Township of Lucan Biddulph

ASSET MANAGEMENT PLAN

2022

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Executive Summary

The 2022 Asset Management Plan (AMP) provides an update to the Township of Lucan Biddulph's (Township) 2018 AMP, in alignment with the Township's Strategic Asset Management Policy 100-54-2019 (Effective July 9, 2019) and Ontario Regulation (O. Reg.) 588/17: Asset Management Planning for Municipal Infrastructure, and as amended by O.Reg. 193/21.

Scope of the AMP

The Introduction (Chapter 1) presents an overview of key concepts of asset management such as the State of Local Infrastructure, Levels of Service, Risk Assessment and Lifecycle Activities, concluding with a section on Growth and a Roadmap with Next Steps.

Chapters 2 through 9 each present one of the asset categories as shown in the table below. The Financing Strategy is presented in Chapter 10.

Core Assets	Non-Core Assets
Roads (Chapter 2)	Buildings and Facilities (Chapter 7)
Bridges and Culverts (Chapter 3)	Parks and Recreation (Chapter 8)
Water (Chapter 4)	Fleet and Equipment (Chapter 9)
Wastewater (Chapter 5)	-
Stormwater (Chapter 6)	-

Strategic Asset Management Policy Alignment

Township's Asset Management Vision:

To proactively manage its assets to best serve the Township's objectives including:

- Prioritizing the needs of existing and future assets to efficiently and effectively deliver services;
- Supporting sustainability and economic development, and;
- Maintaining prudent financial planning and decision making.

Goals include:

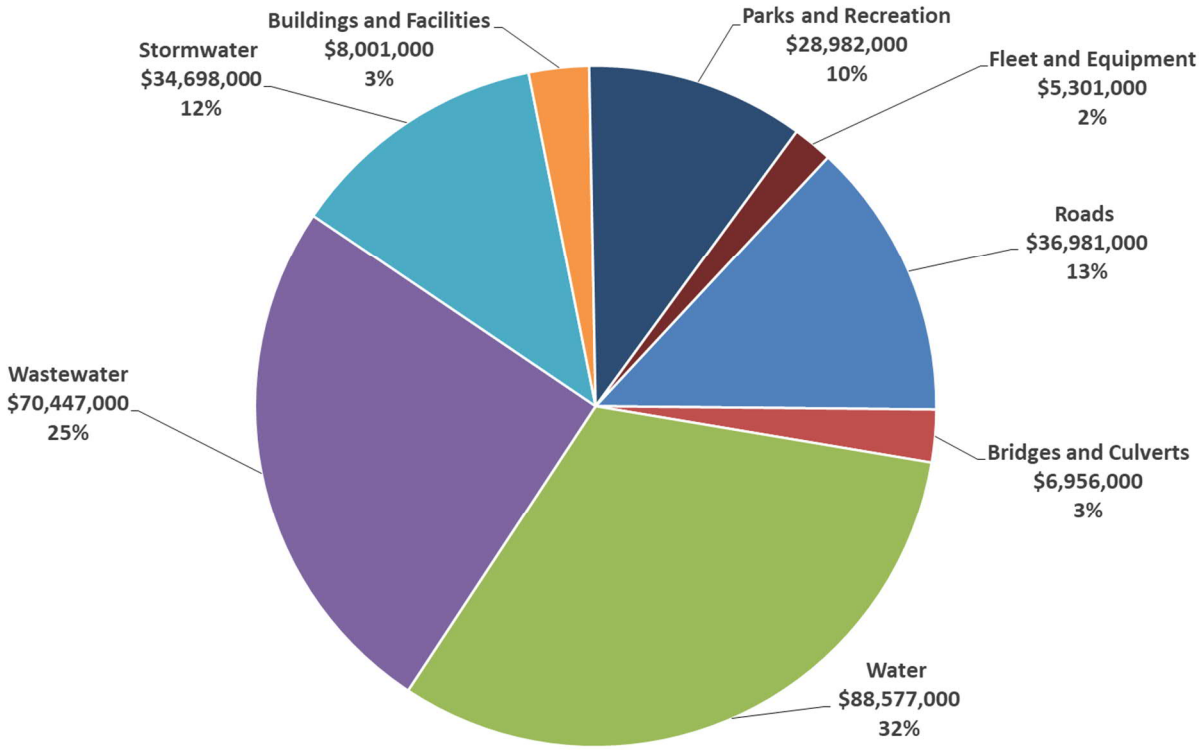
- Provide a framework for implementing asset management to enable a consistent and strategic approach at all levels of the organization;
- Provide guidance to staff responsible for asset management, and;
- Provide transparency and demonstrate to stakeholders the legitimacy of decision-making processes which combine strategic plans, budgets, service levels and risk.

Regulatory Alignment

The 2022 AMP is an update to the 2018 AMP which requires alignment with the new regulation, O. Reg. 588/17, and as amended by O.Reg. 193/21 which requires all core assets to be covered in the asset management plan with current Level of Service (LOS). Core assets include water, wastewater, stormwater, roads and bridges/culverts. This update also includes non-core assets such as buildings and facilities, parks and recreation and fleet and equipment.

Asset Replacement Costs

The current replacement cost for the Township's infrastructure assets is $279.9 million (in 2022 dollars). The distribution of this replacement cost by asset category is shown in the figure below.



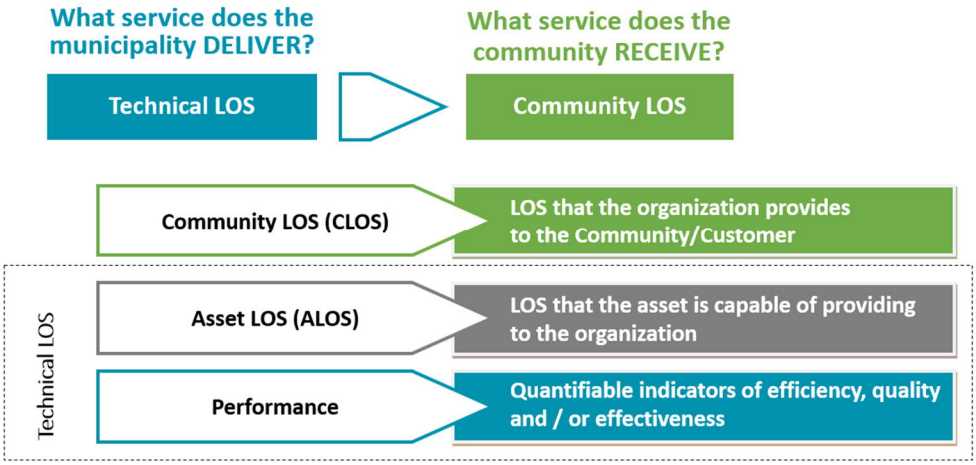
Levels of Service

The current and proposed Levels of Service (LOS) are described in terms of technical metrics and qualitative descriptions for each asset type. These measures are prescribed for core assets within O. Reg. 588/17. For non-core assets it is up to the Township to establish LOS parameters and measures.

LOS are presented in the figure below and defined as follows:

- Community LOS: LOS that the organization provides to the community, intended to be customer-focused, providing a qualitative description of scope and quality; and

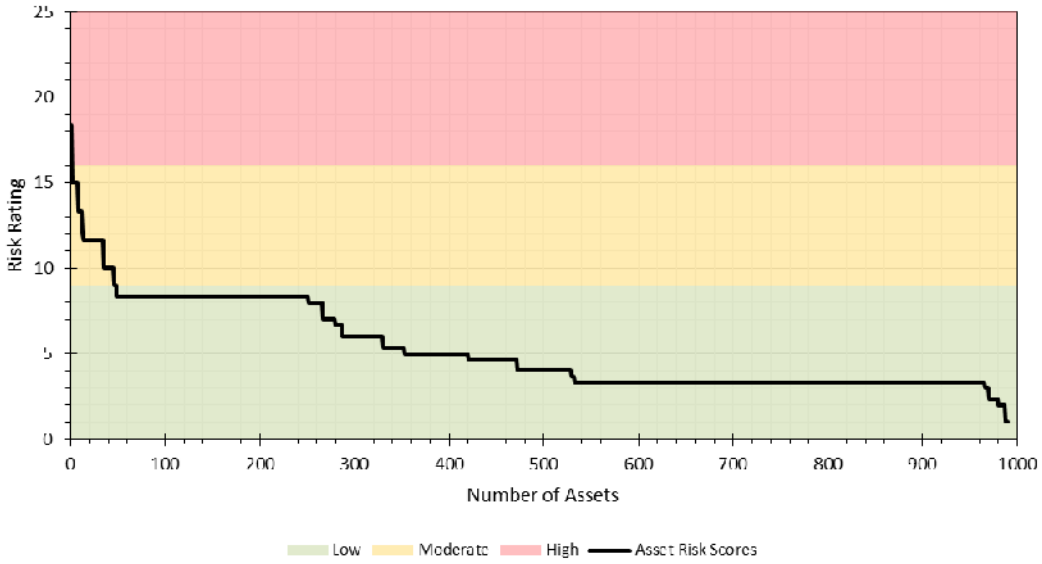
- Technical LOS: LOS that the asset is capable of providing to the Township which is further measured by the performance of the asset, providing technical metrics that support the delivery of LOS.



Risk Profile

The risk profile for all assets is shown in the figure below.

Of the 990 assets tracked within the Township's asset management data, only one (1) is classified as High risk and 12 as Moderate risk. These assets are considered high and moderate priorities for the implementation of lifecycle activities and possible replacement. The remaining assets are considered Low risk.



Financial Strategy

Funding Sources

1. Government funding and grants (i.e. OCIF, CCBF, etc.)
2. Development Charges
3. Reserves
    a. General tax-supported capital reserve funds maintained through allocations from the operating budget
    b. Dedicated reserves maintained through capital levies paid by users for Water and Sewer (Wastewater) Systems
4. Loans

Capital Expenditures

The AMP outlines review of two scenarios which are forecasted to provide an upper and lower bound on the Township's financing needs:

- Unlimited: Replacing assets at the end of their useful life
- Maintain Existing Level of Service (LOS): minimum level of capital investment to maintain current LOS of the Township's assets

These scenarios were compared to the baseline capital funding capacity over a 10 year period to identify if funding gaps exist.

Forecasted Capital Investment and Shortfalls

Unlimited

The forecasted capital expenditure needs exceed the baseline funding capacity in most years, eliminating reserve balances.

Maintain Existing LOS

Baseline funding capacity exceeds the capital expenditure needs in every year except 2023 and 2024, and overall reserves are adequate to fund the expenditure needs in those years.

Since the Township's water and sewer (wastewater) assets are both funded through capital levies paid by users and accrued in dedicated reserve funds, a further breakdown of the Unlimited and Maintain Existing LOS scenarios by General, Water and Sewer indicates that in both scenarios, the water and sewer reserves end up with negative balances at the end of the 10-year forecasts.

Acknowledgements

The consulting team would like to express our appreciation to staff for their cooperation and input to this update. We acknowledge their commitment and flexibility to contribute to this project.

Project Team

- Kathryn Langendyk, Treasurer
- Paul Smith, Parks and Recreation Manager
- Jeff Little, Manager of Public Works
- Julie Overholt, Public Works Assistant
- Ron Reymer, C.A.O./Clerk

About this Report

Dillon Consulting Limited was retained by the Township of Lucan Biddulph to conduct an update to their Asset Management Plan to meet the requirements of O. Reg. 588/17: Asset Management Planning for Municipal Infrastructure and as amended by O. Reg. 193/21.

Consulting Team

- Catherine Liscumb, Project Manager, Dillon Consulting Limited
- Darla Campbell, Asset Management Specialist, Dillon Consulting Limited
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- Heidi Vanheule, Analyst, Dillon Consulting Limited
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1.0 Introduction

The 2022 Asset Management Plan (AMP) provides an update to the Township of Lucan Biddulph's (Township) 2018 AMP, in alignment with the Township's Strategic Asset Management Policy 100-54-2019 (Effective July 9, 2019) and Ontario Regulation (O. Reg.) 588/17: Asset Management Planning for Municipal Infrastructure, and as amended by O.Reg. 193/21.

The AMP documents the Township's assets and strategies based on known information at the time of writing the report and presents a snapshot in time. Assets will continue to deteriorate and investments will be required to improve the condition and extend the useful life of the infrastructure in order to meet the "fit for purpose" measure of the assets in the delivery of services.

The AMP is intended to be a medium to long-term focused document for the Township to use during decision-making processes, including budgeting, and to assist in strategic planning.

1.1 Asset Management Overview

Asset management is a process of making the best possible decisions regarding the creation, maintenance, renewal, rehabilitation, disposal, expansion and procurement of infrastructure assets. The objective of asset management is to maximize the benefits of the assets, minimize risk and provide satisfactory levels of service to the public in a sustainable manner. It considers risks related to the lifecycle of the assets and requires a multi-disciplinary team of planning, finance, engineering, technology, maintenance and operations.

Asset management considers the full lifecycle of the infrastructure, not just the initial cost for designing and constructing the asset, but the operations and maintenance each and every year.

Asset management is an integrated approach that municipalities can use to make informed decisions about their infrastructure. At its core, asset management is about delivering services to communities in a sustainable way. The essential questions for asset management, as described in the InfraGuide: Managing Infrastructure Assets (October 2005), are:

1. What do you have and where is it?
2. What is it worth?
3. What is its condition and expected remaining service life?
4. What is the level of service expectation, and what needs to be done?
5. When do you need to do it?
6. How much will it cost and what is the acceptable level of risk(s)?
7. How do you ensure long-term affordability?

These seven essential questions align to four phases of asset management: asset inventory, condition, levels of service (LOS) and analysis and strategy development. These questions align with O.Reg. 588/17 and ISO55000.

1.2 Scope of the AMP

The AMP is a tool for managing the full lifecycle of physical assets that support the delivery of the Township's services that meet the required levels of service. It provides a long-term perspective to support decision making regarding repairs, rehabilitation and replacement of the assets and managing risks.

As defined by O.Reg. 588/17, the core assets owned by the Township and included in the AMP are:

- Roads (Chapter 2);
- Bridges and Culverts (Chapter 3);
- Water (Chapter 4);
- Wastewater (Chapter 5); and
- Stormwater (Chapter 6).

The non-core assets owned by the Township and included in the AMP are:

- Buildings and Facilities (Chapter 7);
- Parks and Recreation (Chapter 8); and
- Fleet and Equipment (Chapter 9).

1.2.1 Strategic Asset Management Policy Alignment

Township's Asset Management Vision:

To proactively manage its assets to best serve the Township's objectives including:

- Prioritizing the needs of existing and future assets to efficiently and effectively deliver services;
- Supporting sustainability and economic development, and;
- Maintaining prudent financial planning and decision making.

Goals include:

- Provide a framework for implementing asset management to enable a consistent and strategic approach at all levels of the organization;
- Provide guidance to staff responsible for asset management, and;
- Provide transparency and demonstrate to stakeholders the legitimacy of decision-making processes which combine strategic plans, budgets, service levels and risk.

1.2.2 Regulatory Alignment

The 2022 AMP is an update to the 2018 AMP which requires alignment with the new regulation, O. Reg. 588/17, and as amended by O.Reg. 193/21. The regulation requires the following four phases of compliance:

1. By July 2019: Municipalities to have a strategic asset management policy.
2. By July 2022: All core assets to be covered in the asset management plan with current Level of Service (LOS). Core assets include water, wastewater, stormwater, roads and bridges/culverts.
3. By July 2024: All assets owned by the municipality to be covered in the AMP. Non-core assets include buildings, fleet and equipment as well as green infrastructure assets.
4. By July 2025: Municipalities will have approved proposed LOS and the lifecycle management and financial strategy for 10-year period to achieve the proposed LOS.

This AMP includes current LOS for core and non-core assets owned by the Township which meets phase 2 compliance and works towards phase 3 compliance. Future updates will need to include proposed (target) levels of service for core and non-core assets and lifecycle management and financial strategy for 10-year period to achieve the proposed LOS. Future updates will also need to include green infrastructure assets (i.e., natural assets) owned by the Township and further assessment on infrastructure vulnerability to the impacts of climate change.

1.3 State of Local Infrastructure

Each section of the State of Local Infrastructure sets out the following information:

- A summary of the assets in the category;
- The replacement cost of the assets in the category;
- The average age of the assets in the category, determined by assessing the average age of the components of the assets;
- The information available on the condition of the assets in the category; and
- A description of the Township's approach to assessing the condition of the assets in the category, based on recognized and generally accepted good engineering practices where appropriate.

The Township owns infrastructure assets that provide services in the following asset categories: Roads, Bridges and Culverts, Water, Wastewater, Stormwater, Buildings and Facilities, Fleet and Equipment, and Parks and Recreation.

1.3.1 Asset Replacement Costs

The current replacement cost for the Township's infrastructure assets is $279.9 million (in 2022 dollars). The distribution of this replacement cost by asset category is shown in Figure 1.

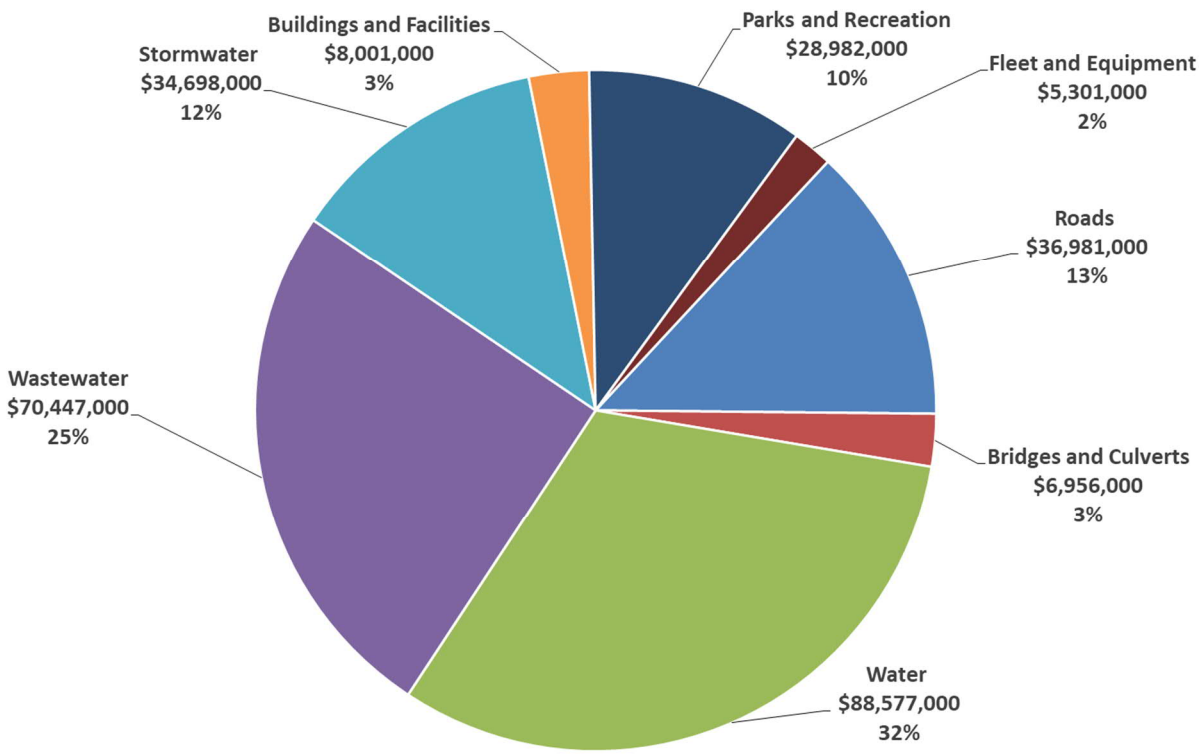


Figure 1: Asset Replacement Cost Distribution

Water and wastewater assets make up 57% of the overall replacement costs, with roads and bridges accounting for 16%, stormwater 12% and parks and recreation 10%.

1.4 Levels of Service

The current and proposed Levels of Service (LOS) are described in terms of technical metrics and qualitative descriptions for each asset type. These measures are prescribed for core assets within O. Reg. 588/17. For non-core assets it is up to the Township to establish LOS parameters and measures.

LOS are presented in Figure 2 and defined as follows:

- Community LOS: LOS that the organization provides to the community, intended to be customer-focused, providing a qualitative description of scope and quality; and
- Technical LOS: LOS that the asset is capable of providing to the Township which is further measured by the performance of the asset, providing technical metrics that support the delivery of LOS.

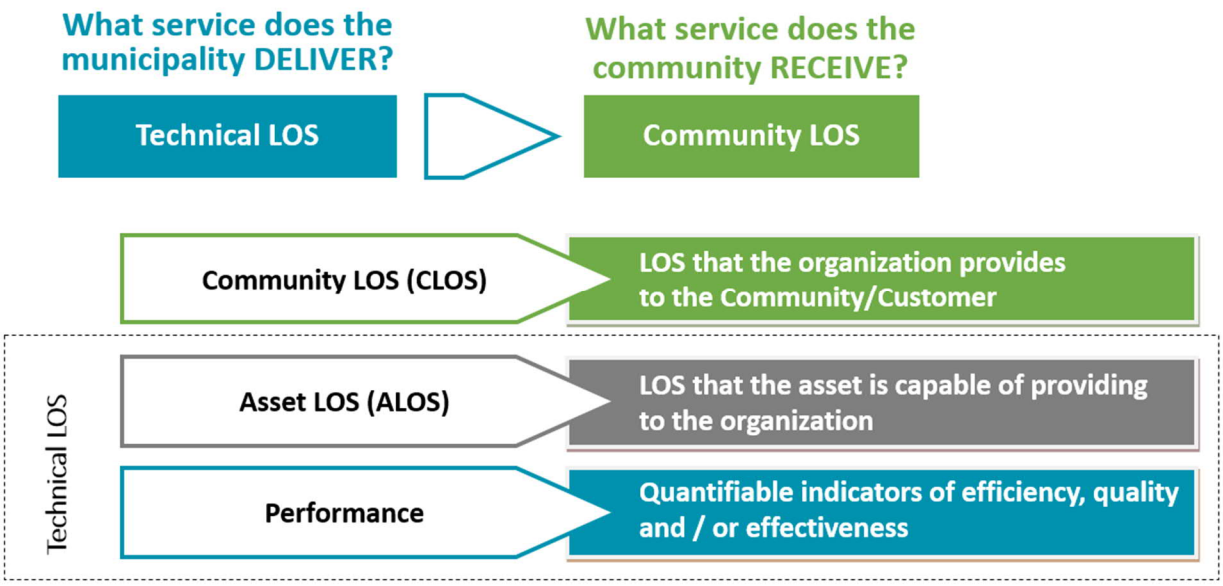


Figure 2: Levels of Service (Community LOS, Technical LOS and Performance)

1.4.1 Levels of Service Workshop

A Levels of Service workshop was held with senior staff from the Township, representing the departments of Public Works, Parks and Recreation and Finance/Treasury. The workshop was held on May 17, 2022 at the Township Office.

The intention of the workshop was to engage with staff and gather qualitative information regarding identification of current levels of service and how levels of service could change in the future. The current services provided, usage of services, performance measures and the community's expectation in terms of current level of service were discussed.

1.5 Risk Assessment

In determining the lifecycle activities for each asset category and identifying the priority activities, the risks associated with the options are to be considered. The risk rating for each asset within the asset category generates a risk profile for the entire asset category.

The assets with the highest risk rating help identify the priorities for the municipality. As part of assessing risk, this methodology considers the factors that increase the likelihood of a hazard occurring (or non-delivery of service) and the consequence. Figure 3 presents a risk "heat map" plotting likelihood and consequence.

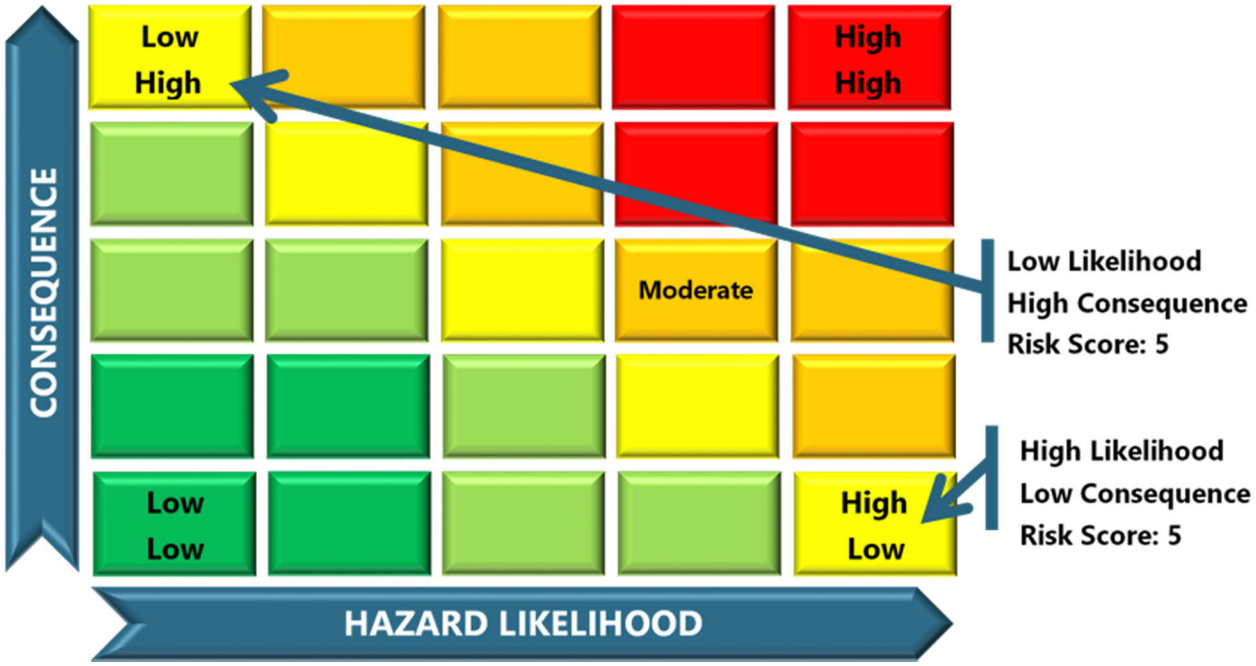


Figure 3: Risk Heat Map

A priority rating has been developed based on the calculated risk rating and displayed in Figure 3 in a 5 by 5 matrix. High risks are shown in the red zone (risk rating 17 to 25), Moderate risks are shown in the orange zone (risk ratings of 10 to 16) and Low risks are in the green and yellow zone (risk ratings of 1 to 9).

The approach and methodology to risk assessment is presented in following sections. A risk profile for each asset category is presented in the corresponding asset category chapters.

1.5.1 Risk Methodology Approach

Risk is the likelihood and magnitude of a negative scenario (hazard) occurring that limits the ability of the asset to deliver the service. Risk is the consideration of asset failure and the consequence of the failure.

Risk = Likelihood of Occurrence x Consequence

The consequence considers the severity of the impact, vulnerability of the asset, and exposure to the negative scenario. Applying the methodology of a score of 1 to 5 for the likelihood and the consequence, the maximum risk rating is 25 (high).

1.5.2 Calculation of Likelihood of Occurrence

The factors that contribute to the likelihood of failure include:

- A – Condition of the asset;
- B – Performance (reliability); and
- C – Vulnerability to climate change.

Table 1 provides a description of these factors.

Table 1: Likelihood Factors

Factors	Low (1)	Moderate (3)	High (5)
A – Condition	Very Good (1)	Good (2); Fair (3)	Poor (4); Very Poor (5)
B – Performance	Always Reliable	Usually Reliable	Not Reliable
C – Climate Change	No or limited impact, quick recovery or mitigation in place	Limited impact with slower recovery; mitigation plan not in place	Moderate or high impact; no or limited mitigation plan

By separating condition and performance as two separate factors, there is an opportunity to consider assets in Poor condition that may still be performing well, compared to those that are not performing, as well as Good condition assets that may not be reliable. The climate change factor brings into consideration assets that are vulnerable to climate change scenarios such as intense rainfall, increased temperatures, extreme weather and drought. The climate change rating includes any mitigation activities in the scoring which reduces the risk and lowers the score.

Therefore, the likelihood of failure is (A + B + C)/3 (i.e., the average of the factors, assuming they are equally weighted).

1.5.3 Calculation of Consequence

The question to consider when calculating consequence is: What increases the impact of non-delivery (or failure of the asset)?

The factors that contribute to the consequence rating include:

- D – Impact or severity
- E – Importance of the asset in delivering service.

Both impact and importance contribute to the consequence and will be multiplied by the likelihood of occurrence. The two ratings are added together for a maximum consequence score of 5. See Table 2 for the description of consequence factors.

Table 2: Consequence Factors

Factors	Low	Moderate	High
D – Impact	Low or no impact (0)	Moderate impact (1)	High impact (2)
E – Importance of the asset in delivering service	Low importance (1)	Moderate importance (2)	High importance (3)

A Risk Workshop was held with senior Township staff on June 9, 2022. As part of this workshop, impact ratings were established by considering the following possible areas of consequence and determining an overall rating of high, moderate or low by taking an average for the impact:

- Safety/Injury;
- Financial Loss;
- Reputation with Stakeholders;
- Environmental Damage; and
- Loss of Service.

The importance ratings were established in consultation with Township staff. The most important assets for delivering service were identified, as well as moderate and low importance. How the importance rankings were applied in each asset category is presented in the section for each asset category.

1.5.4 Calculation of Risk

The risk calculation for each of the assets is determined as follows.

Risk= Likelihood of Occurrence X Consequence
Risk = (A + B + C)/3 x (D + E)

Where: A = Condition
B = Performance
C = Climate Change
D = Impact
E = Importance of the asset

The risk profile for all assets is shown in Figure 4. The relationship shown is fairly linear, with a sharp drop initially, indicating the Township has a broad range of risk across their assets and few High and Moderate risk assets. This is a good position to be in as it allows the management of risk and replacement of assets to move forward at a steady rate.

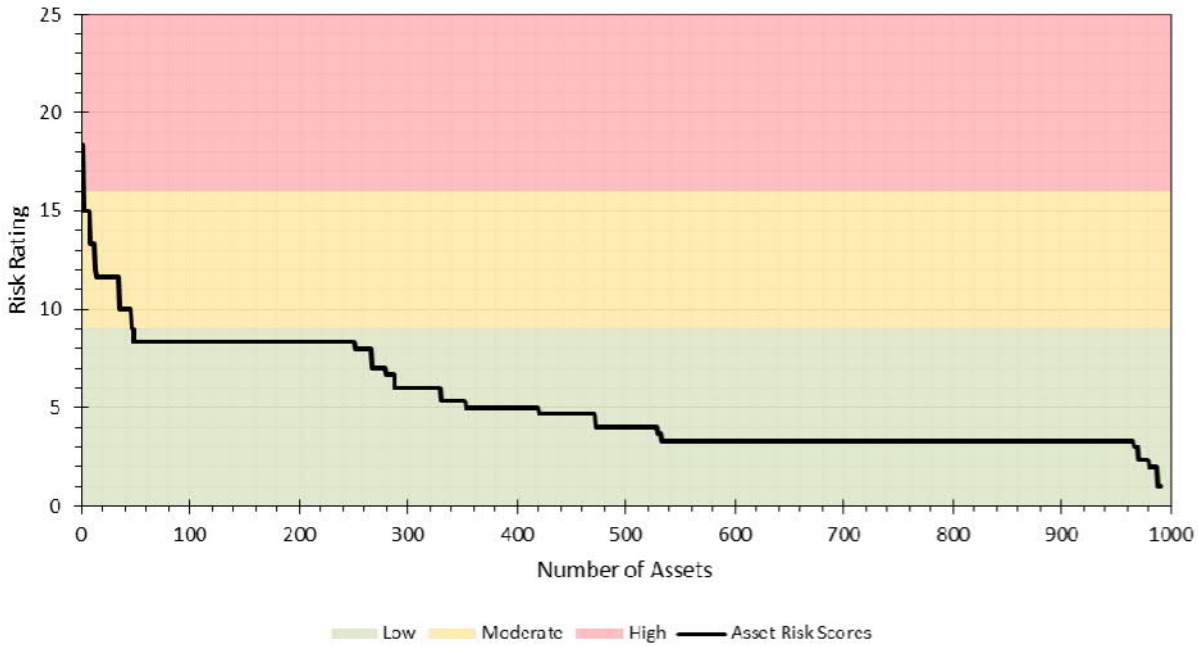


Figure 4: All Asset Risk Profile

Of the 990 assets tracked within the Township's asset management data, only one (1) is classified as High risk and 12 as Moderate risk. These assets are considered high and moderate priorities for the implementation of lifecycle activities and possible replacement. The remaining assets are considered Low risk.

1.5.5 Climate Change

Climate change for the Lucan Biddulph and surrounding region involves shifting temperature and precipitation patterns over time. Temperatures are rising and extreme hot days (days >30C) are expected to increase from an average of 10 days per year historically, to 27 days per year by the 2050s, and 52 days per year by the 2080s. This means nearly two months of high heat days are expected towards the end of the century, and a higher number of annual heat waves. Mean winter temperatures are projected to increase from -5.1C historically, to -2.7C and 0C by the 2050s and 2080s, respectively. Heating degree days (building heating requirements) will decrease, and cooling degree days (building cooling requirements) will increase into the future, which may impact building occupants and HVAC systems (functionality and design).

In general, precipitation projections for the Lucan Biddulph region suggest an increase in annual precipitation, with spring and winter being the most impacted seasons. More intense spring and summer rainfall events are expected; and due to warmer winter temperatures, more precipitation will fall as rain or mixed precipitation than snow, as compared to historical baselines. Freezing rain events and the potential for heavy lake effect snowfalls are expected to increase in frequency and/or intensity

in the near future but over a shorter winter season. The record "snowmageddon" snowfall of 177 cm from December 4-8, 2010 highlighted the impacts from record-breaking lake effect snowfalls due to reduced Great lake ice cover seasons and their higher water temperatures. Mid-winter rainfalls on snowmelt (e.g. February, 2018) also have the potential for increased winter flooding risks. During the warmer seasons, several tornado tracks have brushed the Lucan Biddulph region in the past few years, with risks for tornado damages likely to increase as the length of the severe thunderstorm season increases.

Overall, the proportion of the total precipitation that falls from extreme events, whether intense rain, snow or freezing rainfall, is likely to increase over all seasons, adding to the risks for assets and costs to maintain service levels. Conversely, longer or more frequent drought periods could increase peak demands for water.

There are many direct and indirect climate interactions expected under current and future climate conditions. Some of the direct climate-weather interactions are simpler to identify since they describe assets that are typically exposed to the outdoor weather elements e.g. damages from flooding, high winds, snow and ice storms, and lightning and severe thunderstorms or tornadoes. Other impacts, such as the loss of power from winter storms or severe thunderstorms or loss of backup power due to fuel access and delivery issues are more indirect and can be overlooked. This is particularly true for the indirect impacts of accelerated wind on rain weathering, additional maintenance requirements or impacts of rising UV levels on asset materials (i.e. next couple of decades), reinforced concrete carbonation (temperatures, CO2) from rising GHGs and temperatures or additional burdens for electrical power or water consumption. These ongoing changes in the climate will add to additional demands on operations and maintenance staff and costs of maintaining services.

In the Risk Workshop, municipal staff considered the following climate change scenarios and identified low, moderate or high vulnerability for each asset category:

- Mean Annual Temperature;
- Number of Hot Days (>30C);
- Heavy Snow Events;
- Heavy Rain Events;
- Extreme Weather Events; and
- Occurrence and Magnitude of Flooding.

1.5.6 Risk Assessment Limitations and Assumptions

Several key limitations and assumptions were made as part of the risk assessment process, which are summarized below:

- Field condition assessment data was used as available to determine state of infrastructure and risk. In the absence of field condition assessment data, asset age and estimated useful life was used to approximate physical condition.

- Performance of individual assets was assumed as "Always Reliable" unless otherwise indicated by municipal staff, reviewed reports or provided asset data.

1.6 Lifecycle Activities

The lifecycle activities include activities that can be undertaken over an asset's useful life. These activities, under O. Reg. 588/17, are defined to include constructing, maintaining, renewing, operating and decommissioning of assets and all engineering and design work associated with these activities. Further, Building Together – Guide for Municipal Asset Management Plans (Ministry of Infrastructure) categorizes lifecycle activities into the following categories: non-infrastructure solutions, maintenance, renewal/rehabilitation, replacement, disposal, and expansion activities. Lifecycle activities have been identified for each of the asset categories considered within this AMP.

1.7 Growth

The 2021 Census population of the Township was 5,680, which is in the category of "less than 25,000" as established in O. Reg. 588/17.

In reference to the Township of Lucan Biddulph Official Plan, June 2015, and Amendment No. 10 to the Official Plan of the Township of Lucan Biddulph (Final Draft), May 2022, the Township is expected to grow to 8,710 persons by 2046.

Growth related assumptions and the potential impact on the lifecycle of the Township's assets is presented in Table 3.

Table 3: Growth Related Impacts on Lifecycle of Assets

Asset Category	Growth Impact Assumptions	How Assumptions Relate to Lifecycle of the Assets
Roads	• Increased traffic	• Potential increase in road maintenance costs and capital expenditures
Bridges and Culverts	• Increased usage of bridge crossings by vehicles in the area	• Potential traffic volume delays and mitigation required • Load considerations and regularly scheduled maintenance checks.
Water	• Increased service demands and expansion of network	• Potential increase in capital plan budget to expand network infrastructure and service requirements • Potential increase in operational costs to operate additional pumping and treatment equipment

Asset Category	Growth Impact Assumptions	How Assumptions Relate to Lifecycle of the Assets
Wastewater	• Increased service demands and expansion of network • Increased loading on wastewater treatment facility and effluent flow • Increased flow to central collection mains directly upstream of wastewater treatment facility	• Potential increase in capital plan budget due to increase in service network • Potential increase in operational costs due to increase in wastewater treatment volume
Stormwater	• Increased service demands and expansion of network • Increased storm volumes from urbanization	• Potential increase in capital plan budget due to increase in service network size and capacity
Buildings and Facilities	• Increased facility usage • Changing service demands from aging population	• Increase in capital expenditure for facility development in response to development • Increase in operating costs for facility services and maintenance
Parks and Recreation	• Increased demand for services and variety/quantity of facilities and programs	• Increase in operating costs for services and maintenance
Fleet and Equipment	• Increase in service demands - requiring increased operation or capacity at greater distances	• Increased capital costs for purchase of additional assets to meet service needs • Increased operational costs in fleet maintenance and operational consumables

Growth factors have been considered and projects where growth is a driving factor have been identified by the Township. Project description, proposed schedule and estimated budget are presented in Table 4 for projects identified in the next 10 years. These projects are either supported or identified by the 2021 Lucan Urban Servicing Master Plan and the Township's 2015 Parks and Recreation Master Plan or are linked to other priorities identified by the Township based on recent proposed growth or development. It is also understood that the Township has plans to undertake a fire master plan which may identify other growth related projects.

New financing, such as development charges and special senior-level government funding, should be considered as part of any financial strategy for this plan to fund assets required for growth. The Township is also currently undertaking a development charges review, with expected completion in fall of 2022.

Table 4: Growth Related Projects, **Schedule and Estimated Budget**

Project Description	Proposed Schedule	Estimated Budget
Lucan Wastewater Treatment Plant Expansion and Chestnut Sanitary Pumping Station Upgrades	2023-2024	$12.6 million*
Main Street/Highway 4 Reconstruction	To be determined	To be determined
Community Drive Extension	To be determined	To be determined
Trunk Sanitary Sewer Upgrades to Accommodate Development	Varies	To be determined
Multi-Purpose Athletic Courts	2023-2024	$230,000
Lucan Skate Park	2023	To be determined

*An additional $3.9 million is estimated for rehabilitation of the existing works (non-growth related)

Further, as new residential and commercial development advances within the Township, the Township will assume ownership of the respective road, water, wastewater, stormwater and bridge and culvert assets that the developers have installed as part of the required servicing for each development. With the recent review of the Official Plan, it is anticipated that there will be continue to be additional development within the next 10 years and the corresponding municipal servicing will be assumed by the Township.

1.8 Roadmap with Next Steps

1.8.1 Regulatory Compliance

Annual Report to Council: As required by O. Reg. 588/17, municipalities will report to their Councils at least once per year on the current progress of asset management in the Township and any barriers to aligning operations with the AMP.

Full Update of AMP: A full update of the AMP will be required within 5 years.

Enhancements to the AMP: The inclusion of green infrastructure assets (i.e. green assets) owned by the Township and assessment of vulnerabilities caused by climate change on the performance of infrastructure. By 2025, establishment of proposed LOS for all assets and a financial strategy to meet the proposed LOS will be required for compliance with the regulation.

1.8.2 Recommendations

Condition Assessments

- Condition of the road network can be completed on scheduled basis wherein the entirety of the network is reviewed in annual portions over a defined duration (example every five years).

- Establish a program for regular condition inspections (by professional service providers) to identify the required capital investments for buildings and facilities, including parks and recreation facilities.
- Establish/maintain a condition assessment program for the sanitary sewers. The recommendation is to use visual inspection facilitated by CCTV or Zoom camera inspection. A typical practice is to undertake assessment of 1/5 to 1/3 of the network annually, such that each pipe gets reviewed in a rotating 3 to 5 year basis.
- The inspection of storm sewer assets can be undertaken through a condition assessment program, recommended to be visual inspection through CCTV or zoom camera means. A typical practice is to undertake assessment of 1/5 to 1/3 of the assets annually, such that each pipe gets reviewed on a 3 to 5 year basis.

Performance Data

Expand the collection of performance data to be able to track and report how the assets are performing and to assist the Township in establishing targets for proposed LOS.

- Traffic counts over bridges to assess usage.
- The percentage of properties in the Township that are resilient to a 100-year storm currently unknown. It is recommended that further studies be completed in the future in order to report on the LOS metric.
- The percentage of the municipal stormwater management system resilient to a 5-year storm is currently unknown. It is recommended that further studies be completed in the future in order to report the LOS metric.
- Percentage of the community with stormwater quality and quantity control. Recommended that future analysis be completed in order to track this performance measure.
- Inspection frequency of stormwater ponds and catch basins. Recommended to track in future.
- Fleet performance: maintenance expense per utilization ($/km or hour). Not currently tracked, but it is recommended that the Township should track this performance measure in the future to compare amongst similar vehicles or established standards and identify vehicles which may be costing considerable operating dollars for low utilization.
- Parks and Recreation: Recommend tracking usage rates of facilities, utility usage and customer feedback.

Financing Strategy

It is recommended that the Township undertake a Water and Wastewater Rate Study update to determine the impacts to user rates that would result from adopting the lifecycle strategies and associated funding needs identified in this asset management plan.

2.0 Roads

2.1 State of Local Infrastructure – Roads

The Township owns and maintains a road network which includes paved and unpaved road assets, as well as sidewalks, streetlights and signs.

2.1.1 Road Assets

The Township owns and maintains 35.2 km of asphalt paved road assets and 81.5 km of gravel roads. The asphalt paved roads are classified into the following categories:

a) Full Urban – asphalt paved road in an urban area, which includes curb and gutter and sidewalk
b) Partial Urban – asphalt paved road in an urban area with no curb and gutter or sidewalk
c) Urban Rural – asphalt paved road in a rural area with gravel shoulder

A brief summary of the road assets length by the above classification is presented in Table 5.

Table 5: **Summary of Road Asset by Classification**

Road Classification	Total Length (km)
Full Urban	13.9
Partial Urban	3.0
Urban Rural	18.3
Gravel	81.5

2.1.1.1 Replacement Costs

Replacement costs for the asphalt paved road network were determined based on recent tender information and product information. The replacement costs include costs necessary for full reconstruction of a segment, including granular base. The reconstruction costs are shown in Table 6.

Table 6: Asphalt Paved Road Asset Replacement Costs

Road Classification	Replacement Costs ($/m^2)
Full Urban	$150/m^2
Partial Urban	$85/m^2
Urban Rural	$75/m^2

Using the units costs provided in Table 6, the total replacement costs for the asphalt paved road network is estimated to be $25,978,000.

The replacement costs for rebuilding a gravel road is estimated at $135,000 per km, including subgrade and drainage and culverts.

2.1.1.2 Average Age

The average age of the asphalt paved road network was calculated by road classification and averaged by length, as summarized in Table 57. The average age of the gravel roads is unknown.

Table 7: Road Asset Average Age

Road Classification	Average Age (years)
Full Urban	21
Partial Urban	24
Urban Rural	26

2.1.1.3 Expected Useful Life

Urban rural roads, full urban roads and partial urban roads are assumed to have a lifespans of 25, 20 and 15 years, respectively.

2.1.1 Sidewalks

The Township owns and maintains 19.7 km of concrete sidewalk. The sidewalk varies between in width across the network, but the overall estimated surface area is 26,604 m^2.

2.1.1.1 Replacement Cost

The replacement cost of sidewalk is estimated to $85/m2. This includes the removals and installation of the concrete surface and granular base. The total estimated replacement cost for the sidewalk network is $2,262,000.

2.1.1.2 Average Age

The average age of the existing sidewalks is estimated to be 21 years.

2.1.1.3 Expected Useful Life

The expected useful life of each sidewalk segment is 30 years for concrete sidewalks.

2.2 **Condition** – Roads

2.2.1 Road Assets

Condition of the roads is routinely collected by the Township. The most recent condition assessment was undertaken in 2020 using Streetscan technology, which evaluated the condition of the paved road

surfaces. The assessment establishes the Pavement Condition Index (PCI) for roadway segments on a scale of 0-100, where 100 represented a road in excellent condition, and 0 was a failed asset. A summary of the road condition rating system and total length of road within each condition category is shown in Table 8.

Table 8: **Road Condition Summary (2020 Streetscan)**

Condition Description	Condition Score Category	Condition Rating	Total Length (m)	Percentage of Network
Excellent	1	85 to 100	12,855	36.5%
Good	2	70 to 85	11,937	33.9%
Fair	3	55 to 70	7,323	20.8%
Poor	4	40 to 55	1,831	5.2%
Very Poor	5	0 to 40	1,253	3.6%

2.2.2 Sidewalks

A recent condition assessment was undertaken in 2020 using Streetscan, which evaluated the condition of the concrete sidewalks. The results of the assessment on a scale of 0-100, where 100 represented a sidewalk in excellent condition, and 0 was a failed asset. A summary of the sidewalk condition rating system and total length of sidewalk within each condition category is shown in Table 9.

Table 9: **Sidewalk Condition Summary (2020 Streetscan)**

Condition Description	Condition Score Category	Condition Rating	Total Length (m)	Percentage of Network
Excellent	1	85 to 100	10,241	52.0%
Good	2	70 to 85	6,138	31.2%
Fair	3	55 to 70	1,610	8.2%
Poor	4	40 to 55	1,138	5.8%
Very Poor	5	0 to 40	542	2.8%

2.3 Current Level of Service – Roads

Levels of service minimum reporting requirements for road assets are outlined in Table 4 of O.Reg. 588/17. Table 10 and Table 11 outline the Township's current community and technical LOS for the roads.

Table 10: Community Level of Service – Roads

Service Attribute	Community Levels of Service (Qualitative Description)	Community LOS
Scope	Description, which may include maps, of the road network in the Municipality and its level of connectivity.	The roads in the Township are intended to serve local and through traffic in urban and rural settings, throughout the Township. A map of the road network can be found in Appendix A.
Quality	Description or images that illustrate the different levels of road class pavement condition.	Pavement condition was assessed in 2020. The road segment surfaces were assessed and a PCI score which is between 0 and 100 was given to each segment. PCI of 100 is new condition and as the asset ages and the road condition deteriorates, the PCI score gets lower where PCI of 40 is very poor.

Table 11: Technical Level of Service – Roads

Service Attribute	Technical Levels of Service (Technical Metrics)	Technical LOS
Scope	Number of lane-kilometres of each of arterial roads, collector roads and local roads as a proportion of square kilometres of land area of the Municipality.	The number of lane-kilometres of roads as a proportion of square kilometres of land area of the Township is in Table 12 below.
Quality	For paved roads in the Municipality, the average pavement condition index value.	Based on the road condition assessment completed in 2020, the average Pavement Condition Index (PCI) value for the paved roads is 78 or Good.
	For unpaved roads in the Municipality, the average surface condition (e.g., Excellent, Good, Fair or Poor).	The average surface condition for the unpaved roads is Good.

See Table 12 for roadway type length of lane kilometres and proportion per square kilometer of area.

Table 12**: Proportion of Lane Kilometers**

Street Type	Length of Lane-Kilometers	Lane-Kilometers as Proportion of sq. km of Land Area
Collector	252.8 km	1.5 km per 1 km^2
Local	239.9 km	1.4 km per 1 km^2

2.4 Current Performance – Roads

Asset performance measures were determined in consultation with the Township, which provide relevant metrics against which the Township can gauge the performance of their assets. The performance measures for roads assets, and their current values are shown in Table 13.

Table 13: **Proportion of Lane Kilometers**

Asset Performance Measure	Current Value
Roads with load restrictions	• Coursey Line (Elginfield Road to William Street and Richmond Street to Mooresville Drive) • Saintsbury Line (Fallon Drive to Whalen Line)
Percentage of roads in Fair or Better condition	91.2%

2.5 Risk Assessment – Roads

The risk ratings for the road network, follows the risk methodology and approach, presented in Section 1.5. The risk profile for roads is shown in Figure 4. The risk ratings for the majority of road network is rated as low, with 11 road segments at a moderate risk rating. No road segments were rated high risk.

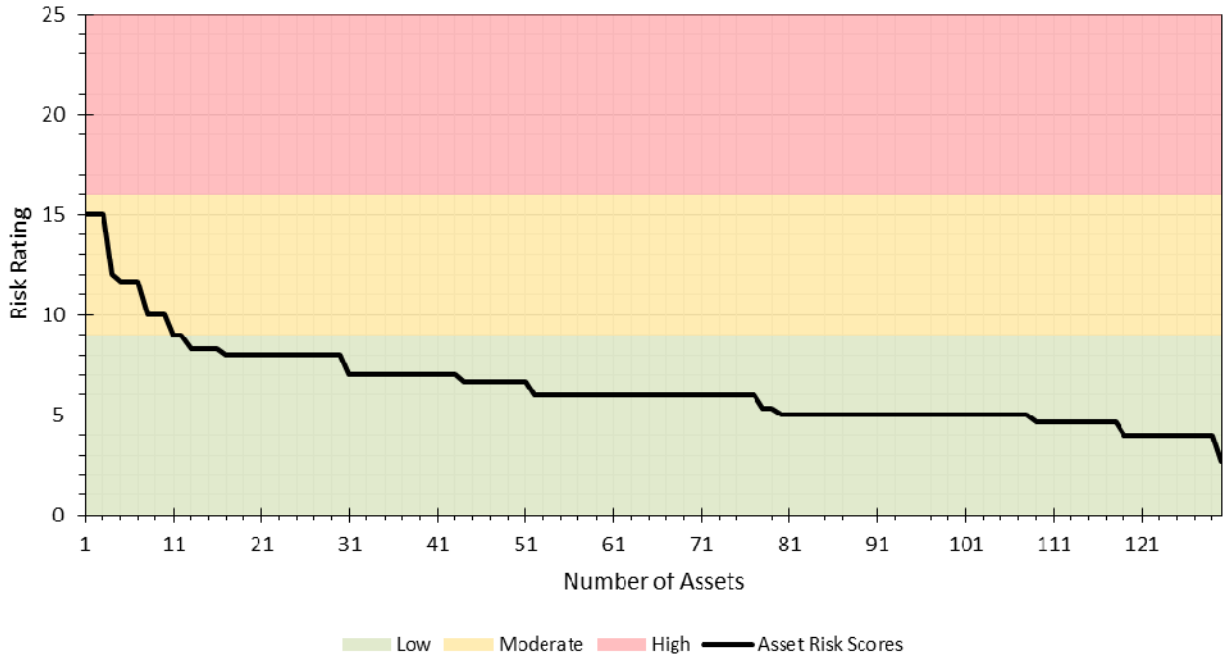


Figure 5: Roads Risk Profile

2.5.1 Importance

Importance of road assets was determined in consultation with Township staff. An importance ranking criteria was applied to all road assets as described in Table 14 for establishing the risk ratings. The importance ratings prioritize roads in the Township based on higher usage or access to schools.

Table 14: **Importance Ratings** – Roads

Importance Rating	Description
High (3)	• Roads that lead to schools (Roman Line, Beech Street) • Gilmour Drive • Spencer Avenue • Saintsbury Line
Moderate (2)	• Market Street • Bus routes (Kent Street, Walnut Street) • Elm Street • Nicoline Avenue • Coursey Line
Low (1)	• All other urban roads • All gravel roads

2.6 **Lifecycle Activities** – Roads

The following section describes the lifecycle activities that can be implemented within the asset management strategy for road assets. The primary lifecycle activities after construction include reconstruction, rehabilitation, and maintenance.

Construction

The initial lifecycle activity of a road asset is its construction. The road asset should be constructed to adhere to applicable requirements, codes, and design guidelines. Design of the road asset should consider the level of service expected to be provided by that particular road asset, such as the anticipated speed or volume of traffic. Varying factors in construction include: the road classification, surface type, and roadside environment (e.g., rural, urban).

Reconstruction

Reconstruction lifecycle activities include works that encompass the full surface of a road segment. Reconstruction activities include:

- Full reconstruction (Varying cost and difficulty for rural, semi-urban, and urban roads);
    - Potential adjustments to existing storm sewer, manholes, catch basins, etc. (semi-urban and urban roads only); and
- Urban paving (typically more costly than paving for rural urban and rural roads).

Selection of a reconstruction activity will depend on multiple factors, such as:

- Lifecycle stage of the asset (previous lifecycle activities undertaken);
- Condition and type of wear on road surface;
- Road surface material;
- Condition of underlying road base; and
- Roadside environment.

Rehabilitation

Rehabilitation lifecycle activities include works that encompass the full surface of a road segment. Rehabilitation activities include:

- Hot mix resurfacing (50 mm – 100 mm);
- Full depth pulverize and pave (100 mm – 150 mm); and
- Full depth removal and pave.

Selection of a reconstruction activity will depend on multiple factors, such as:

- Lifecycle stage of the asset (previous lifecycle activities undertaken);
- Condition and type of wear on road surface;
- Road surface material;
- Condition of underlying road base; and
- Roadside environment.

Maintenance

Maintenance lifecycle activities are smaller in scale than reconstruction or rehabilitation and can be used to address localized issues on the road surface (“spot maintenance”), or to improve or maintain road asset-adjacent components (“specific maintenance”). A spot maintenance activity is typically appropriate when the location for maintenance is less than 60 m in length. Specific maintenance activities are not length based, and address maintenance to non-road surface components. The types of maintenance under each of these categories can include:

- Specific Maintenance
    - Ditching improvements
    - Edge widening
    - Installation of sub drain

- Spot Maintenance
    - Ditch Spot Location
    - Paving Patch
    - Spot repair (paved or gravel road).

Crack sealing can be used on an ad-hoc basis, typically on better condition roads where the severity of the cracks is minimal. Where cracks are more advanced or widespread, more comprehensive maintenance or improvement works will be required.

Decommissioning/Disposal

Disposal activities can include the removal from service of a road segment. These activities can be implemented when a road segment has been determined to be no longer required. A road may be removed from service by removal and disposal of the asset components, or establishment of a barricade to prevent continued usage of the asset. Disposal activities should be conducted such that health and safety protocols are being followed, and spent materials are disposed of at an appropriate or approved facility.

2.7 Asset Management Strategy – Roads

The asset management strategy for the road assets seeks to use the lifecycle activities in a manner that will achieve cost-effective and sustainable management of the road assets. The road assets will deteriorate on a non-linear basis, and the lifecycle activities can be implemented at varying stages within an assets deterioration.

The condition and usage of the road assets is a key driver in the determination of lifecycle activities to use. The condition was determined in 2020 and should continue to be updated by the Township. Condition of the roads can be completed on scheduled basis wherein the entirety of the network is reviewed in annual portions over a defined duration (example every five years). A variety of methods can be implemented for undertaking condition assessment of roads, including visual inspection and street scan technology. A condition rating program can also be implemented that considers the importance or risk of a road segment, and prioritizes frequency and timing of condition assessments to higher usage or higher importance roads. A condition assessment program is recommended for the Township.

Maintenance works should be undertaken throughout the lifecycle of an asset. Selection of the appropriate maintenance activity will depend on the type of deterioration being experienced on the asset, and the condition of the asset. Some activities, such as crack sealing, are best utilized on a road segment that is generally in “Good” condition. As the road segment continues to deteriorate, maintenance activities may become a less preferred option.

Rehabilitation activities should be undertaken on an asset when it has deteriorated past the point where maintenance activities would be adequate to address condition issues. Selection of the appropriate rehabilitation activity will depend on the road surface material, stage in lifecycle, and severity and type of deterioration.

In general, the current strategy for the road assets at the Township is to allow the road surface asset to degrade near to the end of its expected lifecycle, and reconstruct the road surface when required. The road base has a much longer expected useful life than the road surface, and is dealt with as required during road works. The requirement for reconstruction of the road base is determined through a combination of staff knowledge of the road condition, and conducting boreholes to assess the viability of the road base. The Township does not currently undertake boreholes for every road segment to be reconstructed.

As for gravel roads, it is recommended that the gravel roads be graded regularly. Currently, the Township applies maintenance gravel to gravel roads every other year (50% of the Township gravel roads are completed annually). Localized repairs and maintenance should also be completed where required. Reconstruction of these roads may be required if condition is found to have deteriorated, however the expected lifespan is long.

2.7.1 Scenario Analysis

To understand the needs and projected works on the roads assets within a 10-year outlook, reconstruction of the road surface was reviewed under varying budget values to understand the impact on overall network condition. In this analysis, it is assumed that intermittent resurfacing works are not undertaken. Gravel roads are also omitted from analysis, as they are maintained through operations and not reconstructed at the same frequency as the paved roads. The budgets analyzed included:

1. Unlimited budget – To determine backlog of works.
2. No budget – To understand the changes in average network condition with no investment;
3. Maintain average condition across network

A summary of the analysis is outlined in Table 15 below.

Table 15: Budget Scenarios **Reviewed for Road Asset Projections**

	Budget Scenario	Annual Value	Average Annual Investment Over Timeframe	Total Investment Over Timeframe	Average Condition Index (2032)
1	Unlimited	Unlimited	$1,382,550	$13,825,500	0.74
2	No Budget	$ -	$ -	$ -	0.34
3	Maintain average current condition	$650,000	$641,017	$6,410,175	0.67

3.0 Bridges and Culverts

3.1 State of Local Infrastructure – Bridges and Culverts

The Township owns eight bridges and 12 structural culverts for a total of 20 structures. The inventory of the structures is shown in Table 16 and Table 17.

The Ontario Structure Inspection Manual (OSIM) 2008 was used to classify bridges and culverts for consideration. Bridges and structural culverts are defined as structures providing vehicle or pedestrian passage across and obstruction, gap or facility that are greater than or equal to 3 m in span.

Table 16: Inventory of Bridges

Structure Name and Location	Structure Type
Bridge No. 2 – Coursey Line (North of Fallon Drive)	Precast I Beams
Bridge No. 4 – Mooresville Drive (West of Saintsbury Line)	Ridge Frame - Concrete
Bridge No. 5 – Saintsbury Line (South of Adare Drive)	Precast I Beams
Bridge No. 6 – Saintsbury Line (North of Adare Drive)	Precast I Beams
Bridge No. 8 – Saintsbury Line (South of Mount Carmel Drive)	Precast I Beams
Bridge No. 9 – Saintsbury Line (North of Mount Carmel Drive)	Ridge Frame - Concrete
Bridge No. 11 – Roman Line (North of Moorseville Drive)	Ridge Frame - Concrete
Whalen Boundary Bridge (shared ownership with Township of Perth South)	Unknown

Table 17: Inventory of Structural Culverts

Structure Name and Location	Structure Type
Culvert No. 1 – Saintsbury Line (North of Fallon Drive)	Ridge Frame – Concrete
Culvert No. 3 – Saintsbury Line (North of Breen Drive)	Concrete Simple Span
Culvert No. 10 – Roman Line (South of Whalen Line)	Concrete Simple Span
Culvert No. 12 – Mooresville Drive (West of Roman Line)	Corrugated Steel Pipe Arch
Culvert No. 13 – Saintsbury Line (South of Mount Carmel Drive)	Ridge Frame – Concrete
Culvert No. 14 – Coursey Line (North of Fallon Drive)	Corrugated Steel Bolted Pipe Arch
Culvert No. 15 – Coursey Line (South of Fallon Drive)	Corrugated Steel Bolted Pipe Arch
Culvert No. 16 – Observatory Drive (East of Highway 23)	Ridge Frame – Concrete
Culvert No. 17 – Stonehouse Line (North of Observatory Drive)	Ridge Frame – Concrete
Culvert No. 18 – Stonehouse Line (North of Observatory Drive)	Ridge Frame – Concrete
Culvert No. 19 – Campanale Way (North of Walnut Street)	Ridge Frame – Concrete
Culvert No. 20 – Walnut Street Culvert	Ridge Frame – Concrete

3.1.1 Replacement Costs

The total replacement value for the bridge and structural culverts is estimated to be $6.9 million based on historical costs, inflated to 2022 dollars, as summarized in Table 18.

Table 18: Replacement Cost – Bridges and Structural Culverts

Asset Type	Quantity	Total Replacement Cost (2022)
Bridges	8	$4.6 million
Structural Culverts	12	$2.3 million
Total	20	$6.9 million

3.1.2 Average Age

The bridge network varies in age distribution from 1 year old (constructed in 2021) to 59 years (constructed in 1963) and has an average age of 40 years old. The age distribution is shown in Table 19.

Table 19: **Age Distribution of** Bridges

Bridge Name	Year Constructed	Age (years)
Bridge No. 2 – Coursey Line (North of Fallon Drive)	1971	51
Bridge No. 4 – Mooresville Drive (West of Saintsbury Line)	1993	29
Bridge No. 5 – Saintsbury Line (South of Adare Drive)	1965	57
Bridge No. 6 – Saintsbury Line (North of Adare Drive)	1965	57
Bridge No. 8 – Saintsbury Line (South of Mount Carmel Drive)	1964	58
Bridge No. 9 – Saintsbury Line (North of Mount Carmel Drive)	1963	59
Bridge No. 11 – Roman Line (North of Moorseville Drive)	2021	1
Whalen Boundary Bridge	2016	6

The structural culvert network varies in age distribution from 3 years old (constructed in 2019) to 63 years (constructed in 1959) and has an average age of 35 years old. The age distribution is shown in Table 20.

Table 20: **Age Distribution of** Structural Culverts

Structural Culvert Name	Year Constructed	Age (years)
Culvert No. 1 – Saintsbury Line (North of Fallon Drive)	1965	57
Culvert No. 3 – Saintsbury Line (North of Breen Drive)	1964	58
Culvert No. 10 – Roman Line (South of Whalen Line)	1963	59
Culvert No. 12 – Mooresville Drive (West of Roman Line)	2002	20
Culvert No. 13 – Saintsbury Line (South of Mount Carmel Drive)	1959	63
Culvert No. 14 – Coursey Line (North of Fallon Drive)	2000	22
Culvert No. 15 – Coursey Line (South of Fallon Drive)	2001	21
Culvert No. 16 – Observatory Drive (East of Highway 23)	1965	57
Culvert No. 17 – Stonehouse Line (North of Observatory Drive)	1960	62
Culvert No. 18 – Stonehouse Line (North of Observatory Drive)	1964	58
Culvert No. 19 – Campanale Way (North of Walnut Street)	2013	9
Culvert No. 20 – Walnut Street (East of Campanale Way)	2019	3

3.1.3 Expected Useful Life

The average expected useful life of a bridge or structural culvert is generally 75 years. With a good maintenance program, i.e. following recommendations from OSIM reports, the useful life of bridges can be extended, by improving the condition of the bridge or structural culvert to meet levels of service and performance.

3.2 **Condition** – Bridges and Culverts

The Township has previously undertaken condition assessment for bridge and structural culvert assets, determined through completion of OSIM inspections, the most recently having been completed in 2020 by Spriet Associates. An OSIM inspection is scheduled for 2022.

3.3 Current Level of Service – Bridges and Culverts

Levels of service for bridges and culverts are outlined in Table 5 of O.Reg. 588/17. Table 21 and Table 22 outline the Township's current community and technical levels of service for bridges and culverts.

Table 21: Community Levels of Service – Bridges and Culverts

Service **Attribute**	Community Levels of Service **(Qualitative Description)**	Community LOS
Scope	Description of the traffic that is supported by municipal bridges (e.g., heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, cyclists).	The Township's bridge and structural culvert network is designed to support various vehicle types, including: • Heavy transport vehicles • Motor vehicles • Emergency vehicles • Agricultural vehicles and equipment • Pedestrians • Cyclists
Quality	Description or images of the condition of bridges and how this would affect use of the bridges. Description or images of the condition of culverts and how this would affect use of the culverts.	The condition of bridges and culverts are evaluated routinely (every two years) according to the OSIM requirements. For full descriptions and samples images of bridge and culvert condition classifications refer to the Ministry of Transportation's Ontario *Structure Inspection Manual 2008 and Field Inspection* Guide (April 2008). Bridges and culverts in Good condition typically operate as designed and would not receive any additional restrictions or limitations beyond those designed. Bridges and culverts in Fair to Poor condition may receive load restrictions or be subject to closure as deterioration affects asset capacity to safely and reliably deliver the designed level of service.

Table 22: Technical Levels of Service – Bridges and Culverts

Service **Attribute**	Technical Levels of Service (Technical Metrics)	Technical LOS
Scope	Percentage of bridges in the Municipality with loading or dimensional restrictions.	An OSIM bridge inspection report conducted in 2022 by Spriet Associates identified no bridges that are posted with loading restrictions
Quality	For bridges in the Municipality, the average bridge condition index value.	There was no BCI value provided in the OSIM report. It is recommended that a BCI value is provided in the 2022 OSIM Report.
Quality	For structural culverts in the Municipality, the average bridge condition index value.	There was no BCI value provided in the OSIM report. It is recommended that a BCI value is provided in the 2022 OSIM Report.

3.4 Current Performance – Bridges and Culverts

Asset performance measures were determined in consultation with the Township, which provide relevant metrics against which the Township can gauge the performance of their assets. The performance measures for bridge and culvert assets and their current values are shown in Table 23.

Table 23: Bridge and Culvert Performance Measures

Asset Performance Measures	Current Value
Annual average daily traffic (AADT) counts over bridges to assess usage	Not currently tracked, but recommended to be tracked in the future
Number of bridge or culvert failures/road closures	There were no bridge or culvert failures in 2020 and 2021.
Number of structures with load restrictions	There are no bridges or culverts with load restrictions.
Percentage of bridges and culverts in Fair or better condition	An overall BCI was not determined as part of the most recent OSIM inspection in 2020. It is recommended that an overall condition index be developed for the next OSIM inspections.

3.5 Risk Assessment – Bridges and Culverts

The risk ratings for the bridges and culverts, follows the risk methodology and approach, presented in Section 1.5. The risk profile for bridges and culverts is shown in Figure 6.

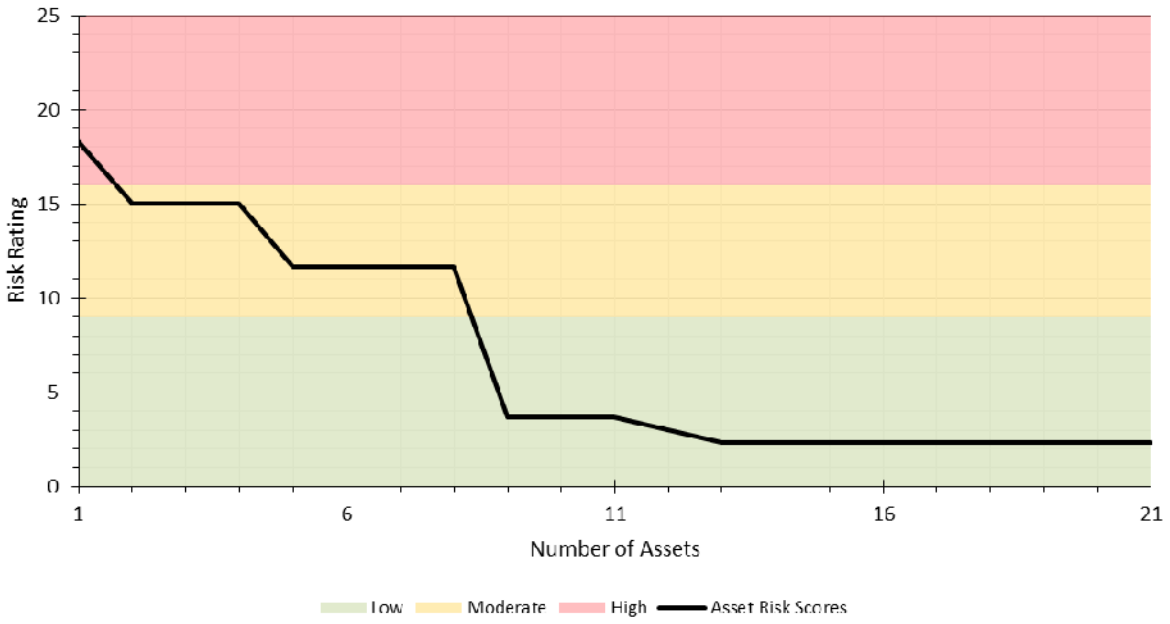


Figure 6: Bridges and Structural Culverts Risk Profile

3.5.1 Importance

Importance of bridge and structural culvert assets was determined in consultation with Township staff. An importance ranking criteria was applied to bridge and culvert assets as described in Table 24.

Table 24: **Importance Ratings** – Bridges and Culverts

Importance Rating	Description
High (3)	• Bridges and culverts on Saintsbury Line and Roman Line
Moderate (2)	• none
Low (1)	• All other bridges and culverts (Coursey Line, Stonehouse Line, Mooresville Drive, Observatory Drive, Campanale Way and Walnut Street)

3.6 **Lifecycle Activities** – Bridges and Culverts

The following section describes the lifecycle activities that can be implemented within the asset management strategy for bridge and structural culvert assets. Note that bridge assets refers to the entirety of the asset which is made up of bridge deck surface and bridge structure. The primary lifecycle activities include construction, inspections, maintenance and repair, replacement, and decommissioning/disposal.

Construction

The start of an asset's lifecycle is its construction. The bridge or structural culvert should be constructed to adhere with the requirements of the O. Reg. 160/02: Standards for Bridges, CSA S6 Canadian Highway Bridge Design Code, and any and all other applicable regional codes and requirements for the bridge and its use. Each bridge or structural culvert should be designed and constructed to provide the services for which it is intended.

Inspections

Under O. Reg. 160/02: Standards for Bridges, the Township is required to complete one inspection of all bridges and structural culverts every two years to identify condition and produce a report outlining the recommended work for a 1 to 10 year period. The inspection uses the Ontario Structural Inspection Manual (OSIM) 2008 and is referred to as the OSIM or Bridge Inspection Report. The Township should continue the current biennial OSIM Bridge Inspections along the current schedule, with the next inspections scheduled for 2022 and 2024. The inspections should include all bridges and culverts with a single or combined span greater than 3 m.

Maintenance and Repairs

Bridge and culvert assets are long-lived assets with estimated useful lives between 15 to beyond 75 years. Throughout the lifecycle of these assets the majority of expected needs will be maintenance and repair works.

Routine maintenance works are typically used to prolong the lifespan of assets and include both preventative and reactive activities designed to maintain the asset condition and function.

Preventative activities are implemented to provide a predictive response to deterioration or possible performance issues by managing the contributing factors prior to an event occurring. Reactive maintenance is conducted in response to a condition or performance issue and designed to correct the issue before it causes asset deterioration and possible deficiencies. The scale of maintenance activities varies widely and is dependent on a variety of factors including the age, asset utilization, environment, and design. Maintenance should be completed based on recommendations in biennial OSIM reports and industry best practices.

A general summary of bridge and structural culvert maintenance activities include, but are not limited to:

- Cleaning, washing or flushing
- Railing system maintenance
- Painting of steel bridge components
- Bearing maintenance
- Pest control
- Deck drainage maintenance
- Erosion control
- Scaling of loose concrete and ACR Steel.

Repair works are driven by the identification and treatment of deficiencies to prevent the continued deterioration of the deficiency which may cause a reduction in asset condition, performance and LOS delivered. Timing of repairs varies widely as they may be prescheduled based on estimated deterioration, in response to biennial condition reporting, or on an emergency basis. Repairs to bridges vary widely and can be in relation to structural and deck surface components.

Replacement

Replacement of a structure is based on current age, estimated lifespan and recommendations from condition assessments. Replacement can be used when an asset is nearing or has reach the end of its life, repairs are not technically feasible, estimated future repair costs are greater than replacement cost, or increases to capacity or LOS are required. Replacement activities are typically large in scale and involve the issuance of a capital project. Timing of replacement activities must consider the impact on adjacent infrastructure, the impact on near-by asset LOS and replacement or maintenance requirements of connected infrastructure.

Disposal

Disposal activities from bridges and culverts can include the removal from service of a bridge or culvert, through:

- Closure of the bridge from access
- Change in level of service of the bridge to limit access (e.g., vehicular bridge)
- Deconstruction of the bridge.

Disposal activities should be implemented when a bridge or culvert structural has reached the end of its useful life, or has degraded to such a state that it can no longer provide the level of service for which it is intended. Removal of a bridge from service without replacement, or decrease in level of service should be undertaken only when it is decided to no longer be required to provide level of service to residents. Disposal activities should be conducted such that health and safety protocols are being followed, and spent materials are disposed of at appropriate or approved facility.

3.7 Asset Management Strategy – Bridges and Culverts

The asset management strategy for bridges and structural culverts in the Township will employ the lifecycle activities to maximize the useful life of each asset.

The primary indicator used in the development of the lifecycle strategy is the condition of each asset, however, the strategy must also consider other factors, such as:

- Consequence of asset failure
- Asset risk score
- Condition of adjacent assets
- Community growth and capacity requirements.

As the Township continues to develop, these factors will continue to change, and each have an impact on the lifecycle of an asset. Consideration of these factors should be given when devising capital project outlooks and budgeting, and updating of the asset management plan.

Under O. Reg. 160/02: Standards for Bridges, the Township is required to complete one inspection of all bridges and structural culverts every two years to identify condition and produce a report outlining the recommended work for a 1 to 10 year period. The inspection uses the Ontario Structural Inspection Manual (OSIM) 2008 and is referred to as the OSIM report. The most recent condition assessment and study was completed in 2020.

It is recommended that the Township use the OSIM report to identify and forecast lifecycle activities for bridge and structural culvert assets. For detailed recommendations of asset management strategies refer to the most current OSIM inspection report.

3.7.1 Scenario Analysis

To understand the needs and projected works on the bridges and culverts within a 10 year period, a summary of the recommendations from Township of Lucan Biddulph Bridge and Culvert Inspection and Assessment Report 2020, prepared by Spriet Associates is presented in Table 25. The costs provided by Spriet Associates were presented in 2020 Dollars and are reflective of the quantity of work required as of 2020. Quantities are expected to increase over time as assets continue to deteriorate.

Table 25: **Projection of Works for Bridge and Culvert Assets based on OSIM Inspections**

Timing of Needs	Estimated Rehabilitation Costs
Within 1 Year	$88,000
1 to 5 Year Period	$304,000
6 to 10 Year Period	$0

4.0 Water

4.1 State of Local Infrastructure – Water

The Township owns and operates a water distribution network. The asset inventory includes linear pipes, appurtenances and water facilities. A summary of the quantity of assets within the network is provided in Table 26.

Table 26: Water Asset Inventory Summary

Water Asset	Quantity	Unit of Measure
Watermain	45,562	Length (m)
Hydrant	123	Each
Valves	214	Each
Elevated Water Tower	1	Each
Booster Pumping Station/Reservoir	2	Each

The analysis within this report related to linear assets is predicated on the assumption that appurtenances included in the system are required componentry that will be replaced in conjunction with the linear components, and are expected to have similar lifespans and conditions as the linear components.

4.1.1 Linear Water Assets

The Township's water distribution network consists of approximately 45 km of watermain. The material types of the existing watermain construction are summarized in Table 27.

Table 27: Material Types of Watermain

Material Type	Diameter Size Range (mm)	Total Length (m)	Percentage of System
Cast Iron	150	980	2.1%
Ductile Iron	150-250	2,507	5.5%
PVC	50-350	41,683	91.5%
PEX	25-50	391	0.9%

4.1.1.1 Replacement Costs

Replacement costs for the linear water network were estimated based on recent tender information and product information. The replacement costs include costs necessary for full reconstruction of a segment, including trench and surface restoration. It is assumed that reconstruction works on the network will be completed using PVC watermain. The reconstruction costs are shown in Table 28.

Table 28: Linear Water Asset Replacement Costs

Diameter	Replacement Costs ($/m)
< 250 mm	$1,600/m
250 mm – 400 mm	$3,000/m

Using the units costs provided in Table 28, the total replacement costs for the linear water network is estimated to be $84,150,000.

4.1.1.2 Average Age

The average age of the linear water assets water network was calculated by pipe material, weighted by length of asset. The average age is summarized in Table 29.

Table 29: Average Age of Linear Water Assets by Pipe Material

Pipe Material	Average Age (years)
Cast Iron	46
Ductile Iron	51
PVC	22
PEX	16

4.1.1.3 Expected Useful Life

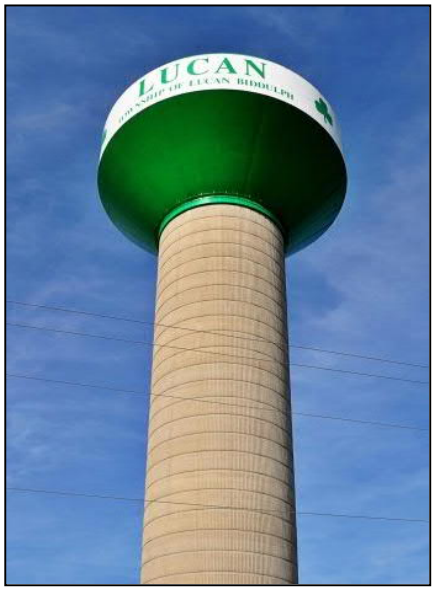
The expected useful life of the linear water assets is used to estimate the replacement schedule. The expected useful life values as summarized in Table 30.

Table 30: Expected Useful Life of Linear Water Assets by Pipe Material

Pipe Material	Expected Useful Life (years)
Cast Iron	50
Ductile Iron	60
PVC	75
PEX	60

As data continues to be available regarding useful life of the watermain construction materials, these values can be reviewed and updated as appropriate.

4.1.2 Water Facility Assets



In addition to the linear watermain assets, the Township's water network also includes water facility assets that provide storage and distribution services. These facility assets are complex and include multiple components, including electrical, mechanical, structural, instrumentation and control, process, civil and architectural. The water facility assets include the following:

1. Lucan Elevated Water Tower
2. Lucan Booster Pumping Station
3. Granton Booster Pumping Station and Reservoir

4.1.2.1 Replacement Costs

Replacement costs for the water facility assets have been estimated based on a review of the individual components of each facility completed by BM Ross in 2022. The total replacement costs of each facility is summarized in Table 31.

Table 31: Water Facility Asset Replacement Costs

Water Facility Asset	Estimated Replacement Cost
Lucan Elevated Water Tower	$2,344,000
Lucan Booster Pumping Station	$1,102,000
Granton Booster Pumping Station and Reservoir	$983,000
Total	$4,429,000

4.1.2.2 Average Age

The average age for each water facility asset was also determined based on an average age of all components within the respective facility. Table 32 summarizes the average age for water facility assets.

Table 32: Water Facility Asset Replacement Costs

Water Facility Asset	Average Age of Components (years)
Lucan Elevated Water Tower	31
Lucan Booster Pumping Station	29
Granton Booster Pumping Station and Reservoir	27
Overall Average Age	29

4.1.2.3 Expected Useful Life

As part of the review of the various components of the water facility assets completed by BM Ross in 2022, expected useful lives were estimated by type of component, as outlined in Table 33.

Table 33: Expected Useful Life of Water Facility Components

Water Facility Component Type	Expected Useful Life (years)
Interior Finishes	10
SCADA	10
Instrumentation and Control Equipment	15
Roof Covering	20
Flow Metering	20
Booster Pump	25
Generator	25-35
Transfer Switch	25
Heating and Ventilation Equipment	30
Doors and Windows	30
Control valve	30
Reservoir Tank	40
Process Piping	50
General Electrical	50
General Plumbing	50
Fire Pump	50
Exterior Walls	75
Reservoir Concrete	75
Elevated Tank Structure	100
Roof Construction	100
Concrete Foundations	100
Miscellaneous Site Works	100

4.2 **Condition** – Water

4.1.1.1 Linear Water Assets

Condition of the linear water network was determined through a deterioration model, which estimates an asset condition based on the age and construction material of the segment. A summary of the average condition of watermain assets, weighted by length of pipe, is included in Table 34. The condition is reported on a scale of 0 to 100, where 100 represents an asset in perfect condition. The average condition score of all linear watermain assets (by length) is 94 or Very Good.

Table 34: **Average Condition of** Watermain Assets

Pipe Material	Total Length (m)	Average Condition Score	Average Condition Rating
Cast Iron	980	53	2.1%
Ductile Iron	2,507	61	5.5%
PVC	41,683	97	91.5%
PEX	391	96	0.9%

4.2.1.2 Water Facility Assets

Comprehensive existing condition scores of the Township's water facility assets is not currently available. It is recommended that a condition rating system be developed of all components of each facility and incorporated into the next update of the AMP.

4.3 Current Levels of Service – Water

Levels of service for water assets are outlined in Table 1 of the regulation, O.Reg. 588/17. Table 35 and Table 36 outline the Township's current community and technical levels of service for water assets.

Table 35: Community Levels of Service – Water

Service **Attribute**	Community Levels of Service **(Qualitative Description)**	Community LOS
Scope	Description, which may include maps, of the user groups or areas of the Municipality that are connected to the municipal water system.	The water distribution system provides water service to properties across the Township. The extents of the network are shown in Appendix A.
	Description, which may include maps, of the user groups or areas of the Municipality that have fire flow.	Fire flow is only available within the communities of Lucan and Granton. The trunk distribution watermain between Lucan and Granton and 100 mm diameter watermain are not designed to provide fire flow.
Reliability	Description of boil water advisories and service interruptions.	The Township does not have any documented boil water advisories in 2020 or 2021. There were two water main service leaks and one valve leak in 2020, and two water service leaks in 2021.

Table 36: Technical Levels of Service – Water

Service **Attribute**	Technical Levels of Service (Technical Metrics)	Technical LOS
Scope	Percentage of properties connected to the municipal water system.	The percentage of properties within the Township with connection to the municipal water distribution system is 70%. This is based on 1,530 metered customers in the Township. In addition, the community of Clandeboye is connected to the Municipality of North Middlesex water distribution system.

Service **Attribute**	Technical Levels of Service (Technical Metrics)	Technical LOS
	Percentage of properties where fire flow is available.	The 95% of properties within the communities of Lucan and Granton where water service is provided have fire flow is available.
Reliability	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.	There were no documented boil water advisories in 2020-2021.
	The number of connection-days per year due to water main breaks compared to the total number of properties connected to the municipal water system.	There were zero water main breaks in 2020 and 2021. There were two service leaks and one valve leak in 2020. There were two service leaks in 2021.

4.4 Current Performance – Water

Asset performance measures were determined in consultation with the Township, which provide relevant metrics against which the Township can gauge the performance of their assets. The performance measures for the water network, and their current values are shown in Table 37.

Table 37: Performance Measures – Water

Asset Performance Measure	Current Value
Number of annual non-compliances of the Ontario Drinking-Water System Regulations and Safe Water Drinking Act	There were 3 non-compliances in 2020 and 1 non-compliance in 2021.
Cost efficiency (operating cost to provide service – $/household for water services)	Average operating cost for water for 2020 and 2021 was $416 per household connected for water service.
Number of watermain breaks and repair time	There were zero watermain breaks in 2020 and 2021.
Service interruptions (duration and number of users impacted)	Not currently tracked, but recommended to be tracked in the future.

4.5 Risk Assessment – Water

The risk ratings for the distribution network included watermains and related facilities, following the risk methodology and approach, presented in Section 1.5. The risk profile for linear water assets is shown in Figure 7 and for water facilities in Figure 8.

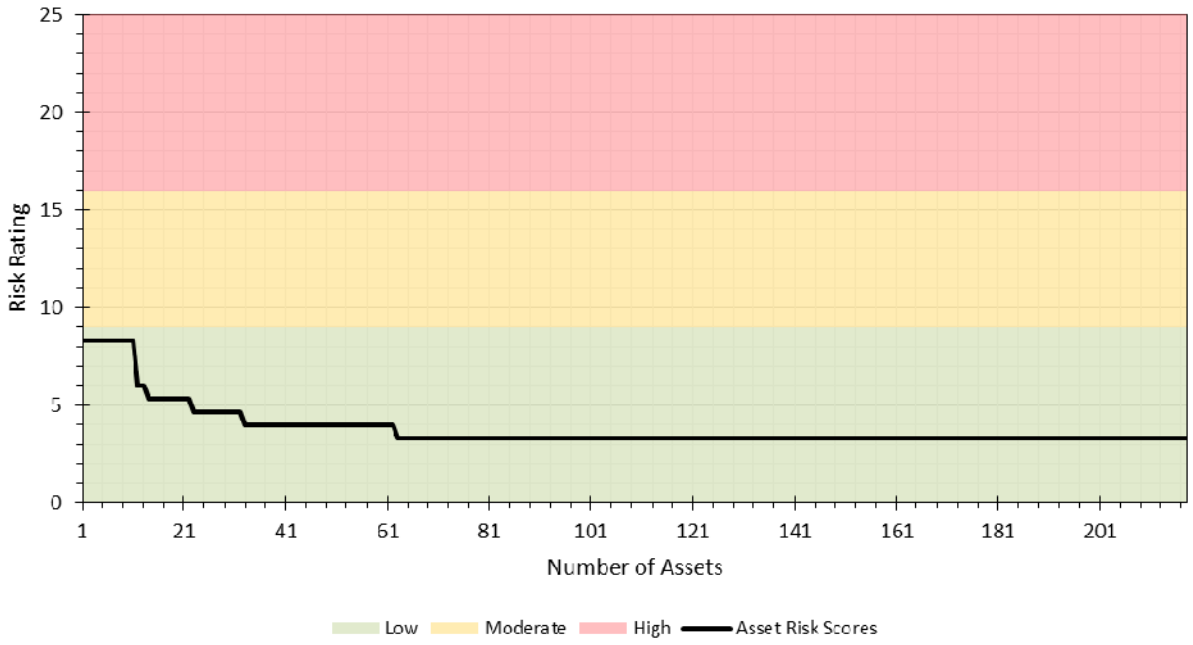


Figure 7: Water (Linear) Risk Profile

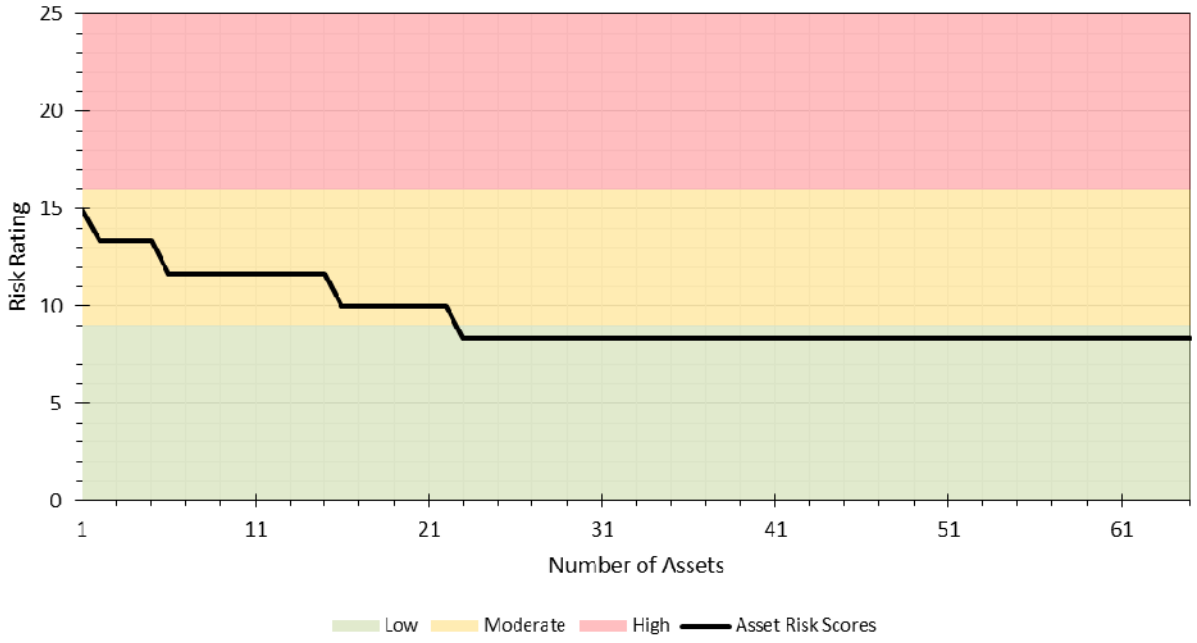


Figure 8: Water (Facility) Risk Profile

4.5.1 Importance

Importance of water distribution mains and facilities was determined in consultation with Township staff. An importance ranking criteria was applied to all water assets as described in Table 38.

Table 38: **Importance Ratings** – Water

Importance Rating	Description
High (3)	• Lucan Booster Pumping Station • Granton Booster Pumping Station and Reservoir • Lucan Elevated Water Tower • Trunk watermain between Lake Huron Primary Water Supply connection point and Lucan Elevated Water Tower • Trunk watermain between Lucan and Granton • Trunk watermain along Community Drive between Main Street and William Street
Moderate (2)	• Distribution watermains 250 mm in diameter or larger
Low (1)	• Distribution watermains less than 250 mm in diameter

4.6 Lifecycle Activities – Water

The following section describes the lifecycle activities that can be implemented within the asset management strategy for water assets. The water assets includes linear and vertical assets, lifecycle activities for each presented separately. The lifecycle activities for water assets include construction, maintenance, renewal, and decommissioning/ disposal.

4.6.1 Linear Water Assets

Construction Activities

Construction of new assets is recommended to be in line with recommendations as part of growth, master plan, or other municipal strategies. The design of the new assets should be consistent with jurisdictional design requirements, including provincial design guidelines and local requirements. New construction of assets will occur where no previous water servicing is available. The risk associated with new construction includes the high cost of brand new assets relative to ability to recoup costs through user rates or development charges.

Construction can also be the replacement of deteriorated assets. At the end of the useful life of an asset, it can be replaced for continuation of service provision. At the time of replacement, design should be undertaken to ensure design requirements are met, and adequate capacity is provided for current and growth usage projections.

Maintenance Activities

Maintenance activities are undertaken on the assets throughout their useful life to maintain their operating condition and performance. Maintenance works includes routine maintenance (flushing, cleaning), and minor repairs to assets (localized pipe repair, appurtenance repair). There exists the risk that a maintenance activity may be implemented that does not adequately mitigate a performance or condition issue, and additional costs are then required for further repair or replacement.

Renewal Activities

Renewal of the watermain assets can include pipe lining (structural, semi-structural or non-structural lining). A lining can be used where the condition has deteriorated, however structurally the pipe segment is still sound. A lining can extend the useful life of an asset and improve performance.

A renewal activity specific to ductile iron pipes is the implementation of cathodic protection. This can act to prevent corrosion of the watermain, prolonging the lifespan. Risks associated with these renewal activities include the improper installation of the renewal works, or continued/advanced deterioration of the original watermain such that the renewal works do not perform as expected.

Operating Activities

Operating activities for the watermain assets include those activities that do not directly deal with the physical state of the watermains, but work to extend the asset's useful life. The operating activities can include non-infrastructure policies, and monitoring/ inspection of the assets. Condition assessment of watermain pipes is challenging to achieve. It is recommended that reactive maintenance works (watermain repairs, etc.) be reviewed and tracked such that they can provide additional information to the Township regarding condition of the pipe segments (beyond the theoretical condition determined through age of pipe and deterioration rate). Operating activities can be used throughout the useful life of an asset.

Decommissioning

Decommissioning of the watermain assets includes abandonment or replacement of the asset at the end of its useful life. Removal of the expended asset can provide additional space for new underground assets to be constructed within a right-of-way.

4.6.2 Water Facility Assets

The lifecycle activities for the water facility assets will be generally consistent with those expected for general municipal buildings, which includes:

Construction

Beginning of an asset's lifecycle. To be constructed to adhere to applicable standards and codes.

Maintenance

Types of maintenance include preventative, reactive and major maintenance. These activities are to be done on a routine basis to retain good condition and performance of the assets, and in response to issue or fault in a component or building asset. Maintenance activities will be undertake throughout the lifecycle of the asset.

Renewal

Addition to or update of existing building component(s) to achieve modernization, compliance with updated codes and requirements, and/or to suit changes to services provided.

Decommissioning/Disposal

Removal from service of a building asset or component. Disposal can be through decommissioning or sale. Activities should comply with applicable health, safety and environmental protocols.

As the water building assets are specialized for treatment and distribution services, there are additional factors that must be considered:

- Water treatment and distribution facilities are highly regulated. Any and all lifecycle activities undertaken must be done in compliance with codes and regulations.
- Expansion of existing facilities may be required for additional water treatment and distribution capacity as a result of growth. Expansion activities may encompass multiple lifecycle stages, such as construction for additional infrastructure required, and renewal for expansion of existing infrastructure such as the treatment facility.

4.7 Asset Management Strategy – Water

4.7.1 Linear Water Assets

The asset management strategy for the water assets in the Township will employ the lifecycle activities to maximize the useful life and economy of each asset.

The primary indicator used in the development of a lifecycle strategy is the condition of each asset, however the strategy should also consider other factors, such as:

- Importance of the asset;
- Asset risk score;
- Condition of adjacent sections;
- Replacement requirements for adjacent infrastructure (sanitary, storm or roadworks);
- Expansion requirements; and
- Maintenance frequency and type.

As the Township continues to age and develop, these factors will continue to change, and each have an impact on the lifecycle of an asset. Consideration of these factors should be given when devising capital project outlooks and budgeting, and updating of the asset management plan.

The assets will deteriorate on a non-linear basis, and the various lifecycle activities can be implemented at varying stages within an assets deterioration. Figure 9 provides a visualization of the theoretical deterioration curve for an asset, and the opportunity windows to conduct lifecycle activities within the expected useful life of an asset.

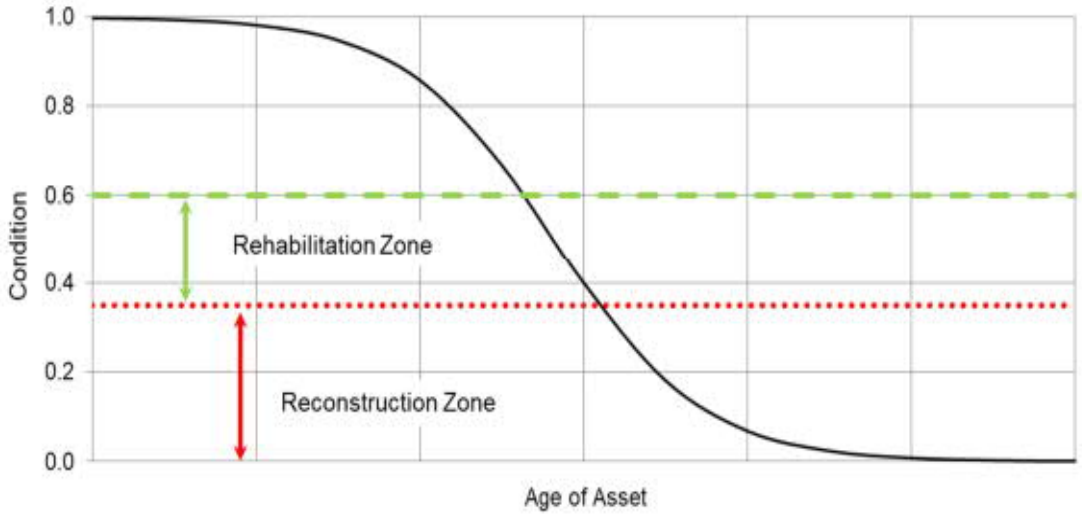


Figure 9: **Deterioration of Assets and Lifecycle Activity Opportunities**

The condition of an asset, a major factor in the asset management strategy, should be established to assist in decision making. Due to the difficulty in undertaking visual inspection of a watermain, the Township should monitor the expected condition of the pipes, based on the age and tracking of maintenance activities completed for each segment.

When the condition of the asset has degraded such that an intervention is required, it is recommended that maintenance be reviewed as the first opportunity to extend the useful life. Maintenance works can include localized repair work, or relining of a pipe segment. Because of the non-intrusive nature of conducting relining, it can be done on an individual pipe segment at a time, or to localized repairs. When the condition of the asset has degraded such that maintenance is no longer an appropriate activity, the segment can and should be reconstructed. The Township should follow best practices and local design guidelines when designing the reconstruction works. Assets at the end of their useful life should be abandoned in place or removed.

A summary of the watermain condition and associated lifecycle activity is provided in Table 39.

Table 39: **Average Condition of** Linear Watermain Assets

Condition Range	Lifecycle Activity Category	Lifecycle Activity
1.0 to 0.60	Maintenance	Maintenance Works (cleaning, flushing) Small pipe section repairs
0.60 to 0.35	Rehabilitation	Localized repairs Structural relining
0.35 to 0	Reconstruction	Pipe replacement or abandonment

Current best practices suggest that that reconstruction and new construction works on the assets will be done using PVC material for all pipe diameters.

The current level of service being provided in water service delivery is generally a high average condition of the assets (resulting in low service interruptions and boil water advisories), and treatment quality within the C of A limits. To maintain these LOS values, the Township's strategy should continue to maintain a very good condition of the linear assets.

4.7.2 Water Facility Assets

The asset management strategy for water facility assets seeks to maximize the useful life and economy of each asset, using the lifecycle activities.

The primary drivers of lifecycle activities for these assets is the condition and service delivery requirements. The Township's water facility assets are complex, the componentry for which are expected to have differing rates of degradation and expected useful lives. As such, lifecycle activities will be required to be implemented at varied frequency and timelines.

The expected useful life of the asset components should be used to approximate the timing and frequency of lifecycle activities, however this should be refined by undertaking detailed condition assessment of the buildings for an understanding of the actual condition of the assets.

A maintenance schedule and forecast of asset improvements should be based on this detailed review, which should be updated at a frequency suitable to the Township, suggested to be every five years. If it is not possible to complete the condition assessment of all buildings in the near term, priority buildings for the condition assessment program are suggested to be identified by the presented risk assessment, condition and performance measures. Buildings with high risk or poor condition/performance components should be prioritized in the condition assessment program.

In preparing a building condition assessment program, the Township may engage staff or third-party consultant for assessment. The approach should consider the capabilities of the intended assessor, and

level of detail required. A hybrid approach can be utilized that engages a consultant for assessment of critical assets or more objective data collection.

Routine maintenance schedules are assumed to be in place currently, and are recommended to continue assuming that they are currently providing sufficient level of maintenance.

Management of facility assets should also include climate change considerations, in new construction, maintenance or renewal lifecycle activities. Assessment should be undertaken to understand vulnerability of building assets to a changing climate, which will inform lifecycle activity requirements, and potential changes to the way lifecycle activities are undertaken.
Works should also be undertaken as required to maintain the treatment efficiency and capacity to meet regulations and user requirements.

The current level of service being provided in water service delivery is generally a high average condition of the assets (resulting in low service interruptions and boil water advisories), and treatment quality within the C of A limits. To maintain these LOS values, the Township's strategy should continue to maintain the condition of the water building assets, and provide upgrades and replacements according to projections to retain quality and quantity of treatment capacity.

4.7.3 Scenario Analysis

4.7.3.1 Linear Water Assets

To understand the needs and projected works on the water assets within a 10 year outlook, replacement activities were reviewed under varying budget values to understand the impact on overall asset condition. The budgets analyzed include:

1. Unlimited budget – To determine backlog of works;
2. No budget – To understand the changes in average network condition with no investment;
3. Maintain average current condition index for linear assets at end of 10 year timeframe.

A summary of the analysis is outlined in Table 40 below.

Table 40: **Budgets Reviewed for Water Asset Projections**

	Budget Scenario	Annual Value	Average Annual Investment Over Timeframe	Total Investment Over Timeframe	Average Condition Index (2032)
1	Unlimited	Unlimited	$402,697	$4,026,974	0.91
2	No Budget	$ -	$ -	$ -	0.86
3	Maintain current average condition		$402,697	$4,026,974	0.91

Best practice recommends maintaining an average condition index of 0.6 across the system. Note that the overall condition of the assets is such that through all scenarios, including the 'no budget' scenario with zero annual spending, after the 10 year timeframe the average condition would be within the acceptable range, however some assets would degrade over time.

4.7.3.2 Water Facility Assets

In the absence of a recommended replacement schedule based on a detailed engineering condition assessment, a best practice of capital investment is an average annual investment of 2% of the estimated replacement value. It is recommended that the Township continue to use this standard practice for future capital investment planning in the short term. It is recommended that a program for regular condition inspections by professional service providers be implemented to provide additional detail and guide the planned capital investment into building asset investment.

5.0 Wastewater

5.1 State of Local Infrastructure – Wastewater

The Township owns and operates a wastewater collection and treatment system, containing linear mains and appurtenances, and facilities for wastewater treatment and collection. A summary of the quantity of assets within the network is provided in Table 41.

Table 41: Wastewater Asset Inventory Summary

Water Asset	Quantity	Unit of Measure
Sanitary sewer (gravity)	21,688	Length (m)
Sanitary forcemain	4,254	Length (m)
Maintenance Holes	320	Each
Wastewater Treatment Plant	2	Each
Sanitary Pumping Station	3	Each
Lagoons	1	Each

The analysis within this report will be limited to the linear assets. This is predicated on the assumption that appurtenances included in the system are required componentry that will be replaced in conjunction with the linear components, and are expected to have similar lifespans and conditions as the linear components.

5.1.1 Linear Wastewater Assets

The material types of the existing sanitary gravity sewers and forcemain construction are summarized in Table 42.

Table 42: Material Types of Sanitary Mains

Material Type	Diameter Size Range (mm)	Total Length (m)	Percentage of System
Asbestos cement	200-375	10,297	40%
PVC	50-375	15,644	60%

5.1.1.1 Replacement Costs

Replacement costs for the linear water network were determined based on recent tender information and product information. The replacement costs include costs necessary for full reconstruction of a segment, including trench and surface restoration. It is assumed that reconstruction works will be done using PVC piping for pipes that are 400 mm in diameter or less, and concrete piping for sizes larger than 400 mm diameter. The reconstruction costs are shown in Table 43.

Table 43: Linear Wastewater Asset Replacement Costs

Pipe Material	Diameter	Replacement Costs ($/m)
PVC	< 250 mm	$1,950/m
PVC	250 mm – 400 mm	$3,200/m
Concrete	Over 400 mm	$4,200/m

Using the units costs provided in Table 43, the total replacement costs for the linear wastewater network is estimated to be $56,238,000.

5.1.1.2 Average Age

The average age of the linear wastewater assets was calculated by pipe material, weighted by length of asset. The average age is summarized in Table 44.

Table 44: Average Age of Linear Water Assets by Pipe Material

Pipe Material	Average Age (years)
Asbestos cement	53
PVC	14

5.1.1.3 Expected Useful Life

The expected useful life of the linear water assets is used to estimate the replacement schedule as summarized in Table 45.

Table 45: Expected Useful Life of Linear Wastewater Assets by Pipe Material

Pipe Material	Average Age (years)
Asbestos cement	60
PVC	75

As data continues to be available regarding useful life of the sanitary sewer construction materials, these values can be reviewed and updated as appropriate.

5.1.2 Wastewater Facility Assets

In addition to the linear wastewater assets, the Township's wastewater network also includes facility assets that provide transmission and treatment services. These facility assets are complex and include multiple components, including electrical, mechanical, structural, instrumentation and control, process, civil and architectural. The wastewater facilities include:

1. Lucan Wastewater Treatment Plant
2. Chestnut Sanitary Pumping Station
3. Granton Wastewater Treatment Plant
4. Granton Sanitary Pumping Station
5. Joseph Sanitary Pumping Station

5.1.2.1 Replacement Costs

Replacement costs for the wastewater facility assets have been estimated based on a review of the individual components of each facility. The total replacement costs of each facility is summarized in Table 46.

Table 46: Wastewater Facility Asset Replacement Costs

Wastewater Facility Asset	Estimated Replacement Cost
Lucan Wastewater Treatment Plant	$9,856,000
Chestnut Sanitary Pumping Station	$2,288,000
Granton Wastewater Treatment Plant	$1,541,000
Granton Sanitary Pumping Station	$123,000
Joseph Sanitary Pumping Station	$454,000
Total	$14,262,000

5.1.2.2 Average Age

The average age for each wasterwater facility asset was also determined based on an average age of all components. Table 47 summarizes the average age for wastewater facility assets.

Table 47: Wastewater Facility Asset Replacement Costs

Wastewater Facility Asset	Average Age of Components (years)
Lucan Wastewater Treatment Plant	27
Chestnut Sanitary Pumping Station	30
Granton Wastewater Treatment Plant	22
Granton Sanitary Pumping Station	22
Joseph Sanitary Pumping Station	20
Overall Average Age	27

5.1.2.3 Expected Useful Life

As part of the review of the various components of the wastewater facility assets, expected useful lives were estimated by type of component, as outlined in Table 48.

Table 48: Expected Useful Life of Water Facility Components

Water Facility Component Type	Expected Useful Life (years)
Interior Finishes	10
SCADA	10
Metering Pumps and Valves	10
Instrumentation and Control Equipment	15
Return Activated Sludge Pump	15
Roof Covering	20
Flow Metering	20
Variable Frequency Drive	20
Submersible Pump	20-25
Booster Pump	25
Blower	25
Backwash Pump	25
Ultraviolet Equipment	25
Generator	25-35
Engineered Fabric Structure	35
Heating and Ventilation Equipment	30
Doors and Windows	30
Backwash Pump Filters	30
Aeration Equipment	40
Clarifier Equipment	40
Walkways and Platforms	40
Fire Pump	50
Process Piping	50
Maintenance Holes	50
Valves	50
General Electrical	50
General Plumbing	50
Exterior Walls	50-75
Sludge, Digester, Aeration and Clarifier Tanks	75
Concrete Pumping Station and Settlement Chamber	75
Roof construction	100
Concrete Foundations	100
Miscellaneous Site Works	100

5.2 Condition – Wastewater

Condition of the wastewater network was estimated based on CCTV inspection work that was completed in 2018. Any sewers that have been replaced since that time have been assigned an average condition score of 100 (very good) as of the year of install.

5.2.1.1 Linear Wastewater Assets

A summary of the average condition of wastewater assets, weighted by length of pipe, is included in Table 49. The condition is reported on a scale of 0 to 100, where 100 represents an asset in perfect condition. The average condition of all linear wastewater assets (by length) is 71 or Good.

Table 49: **Average Condition of** Linear Wastewater Assets

Pipe Material	Total Length (m)	Average Condition Score	Average Condition Rating
Asbestos cement	10,297	61	Fair
PVC	15,644	86	Very Good

5.2.1.2 Wastewater Facility Assets

Comprehensive existing condition scores of the Township's wastewater facility assets is not currently available. It is recommended that a condition rating system be developed of all components of each facility and incorporated into the next update of the AMP.

5.3 Current Levels of Service – Wastewater

Levels of service for wastewater assets are outlined in Table 2 of the regulation, O.Reg. 588/17. Table 50 and Table 53 outline the Township's current community and technical levels of service for wastewater assets.

Table 50: Community Levels of Service – Wastewater

Service **Attribute**	Community Levels of Service **(Qualitative Description)**	Community LOS
Scope	Description, which may include maps, of the user groups or areas of the Municipality that are connected to the municipal wastewater system.	The Township provides wastewater collection and treatment services for properties, primarily located in the urban. A map showing the areas connected to the wastewater system is in Appendix A.
Reliability	Description of how combined sewers in the municipal wastewater system are designed with overflow structures in place which allow overflow during storm events to prevent backups into homes.	The Township's wastewater system does not include any combined sewer segments.

Service **Attribute**	Community Levels of Service **(Qualitative Description)**	Community LOS
Reliability	Description of the frequency and volume of overflows in combined sewers in the municipal wastewater system that occur in habitable areas or beaches.	The Township's wastewater system does not include any combined sewer segments.
Reliability	Description of how stormwater can get into sanitary sewers in the municipal wastewater system, causing sewage to overflow into streets or backup into homes.	Stormwater has the potential to enter into the municipal wastewater system through multiple points of entry, including: • Direct connections from properties, including roof leaders, sump pumps, etc. • Inflow and infiltration within manholes and damaged pipes and joints
Reliability	Description of how sanitary sewers in the municipal wastewater system are designed to be resilient to avoid events described above.	Resiliency in the sanitary sewer system, in the event that inflow of stormwater occurs, is created through: • Prohibition of discharging of stormwater into the wastewater system • Designing wastewater infrastructure to provide minimum sizing and criteria as per current standards
Reliability	Description of the effluent that is discharged from sewage treatment plants in the municipal wastewater system.	The Township reports annually on performance of the wastewater treatment system, including description of the effluent discharged from the sewage treatment plants. Table 51 describes the volume of effluent flow from 2020-2021, as noted within the 'OWCA Annual Reports' for 2020 and 2021. The quality parameters of the effluent are also tracked, and are summarized in Table 52. The source of the table is from the OWCA Annual Reports for 2020 and 2021.

Table 51: Annual E**ffl**uent Flow 2020-2021

Year	Annual E**ffl**uent Flow (m^3)	
	Lucan Wastewater Treatment Plant	Granton Wastewater Treatment Plan
2020	371,403	37,595
2021	399,275	28,682

Table 52: Wastewater Effluent Quality

	Lucan Wastewater Treatment Plan			Granton Wastewater Treatment Plant		
Effluent Parameter	Monthly Average Results Range	ECA Concentration Objectives	Number of Objective Exceedances	Monthly Average Results Range	ECA Concentration Objectives	Number of Objective Exceedances
CBOD5 (mg/L)	< 2.0 - 3.3	10	0	< 2.0 - 6.60	5.0	1
Total Suspended Solids (mg/L)	3.5 – 7.6	10	0	7.6 – 18.4	5.0	12
Total Phosphorus (mg/L)	0.13 - 0.26	0.32	0	0.05 – 0.20	0.2 (May - Nov) 0.5 (Dec – April)	0
E. coli	5.0 – 31.69 cfu /100mL	100 cfu / mL	0	1.4 – 32.14 cfu /100mL	150 E. Coli / mL	0
Total Ammonia Nitrogen (mg/L)	< 0.1 – 0.87	1.3 – 2.6	0	< 0.1 – 0.15 mg/L	2.0 (May - Nov) 4.0 (Dec – April)	0
Dissolved Oxygen (single sample)	6.32 -10 mg/L	> 5.0 mg/L	0	6.32 -10 mg/L	> 5.0 mg/L	0
pH	6.3 -7.81	6.0 – 8.5	0	6.17 – 7.97	6.5 – 8.5	5

Table 53: Technical Levels of Service – Wastewater

Service **Attribute**	Technical Levels of Service (Technical Metrics)	Technical LOS
Scope	Percentage of properties connected to the municipal wastewater system.	The percentage of properties in the Township with connection to the wastewater system is 71%.
Reliability	The number of events per year where combined sewer flow in the municipal wastewater system exceeds system capacity compared to the total number of properties connected to the municipal wastewater system.	The Township does not have a combined sewer system.
	The number of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system.	The Township received 2 complaints of sewer backups or blockages in 2020-2021 out of 1,300 total properties which are connected to the municipal wastewater system (equivalent to 1 connection-day per year).

Service **Attribute**	Technical Levels of Service (Technical Metrics)	Technical LOS
	The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system.	There are 1,300 total properties connected to the municipal wastewater system. At the Lucan Wastewater Treatment Plant, there were no effluent limit exceedances for 2020 or 2021. At the Granton Wastewater Treatment Plant, the final effluent limits were met for all parameters in 2020 except for Total Suspended Solids in the month of January. In 2021, there were ongoing compliance issues with Total Suspended Solids.

5.4 Current Performance – Wastewater

Asset performance measures were determined in consultation with the Township, which provide relevant metrics against which the Township can gauge the performance of their assets. The performance measures for the wastewater network, and their current values are shown in Table 54.

Table 54: Performance Measures – Wastewater

Asset Performance Measure	Current Value
Cost efficiency (operating cost to provide service – $/household for wastewater services)	Average operating cost for wastewater for 2020 and 2021 was $492 per household connected for wastewater services.
Number of customers that have experienced a service interruption in the last year	1 customer experienced a service disruption in 2021. This is equivalent to <1% of the total number of households connected to wastewater services.
Average daily flow as percentage of wastewater treatment plants' rated capacity	• Lucan Wastewater Treatment Plant 2020-2021 average daily flow was 64.9% of the rated capacity of 1,700 m^3/day. • Granton Wastewater Treatment Plant 2020-2021 average daily flow was 34.1% of the rated capacity of 270 m^3/day.

5.5 Risk Assessment – Wastewater

The risk ratings for the distribution network included sanitary gravity sewers, forcemains and related facilities, following the risk methodology and approach, presented in Section 1.5. The risk profile for linear sanitary sewers is shown in Figure 10 and for wastewater facilities in Figure 11.

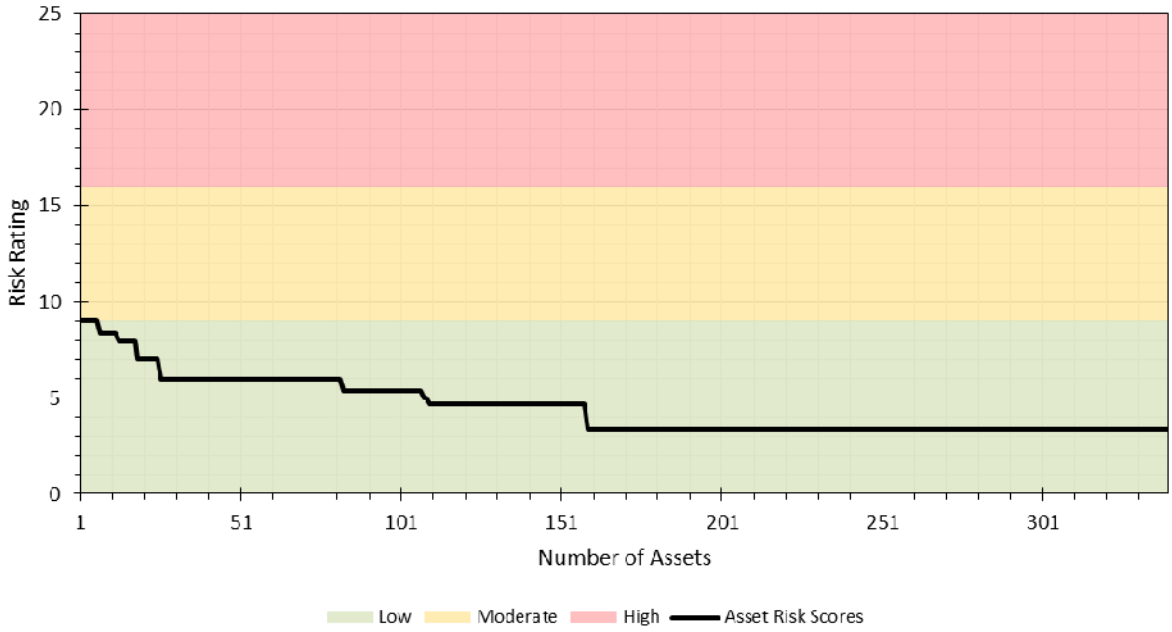


Figure 10: Wastewater – Linear Risk Profile

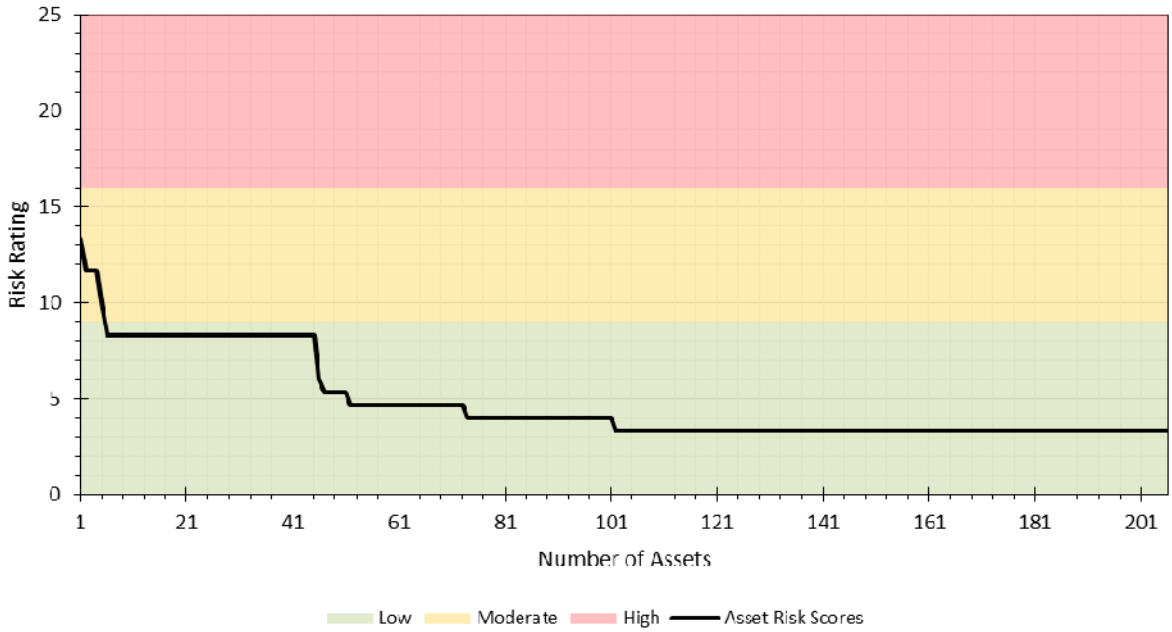


Figure 11: Wastewater – Facility Risk Profile

5.5.1 Importance

Importance of wastewater collection system and facilities was determined in consultation with Township staff. An importance ranking criteria was applied to all wastewater assets as described in Table 55.

Table 55: **Importance Ratings** – Wastewater

Importance Rating	Description
High (3)	• Lucan Wastewater Treatment Plant • Granton Wastewater Treatment Plant • Chestnut Sanitary Pumping Station and forcemain • Granton Sanitary Pumping Station and forcemain
Moderate (2)	• Sanitary sewers 250 mm in diameter or larger • Joseph Sanitary Pumping Station
Low (1)	• Sanitary sewers less than 250 mm in diameter

5.6 **Lifecycle Activities** – Wastewater

The following section describes the lifecycle activities that can be implemented within the asset management strategy for wastewater assets. The wastewater assets includes linear and vertical assets, lifecycle activities for each presented separately. The lifecycle activities for wastewater assets include construction, maintenance, renewal, and decommissioning/ disposal.

5.6.1 Linear Wastewater Assets

In the lifecycle of a linear wastewater asset, there are multiple activities that can be taken, depending on the asset attributes. The expected lifecycle activities recommended to be used are as follows.

Construction Activities

Construction of new assets is recommended to be in line with recommendations as part of growth, master plan, or other municipal strategies. The design of the new assets should be consistent with jurisdictional design requirements, including provincial design guidelines and local requirements. New construction of assets will occur where no previous sanitary servicing is available. The risk associated with new construction includes the high cost of brand new assets relative to ability to recoup costs through user rates or development charges.

Construction can also be the replacement of deteriorated assets. At the end of the useful life of an asset, it can be replaced for continuation of service provision. At the time of replacement, design should be undertaken to ensure design requirements are met, and adequate capacity is provided for current and future requirements.

Maintenance Activities

Maintenance activities are undertaken on the assets throughout their useful life to maintain their operating condition and performance. Maintenance works includes routine maintenance (flushing, cleaning), and minor repairs to assets. There exists the risk that a maintenance activity may be implemented that does not adequately mitigate a performance or condition issue, and additional costs are then required for further repair or replacement.

Renewal Activities

Renewal of the sanitary sewer assets can include structural or non-structural lining. A lining can be used where the condition has deteriorated, however structurally the pipe segment is still sound. A lining can extend the useful life of an asset and improve performance. Risks associated with lining of a pipe include the improper installation of the pipe or continued deterioration of the original pipe such that the lining does not perform as expected.

Operating and Decommissioning Activities

Operating activities for the wastewater network include those activities that do not directly deal with the physical state of the pipe, but work to extend the assets useful life. The operating activities can include non-infrastructure policies, and monitoring/inspection of the assets. The inspection of sanitary sewer assets can be undertaken through a condition assessment program, recommended to be visual inspection through CCTV or zoom camera means. Usage of the zoom camera technology has the risk of insufficient visual detail to make appropriate activity decisions.

Decommissioning activities of the wastewater assets includes abandonment or replacement of the asset at the end of its useful life. While typically assets are abandoned in place, the removal of the expended asset can provide additional space for new underground assets to be constructed.

5.6.2 Wastewater Building Assets

The lifecycle activities for the vertical (building) assets will be generally consistent with those expected for buildings, including:

Construction

Beginning of an asset's lifecycle. To be constructed to adhere to applicable standards and codes.

Maintenance

Types of maintenance include preventative, reactive and major maintenance. These activities are to be done on a routine basis to retain good condition and performance of the assets, and in response to issue or fault in a component or building asset. Maintenance activities will be undertake throughout the lifecycle of the asset.

Renewal

Addition to or update of existing building component(s) to achieve modernization, compliance with updated codes and requirements, and/or to suit changes to services provided.

Decommissioning/Disposal

Removal from service of a facility asset or component. Disposal can be through decommissioning or sale. Activities should comply with applicable health, safety and environmental protocols.

As the wastewater facility assets are specialized for treatment and collection services, there are additional factors that must be considered:

- Wastewater treatment and collection facilities are highly regulated. Any and all lifecycle activities undertaken must be done in compliance with codes and regulations.
- Expansion of existing facilities may be required for additional wastewater treatment and collection capacity as a result of growth. Expansion activities may encompass multiple lifecycle stages, such as construction for additional infrastructure required, and renewal for expansion of existing infrastructure such as the treatment facility.

5.7 Asset Management Strategy – Wastewater

5.7.1 Linear Wastewater Assets

The asset management strategy for the wastewater assets in the Township will employ the lifecycle activities to maximize the useful life and economy of each asset.

The primary indicator used in the development of a lifecycle strategy is the condition of each asset, however the strategy should also consider other factors, such as:

- Importance of the asset;
- Asset risk score;
- Condition of adjacent sections;
- Replacement requirements for adjacent infrastructure (sanitary, storm or roadworks);
- Expansion requirements; and
- Maintenance frequency and type.

As the Township continues to age and develop, these factors will continue to change, and each have an impact on the lifecycle of an asset. Consideration of these factors should be given when devising capital project outlooks and budgeting, and updating of the asset management plan.

The assets will deteriorate on a non-linear basis, and the various lifecycle activities can be implemented at varying stages within an assets deterioration. As previously shown, Figure 9 provides a visualization of the theoretical deterioration curve for an asset, and the opportunity windows to conduct lifecycle activities within the expected useful life of an asset.

The condition of an asset, a major factor in the asset management strategy, should be established to assist in decision making. The Township should establish/maintain a condition assessment program for the sanitary sewers. The recommendation is to use visual inspection facilitated by CCTV or Zoom camera

inspection. A typical practice is to undertake assessment of 1/5 to 1/3 of the network annually, such that each pipe gets reviewed in a rotating 3 to 5 year basis.

When the condition of the asset has degraded such that an intervention is required, it is recommended that maintenance be reviewed as the first opportunity to extend the useful life. Maintenance works can include localized repair work, or relining of a pipe segment. Because of the non-intrusive nature of conducting relining, it can be done on an individual pipe segment at a time, or to localized repairs.

When the condition of the asset has degraded such that maintenance is no longer an appropriate activity, the segment can and should be reconstructed. The Township should follow best practices and local design guidelines when designing the reconstruction works. Assets at the end of their useful life should be abandoned in place or removed.

A summary of the wastewater linear asset condition and associated lifecycle activity is provided in Table 56.

Table 56: **Average Condition of** Linear Wastewater Assets

Condition Range	Lifecycle Activity Category	Lifecycle Activity
1.0 to 0.60	Maintenance	Maintenance Works (cleaning, flushing) Manitenance hole repairs Small pipe section repairs
0.60 to 0.35	Rehabilitation	Localized repairs Structural relining
0.35 to 0	Reconstruction	Pipe replacement or abandonment

Current best practices suggest that that reconstruction and new construction works on the assets will be done using PVC material for pipes that are 400 mm in diameter or less, and concrete material for sizes larger than 400 mm diameter.

The current level of service being provided in wastewater service delivery is generally a high average condition of the assets (resulting in low quantity of complaints or issues), and treatment quality within the C of A limits. To maintain these LOS values, the Township's strategy should continue to maintain a very good condition of the linear assets.

5.7.2 Wastewater Facility Assets

The asset management strategy for wastewater facility assets seeks to maximize the useful life and economy of each asset, using the lifecycle activities.
The primary drivers of lifecycle activities for these assets is the condition and service delivery requirements. The Township's wastewater facility assets are complex, the componentry for which are

expected to have differing rates of degradation and expected useful lives. As such, lifecycle activities will be required to be implemented at varied frequency and timelines.

The expected useful life of the asset components should be used to approximate the timing and frequency of lifecycle activities, however this should be refined by undertaking detailed condition assessment of the buildings at regular intervals for an understanding of the actual condition of the assets. A maintenance schedule and forecast of asset improvements should be based on this detailed review, which should be updated at a frequency suitable to the Township, suggested to be every five years.

If it is not possible to complete the condition assessment of all buildings in the near term, priority buildings for the condition assessment program are suggested to be identified by the presented risk assessment, condition and performance measures. Buildings with high risk or poor condition/performance components should be prioritized in the condition assessment program.

Routine maintenance schedules are assumed to be in place currently, and are recommended to continue assuming that they are currently providing sufficient level of maintenance.

Management of building assets should also include climate change considerations, in new construction, maintenance or renewal lifecycle activities. Assessment should be undertaken to understand vulnerability of building assets to a changing climate, which will inform lifecycle activity requirements, and potential changes to the way lifecycle activities are undertaken.

Works should also be undertaken as required to maintain the treatment efficiency and capacity to meet regulations and user requirements.

The current level of service being provided in wastewater service delivery is generally a high average condition of the assets (resulting in low quantity of complaints or issues), and treatment quality within the C of A limits. To maintain these LOS values, the Township's strategy should continue to maintain the condition of the wastewater building assets, and provide upgrades and replacements according to projections to retain quality and quantity of treatment capacity. Scenario Analysis

5.7.3 Scenario Analysis

5.7.3.1 Linear Wastewater Assets

To understand the needs and projected works on the linear wastewater assets within a 10-year outlook, replacement activities were reviewed under varying budget values to understand the impact on overall asset condition. The budgets analyzed include:

1. Unlimited budget – To determine backlog of works;
2. No budget – To understand the changes in average network condition with no investment;
3. Maintain average current condition index for linear assets at end of timeframe.

A summary of the analysis is outlined in Table 57 below.

Table 57: **Budgets Reviewed for Wastewater Asset Projections**

	Budget Scenario	Annual Value	Average Annual Investment Over Timeframe	Total Investment Over Timeframe	Average Condition Index (2032)
1	Unlimited	Unlimited	$2,139,750	$21,397,503	0.98
2	No Budget	$ -	$ -	$ -	0.63
3	Maintain average current condition	$400,000	$390,994	$3,909,942	0.71

Best practice recommends maintaining an average condition index of 0.6 across the system. Note that the overall condition of the assets is such that through all scenarios, including the 'no budget' scenario with zero annual spending, after the 20 year timeframe the average condition would be within the acceptable range, however some assets would likely degrade to failure.

5.7.3.2 Wastewater Facility Assets

Based on recent analysis and study completed, it is understood that the Lucan Wastewater Treatment Plant and Chestnut Street Sanitary Pumping Station requires significant upgrades to both continue to service the existing users, but also an expansion to accommodate future growth. The estimated costs associated with the upgrades required to service the existing users is $3,900,000. The expansion component would be funded through development charges.

In the absence of recommended replacement schedule based on a detailed engineering condition assessment for the Granton Wastewater Treatment Plant and Pumping Station, a best practice of capital investment is an average annual investment of 2% of the estimated replacement value. It is recommended that the Township continue to use this standard practice for future capital investment planning in the short term. It is recommended that a program for regular condition inspections by professional service providers be implemented to provide additional detail and guide the planned capital investment into building asset investment.

6.0 Stormwater

6.1 State of Local Infrastructure – Stormwater

The Township owns and operates a stormwater network. The asset inventory includes linear pipes, appurtenances and stormwater management facilities. A summary of the quantity of assets within the network is provided in Table 58.

Table 58: Stormwater Asset Inventory Summary

Water Asset	Quantity	Unit of Measure
Storm Sewers	17,371	Length (m)
Maintenance Holes	200	Each
Catch Basins	468	Each
Stormwater Management Facilities	6	Each
Oil Grit Separators	2	Each

The analysis within this report will be limited to the linear assets. This is predicated on the assumption that appurtenances included in the system are required componentry that will be replaced in conjunction with the linear components, and are expected to have similar lifespans and conditions as the linear components.

6.1.1 Linear Stormwater Assets

The material types of the existing storm sewer construction are summarized in Table 59.

Table 59: Material Types of Storm Sewers

Material Type	Diameter Size Range (mm)	Total Length (m)	Percentage of System
Concrete	200-1200	11,941	68%
PVC	150-600	5,148	30%
Tile	100	189	1%
CSP	300	11	<1%
Asbestos cement	200	81	<1%

6.1.1.1 Replacement Costs

Replacement costs for the linear stormwater assets were determined based on recent tender information and product information. The replacement costs include costs necessary for full reconstruction of a segment, including trench and surface restoration. It is assumed that reconstruction works on the assets will be done using PVC material for pipes that are 400 mm in diameter or less, and concrete for sizes larger than 400 mm diameter. The reconstruction costs are shown in Table 60.

Table 60: Linear Stormwater Asset Replacement Costs

Diameter	Replacement Costs ($/m)
< 250 mm	$1,750/m
250 mm – 400 mm	$2,400/m
Over 400 mm	$3,600/m

Using the units costs provided in Table 60, the total replacement costs for the linear stormwater network is estimated to be $32,080,000.

6.1.1.2 Average Age

The average age of the linear stormwater assets water network was calculated by pipe material, weighted by length of asset. The average age is summarized in Table 61.

Table 61: Average Age of Linear Stormwater Assets by Pipe Material

Pipe Material	Average Age (years)
Concrete	31
PVC	11
Tile	11
CSP	16
Asbestos cement	52

6.1.1.3 Expected Useful Life

The expected useful life of the linear stormwater assets is used to estimate the replacement schedule as summarized in Table 62.

Table 62: Expected Useful Life of Linear Stormwater Assets by Pipe Material

Pipe Material	Average Age (years)
Concrete	85
PVC	75
Tile	25
CSP	25
Asbestos cement	70

6.1.2 Stormwater Facility Assets

There are six stormwater management facilities and two oil grit separators that are currently assumed by the Township. A further breakdown of these facilities and corresponding their catchment area is outlined in Table 63.

Table 63: Stormwater Facility Assets

Stormwater Facility Name	Catchment Area (ha)
Ridge Crossing SWM Wet Pond	21.5
Lucan Industrial SWM Wet Pond	11.7
Loyens SWM Wet Pond	6.54
Reliance SWM Wet Pond	6.24
Van Roestel SWM Wet Pond	5.93
Olde Clover SWM Wet Pond	21.0
Campanale Oil and Grit Separator	1.45
Saintsbury Oil and Grit Separator	10.09

6.1.2.1 Replacement Costs

The replacement cost of the six stormwater management facilities is estimated at $2,478,000. This is based on the assumption of a unit cost of $34,000 per hectare of drainage area, in reference to a unit cost provided in the City of Barrie's 2020 Stormwater Asset Management Plan inflated to 2022 Dollars assuming a 3% average annual inflation. The replacement costs of the two oil grit separators is estimated at $140,000 based on recent tender prices.

6.1.2.2 Average Age

The average age of the existing stormwater management facilities is estimated to be approximately 10 years old.

6.1.2.3 Expected Useful Life

The expected useful life of SWM facilities varies depending on the type of facility and the rate of sediment accumulation and the frequency of clean outs that are completed. According to Infrastructure Canada, the average expected useful life of stormwater management ponds is 74 years and other end-of-pipe facilities is 63 years.

6.2 **Condition** – Stormwater

6.2.1.1 Linear Stormwater Assets

Condition of the stormwater network was determined through a deterioration model, which estimates an asset condition based on the age and construction material of the segment.
A summary of the average condition of linear stormwater assets, weighted by length of pipe, is included in Table 64. The condition is reported on a scale of 0 to 100, where 100 represents an asset in perfect condition. The average condition of all linear stormwater assets (by length) is 97 or Very Good.

Table 64**: Average Condition of** Stormwater Assets

Pipe Material	Total Length (m)	Average Condition Score	Average Condition Rating
Concrete	11,941	95	Very Good
PVC	5,148	99	Very Good
Tile	189	96	Very Good
CSP	11	86	Very Good

6.2.1.2 Stormwater Facility Assets

Comprehensive existing condition of the Township's stormwater facility assets is not currently available for all facilities. It is recommended that a condition assessment be completed of all components of each facility and incorporated into the next update of the AMP.

6.3 Current Levels of Service – Stormwater

Levels of service for water assets are outlined in Table 1 of the regulation, O.Reg. 588/17. Table 65 and Table 66 outline the Township's current community and technical levels of service for water assets.

Table 65: Community Levels of Service – Stormwater

Service **Attribute**	Community Levels of Service **(Qualitative Description)**	Community LOS
Scope	Description, which may include maps, of the user groups or areas of the Municipality that are protected from flooding, including the extent of the protection provided by the municipal stormwater management system.	The stormwater management system in the Township is devised of a pipe network and stormwater management facilities, which provide conveyance of stormwater to protect properties. The extents of the network are shown in Appendix A.

Table 66: Technical Levels of Service – Stormwater

Service **Attribute**	Technical Levels of Service (Technical Metrics)	Technical LOS
Scope	Percentage of properties in municipality resilient to a 100-year storm.	The percentage of properties in the Township that are resilient to a 100-year storm currently unknown. It is recommended that further studies be completed in the future in order to assess the LOS metric.
	Percentage of the municipal stormwater management system resilient to a 5-year storm.	The percentage of the municipal stormwater management system resilient to a 5-year storm is currently unknown. It is recommended that further studies be completed in the future in order to assess the LOS metric.

6.4 Current Performance – Stormwater

Asset performance measures were determined in consultation with the Township, which provide relevant metrics against which the Township can gauge the performance of their assets. The performance measures for the water network, and their current values are shown in Table 67.

Table 67: Performance Measures – Stormwater

Asset Performance Measure	Current Value
Percentage of the community with stormwater quality and quantity control	It is recommended that future analysis be completed in order to track this performance measure.
Inspection frequency of stormwater ponds and catch basins	Not currently available, but recommended to be tracked in the future.

6.5 Risk Assessment – Stormwater

The risk ratings for the distribution network included watermains and related facilities, following the risk methodology and approach, presented in Section 1.5. The risk profile for linear watermains is shown in Figure 12 and for water facilities in Figure 13.

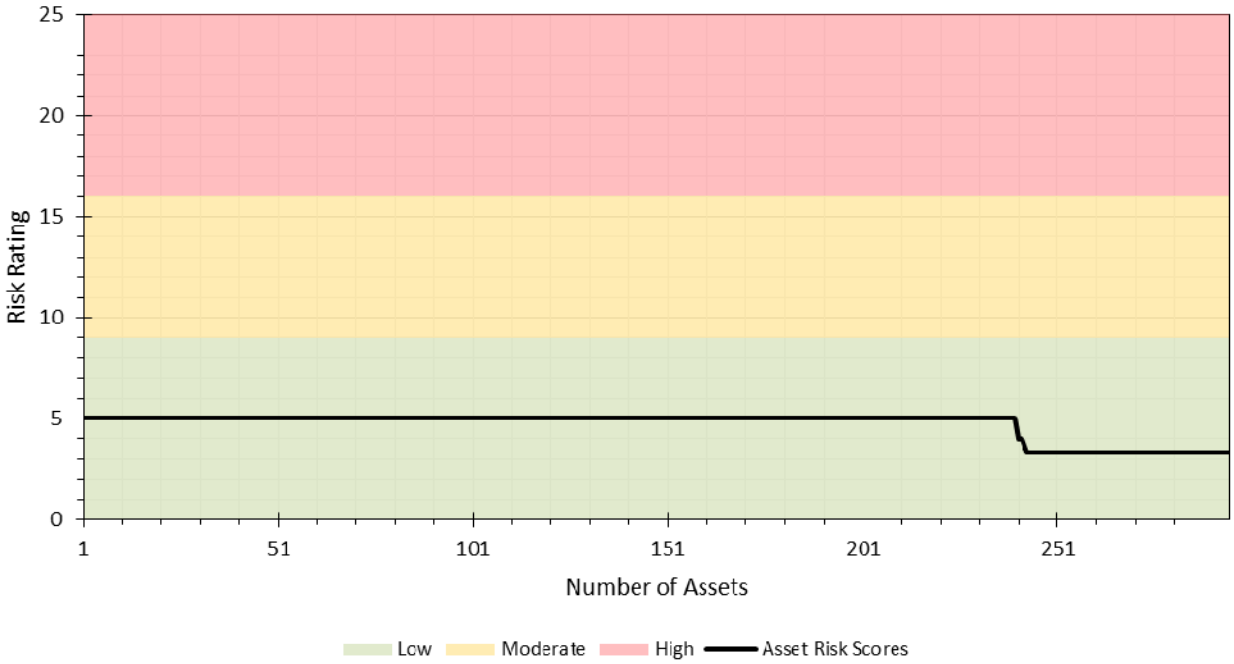


Figure 12: Stormwater – Linear Assets Risk Profile

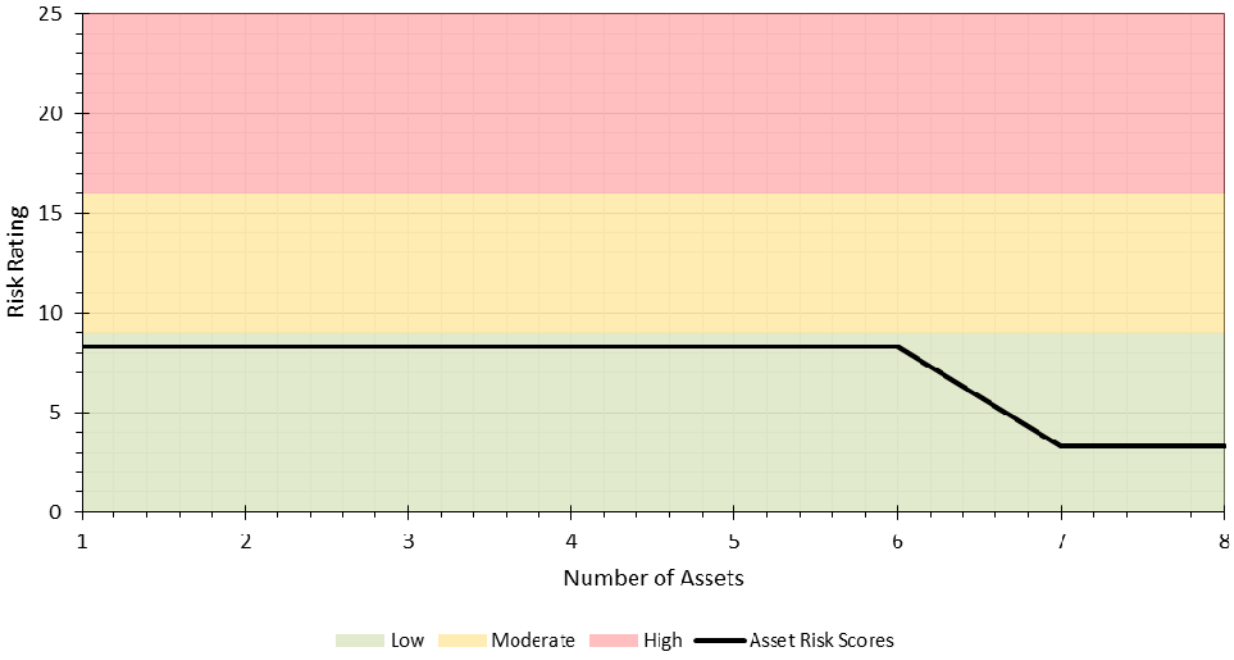


Figure 13: Stormwater – Facility Risk Profile

6.5.1 Importance

Importance of stormwater assets was determined in consultation with Township staff. An importance ranking criteria was applied to all watermains as described in Table 68.

Table 68: **Importance Ratings** – Stormwater

Importance Rating	Description
High (3)	• Stormwater management facilities • Trunk storm sewers
Moderate (2)	• Oil grit separators • Local storm sewers
Low (1)	• Catchbasins

6.6 Lifecycle Activities – Stormwater

In the lifecycle of a stormwater management asset, there are multiple activities that can be taken, depending on the asset attributes. The expected lifecycle activities to be used on the Township assets are as follows.

Construction Activities

The design of the new assets should be consistent with jurisdictional design requirements, including provincial design guidelines, local and conservation authority requirements. New construction of assets will occur where no previous stormwater servicing is available. The risk associated with new construction includes the high cost of brand new assets, and capacity for treatment and outlet of the stormwater flows.

Construction can also be the replacement of deteriorated assets. At the end of the useful life of an asset, it can be replaced for continuation of service provision. At the time of replacement, design should be undertaken to ensure design requirements are met, and adequate capacity is provided for current and future projections.

Maintenance Activities

Maintenance activities are undertaken on linear storm sewer assets throughout their useful life to maintain their operating condition and performance. Maintenance works includes routine maintenance (flushing, cleaning), and minor repairs to assets. There exists the risk that a maintenance activity may be implemented that does not adequately mitigate a performance or condition issue, and additional costs are then required for further repair or replacement.

Routine inspections of the conditions of SWM facilities and catch basins should be completed on an annual basis to identify any necessary cleaning and maintenance activities required.

The condition of the drainage area can have a significant impact on the maintenance cycle of a SWM facility. Soil erosion, construction and upstream sources of contamination should be identified and addressed in a timely manner. Addressing sediment and other contaminants at their source, in the contributing drainage area, is often much more manageable and cost effective than to remove sediment that has already accumulated in the facility.

- Measures that can be taken to manage pollutant sources before they reach the SWM facility include: Erosion and sediment control measures during construction
- Regular catch basin cleaning
- Regular street sweeping
- Reducing pesticide and fertilizer use
- Industrial pollution prevention programs
- Optimizing practices for winter snow and ice management.

Any structural components associated with the SWM facilities should be regularly inspected in order to proactively identify when corrective actions will be needed. Inspection of structural components can reveal reasons for hydraulic malfunctioning (too high or too low water levels) which need to be addressed immediately. Inlets or outlets can become clogged with sediment and debris.

If an inspection reveals, that the water levels are higher than expected after several days of dry weather, this may be an indication that the outlet is clogged with sediment, garbage and/or debris. Minor clogs that are accessible can be cleaned out by hand, but more significant clogs should be removed by flushing or a combination of jet washing and suctioning with a vacuum truck.

Renewal Activities

Renewal of the storm sewer assets can include structural or non-structural lining. A lining can be used where the condition has deteriorated, however structurally the pipe segment is still sound. A lining can extend the useful life of an asset and improve performance. Risks associated with lining of a pipe include the improper installation of the pipe or continued deterioration of the original pipe such that the lining does not perform as expected.

To ensure long-term effectiveness, the sediment that accumulates in a SWM facility should be periodically removed. The required frequency of sediment removal varies between facilities and is dependent on several factors, including the type of facility and characteristics of the contributing drainage area. Sediment accumulation will typically be rapid for the entire construction period, but once the catchment area is completely developed and vegetation is established, sediment accumulation drops significantly.

Slow degradation of concrete structures can be caused by the sustained flow of sediment-laden stormwater and scour and freeze/thaw cycles. The need for structural repairs must be identified through routine preventative maintenance visits.

Operating

Operating activities for the storm sewer assets include those activities that do not directly deal with the physical state of the pipe, but work to extend the assets useful life. The operating activities can include non-infrastructure policies, and monitoring/inspection of the assets. The inspection of storm sewer assets can be undertaken through a condition assessment program, recommended to be visual inspection through CCTV or zoom camera means. Usage of the zoom camera technology has the risk of insufficient visual detail to make appropriate activity decisions.

Decommissioning Activities

Decommissioning activities of the storm sewer assets includes abandonment or replacement of the asset at the end of its useful life. While typically assets are abandoned in place, the removal of the expended asset can provide additional space for new underground assets to be constructed.

6.7 Asset Management Strategy – Stormwater

6.7.1 Linear Stormwater Assets

The asset management strategy for the storm sewer mains in the Township will employ the lifecycle activities to maximize the useful life and economy of each asset. The primary indicator used in the development of a lifecycle strategy is the condition of each asset, however the strategy should be also consider other factors, such as:

- Importance of the asset
- Asset risk score
- Condition of adjacent sections
- Replacement requirements for adjacent infrastructure (watermain, sanitary or roadworks)
- Upstream dependency and expansion requirements.

As the Township continues to age and develop, these factors will continue to change, and each have an impact on the lifecycle of an asset. Consideration of these factors should be given when devising capital project outlooks and budgeting, and updating of the asset management plan.

The assets will deteriorate on a non-linear basis, and the various lifecycle activities can be implemented at varying stages within an assets deterioration. As previously shown, Figure 9 provides a visualization of the theoretical deterioration curve for an asset, and the opportunity windows to conduct lifecycle activities within the expected useful life of an asset.

In reference to Figure 9, it is expected that maintenance and operating activities will occur through the full lifecycle of the asset. Renewal works are most appropriately employed within the rehabilitation zone, and reconstruction and decommissioning will most likely occur within the reconstruction zone.

The condition, a major factor in the asset management strategy, should be established to assist in decision making. The Township should establish/maintain a condition assessment program for the storm sewers. The recommendation is to use visual inspection facilitated by CCTV or Zoom camera inspection on a 3 to 5 year basis.

When the condition of the asset has degraded such that an intervention is required, it is recommended that maintenance be reviewed as the first opportunity to extend the useful life. Maintenance works can include localized repair work, or relining of a storm sewer pipe segment. Because of the non-intrusive nature of conducting relining, it can be done on an individual pipe segment at a time, or to localized repairs.

When the condition of the asset has degraded such that maintenance is no longer an appropriate activity, the segment can and should be reconstructed. The Township should follow best practices and applicable design guidelines when designing the reconstruction works. Assets at the end of their useful life should be abandoned in place or removed.

A summary of recommended storm sewer pipe condition and associated lifecycle activity is provided in Table 69. Note that condition assessment should be undertaken on a routine basis throughout the lifecycle of the asset, and other factors should be considered when selecting a lifecycle activity.

Table 69: **Storm Sewer Lifecycle Activities and Condition Ranges**

Condition Range	Condition Description	Lifecycle Activity Category	Lifecycle Activity
1.0 to 0.60	Very Good to Good	Maintenance	Maintenance Works (cleaning, flushing) Manhole repairs Small pipe section repairs
0.60 to 0.35	Good to Fair	Rehabilitation	Localized repairs Structural relining
0.35 to 0.0	Poor to Very Poor	Reconstruction	Pipe replacement or abandonment

Current best practices suggest that that reconstruction and new construction works on the assets will be done using PVC material for pipes that are 400 mm in diameter or less, and concrete material for sizes larger than 400 mm diameter.

6.7.2 Stormwater Management Facilities

When sediment accumulation in a SWM facility has reached a point where removal efficiency has been reduced by 5% or more, sediment removal is required, as recommended in the MECP's Stormwater Management Planning and Design Manual (March 2003). In-situ measurement of sediment depth can also be carried out regularly (at least every three to five years) to determine when cleanout will be required. Once sediment dredging is complete, the facility is returned to its original design capacity and is again capable of providing effective hydraulic and water quality control.

6.7.3 Scenario Analysis

6.7.3.1 Linear Stormwater Assets

To understand the needs and projected works on the stormwater assets within a 10-year outlook, replacement activities were reviewed under varying budget values to understand the impact on overall asset condition. The budgets analyzed include:

1. Unlimited budget – To determine backlog of works;
2. No budget – To understand the changes in average network condition with no investment;

A summary of the analysis is outlined in Table 70 below.

Table 70: **Budgets Reviewed for Stormwater Asset Projections**

	Budget Scenario	Annual Value	Average Annual Investment Over Timeframe	Total Investment Over Timeframe	Average Condition Index (2032)
1	Unlimited	Unlimited	$ -	$ -	0.93
2	No Budget	$ -	$ -	$ -	0.93

Best practice recommends maintaining an average condition index of 0.6 across the system. Note that the overall condition of the assets is such that through all scenarios, including the 'no budget' scenario with zero annual spending, after the 10 year timeframe the average condition would be within the acceptable range, however some assets would likely degrade to failure.

The storm sewer assets were assessed to be in Very Good condition, with no immediate needs for the system. In the 10-year timeframe, there were no identified investments with the network maintaining an average condition index of 0.93 across the network.

6.7.3.2 Stormwater Facility Assets

In the absence of recommended replacement schedule based on a detailed engineering condition assessment, a best practice of capital investment is an average annual investment of 2% of the estimated replacement value. It is recommended that the Township continue to use this standard practice for future capital investment planning in the short term. It is recommended that a program for regular condition inspections by professional service providers be implemented to provide additional detail and guide the planned capital investment into building asset investment.

7.0 Buildings and Facilities

7.1 State of Local Infrastructure – Buildings and Facilities

The Township owns and maintains 6 buildings and facilities, excluding water, wastewater and parks and recreation facilities which for the purposed of this asset management plan, are categorized under those respective asset categories. The Township's buildings and facilities include the following:

- Municipal Office and Library
- Public Works Building
- Lucan Biddulph Fire Hall
- Biddulph Blanshard Fire Hall
- Ambulance Station
- Museum
- Sand and Salt Dome (being constructed in 2022)

7.1.1 Replacement Costs

The estimated replacement costs of the Township's buildings and facilities is $8.0 million based on historical costs, inflated to 2022 dollars.

7.1.2 Average Age

The average age of the Township's buildings and facilities is 9 years old.

7.1.3 Expected Useful Life

The expected useful life of each building and facility and its various complex components is unknown at this time.

7.2 Condition – Buildings and Facilities

Detailed condition assessment information of the Township's building and facility assets is not currently available. It is recommended that the Township conduct a detailed building condition assessment in order to evaluate existing condition, remaining useful life and recommended capital improvements (including timing and cost) of each component within a building or facility. This information should be analyzed and incorporated into the next update of the asset management plan.

7.3 Current Level of Service – Buildings and Facilities

Levels of service for building and facility assets are not defined in the regulation, O.Reg. 588/17 as buildings are not considered core assets. As such, level of services have been devised based on the

content of the regulation, in consultation with the Township. Table 71 and Table 72 outline the Township's current community and technical levels of service for buildings and facilities.

Table 71: Community Levels of Service – Buildings **and Facilities**

Service Attribute	Community Levels of Service (Qualitative Description)	Community LOS
Scope	Description, which may include maps of the asset category	The locations of building and facility assets is shown in Appendix A.
Quality	Description or images that illustrate the different levels or condition (if applicable). Consider hours of operation and/or when the service is available. • Hours of operation • Available services	The quality of the buildings and accessibility vary, depending on the purpose of the building as follows: • Emergency Services are available 365 days a year, 24 hours a day, 7 days a week • Administrative offices are available during business hours Monday-Friday 8:30 am-4:30 pm • Public Works facilities are accessible by staff only • Library is accessible during business hours

Table 72: Technical Levels of Service – Buildings **and Facilities**

Service Attribute	Technical Levels of Service (Technical Metrics)	Technical LOS
Scope	Provide breakdown of number of buildings by type providing service compared to the size of the community (geography or population)	The scope of the Township's buildings includes their availability to provide service. In Table 73 below, the building type, and number of buildings per capita per building type is provided.
Quality	Legal, regulatory and local standards	The quality of Buildings and Facilities include the following legal, regulatory and local standards for the services provided: • Accessibility (AODA Standards) • Health and safety • Buildings must be in compliance with Ontario Building Code.

Table 73: Technical Levels of Service – Buildings **and Facilities**

Building Type	Buildings per Capita
Fire Hall (2)	1 per 2,840 pop.
Library	1 per 5,680 pop.
Municipal Office	1 per 5,680 pop.
Museum	1 per 5,680 pop.

7.4 Current Performance – **Buildings and Facilities**

Asset performance measures were determined in consultation with the Township, which provide relevant metrics against which the Township can gauge the performance of their assets. Considering each building as a single asset, the performance measures and corresponding units established for buildings and facilities are shown in Table 74.

Table 74: Current Performance **Measures for Buildings and Facilities**

Asset Performances Measure	Current Value
Water usage (m3 per year)	Not currently tracked, but it is recommended that that Township track this in the future.
Energy usage (kWh per year)	Not currently tracked, but it is recommended that that Township track this in the future.
Operation and maintenance cost ($/population)	The 2020 – 2021 average operation and maintenance costs for buildings and facilities assets is approximately $14 per capita.

7.5 Risk Assessment – **Buildings and Facilities**

The risk ratings for the building and facilities, follows the risk methodology and approach, presented in Section 1.5. The risk profile for the buildings and facilities is shown in Figure 14.

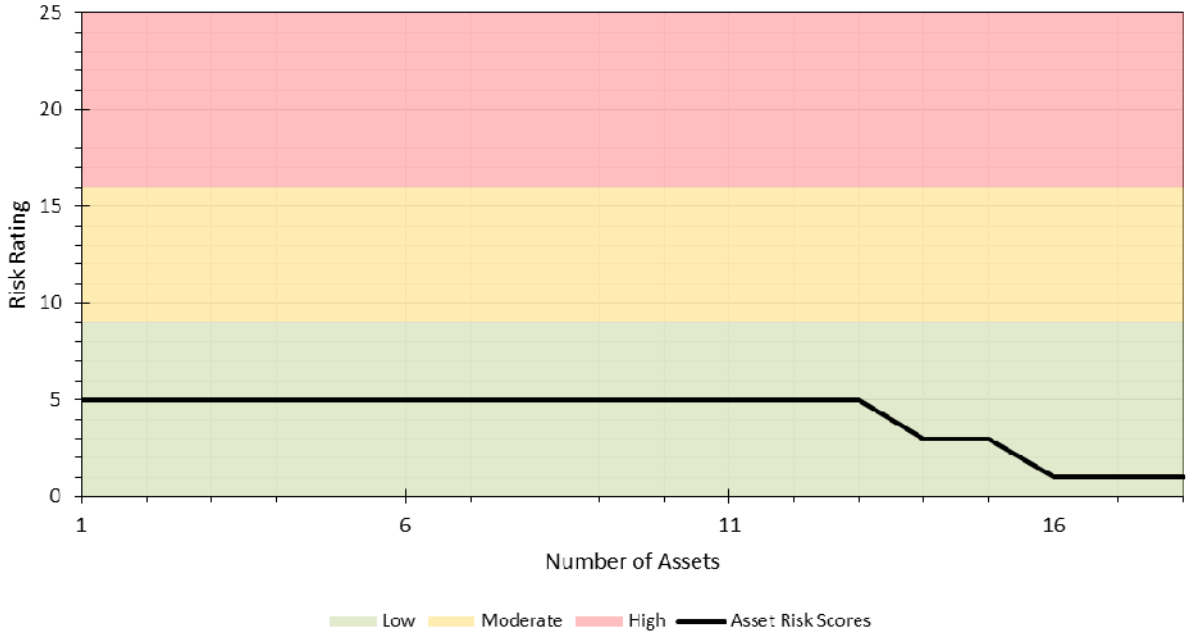


Figure 14**: Buildings and Facilities Risk Profile**

7.5.1 Importance

Importance of municipal buildings and facilities was determined in consultation with the municipal staff. Table 75 outlines the importance rankings developed with staff and utilized in risk calculations.

Table 75: **Importance Rating – Buildings and Facilities**

Importance Rating	Building and Facility Asset
High (3)	• Lucan Biddulph Fire Hall • Biddulph Blanshard Fire Hall • Ambulance Station • Municipal Office and Library • Sand and Salt Dome
Moderate (2)	• Public Works Building
Low (1)	• Museum

7.6 Lifecycle Activities – Buildings and Facilities

The following section describes the lifecycle activities that can be implemented within the asset management strategy for building assets. Note that, as previously discussed, building assets refers to the entirety of the asset which is made up of varying component systems depending on the use of the building. The primary lifecycle activities include construction, maintenance, renewal, and decommissioning/disposal.

Construction

The start of a building asset lifecycle is its construction. The building should be constructed to adhere with the requirements of the Ontario Building code, and any and all other applicable regional codes and requirements for the building and its use. Each building should be designed and constructed to provide the services for which it is intended.

Maintenance

Throughout the full lifecycle of a building, the majority of the expected lifecycle activities to be undertaken will be maintenance works. Maintenance activities can be used to improve the level of service of an asset (or component), or to maintain it. Activities that fall under the maintenance category can be varied by response type and scale of maintenance requirements. Activities can be required through routine maintenance works, response to Poor condition or performance, or on an emergency basis. In general, the expected types of maintenance activities within the lifecycle of a building include:

- Preventative maintenance
    - This type of maintenance activity is undertaken to prevent failure or Poor performance of a building asset component. Preventative maintenance works can be undertaken on an ad-hoc basis based on knowledge of condition, or be undertaken according to a maintenance schedule. Manufacturer directives and condition assessments should assist in determining frequency of preventative maintenance activities.

- Reactive maintenance
    - This type of maintenance activity is undertaken in response to an issue or fault in the building or component systems, on an ad-hoc basis. Scale of reactive maintenance works will be variable depending on the system and type of failure or decrease in level of service.
- Major maintenance (replacement)
    - This type of maintenance activity is undertaken in response to a component which is no longer able to provide adequate level of service. Major maintenance (replacement) will be undertaken for one or more components of a building asset. Major maintenance works can be preventative (in anticipation of end of service life of a component), or in response to a system failure.

Renewal

Renewal works can be used to update a building asset for modernization, to achieve compliance with updated codes and requirements, to expand on an existing building, or to renovate to suit changes to services provided. Renovation works can include:

- Addition of new components to an existing building asset
    - New components can be added to an existing building with the existing building largely unchanged.
- Updating of existing components
    - Updating of existing components can prolong the expected lifespan of a building asset.

Decommissioning/Disposal

Disposal activities can include the removal from service of a building, or a portion of a building and components. Disposal activities should be conducted such that health and safety and environmental protocols are being followed, and spent materials are disposed of at appropriate or approved facility. Disposal activities can also include removal of the building from the Municipal building portfolio through sale of property, if it is no longer required for service delivery.

7.7 Asset Management Strategy – **Buildings and Facilities**

The asset management strategy for the building and facility assets seeks to use the lifecycle activities in a manner that will achieve cost-effective and sustainable management of the building assets.

The Township's strategy should be to maintain the condition and performance of the building assets such that the level of service to the customer is likewise maintained. An industry standard of 2% of the current portfolio replacement value is recommended as a minimum annual investment into capital projects for major maintenance (replacement) and renewal activities.

Implementation of the lifecycle activities for the building assets will vary across the assets, according to the components, condition, and services provided. A detailed condition assessment of the building

assets would guide the Township in determining what maintenance works are required at each of the building assets, and the expected remaining useful life of the components. A maintenance schedule and forecast of asset improvements should be based on this detailed review, which should be updated at a frequency suitable to the Municipality, suggested to be every 5 years. If it is not possible to complete the condition assessment of all buildings in the near term, priority buildings for the condition assessment program are suggested to be identified by the presented risk assessment, condition and performance measures. Buildings with high risk or Poor condition/performance components should be prioritized in the condition assessment program.

Routine maintenance schedules are assumed to be in place currently, and are recommended to continue assuming that they are currently providing sufficient level of maintenance.

Management of building assets should also include climate change considerations, in new construction, maintenance or renewal lifecycle activities. Assessment should be undertaken to understand vulnerability of building assets to a changing climate, which will inform lifecycle activity requirements, and potential changes to the way lifecycle activities are undertaken.

The Township should continuously audit asset data to ensure information is current. It is suggested that additional classifications be implemented to clearly identify the lifecycle activities implemented for building components. Capital investments and betterments of existing assets should be included or amended to the asset data of the corresponding building components.

The Township should provide annual updates to LOS and performance measures to gauge performance of the Township against quantified targets. Where data is not yet available to LOS performance measures, a strategy for collecting, verifying and integrating the data should be developed and implemented.

8.0 Parks and Recreation

8.1 State of Local Infrastructure – **Parks and Recreation**

The Township owns and maintains multiple parks and recreation facilities and associated fleet and equipment. The Township's parks and recreation assets include the following:

Parks and Recreation Facilities

- Lucan Biddulph Community Memorial Centre, including Arena and Community Hall/Gym (Renovation underway in 2022)
- Active Living Centre
- Daycare
- Community Centre Park (Soccer Fields, Ball Diamond, Track, Playground, and Dog Park)
- Lucan Pool (Upgrade to be completed in 2023)
- Scout Hall
- Granton Park (Playground Equipment, Ball Diamond, Trail, Skate Park and Pavilion)
- Elm Street Park (Trail, Splash Pad, and Playground Equipment)
- Market Street Park (Trail, Pavilion, Playground Equipment, Ball Diamond)
- Spencer Park (Pavilion)
- Soccer Complex (Under construction in 2022)

Parks and Recreation Fleet and Equipment

- Olympia
- Lawn mowers (3)
- Truck/plow
- Tractor
- Pickup truck with dump box

8.1.1 Replacement Costs

The estimated replacement costs of the Township's parks and recreation assets is $28.9 million based on historical costs, inflated to 2022 dollars. This replacement value includes the parks and recreation capital works that are underway in 2022 (Community Centre renovations and soccer complex construction).

8.1.2 Average Age

The average age of the components of the Township's parks and recreation assets is 12 years old.

8.1.3 Expected Useful Life

The expected useful life of each parks and recreation asset and its various complex components is unknown at this time, but should be assessed and included in a future update of the asset management plan.

8.2 Condition – Parks and Recreation

Similar to the Township's building and facility assets, detailed condition assessment information of the Township's parks and recreation assets is not currently available. It is recommended that the Township conduct a detailed condition assessment in order to evaluate existing condition, remaining useful life and recommended capital improvements (including timing and cost) of each component of the parks and recreation assets. This information should be analyzed and incorporated into the next update of the asset management plan.

8.3 Current Level of Service – Parks and Recreation

Levels of service for parks and recreation assets are not defined in the regulation, O.Reg. 588/17 as parks and recreation are not considered core assets. As such, level of services have been devised based on the content of the regulation, in consultation with the Township. Table 76 and Table 77 outline the Township's current community and technical levels of service for parks and recreation.

Table 76: Community Levels of Service – **Parks and Recreation**

Service Attribute	Community Level of Service (Qualitative Description)	Community LOS
Scope	Description, which may include maps of parks and recreation facility locations	The locations of parks and recreation facilities throughout the Township are shown in Appendix A.
Quality	Description or images that illustrate the different levels or condition (if applicable). Consider hours of operation and/or when the service is available. • Hours of operation • Available services	Outdoor recreation facilities (parks, pool, playgrounds, sports fields, trails, pavilions) are available seasonally or year round depending on the facility and on a rental basis (where applicable). Indoor recreation facilities (Community Centre, Scout Hall, Active Living Centre, Daycare) are available year round and on a rental basis (where applicable).

Table 77: Technical Levels of Service – **Parks and Recreation**

Service Attribute	Technical Level of Service (Technical Metrics)	Technical LOS
Scope	Number of parks and recreation facilities per population	There are currently 10 parks and recreation facilities located throughout the Township. Based on a total population of 5,680 people, this equates to 1 parks facility per 568 people.
Quality	Legal/regulatory/local standards	Legal/regulatory/local standards include: • Grass cutting guidelines • Playground equipment annual inspection by a certified safety inspector

8.4 Current Performance – **Parks and Recreation**

Asset performance measures were determined in consultation with the Township, which provide relevant metrics against which the Township can gauge the performance of their assets. The performance measures for parks and recreation assets, and their current values are shown in Table 78.

Table 78: Parks and **Recreation Performance Measures**

Asset Performance Measures	Current Value
Usage rates of facilities (by number of patrons, hours of operation, etc.)	Not currently tracked, but it is recommended that that Township track this in the future.
Customer feedback (number of complaints and compliments)	Not currently tracked, but it is recommended that that Township track this in the future.

8.5 Risk Assessment – **Parks and Recreation**

The risk ratings for parks and recreation assets, follows the risk methodology and approach, presented in Section 1.5. The risk profile for parks and recreation assets is shown in Figure 15.

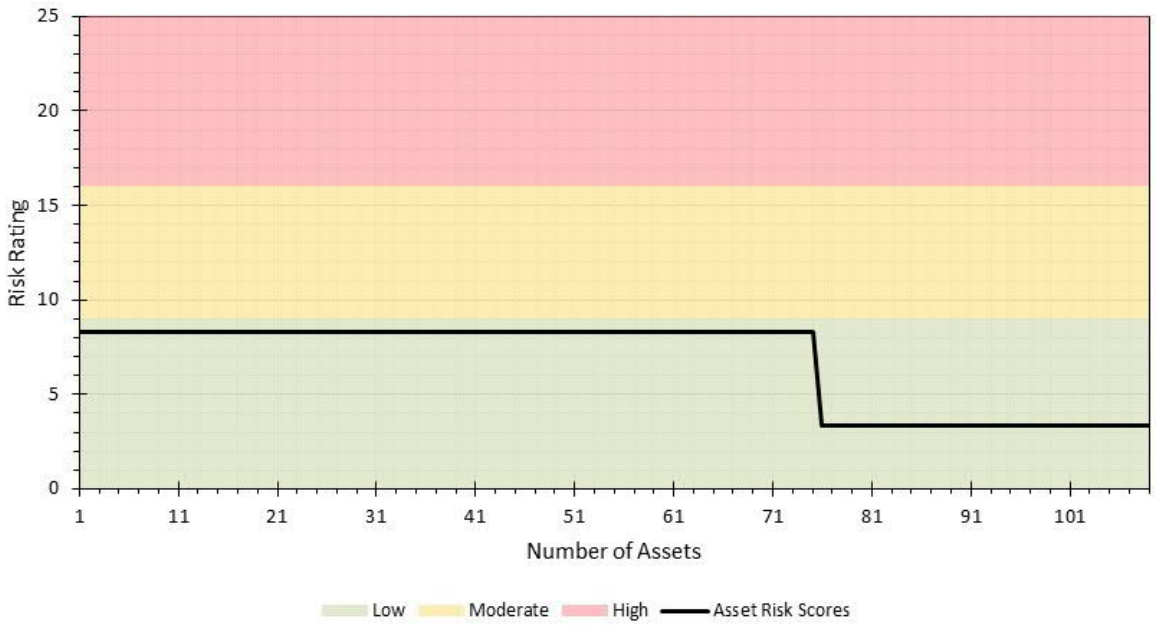


Figure 15: **Parks and Recreation Risk Profile**

8.5.1 Importance

Importance of parks and recreation assets was determined in consultation with the municipal staff. Table 79 outlines the importance rankings developed with staff and utilized in risk calculations.

Table 79: **Importance Rating – Parks and Recreation**

Importance Rating	Parks and Recreation Asset
High (3)	• Lucan Biddulph Community Memorial Centre • Daycare • Olympia
Moderate (2)	• Sports Fields (Ball Diamonds, Soccer Fields/Complex) • Pool • Active Living Centre
Low (1)	• Splash Pad • Scout Hall • Skate Park • Playground • Tennis Court • Dog Park • Pavilions • Trails • Bleachers • Picnic Tables • Lawn Mowers • Pickup Truck/Tractor

8.6 Lifecycle Activities – Parks and Recreation

In the lifecycle of a Parks and Recreation asset, there are multiple activities that can be taken, depending on the asset attributes. The expected lifecycle activities to be used on the Parks and Recreation assets include acquisition, maintenance, and operation and decommissioning.

Acquisition

Acquisition of a new parks and recreation asset should consider the intended usage of the asset. Acquisition should be undertaken based on an understanding of the requirements of the asset for providing service delivery, and should follow municipal procurement procedures. Acquisition of an asset could be as a new purchase, or purchase of a used asset. Acquisition of a new asset can provide the Township with an asset in Very Good condition, however the condition of a used asset could vary.

Maintenance

Maintenance activities will vary across the equipment assets due to the variability in type and usage of assets. The maintenance activities should be undertaken according to manufacturer specifications and as required to address condition and performance issues that arise through regular usage. Maintenance activities should include regular inspections for condition, and recording of maintenance activities undertaken.

Disposal

Disposal activities can include the removal from service through disposal, sale of asset or transfer of an asset to different department. Disposal activities should be conducted such that health and safety protocols are being followed, and out of service assets are disposed of at appropriate or approved facility.

8.7 Asset Management Strategy – **Parks and Recreation**

The asset management strategy for the parks and recreation assets seeks to use the lifecycle activities in a manner that will achieve cost-effective and sustainable management of the assets.

Generally, if acquired new, the assets will begin their expected useful life in Very Good condition and performance. Throughout the lifecycle of the assets, routine maintenance should be conducted. As required, specific maintenance should be conducted. As an asset ages and approaches the end of its useful life, it is expected that the risk and maintenance costs associated with the asset will increase. There will be a point in the lifecycle where the risk and maintenance costs are such that replacement of the asset will be the preferred solution. This point will vary depending on the type of asset and the services delivered by each.

The Township should review usage of parks and recreation assets to confirm if services are being provided adequately. The assets should also be routinely assessed and monitored for condition and performance, to inform any maintenance or replacement works required.

The Township's strategy should be to maintain the condition and performance of the parks and recreation assets such that the level of service to the customer is likewise maintained. An industry standard of 2% of the current portfolio replacement value is recommended as a minimum annual investment into capital projects for major maintenance (replacement) and renewal activities.

9.0 Fleet and Equipment

9.1 State of Local Infrastructure – Fleet and Equipment

The Township owns and maintains 61 fleet and equipment assets, excluding parks and recreation fleet and equipment, which for the purposes of this asset management plan, are categorized within the parks and recreation asset category. The Township's fleet and equipment assets include the following:

Public Works

- Road grader
- Sidewalk Plow
- Backhoe
- Snow Plows
- Pickup trucks
- Parking lot plow
- Wood chipper
- Generator

Municipal Administration

- Generator
- Phone System

Biddulph Blanshard Fire Department Equipment
(shared ownership 51% / 49% between the Township of Lucan Biddulph and Township of Perth South)

- 4 trucks (including fire truck, pumper, tanker trucks)
- On Board Equipment
- Bunker Gear, Helmets and Boots
- Turnout Gear
- Fire Hoses
- Thermal Imaging Camera
- Generator
- LED Light Heads
- Heated Pressure Washer
- Ice Rescue Equipment

Lucan Biddulph Fire Department Equipment

- 3 fire trucks (including fire truck, tanker truck and rescue van)
- On Board Equipment
- Bunker Gear, Helmets and Boots

- Turnout Gear
- Thermal Imaging Camera
- Generator
- Auto Extrication Equipment
- Air Packs
- Air Compressor
- Respirator Fit Tester
- Gas Detector
- Storage Trailer

9.1.1 Replacement Costs

The estimated replacement costs of the Township's fleet and equipment assets is $5.3 million based on historical costs, inflated to 2022 dollars.

9.1.2 Average Age

The average age of the Township's fleet and equipment assets is 9 years old.

9.1.3 Expected Useful Life

The expected useful life of each fleet and equipment asset is not documented at this time, but should be assessed and included in a future update to the asset management plan.

9.2 **Condition** – Fleet and Equipment

Condition information on fleet and equipment assets is not currently available. It is recommended that the Township develop a system for assessing condition and incorporate in a future update of the asset management plan.

9.3 Current Level of Service – Fleet and Equipment

Levels of service for fleet and equipment assets are not defined in the regulation, O. Reg. 588/17 as fleet and equipment are not considered core assets. As such, level of services have been devised based on the content of the regulation, in consultation with the Township. Table 80 and Table 81 outline the Township's current community and technical levels of service for fleet and equipment.

Table 80: Community Levels of Service – Fleet and Equipment

LOS Parameter	Community Levels of Service (Qualitative Description)	Community LOS
Scope	Description, which may include maps of locations where fleet and equipment is stored	Storage facilities for fleet and equipment assets are located across the Township. The storage location is dependent on the type of equipment by all fleet and equipment is stored any of the following facilities: Municipal Office, Public Works Building, Lucan Biddulph Fire Hall or the Biddulph Blanshard Fire Hall.
Quality	Description of fleet condition (i.e., maintained in 'good' or better condition in order to provide reliability	Condition ratings are not currently tracked for fleet and equipment assets. It is recommended that the Township track condition in the future.

Table 81: Technical Levels of Service – Fleet and Equipment

LOS Parameter	Technical Levels of Service (Technical Metrics)	Technical LOS
Scope	Breakdown of number of fleet by department providing service compared to the size of the community (geography or population)	Public Works: 1 fleet per 811 people population Fire Departments: 7 fleet per 811 people per population
Quality	Legal, regulatory, local standards	The fleet assets must adhere to applicable legal, regulatory and local standards, including: • Equipment in vehicle must meet Ontario Provincial Equipment Standards • Manufacturer's recommendations or maintenance and life expectancy on equipment • Vehicle/equipment preventative maintenance program • Vehicle maintenance, safety • Driver training, equipment functioning (negligence, risk management).

With the variety in types of assets categorized as 'equipment' assets, it is not recommended to develop overarching levels of service for this category as the service being delivered by the assets is also greatly varied.

9.4 Current Performance – Fleet and Equipment

Asset performance measures were determined in consultation with the Township, which provide relevant metrics against which the Township can gauge the performance of their assets. The performance measures for fleet and equipment assets, and their current values are shown in Table 82.

Table 82: Fleet and Equipment Performance Measures

Asset Performance Measures	Current Value
Fleet and equipment maintenance expenses or annual operating cost to provide service ($ per population)	The 2020-2021 average operating and maintenance expenses for fleet and equipment assets is approximately $25 per capita.
Maintenance expense per utilization ($/km or hour).	Not currently tracked, but it is recommended that the Township should track this performance measure in the future to compare amongst similar vehicles or established standards and identify vehicles which may be costing considerable operating $ for low utilization.

9.5 Risk Assessment – Fleet and Equipment

The risk ratings for the fleet and equipment assets, follows the risk methodology and approach, presented in Section 1.5. The risk profile for fleet and equipment is shown in Figure 16.

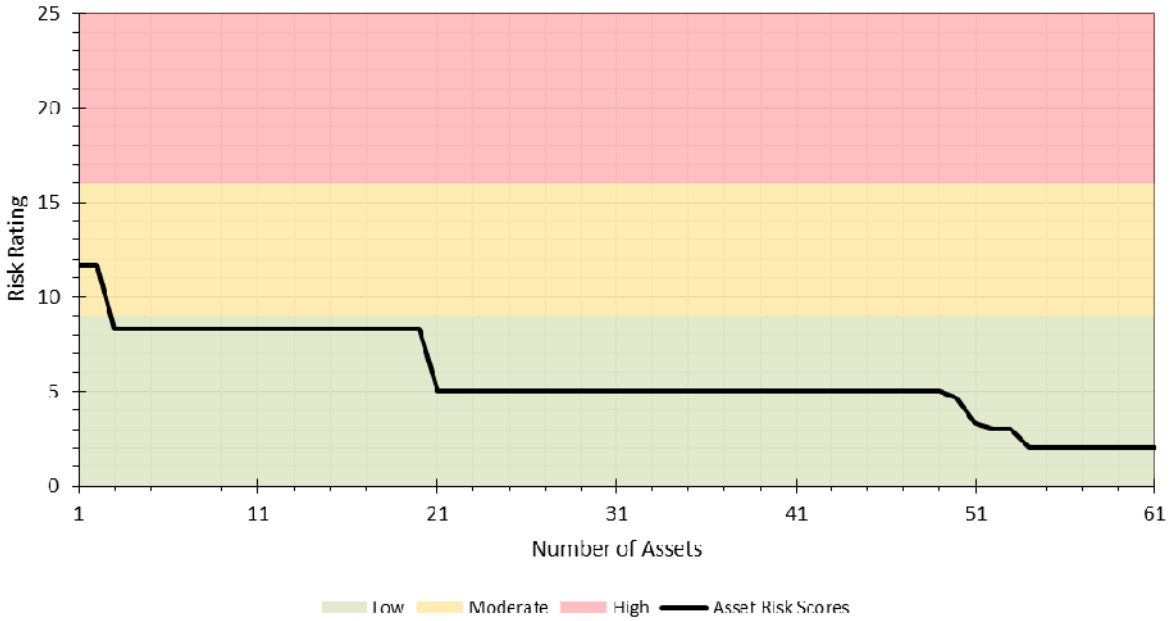


Figure 16: Fleet and Equipment Risk Profile

9.5.1 Importance

Importance of fleet and equipment was determined in consultation with the municipal staff. Table 82 outlines the importance rankings developed with staff and utilized in risk calculations.

Table 83: **Importance Rating** – Fleet and Equipment

Importance Rating	Building and Facility Asset
High (3)	• Fire trucks and associated equipment • Sidewalk plow • Road grader • Generators
Moderate (2)	• Snow plows • Backhoe • Office equipment
Low (1)	• Pickup trucks • Lawn mowers • Office furniture

9.6 Lifecycle **Activities** – Fleet and Equipment

9.6.1 Fleet

In the lifecycle of a fleet asset, there are multiple activities that can be undertaken, depending on the asset attributes. The expected lifecycle activities to be used on the fleet assets include acquisition, maintenance, and operation and decommissioning/disposal.

Acquisition

Acquisition of a fleet asset should consider the intended usage of the asset. Acquisition should be undertaken based on an understanding of the requirements of the asset for providing service delivery, and should follow municipal procurement procedures. Acquisition of an asset could be as a new purchase, or purchase of a used asset. Acquisition of a new asset can provide the Township with an asset in Very Good condition, however the condition of a used asset could vary.

Acquisition activities can also include direct replacement of existing fleet assets. When a fleet asset reaches the end of its useful life, and the asset is found to be adequate for providing service delivery required, the acquisition activity may be asset replacement.

Maintenance

Maintenance activities will vary across the fleet assets due to the variability in type and usage of assets. The maintenance activities should be undertaken according to manufacturer specifications and as required to address condition and performance issues that arise through regular usage. Maintenance activities should include regular inspections of vehicle for condition, and recording of maintenance activities undertaken.

Decommissioning/Disposal

Disposal activities can include the removal from service through disposal, sale of asset or transfer of an asset to a different department. Disposal activities should be conducted such that health and safety protocols are being followed, and out of service assets are disposed of at appropriate or approved facility.

9.6.2 Equipment

In the lifecycle of an equipment asset, there are multiple activities that can be taken, depending on the asset attributes. The expected lifecycle activities to be used on the equipment assets include acquisition, maintenance, and operation and decommissioning.

Acquisition

Acquisition of a new equipment asset should consider the intended usage of the asset. Acquisition should be undertaken based on an understanding of the requirements of the asset for providing service delivery, and should follow municipal procurement procedures. Acquisition of an asset could be as a new purchase, or purchase of a used asset. Acquisition of a new asset can provide the Township with an asset in Very Good condition, however the condition of a used asset could vary.

Maintenance

Maintenance activities will vary across the equipment assets due to the variability in type and usage of assets. The maintenance activities should be undertaken according to manufacturer specifications and as required to address condition and performance issues that arise through regular usage. Maintenance activities should include regular inspections for condition, and recording of maintenance activities undertaken.

Disposal

Disposal activities can include the removal from service through disposal, sale of asset or transfer of an asset to different department. Disposal activities should be conducted such that health and safety

protocols are being followed, and out of service assets are disposed of at appropriate or approved facility.

9.7 Asset Management Strategy – Fleet and Equipment

The asset management strategy for the fleet and equipment assets seeks to use the lifecycle activities in a manner that will achieve cost-effective and sustainable management of the assets.

Generally, if acquired new, the assets will begin their expected useful life in Very Good condition and performance. Throughout the lifecycle of the assets, routine maintenance should be conducted. As required, specific maintenance should be conducted. As an asset ages and approaches the end of its useful life, it is expected that the risk and maintenance costs associated with the asset will increase. There will be a point in the lifecycle where the risk and maintenance costs are such that replacement of the asset will be the preferred solution. This point will vary depending on the type of asset and the services delivered by each.

The Township should review usage of fleet and equipment assets to confirm if services are being provided adequately. The assets should also be routinely assessed and monitored for condition and performance, to inform any maintenance or replacement works required.

The Township's strategy should be to maintain the condition and performance of the fleet and equipment assets such that the level of service to the customer is likewise maintained. An industry standard of 2% of the current portfolio replacement value is recommended as a minimum annual investment into capital projects for major maintenance (replacement) and renewal activities. The Township has also developed a replacement schedule specifically for fleet based on a standard frequency for trading in for new fleet or rotating fleet through departments internally.

10.0 Financial Strategy

10.1 Introduction

This chapter identifies the funding required to sustainably finance the lifecycle management strategies presented in the previous sections. Two capital expenditure scenarios are presented, based on achieving different LOS, to provide an upper and lower bound on the Township's funding needs. The analysis is intended to inform the Township's proposed LOS, which will be set at a future date.

O. Reg. 588/17 requires that by July 2025 municipalities have an approved proposed LOS and a 10-year lifecycle management and financial strategy to achieve the proposed LOS. Various financing options, including reserve funds, debt, and grants can be considered during the process of developing the financial strategy.

10.2 Funding Sources

The Township's current financial strategy is to fund capital expenditures from the following sources, in order of preference: government funding and grants, development charges, reserves, and loans only if the preceding sources are not adequate. Reserve funds are maintained as follows:

- General tax-supported capital reserve funds are maintained through allocations from the operating budget.
- There are also dedicated reserves that are maintained through capital levies paid by users for the following:
    1. Water system
    2. Sewer (wastewater) system.

It is important for the Township to continue to increase annual contributions to capital reserves to build up healthy balances that can sustainable fund capital investments, recognizing that capital expenditures will fluctuate from year-to-year. This financial strategy should be examined and re-evaluated during the annual budgeting processes to ensure the sustainability of the Township's financial position as it relates to its assets. The Financial Strategy was developed based on investment needs. Further analysis and development of the financial strategy will be completed in the future.

Table 84 summarizes the Township's baseline capital funding capacity, based on the funding sources identified in the 2022 Budget that are anticipated to continue over the 10-year capital plan forecast. Allocations to capital reserves from the 2022 Operating Budget, Water System Budget, and Sewer System Budget are considered part of the funding capacity, as the reserves exist to fund capital expenditures.

The baseline capital funding capacity identified is not intended to reflect the Township's maximum available funding; rather, it is intended to represent the standard amount of funding the Township would have in a given year if they maintain the status quo. Additional project- and timing-specific grants and loans are expected to supplement this baseline funding where needed. Decisions that increase budget allocations to capital reserves, such as tax levy increases or increases to capital levies for water or sewer users would increase this funding capacity.

Table 84: Baseline Capital Funding Capacity (2022 Dollars)

Funding Source	Amount
Ontario Community Infrastructure Fund (OCIF)	$401,088
Canada Community-Building Fund (CCBF)	230,000
Development Charges	200,000
Operating Budget Capital Reserve Contributions	2,342,350
Water System Capital Levy	302,135
Sewer System Capital Levy	444,585
Total	$3,920,158

The following funding sources identified in the 2022 Budget have been excluded from the baseline capital funding capacity:

- Transfers from the County of Middlesex: These amounts are assumed to cover capital expenditures related to County-owned assets that are impacted by Township projects. Since the forecasted capital expenditures are based on Township assets only, these amounts have been excluded.
- Loan: The 2022 Budget includes a $2,045,000+ loan to finance a portion of the capital budget. As loans are the Township's lowest-preference funding source, loans have not been included in the baseline funding capacity.
- ICR CCR Grant and ICIP COVID Grant: These grants were assumed to be non-recurring.

10.3 Capital Expenditures

The level of capital expenditure required is dependent on the Township's proposed LOS for its capital assets. Since this target has not yet been determined, two capital expenditure scenarios have been forecasted to provide an upper and lower bound on the Township's financing needs:

- Unlimited: This upper bound scenario is based on replacing assets at the end of their useful life. In reality, funding constraints will limit the Township's ability to achieve this level of capital expenditure. The capital expenditure forecast by asset category for this scenario is included in Table 85.
- Maintain Existing LOS: This lower bound scenario is based on the minimum level of capital expenditure required to maintain the current LOS of the Township's assets. The capital expenditure forecast by asset category for this scenario is included in Table 86.

Table 85: Capital Expenditure Forecast -- Unlimited Scenario (2022 Dollars)

Asset Category	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Roads	1,919,750	1,241,625	2,728,600	1,984,675	929,400	1,659,525	1,376,550	274,400	466,550	1,244,425
Bridges and Culverts	419,920	0	0	0	0	0	0	0	0	0
Water - Linear	925,599	0	0	364,940	0	0	0	1,030,837	1,705,598	0
Water - Facility	88,555	88,555	88,555	88,555	88,555	88,555	88,555	88,555	88,555	88,555
Wastewater - Linear	9,306,542	989,466	1,213,745	834,663	1,485,243	4,780,157	0	2,596,653	191,034	0
Wastewater - Facility	32,262	3,932,262	32,262	32,262	32,262	32,262	32,262	32,262	32,262	32,262
Stormwater - Linear	641,597	641,597	641,597	641,597	641,597	641,597	641,597	641,597	641,597	641,597
Stormwater - Facility	52,353	52,353	52,353	52,353	52,353	52,353	52,353	52,353	52,353	52,353
Buildings and Facilities	160,004	160,004	160,004	160,004	160,004	160,004	160,004	160,004	160,004	160,004
Parks and Recreation	743,453	571,578	636,578	610,578	622,578	571,578	666,422	681,578	571,578	629,578
Fleet and Equipment	803,285	65,285	325,285	107,285	367,785	233,285	161,285	65,285	65,285	652,285
Total	15,093,321	7,742,725	5,878,979	4,876,912	4,379,777	8,219,316	3,179,028	5,623,524	3,974,816	3,501,059

Table 86: Capital Expenditure Forecast – **Maintain Existing LOS Scenario (2022 Dollars)**

Asset Category	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Roads	640,500	638,225	645,435	628,040	644,455	648,270	648,725	644,350	628,980	643,195
Bridges and Culverts	419,920	0	0	0	0	0	0	0	0	0
Water - Linear	925,599	0	0	364,940	0	0	0	1,030,837	1,391,541	314,057
Water - Point	88,555	88,555	88,555	88,555	88,555	88,555	88,555	88,555	88,555	88,555
Wastewater - Linear	384,024	397,658	395,633	396,945	387,614	385,355	398,462	397,314	390,853	376,084
Wastewater - Point	32,262	3,932,262	32,262	32,262	32,262	32,262	32,262	32,262	32,262	32,262
Stormwater - Linear	641,597	641,597	641,597	641,597	641,597	641,597	641,597	641,597	641,597	641,597
Stormwater - Point	52,353	52,353	52,353	52,353	52,353	52,353	52,353	52,353	52,353	52,353
Buildings and Facilities	160,004	160,004	160,004	160,004	160,004	160,004	160,004	160,004	160,004	160,004
Parks and Recreation	509,636	337,761	402,761	376,761	388,761	337,761	432,605	447,761	337,761	395,761
Fleet and Equipment	803,285	65,285	325,285	107,285	367,785	233,285	161,285	65,285	65,285	652,285
Total	4,657,736	6,313,701	2,743,886	2,848,743	2,763,387	2,579,443	2,615,849	3,560,319	3,789,192	3,356,154

10.3.1 Comments on 2023 Projection

It should be noted that under the Unlimited scenario, the larger expenditures related to linear wastewater needs in 2023 are largely attributed to the fact that a large portion of the Township's wastewater collection system was constructed within a similar timeframe (1965 to 1970), and as a result these same sections of sewer are also near the end of their expected useful life on a similar timeline. This brings a level of risk as the average age of the wastewater collection system is increased. CCTV inspections completed in 2018 of the entire wastewater collection system assisted in identifying condition ratings of the sewers that are in better or worse condition than anticipated based on age and expected deterioration. As such, this pushes the timing of the anticipated replacement of the sewers that are in better condition further out into the future, but may also expediate the anticipated replacement schedule of any sections of sewer that are in poorer condition. The linear wastewater needs identified within the next 10 years have been based on the condition assessment that was completed in 2018.

Additionally, the majority of the needs identified in 2024 for the wastewater facility assets is based on the recent study completed by BM Ross that identified $3.9 million in upgrades required to the Lucan Wastewater Treatment Plant and Chestnut Sanitary Pumping Station in order to continue to provide adequate wastewater treatment and conveyance servicing to the existing population in the community of Lucan. This is in addition to the estimated $12.6 million in upgrades that is required to expand the capacity of the system to accommodate future growth.

10.4 Funding Needs Analysis

10.4.1 Forecasted Capital Investment and Shortfalls

The two capital expenditure scenarios can be compared to the baseline capital funding capacity over the 10-year period to determine if funding gaps exist. Figure 17 compares the Township's overall baseline capital funding capacity to the forecasted capital expenditures for each scenario. Figure 18 projects the Township's overall capital reserve balances under each scenario. The Township's overall capital reserve balance at the end of 2022 was projected to be $7.1 million based on the 2021 Financial Statements and 2022 Budget (all reserve funds were included in this balance with the exception of reserves set aside for Working Capital, Tax Rate Stabilization, and Fire Capital needs).

Under the Unlimited scenario, the forecasted capital expenditure needs exceed the baseline funding capacity in most years, eliminating reserve balances. This scenario is not feasible from a financial perspective given the current baseline capital funding capacity. A combination of tax levy and water and sewer user capital levy increases, additional grants, and loan financing would be required to achieve this scenario.

Under the Maintain Existing LOS scenario, the Township's baseline funding capacity exceeds the capital expenditure needs in every year except 2023 and 2024, and overall reserves are adequate to fund the expenditure needs in those years. The annual capital investments in years when baseline funding exceeds capital expenditure needs in this scenario allow the Township to steadily build up capital reserve balances for future capital expenditure needs. While this scenario is feasible from a financial perspective, it is anticipated that the Township would prefer to set a LOS target for capital assets that is higher than the existing LOS provided, requiring an increase in capital investment.

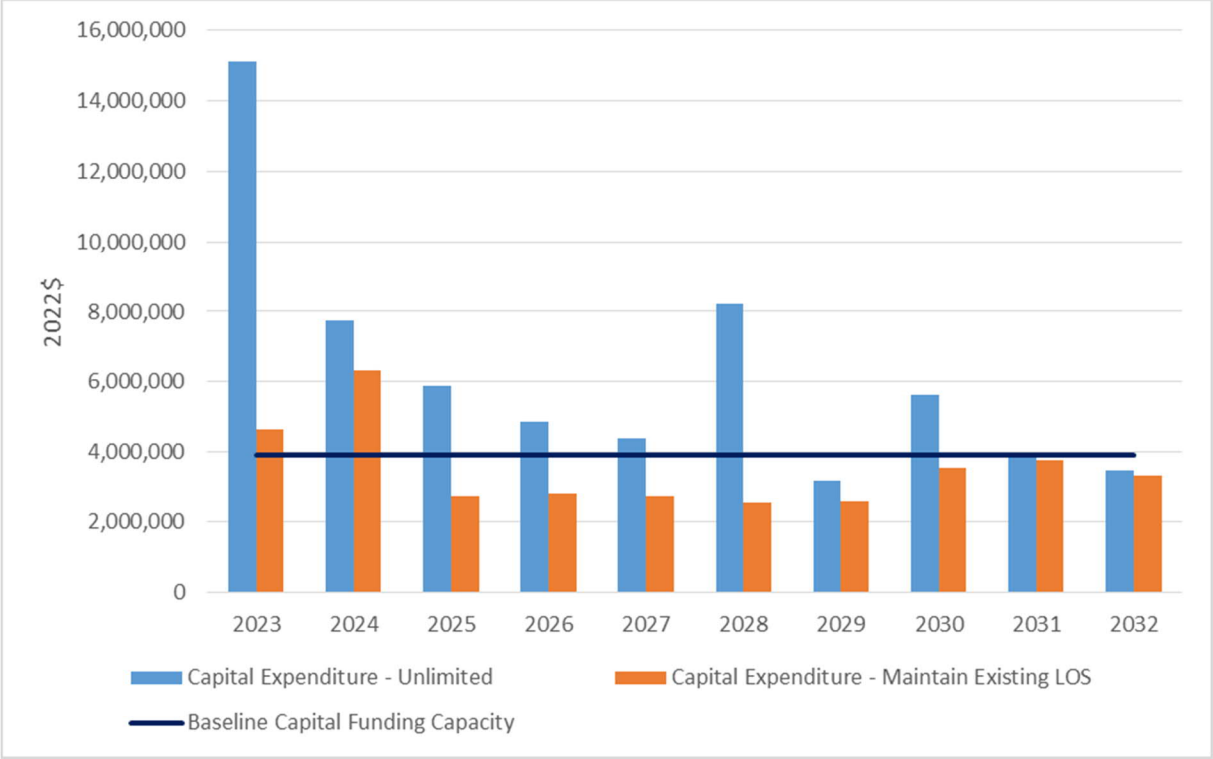


Figure 17: Forecasted Capital Expenditures Relative to Baseline Capital Funding Capacity (2022 Dollars)

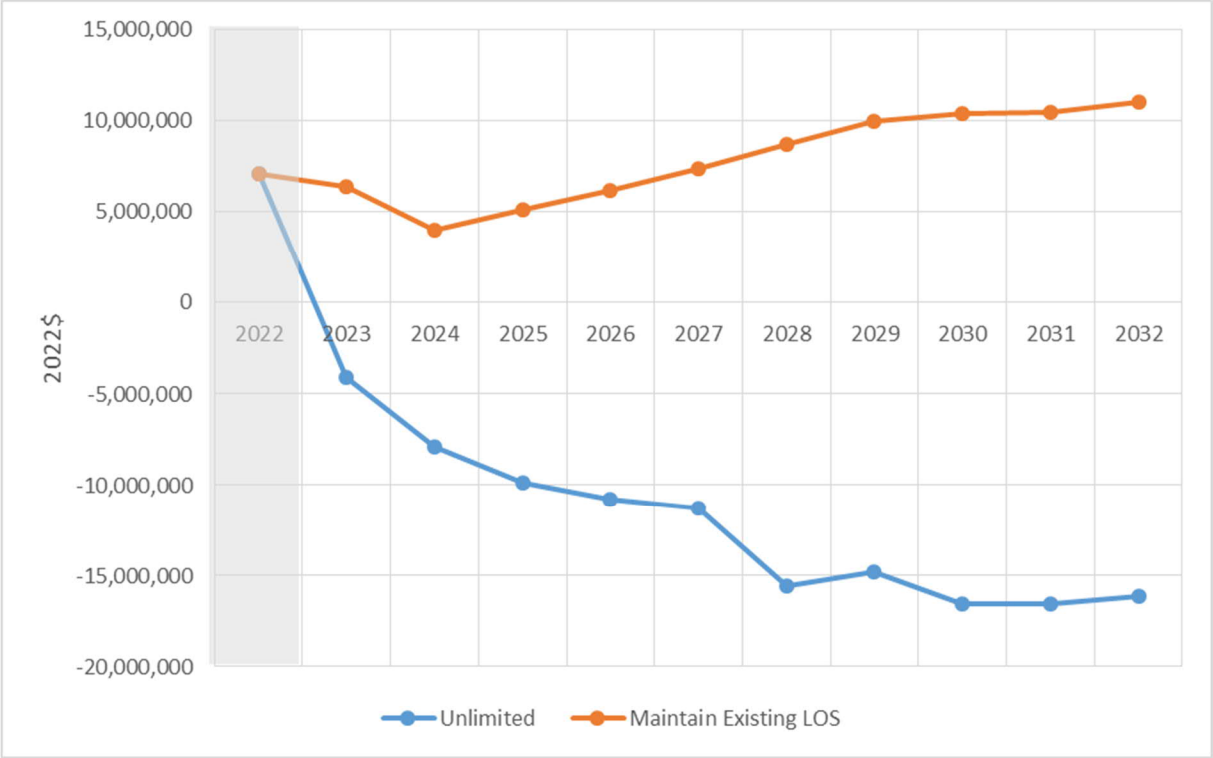


Figure 18: Projected Overall Capital Reserve Balances (2022 Dollars)

A breakdown of the above analysis is included in Table 87 (Unlimited) and Table 88 (Maintain Existing LOS). The annual capital investment or shortfall presented in the tables is the baseline funding capacity less the forecasted capital expenditures required for each scenario. Three categories are included in the breakdown: General, Water, and Sewer. The Township's water and sewer (wastewater) assets are both funded through capital levies paid by users and accrued in dedicated reserve funds. The general category includes all other capital assets and associated reserve funds, with the funding consisting of the operating budget capital reserve contributions, development charges, and grants.

In both scenarios, the water and sewer reserves end up with negative balances at the end of the 10-year forecasts, which shows that the current capital levies on users and reserve balances are not enough to sustain the capital expenditures required for the Township's water and sewer systems. Since the water and sewer systems are intended to be self-funded, the preferred way to mitigate the shortfalls would be to increase the capital levies and obtain other government funding or grants.

Table 87: Funding Needs Breakdown – Unlimited Scenario (2022 Dollars)

Category	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Annual Capital Investments (+) or Shortfall (-)											
General		-1,566,924	440,996	-1,370,979	-383,054	399,721	-144,904	115,227	1,298,221	1,216,071	-206,804
Water		-712,019	213,580	213,580	-151,360	213,580	213,580	213,580	-817,257	-1,492,018	213,580
Sewer		-8,894,219	-4,477,143	-801,422	-422,340	-1,072,920	-4,367,834	412,323	-2,184,330	221,289	412,323
Total		-11,173,163	-3,822,567	-1,958,821	-956,754	-459,619	-4,299,158	741,130	-1,703,366	-54,658	419,099
Reserve Balances (year-end)											
General	4,176,784	2,609,860	3,050,856	1,679,878	1,296,824	1,696,545	1,551,642	1,666,869	2,965,090	4,181,162	3,974,358
Water	704,854	-7,165	206,414	419,994	268,634	482,213	695,793	909,373	92,115	-1,399,903	-1,186,324
Sewer	2,227,755	-6,666,464	-11,143,608	-11,945,030	-12,367,371	-13,440,291	-17,808,125	-17,395,803	-19,580,133	-19,358,844	-18,946,522
Total	7,109,393	-4,063,770	-7,886,337	-9,845,158	-10,801,913	-11,261,532	-15,560,691	-14,819,561	-16,522,927	-16,577,586	-16,158,487

Table 88: Funding Needs Breakdown – **Maintain Existing LOS Scenario (2022** Dollars)

Category	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Annual Capital Investments (+) or Shortfall (-)											
General		-53,857	1,278,213	946,003	1,207,398	918,483	1,100,168	1,076,869	1,162,088	1,287,458	628,243
Water		-712,019	213,580	213,580	-151,360	213,580	213,580	213,580	-817,257	-1,177,961	-100,477
Sewer		28,299	-3,885,335	16,690	15,378	24,709	26,968	13,861	15,009	21,470	36,239
Total		-737,578	-2,393,543	1,176,272	1,071,415	1,156,771	1,340,715	1,304,309	359,839	130,966	564,004
Reserve Balances (year-end)											
General	4,176,784	4,122,927	5,401,140	6,347,143	7,554,541	8,473,024	9,573,192	10,650,061	11,812,149	13,099,607	13,727,850
Water	704,854	-7,165	206,414	419,994	268,634	482,213	695,793	909,373	92,115	-1,085,846	-1,186,324
Sewer	2,227,755	2,256,054	-1,629,282	-1,612,592	-1,597,215	-1,572,506	-1,545,538	-1,531,678	-1,516,669	-1,495,199	-1,458,961
Total	7,109,393	6,371,815	3,978,272	5,154,545	6,225,960	7,382,731	8,723,447	10,027,756	10,387,595	10,518,561	11,082,566

10.4.2 Reinvestment Rates

Another useful perspective for evaluating the adequacy of an asset management financial strategy is reinvestment rates. The reinvestment rate is the annual capital investment as a percentage of the asset replacement value. While the funding analysis in the previous section has the benefit of highlighting years where there will be peaks in capital expenditure needs, reinvestment rates provide a simple annual target.

The 2016 Canadian Infrastructure Report Card found that rates of reinvestment are lower than targets recommended by asset management practitioners. The rate can vary based on factors such as the age of the infrastructure, the level of service and risk tolerance. The values provided are intended to be informative in nature. Table 89 demonstrates the gap between current and target reinvestment levels for the asset categories that the Township owns. Insufficient reinvestment will result in a gradual decline of physical condition levels that will impact municipal service delivery over time

Table 89: Target Reinvestment Rates vs 2016 Canadian Average Reinvestment Rate

Infrastructure Category	Lower Target Investment Rate	Upper Target Investment Rate	Canadian Average Reinvestment Rate (2016)
Potable Water (Linear)	1.0%	1.5%	0.9%
Potable Water (Non-Linear)	1.7%	2.5%	1.1%
Wastewater (Linear)	1.0%	1.3%	0.7%
Wastewater (Non-Linear)	1.7%	2.5%	1.4%
Stormwater (linear)	1.0%	1.3%	0.3%
Stormwater (non-linear)	1.7%	2.0%	1.3%
Roads and Sidewalks	2.0%	3.0%	1.1%
Bridges	1.0%	1.7%	0.8%
Buildings	1.7%	2.5%	1.7%
Sports and Recreation Facilities	1.7%	2.5%	1.3%

As summarized in Section 1.3.1, the total replacement cost for the Township's infrastructure assets is $279.9 million (in 2022 dollars). Table 90 summarizes the equivalent reinvestment rate for the two capital expenditure scenarios considered in this report, as well as the reinvestment rate the Township could achieve through their baseline capital funding capacity alone.

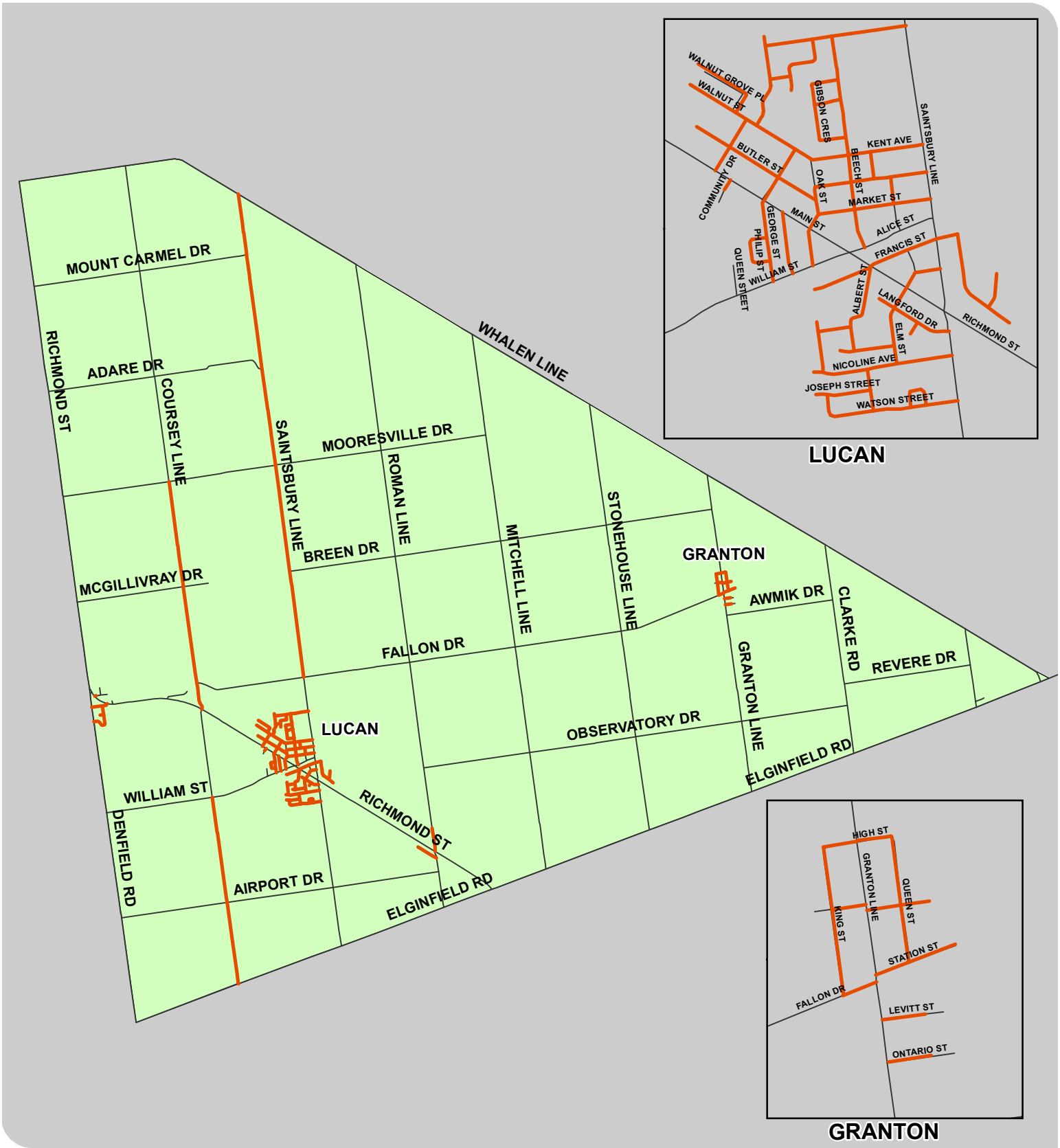
Table 90: Reinvestment Rates (2022 Dollars)

Scenario	Average Annual Capital Expenditures	Reinvestment Rate
Unlimited	6,246,946	2.32%
Maintain Existing LOS	3,522,841	1.31%
Baseline Funding Capacity	3,920,158	1.46%

Appendix A

Current Level of Service (Scope) Figures

DILLON CONSULTING



TOWNSHIP OF LUCAN BIDDULPH
ASSET MANAGEMENT PLAN 2022

OVERALL ROAD NETWORK
FIGURE 1

Township of Lucan Biddulph

TOWNSHIP ROADS
LUCAN BIDDULPH BOUNDARY

DILLON CONSULTING

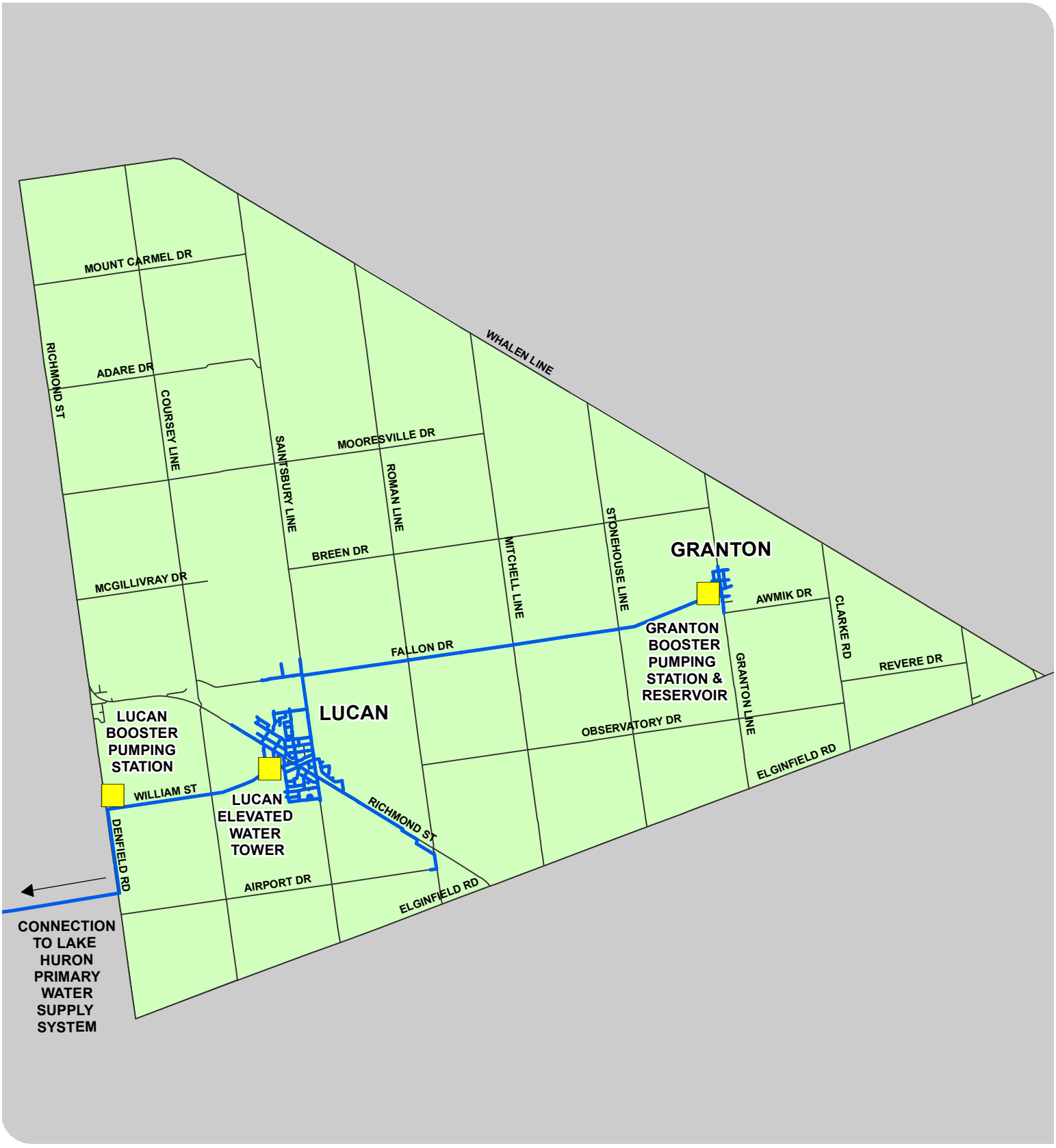
MAP DRAWING INFORMATION:
DATA PROVIDED BY TOWNSHIP OF LUCAN BIDDULPH AND COUNTY OF MIDDLESEX

MAP CREATED BY: CEL
MAP CHECKED BY: JDJ
MAP PROJECTION: NAD 1983 UTM Zone 17N

0 0.5 1 2 km

SCALE 1:100,000

PROJECT: 22-4101 STATUS: DRAFT DATE: 07/01/22



TOWNSHIP OF LUCAN BIDDULPH
ASSET MANAGEMENT PLAN 2022

OVERALL WATER DISTRIBUTION SYSTEM
FIGURE 2

WATERMAIN

LUCAN BIDDULPH BOUNDARY

MAP DRAWING INFORMATION:
DATA PROVIDED BY TOWNSHIP OF LUCAN BIDDULPH AND COUNTY OF MIDDLESEX

MAP CREATED BY: CEL
MAP CHECKED BY: JDJ
MAP PROJECTION: NAD 1983 UTM Zone 17N

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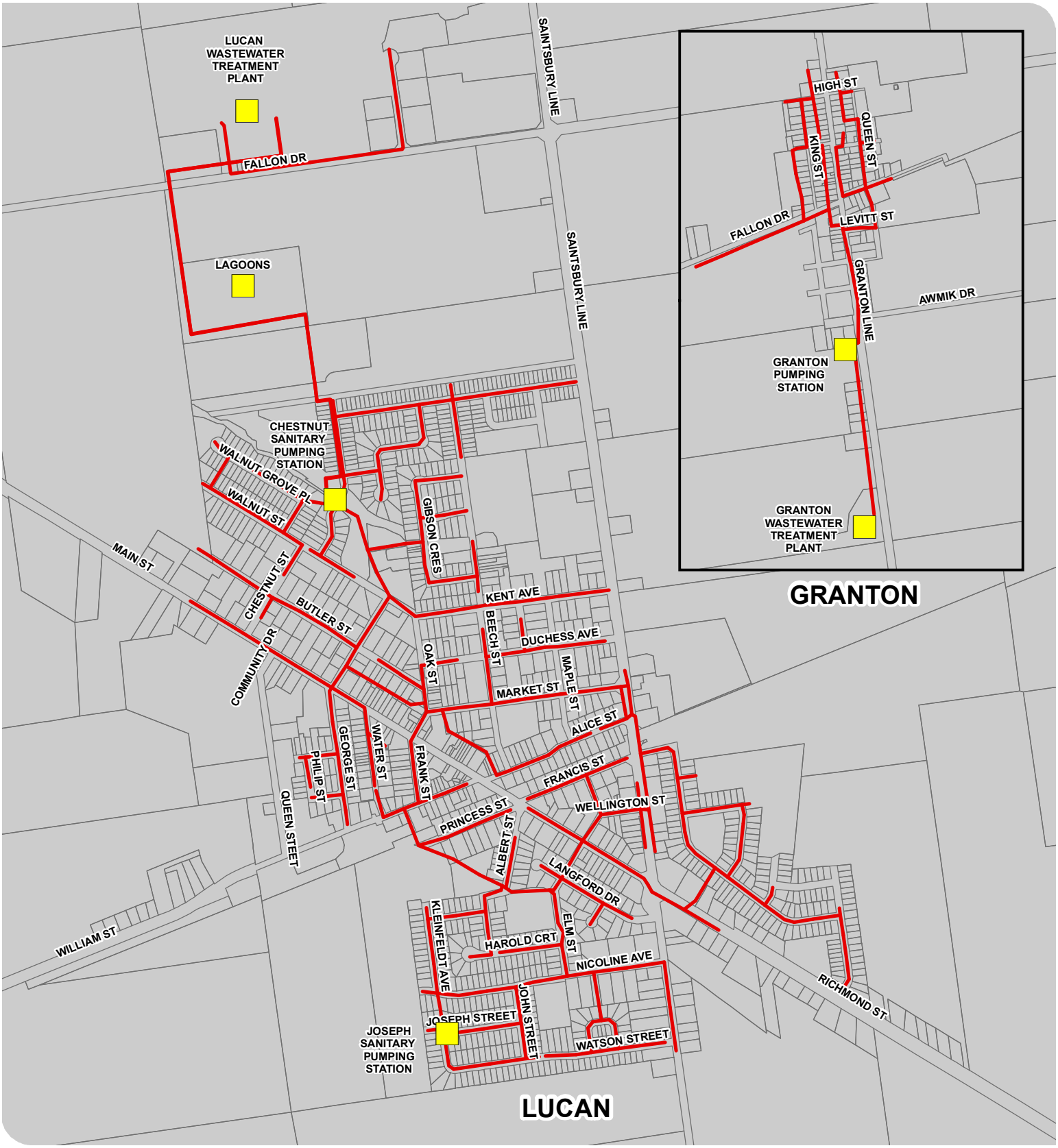
SCALE 1:100,000

DILLON CONSULTING

PROJECT: 22-4101 STATUS: DRAFT DATE: 07/01/22



TOWNSHIP OF LUCAN BIDDULPH
ASSET MANAGEMENT PLAN 2022

OVERALL WASTEWATER COLLECTION SYSTEM
FIGURE 3

Township of Lucan Biddulph

WASTEWATER COLLECTION SYSTEM

PARCELS

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY TOWNSHIP OF LUCAN BIDDULPH AND COUNTY OF MIDDLESEX

MAP CREATED BY: CEL
MAP CHECKED BY: JDJ
MAP PROJECTION: NAD 1983 UTM Zone 17N

PROJECT: 22-4101 STATUS: DRAFT DATE: 07/01/22

TOWNSHIP OF LUCAN BIDDULPH
ASSET MANAGEMENT PLAN 2022

OVERALL STORMWATER COLLECTION SYSTEM
FIGURE 4

Township of Lucan Biddulph

STORMWATER MANAGEMENT FACILITY
STORM SEWERS
PARCELS

MAP DRAWING INFORMATION:
DATA PROVIDED BY TOWNSHIP OF LUCAN BIDDULPH AND COUNTY OF MIDDLESEX

MAP CREATED BY: CEL
MAP CHECKED BY: JDJ
MAP PROJECTION: NAD 1983 UTM Zone 17N

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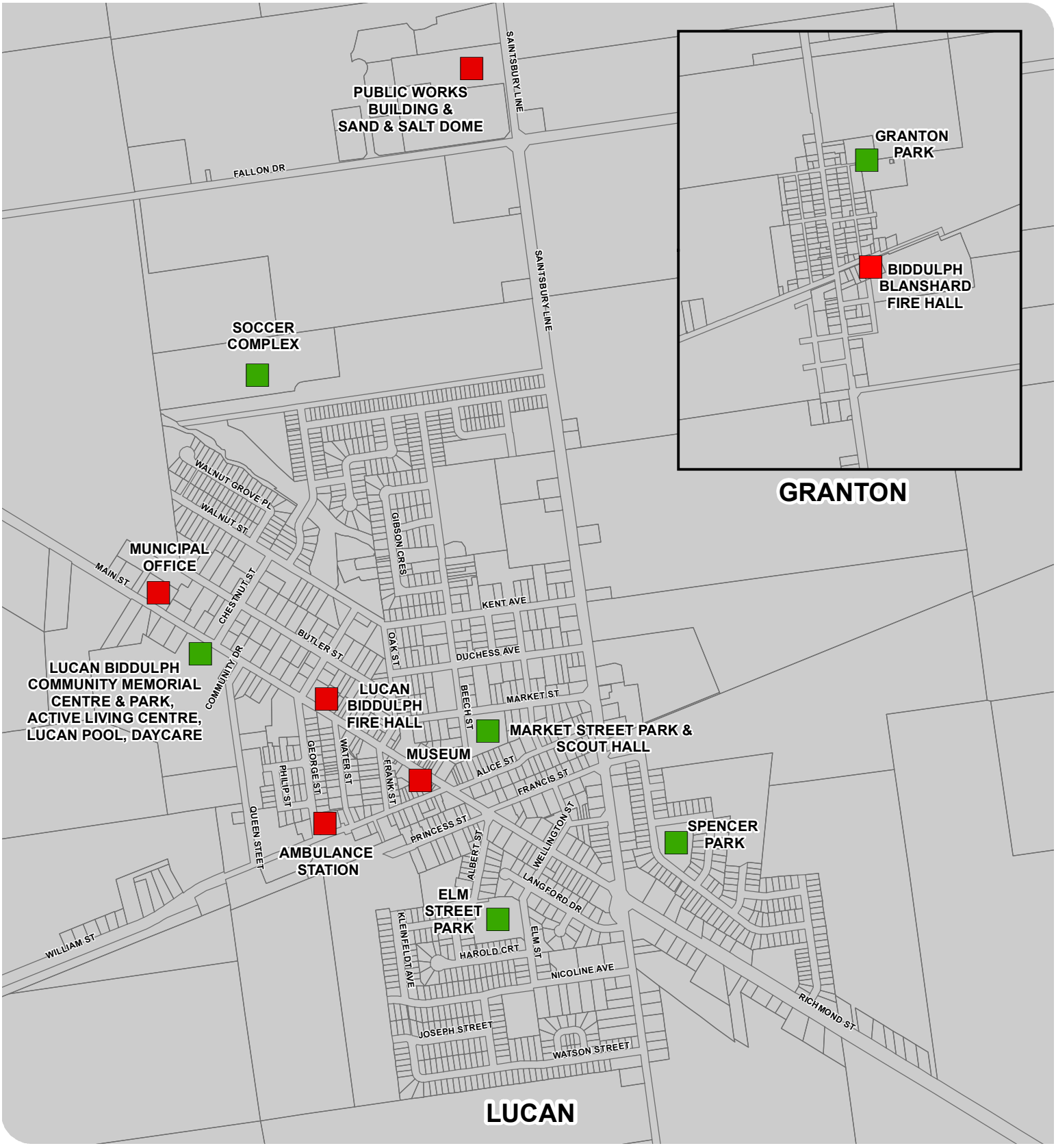
PROJECT: 22-4101 STATUS: DRAFT DATE: 07/01/22



TOWNSHIP OF LUCAN BIDDULPH
ASSET MANAGEMENT PLAN 2022

BUILDINGS & FACILITIES, PARKS & RECREATION ASSET LOCATIONS
FIGURE 5

Township of Lucan Biddulph

PARKS AND RECREATION FACILITIES
BUILDINGS AND FACILITIES
PARCELS

MAP DRAWING INFORMATION:
DATA PROVIDED BY TOWNSHIP OF LUCAN BIDDULPH AND COUNTY OF MIDDLESEX

MAP CREATED BY: CEL
MAP CHECKED BY: JDJ
MAP PROJECTION: NAD 1983 UTM Zone 17N

DILLON CONSULTING

PROJECT: 22-4101 STATUS: DRAFT DATE: 07/01/22

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