City of Owen Sound

Asset Management Plan

Core Infrastructure

2022

Table of Contents

List of Tables

List of Figures

1. Executive Summary

The ability for the City of Owen Sound (the City) to provide services to the community relies on the existence of a network of assets and is restricted by the condition that those assets are in. Choosing a financially sustainable level of service and maintaining, rehabilitating and replacing assets in order to meet that level of service in the most cost-effective manner is not only important for the fiscal health of the community, but it also is at the core of what asset management is all about.

Asset management is the coordinated activity in place to manage the way in which the City realizes value from its assets in order to provide services effectively and in a financially sustainable manner. It helps to reduce risk and allows municipalities to provide reliable and affordable services to residents of the community while ensuring the needs and expectations of current and future users are being met.

Building upon the City's Strategic Asset Management Policy that was created in 2019, the City has developed this asset management plan to cover its core assets. This plan details information about the City's core assets and the actions required to provide an agreed upon level of service in the most cost-effective manner while managing known risks.

This plan covers the City's core assets, including:

- Road Network
- Bridge Network
- Stormwater Network
- Water Network
- Wastewater Network

The City's core assets have a combined replacement value of over $1.1 billion.

Specific details on the components within each of these categories, as well as the total current replacement value, annual deficit, and overall rating for each asset category, can be seen in **Table 1** below.

Table 1: Core Asset Network Overview

Asset Category	Asset Details	Replacement Value (2022 $)	Average Annual Deficit	Overall Rating
Road Network	Roads (paved and unpaved) Sidewalks Curbs Guiderails	$ 156,238,101	$ 390,129	B +
Bridge and Culvert Network	Bridges (Vehicular) Trails & Pedestrian Bridges Culverts	$ 27,697,414	$ 126,951	C -
Stormwater Network	Collection Pipes Manholes Catch Basins Ditch Inlets Leads Stormceptors Retention Ponds Drainage Channels Stormwater Services	$ 188,901,888	$ 2,519,184	D +
Water Network	Watermains Valves Water Chambers Fire Hydrants Services Meters Pumping Stations Water Treatment Plant	$ 422,062,133	$ 11,407,780	D -
Wastewater Network	Collection Pipes Manholes Force Mains Wastewater Services Pump stations Wastewater Treatment Plant	$ 394,643,371	$ 7,902,857	D +
Total Core Assets		**$ 1,189,542,907**	**$ 22,346,901**	**C -**

The City's asset management plan measures the current performance of assets against criteria determined by the Province and by the City itself. The expectations of users of the City's services, along with the performance of these assets, can be thought of as *Levels of Service.* Levels of service describe what people experience from a municipality's infrastructure. Levels of service may be either qualitative or quantitative in nature. For the purposes of this asset management plan, only the City's current levels of service have been considered; however, for future iterations of the plan, proposed (or target) levels of service will also be considered.

This plan highlights the lifecycle activities and associated costs that are required to maintain the current level of service. As with anything, there is a certain level of risk associated with any actions (or inactions) the City takes. Risks and the City's current risk profile for its core assets are also briefly discussed in this plan.

In order to maintain the current levels of service provided, the City requires an average annual investment of $45.6 million; however, given the current capital and operating budgets, only approximately half (51.0%) of this amount is anticipated to be funded. The City has an expected annual infrastructure deficit of $22.3 M. The annual requirement for operations is nearly, if not fully, funded in all asset categories with the exception of the bridge network. Therefore the large majority of this infrastructure deficit is the result of capital shortfalls. If more money is not put into the capital budget, the City can expect this funding shortfall to continue to grow and accumulate, putting the City at risk of not being able to provide the current levels of service.

As the City moves forward in its asset management journey, this asset management plan will continue to be refined and further developed to ensure the accuracy and reliability of information. Additionally in the coming years this plan will be built on to include non-core assets in order to provide a fulsome snapshot of the City's current position as it relates to asset management. The ultimate goal is for the City's asset management plans to become living documents that are continually updated as new information is obtained and capital work is undertaken. This will allow for the City's asset management plan to act as a resource for staff and Council when making decisions that impact how funds are raised, allocated and ultimately how projects are prioritized as those funds are spent.

2. Introduction

2.1 City of Owen Sound Background

The City of Owen Sound (the City) is located on the southern shore of Georgian Bay in a valley below the limestone cliffs of the Niagara Escarpment. It lies at the foot of the Bruce Peninsula, famous for its exceptional geography. Known as the Scenic City, Owen Sound features an expansive harbour and bay, winding rivers, tree-lined streets, extensive parks and trails and a historic downtown. As the largest urban community in Grey county, it holds the seat of government in Grey, supporting regional, provincial, and federal government offices, a regional hospital and a campus of Georgian College.

Home to just under 22,000 residents, Owen Sound has been experiencing modest population growth of 1.3% over the last five years.[1] With 400 new housing units entering the market in the coming months along with the attraction of new industry and significant developer investment, the City is projected to reach a population of approximately 25,000 residents by 2046.[2]

2.2 Ontario Regulation 588/17

As part of the *Infrastructure for Jobs and Prosperity Act, 2015*, the Ontario government introduced Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructure (O. Reg. 588/17). This regulation aims to regulate asset management planning for municipal infrastructure and encourage all municipalities to begin or continue their journey towards implementing strong asset management practices.

O. Reg. 588/17 is separated into multiple phases as shown in below. The output from each phase should be approved by Council. All final output should be made available to the public through the municipality's website.

Strategic AM Policy
July 1, 2019

AM Plan for Core Assets
July 1, 2022

AM Plan for All Other Assets
July 1, 2024

Proposed LoS & Financial Strategy
July 1, 2025

[1] https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/details/page.cfm?Lang=E&SearchText=Owen%20Sound&DGUIDlist=2021A00053542059&GENDERlist=1,2,3&STATISTIClist=1&HEADERlist=0
[2] https://docs.grey.ca/share/public?nodeRef=workspace://SpacesStore/a6df39a7-b37c-410c-ae66-91ac3d073e69

2.3 An Overview of Asset Management

What is Asset Management?

Asset management is the coordinated activity in place to manage the way in which the City realizes value from its assets in order to provide services effectively and in a financially sustainable manner.

It helps to reduce risk and allows municipalities to provide reliable and affordable services to residents of the community while ensuring the needs and expectations of current and future users are being met.

Asset management takes a long-term perspective which results in more informed strategic decisions that optimize investments to better manage the risk of infrastructure while taking into consideration other important factors, such as official plans, strategic initiatives, and climate change. Good asset management does not only maximize the benefits provided by the infrastructure, but also affords the opportunity to achieve cost savings by spotting deterioration early on and taking action to rehabilitate or renew the asset.

Asset management represents a way of doing business that bases decisions on quality data. The goal of an asset management program is to build, maintain and operate infrastructure cost-effectively, provide value to the customer, and improve the credibility and accountability of the municipality. Asset management is a move away from the current infrastructure management system to managing a network of interrelated assets with interdependent programs and services so that scarce resources, including budgetary dollars and staff time, are properly allocated amongst competing asset needs.

Some of the benefits of asset management include:

- Providing the ability to show how, when, and why resources need to be committed by knowing the total investment required to maintain infrastructure assets at acceptable levels to support sound decision making;
- Decisions can be made between competing asset needs to ensure that the priorities of each asset type are being met, reducing the amount of unplanned or high priority maintenance/emergency activities that require a response before the next budgeting cycle;

- Monitoring the performance of assets over the long-term to ensure an adequate level of service is maintained and the ability to measure the progress made in achieving the performance targets;
- Lifecycle costing to identify the investment required to acquire, operate, maintain, renew, and dispose of an asset. Determining how much an asset's lifecycle activities will cost enhances financial planning and helps decision-makers to select the most cost-effective options; and
- Funding decisions can be made with a view of the total cost to be incurred over the useful life of an asset.

What is an Asset Management Plan?

An *asset management plan* (AMP) is a strategic document that states how a group of assets is to be managed over a period of time. The plan describes the characteristics and condition of infrastructure assets, the level of service expected from them, planned actions to ensure the assets are providing the expected level of service, and financing strategies to implement the planned actions.

The purpose of an AMP is to help preserve, protect, and enhance the quality of life within a municipality by systematically managing assets in an efficient, effective and sustainable manner. The objective of the City of Owen Sound Asset Management Plan is to:

- Provide levels of service that meet the needs of the community;
- Provide an asset management process that is effective, achievable, and efficient;
- Develop operating, maintenance, and capital financial plans that support the defined levels of service;
- Manage the assets in a sustainable manner; and
- Enable the collection, coordination, sharing, and communication of information in support of all the above.

An asset management plan helps to highlight what services are really important to the organization and to the community and what the organization is willing and able to pay for. The AMP communicates the requirements for the sustainable delivery of services through management of assets, compliance with regulatory requirements, and required funding to provide the appropriate levels of service.

Asset management is not necessarily all about "*funding* the gap" (the difference between forecast lifecycle activity costs and planned budget); it is about how an organization can *manage* the gap. This may include strategies such as increasing budget/funding and lowering levels of service, among other alternatives. The AMP helps to identify this gap, should one exist, and outlines the consequences and risks of alternatives to manage the gap.

Scope of the Asset Management Plan

This AMP covers the City's core assets, including *Roads, Bridges and Culverts, Stormwater, Water,* and *Wastewater*.

For the purposes of this plan, *water assets* mean any asset that "relates to the collection, production, treatment, storage, supply or distribution of water." *Wastewater assets* mean any asset that "relates to collection, transmission, treatment or disposal of wastewater, including any wastewater asset that from time to time manages stormwater." *Stormwater management assets* mean any asset that "relates to the collection, transmission, treatment, retention, infiltration, control or disposal of stormwater."[3]

For each category, this plan will include the following elements:

- A summary of assets;
- The replacement cost of assets;
- The average age of assets;
- The condition of assets;
- The current levels of service being provided (both qualitative and technical);
- The current performance of assets;

[3] https://www.ontario.ca/laws/regulation/r17588

- The lifecycle activities that would need to be taken to maintain the current level of service and the associated costs to do so; and
- A description of assumptions regarding future changes in population or economic activity.

The sections of this report include:

- State of local infrastructure
- Levels of service
- Asset management strategy
- Financial strategy
- Improvement plan

The state of local infrastructure summarizes the "who, what and where" of the City's assets. It inventories the City's assets and provides replacement cost information as well as other attributes such as age, expected useful life, and condition. Ideally, this component of the plan should be updated annually to ensure that inventories are complete and accurate. Condition assessments should be performed on a rotating schedule to ensure that the physical attribute information does not get out of date.

Levels of service will be measured in several ways for each type of asset including operational indicators such as number of breaks in a water main or the pavement condition index on road segments. Strategic indicators could include the percentage of reinvestment over the total value of the asset category while tactical indicators may be the operating cost per asset unit of measure. For the purposes of this AMP, only current levels of service were considered; however, in the future the City will begin to collect and document desired levels of service which will include targets for services that take into account community expectations, strategic and corporate goals, legislative requirements and expected asset performance.

The asset management strategy includes the activities that will be required to meet the current levels of service. These actions may include regular maintenance and renewal activities, timing the replacement of assets that have reached the end of their useful lives, as well as non-infrastructure solutions such as implementing policies and using land use planning to lower costs and maximize the useful lives of assets. The management strategy will take risk assessments into consideration in prioritizing projects and maintenance activities.

Next, the financing strategy section provides a brief overview of financial planning and available funding sources. This section will be substantially expanded upon in future iterations of the plan. Eventually, the financing strategy will consider all available funding sources including but not limited to reserves, debt instruments, user fees and the tax levy as well as known contributions from third parties. The ultimate result will be a deficit or surplus that is the difference between expenditure requirements and available financing.

Finally, the improvement plan outlines key areas of focus for future iterations of the plan. This could range from further investigation into/validation of data, increased resident engagement/feedback, expanding on existing sections of the plan, or adding new sections of the plan, among other items. The improvement plan lays out the recommended improvement along with who is responsible, what resources are required, and the target timeframe to have the improvement completed.

2.4 Link to Strategic Plan

In 2021 City Council approved Owen Sound's Strategic Plan Refresh (2021-2023). The current Strategic Plan Refresh built off the previous Strategic Plan, maintaining the same vision, mission, values, and pillars as they continue to resonate with the community and staff. The nine key priorities from the refreshed Strategic Plan are: *Prosperous City, Green City, A City that Grows, A City that Moves, City Building, Collaborative City, Clear Direction, Safe City,* and *Service Excellence.*

An asset management program supports the strategic plan in several focus areas.

Proper asset management promotes *Prosperous City* and *Clear Direction* through a plan that helps Council prioritize projects on a risk-assessed needs basis and allocate funding sources to meet those needs in a way that is financially sustainable. The timing of spending on maintenance and renewal is such that the City will maximize the benefit of its assets and their associated useful lives. Having the asset management plan as a reference will also assist Council in making decisions regarding economic development as it is a tool that can be used to visualize the future costs associated with new infrastructure ensuring that growth is sustainable and responsible.

The asset management program supports being a *Collaborative City* and *City Building* by taking the needs of the community into consideration when determining service level goals and ensuring that assets are in place and functioning appropriately to provide the services essential in supporting Owen Sound's vision of being "*Where you want to live*".

Managing the current funding gap on existing assets and ensuring that financial resources are in place to support new growth infrastructure are the main objectives of the asset management plan. The City's progress towards meeting this objective is a metric that will be used going forward to ensure that Council is following the strategic plan and the City is meeting its goals.

2.5 Current Status

While asset management is not a new concept to Owen Sound, the City is still at a fairly early maturity stage in terms of formal asset management planning. The City has a vast amount of institutional knowledge due to the expertise of long-time staff; however, the City is currently working on documenting this knowledge in a more consistent and formalized manner as well as integrating all of its key planning documents with its AMP.

In order to adhere to the requirements set out under the Municipal Infrastructure Investment Initiative Program, in 2014 the City developed an asset management plan that addressed roads (including sidewalks), bridges, stormwater, water, and wastewater systems. The completion of this plan allowed the City to qualify for future Provincial funding programs and acted as a tool to allocate other funding sources to renewal projects in the most efficient and cost-effective manner.

2.6 Next Steps

With this AMP, the City is meeting the requirement under O. Reg. 588/17 to have an asset management plan in place for core assets by July 1, 2022. Additional asset categories, such as recreation and administration facilities, fleet and machinery, traffic and street lighting, parks amenities, trails, paved areas, information technology, and other equipment, will continue to be added to this plan to meet the requirement to have an AMP for all assets by July 1, 2024.

Once complete, the City's AMP will be an integral part of the City's operations. The AMP will feed the long-range financial plan of the City and assist the City in achieving its strategic goals. With the knowledge and support of the community, Council and staff will make decisions that ensure the long-term sustainability of the City.

In accordance with O. Reg. 588/17, the City shall review and update its asset management plan at least every five years. It should be noted that this requirement refers to a formal update of the AMP document; as part of its ongoing operations, the City will continuously be working on asset management practices including updating inventory, keeping condition assessments up to date, updating lifecycle forecast costs, and other asset management best practices.

Additionally, the City will provide an annual asset management progress report to Council on or before July 1st. The annual review will address the City's progress in implementing its asset management plan, any factors impeding the City's ability to implement its asset management plan, and a strategy to address any of the previously mentioned factors.

3. State of Local Infrastructure

3.1 Introduction

This section of the AMP will provide an overview of the City's current position as it relates to core assets. The State of Local Infrastructure section contains key asset data such as inventory, replacement cost, average age, and condition for assets in each category.

As part of the development of the City's 2014 AMP, the City retained the services of a consultant to review and extract asset information from various incomplete asset databases, dated inventory maps, and over 3,500 as-built drawings. The consultant also conducted limited in-field data collection and assessment for the entire road network including the guiderail, curb, and sidewalk components as well as 3D-imaging for almost all sanitary manholes. For this AMP, the 2014 data has been reviewed, verified, updated, and supplemented by more recent asset data as contained within the City's asset management systems, regularly completed third-party asset assessment/condition reports and other reports, data collected and maintained by field staff, and professional judgment and expertise.

3.2 Summary Report Card

Table 2 below summarizes the City's current performance of each core asset category as it relates to *Condition vs. Performance*, *Funding vs. Need,* and *Overall*. More information on these categories and how the scores were calculated can be found in the sections below. Full report cards for each asset class can be found in **Appendix C**.

Table 2: City of Owen Sound Summary Infrastructure Report Card

Asset Category	Condition vs. Performance	Funding vs. Need	Overall Rating
Road Network	B -	A	B +
Bridge Network	A -	F	C -
Stormwater Network	B	F	D +
Water Network	C -	F	D -
Wastewater Network	B -	F	D +
Total Core Assets	**B -**	**D**	**C -**

3.2 Asset Rating Criteria

Each asset network will ultimately be evaluated based on two key dimensions, *Condition vs. Performance* and *Funding vs. Need*.

3.2.1 Condition vs. Performance

The condition of assets within each asset category was considered to determine the condition vs. performance score. The replacement value of assets in each condition category (excellent to very poor) was converted to a weighted average score based on the total replacement value for the category. The score for each condition level was then aggregated to arrive at a total weighted rating score for the category, which could then be converted into a letter grade.

Asset Condition

The City can undertake numerous investigative techniques to determine and track the physical condition of its infrastructure. For instance, the interior of sanitary and stormwater pipes can be routinely inspected using CCTV (closed circuit television) inspection. These inspections are guided by standard principals of defect coding and condition rating that allow for a physical condition "score" for the infrastructure to be developed. For infrastructure without a standardized approach to condition assessment scoring, information such as visual inspections, bridge audits, annual pavement inspections, watermain break records and other maintenance related observations can be used in establishing the condition of the asset.

3.2.2 Funding vs. Need

The second evaluation criterion reflects the status of funding dedicated to maintain, rehabilitate, replace, and improve the current condition of existing infrastructure. Infrastructure systems need funding that is dedicated, indexed, and long-term. The primary measure is the actual amount of funding provided versus the estimated investment required to meet or maintain the desired levels of service. The calculated ratio is then placed into one of five rating categories ranging from Very Good to Very Poor as shown in **Table 3** below.

Table 3 – Rating Categories based on Funding Levels

Rating Category	Description
Very Good (5.0, A)	91% - 100% of the Funding need is supported.
Good (4.0, B)	76% - 90% of the Funding need is supported.
Fair (3.0, C)	61% - 75% of the Funding need is supported.
Poor (2.0, D)	46% - 60% of the Funding need is supported.
Very Poor (1.0, F)	< 45% of the Funding need is supported.

3.2.3 Blended Rating

The overall rating for each asset network should be based on the consolidation of the *Condition vs. Performance* rating and the *Funding vs. Need* rating. At some point the City may want to consider *Capacity vs. Need* as an additional asset evaluation criterion that relates the demand on a system, such as volume or use, to its design capacity.

For the initial State of Local Infrastructure assessment each factor will contribute equally to the overall rating as indicated in **Table 4** below.

Table 4: Overall Rating Contribution

Rating Category	Weighting Factor	Overall Rating
Condition vs. Performance	50%	} A to F
Funding vs. Need	50%	

In the future the City may want to adjust the contribution of each factor to better reflect their relative impact on sustainability. The *Funding vs. Need* criterion appears to be the most critical for most municipalities in terms of sustainability. For example, quite often new infrastructure assets are built through grants, development charges, or other external sources of funding with little or no consideration of its proper maintenance, rehabilitation, and ultimate replacement. In these cases, the newer asset may have received a very favourable *Condition vs. Performance* rating, but it will receive a low rating in the *Funding vs. Need* category due to the lack of financial investment and planning that compromise the long-term sustainability of the asset.

The overall rating ratio is then placed into one of five rating categories as shown in **Table 5** below to provide a letter grade for the asset network[4].

Table 5: Overall Letter Grade

Letter Grade	Criteria (Rating)
A	5.0
A -	4.7
B +	4.3
B	4.0
B -	3.7
C +	3.3
C	3.0
C-	2.7
D +	2.4
D	2.1
D -	1.8
F	1.8 or less

[4] https://blog.collegevine.com/ap-class-grading-scale/

Table 6 below provides a summary of the assets covered by this plan, along with the total replacement value of assets in each category and the percentage of the City's total core infrastructure replacement value each category represents.

Table 6: Core Asset Summary

Asset Category	Asset Details	Replacement Value (2022 $)	Replacement Value (%)
Roads	Roads (arterial, collector, local, unpaved) Sidewalks Curbs Guiderails	$ 156,238,101	13.1%
Bridges and Culverts	Bridges (Vehicular) Trails & Pedestrian Bridges Culverts	$ 27,697,414	2.3%
Stormwater	Collection Pipes Manholes Catch Basins Ditch Inlets Leads Stormceptors Retention Ponds Drainage Channels Stormwater Services	$ 188,901,888	15.9%
Water	Watermains Valves Water Chambers Fire Hydrants Services Meters Pumping Stations Water Treatment Plant	$ 422,062,133	35.5%
Wastewater	Collection Pipes Manholes Force Mains Wastewater Services Pump Stations Wastewater Treatment Plant	$ 394,643,371	33.2%
Total Core Assets		**$ 1,189,542,907**	**100%**

3.2 Road Network

The following information regarding road network asset data is compiled from various incomplete databases, professional expertise, and third-party reports (such as the pavement condition evaluation report).

3.2.1 Inventory

The road network that serves the City of Owen Sound consists of various types of arterial, collector, and local roadways as well as other associated asset components such as curbs, guiderails, and sidewalks. These components have been identified in **Table 7** below.

Table 7: Road Network Inventory

Asset Type	Asset Component	Quantity (km)	Lane (km)
Road Network	Arterial	27.0 km	69.5 km
	Collector	20.9 km	42.3 km
	Local	69.6 km	138.1 km
	Unpaved	2.6 km	
	Total Roads	**120.1 km**	**249.9 km**
	Sidewalks	106.6 km	
	Curb	151.9 km	
	Guiderail	6.8 km	
	Total Other Road Network	**265.3 km**	
	Total Road Network	**385.4 km**	

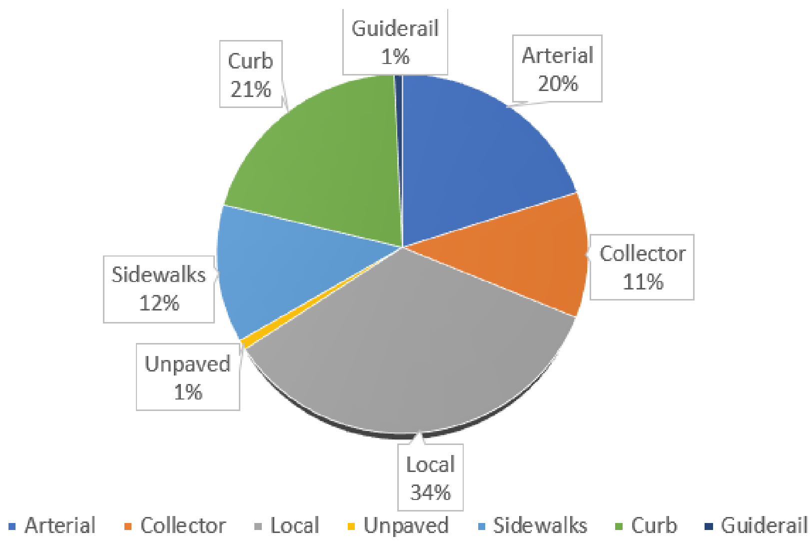
3.2.2 Current Replacement Cost

The replacement cost for the road network was estimated using current standards, historical tender pricing, and current market replacement values. The estimated replacement value of the road network and associated components, based upon current dollar value (2022) is **$156.2 Million.** The following table (**Table 8**) and associated pie chart (**Figure 1**) provide a breakdown of the contribution of each of the network components to the overall system value.

Table 8: Road Network Replacement Value

Asset Type	Asset Component	Quantity (km)	Lane (km)	Replacement Value (2022)
Road Network	Arterial	27.0 km	69.5 km	$ 31,227,961
	Collector	20.9 km	42.3 km	$ 17,669,192
	Local	69.6 km	138.1 km	$ 53,596,397
	Unpaved	2.6 km		$ 1,360,765
	Total Roads	**120.1 km**	**249.9 km**	**$ 103,854,315**
	Sidewalks	106.6 km		$ 19,311,477
	Curb	151.9 km		$ 31,905,184
	Guiderail	6.8 km		$ 1,167,125
	Total Other Road Network	**265.3 km**		**$ 52,383,786**
	Total Road Network	**385.4 km**		**$ 156,238,101**

Figure 1: Breakdown of Road Network Components by Replacement Value



If the total asset value for the City's road network ($156.2 million) is translated to an average value per household assuming 10,140 dwellings, then the average household would have an investment of approximately $15,408 in road network assets.

3.2.3 Average Age

The generalized values used for the typical expected useful life of the road network assets are summarized in **Table 9** below. It should be recognized that the actual asset life is influenced by many variables such as installation, traffic patterns, local weather conditions, etc., and may be greater than the expected useful life in favourable conditions. City staff will continue to refine the asset's expected useful life as more specific data becomes available.

Table 9: Road Network Useful Life and Age

Asset Type	Asset Component	Average Estimated Useful Life (EUL)	Average Age
Road Network	Arterial	40 years	22.4 years
	Collector	40 years	25.4 years
	Local	60 years[5]	32.2 years
	Unpaved	50 years	29.5 years
	Sidewalks	40 years	37.4 years
	Curb	30 years	37.2 years
	Guiderail	40 years	26.9 years

3.2.4 Condition

To determine road condition, the City relies on regularly completed municipal road network studies, which produce a Pavement Condition Index (PCI) score. This score helps to determine the overall condition of each road segment. Additional details on how the road condition is determined can be found in Section 4.2.3 of this report. A similar condition assessment process is in place for other road assets.

The following table (**Table 10**) outlines the road condition rating ranges.

Table 10: Pavement Condition Index Scoring Criteria

Condition	PCI
Excellent	80.0 – 100
Good	65.0 -79.9
Fair	45.0 – 64.9
Poor	40.0 – 44.9
Very Poor	0 – 39.9

[5] Local roads have a substantially higher EUL than arterial or local due to lack of heavy truck traffic which puts significant pressure on the road network and leads to faster deterioration. It is worth noting that within this 60-year lifespan, the road will have to be resurfaced one or two times, but not completed replaced.

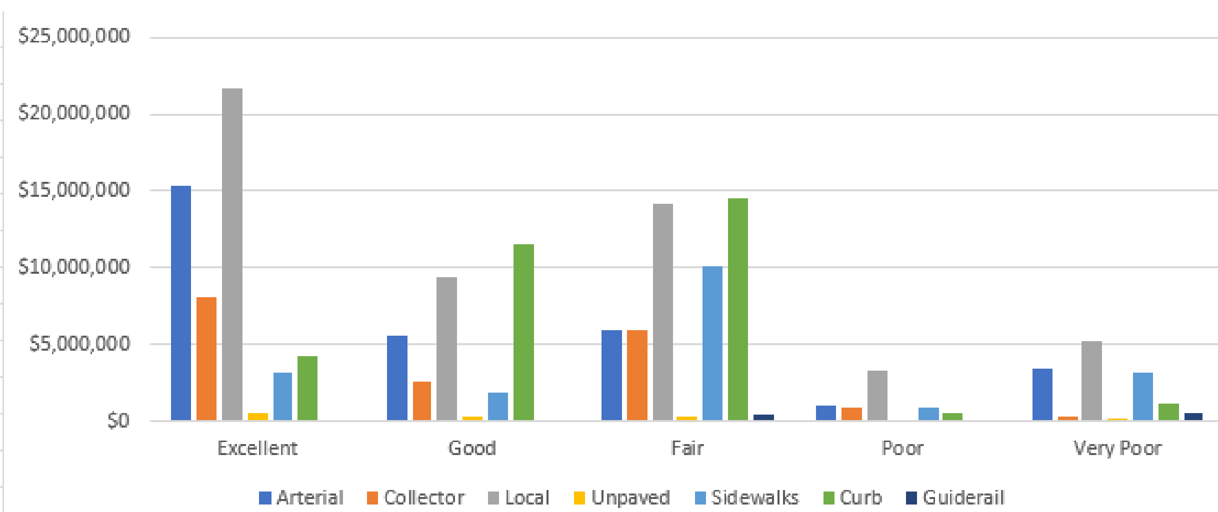
The following table (**Table 11**) and associated pie chart (**Figure 2**) below outline the condition of each component in the road network based on current replacement cost.

Table 11: Road Network Condition by Replacement Value

Asset Type	Asset Component	Excellent	Good	Fair	Poor	Very Poor
Road Network	Arterial	$ 15,337,324	$ 5,583,992	$ 5,917,572	$ 967,693	$ 3,421,381
	Collector	$ 8,026,783	$ 2,528,330	$ 5,876,517	$ 904,523	$ 333,038
	Local	$ 21,653,408	$ 9,323,605	$ 14,131,124	$ 3,251,976	$ 5,236,284
	Unpaved	$ 510,287	$ 340,192	$ 340,192	-	$ 170,095
	Total Roads	**$ 45,527,802**	**$ 17,776,118**	**$ 26,265,405**	**$ 5,124,192**	**$ 9,160,798**
	Sidewalks	$ 3,204,253	$ 1,915,248	$ 10,128,865	$ 909,734	$ 3,153,377
	Curb	$ 4,222,204	$ 11,492,279	$ 14,517,656	$ 567,940	$ 1,105,105
	Guiderail	$ 45,684	$ 105,114	$ 422,123	$ 94,311	$ 499,894
	Total Other Road Network	**$ 7,472,141**	**$ 13,512,641**	**$ 25,068,645**	**$ 1,571,984**	**$ 4,758,376**
	Total Road Network	**$ 52,999,943**	**$ 31,288,758**	**$ 51,334,051**	**$ 6,696,177**	**$ 13,919,174**

Based on the above criteria, nearly 54% of the City's road network is in *good* or *excellent* condition (representing approximately $84.3 million) and about 13% is in *poor* or *very poor* condition (representing approximately $20.6 million).

Figure 2: Breakdown of Road Network Component Conditions by Replacement Value



3.3 Bridges/Culverts

The following information regarding bridge network asset data is compiled from various incomplete databases, professional expertise, and third-party reports (such as the bridge and culvert inspection report).

3.3.1 Inventory

The bridge network that serves the City of Owen Sound consists of various types of bridge structures and culverts. These components have been identified in **Table 12** below.

Table 12: Bridge Network Inventory

Asset Type	Asset Component	Quantity (m^2)	Count (units)
Bridge Network	Bridges (Vehicular)	1,763.6 m^2	4 units
	Pedestrian Bridges	375.8 m^2	7 units
	Culverts	1,329.8 m^2	16 units
	Total	**3,469.2 m^2**	**27 units**

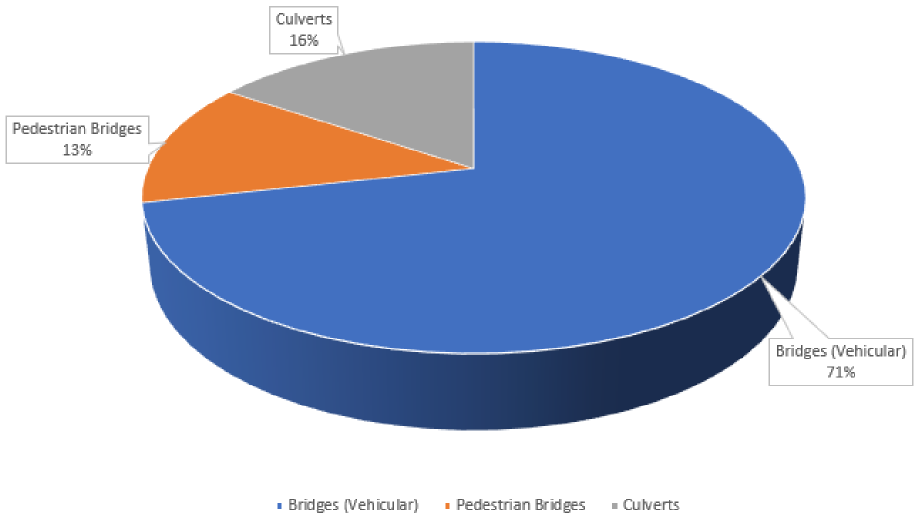
3.3.2 Current Replacement Cost

The replacement cost for the bridge network was estimated using current standards, historical tender pricing, and current market replacement values. The estimated replacement value of the bridge network and associated components, based upon current dollar value (2022) is **$27.7 Million**. The following table (**Table 13**) and associated pie chart (**Figure 3**) provide a breakdown of the contribution of each of the network components to the overall system value.

Table 13: Bridge Network Replacement Value

Asset Type	Asset Component	Count (units)	Replacement Value (2022)
Bridge Network	Bridges (Vehicular)	4 units	$ 19,806,689
	Pedestrian Bridges	7 units	$ 3,592,310
	Culverts	16 units	$ 4,298,415
	Total Bridge Network	**27 units**	**$ 27,697,414**

Figure 3: Breakdown of Bridge Network Components by Replacement Value



If the total asset value for the City's bridge network ($27.7 million) is translated to an average value per household assuming 10,140 dwellings, then the average household would have an investment of approximately $2,732 in bridge network assets.

3.3.3 Average Age

The generalized values used for typical expected useful life of the bridge network assets are summarized in **Table 14** below. It should be recognized that the actual asset life is influenced by many variables such as material, installation, traffic patterns, local weather conditions, etc., and may be greater than the expected useful life in favourable conditions. City staff will continue to refine the asset's expected useful life as more specific data becomes available.

Table 14: Bridge Network Useful Life and Age

Asset Type	Asset Component	Average Estimated Useful Life (EUL)	Average Age
Bridge Network	Bridges (Vehicular)	80 years	17.8 years
	Pedestrian Bridges	80 years	47.4 years
	Culverts	60 years	52.9 years

3.3.4 Condition

To determine bridge/culvert conditions, the City relies on regularly completed bridge and culvert studies, which produce a Bridge Condition Index (BCI) score. This score helps to determine the overall condition of each bridge/culvert.

The following table (**Table 15**) outlines the road condition rating ranges.

Table 15: Bridge Condition Index Scoring Criteria

Condition	BCI
Excellent	80.0 – 100
Good	65.0 -79.9
Fair	45.0 – 64.9
Poor	40.0 – 44.9
Very Poor	0 – 39.9

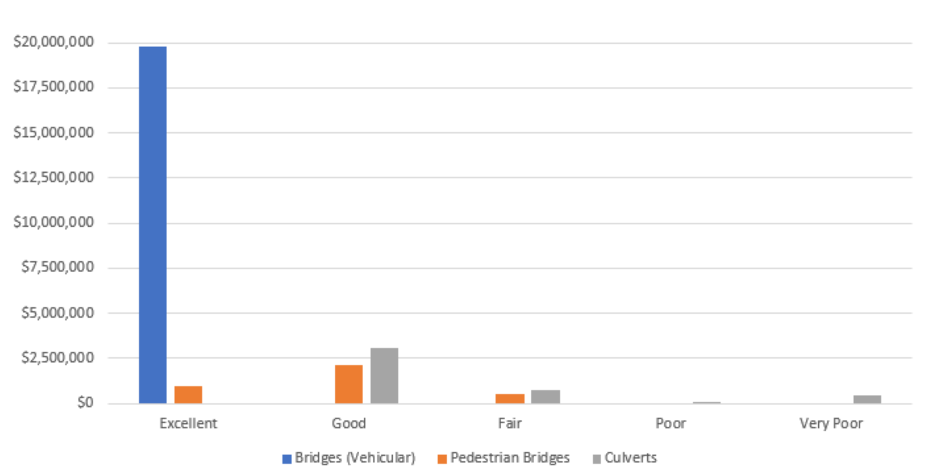
Table 16 below outlines the condition of each component in the bridge network based on current replacement cost.

Table 16: Bridge Network Condition by Replacement Value

Asset Type	Asset Component	Excellent	Good	Fair	Poor	Very Poor
Bridge Network	Bridges (Vehicular)	$ 19,806,689	-	-	-	-
	Pedestrian Bridges	$ 965,994	$ 2,101,237	$ 525,079	-	-
	Culverts	-	$ 3,040,409	$ 700,446	$ 88,706	$ 468,853
	Total Bridge Network	**$ 20,772,683**	**$ 5,141,645**	**$ 1,225,526**	**$ 88,706**	**$ 468,853**

Based on the above criteria, over 94% of the City's bridge network is in *good* or *excellent* condition (representing approximately $25.9 million) and only about 2% is in *poor* or *very poor* condition (representing approximately $558 thousand). The following figure (**Figure 4**) shows the total bridge network condition distribution by replacement value.

Figure 4: Breakdown of Bridge Network Component Conditions by Replacement Value



3.4 Stormwater

The following information regarding stormwater network asset data is compiled from various incomplete databases, professional expertise, dated inventory maps, and as-built drawings.

3.4.1 Inventory

The stormwater network that serves the City of Owen Sound consists of various types and diameters of stormwater collection pipes, manholes, catch basins, ditch inlets, leads, stormceptors, retention ponds, drainage channels, and stormwater services. These components have been identified in **Table 17** below.

Table 17: Stormwater Network Inventory

Asset Type	Asset Component	Quantity
Stormwater Network	Collection Pipes (Stormwater Mains)	178.0 km
	Manholes[6]	2,037 units
	Catch Basins[7]	2,424 units
	Ditch Inlets	164 units
	Leads	31.9 km
	Stormceptors	12 units
	Retention Ponds	5 units
	Drainage Channels (Kenny drain and storm outfalls)	2,980 m
	Stormwater Services	2,000 units

[6] Includes manholes, single catch basin manholes, and double catch basin manholes
[7] includes single and double catch basins

3.4.2 Current Replacement Cost

The replacement cost for the stormwater network was estimated using current standards, historical tender pricing, and current market replacement values. The estimated replacement value of the stormwater network and associated components, based upon current dollar value (2022) is **$188.9 Million**. The following table (**Table 18**) and associated pie chart (**Figure 5**) provide a breakdown of the contribution of each of the network components to the overall system value.

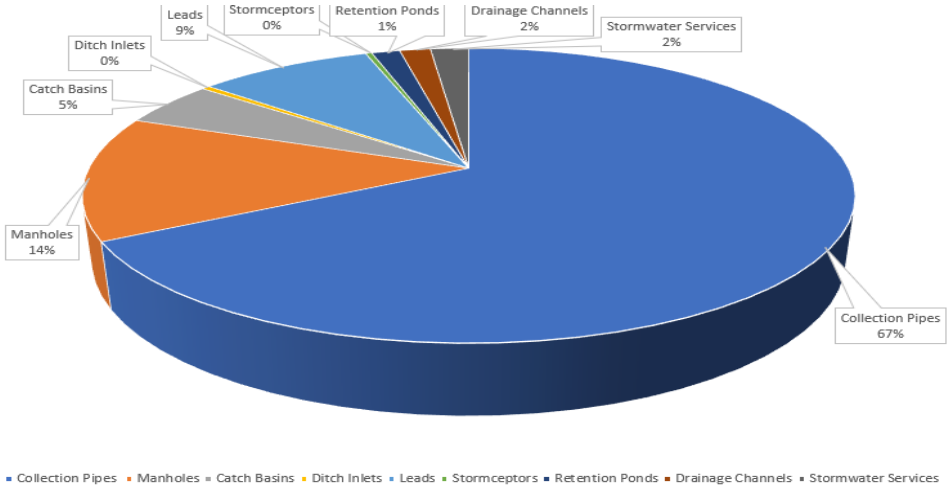
Table 18: Stormwater Network Replacement Value

Asset Type	Asset Component	Quantity	Replacement Value (2022)
Stormwater Network	Collection Pipes (Stormwater Mains)	178.0 km	$ 126,899,561
	Manholes	2,037 units	$ 25,771,490
	Catch Basins	2,424 units	$ 9,250,706
	Ditch Inlets	164 units	$ 773,153
	Leads	31.9 km	$ 16,442,839
	Stormceptors	12 units	$ 593,640
	Retention Ponds	5 units	$ 2,665,000
	Drainage Channels (Kenny drain and storm outfalls)	2,980 m	$ 2,905,500
	Stormwater Services	2,000 units	$ 3,600,000
	Total Stormwater Network		**$ 188,901,888**

As can be seen from **Figure 5** below, the City's stormwater collection pipes make up over 65% of the stormwater collection network based on replacement value.

If this total asset value ($188.9 Million) is translated to an average value per household assuming 10,140 dwellings, then the average household would have an investment of approximately $18,629 in stormwater network assets.

Figure 5: Breakdown of Stormwater Network Components by Replacement Value



3.4.3 Average Age

The generalized values used for the typical expected useful life of the stormwater network assets are summarized in **Table 19** below. It should be recognized that the actual asset life is influenced by many variables such as installation practices, soil conditions, uneven manufacturing quality, local weather conditions, etc., and may be greater than the expected useful life in favourable conditions. City staff will continue to refine the asset's expected useful life as more specific data becomes available.

Table 19: Stormwater Network Useful Life and Age

Asset Type	Asset Component	Estimated Useful Life (EUL)	Average Age
Stormwater Network	Collection Pipes (Stormwater Mains)	80 years	34.7 years
	Manholes	80 years	37.5 years
	Catch Basins	80 years	39.4 years
	Ditch Inlets	80 years	15.6 years
	Leads	80 years	38.9 years
	Stormceptors	80 years	4 years
	Retention Ponds	100 years[8]	15 years
	Drainage Channels (Kenny drain and storm outfalls)	80 years	2.8 years
	Stormwater Services	80 years	40 years

[8] needs to be maintained (i.e. cleaned out) at least every 25 years

3.4.4 Condition

Condition of stormwater assets is determined through a mix of analyzing CCTV images (where possible), completing visual inspections, analyzing the material and/or age of asset components, and supplemented by professional judgment.

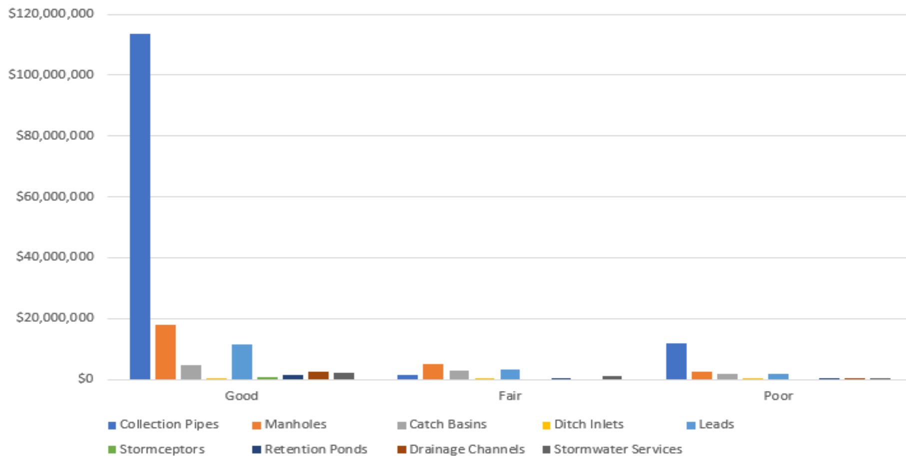
Table 20 below outlines the condition of each component in the stormwater distribution network based on current replacement cost.

Table 20: Stormwater Network Condition by Replacement Value

Asset Type	Asset Component	Good *(No deficiencies)*	Fair *(Some deficiencies)*	Poor *(Many deficiencies)*
Stormwater Distribution	Collection Pipes (Stormwater Mains)	$ 113,579,243	$ 1,511,728	$ 11,808,590
	Manholes	$ 18,040,043	$ 5,154,298	$ 2,577,150
	Catch Basins	$ 4,625,353	$ 2,775,212	$ 1,850,141
	Ditch Inlets	$ 541,208	$ 154,630	$ 77,315
	Leads	$ 11,509,987	$ 3,288,568	$ 1,644,284
	Stormceptors	$ 593,640		
	Retention Ponds	$ 1,599,000	$ 533,000	$ 533,000
	Drainage Channels (Kenny drain and storm outfalls)	$ 2,614,950	-	$ 290,550
	Stormwater Services	$ 2,160,000	$ 1,080,000	$ 360,000
	Total Stormwater Distribution Network	**$ 155,263,424**	**$ 14,497,436**	**$ 19,141,030**

Figure 6 below demonstrates that over 80% of the stormwater collection network is in good condition, representing $155.3 Million, and approximately 10% is in poor condition, representing about $19.1 Million.

Figure 6: Breakdown of Stormwater Network Component Condition by Replacement Value



3.5 Water

The following information regarding water network asset data is compiled from various incomplete databases, professional expertise, dated inventory maps, and as-built drawings.

3.5.1 Inventory

The water network that serves the City of Owen Sound consists of various types and diameters of watermains, valves, water chambers, fire hydrants, services, water meters, pumping stations, and a water treatment plant. These components have been identified in **Table 21** below.

Table 21 Water Network Inventory

Asset Type	Asset Component	Quantity
Water Distribution	Watermain	156.3 km
	Valves	1,982 units
	Valve Chambers	47 units
	Fire Hydrants[9]	715 units
	Services	7,413 units
	Water Meters	7,372 units
	Pumping Stations	2 units
	Water Treatment Plant[10]	1 unit

[9] Includes flush hydrants
[10] Includes three buildings: main treatment plan and control building, raw water pumping station building, and residual management facility building

3.5.2 Current Replacement Cost

The replacement cost for the water distribution network was estimated using current standards, historical tender pricing, and current market replacement values. The estimated replacement value of the water distribution network and associated components, based upon current dollar value (2022) is **$422.1 Million**. The following table (**Table 22)** and associated pie chart (**Figure 7**) provides a breakdown of the contribution of each of the network components to the overall system value.

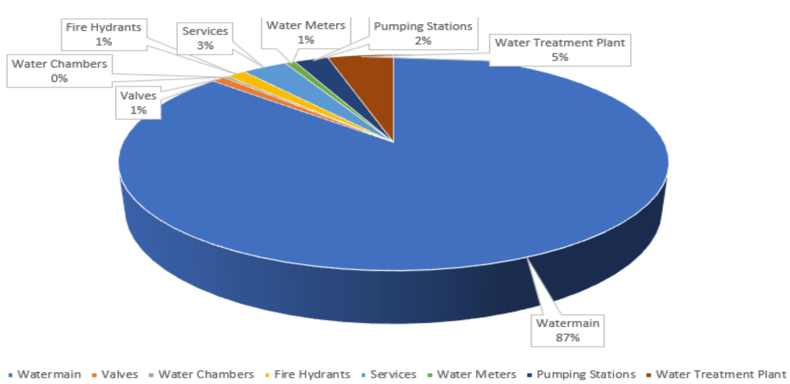
Table 22: Water Network Replacement Value

Asset Type	Asset Component	Quantity	Replacement Value (2022)
Water Network	Watermain	156.3 km	$ 365,010,319
	Valves	1,982 units	$ 4,039,051
	Valve Chambers	47 units	$ 1,330,859
	Fire Hydrants	715 units	$ 5,745,755
	Services	7,413 units	$ 13,343,400
	Water Meters	7,372 units	$ 3,000,000
	Pumping Stations	2 units	$ 10,088,630
	Water Treatment Plant	1 unit	$ 19,504,099
		Total Water Network	**$ 422,062,113**

As can be seen from **Figure 7** below, the City's watermains make up 87% of the water network based on replacement value.

If this total asset value ($422.1 Million) is translated to an average value per household assuming 10,140 dwellings, then the average household would have an investment of approximately $41,623 in water network assets.

Figure 7: Breakdown of Water Network Components by Replacement Value



3.5.3 Average Age

The generalized values used for the typical expected useful life of the water network assets are summarized in **Table 23** below. It should be recognized that the actual asset life is influenced by many variables such as installation practices, soil conditions, uneven manufacturing quality, local weather conditions, etc., and may be greater than the expected useful life in favourable conditions. City staff will continue to refine the asset's expected useful life as more specific data becomes available.

Table 23: Water Network Useful Life and Age

Asset Type	Asset Component	Average Estimated Useful Life (EUL)	Average Age
Water Network	Watermain	80 years	58 years
	Valves	40 years	57.7 years
	Valve Chambers	80 years	32.1 years
	Fire Hydrants	75 years	33.3 years
	Services	75 years	38.7 years
	Water Meters	40 years	30 years
	Pumping Stations[11]	65 years[12]	39.5 years
	Water Treatment Plant (WTP)[13]	50 years	39.1 years[14]

3.5.4 Condition

Condition of water assets is determined through a mix of hiring third-party consultants to complete assessment reports, staff completing visual inspections, analyzing the material and/or age of asset components, and supplemented by professional judgment.

Table 24 below outlines the condition of each component in the water distribution network based on current replacement cost.

[11] Includes Beattie Street Booster Pumping Station (BPS) and East Hill Booster Pumping Station (BPS)
Beattie St. BPS: constructed in 2005 to address low pressure concerns in the SW quadrant of the City. The facility has not undergone any additional upgrades or expansions since its initial construction. The facility consists of four 25 HP pumps.
East Hill BPS: constructed in 1960 in order to serve the City's East Hill pressure zone. At the time of construction, the facility consisted of three pumps (two 75 HP pumps and one 60 HP pump with a back-up diesel generator). In 1999, pump number two was removed and replaced with a larger 250 HP pump and several other mechanical, electrical, and structural upgrades were completed at the same time. In 2004, a self-contained stand-by power diesel generator was installed in addition to structural and electrical upgrades to support the new equipment. In 2014, pumps number one and three were replaced with two 200 HP pumps in addition to other facility upgrades.

[12] the average EUL and average age from the table above represent the overall averages. Within each pumping station there are various structural, electrical, mechanical, and other components that have an EUL of anywhere from 20 – 65 years and an average age of 7 – 65 years

[13] Originally constructed in 1966. Has been expanded/upgraded in 1980, 2000, 2003, and 2006.
1980 expansion: to add additional capacity. Construction of second treatment train, addition of another clear well.
2000 upgrade: replace and upgrade generator.
2003 upgrade: installation of UV reactors, upgrades to fluoridation system, new coagulant chemical tank and pumps, addition of SCADA system components, installation of new vitalization system, installation of new emergency shower.
2006 upgrade: addition of residual management facility (to remove suspended solids from water drained during backwashing operations in the gravity media filters, prior to discharging water into Georgian Bay), expansion to the Chlorine gas room, expansion to the loading dock.

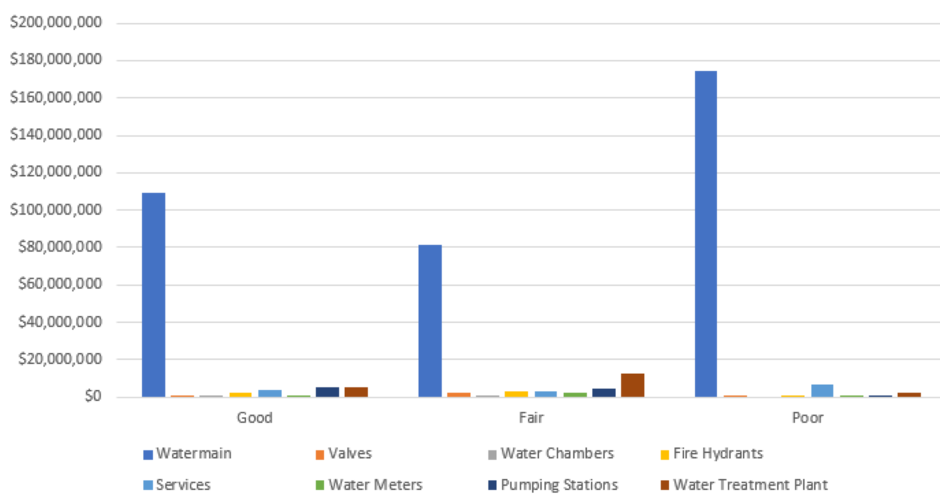
[14] the average age represents the overall average. Within the WTP there are various structural, electrical, mechanical, and other components that have an average age of 7 – 65 years. Average age was calculated through using a weighted average of the age of the original structure and the age of asset components newly implemented through the various updates. Assumption that age is based on 50% of plant being the age of the original construction, 10% being the age of the 1980 update, 15% being the age of the 2003 upgrade, and 25% being the age of the 2006 upgrade based on the magnitude and scale of the upgrades.

Table 24: Water Network Condition by Replacement Value

Asset Type	Asset Component	Good (No deficiencies)	Fair (Some deficiencies)	Poor (Many deficiencies)
Water Network	Watermain	$ 109,145,815	$ 81,474,058	$ 174,390,446
	Valves	$ 807,810	$ 2,221,478	$ 1,009,763
	Valve Chambers	$ 332,715	$ 998,145	-
	Fire Hydrants	$ 2,298,302	$ 3,160,166	$ 287,288
	Services	$ 3,989,958	$ 2,978,387	$ 6,375,055
	Water Meters	$ 450,000	$ 2,400,000	$ 150,000
	Pumping Stations	$ 5,440,833	$ 4,635,689	$ 12,107
	Water Treatment Plant	$ 5,309,721	$ 12,145,118	$ 2,049,259
	Total Water Distribution Network	**$ 127,775,154**	**$ 110,013,040**	**$ 184,273,918**

Figure 8 below demonstrates that about 30% of the water network is in good condition, representing approximately $127.8 Million; however, about 44% of the water network is in poor condition, representing approximately $184.3 Million. The large amount of assets in poor condition is mainly due to watermains, which account for over 90% of the replacement value of those assets in poor condition.

Figure 8: Breakdown of Water Network Component Conditions by Replacement Value



3.6 Wastewater

The following information regarding wastewater network asset data is compiled from various incomplete databases, professional expertise, dated inventory maps, 3-D imaging, and as-built drawings.

3.6.1 Inventory

The wastewater network that serves the City of Owen Sound consists of various types and diameters of sanitary collection pipes, manholes, force mains, wastewater services, pump stations, and a wastewater treatment plant. These components have been identified in **Table 25** below.

Table 25: Wastewater Network Inventory

Asset Type	Asset Component	Quantity
Wastewater Network	Collection Pipes	118.2 km
	Manholes	1,636 units
	Force Main	3.6 km
	Wastewater Services	7,000 units
	Pump Stations	8 units
	Wastewater Treatment Plant	1 unit

3.6.2 Current Replacement Cost

The replacement cost for the wastewater network was estimated using current standards, historical tender pricing, and current market replacement values. The estimated replacement value of the wastewater network and associated components, based upon current dollar value (2022) is **$394.6 Million**. The following table (**Table 26**) and associated pie chart (**Figure 9**) provides a breakdown of the contribution of each of the network components to the overall system value.

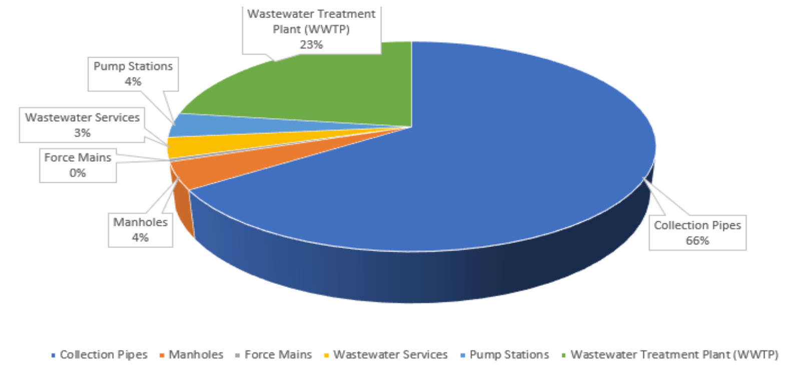
Table 26: Wastewater Network Replacement Value

Asset Type	Asset Component	Quantity	Replacement Value (2022)
Wastewater Network	Collection Pipes	118.2 km	$ 258,739,380
	Manholes	1,636 units	$ 16,451,184
	Force Mains	3.6 km	$ 1,852,806
	Wastewater Services	7,000 units	$ 12,600,000
	Pump Stations	8 units	$ 15,000,000
	Wastewater Treatment Plant (WWTP)	1 unit	$ 90,000,000
	Total Wastewater Network		**$ 394,643,371**

As can be seen from **Figure 9** below, the City's sanitary collection pipes make up over 65% of the wastewater network based on replacement value.

If this total asset value ($394.6 Million) is translated to an average value per household assuming 10,140 dwellings, then the average household would have an investment of approximately $38,919 in wastewater network assets.

Figure 9: Breakdown of Wastewater Network Components by Replacement Value



3.6.3 Average Age

The generalized values used for the typical expected useful life of the wastewater network assets are summarized in **Table 27** below. It should be recognized that the actual asset life is influenced by many variables such as installation practices, soil conditions, uneven manufacturing quality, local weather conditions, etc., and may be greater than the expected useful life in favourable conditions. City staff will continue to refine the asset's expected useful life as more specific data becomes available.

Table 27: Wastewater Network Useful Life

Asset Type	Asset Component	Average Estimated Useful Life (EUL)	Average Age
Wastewater Network	Collection Pipes	80 years	54.3 years
	Manholes	80 years	57.5 years
	Force Mains	80 years	45.8 years
	Wastewater Services	80 years	30.7 years
	Pump Stations	35 years	36.9 years[15]
	Wastewater Treatment Plant (WWTP)	60 years	17.5 years[16]

[15] Pump station ages range from 1 to 48 years old. One of the older pump stations was built in 1962 but underwent a major internal upgrade in 2005; 1962 has been used as its in-service date, although a lot of the components are much newer. Additionally, one of the middle-aged pump stations is set for renewal later in 2022; however, that has not been considered in the average age calculation above.

[16] originally constructed in 1962. The plant has undergone several substantial upgrades over the last several decades, with the most recent (and notable) upgrade completed in 2017. This latest upgrade allows for additional biological treatment, filtration, and disinfection of wastewater before it is discharged back into the Bay. Due to the magnitude of the 2017 update, about 60% of the WWTP can be considered essentially a new facility from this date, with 35% being considered "new" from 1990, and 5% being considered "new" from 1962. Therefore the average age was calculated as (2022-2017) * 0.60 + (2022-1990) * 0.35 + (2022-1962) * 0.05

3.6.4 Condition

Condition of wastewater assets is determined through a mix of hiring third-party consultants to complete assessment reports, staff completing visual inspections, analyzing the material and/or age of asset components, and supplemented by professional judgment.

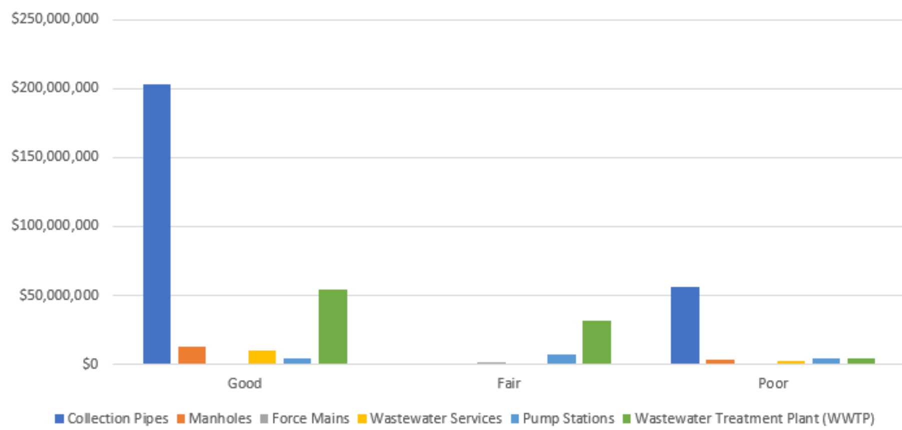
Table 28 below outlines the condition of each component in the wastewater network based on current replacement cost.

Table 28: Wastewater Network Condition by Replacement Value

Asset Type	Asset Component	Good *(No deficiencies)*	Fair *(Some deficiencies)*	Poor *(Many deficiencies)*
Wastewater Distribution	Collection Pipes	$ 202,621,633	-	$ 56,117,747
	Manholes	$ 12,883,102	-	$ 3,568,083
	Force Mains	$ 185,281	$ 1,482,245	$ 185,281
	Wastewater Services	$ 9,867,198	-	$ 2,732,802
	Pump Stations	$ 3,871,429	$ 7,214,286	$ 3,914,286
	Wastewater Treatment Plant (WWTP)	$ 54,000,000	$ 31,500,000	$ 4,500,000
	Total Wastewater Distribution Network	**$ 283,428,643**	**$ 40,196,531**	**$ 71,018,199**

Figure 10 below demonstrates that about 70% of the wastewater network is in good condition, representing approximately $283.4 Million; however, about 18% of the wastewater network is in poor condition, representing approximately $71.0 Million.

Figure 10: Breakdown of Wastewater Network Component Conditions by Replacement Value



4. Levels of Service

4.1 Overview

The goal of every asset manager should be to move away from reactive and “worst first” planning to maintenance of assets in a “state of good repair.” This is the most economical way to manage assets and provide higher levels of service. The path to get there requires a long-term strategy and customer buy-in to assure change.

Levels of service (LoS) describe what people (residents, users of assets, etc.) experience from a municipality’s infrastructure. Levels of service can be qualitative in nature (based on customer values) and describe what is important to users of the service and how users feel about the services, or they can be quantitative in nature (based on specific data, measurables, and metrics).

For the purposes of this AMP, the LoS metrics are focused on the scope and reliability of the service. They will address community levels of service (qualitative) and technical levels of service or technical metrics (quantitative). The levels of service discussed in this plan will only be based on *current* levels of service. For future iterations of the City’s AMP, *proposed* levels of service may be considered.

4.2 Roads

4.2.1 Scope

Community Levels of Service (qualitative descriptions):

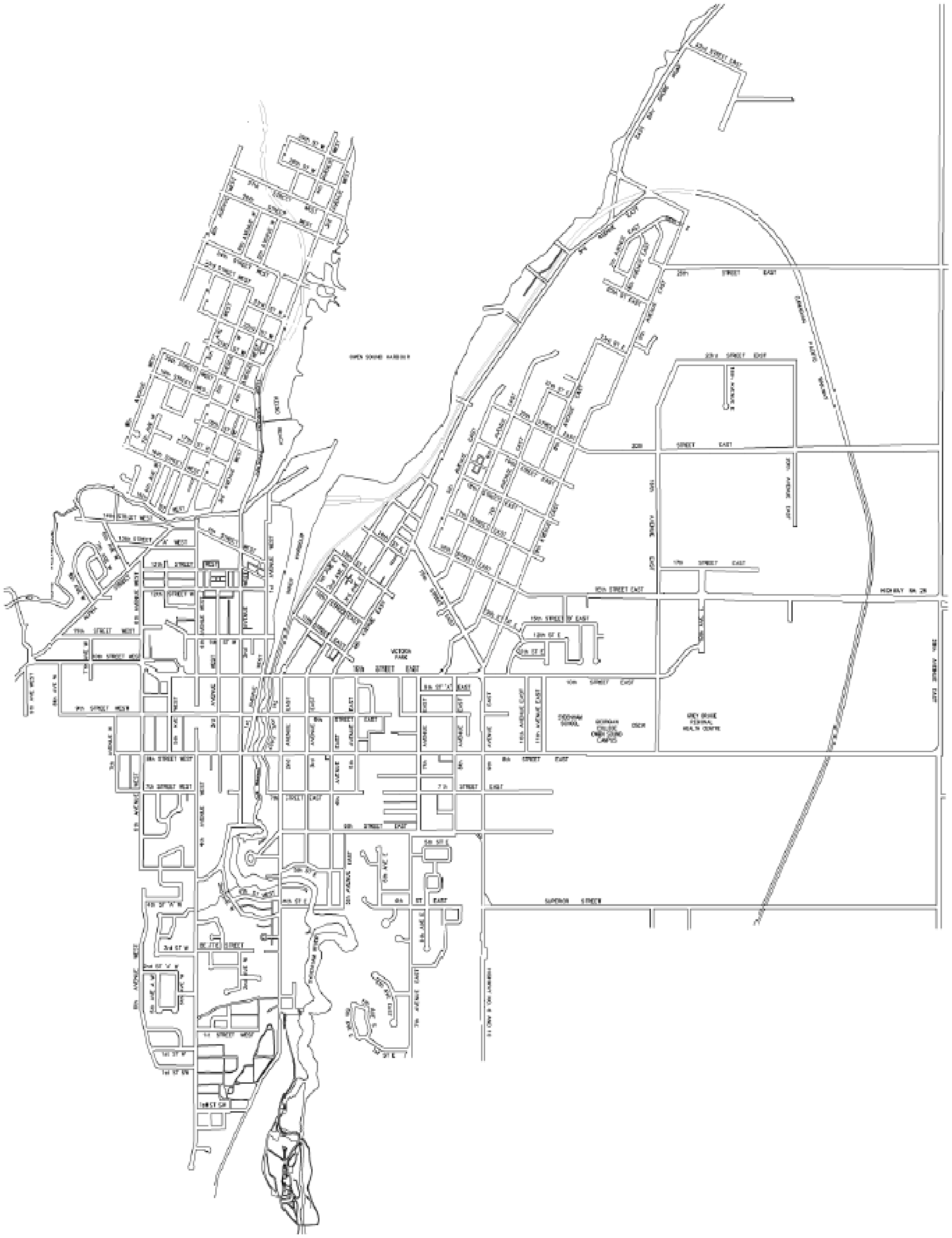
Description, which may include maps, of the road network in the municipality and its level of connectivity

The City’s road network is designed in such a way to allow for all users to efficiently travel through the City in a safe and timely manner. The road network provides connections to and between neighbourhoods, subdivisions, business areas, residential areas, and industrial sites.

Owen Sound’s road network is comprised of 681 road segments, totaling 120.1km. Approximately 117.5km of the road network are asphalt surfaces and 2.6km are gravel.

The following map, **Figure 11**, illustrates the City’s road network infrastructure.

Figure 11: Overview of the City's road network



Technical Levels of Service (technical metrics):

Number of lane-kilometres of each of arterial roads, collector roads and local roads as a proportion of square kilometres of land area of the municipality.

Owen Sound has a land area of 24.27km^2.

Number of lane-kilometres of arterial roads as a proportion of square kilometres of land area of Owen Sound: 0.01002 (1.00%)[17]

Number of lane-kilometres of collector roads as a proportion of square kilometres of land area of Owen Sound: 0.006100 (0.61%)

Number of lane-kilometres of local roads as a proportion of square kilometres of land area of Owen Sound: 0.019916 (1.99%)

4.2.2 Quality

Community Levels of Service (qualitative descriptions):

Description or images that illustrate the different levels of road class pavement condition.

The City retained GM BluePlan Engineering (GMBP) for a six-year term to provide a pavement condition evaluation report on a biennial basis. For the 2021 road condition assessment, as agreed by City staff, GMBP partnered with IRIS R&D Group Inc. in Burlington, ON to provide automated digital data collection for pavement condition for the first time ever, at the same cost as the previous manual methodology. IRIS or similar technology has been implemented by numerous municipalities in Ontario for road asset condition monitoring and assessment.

The IrisGO technology utilizes digital instruments that collect data from a vehicle as it drives on the roads. This includes cameras that are mounted to a vehicle windscreen that take high-resolution digital images at 10-metre intervals over a 110º angle to capture pavement defects. In addition to this, accelerometers mounted in the vehicle collect information related to the roadway roughness. The equipment and instrumentation was supplied by IRIS and the vehicle and driver that was used to drive on the roads was provided by GMBP. The data was transmitted to IRIS' data cloud where it was processed and analyzed using artificial intelligence (AI) and software. The data was used to complete calculations and provide road condition ratings that conform to the Ministry of Transportation Ontario (MTO) criteria for rating pavement condition. The MTO specifications include SP-022 Flexible Pavement Condition Rating Guidelines

[17] Assumed width of roads is 3.5m or 0.0035km. Technical LoS metric calculated as: (69.5 x 0.0035) / 24.27. Similar assumptions and calculations apply to other two road types

for Municipalities, PAV-86-2 Pavement Condition Index (PCI) for Flexible Pavements, and SP-024 Manual for Condition Rating of Flexible Pavements and Distress Manifestations. These are the standards used by municipalities throughout Ontario and the criteria the City has applied for the past 6 years. While the assessment was completed by experienced qualified persons using tables, calculations, reference materials, and professional judgment in 2017 and 2019, the process transitioned to the automated and more consistent methodology, as described above.

The 2021 study inventoried and rated 681 road segments for a total of 120.1 km of roadway in the City. Of this 120.1 km, approximately 117.5 km of roads are asphalt and 2.6 km roads are gravel. Generally, a road segment is defined as a block. For example, 8^{th} Street East from 7^{th} Avenue East to 8^{th} Avenue East (centrelines) is a road segment.

The primary rating criteria is the Pavement Condition Index (PCI), and it is calculated based on the Distress Manifestation Index (DMI) and Ride Comfort Rating (RCR) determined for each road segment by the data collected and interpreted through AI and proprietary software.

Calculating the Pavement Condition Index

The PCI is a numerical value between 0 and 100 where 0 is a failed surface and 100 is a new condition.

The DMI was assessed based on various asphalt surface defects such as loss of aggregate, rippling, wheel rutting, distortion, and cracking. This rating varies from 0.5 for very few slight defects to 4 for many severe defects and is weighted as a percentage of the total surface area. The cameras pick up these images and, based on AI, interprets the images, and determines the DMI.

The RCR was measured by driving on the roads at the posted speed limit and varies from 0 for a very poor ride with constant uncomfortable bumps and depressions to 10 for an excellent ride that is very smooth. The instrumentation was calibrated from actual City roads and used to establish the RCRs for each segment. The vehicle accelerometers measured the vertical displacements and accelerations in the vehicle’s suspension and body caused by the defects and converted the inputs into digital signals that were interpreted and converted into an RCR value.

With the above data collected for each road segment, the PCIs were calculated as per the Transportation Association of Canada’s Pavement Asset Design and Management Guide (2013) and is simplified for illustrative purposes as follows:

$$PCI = 13.75 + (9 \times DMI) - (7.5 \times e^{(8.5-RCR)/3.02})$$

IRIS provided the calculated PCIs for all of the City's road segments in raw form and these results were provided to GMBP staff for further processing.

In the inventory and assessment of roads condition, only City roads including Provincial Connecting Links were assessed. County roads were not included.

A PCI rating of 80 to 100 is excellent, 65 to 79.9 is good, 45 to 64.9 is fair, 40 to 44.9 is poor and 0 to 39.9 is very poor.

Technical Levels of Service (technical metrics):

1. For paved roads in the municipality, the average pavement condition index value.
Based on the 2021 assessment, 22% of the City's paved roads are in excellent condition, 39% are in good condition, 28% are in fair condition, 3% are in poor condition and 8% are in very poor condition (figures rounded to the nearest whole number).

The average PCI for paved roads in the City is 72.5.

2. For unpaved roads in the municipality, the average surface condition (e.g. excellent, good, fair or poor).
Based on the 2021 assessment, it is estimated that 38% the City's unpaved (gravel) roads are in excellent condition, 25% are in good condition, 25% are in fair condition, 0% are in poor condition and 12% are in very poor condition (figures rounded to the nearest whole number).

The average PCI for unpaved (gravel) roads in the City is 68.4.

4.3 Bridges/Culverts

4.3.1 Scope

Community Levels of Service (qualitative descriptions):

Description of the traffic that is supported by municipal bridges (e.g., heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, cyclists). 18
None of the City's bridges have loading or dimensional restrictions, therefore all types of traffic (i.e. heavy transport vehicles, motor vehicles, emergency vehicles) is supported.

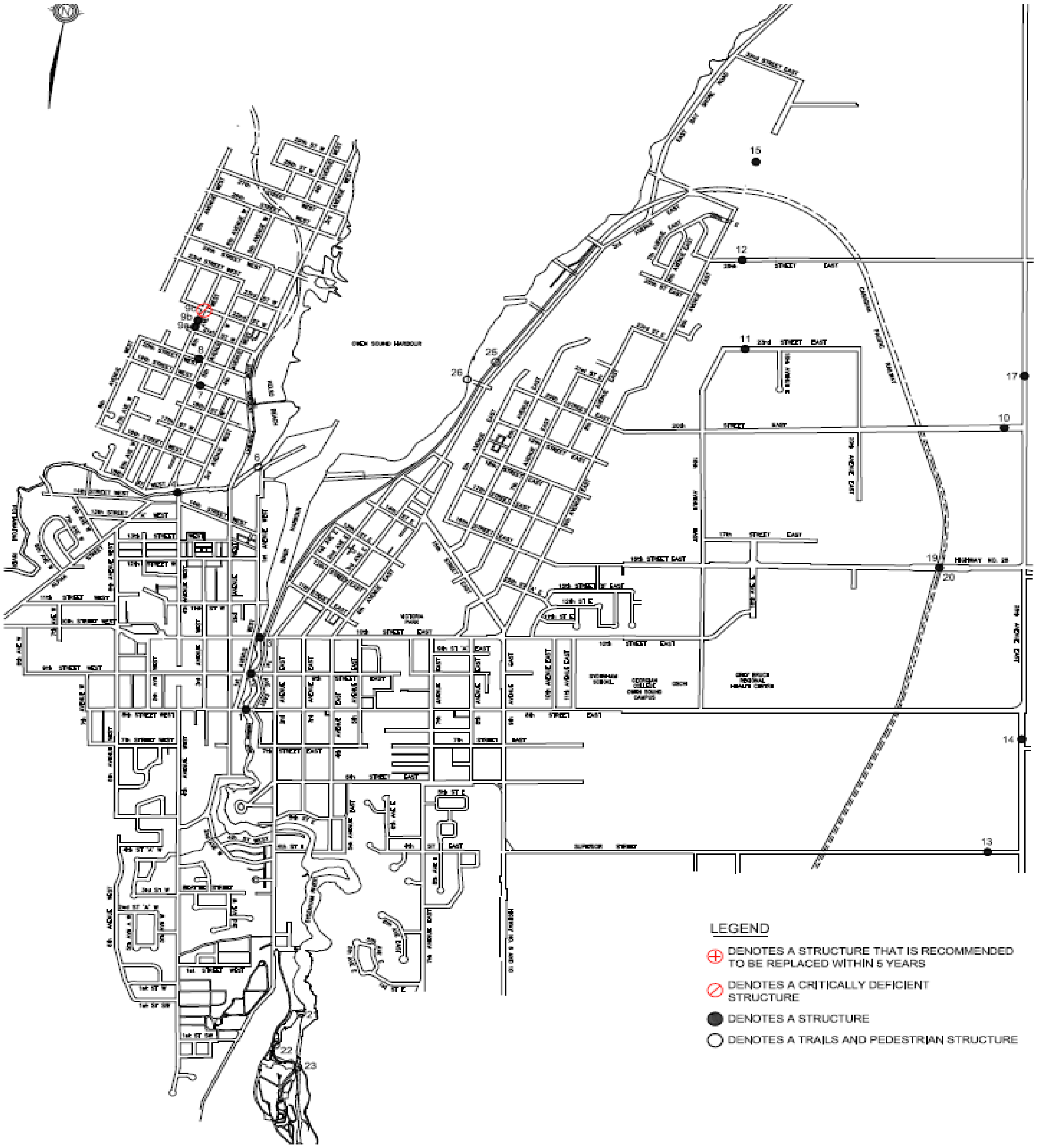
The City's largest and most heavily trafficked bridge has an average annual daily traffic (AADT) of 25,000.

[18] Only vehicular bridges considered for LOS due to lack of data on pedestrian bridges and culverts

The main users of the City's bridges are regular motor vehicles.

The following map, **Figure 12**, illustrates the City's bridge network infrastructure.

Figure 12: Overview of the City's bridge network



Technical Levels of Service (quantitative metrics):

Percentage of bridges in the municipality with loading or dimensional restrictions.

Zero percent of the City's bridges have loading or dimensional restrictions.

One culvert in the City has a load restriction that does not allow bigger vehicles (such as emergency vehicles or Public Works equipment) to use it.

4.3.2 Quality

Community Levels of Service (qualitative descriptions):

1. Description or images of the condition of bridges and how this would affect use of the bridges.

Overall the City's bridges have an average Bridge Condition Index (BCI) of 87.6, meaning they are in excellent condition. Two out of the four vehicular bridges in the City are less than 15 years old, with one of these bridges being less than two years old.

The following photos, **Figures 13** and **14**, illustrate one of the vehicular bridges in the City with the highest BCI rating (100).

Figures 13 & 14: Vehicular Bridge with BCI rating of 100

The following photos, **Figures 15** and **16**, illustrate one of the vehicular bridges in the City with the lowest BCI rating (82).

Figures 15 & 16: Vehicular Bridge with BCI rating of 82

As can be seen from both the photos and the City's BCI scores (lowest score is 82 for vehicular bridges, highest score is 100 for vehicular bridges), the City's vehicular bridges are in excellent condition overall.

While there is a slightly larger BCI range for pedestrian bridges (lowest score is 63 and highest score is 100), the City's pedestrian bridges are also in excellent condition overall.

There is no effect on the use of the bridges (either vehicular or pedestrian) due to their current condition. The City receives a bridge and culvert inspection report biennially, so if any major changes to the condition of the bridges occur that would affect the use of the bridges, the City could make adjustments accordingly.

2. Description or images of the condition of culverts and how this would affect use of the culverts.

Overall the City's culverts have an average BCI of 60.1 (*fair)*. Many of the City's culverts have been in service since the late 1900s, with a few being built as early as 1920.

The following photos, **Figures 17** and **18**, illustrate one of the culverts in the City with the highest BCI rating (75).

Figures 17 & 18: Culvert with BCI rating of 75

The following photos, **Figures 19** and **20**, illustrate one of the culverts in the City with the lowest BCI rating (8).

Figures 19 & 20: Culvert with BCI rating of 8

As can be seen from both the photos and the City's BCI scores (lowest score is 8, highest score is 75), the City's culverts are in fair condition overall.

This does slightly affect the use of the culverts as the City needs to keep a close eye on how conditions may be changing and may need to implement load restrictions on more culverts if conditions continue to decrease.

Technical Levels of Service (quantitative metrics):

1. For bridges in the municipality, the average bridge condition index value.

As previously stated, overall the City's bridges have an average BCI of 87.6 (*excellent*). This can be further broken down to an average BCI of 91.3 (*excellent*) for vehicular bridges and an average BCI of 83.9 (*excellent*) for trails and pedestrian bridges.

2. For structural culverts in the municipality, the average bridge condition index value.

As previously stated, overall the City's culverts have an average BCI of 60.1 (*fair)*.

4.4 Stormwater

4.4.1 Scope

Community Levels of Service (qualitative descriptions):

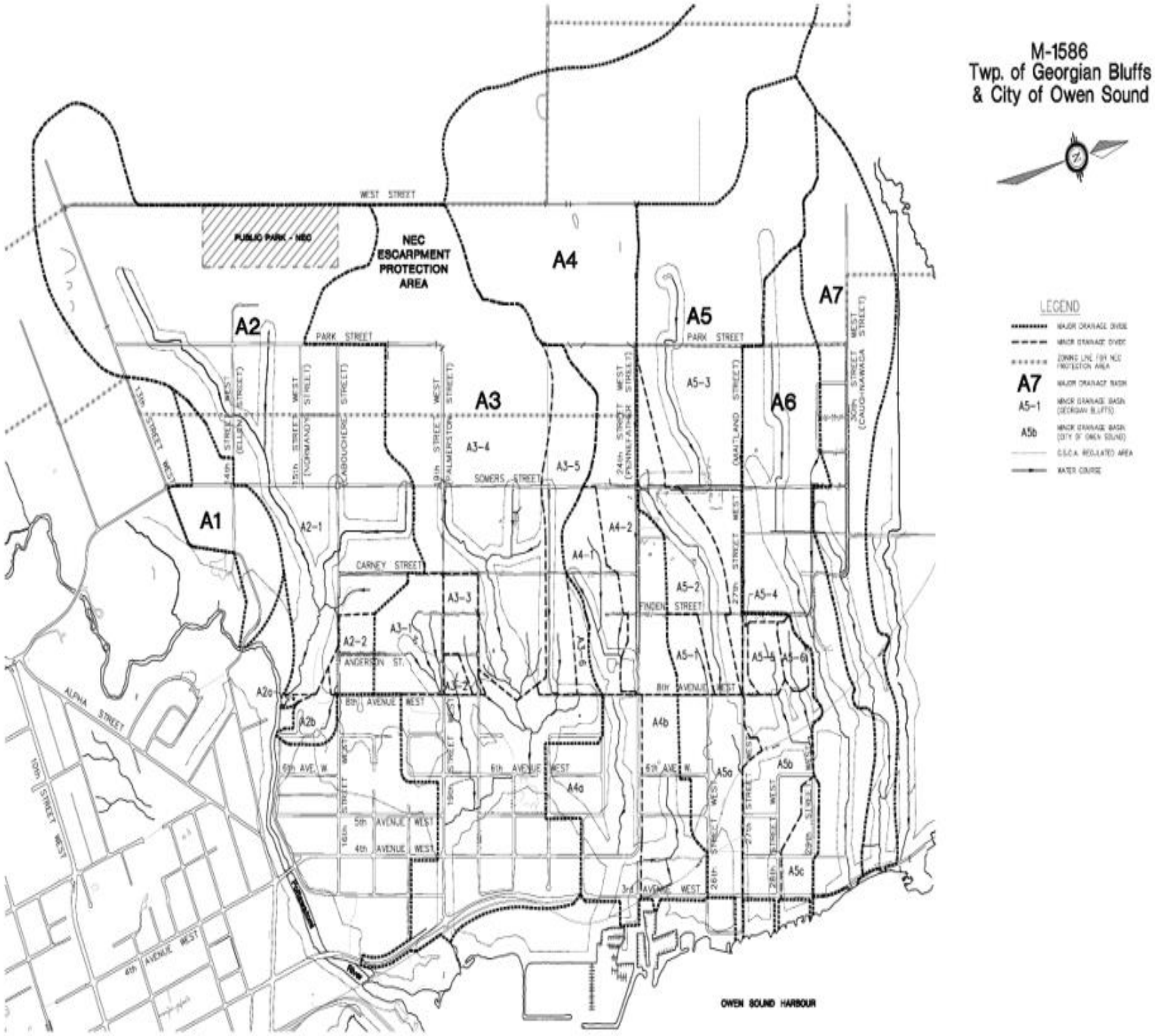
Description, which may include maps, of the user groups or areas of the municipality that are protected from flooding, including the extent of the protection provided by the municipal stormwater management system.

Due to a lack of data for the stormwater network, it is difficult for the City to determine specific performance measurements; however, it can be noted that the City has a program in place for residential properties to disconnect from storm drain and install sump pumps instead; many residential properties are moving in this direction. Additionally, the City has a roof water diversion program in place for larger businesses.

Figure 21 below provides an overview of the City's stormwater infrastructure.[19]

[19] This figure includes properties within the City of Owen Sound as well as the neighbouring municipality of Georgian Bluffs

Figure 21: Overview of the City's stormwater infrastructure



[20]

[20] chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.owensound.ca/en/resourcesGeneral/Documents/Brooke-Area-SW-Man-FigureNo2_Drainage_Basins.pdf

Technical Levels of Service (quantitative metrics):

1. Percentage of properties in municipality resilient to a 100-year storm.

Due to the lack of availability of reliable data for the City's stormwater infrastructure, the percentage of properties in the municipality resilient to a 100-year storm is unable to be determined.

2. Percentage of the municipal stormwater management system resilient to a 5-year storm.

Due to the lack of availability of reliable data for the City's stormwater infrastructure, the percentage of the municipal stormwater management system resilient to a 5-year storm is unable to be determined.

4.5 Water

4.5.1 Scope

Community Levels of Service (qualitative descriptions):

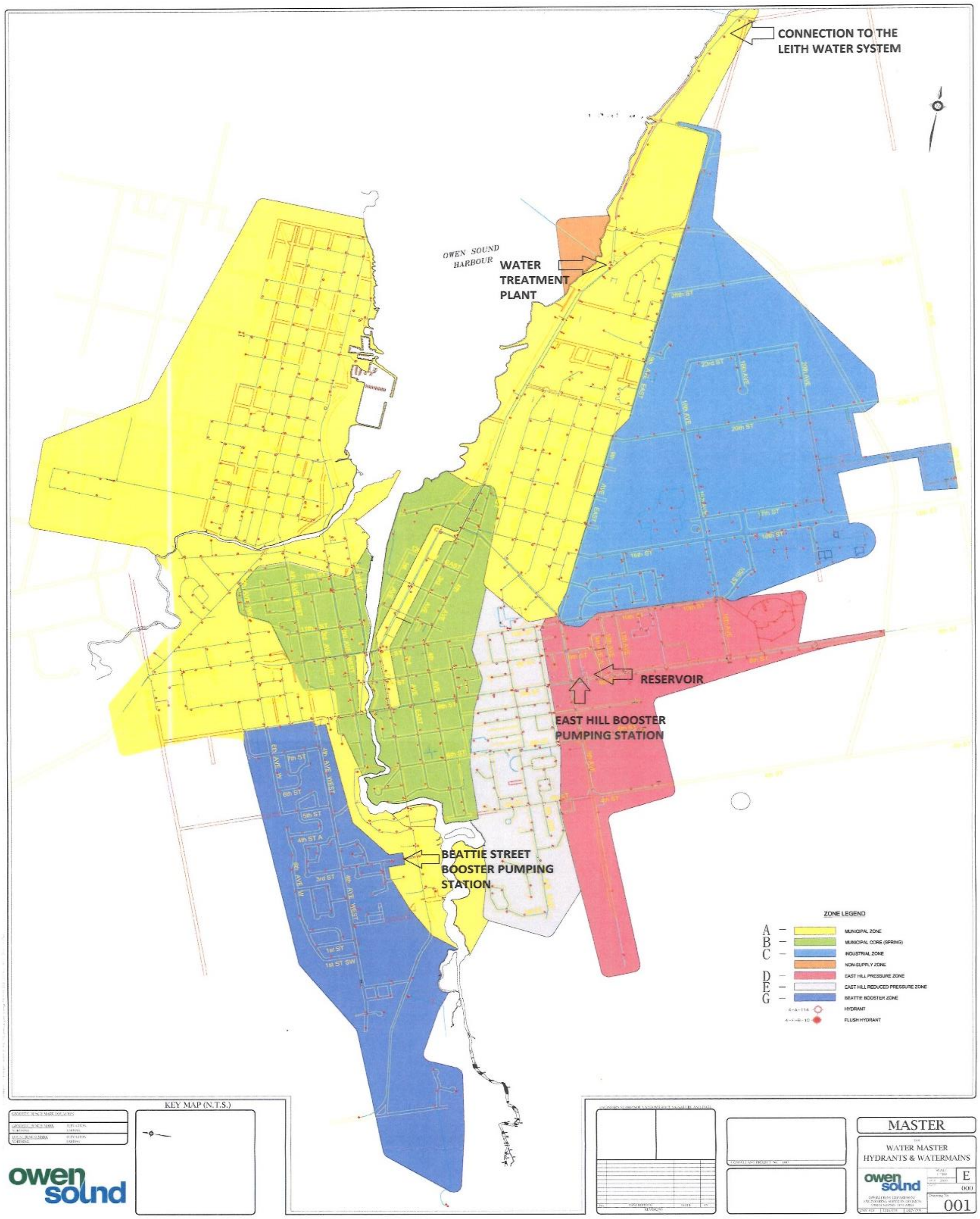
1. Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal water system.

The City has approximately 7,000 residential properties and 372 commercial properties connected to the municipal water system.

All properties within the City limits are serviced with City water except for 11 locations which are mostly rural (Southeast area of the City) or where service is not feasible.

The image below, **Figure 22**, provides an overview of the City's municipal water system.

Figure 22: Overview of the City's water network



2. Description, which may include maps, of the user groups or areas of the municipality that have fire flow.

All properties in the City limits which have City water have fire protection (i.e. excepting the above-mentioned 11 locations).

90 m hydrant spacing is achieved with some rate exceptions where spacing is higher.

Technical Levels of Service (quantitative metrics):

1. Percentage of properties connected to the municipal water system.

The City has 7,372 properties connected to the municipal water system. There are 11 properties that are not on City water or sewer, meaning 7,372 out of 7,383 properties are connected to the municipal water system, representing 99.9%.

2. Percentage of properties where fire flow is available.

All properties in the City that are connected to water (7,372) have fire flow. This means that, similar to above, 99.9% of City properties have fire flow available.

4.5.2 Reliability

Community Levels of Service (qualitative descriptions):

Description of boil water advisories and service interruptions.

The City of Owen Sound experiences very few boil water advisories. When one has occurred, it has been out of an abundance of precaution. The following is an excerpt taken from a 2018 precautionary boil water advisory and provides a general description of the event:

> *"The City of Owen Sound has issued a precautionary boil water advisory for a portion of the City water system in a small area in the south end near Greenwood Cemetery. This boil water advisory is being issued because of adverse bacteriological test results in the distribution system.*
>
> *Persons in the affected area will be receiving a door to door notice. If you are in the affected area, please boil all water used for drinking, preparing food, beverages, ice cubes, washing fruits and vegetables or brushing teeth. Infant formulas should be prepared using boiled tap water, at all times. It's not necessary to boil tap water used for other household purposes, such as*

showering, laundry, bathing or washing dishes. Water should be brought to a rolling boil for 2 minutes.

Adequate chlorine residual has been confirmed in the distribution system. Samples to confirm bacteriological water quality have been taken and sample results should be received by Friday, September 21st. The City will advise affected residents when this advisory is lifted."

Other service interruptions experienced by the City are watermain breaks. These are more frequent than boil water advisories, with an average of 20 watermain breaks occurring in a given year[21]. Watermain breaks may be caused by sudden changes in the temperature, excess pressure on pipes, or aging equipment, among other things. The following is an excerpt taken from a watermain break notice and provides a general description of the event:

"Alpha Street will be closed from 9th Avenue West (Nicol's Gully) to 11th Street West effective immediately for an emergency watermain break repair. There may be interruptions to water services in the area."

Technical Levels of Service (quantitative metrics):

1. 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.

Number of connection days per year where a boil water advisory notice is in place: 0[22]

Total number of properties connected to the municipal water system: 7,372.

The number of connection-days per year where a boil water advisory notice is in place compared to the total number of properties connected to the municipal water system: 0%

[21] Average of the previous two years
[22] Using an average over the last two years

2. 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

Average number of connection days per year due to watermain breaks: 20[23]

Total number of properties connected to the municipal water system: 7,372.

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: 0.27%[24]

4.6 Wastewater

4.6.1 Scope

Community Levels of Service (qualitative descriptions):

Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal wastewater system.

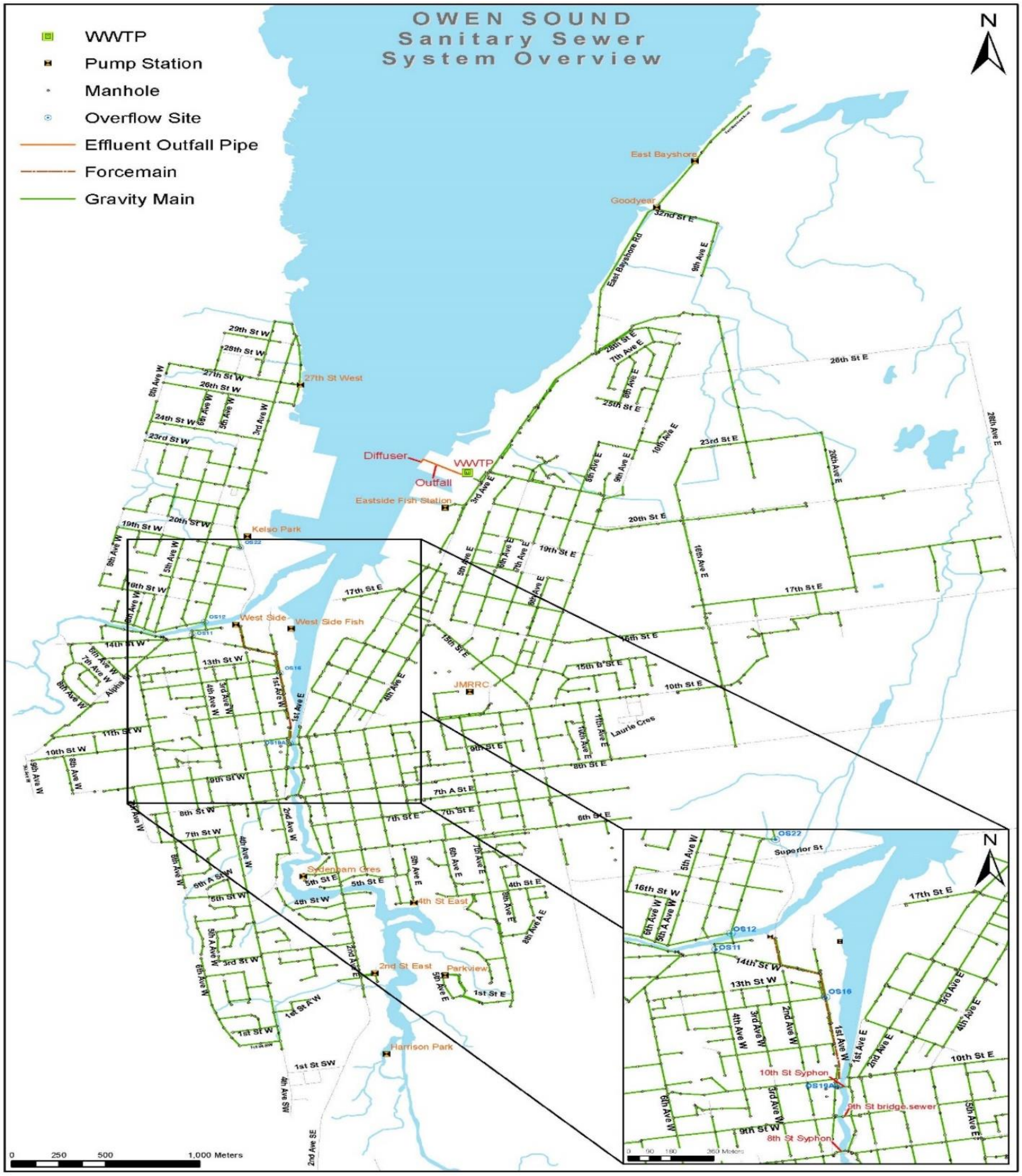
All properties within City limits are serviced with City sewers (wastewater system) except 36 locations which are rural (Southeast area of the City) or where service is not feasible.

The below image, **Figure 23**, provides an overview of the City's sanitary sewer (wastewater) system.

[23] Most main breaks are resolved in 1 days or less, therefore total number of days is the same as total number of main breaks

[24] Calculated as: 20/7372

Figure 23: Overview of the City's wastewater network



Technical Levels of Service (quantitative metrics):

Percentage of properties connected to the municipal wastewater system.

99.5% of properties are connected to the municipal wastewater system.

4.6.2 Reliability

Community Levels of Service (qualitative descriptions):

1. Description of how combined sewers in the municipal wastewater system are designed with overflow structures in place which allow overflow during storm events to prevent backups into homes.

There are trunk sewers in place on the east and west sides of the City which receive the flows from the branch sewers. At many of these locations, there is an overflow structure provided to the receiving water for situations where wet weather flows exceed sewer capacity.

2. Description of the frequency and volume of overflows in combined sewers in the municipal wastewater system that occur in habitable areas or beaches.

Overflows can enter the Pottawatami River or the Sydenham River, which drain into the Owen Sound Bay, or can enter the Owen Sound Bay directly. There are habitable areas and a number of small beaches there. In a typical year 5 events occur and average annual volume is 11,000m^3.

3. Description of how stormwater can get into sanitary sewers in the municipal wastewater system, causing sewage to overflow into streets or backup into homes.

Sewage rarely, if ever, overflows into streets; however sewage can back-up into homes. Often this is because of sources of stormwater which are on the private property which back-up into the home during wet weather. Sometimes sanitary sewers are surcharged by wet weather.

4. Description of how sanitary sewers in the municipal wastewater system are designed to be resilient to avoid events described in paragraph 3.

The above-mentioned overflow locations, typically provided at the connection points to the trunk sewer, generally provide relief to the system to prevent back-ups into homes.

5. Description of the effluent that is discharged from sewage treatment plants in the municipal wastewater system.

The WWTP Effluent requirements are spelled out in the provincial Environmental Compliance Approval (ECA) which set out the requirements for BOD, TSS, Phosphorous, and Ammonia. The WWTP is a secondary treatment plant using Biological Aerated Filter (BAF) technology.

Technical Levels of Service (quantitative metrics):

1. The number of events per year where combined sewer flow in the municipal wastewater system exceeds system capacity compared to the total number of properties connected to the municipal wastewater system.

There are an average of 5 events per year. 5 events out of 7,347 properties connected to the municipal wastewater system is 0.07%.

2. The number of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system.

There are an average of 6 back-ups (from the public side of the lateral) per year. Each back-up has an average duration of 2 days. Therefore there are 12 connection-days per year where a wastewater back-up is in effect. Out of 7,347 properties, this represents a proportion of 0.2%.

3. The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system

There has only been one effluent violation due to wastewater discharge in the past three years. Therefore the City can be assumed to have an average of 0.3333 effluent violations per year. Out of 7,347 properties this represents .005%.

4.7 Current Performance of Assets Against City-Established Performance Measures

The City has various criteria, both qualitative and quantitative, that it measures performance against for each asset category. **Tables 29** to **33** below outlines the City's level of service criteria and its current performance in each category.

Table 29: City Level of Service Criteria and Current Performance – Road Network

Asset Category	Performance Measure (Qualitative)	Current Performance	Performance Measure (Quantitative)	Current Performance
Road Network	To preserve the roadway network with the goal of protecting public safety, health, property, and the natural environment while meeting or exceeding all legislative requirements to move people, goods and services safely, efficiently, and effectively that will enable sustainable community growth and economic development.	Good, but always striving to become better	PCI of all roadways	72.5
			Ride Comfort Rating (RCR) of all roadways	6.5
			Amount of gravel roadways in the City	2.6 km
			Percentage of road network in good or excellent condition	50%
			Percentage of road network replacement value spent on operations and maintenance	2.8%
			Percentage of road network replacement value spent on winter operations	1.2%

Table 30: City Level of Service Criteria and Current Performance – Bridge Network

Asset Category	Performance Measure (Qualitative)	Current Performance	Performance Measure (Quantitative)	Current Performance
Bridge Network	To preserve the existing bridge network with the goal of protecting public safety, health, property, and the natural environment while meeting or exceeding all legislative requirements that will enable sustainable community growth and economic development.	Good, but always striving to become better	Percentage of bridge network in good or excellent condition	93%
			Number of structures with a posted load restriction	1

Table 31: City Level of Service Criteria and Current Performance – Stormwater Network

Asset Category	Performance Measure (Qualitative)	Current Performance	Performance Measure (Quantitative)	Current Performance
Stormwater Network	To preserve the existing stormwater collection and land drainage system with the goal of protecting public safety, health, property, and the natural environment while meeting or exceeding all legislative requirements for stormwater quality and management that will enable sustainable community growth and economic development.	Good, but always striving to become better	Percentage of stormwater network in good or excellent condition	80%

Table 32: City Level of Service Criteria and Current Performance – Water Network

Asset Category	Performance Measure (Qualitative)	Current Performance	Performance Measure (Quantitative)	Current Performance
Water Network	To preserve the existing drinking water distribution system with the goal of protecting public safety, health, property, and the natural environment while meeting or exceeding all legislative requirements for drinking water quality that will enable sustainable community growth and economic development.	Good, but always striving to become better	Percentage of water network in good or excellent condition	30%
			Annual Unaccounted for Water m^3	3,050,622m^3
			Total number of watermain breaks per year	21
			Number of water quality complaints received annually	24
			Number of water pressure complaints received annually	7

Table 33: City Level of Service Criteria and Current Performance – Wastewater Network

Asset Category	Performance Measure (Qualitative)	Current Performance	Performance Measure (Quantitative)	Current Performance
Wastewater Network	To preserve the existing wastewater collection system with the goal of protecting public safety, health, property, and the natural environment while meeting or exceeding all legislative requirements for wastewater quality that will enable sustainable community growth and economic development.	Good, but always striving to become better	Percentage of wastewater network in good or excellent condition	70%
			Number of Months WWTP effluent meets approval	12
			Total number of bypass incidents per year	0
			Number of sanitary complaints received annually	3

5. Asset Management Strategy

5.1 Overview

An asset management strategy is a set of planned actions that will enable the asset to provide the agreed upon levels of service in a sustainable way, while managing risk, at the lowest lifecycle cost.

For the purposes of the AM strategy, lifecycle activities of an asset can be viewed in the context of four phases: minor maintenance, major, rehabilitation, and replacement as detailed in **Table 34** below.

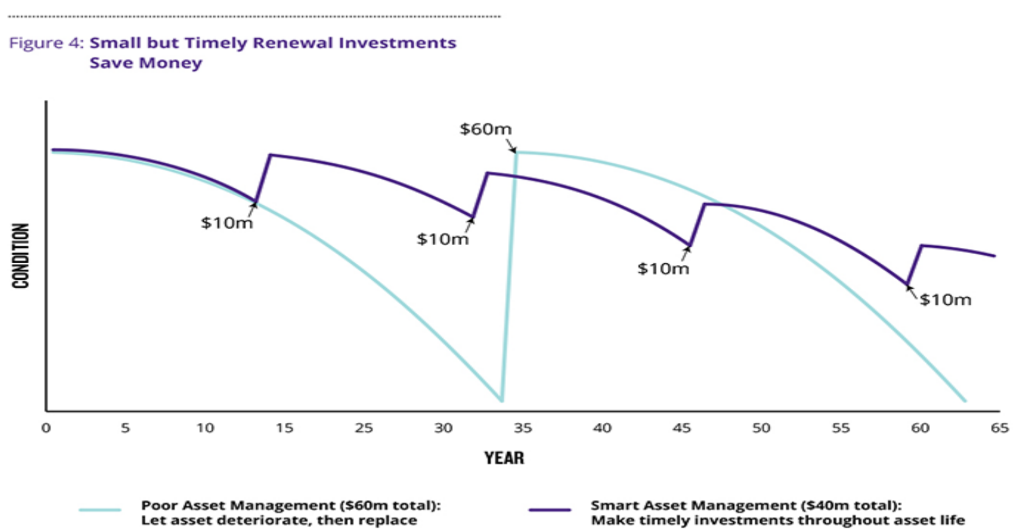
Table 34: Lifecycle Activities Overview

Activity	Definition	Asset Age
Minor Maintenance	Planned activities such as bridge or pavement inspections, monitoring, cleaning and flushing sewers, hydrant flushing, pressure testing, visual inspections, etc.	0 - 25% of asset life
Major Maintenance	Maintenance and repair activities that are generally unplanned; however, they can be anticipated and would generally be accounted for with the City's annual operating budget. These would include such events as repairing water main breaks, replacing individual sections of sewer pipe, or repairing erosion from stormwater run-off.	25 - 50% of asset life
Rehabilitation	Are generally one-time events that rebuild or replace components of an asset to restore the asset to a required functional condition and extend the asset's useful life. Typically involves repairing the asset to deliver its original level of service without resorting to significant upgrading or renewal, using available techniques and standards.	50 - 75% of asset life
Replacement	Assets will reach the end of their useful life and require replacement. The expected life of an asset is impacted by the natural properties of its materials and can vary greatly depending on a number of environmental factors that impact the degree of deterioration and performance.	75 - 100% of asset life

The asset management strategy will develop a process that can be applied to the lifecycle of an asset that will assist in the development of a multi-year plan to ensure the best overall health and performance of the City's infrastructure.

Maintaining accurate asset data, in addition to having proper planning and budgeting processes in place, is paramount to the success of effective asset management. If an organization can accurately monitor the condition of its assets and anticipate when issues may arise (i.e. deterioration of an asset over time based on age), it will be able to plan for timeline maintenance and renewal investments for those assets. This will not only help to ensure the asset reaches (or perhaps even exceeds) its useful life, but it will also help the organization to accurately forecast how much money it should be budgeting for investments at which points in time. As can be seen in **Figure 24** below, timely investments are extremely important to help an organization manage assets in the most cost-effective manner. By making smaller but more frequent pre-emptive investments into the asset over the course of its life (for things such as operations, maintenance, and rehabilitation), an organization will actually save money over the life of the asset in comparison to if the organization does not make any pro-active investments and waits until the asset has reached the need for complete renewal.

Figure 24: Renewal Investment Curve



[25]

[25] https://www.ontario.ca/document/building-better-lives-ontarios-long-term-infrastructure-plan-2017/chapter-2-planning-future

5.2 Risk Management

A large component of managing risk is ensuring that decision makers are informed about the potential consequences of actions (or inactions). There are many types of risk, such as planning risks, management risks, delivery risks, and physical asset risks (risk of asset failure).

All organizations have to accept some level of risk. The important aspect is ensuring the acceptance of risk occurs at the right level.

The risk process is comprised of many stages, such as establishing the context, identifying risks, analyzing risks, evaluating risks, and finally treating risks.

Service consequences, as it relates to risk, are the potential impacts to the reliability and/or quality of a service being provided by an asset. Risk consequences is a broader term that can include financial implications, loss of reputation from users, impacts to the environment, injury to staff or the public, and loss or reduction in service.

While it is important to be aware of the risks associated with all asset types and components, a municipality should place the highest focus on critical assets (those that would have a highly significant impact if the risk occurred). In order to determine which assets are critical, a municipality can assess the risk of each asset through assigning it a risk score. A risk score can be calculated by multiplying the likelihood that a risk will occur by the possible consequences (impact or magnitude of the effect) if the risk does occur. Possible consequences can be determined based on one of the risk consequences elements mentioned above.

It is important that municipalities are aware of their risks, develop a risk management plan/strategy, and build risk resilience into their services and operations.

An estimated risk matrix for the City's core assets can be seen in **Figure 25** below.

Figure 25: Risk Matrix

CONSEQUENCE	1	2	3	4	5
5	$ 129,950,699.07				
4	$ 24,569,426.36	$ 65,161,476.48	$ 19,266,490.64	$ 66,484,243.20	
3		$ 47,263,531.30	$ 610,195,042.79	$ 21,917,944.07	
2		$ 13,053,511.62	$ 48,400,096.00	$ 1,687,975.83	
1	$ 736,387.29	$ 53,324,296.18	$ 85,233,452.09	$ 2,298,334.05	

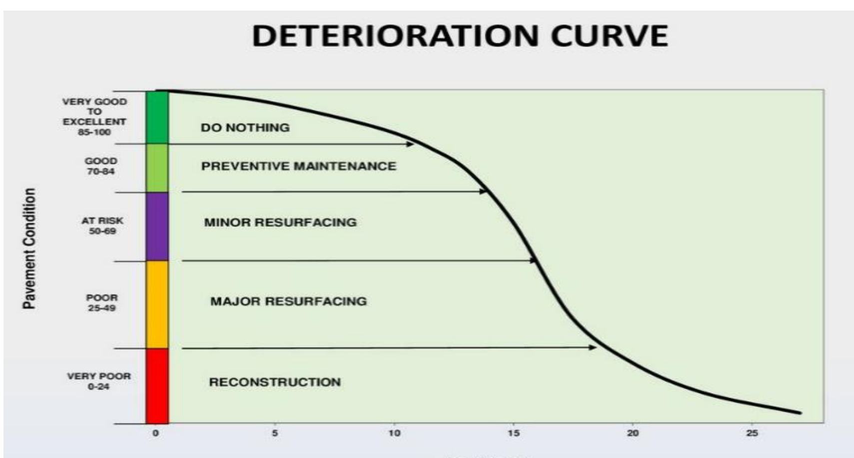
PROBABILITY

5.3 Roads

5.3.1 Lifecycle Activities

Pavement deterioration is non-linear such that initially in the first five to eight years of service the rate of deterioration is slow. At mid service life the rate of deterioration increases and near the end of its service life the rate of deterioration is quite rapid, as shown in **Figure 26** below.

Figure 26: Road Deterioration Curve



[26]

[26] https://slideplayer.com/slide/16535156/

During a road's lifecycle there are various windows available for work activity that will maintain or extend the life of the asset. These windows of work activity generally coincide with the assets condition.

A summary of available lifecycle work activities that could be undertaken to maintain the current levels of service for the road network, along with an estimate of associated costs, are provided in **Tables 35** to **38** below.

Table 35: Road Network Lifecycle Activities – Minor Maintenance

Asset Component	Minor Maintenance Activity Options	Approximate Cost
Asphalt Surfaces	- Pavement Condition Assessments of entire road network once every 5 years.	- $125/centerline km
Sidewalks	- Sidewalk Inspection Program legislatively required once per year	- $100/km

Table 36: Road Network Lifecycle Activities – Major Maintenance

Asset Component	Major Maintenance Activity Options	Approximate Cost
Asphalt Surfaces	- Pothole repairs - Crack Sealing	- $75 to $125 /location (depending on size) - $1.25/$m^2$
Gravel Surfaces	- Grading and leveling - Dust Control	- $150 to $175 per hour - $1,800 to $2,000 per centerline km
Sidewalks	- Grind down elevated edges	- $10/$m^2$

Table 37: Road Network Lifecycle Activities – Rehabilitation

Asset Component	Rehabilitation Activity Options	Approximate Cost
Pavement Surfaces	- **Fog Seal**; light application of slow setting asphalt emulsion diluted with water. It is used to renew old asphalt surfaces and to seal small cracks and surface voids - **Microsurfacing**; a mixture of polymer modified asphalt emulsion, mineral aggregate, mineral filler, water, and other additives, properly proportioned, mixed and spread on a paved surface - **Resurfacing**; a process of removing pavement material from the surface of the pavement either to prepare the surface (by removing rutting and surface irregularities) to receive overlays, to restore pavement cross slopes and profile, or even to re-establish the pavement's surface friction characteristics - **Slurry Seal Coating**; a mixture of slow setting emulsified asphalt, well graded fine aggregate, mineral filler, and water. It is used to fill cracks and seal areas of old pavements, to restore a uniform surface texture, to seal the surface to prevent moisture and air intrusion into the pavement, and to provide skid resistance - **Thin Overlay**; An overlay course consisting of a mix of asphalt cement and a well graded (also called dense-graded) aggregate. A well graded aggregate is uniformly distributed throughout the full range of sieve sizes	- $1.50/m^2 - $5.00/m^2 - $8.00/m^2 - $4.00/m^2 - $6.00/m^2
Gravel Surfaces	- Ditching and drainage improvements - Application of new gravel surface course	- $20 to $250 per hour - $8 to $10 per tonne
Sidewalks	- Panel Replacement	- $150 to $200/m^2 (premium paid due to limited quantity)

Table 38: Road Network Lifecycle Activities – Replacement Maintenance

Asset Component	Replacement Activity Options	Approximate Cost
Pavement Surfaces	- Road replacement including excavation, Gran. A & B and asphalt base and surface coats	- \$135 to \$150/m^2 (depending on road class)
Sidewalks	- Replacement of sections of sidewalk panels	- \$100 to \$125/m^2
Curbs	- Deficient sections are typically removed and replaced	- \$95 to \$125/m
Guiderails	- Deficiencies typically addressed through replacement	- \$90 to \$170/m (depending on type)

There are many risks associated with lifecycle activities of assets. When developing a standard timeframe for when maintenance should occur, the municipality must balance the cost of doing frequent maintenance versus the risks of waiting long periods of time between maintenance activities.

If the City does not perform the above-mentioned lifecycle activities, the road network is at risk of deterioration and structural compromise. This will lead to a reduction in services as road networks could have to be closed, meaning traffic would be detoured. This would not only lead to an inconvenience for residents and users of the road network, but it would also result in the City's reputation and reliability being tarnished.

As previously mentioned, performing lifecycle activities (such as repairs, maintenance, etc.) and investing funds on a regular basis is the most cost-effective way to manage an asset throughout its lifecycle. Although the municipality has to put funds into an asset on more occasions, the sum of the funds is less than if the municipality puts funds into the asset one time when the asset has deteriorated to such a level that it is incredibly costly to restore it to a useable condition. Therefore it is important to perform the lifecycle activities mentioned above on a predetermined, recurring schedule. The costs of performing these lifecycle activities should be considered in terms of staff time and budgetary dollars required. In order to ensure the lifecycle activities are performed at the lowest cost, the City should make note of best practices, issue well-developed request for proposals (RFPs) to obtain competitive bids from third-parties, and stay up to date on the current and expected industry trends/standards.

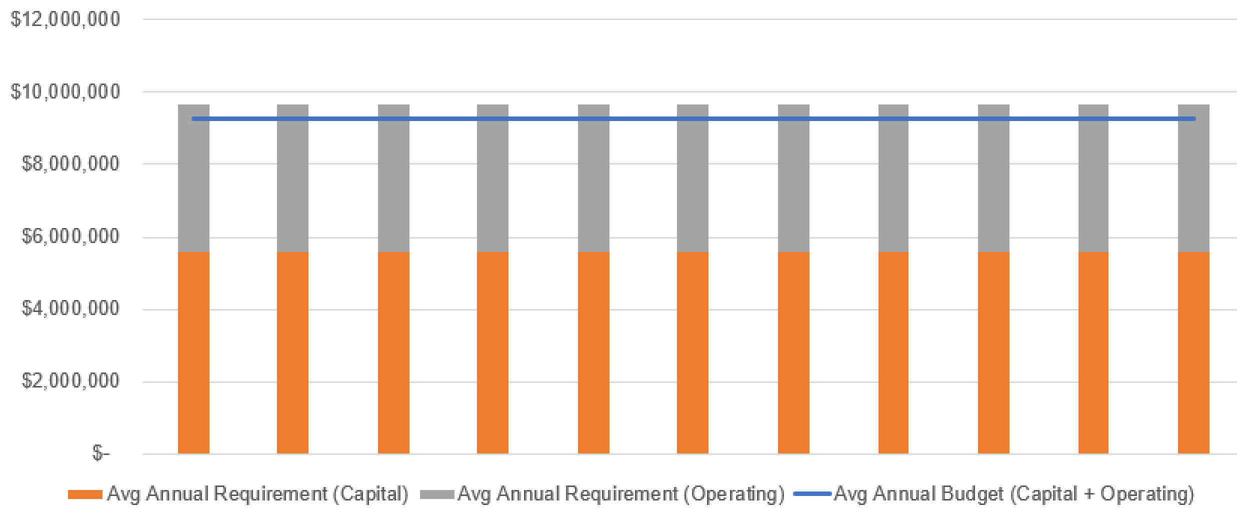
5.3.2 Funding vs. Need

Figure 27 below plots on a timeline the expected replacement (capital) and operating costs in current year dollars for all road assets including sidewalks, curbs and guiderails. The orange bar represents the average annual capital spending required to meet all current and future financial obligations while the grey bar represents the average annual operating spending. The blue horizontal line represents the estimated average budgeted spending[27]. It should be noted that in general, operating requirements for the road network fully covered based on the average operating budget. The average annual deficit for the road network is based on capital shortfalls.

Based on the above assumptions and data known at this time, Owen Sound's average annual funding requirement is approximately $9.7 million[28]. Based on current average annual funding of $9.3 million, the roads annual deficit is approximately $390,000 with a funding vs. need ratio of 96%.

The City has been putting significant investment into the road network in recent years to try to close the funding gap that previously existed.

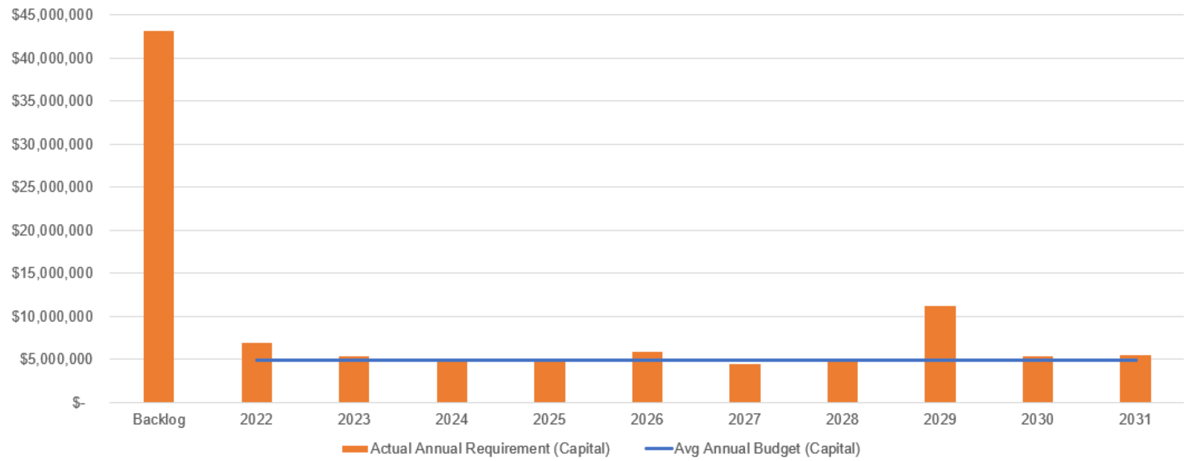
Figure 27: Road Network Funding Requirement - Summary



[27] Average budgeted spending includes both capital and operating budget. Based on an average of the five-year capital budget and two-year operating budget.
[28] Average annual requirement (capital) is calculated based on the average of the upcoming 10-year actual anticipated requirement. Where insufficient or unreliable data exists, the average annual requirement (capital) is calculated by taking the CRC for each asset component divided by the years of life remaining (EUL – average age).

Figure 28 below shows the actual annual anticipated requirement[29] as well as the backlog requirement for assets that are at or beyond their estimated useful life.

Figure 28: Road Network Funding Requirement – Actual Annual Requirement



[30]

5.4. Bridge Network

5.4.1 Lifecycle Activities

For some bridges in Poor condition, a small holding strategy of repairs can be done to extend the life of the bridge by six to ten years. This will defer the major expense of structure replacement, while still maintaining the bridge in a serviceable condition. Some other bridges that are still in Good condition can have work done ahead of other Poor condition bridges to help preserve the bridges before they require extensive repair.

A summary of available lifecycle activities for the bridge network and an estimate of associated costs are provided in **Tables 39** to **42** below.

[29] Only depicts capital requirement and budget. Does not include operating data.
[30] A significant portion of the backlog is comprised of curbs and sidewalks that are at or beyond their EUL; however, asset age data should be supplemented by condition assessments to determine if the asset does need to be renewed.

Table 39: Bridge Network Lifecycle Activities – Minor Maintenance

Asset Component	Minor Maintenance Activity Options	Approximate Cost
All Structures	- OSIM Inspections legislatively required once every two years.	- $1,500 to $1,800 per structure

Table 40: Bridge Network Lifecycle Activities – Major Maintenance

Asset Component	Major Maintenance Activity Options	Approximate Cost
All Structures	- Wearing Surface Crack Sealing -Painting - Washing & Cleaning of: Wearing surface & deck Sidewalk & railings Tops of abutments & piers Expansion joints Seats & bearings Lower chords of trusses Deck drains	- $1.25/m^2 - $35/hour - $115/hour
Concrete Structures	- Crack Repairs • Bonding • Routing and sealing • Stitching	- $60/m^2
Steel Structures	- Rust removal and repainting - Sandblast and repainting	- $35/hour -$135/hour

Table 41: Bridge Network Lifecycle Activities – Rehabilitation Maintenance

Asset Component	Rehabilitation Activity Options	Approximate Cost
Concrete Structures	- Spall Repairs - Disintegration repairs (jacketing) - Delamination repairs	- $175/m^2$ - $95/m^2$ - $135/m^2$
Steel Structures	- Member strengthening (plates) or replacement - Connection plating or replacement	- $400 to $1,000 per location depending on complexity

Table 42: Bridge Network Lifecycle Activities – Replacement Maintenance

Asset Component	Replacement Activity Options	Approximate Cost
Concrete Structures	- Replacement of entire structure	- $5,000 to $6,000/m^2$ (varies by location)
Steel Structures	- Replacement of entire structure	- $8,000 to $9,000/m^2$ (varies by location)

There are many risks associated with lifecycle activities of assets. When developing a standard timeframe for when maintenance should occur, the municipality must balance the cost of doing frequent maintenance versus the risks of waiting long periods of time between maintenance activities. The consequences associated with structural issues in the City's bridge network are extremely high.

If the City does not perform the above-mentioned lifecycle activities, the bridge network is at risk of deterioration and structural compromise. This will lead to a reduction in services as bridges could have to be closed, meaning traffic would be detoured. This could also result in the need to introduce load restrictions on more bridges. This would not only lead to an inconvenience for residents and users of the bridge network, but it would also result in the City's reputation and reliability being tarnished.

As previously mentioned, performing lifecycle activities (such as repairs, maintenance, etc.) and investing funds on a regular basis is the most cost-effective way to manage an asset throughout its lifecycle. Although the municipality has to put funds into an asset on more occasions, the sum of the funds is less than if the municipality puts funds into the asset one time when the asset has deteriorated to such a level that it is incredibly costly to restore it to a useable condition. Therefore it is important to perform the lifecycle activities mentioned above on a predetermined, recurring schedule. The costs of performing these lifecycle activities should be considered in terms of staff time and budgetary dollars required. In order to ensure the lifecycle activities are performed at the lowest cost, the City should make note of best practices, issue well-developed RFPs to obtain competitive bids from third-parties, and stay up to date on the current and expected industry trends/standards.

5.4.2 Funding vs. Need

In **Figure 29** below the average annual financial requirements for the Bridge and Culvert assets are shown on the timeline. The orange bar represents the average annual capital spending required to meet all current and future financial obligations while the grey bar represents the average annual operating spending. The blue horizontal line represents the estimated average budgeted spending[31]. The average annual deficit is comprised of a mixture of capital and operating shortfalls for the bridge network.

The average annual funding requirement is $185,906[32] and the estimated average funding is $58,956. This means there is a small average annual deficit of $126,951 for the bridge and culvert network, representing a funding vs. need ration of just over 30%.

It should be noted that the bridge network has a relatively small number of assets with a large financial value; therefore, one asset can have a significant impact on the overall values within the bridge network.

[31] Average budgeted spending includes both capital and operating budget. Based on an average of the five-year capital budget and two-year operating budget.
[32] Average annual requirement (capital) is calculated based on the average of the upcoming 10-year actual anticipated requirement. Where insufficient or unreliable data exists, the average annual requirement (capital) is calculated by taking the CRC for each asset component divided by the years of life remaining (EUL – average age).

Figure 29: Bridge Network Funding Requirement – Summary

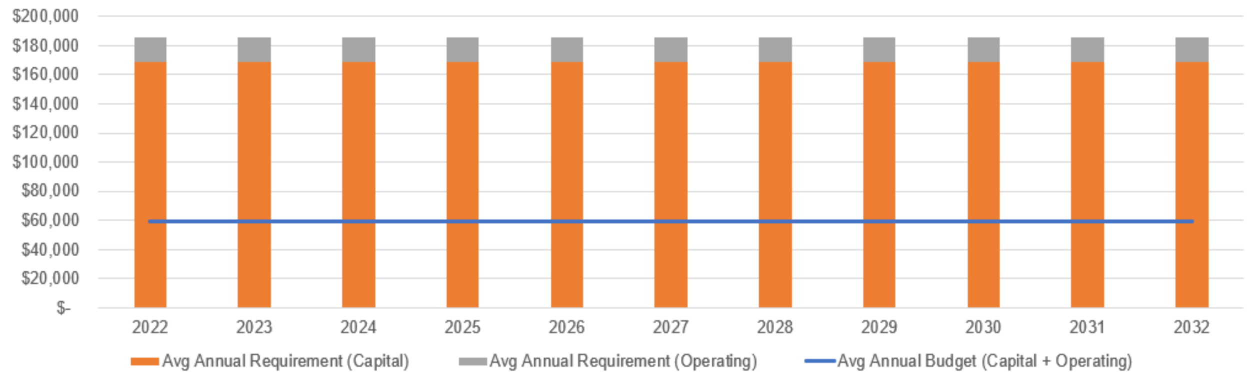
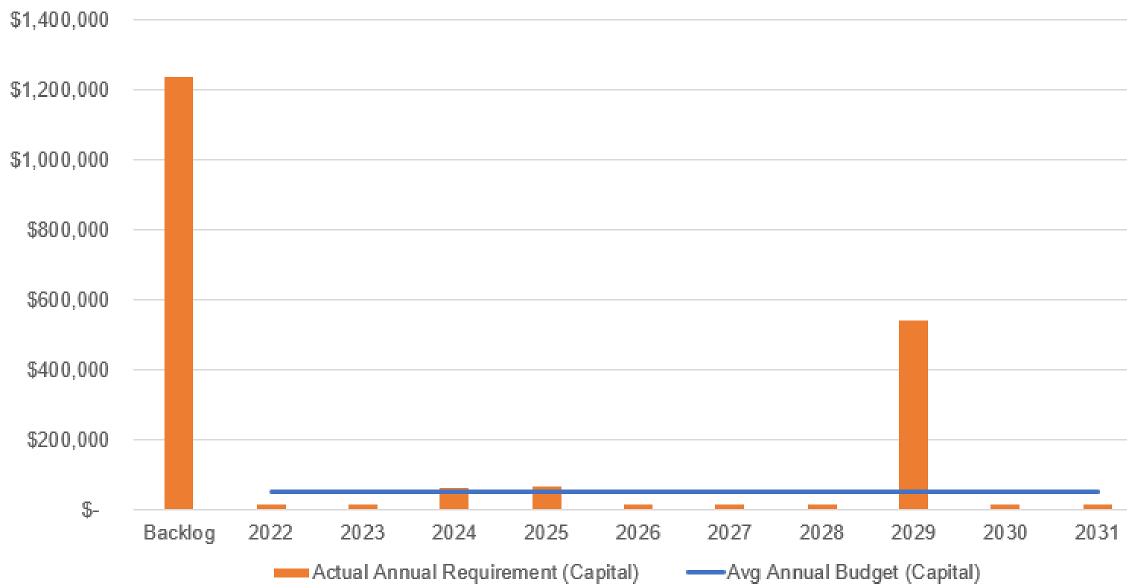


Figure 30 below shows the actual annual anticipated requirement[33] as well as the backlog requirement for assets that are at or beyond their estimated useful life.

Figure 30: Bridge Network Funding Requirement – Actual Annual Requirement



[34]

[33] Only depicts capital requirement and budget. Does not include operating data.
[34] The full backlog is comprised of culverts beyond their EUL; however, asset age data should be supplemented by condition assessments to determine if the asset does need to be renewed.

5.5 Stormwater Network

5.5.1 Lifecycle Activities

A summary of available lifecycle activities for the stormwater collection network and an estimate of associated costs are provided in **Tables 43** to **46** below.

Table 43: Stormwater Network Lifecycle Activities – Minor Maintenance

Asset Component	Minor Maintenance Activity Options	Approximate Cost
Storm Sewer Mains	- Cleaning and Flushing sewers.	- $3.00/m (excl. removal of debris from manholes
Storm Sewer Mains	- TV Inspection mains only	- $8/m (incl. cleaning)

Table 44: Stormwater Network Lifecycle Activities – Major Maintenance

Asset Component	Major Maintenance Activity Options	Approximate Cost
Catch Basins, Catch Basin Manholes, and Ditch Inlets	- Vacuum removal of sediment in sumps of storm sewer structures. The frequency varies and dependent on sediment build-up	- $35/structure
Storm Sewers	- Traditional Replacement: sewer only (emergency)	- $450 to $1,200 varies by diameter & depth

Table 45: Stormwater Network Lifecycle Activities – Rehabilitation

Asset Component	Rehabilitation Activity Options	Approximate Cost
Storm Sewers	- Trenchless Sewer Lining	- $300 to $800/m varies by diameter
Storm Sewers	- Traditional Spot repair of main or leads	- $5,000 to $10,000 (incl. restoration)
Manholes	- Sealing Manholes ($2000 per manhole. Varies. Not as common as for sanitary)	- $2,000/manhole
Manholes/Catch Basins	- Manhole/Catch Basin F&G, Modulock replacement	- $250/F&G -$300/m depth modulock
Manholes/Catch Basins	- Manhole/Catch Basin benching repair	- $1,000/manhole

Table 46: Stormwater Network Lifecycle Activities – Replacement

Asset Component	Replacement Activity Options	Approximate Cost
Storm Sewers	- Pipe Bursting	- $300 to $400/m varies by diameter.
Storm Sewers	- Traditional Replacement : as part of full reconstruction (planned)	- $300 to $850 varies by diameter, depth & soil conditions
Manholes	- Manhole replacement alone or in combination with any of above.	- $8,000 to $16,000 varies by size & depth
Catch Basins	- Catch Basin replacement alone or in combination with any of above.	- $4,000 to $6,000 varies by size & depth

There are many risks associated with lifecycle activities of assets. When developing a standard timeframe for when maintenance should occur, the municipality must balance the cost of doing frequent maintenance versus the risks of waiting long periods of time between maintenance activities.

If the City does not perform the above-mentioned lifecycle activities, the stormwater network is at risk of structural compromise that could lead to main breaks, stormwater run-off issues, water contamination issues, etc. This would not only lead to an inconvenience for residents and have a large impact on their daily lives, but it would also result in the City's reputation and reliability being tarnished.

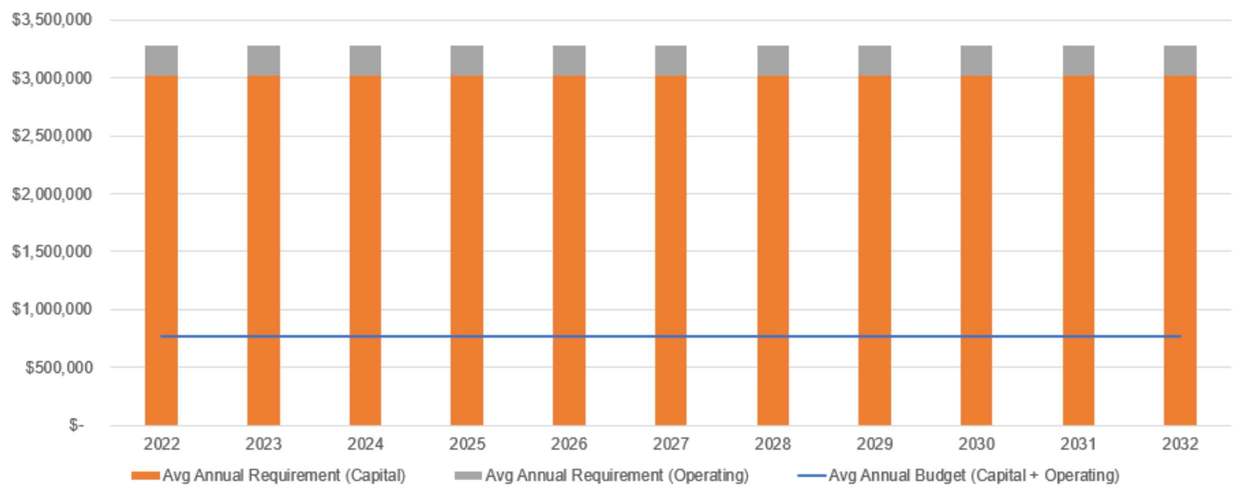
As previously mentioned, performing lifecycle activities (such as repairs, maintenance, etc.) and investing funds on a regular basis is the most cost-effective way to manage an asset throughout its lifecycle. Although the municipality has to put funds into an asset on more occasions, the sum of the funds is less than if the municipality puts funds into the asset one time when the asset has deteriorated to such a level that it is incredibly costly to restore it to a useable condition. Therefore it is important to perform the lifecycle activities mentioned above on a predetermined, recurring schedule. The costs of performing these lifecycle activities should be considered in terms of staff time and budgetary dollars required. In order to ensure the lifecycle activities are performed at the lowest cost, the City should make note of best practices, issue well-developed RFPs to obtain competitive bids from third-parties, and stay up to date on the current and expected industry trends/standards.

5.5.2 Funding vs. Need

Figure 31 below depicts the current funding vs. need ratio for the stormwater network. The orange bar represents the average annual capital spending required to meet all current and future financial obligations while the grey bar represents the average annual operating spending. The blue horizontal line represents the estimated average budgeted spending[35]. It should be noted that operating requirements are generally fully covered by the average operating budget for the stormwater network. The average annual deficit is comprised capital shortfalls.

The current funding vs. need ratio is approximately 23% with an average annual requirement of $3,284,057[36] and average spending of $764,873. This gives an annual funding deficit of $2,519,184.

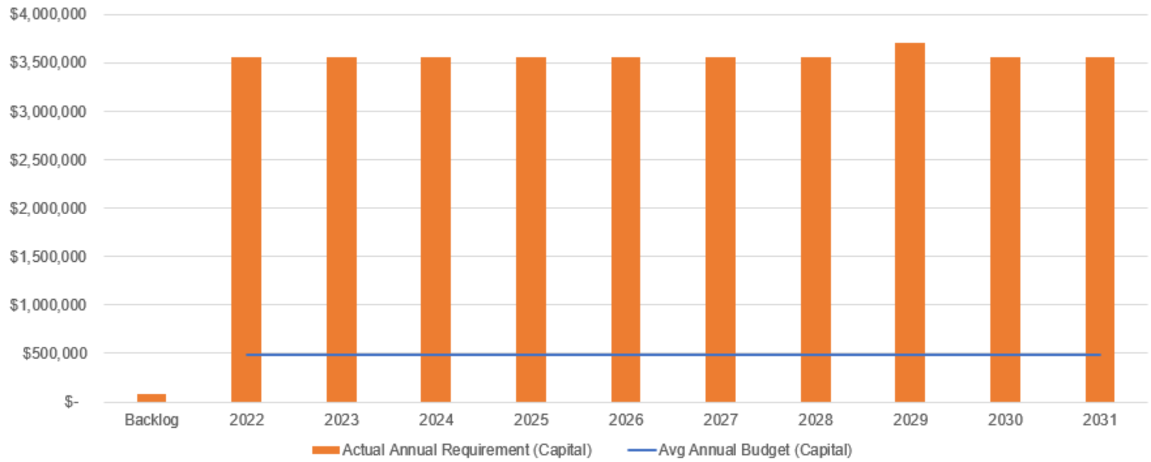
Figure 31: Stormwater Network Funding Requirement – Summary



[35] Average budgeted spending includes both capital and operating budget. Based on an average of the five-year capital budget and two-year operating budget.
[36] Average annual requirement (capital) is calculated based on the average of the upcoming 10-year actual anticipated requirement. Where insufficient or unreliable data exists, the average annual requirement (capital) is calculated by taking the CRC for each asset component divided by the years of life remaining (EUL – average age).

Figure 32 below shows the actual annual anticipated requirement[37] as well as the backlog requirement for assets that are at or beyond their estimated useful life.

Figure 32: Stormwater Network Funding Requirement – Actual Annual Requirement



[38]

[37] Only depicts capital requirement and budget. Does not include operating data.
[38] Although relatively minor, the backlog is comprised of manholes that are at or beyond their EUL; however, asset age data should be supplemented by condition assessments to determine if the asset does need to be renewed.

5.6 Water Network

5.6.1 Lifecycle Activities

A summary of available lifecycle activities for the water distribution network and an estimate of associated costs are provided in **Tables 47** to **52** below.

Table 47: Water Network Lifecycle Activities – Minor Maintenance

Asset Component	Minor Maintenance Activity Options	Approximate Cost
Hydrants (Fire Fighting and Flush Types)	Provide visual inspection for damage, tampering, vandalism, missing parts, need for paint	$5/hydrant
	Check for adequate water pressure and flow rates (may only be required on an as- needed basis if a change in use is proposed or problems are noted).	$40/hour (as required)
	Check for operation, exercise valves, flush lead/barrel, verify that barrel has drained. Where the hydrant services a 'dead end' flushing should occur to clear the volume of water main with potentially stale water.	$40/hydrant/visit
Hydrants (Winter Maintenance)	Clear snow from access to fire hydrants.	$25/hydrant (twice/yr)
	Install and remove fire hydrant markers with the change in seasons	$5/hydrant maker/visit (twice/yr)
	If valves are not non-freezing, there will be extra maintenance.	
Main Line Valves	Check valves for operation and exercise (Valve Maintenance Program).	- $100/valve
PRVs & other Specialty Valves	Provide visual inspection for signs of wear, corrosion, build-up or any abnormal conditions	- $100/chamber (twice/yr)

Table 48: Water Network Lifecycle Activities – Major Maintenance

Asset Component	Major Maintenance Activity Options	Approximate Cost
Main Line Valves	- Check valves for operation and exercise (Valve Maintenance Program).	- $100/valve
Mains and/or Services	- Traditional Replacement: water only (emergency)	- $550 to $1,300 varies by diameter & depth
PRVs & other Specialty Valves	- Check valves (including isolation valves) for operation and exercise. - Each valve on the system should be disassembled and inspected annually, diaphragm and discs to be replaced if they show any signs of wear. Manufacturer's recommendations for regular maintenance details should be referenced.	- $10/chamber - $500/chamber
Water Meters	- Water Meter maintenance activities undertaken by Water Distribution Coordinator.	- $150 per meter

Table 49: Water Network Lifecycle Activities – Rehabilitation

Asset Component	Rehabilitation Activity Options	Approximate Cost
Mains	- Trenchless Lining	- $500/metre (varies on diameter, must replace valves, fire hydrant leads, & services)
Mains/ Services	- Spot repair of Main or Services	- $5,000 to $10,000 (incl. restoration)
Main Line Valves	- Significant repair or replacement of valves coming out of Valve Maintenance Program.	- $1,000 to $5,000 varies on size, depth & extent of repair (incl. restoration)

Trunk Line Valves in Chambers	- Maintenance needs specific to trunk valves.	- $2,000 to $3,000 more for extensive rebuilds.
Hydrants	- Hydrant Repair	- $100 to $200 more for extensive rebuilds.
Hydrants	- Hydrant Painting	- $80/hydrant - $20/hydrant for touch-up

Table 50: Water Network Lifecycle Activities – Replacement

Asset Component	Replacement Activity Options	Approximate Cost
Mains and/or Services	- Traditional Replacement as part of full reconstruction (planned)	- $400 to $1,000 varies by diameter, depth & soil conditions
PRVs & other Specialty Valves	- Replace Valves and/or Chambers	- $10,000/valve - $50,000/chamber
Hydrants	- Hydrant Replacement	- $7,000/hydrant (incl. restoration)
Anodes	- Replace every 25 years to protect City's ductile iron trunk water mains.	- $250/anode (incl. restoration)
Water Meters	- Replacement of meters with upgraded units.	- $175/meter

There are many risks associated with lifecycle activities of assets. When developing a standard timeframe for when maintenance should occur, the municipality must balance the cost of doing frequent maintenance versus the risks of waiting long periods of time between maintenance activities.

If the City does not perform the above-mentioned lifecycle activities, the water network is at risk of structural compromise that could lead to main breaks, water contamination issues, pipe freezing, the need for boil water advisories, etc. This would not only lead to an inconvenience for residents and have a large impact on their daily lives, but it would also result in the City's reputation and reliability being tarnished.

As previously mentioned, performing lifecycle activities (such as repairs, maintenance, etc.) and investing funds on a regular basis is the most cost-effective way to manage an asset throughout its lifecycle. Although the municipality has to put funds into an asset on more occasions, the sum of the funds is less than if the municipality puts funds into the asset one time when the asset has deteriorated to such a level that it is incredibly costly to restore it to a useable condition. Therefore it is important to perform the lifecycle activities mentioned above on a predetermined, recurring schedule. The costs of performing these lifecycle activities should be considered in terms of staff time and budgetary dollars required. In order to ensure the lifecycle activities are performed at the lowest cost, the City should make note of best practices, issue well-developed RFPs to obtain competitive bids from third-parties, and stay up to date on the current and expected industry trends/standards.

5.6.2 Funding vs. Need

In **Figure 33** below the funding deficit for the water network is shown. The orange bar represents the average annual capital spending required to meet all current and future financial obligations while the grey bar represents the average annual operating spending. The blue horizontal line represents the estimated average budgeted spending[39]. It should be noted that in general, operating requirements for the water network are fully covered based on the average annual operating budget. The average annual deficit is comprised capital shortfalls.

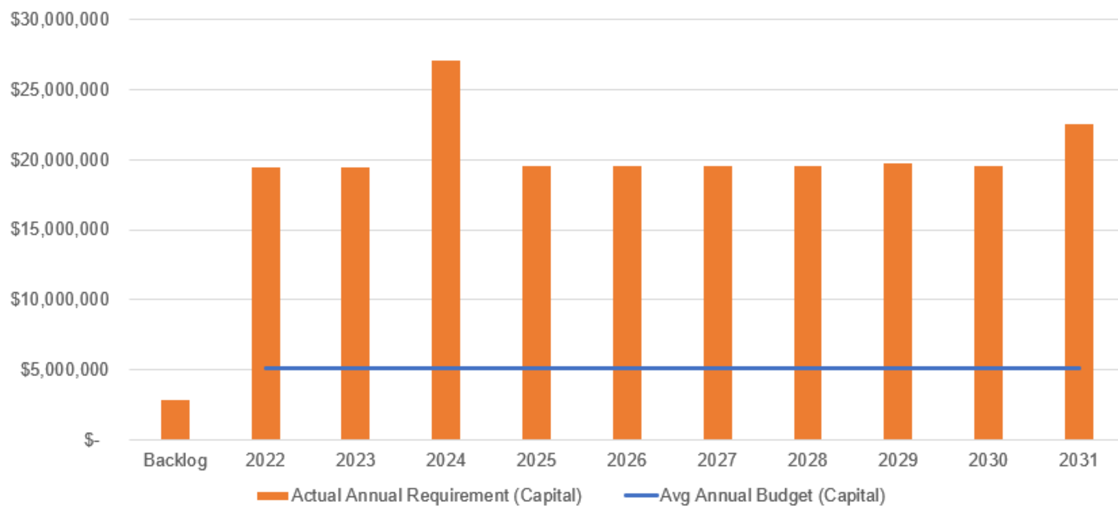
The average annual funding deficit is $11,407,780 with a funding versus need ratio of 40%. This ratio reflects an annual funding need of $19,209,466[40] and average current spending at approximately $7,801,685.

[39] Average budgeted spending includes both capital and operating budget. Based on an average of the five-year capital budget and two-year operating budget.
[40] Average annual requirement (capital) is calculated based on the average of the upcoming 10-year actual anticipated requirement. Where insufficient or unreliable data exists, the average annual requirement (capital) is calculated by taking the CRC for each asset component divided by the years of life remaining (EUL – average age).

Figure 33: Water Network Funding Requirement - Summary

Figure 34 below shows the actual annual anticipated requirement[41] as well as the backlog requirement for assets that are at or beyond their estimated useful life.

Figure 34: Water Network Funding Requirement – Actual Annual Requirement



[42]

[41] Only depicts capital requirement and budget. Does not include operating data.
[42] Although relatively small, most of the backlog is comprised of valve chambers that are at or beyond their EUL; however, asset age data should be supplemented by condition assessments to determine if the asset does need to be renewed

5.7 Wastewater Network

5.7.1 Lifecycle Activities

A summary of available lifecycle activities for the wastewater collection network and an estimate of associated costs are provided in **Tables 51** to **54** below.

Table 51: Wastewater Network Lifecycle Activities – Minor Maintenance

Asset Component	Minor Maintenance Activity Options	Approximate Cost
Sewer Mains and Manholes	- Cleaning and Flushing sewers	- $3.00/m (excl. removal of debris from manholes)
Sewer Mains and Laterals	- TV Inspection (incl. cleaning) mains only and/or laterals	- $8/m for mains -$250/lateral

Table 52: Wastewater Network Lifecycle Activities – Major Maintenance

Asset Component	Major Maintenance Activity Options	Approximate Cost
Sewer Mains	- Cleaning with cutters to remove calcite and other debris, flushing debris	- $4.50/m
Sewer Mains and/or Laterals	- Traditional Replacement: sewer only (emergency)	- $450 to $1,200 varies by diameter & depth

Table 53: Wastewater Network Lifecycle Activities – Rehabilitation

Asset Component	Rehabilitation Activity Options	Approximate Cost
Sewer Mains	- Trenchless Sewer Lining	- $300 to $800/m varies by diameter
Sewer Mains/Laterals	- Trenchless Spot Repair of main or lateral	- $6,000 per location
Sewer Mains/Laterals	- Traditional Spot repair of main or lateral	- $5,000 to $10,000 (incl. restoration

Manholes	- Sealing Manholes	- $2,000/manhole
Manholes	- Manhole F&G, Modulock replacement	- $250/F&G -$300/m depth modulock
Manholes	- Manhole benching repair	- $1,000/manhole

Table 54: Wastewater Network Lifecycle Activities – Replacement

Asset Component	Replacement Activity Options	Approximate Cost
Sewer Mains	- Pipe Bursting	- $300 to $400/m varies by diameter.
Sewer Mains and Laterals	- Traditional Replacement : as part of full reconstruction (planned)	- $300 to $850 varies by diameter, depth & soil conditions
Laterals	- Pipe Bursting	- $2,000/lateral
Manholes	- Manhole replacement alone or in combination with any of above.	- $8,000 to $16,000 varies by size & depth

There are many risks associated with lifecycle activities of assets. When developing a standard timeframe for when maintenance should occur, the municipality must balance the cost of doing frequent maintenance versus the risks of waiting long periods of time between maintenance activities.

If the City does not perform the above-mentioned lifecycle activities, the wastewater network is at risk of structural compromise that could lead to main breaks, wastewater run-off issues, water contamination issues, sewer backup issues, etc. This would not only lead to an inconvenience for residents and have a large impact on their daily lives, but it would also result in the City's reputation and reliability being tarnished.

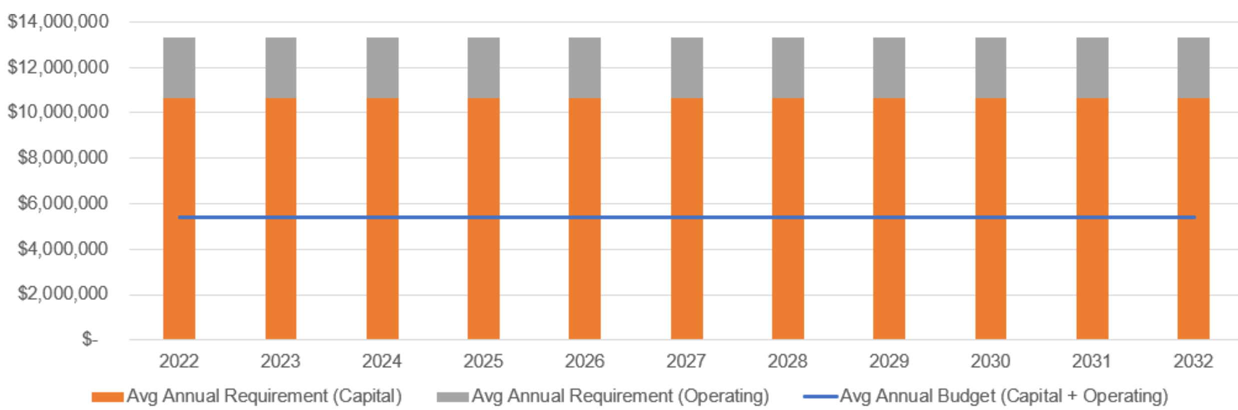
As previously mentioned, performing lifecycle activities (such as repairs, maintenance, etc.) and investing funds on a regular basis is the most cost-effective way to manage an asset throughout its lifecycle. Although the municipality has to put funds into an asset on more occasions, the sum of the funds is less than if the municipality puts funds into the asset one time when the asset has deteriorated to such a level that it is incredibly costly to restore it to a useable condition. Therefore it is important to perform the lifecycle activities mentioned above on a predetermined, recurring schedule. The costs of performing these lifecycle activities should be considered in terms of staff time and budgetary dollars required. In order to ensure the lifecycle activities are performed at the lowest cost, the City should make note of best practices, issue well-developed RFPs to obtain competitive bids from third-parties, and stay up to date on the current and expected industry trends/standards.

5.7.2 Funding vs. Need

Figure 35 below graphs the funding deficit for the wastewater network. The orange bar represents the average annual capital spending required to meet all current and future financial obligations while the grey bar represents the average annual operating spending. The blue horizontal line represents the estimated average budgeted spending[43]. It should be noted that in general, operating requirements for the wastewater network are mostly funded. The average annual deficit is comprised of mostly, capital shortfalls.

The total average annual funding deficit for the wastewater network is $7,902,857. The average annual requirement is $13,296,354[44] and current average spending is $5,393,497, giving a funding vs. need ratio of approximately 40%.

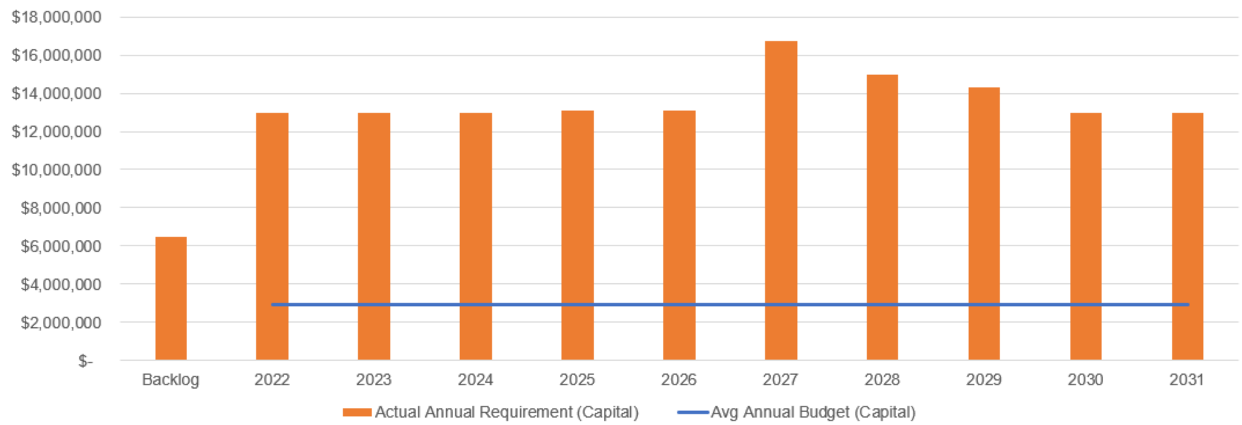
Figure 35: Wastewater Network Funding Requirement – Summary



[43] Average budgeted spending includes both capital and operating budget. Based on an average of the five-year capital budget and two-year operating budget.
[44] Average annual requirement (capital) is calculated based on the average of the upcoming 10-year actual anticipated requirement. Where insufficient or unreliable data exists, the average annual requirement (capital) is calculated by taking the CRC for each asset component divided by the years of life remaining (EUL – average age).

Figure 36 below shows the actual annual anticipated requirement[45] as well as the backlog requirement for assets that are at or beyond their estimated useful life.

Figure 36: Wastewater Network Funding Requirement – Actual Annual Requirement



[46]

[45] Only depicts capital requirement and budget. Does not include operating data.
[46] The backlog is comprised of a pump station that is intended to be replaced later this year as well as some manholes.

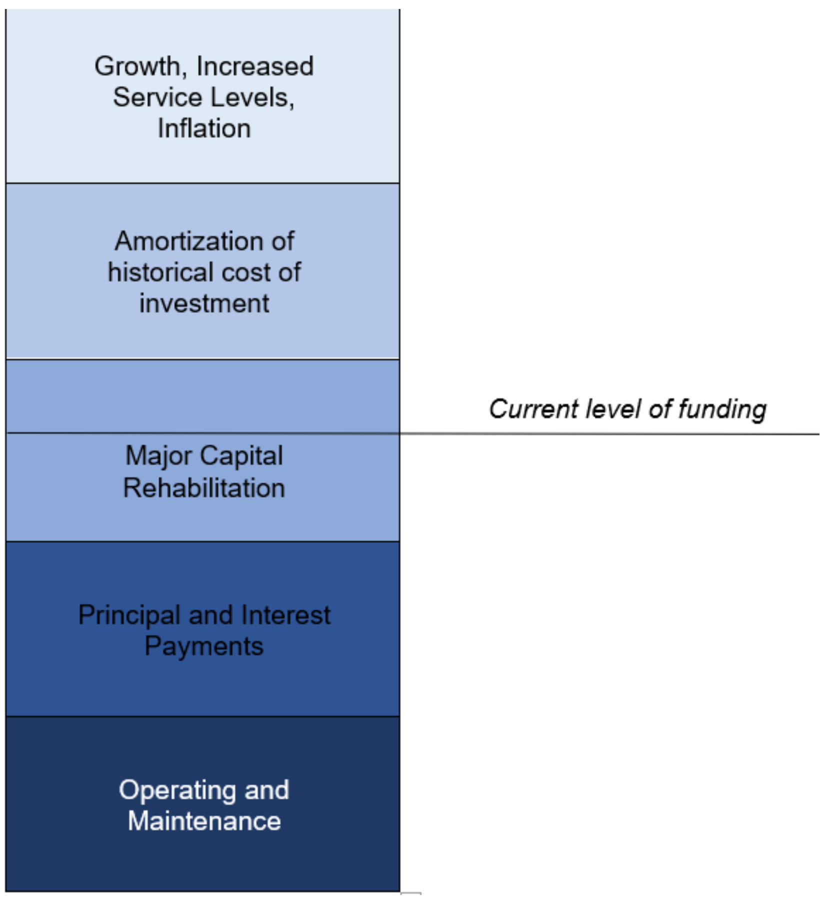
6. Financial Strategy

6.1 Financial Planning Overview

The ultimate goal is to have the Asset Management Plan linked to the long-term financial plan and future years' budgets. Future iterations of the AMP will include the development of a comprehensive financial plan that will allocate dedicated financial resources to meeting the funding needs identified in the Asset Management Plan.

The following figure, **Figure 37**, depicts the various funding levels that will ultimately be incorporated into the asset management plan and long-term financial plan. A fully funded scenario would include costs for regular operating and maintenance (operating budget), debt payments (operating budget), major capital rehabilitation (capital budget), and future replacement including amortization of historical costs and indexed to include inflation, growth of the network and changes in service levels.

Figure 37: Funding Levels



6.2 Sources of Financing

Financing sources available to the municipality to be applied in the long-term financial plan include:

- Municipal Tax Levies;
- User fees (including Water and Sewer charges);
- Reserve balances;
- Debenture Issues;
- Sale of assets;
- Municipal partnerships; and
- Dedicated government grants (gas tax and other programs where there is an agreement in place that is expected to be ongoing and remain stable).

Financial strategy and funding sources will be explored in more detail in future iterations of the AMP.

7. Future Changes in Population or Economic Activity

According to a third-party study completed at the request of Grey County, the upper-tier municipality in Grey-Bruce, the population of the City of Owen Sound is expected to increase by just over 10% over the next 25-years, bringing the total population of the municipality to just under 25,000. Owen Sound has also seen a surge in development in the past couple of years and this trend is expected to continue with more residential and commercial builds projected to occur in the coming years.

The City has also spent significant time rebranding and renewing its downtown core, now known as the *River District*, to highlight its natural beauty and local businesses, making it more of a tourist attraction. This renewal includes increased advertising and promotion of the downtown area, the introduction of new events (such as a bi-weekly Music at the Market event in the summer), among other initiates. With changes such as this, the City can anticipate more tourism and an increased ability to attract those from out of town as well as City residents to the area, thus increasing the amount of money spent in the City.

Despite being good for the City's local economy and small businesses, this anticipated increase in population and tourism will put additional strain on the City's existing infrastructure which may cause it to wear out faster than previously expected, thus decreasing its EUL and remaining lifespan; however, with increased tourism comes an increase in spending in the City which may lead to increased revenues for the City which could help to offset some of the costs associated with more frequent or aggressive performance of the lifecycle activities for the City's core assets.

8. Improvement Plan

Asset management is a process. While the development of this AMP is a great start in helping the City better understand its current position and future goals, there is always room to improve. In addition to working towards the completion of the upcoming requirements under O. Reg. 588/17, the following table, **Table 55**, identifies some areas of improvement that the City should work towards as part of future iterations of this AMP.

Table 55: Improvement Plan

Task #	Task Details	Responsibility	Resources Required	Timeline
1	Obtain Council endorsement of AMP for core assets	Director of Corporate Services	Director of Corporate Services, Asset Coordinator, Council	Immediately
2	Verify and update inventory of all core assets*	Asset Coordinator, Field Staff (i.e. Engineering, PW, etc.), Finance, GIS	Asset Coordinator, Field Staff (i.e. Engineering, PW, etc.), Finance, GIS	1 – 2 years
3	Verify and update estimated useful life and actual age of all core assets*	Asset Coordinator, Field Staff (i.e. Engineering, PW, etc.), Finance, GIS	Asset Coordinator, Field Staff (i.e. Engineering, PW, etc.), Finance, GIS	1 – 2 years
4	Investigate benefit of acquiring additional data to enhance annual requirement calculation	Asset Coordinator, Finance Staff	Asset Coordinator, Finance Staff	1 – 2 years
5	Verify and update condition of all core assets	Asset Coordinator, Field Staff (i.e. Engineering, PW, etc.), Finance, GIS, may require a consultant to determine asset conditions	Asset Coordinator, Field Staff (i.e. Engineering, PW, etc.), Finance, GIS, may require a consultant to determine asset conditions	2 years

6	Update levels of service for all core assets to include proposed level of service	Asset Coordinator, Field Staff (i.e. Engineering, PW, etc.)	Asset Coordinator, Field Staff (i.e. Engineering, PW, etc.), Finance	2 years
7	Collect further data on stormwater infrastructure in the City to be able to better understand the current performance of assets (specifically as it relates to the technical levels of service outlined in Section 4.4.2 of this report)	Engineering, potentially may require the assistance of a consultant to collect data	Engineering, potentially may require the assistance of a consultant to collect data	2 years
8	Obtain input of residents and incorporate feedback into customer values section and current performance section	Asset Coordinator in consultation with Communications department and Senior Leadership	Asset Coordinator, Communications, Senior Leadership	2 years
9	Integrate asset management plan with long-term financial plan and strategic plan	City Manager and Senior Leadership in consultation with Finance and Asset Coordinator	City Manager, Senior Leadership, Finance, Asset Coordinator	3 years

9. Appendices

Appendix 1: Assumptions

Assumption A: Useful Lives of Assets

It was assumed that the estimated useful lives of assets can be based on a predetermined generally accepted standard, unless otherwise able to be determined through means such as inspection, professional judgment, etc.

Assumption B: Asset Conditions

For asset components where accurate condition data could not be determined, such as collection pipes for stormwater, water, and wastewater, the current asset condition was determined based on the material of pipe used. For example, it was assumed that all pipes with a material of clay were in poor condition, pipes with a material of asbestos cement or concrete were in fair condition, and all pipes with a material of PVC of HDPE were in good condition.

Assumption C: Professional Judgment

It was assumed that any assessments made through the use of professional judgement of field staff (i.e. PW, engineering), finance staff, asset management staff, or any other qualified staff, were relatively accurate.

Assumption D: Other Assumptions

Other specific assumptions are stated in footnotes throughout the report.

Appendix 2: Data Confidence

The overall level of confidence for the data provided in this asset management plan is medium.

The City is lacking detailed data on its stormwater network. Obtaining more accurate and up to date data for this asset class has been included in the improvement plan.

Similarly, some asset components (such as stormwater, water, and wastewater collection pipes) have lower data confidence due to out of date or unreliable/unknown asset data. In these cases, professional judgment and realistic assumptions had to be utilized in data and calculations.

More detailed information on data confidence levels can be seen in **Table 56** below.

In 2014 the City hired a consultant to collect, review, and update much of its data; while this data is outdated by a several years at this point, much of the foundational information will likely be relatively consistent.

This 2022 plan used the 2014 data as a comparison point to assess the accuracy of the new data pulled. Asset data for the 2022 plan came from various sources, including the City's asset management system, third-party condition assessments and reports, as-built drawings, CCTV footage, GIS, and was supplemented by professional judgement.

The City must weigh the benefit of collecting more detailed data with the costs (monetary, staff time, etc.) of doing so.

In future iterations of the AMP, further data validation and clean-up will be undertaken, as necessary, as outlined in the *Improvement Plan* section of this AMP.

Table 56: Data Confidence

Asset Category	EUL	Age	Condition	Average Annual Requirement	Average Annual Budget	Average Annual Deficit	Overall Category Confidence
Roads	High	Medium - High	Medium - High	Medium	Medium - High	Medium	**Medium**
Bridges	High	High	High	Medium	Medium - High	Medium	**Medium - High**
Stormwater	High	Low	Low	Low - Medium	Medium - High	Low - Medium	**Low**
Water	High	Medium	Low - Medium	Medium	Medium - High	Medium	**Medium**
Wastewater	High	Medium	Low - Medium	Medium	Medium - High	Medium	**Medium**

Appendix 3: Core Asset Report Cards

Report Card A: Road Network

Road Network			
Overall Rating			
Condition vs. Performance Rating	**Funding vs. Need Rating**	**Average Rating**	**Overall Letter Rating**
3.7	5.0	4.3	B +

Condition vs. Performance								
				Total Replacement Value	**$156,238,101**			
Asset Category	**Condition**	**Letter Grade**	**Rating (1-5)**	**Replacement Value in Given Condition**	**% of Assets in Given Condition**	**Weighted Rating[47]**	**Total Category Rating**	
							Rating	**Letter Grade**
Road Network	Excellent	A	5	$ 52,999,943	34%	1.70	**3.7**	**B -**
	Good	B	4	$ 31,288,758	20%	0.80		
	Fair	C	3	$ 51,334,051	33%	0.99		
	Poor	D	2	$ 6,696,177	4%	0.09		
	Very Poor	F	1	$ 13,919,174	9%	0.09		
				$156,238,101	**100%**	**3.66**		

Funding vs. Need						
Asset Category	**Average Annual Investment Required[48]**	**Average Funding Available[49]**	**Funding Percentage**	**Annual Deficit**	**Total Category Rating**	
					Rating	**Letter Grade**
Road Network	$9,675,315	$9,285,186	96.0%	$390,129	**5.0**	**A**

[47] Calculated as Rating value (1-5) * % of assets in given condition value
[48] Considers both capital (renewal) and operating (operations/maintenance) investment. Calculated by taking an average of the upcoming 10-year actual replacement needs. This figure includes any backlog values. Where the upcoming 10-year actual replacement need could not be calculated, an average annual need was calculated by taking total replacement value for those asset components and dividing by life remaining (EUL – age) for that component group
[49] Calculated using average amount from previous five years of capital budgets plus the average amount from previous two years of operating budgets

Report Card B: Bridge Network

Bridge Network			
Overall Rating			
Condition vs. Performance Rating	**Funding vs. Need Rating**	**Average Rating**	**Overall Letter Rating**
4.7	1.0	2.9	C -

Condition vs. Performance								
			Total Replacement Value		**$ 27,697,414**			
Asset Category	**Condition**	**Letter Grade**	**Rating (1-5)**	**Replacement Value in Given Condition**	**% of Assets in Given Condition**	**Weighted Rating**	**Total Category Rating**	
							Rating	**Letter Grade**
Bridge Network	Excellent	A	5	$ 19,806,689	75%	3.75	**4.7**	**A -**
	Good	B	4	$ 5,141,645	19%	0.74		
	Fair	C	3	$ 1,225,526	4%	0.13		
	Poor	D	2	$ 88,706	0%	0.01		
	Very Poor	F	1	$ 468,853	2%	0.02		
				$27,697,414	**100%**	**4.65**		

Funding vs. Need						
Asset Category	**Average Annual Investment Required[50]**	**Average Funding Available[51]**	**Funding Percentage**	**Deficit**	**Total Category Rating**	
					Rating	**Letter Grade**
Bridge Network	$185,906	$58,956	31.7%	$126,951	**1.0**	**F**

[50] Considers both capital (renewal) and operating (operations/maintenance) investment. Calculated by taking an average of the upcoming 10-year actual replacement needs. This figure includes any backlog values. Where the upcoming 10-year actual replacement need could not be calculated, an average annual need was calculated by taking total replacement value for those asset components and dividing by life remaining (EUL – age) for that component group

[51] Calculated using average amount from previous five years of capital budgets plus the average amount from previous two years of operating budgets

Report Card C: Stormwater Network

Stormwater Network			
Overall Rating			
Condition vs. Performance Rating	**Funding vs. Need Rating**	**Average Rating**	**Overall Letter Rating**
4.1	1.0	2.6	D +

Condition vs. Performance								
				Total Replacement Value	**$ 188,901,889**			
Asset Category	**Condition**	**Letter Grade**	**Rating (1-5)**	**Replacement Value ($) in Given Condition**	**% of Assets in Given Condition**	**Weighted Rating**	**Total Category Rating**	
							Rating	**Letter Grade**
Stormwater Network	Excellent - Good	A/B	5/4	$155,263,424	82%	3.69	**4.1**	**B**
	Fair	C	3	$14,497,436	8%	0.23		
	Poor – Very Poor	D/F	2/1	$19,141,030	10%	0.15		
				$188,901,889	**100%**	**4.08**		

Funding vs. Need						
Asset Category	**Average Annual Investment Required**[52]	**Average Funding Available**[53]	**Funding Percentage**	**Deficit**	**Total Category Rating**	
					Rating	**Letter Grade**
Stormwater Network	$3,284,057	$764,873	23.3%	$2,519,184	**1.0**	**F**

[52] Considers both capital (renewal) and operating (operations/maintenance) investment. Calculated by taking an average of the upcoming 10-year actual replacement needs. This figure includes any backlog values. Where the upcoming 10-year actual replacement need could not be calculated, an average annual need was calculated by taking total replacement value for those asset components and dividing by life remaining (EUL – age) for that component group

[53] Calculated using average amount from previous five years of capital budgets plus the average amount from previous two years of operating budgets

Report Card D: Water Network

Water Network			
Overall Rating			
Condition vs. Performance Rating	**Funding vs. Need Rating**	**Average Rating**	**Overall Letter Rating**
2.8	1.0	1.9	D -

Condition vs. Performance								
				Total Replacement Value	**$ 422,062,113**			
Asset Category	**Condition**	**Letter Grade**	**Rating (1-5)**	**Replacement Value ($) in Given Condition**	**% of Assets in Given Condition**	**Weighted Rating**	**Total Category Rating**	
							Rating	**Letter Grade**
Water Network	Excellent - Good	A/B	5 - 4	$127,775,154	30%	1.36	**2.8**	**C -**
	Fair	C	3	$110,013,040	26%	0.79		
	Poor – Very Poor	D/F	2 - 1	$184,273,918	43%	0.65		
				$422,062,113	**100%**	**2.81**		

Funding vs. Need						
Asset Category	**Average Annual Investment Required**[54]	**Average Funding Available**[55]	**Funding Percentage**	**Deficit**	**Total Category Rating**	
					Rating	**Letter Grade**
Water Network	$19,209,466	$7,801,685	40.6%	$11,407,780	**1.0**	**F**

[54] Considers both capital (renewal) and operating (operations/maintenance) investment. Calculated by taking an average of the upcoming 10-year actual replacement needs. This figure includes any backlog values. Where the upcoming 10-year actual replacement need could not be calculated, an average annual need was calculated by taking total replacement value for those asset components and dividing by life remaining (EUL – age) for that component group

[55] Calculated using average amount from previous five years of capital budgets plus the average amount from previous two years of operating budgets

Report Card E: Wastewater Network

Wastewater Network			
Overall Rating			
Condition vs. Performance Rating	**Funding vs. Need Rating**	**Average Rating**	**Overall Letter Rating**
3.8	1.0	2.4	D +

Condition vs. Performance								
				Total Replacement Value	**$ 394,643,372**			
Asset Category	**Condition**	**Letter Grade**	**Rating (1-5)**	**Replacement Value ($) in Given Condition**	**% of Assets in Given Condition**	**Weighted Rating**	**Total Category Rating**	
							Rating	**Letter Grade**
Wastewater Network	Excellent - Good	A/B	5 - 4	$283,428,643	72%	3.24	**3.8**	**B -**
	Fair	C	3	$40,196,531	10%	0.30		
	Poor – Very Poor	D/F	2 - 1	$71,018,199	18%	0.27		
				$394,643,372	**100%**	**3.81**		

Funding vs. Need						
Asset Category	**Average Annual Investment Required**[56]	**Average Funding Available**[57]	**Funding Percentage**	**Deficit**	**Total Category Rating**	
					Rating	**Letter Grade**
Wastewater Network	$13,296,354	$5,393,497	40.6%	$7,902,857	**1.0**	**F**

[56] Considers both capital (renewal) and operating (operations/maintenance) investment. Calculated by taking an average of the upcoming 10-year actual replacement needs. This figure includes any backlog values. Where the upcoming 10-year actual replacement need could not be calculated, an average annual need was calculated by taking total replacement value for those asset components and dividing by life remaining (EUL – age) for that component group

[57] Calculated using average amount from previous five years of capital budgets plus the average amount from previous two years of operating budgets

Report Card F: Overall Core Assets

Overall Core Assets			
Overall Rating			
Condition vs. Performance Rating	Funding vs. Need Rating	Average Rating	Overall Letter Rating
3.5	2.0	2.8	C -

Condition vs. Performance								
				Total Replacement Value	$ 1,189,542,907			
	Asset Category	Letter Grade	Rating (1-5)	Total Replacement Value ($)	% of Replacement Value out of Total	Weighted Rating	Total Category Rating	
							Rating	Letter Grade
Overall Core Assets	Roads	B -	3.7	$156,238,101	13%	0.47	3.5	B -
	Bridges	A -	4.7	$27,697,414	2%	0.11		
	Stormwater	B	4.1	$188,901,888	16%	0.64		
	Water	C -	2.8	$422,062,113	35%	0.99		
	Wastewater	B -	3.8	$394,643,372	34%	1.29		
				$1,189,542,907	**100%**	**3.50**		

Funding vs. Need						
Asset Category	Average Annual Investment Required	Average Funding Available	Funding Percentage	Deficit	Total Category Rating	
					Rating	Letter Grade
Overall Core Assets	$45,651,099	$23,304,197	51.0%	$22,346,901	**2.0**	**D**

Appendix 4: AMP Availability

This AMP (the City of Owen Sound 2022 Asset Management Plan for Core Assets) will be made available to the public via the City's website (www.owensound.ca). Other background information and reports upon which the previously presented data was based can be found on the City's website or made available through direct request to the City.