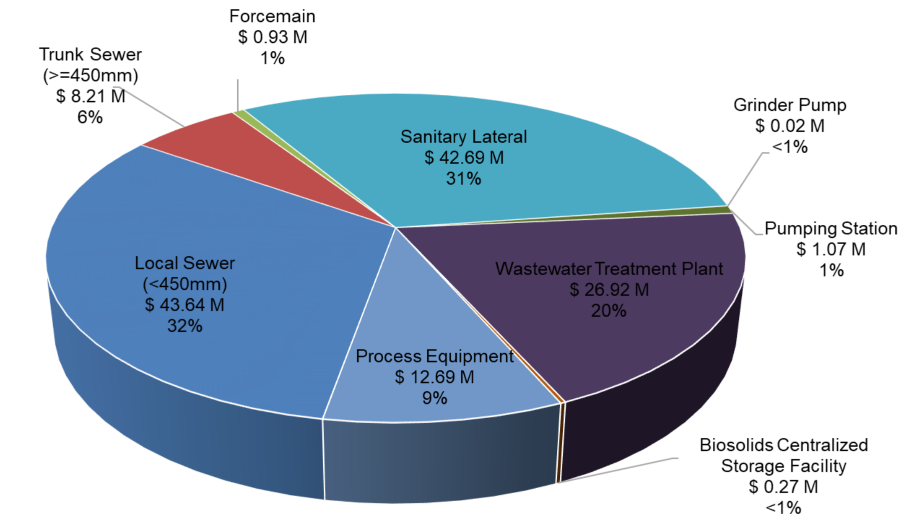
Wastewater assets are those that enable us to live in a clean and safe environment. It includes everything from wastewater mains that service our homes and businesses throughout the County, to the WWTPs, which ensure that effluent is properly treated before being discharged into the natural environment.

We have two different asset classes within the wastewater portfolio in order to effectively collect and treat wastewater from our community:

- Linear, which represent the collection pipe network, including the maintenance holes, connectors and related parts required in such a network.
- Vertical, which represent facilities (including the multiple buildings and structures that the facilities are comprised of), and related process systems and equipment required to perform the needed functions.

Table 2.1.2 displays our current wastewater inventory and the associated replacement costs and average age for each asset component. The County continues to make improvements to increase the integrity of our wastewater data. The inventory figures in table 2.1.2 capture inventory within newly constructed subdivisions which the County is aware of and anticipates assuming ownership of. The County generally assumes ownership of these assets approximately two years after full operation. It is important to include growth assets to ensure that lifecycle activities are planned and funded accordingly.

Figure 2.1.1 Inventory Valuation



2.2 Valuation

The replacement cost valuation for wastewater linear is based on current tender prices, where available. Current tender prices are adjusted where County staff feel some cost increases are only temporary due to COVID.

The replacement cost valuation for wastewater vertical is based on the latest information available, which includes current replacement costs, insurance valuations, and valuations from studies / assessments completed in prior years.

Table 2.1.2 – Tillsonburg Wastewater System Inventory

Asset Type	Asset Component		2017 Inventory	Current Inventory	Replacement Cost	Average Age
Linear	Local Sewer (<450mm)	m	97,938	104,599	$43,636,935	32 Years
	Trunk Sewer (>=450mm)	m	14,438	14,567	8,205,269	32 Years
	Forcemain	m	2,076	2,350	933,140	25 Years
	Low Pressure Main	m	-	-	-	-
	Sanitary Lateral	each	5,999	6,568	42,692,000	31 Years
	Collection Tank	each	-	-	-	-
	STEP Pump	each	-	-	-	-
	Grinder Pump	each	1	1	15,000	10 Years
Vertical	Pumping Station	each	2	3	1,072,452	15 Years
	Wastewater Treatment Plant	each	1	1	26,923,657	27 Years
	Odour Control Facility	each	-	-	-	-
	Other Facilities	each	-	-	-	-
	Biosolids Centralized Storage Facility[1]	each	-	1	273,420	4 Years
	Process Equipment	total	N/A	N/A	12,691,194	36 Years
Total Replacement Cost					**$136,443,067**	

There are several growth / expansion projects planned in Tillsonburg that are included in the County's 2022 approved Long-Term Capital Plan. This includes a new materials and equipment storage building, to facilitate water and wastewater operator response times. The Tillsonburg wastewater system's share of this proposed facility is estimated at 50% or $450,000. There is also an upgrade project at the WWTP (approximately $3.7 million including related process equipment). These growth projects are not included in the figures within table 2.1.2, however their anticipated lifecycle needs are included within this AMP.

[1] The Biosolids Centralized Storage Facility is a shared facility across the County with each system contributing to the costs based on number of customers. The value utilized throughout this report card represents Tillsonburg's share based on 2021 customers.

2.3 Condition Assessment Approach

The assessment approach for our wastewater assets utilizes a combination of physical assessments, asset attributes, such as material and sizing, as well as established anticipated useful lives.

The County's condition scale and visual inspection ratings are based on the following approach:

- Excellent - Asset is well maintained with no noticeable defects.
- Good - Asset may show signs of minor deterioration and may require some maintenance.
- Fair - Deterioration evident, function affected. Asset may require on-going monitoring.
- Poor - Serious deterioration, function inadequate. Asset may require ongoing monitoring.
- Critical - No longer functional, general or complete failure. Asset may require extensive monitoring.

The Pipeline Assessment Certificate Program (PACP) is the North American Standard for pipeline defect identification and assessment[2]. Closed-circuit television (CCTV) is the principal method of inspecting drains and sewers. In this process, a small robotic crawler vehicle with the CCTV camera attached is lowered into the pipe to complete the inspections. A structural rating, on a scale of 0-5, is then assigned using sewer condition assessment standards, with 0 representing an asset with minimal structural deficiencies and 5 representing assets on the verge of failure.

Table 2.3.1 illustrates how the PACP score ratings align with the County's standard condition scale.

Wastewater process assets are inspected by County staff on a regular basis as part the preventative maintenance program. These inspections identify performance and accelerated degradation and will trigger the creation of a reactive work order for repairs and rehabilitation. The County is working towards incorporating these inspections into a formalized condition rating. A visual inspection rating was provided for most process assets as part of the data collection process in 2018 and 2019.

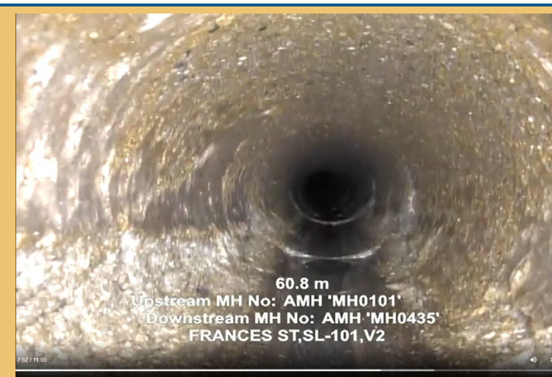
Given the complexities and accessibility of some assets, it is not beneficial to complete a visual or performance based condition assessment on all assets. For assets which are unable to be visually inspected or that have since been replaced, an age-based condition rating is being used based on anticipated useful lives.

[2] https://www.nassco.org/content/pipeline-assessment-pacp

Table 2.3.1 PACP Score Ratings

Excellent
PACP Score of 0 or 1

Poor
PACP Score of 4



Good
PACP Score of 2

Critical
PACP Score of 5

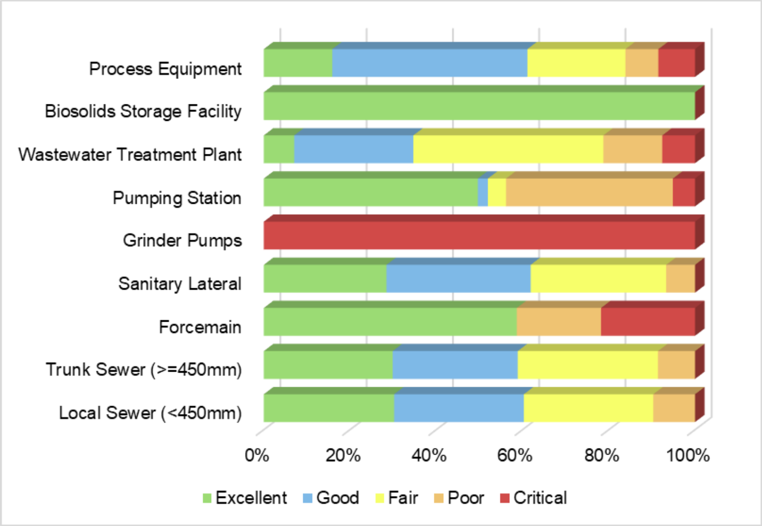
Fair
PACP Score of 3

2.4 Condition Assessment

The condition profile of our Tillsonburg wastewater asset components is shown in figure 2.4.1. The % in each condition is based on replacement costs.

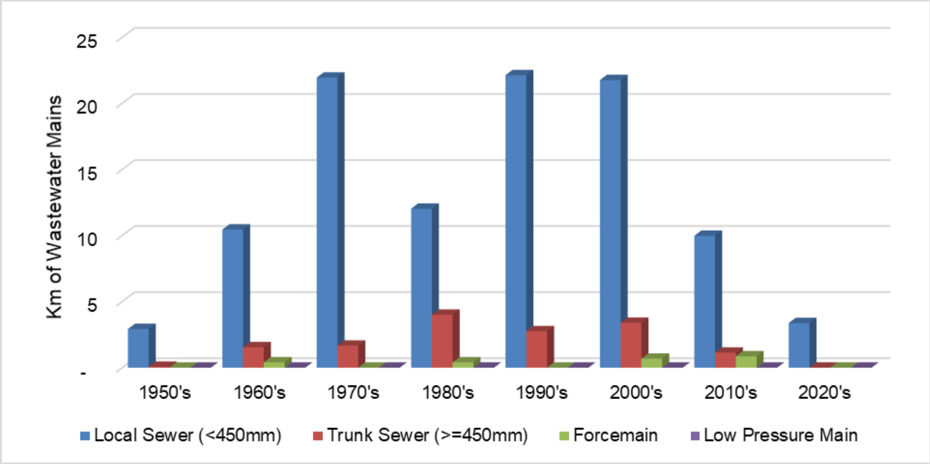
For the Tillsonburg wastewater assets: 12.0% of the assets are in poor or critical condition, and 55.7% in good or excellent condition in comparison to 10-11% and 57-65% respectively for Canadian municipalities reported on the Canadian Infrastructure Report Card[3]. While this may appear that our Tillsonburg wastewater assets are in comparable shape to other Canadian municipalities, the 2019 Canadian Infrastructure Report Card is an aggregate of self reported condition ratings across the Country and are based on a general rating scale which may not match the County's.

Figure 2.4.1 Asset Condition by Component



To better understand our Tillsonburg wastewater collection assets, an age profile of all our wastewater mains by decade is shown in figure 2.4.2.

Figure 2.4.2 Wastewater Mains by Age



The average age of the majority of linear assets within the Tillsonburg wastewater system is approximately 32 years, whereas the average age of the vertical assets varies by facility type from 4 to 36 years. This value must be considered in the context of the different asset types in the category, compared to the typical anticipated useful life of each asset type.

[3] http://canadianinfrastructure.ca/en/index.html

Table 2.4.3 outlines the anticipated useful life for each new build/replacement. The anticipated useful lives for our wastewater assets exclude the management strategies that the County utilizes to extend the overall life of our wastewater assets.

Table 2.4.3 Useful Life

Wastewater System Component	Anticipated Useful Life (years)
Forcemain, Low Pressure Main, Trunk Sewer, Local Sewer, Laterals	90
Collection Tanks	30
Grinder Pumps	10
Facilities	10 - 50
Process Equipment	8 - 75

Figure 2.4.4 illustrates the current average age of the Tillsonburg wastewater system linear components in comparison to their anticipated useful life, based on a run to failure strategy.

As the vertical assets can have a significant variability in age, from both a facility and process standpoint, they are not represented within figure 2.4.4.

There are a number of management strategies that the County may utilize to extend the overall life of our wastewater assets. These strategies all us to align the needs with those of other assets, resulting in the best overall value for our residents.

Figure 2.4.4 Age and Useful Life Comparison

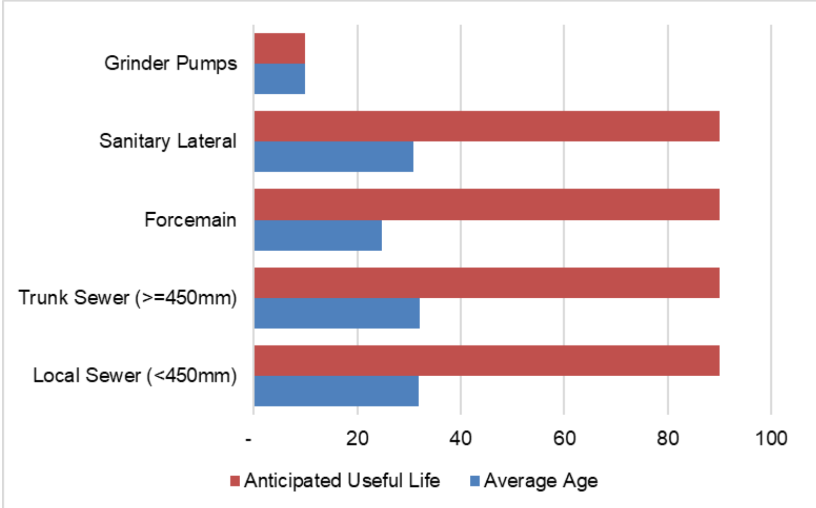


Table 2.4.5 compares the status of our Tillsonburg wastewater asset components, as identified in our 2017 Asset Management Plan to their current condition. The breakdown by component for vertical assets was not available as of the date the 2017 report was published, so there is no condition comparison available. Work is ongoing to further enhance the asset information at the component level.

The trend shows that the status of wastewater assets for the Tillsonburg wastewater system is steady to declining. The decline in condition is commiserate with the aging of these assets. As the system continues to age it is expected that condition ratings will continue to decline until targeted lifecycle strategies are implemented.

Table 2.4.5 Wastewater System Condition Assessment

Asset Type	Asset Component	2017 Condition Rating	Current Condition Rating	Trend
Linear	Local Sewer (<450mm)	Good	Good	→
	Trunk Sewer (>=450mm)	Good	Good	→
	Forcemain	Good	Fair	↓
	Low Pressure Main	-	-	-
	Sanitary Lateral	Good	Good	→
	Collection Tank	-	-	-
	STEP Pump	-	-	-
	Grinder Pump	N/A	Critical	-
Vertical	Pumping Station	Not assessed	Fair	-
	Wastewater Treatment Plant	Not assessed	Fair	-
	Odour Control Facility	-	-	-
	Biosolids Centralized Storage Facility[4]	-	Excellent	-
	Process Equipment	Not assessed	Fair	-

[4] The Biosolids Centralized Storage Facility is a shared facility across the County with each system contributing to the costs based on number of customers. The value utilized throughout this report card represents Tillsonburg's share based on 2021 customers.

3.0 Levels of Service

County staff have developed a comprehensive Level of Service (LOS) Framework. This framework will help to establish a relationship between the current LOS being provided by the County's assets, and the associated operating and capital expenditures required to achieve the proposed LOS. The framework puts into perspective the definition and measurement of service performance in alignment with the County's corporate mission and vision.

Corporate Objective

The wastewater collection and treatment service ensures protection of the environment and public health of residents, visitors to the County and downstream users of the receiver (Big Otter Creek) and our partners in the watershed.

Legislative Requirements

Each of the County's WWTPs are regulated under the Ontario Water Resources Act, 1990[5] and operated in accordance with an ECA or historical Certificates of Approval (C of A) issued by the MECP.

The ECA for the County's WWTPs require annual reporting of operational and treated effluent discharge parameters into the receiving water bodies. The Annual Wastewater Treatment System Summary Reports are available on the County's website.

Framework

The structure of the County's LOS framework was developed to align with international best practices including the International Infrastructure Management Manual (IPWEA, 2015). The framework includes the mandatory measures to meet the requirements of Ontario Regulation (O.Reg.) 588/17 by including both Community and Technical Levels of Service. The metrics in this framework may be expanded upon as the County continues to improve its data collection and reporting processes.

[5] https://www.ontario.ca/laws/statute/90o40

3.1 Customer Levels of Service

Community or Customer Levels of Service are statements that describe quantifiable metrics of the service delivery outcomes from the perspective of the customer, expressed in non-technical terms. The following statements form our qualitative descriptions of the customer level metrics required under O.Reg. 588/17.

The Tillsonburg wastewater system connects to most residential, commercial and industrial spaces in the settlement areas of Tillsonburg, as outlined in figure 3.3.1. The Tillsonburg wastewater system provides for the safe collection and treatment of wastewater.

The County does not have any combined sewers within the Tillsonburg wastewater system. The Tillsonburg wastewater system is a separate wastewater system.

Infiltration and inflow can enter through a variety of sources (cracks in pipes, weeping tile connections, cross connections, etc.). In the case of heavy rainfall events, wastewater mains may experience a volume of water and wastewater that exceeds its designed capacity. In some cases, this can cause water and/or wastewater to overflow into streets or backup into homes or businesses.

To minimize wastewater overflow into streets or backup into homes, the County has established design standards to convey flows under ultimate conditions, design sheets for capacity needs that include infiltration inflow. Newer wastewater mains are made of gasketed PVC piping to reduce potential leaks occurring between fitted pipe segments.

Final Effluent is the treated water that is discharged to the environment through the approved effluent disposal facilities, including all Bypasses that are required to meet the compliance limits stipulated in the ECA for the WWTP, at the final effluent sampling points. The effluent criteria includes effluent flow rates, and parameters such as total suspended solids, Biochemical Oxygen Demand (BOD), phosphorous, ammonia, and E. coli. The County produces annual reports summarizing each WWTPs operation and treated effluent discharge quality and these can be found on the County's website at: http://www.oxfordcounty.ca/Services-for-You/Water-Wastewater/Wastewater/Annual-reports.

Table 3.1.1 outlines additional customer focused performance metrics from the County's LOS framework.

3.2 Technical Levels of Service

Technical Levels of Service metrics are quantifiable metrics applied against assets that are subject-matter specific inputs or outputs supported by the day-to-day activities of County staff. Table 3.1.1 includes the technical metrics required under O.Reg. 588/17, as well as, additional metrics the County has included in the framework.

3.3 Levels of Service Maps

As a further illustrative example of our community levels of service, a map is included as figure 3.3.1 showing areas within the Town of Tillsonburg boundary that are serviced by the Tillsonburg wastewater system.

Figure 3.3.1 Tillsonburg sanitary serviced properties

Tillsonburg

Properties with fronting sewer

- Properties with fronting sewer
- Properties without fronting sewer
- Municipal Boundary
- Railway
- Waterbody

Total # of parcels:	7,149
Without fronting sewer:	278
With fronting sewer:	6,871
Coverage:	96%

N

0 270 540 1,080 1,620 m

Parcels with fronting sewer identified as being a distance of 30m from sanitary mains.

Oxford County
Growing stronger together
Produced By The Department of Corporate Services
Information Services ©2021

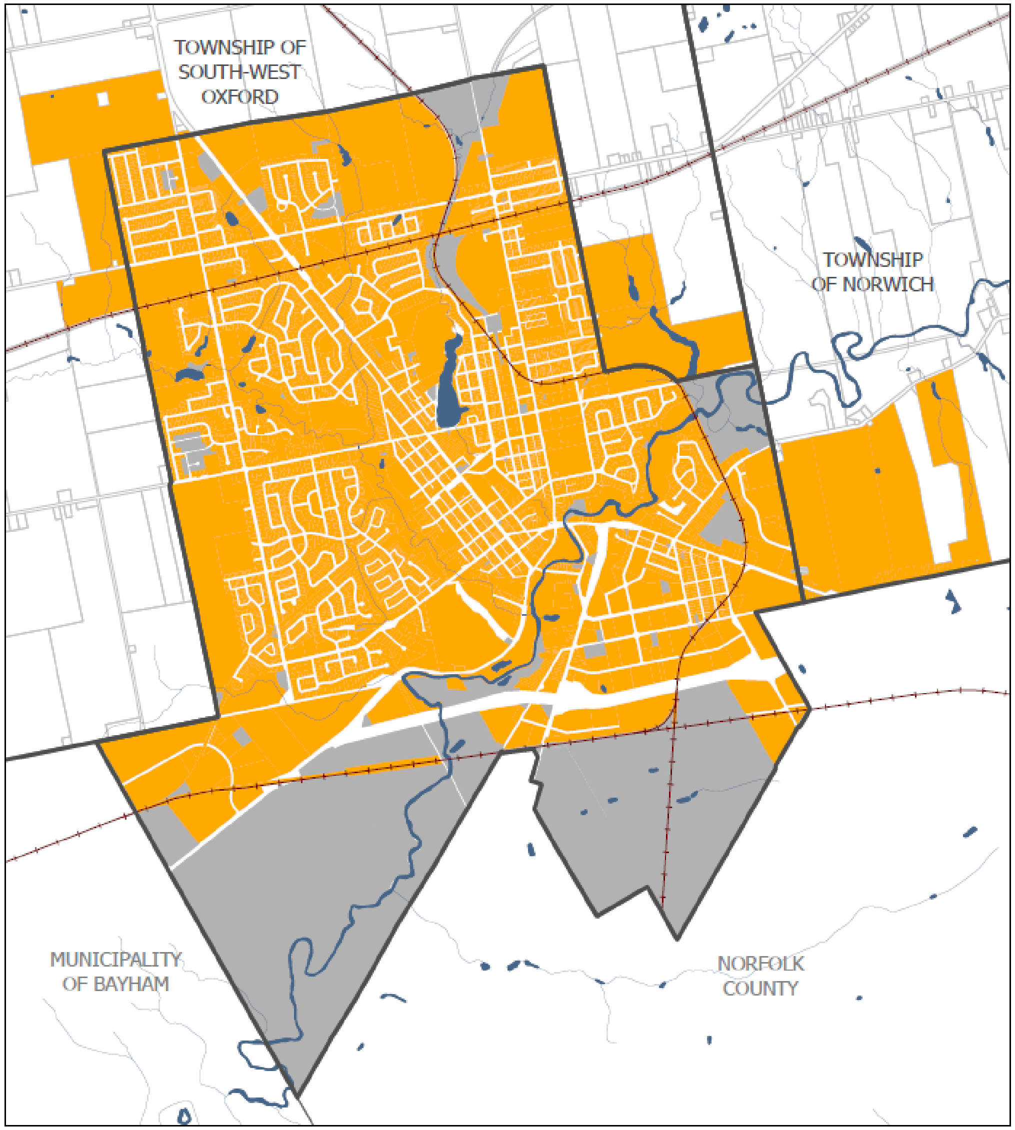


Table 3.1.1 Performance Measures

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Customer / Council Focused Performance Measures					
Reliability	Providing wastewater services with minimal interruptions	% of properties within the system boundary connected to the municipal wastewater system	N/A	96%	TBD
		% of wastewater mains designed to be resilient to overflow or flooding during wet weather events	100%	100%	100%
Environmental Stewardship	Providing wastewater services that have minimal impacts on the environment	% of overall facility ECA compliance rate	98.8%	100%	100%
Cost Efficient	Providing wastewater services in an efficient manner	Operating cost to provide service ($/connection)	$478	$706	TBD
Technical Focused Performance Measures					
Reliability	Providing wastewater services with minimal interruptions	The number of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system.	0.75 connection-days to 6,364 connections	0.125 connection-days to 6,189 connections	TBD
		% of system inspected (CCTV) annually	1.8%	1.9%	7%
		% of wastewater mains flushed annually	24.8%	21.5%	20%
		# of overflow or spill occurrences	1	0	0
Environmental Stewardship	Providing wastewater services that have minimal impacts on the environment	% of wastewater estimated to have by-passed treatment	0%	0%	0%
		The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system.	1 ECA violation to 6,364 connections	0 violations to 6,189 connections	0

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Cost Efficient	Providing wastewater services in an efficient manner	Operating cost per kilometre of wastewater main for collection	N/A	$10,137	TBD
		5 year average capital expenditure for wastewater collection	$0.8M	$0.9M	TBD
		5 year average capital expenditure for wastewater treatment	$0.2M	$0.6M	TBD

4.0 Asset Management Strategy

4.1 Lifecycle Activities and Planned Actions

Wastewater collection assets undergo regular maintenance and inspection. As part of capital works project analysis, determinations of whether wastewater pipe replacement or relining should occur is reviewed. This process is fully integrated with the renewal needs of the roadways and other underground assets, such as drinking water and stormwater. This integrated approach ensures our renewal projects for these service areas are delivered with optimal timing to increase value and minimize disruption to our communities. For example, if a roadway is targeted for renewal, coordination between service areas and area municipalities will determine whether the underlying stormwater, drinking water or wastewater assets are also of an age or condition that requires renewal, to ensure these projects are delivered together to reduce disruption for our communities and deliver enhanced value.

Process assets and equipment undergo extensive operations and maintenance regimes to sustain their reliable operation. Investment needs are identified and coordinated with normal operations to minimize disruptions to service. Major replacements are planned and accommodated using system redundancy and changes to operations, in order to maintain service. It is critical to maintain wastewater service in order to protect public health and the environment.

There are six main lifecycle activities considered in the overall sustainable management of wastewater assets, described in table 4.1.1.

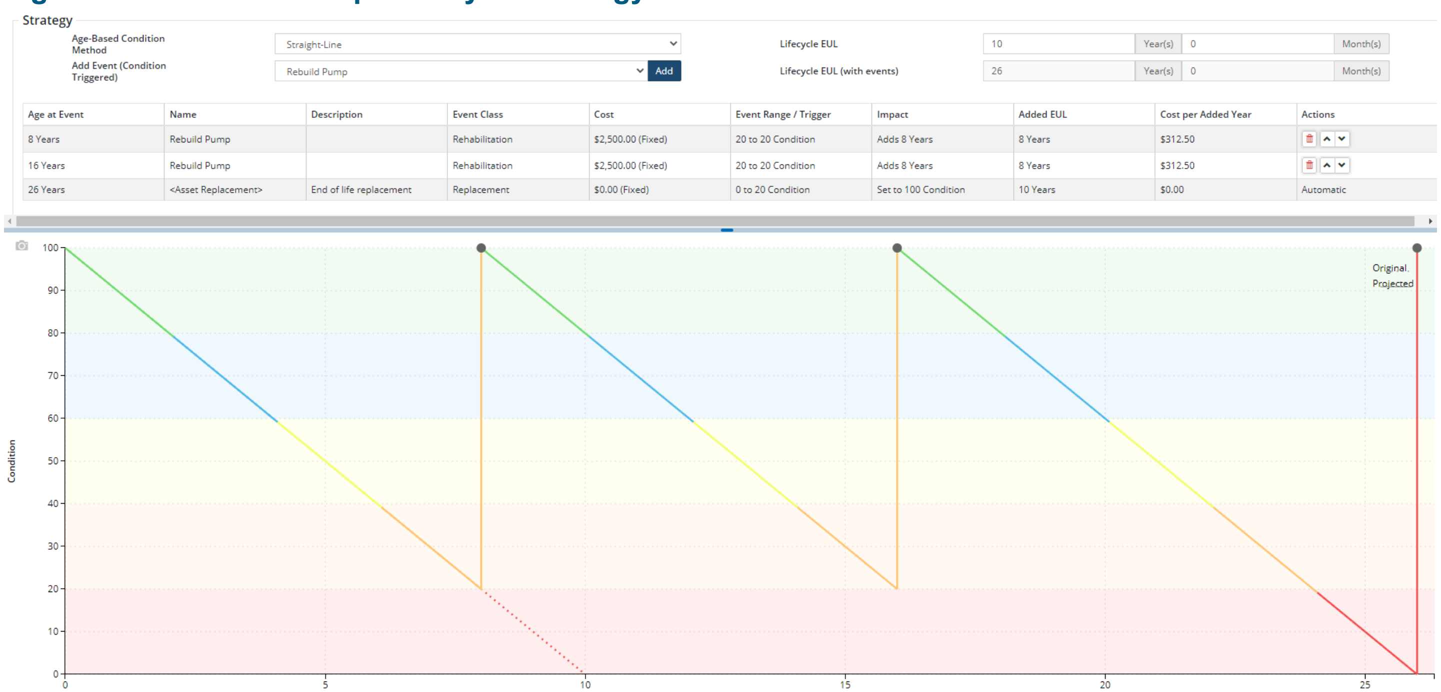
Table 4.1.1 Lifecycle Activities

Strategy	Lifecycle Activity
Non-Infrastructure Solutions	Actions or policies that can lower costs or extend useful lives. **Trigger: Ongoing**
Maintenance	Regularly scheduled maintenance and inspection programs including cleaning and flushing, manhole repairs, CCTV inspections, exercising diesel gen-sets and minor repairs. These activities do not improve the overall condition of the asset, nor increase its useful life. **Trigger: Ongoing**
Rehabilitation / Renewal	One-time events that increase the condition and extend the useful life of the asset; including sewer lining and seal and grout programs. **Trigger: Fair/Poor**
Replacement	Occurs at the end of the useful life and/or when rehabilitation is no longer an option – can vary among assets due to construction material and environmental factors that impact the degree of deterioration and performance. **Trigger: Poor/Critical**
Disposal	Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the County to provide services. County staff coordinate with contractors to ensure safe removal and environmental compliance when disposing of assets. **Trigger: Poor/Critical**
Expansion / Growth	Planned activities required to extend services to previously unserved areas, expand services to meet growth demands, or increase the level of service being provided. **Trigger: Development**

The lifecycle management strategy is the set of planned actions that should enable the assets to provide users with the proposed level of service in a sustainable way, while achieving acceptable levels of risk and the lowest lifecycle costs required to provide that level of service. Lifecycle considerations for assets include analysis of the timing to carry out key asset management activities including inspection, maintenance, repair, and replacement. Ongoing preventative maintenance activities are outlined in the County's work management system. The rehabilitation and replacement activities impacting the asset components condition and useful life are contained within profiles in the County's asset management system. For some assets, replacement needs are based on a run to failure strategy, as this is the most economical. Work is ongoing within the County's asset management systems to build all the component profiles and identify where each asset is within the lifecycle.

As an example, figure 4.1.2 illustrates the lifecycle strategy of grinder pumps. The pumps are re-built twice, extending the overall useful life from 10 years to approximately 25. The annual cost requirement from a run to failure strategy is $1,500 per year where the annual cost requirement using the rehabilitation strategies decreases to just below $800 per year.

Figure 4.1.2 Grinder Pumps Lifecycle Strategy



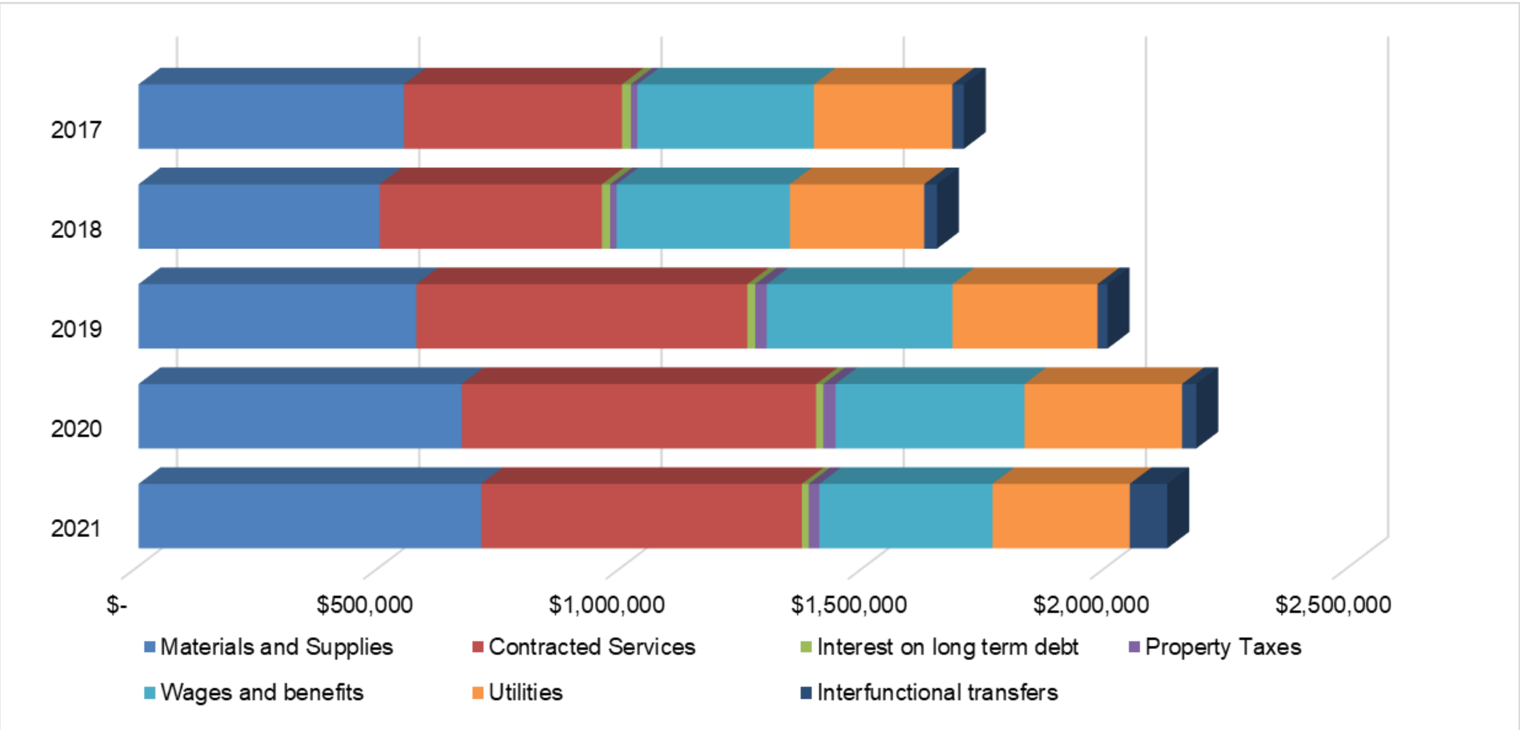
Age at Event	Name	Description	Event Class	Cost	Event Range / Trigger	Impact	Added EUL	Cost per Added Year	Actions
8 Years	Rebuild Pump		Rehabilitation	$2,500.00 (Fixed)	20 to 20 Condition	Adds 8 Years	8 Years	$312.50	
16 Years	Rebuild Pump		Rehabilitation	$2,500.00 (Fixed)	20 to 20 Condition	Adds 8 Years	8 Years	$312.50	
26 Years	<Asset Replacement>	End of life replacement	Replacement	$0.00 (Fixed)	0 to 20 Condition	Set to 100 Condition	10 Years	$0.00	Automatic

4.2 Significant Operating Expenses

Significant operating expenses are required in order to sustain an asset over its lifecycle. The County is always looking at ways to optimize our operating investment to ensure we are achieving the best value for our residents, and businesses. Essential to this is a strong operations and maintenance plan within our work management system. Operating expenses are incurred through a number of sources – preventative maintenance activities, utility costs, property taxes and more. Despite the fact that minor maintenance is incorporated into planned operations and maintenance programs, there are cases where it is unplanned.

Figure 4.2.1 shows the operating expenses from 2017 through 2021 for the Tillsonburg wastewater system grouped by expense type. The groupings align with those reported on the County's Financial Information Return (FIR), with further breakdown for property taxes and utility costs as these expenses can be significant.

Figure 4.2.1 Operating Expenses



4.3 Risk Strategy

Risk management frameworks are developed to assist with the prioritization of investments within the capital planning period. The preferred approach is to implement a triple bottom line analysis approach to evaluate:

- Social impacts of asset failure, including impacts to customers, businesses and the County's reputation;
- Environmental impacts of asset failure; and
- Economic impacts of failure including the cost of remediation.

In the context of asset management, risk is the multiple of the consequence of an asset failing and the probability that the event will occur.

Figure 4.3.1 illustrates the risk ratings for the Tillsonburg wastewater assets at a summary level. The highest risk assets are located at the Tillsonburg WWTP, which is currently under construction. County staff will continue to monitor the higher risk assets, review and/or complete physical inspections to further validate the age-based condition ratings and plan for lifecycle strategies accordingly.

Figure 4.3.1 Asset risk profile

Consequence	1	2	3	4	5
5	0 Assets - $0.00	1 Asset 1.00 unit(s) $5,187,000.00	0 Assets - $0.00	2 Assets 2.00 unit(s) $9,676,000.00	1 Asset 1.00 unit(s) $2,044,000.00
4	2 Assets 2.00 unit(s) $3,210,000.00	1 Asset 1.00 unit(s) $1,471,000.00	3 Assets 3.00 unit(s) $4,476,000.00	1 Asset 1.00 unit(s) $1,217,000.00	0 Assets - $0.00
3	1 Asset 852.61 m $341,044.00	10 Assets 783.03 m, unit(s) $1,647,018.00	21 Assets 1,459.25 m, unit(s) $2,883,150.00	4 Assets 273.31 m, unit(s) $1,355,745.00	0 Assets - $0.00
2	195 Assets 11,968.43 m, unit(s) $6,165,063.00	452 Assets 17,214.00 m, unit(s) $10,379,479.00	716 Assets 11,768.03 m, unit(s) $9,929,834.00	148 Assets 6,243.41 m, unit(s) $4,313,327.00	5 Assets 630.77 m, unit(s) $492,337.00
1	2,079 Assets 21,194.20 m, unit(s) $19,561,771.50	2,156 Assets 21,322.49 m, unit(s) $20,564,538.00	2,305 Assets 26,951.14 m, unit(s) $23,816,752.00	571 Assets 7,606.59 m, unit(s) $6,314,400.00	44 Assets 274.47 m, unit(s) $1,124,188.00

Probability

5.0 Financial Strategy

5.1 Financing Strategy

Hemson Consulting Ltd. (Hemson) was retained through a competitive process to assist with analyzing and developing the County's water and wastewater rates for a 4-year period from 2021 to 2024. The rate modeling includes all system asset management needs and all sources of funding including Community Servicing Assistance Program (CSAP) funding, development charges, developer and resident contributions. In most cases, the capital replacement component is the average annual required contribution level in order to establish full cost recovery; however, the contribution may vary based on the system's ability to meet full cost recovery for the next 10-years.

Capital work is funded from reserves (based on the capital contribution included in the user rates), development charges (for growth projects), debentures and grant funding when available. The County continually assesses opportunities for additional funding options and revenue streams to address our asset needs.

Where possible, replacement activities are planned in conjunction with the replacement needs of the road network and underlying water and stormwater assets. This requires a co-ordinated effort with area municipalities as the majority of the County owned water and wastewater linear assets falls under the area municipalities' roadways. This collaboration is essential for ensuring a cost effective approach to maintaining assets within the County regardless of ownership.

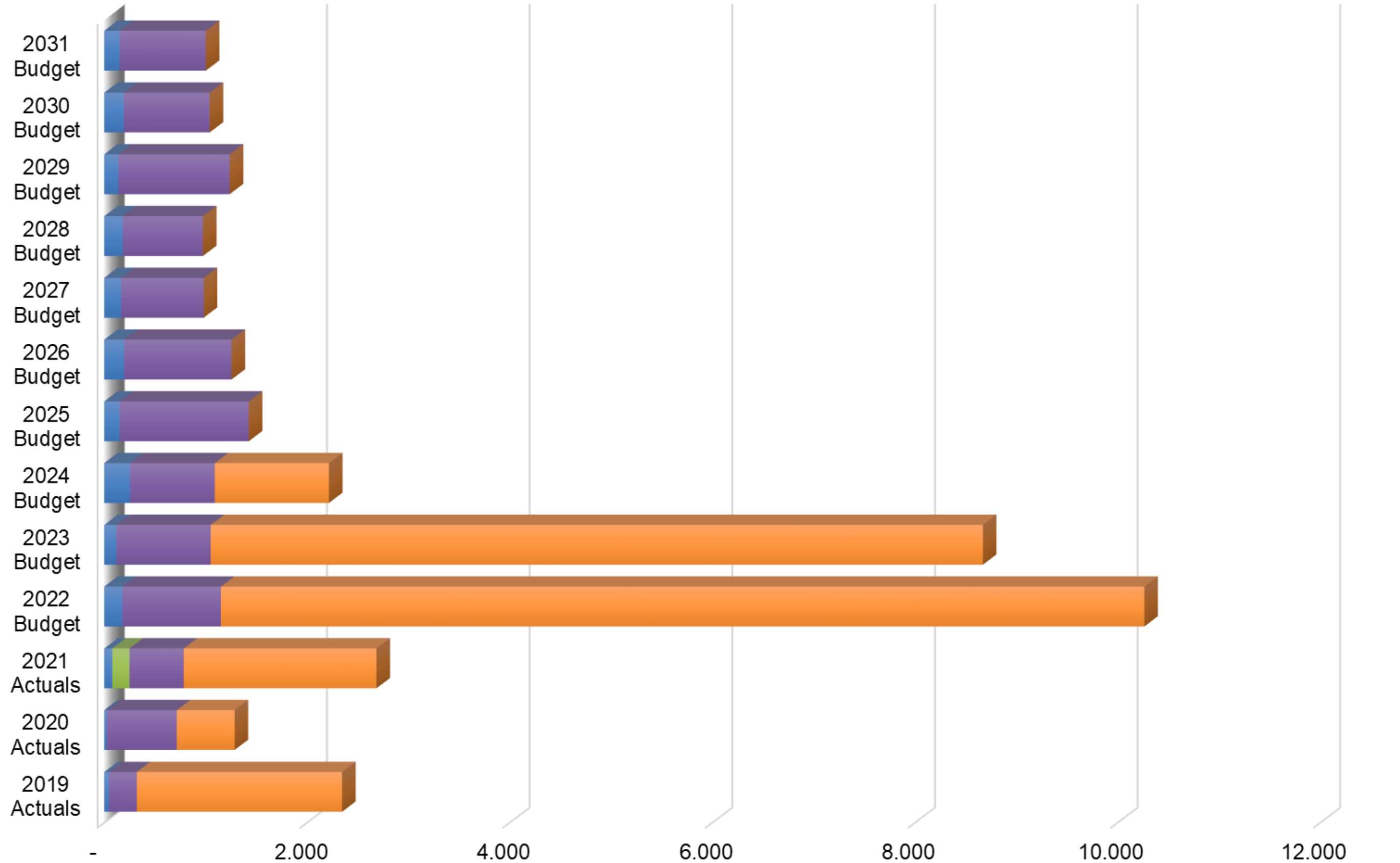
In addition to targeting and prioritizing the investment needed to maintain existing assets, there are also planning processes in place to determine the additional assets needed to meet growing demands through population increases or demand for new services. The projects targeted to meet growth are funded primarily through Development Charges (DC) – the mechanism that enables recovery of growth-related capital expenditures from new development. These charges are governed by the Development Charges Act and are applied in accordance with our Development Charges By-Law. Impacts from the growth activities analyzed in the 2019 DC Background Study are included in this AMP.

5.2 Expenditure History and Forecasts

The Tillsonburg wastewater system contains a significant capital project within the 10-year approved budget for the rehabilitation and expansion of the WWTP, as illustrated in figure 5.2.1. Linear asset replacements are ongoing, in conjunction with the local area municipal roadway construction projects. Minor process equipment replacements were included in the 2020 to 2022 budgets. County staff continue to review anticipated asset management needs with each budget cycle, subject to existing resource limitations.

Non-Infrastructure solution projects include shared projects for condition reviews, studies and implementation of the work management system.

Figure 5.2.1 Expenditures (millions)

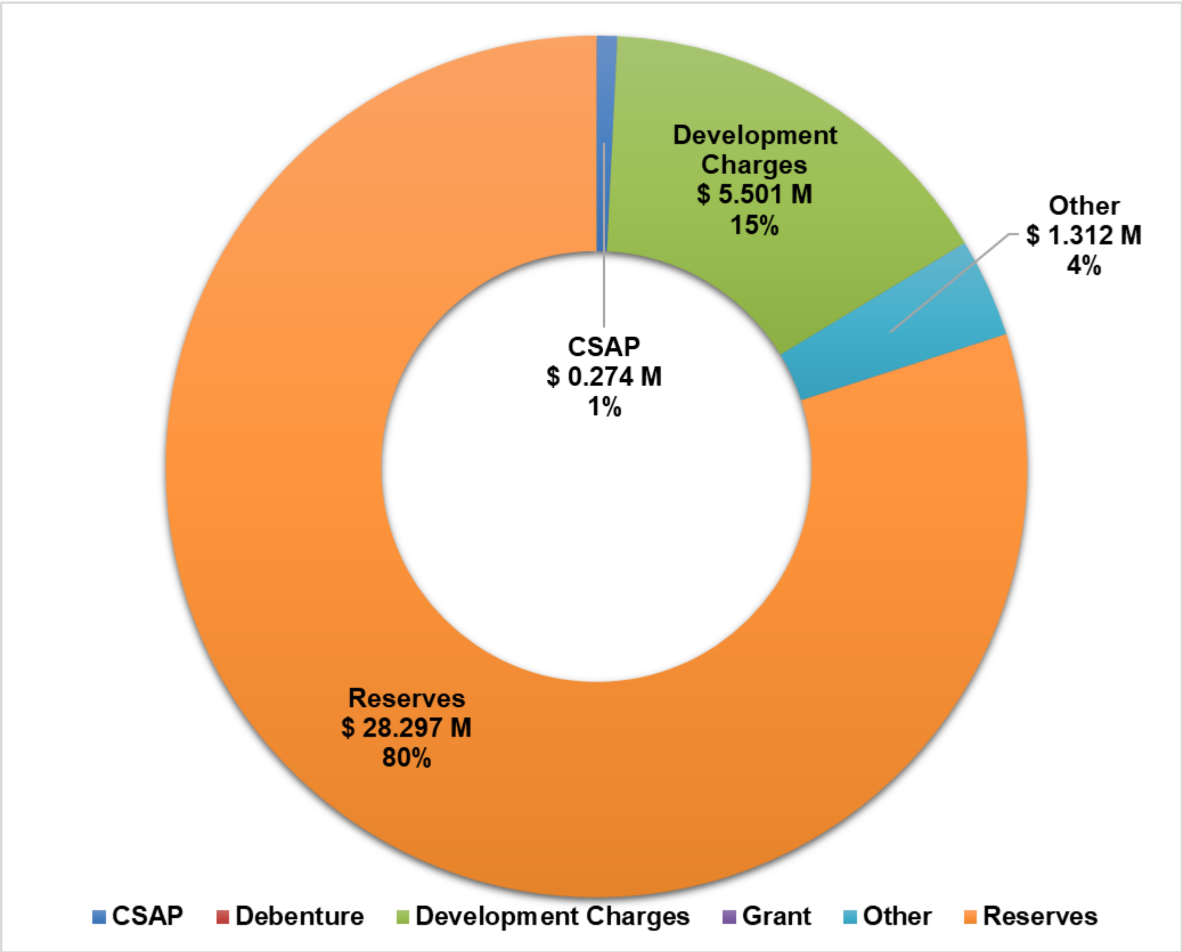


	2019 Actuals	2020 Actuals	2021 Actuals	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Non-Infrastructure Solution	0.046	0.025	0.078	0.178	0.119	0.253	0.152	0.196	0.167	0.181	0.139	0.191	0.152
Maintenance	-	-	-	-	-	-	-	-	-	-	-	-	-
Rehabilitation / Renewal	-	-	0.170	-	-	-	-	-	-	-	-	-	-
Replacement	0.274	0.690	0.535	0.973	0.930	0.837	1.275	1.061	0.814	0.793	1.099	0.848	0.849
Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-
Expansion / Growth	2.025	0.571	1.903	9.113	7.621	1.127	-	-	-	-	-	-	-

5.3 Capital Revenues

Replacement projects, identified in the County's 10-year capital plan, are anticipated to be funded by the Wastewater – Tillsonburg Reserve, which is funded by user fees. The Tillsonburg WWTP rehabilitation and expansion project is funded by both the Wastewater – Tillsonburg Reserve and Development Charges. The Wastewater – Tillsonburg Reserve, including the anticipated capital contributions within the 10-year period, is sufficient to fund the 10-year related asset activities within the approved 2022 Long-Term Capital Plan.

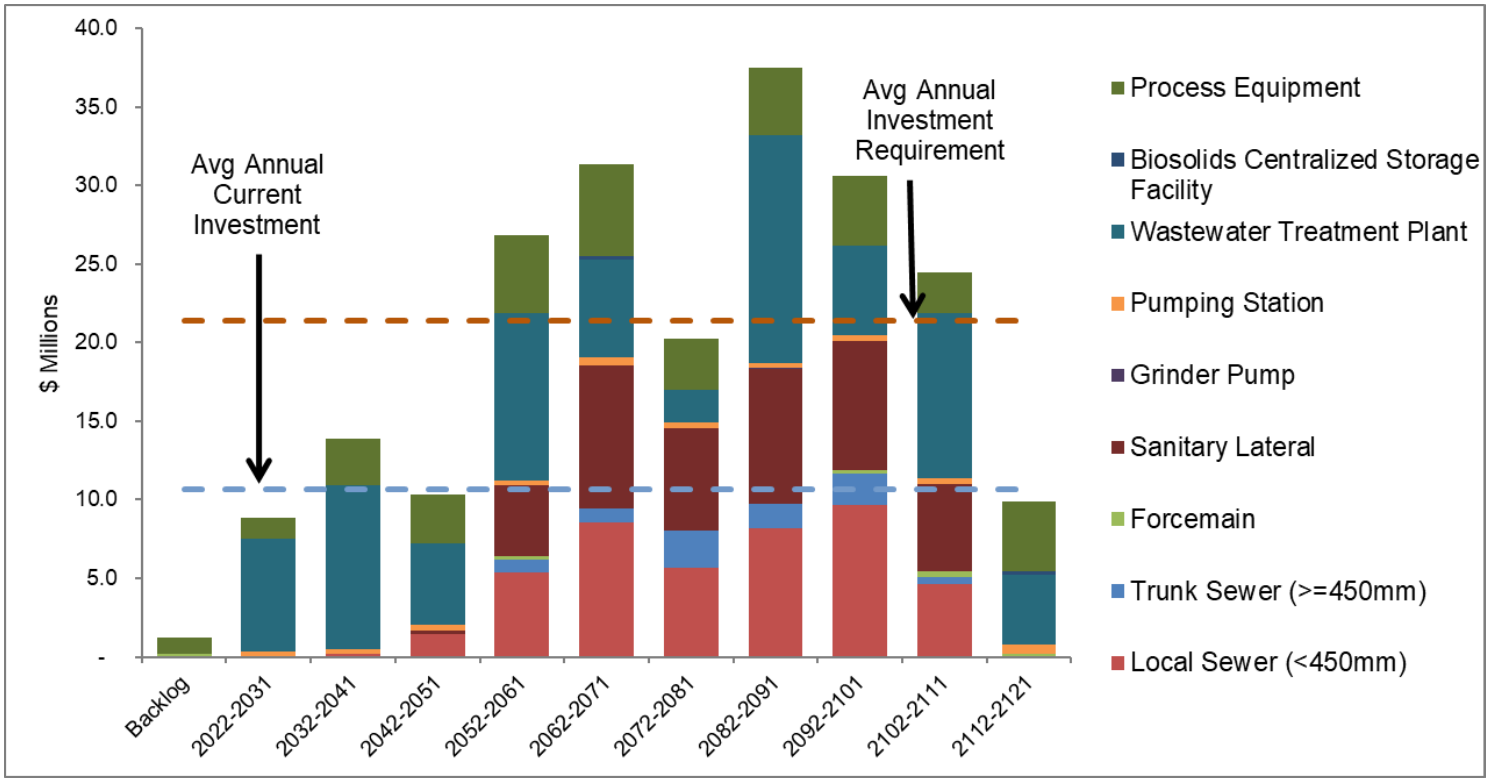
Figure 5.3.1 Sources of Capital Revenues 2019-2031 (millions)



5.4 Capital Investment

Based on the asset management lifecycle strategies identified, the financial requirements over the next 100-years are determined in current dollars. The average annual investment requirement represents the amount of capital funding required to renew and maintain the existing assets on an annual basis so services can continue to be delivered. These estimates assume that all work is able to be completed, as indicated, and does not take into account future changes due to environmental factors, new maintenance techniques, and unidentified growth. The annual requirement has increased from the 2017 AMP, due to improvements the County has made to the vertical data, resulting in asset useful lives that are more reflective of their actual lifecycle. Further work is ongoing with the vertical data to fully determine lifecycle needs (including maintenance and rehabilitation strategies) which will impact the annual requirement for vertical assets. The data will continue to be reviewed with each budget and business plan cycle.

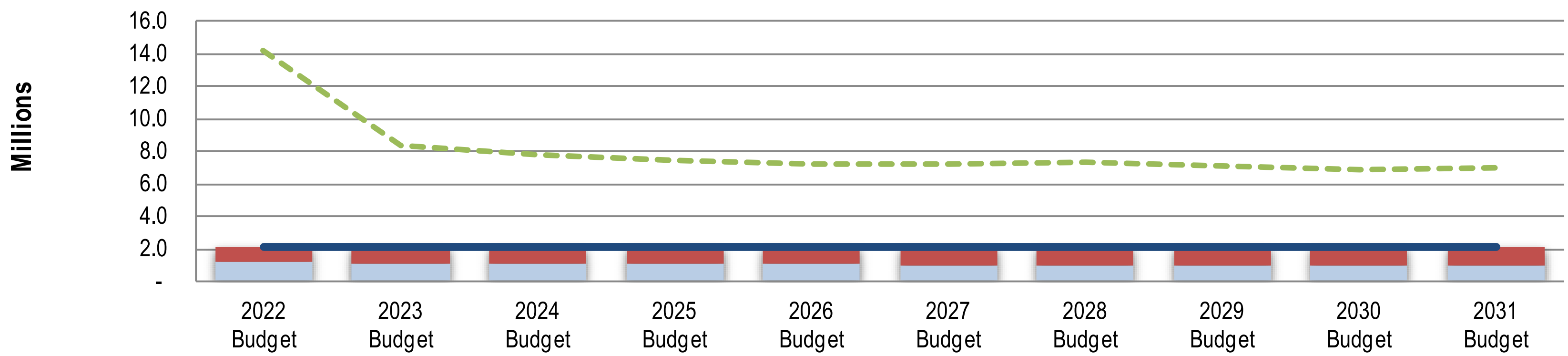
Figure 5.4.1 Average Annual Capital Requirements



The following figure links the annual capital funding needs to the capital investments contained in the budget. The timing of the actual capital projects may vary, however annual investments in capital assets is important for financial sustainability.

Figure 5.4.2 Funding Requirements

	Key	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Annual Required Investment		**2,139,000**	**2,139,000**	**2,139,000**	**2,139,000**	**2,139,000**	**2,139,000**	**2,139,000**	**2,139,000**	**2,139,000**	**2,139,000**
Current Investment		1,196,505	1,124,972	1,112,028	1,085,558	1,070,080	1,023,795	1,023,305	1,021,706	1,019,387	1,018,006
Funding Deficit		*942,495*	*1,014,028*	*1,026,972*	*1,053,442*	*1,068,920*	*1,115,205*	*1,115,695*	*1,117,294*	*1,119,613*	*1,120,994*
Funding Surplus		-	-	-	-	-	-	-	-	-	-
Reserve Balance		14,170,664	8,306,100	7,747,547	7,381,485	7,174,000	7,215,483	7,274,898	7,047,140	6,920,828	6,928,903



The amount of the current investment that would be restricted to debenture payments is anticipated to be 2.9% over the 10-year period.

5.5 Funding Gap Analysis

Using the anticipated 10-year asset lifecycle needs, along with the current capital investment level, the County is able to determine if there is a projected funding gap for the Tillsonburg wastewater system. Consideration is then given to the current system reserve balance to determine the residual funding gap. The County would then investigate opportunities for reducing this residual funding gap which, may include increases to the user rates, utilization of grant funding opportunities and further review of lifecycle strategies and proposed levels of service.

Figure 5.5.1 illustrates the anticipated asset management 10-year lifecycle needs, including the projected funding surplus (left side of figure 5.5.1) and funding needs (right side of figure 5.5.1) for the Tillsonburg wastewater system. The system calculates the optimal expenditures based on theoretical asset lifecycle needs. These needs have not yet been reviewed in depth with County operations staff, and incorporated into the 10-year capital budget. This is anticipated to be completed as part of the 2023 Business Plan and Budget process with subsequent review annually.

The anticipated expenditures have been increased for non-infrastructure solution projects; approximately $1.5 million.

While the anticipated expenditure calculation accounts for the lifecycle activities of expansion / growth projects it does not account for the initial investment. It is important to adjust for these projects, where the initial investment is growth related and not projected to be DC funded within the 10-year capital plan. The resulting growth/expansion projects added to the anticipated asset needs is approximately $1.3 million.

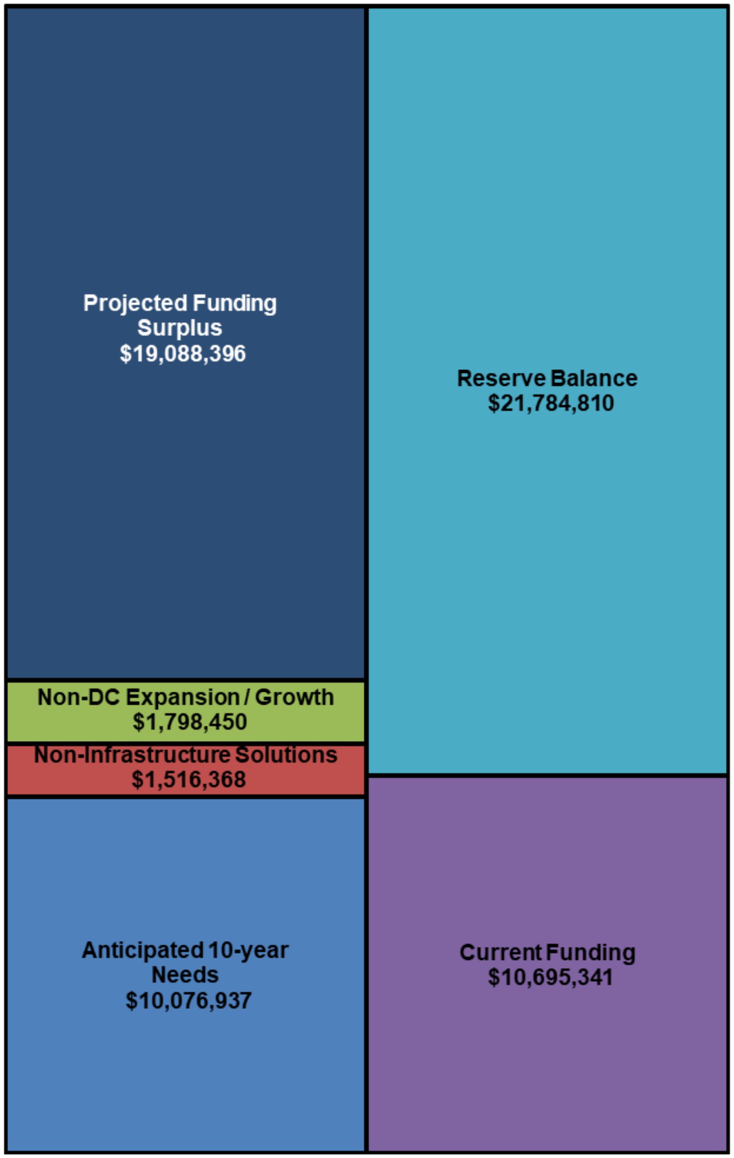
The Tillsonburg wastewater system is projecting a funding surplus over the 10-year capital planning period. Although the Tillsonburg wastewater system has a projected funding surplus over the 10-year horizon, the annual funding requirement is the basis for ensuring the long-term financial sustainability well into the future. Approximately 2.9% of the current funding is committed to debenture payments over the 10-year horizon. The annual funding requirement will be reviewed holistically as part of the next rate study.

Drawing the reserve balance to zero would likely result in increased user fee requirements in the subsequent 10-year period in order to fund the anticipated asset lifecycle needs.

The reserve is also utilized to fund emergency or unplanned expenses. A minimal or fully committed balance would limit the ability to fund these types of expenses. Consideration needs to be given to a minimum balance the County should maintain based on these risks. Analysis of the reserve target minimum balance, will be completed as part of the annual reserve review process.

Failure to address the long-term asset lifecycle needs could result in significant increases to rates in the future as assets reach end of life; or reductions in localized and/or regional service. This may include blockages, sewer backups, basement flooding, localized service outages, increased maintenance costs on assets past their optimal life, poor quality effluent, damage to the natural environment, fines, increase in insurance claims for property damage and personal injury resulting from poor asset conditions, etc.

Figure 5.5.1 Anticipated Needs (10-Year)



6.0 Climate Change

As part of the asset management planning process, the County will consider the risks and vulnerabilities of capital assets to climate change and the resulting actions that may be required. Commitment will be made to the development of tailored actions that make the best use of our resources to mitigate and adapt to climate change, in accordance with our local reduction targets, financial capacity and stakeholder support.

Optimization of the wastewater treatment process can help reduce the emissions of GHG such as nitrous oxide (N_2O), carbon dioxide (CO_2) and methane (CH_4) from being released into the environment at WWTPs. Optimization requires the correct equipment to ensure conditions can be achieved to reduce GHG emissions, while maintaining WWTP regulatory compliance.

Nitrous oxide (N_2O) is released in the secondary treatment train through the nitrification and denitrification process, which is used to remove nitrogenous components from the wastewater. Nitrifying bacteria oxidize ammonia to nitrites and nitrates. To minimize N_2O emissions, the plant is optimized by running the activated sludge process at a high sludge retention time (SRT) with optimal dissolved oxygen levels, which results in low ammonia and nitrite concentrations. High amounts ammonia and nitrite compounds, especially when there are excessive amounts of dissolved oxygen, can trigger biogenic N_2O emissions. To control this process, an upgrade is underway:

- Installation of actuated digestion valves to properly control the aerobic digestion process and biomass concentrations.

Methane (CH_4) is generated by the anaerobic biological break down of organics or the release of dissolved CH_4 found in the wastewater influent. The Tillsonburg WWTP does not have anaerobic digestion and does not generate significant levels of methane gas.

Carbon Dioxide (CO_2) is produced in biological treatment, where the organic carbon in the wastewater is utilized for biomass growth or oxidized into CO_2. By operating WWTPs at high sludge retention times, endogenous respiration (cell lysis results in biomass growth) is encouraged, which decreases the overall sludge production, which results in a decrease in CO_2 production. Upgrades with this process include:

- Oxford County's Biosolids Clean out Plan: A 20 year guide to maintaining equipment involved in biosolids stabilization, based on industry best practices. In 2020 Primary Digester 3 was cleaned out, to optimize the aerobic digestion process and promote endogenous respiration.

Improving energy efficiency at WWTPs can help to reduce GHG emissions by decreasing consumption of fossil fuel-based energy. Significant energy savings can be realized by increasing the efficiency of plant equipment such as pumps and blowers, and using generated fuel sources.

- Plant upgrade commenced in 2021, to address operational issues, including new headworks, primary treatment, blower and secondary clarifier. Upgrades will include new more energy efficient equipment.

Climate change risks are considered during the planning phase of each capital project. Increasing resiliency to changing climate conditions through the use of backup power generation, redundancies with critical equipment, use of SCADA to collect accurate information and make informed decisions. By conducting inspections and completing studies, problem areas can be identified and planned to repair.

- CCTV sewer inspections for 2021.
- Clearing ditches and catch basins of debris to direct stormwater runoff to storm sewers. Prevents flooding and conveys runoff away from sanitary sewers.
- All SPS have permanent or mobile standby power generation.
- Ongoing development and implementation of a SCADA Master Plan.

WASTEWATER SYSTEM

Ingersoll

Table of Contents

1.0 Introduction

The County maintains a diverse portfolio of assets that are required to provide the community of Ingersoll with the safe collection and treatment of wastewater. The Ingersoll Wastewater Treatment Plant (WWTP) provides wastewater treatment for residential, commercial, and industrial users in the Town of Ingersoll. The Ingersoll WWTP also provides treatment for septic tank waste, hauled waste, holding tank waste, and landfill leachate from within the County.

The Ingersoll WWTP is a Class IV rated facility, as defined by Ontario Regulation 129/04. It is a conventional activated sludge system consisting of primary and secondary treatment, and UV disinfection, with an outfall pipe to the Thames River. The entire treatment process is completed in accordance with strict standards, processes, and limits as regulated by the WWTPs Environmental Compliance Approval (ECA) issued by the Ministry of Environment, Conservation, and Parks (MECP) of the Ontario Provincial Government.

The wastewater collection network transports residential, commercial and industrial waste to the WWTP for treatment. The wastewater collection network consists of a mix of gravity mains, low pressure mains and forcemains. Wastewater flows by gravity wherever possible, where changing elevations require the use of sewage pumping stations (SPS). Other specialized structures such as manholes, valve vaults, meter stations, diversion structures and siphons are required to convey wastewater to the WWTP.

Sound management of our wastewater systems helps us realize our vision of being a vibrant community, working well and growing stronger together!

Like many of our assets, wastewater assets are facing increased challenges as a result of aging assets, climate change, increasing demand due to growth in our communities and regulatory changes. Our investment in these assets must therefore be balanced to optimize investment for renewal with the growing needs of our community.

This plan provides information regarding our approach to the management of our wastewater assets over the short (10-year) and long (100-year) term, demonstrating our commitment to assessing and meeting the levels of service valued by our residents and businesses.

1.1 Improvement Plan

The County recognizes that asset management is a continuously evolving process. The following recommendations are based on the review of current management practices, inventory, valuation and condition analysis.

- Document lifecycle history on assets within the asset management systems.
- Continue to reduce asset data gaps.
- Determine asset components and maintenance strategies for facilities and associated processes.
- Refine the risk assessment approach at the component level.
- Incorporate findings from the Water and Wastewater Master Plan.

2.0 State of Assets

2.1 Inventory

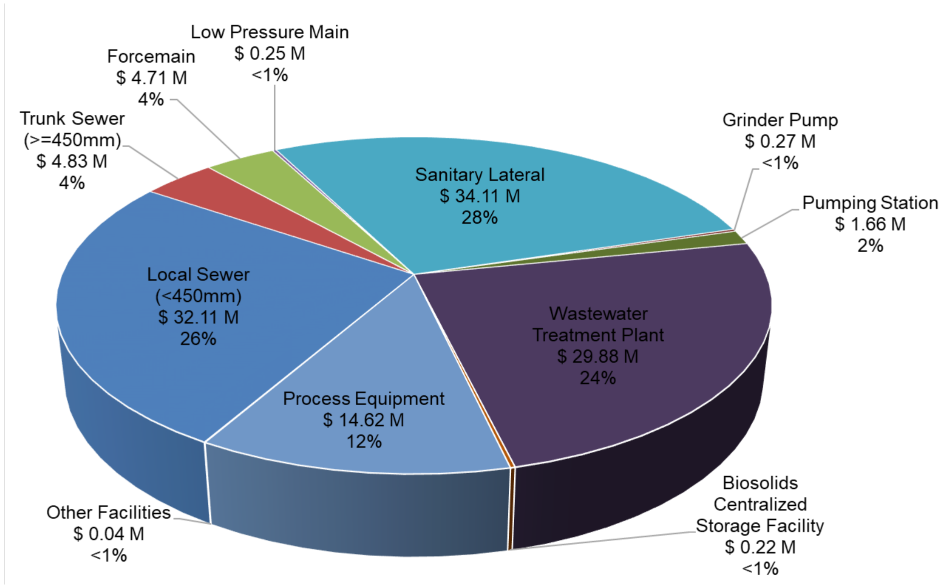
Wastewater assets are those that enable us to live in a clean and safe environment. It includes everything from wastewater mains that service our homes and businesses throughout the County, to the WWTPs, which ensure that effluent is properly treated before being discharged into the natural environment.

We have two different asset classes within the wastewater portfolio in order to effectively collect and treat wastewater from our community:

- Linear, which represent the collection pipe network, including the maintenance holes, connectors and related parts required in such a network.
- Vertical, which represent facilities (including the multiple buildings and structures that the facilities are comprised of), and related process systems and equipment required to perform the needed functions.

Table 2.1.2 displays our current wastewater inventory and the associated replacement costs and average age for each asset component. The County continues to make improvements to increase the integrity of our wastewater data. The inventory figures in table 2.1.2 capture inventory within newly constructed subdivisions which the County is aware of and anticipates assuming ownership of. The County generally assumes ownership of these assets approximately two years after full operation. It is important to include growth assets to ensure that lifecycle activities are planned and funded accordingly.

Figure 2.1.1 Inventory Valuation



2.2 Valuation

The replacement cost valuation for wastewater linear is based on current tender prices, where available. Current tender prices are adjusted where County staff feel some cost increases are only temporary due to COVID.

The replacement cost valuation for wastewater vertical is based on the latest information available, which includes current replacement costs, insurance valuations, and valuations from studies / assessments completed in prior years.

Table 2.1.2 – Ingersoll Wastewater System Inventory

Asset Type	Asset Component		2017 Inventory	Current Inventory	Replacement Cost	Average Age
Linear	Local Sewer (<450mm)	m	75,366	78,050	$32,112,933	35 Years
	Trunk Sewer (>=450mm)	m	7,765	8,277	4,831,095	36 Years
	Forcemain	m	14,072	14,323	4,708,263	15 Years
	Low Pressure Main	m	526	761	250,673	23 Years
	Sanitary Lateral	each	4,860	5,242	34,112,000	33 Years
	Collection Tank	each	-	-	-	-
	STEP Pump	each	-	-	-	-
	Grinder Pump	each	9	18	270,000	4 Years
Vertical	Pumping Station	each	3	3	1,664,022	22 Years
	Wastewater Treatment Plant	each	1	1	29,884,633	23 Years
	Odour Control Facility	each	-	-	-	-
	Other Facilities	each	-	1	36,158	4 Years
	Biosolids Centralized Storage Facility[1]	each	-	1	223,232	4 Years
	Process Equipment	total	N/A	N/A	14,620,678	19 Years
Total Replacement Cost					**$122,713,687**	

[1] The Biosolids Centralized Storage Facility is a shared facility across the County with each system contributing to the costs based on number of customers. The value utilized throughout this report card represents Ingersoll's share based on 2021 customers.

2.3 Condition Assessment Approach

The assessment approach for our wastewater assets utilizes a combination of physical assessments, asset attributes, such as material and sizing, as well as established anticipated useful lives.

The County's condition scale and visual inspection ratings are based on the following approach:

- Excellent - Asset is well maintained with no noticeable defects.
- Good - Asset may show signs of minor deterioration and may require some maintenance.
- Fair - Deterioration evident, function affected. Asset may require on-going monitoring.
- Poor - Serious deterioration, function inadequate. Asset may require ongoing monitoring.
- Critical - No longer functional, general or complete failure. Asset may require extensive monitoring.

The Pipeline Assessment Certificate Program (PACP) is the North American Standard for pipeline defect identification and assessment[2]. Closed-circuit television (CCTV) is the principal method of inspecting drains and sewers. In this process, a small robotic crawler vehicle with the CCTV camera attached is lowered into the pipe to complete the inspections. A structural rating, on a scale of 0-5, is then assigned using sewer condition assessment standards, with 0 representing an asset with minimal structural deficiencies and 5 representing assets on the verge of failure.

Table 2.3.1 illustrates how the PACP score ratings align with the County's standard condition scale.

Wastewater process assets are inspected by County staff on a regular basis as part the preventative maintenance program. These inspections identify performance and accelerated degradation and will trigger the creation of a reactive work order for repairs and rehabilitation. The County is working towards incorporating these inspections into a formalized condition rating. A visual inspection rating was provided for most process assets as part of the data collection process in 2018 and 2019.

Given the complexities and accessibility of some assets, it is not beneficial to complete a visual or performance based condition assessment on all assets. For assets which are unable to be visually inspected or that have since been replaced, an age-based condition rating is being used based on anticipated useful lives.

[2] https://www.nassco.org/content/pipeline-assessment-pacp

Table 2.3.1 PACP Score Ratings

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PACP Score of
0 or 1</td>
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PACP Score of
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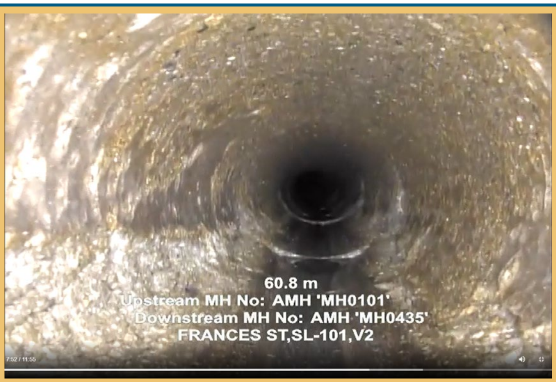
<td></td>
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PACP Score of
3</td>
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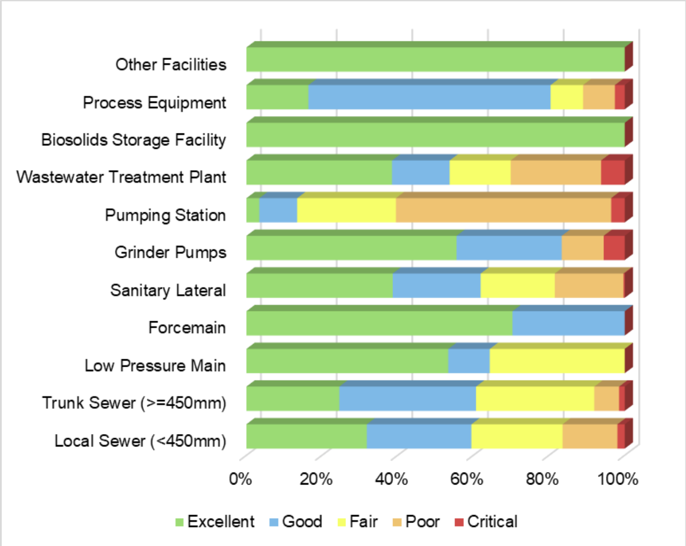
2.4 Condition Assessment

The condition profile of our Ingersoll wastewater asset components is shown in figure 2.4.1. The % in each condition is based on replacement costs.

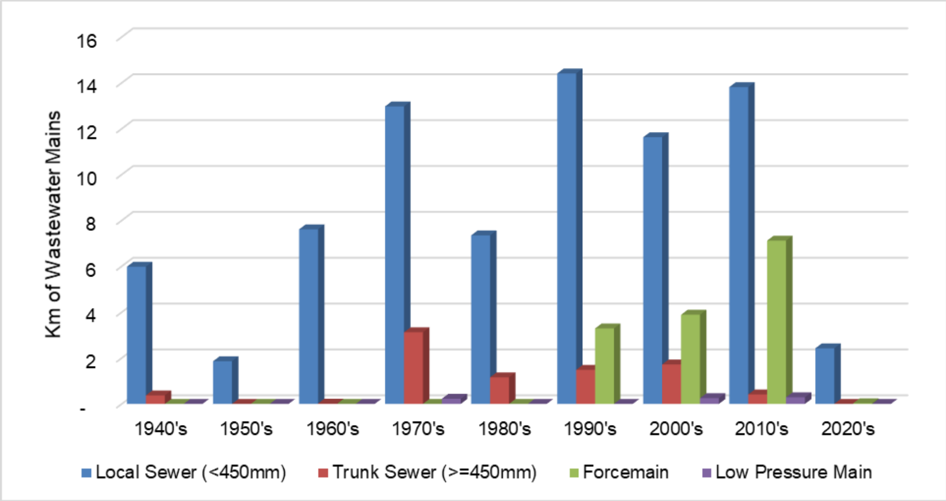
For the Ingersoll wastewater assets: 19.3% of these assets are in poor or critical condition, and 62.4% in good or excellent condition in comparison to 10-11% and 57-65% respectively for Canadian municipalities reported on the Canadian Infrastructure Report Card[3]. While this may appear that our Ingersoll wastewater assets are in comparable shape to other Canadian municipalities, the 2019 Canadian Infrastructure Report Card is an aggregate of self reported condition ratings across the Country and are based on a general rating scale which may not match the County's.

Figure 2.4.1 Asset Condition by Component



To better understand our Ingersoll wastewater collection assets, an age profile of all our wastewater mains by decade is shown in figure 2.4.2.

Figure 2.4.2 Wastewater Mains by Age



The average age of the majority of linear assets within the Ingersoll wastewater system is approximately 32 years, whereas the average age of the vertical assets varies by facility type from 4 to 23 years. This value must be considered in the context of the different asset types in the category, compared to the typical anticipated useful life of each asset type.

[3] http://canadianinfrastructure.ca/en/index.html

Table 2.4.3 outlines the anticipated useful life for each new build/replacement. The anticipated useful lives for our wastewater assets exclude the management strategies that the County utilizes to extend the overall life of our wastewater assets.

Table 2.4.3 Useful Life

Wastewater System Component	Anticipated Useful Life (years)
Forcemain, Low Pressure Main, Trunk Sewer, Local Sewer, Laterals	90
Collection Tanks	30
Grinder Pumps	10
Facilities	10 - 50
Process Equipment	8 - 75

Figure 2.4.4 illustrates the current average age of the Ingersoll wastewater system linear components in comparison to their anticipated useful life, based on a run to failure strategy.

As the vertical assets can have a significant variability in age, from both a facility and process standpoint, they are not represented within figure 2.4.4.

There are a number of management strategies that the County may utilize to extend the overall life of our wastewater assets. These strategies allow us to align the needs with those of other assets, resulting in the best overall value for our residents.

Figure 2.4.4 Age and Useful Life Comparison

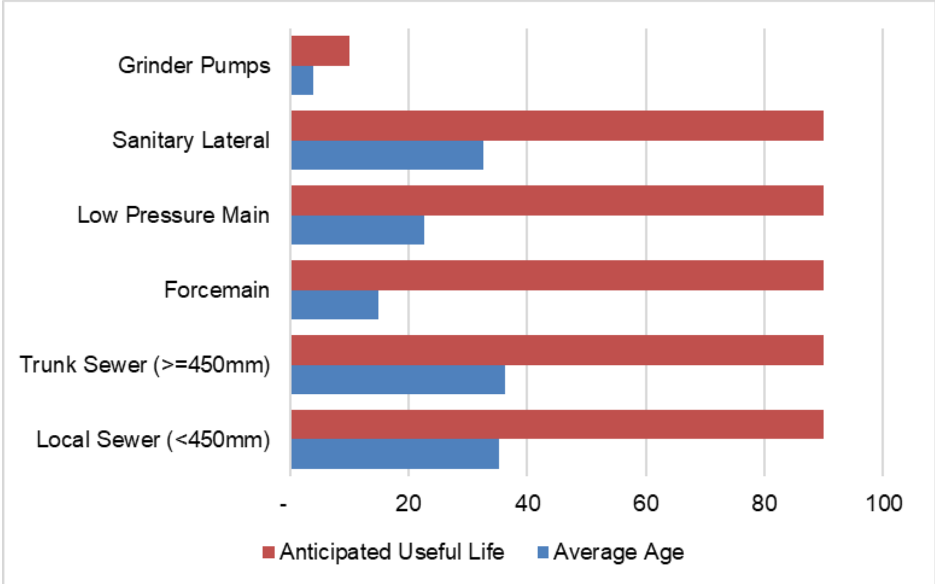


Table 2.4.5 compares the status of our Ingersoll wastewater asset components, as identified in our 2017 Asset Management Plan to their current condition. The breakdown by component for vertical assets was not available as of the date the 2017 report was published, so there is no condition comparison available. Work is ongoing to further enhance the asset information at the component level.

The trend shows that the status of wastewater assets for the Ingersoll wastewater system is steady to declining. The decline in condition is commiserate with the aging of these assets. As the system continues to age it is expected that condition ratings will continue to decline until targeted lifecycle strategies are implemented.

Table 2.4.5 Wastewater System Condition Assessment

Asset Type	Asset Component	2017 Condition Rating	Current Condition Rating	Trend
Linear	Local Sewer (<450mm)	Good	Good	→
	Trunk Sewer (>=450mm)	Good	Good	→
	Forcemain	Excellent	Excellent	→
	Low Pressure Main	Excellent	Good	↓
	Sanitary Lateral	Good	Good	→
	Collection Tank	-	-	-
	STEP Pump	-	-	-
	Grinder Pump	Excellent	Good	↓
Vertical	Pumping Station	Not assessed	Poor	-
	Wastewater Treatment Plant	Not assessed	Fair	-
	Odour Control Facility	-	-	-
	Other Facilities	-	Excellent	-
	Biosolids Centralized Storage Facility[4]	-	Excellent	-
	Process Equipment	Not assessed	Good	-

[4] The Biosolids Centralized Storage Facility is a shared facility across the County with each system contributing to the costs based on number of customers. The value utilized throughout this report card represents Ingersoll's share based on 2021 customers.

3.0 Levels of Service

County staff have developed a comprehensive Level of Service (LOS) Framework. This framework will help to establish a relationship between the current LOS being provided by the County's assets, and the associated operating and capital expenditures required to achieve the proposed LOS. The framework puts into perspective the definition and measurement of service performance in alignment with the County's corporate mission and vision.

Corporate Objective

The wastewater collection and treatment service ensures protection of the environment and public health of residents, visitors to the County and downstream users of the receiver (Thames River) and our partners in the watershed.

Legislative Requirements

Each of the County's WWTPs are regulated under the Ontario Water Resources Act, 1990[5] and operated in accordance with an ECA or historical Certificates of Approval (C of A) issued by the MECP.

The ECA for the County's WWTPs require annual reporting of operational and treated effluent discharge parameters into the receiving water bodies. The Annual Wastewater Treatment System Summary Reports are available on the County's website.

Framework

The structure of the County's LOS framework was developed to align with international best practices including the International Infrastructure Management Manual (IPWEA, 2015). The framework includes the mandatory measures to meet the requirements of Ontario Regulation (O.Reg.) 588/17 by including both Community and Technical Levels of Service. The metrics in this framework may be expanded upon as the County continues to improve its data collection and reporting processes.

[5] https://www.ontario.ca/laws/statute/90o40

3.1 Customer Levels of Service

Community or Customer Levels of Service are statements that describe quantifiable metrics of the service delivery outcomes from the perspective of the customer, expressed in non-technical terms. The following statements form our qualitative descriptions of the customer level metrics required under O.Reg. 588/17.

The Ingersoll wastewater system connects to most residential, commercial and industrial spaces in the settlement areas of Ingersoll, as outlined in figure 3.3.1. The Ingersoll wastewater system provides for the safe collection and treatment of wastewater.

The County does not have any combined sewers within the Ingersoll wastewater system. The Ingersoll wastewater system is a separate wastewater system.

Infiltration and inflow can enter through a variety of sources (cracks in pipes, weeping tile connections, cross connections, etc.). In the case of heavy rainfall events, wastewater mains may experience a volume of water and wastewater that exceeds its designed capacity. In some cases, this can cause water and/or wastewater to overflow into streets or backup into homes or businesses.

To minimize wastewater overflow into streets or backup into homes, the County has established design standards to convey flows under ultimate conditions, design sheets for capacity needs that include infiltration inflow. Newer wastewater mains are made of gasketed PVC piping to reduce potential leaks occurring between fitted pipe segments.

Final Effluent is the treated water that is discharged to the environment through the approved effluent disposal facilities, including all bypasses that are required to meet the compliance limits stipulated in the ECA for the WWTP, at the final effluent sampling points. The effluent criteria includes effluent flow rates, and parameters such as total suspended solids, Biochemical Oxygen Demand (BOD), phosphorous, ammonia, and E. coli. The County produces annual reports summarizing each WWTPs operation and treated effluent discharge quality and these can be found on the County's website at: http://www.oxfordcounty.ca/Services-for-You/Water-Wastewater/Wastewater/Annual-reports.

Table 3.1.1 outlines additional customer focused performance metrics from the County's LOS framework.

3.2 Technical Levels of Service

Technical Levels of Service metrics are quantifiable metrics applied against assets that are subject-matter specific inputs or outputs supported by the day-to-day activities of County staff. Table 3.1.1 includes the technical metrics required under O.Reg. 588/17, as well as, additional metrics the County has included in the framework.

3.3 Levels of Service Maps

As a further illustrative example of our community levels of service, a map is included as figure 3.3.1 showing areas within the Town of Ingersoll boundary that are serviced by the Ingersoll wastewater system.

Figure 3.3.1 Ingersoll sanitary serviced properties

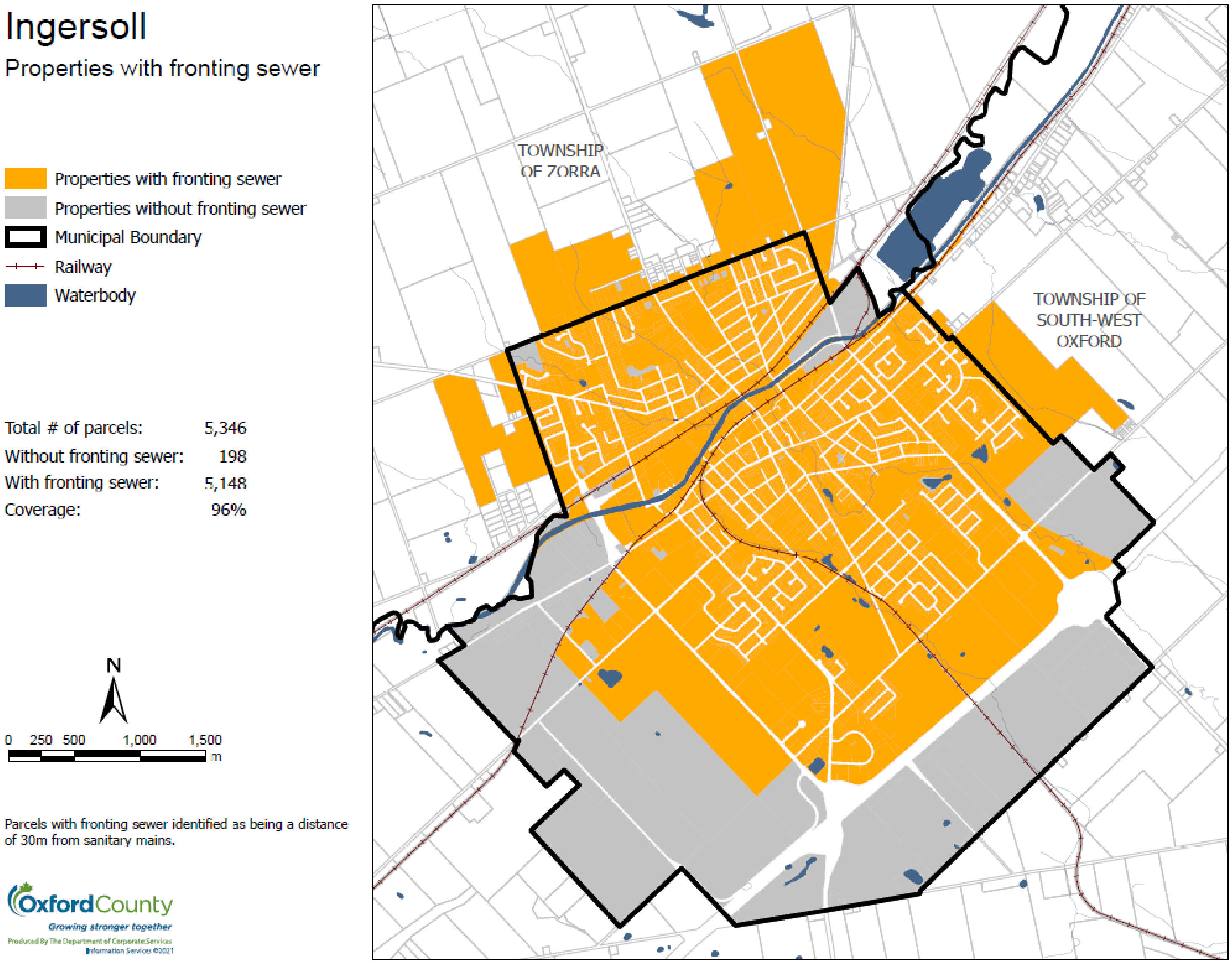


Table 3.1.1 Performance Measures

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Customer / Council Focused Performance Measures					
Reliability	Providing wastewater services with minimal interruptions	% of properties within the system boundary connected to the municipal wastewater system	N/A	96%	TBD
		% of wastewater mains designed to be resilient to overflow or flooding during wet weather events	100%	100%	100%
Environmental Stewardship	Providing wastewater services that have minimal impacts on the environment	% of overall facility ECA compliance rate	100%	100%	100%
Cost Efficient	Providing wastewater services in an efficient manner	Operating cost to provide service ($/connection)	$633	$592	TBD
Technical Focused Performance Measures					
Reliability	Providing wastewater services with minimal interruptions	The number of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system.	0.0625 connection-days to 4,944 connections	0 connection-days to 5,053 connections	TBD
		% of system inspected (CCTV) annually	6.5%	6.7%	7%
		% of wastewater mains flushed annually	11%	16%	20%
		# of overflow or spill occurrences	0	1	0
Environmental Stewardship	Providing wastewater services that have minimal impacts on the environment	% of wastewater estimated to have by-passed treatment	0%	0.003%	0%
		Volume (cubic meter) of biogas produced	72,829	274,696	TBD

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
		The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system.	0 violations to 4,944 connections	0 violations to 5,053 connections	0
Cost Efficient	Providing wastewater services in an efficient manner	Operating cost per kilometre of wastewater main for collection	N/A	$5,669	TBD
		5 year average capital expenditure for wastewater collection	$0.6M	$0.6M	TBD
		5 year average capital expenditure for wastewater treatment	$2.8M	$1.6M	TBD

4.0 Asset Management Strategy

4.1 Lifecycle Activities and Planned Actions

Wastewater collection assets undergo regular maintenance and inspection. As part of capital works project analysis, determinations of whether wastewater pipe replacement or relining should occur is reviewed. This process is fully integrated with the renewal needs of the roadways and other underground assets, such as drinking water and stormwater. This integrated approach ensures our renewal projects for these service areas are delivered with optimal timing to increase value and minimize disruption to our communities. For example, if a roadway is targeted for renewal, coordination between service areas and area municipalities will determine whether the underlying stormwater, drinking water or wastewater assets are also of an age or condition that requires renewal, to ensure these projects are delivered together to reduce disruption for our communities and deliver enhanced value.

Process assets and equipment undergo extensive operations and maintenance regimes to sustain their reliable operation. Investment needs are identified and coordinated with normal operations to minimize disruptions to service. Major replacements are planned and accommodated using system redundancy and changes to operations, in order to maintain service. It is critical to maintain wastewater service in order to protect public health and the environment.

There are six main lifecycle activities considered in the overall sustainable management of wastewater assets, described in table 4.1.1.

Table 4.1.1 Lifecycle Activities

Strategy	Lifecycle Activity
Non-Infrastructure Solutions	Actions or policies that can lower costs or extend useful lives. **Trigger: Ongoing**
Maintenance	Regularly scheduled maintenance and inspection programs including cleaning and flushing, manhole repairs, CCTV inspections, exercising diesel gen-sets and minor repairs. These activities do not improve the overall condition of the asset, nor increase its useful life. **Trigger: Ongoing**
Rehabilitation / Renewal	One-time events that increase the condition and extend the useful life of the asset; including sewer lining and seal and grout programs. **Trigger: Fair/Poor**
Replacement	Occurs at the end of the useful life and/or when rehabilitation is no longer an option – can vary among assets due to construction material and environmental factors that impact the degree of deterioration and performance. **Trigger: Poor/Critical**
Disposal	Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the County to provide services. County staff coordinate with contractors to ensure safe removal and environmental compliance when disposing of assets. **Trigger: Poor/Critical**
Expansion / Growth	Planned activities required to extend services to previously unserved areas, expand services to meet growth demands, or increase the level of service being provided. **Trigger: Development**

The lifecycle management strategy is the set of planned actions that should enable the assets to provide users with the proposed level of service in a sustainable way, while achieving acceptable levels of risk and the lowest lifecycle costs required to provide that level of service. Lifecycle considerations for assets include analysis of the timing to carry out key asset management activities including inspection, maintenance, repair, and replacement. Ongoing preventative maintenance activities are outlined in the County's work management system. The rehabilitation and replacement activities impacting the asset components condition and useful life are contained within profiles in the County's asset management system. For some assets, replacement needs are based on a run to failure strategy, as this is the most economical. Work is ongoing within the County's asset management systems to build all the component profiles and identify where each asset is within the lifecycle.

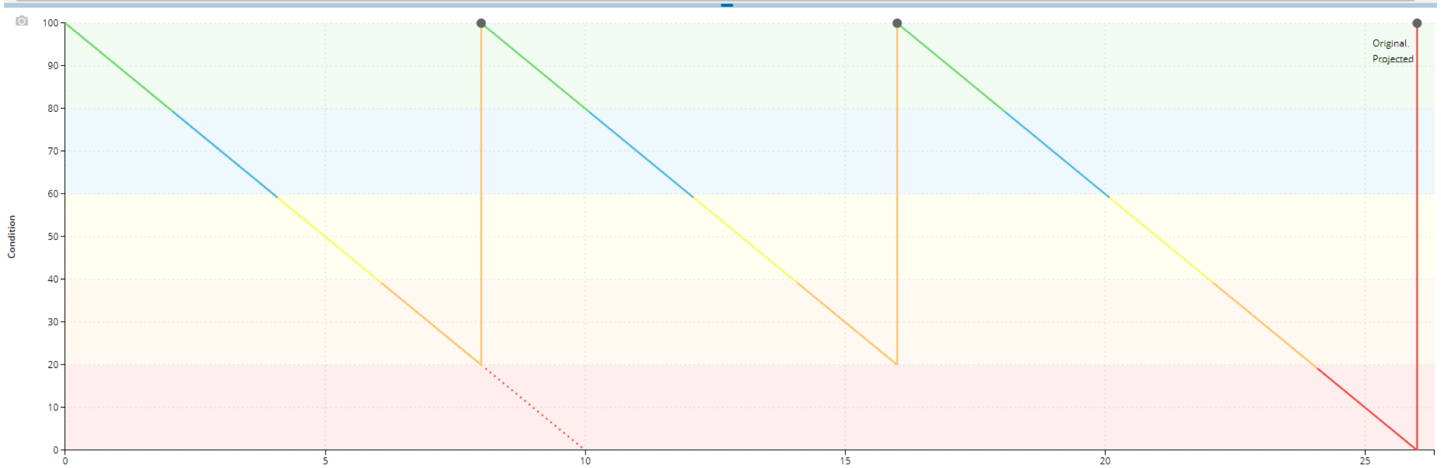
As an example, figure 4.1.2 illustrates the lifecycle strategy of grinder pumps. The pumps are re-built twice, extending the overall useful life from 10 years to approximately 25. The annual cost requirement from a run to failure strategy is $1,500 per year where the annual cost requirement using the rehabilitation strategies decreases to just below $800 per year.

Figure 4.1.2 Grinder Pumps Lifecycle Strategy

Strategy

Age-Based Condition Method	Straight-Line	Lifecycle EUL	10 Year(s) 0 Month(s)
Add Event (Condition Triggered)	Rebuild Pump (Add)	Lifecycle EUL (with events)	26 Year(s) 0 Month(s)

Age at Event	Name	Description	Event Class	Cost	Event Range / Trigger	Impact	Added EUL	Cost per Added Year	Actions
8 Years	Rebuild Pump		Rehabilitation	$2,500.00 (Fixed)	20 to 20 Condition	Adds 8 Years	8 Years	$312.50	
16 Years	Rebuild Pump		Rehabilitation	$2,500.00 (Fixed)	20 to 20 Condition	Adds 8 Years	8 Years	$312.50	
26 Years	<Asset Replacement>	End of life replacement	Replacement	$0.00 (Fixed)	0 to 20 Condition	Set to 100 Condition	10 Years	$0.00	Automatic

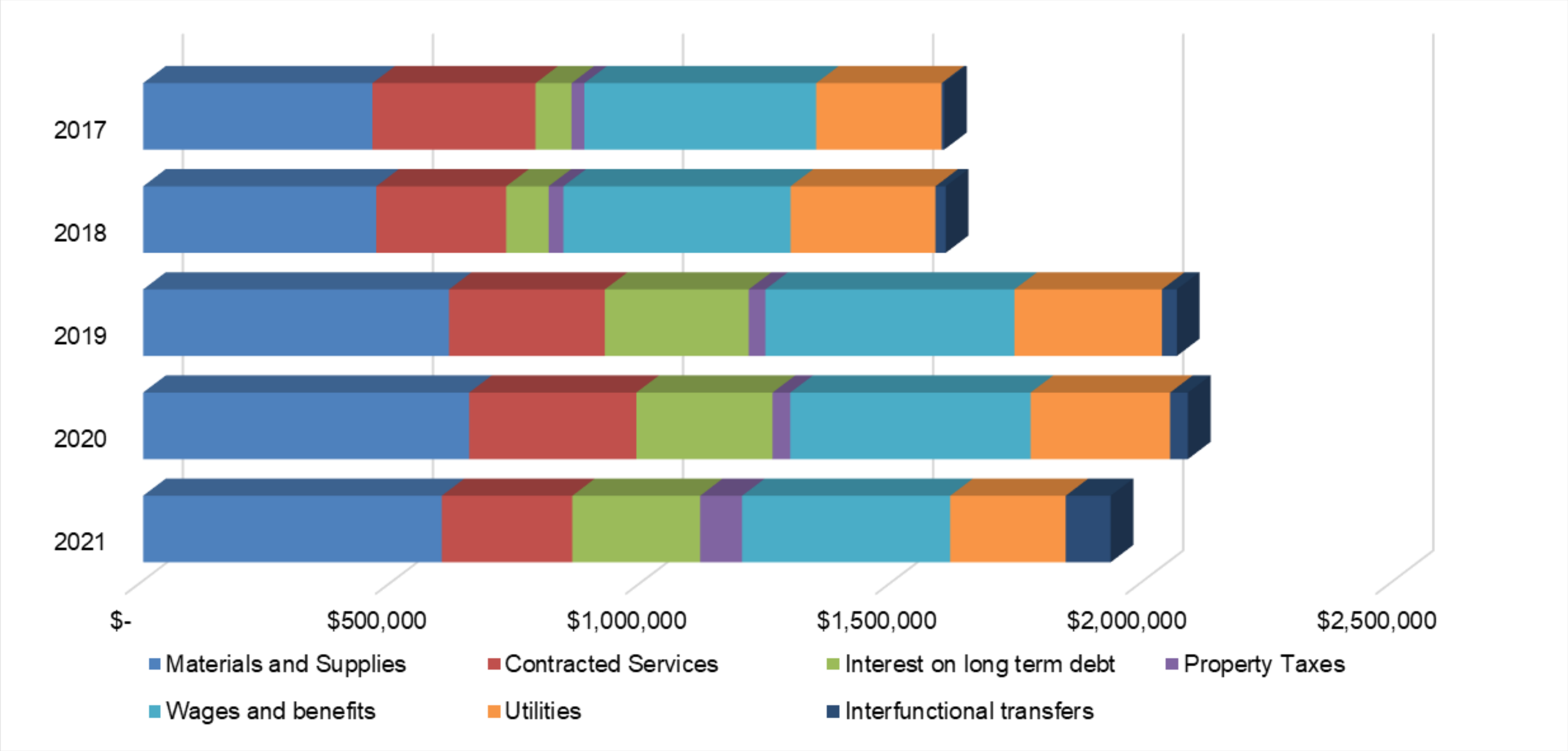


4.2 Significant Operating Expenses

Significant operating expenses are required in order to sustain an asset over its lifecycle. The County is always looking at ways to optimize our operating investment to ensure we are achieving the best value for our residents, and businesses. Essential to this is a strong operations and maintenance plan within our work management system. Operating expenses are incurred through a number of sources – preventative maintenance activities, utility costs, property taxes and more. Despite the fact that minor maintenance is incorporated into planned operations and maintenance programs, there are cases where it is unplanned.

Figure 4.2.1 shows the operating expenses from 2017 through 2021 for the Ingersoll wastewater system grouped by expense type. The groupings align with those reported on the County's Financial Information Return (FIR), with further breakdown for property taxes and utility costs as these expenses can be significant.

Figure 4.2.1 Operating Expenses



4.3 Risk Strategy

Risk management frameworks are developed to assist with the prioritization of investments within the capital planning period. The preferred approach is to implement a triple bottom line analysis approach to evaluate:

- Social impacts of asset failure, including impacts to customers, businesses and the County's reputation;
- Environmental impacts of asset failure; and
- Economic impacts of failure including the cost of remediation.

In the context of asset management, risk is the multiple of the consequence of an asset failing and the probability that the event will occur.

Figure 4.3.1 illustrates the risk ratings for the Ingersoll wastewater assets at a summary level. The highest risk assets are located at the Ingersoll WWTP, within the older structures. County staff will continue to monitor the higher risk assets, review and/or complete physical inspections to further validate the age-based condition ratings and plan for lifecycle strategies accordingly.

Figure 4.3.1 Asset risk profile

Consequence \ Probability	1	2	3	4	5
5	1 Asset 1.00 unit(s) $3,985,791.00	1 Asset 1.00 unit(s) $3,687,666.00	1 Asset 1.00 unit(s) $2,029,000.00	0 Assets - $0.00	1 Asset 1.00 unit(s) $5,933,000.00
4	1 Asset 1.00 unit(s) $1,348,757.00	0 Assets - $0.00	1 Asset 1.00 unit(s) $1,682,000.00	1 Asset 1.00 unit(s) $1,002,000.00	1 Asset 1.00 unit(s) $1,490,000.00
3	16 Assets 417.73 unit(s), m $3,472,169.00	22 Assets 2,022.15 m, unit(s) $4,475,116.00	27 Assets 1,683.43 m, unit(s) $2,924,412.00	4 Assets 106.49 m, unit(s) $1,639,094.00	1 Asset 1.00 unit(s) $372,000.00
2	146 Assets 15,985.24 m, unit(s) $7,648,420.00	715 Assets 10,169.73 m, unit(s) $10,686,321.00	722 Assets 8,458.32 m, unit(s) $8,097,531.00	511 Assets 4,288.42 m, unit(s) $5,005,438.00	420 Assets 4,842.66 m, unit(s) $4,464,237.00
1	2,193 Assets 19,707.52 m, unit(s) $20,517,717.00	1,418 Assets 17,316.43 m, unit(s) $16,579,772.00	725 Assets 16,264.55 m, unit(s) $10,788,564.00	154 Assets 3,908.10 m, unit(s) $2,717,240.00	156 Assets 2,208.65 m, unit(s) $1,823,635.00

5.0 Financial Strategy

5.1 Financing Strategy

Hemson Consulting Ltd. (Hemson) was retained through a competitive process to assist with analyzing and developing the County's water and wastewater rates for a 4-year period from 2021 to 2024. The rate modeling includes all system asset management needs and all sources of funding including Community Servicing Assistance Program (CSAP) funding, development charges, developer and resident contributions. In most cases, the capital replacement component is the average annual required contribution level in order to establish full cost recovery; however, the contribution may vary based on the system's ability to meet full cost recovery for the next 10-years.

Capital work is funded from reserves (based on the capital contribution included in the user rates), development charges (for growth projects), debentures and grant funding when available. The County continually assesses opportunities for additional funding options and revenue streams to address our asset needs.

Where possible, replacement activities are planned in conjunction with the replacement needs of the road network and underlying water and stormwater assets. This requires a co-ordinated effort with area municipalities as the majority of the County owned water and wastewater linear assets falls under the area municipalities' roadways. This collaboration is essential for ensuring a cost effective approach to maintaining assets within the County regardless of ownership.

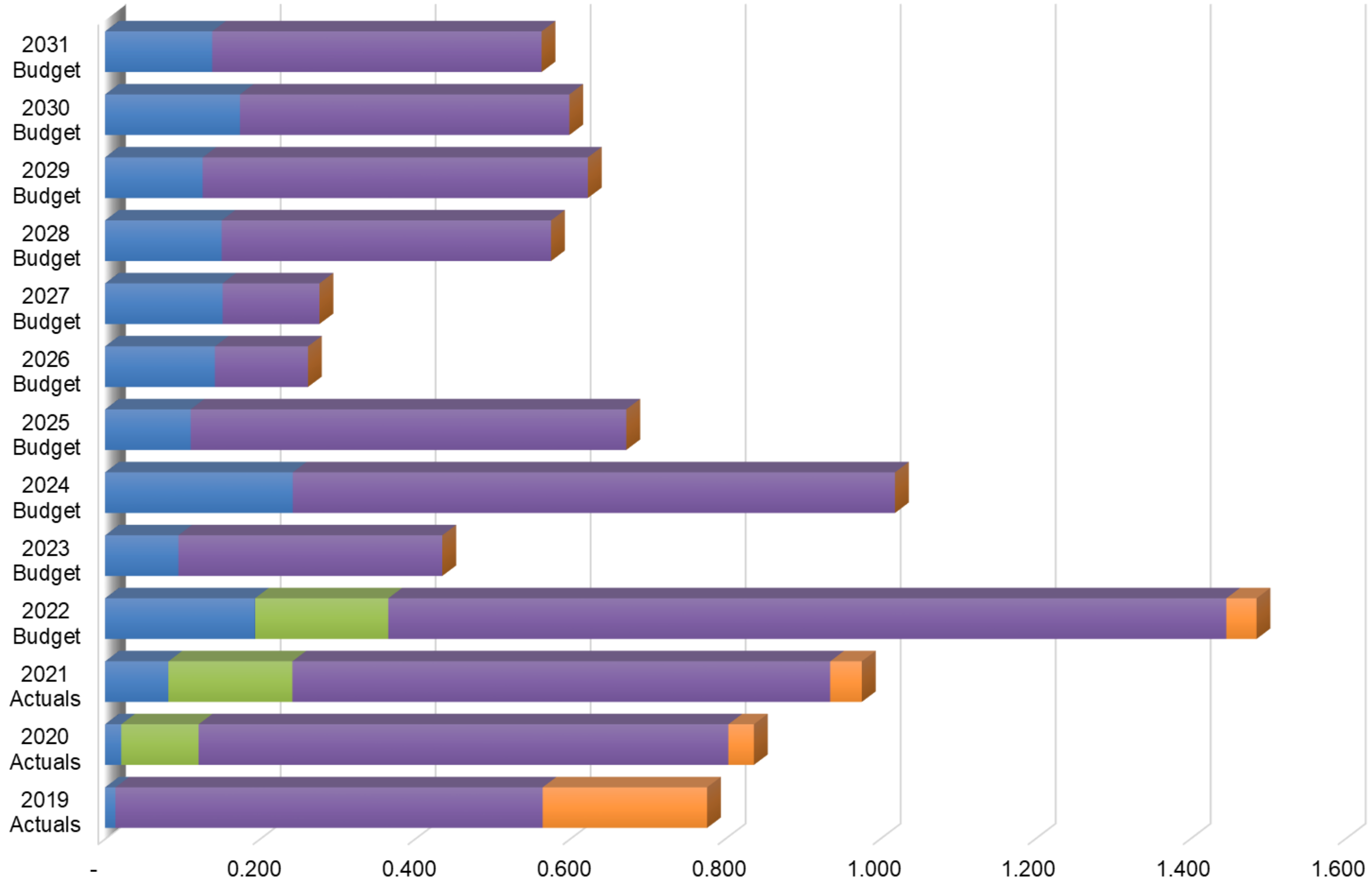
In addition to targeting and prioritizing the investment needed to maintain existing assets, there are also planning processes in place to determine the additional assets needed to meet growing demands through population increases or demand for new services. The projects targeted to meet growth are funded primarily through Development Charges (DC) – the mechanism that enables recovery of growth-related capital expenditures from new development. These charges are governed by the Development Charges Act and are applied in accordance with our Development Charges By-Law. Impacts from the growth activities analyzed in the 2019 DC Background Study are included in this AMP.

5.2 Expenditure History and Forecasts

Based on the 2022 approved long-term capital plan, there are no planned large capital replacement projects for the Ingersoll wastewater system, as illustrated in figure 5.2.1. Linear asset replacements are ongoing, in conjunction with the local area municipal roadway construction projects. Minor process equipment replacements were included in the 2020 to 2022 budgets. County staff continue to review anticipated asset management needs with each budget cycle, subject to existing resource limitations.

Non-Infrastructure solution projects include shared projects for condition reviews, studies and implementation of the work management system.

Figure 5.2.1 Expenditures (millions)

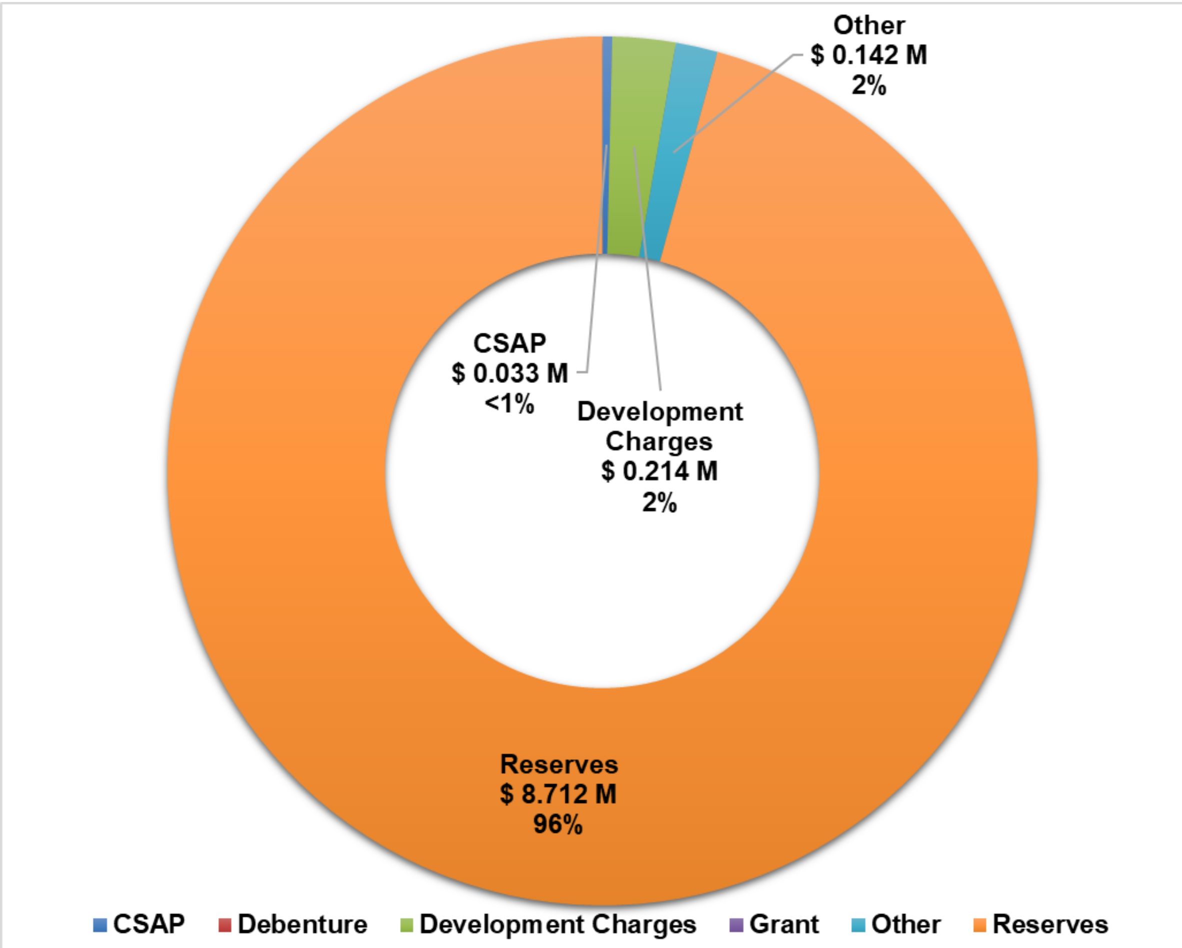


	2019 Actuals	2020 Actuals	2021 Actuals	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Non-Infrastructure Solution	0.013	0.021	0.082	0.193	0.095	0.242	0.110	0.142	0.152	0.150	0.126	0.174	0.138
Maintenance	-	-	-	-	-	-	-	-	-	-	-	-	-
Rehabilitation / Renewal	-	0.100	0.160	0.172	-	-	-	-	-	-	-	-	-
Replacement	0.551	0.683	0.694	1.081	0.341	0.777	0.562	0.120	0.125	0.425	0.497	0.425	0.425
Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-
Expansion / Growth	0.212	0.033	0.041	0.039	-	-	-	-	-	-	-	-	-

5.3 Capital Revenues

Replacement projects, identified in the County's 10-year capital plan, are anticipated to be funded by the Wastewater – Ingersoll Reserve, which is funded by user fees. The Wastewater – Ingersoll Reserve, including the anticipated capital contributions within the 10-year period, is sufficient to fund the 10-year related asset activities within the approved 2022 Long-Term Capital Plan.

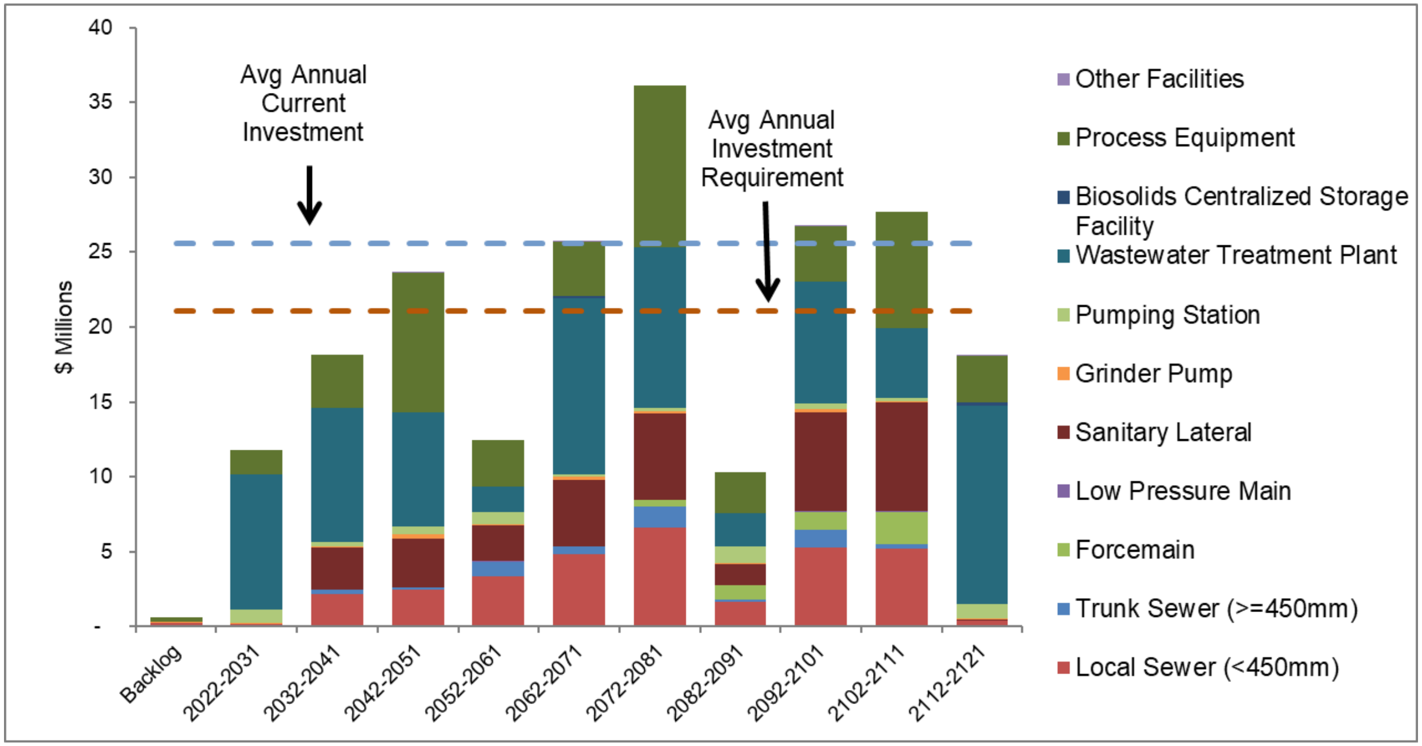
Figure 5.3.1 Sources of Capital Revenues 2019-2031 (millions)



5.4 Capital Investment

Based on the asset management lifecycle strategies identified, the financial requirements over the next 100-years are determined in current dollars. The average annual investment requirement represents the amount of capital funding required to renew and maintain the existing assets on an annual basis so services can continue to be delivered. These estimates assume that all work is able to be completed, as indicated, and does not take into account future changes due to environmental factors, new maintenance techniques, and unidentified growth. The annual requirement has been adjusted from the 2017 AMP, due to improvements the County has made to the vertical data, resulting in asset useful lives that are more reflective of their actual lifecycle. Further work is ongoing with the vertical data to fully determine lifecycle needs (including maintenance and rehabilitation strategies) which will impact the annual requirement for vertical assets. The data will continue to be reviewed with each budget and business plan cycle

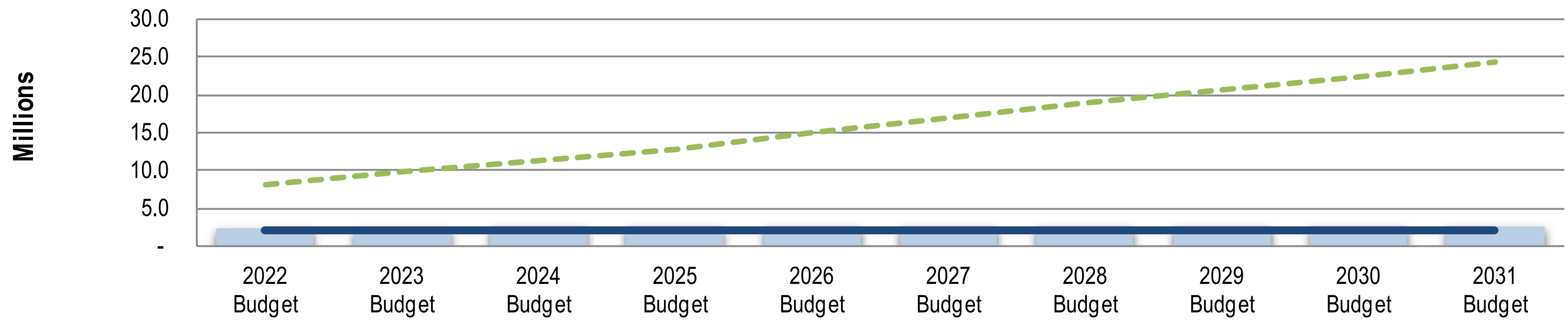
Figure 5.4.1 Average Annual Capital Requirements



The following figure links the annual capital funding needs to the capital investments contained in the budget. The timing of the actual capital projects may vary, however annual investments in capital assets is important for financial sustainability.

Figure 5.4.2 Funding Requirements

	Key	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Annual Required Investment		**2,109,000**	**2,109,000**	**2,109,000**	**2,109,000**	**2,109,000**	**2,109,000**	**2,109,000**	**2,109,000**	**2,109,000**	**2,109,000**
Current Investment		2,263,093	2,336,506	2,496,404	2,512,545	2,562,355	2,666,487	2,673,819	2,680,319	2,686,157	2,692,357
Funding Deficit		-	-	-	-	-	-	-	-	-	-
Funding Surplus		*154,093*	*227,506*	*387,404*	*403,545*	*453,355*	*557,487*	*564,819*	*571,319*	*577,157*	*583,357*
Reserve Balance		8,091,743	9,898,215	11,315,477	12,893,821	14,895,245	17,004,040	18,825,561	20,606,532	22,431,654	24,302,944



A portion of the current investment is being utilized for debenture payments (approximately 12.5%), and is not available for use on lifecycle activities within the 10-year period.

5.5 Funding Gap Analysis

Using the anticipated 10-year asset lifecycle needs, along with the current capital investment level, the County is able to determine if there is an anticipated funding gap for the Ingersoll wastewater system. Consideration is then given to the current system reserve balance to determine the residual funding gap. The County would then investigate opportunities for reducing this residual funding gap which, may include increases to the user rates, utilization of grant funding opportunities and further review of lifecycle strategies and proposed levels of service.

Figure 5.5.1 illustrates the anticipated asset management 10-year lifecycle needs, including the projected funding surplus (left side of figure 5.5.1) and funding needs (right side of figure 5.5.1) for the Ingersoll wastewater system. The system calculates the optimal expenditures based on theoretical asset lifecycle needs. These needs have not yet been reviewed in depth with County operations staff, and incorporated into the 10-year capital budget. This is anticipated to be completed as part of the 2023 Business Plan and Budget process with subsequent review annually.

The anticipated expenditures have been increased for non-infrastructure solution projects; approximately $1.3 million.

While the anticipated expenditure calculation accounts for the lifecycle activities of expansion / growth projects it does not account for the initial investment. It is important to adjust for these projects, where the initial investment is growth related and not projected to be DC funded within the 10-year capital plan. There are currently no resulting growth/expansion projects to be added to the anticipated asset needs.

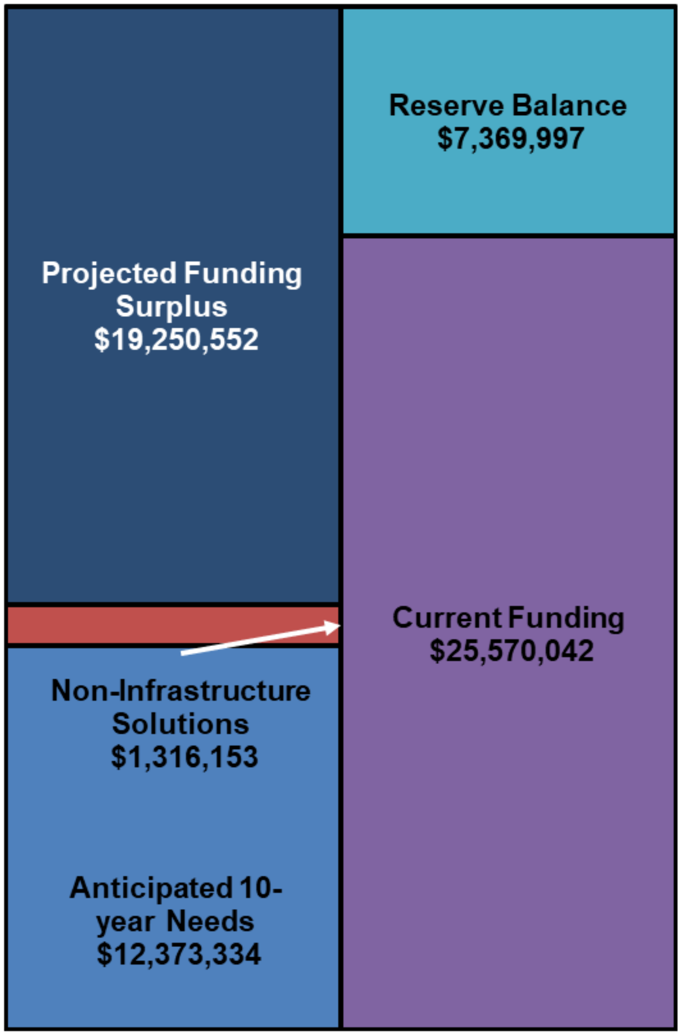
The Ingersoll wastewater system is projecting a funding surplus over the 10-year capital planning period. Although the Ingersoll wastewater system has a projected funding surplus over the 10-year horizon, the annual funding requirement is the basis for ensuring the long-term financial sustainability well into the future. Approximately 12.5% of the current funding is committed to debenture payments over the 10-year horizon. The annual funding requirement will be reviewed holistically as part of the next rate study.

Drawing the reserve balance to zero would likely result in increased user fee requirements in the subsequent 10-year period in order to fund the anticipated asset lifecycle needs.

The reserve is also utilized to fund emergency or unplanned expenses. A minimal or fully committed balance would limit the ability to fund these types of expenses. Consideration needs to be given to a minimum balance the County should maintain based on these risks. Analysis of the reserve target minimum balance, will be completed as part of the annual reserve review process.

Failure to address the long-term asset lifecycle needs could result in significant increases to rates in the future as assets reach end of life; or reductions in localized and/or regional service. This may include blockages, sewer backups, basement flooding, localized service outages, increased maintenance costs on assets past their optimal life, poor quality effluent, damage to the natural environment, fines, increase in insurance claims for property damage and personal injury resulting from poor asset conditions, etc.

Figure 5.5.1 Anticipated Needs (10-Year)



6.0 Climate Change

As part of the asset management planning process, the County will consider the risks and vulnerabilities of capital assets to climate change and the resulting actions that may be required. Commitment will be made to the development of tailored actions that make the best use of our resources to mitigate and adapt to climate change, in accordance with our local reduction targets, financial capacity and stakeholder support.

Optimization of the wastewater treatment process can help reduce the emissions of GHG such as nitrous oxide (N_2O), carbon dioxide (CO_2) and methane (CH_4) from being released into the environment at treatment plants. Optimization requires the correct equipment to ensure conditions can be achieved to reduce GHG emissions.

Nitrous oxide (N_2O) is released in the secondary treatment train through the nitrification and denitrification process, which is used to remove nitrogenous components from the wastewater. Nitrifying bacteria oxidize ammonia to nitrites and nitrates. To minimize N_2O emissions, the plant is optimized by running the activated sludge process at a high sludge retention time (SRT) with optimal dissolved oxygen levels, which results in low ammonia and nitrite concentrations. High amounts ammonia and nitrite compounds, especially when there are excessive amounts of dissolved oxygen, can trigger biogenic N_2O emissions. To control this process, an upgrade is underway:

- Installation of an actuated waste activated sludge valve to control the biomass concentration to the desired sludge retention time.

Methane (CH4) is generated by the anaerobic biological break down of organics or the release of dissolved CH4 found in the wastewater influent. At the WWTPs, it is mainly generated in anaerobic digesters and used as a fuel source for heating and electricity. Proper operations ensures the organic material is transferred to the anaerobic digesters to be stabilized by bacteria. The biogas produced can be utilized as a fuel source and the excess can be burned off in a waste gas flare stack. Maintaining the equipment involved in anaerobic digestion is important to preventing CH4 emissions:

- New digester recirculation pump installation to aid in providing constant and consistent mixing of primary biosolids and incoming waste loads.
- Installation of new valves on the digestion system for proper digestion operations.

Carbon Dioxide (CO_2) is produced in biological treatment, where the organic carbon in the wastewater is utilized for biomass growth or oxidized into CO_2. By operating WWTPs at high sludge retention times, endogenous respiration (cell lysis results in biomass growth) is encouraged, which decreases the overall sludge production, which results in a decrease in CO_2 production. Upgrades with this process include:

- Installation of an actuated Waste Activated Sludge valve to control the biomass concentration to the desired sludge retention time.

Improving energy efficiency at WWTPs can help to reduce GHG emissions by decreasing consumption of fossil fuel-based energy. Significant energy savings can be realized by increasing the efficiency of plant equipment such as pumps and blowers, and using generated fuel sources:

- The purchase of the new efficient digester recirculation pump will provide more proper mixing of the primary digester optimizing the methane gas production, which is used to heat the digesters/building.

Climate change risks are considered during the planning phase of each capital project. Increasing resiliency to changing climate conditions through the use of backup power generation, redundancies with critical equipment, use of SCADA to collect accurate information and make informed decisions. By conducting inspections and completing studies, problem areas can be identified and planned to repair.

- CCTV sewer inspections for 2021.
- Lining approximately 500 m of sanitary sewer and spot liner repair to reduce inflow and infiltration.
- Clearing ditches and catch basins of debris to direct stormwater runoff to storm sewers. Prevents flooding and conveys runoff away from sanitary sewers.
- Fats, oil and grease (FOG) pilot study, looking to increase methane gas production from the anaerobic digestion process.
- All SPS have permanent or mobile standby power generation.
- Ongoing development and implementation of a SCADA Master Plan.

WASTEWATER SYSTEM

Norwich

Table of Contents

1.0 Introduction

The County maintains a diverse portfolio of assets that are required to provide the community of Norwich with the safe collection and treatment of wastewater. The Norwich Wastewater Treatment Plant (WWTP) provides wastewater treatment for residential, commercial, and industrial users in the Village of Norwich.

The Norwich WWTP is a Class I rated facility, as defined by Ontario Regulation 129/04. It is a lagoon treatment facility consisting of two facultative lagoon cells, a filter pump station and four intermittent sand filters, with an outfall pipe to Otter Creek. The entire treatment process is completed in accordance with strict standards, processes, and limits as regulated by the WWTPs Environmental Compliance Approval (ECA) issued by the Ministry of Environment, Conservation, and Parks (MECP) of the Ontario Provincial Government.

The wastewater collection network transports residential, commercial and industrial waste to the WWTP for treatment. The wastewater collection network consists of a mix of gravity mains, low pressure mains and forcemains. Wastewater flows by gravity wherever possible, where changing elevations require the use of sewage pumping stations (SPS). Other specialized structures such as manholes, valve vaults, meter stations, diversion structures and siphons are required to convey wastewater to the WWTP.

Sound management of our wastewater systems helps us realize our vision of being a vibrant community, working well and growing stronger together!

Like many of our assets, wastewater assets are facing increased challenges as a result of aging assets, climate change, increasing demand due to growth in our communities and regulatory changes. Our investment in these assets must therefore be balanced to optimize investment for renewal with the growing needs of our community.

This plan provides information regarding our approach to the management of our wastewater assets over the short (10-year) and long (100-year) term, demonstrating our commitment to assessing and meeting the levels of service valued by our residents and businesses.

1.1 Improvement Plan

The County recognizes that asset management is a continuously evolving process. The following recommendations are based on the review of current management practices, inventory, valuation and condition analysis.

- Document lifecycle history on assets within the asset management systems.
- Continue to reduce asset data gaps.
- Determine asset components and maintenance strategies for facilities and associated processes.
- Refine the risk assessment approach at the component level.
- Incorporate findings from the Water and Wastewater Master Plan.

2.0 State of Assets

2.1 Inventory

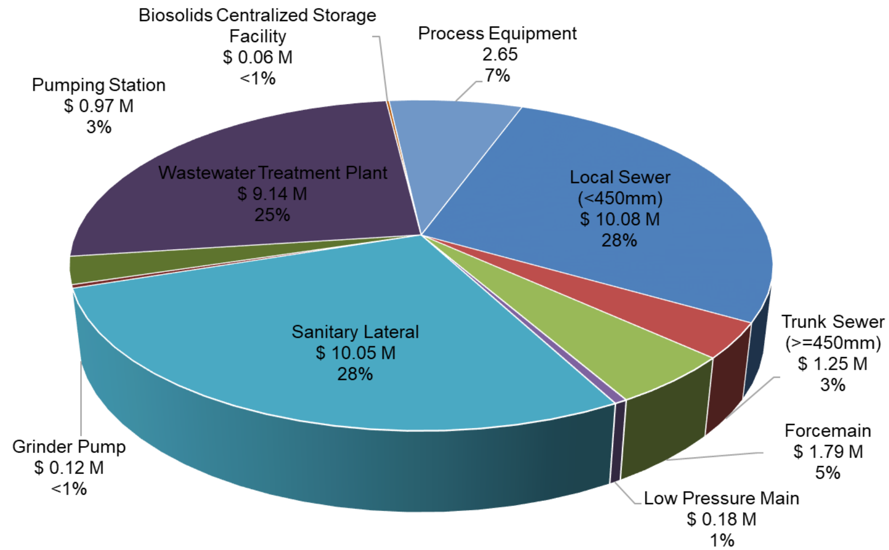
Wastewater assets are those that enable us to live in a clean and safe environment. It includes everything from wastewater mains that service our homes and businesses throughout the County, to the WWTPs, which ensure that effluent is properly treated before being discharged into the natural environment.

We have two different asset classes within the wastewater portfolio in order to effectively collect and treat wastewater from our community:

- Linear, which represent the collection pipe network, including the maintenance holes, connectors and related parts required in such a network.
- Vertical, which represent facilities (including the multiple buildings and structures that the facilities are comprised of), and related process systems and equipment required to perform the needed functions.

Table 2.1.2 displays our current wastewater inventory and the associated replacement costs and average age for each asset component. The County continues to make improvements to increase the integrity of our wastewater data. The inventory figures in table 2.1.2 capture inventory within newly constructed subdivisions which the County is aware of and anticipates assuming ownership of. The County generally assumes ownership of these assets approximately two years after full operation. It is important to include growth assets to ensure that lifecycle activities are planned and funded accordingly.

Figure 2.1.1 Inventory Valuation



2.2 Valuation

The replacement cost valuation for wastewater linear is based on current tender prices, where available. Current tender prices are adjusted where County staff feel some cost increases are only temporary due to COVID.

The replacement cost valuation for wastewater vertical is based on the latest information available, which includes current replacement costs, insurance valuations, and valuations from studies / assessments completed in prior years.

Table 2.1.2 – Norwich Wastewater System Inventory

Asset Type	Asset Component		2017 Inventory	Current Inventory	Replacement Cost	Average Age
Linear	Local Sewer (<450mm)	m	21,589	24,915	$10,081,382	34 Years
	Trunk Sewer (>=450mm)	m	817	2,506	1,252,885	33 Years
	Forcemain	m	2,505	4,503	1,786,871	21 Years
	Low Pressure Main	m	613	613	183,990	8 Years
	Sanitary Lateral	each	1,858	1,546	10,049,000	32 Years
	Collection Tank	each	-	-	-	-
	STEP Pump	each	-	-	-	-
	Grinder Pump	each	-	8	120,000	3 Years
Vertical	Pumping Station	each	3	3	973,100	24 Years
	Wastewater Treatment Plant	each	1	1	9,138,600	24 Years
	Odour Control Facility	each	-	-	-	-
	Biosolids Centralized Storage Facility[1]	each	-	1	56,945	4 Years
	Process Equipment	total	N/A	N/A	2,651,684	24 Years
Total Replacement Cost					**$36,294,457**	

The trunk sewer and forcemain quantity increases are largely driven by the addition of data not previously available in 2017, along with some new forcemain installations in 2018.

There is a growth project planned at the Norwich lagoon that is included in the County's 2022 approved Long-Term Capital Plan. This growth project is not included in the figures within table 2.1.2, however its anticipated lifecycle needs are included within this AMP.

[1] The Biosolids Centralized Storage Facility is a shared facility across the County with each system contributing to the costs based on number of customers. The value utilized throughout this report card represents Norwich's share based on 2021 customers.

2.3 Condition Assessment Approach

The assessment approach for our wastewater assets utilizes a combination of physical assessments, asset attributes, such as material and sizing, as well as established estimated useful lives.

The County's condition scale and visual inspection ratings are based on the following approach:

- Excellent - Asset is well maintained with no noticeable defects.
- Good - Asset may show signs of minor deterioration and may require some maintenance.
- Fair - Deterioration evident, function affected. Asset may require on-going monitoring.
- Poor - Serious deterioration, function inadequate. Asset may require ongoing monitoring.
- Critical - No longer functional, general or complete failure. Asset may require extensive monitoring.

The Pipeline Assessment Certificate Program (PACP) is the North American Standard for pipeline defect identification and assessment[2]. Closed-circuit television (CCTV) is the principal method of inspecting drains and sewers. In this process, a small robotic crawler vehicle with the CCTV camera attached is lowered into the pipe to complete the inspections. A structural rating, on a scale of 0-5, is then assigned using sewer condition assessment standards, with 0 representing an asset with minimal structural deficiencies and 5 representing assets on the verge of failure.

Table 2.3.1 illustrates how the PACP score ratings align with the County's standard condition scale. Unless otherwise noted, all images are of County assets, and are general representations of the asset condition at the time the photo was taken. Assets may have undergone lifecycle strategies since the date of the image impacting its condition.

Wastewater process assets are inspected by County staff on a regular basis as part the preventative maintenance program. These inspections identify performance and accelerated degradation and will trigger the creation of a reactive work order for repairs and rehabilitation. The County is working towards incorporating these inspections into a formalized condition rating. A visual inspection rating was provided for most process assets as part of the data collection process in 2018 and 2019.

Given the complexities and accessibility of some assets, it is not beneficial to complete a visual or performance based condition assessment on all assets. For assets which are unable to be visually inspected or that have since been replaced, an age-based condition rating is being used based on anticipated useful lives.

[2] https://www.nassco.org/content/pipeline-assessment-pacp

Table 2.3.1 PACP Score Ratings

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<tr>
<td>Excellent
PACP Score of
0 or 1</td>
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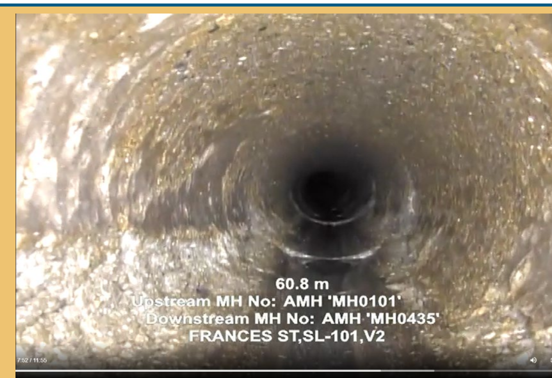
<td>Poor
PACP Score of
4</td>
<td>
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PACP Score of
2</td>
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PACP Score of
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PACP Score of
3</td>
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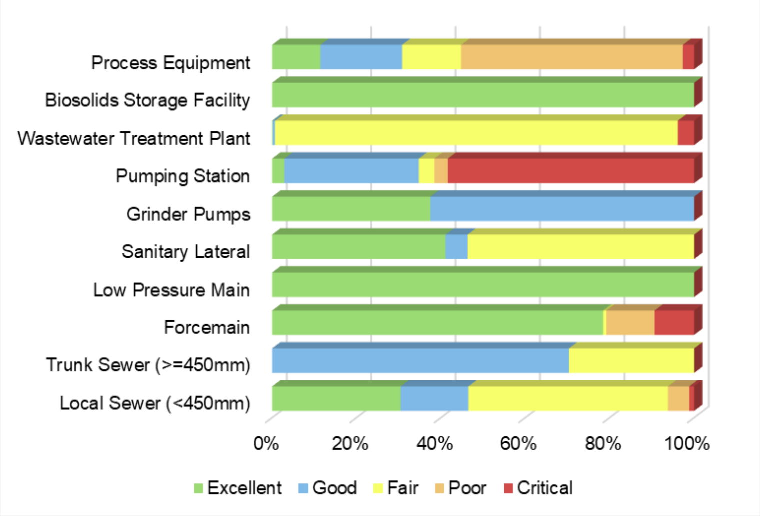
2.4 Condition Assessment

The condition profile of our Norwich wastewater asset components is shown in figure 2.4.1. The % in each condition is based on replacement costs.

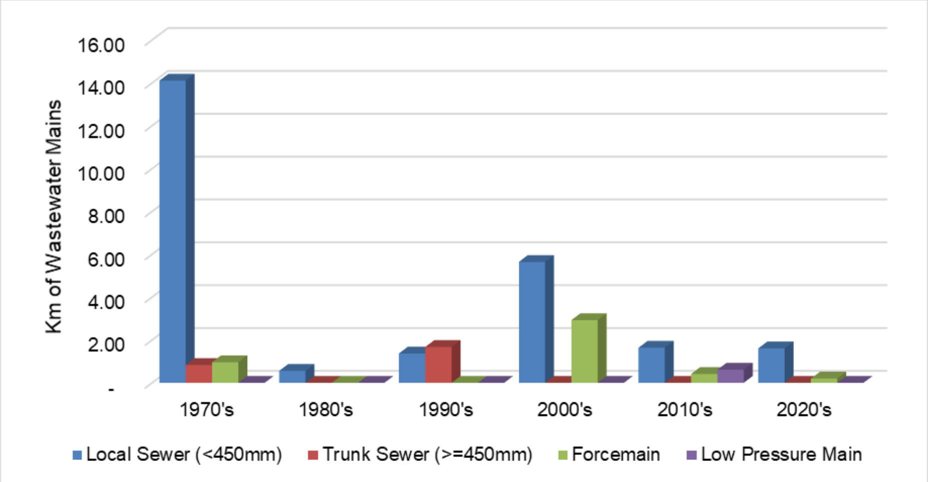
For the Norwich wastewater assets: 9.4% of these assets are in poor or critical condition, and 36.4% in good or excellent condition in comparison to 10-11% and 57-65% respectively for Canadian municipalities reported on the Canadian Infrastructure Report Card[3]. While this may appear that our Norwich wastewater assets are in slightly worse shape than other Canadian municipalities, the 2019 Canadian Infrastructure Report Card is an aggregate of self reported condition ratings across the Country and are based on a general rating scale which may not match the County's.

Figure 2.4.1 Asset Condition by Component



To better understand our Norwich wastewater collection assets, an age profile of all our wastewater mains by decade is shown in figure 2.4.2.

Figure 2.4.2 Wastewater Mains by Age



The average age of the majority of linear assets within the Norwich wastewater system is approximately 34 years, whereas the average age of the vertical assets is approximately 24 years. This value must be considered in the context of the different asset types in the category, compared to the typical anticipated useful life of each asset type.

[3] http://canadianinfrastructure.ca/en/index.html

Table 2.4.3 outlines the anticipated useful life for each new build/replacement. The anticipated useful lives for our wastewater assets exclude the management strategies that the County utilizes to extend the overall life of our wastewater assets.

Table 2.4.3 Useful Life

Wastewater System Component	Anticipated Useful Life (years)
Forcemain, Low Pressure Main, Trunk Sewer, Local Sewer, Laterals	90
Collection Tanks	30
Grinder Pumps	10
Facilities	10 - 50
Process Equipment	8 - 75

Figure 2.4.4 illustrates the current average age of the Norwich wastewater system linear components in comparison to their anticipated useful life, based on a run to failure strategy.

As the vertical assets can have a significant variability in age, from both a facility and process standpoint, they are not represented within figure 2.4.4.

There are a number of management strategies that the County may utilize to extend the overall life of our wastewater assets. These strategies allow us to align the needs with those of other assets, resulting in the best overall value for our residents.

Figure 2.4.4 Age and Useful Life Comparison

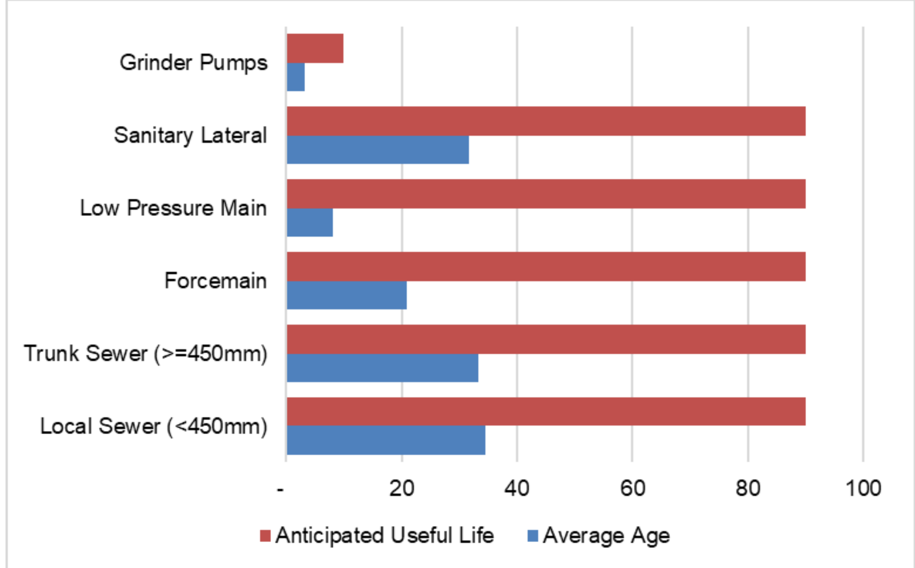


Table 2.4.5 compares the status of our Norwich wastewater asset components, as identified in our 2017 Asset Management Plan to their current condition. The breakdown by component for vertical assets was not available as of the date the 2017 report was published, so there is no condition comparison available. Work is ongoing to further enhance the asset information at the component level.

The trend shows that the status of wastewater assets for the Norwich wastewater system is relatively steady. The trunk sewer, and forcemain data updates have resulted in the overall condition rating appearing to increase, despite limited capital investments in these areas. As the system continues to age it is expected that condition ratings will continue to decline until targeted lifecycle strategies are implemented.

Table 2.4.5 Wastewater Systems Condition Assessment

Asset Type	Asset Component	2017 Condition Rating	Current Condition Rating	Trend
Linear	Local Sewer (<450mm)	Fair	Good	↑
	Trunk Sewer (>=450mm)	Fair	Good	↑
	Forcemain	Good	Good	→
	Low Pressure Main	Excellent	Excellent	→
	Sanitary Lateral	Good	Good	→
	Collection Tank	-	-	-
	STEP Pump	-	-	-
	Grinder Pump	-	Good	-
Vertical	Pumping Station	Not assessed	Fair	-
	Wastewater Treatment Plant	Not assessed	Fair	-
	Odour Control Facility	-	-	-
	Biosolids Centralized Storage Facility[4]	-	Excellent	-
	Process Equipment	Not assessed	Fair	-

[4] The Biosolids Centralized Storage Facility is a shared facility across the County with each system contributing to the costs based on number of customers. The value utilized throughout this report card represents Norwich's share based on 2021 customers.

3.0 Levels of Service

County staff have developed a comprehensive Level of Service (LOS) Framework. This framework will help to establish a relationship between the current LOS being provided by the County's assets, and the associated operating and capital expenditures required to achieve the proposed LOS. The framework puts into perspective the definition and measurement of service performance in alignment with the County's corporate mission and vision.

Corporate Objective

The wastewater collection and treatment service ensures protection of the environment and public health of residents, visitors to the County and downstream users of the receiver (Otter Creek) and our partners in the watershed.

Legislative Requirements

Each of the County's WWTPs are regulated under the Ontario Water Resources Act, 1990[5] and operated in accordance with an ECA or historical Certificates of Approval (C of A) issued by the MECP.

The ECA for the County's WWTPs require annual reporting of operational and treated effluent discharge parameters into the receiving water bodies. The Annual Wastewater Treatment System Summary Reports are available on the County's website.

Framework

The structure of the County's LOS framework was developed to align with international best practices including the International Infrastructure Management Manual (IPWEA, 2015). The framework includes the mandatory measures to meet the requirements of Ontario Regulation (O.Reg.) 588/17 by including both Community and Technical Levels of Service. The metrics in this framework may be expanded upon as the County continues to improve its data collection and reporting processes.

[5] https://www.ontario.ca/laws/statute/90o40

3.1 Customer Levels of Service

Community or Customer Levels of Service are statements that describe quantifiable metrics of the service delivery outcomes from the perspective of the customer, expressed in non-technical terms. The following statements form our qualitative descriptions of the customer level metrics required under O.Reg. 588/17.

The Norwich wastewater system connects to most residential, commercial and industrial spaces in the settlement areas of Norwich, as outlined in figure 3.3.1. The Norwich wastewater system provides for the safe collection and treatment of wastewater.

The County does not have any combined sewers within the Norwich wastewater system. The Norwich wastewater system is a separate wastewater system.

Infiltration and inflow can enter through a variety of sources (cracks in pipes, weeping tile connections, cross connections, etc.). In the case of heavy rainfall events, wastewater mains may experience a volume of water and wastewater that exceeds its designed capacity. In some cases, this can cause water and/or wastewater to overflow into streets or backup into homes or businesses.

To minimize wastewater overflow into streets or backup into homes, the County has established design standards to convey flows under ultimate conditions, design sheets for capacity needs that include infiltration inflow. Newer wastewater mains are made of gasketed PVC piping to reduce potential leaks occurring between fitted pipe segments.

Final Effluent is the treated water that is discharged to the environment through the approved effluent disposal facilities, including all bypasses that are required to meet the compliance limits stipulated in the ECA for the WWTP, at the final effluent sampling points. The effluent criteria includes effluent flow rates, and parameters such as total suspended solids, Biochemical Oxygen Demand (BOD), phosphorous, ammonia, and E. coli. The County produces annual reports summarizing each WWTPs operation and treated effluent discharge quality and these can be found on the County's website at: http://www.oxfordcounty.ca/Services-for-You/Water-Wastewater/Wastewater/Annual-reports.

Table 3.1.1 outlines additional customer focused performance metrics from the County's LOS framework.

3.2 Technical Levels of Service

Technical Levels of Service metrics are quantifiable metrics applied against assets that are subject-matter specific inputs or outputs supported by the day-to-day activities of County staff. Table 3.1.1 includes the technical metrics required under O.Reg. 588/17, as well as, additional metrics the County has included in the framework.

3.3 Levels of Service Maps

As a further illustrative example of our community levels of service, a map is included as figure 3.3.1 showing areas within the Norwich village boundary that are serviced by the Norwich wastewater system.

Figure 3.3.1 Norwich sanitary serviced properties

Village of Norwich

Properties with fronting sewer

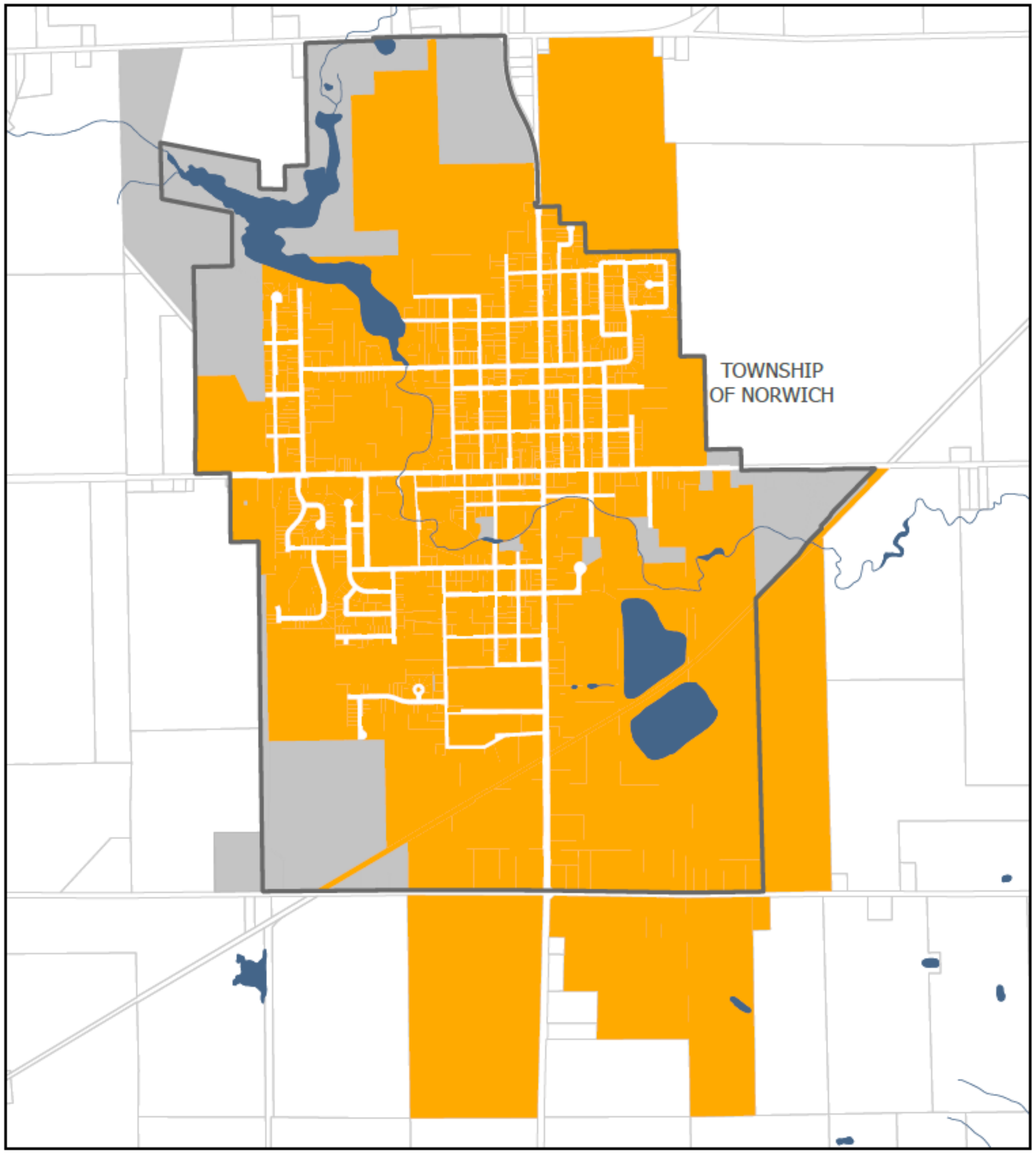
- Properties with fronting sewer
- Properties without fronting sewer
- Municipal Boundary
- Village Boundary
- Railway
- Waterbody

Total # of parcels:	1,419
Without fronting sewer:	37
With fronting sewer:	1,382
Coverage:	97%

N

0 150 300 600 900 m

Parcels with fronting sewer identified as being a distance of 30m from sanitary mains.



Produced By The Department of Corporate Services Information Services ©2021

Table 3.1.1 Performance Measures

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Customer / Council Focused Performance Measures					
Reliability	Providing wastewater services with minimal interruptions	% of properties within the system boundary connected to the municipal wastewater system	N/A	97%	TBD
		% of wastewater mains designed to be resilient to overflow or flooding during wet weather events	100%	100%	100%
Environmental Stewardship	Providing wastewater services that have minimal impacts on the environment	% of overall facility ECA compliance rate	97.1%	100%	100%
Cost Efficient	Providing wastewater services in an efficient manner	Operating cost to provide service ($/connection)	$502	$406	TBD
Technical Focused Performance Measures					
Reliability	Providing wastewater services with minimal interruptions	The number of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system.	0 connection-days to 1,271 connections	0.125 connection-days to 1,289 connections	TBD
		% of system inspected (CCTV) annually	4.8%	9.8%	7%
		% of wastewater mains flushed annually	23%	28%	20%
		# of overflow or spill occurrences	0	0	0
Environmental Stewardship	Providing wastewater services that have minimal impacts on the environment	% of wastewater estimated to have by-passed treatment	0%	0%	0%
		The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system.	7 ECA violations to 1,271 connections	0 violations to 1,289 connections	0

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Cost Efficient	Providing wastewater services in an efficient manner	Operating cost per kilometre of wastewater main for collection	N/A	$6,378	TBD
		5 year average capital expenditure for wastewater collection	$0.3M	$0.3M	TBD
		5 year average capital expenditure for wastewater treatment	$0.2M	$0.2M	TBD

4.0 Asset Management Strategy

4.1 Lifecycle Activities and Planned Actions

Wastewater collection assets undergo regular maintenance and inspection. As part of capital works project analysis, determinations of whether wastewater pipe replacement or relining should occur is reviewed. This process is fully integrated with the renewal needs of the roadways and other underground assets, such as drinking water and stormwater. This integrated approach ensures our renewal projects for these service areas are delivered with optimal timing to increase value and minimize disruption to our communities. For example, if a roadway is targeted for renewal, coordination between service areas and area municipalities will determine whether the underlying stormwater, drinking water or wastewater assets are also of an age or condition that requires renewal, to ensure these projects are delivered together to reduce disruption for our communities and deliver enhanced value.

Process assets and equipment undergo extensive operations and maintenance regimes to sustain their reliable operation. Investment needs are identified and coordinated with normal operations to minimize disruptions to service. Major replacements are planned and accommodated using system redundancy and changes to operations, in order to maintain service. It is critical to maintain wastewater service in order to protect public health and the environment.

There are six main lifecycle activities considered in the overall sustainable management of wastewater assets, described in table 4.1.1.

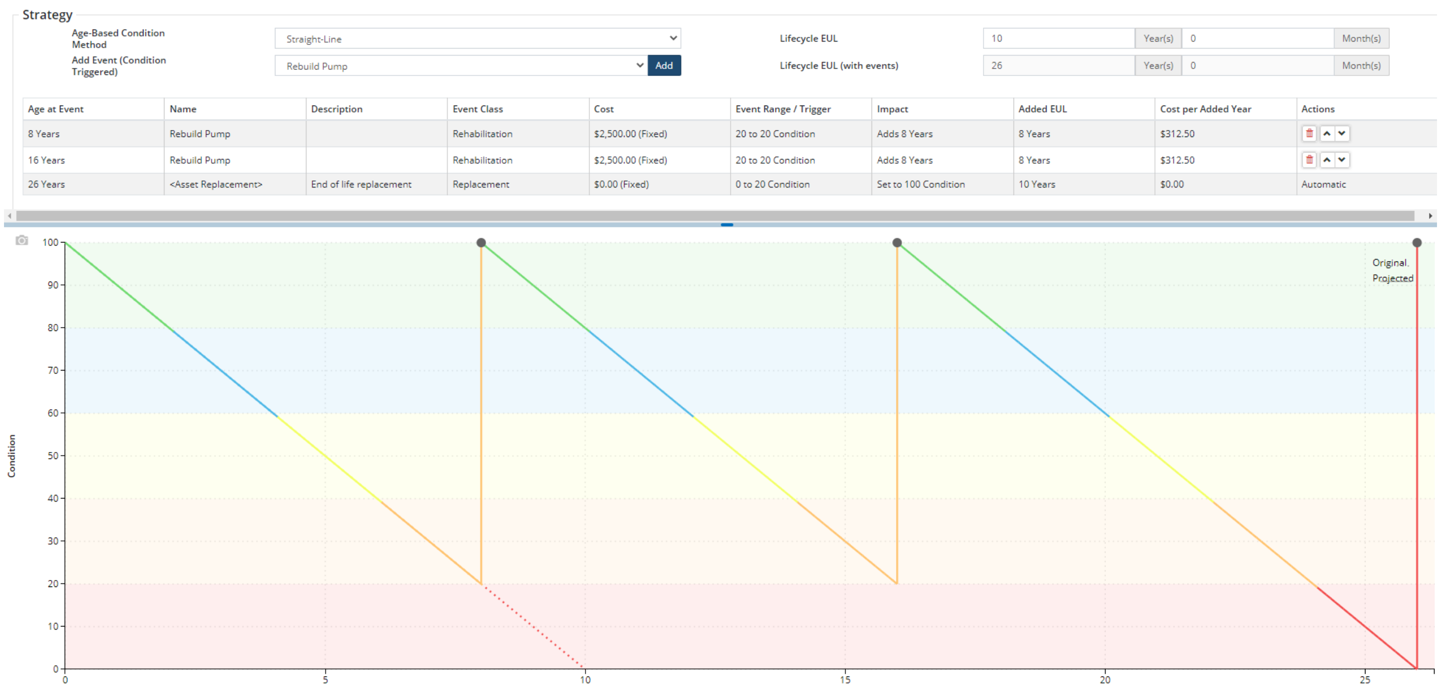
Table 4.1.1 Lifecycle Activities

Strategy	Lifecycle Activity
Non-Infrastructure Solutions	Actions or policies that can lower costs or extend useful lives. **Trigger: Ongoing**
Maintenance	Regularly scheduled maintenance and inspection programs including cleaning and flushing, manhole repairs, CCTV inspections, exercising diesel gen-sets and minor repairs. These activities do not improve the overall condition of the asset, nor increase its useful life. **Trigger: Ongoing**
Rehabilitation / Renewal	One-time events that increase the condition and extend the life useful of the asset; including sewer lining and seal and grout programs. **Trigger: Fair/Poor**
Replacement	Occurs at the end of the useful life and/or when rehabilitation is no longer an option – can vary among assets due to construction material and environmental factors that impact the degree of deterioration and performance. **Trigger: Poor/Critical**
Disposal	Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the County to provide services. County staff coordinate with contractors to ensure safe removal and environmental compliance when disposing of assets. **Trigger: Poor/Critical**
Expansion / Growth	Planned activities required to extend services to previously unserved areas, expand services to meet growth demands, or increase the level of service being provided. **Trigger: Development**

The lifecycle management strategy is the set of planned actions that should enable the assets to provide users with the proposed level of service in a sustainable way, while achieving acceptable levels of risk and the lowest lifecycle costs required to provide that level of service. Lifecycle considerations for assets include analysis of the timing to carry out key asset management activities including inspection, maintenance, repair, and replacement. Ongoing preventative maintenance activities are outlined in the County's work management system. The rehabilitation and replacement activities impacting the asset components condition and useful life are contained within profiles in the County's asset management system. For some assets, replacement needs are based on a run to failure strategy, as this is the most economical. Work is ongoing within the County's asset management systems to build all the component profiles and identify where each asset is within the lifecycle.

As an example, figure 4.1.2 illustrates the lifecycle strategy of grinder pumps. The pumps are re-built twice, extending the overall useful life from 10 years to approximately 25. The annual cost requirement from a run to failure strategy is $1,500 per year where the annual cost requirement using the rehabilitation strategies decreases to just below $800 per year.

Figure 4.1.2 Grinder Pumps Lifecycle Strategy

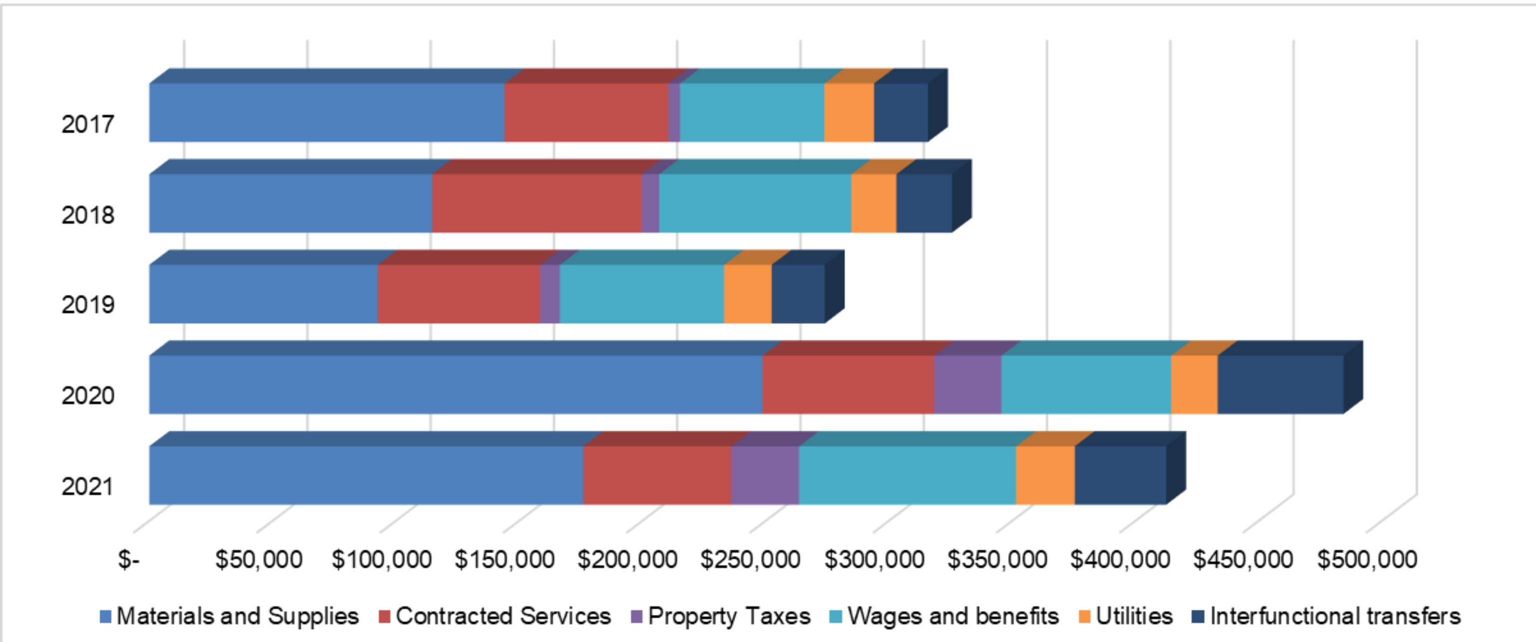


4.2 Significant Operating Expenses

Significant operating expenses are required in order to sustain an asset over its lifecycle. The County is always looking at ways to optimize our operating investment to ensure we are achieving the best value for our residents, and businesses. Essential to this is a strong operations and maintenance plan within our work management system. Operating expenses are incurred through a number of sources – preventative maintenance activities, utility costs, property taxes and more. Despite the fact that minor maintenance is incorporated into planned operations and maintenance programs, there are cases where it is unplanned.

Figure 4.2.1 shows the operating expenses from 2017 through 2021 for the Norwich wastewater system grouped by expense type. The groupings align with those reported on the County's Financial Information Return (FIR), with further breakdown for property taxes and utility costs as these expenses can be significant.

Figure 4.2.1 Operating Expenses



4.3 Risk Strategy

Risk management frameworks are developed to assist with the prioritization of investments within the capital planning period. The preferred approach is to implement a triple bottom line analysis approach to evaluate:

- Social impacts of asset failure, including impacts to customers, businesses and the County's reputation;
- Environmental impacts of asset failure; and
- Economic impacts of failure including the cost of remediation.

In the context of asset management, risk is the multiple of the consequence of an asset failing and the probability that the event will occur.

Figure 4.3.1 illustrates the risk ratings for the Norwich wastewater assets at a summary level. A Class EA Study and capacity expansion project for the Norwich lagoon is underway with construction anticipated for 2023 and 2024. This project is anticipated to also address the assets identified as high risk. County staff will continue to monitor the higher risk assets, review and/or complete physical inspections to further validate the age-based condition ratings and plan for lifecycle strategies accordingly.

Figure 4.3.1 Asset risk profile

Consequence \ Probability	1	2	3	4	5
5	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	1 Asset 1.00 unit(s) $8,637,600.00	0 Assets - $0.00
4	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
3	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	4 Assets 4.00 unit(s) $1,200,000.00
2	107 Assets 3,759.94 m, unit(s) $1,737,831.00	138 Assets 2,515.40 m, unit(s) $1,807,329.00	589 Assets 3,662.57 m, unit(s) $4,946,879.00	5 Assets 720.91 m $288,364.00	8 Assets 525.67 m, unit(s) $802,068.00
1	724 Assets 8,239.76 m, unit(s) $6,986,449.00	130 Assets 2,169.76 m, unit(s) $1,827,435.00	469 Assets 10,219.21 m, unit(s) $6,423,965.00	36 Assets 1,313.94 m, unit(s) $596,076.00	38 Assets 1,084.04 m, unit(s) $983,516.00

5.0 Financial Strategy

5.1 Financing Strategy

Hemson Consulting Ltd. (Hemson) was retained through a competitive process to assist with analyzing and developing the County's water and wastewater rates for a 4-year period from 2021 to 2024. The rate modeling includes all system asset management needs and all sources of funding including Community Servicing Assistance Program (CSAP) funding, development charges, developer and resident contributions. In most cases, the capital replacement component is the average annual required contribution level in order to establish full cost recovery; however, the contribution may vary based on the system's ability to meet full cost recovery for the next 10-years.

Capital work is funded from reserves (based on the capital contribution included in the user rates), development charges (for growth projects), debentures and grant funding when available. The County continually assesses opportunities for additional funding options and revenue streams to address our asset needs.

Where possible, replacement activities are planned in conjunction with the replacement needs of the road network and underlying water and stormwater assets. This requires a co-ordinated effort with area municipalities as the majority of the County owned water and wastewater linear assets falls under the area municipalities' roadways. This collaboration is essential for ensuring a cost effective approach to maintaining assets within the County regardless of ownership.

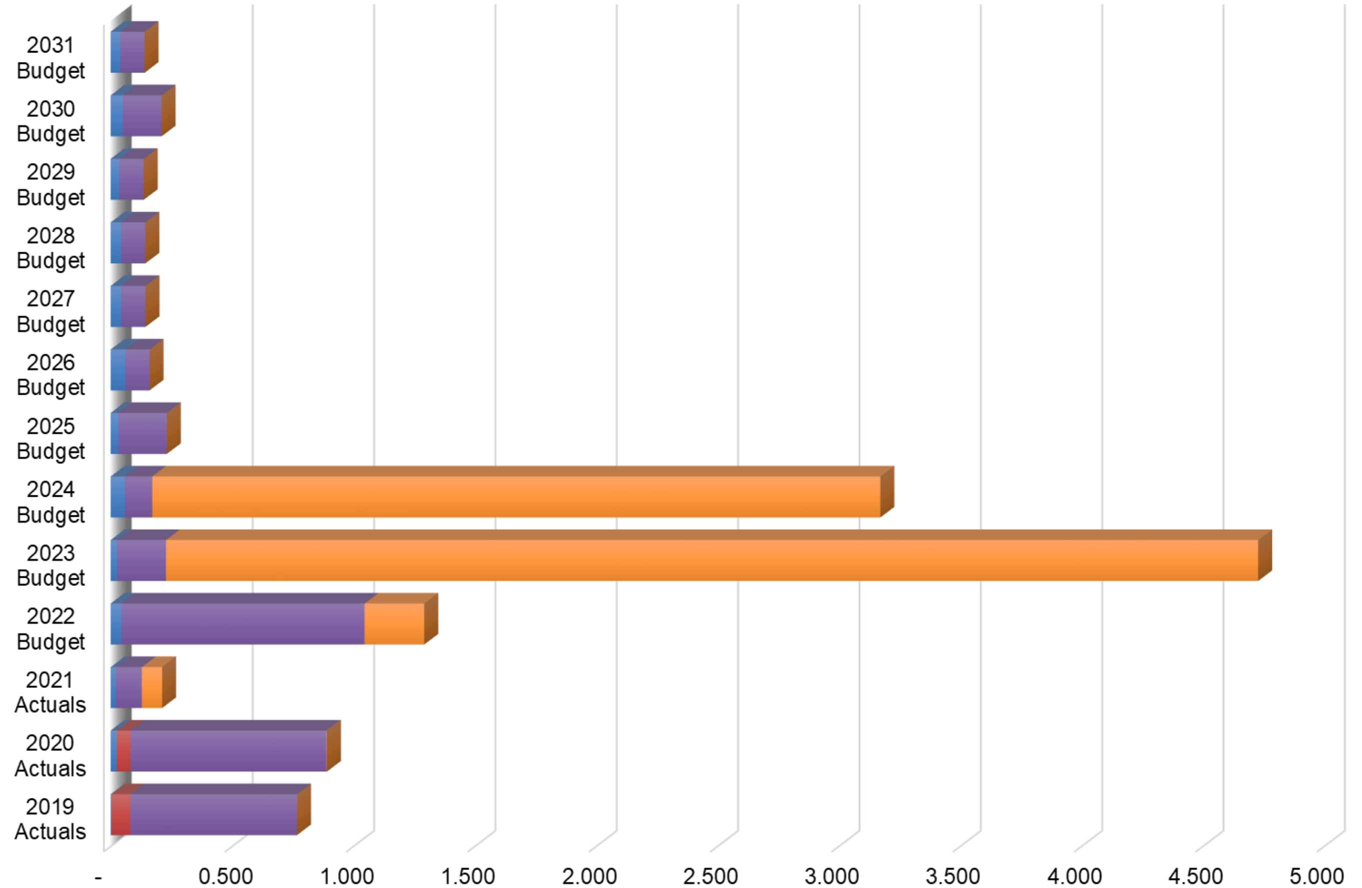
In addition to targeting and prioritizing the investment needed to maintain existing assets, there are also planning processes in place to determine the additional assets needed to meet growing demands through population increases or demand for new services. The projects targeted to meet growth are funded primarily through Development Charges (DC) – the mechanism that enables recovery of growth-related capital expenditures from new development. These charges are governed by the Development Charges Act and are applied in accordance with our Development Charges By-Law. Impacts from the growth activities analyzed in the 2019 DC Background Study are included in this AMP.

5.2 Expenditure History and Forecasts

Based on the 2022 approved budget the Norwich lagoon upgrade/expansion project is the only significant expense for the Norwich wastewater system within the 10-year approved budget, as illustrated in figure 5.2.1. Linear asset replacements are ongoing, in conjunction with the local area municipal roadway construction projects. Minor process equipment replacements were included in the 2021 budget. County staff continue to review anticipated asset management needs with each budget cycle, subject to existing resource limitations.

Non-Infrastructure solution projects include shared projects for condition reviews, studies and implementation of the work management system.

Figure 5.2.1 Expenditures (millions)

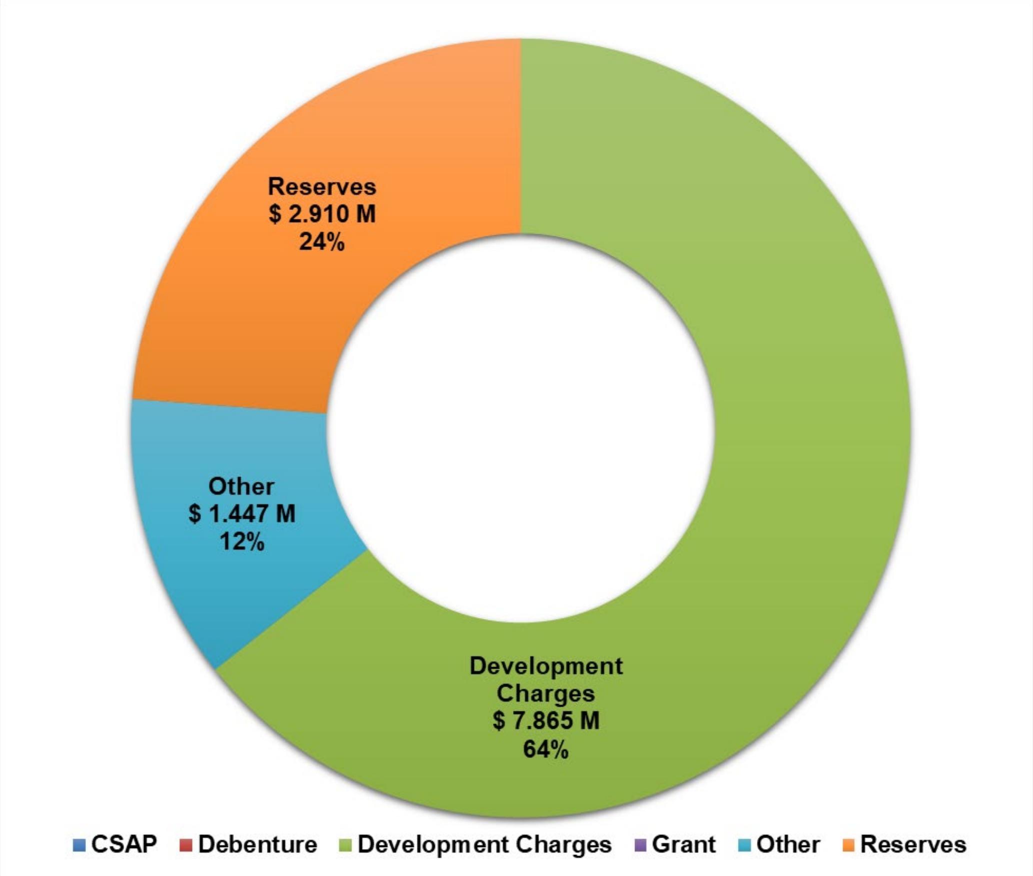


	2019 Actuals	2020 Actuals	2021 Actuals	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Non-Infrastructure Solution	0.004	0.025	0.022	0.044	0.027	0.058	0.031	0.060	0.043	0.043	0.036	0.050	0.039
Maintenance	0.077	0.056	-	-	-	-	-	-	-	-	-	-	-
Rehabilitation / Renewal	-	-	-	-	-	-	-	-	-	-	-	-	-
Replacement	0.687	0.808	0.107	1.002	0.201	0.113	0.200	0.100	0.100	0.100	0.100	0.160	0.100
Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-
Expansion / Growth	-	0.002	0.083	0.246	4.500	3.000	-	-	-	-	-	-	-

5.3 Capital Revenues

Replacement projects, identified in the County's 10-year capital plan, are anticipated to be funded by the Wastewater – Norwich Reserve, which is funded by user fees. The Norwich lagoon upgrade / expansion project is primarily funded by DCs. The Norwich wastewater reserve currently has a sufficient balance to fund the 10-year non-growth related asset activities within the approved 2022 Long-Term Capital Plan.

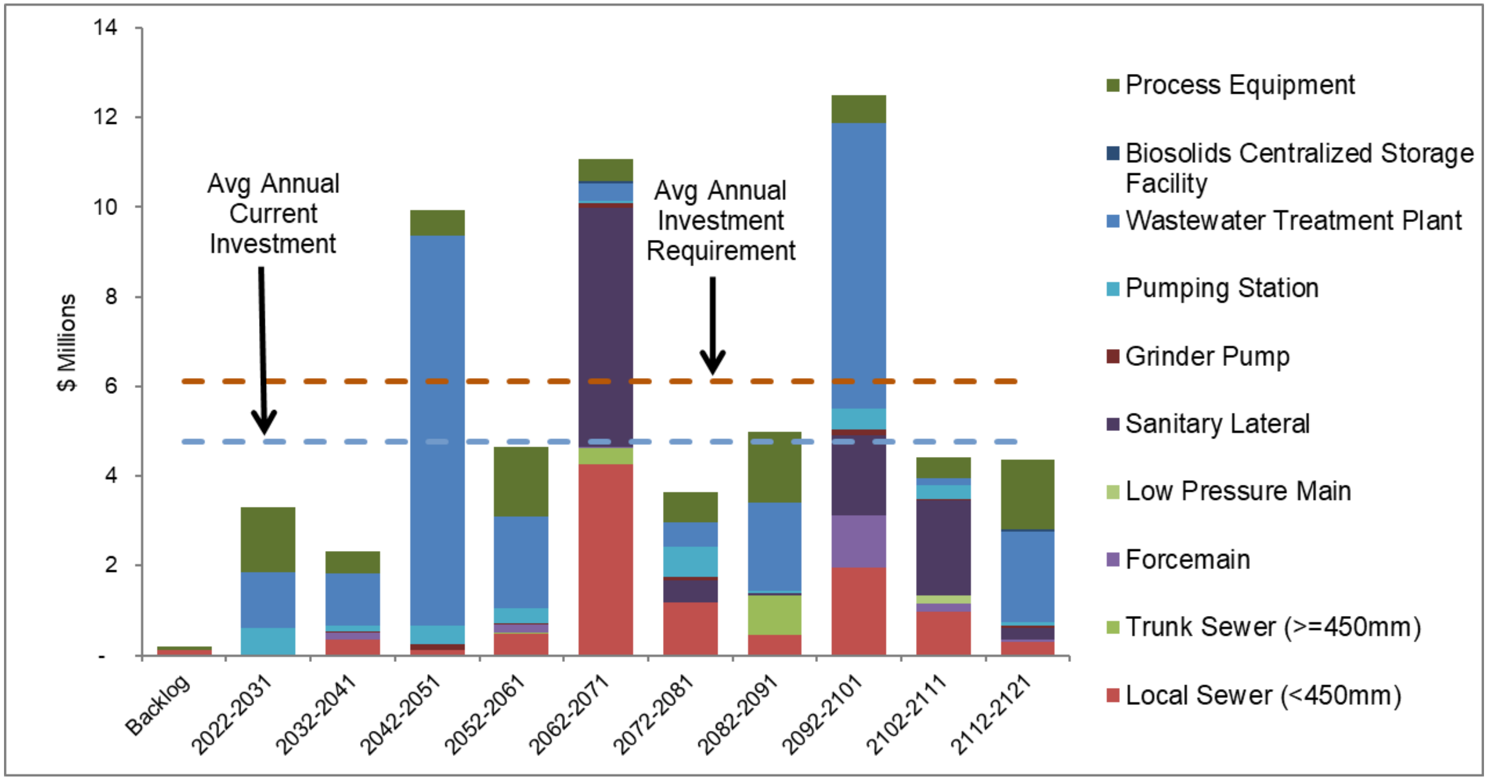
Figure 5.3.1 Sources of Capital Revenues 2019-2031 (millions)



5.4 Capital Investment

Based on the asset management lifecycle strategies identified, the financial requirements over the next 100-years are determined in current dollars. The average annual investment requirement represents the amount of capital funding required to renew and maintain the existing assets on an annual basis so services can continue to be delivered. These estimates assume that all work is able to be completed, as indicated, and does not take into account future changes due to environmental factors, new maintenance techniques, and unidentified growth. The annual requirement has increased from the 2017 AMP, primarily due to significant development and improvements the County has made to the vertical data, resulting in asset useful lives that are more reflective of their actual lifecycle. Further work is ongoing with the vertical data to fully determine lifecycle needs (including maintenance and rehabilitation strategies) which will impact the annual requirement for vertical assets. The data will continue to be reviewed with each budget and business plan cycle.

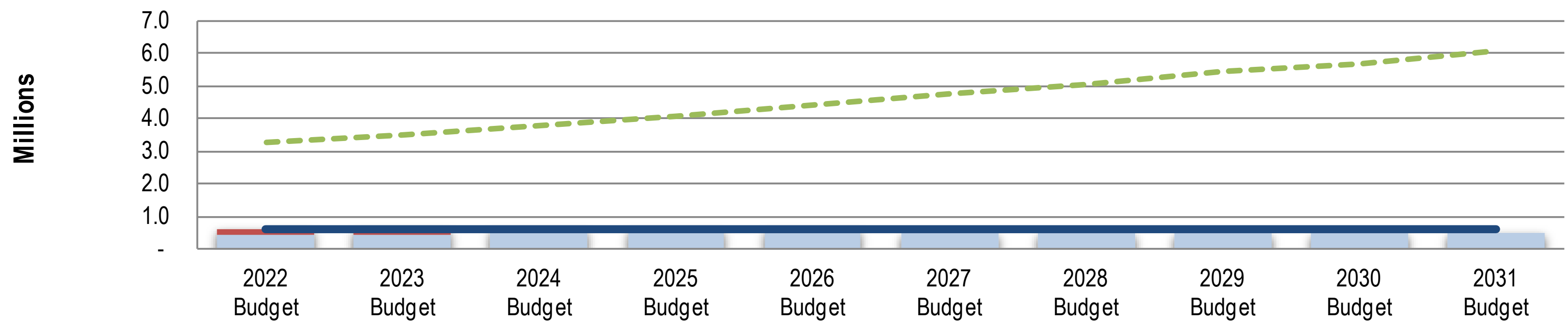
Figure 5.4.1 Average Annual Capital Requirements



The following figure links the annual capital funding needs to the capital investments contained in the budget. The timing of the actual capital projects may vary, however annual investments in capital assets is important for financial sustainability.

Figure 5.4.2 Funding Requirements

	Key	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Annual Required Investment		**612,000**	**612,000**	**612,000**	**612,000**	**612,000**	**612,000**	**612,000**	**612,000**	**612,000**	**612,000**
Current Investment		457,805	458,644	472,954	483,234	498,479	476,217	478,919	481,660	484,152	486,651
Funding Deficit		*154,195*	*153,356*	*139,046*	*128,766*	*113,521*	*135,783*	*133,081*	*130,340*	*127,848*	*125,349*
Funding Surplus		-	-	-	-	-	-	-	-	-	-
Reserve Balance		3,263,627	3,499,397	3,798,809	4,052,946	4,393,662	4,731,892	5,071,867	5,419,802	5,697,343	6,046,980



5.5 Funding Gap Analysis

Using the anticipated 10-year asset lifecycle needs, along with the current capital investment level, the County is able to determine if there is an anticipated funding gap for the Norwich wastewater system. Consideration is then given to the current system reserve balance to determine the residual funding gap. The County would then investigate opportunities for reducing this residual funding gap which, may include increases to the user rates, utilization of grant funding opportunities and further review of lifecycle strategies and proposed levels of service.

Figure 5.5.1 illustrates the anticipated asset management 10-year lifecycle needs, including the projected funding surplus (left side of figure 5.5.1) and funding needs (right side of figure 5.5.1) for the Norwich wastewater system. The system calculates the optimal expenditures based on theoretical asset lifecycle needs. These needs have not yet been reviewed in depth with County operations staff, and incorporated into the 10-year capital budget. This is anticipated to be completed as part of the 2023 Business Plan and Budget process with subsequent review annually.

The anticipated expenditures have been increased for non-infrastructure solution projects; approximately $0.4 million.

While the anticipated expenditure calculation accounts for the lifecycle activities of expansion / growth projects it does not account for the initial investment. It is important to adjust for these projects, where the initial investment is growth related and not projected to be DC funded within the 10-year capital plan. As the lagoon project is fully DC funded there are no anticipated expansion / growth project costs to be added.

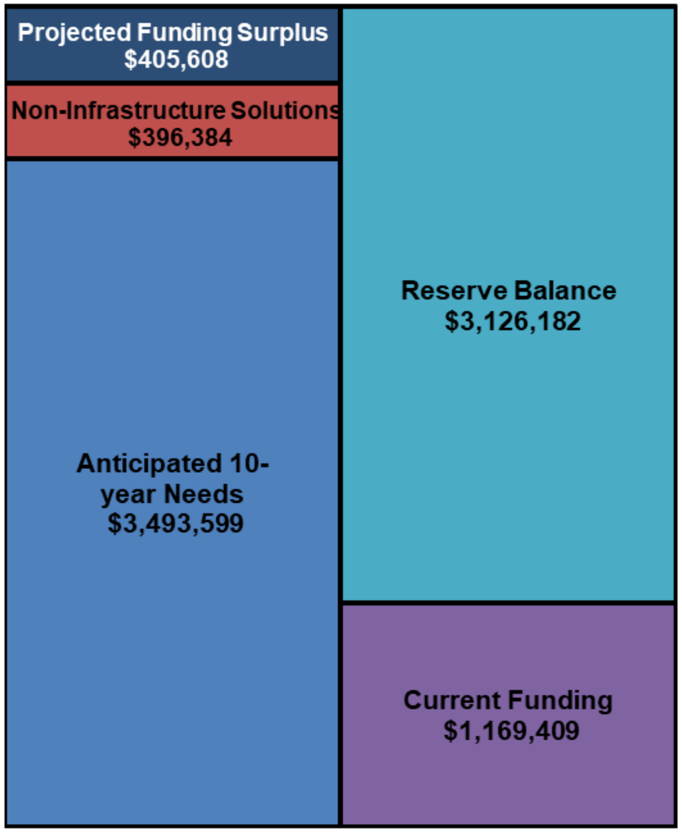
The Norwich wastewater system is projecting a funding surplus over the 10-year capital planning period. Although the Norwich wastewater system has a projected funding surplus over the 10-year horizon, the annual funding requirement is the basis for ensuring the long-term financial sustainability well into the future. The annual funding requirement will be reviewed holistically as part of the next rate study.

Drawing the reserve balance to zero would likely result in increased user fee requirements in the subsequent 10-year period in order to fund the anticipated asset lifecycle needs.

The reserve is also utilized to fund emergency or unplanned expenses. A minimal or fully committed balance would limit the ability to fund these types of expenses. Consideration needs to be given to a minimum balance the County should maintain based on these risks. Analysis of the reserve target minimum balance, will be completed as part of the annual reserve review process.

Failure to address the long-term asset lifecycle needs could result in significant increases to rates in the future as assets reach end of life; or reductions in localized and/or regional service. This may include blockages, sewer backups, basement flooding, localized service outages, increased maintenance costs on assets past their optimal life, poor quality effluent, damage to the natural environment, fines, increase in insurance claims for property damage and personal injury resulting from poor asset conditions, etc.

Figure 5.5.1 Anticipated Needs (10-Year)



6.0 Climate Change

As part of the asset management planning process, the County will consider the risks and vulnerabilities of capital assets to climate change and the resulting actions that may be required. Commitment will be made to the development of tailored actions that make the best use of our resources to mitigate and adapt to climate change, in accordance with our local reduction targets, financial capacity and stakeholder support.

Optimization of the wastewater treatment process can help reduce the emissions of GHG such as nitrous oxide (N_2O), carbon dioxide (CO_2) and methane (CH_4) from being released into the environment at WWTPs. Optimization requires the correct equipment to ensure conditions can be achieved to reduce GHG emissions, while maintaining WWTP regulatory compliance.

Nitrous oxide (N_2O) is released in the secondary treatment train through the nitrification and denitrification process, which is used to remove nitrogenous components from the wastewater. Nitrifying bacteria oxidize ammonia to nitrites and nitrates. To minimize N_2O emissions, the plant is optimized by running the activated sludge process at a high sludge retention time (SRT) with optimal dissolved oxygen levels, which results in low ammonia and nitrite concentrations. High amounts ammonia and nitrite compounds, especially when there are excessive amounts of dissolved oxygen, can trigger biogenic N_2O emissions. To control this process, an upgrade is underway:

- Replacement actuated sand filter valves to ensure proper distribution of pond effluent through the tertiary sand filters for nitrification.

Methane (CH_4) is generated by the anaerobic biological break down of organics or the release of dissolved CH_4 found in the wastewater influent. The Norwich WWTP does not have anaerobic digestion and does not generate significant levels of methane gas.

Carbon Dioxide (CO_2) is produced in biological treatment, where the organic carbon in the wastewater is utilized for biomass growth or oxidized into CO_2. By operating WWTPs at high sludge retention times, endogenous respiration (cell lysis results in biomass growth) is encouraged, which decreases the overall sludge production, which results in a decrease in CO_2 production.

Improving energy efficiency at WWTPs can help to reduce GHG emissions by decreasing consumption of fossil fuel-based energy. Significant energy savings can be realized by increasing the efficiency of plant equipment such as pumps and blowers, and using generated fuel sources.

Climate change risks are considered during the planning phase of each capital project. Increasing resiliency to changing climate conditions through the use of backup power generation, redundancies with critical equipment, use of SCADA to collect accurate information and make informed decisions. By conducting inspections and completing studies, problem areas can be identified and planned to repair.

- use of backup power generation,
- redundancies with critical equipment,
- Ongoing development and implementation of a SCADA Master Plan, and
- conducting inspections (including CCTV) and studies to identify problem areas and complete repairs.

WASTEWATER SYSTEM

Tavistock

Table of Contents

1.0 Introduction

The County maintains a diverse portfolio of assets that are required to provide the community of Tavistock with the safe collection and treatment of wastewater. The Tavistock Wastewater Treatment Plant (WWTP) provides wastewater treatment for residential, commercial, and industrial users in the Village of Tavistock.

The Tavistock WWTP is a Class I rated facility, as defined by Ontario Regulation 129/04. It is a lagoon treatment facility consisting of three aerated lagoon cells, one polishing pod, a filter pump station, and four intermittent sand filters, with an outfall pipe to the Hohner Drain (and eventually the Thames River). The entire treatment process is completed in accordance with strict standards, processes, and limits as regulated by the WWTPs Environmental Compliance Approval (ECA) issued by the Ministry of Environment, Conservation, and Parks (MECP) of the Ontario Provincial Government.

The wastewater collection network transports residential, commercial and industrial waste to the WWTP for treatment. The wastewater collection network consists of a mix of gravity mains, low pressure mains and forcemains. Wastewater flows by gravity wherever possible, where changing elevations require the use of sewage pumping stations (SPS). Other specialized structures such as manholes, valve vaults, meter stations, diversion structures and siphons are required to convey wastewater to the WWTP.

Sound management of our wastewater systems helps us realize our vision of being a vibrant community, working well and growing stronger together!

Like many of our assets, wastewater assets are facing increased challenges as a result of aging assets, climate change, increasing demand due to growth in our communities and regulatory changes. Our investment in these assets must therefore be balanced to optimize investment for renewal with the growing needs of our community.

This plan provides information regarding our approach to the management of our wastewater assets over the short (10-year) and long (100-year) term, demonstrating our commitment to assessing and meeting the levels of service valued by our residents and businesses.

1.1 Improvement Plan

The County recognizes that asset management is a continuously evolving process. The following recommendations are based on the review of current management practices, inventory, valuation and condition analysis.

- Document lifecycle history on assets within the asset management systems.
- Continue to reduce asset data gaps.
- Determine asset components and maintenance strategies for facilities and associated processes.
- Refine the risk assessment approach at the component level.
- Incorporate findings from the Water and Wastewater Master Plan.

2.0 State of Assets

2.1 Inventory

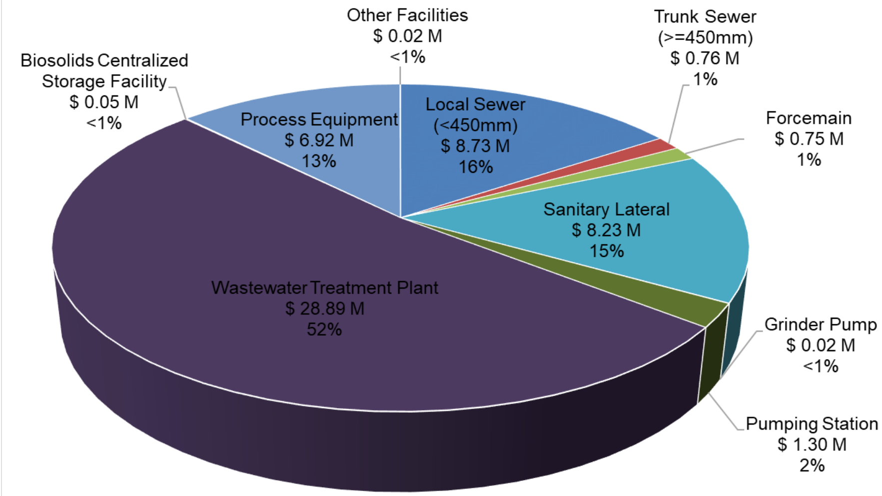
Wastewater assets are those that enable us to live in a clean and safe environment. It includes everything from wastewater mains that service our homes and businesses throughout the County, to the WWTPs, which ensure that effluent is properly treated before being discharged into the natural environment.

We have two different asset classes within the wastewater portfolio in order to effectively collect and treat wastewater from our community:

- Linear, which represent the collection pipe network, including the maintenance holes, connectors and related parts required in such a network.
- Vertical, which represent facilities (including the multiple buildings and structures that the facilities are comprised of), and related process systems and equipment required to perform the needed functions.

Table 2.1.2 displays our current wastewater inventory and the associated replacement costs and average age for each asset component. The County continues to make improvements to increase the integrity of our wastewater data. The inventory figures in table 2.1.2 capture inventory within newly constructed subdivisions which the County is aware of and anticipates assuming ownership of. The County generally assumes ownership of these assets approximately two years after full operation. It is important to include growth assets to ensure that lifecycle activities are planned and funded accordingly.

Figure 2.1.1 Inventory Valuation



2.2 Valuation

The replacement cost valuation for wastewater linear is based on current tender prices, where available. Current tender prices are adjusted where County staff feel some cost increases are only temporary due to COVID.

The replacement cost valuation for wastewater vertical is based on the latest information available, which includes current replacement costs, insurance valuations, and valuations from studies / assessments completed in prior years.

Table 2.1.2 – Tavistock Wastewater System Inventory

Asset Type	Asset Component		2017 Inventory	Current Inventory	Replacement Cost	Average Age
Linear	Local Sewer (<450mm)	m	20,229	21,069	$8,734,078	36 Years
	Trunk Sewer (>=450mm)	m	-	1,409	758,192	26 Years
	Forcemain	m	1,884	1,884	753,516	57 Years
	Low Pressure Main	m	-	-	-	-
	Sanitary Lateral	each	1,075	1,266	8,229,000	33 Years
	Collection Tank	each	-	-	-	-
	STEP Pump	each	-	-	-	-
	Grinder Pump	each	1	1	15,000	9 Years
Vertical	Pumping Station	each	3	3	1,300,298	16 Years
	Wastewater Treatment Plant	each	1	1	28,893,000	30 Years
	Odour Control Facility	each	-	-	-	-
	Biosolids Centralized Storage Facility[1]	each	-	1	50,849	4 Years
	Other Facilities	Each	-	1	15,000	11 Years
	Process Equipment	total	N/A	N/A	6,924,286	14 Years
Total Replacement Cost					**$55,673,219**	

The trunk sewer quantity increase is largely driven by the addition of data not previously available in 2017, along with some new installations in 2019.

[1] The Biosolids Centralized Storage Facility is a shared facility across the County with each system contributing to the costs based on number of customers. The value utilized throughout this report card represents Tavistock's share based on 2021 customers.

2.3 Condition Assessment Approach

The assessment approach for our wastewater assets utilizes a combination of physical assessments, asset attributes, such as material and sizing, as well as established estimated useful lives.

The County's condition scale and visual inspection ratings are based on the following approach:

- Excellent - Asset is well maintained with no noticeable defects.
- Good - Asset may show signs of minor deterioration and may require some maintenance.
- Fair - Deterioration evident, function affected. Asset may require on-going monitoring.
- Poor - Serious deterioration, function inadequate. Asset may require ongoing monitoring.
- Critical - No longer functional, general or complete failure. Asset may require extensive monitoring.

The Pipeline Assessment Certificate Program (PACP) is the North American Standard for pipeline defect identification and assessment[2]. Closed-circuit television (CCTV) is the principal method of inspecting drains and sewers. In this process, a small robotic crawler vehicle with the CCTV camera attached is lowered into the pipe to complete the inspections. A structural rating, on a scale of 0-5, is then assigned using sewer condition assessment standards, with 0 representing an asset with minimal structural standards, with 0 representing an asset with minimal structural deficiencies and 5 representing assets on the verge of failure.

Table 2.3.1 illustrates how the PACP score ratings align with the County's standard condition scale. Unless otherwise noted, all images are of County assets, and are general representations of the asset condition at the time the photo was taken. Assets may have undergone lifecycle strategies since the date of the image impacting its condition.

Wastewater process assets are inspected by County staff on a regular basis as part the preventative maintenance program. These inspections identify performance and accelerated degradation and will trigger the creation of a reactive work order for repairs and rehabilitation. The County is working towards incorporating these inspections into a formalized condition rating. A visual inspection rating was provided for most process assets as part of the data collection process in 2018 and 2019.

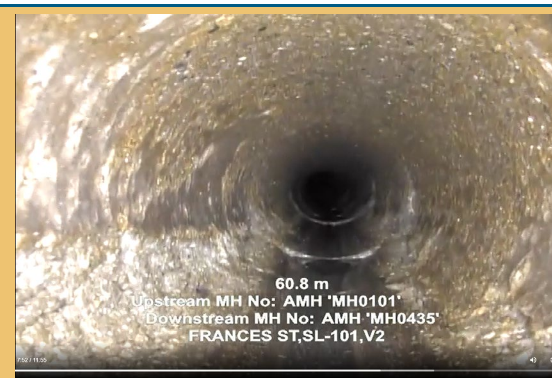
Given the complexities and accessibility of some assets, it is not beneficial to complete a visual or performance based condition assessment on all assets. For assets which are unable to be visually inspected or that have since been replaced, an age-based condition rating is being used based on anticipated useful lives.

[2] https://www.nassco.org/content/pipeline-assessment-pacp

Table 2.3.1 PACP Score Ratings

Excellent
PACP Score of
0 or 1

Poor
PACP Score of
4



Good
PACP Score of
2

Critical
PACP Score of
5

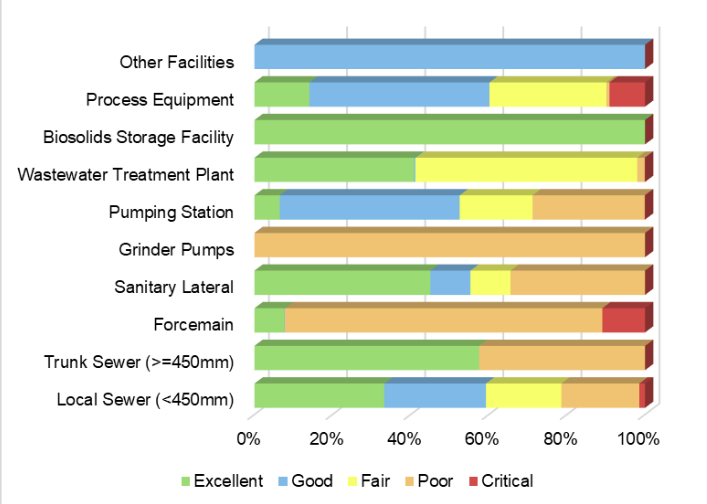
Fair
PACP Score of
3

2.4 Condition Assessment

The condition profile of our Tavistock wastewater asset components is shown in figure 2.4.1. The % in each condition is based on replacement costs.

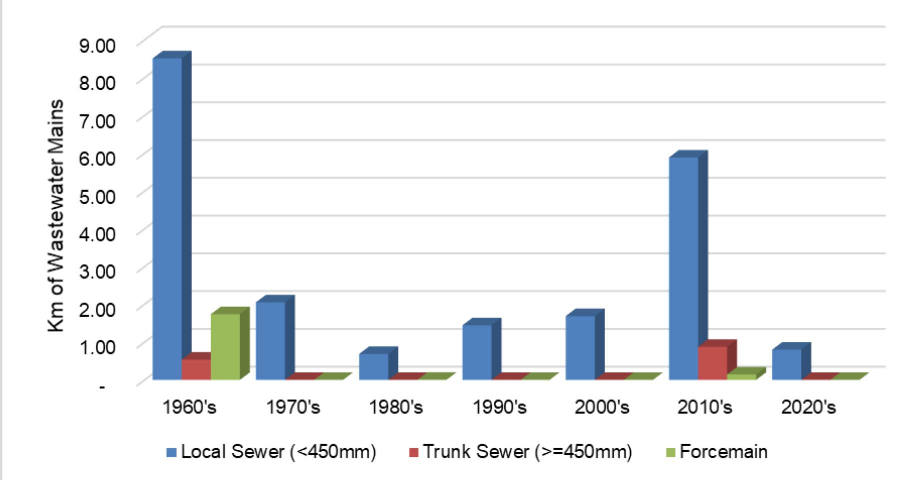
For the Tavistock wastewater assets: 13.2% of these assets are in poor or critical condition, and 48.6% in good or excellent condition in comparison to 10-11% and 57-65% respectively for Canadian municipalities reported on the Canadian Infrastructure Report Card[3]. While this may appear that our Tavistock wastewater assets are in slightly worse shape than other Canadian municipalities, the 2019 Canadian Infrastructure Report Card is an aggregate of self reported condition ratings across the Country and are based on a general rating scale which may not match the County's.

Figure 2.4.1 Asset Condition by Component



To better understand our Tavistock wastewater collection assets, an age profile of all our wastewater mains by decade is shown in Figure 2.4.2.

Figure 2.4.2 Wastewater Mains by Age



The average age of the majority of linear assets within the Tavistock wastewater system is approximately 35 years, whereas the average age of the vertical assets varies by facility type from 4 to 30 years. This value must be considered in the context of the different asset types in the category, compared to the typical anticipated useful life of each asset type.

[3] http://canadianinfrastructure.ca/en/index.html

Table 2.4.3 outlines the anticipated useful life for each new build/replacement. The anticipated useful lives for our wastewater assets exclude the management strategies that the County utilizes to extend the overall life of our wastewater assets.

Table 2.4.3 Useful Life

Wastewater System Component	Anticipated Useful Life (years)
Forcemain, Low Pressure Main, Trunk Sewer, Local Sewer, Laterals	90
Collection Tanks	30
Grinder Pumps	10
Facilities	10 - 50
Process Equipment	8 - 75

Figure 2.4.4 illustrates the current average age of the Tavistock wastewater system linear components in comparison to their anticipated useful life, based on a run to failure strategy.

As the vertical assets can have a significant variability in age, from both a facility and process standpoint, they are not represented within figure 2.4.4.

There are a number of management strategies that the County may utilize to extend the overall life of our wastewater assets.

These strategies allow us to align the needs with those of other assets, resulting in the best overall value for our residents.

Figure 2.4.4 Age and Useful Life Comparison

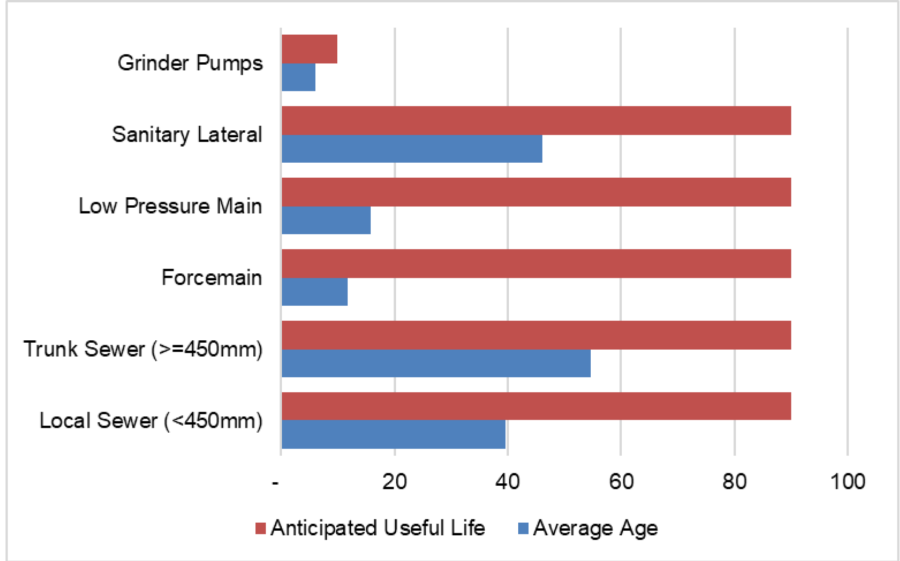


Table 2.4.5 compares the status of our Tavistock wastewater asset components, as identified in our 2017 Asset Management Plan to their current condition. The breakdown by component for vertical assets was not available as of the date the 2017 report was published, so there is no condition comparison available. Work is ongoing to further enhance the asset information at the component level.

The trend shows that the status of wastewater assets for the Tavistock system is relatively steady. The decline in condition for the forcemain and grinder pump assets is commiserate with their aging. The increase in trunk sewer overall condition rating is a result of the new linear installation in 2019. As the system continues to age it is expected that condition ratings will decline slightly, along with anticipated increases to operating and capital cost requirements.

Table 2.4.5 Wastewater Systems Condition Assessment

Asset Type	Asset Component	2017 Condition Rating	Current Condition Rating	Trend
Linear	Local Sewer (<450mm)	Good	Good	→
	Trunk Sewer (>=450mm)	Fair	Good	↑
	Forcemain	Fair	Poor	↓
	Low Pressure Main	-	-	-
	Sanitary Lateral	Fair	Good	↑
	Collection Tank	-	-	-
	STEP Pump	-	-	-
	Grinder Pump	Excellent	Poor	↓
Vertical	Pumping Station	Not assessed	Fair	-
	Wastewater Treatment Plant	Not assessed	Good	-
	Odour Control Facility	-	-	-
	Biosolids Centralized Storage Facility[4]	-	Excellent	-
	Other Facilities	Not assessed	Good	-
	Process Equipment	Not assessed	Good	-

[4] The Biosolids Centralized Storage Facility is a shared facility across the County with each system contributing to the costs based on number of customers. The value utilized throughout this report card represents Tavistock's share based on 2021 customers.

3.0 Levels of Service

County staff have developed a comprehensive Level of Service (LOS) Framework. This framework will help to establish a relationship between the current LOS being provided by the County's assets, and the associated operating and capital expenditures required to achieve the proposed LOS. The framework puts into perspective the definition and measurement of service performance in alignment with the County's corporate mission and vision.

Corporate Objective

The wastewater collection and treatment service ensures protection of the environment and public health of residents, visitors to the County and downstream users of the receiver (Thames River) and our partners in the watershed.

Legislative Requirements

Each of the County's WWTPs are regulated under the Ontario Water Resources Act, 1990[5] and operated in accordance with an ECA or historical Certificates of Approval (C of A) issued by the MECP.

The ECA for the County's WWTPs require annual reporting of operational and treated effluent discharge parameters into the receiving water bodies. The Annual Wastewater Treatment System Summary Reports are available on the County's website.

Framework

The structure of the County's LOS framework was developed to align with international best practices including the International Infrastructure Management Manual (IPWEA, 2015). The framework includes the mandatory measures to meet the requirements of Ontario Regulation (O.Reg.) 588/17 by including both Community and Technical Levels of Service. The metrics in this framework may be expanded upon as the County continues to improve its data collection and reporting processes.

[5] https://www.ontario.ca/laws/statute/90o40

3.1 Customer Levels of Service

Community or Customer Levels of Service are statements that describe quantifiable metrics of the service delivery outcomes from the perspective of the customer, expressed in non-technical terms. The following statements form our qualitative descriptions of the customer level metrics required under O.Reg. 588/17.

The Tavistock wastewater system connects to most residential, commercial and industrial spaces in the settlement areas of Tavistock, as outlined in figure 3.3.1. The Tavistock wastewater system provides for the safe collection and treatment of wastewater.

The County does not have any combined sewers within the Tavistock wastewater system. The Tavistock wastewater system is a separate wastewater system.

Infiltration and inflow can enter through a variety of sources (cracks in pipes, weeping tile connections, cross connections, etc.). In the case of heavy rainfall events, wastewater mains may experience a volume of water and wastewater that exceeds its designed capacity. In some cases, this can cause water and/or wastewater to overflow into streets or backup into homes or businesses.

To minimize wastewater overflow into streets or backup into homes, the County has established design standards to convey flows under ultimate conditions, design sheets for capacity needs that include infiltration inflow. Newer wastewater mains are made of gasketed PVC piping to reduce potential leaks occurring between fitted pipe segments.

Final Effluent is the treated water that is discharged to the environment through the approved effluent disposal facilities, including all bypasses that are required to meet the compliance limits stipulated in the ECA for the WWTP, at the final effluent sampling points. The effluent criteria includes effluent flow rates, and parameters such as total suspended solids, Biochemical Oxygen Demand (BOD), phosphorous, ammonia, and E. coli. The County produces annual reports summarizing each WWTPs operation and treated effluent discharge quality and these can be found on the County's website at: http://www.oxfordcounty.ca/Services-for-You/Water-Wastewater/Wastewater/Annual-reports.

Table 3.1.1 outlines additional customer focused performance metrics from the County's LOS framework.

3.2 Technical Levels of Service

Technical Levels of Service metrics are quantifiable metrics applied against assets that are subject-matter specific inputs or outputs supported by the day-to-day activities of County staff. Table 3.1.1 includes the technical metrics required under O.Reg. 588/17, as well as, additional metrics the County has included in the framework.

3.3 Levels of Service Maps

As a further illustrative example of our community levels of service, a map is included as figure 3.3.1 showing areas within the Tavistock village boundary that are serviced by the Tavistock wastewater system.

Figure 3.3.1 Tavistock sanitary serviced properties

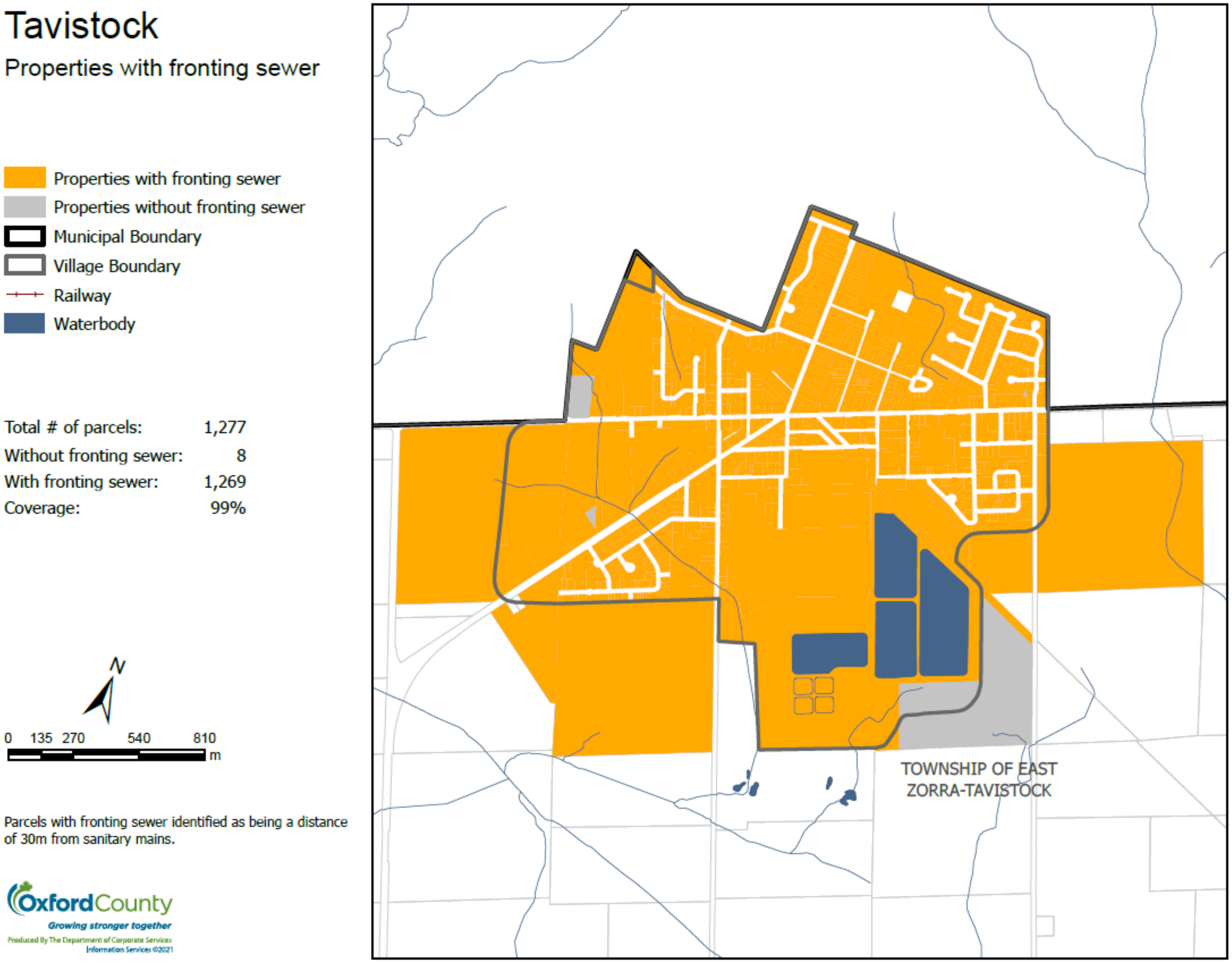


Table 3.1.1 Performance Measures

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Customer / Council Focused Performance Measures					
Reliability	Providing wastewater services with minimal interruptions	% of properties within the system boundary connected to the municipal wastewater system	N/A	99%	TBD
		% of wastewater mains designed to be resilient to overflow or flooding during wet weather events	100%	100%	100%
Environmental Stewardship	Providing wastewater services that have minimal impacts on the environment	% of overall facility ECA compliance rate	100%	100%	100%
Cost Efficient	Providing wastewater services in an efficient manner	Operating cost to provide service ($/connection)	$5,183[6]	$933	TBD
Technical Focused Performance Measures					
Reliability	Providing wastewater services with minimal interruptions	The number of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system.	0 connection-days to 1,120 connections	0 connection-days to 1,151 connections	TBD
		% of system inspected (CCTV) annually	4.2%	8%	7%
		% of wastewater mains flushed annually	19.8%	17.5%	20%
		# of overflow or spill occurrences	0	1	0
Environmental Stewardship	Providing wastewater services that have minimal impacts on the environment	% of wastewater estimated to have by-passed treatment	0%	0.009%	0%

[6] The significant increases in operating costs in 2020 is due to the bio-solids cleanout at the Tavistock lagoons, although completed as a capital project, is considered a maintenance activity.

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
		The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system.	0 violations to 1,120 connections	0 violations to 1,151 connections	0
Cost Efficient	Providing wastewater services in an efficient manner	Operating cost per kilometre of wastewater main for collection	N/A	$8,097	TBD
		5 year average capital expenditure for wastewater collection	$0.05M	$0.06M	TBD
		5 year average capital expenditure for wastewater treatment	$1.3M	$1.2M	TBD

4.0 Asset Management Strategy

4.1 Lifecycle Activities and Planned Actions

Wastewater collection assets undergo regular maintenance and inspection. As part of capital works project analysis, determinations of whether wastewater pipe replacement or relining should occur is reviewed. This process is fully integrated with the renewal needs of the roadways and other underground assets, such as drinking water and stormwater. This integrated approach ensures our renewal projects for these service areas are delivered with optimal timing to increase value and minimize disruption to our communities. For example, if a roadway is targeted for renewal, coordination between service areas and area municipalities will determine whether the underlying stormwater, drinking water or wastewater assets are also of an age or condition that requires renewal, to ensure these projects are delivered together to reduce disruption for our communities and deliver enhanced value.

Process assets and equipment undergo extensive operations and maintenance regimes to sustain their reliable operation. Investment needs are identified and coordinated with normal operations to minimize disruptions to service. Major replacements are planned and accommodated using system redundancy and changes to operations, in order to maintain service. It is critical to maintain wastewater service in order to protect public health and the environment.

There are six main lifecycle activities considered in the overall sustainable management of wastewater assets, described in table 4.1.1.

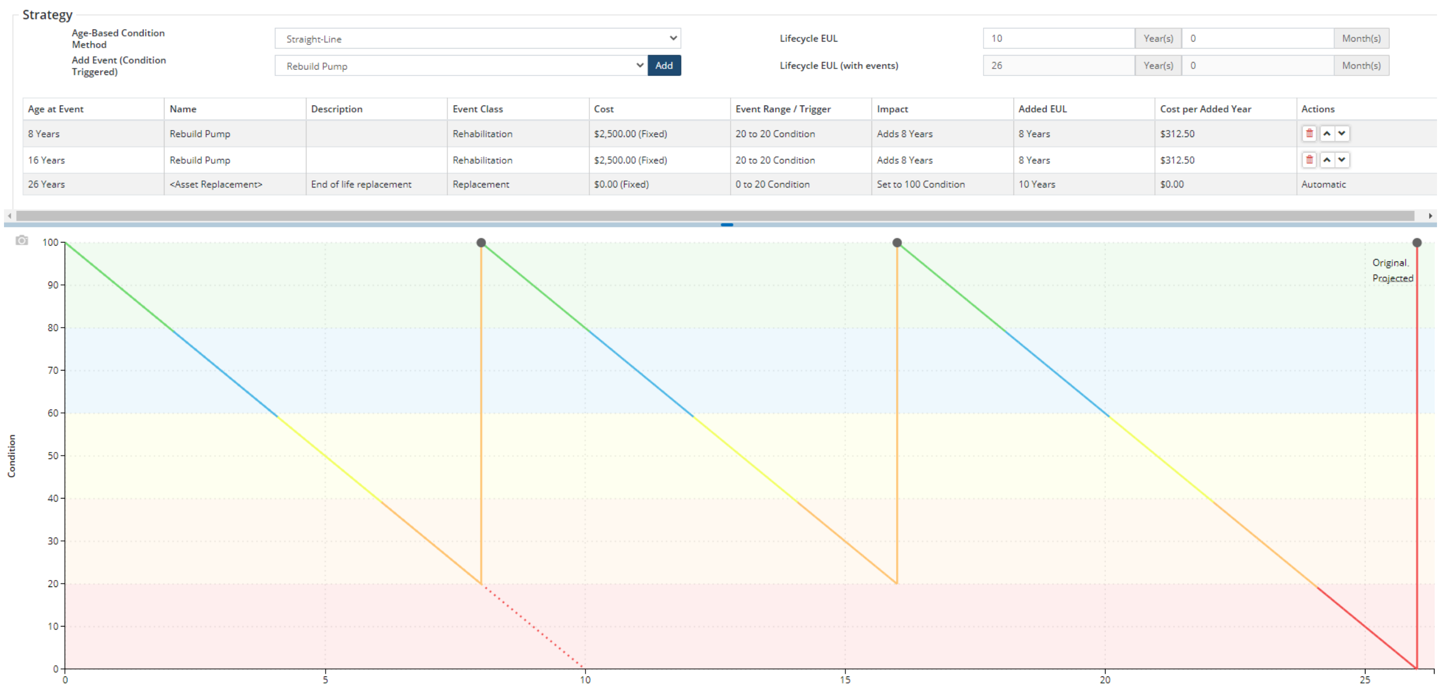
Table 4.1.1 Lifecycle Activities

Strategy	Lifecycle Activity
Non-Infrastructure Solutions	Actions or policies that can lower costs or extend useful lives. **Trigger: Ongoing**
Maintenance	Regularly scheduled maintenance and inspection programs including cleaning and flushing, manhole repairs, CCTV inspections, exercising diesel gen-sets and minor repairs. These activities do not improve the overall condition of the asset, nor increase its useful life. **Trigger: Ongoing**
Rehabilitation / Renewal	One-time events that increase the condition and extend the useful life of the asset; including sewer lining and seal and grout programs. **Trigger: Fair/Poor**
Replacement	Occurs at the end of the useful life and/or when rehabilitation is no longer an option – can vary among assets due to construction material and environmental factors that impact the degree of deterioration and performance. **Trigger: Poor/Critical**
Disposal	Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the County to provide services. County staff coordinate with contractors to ensure safe removal and environmental compliance when disposing of assets. **Trigger: Poor/Critical**
Expansion / Growth	Planned activities required to extend services to previously unserved areas, expand services to meet growth demands, or increase the level of service being provided. **Trigger: Development**

The lifecycle management strategy is the set of planned actions that should enable the assets to provide users with the proposed level of service in a sustainable way, while achieving acceptable levels of risk and the lowest lifecycle costs required to provide that level of service. Lifecycle considerations for assets include analysis of the timing to carry out key asset management activities including inspection, maintenance, repair, and replacement. Ongoing preventative maintenance activities are outlined in the County's work management system. The rehabilitation and replacement activities impacting the asset components condition and useful life are contained within profiles in the County's asset management system. For some assets, replacement needs are based on a run to failure strategy, as this is the most economical. Work is ongoing within the County's asset management systems to build all the component profiles and identify where each asset is within the lifecycle.

As an example, figure 4.1.2 illustrates the lifecycle strategy of grinder pumps. The pumps are re-built twice, extending the overall useful life from 10 years to approximately 25. The annual cost requirement from a run to failure strategy is $1,500 per year where the annual cost requirement using the rehabilitation strategies decreases to just below $800 per year.

Figure 4.1.2 Grinder Pumps Lifecycle Strategy



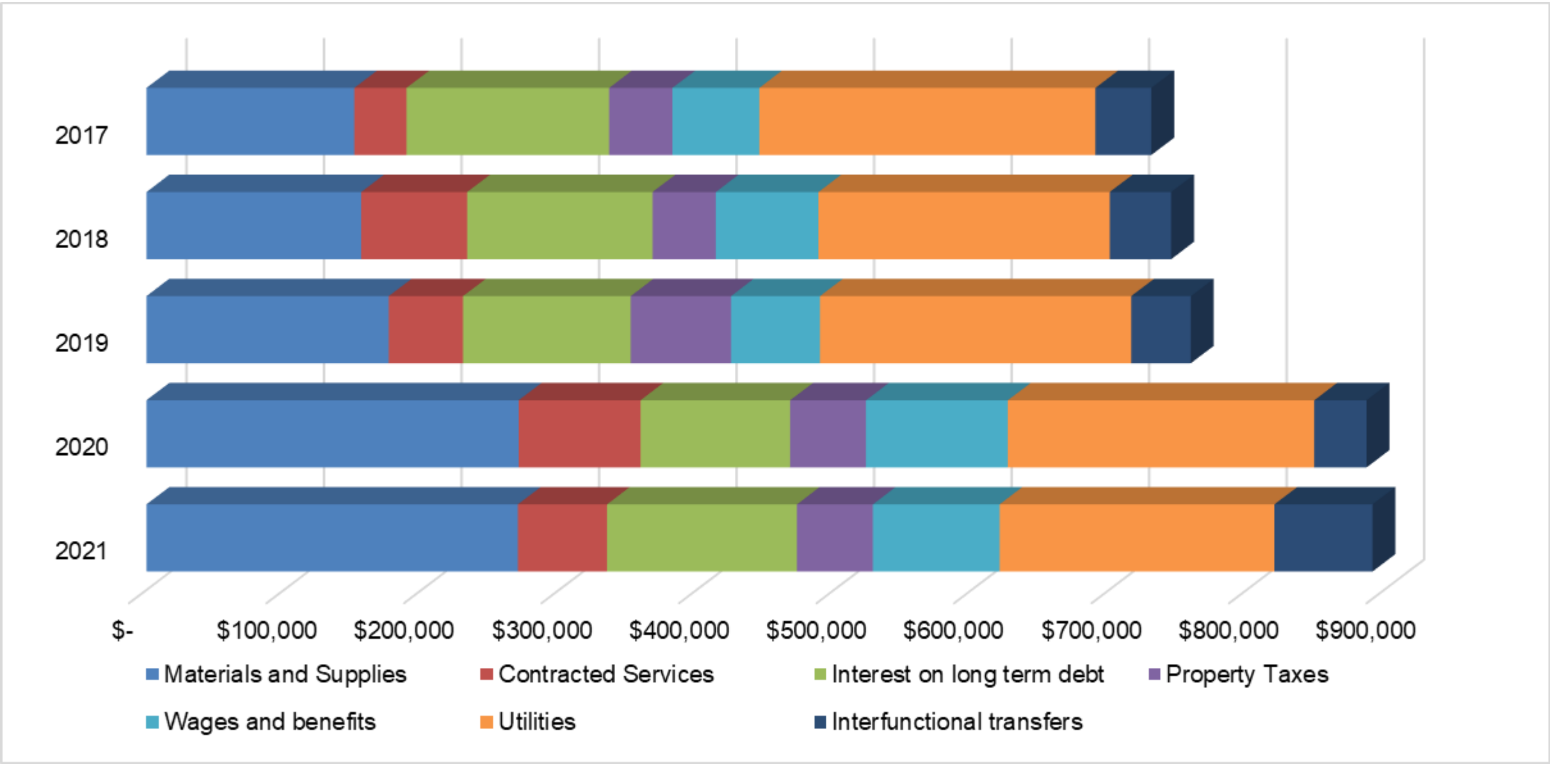
Age at Event	Name	Description	Event Class	Cost	Event Range / Trigger	Impact	Added EUL	Cost per Added Year	Actions
8 Years	Rebuild Pump		Rehabilitation	$2,500.00 (Fixed)	20 to 20 Condition	Adds 8 Years	8 Years	$312.50	
16 Years	Rebuild Pump		Rehabilitation	$2,500.00 (Fixed)	20 to 20 Condition	Adds 8 Years	8 Years	$312.50	
26 Years	<Asset Replacement>	End of life replacement	Replacement	$0.00 (Fixed)	0 to 20 Condition	Set to 100 Condition	10 Years	$0.00	Automatic

4.2 Significant Operating Expenses

Significant operating expenses are required in order to sustain an asset over its lifecycle. The County is always looking at ways to optimize our operating investment to ensure we are achieving the best value for our residents, and businesses. Essential to this is a strong operations and maintenance plan within our work management system. Operating expenses are incurred through a number of sources – preventative maintenance activities, utility costs, property taxes and more. Despite the fact that minor maintenance is incorporated into planned operations and maintenance programs, there are cases where it is unplanned.

Figure 4.2.1 shows the operating expenses from 2017 through 2021 for the Tavistock wastewater system grouped by expense type. The groupings align with those reported on the County's Financial Information Return (FIR), with further breakdown for property taxes and utility costs as these expenses can be significant.

Figure 4.2.1 Operating Expenses



4.3 Risk Strategy

Risk management frameworks are developed to assist with the prioritization of investments within the capital planning period. The preferred approach is to implement a triple bottom line analysis approach to evaluate:

- Social impacts of asset failure, including impacts to customers, businesses and the County's reputation;
- Environmental impacts of asset failure; and
- Economic impacts of failure including the cost of remediation.

In the context of asset management, risk is the multiple of the consequence of an asset failing and the probability that the event will occur.

Figure 4.3.1 illustrates the risk ratings for the Tavistock wastewater assets at a summary level. Although work was recently completed at the Tavistock lagoons, not all cells were rehabilitated. County staff will continue to monitor the higher risk assets, review and/or complete physical inspections to further validate the age-based condition ratings and plan for lifecycle strategies accordingly.

Figure 4.3.1 Asset risk profile

Consequence	1	2	3	4	5
5	2 Assets 2.00 unit(s) $11,676,000.00	0 Assets - $0.00	2 Assets 2.00 unit(s) $16,416,000.00	0 Assets - $0.00	0 Assets - $0.00
4	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
3	3 Assets 739.22 m $369,610.00	4 Assets 4.00 unit(s) $2,000,000.00	4 Assets 4.00 unit(s) $1,910,000.00	2 Assets 382.10 m $229,260.00	0 Assets - $0.00
2	55 Assets 2,773.96 m, unit(s) $1,382,294.00	72 Assets 683.63 m, unit(s) $680,155.00	113 Assets 1,025.59 m, unit(s) $1,154,622.00	80 Assets 2,883.58 m, unit(s) $1,979,204.00	6 Assets 422.74 m, unit(s) $292,161.00
1	698 Assets 5,004.18 m, unit(s) $6,482,456.00	208 Assets 3,409.47 unit(s), m $2,942,388.00	104 Assets 3,439.95 m, unit(s) $2,482,280.00	465 Assets 4,154.01 m, unit(s) $4,646,004.00	53 Assets 969.59 m, unit(s) $979,936.00

Probability

5.0 Financial Strategy

5.1 Financing Strategy

Hemson Consulting Ltd. (Hemson) was retained through a competitive process to assist with analyzing and developing the County's water and wastewater rates for a 4-year period from 2021 to 2024. The rate modeling includes all system asset management needs and all sources of funding including Community Servicing Assistance Program (CSAP) funding, development charges, developer and resident contributions. In most cases, the capital replacement component is the average annual required contribution level in order to establish full cost recovery; however, the contribution may vary based on the system's ability to meet full cost recovery for the next 10-years.

Capital work is funded from reserves (based on the capital contribution included in the user rates), development charges (for growth projects), debentures and grant funding when available. The County continually assesses opportunities for additional funding options and revenue streams to address our asset needs.

Where possible, replacement activities are planned in conjunction with the replacement needs of the road network and underlying water and stormwater assets. This requires a co-ordinated effort with area municipalities as the majority of the County owned water and wastewater linear assets falls under the area municipalities' roadways. This collaboration is essential for ensuring a cost effective approach to maintaining assets within the County regardless of ownership.

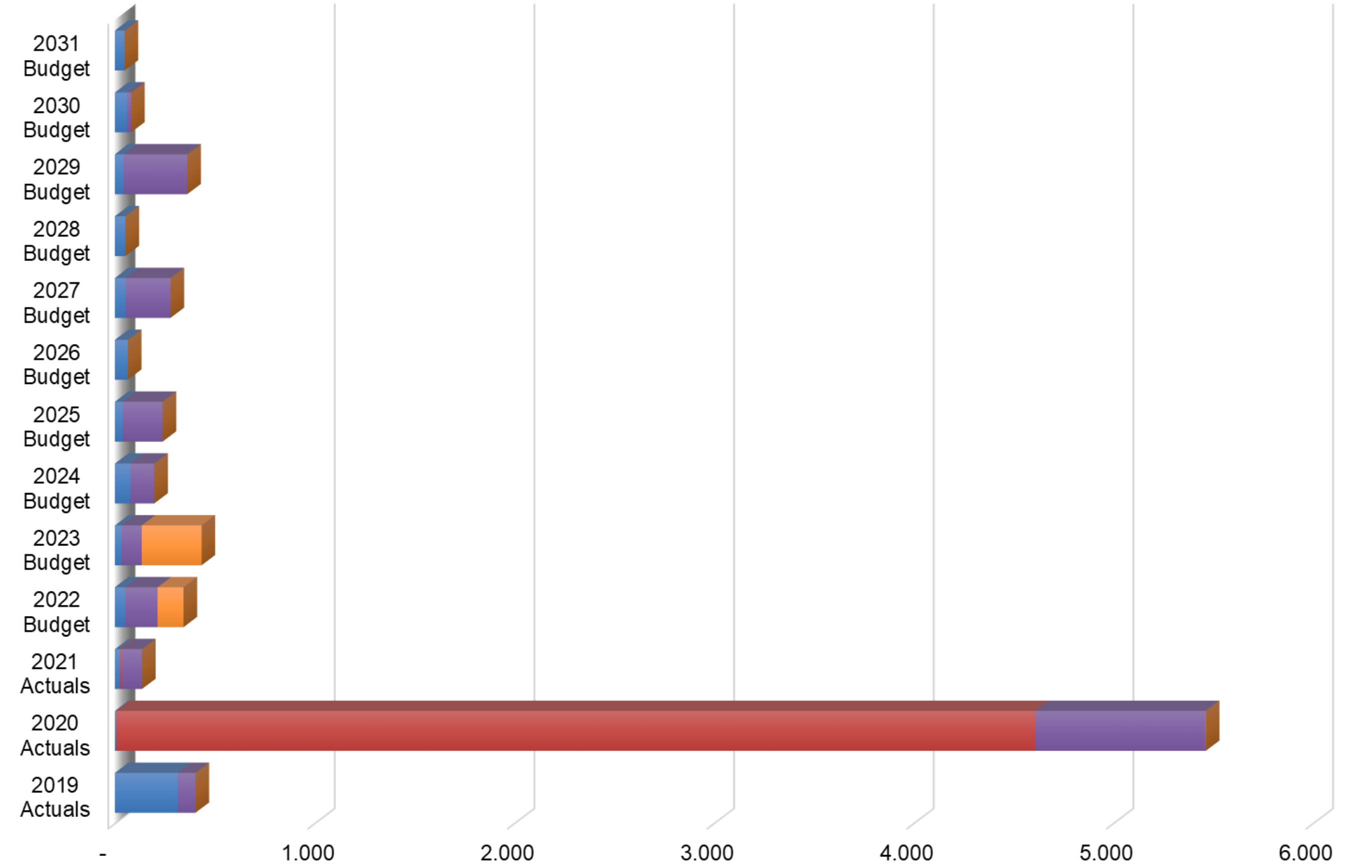
In addition to targeting and prioritizing the investment needed to maintain existing assets, there are also planning processes in place to determine the additional assets needed to meet growing demands through population increases or demand for new services. The projects targeted to meet growth are funded primarily through Development Charges (DC) – the mechanism that enables recovery of growth-related capital expenditures from new development. These charges are governed by the Development Charges Act and are applied in accordance with our Development Charges By-Law. Impacts from the growth activities analyzed in the 2019 DC Background Study are included in this AMP.

5.2 Expenditure History and Forecasts

There are currently no significant expenditures anticipated for the Tavistock wastewater system within the 10-year approved budget, as illustrated in figure 5.2.1. Linear asset replacements are ongoing, in conjunction with the local area municipal roadway construction projects. Minor process equipment replacements were included in the 2021 budget. County staff continue to review anticipated asset management needs with each budget cycle, subject to existing resource limitations.

Non-Infrastructure solution projects include shared projects for condition reviews, studies and implementation of the work management system.

Figure 5.2.1 Expenditures (millions)

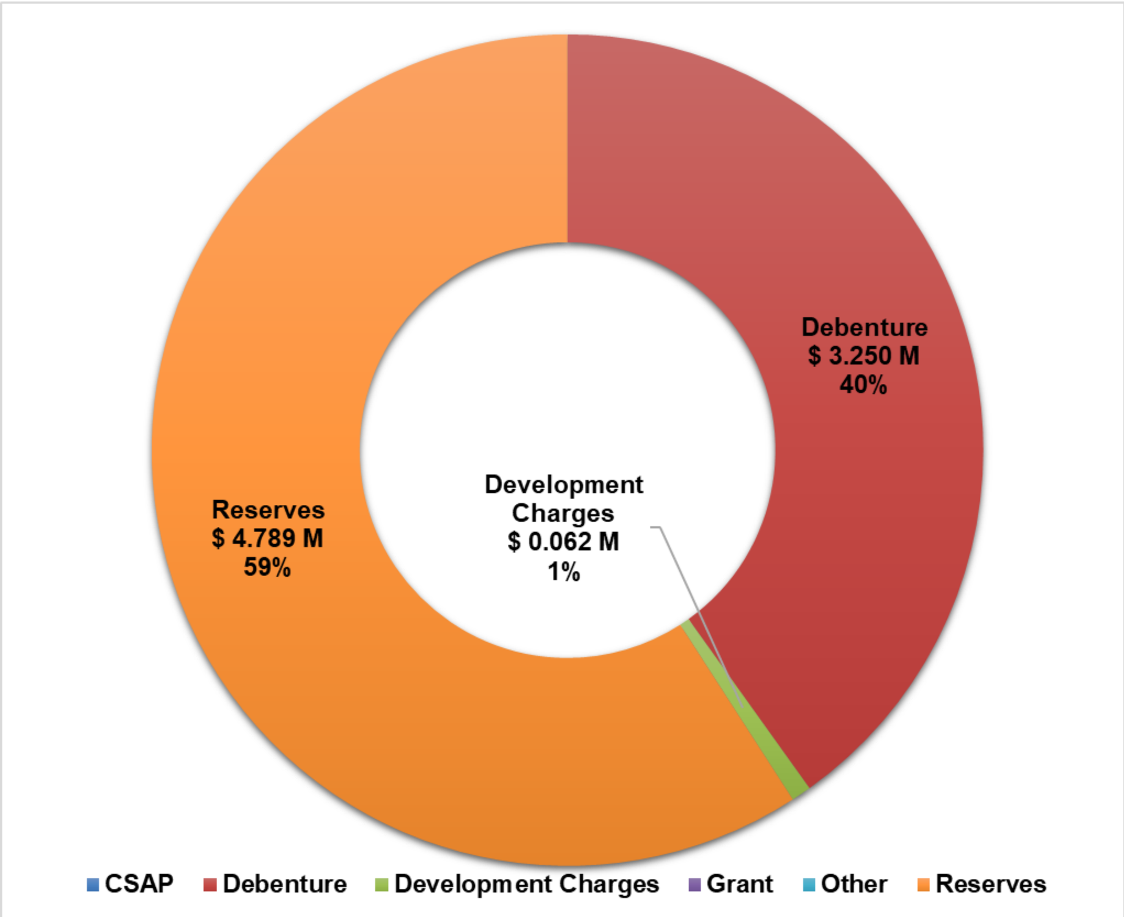


	2019 Actuals	2020 Actuals	2021 Actuals	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Non-Infrastructure Solution	0.315	0.006	0.025	0.052	0.033	0.077	0.039	0.065	0.053	0.053	0.044	0.061	0.048
Maintenance	-	4.603	0.009	-	-	-	-	-	-	-	-	-	-
Rehabilitation / Renewal	-	-	-	-	-	-	-	-	-	-	-	-	-
Replacement	0.088	0.853	0.102	0.162	0.101	0.120	0.200	-	0.225	-	0.318	0.020	-
Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-
Expansion / Growth	-	0.001	-	0.130	0.300	-	-	-	-	-	-	-	-

5.3 Capital Revenues

Primarily the Tavistock Wastewater replacement projects, identified in the County's 10-year capital plan, are anticipated to be funded by the Wastewater – Tavistock Reserve, which is funded by user fees. The Tavistock lagoon bio-solids cleanout project, recently completed, was largely funded by debt. The Tavistock wastewater reserve currently has a sufficient balance to fund the 10-year non-growth related asset activities within the approved 2022 Long-Term Capital Plan.

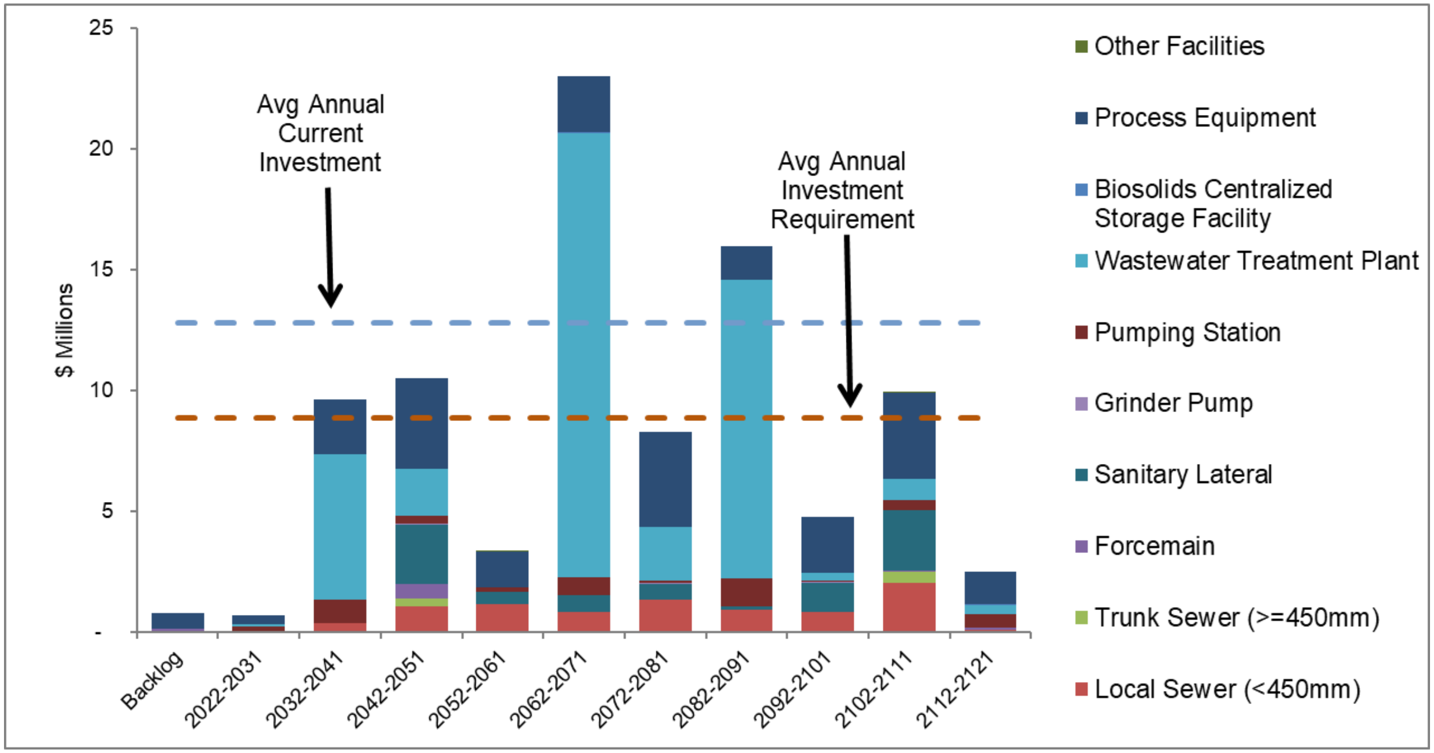
Figure 5.3.1 Sources of Capital Revenues 2019-2031 (millions)



5.4 Capital Investment

Based on the asset management lifecycle strategies identified, the financial requirements over the next 100-years are determined in current dollars. The average annual investment requirement represents the amount of capital funding required to renew and maintain the existing assets on an annual basis so services can continue to be delivered. These estimates assume that all work is able to be completed, as indicated, and does not take into account future changes due to environmental factors, new maintenance techniques, and unidentified growth. The annual requirement has increased from the 2017 AMP, primarily due to significant development and improvements the County has made to the vertical data, resulting in asset useful lives that are more reflective of their actual lifecycle. Further work is ongoing with the vertical data to fully determine lifecycle needs (including maintenance and rehabilitation strategies) which will impact the annual requirement for vertical assets. The data will continue to be reviewed with each budget and business plan cycle.

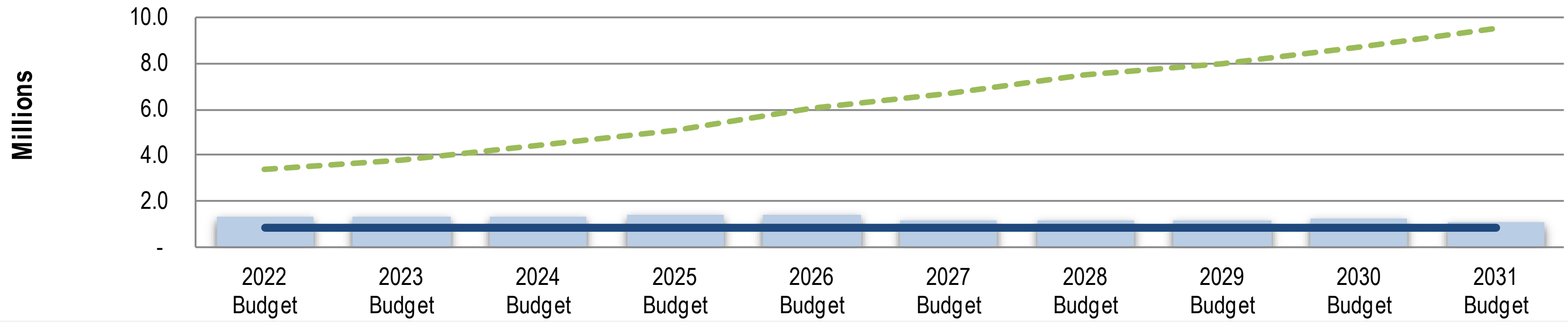
Figure 5.4.1 Average Annual Capital Requirements



The following figure links the annual capital funding needs to the capital investments contained in the budget. The timing of the actual capital projects may vary, however annual investments in capital assets is important for financial sustainability.

Figure 5.4.2 Funding Requirements

	Key	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Annual Required Investment		**887,000**	**887,000**	**887,000**	**887,000**	**887,000**	**887,000**	**887,000**	**887,000**	**887,000**	**887,000**
Current Investment		1,340,295	1,349,644	1,363,244	1,394,961	1,421,380	1,217,929	1,215,518	1,212,058	1,230,833	1,065,936
Funding Deficit		-	-	-	-	-	-	-	-	-	-
Funding Surplus		*453,295*	*462,644*	*476,244*	*507,961*	*534,380*	*330,929*	*328,518*	*325,058*	*343,833*	*178,936*
Reserve Balance		3,372,776	3,762,434	4,422,626	5,115,003	6,049,796	6,731,452	7,502,122	7,965,885	8,717,244	9,506,095



It is important to note that although Tavistock is showing a surplus in the current investment level, a significant portion of this investment is being utilized for debenture payments (approximately 40%), and is not available for use on lifecycle activities within the 10-year period.

5.5 Funding Gap Analysis

Using the anticipated 10-year asset lifecycle needs, along with the current capital investment level, the County is able to determine if there is an anticipated funding gap for the Tavistock wastewater system. Consideration is then given to the current system reserve balance to determine the residual funding gap. The County would then investigate opportunities for reducing this residual funding gap which, may include increases to the user rates, utilization of grant funding opportunities and further review of lifecycle strategies and proposed levels of service.

Figure 5.5.1 illustrates the anticipated asset management 10-year lifecycle needs, including the projected funding surplus (left side of figure 5.5.1) and funding needs (right side of figure 5.5.1) for the Tavistock wastewater system. The system calculates the optimal expenditures based on theoretical asset lifecycle needs. These needs have not yet been reviewed in depth with County operations staff, and incorporated into the 10-year capital budget. This is anticipated to be completed as part of the 2023 Business Plan and Budget process with subsequent review annually.

The anticipated expenditures have been increased for non-infrastructure solution projects; approximately $0.5 million.

While the anticipated expenditure calculation accounts for the lifecycle activities of expansion / growth projects it does not account for the initial investment. It is important to adjust for these projects, where the initial investment is growth related and not projected to be DC funded within the 10-year capital plan. The resulting growth / expansion projects added to the anticipated asset needs is approximately $0.4 million.

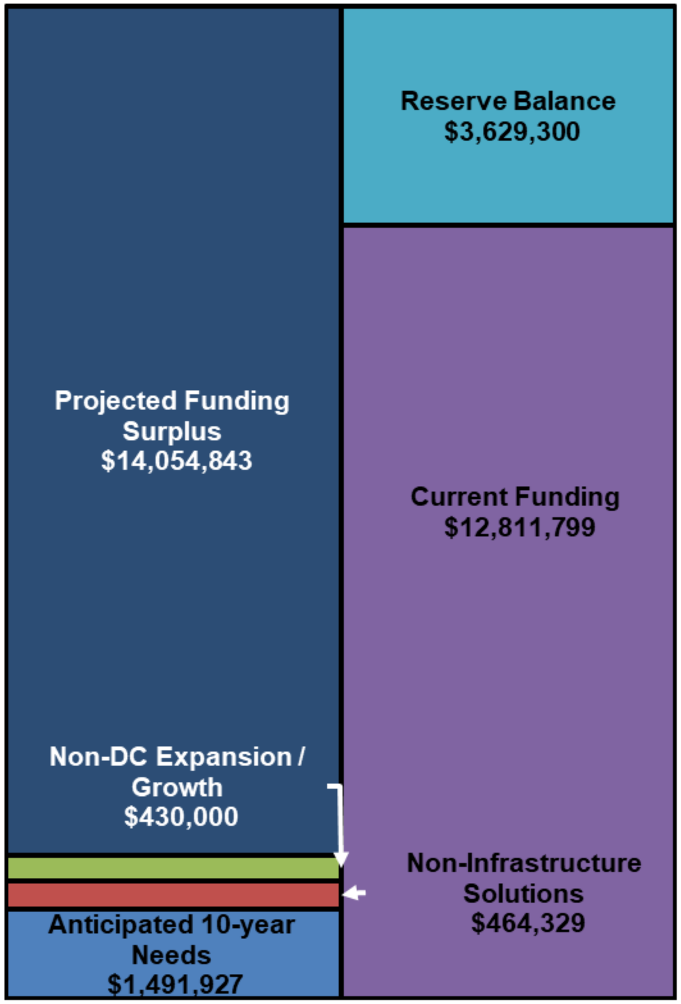
The Tavistock wastewater system is projecting a funding surplus over the 10-year capital planning period. Although the Tavistock wastewater system has a projected funding surplus over the 10-year horizon, the annual funding requirement is the basis for ensuring the long-term financial sustainability well into the future. Approximately 40% of the current funding is committed to debenture payments over the 10-year horizon. The annual funding requirement will be reviewed holistically as part of the next rate study.

Drawing the reserve balance to zero would likely result in increased user fee requirements in the subsequent 10-year period in order to fund the anticipated asset lifecycle needs.

The reserve is also utilized to fund emergency or unplanned expenses. A minimal or fully committed balance would limit the ability to fund these types of expenses. Consideration needs to be given to a minimum balance the County should maintain based on these risks. Analysis of the reserve target minimum balance, will be completed as part of the annual reserve review process.

Failure to address the long-term asset lifecycle needs could result in significant increases to rates in the future as assets reach end of life; or reductions in localized and/or regional service. This may include blockages, sewer backups, basement flooding, localized service outages, increased maintenance costs on assets past their optimal life, poor quality effluent, damage to the natural environment, fines, increase in insurance claims for property damage and personal injury resulting from poor asset conditions, etc.

Figure 5.5.1 Anticipated Needs (10-Year)



6.0 Climate Change

As part of the asset management planning process, the County will consider the risks and vulnerabilities of capital assets to climate change and the resulting actions that may be required. Commitment will be made to the development of tailored actions that make the best use of our resources to mitigate and adapt to climate change, in accordance with our local reduction targets, financial capacity and stakeholder support.

Optimization of the wastewater treatment process can help reduce the emissions of GHG such as nitrous oxide (N2O), carbon dioxide (C02) and methane (CH4) from being released into the environment at treatment plants. Optimization requires the correct equipment to ensure conditions can be achieved to reduce GHG emissions.

Nitrous oxide (N_2O) is released in the secondary treatment train through the nitrification and denitrification process, which is used to remove nitrogenous components from the wastewater. Nitrifying bacteria oxidize ammonia to nitrites and nitrates. To minimize N_2O emissions, the plant is optimized by running the activated sludge process at a high sludge retention time (SRT) with optimal dissolved oxygen levels, which results in low ammonia and nitrite concentrations. High amounts ammonia and nitrite compounds, especially when there are excessive amounts of dissolved oxygen, can trigger biogenic N_2O emissions.To control this process, upgrades were recently completed:

- Fine bubble membrane diffusers installed at the end of 2020 to provide optimum dissolved oxygen.

Methane (CH_4) is generated by the anaerobic biological break down of organics or the release of dissolved CH_4 found in the wastewater influent. The Tavistock WWTP does not have anaerobic digestion and does not generate significant levels of methane gas.

Carbon Dioxide (CO_2) is produced in biological treatment, where the organic carbon in the wastewater is utilized for biomass growth or oxidized into CO_2. By operating WWTPs at high sludge retention times, endogenous respiration (cell lysis results in biomass growth) is encouraged, which decreases the overall sludge production, which results in a decrease in CO_2 production. Upgrades with this process include:

- New surface aerator installation to provide proper mixing for biomass growth.

Improving energy efficiency at WWTPs can help to reduce GHG emissions by decreasing consumption of fossil fuel-based energy. Significant energy savings can be realized by increasing the efficiency of plant equipment such as pumps and blowers, and using generated fuel sources.

Climate change risks are considered during the planning phase of each capital project. Increasing resiliency to changing climate conditions through the use of backup power generation, redundancies with critical equipment, use of SCADA to collect accurate information and make informed decisions. By conducting inspections and completing studies, problem areas can be identified and planned to repair.

- use of backup power generation,
- redundancies with critical equipment,
- Ongoing development and implementation of a SCADA Master Plan, and
- conducting inspections (including CCTV) and studies to identify problem areas and complete repairs.

WASTEWATER SYSTEM

Plattsville

Table of Contents

1.0 Introduction

The County maintains a diverse portfolio of assets that are required to provide the community of Plattsville with the safe collection and treatment of wastewater. The Plattsville Wastewater Treatment Plant (WWTP) provides wastewater treatment for residential, commercial, and industrial users in the Village of Plattsville.

The Plattsville WWTP is a Class I rated facility, as defined by Ontario Regulation 129/04. It is a lagoon treatment facility consisting of two aerated lagoon cells and two conventional wastewater stabilization ponds, a filter pump station and four intermittent sand filters, with an outfall pipe to the Nith River. The entire treatment process is completed in accordance with strict standards, processes, and limits as regulated by the WWTPs Environmental Compliance Approval (ECA) issued by the Ministry of Environment, Conservation, and Parks (MECP) of the Ontario Provincial Government.

The wastewater collection network transports residential, commercial and industrial waste to the WWTP for treatment. The wastewater collection network consists of a mix of gravity mains, low pressure mains and forcemains. Wastewater flows by gravity wherever possible, where changing elevations require the use of sewage pumping stations (SPS). Other specialized structures such as manholes, valve vaults, meter stations, diversion structures and siphons are required to convey wastewater to the WWTP.

Sound management of our wastewater systems helps us realize our vision of being a vibrant community, working well and growing stronger together!

Like many of our assets, wastewater assets are facing increased challenges as a result of aging assets, climate change, increasing demand due to growth in our communities and regulatory changes. Our investment in these assets must therefore be balanced to optimize investment for renewal with the growing needs of our community.

This plan provides information regarding our approach to the management of our wastewater assets over the short (10-year) and long (100-year) term, demonstrating our commitment to assessing and meeting the levels of service valued by our residents and businesses.

1.1 Improvement Plan

The County recognizes that asset management is a continuously evolving process. The following recommendations are based on the review of current management practices, inventory, valuation and condition analysis.

- Document lifecycle history on assets within the asset management systems.
- Continue to reduce asset data gaps.
- Determine asset components and maintenance strategies for facilities and associated processes.
- Refine the risk assessment approach at the component level.
- Incorporate findings from the Water and Wastewater Master Plan.

2.0 State of Assets

2.1 Inventory

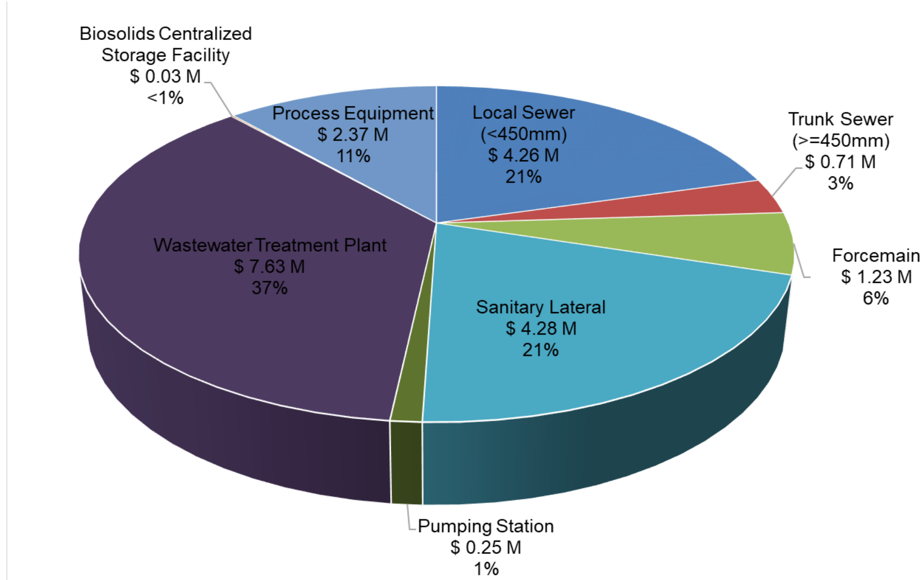
Wastewater assets are those that enable us to live in a clean and safe environment. It includes everything from wastewater mains that service our homes and businesses throughout the County, to the WWTPs, which ensure that effluent is properly treated before being discharged into the natural environment.

We have two different asset classes within the wastewater portfolio in order to effectively collect and treat wastewater from our community:

- Linear, which represent the collection pipe network, including the maintenance holes, connectors and related parts required in such a network.
- Vertical, which represent facilities (including the multiple buildings and structures that the facilities are comprised of), and related process systems and equipment required to perform the needed functions.

Table 2.1.2 displays our current wastewater inventory and the associated replacement costs and average age for each asset component. The County continues to make improvements to increase the integrity of our wastewater data. The inventory figures in table 2.1.2 capture inventory within newly constructed subdivisions which the County is aware of and anticipates assuming ownership of. The County generally assumes ownership of these assets approximately two years after full operation. It is important to include growth assets to ensure that lifecycle activities are planned and funded accordingly.

Figure 2.1.1 Inventory Valuation



2.2 Valuation

The replacement cost valuation for wastewater linear is based on current tender prices, where available. Current tender prices are adjusted where County staff feel some cost increases are only temporary due to COVID.

The replacement cost valuation for wastewater vertical is based on the latest information available, which includes current replacement costs, insurance valuations, and valuations from studies / assessments completed in prior years.

Table 2.1.2 – Plattsville Wastewater System Inventory

Asset Type	Asset Component		2017 Inventory	Current Inventory	Replacement Cost	Average Age
Linear	Local Sewer (<450mm)	m	8,726	10,455	$4,264,910	33 Years
	Trunk Sewer (>=450mm)	m	-	1,428	713,760	43 Years
	Forcemain	m	2,042	3,085	1,232,822	42 Years
	Low Pressure Main	m	-	-	-	-
	Sanitary Lateral	each	652	659	4,283,500	29 Years
	Collection Tank	each	-	-	-	-
	STEP Pump	each	-	-	-	-
	Grinder Pump	each	-	-	-	-
Vertical	Pumping Station	each	1	1	250,000	27 Years
	Wastewater Treatment Plant	each	1	1	7,630,512	38 Years
	Odour Control Facility	each	-	-	-	-
	Biosolids Centralized Storage Facility[1]	each	-	1	25,138	4 Years
	Process Equipment	total	N/A	N/A	2,372,231	19 Years
Total Replacement Cost					**$20,772,873**	

The local sewer, trunk sewer and forcemain quantity increases are largely driven by the addition of data, related to the lagoon site, not previously available in 2017, along with some forcemain installation completed in 2017.

[1] The Biosolids Centralized Storage Facility is a shared facility across the County with each system contributing to the costs based on number of customers. The value utilized throughout this report card represents Plattsville's share based on 2021 customers.

2.3 Condition Assessment Approach

The assessment approach for our wastewater assets utilizes a combination of physical assessments, asset attributes, such as material and sizing, as well as established estimated useful lives.

The County's condition scale and visual inspection ratings are based on the following approach:

- Excellent - Asset is well maintained with no noticeable defects.
- Good - Asset may show signs of minor deterioration and may require some maintenance.
- Fair - Deterioration evident, function affected. Asset may require on-going monitoring.
- Poor - Serious deterioration, function inadequate. Asset may require ongoing monitoring.
- Critical - No longer functional, general or complete failure. Asset may require extensive monitoring.

The Pipeline Assessment Certificate Program (PACP) is the North American Standard for pipeline defect identification and assessment[2]. Closed-circuit television (CCTV) is the principal method of inspecting drains and sewers. In this process, a small robotic crawler vehicle with the CCTV camera attached is lowered into the pipe to complete the inspections. A structural rating, on a scale of 0-5, is then assigned using sewer condition assessment standards, with 0 representing an asset with minimal structural deficiencies and 5 representing assets on the verge of failure.

Table 2.3.1 illustrates how the PACP score ratings align with the County's standard condition scale. Unless otherwise noted, all images are of County assets, and are general representations of the asset condition at the time the photo was taken. Assets may have undergone lifecycle strategies since the date of the image impacting its condition.

Wastewater process assets are inspected by County staff on a regular basis as part the preventative maintenance program. These inspections identify performance and accelerated degradation and will trigger the creation of a reactive work order for repairs and rehabilitation. The County is working towards incorporating these inspections into a formalized condition rating. A visual inspection rating was provided for most process assets as part of the data collection process in 2018 and 2019.

Given the complexities and accessibility of some assets, it is not beneficial to complete a visual or performance based condition assessment on all assets. For assets which are unable to be visually inspected or that have since been replaced, an age-based condition rating is being used based on anticipated useful lives.

[2] https://www.nassco.org/content/pipeline-assessment-pacp

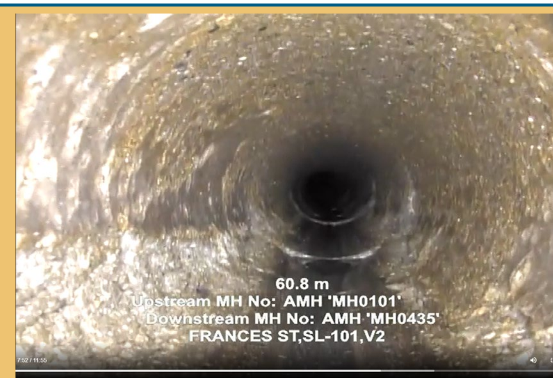
Table 2.3.1 PACP Score Ratings

Excellent
PACP Score of 0 or 1

Good
PACP Score of 2

Fair
PACP Score of 3

Poor
PACP Score of 4



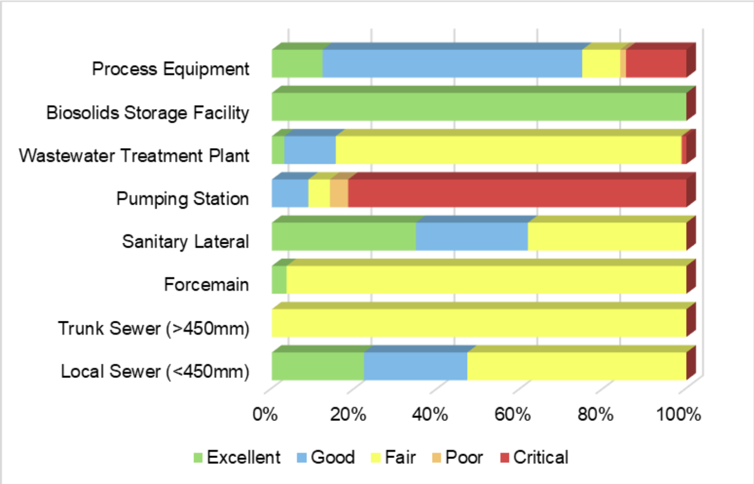
Critical
PACP Score of 5

2.4 Condition Assessment

The condition profile of our Plattsville wastewater asset components is shown in figure 2.4.1. The % in each condition is based on replacement costs.

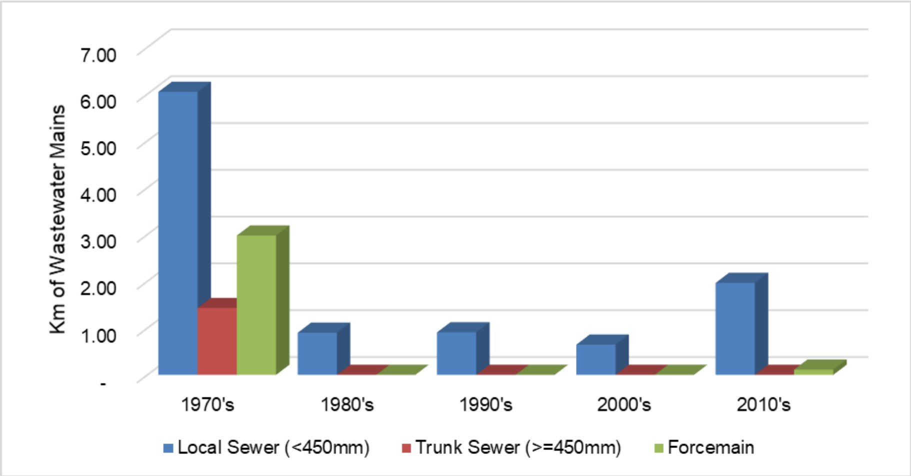
For the Plattsville wastewater assets: 3.3% of these assets are in poor or critical condition, and 37.1% in good or excellent condition in comparison to 10-11% and 57-65% respectively for Canadian municipalities reported on the Canadian Infrastructure Report Card[3]. While this may appears that our Plattsville wastewater assets are in slightly worse shape than other Canadian municipalities, the 2019 Canadian Infrastructure Report Card is an aggregate of self reported condition ratings across the Country and are based on a general rating scale which may not match the County's.

Figure 2.4.1 Asset Condition by Component



To better understand our Plattsville wastewater collection assets, an age profile of all our wastewater mains by decade is shown in figure 2.4.2.

Figure 2.4.2 Wastewater Mains by Age



The average age of the majority of linear assets within the Plattsville wastewater system is approximately 36 years, whereas the average age of the vertical assets varies by facility type from 4 to 38 years. This value must be considered in the context of the different asset types in the category, compared to the typical anticipated useful life of each asset type.

[3] http://canadianinfrastructure.ca/en/index.html

Table 2.4.3 outlines the anticipated useful life for each new build/replacement. The anticipated useful lives for our wastewater assets exclude the management strategies that the County utilizes to extend the overall life of our wastewater assets.

Table 2.4.3 Useful Life

Wastewater System Component	Anticipated Useful Life (years)
Forcemain, Low Pressure Main, Trunk Sewer, Local Sewer, Laterals	90
Collection Tanks	30
Grinder Pumps	10
Facilities	10 - 50
Process Equipment	8 - 75

Figure 2.4.4 illustrates the current average age of the Plattsville wastewater system linear components in comparison to their anticipated useful life, based on a run to failure strategy.

As the vertical assets can have a significant variability in age, from both a facility and process standpoint, they are not represented within figure 2.4.4.

There are a number of management strategies that the County may utilize to extend the overall life of our wastewater assets.

These strategies allow us to align the needs with those of other assets, resulting in the best overall value for our residents.

Figure 2.4.4 Age and Useful Life Comparison

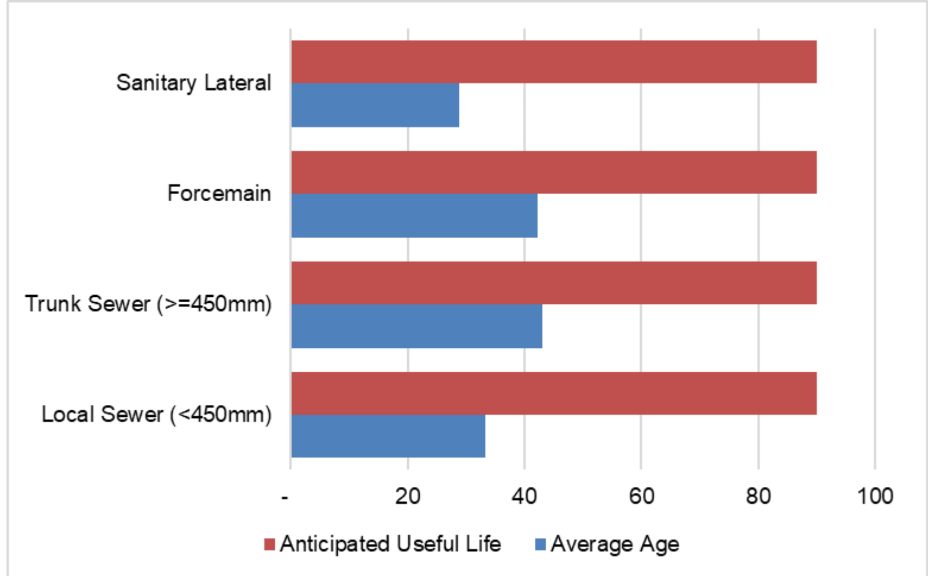


Table 2.4.5 compares the status of our Plattsville wastewater asset components, as identified in our 2017 Asset Management Plan to their current condition. The breakdown by component for vertical assets was not available as of the date the 2017 report was published, so there is no condition comparison available. Work is ongoing to further enhance the asset information at the component level.

The trend shows that the status of wastewater assets for the Plattsville system is steady to declining. The decline in condition is commiserate with the aging of these assets. The pumping station structure is showing a critical condition utilizing an age based condition rating. Operations staff will review the pumping stations information and complete a physical inspection, as required, confirming the condition of this facility. As the system continues to age it is expected that condition ratings will continue to decline until targeted lifecycle strategies are implemented.

Table 2.4.5 Wastewater Systems Condition Assessment

Asset Type	Asset Component	2017 Condition Rating	Current Condition Rating	Trend
Linear	Local Sewer (<450mm)	Good	Good	→
	Trunk Sewer (>=450mm)	-	Fair	-
	Forcemain	Good	Fair	↓
	Low Pressure Main	-	-	-
	Sanitary Lateral	Good	Good	→
	Collection Tank	-	-	-
	STEP Pump	-	-	-
	Grinder Pump	-	-	-
Vertical	Pumping Station	Not assessed	Critical	-
	Wastewater Treatment Plant	Not assessed	Fair	-
	Odour Control Facility	-	-	-
	Biosolids Centralized Storage Facility[4]	-	Excellent	-
	Process Equipment	Not assessed	Fair	-

[4] The Biosolids Centralized Storage Facility is a shared facility across the County with each system contributing to the costs based on number of customers. The value utilized throughout this report card represents Plattsville's share based on 2021 customers.

3.0 Levels of Service

County staff have developed a comprehensive Level of Service (LOS) Framework. This framework will help to establish a relationship between the current LOS being provided by the County's assets, and the associated operating and capital expenditures required to achieve the proposed LOS. The framework puts into perspective the definition and measurement of service performance in alignment with the County's corporate mission and vision.

Corporate Objective

The wastewater collection and treatment service ensures protection of the environment and public health of residents, visitors to the County and downstream users of the receiver (Nith River) and our partners in the watershed.

Legislative Requirements

Each of the County's WWTPs are regulated under the Ontario Water Resources Act, 1990[5] and operated in accordance with an ECA or historical Certificates of Approval (C of A) issued by the MECP.

The ECA for the County's WWTPs require annual reporting of operational and treated effluent discharge parameters into the receiving water bodies. The Annual Wastewater Treatment System Summary Reports are available on the County's website.

Framework

The structure of the County's LOS framework was developed to align with international best practices including the International Infrastructure Management Manual (IPWEA, 2015). The framework includes the mandatory measures to meet the requirements of Ontario Regulation (O.Reg.) 588/17 by including both Community and Technical Levels of Service. The metrics in this framework may be expanded upon as the County continues to improve its data collection and reporting processes.

[5] https://www.ontario.ca/laws/statute/90o40

3.1 Customer Levels of Service

Community or Customer Levels of Service are statements that describe quantifiable metrics of the service delivery outcomes from the perspective of the customer, expressed in non-technical terms. The following statements form our qualitative descriptions of the customer level metrics required under O.Reg. 588/17.

The Plattsville wastewater system connects to most residential, commercial and industrial spaces in the settlement areas of Plattsville, as outlined in figure 3.3.1. The Plattsville wastewater system provides for the safe collection and treatment of wastewater.

The County does not have any combined sewers within the Plattsville wastewater system. The Plattsville wastewater system is a separate wastewater system.

Infiltration and inflow can enter through a variety of sources (cracks in pipes, weeping tile connections, cross connections, etc.). In the case of heavy rainfall events, wastewater mains may experience a volume of water and wastewater that exceeds its designed capacity. In some cases, this can cause water and/or wastewater to overflow into streets or backup into homes or businesses.

To minimize wastewater overflow into streets or backup into homes, the County has established design standards to convey flows under ultimate conditions, design sheets for capacity needs that include infiltration inflow. Newer wastewater mains are made of gasketed PVC piping to reduce potential leaks occurring between fitted pipe segments.

Final Effluent is the treated water that is discharged to the environment through the approved effluent disposal facilities, including all bypasses that are required to meet the compliance limits stipulated in the ECA for the WWTP, at the final effluent sampling points. The effluent criteria includes effluent flow rates, and parameters such as total suspended solids, Biochemical Oxygen Demand (BOD), phosphorous, ammonia, and E. coli. The County produces annual reports summarizing each WWTPs operation and treated effluent discharge quality and these can be found on the County's website at: http://www.oxfordcounty.ca/Services-for-You/Water-Wastewater/Wastewater/Annual-reports.

Table 3.1.1 outlines additional customer focused performance metrics from the County's LOS framework.

3.2 Technical Levels of Service

Technical Levels of Service metrics are quantifiable metrics applied against assets that are subject-matter specific inputs or outputs supported by the day-to-day activities of County staff. Table 3.1.1 includes the technical metrics required under O.Reg. 588/17, as well as, additional metrics the County has included in the framework.

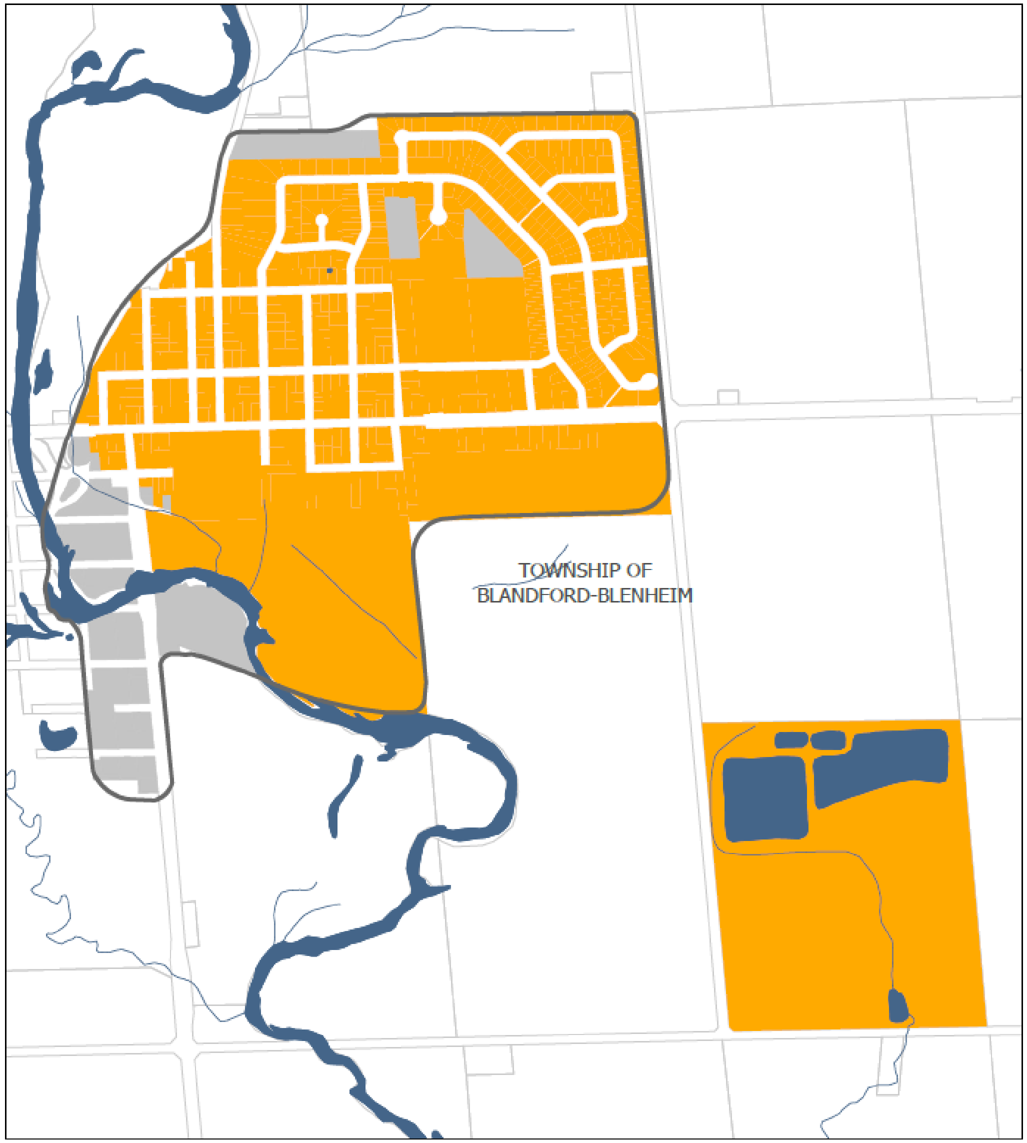
3.3 Levels of Service Maps

As a further illustrative example of our community levels of service, a map is included as figure 3.3.1 showing areas within the Plattsville village boundary that are serviced by the Plattsville wastewater system.

Figure 3.3.1 Plattsville sanitary serviced properties

Plattsville

Properties with fronting sewer



- Properties with fronting sewer
- Properties without fronting sewer
- Municipal Boundary
- Village Boundary
- Railway
- Waterbody

Total # of parcels:	682
Without fronting sewer:	48
With fronting sewer:	634
Coverage:	93%

N

0 87.5 175 350 525 m

Parcels with fronting sewer identified as being a distance of 30m from sanitary mains.

Oxford County
Growing stronger together
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Table 3.1.1 Performance Measures

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Customer / Council Focused Performance Measures					
Reliability	Providing wastewater services with minimal interruptions	% of properties within the system boundary connected to the municipal wastewater system	N/A	93%	TBD
		% of wastewater mains designed to be resilient to overflow or flooding during wet weather events	100%	100%	100%
Environmental Stewardship	Providing wastewater services that have minimal impacts on the environment	% of overall facility ECA compliance rate	100%	95%	100%
Cost Efficient	Providing wastewater services in an efficient manner	Operating cost to provide service ($/connection)	$594	$687	TBD
Technical Focused Performance Measures					
Reliability	Providing wastewater services with minimal interruptions	The number of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system.	0 connection-days to 561 connections	0 connection-days to 569 connections	TBD
		% of system inspected (CCTV) annually	7.2%	9.5%	7%
		% of wastewater mains flushed annually	10.4%	21.8%	20%
		# of overflow or spill occurrences	0	0	0
Environmental Stewardship	Providing wastewater services that have minimal impacts on the environment	% of wastewater estimated to have by-passed treatment	0%	0%	0%
		The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system.	0 violations to 561 connections	2 ECA violations to 569 connections	0

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Cost Efficient	Providing wastewater services in an efficient manner	Operating cost per kilometre of wastewater main for collection	N/A	$8,264	TBD
		5 year average capital expenditure for wastewater collection	$0.01M	$0.02M	TBD
		5 year average capital expenditure for wastewater treatment	$0.00M	$0.006M	TBD

4.0 Asset Management Strategy

4.1 Lifecycle Activities and Planned Actions

Wastewater collection assets undergo regular maintenance and inspection. As part of capital works project analysis, determinations of whether wastewater pipe replacement or relining should occur is reviewed. This process is fully integrated with the renewal needs of the roadways and other underground assets, such as drinking water and stormwater. This integrated approach ensures our renewal projects for these service areas are delivered with optimal timing to increase value and minimize disruption to our communities. For example, if a roadway is targeted for renewal, coordination between service areas and area municipalities will determine whether the underlying stormwater, drinking water or wastewater assets are also of an age or condition that requires renewal, to ensure these projects are delivered together to reduce disruption for our communities and deliver enhanced value.

Process assets and equipment undergo extensive operations and maintenance regimes to sustain their reliable operation. Investment needs are identified and coordinated with normal operations to minimize disruptions to service. Major replacements are planned and accommodated using system redundancy and changes to operations, in order to maintain service. It is critical to maintain wastewater service in order to protect public health and the environment.

There are six main lifecycle activities considered in the overall sustainable management of wastewater assets, described in table 4.1.1.

Table 4.1.1 Lifecycle Activities

Strategy	Lifecycle Activity
Non-Infrastructure Solutions	Actions or policies that can lower costs or extend useful lives. **Trigger: Ongoing**
Maintenance	Regularly scheduled maintenance and inspection programs including cleaning and flushing, manhole repairs, CCTV inspections, exercising diesel gen-sets and minor repairs. These activities do not improve the overall condition of the asset, nor increase its useful life. **Trigger: Ongoing**
Rehabilitation / Renewal	One-time events that increase the condition and extend the useful life of the asset; including sewer lining and seal and grout programs. **Trigger: Fair/Poor**
Replacement	Occurs at the end of the useful life and/or when rehabilitation is no longer an option – can vary among assets due to construction material and environmental factors that impact the degree of deterioration and performance. **Trigger: Poor/Critical**
Disposal	Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the County to provide services. County staff coordinate with contractors to ensure safe removal and environmental compliance when disposing of assets. **Trigger: Poor/Critical**
Expansion / Growth	Planned activities required to extend services to previously unserved areas, expand services to meet growth demands, or increase the level of service being provided. **Trigger: Development**

The lifecycle management strategy is the set of planned actions that should enable the assets to provide users with the proposed level of service in a sustainable way, while achieving acceptable levels of risk and the lowest lifecycle costs required to provide that level of service. Lifecycle considerations for assets include analysis of the timing to carry out key asset management activities including inspection, maintenance, repair, and replacement. Ongoing preventative maintenance activities are outlined in the County's work management system. The rehabilitation and replacement activities impacting the asset components condition and useful life are contained within profiles in the County's asset management system. For some assets, replacement needs are based on a run to failure strategy, as this is the most economical. Work is ongoing within the County's asset management systems to build all the component profiles and identify where each asset is within the lifecycle.

As an example, figure 4.1.2 illustrates the lifecycle strategy of grinder pumps. The pumps are re-built twice, extending the overall useful life from 10 years to approximately 25. The annual cost requirement from a run to failure strategy is $1,500 per year where the annual cost requirement using the rehabilitation strategies decreases to just below $800 per year.

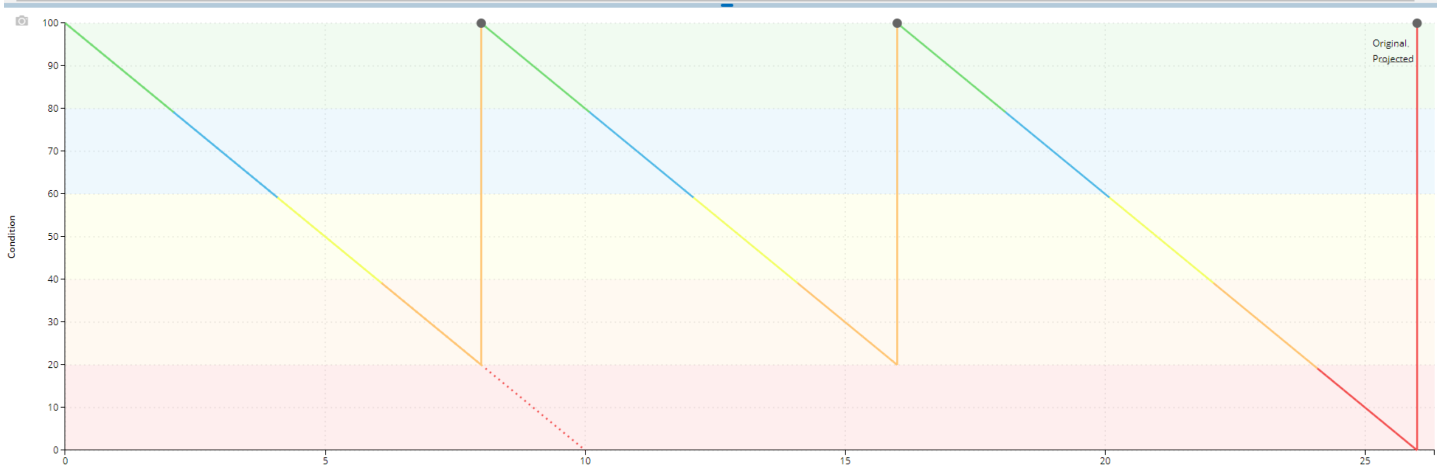
Figure 4.1.2 Grinder Pumps Lifecycle Strategy

Strategy

Age-Based Condition Method: Straight-Line — Lifecycle EUL: 10 Year(s) 0 Month(s)

Add Event (Condition Triggered): Rebuild Pump — Add — Lifecycle EUL (with events): 26 Year(s) 0 Month(s)

Age at Event	Name	Description	Event Class	Cost	Event Range / Trigger	Impact	Added EUL	Cost per Added Year	Actions
8 Years	Rebuild Pump		Rehabilitation	$2,500.00 (Fixed)	20 to 20 Condition	Adds 8 Years	8 Years	$312.50	
16 Years	Rebuild Pump		Rehabilitation	$2,500.00 (Fixed)	20 to 20 Condition	Adds 8 Years	8 Years	$312.50	
26 Years	<Asset Replacement>	End of life replacement	Replacement	$0.00 (Fixed)	0 to 20 Condition	Set to 100 Condition	10 Years	$0.00	Automatic

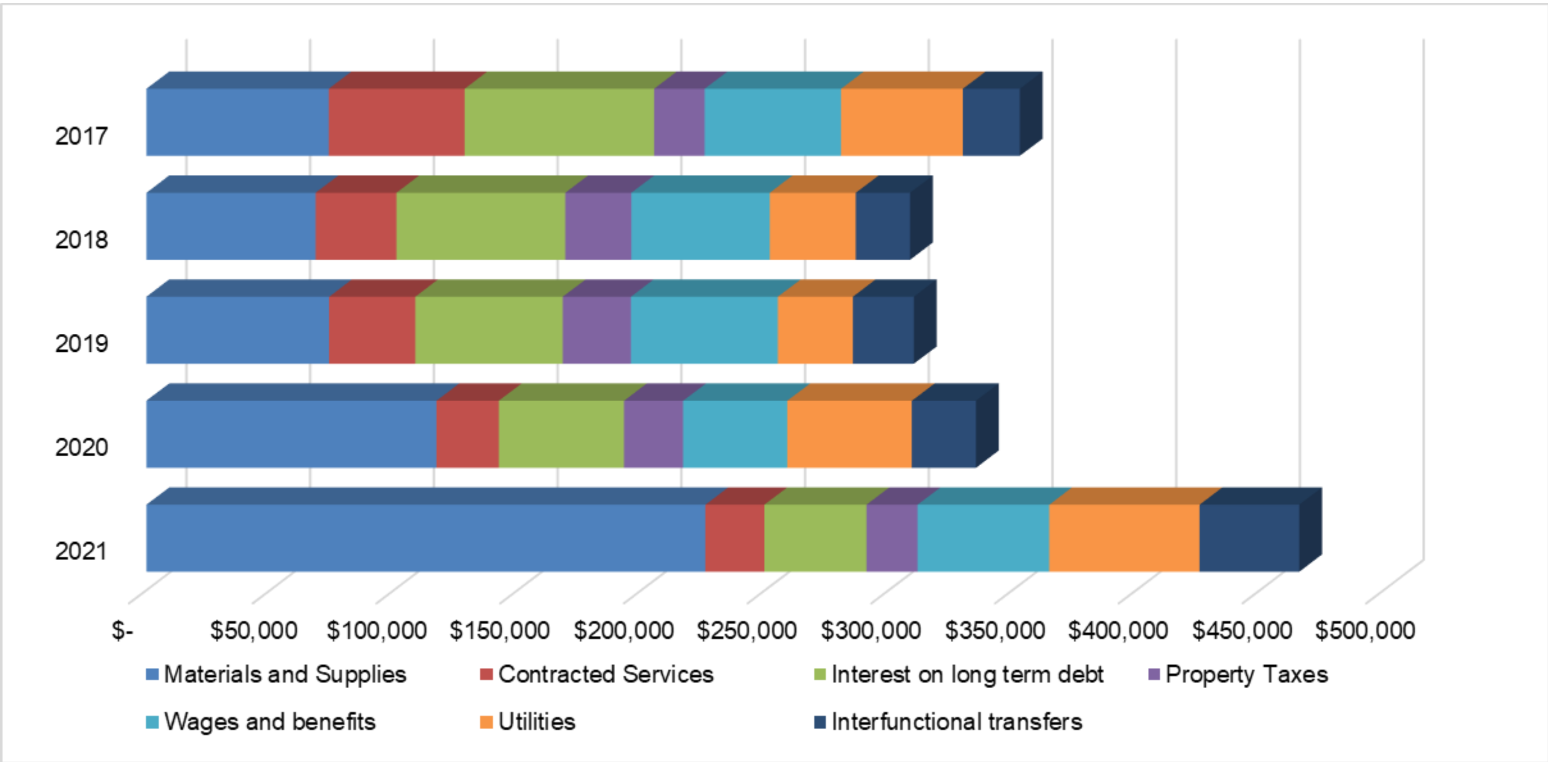


4.2 Significant Operating Expenses

Significant operating expenses are required in order to sustain an asset over its lifecycle. The County is always looking at ways to optimize our operating investment to ensure we are achieving the best value for our residents, and businesses. Essential to this is a strong operations and maintenance plan within our work management system. Operating expenses are incurred through a number of sources – preventative maintenance activities, utility costs, property taxes and more. Despite the fact that minor maintenance is incorporated into planned operations and maintenance programs, there are cases where it is unplanned.

Figure 4.2.1 shows the operating expenses from 2017 through 2021 for the Plattsville wastewater system grouped by expense type. The groupings align with those reported on the County's Financial Information Return (FIR), with further breakdown for property taxes and utility costs as these expenses can be significant.

Figure 4.2.1 Operating Expenses



4.3 Risk Strategy

Risk management frameworks are developed to assist with the prioritization of investments within the capital planning period. The preferred approach is to implement a triple bottom line analysis approach to evaluate:

- Social impacts of asset failure, including impacts to customers, businesses and the County's reputation;
- Environmental impacts of asset failure; and
- Economic impacts of failure including the cost of remediation.

In the context of asset management, risk is the multiple of the consequence of an asset failing and the probability that the event will occur.

Figure 4.3.1 illustrates the risk ratings for the Plattsville wastewater assets at a summary level. The waste stabilization ponds at the Plattsville lagoon site are showing as being in fair condition, however are considered high risk due to their replacement cost. County staff will continue to monitor the higher risk assets, review and/or complete physical inspections to further validate the age-based condition ratings and plan for lifecycle strategies accordingly.

Figure 4.3.1 Asset risk profile

Consequence \ Probability	1	2	3	4	5
5	0 Assets - $0.00	0 Assets - $0.00	2 Assets 2.00 unit(s) $5,626,200.00	0 Assets - $0.00	0 Assets - $0.00
4	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
3	0 Assets - $0.00	1 Asset 1.00 unit(s) $660,800.00	5 Assets 1,529.49 m, unit(s) $1,536,737.00	0 Assets - $0.00	0 Assets - $0.00
2	0 Assets - $0.00	0 Assets - $0.00	41 Assets 4,292.06 m $1,877,057.00	3 Assets 3.00 unit(s) $601,000.00	1 Asset 1.00 unit(s) $130,000.00
1	295 Assets 2,514.12 m, unit(s) $2,774,318.00	248 Assets 2,323.60 m, unit(s) $2,512,640.00	335 Assets 4,244.65 m, unit(s) $4,079,211.00	26 Assets 824.43 m, unit(s) $413,272.00	24 Assets 24.00 unit(s) $536,500.00

5.0 Financial Strategy

5.1 Financing Strategy

Hemson Consulting Ltd. (Hemson) was retained through a competitive process to assist with analyzing and developing the County's water and wastewater rates for a 4-year period from 2021 to 2024. The rate modeling includes all system asset management needs and all sources of funding including Community Servicing Assistance Program (CSAP) funding, development charges, developer and resident contributions. In most cases, the capital replacement component is the average annual required contribution level in order to establish full cost recovery; however, the contribution may vary based on the system's ability to meet full cost recovery for the next 10-years.

Capital work is funded from reserves (based on the capital contribution included in the user rates), development charges (for growth projects), debentures and grant funding when available. The County continually assesses opportunities for additional funding options and revenue streams to address our asset needs.

Where possible, replacement activities are planned in conjunction with the replacement needs of the road network and underlying water and stormwater assets. This requires a co-ordinated effort with area municipalities as the majority of the County owned water and wastewater linear assets falls under the area municipalities' roadways. This collaboration is essential for ensuring a cost effective approach to maintaining assets within the County regardless of ownership.

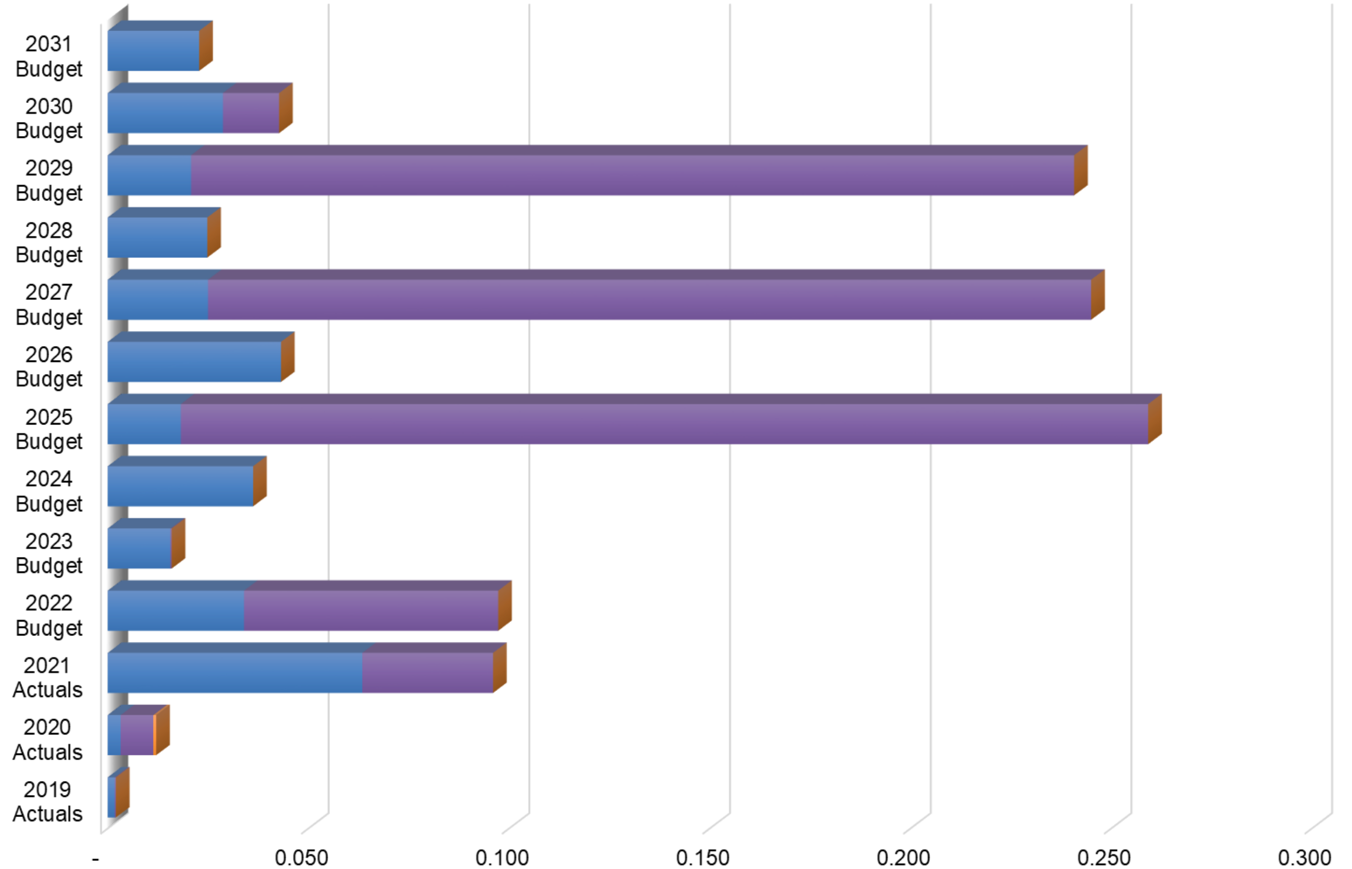
In addition to targeting and prioritizing the investment needed to maintain existing assets, there are also planning processes in place to determine the additional assets needed to meet growing demands through population increases or demand for new services. The projects targeted to meet growth are funded primarily through Development Charges (DC) – the mechanism that enables recovery of growth-related capital expenditures from new development. These charges are governed by the Development Charges Act and are applied in accordance with our Development Charges By-Law. Impacts from the growth activities analyzed in the 2019 DC Background Study are included in this AMP.

5.2 Expenditure History and Forecasts

There are currently no significant expenditures anticipated for the Plattsville wastewater system within the 10-year approved budget, as illustrated in figure 5.2.1. Linear asset replacements are ongoing, in conjunction with the local area municipal roadway construction projects. Minor process equipment replacements were included in the 2021 and 2022 budgets. County staff continue to review anticipated asset management needs with each budget cycle, subject to existing resource limitations.

Non-Infrastructure solution projects include shared projects for condition reviews, studies and implementation of the work management system.

Figure 5.2.1 Expenditures (millions)

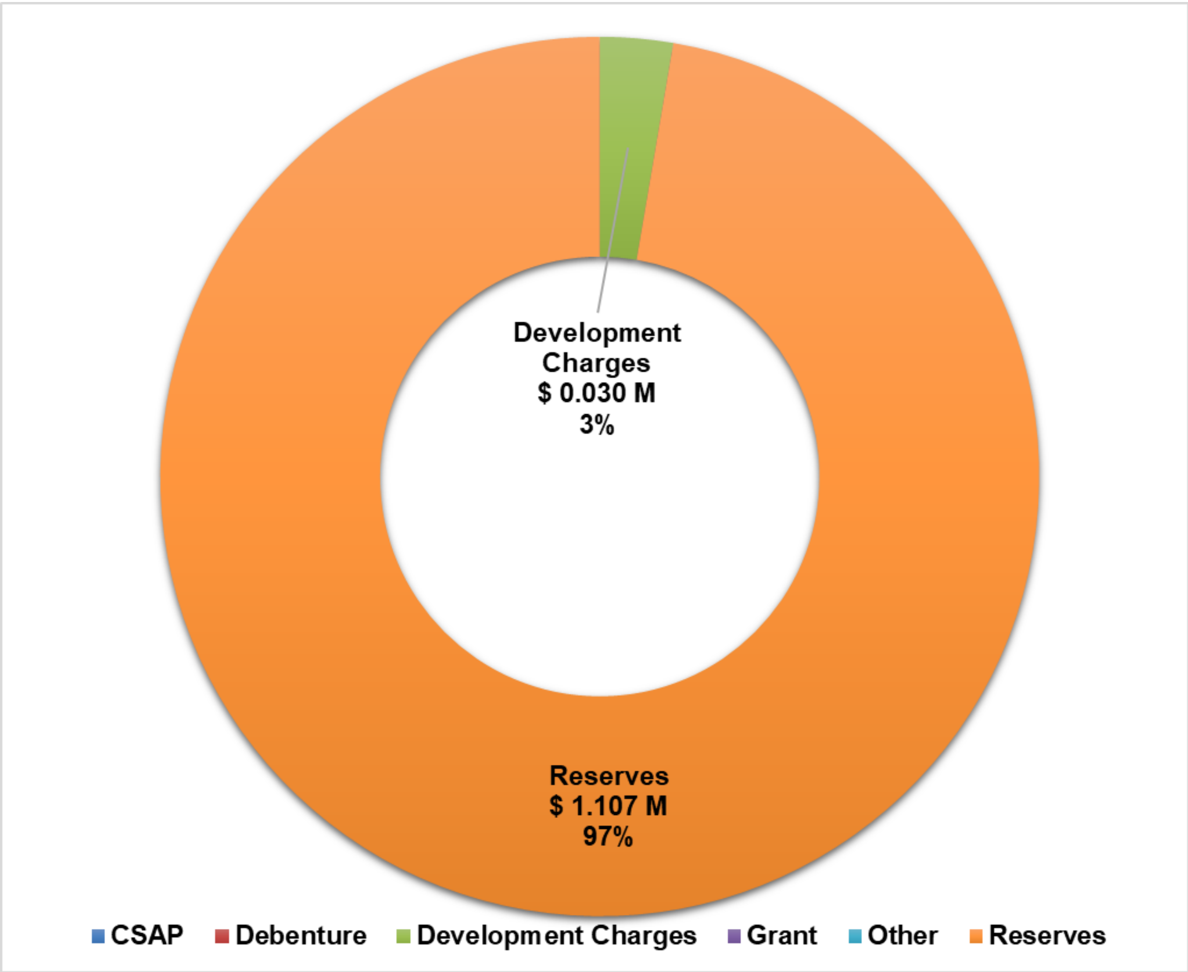


	2019 Actuals	2020 Actuals	2021 Actuals	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Non-Infrastructure Solution	0.002	0.003	0.063	0.034	0.016	0.036	0.018	0.043	0.025	0.025	0.021	0.029	0.023
Maintenance	-	-	-	-	-	-	-	-	-	-	-	-	-
Rehabilitation / Renewal	-	-	-	-	-	-	-	-	-	-	-	-	-
Replacement	0.000	0.008	0.033	0.063	0.000	-	0.241	-	0.220	-	0.220	0.014	-
Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-
Expansion / Growth	-	0.001	-	-	-	-	-	-	-	-	-	-	-

5.3 Capital Revenues

Primarily the Plattsville wastewater replacement projects, identified in the County's 10-year capital plan, are anticipated to be funded by the Wastewater – Plattsville Reserve, which is funded by user fees. The Plattsville wastewater reserve currently has a sufficient balance to fund the 10-year non-growth related asset activities within the approved 2022 Long-Term Capital Plan.

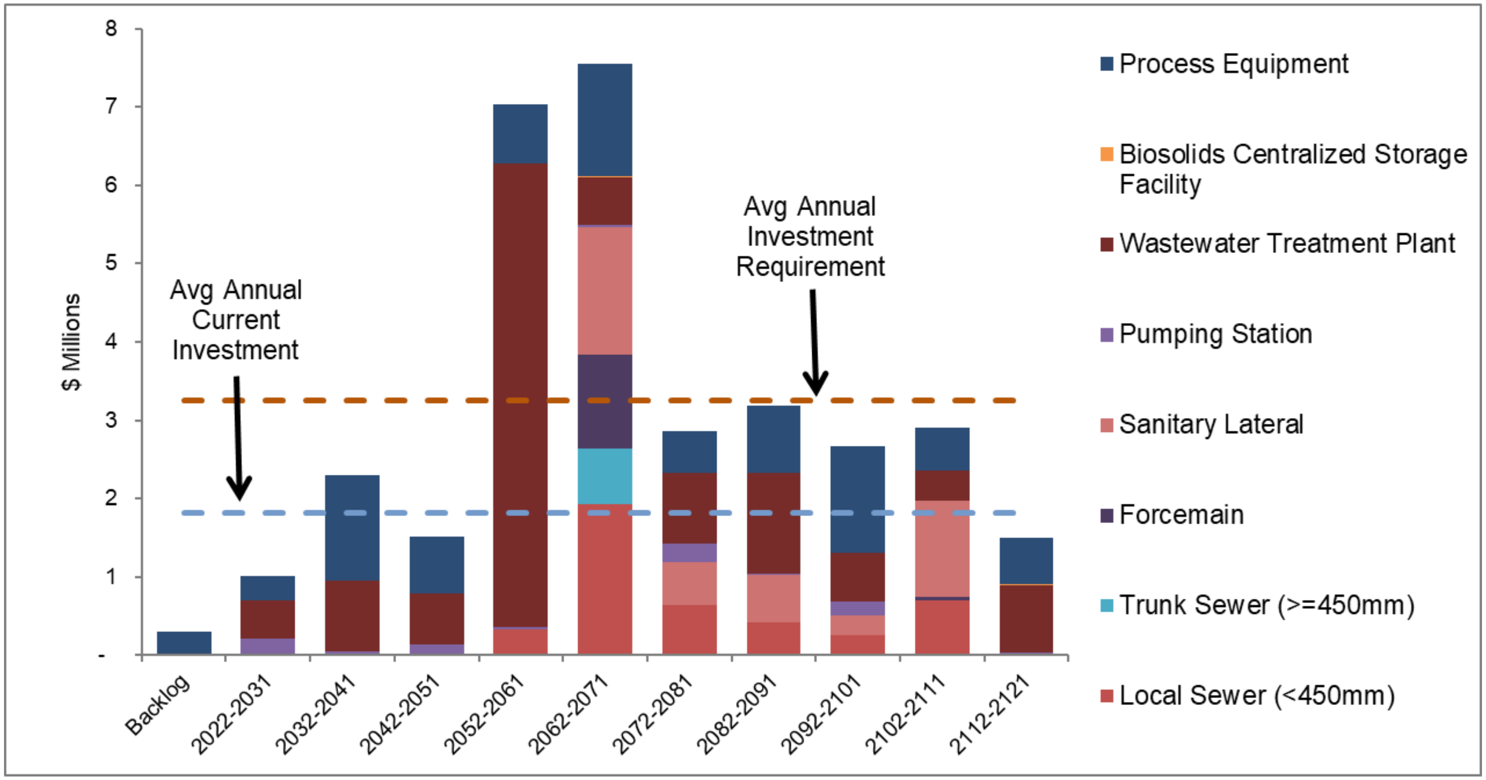
Figure 5.3.1 Sources of Capital Revenues 2019-2031 (millions)



5.4 Capital Investment

Based on the asset management lifecycle strategies identified, the financial requirements over the next 100-years are determined in current dollars. The average annual investment requirement represents the amount of capital funding required to renew and maintain the existing assets on an annual basis so services can continue to be delivered. These estimates assume that all work is able to be completed, as indicated, and does not take into account future changes due to environmental factors, new maintenance techniques, and unidentified growth. The annual requirement has increased from the 2017 AMP, primarily due to significant development and improvements the County has made to the vertical data, resulting in asset useful lives that are more reflective of their actual lifecycle. Further work is ongoing with the vertical data to fully determine lifecycle needs (including maintenance and rehabilitation strategies) which will impact the annual requirement for vertical assets. The data will continue to be reviewed with each budget and business plan cycle.

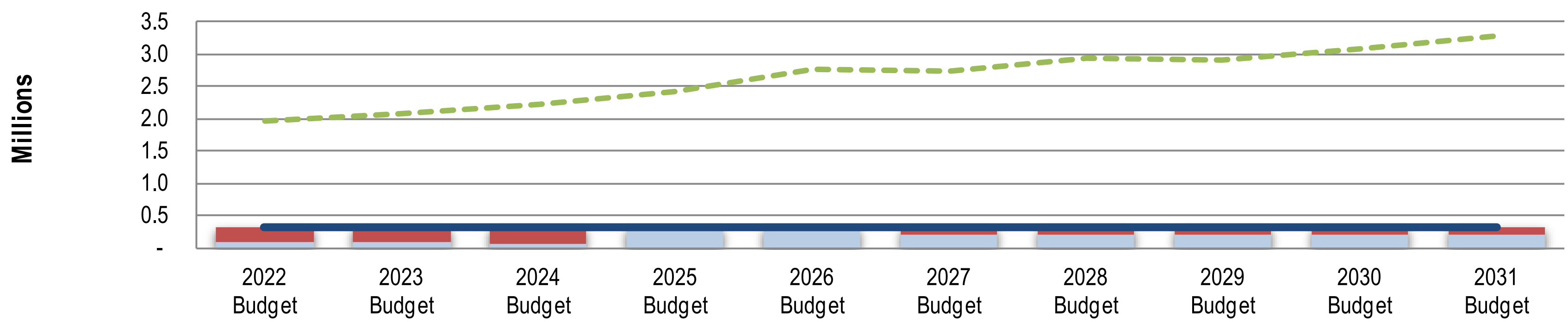
Figure 5.4.1 Average Annual Capital Requirements



The following figure links the annual capital funding needs to the capital investments contained in the budget. The timing of the actual capital projects may vary, however annual investments in capital assets is important for financial sustainability.

Figure 5.4.2 Funding Requirements

	Key	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Annual Required Investment		**325,000**	**325,000**	**325,000**	**325,000**	**325,000**	**325,000**	**325,000**	**325,000**	**325,000**	**325,000**
Current Investment		88,829	75,884	68,783	258,420	259,378	211,686	212,329	212,987	213,577	215,045
Funding Deficit		*236,171*	*249,117*	*256,217*	*66,580*	*65,622*	*113,314*	*112,671*	*112,013*	*111,423*	*109,955*
Funding Surplus		-	-	-	-	-	-	-	-	-	-
Reserve Balance		1,951,862	2,093,459	2,227,590	2,432,089	2,766,202	2,736,865	2,927,658	2,901,995	3,075,796	3,270,373



It is important to note that the Plattsville wastewater system is projected to operate in a deficit position from 2022-2024 limiting the current investment towards capital projects during this period. The resultant current investment from 2022-2024 is further constrained by the exclusive use of the investment towards debt payments. The amount of the current investment that would be restricted to debenture payments is anticipated to be 15.7% over the 10-year period.

5.5 Funding Gap Analysis

Using the anticipated 10-year asset lifecycle needs, along with the current capital investment level, the County is able to determine if there is an anticipated funding gap for the Plattsville wastewater system. Consideration is then given to the current system reserve balance to determine the residual funding gap. The County would then investigate opportunities for reducing this residual funding gap which, may include increases to the user rates, utilization of grant funding opportunities and further review of lifecycle strategies and proposed levels of service.

Figure 5.5.1 illustrates the anticipated asset management 10-year lifecycle needs, including the projected funding surplus (left side of figure 5.5.1) and funding needs (right side of figure 5.5.1) for the Plattsville wastewater system. The system calculates the optimal expenditures based on theoretical asset lifecycle needs. These needs have not yet been reviewed in depth with County operations staff, and incorporated into the 10-year capital budget. This is anticipated to be completed as part of the 2023 Business Plan and Budget process with subsequent review annually.

The anticipated expenditures have been increased for non-infrastructure solution projects; approximately $0.2 million.

While the anticipated expenditure calculation accounts for the lifecycle activities of expansion / growth projects it does not account for the initial investment. It is important to adjust for these projects, where the initial investment is growth related and not projected to be DC funded within the 10-year capital plan. There are no noted expansion / growth projects within the 10-year capital plan for the Plattsville wastewater system.

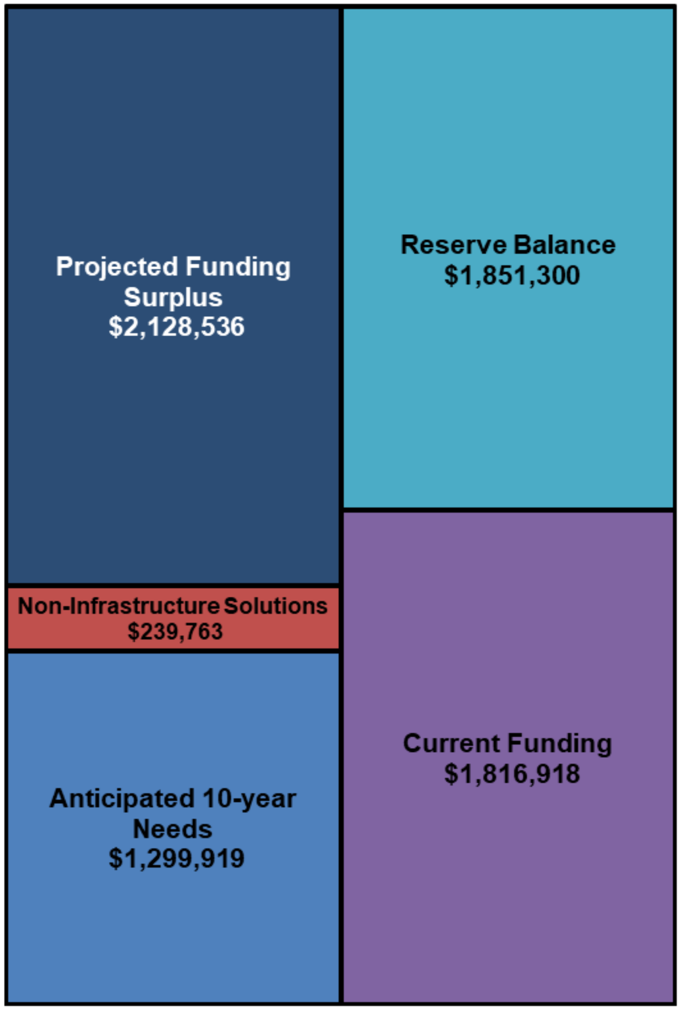
The Plattsville wastewater system is projecting a funding surplus over the 10-year capital planning period. Although the Plattsville wastewater system has a projected funding surplus over the 10-year horizon, the annual funding requirement is the basis for ensuring the long-term financial sustainability well into the future. Approximately 15.7% of the current funding is committed to debenture payments over the 10-year horizon. The annual funding requirement will be reviewed holistically as part of the next rate study.

Drawing the reserve balance to zero would likely result in increased user fee requirements in the subsequent 10-year period in order to fund the anticipated asset lifecycle needs.

The reserve is also utilized to fund emergency or unplanned expenses. A minimal or fully committed balance would limit the ability to fund these types of expenses. Consideration needs to be given to a minimum balance the County should maintain based on these risks. Analysis of the reserve target minimum balance, will be completed as part of the annual reserve review process.

Failure to address the long-term asset lifecycle needs could result in significant increases to rates in the future as assets reach end of life; or reductions in localized and/or regional service. This may include blockages, sewer backups, basement flooding, localized service outages, increased maintenance costs on assets past their optimal life, poor quality effluent, damage to the natural environment, fines, increase in insurance claims for property damage and personal injury resulting from poor asset conditions, etc.

Figure 5.5.1 Anticipated Needs (10-Year)



6.0 Climate Change

As part of the asset management planning process, the County will consider the risks and vulnerabilities of capital assets to climate change and the resulting actions that may be required. Commitment will be made to the development of tailored actions that make the best use of our resources to mitigate and adapt to climate change, in accordance with our local reduction targets, financial capacity and stakeholder support.

Optimization of the wastewater treatment process can help reduce the emissions of GHG such as nitrous oxide (N2O), carbon dioxide (C02) and methane (CH4) from being released into the environment at treatment plants. Optimization requires the correct equipment to ensure conditions can be achieved to reduce GHG emissions.

Nitrous oxide (N_2O) is released in the secondary treatment train through the nitrification and denitrification process, which is used to remove nitrogenous components from the wastewater. Nitrifying bacteria oxidize ammonia to nitrites and nitrates. To minimize N_2O emissions, the plant is optimized by running the activated sludge process at a high sludge retention time (SRT) with optimal dissolved oxygen levels, which results in low ammonia and nitrite concentrations. High amounts ammonia and nitrite compounds, especially when there are excessive amounts of dissolved oxygen, can trigger biogenic N_2O emissions. To control this process, an upgrade is underway:

- Installation of new aeration valves, and
- Installation of a new blower.

Methane (CH_4) is generated by the anaerobic biological break down of organics or the release of dissolved CH_4 found in the wastewater influent. The Plattsville WWTP does not have anaerobic digestion and does not generate significant levels of methane gas.

Carbon Dioxide (CO_2) is produced in biological treatment, where the organic carbon in the wastewater is utilized for biomass growth or oxidized into CO_2. By operating WWTPs at high sludge retention times, endogenous respiration (cell lysis results in biomass growth) is encouraged, which decreases the overall sludge production, which results in a decrease in CO_2 production. Upgrades with this process include:

- Replacement of control valves to maintain proper lagoon levels, direct flow and maintain adequate hydraulic retention time for proper treatment.

Improving energy efficiency at WWTPs can help to reduce GHG emissions by decreasing consumption of fossil fuel-based energy. Significant energy savings can be realized by increasing the efficiency of plant equipment such as pumps and blowers, and using generated fuel sources.

Climate change risks are considered during the planning phase of each capital project. Increasing resiliency to changing climate conditions through the use of backup power generation, redundancies with critical equipment, use of SCADA to collect accurate information and make informed decisions. By conducting inspections and completing studies, problem areas can be identified and planned to repair.

- use of backup power generation,
- redundancies with critical equipment,
- Ongoing development and implementation of a SCADA Master Plan, and
- conducting inspections (including CCTV) and studies to identify problem areas and complete repairs.

WASTEWATER SYSTEM

Thamesford

Table of Contents

1.0 Introduction

The County maintains a diverse portfolio of assets that are required to provide the community of Thamesford with the safe collection and treatment of wastewater. The Thamesford Wastewater Treatment Plant (WWTP) provides wastewater treatment for residential, commercial, and industrial users in the Village of Thamesford.

The Thamesford WWTP is a Class II rated facility, as defined by Ontario Regulation 129/04. It is an extended air activated sludge plant equipped with a large aeration system, secondary clarification, tertiary sand filtration and chlorination/de-chlorination disinfection, with an outfall to the Middle Thames River. The entire treatment process is completed in accordance with strict standards, processes, and limits as regulated by the WWTPs Environmental Compliance Approval (ECA) issued by the Ministry of Environment, Conservation, and Parks (MECP) of the Ontario Provincial Government.

The wastewater collection network transports residential, commercial and industrial waste to the WWTP for treatment. The wastewater collection network consists of a mix of gravity mains, low pressure mains and forcemains. Wastewater flows by gravity wherever possible, where changing elevations require the use of sewage pumping stations (SPS). Other specialized structures such as manholes, valve vaults, meter stations, diversion structures and siphons are required to convey wastewater to the WWTP.

Sound management of our wastewater systems helps us realize our vision of being a vibrant community, working well and growing stronger together!

Like many of our assets, wastewater assets are facing increased challenges as a result of aging assets, climate change, increasing demand due to growth in our communities and regulatory changes. Our investment in these assets must therefore be balanced to optimize investment for renewal with the growing needs of our community.

This plan provides information regarding our approach to the management of our wastewater assets over the short (10-year) and long (100-year) term, demonstrating our commitment to assessing and meeting the levels of service valued by our residents and businesses.

1.1 Improvement Plan

The County recognizes that asset management is a continuously evolving process. The following recommendations are based on the review of current management practices, inventory, valuation and condition analysis.

- Document lifecycle history on assets within the asset management systems.
- Continue to reduce asset data gaps.
- Determine asset components and maintenance strategies for facilities and associated processes.
- Refine the risk assessment approach at the component level.
- Incorporate findings from the Water and Wastewater Master Plan.

2.0 State of Assets

2.1 Inventory

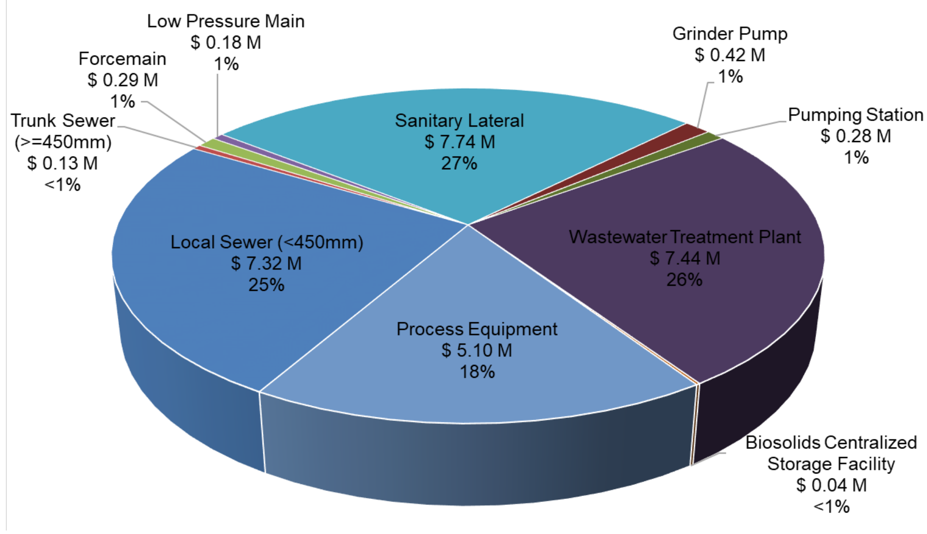
Wastewater assets are those that enable us to live in a clean and safe environment. It includes everything from wastewater mains that service our homes and businesses throughout the County, to the WWTPs, which ensure that effluent is properly treated before being discharged into the natural environment.

We have two different asset classes within the wastewater portfolio in order to effectively collect and treat wastewater from our community:

- Linear, which represent the collection pipe network, including the maintenance holes, connectors and related parts required in such a network.
- Vertical, which represent facilities (including the multiple buildings and structures that the facilities are comprised of), and related process systems and equipment required to perform the needed functions.

Table 2.1.2 displays our current wastewater inventory and the associated replacement costs and average age for each asset component. The County continues to make improvements to increase the integrity of our wastewater data. The inventory figures in table 2.1.2 capture inventory within newly constructed subdivisions which the County is aware of and anticipates assuming ownership of. The County generally assumes ownership of these assets approximately two years after full operation. It is important to include growth assets to ensure that lifecycle activities are planned and funded accordingly.

Figure 2.1.1 Inventory Valuation



2.2 Valuation

The replacement cost valuation for wastewater linear is based on current tender prices, where available. Current tender prices are adjusted where County staff feel some cost increases are only temporary due to COVID.

The replacement cost valuation for wastewater vertical is based on the latest information available, which includes current replacement costs, insurance valuations, and valuations from studies / assessments completed in prior years.

Table 2.1.2 – Thamesford Wastewater System Inventory

Asset Type	Asset Component		2017 Inventory	Current Inventory	Replacement Cost	Average Age
Linear	Local Sewer (<450mm)	m	15,535	18,103	$7,318,839	15 Years
	Trunk Sewer (>=450mm)	m	100	220	131,856	16 Years
	Forcemain	m	978	978	293,469	20 Years
	Low Pressure Main	m	589	589	176,987	17 Years
	Sanitary Lateral	each	932	1191	7,741,500	13 Years
	Collection Tank	each	-	-	-	-
	STEP Pump	each	-	-	-	-
	Grinder Pump	each	27	28	420,000	6 Years
Vertical	Pumping Station	each	1	1	283,600	22 Years
	Wastewater Treatment Plant	each	1	1	7,438,667	21 Years
	Odour Control Facility	each	-	-	-	-
	Biosolids Centralized Storage Facility[1]	each	-	1	41,219	4 Years
	Process Equipment	total	N/A	N/A	5,102,565	9 Years
Total Replacement Cost					**$28,948,702**	

The trunk sewer quantity increases is driven by the addition of data, not previously available in 2017.

There is a growth / expansion project planned within the Thamesford wastewater system that is included in the County's 2022 approved Long-Term Capital Plan. This growth project is not included in the figures within table 2.1.2, however its anticipated lifecycle needs are included within this AMP.

[1] The Biosolids Centralized Storage Facility is a shared facility across the County with each system contributing to the costs based on number of customers. The value utilized throughout this report card represents Thamesford's share based on 2021 customers.

2.3 Condition Assessment Approach

The assessment approach for our wastewater assets utilizes a combination of physical assessments, asset attributes, such as material and sizing, as well as established anticipated useful lives.

The County's condition scale and visual inspection ratings are based on the following approach:

- Excellent - Asset is well maintained with no noticeable defects.
- Good - Asset may show signs of minor deterioration and may require some maintenance.
- Fair - Deterioration evident, function affected. Asset may require on-going monitoring.
- Poor - Serious deterioration, function inadequate. Asset may require ongoing monitoring.
- Critical - No longer functional, general or complete failure. Asset may require extensive monitoring.

The Pipeline Assessment Certificate Program (PACP) is the North American Standard for pipeline defect identification and assessment[2]. Closed-circuit television (CCTV) is the principal method of inspecting drains and sewers. In this process, a small robotic crawler vehicle with the CCTV camera attached is lowered into the pipe to complete the inspections. A structural rating, on a scale of 0-5, is then assigned using sewer condition assessment standards, with 0 representing an asset with minimal structural deficiencies and 5 representing assets on the verge of failure.

Table 2.3.1 illustrates how the PACP score ratings align with the County's standard condition scale. Unless otherwise noted, all images are of County assets, and are general representations of the asset condition at the time the photo was taken. Assets may have undergone lifecycle strategies since the date of the image impacting its condition.

Wastewater process assets are inspected by County staff on a regular basis as part the preventative maintenance program. These inspections identify performance and accelerated degradation and will trigger the creation of a reactive work order for repairs and rehabilitation. The County is working towards incorporating these inspections into a formalized condition rating. A visual inspection rating was provided for most process assets as part of the data collection process in 2018 and 2019.

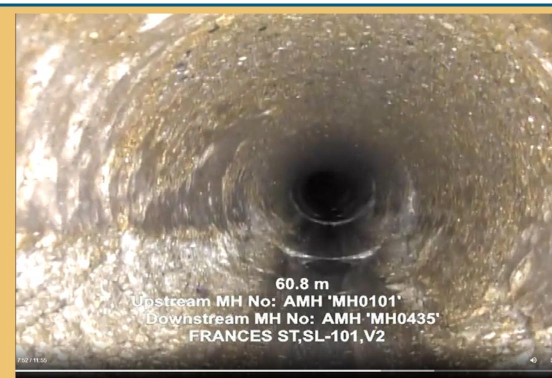
Given the complexities and accessibility of some assets, it is not beneficial to complete a visual or performance based condition assessment on all assets. For assets which are unable to be visually inspected or that have since been replaced, an age-based condition rating is being used based on anticipated useful lives.

[2] https://www.nassco.org/content/pipeline-assessment-pacp

Table 2.3.1 PACP Score Ratings

Excellent
PACP Score of
0 or 1

Poor
PACP Score of
4



Good
PACP Score of
2

Critical
PACP Score of
5

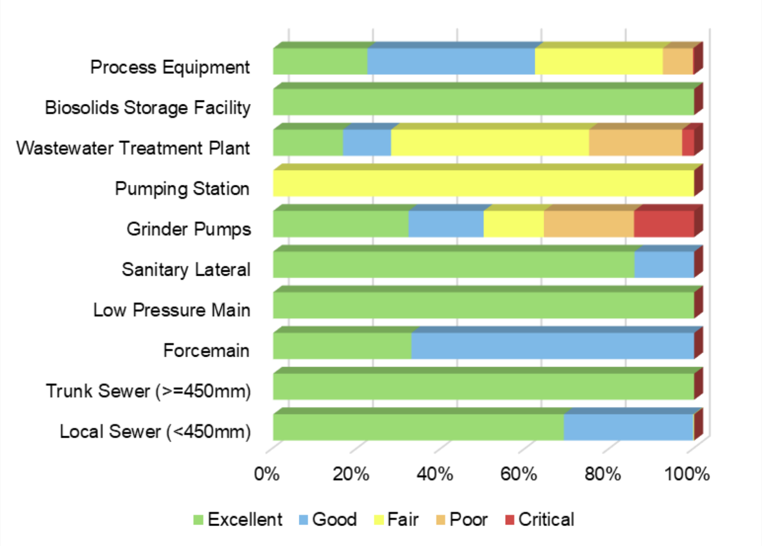
Fair
PACP Score of
3

2.4 Condition Assessment

The condition profile of our Thamesford wastewater asset components is shown in figure 2.4.1. The % in each condition is based on replacement costs.

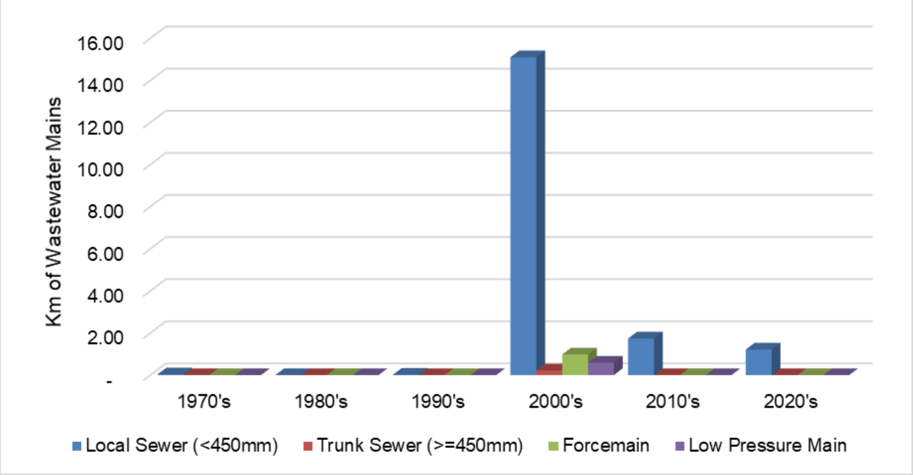
For our wastewater assets: 8.3% of these assets are in poor or critical condition, and 73.1% in good or excellent condition in comparison to 10-11% and 57-65% respectively for Canadian municipalities reported on the Canadian Infrastructure Report Card[3]. While it may appear that our Thamesford wastewater assets are in better shape than other Canadian municipalities, the 2019 Canadian Infrastructure Report Card is an aggregate of self reported condition ratings across the Country and are based on a general rating scale which may not match the County's.

Figure 2.4.1 Asset Condition by Component



To better understand our Thamesford wastewater collection assets, an age profile of all our wastewater mains by decade is shown in figure 2.4.2.

Figure 2.4.2 Wastewater Mains by Age



The average age of the majority of linear assets within the Thamesford wastewater system is approximately 15 years, whereas the average age of the vertical assets varies by facility type from 4 to 21 years. This value must be considered in the context of the different asset types in the category, compared to the typical anticipated useful life of each asset type.

[3] http://canadianinfrastructure.ca/en/index.html

Table 2.4.3 outlines the anticipated useful life for each new build/replacement. The anticipated useful lives for our wastewater assets exclude the management strategies that the County utilizes to extend the overall life of our wastewater assets.

Table 2.4.3 Useful Life

Wastewater System Component	Anticipated Useful Life (years)
Forcemain, Low Pressure Main, Trunk Sewer, Local Sewer, Laterals	90
Collection Tanks	30
Grinder Pumps	10
Facilities	10 - 50
Process Equipment	8 - 75

Figure 2.4.4 illustrates the current average age of the Thamesford wastewater system linear components in comparison to their anticipated useful life, based on a run to failure strategy.

As the vertical assets can have a significant variability in age, from both a facility and process standpoint, they are not represented within figure 2.4.4.

There are a number of management strategies that the County may utilize to extend the overall life of our wastewater assets.

These strategies allow us to align the needs with those of other assets, resulting in the best overall value for our residents.

Figure 2.4.4 Age and Useful Life Comparison

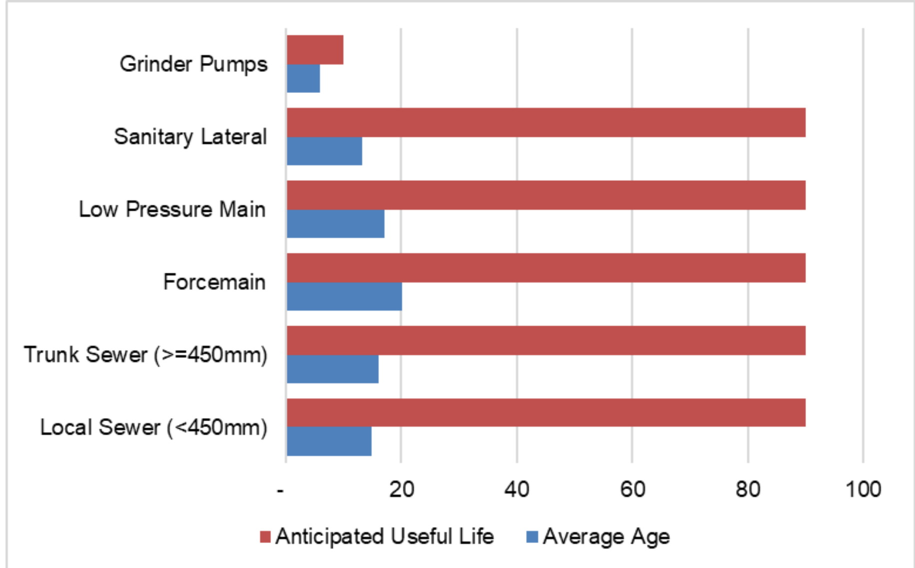


Table 2.4.5 compares the status of our Thamesford wastewater asset components, as identified in our 2017 Asset Management Plan to their current condition. The breakdown by component for vertical assets was not available as of the date the 2017 report was published, so there is no condition comparison available. Work is ongoing to further enhance the asset information at the component level.

The trend shows that the status of wastewater assets for the Thamesford system is steady to declining. The decline in condition is commiserate with the aging of these assets. As the system continues to age it is expected that condition ratings will continue to decline until targeted lifecycle strategies are implemented.

Table 2.4.5 Wastewater Systems Condition Assessment

Asset Type	Asset Component	2017 Condition Rating	Current Condition Rating	Trend
Linear	Local Sewer (<450mm)	Excellent	Excellent	➔
	Trunk Sewer (>=450mm)	Excellent	Excellent	➔
	Forcemain	Excellent	Good	↓
	Low Pressure Main	Excellent	Excellent	➔
	Sanitary Lateral	Excellent	Excellent	➔
	Collection Tank	-	-	-
	STEP Pump	-	-	-
	Grinder Pump	Good	Fair	↓
Vertical	Pumping Station	Not assessed	Fair	-
	Wastewater Treatment Plant	Not assessed	Fair	-
	Odour Control Facility	-	-	-
	Biosolids Centralized Storage Facility[4]	-	Excellent	-
	Process Equipment	Not assessed	Good	-

[4] The Biosolids Centralized Storage Facility is a shared facility across the County with each system contributing to the costs based on number of customers. The value utilized throughout this report card represents Thamesford's share based on 2021 customers.

3.0 Levels of Service

County staff have developed a comprehensive Level of Service (LOS) Framework. This framework will help to establish a relationship between the current LOS being provided by the County's assets, and the associated operating and capital expenditures required to achieve the proposed LOS. The framework puts into perspective the definition and measurement of service performance in alignment with the County's corporate mission and vision.

Corporate Objective

The wastewater collection and treatment service ensures protection of the environment and public health of residents, visitors to the County and downstream users of the receiver (Thames River) and our partners in the watershed.

Legislative Requirements

Each of the County's WWTPs are regulated under the Ontario Water Resources Act, 1990[5] and operated in accordance with an ECA or historical Certificates of Approval (C of A) issued by the MECP.

The ECA for the County's WWTPs require annual reporting of operational and treated effluent discharge parameters into the receiving water bodies. The Annual Wastewater Treatment System Summary Reports are available on the County's website.

Framework

The structure of the County's LOS framework was developed to align with international best practices including the International Infrastructure Management Manual (IPWEA, 2015). The framework includes the mandatory measures to meet the requirements of Ontario Regulation (O.Reg.) 588/17 by including both Community and Technical Levels of Service. The metrics in this framework may be expanded upon as the County continues to improve its data collection and reporting processes.

[5] https://www.ontario.ca/laws/statute/90o40

3.1 Customer Levels of Service

Community or Customer Levels of Service are statements that describe quantifiable metrics of the service delivery outcomes from the perspective of the customer, expressed in non-technical terms. The following statements form our qualitative descriptions of the customer level metrics required under O.Reg. 588/17.

The Thamesford wastewater system connects to most residential, commercial and industrial spaces in the settlement areas of Thamesford, as outlined in figure 3.3.1. The Thamesford wastewater system provides for the safe collection and treatment of wastewater.

The County does not have any combined sewers within the Thamesford wastewater system. The Thamesford wastewater system is a separate wastewater system.

Infiltration and inflow can enter through a variety of sources (cracks in pipes, weeping tile connections, cross connections, etc.). In the case of heavy rainfall events, wastewater mains may experience a volume of water and wastewater that exceeds its designed capacity. In some cases, this can cause water and/or wastewater to overflow into streets or backup into homes or businesses.

To minimize wastewater overflow into streets or backup into homes, the County has established design standards to convey flows under ultimate conditions, design sheets for capacity needs that include infiltration inflow. Newer wastewater mains are made of gasketed PVC piping to reduce potential leaks occurring between fitted pipe segments.

Final Effluent is the treated water that is discharged to the environment through the approved effluent disposal facilities, including all bypasses that are required to meet the compliance limits stipulated in the ECA for the WWTP, at the final effluent sampling points. The effluent criteria includes effluent flow rates, and parameters such as total suspended solids, Biochemical Oxygen Demand (BOD), phosphorous, ammonia, and E. coli. The County produces annual reports summarizing each WWTPs operation and treated effluent discharge quality and these can be found on the County's website at: http://www.oxfordcounty.ca/Services-for-You/Water-Wastewater/Wastewater/Annual-reports.

Table 3.1.1 outlines additional customer focused performance metrics from the County's LOS framework.

3.2 Technical Levels of Service

Technical Levels of Service metrics are quantifiable metrics applied against assets that are subject-matter specific inputs or outputs supported by the day-to-day activities of County staff. Table 3.1.1 includes the technical metrics required under O.Reg. 588/17, as well as, additional metrics the County has included in the framework.

3.3 Levels of Service Maps

As a further illustrative example of our community levels of service, a map is included as figure 3.3.1 showing areas within the Thamesford village boundary that are serviced by the Thamesford wastewater system.

Figure 3.3.1 Thamesford sanitary serviced properties

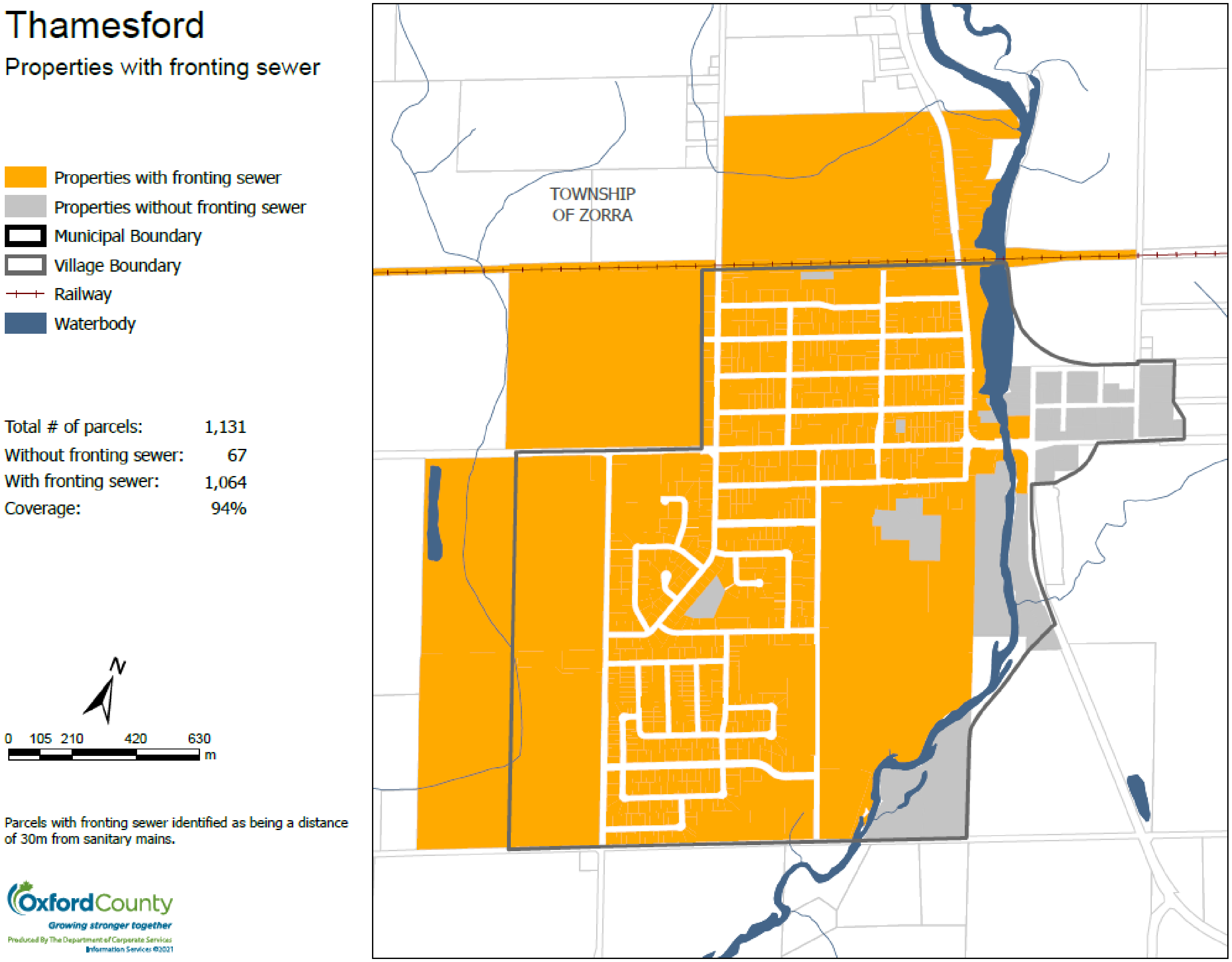


Table 3.1.1 Performance Measures

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Customer / Council Focused Performance Measures					
Reliability	Providing wastewater services with minimal interruptions	% of properties within the system boundary connected to the municipal wastewater system	N/A	94%	TBD
		% of wastewater mains designed to be resilient to overflow or flooding during wet weather events	100%	100%	100%
Environmental Stewardship	Providing wastewater services that have minimal impacts on the environment	% of overall facility ECA compliance rate	99.1%	99.0%	100%
Cost Efficient	Providing wastewater services in an efficient manner	Operating cost to provide service ($/connection)	$641	$703	TBD
Technical Focused Performance Measures					
Reliability	Providing wastewater services with minimal interruptions	The number of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system.	0 connection-days to 872 connections	0 connection-days to 933 connections	TBD
		% of system inspected (CCTV) annually	N/A	24.7%	7%
		% of wastewater mains flushed annually	25%	25%	20%
		# of overflow or spill occurrences	0	0	0
Environmental Stewardship	Providing wastewater services that have minimal impacts on the environment	% of wastewater estimated to have by-passed treatment	0%	0%	0%
		The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system.	1 ECA violation to 872 connections	2 ECA violations to 933 connections	0

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Cost Efficient	Providing wastewater services in an efficient manner	Operating cost per kilometre of wastewater main for collection	N/A	$8,736	TBD
		5 year average capital expenditure for wastewater collection	$0.2M	$0.2M	TBD
		5 year average capital expenditure for wastewater treatment	$0.001M	$0.009M	TBD

4.0 Asset Management Strategy

4.1 Lifecycle Activities and Planned Actions

Wastewater collection assets undergo regular maintenance and inspection. As part of capital works project analysis, determinations of whether wastewater pipe replacement or relining should occur is reviewed. This process is fully integrated with the renewal needs of the roadways and other underground assets, such as drinking water and stormwater. This integrated approach ensures our renewal projects for these service areas are delivered with optimal timing to increase value and minimize disruption to our communities. For example, if a roadway is targeted for renewal, coordination between service areas and area municipalities will determine whether the underlying stormwater, drinking water or wastewater assets are also of an age or condition that requires renewal, to ensure these projects are delivered together to reduce disruption for our communities and deliver enhanced value.

Process assets and equipment undergo extensive operations and maintenance regimes to sustain their reliable operation. Investment needs are identified and coordinated with normal operations to minimize disruptions to service. Major replacements are planned and accommodated using system redundancy and changes to operations, in order to maintain service. It is critical to maintain wastewater service in order to protect public health and the environment.

There are six main lifecycle activities considered in the overall sustainable management of wastewater assets, described in table 4.1.1.

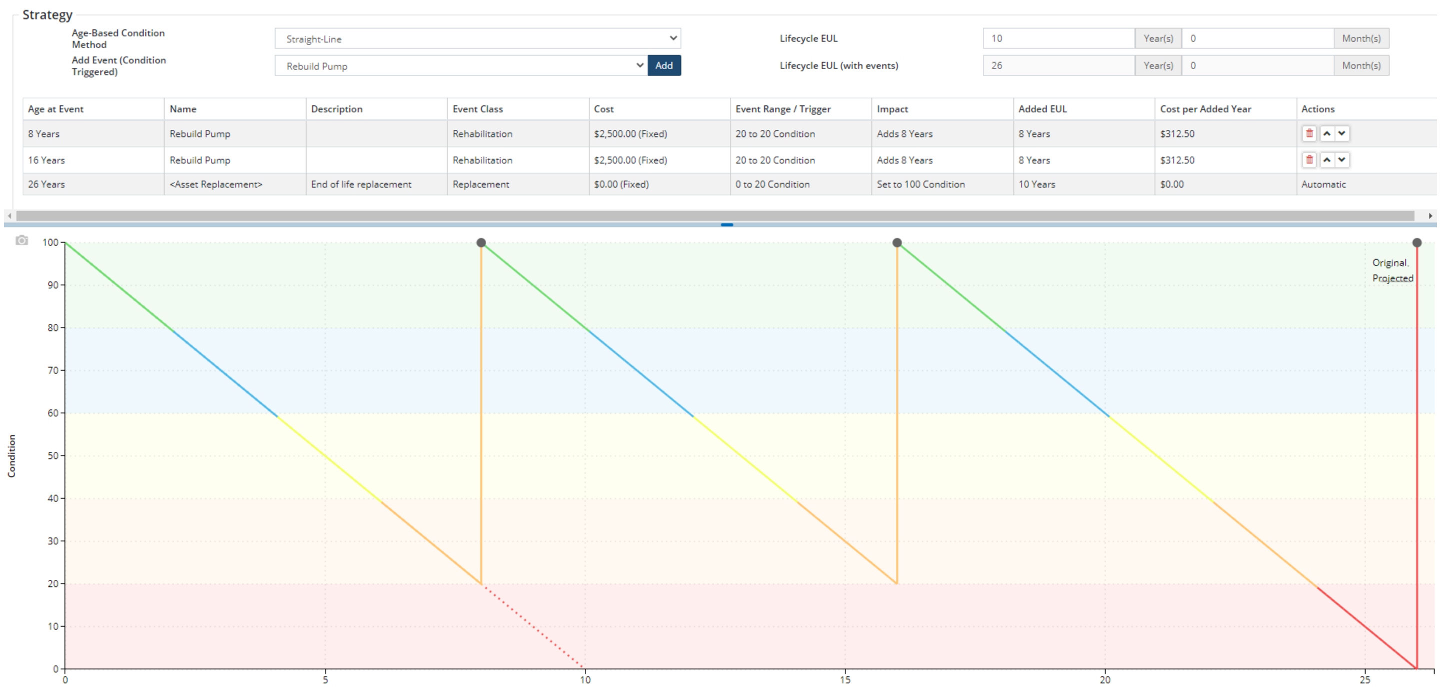
Table 4.1.1 Lifecycle Activities

Strategy	Lifecycle Activity
Non-Infrastructure Solutions	Actions or policies that can lower costs or extend useful lives. **Trigger: Ongoing**
Maintenance	Regularly scheduled maintenance and inspection programs including cleaning and flushing, manhole repairs, CCTV inspections, exercising diesel gen-sets and minor repairs. These activities do not improve the overall condition of the asset, nor increase its useful life. **Trigger: Ongoing**
Rehabilitation / Renewal	One-time events that increase the condition and extend the useful life of the asset; including sewer lining and seal and grout programs. **Trigger: Fair/Poor**
Replacement	Occurs at the end of the useful life and/or when rehabilitation is no longer an option – can vary among assets due to construction material and environmental factors that impact the degree of deterioration and performance. **Trigger: Poor/Critical**
Disposal	Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the County to provide services. County staff coordinate with contractors to ensure safe removal and environmental compliance when disposing of assets. **Trigger: Poor/Critical**
Expansion / Growth	Planned activities required to extend services to previously unserved areas, expand services to meet growth demands, or increase the level of service being provided. **Trigger: Development**

The lifecycle management strategy is the set of planned actions that should enable the assets to provide users with the proposed level of service in a sustainable way, while achieving acceptable levels of risk and the lowest lifecycle costs required to provide that level of service. Lifecycle considerations for assets include analysis of the timing to carry out key asset management activities including inspection, maintenance, repair, and replacement. Ongoing preventative maintenance activities are outlined in the County's work management system. The rehabilitation and replacement activities impacting the asset components condition and useful life are contained within profiles in the County's asset management system. For some assets, replacement needs are based on a run to failure strategy, as this is the most economical. Work is ongoing within the County's asset management systems to build all the component profiles and identify where each asset is within the lifecycle.

As an example, figure 4.1.2 illustrates the lifecycle strategy of grinder pumps. The pumps are re-built twice, extending the overall useful life from 10 years to approximately 25. The annual cost requirement from a run to failure strategy is $1,500 per year where the annual cost requirement using the rehabilitation strategies decreases to just below $800 per year.

Figure 4.1.2 Grinder Pumps Lifecycle Strategy



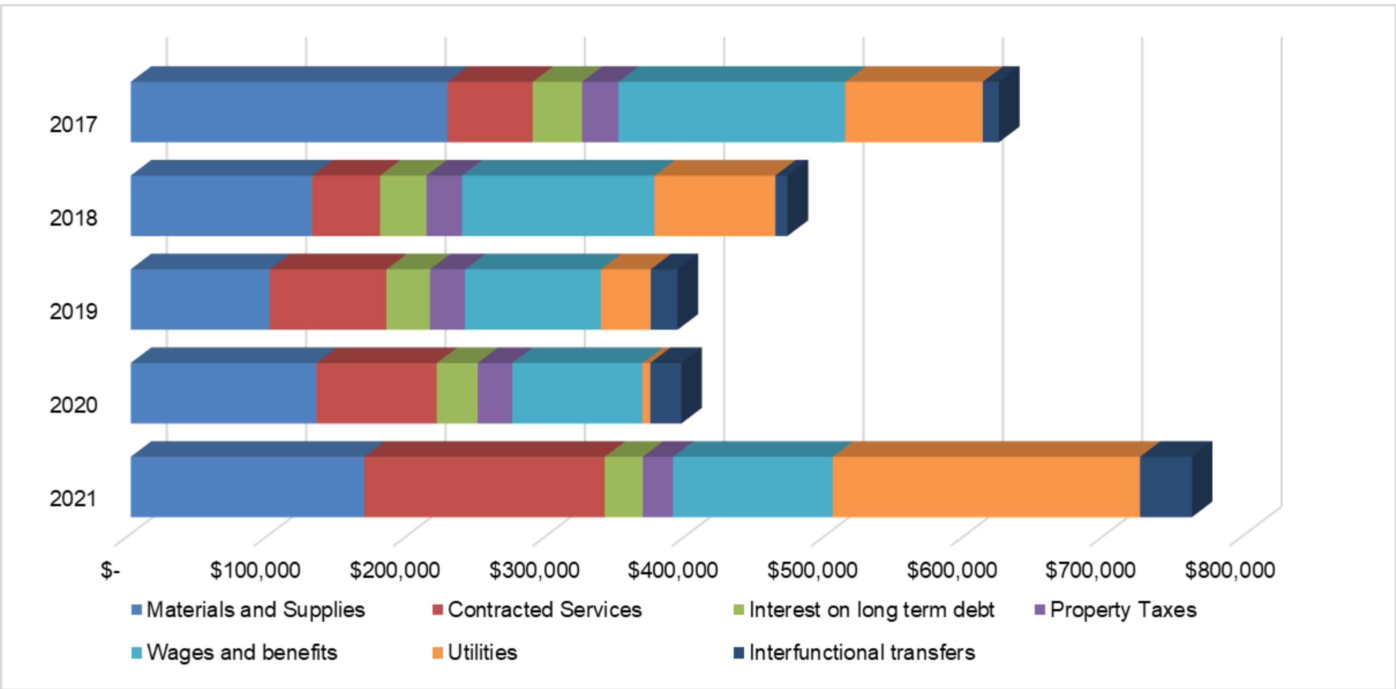
Age at Event	Name	Description	Event Class	Cost	Event Range / Trigger	Impact	Added EUL	Cost per Added Year	Actions
8 Years	Rebuild Pump		Rehabilitation	$2,500.00 (Fixed)	20 to 20 Condition	Adds 8 Years	8 Years	$312.50	
16 Years	Rebuild Pump		Rehabilitation	$2,500.00 (Fixed)	20 to 20 Condition	Adds 8 Years	8 Years	$312.50	
26 Years	<Asset Replacement>	End of life replacement	Replacement	$0.00 (Fixed)	0 to 20 Condition	Set to 100 Condition	10 Years	$0.00	Automatic

4.2 Significant Operating Expenses

Significant operating expenses are required in order to sustain an asset over its lifecycle. The County is always looking at ways to optimize our operating investment to ensure we are achieving the best value for our residents, and businesses. Essential to this is a strong operations and maintenance plan within our work management system. Operating expenses are incurred through a number of sources – preventative maintenance activities, utility costs, property taxes and more. Despite the fact that minor maintenance is incorporated into planned operations and maintenance programs, there are cases where it is unplanned. Thamesford utilities were high in 2021 due to a hydro adjustment dating back to 2019. Utilities expenses are anticipated to return to normal operating expectations for 2022.

Figure 4.2.1 shows the operating expenses from 2017 through 2021 for the Thamesford wastewater system grouped by expense type. The groupings align with those reported on the County's Financial Information Return (FIR), with further breakdown for property taxes and utility costs as these expenses can be significant.

Figure 4.2.1 Operating Expenses



4.3 Risk Strategy

Risk management frameworks are developed to assist with the prioritization of investments within the capital planning period. The preferred approach is to implement a triple bottom line analysis approach to evaluate:

- Social impacts of asset failure, including impacts to customers, businesses and the County's reputation;
- Environmental impacts of asset failure; and
- Economic impacts of failure including the cost of remediation.

In the context of asset management, risk is the multiple of the consequence of an asset failing and the probability that the event will occur.

Figure 4.3.1 illustrates the risk ratings for the Thamesford wastewater assets at a summary level. The Thamesford WWTP building contains an asset component in fair condition based on an age-based condition rating, however is considered high risk due to the replacement cost. County staff will continue to monitor the higher risk assets, review and/or complete physical inspections to further validate the age-based condition ratings and plan for lifecycle strategies accordingly.

Figure 4.3.1 Asset risk profile

Consequence	1	2	3	4	5
5	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	1 Asset 1.00 unit(s) $3,381,000.00	0 Assets - $0.00
4	1 Asset 1.00 unit(s) $1,156,000.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
3	0 Assets - $0.00	3 Assets 3.00 unit(s) $1,569,000.00	1 Asset 1.00 unit(s) $283,600.00	2 Assets 2.00 unit(s) $1,530,000.00	0 Assets - $0.00
2	15 Assets 1,059.58 m, unit(s) $637,536.00	21 Assets 1,925.40 m, unit(s) $1,462,133.00	4 Assets 40.64 m, unit(s) $236,320.00	1 Asset 1.00 unit(s) $117,000.00	2 Assets 2.00 unit(s) $322,750.00
1	1,195 Assets 13,663.32 m, unit(s) $11,888,995.00	313 Assets 3,080.98 m, unit(s) $3,735,461.00	92 Assets 1,538.22 m, unit(s) $2,113,688.00	24 Assets 24.00 unit(s) $399,100.00	9 Assets 9.00 unit(s) $74,900.00

Probability

5.0 Financial Strategy

5.1 Financing Strategy

Hemson Consulting Ltd. (Hemson) was retained through a competitive process to assist with analyzing and developing the County's water and wastewater rates for a 4-year period from 2021 to 2024. The rate modeling includes all system asset management needs and all sources of funding including Community Servicing Assistance Program (CSAP) funding, development charges, developer and resident contributions. In most cases, the capital replacement component is the average annual required contribution level in order to establish full cost recovery; however, the contribution may vary based on the system's ability to meet full cost recovery for the next 10-years.

Capital work is funded from reserves (based on the capital contribution included in the user rates), development charges (for growth projects), debentures and grant funding when available. The County continually assesses opportunities for additional funding options and revenue streams to address our asset needs.

Where possible, replacement activities are planned in conjunction with the replacement needs of the road network and underlying water and stormwater assets. This requires a co-ordinated effort with area municipalities as the majority of the County owned water and wastewater linear assets falls under the area municipalities' roadways. This collaboration is essential for ensuring a cost effective approach to maintaining assets within the County regardless of ownership.

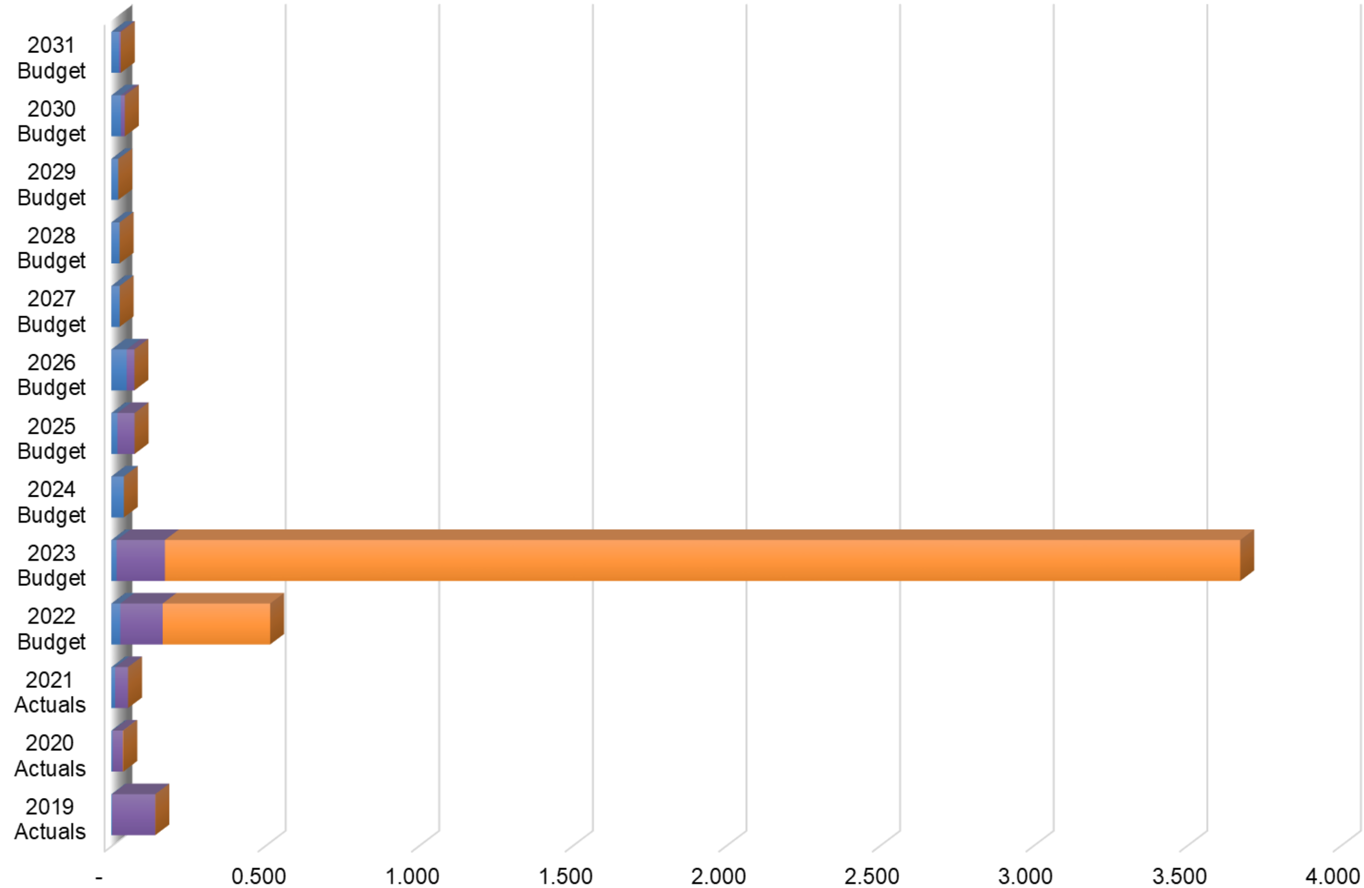
In addition to targeting and prioritizing the investment needed to maintain existing assets, there are also planning processes in place to determine the additional assets needed to meet growing demands through population increases or demand for new services. The projects targeted to meet growth are funded primarily through Development Charges (DC) – the mechanism that enables recovery of growth-related capital expenditures from new development. These charges are governed by the Development Charges Act and are applied in accordance with our Development Charges By-Law. Impacts from the growth activities analyzed in the 2019 DC Background Study are included in this AMP.

5.2 Expenditure History and Forecasts

The Thamesford wastewater system contains a significant capital project within the 10-year approved budget for the design of headworks screening required for treatment process enhancements, as illustrated in figure 5.2.1. Linear asset replacements are ongoing, in conjunction with the local area municipal roadway construction projects. Minor process equipment replacements were included in the 2020 to 2022 budgets. County staff continue to review anticipated asset management needs with each budget cycle, subject to existing resource limitations.

Non-Infrastructure solution projects include shared projects for condition reviews, studies and implementation of the work management system.

Figure 5.2.1 Expenditures (millions)

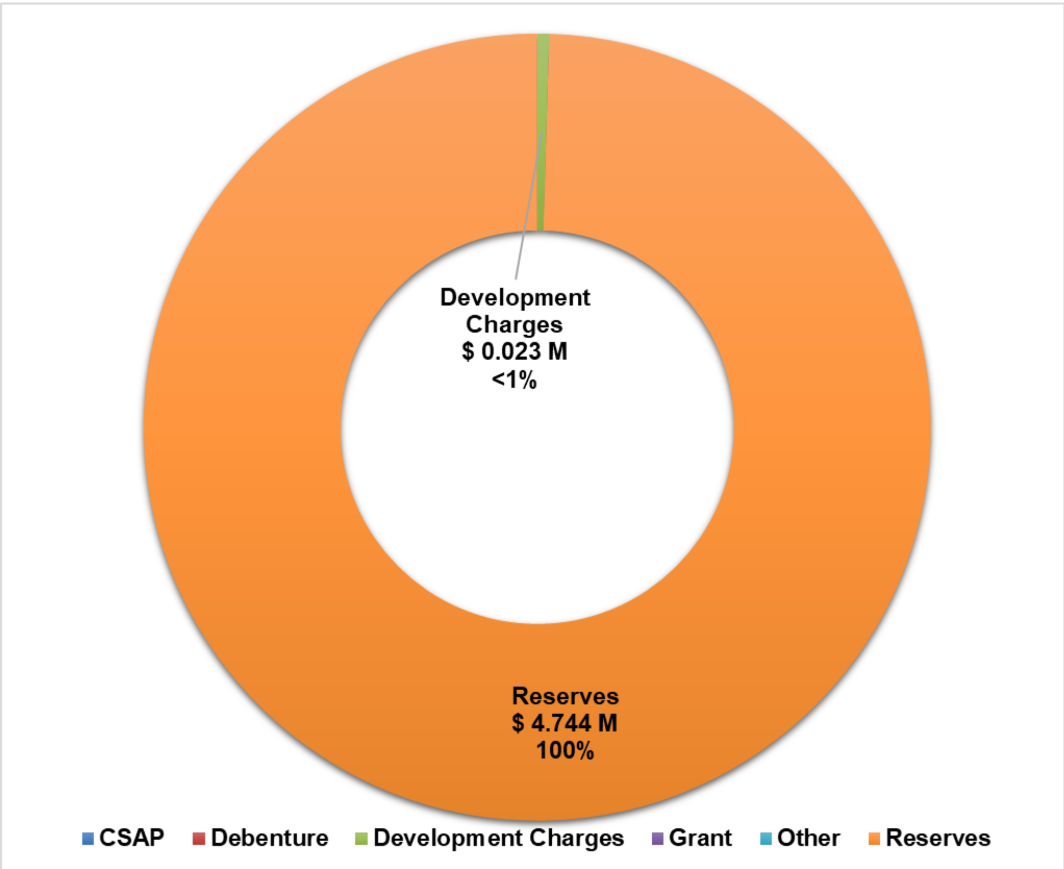


	2019 Actuals	2020 Actuals	2021 Actuals	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Non-Infrastructure Solution	0.002	0.004	0.012	0.029	0.017	0.040	0.020	0.050	0.027	0.027	0.022	0.031	0.024
Maintenance	-	-	-	-	-	-	-	-	-	-	-	-	-
Rehabilitation / Renewal	-	-	-	-	-	-	-	-	-	-	-	-	-
Replacement	0.140	0.034	0.042	0.138	0.158	-	0.056	0.025	-	-	-	0.013	0.006
Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-
Expansion / Growth	0.000	0.001	-	0.350	3.500	-	-	-	-	-	-	-	-

5.3 Capital Revenues

Replacement projects, identified in the County's 10-year capital plan, are anticipated to be funded by the Wastewater – Thamesford Reserve, which is funded by user fees. The Thamesford WWTP pretreatment / screening process enhancements is identified as an expansion project, however was not listed within the County's 2019 DC Study. This project will be included in the next DC Background Study, to determine its eligibility for DC funding, however in the meantime the project is proposed to be fully funded by the reserve. The Thamesford wastewater reserve currently has a sufficient balance to fund the 10-year related asset activities within the approved 2022 Long-Term Capital Plan.

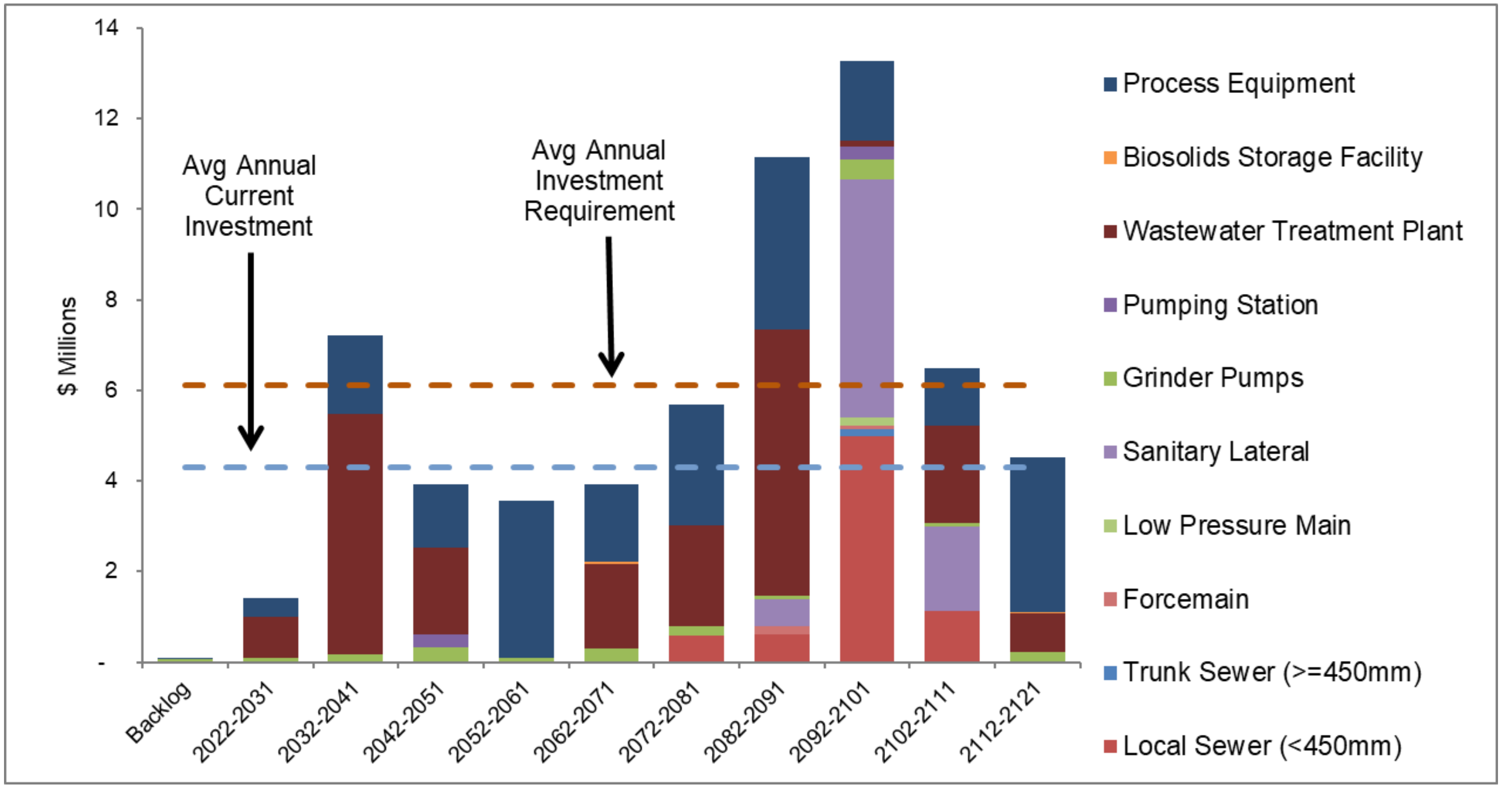
Figure 5.3.1 Sources of Capital Revenues 2019-2031 (millions)



5.4 Capital Investment

Based on the asset management lifecycle strategies identified, the financial requirements over the next 100-years are determined in current dollars. The average annual investment requirement represents the amount of capital funding required to renew and maintain the existing assets on an annual basis so services can continue to be delivered. These estimates assume that all work is able to be completed, as indicated, and does not take into account future changes due to environmental factors, new maintenance techniques, and unidentified growth. The annual requirement has increased from the 2017 AMP, primarily due to significant development and improvements the County has made to the vertical data, resulting in asset useful lives that are more reflective of their actual lifecycle. Further work is ongoing with the vertical data to fully determine lifecycle needs (including maintenance and rehabilitation strategies) which will impact the annual requirement for vertical assets. The data will continue to be reviewed with each budget and business plan cycle.

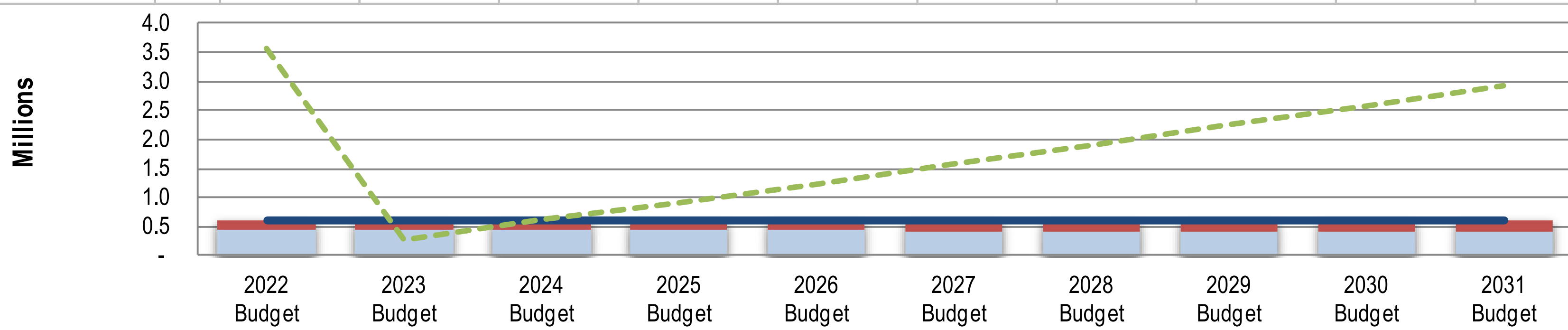
Figure 5.4.1 Average Annual Capital Requirements



The following figure links the annual capital funding needs to the capital investments contained in the budget. The timing of the actual capital projects may vary, however annual investments in capital assets is important for financial sustainability.

Figure 5.4.2 Funding Requirements

	Key	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Annual Required Investment		**612,000**	**612,000**	**612,000**	**612,000**	**612,000**	**612,000**	**612,000**	**612,000**	**612,000**	**612,000**
Current Investment		435,872	433,241	431,619	441,616	451,022	417,958	418,704	419,407	420,097	420,777
Funding Deficit		*176,128*	*178,759*	*180,381*	*170,384*	*160,978*	*194,042*	*193,296*	*192,593*	*191,903*	*191,223*
Funding Surplus		-	-	-	-	-	-	-	-	-	-
Reserve Balance		3,578,284	274,975	605,112	911,064	1,229,482	1,566,565	1,905,745	2,250,879	2,577,721	2,920,165



It is important to note that a portion of the current investment is being utilized for debenture payments (approximately 13.6%), and is not available for use on lifecycle activities within the 10-year period.

5.5 Funding Gap Analysis

Using the anticipated 10-year asset lifecycle needs, along with the current capital investment level, the County is able to determine if there is an anticipated funding gap for the Thamesford wastewater system. Consideration is then given to the current system reserve balance to determine the residual funding gap. The County would then investigate opportunities for reducing this residual funding gap which, may include increases to the user rates, utilization of grant funding opportunities and further review of lifecycle strategies and proposed levels of service.

Figure 5.5.1 illustrates the anticipated asset management 10-year lifecycle needs, including the projected funding surplus (left side of figure 5.5.1) and funding needs (right side of figure 5.5.1) for the Thamesford wastewater system. The system calculates the optimal expenditures based on theoretical asset lifecycle needs. These needs have not yet been reviewed in depth with County operations staff, and incorporated into the 10-year capital budget. This is anticipated to be completed as part of the 2023 Business Plan and Budget process with subsequent review annually.

The anticipated expenditures have been increased for non-infrastructure solution projects; approximately $0.3 million.

While the anticipated expenditure calculation accounts for the lifecycle activities of expansion / growth projects it does not account for the initial investment. It is important to adjust for these projects, where the initial investment is growth related and not projected to be DC funded within the 10-year capital plan. The resulting growth/expansion projects added to the anticipated asset needs is approximately $3.85 million for the Thamesford WWTP pretreatment / screening process enhancements.

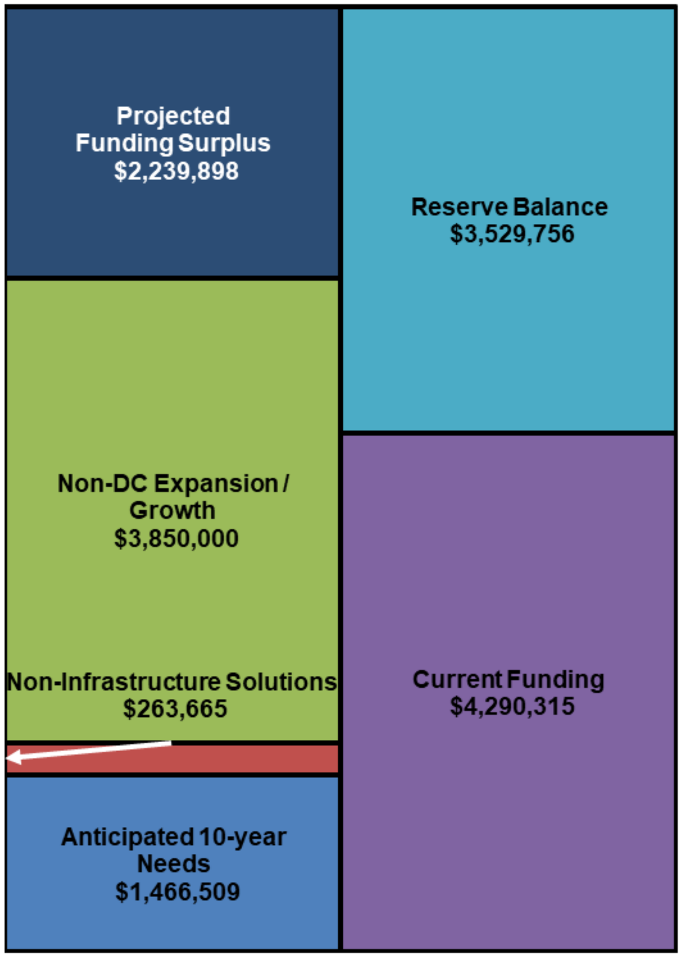
The Thamesford wastewater system is projecting a funding surplus over the 10-year capital planning period. Although the Thamesford wastewater system has a projected funding surplus over the 10-year horizon, the annual funding requirement is the basis for ensuring the long-term financial sustainability well into the future. Approximately 13.6% of the current funding is committed to debenture payments over the 10-year horizon. The annual funding requirement will be reviewed holistically as part of the next rate study.

Drawing the reserve balance to zero would likely result in increased user fee requirements in the subsequent 10-year period in order to fund the anticipated asset lifecycle needs.

The reserve is also utilized to fund emergency or unplanned expenses. A minimal or fully committed balance would limit the ability to fund these types of expenses. Consideration needs to be given to a minimum balance the County should maintain based on these risks. Analysis of the reserve target minimum balance, will be completed as part of the annual reserve review process.

Failure to address the long-term asset lifecycle needs could result in significant increases to rates in the future as assets reach end of life; or reductions in localized and/or regional service. This may include blockages, sewer backups, basement flooding, localized service outages, increased maintenance costs on assets past their optimal life, poor quality effluent, damage to the natural environment, fines, increase in insurance claims for property damage and personal injury resulting from poor asset conditions, etc.

Figure 5.5.1 Anticipated Needs (10-Year)



6.0 Climate Change

As part of the asset management planning process, the County will consider the risks and vulnerabilities of capital assets to climate change and the resulting actions that may be required. Commitment will be made to the development of tailored actions that make the best use of our resources to mitigate and adapt to climate change, in accordance with our local reduction targets, financial capacity and stakeholder support.

Optimization of the wastewater treatment process can help reduce the emissions of GHG such as nitrous oxide (N_2O), carbon dioxide (CO_2) and methane (CH_4) from being released into the environment at WWTPs. Optimization requires the correct equipment to ensure conditions can be achieved to reduce GHG emissions, while maintaining WWTP regulatory compliance.

Nitrous oxide (N_2O) is released in the secondary treatment train through the nitrification and denitrification process, which is used to remove nitrogenous components from the wastewater. Nitrifying bacteria oxidize ammonia to nitrites and nitrates. To minimize N_2O emissions, the plant is optimized by running the activated sludge process at a high sludge retention time (SRT) with optimal dissolved oxygen levels, which results in low ammonia and nitrite concentrations. High amounts ammonia and nitrite compounds, especially when there are excessive amounts of dissolved oxygen, can trigger biogenic N_2O emissions. To control this process, an upgrade is underway:

- Installation of a dissolved oxygen sensor to monitor for optimum oxygen concentrations.

- Installation of an ammonium/nitrate sensor to monitor the nitrification process and give advance warning of upset conditions.

Methane (CH_4) is generated by the anaerobic biological break down of organics or the release of dissolved CH_4 found in the wastewater influent. The Thamesford WWTP employs aerobic digestion, and does not generate significant levels of methane gas.

Carbon Dioxide (CO_2) is produced in biological treatment, where the organic carbon in the wastewater is utilized for biomass growth or oxidized into CO_2. By operating WWTPs at high sludge retention times, endogenous respiration (cell lysis results in biomass growth) is encouraged, which decreases the overall sludge production, which results in a decrease in CO_2 production. Upgrades with this process include:

- Installation of an actuated Waste Activated Sludge valve to control the biomass concentration to the desired sludge retention time.

Improving energy efficiency at WWTPs can help to reduce GHG emissions by decreasing consumption of fossil fuel-based energy. Significant energy savings can be realized by increasing the efficiency of plant equipment such as pumps and blowers, and using generated fuel sources.

- Repair and maintenance to the tertiary sand filter, including new media and filtration pumps for the process to run at optimum efficiency.

Climate change risks are considered during the planning phase of each capital project. Increasing resiliency to changing climate conditions through the use of backup power generation, redundancies with critical equipment, use of SCADA to collect accurate information and make informed decisions. By conducting inspections and completing studies, problem areas can be identified and planned to repair.

- use of backup power generation,
- redundancies with critical equipment,
- Ongoing development and implementation of a SCADA Master Plan, and
- conducting inspections (including CCTV) and studies to identify problem areas and complete repairs.

WASTEWATER SYSTEM

Drumbo

Table of Contents

1.0 Introduction

The County maintains a diverse portfolio of assets that are required to provide the community of Drumbo with the safe collection and treatment of wastewater. The Drumbo Wastewater Treatment Plant (WWTP) provides wastewater treatment for residential, commercial, and industrial users in the Village of Drumbo.

The Drumbo WWTP is a Class II rated facility, as defined by Ontario Regulation 129/04. It is a sequential batch reactor (SBR) plant, consisting of two alternating reactors, tertiary pressure filters and UV light for disinfection, with an outfall pipe to a wetland area which discharges to the Cowan Drain. The entire treatment process is completed in accordance with strict standards, processes, and limits as regulated by the WWTPs Environmental Compliance Approval (ECA) issued by the Ministry of Environment, Conservation, and Parks (MECP) of the Ontario Provincial Government.

The wastewater collection network transports residential, commercial and industrial waste to the WWTP for treatment. The wastewater collection network consists of a mix of gravity mains, low pressure mains and forcemains. Wastewater flows by gravity wherever possible, where changing elevations require the use of sewage pumping stations (SPS). Other specialized structures such as manholes, valve vaults, meter stations, diversion structures and siphons are required to convey wastewater to the WWTP.

Sound management of our wastewater systems helps us realize our vision of being a vibrant community, working well and growing stronger together!

Like many of our assets, wastewater assets are facing increased challenges as a result of aging assets, climate change, increasing demand due to growth in our communities and regulatory changes. Our investment in these assets must therefore be balanced to optimize investment for renewal with the growing needs of our community.

This plan provides information regarding our approach to the management of our wastewater assets over the short (10-year) and long (100-year) term, demonstrating our commitment to assessing and meeting the levels of service valued by our residents and businesses.

1.1 Improvement Plan

The County recognizes that asset management is a continuously evolving process. The following recommendations are based on the review of current management practices, inventory, valuation and condition analysis.

- Document lifecycle history on assets within the asset management systems.
- Continue to reduce asset data gaps.
- Refine asset components and maintenance strategies for facilities and associated processes.
- Refine the risk assessment approach at the component level.
- Incorporate findings from the Water and Wastewater Master Plan.

2.0 State of Assets

2.1 Inventory

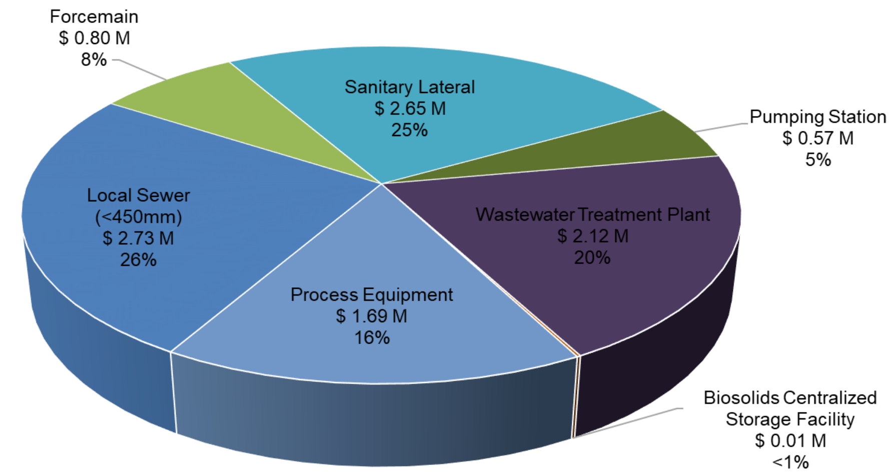
Wastewater assets are those that enable us to live in a clean and safe environment. It includes everything from wastewater mains that service our homes and businesses throughout the County, to the WWTPs, which ensure that effluent is properly treated before being discharged into the natural environment.

We have two different asset classes within the wastewater portfolio in order to effectively collect and treat wastewater from our community:

- Linear, which represent the collection pipe network, including the maintenance holes, connectors and related parts required in such a network.
- Vertical, which represent facilities (including the multiple buildings and structures that the facilities are comprised of), and related process systems and equipment required to perform the needed functions.

Table 2.1.2 displays our current wastewater inventory and the associated replacement costs and average age for each asset component. The County continues to make improvements to increase the integrity of our wastewater data. The inventory figures in table 2.1.2 capture inventory within newly constructed subdivisions which the County is aware of and anticipates assuming ownership of. The County generally assumes ownership of these assets approximately two years after full operation. It is important to include growth assets to ensure that lifecycle activities are planned and funded accordingly.

Figure 2.1.1 Inventory Valuation



2.2 Valuation

The replacement cost valuation for wastewater linear is based on current tender prices, where available. Current tender prices are adjusted where County staff feel some cost increases are only temporary due to COVID.

The replacement cost valuation for wastewater vertical is based on the latest information available, which includes current replacement costs, insurance valuations, and valuations from studies / assessments completed in prior years.

Table 2.1.2 – Drumbo Wastewater System Inventory

Asset Type	Asset Component		2017 Inventory	Current Inventory	Replacement Cost	Average Age
Linear	Local Sewer (<450mm)	m	6,678	6,865	$2,727,948	23 Years
	Trunk Sewer (>=450mm)	m	-	-	-	-
	Forcemain	m	2,057	2,676	802,713	18 Years
	Low Pressure Main	m	-	-	-	-
	Sanitary Lateral	each	404	408	2,652,000	21 Years
	Collection Tank	each	-	-	-	-
	STEP Pump	each	-	-	-	-
	Grinder Pump	each	-	-	-	-
Vertical	Pumping Station	each	3	3	571,400	30 Years
	Wastewater Treatment Plant	each	1	1	2,120,000	24 Years
	Odour Control Facility	each	-	-	-	-
	Biosolids Centralized Storage Facility[1]	each	-	1	14,888	4 Years
	Process Equipment	total	N/A	N/A	1,691,980	28 Years
Total Replacement Cost					**$10,580,929**	

There is a growth / expansion projects planned in Drumbo that is included in the County's 2022 approved Long-Term Capital Plan. This includes an expansion of the WWTP facility including related process equipment (approximately $7.8 million). This growth project is not included in the figures within table 2.1.2, however the project's anticipated lifecycle needs are included within this AMP.

[1] The Biosolids Centralized Storage Facility is a shared facility across the County with each system contributing to the costs based on number of customers. The value utilized throughout this report card represents Drumbo's share based on 2021 customers.

2.3 Condition Assessment Approach

The assessment approach for our wastewater assets utilizes a combination of physical assessments, asset attributes, such as material and sizing, as well as established anticipated useful lives.

The County's condition scale and visual inspection ratings are based on the following approach:

- Excellent - Asset is well maintained with no noticeable defects.
- Good - Asset may show signs of minor deterioration and may require some maintenance.
- Fair - Deterioration evident, function affected. Asset may require on-going monitoring.
- Poor - Serious deterioration, function inadequate. Asset may require ongoing monitoring.
- Critical - No longer functional, general or complete failure. Asset may require extensive monitoring.

The Pipeline Assessment Certificate Program (PACP) is the North American Standard for pipeline defect identification and assessment[2]. Closed-circuit television (CCTV) is the principal method of inspecting drains and sewers. In this process, a small robotic crawler vehicle with the CCTV camera attached is lowered into the pipe to complete the inspections. A structural rating, on a scale of 0-5, is then assigned using sewer condition assessment standards, with 0 representing an asset with minimal structural deficiencies and 5 representing assets on the verge of failure.

Table 2.3.1 illustrates how the PACP score ratings align with the County's standard condition scale. Unless otherwise noted, all images are of County assets, and are general representations of the asset condition at the time the photo was taken. Assets may have undergone lifecycle strategies since the date of the image impacting its condition.

Wastewater process assets are inspected by County staff on a regular basis as part the preventative maintenance program. These inspections identify performance and accelerated degradation and will trigger the creation of a reactive work order for repairs and rehabilitation. The County is working towards incorporating these inspections into a formalized condition rating. A visual inspection rating was provided for most process assets as part of the data collection process in 2018 and 2019.

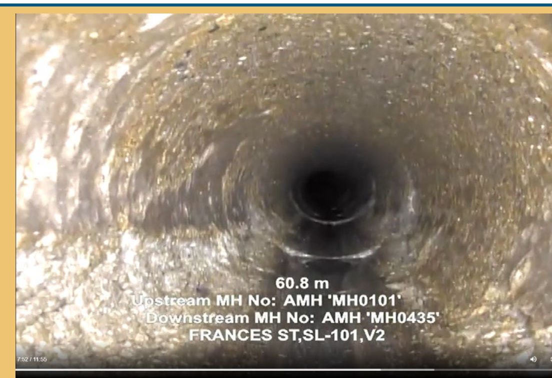
Given the complexities and accessibility of some assets, it is not beneficial to complete a visual or performance based condition assessment on all assets. For assets which are unable to be visually inspected or that have since been replaced, an age-based condition rating is being used based on anticipated useful lives.

[2] https://www.nassco.org/content/pipeline-assessment-pacp

Table 2.3.1 PACP Score Ratings

Excellent
PACP Score of
0 or 1

Poor
PACP Score of
4



Good
PACP Score of
2

Fair
PACP Score of
3

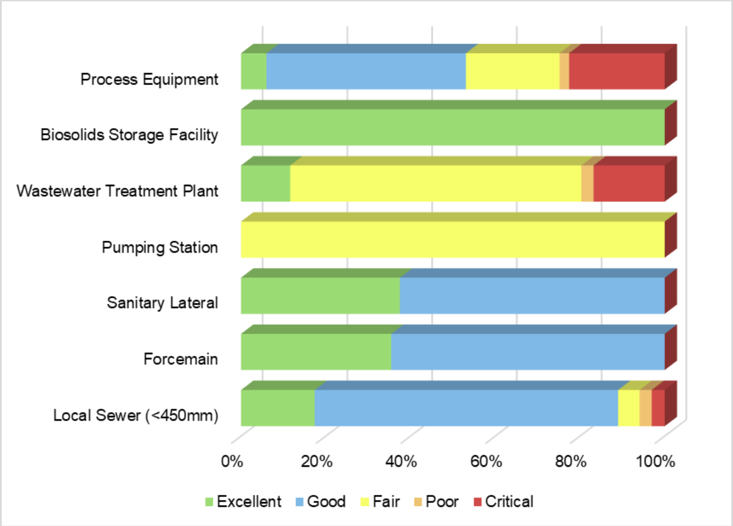
Critical
PACP Score of
5

2.4 Condition Assessment

The condition profile of our Drumbo wastewater asset components is shown in figure 2.4.1. The % in each condition is based on replacement costs.

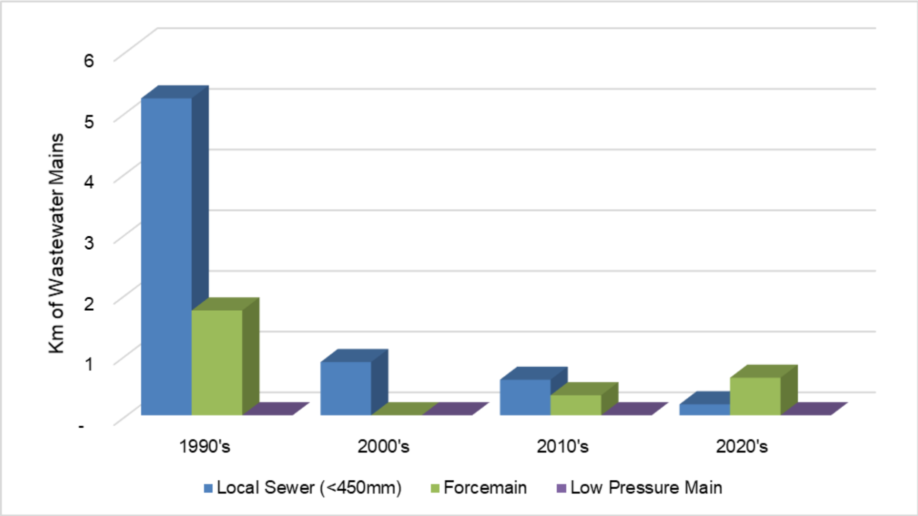
For the Drumbo wastewater assets: 9.4% of these assets are in poor or critical condition, and 66.6% in good or excellent condition in comparison to 10-11% and 57-65% respectively for Canadian municipalities reported on the Canadian Infrastructure Report Card[3]. While it may appear that our Drumbo wastewater assets are in comparable shape to other Canadian municipalities, the 2019 Canadian Infrastructure Report Card is an aggregate of self reported condition ratings across the Country and are based on a general rating scale which may not match the County's.

Figure 2.4.1 Asset Condition by Component



To better understand our Drumbo wastewater collection assets, an age profile of all our wastewater mains by decade is shown in figure 2.4.2.

Figure 2.4.2 Wastewater Mains by Age



The average age of the majority of linear assets within the Drumbo wastewater system is approximately 22 years, whereas the average age of the vertical assets varies by facility type from 4 to 30 years. This value must be considered in the context of the different asset types in the category, compared to the typical anticipated useful life of each asset type.

[3] http://canadianinfrastructure.ca/en/index.html

Table 2.4.3 outlines the anticipated useful life for each new build/replacement. The anticipated useful lives for our wastewater assets exclude the management strategies that the County utilizes to extend the overall life of our wastewater assets.

Table 2.4.3 Useful Life

Wastewater System Component	Anticipated Useful Life (years)
Forcemain, Low Pressure Main, Trunk Sewer, Local Sewer, Laterals	90
Collection Tanks	30
Grinder Pumps	10
Facilities	10 - 50
Process Equipment	8 - 75

Figure 2.4.4 illustrates the current average age of the Drumbo wastewater system linear components in comparison to their anticipated useful life, based on a run to failure strategy.

As the vertical assets can have a significant variability in age, from both a facility and process standpoint, they are not represented within figure 2.4.4.

There are a number of management strategies that the County may utilize to extend the overall life of our wastewater assets.

These strategies allow us to align the needs with those of other assets, resulting in the best overall value for our residents.

Figure 2.4.4 Age and Useful Life Comparison

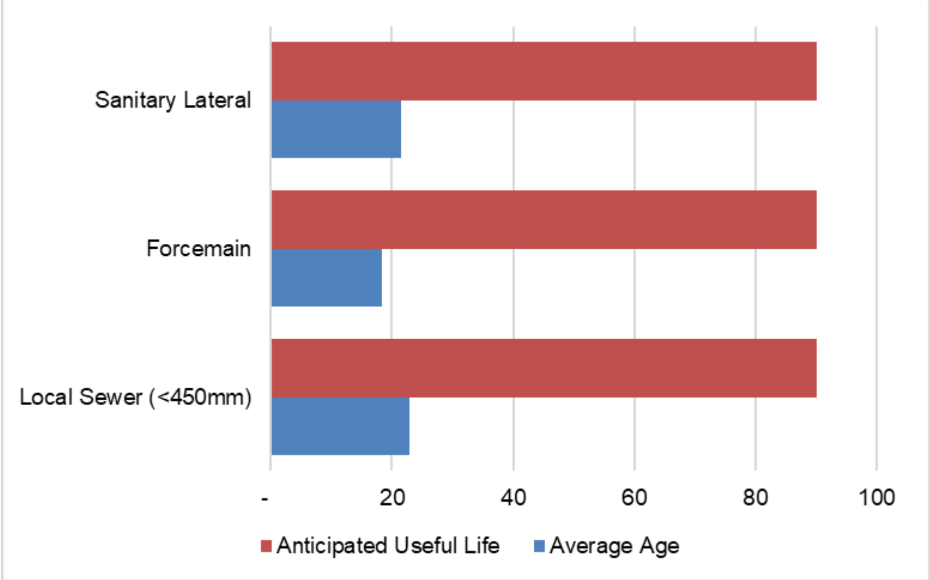


Table 2.4.5 compares the status of our Drumbo wastewater asset components, as identified in our 2017 Asset Management Plan to their current condition. The breakdown by component for vertical assets was not available as of the date the 2017 report was published, so there is no condition comparison available. Work is ongoing to further enhance the asset information at the component level.

The trend shows that the status of wastewater assets for the Drumbo system is steady. The installation of new forcemain has increased the overall condition rating. As the system continues to age it is expected that condition ratings will decline until targeted lifecycle strategies are implemented.

Table 2.4.5 Wastewater Systems Condition Assessment

Asset Type	Asset Component	2017 Condition Rating	Current Condition Rating	Trend
Linear	Local Sewer (<450mm)	Good	Good	→
	Trunk Sewer (>=450mm)	-	-	-
	Forcemain	Good	Excellent	↑
	Low Pressure Main	-	-	-
	Sanitary Lateral	Good	Good	→
	Collection Tank	-	-	-
	STEP Pump	-	-	-
	Grinder Pump	-	-	-
Vertical	Pumping Station	Not assessed	Fair	-
	Wastewater Treatment Plant	Not assessed	Fair	-
	Odour Control Facility	-	-	-
	Biosolids Centralized Storage Facility[4]	-	Excellent	-
	Process Equipment	Not assessed	Fair	-

[4] The Biosolids Centralized Storage Facility is a shared facility across the County with each system contributing to the costs based on number of customers. The value utilized throughout this report card represents Drumbo's share based on 2021 customers.

3.0 Levels of Service

County staff have developed a comprehensive Level of Service (LOS) Framework. This framework will help to establish a relationship between the current LOS being provided by the County's assets, and the associated operating and capital expenditures required to achieve the proposed LOS. The framework puts into perspective the definition and measurement of service performance in alignment with the County's corporate mission and vision.

Corporate Objective

The wastewater collection and treatment service ensures protection of the environment and public health of residents, visitors to the County and downstream users of the receiver (Nith River) and our partners in the watershed.

Legislative Requirements

Each of the County's WWTPs are regulated under the Ontario Water Resources Act, 1990[5] and operated in accordance with an ECA or historical Certificates of Approval (C of A) issued by the MECP.

The ECA for the County's WWTPs require annual reporting of operational and treated effluent discharge parameters into the receiving water bodies. The Annual Wastewater Treatment System Summary Reports are available on the County's website.

Framework

The structure of the County's LOS framework was developed to align with international best practices including the International Infrastructure Management Manual (IPWEA, 2015). The framework includes the mandatory measures to meet the requirements of Ontario Regulation (O.Reg.) 588/17 by including both Community and Technical Levels of Service. The metrics in this framework may be expanded upon as the County continues to improve its data collection and reporting processes.

[5] https://www.ontario.ca/laws/statute/90o40

3.1 Customer Levels of Service

Community or Customer Levels of Service are statements that describe quantifiable metrics of the service delivery outcomes from the perspective of the customer, expressed in non-technical terms. The following statements form our qualitative descriptions of the customer level metrics required under O.Reg. 588/17.

The Drumbo wastewater system connects to most residential, commercial and industrial spaces in the settlement areas of Drumbo, as outlined in figure 3.3.1. The Drumbo wastewater system provides for the safe collection and treatment of wastewater.

The County does not have any combined sewers within the Drumbo wastewater system. The Drumbo wastewater system is a separate wastewater system.

Infiltration and inflow can enter through a variety of sources (cracks in pipes, weeping tile connections, cross connections, etc.). In the case of heavy rainfall events, wastewater mains may experience a volume of water and wastewater that exceeds its designed capacity. In some cases, this can cause water and/or wastewater to overflow into streets or backup into homes or businesses.

To minimize wastewater overflow into streets or backup into homes, the County has established design standards to convey flows under ultimate conditions, design sheets for capacity needs that include infiltration inflow. Newer wastewater mains are made of gasketed PVC piping to reduce potential leaks occurring between fitted pipe segments.

Final Effluent is the treated water that is discharged to the environment through the approved effluent disposal facilities, including all bypasses that are required to meet the compliance limits stipulated in the ECA for the WWTP, at the final effluent sampling points. The effluent criteria includes effluent flow rates, and parameters such as total suspended solids, Biochemical Oxygen Demand (BOD), phosphorous, ammonia, and E. coli. The County produces annual reports summarizing each WWTPs operation and treated effluent discharge quality and these can be found on the County's website at: http://www.oxfordcounty.ca/Services-for-You/Water-Wastewater/Wastewater/Annual-reports.

Table 3.1.1 outlines additional customer focused performance metrics from the County's LOS framework.

3.2 Technical Levels of Service

Technical Levels of Service metrics are quantifiable metrics applied against assets that are subject-matter specific inputs or outputs supported by the day-to-day activities of County staff. Table 3.1.1 includes the technical metrics required under O.Reg. 588/17, as well as, additional metrics the County has included in the framework.

3.3 Levels of Service Maps

As a further illustrative example of our community levels of service, a map is included as figure 3.3.1 showing areas within the Village of Drumbo boundary that are serviced by the Drumbo wastewater system.

Figure 3.3.1 Drumbo sanitary serviced properties

Drumbo

Properties with fronting sewer

- Properties with fronting sewer
- Properties without fronting sewer
- Municipal Boundary
- Village Boundary
- Railway
- Waterbody

Total # of parcels:	412
Without fronting sewer:	9
With fronting sewer:	403
Coverage:	98%

N

0 87.5 175 350 525 m

Parcels with fronting sewer identified as being a distance of 30m from sanitary mains.

Oxford County
Growing stronger together
Produced By The Department of Corporate Services Information Services ©2021

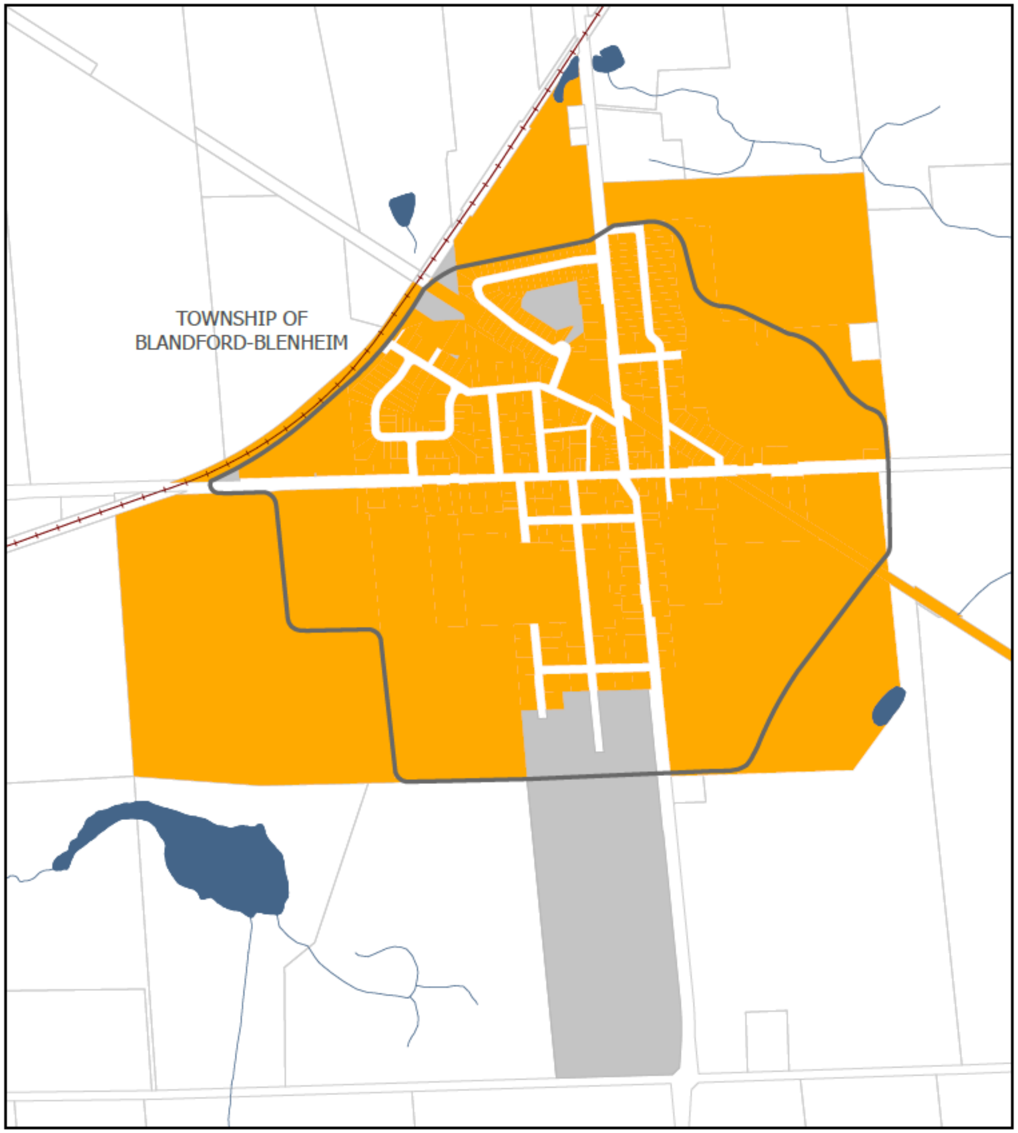


Table 3.1.1 Performance Measures

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Customer / Council Focused Performance Measures					
Reliability	Providing wastewater services with minimal interruptions	% of properties within the system boundary connected to the municipal wastewater system	N/A	98%	TBD
		% of wastewater mains designed to be resilient to overflow or flooding during wet weather events	100%	100%	100%
Environmental Stewardship	Providing wastewater services that have minimal impacts on the environment	% of overall facility ECA compliance rate	98.2%	96%	100%
Cost Efficient	Providing wastewater services in an efficient manner	Operating cost to provide service ($/connection)	$793	$805	TBD
Technical Focused Performance Measures					
Reliability	Providing wastewater services with minimal interruptions	The number of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system.	0 connection-days to 331 connections	0 connection-days to 337 connections	TBD
		% of system inspected (CCTV) annually	12.9%	15.1%	7%
		% of wastewater mains flushed annually	19.4%	21.4%	20%
		# of overflow or spill occurrences	0	0	0
Environmental Stewardship	Providing wastewater services that have minimal impacts on the environment	% of wastewater estimated to have by-passed treatment	0%	0%	0%
		The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system.	1 ECA violation to 331 connections	6 ECA violations to 337 connections	0

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Cost Efficient	Providing wastewater services in an efficient manner	Operating cost per kilometre of wastewater main for collection	N/A	$9,690	TBD
		5 year average capital expenditure for wastewater collection	$0.03M	$0.02M	TBD
		5 year average capital expenditure for wastewater treatment	$0.1M	$0.5M	TBD

4.0 Asset Management Strategy

4.1 Lifecycle Activities and Planned Actions

Wastewater collection assets undergo regular maintenance and inspection. As part of capital works project analysis, determinations of whether wastewater pipe replacement or relining should occur is reviewed. This process is fully integrated with the renewal needs of the roadways and other underground assets, such as drinking water and stormwater. This integrated approach ensures our renewal projects for these service areas are delivered with optimal timing to increase value and minimize disruption to our communities. For example, if a roadway is targeted for renewal, coordination between service areas and area municipalities will determine whether the underlying stormwater, drinking water or wastewater assets are also of an age or condition that requires renewal, to ensure these projects are delivered together to reduce disruption for our communities and deliver enhanced value.

Process assets and equipment undergo extensive operations and maintenance regimes to sustain their reliable operation. Investment needs are identified and coordinated with normal operations to minimize disruptions to service. Major replacements are planned and accommodated using system redundancy and changes to operations, in order to maintain service. It is critical to maintain wastewater service in order to protect public health and the environment.

There are six main lifecycle activities considered in the overall sustainable management of wastewater assets, described in table 4.1.1.

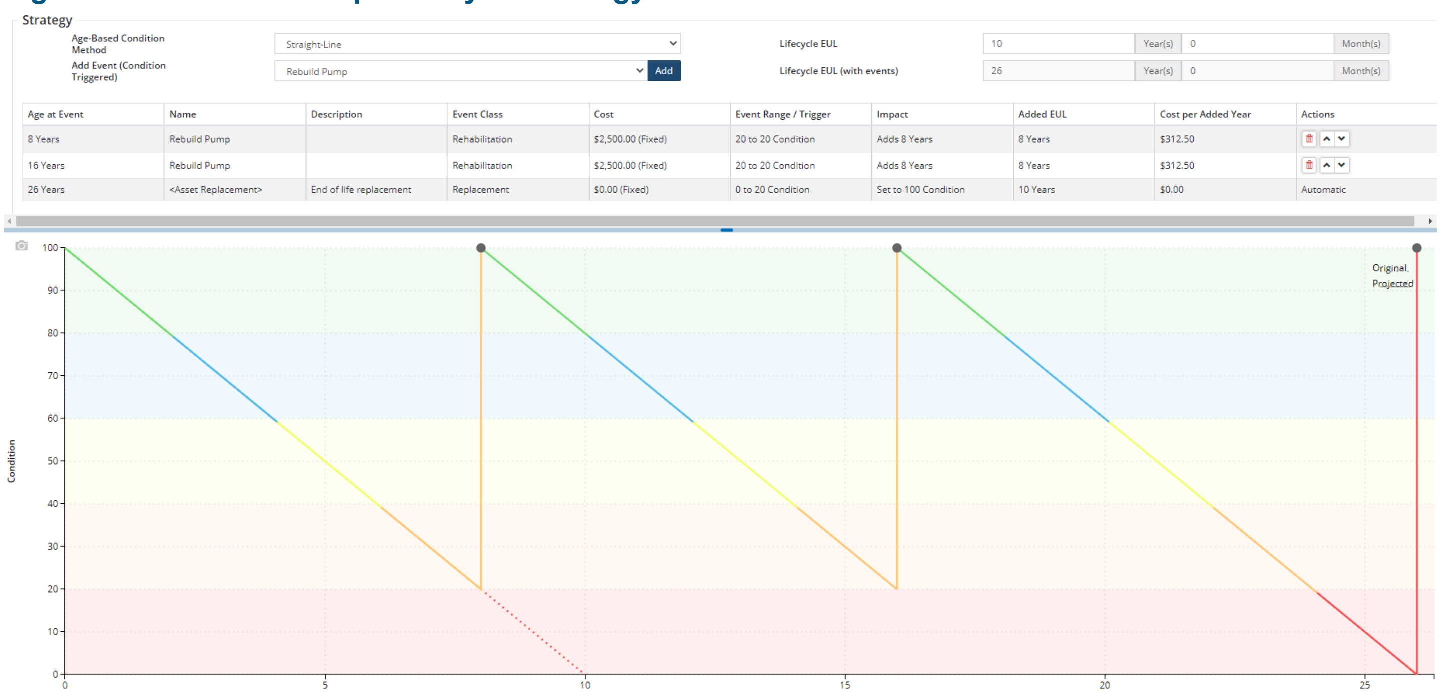
Table 4.1.1 Lifecycle Activities

Strategy	Lifecycle Activity
Non-Infrastructure Solutions	Actions or policies that can lower costs or extend useful lives. **Trigger: Ongoing**
Maintenance	Regularly scheduled maintenance and inspection programs including cleaning and flushing, manhole repairs, CCTV inspections, exercising diesel gen-sets and minor repairs. These activities do not improve the overall condition of the asset, nor increase its useful life. **Trigger: Ongoing**
Rehabilitation / Renewal	One-time events that increase the condition and extend the useful life of the asset; including sewer lining and seal and grout programs. **Trigger: Fair/Poor**
Replacement	Occurs at the end of the useful life and/or when rehabilitation is no longer an option – can vary among assets due to construction material and environmental factors that impact the degree of deterioration and performance. **Trigger: Poor/Critical**
Disposal	Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the County to provide services. County staff coordinate with contractors to ensure safe removal and environmental compliance when disposing of assets. **Trigger: Poor/Critical**
Expansion / Growth	Planned activities required to extend services to previously unserved areas, expand services to meet growth demands, or increase the level of service being provided. **Trigger: Development**

The lifecycle management strategy is the set of planned actions that should enable the assets to provide users with the proposed level of service in a sustainable way, while achieving acceptable levels of risk and the lowest lifecycle costs required to provide that level of service. Lifecycle considerations for assets include analysis of the timing to carry out key asset management activities including inspection, maintenance, repair, and replacement. Ongoing preventative maintenance activities are outlined in the County's work management system. The rehabilitation and replacement activities impacting the asset components condition and useful life are contained within profiles in the County's asset management system. For some assets, replacement needs are based on a run to failure strategy, as this is the most economical. Work is ongoing within the County's asset management systems to build all the component profiles and identify where each asset is within the lifecycle.

As an example, figure 4.1.2 illustrates the lifecycle strategy of grinder pumps. The pumps are re-built twice, extending the overall useful life from 10 years to approximately 25. The annual cost requirement from a run to failure strategy is $1,500 per year where the annual cost requirement using the rehabilitation strategies decreases to just below $800 per year.

Figure 4.1.2 Grinder Pumps Lifecycle Strategy



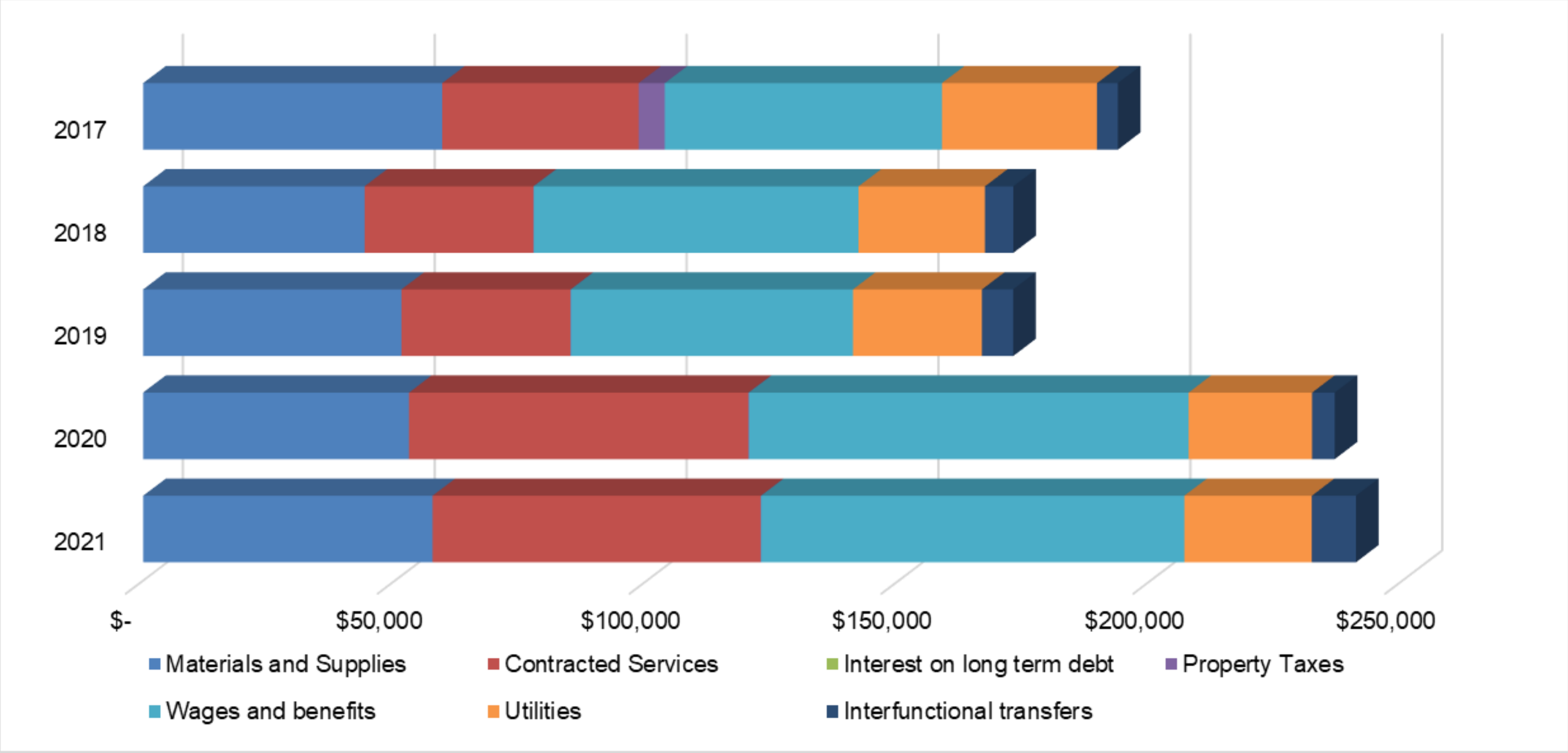
Age at Event	Name	Description	Event Class	Cost	Event Range / Trigger	Impact	Added EUL	Cost per Added Year	Actions
8 Years	Rebuild Pump		Rehabilitation	$2,500.00 (Fixed)	20 to 20 Condition	Adds 8 Years	8 Years	$312.50	
16 Years	Rebuild Pump		Rehabilitation	$2,500.00 (Fixed)	20 to 20 Condition	Adds 8 Years	8 Years	$312.50	
26 Years	<Asset Replacement>	End of life replacement	Replacement	$0.00 (Fixed)	0 to 20 Condition	Set to 100 Condition	10 Years	$0.00	Automatic

4.2 Significant Operating Expenses

Significant operating expenses are required in order to sustain an asset over its lifecycle. The County is always looking at ways to optimize our operating investment to ensure we are achieving the best value for our residents, and businesses. Essential to this is a strong operations and maintenance plan within our work management system. Operating expenses are incurred through a number of sources – preventative maintenance activities, utility costs, property taxes and more. Despite the fact that minor maintenance is incorporated into planned operations and maintenance programs, there are cases where it is unplanned.

Figure 4.2.1 shows the operating expenses from 2017 through 2021 for the Drumbo wastewater system grouped by expense type. The groupings align with those reported on the County's Financial Information Return (FIR), with further breakdown for property taxes and utility costs as these expenses can be significant.

Figure 4.2.1 Operating Expenses



4.3 Risk Strategy

Risk management frameworks are developed to assist with the prioritization of investments within the capital planning period. The preferred approach is to implement a triple bottom line analysis approach to evaluate:

- Social impacts of asset failure, including impacts to customers, businesses and the County's reputation;
- Environmental impacts of asset failure; and
- Economic impacts of failure including the cost of remediation.

In the context of asset management, risk is the multiple of the consequence of an asset failing and the probability that the event will occur.

Figure 4.3.1 illustrates the risk ratings for the current Drumbo wastewater assets at a summary level. County staff will continue to monitor the higher risk assets, review and/or complete physical inspections to further validate the age-based condition ratings and plan for lifecycle strategies accordingly.

Figure 4.3.1 Asset risk profile

Consequence \ Probability	1	2	3	4	5
5	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
3	0 Assets - $0.00	1 Asset 1.00 unit(s) $325,000.00	2 Assets 2.00 unit(s) $1,258,000.00	2 Assets 2.00 unit(s) $571,400.00	1 Asset 1.00 unit(s) $335,000.00
2	4 Assets 4.00 m, unit(s) $265,500.00	3 Assets 679.78 m $210,962.00	1 Asset 1.00 unit(s) $165,000.00	0 Assets - $0.00	0 Assets - $0.00
1	177 Assets 1,538.21 m, unit(s) $1,580,970.32	347 Assets 5,822.92 m, unit(s) $3,994,831.00	59 Assets 600.23 m, unit(s) $859,492.00	9 Assets 308.90 m, unit(s) $240,460.00	36 Assets 331.85 m, unit(s) $519,840.00

5.0 Financial Strategy

5.1 Financing Strategy

Hemson Consulting Ltd. (Hemson) was retained through a competitive process to assist with analyzing and developing the County's water and wastewater rates for a 4-year period from 2021 to 2024. The rate modeling includes all system asset management needs and all sources of funding including Community Servicing Assistance Program (CSAP) funding, development charges, developer and resident contributions. In most cases, the capital replacement component is the average annual required contribution level in order to establish full cost recovery; however, the contribution may vary based on the system's ability to meet full cost recovery for the next 10-years.

Capital work is funded from reserves (based on the capital contribution included in the user rates), development charges (for growth projects), debentures and grant funding when available. The County continually assesses opportunities for additional funding options and revenue streams to address our asset needs.

Where possible, replacement activities are planned in conjunction with the replacement needs of the road network and underlying water and stormwater assets. This requires a co-ordinated effort with area municipalities as the majority of the County owned water and wastewater linear assets falls under the area municipalities' roadways. This collaboration is essential for ensuring a cost effective approach to maintaining assets within the County regardless of ownership.

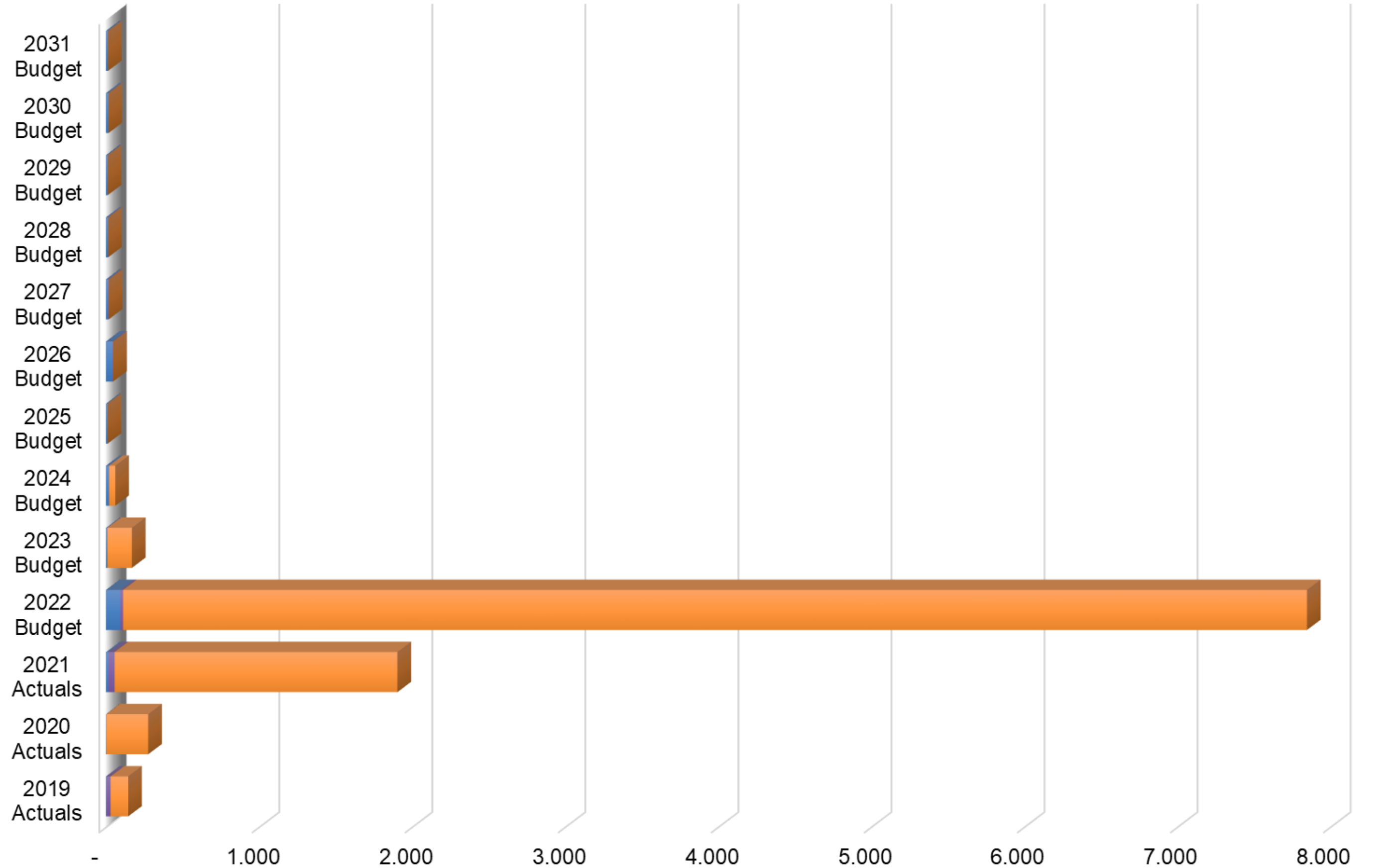
In addition to targeting and prioritizing the investment needed to maintain existing assets, there are also planning processes in place to determine the additional assets needed to meet growing demands through population increases or demand for new services. The projects targeted to meet growth are funded primarily through Development Charges (DC) – the mechanism that enables recovery of growth-related capital expenditures from new development. These charges are governed by the Development Charges Act and are applied in accordance with our Development Charges By-Law. Impacts from the growth activities analyzed in the 2019 DC Background Study are included in this AMP.

5.2 Expenditure History and Forecasts

The Drumbo wastewater system contains a significant capital project within the 10-year approved budget for the expansion of the WWTP, as illustrated in figure 5.2.1. Minor process equipment replacements were included in the 2021 to 2022 budgets. County staff continue to review anticipated asset management needs with each budget cycle, subject to existing resource limitations.

Non-Infrastructure solution projects include shared projects for condition reviews, studies and implementation of the work management system.

Figure 5.2.1 Expenditures (millions)

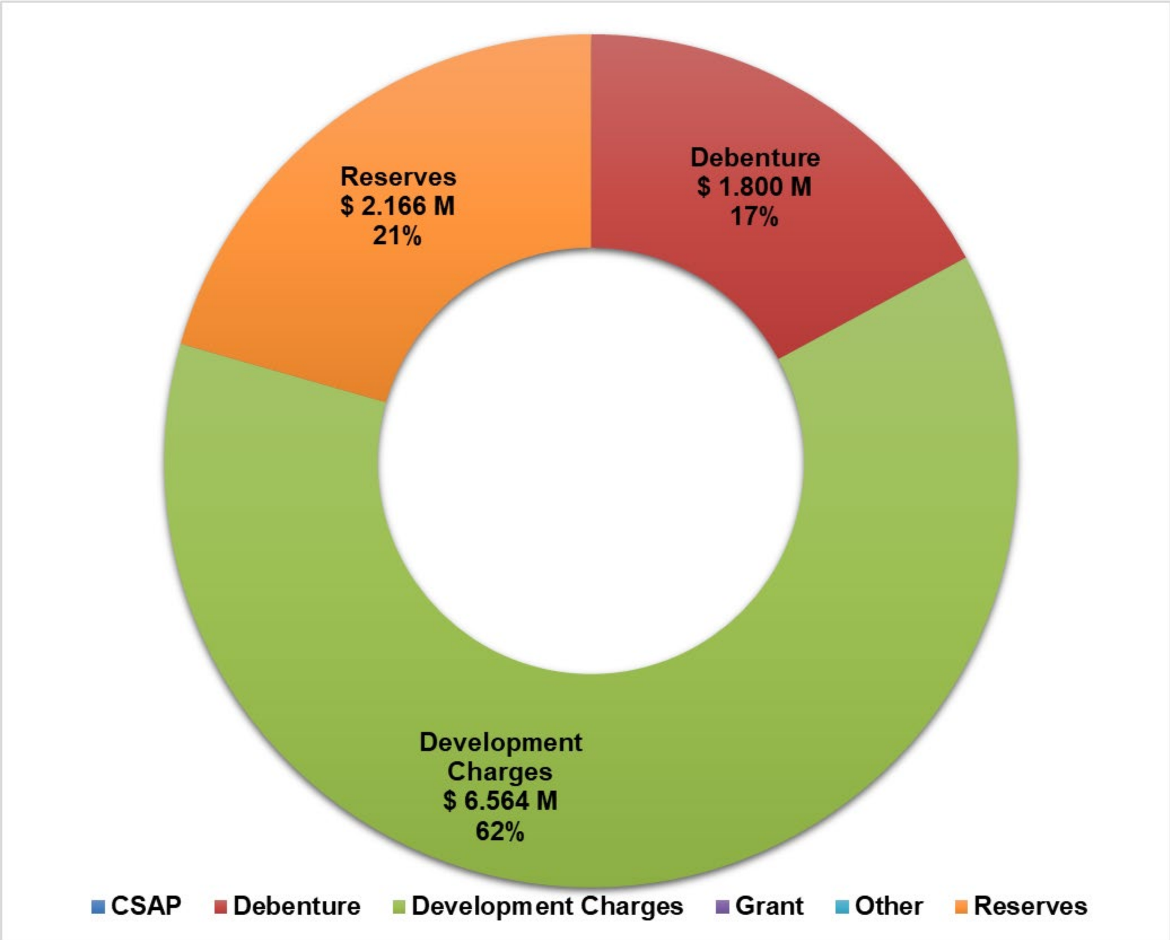


	2019 Actuals	2020 Actuals	2021 Actuals	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Non-Infrastructure Solution	0.001	0.002	0.015	0.094	0.009	0.020	0.010	0.043	0.014	0.014	0.012	0.016	0.013
Maintenance	-	-	-	-	-	-	-	-	-	-	-	-	-
Rehabilitation / Renewal	-	-	-	-	-	-	-	-	-	-	-	-	-
Replacement	0.029	-	0.040	0.018	0.000	-	-	0.004	0.004	-	-	-	-
Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-
Expansion / Growth	0.115	0.274	1.848	7.735	0.160	0.040	-	-	-	-	-	-	-

5.3 Capital Revenues

Replacement projects, identified in the County's 10-year capital plan, are anticipated to be funded by the Wastewater – Drumbo Reserve, which is funded by user fees. The Drumbo WWTP expansion project is anticipated to be partially debt funded. As a result of the Drumbo WWTP expansion, replacement projects within the 10-year capital plan, and ongoing debt repayment needs, the Wastewater – Drumbo Reserve will be drawn to a nil balance, and the Drumbo wastewater system is anticipated to operate in a deficit position for several years.

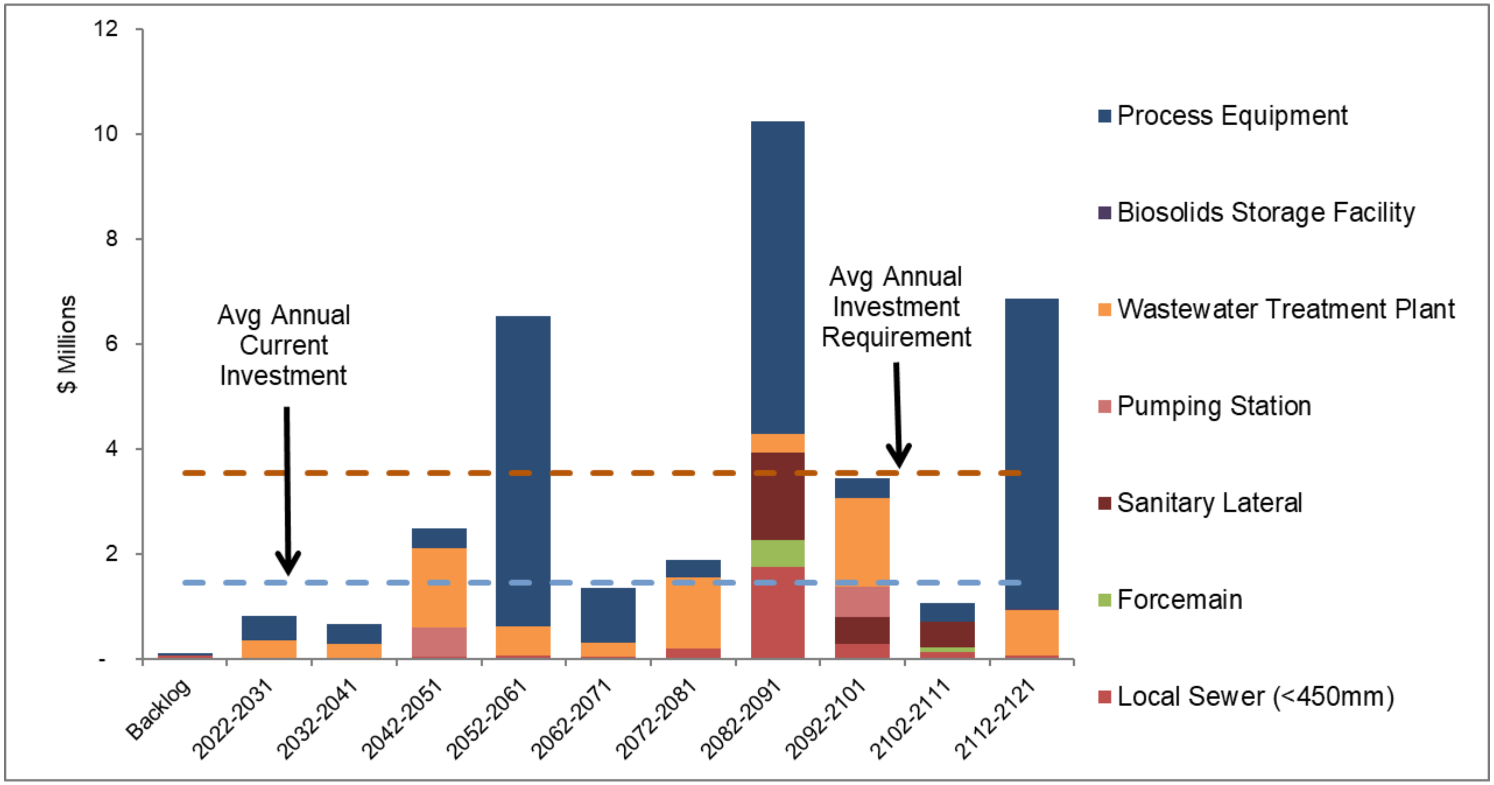
Figure 5.3.1 Sources of Capital Revenues 2019-2031 (millions)



5.4 Capital Investment

Based on the asset management lifecycle strategies identified, the financial requirements over the next 100-years are determined in current dollars. The average annual investment requirement represents the amount of capital funding required to renew and maintain the existing assets on an annual basis so services can continue to be delivered. These estimates assume that all work is able to be completed, as indicated, and does not take into account future changes due to environmental factors, new maintenance techniques, and unidentified growth. The annual requirement has increased from the 2017 AMP, primarily due to significant development and improvements the County has made to the vertical data, resulting in asset useful lives that are more reflective of their actual lifecycle. Further work is ongoing with the vertical data to fully determine lifecycle needs (including maintenance and rehabilitation strategies) which will impact the annual requirement for vertical assets. The data will continue to be reviewed with each budget and business plan cycle.

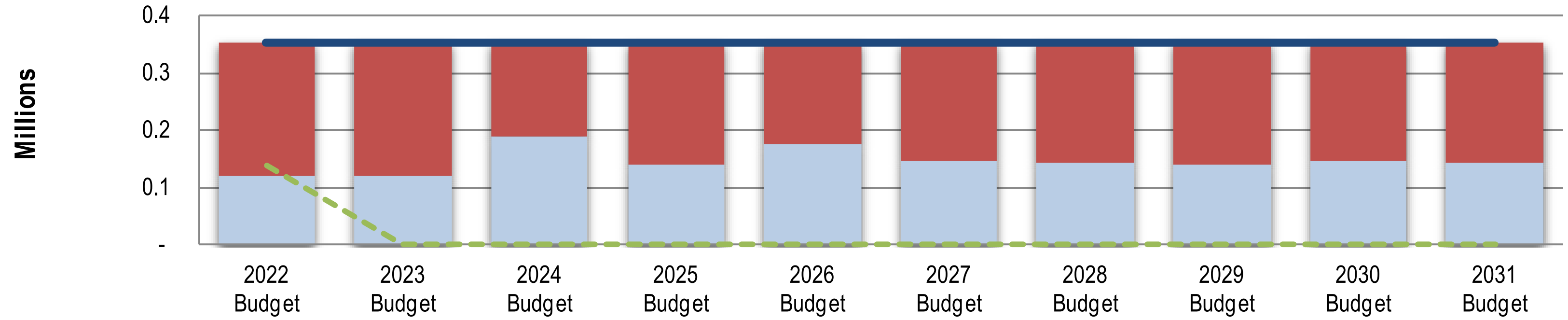
Figure 5.4.1 Average Annual Capital Requirements



The following figure links the annual capital funding needs to the capital investments contained in the budget. The timing of the actual capital projects may vary, however annual investments in capital assets is important for financial sustainability.

Figure 5.4.2 Funding Requirements

	Key	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Annual Required Investment		**354,000**	**354,000**	**354,000**	**354,000**	**354,000**	**354,000**	**354,000**	**354,000**	**354,000**	**354,000**
Current Investment		120,154	120,488	189,254	139,904	175,717	146,539	143,054	141,193	145,213	142,219
Funding Deficit		*233,846*	*233,512*	*164,746*	*214,096*	*178,283*	*207,461*	*210,946*	*212,807*	*208,787*	*211,781*
Funding Surplus		-	-	-	-	-	-	-	-	-	-
Reserve Balance		139,426	-	-	-	-	-	-	-	-	-



As the Drumbo WWTP expansion project is anticipated to be partially funded by debt, the amount of the current investment that would be restricted to debenture payments is anticipated to be 77.7% over the 10-year period.

5.5 Funding Gap Analysis

Using the anticipated 10-year asset lifecycle needs, along with the current capital investment level, the County is able to determine if there is an anticipated funding gap for the Drumbo wastewater system. Consideration is then given to the current system reserve balance to determine the residual funding gap. The County would then investigate opportunities for reducing this residual funding gap which, may include increases to the user rates, utilization of grant funding opportunities and further review of lifecycle strategies and proposed levels of service.

Figure 5.5.1 illustrates the anticipated asset management 10-year lifecycle needs (left side of figure 5.5.1) and funding needs, including the projected funding gap (right side of figure 5.5.1) for the Drumbo wastewater system. The system calculates the optimal expenditures based on theoretical asset lifecycle needs. These needs have not yet been reviewed in depth with County operations staff, and incorporated into the 10-year capital budget. This is anticipated to be completed as part of the 2023 Business Plan and Budget process with subsequent review annually.

The anticipated expenditures have been increased for non-infrastructure solution projects; approximately $0.2 million.

While the anticipated expenditure calculation accounts for the lifecycle activities of expansion / growth projects it does not account for the initial investment. It is important to adjust for these projects, where the initial investment is growth related and not projected to be DC funded within the 10-year capital plan. The resulting growth/expansion projects added to the anticipated asset needs is approximately $2.5 million, plus $0.5 million in anticipated interest costs.

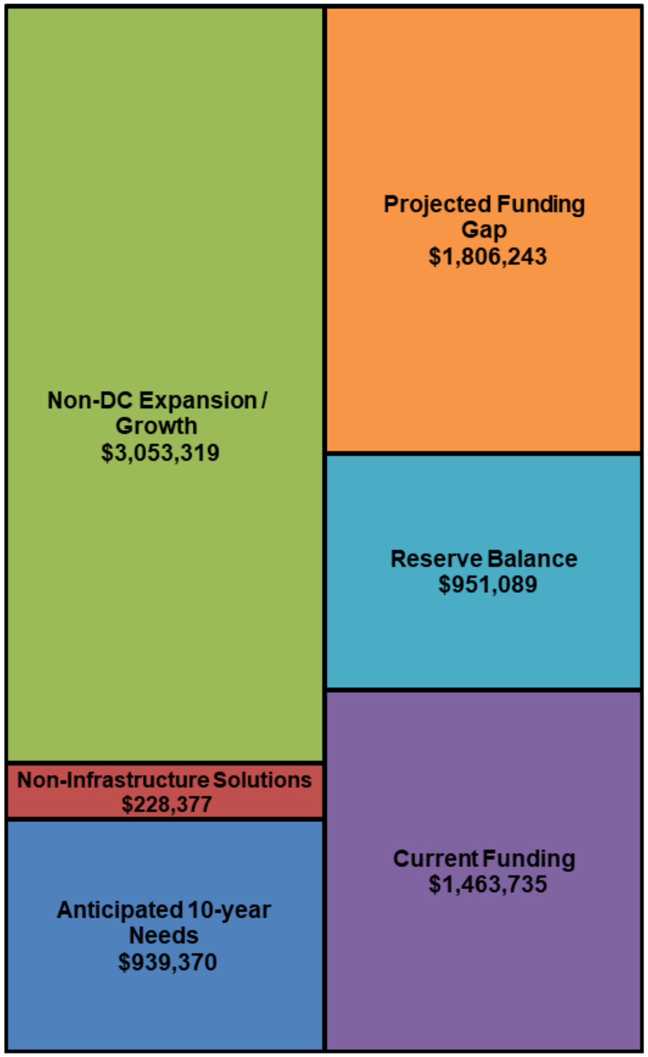
The Drumbo wastewater system is projecting a funding gap over the 10-year capital planning period. This gap is partially being addressed through the issuance of debenture funds for the WWTP expansion project (approximately $1.8 million in debt issuance). Of the debt issued, $0.6 million of the principal is proposed to be repaid within the current 10-year period, along with approximately $0.5 million in interest charges. Approximately 77.7% of the current funding is committed to debenture payments over the 10-year horizon. The annual funding requirement will be reviewed holistically as part of the next rate study.

This analysis assumes the full reserve balance is utilized within the current 10-year period. Drawing the reserve balance to zero would likely result in increased user fee requirements in the subsequent 10-year period in order to fund the anticipated asset lifecycle needs.

The reserve is also utilized to fund emergency or unplanned expenses. A minimal or fully committed balance would limit the ability to fund these types of expenses. Consideration needs to be given to a minimum balance the County should maintain based on these risks. Analysis of the reserve target minimum balance, will be completed as part of the annual reserve review process.

Failure to address the long-term asset lifecycle needs could result in significant increases to rates in the future as assets reach end of life; or reductions in localized and/or regional service. This may include blockages, sewer backups, basement flooding, localized service outages, increased maintenance costs on assets past their optimal life, poor quality effluent, damage to the natural environment, fines, increase in insurance claims for property damage and personal injury resulting from poor asset conditions, etc.

Figure 5.5.1 Anticipated Needs (10-Year)



6.0 Climate Change

As part of the asset management planning process, the County will consider the risks and vulnerabilities of capital assets to climate change and the resulting actions that may be required. Commitment will be made to the development of tailored actions that make the best use of our resources to mitigate and adapt to climate change, in accordance with our local reduction targets, financial capacity and stakeholder support.

Optimization of the wastewater treatment process can help reduce the emissions of GHG such as nitrous oxide (N_2O), carbon dioxide (CO_2) and methane (CH_4) from being released into the environment at WWTPs. Optimization requires the correct equipment to ensure conditions can be achieved to reduce GHG emissions, while maintaining WWTP regulatory compliance.

Nitrous oxide (N_2O) is released in the secondary treatment train through the nitrification and denitrification process, which is used to remove nitrogenous components from the wastewater. Nitrifying bacteria oxidize ammonia to nitrites and nitrates. To minimize N_2O emissions, the plant is optimized by running the activated sludge process at a high sludge retention time (SRT) with optimal dissolved oxygen levels, which results in low ammonia and nitrite concentrations. High amounts ammonia and nitrite compounds, especially when there are excessive amounts of dissolved oxygen, can trigger biogenic N_2O emissions. To control this process, a plant expansion is underway:

- Converting the Sequential Batch Reactor plant into a Membrane Bioreactor plant. Blowers will be modulated based off feedback, to provide optimum dissolved oxygen levels for nitrification.

Methane (CH_4) is generated by the anaerobic biological break down of organics or the release of dissolved CH_4 found in the wastewater influent. The Drumbo WWTP does not have anaerobic digestion and does not generate significant levels of methane gas.

Carbon Dioxide (CO_2) is produced in biological treatment, where the organic carbon in the wastewater is utilized for biomass growth or oxidized into CO_2. By operating WWTPs at high sludge retention times, endogenous respiration (cell lysis results in biomass growth) is encouraged, which decreases the overall sludge production, which results in a decrease in CO_2 production. Upgrades with this process include:

- The new treatment plant system maintains high sludge retention times.

Improving energy efficiency at WWTPs can help to reduce GHG emissions by decreasing consumption of fossil fuel-based energy. Significant energy savings can be realized by increasing the efficiency of plant equipment such as pumps and blowers, and using generated fuel sources:

- Efficiency is always a consideration with all new equipment installations.

Climate change risks are considered during the planning phase of each capital project. Increasing resiliency to changing climate conditions through the use of backup power generation, redundancies with critical equipment, use of SCADA to collect accurate information and make informed decisions. By conducting inspections and completing studies, problem areas can be identified and planned to repair.

- CCTV sewer inspections for 2021.
- New main pumping station permanent back up power generation, all other SPS have permanent or mobile standby power generation.
- Clearing ditches and catchbasins of debris to direct stormwater runoff away. Catchbasin and culvert replacements in 2021.
- Feasibility study for future expansion in 2021.
- Ongoing development and implementation of a SCADA Master Plan.

WASTEWATER SYSTEM

Mount Elgin

Table of Contents

1.0 Introduction

The County maintains a diverse portfolio of assets that are required to provide the community of Mount Elgin with the safe collection and treatment of wastewater. The Mount Elgin Wastewater Treatment Plant (WWTP) provides wastewater treatment for residential, commercial, and industrial users in the Village of Mount Elgin.

The Mount Elgin WWTP consists of a central Recirculating Sand Filter (RSF) and subsurface discharge. At the WWTP the primary treated effluent is pumped to the recirculation tanks. The influent is pumped to the recirculating sand filter and then collected and pumped to a splitter valve that allows 80% of the flow to recirculate and 20% to enter the dosing tank. From the dosing tank, treated effluent is pumped to the shallow buried trench drain field that provides for the subsurface discharge of the treated effluent. The entire treatment process is completed in accordance with strict standards, processes, and limits as regulated by the WWTPs Environmental Compliance Approval (ECA) issued by the Ministry of Environment, Conservation, and Parks (MECP) of the Ontario Provincial Government.

Within the wastewater collection system, individual properties are serviced by septic tanks where sewage is pretreated to remove solids and grease before discharge to a small diameter variable grade sewer. The small diameter collection mains direct the primary treated effluent to a sewage pumping station, to be conveyed to the WWTP.

Sound management of our wastewater systems helps us realize our vision of being a vibrant community, working well and growing stronger together!

Like many of our assets, wastewater assets are facing increased challenges as a result of aging assets, climate change, increasing demand due to growth in our communities and regulatory changes. Our investment in these assets must therefore be balanced to optimize investment for renewal with the growing needs of our community.

This plan provides information regarding our approach to the management of our wastewater assets over the short (10-year) and long (100-year) term, demonstrating our commitment to assessing and meeting the levels of service valued by our residents and businesses.

1.1 Improvement Plan

The County recognizes that asset management is a continuously evolving process. The following recommendations are based on the review of current management practices, inventory, valuation and condition analysis.

- Document lifecycle history on assets within the asset management systems.
- Continue to reduce asset data gaps.
- Determine asset components and maintenance strategies for facilities and associated processes.
- Refine the risk assessment approach at the component level.
- Incorporate findings from the Water and Wastewater Master Plan.

2.0 State of Assets

2.1 Inventory

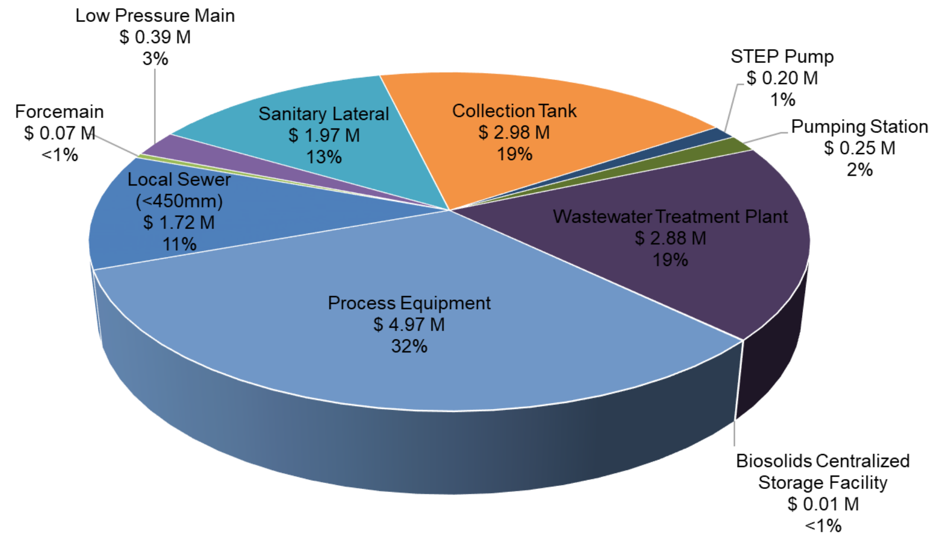
Wastewater assets are those that enable us to live in a clean and safe environment. It includes everything from wastewater mains that service our homes and businesses throughout the County, to the WWTPs, which ensure that effluent is properly treated before being discharged into the natural environment.

We have two different asset classes within the wastewater portfolio in order to effectively collect and treat wastewater from our community:

- Linear, which represent the collection pipe network, including the maintenance holes, connectors and related parts required in such a network.
- Vertical, which represent facilities (including the multiple buildings and structures that the facilities are comprised of), and related process systems and equipment required to perform the needed functions.

Table 2.1.2 displays our current wastewater inventory and the associated replacement costs and average age for each asset component. The County continues to make improvements to increase the integrity of our wastewater data. The inventory figures in table 2.1.2 capture inventory within newly constructed subdivisions which the County is aware of and anticipates assuming ownership of. The County generally assumes ownership of these assets approximately two years after full operation. It is important to include growth assets to ensure that lifecycle activities are planned and funded accordingly.

Figure 2.1.1 Inventory Valuation



2.2 Valuation

The replacement cost valuation for wastewater linear is based on current tender prices, where available. Current tender prices are adjusted where County staff feel some cost increases are only temporary due to COVID.

The replacement cost valuation for wastewater vertical is based on the latest information available, which includes current replacement costs, insurance valuations, and valuations from studies / assessments completed in prior years.

Table 2.1.2 – Mount Elgin Wastewater System Inventory

Asset Type	Asset Component		2017 Inventory	Current Inventory	Replacement Cost	Average Age
Linear	Local Sewer (<450mm)	m	4,349	5,726	$1,717,875	10 Years
	Trunk Sewer (>=450mm)	m	-	-	-	-
	Forcemain	m	-	220	65,982	3 Years
	Low Pressure Main	m	1,287	1,287	386,166	11 Years
	Sanitary Lateral	each	222	303	1,969,500	9 Years
	Collection Tank	each	143	248	2,976,000	7 Years
	STEP Pump	each	16	27	202,500	6 Years
	Grinder Pump	each	-	-	-	-
Vertical	Pumping Station	each	-	1	250,000	2 Years
	Wastewater Treatment Plant	each	1	1	2,879,398	13 Years
	Odour Control Facility	each	-	-	-	-
	Biosolids Centralized Storage Facility[1]	each	-	1	7,598	4 Years
	Process Equipment	total	N/A	N/A	4,974,100	13 Years
Total Replacement Cost					**$15,429,119**	

There is a growth / expansion projects planned in Mount Elgin that is included in the County's 2022 approved Long-Term Capital Plan. This includes an expansion of the process equipment at the WWTP (approximately $1 million). This growth project is not included in the figures within table 2.1.2, however the project's anticipated lifecycle needs are included within this AMP.

[1] The Biosolids Centralized Storage Facility is a shared facility across the County with each system contributing to the costs based on number of customers. The value utilized throughout this report card represents Mount Elgin's share based on 2021 customers.

2.3 Condition Assessment Approach

The assessment approach for our wastewater assets utilizes a combination of physical assessments, asset attributes, such as material and sizing, as well as established anticipated useful lives.

The County's condition scale and visual inspection ratings are based on the following approach:

- Excellent - Asset is well maintained with no noticeable defects.
- Good - Asset may show signs of minor deterioration and may require some maintenance.
- Fair - Deterioration evident, function affected. Asset may require on-going monitoring.
- Poor - Serious deterioration, function inadequate. Asset may require ongoing monitoring.
- Critical - No longer functional, general or complete failure. Asset may require extensive monitoring.

The Pipeline Assessment Certificate Program (PACP) is the North American Standard for pipeline defect identification and assessment[2]. Closed-circuit television (CCTV) is the principal method of inspecting drains and sewers. In this process, a small robotic crawler vehicle with the CCTV camera attached is lowered into the pipe to complete the inspections. A structural rating, on a scale of 0-5, is then assigned using sewer condition assessment standards, with 0 representing an asset with minimal structural deficiencies and 5 representing assets on the verge of failure.

Table 2.3.1 illustrates how the PACP score ratings align with the County's standard condition scale. Unless otherwise noted, all images are of County assets, and are general representations of the asset condition at the time the photo was taken. Assets may have undergone lifecycle strategies since the date of the image impacting its condition.

Wastewater process assets are inspected by County staff on a regular basis as part the preventative maintenance program. These inspections identify performance and accelerated degradation and will trigger the creation of a reactive work order for repairs and rehabilitation. The County is working towards incorporating these inspections into a formalized condition rating. A visual inspection rating was provided for most process assets as part of the data collection process in 2018 and 2019.

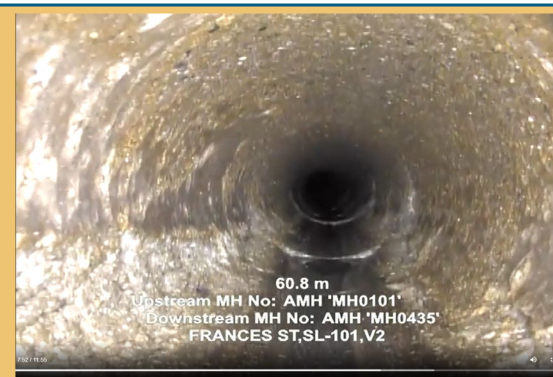
Given the complexities and accessibility of some assets, it is not beneficial to complete a visual or performance based condition assessment on all assets. For assets which are unable to be visually inspected or that have since been replaced, an age-based condition rating is being used based on anticipated useful lives.

[2] https://www.nassco.org/content/pipeline-assessment-pacp

Table 2.3.1 PACP Score Ratings

Excellent
PACP Score of 0 or 1

Poor
PACP Score of 4



Good
PACP Score of 2

Critical
PACP Score of 5

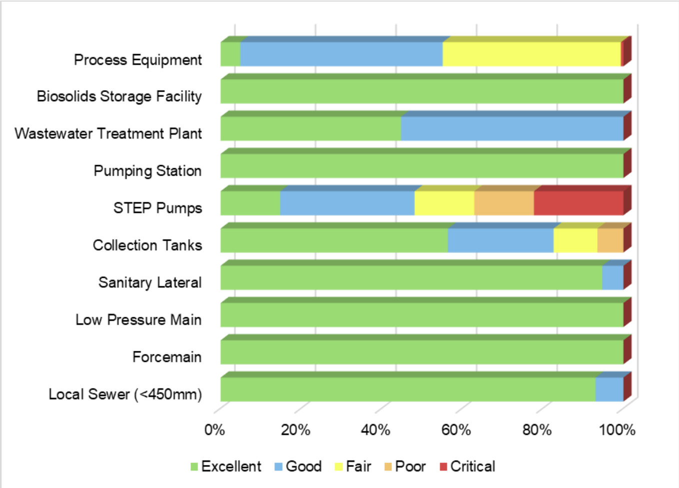
Fair
PACP Score of 3

2.4 Condition Assessment

The condition profile of our Mount Elgin wastewater asset components is shown in figure 2.4.1. The % in each condition is based on replacement costs.

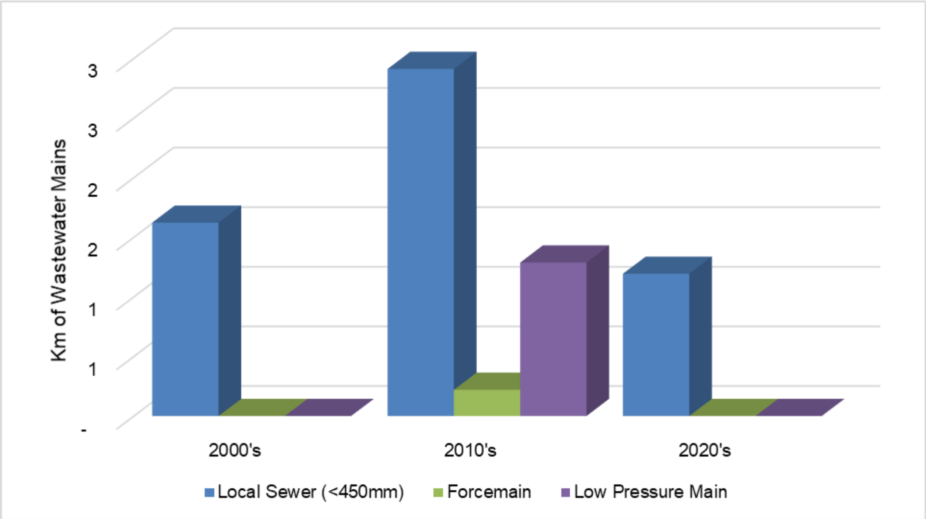
For the Mount Elgin wastewater assets: 1.9% of these assets are in poor or critical condition, and 81.5% in good or excellent condition in comparison to 10-11% and 57-65% respectively for Canadian municipalities reported on the Canadian Infrastructure Report Card[3]. While it may appear that our Mount Elgin wastewater assets are in better shape than other Canadian municipalities, the 2019 Canadian Infrastructure Report Card is an aggregate of self reported condition ratings across the Country and are based on a general rating scale which may not match the County's.

Figure 2.4.1 Asset Condition by Component



To better understand our Mount Elgin wastewater collection assets, an age profile of all our wastewater mains by decade is shown in figure 2.4.2.

Figure 2.4.2 Wastewater Mains by Age



The average age of the majority of linear assets within the Mount Elgin wastewater system is approximately 10 years, whereas the average age of the vertical assets varies by facility type from 4 to 13 years. This value must be considered in the context of the different asset types in the category, compared to the typical anticipated useful life of each asset type.

[3] http://canadianinfrastructure.ca/en/index.html

Table 2.4.3 outlines the anticipated useful life for each new build/replacement. The anticipated useful lives for our wastewater assets exclude the management strategies that the County utilizes to extend the overall life of our wastewater assets.

Table 2.4.3 Useful Life

Wastewater System Component	Anticipated Useful Life (years)
Forcemain, Low Pressure Main, Trunk Sewer, Local Sewer, Laterals	90
Collection Tanks	30
Grinder Pumps	10
Facilities	10 - 50
Process Equipment	8 - 75

Figure 2.4.4 illustrates the current average age of the Mount Elgin wastewater system linear components in comparison to their anticipated useful life, based on a run to failure strategy.

As the vertical assets can have a significant variability in age, from both a facility and process standpoint, they are not represented within figure 2.4.4.

There are a number of management strategies that the County may utilize to extend the overall life of our wastewater assets. These strategies allow us to align the needs with those of other assets, resulting in the best overall value for our residents.

Figure 2.4.4 Age and Useful Life Comparison

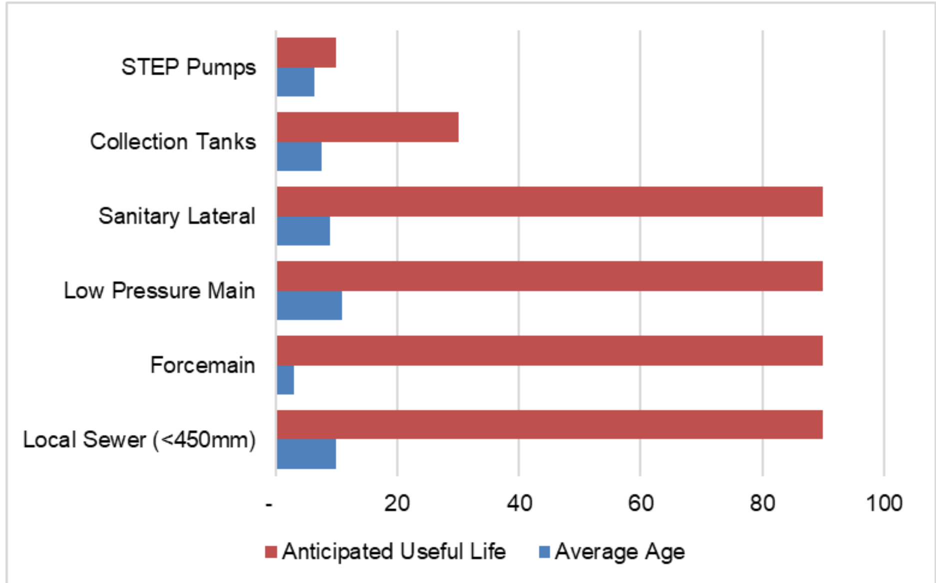


Table 2.4.5 compares the status of our Mount Elgin wastewater asset components, as identified in our 2017 Asset Management Plan to their current condition. The breakdown by component for vertical assets was not available as of the date the 2017 report was published, so there is no condition comparison available. Work is ongoing to further enhance the asset information at the component level.

The trend shows that the status of wastewater assets for the Mount Elgin system is steady to declining. The decline in condition is commiserate with the aging of these assets. As the system continues to age it is expected that condition ratings will continue to decline until targeted lifecycle strategies are implemented.

Table 2.4.5 Wastewater Systems Condition Assessment

Asset Type	Asset Component	2017 Condition Rating	Current Condition Rating	Trend
Linear	Local Sewer (<450mm)	Excellent	Excellent	→
	Trunk Sewer (>=450mm)	-	-	-
	Forcemain	-	Excellent	-
	Low Pressure Main	Excellent	Excellent	→
	Sanitary Lateral	Excellent	Excellent	→
	Collection Tank	Excellent	Good	↓
	STEP Pump	Excellent	Fair	↓
	Grinder Pump	-	-	-
Vertical	Pumping Station	Not assessed	Excellent	-
	Wastewater Treatment Plant	Not assessed	Good	-
	Odour Control Facility	-	-	-
	Biosolids Centralized Storage Facility[4]	-	Excellent	-
	Process Equipment	Not assessed	Good	-

[4] The Biosolids Centralized Storage Facility is a shared facility across the County with each system contributing to the costs based on number of customers. The value utilized throughout this report card represents Mount Elgin's share based on 2021 customers.

3.0 Levels of Service

County staff have developed a comprehensive Level of Service (LOS) Framework. This framework will help to establish a relationship between the current LOS being provided by the County's assets, and the associated operating and capital expenditures required to achieve the proposed LOS. The framework puts into perspective the definition and measurement of service performance in alignment with the County's corporate mission and vision.

Corporate Objective

The wastewater collection and treatment service ensures protection of the environment and public health of residents, visitors to the County.

Legislative Requirements

Each of the County's WWTPs are regulated under the Ontario Water Resources Act, 1990[5] and operated in accordance with an ECA or historical Certificates of Approval (C of A) issued by the MECP.

The ECA for the County's WWTPs require annual reporting of operational and treated effluent discharge parameters into the receiving water bodies. The Annual Wastewater Treatment System Summary Reports are available on the County's website.

Framework

The structure of the County's LOS framework was developed to align with international best practices including the International Infrastructure Management Manual (IPWEA, 2015). The framework includes the mandatory measures to meet the requirements of Ontario Regulation (O.Reg.) 588/17 by including both Community and Technical Levels of Service. The metrics in this framework may be expanded upon as the County continues to improve its data collection and reporting processes.

[5] https://www.ontario.ca/laws/statute/90o40

3.1 Customer Levels of Service

Community or Customer Levels of Service are statements that describe quantifiable metrics of the service delivery outcomes from the perspective of the customer, expressed in non-technical terms. The following statements form our qualitative descriptions of the customer level metrics required under O.Reg. 588/17.

The Mount Elgin wastewater system connects to most residential, commercial and industrial spaces in the settlement areas of Mount Elgin, as outlined in figure 3.3.1. The Mount Elgin wastewater system provides for the safe collection and treatment of wastewater.

The County does not have any combined sewers within the Mount Elgin wastewater system. The Mount Elgin wastewater system is a separate wastewater system.

Infiltration and inflow can enter through a variety of sources (cracks in pipes, weeping tile connections, cross connections, etc.). In the case of heavy rainfall events, wastewater mains may experience a volume of water and wastewater that exceeds its designed capacity. In some cases, this can cause water and/or wastewater to overflow into streets or backup into homes or businesses.

To minimize wastewater overflow into streets or backup into homes, the County has established design standards to convey flows under ultimate conditions, design sheets for capacity needs that include infiltration inflow. Newer wastewater mains are made of gasketed PVC piping to reduce potential leaks occurring between fitted pipe segments.

Final Effluent is the treated water that is discharged to the environment through the approved effluent disposal facilities, including all bypasses that are required to meet the compliance limits stipulated in the ECA for the WWTP, at the final effluent sampling points. The effluent criteria includes effluent flow rates, and parameters such as total suspended solids, Biochemical Oxygen Demand (BOD), phosphorous, ammonia, and E. coli. The County produces annual reports summarizing each WWTPs operation and treated effluent discharge quality and these can be found on the County's website at: http://www.oxfordcounty.ca/Services-for-You/Water-Wastewater/Wastewater/Annual-reports.

Table 3.1.1 outlines additional customer focused performance metrics from the County's LOS framework.

3.2 Technical Levels of Service

Technical Levels of Service metrics are quantifiable metrics applied against assets that are subject-matter specific inputs or outputs supported by the day-to-day activities of County staff. Table 3.1.1 includes the technical metrics required under O.Reg. 588/17, as well as, additional metrics the County has included in the framework.

3.3 Levels of Service Maps

As a further illustrative example of our community levels of service, a map is included as figure 3.3.1 showing areas within the village of Mount Elgin boundary that are serviced by the Mount Elgin wastewater system.

Figure 3.3.1 Mount Elgin sanitary serviced properties

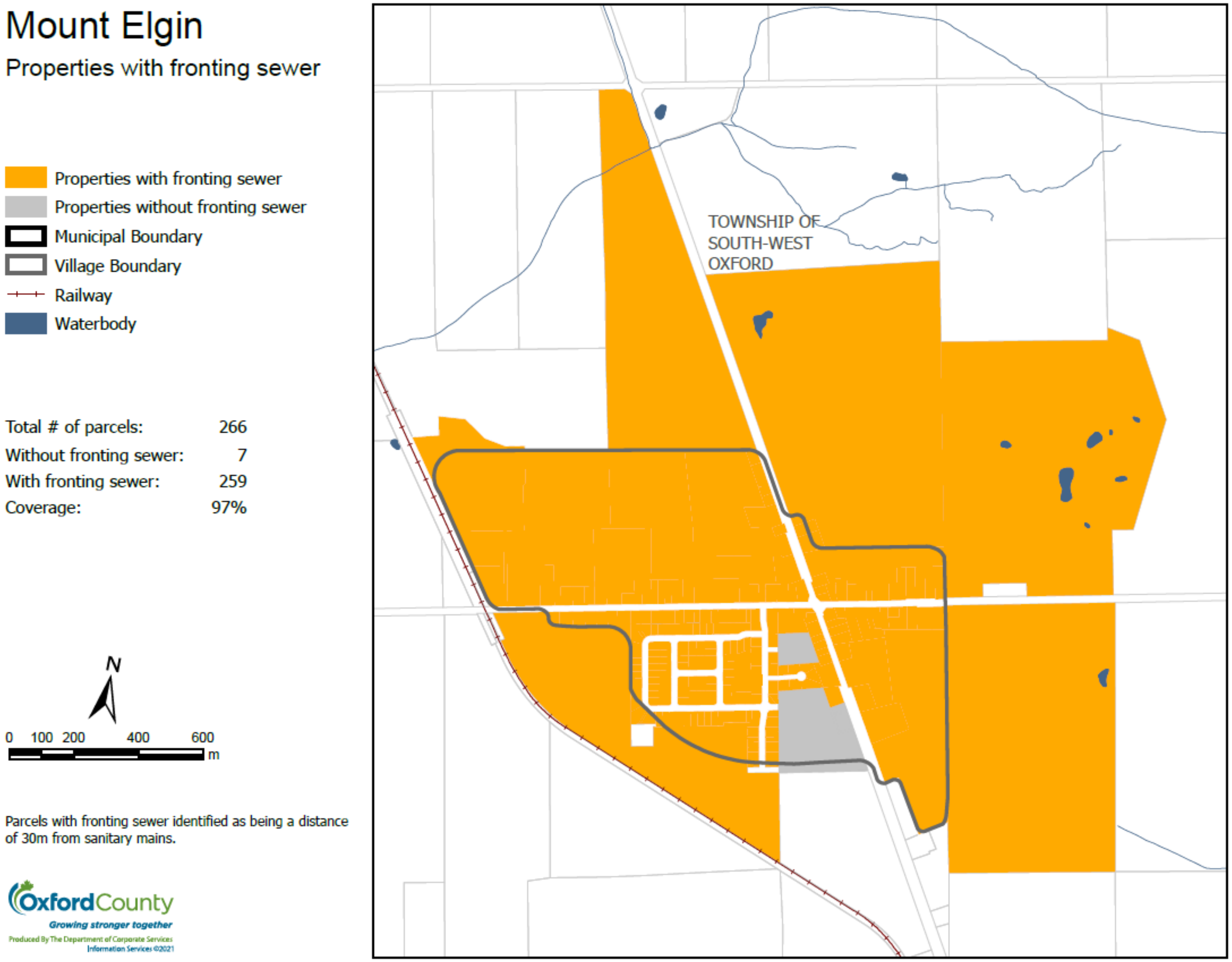


Table 3.1.1 Performance Measures

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Customer / Council Focused Performance Measures					
Reliability	Providing wastewater services with minimal interruptions	% of properties within the system boundary connected to the municipal wastewater system	N/A	97%	TBD
		% of wastewater mains designed to be resilient to overflow or flooding during wet weather events	100%	100%	100%
Environmental Stewardship	Providing wastewater services that have minimal impacts on the environment	% of overall facility ECA compliance rate	100%	100%	100%
Cost Efficient	Providing wastewater services in an efficient manner	Operating cost to provide service ($/connection)	$848	$931	TBD
Technical Focused Performance Measures					
Reliability	Providing wastewater services with minimal interruptions	The number of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system.	0 connection-days to 165 connections	0 connection-days to 172 connections	TBD
		% of septic tanks pumped annually	31%	13%	20%
		# of overflow or spill occurrences	0	0	0
Environmental Stewardship	Providing wastewater services that have minimal impacts on the environment	% of wastewater estimated to have by-passed treatment	0%	0%	0%
		The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system.	0 violations to 165 connections	0 violations to 172 connections	0
Cost Efficient	Providing wastewater services in an efficient manner	Operating cost per kilometre of wastewater main for collection	N/A	$7,950	TBD
		5 year average capital expenditure for wastewater collection	$0.03M	$0.02M	TBD
		5 year average capital expenditure for wastewater treatment	$0.01M	$0.01M	TBD

4.0 Asset Management Strategy

4.1 Lifecycle Activities and Planned Actions

Wastewater collection assets undergo regular maintenance and inspection. As part of capital works project analysis, determinations of whether wastewater pipe replacement or relining should occur is reviewed. This process is fully integrated with the renewal needs of the roadways and other underground assets, such as drinking water and stormwater. This integrated approach ensures our renewal projects for these service areas are delivered with optimal timing to increase value and minimize disruption to our communities. For example, if a roadway is targeted for renewal, coordination between service areas and area municipalities will determine whether the underlying stormwater, drinking water or wastewater assets are also of an age or condition that requires renewal, to ensure these projects are delivered together to reduce disruption for our communities and deliver enhanced value.

Process assets and equipment undergo extensive operations and maintenance regimes to sustain their reliable operation. Investment needs are identified and coordinated with normal operations to minimize disruptions to service. Major replacements are planned and accommodated using system redundancy and changes to operations, in order to maintain service. It is critical to maintain wastewater service in order to protect public health and the environment.

There are six main lifecycle activities considered in the overall sustainable management of wastewater assets, described in table 4.1.1.

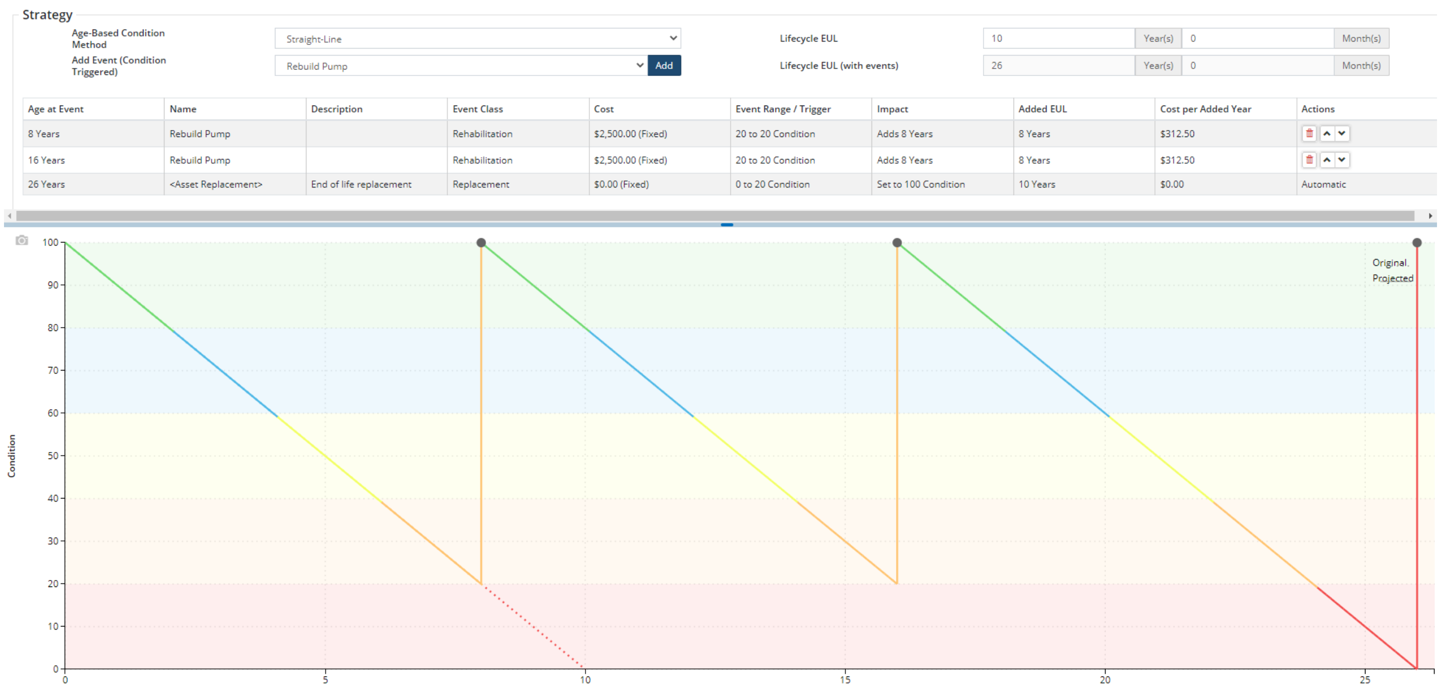
Table 4.1.1 Lifecycle Activities

Strategy	Lifecycle Activity
Non-Infrastructure Solutions	Actions or policies that can lower costs or extend useful lives. **Trigger: Ongoing**
Maintenance	Regularly scheduled maintenance and inspection programs including cleaning and flushing, manhole repairs, CCTV inspections, exercising diesel gen-sets and minor repairs. These activities do not improve the overall condition of the asset, nor increase its useful life. **Trigger: Ongoing**
Rehabilitation / Renewal	One-time events that increase the condition and extend the useful life of the asset; including sewer lining and seal and grout programs. **Trigger: Fair/Poor**
Replacement	Occurs at the end of the useful life and/or when rehabilitation is no longer an option – can vary among assets due to construction material and environmental factors that impact the degree of deterioration and performance. **Trigger: Poor/Critical**
Disposal	Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the County to provide services. County staff coordinate with contractors to ensure safe removal and environmental compliance when disposing of assets. **Trigger: Poor/Critical**
Expansion / Growth	Planned activities required to extend services to previously unserved areas, expand services to meet growth demands, or increase the level of service being provided. **Trigger: Development**

The lifecycle management strategy is the set of planned actions that should enable the assets to provide users with the proposed level of service in a sustainable way, while achieving acceptable levels of risk and the lowest lifecycle costs required to provide that level of service. Lifecycle considerations for assets include analysis of the timing to carry out key asset management activities including inspection, maintenance, repair, and replacement. Ongoing preventative maintenance activities are outlined in the County's work management system. The rehabilitation and replacement activities impacting the asset components condition and useful life are contained within profiles in the County's asset management system. For some assets, replacement needs are based on a run to failure strategy, as this is the most economical. Work is ongoing within the County's asset management systems to build all the component profiles and identify where each asset is within the lifecycle.

As an example, figure 4.1.2 illustrates the lifecycle strategy of grinder pumps. The pumps are re-built twice, extending the overall useful life from 10 years to approximately 25. The annual cost requirement from a run to failure strategy is $1,500 per year where the annual cost requirement using the rehabilitation strategies decreases to just below $800 per year.

Figure 4.1.2 Grinder Pumps Lifecycle Strategy

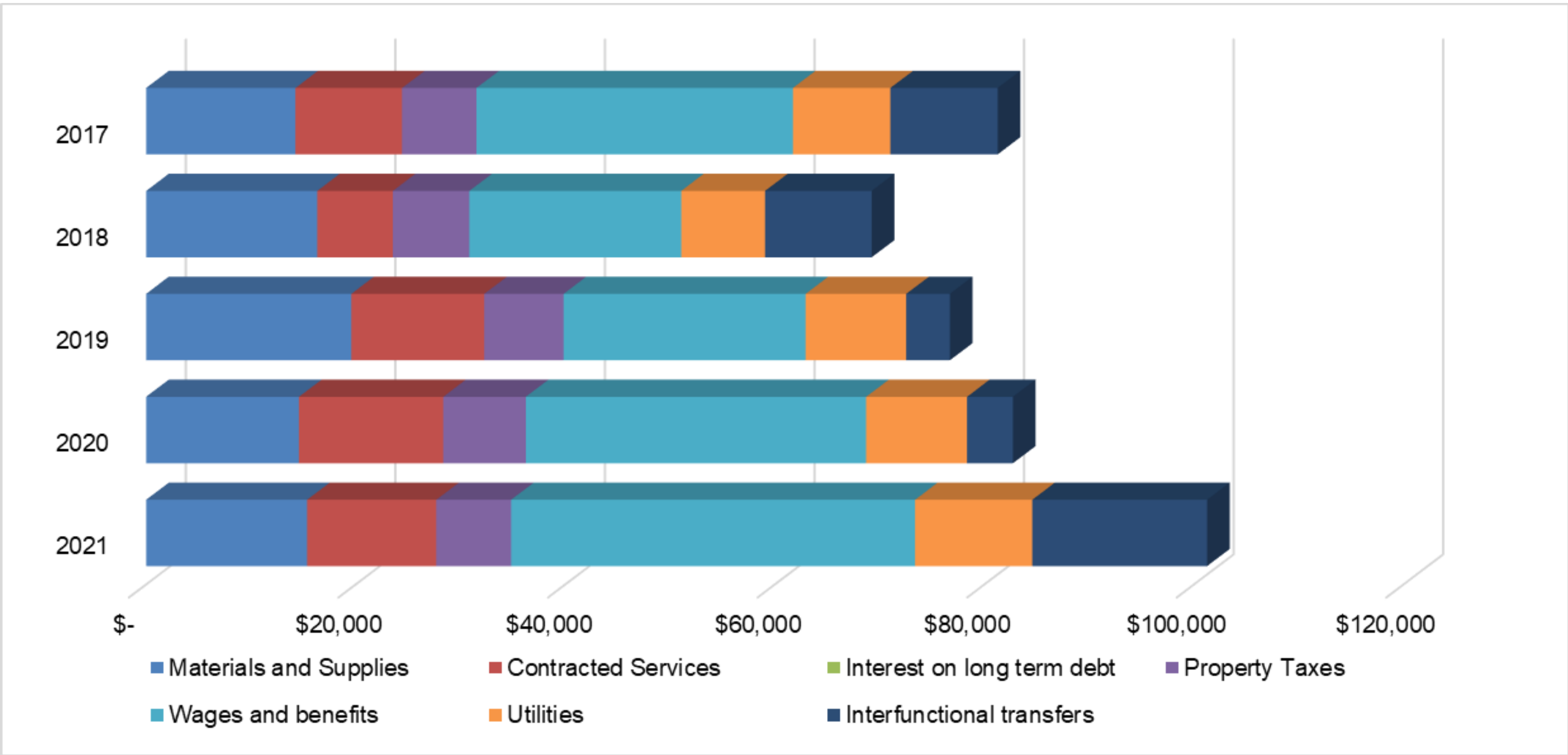


4.2 Significant Operating Expenses

Significant operating expenses are required in order to sustain an asset over its lifecycle. The County is always looking at ways to optimize our operating investment to ensure we are achieving the best value for our residents, and businesses. Essential to this is a strong operations and maintenance plan within our work management system. Operating expenses are incurred through a number of sources – preventative maintenance activities, utility costs, property taxes and more. Despite the fact that minor maintenance is incorporated into planned operations and maintenance programs, there are cases where it is unplanned.

Figure 4.2.1 shows the operating expenses from 2017 through 2021 for the Mount Elgin wastewater system grouped by expense type. The groupings align with those reported on the County's Financial Information Return (FIR), with further breakdown for property taxes and utility costs as these expenses can be significant.

Figure 4.2.1 Operating Expenses



4.3 Risk Strategy

Risk management frameworks are developed to assist with the prioritization of investments within the capital planning period. The preferred approach is to implement a triple bottom line analysis approach to evaluate:

- Social impacts of asset failure, including impacts to customers, businesses and the County's reputation;
- Environmental impacts of asset failure; and
- Economic impacts of failure including the cost of remediation.

In the context of asset management, risk is the multiple of the consequence of an asset failing and the probability that the event will occur.

Figure 4.3.1 illustrates the risk ratings for the current Mount Elgin wastewater assets at a summary level. The higher risk assets are process assets within the Mount Elgin WWTP. County staff will continue to monitor the higher risk assets, review and/or complete physical inspections to further validate the age-based condition ratings and plan for lifecycle strategies accordingly.

Figure 4.3.1 Asset risk profile

Consequence \ Probability	1	2	3	4	5
5	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	1 Asset 1.00 unit(s) $1,185,321.00	2 Assets 2.00 unit(s) $3,090,306.00	0 Assets - $0.00	1 Asset 1.00 unit(s) $1,500,000.00	0 Assets - $0.00
3	0 Assets - $0.00	1 Asset 1.00 unit(s) $400,000.00	0 Assets - $0.00	1 Asset 1.00 unit(s) $400,000.00	0 Assets - $0.00
2	2 Assets 386.97 m, unit(s) $275,791.00	2 Assets 2.00 unit(s) $275,000.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
1	449 Assets 6,241.76 m, unit(s) $5,285,999.00	139 Assets 1,144.68 unit(s), m $1,957,904.00	50 Assets 50.00 unit(s) $422,700.00	28 Assets 28.00 unit(s) $522,000.00	28 Assets 28.00 unit(s) $106,500.00

5.0 Financial Strategy

5.1 Financing Strategy

Hemson Consulting Ltd. (Hemson) was retained through a competitive process to assist with analyzing and developing the County's water and wastewater rates for a 4-year period from 2021 to 2024. The rate modeling includes all system asset management needs and all sources of funding including Community Servicing Assistance Program (CSAP) funding, development charges, developer and resident contributions. In most cases, the capital replacement component is the average annual required contribution level in order to establish full cost recovery; however, the contribution may vary based on the system's ability to meet full cost recovery for the next 10-years.

Capital work is funded from reserves (based on the capital contribution included in the user rates), development charges (for growth projects), debentures and grant funding when available. The County continually assesses opportunities for additional funding options and revenue streams to address our asset needs.

Where possible, replacement activities are planned in conjunction with the replacement needs of the road network and underlying water and stormwater assets. This requires a co-ordinated effort with area municipalities as the majority of the County owned water and wastewater linear assets falls under the area municipalities' roadways. This collaboration is essential for ensuring a cost effective approach to maintaining assets within the County regardless of ownership.

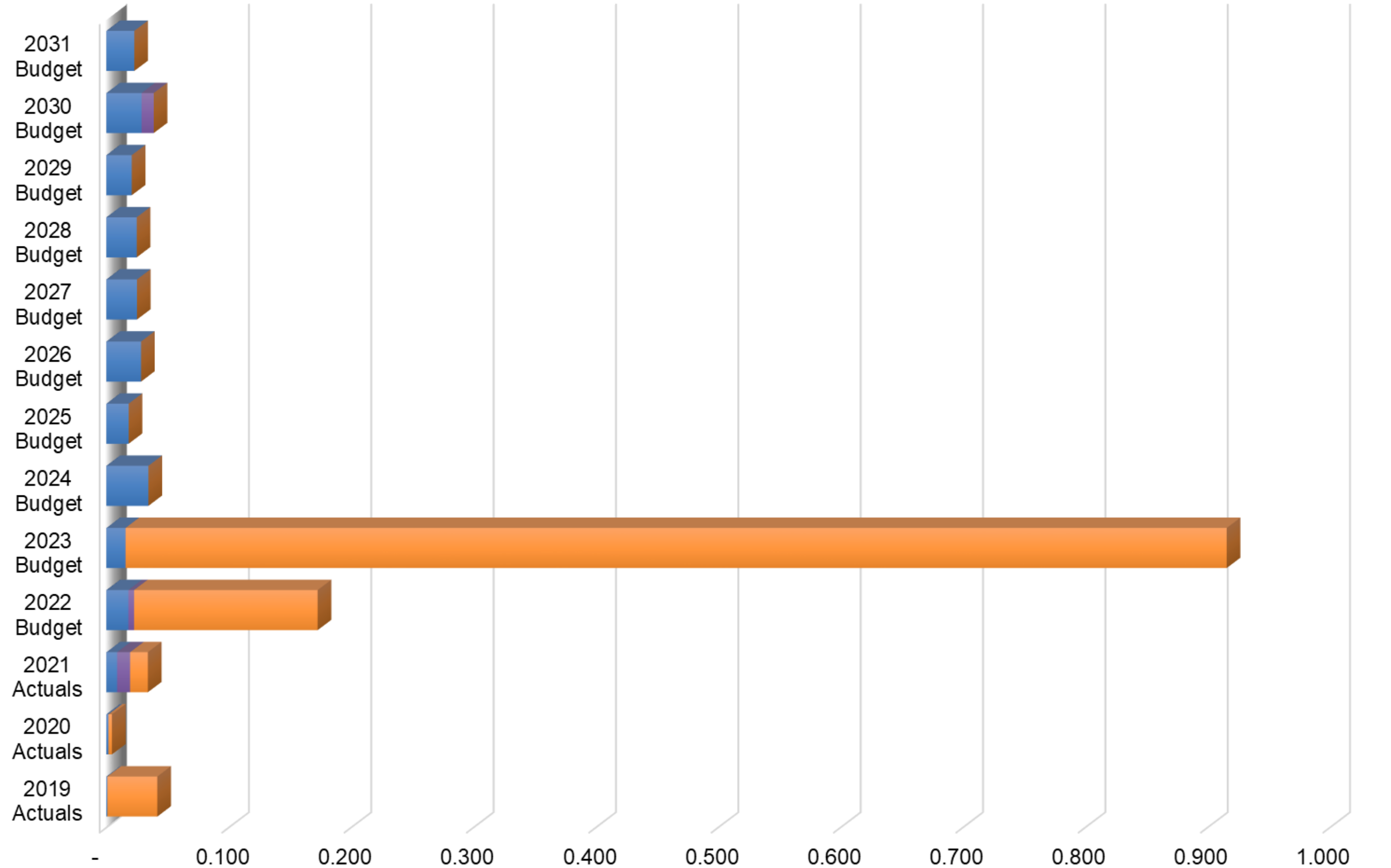
In addition to targeting and prioritizing the investment needed to maintain existing assets, there are also planning processes in place to determine the additional assets needed to meet growing demands through population increases or demand for new services. The projects targeted to meet growth are funded primarily through Development Charges (DC) – the mechanism that enables recovery of growth-related capital expenditures from new development. These charges are governed by the Development Charges Act and are applied in accordance with our Development Charges By-Law. Impacts from the growth activities analyzed in the 2019 DC Background Study are included in this AMP.

5.2 Expenditure History and Forecasts

The Mount Elgin wastewater system contains a significant capital project within the 10-year approved budget for the expansion of the WWTP, as illustrated in figure 5.2.1. Linear asset replacements are ongoing, in conjunction with the local area municipal roadway construction projects. Minor process equipment replacements were included in the 2021 to 2022 budgets. County staff continue to review anticipated asset management needs with each budget cycle, subject to existing resource limitations.

Non-Infrastructure solution projects include shared projects for condition reviews, studies and implementation of the work management system.

Figure 5.2.1 Expenditures (millions)

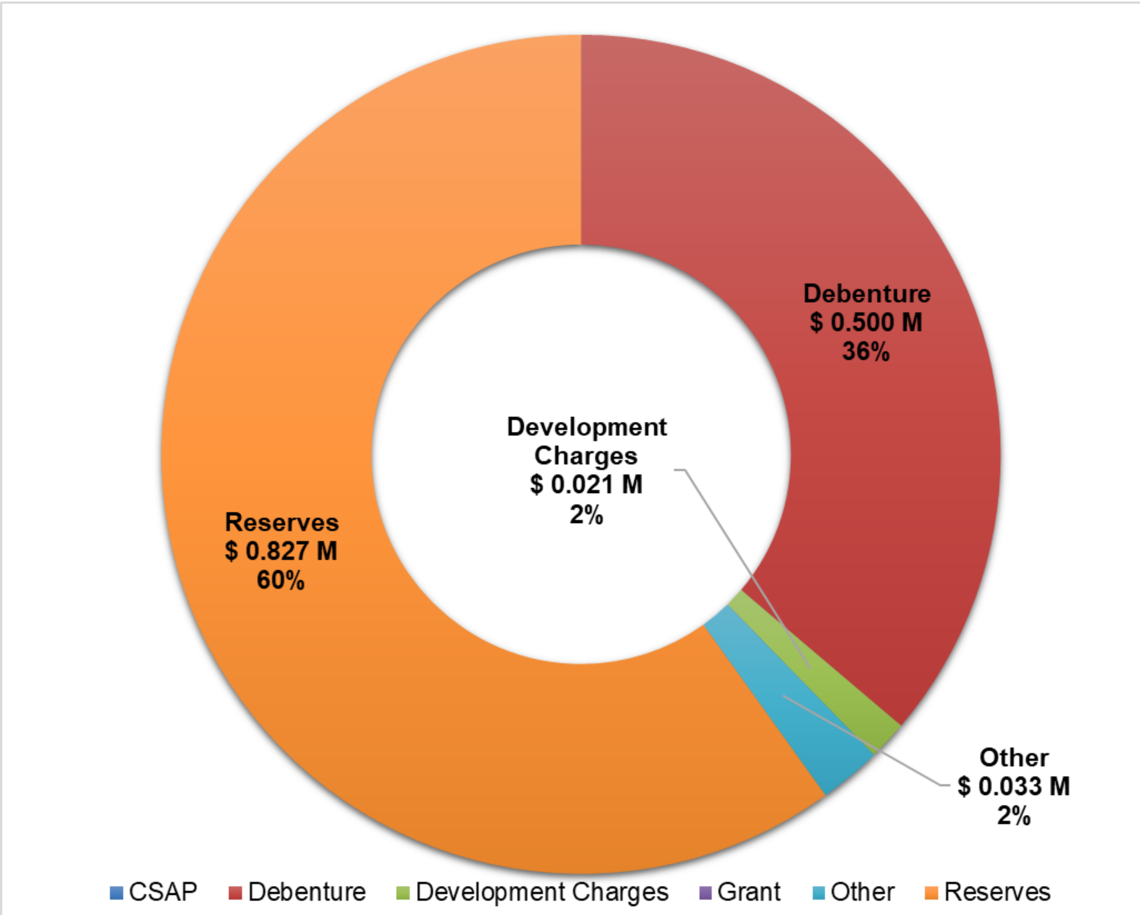


	2019 Actuals	2020 Actuals	2021 Actuals	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Non-Infrastructure Solution	0.001	0.002	0.009	0.018	0.016	0.034	0.018	0.028	0.025	0.025	0.021	0.029	0.023
Maintenance	-	-	-	-	-	-	-	-	-	-	-	-	-
Rehabilitation / Renewal	-	-	-	-	-	-	-	-	-	-	-	-	-
Replacement	0.000	-	0.011	0.005	0.000	-	-	-	-	-	-	0.010	-
Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-
Expansion / Growth	0.041	0.003	0.014	0.150	0.900	-	-	-	-	-	-	-	-

5.3 Capital Revenues

Replacement projects, identified in the County's 10-year capital plan, are anticipated to be funded by the Wastewater – Mount Elgin Reserve, which is funded by user fees. The Mount Elgin WWTP expansion project is anticipated to be partially debenture funded. With the exception of the WWTP expansion, the Wastewater – Mount Elgin Reserve, including the anticipated capital contributions within the 10-year period, is insufficient to fund the 10-year related asset activities within the approved 2022 Long-Term Capital Plan.

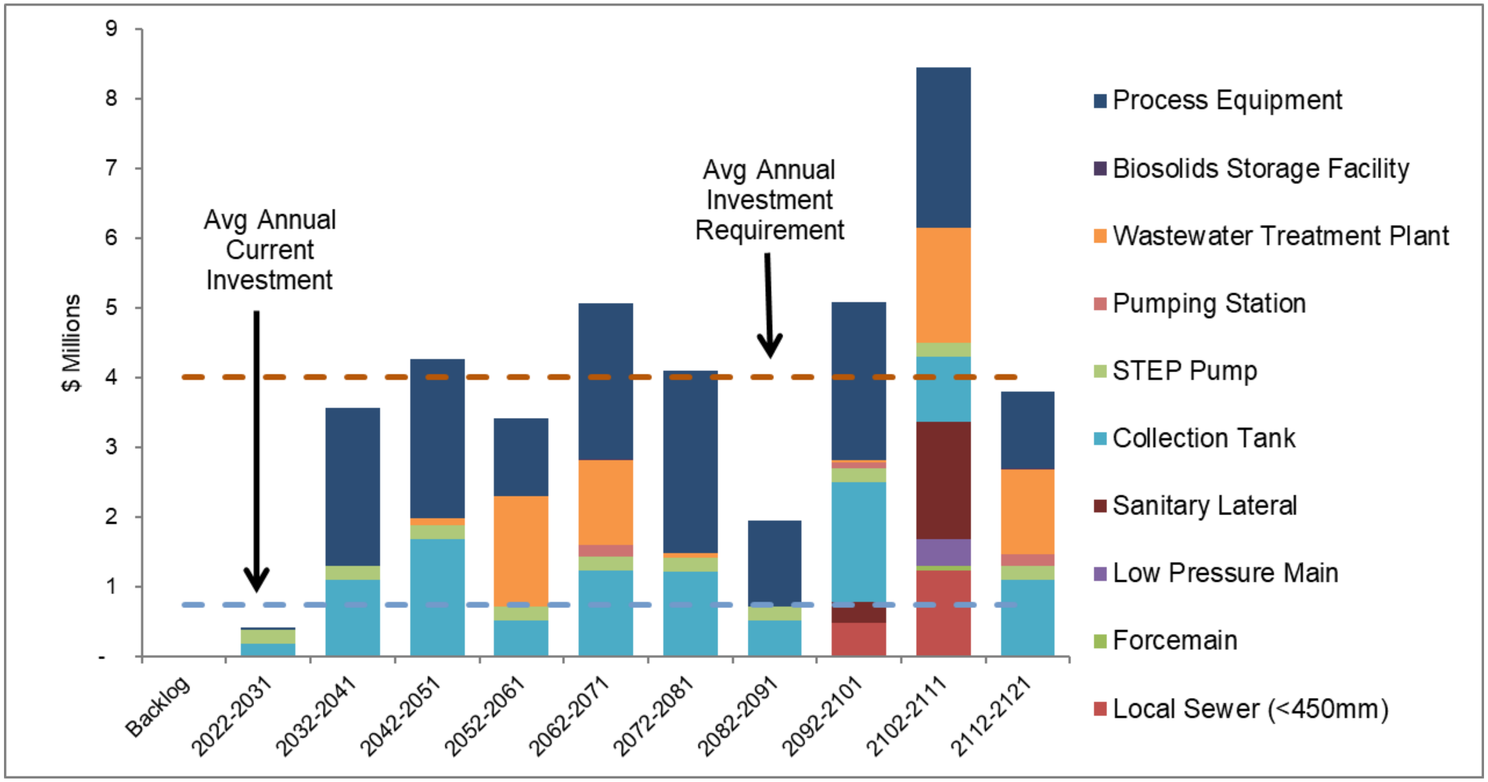
Figure 5.3.1 Sources of Capital Revenues 2019-2031 (millions)



5.4 Capital Investment

Based on the asset management lifecycle strategies identified, the financial requirements over the next 100-years are determined in current dollars. The average annual investment requirement represents the amount of capital funding required to renew and maintain the existing assets on an annual basis so services can continue to be delivered. These estimates assume that all work is able to be completed, as indicated, and does not take into account future changes due to environmental factors, new maintenance techniques, and unidentified growth. The annual requirement has increased from the 2017 AMP, primarily due to significant development and improvements the County has made to the vertical data, resulting in asset useful lives that are more reflective of their actual lifecycle. Further work is ongoing with the vertical data to fully determine lifecycle needs (including maintenance and rehabilitation strategies) which will impact the annual requirement for vertical assets. The data will continue to be reviewed with each budget and business plan cycle.

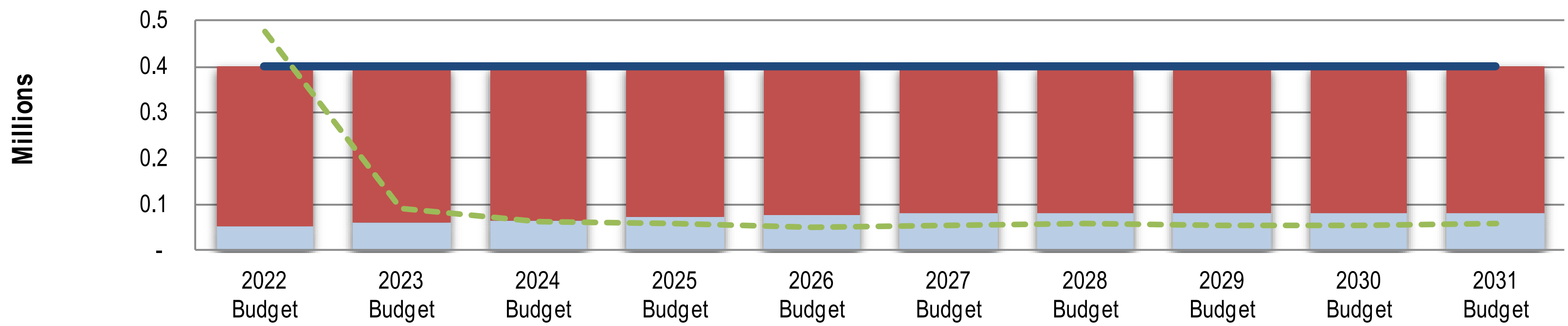
Figure 5.4.1 Average Annual Capital Requirements



The following figure links the annual capital funding needs to the capital investments contained in the budget. The timing of the actual capital projects may vary, however annual investments in capital assets is important for financial sustainability.

Figure 5.4.2 Funding Requirements

	Key	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Annual Required Investment		**401,000**	**401,000**	**401,000**	**401,000**	**401,000**	**401,000**	**401,000**	**401,000**	**401,000**	**401,000**
Current Investment		54,021	62,565	64,360	71,223	76,716	83,226	83,251	83,246	83,225	83,236
Funding Deficit		*346,979*	*338,435*	*336,640*	*329,777*	*324,284*	*317,774*	*317,749*	*317,754*	*317,775*	*317,764*
Funding Surplus		-	-	-	-	-	-	-	-	-	-
Reserve Balance		474,406	89,515	63,789	60,150	52,215	55,728	58,710	54,706	53,227	57,310



As the Mount Elgin WWTP expansion project is anticipated to be partially funded by debt, the amount of the current investment that would be restricted to debenture payments is anticipated to be 66.6% over the 10-year period.

5.5 Funding Gap Analysis

Using the anticipated 10-year asset lifecycle needs, along with the current capital investment level, the County is able to determine if there is an anticipated funding gap for the Mount Elgin wastewater system. Consideration is then given to the current system reserve balance to determine the residual funding gap. The County would then investigate opportunities for reducing this residual funding gap which, may include increases to the user rates, utilization of grant funding opportunities and further review of lifecycle strategies and proposed levels of service.

Figure 5.5.1 illustrates the anticipated asset management 10-year lifecycle needs (left side of figure 5.5.1) and funding needs, including the projected funding gap (right side of figure 5.5.1) for the Mount Elgin wastewater system. The system calculates the optimal expenditures based on theoretical asset lifecycle needs. These needs have not yet been reviewed in depth with County operations staff, and incorporated into the 10-year capital budget. This is anticipated to be completed as part of the 2023 Business Plan and Budget process with subsequent review annually.

The anticipated expenditures have been increased for non-infrastructure solution projects; approximately $0.2 million.

While the anticipated expenditure calculation accounts for the lifecycle activities of expansion / growth projects it does not account for the initial investment. It is important to adjust for these projects, where the initial investment is growth related and not projected to be DC funded within the 10-year capital plan. The resulting growth/expansion projects added to the anticipated asset needs is approximately $1.0 million, plus $0.1 million in anticipated interest costs.

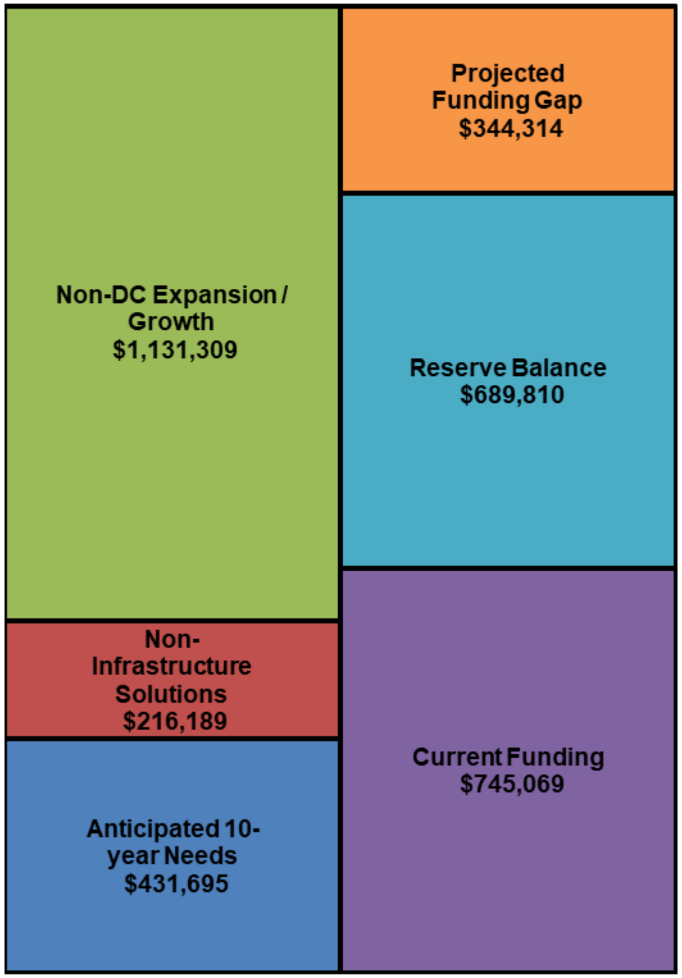
The Mount Elgin wastewater system is projecting a funding gap over the 10-year capital planning period. This gap is partially being addressed through the issuance of debenture funds for the WWTP expansion project (approximately $0.5 million in debt issuance). Of the debt issued, $0.4 million of the principal is proposed to be repaid within the current 10-year period, along with approximately $0.08 million in interest charges. Approximately 66.6% of the current funding is committed to debenture payments over the 10-year horizon. The annual funding requirement will be reviewed holistically as part of the next rate study.

This analysis assumes the full reserve balance is utilized within the current 10-year period. Drawing the reserve balance to zero would likely result in increased user fee requirements in the subsequent 10-year period in order to fund the anticipated asset lifecycle needs.

The reserve is also utilized to fund emergency or unplanned expenses. A minimal or fully committed balance would limit the ability to fund these types of expenses. Consideration needs to be given to a minimum balance the County should maintain based on these risks. Analysis of the reserve target minimum balance, will be completed as part of the annual reserve review process.

Failure to address the long-term asset lifecycle needs could result in significant increases to rates in the future as assets reach end of life; or reductions in localized and/or regional service. This may include blockages, sewer backups, basement flooding, localized service outages, increased maintenance costs on assets past their optimal life, poor quality effluent, damage to the natural environment, fines, increase in insurance claims for property damage and personal injury resulting from poor asset conditions, etc.

Figure 5.5.1 Anticipated Needs (10-Year)



6.0 Climate Change

As part of the asset management planning process, the County will consider the risks and vulnerabilities of capital assets to climate change and the resulting actions that may be required. Commitment will be made to the development of tailored actions that make the best use of our resources to mitigate and adapt to climate change, in accordance with our local reduction targets, financial capacity and stakeholder support.

Optimization of the wastewater treatment process can help reduce the emissions of GHG such as nitrous oxide (N_2O), carbon dioxide (CO_2) and methane (CH_4) from being released into the environment at WWTPs. Optimization requires the correct equipment to ensure conditions can be achieved to reduce GHG emissions, while maintaining WWTP regulatory compliance.

Nitrous oxide (N_2O) is released in the secondary treatment train through the nitrification and denitrification process, which is used to remove nitrogenous components from the wastewater. Nitrifying bacteria oxidize ammonia to nitrites and nitrates. To minimize N_2O emissions, the plant is optimized by running the activated sludge process at a high sludge retention time (SRT) with optimal dissolved oxygen levels, which results in low ammonia and nitrite concentrations. High amounts ammonia and nitrite compounds, especially when there are excessive amounts of dissolved oxygen, can trigger biogenic N_2O emissions. To control this process, upgrades are being completed:

- The addition of a new curb-stop valve to accurately distribute the incoming waste load between the different plant phases.

Methane (CH_4) is generated by the anaerobic biological break down of organics or the release of dissolved CH_4 found in the wastewater influent. The Mount Elgin WWTP does not have anaerobic digestion and does not generate significant levels of methane gas.

Carbon Dioxide (CO_2) is produced in biological treatment, where the organic carbon in the wastewater is utilized for biomass growth or oxidized into CO_2. By operating WWTPs at high sludge retention times, endogenous respiration (cell lysis results in biomass growth) is encouraged, which decreases the overall sludge production, which results in a decrease in CO_2 production. Upgrades with this process include:

- Pump rebuilds to ensure the process remains resilient.

Improving energy efficiency at WWTPs can help to reduce GHG emissions by decreasing consumption of fossil fuel-based energy. Significant energy savings can be realized by increasing the efficiency of plant equipment such as pumps and blowers, and using generated fuel sources.

- All equipment used at the treatment plant are efficient low power units.

Climate change risks are considered during the planning phase of each capital project. Increasing resiliency to changing climate conditions through the use of backup power generation, redundancies with critical equipment, use of SCADA to collect accurate information and make informed decisions. By conducting inspections and completing studies, problem areas can be identified and planned to repair.

- CCTV sewer inspections for 2021.
- Clearing ditches and catchbasins of debris to direct stormwater runoff.
- All SPS have permanent or mobile standby power generation.
- Ongoing development and implementation of a SCADA Master Plan.

WASTEWATER SYSTEM

Embro

Table of Contents

1.0 Introduction

The County maintains a diverse portfolio of assets that are required to provide the community of Embro with the safe collection and treatment of wastewater. Wastewater generated by the residents and businesses in the Village of Embro is collected in a network of wastewater mains and conveyed by sewage pumping stations (SPS) to the Woodstock Wastewater Treatment Plant (WWTP) for treatment. The collected wastewater is treated and discharged into the Thames River. The entire treatment process is completed in accordance with strict standards, processes, and limits as regulated by the WWTPs Environmental Compliance Approval (ECA) issued by the Ministry of Environment, Conservation, and Parks (MECP) of the Ontario Provincial Government.

The wastewater collection network transports residential, commercial and industrial waste to the WWTP for treatment. The collection system incorporates an odour control facility, to mitigate potential odour issues. The wastewater collection network consists of a mix of gravity mains, low pressure mains and forcemains. Wastewater flows by gravity wherever possible, where changing elevations require the use of an SPS. Other specialized structures such as manholes, valve vaults, meter stations, diversion structures and siphons are required to convey wastewater to the WWTP.

Sound management of our wastewater systems helps us realize our vision of being a vibrant community, working well and growing stronger together!

Like many of our assets, wastewater assets are facing increased challenges as a result of aging assets, climate change, increasing demand due to growth in our communities and regulatory changes. Our investment in these assets must therefore be balanced to optimize investment for renewal with the growing needs of our community.

This plan provides information regarding our approach to the management of our wastewater assets over the short (10-year) and long (100-year) term, demonstrating our commitment to assessing and meeting the levels of service valued by our residents and businesses.

1.1 Improvement Plan

The County recognizes that asset management is a continuously evolving process. The following recommendations are based on the review of current management practices, inventory, valuation and condition analysis.

- Document lifecycle history on assets within the asset management systems.
- Continue to reduce asset data gaps.
- Determine asset components and maintenance strategies for facilities and associated processes.
- Refine the risk assessment approach at the component level.
- Incorporate findings from the Water and Wastewater Master Plan.

2.0 State of Assets

2.1 Inventory

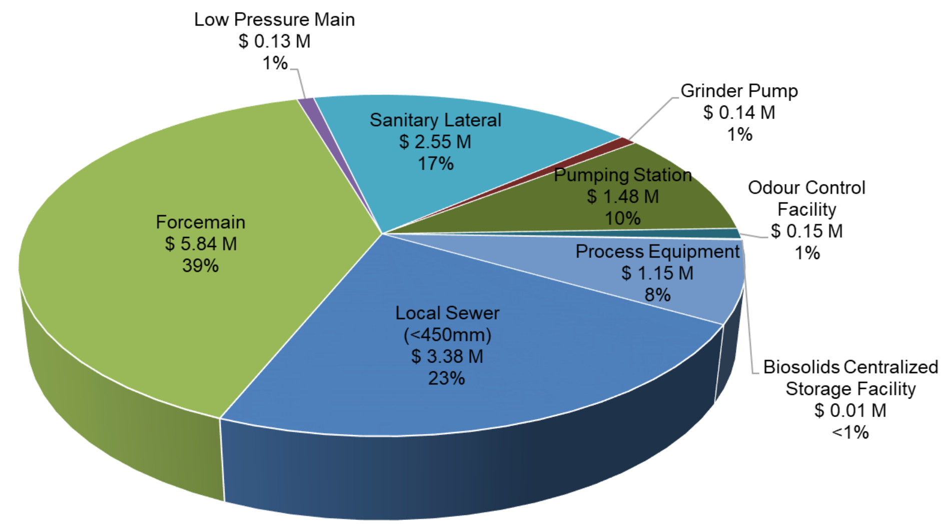
Wastewater assets are those that enable us to live in a clean and safe environment. It includes everything from wastewater mains that service our homes and businesses throughout the County, to the WWTPs, which ensure that effluent is properly treated before being discharged into the natural environment.

We have two different asset classes within the wastewater portfolio in order to effectively collect and treat wastewater from our community:

- Linear, which represent the collection pipe network, including the maintenance holes, connectors and related parts required in such a network.
- Vertical, which represent facilities (including the multiple buildings and structures that the facilities are comprised of), and related process systems and equipment required to perform the needed functions.

Table 2.1.2 displays our current wastewater inventory and the associated replacement costs and average age for each asset component. The County continues to make improvements to increase the integrity of our wastewater data. The inventory figures in table 2.1.2 capture inventory within newly constructed subdivisions which the County is aware of and anticipates assuming ownership of. The County generally assumes ownership of these assets approximately two years after full operation. It is important to include growth assets to ensure that lifecycle activities are planned and funded accordingly.

Figure 2.1.1 Inventory Valuation



2.2 Valuation

The replacement cost valuation for wastewater linear is based on current tender prices, where available. Current tender prices are adjusted where County staff feel some cost increases are only temporary due to COVID.

The replacement cost valuation for wastewater vertical is based on the latest information available, which includes current replacement costs, insurance valuations, and valuations from studies / assessments completed in prior years.

Table 2.1.2 – Embro Wastewater System Inventory

Asset Type	Asset Component		2017 Inventory	Current Inventory	Replacement Cost	Average Age
Linear	Local Sewer (<450mm)	m	7,458	8,480	$3,381,621	11 Years
	Trunk Sewer (>=450mm)	m	-	-	-	-
	Forcemain	m	14,774	14,774	5,836,073	11 Years
	Low Pressure Main	m	426	443	132,918	11 Years
	Sanitary Lateral	each	318	392	2,548,000	11 Years
	Collection Tank	each	-	-	-	-
	STEP Pump	each	-	-	-	-
	Grinder Pump	each	5	9	135,000	4 Years
Vertical	Pumping Station	each	4	4	1,484,080	11 Years
	Wastewater Treatment Plant	each	-	-	-	-
	Odour Control Facility	each	1	1	150,000	11 Years
	Biosolids Centralized Storage Facility[1]	each	-	1	13,562	4 Years
	Process Equipment	total	N/A	N/A	1,151,600	10 Years
Total Replacement Cost					**$14,832,854**	

[1] The Biosolids Centralized Storage Facility is a shared facility across the County with each system contributing to the costs based on number of customers. The value utilized throughout this report card represents Embro's share based on 2021 customers.

2.3 Condition Assessment Approach

The assessment approach for our wastewater assets utilizes a combination of physical assessments, asset attributes, such as material and sizing, as well as established anticipated useful lives.

The County's condition scale and visual inspection ratings are based on the following approach:

- Excellent - Asset is well maintained with no noticeable defects.
- Good - Asset may show signs of minor deterioration and may require some maintenance.
- Fair - Deterioration evident, function affected. Asset may require on-going monitoring.
- Poor - Serious deterioration, function inadequate. Asset may require ongoing monitoring.
- Critical - No longer functional, general or complete failure. Asset may require extensive monitoring.

The Pipeline Assessment Certificate Program (PACP) is the North American Standard for pipeline defect identification and assessment[2]. Closed-circuit television (CCTV) is the principal method of inspecting drains and sewers. In this process, a small robotic crawler vehicle with the CCTV camera attached is lowered into the pipe to complete the inspections. A structural rating, on a scale of 0-5, is then assigned using sewer condition assessment standards, with 0 representing an asset with minimal structural deficiencies and 5 representing assets on the verge of failure.

Table 2.3.1 illustrates how the PACP score ratings align with the County's standard condition scale. Unless otherwise noted, all images are of County assets, and are general representations of the asset condition at the time the photo was taken. Assets may have undergone lifecycle strategies since the date of the image impacting its condition.

Wastewater process assets are inspected by County staff on a regular basis as part the preventative maintenance program. These inspections identify performance and accelerated degradation and will trigger the creation of a reactive work order for repairs and rehabilitation. The County is working towards incorporating these inspections into a formalized condition rating. A visual inspection rating was provided for most process assets as part of the data collection process in 2018 and 2019.

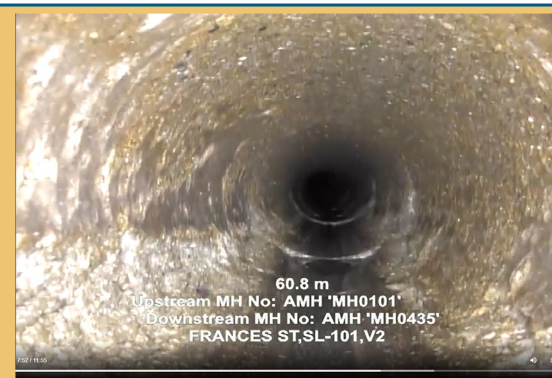
Given the complexities and accessibility of some assets, it is not beneficial to complete a visual or performance based condition assessment on all assets. For assets which are unable to be visually inspected or that have since been replaced, an age-based condition rating is being used based on anticipated useful lives.

[2] https://www.nassco.org/content/pipeline-assessment-pacp

Table 2.3.1 PACP Score Ratings

Excellent
PACP Score of
0 or 1

Poor
PACP Score of
4



Good
PACP Score of
2

Critical
PACP Score of
5

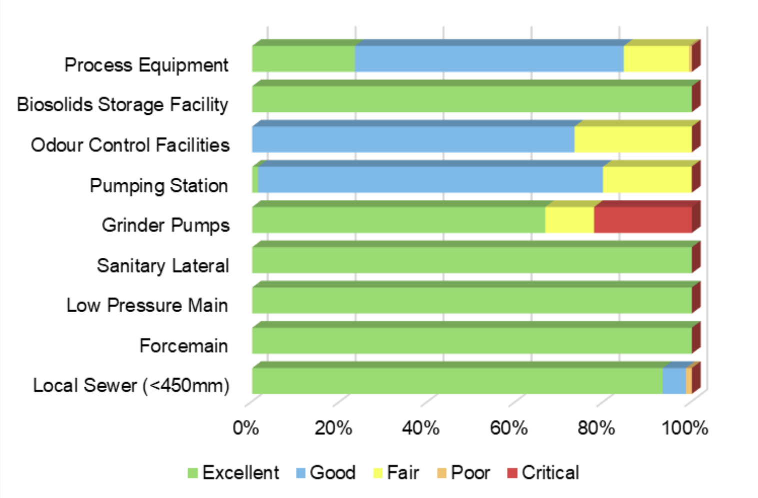
Fair
PACP Score of
3

2.4 Condition Assessment

The condition profile of our Embro wastewater asset components is shown in figure 2.4.1. The % in each condition is based on replacement costs.

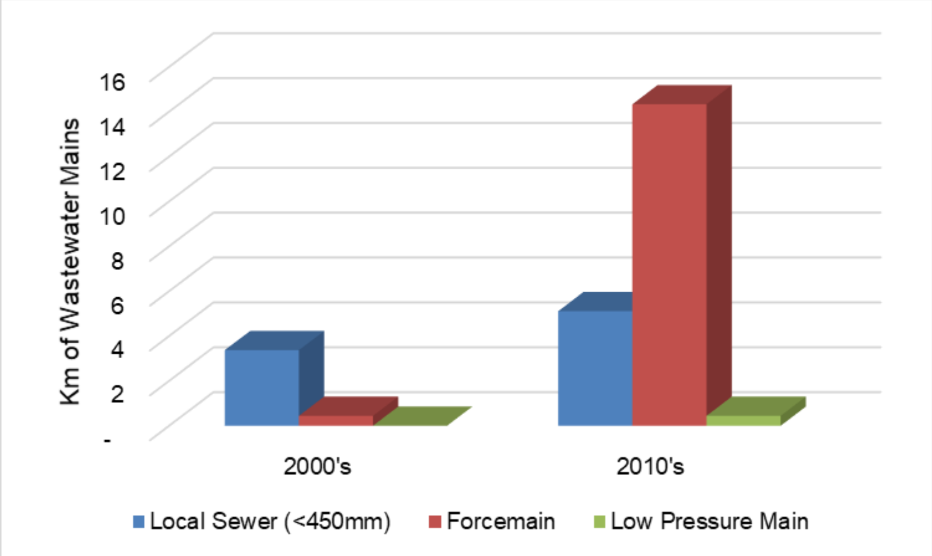
For the Embro wastewater assets: 0.6% of these assets are in poor or critical condition, and 95.9% in good or excellent condition in comparison to 10-11% and 57-65% respectively for Canadian municipalities reported on the Canadian Infrastructure Report Card[3]. While this may appear that our Embro wastewater assets are in better shape than other Canadian municipalities, the 2019 Canadian Infrastructure Report Card is an aggregate of self reported condition ratings across the Country and are based on a general rating scale which may not match the County's.

Figure 2.4.1 Asset Condition by Component



To better understand our Embro wastewater collection assets, an age profile of all our wastewater mains by decade is shown in figure 2.4.2.

Figure 2.4.2 Wastewater Mains by Age



The average age of the assets within the Embro wastewater system is only approximately 11 years, as Embro is a newer system. This value must be considered in the context of the different asset types in the category, compared to the typical anticipated useful life of each asset type.

[3] http://canadianinfrastructure.ca/en/index.html

Table 2.4.3 outlines the anticipated useful life for each new build/replacement. The anticipated useful lives for our wastewater assets exclude the management strategies that the County utilizes to extend the overall life of our wastewater assets.

Table 2.4.3 Useful Life

Wastewater System Component	Anticipated Useful Life (years)
Forcemain, Low Pressure Main, Trunk Sewer, Local Sewer, Laterals	90
Collection Tanks	30
Grinder Pumps	10
Facilities	10 - 50
Process Equipment	8 - 75

Figure 2.4.4 illustrates the current average age of the Embro wastewater system linear components in comparison to their anticipated useful life, based on a run to failure strategy.

As the vertical assets can have a significant variability in age, from both a facility and process standpoint, they are not represented within figure 2.4.4.

There are a number of management strategies that the County may utilize to extend the overall life of our wastewater assets. These strategies allow us to align the needs with those of other assets, resulting in the best overall value for our residents.

Figure 2.4.4 Age and Useful Life Comparison

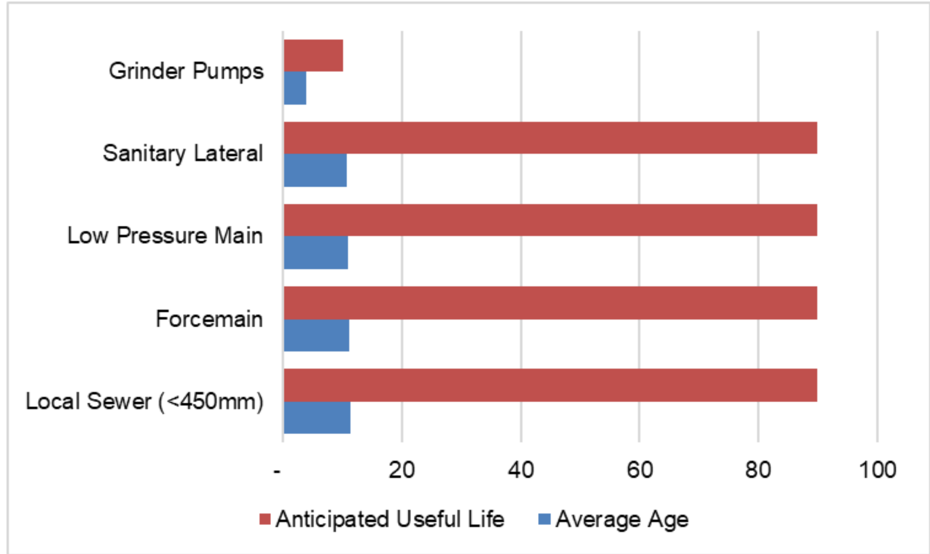


Table 2.4.5 compares the status of our Embro wastewater asset components, as identified in our 2017 Asset Management Plan to their current condition. The breakdown by component for vertical assets was not available as of the date the 2017 report was published, so there is no condition comparison available. Work is ongoing to further enhance the asset information at the component level.

The trend shows that the status of wastewater assets for the Embro wastewater system is relatively steady, which is representative of the age of this system. As the system continues to age it is expected that condition ratings will continue to decline until targeted lifecycle strategies are implemented.

Table 2.4.5 Wastewater Systems Condition Assessment

Asset Type	Asset Component	2017 Condition Rating	Current Condition Rating	Trend
Linear	Local Sewer (<450mm)	Excellent	Excellent	→
	Trunk Sewer (>=450mm)	-	-	-
	Forcemain	Excellent	Excellent	→
	Low Pressure Main	Excellent	Excellent	→
	Sanitary Lateral	Excellent	Excellent	→
	Collection Tank	-	-	-
	STEP Pump	-	-	-
	Grinder Pump	Good	Good	→
Vertical	Pumping Station	Not assessed	Good	-
	Wastewater Treatment Plant	-	-	-
	Odour Control Facility	Not assessed	Good	-
	Biosolids Centralized Storage Facility[4]	-	Excellent	-
	Process Equipment	Not assessed	Good	-

[4] The Biosolids Centralized Storage Facility is a shared facility across the County with each system contributing to the costs based on number of customers. The value utilized throughout this report card represents Embro's share based on 2021 customers.

3.0 Levels of Service

County staff have developed a comprehensive Level of Service (LOS) Framework. This framework will help to establish a relationship between the current LOS being provided by the County's assets, and the associated operating and capital expenditures required to achieve the proposed LOS. The framework puts into perspective the definition and measurement of service performance in alignment with the County's corporate mission and vision.

Corporate Objective

The wastewater collection and treatment service ensures protection of the environment and public health of residents, visitors to the County and downstream users of the receiver (Thames River) and our partners in the watershed.

Legislative Requirements

Each of the County's WWTPs are regulated under the Ontario Water Resources Act, 1990[5] and operated in accordance with an ECA or historical Certificates of Approval (C of A) issued by the MECP.

The ECA for the County's WWTPs require annual reporting of operational and treated effluent discharge parameters into the receiving water bodies. The Annual Wastewater Treatment System Summary Reports are available on the County's website.

Framework

The structure of the County's LOS framework was developed to align with international best practices including the International Infrastructure Management Manual (IPWEA, 2015). The framework includes the mandatory measures to meet the requirements of Ontario Regulation (O.Reg.) 588/17 by including both Community and Technical Levels of Service. The metrics in this framework may be expanded upon as the County continues to improve its data collection and reporting processes.

[5] https://www.ontario.ca/laws/statute/90o40

3.1 Customer Levels of Service

Community or Customer Levels of Service are statements that describe quantifiable metrics of the service delivery outcomes from the perspective of the customer, expressed in non-technical terms. The following statements form our qualitative descriptions of the customer level metrics required under O.Reg. 588/17.

The Embro wastewater system connects to most residential, commercial and industrial spaces in the settlement areas of Embro, as outlined in figure 3.3.1. The Embro wastewater system provides for the safe collection and treatment of wastewater.

The County does not have any combined sewers within the Embro wastewater system. The Embro wastewater system is a separate wastewater system.

Infiltration and inflow can enter through a variety of sources (cracks in pipes, weeping tile connections, cross connections, etc.). In the case of heavy rainfall events, wastewater mains may experience a volume of water and wastewater that exceeds its designed capacity. In some cases, this can cause water and/or wastewater to overflow into streets or backup into homes or businesses.

To minimize wastewater overflow into streets or backup into homes, the County has established design standards to convey flows under ultimate conditions, design sheets for capacity needs that include infiltration inflow. Newer wastewater mains are made of gasketed PVC piping to reduce potential leaks occurring between fitted pipe segments.

Final Effluent is the treated water that is discharged to the environment through the approved effluent disposal facilities, including all bypasses that are required to meet the compliance limits stipulated in the ECA for the Woodstock WWTP, at the final effluent sampling points. The effluent criteria includes effluent flow rates, and parameters such as total suspended solids, Biochemical Oxygen Demand (BOD), phosphorous, ammonia, and E. coli. The County produces annual reports summarizing each WWTPs operation and treated effluent discharge quality and these can be found on the County's website at: http://www.oxfordcounty.ca/Services-for-You/Water-Wastewater/Wastewater/Annual-reports.

Table 3.1.1 outlines additional customer focused performance metrics from the County's LOS framework.

3.2 Technical Levels of Service

Technical Levels of Service metrics are quantifiable metrics applied against assets that are subject-matter specific inputs or outputs supported by the day-to-day activities of County staff. Table 3.1.1 includes the technical metrics required under O.Reg. 588/17, as well as, additional metrics the County has included in the framework.

3.4 Levels of Service Maps

As a further illustrative example of our community levels of service, a map is included in figure 3.3.1 showing areas within the Embro village boundary that are serviced by the Embro wastewater system.

Figure 3.3.1 Embro sanitary serviced properties

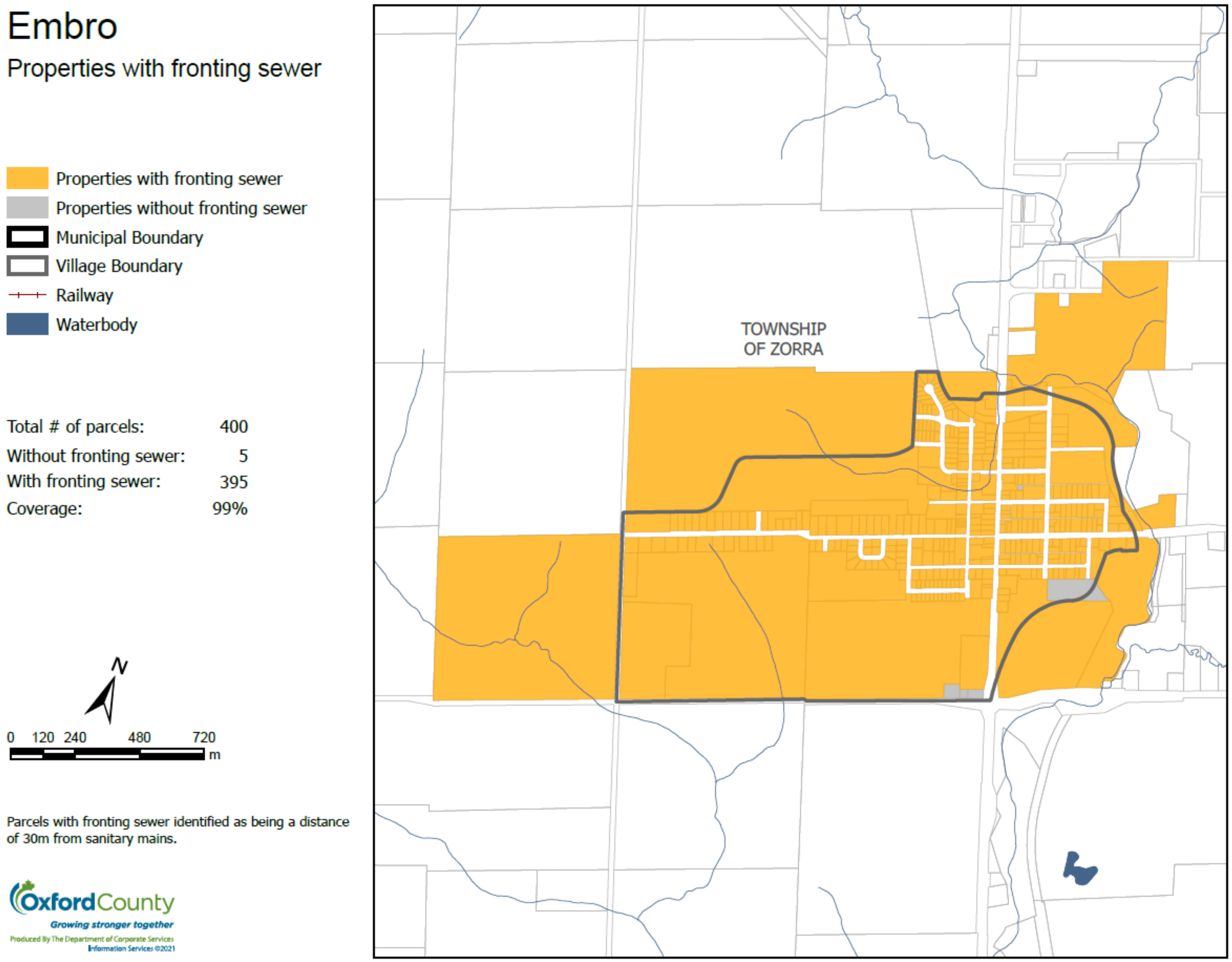


Table 3.1.1 Performance Measures

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Customer / Council Focused Performance Measures					
Reliability	Providing wastewater services with minimal interruptions	% of properties within the system boundary connected to the municipal wastewater system	N/A	99%	TBD
		% of wastewater mains designed to be resilient to overflow or flooding during wet weather events	100%	100%	100%
Environmental Stewardship	Providing wastewater services that have minimal impacts on the environment	% of overall facility ECA compliance rate (Woodstock WWTP)	100%	100%	100%
Cost Efficient	Providing wastewater services in an efficient manner	Operating cost to provide service ($/connection)	$1,035	$848	TBD
Technical Focused Performance Measures					
Reliability	Providing wastewater services with minimal interruptions	The number of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system.	0 connection-days to 285 connections	0 connection-days to 307 connections	TBD
		% of system inspected (CCTV) annually	6%	6.2%	7%
		% of wastewater mains flushed annually	10%	19.9%	20%
		# of overflow or spill occurrences	0	0	0
Cost Efficient	Providing wastewater services in an efficient manner	Operating cost per kilometre of wastewater main for collection	N/A	$10,743	TBD
		5 year average capital expenditure for wastewater collection	$0.01M	$0.01M	TBD

4.0 Asset Management Strategy

4.1 Lifecycle Activities and Planned Actions

Wastewater collection assets undergo regular maintenance and inspection. As part of capital works project analysis, determinations of whether wastewater pipe replacement or relining should occur is reviewed. This process is fully integrated with the renewal needs of the roadways and other underground assets, such as drinking water and stormwater. This integrated approach ensures our renewal projects for these service areas are delivered with optimal timing to increase value and minimize disruption to our communities. For example, if a roadway is targeted for renewal, coordination between service areas and area municipalities will determine whether the underlying stormwater, drinking water or wastewater assets are also of an age or condition that requires renewal, to ensure these projects are delivered together to reduce disruption for our communities and deliver enhanced value.

Process assets and equipment undergo extensive operations and maintenance regimes to sustain their reliable operation. Investment needs are identified and coordinated with normal operations to minimize disruptions to service. Major replacements are planned and accommodated using system redundancy and changes to operations, in order to maintain service. It is critical to maintain wastewater service in order to protect public health and the environment.

There are six main lifecycle activities considered in the overall sustainable management of wastewater assets, described in table 4.1.1.

Table 4.1.1 Lifecycle Activities

Strategy	Lifecycle Activity
Non-Infrastructure Solutions	Actions or policies that can lower costs or extend useful lives. **Trigger: Ongoing**
Maintenance	Regularly scheduled maintenance and inspection programs including cleaning and flushing, manhole repairs, CCTV inspections, exercising diesel gen-sets and minor repairs. These activities do not improve the overall condition of the asset, nor increase its useful life. **Trigger: Ongoing**
Rehabilitation / Renewal	One-time events that increase the condition and extend the useful life of the asset; including sewer lining and seal and grout programs. **Trigger: Fair/Poor**
Replacement	Occurs at the end of the useful life and/or when rehabilitation is no longer an option – can vary among assets due to construction material and environmental factors that impact the degree of deterioration and performance. **Trigger: Poor/Critical**
Disposal	Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the County to provide services. County staff coordinate with contractors to ensure safe removal and environmental compliance when disposing of assets. **Trigger: Poor/Critical**
Expansion / Growth	Planned activities required to extend services to previously unserved areas, expand services to meet growth demands, or increase the level of service being provided. **Trigger: Development**

The lifecycle management strategy is the set of planned actions that should enable the assets to provide users with the proposed level of service in a sustainable way, while achieving acceptable levels of risk and the lowest lifecycle costs required to provide that level of service. Lifecycle considerations for assets include analysis of the timing to carry out key asset management activities including inspection, maintenance, repair, and replacement. Ongoing preventative maintenance activities are outlined in the County's work management system. The rehabilitation and replacement activities impacting the asset components condition and useful life are contained within profiles in the County's asset management system. For some assets, replacement needs are based on a run to failure strategy, as this is the most economical. Work is ongoing within the County's asset management systems to build all the component profiles and identify where each asset is within the lifecycle.

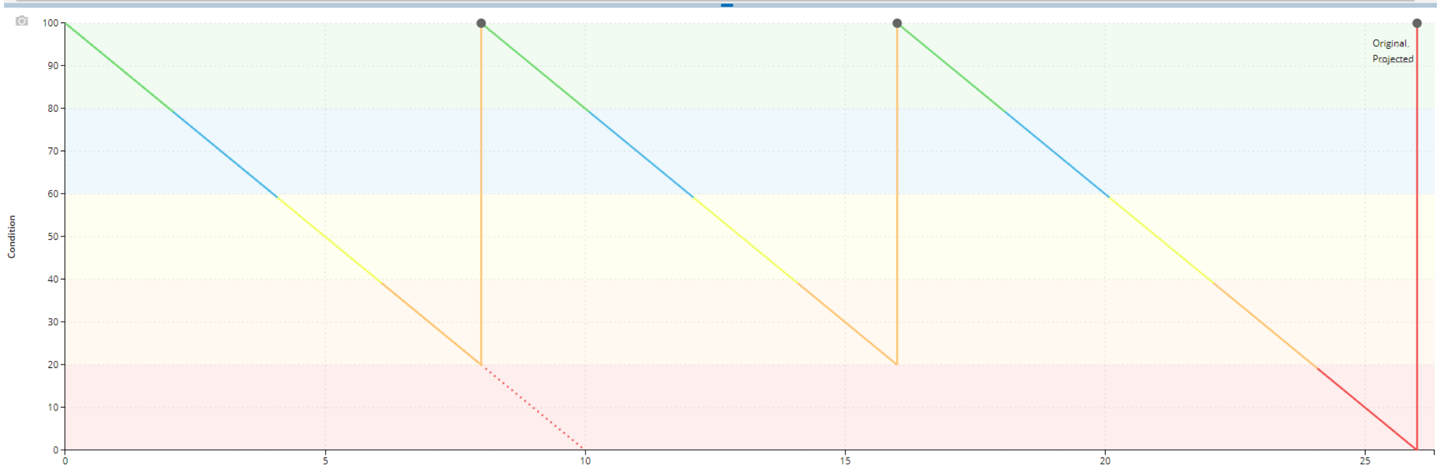
As an example, figure 4.1.2 illustrates the lifecycle strategy of grinder pumps. The pumps are re-built twice, extending the overall useful life from 10 years to approximately 25. The annual cost requirement from a run to failure strategy is $1,500 per year where the annual cost requirement using the rehabilitation strategies decreases to just below $800 per year.

Figure 4.1.2 Grinder Pumps Lifecycle Strategy

Strategy

Age-Based Condition Method	Straight-Line	Lifecycle EUL	10 Year(s) 0 Month(s)
Add Event (Condition Triggered)	Rebuild Pump Add	Lifecycle EUL (with events)	26 Year(s) 0 Month(s)

Age at Event	Name	Description	Event Class	Cost	Event Range / Trigger	Impact	Added EUL	Cost per Added Year	Actions
8 Years	Rebuild Pump		Rehabilitation	$2,500.00 (Fixed)	20 to 20 Condition	Adds 8 Years	8 Years	$312.50	
16 Years	Rebuild Pump		Rehabilitation	$2,500.00 (Fixed)	20 to 20 Condition	Adds 8 Years	8 Years	$312.50	
26 Years	<Asset Replacement>	End of life replacement	Replacement	$0.00 (Fixed)	0 to 20 Condition	Set to 100 Condition	10 Years	$0.00	Automatic

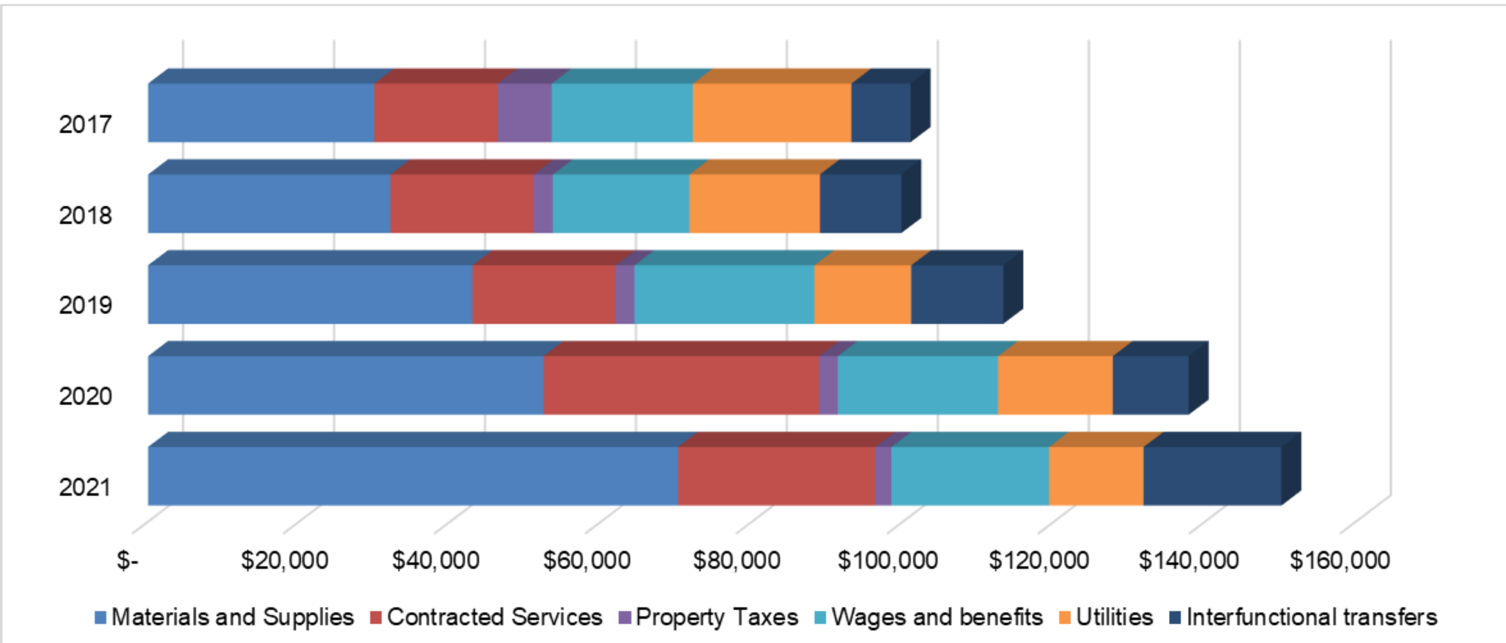


4.2 Significant Operating Expenses

Significant operating expenses are required in order to sustain an asset over its lifecycle. The County is always looking at ways to optimize our operating investment to ensure we are achieving the best value for our residents, and businesses. Essential to this is a strong operations and maintenance plan within our work management system. Operating expenses are incurred through a number of sources – preventative maintenance activities, utility costs, property taxes and more. Despite the fact that minor maintenance is incorporated into planned operations and maintenance programs, there are cases where it is unplanned.

Figure 4.2.1 shows the operating expenses from 2017 through 2021 for the Embro Wastewater System grouped by expense type. The groupings align with those reported on the County's Financial Information Return (FIR), with further breakdown for property taxes and utility costs as these expenses can be significant.

Figure 4.2.1 Operating Expenses



4.3 Risk Strategy

Risk management frameworks are developed to assist with the prioritization of investments within the capital planning period. The preferred approach is to implement a triple bottom line analysis approach to evaluate:

- Social impacts of asset failure, including impacts to customers, businesses and the County's reputation;
- Environmental impacts of asset failure; and
- Economic impacts of failure including the cost of remediation.

In the context of asset management, risk is the multiple of the consequence of an asset failing and the probability that the event will occur.

Figure 4.3.1 illustrates the risk ratings for the Embro wastewater assets at a summary level. Given that the Embro system is a relatively new system, there are currently no high risk assets. County staff will continue to monitor risks, review and/or complete physical inspections to further validate the age-based condition ratings and plan for lifecycle strategies accordingly.

Figure 4.3.1 Asset risk profile

Consequence	1	2	3	4	5
5	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
3	3 Assets 12,094.09 m $4,837,636.00	2 Assets 2.00 unit(s) $785,280.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
2	7 Assets 2,979.20 m $1,192,966.00	3 Assets 3.00 unit(s) $390,000.00	2 Assets 2.00 unit(s) $265,000.00	0 Assets - $0.00	0 Assets - $0.00
1	528 Assets 8,472.04 m, unit(s) $5,943,186.00	57 Assets 310.06 m, unit(s) $834,424.00	34 Assets 223.01 m, unit(s) $470,204.00	5 Assets 5.00 unit(s) $25,100.00	4 Assets 115.99 m, unit(s) $75,496.00

Probability

5.0 Financial Strategy

5.1 Financing Strategy

Hemson Consulting Ltd. (Hemson) was retained through a competitive process to assist with analyzing and developing the County's water and wastewater rates for a 4-year period from 2021 to 2024. The rate modeling includes all system asset management needs and all sources of funding including Community Servicing Assistance Program (CSAP) funding, development charges, developer and resident contributions. In most cases, the capital replacement component is the average annual required contribution level in order to establish full cost recovery; however, the contribution may vary based on the system's ability to meet full cost recovery for the next 10-years.

Capital work is funded from reserves (based on the capital contribution included in the user rates), development charges (for growth projects), debentures and grant funding when available. The County continually assesses opportunities for additional funding options and revenue streams to address our asset needs.

Where possible, replacement activities are planned in conjunction with the replacement needs of the road network and underlying water and stormwater assets. This requires a co-ordinated effort with area municipalities as the majority of the County owned water and wastewater linear assets falls under the area municipalities' roadways. This collaboration is essential for ensuring a cost effective approach to maintaining assets within the County regardless of ownership.

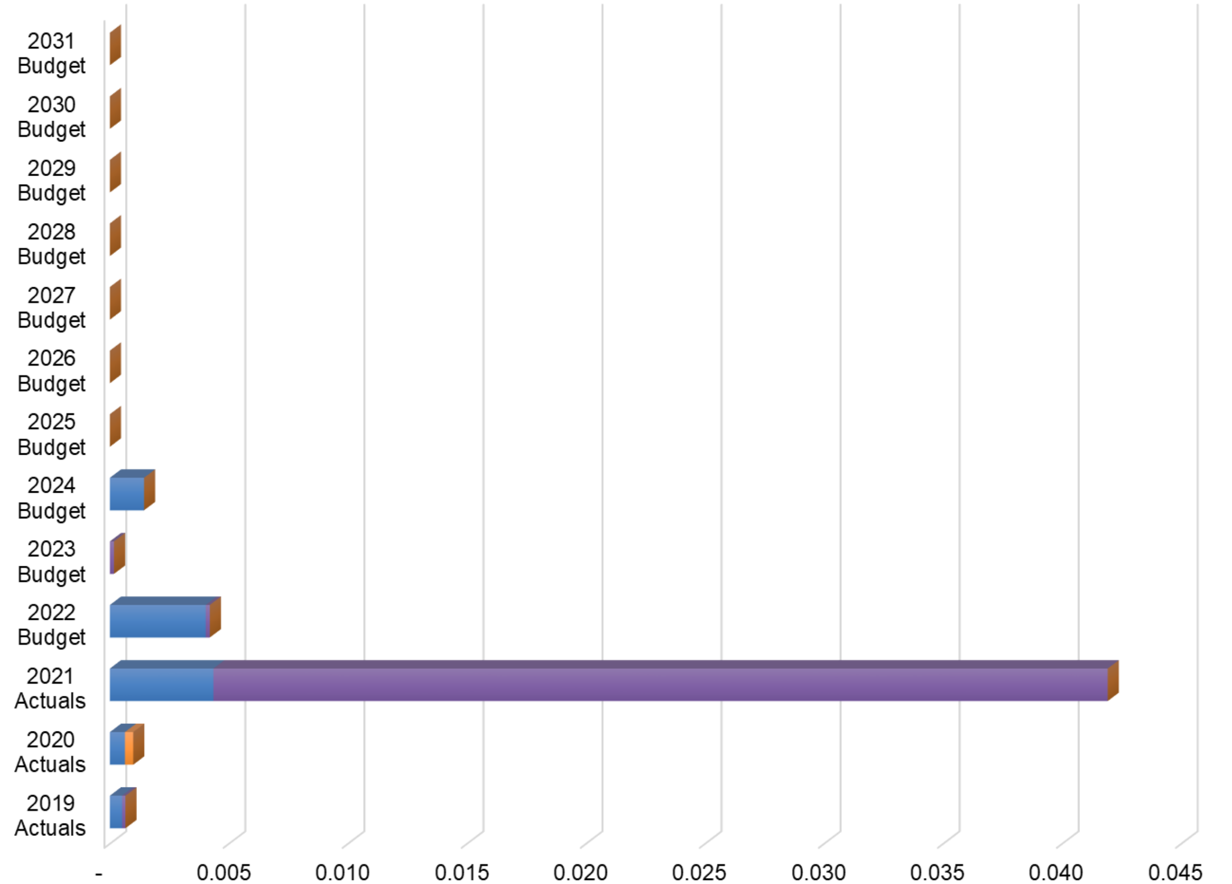
In addition to targeting and prioritizing the investment needed to maintain existing assets, there are also planning processes in place to determine the additional assets needed to meet growing demands through population increases or demand for new services. The projects targeted to meet growth are funded primarily through Development Charges (DC) – the mechanism that enables recovery of growth-related capital expenditures from new development. These charges are governed by the Development Charges Act and are applied in accordance with our Development Charges By-Law. The 2019 DC Background Study investigated the need to implement wastewater development charges within the Embro village boundary, however it was determined the level of growth did not support the need to implement the DC's at that time. This decision will continue to be reviewed with each subsequent DC study.

5.2 Expenditure History and Forecasts

Based on the 2022 approved budget there are no planned large capital replacement projects for the Embro wastewater system within the 10-year approved budget, as illustrated in figure 5.2.1. This is largely due to the fact that the Embro wastewater system is a newer system. Minor process equipment replacements were included in the 2021 budget. County staff continue to review anticipated asset management needs with each budget cycle, subject to existing resource limitations.

Non-Infrastructure solution projects include shared projects for condition reviews, studies and implementation of the work management system.

Figure 5.2.1 Expenditures (millions)

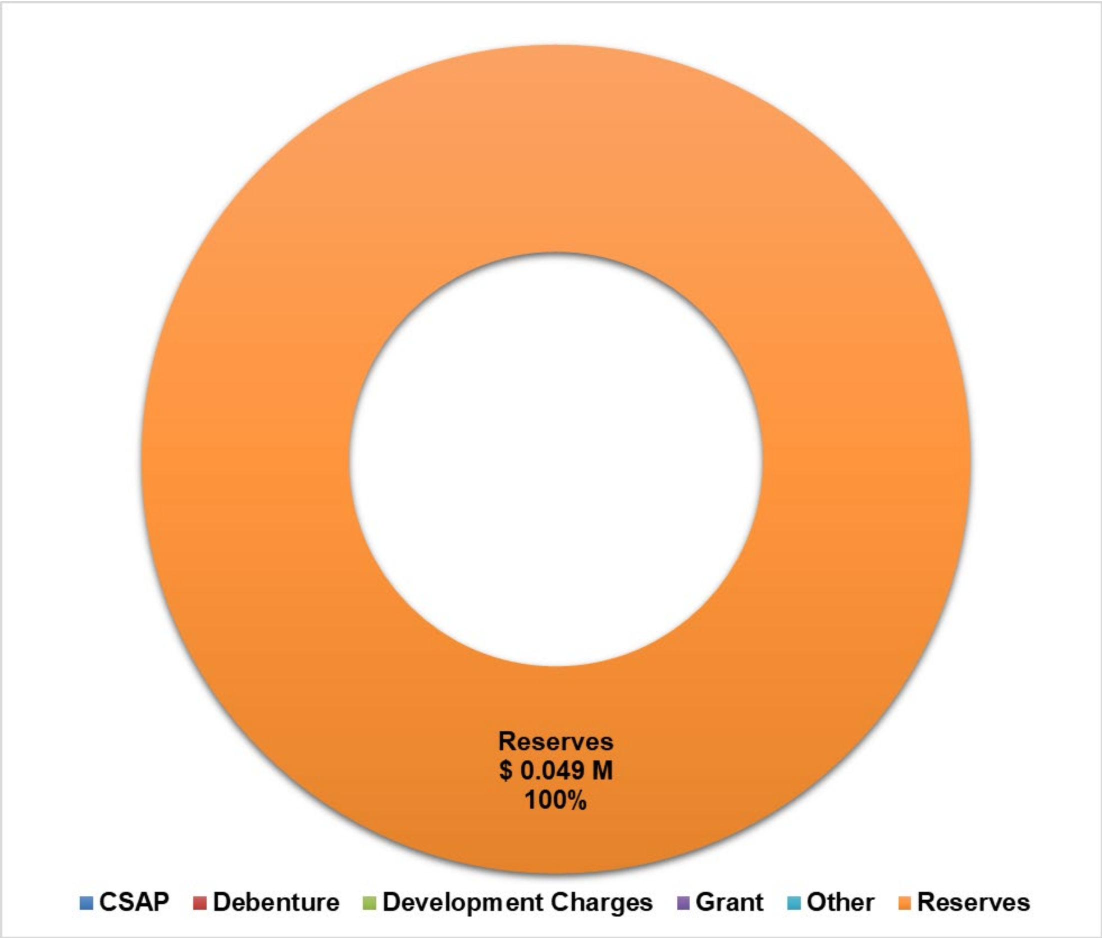


	2019 Actuals	2020 Actuals	2021 Actuals	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Non-Infrastructure Solution	0.001	0.001	0.004	0.004	-	0.001	-	-	-	-	-	-	-
Maintenance	-	-	-	-	-	-	-	-	-	-	-	-	-
Rehabilitation / Renewal	-	-	-	-	-	-	-	-	-	-	-	-	-
Replacement	0.000	-	0.038	0.000	0.000	-	-	-	-	-	-	-	-
Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-
Expansion / Growth	-	0.000	-	-	-	-	-	-	-	-	-	-	-

5.3 Capital Revenues

All Embro Wastewater projects identified in the County's 10-year capital plan are anticipated to be funded by the Wastewater - Embro Reserve, which is funded by user fees. The Embro wastewater reserve currently has a sufficient balance to fund the 10-year asset activities within the approved 2022 Long-Term Capital Plan.

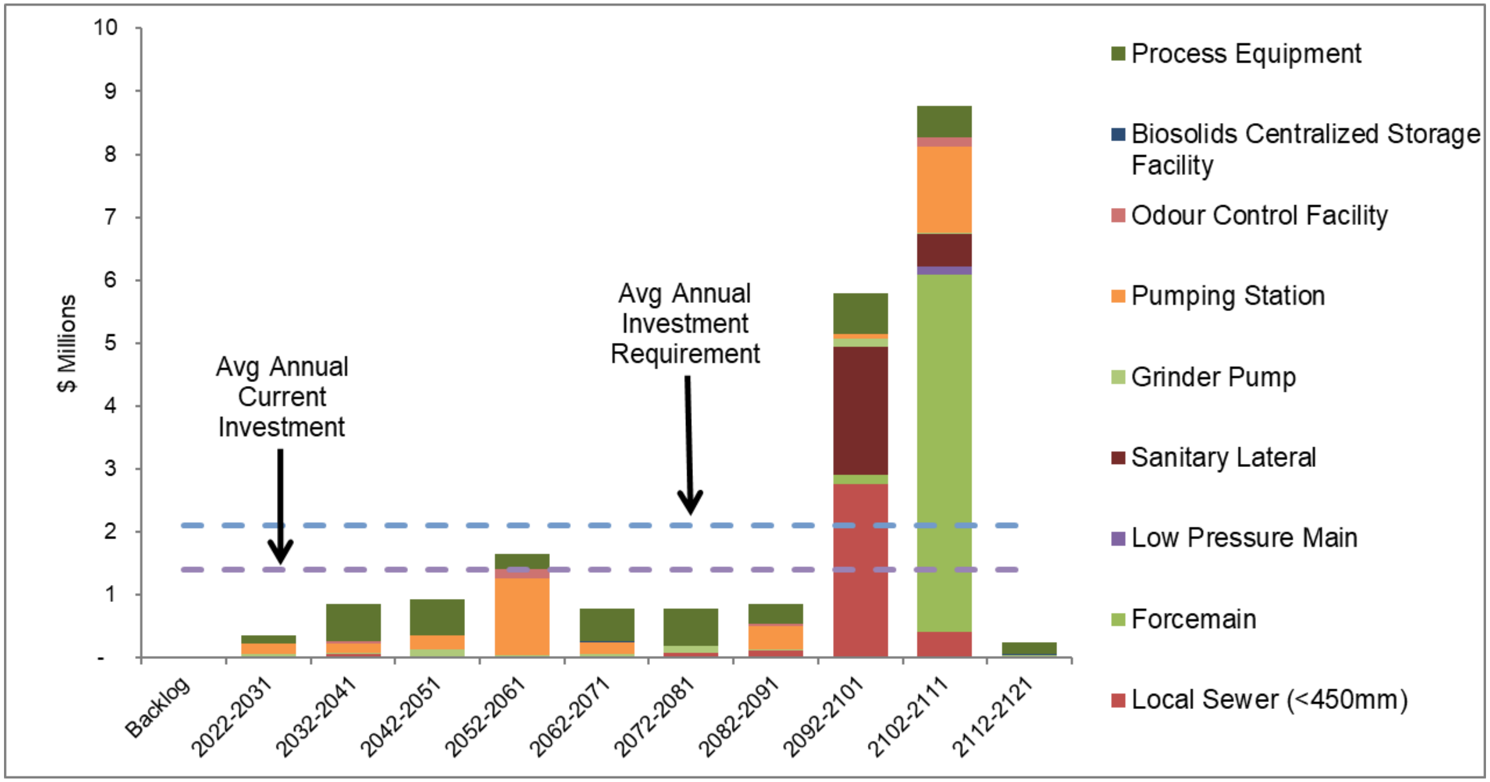
Figure 5.3.1 Sources of Capital Revenues 2019-2031 (millions)



5.4 Capital Investment

Based on the asset management lifecycle strategies identified, the financial requirements over the next 100-years are determined in current dollars. The average annual investment requirement represents the amount of capital funding required to renew and maintain the existing assets on an annual basis so services can continue to be delivered. These estimates assume that all work is able to be completed, as indicated, and does not take into account future changes due to environmental factors, new maintenance techniques, and unidentified growth. The annual requirement has increased from the 2017 AMP, primarily due to significant development and improvements the County has made to the vertical data, resulting in asset useful lives that are more reflective of their actual lifecycle. Further work is ongoing with the vertical data to fully determine lifecycle needs (including maintenance and rehabilitation strategies) which will impact the annual requirement for vertical assets. The data will continue to be reviewed with each budget and business plan cycle.

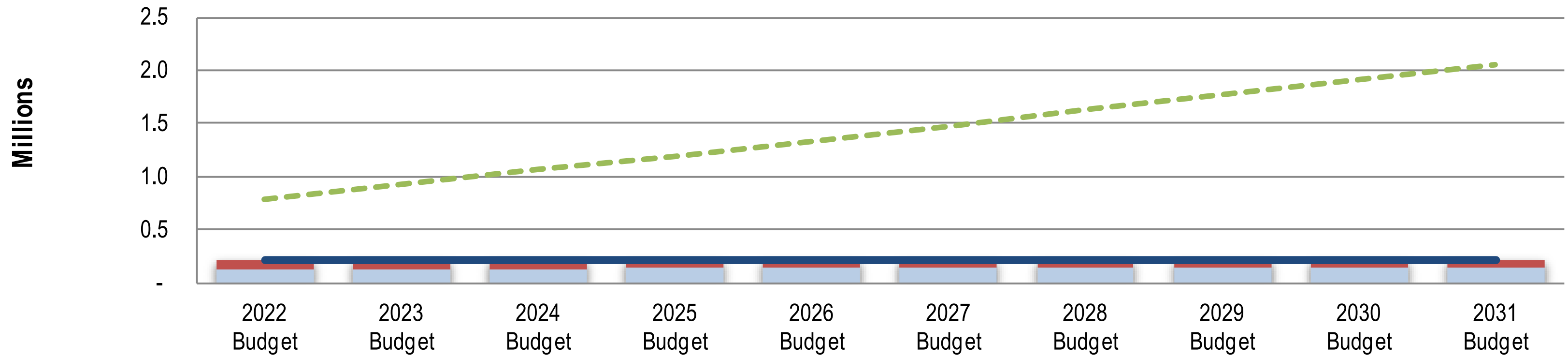
Figure 5.4.1 Average Annual Capital Requirements



The following figure links the annual capital funding needs to the capital investments contained in the budget. The timing of the actual capital projects may vary, however annual investments in capital assets is important for financial sustainability.

Figure 5.4.2 Funding Requirements

	Key	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Annual Required Investment		**210,000**	**210,000**	**210,000**	**210,000**	**210,000**	**210,000**	**210,000**	**210,000**	**210,000**	**210,000**
Current Investment		127,564	132,395	135,736	138,180	140,462	141,120	142,249	143,387	144,534	145,690
Funding Deficit		*82,436*	*77,605*	*74,264*	*71,820*	*69,538*	*68,880*	*67,751*	*66,613*	*65,466*	*64,310*
Funding Surplus		-	-	-	-	-	-	-	-	-	-
Reserve Balance		793,828	926,051	1,060,355	1,198,535	1,338,997	1,480,117	1,622,366	1,765,753	1,910,287	2,055,977



5.5 Funding Gap Analysis

Using the anticipated 10-year asset lifecycle needs, along with the current capital investment level, the County is able to determine if there is an anticipated funding gap for the Embro wastewater system. Consideration is then given to the current system reserve balance to determine the residual funding gap. The County would then investigate opportunities for reducing this residual funding gap which, may include increases to the user rates, utilization of grant funding opportunities and further review of lifecycle strategies and proposed levels of service.

Figure 5.5.1 illustrates the anticipated asset management 10-year lifecycle needs, including the projected funding surplus (left side of figure 5.5.1) and funding needs (right side of figure 5.5.1) for the Embro wastewater system. The system calculates the optimal expenditures based on theoretical asset lifecycle needs. These needs have not yet been reviewed in depth with County operations staff, and incorporated into the 10-year capital budget. This is anticipated to be completed as part of the 2023 Business Plan and Budget process with subsequent review annually.

The anticipated expenditures have been increased for non-infrastructure solution projects; approximately $5 thousand.

While the anticipated expenditure calculation accounts for the lifecycle activities of expansion / growth projects it does not account for the initial investment. It is important to adjust for these projects, where the initial investment is growth related and not projected to be DC funded within the 10-year capital plan. There are no anticipated expansion / growth project costs to be added.

The Embro wastewater system is projecting a funding surplus over the 10-year capital planning period. Although the Embro wastewater system has a projected funding surplus over the 10-year horizon, the annual funding requirement is the basis for ensuring the long-term financial sustainability well into the future. The annual funding requirement will be reviewed holistically as part of the next rate study.

Drawing the reserve balance to zero would likely result in increased user fee requirements in the subsequent 10-year period in order to fund the anticipated asset lifecycle needs.

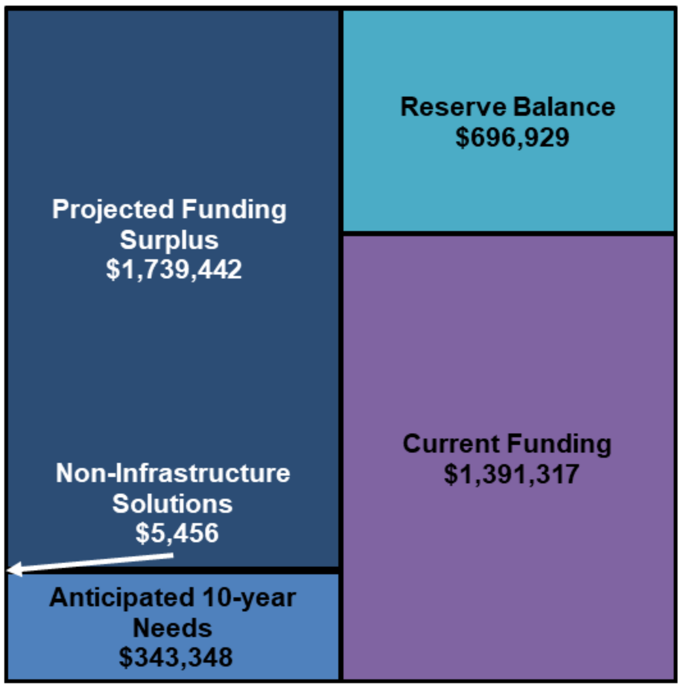
The reserve is also utilized to fund emergency or unplanned expenses. A minimal or fully committed balance would limit the ability to fund these types of expenses. Consideration needs to be given to a minimum balance the County should maintain based on these risks. Analysis of the reserve target minimum balance, will be completed as part of the annual reserve review process.

When the Embro system was constructed, $2.5 million[6] in costs were assigned to future development. As of December 31, 2021 approximately $1.9 million remains unfunded. Consideration should be given to funding this remaining balance through debenture funding, or using a portion of the funding surplus to help reduce this balance. Ongoing contributions from development would then offset debt payments or replenish the reserve.

[6] By-Law No. 5363-2012

Failure to address the long-term asset lifecycle needs could result in significant increases to rates in the future as assets reach end of life; or reductions in localized and/or regional service. This may include blockages, sewer backups, basement flooding, localized service outages, increased maintenance costs on assets past their optimal life, poor quality effluent, damage to the natural environment, fines, increase in insurance claims for property damage and personal injury resulting from poor asset conditions, etc.

Figure 5.5.1 Anticipated Needs (10-Year)



6.0 Climate Change

As part of the asset management planning process, the County will consider the risks and vulnerabilities of capital assets to climate change and the resulting actions that may be required. Commitment will be made to the development of tailored actions that make the best use of our resources to mitigate and adapt to climate change, in accordance with our local reduction targets, financial capacity and stakeholder support.

Climate change risks are considered during the planning phase of each capital project. Increasing resiliency to changing climate conditions through the use of backup power generation, redundancies with critical equipment, use of SCADA to collect accurate information and make informed decisions. By conducting inspections and completing studies, problem areas can be identified and planned to repair.

- use of backup power generation,
- redundancies with critical equipment,
- use of SCADA to collect accurate information and make informed decisions, and
- conducting inspections (including CCTV) and studies to identify problem areas and complete repairs.

WASTEWATER SYSTEM

Innerkip

Table of Contents

1.0 Introduction

The County maintains a diverse portfolio of assets that are required to provide the community of Innerkip with the safe collection and treatment of wastewater. Wastewater generated by the residents and businesses in the Village of Innerkip is collected in a network of wastewater mains and conveyed by sewage pumping stations (SPS) to the Woodstock Wastewater Treatment Plant (WWTP) for treatment. The collected wastewater is treated and discharged into the Thames River. The entire treatment process is completed in accordance with strict standards, processes, and limits as regulated by the WWTPs Environmental Compliance Approval (ECA) issued by the Ministry of Environment, Conservation, and Parks (MECP) of the Ontario Provincial Government.

The wastewater collection network transports residential, commercial and industrial waste to the WWTP for treatment. The collection system incorporates an odour control facility, to mitigate potential odour issues. The wastewater collection network consists of a mix of gravity mains, low pressure mains and forcemains. Wastewater flows by gravity wherever possible, where changing elevations require the use of an SPS. Other specialized structures such as manholes, valve vaults, meter stations, diversion structures and siphons are required to convey wastewater to the WWTP.

Sound management of our wastewater systems helps us realize our vision of being a vibrant community, working well and growing stronger together!

Like many of our assets, wastewater assets are facing increased challenges as a result of aging assets, climate change, increasing demand due to growth in our communities and regulatory changes. Our investment in these assets must therefore be balanced to optimize investment for renewal with the growing needs of our community.

This plan provides information regarding our approach to the management of our wastewater assets over the short (10-year) and long (100-year) term, demonstrating our commitment to assessing and meeting the levels of service valued by our residents and businesses.

1.1 Improvement Plan

The County recognizes that asset management is a continuously evolving process. The following recommendations are based on the review of current management practices, inventory, valuation and condition analysis.

- Document lifecycle history on assets within the asset management systems.
- Continue to reduce asset data gaps.
- Determine asset components and maintenance strategies for facilities and associated processes.
- Refine the risk assessment approach at the component level.
- Incorporate findings from the Water and Wastewater Master Plan.

2.0 State of Assets

2.1 Inventory

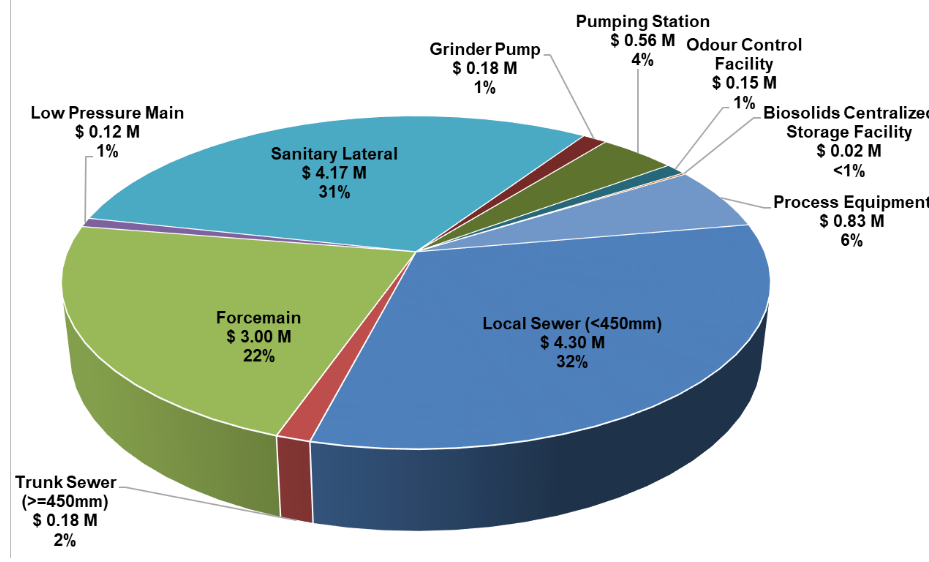
Wastewater assets are those that enable us to live in a clean and safe environment. It includes everything from wastewater mains that service our homes and businesses throughout the County, to the WWTPs, which ensure that effluent is properly treated before being discharged into the natural environment.

We have two different asset classes within the wastewater portfolio in order to effectively collect and treat wastewater from our community:

- Linear, which represent the collection pipe network, including the maintenance holes, connectors and related parts required in such a network.
- Vertical, which represent facilities (including the multiple buildings and structures that the facilities are comprised of), and related process systems and equipment required to perform the needed functions.

Table 2.1.2 displays our current wastewater inventory and the associated replacement costs and average age for each asset component. The County continues to make improvements to increase the integrity of our wastewater data. The inventory figures in table 2.1.2 capture inventory within newly constructed subdivisions which the County is aware of and anticipates assuming ownership of. The County generally assumes ownership of these assets approximately two years after full operation. It is important to include growth assets to ensure that lifecycle activities are planned and funded accordingly.

Figure 2.1.1 Inventory Valuation



2.2 Valuation

The replacement cost valuation for wastewater linear is based on current tender prices, where available. Current tender prices are adjusted where County staff feel some cost increases are only temporary due to COVID.

The replacement cost valuation for wastewater vertical is based on the latest information available, which includes current replacement costs, insurance valuations, and valuations from studies / assessments completed in prior years.

Table 2.2.1 – Innerkip Wastewater System Inventory

Asset Type	Asset Component		2017 Inventory	Current Inventory	Replacement Cost	Average Age
Linear	Local Sewer (<450mm)	m	9,135	10,710	$4,295,914	11 Years
	Trunk Sewer (>=450mm)	m	360	360	181,220	12 Years
	Forcemain	m	7,658	7,658	3,001,813	11 Years
	Low Pressure Main	m	365	402	120,543	11 Years
	Sanitary Lateral	each	509	642	4,173,000	10 Years
	Collection Tank	each	-	-	-	-
	STEP Pump	each	-	-	-	-
	Grinder Pump	each	11	12	180,000	6 Years
Vertical	Pumping Station	each	3	3	560,000	11 Years
	Wastewater Treatment Plant	each	-	-	-	-
	Odour Control Facility	each	1	1	150,000	11 Years
	Biosolids Centralized Storage Facility[1]	each	-	1	20,984	4 Years
	Process Equipment	total	N/A	N/A	826,102	9 Years
Total Replacement Cost					**$13,509,576**	

[1] The Biosolids Centralized Storage Facility is a shared facility across the County with each system contributing to the costs based on number of customers. The value utilized throughout this report card represents Innerkip's share based on 2021 customers.

2.3 Condition Assessment Approach

The assessment approach for our wastewater assets utilizes a combination of physical assessments, asset attributes, such as material and sizing, as well as established anticipated useful lives.

The County's condition scale and visual inspection ratings are based on the following approach:

- Excellent - Asset is well maintained with no noticeable defects.
- Good - Asset may show signs of minor deterioration and may require some maintenance.
- Fair - Deterioration evident, function affected. Asset may require on-going monitoring.
- Poor - Serious deterioration, function inadequate. Asset may require ongoing monitoring.
- Critical - No longer functional, general or complete failure. Asset may require extensive monitoring.

The Pipeline Assessment Certificate Program (PACP) is the North American Standard for pipeline defect identification and assessment[2]. Closed-circuit television (CCTV) is the principal method of inspecting drains and sewers. In this process, a small robotic crawler vehicle with the CCTV camera attached is lowered into the pipe to complete the inspections. A structural rating, on a scale of 0-5, is then assigned using sewer condition assessment standards, with 0 representing an asset with minimal structural deficiencies and 5 representing assets on the verge of failure.

Table 2.3.1 illustrates how the PACP score ratings align with the County's standard condition scale. Unless otherwise noted, all images are of County assets, and are general representations of the asset condition at the time the photo was taken. Assets may have undergone lifecycle strategies since the date of the image impacting its condition.

Wastewater process assets are inspected by County staff on a regular basis as part the preventative maintenance program. These inspections identify performance and accelerated degradation and will trigger the creation of a reactive work order for repairs and rehabilitation. The County is working towards incorporating these inspections into a formalized condition rating. A visual inspection rating was provided for most process assets as part of the data collection process in 2018 and 2019.

Given the complexities and accessibility of some assets, it is not beneficial to complete a visual or performance based condition assessment on all assets. For assets which are unable to be visually inspected or that have since been replaced, an age based condition rating is being used based on anticipated useful lives.

[2] https://www.nassco.org/content/pipeline-assessment-pacp

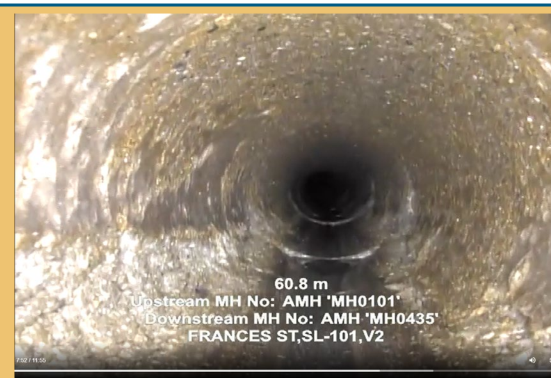
Table 2.3.1 PACP Score Ratings

Excellent
PACP Score of 0 or 1

Good
PACP Score of 2

Fair
PACP Score of 3

Poor
PACP Score of 4



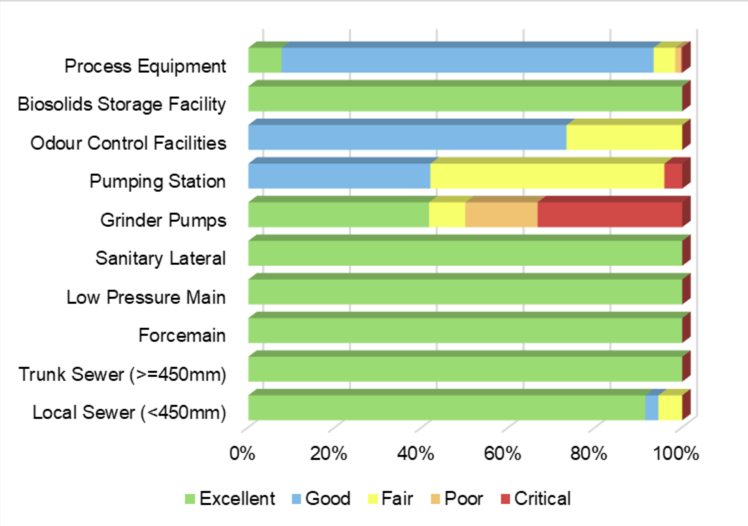
Critical
PACP Score of 5

2.4 Condition Assessment

The condition profile of our Innerkip wastewater asset components is shown in figure 2.4.1. The % in each condition is based on replacement costs.

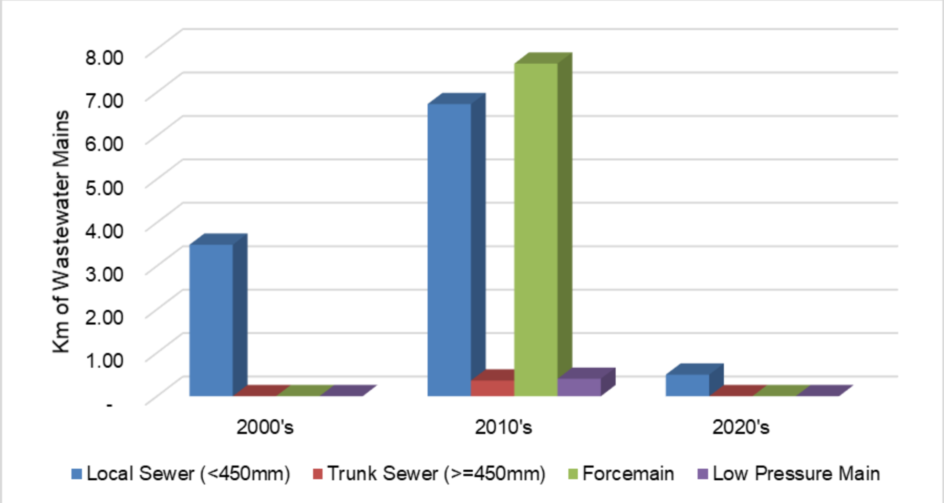
For the Innerkip wastewater assets: 0.9% of these assets are in poor or critical condition, and 94.4% in good or excellent condition in comparison to 10-11% and 57-65% respectively for Canadian municipalities reported on the Canadian Infrastructure Report Card[3]. While this may appear that our Innerkip wastewater assets are in better shape than other Canadian municipalities, the 2019 Canadian Infrastructure Report Card is an aggregate of self reported condition ratings across the Country and are based on a general rating scale which may not match the County's.

Figure 2.4.1 Asset Condition by Component



To better understand our Innerkip wastewater collection assets, an age profile of all our wastewater mains by decade is shown in figure 2.4.2.

Figure 2.4.2 Wastewater Mains by Age



The average age of the assets within the Innerkip wastewater system is only approximately 11 years, as Innerkip is a newer system. This value must be considered in the context of the different asset types in the category, compared to the typical anticipated useful life of each asset type.

[3] http://canadianinfrastructure.ca/en/index.html

Table 2.4.3 outlines the anticipated useful life for each new build/replacement. The anticipated useful lives for our wastewater assets exclude the management strategies that the County utilizes to extend the overall life of our wastewater assets.

Table 2.4.3 Useful Life

Wastewater System Component	Anticipated Useful Life (years)
Forcemain, Low Pressure Main, Trunk Sewer, Local Sewer, Laterals	90
Collection Tanks	30
Grinder Pumps	10
Facilities	10 - 50
Process Equipment	8 - 75

Figure 2.4.4 illustrates the current average age of the Innerkip wastewater system linear components in comparison to their anticipated useful life, based on a run to failure strategy.

As the vertical assets can have a significant variability in age, from both a facility and process standpoint, they are not represented within figure 2.4.4.

There are a number of management strategies that the County may utilize to extend the overall life of our wastewater assets. These strategies allow us to align the needs with those of other assets, resulting in the best overall value for our residents.

Figure 2.4.4 Age and Useful Life Comparison

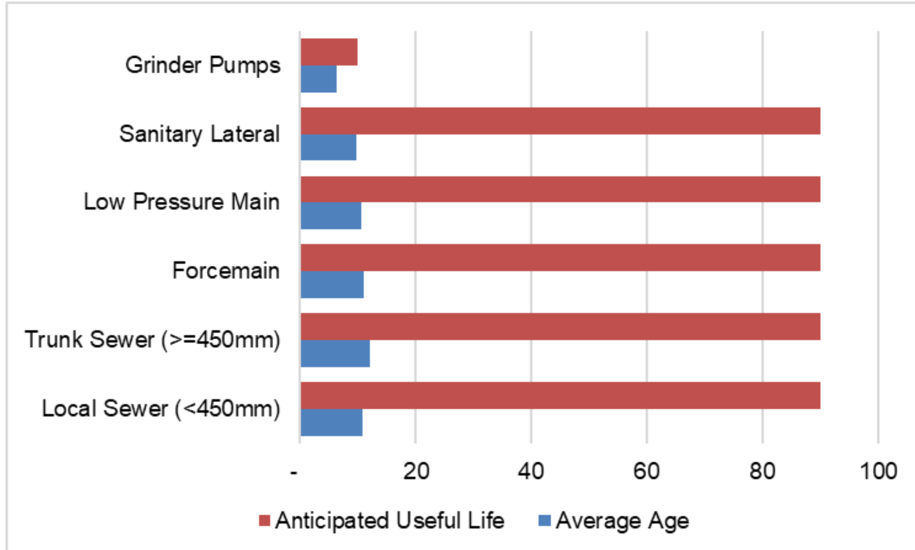


Table 2.4.5 compares the status of our Innerkip wastewater asset components, as identified in our 2017 Asset Management Plan to their current condition. The breakdown by component for vertical assets was not available as of the date the 2017 report was published, so there is no condition comparison available. Work is ongoing to further enhance the asset information at the component level.

The trend shows that the status of wastewater assets for the Innerkip system is relatively steady, which is representative of the age of this system. As the system continues to age it is expected that condition ratings will continue to decline until targeted lifecycle strategies are implemented.

Table 2.4.5 Wastewater Systems Condition Assessment

Asset Type	Asset Component	2017 Condition Rating	Current Condition Rating	Trend
Linear	Local Sewer (<450mm)	Excellent	Excellent	→
	Trunk Sewer (>=450mm)	Excellent	Excellent	→
	Forcemain	Excellent	Excellent	→
	Low Pressure Main	Excellent	Excellent	→
	Sanitary Lateral	Excellent	Excellent	→
	Collection Tank	-	-	-
	STEP Pump	-	-	-
	Grinder Pump	Excellent	Good	↓
Vertical	Pumping Station	Not assessed	Fair	-
	Wastewater Treatment Plant	-	-	-
	Odour Control Facility	Not assessed	Good	-
	Biosolids Centralized Storage Facility[4]	-	Excellent	-
	Process Equipment	Not assessed	Good	-

[4] The Biosolids Centralized Storage Facility is a shared facility across the County with each system contributing to the costs based on number of customers. The value utilized throughout this report card represents Innerkip's share based on 2021 customers.

3.0 Levels of Service

County staff have developed a comprehensive Level of Service (LOS) Framework. This framework will help to establish a relationship between the current LOS being provided by the County's assets, and the associated operating and capital expenditures required to achieve the proposed LOS. The framework puts into perspective the definition and measurement of service performance in alignment with the County's corporate mission and vision.

Corporate Objective

The wastewater collection and treatment service ensures protection of the environment and public health of residents, visitors to the County and downstream users of the receiver (Thames River) and our partners in the watershed.

Legislative Requirements

Each of the County's WWTPs are regulated under the Ontario Water Resources Act, 1990[5] and operated in accordance with an ECA or historical Certificates of Approval (C of A) issued by the MECP.

The ECA for the County's WWTPs require annual reporting of operational and treated effluent discharge parameters into the receiving water bodies. The Annual Wastewater Treatment System Summary Reports are available on the County's website.

Framework

The structure of the County's LOS framework was developed to align with international best practices including the International Infrastructure Management Manual (IPWEA, 2015). The framework includes the mandatory measures to meet the requirements of Ontario Regulation (O.Reg.) 588/17 by including both Community and Technical Levels of Service. The metrics in this framework may be expanded upon as the County continues to improve its data collection and reporting processes.

[5] https://www.ontario.ca/laws/statute/90o40

3.1 Customer Levels of Service

Community or Customer Levels of Service are statements that describe quantifiable metrics of the service delivery outcomes from the perspective of the customer, expressed in non-technical terms. The following statements form our qualitative descriptions of the customer level metrics required under O.Reg. 588/17.

The Innerkip wastewater system connects to most residential, commercial and industrial spaces in the settlement areas of Innerkip, as outlined in figure 3.3.1. The Innerkip wastewater system provides for the safe collection and treatment of wastewater.

The County does not have any combined sewers within the Innerkip wastewater system. The Innerkip wastewater system is a separate wastewater system.

Infiltration and inflow can enter through a variety of sources (cracks in pipes, weeping tile connections, cross connections, etc.). In the case of heavy rainfall events, wastewater mains may experience a volume of water and wastewater that exceeds its designed capacity. In some cases, this can cause water and/or wastewater to overflow into streets or backup into homes or businesses.

To minimize wastewater overflow into streets or backup into homes, the County has established design standards to convey flows under ultimate conditions, design sheets for capacity needs that include infiltration inflow. Newer wastewater mains are made of gasketed PVC piping to reduce potential leaks occurring between fitted pipe segments.

Final Effluent is the treated water that is discharged to the environment through the approved effluent disposal facilities, including all bypasses that are required to meet the compliance limits stipulated in the ECA for the Woodstock WWTP, at the final effluent sampling points. The effluent criteria includes effluent flow rates, and parameters such as total suspended solids, Biochemical Oxygen Demand (BOD), phosphorous, ammonia, and E. coli. The County produces annual reports summarizing each WWTPs operation and treated effluent discharge quality and these can be found on the County's website at: http://www.oxfordcounty.ca/Services-for-You/Water-Wastewater/Wastewater/Annual-reports.

Table 3.1.1 outlines additional customer focused performance metrics from the County's LOS framework.

3.2 Technical Levels of Service

Technical Levels of Service metrics are quantifiable metrics applied against assets that are subject-matter specific inputs or outputs supported by the day-to-day activities of County staff. Table 3.1.1 includes the technical metrics required under O.Reg. 588/17, as well as, additional metrics the County has included in the framework.

3.3 Levels of Service Maps

As a further illustrative example of our community levels of service, a map is included as figure 3.3.1 showing areas within the Innerkip village boundary that are serviced by the Innerkip wastewater system.

Figure 3.3.1 Innerkip sanitary serviced properties

Innerkip

Properties with fronting sewer

- Properties with fronting sewer
- Properties without fronting sewer
- Municipal Boundary
- Village Boundary
- Railway
- Waterbody

Total # of parcels:	617
Without fronting sewer:	25
With fronting sewer:	592
Coverage:	96%

N

0 120 240 480 720 m

Parcels with fronting sewer identified as being a distance of 30m from sanitary mains.

OxfordCounty
Growing stronger together
Produced By The Department of Corporate Services Information Services ©2021

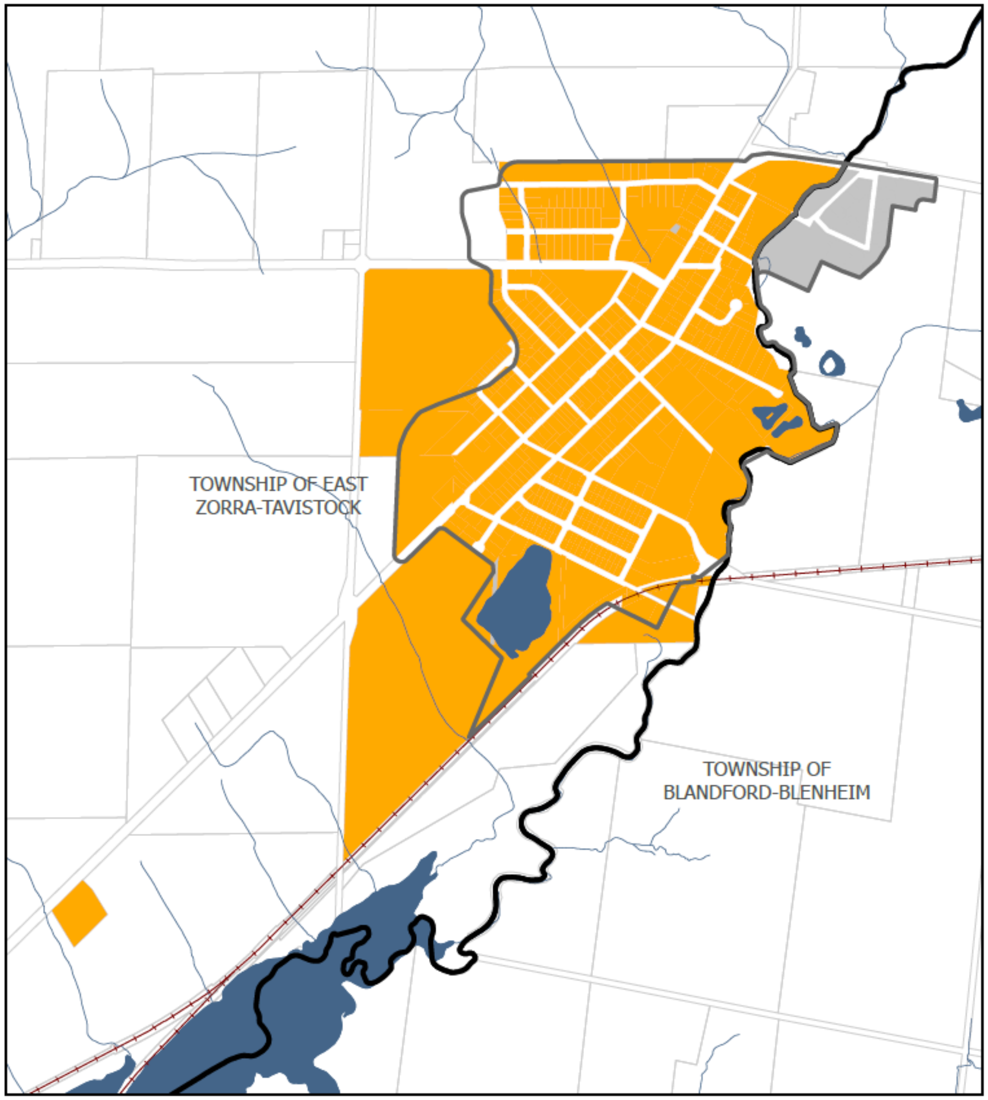


Table 3.1.1 Performance Measures

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Customer / Council Focused Performance Measures					
Reliability	Providing wastewater services with minimal interruptions	% of properties within the system boundary connected to the municipal wastewater system	N/A	96%	TBD
		% of wastewater mains designed to be resilient to overflow or flooding during wet weather events	100%	100%	100%
Environmental Stewardship	Providing wastewater services that have minimal impacts on the environment	% of overall facility ECA compliance rate (Woodstock WWTP)	100%	100%	100%
Cost Efficient	Providing wastewater services in an efficient manner	Operating cost to provide service ($/connection)	$703	$850	TBD
Technical Focused Performance Measures					
Reliability	Providing wastewater services with minimal interruptions	The number of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system.	0 connection-days to 427 connections	0 connection-days to 475 connections	TBD
		% of system inspected (CCTV) annually	N/A	8%	7%
		% of wastewater mains flushed annually	16.3%	18.6%	20%
		# of overflow or spill occurrences	0	2	0
Cost Efficient	Providing wastewater services in an efficient manner	Operating cost per kilometre of wastewater main for collection	N/A	$20,569	TBD
		5 year average capital expenditure for wastewater collection	$0.01M	$0.03M	TBD

4.0 Asset Management Strategy

4.1 Lifecycle Activities and Planned Actions

Wastewater collection assets undergo regular maintenance and inspection. As part of capital works project analysis, determinations of whether wastewater pipe replacement or relining should occur is reviewed. This process is fully integrated with the renewal needs of the roadways and other underground assets, such as drinking water and stormwater. This integrated approach ensures our renewal projects for these service areas are delivered with optimal timing to increase value and minimize disruption to our communities. For example, if a roadway is targeted for renewal, coordination between service areas and area municipalities will determine whether the underlying stormwater, drinking water or wastewater assets are also of an age or condition that requires renewal, to ensure these projects are delivered together to reduce disruption for our communities and deliver enhanced value.

Process assets and equipment undergo extensive operations and maintenance regimes to sustain their reliable operation. Investment needs are identified and coordinated with normal operations to minimize disruptions to service. Major replacements are planned and accommodated using system redundancy and changes to operations, in order to maintain service. It is critical to maintain wastewater service in order to protect public health and the environment.

There are six main lifecycle activities considered in the overall sustainable management of wastewater assets, described in table 4.1.1.

Table 4.1.1 Lifecycle Activities

Strategy	Lifecycle Activity
Non-Infrastructure Solutions	Actions or policies that can lower costs or extend useful lives. **Trigger: Ongoing**
Maintenance	Regularly scheduled maintenance and inspection programs including cleaning and flushing, manhole repairs, CCTV inspections, exercising diesel gen-sets and minor repairs. These activities do not improve the overall condition of the asset, nor increase its useful life. **Trigger: Ongoing**
Rehabilitation / Renewal	One-time events that increase the condition and extend the useful life of the asset; including sewer lining and seal and grout programs. **Trigger: Fair/Poor**
Replacement	Occurs at the end of the useful life and/or when rehabilitation is no longer an option – can vary among assets due to construction material and environmental factors that impact the degree of deterioration and performance. **Trigger: Poor/Critical**
Disposal	Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the County to provide services. County staff coordinate with contractors to ensure safe removal and environmental compliance when disposing of assets. **Trigger: Poor/Critical**
Expansion / Growth	Planned activities required to extend services to previously unserved areas, expand services to meet growth demands, or increase the level of service being provided. **Trigger: Development**

The lifecycle management strategy is the set of planned actions that should enable the assets to provide users with the proposed level of service in a sustainable way, while achieving acceptable levels of risk and the lowest lifecycle costs required to provide that level of service. Lifecycle considerations for assets include analysis of the timing to carry out key asset management activities including inspection, maintenance, repair, and replacement. Ongoing preventative maintenance activities are outlined in the County's work management system. The rehabilitation and replacement activities impacting the asset components condition and useful life are contained within profiles in the County's asset management system. For some assets, replacement needs are based on a run to failure strategy, as this is the most economical. Work is ongoing within the County's asset management systems to build all the component profiles and identify where each asset is within the lifecycle.

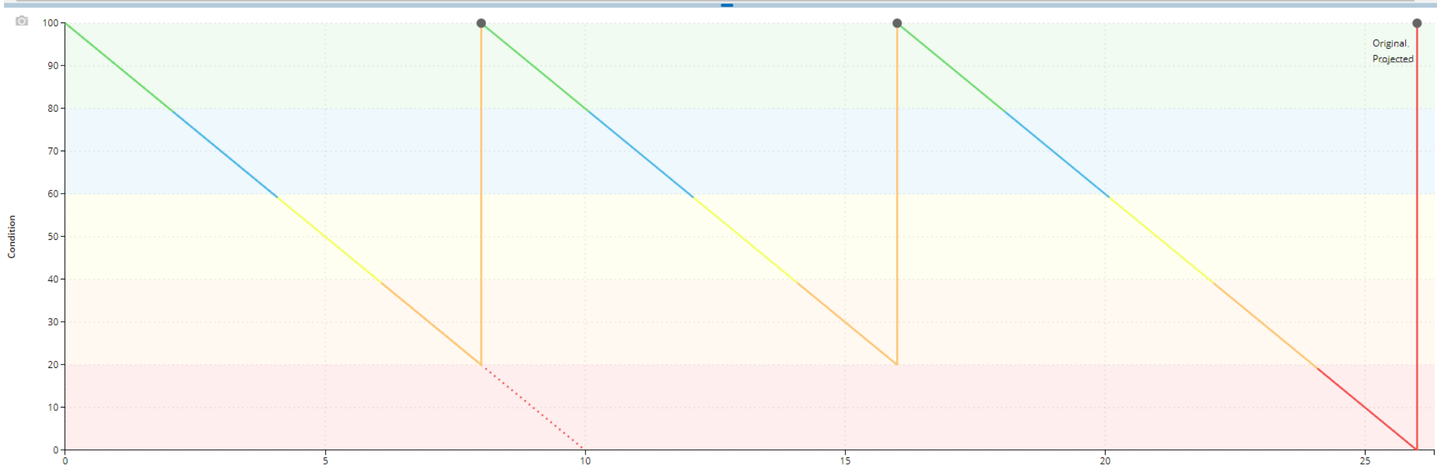
As an example, figure 4.1.2 illustrates the lifecycle strategy of grinder pumps. The pumps are re-built twice, extending the overall useful life from 10 years to approximately 25. The annual cost requirement from a run to failure strategy is $1,500 per year where the annual cost requirement using the rehabilitation strategies decreases to just below $800 per year.

Figure 4.1.2 Grinder Pumps Lifecycle Strategy

Strategy

Age-Based Condition Method	Straight-Line	Lifecycle EUL	10 Year(s) 0 Month(s)
Add Event (Condition Triggered)	Rebuild Pump (Add)	Lifecycle EUL (with events)	26 Year(s) 0 Month(s)

Age at Event	Name	Description	Event Class	Cost	Event Range / Trigger	Impact	Added EUL	Cost per Added Year	Actions
8 Years	Rebuild Pump		Rehabilitation	$2,500.00 (Fixed)	20 to 20 Condition	Adds 8 Years	8 Years	$312.50	
16 Years	Rebuild Pump		Rehabilitation	$2,500.00 (Fixed)	20 to 20 Condition	Adds 8 Years	8 Years	$312.50	
26 Years	<Asset Replacement>	End of life replacement	Replacement	$0.00 (Fixed)	0 to 20 Condition	Set to 100 Condition	10 Years	$0.00	Automatic

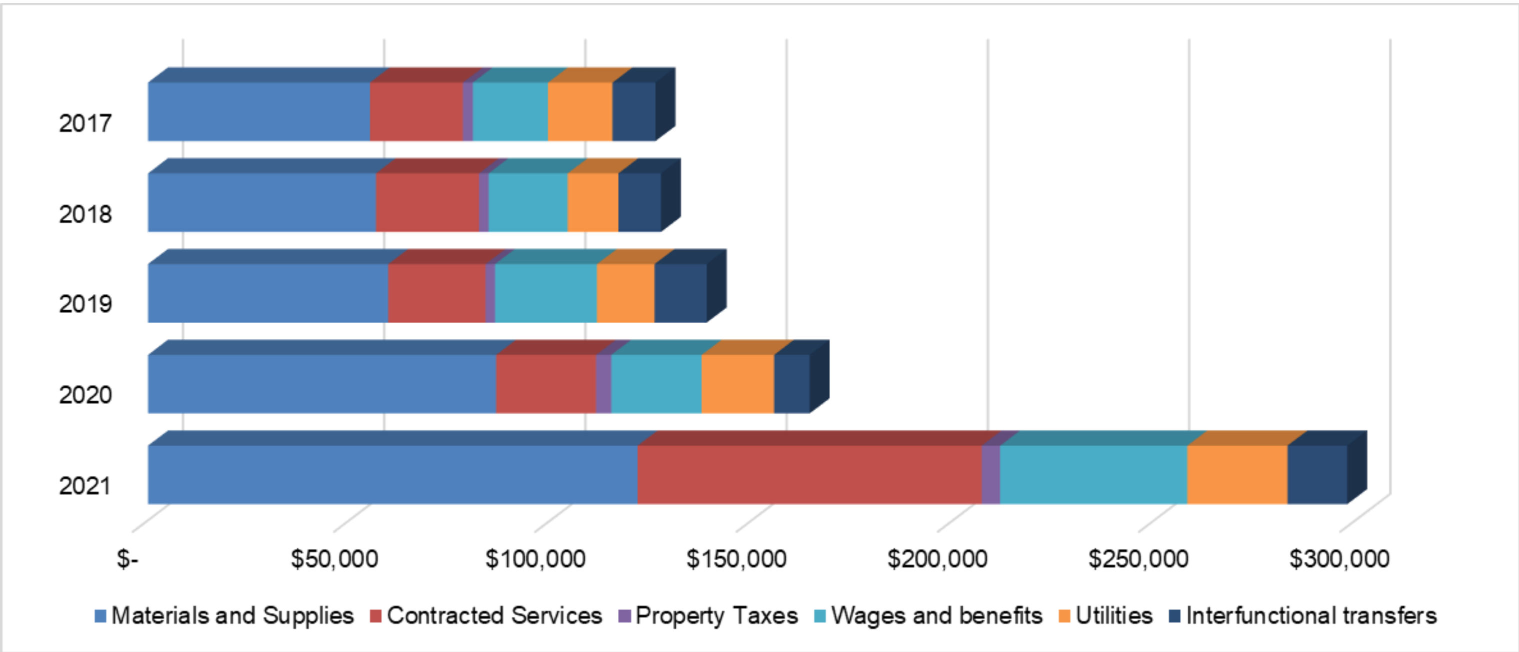


4.2 Significant Operating Expenses

Significant operating expenses are required in order to sustain an asset over its lifecycle. The County is always looking at ways to optimize our operating investment to ensure we are achieving the best value for our residents, and businesses. Essential to this is a strong operations and maintenance plan within our work management system. Operating expenses are incurred through a number of sources – preventative maintenance activities, utility costs, property taxes and more. Despite the fact that minor maintenance is incorporated into planned operations and maintenance programs, there are cases where it is unplanned.

Figure 4.2.1 shows the operating expenses from 2017 through 2021 for the Innerkip Wastewater System grouped by expense type. The groupings align with those reported on the County's Financial Information Return (FIR), with further breakdown for property taxes and utility costs as these expenses can be significant.

Figure 4.2.1 Operating Expenses



4.3 Risk Strategy

Risk management frameworks are developed to assist with the prioritization of investments within the capital planning period. The preferred approach is to implement a triple bottom line analysis approach to evaluate:

- Social impacts of asset failure, including impacts to customers, businesses and the County's reputation;
- Environmental impacts of asset failure; and
- Economic impacts of failure including the cost of remediation.

In the context of asset management, risk is the multiple of the consequence of an asset failing and the probability that the event will occur.

Figure 4.3.1 illustrates the risk ratings for the Innerkip wastewater assets at a summary level. Given that the Innerkip system is a relatively new system, there are currently no high risk assets. County staff will continue to monitor risks, review and/or complete physical inspections to further validate the age-based condition ratings and plan for lifecycle strategies accordingly.

Figure 4.3.1 Asset risk profile

Consequence	1	2	3	4	5
5	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
3	0 Assets - $0.00	0 Assets - $0.00	1 Asset 1.00 unit(s) $260,000.00	0 Assets - $0.00	0 Assets - $0.00
2	34 Assets 8,362.78 m, unit(s) $3,400,346.00	2 Assets 2.00 unit(s) $260,000.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
1	777 Assets 10,500.85 m, unit(s) $8,099,900.00	58 Assets 377.95 unit(s), m $928,582.00	18 Assets 142.20 m, unit(s) $227,280.00	8 Assets 468.21 m, unit(s) $212,484.00	7 Assets 7.00 unit(s) $100,000.00
	Probability				

5.0 Financial Strategy

5.1 Financing Strategy

Hemson Consulting Ltd. (Hemson) was retained through a competitive process to assist with analyzing and developing the County's water and wastewater rates for a 4-year period from 2021 to 2024. The rate modeling includes all system asset management needs and all sources of funding including Community Servicing Assistance Program (CSAP) funding, development charges, developer and resident contributions. In most cases, the capital replacement component is the average annual required contribution level in order to establish full cost recovery; however, the contribution may vary based on the system's ability to meet full cost recovery for the next 10-years.

Capital work is funded from reserves (based on the capital contribution included in the user rates), development charges (for growth projects), debentures and grant funding when available. The County continually assesses opportunities for additional funding options and revenue streams to address our asset needs.

Where possible, replacement activities are planned in conjunction with the replacement needs of the road network and underlying water and stormwater assets. This requires a co-ordinated effort with area municipalities as the majority of the County owned water and wastewater linear assets falls under the area municipalities' roadways. This collaboration is essential for ensuring a cost effective approach to maintaining assets within the County regardless of ownership.

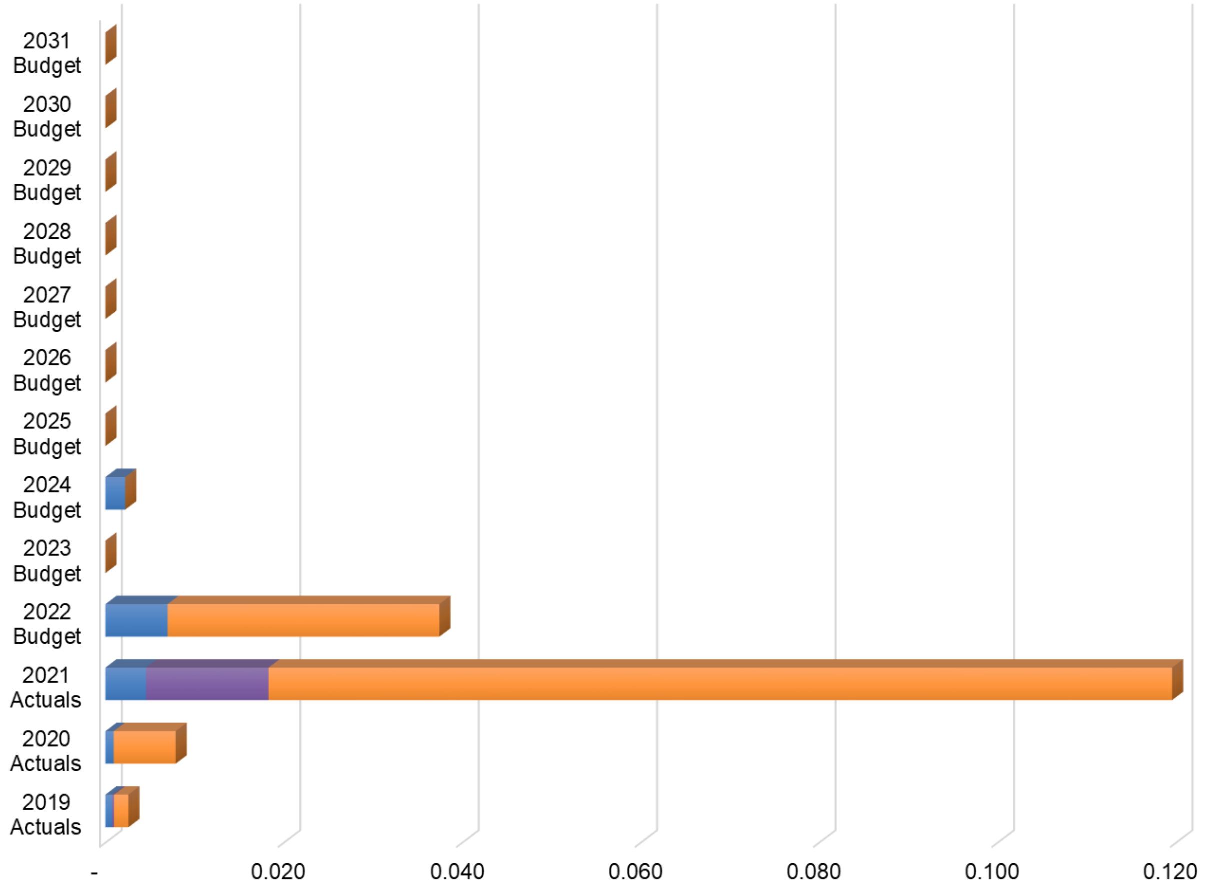
In addition to targeting and prioritizing the investment needed to maintain existing assets, there are also planning processes in place to determine the additional assets needed to meet growing demands through population increases or demand for new services. The projects targeted to meet growth are funded primarily through Development Charges (DC) – the mechanism that enables recovery of growth-related capital expenditures from new development. These charges are governed by the Development Charges Act and are applied in accordance with our Development Charges By-Law. The 2019 DC Background Study investigated the need to implement wastewater development charges within the Innerkip village boundary, however it was determined the level of growth did not support the need to implement the DC's at that time. This decision will continue to be reviewed with each subsequent DC study.

5.2 Expenditure History and Forecasts

Based on the 2022 approved budget there are no planned large capital replacement projects for the Innerkip wastewater system within the 10-year approved budget, as illustrated in figure 5.2.1. This is largely due to the fact that the Innerkip wastewater system is a newer system. Minor process equipment replacements were included in the 2021 budget. County staff continue to review anticipated asset management needs with each budget cycle, subject to existing resource limitations.

Non-Infrastructure solution projects include shared projects for condition reviews, studies and implementation of the work management system.

Figure 5.2.1 Expenditures (millions)

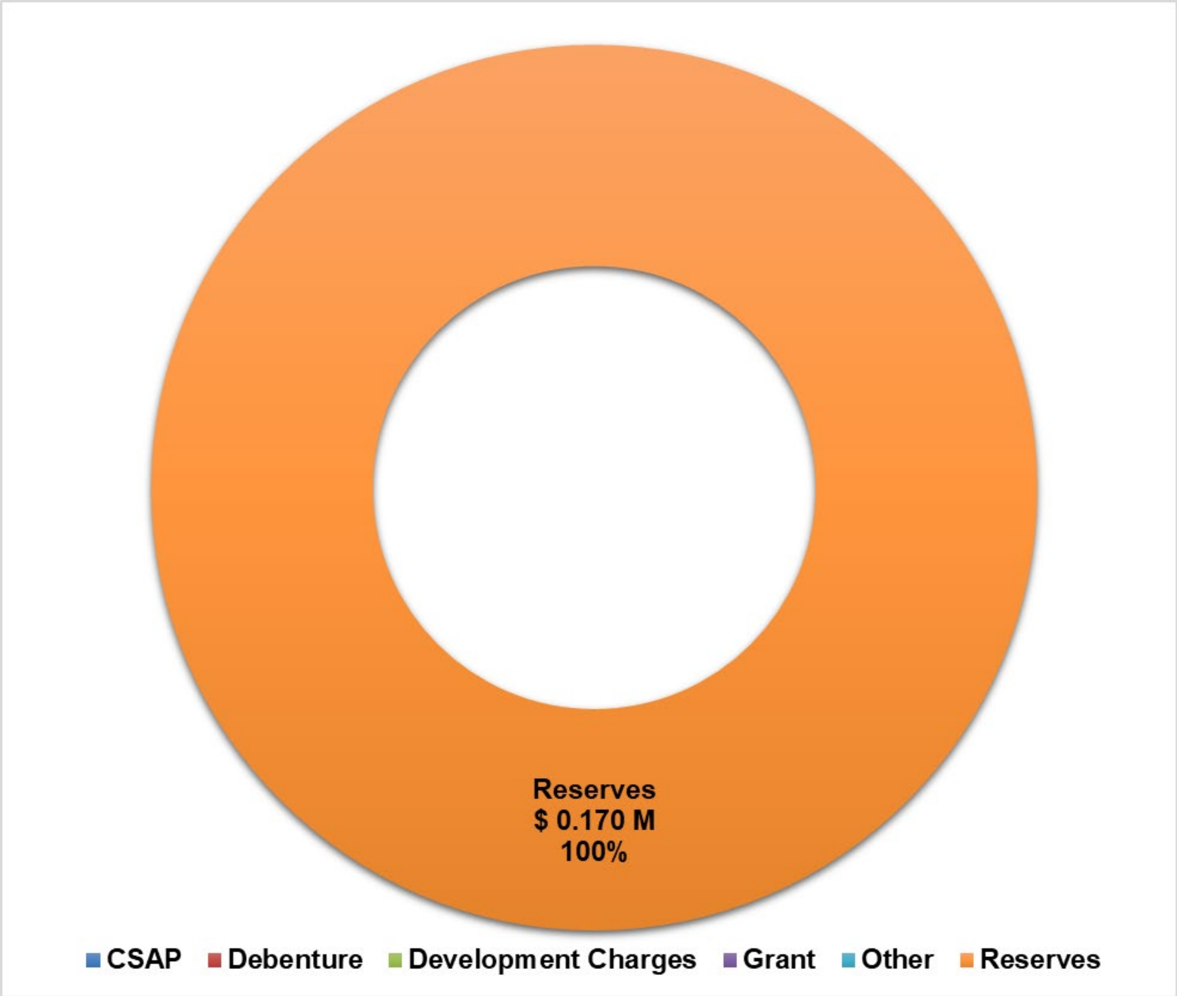


	2019 Actuals	2020 Actuals	2021 Actuals	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Non-Infrastructure Solution	0.001	0.001	0.005	0.007	-	0.002	-	-	-	-	-	-	-
Maintenance	-	-	-	-	-	-	-	-	-	-	-	-	-
Rehabilitation / Renewal	-	-	-	-	-	-	-	-	-	-	-	-	-
Replacement	0.000	-	0.014	-	-	-	-	-	-	-	-	-	-
Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-
Expansion / Growth	0.002	0.007	0.101	0.030	-	-	-	-	-	-	-	-	-

5.3 Capital Revenues

All Innerkip Wastewater projects identified in the County's 10-year capital plan are anticipated to be funded by the Wastewater – Innerkip Reserve, which is funded by user fees. The Innerkip wastewater reserve currently has a sufficient balance to fund the 10-year asset activities within the approved 2022 Long-Term Capital Plan.

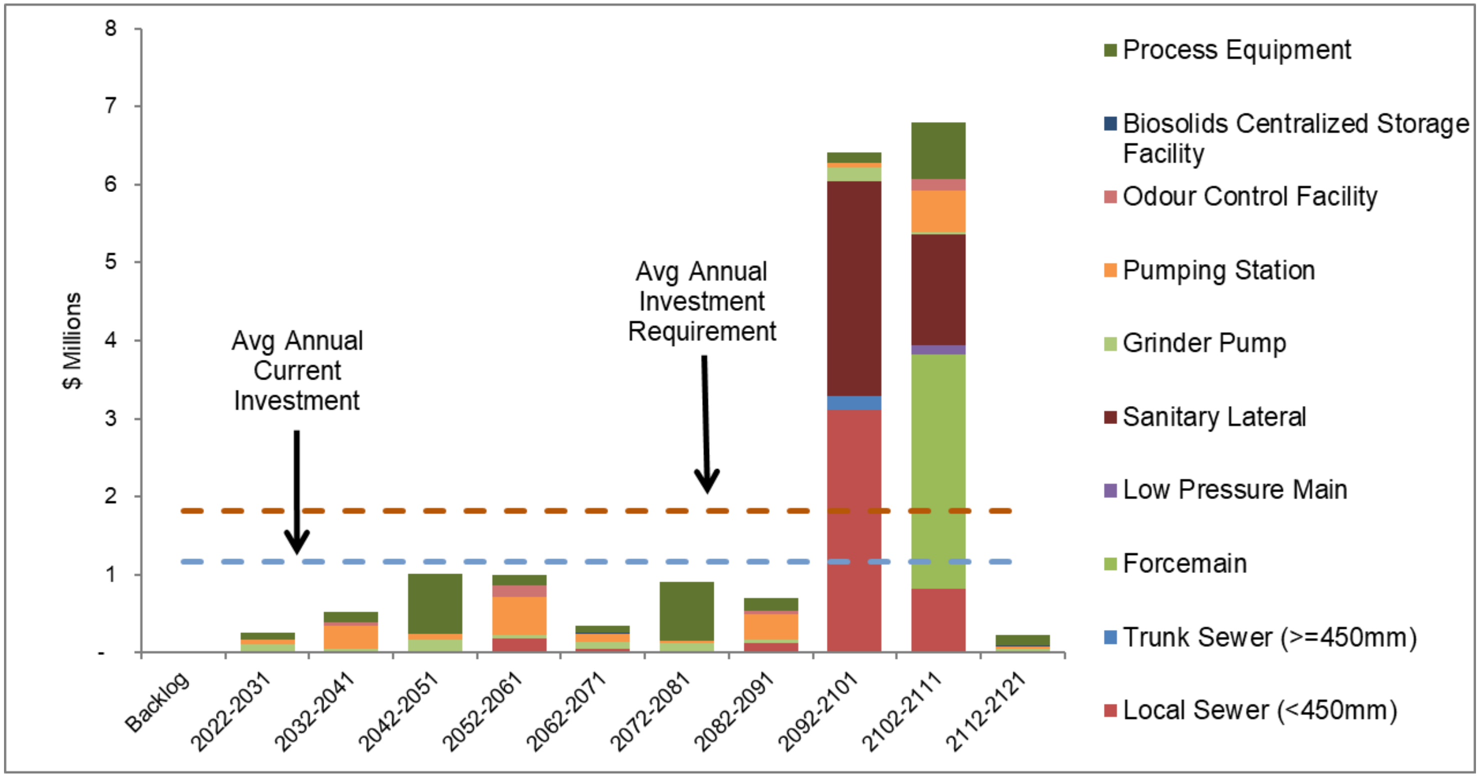
Figure 5.3.1 Sources of Capital Revenues 2019-2031 (millions)



5.4 Capital Investment

Based on the asset management lifecycle strategies identified, the financial requirements over the next 100-years are determined in current dollars. The average annual investment requirement represents the amount of capital funding required to renew and maintain the existing assets on an annual basis so services can continue to be delivered. These estimates assume that all work is able to be completed, as indicated, and does not take into account future changes due to environmental factors, new maintenance techniques, and unidentified growth. The annual requirement has increased from the 2017 AMP, primarily due to significant development and improvements the County has made to the vertical data, resulting in asset useful lives that are more reflective of their actual lifecycle. Further work is ongoing with the vertical data to fully determine lifecycle needs (including maintenance and rehabilitation strategies) which will impact the annual requirement for vertical assets. The data will continue to be reviewed with each budget and business plan cycle.

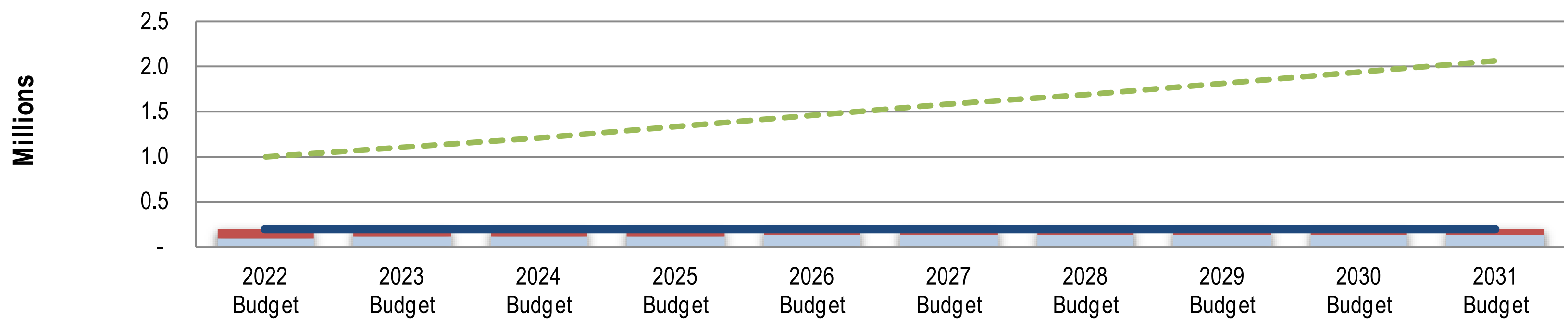
Figure 5.4.1 Average Annual Capital Requirements



The following figure links the annual capital funding needs to the capital investments contained in the budget. The timing of the actual capital projects may vary, however annual investments in capital assets is important for financial sustainability.

Figure 5.4.2 Funding Requirements

	Key	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Annual Required Investment		**182,000**	**182,000**	**182,000**	**182,000**	**182,000**	**182,000**	**182,000**	**182,000**	**182,000**	**182,000**
Current Investment		96,228	104,364	111,075	116,771	121,850	121,859	122,834	123,816	124,807	125,805
Funding Deficit		*85,772*	*77,636*	*70,925*	*65,229*	*60,150*	*60,141*	*59,166*	*58,184*	*57,193*	*56,195*
Funding Surplus		-	-	-	-	-	-	-	-	-	-
Reserve Balance		1,001,789	1,105,887	1,214,746	1,331,517	1,453,367	1,575,226	1,698,060	1,821,876	1,946,683	2,072,488



5.5 Funding Gap Analysis

Using the anticipated 10-year asset lifecycle needs, along with the current capital investment level, the County is able to determine if there is an anticipated funding gap for the Innerkip wastewater system. Consideration is then given to the current system reserve balance to determine the residual funding gap. The County would then investigate opportunities for reducing this residual funding gap which, may include increases to the user rates, utilization of grant funding opportunities and further review of lifecycle strategies and proposed levels of service.

Figure 5.5.1 illustrates the anticipated asset management 10-year lifecycle needs, including the projected funding surplus (left side of figure 5.5.1) and funding needs (right side of figure 5.5.1) for the Innerkip wastewater system. The system calculates the optimal expenditures based on theoretical asset lifecycle needs. These needs have not yet been reviewed in depth with County operations staff, and incorporated into the 10-year capital budget. This is anticipated to be completed as part of the 2023 Business Plan and Budget process with subsequent review annually.

The anticipated expenditures have been increased for non-infrastructure solution projects; approximately $10 thousand.

While the anticipated expenditure calculation accounts for the lifecycle activities of expansion / growth projects it does not account for the initial investment. It is important to adjust for these projects, where the initial investment is growth related and not projected to be DC funded within the 10-year capital plan. The resulting amount added to the anticipated 10-year needs is approximately $30 thousand.

The Innerkip wastewater system is projecting a funding surplus over the 10-year capital planning period. Although the Innerkip wastewater system has a projected funding surplus over the 10-year horizon, the annual funding requirement is the basis for ensuring the long-term financial sustainability well into the future. The annual funding requirement will be reviewed holistically as part of the next rate study.

Drawing the reserve balance to zero would likely result in increased user fee requirements in the subsequent 10-year period in order to fund the anticipated asset lifecycle needs.

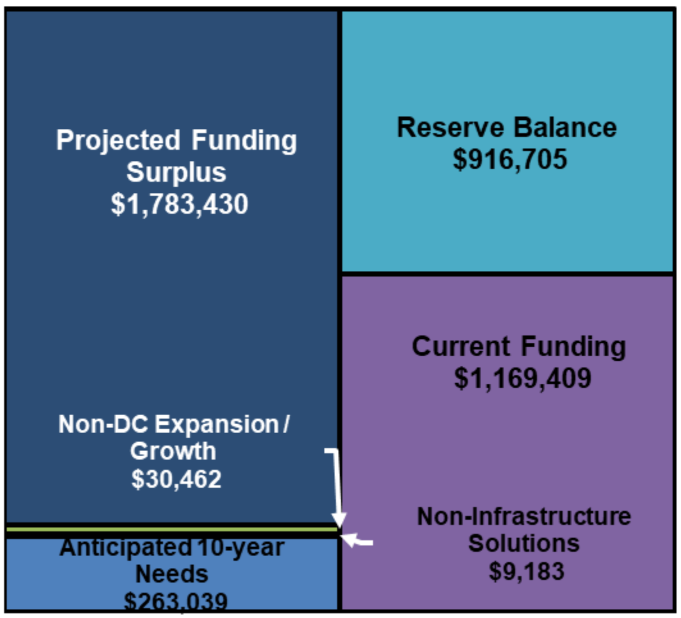
The reserve is also utilized to fund emergency or unplanned expenses. A minimal or fully committed balance would limit the ability to fund these types of expenses. Consideration needs to be given to a minimum balance the County should maintain based on these risks. Analysis of the reserve target minimum balance, will be completed as part of the annual reserve review process.

When the Innerkip system was constructed, approximately $2.0 million[6] in costs were assigned to future development. As of December 31, 2021 approximately $0.68 million remains unfunded. Consideration should be given to funding this remaining balance through debenture funding, or using a portion of the funding surplus to help reduce this balance. Ongoing contributions from development would then offset debt payments or replenish the reserve.

[6] By-Law No. 5360-2012

Failure to address the long-term asset lifecycle needs could result in significant increases to rates in the future as assets reach end of life; or reductions in localized and/or regional service. This may include blockages, sewer backups, basement flooding, localized service outages, increased maintenance costs on assets past their optimal life, poor quality effluent, damage to the natural environment, fines, increase in insurance claims for property damage and personal injury resulting from poor asset conditions, etc.

Figure 5.5.1 Anticipated Needs (10-Year)



6.0 Climate Change

As part of the asset management planning process, the County will consider the risks and vulnerabilities of capital assets to climate change and the resulting actions that may be required. Commitment will be made to the development of tailored actions that make the best use of our resources to mitigate and adapt to climate change, in accordance with our local reduction targets, financial capacity and stakeholder support.

Climate change risks are considered during the planning phase of each capital project. Increasing resiliency to changing climate conditions through the use of backup power generation, redundancies with critical equipment, use of SCADA to collect accurate information and make informed decisions. By conducting inspections and completing studies, problem areas can be identified and planned to repair.

- use of backup power generation,
- redundancies with critical equipment,
- use of SCADA to collect accurate information and make informed decisions, and
- conducting inspections (including CCTV) and studies to identify problem areas and complete repairs.

Water system

Growing stronger together

WATER SYSTEM

Woodstock

Table of Contents

1.0 Introduction

The County maintains a diverse portfolio of assets necessary to produce and supply safe and clean drinking water. The county maintains a drinking water Quality Management System that demonstrates continued compliance with drinking water regulations and the County's commitment to continual improvement in the provision of a safe, reliable and sustainable supply of drinking water for its residents and businesses.

The Woodstock Drinking Water System is a Large Municipal Water system as defined by Ontario Regulation (O.Reg.) 170/03 that supplies the City of Woodstock and Village of Sweaburg with safe drinking water.

The Woodstock water system consists of four water treatment plants (WTP), each housing high lift pumps, monitoring equipment and treatment equipment for the production wells. Each WTP also includes varying types of disinfection and filtration treatment specific for each location.

The water distribution network transports potable drinking water to homes and businesses. The distribution network consists of watermains, services, hydrants, valves, meters, pressure boosting stations, reservoirs, and water towers.

Sound management of our water systems helps us realize our vision of being a vibrant community, working well and growing stronger together!

Like many of our assets, water assets are facing increased challenges as a result of aging assets, climate change, increasing demand due to growth in our communities and regulatory changes. Our investment in these assets must therefore be balanced to optimize investment for renewal with the growing needs of our community.

This plan provides information regarding our approach to the management of our water assets over the short (10-year) and long (100-year) term, demonstrating our commitment to assessing and meeting the levels of service valued by our residents and businesses.

1.1 Improvement Plan

The County recognizes that asset management is a continuously evolving process. The following recommendations are based on the review of current management practices, inventory, valuation and condition analysis.

- Document lifecycle history on assets within the asset management systems.
- Continue to work with the City of Woodstock to reduce asset data gaps.
- Refine asset components and maintenance strategies for facilities and associated processes.
- Refine the risk assessment approach at the component level, including the incorporation of watermain break data.
- Incorporate findings from the Water and Wastewater Master Plan.

2.0 State of Assets

2.1 Inventory

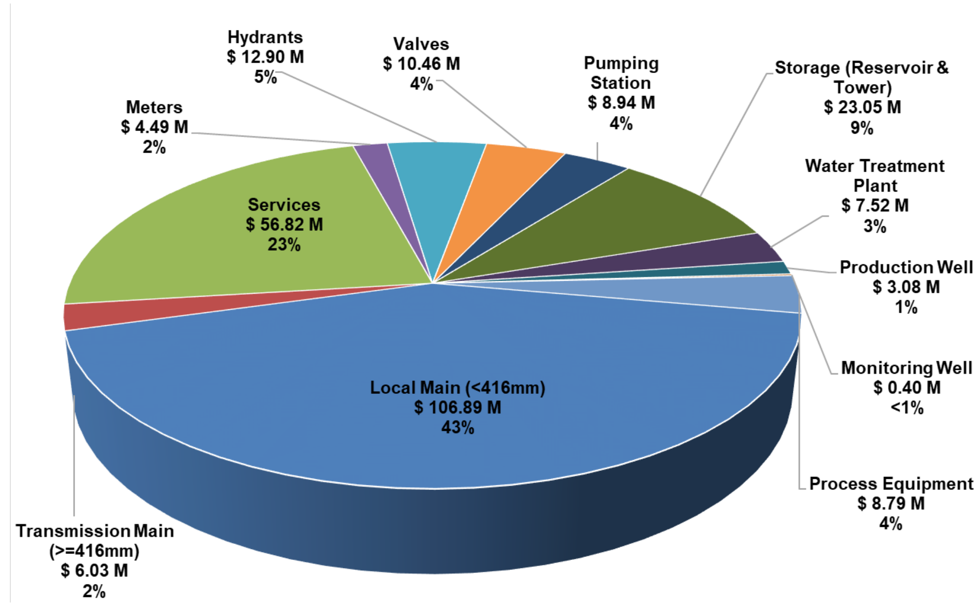
Water assets are those that contribute to community wellbeing by providing safe, potable drinking water in the interest of protecting public health and the quantity and pressure of water needed for fire protection. It includes everything from the watermains that service our homes and businesses throughout the City, the hydrants which provide water for fire services, to the wells and treatment plants which ensure that our water is safe and available.

We have two different asset classes within the water portfolio in order to effectively treat and distribute water to our community:

- Linear, which represent the distribution pipe network, including the valves, hydrants, connectors and related parts required in such a network.
- Vertical, which represent facilities (including the multiple buildings and structures that the facilities are comprised of), and related process systems and equipment required to perform the needed functions.

Table 2.1.2 displays our current water inventory and the associated replacement costs and average age for each asset component. The County continues to make improvements to increase the integrity of our water data. The inventory figures below capture inventory within newly constructed subdivisions which the County is aware of and anticipates assuming ownership of. The County generally assumes ownership of these assets approximately two years after full operation. It is important to include this new growth infrastructure to ensure that lifecycle activities are planned and funded accordingly.

Figure 2.1.1 Inventory Valuation



2.2 Valuation

The replacement cost valuation for water linear is based on current tender prices, where available. Current tender prices are adjusted where County staff feel some cost increases are only temporary due to COVID.

The replacement cost valuation for water vertical is based on the latest information available, which includes current replacement costs, insurance valuations, and valuations from studies / assessments completed in prior years.

Table 2.1.2 – Woodstock Water System Inventory

Asset Type	Asset Component		2017 Inventory	Current Inventory	Replacement Cost	Average Age
Linear	Local Main (<416mm)	m	254,810	286,048	$106,885,439	37 Years
	Transmission Main (>=416mm)	m	10,401	10,311	6,031,109	39 Years
	Services	each	15,961	16,233	56,815,500	30 Years
	Meters	each	14,614	16,339	4,493,225	11 Years
	Hydrants	each	1,509	1,358	12,901,000	26 Years
	Valves	each	2,609	2,692	10,460,500	24 Years
Vertical	Pumping Station	each	10	10	8,942,590	18 Years
	Well – Pumphouse	each	-	-	-	-
	Storage (Reservoir & Tower)	each	9	8	23,050,800	29 Years
	Water Treatment Plant	each	4	4	7,520,822	25 Years
	Production Well	each	10	11	3,080,000	57 Years
	Monitoring Well	each	N/A	12	400,000	48 Years
	Other Facilities	each	-	-	-	-
	Process Equipment	total	N/A	N/A	8,785,121	22 Years
Total Replacement Cost					**$249,366,106**	

There are several growth / expansion projects planned in Woodstock that are included in the County's 2022 approved Long-Term Capital Plan. This includes 2 new booster stations (approximately $2.2 million including related process equipment) and linear expansion of both local and transmission mains (approximately $4.5 million). These growth projects are not included in the figures within table 2.1.2, however their anticipated lifecycle needs are included within this AMP.

2.3 Condition Assessment Approach

The assessment approach for our water assets utilizes a combination of physical assessments, asset attributes, such as material and sizing, as well as established anticipated useful lives.

The County's condition scale and visual inspection ratings are based on the following approach:

- Excellent - Asset is well maintained with no noticeable defects.
- Good - Asset may show signs of minor deterioration and may require some maintenance.
- Fair - Deterioration evident, function affected. Asset may require on-going monitoring.
- Poor - Serious deterioration, function inadequate. Asset may require ongoing monitoring.
- Critical - No longer functional, general or complete failure. Asset may require extensive monitoring.

Watermains are difficult to inspect due to the high pressure of water constantly flowing through them. Completing physical inspections would require disruptions to service, are time consuming and costly. The County will perform physical inspections on an as needed bases for large, critical pipes. There are also a number of new high tech, non-intrusive inspection techniques that the County continues to investigate.

Watermain breaks are helpful indicators of the condition of the pipe segment, as they can be used to predict pipe failure. The County tracks watermain breaks, and assigns them to their corresponding pipe segment, which assists in determining risk.

Water process assets are inspected by County staff on a regular basis as part the County's preventative maintenance program. These inspections identify performance and accelerated degradation and will trigger the creation of a reactive work order for repairs and rehabilitation. The County is working towards incorporating these inspections into a formalized condition rating. A visual inspection rating was provided for most water process assets as part of the data collection process in 2018 and 2019.

Given the complexities and accessibility of some assets, it is not beneficial to complete a visual or performance based condition assessment on all assets. For assets which are unable to be visually inspected or that have since been replaced, an age-based condition rating is being used based on anticipated useful lives.

2.4 Condition Assessment

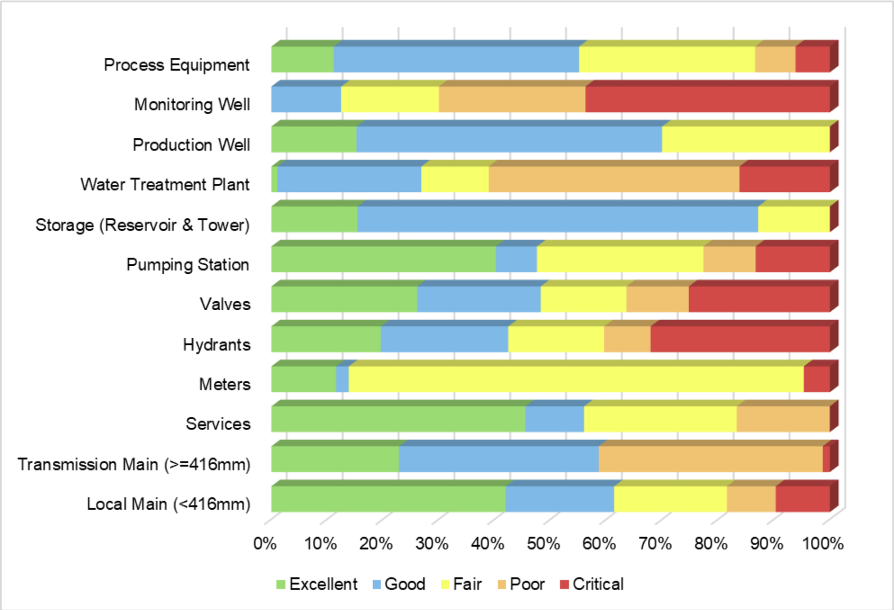
The condition profile of our Woodstock water asset components is shown in figure 2.4.1. The % in each condition is based on replacement costs.

For the Woodstock water assets: 19.6% of these assets are in poor or critical condition, and 58.4% in good or excellent condition in comparison to 6-9% and 67-74% respectively for Canadian municipalities reported on the Canadian Infrastructure Report Card[1]. While this may appear that our Woodstock water assets are in worse shape than other Canadian municipalities, the 2019

[1] http://canadianinfrastructure.ca/en/index.html

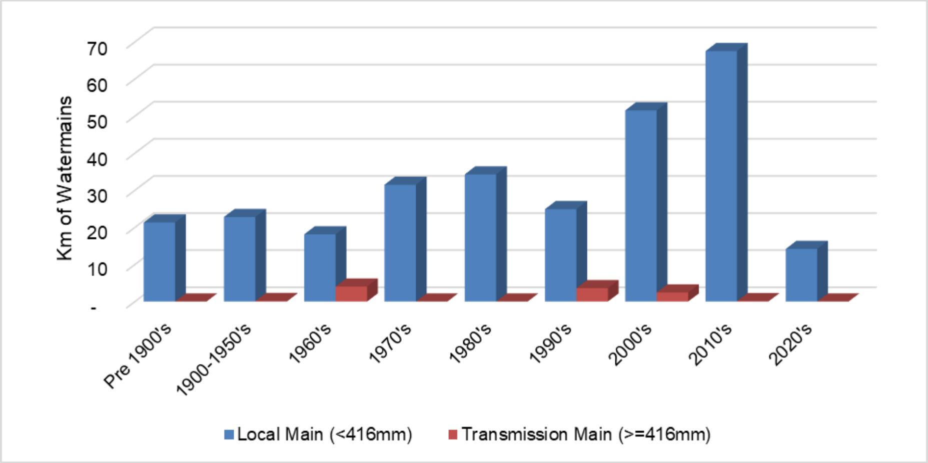
Canadian Infrastructure Report Card is an aggregate of self reported condition ratings across the Country and are based on a general rating scale which may not match the County's.

Figure 2.4.1 Asset Condition by Component



To better understand our Woodstock water distribution assets, an age profile of all our watermains by decade is shown in figure 2.4.2.

Figure 2.4.2 Watermains by Age



The average age of the majority of linear assets within the Woodstock water system is approximately 37 years, whereas the average age of the vertical assets varies by facility type from 6 to 57 years. This value must be considered in the context of the different asset types in the category, compared to the typical anticipated useful life of each asset type.

Table 2.4.3 outlines the anticipated useful life for each new build/replacement. The anticipated useful lives for our water assets exclude the management strategies that the County utilizes to extend the overall life of our water assets.

Table 2.4.3 Useful Life

Water System Component	Anticipated Useful Life (years)
Local Main, Transmission Main, Services	90
Water Meter and Radio Transmitter	20
Hydrants, Main Line Valves	40
Facilities	10 - 50
Process Equipment	8 - 75

Figure 2.4.4 illustrates the current average age of the Woodstock water system linear components in comparison to their anticipated useful life, based on a run to failure strategy.

As the vertical assets can have a significant variability in age, from both a facility and process standpoint, they are not represented within figure 2.4.4.

There are a number of management strategies that the County may utilize to extend the overall life of our water assets. These strategies allow us to align the needs with those of other assets, resulting in the best overall value for our residents.

Figure 2.4.4 Age and Useful Life Comparison

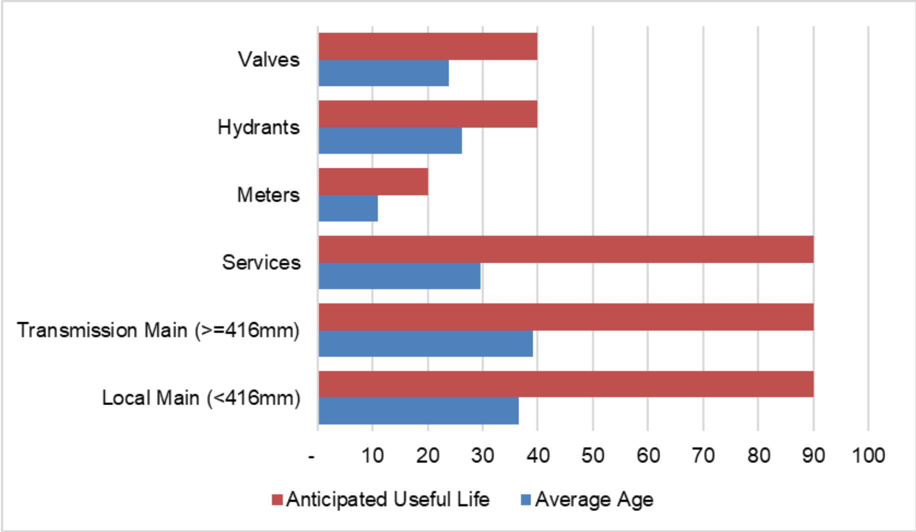


Table 2.4.5 compares the status of our Woodstock water asset components, as identified in our 2017 Asset Management Plan to their current condition. The breakdown by component for vertical infrastructure was not available as of the date the 2017 report was published, so there is no condition comparison available. Work continues to be ongoing to further enhance the asset information at the component level.

The trend shows that the status of water assets for the Woodstock water system is steady to declining. The decline in condition is commiserate with the aging of these assets. As the system continues to age it is expected that condition ratings will continue to decline until targeted lifecycle strategies are implemented.

Table 2.4.5 Water Systems Condition Assessment

Asset Type	Asset Component	2017 Condition Rating	Current Condition Rating	Trend
Linear	Local Main (<416mm)	Good	Good	→
	Transmission Main (>=416mm)	Good	Fair	↓
	Services	Fair	Good	↑
	Meters	Good	Fair	↓
	Hydrants	Fair	Fair	→
	Valves	Fair	Fair	→
Vertical	Pumping Station	Not assessed	Fair	-
	Well – Pumphouse	-	-	-
	Storage (Reservoir & Tower)	Not assessed	Good	-
	Water Treatment Plant	Not assessed	Poor	-
	Production Well	Not assessed	Good	-
	Monitoring Well	Not assessed	Poor	-
	Other Facilities	-	-	-
	Process Equipment	Not assessed	Fair	-

3.0 Levels of Service

County staff have developed a comprehensive Level of Service (LOS) Framework. This framework will help to establish a relationship between the current LOS being provided by the County's assets, and the associated operating and capital expenditures required to achieve the proposed LOS. The framework puts into perspective the definition and measurement of service performance in alignment with the County's corporate mission and vision.

Corporate Objective

The County is committed to providing the appropriate quantity of water and quality water as it directly impacts the quality of life of customers by reducing the potential for water-borne disease, allowing for economic development and fire protection, and providing opportunities for recreational activities.

Legislative Requirements

The purpose of the *Safe Drinking Water Act, 2002*[2] is to recognize that the people of Ontario are entitled to expect their drinking water to be safe and to provide for the protection of human health and the prevention of drinking water health hazards through the control and regulation of drinking water systems and drinking water testing.

Ontario Regulation 170/03[3] provides specifications and reporting requirements regarding drinking water systems. Ontario Regulation 169/03[4] specifies the Ontario Drinking Water Quality Standards.

The DWQMS[5] requires an operating authority to document a quality management system for each municipal, year-round, residential drinking water system that it operates in an operational plan which must be accepted by the Ministry of the Environment and Climate Change.

Framework

The structure of the County's LOS framework was developed to align with international best practices including the International Infrastructure Management Manual (IPWEA, 2015). The framework includes the mandatory measures to meet the requirements of Ontario Regulation (O.Reg.) 588/17 by including both Community and Technical Levels of Service. The metrics in this framework may be expanded upon as the County continues to improve its data collection and reporting processes.

[2] https://www.ontario.ca/laws/statute/02s32
[3] https://www.ontario.ca/laws/regulation/030170#BK26
[4] https://www.ontario.ca/laws/regulation/030169
[5] https://www.ontario.ca/page/ontarios-drinking-water-quality-management-standard-pocket-guide

3.1 Customer Levels of Service

Community or Customer Levels of Service are statements that describe quantifiable metrics of the service delivery outcomes from the perspective of the customer, expressed in non-technical terms. The following statements form our qualitative descriptions of the customer level metrics required under O.Reg. 588/17.

The Woodstock water system connects to most residential, commercial and industrial spaces in the settlement areas of Woodstock, as outlined in figure 3.3.1. The Woodstock water system provides for the safe treatment and distribution of water.

Fire flow protection is determined when a system is designed based on discussions with area municipalities. The minimum pipe size to allow for fire flow protection is 150mm, as such it is very difficult to implement fire flow after a system has been constructed. The Woodstock water system was designed to accommodate the needs for fire flow protection.

Boil Water Advisories (BWA) are issued by the Medical Officer of Health to advise residents when bacteria or other microorganisms may be present in the municipal drinking water supply, making it unsafe to drink. During a BWA, residents are advised to boil their water before using it for drinking, washing or preparing food, and brushing teeth. Drinking Water Advisories (DWA) are issued by the Medical Officer of Health to advise residents to use an alternate water source, such as bottled water. A DWA would be issued during situations when boiling the water will not get rid of the problem, such as a chemical contamination.

Service interruptions are any event including emergency situations or planned and unplanned maintenance which may prevent residents from using their municipal drinking water supply. This includes; loss of power, contamination, transmission line or major watermain breaks or interruptions in service pressure

The County is constantly monitoring water quality and service to ensure minimal disruptions and compliance with the Ontario Drinking Water Quality Management Standard (DWQMS). In the event of a water quality issue or service disruption, a notice is issued to the affected area to ensure all users are aware and can take appropriate precautions.

The County has an objective to minimize water loss by detecting leakages and repairing them promptly.

Table 3.1.1 outlines additional customer focused performance metrics from the County's LOS framework.

3.2 Technical Levels of Service

Technical Levels of Service metrics are quantifiable metrics applied against assets that are subject-matter specific inputs or outputs supported by the day-to-day activities of County staff. Table 3.1.1 includes the technical metrics required under O.Reg. 588/17, as well as, additional metrics the County has included in the framework.

3.3 Levels of Service Maps

As a further illustrative example of our community levels of service, a map is included as figure 3.3.1 showing areas within the City of Woodstock boundary that are serviced by the Woodstock water system.

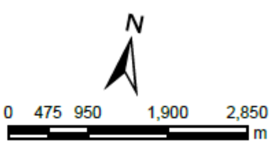
Figure 3.3.1 Woodstock water serviced properties

Woodstock

Properties with fronting water

- Properties with fronting water
- Properties without fronting water
- Municipal Boundary
- Village Boundary
- Railway
- Waterbody

Total # of parcels:	15,719
Without fronting water:	281
With fronting water:	15,438
Coverage:	98%



Parcels with fronting water identified as being a distance of 30m from water mains.

OxfordCounty
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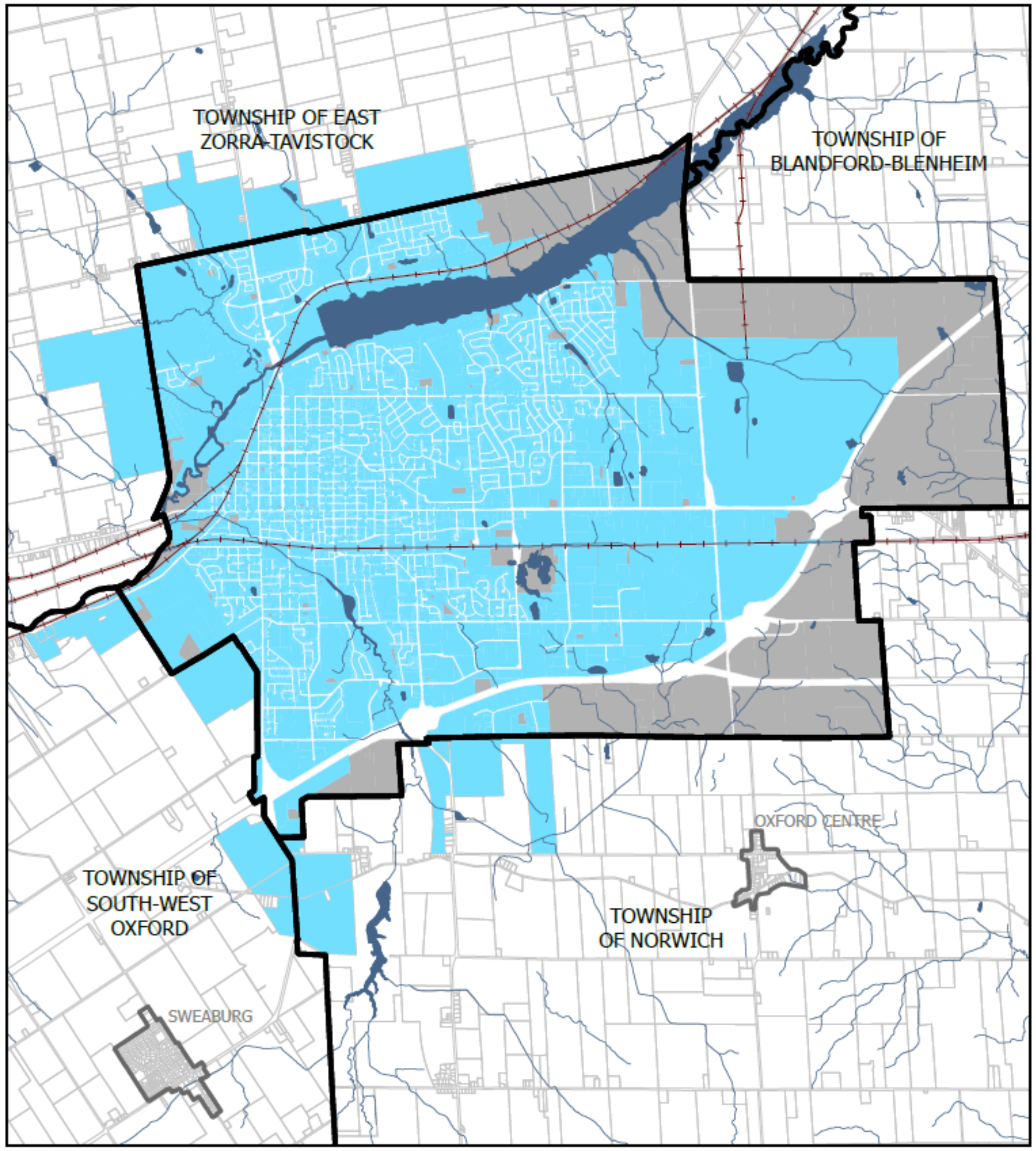


Table 3.1.1 Performance Measures

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Customer / Council Focused Performance Measures					
Safety	Providing efficient and safe drinking water and supports fire protection	% of properties within the system boundary connected to the municipal water system	N/A	98%	TBD
		% of properties where fire flow is available	100%	100%	TBD
Environmental Stewardship	Providing a water service that is environmentally conscious	# of days of restrictions per system	0	0	TBD
Cost Efficient	Providing water services in an efficient manner	Operating cost to provide service ($/connection)	$279	$292	TBD
Technical Focused Performance Measures					
Safety	Providing efficient and safe drinking water and supports fire protection	% of active hydrants flushed annually	100%	100%	TBD
		% of bacteriological samples compliant with all applicable water quality regulations	100%	99.9%	TBD
		% of active hydrants with a low flow rating	unknown	unknown	TBD
Reliability	Providing water services with minimal interruptions	# of Watermain breaks per 100 km's of watermain	4.76	TBD	TBD
		The number of connection-days per year where a boil water advisory notice is in place compared to the total number of properties connected to the municipal water system	0 connection-days compared to 15,469 connections	0 connection-days compared to 15,945 connections	TBD
		The number of connection-days per year due to watermain breaks compared to the total number of properties connected to the municipal water system	unknown	unknown	TBD

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
		% of Critical Main Line Valves Turned	100%	51%	100%
		% of Non-Critical Main Line Valves Turned	100%	42%	25%
Cost Efficient	Providing water services in an efficient manner	The operating costs per kilometer of water distribution pipe (distribution)	N/A	$10,394	TBD
		5 year Average capital expenditure for water treatment	$0.04M	$0.04M	TBD
		5 year Average capital expenditure for water distribution	$2.6M	$3.2M	TBD

4.0 Asset Management Strategy

4.1 Lifecycle Activities and Planned Actions

Distribution assets undergo regular maintenance and inspection. As part of capital works project analysis, determinations of whether water pipe replacement or relining should occur is reviewed. This process is fully integrated with the renewal needs of the roadways and other underground infrastructure, such as wastewater and stormwater. This integrated approach ensures our renewal projects for these service areas are delivered with optimal timing to increase value and minimize disruption to our communities. For example, if a roadway is targeted for renewal, coordination between service areas and area municipalities will determine whether the underlying stormwater, drinking water or wastewater infrastructure is also of an age or condition that requires renewal, to ensure these projects are delivered together to reduce disruption for our communities and deliver enhanced value.

Process assets and equipment undergo extensive operations and maintenance regimes to sustain their reliable operation. Investment needs are identified and coordinated with normal operations to minimize disruptions to service. Major replacements are planned and accommodated using system redundancy and changes to operations, in order to maintain service. It is critical to maintain water service in order to protect public health.

There are six main lifecycle activities considered in the overall sustainable management of water assets, described in table 4.1.1.

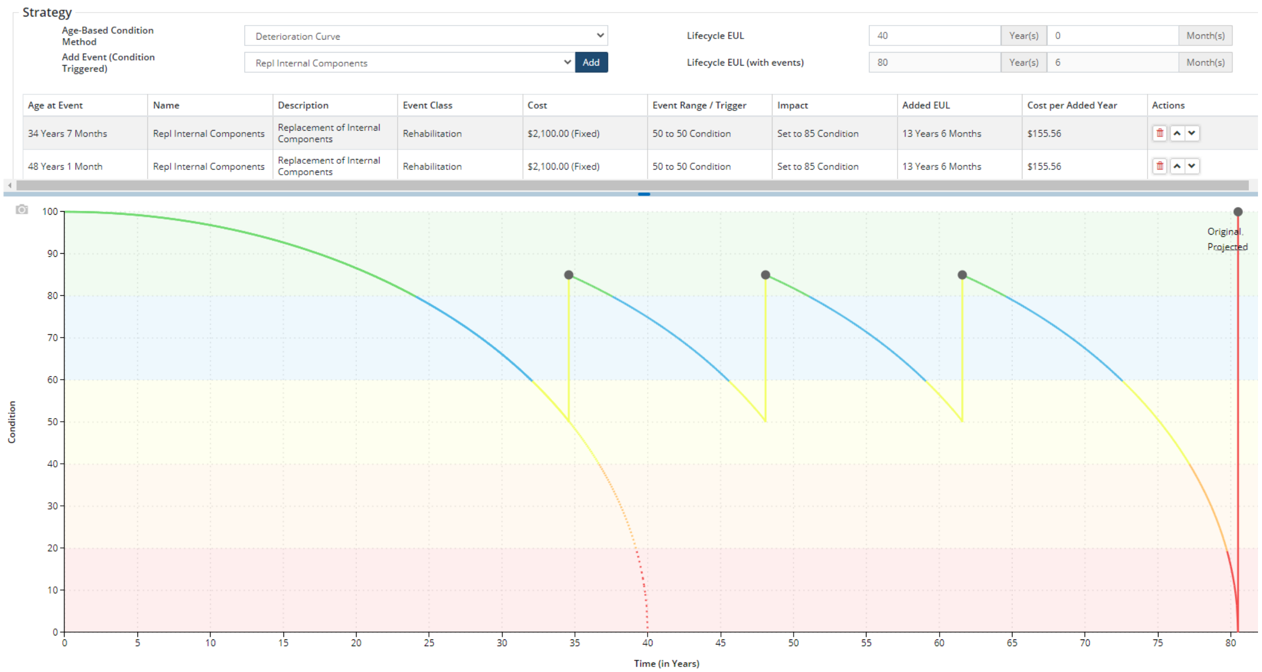
Table 4.1.1 Lifecycle Activities

Strategy	Lifecycle Activity
Non-Infrastructure Solutions	Actions or policies that can lower costs or extend useful lives. **Trigger: Ongoing**
Maintenance	Regularly scheduled maintenance and inspection programs including cleaning and flushing, hydrant flushing, pressure testing, visual inspections, lubricating and minor repairs. These activities do not improve the overall condition of the asset, nor increase its useful life. **Trigger: Ongoing**
Rehabilitation / Renewal	One-time events that increase the condition and extend the useful life of the asset; including watermain lining. **Trigger: Fair/Poor**
Replacement	Occurs at the end of the useful life and/or when rehabilitation is no longer an option – can vary among assets due to construction material and environmental factors that impact the degree of deterioration and performance. **Trigger: Poor/Critical**
Disposal	Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the County to provide services. County staff coordinate with contractors to ensure safe removal and environmental compliance when disposing of assets. **Trigger: Poor/Critical**
Expansion / Growth	Planned activities required to extend services to previously unserved areas, expand services to meet growth demands, or increase the level of service being provided. **Trigger: Development**

The lifecycle management strategy is the set of planned actions that should enable the assets to provide users with the proposed level of service in a sustainable way, while achieving acceptable levels of risk and the lowest lifecycle costs required to provide that level of service. Lifecycle considerations for assets include analysis of the timing to carry out key asset management activities including inspection, maintenance, repair, and replacement. Ongoing preventative maintenance activities are outlined in the County's work management system. The rehabilitation and replacement activities impacting the asset components condition and useful life are contained within profiles in the County's asset management system. For some assets, replacement needs are based on a run to failure strategy, as this is the most economical. Work is ongoing within the County's systems to build all the component profiles and identify where each asset is within the lifecycle.

As an example, figure 4.1.2 illustrates the lifecycle strategy of hydrants. The internal components of a hydrant can be replaced multiple times, extending the overall useful life from 40 years to approximately 80. The annual cost requirement from a run to failure strategy is $234 per year where the annual cost requirement using the rehabilitation strategies decreases to $196 per year.

Figure 4.1.2 Hydrants Lifecycle Strategy

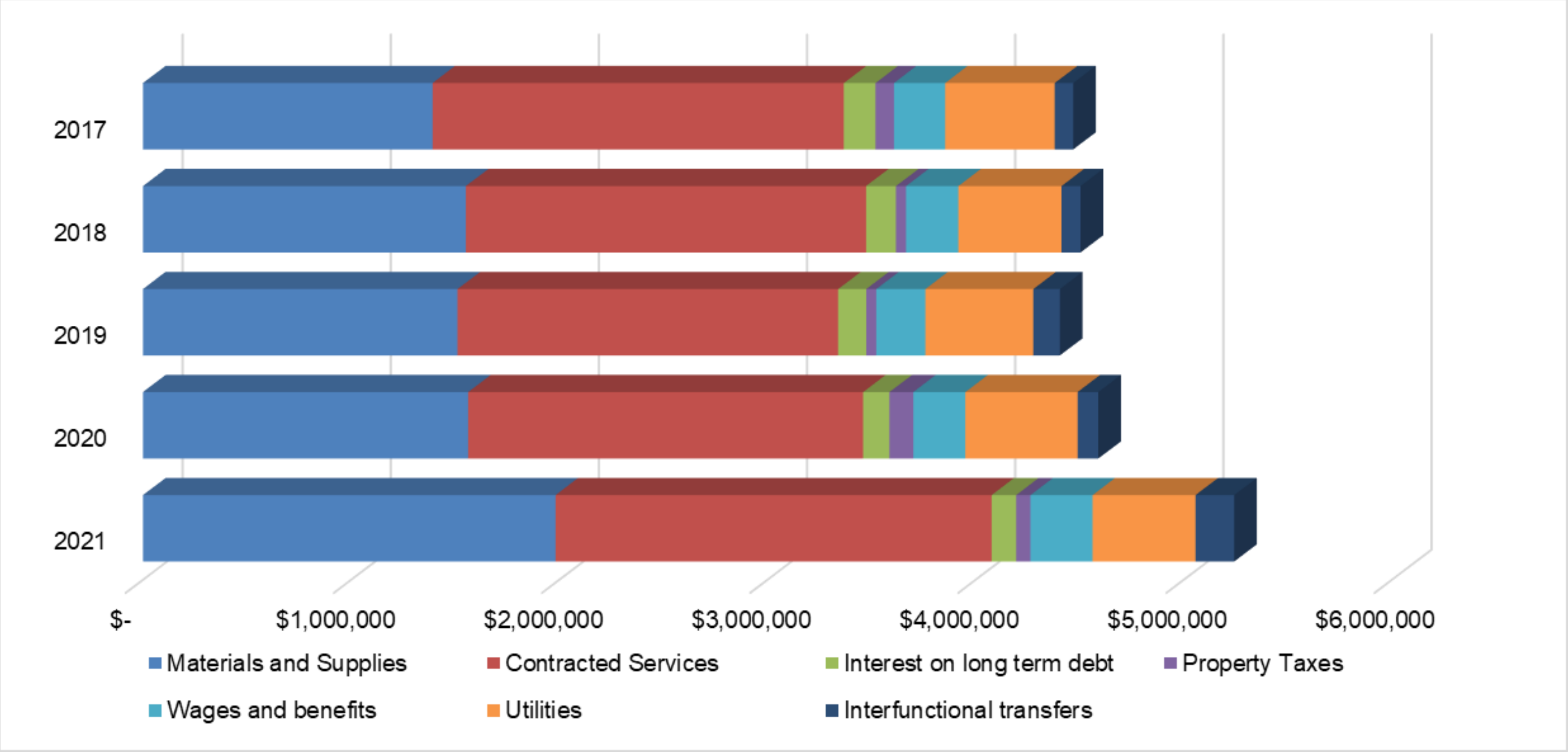


4.2 Significant Operating Expenses

Significant operating expenses are required in order to sustain an asset over its lifecycle. The County is always looking at ways to optimize our operating investment to ensure we are achieving the best value for our residents. Essential to this is a strong operations and maintenance plan within our work management system. Operating expenses are incurred through a number of sources – preventative maintenance activities, utility costs, property taxes and more. Despite the fact that minor maintenance is incorporated into planned operations and maintenance programs, there are cases where it is unplanned.

Figure 4.2.1 shows the operating expenses from 2017 through 2021 for the Woodstock water system grouped by expense type. The groupings align with those reported on the County's Financial Information Return (FIR), with further breakdown for property taxes and utility costs as these expenses can be significant.

Figure 4.2.1 Operating Expenses



4.3 Risk Strategy

Risk management frameworks are developed to assist with the prioritization of investments within the capital planning period. The preferred approach is to implement a triple bottom line analysis approach to evaluate:

- Social impacts of asset failure, including impacts to customers, businesses and the County's reputation;
- Environmental impacts of asset failure; and
- Economic impacts of failure including the cost of remediation.

In the context of asset management, risk is the multiple of the consequence of an asset failing and the probability that the event will occur.

Figure 4.3.1 illustrates the risk ratings for the Woodstock water assets at a summary level. County staff will continue to monitor the higher risk assets, review and/or complete physical inspections to further validate the age-based condition ratings and plan for lifecycle strategies accordingly.

Figure 4.3.1 Asset risk profile

Consequence \ Probability	1	2	3	4	5
5	1 Asset 1.00 unit(s) $2,982,400.00	2 Assets 2.00 unit(s) $13,350,000.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	0 Assets - $0.00	1 Asset 2,439.84 m $1,463,904.00	4 Assets 2,378.06 m, unit(s) $5,245,930.00	1 Asset 2,638.44 unit(s) $1,583,064.00	0 Assets - $0.00
3	11 Assets 7,650.74 m, unit(s) $19,563,870.00	14 Assets 3,412.56 m, unit(s) $11,630,350.00	5 Assets 4,912.52 m, unit(s) $16,373,460.00	13 Assets 3,283.01 unit(s) $13,666,772.00	2 Assets 2.00 unit(s) $1,075,000.00
2	221 Assets 23,023.15 m, unit(s) $13,340,684.00	120 Assets 8,044.15 m, unit(s) $5,067,950.00	146 Assets 13,931.00 m, unit(s) $7,781,516.00	138 Assets 9,109.05 m, unit(s) $5,969,392.00	99 Assets 1,394.68 m, unit(s) $1,889,997.00
1	4,833 Assets 95,225.24 m, unit(s) $48,160,730.00	2,291 Assets 53,284.69 m, unit(s) $27,935,457.00	1,608 Assets 38,500.84 m, unit(s) $19,922,786.00	803 Assets 30,746.77 m, unit(s) $13,663,979.00	1,650 Assets 33,881.32 m, unit(s) $18,698,865.00

5.0 Financial Strategy

5.1 Financing Strategy

Hemson Consulting Ltd. (Hemson) was retained through a competitive process to assist with analyzing and developing the County's water and wastewater rates for a 4-year period from 2021 to 2024. The rate modeling includes all system asset management needs and all sources of funding including Community Servicing Assistance Program (CSAP) funding, development charges, developer and resident contributions. In most cases, the capital replacement component is the average annual required contribution level in order to establish full cost recovery; however, the contribution may vary based on the system's ability to meet full cost recovery for the next 10-years.

Capital work is funded from reserves (based on the capital contribution included in the user rates), development charges (for growth projects) and grant funding when available. The County continually assesses opportunities for additional funding options and revenue streams to address our funding gaps.

Where possible, replacement activities are planned in conjunction with the replacement needs of the road network and underlying wastewater/stormwater infrastructure. This requires a co-ordinated effort with area municipalities as the majority of the County owned water and wastewater linear assets falls under the area municipalities' roads infrastructure. This collaboration is essential for ensuring a cost effective approach to maintaining assets within the County regardless of ownership.

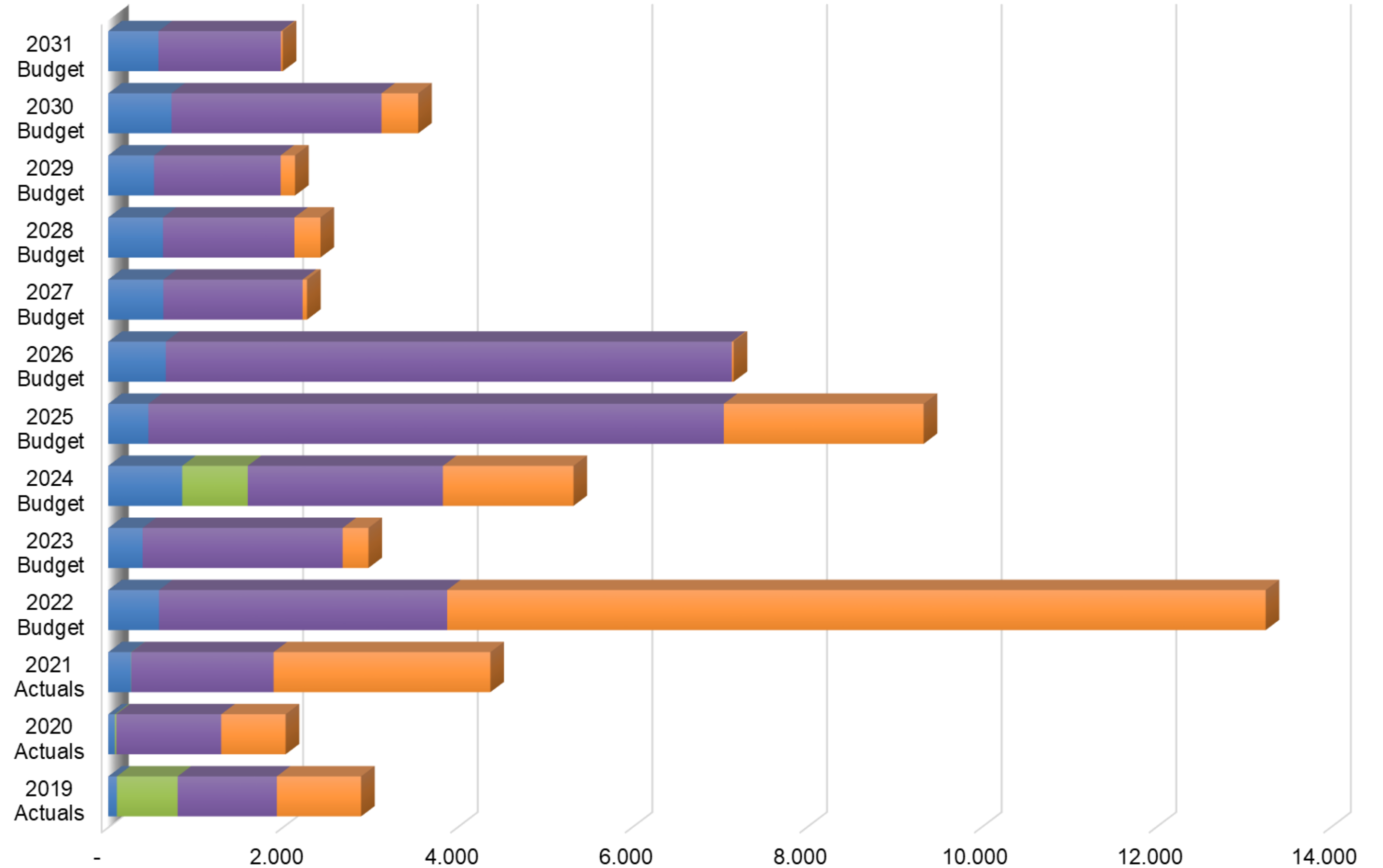
In addition to targeting and prioritizing the investment needed to maintain existing assets, there are also planning processes in place to determine the additional assets needed to meet growing demands through population increases or demand for new services. The projects targeted to meet growth are funded primarily through Development Charges (DC) – the mechanism that enables recovery of growth-related capital expenditures from new development. These charges are governed by the Development Charges Act and are applied in accordance with our Development Charges By-Law. Impacts from the growth activities analyzed in the 2019 DC Background Study are included in this AMP.

5.2 Expenditure History and Forecasts

The Woodstock water system contains significant capital projects within the 10-year approved budget, as illustrated in figure 5.2.1. Linear asset replacements are ongoing, in conjunction with the local area municipal roadway construction projects. Minor process equipment replacements were included in the 2019 to 2025 budgets. County staff continue to review anticipated asset management needs with each budget cycle, subject to existing resource limitations.

Non-Infrastructure solution projects include shared projects for condition reviews, studies and implementation of the work management system.

Figure 5.2.1 Expenditures (millions)

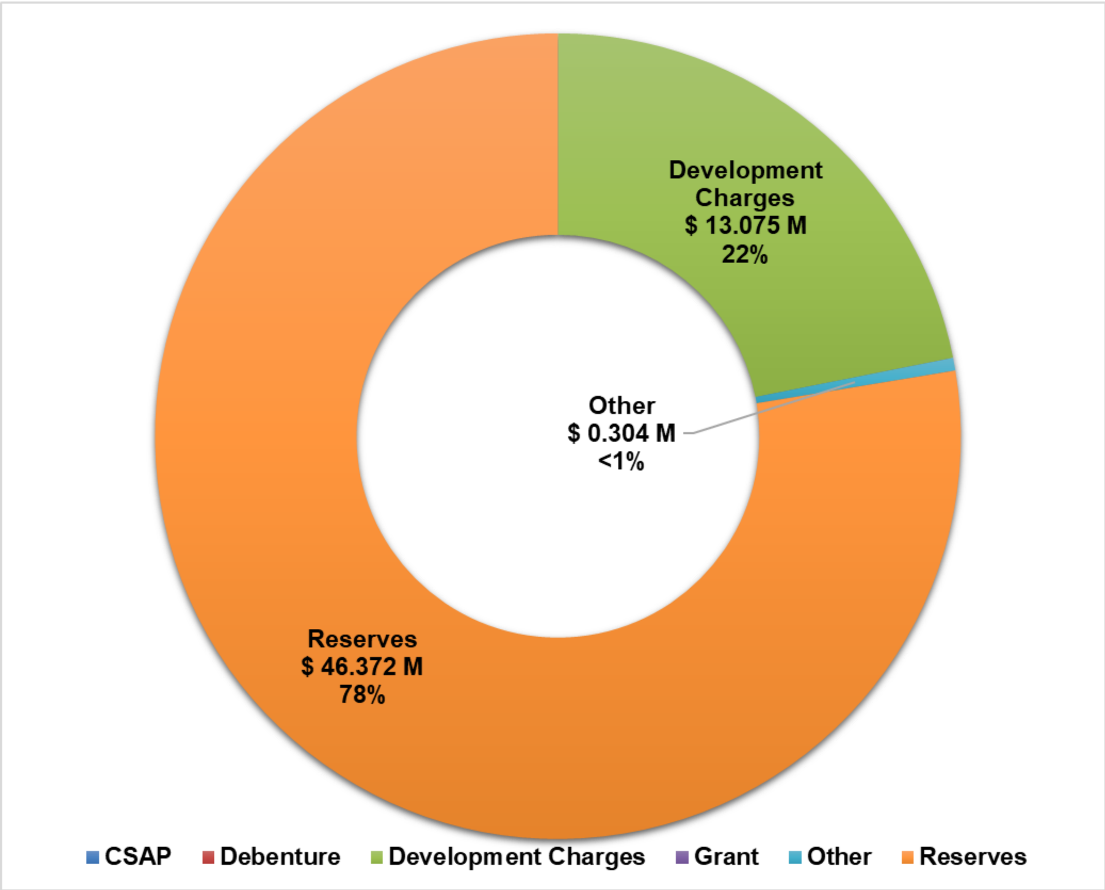


	2019 Actuals	2020 Actuals	2021 Actuals	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Non-Infrastructure Solution	0.098	0.075	0.261	0.581	0.393	0.847	0.460	0.659	0.630	0.625	0.524	0.724	0.575
Maintenance	-	-	-	-	-	-	-	-	-	-	-	-	-
Rehabilitation / Renewal	0.697	0.016	0.003	-	-	0.750	-	-	-	-	-	-	-
Replacement	1.135	1.202	1.629	3.300	2.291	2.236	6.590	6.483	1.595	1.506	1.450	2.405	1.403
Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-
Expansion / Growth	0.965	0.737	2.483	9.374	0.295	1.495	2.289	0.020	0.051	0.299	0.165	0.420	0.020

5.3 Capital Revenues

Replacement projects, along with the expansion projects into industrial areas, identified in the County's 10-year capital plan, are anticipated to be funded by the Water – Woodstock Reserve, which is funded by user fees. The Woodstock expansion projects into industrial areas will be included in the next DC Background Study to determine their eligibility for DC funding. The Water – Woodstock Reserve, including the anticipated capital contributions within the 10-year period, is sufficient to fund the 10-year related asset activities within the approved 2022 Long-Term Capital Plan.

Figure 5.3.1 Sources of Capital Revenues 2019-2031 (millions)



5.4 Capital Investment

Based on the asset management strategies identified, the financial requirements over the next 100-years are determined in current dollars. The average annual investment requirement represents the amount of capital funding required to renew and maintain the existing assets on an annual basis so services can continue to be delivered. These estimates assume that all work is able to be completed, as indicated, and does not take into account future changes due to environmental factors, new maintenance techniques, and unidentified growth. The annual requirement has increased from the 2017 AMP, primarily due to significant development and improvements the County has made to the vertical data, resulting in asset useful lives that are more reflective of their actual lifecycle. Further work is ongoing with the vertical data to fully determine lifecycle needs (including maintenance and rehabilitation strategies) which will impact the annual requirement for vertical assets. The data will continue to be reviewed with each budget and business plan cycle.

Figure 5.4.1 Average Annual Capital Requirements

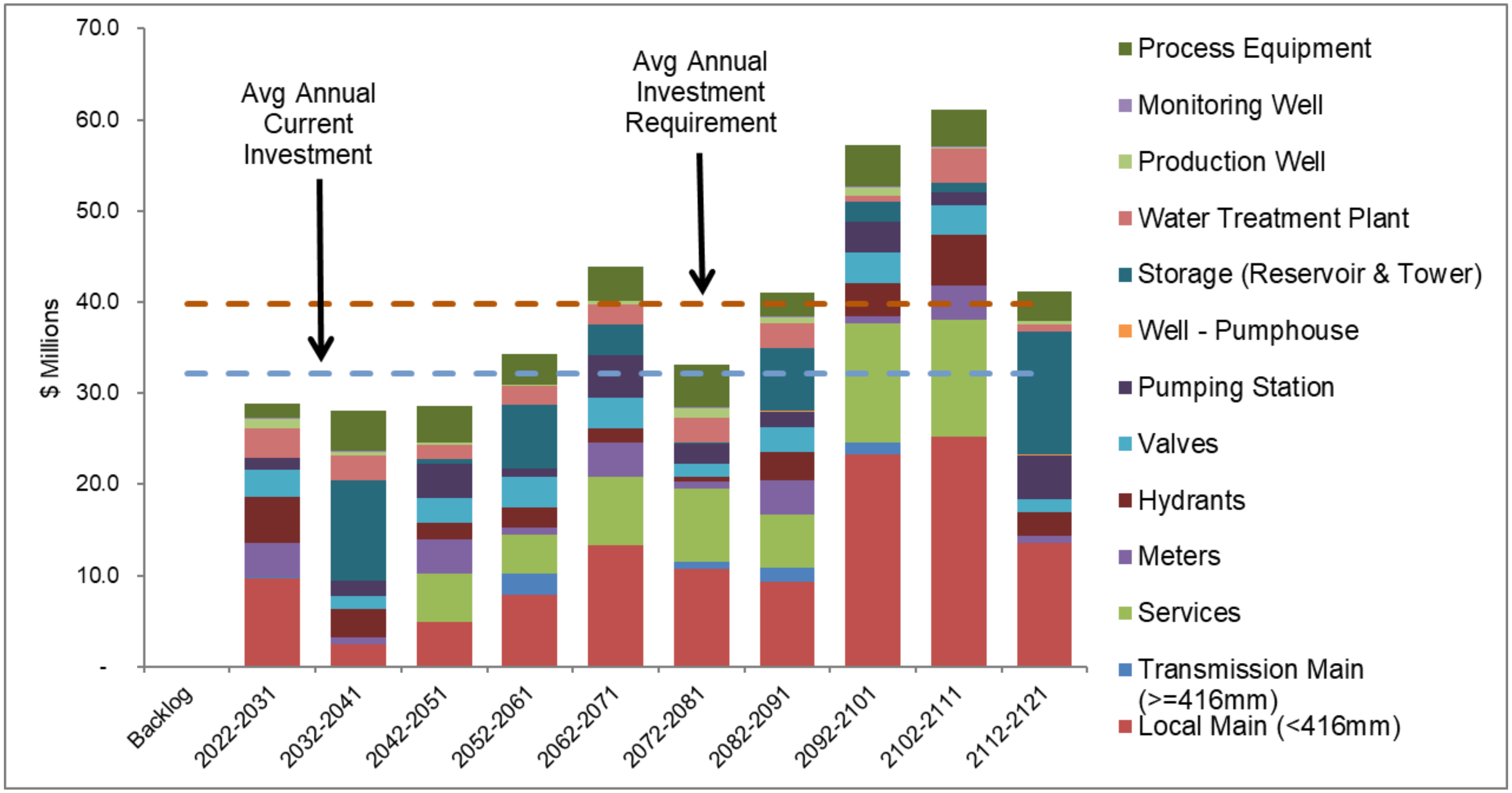
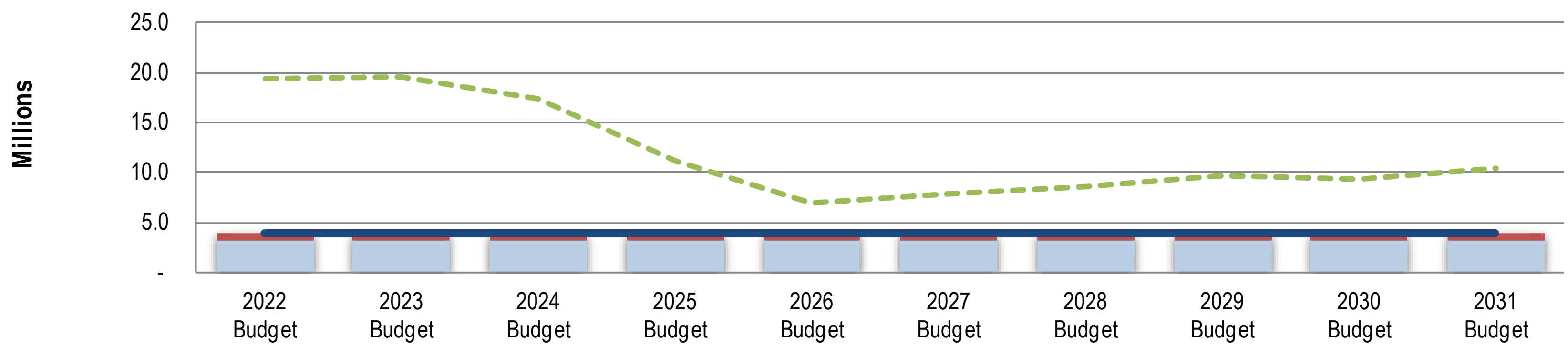


Figure 5.4.2 links the annual capital funding needs to the capital investments contained in the budget. The timing of the actual capital projects may vary, however annual investments in capital assets is important for financial sustainability.

Figure 5.4.2 Funding Requirements

	Key	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Annual Required Investment		**3,975,000**	**3,975,000**	**3,975,000**	**3,975,000**	**3,975,000**	**3,975,000**	**3,975,000**	**3,975,000**	**3,975,000**	**3,975,000**
Current Investment		3,103,882	3,153,679	3,218,127	3,171,410	3,209,422	3,256,774	3,254,811	3,252,920	3,246,768	3,241,236
Funding Deficit		*871,118*	*821,321*	*756,873*	*803,590*	*765,578*	*718,226*	*720,189*	*722,080*	*728,232*	*733,764*
Funding Surplus		-	-	-	-	-	-	-	-	-	-
Reserve Balance		19,456,264	19,599,725	17,437,863	11,102,869	7,012,380	7,902,767	8,629,723	9,620,582	9,237,043	10,383,286



A portion of the current investment is being utilized for debenture payments (approximately 7.8%) and is not available for use on lifecycle activities within the 10-year period.

5.5 Funding Gap Analysis

Using the anticipated 10-year asset lifecycle needs, along with the current capital investment level, the County is able to determine if there is an anticipated funding gap for the Woodstock water system. Consideration is then given to the current system reserve balance to determine the residual funding gap. The County would then investigate opportunities for reducing this residual funding gap which, may include increases to the user rates, utilization of grant funding opportunities and further review of lifecycle strategies and proposed levels of service.

Figure 5.5.1 illustrates the anticipated asset management 10-year lifecycle needs, including the projected funding surplus (left side of figure 5.5.1) and funding needs (right side of figure 5.5.1) for the Woodstock water system. The system calculates the optimal expenditures based on theoretical asset lifecycle needs. These needs have not yet been reviewed in depth with County operations staff, and incorporated into the 10-year capital budget. This is anticipated to be completed as part of the 2023 Business Plan and Budget process with subsequent review annually.

The anticipated expenditures have been increased for non-infrastructure solution projects; approximately $4.9 million.

While the anticipated expenditure calculation accounts for the lifecycle activities of expansion / growth projects it does not account for the initial investment. It is important to adjust for these projects, where the initial investment is growth related and not projected to be DC funded within the 10-year capital plan. The resulting growth/expansion projects added to the anticipated asset needs is approximately $5.7 million.

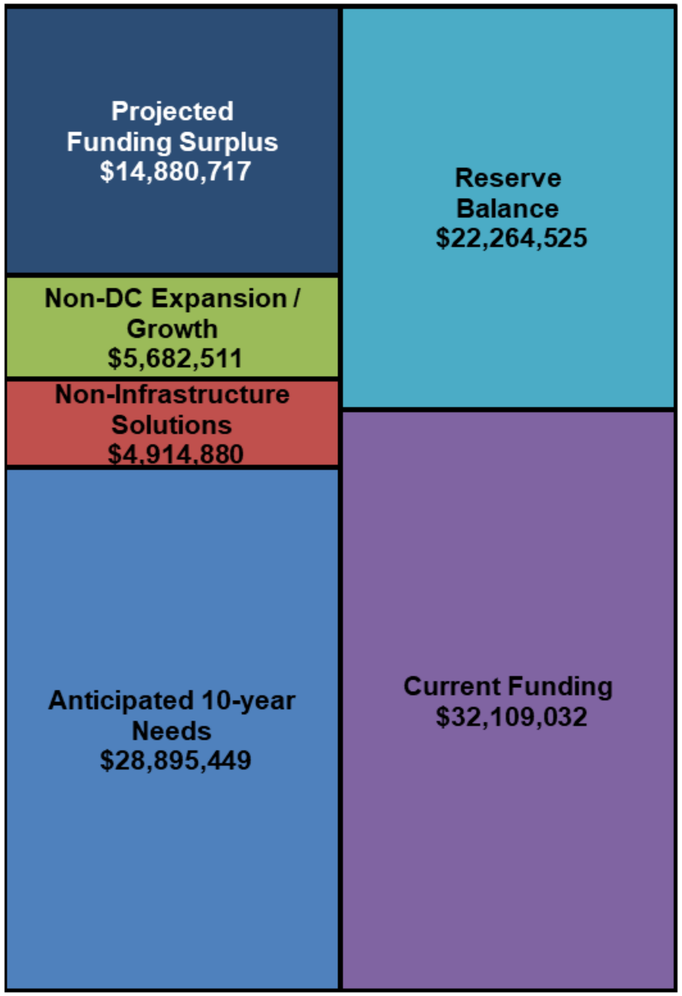
The Woodstock water system is projecting a funding surplus over the 10-year capital planning period. Although the Woodstock water system has a projected funding surplus over the 10-year horizon, the annual funding requirement is the basis for ensuring the long-term financial sustainability well into the future. Approximately 7.8% of the current funding is committed to debenture payments over the 10-year horizon. The annual funding requirement will be reviewed holistically as part of the next rate study.

Drawing the reserve balance to zero would likely result in increased user fee requirements in the subsequent 10-year period in order to fund the anticipated asset lifecycle needs.

The reserve is also utilized to fund emergency or unplanned expenses. A minimal or fully committed balance would limit the ability to fund these types of expenses. Consideration needs to be given to a minimum balance the County should maintain based on these risks. Analysis of the reserve target minimum balance, will be completed as part of the annual reserve review process.

Failure to address the long-term asset lifecycle needs could result in significant increases to rates in the future as assets reach end of life; or reductions in localized and/or regional service. This may include watermain breaks causing localized service outages, quality advisories being issued, increased maintenance costs, stress on the County's ability to meet regulations, fines, increase in insurance claims for property damage and personal injury resulting from poor asset conditions, etc.

Figure 5.5.1 Anticipated Needs (10-Year)



6.0 Climate Change

As part of the asset management planning process, the County will consider the risks and vulnerabilities of capital assets to climate change and the resulting actions that may be required. Commitment will be made to the development of tailored actions that make the best use of our resources to mitigate and adapt to climate change, in accordance with our local reduction targets, financial capacity and stakeholder support.

Climate change risks are considered during the planning phase of each capital project. Considerations to increasing infrastructure resiliency and adapting to climate change may include the following:

- use of backup power generation,
- redundancies with critical equipment,
- use of SCADA to collect accurate information and make informed decisions,
- conducting inspections and studies to identify problem areas and complete repairs.

WATER SYSTEM

Tillsonburg

Table of Contents

1.0 Introduction

The County maintains a diverse portfolio of assets necessary to produce and supply safe and clean drinking water. The county maintains a drinking water Quality Management System that demonstrates continued compliance with drinking water regulations and the County’s commitment to continual improvement in the provision of a safe, reliable and sustainable supply of drinking water for its residents and businesses.

The Tillsonburg Drinking Water System is a Large Municipal Water system as defined by Ontario Regulation (O.Reg.) 170/03 that supplies the Town of Tillsonburg with safe drinking water.

The Tillsonburg water system consists of water treatment plants (WTP), each housing high lift pumps, monitoring equipment and treatment equipment for the production wells. Each WTP also includes varying types of disinfection and filtration treatment specific for each location.

The water distribution network transports potable drinking water to homes and businesses. The distribution network consists of watermains, services, hydrants, valves, meters, pressure boosting stations, reservoirs, and water towers.

Sound management of our water systems helps us realize our vision of being a vibrant community, working well and growing stronger together!

Like many of our assets, water assets are facing increased challenges as a result of aging assets, climate change, increasing demand due to growth in our communities and regulatory changes. Our investment in these assets must therefore be balanced to optimize investment for renewal with the growing needs of our community.

This plan provides information regarding our approach to the management of our water assets over the short (10-year) and long (100-year) term, demonstrating our commitment to assessing and meeting the levels of service valued by our residents and businesses.

1.1 Improvement Plan

The County recognizes that asset management is a continuously evolving process. The following recommendations are based on the review of current management practices, inventory, valuation and condition analysis.

- Document lifecycle history on assets within the asset management systems.
- Continue to reduce asset data gaps.
- Determine asset components and maintenance strategies for facilities and associated processes.
- Refine the risk assessment approach at the component level, including the incorporation of watermain break data.
- Incorporate findings from the Water and Wastewater Master Plan.

2.0 State of Assets

2.1 Inventory

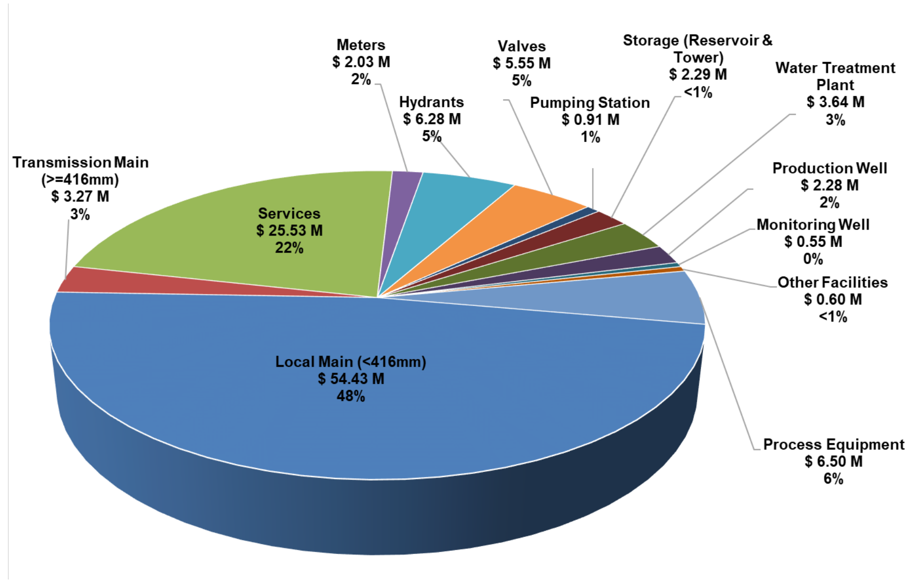
Water assets are those that contribute to community wellbeing by providing safe, potable drinking water in the interest of protecting public health and the quantity and pressure of water needed for fire protection. It includes everything from the watermains that service our homes and businesses throughout the Town, the hydrants which provide water for fire services, to the wells and treatment plants which ensure that our water is safe and available.

We have two different asset classes within the water portfolio in order to effectively treat and distribute water to our community:

- Linear, which represent the distribution pipe network, including the valves, hydrants, connectors and related parts required in such a network.
- Vertical, which represent facilities (including the multiple buildings and structures that the facilities are comprised of), and related process systems and equipment required to perform the needed functions.

Table 2.1.2 displays our current water inventory and the associated replacement costs and average age for each asset component. The County continues to make improvements to increase the integrity of our water data. The inventory figures below capture inventory within newly constructed subdivisions which the County is aware of and anticipates assuming ownership of. The County generally assumes ownership of these assets approximately two years after full operation. It is important to include this new growth infrastructure to ensure that lifecycle activities are planned and funded accordingly.

Figure 2.1.1 Inventory Valuation



2.2 Valuation

The replacement cost valuation for water linear is based on current tender prices, where available. Current tender prices are adjusted where County staff feel some cost increases are only temporary due to COVID.

The replacement cost valuation for water vertical is based on the latest information available, which includes current replacement costs, insurance valuations, and valuations from studies / assessments completed in prior years.

Table 2.1.2 – Tillsonburg Water System Inventory

Asset Type	Asset Component		2017 Inventory	Current Inventory	Replacement Cost	Average Age
Linear	Local Main (<416mm)	m	136,919	144,869	$54,431,483	30 Years
	Transmission Main (>=416mm)	m	4,987	5,427	3,268,182	28 Years
	Services	each	5,869	7,293	25,529,000	30 Years
	Meters	each	6,282	7,395	2,033,625	6 Years
	Hydrants	each	620	661	6,279,500	28 Years
	Valves	each	1,263	1,421	5,546,200	28 Years
Vertical	Pumping Station	each	6	6	910,239	24 Years
	Storage (Reservoir & Tower)	each	2	4	2,290,000	37 Years
	Water Treatment Plant	each	5	5	3,636,847	15 Years
	Production Well	each	11	11	2,280,000	44 Years
	Monitoring Well	each	N/A	15	545,000	40 Years
	Other Facilities	each	1	1	600,000	9 Years
	Process Equipment	total	N/A	N/A	6,496,874	19 Years
Total Replacement Cost					**$113,846,950**	

There are several growth / expansion projects planned in Tillsonburg that are included in the County's 2022 approved Long-Term Capital Plan. This includes a new materials and equipment storage building, to facilitate water and wastewater operator response times (approximately $0.2[1] million) and linear expansion of local mains (approximately $3.5 million). These growth projects are not included in the figures within table 2.1.2, however their anticipated lifecycle needs are included within this AMP.

[1] Tillsonburg Water System Share

2.3 Condition Assessment Approach

The assessment approach for our water assets utilizes a combination of physical assessments, asset attributes, such as material and sizing, as well as established anticipated useful lives.

The County's condition scale and visual inspection ratings are based on the following approach:

- Excellent - Asset is well maintained with no noticeable defects.
- Good - Asset may show signs of minor deterioration and may require some maintenance.
- Fair - Deterioration evident, function affected. Asset may require on-going monitoring.
- Poor - Serious deterioration, function inadequate. Asset may require ongoing monitoring.
- Critical - No longer functional, general or complete failure. Asset may require extensive monitoring.

Watermains are difficult to inspect due to the high pressure of water constantly flowing through them. Completing physical inspections would require disruptions to service, are time consuming and costly. The County will perform physical inspections on an as needed bases for large, critical pipes. There are also a number of new high tech, non-intrusive inspection techniques that the County continues to investigate.

Watermain breaks are helpful indicators of the condition of the pipe segment, as they can be used to predict pipe failure. The County tracks watermain breaks, and assigns them to their corresponding pipe segment, which assists in determining risk.

Water process assets are inspected by County staff on a regular basis as part the County's preventative maintenance program. These inspections identify performance and accelerated degradation and will trigger the creation of a reactive work order for repairs and rehabilitation. The County is working towards incorporating these inspections into a formalized condition rating. A visual inspection rating was provided for most water process assets as part of the data collection process in 2018 and 2019.

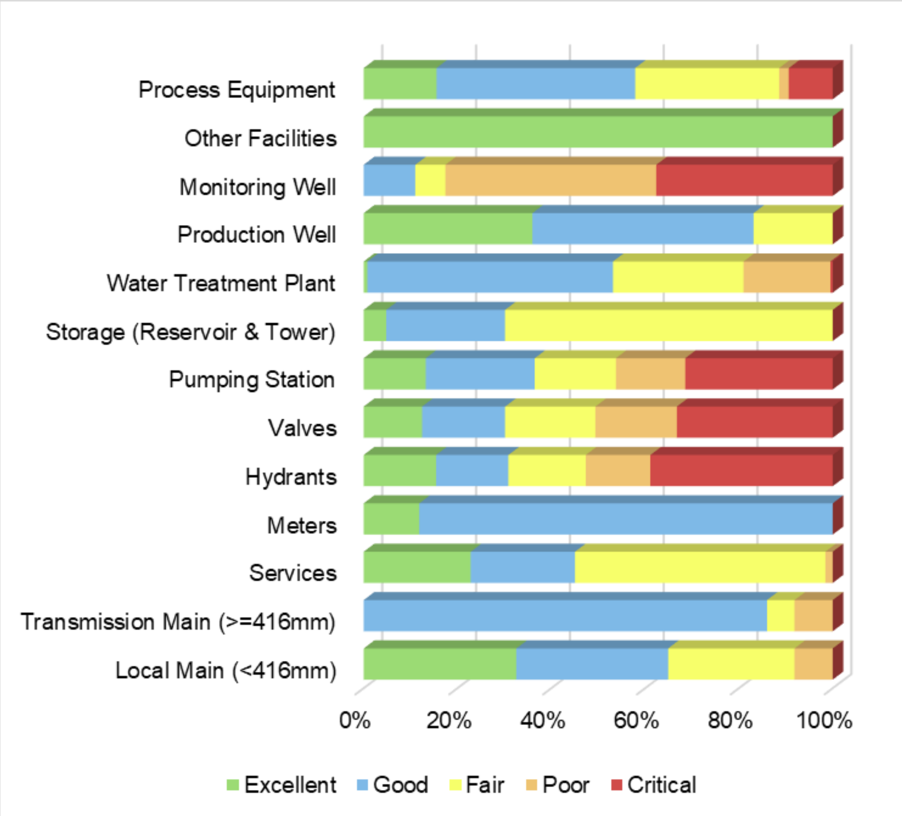
Given the complexities and accessibility of some assets, it is not beneficial to complete a visual or performance based condition assessment on all assets. For assets which are unable to be visually inspected or that have since been replaced, an age-based condition rating is being used based on anticipated useful lives.

2.4 Condition Assessment

The condition profile of our Tillsonburg water asset components is shown below in figure 2.4.1. The % in each condition is based on replacement costs.

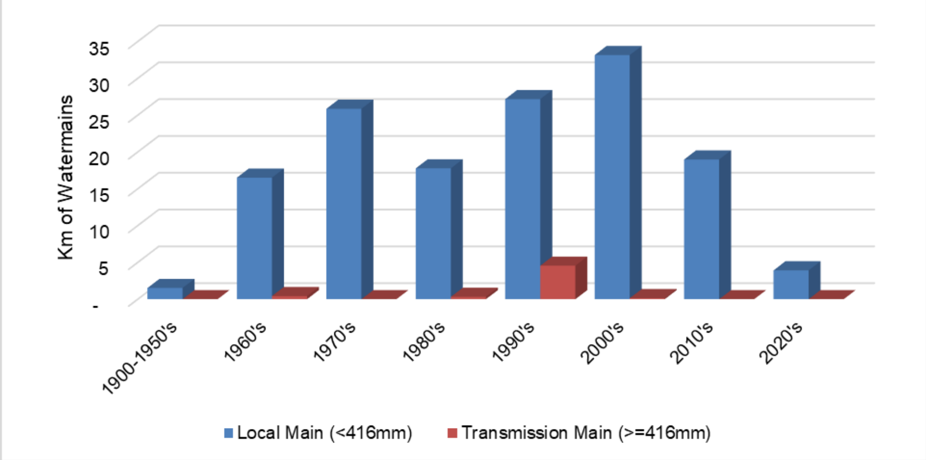
For the Tillsonburg water assets: 11.9% of these assets are in poor or critical condition, and 56.7% in good or excellent condition in comparison to 6-9% and 67-74% respectively for Canadian municipalities reported on the Canadian Infrastructure Report Card[2]. While this may appear that our Tillsonburg water assets are in worse shape than other Canadian municipalities, the 2019 Canadian Infrastructure Report Card is an aggregate of self reported condition ratings across the Country and are based on a general rating scale which may not match the County's.

Figure 2.4.1 Asset Condition by Component



To better understand our Tillsonburg water distribution assets, an age profile of all our watermains by decade is shown in figure 2.4.2.

Figure 2.4.2 Watermains by Age



The average age of the majority of linear assets within the Tillsonburg water system is approximately 30 years, whereas the average age of the vertical assets varies by facility type from 9 to 46 years. This value must be considered in the context of the different asset types in the category, compared to the typical anticipated useful life of each asset type.

Table 2.4.3 outlines the anticipated useful life for each new build/replacement. The anticipated useful lives for our water assets exclude the management strategies that the County utilizes to extend the overall life of our water assets.

[2] http://canadianinfrastructure.ca/en/index.html

Table 2.4.3 Useful Life

Water System Component	Anticipated Useful Life (years)
Local Main, Transmission Main, Services	90
Water Meter and Radio Transmitter	20
Hydrants, Main Line Valves	40
Facilities	10 - 50
Process Equipment	8 - 75

Figure 2.4.4 illustrates the current average age of the Tillsonburg water system linear components in comparison to their anticipated useful life, based on a run to failure strategy.

As the vertical assets can have a significant variability in age, from both a facility and process standpoint, they are not represented within figure 2.4.4.

There are a number of management strategies that the County may utilize to extend the overall life of our water assets. These strategies allow us to align the needs with those of other assets, resulting in the best overall value for our residents.

Figure 2.4.4 Age and Useful Life Comparison

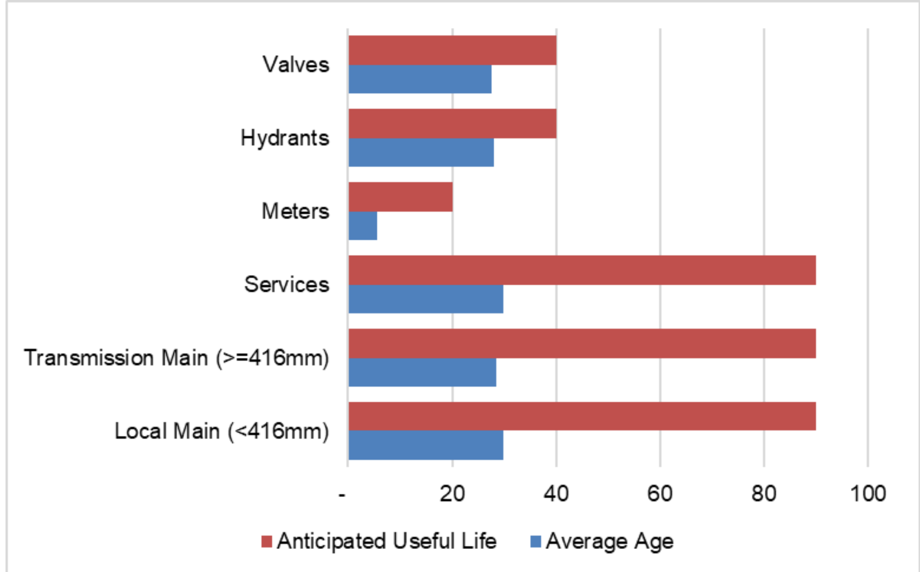


Table 2.4.5 compares the status of our Tillsonburg water asset components, as identified in our 2017 Asset Management Plan to their current condition. The breakdown by component for vertical infrastructure was not available as of the date the 2017 report was published, so there is no condition comparison available. Work continues to be ongoing to further enhance the asset information at the component level.

The trend shows that the status of water assets for the Tillsonburg system is steady to declining. The decline in condition is commiserate with the aging of these assets. As the system continues to age it is expected that condition ratings will continue to decline until targeted lifecycle strategies are implemented.

Table 2.4.5 Water Systems Condition Assessment

Asset Type	Asset Component	2017 Condition Rating	Current Condition Rating	Trend
Linear	Local Main (<416mm)	Good	Good	→
	Transmission Main (>=416mm)	Good	Good	→
	Services	Good	Good	→
	Meters	Excellent	Good	↓
	Hydrants	Good	Poor	↓
	Valves	Poor	Poor	→
Vertical	Pumping Station	Not assessed	Fair	-
	Storage (Reservoir & Tower)	Not assessed	Fair	-
	Water Treatment Plant	Not assessed	Fair	-
	Production Well	Not assessed	Good	-
	Monitoring Well	Not assessed	Poor	-
	Other Facilities	-	Excellent	-
	Process Equipment	Not assessed	Fair	-

3.0 Levels of Service

County staff have developed a comprehensive Level of Service (LOS) Framework. This framework will help to establish a relationship between the current LOS being provided by the County's assets, and the associated operating and capital expenditures required to achieve the proposed LOS. The framework puts into perspective the definition and measurement of service performance in alignment with the County's corporate mission and vision.

Corporate Objective

The County is committed to providing the appropriate quantity of water and quality water as it directly impacts the quality of life of customers by reducing the potential for water-borne disease, allowing for economic development and fire protection, and providing opportunities for recreational activities.

Legislative Requirements

The purpose of the *Safe Drinking Water Act, 2002*[3] is to recognize that the people of Ontario are entitled to expect their drinking water to be safe and to provide for the protection of human health and the prevention of drinking water health hazards through the control and regulation of drinking water systems and drinking water testing.

Ontario Regulation 170/03[4] provides specifications and reporting requirements regarding drinking water systems. Ontario Regulation 169/03[5] specifies the Ontario Drinking Water Quality Standards.

The DWQMS[6] requires an operating authority to document a quality management system for each municipal, year-round, residential drinking water system that it operates in an operational plan which must be accepted by the Ministry of the Environment and Climate Change.

Framework

The structure of the County's LOS framework was developed to align with international best practices including the International Infrastructure Management Manual (IPWEA, 2015). The framework includes the mandatory measures to meet the requirements of Ontario Regulation (O.Reg.) 588/17 by including both Community and Technical Levels of Service. The metrics in this framework may be expanded upon as the County continues to improve its data collection and reporting processes.

[3] https://www.ontario.ca/laws/statute/02s32
[4] https://www.ontario.ca/laws/regulation/030170#BK26
[5] https://www.ontario.ca/laws/regulation/030169
[6] https://www.ontario.ca/page/ontarios-drinking-water-quality-management-standard-pocket-guide

3.1 Customer Levels of Service

Community or Customer Levels of Service are statements that describe quantifiable metrics of the service delivery outcomes from the perspective of the customer, expressed in non-technical terms. The following statements form our qualitative descriptions of the customer level metrics required under O.Reg. 588/17.

The Tillsonburg water system connects to most residential, commercial and industrial spaces in the settlement areas of Tillsonburg, as outlined in figure 3.3.1. The Tillsonburg water system provides for the safe treatment and distribution of water.

Fire flow protection is determined when a system is designed based on discussions with area municipalities. The minimum pipe size to allow for fire flow protection is 150mm, as such it is very difficult to implement fire flow after a system has been constructed. The Tillsonburg water system was designed to accommodate the needs for fire flow protection.

Boil Water Advisories (BWA) are issued by the Medical Officer of Health to advise residents when bacteria or other microorganisms may be present in the municipal drinking water supply, making it unsafe to drink. During a BWA, residents are advised to boil their water before using it for drinking, washing or preparing food, and brushing teeth. Drinking Water Advisories (DWA) are issued by the Medical Officer of Health to advise residents to use an alternate water source, such as bottled water. A DWA would be issued during situations when boiling the water will not get rid of the problem, such as a chemical contamination.

Service interruptions are any event including emergency situations or planned and unplanned maintenance which may prevent residents from using their municipal drinking water supply. This includes; loss of power, contamination, transmission line or major watermain breaks or interruptions in service pressure

The County is constantly monitoring water quality and service to ensure minimal disruptions and compliance with the Ontario Drinking Water Quality Management Standard (DWQMS). In the event of a water quality issue or service disruption, a notice is issued to the affected area to ensure all users are aware and can take appropriate precautions.

The County has an objective to minimize water loss by detecting leakages and repairing them promptly.

Table 3.1.1 outlines additional customer focused performance metrics from the County's LOS framework.

3.2 Technical Levels of Service

Technical Levels of Service metrics are quantifiable metrics applied against assets that are subject-matter specific inputs or outputs supported by the day-to-day activities of County staff. Table 3.1.1 includes the technical metrics required under O.Reg. 588/17, as well as, additional metrics the County has included in the framework.

3.3 Levels of Service Maps

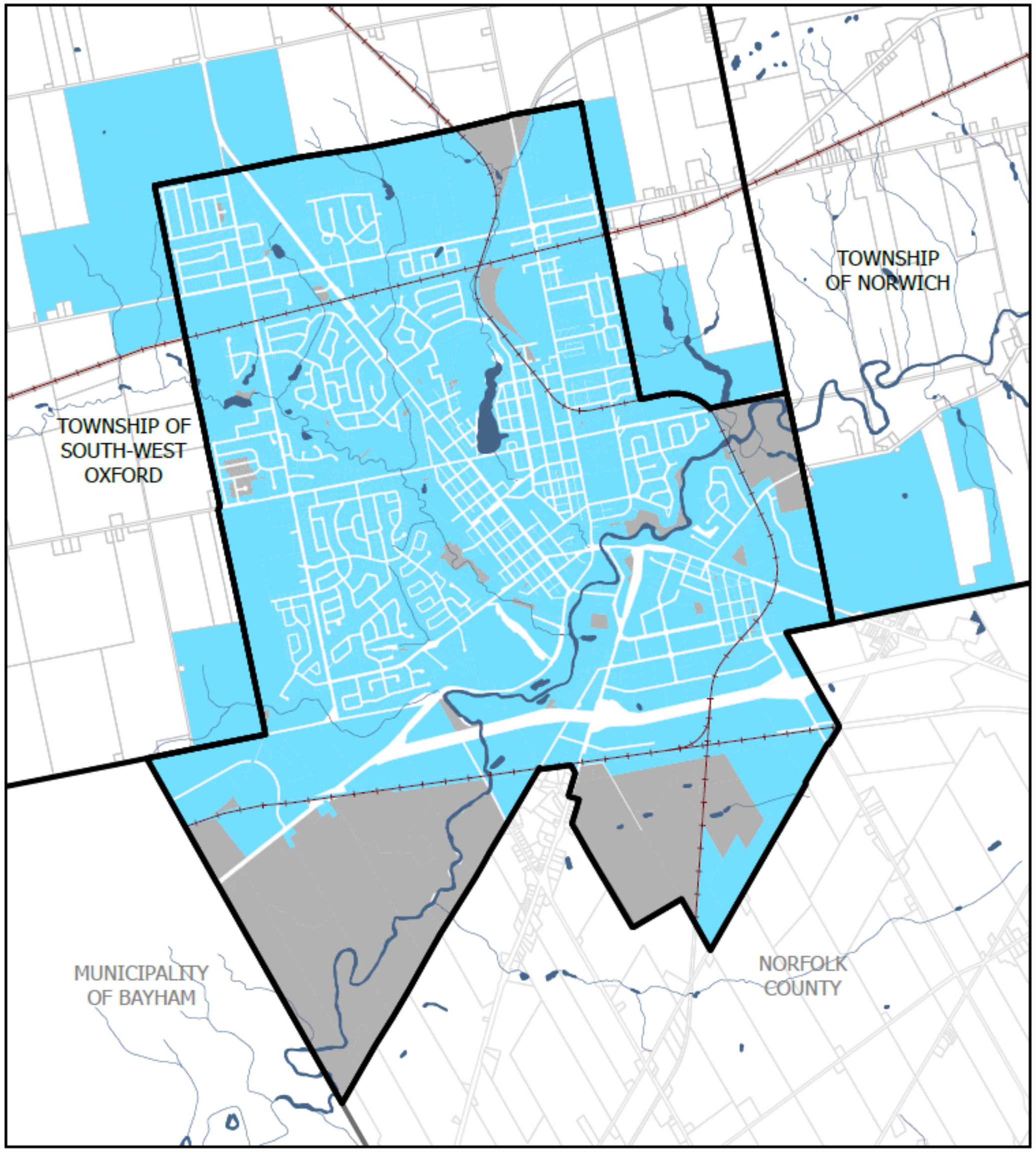
As a further illustrative example of our community levels of service, a map is included as figure 3.3.1 showing areas within the Town of Tillsonburg boundary that are serviced by the Tillsonburg water system.

Figure 3.3.1 Tillsonburg water serviced properties

Tillsonburg

Properties with fronting water

- Properties with fronting water
- Properties without fronting water
- Municipal Boundary
- Railway
- Waterbody



Total # of parcels:	7,170
Without fronting water:	187
With fronting water:	6,983
Coverage:	97%

N

0 285 570 1,140 1,710 m

Parcels with fronting water identified as being a distance of 30m from water mains.

Oxford County
Growing stronger together
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Table 3.1.1 Performance Measures

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Customer / Council Focused Performance Measures					
Safety	Providing efficient and safe drinking water and supports fire protection	% of properties within the system boundary connected to the municipal water system	N/A	97%	TBD
		% of properties where fire flow is available	100%	100%	TBD
Environmental Stewardship	Providing a water service that is environmentally conscious	# of days of restrictions per system	0	0	TBD
Cost Efficient	Providing water services in an efficient manner	Operating cost to provide service ($/connection)	$360	$354	TBD
Technical Focused Performance Measures					
Safety	Providing efficient and safe drinking water and supports fire protection	% of bacteriological samples compliant with all applicable water quality regulations	99.5%	99.8%	TBD
Reliability	Providing water services with minimal interruptions	The number of connection-days per year where a boil water advisory notice is in place compared to the total number of properties connected to the municipal water system	0 connection-days compared to 6,364 connections	24 connection-days compared to 6,658 connections	TBD
		The number of connection-days per year due to watermain breaks compared to the total number of properties connected to the municipal water system	0 connection-days compared to 6,364 connections	0 connection-days compared to 6,658 connections	TBD
		% of Critical Main Line Valves Turned	16%	28%	100%
		% of Non-Critical Main Line Valves Turned	16%	16%	25%

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Cost Efficient	Providing water services in an efficient manner	The operating costs per kilometer of water distribution pipe (distribution)	N/A	$9,822	TBD
		5 year Average capital expenditure for water treatment	$0.04M	$0.06M	TBD
		5 year Average capital expenditure for water distribution	$1.1M	$1.2M	TBD

4.0 Asset Management Strategy

4.1 Lifecycle Activities and Planned Actions

Distribution assets undergo regular maintenance and inspection. As part of capital works project analysis, determinations of whether water pipe replacement or relining should occur is reviewed. This process is fully integrated with the renewal needs of the roadways and other underground infrastructure, such as wastewater and stormwater. This integrated approach ensures our renewal projects for these service areas are delivered with optimal timing to increase value and minimize disruption to our communities. For example, if a roadway is targeted for renewal, coordination between service areas and area municipalities will determine whether the underlying stormwater, drinking water or wastewater infrastructure is also of an age or condition that requires renewal, to ensure these projects are delivered together to reduce disruption for our communities and deliver enhanced value.

Process assets and equipment undergo extensive operations and maintenance regimes to sustain their reliable operation. Investment needs are identified and coordinated with normal operations to minimize disruptions to service. Major replacements are planned and accommodated using system redundancy and changes to operations, in order to maintain service. It is critical to maintain water service in order to protect public health.

There are six main lifecycle activities considered in the overall sustainable management of water assets, described in table 4.1.1.

Table 4.1.1 Lifecycle Activities

Strategy	Lifecycle Activity
Non-Infrastructure Solutions	Actions or policies that can lower costs or extend useful lives. **Trigger: Ongoing**
Maintenance	Regularly scheduled maintenance and inspection programs including cleaning and flushing, hydrant flushing, pressure testing, visual inspections, lubricating and minor repairs. These activities do not improve the overall condition of the asset, nor increase its useful life. **Trigger: Ongoing**
Rehabilitation / Renewal	One-time events that increase the condition and extend the useful life of the asset; including watermain lining. **Trigger: Fair/Poor**
Replacement	Occurs at the end of the useful life and/or when rehabilitation is no longer an option – can vary among assets due to construction material and environmental factors that impact the degree of deterioration and performance. **Trigger: Poor/Critical**
Disposal	Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the County to provide services. County staff coordinate with contractors to ensure safe removal and environmental compliance when disposing of assets. **Trigger: Poor/Critical**
Expansion / Growth	Planned activities required to extend services to previously unserved areas, expand services to meet growth demands, or increase the level of service being provided. **Trigger: Development**

The lifecycle management strategy is the set of planned actions that should enable the assets to provide users with the proposed level of service in a sustainable way, while achieving acceptable levels of risk and the lowest lifecycle costs required to provide that level of service. Lifecycle considerations for assets include analysis of the timing to carry out key asset management activities including inspection, maintenance, repair, and replacement. Ongoing preventative maintenance activities are outlined in the County's work management system. The rehabilitation and replacement activities impacting the asset components condition and useful life are contained within profiles in the County's asset management system. For some assets, replacement needs are based on a run to failure strategy, as this is the most economical. Work is ongoing within the County's systems to build all the component profiles and identify where each asset is within the lifecycle.

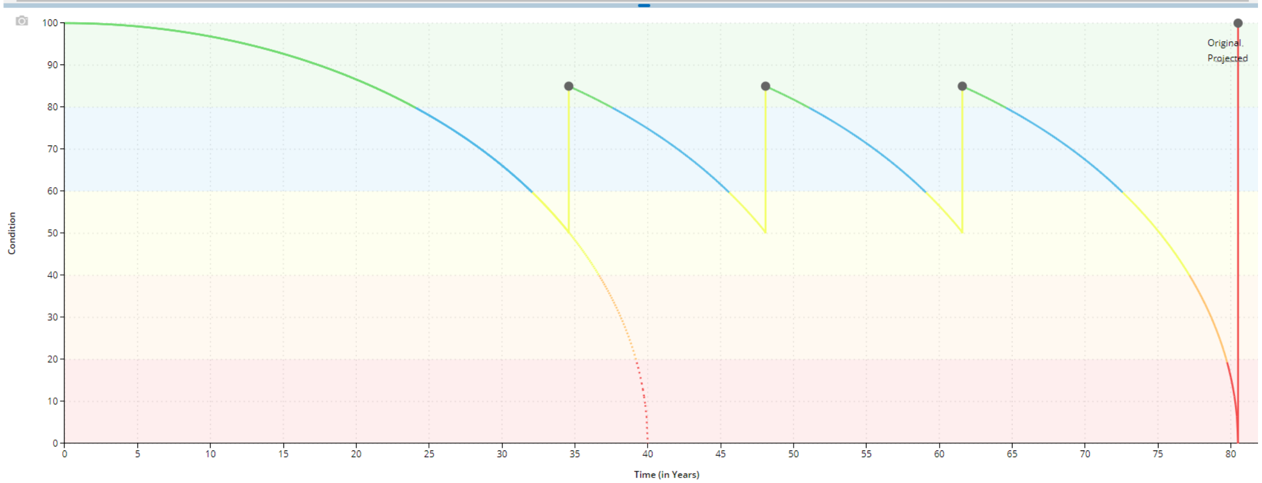
As an example, figure 4.1.2 illustrates the lifecycle strategy of hydrants. The internal components of a hydrant can be replaced multiple times, extending the overall useful life from 40 years to approximately 80. The annual cost requirement from a run to failure strategy is $234 per year where the annual cost requirement using the rehabilitation strategies decreases to $196 per year.

Figure 4.1.2 Hydrants Lifecycle Strategy

Strategy

Age-Based Condition Method: Deterioration Curve
Add Event (Condition Triggered): Repl Internal Components — Add
Lifecycle EUL: 40 Year(s) 0 Month(s)
Lifecycle EUL (with events): 80 Year(s) 6 Month(s)

Age at Event	Name	Description	Event Class	Cost	Event Range / Trigger	Impact	Added EUL	Cost per Added Year	Actions
34 Years 7 Months	Repl Internal Components	Replacement of Internal Components	Rehabilitation	$2,100.00 (Fixed)	50 to 50 Condition	Set to 85 Condition	13 Years 6 Months	$155.56	
48 Years 1 Month	Repl Internal Components	Replacement of Internal Components	Rehabilitation	$2,100.00 (Fixed)	50 to 50 Condition	Set to 85 Condition	13 Years 6 Months	$155.56	

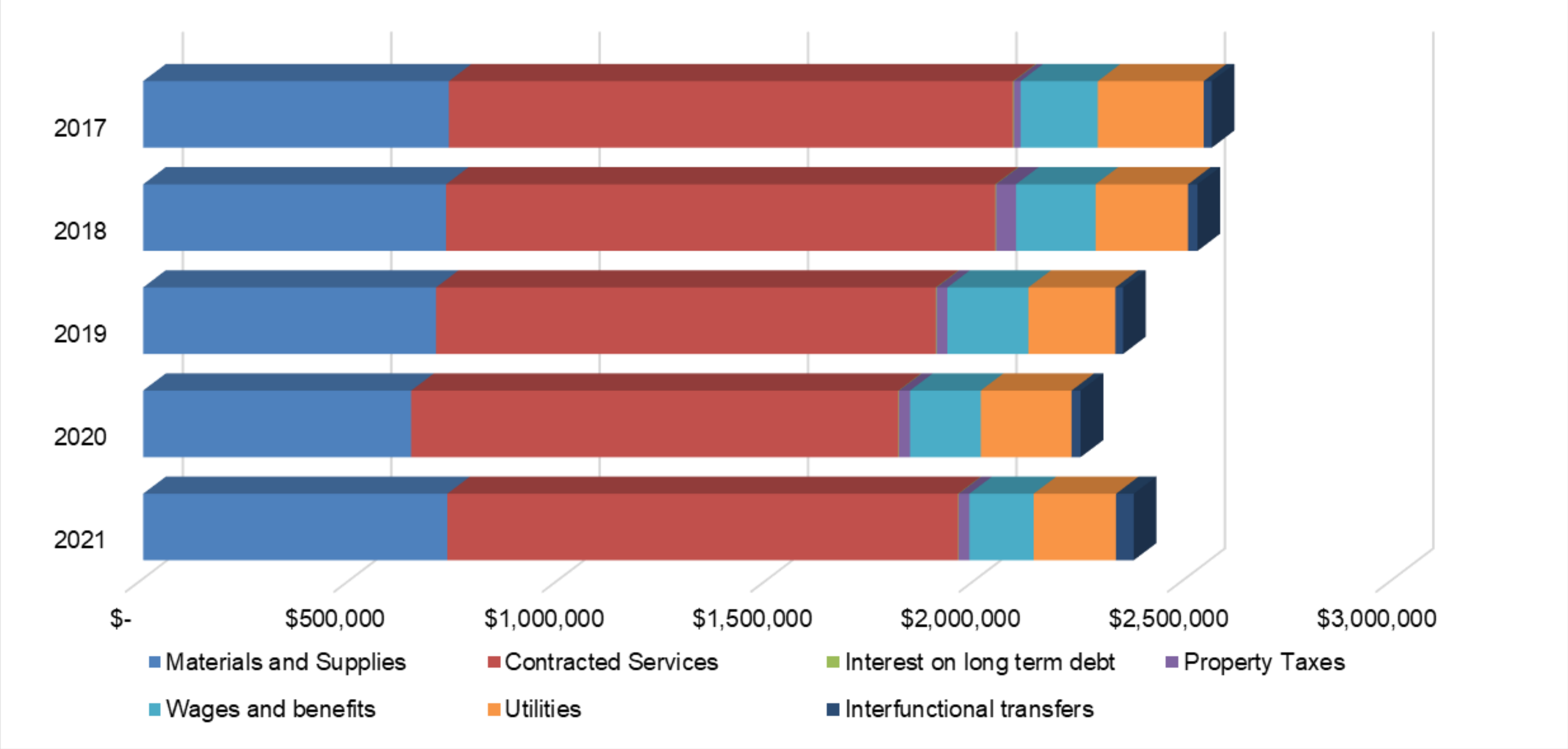


4.2 Significant Operating Expenses

Significant operating expenses are required in order to sustain an asset over its lifecycle. The County is always looking at ways to optimize our operating investment to ensure we are achieving the best value for our residents. Essential to this is a strong operations and maintenance plan within our work management system. Operating expenses are incurred through a number of sources – preventative maintenance activities, utility costs, property taxes and more. Despite the fact that minor maintenance is incorporated into planned operations and maintenance programs, there are cases where it is unplanned.

Figure 4.2.1 shows the operating expenses from 2017 through 2021 for the Tillsonburg water system grouped by expense type. The groupings align with those reported on the County's Financial Information Return (FIR), with further breakdown for property taxes and utility costs as these expenses can be significant.

Figure 4.2.1 Operating Expenses



4.3 Risk Strategy

Risk management frameworks are developed to assist with the prioritization of investments within the capital planning period. The preferred approach is to implement a triple bottom line analysis approach to evaluate:

- Social impacts of asset failure, including impacts to customers, businesses and the County's reputation;
- Environmental impacts of asset failure; and
- Economic impacts of failure including the cost of remediation.

In the context of asset management, risk is the multiple of the consequence of an asset failing and the probability that the event will occur.

Figure 4.3.1 illustrates the risk ratings for the Tillsonburg water assets at a summary level. County staff will continue to monitor the higher risk assets, review and/or complete physical inspections to further validate the age-based condition ratings and plan for lifecycle strategies accordingly.

Figure 4.3.1 Asset risk profile

Consequence	1	2	3	4	5
5	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	0 Assets - $0.00	0 Assets - $0.00	1 Asset 1.00 unit(s) $1,600,000.00	0 Assets - $0.00	0 Assets - $0.00
3	2 Assets 954.11 m, unit(s) $1,076,555.00	10 Assets 5,771.80 m, unit(s) $6,541,992.00	2 Assets 3,896.40 m, unit(s) $11,339,060.00	2 Assets 501.02 m, unit(s) $506,010.00	0 Assets - $0.00
2	50 Assets 8,722.67 m, unit(s) $4,659,270.00	125 Assets 12,135.30 m, unit(s) $7,902,242.00	43 Assets 6,119.46 m, unit(s) $3,419,460.00	60 Assets 3,407.41 m, unit(s) $2,402,972.50	65 Assets 65.00 unit(s) $555,600.00
1	2,339 Assets 36,750.23 m, unit(s) $20,825,485.00	2,146 Assets 42,032.02 m, unit(s) $22,259,833.00	1,627 Assets 33,121.82 m, unit(s) $17,384,910.25	708 Assets 13,508.36 m, unit(s) $7,827,795.25	792 Assets 791.00 unit(s) $5,545,764.83

Probability

5.0 Financial Strategy

5.1 Financing Strategy

Hemson Consulting Ltd. (Hemson) was retained through a competitive process to assist with analyzing and developing the County's water and wastewater rates for a 4-year period from 2021 to 2024. The rate modeling includes all system asset management needs and all sources of funding including Community Servicing Assistance Program (CSAP) funding, development charges, developer and resident contributions. In most cases, the capital replacement component is the average annual required contribution level in order to establish full cost recovery; however, the contribution may vary based on the system's ability to meet full cost recovery for the next 10-years.

Capital work is funded from reserves (based on the capital contribution included in the user rates), development charges (for growth projects) and grant funding when available. The County continually assesses opportunities for additional funding options and revenue streams to address our funding gaps.

Where possible, replacement activities are planned in conjunction with the replacement needs of the road network and underlying wastewater/stormwater infrastructure. This requires a co-ordinated effort with area municipalities as the majority of the County owned water and wastewater linear assets falls under the area municipalities' roads infrastructure. This collaboration is essential for ensuring a cost effective approach to maintaining assets within the County regardless of ownership.

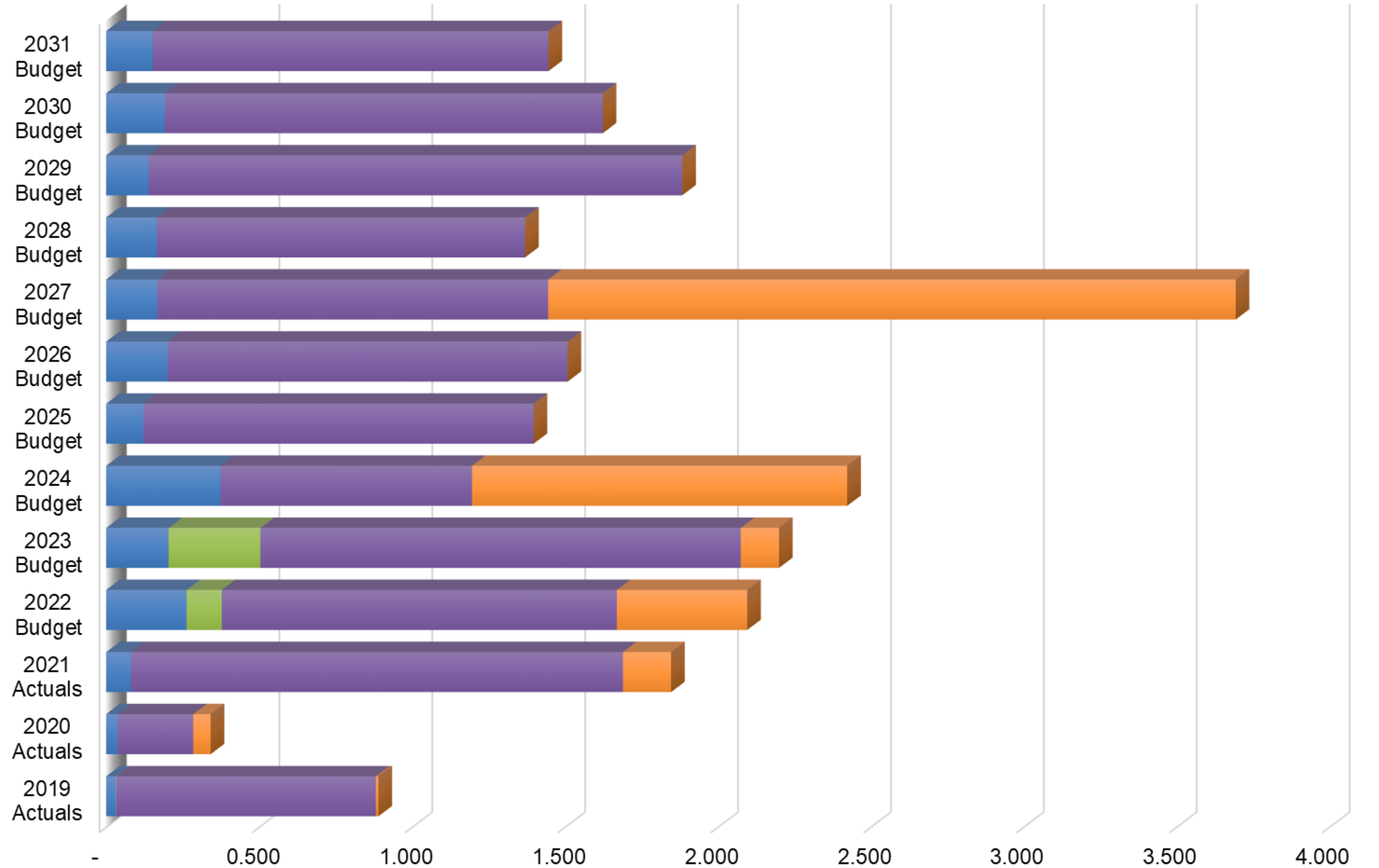
In addition to targeting and prioritizing the investment needed to maintain existing assets, there are also planning processes in place to determine the additional assets needed to meet growing demands through population increases or demand for new services. The projects targeted to meet growth are funded primarily through Development Charges (DC) – the mechanism that enables recovery of growth-related capital expenditures from new development. These charges are governed by the Development Charges Act and are applied in accordance with our Development Charges By-Law. Impacts from the growth activities analyzed in the 2019 DC Background Study are included in this AMP.

5.2 Expenditure History and Forecasts

The Tillsonburg water system contains significant capital projects within the 10-year approved budget, as illustrated in figure 5.2.1. Linear asset replacements are ongoing, in conjunction with the local area municipal roadway construction projects. Minor process equipment replacements were included in the 2019 to 2025 budgets. County staff continue to review anticipated asset management needs with each budget cycle, subject to existing resource limitations.

Non-Infrastructure solution projects include shared projects for condition reviews, studies and implementation of the work management system.

Figure 5.2.1 Expenditures (millions)

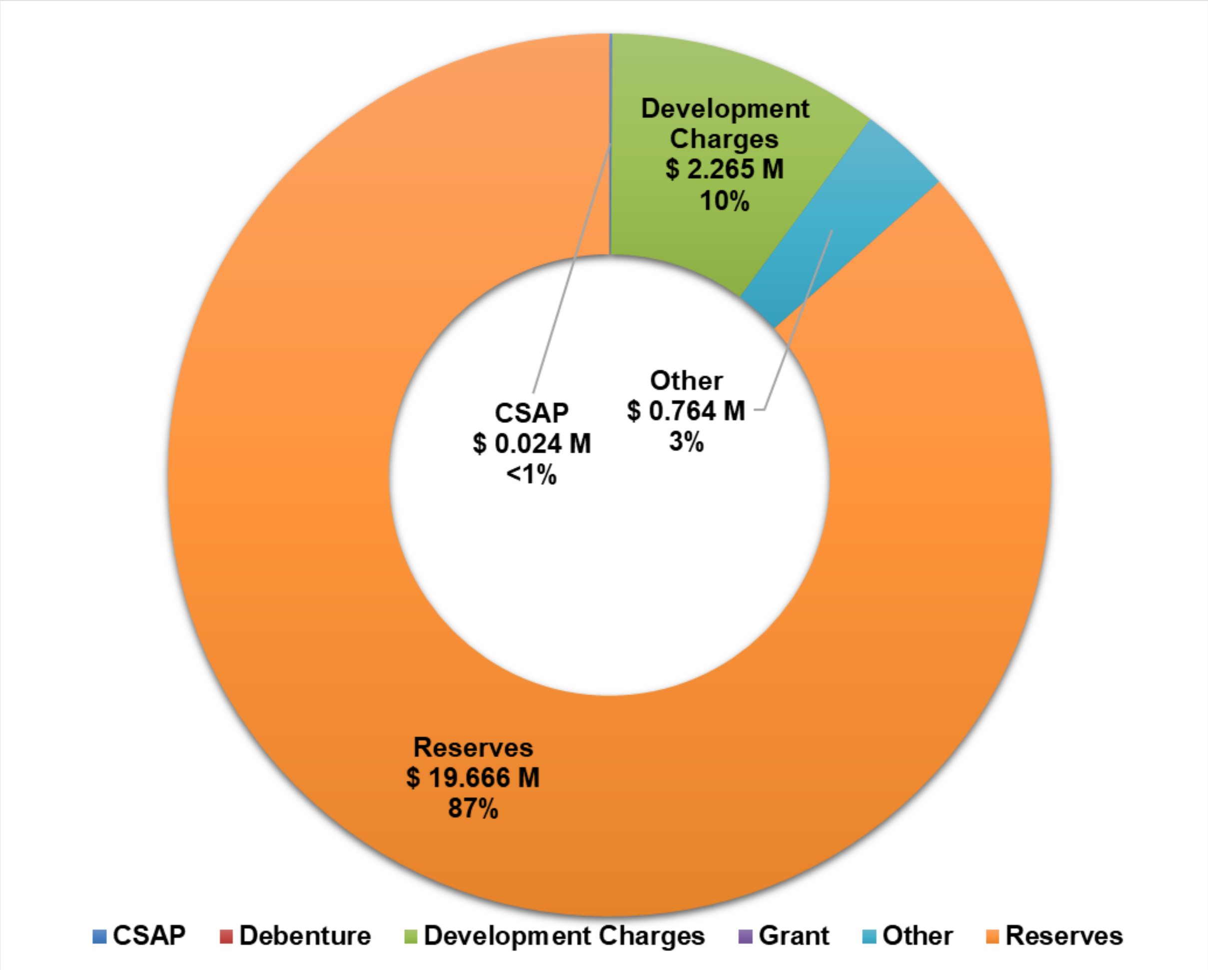


	2019 Actuals	2020 Actuals	2021 Actuals	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Non-Infrastructure Solution	0.032	0.037	0.081	0.263	0.204	0.374	0.122	0.200	0.167	0.165	0.139	0.191	0.152
Maintenance	-	-	-	-	-	-	-	-	-	-	-	-	-
Rehabilitation / Renewal	0.001	-	-	0.115	0.300	-	-	-	-	-	-	-	-
Replacement	0.849	0.247	1.608	1.292	1.571	0.822	1.276	1.308	1.278	1.204	1.745	1.432	1.294
Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-
Expansion / Growth	0.008	0.057	0.158	0.426	0.125	1.227	-	-	2.249	-	-	-	-

5.3 Capital Revenues

Replacement projects, identified in the County's 10-year capital plan, are anticipated to be funded by the Water – Tillsonburg Reserve, which is funded by user fees. The Tillsonburg expansion project on Cranberry Road will be included in the next DC Background Study to determine eligibility for DC funding. The Water – Tillsonburg Reserve, including the anticipated capital contributions within the 10-year period, is sufficient to fund the 10-year related asset activities within the approved 2022 Long-Term Capital Plan.

Figure 5.3.1 Sources of Capital Revenues 2019-2031 (millions)



5.4 Capital Investment

Based on the asset management strategies identified, the financial requirements over the next 100-years are determined in current dollars. The average annual investment requirement represents the amount of capital funding required to renew and maintain the existing assets on an annual basis so services can continue to be delivered. These estimates assume that all work is able to be completed, as indicated, and does not take into account future changes due to environmental factors, new maintenance techniques, and unidentified growth. The annual requirement differs from the 2017 AMP, primarily due to significant development and improvements the County has made to the vertical data, resulting in asset useful lives that are more reflective of their actual lifecycle. Further work is ongoing with the vertical data to fully determine lifecycle needs (including maintenance and rehabilitation strategies) which will impact the annual requirement for vertical assets. The data will continue to be reviewed with each budget and business plan cycle.

Figure 5.4.1 Average Annual Capital Requirements

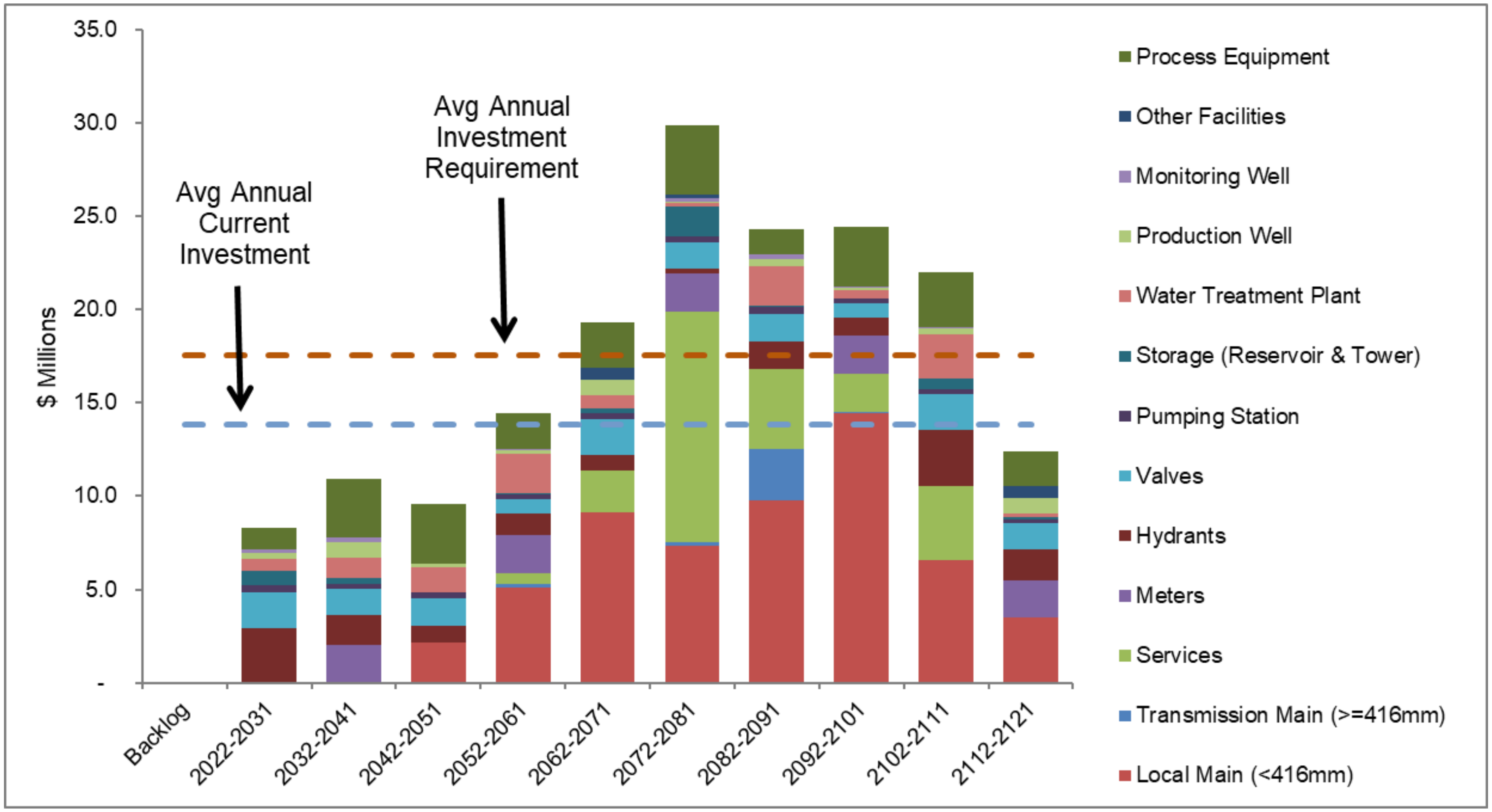
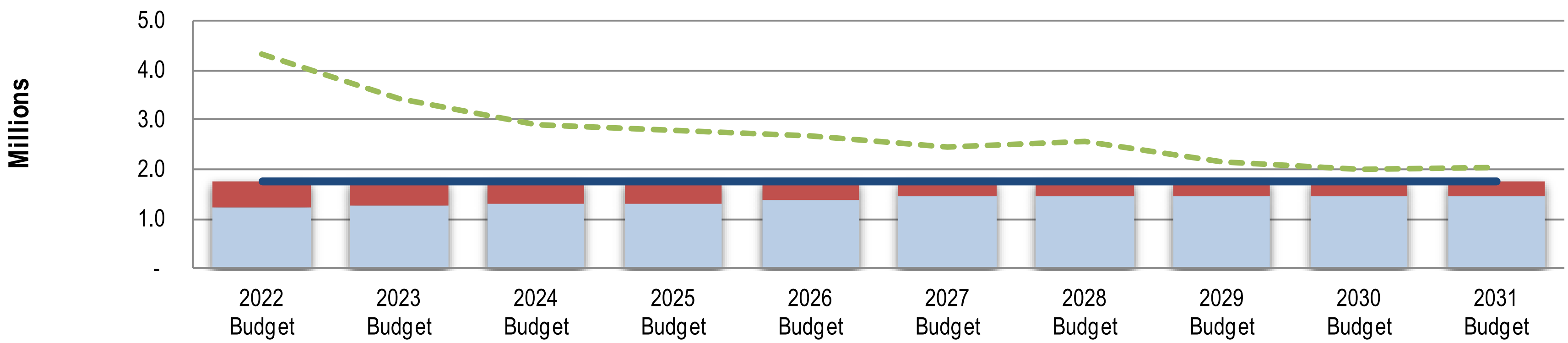


Figure 5.4.2 links the annual capital funding needs to the capital investments contained in the budget. The timing of the actual capital projects may vary, however annual investments in capital assets is important for financial sustainability.

Figure 5.4.2 Funding Requirements

	Key	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Annual Required Investment		**1,756,000**	**1,756,000**	**1,756,000**	**1,756,000**	**1,756,000**	**1,756,000**	**1,756,000**	**1,756,000**	**1,756,000**	**1,756,000**
Current Investment		1,250,048	1,263,792	1,309,988	1,307,012	1,385,356	1,465,254	1,464,736	1,463,572	1,461,372	1,460,910
Funding Deficit		*505,952*	*492,208*	*446,012*	*448,988*	*370,644*	*290,746*	*291,264*	*292,428*	*294,628*	*295,090*
Funding Surplus		-	-	-	-	-	-	-	-	-	-
Reserve Balance		4,330,009	3,406,646	2,888,960	2,800,950	2,683,478	2,438,232	2,553,465	2,146,032	2,001,255	2,029,874



5.5 Funding Gap Analysis

Using the anticipated 10-year asset lifecycle needs, along with the current capital investment level, the County is able to determine if there is an anticipated funding gap for the Tillsonburg water system. Consideration is then given to the current system reserve balance to determine the residual funding gap. The County would then investigate opportunities for reducing this residual funding gap which, may include increases to the user rates, utilization of grant funding opportunities and further review of lifecycle strategies and proposed levels of service.

Figure 5.5.1 illustrates the anticipated asset management 10-year lifecycle needs, including the projected funding surplus (left side of figure 5.5.1) and funding needs (right side of figure 5.5.1) for the Tillsonburg water system. The system calculates the optimal expenditures based on theoretical asset lifecycle needs. These needs have not yet been reviewed in depth with County operations staff, and incorporated into the 10-year capital budget. This is anticipated to be completed as part of the 2023 Business Plan and Budget process with subsequent review annually.

The anticipated expenditures have been increased for non-infrastructure solution projects; approximately $1.8 million.

While the anticipated expenditure calculation accounts for the lifecycle activities of expansion / growth projects it does not account for the initial investment. It is important to adjust for these projects, where the initial investment is growth related and not projected to be DC funded within the 10-year capital plan. The resulting growth/expansion projects added to the anticipated asset needs is approximately $2.0 million.

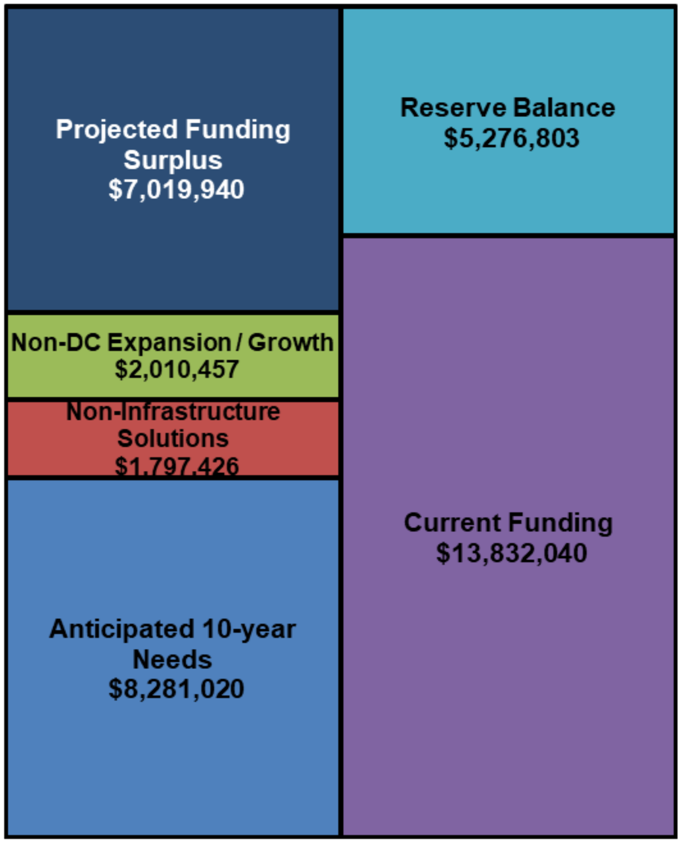
The Tillsonburg water system is projecting a funding surplus over the 10-year capital planning period. Although the Tillsonburg water system has a projected funding surplus over the 10-year horizon, the annual funding requirement is the basis for ensuring the long-term financial sustainability well into the future. The annual funding requirement will be reviewed holistically as part of the next rate study.

Drawing the reserve balance to zero would likely result in increased user fee requirements in the subsequent 10-year period in order to fund the anticipated asset lifecycle needs.

The reserve is also utilized to fund emergency or unplanned expenses. A minimal or fully committed balance would limit the ability to fund these types of expenses. Consideration needs to be given to a minimum balance the County should maintain based on these risks. Analysis of the reserve target minimum balance, will be completed as part of the annual reserve review process.

Failure to address the long-term asset lifecycle needs could result in significant increases to rates in the future as assets reach end of life; or reductions in localized and/or regional service. This may include watermain breaks causing localized service outages, quality advisories being issued, increased maintenance costs, stress on the County's ability to meet regulations, fines, increase in insurance claims for property damage and personal injury resulting from poor asset conditions, etc.

Figure 5.5.1 Anticipated Needs (10-Year)



6.0 Climate Change

As part of the asset management planning process, the County will consider the risks and vulnerabilities of capital assets to climate change and the resulting actions that may be required. Commitment will be made to the development of tailored actions that make the best use of our resources to mitigate and adapt to climate change, in accordance with our local reduction targets, financial capacity and stakeholder support.

Climate change risks are considered during the planning phase of each capital project. Considerations to increasing infrastructure resiliency and adapting to climate change may include the following:

- use of backup power generation,
- redundancies with critical equipment,
- use of SCADA to collect accurate information and make informed decisions,
- conducting inspections and studies to identify problem areas and complete repairs.

WATER SYSTEM

Ingersoll

Table of Contents

1.0 Introduction

The County maintains a diverse portfolio of assets necessary to produce and supply safe and clean drinking water. The county maintains a drinking water Quality Management System that demonstrates continued compliance with drinking water regulations and the County's commitment to continual improvement in the provision of a safe, reliable and sustainable supply of drinking water for its residents and businesses.

The Ingersoll Drinking Water System is a Large Municipal Water system as defined by Ontario Regulation (O.Reg.) 170/03 that supplies the Town of Ingersoll with safe drinking water.

The Ingersoll water system consists of water treatment plants (WTP), each housing high lift pumps, monitoring equipment and treatment equipment for the production wells. Each WTP also includes varying types of disinfection and filtration treatment specific for each location.

The water distribution network transports potable drinking water to homes and businesses. The distribution network consists of watermains, services, hydrants, valves, meters, pressure boosting stations, reservoirs, and water towers.

Sound management of our water systems helps us realize our vision of being a vibrant community, working well and growing stronger together!

Like many of our assets, water assets are facing increased challenges as a result of aging assets, climate change, increasing demand due to growth in our communities and regulatory changes. Our investment in these assets must therefore be balanced to optimize investment for renewal with the growing needs of our community.

This plan provides information regarding our approach to the management of our water assets over the short (10-year) and long (100-year) term, demonstrating our commitment to assessing and meeting the levels of service valued by our residents and businesses.

1.1 Improvement Plan

The County recognizes that asset management is a continuously evolving process. The following recommendations are based on the review of current management practices, inventory, valuation and condition analysis.

- Document lifecycle history on assets within the asset management systems.
- Continue to reduce asset data gaps.
- Refine asset components and maintenance strategies for facilities and associated processes.
- Refine the risk assessment approach at the component level, including the incorporation of watermain break data.
- Incorporate findings from the Water and Wastewater Master Plan.

2.0 State of Assets

2.1 Inventory

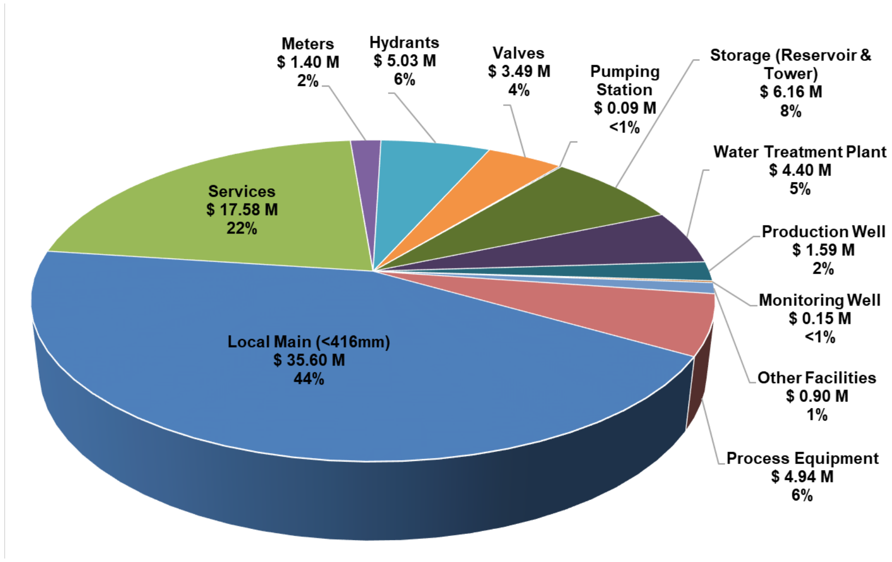
Water assets are those that contribute to community wellbeing by providing safe, potable drinking water in the interest of protecting public health and the quantity and pressure of water needed for fire protection. It includes everything from the watermains that service our homes and businesses throughout the Town, the hydrants which provide water for fire services, to the wells and treatment plants which ensure that our water is safe and available.

We have two different asset classes within the water portfolio in order to effectively treat and distribute water to our community:

- Linear, which represent the distribution pipe network, including the valves, hydrants, connectors and related parts required in such a network.
- Vertical, which represent facilities (including the multiple buildings and structures that the facilities are comprised of), and related process systems and equipment required to perform the needed functions.

Table 2.1.2 displays our current water inventory and the associated replacement costs and average age for each asset component. The County continues to make improvements to increase the integrity of our water data. The inventory figures below capture inventory within newly constructed subdivisions which the County is aware of and anticipates assuming ownership of. The County generally assumes ownership of these assets approximately two years after full operation. It is important to include this new growth infrastructure to ensure that lifecycle activities are planned and funded accordingly.

Figure 2.1.1 Inventory Valuation



2.2 Valuation

The replacement cost valuation for water linear is based on current tender prices, where available. Current tender prices are adjusted where County staff feel some cost increases are only temporary due to COVID.

The replacement cost valuation for water vertical is based on the latest information available, which includes current replacement costs, insurance valuations, and valuations from studies / assessments completed in prior years.

Table 2.1.2 – Ingersoll Water System Inventory

Asset Type	Asset Component		2017 Inventory	Current Inventory	Replacement Cost	Average Age
Linear	Local Main (<416mm)	m	92,774	96,275	$35,602,233	36 Years
	Transmission Main (>=416mm)	m	-	-	-	-
	Services	each	5,020	5,023	17,580,500	33 Years
	Meters	each	4,622	5,089	1,399,475	5 Years
	Hydrants	each	502	529	5,025,500	28 Years
	Valves	each	969	923	3,491,200	28 Years
Vertical	Pumping Station	each	-	1	91,770	14 Years
	Well – Pumphouse	each	-	-	-	-
	Storage (Reservoir & Tower)	each	2	7	6,164,000	55 Years
	Water Treatment Plant	each	7	7	4,398,642	16 Years
	Production Well	each	7	7	1,590,000	51 Years
	Monitoring Well	each	N/A	2	146,388	1 Year
	Other Facilities	each	2	2	903,566	31 Years
	Process Equipment	total	N/A	N/A	4,935,037	16 Years
Total Replacement Cost					**$81,328,311**	

2.3 Condition Assessment Approach

The assessment approach for our water assets utilizes a combination of physical assessments, asset attributes, such as material and sizing, as well as established anticipated useful lives.

The County's condition scale and visual inspection ratings are based on the following approach:

- Excellent - Asset is well maintained with no noticeable defects.
- Good - Asset may show signs of minor deterioration and may require some maintenance.
- Fair - Deterioration evident, function affected. Asset may require on-going monitoring.
- Poor - Serious deterioration, function inadequate. Asset may require ongoing monitoring.
- Critical - No longer functional, general or complete failure. Asset may require extensive monitoring.

Watermains are difficult to inspect due to the high pressure of water constantly flowing through them. Completing physical inspections would require disruptions to service, are time consuming and costly. The County will perform physical inspections on an as needed bases for large, critical pipes. There are also a number of new high tech, non-intrusive inspection techniques that the County continues to investigate.

Watermain breaks are helpful indicators of the condition of the pipe segment, as they can be used to predict pipe failure. The County tracks watermain breaks, and assigns them to their corresponding pipe segment, which assists in determining risk.

Water process assets are inspected by County staff on a regular basis as part the County's preventative maintenance program. These inspections identify performance and accelerated degradation and will trigger the creation of a reactive work order for repairs and rehabilitation. The County is working towards incorporating these inspections into a formalized condition rating. A visual inspection rating was provided for most water process assets as part of the data collection process in 2018 and 2019.

Given the complexities and accessibility of some assets, it is not beneficial to complete a visual or performance based condition assessment on all assets. For assets which are unable to be visually inspected or that have since been replaced, an age-based condition rating is being used based on anticipated useful lives.

2.4 Condition Assessment

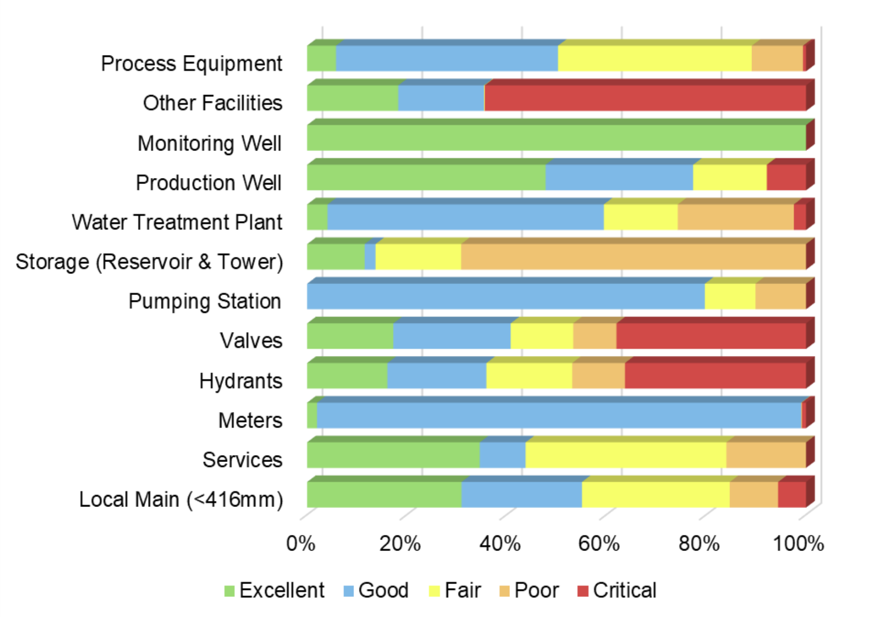
The condition profile of our Ingersoll water asset components is shown in figure 2.4.1. The % in each condition is based on replacement costs.

For the Ingersoll water assets: 23.2% of these assets are in poor or critical condition, and 48.7% in good or excellent condition in comparison to 6-9% and 67-74% respectively for Canadian municipalities reported on the Canadian Infrastructure Report Card[1]. While this may appear that our Ingersoll water assets are in worse shape than other Canadian municipalities, the 2019

[1] http://canadianinfrastructure.ca/en/index.html

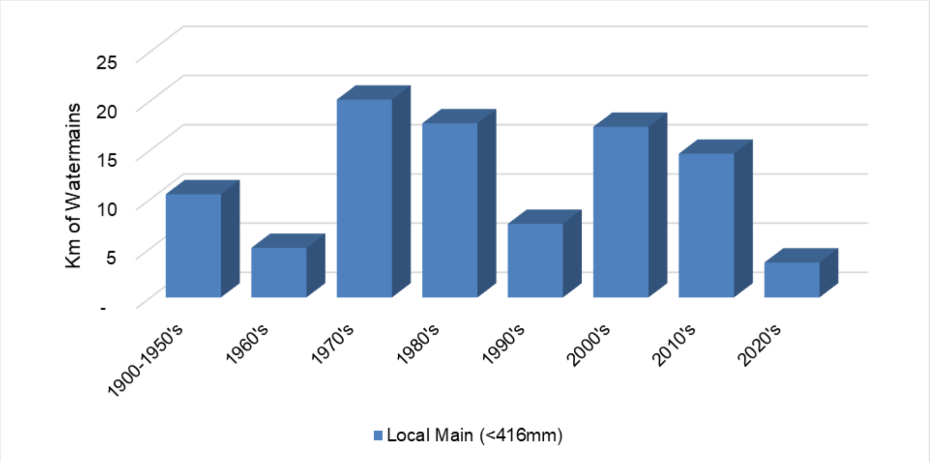
Canadian Infrastructure Report Card is an aggregate of self reported condition ratings across the Country and are based on a general rating scale which may not match the County's.

Figure 2.4.1 Asset Condition by Component



To better understand our water distribution assets, an age profile of all our watermains by decade is shown in Figure 2.4.2.

Figure 2.4.2 Watermains by Age



The average age of the majority of linear assets within the Ingersoll water system is approximately 36 years, whereas the average age of the vertical assets varies by facility type from 1 to 55 years. This value must be considered in the context of the different asset types in the category, compared to the typical anticipated useful life of each asset type.

Table 2.4.3 outlines the anticipated useful life for each new build/replacement. The anticipated useful lives for our water assets exclude the management strategies that the County utilizes to extend the overall life of our water assets.

Table 2.4.3 Useful Life

Water System Component	Anticipated Useful Life (years)
Local Main, Transmission Main, Services	90
Water Meter and Radio Transmitter	20
Hydrants, Main Line Valves	40
Facilities	10 - 50
Process Equipment	8 - 75

Figure 2.4.4 illustrates the current average age of the Ingersoll water system linear components in comparison to their anticipated useful life, based on a run to failure strategy.

As the vertical assets can have a significant variability in age, from both a facility and process standpoint, they are not represented within figure 2.4.4.

There are a number of management strategies that the County may utilize to extend the overall life of our water assets. These strategies allow us to align the needs with those of other assets, resulting in the best overall value for our residents.

Figure 2.4.4 Age and Useful Life Comparison

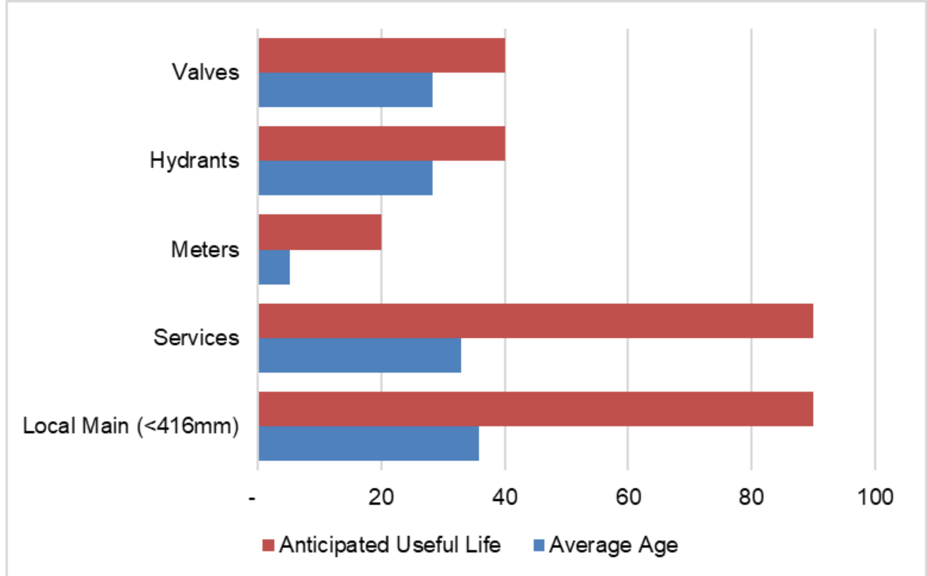


Table 2.4.5 compares the status of our Ingersoll water asset components, as identified in our 2017 Asset Management Plan to their current condition. The breakdown by component for vertical infrastructure was not available as of the date the 2017 report was published, so there is no condition comparison available. Work continues to be ongoing to further enhance the asset information at the component level.

The trend shows that the status of water assets for the Ingersoll system is steady to increasing. The County completed a meter replacement project, which resulted in the increase in overall condition rating. As the system continues to age it is expected that condition ratings will continue to decline until targeted lifecycle strategies are implemented.

Table 2.4.5 Water Systems Condition Assessment

Asset Type	Asset Component	2017 Condition Rating	Current Condition Rating	Trend
Linear	Local Main (<416mm)	Good	Good	→
	Transmission Main (>=416mm)	-	-	-
	Services	Fair	Good	→
	Meters	Critical	Good	↑
	Hydrants	Fair	Fair	→
	Valves	Critical	Fair	↑
Vertical	Pumping Station	Not assessed	Good	-
	Well – Pumphouse	-	-	-
	Storage (Reservoir & Tower)	Not assessed	Fair	-
	Water Treatment Plant	Not assessed	Fair	-
	Production Well	Not assessed	Good	-
	Monitoring Well	Not assessed	Excellent	-
	Other Facilities	Not assessed	Poor	-
	Process Equipment	Not assessed	Fair	-

3.0 Levels of Service

County staff have developed a comprehensive Level of Service (LOS) Framework. This framework will help to establish a relationship between the current LOS being provided by the County's assets, and the associated operating and capital expenditures required to achieve the proposed LOS. The framework puts into perspective the definition and measurement of service performance in alignment with the County's corporate mission and vision.

Corporate Objective

The County is committed to providing the appropriate quantity of water and quality water as it directly impacts the quality of life of customers by reducing the potential for water-borne disease, allowing for economic development and fire protection, and providing opportunities for recreational activities.

Legislative Requirements

The purpose of the *Safe Drinking Water Act, 2002*[2] is to recognize that the people of Ontario are entitled to expect their drinking water to be safe and to provide for the protection of human health and the prevention of drinking water health hazards through the control and regulation of drinking water systems and drinking water testing.

Ontario Regulation 170/03[3] provides specifications and reporting requirements regarding drinking water systems. Ontario Regulation 169/03[4] specifies the Ontario Drinking Water Quality Standards.

The DWQMS[5] requires an operating authority to document a quality management system for each municipal, year-round, residential drinking water system that it operates in an operational plan which must be accepted by the Ministry of the Environment and Climate Change.

Framework

The structure of the County's LOS framework was developed to align with international best practices including the International Infrastructure Management Manual (IPWEA, 2015). The framework includes the mandatory measures to meet the requirements of Ontario Regulation (O.Reg.) 588/17 by including both Community and Technical Levels of Service. The metrics in this framework may be expanded upon as the County continues to improve its data collection and reporting processes.

[2] https://www.ontario.ca/laws/statute/02s32
[3] https://www.ontario.ca/laws/regulation/030170#BK26
[4] https://www.ontario.ca/laws/regulation/030169
[5] https://www.ontario.ca/page/ontarios-drinking-water-quality-management-standard-pocket-guide

3.1 Customer Levels of Service

Community or Customer Levels of Service are statements that describe quantifiable metrics of the service delivery outcomes from the perspective of the customer, expressed in non-technical terms. The following statements form our qualitative descriptions of the customer level metrics required under O.Reg. 588/17.

The Ingersoll water system connects to most residential, commercial and industrial spaces in the settlement areas of Ingersoll, as outlined in figure 3.3.1. The Ingersoll water system provides for the safe treatment and distribution of water.

Fire flow protection is determined when a system is designed based on discussions with area municipalities. The minimum pipe size to allow for fire flow protection is 150mm, as such it is very difficult to implement fire flow after a system has been constructed. The Ingersoll water system was designed to accommodate the needs for fire flow protection.

Boil Water Advisories (BWA) are issued by the Medical Officer of Health to advise residents when bacteria or other microorganisms may be present in the municipal drinking water supply, making it unsafe to drink. During a BWA, residents are advised to boil their water before using it for drinking, washing or preparing food, and brushing teeth. Drinking Water Advisories (DWA) are issued by the Medical Officer of Health to advise residents to use an alternate water source, such as bottled water. A DWA would be issued during situations when boiling the water will not get rid of the problem, such as a chemical contamination.

Service interruptions are any event including emergency situations or planned and unplanned maintenance which may prevent residents from using their municipal drinking water supply. This includes; loss of power, contamination, transmission line or major watermain breaks or interruptions in service pressure

The County is constantly monitoring water quality and service to ensure minimal disruptions and compliance with the Ontario Drinking Water Quality Management Standard (DWQMS). In the event of a water quality issue or service disruption, a notice is issued to the affected area to ensure all users are aware and can take appropriate precautions.

The County has an objective to minimize water loss by detecting leakages and repairing them promptly.

Table 3.1.1 outlines additional customer focused performance metrics from the County's LOS framework.

3.2 Technical Levels of Service

Technical Levels of Service metrics are quantifiable metrics applied against assets that are subject-matter specific inputs or outputs supported by the day-to-day activities of County staff. Table 3.1.1 includes the technical metrics required under O.Reg. 588/17, as well as, additional metrics the County has included in the framework.

3.4 Levels of Service Maps

As a further illustrative example of our community levels of service, a map is included as figure 3.3.1 showing areas within the Town of Ingersoll boundary that are serviced by the Ingersoll water system.

Figure 3.3.1 Ingersoll water serviced properties

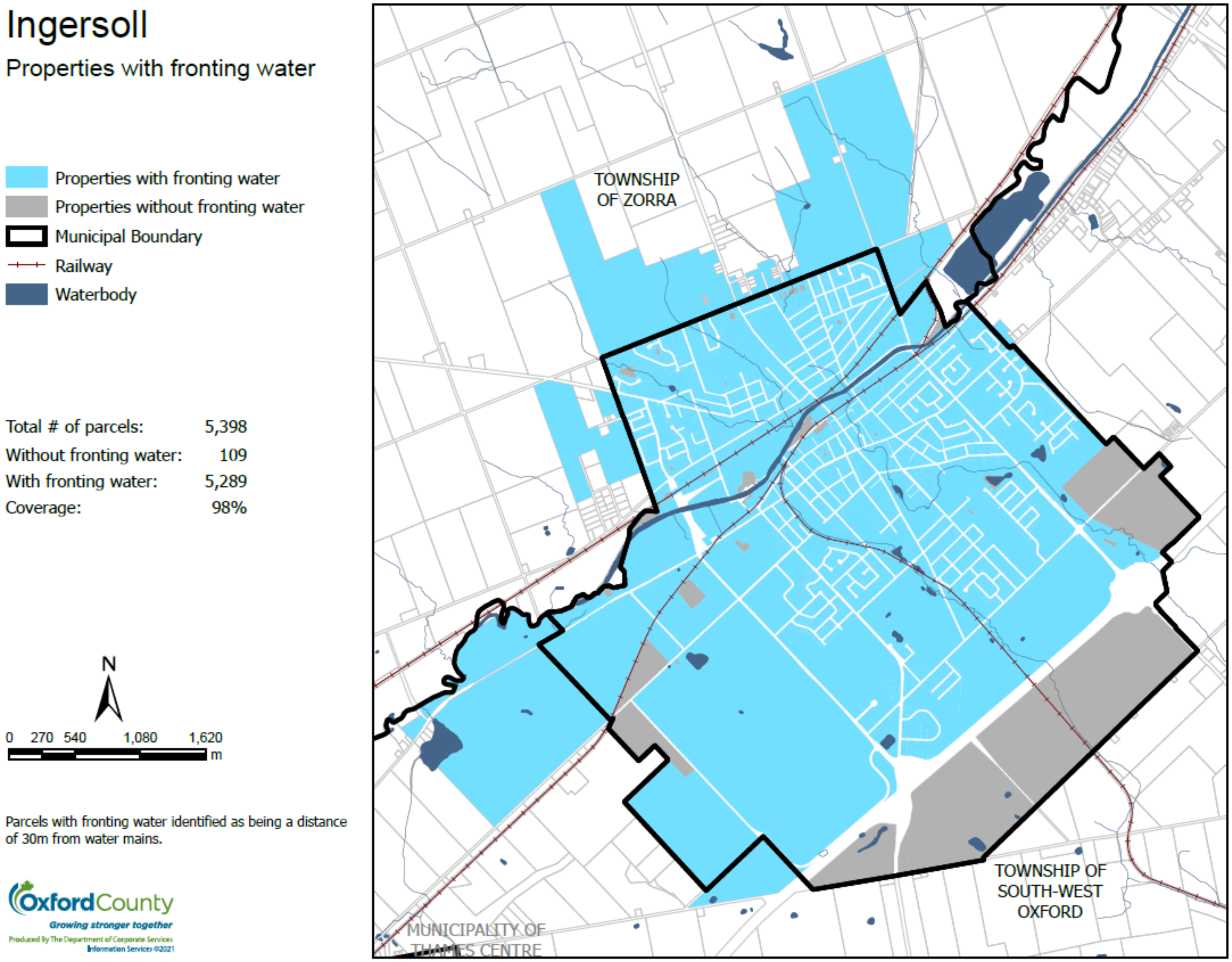


Table 3.1.1 Performance Measures

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Customer / Council Focused Performance Measures					
Safety	Providing efficient and safe drinking water and supports fire protection	% of properties within the system boundary connected to the municipal water system	N/A	98%	TBD
		% of properties where fire flow is available	100%	100%	TBD
Environmental Stewardship	Providing a water service that is environmentally conscious	# of days of restrictions per system	0	0	TBD
Cost Efficient	Providing water services in an efficient manner	Operating cost to provide service ($/connection)	$361	$372	TBD
Technical Focused Performance Measures					
Safety	Providing efficient and safe drinking water and supports fire protection	% of active hydrants flushed annually	100%	100%	TBD
		% of bacteriological samples compliant with all applicable water quality regulations	99.9%	100%	TBD
		% of active hydrants with a low flow rating	0%	0%	TBD
Quality	Providing high quality water to residents	% of system that is constructed with Cast Iron or Ductile Iron	59.87%	59.05%	0%
		% of watermains flushed	100%	100%	TBD
Reliability	Providing water services with minimal interruptions	# of Watermain breaks per 100 km's of watermain	7	5	TBD
		The number of connection-days per year where a boil water advisory notice is in place compared to the total number of properties connected to the municipal water system	0 connection-days compared to 5,170 connections	0 connection-days compared to 5,253 connections	TBD

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
		The number of connection-days per year due to watermain breaks compared to the total number of properties connected to the municipal water system	9.78 connection days compared to 5,170 connections	6.77 connection days compared to 5,253 connections	TBD
		% of Critical Main Line Valves Turned	77%	99%	100%
		% of Non-Critical Main Line Valves Turned	0%	0%	25%
Cost Efficient	Providing water services in an efficient manner	The operating costs per kilometer of water distribution pipe (distribution)	N/A	$9,584	TBD
		5 year Average capital expenditure for water treatment	$0.05M	$0.1M	TBD
		5 year Average capital expenditure for water distribution	$1.1M	$1.0M	TBD

4.0 Asset Management Strategy

4.1 Lifecycle Activities and Planned Actions

Distribution assets undergo regular maintenance and inspection. As part of capital works project analysis, determinations of whether water pipe replacement or relining should occur is reviewed. This process is fully integrated with the renewal needs of the roadways and other underground infrastructure, such as wastewater and stormwater. This integrated approach ensures our renewal projects for these service areas are delivered with optimal timing to increase value and minimize disruption to our communities. For example, if a roadway is targeted for renewal, coordination between service areas and area municipalities will determine whether the underlying stormwater, drinking water or wastewater infrastructure is also of an age or condition that requires renewal, to ensure these projects are delivered together to reduce disruption for our communities and deliver enhanced value.

Process assets and equipment undergo extensive operations and maintenance regimes to sustain their reliable operation. Investment needs are identified and coordinated with normal operations to minimize disruptions to service. Major replacements are planned and accommodated using system redundancy and changes to operations, in order to maintain service. It is critical to maintain water service in order to protect public health.

There are six main lifecycle activities considered in the overall sustainable management of water assets, described in table 4.1.1.

Table 4.1.1 Lifecycle Activities

Strategy	Lifecycle Activity
Non-Infrastructure Solutions	Actions or policies that can lower costs or extend useful lives. **Trigger: Ongoing**
Maintenance	Regularly scheduled maintenance and inspection programs including cleaning and flushing, hydrant flushing, pressure testing, visual inspections, lubricating and minor repairs. These activities do not improve the overall condition of the asset, nor increase its useful life. **Trigger: Ongoing**
Rehabilitation / Renewal	One-time events that increase the condition and extend the useful life of the asset; including watermain lining. **Trigger: Fair/Poor**
Replacement	Occurs at the end of the useful life and/or when rehabilitation is no longer an option – can vary among assets due to construction material and environmental factors that impact the degree of deterioration and performance. **Trigger: Poor/Critical**
Disposal	Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the County to provide services. County staff coordinate with contractors to ensure safe removal and environmental compliance when disposing of assets. **Trigger: Poor/Critical**
Expansion / Growth	Planned activities required to extend services to previously unserved areas, expand services to meet growth demands, or increase the level of service being provided. **Trigger: Development**

The lifecycle management strategy is the set of planned actions that should enable the assets to provide users with the proposed level of service in a sustainable way, while achieving acceptable levels of risk and the lowest lifecycle costs required to provide that level of service. Lifecycle considerations for assets include analysis of the timing to carry out key asset management activities including inspection, maintenance, repair, and replacement. Ongoing preventative maintenance activities are outlined in the County's work management system. The rehabilitation and replacement activities impacting the asset components condition and useful life are contained within profiles in the County's asset management system. For some assets, replacement needs are based on a run to failure strategy, as this is the most economical. Work is ongoing within the County's systems to build all the component profiles and identify where each asset is within the lifecycle.

As an example, figure 4.1.2 illustrates the lifecycle strategy of hydrants. The internal components of a hydrant can be replaced multiple times, extending the overall useful life from 40 years to approximately 80. The annual cost requirement from a run to failure strategy is $234 per year where the annual cost requirement using the rehabilitation strategies decreases to $196 per year.

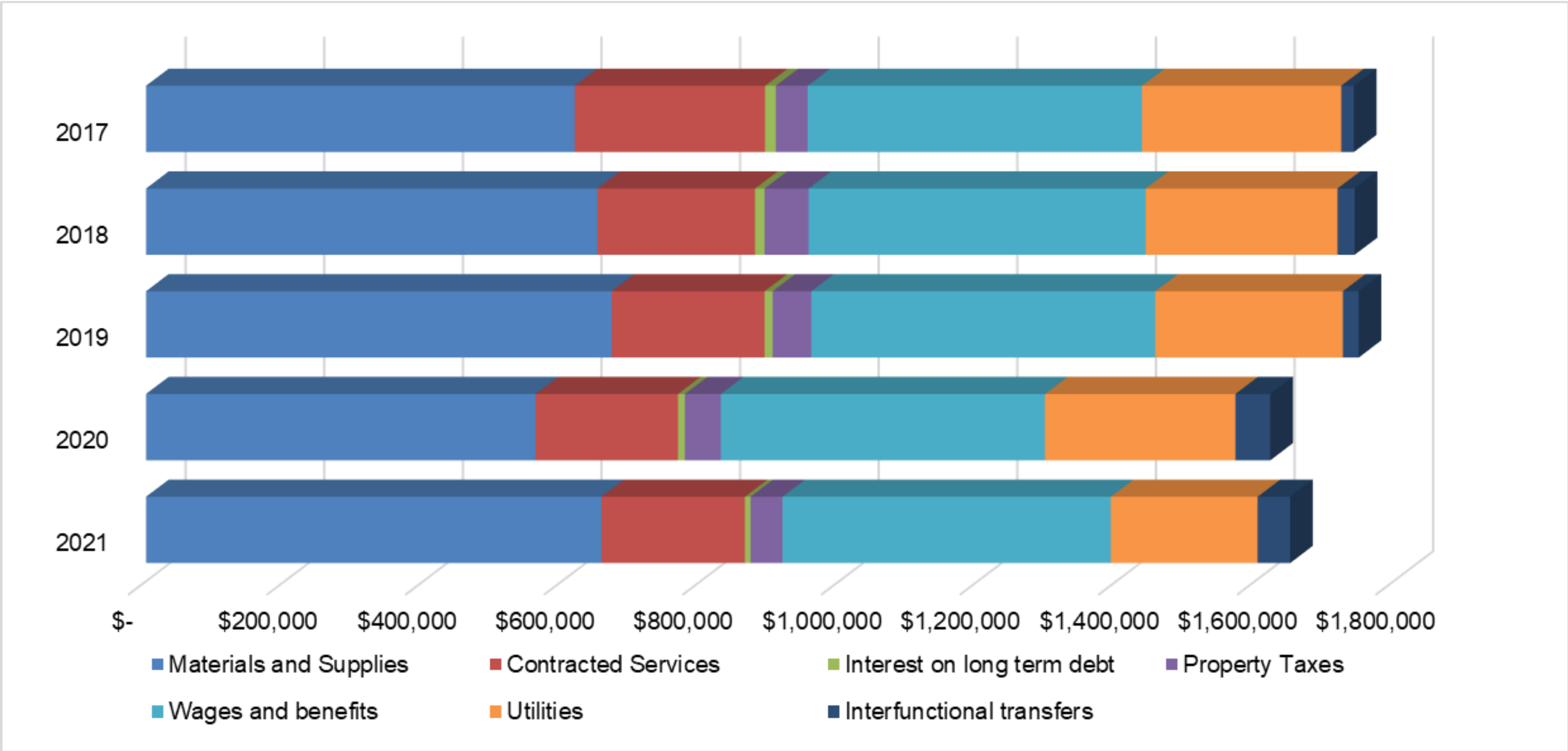
Figure 4.1.2 Hydrants Lifecycle Strategy

4.2 Significant Operating Expenses

Significant operating expenses are required in order to sustain an asset over its lifecycle. The County is always looking at ways to optimize our operating investment to ensure we are achieving the best value for our residents. Essential to this is a strong operations and maintenance plan within our work management system. Operating expenses are incurred through a number of sources – preventative maintenance activities, utility costs, property taxes and more. Despite the fact that minor maintenance is incorporated into planned operations and maintenance programs, there are cases where it is unplanned.

Figure 4.2.1 shows the operating expenses from 2017 through 2021 for the Ingersoll water system grouped by expense type. The groupings align with those reported on the County's Financial Information Return (FIR), with further breakdown for property taxes and utility costs as these expenses can be significant.

Figure 4.2.1 Operating Expenses



4.3 Risk Strategy

Risk management frameworks are developed to assist with the prioritization of investments within the capital planning period. The preferred approach is to implement a triple bottom line analysis approach to evaluate:

- Social impacts of asset failure, including impacts to customers, businesses and the County's reputation;
- Environmental impacts of asset failure; and
- Economic impacts of failure including the cost of remediation.

In the context of asset management, risk is the multiple of the consequence of an asset failing and the probability that the event will occur.

Figure 4.3.1 illustrates the risk ratings for the current Ingersoll water assets at a summary level. County staff will continue to monitor the higher risk assets, review and/or complete physical inspections to further validate the age-based condition ratings and plan for lifecycle strategies accordingly.

Figure 4.3.1 Asset risk profile

Consequence	1	2	3	4	5
5	1 Asset 1.00 unit(s) $4,261,500.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
3	3 Assets 1,453.27 m, unit(s) $3,576,635.00	7 Assets 1,616.12 m, unit(s) $3,545,560.00	6 Assets 4,066.27 m, unit(s) $8,603,041.00	2 Assets 801.00 unit(s) $3,100,000.00	1 Asset 1,539.09 m $615,636.00
2	46 Assets 6,790.08 m, unit(s) $3,645,109.00	96 Assets 5,510.00 m, unit(s) $3,534,474.00	86 Assets 10,074.93 m, unit(s) $5,492,488.00	33 Assets 1,969.70 m, unit(s) $1,042,339.00	114 Assets 1,682.10 m, unit(s) $1,586,323.09
1	1,017 Assets 22,635.77 m, unit(s) $11,840,395.00	757 Assets 21,469.44 m, unit(s) $11,855,399.00	518 Assets 17,582.51 m, unit(s) $9,632,164.00	223 Assets 3,385.37 m, unit(s) $2,857,961.00	597 Assets 7,832.27 m, unit(s) $6,129,787.18

Probability

5.0 Financial Strategy

5.1 Financing Strategy

Hemson Consulting Ltd. (Hemson) was retained through a competitive process to assist with analyzing and developing the County's water and wastewater rates for a 4-year period from 2021 to 2024. The rate modeling includes all system asset management needs and all sources of funding including Community Servicing Assistance Program (CSAP) funding, development charges, developer and resident contributions. In most cases, the capital replacement component is the average annual required contribution level in order to establish full cost recovery; however, the contribution may vary based on the system's ability to meet full cost recovery for the next 10-years.

Capital work is funded from reserves (based on the capital contribution included in the user rates), development charges (for growth projects) and grant funding when available. The County continually assesses opportunities for additional funding options and revenue streams to address our funding gaps.

Where possible, replacement activities are planned in conjunction with the replacement needs of the road network and underlying wastewater/stormwater infrastructure. This requires a co-ordinated effort with area municipalities as the majority of the County owned water and wastewater linear assets falls under the area municipalities' roads infrastructure. This collaboration is essential for ensuring a cost effective approach to maintaining assets within the County regardless of ownership.

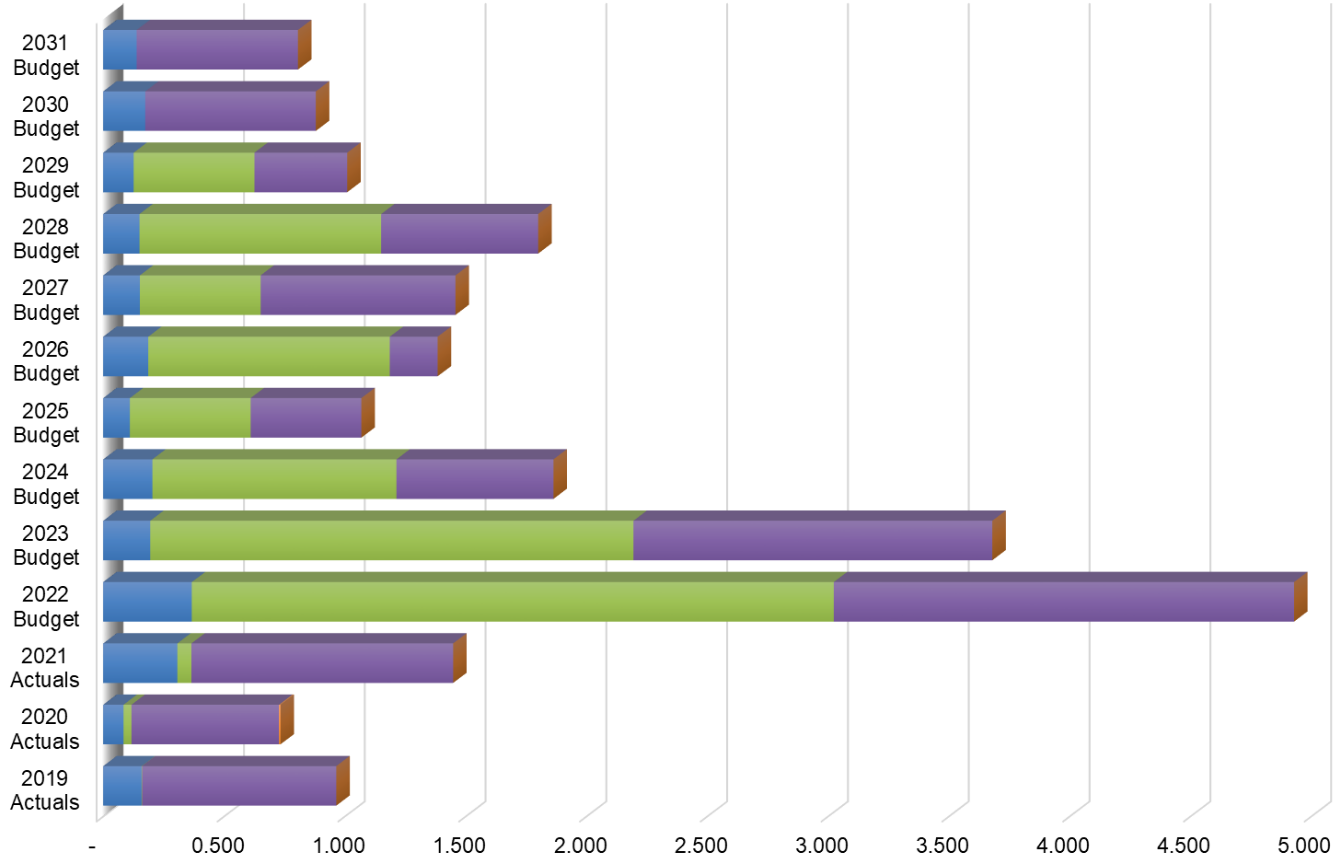
In addition to targeting and prioritizing the investment needed to maintain existing assets, there are also planning processes in place to determine the additional assets needed to meet growing demands through population increases or demand for new services. The projects targeted to meet growth are funded primarily through Development Charges (DC) – the mechanism that enables recovery of growth-related capital expenditures from new development. These charges are governed by the Development Charges Act and are applied in accordance with our Development Charges By-Law. Impacts from the growth activities analyzed in the 2019 DC Background Study are included in this AMP.

5.2 Expenditure History and Forecasts

The Ingersoll water system contains significant capital projects within the 10 year approved budget, as illustrated in figure 5.2.1. Linear asset replacements are ongoing, in conjunction with the local area municipal road construction projects. Minor process equipment replacements were included in the 2019 to 2025 budgets. County staff continue to review anticipated asset management needs with each budget cycle, subject to existing resource limitations.

Non-Infrastructure solution projects include shared projects for condition reviews, studies and implementation of the work management system.

Figure 5.2.1 Expenditures (millions)

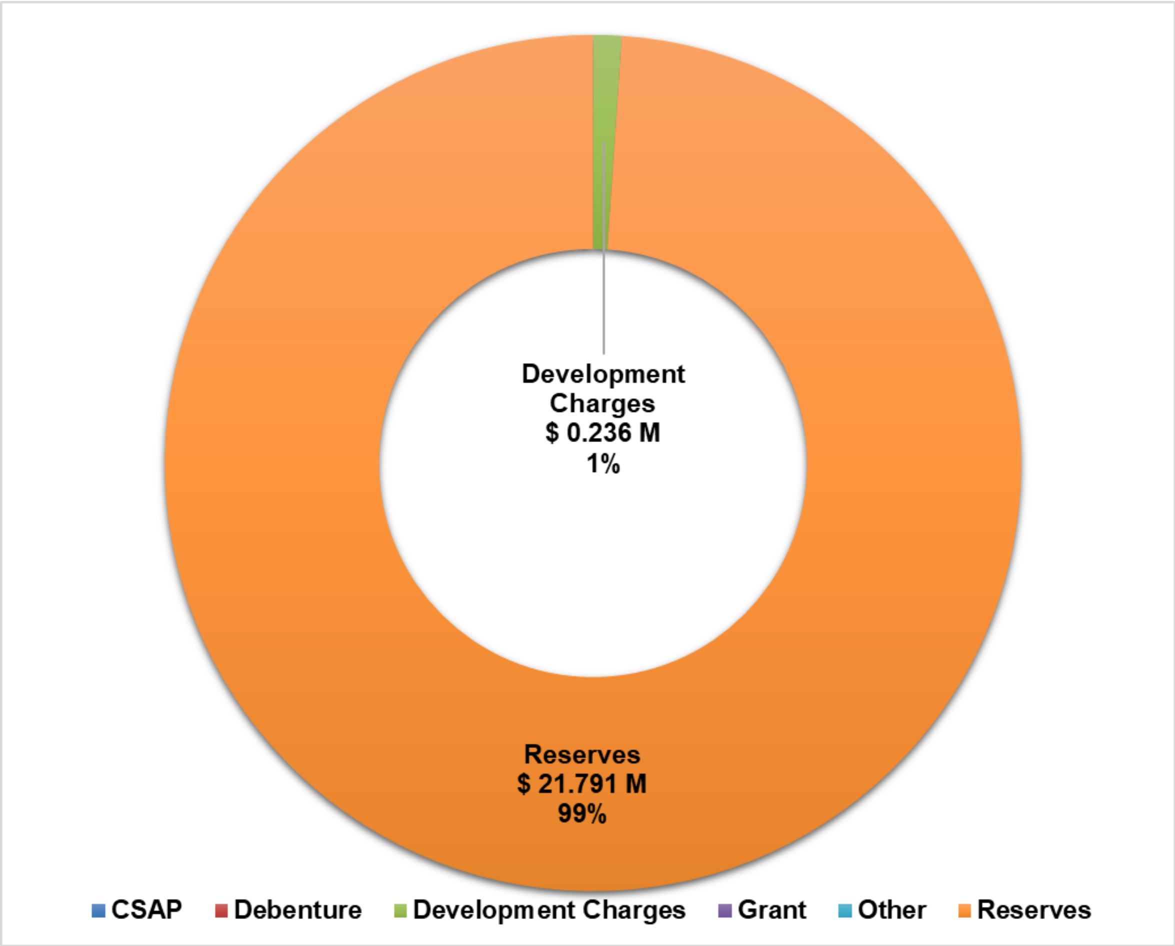


	2019 Actuals	2020 Actuals	2021 Actuals	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Non-Infrastructure Solution	0.159	0.084	0.307	0.367	0.195	0.204	0.110	0.186	0.152	0.150	0.126	0.174	0.138
Maintenance	-	-	-	-	-	-	-	-	-	-	-	-	-
Rehabilitation / Renewal	0.002	0.033	0.058	2.657	2.000	1.010	0.500	1.000	0.500	1.000	0.500	-	-
Replacement	0.804	0.611	1.083	1.905	1.486	0.650	0.458	0.198	0.807	0.650	0.384	0.706	0.668
Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-
Expansion / Growth	-	0.006	-	-	-	-	-	-	-	-	-	-	-

5.3 Capital Revenues

Replacement projects, identified in the County's 10-year capital plan, are anticipated to be funded by the Water – Ingersoll Reserve, which is funded by user fees. The Water – Ingersoll Reserve, including the anticipated capital contributions within the 10-year period, is sufficient to fund the 10-year related asset activities within the approved 2022 Long-Term Capital Plan.

Figure 5.3.1 Sources of Capital Revenues 2019-2031 (millions)



5.4 Capital Investment

Based on the asset management strategies identified, the financial requirements over the next 100-years are determined in current dollars. The average annual investment requirement represents the amount of capital funding required to renew and maintain the existing assets on an annual basis so services can continue to be delivered. These estimates assume that all work is able to be completed, as indicated, and does not take into account future changes due to environmental factors, new maintenance techniques, and unidentified growth. The annual requirement has increased from the 2017 AMP, primarily due to significant development and improvements the County has made to the vertical data, resulting in asset useful lives that are more reflective of their actual lifecycle. Further work is ongoing with the vertical data to fully determine lifecycle needs (including maintenance and rehabilitation strategies) which will impact the annual requirement for vertical assets. The data will continue to be reviewed with each budget and business plan cycle.

Figure 5.4.1 Average Annual Capital Requirements

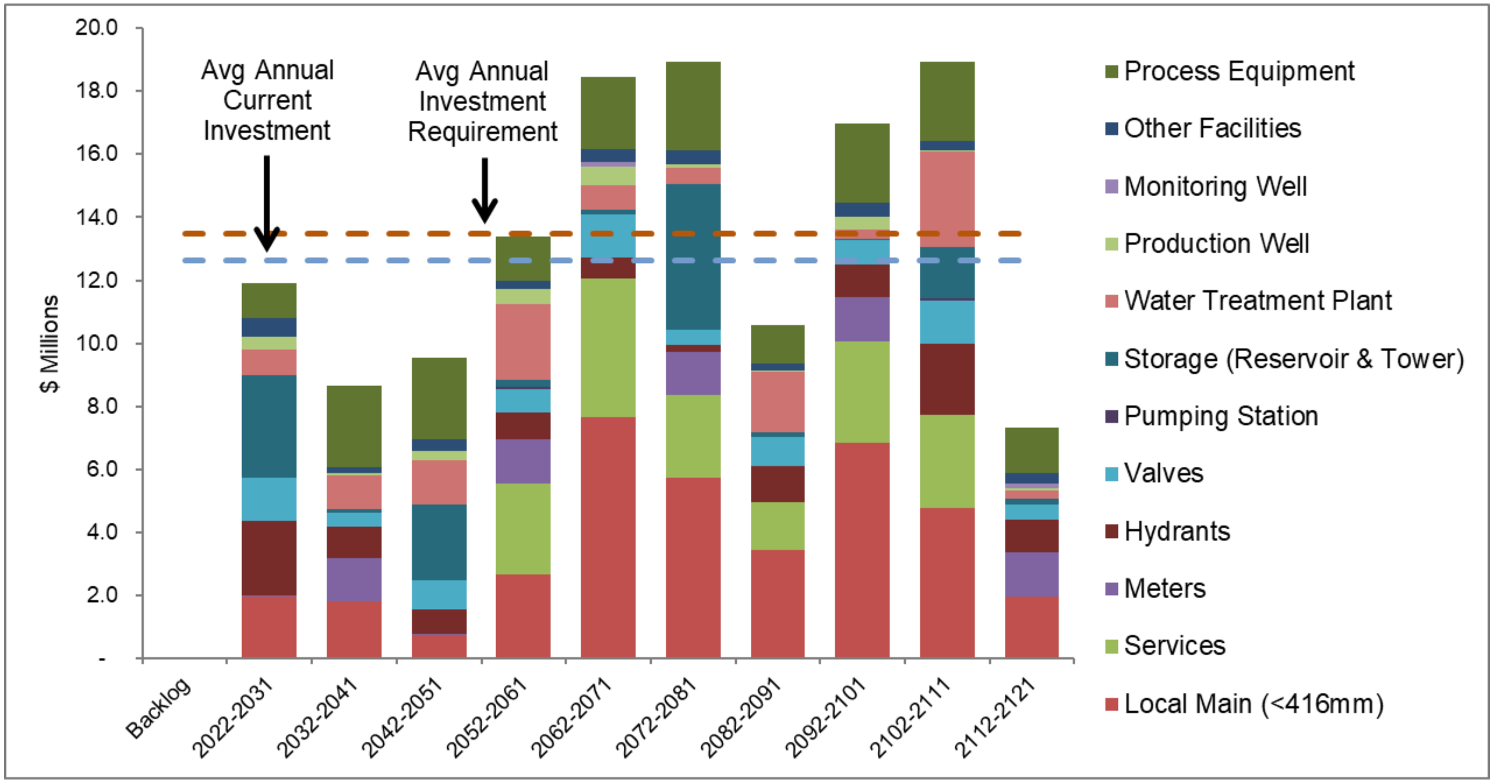
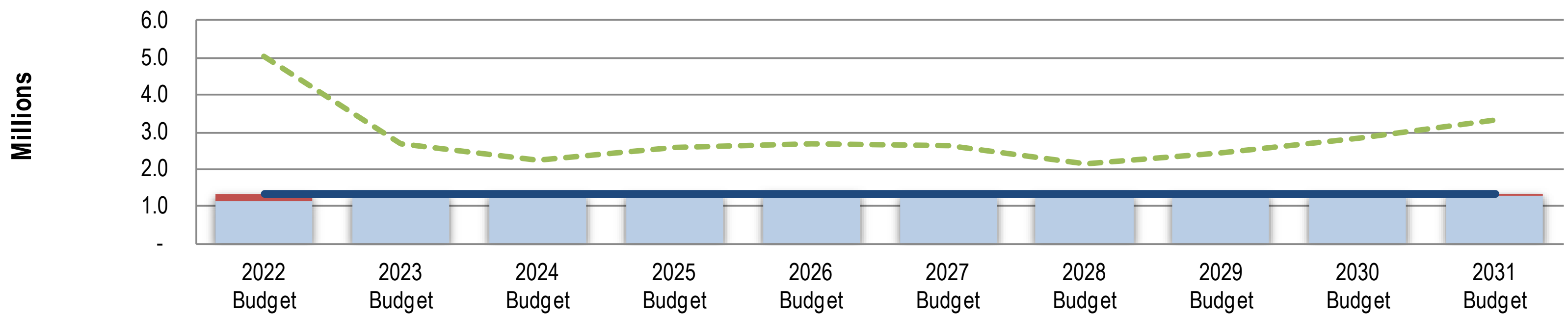


Figure 5.4.2 links the annual capital funding needs to the capital investments contained in the budget. The timing of the actual capital projects may vary, however annual investments in capital assets is important for financial sustainability.

Figure 5.4.2 Funding Requirements

	Key	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Annual Required Investment		**1,347,000**	**1,347,000**	**1,347,000**	**1,347,000**	**1,347,000**	**1,347,000**	**1,347,000**	**1,347,000**	**1,347,000**	**1,347,000**
Current Investment		1,158,411	1,211,635	1,302,888	1,289,822	1,315,295	1,271,925	1,269,902	1,269,064	1,271,803	1,275,386
Funding Deficit		*188,589*	*135,365*	*44,112*	*57,178*	*31,705*	*75,075*	*77,098*	*77,936*	*75,197*	*71,614*
Funding Surplus		-	-	-	-	-	-	-	-	-	-
Reserve Balance		5,059,249	2,675,084	2,235,803	2,582,980	2,672,366	2,649,317	2,164,396	2,438,973	2,852,073	3,338,198



5.5 Funding Gap Analysis

Using the anticipated 10-year asset lifecycle needs, along with the current capital investment level, the County is able to determine if there is an anticipated funding gap for the Ingersoll water system. Consideration is then given to the current system reserve balance to determine the residual funding gap. The County would then investigate opportunities for reducing this residual funding gap which, may include increases to the user rates, utilization of grant funding opportunities and further review of lifecycle strategies and proposed levels of service.

Figure 5.5.1 illustrates the anticipated asset management 10-year lifecycle needs, including the projected funding surplus (left side of figure 5.5.1) and funding needs (right side of figure 5.5.1) for the Ingersoll water system. The system calculates the optimal expenditures based on theoretical asset lifecycle needs. These needs have not yet been reviewed in depth with County operations staff, and incorporated into the 10-year capital budget. This is anticipated to be completed as part of the 2023 Business Plan and Budget process with subsequent review annually.

The anticipated expenditures have been increased for non-infrastructure solution projects; approximately $1.6 million.

While the anticipated expenditure calculation accounts for the lifecycle activities of expansion / growth projects it does not account for the initial investment. It is important to adjust for these projects, where the initial investment is growth related and not projected to be DC funded within the 10-year capital plan. There are no resulting growth/expansion projects added to the anticipated asset needs.

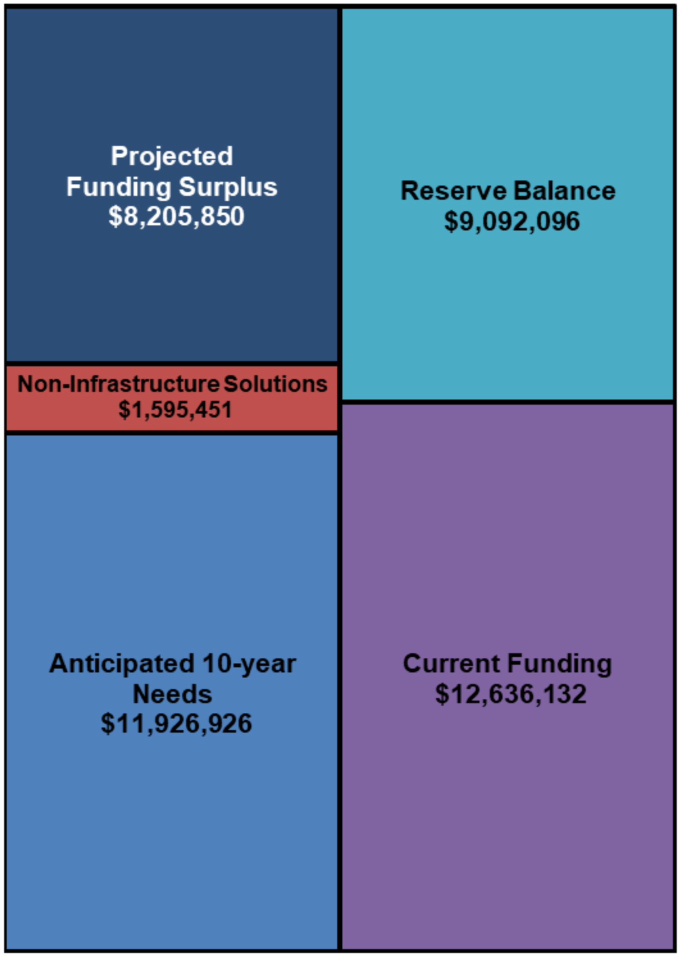
The Ingersoll water system is projecting a funding surplus over the 10-year capital planning period. Although the Ingersoll water system has a projected funding surplus over the 10-year horizon, the annual funding requirement is the basis for ensuring the long-term financial sustainability well into the future. The annual funding requirement will be reviewed holistically as part of the next rate study.

Drawing the reserve balance to zero would likely result in increased user fee requirements in the subsequent 10-year period in order to fund the anticipated asset lifecycle needs.

The reserve is also utilized to fund emergency or unplanned expenses. A minimal or fully committed balance would limit the ability to fund these types of expenses. Consideration needs to be given to a minimum balance the County should maintain based on these risks. Analysis of the reserve target minimum balance, will be completed as part of the annual reserve review process.

Failure to address the long-term asset lifecycle needs could result in significant increases to rates in the future as assets reach end of life; or reductions in localized and/or regional service. This may include watermain breaks causing localized service outages, quality advisories being issued, increased maintenance costs, stress on the County's ability to meet regulations, fines, increase in insurance claims for property damage and personal injury resulting from poor asset conditions, etc.

Figure 5.5.1 Anticipated Needs (10-Year)



6.0 Climate Change

As part of the asset management planning process, the County will consider the risks and vulnerabilities of capital assets to climate change and the resulting actions that may be required. Commitment will be made to the development of tailored actions that make the best use of our resources to mitigate and adapt to climate change, in accordance with our local reduction targets, financial capacity and stakeholder support.

Climate change risks are considered during the planning phase of each capital project. Considerations to increasing infrastructure resiliency and adapting to climate change may include the following:

- use of backup power generation,
- redundancies with critical equipment,
- use of SCADA to collect accurate information and make informed decisions,
- conducting inspections and studies to identify problem areas and complete repairs.

WATER SYSTEM

Townships

Table of Contents

1.0 Introduction

The County maintains a diverse portfolio of assets necessary to produce and supply safe and clean drinking water. The county maintains a drinking water Quality Management System that demonstrates continued compliance with drinking water regulations and the County's commitment to continual improvement in the provision of a safe, reliable and sustainable supply of drinking water for its residents and businesses.

The Townships water system is comprised of 14 individual water systems. The Bright, Brownsville, Drumbo-Princeton, Embro, Innerkip, Lakeside, Mount Elgin, Oxford South, Plattsville, Tavistock and Thamesford water systems are all a Large Municipal Water system as defined by Ontario Regulation (O.Reg.) 170/03, whereas Beachville, Dereham Centre and Hickson are all considered Small Municipal Water systems.

Each water system consists of water treatment plant(s) (WTP), housing high lift pumps, monitoring equipment and treatment equipment for the production wells. Each WTP also includes varying types of disinfection and filtration treatment specific for each location.

The water distribution network transports potable drinking water to homes and businesses. The distribution network consists of watermains, services, hydrants, valves, meters, pressure boosting stations, reservoirs, and water towers.

Sound management of our water systems helps us realize our vision of being a vibrant community, working well and growing stronger together!

Like many of our assets, water assets are facing increased challenges as a result of aging assets, climate change, increasing demand due to growth in our communities and regulatory changes. Our investment in these assets must therefore be balanced to optimize investment for renewal with the growing needs of our community.

This plan provides information regarding our approach to the management of our water assets over the short (10-year) and long (100-year) term, demonstrating our commitment to assessing and meeting the levels of service valued by our residents and businesses.

1.1 Improvement Plan

The County recognizes that asset management is a continuously evolving process. The following recommendations are based on the review of current management practices, inventory, valuation and condition analysis.

- Document lifecycle history on assets within the asset management systems.
- Continue to work to reduce asset data gaps.
- Determine asset components and maintenance strategies for facilities and associated processes.
- Refine the risk assessment approach at the component level, including the incorporation of watermain break data.
- Incorporate findings from the Water and Wastewater Master Plan.

2.0 State of Assets

2.1 Inventory

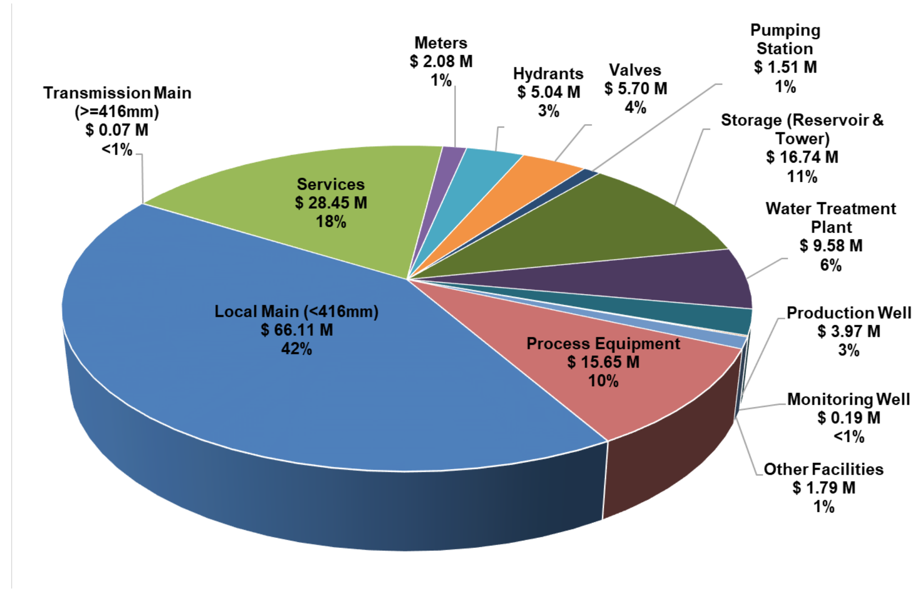
Water assets are those that contribute to community wellbeing by providing safe, potable drinking water in the interest of protecting public health and the quantity and pressure of water needed for fire protection. It includes everything from the watermains that service our homes and businesses throughout the County, the hydrants which provide water for fire services, to the wells and treatment plants which ensure that our water is safe and available.

We have two different asset classes within the water portfolio in order to effectively treat and distribute water to our community:

- Linear, which represent the distribution pipe network, including the valves, hydrants, connectors and related parts required in such a network.
- Vertical, which represent facilities (including the multiple buildings and structures that the facilities are comprised of), and related process systems and equipment required to perform the needed functions.

Table 2.1.2 displays our current water inventory and the associated replacement costs and average age for each asset component. The County continues to make improvements to increase the integrity of our water data. The inventory figures below capture inventory within newly constructed subdivisions which the County is aware of and anticipates assuming ownership of. The County generally assumes ownership of these assets approximately two years after full operation. It is important to include this new growth infrastructure to ensure that lifecycle activities are planned and funded accordingly.

Figure 2.1.1 Inventory Valuation



2.2 Valuation

The replacement cost valuation for water linear is based on current tender prices, where available. Current tender prices are adjusted where County staff feel some cost increases are only temporary due to COVID.

The replacement cost valuation for water vertical is based on the latest information available, which includes current replacement costs, insurance valuations, and valuations from studies / assessments completed in prior years.

Table 2.1.2 – Townships Water System Inventory

Asset Type	Asset Component		2017 Inventory	Current Inventory	Replacement Cost	Average Age
Linear	Local Main (<416mm)	m	182,651	196,908	$66,108,934	24 Years
	Transmission Main (>=416mm)	m	166	134	67,120	17 Years
	Services	each	7,318	8,128	28,448,000	23 Years
	Meters	each	5,451	7,576	2,083,400	5 Years
	Hydrants	each	500	531	5,044,500	24 Years
	Valves	each	1,510	1,613	5,704,200	23 Years
Vertical	Pumping Station	each	8	8	1,506,183	18 Years
	Well – Pumphouse	each	-	-	-	-
	Storage (Reservoir & Tower)	each	13	16	16,743,500	21 Years
	Water Treatment Plant	each	17	17	9,584,233	21 Years
	Production Well	each	32	34	3,970,000	31 Years
	Monitoring Well	each	N/A	5	190,000	11 Years
	Other Facilities	each	6	8	1,793,218	13 Years
	Process Equipment	total	N/A	N/A	15,648,410	16 Years
Total Replacement Cost					**$156,891,698**	

There are several growth / expansion projects planned in the Townships water system that are included in the County's 2022 approved Long-Term Capital Plan. This includes a new well and pumphouse (approximately $1.4 million including related process equipment) new process equipment for manganese filtration (approximately $11.8 million), a new materials and equipment storage building, to facilitate water and wastewater operator response times (approximately $0.3[1] million) and linear expansion of local mains (approximately $1.6 million). These growth projects are not included in the figures within table 2.1.2, however their anticipated lifecycle needs are included within this AMP.

[1] Townships Water System Share

2.3 Condition Assessment Approach

The assessment approach for our water assets utilizes a combination of physical assessments, asset attributes, such as material and sizing, as well as established anticipated useful lives.

The County's condition scale and visual inspection ratings are based on the following approach:

- Excellent - Asset is well maintained with no noticeable defects.
- Good - Asset may show signs of minor deterioration and may require some maintenance.
- Fair - Deterioration evident, function affected. Asset may require on-going monitoring.
- Poor - Serious deterioration, function inadequate. Asset may require ongoing monitoring.
- Critical - No longer functional, general or complete failure. Asset may require extensive monitoring.

Watermains are difficult to inspect due to the high pressure of water constantly flowing through them. Completing physical inspections would require disruptions to service, are time consuming and costly. The County will perform physical inspections on an as needed bases for large, critical pipes. There are also a number of new high tech, non-intrusive inspection techniques that the County continues to investigate.

Watermain breaks are helpful indicators of the condition of the pipe segment, as they can be used to predict pipe failure. The County tracks watermain breaks, and assigns them to their corresponding pipe segment, which assists in determining risk.

Water process assets are inspected by County staff on a regular basis as part the County's preventative maintenance program. These inspections identify performance and accelerated degradation and will trigger the creation of a reactive work order for repairs and rehabilitation. The County is working towards incorporating these inspections into a formalized condition rating. A visual inspection rating was provided for most water process assets as part of the data collection process in 2018 and 2019.

Given the complexities and accessibility of some assets, it is not beneficial to complete a visual or performance based condition assessment on all assets. For assets which are unable to be visually inspected or that have since been replaced, an age-based condition rating is being used based on anticipated useful lives.

2.4 Condition Assessment

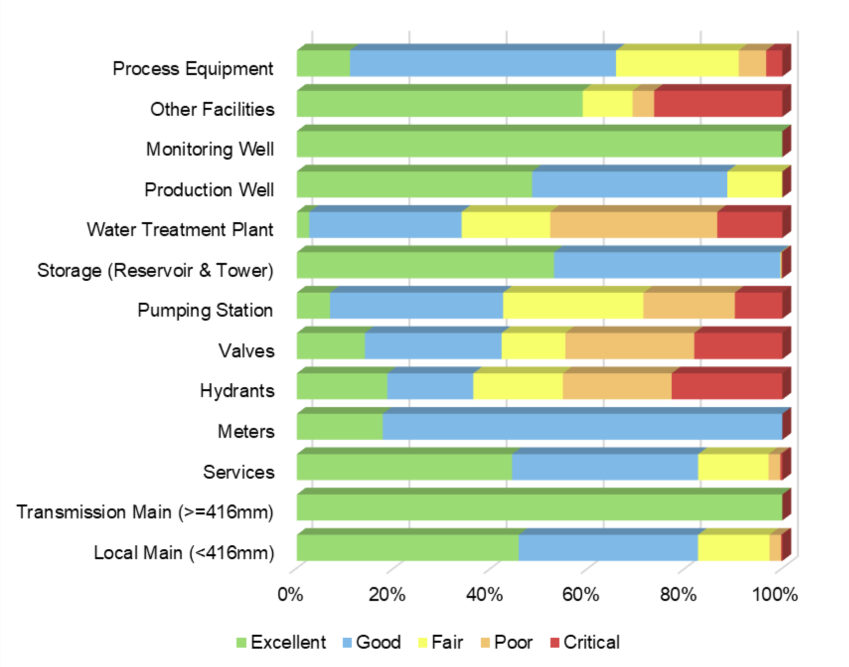
The condition profile of our Townships water asset components is shown in figure 2.4.1. The % in each condition is based on replacement costs.

For the Townships water assets: 9.2% of these assets are in poor or critical condition, and 76.6% in good or excellent condition in comparison to 6-9% and 67-74% respectively for Canadian municipalities reported on the Canadian Infrastructure Report Card[2]. While this may appear that our Townships water assets are in comparable shape to other Canadian municipalities, the

[2] http://canadianinfrastructure.ca/en/index.html

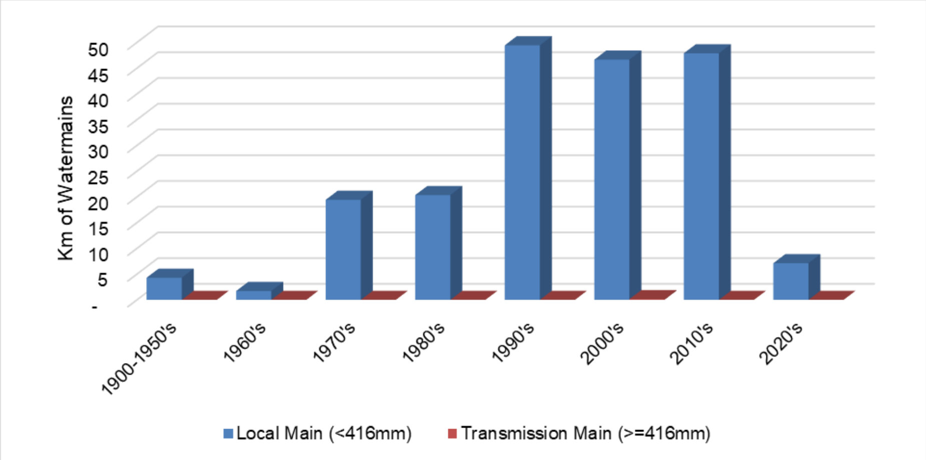
2019 Canadian Infrastructure Report Card is an aggregate of self reported condition ratings across the Country and are based on a general rating scale which may not match the County's.

Figure 2.4.1 Asset Condition by Component



To better understand our Townships water distribution assets, an age profile of all our watermains by decade is shown in Figure 2.4.2.

Figure 2.4.2 Watermains by Age



The average age of the majority of linear assets within the Townships water system is approximately 24 years, whereas the average age of the vertical assets varies by facility type from 11 to 31 years. This value must be considered in the context of the different asset types in the category, compared to the typical anticipated useful life of each asset type.

Table 2.4.3 outlines the anticipated useful life for each new build/replacement. The anticipated useful lives for our water assets exclude the management strategies that the County utilizes to extend the overall life of our water assets.

Table 2.4.3 Useful Life

Water System Component	Anticipated Useful Life (years)
Local Main, Transmission Main, Services	90
Water Meter and Radio Transmitter	20
Hydrants, Main Line Valves	40
Facilities	10 - 50
Process Equipment	8 - 75

Figure 2.4.4 illustrates the current average age of the Townships water system linear components in comparison to their anticipated useful life, based on a run to failure strategy.

As the vertical assets can have a significant variability in age, from both a facility and process standpoint, they are not represented within figure 2.4.4.

There are a number of management strategies that the County may utilize to extend the overall life of our water assets. These strategies allow us to align the needs with those of other assets, resulting in the best overall value for our residents.

Figure 2.4.4 Age and Useful Life Comparison

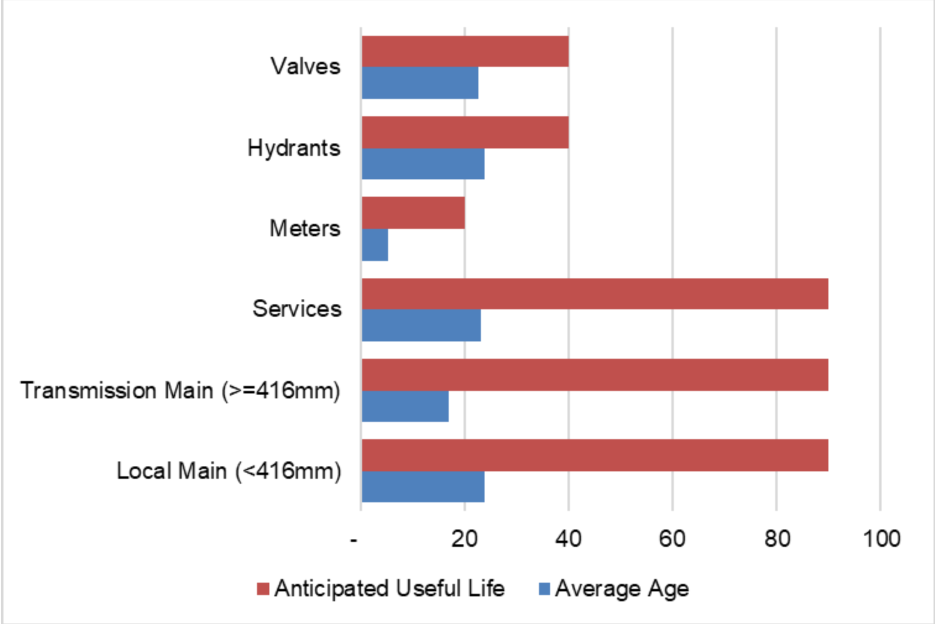


Table 2.4.5 compares the status of our Township water asset components, as identified in our 2017 Asset Management Plan to their current condition. The breakdown by component for vertical infrastructure was not available as of the date the 2017 report was published, so there is no condition comparison available. Work continues to be ongoing to further enhance the asset information at the component level.

The trend shows that the status of water assets for the Townships system is steady to declining. The decline in condition is commiserate with the aging of these assets. As the system continues to age it is expected that condition ratings will continue to decline until targeted lifecycle strategies are implemented.

Table 2.4.5 Water Systems Condition Assessment

Asset Type	Asset Component	2017 Condition Rating	Current Condition Rating	Trend
Linear	Local Main (<416mm)	Excellent	Good	↓
	Transmission Main (>=416mm)	Excellent	Excellent	→
	Services	Good	Good	→
	Meters	Excellent	Good	↓
	Hydrants	Good	Fair	↓
	Valves	Fair	Fair	→
Vertical	Pumping Station	Not assessed	Fair	-
	Well – Pumphouse	-	-	-
	Storage (Reservoir & Tower)	Not assessed	Good	-
	Water Treatment Plant	Not assessed	Fair	-
	Production Well	Not assessed	Good	-
	Monitoring Well	Not assessed	Excellent	-
	Other Facilities	-	Good	-
	Process Equipment	Not assessed	Good	-

3.0 Levels of Service

County staff have developed a comprehensive Level of Service (LOS) Framework. This framework will help to establish a relationship between the current LOS being provided by the County's assets, and the associated operating and capital expenditures required to achieve the proposed LOS. The framework puts into perspective the definition and measurement of service performance in alignment with the County's corporate mission and vision.

Corporate Objective

The County is committed to providing the appropriate quantity of water and quality water as it directly impacts the quality of life of customers by reducing the potential for water-borne disease, allowing for economic development and fire protection, and providing opportunities for recreational activities.

Legislative Requirements

The purpose of the *Safe Drinking Water Act, 2002*[3] is to recognize that the people of Ontario are entitled to expect their drinking water to be safe and to provide for the protection of human health and the prevention of drinking water health hazards through the control and regulation of drinking water systems and drinking water testing.

Ontario Regulation 170/03[4] provides specifications and reporting requirements regarding drinking water systems. Ontario Regulation 169/03[5] specifies the Ontario Drinking Water Quality Standards.

The DWQMS[6] requires an operating authority to document a quality management system for each municipal, year-round, residential drinking water system that it operates in an operational plan which must be accepted by the Ministry of the Environment and Climate Change.

Framework

The structure of the County's LOS framework was developed to align with international best practices including the International Infrastructure Management Manual (IPWEA, 2015). The framework includes the mandatory measures to meet the requirements of Ontario Regulation (O.Reg.) 588/17 by including both Community and Technical Levels of Service. The metrics in this framework may be expanded upon as the County continues to improve its data collection and reporting processes.

[3] https://www.ontario.ca/laws/statute/02s32
[4] https://www.ontario.ca/laws/regulation/030170#BK26
[5] https://www.ontario.ca/laws/regulation/030169
[6] https://www.ontario.ca/page/ontarios-drinking-water-quality-management-standard-pocket-guide

3.1 Customer Levels of Service

Community or Customer Levels of Service are statements that describe quantifiable metrics of the service delivery outcomes from the perspective of the customer, expressed in non-technical terms. The following statements form our qualitative descriptions of the customer level metrics required under O.Reg. 588/17.

The Townships water system is comprised of 14 rural systems connecting to most residential, commercial and industrial spaces within each settlement areas, as outlined in figures 3.3.1 through 3.4.5. The Townships water system provides for the safe treatment and distribution of water.

Fire flow protection is determined when a system is designed based on discussions with area municipalities. The minimum pipe size to allow for fire flow protection is 150mm, as such it is very difficult to implement fire flow after a system has been constructed. Communities that were not designed for fire flow coverage include, Beachville, Bright, Brownsville, Dereham Center, Drumbo/Princeton, Embro, Innerkip, Hickson, Lakeside, Mt Elgin, Springford, and Sweaburg. The communities of Norwich, Plattsville, Otterville, Tavistock and Thamesford were designed for fire flow.

Boil Water Advisories (BWA) are issued by the Medical Officer of Health to advise residents when bacteria or other microorganisms may be present in the municipal drinking water supply, making it unsafe to drink. During a BWA, residents are advised to boil their water before using it for drinking, washing or preparing food, and brushing teeth. Drinking Water Advisories (DWA) are issued by the Medical Officer of Health to advise residents to use an alternate water source, such as bottled water. A DWA would be issued during situations when boiling the water will not get rid of the problem, such as a chemical contamination.

Service interruptions are any event including emergency situations or planned and unplanned maintenance which may prevent residents from using their municipal drinking water supply. This includes; loss of power, contamination, transmission line or major watermain breaks or interruptions in service pressure

The County is constantly monitoring water quality and service to ensure minimal disruptions and compliance with the Ontario Drinking Water Quality Management Standard (DWQMS). In the event of a water quality issue or service disruption, a notice is issued to the affected area to ensure all users are aware and can take appropriate precautions.

The County has an objective to minimize water loss by detecting leakages and repairing them promptly.

Table 3.1.1 outlines additional customer focused performance metrics from the County's LOS framework.

3.2 Technical Levels of Service

Technical Levels of Service metrics are quantifiable metrics applied against assets that are subject-matter specific inputs or outputs supported by the day-to-day activities of County staff. Table 3.1.1 includes the technical metrics required under O.Reg. 588/17, as well as, additional metrics the County has included in the framework.

3.3 Levels of Service Maps

As a further illustrative example of our community levels of service, maps are included as figures 3.3.1 through 3.3.5 showing areas within each village boundary that are serviced by the water system.

Figure 3.3.1 Township of Blandford-Blenheim serviced properties

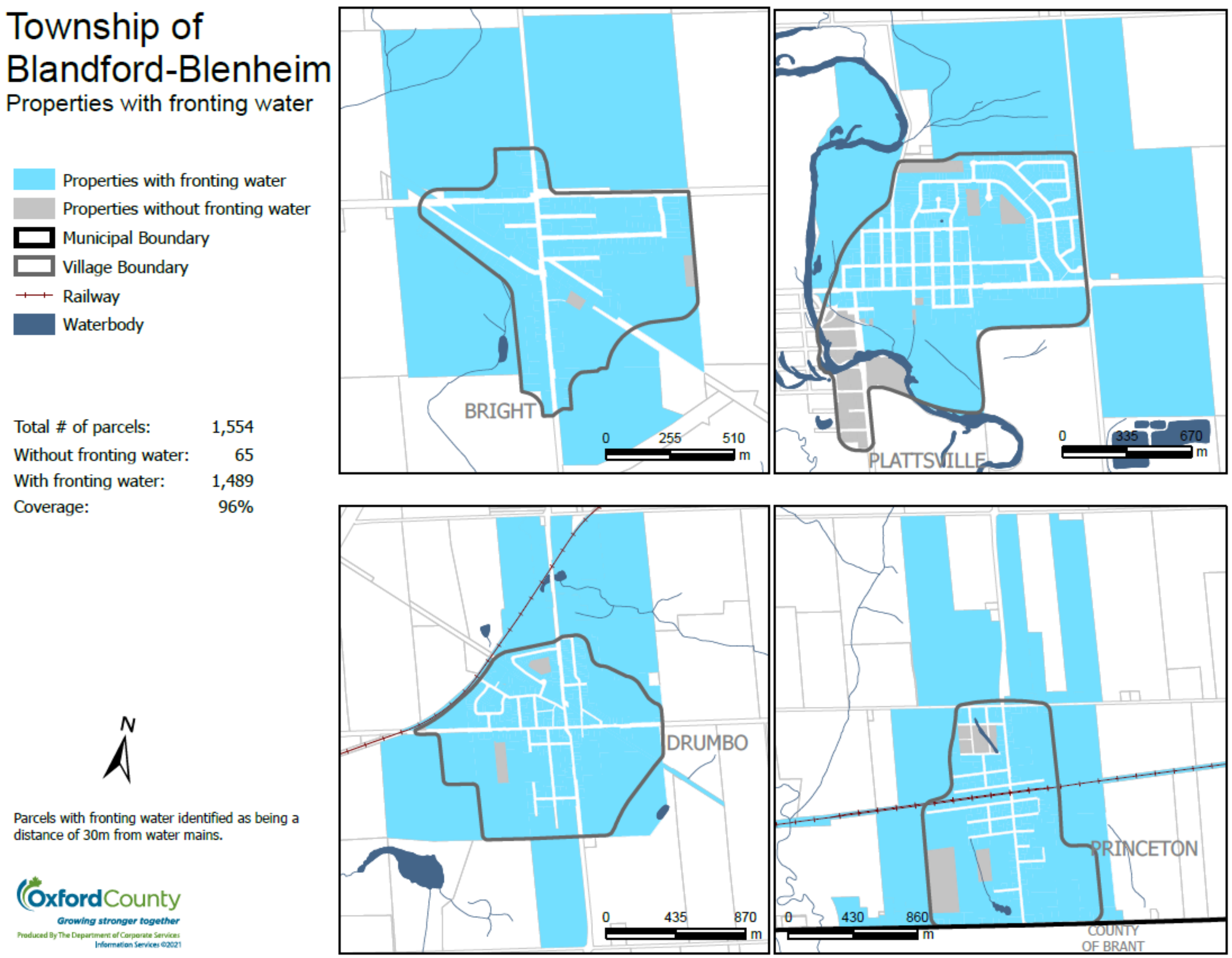


Figure 3.3.2 Township of East Zorra-Tavistock serviced properties

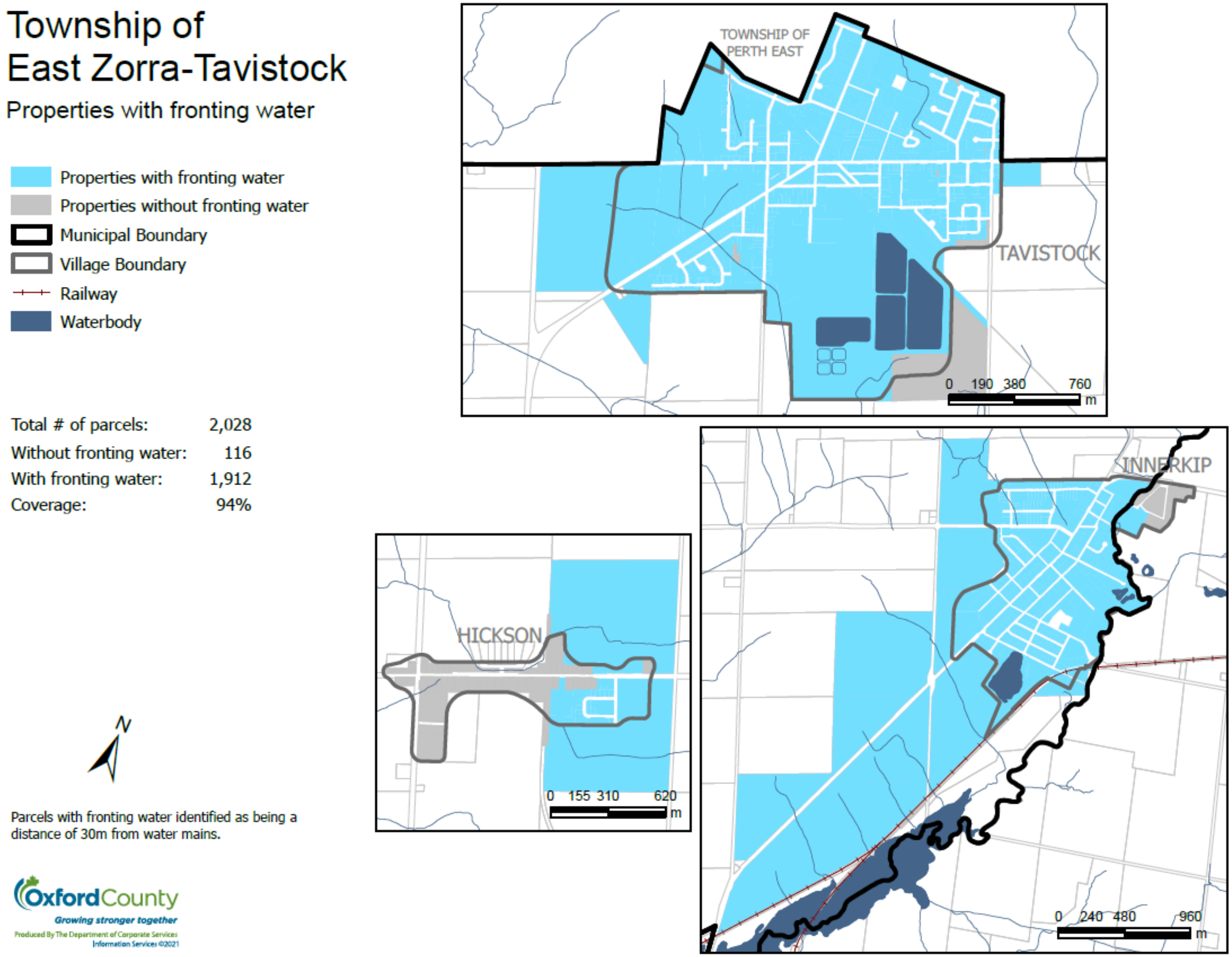


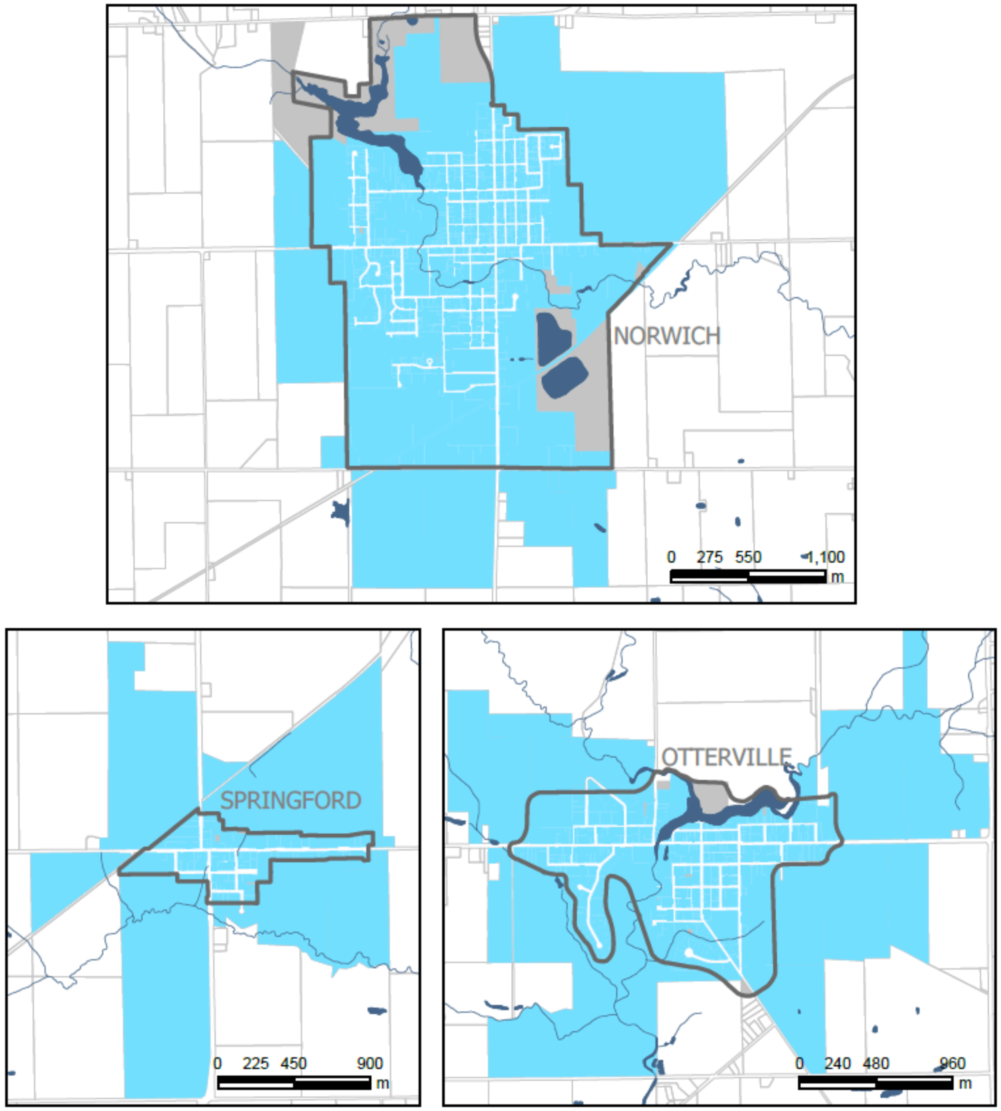
Figure 3.3.3 Township of Norwich serviced properties

Township of Norwich

Properties with fronting water

- Properties with fronting water
- Properties without fronting water
- Municipal Boundary
- Village Boundary
- Railway
- Waterbody

Total # of parcels:	2,125
Without fronting water:	30
With fronting water:	2,095
Coverage:	99%



N

Parcels with fronting water identified as being a distance of 30m from water mains.

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Figure 3.3.4 Township of South-West Oxford serviced properties

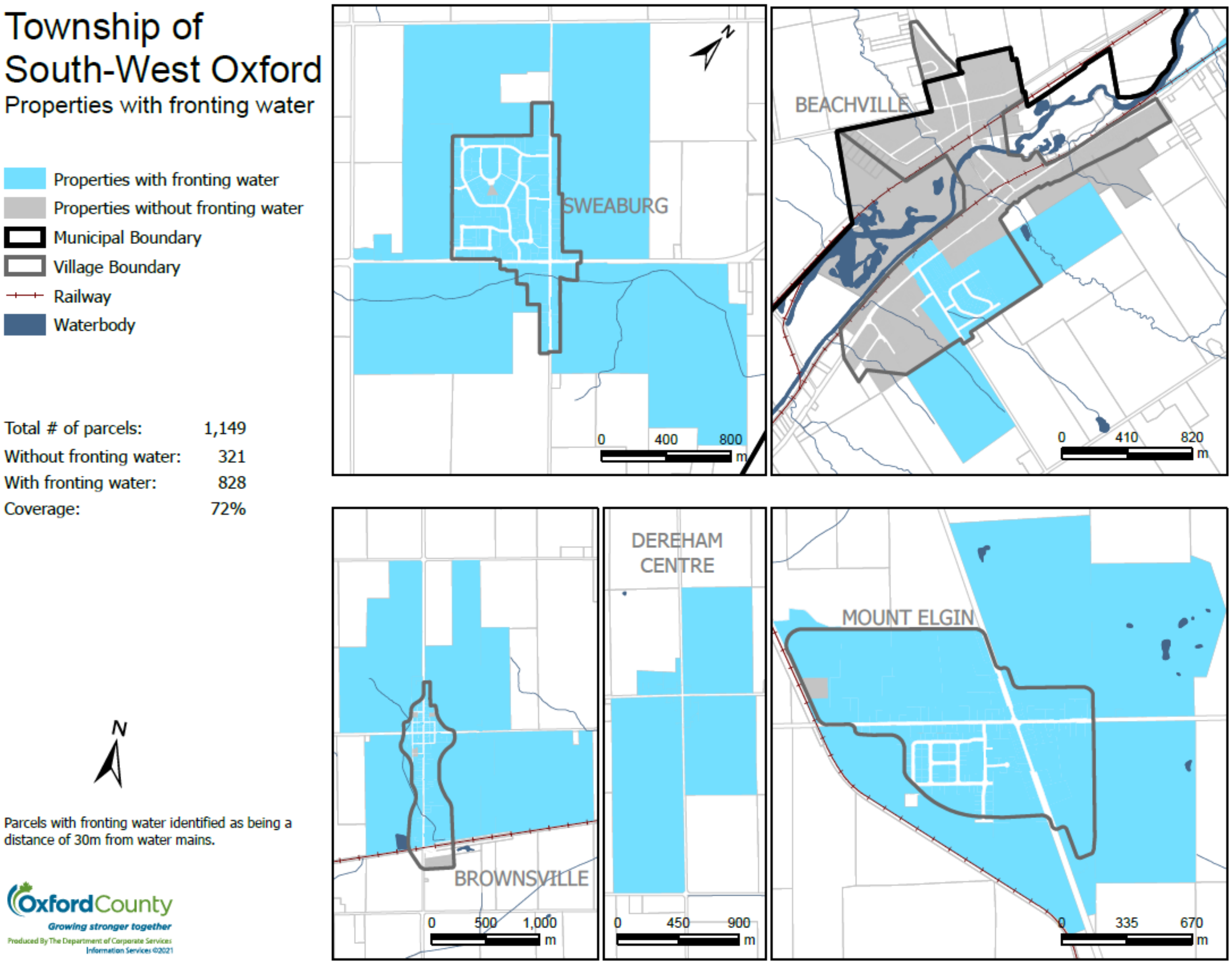

Figure 3.3.5 Township of Zorra serviced properties

Township of Zorra

Properties with fronting water

- Properties with fronting water
- Properties without fronting water
- Municipal Boundary
- Village Boundary
- Railway
- Waterbody

Total # of parcels:	1,707
Without fronting water:	30
With fronting water:	1,677
Coverage:	98%

N

Parcels with fronting water identified as being a distance of 30m from water mains.

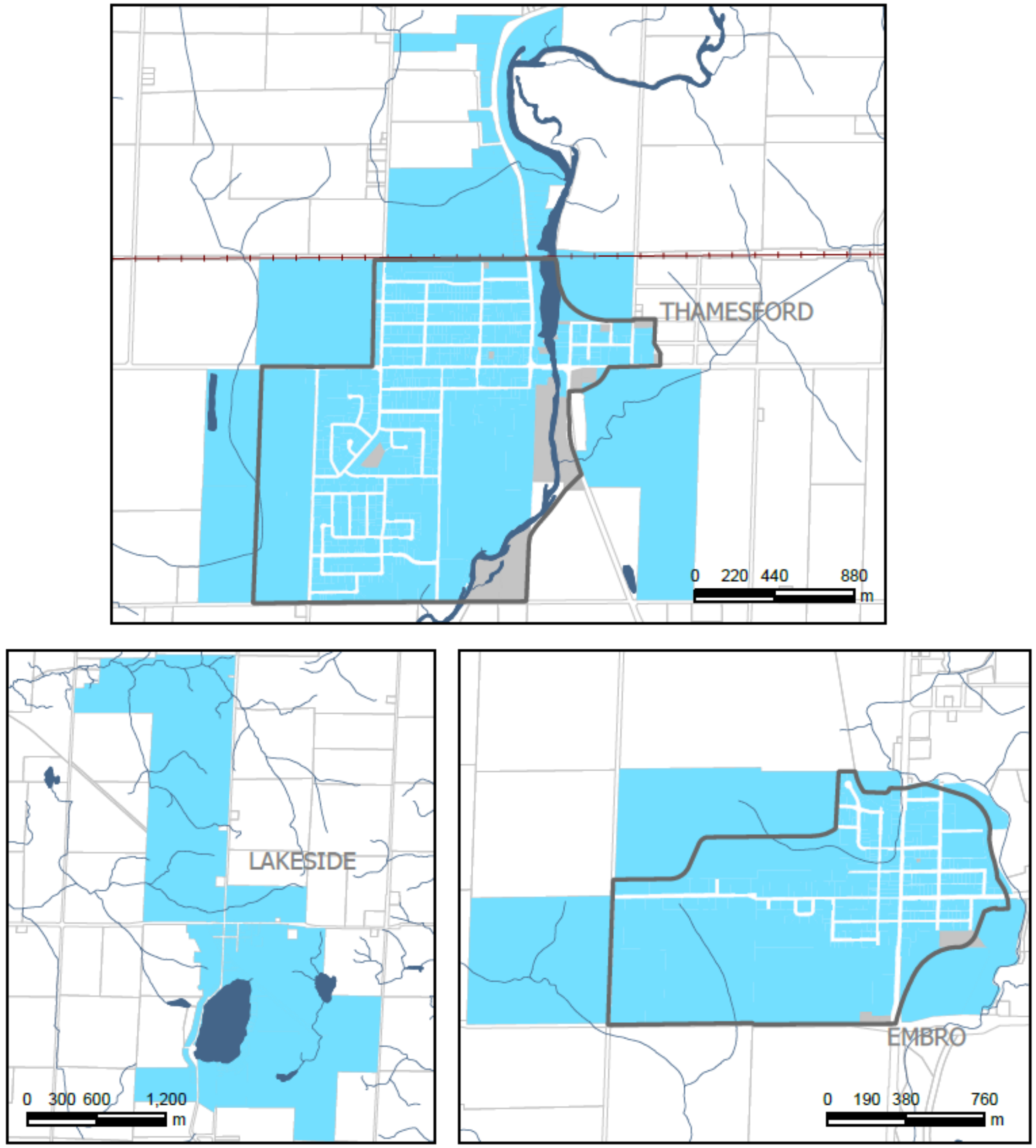

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Table 3.1.1 Performance Measures

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Customer / Council Focused Performance Measures					
Safety	Providing efficient and safe drinking water and supports fire protection	% of properties within the system boundary connected to the municipal water system	N/A	93%	TBD
		% of properties where fire flow is available	53.3%	53.3%	TBD
Environmental Stewardship	Providing a water service that is environmentally conscious	# of days of restrictions per system	29 days (Mt. Elgin)	0	TBD
Cost Efficient	Providing water services in an efficient manner	Operating cost to provide service ($/connection)	$499	$495	TBD
Technical Focused Performance Measures					
Safety	Providing efficient and safe drinking water and supports fire protection	% of active hydrants flushed annually	100%	100%	TBD
		% of bacteriological samples compliant with all applicable water quality regulations	99.9%	99.9%	TBD
		% of active hydrants with a low flow rating	N/A	0.2%	TBD
Quality	Providing high quality water to residents	% of system that is constructed with Cast Iron or Ductile Iron	28.56%	28.02%	0%
		% of watermains flushed	100%	100%	TBD
Reliability	Providing water services with minimal interruptions	# of Watermain breaks per 100 km's of watermain	0.5	2.5	TBD
		The number of connection-days per year where a boil water advisory notice is in place compared to the total number of properties connected to the municipal water system	360 connection-days compared to 6,886 connections	316 connection-days compared to 7,093 connections	TBD

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
		The number of connection-days per year due to watermain breaks compared to the total number of properties connected to the municipal water system	5.69 connection-days compared to 6,886 connections	9.63 connection-days compared to 7,093 connections	TBD
		% of Critical Main Line Valves Turned	92%	100%	100%
		% of Non-Critical Main Line Valves Turned	51%	11%	25%
Cost Efficient	Providing water services in an efficient manner	The operating costs per kilometer of water distribution pipe (distribution)	N/A	$7,644	TBD
		5 year Average capital expenditure for water treatment	$0.4M	$0.9M	TBD
		5 year Average capital expenditure for water distribution	$1.6M	$1.2M	TBD

4.0 Asset Management Strategy

4.1 Lifecycle Activities and Planned Actions

Distribution assets undergo regular maintenance and inspection. As part of capital works project analysis, determinations of whether water pipe replacement or relining should occur is reviewed. This process is fully integrated with the renewal needs of the roadways and other underground infrastructure, such as wastewater and stormwater. This integrated approach ensures our renewal projects for these service areas are delivered with optimal timing to increase value and minimize disruption to our communities. For example, if a roadway is targeted for renewal, coordination between service areas and area municipalities will determine whether the underlying stormwater, drinking water or wastewater infrastructure is also of an age or condition that requires renewal, to ensure these projects are delivered together to reduce disruption for our communities and deliver enhanced value.

Process assets and equipment undergo extensive operations and maintenance regimes to sustain their reliable operation. Investment needs are identified and coordinated with normal operations to minimize disruptions to service. Major replacements are planned and accommodated using system redundancy and changes to operations, in order to maintain service. It is critical to maintain water service in order to protect public health.

There are six main lifecycle activities considered in the overall sustainable management of water assets, described in table 4.1.1.

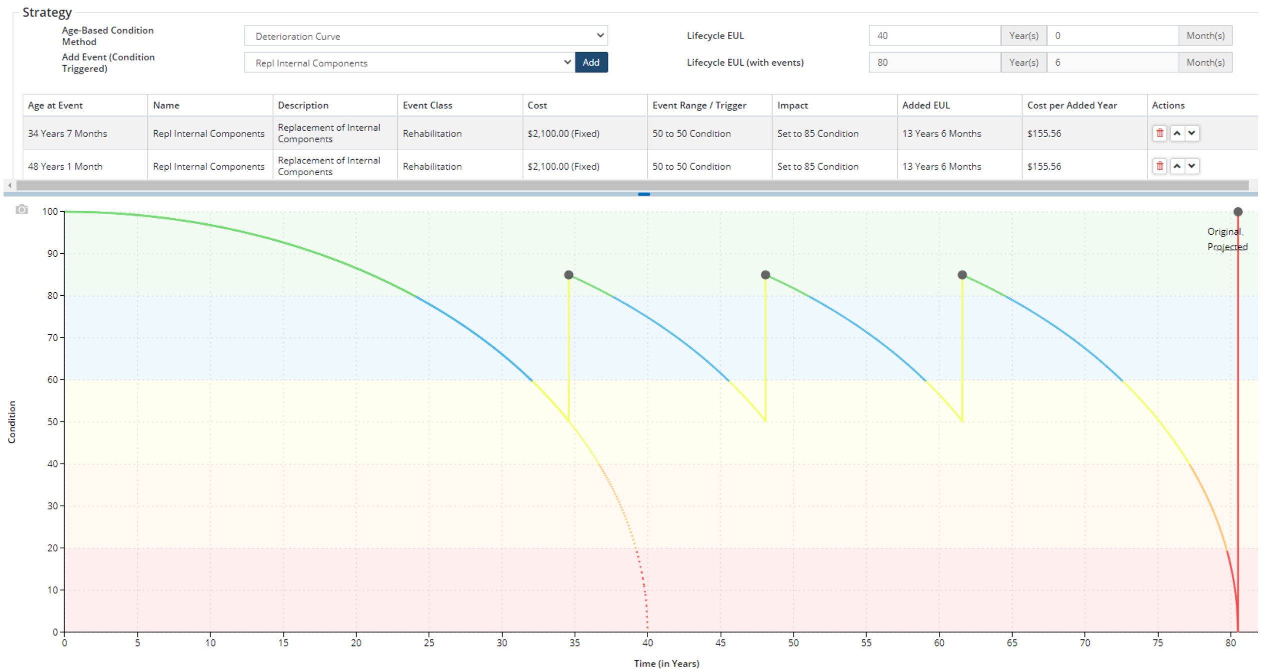
Table 4.1.1 Lifecycle Activities

Strategy	Lifecycle Activity
Non-Infrastructure Solutions	Actions or policies that can lower costs or extend useful lives. **Trigger: Ongoing**
Maintenance	Regularly scheduled maintenance and inspection programs including cleaning and flushing, hydrant flushing, pressure testing, visual inspections, lubricating and minor repairs. These activities do not improve the overall condition of the asset, nor increase its useful life. **Trigger: Ongoing**
Rehabilitation / Renewal	One-time events that increase the condition and extend the useful life of the asset; including watermain lining. **Trigger: Fair/Poor**
Replacement	Occurs at the end of the useful life and/or when rehabilitation is no longer an option – can vary among assets due to construction material and environmental factors that impact the degree of deterioration and performance. **Trigger: Poor/Critical**
Disposal	Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the County to provide services. County staff coordinate with contractors to ensure safe removal and environmental compliance when disposing of assets. **Trigger: Poor/Critical**
Expansion / Growth	Planned activities required to extend services to previously unserved areas, expand services to meet growth demands, or increase the level of service being provided. **Trigger: Development**

The lifecycle management strategy is the set of planned actions that should enable the assets to provide users with the proposed level of service in a sustainable way, while achieving acceptable levels of risk and the lowest lifecycle costs required to provide that level of service. Lifecycle considerations for assets include analysis of the timing to carry out key asset management activities including inspection, maintenance, repair, and replacement. Ongoing preventative maintenance activities are outlined in the County's work management system. The rehabilitation and replacement activities impacting the asset components condition and useful life are contained within profiles in the County's asset management system. For some assets, replacement needs are based on a run to failure strategy, as this is the most economical. Work is ongoing within the County's systems to build all the component profiles and identify where each asset is within the lifecycle.

As an example, figure 4.1.2 illustrates the lifecycle strategy of hydrants. The internal components of a hydrant can be replaced multiple times, extending the overall useful life from 40 years to approximately 80. The annual cost requirement from a run to failure strategy is $234 per year where the annual cost requirement using the rehabilitation strategies decreases to $196 per year.

Figure 4.1.2 Hydrants Lifecycle Strategy

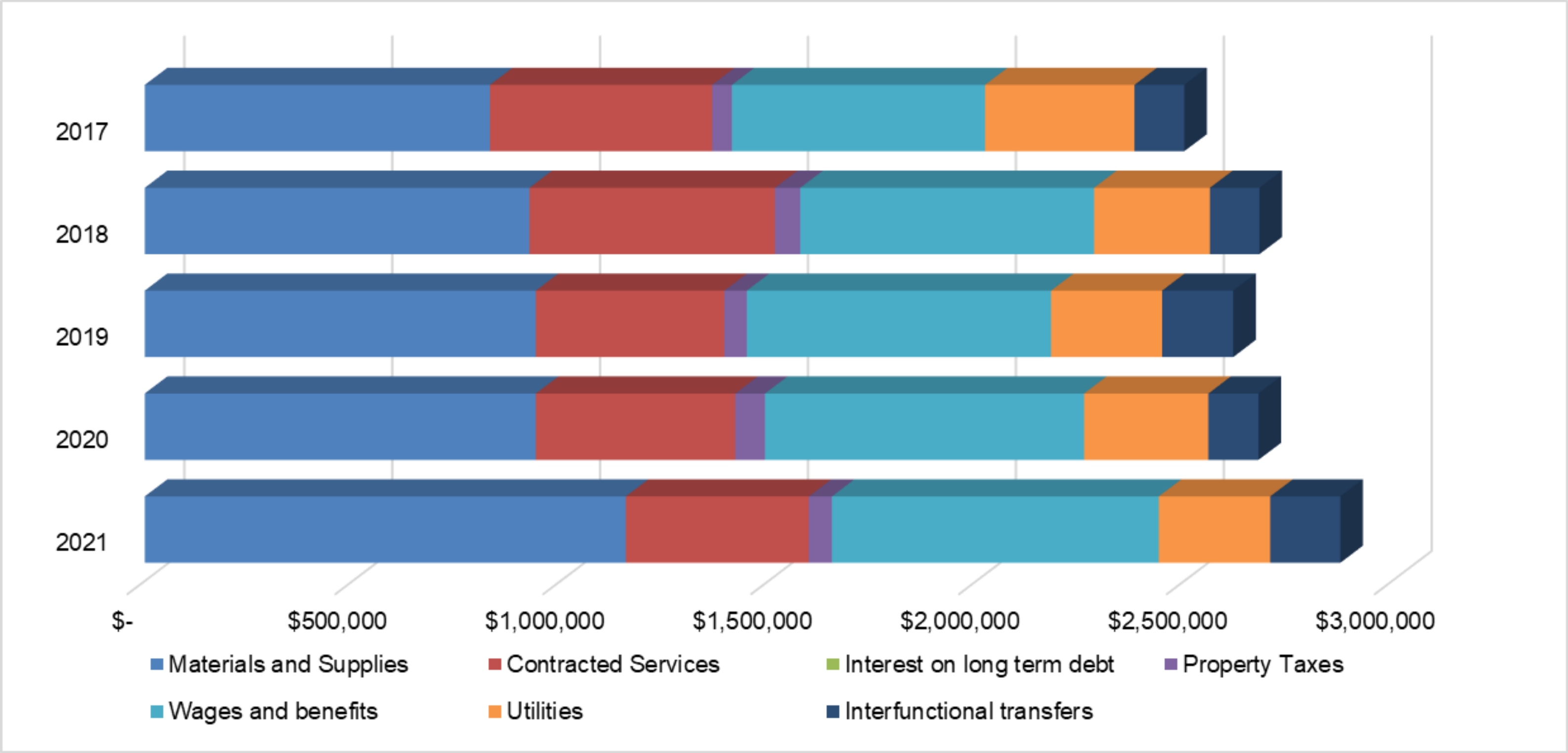


4.2 Significant Operating Expenses

Significant operating expenses are required in order to sustain an asset over its lifecycle. The County is always looking at ways to optimize our operating investment to ensure we are achieving the best value for our residents. Essential to this is a strong operations and maintenance plan within our work management system. Operating expenses are incurred through a number of sources – preventative maintenance activities, utility costs, property taxes and more. Despite the fact that minor maintenance is incorporated into planned operations and maintenance programs, there are cases where it is unplanned.

Figure 4.2.1 shows the operating expenses from 2017 through 2021 for the Townships water system grouped by expense type. The groupings align with those reported on the County's Financial Information Return (FIR), with further breakdown for property taxes and utility costs as these expenses can be significant.

Figure 4.2.1 Operating Expenses



4.3 Risk Strategy

Risk management frameworks are developed to assist with the prioritization of investments within the capital planning period. The preferred approach is to implement a triple bottom line analysis approach to evaluate:

- Social impacts of asset failure, including impacts to customers, businesses and the County's reputation;
- Environmental impacts of asset failure; and
- Economic impacts of failure including the cost of remediation.

In the context of asset management, risk is the multiple of the consequence of an asset failing and the probability that the event will occur.

Figure 4.3.1 illustrates the risk ratings for the current Townships system water assets at a summary level. County staff will continue to monitor the higher risk assets, review and/or complete physical inspections to further validate the age-based condition ratings and plan for lifecycle strategies accordingly.

Figure 4.3.1 Asset risk profile

Consequence \ Probability	1	2	3	4	5
5	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
3	10 Assets 17,739.47 m, unit(s) $4,616,438.00	1 Asset 626.43 m $250,572.00	1 Asset 629.95 m $251,980.00	0 Assets - $0.00	1 Asset 9,385.00 unit(s) $269,235.00
2	63 Assets 19,889.21 m, unit(s) $8,522,029.00	125 Assets 20,431.12 m, unit(s) $8,760,115.00	69 Assets 4,016.30 m, unit(s) $2,163,130.00	51 Assets 51.00 unit(s) $193,100.00	26 Assets 26.00 unit(s) $91,800.00
1	4,472 Assets 53,322.34 m, unit(s) $31,081,126.00	5,092 Assets 71,261.19 m, unit(s) $43,623,880.00	2,125 Assets 29,368.28 m, unit(s) $19,035,666.00	695 Assets 4,560.07 m, unit(s) $5,647,144.00	707 Assets 2,551.27 m, unit(s) $4,240,328.00

5.0 Financial Strategy

5.1 Financing Strategy

Hemson Consulting Ltd. (Hemson) was retained through a competitive process to assist with analyzing and developing the County's water and wastewater rates for a 4-year period from 2021 to 2024. The rate modeling includes all system asset management needs and all sources of funding including Community Servicing Assistance Program (CSAP) funding, development charges, developer and resident contributions. In most cases, the capital replacement component is the average annual required contribution level in order to establish full cost recovery; however, the contribution may vary based on the system's ability to meet full cost recovery for the next 10-years.

Capital work is funded from reserves (based on the capital contribution included in the user rates), development charges (for growth projects) and grant funding when available. The County continually assesses opportunities for additional funding options and revenue streams to address our funding gaps.

Where possible, replacement activities are planned in conjunction with the replacement needs of the road network and underlying wastewater/stormwater infrastructure. This requires a co-ordinated effort with area municipalities as the majority of the County owned water and wastewater linear assets falls under the area municipalities' roads infrastructure. This collaboration is essential for ensuring a cost effective approach to maintaining assets within the County regardless of ownership.

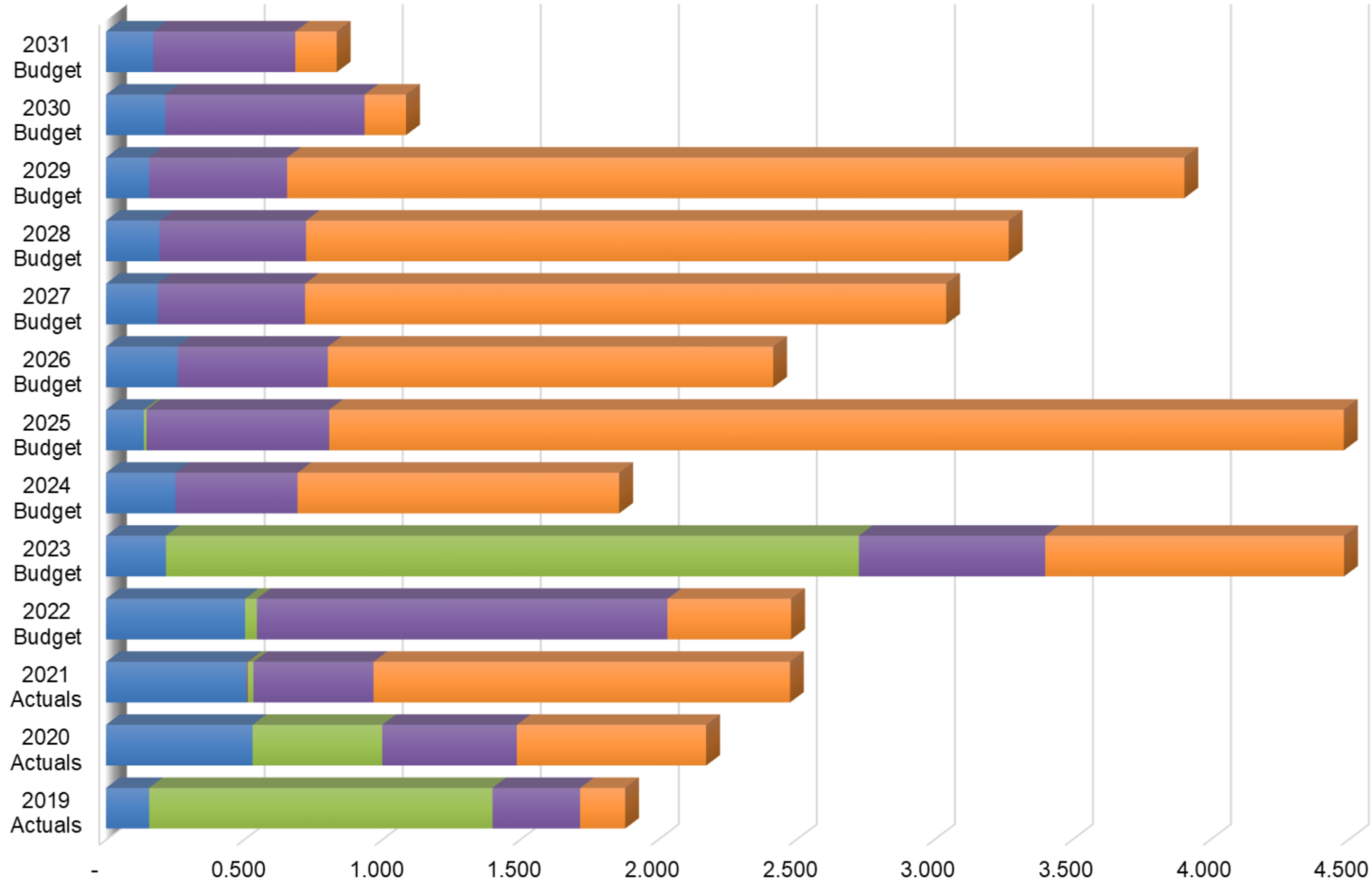
In addition to targeting and prioritizing the investment needed to maintain existing assets, there are also planning processes in place to determine the additional assets needed to meet growing demands through population increases or demand for new services. The projects targeted to meet growth are funded primarily through Development Charges (DC) – the mechanism that enables recovery of growth-related capital expenditures from new development. These charges are governed by the Development Charges Act and are applied in accordance with our Development Charges By-Law. Impacts from the growth activities analyzed in the 2019 DC Background Study are included in this AMP.

5.2 Expenditure History and Forecasts

The Townships water system contains significant capital projects within the 10-year approved budget, as illustrated in figure 5.2.1. Linear asset replacements are ongoing, in conjunction with the local area municipal road construction projects. Minor process equipment replacements were included in the 2019 to 2025 budgets. County staff continue to review anticipated asset management needs with each budget cycle, subject to existing resource limitations.

Non-Infrastructure solution projects include shared projects for condition reviews, studies and implementation of the work management system.

Figure 5.2.1 Expenditures (millions)

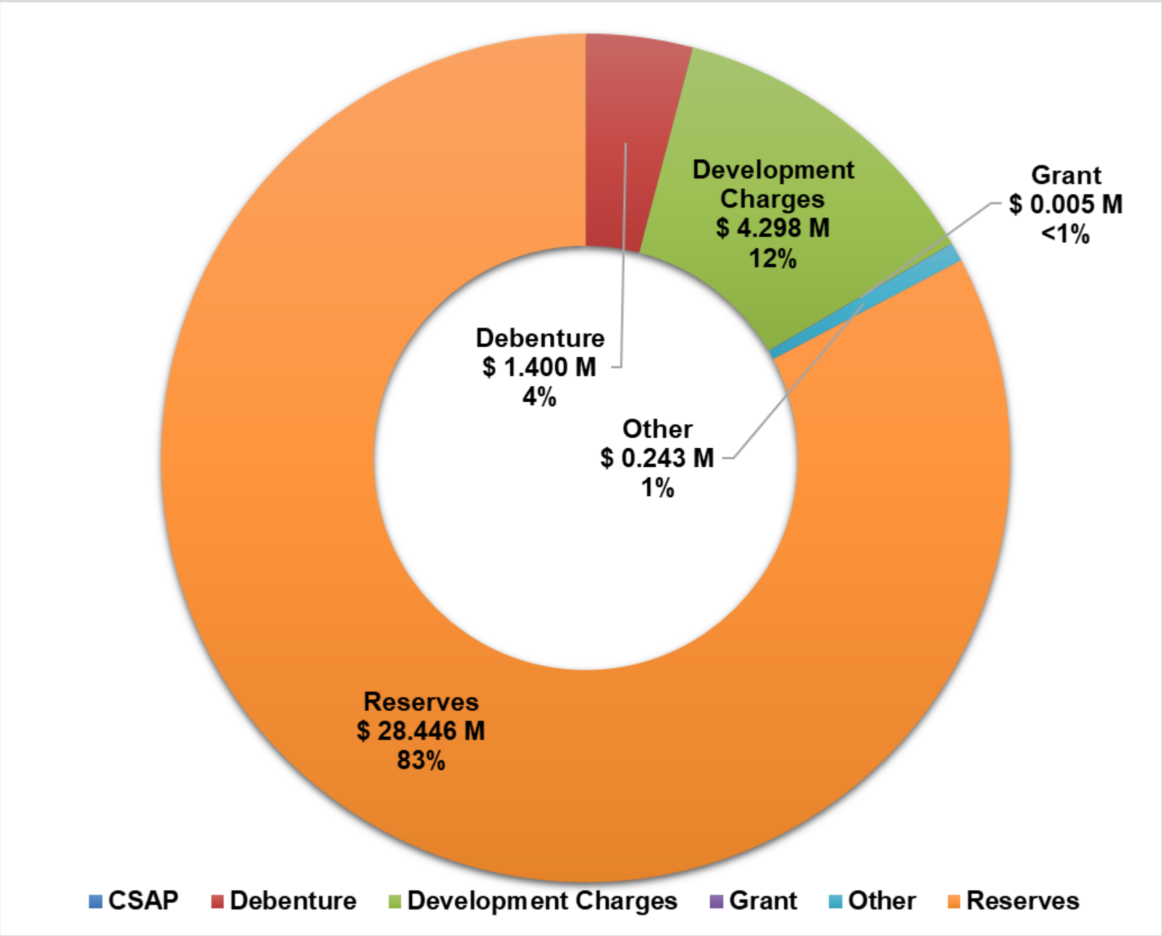


	2019 Actuals	2020 Actuals	2021 Actuals	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Non-Infrastructure Solution	0.156	0.530	0.510	0.503	0.217	0.251	0.136	0.259	0.187	0.193	0.155	0.215	0.171
Maintenance	-	-	0.003	-	-	-	-	-	-	-	-	-	-
Rehabilitation / Renewal	1.244	0.470	0.020	0.043	2.510	-	0.010	-	-	-	-	-	-
Replacement	0.317	0.487	0.435	1.487	0.675	0.442	0.662	0.544	0.534	0.531	0.500	0.722	0.515
Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-
Expansion / Growth	0.163	0.686	1.509	0.448	1.082	1.165	3.675	1.613	2.322	2.545	3.250	0.150	0.150

5.3 Capital Revenues

Replacement projects, identified in the County's 10-year capital plan, are anticipated to be funded by the Water – Townships Reserve, which is funded by user fees. The manganese filtration projects will be included in the next DC Background Study to determine their eligibility for DC funding. A portion of the manganese projects is anticipated to be debt funded. The Water – Townships Reserve, including the anticipated capital contributions within the 10-year period, is insufficient to fund the 10-year related asset activities within the approved 2022 Long-Term Capital Plan.

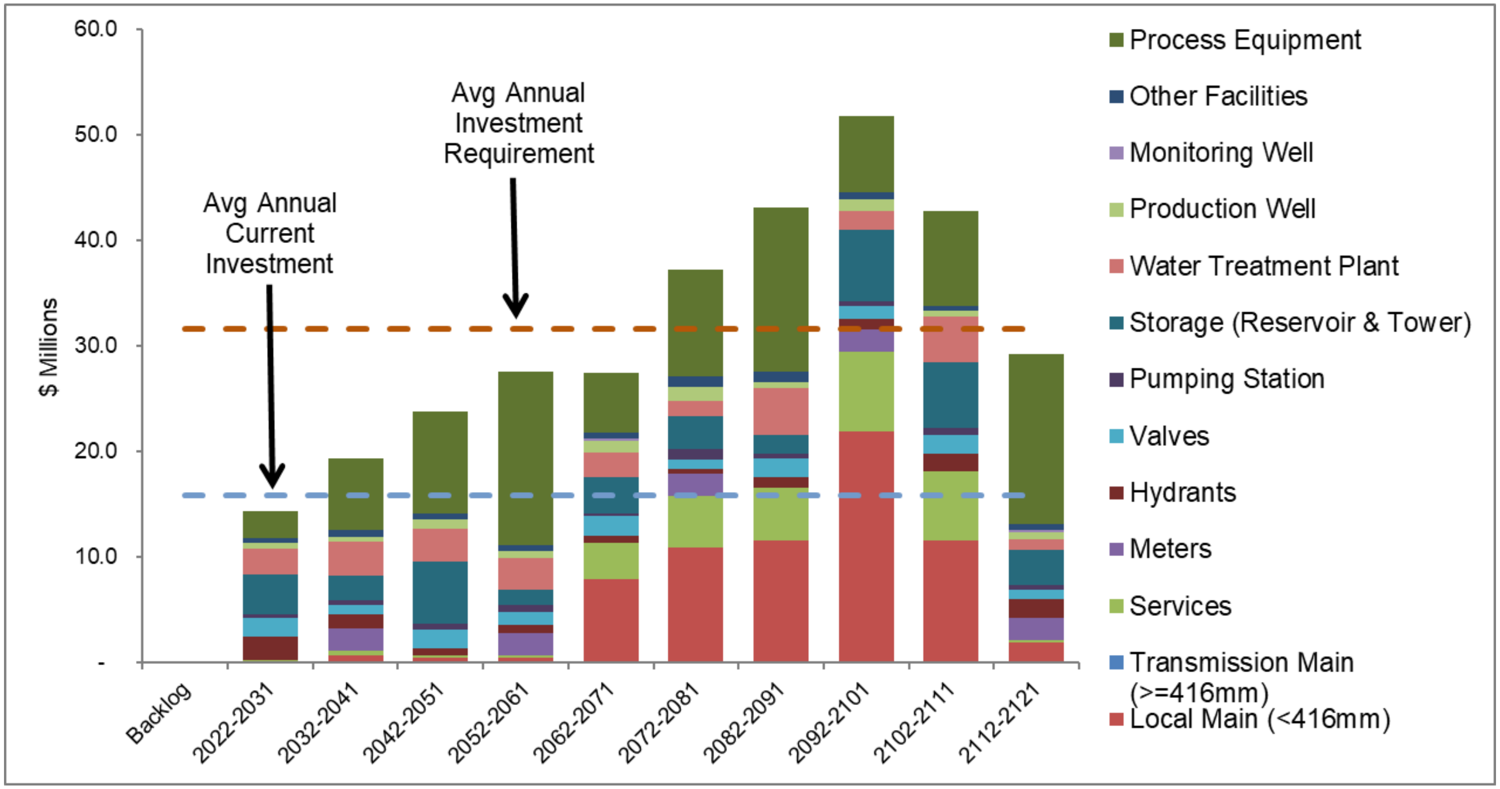
Figure 5.3.1 Sources of Capital Revenues 2019-2031 (millions)



5.4 Capital Investment

Based on the asset management strategies identified, the financial requirements over the next 100-years are determined in current dollars. The average annual investment requirement represents the amount of capital funding required to renew and maintain the existing assets on an annual basis so services can continue to be delivered. These estimates assume that all work is able to be completed, as indicated, and does not take into account future changes due to environmental factors, new maintenance techniques, and unidentified growth. The annual requirement has increased from the 2017 AMP, primarily due to significant development and improvements the County has made to the vertical data, resulting in asset useful lives that are more reflective of their actual lifecycle. Further work is ongoing with the vertical data to fully determine lifecycle needs (including maintenance and rehabilitation strategies) which will impact the annual requirement for vertical assets. The data will continue to be reviewed with each budget and business plan cycle.

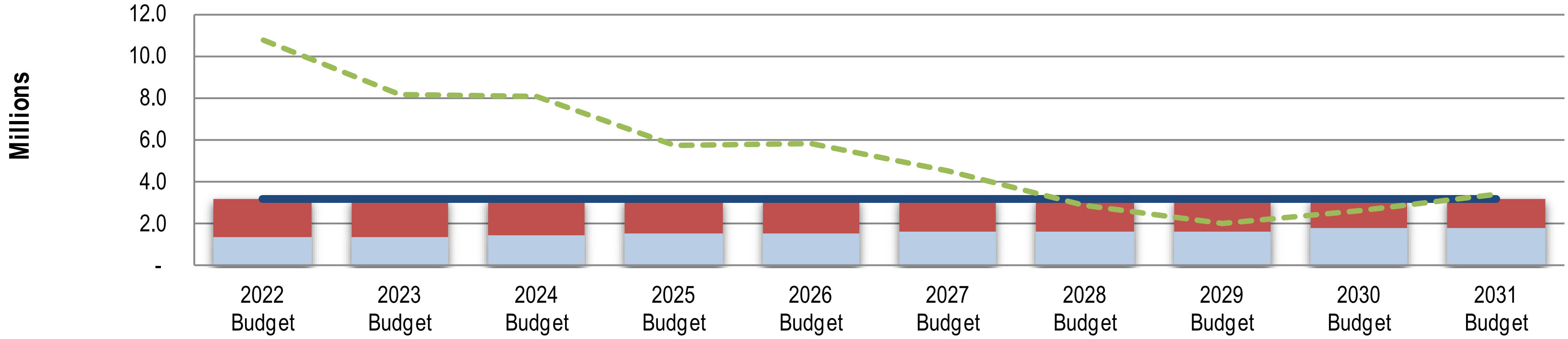
Figure 5.4.1 Average Annual Capital Requirements



The following figure links the annual capital funding needs to the capital investments contained in the budget. The timing of the actual capital projects may vary, however annual investments in capital assets is important for financial sustainability.

Figure 5.4.2 Funding Requirements

	Key	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Annual Required Investment		**3,168,000**	**3,168,000**	**3,168,000**	**3,168,000**	**3,168,000**	**3,168,000**	**3,168,000**	**3,168,000**	**3,168,000**	**3,168,000**
Current Investment		1,385,386	1,408,702	1,500,254	1,518,982	1,586,393	1,641,933	1,630,333	1,620,503	1,783,623	1,789,109
Funding Deficit		*1,782,614*	*1,759,298*	*1,667,746*	*1,649,018*	*1,581,607*	*1,526,067*	*1,537,667*	*1,547,497*	*1,384,377*	*1,378,891*
Funding Surplus		-	-	-	-	-	-	-	-	-	-
Reserve Balance		10,772,122	8,178,908	8,042,226	5,779,615	5,803,256	4,498,285	2,891,690	2,030,918	2,592,756	3,407,820



As the manganese filtration projects are anticipated to be partially funded by debt, the amount of the current investment restricted to debt payments is anticipated to be approximately 9% starting in 2030.

5.5 Funding Gap Analysis

Using the anticipated 10-year asset lifecycle needs, along with the current capital investment level, the County is able to determine if there is an anticipated funding gap for the Townships water system. Consideration is then given to the current system reserve balance to determine the residual funding gap. The County would then investigate opportunities for reducing this residual funding gap which, may include increases to the user rates, utilization of grant funding opportunities and further review of lifecycle strategies and proposed levels of service.

Figure 5.5.1 illustrates the anticipated asset management 10-year lifecycle needs (left side of figure 5.5.1) and funding needs, including the projected funding gap (right side of figure 5.5.1) for the Townships water system. The system calculates the optimal expenditures based on theoretical asset lifecycle needs. These needs have not yet been reviewed in depth with County operations staff, and incorporated into the 10-year capital budget. This is anticipated to be completed as part of the 2023 Business Plan and Budget process with subsequent review annually.

The anticipated expenditures have been increased for non-infrastructure solution projects; approximately $2.0 million.

While the anticipated expenditure calculation accounts for the lifecycle activities of expansion / growth projects it does not account for the initial investment. It is important to adjust for these projects, where the initial investment is growth related and not projected to be DC funded within the 10-year capital plan. The resulting growth/expansion projects added to the anticipated asset needs is approximately $14.3 million.

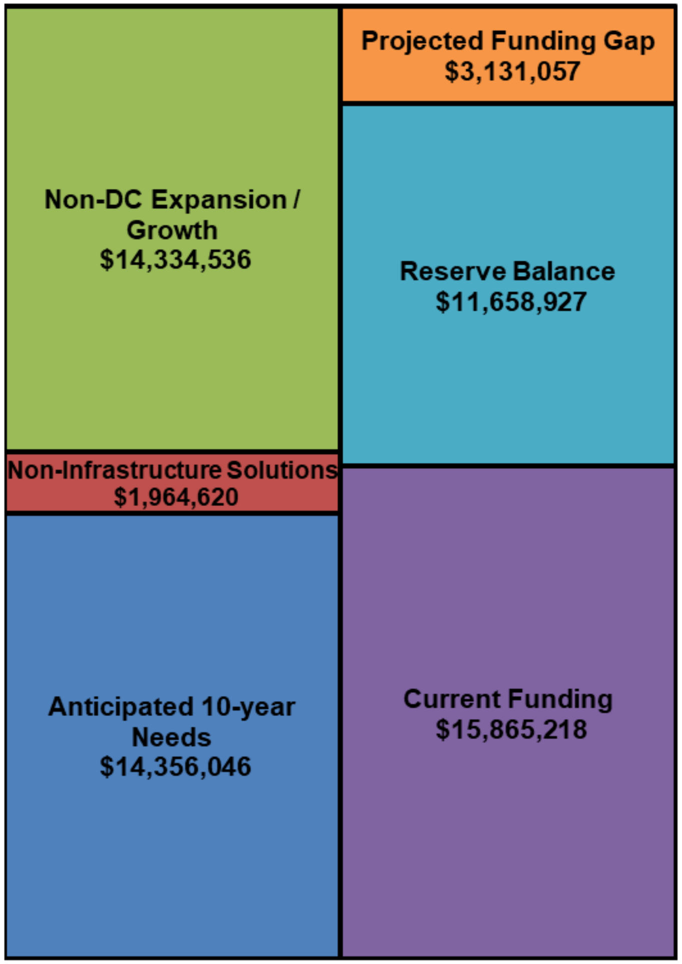
The Townships water system is projecting a funding gap over the 10-year capital planning period. This gap is partially being addressed through the issuance of debenture funds for the manganese filtration projects (approximately $1.4 million in debt issuance). Of the debt issued, $0.2 million of the principal is proposed to be repaid within the current 10-year period, along with approximately $0.1 million in interest charges. The annual funding requirement is the basis for ensuring the long-term financial sustainability well into the future. Approximately 2.1% of the current funding is committed to debenture payments over the 10-year horizon. The annual funding requirement will be reviewed holistically as part of the next rate study.

This analysis assumes the full reserve balance is utilized within the current 10-year period. Drawing the reserve balance to zero would likely result in increased user fee requirements in the subsequent 10-year period in order to fund the anticipated asset lifecycle needs.

The reserve is also utilized to fund emergency or unplanned expenses. A minimal or fully committed balance would limit the ability to fund these types of expenses. Consideration needs to be given to a minimum balance the County should maintain based on these risks. Analysis of the reserve target minimum balance, will be completed as part of the annual reserve review process.

Failure to address the long-term asset lifecycle needs could result in significant increases to rates in the future as assets reach end of life; or reductions in localized and/or regional service. This may include watermain breaks causing localized service outages, quality advisories being issued, increased maintenance costs, stress on the County's ability to meet regulations, fines, increase in insurance claims for property damage and personal injury resulting from poor asset conditions, etc.

Figure 5.5.1 Anticipated Needs (10-Year)



6.0 Climate Change

As part of the asset management planning process, the County will consider the risks and vulnerabilities of capital assets to climate change and the resulting actions that may be required. Commitment will be made to the development of tailored actions that make the best use of our resources to mitigate and adapt to climate change, in accordance with our local reduction targets, financial capacity and stakeholder support.

Climate change risks are considered during the planning phase of each capital project. Considerations to increasing infrastructure resiliency and adapting to climate change may include the following:

- use of backup power generation,
- redundancies with critical equipment,
- use of SCADA to collect accurate information and make informed decisions,
- conducting inspections and studies to identify problem areas and complete repairs.

Bridges and major culverts

Oxford County
Growing stronger together

Table of Contents

1.0 Introduction

The County maintains a diverse transportation network to provide safe and effective means to keep our communities moving and connected. The bridges and major culverts network is integral to this and helps provide continuous efficient movement of traffic as part of the overall transportation network.

The bridges and major culverts network is categorized into three components, as a result of differing life spans and maintenance strategies. They are bridges, culverts with a span of 3 meters or greater (culverts with spans less than 3 meters are included in the stormwater network), and guide rails related to the bridge approaches and culvert structures.

Sound management of our bridges and major culverts network helps us realize our vision of being a vibrant community, working well and growing stronger together!

Like many of our assets, bridges and major culverts are facing increased challenges as a result of aging assets, climate change and increasing demand due to growth in our communities. Our investment in these assets must therefore be balanced to optimize investment for renewal with the growing needs of our community.

This plan provides information regarding our approach to the management of our bridges and major culverts over the short (10-year) and long (100-year) term, demonstrating our commitment to assessing and meeting the levels of service valued by our residents.

1.1 Improvement Plan

The County recognizes that asset management is a continuously evolving process. The following recommendations are based on the review of current management practices, inventory, valuation and condition analysis.

- Incorporate findings from the Transportation Master Plan, as applicable.
- Continue to monitor new technologies as they emerge to determine when cost effective to be implemented, in order to extend useful lives of structures.
- Incorporate maintenance requirements into lifecycle strategies.

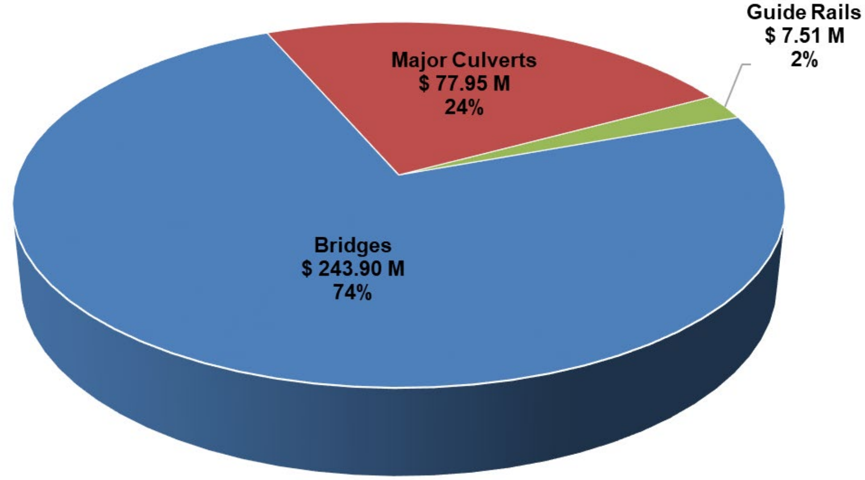
2.0 State of Assets

2.1 Inventory

Bridges and major culverts are part of our transportation network which enables us to get to where we need to go throughout the County. Bridge and major culvert assets are some of our most highly utilized and visible assets, and include both vehicular and pedestrian bridges and major culverts throughout the County, along with the guide rails that protect road users from underlying and/or roadside hazards. We recognize that the efficiency and value we can derive from our transportation assets extends into all other portfolios, which is what makes transportation particularly important.

Table 2.1.2 displays our current bridges and major culverts inventory and the associated replacement costs and average age for each asset component.

Figure 2.1.1 Inventory Valuation



2.2 Valuation

Due to the varying structure types and material, the replacement costs are not easily defined as a value per square meter of bridge/culvert deck area. As a result, replacement costs were provided within the 2020 Bridge Needs Study.

The replacement cost valuation for guide rails is based on current tender prices, where available. The cost of end treatments can have a significant impact on the overall cost per meter.

Table 2.1.2 – Bridges & Culverts Inventory

Asset Type	Asset Component		2017 Inventory	Current Inventory	Replacement Cost	Average Age
Bridges and Major Culverts	Guide Rails	m	1,742	6,980	$7,510,297	9 Years
	Bridges	each	94	95	243,902,600	51 Years
	Culverts	each	61	69	77,947,195	46 Years
Total Replacement Cost					**$329,360,092**	

Road rationalization was undertaken as part of the 2019 Transportation Master Plan. Council Report PW 2021-29 includes information on the road transfers recommended. The road transfers, effective January 1, 2022, included a number of structures that are included in the current inventory figures above.

Previously, installed guide rails were not listed as separate components in the County's inventory. Guide rails are now listed separately due to their different lifecycle and maintenance strategy.

2.3 Condition Assessment Approach

The assessment approach for our bridge and major culvert assets utilizes a combination of physical assessments, asset attributes, such as material and sizing, as well as established anticipated useful lives.

The County's condition scale and visual inspection ratings are based on the following approach:

- Excellent - Asset is well maintained with no noticeable defects.
- Good - Asset may show signs of minor deterioration and may require some maintenance.
- Fair - Deterioration evident, function affected. Asset may require on-going monitoring.
- Poor - Serious deterioration, function inadequate. Asset may require ongoing monitoring.
- Critical - No longer functional, general or complete failure. Asset may require extensive monitoring.

The Bridge Needs Study is required to be carried out every two years to comply with the Public Transportation and Highway Improvement Act and Ontario Regulation 104/97, amended to Ontario Regulation 160/02. Structure inspections are to be performed under the direction of a professional engineer. The study evaluates the structural and serviceability of individual elements and recommends required improvements. The Ministry of Transportation (MTO) has developed an Ontario Structure Inspection Manual (OSIM), which is used to complete the inspections. The OSIM has specified condition states for each material type and where required, for specialized elements. Once inspections have been completed, the Bridge Condition Index (BCI) for each structure is determined based on the MTO methodology. The BCI determined helps to schedule maintenance and rehabilitation work and is not a direct indication of the safety of the bridge. In general, for a bridge with a BCI value:

- Greater than 70 - Repair work is not usually required within the next five years.
- Between 60 and 70 - Repair work is usually recommended within the next five years.
- Less than 60 - Repair work is usually recommended within the next year.

Other factors are also considered in the prioritization of our structure rehabilitation recommendations including:

- State of deterioration and estimated length of prolonged useful life are considered against asset management needs through a cost/benefit analysis.
- Impacts of rehabilitation methods on users based on the length of detour or alternate access.

Table 2.3.1 illustrates how the BCI score ratings align with the County's standard condition scale. Unless otherwise noted, all images are of County assets, and are general representations of the condition at the time the photo was taken. Assets may have undergone lifecycle strategies since the date of the image impacting its condition.

Table 2.3.1 BCI Score Ratings

Excellent
BCI Score of
90-100

Example
Structure:
BCI of 99.4

Poor
BCI Score of
40-49

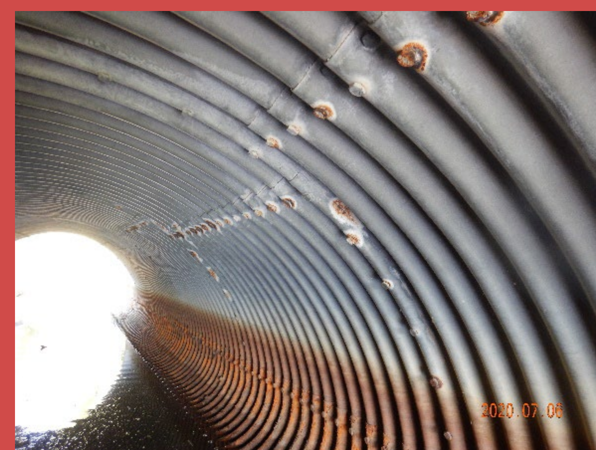
Example
Structre:
BCI of 48.0

Good
BCI Score of
70-89

Example
Structure:
BCI of 72.1

Critical
BCI Score of
0-39

Example
Strcuture:
BCI of 19.4



Fair
BCI Score of
50-69

Example
Structure:
BCI of 56.7

2.4 Condition Assessment

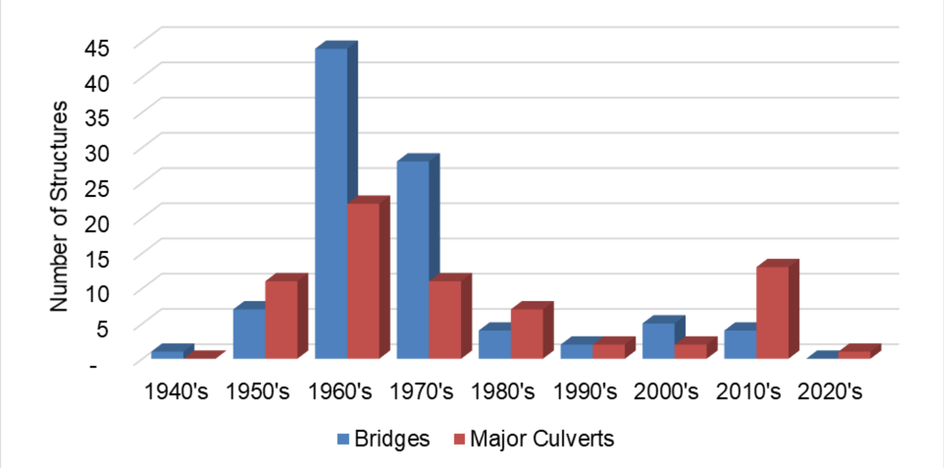
The condition profile of our bridge and major culvert asset components is shown in figure 2.4.1. The quantity in each condition is based on replacement costs as opposed to the number of structures, given the variability of structure sizes.

For our bridge and major culvert assets: 0.9% of these assets are in poor or critical condition, and 60.0% in good or excellent condition in comparison to 12% and 60% respectively for Canadian municipalities reported on the Canadian Infrastructure Report Card[1]. While this may appear that our bridge and major culvert assets are in comparable shape to other Canadian municipalities, the 2019 Canadian Infrastructure Report Card is an aggregate of self reported condition ratings across the Country and are based on a general rating scale which may not match the County's.

Figure 2.4.1 Asset Condition by Component

To better understand our bridge and major culvert assets, an age profile of all our structures by decade is shown in figure 2.4.2.

Figure 2.4.2 Structures by Age



The average age of the majority of the bridge and major culvert assets is approximately 49 years. This value must be considered in the context of the different asset types in the category, compared to the typical anticipated useful life of each asset type.

[1] http://canadianinfrastructure.ca/en/index.html

Table 2.4.3 outlines the anticipated useful life for each new build/replacement. The anticipated useful lives for our bridge and major culvert assets exclude the management strategies that the County utilizes to extend the overall life of our structures.

Anticipated useful lives are reviewed with each AMP update. This process consists of a review of industry standards and asset performance history.

Table 2.4.3 Useful Life

Bridges and Major Culverts	Anticipated Useful Life (years)
Guide Rails	30
Culverts - Concrete	65
Culverts - Steel	50
Bridges	60

Figure 2.4.4 illustrates the current average age of the bridge and major culvert assets in comparison to their anticipated useful life, based on a run to failure strategy.

There are a number of management strategies that the County may utilize to extend the overall life of our bridge and major culvert assets. These strategies allow us to align the needs with those of other assets, resulting in the best overall value for our residents.

Figure 2.4.4 Age and Useful Life Comparison

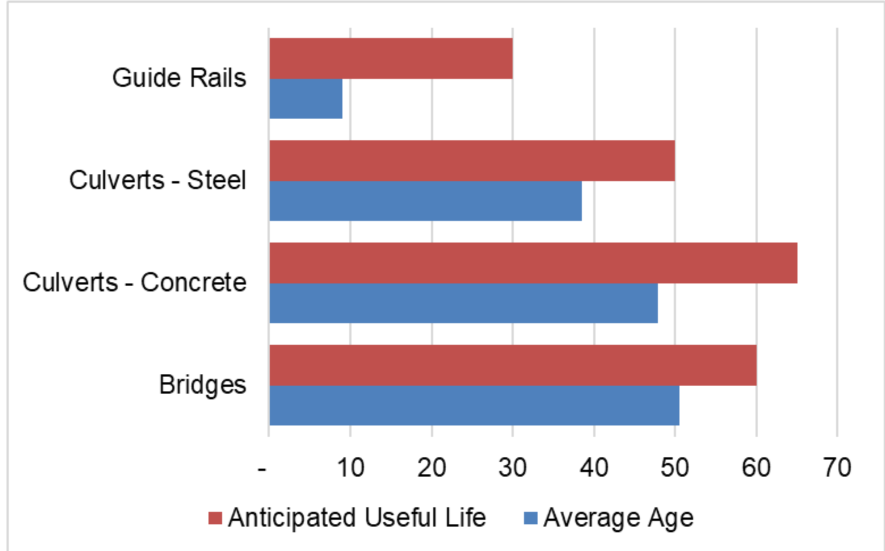


Table 2.4.5 compares the status of our bridge and major culvert asset components, as identified in our 2017 Asset Management Plan to their current condition. Conditions have been adjusted for bridges and major culverts that have had work completed since being evaluated in the 2020 study.

The trend shows that the status of bridges and major culvert assets is steady. The 2020 Bridge Needs study noted that the County's structures appear to be declining at a slower pace than the MTO deterioration curves would suggest. The County will continue to target lifecycle strategies appropriately to ensure a safe and reliable network.

Table 2.4.5 Bridges and Major Culverts Condition Assessment

Asset Type	Asset Component	2017 Condition Rating	Current Condition Rating	Trend
Bridges and Major Culverts	Guide Rails	Excellent	Good	↓
	Culverts	Good	Good	→
	Bridges	Good	Good	→

3.0 Levels of Service

County staff have developed a comprehensive Level of Service (LOS) Framework. This framework will help to establish a relationship between the current LOS being provided by the County's assets, and the associated operating and capital expenditures required to achieve the proposed LOS. The framework puts into perspective the definition and measurement of service performance in alignment with the County's corporate mission and vision.

Corporate Objective

The corporate objective of the road maintenance and traffic management service, which includes the maintenance of the County's bridge and major culvert structures, is to ensure people and goods are able to move safely and efficiently throughout the County. The bridge and major culverts inventory includes a number of structures located on boundary roads with neighbouring municipalities in which the County and the neighbouring municipality share in the maintenance activity costs. Service agreements are in place to ensure that service levels are maintained.

Legislative Requirements

In addition to Ontario Regulation 104/97, amended to Ontario Regulation 160/02 specifying the requirements for biennial inspections, Ontario Regulation 239/02 specifies the Maintenance Standards for bridge decks. The maintenance requirement is based on the highway classification associated with the bridge or major culvert.

Framework

The structure of the County's LOS framework was developed to align with international best practices including the International Infrastructure Management Manual (IPWEA, 2015). The framework includes the mandatory measures to meet the requirements of Ontario Regulation (O.Reg.) 588/17 by including both Community and Technical Levels of Service. The metrics in this framework may be expanded upon as the County continues to improve its data collection and reporting processes.

3.1 Customer Levels of Service

Community or Customer Levels of Service are statements that describe quantifiable metrics of the service delivery outcomes from the perspective of the customer, expressed in non-technical terms. The following statements form our qualitative descriptions of the customer level metrics required under O.Reg. 588/17.

The County's bridges and major culverts are used by all types of vehicles on the road, including heavy transport vehicles, motor vehicles, farm equipment, horse and buggy, emergency vehicles, pedestrians and cyclists.

Included in Table 2.3.1 are images illustrating each condition category.

Bridge assets that are not maintained in a state of good repair could result in bridge weight restrictions, which significantly impact goods movements and inadvertently divert traffic to local roads that are not designed for higher traffic volumes.

Major culverts, which are typically used for water conveyance, that are not maintained in a state of good repair could negatively impact drainage of adjacent lands by reducing flood resilience and increasing flooding susceptibility that results in property damage, crop failure, and damage to the road asset. Culvert failure can compromise the structural integrity of the road and become a significant risk to public safety and negatively impact other essential services (waste management, emergency services, water and wastewater) that rely on the County road network for business continuity.

Table 3.1.1 outlines additional customer focused performance metrics from the County's LOS framework.

3.2 Technical Levels of Service

Technical Levels of Service metrics are quantifiable metrics applied against assets that are subject-matter specific inputs or outputs supported by the day-to-day activities of County staff. Table 3.1.1 includes the technical metrics required under O.Reg. 588/17, as well as, additional metrics the County has included in the framework.

Table 3.1.1 Performance Measures

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Customer / Council Focused Performance Measures					
Cost Efficient	Providing a cost effective bridge and culvert network	Operating Cost to provide service ($/household)	$19	$35	TBD
Technical Focused Performance Measures					
Safety	Providing safe bridges and culverts for users	% of bridges in the municipality with loading or dimensional restrictions.	0%	0%	0%
		Total sq. meter of surface area on roads bridges and culverts >3m	33,347	34,362	TBD
Quality	Providing a bridge and culvert network at the appropriate material quality	For bridges in the municipality, the average bridge condition index value	N/A	72.1	TBD
		For culverts >3m in the municipality, the average bridge condition index value	N/A	73.4	TBD
Reliability	Providing a bridge network that is reliable	% of culverts >3m in poor or critical condition	N/A	2.0%	TBD
		% of bridges in poor or critical condition	N/A	0.0%	TBD
		% of guiderails in poor or critical condition (bridge and structural culvert guiderails)	0%	0%	TBD
Cost Efficient	Providing a cost effective bridge and culvert network	Annual operating cost for bridges and culverts >3m per sq. metre of surface area	$6.24	TBD	TBD
		5 year average capital expenditure for bridges and culverts >3m	$2.9M	$3.3M	TBD

4.0 Asset Management Strategy

4.1 Lifecycle Activities and Planned Actions

The County's Transportation Master Plan (TMP) and Bridge Needs Study have developed strategies and guidelines for managing the County's transportation network, which includes the County's structures.

Routine maintenance requires minimal effort to maintain the useful life of the structure, provided maintenance is completed within 1-2 years as identified in the Bridge Needs Study. The County is not currently completing all the routine work as identified, and will be investigating ways to incorporate this into the asset lifecycle strategies. Safety critical elements are identified during the inspection process if in immediate need for repair. All safety concerns are addressed in a timely manner.

The most effective improvement in a structure's useful life can be achieved by completing rehabilitations while the structure has a BCI between 50 and 69. Although BCI is a measure of overall condition of the structure, other factors are considered when prioritizing maintenance. The rehabilitation strategy is not cost effective for all structures. Depending on the span size of bridge structures they may undergo one or two rehabilitations. This information is maintained within asset profiles and aligns with OSIM curves from MTO.

There are six main lifecycle activities considered in the overall sustainable management of bridge and major culvert assets, described in table 4.1.1.

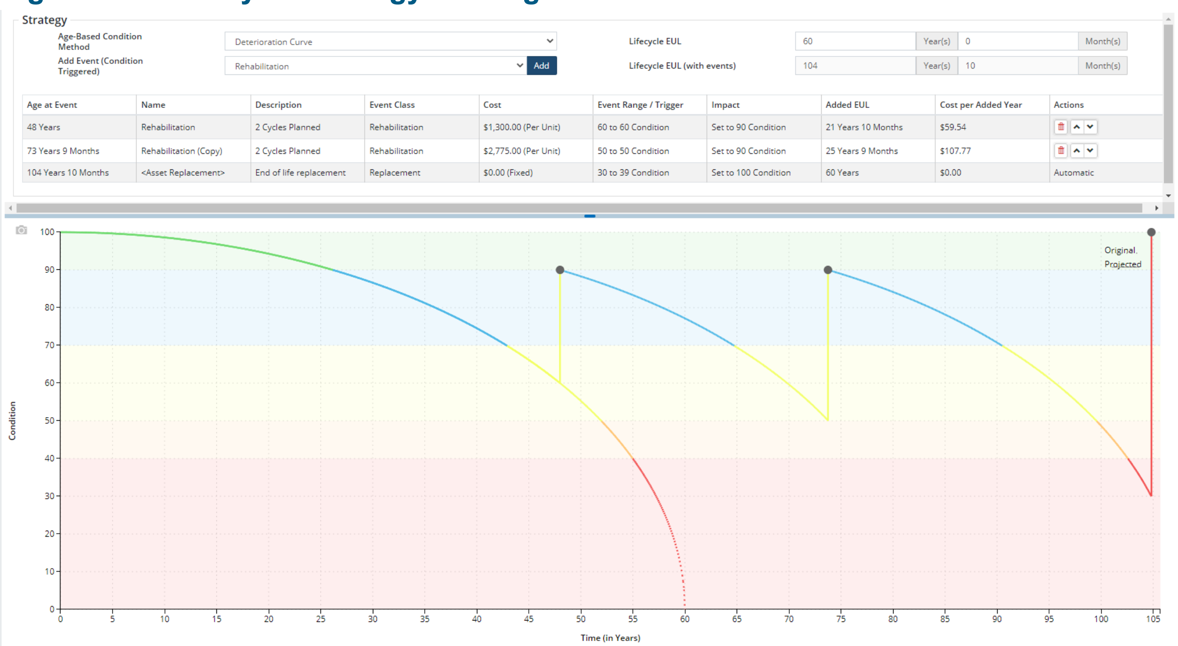
Table 4.1.1 Lifecycle Activities

Strategy	Lifecycle Activity
Non-Infrastructure Solutions	Actions or policies that can lower costs or extend useful lives. **Trigger: Ongoing**
Maintenance	Regularly scheduled maintenance and inspection programs including structure cleaning, expansion joint replacement, brush/vegetation removal and minor repairs. These activities do not improve the overall condition of the asset, nor increase its useful life. **Trigger: Ongoing**
Rehabilitation / Renewal	One-time events that increase the condition and extend the useful life of the asset; including major & minor structure rehabilitations. **Trigger: BCI = 50-69**
Replacement	Occurs at the end of the useful life and/or when rehabilitation is no longer an option – can vary among assets due to construction material and environmental factors that impact the degree of deterioration and performance. **Trigger: BCI < 50**
Disposal	Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the County to provide services. County staff coordinate with contractors to ensure safe removal and environmental compliance when disposing of assets. **Trigger: Poor/Critical**
Expansion / Growth	Planned activities required to extend services to previously unserved areas, expand services to meet growth demands, or increase the level of service being provided. **Trigger: Development**

The lifecycle management strategy is the set of planned actions that should enable the assets to provide users with the proposed level of service in a sustainable way, while achieving acceptable levels of risk and the lowest lifecycle costs required to provide that level of service. Lifecycle considerations for assets include analysis of the timing to carry out key asset management activities including inspection, maintenance, repair, and replacement. Ongoing preventative maintenance activities will be outlined in the County's work management system. The rehabilitation and replacement activities impacting the asset components condition and useful life are contained within profiles in the County's asset management system. For some assets, replacement needs are based on a run to failure strategy, as this is the most economical.

As an example, figure 4.1.2 illustrates the lifecycle strategy of a larger bridge. Bridges with spans > 20m are anticipated to be rehabilitated twice, extending the overall useful life from 60 years to approximately 104. The annual cost requirement will vary by structure based on the size of the structure. Using County structure 10341 on Ingersoll Street as an example; the annual cost requirement on a run to failure strategy is $52,151.67 ($160.22/m2) per year where the annual cost requirement using the rehabilitation strategies decreases to $42,495.19 ($130.55/m2) per year.

Figure 4.1.2 Lifecycle Strategy of bridge structure with 2 rehabilitations



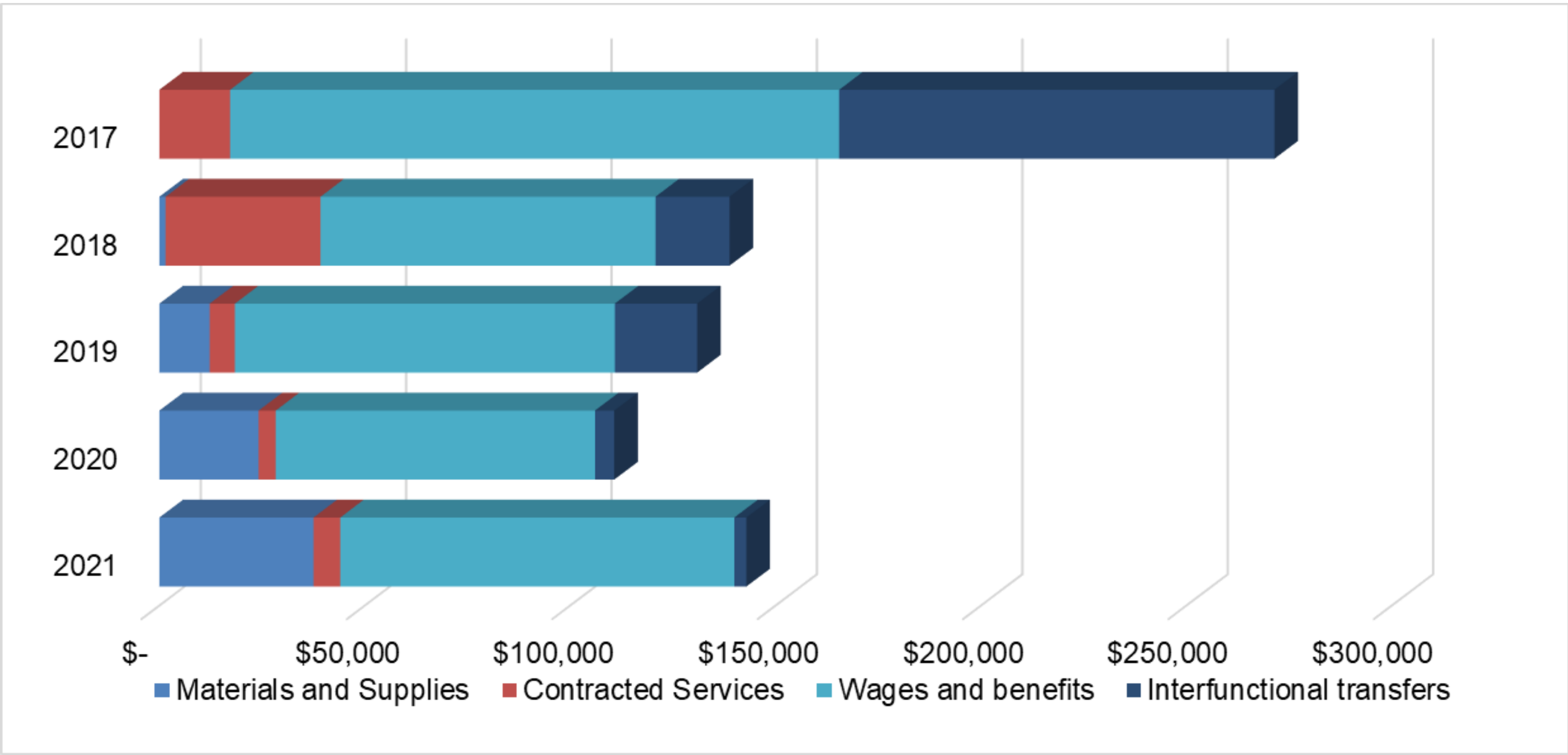
Age at Event	Name	Description	Event Class	Cost	Event Range / Trigger	Impact	Added EUL	Cost per Added Year	Actions
48 Years	Rehabilitation	2 Cycles Planned	Rehabilitation	$1,300.00 (Per Unit)	60 to 60 Condition	Set to 90 Condition	21 Years 10 Months	$59.54	
73 Years 9 Months	Rehabilitation (Copy)	2 Cycles Planned	Rehabilitation	$2,775.00 (Per Unit)	50 to 50 Condition	Set to 90 Condition	25 Years 9 Months	$107.77	
104 Years 10 Months	<Asset Replacement>	End of life replacement	Replacement	$0.00 (Fixed)	30 to 39 Condition	Set to 100 Condition	60 Years	$0.00	Automatic

4.2 Significant Operating Expenses

Significant operating expenses are required in order to sustain an asset over its lifecycle. The County is always looking at ways to optimize our operating investment to ensure we are achieving the best value for our residents and businesses. Essential to this is a strong operations and maintenance plan within our work management system. Operating expenses are incurred through a number of sources – preventative maintenance activities, bridge cleaning, guide rail repairs and more. Despite the fact that minor maintenance is incorporated into planned operations and maintenance programs, there are cases where it is unplanned.

Figure 4.2.1 shows the operating expenses from 2017 through 2021 for the bridges and major culverts grouped by expense type. The groupings align with those reported on the County's Financial Information Return (FIR). The County completes larger maintenance recommendations through the capital plan, with these maintenance costs illustrated in figure 5.2.1.

Figure 4.2.1 Operating Expenses



4.3 Risk Strategy

Risk management frameworks are developed to assist with the prioritization of investments within the capital planning period. The preferred approach is to implement a triple bottom line analysis approach to evaluate:

- Social impacts of asset failure, including impacts to customers, businesses and the County's reputation;
- Environmental impacts of asset failure; and
- Economic impacts of failure including the cost of remediation.

In the context of asset management, risk is the multiple of the consequence of an asset failing and the probability that the event will occur.

Figure 4.3.1 illustrates the risk ratings for the bridge and major culvert assets at a summary level. County staff will continue to monitor the higher risk assets, review and/or complete physical inspections to further validate needs and plan for lifecycle strategies accordingly.

Figure 4.3.1 Asset risk profile

Consequence \ Probability	1	2	3	4	5
5	0 Assets - $0.00	0 Assets - $0.00	1 Asset 684.32 m2 $6,827,500.00	0 Assets - $0.00	0 Assets - $0.00
4	1 Asset 124.44 m2 $1,431,500.00	19 Assets 5,936.48 m2 $53,131,200.00	32 Assets 12,153.66 m2 $116,078,950.00	0 Assets - $0.00	0 Assets - $0.00
3	5 Assets 658.26 m2 $5,797,445.00	22 Assets 3,217.95 m2, m $28,938,180.00	56 Assets 8,938.37 m2 $86,145,700.00	3 Assets 442.10 m2 $2,973,750.00	1 Asset 177.61 m2 $2,138,000.00
2	4 Assets 343.14 m2 $2,913,500.00	34 Assets 2,037.03 m2, m, unit(s) $7,514,722.00	9 Assets 629.38 m2 $7,282,000.00	2 Assets 625.40 m2 $805,750.00	1 Asset 110.00 m2 $558,250.00
1	136 Assets 8,856.64 m $3,187,233.50	81 Assets 3,889.41 m $1,507,190.05	28 Assets 1,704.16 m $681,663.20	24 Assets 1,232.13 m $410,289.55	47 Assets 3,048.61 m $1,037,268.90

5.0 Financial Strategy

5.1 Financing Strategy

Of the maintenance strategies identified, routine maintenance is part of the operating budget, while all other activities are considered part of the capital budget.

Where possible, rehabilitation and replacement activities for the structures are planned in collaboration with the rehabilitation and replacement activities of the road network to minimize disruption and to achieve cost efficiencies. The availability of funding by other municipalities for shared structures will also have an impact on the timing of rehabilitation and replacement projects.

Capital work is funded from reserves (based on the capital contribution included in the levy), development charges (for growth projects) and grant funding (including the Ontario Community Infrastructure Fund) when available. The County continually assesses opportunities for additional funding options and revenue streams to address our funding gaps.

While debentures are not currently used to fund bridge and major culvert projects, the funding option is available in times of high replacement requirements and low reserve balances. Canada Community Building Funds (CCBF) are also available for bridge and major culvert projects; currently the County prioritizes CCBF funds towards replacement needs of the road network.

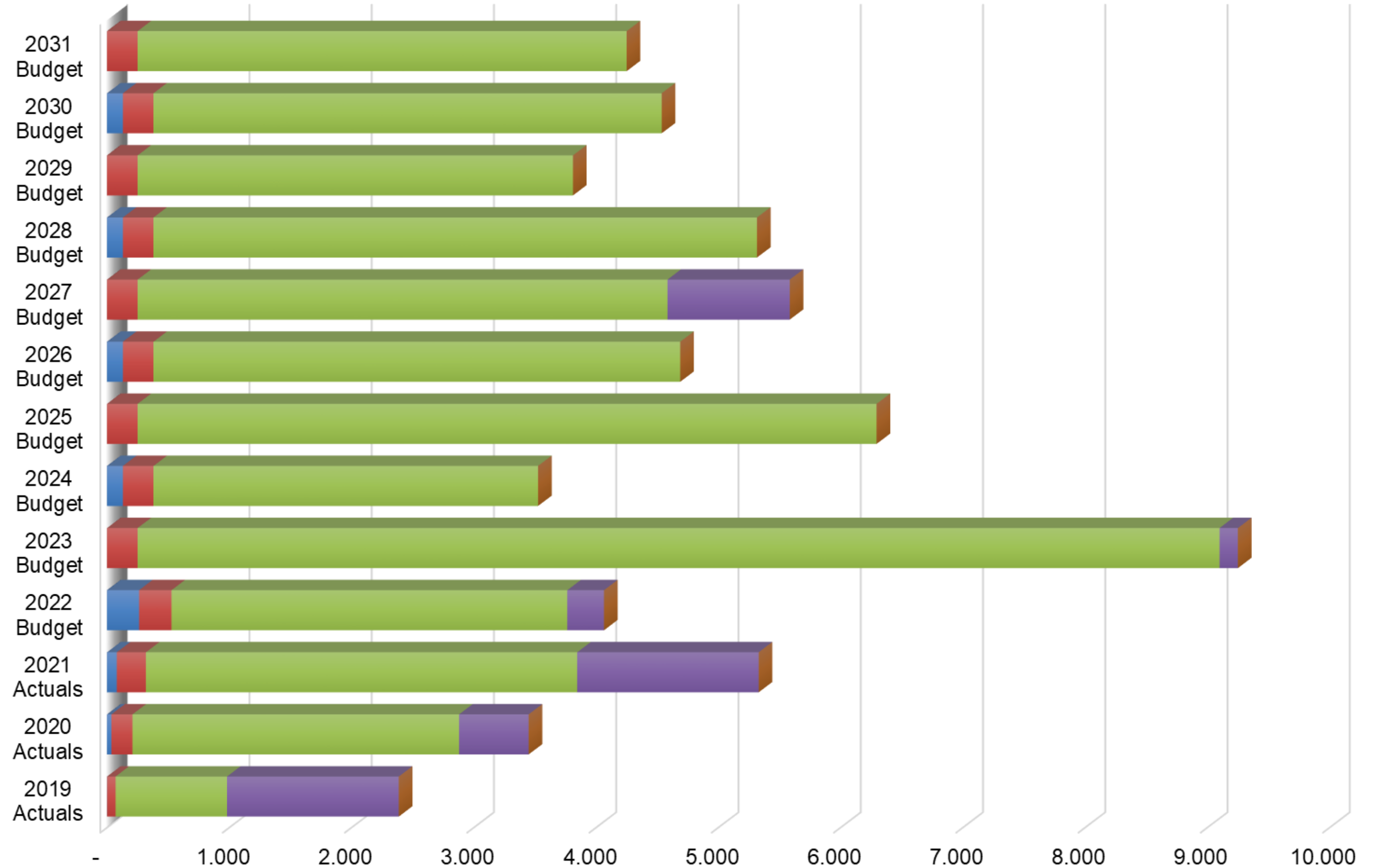
In addition to targeting and prioritizing the investment needed to maintain existing assets, there are also planning processes in place to determine the additional assets and expansion of existing assets (e.g. the widening of structures) needed to meet growing demands through population increases or demand for new services. The projects targeted to meet growth are funded primarily through Development Charges (DC) – the mechanism that enables recovery of growth-related capital expenditures from new development. These charges are governed by the Development Charges Act and are applied in accordance with our Development Charges By-Law.

5.2 Expenditure History and Forecasts

The County has incorporated a number of recommended projects from the 2020 Bridge Needs Study into the 10-year approved capital plan, as illustrated in figure 5.2.1. County staff continue to review anticipated asset management needs with each budget cycle, subject to existing resource limitations.

Non-Infrastructure solution projects include bridge needs study updates, and implementation of the work management system.

Figure 5.2.1 Expenditures (millions)

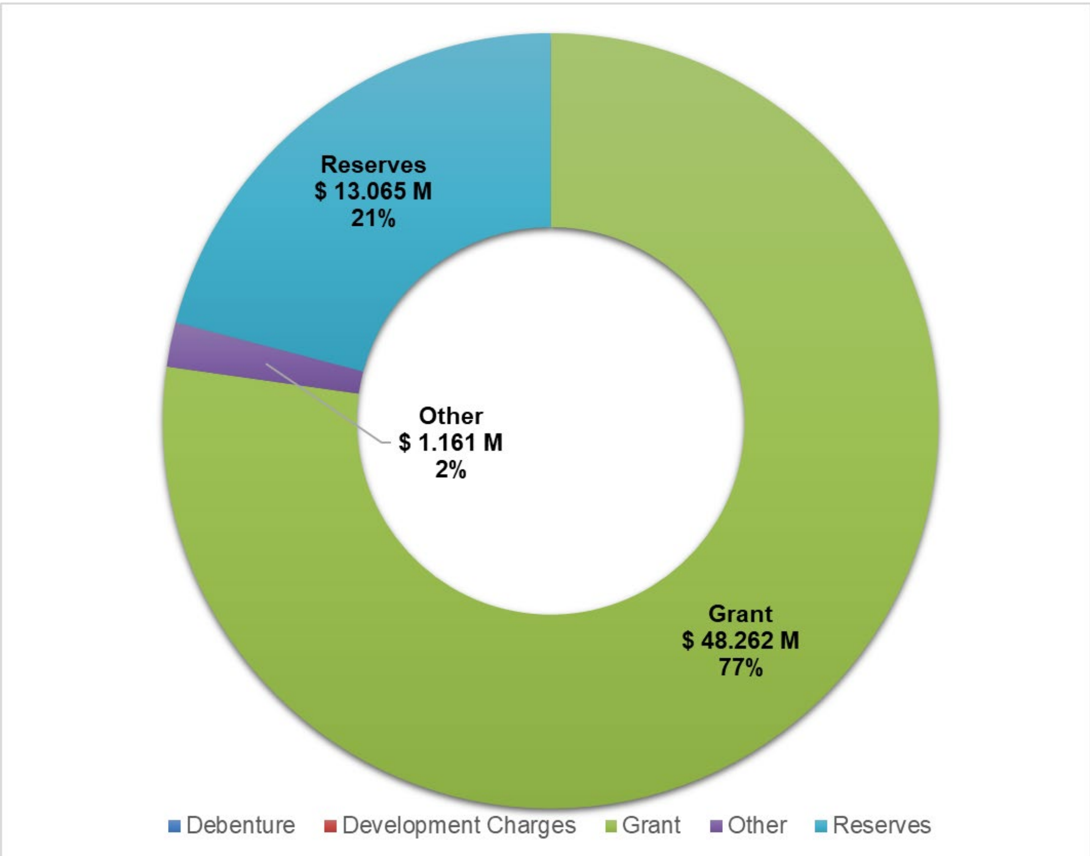


	2019 Actuals	2020 Actuals	2021 Actuals	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Non-Infrastructure Solution	0.000	0.036	0.080	0.262	-	0.130	-	0.130	-	0.130	-	0.130	-
Maintenance	0.070	0.172	0.238	0.265	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
Rehabilitation / Renewal	0.912	2.672	3.528	3.238	8.850	3.146	6.045	4.308	4.335	4.937	3.561	4.157	4.000
Replacement	1.405	0.569	1.485	0.300	0.150	-	-	-	1.000	-	-	-	-
Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-
Expansion / Growth	-	-	-	-	-	-	-	-	-	-	-	-	-

5.3 Capital Revenues

After completing the 2022 Long-Term Capital Plan, County staff received the 2022 Ontario Community Infrastructure Fund (OCIF) allocation notice. County staff further confirmed with ministry personnel that under this program the County is considered a rural municipality, so would continue to be eligible for the OCIF grant. Starting with 2023 allocations the OCIF funding formula would use current replacement values from updated AMPs. The County is unaware what impact this will have on its ongoing funding allocation. Although the OCIF grant was not included in the approved 2022 Long-Term Capital Plan as a funding source, anticipated funding sources over the 10-year plan have been updated, for the purposes of this AMP, based on an ongoing annual OCIF grant similar to the 2022 allocation of approximately $5 million.

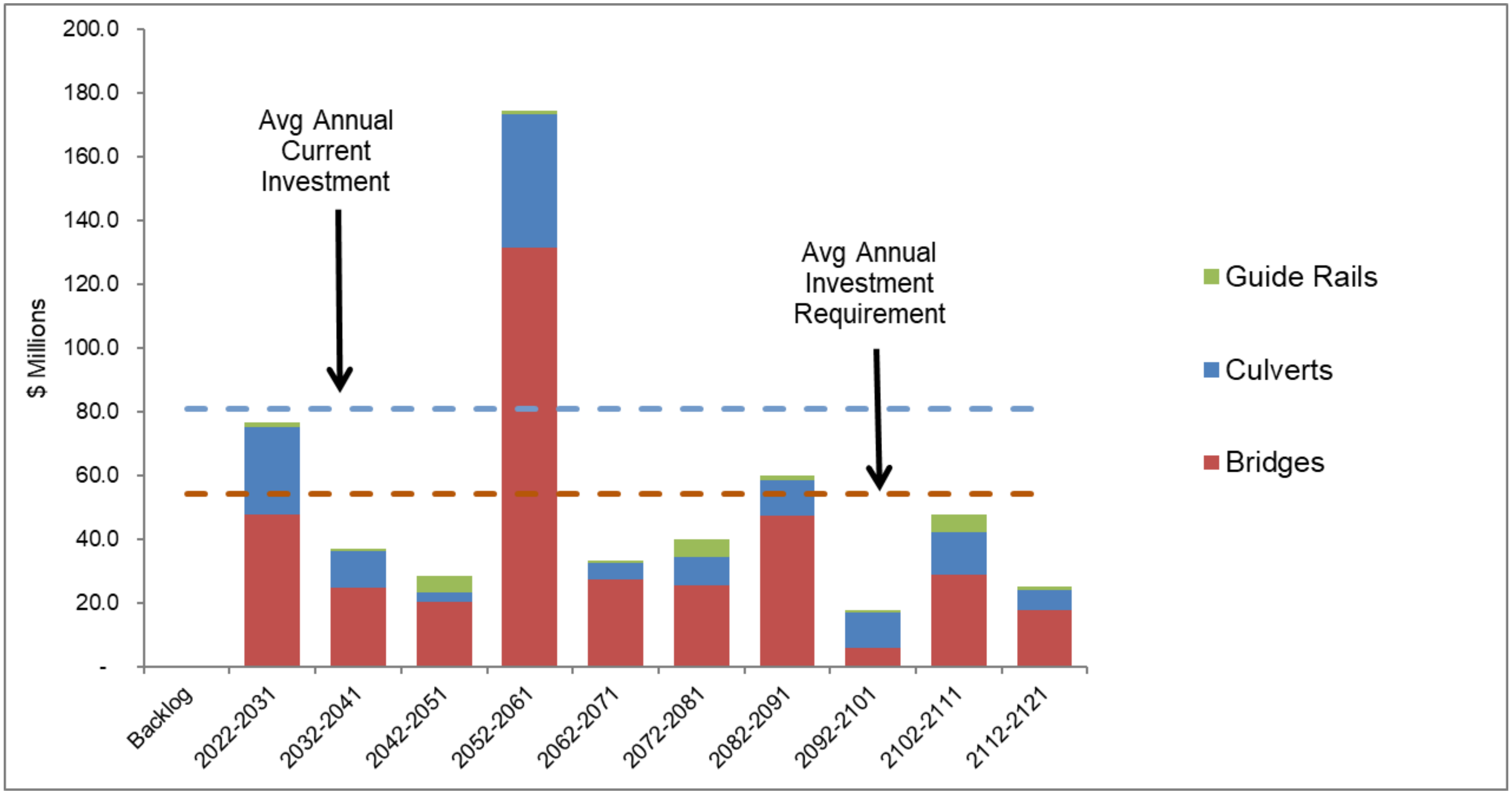
Figure 5.3.1 Sources of Capital Revenues 2019-2031 (millions)



5.4 Capital Investment

Based on the asset management strategies identified, the financial requirements over the next 100-years are determined in current dollars. The average annual investment requirement represents the amount of capital funding required to renew and maintain the existing assets on an annual basis so services can continue to be delivered. These estimates assume that all work is able to be completed, as indicated, and does not take into account future changes due to environmental factors, new maintenance techniques, and unidentified growth. The annual requirement has increased from the 2017 AMP, due to replacement cost increases and the addition of structures from the road rationalization. The data will continue to be reviewed with each budget and business plan cycle.

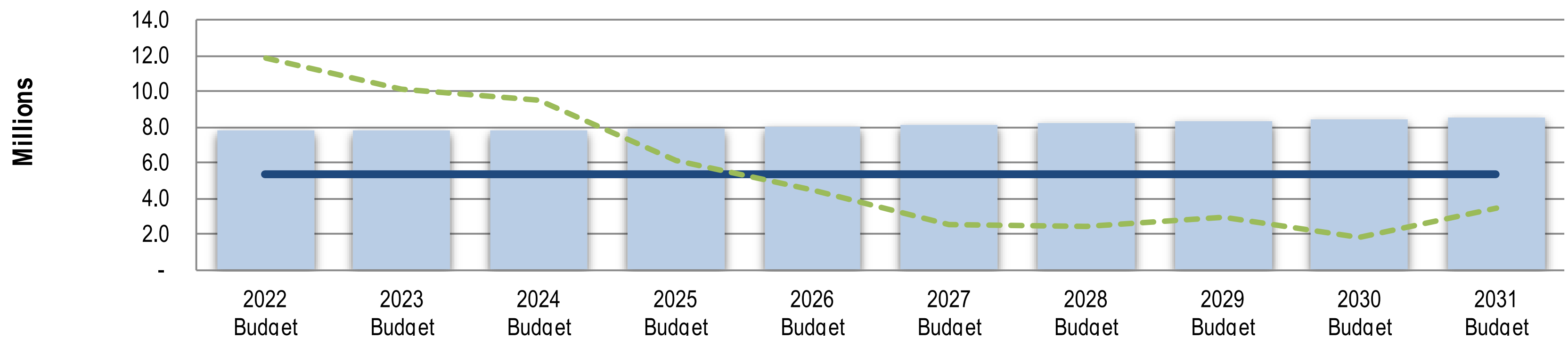
Figure 5.4.1 Average Annual Capital Requirements



The following figure links the annual capital funding needs to the capital investments contained in the budget. The timing of the actual capital projects may vary, however annual investments in capital assets is important for financial sustainability.

Figure 5.4.2 Funding Requirements

	Key	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Annual Required Investment		**5,414,000**	**5,414,000**	**5,414,000**	**5,414,000**	**5,414,000**	**5,414,000**	**5,414,000**	**5,414,000**	**5,414,000**	**5,414,000**
Current Investment		7,783,968	7,788,712	7,880,060	7,965,020	8,046,010	8,132,487	8,225,143	8,327,434	8,425,662	8,528,321
Funding Deficit		-	-	-	-	-	-	-	-	-	-
Funding Surplus		*2,369,968*	*2,374,712*	*2,466,060*	*2,551,020*	*2,632,010*	*2,718,487*	*2,811,143*	*2,913,434*	*3,011,662*	*3,114,321*
Reserve Balance		11,846,532	10,120,244	9,474,804	6,145,324	4,503,084	2,551,071	2,459,714	2,926,148	1,815,110	3,493,431



The current investment included in figure 5.4.2 has been updated to reflect an ongoing annual OCIF grant at approximately $5 million. The reserve balance reflects the balance noted in the 2022 Approved Budget.

5.5 Funding Gap Analysis

Using the anticipated 10-year asset lifecycle needs, along with the current capital investment level, the County is able to determine if there is an anticipated funding gap for the bridge and major culvert assets. Consideration is then given to the reserve balance to determine the residual funding gap. The County would then investigate opportunities for reducing this residual funding gap which, may include increases to the levy contribution, utilization of grant funding opportunities and further review of lifecycle strategies and proposed levels of service.

Figure 5.5.1 illustrates the anticipated asset management 10-year lifecycle needs and anticipated funding surplus (left side of figure 5.5.1) and funding needs (right side of figure 5.5.1) for the County's bridge and major culvert assets. The system calculates the optimal expenditures based on theoretical asset lifecycle needs. These needs have not yet been reviewed in depth with County operations staff, and incorporated into the 10-year capital budget. This is anticipated to be completed as part of the 2023 Business Plan and Budget process with subsequent review annually.

The anticipated expenditures have been increased for non-infrastructure solution projects; approximately $0.8 million.

Given the ongoing assumption of receipt of the OCIF grant, there is a projected surplus within the 10-year period. County staff will review the 10-year projected contributions to the Bridges reserve during 2023 Budget and Business Plan deliberations to confirm if future year anticipated increases can be paused and contributions held at the 2022 level. Staff will also continue to monitor projected future OCIF allocations to ensure any changes in funding are appropriately accounted for in order to maximize use of this funding, which may include the re-allocation of funds to other eligible asset categories.

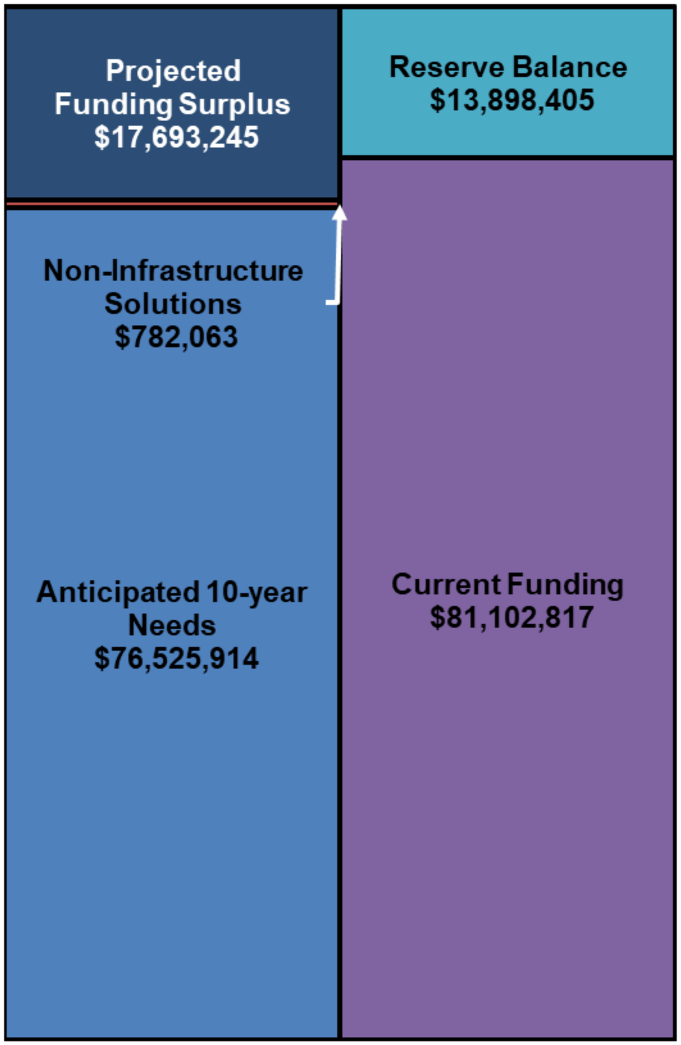
Drawing the reserve balance to zero would likely result in increased levy contribution requirements in the subsequent 10-year period in order to fund the anticipated asset lifecycle needs.

The reserve is also utilized to fund emergency or unplanned expenses. A minimal or fully committed balance would limit the ability to fund these types of expenses. Consideration needs to be given to a minimum balance the County should maintain based on these risks.

Analysis of the reserve target minimum balance will be completed as part of the annual reserve review process.

Failure to address long-term asset lifecycle needs could result in significant increases to future taxation levels as assets reach end of life; or reductions in localized and/or regional service. This may include load restrictions and structure closure resulting in disruption to traffic flow.

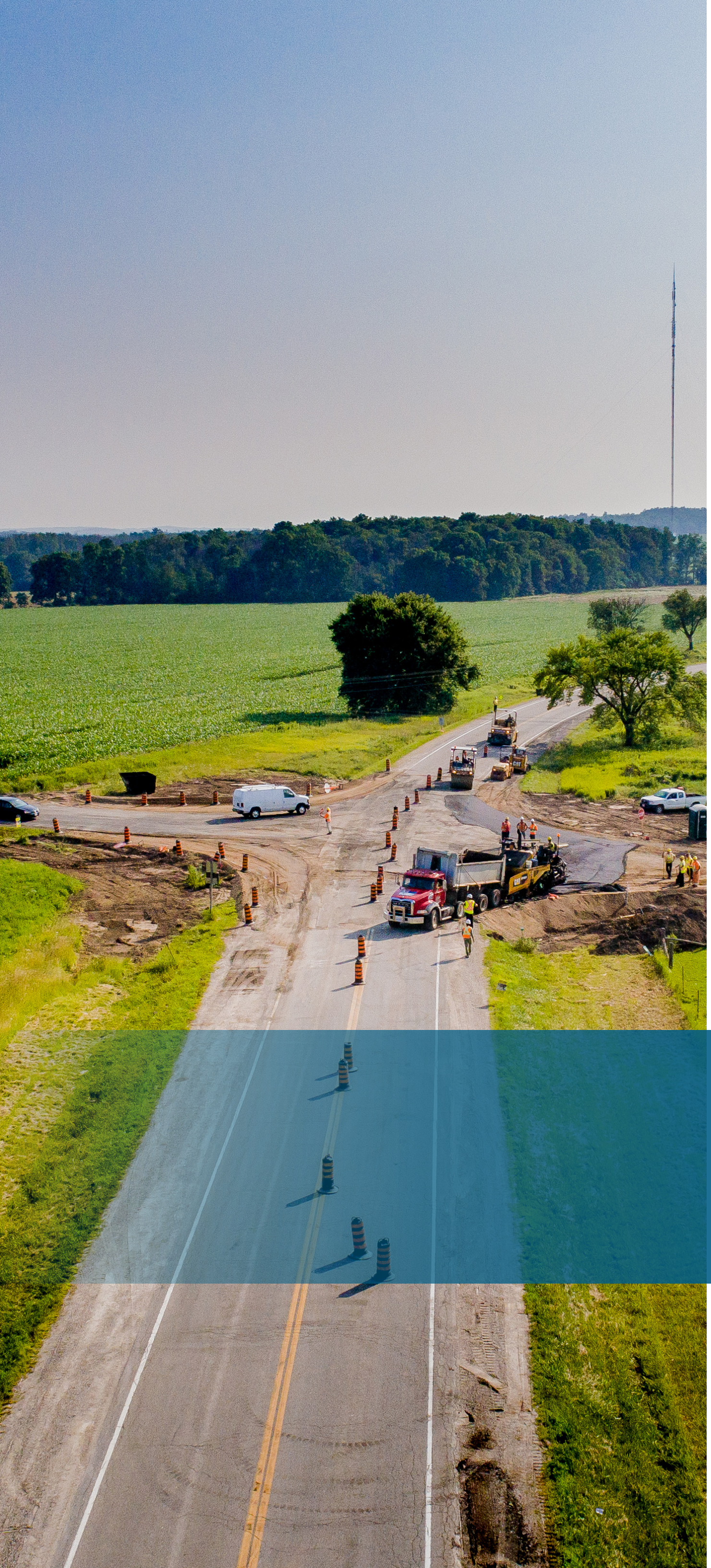
Figure 5.5.1 Anticipated Needs (10-Year)



6.0 Climate Change

As part of the asset management planning process, the County will consider the risks and vulnerabilities of capital assets to climate change and the resulting actions that may be required. Commitment will be made to the development of tailored actions that make the best use of our resources to mitigate and adapt to climate change, in accordance with our local reduction targets, financial capacity and stakeholder support.

Climate change resiliency will be included as a design criterion for bridge and major culvert renewal/replacement projects as part of the County's capital plan.



Road network

Growing stronger together

Table of Contents

1.0 Introduction

The County maintains a diverse transportation network to provide safe and effective means to keep our communities moving and connected. The road network is integral to this and helps provide continuous efficient movement of traffic as part of the overall transportation network.

The County's road network is categorized into various components, as a result of differing life spans and maintenance strategies. They are arterial, collector and local roads, works yards, trails and road appurtenances which include guide rails, traffic signals, pedestrian crossings, street lights and retaining walls.

Sound management of our road network helps us realize our vision of being a vibrant community, working well and growing stronger together!

Like many of our assets, our road network is facing increased challenges as a result of aging assets, climate change and increasing demand due to growth in our communities. Our investment in these assets must therefore be balanced to optimize investment for renewal with the growing needs of our community.

This plan provides information regarding our approach to the management of our road network over the short (10-year) and long (100-year) term, demonstrating our commitment to assessing and meeting the levels of service valued by our residents and businesses.

1.1 Improvement Plan

The County recognizes that asset management is a continuously evolving process. The following recommendations are based on the review of current management practices, inventory, valuation and condition analysis.

- Incorporate findings from the Transportation Master Plan.
- Continue to monitor new technologies as they emerge to determine when cost effective to be implemented, in order to extend useful lives of components.
- Incorporate maintenance requirements into lifecycle strategies.
- Continue to work to reduce asset data gaps.
- Document lifecycle history on asset components within the asset management systems.
- Continue to work on establishing components and lifecycle strategies for facility related road network assets.

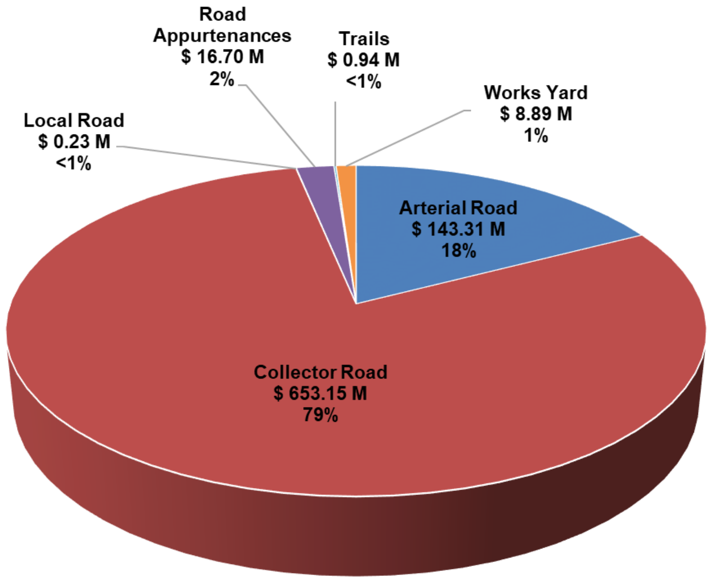
2.0 State of Assets

2.1 Inventory

Our road network enables us to get to where we need to go throughout the County. Our road assets are some of our most highly utilized and visible assets. It includes everything from the roadways throughout the County to the guide rails, retaining walls and signalized crossings which support them. We recognize that the efficiency and value we can derive from our transportation assets extends into all other asset portfolios, which is what makes transportation particularly important.

Table 2.1.2 displays our current road network inventory and the associated replacement costs and average age for each asset component.

Figure 2.1.1 Inventory Valuation



2.2 Valuation

The replacement cost valuation for the assets in our road network are based on current tender prices, where available. Current tender prices are adjusted where County staff feel some cost increases are only temporary due to COVID.

The replacement cost valuation for our works yards is based on the latest information available, which includes current replacement costs, insurance valuations, and valuations from studies / assessments completed in prior years.

Table 2.1.2 – Road Network Inventory

Asset Type	Asset Component		2017 Inventory	Current Inventory	Replacement Cost	Average Age
Road Network	Arterial Roads[1]	km[2]	114.03	114.34	$143,306,335	19 Years
	Collector Roads[3]	km[2]	529.53	551.11	653,152,918	19 Years
	Local Roads[4]	km[2]	0.20	0.20	228,335	12 Years
	Guide Rails	m	808	2,449	4,146,420	3 Years
	Traffic Signals - Signal	intersection	37	39	8,490,000	24 Years
	Traffic Signals – Controller & Detection	intersection	N/A	17	1,190,000	3 Years
	Beacons	each	N/A	19	95,000	8 Years
	Pedestrian Crossings	each crossing	N/A	8	445,370	1 Year
	Retaining Walls	square meter	N/A	675	1,849,672	2 Years
	Street Lights	each	N/A	67	281,400	10 Year
	Equipment	total	N/A	N/A	206,365	2 Years
	Works Yards	each	4	4	8,891,258	16 Years
	Trails[5]	km	-	20	943,741	4 Years
Total Replacement Cost					**$823,226,815**	

Road rationalization was undertaken as part of the 2019 Transportation Master Plan. Council Report PW 2021-29 includes information on the road transfers recommended. The road transfers, effective January 1, 2022, are included in the current inventory figures above.

There are several growth / expansion projects planned throughout the County's road network that are included in the County's 2022 approved Long-Term Capital Plan. These growth projects are not included in the figures within table 2.1.2, however their anticipated lifecycle needs are included within this AMP.

[1] "Arterial Roads" means Class 1 and Class 2 highways as determined under the Table to section 1 of Ontario Regulation 239/02 (Minimum Maintenance Standards for Municipal Highways) made under the Municipal Act, 2001
[2] Centreline km
[3] "Collector Roads" means Class 3 and Class 4 highways as determined under the Table to section 1 of Ontario Regulation 239/02
[4] "Local Roads" means Class 5 and Class 6 highways as determined under the Table to section 1 of Ontario Regulation 239/02
[5] Includes replacement cost of fencing and gates along the trail

2.3 Condition Assessment Approach

The assessment approach for our road network assets utilizes a combination of physical assessments, asset attributes, such as material, as well as established anticipated useful lives.

The County's condition scale and visual inspection ratings are based on the following approach:

- Excellent - Asset is well maintained with no noticeable defects.
- Good - Asset may show signs of minor deterioration and may require some maintenance.
- Fair - Deterioration evident, function affected. Asset may require on-going monitoring.
- Poor - Serious deterioration, function inadequate. Asset may require ongoing monitoring.
- Critical - No longer functional, general or complete failure. Asset may require extensive monitoring.

The state of the arterial, collector and local road assets is determined based on the Pavement Condition Index (PCI). The PCI is calculated from the Ride Comfort Rating (RCR) and the Distress Manifestation Index (DMI).

The Ministry of Transportation developed a formula to determine the cumulative impacts of the various surface distresses, in order to determine the DMI for each road section. The higher the calculated DMI the better overall condition of the road surface.

The PCI tells us what the current condition of the road segment is and can help determine the rate of deterioration of that segment by comparing PCI values over time. It helps to identify immediate maintenance and rehabilitation requirements, as well as, provide a base for establishing a long-term maintenance strategy.

Table 2.3.1 summarizes the PCI values and how they relate to the overall quality of the road segment. Unless otherwise noted, all images are of County assets, and are general representations of the road condition at the time the photo was taken. Assets may have undergone lifecycle strategies since the date of the image impacting its condition.

The County conducts a Road Needs Study every five years to provide an overview of the condition of the various road segments. The condition information utilized for the road segments is based on the 2020 Road Needs Study, prepared by Golder Associates Ltd, to be finalized in 2022. Conditions have been adjusted for road segments that have had work completed since being evaluated in the 2020 study.

Given the complexities and accessibility of some assets, not all assets allow for a visual or performance-based condition assessment. For assets which have not been visually inspected an age based condition rating is being used based on anticipated useful lives.

Table 2.3.1 PCI Score Ratings

Excellent
PCI Score of
80-100

Example
Roadway:
PCI of 92.9

Good
PCI Score of
60-79

Example
Roadway:
PCI of 73.7

Fair
PCI Score of
40-59

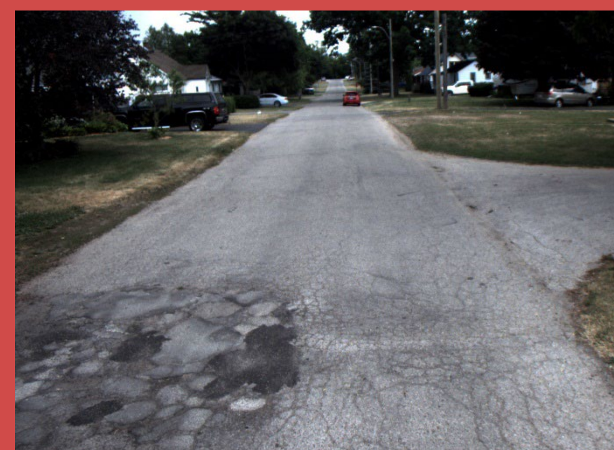
Example
Roadway:
PCI of 49.5

Poor
PCI Score of
20-39

Example
Roadway:
PCI of 38.0

Critical
PCI Score of
0-19

Example
Area Municipal
Roadway:
PCI of 8.3

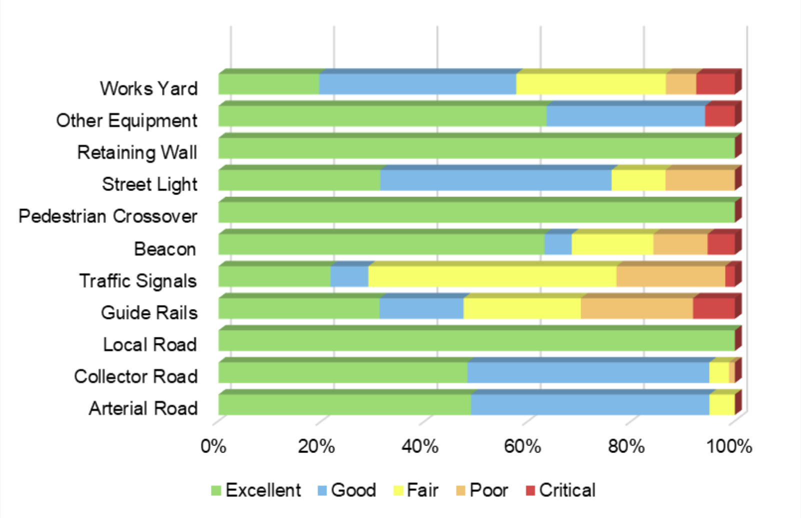


2.4 Condition Assessment

The condition profile of our road network by components is shown in figure 2.4.1. The quantity in each condition is based on replacement costs.

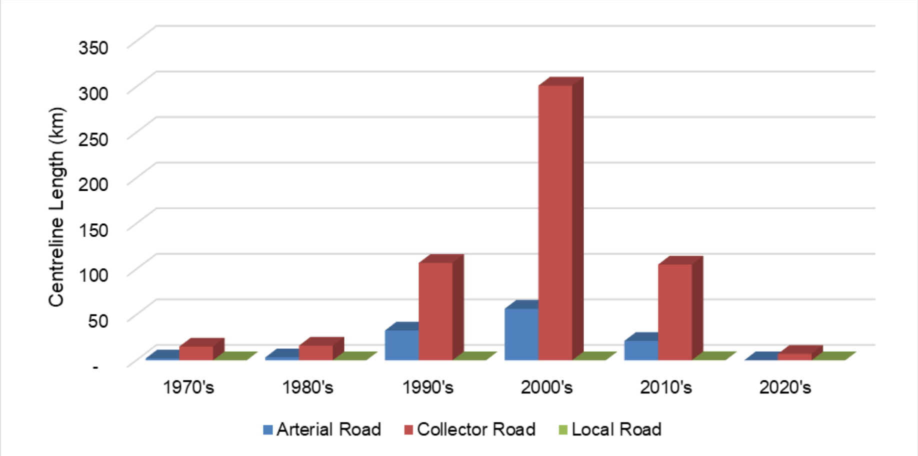
For our road network assets: 1.5% of these assets are in poor or critical condition, and 93.7% in good or excellent condition in comparison to 16.4% and 61% respectively for Canadian municipalities reported on the Canadian Infrastructure Report Card[6]. While this may appear that our road network assets are in better shape than other Canadian municipalities, the 2019 Canadian Infrastructure Report Card is an aggregate of self reported condition ratings across the Country and are based on a general rating scale which may not match the County's.

Figure 2.4.1 Asset Condition by Component



An age profile of the County's arterial, collector and local road assets, is shown by decade in figure 2.4.2. The age represents the last time the asphalt surface of the road segment was fully reconstructed.

Figure 2.4.2 Roads by Age



The average age of our road assets is approximately 19 years. This value must be considered in the context of the different road classes in the category, compared to the typical expected useful lifecycle of each road class based on the lifecycle strategies used.

Figure 2.4.3 depicts the age of the County's traffic signals by intersection.

[6] http://canadianinfrastructure.ca/en/index.html

Figure 2.4.3 Traffic Signals by Age

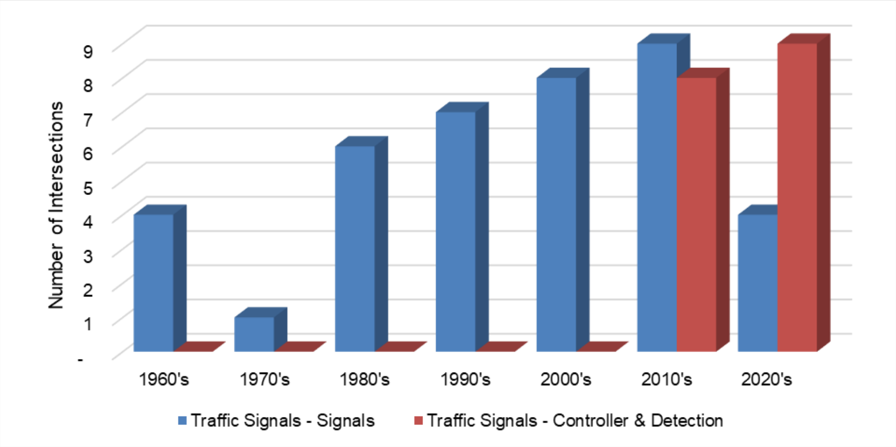


Table 2.4.4 outlines the anticipated useful life for each new build/replacement. The anticipated useful lives for our roads assets exclude the management strategies that the County utilizes to extend the overall life of our roadways. Anticipated useful lives are reviewed with each AMP update. This process consists of a review of industry standards and asset performance history.

Table 2.4.4 Useful Life

Road Network Component	Anticipated Useful Life (years)
Arterial, Collector, and Local Roads	25
Guide Rails	30
Traffic Signals – Signal, Beacon, Pedestrian Crossovers, Street Lights	30
Traffic Signals – Controller & Detection	15
Retaining Walls	50
Facilities	10 - 50
Equipment	5 - 10

Figure 2.4.5 illustrates the current average age of the road network assets in comparison to their anticipated useful life, based on a run to failure strategy.

There are a number of management strategies that the County may utilize to extend the overall life of our road network assets. These strategies allow the County to align full roadway reconstruction with the needs of the underground assets, resulting in the best overall value for our residents.

Figure 2.4.5 Age and Useful Life Comparison

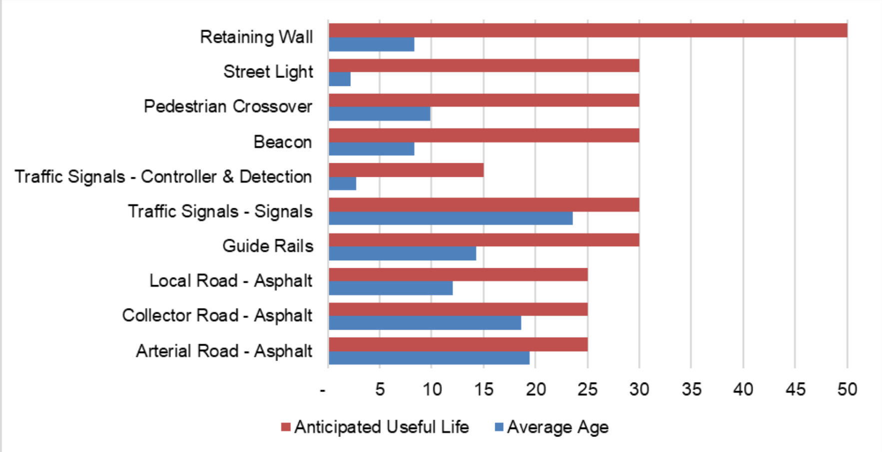


Table 2.4.6 compares the status of our road network asset components, as identified in our 2017 Asset Management Plan to their current condition. Conditions have been adjusted for roads that have had work completed since being evaluated in the 2020 study. As the County has expanded on the component tracking of its road network, comparisons to the 2017 ratings are not available for all components.

The trend shows that the status of our road network assets is relatively steady. While it may appear that the overall condition of the guide rails is declining this is a result of reducing data gaps in this area as the 2017 condition rating was for a limited number of guide rails. The County will continue to target lifecycle strategies appropriately to ensure a safe and reliable network.

Table 2.4.6 Road Network Condition Assessment

Asset Type	Asset Component	2017 Condition Rating	Current Condition Rating	Trend
Road Network	Arterial Roads	Excellent	Good	↓
	Collector Roads	Good	Good	→
	Local Road	Good	Excellent	↑
	Guide Rails	Excellent	Fair	↓
	Traffic Signals - Signal	Good	Fair	↓
	Traffic Signals – Controller & Detection	-	Excellent	-
	Beacons	-	Good	-
	Pedestrian Crossing	-	Excellent	-
	Retaining Walls	-	Excellent	-
	Street Lights	-	Good	-
	Equipment	-	Good	-
	Works Yards	-	Fair	-
	Trails	-	Excellent	-

3.0 Levels of Service

County staff have developed a comprehensive Level of Service (LOS) Framework. This framework will help to establish a relationship between the current LOS being provided by the County's assets, and the associated operating and capital expenditures required to achieve the proposed LOS. The framework puts into perspective the definition and measurement of service performance in alignment with the County's corporate mission and vision.

Corporate Objective

The corporate objective of the road maintenance and traffic management service, which includes the maintenance of the County's road network, is to ensure people and goods are able to move safely and efficiently throughout the County. The roads network includes a number of boundary roads with neighbouring municipalities in which the County and the neighbouring municipality share in the maintenance activity costs. Service agreements are in place to ensure that service levels are maintained.

Legislative Requirements

Ontario Regulation 239/02[7] specifies the Maintenance Standards for Municipal Highways. It covers such items as, but not limited to, patrolling frequency, snow accumulation, potholes, and regulatory/warning signs and traffic signals. The level of service provided by the County for winter maintenance meets the level required by Ontario Regulation 239/02. The County currently maintains Class 3 and below roads at a level that is equal to the requirements for Class 3 roads.

Framework

The structure of the County's LOS framework was developed to align with international best practices including the International Infrastructure Management Manual (IPWEA, 2015). The framework includes the mandatory measures to meet the requirements of Ontario Regulation (O.Reg.) 588/17 by including both Community and Technical Levels of Service. The metrics in this framework may be expanded upon as the County continues to improve its data collection and reporting processes.

[7] https://www.ontario.ca/laws/regulation/020239

3.1 Customer Levels of Service

Community or Customer Levels of Service are statements that describe quantifiable metrics of the service delivery outcomes from the perspective of the customer, expressed in non-technical terms. The following statements form our qualitative descriptions of the customer level metrics required under O.Reg. 588/17.

The County's road network provides a safe and efficient multi-modal transportation system, which moves people and goods into and through the County while meeting the present and future needs of County residents and businesses.

Included in Table 2.3.1 are images illustrating the pavement condition of roadways in various condition ranges based on the PCI.

Table 3.1.1 outlines additional customer focused performance metrics from the County's LOS framework.

3.2 Technical Levels of Service

Technical Levels of Service metrics are quantifiable metrics applied against assets that are subject-matter specific inputs or outputs supported by the day-to-day activities of County staff. Table 3.1.1 includes the technical metrics required under O.Reg. 588/17, as well as, additional metrics the County has included in the framework.

3.3 Levels of Service Maps

As a further illustrative example of our community levels of service, a map is included as figure 3.3.1 showing the connectivity of our road network.

Figure 3.3.1 Road Network Connectivity

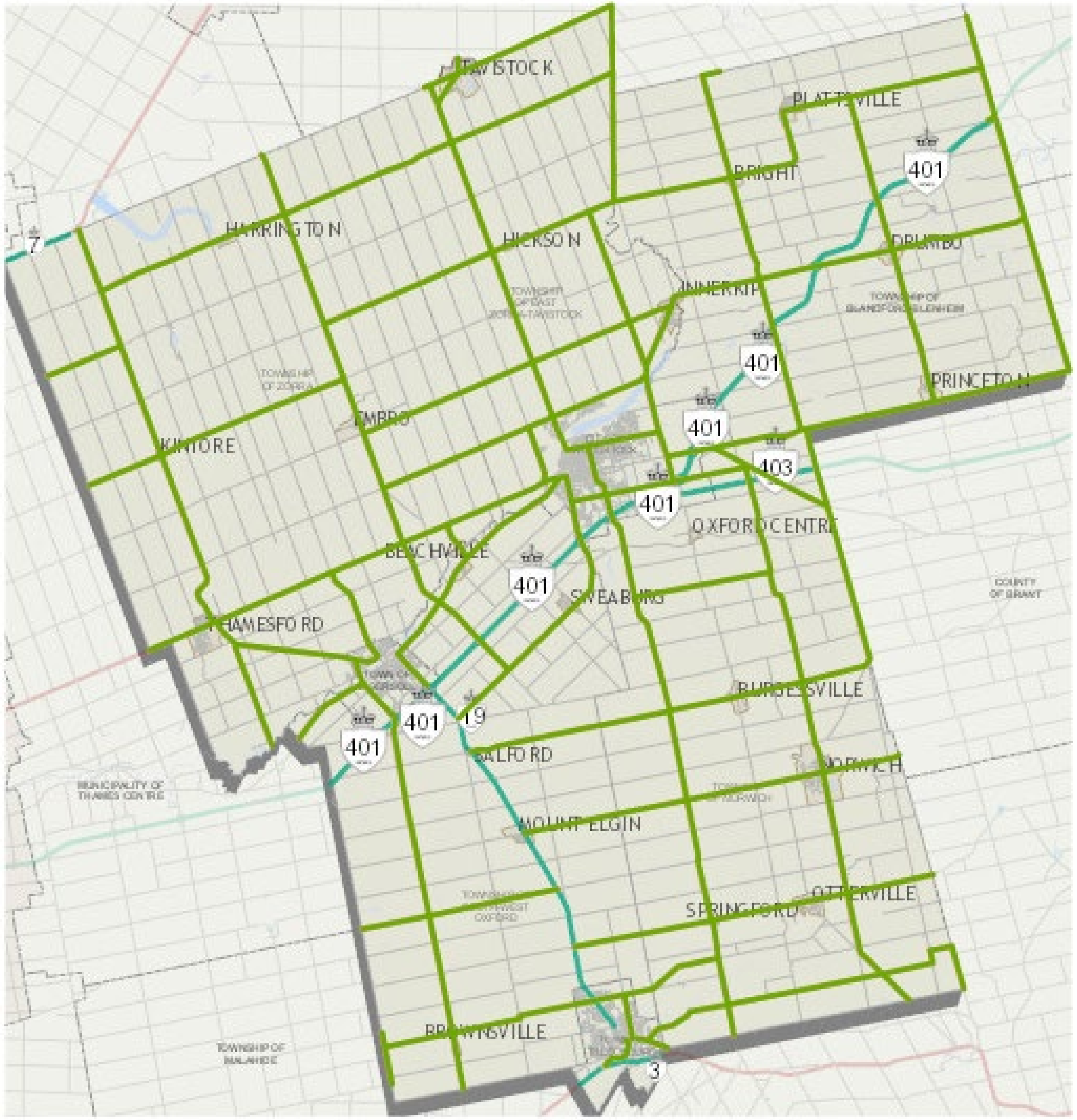


Table 3.1.1 Performance Measures

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Customer / Council Focused Performance Measures					
Safety	Providing an operational and accessible transportation network that is safe for all modes and uses of the transportation network	# of direct connections to Provincial Highways	12	12	N/A
		% of grade level crossings where crossing surface meets Federal regulation	50%	50%	100%
Quality	Maintaining transportation network in a state of good repair	% of arterial roads with surfaces in fair or better condition	-	100%	TBD
		% of collector roads with surfaces in fair or better condition	-	98.9%	TBD
		% of local roads with surfaces in fair or better condition	-	100%	TBD
Reliability	Providing a transportation network that is reliable	# of Winter Event Response as per MMS	61	66	N/A
		Hectares sprayed for control of invasive species	13.2	10	N/A
Cost Efficient	Providing an efficient transportation network for all modes	Operating Cost to provide service ($/household)	$372	$409	TBD
Technical Focused Performance Measures					
Safety	Providing an operational and accessible transportation network that is safe for all modes and uses of the transportation network	# of lane-kilometers of arterial roads as a proportion of square kilometers of land area of the municipality	225 lane-km to 2,049 km^2 of land area	225 lane-km to 2,049 km^2 of land area	N/A
		# of lane-kilometers of collector roads as a proportion of square kilometers of land area of the municipality	1,042 lane-km to 2,049 km^2 of land area	1,042 lane-km to 2,049 km^2 of land area	N/A

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
		# of lane-kilometers of local roads as a proportion of square kilometers of land area of the municipality	0.4 lane-km to 2,049 km^2 of land area	0.4 lane-km to 2,049 km^2 of land area	N/A
		% of winter events where the response met or exceeded Minimum Maintenance Standards (MMS)	100%	100%	100%
Quality	Maintaining transportation network in a state of good repair	Average Pavement Condition Index (for arterial paved roads)	N/A	76.7	TBD
		Average Pavement Condition Index (for collector paved roads)	N/A	78.8	TBD
		Average Pavement Condition Index (for local paved roads)	N/A	96	TBD
		% of roads renewed annually (including resurfacing and reconstruction)	2.5%	2.9%	TBD
		% of regulated signs that meet retroreflectivity standards	N/A	96.2%	100%
Reliability	Providing a transportation network that is reliable	% of roads/paved surface area in poor or critical condition	N/A	0.9%	TBD
		% of pedestrian crossovers in poor or critical condition	0%	0%	0%
		Tonnage of salt applied to road	8,263	9,374	TBD
		Tonnage of sand applied to road[8]	8,069	6,270	TBD
		Liters of winter liquids applied to road[8]	346,564	273,138	TBD

[8] By winter season

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Cost Efficient	Providing an efficient transportation network for all modes	Operating cost for roads per lane kilometer	$3,478	TBD	TBD
		Operating costs for winter control per lane kilometre	$1,966	TBD	TBD
		Operating cost for traffic operations per lane kilometer	$2,605	TBD	TBD
		5 year Average capital expenditure for roads linear assets	$9.8M	$10.2M	TBD
		5 year Average capital expenditure for roads traffic assets	$0.7M	$0.9M	TBD

4.0 Asset Management Strategy

4.1 Lifecycle Activities and Planned Actions

The County has developed various maintenance strategies depending on the asset component and type of surface. These strategies align with the Road Needs Study and Transportation Master Plan (TMP) and are maintained within an asset profile which informs the annual requirements for the capital plan. The TMP recognizes existing and future mobility and development issues confronting County residents in order to preserve the quality of life supported by an effective transportation network.

Routine maintenance requires minimal effort to maintain the useful life of our road network. Safety critical elements are identified during the inspection process to determine if any assets are in need of immediate repair. All safety concerns are addressed in alignment with minimum maintenance standard requirements.

The most effective improvement in a road's useful life can be achieved by completing rehabilitations while the roadway has a PCI between 45 and 65. Although PCI is a measure of overall condition of the roadway surface, other factors are considered when prioritizing maintenance.

Weather factors and actual traffic flow will also have an effect on the actual life achieved. It is possible to have segments exceed the anticipated useful lives defined, as well as, segments that require replacement prior to the end of their anticipated useful life.

As part of capital works project analysis, determinations of whether the roadway replacement or rehabilitation should occur is reviewed. This process is fully integrated with the renewal needs of the underground assets, such as drinking water, wastewater and stormwater. This integrated approach ensures our renewal projects for these service areas are delivered with optimal timing to increase value and minimize disruption to our communities. For example, if a roadway is targeted for renewal, coordination between service areas and area or neighbouring municipalities will determine whether the underlying stormwater, drinking water or wastewater assets are also of an age or condition that requires renewal, to ensure these projects are delivered together to reduce disruption for our communities and deliver enhanced value.

There are six main lifecycle activities considered in the overall sustainable management of our road network assets, described in table 4.1.1.

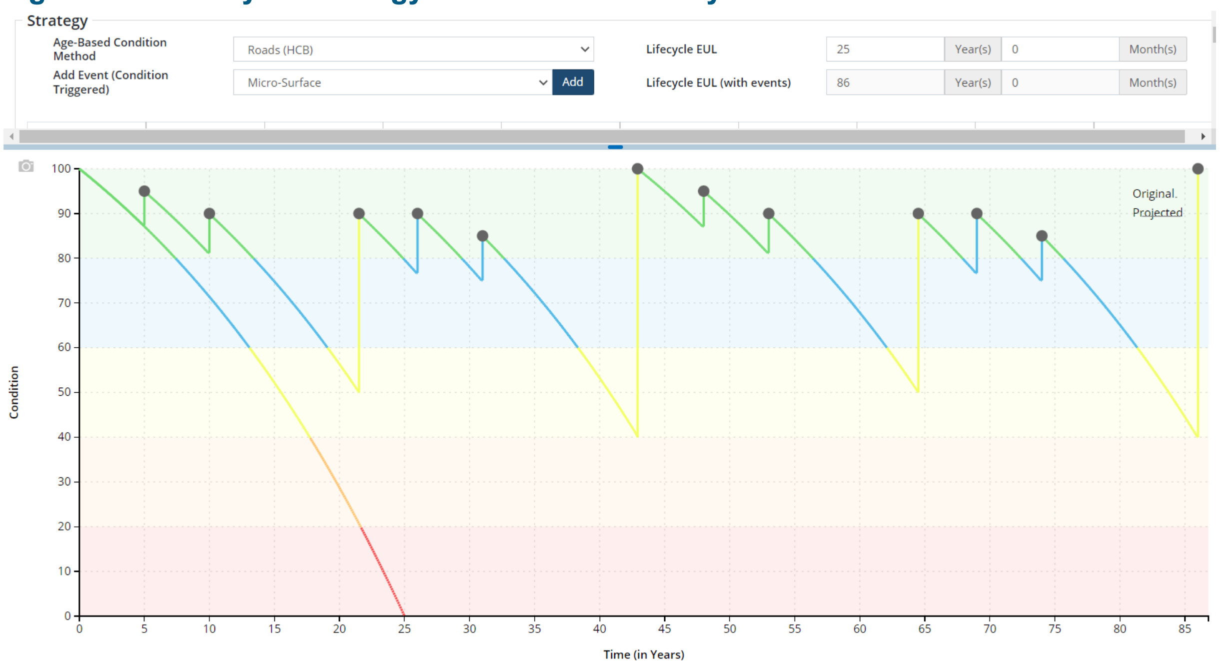
Table 4.1.1 Lifecycle Activities

Strategy	Lifecycle Activity
Non-Infrastructure Solutions	Actions or policies that can lower costs or extend useful lives. **Trigger: Ongoing**
Maintenance	Regularly scheduled maintenance and inspection programs including pothole repairs, invasive species management, sweeping and spot repairs. These activities do not improve the overall condition of the asset, nor increase its useful life. **Trigger: Ongoing**
Rehabilitation / Renewal	One-time events that increase the condition and extend the useful life of the asset; including surface grinding and partial depth asphalt removal/repaving. **Trigger: PCI between 45 and 65**
Replacement	Occurs at the end of the useful life and/or when rehabilitation is no longer an option – can vary among assets due to construction material and environmental factors that impact the degree of deterioration and performance. **Trigger: PCI < 50**
Disposal	Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the County to provide services. County staff coordinate with contractors to ensure safe removal and environmental compliance when disposing of assets. **Trigger: Poor/Critical**
Expansion / Growth	Planned activities required to expand services to meet growth demands, or increase the level of service being provided. **Trigger: Development**

The lifecycle management strategy is the set of planned actions that should enable the assets to provide users with the proposed level of service in a sustainable way, while achieving acceptable levels of risk and the lowest lifecycle costs required to provide that level of service. Lifecycle considerations for assets include analysis of the timing to carry out key asset management activities including inspection, maintenance, repair, and replacement. Ongoing preventative maintenance activities will be outlined in the County's work management system. The rehabilitation and replacement activities impacting the asset components condition and useful life are contained within profiles in the County's asset management system. For some assets, replacement needs are based on a run to failure strategy, as this is the most economical.

As an example, figure 4.1.2 illustrates the lifecycle strategy of an urban collector road. These roads are anticipated to be rehabilitated three times, with crack sealing and other preventative maintenance performed in between, extending the overall useful life from 25 years to approximately 90, to align the full roadway re-construction with the expected needs of the underground assets. Using the 2 lane class 3 section of Devonshire Ave in Woodstock from Vansittart Ave to Wellington St, the annual cost requirement from a run to failure strategy is $5.40/m^2 per year where the annual cost requirement using the rehabilitation strategies decreases to $2.80/m^2 per year.

Figure 4.1.2 Lifecycle Strategy of an Urban roadway

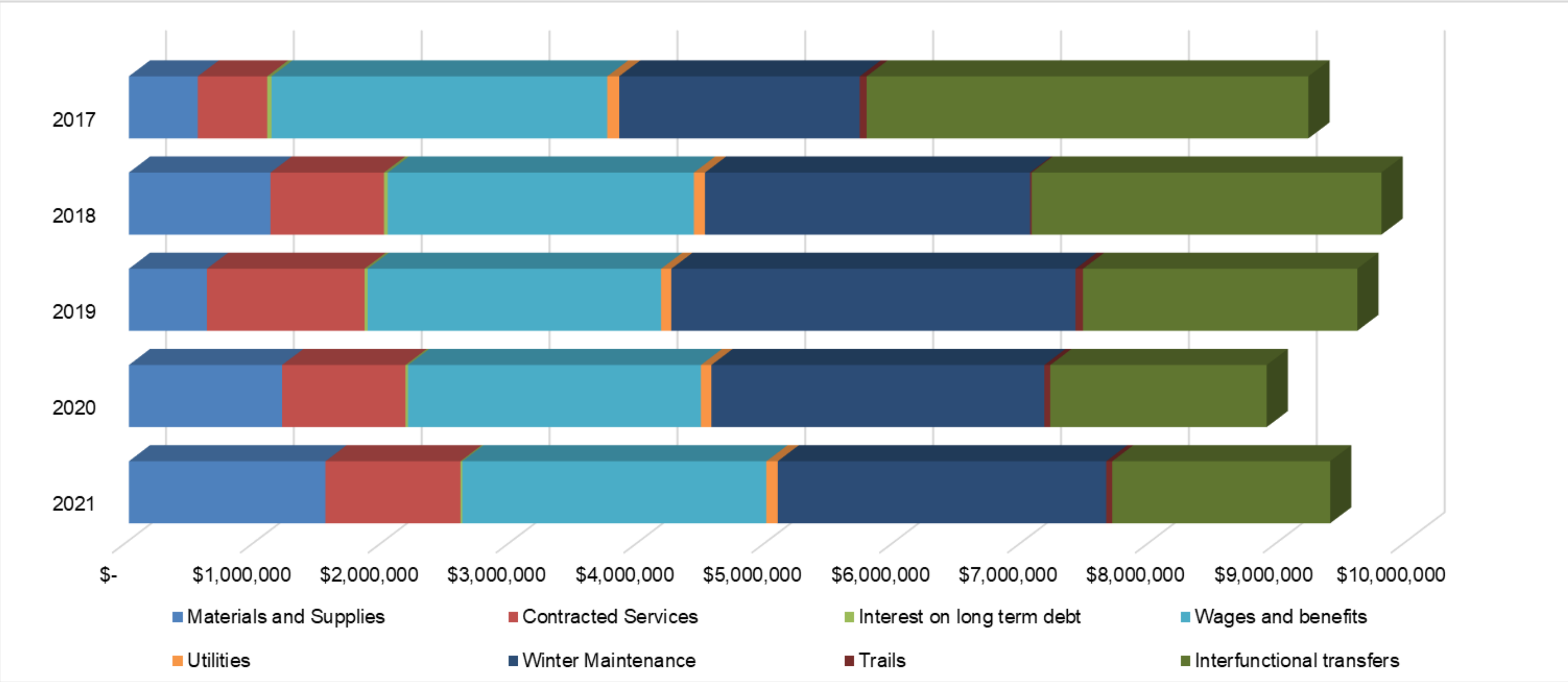


4.2 Significant Operating Expenses

Significant operating expenses are required in order to sustain an asset over its lifecycle. The County is always looking at ways to optimize our operating investment to ensure we are achieving the best value for our residents and businesses. Essential to this is a strong operations and maintenance plan within our work management system. Operating expenses are incurred through a number of sources – preventative maintenance activities, shoulder grading, winter maintenance activities, guide rail repairs and more. Despite the fact that minor maintenance is incorporated into planned operations and maintenance programs, there are cases where it is unplanned.

Figure 4.2.1 shows the operating expenses from 2017 through 2021 for the roads network grouped by expense type. The groupings align with those reported on the County's Financial Information Return (FIR), with further breakdown for utilities costs.

Figure 4.2.1 Operating Expenses



4.3 Risk Strategy

Risk management frameworks are developed to assist with the prioritization of investments within the capital planning period. The preferred approach is to implement a triple bottom line analysis approach to evaluate:

- Social impacts of asset failure, including impacts to customers, businesses and the County's reputation;
- Environmental impacts of asset failure; and
- Economic impacts of failure including the cost of remediation.

In the context of asset management, risk is the multiple of the consequence of an asset failing and the probability that the event will occur.

Figure 4.3.1 illustrates the risk ratings for the County's road network assets at a summary level. County staff will continue to monitor the higher risk assets, review and/or complete physical inspections to further validate needs and plan for lifecycle strategies accordingly.

Figure 4.3.1 Asset risk profile

Consequence \ Probability	1	2	3	4	5
5	0 Assets - $0.00	3 Assets 51,836.00 m2 $8,079,158.96	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	44 Assets 943,601.15 m2 $145,839,826.25	70 Assets 1,778,316.80 m2 $277,725,096.61	23 Assets 656,698.00 m2 $102,352,950.28	3 Assets 92,309.00 m2 $14,387,280.74	0 Assets - $0.00
3	66 Assets 461,339.31 m2, unit(s) $71,248,343.17	56 Assets 411,958.60 m2, unit(s) $62,807,675.30	33 Assets 284,328.10 m2, unit(s), m $45,999,155.97	2 Assets 13,759.00 m2 $2,144,477.74	1 Asset 1.00 unit(s) $256,074.00
2	119 Assets 254,355.29 m2, unit(s), m $37,328,792.02	74 Assets 193,474.04 m2, unit(s), m $28,608,535.08	77 Assets 55,592.96 m2, unit(s), m $14,649,142.41	42 Assets 18,314.26 m2, unit(s), m $5,388,569.97	9 Assets 908.97 unit(s), m $508,588.26
1	125 Assets 9,720.56 m2, unit(s), m $3,009,719.73	49 Assets 1,973.00 m2, unit(s) $1,512,009.30	46 Assets 64.15 unit(s), m $1,558,932.01	33 Assets 1,782.00 unit(s), m $862,721.12	33 Assets 68.27 unit(s), m $460,215.93

5.0 Financial Strategy

5.1 Financing Strategy

Of the maintenance strategies identified, routine maintenance is part of the operating budget, while all other activities are considered part of the capital budget.

Where possible, rehabilitation and replacement activities for the road network are planned in collaboration with the rehabilitation and replacement activities of the underground assets to minimize disruption and achieve cost efficiencies. The availability of funding by other municipalities for shared assets will also have an impact on the timing of rehabilitation and replacement projects.

Capital work is funded from reserves (based on the capital contribution included in the levy), development charges (for growth projects) and grant funding (including the Canada Community Building Fund) when available. The County continually assesses opportunities for additional funding options and revenue streams to address our asset needs.

While debentures are not currently used to fund road network projects, the funding option is available in times of high replacement requirements and low reserve balances.

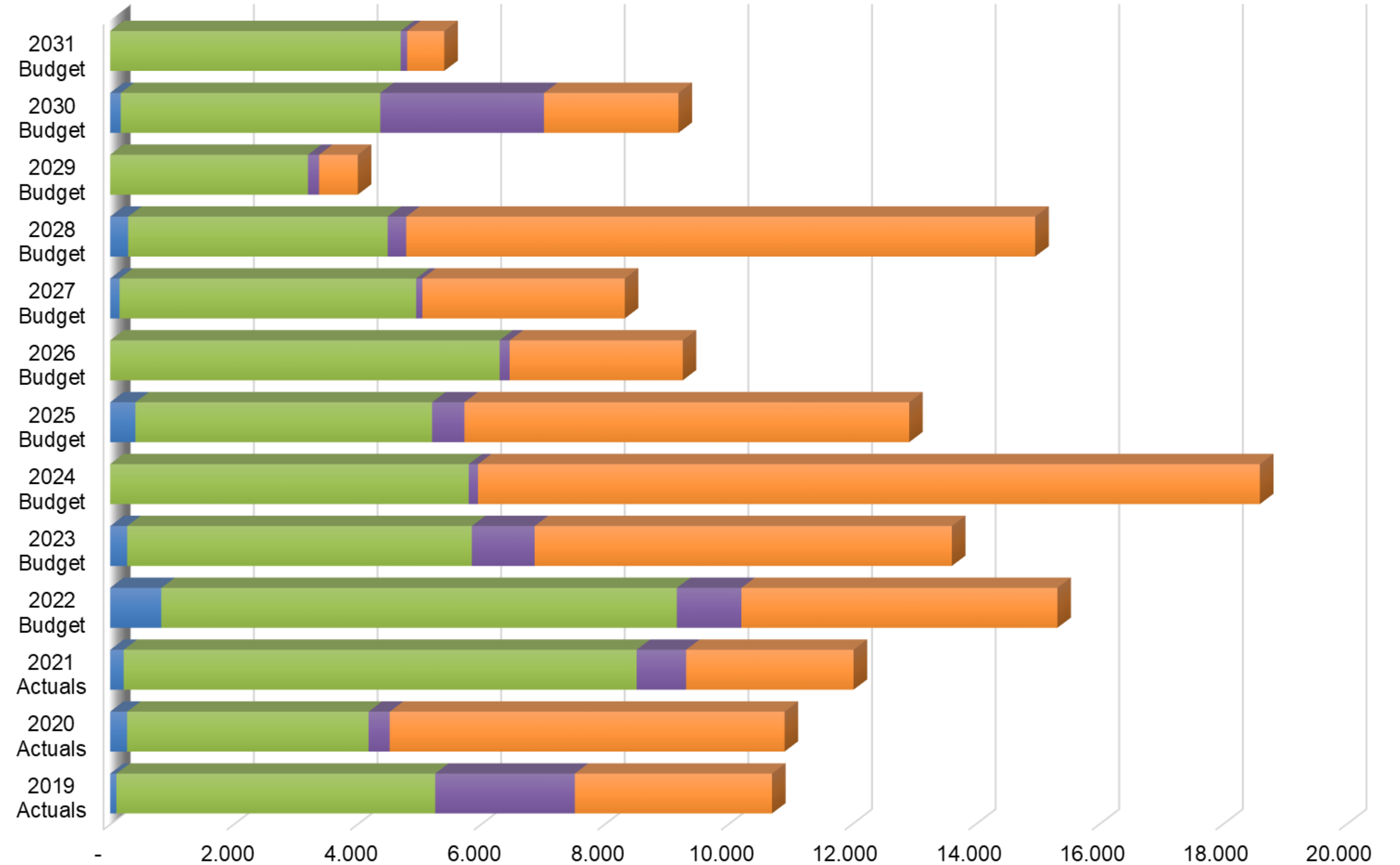
In addition to targeting and prioritizing the investment needed to maintain existing assets, there are also planning processes in place to determine the additional assets and expansion of existing assets (e.g. the widening of roadways and intersection improvements) needed to meet growing demands through population increases or demand for new services. The projects targeted to meet growth are funded primarily through Development Charges (DC) – the mechanism that enables recovery of growth-related capital expenditures from new development. These charges are governed by the Development Charges Act and are applied in accordance with our Development Charges By-Law.

5.2 Expenditure History and Forecasts

The County has incorporated a number of recommended projects from the 2020 Road Needs Study into the 10-year approved capital plan, as illustrated in figure 5.2.1. County staff continue to review anticipated asset management needs with each budget cycle, subject to existing resource limitations.

Non-Infrastructure solution projects include road needs study updates, and implementation of the work management system. The total project cost is used for projects identified as expansion / growth projects, which includes the work being completed on existing assets as a part of the project.

Figure 5.2.1 Expenditures (millions)

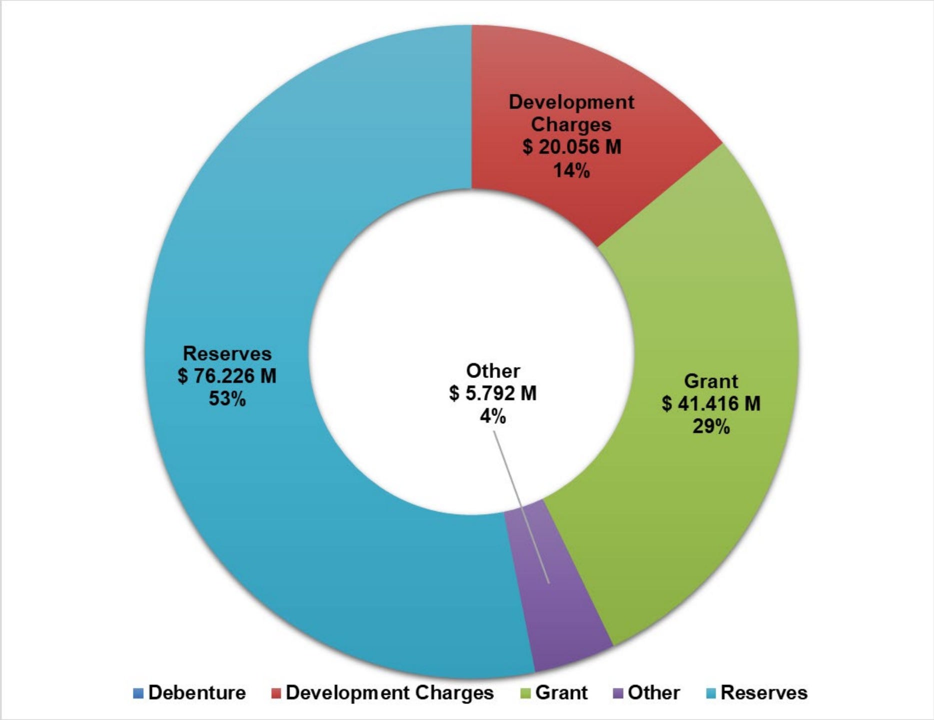


	2019 Actuals	2020 Actuals	2021 Actuals	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Non-Infrastructure Solution	0.100	0.274	0.219	0.827	0.275	-	0.408	-	0.150	0.290	-	0.169	-
Maintenance	-	-	-	-	-	-	-	-	-	-	-	-	-
Rehabilitation / Renewal	5.159	3.907	8.299	8.341	5.575	5.800	4.800	6.300	4.800	4.200	3.200	4.200	4.700
Replacement	2.259	0.341	0.800	1.043	1.018	0.151	0.523	0.163	0.100	0.300	0.180	2.650	0.105
Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-
Expansion / Growth	3.190	6.389	2.709	5.113	6.750	12.650	7.195	2.800	3.275	10.175	0.625	2.175	0.600

5.3 Capital Revenues

Capital investments for the road network assets are currently funded by levy supported dedicated reserves, the Canada Community Building Fund Grant, development charges (for growth projects) and other contributions as a result of shared infrastructure projects. The Ontario Community Infrastructure Fund (OCIF), a provincial funding program, also provides funds available for roads projects, although to date, the County has invested all of its OCIF funds in bridge and major culvert lifecycle needs. A number of growth / expansion projects included in the 10-year capital plan (road widening, intersection improvements including roundabouts), were not included in the existing DC study and therefore are currently anticipated to be funded by the roads reserve. These projects will be included in the next DC Background Study to determine their eligibility for DC funding. The roads reserve and annual contributions are currently used to fund both road network and stormwater network projects. For the purposes of this AMP and financial analysis, it has been assumed that the roads reserve balance at December 31, 2021 is for exclusive use by road network projects, with the annual contributions allocated first to stormwater based on the projects in the approved 2022 capital plan, with the remaining contributions allocated to the roads network.

Figure 5.3.1 Sources of Capital Revenues 2019-2031 (millions)



5.4 Capital Investment

Based on the asset management lifecycle strategies identified, the financial requirements over the next 100-years are determined in current dollars. The average annual investment requirement represents the amount of capital funding required to renew and maintain the existing assets on an annual basis so services can continue to be delivered. These estimates assume that all work is able to be completed, as indicated, and does not take into account future changes due to environmental factors, new maintenance techniques, and unidentified growth. The annual requirement has increased from the 2017 AMP, due to replacement cost increases and the addition of roadways from the road rationalization. The data will continue to be reviewed with each budget and business plan cycle.

Figure 5.4.1 Average Annual Capital Requirements

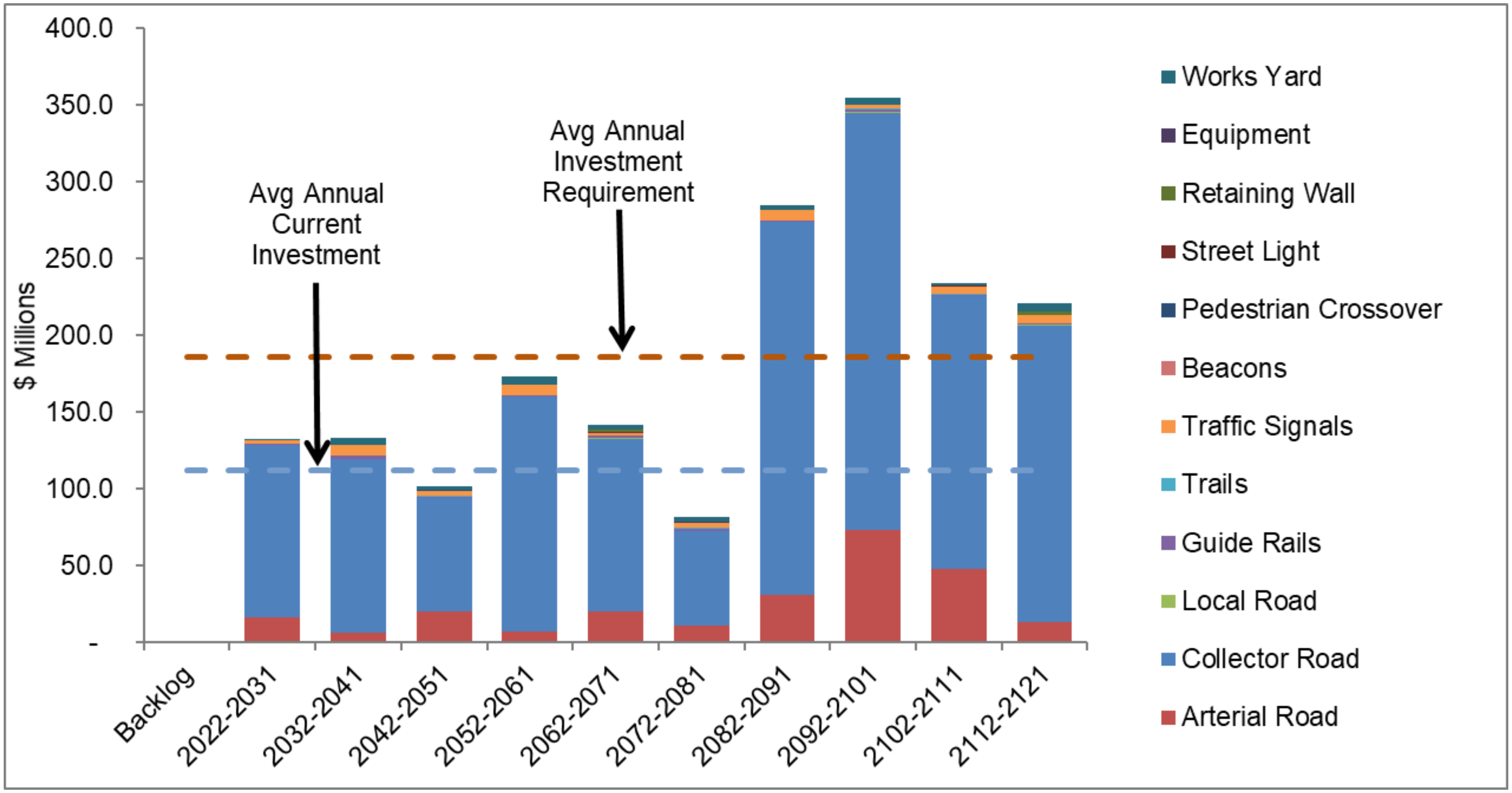
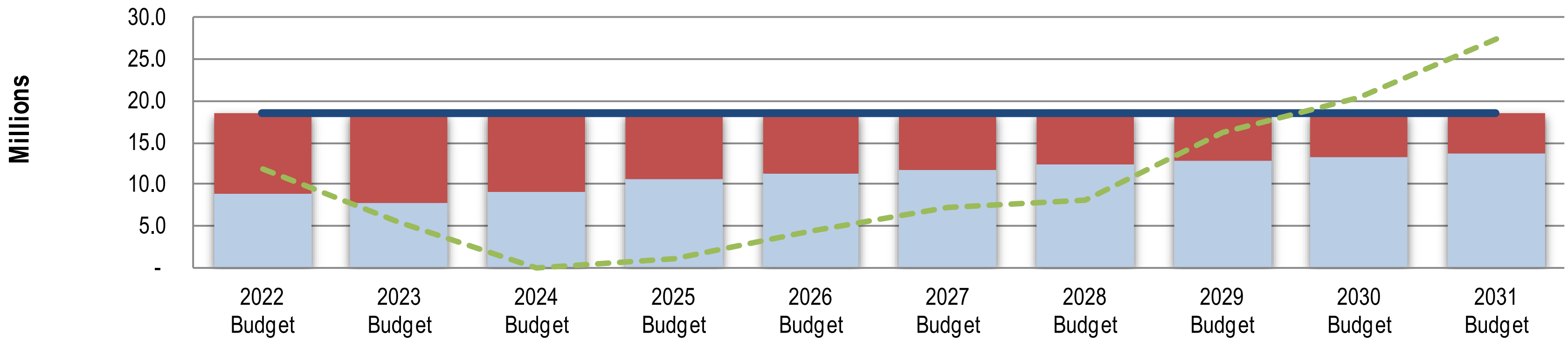


Figure 5.4.2 links the annual capital funding needs to the capital investments contained in the budget. The timing of the actual capital projects may vary, however annual investments in capital assets is important for financial sustainability.

Figure 5.4.2 Funding Requirements

	Key	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Annual Required Investment		**18,591,000**	**18,591,000**	**18,591,000**	**18,591,000**	**18,591,000**	**18,591,000**	**18,591,000**	**18,591,000**	**18,591,000**	**18,591,000**
Current Investment		8,959,668	7,682,056	9,111,459	10,734,657	11,250,172	11,778,557	12,294,067	12,826,491	13,376,837	13,721,951
Funding Deficit		*9,631,332*	*10,908,944*	*9,479,541*	*7,856,343*	*7,340,828*	*6,812,443*	*6,296,933*	*5,764,509*	*5,214,163*	*4,869,049*
Funding Surplus		-	-	-	-	-	-	-	-	-	-
Reserve Balance		11,748,028	5,516,653	29,335	1,040,464	4,429,078	7,320,999	8,126,137	16,217,708	20,424,866	27,426,575



5.5 Funding Gap Analysis

Using the anticipated 10-year asset lifecycle needs, along with the current capital investment level, the County is able to determine if there is an anticipated funding gap for the road network assets. Consideration is then given to the reserve balance to determine the residual funding gap. The County would then investigate opportunities for reducing this residual funding gap, which may include increases to the levy contribution, utilization of grant funding opportunities and further review of lifecycle strategies and proposed levels of service.

Figure 5.5.1 illustrates the anticipated asset management 10-year lifecycle needs (left side of figure 5.5.1) and funding needs, including the projected funding gap (right side of figure 5.5.1) for the County's road network. The system calculates the optimal expenditures based on theoretical asset lifecycle needs. These needs have not yet been reviewed in depth with County operations staff, and incorporated into the 10-year capital budget. This is anticipated to be completed as part of the 2023 Business Plan and Budget process with subsequent review annually.

The anticipated 10-year needs have been increased for non-infrastructure solution projects; approximately $1.3 million.

While the anticipated expenditure calculation accounts for the lifecycle activities of expansion / growth projects it does not account for the initial investment. It is important to adjust for these projects, where the initial investment is growth related and not projected to be DC funded within the 10-year capital plan. As a road widening or intersection improvement project would include activities related to existing assets, the growth/expansion figure was reduced by an estimate of those costs. The resulting new growth/expansion projects added to the anticipated asset needs are approximately $4.0 million.

This analysis assumes the full reserve balance is utilized within the current 10-year period. Drawing the reserve balance to zero would likely result in increased levy contribution requirements in the subsequent 10-year period in order to fund the anticipated asset lifecycle needs.

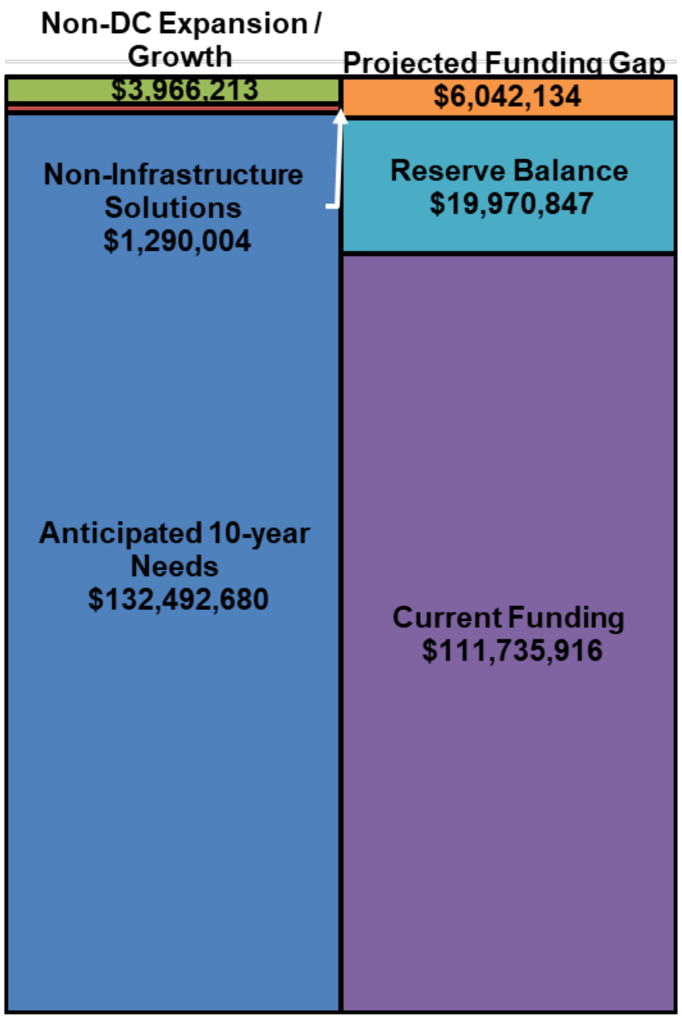
The reserve is also utilized to fund emergency or unplanned expenses. A minimal or fully committed balance would limit the ability to fund these types of expenses. Consideration needs to be given to a minimum balance the County should maintain based on these risks.

The County will also analyze the benefits of maintaining a separate reserve for stormwater assets. This will facilitate the required reporting and the ongoing management of asset lifecycle needs.

Analysis of the reserve target minimum balance, and splitting of the reserve will be completed as part of the annual reserve review process.

Failure to address long-term asset lifecycle needs could result in significant increases to future taxation levels as assets reach end of life; or reductions in localized and/or regional service. This may include decreased road conditions resulting in disruptions to traffic flow or exposure to increase in insurance claims for property damage and personal injury resulting from poor asset conditions.

Figure 5.5.1 Anticipated Needs (10-Year)



6.0 Climate Change

As part of the asset management planning process, the County will consider the risks and vulnerabilities of capital assets to climate change and the resulting actions that may be required. Commitment will be made to the development of tailored actions that make the best use of our resources to mitigate and adapt to climate change, in accordance with our local reduction targets, financial capacity and stakeholder support.

Climate change resiliency will be identified as a design criterion for asset renewal/replacement projects as part of the County's capital plan.

Stormwater network

Growing stronger together

Table of Contents

1.0 Introduction

The County maintains a diverse stormwater network to protect County residents and businesses, along with our natural and built environments. The County is responsible for all stormwater assets within a County right of way. Due to the interconnected nature of stormwater assets throughout the County, analysis on stormwater flows is completed holistically.

The County's stormwater network is categorized into various components, as a result of differing life spans and maintenance strategies. They are culverts with a diameter below 3 meters, catchbasins, catchbasin leads, and storm sewers.

Sound management of our stormwater network helps us realize our vision of being a vibrant community, working well and growing stronger together! Like many of our assets, our stormwater network is facing increased challenges as a result of aging assets, climate change and increasing demand due to growth in our communities. Our investment in these assets must therefore be balanced to optimize investment for renewal with the wellbeing of our community.

This plan provides information regarding our approach to the management of our stormwater network over the short (10-year) and long (100-year) term, demonstrating our commitment to assessing and meeting the levels of service valued by our residents.

1.1 Improvement Plan

The County recognizes that asset management is a continuously evolving process. As this is the County's initial Stormwater Asset Management Plan (AMP), we recognize that our data is still in its infancy and a large number of assumptions were made to complete this plan. Initial reviews also appear to suggest that there are significant gaps within the County's current stormwater data. County staff will work diligently to improve the quality and confidence in our stormwater data. Until such time, this AMP should not solely be used for decision-making purposes with respect to the stormwater network. The following recommendations are based on the review of current management practices, inventory, valuation and condition analysis.

- Reduce asset data gaps.
- Incorporate findings from the Transportation Master Plan, as applicable.
- Continue to monitor new technologies as they emerge to determine when cost effective to be implemented, in order to extend useful lives of components.
- Incorporate maintenance requirements into lifecycle strategies.
- Document lifecycle history on assets within the asset management systems.
- Implement a CCTV program and incorporate results into condition ratings.
- Identify stormwater asset components associated with the road transfers that were effective January 1, 2022.
- Determine methodology to utilize culvert depth in determining replacement cost and risk.

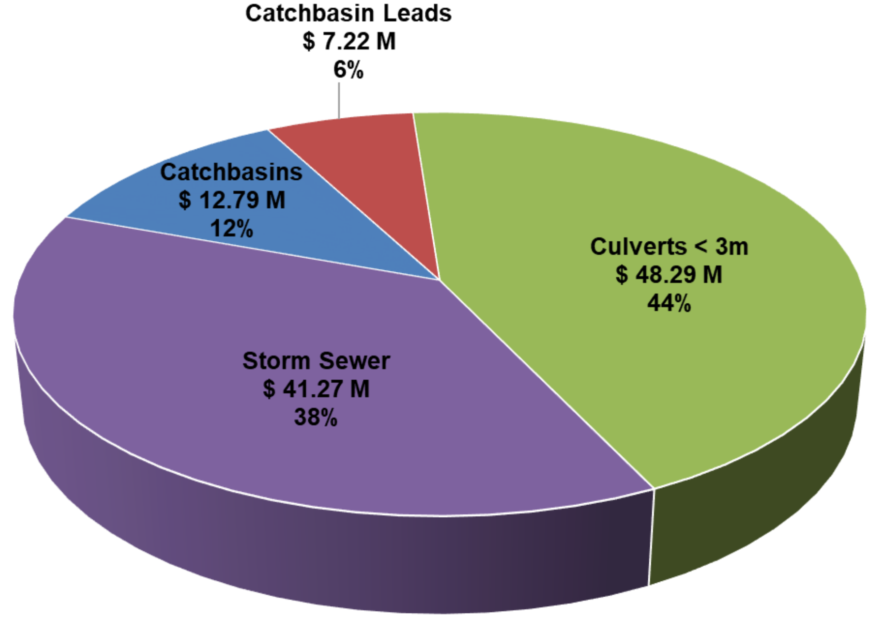
2.0 State of Assets

2.1 Inventory

Our stormwater network collects water runoff from precipitation to prevent flooding and associated property damage. Stormwater assets are critical assets and include everything from the stormwater mains that service our urban roadways to the culverts which service our rural roads. We recognize that our stormwater assets are imperative to the wellbeing of our community and extends into all other portfolios, which is what makes stormwater services particularly important.

Table 2.1.2 displays our current stormwater network inventory and the associated replacement costs and average age for each asset component. Given the infancy of our stormwater network data, road reconstruction dates have been utilized as an estimate for the age of the stormwater assets associated with each road section. As this is the County's initial Stormwater AMP, comparative figures are not available.

Figure 2.1.1 Inventory Valuation



2.2 Valuation

The replacement cost valuation for the assets in our stormwater network are based on current tender prices, where available. Current tender prices are adjusted where County staff feel some cost increases are only temporary due to COVID.

Table 2.1.2 – Stormwater Network Inventory

Asset Type	Asset Component		Current Inventory	Replacement Cost	Average Age
Stormwater Network	Catchbasins	each	3,248	$12,786,500	31 Years
	Catchbasin Leads	m	17,097	7,219,602	29 Years
	Culverts < 3m	m	61,247	48,293,516	23 Years
	Storm Sewer	m	71,182	41,270,404	32 Years
Total Replacement Cost				**$109,570,022**	

Road rationalization was undertaken as part of the 2019 Transportation Master Plan. Council Report PW 2021-29 includes information on the road transfers recommended. The road transfers, were effective January 1, 2022, however not all stormwater infrastructure assets associated with these roadways have been identified. Only those stormwater assets that have been identified to date are included in the figures in table 2.1.2.

2.3 Condition Assessment Approach

The assessment approach for our stormwater network assets utilizes a combination of physical assessments, asset attributes, such as material, as well as established anticipated useful lives.

The County's condition scale and visual inspection ratings are based on the following approach:

- Excellent - Asset is well maintained with no noticeable defects.
- Good - Asset may show signs of minor deterioration and may require some maintenance.
- Fair - Deterioration evident, function affected. Asset may require on-going monitoring.
- Poor - Serious deterioration, function inadequate. Asset may require ongoing monitoring.
- Critical - No longer functional, general or complete failure. Asset may require extensive monitoring.

The Pipeline Assessment Certificate Program (PACP) is the North American Standard for pipeline defect identification and assessment[1]. Closed-circuit television (CCTV) is the principal method of inspecting drains and sewers. In this process, a small robotic crawler vehicle with the CCTV camera attached is lowered into the pipe to complete the inspections. A structural rating, on a scale of 0-5, is assigned using sewer condition assessment standards, with 0 representing an asset with minimal structural deficiencies and 5 representing assets on the verge of failure.

Table 2.3.1 illustrates how the PACP score ratings align with the County's standard condition scale. Unless otherwise noted, all images are of County assets, and are general representations of the asset condition at the time the photo was taken. Assets may have undergone lifecycle strategies since the date of the image impacting its condition.

The County has completed limited CCTV inspections of its stormwater mains, typically on an as needed bases when looking at reconstruction projects. Due to a lack of sewer ratings, the age and material of the assets are used to assign conditions to our stormwater network assets.

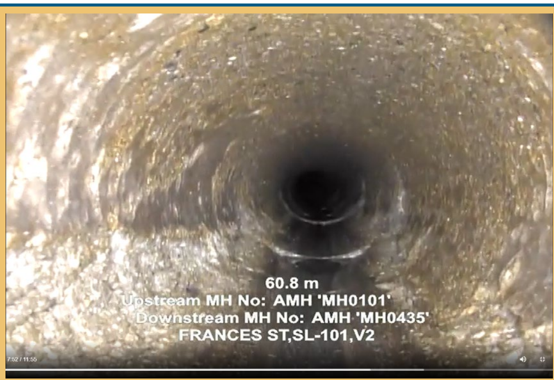
Given the complexities and accessibility of some assets, not all assets allow for a visual or performance-based condition assessment. For assets which have not been visually inspected an age based condition rating is being used based on anticipated useful lives.

[1] https://www.nassco.org/content/pipeline-assessment-pacp

Table 2.3.1 PACP Score Ratings

Excellent
PACP Score of 0 or 1

Poor
PACP Score of 4



Good
PACP Score of 2

Critical
PACP Score of 5

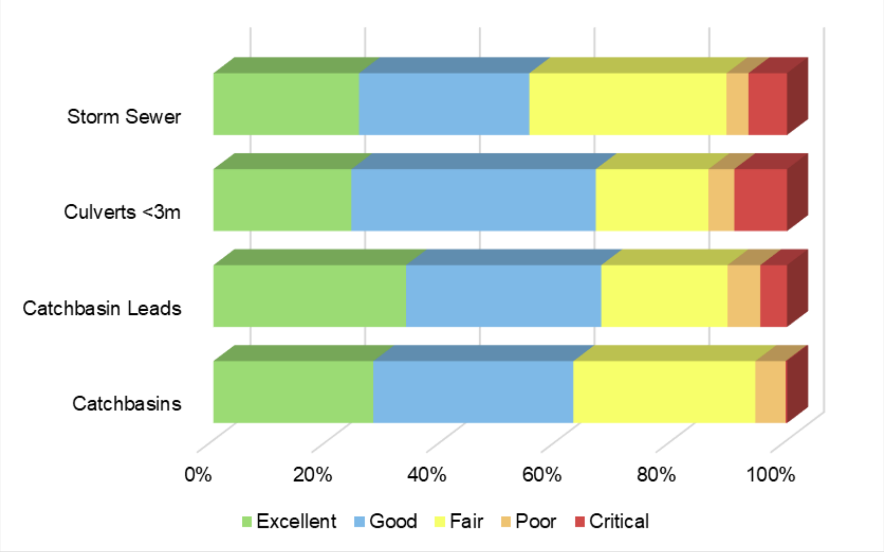
Fair
PACP Score of 3

2.4 Condition Assessment

The condition profile of our stormwater network by components, using an age based approach, is shown in figure 2.4.1. The quantity in each condition is based on replacement costs.

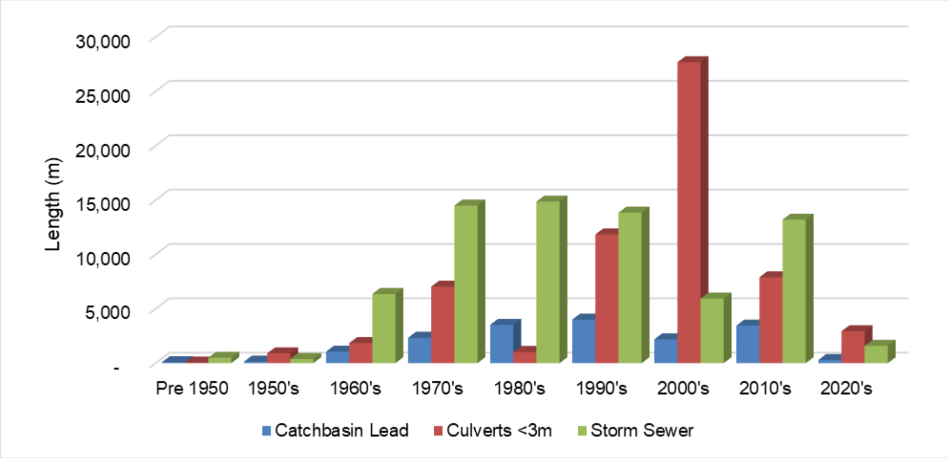
For our stormwater network assets: 10.4% of these assets are in poor or critical condition, and 67.6% in good or excellent condition in comparison to 11% and 45% respectively for Canadian municipalities reported on the Canadian Infrastructure Report Card[2]. While this may appear that our stormwater network assets are in better shape than other Canadian municipalities, the 2019 Canadian Infrastructure Report Card is an aggregate of self reported condition ratings across the Country and are based on a general rating scale which may not match the County's.

Figure 2.4.1 Asset Condition by Component



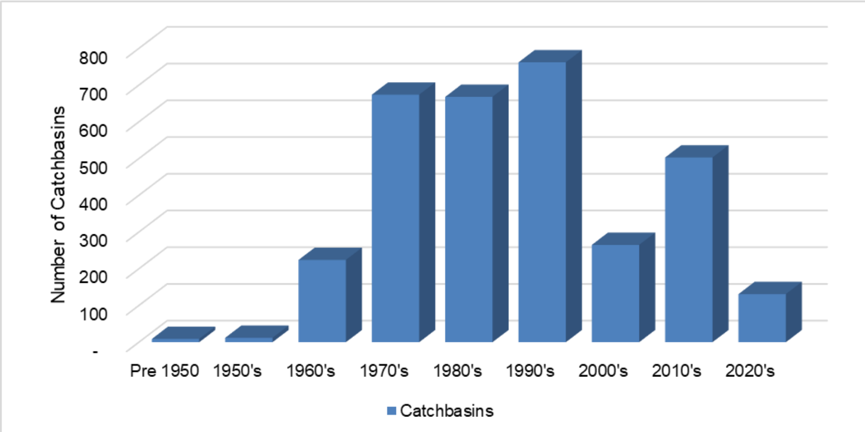
An age profile of the County's linear stormwater network assets, is shown by decade in Figure 2.4.2, where figure 2.4.3 shows the age profile of the catchbasins. As there was a significant number of gaps when it came to the installation date of stormwater network assets, it has been assumed that the installation date coincides with the latest major reconstruction/rehabilitation completed on the road section associated with the stormwater asset.

Figure 2.4.2 Stormwater Linear by Age



[2] http://canadianinfrastructure.ca/en/index.html

Figure 2.4.3 Catchbasins by Age



The average age of our stormwater linear is approximately 28 years, while the average age of the catchbasins is approximately 31 years. This value must be considered in the context of the assumptions made regarding installation dates and different asset components, compared to the typical anticipated useful life for each component based on the lifecycle strategies used.

Table 2.4.4 outlines the anticipated useful life for each new build/replacement. The anticipated useful lives for our stormwater assets exclude the management strategies that the County utilizes to extend the overall life of our stormwater network assets.

Table 2.4.4 Useful Life

Stormwater Network Component	Anticipated Useful Life (years)
Catchbasins	90
Catchbasin Leads	90
Culverts < 3m	90
Storm Sewer	90

Figure 2.4.5 illustrates the current average age of the stormwater network assets in comparison to their anticipated useful life, based on a run to failure strategy.

There are a number of management strategies that the County may utilize to extend the overall life of our stormwater network assets. These strategies allow the County to align the stormwater network needs with roadway reconstruction projects, resulting in the best overall value for our residents.

Figure 2.4.5 Age and Useful Life Comparison

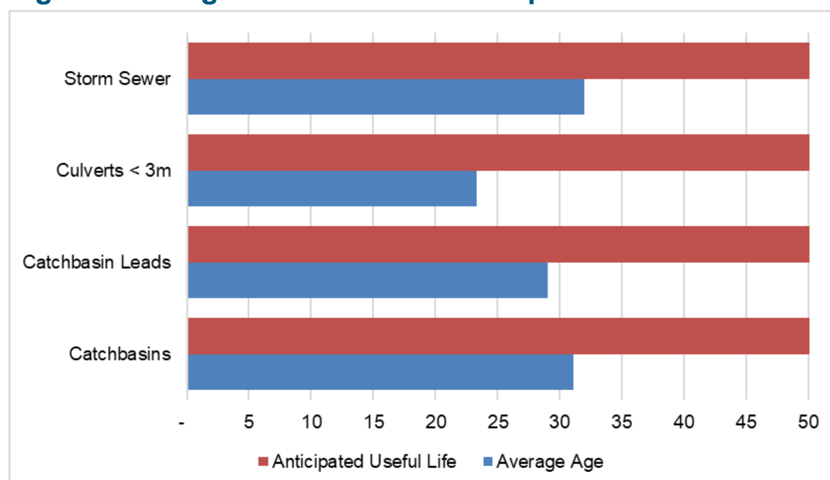


Table 2.4.6 illustrates the status of our stormwater network asset components. The 2017 Asset Management Plan did not include information on stormwater assets, so comparative ratings are not available. Conditions were derived using an age-based formula, given the assumptions made regarding installation dates, they may not accurately reflect the condition of the assets. The County will target lifecycle strategies appropriately to ensure a reliable network.

Table 2.4.6 Stormwater Network Condition Assessment

Asset Type	Asset Component	2017 Condition Rating	Current Condition Rating	Trend
Stormwater Network	Catchbasins	-	Good	-
	Catchbasin Leads	-	Good	-
	Culverts < 3m	-	Good	-
	Storm Sewer	-	Good	-

3.0 Levels of Service

County staff have developed a comprehensive Level of Service (LOS) Framework. This framework will help to establish a relationship between the current LOS being provided by the County's assets, and the associated operating and capital expenditures required to achieve the proposed LOS. The framework puts into perspective the definition and measurement of service performance in alignment with the County's corporate mission and vision.

Corporate Objective

The corporate objective of the road maintenance and traffic management service, which includes the collection of stormwater, is to efficiently provide reliable stormwater services and protect the community from flooding and associated property damage. The stormwater network is located throughout the County, including on a number of boundary roads with neighbouring municipalities in which the County and the neighbouring municipality share in the maintenance activity costs. Service agreements are in place to ensure that service levels are maintained.

Legislative Requirements

Ontario does not currently have a regulation specifically for stormwater management. Under the Ontario Water Resources Act (OWRA) Section 53, stormwater infrastructure requires an Environmental Compliance Approval (ECA), formerly a Certificate of Approval (C of A), for its establishment, alteration, extension and replacement. Operations, maintenance and reporting requirements are typically identified in ECA condition(s) if applicable.

Framework

The structure of the County's LOS framework was developed to align with international best practices including the International Infrastructure Management Manual (IPWEA, 2015). The framework includes the mandatory measures to meet the requirements of Ontario Regulation (O.Reg.) 588/17 by including both Community and Technical Levels of Service. The metrics in this framework may be expanded upon as the County continues to improve its data collection and reporting processes.

3.1 Customer Levels of Service

Community or Customer Levels of Service are statements that describe quantifiable metrics of the service delivery outcomes from the perspective of the customer, expressed in non-technical terms. The following statements form our qualitative descriptions of the customer level metrics required under O.Reg. 588/17.

The County stormwater network works to mitigate the risk of flooding throughout the County, in combination with local area municipality systems.

Stormwater infrastructure, which is resilient to the 5-year storm, will be considered as any County stormwater main which has been designed to convey/treat/detain runoff from storm events up to the 5 year event.

The county has undertaken a two-part analysis to determine properties resilient to the 100-year storm. Properties that have structures that lie within 1.5m of the 100-year floodline are considered not resilient. Outside of the 100-year floodline, overland flow routes were determined, ultimately directing runoff from the 100-year event to a downstream receiver. Where there are instances of sags in the road profile, all properties which front the road within the sag limits are considered as non-resilient. Also, properties which have an entrance leading to a structure at a lower elevation than the road grade is considered as non-resilient.

Table 3.1.1 outlines additional customer focused performance metrics from the County's LOS framework.

3.2 Technical Levels of Service

Technical Levels of Service metrics are quantifiable metrics applied against assets that are subject-matter specific inputs or outputs supported by the day-to-day activities of County staff. Table 3.1.1 includes the technical metrics required under O.Reg. 588/17, as well as, additional metrics the County has included in the framework.

3.3 Levels of Service Maps

As a further illustrative example of our community levels of service, a map is included as figure 3.3.1 showing the properties within the County that are considered resilient to the 100-year storm event.

Figure 3.3.1 100-Year Storm Resiliency

Property resiliency to the 100 year storm event

- Properties Considered Not Resilient to the 100 Year Storm Event
- Provincial Highway
- County Road
- Railway
- Water
- Waterbody
- Village Boundary
- Municipal Boundary

Total # of properties:	47972
Resilient Properties:	46883
Coverage:	97.7 %

Properties that are not resilient to the 100 year storm event are identified as those with structures that are within 5 metres of the flood line as identified by the Conservation Authority with jurisdiction.

0 1.5 3 6 9 Kilometres

N

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Growing stronger together
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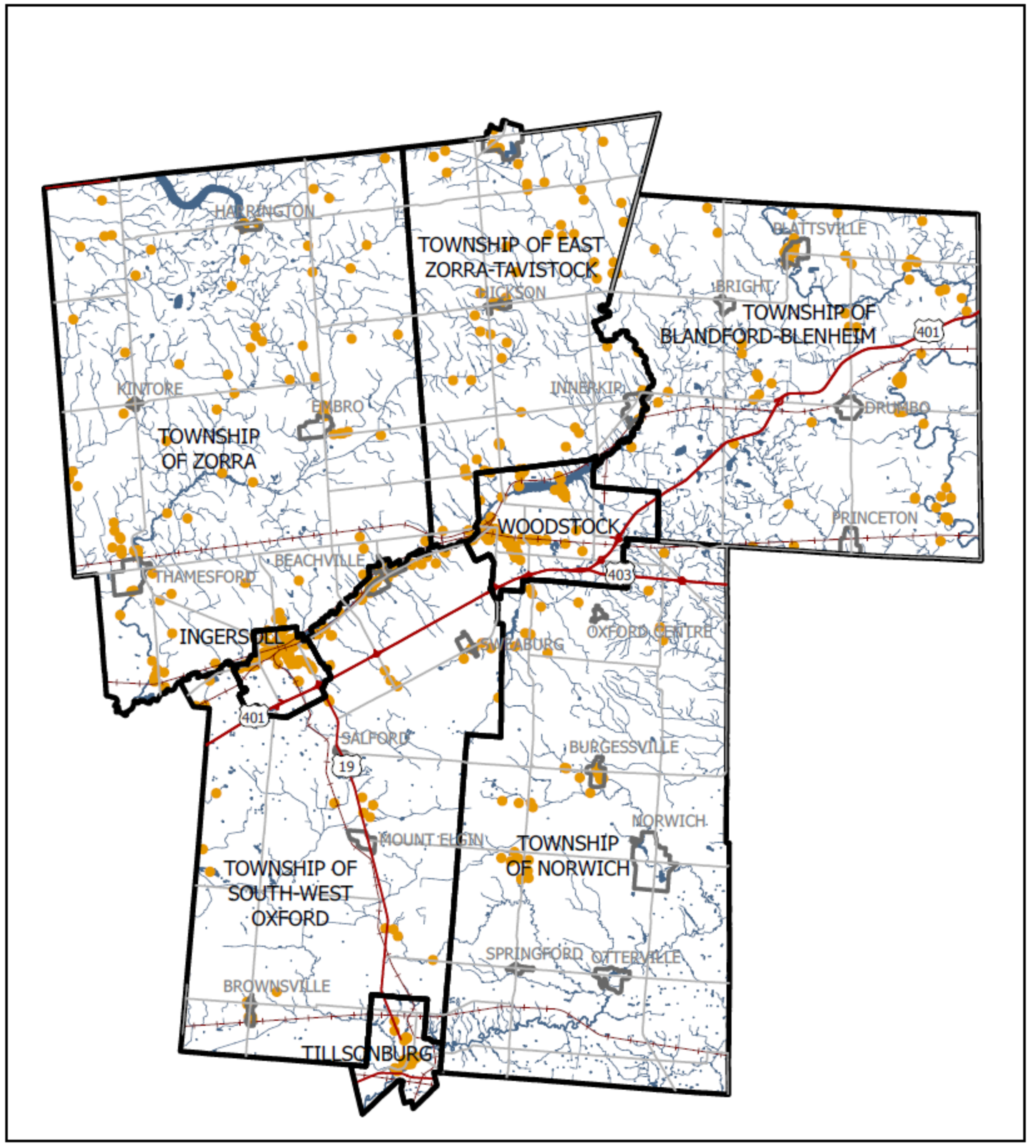


Table 3.1.1 Performance Measures

Key Service Attribute	LOS Statement	Performance Measure	2020	2021	Target
Customer / Council Focused Performance Measures					
Cost Efficient	Providing stormwater services in an efficient manner	Operating Cost to provide service ($/household)	$15	$17	TBD
Technical Focused Performance Measures					
Safety	Providing a safe stormwater network which mitigates the impacts of property damage during stormwater events	% of properties in municipality resilient to a 100-year storm	N/A	97.7%	TBD
		% of the municipal stormwater management system resilient to a 5-year storm (urban areas and settlement villages)	N/A	89.5%	TBD
		% of storm sewers in poor or critical condition	N/A	10.5%	TBD
		% of stormwater culverts in poor or critical condition	N/A	13.7%	TBD
		% of stormwater network inspected (CCTV) on a yearly basis	1%	1%	10%
Cost Efficient	Providing stormwater services in an efficient manner	Rural stormwater network operating cost per kilometre	$7,765	TBD	TBD
		Urban stormwater network operating cost per kilometre	$6,283	TBD	TBD
		5 year average capital expenditure for rural stormwater	$0.9M	$1.1M	TBD
		5 year average capital expenditure for urban stormwater	$0.5M	$0.6M	TBD

4.0 Asset Management Strategy

4.1 Lifecycle Activities and Planned Actions

Stormwater collection assets undergo regular maintenance and inspection. As part of capital works project analysis, determinations of whether stormwater pipe replacement or relining should occur is reviewed. This process is fully integrated with the renewal needs of the roadways and other underground assets, such as drinking water and wastewater. This integrated approach ensures our renewal projects for these service areas are delivered with optimal timing to increase value and minimize disruption to our communities. For example, if a roadway is targeted for renewal, coordination between service areas and area or neighbouring municipalities will determine whether the underlying stormwater, drinking water or wastewater assets are also of an age or condition that requires renewal, to ensure these projects are delivered together to reduce disruption for our communities and deliver enhanced value.

Weather factors may also have an effect on the actual life achieved. It is possible to have assets exceed the anticipated useful lives defined, as well as, assets that require replacement prior to the end of their anticipated useful life.

There are six main lifecycle activities considered in the overall sustainable management of our stormwater network assets, described in table 4.1.1.

Table 4.1.1 Lifecycle Activities

Strategy	Lifecycle Activity
Non-Infrastructure Solutions	Actions or policies that can lower costs or extend useful lives. **Trigger: Ongoing**
Maintenance	Regularly scheduled maintenance and inspection programs including CCTV inspections, catchbasin cleaning and minor repairs. These activities do not improve the overall condition of the asset, nor increase its useful life. **Trigger: Ongoing**
Rehabilitation / Renewal	One-time events that increase the condition and extend the useful life of the asset; including storm sewer lining. **Trigger: Trigger: Fair/Poor**
Replacement	Occurs at the end of the useful life and/or when rehabilitation is no longer an option – can vary among assets due to construction material and environmental factors that impact the degree of deterioration and performance. **Trigger: Poor/Critical**
Disposal	Activities associated with disposing of an asset once it has reached the end of its useful life, or is otherwise no longer needed by the County to provide services. County staff coordinate with contractors to ensure safe removal and environmental compliance when disposing of assets. **Trigger: Poor/Critical**
Expansion / Growth	Planned activities required to expand services to meet growth demands, or increase the level of service being provided. **Trigger: Development**

The lifecycle management strategy is the set of planned actions that should enable the assets to provide users with the proposed level of service in a sustainable way, while achieving acceptable levels of risk and the lowest lifecycle costs required to provide that level of service. Lifecycle considerations for assets include analysis of the timing to carry out key asset management activities including inspection, maintenance, repair, and replacement. Ongoing preventative maintenance activities will be outlined in the County's work management system. The rehabilitation and replacement activities impacting the asset components condition and useful life are contained within profiles in the County's asset management system.

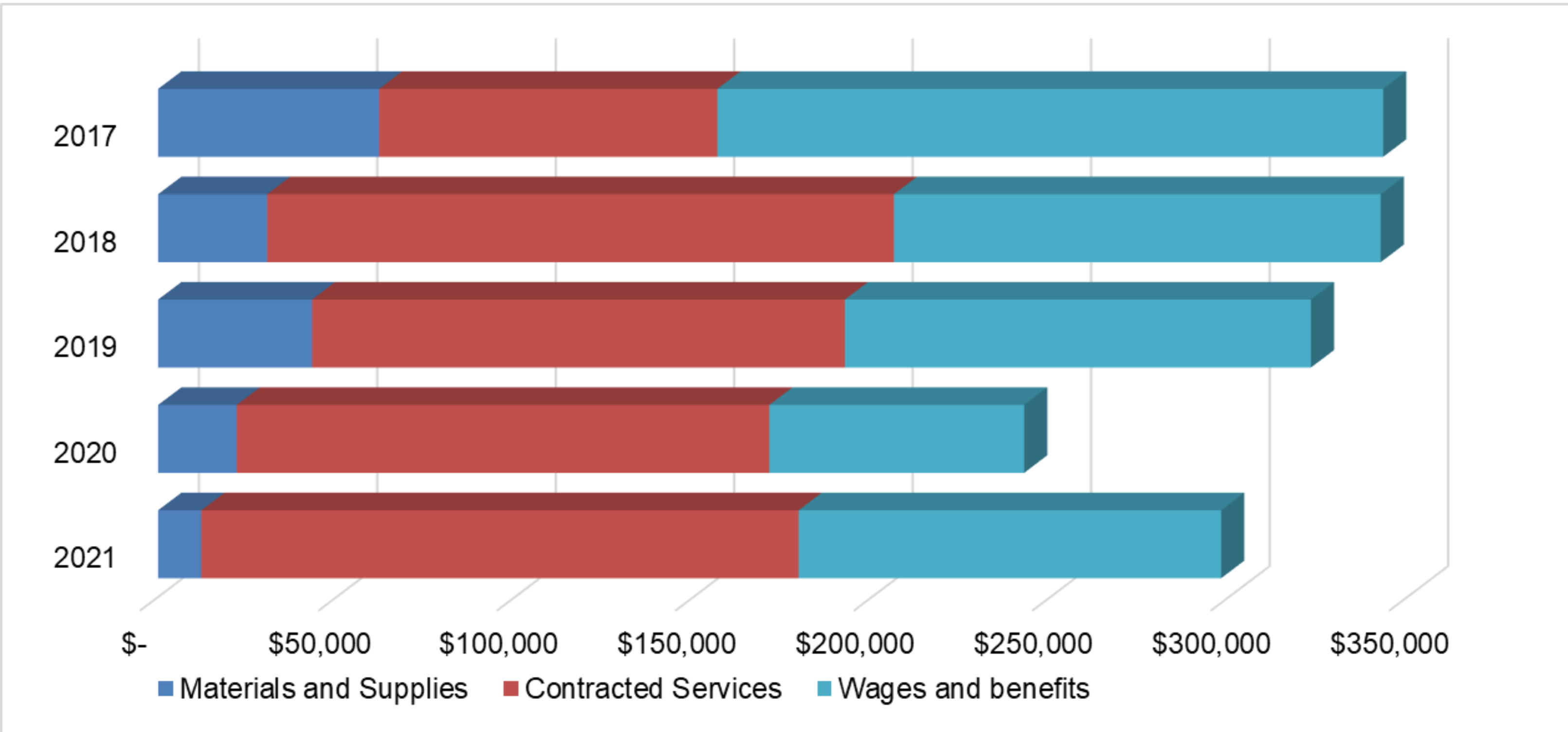
For stormwater assets, replacement needs are based on a run to failure strategy, as this is the most economical. County staff will continue to monitor industry trends and best practices, evaluating any lifecycle activities to determine if there is value to implementing them.

4.2 Significant Operating Expenses

Significant operating expenses are required in order to sustain an asset over its lifecycle. The County is always looking at ways to optimize our operating investment to ensure we are achieving the best value for our residents and businesses. Essential to this is a strong operations and maintenance plan within our work management system. Operating expenses are incurred through a number of sources – preventative maintenance activities, catchbasin cleaning, repairs and more. Despite the fact that minor maintenance is incorporated into planned operations and maintenance programs, there are cases where it is unplanned.

Figure 4.2.1 shows the operating expenses from 2017 through 2021 for the stormwater network, rural and urban combined, grouped by expense type. The groupings align with those reported on the County's Financial Information Return (FIR).

Figure 4.2.1 Operating Expenses



4.3 Risk Strategy

Risk management frameworks are developed to assist with the prioritization of investments within the capital planning period. The preferred approach is to implement a triple bottom line analysis approach to evaluate:

- Social impacts of asset failure, including impacts to customers, businesses and the County's reputation;
- Environmental impacts of asset failure; and
- Economic impacts of failure including the cost of remediation.

In the context of asset management, risk is the multiple of the consequence of an asset failing and the probability that the event will occur.

Figure 4.3.1 illustrates the risk ratings for the County's stormwater network assets at a summary level. County staff will continue to monitor the higher risk assets, review and/or complete physical inspections to further validate needs and plan for lifecycle strategies accordingly.

Figure 4.3.1 Asset risk profile

Consequence	1	2	3	4	5
5	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
3	9 Assets 480.13 m $1,149,471.00	19 Assets 1,806.20 m $2,665,418.15	20 Assets 2,559.17 m $4,265,702.05	0 Assets - $0.00	2 Assets 192.60 m $385,200.00
2	1,386 Assets 21,287.29 m, unit(s) $18,478,151.93	2,676 Assets 35,707.26 m, unit(s) $28,521,820.82	2,293 Assets 26,126.45 m, unit(s) $20,896,769.19	433 Assets 4,910.50 m, unit(s) $3,962,832.35	479 Assets 8,235.56 m, unit(s) $5,462,627.23
1	1,126 Assets 14,471.77 m, unit(s) $6,993,884.85	1,158 Assets 15,163.41 m, unit(s) $7,000,360.15	938 Assets 14,026.27 m $6,369,461.15	128 Assets 3,061.61 m, unit(s) $1,312,230.25	193 Assets 4,746.28 m $2,106,092.95

Probability

5.0 Financial Strategy

5.1 Financing Strategy

Of the maintenance strategies identified, routine maintenance is part of the operating budget, while all other activities are considered part of the capital budget.

Where possible, rehabilitation and replacement activities for the stormwater network are planned in collaboration with the rehabilitation and replacement activities of other underground assets and the needs of the road network to minimize disruption and achieve cost efficiencies. The availability of funding by other municipalities for shared assets will also have an impact on the timing of projects.

Capital work is funded from reserves (based on the capital contribution included in the levy), development charges (for growth projects) and grant funding when available. The County continually assesses opportunities for additional funding options and revenue streams to address our asset needs.

While debentures are not currently used to fund stormwater network projects, the funding option is available in times of high replacement requirements and low reserve balances.

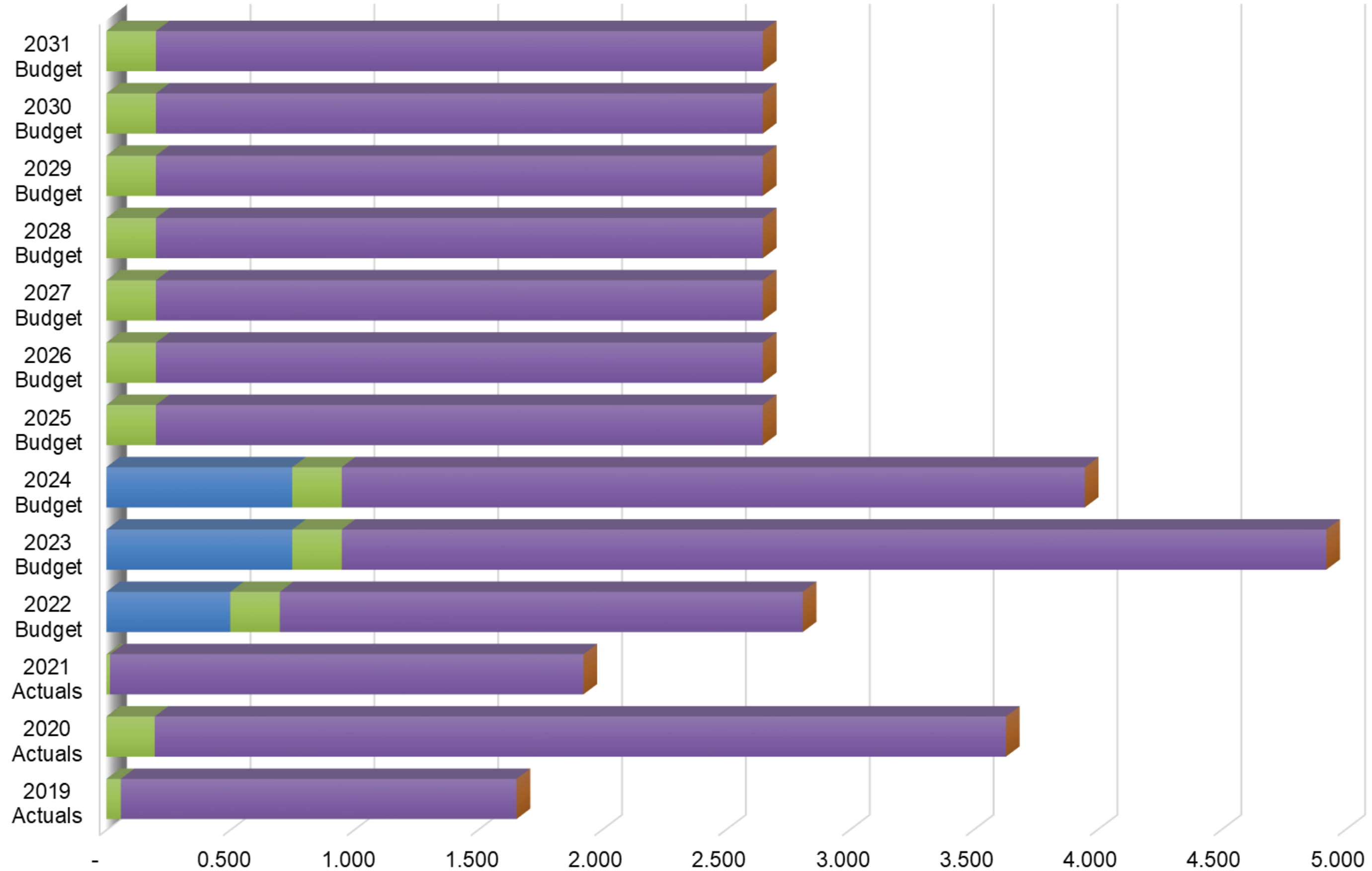
In addition to targeting and prioritizing the investment needed to maintain existing assets, there are also planning processes in place to determine the additional assets and expansion of existing assets needed to meet growing demands through population increases or demand for new services. The projects targeted to meet growth are funded primarily through Development Charges (DC) – the mechanism that enables recovery of growth-related capital expenditures from new development. These charges are governed by the Development Charges Act and are applied in accordance with our Development Charges By-Law.

5.2 Expenditure History and Forecasts

County staff have estimated stormwater network projects within the 10-year approved capital plan, as illustrated in figure 5.2.1. As each roadway project nears, staff are doing a more fulsome review of the stormwater network needs associated within each roadway segment. Current stormwater design standards are used when planning projects, which may result in upsizing of linear assets, at an increased cost, to accommodate current storm levels. As the stormwater network data matures staff will be able to utilize the outcomes of the AMP to aid in each budget cycle.

Non-Infrastructure solution projects include shared projects for condition reviews, studies and implementation of the work management system. With respect to stormwater, these costs will also include the County’s required contribution to projects completed under the Drainage Act.

Figure 5.2.1 Expenditures (millions)

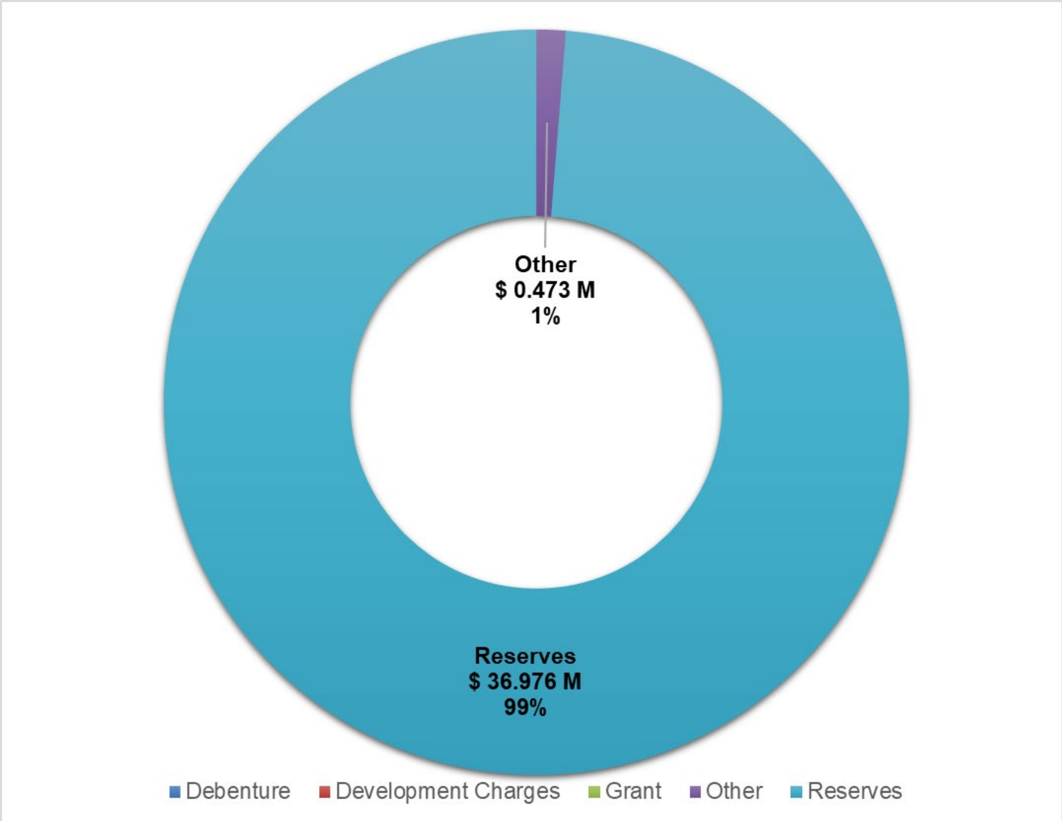


	2019 Actuals	2020 Actuals	2021 Actuals	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Non-Infrastructure Solution	-	-	-	0.500	0.750	0.750	-	-	-	-	-	-	-
Maintenance	-	-	-	-	-	-	-	-	-	-	-	-	-
Rehabilitation / Renewal	0.058	0.195	0.014	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200
Replacement	1.597	3.436	1.911	2.111	3.975	3.000	2.450	2.450	2.450	2.450	2.450	2.450	2.450
Disposal	-	-	-	-	-	-	-	-	-	-	-	-	-
Expansion / Growth	-	-	-	-	-	-	-	-	-	-	-	-	-

5.3 Capital Revenues

Capital investments for the stormwater network are currently funded by the levy supported dedicated roads reserve, development charges (for growth projects) and other contributions as a result of shared asset projects. The roads reserve and annual contributions are currently used to fund both road network and stormwater network projects. For the purposes of this AMP and financial analysis, it has been assumed that the roads reserve balance at December 31, 2021 is for exclusive use by road network projects, with the annual contributions allocated first to stormwater based on the projects in the approved 2022 capital plan, with the remaining contributions allocated to the roads network.

Figure 5.3.1 Sources of Capital Revenues 2019-2031 (millions)



5.4 Capital Investment

Based on the asset management lifecycle strategies identified, the financial requirements over the next 100 years are determined in current dollars. The average annual investment requirement represents the amount of capital funding required to renew and maintain the existing assets on an annual basis so services can continue to be delivered. These estimates assume that all work is able to be completed, as indicated, and does not take into account future changes due to environmental factors, new maintenance techniques, and unidentified growth. The annual requirement appears to be significantly lower than the current investment level based on the 2022 approved long term capital plan. As the stormwater data is still in its infancy it is difficult to determine the appropriateness of the current investment level. Staff will work diligently on reducing data gaps so that investment requirements can be determined with a high degree of confidence.

Figure 5.4.1 Average Annual Capital Requirements

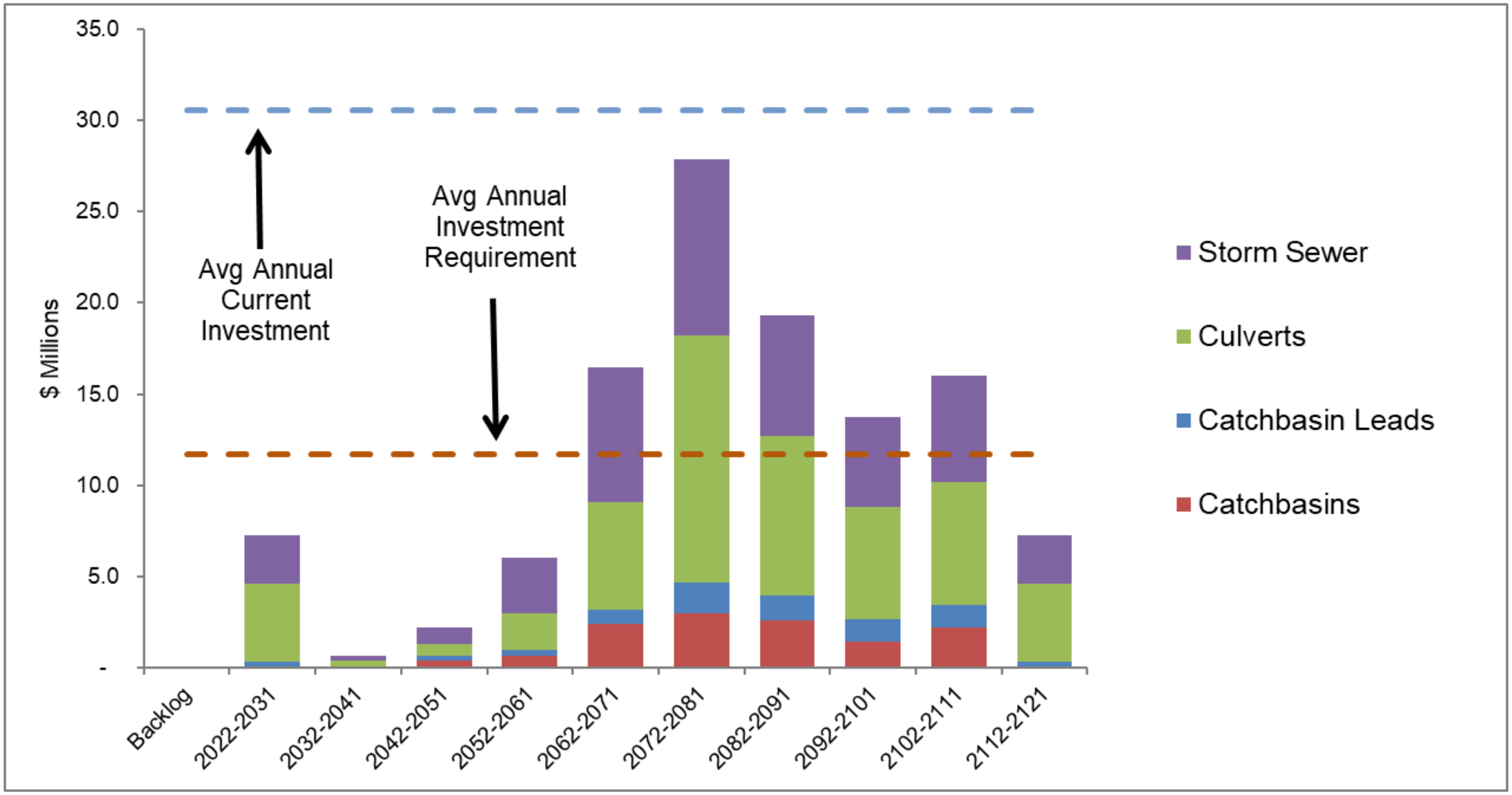
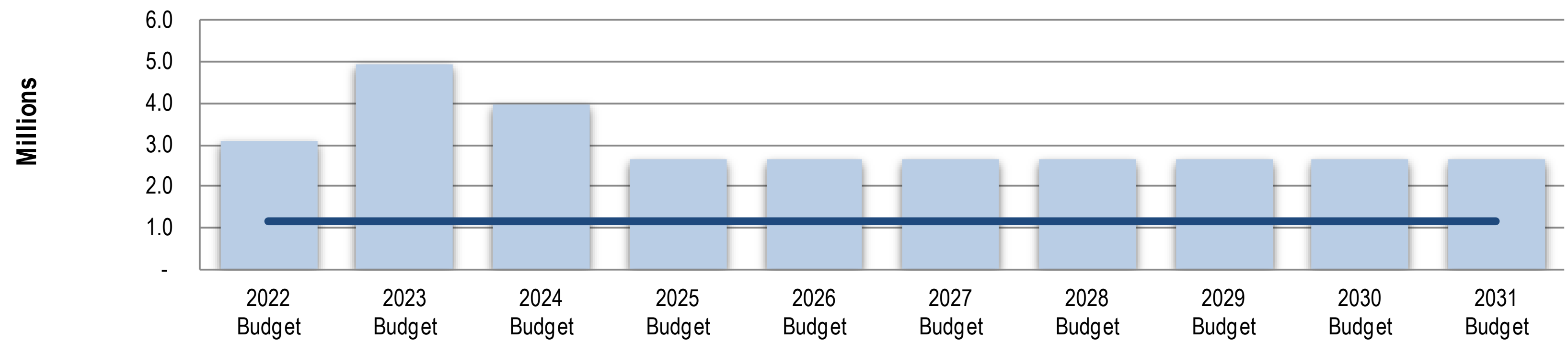


Figure 5.4.2 links the annual capital funding needs to the capital investments contained in the budget. The timing of the actual capital projects may vary, however annual investments in capital assets is important for financial sustainability.

Figure 5.4.2 Funding Requirements

	Key	2022 Budget	2023 Budget	2024 Budget	2025 Budget	2026 Budget	2027 Budget	2028 Budget	2029 Budget	2030 Budget	2031 Budget
Annual Required Investment		**1,168,000**	**1,168,000**	**1,168,000**	**1,168,000**	**1,168,000**	**1,168,000**	**1,168,000**	**1,168,000**	**1,168,000**	**1,168,000**
Current Investment		3,100,000	4,925,000	3,950,000	2,650,000	2,650,000	2,650,000	2,650,000	2,650,000	2,650,000	2,650,000
Funding Deficit		-	-	-	-	-	-	-	-	-	-
Funding Surplus		*1,932,000*	*3,757,000*	*2,782,000*	*1,482,000*	*1,482,000*	*1,482,000*	*1,482,000*	*1,482,000*	*1,482,000*	*1,482,000*
Reserve Balance											



5.5 Funding Gap Analysis

Using the anticipated 10-year asset lifecycle needs, along with the current capital investment level, the County is able to determine if there is an anticipated funding gap for the stormwater network assets. Consideration is then given to the reserve balance, if available, to determine the residual funding gap. The County would then investigate opportunities for reducing this residual funding gap, which may include increases to the levy contribution, utilization of grant funding opportunities and further review of lifecycle strategies and proposed levels of service.

Figure 5.5.1 illustrates the anticipated asset management 10-year lifecycle needs, including the projected funding surplus (left side of figure 5.5.1) and funding needs (right side of figure 5.5.1) for the County's stormwater network. The system calculates the optimal expenditures based on theoretical asset lifecycle needs. These needs have not yet been reviewed in depth with County operations staff, and incorporated into the 10-year capital budget. Staff will review the anticipated needs as part of the 2023 Business Plan and Budget process with subsequent review annually. Further validation on asset age and condition will also be completed.

The anticipated 10-year needs have been increased for non-infrastructure solution projects; approximately $2 million.

The stormwater network is projecting a funding surplus over the 10-year capital planning period. This surplus may be the result of data gaps both in age-based condition ratings, as well as, missing data, and will be reviewed with each Business Plan and Budget cycle.

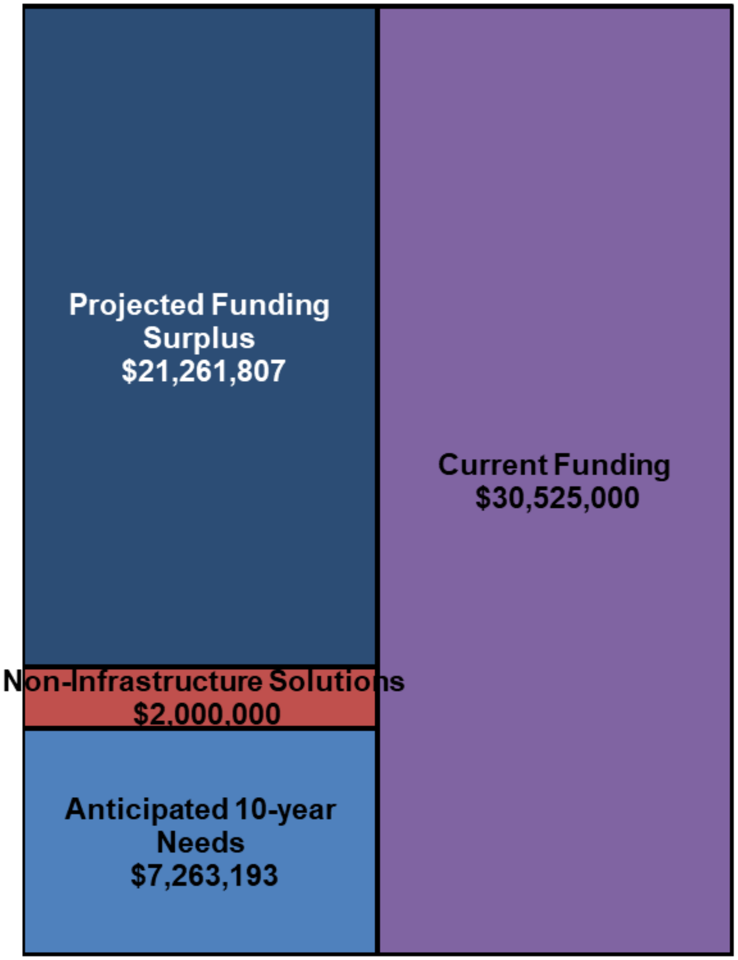
The County will also analyze the benefits of maintaining a separate reserve for stormwater assets. This will facilitate the required reporting and the ongoing management of asset lifecycle needs.

Analysis of the reserve target minimum balance, and splitting of the roads reserve will be completed as part of the annual reserve review process.

Reserve balances are also utilized to fund emergency or unplanned expenses. A minimal or fully committed balance would limit the ability to fund these types of expenses. Consideration needs to be given to a minimum balance the County should maintain based on these risks.

Failure to address long-term asset lifecycle needs could result in significant increases to future taxation levels as assets reach end of life; or reductions in localized and/or regional service. This may include localized or widespread flooding resulting in disruptions to traffic flow or exposure to increase in insurance claims for property damage and personal injury resulting from poor asset conditions, along with reduced quality of stormwater being discharged into the environment.

Figure 5.5.1 Anticipated Needs (10-Year)



6.0 Climate Change

As part of the asset management planning process, the County will consider the risks and vulnerabilities of capital assets to climate change and the resulting actions that may be required. Commitment will be made to the development of tailored actions that make the best use of our resources to mitigate and adapt to climate change, in accordance with our local reduction targets, financial capacity and stakeholder support.

An analysis of the impact of climate change on design storms and their Intensity-Duration-Frequency (IDF) curves was completed based on data available on the Ministry of Transportation of Ontario (MTO) IDF curve lookup website[3].

To summarize the findings, MTO and the University of Waterloo based future design storms off of historical rainfall data. Design storms which are decades into the future have only very minimal increases in intensities and depths of rainfall. From the MTO IDF data, a linear approximation was developed of each design storm (for various durations and extending several decades into the future). From this linear approximation it was found that climate change has a negligible impact on future and past storms. As such, it is reasonable to assume that a design storm in the 2018-2021 year range is approximately equal to 50 year old design storms or design storms set 50 years into the future.

Given that a 50 year old design storm is approximately equal to a modern design storm, if any of a municipality's design sheets for storm sewers (or ditches or other storm infrastructure) is based off of a design storm of that era it can be assumed that the design storm is still acceptable provided that the design storm parameters were obtained from the MTO or are similar to current design storm parameters.

If the parameters were not obtained by the MTO they need to be checked against current design storm parameters. If the parameters result in intensities or depths of $\pm$10% of a current design storm then the original design storm can be considered as acceptable.

[3] http://www.eng.uwaterloo.ca/~dprincz/mto_site/terms.shtml