GEORGINA

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Asset Management Plan

Core Infrastructure

Town of Georgina

June 2022

Prepared for:

Nancy Fleming, P.Eng.
Manager Asset Management and Technical Services
Operations & Infrastructure

Town of Georgina
26557 Civic Centre Road
Keswick, ON L4P 3G1
T: 905-476-4301 ext. 2303 | georgina.ca

Prepared by:

Chris Lombard, P.Eng. MBA
Project Manager
T: +1.604.444.6400
M: +1.604.314.6167
E: christiaan.lombard@aecom.com

AECOM Canada Ltd.
105 Commerce Valley Drive West
7th Floor
Markham, ON L3T 7W3
Canada
T: 905.886.7022
F: 905.538.8076
aecom.com

Executive Summary

In 2021, the Town of the Corporation of Georgina (the "Town") appointed AECOM Canada Ltd. ("AECOM") to develop an Asset Management Plan (AMP) for its core municipal infrastructure, in accordance with Ontario Regulation (O.Reg.) 588/17, by July 1, 2022.

E.1 Introduction

The scope of the AMP is shown in **Table E.1-1** which outlines the Town's core municipal infrastructure assets and their respective service areas.

Table E.1-1 The Town's Core Infrastructure Assets

Asset Category	Asset Types	Service Area
Roads Infrastructure	Roads, bridges & culverts (> 3 m), sidewalks, streetlights, and roadside safety infrastructure.	Roads Operations
Stormwater	Stormwater mains, laterals, maintenance holes, oil and grit separators, ponds, and Low Impact Developments (LIDs).	Environmental Services
	Ditches, catch basins, driveway culverts, and road crossing culverts (< 3 m in dia.).	Roads Operations
Water	Watermains, service connections, valves, valve chambers, hydrants, water meters, and pump stations.	Environmental Services
Wastewater	Wastewater mains, laterals, maintenance holes, valves, and pump stations.	Environmental Services

The purpose of the AMP is to deliver a financial and technical roadmap for the management of the Town's core municipal infrastructure, described in **Table E.1-1**, and to provide a means for the Town to maximize value from its assets, at the lowest overall expense while, at the same time, providing enhanced service levels for its residents.

The AMP is a compilation of four technical memorandums (TMs) that were prepared throughout the project and which make up the key sections of the AMP which include:

State of Infrastructure	Summarizes the current state of the Town's core municipal infrastructure, including asset quantities, age, estimated service life, remaining service life, condition, and replacement costs.
Level of Service (LoS)	Documents a suite of LoS performance measures required by O. Reg. 588/17 on the quality, reliability, and availability of the core municipal infrastructure services across the community.
AM Strategies	Documents the development of the risk model for the Town's core municipal infrastructure and establishes consistent strategies for condition assessments and operations and maintenance (O&M) across service areas.
Financial Strategies	Provides financial modeling for each asset category to identify renewal needs over a planning horizon of 10, 25, and 50 years; and promotes a systematic approach to the planning and operation of an asset over its lifecycle while minimizing cost and risk.

Key analysis and outputs from the AM Plan are summarized in the subsequent sections.

E.2 State of Infrastructure

A high-level summary of the Town's core asset inventory, including total replacement values, is shown in Table **E.2-1**.

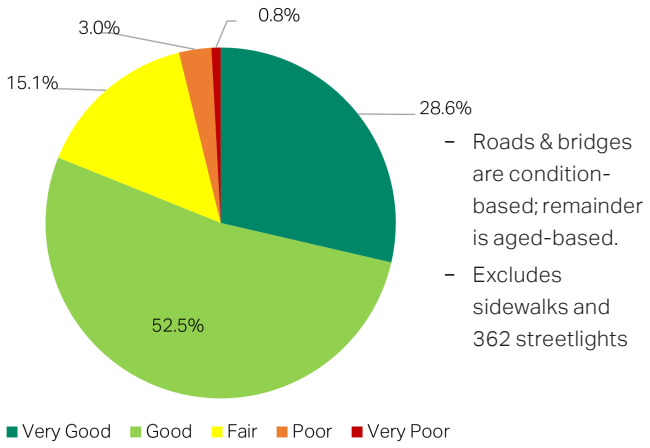
Table E.2-1 Asset Inventory Summary

Asset Category	Asset Sub-Group	Asset	Quantity	Total Replacement Value
Water	Water Linear	Watermains	218 km	$103,988,000
		Service Connections	13,750 each	$34,375,000
		Valves	3,290 each	$21,109,000
		Valve Chambers	278 each	$3,070,000
		Hydrants	1,509 each	$14,864,000
		Water Meters	13,750 each	$6,187,500
	Water Facilities	Pump Stations	2 each	$8,960,000
			Water Total	**$192,553,500**
Wastewater	Wastewater Linear	Forcemains	17 km	$9,682,000
		Gravity Mains	185 km	$84,031,000
		Laterals	13,750 each	$55,000,000
		Maintenance Holes	2,561 each	$28,376,000
		Valves	3,318 each	$165,000
	Wastewater Facilities	Pump Stations	18 each	$18,360,000
			Wastewater Total	**$195,614,000**
Stormwater	Stormwater Linear	Stormwater Mains	71 km	$64,135,000
		Stormwater Laterals	33 km	$35,412,000
		Stormwater Maintenance Holes	1,210 each	$28,626,000
		Ditches	463 km	$291,413,000
		Driveway Culverts	7,577 each	$34,410,000
		Roadway Crossing Culverts*	13 km	$9,152,000
	Stormwater Facilities	Stormwater Management Ponds	20 each	$9,815,000
		Oil and Grit Separators	21 each	$525,000
		Catch Basins	3,260 each	$47,823,000
	Stormwater LID	Infiltration & Exfiltration Galleries	2 projects	Under construction
		Bioswales	1 project	Under construction
			Stormwater Total	**$521,761,000**
Roads Infrastructure	Roads	Collector Roads	38 centerline-km	$117,066,000
		Local Roads	180 centerline-km	$288,470,000
		Rural Roads	119 centerline-km	$171,852,000
	Bridges & Culverts	Bridge	9 each	$7,129,000
		Culvert (> 3 m in span)	8 each	$4,533,000
	Other	Sidewalks	120 km	$29,691,000
		Streetlights	4,381 each	$35,048,000
			Roads Infrastructure Total	**$653,790,000**
			Asset Inventory Total	**$1.5 B**

** Less than 3 m in diameter.*

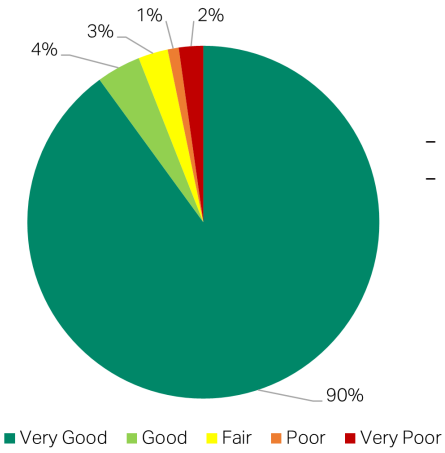
The assessment of the physical condition of the Town's core municipal infrastructure was based on a desktop review of existing condition data. Where empirical data was not available an age-based approach was applied to assess the condition. It should be noted that no on-site condition assessments were carried out for this project. **Figure E.2-1** illustrates the condition across each asset group weighted by replacement values.

Roads Infrastructure Condition Summary



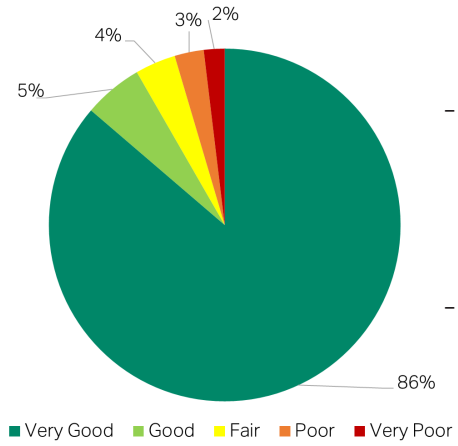
- Roads & bridges are condition-based; remainder is aged-based.
- Excludes sidewalks and 362 streetlights

Water Condition Summary



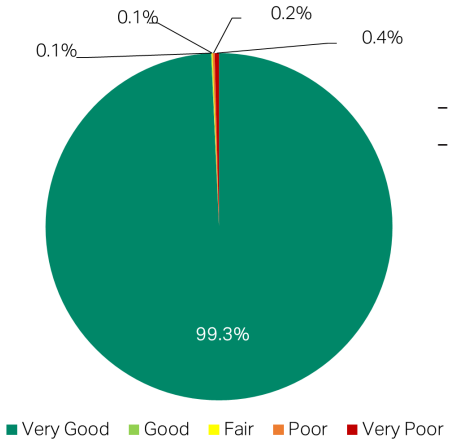
- All aged-based
- Excludes service connections and water meters (no age data available)

Wastewater Condition Summary



- 50% of sewers and four pump stations are condition-based;remainder is aged-based
- Excludes laterals (no age data available)

Stormwater Condition Summary



- All aged-based
- Excludes ditches, road crossing culverts, OGS, and stormwater ponds (no age data available)

Figure E.2-1 The Town's Core Infrastructure Asset Condition Assessment

For further details on the Town's state of infrastructure across its core municipal infrastructure please refer to **Section 2** of the AMP.

E.3 Levels of Service (LoS)

O. Reg. 588/17 stipulates that community and technical LoS must be provided for all municipal core infrastructure. Community LoS uses qualitative descriptions to describe the scope, quality, or availability of the service delivered by the asset; whereas technical LoS use metrics to quantitatively measure the service being delivered by the asset.

O. Reg. 588/17 requires that by July 1st, 2025, the LoS measures shown in **Table E.3-1** be formalized along with the activities required for those measures, and a strategy to fund those activities. For further information on LoS and the Town's approach please refer to **Section 3** of the AMP.

Table E.3-1 O.Reg 588/17 Level of Service Measures

Asset Category	Community Levels of Service	Technical Levels of Service
Water	– Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal water system. – Description, which may include maps, of the user groups or areas of the municipality that have fire flow.	– Percentage of properties connected to the municipal water system. – Percentage of properties where fire flow is available
	– Description of boil water advisories and service interruptions.	– The number of connection-days per year where a boil water advisory notice is in place compared to the total number of properties connected to the municipal water system. – 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.
Wastewater	– Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal wastewater system.	– Percentage of properties connected to the municipal wastewater system.
	– Description of how stormwater can get into sanitary sewers in the municipal wastewater system, causing sewage to overflow into streets or backup into homes. – Description of how sanitary sewers in the municipal wastewater system are designed to be resilient to avoid events described in previous bullet point. – Description of the effluent that is discharged from sewage treatment plants in the municipal wastewater 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 number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system. – The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system.
Stormwater	– 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.	– Percentage of properties in municipality resilient to a 100-year storm. – Percentage of the municipal stormwater management system resilient to a 5-year storm.

Asset Category	Community Levels of Service	Technical Levels of Service
Roads Infrastructure	– Description, which may include maps, of the road network in the municipality and its level of connectivity.	– Number of lane-kilometers of each of arterial roads, collector roads and local roads as a proportion of square kilometers of land area of the municipality.
	– Description or images that illustrate the different levels of road class pavement condition.	– For paved roads in the municipality, the average pavement condition index value. – For unpaved roads in the municipality, the average surface condition.
	– Description of the traffic that is supported by municipal bridges (e.g., heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, cyclists).	– Percentage of bridges in the municipality with loading or dimensional restrictions.
	– 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.	– For bridges in the municipality, the average bridge condition index value. – For structural culverts in the municipality, the average bridge condition index value.

The Town's current service levels for the measures outlined in **Table E.3-1** are documented in **Table 3-2** to **Table 3-6** in **Section 3.3**. Additional maps and figures that support the Town's O. Reg. 588/17 LoS measures are included in **Appendix C**.

E.4 AM Strategies

Assessing asset risk is a necessary component of any AMP to understand which assets are most exposed to risk, and thus the most critical; in turn, this information is used to drive the prioritization of appropriate maintenance activities and to target investments that reduce risk exposure most effectively.

In order to assess risk, it is generally accepted that the probability of asset failure (PoF) and the consequence of asset failure (CoF) be independently assessed and multiplied, as shown in the equation:

$$\textbf{Risk} = \textbf{Probability of Failure} \times \textbf{Consequence of Failure}$$

In order to evaluate risk, it is important to develop a data-driven quantitative risk model to ensure that risk assessments are structured, consistent, and repeatable. As such, a Risk Model was developed for the Town's core infrastructure assets which utilized a triple-bottom-line approach by applying the following three criticality indices

ECONOMIC

Impact of the asset's failure on monetary resources

SOCIAL

Impact of the asset's failure on society

ENVIRONMENTAL

Impact of the asset's failure on the environment

Further information on the risk approach, methodology, and analysis is documented in **Section 4.1**. A conceptual version of the Town's Risk Model is included in **Appendix E** and a series of linear risk maps, prepared in ArcGIS, are included in **Appendix F** for visual reference.

The risk score outputs from this assignment were used to inform asset management planning and prioritize asset rehabilitation and renewal for the Town's core infrastructure assets. As shown in Figure E.4-1, all actions for the first year are ranked by risk score and funded in this order until the budget constraint is reached. All unfunded activities roll over to the next year and the prioritization process continues. This approach is beneficial especially when there are budget constraints.

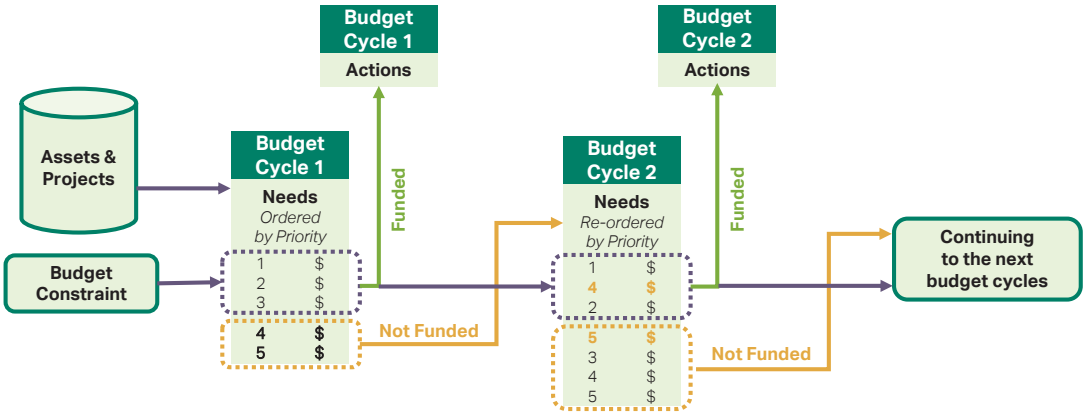


Figure E.4-1 Use of Risk to Prioritize Asset Renewal

A MS Excel Lifecycle Model was developed to calculate and determine the actions to replace assets as they age and move past their Estimated Service Life. Please refer to **Section 5.1** for further information on the Town's Asset Lifecycle Model including asset renewal needs forecasted over the next 10-, 25-, and 50-Years.

E.5 Financial Strategies

The financial strategy section identifies the annual cost of O&M and capital renewal reserve contributions required to deliver the services provided by the Town's core assets and describes how the Town could fund these needs. Like other Canadian Municipalities, the Town of Georgina is facing an infrastructure funding gap which is defined as the difference between the sustainable funding required to keep the assets in a state of good repair and the revenue from available resources.

Mitigating the infrastructure gap requires either an increase of funds available for infrastructure renewal or a reduction in service levels. However, reducing service levels of critical infrastructure, such as roads and utilities, is not a viable or recommended solution. The analysis in **Section 5.2** of the AMP describes the impacts of increasing revenues and recommends a phased-in approach to support taxpayer affordability and gradually close the infrastructure gap.

A summary of the Town's infrastructure funding gap is shown in **Table E.5-1** which reflects the current available funding as well as the average annual O&M investment and capital contributions proposed to achieve financial sustainability.

Table E.5-1 The Town's Core Municipal Infrastructure Funding Gap

Asset Category		Current Annual Funding	Proposed Annual Funding	Annual Funding Shortfall
Water	O&M	$1,903,210	$1,998,371	($95,161)
	Capital	$100,000	$3,500,000	($3,400,000)
Wastewater	O&M	$1,138,720	$1,406,465	($267,745)
	Capital	$100,000	$2,500,000	($2,400,000)
Stormwater	O&M	$412,430	$921,878	($509,448)
	Capital	$100,000	$975,000	($875,000)
Roads Infrastructure	O&M	$3,632,810	$4,836,887	($1,204,077)
	Capital	$5,889,019	$12,435,000	($6,545,981)
			Total O&M	**($2,076,431)**
			Total Capital	**($13,220,981)**

Please refer to **Sections 5.2.1** and **5.2.2** for further details on the Town's infrastructure gap presented in **Table E.5-1** and the recommended financial strategies to meet funding requirements.

E.6 Continuous Improvement

Presented in **Table E.6-1** is a suite of **27 improvement** initiatives that came out of this study, of which several high priority initiatives have been identified for implementation over the next four years. Please refer to Section 6 of the AMP for a detailed description of each improvement initiative as well as guidance on their sequencing and implementation.

Table E.6-1 Summary of AM Improvement Initiatives

Improvement Initiative	Description
State of Infrastructure	
A-1.	Link assets across data sources with unique IDs
A-2.	Refine the asset hierarchy
A-3.	Refine the asset inventory*
A-4.	Develop an Asset Condition Assessment Program*
A-5.	Develop a Standardized Maintenance Work Template
Level of Service	
B-1.	Review the LoS performance measures on an annual basis, and update asset performance data as required
B-2.	Refine the LOS Framework*
B-3.	Document information workflows and clearly define roles & responsibilities in the continual improvement planning process
B-4.	Analyse and monitor LoS performance data
B-5.	Develop a Customer Consultation Plan*
B-6.	Prepare a Demand Management Strategy*
B-7.	Develop a Climate Change Adaptation Plan*
AM Strategies	
C-1.	Approve and implement the updated AM Policy*
C-2.	Refine the Risk Framework*
C-3.	Develop a Risk Contingency Plan*
C-4.	Consolidate the asset O&M activities into one centralized database and ensure each activity is assigned a unique maintenance activity code*
C-5.	Track O&M costs at the asset level*
C-6.	Establish Standard Operating Procedures (SOP) for maintenance activities*
C-7.	Develop an AM Software Strategy
C-8.	Continue overlaying risk models with the current state of the assets (i.e., condition) and refine asset unit costs and estimated services lives (ESLs) to drive the funding need forecast*
C-9.	Align the Financial and Non-Financial Functions of AM
Financial Strategies	
D-1.	Review staff availability and increase staff resources to complete O&M work and capital projects as required*
D-2.	For tax-supported services, consideration should be given to increasing the Town's infrastructure tax levy
D-3.	For utility rate supported service, consideration should be given to a one-time rate increase over and above the normal inflationary increases

** Denotes a high priority improvement initiative.*

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List of Abbreviations

Abbreviation	Description
AADT	Annual Average Annual Daily Traffic
AC	Asbestos Cement
AM	Asset Management
AMP	Asset Management Plan
ASTM	American Society for Testing and Materials
Avg.	Average
AWWA	American Water Work Association
BCI	Bridge Condition Index
CCTV	Closed-Circuit Television
CI	Cast Iron
CIBI	Canadian Infrastructure Benchmarking Initiatives
CMMS	Computerized Maintenance Management System
CoF	Consequence of Failure
CP	Concrete Pipe
CPP	Concrete Pressure Pipe
CSP	Corrugated Steel Pipe
DI	Ductile Iron
Dia.	Diameter
DWQMS	Drinking Water Quality Management System
ECA	Environmental Compliance Approval
ESA	Environmentally Sensitive Area/Electrical Safety Authority
ESC	ES Concrete
ESL	Expected Service Life
EXP	Expanded Asphalt
FCM	Federation of Canadian Municipalities
GIS	Geographic Information System
HCB	High Class Bituminous
HDPE	High Density Polyethylene
HVAC	Heating, Ventilation, and Air Conditioning
I&I	Inflow & Infiltration
ICI	Industrial, Commercial, and Institutional
IDF	Intensity-Duration-Frequency
Km	Kilometer
KPI	Key Performance Indicators

Abbreviation	Description
LCB	Low Class Bituminous
LED	Light Emitting Diode
LID	Low Impact Development
LoS	Level of Service
LSPP	Lake Simcoe Protection Plan
LSRCA	Lake Simcoe Region Conservation Authority
m	Meter
M	Million
MECP	Ministry of the Environment, Conservation and Parks
MMS	Minimum Maintenance Standards
NASSCO	National Association of Sewer Service Companies
NTBI	National Transportation Benchmarking Initiative
NWWBI	National Water and Wastewater Benchmarking Initiative
O&M	Operations and Maintenance
O. Reg.	Ontario Regulation
OGS	Oil and Grit Separators
OIC	Operator In-Charge
OPSS	Ontario Provincial Standard Specifications
ORO	Overall Responsible Operator
OSIM	Ontario Structure Inspection Manual
OTM	Ontario Traffic Manual
PACP	Pipeline Assessment Certification Program
PCI	Pavement Condition Index
PE	Polyethylene
PoF	Probability of Failure
PPR	Pipe Penetrating Radar
PS	Pump Station
PVC	Polyvinyl Chloride
R.S.O.	Revised Statutes of Ontario
RC	Reinforced Concrete
S.O.	Statutes of Ontario
SAMP	Strategic Asset Management Plan
SC	Service Connection
SCADA	Supervisory Control and Data Acquisition
SOP	Standard Operating Procedures
SPS	Sewer Pump Stations

Abbreviation	Description
SWM	Stormwater Management
TCA	Tangible Capital Asset
TM	Technical Memorandum
Trt.	Treatment
UNK	Unknown
VFD	Variable Frequency Drive
VSD	Variable Speed Drives
WERF	Water Environment Research Foundation
Yr.	Year

01

Introduction

Asset Management is an integrated process, bringing together skills, expertise, and activities of people; with information about a community's physical assets; and finances; so that informed decisions can be made, supporting sustainable service delivery.

1.1 Purpose

In 2012, the Ontario Ministry of Economic Development, Employment and Infrastructure developed a Guide for the municipal asset management plan (AMP) called, "Building Together: Guide for Municipal Asset Management Plans". In December 2017, O. Reg. 588/17 Asset Management Planning for Municipal Infrastructure came into effect. This regulation outlines formal municipal responsibilities for asset management planning throughout Ontario. It includes requirements for an asset management Policy, as well as a phased approach for expanding and improving municipal AMP.

The purpose of this AM Plan is to deliver a financial and technical roadmap for the management of the Town's core assets, and to provide the means for the Town to maximize value from its assets, at the lowest overall expense while, at the same time, providing enhanced service levels for its residents.

1.2 Objective

The objectives of this AMP, across each of the key sections, are as follows:

State of Infrastructure

- Prepare an inventory for each of the asset categories within the Town's core municipal infrastructure.
- Identify data gaps where information does not exist or where additional data is needed to support asset management decisions.
- Summarize existing asset management tools and technologies used by the Town.
- Document current asset management processes, challenges, and opportunities through discussion with the Town's Operations and Infrastructure staff.
- Review current maintenance strategies and programs for each of the core asset categories.
- Identify factors which could lead to accelerated deterioration, unplanned repairs, and / or asset failure.
- Document current procedures in place for updating asset data in the Town's current work management system, Worktech. (CMMS).

Levels of Service

- Link corporate strategic objectives to customer expectations and technical operations.
- Balance customer needs and expectations while evaluating the effectiveness of operations and whether the right Level of Service (LoS) is being provided at the right cost.
- Transition from an "asset stewardship" approach that focuses on making decisions based on maintaining assets in an acceptable condition to a "serviceability" approach that is geared towards making decisions based on balancing the costs, risks, and goals for the LoS being provided by the Town's assets.
- Communicate the physical nature of infrastructure that the Town owns, and is financially responsible for, while promoting the use of LoS to enable effective consultation with stakeholders regarding alternative funding options according to desired LoS outcomes.
- Make recommendations on strategies that the Town can take now to minimize future renewal costs while ensuring that adequate LoS can be delivered without burdening the economic, social, and financial needs of future generations.
- Assess internal (e.g., program changes) and external (e.g., climate change) factors that have the potential to impact the Town's ability to deliver services and how these factors may impact the LoS being provided.
- Implement a corporate continuous improvement program to further optimize asset management across all service areas.

Asset Management Strategies

- Update the Town's asset management Policy.
- Development of risk framework for the Town's core municipal infrastructure.
- Establish a condition assessment strategy for each of the asset type.
- Conduct operations and maintenance planning and provide operating budget forecasting.

Financial Analysis and Strategy

- Provide a systematic approach for the planning and operation of an asset over its lifecycle while minimizing cost and risk.
- Develop financial models for each asset category for identifying asset renewal needs over planning horizon of 10, 25, and 50 years.
- Use benchmarking with other Canadian municipalities on the capital budgets and operating budgets prepared to provide a comparison.
- Review all available financial plans and undertake a financial analysis of historical capital and operational expenditures made over the past five (5) years on core asset categories.
- Prepare a consolidated summary of expenditure projections for capital, operations and maintenance plans and actual revenue sources for implementing the plans.

Implementation Plan and Continuous Improvement

- Prioritize asset management initiatives for continuous improvement based on three outlook periods (1-5 years, 5-10 years and 10- 25 years).
- Develop a change management strategy outlining suggested change management processes and initiatives required to successfully develop asset management practices that include a detailed implementation plan with a phase in approach for the Town to follow.

1.3 Approach

This AM Plan is a compilation of four technical memo (TM) deliverables that were prepared throughout the project as shown in **Figure 1-1**.

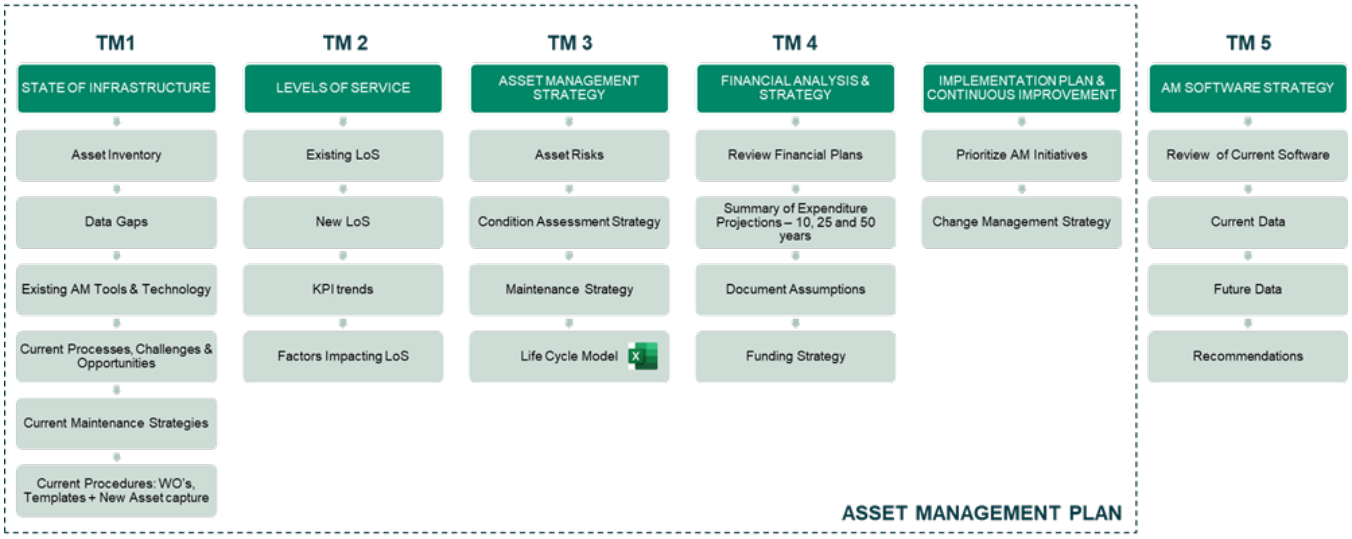


Figure 1-1 AM Plan Approach & Methodology

1.4 Scope

Table 1-1 documents the in-scope service areas of this AM Plan, which includes the Town's core infrastructure assets and their respective asset types.

Table 1-1 In-Scope Core Infrastructure Assets

Service Area	Asset Category	Asset Types
Roads Operations Division	Road Infrastructure	Roads, bridges & culverts (> 3 m), sidewalks, streetlights, and roadside safety infrastructure.
	Stormwater	Ditches, catch basins, driveway culverts, and road crossing culverts (< 3 m in dia.).
Environmental Services Division	Water	Watermains, service connections, valves, valve chambers, hydrants, water meters, and pump stations.
	Wastewater	Wastewater mains, laterals, maintenance holes, valves, and pump stations.
	Stormwater	Stormwater mains, laterals, maintenance holes, oil and grit separators, stormwater ponds, and LIDs.

02

State of Infrastructure

2.1 Inventory & Hierarchy

For developing a meaningful AMP, the core municipal infrastructure inventory must be granular enough to identify which individual assets are due for renewal (refurbishment or replacement). However, it is important to note the fine balance between adequate granularity to provide the necessary information, and too much granularity that the effort to collect and manage the information outweighs the usefulness of the data itself.

The asset hierarchy for the Town's core municipal infrastructure is presented in **Figure 2-1**. The asset hierarchy is derived from the way the assets are presented within its data sources and shows program area responsibilities and parent-child relationships within each asset type.

Driveway culverts, road crossing culverts, ditches, and catch basins were in the scope of the development of stormwater asset inventory, however, these assets are maintained by the Roads Operation Division. As such, the summary of these asset categories is linked to the Roads Operation Division in **Figure 2-1** (as shown by the dotted line).

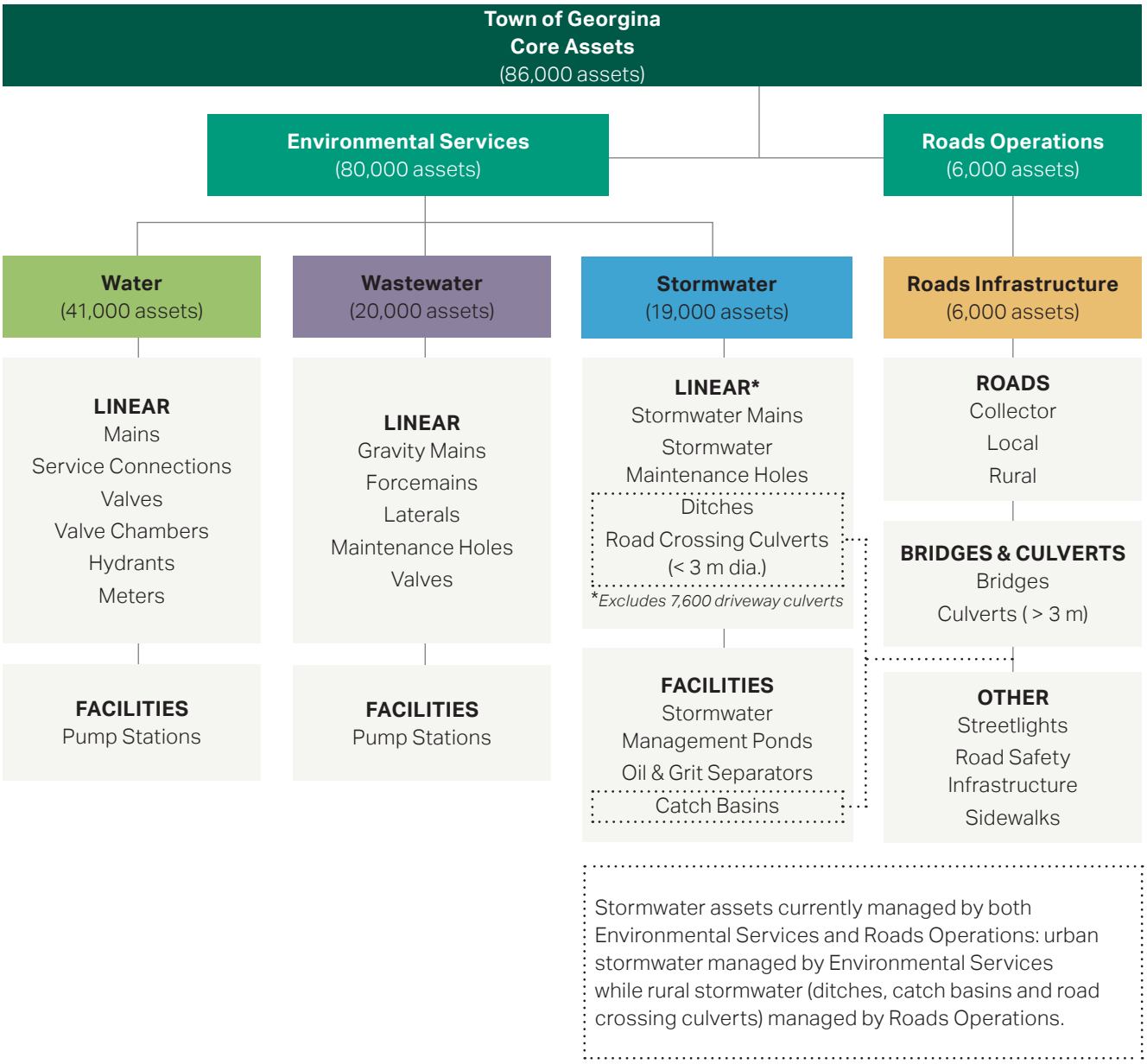


Figure 2-1 Town of Georgina Core Infrastructure Asset Hierarchy

Good asset information enables better decisions to be made, such as determining the optimal maintenance or renewal frequency for an asset.

2.1.1 Water

The Town's water is sourced from Lake Simcoe and treated and supplied by York Region through a 218 km water distribution network, operated and maintained by the Town. Supplying safe, drinkable water to residential, industrial, commercial, and institutional customers involves managing a reliable water system capable of providing sufficient quality, flow, and pressure to satisfy customer needs. In total, approximately 68% of the Town's properties are connected to the municipal water system where drinking water and fire flow is provided to all connected customers.

The Town's water assets are managed and maintained to meet provincially issued system and facility operating permits, as well as the Town's performance and reliability targets. Valued at approximately $193M, the water assets can be categorized into two groups: water linear and water facilities (**Table 2-1**). The water assets are further divided into seven asset categories. The water linear asset group includes watermains, service connections, valves, valve chambers, and hydrants; and the water facility asset group includes pump stations.

Table 2-1 Water Asset Inventory and Replacement Value

Asset Sub-Group	Asset Category	Quantity	Unit Replacement Cost ($/Unit)*	Total Replacement Value ($)
Water Linear	Watermains	218 km	$200 - $1,260 / m	$103,988,000
	Service Connections	13,750 each	$2,500 / each	$34,375,000
	Valves	3,290 each	$4,420 - $13,250 / each	$21,109,000
	Valve Chambers	278 each	$11,040 / each	$3,070,000
	Hydrants	1,509 each	$9,850 / each	$14,864,000
	Water Meters	13,750 each	$450 / each	$6,187,500
Water Facilities	Pump Stations	2 each	$4,480,000 / each	$8,960,000
			Water Linear Total	**$183,593,500**
			Water Linear + Facilities Total	**$192,553,500**

** Unit cost ranges are due to varying pipe diameters.*

2.1.2 Wastewater

The Town's wastewater collection system is a combination of linear sewer mains and pumping stations that collect wastewater and, in turn, discharge that wastewater into the Region's transmission mains. This wastewater is eventually transferred to the Region's wastewater treatment plants, where it is treated and discharged into Lake Simcoe. The Town's wastewater collection system is designed to collect residential, industrial, commercial, and institutional wastewater.

The Town's wastewater assets are managed and maintained to meet provincially issued system and facility operating permits, as well as the Town's technical targets for performance and reliability. Valued at approximately $196M, the wastewater assets can be categorized into two groups: wastewater linear and wastewater facilities (**Table 2-2**). The wastewater assets are further divided into six asset categories. The wastewater linear asset group includes force mains, gravity mains, laterals, maintenance holes, and valves; and the wastewater facility asset group includes pump stations.

Table 2-2 Wastewater Asset Inventory and Replacement Value

Asset Sub-Group	Asset Category	Quantity	Unit Replacement Cost ($/Unit)*	Total Replacement Value ($)
Wastewater Linear	Forcemains	17 km	$390 - $1,110 / m	$9,682,000
	Gravity Mains	185 km	$460 - $760 / m	$84,031,000
	Laterals	13,750 each	$4,000 / each	$55,000,000
	Maintenance Holes	2,561 each	$11,080 / each	$28,376,000
	Valves	3,318 each	$4,420 - $6,410 / each	$165,000
Wastewater Facilities	Pump Stations	18 each	$1,020,000 / each	$18,360,000
			Wastewater Linear Total	**$177,254,000**
			Wastewater Linear + Facilities Total	**$195,614,000**

** Unit cost ranges are due to varying pipe diameters.*

2.1.3 Stormwater

Stormwater management practices help minimize the impact of polluted runoff flowing into lakes and streams, and reduce the strain that stormwater places on municipal infrastructure. The Town has taken steps to update its Comprehensive Stormwater Management Master Plan[1], developed in 2017, to manage the potentially damaging effects of stormwater and achieve alignment of the policies of the Lake Simcoe Protection Plan (LSPP) and the Lake Simcoe Phosphorus Reduction Strategy.

As an extension of this AMP assignment, the Town undertook work to develop a stormwater asset inventory to quantify the assets the Town owned as this was identified as an area where data gaps existed.

The total replacement value of the Town's stormwater assets is approximately $522M presented in **Table 2-3**. There are three key stormwater asset sub-groups: Stormwater Linear, Stormwater Facilities, and Stormwater Low Impact Development (LID). These asset sub-groups are operated and maintained between the Environmental Services and Roads Operations Divisions. Ditches, driveway culverts, roadway crossing culverts, and catch basins are stormwater infrastructure assets that are operated and maintained by the Town's Roads Operations Division; while linear stormwater and stormwater ponds found in urbanized areas of the Town are operated and maintained by the Environmental Services Division (see **Figure 2-1** for reference).

[1] Aquafor Beech Ltd. (2017): Georgina Comprehensive Stormwater Management Master Plan

Table 2-3 Stormwater Asset Inventory and Replacement Value

Division	Asset Sub-Group	Asset Category	Quantity	Unit Replacement Cost ($/Unit)*	Total Replacement Value ($)
Environmental Services	Stormwater Linear	Stormwater Mains	71 km	$310 - $5,070 / m	$64,135,000
		Stormwater Laterals	33 km	$840 - $2,850 / m	$35,412,000
		Stormwater Maintenance Holes	1,210 each	$11,080 - $33,200 / each	$28,626,000
	Stormwater Facilities	Stormwater Management Ponds	20 each	$67,700 - $1,705,100 / each	$9,815,000
		Oil and Grit Separators	21 each	$25,000 / each	$525,000
	Stormwater Low Impact Development (LID)	Infiltration & Exfiltration Galleries	2 projects	$380 - $500 / m	Under Construction
		Bioswales	1 project	$380 - $500 / m	Under Construction
Roads Operations	Stormwater Linear	Ditches	463 km	$630 / m	$291,413,000
		Driveway Culverts	7,577 each	$560 / m	$34,410,000
		Roadway Crossing Culverts (< 3 m in dia.)	13 km	$270 - $3,570 / m	$9,152,000
	Stormwater Facilities	Catch Basins	3,260 each	$11,080 - $33,200 / each	$47,823,000
				Stormwater Linear Total	**$463,598,000**
				Stormwater Linear + Facilities Total	**$521,761,000**

** Unit cost ranges are due to varying pipe diameters and facility capacities.*

2.1.4 Roads Infrastructure

The Roads Infrastructure maintained and operated by the Town's Roads Operations Division includes roads, bridges and culverts (structural culverts with a span over 3 m), sidewalks, and streetlights. The Town is committed to maintaining and rehabilitating its local roads and keeping them in good repair for the benefit of the community.

The current replacement value of the Town's roadways network is approximately $577M, and the total length of the road network is approximately 337 centerline kilometers. The Town's Road network is classified by Collector Roads, Local Roads, and Rural Roads. The Town has a total of 9 bridges and 8 culverts which are currently valued at approximately $12M. The total replacement value for the Town's roads infrastructure (including the road network, bridges and culverts, sidewalks, and streetlights) is approximately $654M (**Table 2-4**).

Table 2-4 Roads Infrastructure Asset Inventory and Replacement Value

Asset Sub-Group	Asset Category	Quantity	Unit Replacement Cost ($/Unit)*	Total Replacement Value ($)
Roads	Collector Roads	38 centerline-km	$414 / m²	$117,066,000
	Local Roads	180 centerline-km	$235 / m²	$288,470,000
	Rural Roads	119 centerline-km	$235 / m²	$171,852,000
Bridges & Culverts	Bridges	9 each	$6,300 - $10,300 / m²	$7,129,000
	Culverts**	8 each	$6,300 - $10,300 / m²	$4,533,000
Other	Sidewalks	119.5 km	$117 - $409 / m	$29,691,000
	Streetlights***	4,381 each	$8,000 / each	$35,048,000
			Roads Total	**$577,388,000**
			Bridges & Culverts Total	**$11,662,000**
			Roads Infrastructure Total	**$653,790,000**

** Unit cost ranges are due to varying culvert diameters, bridge deck areas, and sidewalk material types.*
*** These culverts are structural culverts with span greater than 3 m.*
**** The Town's Community Services Division maintains and operates other streetlights and luminaires in addition to the 4,381 streetlights in **Table 2-4**.*

2.2 Age & Expected Service Life

The Expected Service Life (ESL) of an asset is defined as the period over which an asset is available for use and able to provide the required Level of Service at an acceptable risk (i.e., without unforeseen costs of disruption for maintenance and repair). The ESL for assets within this AMP is based on the information collected from data inputted into the Town's GIS system, as built drawings and operational input.

For a full listing of all the ESL values applied in this AMP, please refer to the detailed asset inventory provided in **Appendix A**.

2.2.1 Water

The age of the Town's water infrastructure assets has been established using data from the Town's GIS database. **Figure 2-2** shows the average asset age and average remaining service life (weighted by replacement value) as a proportion of the average ESL of each water asset. As shown in **Figure 2-2** the pump stations and watermains are at approximately one-third of their ESLs, and hydrants and valves are more than halfway through their ESLs.

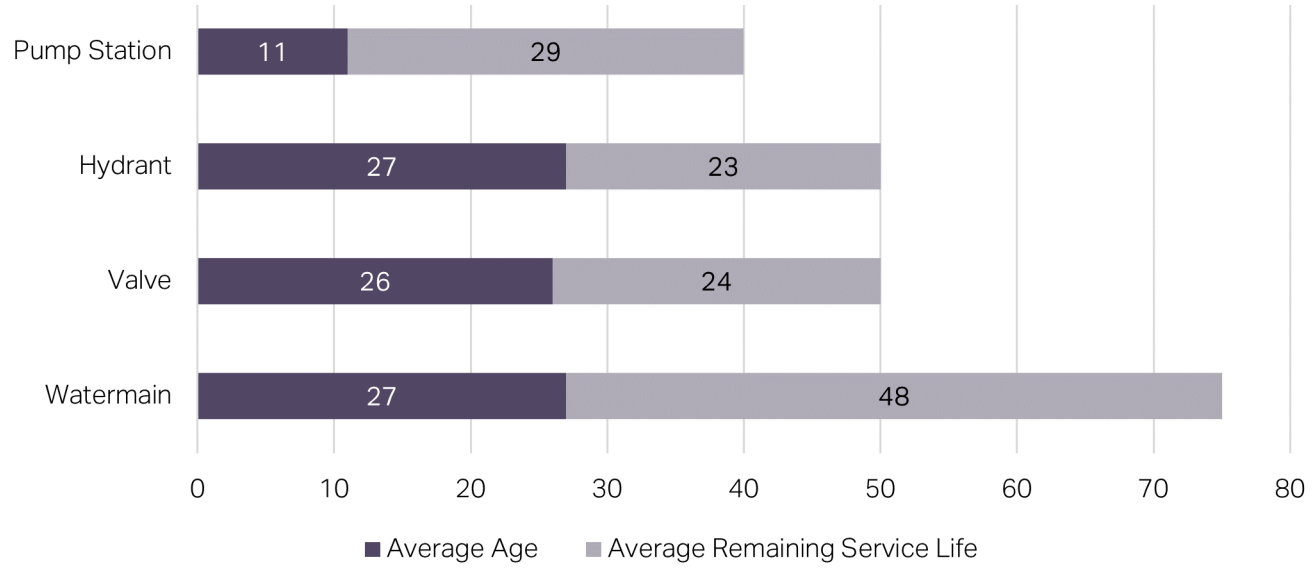


Figure 2-2 Average Age vs. ESL for Water Assets

Figure 2-3 shows the installation profile of the Town's watermains, valves and hydrants. It should be noted that the install year data is missing for valve chambers and service connections and, as such, has not been included in **Figure 2-3**. Where install year data is missing for valves and hydrants, the install year was estimated by assuming the install year of the adjacent watermain. Watermains were installed from the late 1950s onwards, with the majority of the Town's watermains installed between 1986 and 1990, and between 2001 and 2005.

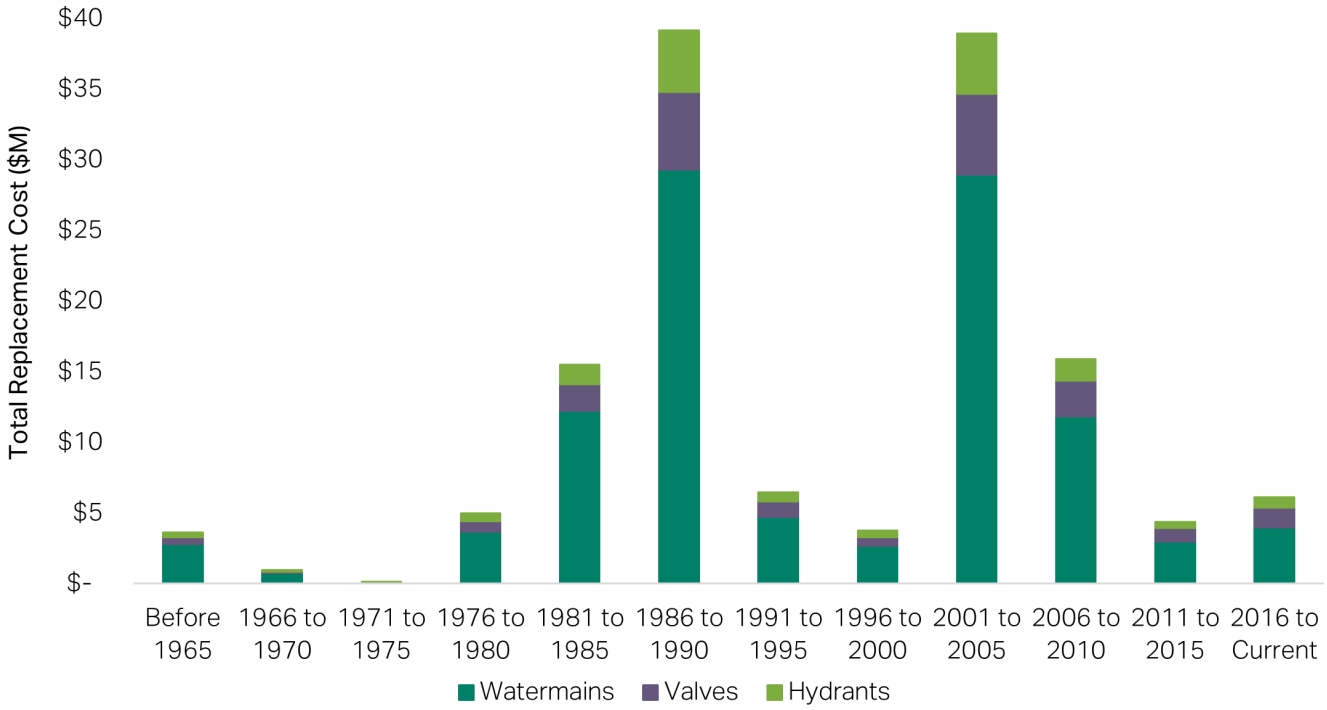


Figure 2-3 Water Asset Installation Profile

The material of the Town's watermains are primarily polyvinyl chloride (PVC) which makes up approximately 83% of the total watermain inventory by length (**Table 2-5**). As such, the ESL of PVC pipes are assumed to be 80 years. Considering that the Town's watermains were primarily installed after 1980, it is fair to expect that the mains are still in relatively good condition. This is important as PVC pipelines constructed post 1975 are in accordance with American Water Works Association (AWWA) C900 which has a better-quality assurance standard than the American Society for Testing and Materials (ASTM) Series pipes which was used for construction of watermains prior to 1975.

The Town should focus its efforts on the renewal of its cast iron and ductile iron watermains (which make up 3% and 6% of the total watermain network by length respectively) in order to continue meeting service goals as these pipes are starting to approach and exceed their respective ESLs. Iron pipes that are buried in highly corrosive soil and are not cathodically protected maybe tackled first.

While the Town does not have extensive asbestos cement pipelines in its water distribution system (approximately 3% of total network length), additional health and safety measures should be taken into consideration when attempting to repair, remove, or dispose of these pipes.

Table 2-5 Watermain Average Age and ESL

Asset Group	Asset Category	Material	% of Total Length	Average Age	ESL
Water	Watermain	Polyvinyl Chloride (PVC)	83%	24	80
		Ductile Iron (DI)	6%	38	40
		Cast Iron (CI)	3%	51	50
		Asbestos Cement (AC)	3%	50	50
		Concrete Pressure Pipe (CPP)	2%	39	80
		High Density Polyethylene (HDPE)	1%	19	80
		Polyethylene (PE)	0.2%	36	80
		Unknown (UNK)	0.1%	44	60

2.2.2 Wastewater

Figure 2-4 shows the average age and average remaining service (weighted by replacement value) life of the Town's wastewater infrastructure assets as a proportion of their average ESL. Asset ages have been established using data from the Town's GIS database, and as built drawing records.

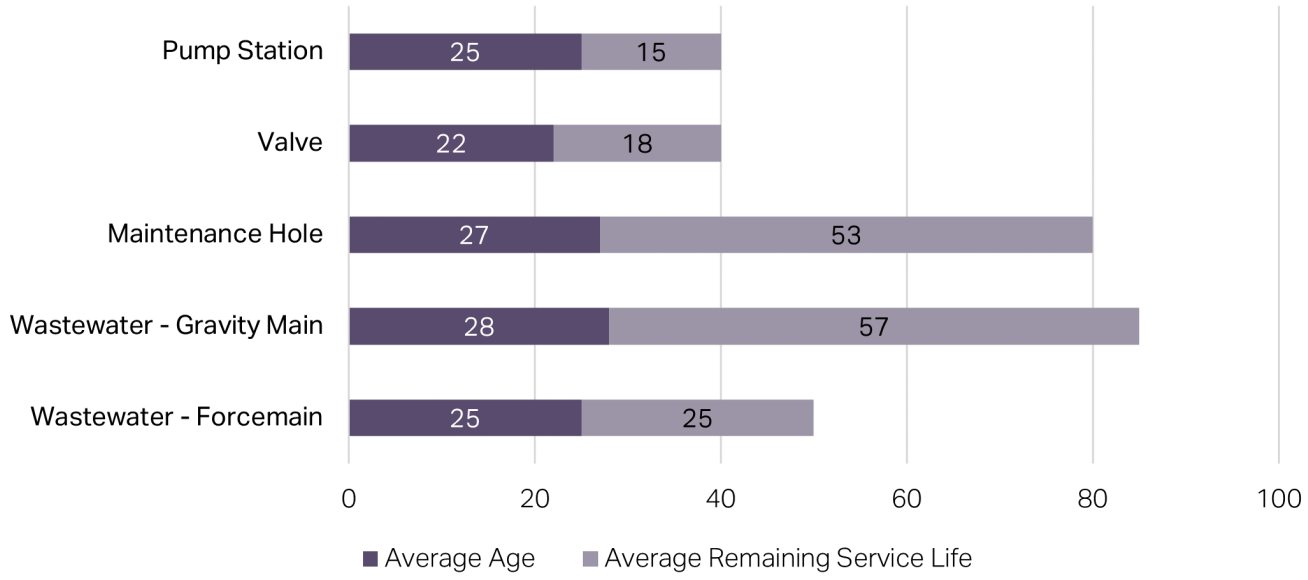


Figure 2-4 Average Age vs. ESL for Wastewater Assets

Figure 2-5 shows the installation profile of wastewater mains, valves, and maintenance holes. The missing years of installation for valves and maintenance holes are estimated by the install year of the associated wastewater mains. The Town's wastewater mains were installed from the early 1960s onwards and similar to the Town's watermains, the material of the wastewater mains is primarily PVC (**Table 2-6**) due to the usage of PVC worldwide, post 1980s.

Considering that the wastewater mains were primarily installed after 1980 it is fair to expect that the mains are overall still in relatively good condition. Further assessment is warranted for approximately 1.2 kilometers of the Town's wastewater forcemain network which was installed in 1962 using the specifications of ASTM Series (pre-1975), which has a lower quality assurance requirement compared to AWWA standard.

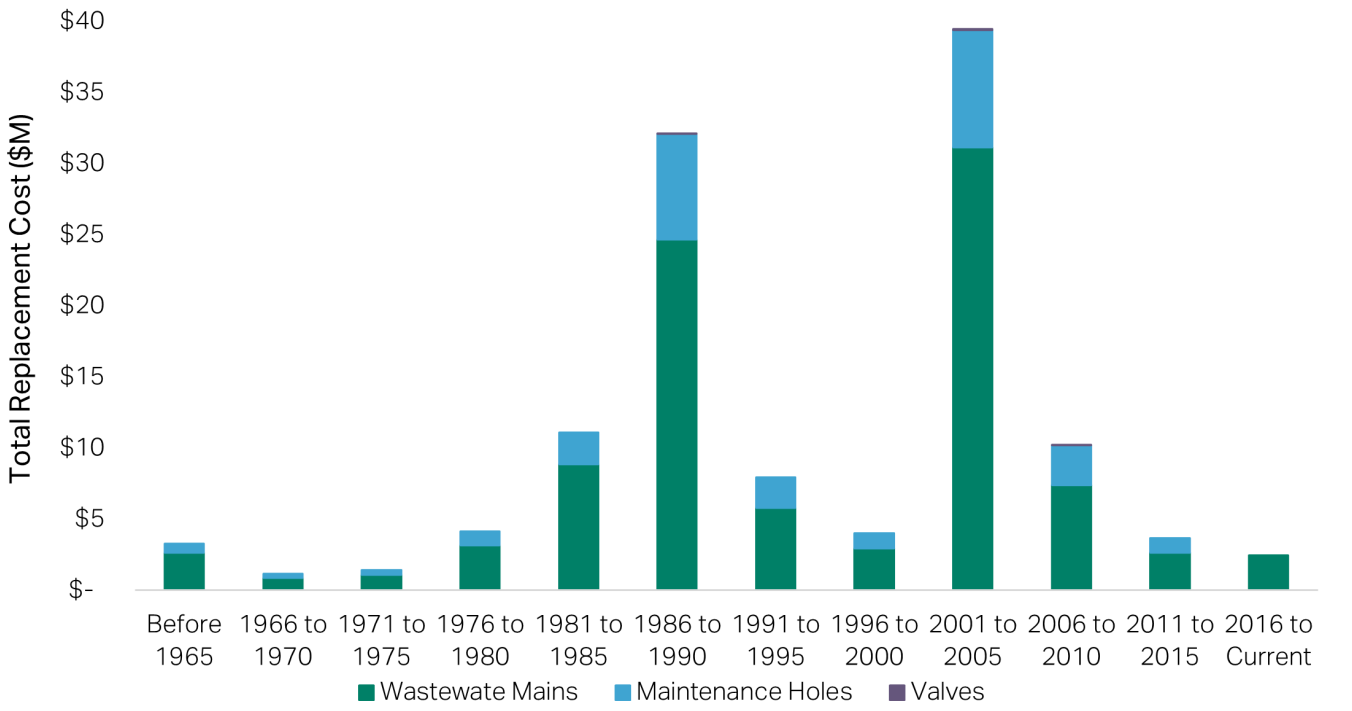


Figure 2-5 Wastewater Asset Installation Profile

It should be noted that 6.4% of the Town's wastewater total network length (5.8% of gravity mains and 0.6% of forcemains) is composed of asbestos cement pipes which, on average, have exceeded their ESLs. In addition to the asbestos cement pipes, corrugated steel pipe in the inventory has exceeded its ESL, indicating a need for rehabilitation/replacement in the short term.

Table 2-6 Wastewater Mains Average Age and ESL

Asset Group	Asset Category	Material	% of Total Length	Average Age	ESL
Wastewater	Wastewater Gravity Mains	Polyvinyl Chloride (PVC)	82.2%	25	85
		Asbestos Cement (AC)	5.8%	51	80
		Concrete Pipe (CP)	3.3%	37	80
		High Density Polyethylene (HDPE)	0.2%	7	85
		Corrugated Steel Pipe (CSP)	0.2%	35	30
		Reinforced Concrete (RC)	0.1%	9	85
		Ductile Iron (DI)	0.01%	29	40
	Wastewater Forcemains	High Density Polyethylene (HDPE)	2.3%	17	50
		Polyvinyl Chloride (PVC)	4.9%	24	50
		Asbestos Cement (AC)	0.6%	60	50
		Cast Iron (CI)	0.002%	17	50
		Ductile Iron (DI)	0.11%	20	40

2.2.3 Stormwater

Figure 2-6 shows the age of Town's stormwater infrastructure assets as a proportion of average ESL. The age of the assets has been established through a process of in field survey work and as-built drawings within the scope of the Stormwater Asset Inventory Project. The average age is weighed by replacement value of each asset. Stormwater management ponds is on average 20 years old. The catch basins, maintenance holes, laterals and stormwater mains are approximately one quarter of the way through their ESL.

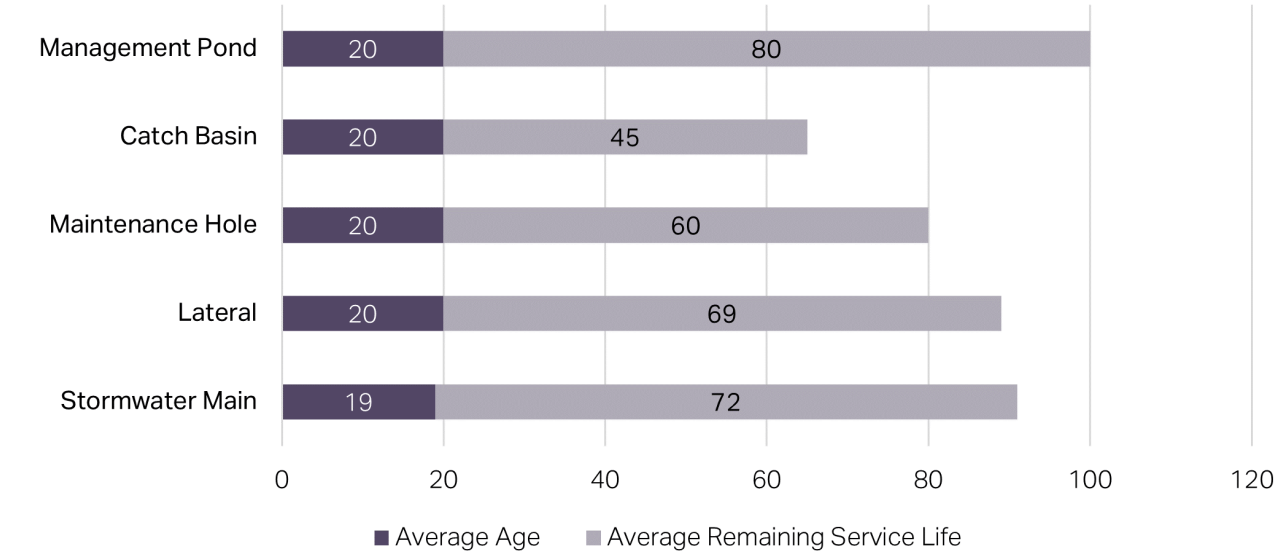


Figure 2-6 Average Age vs. ESL for Stormwater Assets

Figure 2-7 shows the installation profile of catch basins, maintenance holes, laterals, and stormwater mains. Stormwater mains and laterals were installed from the early 1980s. A little more than two-thirds of the stormwater mains are precast concrete pipe (CP), followed by PVC. A small percentage of the stormwater main inventory consists of other materials such as reinforced concrete (RC) and corrugated steel pipe (CSP) (Table 2 7). It should be noted that approximately 80% of the CSP mains, installed in the mid-1980s, have already exceeded their ESL. This indicates a need for intervention in the short-term planning window.

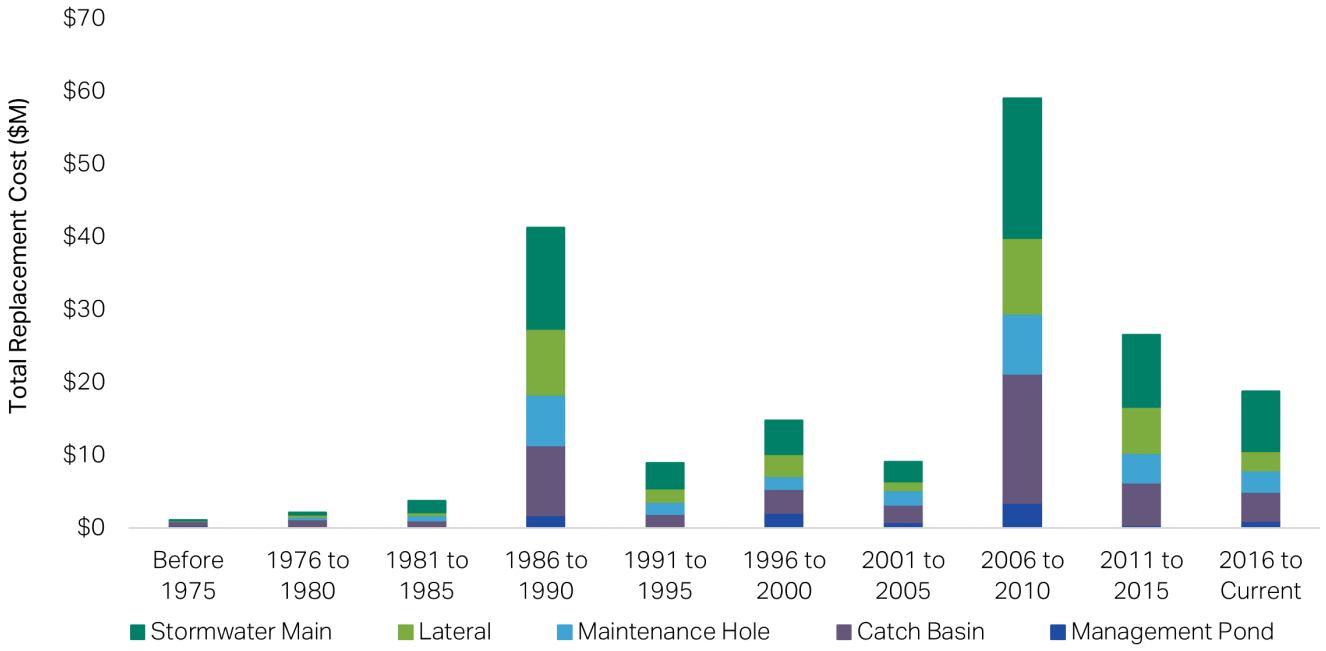


Figure 2-7 Stormwater Asset Installation Profile

Table 2-7 Stormwater Mains Average Age and ESL

Asset Group	Asset Category	Material	% of Total Length	Average Age	ESL
Stormwater	Stormwater Main	Concrete Pipe (CP)	72.8%	18	95
		Polyvinyl Chloride (PVC)	13.8%	19	85
		Reinforced Concrete (RC)	0.8%	31	85
		ES Concrete (ESC)	5.5%	33	85
		Corrugated Steel Pipe Annular (CSP)	0.7%	35	30
		High Density Polyethylene (HDPE)	0.9%	24	85
		Unknown (UNK)	5.5%	20	60

2.2.4 Roads Infrastructure

Figure 2-8 shows the Roads Infrastructure age as a proportion of average ESL by asset types. Asset ages have been established using data from the Town's GIS database. The average age is weighed by replacement value of each asset. Due to the scarcity of the age information for roads and sidewalks, detailed age vs. ESL analysis is not presented. It is noticeable that the average age of the Town's bridges and culverts have exceeded their ESL. This is primarily the result of a few bridges in the Town's inventory, with significant replacement values, that were constructed before the 1960s.

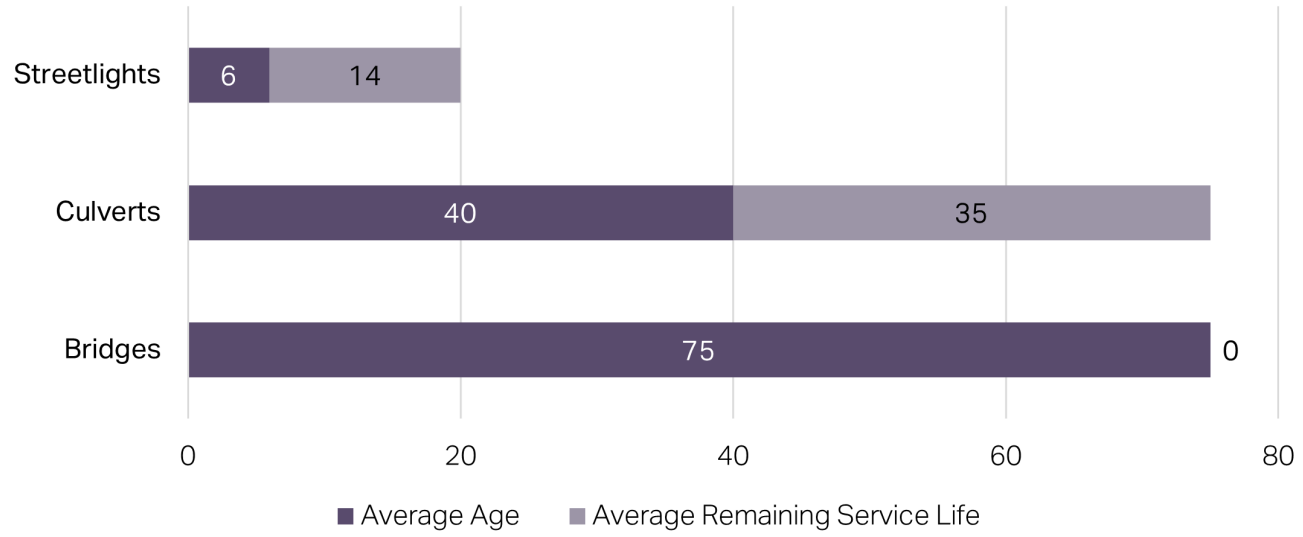


Figure 2-8 Average Age vs. ESL for Roads Infrastructure Assets

Table 2-8 presents the ESL for the Town's roads infrastructure assets. In general, the average useful life for a road can be assumed to be 60 years, which applies to the whole road cross-section including the base, sub-base, and surface layer (asphalt or concrete). Normally, the design life of surface layer for most asphalt pavements is approximately 15-20 years and should be rehabilitated or replaced two to three times in order for the roadway to last to its ESL of 60 years.

The average ESL for bridges and culverts is assumed to be 50 to 60 years. Similar to roads, bridges and culverts require ongoing maintenance and minor rehabilitation in order to achieve their ESL. Major rehabilitation is expected to occur two to three times over the life of a bridge to prolong its ESL.

It is noted that the Town took the initiative to replace a significant number of streetlights with LED lights in 2015; thereby, the ESL is assumed to be 20 years with an existing average age of 6 years. The ESL for all roadside safety systems is 30 years unless they are three-cable guide rails; the latter has an ESL of 20 years.

The average age of sidewalks was not estimated using age-based condition assessment due to the scarcity of construction date information.

Generally, ditches do not have an ESL assuming that these assets will essentially be maintained indefinitely (i.e., re-ditch every 50 years or more frequently).

Table 2-8 Roads Infrastructure Average Age and ESL

Asset Group	Asset Category	Material	ESL
Roads Infrastructure	Roads	Roads	60
	Bridges & Culverts	Bridges	75
		Culverts	75
	Sidewalks	Sidewalks	60
	Streetlights	Poles	50
		Fixtures	20
	Roadside Safety Infrastructure	Three-Cable Guide Rails	20
		Guide Rails (excl. three cable guide rails)	30

2.3 Asset Condition

All assets are expected to deteriorate over their lifetime, and their assigned condition reflects the physical state of the asset. The physical condition of the assets discussed in this section are based on the Town's existing condition data where available. Where empirical data was not available (i.e., condition assessments and inspections), an age-based approach has been applied to assess the condition of the core municipal infrastructure. It should be noted that no on-site condition assessments were carried out in the preparation of this AMP.

Existing condition assessment programs exist for the Town's wastewater mains, bridges, culverts, and roads and have been incorporated into the asset condition summaries where available. As these programs are at varying degrees of maturity, baseline data has not been collected yet for all asset classes. Where empirical data is not available for other asset categories, a two-parameter Weibull distribution function was used to assess the current condition of the Town's assets. The Weibull distribution has been used extensively in reliability studies and lifetime prediction models in industries ranging from automotive to oil & gas and provides a suitable distribution for this type of analysis.

The underlying premise of the Weibull-shaped deterioration is that while some assets fail prematurely due to severe conditions or improper installation, other assets have a long lifecycle and function well beyond their theoretical ESL. In order to perform a high order network-level analysis, it was assumed that assets would fail (and require replacement) within a deterioration envelope / curve approximated by a Weibull probability distribution. The two-parameter Weibull cumulative distribution has two parameters for scale and shape, as set out in **Equation [1]**:

$$f(x;\alpha,\beta) = e^{-\left(\frac{x}{\beta}\right)^{\alpha}} \quad [1]$$

Where: x = Age
α = Shape parameter (or slope)
β = Scale parameter

A set of Weibull cumulative distribution functions were leveraged to simulate a set of deterioration curves for assets with different ESLs as shown in **Figure 2-9**.

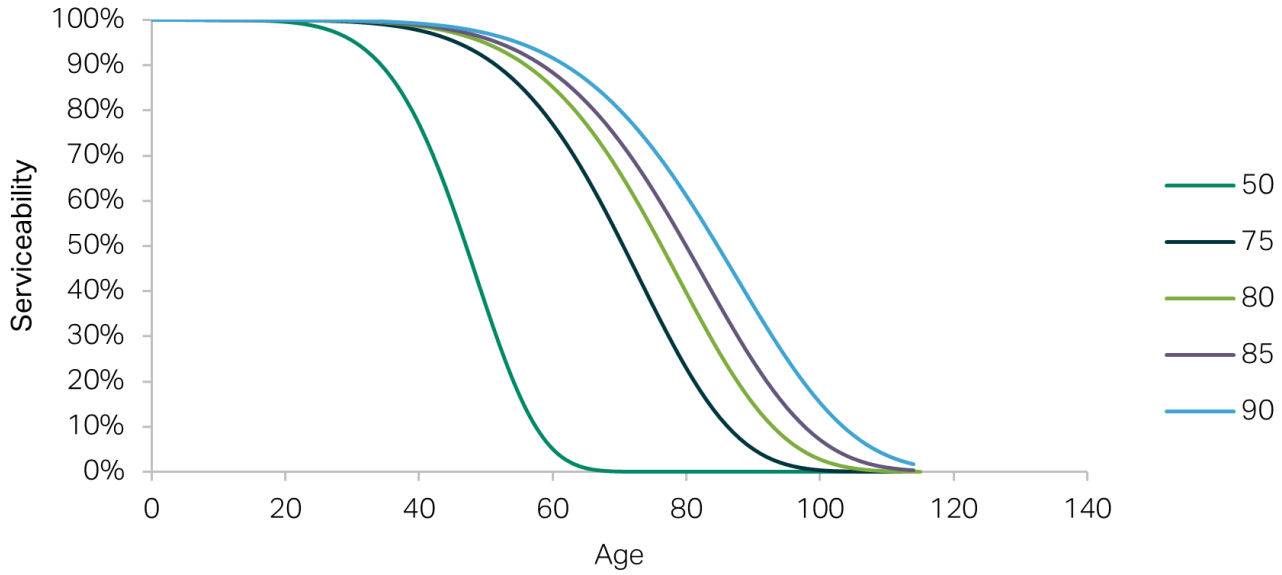


Figure 2-9 Asset Deterioration Curve Samples

Table 2-9 presents the condition states, condition rating, and condition score ranges for field condition assessment and age-based condition rating approach. The condition scores and rating scales are aligned with the Town's overall condition rating strategy, where a five-point condition rating scale has been adopted. **Table 2-9** demonstrates how the five-point condition rating scale from Very Good to Very Poor corresponds to the Pipeline Assessment Certification Program (PACP), the Pavement Condition Index (PCI), the Bridge Condition Index (BCI), and aged based condition scores.

Table 2-9 Physical Condition Scale

Condition		Field Condition Assessment		Age Based Condition Assessment		
Condition State	Condition Rating	PACP Score	PCI / BCI Score	Weibull Distribution Score	Range % of ESL Consumed	Range of % Operational Life Consumed *
1	Very Good	1	80 – 100	1 – 1.5	0% – 71%	0% – 47%
2	Good	2	60 – 80	1.5 – 2.2	72% - 84%	48% - 56%
3	Fair	3	40 – 60	2.2 – 2.8	85% – 92%	57% – 60%
4	Poor	4	20 – 40	2.8 – 3.5	93% - 99%	61% - 66%
5	Very Poor	5	0 - 20	3.5 - 5	>=100%	67% -100%

** Water Environment Research Foundation (WERF) uses the term "operational life" to define the time-period over which an asset remains operational irrespective of performance, risk, or cost considerations.*

2.3.1 Water

The condition of the Town's water assets has been determined by using the data from the Town' GIS database based on age and ESL. **Figure 2-10** provides a condition summary of the Town's water assets weighted by replacement value. As shown in **Figure 2-10**, approximately 94% of the total water inventory is considered to be in Very Good or Good condition, and 3% is considered to be in Fair condition. The remaining 3% of the asset inventory is in Poor or Very Poor condition which means that these assets are very close to approaching, or have already approached, and are exceeding their ESL. These assets in Poor and Very Poor condition may require intervention and investment in the short to medium term due to their deterioration.

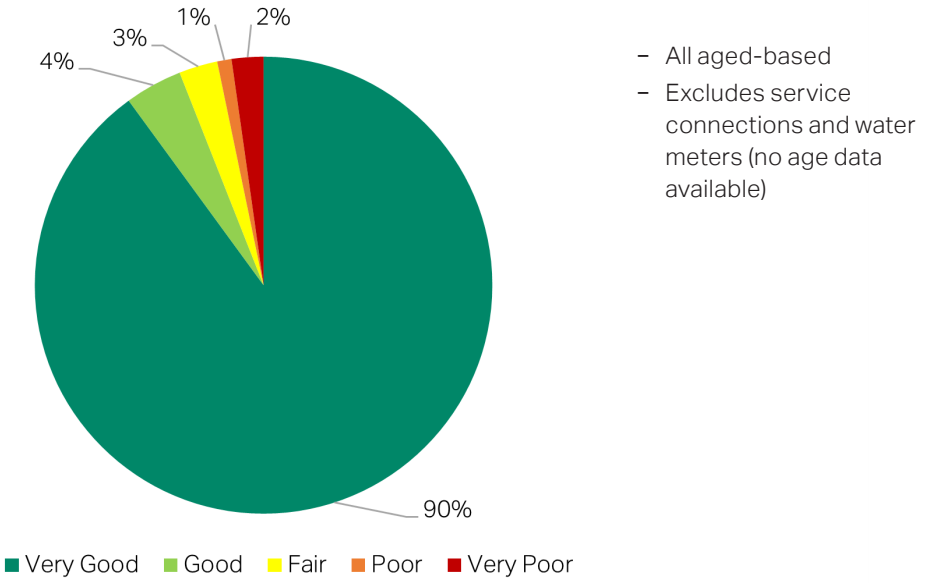


Figure 2-10 Overall Water Asset Condition Weighted by Replacement Value

A further breakdown of condition by water asset type is illustrated in **Figure 2-11**. Weighted by replacement value, **Figure 2-11** illustrates that approximately 94% of the Town's watermains are in Very Good to Fair condition. The remaining 6% of the watermains are approaching or have already exceeded their ESL and are in Poor or Very Poor condition, indicating the need for reinvestment in the short to medium term. Continued focus on the renewal of cast iron and ductile iron watermains is necessary to meet the Town's service goals. **Figure 2-11** also illustrates that approximately 97% of the Town's valves and hydrants are in Very Good to Fair condition. As well, the Town's two pump stations, one of which was commissioned in 2021, are considered to be overall in Very Good condition.

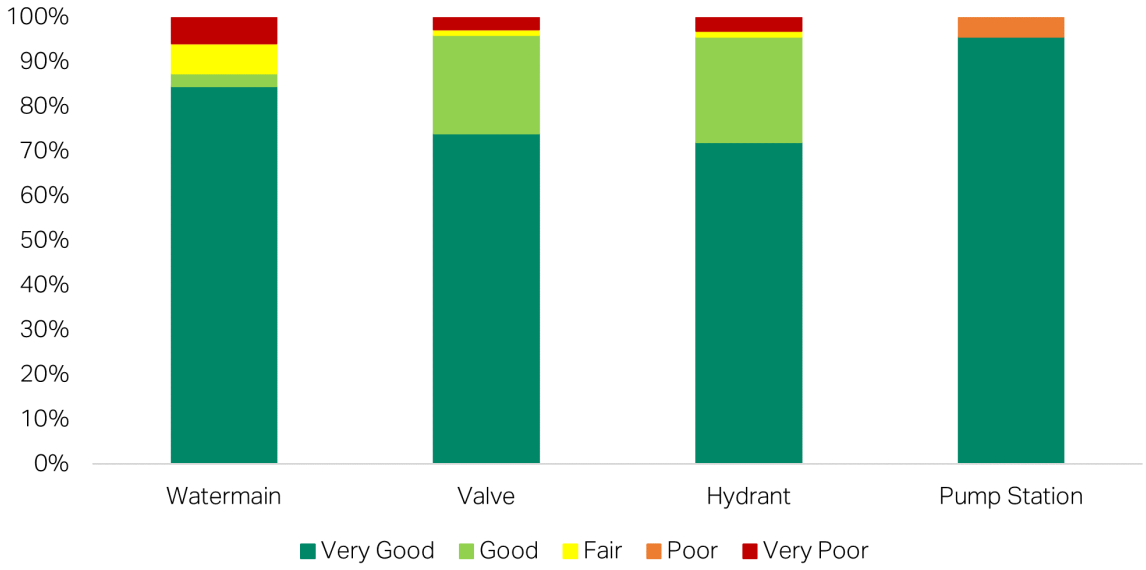


Figure 2-11 Distribution of Water Asset Condition Weighted by Replacement Value

2.3.2 Wastewater

The condition of the Town's wastewater mains has been determined by analyzing the available Pipeline Assessment Certification Program (PACP) scores from historical closed-circuit television (CCTV) inspection. Developed in 2001 by National Association of Sewer Service Companies (NASSCO) with assistance from the Water Research Centre in the U.K., PACP provides North American professionals with a standard method in which pipeline conditions and defects are identified, evaluated and managed. The PACP likelihood values from the Town's database were used to represent both structural defects and operations and maintenance defects. The Town has implemented wastewater facility condition assessment program. Currently, there are four pump stations' field condition assessment data available, which has been incorporated in the condition summary. Where field condition assessment data was not provided, an age-based condition assessment was conducted for the remaining wastewater assets. **Figure 2-12** provides a condition summary of the Town's wastewater assets weighted by replacement value. Approximately 91% of the total wastewater inventory is considered to be in Very Good or Good condition, and 4% is considered to be in Fair condition. The remaining 5% of the asset inventory is in Poor or Very Poor condition which means that these assets are very close to approaching, or have already approached, and are exceeding their ESL. These assets in Poor and Very Poor condition may require intervention and investment in the short to medium term due to their deterioration.

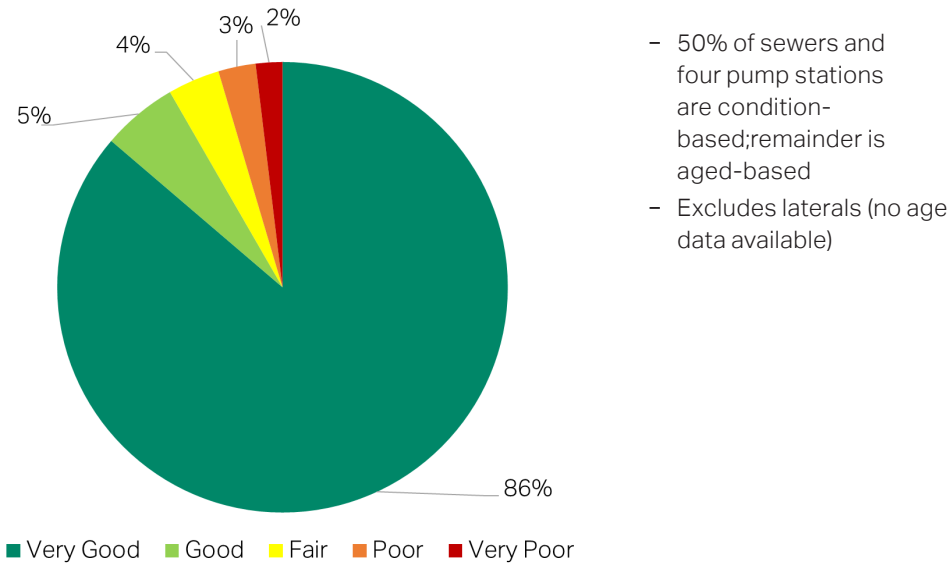


Figure 2-12 Overall Wastewater Asset Condition Weighted by Replacement Value

A further breakdown of condition by wastewater asset type is illustrated in **Figure 2-13**. Weighted by replacement value, **Figure 2-13** shows that approximately 95% of the Town's wastewater gravity mains are in Very Good to Fair condition, and the remaining 5% are approaching, or have already exceeded their ESL, and are in Poor or Very Poor condition. Approximately 70% of the wastewater valves are in Very Good condition, and 100% of the maintenance holes are in Very Good condition. It is important to document, however, that existing data gaps in the maintenance hole's install dates were estimated based on the install year of the associated wastewater main.

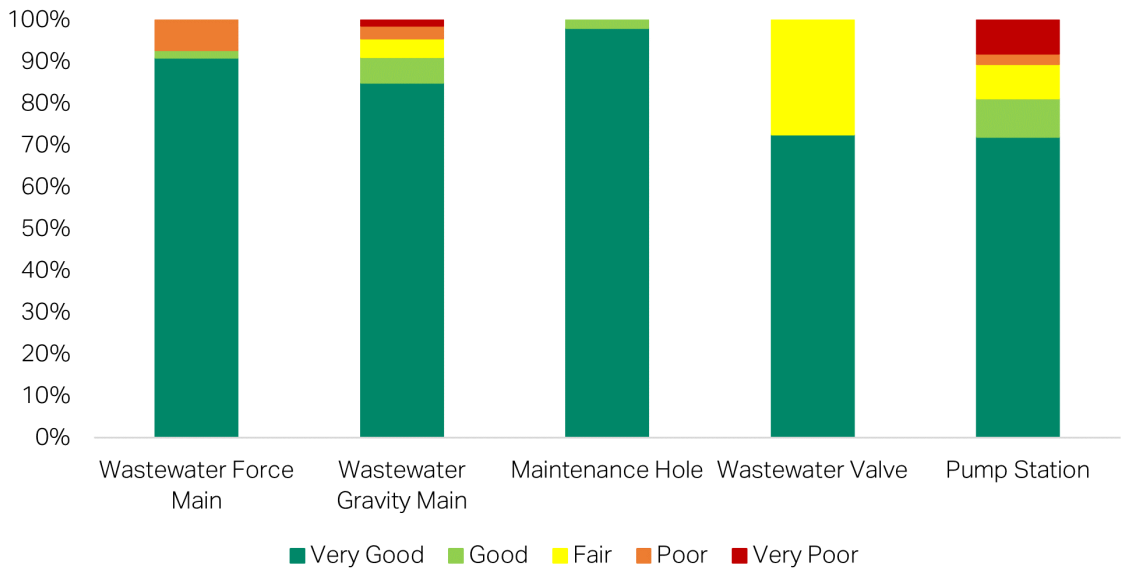


Figure 2-13 Distribution of Wastewater Asset Condition Weighted by Replacement Value

2.3.3 Stormwater

Stormwater asset conditions have been determined by using the age and ESL. The Town's stormwater assets are overall in Very Good condition with approximately 99.3% of assets in Very Good condition weighted by replacement value (**Figure 2-14**). There are only 0.4% of assets in Very Poor condition meaning that they have exceeded their ESL and are in need for intervention in the short to medium term.

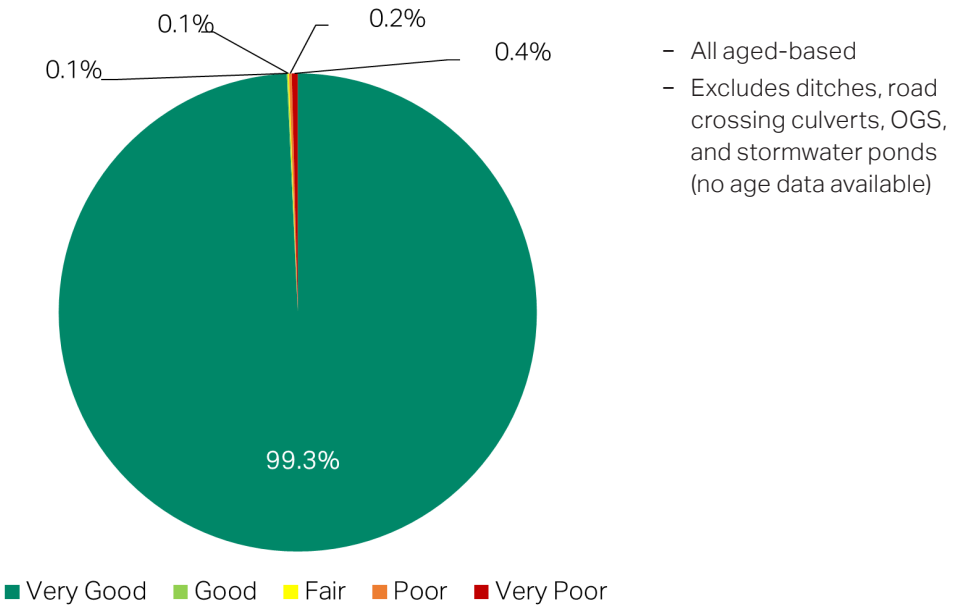


Figure 2-14 Stormwater Asset Condition Weighted by Replacement Value

Figure 2-15 shows that there are approximately 99.4% of the stormwater mains are in Very Good condition and 0.5% of the stormwater mains are in Very Poor condition and have exceeded their ESL. Similarly, 99% of the laterals are generally in Very Good condition. The remaining 1% of laterals are in Very Poor condition and may require intervention in the short to medium term capital planning window. All maintenance holes and catch basins are currently in Very Good Condition.

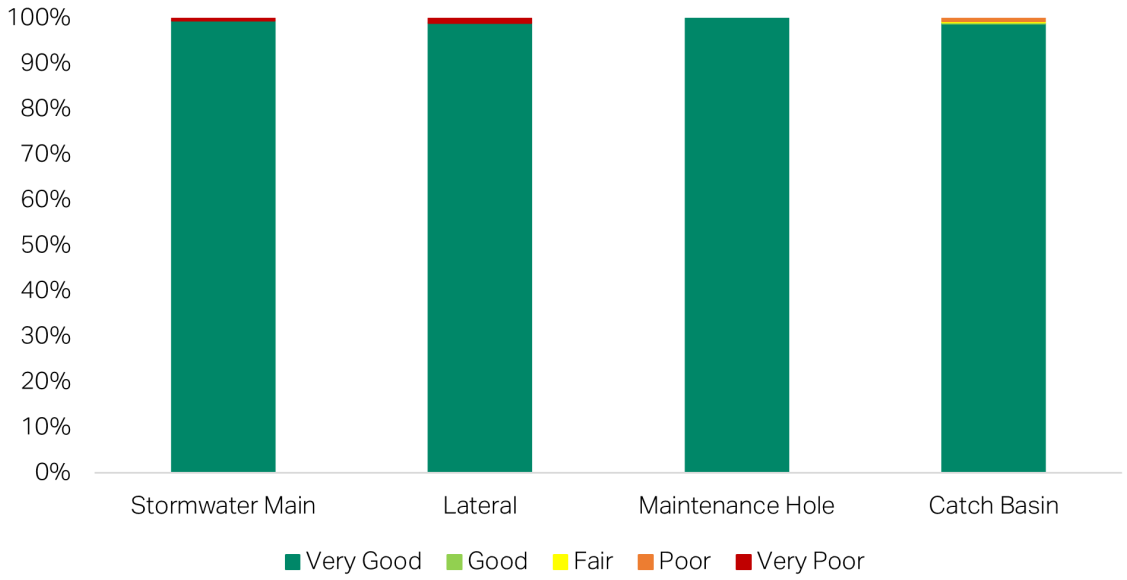


Figure 2-15 Distribution of Stormwater Asset Condition Weighted by Replacement Value

2.3.4 Roads Infrastructure

The Town's roads infrastructure includes roads, bridges & culverts (> 3 m), sidewalks, streetlights, and roadside safety infrastructure. The Town's latest roads condition assessment was conducted in 2021 where the Pavement Condition Index (PCI) was investigated for each of the Town's roads segment. The Town's bridges and culverts undergo biennial condition assessment by qualified experts to identify structural issues and concerns as guided by the Ontario Structure Inspection Manual (OSIM). The Town's condition inspection results, which include Bridge Condition Index (BCI) scores, are available in the Town's 2020 OSIM Bridges and Culverts Inspection Report[2]. The PCI and BCI results are summarized and presented in the condition summary in **Figure 2-16**.

The Town's roads infrastructure is overall in Good to Very Good condition with nearly 29% of assets in Very Good condition. There are 4% of assets in Poor and Very Poor condition meaning that there is a need for investment in the short to medium term. The remainder 15% of assets are in Fair condition indicating that they are meeting current needs but are deteriorating and should be monitored and may require intervention in the medium to long term.

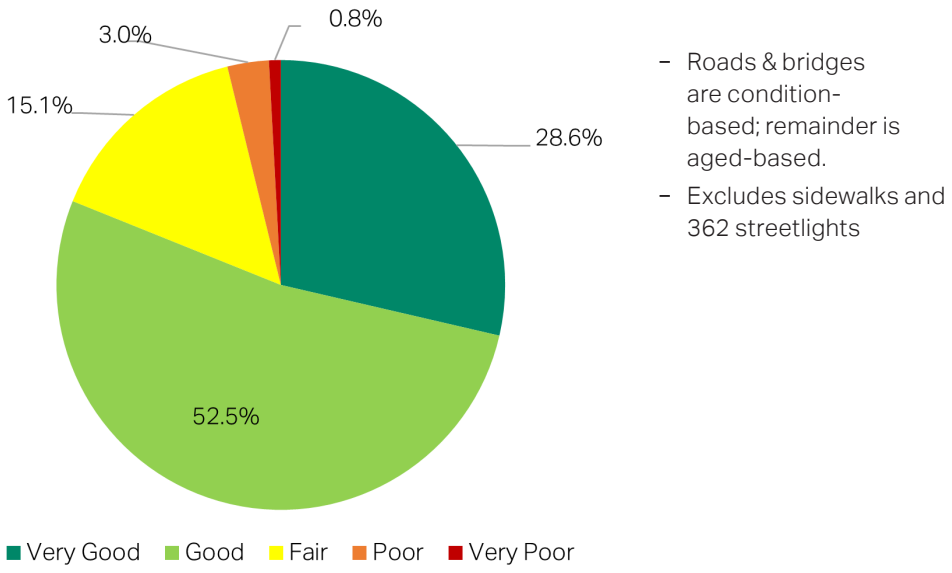


Figure 2-16 Overall Roads Infrastructure Asset Condition Weighted by Replacement Value

[2] Safe Roads Engineering. (2021): Contract No. OID2020-093 OSIM Bridges and Culverts Inspection Report SRE Job No.: J203043

Figure 2-17 presents the details of the condition of the Town's roads infrastructure including roads, bridges & culverts, and streetlights. Streetlight condition was evaluated using an age-based assessment approach.

The condition of the sidewalks and roadside safety infrastructure will be presented in the future iteration of the Town's AM Plan, as condition assessments and / or age information is currently not readily available.

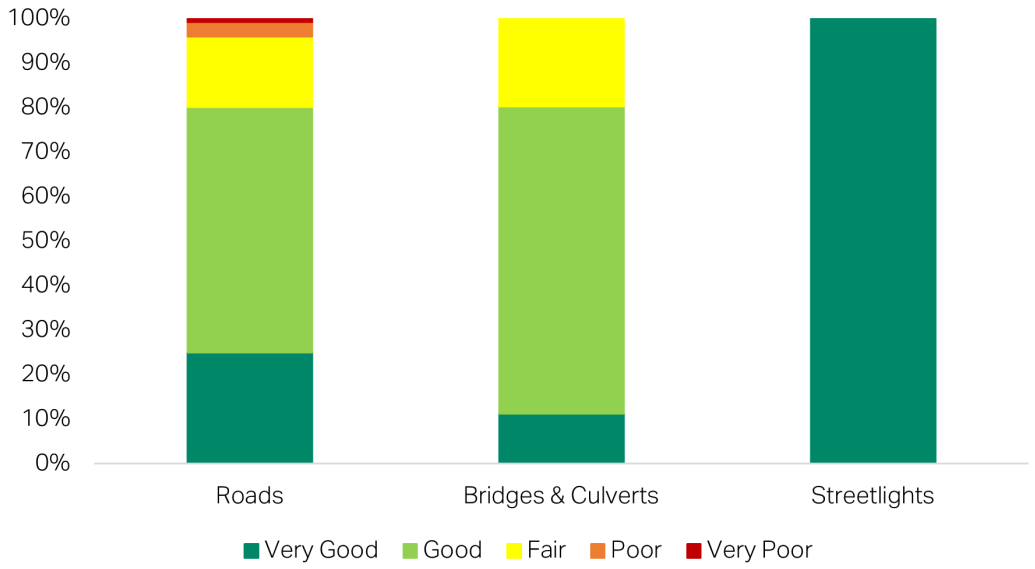
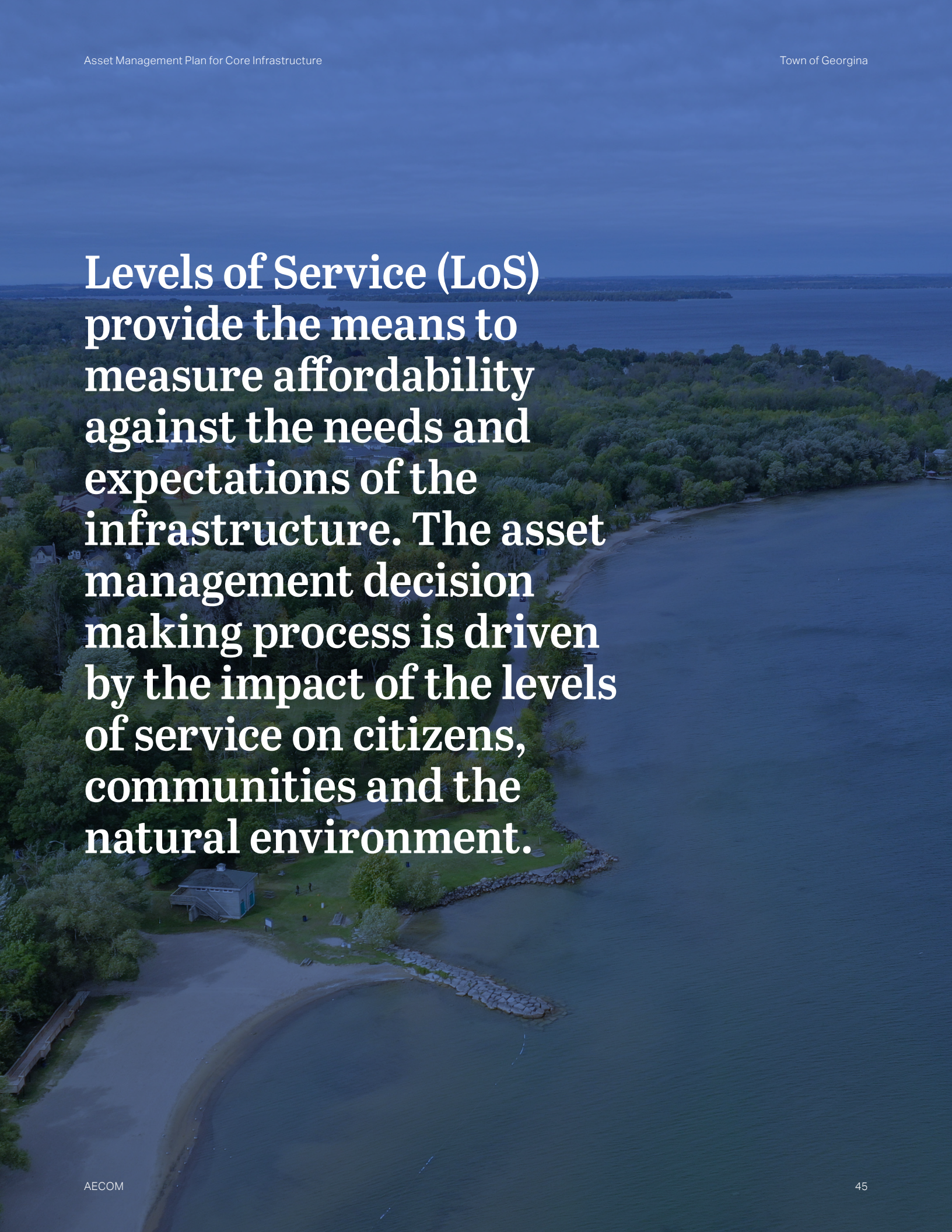


Figure 2-17 Distribution of Roads Infrastructure Asset Condition Weighted by Replacement Value

> Please refer to Section 6.1 for continuous improvement initiatives related to State of Infrastructure.

03

Levels of Service



Levels of Service (LoS) provide the means to measure affordability against the needs and expectations of the infrastructure. The asset management decision making process is driven by the impact of the levels of service on citizens, communities and the natural environment.

To support service delivery, LoS performance evaluation is a fundamental component within the Town's overall asset management system.

Figure 3-1 demonstrates how LoS helps to inform every aspect of the Town's asset management program including financial planning, risk management, and the implementation of asset lifecycle activities.

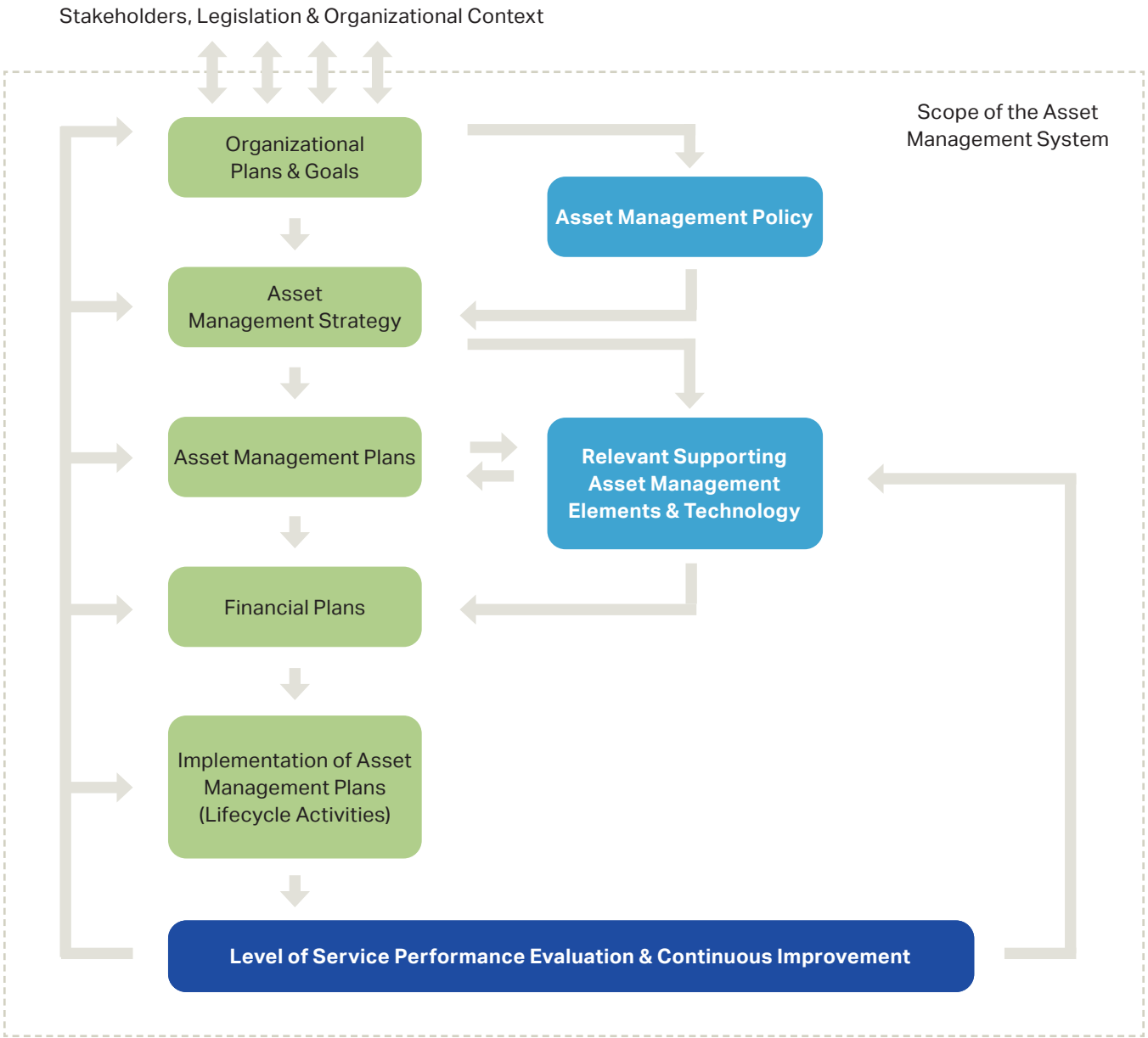


Figure 3-1 Levels of Service within the AM System

3.1 Types of Service Levels

There are two types of service levels, Community LoS and Technical LoS. Community LoS are recorded in a manner that attempts to describe the LoS in terms of what is being provided to the community (i.e., the public) and how the customer experiences the service. Community LoS are qualitative, non-technical, and are driven by the municipality's strategic objectives. As such, Community LoS are not concerned with the specific operating requirements of the assets that provide the service, but rather the value they obtain from the operation of the assets. However, in order to achieve Community LoS, there needs to be line of sight between the value delivered and how that value is realized. This is the purpose of Technical LoS which attempts to describe, quantitatively, how the Town will provide and meet its expected Community LoS.

3.2 Strategic Alignment

The Town's LoS Framework (**Figure 3-2**) requires a tactical approach, which links "top-down" strategic objectives with "bottom-up" operational activities. This integrated approach to asset ownership empowers the Town to make better and more informed asset decisions, at the right time and at the right cost.

The application of service levels is an important step towards incorporating the Town's strategic vision, mission, and goals to ensure that the Town's critical infrastructure assets are maintained and provided to the community in a consistent, reliable, and sustainable manner. Ultimately, how the Town's assets are managed and operated (i.e., asset lifecycle activities) play a key role in achieving the Town's strategic vision, mission and goals outlined in the Town's 2019 – 2023 Strategic Plan.

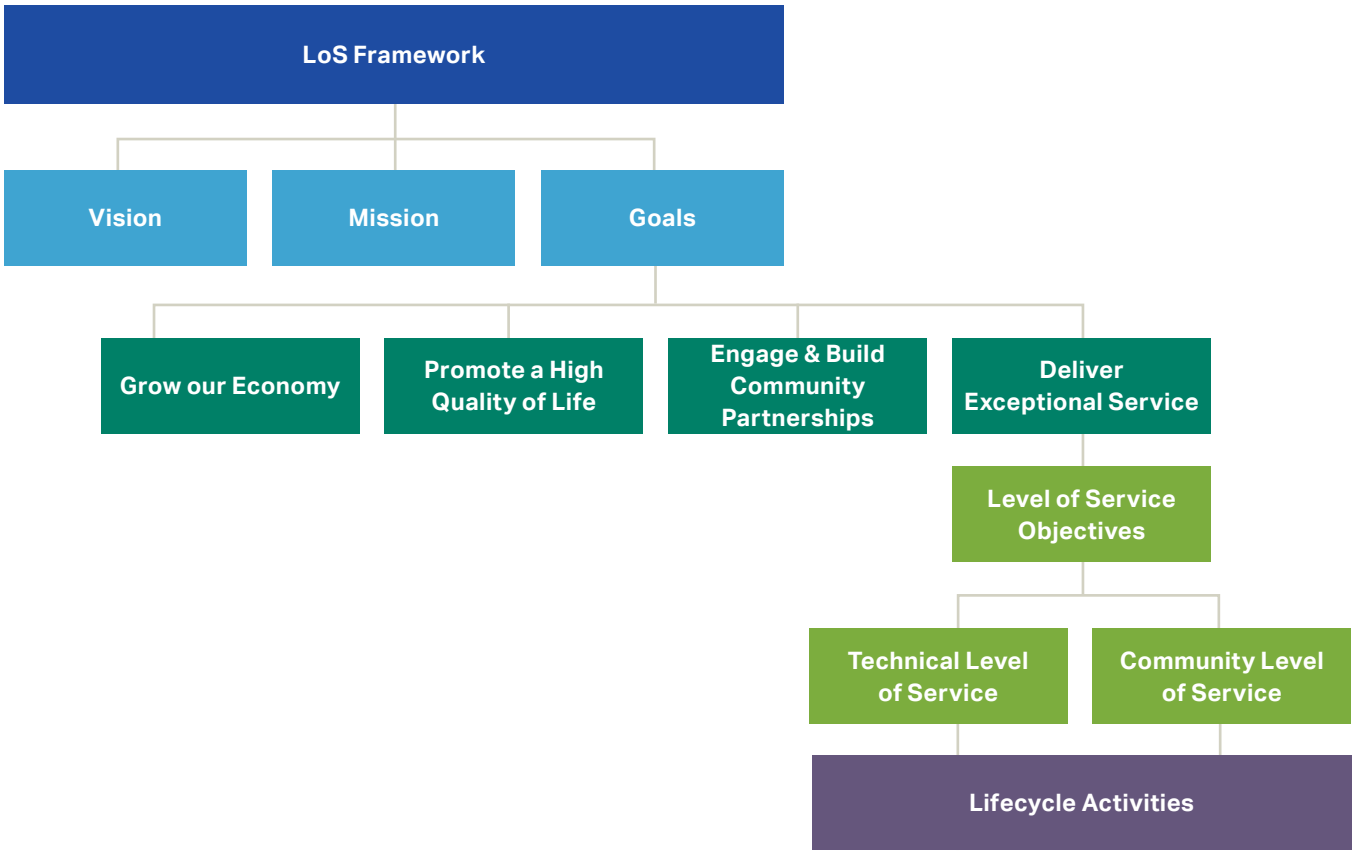


Figure 3-2 The Town's LOS Framework

A demonstration of how LoS performance measures are incorporated into the LoS Framework is shown in **Figure 3-3** which utilizes the wastewater asset category as an example. If viewed holistically, community and technical service levels will enable the Town to assess the effectiveness of its various maintenance activities and programs.

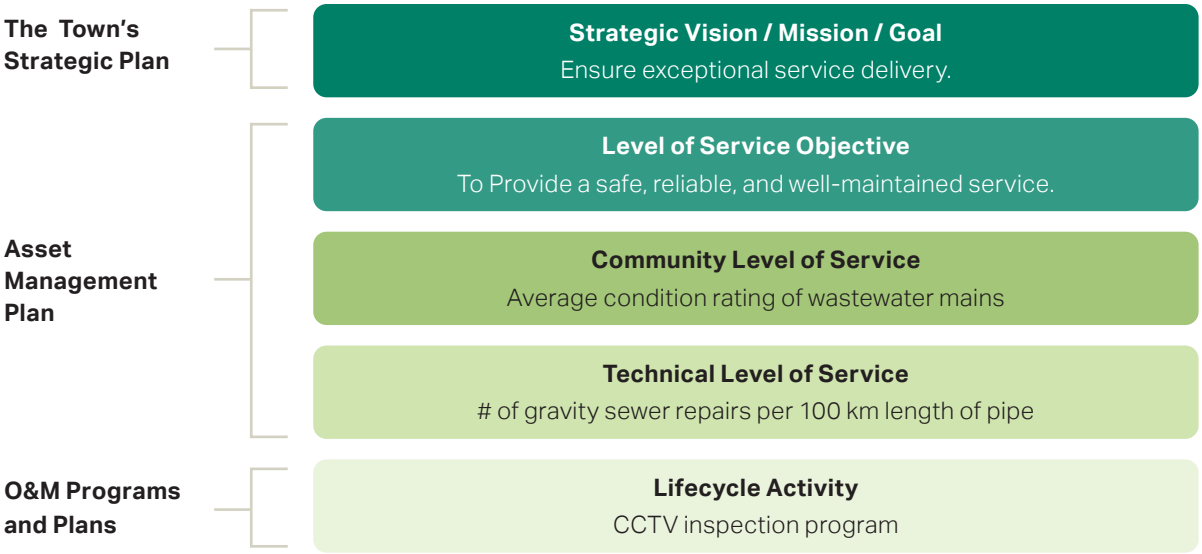


Figure 3-3 Applying the Level of Service Framework

3.3 The Level of Service Framework

3.3.1 Stakeholder Identification

A stakeholder is any person or organization that can affect, be affected by, or perceive themselves to be affected by a decision or an activity. Stakeholder analysis is the process of understanding stakeholder needs, expectations, and perceptions relative to the stakeholder's level of interest and level of influence over the organization. Organizations typically engage with their stakeholders to:

- Establish which activities or services matter most to them
- Understand their risk appetite and risk threshold
- Understand their willingness to pay for services

Stakeholders can take many forms and may be internal (i.e., staff, Council) or external (i.e., the public, regulatory agencies, suppliers, neighbouring municipalities, etc.) to the organization. Key stakeholders identified by the Town may include, but are not limited to, the following groups:

- Council
- Town staff
- Advisory committees
- Residents (i.e., property owners and tenants)
- Community associations
- Local business owners
- Developers
- Special interest groups (i.e., environmental groups, etc.)
- Government agencies
- Regulators
- Indigenous communities
- Neighbouring municipalities

3.3.2 Level of Service Objectives

Defining LoS objectives is important for drawing a line of sight between the Town's corporate objectives and the tangible asset performance outcomes. To do so, the LoS objectives must take into consideration stakeholder interests to develop asset performance measures that aim to meet the needs and expectations of the community. By doing this, the Town will ensure their assets are striving towards optimal performance, not only operationally, but economically, socially, and sustainably as well.

Every stakeholder has certain interests in the service being provided and in general, these interests can be categorized into the universal customer values. Each universal customer value is assigned a LoS objective which is applicable across each of the Town's core infrastructure assets, as shown in **Table 3-1**.

Table 3-1 The Town's Stakeholder Interests and LoS Objectives

Stakeholder Interest	LoS Objective	Related Corporate Document(s)
Quality & Reliability	To provide a safe, reliable, and well-maintained service.	– AM Policy 2021 Update. – Strategic Plan 2019-2023. - Deliver Exceptional Service Strategy: ensure exceptional service delivery.
Environmental Sustainability	To operate in an environmentally responsible manner.	– AM Policy 2021 Update. – Strategic Plan 2019-2023. - Promote a High Quality of Life Strategy: promote reasonable growth. – Official Plan 2020: - 2.2.1: Sustainability Guiding Principle. - 2.2.3: Natural Environment Guiding Principle.
Health & Safety	To protect public health and safety.	– AM Policy 2021 Update. – Strategic Plan 2019-2023. - Promote a High Quality of Life Strategy: build a healthy, safe, and accessible community. – Official Plan 2020: - 2.2.11: Healthy and Complete Communities Guiding Principle.
Access & Capacity	To provide customers with access to the available service; and ensure there is adequate capacity of the service to meet the needs of users.	– AM Policy 2021 Update. – Strategic Plan 2019-2023. - Promote a High Quality of Life Strategy: build a healthy, safe, and accessible community. – Official Plan 2020: - 2.27: Growth Management Guiding Principle.
Affordability	To provide service in a cost-effective and fiscally responsible manner.	– AM Policy 2021 Update. – Strategic Plan 2019-2023. - Deliver Exceptional Service Strategy: manage our finances and assets proactively. – Official Plan 2020: - 2.2.14: Economic Development and Tourism Objectives.

Although the Town's LoS performance measures are primarily driven by O. Reg. 588/17 LoS requirements, it is important that the Town take into consideration all stakeholder interests when implementing performance measures in future iterations of the AM Plan. This will help to ensure that all aspects of Town's LoS objectives are included within the LoS Framework.

3.3.3 Level of Service Performance Measures

A documented suite of LoS performance measures enables a common understanding of the service delivery that the Town currently provides, and the associated cost of maintaining infrastructure assets to provide the service. Having these performance measures set at the appropriate levels within the Town ensures alignment from the corporate vision to asset investment decisions, and to day-to-day operational activities. When establishing LoS performance measures it is important to keep in mind the "**SMART**" acronym, as follows:

Specific
Easily evaluated and understood

Measurable
Quantifiable, and easily collectible to ensure ongoing data availability

Attainable
So that they work to motivate as opposed to discourage

Relevant
In that they relate and align with a specific goal

Time-bound
Measured over a specific period, which is typically annually for benchmarking

3.3.3.1 Current LoS Performance Measures

In addition to the O. Reg. 588/17 LoS requirements, the Town has included additional LoS performance measures carried forward from the Town's 2014 AMP to ensure a wide range of performance measures are documented to holistically assess its core infrastructure.

A total of 40 LoS Performance measures have been documented, of which 27 are O. Reg. 588/17 requirements, and 13 are the Town's own performance measures documented within the 2014 AM Plan. **Table 3-2** to **Table 3-6** provides a summary of the Town's current LoS performance measures across each asset category.

The Town is early in its asset management maturity, as such the LoS performance measures provided in the tables below are an excellent starting point for the Town to track and evaluate. Proposed service level targets are discussed in **Section 3.3.4.** In future iterations of the AM Plan, it is recommended that the Town consider adding additional LoS performance measures from the proposed list included within **Appendix B**.

Table 3-2 Water LoS Performance Measures

Universal Stakeholder Interest	LoS Objective	O. Reg 588/17 LoS Performance Measure	Source	Unit	Community or Technical LoS	Current LoS Performance (2021)	Current LoS Data Source
Access & Capacity	To provide customers with access to the available service; and ensure there is adequate capacity of the service to meet the needs of users.	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal water system.	O. Reg. 588/17	Text / Map	Community	- The Town maintains a water distribution system map in GIS. The GIS data set includes asset inventory attributes such as pipe size and material. - The Town maintains records of its water distribution system including a library of as-built drawings and water service connection records. - The Town maintains a water meter account database of all customers connected to the system and categorizes the customers as either residential or Industrial, Commercial, or Institutional (ICI). - The Town has an Official Plan and Secondary Plans (i.e., Land Development Planning Document) that provides mapping to define the area of the municipality that is currently, or will be in the future, included in the water distribution service area; as well as the current and proposed land uses in those areas (i.e., Land Use Zoning Maps). - See **Figure C.1** in **Appendix C**.	- GIS database (All-Pipes Model) - As-built drawings and service connection records
		Description, which may include maps of the user groups or areas of the municipality that have fire flow.	O. Reg. 588/17	Text / Map	Community	- The Town has fire flow data as a GIS layer and fire hydrant locations are included on the water distribution map in GIS.	- GIS data - As-built drawings
		% of properties connected to the municipal water system.	O. Reg. 588/17	%	Technical	- 68% of the Town's properties are connected to the municipal water system. - See **Figure C.1** in **Appendix C**.	- iCity Financial
		% of properties where fire flow is available.	O. Reg. 588/17	%	Technical	- 68% of the Town's properties have available fire flow. - Properties in rural areas, which are not connected to the municipal water system, are serviced by the Fire Department responding to the fire with fire trucks and their own water supply.	- iCity Financial

Universal Stakeholder Interest	LoS Objective	O. Reg 588/17 LoS Performance Measure	Source	Unit	Community or Technical LoS	Current LoS Performance (2021)	Current LoS Data Source
Quality & Reliability	To provide a safe, reliable, and well-maintained service.	Description of boil water advisories and service interruptions.	O. Reg. 588/17	Text	Community	- There are no current boil water advisories in effect; and there have been none in the past two years. - For other service interruptions the Overall Responsible Operator (ORO) or Operator In-Charge (OIC) will be notified by the Water Operator within Environmental Services and shall be responsible to provide notice of service interruptions to the Town ,York Region Public Health and the Ministry when required.	- Drinking Water Quality Management System (DWQMS) Operational Plan: 2020 Emergency Response Plan - Municipal Drinking Water Distribution System - Water Operating Procedures Manual - Watermain Break and Shutdown Reporting document
		# 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.	O. Reg. 588/17	#	Technical	- Zero connection-days per year.	- 2020 Annual Water Summary Management Review Report - DWQMS records
		# of connection-days per year due to water main breaks compared to the total number of properties connected to the municipal water system.	O. Reg. 588/17	#	Technical	- Five connection days per year	- Work order records and Operator Reports
		% of valves cycled annually	2014 AM Plan	%	Technical	- Current 0% - Target is 20% (Page 30 of 2014 AMP). - A valve exercising project is being developed in 2022.	- Work order records

Table 3-3 Wastewater LoS Performance Measures

Universal Customer Value	LoS Objective	O. Reg 588/17 LoS Performance Measure	Source	Unit	Community or Technical LoS	Current LoS Performance (2020)	Current LoS Data Source
Access & Capacity	To provide customers with access to the available service; and ensure there is adequate capacity of the service to meet the needs of users.	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal wastewater system.	O. Reg. 588/17	Text / Map	Community	- The Town has a GIS layer which is updated on a regular basis by the Town's GIS Specialist. Furthermore, the Asset Management and Technical Services Group maintains records of as-built drawings which are updated as required. - See **Figure C.2** in **Appendix C**.	- GIS layers - As-built drawings
		% of properties connected to the municipal wastewater system.	O. Reg. 588/17	%	Technical	- 66% of the Town's properties are connected to the municipal wastewater system. - See **Figure C.2** in **Appendix C.**	- iCity Financial
		Description of how stormwater can get into sanitary sewers in the municipal wastewater system, causing sewage to overflow into streets or backup into homes.	O. Reg. 588/17	Text	Community	- Stormwater can get into the wastewater system through maintenance hole covers, inflow and infiltration (I&I), as well as cross connections from residential properties.	- Flow Monitoring and I&I Calculation – Region of York - The Town's 2021 Wastewater Master Plan identifies areas of high I&I.
		Description of how sanitary sewers in the municipal wastewater system are designed to be resilient to avoid events described in previous paragraph.	O. Reg. 588/17	Text	Community	- Sanitary sewers have to be built to the Town's design standards which meet or exceed Ontario's Ministry of the Environment, Conservation and Parks (MECP) Sanitary Sewer Design Guidelines and Current Ontario Provincial Standard Specifications (OPSS) requirements.	- Operations & Engineering Development Design Criteria, 2017 - Testing and Commissioning Standard to the York Region/LAM Standards for Leakage
		# of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system.	O. Reg. 588/17	#	Technical	- 1.8 connection days per year	- Work order records

Universal Customer Value	LoS Objective	O. Reg 588/17 LoS Performance Measure	Source	Unit	Community or Technical LoS	Current LoS Performance (2020)	Current LoS Data Source
Quality & Reliability	To provide a safe, reliable, and well-maintained service.	# of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system.	O. Reg. 588/17	#	Technical	- Zero	- Work order records
		% of sewers CCTV inspected annually.	2014 AM Plan	%	Technical	- 12% of sewers inspected annually.	- CCTV Inspection Program - Contractor - Records/Reports
		% of sewers flushed annually.	2014 AM Plan	%	Technical	- 25% of linear infrastructure flushed annually.	- Annual Flushing Program - Contractor - Records/Reports

Table 3-4 Stormwater LoS Performance Measures

Universal Customer Value	LoS Objective	LoS Performance Measure	Source	Unit	Community or Technical Level of Service	Current Level of Service Performance (2020)	Current Level of Service Data Source
Access & Capacity	To provide customers with access to the available service; and ensure there is adequate capacity of the service to meet the needs of users	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.	O. Reg. 588/17	Text	Community	- Mapping of stormwater asset location available in GIS with data attributes. - LSRCA Regulation Flood Mapping provides location of areas prone to flooding during regional storm events. - Land developed through subdivision development ensures that structures are protected above the 100-Year Design Storm Flood Level; however, these areas are not mapped. - Flood protected properties are not yet defined.	- GIS database - As-built drawings - AECOM will provide an updated stormwater asset inventory in 2022
		% of properties in municipality resilient to a 100-year storm.	O. Reg. 588/17	%	Technical	- 100% of the Town's properties that are connected to urbanized linear infrastructure are resilient to a 100-year storm.	- GIS database - As-built drawings - Town's design criteria
		% of the municipal stormwater management system resilient to a 5-year storm.	O. Reg. 588/17	%	Technical	- 100% of the municipal stormwater management system is resilient to a 5-year storm.	- GIS layers - As-built drawings - Town's design criteria

Table 3-5 Road Infrastructure LoS Performance Measures

Universal Customer Value	LoS Objective	O. Reg 588/17 LoS Performance Measure	Source	Unit	Community or Technical LoS	Current LoS Performance (2020)*	Current LoS data Source
Access & Capacity	To provide customers with access to the available service; and ensure there is adequate capacity of the service to meet the needs of users	Description, which may include maps, of the road network in the municipality and its level of connectivity.	O. Reg. 588/17	Map / Text	Community	- The Town uses GIS layers to describe the road network, which is updated by the Town's GIS Specialist when roads are constructed or assumed. - See **Figure C.3** in **Appendix C.**	- Roads GIS Layer
		# 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.	O. Reg. 588/17	#	Technical	- Collector: 0.38 Lane km/km^2 - Local: 1.93 Lane km/km^2	- 2021 Georgina Road Network Condition Assessment.

Quality & Reliability	To provide a safe, reliable, and well-maintained service.	Description or images that illustrate the different levels of road class pavement condition.	O. Reg. 588/17	Text / Images	Community	- The percentage of roads within the Town considered to be in Good to Very Good condition are as follows:
						  - Collector: 77.8%
						  - Local: 80.3%
						See **Figure C.4** in **Appendix C.**
							- 2021 Georgina Road Network Condition Assessment.

		For paved roads in the municipality, the average pavement condition index value.	O. Reg. 588/17	PCI	Technical	- Average PCI = 71	- 2021 Georgina Road Network Condition Assessment.
		For unpaved roads in the municipality, the average surface condition.	O. Reg. 588/17	PCI	Technical	- Average PCI = 73	- 2015 Georgina Roads Need Study.
		Frequency of gravel road maintenance (grading, dust control).	2014 AM Plan	# / yr	Technical	- Grading = 4 times per year - Dust control = 1 time per year	- Contracts

Universal Customer Value	LoS Objective	O. Reg 588/17 LoS Performance Measure	Source	Unit	Community or Technical LoS	Current LoS Performance (2020)*	Current LoS data Source
		Frequency of LCB, HCB, and EXP road maintenance (crack sealing, pothole repair).	2014 AM Plan	# / yr	Technical	- Approximately twice a year (specific frequency may differ based on how often deficiencies are found).	- WorkTech work orders - Contracts

** Note: the current LoS Performance is based on the Town's assumed roads only.*

Table 3-6 Bridges & Culverts LoS Performance Measures

Universal Customer Value	LoS Objective	O. Reg 588/17 LoS Performance Measure	Source	Unit	Community or Technical LoS	Current LoS Performance (2020)	Current LoS Data Source
Access & Capacity	To provide customers with access to the available service; and ensure there is adequate capacity of the service to meet the needs of users.	Description of the traffic that is supported by municipal bridges (e.g., heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, cyclists).	O. Reg. 588/17	Text	Community	- The Average Annual Daily Traffic (AADT) that the Town's bridges received in 2020 varied from 90 AADT (i.e., B2 – Frog Street) to 2,246 AADT (i.e., C201 – Lake Drive). The % of trucks that used each municipal bridge is 2%.	- 2020 OSIM Report

		% of bridges in the municipality with loading or dimensional restrictions.	O. Reg. 588/17	%	Technical	- Two of the nine bridges (i.e., 22% of bridges in the Town) have loading or dimensional restrictions, as follows:
						  - B5-Pefferlaw Bridge on Main Street has a 12t load limit; and
						  - B6-Mossington Bridge on Hedge Road requires a 4.28m vertical clearance
							- 2020 OSIM Report

Quality & Reliability	To provide a safe, reliable, and well-maintained service.	Description or images of the condition of bridges and how this would affect use of the bridges.	O. Reg. 588/17	Text / Images	Community	- The Town has **four bridges** in good condition, **three bridges** in fair condition, and **two bridges** in poor condition as per the 2020 OSIM Report. - The condition of the bridges is based on several factors including, but not limited to, the age of the structures, material deterioration due to exposure to chlorides, instable embankments due to erosion, and excessive deformation, etc. - See **Figure C.5** in **Appendix C**.	- 2020 OSIM Report
		Description or images of the condition of culverts and how this would affect use of the culverts.*	O. Reg. 588/17	Text / Images	Community	- The Town has **four culverts** in good condition, **four culverts** in fair condition, and **zero culverts** in poor condition as per the 2020 OSIM Report. - The condition of the inspected culverts is based on several factors including, but not limited to, the age of the structures, material deterioration due to exposure to chlorides. - See **Figure C.6** in **Appendix C**.	- 2020 OSIM Report

Universal Customer Value	LoS Objective	O. Reg 588/17 LoS Performance Measure	Source	Unit	Community or Technical LoS	Current LoS Performance (2020)	Current LoS Data Source
		For bridges in the municipality, the average bridge condition index value.	O. Reg. 588/17	BCI	Technical	- Average BCI = 65	- 2020 OSIM Report
		For structural culverts in the municipality, the average bridge condition index value.	O. Reg. 588/17	BCI	Technical	- Average BCI = 70	- 2020 OSIM Report

** Note: that the culverts in **Table 3-6** refer to large structural culverts with span greater than 3 m.*

Establishing LoS targets is an important part of continual improvement and performance management.

3.3.4 Levels of Service Targets

LoS targets are essential to ascertain whether goals are being met, or the extent of the gap if they are not. Incorporating targets into the Town's LoS Framework helps to ensure that targets are reasonable, aligned with stakeholder expectations, and evaluated on an objective basis by considering cost-benefit trade-offs.

It is important to review LoS targets with internal and external stakeholders, especially the customers who will be impacted the most by changes in service delivery. An important aspect of evaluating LoS targets is determining how willing the user is to pay for the service. Regulatory requirements are an exception; however, they only provide the minimum service standard. Cost is still an important parameter to consider when assessing the merits of service improvements. To deal with the financial realities, it is necessary to:

- Calculate how much the service costs based on current LoS.
- Determine the cost associated with varying the LoS.
- Assess the stakeholders' willingness to pay.

It is important that any targets set be realistic and achievable. Therefore, it is not advisable that the Town set any firm targets until their current performance has been fully assessed. As a starting point, AECOM has suggested possible targets in **Appendix B** of this report for O.Reg. 588/17 Technical LoS based on the median values from the Canadian Infrastructure Benchmarking Initiative (CIBI). The CIBI is a partnership of over 50 Canadian municipalities, stretching from coast-to-coast, that annually collect and report on water, wastewater, stormwater, and transportation LoS across financial, environmental, and social "bottom lines". Median values from the CIBI provide a good baseline regarding service levels across Canada. However, median values are not always appropriate for targets. In some cases, most Canadian municipalities are behind the curve due to alternate priorities. In other cases, performance measures may be highly skewed by situational factors. An example would be the unit cost to perform a particular maintenance activity which can vary greatly depending on the local labour markets. It is, therefore, recommended that the Town evaluate the median values on a line-by-line basis against their own strategic objectives and performance to ensure alignment with stakeholders.

3.3.5 Level of Service Monitoring

The LoS Framework provides an opportunity for the Town to ask whether its asset management practices could be performed in a different, better way, and what activities are appropriate for now. The opportunity exists to create more robust linkages between WorkTech, GIS, iCity and other systems used within the Town. This will also be further explored in the asset management Software Strategy that will be undertaken as a next step to the completion of the AMP. The data generated through these systems must inform the Town's decisions on when and how to intervene on assets to ensure service level targets are met. For example, the data collected on the number of breaks for example could inform the Town whether the main needs to be replaced or simply run to failure. These systems should inform the Town's AM decision making process by capturing and integrating operational data and leveraging processes across the organization.

A review of asset management practices will bring improvements to the LoS Framework each year by enabling a culture of annual review and refinement. Other benefits of reviewing current asset management practices and workflows include:

Being a catalyst for organizational change	Acting as a catalyst for cultural change through staff making better and smarter use of the information technology tools at their disposal, resulting in more efficient and more effective maintenance planning, performance, and evaluation.
Staff training	Helping staff to understand "where they live in the process" (i.e., the significance of collecting asset data, and understanding their roles in relation to other services and how other services might affect them).
Improved performance measurement	Continue to identify key performance indicators (KPIs) that measure how well the Town is performing in terms of asset performance and the maintenance of assets. Many municipal organizations are data rich but information poor, with performance data scattered throughout the organization.
Consistency across the Town	Achieving consistent asset management standards and practices across the Town supports cross-functional teams and eliminates silos by providing a uniform approach to maintenance forecasting and planning.

Please refer to Section 6.1 for continuous improvement initiatives related to Levels of Service.

3.4 Impacts on Service Delivery

Understanding internal and external factors that may impact service delivery (positively or negatively), such as staff resources, climate change, and shifts in population is a critical component for managing desired service levels in a sustainable manner.

In most cases, the factors presented in this section may result in a negative impact on the Town's existing service levels, unless additional funding or resources can be allocated to meet future needs; however, in some instances, such as technological advancements and higher regulation standards, the impact on service delivery may actually improve as a result.

By considering potential drivers, as well as any issues that may pose a threat to meeting future demand, the Town has the advantage to proactively plan and prepare mitigation strategies. Approaches for the Town to consider include:

- Asset based solutions (e.g., upgrading existing assets, providing new assets, etc.).
- Non-asset-based solutions (e.g., restricting usage, changing habits through education, providing service alternatives, etc.).

A hybrid solution often works well since every municipality has its own challenges and there is not a "one solution fits all" approach. It is important that the Town remains aware of its internal and external situational context and modifies its approach and mitigation strategies in a consistent, periodic, and well documented manner.

It is important to proactively develop effective, long-term strategies that are suitable for the Town's unique economic, environmental, and social landscape.

3.4.1 External Factors

The Town, like many other Canadian municipalities, faces a multitude of challenges driven by external factors. Some of the specific challenges that may impact service delivery include, but are not limited to, the following:

- Climate change: impacts such as increased flooding, forest fires, and water shortages present risks to service and financial sustainability. The construction, operation, maintenance, replacement, and renewal of assets contributes to greenhouse gas emissions that in turn contribute to climate change.
- Regulatory changes: As legislative requirements become more stringent or new regulation is implemented, such as O. Reg. 588/17, service delivery standards increase which often coincide with increased asset reliability, quality, accessibility, and public health and safety.

The challenges described above call for the Town to manage its assets in a comprehensive and systematic way that supports sustainable service delivery. This LoS framework and the development of the AM Plan for the Town's core infrastructure will help to measure progress in overcoming the above-mentioned challenges, which are discussed in more detail in the sub-sections below.

The LoS Framework contributes to a defensible business case that will demonstrate to key decision-makers the inconsistency between service level targets and current funding.

3.4.1.1 Population Growth

The Town of Georgina is the northern most municipality in York Region. The total land area of the municipality is 28,959 hectares (71,557 acres), and the Town's 2021 year-end estimated permanent population is approximately 49,000 (**Table 3-7**).

Table 3-7 Population Growth Forecast

Year	2021	2026	2031
Total Population Forecast for Town	49,278	63,900	70,300
Population Forecast Distribution			
Keswick	32,200	36,500	40,700
Sutton Jackson's Pt.	13,000	14,400	15,150
Pefferlaw/Port Bolster	2,945	2,980	3,000
Serviced Lakeshore Residential Area	5,370	5,390	5,420
Unserviced Lakeshore Residential Area	865	870	875
Hamlet Areas	2,290	2,320	2,355
Countryside Area	880	890	900

The relevant policies within the Town's Official Plan and the Town's Master Plan growth strategies seek to accommodate growth and maintain service levels across their specific service areas (i.e., stormwater, water, wastewater, etc.). As the Town's population continues to grow, careful asset management planning is required to balance the cost of delivering enhanced LoS, while also meeting the needs of the community to accommodate Georgina's future growth in a sustainable manner.

3.4.1.2 Climate Change

Town's guiding principle is "to be responsible and efficient in the use of land, resources, services and infrastructure in order to meet the needs of the present without compromising the ability of future generations to meet their own needs"[3]. For the Town to align itself strategically with its guiding principle and objectives for Sustainability as outlined in the 2020 Official Plan, it is crucial that the Town consider the impacts of climate change, identify mitigation and adaptation strategies, and develop a Climate Adaptation Plan (included as an improvement initiative in **Section 6.1**).

The impacts of climate change on the Town are anticipated to result in more extreme weather events. Across Ontario it is expected that warming will continue to increase in the winter. Furthermore, total annual precipitation may increase by up to 240mm by 2080, with more lake-effect precipitation and more frequent extreme weather events including heavy rains, wind, and ice storms. Summers in Ontario are projected to be drier on average, with a range of 69 to 48 mm less precipitation than baseline levels (**Figure 3-4**)[4].

Figure 3-4 Ontario's Ministry of Natural Resources and Forestry Climate Change Infographic

[3] Georgina Official Plan, 2020.
[4] Naturally Resilient, Ministry of Natural Resource Natural Resources and Forestry's Climate Adaptation Strategy, 2017 – 2021.

Other climate change impacts that may result in more stresses being placed on the Town's infrastructure include:

- An increase in the quantity and decrease in the quality of stormwater runoff.
- A longer growing season, and an uptick in invasive plant species, requiring increased pest and vegetation control to manage the negative impacts on the capacity and quality of infrastructure, such as detention ponds and ditches.
- Increased erosion of stormwater infrastructure, such as culverts, that could negatively impact fish populations and downstream infrastructure. This may increase the need for repairs and sediment removal resulting from erosion.
- More frequent weather events, such as windstorms, may result in fallen trees and power outages, severely impacting service delivery of roads and environmental services to the community. Potential costs to the Town include preparing for, responding to, and cleaning-up after the weather event.
- Increase in freeze-thaw events which may lead to watermain breaks, and pavement heaving, cracking, and potholes. Moreover, precipitation intensity can cause flooding, resulting in road or sidewalk washouts, which may directly impede travel by motorists and pedestrians.

To mitigate the above-mentioned service impacts and to help guide the Town towards the development of Climate Change Adaptation Plan Objectives, the following asset management-related strategies are recommended:

Increase system resilience to adapt for climate change when assets are being replaced at the end of their service life.

- The Town can use current rainfall data (i.e., IDF curves) to predict future rainfall and analyze post-development flows to maintain post-development flows to pre-development conditions; however, if no additional measures are implemented to control post-development flows, the capacity of storm sewers will need to increase.
- Since most drainage infrastructure installed now will last for 50-100 years, it is important that any new infrastructure be sized for rainfall increases projected for 2100. Increasing a pipe size by one size (e.g., from 450 mm to 525 mm) increases a pipe's capacity by 35%, on average. The resulting increase in cost by going up one pipe size is approximately 15%. Therefore, as the Town projects future drainage renewal needs, it should not expect to be making like-for-like replacement. It should plan, in general, to replace existing assets with larger assets (i.e., greater capacity).

Greater use of green infrastructure to control run-off volumes, peak flows, and quality, to replenish groundwater, to increase stream baseflows, and to resist flooding from storm surges.

This is in alignment with the Town's sustainability objective to promote the use of sustainable design principles or technologies and climate change resilient design in community development, site design, and buildings.

Greater use of drought and pest / disease resistant vegetation

Paired with increased knowledge and effort in vegetation control, this strategy will help lighten the burden of maintaining green infrastructure.

This is in addition to infrastructure management strategies that the Town will need to consider around emergency preparedness and increased and modified maintenance practices. The Town may also need to consider increasing future budgets to account for emergency flooding response. This would include costs associated with preparing for extreme events (i.e., sandbagging, clearing catch basins), responding to extreme events, and repairing any resulting damage.

3.4.1.3 Aging Infrastructure

All assets are expected to deteriorate over their lifecycle, but actual service life can vary significantly from the expected service life (ESL) due to the following factors:

- **Operating conditions and demands:** Some assets are operated intermittently or are operated at a lower demand than its design capacity, thus the actual operating "age" of the asset is reduced.
- **Environment:** Some assets are exposed to very aggressive environmental conditions (e.g., corrosive chemicals, rain, wind, etc.), while other assets operate in relatively benign conditions, thus the deterioration of assets is affected differently.
- **Maintenance:** Assets are maintained through refurbishment or replacement of components, which prolongs the service life of the asset.
- **Technological Obsolescence:** Some assets can theoretically be maintained indefinitely, although considerations such as cost to maintain the asset, its energy efficiency, and the cost to upgrade to an updated technology that would result in cost savings are likely to render this approach uneconomical.

Aging infrastructure places a burden on the Town's existing asset network and can have devastating impacts on the reliability, safety, and quality of the Town's core infrastructure assets. **Table 3-8** aims to identify examples of how changes in asset condition can impact the Town's delivery of its core infrastructure assets.

Table 3-8 The Impacts of Aging Infrastructure on Service Delivery

Asset Category	Potential Deterioration Factors	Impacts on Service Delivery
Water Linear	Interior and / or exterior corrosion, tuberculation, variable pressure, soil movement, flooding, ground freezing, applied loads, material, age, maintenance practices, etc.	– Disruption of service, and potential flooding, due to watermain breaks, collapse, leaks, and/or corrosion. – Increased maintenance costs due to assets requiring premature repair or replacement. – Increased risk of emergency repairs.
Wastewater Linear	H_2S, root intrusion, I&I, soil movement, applied loads, variable pressures, sedimentation, corrosion, flooding, material, age, maintenance practices, etc.	– Disruption of service, potential flooding, and sewage backup due to wastewater main breaks, collapse, leaks, and/or corrosion. – Potential contamination or pollution of environmentally sensitive areas. – Increased maintenance costs due to assets requiring premature repair or replacement. – Increased risk of emergency repairs.
Stormwater Linear	Root intrusion, soil movement, applied loads, variable pressures, silting, structural degradation, erosion, material, age, maintenance practices, etc.	– Increased flooding, and contamination or pollution of environmentally sensitive areas. – Increased maintenance and costs due to assets requiring premature repair or replacement. – Increased risk of emergency repairs.
Road Infrastructure	Freeze-thaw, chemical exposure, poor drainage, abrasion, age, material, maintenance, etc.	– Disruption of service due to pavement cracking, heaving, potholes, sinkholes, or flooding. – Increased maintenance costs due to assets requiring premature repair or replacement. – Increased risk of emergency repairs.

3.4.1.4 Legislated Requirements

Core infrastructure assets are critical to the Town's ability to provide essential services to the community, and for protecting the health and safety of the public. As such, key legislative requirements exist for the Town's core infrastructure assets, which ensure that the minimum requirements are met and standards are in place that promote a high quality of life (i.e., clean drinking water and safe roads, etc.). A sample of key Ontario legislated requirements are listed, but not limited to, the following items in **Table 3-9**.

Table 3-9 Core Infrastructure Legislated Requirements

Service Area	Legislated Requirements
All	Infrastructure for Jobs and Prosperity Act, 2015; Ontario Regulation 588/17 Asset Management Planning for Municipal Infrastructure
	Municipal Act, S.O. 2001
Water	Safe Drinking Water Act, 2002
	Ontario Regulation 128/04 Certification of Drinking Water System Operators and Water Quality Analysts
	Ontario Regulation 170/03 Drinking Water System
	Ontario Regulation 169/03 Ontario Drinking Water Quality Standards
	Fire Protection and Prevention Act, 1997; Ontario Regulation 213/07 Fire Code
Wastewater	Ontario Water Resources Act, R.S.O. 1990
	Ontario Regulation 129/04 Licensing of Sewage Works Operations
	Town of Georgina Current System Wide ECA
Stormwater	Lake Simcoe Protection Act (2008); Ontario Regulation 60/08 Lake Simcoe Protection
	Ontario Water Resources Act; Environmental Compliance Approval (ECA) for each facility – and consolidated Linear ECA.
	Ontario Water Resources Act MECP Stormwater Management Planning and Design Manual
	Environmental Protection Act, 1990: Ontario Regulation 406/19 On-Site and Excess Soil Management (SWM Pond)
	LSRCA Technical Guidelines for Stormwater Management Submissions, 2016
	LSRCA SWM Guidelines for Municipalities, 2015
Roads Infrastructure	Municipal Act, 2001; Ontario Regulation 239/02 Minimum Maintenance Standard for Municipal Highways
	Municipal Act, 2001; Ontario Regulation 472/10 and Ontario Structure Inspection Manual (OSIM)

3.4.2 Internal Factors

Potential internal factors that may impact the future service delivery of the Town's core infrastructure assets include, but are not limited to, the following:

- **Staff resources:** As assets age and deteriorate over time, and as demand increases with the development of new subdivisions, it is anticipated that staff resourcing will be a challenge for the Town to successfully meet service level targets. Building more preventive vs. corrective maintenance programs and developing and implementing condition assessment programs will be critical as increased pressure is placed on the Town's core infrastructure assets.
- **Financial resources:** As outlined in **Section 3.4.1**, future service level requirements are increasing due to increasing population, impacts of climate change, aging infrastructure, and more stringent legislation. As such, service levels provided to the community have the potential to decline if O&M and capital funding does not meet future demand requirements and expectations.
- **Organizational Changes:** Staff turnover and retirements, particularly in operations roles, can lead to the loss of knowledge (i.e., subject matter expertise) unless this information has been formally recorded and documented. Lack of knowledge transfer can have a significant impact on the service delivery of the Town's core infrastructure assets, leading to operational inefficiencies or duplication of effort.

04

Asset Management Strategy

4.1 Asset Risk

Understanding the risk exposure for a given asset allows the Town to identify where they are most exposed to risk, which is used to drive the prioritization of appropriate maintenance activities, and to target investments that reduce the risk exposure most effectively.

As municipal infrastructure ages, it becomes increasingly more challenging to assign limited capital expenditures to the repair, rehabilitation, or replacement of the assets. This section describes how the Town's risk model can be used in day-to-day decision making and in capital improvement programs for the prioritization for water, wastewater, stormwater, and roads infrastructure. The intent of the risk model is to answer questions, such as "which watermains will have the greatest impact if a failure is to occur?". This allows staff to focus resources and effort on these assets before they fail.

4.1.1 Risk Model Approach

Effective asset management applies risk exposure and the concept of infrastructure "criticality" in evaluating the effectiveness of competing alternatives. According to the risk equation, the estimated risk exposure posed by a given asset is based on the consequence of failure (CoF) and the probability of failure (PoF) which is best measured by applying the equation below:

Risk Exposure = Probability of Failure x Consequence of Failure ***[2]***

The PoF reflects the relative "likelihood" of a given asset failure to provide its required LoS. In other words, the PoF score does not represent the true probability that the asset will fail, but a general indication of its likelihood given the conditions under which it operates. Assessing this relative likelihood of failure increases the understanding of the stresses individual assets may experience. The CoF reflects the relative "impact" of a given asset's failure. While traditionally the CoF has been looked at in purely economic terms (i.e., repair cost, loss of revenue, etc.), the truth is that investment decisions are often driven by non-economic factors. Understanding both the economic and non-economic impacts associated with loss or limitation of service help in categorizing an asset's "criticality" and justifying infrastructure decisions in a consistent, defensible manner.

Based on this principal, the risk associated with a given asset's failure can be managed by limiting its likelihood of occurring, or the impact realized, should it occur. Even without understanding when failure will occur, categorizing assets based on "criticality" or "failure consequence" allows municipalities to effectively target management strategies aimed at mitigating risk.

Figure 4-1 presents a sample risk-based intervention matrix based on an asset's risk exposure, ranging from monitoring asset condition or "run-to-failure" for low-risk assets to immediate replacement of the very high-risk assets. The failure of high-risk assets presents the greatest risk to the organization and should be avoided through close monitoring, scheduling interventions, and performing the necessary renewals / replacements before failure occurs.

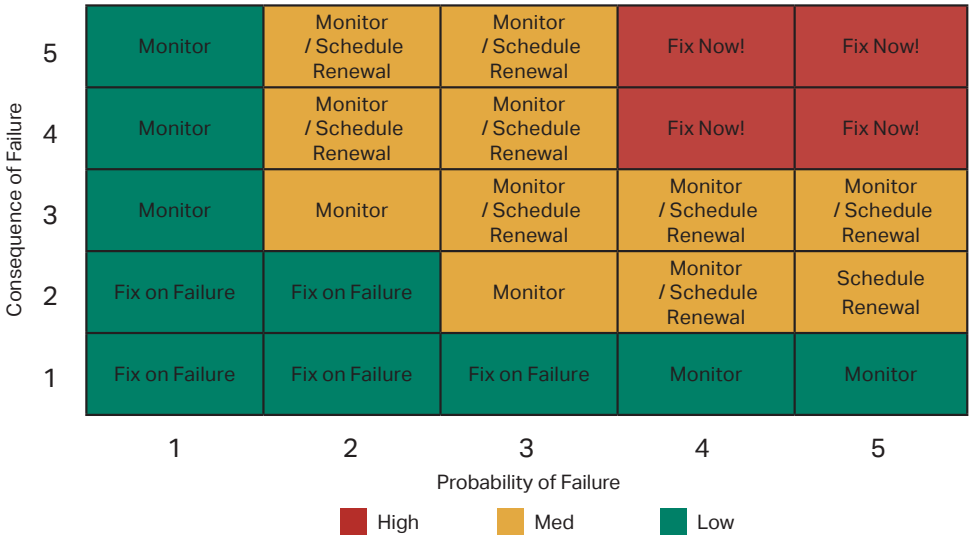


Figure 4-1 Risk-Based Intervention Matrix

[5] WERF, 2010

4.1.2 Risk Model Development Process

The fundamental principle of the risk model is to evaluate the criticality of an asset (or set of assets) based on select criteria. As such, critical assets are those that will potentially have the greatest impact on service delivery should they fail.

The Risk model was developed through a collaborative workshop and consultation processes with Town staff which involved the selection and ranking of criticality criteria that has the potential to impact AM decisions across the Town's core municipal infrastructure.

4.1.2.1 Consequence of Failure Methodology

The Risk model evaluates the CoF of assets based on the following triple-bottom-line indices:

ECONOMIC

Impact of the asset's failure on monetary resources

SOCIAL

Impact of the asset's failure on society

ENVIRONMENTAL

Impact of the asset's failure on the environment

Factors affecting the relative criticality and their weightings were selected based on literature review and vetted through a series of workshops with Town staff. Each of the criticality factors have been assigned a score based on a one through five risk rating, where five is the maximum score (i.e., most critical) and one is the lowest score (i.e., least critical).

4.1.2.2 Probability of Failure Methodology

The PoF is assessed based on the condition of the asset. Where condition data was not available the age of the asset was used as a proxy. The PoF factors have also been assigned a score based on a one through five risk rating, where five is the maximum score (i.e., most critical) and one is the lowest score (i.e., least critical). By applying the criteria above and utilizing **Equation [2]**, an overall risk score from one to 25 is generated for each asset.

The risk model was developed through a series of iterative steps as outlined in **Table 4-1**.

Table 4-1 The Risk Model Development Process

Step		Process
1.	Propose Preliminary Risk model	A preliminary framework was proposed based on comparable risk models developed for other municipalities. The model was subsequently revised through a series of workshops and communication with the Town.
2.	Determine Criticality Factors and Weights	The triple-bottom-line approach to risk criticality was established in collaboration with the Town. The factors and weights were determined by assessing the Town's available data and facilitating a collaborative risk workshop to gather qualitative input from Town staff.
3.	Process the Data & Run the Risk model	Once the risk model factors were confirmed, the Town provided additional data as required to support the model, and geo-processing was undertaken as needed for criticality evaluation. An Excel-based model was developed using the proposed indices, factors, weights, and processed data as inputs. The model was run to determine the CoF score, the PoF score, and the combined risk score.
4.	Import Results into GIS	The water, wastewater, stormwater, and roads infrastructure linear risk results were exported from Excel and imported into GIS for the purpose of representing the criticality of these assets visually in a series of risk maps (**Appendix F**).
5.	Review Model	The model was reviewed by the Town and adjusted as necessary. Steps 1 through 5 were iteratively completed until the model was deemed to meet the Town's needs.

A conceptualized version of the Town's risk model is presented in **Appendix E** which shows the criticality indices, factors, and weightings for each of the core infrastructure asset categories. The specific criticality factors and weighting should be reviewed, and the process reiterated as per **Table 4-1** to reflect the priorities of the Town on a continual improvement cycle.

4.1.3 Risk Analysis

4.1.3.1 Consequence of Failure

Table 4-2 outlines the various factors identified in the risk model that contribute to the consequence of risk, upon an asset failure to the community. **Table 4-2** provides a definition of each CoF risk factor, grouped by its corresponding index (i.e., economic, social, and environmental), and reveals where the factor was applied across the risk model. Each CoF factor was assigned a one to five score in the risk model.

Table 4-2 CoF Risk Model Factors & Definitions

Index	CoF Factor	Description	Risk Model Application
Economic	Total Replacement Cost	Examines the total replacement cost of the asset. The higher the total replacement cost the higher the score assigned. The score distribution was established by examining the Town's distribution of total replacement costs for its linear water infrastructure.	Roads, bridges & culverts (> 3 m), water linear, wastewater linear, wastewater facilities, stormwater linear, stormwater non-linear
	Pipe Size	The measure of the quantity of material expected to be conveyed by a pipe. In general, a larger diameter pipe can be assumed to have a greater capacity than a smaller diameter pipe. Scores increase as the pipe diameter increases which represent the potential for more people serviced by large pipes to be impacted by pipe breaks, leaks, or other failures. The score distribution was established by examining the Town's distribution of watermain and sewer diameters.	Water linear, wastewater linear, stormwater linear
	Capacity	Stormwater management ponds are used to manage runoff from urban areas. CoF scores increase as the volume of the pond increases which represents the potential of greater impacts to the surrounding environment. The level of redundancy of pump station assets are typically considered to reflect the capacity.	Stormwater non-linear
Social	Adjacent Land Use	Examines how the area around the asset is utilized. Linear assets that are located in areas where there is minimal expected impact, such as rural areas, are assigned relatively low scores. Where the social impact can be expected to be greater, such as in an institutional area or parkland (i.e., open space) a higher score was assigned.	Water linear, water vertical, wastewater linear, wastewater vertical, stormwater linear, stormwater non-linear
	Critical Customers	Identifies linear infrastructure assets that serve a customer with a greater requirement for service reliability. The Town's critical customers include Child Care Centres, Schools, Long-Term Care Facilities, Major Health Centres, and Emergency Medical Services. Any linear asset flagged as critical has been assigned the maximum score of five; all other assets are assigned the lowest score of one.	Water linear, water vertical, wastewater linear, wastewater facilities, stormwater linear, stormwater non-linear
	MMS Classification	Minimum Maintenance Standards (MMS) provide the Town with a level of care standard for its roads and bridges. MMS classifications are based on the roadway Annual Average Daily Traffic (AADT) and speed limit, where the higher the MMS Classification the lower the AADT and speed limit. As such, the CoF score increases as MMS Classifications decrease.	Roads, bridges & culverts (> 3 m)

Index	CoF Factor	Description	Risk Model Application
Environmental	Proximity to Environmentally Sensitive Area	Identifies the proximity of an asset to an Environmentally Sensitive Area (ESA). Assets that are within or near an ESA (i.e., < 8 m) were assigned the highest score, whereas assets further away from an ESA (i.e., > 45 m) were assigned the lowest score. The scale of ESA proximity distances is based on the National Association of Sewer Service Companies (NASSCO)'s risk management guideline for environmentally sensitive features. While the scale is provided for sewers, it can also be applied to other linear assets.	Roads, bridges & culverts (> 3 m), water linear, wastewater linear, wastewater facilities, stormwater linear, stormwater non-linear
	Climate Change	Identifies the location of the asset relative to a watercourse and flood regulated area, which reflects the vulnerabilities that may be caused by climate change to the Town's core infrastructure assets. The CoF score increases in areas where the asset is closest to a watercourse and within a flood regulated area.	Roads, bridges & culverts (> 3 m), water linear, wastewater linear, wastewater facilities, stormwater linear, stormwater non-linear

4.1.3.2 Probability of Failure

Table 4-3 outlines the various factors identified in the risk model that contribute to the probability of a core municipal infrastructure asset failing. **Table 4-3** provides a definition of each PoF risk factor and reveals where the factor was applied across the risk model. Each PoF factor was assigned a one to five score in the risk model.

Table 4-3 PoF Risk Model Factors & Definitions

PoF Factor	Definition	Risk Model Application
Age vs. ESL	Provides an indication of the lifecycle stage of an asset. Similarly, older assets can generally be assumed to be in "worse" condition than newer assets of the same type. This factor takes into consideration the asset's date of installation and associated ESL. Scores are established by assigning greater scores to older assets based on the Weibull distribution. Age is used to estimated ESL when condition data is unavailable.	Streetlights, water linear, water facilities, wastewater linear, wastewater facilities, stormwater linear, stormwater non-linear
PCI	Identifies the Pavement Condition Index of a road segment. Assets that are considered to be in "Poor" condition (i.e., low PCI rating) were assigned a higher PoF score than assets considered in "Good" condition (i.e., high PCI rating)	Roads
AADT	Identifies the Annual Average Daily Traffic (AADT) on a particular road. Scores are established as increasing along with the AADT count to represent the increasing road segment criticality.	Roads

PoF Factor	Definition	Risk Model Application
BCI (Condition)	Identifies the Bridge Condition Index of each bridge and culvert (> 3 m). Each component of the bridge is rigorously examined and assigned a BCI rating from "Poor" to "Good" based on the assessed condition. Assets that are considered to be in "Poor" condition (i.e., low BCI rating) were assigned a higher criticality score than assets considered in "Good" condition (i.e., high BCI rating).	Bridges & culverts (> 3 m)
PACP (Condition)	Sewer condition assessment scores that are based on the scheme of NASSCO's Pipeline Assessment Certification Program (PACP). Scores are assigned based on observations (mainly structural and operational defects) recorded during closed-circuit television (CCTV) inspections. Higher PACP scores reflects a poor asset condition that is either operationally and/or structurally deficient. Higher PACP scores are assigned higher PoF scores as the probability of the asset to fail increases with the increased severity of the operational and/or structural defects.	Wastewater linear
Material	A gauge of the physical condition of the asset based on different material types.	Bridges & culverts (> 3 m), water linear, stormwater linear

A series of linear risk maps for the Town's core infrastructure assets can be found in **Appendix F**. The risk scores of the linear and non-linear core municipal infrastructure assets have been incorporated into the Excel-based Asset Lifecycle Model to inform asset management, rehabilitation, and replacement within the Town.

4.2 Asset Deterioration Factors

Understanding the factors that contribute to accelerated asset deterioration, unplanned repairs and/or asset failure will assist the Town in making educated predictions about future system condition, thereby enabling the selection of the correct treatment strategy to prolong asset life at the least cost and most benefit to the Town. **Figure 4-2** presents a sample asset deterioration curve with three sets of intervention strategies over the hypothetical 20-year asset lifecycle, as follows:.

Do-Minimum Strategy (black line)

The asset deteriorates from a very good to very poor condition. This might be a low-cost option but the rapid deterioration of asset condition towards the end of the asset life presents an unacceptable risk of failure and inadequate LoS to customers. The eventual asset condition is such that the asset will have to be replaced at a high cost.

Minor Treatment (blue line)

A number of minor interventions starting a third into the life of the asset somewhat improves the condition but not for long. The minor treatment is repeated a number of times over the life of the asset. Although the asset could potentially be indefinitely maintained in an acceptable condition, the cumulative cost of the minor treatments combined with factors such as capacity limitations or technological obsolescence might make this option sub-optimal.

Major Treatment (red line)

The asset undergoes a major renewal half-way through its life, returning the asset to a near-new condition. Although the asset ends up in a slight worse condition than with the minor treatment option, the overall result might still be preferred over the minor treatment option due to a potentially lower life cycle cost.

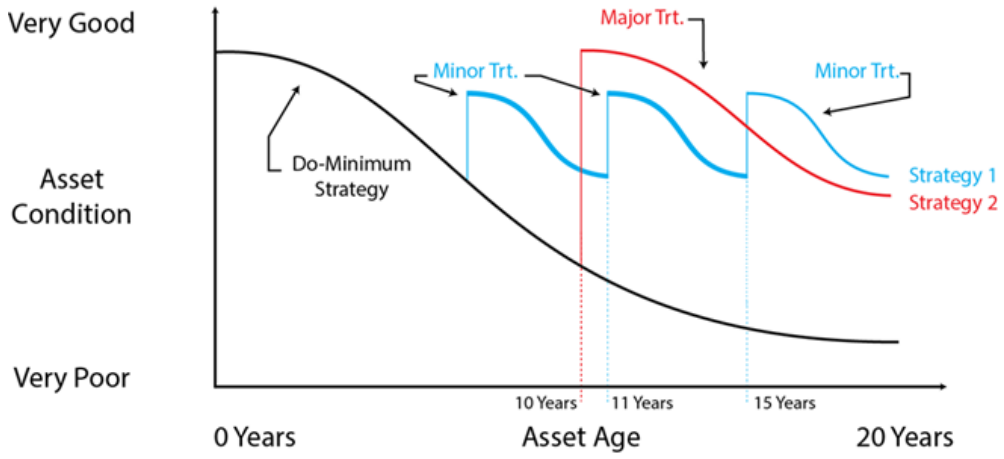


Figure 4-2 Evaluating Several Strategies using Life Cycle Cost Analysis

Often the best intervention strategy for a particular asset is a combination of minor and major treatment strategies. For example, the cleaning of sewers is a minor treatment to improve the operational capacity of the sewer. At the same time, the asset can be structurally rehabilitated through lining which is a major rehabilitation option. Understanding asset deterioration enables the Town to recognize when large expenditures are more likely to occur in the future, in order to plan for adequate financing and resources to conduct the necessary amount of work in a timely manner to minimize risk and public impacts, and to optimize life cycle costs. This type of deterioration analysis, based on actual physical deterioration rate observations is considerably more precise than assessments made purely on system age, and is a fundamental building block in the transition from basic to advanced asset management practices.

Through a desktop literature review and consultation with Roads and Environmental Services Operations staff, general and Town-specific factors contributing to asset deterioration have been identified, as listed in the **Table 4-4**. Note that with most assets, factors including but not limited to, inadequacy of design, construction, material selection, maintenance, and drainage, could potentially play a role in asset deterioration.

Table 4-4 General and Town-Specific Asset Deterioration Factors

Asset Group: Water

Asset Category:
Watermains

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Interior and / or exterior corrosion, tuberculation, variable pressure, soil movement, ground freezing, applied loads, material selection

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

The Town's watermains are primarily PVC mains installed after 1990, which corresponds to the AWWA C900 standard for quality assurance and factor of safety. There also exists several non-AWWA standard PVC mains from the pre-1975 era. Prior to the advent of the first AWWA Standard for small diameter PVC (<=300 mm) it was manufactured with poor quality assurance processes, designed with lower factors of safety, and installed with poor bedding practices. Pipe manufactured to ASTM (Series Pipe) (non-AWWA Standard) was subject to poorer Quality Assurance (QA) standards and typically installed with thinner walls or high Dimension Ratios (DR's) making it more susceptible to external loading (deflection), internal pressure (buckling), and cyclic fatigue failure.

Based on the era of construction present in the GIS, the Town's existing cast iron pipes are expected to have thinner wall thicknesses when compared to older cast iron pipes used in North America. Due to the degradation factors and their impacts on ferrous materials, the wall thickness would decrease by time; in fact, deterioration expedites in very corrosive areas leading to reduced wall thickness that does not withstand applied loads.

The Town is installing cathodic protection on new ferrous mains (e.g., ductile iron) in the event of localized repairs. However, the Town does not have a cathodic protection program. It is unclear how prevalent cathodic protection is on the older mains, since soil corrosivity is one of the leading factors for ductile and cast-iron main corrosion / failure.

Generally, the Town's soils are corrosive, depending on location, considering that the Town is located at the bottom of what was a prehistoric lake. Soils vary from glacial till, high organics to sand.

The groundwater table is very shallow, and most pipes close to the shoreline are essentially under water. The freeze-thaw cycle has an adverse effect especially on cast iron and ductile irons mains.

Poor construction practices / workmanship / inspection practices during installation often results in mains having to be replaced prematurely (e.g., over-insertion of PVC mains using a backhoe causing the bell to split). Generally, the primary failure causes of PVC pipes are a combination of pressure and the way the pipe is exhumed. Poorly exhumed pipe will increase the probability of failure.

Asset Group: Water

Asset Category:
Service Connections

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Material (lead), Int. / ext. corrosion, tuberculation, variable pressure, soil movement, ground freezing, applied loads

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

The Town has an existing program to replace polybutylene water service connections installed in the 1970s and 1980s. In water systems where chlorine is applied, this oxidant reacts with polybutylene material decreasing its elasticity, increasing its brittleness which results in decreased structural integrity. In several jurisdictions in the US and North America, these services have been replaced due to their poor performance and causes of damages that were reported in the 1980s and 1990s.

Poor construction practices / workmanship / inspection practices during installation often results in service connections having to be replaced prematurely. E.g., the polybutylene service connections should have been installed at a 90-degree angle to the main but were instead installed at a 45-degree angle, similar to PVC or copper services.

Asset Group: Water

Asset Category:
Valves

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Corrosion, leakage, cannot be located, age, no maintenance, temperature

Asset Category:
Valve Chambers

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Concrete corrosion, flooding, traffic damage

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

The bolts found on the valves can usually be found to be rusted and are starting to fail; almost always when valves are being cycled.

Currently there is no valve maintenance program in place, but the Town has a valve cycling pilot project currently in its early stages.

Asset Group: Water

Asset Category:
Hydrants

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Corrosion, traffic damage, cannot be located, age, no maintenance, changes in temperature

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

The Town has a hydrant maintenance program where each hydrant is winterized, as well as a hydrant painting program in its early stages.

Approximately 20-30 hydrants are repaired annually (i.e., replacement of internal components)

Asset Group: Water

Asset Category:
Pump Stations

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Flooding, component age, technical obsolescence

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

One booster pump station was recently commissioned and the other was built in 2002. Condition assessment is required in the next year or so (exclude the new pump station) to determine the rehabilitation need.

The Town has an electrical contractor in place to undertake maintenance when required.

The two water booster stations are equipped with variable speed drives (VSDs), which help to protect the pressure mains against water hammer and transients.

Asset Group: Wastewater

Asset Category:
Wastewater Mains

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
H2S, root intrusion, I&I, soil movement, applied loads, variable pressures, sedimentation

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

The future ongoing CCTV program will drive capital renewals, and the O&M-driven flushing maintenance program will continue to inform maintenance practices. The.

The Town would like to have a condition assessment program for force mains that includes transient analysis.

Asset Group: Wastewater

Asset Category:
Laterals

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Root intrusion, soil movement, applied loads

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

No specific concerns other than that mentioned for mains.

Asset Group: Wastewater

Asset Category:
Maintenance holes

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
I&I, traffic damage, applied loads, root intrusion

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

No specific concerns other than that mentioned for mains.

Asset Group: Wastewater

Asset Category:
Valves

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Corrosion, leakage, cannot be located, age, no maintenance, temperature

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

The bolts found on the valves can usually be found to be rusted and are starting to fail; almost always when valves are being cycled.

Asset Group: Wastewater

Asset Category:
Pump Stations

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Flooding, component age, technical obsolescence, silting

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

The Town has recently put a condition assessment program in place for sewage pump stations. The program, , sees four stations inspected per year as a baseline until all stations have gone through one condition assessment cycle. Once baseline condition assessment has been undertaken, the program will undertake condition assessment every 5 years and will review process/mechanical, structural, electrical and SCADA components.

Asset Group: Stormwater

Asset Category:
Stormwater Piping

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Root intrusion, soil movement, applied loads, variable pressures, silting up, sizing / climate change

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

The stormwater deterioration factors are expected to be almost similar sanitary sewers.

Asset Group: Stormwater

Asset Category:
Oil and Grit Separators

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Silting builds up; never cleaned out; structural degradation

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

Oil and grit separators (OGSs) are maintained by Roads Division. They are cleaned out as part of the catch basin contract.

Asset Group: Stormwater

Asset Category:
Stormwater Management Ponds

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Silting builds up; vegetation; structural degradation; pipe degradation, erosion

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

The Town needs to develop a condition assessment program for ponds (i.e., bathymetric surveys, sediment analysis, dredging, etc.) in addition to the inspections being performed by Environmental Services.

Engineering drawings are available for most stormwater ponds together with basic information to enable estimation of the design volumes.

Asset Group: Stormwater

Asset Category:
Infiltration & Exfiltration Galleries

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Silt up; vegetation; pipe collapse

Asset Category:
Bioswales

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Silt up; vegetation; pipe collapse

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

Some of these assets are being constructed within easements (e.g., in the backyards of properties or on public lands like parks) and will therefore be difficult to inspect.

Asset Group: Roads Operations

Asset Category:
Roads

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
High traffic, freeze-thaw, chemical exposure, poor drainage, traffic damage

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

Historically being a cottage town, the inadequacy of design, construction, material selection, and drainage are all factors in the deterioration of roads. For example, very few of the Town's roads were designed and constructed based on current standards but rather evolved over time from gravel roads that were eventually topped with asphalt.

The high-water table and proximity to the lake contributes to significant freeze-thaw cycles within the Town.

Ongoing utility cuts add to roadway deterioration. For example, in the absence of overall infrastructure rehabilitation planning, the utility servicing in some areas often follows once the roads are in place. The Town needs a process to allow for full road reinstatement in the event of utility cuts.

Agricultural equipment is much heavier now than it used to be, thus road edges are getting damaged all the time by this type of equipment.

Due to its northern location, the Town does not have a long inspection or construction / resurfacing season. E.g., surface treatments have a very specific temperature requirement for before and after application. The middle of September is typically seen as the end of surface treatment season.

Asset Group: Roads Operations

Asset Category:
Bridges

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Damage from accidents, scour, corrosion, freeze–thaw, salt damage

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

The timber bridges are subject to wood rot, especially the timber piers.

Asset Group: Roads Operations

Asset Category:
Culverts (> 3 m dia.)

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Scour, under-sizing, water velocity, corrosion, abrasion, freeze-thaw, collapse

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

The Town's 2020 OSIM bridge inspection report outline deficiencies for each of the bridges.

Asset Group: Roads Operations

Asset Category:
Sidewalks

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Freeze-thaw, tree roots, vehicle traffic, salt damage, chemical exposure

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

Freeze-thaw, shifting of concrete.

Asset Group: Roads Operations

Asset Category:
Streetlights

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Corrosion, energy efficiency, traffic damage, wind

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

No specific concerns.

Asset Group: Roads Operations

Asset Category:
Roadside Safety Infrastructure

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Corrosion, traffic damage, flooding, scour, fire

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

Out-of-specification systems.

Erosion of the roadside environment.

Asset Group: Roads Operations

Asset Category:
Driveway Culverts

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Traffic damage, collapse, vegetation, silting up

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

The Town is responsible for maintaining the overall stormwater system functionality. However, the entrance to a property and the associated culvert is an asset under shared responsibility. If a homeowner wants to alter their entrance (widen, change location), then these costs shall be borne by the property owner. The Town may also maintain, replace, or upgrade the culvert based up stormwater system functionality.

Causes of deterioration include poor construction, resident actions such as adding headwalls, filling in ditches, lack of cleaning, use of heavy equipment on driveway culverts that were not designed for the load, etc.

Asset Group: Roads Operations

Asset Category:
Road Crossing Culverts (< 3 m in dia.)

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Scour, under-sizing, water velocity, corrosion, abrasion, freeze-thaw, collapse

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

Culverts close to Lake Simcoe are always filled with water and do not last as long as expected.

Asset Group: Roads Operations

Asset Category:
Ditches

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Vegetation, silting up, erosion

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

Encroachment actions from property owners (e.g., ditches being filled in by owners).

Silting up from the application of sand to the roads during winter maintenance ("30 – 40 years of sand application at the rate of 500 – 600 kg of sand per lane km, a hundred times per year").

Asset Group: Roads Operations

Asset Category:
Catch Basins

Typical Asset Deterioration Factors / Contributors at Other Municipalities:
Sediment build-up, corrosion, damage from traffic, chemical exposure

Additional Deterioration Factors within the Town of Georgina and Current Approaches to Prevent Accelerated Deteriorations:

No specific concerns.

4.3 Operations and Maintenance Planning

Formalizing an optimal asset maintenance plan is the practice of analyzing, defining, and monetizing O&M practices to achieve the desired asset management objectives. Completed successfully, annualized savings may accrue from some or all of the following:

- Reduced cost of individual work orders through better planning and execution.
- Reduced levels of overtime and premium pricing of equipment and materials.
- Extended useful life of assets, thereby reducing the need for replacements and capital reinvestments.
- Better and more predictive O&M planning, as past year results feed directly into the forecasting of workloads and budgets for the future.

Strong planning and good operation and maintenance practices are a vital component of AM.

The approach builds an intimate understanding of current operations and maintenance at the Town for optimizing areas of the O&M program using the Town's current and desired levels of service, regulation requirement, industry best practices, and trends established in the Canadian Infrastructure Benchmarking Initiative (CIBI).

The findings from the CIBI, which includes the former National Water and Wastewater Benchmarking Initiative (NWWBI) and the National Transportation Benchmarking Initiative (NTBI), serve as key inputs into establishing what constitutes industry best practice for O&M activities across similar-sized Canadian municipalities. Asset management activity targets of approximately 50 Canadian municipalities were reviewed to provide the Town with context and useful comparable information to make informed decisions regarding their own asset management activities.

In developing this asset maintenance plan, extensive internal stakeholder consultation was undertaken throughout the process. A detailed, asset-based maintenance plan is provided (**Appendix G**) to ensure that the plan is well documented, transparent and can be continually improved by the Town following the inception of any new O&M activities.

The recommended O&M program is a custom "built in Georgina" solution.

4.4 Current State of Operations and Maintenance Planning

The Town has implemented a computerized maintenance management system (CMMS) known as WorkTech. A review of work orders implemented over the past three years within WorkTech was undertaken and consultation with the Town to identify gaps in the existing O&M planning program. Three key findings that came out of this collaborative exercise include the following:

- There are a number of completed work activities not entered into WorkTech. For example, most activities from the water and wastewater preventive maintenance calendar are not entered into WorkTech. Roads contracted activities are also not documented in WorkTech, such as selective resurfacing and maintenance, rout and seal, road grading, and sidewalk cutting (i.e., trip hazard removal). These activities are recorded in various locations, separate from WorkTech, such as MS Excel spreadsheets, or in GIS. In some cases, maintenance activities conducted across multiple assets are only documented in one work order line item.

- For the current records that are in WorkTech, the activities are not adequately linked to each asset class. In addition, resource information which are key components for developing activity cost estimates, such as labour hours, materials, equipment, and contracted services are not built into the system. Ideally, each activity should be assigned a code to allow staff to track the type of work that is performed for each asset, as well as associated costs and resources.

- Stormwater asset maintenance work is not currently defined sufficiently in WorkTech to be able to assign work orders to these assets. With the completion of the stormwater asset inventory that occurred in parallel to this project, stormwater maintenance activities could in the future be generated and included in budget and asset management planning.

A good O&M tracking system requires a digital approach that maximizes data capture and uses asset-level tracking. It is important to note that software requirements for asset management planning, analysis, and performance measurement will be further explored in an asset management software strategy.

4.4.1 Maintenance Strategies and Programs

Any responsible owner of assets such as the Town has a desire to preserve the condition of their existing assets for as long as possible, by maintaining or even extending their design lives through routine activities such as maintenance, condition assessment and active interventions such as rehabilitation (see **Figure 4-2**). The Town is continually acquiring assets that require additional funding for O&M. The Town is also responsible for the replacement of deteriorated assets for as long as their service is required. While individual assets may have an ESL that can be predicted in years or decades, the service that the asset provides could be required for a substantially longer duration. In general, the maintenance activities can be categorized into inspections, preventative maintenance, and corrective maintenance.

Inspections

Regularly scheduled and periodic inspection to ensure reliable operations. There are different types of inspections that can occur throughout the life cycle of an asset. Some simply check that the asset is operating as planned and can provide early warning of conditions. Other inspections are for measuring or observing the condition of assets, or for measuring performance. These shed light on renewal plannning and goal setting. Inspections may also be required by legislation, departmental policy, or completed based on industry standards or manufacturers' recommendations.

Preventative Maintenance

Regularly scheduled and periodic maintenance to ensure reliable operations. These are regularly scheduled activities, completed while the asset is still in an "operational" condition. The purpose of preventive maintenance is to keep an asset in a state of good repair thereby reducing the likelihood of malfunction. Conducting preventive maintenance mitigates the need for corrective maintenance leading to reduced lifecycle costs and improved service delivery.

Corrective Maintenance

Physical repairs to an asset that is not functioning as required. The repair reinstates the asset to its normal "operating" condition but does not significantly extend the overall life of the asset. Corrective maintenance activities generally increase as assets age. In addition, they can be considerably more expensive than planned (preventive) maintenance activities and often impact service delivery.

4.4.1.1 Water

The Town's preventive maintenance calendar lists water asset maintenance activities and the frequency to perform the work. In addition to these maintenance activities, the Town conducts emergency repairs through external contracts. Currently, the Town is making efforts to plan and implement water asset condition assessment programs to identify asset capital reinvestment needs and optimize maintenance strategies.

Table 4-5 presents the Town's water asset maintenance strategies. The Town is aiming to establish new programs that are important for achieving the desired service level including, water valve exercising, and water flow meter calibration.

Table 4-5 Maintenance Strategies for Water Assets

Asset Category	Inspections	Preventive Maintenance	Corrective Maintenance
Watermains	– None Currently	– Watermain Flushing	Emergency Repairs (performed quickly to restore the assets to an acceptable level of service due to unforeseen conditions necessitated by accidents, weather-related conditions, premature failures, malfunctions, or other unusual or unexpected damage)
Service Connections	– None Currently	– Service Connection replacement program to replace Polybutylene service connections installed in 1970s and 1980s. Copper services are being replaced if they are leaking. This work is being done through an annual capital program.	
Water Valves	– None currently	– None currently	
Valve Chambers	– None Currently	– None Currently	
Hydrants	– None Currently	– Hydrant Winterization – Hydrant Painting	
Pump Station	– Water Booster Station Inspection (Once every week) – Generator inspection (Monthly)	– Standby Power Testing (Annually) – Greasing Pumps (Twice a year) – Backflow Device Annual Inspections (Annually) – Pressure Indicating Transmitter Calibration Verification (Annually)	
Water Asset General	– Emergency Health and Safety Inspections (Monthly) – Electrical Safety Authority (ESA) Inspection (Annually) – Fire Safety Inspections (Annually) – Lift/Hoist Equipment Inspection (Annually)	– Annual Notice to Residents on Running Taps in Winter – Field Test Kit Calibrations (The process of calibrating tools in field test kit for proper reading/detection) (Annually)	

4.4.1.2 Wastewater

Similar to the Town's water assets, there is a preventive maintenance calendar listing the details of wastewater asset maintenance activities. **Table 4-6** presents the wastewater asset maintenance strategies. Currently, some CCTV inspection data has been collected for the Town's gravity sewer infrastructure and the resulting data and video is stored in individual reports and external hard drives but has not been reviewed to inform rehabilitation needs and capital budgeting planning. Sewer infrastructure is also flushed regularly depending on need as determined by the Environmental Services Division. The Town has begun the baseline condition assessment of wastewater sewage pump stations in 2021. The emergency repair of wastewater assets when required are performed through external contracts.

The Town is currently establishing new programs that are important for achieving the desired service level including wastewater electrical maintenance, wastewater maintenance hole inspections, wastewater flow meter calibration, HVAC maintenance, semi-annual pump vibration analysis on dry wells, and thermographic inspections on dry wells.

Table 4-6 Maintenance Strategies for Wastewater Assets

Asset Category	Inspections	Preventive Maintenance	Corrective Maintenance
Wastewater Gravity Mains	– CCTV inspection as part of the flushing program	– Sewer Flushing (Twice a Year) – Sewer Reaming (Annually) – Trouble/Hot Spot Cleaning (Twice a Year)	Emergency Repairs (performed to quickly restore the assets to an acceptable level of service due to unforeseen conditions necessitated by accidents, weather-related conditions, premature failures, malfunctions, or other unusual or unexpected damage)
Wastewater Force Mains	– None Currently	– None Currently	
Laterals	– Lateral Inspection	– None Currently	
Wastewater Valves	– None Currently	– None Currently	
Maintenance Holes	– None Currently	– Maintenance Hole Spot Cleaning Monthly – H_2S Control in Maintenance Holes, SPS 12, 23, 24 and the Briars (Bi-Weekly)	
Pump Stations	– SPS Inspection (Once per Week)	– Bioxide Dosing (odour control) (Weekly) – Wet Well Cleaning (Twice a Year) – OdaLogger Calibrations (Annually) – Pressure Gauge Calibration Verification (Annually) – Submersible Pump Inspection (Annually) – VFD Inspection (Annually)	
Wastewater Asset General	– Emergency Health and Safety Inspections (Monthly) – Fire Safety Inspections (Annually) – Gas Fired Equipment Inspection (Annually)	– None Currently	

4.4.1.3 Stormwater

The Town developed a Stormwater Infrastructure Management, Operations and Maintenance Manual[5] which provides guidance on the infrastructure management, O&M practices and general procedures for stormwater assets that the Environmental Services Division currently oversees. **Table 4-7** presents the stormwater asset maintenance strategies.

Table 4-7 Maintenance Strategies for Stormwater Assets

Asset Category	Inspections	Preventive Maintenance	Corrective Maintenance
Stormwater Mains	– None Currently	– None Currently	Emergency Repairs (performed to quickly restore the assets to an acceptable level of service due to unforeseen conditions necessitated by accidents, weather-related conditions, premature failures, malfunctions, or other unusual or unexpected damage)
Service Connections	– None Currently	– None Currently	
Stormwater Management Ponds (SWM Ponds)	– SWM Pond Inspections (Future): twice a year (early spring and mid to late fall) including: – Hydraulic operation of the facility – Condition of vegetation around the facility – Condition of facility infrastructure – Obstruction at the inlet, outlet and/or emergency spillway – Sediment buildup in sediment forebay, main cell and/or in the receiving water body – Evidence of contaminant spills (e.g., oil, grease, and hydrocarbons) – Presence and concentration of trash & garbage	– Vegetation Control and Management – Litter and Debris Removal – Inlet and Outlet Unclogging – Sediment Accumulation Monitoring – Mosquito Control – Beaver Management – Fish Management – Waterfowl Management	– Facility repairs: malfunction & failures – Bank erosion – Pipe repairs or replacements
Low Impact Development (LID)	– None Currently	– None Currently	– Emergency Repairs (performed to quickly restore the assets to an acceptable level of service due to unforeseen conditions necessitated by accidents, weather-related conditions, premature failures, malfunctions, or other unusual or unexpected damage)

[5] Town of Georgina (2021): Stormwater: Infrastructure Management, Operations and Maintenance Manual

4.4.1.4 Roads Operations

The current maintenance activities for roads, bridges & culverts, sidewalks, streetlights, driveway culverts, culverts (< 3 m in dia.), ditches, and Oil Grit Separators are summarized from **Table 4-8** to **Table 4-12**.

The Town has entered into a partnership with the Regional Municipality of York to undertake a Pavement Management Program for the collection and analysis of pavement condition survey data to assist in the assessment of the overall condition of the Town's road network and provide information for the development and prioritization of the Town's capital plan for roads rehabilitation projects. This program will also inform maintenance requirements such as rout and seal and patching needs. This condition assessment program will be conducted every two years for each of the Town's road segments.

The Town also undertakes inspections of its road network as per Ontario Regulation 239/02 and has a selective resurfacing maintenance program that includes pothole and shoulder repair, rout and seal, micro-surfacing and asphalt resurfacing to prolong the lifecycle of the road surface prior to requiring reconstruction that is informed by the condition assessment program described above. The Town is taking the initiatives to optimizing the sand and salt usage to achieve the most effective and efficient winter maintenance activities.

Table 4-8 Maintenance Strategies for Roads

Asset Category	Inspections	Preventive Maintenance	Corrective Maintenance
General Road Activities	Regular Inspections – Inspections of road network as per Ontario Regulation 239/02	– Selective Resurfacing Maintenance Program – Pothole and Shoulder Repair – Rout and Seal – Micro-Surfacing and Asphalt Resurfacing (Partial Depth, Prolongs the Lifecycle of The Road Surface Prior To Requiring Reconstruction) – Pavement Markings – Street Sweeping – Curb and Edge Repairs – Vegetation Control – Sign Install / Maintenance – Graffiti Removal – Railway Crossing Maintenance	Emergency Repairs (performed to quickly restore the roadways, roadsides, structures or facilities to an acceptable level of service due to unforeseen conditions necessitated by accidents, storms and other weather-related conditions, premature failures, malfunctions, or other unusual or unexpected damage)
Winter Road Activities	– Inspections of road network as per Ontario Regulation 239/02 winter road patrol components	– Sand and Salt Purchase – Salting and Sanding – Winter Equipment Fueling – Plowing – Ice and Snow Removal / Cleaning – Drainage – Snow Fencing – Winter Control Standby	Emergency Actions / Repairs – Potholing – Ice-ditching – Activities due to spring flooding

The Town conducts a biennial Ontario Structure Inspection Manual (OSIM) inspection to inspect all bridges and culverts with a span greater than three meters as per the requirements of Ontario Regulation 472/10. Recommendations on required rehabilitation planning typically result in a capital budget request to Council and construction takes place in years following. The OSIM inspection is a condition assessment function that also informs the preventive maintenance program.

Table 4-9 Maintenance Strategies for Bridges & Culverts

Asset Category	Inspectionsw	Preventive Maintenance*	Corrective Maintenance
Bridges & Culverts Activities	– Regular Inspections	– Bridge Cleaning – Railing System Repair – Animal / Pest Control – Bridge Surface Repair – Other Maintenance Strategies – Asphalt Surface Repair / Rout and Seal – Painting Steel Bridge Structures – Bridge Deck Joint Repair – Bridge Bearing Maintenance – Flow Obstruction Removal – Re-Grade Approaches (Gravel) – Vegetation / Debris Removal – Timber Repair – Concrete Sealing – Works for Drainage System – Scaling (Loose Concrete or Corroded Steel)	– Emergency Repairs (performed to quickly restore the roadways, roadsides, structures or facilities to an acceptable level of service due to unforeseen conditions necessitated by accidents, storms and other weather-related conditions, premature failures, malfunctions, or other unusual or unexpected damage)

** Recommended maintenance strategies from 2020 OSIM Bridges and Culverts Inspection Report.*

Sidewalks are inspected annually per the Minimum Maintenance Standards from Ontario Regulation 239/02 for vertical discontinuities of equal to or greater than 20 mm to reduce reducing sidewalk trip hazard. Deficiencies are marked and grinded by Roads Operations staff. Sidewalk bays are replaced by criticality as determined by visual inspection undertaken by Roads Operations staff.

Table 4-10 Maintenance Strategies for Sidewalks and Multi-Use Pathways

Asset Category	Inspections	Preventive Maintenance	Corrective Maintenance
Sidewalks	Regular Inspections – Annual Sidewalk Inspection Program - Sidewalk trip hazard reduction and inspection - Winter patrol (snow and ice buildup, etc.)	– Sidewalk trip hazard reduction and inspection as per Ontario Regulation 239/02	– Pothole Patching – Asphalt Placement – Cement Patching – Mud Pumping – Sidewalk Cutting – Slab Replacement

There is an annual luminaire inspection program for the Town's streetlights. Based on resident feedback, corrective maintenance activities will be performed for the major streetlight components.

Table 4-11 Maintenance Strategies for Streetlights

Asset Category	Inspections	Preventive Maintenance	Corrective Maintenance
Streetlights	- Annual Luminaire Inspection (Later Winter or Early Spring) - Regular Patrol	– Painting – Lamp replacement	– Pole Base Replacement – Pole Replacement – Pole Secondary Components Replacement – Fixture Replacement – Lamp Replacement

Larger and complex culvert projects that require engineering design services are grouped into capital projects for rehabilitation. Currently catch basins are cleaned biannually or annually depending on the level of debris.

Table 4-12 Maintenance Strategies for Driveway Culverts, Culverts (< 3 m) and Oil Grit Separators

Asset Category	Inspections	Preventive Maintenance	Corrective Maintenance
Driveway Culverts	- Resident feedback through service requests	– None currently	Ditch and Culvert Program cleaning for average 10 km ditches per year on reactive basis
Culverts (< 3 m in dia.)	- Resident feedback through service requests	– None currently	– Ditch and Culvert Program cleaning for average 10 km ditches per year on reactive basis – De-thawing
Ditches	- Visual inspection at least once every 28 days through road patrol - Feedback provided by residents assist Town staff to identify deficiencies that need maintenance and repair through service requests	– None currently	Ditch and Culvert Program: cleaning for average 10 km ditches per year on reactive basis
Catch Basins	- Routine patrols: surface condition - Once every 2 years fulsome catch basin inspection. Key components include surrounding road surface, catch basin lid, catch basin frame, catch basin structure.	– Catch basin cleaning (once every 2 years). Contracted service.	Emergency repairs (performed to quickly restore the roadways, roadsides, structures or facilities to an acceptable level of service due to unforeseen conditions necessitated by accidents, storms and other weather-related conditions, premature failures, malfunctions, or other unusual or unexpected damage)
Oil Grit Separators (OGS)	- Inspected during cleaning once every two years - Privately owned OGSs are monitored by the Region	– Cleaning once every two years by Roads Operations	

4.5 Proposed Operations and Maintenance Plan

4.5.1 Approach

To adopt an asset management approach to structuring and financing O&M, the Town should track resources used and measure the total cost of O&M. Clearly defining activities, time and resources, and asset-level targets will allow for an understanding of what actions have been taken at the asset level, at what cost, and what further actions should be anticipated. On a system-wide level, the Town should be able to analyze what assets are being serviced and if current efforts support a sustainable infrastructure portfolio in the long term. Actions taken at the asset level should be directly tied to achieving the Town's desired levels of service, thereby shifting the paradigm of how activities are funded.

Recommended approach to determine the O&M budget for the Town:

- Maintenance activities should be defined for all asset categories and asset classes with unique activity IDs assigned.
- Activities should be recorded by work orders within the Computerized Maintenance Management System (CMMS) and the number of assets that will be serviced.
- Labour, equipment, and material costs as unit or hourly rates are recommended to be defined for all activities using Standard Operating Procedures (SOPs). See an example of an SOP in **Figure 4-3**.
- Annual targets for work orders should be defined and aligned with the Town's LoS.
- Budgets should be based on achieving the annual targets, rather than past spending.

The above approach describes an ideal approach for maintenance planning. This iteration of the O&M plan is a hybrid of the Town's current maintenance activities and new activities, across each asset class, to provide the Town with a realistic and achievable plan based on best practice of maintenance activities, frequencies, and costs. In the next iteration of the AMP, and once the Town has potentially implemented a new CMMSIs it recommended that work orders be categorized to align with the Town's SOPs for its maintenance activities. **Figure 4-3** shows an example of the Town's road crossing culvert maintenance SOP. The SOPs help understand resources (i.e., labour, equipment, and material) required for the Town's O&M activities. Thus, the cost estimates will be more accurate to identify the resources needed for annual maintenance work across each asset category. As the Town continues tracking its asset performance, the O&M practices will be optimized through a continual improvement process.

Activity Code ## Road Crossing Culvert Maintenance (Example)

Description: Roadway Culvert Maintenance: This activity is used to repair road culverts including repairs to the road base when performed at the same time. It includes excavation, backfilling and repairing to the travelled surfaces. Any resurfacing with asphalt is to be carried out under the appropriate asphalt patching activity. Accomplishments are measured in linear meters.

Methods: Roadway Culvert Replacement

Purpose: To maintain the flow of water in culverts by repairing defective culverts or by replacing culverts that are interfering with traffic such as when a broken, collapsed or heaved culvert is restricting the flow of water and causing damage to the roadway.

Procedure:

1. First generate and discuss traffic control and complete circle check. (15 minutes)
2. Break the surface with a backhoe and or hand tools to remove pipe and roll to one side.
3. Clean the excavation to allow new pipe to sit properly adding more bedding if required.
4. Place new pipe using any available stones to hold in place and backfill in and around the pipe with new granular material and compact in no more than six inches layers to the level of the remaining roadway, then, re-paving.
5. Sweep excess to the roadside then load old pipe and any leftover material and then move to new site.
6. At the end of the shift return to the yard to gas up and ensure all tools and equipment are cleaned.
7. Report any necessary repairs and hand in the complete crew card to the foreman.
8. At the back of the crew card, indicate where the work was completed by the street address or by some other reference point.

Crew Size:

1 Lead Hand.....8 Hrs
1 Equipment Operator A.....4 Hrs
2 Utility Person.....6 Hrs
2 Truck Driver.....16 Hrs
2 Multi Function Tandems.....16 Hrs
1 Utility Tandem Trailer.....8 Hrs
1 Solartech Arrowboard.....8 Hrs
1 Backhoe w / Hoeram.....6 Hrs
1 Bomag / Tralier (Double Drum) ...1 Hr

Equipment:

1 ¾ Ton Truck.....4 Hrs
1 Backhoe / Loader.....4 Hrs

Materials:

Granular A.....22 Tonnes
Galv. Lockseam Pipe.....16 Meters
Couplers Corrugated.....2

Achievement:

16 Linear Meters

Figure 4-3 A Sample of Standard Operating Procedure

4.5.2 Methodology

The Town's proposed O&M plan was developed through a detailed process consisting of a line-by-line review of the Town's maintenance activities, funding, and achievements benchmarked against CIBI benchmarking results, and the Town's target service levels (see **Section 3.3.4**). The attributes of each maintenance activity include:

- Clear definitions and benefits of each activity which link to the Town's LoS, applicable regulations, and other benefits.
- Each maintenance activity is categorized by whether the activity is "in-house vs. contract" or "preventive vs. corrective".
- The activity items were assigned with "quantity", "frequency", "unit cost", and "total annual cost" attributes where information is available.

The proposed O&M plan for each asset type are described in detail within **Appendix G**. The following sub-sections summarize the maintenance planning results.

4.5.3 Proposed New Activities

In addition to the activities defined by the Town, new activities were also proposed for the new O&M plan. **Table 4-13** and **Table 4-14** list new activities for different asset classes. It should be highlighted that the Town has recently undertaken the development of the stormwater inventory and it is expected that the stormwater O&M activities will evolve over time as the Town become more familiar with the entire stormwater inventory and its maintenance needs.

Table 4-13 List of New O&M Activities for Environmental Services

Asset Group	Asset Class	Maintenance Activity Name
Water	Water Valves	Valve Exercising
Water	Water Valve Chambers	Valve Chamber Inspection
Water	Hydrants	Hydrant Corrosion Control
Water	Water Pump Stations	Water Flow Meter Calibration
Water	Water Pump Stations	Control PRV Inspection
Wastewater	Wastewater Forcemains	Force main Inspection and cleaning
Wastewater	Wastewater Valves	Air Release Valve Maintenance
Wastewater	Wastewater Valves	Valve/Siphon Maintenance and Repair
Wastewater	Maintenance Holes	Maintenance Hole Inspection
Wastewater	Maintenance Holes	Maintenance Holes - Casting Replacement (Betterment)
Wastewater	Wastewater Pump Stations	Pumping Station Maintenance Mechanical/HVAC Maintenance
Wastewater	Wastewater Pump Stations	Thermographic Inspections on Dry Wells
Wastewater	Wastewater Pump Stations	Wastewater Flow Meter Calibration
Wastewater	Wastewater Pump Stations	Sewer Pump Station - Check and Gate Valves Exercising
Wastewater	Wastewater Pump Stations	Sewer Pump Station - Response to Failure (Emergency)
Stormwater	Storm Sewers	Storm Sewer Flushing
Stormwater	Storm Sewers	Storm Sewer Repairs (Urgent)
Stormwater	Stormwater Service Connections	Inspect stormwater service connections
Stormwater	Stormwater Maintenance Holes	Maintenance Hole Cleaning and Inspection
Stormwater	Stormwater Management Ponds	Routine Inspection and Maintenance
Stormwater	LIDs	Inspect, Clean and Repair bioswale & infiltration facilities

Table 4-14 List of New O&M Activities for Roads Operations

Asset Group	Asset Class	Maintenance Activity Name
Roads Operations	Bridges & Culverts	Additional Investigations
Roads Operations	Bridges & Culverts	Bridge Cleaning (Routine)
Roads Operations	Bridges & Culverts	Bridge Deck Joint Repair
Roads Operations	Bridges & Culverts	Bridge Surface Repair
Roads Operations	Bridges & Culverts	Erosion Control at Bridges
Roads Operations	Bridges & Culverts	Railing System Repair
Roads Operations	Bridges & Culverts	Rout and Seal – Concrete and Asphalt Pavement on Bridge Decks
Roads Operations	Bridges & Culverts	Works for Drainage System
Roads Operations	Guide Rails	Guide Rail Inspection
Roads Operations	Catch Basins	Open Catch Basins
Roads Operations	Road Crossing Culverts (< 3 m in dia.)	Culvert Inspection - Small
Roads Operations	Road Crossing Culverts (< 3 m in dia.)	Open Culverts - Manual
Roads Operations	Road Crossing Culverts (< 3 m in dia.)	Open Culverts - Steam
Roads Operations	Road Crossing Culverts (< 3 m in dia.)	Open Ditches/Culverts - Mechanical
Roads Operations	Road Crossing Culverts (< 3 m in dia.)	Screens and Inlets Maintenance
Roads Operations	Ditches	Ditch Inspection

4.5.4 Budget Requirements and Gap Analysis

As mentioned in **Section 4.4**, the current available information is not adequate for developing O&M activity costs for each asset type. Therefore, this analysis was based on a top-down approach i.e., utilizing the range of O&M costs of similar municipalities from the CIBI to identify the Town's O&M funding needs. The baseline budget level used for comparison was the O&M budgets from 2022, as budgets normally fluctuate year by year and it was felt that the recent (2022) budget is more representative of the Town's direction for O&M expenditures.

Figure 4-4 presents the total proposed budget for water, wastewater, stormwater, and roads infrastructure O&M activities, which are $2.0M, $1.4M, $0.9M, and $4.8M, respectively based on the average budget level of similar municipalities. The roads infrastructure column in **Figure 4-4** includes O&M costs for roads, bridges & culverts, sidewalks, streetlights, and roadside safety infrastructure. It should be noted that the total O&M cost for culverts (< 3 m in dia.), catch basins, and ditches are presented in stormwater O&M Cost, although these assets are managed by Roads Operations (and appear in the Road Operations budget). Refer to **Section 4.5.3** for details on new activities to budget for.

The lower limit and the upper limit of the error bars show the O&M costs calculated by using the 25th percentile and 75th percentile unit costs from the benchmarking group multiplied by the Town's asset quantities for each asset group. The range can also be interpreted as 50% of Canadian benchmarking municipalities have annual O&M costs within the range, and the proposed O&M budgets for the Town are in line with the current practices when compared to benchmarking municipalities.

There is a slight increase in the proposed water and wastewater O&M budgets compared to Town's 2022 budget for addressing the new planned activities and altered frequency of the existing activities where applicable. As the Town has developed a more comprehensive stormwater inventory, a significant increase of stormwater O&M funding is required to sustain the asset in the inventory.

For roads, the Town's non-winter activity for roads is in line with most benchmarking participants. However, the winter activities cost is below the 25th percentile compared to the benchmarking group. Therefore, it is recommended that the Town to increase the frequency of winter activities. The specific winter activities that can be improved to be on par with

the benchmarking group include sand and salting, snow plowing and removal, winter standby, winter road patrol, and other activities such as snow fence, culvert thawing, etc.

It is also recommended that the Town implement the suggested maintenance needs for bridges & culverts (> 3 m) according to the OSIM inspection and update the maintenance plan every two years based on the results from bi-annual OSIM inspection.

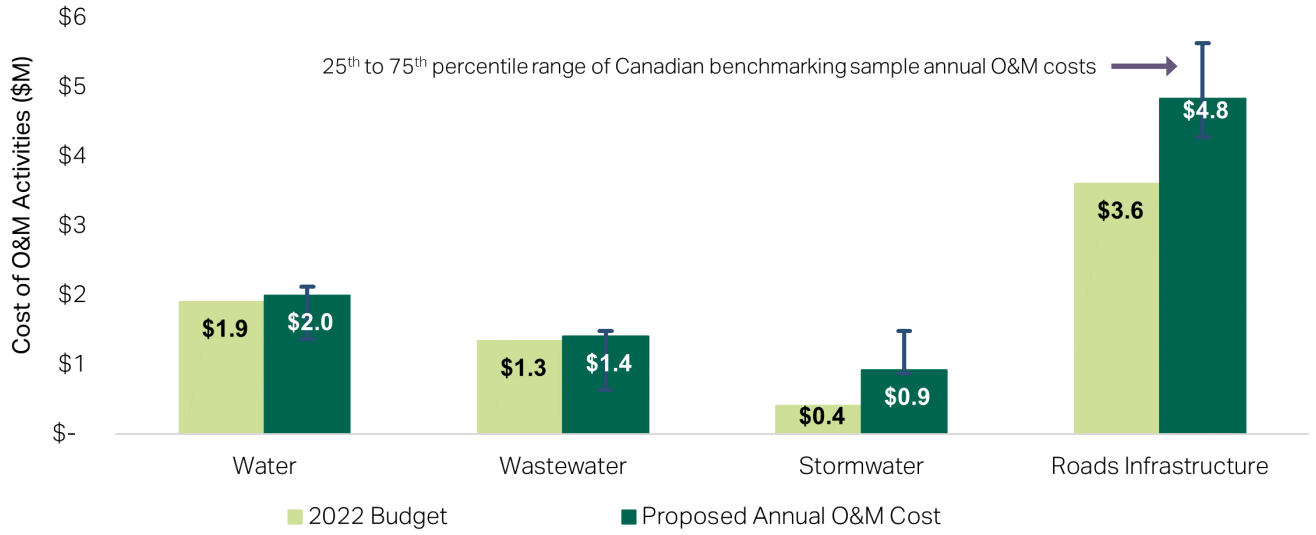


Figure 4-4 Existing and Proposed O&M Budgets

4.5.5 10-Year O&M Funding Forecast

The average annual O&M need for the Town's water, wastewater, stormwater, and roads infrastructure assets is $8.8M over the next 10 years in inflated dollar values (assuming 2% inflation annually). This is equivalent to a total of approximately $88M over the next 10-year period, as presented in **Figure 4-5**. The O&M funding needs for roads infrastructure are significantly higher than the need for water, wastewater and stormwater assets.

The detailed average annual O&M needs and 10-year total need for each asset category are presented in **Figure 4-5**. It should be noted that funding requirements will vary from year to year, once more information is available, the use of activity frequencies to plan O&M work will lead to more accurate annual funding need predictions.

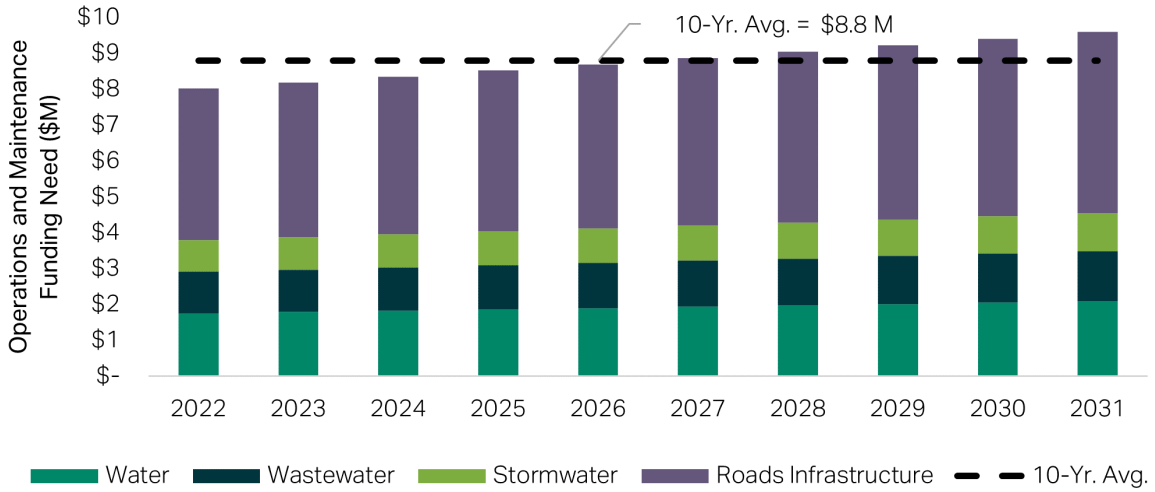


Figure 4-5 10-Year Operations & Maintenance Funding Need

Table 4-15 10-Year Total and Annual Average O&M Funding Need

	Water	Wastewater	Stormwater	Roads Infrastructure	Total
Annual Average Need	$1,924,000	$1,272,000	$970,000	$4,629,000	$8,795,000
10-Year Total	$19,240,000	$12,272,000	$9,700,000	$46,629,000	$87,950,000

4.6 Condition Assessment Strategy

4.6.1 Condition Assessment Plan

A key requirement for the implementation of a proactive maintenance strategy is the ability to anticipate when a failure will occur. Condition and monitoring of asset performance plays a significant role in this. Knowing asset condition allows to better understand its remaining useful life and the maintenance needs to reach, if not extend, the useful life of an asset.

In asset management planning, condition assessments help identify high risk assets, and also avoid replacing assets in good condition by age-based planning assumptions.

When specifying a condition assessment program, alignments should be achieved between information collection efforts with drivers and objectives as well as decision support needs.

The development of the condition assessment plan considers a number of factors and components including:

- Customized programs for each asset category and asset type.
- Linking the benefit of the programs including levels of service goals or applicable regulations.
- Applying the state of the current technologies considering asset characteristics (such as material and size).
- Unit cost.
- Quantity of asset.
- Frequency of assessment.
- Total cost.
- Other considerations including assumption and other factors affecting the cost estimation.

Although a number of factors were considered in the condition assessment planning for this AMP, it should be noted that there are other factors affecting the cost estimations of the condition assessment programs including but not limited to the following factors: site characteristics and enabling works, technologies and platforms selected, depth of analysis including the need for engineering interpretations, and relevant project management costs.

Please refer to **Appendix H** for the Condition Assessment Plan details.

The condition rating of the condition assessment results should align with the Town's condition rating scale outlined in **Table 2-9**. Currently, the Town is applying a five-point (1-5) condition rating system on a scale of Very Good to Very Poor to identify asset condition.

4.6.2 Condition Assessment Budget Forecast

For each of the asset category, condition assessment funding need was calculated based on cost, quantity, and frequency. The average annual condition assessment need for the Town's water, wastewater, stormwater, and roads infrastructure assets is $799,000 over the next 10 years in inflated dollar values. This is equivalent to a total of approximately $7.9 M over the next 10-year period, as presented in **Figure 4-6**.

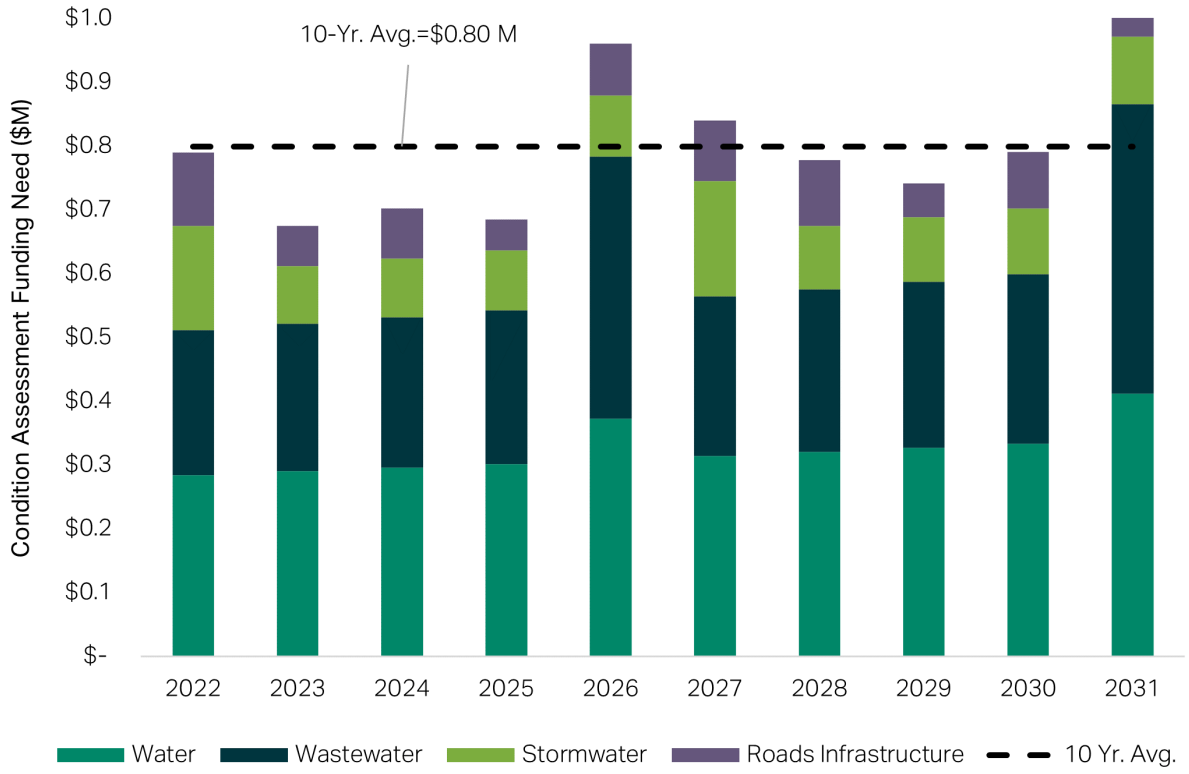


Figure 4-6 10-Year Condition Assessment Funding Need

The detailed condition assessment needs for each asset category are presented in **Table 4-16**.

Table 4-16 10-Year Total and Annual Average Condition Assessment Funding Need

	Water	Wastewater	Stormwater	Roads Infrastructure	Total
Annual Average Need	$325,000	$283,000	$113,000	$78,000	$799,000
10-Year Total	$3,250,000	$2,830,000	$1,130,000	$780,000	$7,990,000

Figure 4-7 presents the detailed condition assessment programs for each asset type. The funding needs for watermain condition assessment (diameter less than 400 mm), and wastewater gravity mains account for approximately half of the annual condition assessment cost. It is noticeable that condition assessment for wastewater pump stations will be carried out every five year which requires a higher funding need in 2026 and 2031.

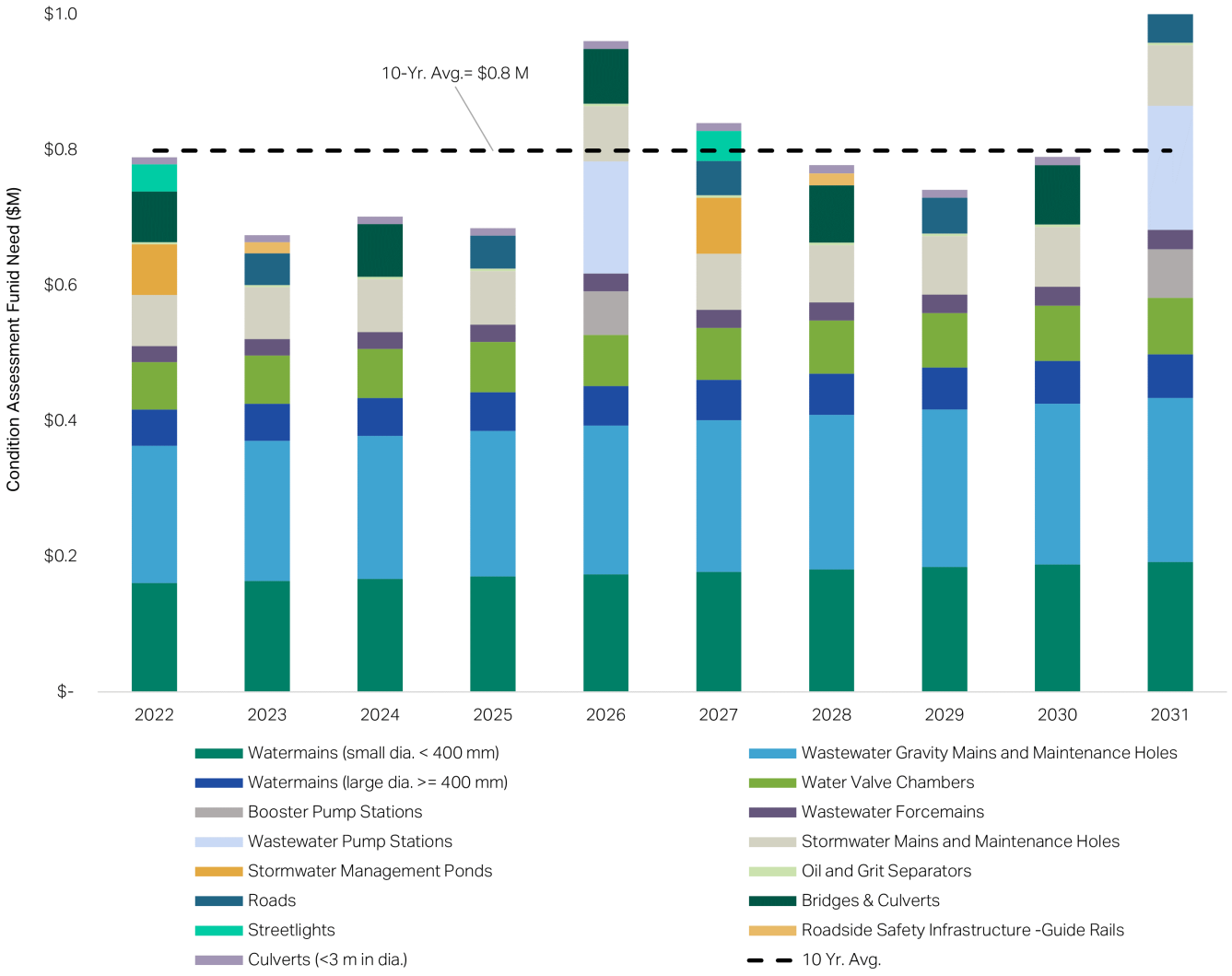


Figure 4-7 10-Year Condition Assessment Funding Need Details

> Please refer to Appendix H for condition assessment. See Section 6.1 for continuous improvement initiatives related to AM Strategy.

05

Financial Analysis and Strategy

5.1 Asset Lifecycle Modeling

An asset owner has a desire to preserve the condition of their existing assets for as long as possible, by maintaining or even extending their lifecycle through routine activities such as preventative maintenance and rehabilitation prior to a replacement being required. The Town is continually acquiring infrastructure assets, but these assets require increased funding for operation and maintenance as they age. The Town is also responsible for the replacement of deteriorated assets as long as the service is required. While individual assets may have a useful life that can be predicted in years or decades, the service that the asset provides could be for a substantially longer duration.

Part of the purpose of the asset management planning process is to fully understand and predict the long-range financial requirements for the Town's infrastructure to facilitate planning and resource management in the most cost-effective manner possible. **Figure 5-1** illustrates how costs typically accumulate over an asset's life. It is worth noting that the accumulation of the ongoing operations and maintenance (O&M), refurbishment and disposal / replacement costs is many multiples of the initial acquisition costs. A key and important take-away from **Figure 5-1** is for the Town to fully understand the entire lifecycle cost of an asset before proceeding with any asset acquisition.

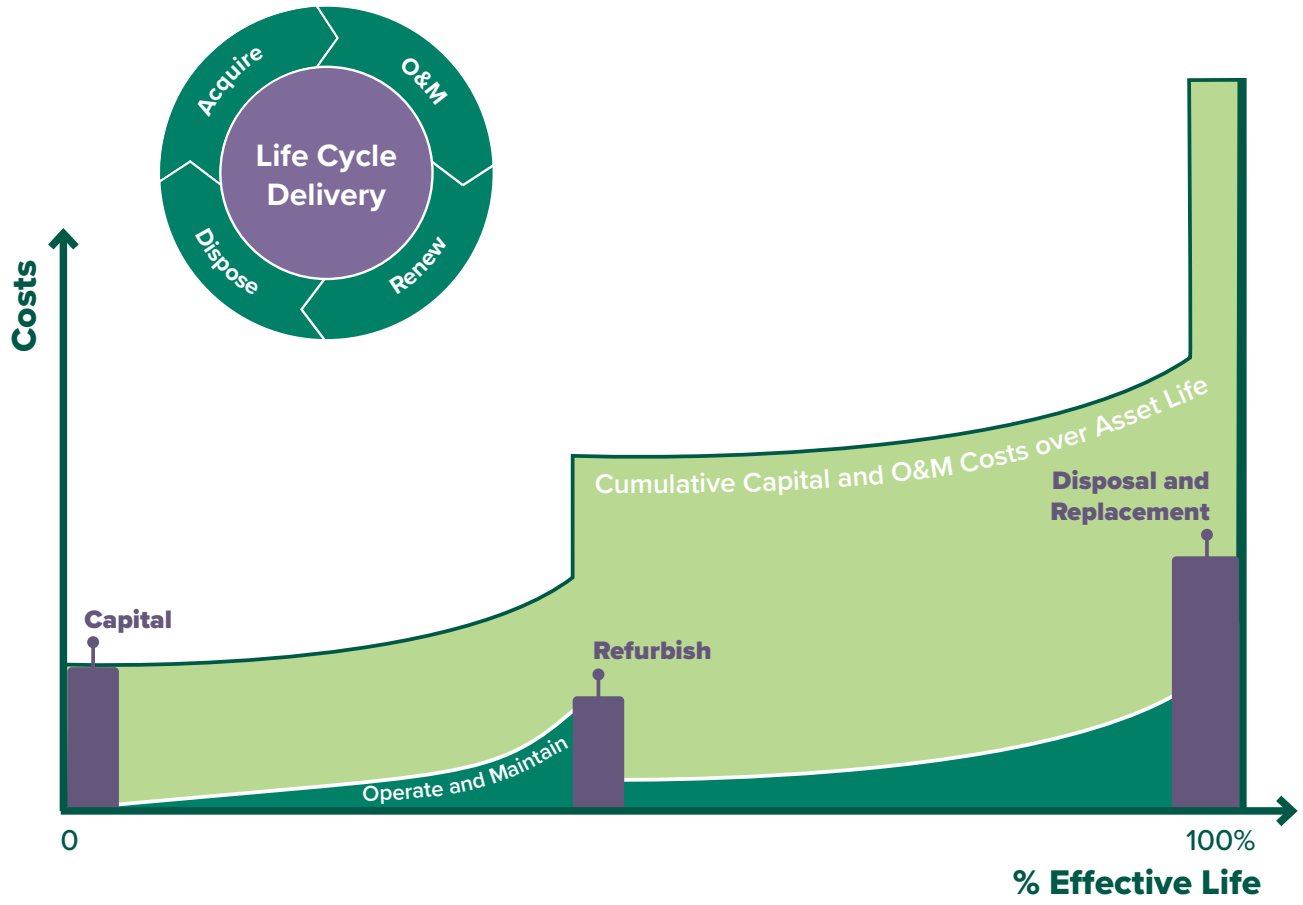


Figure 5-1 The Accumulation of Costs over the Asset Lifecycle

The lifecycle analysis involves integrating asset inventory, age, ESL, replacement values, condition, and risk scores to create a theoretical asset replacement cycle for each asset. The asset renewal forecasts prepared for this assessment are estimates of what it will cost over the next 10, 25, and 50 years to replace assets as they age and move past their ESLs. Where install year information is not available, the annual renewal needs were based on the total replacement value multiplied by asset change-out rate (e.g., water meters' change out rate is 5% annually which is based on ESL of 20 years).

Figure 5-2 presents the logic to use asset risk value in prioritizing asset replacement with constrained funding. All actions for the first budget cycle of the analysis are ranked according to risk scores, and needs are funded in this order until the budget constraint is reached for that budget cycle. Funded needs become actions for the first budget cycle, but all unfunded needs are rolled over into the set of needs for the next budget cycle. This approach can be used by the Town to prioritize work especially when there is a budget constraint.

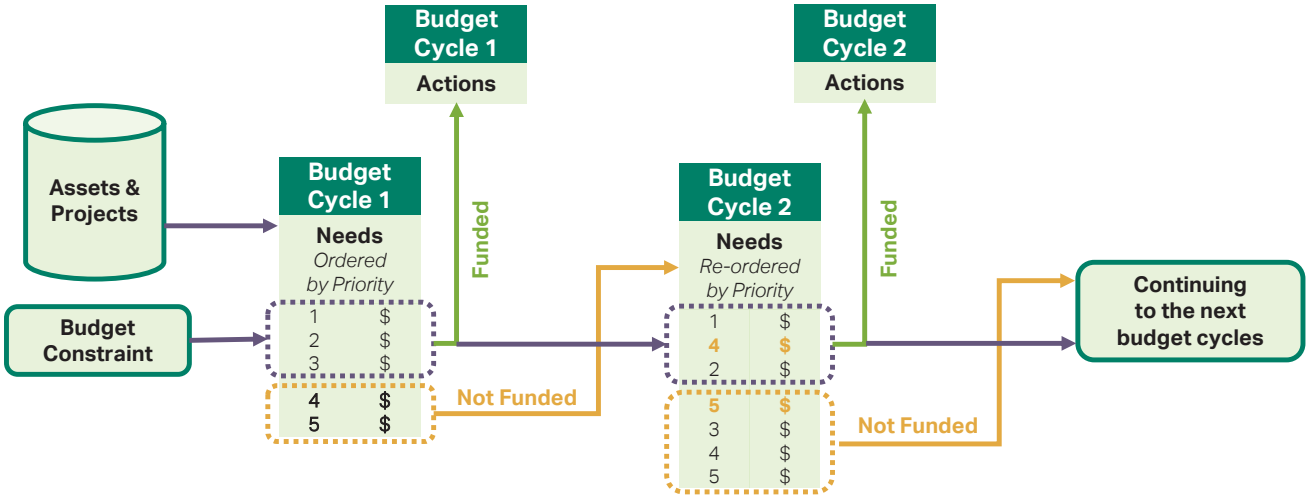


Figure 5-2 Use Risk to Prioritize Asset Renewal

The assets that have a poor condition rating and high criticality, resulting in a high-risk score (risk score ≥ 16) are prioritized for replacement in the next budget cycle. These assets are preferably replaced immediately to avoid any negative impacts on the Town's service delivery. In the years after, risk should be re-assessed by incorporating new asset condition and age information to prioritize work for the specific year. Refer to **Section 4.1** for the detailed risk assessment approach and results.

The lifecycle analysis was implemented in an MS Excel Asset Lifecycle Model and a financial dashboard was developed to present the lifecycle modeling results. It should be noted that the nature of this type of analysis is based on a wide range of data inputs, currently available information, and a number of assumptions, and is therefore at best a high-level estimate of future funding needs. The lifecycle model provides costs anticipated for asset classes based on ESL, and projects will get further refined as they get closer in their budget planning cycle.

5.1.1 Asset Reinvestment Measures and Targets

Table 5-1 shows the assumptions on the reinvestment measures for each asset type, the proposed renewal targets and the resulting 10-year annual average reinvestment rate for the period 2022 to 2031. The key assumptions that were built in the life cycle model is to determine, for each year in the analysis period, which assets need to be replaced based on their ESL and risk levels. Typical assumptions include:

- Replace all assets that have already exceeded their ESL, which can be translated to a target of 100% of these assets to be replaced.
- Replace the asset that has high risk (risk score >=16), which can be translated to a target of 100% of the high-risk assets to be replaced. Refer to **Section 4.1.1** for the risk-based intervention matrix approach.
- Where the age information is not available, the assumption is to replace assets for a lifecycle of their ESL.

In the future, when condition assessment programs are implemented, asset conditions will be used to update the risk assessment results to better inform asset renewal needs forecasting.

Table 5-1 Reinvestment Rate Assumptions

Asset	Measure	Target	10-Yr. Annual Avg. Reinvestment Rate (2022- 2031)
Water			
Watermains	Percentage of watermains with risk equal or more than 16 replaced in year one	100%	1.5%
	Percentage of watermains exceed their expected service life replaced in year one and thereafter	100%	
Water Service Connections	Percentage of water service connections replaced annually	Replace for a life cycle of 80 years	1.25%
Water Valves	Percentage of water valves with risk equal or more than 16 replaced in year one	100%	1.4%
	Percentage of water valves exceed their expected service life replaced in year one and thereafter	100%	
Valve Chambers	Percentage of water valve chambers with risk equal or more than 16 replaced in year one	100%	1.8%
	Percentage of water valve chambers exceed their expected service life replaced in year one and thereafter	100%	
Hydrants	Percentage of water hydrants with risk equal or more than 16 replaced in year one	100%	1.5%
	Percentage of water hydrants exceed their expected service life replaced in year one and thereafter	100%	
Water Meters	Percentage of water meters replaced annually	Replace for a life cycle of 20 years	5.0%
Water Pump Stations	Percentage of pump station assets with risk equal or more than 16 replaced in year one	100%	0.4%
	Percentage of pump station assets exceed their expected service life replaced in year one and thereafter	100%	
Wastewater			
Wastewater Gravity Mains	Number of Prioritized sewers addressed For this analysis, sewer prioritization was based on the Town's Sanitary Sewer Master Plan[6] priority numbers. Sewer condition assessment results will be used to refine reinvestment needs analysis when they become available.	- 2022 - 2028: Address Priority No. 1 to 9 - 2029 - 2031: Address Priority No. 10 to 74 - 2032 - 2041: Address Priority No. 75 to 260 - 2042 - 2051: Address Priority No. 261 to 425 - 2052 - 2061: Address Priority No. 426 to 587 - 2062 - 2071: Address Priority No. 588 to 811	0.9%

[6] GM Blue Plan. May 2021. Town of Georgina Sanitary Sewer Master Plan Appendix 8

Asset	Measure	Target	10-Yr. Annual Avg. Reinvestment Rate (2022- 2031)
Wastewater Forcemains	Percentage of forcemains with risk equal or more than 16 replaced in 2022	100%	0.9%
	Percentage of forcemains exceed their expected service life replaced in 2022 and thereafter	100%	
Wastewater Laterals	Percentage of wastewater laterals replaced annually	In line with reinvestment rate of wastewater mains	0.9%
Wastewater Maintenance holes	Percentage of required replacement of maintenance holes when replacing gravity mains addressed	100% (equivalent to 35% of the reinvestment cost of gravity mains for a certain year)	0.9%
Wastewater Valves	Percentage of wastewater valves with risk equal and more than 16 replaced in 2022	100%	2.7%
	Percentage of wastewater valves exceed their expected service life replaced in 2022 and thereafter	100%	
Wastewater Pump Stations	Percentage of pump station assets with risk equal or more than 16 replaced in 2022	100%	2.1%
	Percentage of pump station assets exceed their expected service life replaced in 2022 and thereafter	100%	
Stormwater			
Stormwater Mains	Percentage of stormwater mains with risk equal or more than 16 replaced in 2022	100%	0.1%
	Percentage of stormwater mains exceed their expected service life replaced in 2022 and thereafter	100%	
Stormwater Laterals	Percentage of stormwater laterals with risk equal or more than 16 replaced in 2022	100%	0.1%
	Percentage of stormwater laterals exceed their expected service life replaced in 2022 and thereafter	100%	
Stormwater Maintenance Holes	Percentage of required replacement of maintenance holes when replacing stormwater mains addressed	100% (equivalent to 45% of the reinvestment cost of stormwater mains for a certain year)	0.1%
Stormwater Management Ponds	Percentage of stormwater wet ponds cleaned	100% (equivalent to cleaning all wet ponds every 25 Years)	2.9%
Oil and Grit Separator (OGS)	Percentage of OGS replaced annually	Replace for a life cycle of 25 years	4%
Catch Basins	Percentage of catch basins with risk equal or more than 16 replaced in 2022	100%	0.1%
	Percentage of catch basins exceed their expected service life replaced in 2022 and thereafter	100%	
Road Crossing Culverts (< 3 m in dia.)	Percentage of road crossing culverts (< 3 m in dia.) replaced annually	Replace for a life cycle of 35 years	2.9%
Ditches	Percentage of ditches rehabilitated annually	5% (equivalent to re-ditching all ditches every 20 years)	0.1%

Asset	Measure	Target	10-Yr. Annual Avg. Reinvestment Rate (2022- 2031)
Driveway Culverts	Percentage of driveway culverts replaced annually	0.05%, the Town does not own the driveway culverts; but the Town replace driveway culverts as part of the ditch rehabilitation program as needed.	0.05%
Roads Infrastructure			
Roads	Average Pavement Condition Index (PCI) for the Town's roads network by 2031 based on 2021 road condition assessment results and RoadMatrix analysis. Refer to Section 5.1.2 for details on the three budget scenarios.	- Scenario 1: PCI target 63 (annual average budget $6.1M)	1.1%
		- Scenario 2: PCI target 72 (annual average budget $9.7M)	1.7%
		- Scenario 3: PCI target 76 (annual average budget $12.4M)	2.2%
Bridges & Culverts	Percentage of biennial OSIM inspection recommended capital works addressed for structures with bridge condition index (BCI) < 70	100%	2.7%
Sidewalks	Percentage of sidewalks replaced annually	Replace for a life cycle of 60 years	1.7%
Streetlights	Percentage of streetlight poles and underground cables replaced annually	Replace for a life cycle of 50 years	1.8%
	Percentage of streetlight lighting fixtures exceed their expected service life replaced – assets with install date available	100%	
	Percentage of streetlight lighting fixtures replaced annually – assets with install date not available	Replace for a life cycle of 20 years	

5.1.2 Roads Infrastructure

5.1.2.1 Scenario Analysis of Roads Reinvestment Funding Needs

Based on the 2021 roads condition assessment[7] results, the Town utilized the RoadMatrix Pavement Management System to perform different funding scenarios analysis for developing the pavement asset management strategy. Three budget scenarios were considered in the analysis: Scenario 1 $6.1M, Scenario 2 $9.7M, and Scenario 3 $12.4M. These three scenarios would result in different PCI forecasts over a 10-year period. Figure 5 3 presents the 10-year pavement condition index (PCI) forecasts from 2022 to 2031.

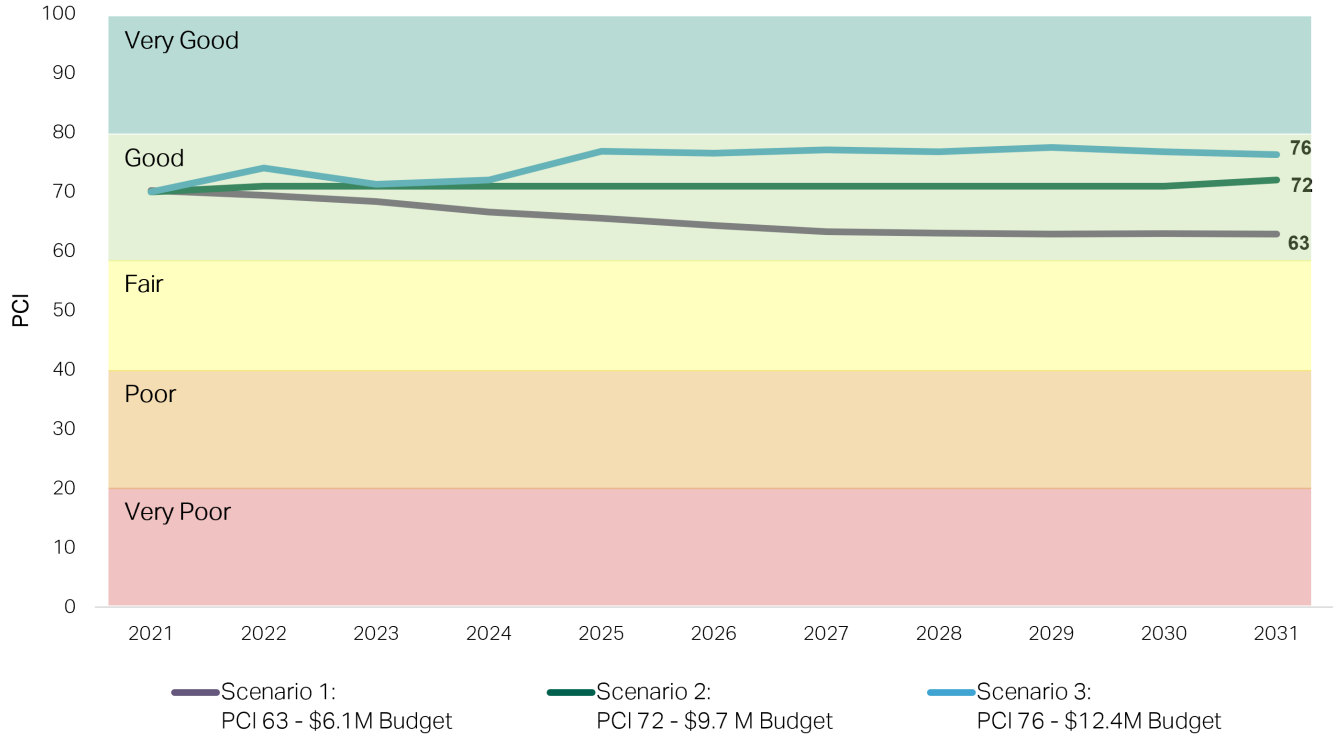


Figure 5-3 Projected Road Network Conditions under Three Budget Scenarios

When analyzing the three budget scenarios for roads, PCI targets from neighboring municipalities were considered to provide context on. **Table 5-2** presents the results of a survey performed by the Town of the current average and target PCI values of neighboring municipalities.

Table 5-2 Current and Target PCI Values for Neighbouring Municipalities

List of Municipalities	Region/County	Current Average PCI	Avg. Road Network PCI Target
Other Local Area Municipalities in York Region			
Town of Aurora	York	50 - 69	65
Town of East Gwillimbury	York	72	None
Town of Newmarket	York	70	None
Town of Stouffville	York	70	None
City of Richmond Hill	York	Urban 70 - 90; Rural 45 - 70	70 - 90
City of Markham	York	79	70

[7] Stantec. 2021 Georgina Road Network Condition Assessment

List of Municipalities	Region/County	Current Average PCI	Avg. Road Network PCI Target
Township of King	York	Paved LCB 67; Paved HCB 75	75
Other Municipalities			
City of Barrie	Simcoe	Collector 75; Local 72	75
City of Brantford	-	Paved 64; Unpaved 63	75
Town of New Tecumseth	Simcoe	Paved 83.6	85
Town of Georgina (Proposed)	**York**	**71**	**72**

The following observations are made regarding the three pavement scenarios presented in **Figure 5-3** versus the neighboring municipality PCI values presented in **Table 5-2**:

- The Town's current budgeted pavement expenditures presented by Scenario 1 ($6.1M) will result in a PCI value of 63 by 2031, which is markedly lower than the sample of municipalities presented above, barring the Town of Aurora (PCI target: 65).
- The Town's current PCI of 71 is comparable to that of the Towns of East Gwillimbury (72), Newmarket (70) and Stouffville (70), and that pavement Scenario 2 ($9.7M) will maintain the Town's roads in a similar condition as currently with a PCI value of 72 by 2031. However, Scenario 2 will require a significant funding increase of 60% over the current annual pavement budget, from $6.1M to $9.7M. Depending on funding availability, Scenario 2 is the most desirable funding scenario as it will slightly improve the Town's road condition while resulting also in a PCI value that is comparable to its peer municipalities' current and target PCI values.
- The 2031 PCI value of 76 predicted by pavement Scenario 3 ($12.4M) is comparable to the PCI targets of the City of Barrie (75), Township of King (75) and City of Brantford (75) but would require a 103% increase over the current annual pavement budget, from $6.1M to $12.4M.

To further provide background to the Town's current and proposed pavement expenditures, AECOM has performed a benchmarking comparison of capital reinvestment rates for similar municipalities. Please refer to **Section 5.1.7** for more detail.

5.1.2.2 10-Year Reinvestment Needs

The average annual reinvestment cost for the Town's roads infrastructure assets including roads, bridges & culverts, sidewalks, and streetlights is $8.2M over the next 10 years in inflated dollar values under roads budget Scenario 1 ($6.1M). This is equivalent to a total of approximately $82M over the next 10-year period, as presented in **Figure 5-4**. It is also important to note that there is a significant reinvestment required for bridges & culverts in 2022, which is in line with the recommendations from 2021 OSIM bridge inspection results[8], where one of the Town's bridges is scheduled for replacement in the short-term planning window.

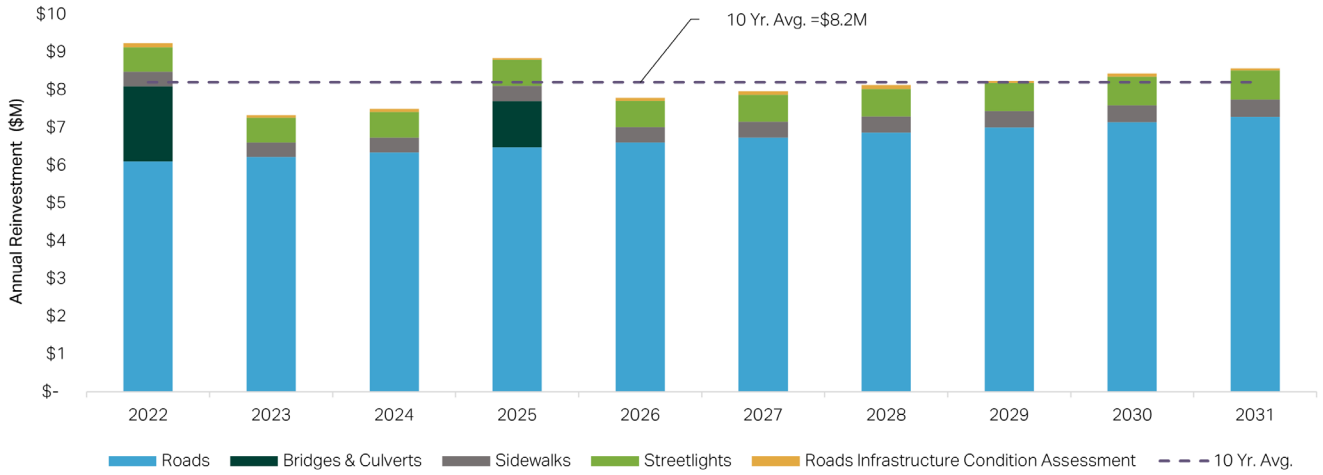


Figure 5-4 Roads Infrastructure 10-Year Reinvestment Need Details (Scenario 1)

[8] Safe Roads Engineering. (2021): Contract No. OID2020-093 OSIM Bridges and Culverts Inspection Report SRE Job No.: J203043

For road budget Scenario 2 ($9.7M), the average reinvestment cost becomes $12.1M, as presented in **Figure 5-5**.

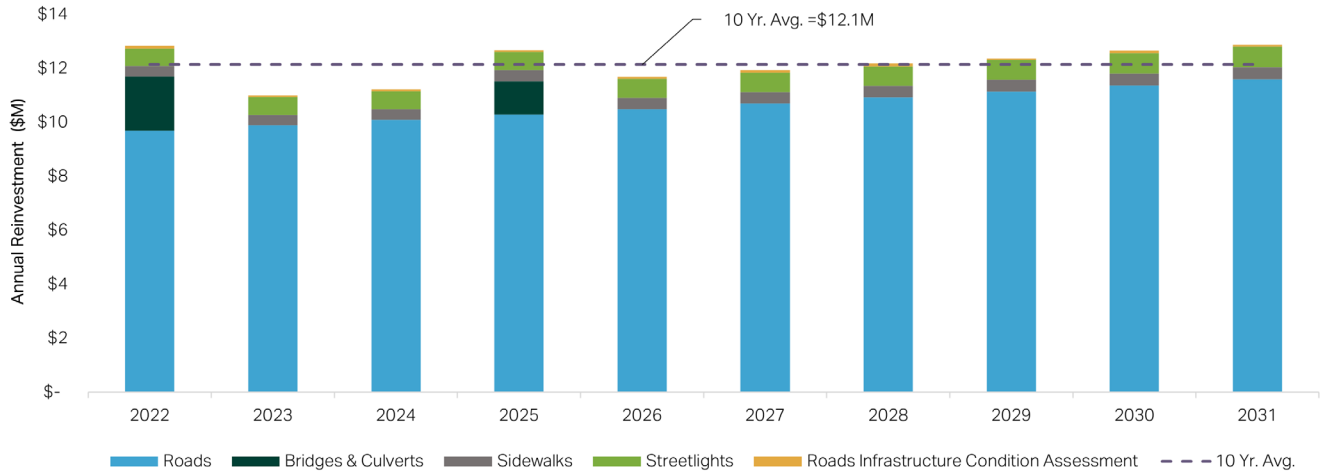


Figure 5-5 Roads Infrastructure 10-Year Reinvestment Need Details (Scenario 2)

For road budget Scenario 3 ($12.4M), the average reinvestment cost becomes 15.1M, as presented in **Figure 5-6**.

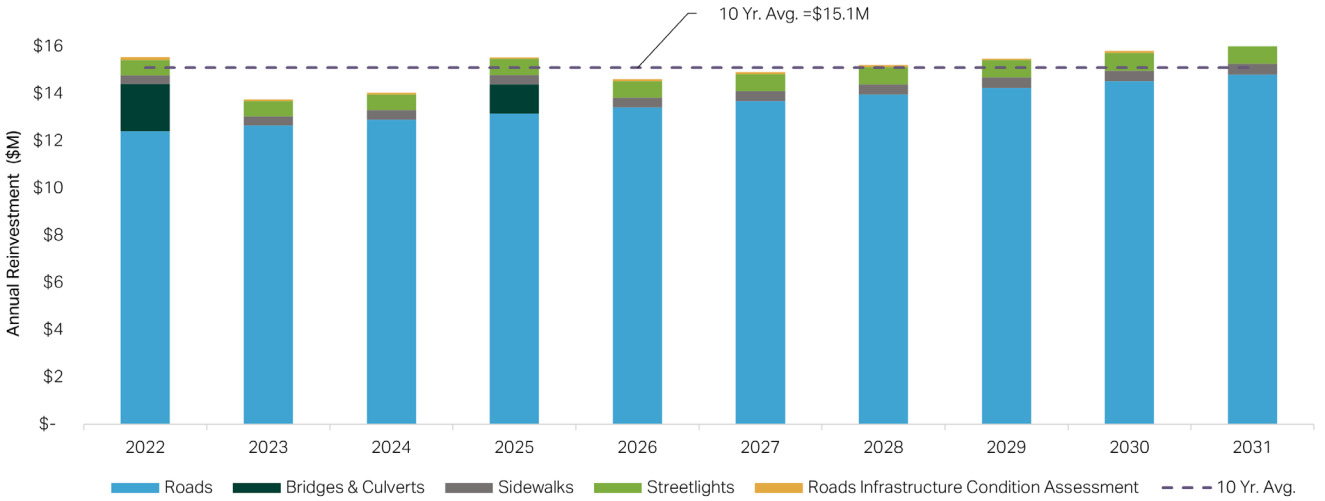


Figure 5-6 Roads Infrastructure 10-Year Reinvestment Need Details (Scenario 3)

5.1.2.3 25-Year and 50-Year Reinvestment Needs

Considering road budget Scenario 1 ($6.1M budget), the average annual reinvestment rate for the Town's roads infrastructure assets is $9.6M over the next 25 years in inflated dollar value. This is equivalent to a total of approximately $240M over the next 25-year period, as presented in **Figure 5-7**. While the average annual reinvestment rate for the Town's roads infrastructure assets is $12.5M over the next 50 years in inflated dollar value, for a total of approximately $625M, as presented in **Figure 5-7**.

For road budget Scenario 2 ($9.7M) and Scenario 3 ($12.4M), the average annual reinvestment rate become $12.1M and $15.1M in 25-year, and $14.2M and $17.7M in 50-year, respectively.

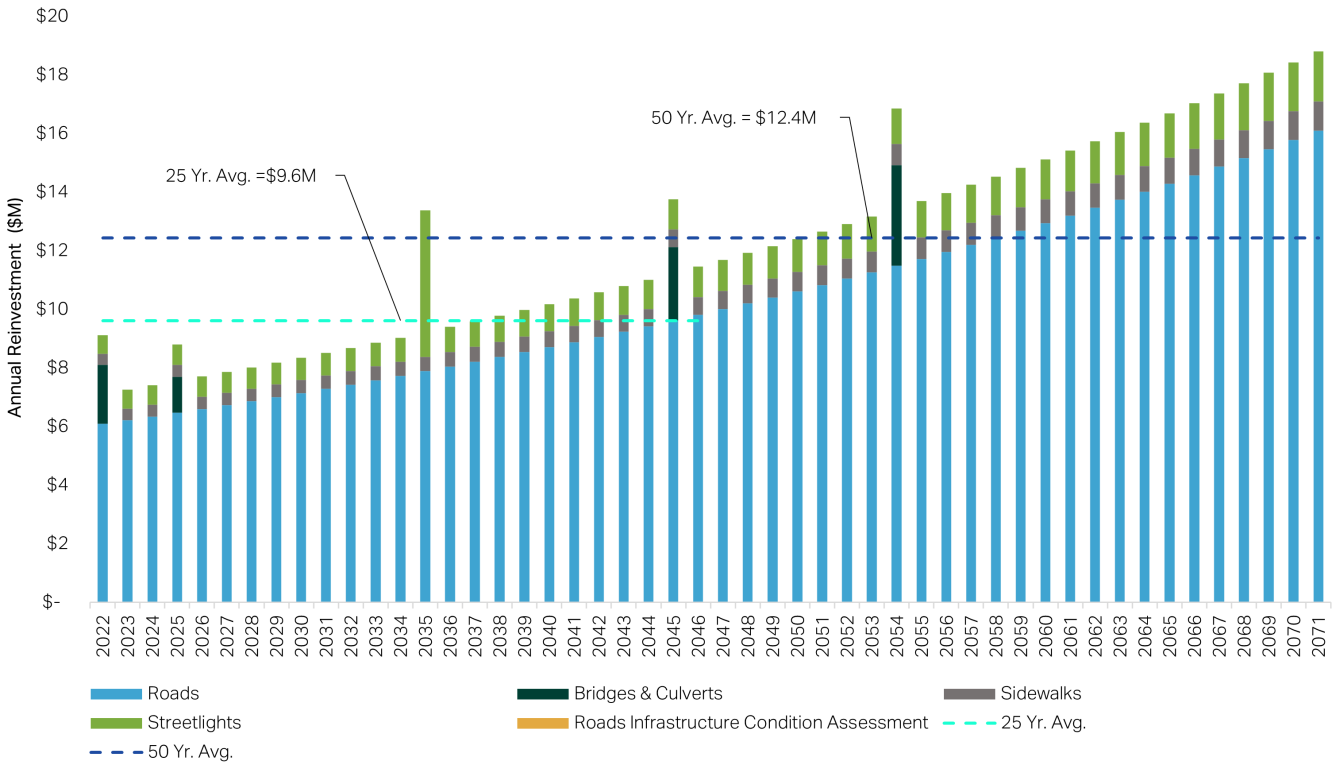


Figure 5-7 Roads Infrastructure 25-Year and 50-Year Reinvestment Need Details (Scenario 1)

5.1.2.4 Full Funding Need Profile for Roads Operations

Figure 5-8 shows a full picture of the Town's Roads Operations Division funding need forecast over the next 10 years, which provides the Town the full funding requirements for performing effective financial planning activities. The total annual reinvestment rate for roads infrastructure and the responsible stormwater assets was overlaid with the O&M cost, and Roads Operations development cost to provide a full funding need profile.

The Town's Roads Operations Division funding requirement increases to approximately $155M over the next 10 years considering all capital and O&M need, equivalent to $15.5M per year in inflated dollar value under road budget Scenario 1 ($6.1M). The average annual full funding needs become $19.5M and $22.4M for road budget Scenario 2 ($9.7M) and Scenario 3 ($12.4M), respectively.

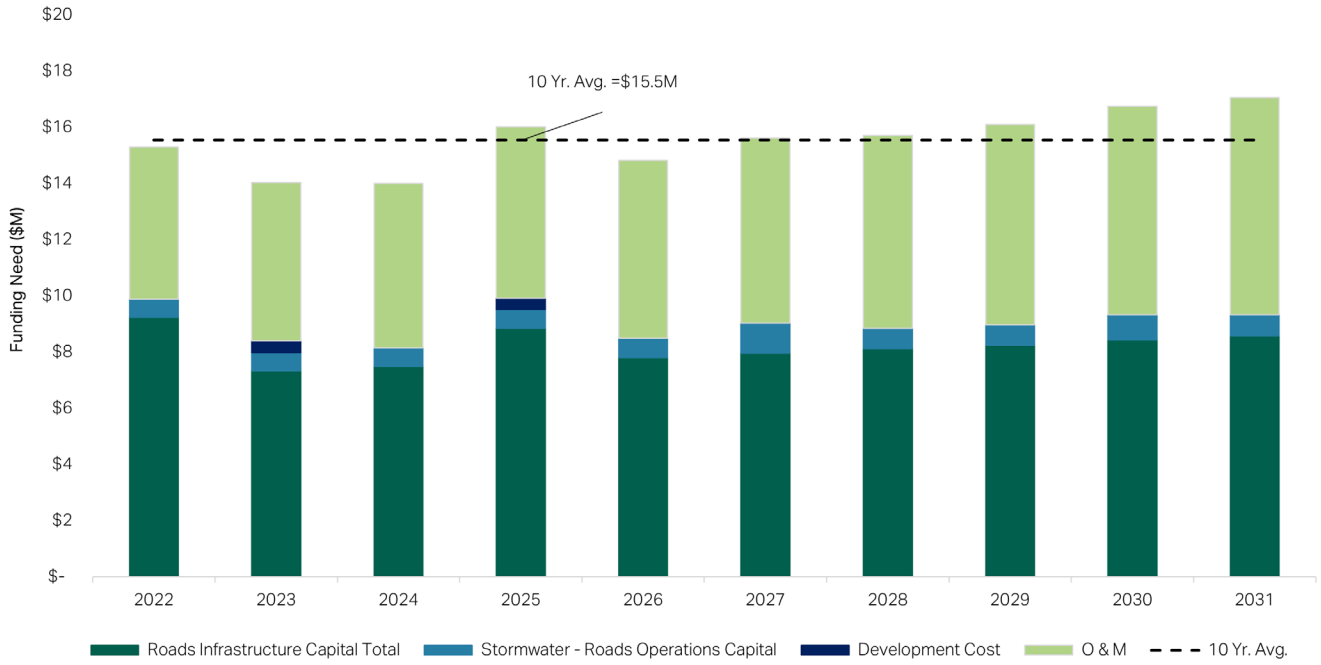


Figure 5-8 Roads Infrastructure 10-Year Full Funding Need Profile (Scenario 1)

5.1.3 Water

5.1.3.1 10-Year Reinvestment Needs

The average annual reinvestment funding need for the Town's entire water infrastructure assets is $3.5M over the next 10 years in inflated dollar values. This is equivalent to a total of approximately $35M over the next 10-year period, as presented in **Figure 5-9**.

It is important to note that there is significant reinvestment required for 2022 because many pipe segments with material type of asbestos cement and ductile iron has reached or exceeded their expected service life, as well as water valves and hydrant replacement. Looking ahead in the short-term starting in 2026, the Town should prepare for more reinvestment as pipes continue to age, especially as ductile iron pipes start to approach and exceed their ESLs.

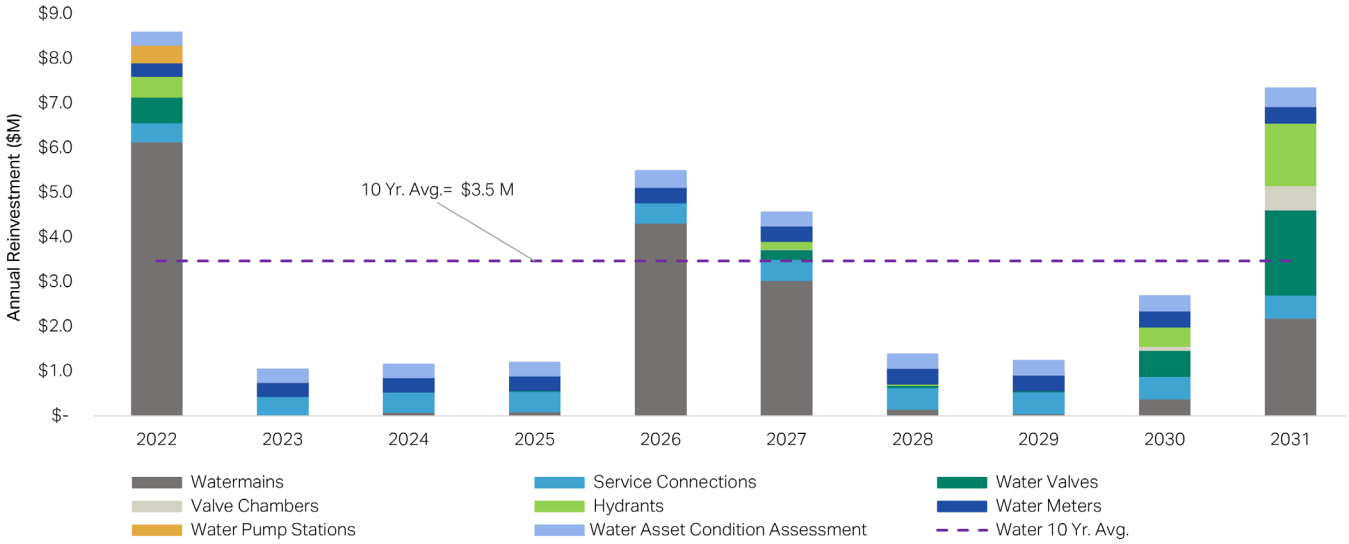


Figure 5-9 Water 10-Year Reinvestment Need Details

5.1.3.2 25-Year and 50-Year Reinvestment Needs

The average annual reinvestment funding need for the Town's entire water infrastructure assets is $3.2M and $5.9M over the next 25 years and 50 years, respectively, in inflated dollar values. This is equivalent to a total of approximately $80M over the next 25-year period and $295M over the next 50-year period, respectively, as presented in **Figure 5-10**.

Looking at the reinvestment need in the decade between 2060 to 2070, significant amount of the Town's aged assets especially pipes will require to be renewed or replaced as they exceed their expected service life. For growing communities like the Town, there has not been a historical need to forecast expenses that are not anticipated for decades. However, based on the experiences of more established Canadian cities (where vast inventories of old assets are in need of renewal or replacement), it is vital that communities fully understand the looming obligations of infrastructure renewal or replacement in the long term and develop a strategy to respond in a manner that is fair and affordable.

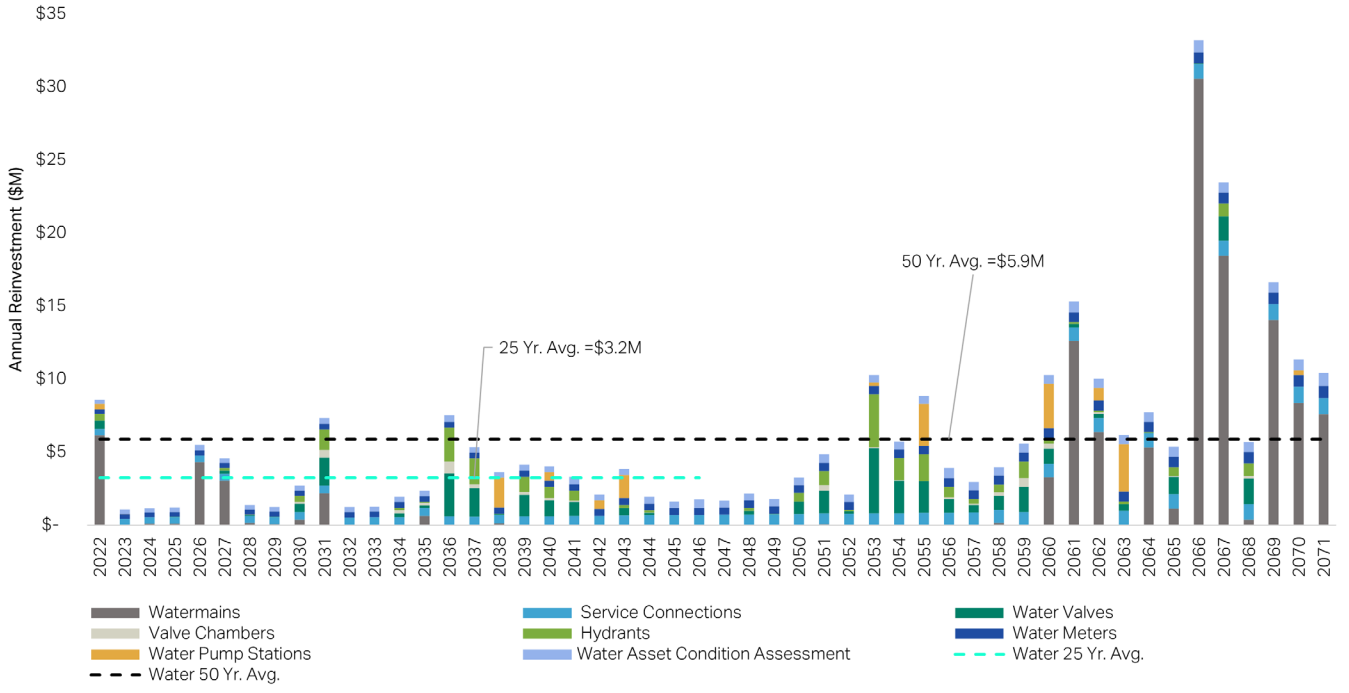


Figure 5-10 Water 25-Year and 50-Year Reinvestment Need Details

5.1.4 Wastewater

5.1.4.1 10-Year Reinvestment Needs

The average annual reinvestment rate for the Town's wastewater assets is $2.5M over the next 10 years in inflated dollar values. This is equivalent to a total of approximately $25M over the next 10-year period, as presented in **Figure 5-11**. As presented in **Table 5-1** the gravity sewer with priority number 1 to 74 will be addressed under this funding level with a steady annual reinvestment rate.

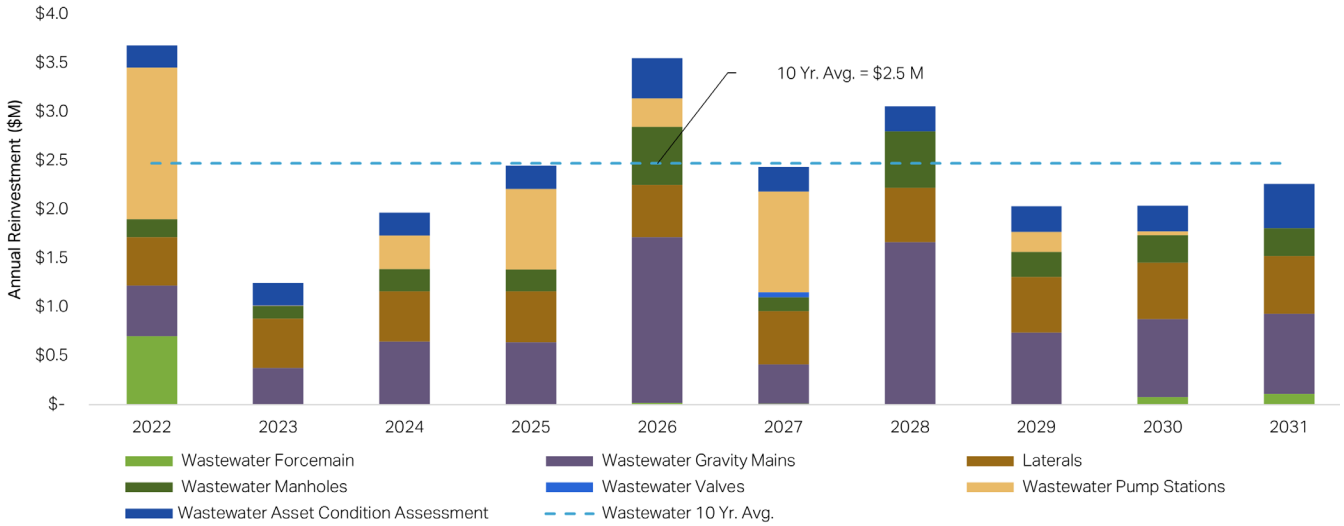


Figure 5-11 Wastewater 10-Year Reinvestment Need Details

5.1.4.2 25-Year and 50-Year Reinvestment Needs

The average annual reinvestment funding need for the Town's wastewater assets is $3.1M over the next 25 years in inflated dollar values. This is equivalent to a total of approximately $77.5M over the next 25-year period, as presented in **Figure 5-12**. While the average annual reinvestment rate for the Town's wastewater assets is $4.0M over the next 50 years in inflated dollar value, for a total of approximately $200M, as presented in **Figure 5-12**. Looking at the reinvestment need in 2054 and 2055, significant amount of the Town's aged force mains will require renewal or replacement as they will exceed their expected service life.

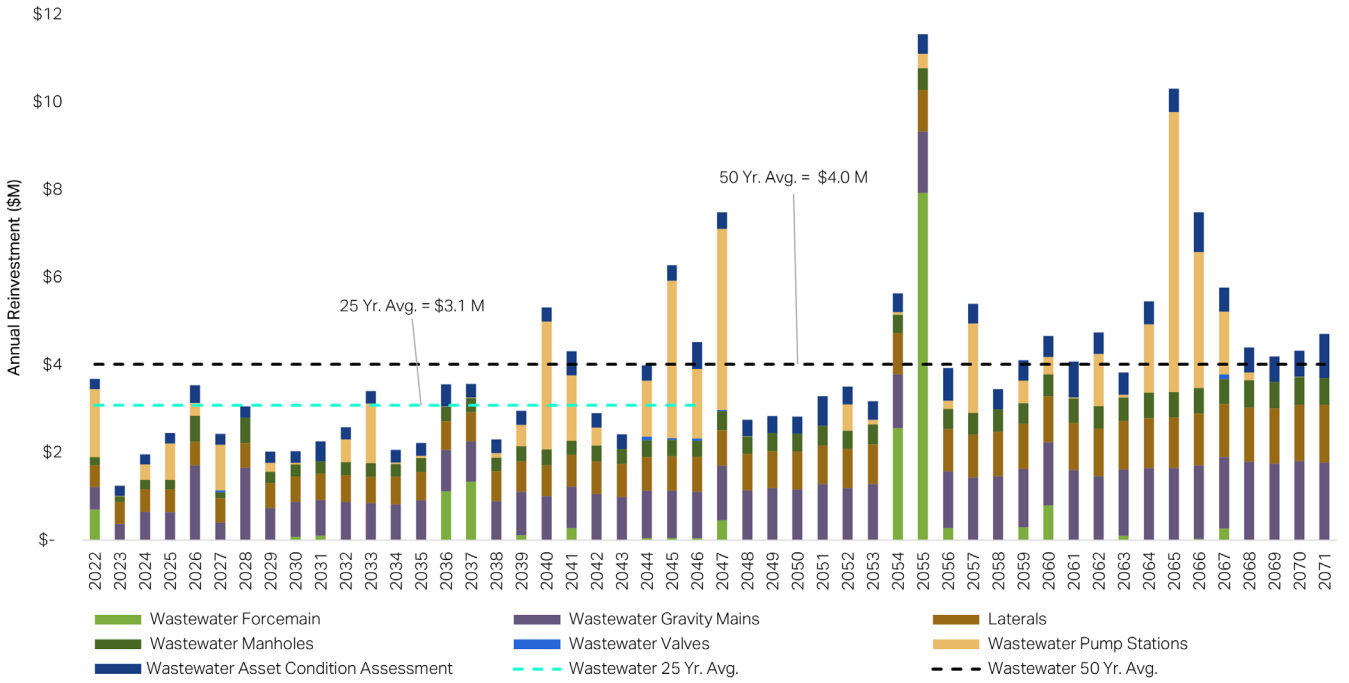


Figure 5-12 Wastewater 25-Year and 50-Year Reinvestment Need Details

5.1.5 Stormwater

5.1.5.1 10-Year Reinvestment Needs

The average annual reinvestment funding need for the Town's stormwater assets is $1.3M over the next 10 years in inflated dollar values. This is equivalent to a total of approximately $13M over the next 10-year period, as presented in **Figure 5-13**.

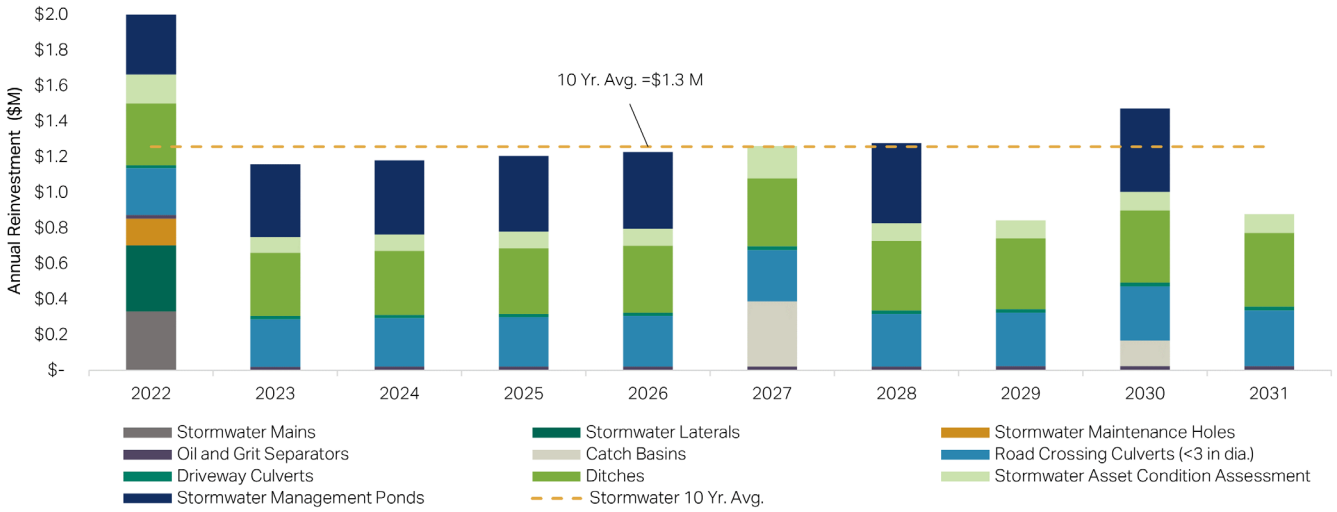


Figure 5-13 Stormwater 10-Year Reinvestment Need Details

5.1.5.2 25-Year and 50-Year Reinvestment Needs

The average annual reinvestment funding need for the Town's stormwater assets is $1.5M over the next 25 years in inflated dollar values. This is equivalent to a total of approximately $37.5M over the next 25-year period, as presented in **Figure 5-14**. While the average annual reinvestment rate for the Town's stormwater assets is $3.4M over the next 50 years in inflated dollar value, for a total of approximately $170M. Looking at the reinvestment need starting from 2050s, significant amount of the Town's aged catch basins will require replacements as they will exceed their expected service life.of the Town's aged catch basins will require replacements as they will exceed their expected service life.

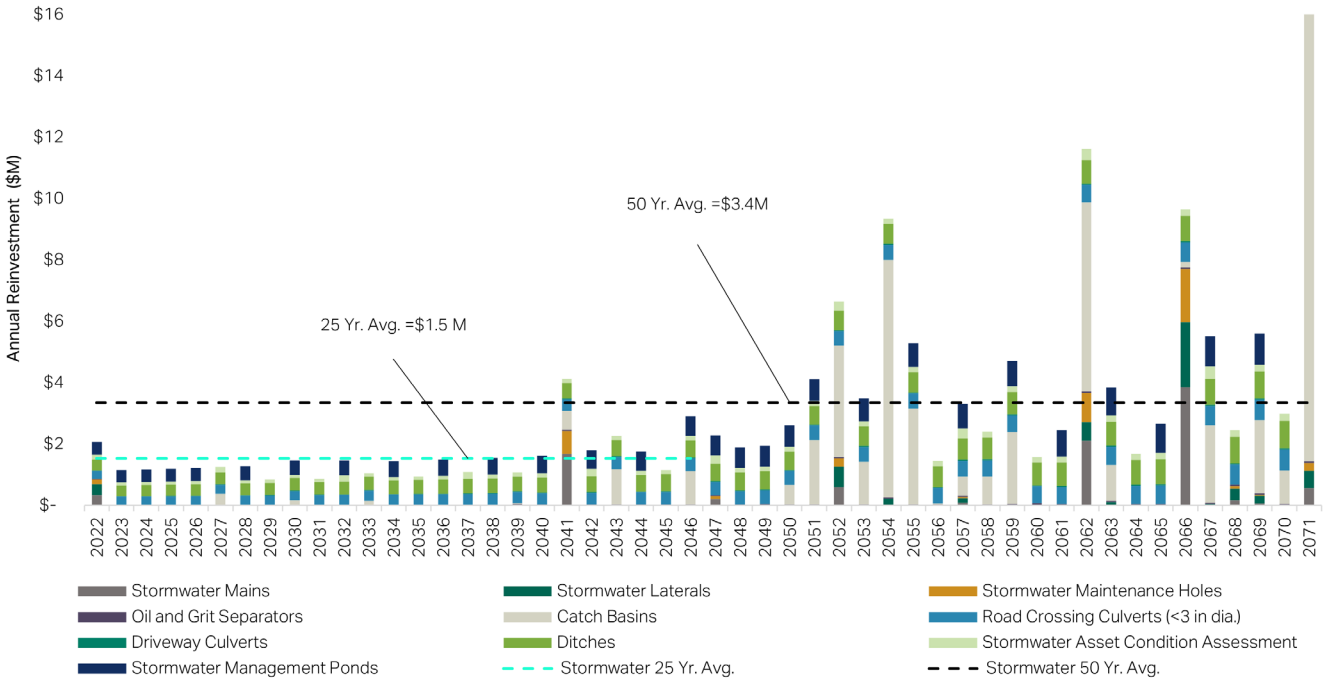


Figure 5-14 Stormwater 10-Year Reinvestment Need Details

5.1.6 Funding Need Profile for Environmental Services

Figure 5-15 shows a full picture of the Town's Environmental Services Division funding need forecast over the next 10 years, which provides the Town the full funding requirements. The total annual reinvestment rate was overlaid with the O&M cost, and Environmental Services development cost to provide a full funding need profile.

The Town's Environmental Services Division funding requirement increases to approximately $222M over the next 10 years considering all capital need and O&M need, equivalent to $22M per year in inflated dollar value.

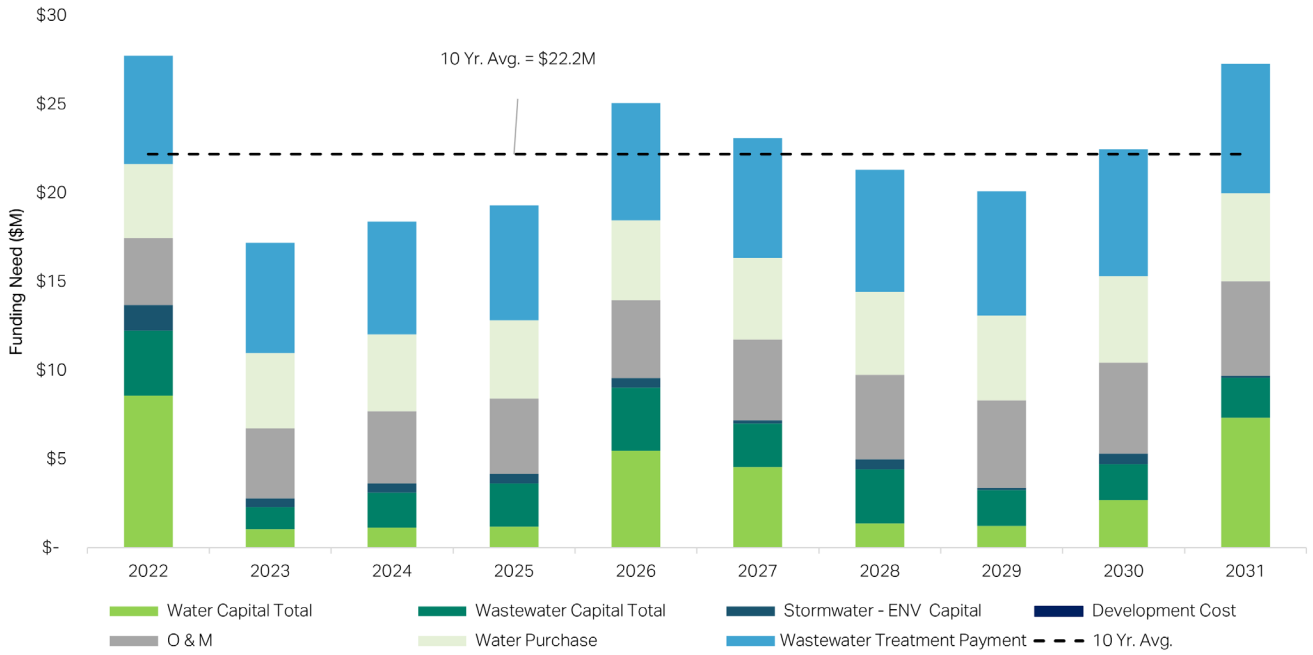


Figure 5-15 Environmental Services 10-Year Full Funding Need Profile

5.1.7 Benchmarking for Capital Reinvestment Needs

Capital reinvestment rates of similar municipalities from Canadian Infrastructure Benchmarking Initiative (CIBI) were used to benchmark with the proposed capital reinvestment funding need for the Town.

Table 5-3 presents the proposed 10-year annual average budgets for water, wastewater, stormwater, and roads capital reinvestment activities in inflated dollar values. **Figure 5-16** shows the capital reinvestment benchmarking results. The lower and upper limit of the error bars were calculated by using the 25th percentile and 75th percentile reinvestment rate from the benchmarking group multiplied by the Town's asset replacement cost for water distribution, wastewater collection, stormwater management system, and roads.

When comparing the range with the proposed budgets, it is noticeable that the proposed capital reinvestment budgets for wastewater collection, and roads assets (Scenario 1 - $6.1M Budget) are between the range indicating the Town's capital reinvestment plan are in line with 50% of Canadian benchmarking municipalities' current capital reinvestment practice.

The proposed water reinvestment budget is higher than the range, which is primarily attributed to the Town's noticeable number of water mains made of ductile iron and cast iron that are due for replacement in the next 10 years. As the Town's stormwater management assets is relatively young, the proposed capital reinvestment budget is sitting just slightly under the 25th percentile in the benchmarking group.

Table 5-3 Town's 10-Year Capital Reinvestment Need Summary

Asset Group	Water	Wastewater	Stormwater	Roads Scenario 1	Roads Scenario 2	Roads Scenario 3
10-Year Average	$3.5M	$2.5M	$1.3M	$6.7M	$10.6M	$13.6M

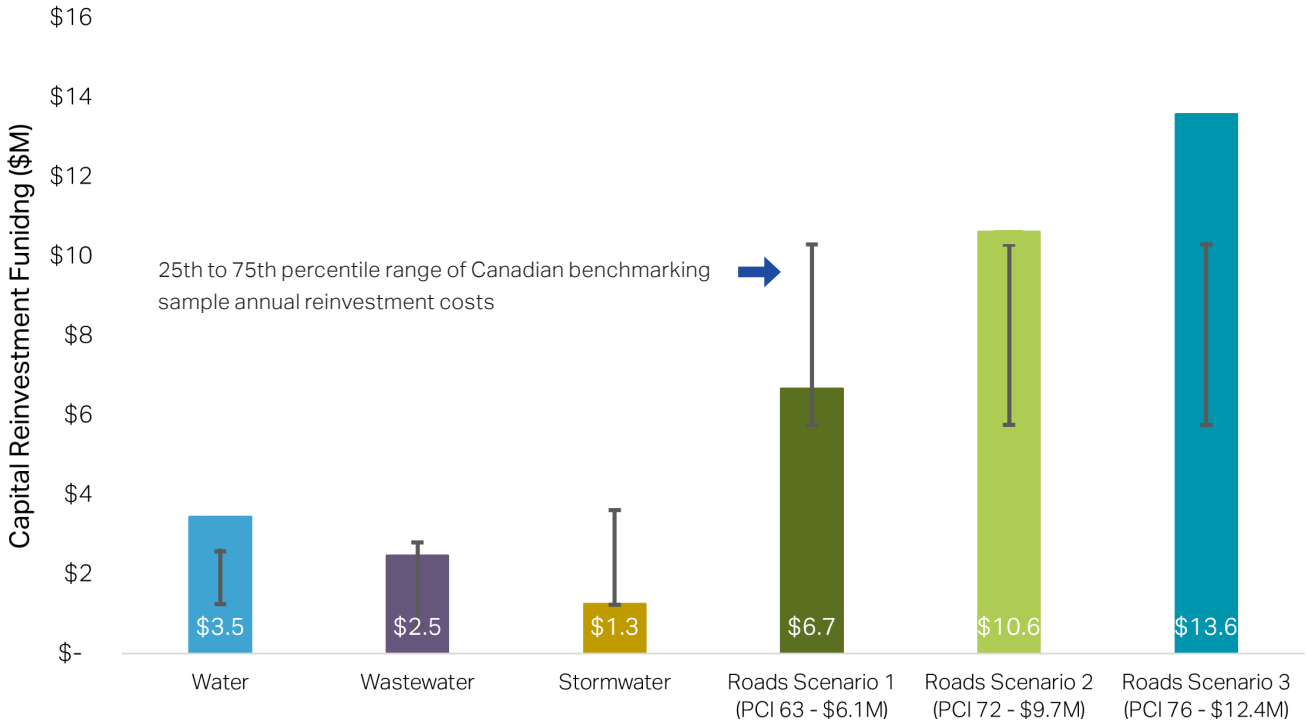


Figure 5-16 Capital Reinvestment Benchmarking

5.2 Financial Analysis and Strategy

The financial strategy identifies the annual cost of operations and maintenance (O&M) and capital renewal reserve contributions required to provide for the Town's core assets and describes how the Town could fund these needs. Similar to other Canadian Municipalities, the Town of Georgina is facing an infrastructure funding gap which is defined as the difference between the sustainable funding required to keep the assets in a state of good repair and the revenue from available resources.

Mitigating the infrastructure gap requires either an increase of funds available for infrastructure renewal or a reduction in service levels. This analysis shows the impacts of increasing revenues while acknowledging that choosing to reduce service levels may also be available to manage affordability. Reducing service levels in critical infrastructure like roads and utilities is not a viable or recommended solution. A phase-in strategy has been developed to support taxpayer affordability and gradually close the infrastructure gap.

The core assets have been categorized as follows:

- **Utility Rate Supported Services** - Water and wastewater are supported by rates directly billed to users of these assets. The revenue collected from water and Wastewater rates can only be used to operate, maintain and replace these assets.
- **Tax Supported Services** - Roads Infrastructure (which includes bridges, culverts, sidewalks, streetlights) and Stormwater assets are supported from taxes.

In addition to separating the funding sources by type of service which is consistent with the practice in other municipalities, the Town also summarizes their budgets as follows:

- **Capital Budget and Capital Forecast** - The Capital Budget allocates funds for new growth primarily funded from development charges and for rehabilitation and replacement of existing infrastructure funded primarily from the tax levy and, in the case of water and wastewater, user rates. The capital forecast identifies priority capital projects over the next 10 years.
- **Operating Budget** – The Operating Budget includes the Town's annual operating expenses, estimated revenues and capital replacement reserve contributions. This includes day-to-day operating expenses such as utilities, rent, insurance, salaries and wages, program supplies, repairs and maintenance, repayment of debt. Operations and maintenance (O&M) activities are critical in ensuring that assets are able to support their intended service delivery.

5.2.1 Tax Supported Assets

Tax-supported assets include Roads Infrastructure and Stormwater.

5.2.1.1 Roads Infrastructure Capital Budget

An important component of a road asset management strategy is to define a level of service for the network that will be used as a benchmark for where the network condition should be maintained.

There were three scenarios in the roads capital funding need analysis. Scenario 2 was used to illustrate the capital budget requirements for roads, and this would require updating depending on what scenario that the town moves forward with.

Under Scenario 2, the existing Roads Infrastructure capital reserve contribution is $5.89M. To achieve the suggested Pavement Condition Index (PCI) of 72, the total investment required is $12.4M annually to meet the replacement needs as they arise, prevent infrastructure backlog, and achieve long term sustainability. Currently there is a $6.5M annual funding shortfall. Funding the shortfall in one year would result in an additional tax levy of 13.9%. Taking into consideration taxpayer affordability, three options were considered to phase-in the required annual contribution over a period of 10, 15, 20 years.

Table 5-4 Roads Capital Contribution Options

Asset	Existing	Proposed	Shortfall	10-Year Annual Levy Impact	15-Year Annual Levy Impact	20-YearAnnual Levy Impact
Roads Infrastructure Capital	$5,889,019	$12,435,000	($6,545,981)	1.39%	0.93%	0.70%

The estimated annual impact on the tax levy is shown above for Roads Infrastructure. For example, if a 10-year phase-in were to be implemented, this would result in an additional annual levy rate increase of 1.39% each year over the 10-year period. A 15-year phase-in would require an annual levy increase of 0.93% over the 15-year period. A 20-year phase-in would result in an annual increase in the levy of 0.70% each year over the 20-year period.

5.2.1.2 Roads Infrastructure Operating Budget

The Town's operating budget objective is to meet the operating and maintenance (O&M) needs of the Town's existing assets while maintaining taxpayer affordability. O&M activities are critical in ensuring that the assets are able to support their intended service delivery.

It is estimated that the Town should be spending approximately $4.8M annually on O&M for roads infrastructure compared to the existing annual O&M budget of $3.6M, resulting in a shortfall of $1.2M.

Three phase-in options were considered to gradually increase the O&M budget over 10, 15, and 20 years.

Table 5-5 Roads O&M Options

Asset	Existing	Proposed	Shortfall	10-Year Annual Levy Impact	15-Year Annual Levy Impact	20-YearAnnual Levy Impact
Roads Infrastructure O&M	$3,632,810	$4,836,887	($1,204,077)	0.26%	0.17%	0.13%

The estimated annual impact on the tax levy for each option is shown in table 5-5. A 10-year phase-in would result in an additional annual tax levy rate increase of 0.28% each year over the 10-year period. A 15-year phase-in would increase the annual tax levy by an additional 0.17% each year over 15-years. A 20-year phase-in would result in an additional annual increase in the tax levy of 0.13%.

5.2.1.3 Stormwater Capital Budget

The existing stormwater capital reserve contribution by the Town is $100,000 annually. Based on the findings of the AMP, there is a need to contribute $975,000 annually to the storm sewer capital reserve. Currently there is a $875,000 annual funding shortfall. Funding the shortfall in one year would result in an additional tax levy one time increase of 1.9%.

Table 5-6 Storm Capital Contributions Options

Asset	Existing	Proposed	Shortfall	10-Year Annual Levy Impact	15-Year Annual Levy Impact	20-YearAnnual Levy Impact
Stormwater Capital	$100,000	$975,000	($875,000)	0.19%	0.12%	0.09%

Taking into consideration taxpayer affordability, three options were considered to phase-in the required annual contribution over a period of 10, 15, 20 years. The estimated annual impact on the tax levy is shown in table 5-6. Should a 10-year phase-in be implemented, this would result in an annual levy rate increase of 0.19% each year over the next 10 years. Under a 15-year phase-in, this would increase the annual levy by 0.12% in each of the next 15 years. A 20-year phase-in would result in an annual increase in the levy of 0.09% in each of the next 20 years.

5.2.1.4 Stormwater Operating Budget

The AMP estimates that the Town should be spending approximately $922,000 annually on O&M expenditures for stormwater infrastructure. In 2022, the Town budgeted $412,000, reflecting a shortfall of $510,000.

Three phase-in options were considered to gradually increase the stormwater O&M expenditures over 10, 15, and 20 years.

Table 5-7 Storm O&M Options

Asset	Existing	Proposed	Shortfall	10-Year Annual Levy Impact	15-Year Annual Levy Impact	20-YearAnnual Levy Impact
Stormwater O&M	$412,430	$921,878	($509,448)	0.11%	0.07%	0.05%

The estimated annual impact on the tax levy impact is shown in table 5-7 for each option. A 10-year phase-in would result in an additional annual tax levy rate increase of 0.11%. A 15-year phase-in would increase the annual tax levy by 0.07% and a 20-year phase-in would result in an additional annual increase in the tax levy of 0.05%.

5.2.1.5 Tax Levy Impact Summary

Table 5-8 provides a summary of the estimated annual investment requirement in comparison to the average funding currently available in the Town's operating budget. This summary reflects the O&M as well as the capital contribution needs to achieve financial sustainability.

Table 5-8 Tax Levy Impacts for Roads and Storm

Asset	Existing	Proposed	Shortfall	10-Year Annual Levy Impact	15-Year Annual Levy Impact	20-Year Annual Levy Impact
Stormwater O&M	$412,430	$921,878	($509,448)	0.11%	0.07%	0.05%
Stormwater Capital	$100,000	$975,000	($875,000)	0.19%	0.12%	0.09%
Total Stormwater	**$512,430**	**$1,896,878**	**($1,384,448)**	**0.29%**	**0.20%**	**0.15%**
Roads Infrastructure O&M	$3,632,810	$4,836,887	($1,204,077)	0.26%	0.17%	0.13%
Roads Infrastructure Capital	$5,889,019	$12,435,000	($6,545,981)	1.39%	0.93%	0.70%
Total Roads Infrastructure	**$9,521,829**	**$17,271,887**	**($7,750,058)**	**1.65%**	**1.10%**	**0.82%**
			Total O&M Annual Levy Increase	0.36%	0.24%	0.18%
			Total Capital Annual Levy Increase	1.58%	1.05%	0.79%
			Total Annual Levy Impact	**1.94%**	**1.30%**	**0.97%**

As shown above, to fund the operating, maintenance and capital replacement costs for stormwater assets would result in a tax levy increase of $1.4M for stormwater and $7.7M for roads infrastructure, for a total tax levy increase of $9.1M. Funding this shortfall over a one-year period would result in a tax levy increase of 19.4%.

The Town has other budgetary challenges that must considered in addition to the roads and stormwater asset management funding gaps. Phase in strategies have been presented to take into consideration taxpayer affordability to gradually close the infrastructure funding gap. The total impact, on an annual basis is shown at the bottom of **Table 5-8** for roads and stormwater combined for both O&M and capital under each phase-in option. On a consolidated basis, if a 10-year phase-in were implemented for both stormwater and roads infrastructure for both O&M and capital, there would need for an additional increase in the annual tax levy of 1.94% each year over the next 10 years. If the plan were to be undertaken over a 15-year period, there would be an additional annual increase of 1.30% and 0.97% with a 20-year phase-in.

5.2.2 Rate Supported Assets

Funding for the replacement of water and wastewater system capital assets are provided from water and wastewater user fees. The Town of Georgina Water/Wastewater Rate Study dated November 2020 which involved a comprehensive analysis of long-term operating and capital needs and available funding sources was used as the basis for the development of the funding strategy.

5.2.2.1 Water/Wastewater Capital Budget

Replacement of the water and wastewater capital assets are funded by contributions to the water and wastewater capital reserves from the operating budget. The AMP estimates that the average annual contribution required to the water capital reserve is $3.5M and $2.5M to the wastewater capital reserve. The 2022 water and wastewater Operating Budgets reflect a total capital reserve contribution of $0.2M resulting in an annual infrastructure gap of $5.8M.

The asset consumption ratio which is the accumulated amortization as a percentage of historical cost measures the extent to which the infrastructure assets have been consumed. This financial indicator highlights the potential asset replacement needs. Based on the Georgina's 2020 financial statements, the Asset Consumption Ratio for water was only 25% of which means there is 75% remaining useful life in the waterworks assets. The wastewater asset consumption ratio is 28%. The assets being relatively new provides the Town the opportunity to gradually phase-in increases in contributions to the capital reserves and mitigate an impractical increase in user rates. The Water/Wastewater Infrastructure Funding Strategy is to gradually close the annual infrastructure gap over a 10-year period. The 2020 Water Rate Study forecasts capital replacement reserve contributions to increase from $0.1M in water to $3.7M in 2031 and from $0.1M wastewater to $2.6M in 2031.

5.2.2.2 Water/Wastewater Operating Budget

Operating expenditures include salaries and benefits, materials, contracts, services, hydro, insurance and utility costs. These costs are necessary to ensure water assets are operating efficiently and in accordance with provincial regulations.

The Town's approved 2022 Operating Budget for water systems O&M budget is $1.9M. The average annual O&M expenditures for water operations is estimated at $2.0M, based on the AMP findings, resulting in an annual shortfall of approximately $95,000. Based on the 2022 projected rate revenues of $7.5M, a one-time rate revenue increase of 1.27% is required over and above the normal inflationary increases.

Table 5-9 Water Operating Funding Gap

Water	2022
Annual Average O&M	$1,998,371
2022 Budget Water System	$1,903,210
Shortfall	**($95,161)**

The Town's approved 2022 Operating Budget for wastewater systems is $1.1M. The average annual O&M expenditures are estimated at $1.4M reflecting a shortfall of approximately $268,000. Based on the 2022 projected rate revenues of $7.91M, a one-time rate revenue increase of 3.38% is required over and above the normal inflationary increases.

Table 5-10 Wastewater Operating Funding Gap

Water	2022
Annual Average O&M	$1,406,465
2022 Budget Water System	$1,138,720
Shortfall	**($267,745)**

> Please refer to Section 6.1 for continuous improvement initiatives related to Financial Analysis & Strategy.

06

Continuous Improvement

Continuous improvement is an important component of any AM program and is achieved through the implementation of recommended improvement initiatives which support sustainable service delivery.

Typically, the Asset Management continual improvement process involves:

Identifying areas of improvement and establishing asset management improvement initiatives.

See Section 6.1

Prioritizing the improvement initiatives based on criticality and availability of resources.

See Section 6.2.1

Selecting an organizational champion and/or steering committee to spearhead the Asset Management Program and allocating roles and responsibilities to implement asset management improvement initiatives

See Section 6.2.2 and 6.2.3

Training relevant staff in asset management concepts and principles, software/systems usage, data collection and the importance of keeping information up to date.

See Section 6.2.5

Monitoring and reporting on the progress of asset management improvement initiatives through well-defined KPI's.

See Section 6.2.6

6.1 Improvement Initiatives

This section presents a suite of 27 improvement initiatives grouped by sections of the AMP (see **Section 6.1.1** to **6.1.4**). An Implementation Plan in **Section 6.2** provides a prioritized roadmap to guide the sequencing and implementation of the improvement initiatives.

6.1.1 State of Infrastructure Improvement Initiatives

A-1. Link assets across data sources with unique IDs.	– Currently, there are blank Asset IDs in the GIS asset inventory and Asset IDs are not linked across the Town's data sources, such as between GIS, and WorkTech. – Assigning unique asset IDs should be a priority for the Town so that assets can be tracked throughout their whole lifecycle with minimal effort.
A-2. Refine the asset hierarchy.	– For the purpose of this study, an asset hierarchy was developed, based on the Town's GIS asset inventory, as shown in **Figure 2-1** of **Section 2.1.1**. – It is recommended that the Town review this asset hierarchy in greater detail to ensure it is suited to its asset management planning needs and consider a more comprehensive asset hierarchy, with a further breakdown of asset components, in the future. – When considering the asset hierarchy, it is important to note the fine balance between adequate granularity to provide the necessary information, and too much granularity that the effort to collect and manage the information outweighs the usefulness of the data itself.
A-3. Refine the asset inventory.	– The Town should close the data gaps including install years, condition, ESLs, and unit costs. For instance, the Town has the technology in place to conduct regular inspections on assets such as Geocortex and ArcGIS Online Data Collector and should be utilized more frequently to update asset condition. In addition, condition tables from already inspected assets such as watermains, sewers, hydrants, and sidewalks etc. should be linked or merged with the asset inventory in GIS via the Asset IDs. – Once asset data gaps have been closed an asset inventory list should be prepared and distributed to contractors with the purpose of updating the list with asset attributes collected onsite. This ability to streamline information from contractors to the Town's Asset Management and / or GIS Specialist would enable accurate data to be reflected in the GIS more efficiently.
A-4. Develop an Asset Condition Assessment Program.	– Condition assessment is one of the primary steps utilized prior to performing maintenance, and renewal or replacement activities. **Section 4.6** and **Appendix H** provide the condition assessment strategy and plan for the next 10 years for the Town. It is recommended that the Town budget on average of $0.8M per year for condition assessment expenditures (**Figure 4-7**) over the next 10 years – It is recommended that the Town ensures that asset condition assessment information is integrated into the asset inventory and updated in the Town's GIS and keep records of asset failures. For example, whenever a pressure main fails, obtain a coupon sample of the failed section and conduct a root cause investigation of the failure. This will assist in building the Town's knowledge on the asset deterioration trend and the contributing factors such as material selection, location, soil conditions, pressures, etc.
A-5. Develop a Standardized Maintenance Work Template.	– The Town requires a standardized maintenance work template which can be populated by maintenance contractors with accurate data from the field, such as date of installation, material, size, and condition. – The ability to streamline information from maintenance contractors to the Town's Asset Management and/or GIS Specialist would enable accurate data to be reflected in the GIS in a timely manner.

6.1.2 Level of Service Improvement Initiatives

B-1. Review the LoS performance measures on an annual basis, and update asset performance data as required.	– The LoS performance measures presented in **Section 3.3.3** are intended to be reviewed and refined on an annual basis. As such, the Town may find that certain performance measures no longer provide value to the organization or that the LoS Framework is missing certain measures that the Town would like to track. Besides the required O. Reg. 588/17 LoS, the Town has flexibility to modify the LoS that it tracks annually.
B-2. Refine the LOS Framework.	– The Town should begin populating the LoS Framework with current and historical performance data (where available) to close existing information gaps. In addition to performance data, the Town should collect cost data associated with current service levels. This will enable the Town to understand the financial gap between current and target levels of service and empower the Town to explain the relationship between funding requirements and service levels. – Where the Town has chosen to carry forward LoS from the 2014 AMP, historical trend data exists for only a few performance measures. It is possible that the Town does not have this data available; however, it may be that the asset performance data is stored in various sources which may require time for the Town to locate and collate accordingly.
B-3. Document information workflows, and clearly define roles and responsibilities in the LoS Continual Improvement Planning Process.	– A component of collecting LoS performance data is ensuring that the right processes are in place to enable efficient LoS reporting. It is recommended that the Town review existing information workflows and identify opportunities for more robust linkages between GIS, WorkTech, iCity, and other systems used within the Town to support cross-functional teamwork. This includes developing process maps and documenting clear roles and responsibilities so that key staff understand their role in the process of data collection, recording, analysing, and monitoring.
B-4. Analyse and monitor LoS performance data.	– It is important that the Town analyse the LoS performance data that it is collecting, as this information is meaningful for the Town in order to assess the service delivery of its core infrastructure assets. It is proposed that the Town develop a Standard Operating Procedure (SOP) to address this recommendation similar to the Town's existing DWQMS Infrastructure Review Procedure. – The success of the LoS Framework is dependent on the Town continuing to collect and benchmark asset performance data year over year. By analysing leading indicators and observing trends in service levels, this enables the Town to proactively manage its assets to mitigate potential risks associated with asset failure.
B-5. Develop a Customer Consultation Plan.	– Develop a Customer Communication & Consultation Plan to engage the public and other stakeholders on the proposed LoS Framework to be developed and approved in future Asset Management Planning phases, as well as to better understand stakeholder willingness to pay for enhanced service levels. The communication component of this plan is intended for internal and external use. Internally, this plan often acts as a change management document by communicating the importance of, and bringing awareness to, the Town's existing and desired service levels, which often generates overall asset management buy-in from staff across varying levels in the organization.

B-6. Prepare a Demand Management Strategy.	– Develop a formal Demand Management Strategy by identifying future demand drivers that may affect future service delivery and the utilization of core infrastructure assets. Some drivers have been identified in **Section 3.4** of this AMP but should be reviewed in greater detail and incorporated into a Demand Management Strategy to be considered in long-term capital planning. – When the Town conducts its annual LoS Framework review, the Town should review the need for any change in target service levels due to future demands and estimate the required capital investment.
B-5. Develop a Climate Change Adaptation Plan.	– Develop a robust Climate Change Adaptation Plan building on from the identified impacts addressed in **Section 3.4.1.2** It is recommended the following asset management-related strategies be implemented to guide the Town towards the development of the plan: - Increase resilience to climate change when assets are being replaced at the end of their service life. - Incorporate green initiatives and sustainable design principles to mitigate potential climate change impacts within the community. - Develop infrastructure management strategies for climate emergency preparedness and response. - Determine the funding requirements for increasing maintenance costs to ensure the Town is able to sustain service levels as a result of climate change impacts.

6.1.3 AM Strategy Improvement Initiatives

C-1. Implement the updated AM Policy (**Appendix D**).	– The Asset Management Policy is an important document for guiding the overall approach to the Town's asset management activities within the organization. The Town should review the Asset Management Policy updated in this TM and identify areas where greater enforcement is required and document the necessary actions for improvement. – Successful implementation of the Asset Management Policy will depend on the asset management buy-in and support by staff across the Town. Internal communication and engagement are key factors for the implementation of new asset management initiatives and tools to be incorporated across the organization.
C-2. Refine the Risk Framework.	– The Town should review the risk framework presented in **Appendix E** and ensure that appropriate risk parameters and thresholds are defined for each core asset category. The Town should also fill data gaps where age data is being used instead of performance data (i.e., condition) for the probability of failure criteria. – Once the Town is satisfied with the risk framework, GIS-based risk maps should be completed for the non-linear core assets as well.
C-3. Develop a Risk Contingency Plan.	– Risk control activities should be regularly reviewed, monitored, and documented within a risk register or log. A contingency plan should also be developed to document the processes and procedures to deal with risk events, and may include the following: - Potential risk threats or emergencies. - Potential evacuation procedures. - Operating / shut down procedures. - Roles and responsibilities of staff during an emergency. - How to communicate with the public and regulatory agencies.

C-4. Consolidate the asset O&M activities into one centralized database and ensure each activity is assigned a unique maintenance activity code.	– Currently, the Town has asset maintenance information located in multiple sources such as WorkTech, various Excel spreadsheets, and reports. It is recommended that the Town consolidate its asset O&M activities into one centralized database to improve workflow efficiency. Refer to **Appendix G** for the consolidated maintenance activities across the asset categories. – It is recommended that the Town assign unique activity IDs so they are easily tracked, by the O&M team, and with a minimum effort.
C-5. Track O&M costs at the asset level.	– The Town should move to whole portfolio governance, tracking and prioritizing to comprehensively measure the cost of O&M. Clearly defining activities, time and resources, and asset-level targets will allow for an understanding of what actions have been taken at the asset level, at what cost, and what further actions should be anticipated. On a system-wide level, the Town should be able to analyze what assets are being serviced and if current efforts support a sustainable infrastructure portfolio in the long term. Actions taken at the asset level should be directly tied to achieving the Town's desired Levels of Service, thereby shifting the paradigm of how activities are funded. Refer to **Section 4.5** for proposed O&M planning approach. – Existing O&M costs are categorized by broad groupings at the program level, but not at the asset level. Managing and tracking O&M costs at the asset level involves a significant procedural change that will require time and effort by the Town. However, this will enable the Town to identify problematic assets and optimize their lifecycle strategies accordingly. Development of SOPs (see recommendation C-6) is an effective approach to help with better tracking with O&M costs at the asset level.
C-6. Establish Standard Operating Procedures (SOP) for maintenance activities.	– SOPs enable that O&M activities are performed consistently to maintain quality control of processes. It is recommended that the Town develops SOPs that provide a brief description of the activity, step-by-step procedure, labour, equipment & material requirements along with quantities and operating procedure achievements (refer to **Figure 4-3** for a sample SOP). The SOPs enable to understand resources (i.e., labour, equipment, and material) required for the Town's O&M activities. Thus, the O&M cost estimates will be more accurate to identify the resources needed for maintenance work across each asset category.
C-7. Develop an AM Software Strategy.	– Beyond its current use of WorkTech, the Town requires a CMMS to plan, track, measure and optimize all maintenance activities. The proposed O&M activities and plan (**Section 4.5** and **Appendix G**) will help to ensure a successful CMMS implementation within the Town. Establishing requirements and ensuring enough resources and support are in place prior to the procurement of a CMMS is important. The CMMS has the potential to develop consistency in how asset data is tracked across the Town. – As a later phase in this project, an Asset Management Software Strategy will be developed which will address this recommendation (see TM 5 in **Figure 1-1**).

C-8.

Continue overlaying risk models with the current state of the assets (i.e., condition) and refine asset unit costs and estimated services lives (ESLs) to drive the funding need forecast.

- The accuracy of financial forecasts is limited by the accuracy of risk, condition assessment results, replacement cost, and ESLs. It is recommended that the Town review risk framework periodically to ensure alignment with business objective and appetite to incorporate the latest condition assessment results in the life cycle model to improve financial forecasting.
- In addition, the Town should consider developing processes and procedures to help track the costs associated with replacing existing assets and the time interval between replacements. It is important that the Town continue to review this information not only to improve their financial forecasting but to better identify performance improvement opportunities.

C-9.

Align the Financial and Non-Financial Functions of AM.

- The lack of alignment between financial and non-financial functions can be attributed to silos in an organization, including reporting structures, functional / operational business processes, and related technical data. Silos generally bring forth the necessary level of specialization. However, with a lack a communication between the silos, organizations are at risk of inefficiencies and errors in asset management results, or asset management failures due to a lack of alignment between asset management staff and senior management. Financial and non-financial alignment needs to work both "vertically" and "horizontally", as follows:
  - Vertical Alignment: Financial and non-financial asset-related directives by management are informed by accurate upward information flows, effectively implemented across the appropriate levels of the organization.
  - Horizontal alignment: Financial and non-financial information that flows between departments (conducting functions such as operations, engineering, maintenance, financial accounting and management) uses the same terminology and refers to the assets identified in the same way.
  - The implementation of CMMS system can result in optimized tracking of work orders and inform the optimization of financial settings (see recommendation C-7). Eventually, the alignment between non-financial and financial functions can be achieved.

6.1.4 Financial Analysis & Strategy

D-1.

Increase capital budgets to address service delivery needs and align with the funding levels from peer municipalities.

- In light of the capital budget needs outlined in **Section 5.1.2** to **5.1.5**, the Town should increase water, wastewater, stormwater, and roads infrastructure expenditures on capital to the following amounts per year over the next 10 years to align with the capital funding levels from peer municipalities.
- This recommendation also includes reviewing the availability of staff to ensure that capital projects are able to be completed as efficiently and effectively as possible.

D-2. Continue to increase capital replacement reserve contributions in accordance with the Financial Plan (November 2020).	– To achieve the middle scenario PCI of 72 for the Town's road infrastructure, the total investment required is $12.4M annually to meet the replacement needs as they arise, prevent infrastructure backlog, and achieve long term sustainability. Currently there is a $5.5M annual funding shortfall. Please refer to **Section 5.2.1.1** for details on three funding scenarios over a 10-, 15-, and 25-year period. – The existing stormwater capital reserve contribution is $100,000 annually to fund future replacement requirements. There is a need to contribute $975,000 annually to the stormwater capital reserve. Please refer to **Section 5.2.1.3** for details on three funding scenarios over a 10-, 15-, and 25-year period. – The Water Rate Study forecasts capital replacement reserve contributions to increase from $0.1M in 2022 to $3.7M in 2031 (see **Section 5.2.2.1**). – The Wastewater Rate Study forecasts capital replacement reserve contributions to increase from $0.1M in 2022 to $2.6M in 2031 (see **Section 5.2.2.2.3**).
D-3. Continue to meet the Town's O&M needs while maintaining taxpayer affordability.	– It is estimated that the Town should be spending approximately $4.8M annually on O&M for its roads infrastructure, compared to the existing annual operating budget of $3.6M, resulting in a shortfall of $1.2M. Please refer to **Section 5.2.1.2** for details on three funding scenarios over a 10-, 15-, and 25-year period. – It is recommended that the Town should be spending approximately $922,000 annually on O&M expenditures for stormwater infrastructure. In 2022, the Town budgeted $412,000, reflecting a shortfall of $510,000. Please refer to **Section 5.2.1.4** for details on three funding scenarios over a 10-, 15-, and 25-year period. – This recommendation also includes reviewing the availability of staff to ensure that O&M activities are able to be conducted to maintain desired service levels.
D-4. Implement a one-time increase in utility rate supported services by 2023.	– A one-time increase in water rates of 1.27% and a one-time increase in wastewater rates of 3.38% in 2023 is required to maintain service levels.

6.2 Implementation Plan

This is a strategic plan that provides guidance on the prioritization, sequencing, implementation, and monitoring of the improvement initiatives presented in **Section 6.1**. This plan will ensure that progress is made on improving AM practices across the Town and ensure that progress can be measured and quantified over time.

6.2.1 Prioritized Roadmap

Table 6-1 highlights the high priority improvement initiatives from **Section 6.1** across a four-year timeline and shows the recommended sequencing of implementation. For further information on each improvement initiative please refer to the tables in Section 6.1. It is expected that the successful implementation of one initiative may be dependent upon the successful implementation of another initiative to a greater or lesser extent. Whenever feasible, AECOM recommends overlapping the implementation of some initiatives and packaging deliverables together to support an efficient implementation timeline. It is important to keep in mind that this approach will require significant commitment from the Town in terms of time, resources, and funding. Table 6 5 is intended as a guideline, but ultimately it is up to the Town to decide the most appropriate sequencing of initiatives based on its available resources.

Table 6-1 Four-Year Roadmap for the Implementation of High Priority Improvement Initiatives

Improvement Initiative		Responsible, Accountable, Consulted & Informed	Year 1				Year 2				Year 3				Year 4			
C-1	Approve and implement the updated AM Policy.	- Council (consulted & informed) - Senior Leadership (consulted & informed) - Asset Management & Technical Services Division (responsible & accountable)	●	●	●	●												
A-3	Refine the asset inventory.	- Asset Management & Technical Services Division (responsible and accountable) - O&I Staff (responsible and accountable)	●	●	●	●												
C-8	Develop an Asset Management Software Strategy.	- Council (consulted & informed) - Senior Leadership (consulted & informed) - Asset Management & Technical Services Division (responsible & accountable) - IT	●	●	●	●												
A-4	Develop an Asset Condition Assessment Program	- Council (consulted & informed) - Senior Leadership (consulted & informed) - Asset Management & Technical Services Division (responsible and accountable) - O&I Staff (responsible)			●	●	●	●	●	●	●	●						
C-6	Establish Standard Operating Procedures (SOP) for maintenance activities.	- Senior Leadership (consulted & informed) - Asset Management & Technical Services Division (accountable) - O&I Staff (responsible)					●	●	●	●	●	●						
C-4	Consolidate O&M activities into one centralized database with unique maintenance activity codes.	- Senior Leadership (consulted & informed) - Asset Management & Technical Services Division (accountable) - O&I Staff (responsible)						●	●	●	●	●						

Improvement Initiative		Responsible, Accountable, Consulted & Informed	Year 1				Year 2				Year 3				Year 4			
C-5	Track O&M costs at the asset level.	- Senior Leadership & Finance (consulted & informed) - Asset Management & Technical Services Division (accountable) - O&I Staff (responsible)					●	●	●	●								
B-2	Refine the LOS Framework	- Council (consulted & informed) - Senior Leadership (consulted & informed) - Asset Management & Technical Services Division (responsible & accountable)							●	●	●	●	●	●				
B-5	Develop a LOS Customer Consultation Plan	- Council (consulted & informed) - Senior Leadership (consulted & informed) - Asset Management & Technical Services Division (responsible & accountable)									●	●	●	●				
B-6	Develop an AM Demand Management Strategy.	- Council (consulted & informed) - Senior Leadership (consulted & informed) - Asset Management & Technical Services Division (accountable)									●	●	●	●				
B-7	Develop a Climate Change Adaptation Plan.	- Council (consulted & informed) - Senior Leadership (consulted & informed) - Asset Management & Technical Services Division (accountable)									●	●	●	●				
C-2	Refine the Risk Framework	- Council (consulted & informed) - Senior Leadership (consulted & informed) - Asset Management & Technical Services Division (responsible & accountable)											●	●	●	●	●	●
C-3	Develop a Risk Contingency Plan	- Council (consulted & informed) - Senior Leadership (consulted & informed) - Asset Management & Technical Services Division (responsible & accountable)													●	●	●	●
D (all)	Incorporate Financial Strategies in accordance with the Town's Financial Plan and LoS Objectives.	- Council (consulted & informed) - Senior Leadership (consulted & informed) - Finance (responsible)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

6.2.2 Change Management

Successful implementation of this AMP depends on the following factors:

- Asset Management buy-in from Council, senior management, staff, and departments;
- Asset Management maturity targets are realistic and achievable;
- Asset Management improvement initiatives are appropriately resourced;
- An Asset Management monitoring program is in place to hold staff and departments accountable and to track the implementation of the improvement initiatives; and
- A network of Asset Management champions is developed and empowered across the Town.

Implementing change is a significant undertaking, requiring careful planning and changes to the way people work. Buy-in and support are needed from all levels of the Town to ensure that the needed Asset Management standards, practices, and tools are properly adopted and incorporated into day-to-day work activities.

The Town's mission and vision can be a driver for enhanced enterprise performance, meaningful employee experience, and positive community impact. Realizing the full benefits of an Asset Management Program requires stakeholders to shift attitudes and change behaviors. The successful implementation of an AMP depends on a carefully crafted change management approach that considers the needs and experiences of staff, managers, and leaders alike to inspire new conversations and value led outcomes.

Figure 6-1 provides an organizational change process diagram for the Town using effective communication and change management for its asset management capacity building.

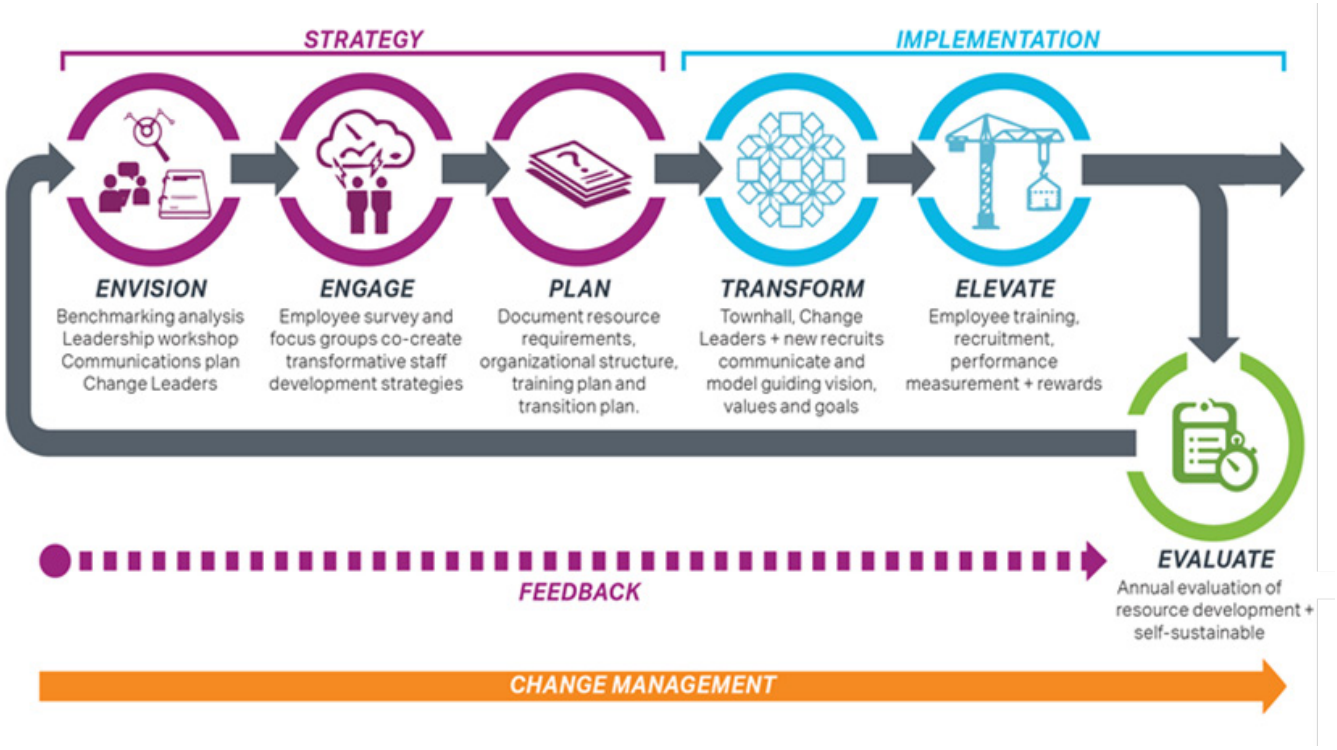


Figure 6-1 Organizational Change Management Process

6.2.3 Asset Management Roles & Responsibilities

The roles within the Town that are responsible for the successful delivery and implementation of the AMP are documented in **Table 6-2**.

Table 6-2 AM Plan Roles & Responsibilities Matrix

AM Plan Roles & Responsibilities Matrix	Council	Senior Leadership Team	Managers & Directors	Asset Management & Technical Services	GIS	O&M Staff	Finance
Asset Data Collection				●	●	●	
Condition Monitoring & Inspection				●		●	
Levels of Service Measuring & Monitoring			●	●		●	●
Risk Management		●	●	●	●	●	
O&M Program Planning		●	●	●		●	●
Capital Program Planning		●	●	●			●
Investment Planning (Funding)	●	●	●	●			●
Continuous Improvement		●	●	●			
Monitor Asset Management Program	●	●	●	●			
Review & Approve AMP	●						

Further information on asset management governance, roles & responsibilities are referenced within the Town's asset management Policy (see **Appendix D**).

6.2.4 Knowledge-Sharing & Communication

Experience with other municipalities demonstrate that the following key concepts are required for the successful implementation of asset management improvement initiatives:

- **Asset Management Knowledge Transfer to Town Staff:** Effective communication from leaders within the organization is an essential aspect of a comprehensive Asset Management Program.
- **Leading Change:** Implementing asset management initiatives is about introducing new corporate practices; thus, it is important that the Town's senior leadership team lead this process of change.
- **Use of Institutional Knowledge:** In the early stages of implementation, it is recommended that the Town make use of staff knowledge to drive the asset management decision-making process. As more information is gleaned and asset data is gathered over time, the Town will be able to make more informed decisions.
- **Quality Assurance and Control:** It is important to keep in mind that the Town's Asset Management Program will continue to evolve and improve over time but ensuring quality assurance of deliverables is essential.

6.2.5 Data Quality Management

Asset data is the foundation of every Asset Management Program; as such, communicating to the organization what data is meaningful and the importance of data quality is an important first step of any implementation plan. Gathering quality asset data helps to better understand the current state (or "health") of the asset and to make more informed decisions about the asset over its lifecycle.

When assessing data quality, it is important to measure key metrics such as the accuracy, completeness, validity, consistency, uniqueness, and timeliness of the data as shown in **Table 6-3**. The data quality metrics presented in **Table 6-3** are intended as a reference to data management best practice.

Table 6-3 Data Quality Metrics

Data Quality Metric	Description
Accuracy	The data record is correct in all details and is a true representation of the physical asset it represents.
Completeness	All physical assets are recorded, and pertinent attributes are available for the asset's intended purpose.
Validity	The data conforms to expected requirements and standards, including compliance with data storage rules.
Consistency	An asset has the same identifier across the organization. The data is consistent in its rules, definition, format & value.
Uniqueness	A single representation and unique identifier exist for each physical asset. All assets should be recorded only once, with no duplication of data.
Timeliness	The data reflects the current state of the asset, is easily accessed when required, and follows organizational standards for data update timescales.

The Federation of Canadian Municipalities (FCM) note that communities who pursue training to enhance their asset data management approach focus on the following three topics[9]:

- **Understand the factors influencing data quality:** Recognizing the link between data collection, data quality and the influence it has on the success of municipal asset management initiatives.
- **Improving data interpretation skills:** Enhancing municipal practitioners' know-how around data collection, interpretation and analysis is a key factor in supporting municipal decision-making.
- **Connecting data to municipal processes:** Better understanding the relationship between data and municipal processes, forecast modelling, long term capital needs planning, and examining adequacy of budgets.

6.2.6 Monitor & Review

The AMP is a living document which should be formally reviewed each year and updated formally on a four-year cycle. The process of monitoring and reviewing the AMP on a cyclical basis provides the Town with an opportunity to identify and fill data gaps in the asset inventory, refine performance measures and adjust targets if needed, and ensure asset management roles and responsibilities are clearly defined.

In addition to an annual review, the AMP's implementation success can be tracked by establishing internal indictors and targets to benchmark performance year-over-year. Examples of potential performance indicators are included in **Table 6-4**.

[9] Federation of Canadian Municipalities, Asset Management Insights: Data and Information, 2022.

Table 6-4 AMP Performance Monitoring Indicators

AMP Section	Performance Monitoring Indicators
State of Infrastructure	– % of core infrastructure assets in "good" or "very good" condition (by asset type). – % of core infrastructure assets with <10% remaining useful life.
Levels of Service	– % of LoS performance measures of which current performance is recorded. – % of LoS performance measures for which current performance meets/exceeds target performance.
Risk Management	– # of identified risks to Town assets. – # of identified "high" or "very high" risk assets.
Lifecycle Strategies & Financial Plan	– The Town's core infrastructure reinvestment rate (%) by asset type. – The Town's core infrastructure expansion rate (%) by asset type. – The Town's core infrastructure forecasted annual expenditure ($) by asset type. – The Town's core infrastructure forecasted annual revenue ($) by asset type. – The Town's core infrastructure asset backlog ($) by asset type.
Continuous Improvement	– % of high priority improvement initiatives implemented.

Appendix A – Core Asset Inventory

The Town's core asset inventory is presented as a separate MS Excel file.

Appendix B – Level of Service Proposed Measures

The proposed LoS performance measures in **Table B.1** to **Table B.4** has been gleaned from the Canadian Infrastructure Benchmarking Initiative (CIBI) for water, wastewater, stormwater, and transportation service areas (see www.nationalbenchmarking.com), as well as from previous projects with comparable municipal clients. It is not recommended that the Town implement every LoS performance measure in this library, rather the Town may use this library as a reference for future LoS reporting. A priority column has been included to help guide the Town with the implementation of future LoS performance measures; however, ultimately it is up to the Town to decide which metrics are meaningful to the community and which metrics can be supported by sufficient data.

Table B-1 Proposed Level of Service Measures for the Water Asset Category

Asset Category	Customer Value	Level of Service Objective	Level of Service Performance Measure	Unit	Median Benchmarking Value (2020)	Priority		
						High	Medium	Low
Water	Access & Capacity	To provide customers with access to the available service; and ensure there is adequate capacity of the service to meet the needs of users.	# of customer days without service / total # of service connections	# / total service connections	0	•		
			Minimum water pressure is met for fire flow event	psi	n/a	•		
			Minimum water pressure is met for normal operations	psi	n/a	•		
			Total hydrant fire flow in commercial areas during peak day demands	l/s	n/a	•		
			Total hydrant fire flow in industrial and institutional areas during peak day demands	l/s	n/a	•		
			Total hydrant fire flow in residential areas during peak day demands	l/s	n/a	•		
	Affordability	To provide service in a cost-effective and fiscally responsible manner.	(O&M cost + capital reinvestment ('000)) / km length	('000 $) / km	$20.88	•		
			Average Unit Cost of Meters Replaced	$ / meter	$259.60		•	
			Capital reinvestment / replacement value	%	0.81	•		
			Cost of Customer Billing / Number of Service Connections	$ / capita	$12.46		•	
			Cost of Fire Hydrant O&M / # of Fire Hydrants	$ / hydrant	$101.45	•		
			Cost of Main Break Repairs as % of Total O&M Cost	%	12.06	•		
			Cost to Provide Water / capita	$ / capita	$212.93	•		
			FTEs / 100km Length	FTEs / 100km	4.86	•		
			Indirect Costs / capita	$ / capita	$12.45		•	
			Metering O&M Cost / # of Meters	('000 $) / meter	$12.56		•	
			O&M Cost ('000) / km Length	('000 $) / km	$8.81	•		
			Pipe and Pump O&M Cost ('000) / km length	('000 $) / km	$7.91	•		
			Pipe O&M Cost ('000) / km length	('000 $) / km	$6.49			
			Pump station energy consumed / total pump hp	('000 kWh) / PS HP	1423.09		•	
			Pump station O&M cost / total pump station horsepower	$ / HP	$315.80	•		
			Water Charge for a Typical Size Residential Connection Using Canadian Average Consumption Rate (210m^3/year)	$	$470.00		•	
			Cost of Performing Locates / km length	$ / km	$277.96		•	
			Water Charge for an Average Residence Using Local Consumption Rate	$	$467.00		•	
	Customer Service & Responsiveness	Respond to challenges through proactive operations, and maintenance practices.	# of Water Pressure Complaints by Customers / 1,000 People Served	# / 1000 people	0.5		•	
			# of Water Quality Customer Complaints / 1,000 People Served	# / 1000 people	0.5		•	
			Average response time to repair main break	hrs	n/a		•	
	Environment & Sustainability	To operate in an environmentally responsible manner.	# of Days of Water Restrictions	Days	120 days		•	
			% Metered	%	99.8		•	
			% of permits that are compliant with the Ministry of Environment	%	n/a	•		

Asset Category	Customer Value	Level of Service Objective	Level of Service Performance Measure	Unit	Median Benchmarking Value (2020)	Priority		
						High	Medium	Low
			#of spills reported	#	n/a		•	
			Average Residential Daily Consumption per Capita (L/Cap/Day)	L / Cap / day	175.76		•	
	Health & Safety	To protect public health and safety.	# of Days with Total Coliform	days	0.5	•		
			% of tests in compliance with drinking water quality requirements	%	n/a	•		
			Average value for THMs	mg / L	0.03	•		
			Average Value for Turbidity	NTU	0.18	•		
			Cumulative Length Cleaned as % of System Length	%	13.74	•		
			Minimum chlorine residual maintained within distribution system	ppm	n/a		•	
			Reactive System Length Tested for Leakage / km Length	%	n/a		•	
			Preventative System Length Tested for Leakage / km Length	%	n/a		•	
			# of Sick Days Taken per O&M Employee	# / employee	10.1			•
			Cost of Overtime Hours per O&M FTE	$ / FTE	8112.81		•	
			Lost Hours due to Accidents per 1,000 O&M Labour Hours	lost hrs / 1000 labour hrs	0.89		•	
			# of O&M Accidents with Lost Time / 1,000 O&M Labour Hours	# / 1000 labour hrs	0.02		•	
			Total Available O&M Hours / Total Paid O&M Hours	%	79.12		•	
			Total Overtime Hours / Total Paid O&M Hours	%	5.68		•	
			Unavailable O&M Hours / Total Paid O&M Hours	%	23.38		•	
	Quality & Reliability	To provide a safe, reliable, and well-maintained service.	Average condition rating of watermains*	Rating	n/a	•		
			Average condition rating of water booster stations**	Rating	n/a	•		
			# of facilities that have standby generators	#	n/a		•	
			# of hospital customer hours without service annually	hrs	n/a	•		
			# of individual customer hours without service annually	hrs	n/a		•	
			# of main breaks / 100 km length	# / 100 km	7.03	•		
			# of unplanned valve and fitting repairs	#	n/a	•		
			# of unplanned service interruptions / 100 km length	# / 100 km	9.34	•		
			# Service Connection Repairs & Replacements / # of Service Connections	%	0.23	•		
			% inoperable or leaking hydrants	%	0.5	•		
			% inoperable or leaking valves	%	0.31	•		
			% of Hydrants Inspected	%	96.03	•		
			% of hydrants that are operational at any one time (uptime)	%	n/a		•	
			% of Hydrants Winterized	%	68.58	•		
			% of Main Length Replaced or Relined	%	0.42		•	
			% of pump station redundancy	%	n/a		•	
			% of valves that are operational at any one time (uptime)	%	n/a		•	
			Infrastructure Leakage Index	ILI	1.44			•

Asset Category	Customer Value	Level of Service Objective	Level of Service Performance Measure	Unit	Median Benchmarking Value (2020)	Priority		
						High	Medium	Low
			Metallic Main Breaks / 100 km of Metallic Mains	# / 100 km	11.77			•
			Non-Metallic Main Breaks / 100 km of Non-Metallic Mains	# / 100 km	1.5			•
			Non-Revenue Water in L/Connection/Day	L / Cap / Day	69.04			•
			Preventative and Corrective Maintenance Hours / km length	hrs / km Length	41.91		•	
			Total Corrective Maintenance Hours / Total Maintenance Hours	%	55.26		•	
					Total	31	32	5

** The Town is currently developing a condition assessment and maintenance program for its linear water infrastructure.*
*** The Town is currently developing a condition assessment and maintenance program for its Water Booster Stations.*

Table B-2 Proposed Level of Service Measures for the Wastewater Asset Category

Asset Category	Customer Value	Level of Service Objective	Level of Service Performance Measure	Unit	Median Benchmarking Value (2020)	Priority		
						High	Medium	Low
Wastewater	Access & Capacity	To provide customers with feasible availability to the service or adequate capacity of the service.	# of Reported Overflows due to Capacity / 100 km Length	# / 100km	0	•		
			# of Blocked Service Connections / 1,000 Service Connections	# / 1000 SC	n/a	•		
			# of Connections with Sanitary Flooding / 1,000 Service Connections	# / 1000 SC	0.11	•		
	Affordability	To provide service in a cost-effective and fiscally responsible manner.	Total Cost to Provide Wastewater Services / Population Served	$ / capita	209.56	•		
			Total O&M Cost / km Length	$ / km	$6.41	•		
			Cost of Cleaning Hydraulically / km Length Cleaned	$ / km	$2150	•		
	Health & Safety	To protect public health and safety.	# of staff hygiene training hours	Hrs	n/a		•	
			Compliance to WS Ontario regulations are met	%	n/a		•	
			# of O&M Accidents with Lost Time / 1,000 O&M Labour Hours	# / 1000 labour hrs	0.03	•		
			# of Lost Hours Due to Accidents / 1,000 O&M Labour Hours	# / 1000 labour hrs	1.1	•		
			# of Sick Days Taken per O&M Employee	# / employee	11.2			•
			Unavailable Hours / Total Paid O&M Hours	%	23.75			•
			Overtime Hours as % of Total Paid O&M Hours	%	5.93			•
			# of Wastewater Related Customer Complaints / 1,000 People Served	# / 1,000 people	1.7	•		
	Quality & Reliability	To provide a safe, reliable, and well-maintained service.	Average condition rating of wastewater mains*	Rating	n/a	•		
			Average condition rating of wastewater pumping stations**	Rating	n/a	•		
			% of forecemains inspected every five years	%	n/a	•		
			% of forecemain valves exercised every two years	%	n/a	•		
			% of sanitary facilities inspected every year	%	n/a	•		
			% of pump station with emergency backup	%	n/a	•		
			# Blocked Sewers / 100 km Length Due to Different Causes	# / 100km	1.67	•		

Asset Category	Customer Value	Level of Service Objective	Level of Service Performance Measure	Unit	Median Benchmarking Value (2020)	Priority		
						High	Medium	Low
			Total Length of Sewer Cleaned / Total Sewer Length	%	15.75	•		
			% of Sewer Length Replaced and Relined	%	0.53	•		
			# of Pump Station Failures / # Pump Station	# / PS	0	•		
			Forecemain sewer repairs	# / 100km	0	•		
			Gravity sewer repairs	# / 100km	1.21	•		
			% of Manholes Inspected	%	5.83	•		
			% Manholes Repaired and Replaced for I&I	%	0.02		•	
			# of Scheduled & Emergency Service Connection Repairs / 1,000 Service Connections	# / 1000 SC	1.31		•	
			% Reactive Maintenance Hours (unscheduled maintenance hours / total maintenance hours)	%	52.79		•	
			% total length of sewers cleaned	%	15.75		•	
			Service connection blockages resulting in back-ups	# / 1,000 SC	1.70	•		
			# of Reported Overflows by Cause / 100 km Length	# / 100km	0.12	•		
					Total	24	6	3

** The Town is currently developing a condition assessment and maintenance program for its wastewater mains.*
*** The Town is currently developing a condition assessment and maintenance program for its wastewater pumping stations.*

Table B-3 Proposed Level of Service Measures for the Stormwater Asset Category

Asset Category	Customer Value	Level of Service Objective	Level of Service Performance Measure	Unit	Median Benchmarking Value (2020)	Priority		
						High	Medium	Low
Stormwater	Access & Capacity	To provide customers with feasible availability to the service or adequate capacity of the service.	% of Sewer Length Cleaned	%	1.54	•		
			# of Sewer Blockage Removals / 100 km of Sewer	# / 100 km	0.13	•		
			% of Sewer Length CCTV Inspected	%	2.22		•	
			% of Manholes Visually Inspected	%	3.45	•		
			% Culverts Inspected < 3 m in dia.	%	3.73	•		
			% Culverts Inspected > = 3 m in dia.	%	0	•		
			% Culverts Inspected	%	7.08	•		
	Affordability	To provide service in a cost-effective and fiscally responsible manner.	Total Linear O&M Cost ('000)/ km of Sewer and Ditches	('000)$ / km	2	•		
			Total Stormwater O&M Cost ('000) / km of Sewer and Ditches	('000)$ / km	3.59	•		
			Facilities O&M Cost ('000) per Pond	('000)$ / pond	3.34		•	
			Unit Cost of Storm Sewer Cleaning per km	$ / km	3867		•	
			Unit Cost of Catch Basin Inspections	$ / basin	22.31		•	
			Unit Cost of Catch Basin Cleaning	$ / basin	33.92		•	

Asset Category	Customer Value	Level of Service Objective	Level of Service Performance Measure	Unit	Median Benchmarking Value (2020)	Priority		
						High	Medium	Low
	Customer Service & Responsiveness	Respond to challenges through proactive operations, and maintenance practices.	# of Stormwater Related Customer Complaints / 1,000 People Served	# / 1000 people	1.88	•		
			Serviced Properties Experiencing Flooding	serviced properties	1	•		
	Quality & Reliability	To provide a safe, reliable, and well-maintained service.	Average condition rating of storm mains	Rating	n/a	•		
			Average condition rating of retention ponds	Rating	n/a	•		
			% of stormwater assets that are within the City's GIS system	%	n/a	•		
					Total	12	5	0

Table B-4 Proposed Level of Service Measures for the Road Infrastructure Asset Category

Asset Category	Customer Value	Level of Service Objective	Level of Service Performance Measure	Unit	Median Benchmarking Value (2020)	Priority		
						High	Medium	Low
Road Infrastructure	Access & Capacity	To provide customers with feasible access and availability to the service.	Number of parking spaces, passenger pick up, and drop off zones within TTC station and York region terminal downtown VMC Mobility Zone	%	n/a			•
			Total lane-km of road added per year	Lane-km	n/a		•	
			Total lane-km of road per square kilometre of land (excluding forests)	Lane-km / km^2	n/a			•
	Affordability	To provide service in a cost-effective and fiscally responsible manner.	Capital reinvestment per lane-km	$ / Lane-km	$4295	•		
			Bridge reinvestment rate ($ spent on renewing existing infrastructure / Total Replacement Value)	%	n/a	•		
			Culvert reinvestment rate ($ spent on renewing existing infrastructure / Total Replacement Value)	%	n/a	•		
			Road expansion rate ($ spent on new infrastructure / Total Replacement Value)	%	n/a	•		
			Bridge expansion rate ($ spent on new infrastructure / Total Replacement Value)	%	n/a	•		
			Culvert expansion rate ($ spent on new infrastructure / Total Replacement Value)	%	n/a	•		
			Non winter related O&M expenditures per lane-km	$ / Lane-km	$2572		•	
			Winter related O&M expenditures per lane-km	$ / Lane-km	$3132		•	
			Bridge operating rate ($ spent on O&M / Total Replacement Value)	%	n/a	•		
			Culvert operating rate($ spent on O&M / Total Replacement Value)	%	n/a	•		
			$ spent on roads per lane-km	$ / Lane-km	n/a		•	
			$ spent on bridges per bridge	$/bridge	n/a		•	
			$ spent on culverts per capita	$	n/a		•	
	Customer Service & Responsiveness	Respond to challenges through proactive operations, and maintenance practices.	Max time to clear snow from main roads	Hours	n/a	•		
			Max time to clear snow from local roads	Hours	n/a	•		
			# of requests for O&M (potholes)	# / Lane-km	0.44	•		
			# of requests for O&M (snow clearing)	# / Lane-km	0.13	•		
	Health & Safety	To protect public health and safety.	Annual Accident Rate	# / Lane-km	3.08		•	
			Annual Driver Fatality Rate	# / Lane-km	0		•	
			Annual Drive Injury Rate	# / Lane-km	0.97		•	

Asset Category	Customer Value	Level of Service Objective	Level of Service Performance Measure	Unit	Median Benchmarking Value (2020)	Priority		
						High	Medium	Low
			Annual Property Damage Only Rate	# / Lane-km	1.72		•	
			Annual Pedestrian / Cyclist Only Collision Rate	# / Lane-km	0.05		•	
			% of major road network with lighting assets	%	n/a			•
			% of collectors with lighting assets	%	n/a			•
			% of locals with lighting assets	%	n/a			•
			# of claims received per year	# / Lane-km	0.05		•	
	Quality & Reliability	To provide a safe, reliable, and well-maintained service.	Average condition rating of sidewalks	Rating	n/a			
			Average condition rating of streetlights	Rating	n/a			
			Total curb km swept per rotation per year	km	59.59		•	
	Environment & Sustainability	To operate in an environmentally responsible manner.	# of fleet vehicles which are electric and hybrid	#	n/a		•	
			Annual fuel volume used for all Town fleet & contracted equipment (gas and diesel)	Litres	n/a		•	
			% of streetlights that are energy efficient	%	n/a		•	
					Total	**12**	**16**	**5**

Appendix C – Level of Service Maps & Figures

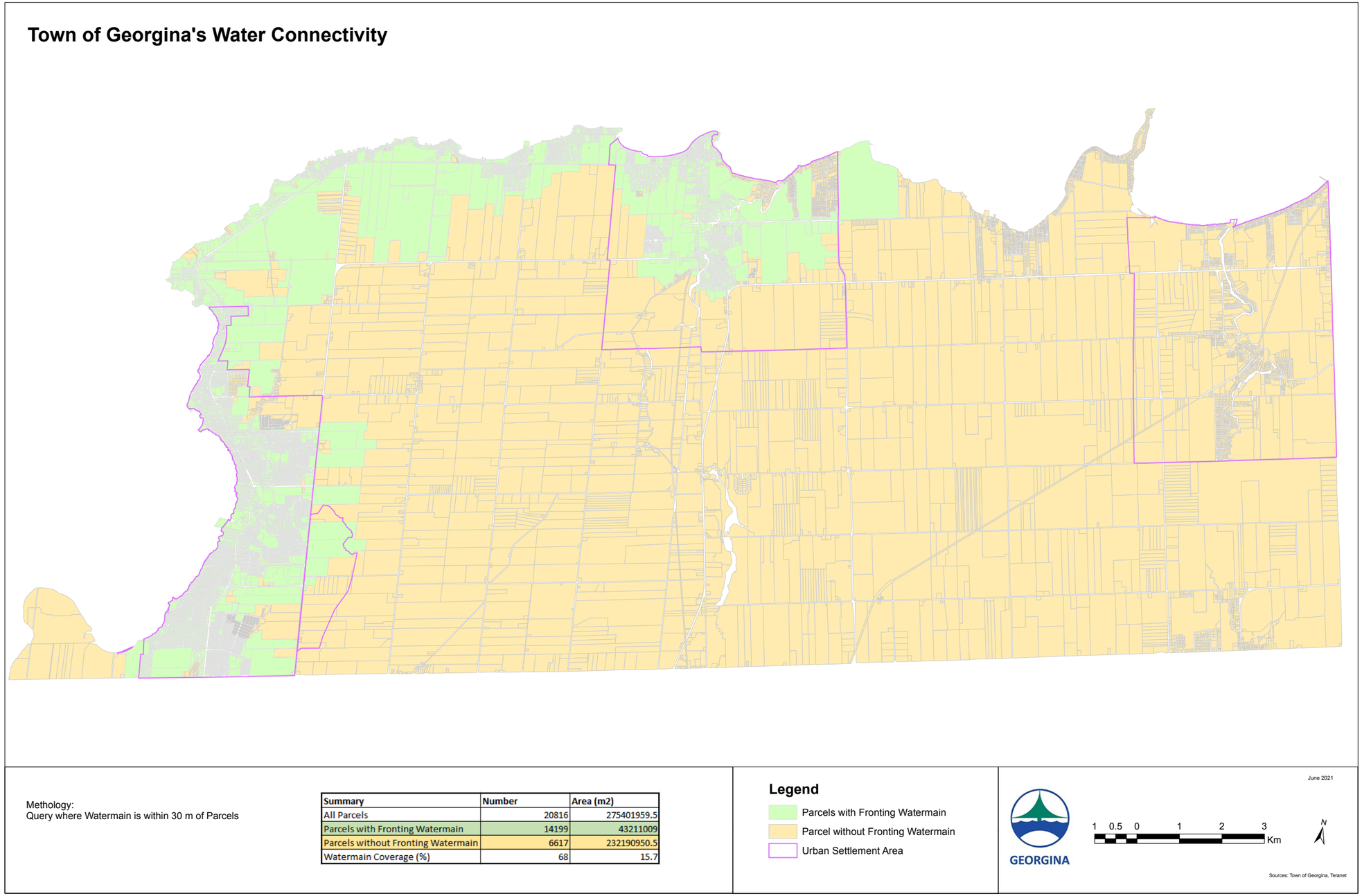
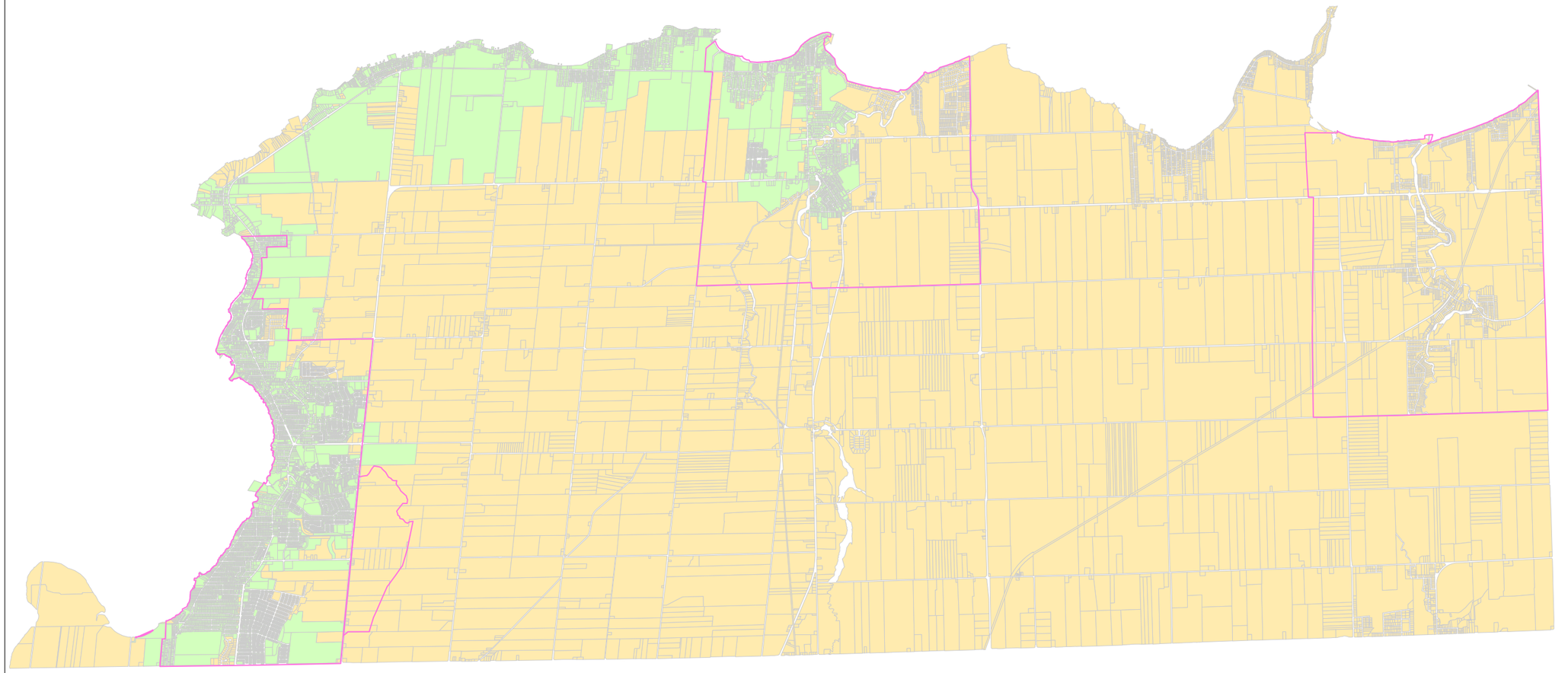


Figure C-1 Water Connectivity Map

Town of Georgina's Wastewater Connectivity



Methology:
Query where Wastewatermain is within 30 m of Parcels

Summary	Number	Area (m2)
All Parcels	20816	275401959.5
Parcels with Fronting Wastewatermain	13799	33340341.2
Parcels without Fronting Wastewatermain	7017	242061618.3
Wastewatermain Coverage (%)	66	12.1

Legend

- Parcel with Fronting Wastewatermain
- Parcel without Fronting Wastewatermain
- Urban Settlement Area

June 2021

GEORGINA

1 0.5 0 1 2 3 Km

N

Sources: Town of Georgina, Teranet

Figure C-2 Wastewater Connectivity Map

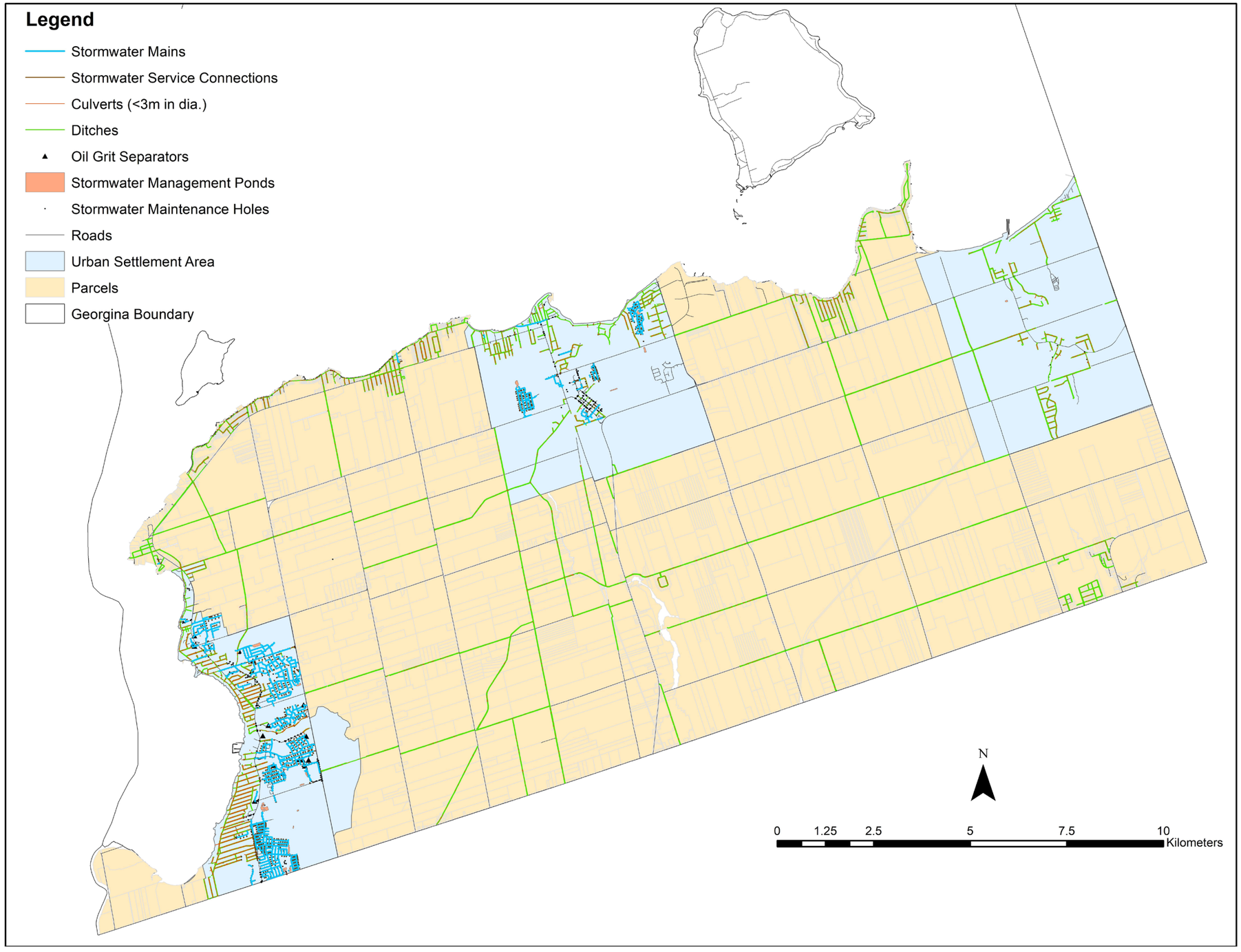


Figure C-3 Stormwater Connectivity Map

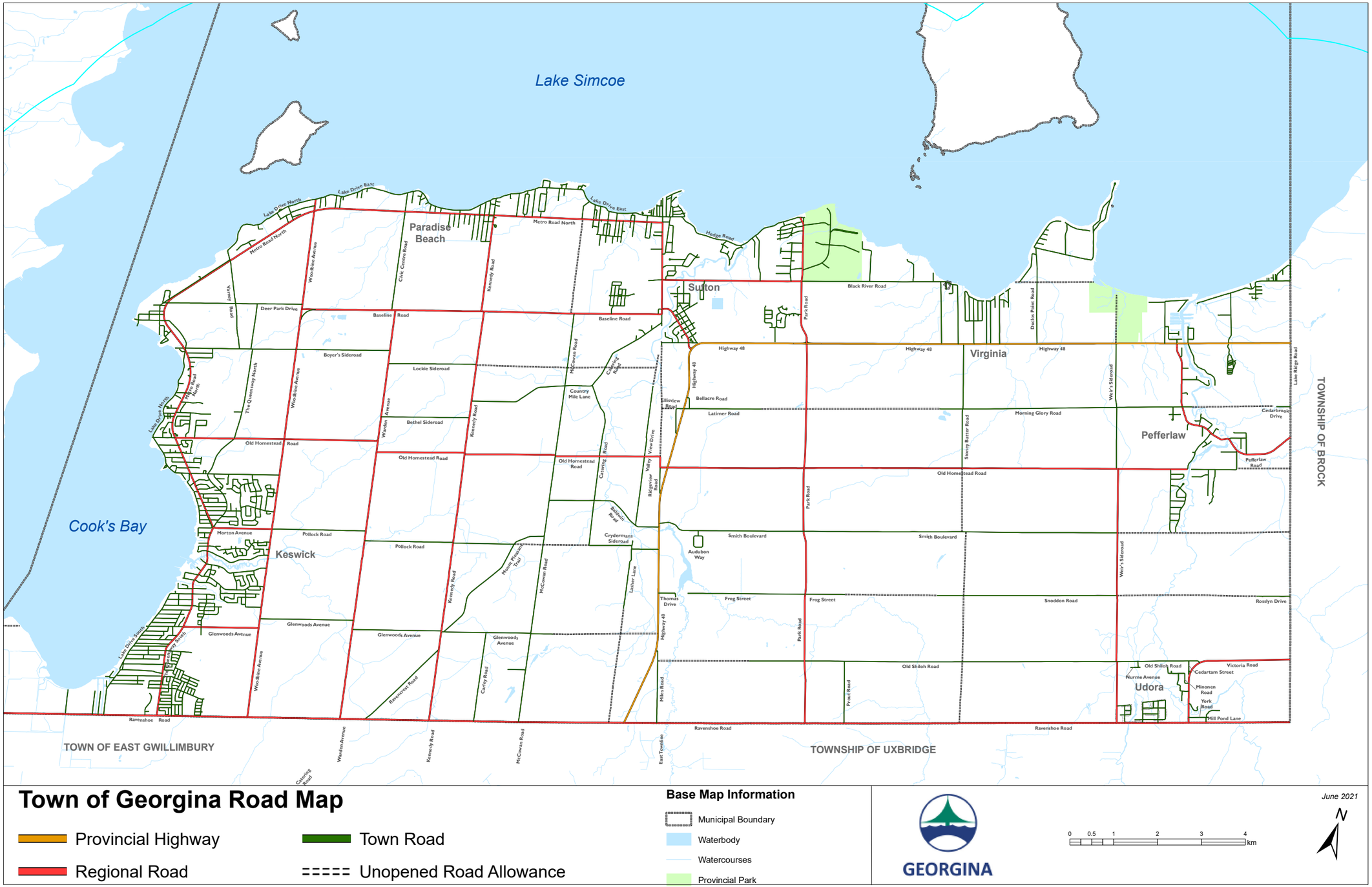


Figure C-4 Roads Connectivity Map

High Severity Fatigue

Moderate Severity Fatigue

Low Severity Fatigue

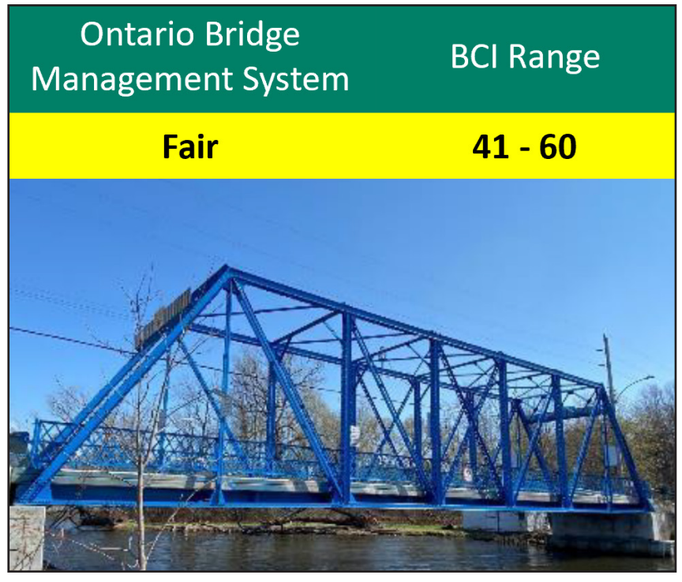
High Severity Longitudinal Cracking

Moderate Severity Longitudinal Cracking

Low Severity Longitudinal Cracking

Figure C-5 Examples of Images of Pavement Distress Type and their Severity Level for the Town's Pavement Condition Assessment

B1 – Baldwin Road



B6 – Hedge Road

B4 – Old Shiloh Road West

Figure C-6 Example of the Town's Bridge Structures in Good, Fair & Poor Condition

C203 – Pollock Road

C202 – Church Street

Figure C-7 Example of the Town's Culvert Structures in Good & Fair Condition

Appendix D – AM Policy

Background

The Town is responsible for providing a range of essential services to the community, including safe and reliable roads, water, wastewater and wastewater infrastructure. To deliver these services, the Town owns and manages a diverse municipal infrastructure asset portfolio including roads, bridges, culverts, water and wastewater mains, storm sewers, equipment, land, land improvements, recreation and cultural facilities, parks, and trails. As the social, economic, and environmental wellbeing of the community depends on the reliable performance of these municipal core and non-core infrastructure assets, it is critical to implement a systemic, sustainable approach to their management.

Asset management (AM) refers to the set of policies, practices and procedures that allow an organization to realize maximum value from its infrastructure assets. An asset management program allows organizations to make informed decisions regarding the planning, building, operating, maintenance, renewing, replacing, and disposing of infrastructure assets through a wide range of lifecycle activities. Furthermore, it is an organization-wide process that involves the coordination of activities across all the Town's Departments. As such, it is useful to adopt a structured and coordinated approach to outlining the activities, roles and responsibilities required of all stakeholders, as well as the key principles that should guide all asset management decision-making.

A comprehensive asset management program will support efficient and effective delivery of expected levels of service and ensure that due regard and process are applied to the near- and long-term management and stewardship of all municipal infrastructure assets.

Purpose

This asset management Policy is applicable across the Town including core and non-core municipal infrastructure. Although this AMP is solely focused on the Town's core infrastructure assets, the Town will be developing a non-core AMP in the next year which will also fall under the umbrella of this asset management Policy.

The purpose of the Town's Strategic Asset Management Policy (SAMP) is to provide leadership and commitment to the development and implementation of the Town's asset management program. The structure and content of the SAMP is meant to comply with the Ontario Regulation 588/17 (the "Regulation") and establish principles as intended under The Infrastructure for Jobs and Prosperity Act, 2015 (the "Act").

The application of this Policy is an important step towards incorporating the Town's strategic mission, vision, and goals through its asset management program, and ensuring that critical municipal infrastructure assets and services are maintained and provided to the community in a consistent, reliable, and sustainable manner.

Scope

This Policy applies to all physical assets owned and/or managed by the Town, for the provision of services, as documented within the Town's Tangible Capital Asset (TCA) Policy by the following high-level asset categories:

- Land and land improvements
- Buildings and building improvements
- Vehicles
- Machinery and equipment
- Infrastructure

Definitions

Act: The infrastructure for Jobs and Prosperity Act, 2015.

Asset: Item, thing or entity that has potential or actual value to an organization. Value can be tangible or intangible, financial, or non-financial, and includes consideration of risks and liabilities.

Asset Management: Coordinated activity of an organization to realize value from assets. Realization of value will normally involve an appropriate balancing of costs, performance and risks, opportunities, and performance benefits.

Asset Management Plan: Documented information that specifies the activities, resources, and timescales required for an individual asset, or a grouping of assets, to achieve the Town of Georgina's AM objectives (ISO 55000).

Strategic Asset Management Policy: The SAMP shall guide the overall direction of the Asset Management Plans (AMPs), providing clear direction as to the appropriate focus and level of AM practice expected. It shall establish the key principles, overall mission, and goals for the plan.

Asset Management Strategy: The high-level short-, medium- and long-term approach to AM, including AMPs and objectives for managing the assets.

Corporate Asset Management Framework:

Capitalization Threshold: The value of a municipal infrastructure asset at or above which a municipality will capitalize the value of it and below which it will expense the value of it.

Core Municipal Infrastructure Asset: Any municipal infrastructure asset that is a:

- Water asset that relates to the collection, production, treatment, storage, supply, or distribution of water.
- Wastewater asset that relates to the collection, transmission, treatment or disposal of water, including any wastewater asset that from time to time manages stormwater.
- Stormwater management asset that relates to the collection, transmission, treatment, retention, infiltration, control, or disposal of stormwater.
- Roads
- Bridge or culvert

Green Infrastructure Asset: An infrastructure asset consisting of natural or human-made elements that provide ecological and hydrological functions and processes and includes natural heritage features and systems, parklands, stormwater management systems, street trees, urban forests, natural channels, permeable surfaces, and green roofs.

Levels of Service: The condition and performance standard for a particular asset against which service performance may be measured.

Lifecycle: The time interval that commences with the identification of the need for an asset and terminates with the disposal/ or renewal of the asset.

Lifecycle Activities: Activities undertaken with respect to a municipal infrastructure asset over its service life, including constructing, maintaining, renewing, operating, and decommissioning, and all engineering and design work associated with those activities.

Lifecycle Cost: The total cost of an asset throughout its useful life, including capital costs, operating and maintenance costs, rehabilitation, renewal, and disposal costs.

Municipal Infrastructure Assets: An infrastructure asset, including a green infrastructure asset, directly owned by a municipality, or included in the consolidated financial statements of a municipality

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

Asset Management Objectives & Principles

Key Objectives

The objective of the AM planning process is to equip the Town with the knowledge and insights to:

- Make informed decisions identifying all revenues and costs (including operational, maintenance, replacement, and decommissioning costs) associated with asset decisions, including additions and deletions.
- Manage the Town's municipal infrastructure assets in accordance with formal, consistent and repeatable methods that reinforce the confidence of member stakeholders (Council, Senior Leadership, staff, and public) that the Town is managing its assets in an efficient, effective and responsible way.
- Integrate corporate, financial, operational, technical, and budgetary planning for all assets.

- Determine and refine the levels of service in consultation with the service area.
- Take a whole life cost approach when selecting the most appropriate asset interventions, where all costs associated with the asset are taken into consideration and not just the initial capital cost.
- Minimize total life cycle costs of assets.
- Create a corporate culture where all staff play a part in the overall care for the Town's municipal infrastructure assets by providing the necessary awareness, training, and professional development.
- Manage municipal infrastructure assets in a sustainable manner in order to meet the needs of the present without compromising the ability of future generations to meet their own needs.
- Identify and manage natural assets in a similar manner to engineered assets, as processes become available.
- Minimize risks to users and risks associated with failure
- Pursue best practices where available
- Report the performance of its AM program
- Continually improve its AM approach by actively monitoring the effectiveness of its AM program, and driving innovation in the development of tools, practices, and solutions.

Guiding Principles

The following principles will guide AM planning and decision-making related to infrastructure assets. The Town shall:

- Strive to implement a data driven, evidence based, and service needs analysis considering infrastructure and non-infrastructure solutions for proposed development and rehabilitation or replacement of assets. The analysis shall consider lifecycle costs and other associated factors. Existing assets shall be inventoried, valued, and assessed over the lifecycle of the asset.
- Review and continually improve the AM program formally on a five-year basis. The Town shall strive to review the program annually through process reviews, audits, and benchmarking for resource requirements, training, technology, and adoption of appropriate levels of best practice.
- Strive to identify funding gaps across the asset portfolio. Where a funding gap exists, the Town shall commit to a program to reduce the funding gap. Changes and updates to the SAMP can be made as part of the defined process or as new information becomes available.

The Town shall also consider the following principles outlined in Section 3 of the Act and Section 3 of the Regulation when making decisions related to infrastructure:

- Infrastructure planning and investment should take a long-term view, and decision makers should consider the needs of citizens by being mindful of, among other things, demographic and economic trends.
- Infrastructure planning and investment should take into account any applicable budgets or fiscal plans.
- Infrastructure priorities should be clearly identified in order to better inform investment decisions respecting infrastructure.
- Infrastructure planning and investment should ensure the continued provision of core public services, such as health care and education.
- Infrastructure planning and investment should promote economic competitiveness, productivity, job creation and training opportunities.
- Infrastructure planning and investment should ensure that the health and safety of workers involved in the construction and maintenance of infrastructure assets is protected.
- Infrastructure planning and investment should foster innovation by creating opportunities to make use of innovative technologies, services, and practices, particularly when doing so would utilize technology, techniques and practices developed in Ontario.
- Infrastructure planning and investment should be evidence based and transparent, and, subject to any restrictions or prohibitions under an Act or otherwise by law on the collection, use or disclosure of information.
- Investment decisions respecting infrastructure should be made based on information that is either publicly available or is made available to the public.
- Information with implications for infrastructure planning should be shared between the Municipality and broader public sector entities and should factor into investment decisions respecting infrastructure.
- Where provincial or municipal plans or strategies have been established in Ontario, under an Act or otherwise, but do

not bind or apply to the Municipality, as the case may be, the Municipality should nevertheless be mindful of those plans and strategies and make investment decisions respecting infrastructure that support them, to the extent that they are relevant.

- Infrastructure planning and investment should promote accessibility for persons with disabilities.
- Infrastructure planning and investment should minimize the impact of infrastructure on the environment and respect and help maintain ecological and biological diversity, and infrastructure should be designed to be resilient to the effects of climate change.
- Infrastructure planning and investment should endeavour to make use of acceptable recycled aggregates.
- Infrastructure planning and investment should promote community benefits, being the supplementary social and economic benefits arising from an infrastructure project that are intended to improve the well-being of a community affected by the project, such as local job creation and training opportunities, improvement of public space within the community, and any specific benefits identified by the community.

Corporate Asset Management Framework

Figure D-1 illustrates a comprehensive AM Framework which the Town will adopt to provide a coordinated and holistic approach to AM planning across the municipality.

Figure D-1 Corporate Asset Management Framework

Please refer **Section 4** for further information on the AM Strategy including operational and maintenance planning.

Policy Statement

The following policy directions shall be embedded into the Town's AM practices and will guide the development of the AMPs. The AMPs will be developed for all core municipal infrastructure assets owned and/or managed by the Town and will be developed in accordance with the Act and the Regulation.

Alignment with the Town's Strategic Direction

- **Index of Endorsed Plans, Policies and Goals:** The Town shall maintain a list of all current policies, goals and plans as endorsed by Council that are supported by the Town's AMP. For each such policy, goal or plan, a senior leader shall be appointed and listed to be responsible for maintaining and updating the specific document. It is intended that these items be supported by the Town's SAMP.
- **Alignment with Financial Plans:** The AMP shall be considered during the development or update of all Town financial plans.
- **Alignment with Municipal and Provincial Planning:** The SAMP shall align with the Town's Official Plan, and any relevant policy statements or frameworks issued under Section 3 (1) of the Planning Act and Provincial Plans.

Asset Management Planning

- **Capitalization Thresholds:** The Town's Tangible Capital Assets (TCA) Policy describes the capitalization thresholds that are used to determine if an item is a capital asset for each category for Town purposes. The Town's AMP shall follow the capitalization threshold policy table contained in the TCA Policy. Assets that require management by either operational or capital means will be included even if they fall below the capitalization threshold amount.
- **Annual Budget Validation:** The AMP will be a guiding document for the development of the annual budget. The capital projects from the AMP will be validated by other service areas across the Town and optimized with capital projects from all service areas to provide the best value to the community.
- **Internal and External Asset Management Planning Coordination:** The AMP and resultant goals, policies and plans will consider other assets that may be impacted by a specific project scope and timing. The Town shall employ the practices of cross asset integration which shall consider not only Town assets, but other assets that may have a direct or indirect impact on Town asset lifecycle and performance, such as other levels of government and private utilities. This is particularly true of linear assets within the road allowance (such as water, sewer, storm, gas, electrical and telecommunication infrastructure). The Town is committed to coordinating its AM planning and working with other public and private entities to ensure efficient and effective service delivery.
- **Climate Change and Green Infrastructure:** The Town commits to consider as part of its AM planning, the impacts and vulnerabilities that may be caused by climate change as required by the Regulation, in respect to operations, levels of service and asset lifecycle management. Adaptation opportunities and mitigation approaches should be identified, including green infrastructure strategies, to manage the vulnerabilities that may be caused by climate change, in addition to disaster planning and contingency funding.

Continuous Improvement and Reporting Requirements

The Town will publish the SAMP and a list of all current goals, policies or plans that are supported by the AMP on the Town's website. The Town will consider public feedback as it relates to the SAMP and AMP as part of the public budgetary development process and five-year reviews as required by the Regulation. Information provided shall include applicable legislation, inventory details of existing assets and AM practices. Additionally, a copy of the SAMP and the AMP shall be provided to any person requesting them.

Asset Management Roles & Responsibilities

Key Roles & Responsibilities

The implementation of the Town's AM guiding principles depends on an integrated and collaborative approach across the whole Town to ensure that the AM program is supported and continuously improving. The AM roles and responsibilities are summarized below:

- **Council:** Council shall be responsible for the management of all municipal assets. Council will review the SAMP annually as part of the budget process. Since the AMP is a guide for financial planning along with the annual budget, Council shall be informed of the capital AMP outputs annually. Council shall review the SAMP on a five-year basis.
- **Senior Leadership:** Senior Leadership shall be responsible for the maintenance and updating of any assigned goals, policies or plans that are supported by the AMP.
- **Asset Management & Technical Services Division:** The Division shall be responsible for developing AM work

programs, project timelines, and project budgets and allocate resources towards achieving the directions, goals and objectives outlined in the SAMP. The AM & Technical Services Division is also the executive sponsor of the AM program providing overall leadership to the program and reporting on the program to the Senior Leadership team and Council.

- **Operations and Infrastructure Field Staff:** O&I staff are considered Asset Owners to ensure sustainable delivery of services to the Town. The O&I staff are responsible for the operation and maintenance under the stewardship of its Council.

AM Governance Structure

The AM governance structure, as illustrated in **Figure D-2**, is a foundational element of any AM program. It provides guidance on the development, application, and update of AM tools, guidelines, and processes.

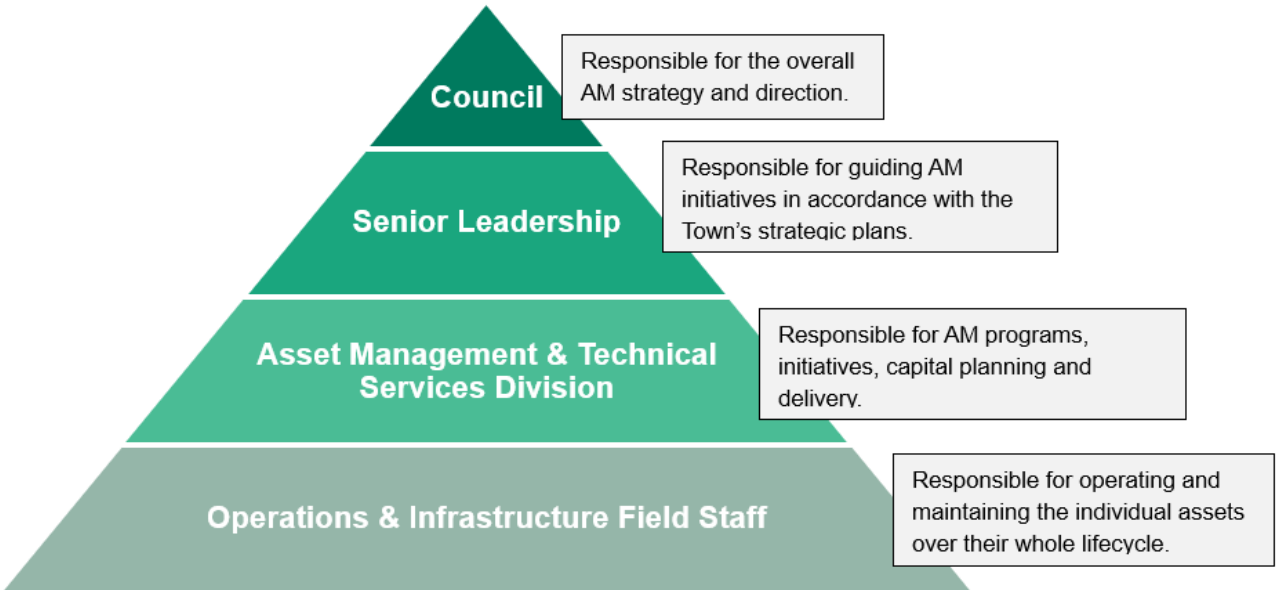


Figure D-2 Asset Management Governance Structure

Appendix E – Conceptual Risk Models

Water

Water Linear Risk Model

The Town's linear water infrastructure assets include watermains, service connections, valves, valve chambers, hydrants, and water meters. The factors that make-up the CoF and PoF indices for these linear assets are shown in **Figure E-1**.

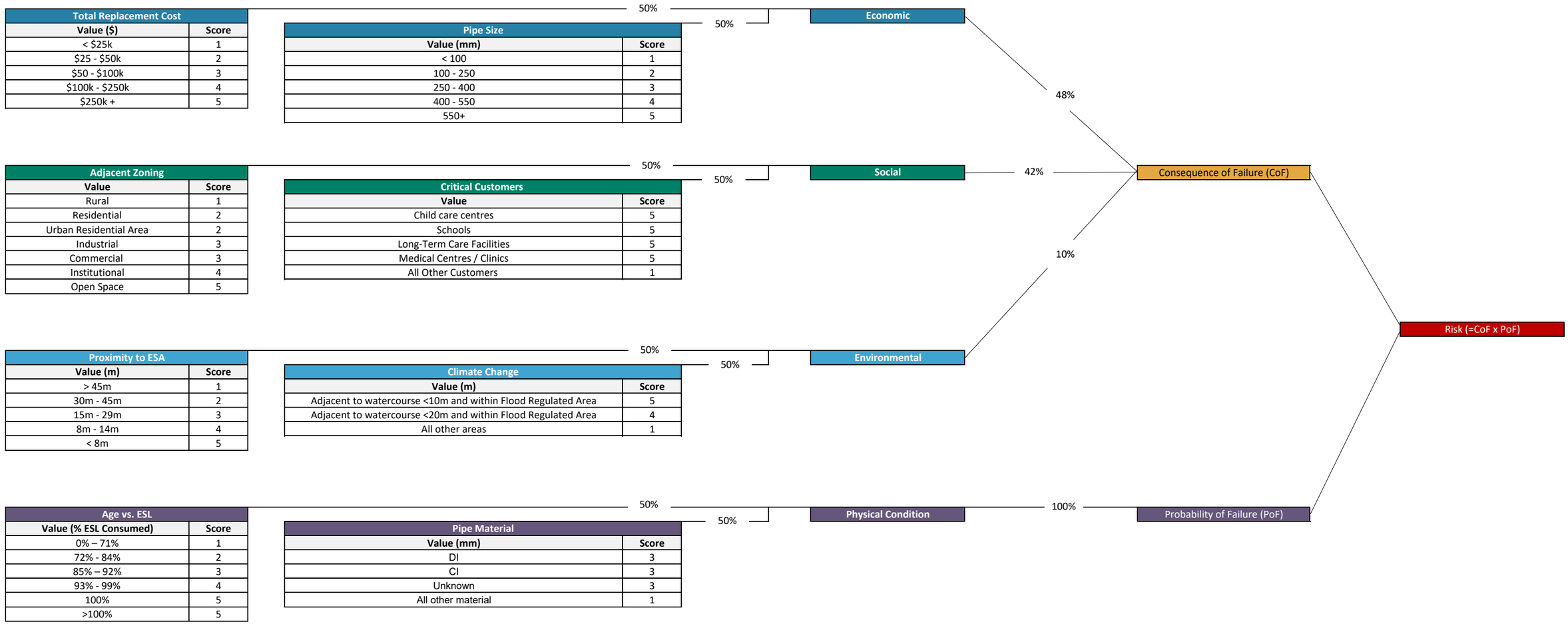
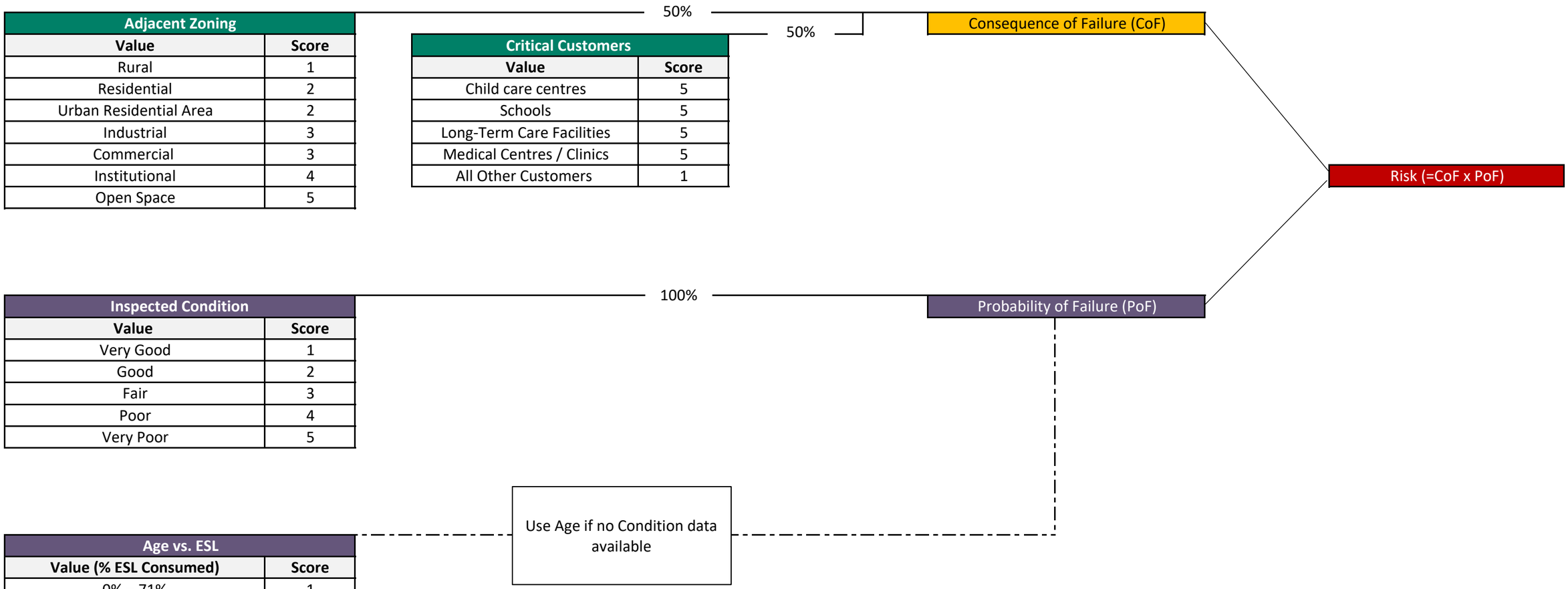


Figure E-1 Water Linear Risk Model

Water Facilities Risk Model

The Town's water facilities include two water booster stations. The factors that make-up the CoF and PoF indices for these facilities are shown in **Figure E-2**.



Risk Score Thresholds		
Lower	**Upper**	**Score**
0	4	Very Low
4	7	Low
7	11	Medium
11	16	High
16	25	Very High

Figure E-2 Water Booster Station Risk Model

Wastewater

Wastewater Linear Risk Model

The Town's linear wastewater infrastructure assets include forcemains, gravity mains, laterals, manholes, and valves. The factors that make-up the CoF and PoF indices for these linear assets are shown in **Figure E-3**.

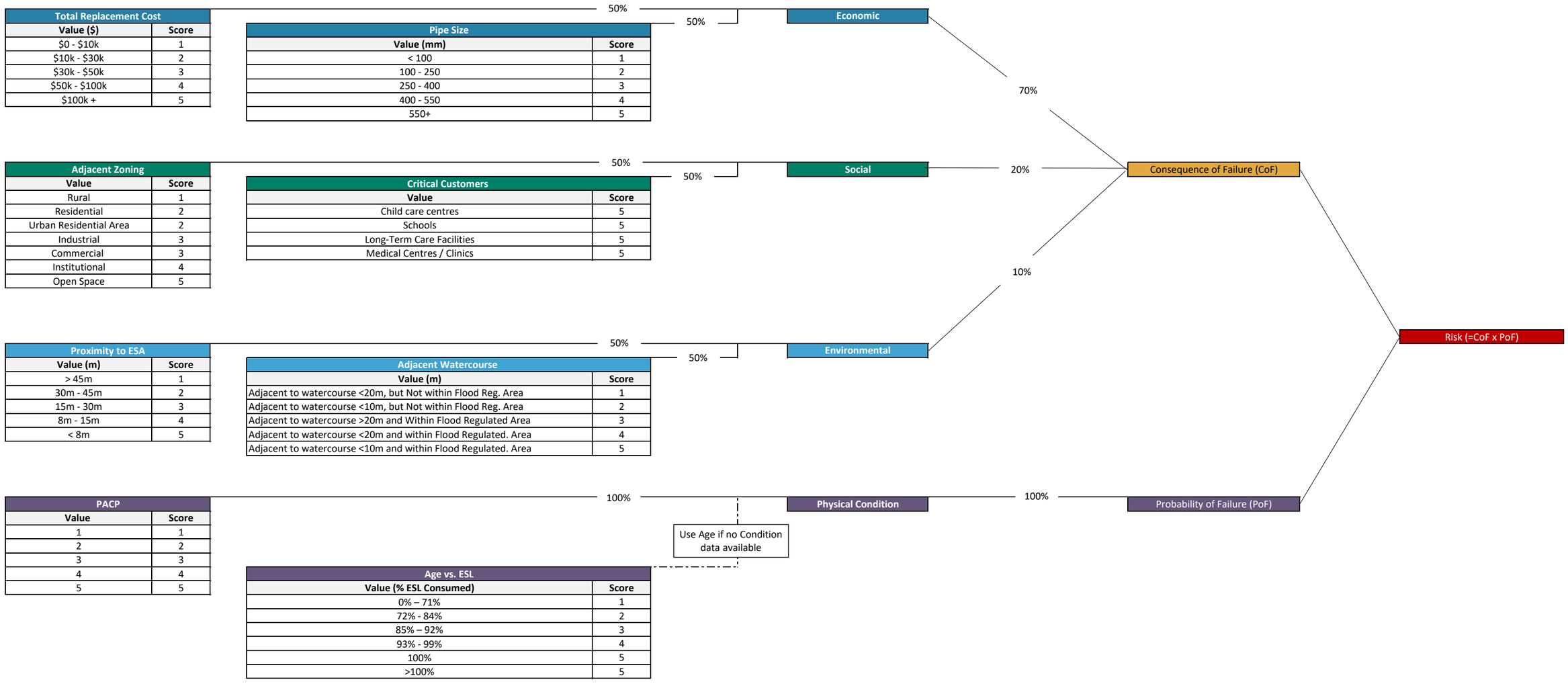


Figure E-3 Wastewater Linear Risk Model

Wastewater Facilities Risk Model

The Town's wastewater facilities include eighteen sewer pump stations. The factors that make-up the CoF and PoF indices for these facilities are shown in **Figure E-4**.

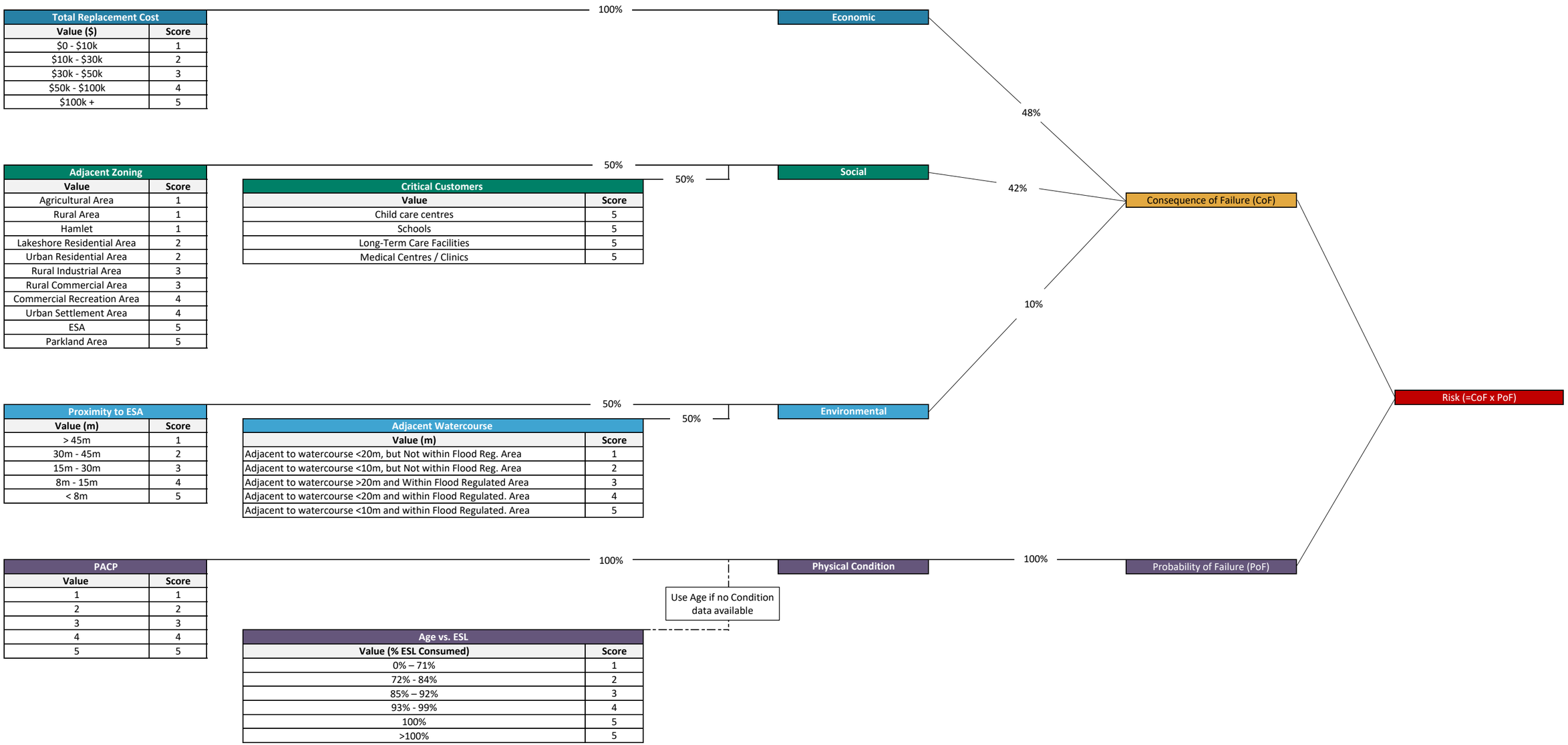


Figure E-4 Sewer Pump Station Risk Model

Stormwater

Stormwater Linear Risk Model

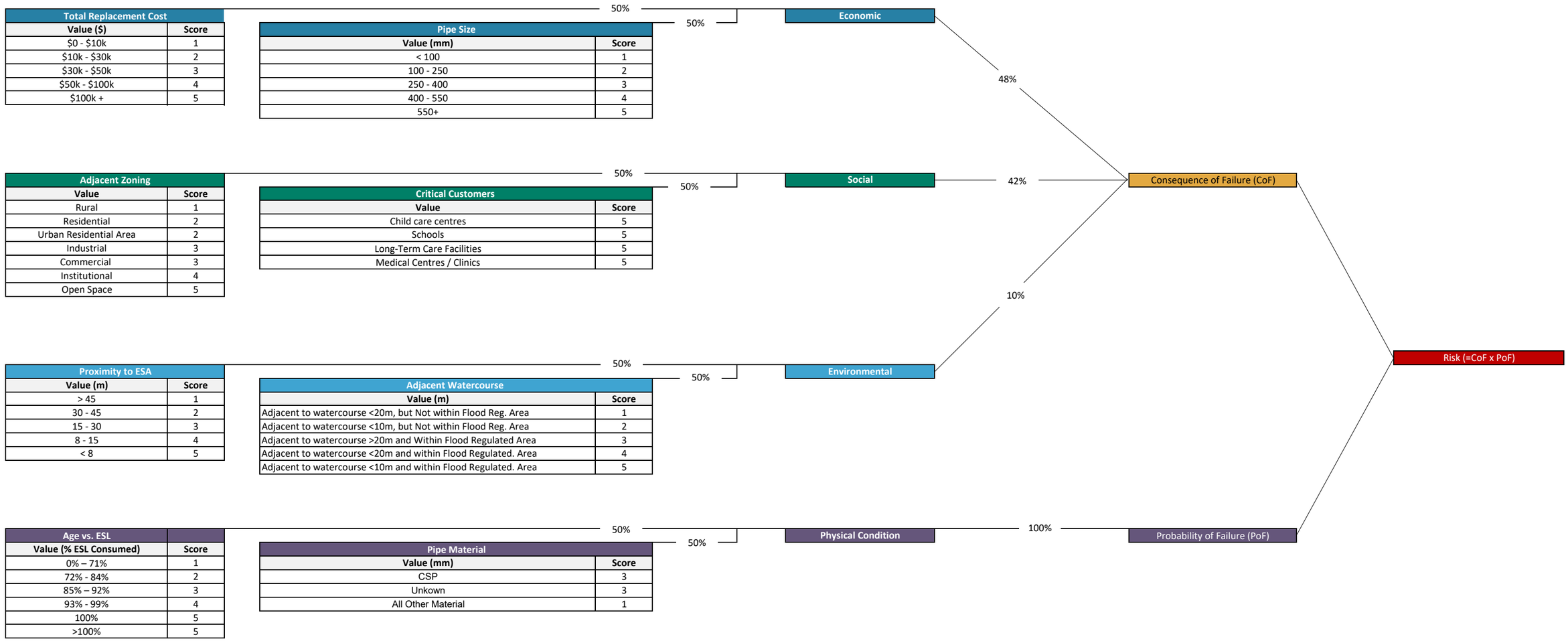


Figure E-5 Stormwater Linear Risk Model

Stormwater Non-Linear Risk Model

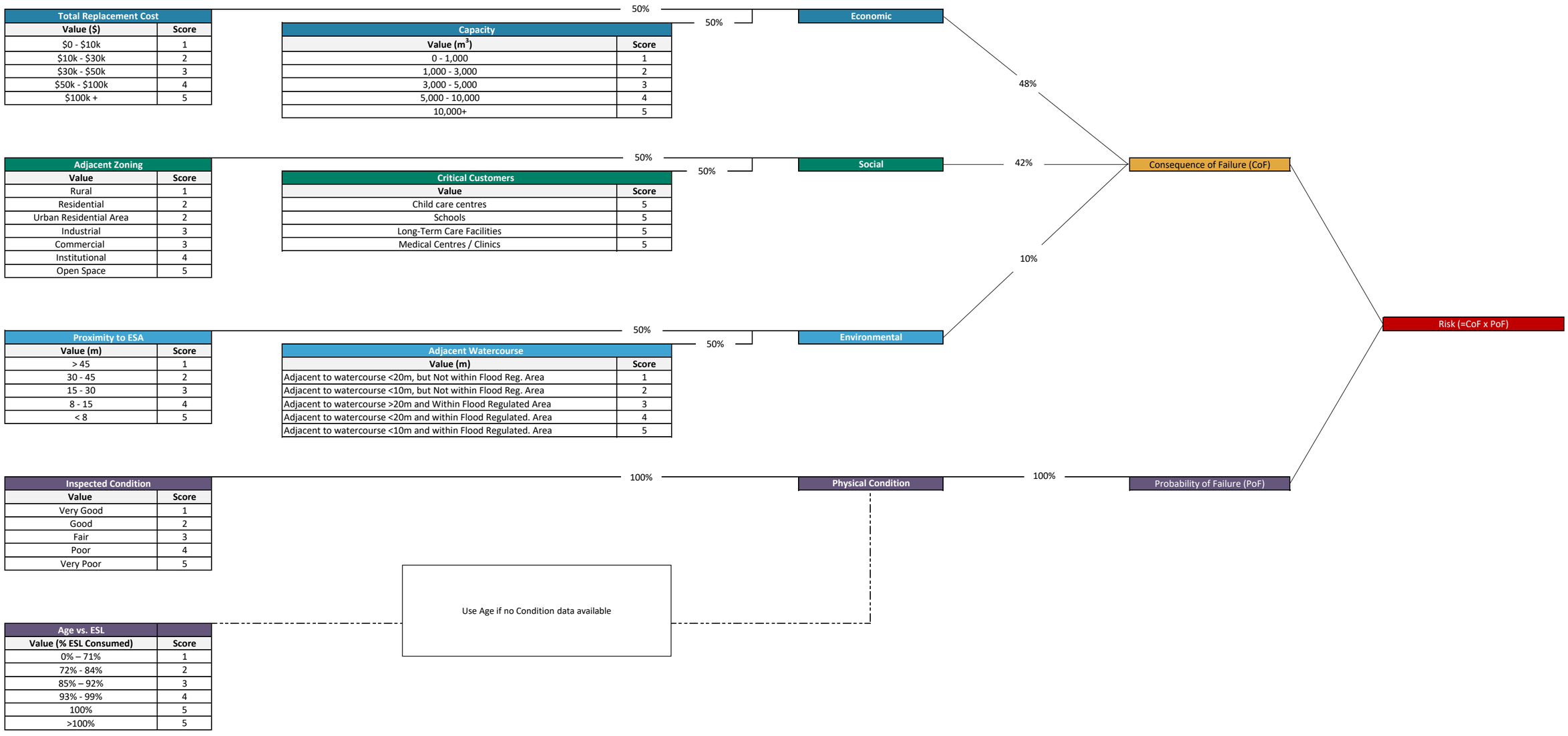


Figure E-6 Stormwater Non-Linear Risk Model

Roads Infrastructure

Roads Risk Model

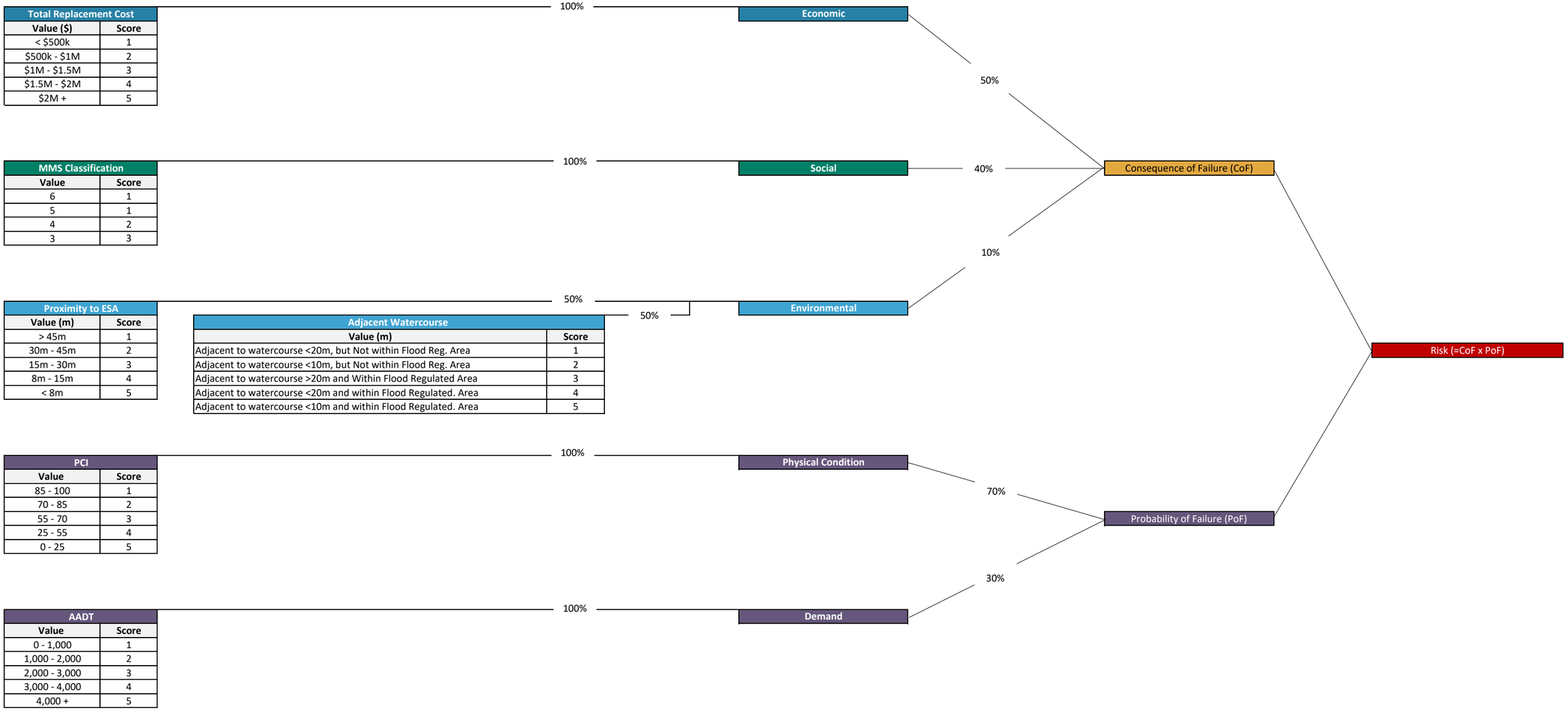


Figure E-7 Roads Risk Model

Bridges & Culverts (> 3 m) Risk Model

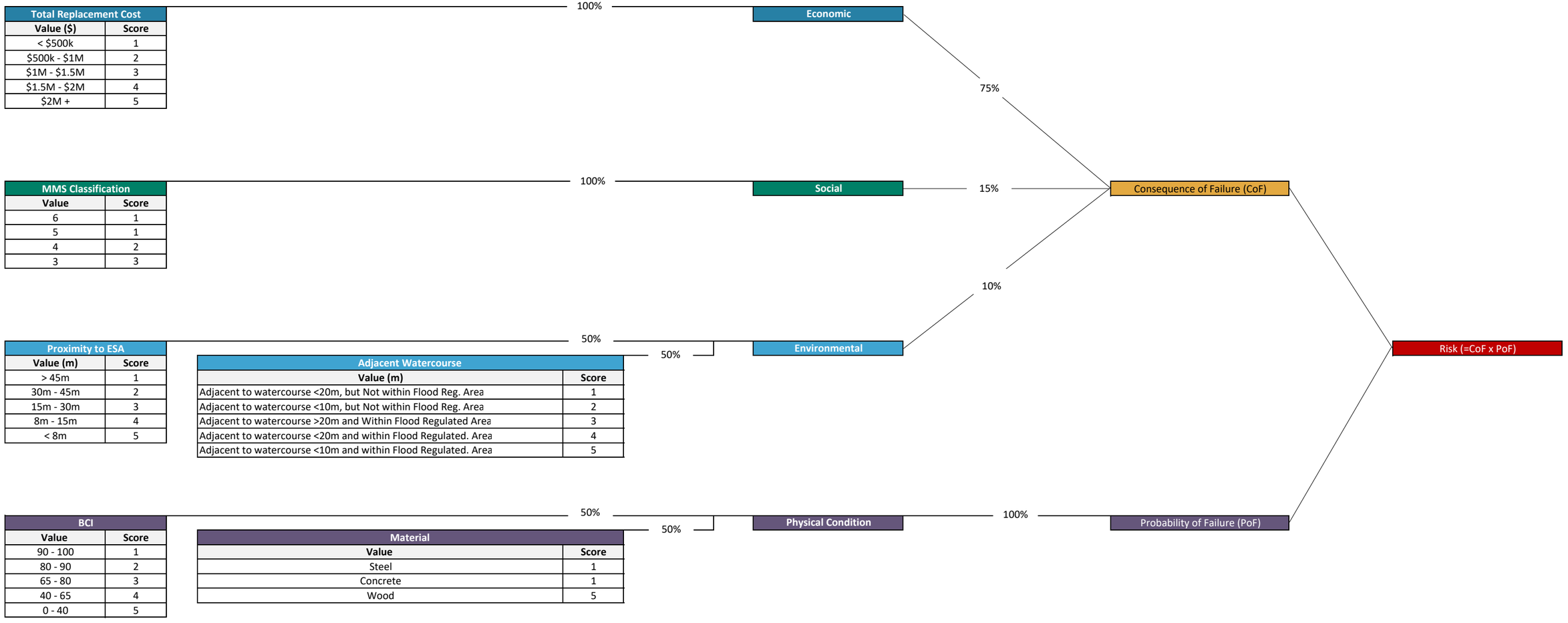
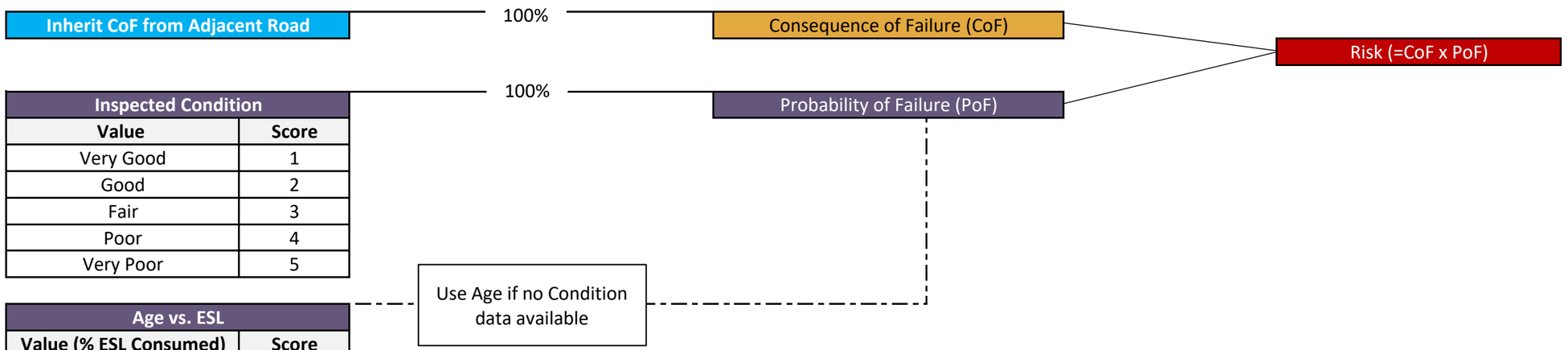


Figure E-8 Bridges & Culverts (< 3 m) Risk Model

Streetlights & Sidewalks Risk Model



Inspected Condition	
Value	**Score**
Very Good	1
Good	2
Fair	3
Poor	4
Very Poor	5

Age vs. ESL	
Value (% ESL Consumed)	**Score**
0% – 71%	1
72% - 84%	2
85% – 92%	3
93% - 99%	4
100%	5
>100%	5

Figure E-9 Streetlights & Sidewalks Risk Mode

Appendix F – Linear Risk Maps

Based on a score of one to five for CoF and PoF, the risk thresholds (i.e., very high to very low) are shown in **Figure F-1**.

Figure F-2 to **Figure F-5** provide a visual representation of the Town's critical linear assets (i.e., watermains, wastewater mains, stormwater mains, and roads) based on a detailed risk assessment as per the criteria described in **Section 4.1.3**.

Risk Score Thresholds		
Lower	**Upper**	**Score**
0	4	Very Low
4	7	Low
7	11	Medium
11	16	High
16	25	Very High

Figure F-1 Risk Thresholds

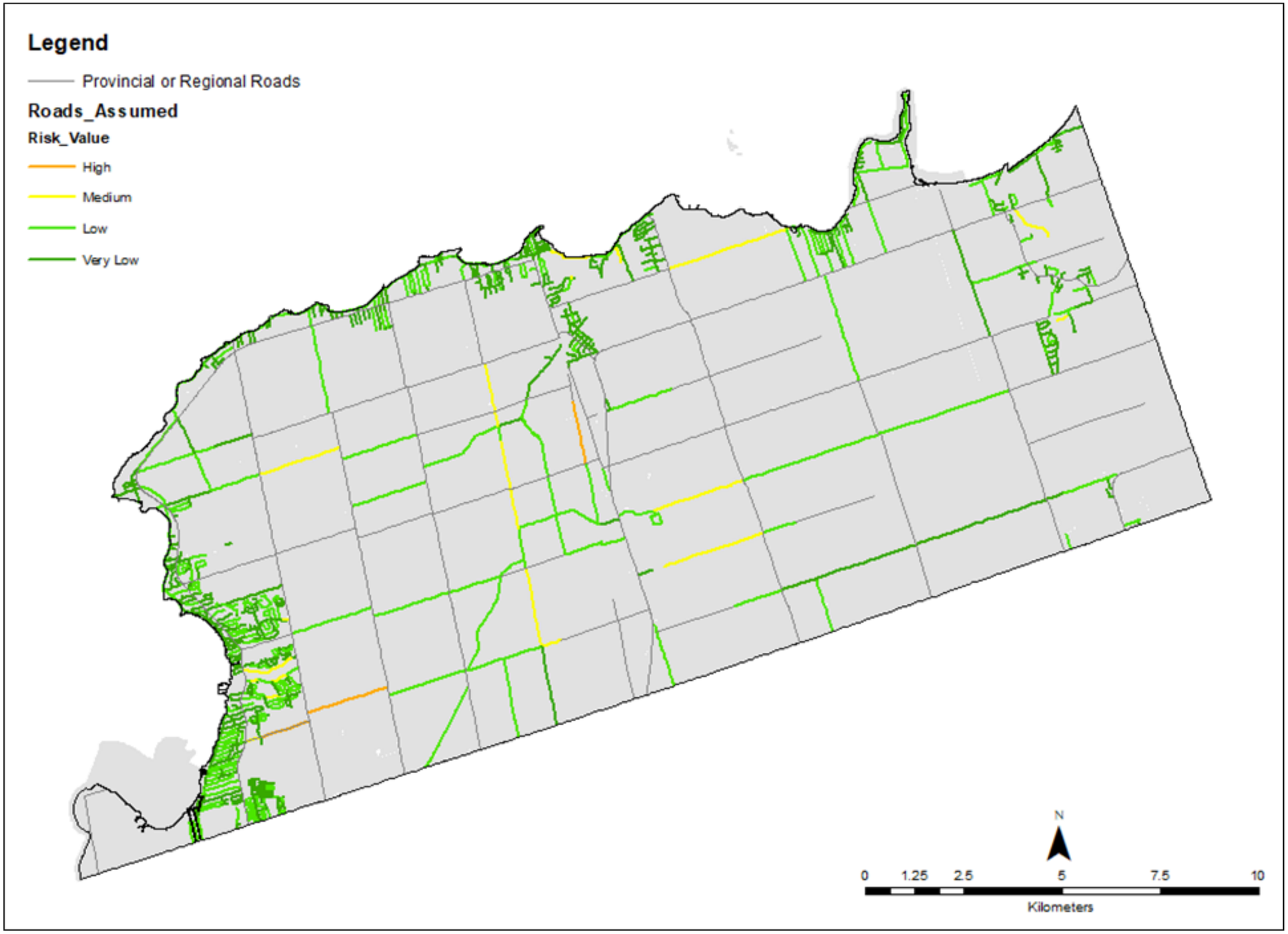


Figure F-2 Risk Map of the Town's Assumed Roads

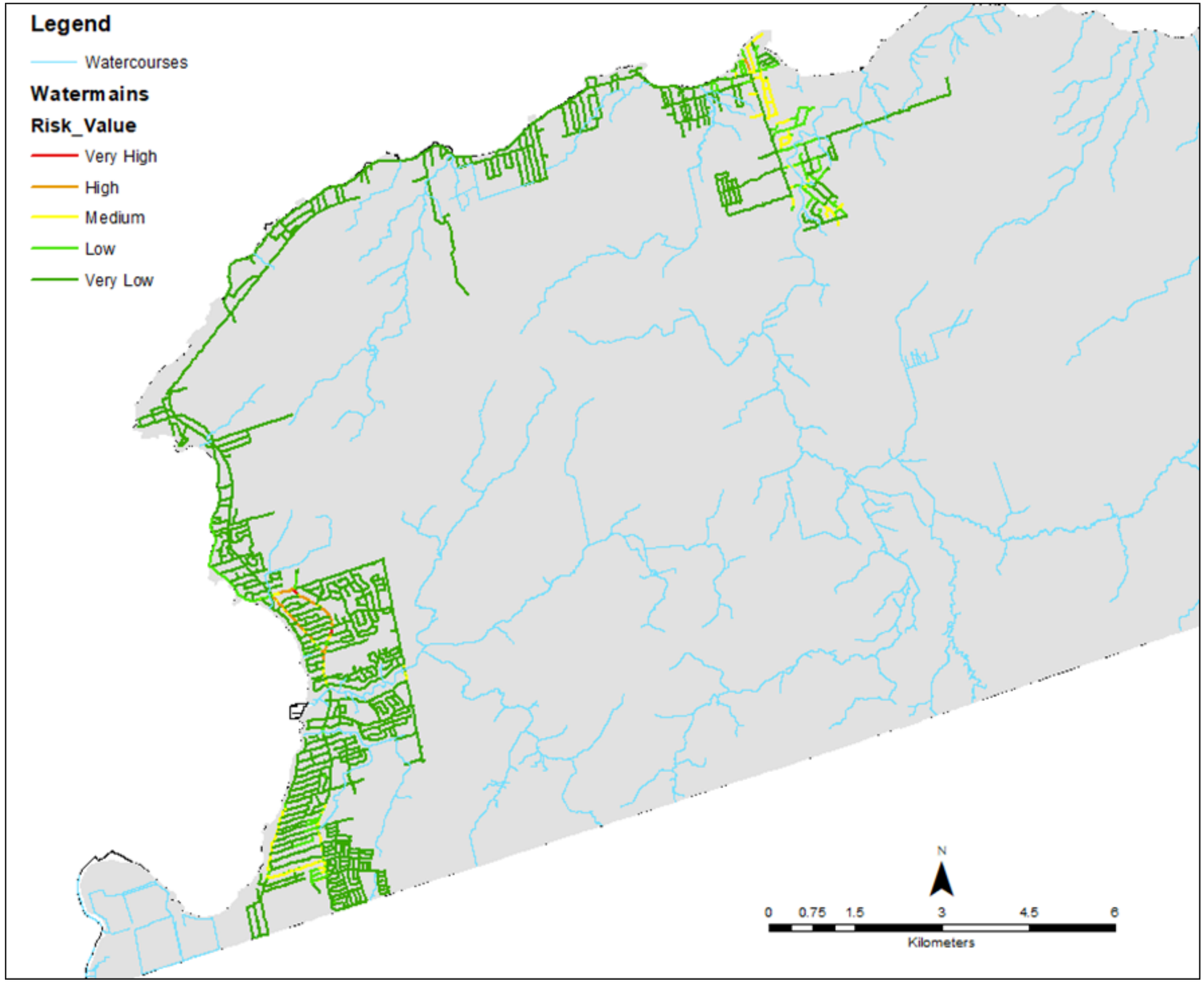


Figure F-3 Risk Map of the Town's Watermains

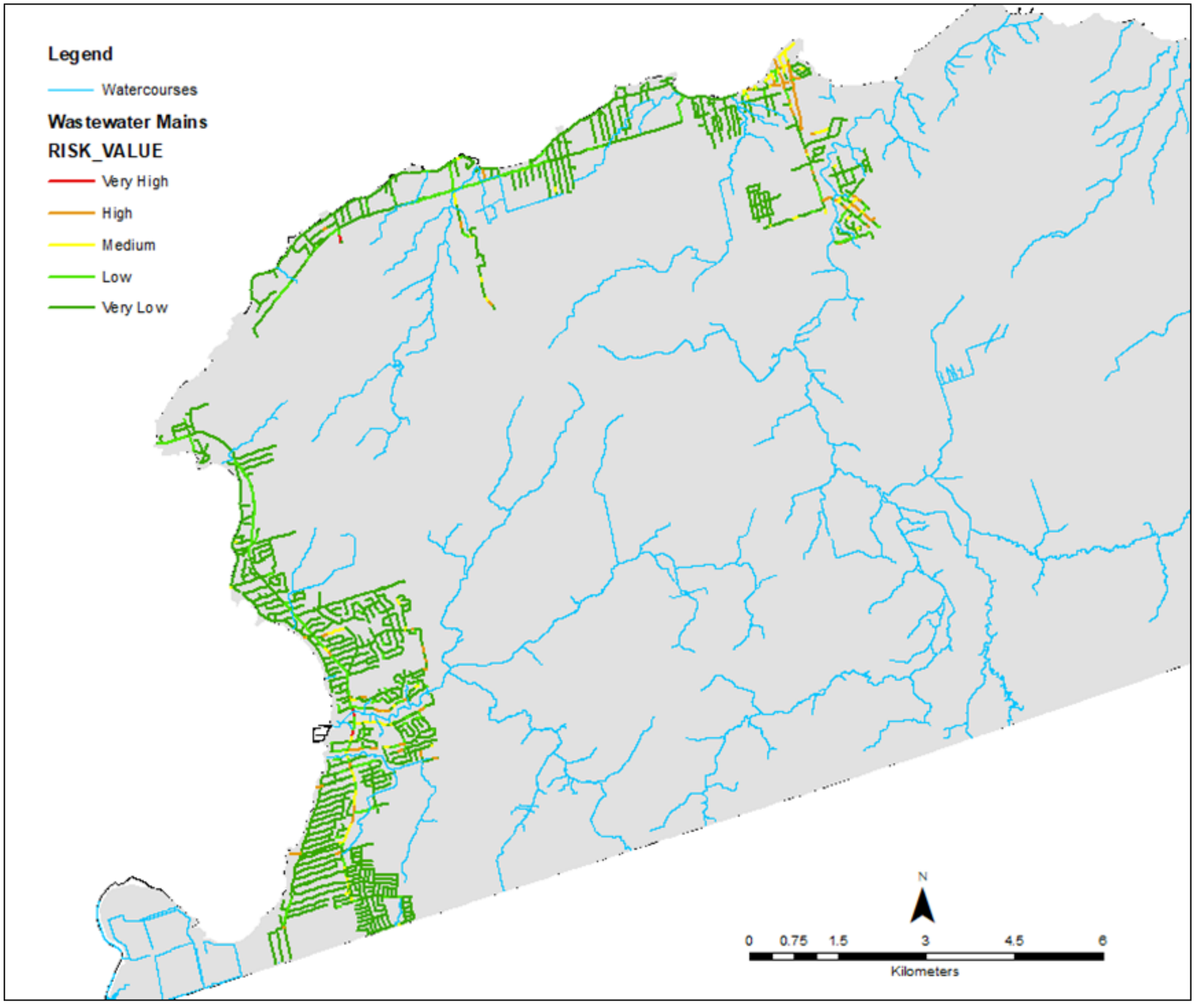


Figure F-4 Risk Map of the Town's Wastewater Mains

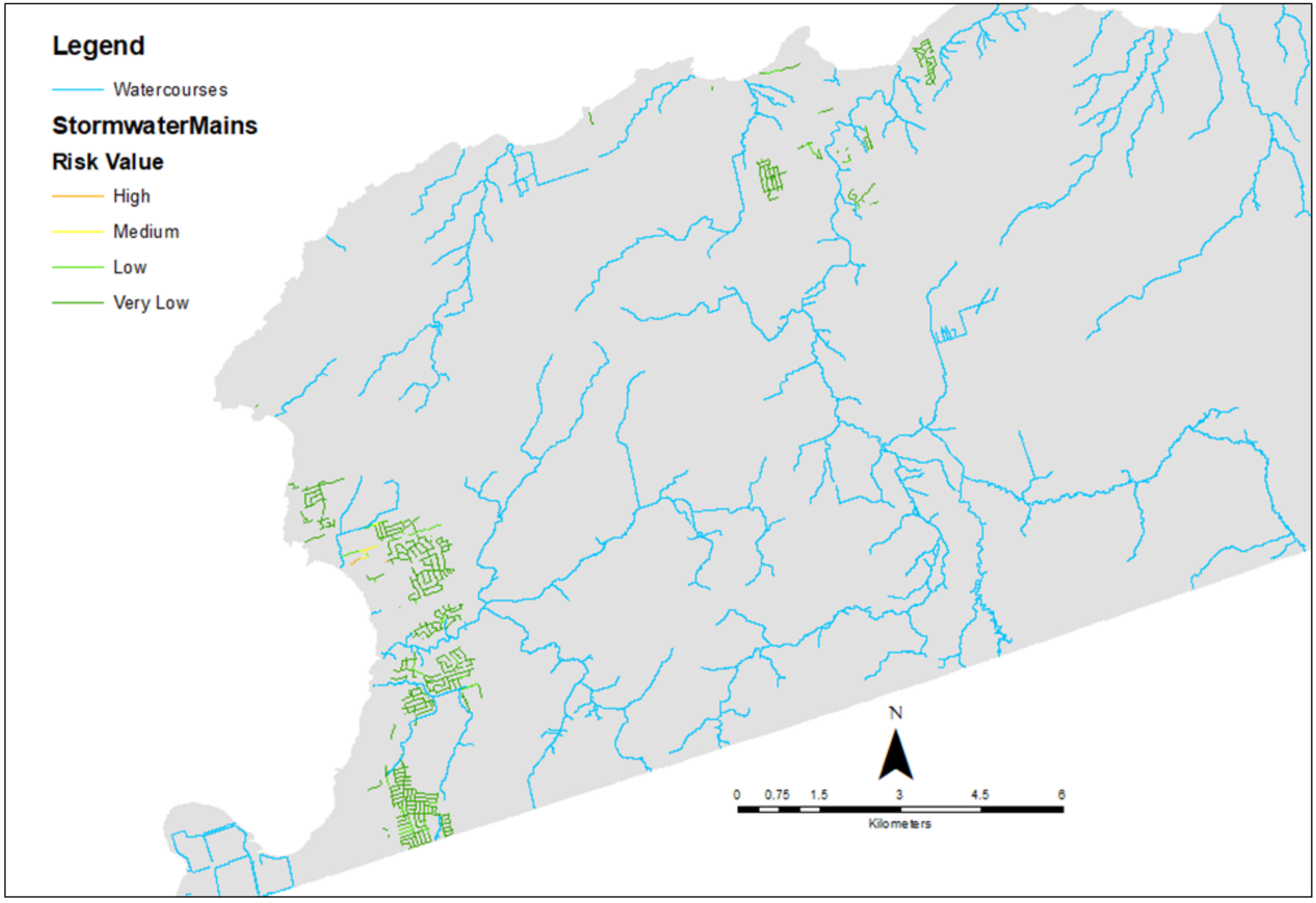


Figure F-3 Risk Map of the Town's Stormwater Mains

Appendix G – O&M Plan

Environmental Services O&M Plan

Asset Group	Asset Class	Asset Type	Activity Timing	In-house or Contract	Maintenance Activity Name	Definition	Benefits / Applicable Regulation / Levels of Service	Maintenance Type	Total Quantity	Units	Desired Activity Frequency	Existing or Future Plan
Environmental Services	Water	Watermains	All Year Round	Contract	Watermain Leak / Watermain Break	Unplanned water main leaks fixed by the environmental services division / Planned repairs to facility or equipment to ensure proper continued operation.	– Ensures main operates as intended; prevents failure and potential loss of service. – Link to water Levels of Service Metrics: # of connection-days per year due to water main breaks compared to the total number of properties connected to the municipal water system. – Prevents water loss and reduced cost of treating and pumping water – AWWA G200-15	Corrective Maintenance	218	km	As Required	Existing
Environmental Services	Water	Watermains	All Year Round	In-House	Water Quality Testing	Regular water sampling and testing based on regulatory requirements to ensure water quality.	– Identifies water quality issues so that immediate action can be taken to protect public health – Ontario Regulation 170/03 Drink Water System Schedule 6 and 7 Operational checks, sampling, and testing – Ontario Regulation 169/03 Ontario Drinking Water Quality Standards – DWQMS	Preventive Maintenance	Refer to DWQMS	Sample	Daily and Weekly	Existing
Environmental Services	Water	Service Connections	All Year Round	Contract	Water Service Leak / Water Service Repair	Customer concern called in regarding a leak. Corrective maintenance / Repairs or replacement of connections that are defective or that have been accidentally damaged. Work undertaken by Town's contractor	Respond to broken connection to restore service to customer Prevents water lost and reduced cost of treating and pumping water	Corrective Maintenance	13,750	Asset	As Required	Existing
Environmental Services	Water	Service Connections	All Year Round	Contract	Water Service Box Repair	Repairs to Water Services boxes.	Ensures the continued reliability and proper functioning of Service Connections	Preventive Maintenance	13,750	Asset	Depend on condition	Existing
Environmental Services	Water	Service Connections	All Year Round	Contract	Water Service Box-Stem Repair	Repairs to Water Services boxes Stem.	Ensures the continued reliability and proper functioning of Service Connections	Preventive Maintenance	13,750	Asset	Depend on condition	Existing
Environmental Services	Water	Water Valves	Spring and Fall	In-House	Valve Assessment and Functional Test (Calendar)	Activities required to assess the serviceability of the valves including gearbox and stem, valve disc. Assessment includes checking for excessive slop, wear and tear and adequate lubrication of gears and moving parts	– Ensures valve operates as intended; prevents failure and potential loss of service – AWWA G200-15: AWWA Manual M44	Preventive Maintenance	3,290	Asset	Twice a year	Existing
Environmental Services	Water	Water Valves	All Year Round	In-House	Valve Box Repair (Mainline)	Repair value to ensure proper continued operation.	– Ensures valve operates as intended; prevents failure and potential loss of service – AWWA G200-15: AWWA Manual M44	Corrective Maintenance	3,290	Asset	As Required	Existing

Asset Group	Asset Class	Asset Type	Activity Timing	In-house or Contract	Maintenance Activity Name	Definition	Benefits / Applicable Regulation / Levels of Service	Maintenance Type	Total Quantity	Units	Desired Activity Frequency	Existing or Future Plan
Environmental Services	Water	Water Valves	All Year Round	In-House	Valve Repair Direct Bury Excavation	Repair valve to ensure proper continued operation.	– Ensures valve operates as intended; prevents failure and potential loss of service – AWWA G200-15: AWWA Manual M44	Corrective Maintenance	3,290	Asset	As Required	Existing
Environmental Services	Water	Water Valves	All Year Round	In-House	Valve Exercising	Planned maintenance to exercise the valve, clean out valve box, paint valve lid, and record data about the valve	– Ensures that valves can be easily located and operated when and as needed - Link to Levels of Service Metrics: % of Valves Cycled Annually	Preventive Maintenance	3,290	Asset	30% per year ongoing	Future Planned Maintenance
Environmental Services	Water	Water Valve Chambers	All Year Round	In-House	Valve Chamber Inspection	Inspect structural Valve Chamber	Ensures the continued operation and reliability of Valve Chamber.	Inspection	278	Asset	10% per year ongoing	Future Planned Maintenance
Environmental Services	Water	Water Valve Chambers	All Year Round	In-House	Valve Repair (In Chamber) / Valve Chamber Repair	Repair value to ensure proper continued operation / Repair valve chamber to ensure proper continued operation	Ensures valve operates as intended; prevents failure and potential loss of service.	Corrective Maintenance	278	Asset	As Required	Existing
Environmental Services	Water	Hydrants	All Year Round	In-House	Hydrant Inspection / Repair Program / Fire Hydrant Flow Testing	Hydrant checks can include checking operation, caps, oil, pressure, sounding access, winter leakage, freezing, and string test / Repairs or replacement of hydrants that are defective or that have been accidentally damaged. Snow removal around fire hydrants / Measure the pressure and flow of a pipe to make sure minimum available fire flow is achieved as per design standards	– Ensures hydrants are in good working condition. Hydrant checks are required by the Fire Code – Ontario Regulation 213/07 Fire Code: CHECKING, INSPECTION, TESTING, NOTIFICATION AND MAINTENANCE OF FIRE EMERGENCY SYSTEMS – AWWA G200: AWWA Manual M17	Preventive Maintenance	1,509	Asset	Once a year	Existing
Environmental Services	Water	Hydrants	Fall	In-House	Hydrant Winterization	To prevent freezing during winter by removing water from the hydrant barrel	– AWWA G200: AWWA Manual M17	Preventive Maintenance	1,509	Asset	Once a year	Existing
Environmental Services	Water	Hydrants	All Year Round	In-House	Hydrant Corrosion Control	Painting hydrant for easy identification	– Ontario Regulation 213/07 Fire Code	Preventive Maintenance	1,509	Asset	Depend on condition	Future Planned Maintenance
Environmental Services	Water	Water Pump Stations	All Year Round	In-House	Water Booster Station Inspection (Once every week)	Inspection of facility and equipment for cleanliness, leaks, corrosion, and damage. The lights, ventilation fans, heater, sump pump and drains are also checked for operation. The pump meters are read and, where applicable, fire pumps are tested.	To ensure that the station is operating properly and that potential maintenance issues are identified and prioritized for repair to avoid equipment failure.	Preventive Maintenance	2	Pump Station	Weekly	Existing
Environmental Services	Water	Water Pump Stations	All Year Round	In-House	Generator inspection (Monthly)	Inspection of facility and equipment for cleanliness, leaks, corrosion, and damage. The lights, ventilation fans, heater, sump pump and drains are also checked for operation. The pump meters are read and, where applicable, fire pumps are tested.	To ensure that the station is operating properly and that potential maintenance issues are identified and prioritized for repair to avoid equipment failure.	Preventive Maintenance	25	Asset	Monthly	Existing

Asset Group	Asset Class	Asset Type	Activity Timing	In-house or Contract	Maintenance Activity Name	Definition	Benefits / Applicable Regulation / Levels of Service	Maintenance Type	Total Quantity	Units	Desired Activity Frequency	Existing or Future Plan
Environmental Services	Water	Water Pump Stations	Winter	Contract	Standby Power Testing (Annually)	The process of performing harmonic analysis, data logging, measuring voltage of power supply, temperature, etc. This test is needed to reduce energy consumption	O. Reg. 346/12: REGISTRATIONS UNDER PART II.2 OF THE ACT - HEATING SYSTEMS AND STANDBY POWER SYSTEMS	Preventive Maintenance	25	Asset	Once a year	Existing
Environmental Services	Water	Water Pump Stations	Spring and Fall	In-House	Greasing Pumps	Application of grease/lubricants to increase the viscosity needed for the pump bearings to avoid failure of moving parts	AWWA M8 Pumping Stations, Pumps, and Appurtenances: AWWA Distribution Manual	Preventive Maintenance	38	Asset	Twice a year	Existing
Environmental Services	Water	Water Pump Stations	Spring	Contract	Backflow Device Annual Inspections	Activities needed to ensure that backflow devices are working properly. Activities could include dismantling devices for tear and wear and checking moving parts are not worn down	AWWA M8 Pumping Stations, Pumps, and Appurtenances: AWWA Distribution Manual	Preventive Maintenance	38	Pump Station	Once a year	Existing
Environmental Services	Water	Water Pump Stations	Fall	In-House	Pressure Indicating Transmitter Calibration Verification	The process of calibrating the pressure indicating transmitter for proper pressure reading	AWWA M8 Pumping Stations, Pumps, and Appurtenances: AWWA Distribution Manual	Preventive Maintenance	20	Asset	Once a year	Existing
Environmental Services	Water	Water Pump Stations	All Year Round	In-House	Water Flow Meter Calibration	Process of calibrating the flow meter for proper reading of flow	AWWA M8 Pumping Stations, Pumps, and Appurtenances: AWWA Distribution Manual	Preventive Maintenance	2	Asset	Once a year	Future Planned Maintenance
Environmental Services	Water	Water Pump Stations	All Year Round	In-House	Control PRV Tear-Down and Inspection	Annual Tear-down and inspection of control valves (where applicable).	Ensures PRVs are in good operating condition; allows crews to identify any corrective maintenance required.	Preventive Maintenance	2	Asset	Once a year	Future Planned Maintenance
Environmental Services	Water	Water Asset General	All Year Round	In-House	Emergency Health and Safety Inspections (Monthly)	Inspections to investigate when accidents have happened, or a complaint is made.	– Occupational Health and Safety Act, R.S.O. 1990	Preventive Maintenance	2	Facility	Monthly	Existing
Environmental Services	Water	Water Asset General	Summer	Contract	Electrical Safety Authority (ESA) Inspection (Annually)	Inspection to investigate that safe process and procedures are in place to operate machine and equipment	– Occupational Health and Safety Act, R.S.O. 1990	Preventive Maintenance	2	Facility	Once a year	Existing
Environmental Services	Water	Water Asset General	Spring	Contract	Fire Safety Inspections (Annually)	Inspection to investigate that safe process, procedures and tools are available to mitigate and/or eliminate fire safety hazards	– Occupational Health and Safety Act, R.S.O. 1990	Preventive Maintenance	2	Facility	Once a year	Existing
Environmental Services	Water	Water Asset General	Winter - January / February	Contract	Lift/Hoist Equipment Inspection (Annually)	Inspection to investigate the condition of lift/hoist condition to avoid safety hazards during lifting/hoisting operations	– Occupational Health and Safety Act, R.S.O. 1990	Preventive Maintenance	243	Asset	Once a year	Existing
Environmental Services	Water	Water Asset General	Spring and Winter	In-House	Annual Notice to Residents on Running Taps in Winter	To prevent the water service from freezing	Prevent water service from freezing	Preventive Maintenance	2	Notice	Twice a year	Existing
Environmental Services	Water	Water Asset General	Spring	In-House	Field Test Kit Calibrations	Process of calibrating tools in field test kit for proper reading/detection	Ensure proper reading/detection	Preventive Maintenance	2	Pump Station	Once a year	Existing

Asset Group	Asset Class	Asset Type	Activity Timing	In-house or Contract	Maintenance Activity Name	Definition	Benefits / Applicable Regulation / Levels of Service	Maintenance Type	Total Quantity	Units	Desired Activity Frequency	Existing or Future Plan
Environmental Services	Water/Wastewater	Water/Wastewater Asset General	All Year Round	Contract	Pumping Station Maintenance Mechanical/HVAC Maintenance	Activities that are conducted to inspect and maintain mechanical components in pumping stations	Ensure to provide thermal comfort and acceptable indoor air quality.	Preventive Maintenance	20	Pump Station	Once a year	Existing
Environmental Services	Water/Wastewater	Water/Wastewater Asset General	All Year Round	Contract	SCADA Engineering Maintenance & Support Services	Include all SCADA Engineering Maintenance & Support Services, not limited to emergency response 24-7-365 service, remote access communication, annual inspections and cleaning, the semi-annual deficiencies report and quarterly services.)	Ensure proper process control.	Preventive Maintenance	20	Pump Station	As Required	Existing
Environmental Services	Wastewater	Wastewater Force Mains	All Year Round	Contract	Force main Inspection and cleaning	To systematically inspect the sewer system for the purpose of structural assessment and / or leak detection	This information assists in setting the priorities for the capital renewal and replacement program.	Preventive Maintenance	17	km	10% per year ongoing	Future Planned Maintenance
Environmental Services	Wastewater	force main	All Year Round	Contract	Force main repair	A method to remove sludge from force mains to ensure adequate hydraulics present in the pipe / To perform either spot repairs or relay short stretches of mains.	To remove debris for the mains so that they don't lose capacity and to identify potential problems before they happen / To fix mains that have or may collapse and cause disruptions to service, backups and / or overflows.	Corrective Maintenance	17	km	As Required	Existing
Environmental Services	Wastewater	Wastewater Gravity Mains	All Year Round	Contract	Sewer Flushing	To clean the grease, debris and foam build-up from the wet well that might interfere with the operation of the control floats.	– To remove debris for the mains so that they don't lose capacity and to identify potential problems before they happen. – Link to Levels of Service Metrics: % of sewers flushed annually	Preventive Maintenance	185	km	Twice a year	Existing
Environmental Services	Wastewater	Wastewater Gravity Mains	All Year Round	Contract	Sewer Reaming	A method to remove roots that are represented in a sewer pipe that could be observed at joints or through structural defects	– Link to Levels of Service Metrics: Average condition rating of sanitary sewers	Preventive Maintenance	185	km	Once a year	Existing
Environmental Services	Wastewater	Wastewater Gravity Mains	Spring and Fall	Contract	Sewer Trouble/Hot Spot Cleaning	Hot spot cleaning is carried our every year at the hotspots to avoid sewer trouble and backup	– Link to Levels of Service Metrics: Average condition rating of sanitary sewers	Preventive Maintenance	185	km	Twice a year	Existing
Environmental Services	Wastewater	Wastewater Gravity Mains	All Year Round	Contract	Sewer Backup (Sewer Emergency Blockage or Break response) / Sewer Repair	To remove or clear blockages from mains.	To remove partial or full blockages from mains that would cause disruptions to service, backups and / or overflows.	Corrective Maintenance	185	km	As Required	Existing
Environmental Services	Wastewater	Wastewater Gravity Mains	All Year Round	Contract	Sewer CCTV - Emergency Blockage Investigation	In conjunction with the cleaning program investigate sources of gravel, rocks and/or broken pipe; sources of odors; and post main back-ups or surcharging to identify potential problems.	Immediate response to identify area where a blockage or break needs immediate attention	Corrective Maintenance	185	km	As Required	Existing
Environmental Services	Wastewater	Wastewater Gravity Mains	All Year Round	In-House	Sewer Repair	To perform either spot repairs or relay short stretches of mains.	To fix mains that have or may collapse and cause disruptions to service, backups and / or overflows.	Corrective Maintenance	185	km	0.7 repairs per 100 km	Existing
Environmental Services	Wastewater	Laterals	All Year Round	Contract	Emergency Lateral Inspection	To inspect the condition of service connections to	To pinpoint any problem that might be encountered in a lateral and determine the best method for correction.	Corrective Maintenance	13,750	Asset	As Required	Existing

Asset Group	Asset Class	Asset Type	Activity Timing	In-house or Contract	Maintenance Activity Name	Definition	Benefits / Applicable Regulation / Levels of Service	Maintenance Type	Total Quantity	Units	Desired Activity Frequency	Existing or Future Plan
						identify and locate deficiencies or problems.						
Environmental Services	Wastewater	Laterals	All Year Round	Contract	Wastewater Backup (Lateral)	To jet rod lateral to remove debris in the line to remove a blockage (on the Town's side only)	To remove a blockage that can cause a connection back up. Reduced backups will reduce damage claims	Corrective Maintenance	13,750	Asset	1.6 back-ups per 1,000 service connections	Existing
Environmental Services	Wastewater	Laterals	All Year Round	Contract	Sewer Lateral Repair	To perform spot repairs on damaged laterals	To repair laterals where a problem has occurred and minimize the amount of the excavation and impact.	Corrective Maintenance	13,750	Asset	1.2 repairs per 1,000 service connections	Existing
Environmental Services	Wastewater	Wastewater Valves	All Year Round	In-House	Air Release Valve Maintenance	Routine inspection and repair of force main air/vac valves.	To ensure proper air/vac valve operation to prevent possible force main damage. Also, to make sure lift station pumps are operating as efficient as possible.	Preventive Maintenance	TBD	Asset	Depend on condition	Future Planned Maintenance
Environmental Services	Wastewater	Wastewater Valves	All Year Round	In-House	Valve/siphon Maintenance and Repair	Repairs to facility or equipment; usually identified through inspections or SCADA system alarms. No emendate concern of loss of service.	Repair required due to alarm or reported failure, but redundancy is available. No immediate concern of spill or other system failure.	Preventive Maintenance	28	Asset	Depend on condition	Future Planned Maintenance
Environmental Services	Wastewater	Maintenance Holes	January to May	Contract	CCTV Deficiencies on MH - Spot Cleaning/Investigation	A method used record defects present in maintenance holes through utilizing Panoramic Camera. Records are evaluated in accordance with MACP	Identify conditions that require correction	Preventive Maintenance	2,561	Asset	Monthly	Existing
Environmental Services	Wastewater	Maintenance Holes	All Year Round	In-House	Maintenance Holes and easements cleaning	Activities/Inspection needed to monitor and clean maintenance holes and easements from deposits and roots	OPSD 700 - Catch basins and Maintenance Holes	Inspection	2,561	Asset	10% per year ongoing	Future Planned Maintenance
Environmental Services	Wastewater	Maintenance Holes	All Year Round	In-House	Manholes - Casting Replacement (Betterment)	Replacing an existing manhole with a newer manhole.	OPSD 700 - Catch basins and Maintenance Holes	Corrective Maintenance	2,561	Asset	As Required	Future Planned Maintenance
Environmental Services	Wastewater	Maintenance Holes	All Year Round	In-House	H2S Control in Manhole, SPS 12, 23, 24 and the Briars (Once every other Week)	Measures taken to control the emission of H2S gas in manholes	Design Guidelines for Sewage Works: Sewage Pumping Stations	Preventive Maintenance	4	Asset	Bi-Weekly	Existing
Environmental Services	Wastewater	Wastewater Pump Stations	All Year Round	In-House	SPS Inspection (Once per Week)	Regular inspection of the station and pull pumps for a visual inspection according to Standard Operating Procedure (SOP)	To ensure that the station is operating properly and that potential maintenance issues are identified and prioritized for repair to avoid equipment failure.	Preventive Maintenance	18	Asset	Weekly	Existing
Environmental Services	Wastewater	Wastewater Pump Stations	June to December	Contract	Bioxide Dosing	Bioxide dosing is carried out from June to December depending on the temperature		Preventive Maintenance	28	Dose	Weekly	Existing
Environmental Services	Wastewater	Wastewater Pump Stations	Spring and Winter	Contract	Wet Well Cleaning	To wash down and remove debris that has built up in the lift station chamber.	Removal of debris from the lift station chamber will ensure that the efficiency of the pumps is maintained and reduce wear on and possibly failure of the pump which could lead to a system back-up or overflow to the environment.	Preventive Maintenance	28	Asset	Twice a year	Existing
Environmental Services	Wastewater	Wastewater Pump Stations	Fall	Contract	Edublogger Calibrations	The process of calibrating the OdaLogger for proper reading and/detection of gases/emissions.	Design Guidelines for Sewage Works: Sewage Pumping Stations	Preventive Maintenance	9	Asset	Once a year	Existing

Asset Group	Asset Class	Asset Type	Activity Timing	In-house or Contract	Maintenance Activity Name	Definition	Benefits / Applicable Regulation / Levels of Service	Maintenance Type	Total Quantity	Units	Desired Activity Frequency	Existing or Future Plan
Environmental Services	Wastewater	Wastewater Pump Stations	Fall	In-House	Pressure Gauge Calibration Verification	The process of calibrating pressure gauges for proper reading of pressure	Design Guidelines for Sewage Works: Sewage Pumping Stations	Preventive Maintenance	18	Asset	Once a year	Existing
Environmental Services	Wastewater	Wastewater Pump Stations	Summer	In-House	Submersible Pump Inspection	Activities needed to verify and report the condition of submersible pumps. This could include alarm monitoring system, pressure, and flow checks, and conducting visual inspection to verify the reliability and serviceability of the pump	Design Guidelines for Sewage Works: Sewage Pumping Stations	Preventive Maintenance	TBD	Asset	Once a year	Existing
Environmental Services	Wastewater	Wastewater Pump Stations	Winter	In-House	VFD Inspection	Activities needed to record the condition of VFD. These activities include visual inspection, checking power connections, and capacitor reforming. This inspection helps in determining the longevity of VFDs	Design Guidelines for Sewage Works: Sewage Pumping Stations	Preventive Maintenance	TBD	TBD	Once a year	Existing
Environmental Services	Wastewater	Wastewater Pump Stations	All Year Round	In-House	Thermographic Inspections on Dry Wells	The use of thermography (infrared/thermal imaging) equipment/tool to inspect dry well to determine any temperature variations that could indicate structural deficiencies	Design Guidelines for Sewage Works: Sewage Pumping Stations	Preventive Maintenance	18	Pump Station	Depend on condition	Future Planned Maintenance
Environmental Services	Wastewater	Wastewater Pump Stations	Winter	Contract	Wastewater Electrical Maintenance	To maintain the electronic components that monitor station security, controls, and diagnostics.	To ensure that the lift station continues operate properly and to ensure that a system failure occurs the appropriate level of emergency response can be assigned.	Preventive Maintenance	18	Pump Station	Once a year	Existing
Environmental Services	Wastewater	Wastewater Pump Stations	All Year Round	In-House	Wastewater Flow Meter Calibration	Process of calibrating the flow meter for proper flow reading	O. Reg. 561/94: EFFLUENT MONITORING AND EFFLUENT LIMITS - INDUSTRIAL MINERALS SECTOR: Flow Volume	Preventive Maintenance	28	Asset	Once a year	Future Planned Maintenance
Environmental Services	Wastewater	Wastewater Pump Stations	All Year Round	In-House	Sewer Pump Station - Check and Gate Valves	To exercise both the gate and check valves to ensure a smooth operation for when they are needed.	The proper operation of the lift station and the ability to shut down each pump for removal or maintenance.	Preventive Maintenance	28	Asset	Varies	Future Planned Maintenance
Environmental Services	Wastewater	Wastewater Pump Stations	All Year Round	In-House	Sewer Pump Station - Response to Failure (Emergency)	Emergency repairs to facility or equipment; usually triggered by customer calls or SCADA system alarms.	Lift station response due to failure alarm or reported failure. Immediate response is required to reduce the possibility of a spill or other system failure. Emergency back or redundancy may not be available.	Corrective Maintenance	18	Pump Station	As Required	Future Planned Maintenance
Environmental Services	Wastewater	Wastewater Asset General	All Year Round	In-House	Emergency Health and Safety Inspections (Monthly)	Inspection to investigate that safe process and procedures are in place to conduct activities	– Occupational Health and Safety Act, R.S.O. 1990	Preventive Maintenance	18	Pump Station	Monthly	Existing
Environmental Services	Wastewater	Wastewater Asset General	Winter	Contract	Fire Safety Inspections (Annually)	Inspection to investigate that safe process, procedures and tools are available to mitigate and/or eliminate fire safety hazards.	– Occupational Health and Safety Act, R.S.O. 1990 – OFM-TG-01-2012	Preventive Maintenance	18	Pump Station	Once a year	Existing
Environmental Services	Wastewater	Wastewater Asset General	Fall	Contract	Gas Fired Equipment Inspection (Annually)	Activities needed to ensure that gas-fired equipment is	– Occupational Health and Safety Act, R.S.O. 1990 – CAN/CSA-B149.3-00	Inspection	18	Pump Station	Once a year	Existing

Asset Group	Asset Class	Asset Type	Activity Timing	In-house or Contract	Maintenance Activity Name	Definition	Benefits / Applicable Regulation / Levels of Service	Maintenance Type	Total Quantity	Units	Desired Activity Frequency	Existing or Future Plan
						operating in a safe manner to avoid explosion or fire.						
Environmental Services	Stormwater	Storm Sewers	All Year Round	In-House	Storm Sewer Flushing	Flushing of sewer, to prevent blockages and ensure a proper functioning Sewer System	– Ensures a reliable and well-functioning storm sewer main system. Prevents blockages and improves drainage etc. – Ontario Regulation 60/08 Lake Simcoe Protection, page 28, f. a description of existing or planned programs for regular maintenance of stormwater management works; – Environmental Compliance Approval (ECA): 4.10.2(d) Design Report for Stormwater Management: 9. Detailed description of the proposed operation and maintenance procedures for the works, including an agreement between the local municipality and the applicant outlining a maintenance program that contains the name of the operating authority or the person responsible for the maintenance and operation. – Link to stormwater Levels of Service Metrics	Corrective and Preventative Maintenance	71	km	5% per year ongoing	Future Planned Maintenance
Environmental Services	Stormwater	Storm Sewers	All Year Round	In-House	Storm Sewer Repairs (Planned)	Planned and scheduled repairs (or replacements) to sewer mains that are identified through inspection or observation. The repairs may be performed by either dig-up or trenchless methods. Includes reaming & sealing, spot repair < 10 m and relining (i.e., excludes replacements).	– Protects the integrity of the sewer main and prevents main breaks – Environmental Compliance Approval (ECA): 4.10.2(d) Design Report for Stormwater Management: 9. Detailed description of the proposed operation and maintenance procedures for the works, including an agreement between the local municipality and the applicant outlining a maintenance program that contains the name of the operating authority or the person responsible for the maintenance and operation	Corrective Maintenance	71	km	5 repairs per 100 km	Future Planned Maintenance
Environmental Services	Stormwater	Storm Sewers	All Year Round	In-House	Storm Sewer Repairs (Urgent)	Urgent repairs to storm mains due to breakdowns. Breakdowns may result in loss of service or other severe detriment to the utility (e.g., spill, flooding, etc.), Maintenance must be deployed as soon as possible. These repairs may be performed by either dig-up or trenchless methods. Includes reaming & sealing, spot repair < 10 m and relining (i.e., excludes replacements). Usually less than 48 hr. notice.	– Protect property and minimize damage through flooding	Corrective Maintenance	71	km	As Required	Future Planned Maintenance
Environmental Services	Stormwater	Stormwater Management Ponds	All Year Round	In-House	Routine Maintenance	Visual inspection of sediment accumulation; Vegetation Control and Management, Litter and Debris Removal, Inlet and Outlet Unclogging; Minor	– Routine Maintenance of SWM treatment facilities is necessary to sustain its adequate operation, control the growth of vegetation, reduce the presence of nuisance animals, retain the aesthetic value of the ponds and the general acceptability in the public eye	Preventive Maintenance	20	Asset	Fourfold a year	Future Planned Maintenance

Asset Group	Asset Class	Asset Type	Activity Timing	In-house or Contract	Maintenance Activity Name	Definition	Benefits / Applicable Regulation / Levels of Service	Maintenance Type	Total Quantity	Units	Desired Activity Frequency	Existing or Future Plan
						repairs of SWM treatment facilities	– Environmental Compliance Approval (ECA): 4.10.2(d) Design Report for Stormwater Management: 9. Detailed description of the proposed operation and maintenance procedures for the works, including an agreement between the local municipality and the applicant outlining a maintenance program that contains the name of the operating authority or the person responsible for the maintenance and operation – Ensure that the infrastructure of the pond is intact and operating properly, and to check for large debris that may have been swept in – Link to stormwater Levels of Service Metrics: Average condition rating of retention ponds					
Environmental Services	Stormwater	LID	All Year Round	In-House	Inspect, repair and clean bioswale & infiltration facilities	Preventative maintenance program to inspect, clean and repair the infiltration facilities and identify problems with blockages, flow regimes, settlement, accumulated sediment, structures, mechanical components etc.; repair	– Identifies and prevents potential problems or issues with the infiltration facility – Provincial Guideline: Stormwater Management Planning and Design Manual	Preventive Maintenance	3	Asset	Once a year	Future Planned Maintenance
Environmental Services	Stormwater	Stormwater Service Connections	All Year Round	In-House	Inspect Laterals	To inspect the condition of service connections to identify and locate deficiencies or problems.	Ensures the continued operation and reliability.	Inspection	33	km	30% per year ongoing	Future Planned Maintenance
Environmental Services	Stormwater	Maintenance Holes	All Year Round	In-House	Manhole Cleaning	Ensures proper drainage	Ensures proper drainage	Preventive Maintenance	1,210	Asset	5% per year ongoing	Future Planned Maintenance

Asset Group	Asset Class	Activity Type	In-house or Contract	Maintenance Activity Name	Definition	Benefits / Applicable Regulation / Levels of Service	Maintenance Type	Total Quantity	Units	Desired Activity Frequency	Maintenance Status Prior to 2021
Roads Operations	Roads	Program	Contract	Asphalt Driveway Ends Paving	Activity to pave the end of driveway	Ontario Regulation 239/02, MMS	Preventive Maintenance	337	Centerline km	Depends on condition	Program
Roads Operations	Roads	Planned	In-House	Brushing	Clearing vegetation from roadside shoulders and ditches	Ontario Regulation 239/02, MMS - Debris	Preventive Maintenance	337	Centerline km	Depends on condition	Planned
Roads Operations	Roads	Program	Contract	Brushing	Clearing vegetation from roadside shoulders and ditches.	Ontario Regulation 239/02, MMS - Debris	Preventive Maintenance	337	Centerline km	Depends on condition	Program
Roads Operations	Roads	Program	In-House	Curb/Gutter Repair	To repair curb/gutter to ensure adequate drainage	Ensure adequate road surface drainage, prevent erosion along roadside ditches or boulevards, provide wheelchair access at intersections and sidewalks, provide reasonable transition from roadways into private driveways	Corrective Maintenance	337	Centerline km	Depends on condition	Program
Roads Operations	Roads	Program	Contract	Dust Control	Application of calcium chloride to gravel roads and parking lots for dust control	– Link to Levels of Service Metric: Gravel Road Dust Control	Preventive Maintenance	337	Centerline km	Depends on condition	Program
Roads Operations	Roads	Reactive	In-House	Flooding	Clearing flood water from roadside - could be related to culverts, ditches, sidewalks, etc.	Ontario Regulation 239/02, MMS - Debris	Corrective Maintenance	337	Centerline km	As requested	Reactive
Roads Operations	Roads	Program	In-House	Grass Cutting	Clearing vegetation from roadside	Ontario Regulation 239/02, MMS - Encroachments, area adjacent to sidewalk	Preventive Maintenance	337	Centerline km	Depends on condition	Program
Roads Operations	Roads	Reactive	In-House	Gravel Repair	Repairing gravel roads	Ontario Regulation 239/02, MMS	Corrective Maintenance	5	Centerline km	As requested	Reactive
Roads Operations	Roads	Program	In-House	Intersection Cleaning	Cleaning intersections to remove accumulated sediment and debris	– Reduces the amount of sediment that reaches the receiving environment as well as the need to clean and flush catch basins and sewers – Ontario Regulation 239/02, MMS - Debris – Link to stormwater Levels of Service Metrics	Preventive Maintenance	--	# intersection	Depends on condition	Program
Roads Operations	Roads	Program	In-House	Noxious Weeds (June 1 to November 1)	Clearing vegetation from roadside	Ontario Regulation 239/02, MMS - Encroachments, area adjacent to sidewalk	Preventive Maintenance	337	Centerline km	Depends on condition	Program
Roads Operations	Roads	Program	Contract	Pavement Markings	Mark on pavement to convey messages to roadway users	Ontario Regulation 239/02, MMS - Signs, Ontario Traffic Manual (OTM), Highway Traffic Act, R.S.O. 1990, c. H.8	Preventive Maintenance	337	Centerline km	Depends on condition	Program
Roads Operations	Roads	External	In-House	Railway Crossing Maintenance	Railway crossing maintenance done by CN, but which the Town pays for	– Reduces the amount of sediment that reaches the receiving environment as well as the need to clean and flush catch basins and sewers – Ontario Regulation 239/02, MMS - Debris – Link to stormwater Levels of Service Metrics	Preventive Maintenance	NA	NA	External	External
Roads Operations	Roads	Reactive	In-House	Reactive sweeping	Sweep streets to remove accumulated sediment and debris.	– Reduces the amount of sediment that reaches the receiving environment as well as the need to clean and flush catch basins and sewers – Ontario Regulation 239/02, MMS - Debris – Link to stormwater Levels of Service Metrics	Corrective Maintenance	337	Centerline km	As requested	Reactive
Roads Operations	Roads	Reactive	In-House	Road Debris Clearing	Clearing debris from road and roadside, which may include dead animals, illegally dumped items, etc.	Ontario Regulation 239/02, MMS - Debris	Corrective Maintenance	337	Centerline km	As requested	Reactive
Roads Operations	Roads	Program	In-House	Road Grading	The process of restoring the driving surface of a gravel or natural surface road to a desired smoothness and	– Ontario Regulation 239/02, MMS – Link to Levels of Service Metrics	Preventive Maintenance	5	Centerline km	Depends on condition	Program

Roads Operations O&M Plan

Asset Group	Asset Class	Activity Type	In-house or Contract	Maintenance Activity Name	Definition	Benefits / Applicable Regulation / Levels of Service	Maintenance Type	Total Quantity	Units	Desired Activity Frequency	Maintenance Status Prior to 2021
					shape by removing irregularities such as corrugations and potholes and redistributing gravel						
Roads Operations	Roads	Planned	In-House	Roadside Trees	Clearing vegetation from roadside	Ontario Regulation 239/02, MMS - Encroachments, area adjacent to sidewalk	Preventive Maintenance	337	Centerline km	Depends on condition	Planned
Roads Operations	Roads	Planned	In-House	Routine Patrols	Inspect every road @ two weeks, ward by ward schedule. Any Town asset with a deficiency. Two days per ward (5 wards)	Ontario Regulation 239/02, MMS - Patrolling	Inspections	337	Centerline km	Bi-Weekly	Planned
Roads Operations	Roads	Reactive	In-House	Salting/Sanding	Apply sand and salt to roadways in order to provide traction and break down snow and ice on the surface	Ontario Regulation 239/02, MMS - Snow accumulation, roadways	Corrective Maintenance	337	Centerline km	As requested	Reactive
Roads Operations	Roads	Program	Contract	Selective Resurfacing and Maintenance	Town's program to remove and replace asphalt surfaces of selected roads, includes activities such as Asphalt Patching, Pothole Repair, Patching and Washout, In-House Resurfacing, Road Damage Repair, Rout and Seal, and any future maintenance activities related to Surface Repair	Ontario Regulation 239/02, MMS - Roadway surface discontinuities	Preventive Maintenance	337	Centerline km	Depends on condition	Program
Roads Operations	Roads	Program	In-House	Shoulder Inspection	Shoulder inspection for identifying conditions that require correction	Ontario Regulation 239/02, MMS - Shoulder drop-offs	Inspections	337	Centerline km	Bi-Weekly	Reactive
Roads Operations	Roads	Program	In-House	Shoulder Repair	To repair shoulder to ensure adequate lateral support to the roadway	Ontario Regulation 239/02, MMS - Shoulder drop-offs	Corrective Maintenance	337	Centerline km	Depends on condition	Program
Roads Operations	Roads	Reactive	In-House	Sightline Issue	Activities to address sightline issues	Ontario Regulation 239/02, MMS - Signs, Ontario Traffic Manual (OTM), Highway Traffic Act, R.S.O. 1990, c. H.8	Corrective Maintenance	337	Centerline km	As requested	Reactive
Roads Operations	Roads	Reactive	In-House	Sign Reflectivity	Activities to make sure signs meet the retro-reflectivity requirements of the Ontario Traffic Manual	Ontario Regulation 239/02, MMS - Signs	Corrective Maintenance	337	Centerline km	As requested	Reactive
Roads Operations	Roads	Program	Contract	Sign Reflectivity	Activities to make sure signs meet the retro-reflectivity requirements of the Ontario Traffic Manual	Ontario Regulation 239/02, MMS - Signs	Preventive Maintenance	337	Centerline km	Depends on condition	Program
Roads Operations	Roads	Planned	In-House	Sign Repair/Replacement	Activities to repair or replace information sign and regulatory sign.	Ontario Regulation 239/02, MMS - Signs	Preventive Maintenance	337	Centerline km	Depends on condition	Planned
Roads Operations	Roads	Reactive	In-House	Sign Study	Study conducted by Town to assess need for sign installation upon request or incidents	Ontario Regulation 239/02, MMS - Signs	Corrective Maintenance	337	Centerline km	As requested	Reactive
Roads Operations	Roads	Reactive	In-House	Sink Hole Repair	The activities to excavate and build an aggregate filter in the hole	Ontario Regulation 239/02, MMS - Roadway surface discontinuities	Corrective Maintenance	--	Per Sink Hole	As requested	Reactive
Roads Operations	Roads	Program	Contract	Spring & Fall Streets Cleanup Machine Sweeping & Flushing	Sweep streets to remove accumulated sediment and debris, generally urban section roads, curb, and gutter. Matches catch basin cleaning. Annual PO. Also fall sweeping - smaller more concise area; low-lying urban areas with significant foliage - to assist stormwater system. Approx. week's work	– Reduces the amount of sediment that reaches the receiving environment as well as the need to clean and flush catch basins and sewers – Ontario Regulation 239/02, MMS - Debris – Link to stormwater Levels of Service Metrics	Preventive Maintenance	337	Centerline km	33% per year ongoing	Winter Activities
Roads Operations	Roads	Reactive	In-House	Standing Water	Clearing flood water from roadside	Ontario Regulation 239/02, MMS - Debris	Corrective Maintenance	337	Centerline km	As requested	Winter Activities
Roads Operations	Roads	Planned	In-House	Surface Repair	Activities to repair road surface including Asphalt Patching, Patching and Washout, Pothole Repair, Road Damage Repair, Resurfacing (In-House). If needed, activities such as micro surfacing, surface treatment, asphalt rejuvenation, mill and pave, rout and seal are also included.	Ontario Regulation 239/02, MMS - Roadway surface discontinuities	Preventive Maintenance	337	Centerline km	Depends on condition	Spring & Fall Activities

Asset Group	Asset Class	Activity Type	In-house or Contract	Maintenance Activity Name	Definition	Benefits / Applicable Regulation / Levels of Service	Maintenance Type	Total Quantity	Units	Desired Activity Frequency	Maintenance Status Prior to 2021
Roads Operations	Roads	Reactive	In-House	Traffic Count	Study conducted by Town to assess need for road safety hardware (signs, speed bumps, etc.) installation upon request or incidents		Corrective Maintenance	337	Centerline km	As requested	Reactive
Roads Operations	Roads	Reactive	In-House	Tree Down on Road	Clearing trees that are down on roadside	Ontario Regulation 239/02, MMS - Debris	Corrective Maintenance	337	Centerline km	As requested	Planned and Reactive
Roads Operations	Roads	Program	In-House	Snowplow Damage Repair	Repair associated with damage from snow plowing	Ontario Regulation 239/02, MMS - Snow accumulation, roadways	Corrective Maintenance	--	Asset	Depends on condition	Reactive
Roads Operations	Roads	Reactive	In-House	Snow Plowing	Activities to clear away snow	Ontario Regulation 239/02, MMS - Snow accumulation, roadways	Corrective Maintenance	337	Centerline km	Depends on Whether	Reactive
Roads Operations	Roads	Reactive	Contract	Winter Road Maintenance	Snow and ice treatment including providing staff and equipment, and including special event dispatch	Ontario Regulation 239/02, MMS	Corrective Maintenance	337	Centerline km	Depends on Whether	Winter Activities
Roads Operations	Roads	Planned	In-House	Winter Snow Removal, Ice Blading on Gravel Roads and Parking Lots	Removal of snow and removal or roughening of ice and packed snow	Ontario Regulation 239/02, MMS - Ice formation on roadways and icy roadways	Corrective Maintenance	5	Centerline km	Depends on Whether	Winter Activities
Roads Operations	Bridges & Culverts	Reactive	Contract	Additional Investigation	During OSIM inspection, the presence of severe material defects or performance deficiencies may necessitate additional investigations to be done.	Ontario Regulation 472/10 - OSIM Recommended Additional Investigation	Corrective Maintenance	17	Asset	Depends on condition	None
Roads Operations	Bridges & Culverts	Program	In-House	Bridge Cleaning (Routine)	The cleaning of bridge components including: 1) Washing of bearings, bearing seats, truss members, etc. 2) Sweeping of bridge decks, curbs, and gutters. 3) Removal of debris from expansion joints. 4) Debris pick-up or minor removal of aggregate. 5) Cleaning of catch-basins, manholes and deck drains.	– Ontario Regulation 239/02, MMS - Debris – Ontario Regulation 472/10 - OSIM Recommended Works (Routine)	Preventive Maintenance	17	Asset	Once a year	None
Roads Operations	Bridges & Culverts	Reactive	Contract	Bridge Deck Joint Repair	The repair and/or replacement of expansion and/or fixed deck joints and end dams.	Ontario Regulation 472/10 - OSIM Recommended Works (Urgent, 1 Year and 2 Year)	Corrective Maintenance	17	Asset	As requested	None
Roads Operations	Bridges & Culverts	Program	Contract	Bridge Surface Repair	The repair of bridge surfaces such as pothole patching.	Ontario Regulation 472/10 - OSIM Recommended Works (Urgent, 1 Year and 2 Year)	Corrective Maintenance	17	Asset	Depends on condition	None
Roads Operations	Bridges & Culverts	Program	Contract	Concrete Repair	The repair of all concrete components of the structure, such as localized areas on exposed decks or concrete end dams, curbs, pedestrian walks, concrete handrail posts, parapet walls, abutments, and piers, except when the repair is more directly associated with one of the other defined bridge maintenance operations or the quantity of repair is excessive for a maintenance operation.	Ontario Regulation 472/10 - OSIM Recommended Works (Urgent, 1 Year and 2 Year)	Corrective Maintenance	17	Asset	Depends on condition	None
Roads Operations	Bridges & Culverts	Program	Contract	Erosion Control at Bridges	Operations performed to prevent or repair damage due to erosion, such as scour at abutments and around piers, and washouts on slopes. Includes removal	Ontario Regulation 472/10 - OSIM Recommended Works (Urgent, 1 Year and 2 Year)	Preventive Maintenance	17	Asset	Depends on condition	None

Asset Group	Asset Class	Activity Type	In-house or Contract	Maintenance Activity Name	Definition	Benefits / Applicable Regulation / Levels of Service	Maintenance Type	Total Quantity	Units	Desired Activity Frequency	Maintenance Status Prior to 2021
					of obstructions to water flow, clearing of vegetation growth, etc.						
Roads Operations	Bridges & Culverts	Program	Contract	Railing System Repair	The painting, repair and/or replacement of metal handrails, railing systems and posts, as well as touch-up painting activities.	Ontario Regulation 472/10 - OSIM Recommended Works (Urgent, 1 Year and 2 Year)	Corrective Maintenance	17	Asset	Depends on condition	None
Roads Operations	Bridges & Culverts	Program	Contract	Rout and Seal – Concrete and Asphalt Pavement on Bridge Decks	The routing of joints and/or cracks in concrete and asphalt pavement and the filling of same with joint fillers or rubberized asphaltic sealing compounds.	Ontario Regulation 239/02, MMS - Roadway surface discontinuities	Preventive Maintenance	17	Asset	Depends on condition	None
Roads Operations	Bridges & Culverts	Program	Contract	Works for Drainage System	The repair, maintenance, and replacement/ extension of deck drains. Includes steaming and calcium application to unthaw.	Ontario Regulation 472/10 - OSIM Recommended Works (Urgent, 1 Year and 2 Year)	Preventive Maintenance	17	Asset	Depends on condition	None
Roads Operations	Sidewalks	Program	Contract	Sidewalk Cutting (Trip Hazard Removal)	Use a cutting technology to cut the trip hazard from sidewalks	Ontario Regulation 239/02, MMS - Sidewalk surface discontinuities	Preventive Maintenance	120	km	Depends on condition	Program
Roads Operations	Sidewalks	Reactive	In-House	Sidewalk Inspections	Regular sidewalk inspection for identifying hazardous conditions that require correction	Ontario Regulation 239/02, MMS - Sidewalk surface discontinuities – Link to Levels of Service Metrics: Average condition rating of sidewalks	Inspections	120	km	As requested	Reactive
Roads Operations	Sidewalks	Program	Contract	Sidewalk Inspections	Sidewalk inspection program for identifying hazardous conditions that require correction	Ontario Regulation 239/02, MMS - Sidewalk surface discontinuities – Link to Levels of Service Metrics: Average condition rating of sidewalks	Corrective Maintenance	120	km	Once a year	Program
Roads Operations	Sidewalks	Reactive	In-House	Sidewalk Maintenance	In-House activities to address hazards and complaints on sidewalks (ex. trip hazard removal, asphalt patching, etc.)	Ontario Regulation 239/02, MMS - Sidewalk surface discontinuities	Corrective Maintenance	120	km	As requested	Reactive
Roads Operations	Sidewalks	Program	Contract	Sidewalk Mud Jacking	A method for lifting, leveling and restabilizing sunken concrete slabs	Ontario Regulation 239/02, MMS - Sidewalk surface discontinuities	Preventive Maintenance	120	km	Depends on condition	Program
Roads Operations	Sidewalks	Reactive	Contract	Sidewalk Winter Maintenance Services (Snow Plowing, Salting/Sanding)	Activities to maintain sidewalks during winter	Ontario Regulation 239/02, MMS - Snow accumulation on sidewalks	Corrective Maintenance	120	km	Depends on Whether	Reactive
Roads Operations	Sidewalks	Program	In-House	Spring Cleanup - Sidewalk Sweeping	To prevents unwanted materials from flowing into the storm drains causing backups and flooding. It also keeps job sites clean and safe and helps to minimize damage.	Ontario Regulation 239/02, MMS - Sidewalk surface discontinuities	Preventive Maintenance	120	km	20% per year Ongoing	Program
Roads Operations	Streetlights	Program	In-House	Streetlight Inspection	Functional and maintenance inspections on streetlights	– To ensure safety and good operating conditions – Ontario Regulation 239/02, MMS - Luminaires – Link to Levels of Service Metrics: Average condition rating of Average condition rating of streetlights	Inspections	4,381	Asset	Once a year	Reactive
Roads Operations	Streetlights	Planned	In-House	Streetlight Patrol	Biannual inspections of streetlights	Ontario Regulation 239/02, MMS - Luminaires	Inspections	4,381	Asset	Once every two year	Planned
Roads Operations	Streetlights	Reactive	Contract	Streetlight Repairs and Maintenance	Repair streetlights to ensure proper continued operation.	Ontario Regulation 239/02, MMS - Luminaires	Corrective Maintenance	4,381	Asset	As requested	Reactive
Roads Operations	Guardrails	Program	In-House	Guide Rail Inspection	Functional and maintenance inspections on guide rails	Occupational Health and Safety Act, R.S.O. 1990	Inspection	4,500	Meter	Once a year	None
Roads Operations	Guiderails	Reactive	In-House	Guide Rail Maintenance	Reactive maintenance for guide rails	Occupational Health and Safety Act, R.S.O. 1990	Corrective Maintenance	4,500	Meter	As requested	Reactive

Asset Group	Asset Class	Activity Type	In-house or Contract	Maintenance Activity Name	Definition	Benefits / Applicable Regulation / Levels of Service	Maintenance Type	Total Quantity	Units	Desired Activity Frequency	Maintenance Status Prior to 2021
Roads Operations	Ditches	Reactive	In-House	Ditch Inspection	Inspection of the ditches to identify condition and to identify defects. Two types of inspection - routine through patrol. Reactive through complaint	– Reduces the possibility of ditch flooding and failure – Link to stormwater Levels of Service Metrics	Inspection	463	km	20% per year ongoing	None
Roads Operations	Ditches	Reactive	In-House	Ditching	Repairing of ditches and shoulders to improve drainage and reduce the risk of flooding.	– Reduce/eliminate flooding – Link to stormwater Levels of Service Metrics	Corrective Maintenance	--	km	As requested	Reactive
Roads Operations	Culverts (< 3 m in dia.)	Program	In-House	Culvert Flushing	A preventative maintenance program to clean the culverts to ensure they remain free of obstruction; flushing	– Allows clear flow of stormwater through culverts – Link to stormwater Levels of Service Metrics	Preventive Maintenance	904	Asset	20% per year ongoing	Program
Roads Operations	Culverts (< 3 m in dia.)	Reactive	In-House	Culvert Inspection - Small	To inspect the culverts and associated debris barriers in order to identify problems with corrosion, blockages etc.	– Identifies and prevents potential problems or issues with the culverts – Link to stormwater Levels of Service Metrics	Corrective Maintenance	904	Asset	As requested	None
Roads Operations	Culverts (< 3 m in dia.)	Program	In-House	Culvert Repair	Repairs (not full replacement) to culverts including work to headwalls, screens and immediately adjacent channel/bank erosion.	– Prevents further damage to and the ultimate failure of culverts – Link to stormwater Levels of Service Metrics	Corrective Maintenance	904	Asset	Depends on condition	Reactive
Roads Operations	Culverts (< 3 m in dia.)	Program	In-House	Open Culverts - Manual	A corrective action item to manually open up culverts that are plugged with ice, snow or debris.	– Allows clear flow of stormwater through culverts – Link to stormwater Levels of Service Metrics	Preventive Maintenance	904	Asset	10% per year ongoing	None
Roads Operations	Culverts (< 3 m in dia.)	Program	In-House	Open Culverts - Steam	A corrective action item to open up culverts that are plugged with ice or snow using steam.	– Allows clear flow of stormwater through culverts – Link to stormwater Levels of Service Metrics	Preventive Maintenance	904	Asset	10% per year ongoing	None
Roads Operations	Culverts (< 3 m in dia.)	Program	In-House	Open Ditches/Culverts - Mechanical	A corrective action item to use machinery to open up ditches or culverts that are plugged with ice, snow.	– Allows clear flow of stormwater through culverts and ditches – Link to stormwater Levels of Service Metrics	Preventive Maintenance	476	km	5% per year ongoing	None
Roads Operations	Culverts (< 3 m in dia.)	Program	In-House	Screens and Inlets Maintenance	Activities to maintain screen and inlet of culvert to reduce flooding	– Reduce/eliminate flooding – Link to stormwater Levels of Service Metrics	Preventive Maintenance	904	Asset	Depends on condition	None
Roads Operations	Catch Basins	Reactive	In-House	Catch Basin Cleaning	A program to clean catch basins by hand and mechanically to remove debris and improves proper drainage	– Link to stormwater Levels of Service Metrics	Inspection	3,260	Asset	As requested	Reactive
Roads Operations	Catch Basins	Program	Contract	Catch Basin and Oil Grit Separator Cleaning	A program to clean catch basins by hand and mechanically	– Removes debris and improves proper drainage – Link to stormwater Levels of Service Metrics	Corrective Maintenance	2,271	Asset	Once a year	Program
Roads Operations	Catch Basins	Reactive	In-House	Catch Basin Repair	Emergency repair of catch basins to remove blockages	– Ensures proper drainage – Link to stormwater Levels of Service Metrics	Corrective Maintenance	3,260	Asset	As requested	Reactive
Roads Operations	Catch Basins	Program	In-House	Catch Basins Inspection	– Identifies and prevents potential problems or issues with the Catch Basins – Inspection is done by Town staff who goes out with the contractor for the Catch Basin & OGS Cleaning, but there is no formal program for Catch Basin Inspections – To inspect the Catch Basins and associated debris barriers in order to identify problems with corrosion, blockages etc.	– Link to stormwater Levels of Service Metrics	Corrective Maintenance	3,260	Asset	Once a year	Program
Roads Operations	Catch Basins	Program	In-House	Open Catch Basins - Manual	Removing snow, ice or debris manually (ie shovel) to open up catch basins.	– Ensures proper drainage – Link to stormwater Levels of Service Metrics	Corrective Maintenance	3,260	Asset	72 hours a year as per NWWBI	None

Appendix H – Condition Assessment Plan

Water Condition Assessment Plan

Asset Category	Level of Service Goals / Benefit to Georgina	Methodology / Technology	Unit Cost	Quantity	Frequency	Condition Assessment Cost	Comment

Watermains
(small dia. < 400 mm)
	- Town's Level of Service Goal: Average condition rating of watermains
	- Prevent main breaks and loss of service
	- Inform maintenance plans
	- Prioritize capital programs
	- Forensic investigations
	- Provide Town's Level of Service KPI value:
	  - Average condition rating of watermains
		- External acoustic leak detection (all materials)
		- Structural assessment:
		  - Remaining wall thickness (metallic and asbestos cement (AC)) assessment by using external acoustic stiffness measurement tool. Two sensors are attached to pipe features and noise is induced to create acoustic waves. Stiffness is then determined to calculate the remaining wall thickness of the inspected section (the calculated remaining wall thickness represents the section between the two sensors).
		  - Transient and fatigue analysis for low-risk PVC pipes and HDPE pipes. This is performed to understand the stresses imposed on the pipe. Hydraulic modelling results is considered an input to the assessment.
			- External acoustic leak detection: $12/meter
			- Structural assessment: $25/meter (remaining wall thickness); transient and fatigue analysis (varies)
				Total: 193 km
				(Metallic and AC: 18km)
					- External acoustic leak detection: ongoing 5% per year
					- Structural assessment:
					  - Metallic and AC: ongoing 10% per year
					  - Transient and fatigue analysis:10% per year
						- External acoustic leak detection: $115,800 per year
						- Structural assessment:
						  - Metallic: $45,000 per year
						  - Transient and fatigue analysis: cost varies
							While this assessment considers external acoustic tools, there are distinct types of technologies and platforms in the market. It is recommended to select the inspection method (technology/platform) by considering the following:
							- Material mode of failure
							- Accessibility level
							- Direct and indirect cost
							- Enabling work requirement in case (in-line inspection)
							- Accuracy and resolution of the findings
							Cost excludes engineering services to interpret condition assessment results (estimated $50,000 - $100,000/year depending on the length of inspection, materials involved, project scope, etc.). The cost also excludes soil investigation which would most likely cost $300 per soil sample which covers the use of manual augur for soil sampling and testing in accordance with AWWA C105/A21.5.
							Generally, the first step for a proper condition assessment plan is to complete a desktop analysis prior to selecting segments for inspections (completed as part of the risk management framework). Pipelines that are critical to the network and at a high likelihood to fail, are prioritized for inspection. Based on inspection results, the outputs can be used to update the estimated remaining service life. For example, in metallic pipelines such as CI and DI, the remaining wall thickness obtained from the condition assessment can be extrapolated to determine the number of years remaining for the pipe to fail.
							This occurs when the remaining wall thickness at any point in time reaches a thickness were the pipe cannot withstand the imposed live and dead load. In such a case, the factor of safety will be less than one. Interventions should be completed at a point before the pipe reaches a factor of safety closer to one to avoid sudden failure.
							The Town should prioritize condition assessment by risk assessment results.

Asset Category	Level of Service Goals / Benefit to Georgina	Methodology / Technology	Unit Cost	Quantity	Frequency	Condition Assessment Cost	Comment
Watermains (large dia. >= 400 mm)	- Inform maintenance plans - Prioritize capital programs - Forensic investigations - Provide Town's Level of Service KPI value: - Average condition rating of watermains	- External acoustic leak detection - Electromagnetic (wire break detection and localization) for Concrete Pressure Pipe (CPP)	- External acoustic leak detection: $12/meter - CPP Electromagnetic: $70/meter, excluding enabling work	- Leak detection: 22 km - CPP Electromagnetic: 4 km	- External acoustic leak detection: ongoing 10% per year - CPP Electromagnetic: ongoing 10% per year	- Leak detection: $26,000 per year - CPP Electromagnetic: $28,000 per year	Costs exclude enabling work requirements or the application of Electromagnetic technique. Enabling work including equipment and excavation range from $50,000 to $100,000 depending on the pigging launch platform and extraction platform. Costs are also subject to site conditions and other factors that may impact the estimation and workflow. Leak detection considers the application of external acoustic sensors, but some inline free-swimming tools can be deployed as well while also considering enabling work for insertion and extraction. Cost excludes engineering services to interpret condition assessment results (estimated $50,000 - $100,000/year depending on the length of inspection, materials involved, project scope etc.) Larger pipelines may need finite element analysis (FEA) which may cost more than $100,000. Cost also excludes soil investigation which would most likely cost $300 per soil sample which covers the use of manual augur for soil sampling and testing in accordance with AWWA C105/A21.5. Generally, the first step for a proper condition assessment plan is to complete a desktop analysis prior to selecting segments for inspections (completed as part of the risk management framework). Pipelines that are critical to the network and at a high likelihood to fail, are prioritized for inspection. Based on inspection results, the outputs can be used to update the estimated remaining service life. For example, in metallic pipelines such as CI and DI, the remaining wall thickness obtained from the condition assessment can be extrapolated to determine the number of years remaining for the pipe to fail. This occurs when the remaining wall thickness at any point in time reaches a thickness where the pipe cannot withstand the imposed live and dead load. In such a case, the factor of safety will be less than 1. Interventions should be completed at a point before the pipe reaches a factor of safety closer to one to avoid sudden failure. **The Town should prioritize condition assessment by risk assessment results.**
Service Connections	- Inform maintenance plans	- Leak detection	- $12/meter	- 13,750	- Ongoing 2% per year	- $26,400 per year	Costs assume the length is 8 m per service. Leak detection can be performed using acoustic leak listening device.

Asset Category	Level of Service Goals / Benefit to Georgina	Methodology / Technology	Unit Cost	Quantity	Frequency	Condition Assessment Cost	Comment
	- Prioritize capital programs						Advanced condition assessment is rarely deployed for service connections as costs of advanced assessment would mostly be higher than the installation of new connection. Generally, service connections are inspected if a leak is suspected from an area close to a connection, but not detected along a pipe. In general, the most common failure to occur is at the location where the service and watermain are connected. In such a case, a leak would have been already detected when utilizing external acoustic sensor on the pipe. Also, inspection may be completed via opportunistic inspection by observing deficiencies at connection/leaks or any substandard conditions that would require replacement. **The Town should prioritize large diameter service connections, such as service connections at industry areas or critical buildings given that the length of the connection are long enough to justify condition assessment cost.**
Water Valves	- Inform maintenance plans - Prioritize capital programs	- Field survey and visual inspection (valves and valve box); locate valve box, valve cycling, detection of leaks (if visible), etc. - Included in Maintenance Plan	- $100/valve	- 3,290	- Ongoing 50% per year	- $164,500 per year	Water valve inspection and turning is included in the Town's maintenance plans. Costs assume that valves are inspected by two personnel at a cost of 100/hr each. Each valve would most likely require 0.5 hrs for inspection. A staged condition assessment approach may also impact the annual expected budgets per year.
Valve Chambers	- Inform maintenance plans - Prioritize capital programs	- Visual inspection included in Maintenance Plan - Detailed condition assessment	- Detailed condition assessment: $2,500/chamber	- 278	- Ongoing 10% per year	- $69,500 per year	The cost could vary depending on location, depth, confined space entry, and type of inspection if other than visual inspection is selected. In practice, there is not a specific standard to assess valve chambers; however, the Manhole Assessment Certification Program (MACP) is a tool that can be applied to assess the valve chamber. The MACP approach would consider the defects that are applicable to valve chambers and determine which valve chambers are in the operational and structural defect categories. Based on the MACP grading system, scores would range between one and five. Each chamber will have a structural and operational grade. It is important to note that prior to the assessment, an inspection form is prepared to suit the inspection of valve chambers as opposed to sewer manhole assessment.
Water Hydrants	- Ontario Regulation 213/07 Fire Code -	- Field survey and visual inspection	- $100/hydrant	- 1,509	- Once every year	- $150,900 per year	Water hydrant inspections are included in the Town's maintenance plans.

Asset Category	Level of Service Goals / Benefit to Georgina	Methodology / Technology	Unit Cost	Quantity	Frequency	Condition Assessment Cost	Comment
	Checking, inspection, testing, notification, and maintenance of fire emergency system - Inform maintenance plans - Prioritize capital programs	- Included in Maintenance plan					The cost assumes that hydrants are inspected by two personnel at a rate of 100/hr each. Each hydrant would most likely require 0.5 hrs for inspection.
Water Meters	- Ensures billing accuracy - Inform maintenance plans - Prioritize capital programs	- Field survey - Consumption record observation (very low or no consumption record) - For larger diameters: Meter testing (remove and test)	- Varies	- 13,750	- Varies	- Varies	Residential meters: replace every 20-25 year. Larger diameter: Meter testing; Town to determine the distribution of diameter and sizes to focus meter testing efforts.
Booster Pump Stations	- Inform maintenance plans - Prioritize capital programs - Provide Town's Level of Service KPI value: - Average condition rating of water booster stations	- Weekly water booster station O&M inspection as a Preventive Maintenance activity in Maintenance Plan - Detailed condition assessment every 5 years	- Detailed condition assessment: $30,000/pump station	- 2	- Weekly water booster station Inspection - Detailed condition assessment once every 5 years	- $60,000 every 5 years	Weekly water booster station O&M inspection is a preventive maintenance activity included in the Town's Maintenance Plan. The Condition Assessment cost varies depending on the size of the booster pumping station. A detailed condition assessment includes: - Pressure and flow testing - Inventory confirmations for process equipment including process structural, process mechanical, process electrical and process instrumentation, building structures and systems including HVAC/mechanical, electrical, plumbing and fire protection components both inside the building and outside close to the building perimeter, and site works such as roads and pavements, drainage, landscaping, manhole, and utilities - Completion of all required asset class attributes (includes capturing manufacturer, model, serial number, and year installed) - Determining the current condition grade of each asset using the condition rating scale - Application of consequence of failure/criticality values based upon established criteria and information derived from discussion with plant staff - Populating the current asset replacement value based on local cost data - Developing a risk assessment and forecasting model

Wastewater Condition Assessment Plan

Asset Category	Level of Service Goals/ Regulation / Benefit to Georgina	Methodology / Technology	Unit Cost	Quantity	Frequency	Condition Assessment Cost and Frequency	Comment

Wastewater-Force Mains	- Inform maintenance plans
	- Prioritize capital programs
	- Forensic investigations
	- Provide Town's Level of Service KPI value:
	  - Average condition rating of sanitary sewers
		- External acoustic leak detection
		- Structural assessment:
		  - Remaining wall thickness (metallic and AC) assessment by using external acoustic stiffness measurement tool.
		  - Two sensors are attached to pipe features and noise is induced to create acoustic waves.
		  - Stiffness is then determined to calculate the remaining wall thickness of the inspected section.
		  - The calculated remaining wall thickness represents the section between the two sensors.
			- External acoustic leak detection: $12/meter
			- Structure assessment Remaining wall thickness: $25/meter
				- 17 km
				- Metallic: 1.45 km
					- Leak detection: ongoing 10% per year
					- Structural assessment: ongoing 10% per year
						- External acoustic leak detection: $20,400 per year
						- Structural assessment:
						- Metallic = $3,700 per year
							While this assessment considers external acoustic tools, there are distinct types of technologies and platforms in the market. It is recommended to select the inspection method (technology/platform) by considering the following:
							- Material mode of failure
							- Accessibility level
							- Direct and indirect cost
							- Enabling work requirement in case (in-line inspection)
							- Accuracy and resolution of the findings
							Cost excludes engineering services to interpret condition assessment results (estimated $50,000 -$100,000/year depending on the length of inspection, materials involved, project scope, etc.).
							Cost also excludes soil investigation which would most likely cost $300 per soil sample. Cost would cover the use of manual augur for soil sampling and testing in accordance with AWWA C105/A21.5.
							The Town should prioritize condition assessment by risk assessment results.

Wastewater-Gravity Mains and Maintenance Holes	- Inform maintenance plans - Prioritize capital programs - Forensic investigations	- Gravity mains: CCTV - Maintenance Holes: Panoramic camera	- CCTV: $8/meter - Hot spot flushing: $1.46 /meter - Panoramic camera Inspection: 150/asset	- Gravity mains: 185 km - Hot mains: 5.5 km - Maintenance Holes: 2,561	Gravity mains: - Ongoing 10% per year - Flushing hot spots twice a year (capital) Maintenance Holes: - Ongoing 10% per year	- Gravity mains and Maintenance Holes Condition Assessment: $148,000 + $38,500 = $186,500 per year - Flushing hot spots $16,000 per year	National Association of Sewer Service Companies (NASSCO) recommend frequency is 10% annually. Costs include cleaning and inspection using CCTV. Usually, Sewer condition assessment program includes assessing pipes and maintenance holes in the same program. Assuming maintenance holes are accessible, and inspection is completed via panoramic camera. For larger sewer diameters, advanced sensors are most commonly utilized. These sensors could be sonar, pipe penetrating radar (PPR), or laser profilers. Deploying any of these increases the costs of inspection. **The Town should prioritize condition assessment by risk assessment results.**
Laterals	- Inform maintenance plans - Prioritize capital programs	- CCTV	- $8/meter	- 13,750	- Ongoing 10% per year	- $88,000 per year	Cost assumes that laterals are 8 m in length. Advanced condition assessment is rarely deployed for laterals since the cost of an advanced assessment would most likely be higher than the installation of new laterals. **The Town should prioritize large diameter laterals.**

Asset Category	Level of Service Goals/ Regulation / Benefit to Georgina	Methodology / Technology	Unit Cost	Quantity	Frequency	Condition Assessment Cost and Frequency	Comment
Wastewater Pump Stations (SPS)	- Inform maintenance plans - Prioritize capital programs - Provide Town's Level of Service KPI value: - Average condition of wastewater pumping stations	- Weekly SPS Inspection included in Maintenance Plan - Detailed condition assessment every four years	- $8,500 /pump station on average	- 18	- Once every 5 years	- $153,000 every 5 years	Condition Assessment cost varies depending on the size of the pumping station. A detailed condition assessment includes: - Inventory confirmations of key process equipment including process structural, process mechanical, process electrical and process instrumentation, building structures and systems (such as HVAC/mechanical, electrical, plumbing and fire protection components both inside the building and outside close to the building perimeter), and site work such as roads and pavements, drainage, landscaping, manholes, and utilities. - Completion of all required asset class attributes (includes capturing manufacturer, model, serial number, and year installed. - Determining the current condition grade of each asset using the condition rating scale. - Application of consequence of failure/criticality values based upon established criteria and information derived from discussion with plant staff. - Populating current asset replacement value based on local cost data. - Developing a risk assessment and forecasting model

Stormwater Condition Assessment Plan

Asset Category	Level of Service Goals/ Regulation / Benefit to Georgina	Methodology / Technology	Unit Cost	Quantity	Frequency	Condition Assessment Cost and Frequency	Comment

Stormwater Mains and Maintenance Holes	- Inform maintenance plans
	- Prioritize capital programs
	- Forensic investigations
	- Provide Town's Level of Service KPI value:
	  - Average condition rating of storm sewers
		- Storm Mains: CCTV
		- Maintenance Holes: Panoramic camera
			- CCTV: $8/meter
			- Panoramic camera Inspection: 150/asset
				- Storm Sewer: 71 km
				- Maintenance Holes: 1,210
					- Storm Mains:
					  - Ongoing 10% per year
					  - Flushing hot spots twice a year (capital)
					- Maintenance Holes:
					  - Ongoing 10% per year
						- Storm Mains and Maintenance Holes Condition Assessment: $56,800+ $18,200 = $75,000 per year	NASSCO recommend frequency is 10% annually.
							Costs include cleaning and inspection using CCTV. Usually storm sewer condition assessment programs include assessing pipes and maintenance holes; assuming maintenance holes are accessible, and inspection is completed via panoramic camera.
							For larger main diameters, advanced sensors are most commonly utilized. These sensors could be sonar, pipe penetrating radar (PPR), or laser profilers. Deploying any of these increases the costs of inspection.
							The Town should prioritize condition assessment by risk assessment results.

Stormwater Management Ponds	- Inform maintenance plans - Prioritize capital programs - Provide Town's Level of Service KPI value: - Average condition rating of retention ponds	- Visual inspection included in Maintenance Plan - Bathymetric surveys	- $5,000	- 23 - (Wet Pond: 15)	- Visual inspection: once a year - Bathymetric Survey for wet pond: Once five years	- Bathymetric Survey: $75,000 every five years	Stormwater management ponds visual inspection is included in the Town's Maintenance Plan. Bathymetric Surveys involve monitoring accumulated sediment to plan for large sediment removal projects. Bathymetric surveys are intended to a periodic monitoring tool for wet ponds only. In addition to capital planning, they can support monitoring and reporting of regulatory requirements related to sediment removal. Bathymetric surveys and environmental monitoring can be used to trigger dredging products that "reset" the capacity of the storage basin. Sediment survey cost varies depending on size of ponds.
Oil and Grit Separators	- Inform maintenance plans - Prioritize capital programs	- Visual inspection for oil/sediment included in Maintenance Plan - Camera inspection for condition Assessment	- $150/each for condition assessment (Oil/sediment accumulation)	- 21	- Oil/sediment accumulation once every year	- Oil/sediment accumulation: $3,150 per year	OGS visual inspection is included in the Town's Maintenance Plan. Visual inspection includes accessing the unit, measuring accumulated sediment, and recording observations.
Infiltration & Exfiltration Galleries	- Inform maintenance plans	- Visual inspection included in Maintenance Plan	- $100/each for visual inspection	- 20	- Visual inspection: ongoing 10% per year - Blockages and sediment: once every year	- $2,000 per year	Stormwater LIDs visual inspection is included in the Town's Maintenance Plan.
Bioswales	- Inform maintenance plans	- Visual inspection included in Maintenance Plan	- $100/each	- 1	- Once every year	- $100 per year	Bioswale visual inspection includes inspecting litter, blockages, sediment, and vegetation

Asset Category	Level of Service Goals/ Regulation / Benefit to Georgina	Methodology / Technology	Unit Cost	Quantity	Frequency	Condition Assessment Cost and Frequency	Comment
Road Crossing Culverts (< 3 m in dia.)	- Allows clear flow of stormwater through culverts - Inform maintenance plans - Prioritize capital programs	- Outside visual inspection is a preventive activity included in Maintenance Plan - Inside camera inspection for culvert condition	- $150/each for visual inspection - $8/meter for CCTV inspection	- 13 km - 904 Items (GIS)	- Outside visual inspection: once per year - Inside camera inspection: ongoing 10% per year	- Outside visual inspection: $135,600 per year - Inside CCTV inspection: $10,400 per year ongoing	Outside visual inspection is included in Town's maintenance Plan for inspecting blockages and erosion.
Ditches	- Reduces the possibility of ditch flooding and failure - Inform maintenance plans - Prioritize capital programs	- Visual inspection included in Maintenance Plan	- $0.24/meter	- 463 km (GIS)	- Ongoing 20% per year	- $22,300 per year	Ditch visual inspections are included in the Town's Maintenance Plan for inspecting litter, blockages, erosion, sediment, and excessive vegetation. Ditches do not need to be "replaced" and can be managed operationally. Inspection and condition information should drive maintenance renewals.
Catch Basins	- Identify debris barriers and prevent problems with corrosion, blockages etc. - Inform maintenance plans - Prioritize capital programs	- Visual inspection included in Maintenance Plan	- $20/each	- 3,260	- Ongoing100% per year	- $65,200 per year	Catch Basin visual inspection is included in the Town's Maintenance Plan for inspecting litter, blockages, erosion, and sediment.

Roads Infrastructure Condition Assessment Plan

Asset Category	Level of Service Goals/ Regulation / Benefit to Georgina	Methodology / Technology	Unit Cost	Quantity	Frequency	Condition Assessment Cost and Frequency	Comment

Roads	- Ontario Regulation 588 /17 Asset Management Planning for Municipal Infrastructure - Level of Service Metrics
	  - Description or images that illustrate the different levels of road class pavement condition
	  - For paved roads in the municipality, the average pavement condition index value
	  - For unpaved roads in the municipality, the average surface condition
	- Ontario Regulation 239/02 Minimum Maintenance Standard for Municipal Highways – Cracks repair, Roadway surface discontinuities
	- Inform maintenance plans
	- Prioritize capital programs
	- Forensic investigations
		- Road Routine Patrols included in **Maintenance Plan**
		- York Region CA program
			- Detailed condition assessment: $109/Survey-Km	- 330 Survey-km	- Once every two years	- Approximately $36,000 every 2 years
						- $5,000 per year software licensing and Support
							Road Routine Patrols is included in Town's Maintenance Plan.
							Town is currently performing road network condition assessment every 2 years.
							Cost excludes RoadMatrix Pavement Management System implementation ($18,000 each), training ($5,000 per 2 days training).
							For paved roads, the typical frequency in the national benchmarking group is inspecting the entire road network once every 4 years and the average unit cost is $115/Survey-km.

Bridges & Culverts (> 3 m)	- Ontario Regulation 588 /17 Asset Management Planning for Municipal Infrastructure - Level of Service Metrics
	  - 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
	  - For bridges in the municipality, the average bridge condition index value
	  - For structural culverts in the municipality, the average bridge condition index value
	- Ontario Regulation 472/10 Standard for Bridges – OSIM Inspection
	- Ontario Regulation 239/02 Minimum Maintenance Standard for Municipal Highways – Cracks repair, Roadway surface discontinuities
	- Inform maintenance plans
	- Prioritize capital programs
	- Forensic investigations
		- Ontario Structure Inspection Manual (OSIM)	- $850 per bridge and $500 per culvert	- Bridges: 9
				- Culverts: 8
					- Once every two years	- $11,700 every two years	Town is currently performing OSIM Inspection for bridges & culverts.
							The unit cost can vary greatly for larger bridges.

Sidewalks	- Ontario Regulation 239/02 Minimum Maintenance Standard for Municipal Highways	- Visual Inspection Included in Maintenance Plan	- Encroachment / Surface	- 120 km	- Once every year	- $9,900 per year	Sidewalk inspection is included in the Town's maintenance plan.

Asset Category	Level of Service Goals/ Regulation / Benefit to Georgina	Methodology / Technology	Unit Cost	Quantity	Frequency	Condition Assessment Cost and Frequency	Comment
	- The standard for the frequency of inspecting sidewalks to check for surface discontinuity is once per calendar year, with each inspection taking place not more than 16 months from the previous inspection. - Sidewalk surface discontinuities standard - Inform maintenance plans - Prioritize capital programs - Provide Town's Level of Service KPI value: - Average condition rating of sidewalks	- Sidewalk Condition Assessment	inspection: $82/km				Detailed condition assessment scope includes inventory confirmation, condition evaluation and identification of required maintenance activities. Required maintenance activities noted in the sidewalk inspection should be identified with timing of recommended future investment. The activities and timing of recommended repairs shall be consistent with the Minimum Maintenance Requirements in Ontario Regulation 239/02. Some municipalities collect sidewalk condition data in conjunction with pavement condition data in accordance with the requirements of ASTM D6433 Standard Practice for Roads and Parking Lot Pavement Condition Index Surveys. The data collected could be imported into a pavement management system where condition indices are calculated using the methods of ASTM D6433 and deficiencies are identified for required maintenance activities. Accessibility Considerations. According to Ontario Regulation 413/12 Integrated Accessibility Standards: Exterior paths of travel, technical requirements – sidewalk slop cannot be steeper than the slope of the adjacent roadway, the Town may perform assessment on accessibility to ensure compliance with the regulation.
Streetlights	- Ontario Regulation 164/99 Electrical Safety Code - Ontario Regulation 239/02 Minimum Maintenance Standard for Municipal Highways - The standard for the frequency of inspecting all luminaires to check to see that they are functioning is once per calendar year, with each inspection taking place not more than 16 months from the previous inspection. - Luminaires Standard - Inform maintenance plans - Prioritize capital programs - Provide Town's Level of Service KPI value: - Average condition rating of streetlights	- Visual Inspection included in **Maintenance Plan** - Condition Assessment: Approach from Electrical Safety Authority (ESA). 2015 Guidelines for the Design, Installation, Operation & Maintenance of Street Lighting Assets	- $10/streetlights	- 4,381	- Luminaires: 100% - Ground resistance testing at each power supply ground electrode: 25% - each ground grid: 12.5% - Visual inspection of all grounding and bonding connections and terminations: 25%	- Approximately $40,000 /every 5 years	Streetlight luminaire Inspection is included in the Town's Maintenance Plan. For detailed condition assessment, adopt approach from Ontario Guide: Electrical Safety Authority (ESA). 2015 Guidelines for the Design, Installation, Operation & Maintenance of Street Lighting Assets

Roadside Safety Infrastructure - Guide Rails	- To reduce roadside related collision frequency and/or severity by correcting deficiencies and/or upgrading roadside safety devices to current standards
	  - MTO's 2017 Roadside Design Guide (RDG)
	  - TAC's 2017 Geometric Design for Canadian Roads (GDGCR)
	- Inform maintenance plans
	- Prioritize capital programs
		- Visual Inspection included in **Maintenance Plan**
		- Detailed condition assessment: Roadside Safety Study
			- Roadside Safety Study: $3,500/km	- 4.5 km	- Once every 5 years	- Approximately $16,000/ every 5 years	Guide Inspection is included in Town's Maintenance Plan.
							Costs of road safety study is dependent on and not limited to the following factors:
							Area of study (Urban vs Rural)
							Existing or anticipated volumes
							Number of intersections
							Field visit requirement vs Desktop review
							Number of project meetings and any other stakeholder meetings

Summary of Condition Assessment Funding Needs

Year	Watermains (small dia. < 400 mm)	Watermains (large dia. >= 400 mm)	Water Valve Chambers	Booster Pump Stations	Wastewater Forcemains	Wastewater Gravity Mains and Maintenance Holes	Wastewater Pump Stations	Stormwater Mains and Maintenance Holes	Stormwater Management Ponds	Oil and Grit Separators	Roads	Bridges & Culverts	Streetlights	Roadside Safety Infrastructure - Guide Rails	Road Crossing Culverts (< 3 m in dia.)	Total
2022	$160,800	$54,000	$69,500	$-	$24,100	$202,500	$-	$75,000	$75,000	$3,150	$-	$75,000	$40,000	$-	$10,400	**$790,000**
2023	$164,016	$55,080	$70,890	$-	$24,582	$206,550	$-	$76,500	$-	$3,213	$46,920	$-	$-	$16,320	$10,608	**$675,000**
2024	$167,296	$56,182	$72,308	$-	$25,074	$210,681	$-	$78,030	$-	$3,277	$-	$78,030	$-	$-	$10,820	**$702,000**
2025	$170,642	$57,305	$73,754	$-	$25,575	$214,895	$-	$79,591	$-	$3,343	$48,816	$-	$-	$-	$11,037	**$685,000**
2026	$174,055	$58,451	$75,229	$64,946	$26,087	$219,193	$165,612	$81,182	$-	$3,410	$-	$81,182	$-	$-	$11,257	**$961,000**
2027	$177,536	$59,620	$76,734	$-	$26,608	$223,576	$-	$82,806	$82,806	$3,478	$50,788	$-	$44,163	$-	$11,482	**$840,000**
2028	$181,087	$60,813	$78,268	$-	$27,141	$228,048	$-	$84,462	$-	$3,547	$-	$84,462	$-	$18,019	$11,712	**$778,000**
2029	$184,709	$62,029	$79,834	$-	$27,683	$232,609	$-	$86,151	$-	$3,618	$52,840	$-	$-	$-	$11,946	**$742,000**
2030	$188,403	$63,270	$81,430	$-	$28,237	$237,261	$-	$87,874	$-	$3,691	$-	$87,874	$-	$-	$12,185	**$791,000**
2031	$192,171	$64,535	$83,059	$71,706	$28,802	$242,006	$182,849	$89,632	$-	$3,765	$54,974	$-	$-	$-	$12,429	**$1,026,000**
Total	$1,761,000	$592,000	$762,000	$137,000	$264,000	$2,218,000	$349,000	$822,000	$158,000	$35,000	$255,000	$407,000	$85,000	$35,000	$114,000	$7,990,000

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