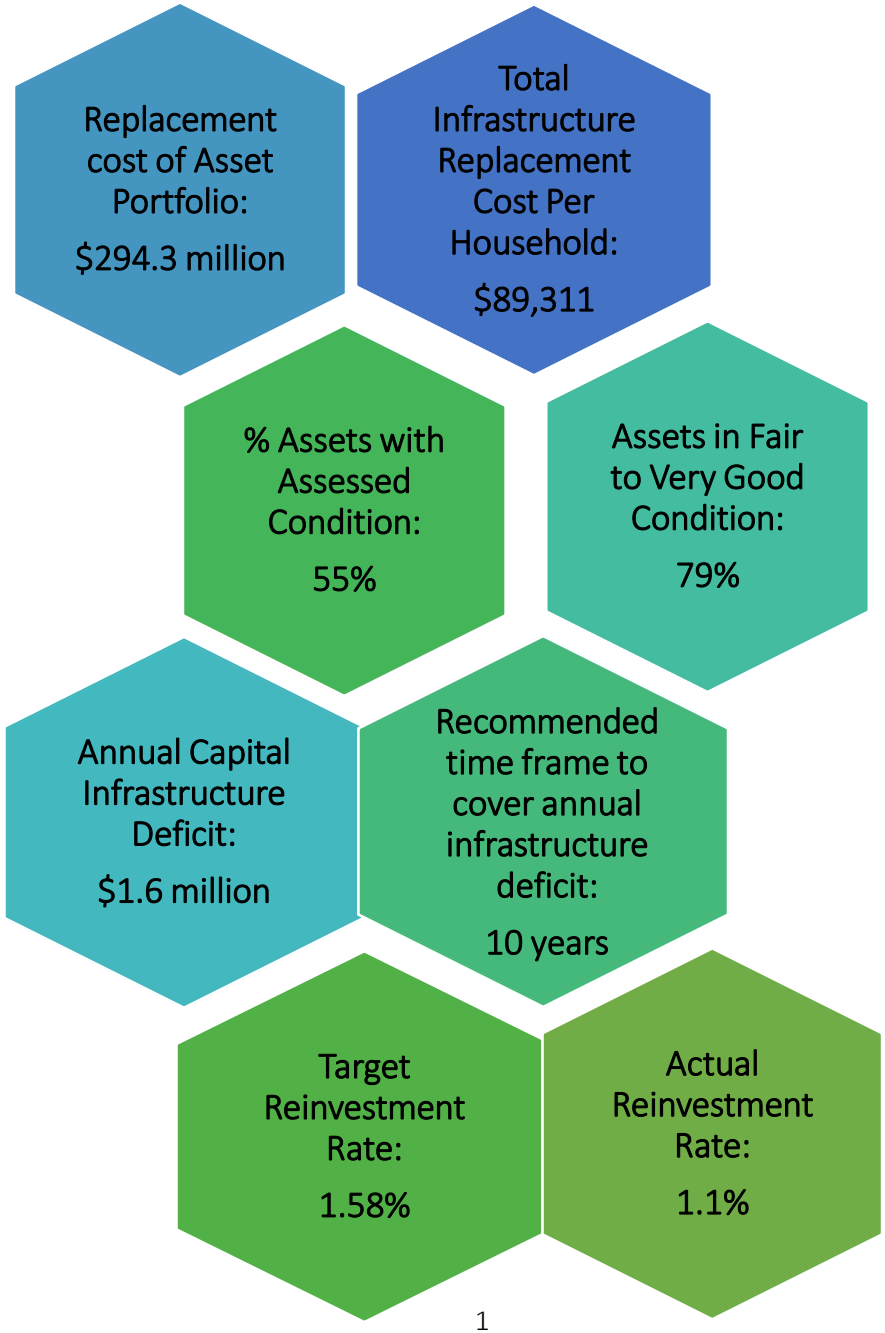
Asset Management Plan

2022

THE NATION MUNICIPALITY


Replacement cost of Asset Portfolio:
$294.3 million
Total Infrastructure Replacement Cost Per Household:
$89,311
% Assets with Assessed Condition:
55%
Assets in Fair to Very Good Condition:
79%
Annual Capital Infrastructure Deficit:
$1.6 million
Recommended time frame to cover annual infrastructure deficit:
10 years
Target Reinvestment Rate:
1.58%
Actual Reinvestment Rate:
1.1%

Contents

Executive Summary

The performance of a community's infrastructure provides the foundation for its economic development, competitiveness, prosperity, reputation, and the overall quality of life for its residents. Reliable and well-maintained infrastructure assets are essential for the delivery of critical core services for the citizens of a municipality.

A technically precise and financially rigorous asset management plan, diligently implemented, will mean that sufficient investments are made to ensure delivery of sustainable infrastructure services to current and future residents. The plan will also indicate the respective financial obligations required to maintain this delivery at established levels of service.

This Asset Management Plan (AMP) for the Nation Municipality meets all requirements as outlined within the **Asset Management Planning for Municipal Infrastructure Regulation, O. Reg. 588/17** and is integrated with financial planning and long-term budgeting. It will serve as a strategic, tactical, and financial document, ensuring the management of the municipal infrastructure follows sound asset management practices and principles, while optimizing available resources and establishing desired levels of service. Given the expansive financial and social impact of asset management on both a municipality, and its citizens, it is critical that senior decision-makers, including department heads as well as the chief executives, are strategically involved.

Scope

This AMP includes the following asset categories along with the source of funding:

Asset Category	Source of Funding
Road Network	Tax funded
Bridges and Culverts	Tax funded
Storm water Network	Tax funded
Water Network	Rate funded
Wastewater Network	Rate funded

This AMP complies with requirements of O. Reg. 588/17 that have to be met by July 1, 2022, while there are additional requirements like AMP for assets other than Core assets, their current levels of service, identification of proposed of levels of service for all municipal infrastructure assets and Strategies to fund these activities, which have to be done by July 1, 2024, and 2025, respectively.

The replacement value of the five core asset categories analyzed totaled approximately **$294.3 million** for the Nation Municipality of which 79% of assets are in fair to very good condition. For 55% of the assets, condition assessment data was available while the remaining 45% of assets had age to approximate the condition due to unavailability of actual condition assessment data.

In addition to the inventory and condition of assets, this AMP also includes a combination of Lifecycle strategies and replacement only strategies to evaluate the lowest cost alternatives while extracting the highest total value from the municipal assets while maintaining or exceeding current levels of service.

To deliver the required levels of service, the municipality has to meet capital replacement, rehabilitation needs for existing infrastructure, prevent backlogs, address the growth requirements, and achieve long-term sustainability. For this, the municipality's average annual capital requirement is $4.6 million for next 10 years while the municipality is committing $3.2 million towards capital projects each year, there is a deficiency of $1.4 million in the funding.

Please note that these values are in current dollars and does not consider the price increases over the next 10 years.

While the Municipality is responsible for the strategic direction, it is the taxpayer in Nation who ultimately bears the financial burden. Although the Nation Municipality's total population is 13,350 based on May 2021 official census, a 'Cost per Household' (CPH) analysis was conducted for each of the asset categories to determine the financial obligation of each household in sharing the replacement cost of the Municipality's assets. Such a measurement can serve as an excellent communication tool for both the administration and the council in communicating the importance of asset management to the citizen.

Asset Category	Infrastructure Replacement Cost	Number of Contributing Households	Infrastructure Replacement Cost Per Household
Road Network	$63.85 million	7200	$8,868
Bridges and Culverts	$69.44 million	7200	$9,644
Storm water Network	$23.07 million	7200	$3,204
Water Network	$59.80 million	2010	$29,750
Wastewater Network	$78.15 million	2065	$37,845
Total	**$294.3 million**		**$89,311**

Recommendations

A financial strategy was developed to address the annual capital funding gap for next 10 years.

For tax-funded assets, the Nation Municipality has developed a 10-year plan to eliminate the municipality's infrastructure deficit (for core assets only) by increasing existing tax revenues by 1% each year for next 10 years and increasing existing and future infrastructure budgets by applicable inflation index on an annual basis, assuming the current community building fund and OCIF grants.

For each rate-funded asset, we have developed separate 10-year plan to achieve full funding.

For Sanitary Sewers, we have considered increasing existing rate revenues by 6% for sanitary sewers, every year for next 10-years for the purpose of full funding and increasing future infrastructure budgets by applicable inflation index on an annual basis while for Water Services, we are considering an increase of 4.3% and 3.9% to achieve full funding for Limoges Water and St. Isidore Water, respectively to cater for the annual capital requirements and to build some reserve for the unforeseen as well as large upcoming capital expenditures. Existing and future infrastructure deficit budgets might have to be increased by the applicable change in inflation index on an annual basis.

This Asset Management Plan is based on the best available data, resources, practices, and processes in the municipality. However, being a living document, it requires continuous updating, improvements, and dedicated resources as per the changes in strategic planning.

For the continuous improvement and refinement of the Nation Municipality's asset management planning, the municipality should:

- Continue to review and update the data to maintain an accurate asset inventory
- Formalize the condition assessment strategies for all asset types
- Emphasize on risk-based decision-making in planning and budgeting
- Review existing and continue to develop and implement optimal lifecycle strategies of all asset types
- Identify and work towards the proposed levels of service

1. Introduction

- Core Infrastructure assets are key to The Nation Municipality's mandate to deliver an array of services to its community. The municipality is considering asset management planning to deliver sustainable services to the community, and to ensure asset-related decision making and investments are approached in a coordinated manner.
- The goal of asset management is to minimize the lifecycle costs of owning, operating, and maintaining assets, at an acceptable level of risk, while continuously delivering established levels of service for present and future customers**.**
- O. Reg. 588/17, Asset Management Planning for Municipal Infrastructure, provides various milestones and requirements for AMPs in Ontario that have to be met between July 1, 2022, and July 1, 2025.

1.1 Overview of Asset Management

Asset management (or infrastructure asset management) is the way we manage the infrastructure we own. Asset management is a municipality's plan for how to manage municipal infrastructure to provide services to residents and other users in a way that meets their expectations and is financially sustainable into the future.

Asset management is an important tool because it helps municipalities maintain and operate infrastructure in the most effective way so critical services can be provided to the community. The outputs of asset management planning support municipal decision makers about maintaining infrastructure and providing municipal services. It is not realistic to think municipal leaders can make fully informed decisions when managing these services without knowing information such as:

- full life cycle costs of owning and operating existing or proposed infrastructure
- levels of service: current, expected future and desired
- risks and how they are managed
- implications of future demands

The total cost of ownership of an asset includes its acquisition cost, operational cost, maintenance cost, and disposal cost. The acquisition cost of most capital assets usually accounts only for a small share while the major costs (around 80%) are associated with operations and maintenance. Thus, it is very important to carefully analyze the capital costs to maintain, rehabilitate and replace the municipal assets and it is the focus of this AMP.

1.2 Provincial Regulation (O. Reg. 588/17)

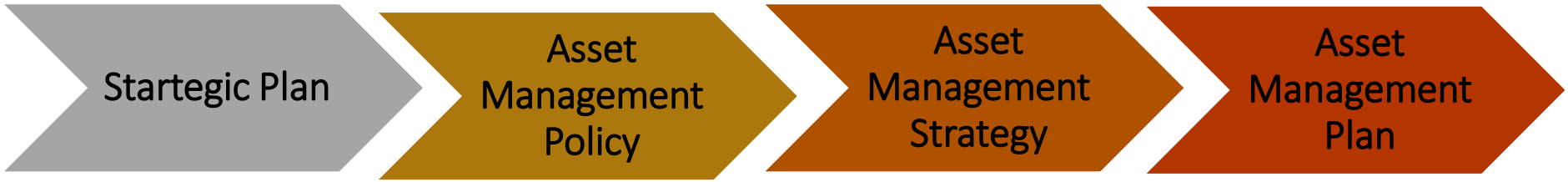
The municipal asset management planning regulation (O. Reg. 588/2017) was made under the Infrastructure for Jobs and Prosperity Act, 2015, and it came into force on January 1, 2018.

O. Reg. 588/2017 helps municipalities better understand what important services need to be supported over the long term, while identifying infrastructure challenges and opportunities, and finding innovative solutions.

In order to regulate, it was important to the province to standardize planning processes while taking into consideration the differences in capacity and asset management maturity across municipalities. The requirements and their proposed timelines are shown in the following table:

	Completion Date	Requirements
Phase 1	July 1, 2022	(Core Infrastructure Assets Only) 1. Current Levels of Service 2. Inventory Analysis 3. Estimated Cost and Lifecycle Activities Required to Sustain Current Levels of Service 4. Population under 25,000: Description of assumptions regarding future changes in population or economic activity
Phase 2	July 1, 2024	1. Same Requirements as Phase 1 expanded to all Infrastructure Assets
Phase 3	July 1, 2025	1. Proposed Levels of Service for the next 10 Years 2. Updated Inventory Analysis 3. Lifecycle Management Strategy 4. Financial Strategy 5. Addressing Shortfalls 6. Population Under 25,000: Discussion of how growth assumptions impacted the Lifecycle Management and Financial Strategy

1.3 Industry Approach to Asset Management



1.3.1 Strategic Plan

The major benefit of strategic planning is the promotion of strategic thought and action. A strategic plan spells out where an organization wants to go, how it's going to get there, and helps decide how and where to allocate resources, ensuring alignment to the strategic priorities and objectives. It will help identify priorities and guide how municipal tax dollars and revenues are spent into the future.

The strategic plan usually includes a vision and mission statement, and key organizational priorities with alignment to objectives and action plans. Given the growing economic and political significance of infrastructure, the asset management plan will become a central component of most municipal strategic plans, influencing corporate priorities, objectives, and actions.

1.3.2 Asset Management Policy

It represents the principles and mandated requirements derived from and consistent with the municipality's plan, to provide a framework for the development and implementation of the strategic plan. It provides direction to the municipal staff on their roles and responsibilities as part of the asset management program.

The Nation Municipality adopted their Strategic Asset Management Policy on June 24, 2019, in accordance with O. Reg. 588/17.

The purpose of this policy is to detail the AM program principles with the aim of:

- Striving to deliver services at approved levels of service
- Improving decision-making accountability and transparency
- Better demonstrating the long-term consideration of short-term decisions
- Improving customer service
- Reducing the life cycle costs while maintaining acceptable levels of service
- Linking infrastructure investment decisions to service outcomes

1.3.3 Asset Management Strategy

The asset management strategy describes the long-term approach to management of physical assets, specifies how municipality's objectives are to be converted into asset management objectives, and the approach for asset management plan. It provides greater detail than the policy on how the municipality plans to achieve asset management objectives through planned activities and decision-making criteria.

1.3.4 Asset Management Plan

An asset management plan is a key component of the municipality's planning process, and it reflects the outcomes of municipality's asset management program. The AMP typically includes the:

- State of Infrastructure
- Asset Management Strategies
- Levels of Service
- Financial Strategies

The AMP is a living document that should be updated regularly, at least every 5 years according to O.Reg.588/17 as additional asset and financial data becomes available. This will allow the organization to re-evaluate the state of infrastructure and identify how the organization's asset management and financial strategies are progressing.

1.4 Asset Management- Key Concepts

Implementing the key principles and best practices of asset management can lead to a significant overhaul of organizational processes, practices, and procedures. Components like condition assessments, lifecycle management, risk management, and levels of service are integral parts of effective asset management, and these concepts are applied throughout this AMP.

1.4.1 Lifecycle Management Strategies

The condition or performance of most assets will deteriorate over time. This process is affected by a range of factors including an asset's characteristics, location, utilization, maintenance history and environment. Asset deterioration has a negative effect on the ability of an asset to fulfill its intended function, and may be characterized by increased cost, risk and even service disruption.

To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration. The lifecycle management strategy helps municipalities plan for these maintenance costs over a forecast period. Because most assets currently managed by a municipality are already part way through their lifecycle, the task of planning for lifecycle costs over a shortened lifecycle period can become difficult.

These activities can generally fall within the categories of maintenance, rehabilitation, and replacement. The following table provides a description of each type of activity and the general difference in cost.

Lifecycle Activity	Description	Example (Roads)	Cost
Preventive Maintenance	Activities that prevent defects or deteriorations from occurring	Patching	$
Corrective Maintenance/Rehabilitation	Activities that rectify defects or deficiencies that are already present and may be affecting asset performance	Mill & Overlay	$$
Replacement/ Reconstruction	Asset end-of-life activities that often involve the complete replacement of assets	Full Reconstruction	$$$

The municipality's approach to lifecycle management is described within each asset category outlined in this AMP. Developing and implementing a proactive lifecycle strategy will help staff to determine which activities to perform on an asset and when they should be performed to maximize useful life at the lowest total cost of ownership. The condition assessment information provides a more accurate indication of lifecycle needs.

1.4.2 Risk Management Strategies

In a municipality, not all the assets are equal. Some are more important than others, and their failure could have posed more risk and have more serious repercussions on the society than others. So, there should be sound risk assessment and management techniques to prioritize the likelihood and impact of failure of assets. By identifying the various impacts of asset failure and the likelihood that it will fail, risk management strategies can identify critical assets, and determine where maintenance efforts, and spending, should be focused.

Good asset management practice includes the assessment of risk, the likelihood and consequence of an undesirable event or circumstance that could negatively impact the ability of assets to meet the objectives of the community it serves.

This AMP includes a high- level evaluation of asset risk and criticality, with each asset having an assigned probability and consequence of failure score. These risk scores can be used to prioritize maintenance, rehabilitation, and replacement strategies for critical assets.

1.4.3 Levels of Service

The primary responsibility of a municipality is to ensure that they are providing adequate and sustainable services to their community. Levels of Service can be defined as the performance of the assets or the quality of the service they provide to the community. Municipalities are expected to establish realistic targets based on the available financial resources and the minimum asset condition or performance requirements to address community needs. Higher service levels will result in reduced risk of asset failures or service interruption.

Within each asset category in this AMP, technical metrics and qualitative descriptions that measure both technical and community levels of service have been established and measured as data is available, in reference to those outlined in O. Reg. 588/17.

Community Levels of Service are a simple, plain language description of service that the customer receives.

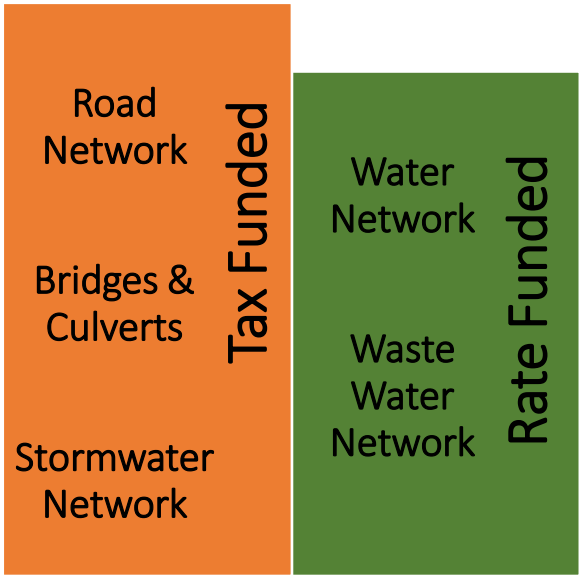
Technical Levels of Service are a key performance indicator measured internally that indicates how the municipality is performing in relation to the level of service. It measures the key technical attributes of the service that is provide to the community. These include mostly quantitative measures and reflect the impact of the municipality's asset management strategies on the physical condition of assets or the quality/capacity of the services they provide.

2. Scope

2.1 Asset Categories Included in this AMP

This AMP includes the analysis of 5 core asset categories (Roads, Bridges & Culverts, Water, Wastewater, and Storm water).

As per O. Reg. 588/17, this AMP includes the state of infrastructure, current levels of service, lifecycle strategies and financial strategies for the core assets, where Roads, bridges & culverts, and storm water are tax funded while water and wastewater are rate funded entities.



2.2 Replacement Cost Methods

Out of the numerous methods available to derive the replacement cost of assets, the Nation Municipality used following:

- **User-defined Cost**
- **Cost/Unit**
- **CPI (Consumer Price Index) Tables**

User-defined and Cost/Unit are usually the costs provided by the municipal staff, which are based on recent contracts, invoices, from engineering reports, staff estimates based on the quantity, and material etc. based on their experience and knowledge. These costs based on reliable sources are reasonably correct and a reliable way for determining the replacement costs.

In CPI tables, the historical costs are inflated based on the consumer Price Index or Non-Residential Building Construction Price Index and is typically used in absence of reliable data for replacement costs.

2.3 Asset Life

Life of assets plays a key role in keeping the asset inventory updated and accurate. The Nation Municipality considers the EUL (Estimated Useful Life) and SLR (Service Life Remaining) for planning and maintaining its assets.

Estimated useful life (EUL) of an asset is the time period over which the municipality expects the asset to be available for use and could remain in service before the need for replacement or disposal. In this report, the EUL of assets is assigned based on industry standards, in addition to the knowledge and expertise of staff.

Service life remaining (SLR) for each asset is calculated by using the asset's estimated useful life and in-service date.

Service Life Remaining= In-service date + EUL – Current Year

Service life remaining is subjected to change based on the condition of assets. But if measured correctly, it can help the municipality to forecast and plan replacement of assets more effectively and accurately.

For example, a part of Concession 10 was constructed in 2020, and its estimated useful life (EUL) is 25 years. Based on this, service life remaining for this road section is:

Service Life Remaining = 2020 + 25 – 2022 = 23 years

2.4 Reinvestment Rate

An additional expenditure is always required to keep assets in good or working condition as they are subjected to deterioration with the age and usage. These additional costs (renewal or replacement) termed as reinvestment, are necessary to provide the required levels of service to the community. The reinvestment rate is a measurement of available or required funding relative to the total replacement cost.

By comparing the actual vs. target reinvestment rate the municipality can determine the extent of any existing funding gap. The reinvestment rate is calculated as follows:

Target Investment Rate = **Annual Capital Requirement / Total Replacement Cost**

Actual Investment Rate = **Annual Capital Funding Available / Total Replacement Cost**

2.5 Asset Condition

The foundation of good asset management practice is comprehensive and reliable information on the current condition of your infrastructure. Municipalities need to have a clear understanding of the performance and condition of their assets, and all management decisions regarding future expenditures and field activities should be based on this knowledge. Accurate and reliable condition data helps to prevent premature and costly rehabilitation or replacement and ensures that lifecycle activities occur at the right time to maximize asset value and useful life.

A condition assessment rating system provides a standardized descriptive framework that allows comparative benchmarking across the organization's asset portfolio. The following table outlines the condition rating system used in this AMP to determine asset condition. This rating system is aligned with the Canadian Core Public Infrastructure Survey which is used to develop the Canadian Infrastructure Report Card. When assessed condition data is not available, service life remaining is used to approximate asset condition.

Condition Rating	Description
Very Good	Well maintained, good condition, new or recently rehabilitated
Good	Acceptable, generally approaching mid-stage of expected service life
Fair	Signs of deterioration, some elements exhibit deficiencies
Poor	Approaching end of service life, condition below standard, large portion of system exhibits significant deterioration
Very Poor	Near or beyond expected service life, widespread signs of advanced deterioration, some assets may be unusable

Without accurate and reliable asset data, there may be little confidence in asset management decision-making which can lead to premature asset failure, service disruption and suboptimal investment strategies. To prevent these outcomes, the municipality's condition assessment strategy should outline several key considerations, including:

- The role of asset condition data in decision-making
- Guidelines for the collection of asset condition data
- A schedule for how regularly asset condition data should be collected

Role of Asset Condition Data

The goal of collecting asset condition data is to ensure that data is available to inform maintenance and renewal programs required to meet the desired level of service. Accurate and reliable condition data allows municipal staff to determine the remaining service life of assets, and identify the most cost-effective approach to deterioration, whether it involves extending the life of the asset through remedial efforts or determining that replacement is required to avoid asset failure.

In addition to the optimization of lifecycle management strategies, asset condition data also impacts the municipality's risk management and financial strategies. Assessed condition is a key variable in the determination of an asset's probability of failure. With a strong understanding of the probability of failure across the entire asset portfolio, the municipality can develop strategies to mitigate both the probability and consequences of asset failure and service disruption. Furthermore, with condition-based determinations of future capital expenditures, the municipality can develop long-term financial strategies with higher accuracy and reliability.

Guidelines for Condition Assessment

Whether completed by external consultants or internal staff, condition assessments should be completed in a structured and repeatable fashion, according to consistent and objective assessment criteria. Without proper guidelines for the completion of condition assessments there can be little confidence in the validity of condition data and asset management strategies based on this data.

Condition assessments must include a quantitative or qualitative assessment of the current condition of the asset, collected according to specified condition rating criteria, in a format that can be used for asset management decision-making. As a result, it is important to define the condition rating criteria that should be used and the assets that require a discrete condition rating.

Developing a Condition Assessment Schedule

Condition assessments and general data collection can be both time-consuming and resource intensive. It is not necessarily an effective strategy to collect assessed condition data across the entire asset inventory. Instead, the municipality should prioritize the collection of assessed condition data based on the

anticipated value of this data in decision-making. The International Infrastructure Management Manual (IIMM) identifies four key criteria to consider when making this determination:

1. **Relevance**: every data item must have a direct influence on the output that is required

2. **Appropriateness**: the volume of data and the frequency of updating should align with the stage in the assets life and the service being provided

3. **Reliability**: the data should be sufficiently accurate, have sufficient spatial coverage and be appropriately complete and current

4. **Affordability**: the data should be affordable to collect and maintain

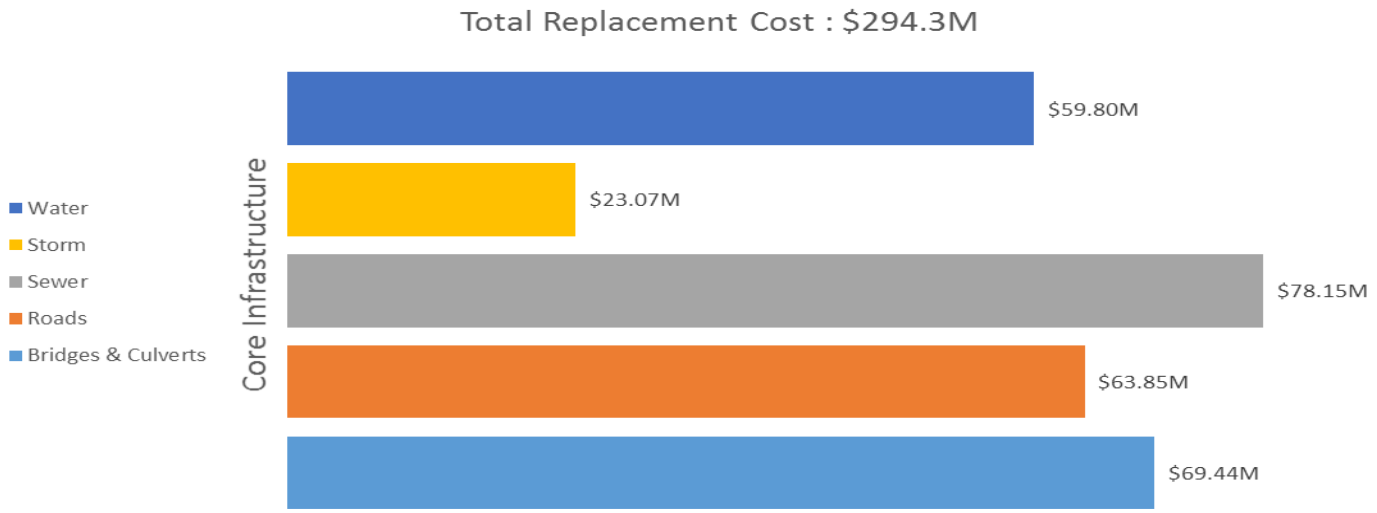
In this AMP, wherever assessed condition data is not available, age is used as a proxy to determine the condition of assets.

3. Asset Portfolio Overview

- The total asset inventory (core assets only) of the Nation Municipality is worth $294.3 million
- 79% of assets are in fair to very good condition
- 28% of assets are projected for replacement in next 10 years
- There is gap of $1.4 million in annual capital funding, where the requirement is $4.6 million and the funding available is $3.2 million

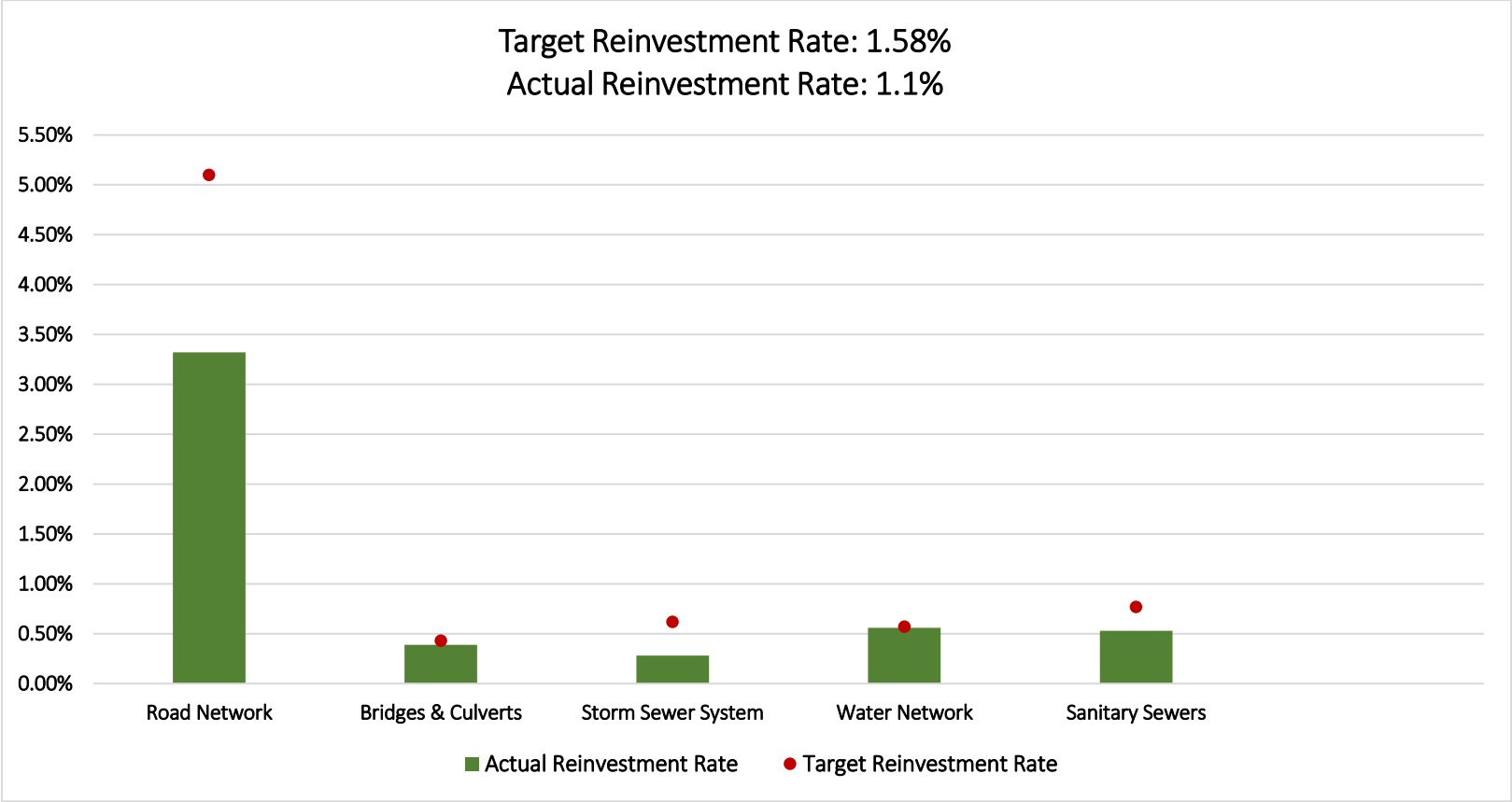
3.1 Total Replacement Cost of Assets

Based on the Nation Municipality's inventory in 2021, the total replacement cost of assets is $294.3 million based on the user-defined costs, cost/unit and CPI tables.



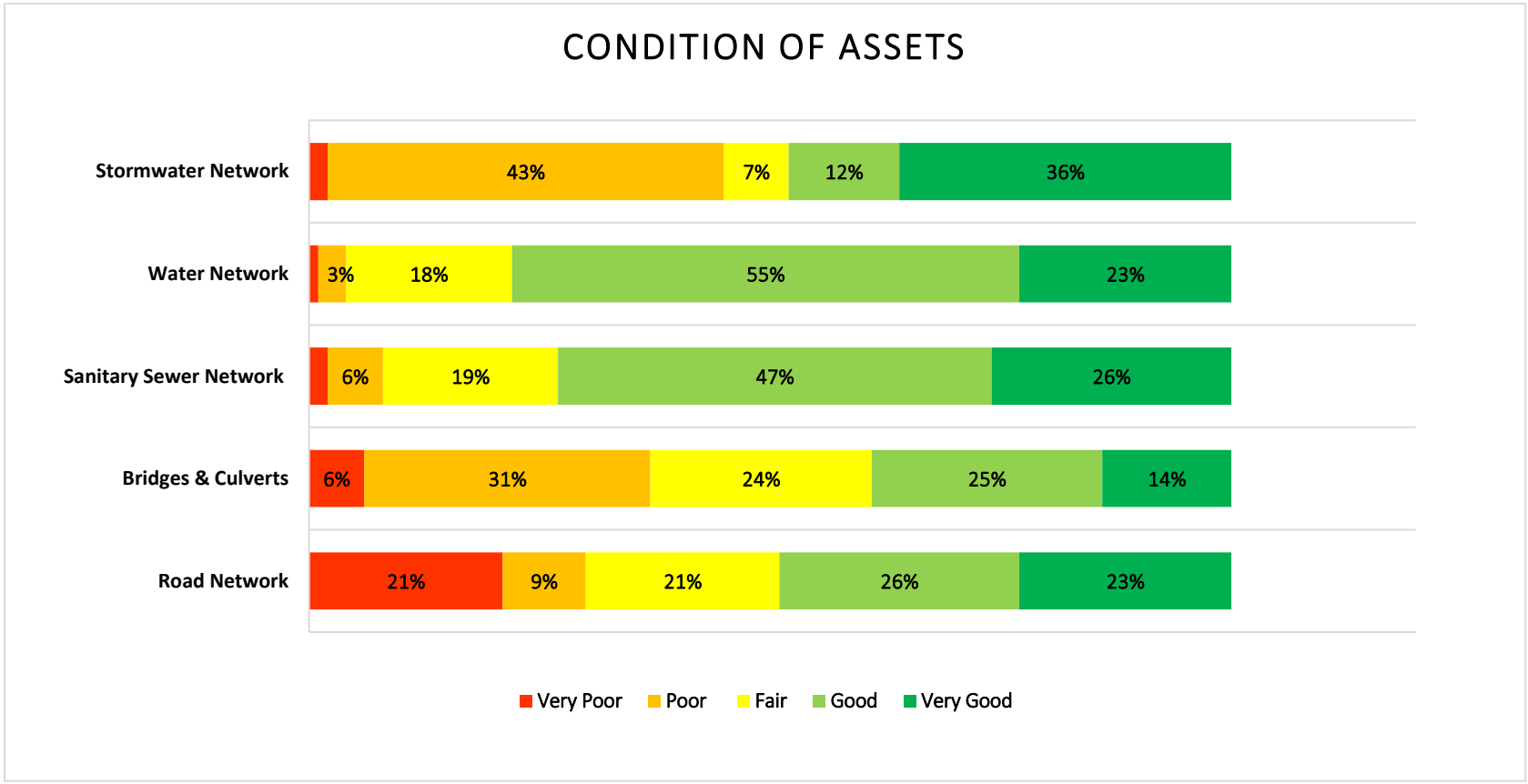
3.2 Target Vs Actual Reinvestment Rate

As mentioned earlier, the municipality is facing annual funding gap of $1.4 million. The graph below illustrates the funding differences by comparing target and actual reinvestment rates. To meet the long-term replacement needs, the municipality should be allocating approximately $4.6 million annually, for a target reinvestment rate of 1.58%. Actual annual spending on infrastructure totals approximately $3.2 million, for an actual reinvestment rate of 1.1%.



3.3 Condition of Assets Portfolio

The current condition of the assets is central to all asset management planning. Collectively, 79% of assets in the Nation Municipality are in fair or better condition. This estimate relies on both age-based and assessed condition data.



This AMP relies on assessed condition data for 55% of assets; for the remaining portfolio, age is used as an approximation of condition. Assessed condition data is invaluable in asset management planning as it reflects the true condition of the asset and its ability to perform its functions. The table below identifies the source of condition data used throughout this AMP.

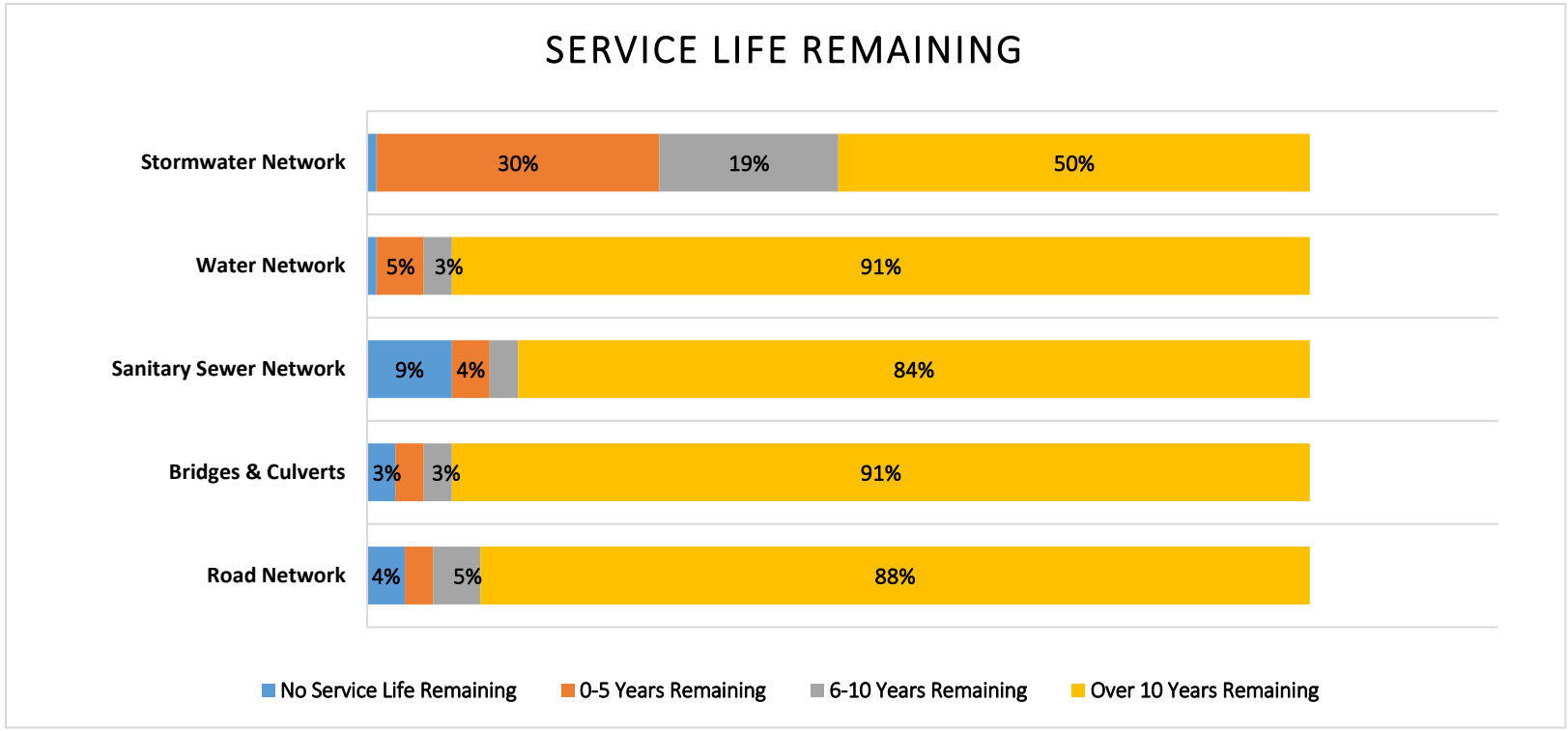
Asset Category	Asset Segment	% Of Assets with Assessed Condition	Source of Condition Data
Road Network	Paved Roads	100%	Staff Assessments
Bridges & Culverts	Bridges	100%	2021 OSIM Report (by Keystone Bridge Management)
	Structural Culverts (over 3m)	100%	2021 OSIM Report (by Keystone Bridge Management)
Water Network	All	25%	Assessments for water tower, reservoirs, wells All other components are assessed by staff based on break history & quality complaints
Sanitary Sewers	All	45%	Staff assessments for lagoons, pumping stations and treatment units
Storm water Network	All	0%	N/A

*OSIM refers to Ontario's Structure Inspection Manual

*% of Condition Assessment data is calculated considering the replacement cost.

3.4 Service Life Remaining

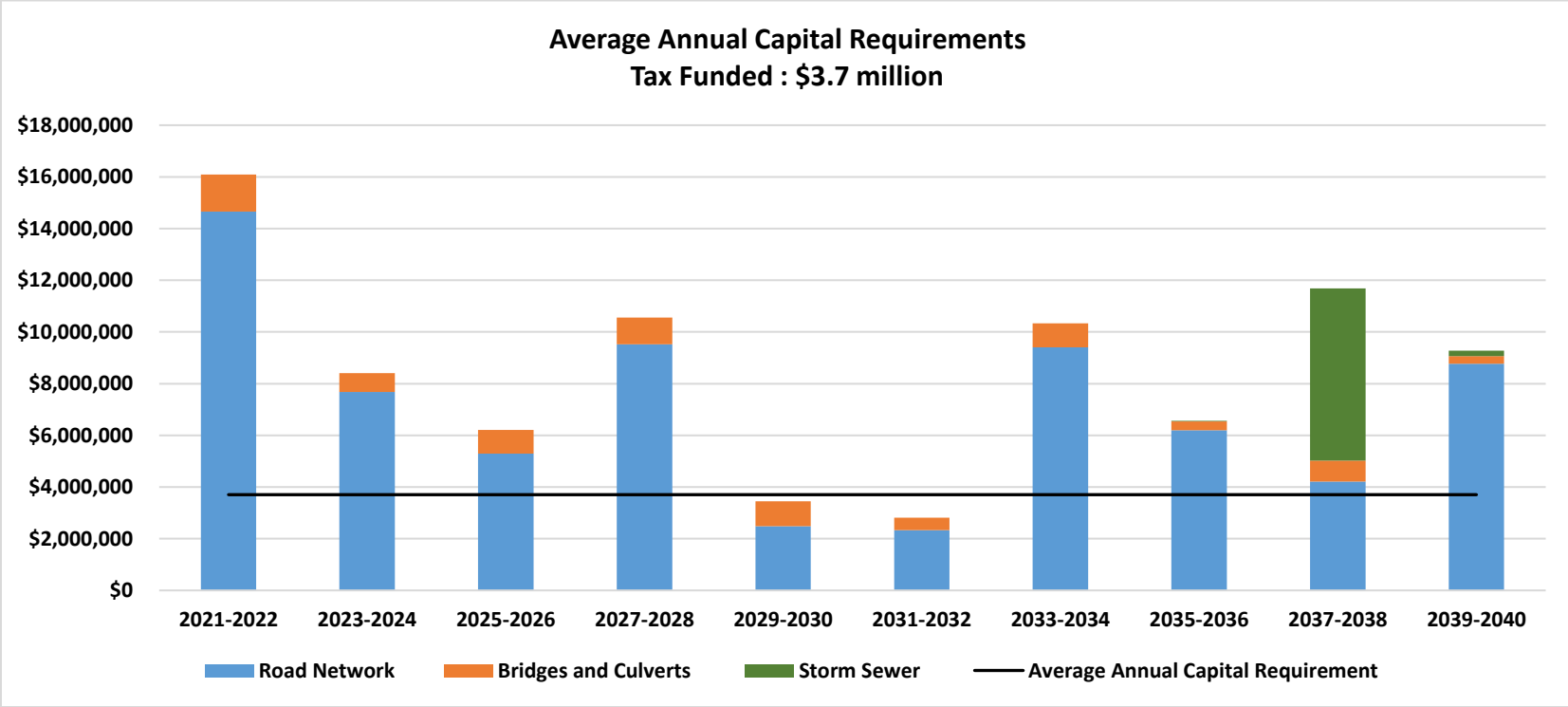
Based on asset age, available assessed condition data and estimated useful life, 28% of the Municipality's assets will require replacement within the next 10 years. Capital requirements over the next 10 years are identified in Appendix C.



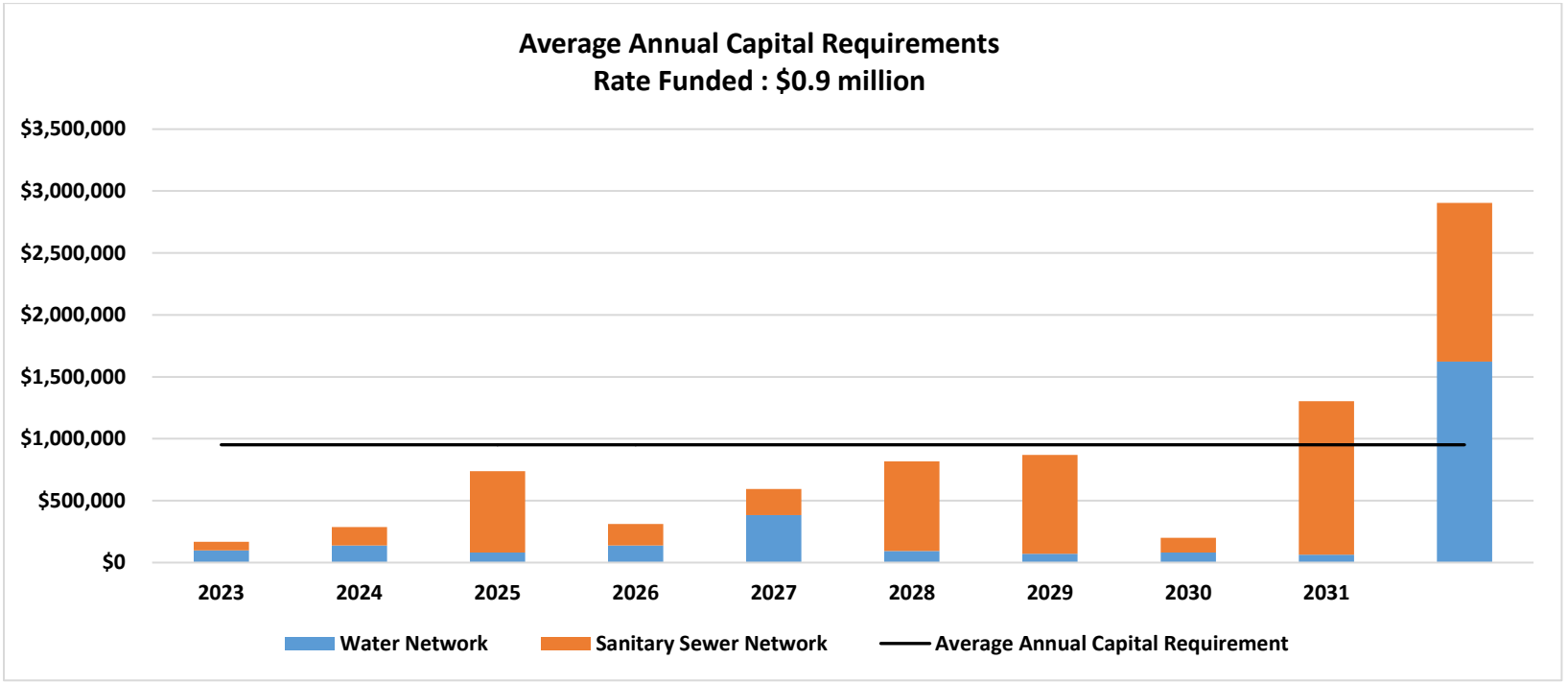
3.5 Forecasted Capital Requirements

The development of a long-term capital forecast should include both asset rehabilitation and replacement requirements. With the development of asset-specific lifecycle strategies that include the timing and cost of future capital events, the Municipality can produce an accurate long-term capital forecast.

The following graph identifies capital requirements over the next 20 years, for tax-funded asset categories only.



The next graph illustrates the capital requirements for rate-funded assets, over next 10 years:



4. Analysis of Core Assets

- **Tax funded assets valued at $156.4 million**
- **Rate funded assets valued at $137.9 million**
- **Average annual capital requirement for tax-funded assets, to maintain current levels of service is $3.7 million, based on 20-year projections**
- **Average annual capital requirement for rate-funded assets, to maintain current levels of service is $0.9 million, based on 10-year projections**

4.1 Road Network

Roads are the key component of The Nation Municipality's transportation network. It is the road network that support essential services for the community in terms of quality of life, public safety, sustainability and is amongst the highest valued asset categories in the municipality's infrastructure. The inventory below shows all municipally owned and maintained roads along with the supporting infrastructure like shoulders, sidewalks, streetlights, and signs.

Road Classification:

The Nation Municipality has different categories of roads, and all the roads are classified to three categories depending upon the volume and type of traffic they carry.

Arterial roads: Arterial roads are the roads which carried the high volume of traffic and the average annual daily traffic (AADT) of these roads is more than 1000.

Collector roads: Collector roads are the roads which has AADT 500-1000 approximately.

Local roads: Local roads carry much less traffic as compared to other two categories of the road. The AADT for local roads is under 500**.** The local roads are further classified in two categories: Seasonal local roads and granular roads.

4.1.1 What do we own?

As shown in the table below, the entire network comprises approximately 492 centreline km of road (excludes base).
The road surface is the top layer of a road which is categorized in 4 categories depending upon the traffic volume carried and the locality of the road.
Road Surface-Sand
Road Surface-Gravel
Road Surface-Hot Mix
Road Surface-Road Surface Treatment

Asset Type	Asset Segment	Quantity
ROAD NETWORK	Curb	1,201m
	Guide Rails	10,109m
	Road Base Berms	1590m
	Road Surface - Sand	20,956m
	Road Surface – Gravel	195,589m
	Road Surface - Hot Mix	192,366 m
	Road Surface Treatment	83,089m
	Shoulders	35,030m
	Sidewalks	16,678m
	Signs	1,260
	Streetlights	1,640
	Traffic Signals	1

4.1.2 What is it worth?

The total valuation of $63.8 million of the Nation's Road Network is based on unit cost estimates, CPI tables, and user defined costs.

The **CPI (Consumer Price Index)** is an indicator of changes in consumer prices experienced by Canadians and is obtained by comparing, over time, the cost of a fixed basket of goods and services purchased by consumers.

The **unit cost estimates** are calculated by multiplying the specific unit cost (2021 rates) associated with an asset with the quantity (count, length).

The **user defined cost** is the cost incurred over a time period by the municipality because of using the assets to provide flow of services and is based on the annual cost of investing in physical capital, determined by factors such as interest rate, the rate of depreciation of the asset, and tax regulations. Estimated soft costs such as design and engineering costs, contingencies are also included in each.

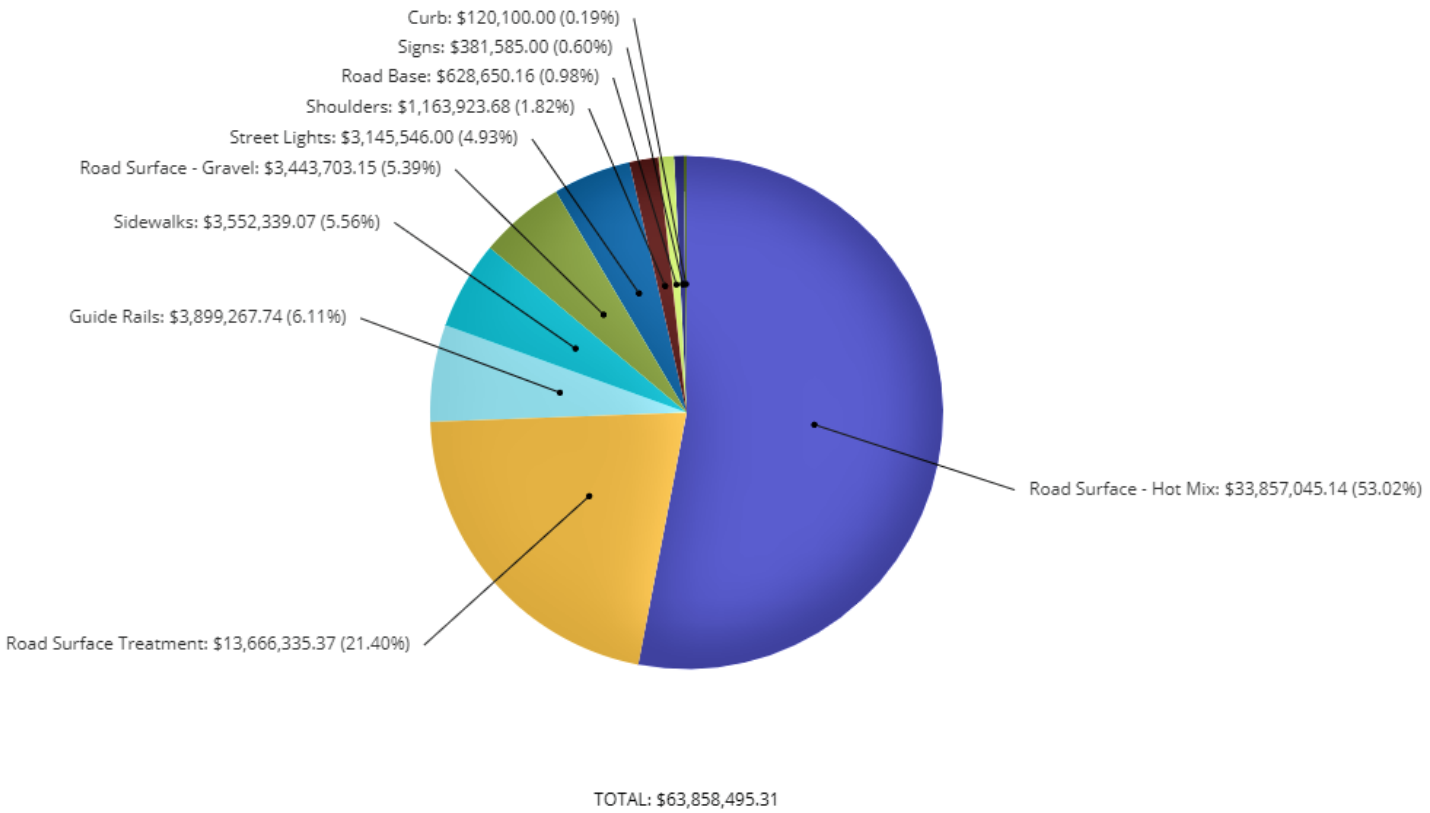
For roads, the user defined cost is calculated as capital cost of assets in 2021 plus the engineering & design costs, contingencies, labour and installation costs, all calculated according to 2021 rates.

The table below shows The Nation Municipality's total road network inventory, with the replacement prices, in 2021 dollars.

Asset Type	Asset Segment	Quantity	Replacement Cost Method	2021 Total Replacement Cost
ROAD NETWORK	Curb	1,201m	Cost/Unit	**$120,100**
	Guide Rails	10,109m	User-Defined Cost	**$3,899,268**
	Road Base Berms	1590m	User-Defined Cost	**$628,650**
	Road Surface – Gravel	195,589m	User-Defined Cost	**$3,443,703**
	Road Surface - Hot Mix	192,366m	User-Defined Cost	**$33,857,045**
	Road Surface Treatment	83,089m	User-Defined Cost	**$13,666,335**
	Shoulders	35,030m	User-Defined Cost	**$1,163,924**
	Sidewalks	16,678m	User-Defined Cost	**$3,552,339**
	Signs	1,260	Cost/Unit	**$252,000**
	Streetlights	1,640	User-Defined Cost	**$3,145,546**
	Traffic Signal	1	User-Defined Cost	**$129,585**
			Total	**$63,858,495**

2021 ROAD NETWORK REPLACEMENT VALUE

The pie chart below provides a breakdown of each of the road network components to the overall system value.



ASSET VALUATION: ROAD NETWORK

*Road Base cost above corresponds to cost of road base berms

4.1.3 Asset Condition

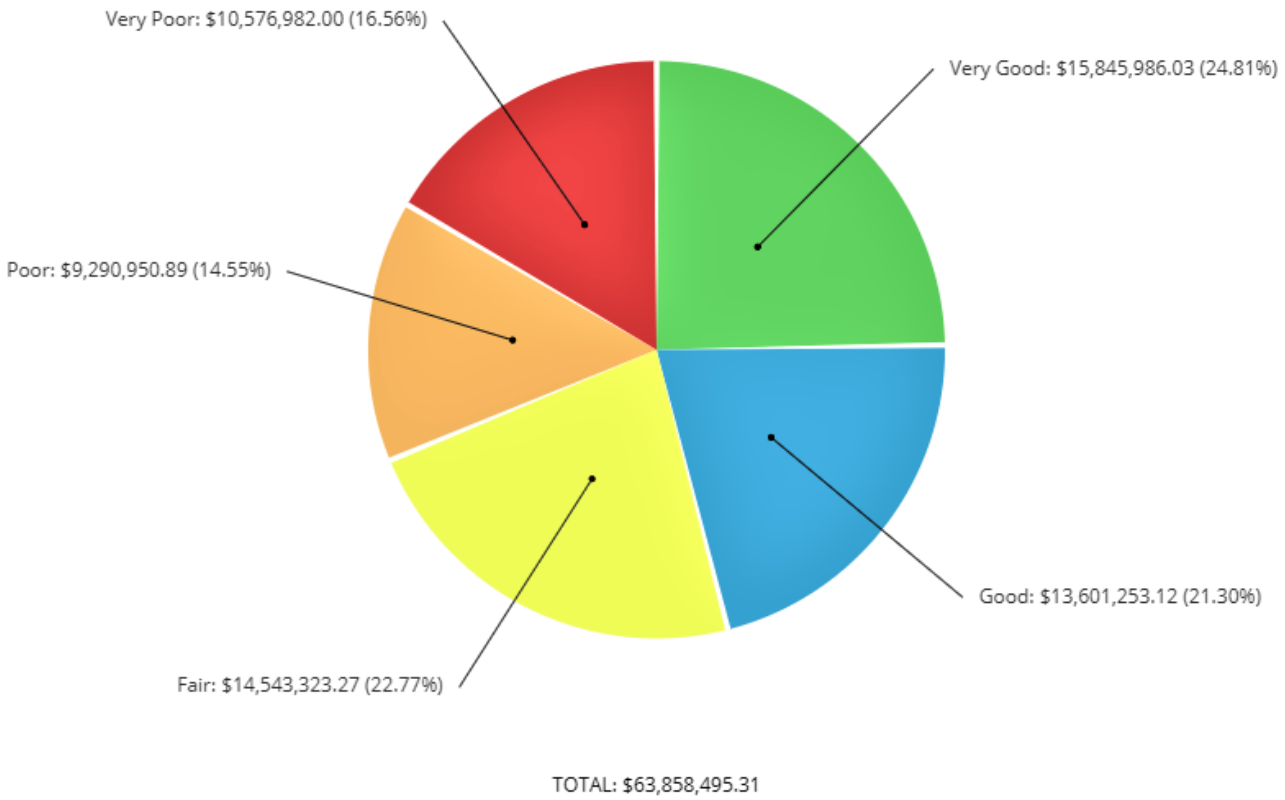
Condition of an asset is very important when we must know about different parameters like life, replacement costs, annual requirement cost, risks associated with it. It is considered as an input when we must measure the risks and considering those measures what would be the remedial measures for keeping the asset in service and to increase the performance levels of an asset.

For the road system to provide safe access and an acceptable level of service, The Nation Municipality monitors the condition of all assets at suitable intervals of time. The terminology which is used for assessing the condition of the roads is called as Pavement Condition Index. The PCI of the roads is based on some factors which are responsible for finding out the present condition of a road. The PCI of a road is rated out of 100, considering 100 as excellent and 0 as the failed. If assessed data is not available, age-based data is used.

The table below indicates the average condition and source of condition data for all the assets under the municipality's road network.

Asset Type	Asset Segment	Average Assessed Condition	Average Condition Rating	Condition Assessment Source
ROAD NETWORK	Curb	92.7%	Very Good	Assessed Condition
	Guide Rails	69.37%	Good	Assessed Condition
	Road Base berms	62.54%	Good	Assessed Condition
	Road Surface – Gravel	53.1%	Fair	Assessed Condition
	Road Surface - Hot Mix	68.27%	Good	Assessed Condition
	Road Surface Treatment	41.8%	Poor	Assessed Condition
	Shoulders	70.3%	Good	Assessed Condition
	Sidewalks	77.43%	Good	Assessed Condition
	Signs	42%	Fair	Age Based Condition
	Streetlights	63.1%	Good	Age Based Condition
	Traffic Signals	62.08%	Good	Age Based Condition
	Total	**60.6%**	**Good**	**95% Assessed**

The following pie chart describes the current condition of different segments based on the replacement cost.



CONDITION OF ASSETS BASED ON REPLACEMENT COST

Approach to Condition Assessment

It is of utmost importance to have accurate and reliable data about the asset's condition for effectively managing the assets, improving the performance levels, and determining the factors like remaining service age, risk factor etc. Nation's current approach for the condition assessment of road network includes:

- Detailed assessment of the condition of each road segment is carried out collectively in 2020 & 2021, considering different types of distress, distresses quantity, and distress severity.

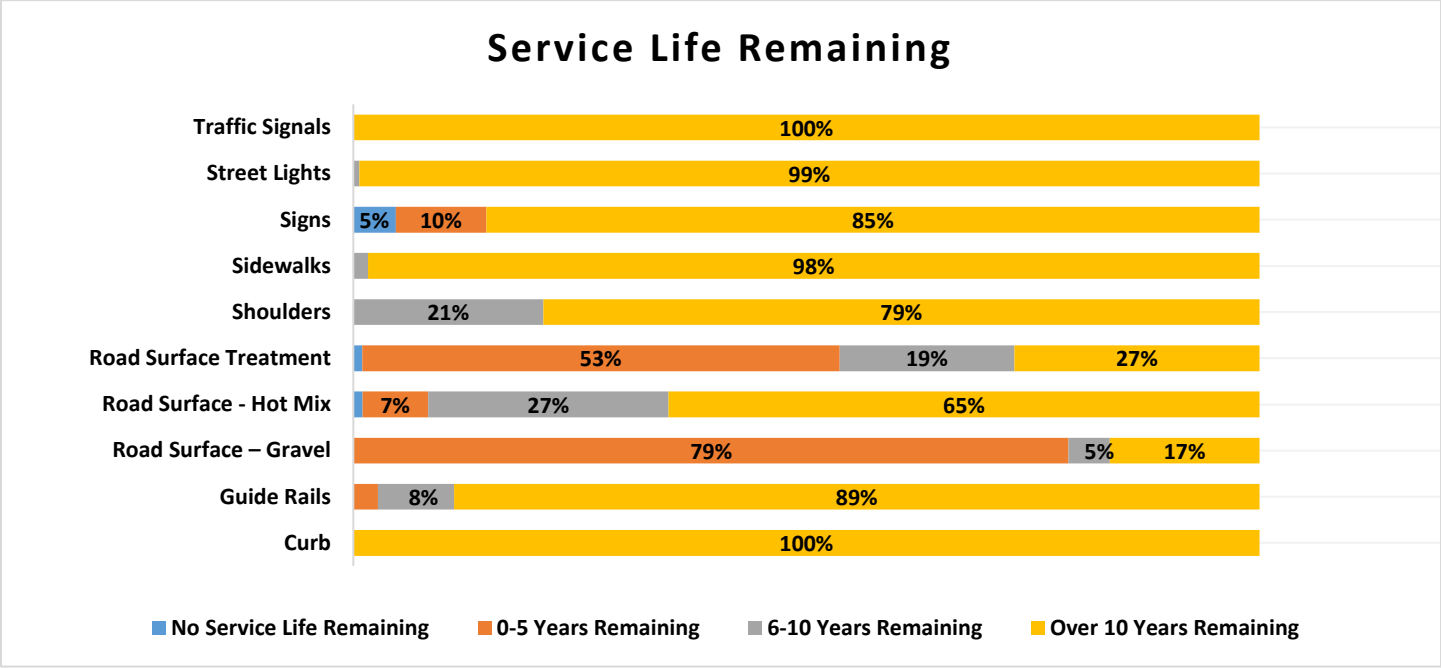
- Streetlights are all LED fixture lights and most of them were replaced in 2015 and afterwards. Depending on condition, maintenance or replacement is done.
- Paved Shoulders Condition Index (PSCI) is determined by evaluating the factors like ravelling, wheel track rutting, longitudinal, centreline and transverse cracking, distortion, flushing, rippling, and shoving etc.
- Sidewalks are assessed for distresses like cracks, rutting, broken or missing concrete slab, tree root damage, utility cut holes, open side drains and surface deformation in addition to age based factors.
- Reviewing the frequency and budget for maintenance events required like preventive maintenance (cold patch, hot mix), routing, chip sealing etc. and evaluating whether maintenance is more economical than replacement or not.
- Prioritization of replacement and rehabilitation events is done by evaluating the factors including PCI (Pavement Condition Index), Location, AADT, Risk Criticality, Cost etc.

4.1.4 Age of Assets in Road Network

The **Average age** of assets is the average number of years each asset has been in-service since the construction, installation, or acquisition date while the **Estimated Useful Life** for roads is an estimate of average number of years an asset is considered usable before its value is fully from depreciated. It could be based either on industrial or governmental guidelines, condition, or quality of assets, on staff knowledge and expertise or on combination of these. The difference between the estimated useful life and the average age of an asset represents its **Average Remaining Service Life**. However, the average Remaining Service Life is entitled to change based on the Assessed Condition Rating.

The following table shows the estimated useful age, the average age, and the service life remaining for different assets in the municipality's road network (in 2021).

Asset Segment	Estimated Useful Life (Years)	Average Age (Years)	Average Service Life Remaining (Years)
Curb	30	2	28
Guide Rails	30 & 75	17.66 & 5	15.66 & 70
Road Surface – Gravel	5-10	4.5	5.5
Road Surface - Hot Mix	20-25	10	15.5
Road Surface Treatment	10-20	13.25	6.5
Shoulders	20-40	11.5	18
Sidewalks	30	11	24.75
Signs	15-25	15	9.5
Streetlights	25	14	21
Traffic Signals	20	7.5	12.5



***% of Service Life Remaining is a weighted value calculated based on replacement cost of assets**

4.1.5 Risk Management

Risk within the infrastructure industry is often defined as the probability (likelihood) of failure multiplied by the consequence of that failure.

RISK = LIKELIHOOD OF FAILURE x CONSEQUENCE OF FAILURE

The likelihood of failure relates to the current condition state of each asset, whether they are in Excellent, Good, Fair, Poor or Critical condition, as this is a good indicator regarding their future risk of failure. The consequence of failure relates to the magnitude, or overall effect, that an asset's failure will cause. For instance, a local road failure or closure in a subdivision may cause a few residents to have difficulty commuting for some time, whereby a busy primary road (carrying high traffic volume) failure could have disastrous effects and would be a front-page news item. The following risk matrix represents the relationship between the probability of failure and the consequence of failure for the Nation's Road asset inventory (2021) within the Citywide Software.

RISK MATRIX

- Appendix B provides the criteria used to calculate the risk rating and based on that rating, the Nation plans suitable lifecycle strategies and treatment options.

4.1.6 Asset Management Lifecycle Strategy

With the passage of time, assets start deteriorating and it varies depending upon the climatic conditions, characteristics, location, and maintenance of each asset. In order to ensure the road assets, perform at the required standards and provide suitable levels of service, there is an average annual capital requirement. It could be based on end-of-life replacement or on lifecycle strategies at suitable intervals of time.

Lifecycle Strategy

After conducting appropriate studies and assessments, suitable life cycle activities are applied at the appropriate time in an asset's life, to provide the greatest additional life at the lowest cost. In the asset management industry, this is simply put as doing the right thing to the right asset at the right time.

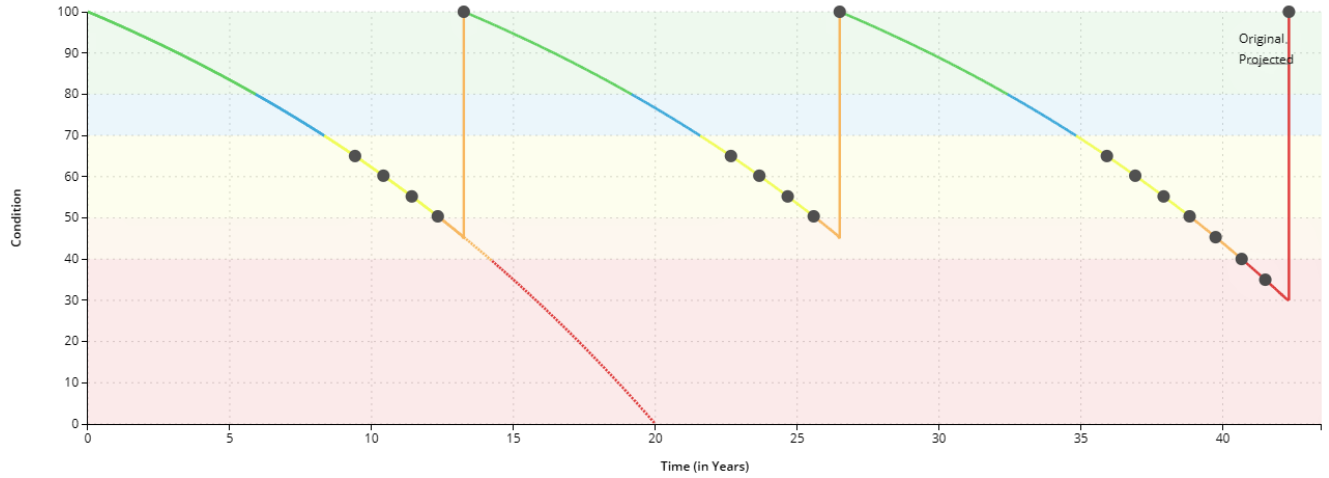
Lifecycle Events for Road Network

Segment	Lifecycle Event	Lifecycle Event Class	Event Trigger*
Paved Shoulders	Patching	Preventive Maintenance	60-80% Condition
	Overlay	Rehabilitation	45-60% Condition
	Full Reconstruction	Replacement	30-40% Condition (42 Years)
Hot Mix (Local)	Patching	Preventive Maintenance	50-80% Condition
	Overlay	Rehabilitation	49-60% Condition
	Full Reconstruction	Replacement	30-40% Condition (51 Years)
Hot Mix (Arterial/Collector)	Patching	Preventive Maintenance	50-80% Condition
	Overlay	Rehabilitation	45-50% Condition
	Full Reconstruction	Replacement	30-40% Condition (42Years)

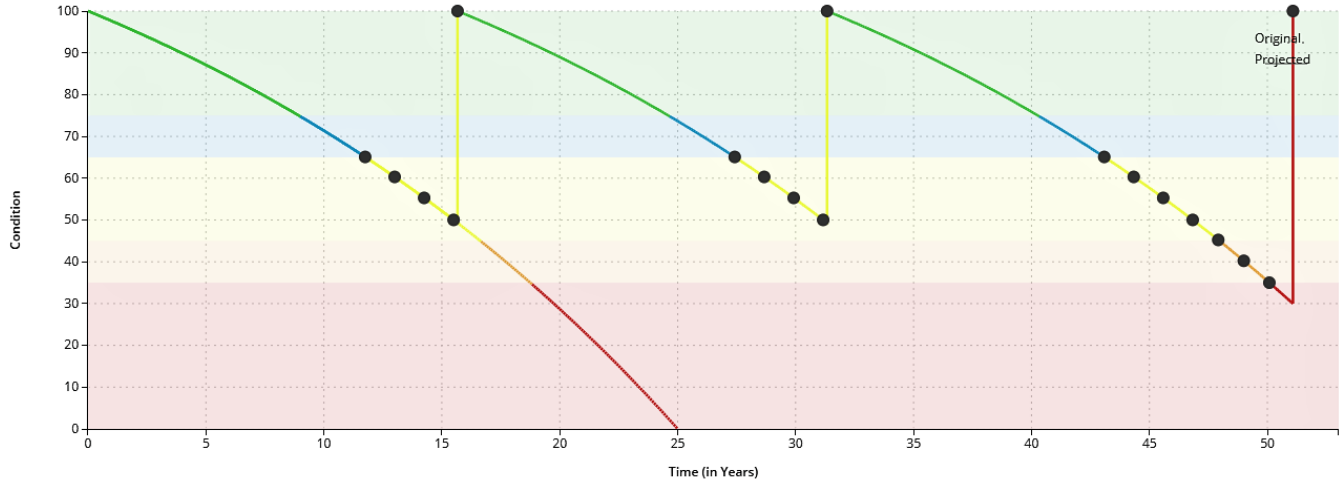
*Event Trigger refers to the occurrence of lifecycle events, which is based on Condition Indexes (e.g., 80% Condition of an asset means its calculated Condition Index is 80)

The graphs below illustrate the difference between EUL (expected useful life) before and after applying the lifecycle events, for different road network segments.

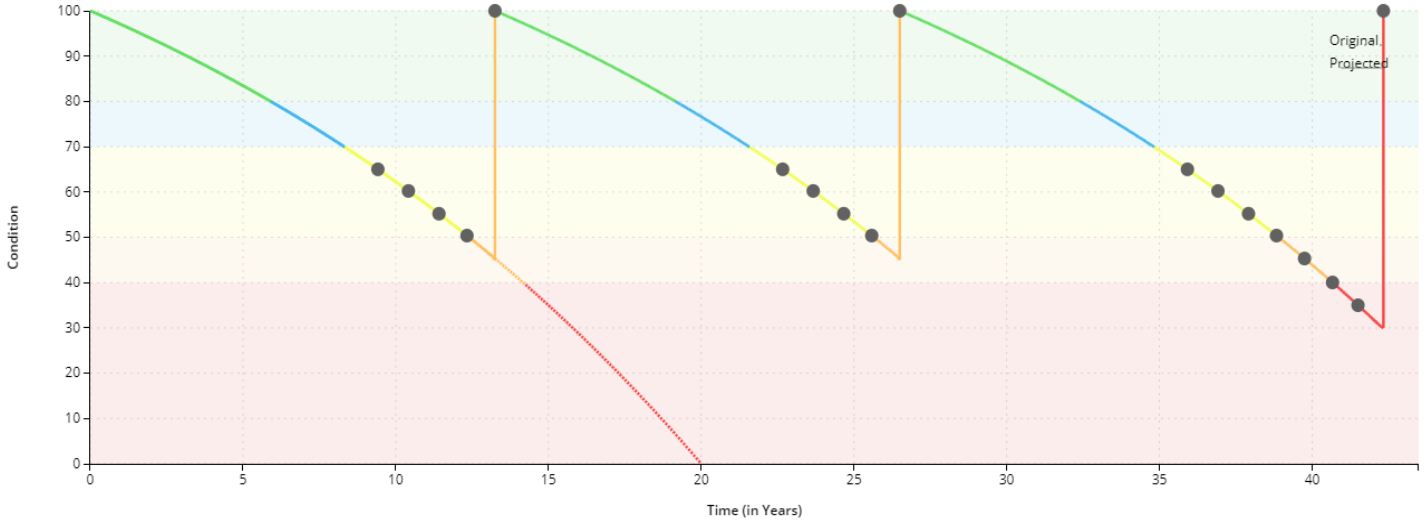
Paved Shoulders	EUL- Before Lifecycle Events	EUL- After Lifecycle Events
	20 Years	42 Years



Hot Mix (Local)	EUL- Before Lifecycle Events	EUL- After Lifecycle Events
	20 Years	51 Years



Hot Mix (Arterial/Collector)	EUL- Before Lifecycle Events	EUL- After Lifecycle Events
	20 Years	42 Years

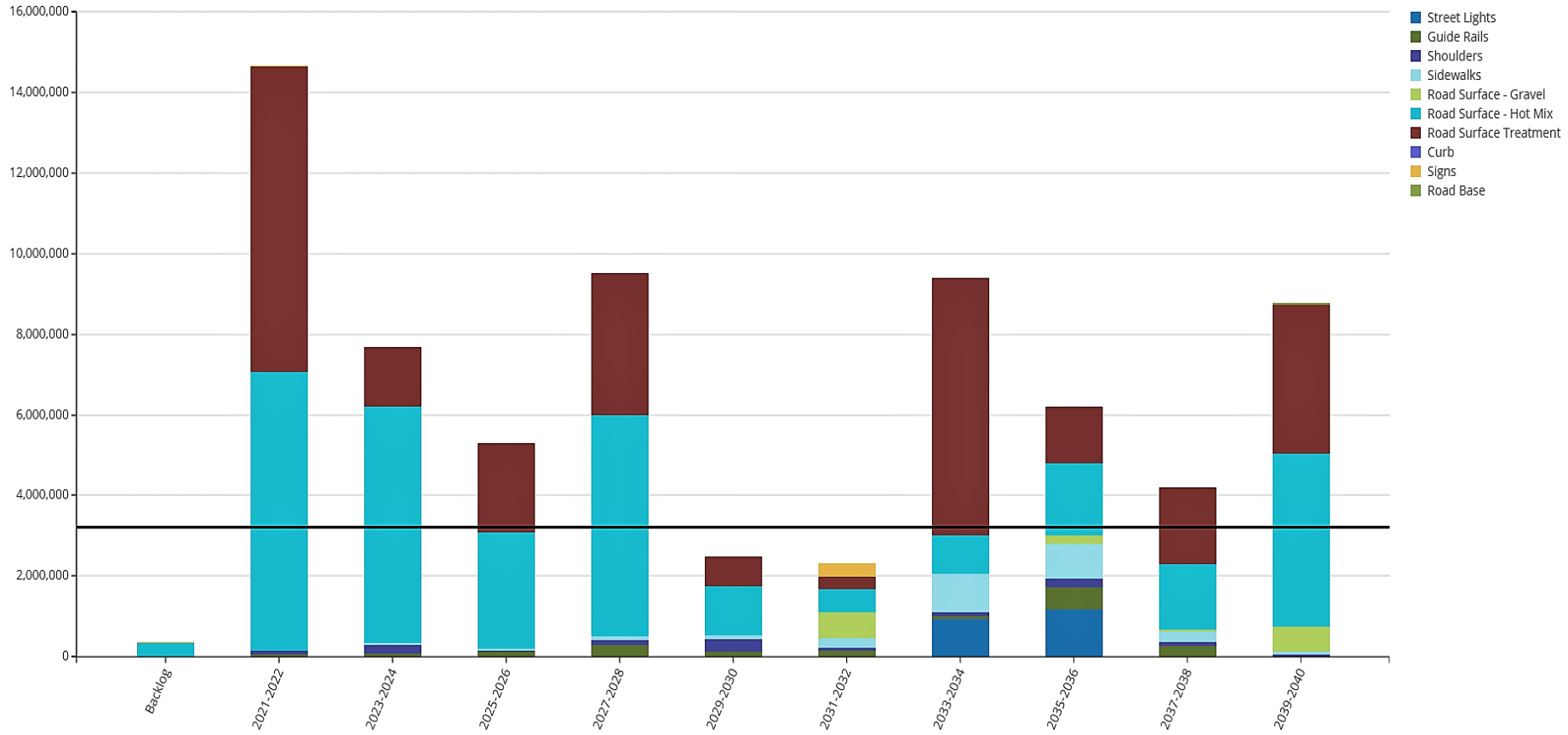


Forecasted Capital Needs

This section explains the capital requirements for the municipality's road network assets, based on the end-of-life replacement, for 20 years. The backlog refers to the amount of infrastructure investments that were pushed back from previous years or it could be the value of assets that are in service, even after their useful service life.

From the graph, it can be seen that the Municipality requires $14.6 million for replacement of road assets between 2021-2022, around $7.6 million in 2023-2024, $5.3 million from 2025 to 2026 and so on.

However, Nation's average annual capital requirement (end-of-life replacement only) for its Road Network is **$3,259,000** (black line), by analyzing the financial requirements from 2021 to 2040.



❖ Appendix C shows the projected capital requirements for next 10 years to maintain the current Levels of Service.

4.1.7 Levels of Service

The tables below indicate The Nation Municipality's current levels of service for Road Network according to the guidelines given in O. Reg. 588/17. The tables include the Community (qualitative) and Technical Levels of Service along with the performance.

Community Levels of Service

The table shows the Community levels of service based on qualitative description of The Nation's Road Network.

Service Attribute	Qualitative Description	Current LOS (2021)
Scope	Description, which may include maps, of the road network in the municipality and its level of connectivity.	**Appendix D**
Quality	Description or images that illustrate the different levels of road class pavement condition.	Based on the condition assessment, every road segment in the municipality is rated from 0-100 as Pavement Condition Index (PCI). 0-40 condition - Road segment in Very Poor Condition and requires immediate attention. 40-50 condition - Road segment in Poor condition and require attention within 1-5 years. 50-70 condition - Road segment in Fair Condition and need renewal or replacement in 6-10 years. 70-80 condition - Road segment is in Good condition and may require only preventive maintenance. 80-100 condition – Road surface is in Very Good condition. For images, see Appendix A

Technical Levels of Service

The table shows the Technical levels of service based on quantitative description of the Nation's Road Network.

Service Attribute	Technical Metric	Current LOS (2021)
Scope	Lane-kilometres of arterial roads as a proportion of square kilometres of land area of the municipality	**0.16**
	Lane-kilometres of collector roads as a proportion of square kilometres of land area of the municipality	**0.43**
	Lane-kilometres of local roads as a proportion of square kilometres of land area of the municipality	**0.15**
Quality	For paved roads in the municipality, the average pavement condition index value	**65.58**
	For unpaved roads in the municipality, the average surface condition (e.g., excellent, good, fair or poor)	**Fair**

4.1.8 Recommendations

- The municipality should review the inventory regularly in order to account for any road network assets missed in the report or any new acquisitions or additions.
- Condition assessments of road segments on suitable intervals should be continued and all other asset segments should be included in assessments to have more realistic and precise results for the current state of assets and levels of services the municipality is providing to the community.
- Citywide inventory should be linked to GIS, and the system should be regularly updated with condition, quantity, replacement cost and method, adjusted useful lifecycle and another key attributes.
- Condition assessments should be integrated with risk models, and more risk management framework should be defined to have a better understanding of probability and consequences of failure, prioritizing the projects, and estimating replacement needs.
- More lifecycle strategies should be defined and implemented for all other segments in road network in addition to road surface, to increase the estimated useful life, improve levels of service, reduce capital costs in long-term.

4.2 Bridges and Culverts

In addition to the Road Network, Bridges and Culverts hold a significant place in the transportation services that The Nation Municipality is providing to the community. The Nation's inventory includes total of 791 bridges and culverts and the culverts over 3m of span are treated as bridges. The whole transportation network, including roads and bridges is managed by Public Works Department.

Culverts are defined as an opening through the embankment and have soil cover.

Bridges typically have no cover, although certain bridges may have had their riding surface elevated by infilling between the curbs.

4.2.1 What do we own?

The following tables illustrates the municipality's key assets for bridges and culverts, along with the quantities.

Asset Type	Asset Segment	Quantity
BRIDGES & CULVERTS	Bridges	26
	Culverts (span over 3m)	21
	Concrete Box Culverts (Less than 3m)	9
	Corrugated Steel Pipe (CSP<900mm) Culverts	284
	Corrugated Steel Pipe (CSP≥900mm) Culverts	197
	Plastic Culverts	254

4.2.2 What is it worth?

The total valuation of $69.44 million of the Nation's Bridges & Culverts is based on unit cost estimates, CPI tables, and user defined costs.

The **CPI (Consumer Price Index)** is an indicator of changes in consumer prices experienced by Canadians and is obtained by comparing, over time, the cost of a fixed basket of goods and services purchased by consumers.

The **unit cost estimates** are calculated by multiplying the specific unit cost (2021 rates) associated with an asset with the quantity (count, length).

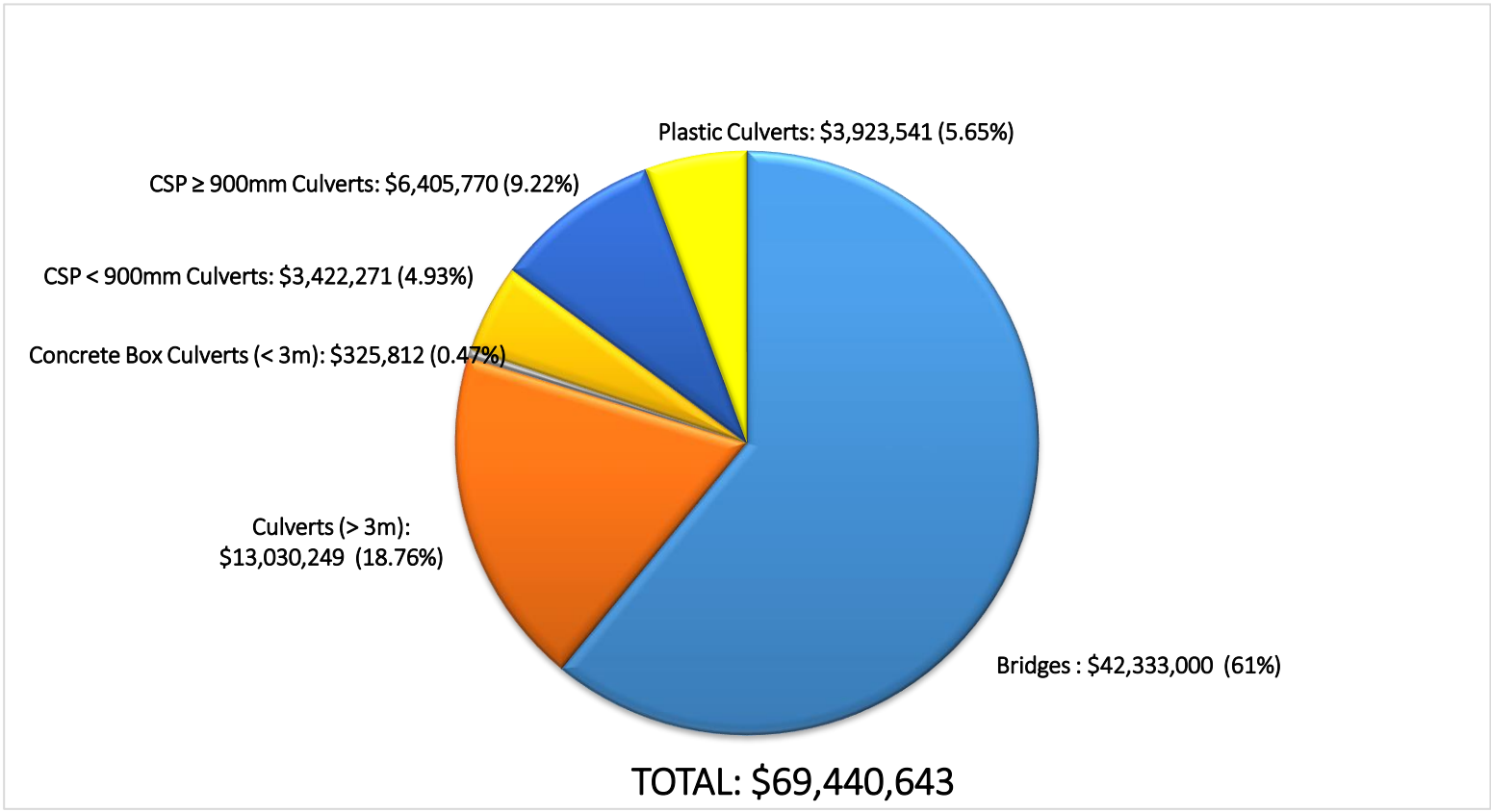
The **user defined cost** is the cost incurred over a time period by the municipality because of using the assets to provide flow of services and is based on the annual cost of investing in physical capital, determined by factors such as interest rate, the rate of depreciation of the asset, and tax regulations. Estimated soft costs such as design and engineering costs, contingencies are also included in each. The user defined cost is calculated as capital cost of assets in 2021 plus the engineering & design costs, contingencies, labour and installation costs, all calculated according to 2021 rates.

The table shows The Nation Municipality's assets for Bridges & Culverts, with the replacement prices, in 2021 dollars.

Asset Type	Asset Segment	Quantity	Replacement Cost Method	2021 Total Replacement Cost
BRIDGES & CULVERTS	Bridges	26	User-Defined Cost	**$42,333,000**
	Culverts (span over 3m)	21	User-Defined Cost	**$13,030,249**
	Concrete Box Culverts (Less than 3m)	9	User-Defined Cost	**$325,812**
	Corrugated Steel Pipe (CSP<900mm) Culverts	284	User-Defined Cost	**$3,422,271**
	Corrugated Steel Pipe (CSP≥900mm) Culverts	197	User-Defined Cost	**$6,405,770**
	Plastic Culverts	254	User-Defined Cost	**$3,923,541**
			Total	**$69,440,643**

2021 BRIDGES & CULVERTS REPLACEMENT VALUE

The pie chart below provides a breakdown of Bridges & Culverts components to the overall system value.



ASSET VALUATION: BRIDGES & CULVERTS

4.2.3 Asset Condition

Condition of an asset is very important when we must know about different parameters like life, replacement costs, annual requirement cost, risks associated with it. It is considered as an input when we have to measure the risks and considering those measures what would be the remedial measures for keeping the asset in service and to increase the performance levels of an asset.

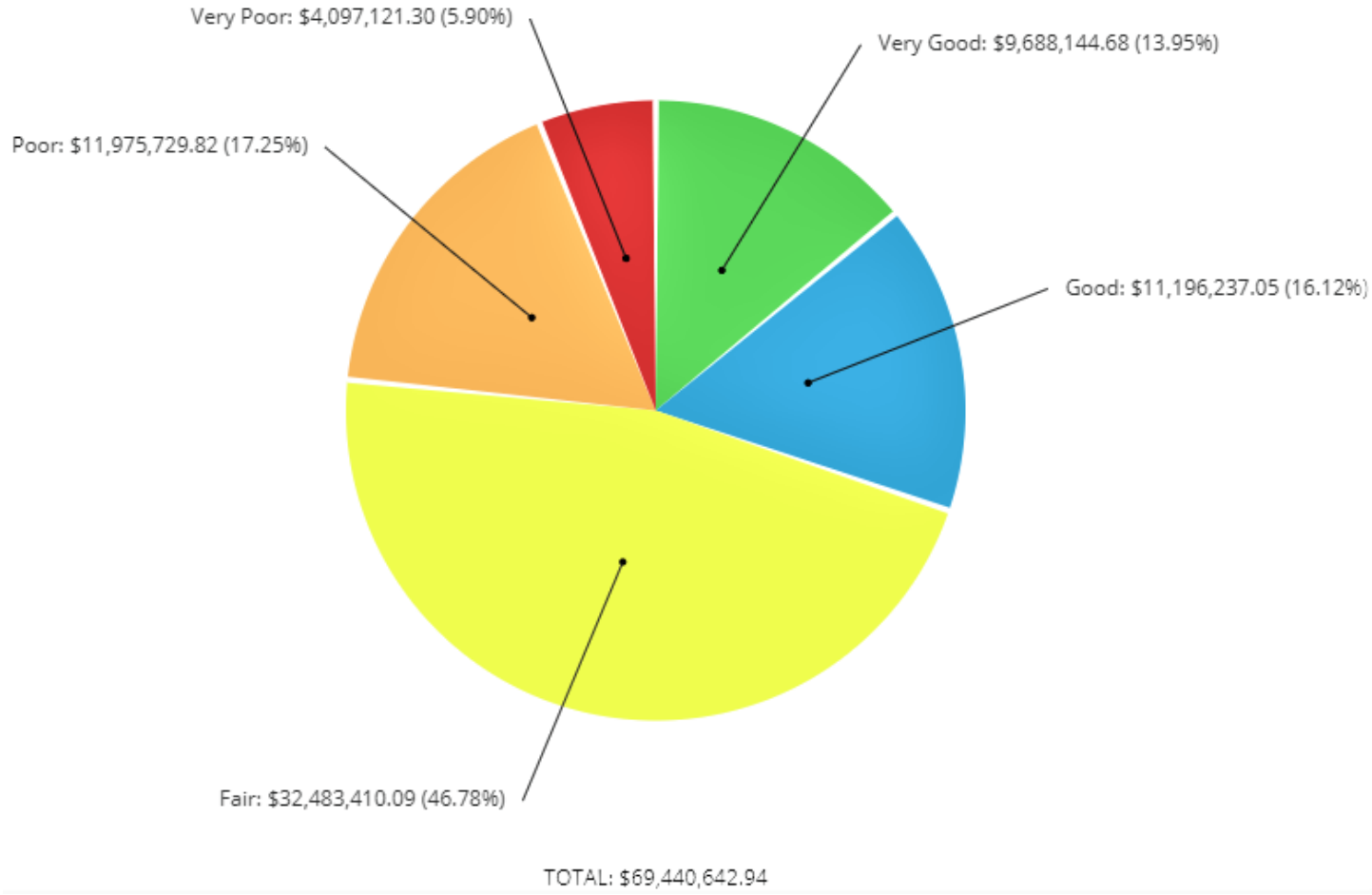
The Nation Municipality has retained a third party to provide detailed biennial inspections for all its bridges and large culverts, while all other assets are inspected by trained staff, as per the guidelines of Ontario's Structure Inspection Manual (OSIM).

The given picture explains the Condition Ranges from 0-100 to describe the condition from Very Poor to Very Good, for Bridges & Culverts, specifically.

The following table indicates the average condition and source of condition data for all the assets under the municipality's Bridges and Culverts category.

Asset Type	Asset Segment	Average Assessed Condition	Average Condition Rating	Condition Assessment Source
BRIDGES & CULVERTS	Bridges	67.48%	Fair	Assessed Condition
	Culverts (span over 3m)	76.6%	Good	Assessed Condition
	Concrete Box Culverts (Less than 3m)	66.3%	Fair	Age Based Condition
	Corrugated Steel Pipe (CSP<900mm) Culverts	48.9%	Very Poor	Age Based Condition
	Corrugated Steel Pipe (CSP≥900mm) Culverts	65%	Fair	Age Based Condition
	Plastic Culverts	89.5%	Very Good	Age Based Condition
	Total	**66%**	**Fair**	

The given pie chart here describes the replacement cost of assets in bridges & culverts inventory based on their current condition.



CONDITION OF ASSETS BASED ON REPLACEMENT COST

Approach to Condition Assessment

It is of utmost importance to have accurate and reliable data about the asset's condition for effectively managing the assets, improving the performance levels and determining the factors like remaining service age, risk factor etc. Nation's current approach for the condition assessment of bridges and culverts includes:

- Biennial inspection of all bridges and culverts with a span equal to or exceeding 3.0 metres are conducted for Condition assessments, based on the OSIM.
- The structures being made up of different components that deteriorate at different rates, they are all individually evaluated and individual component condition scores are compiled into the Bridge Condition Index (BCI).
- Twelve structures (bridges & culverts with span ≥ 3m) are new or have been replaced in the past 20 years. The average age of these structures is 45.7 years.
- The smaller culverts are inspected for the condition while redoing the roads, and if their projected life (or condition) seems to be less than the road, they are replaced at the same time.

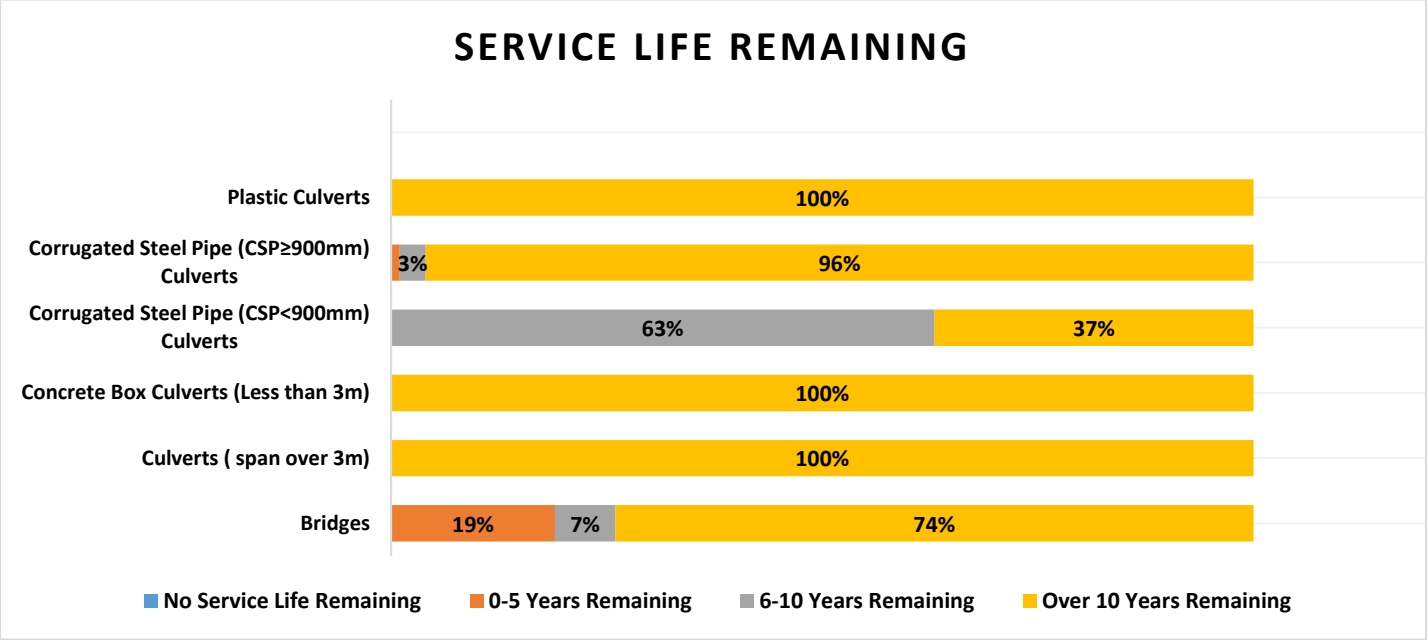
4.2.4 Age of Assets in Bridges & Culverts Category

The **Average age** of assets is the average number of years each asset has been in-service since the construction, installation, or acquisition date while the **Estimated Useful Life** for roads is an estimate of average number of years an asset is considered usable before its value is fully from depreciated. It could be based either on industrial or governmental guidelines, condition, or quality of assets, on staff knowledge and expertise or on combination of these.

The **Average Remaining Service Life** is calculated based on the deemed life of the structure, and present age. This is modified by an algorithm that recognizes the actual condition of the structure. Old bridges in very good condition automatically have their lives extended. Newer structures in exceptionally poor condition have their life expectancy reduced. Thereafter, engineering judgement is applied to arrive at the listed **Average Remaining Service Life**.

The following table shows the estimated useful age, the average age, and the service life remaining for the municipality's bridges & culverts.

Asset Type	Asset Segment	Estimated Useful Life (Years)	Average Age (Years)	Average Service Life Remaining (Years)
BRIDGES & CULVERTS	Bridges	75	33	41.25
	Culverts (span over 3m)	75	22.5	44.5
	Concrete Box Culverts (Less than 3m)	50	14	26
	Corrugated Steel Pipe (CSP<900mm) Culverts	20	8.5	10.5
	Corrugated Steel Pipe (CSP≥900mm) Culverts	50	17	32
	Plastic Culverts	50	6	44



4.2.5 Risk Management

Risk within the infrastructure industry is often defined as the probability (likelihood) of failure multiplied by the consequence of that failure.

RISK = LIKELIHOOD OF FAILURE x CONSEQUENCE OF FAILURE

The likelihood of failure relates to the current condition state of each asset, whether they are in Excellent, Good, Fair, Poor or Critical condition, as this is a good indicator regarding their future risk of failure. The probability of structure failure for bridges and large culverts is attributed to overall deterioration due to aging, increased loading, cracking, corrosion, environmental effects (freeze-thaw) and fatigue. The consequence of failure is the effect, or impact, of the structure failing to provide its intended service or function.
The following risk matrix represents the relationship between the probability of failure and the consequence of failure for the Nation's Bridges & Culverts asset inventory (2021) within the Citywide Software.

- Touchette Bridge (current project) is the only bridge which lies in very high risk (red) zone where both the probability and consequences of failure are very high (above 4).

RISK MATRIX

- Appendix B provides the criteria (risk metrics) used to calculate the risk rating and based on that rating, the Nation plans suitable lifecycle strategies and treatment options.

4.2.6 Asset Management Lifecycle Strategy

With the passage of time, assets start deteriorating and it varies depending upon the climatic conditions, characteristics, location, and maintenance of each asset. In order to ensure the bridges & culverts to perform at the required standards and provide suitable levels of service, there is an average annual capital requirement. It could be based on end-of-life replacement or could be based on lifecycle strategies at suitable intervals of time.

Lifecycle Strategy

After conducting appropriate studies and assessments, suitable life cycle activities are applied at the appropriate time in an asset's life, to provide the greatest additional life at the lowest cost. In the asset management industry, this is simply put as doing the right thing to the right asset at the right time.

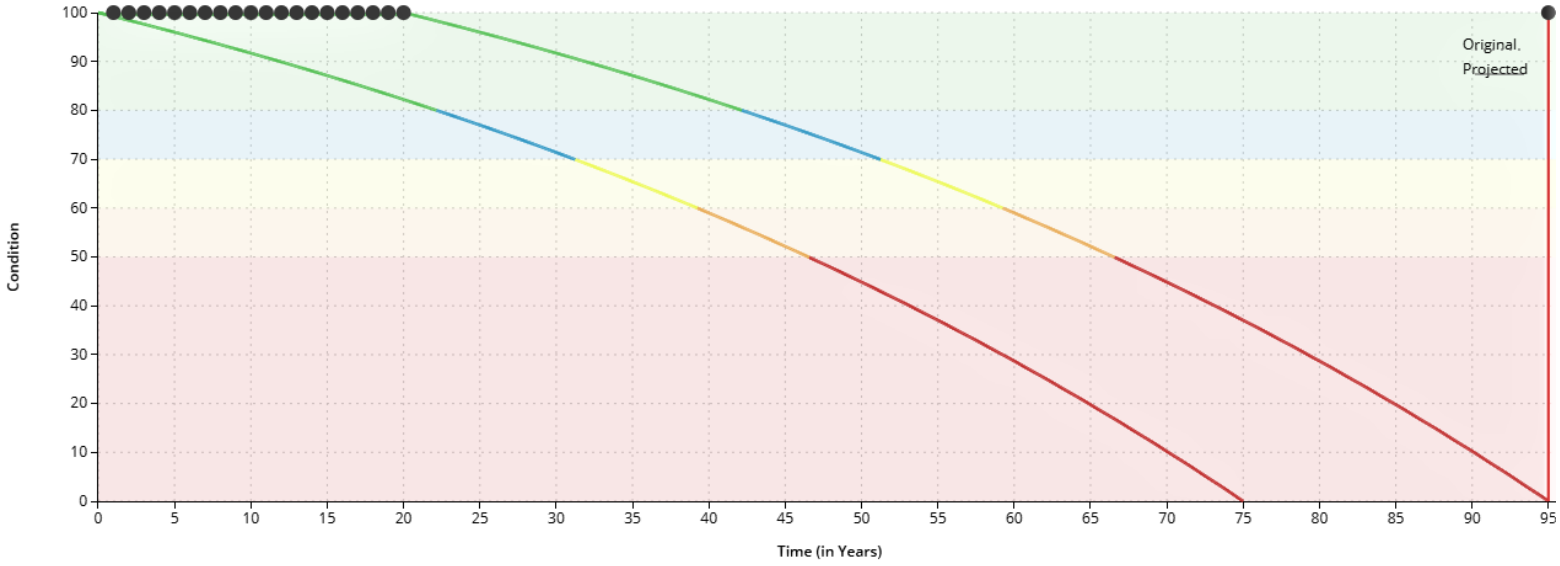
Lifecycle Events for Bridges & Culverts

Asset Type	Lifecycle Event Class	Event Trigger
Bridges & Culverts (span > 3m)	Maintenance	Every Year (up to 20 Years)

For Bridges & Structural Culverts, the maintenance, repair, and rehabilitation activities are described in detail in the OSIM Inspection Report 2021 (conducted every 2 years). However, due to financial constraints, not all the activities could be completed and thus, the municipality prioritizes the projects considering the criticality of and the risk associated with the structures.

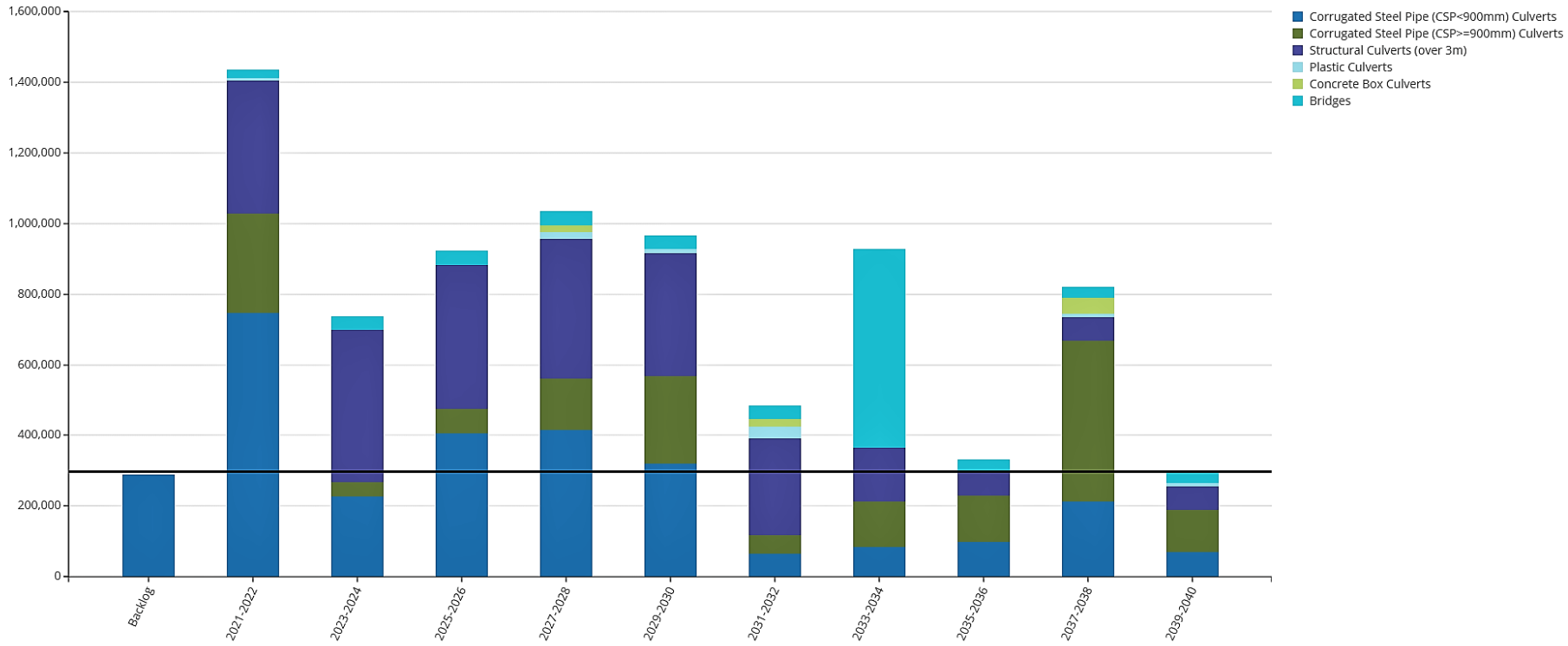
The graph below exemplifies the difference between EUL (expected useful life) before and after applying the lifecycle events, for bridges & culverts.

BRIDGES	EUL- Before Lifecycle Events	EUL- After Lifecycle Events
	75 Years	95 Years



Forecasted Capital Needs

This section explains the capital requirements for the municipality's bridges & culverts, based on the end-of-life replacement, for 20 years. The backlog refers to the amount of infrastructure investments that were pushed back from previous years or it could be the value of assets that are in service, even after their useful service life.



From the graph, the municipality requires $1.43 million for replacement of bridges and culverts from 2021 to 2022, and requirement is almost around $1 million up to 2029-2030.However, Nation's average annual capital requirement (end-of-life replacement only) for its Bridges and Culverts is $301,000 by analyzing the financial requirements from 2021 to 2040.

❖ Appendix C shows the projected capital requirements for next 10 years in order to maintain the current Levels of Service.

4.2.7 Levels of Service

The tables below indicate The Nation Municipality's current levels of service for bridges & culverts according to the guidelines given in O. Reg. 588/17. The tables include the Community (qualitative) and Technical Levels of Service along with the performance.

Community Levels of Service

The table shows the Community levels of service based on qualitative description of The Nation's Bridges and Culverts.

Service Attribute	Qualitative Description	Current LOS (2021)
Scope	Description of the traffic that is supported by municipal bridges (e.g., heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, cyclists).	In the municipal transportation, Bridges and structural culverts play a significant role and majority of them are accessible to most types of traffic including heavy transport, emergency vehicles, motor vehicles, and cyclists without restrictions. Only 5 bridges have loading and/or dimensional restrictions, out of which one is the pedestrian bridge.
Quality	Description or images of the condition of bridges and how this would affect use of the bridges.	**Appendix D**
	Description or images of the condition of culverts and how this would affect use of the culverts.	**Appendix D**

Technical Levels of Service

The table shows the technical levels of service based on quantitative description of The Nation's Bridges & Culverts.

Service Attribute	Technical Metric	Current LOS (2021)
Scope	Percentage of bridges in the municipality with loading or dimensional restrictions.	**5.2%**
Quality	For bridges in the municipality, the average bridge condition index value.	**67.48**
	For structural culverts in the municipality, the average bridge condition index value.	**76.6**
Safe and Regulatory	Percentage of bridges and structural culverts in the municipality with inspected every two years.	**100%**

4.2.8 Recommendations

- Condition assessment, maintenance, repair or replacement of bridges and larger culverts should be continued based on the biennial inspections conducted based on OSIM manual.
- The smaller culverts should also be planned for regular condition assessments for more accurate and precise data to evaluate field and financial needs.
- Risk models should be regularly assessed and revised for more realistic outcomes.
- Suitable strategies should be developed to bridge the gap between current and proposed levels of service.

4.3 Water Network

The water services provided by the Nation are provided and managed by the Water and Sewer Department. The department is responsible for water network maintenance and repair, installation of water meters and other related services.

4.3.1 What do we own?

The Nation Municipality is responsible for the water network inventory which includes over 65kms of water mains.

The Nation's residents and businesses get their drinking water from two separate sources:

- Limoges Drinking Water System
- St. Isidore Distribution System

The two water systems are approximately 35km apart. Both systems are maintained and operated by the Public Works Department of The Nation Municipality.

Limoges Drinking Water System

The Limoges Drinking Water system service has approximately 1611 service connections servicing a population of approximately 4030.The water is being provided from two groundwater wells located on Russland Road in the Township of Russell.

St. Isidore Distribution System

The St. Isidore Distribution System service has approximately 395 service connections servicing a population of approximately 990. The water is being provided by the Alfred/Lefaivre Drinking System.

The Nation municipality is installing a new drinking water pipeline between Cheney and Limoges. The project involves installing approximately 10 km of water main between the Cheney water tower, along Indian Creek Road, and The Nation's existing water treatment plant, on Limoges Road, in Limoges. The construction started in September 2021 and should end by September 2022. Costs are estimated at $ 12 million dollars. Since the project is yet incomplete and not in service, it has not been added to The Nation's Water Inventory and has not been considered in this report (except for Section 6.5.

4.3.2 What is it worth?

The total valuation of $59.8 million of the Nation's Water Network is based on unit cost estimates, CPI tables, and user defined costs.

The **CPI (Consumer Price Index)** is an indicator of changes in consumer prices experienced by Canadians and is obtained by comparing, over time, the cost of a fixed basket of goods and services purchased by consumers.

The **unit cost estimates** are calculated by multiplying the specific unit cost (2020 rates) associated with an asset with the quantity (count, length).

The **user defined cost** is the cost incurred over a time period by the municipality because of using the assets to provide flow of services and is based on the annual cost of investing in physical capital, determined by factors such as interest rate, the rate of depreciation of the asset, and tax regulations. Estimated soft costs such as design and engineering costs, contingencies are also included in each cost.

The estimated replacement value of the **Limoges Water Network**, in 2020 dollars, is almost $37.1 million.

Asset Type	Asset Segment	Quantity	Replacement Cost Method	2020 Replacement Cost
LIMOGES WATER NETWORK	Water mains	37,993m	User-Defined Cost	$19,967,580
	Buildings	3	CPI Tables	$489,353
	Flowmeters	9	User-Defined Cost	$56,345
	Hydrants	191	User-Defined Cost	$1,325,776
	Mechanical	5	User-Defined Cost	$207,350
	Water meters	1559	Cost/Unit	$629,700
	Reservoir and Clear Well	3	User-Defined Cost	$3,700,000
	Water Housing Connections	1621	Cost/Unit	$7,148,610
	Valves Chambers and Manholes	2	User-Defined Cost	$58,000
	Valves and Valve boxes	274	User-Defined Cost	$1,116,910
	Well	2	User-Defined Cost	$52,000
	Treatment	47	User-Defined Cost	$2,361,050
			TOTAL	**$37,112,674**

The estimated replacement value of the **St. Isidore Water Network**, in 2021 dollars, is approximately $22.7 million.

Asset Type	Asset Segment	Quantity	Replacement Cost Method	2020 Replacement Cost
ST. ISIDORE WATER NETWORK	Water mains	27,190m	User-Defined Cost	$14,233,125
	Buildings	1	CPI Tables	$89,298
	Flowmeters	2	User-Defined Cost	$14,820
	Hydrants	74	User-Defined Cost	$521,848
	Mechanical	2	User-Defined Cost	$48,100
	Water meters	391	Cost/Unit	$156,400
	Reservoir and Clear Well	1	User-Defined Cost	$300,000
	Water Tower	1	User-Defined Cost	$5,000,000
	Water Housing Connections	356	Cost/Unit	$1,569,960
	Valves Chambers and Manholes	5	User-Defined Cost	$112,000
	Valves and Valve boxes	105	User-Defined Cost	$461,600
	Treatment	6	User-Defined Cost	$184,733
			TOTAL	**$22,691,884**

The table below shows The Nation Municipality's total water inventory, with the replacement prices, in 2020 dollars.

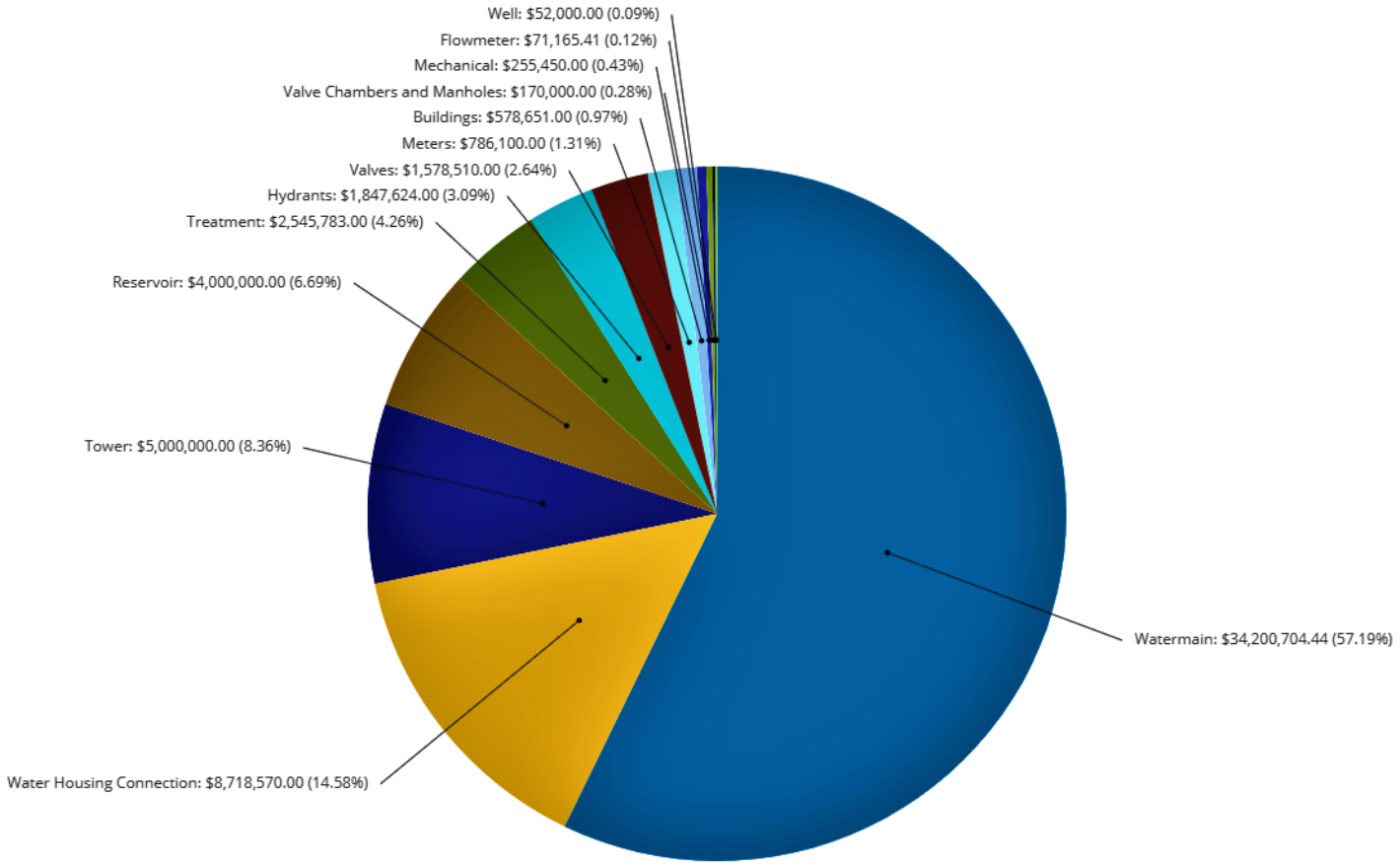
Asset Type	Asset Segment	Quantity	Replacement Cost Method	2020 Total Replacement Cost
WATER NETWORK	Water mains(50mm)	1189m	Cost/Unit	$356,565
	Water mains (100mm)	100m	Cost/Unit	$40,000
	Water mains (150mm)	14560m	Cost/Unit	$6,615,798
	Water mains (200mm)	20605m	Cost/Unit	$10,302,655
	Water mains (250mm)	997m	Cost/Unit	$523,635
	Water mains (300mm)	27732m	Cost/Unit	$16,362,051
	Buildings	4	CPI Tables	$578,651
	Flowmeters	11	User-defined Cost	$71,165
	Hydrants	265	User-defined Cost	$1,847,624
	Mechanical	7	User-defined Cost	$255,450
	Water meters	1950	Cost/Unit	$786,100
	Reservoir and Clear Well	4	User-defined Cost	$4,000,000
	Water tower	1	User-defined Cost	$5,000,000
	Water Housing Connections	1977	Cost/Unit	$8,718,570
	Valves Chambers and Manholes	7	User-defined Cost	$170,000
	Valves and valve boxes	379	User-defined Cost	$1,578,510
	Well	2	User-defined Cost	$52,000
	Treatment	58	User-defined Cost	$2,545,783
			TOTAL	**$59,804,558**

2020 WATER NETWORK REPLACEMENT VALUE

*Mechanical comprises of components like Generator Fuel Tank, Electrical Panel etc.

*Treatment includes all treatment and pumping components like Ammonia Pump, Chlorine Pump, and Booster Pump etc.

The pie chart provides a breakdown of each of the water network components to the overall system value.



TOTAL: $59,804,557.85

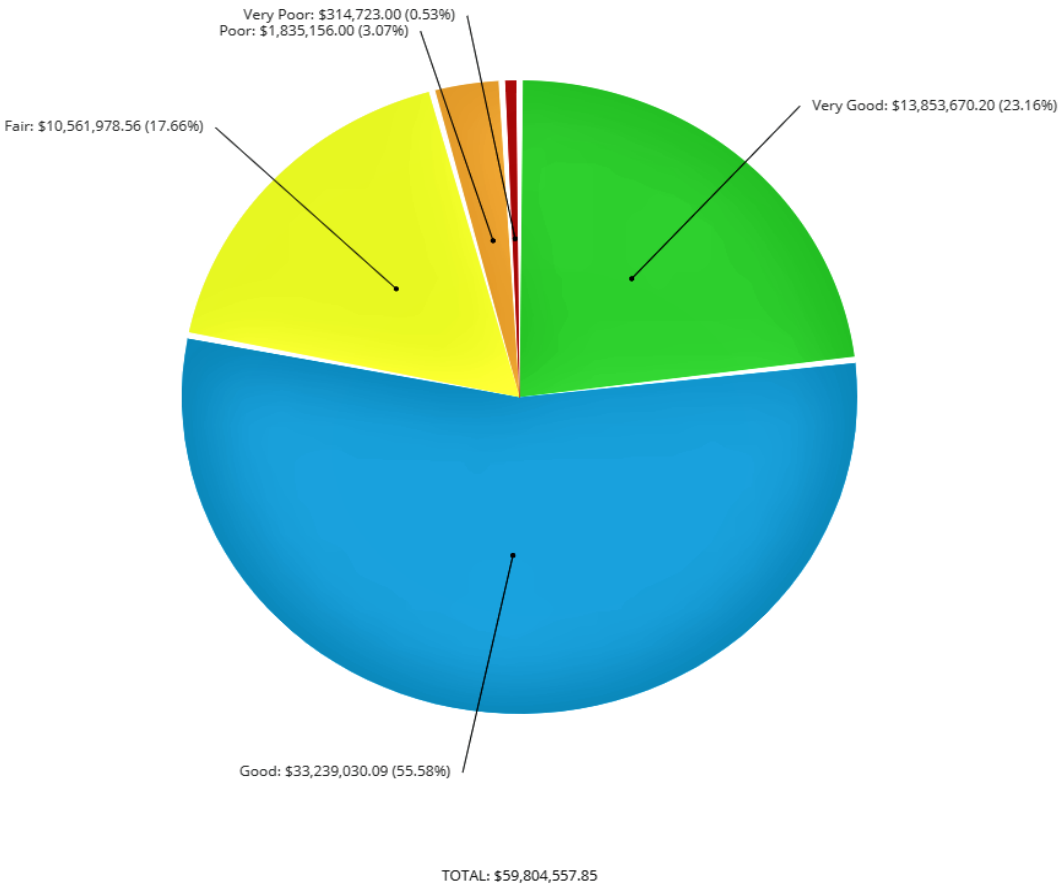
ASSET VALUATION: WATER SYSTEM

4.3.3 Asset Condition

For the water system to provide safe and an acceptable level of service, The Nation Municipality monitors the condition of all assets at suitable intervals of time. The next table indicates the average condition and source of condition data for all the assets under the municipality's water system.

Asset Type	Asset Segment	Average Condition	Average Condition Rating	Condition Assessment Source
WATER NETWORK	Water mains	75.6%	Good	Age based
	Buildings	68.8%	Good	Assessed Condition
	Flowmeter	47.9%	Fair	Assessed Condition
	Hydrants	60.5%	Good	Age based
	Mechanical	58%	Fair	Assessed Condition
	Water meters	52.6%	Fair	Age based
	Water tower	70%	Good	Assessed Condition
	Reservoir and Clear Well	70%	Good	Assessed Condition
	Water Housing Connections	68%	Good	Age based
	Valves and valve boxes	52%	Good	Age based
	Valves Chambers and Manholes	80%	Good	Age based
	Well	51.4%	Fair	Assessed Condition
	Treatment	55.5%	Fair	Assessed Condition
	AVERAGE	**69.3%**	**Good**	

The pie chart below describes the replacement cost of assets in water inventory based on their current condition.



CONDITION OF ASSETS BASED ON REPLACEMENT COST

Approach to Condition Assessment

It is of utmost importance to have accurate and reliable data about the asset's condition for effectively managing the assets, improving the performance levels and determining the factors like remaining service age, risk factor etc. Nation's current approach for the condition assessment of water network includes:

- Condition of water mains is primarily determined based on the factors including age, pipe material, environment and soil types, break history etc.
- Annual inspection of groundwater supply wells is conducted and are scheduled for maintenance every 7 years which include removing pump, brushing and cleaning well, and performing the flow tests.

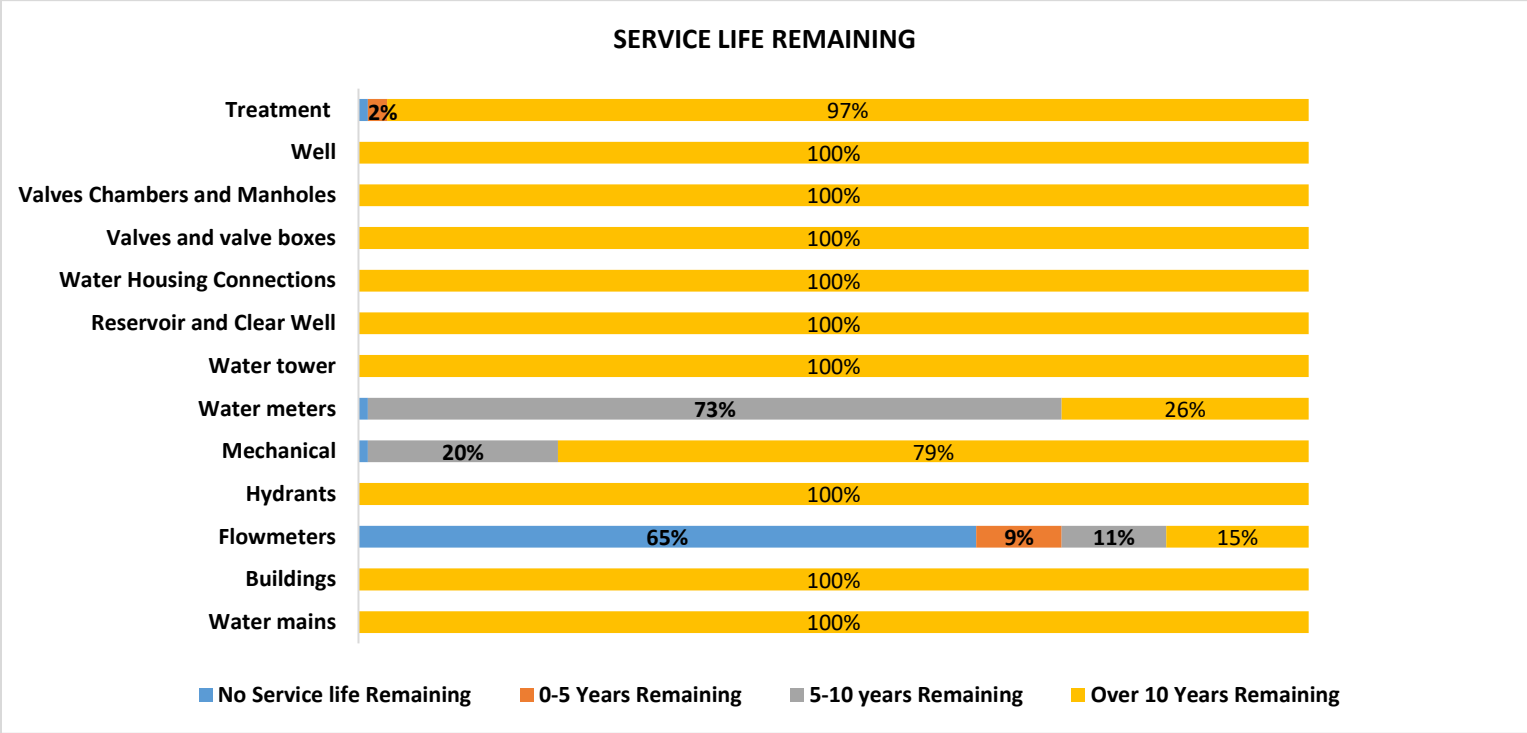
- Equipment components checks for current levels of wear on components are done annually.
- Structural and functional integrity checks of buildings are done on yearly basis for exterior and interior structural damages as well as for adequacy of working spaces.
- Loading capacity assessments are carried out every year to investigate the water pumps run time, water production time schedules, and for adequacy of water storage levels for fire and communal consumption.
- Structural and functional integrity checks of fire hydrants, trunk and distribution water mains, line valves, and services is done at least once a year to check for corrosion and leaks, pressure and water flow tests and for the operability of components.

4.3.4 Age of Assets in Water System

The **Average age** of assets is the average number of years each asset has been in-service since the construction, installation or acquisition date while the **Estimated Useful Life** is an estimate of average number of years an asset is considered usable before its value is fully from depreciated. It could be either based on industrial or governmental guidelines, condition or quality of assets, or on staff knowledge and expertise. The difference between the estimated useful life and the average age of an asset represents its **Average Remaining Service Life**. However, the average Remaining Service Life is entitled to change based on the Assessed Condition Rating.

The following table shows the estimated useful age, the average age, and the service life remaining for different assets in the municipality's water system.

Asset Segment	Estimated Useful Life (Years)	Average Age (Years)	Average Service Life Remaining (Years)
Water mains	75	18	55
Buildings	75	23.25	51.75
Flowmeters	20	10.5	9.5
Hydrants	40	19	28
Mechanical	20-30	13	18
Water meters	20	9	11
Water tower	80	23	57
Reservoir and Clear Well	40-50	13.5	33
Water Housing Connections	50	18.5	37.5
Valves and valve boxes	30	18	18.5
Valves Chambers and Manholes	75	15	60
Well	40	19.5	20.5
Treatment	25-30	12.5	16



4.3.5 Risk Management

Risk within the infrastructure industry is often defined as the probability (likelihood) of failure multiplied by the consequence of that failure.

RISK = LIKELIHOOD OF FAILURE x CONSEQUENCE OF FAILURE

The likelihood of failure relates to the current condition state of each asset, whether they are in Excellent, Good, Fair, Poor or Critical condition, as this is a good indicator regarding their future risk of failure. The consequence of failure relates to the magnitude, or overall effect, that an asset's failure will cause. For instance, a small diameter water main break in a subdivision may cause a few customers to have no water service for a few hours, whereby a large trunk water main break outside a hospital could have disastrous effects and would be a front page news item. The following risk matrix represents the relationship between the probability of failure and the consequence of failure for the Nation's Water asset inventory 2020 within the CityWide Software.

RISK MATRIX

- Appendix B provides the criteria used to calculate the risk rating and based on that rating, the Nation plans suitable lifecycle strategies and treatment options.

4.3.6 Asset Management Lifecycle Strategy

With the passage of time, assets start deteriorating and it varies depending upon the climatic conditions, characteristics, location, and maintenance of each asset. In order to ensure the water assets to perform at the required standards and provide suitable levels of service, there is an average annual capital requirement. It could be based on end-of-life replacement or could be based on lifecycle strategies at suitable intervals of time.

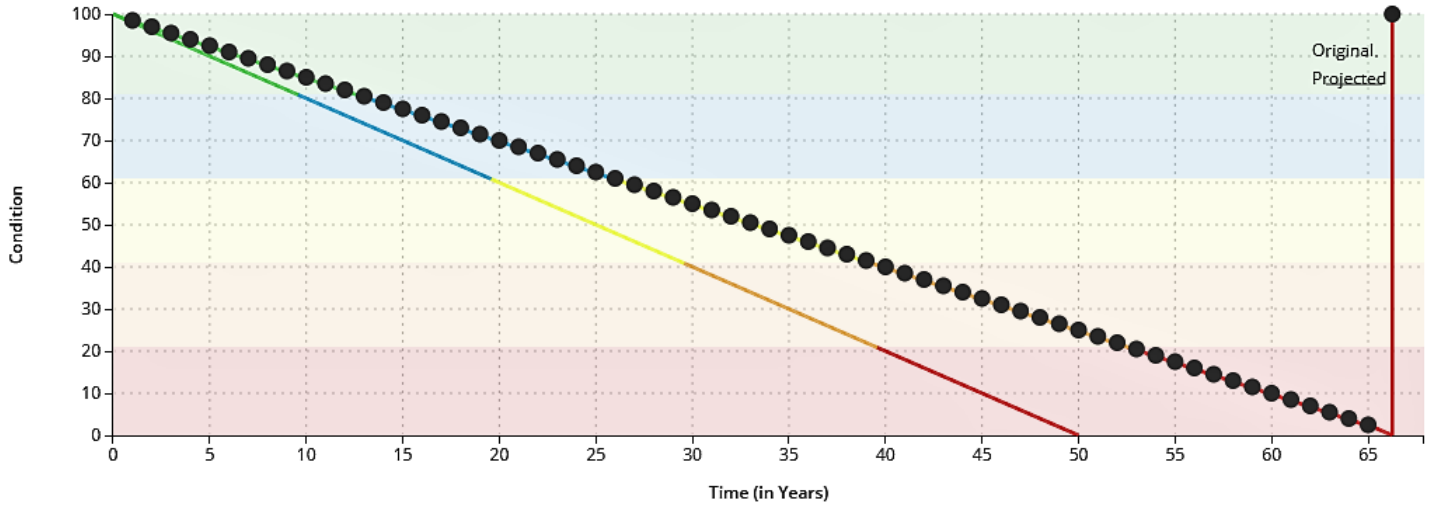
Lifecycle Strategy

After conducting appropriate studies and assessments, suitable life cycle activities are applied at the appropriate time in an asset's life, to provide the greatest additional life at the lowest cost. In the asset management industry, this is simply put as doing the right thing to the right asset at the right time.

Lifecycle Events for Water Network

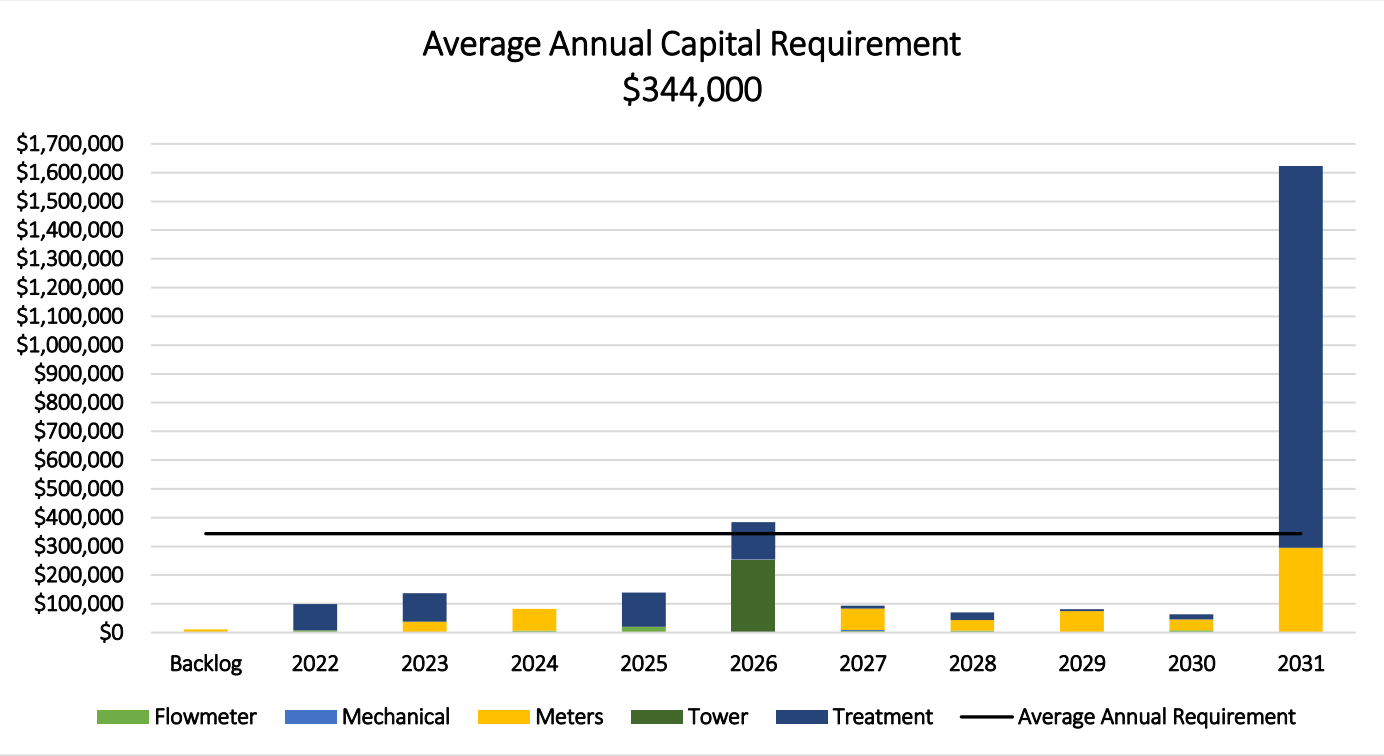
Segment	Lifecycle Event Class	Event Trigger
Hydrants	Maintenance	Annually
Mechanical	Preventative Maintenance	Annually
Reservoir	Regulatory	Every 10 years
Treatment	Preventative Maintenance	Annually
Tower	Regulatory	Every 10 years
Valve Chambers and Manholes	Preventative Maintenance	Annually
Valves	Preventative Maintenance	Every 2 years
Well	Regulatory	Every 7 years

The graph below illustrates the difference between EUL (expected useful life) before and after applying the lifecycle events, for hydrants. It adds up life of over 15 years to hydrants by doing some maintenance events every year.



Forecasted Capital Needs

Following graph shows the capital requirements for the municipality's water assets, based on the end-of-life replacement, for next 10 years. The municipality requires approximately $0.1 million as annual capital cost for water assets from 2022 to 2025 every year while the capital requirement is around $0.4 million and over $1.6 million in 2026 and 2031, respectively. Considering the average over 10 years, Nation's average annual capital requirement (end-of-life replacement only) for its water system is $344,000, by analyzing the capital requirements from 2022 to 2031.



❖ Appendix C shows the projected capital requirements for next 10 years in order to maintain the current Levels of Service.

4.3.7 Levels of Service

The tables below indicate The Nation Municipality's current levels of service for Water System according to the guidelines given in O. Reg. 588/17. The tables include the Community (qualitative) and Technical Levels of Service along with the performance.

Community Levels of Service

The table shows the Community levels of service based on qualitative description of The Nation's Water Services.

Service Attribute	Qualitative Description	Current LOS (2020)
Scope	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal water system	**Appendix D**
	Description, which may include maps, of the user groups or areas of the municipality that have fire flow	**Appendix D**
Reliability	Description of boil water advisories and service interruptions	The municipality issued 2 boil water advisories in 2020 due to loss of pressure and low chlorine in water supply network. The advisories were lifted in 3 days and were only preventive measures to help protect residents from drinking contaminated water.

Technical Levels of Service

The following table shows the technical levels of service based on the quantitative description of The Nation's Water System.

Service Attribute	Technical Metric	Current LOS (2020)
Scope	Percentage of properties connected to the municipal water system	**Limoges Water System – 89%** **St. Isidore Water System– 82%**
	Percentage of properties where fire flow is available	**100%**
Reliability	The number of connection-days per year where a boil water advisory notice is in place compared to the total number of properties connected to the municipal water system	**0**
	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	**5 days**

4.3.8 Recommendations

- The municipality should establish more condition assessment strategies to identify high-risk water assets more accurately and thus, the actual field and financial requirements.
- Key performance indicators for the water network should be established and assessed regularly to highlight areas of growth, deficiencies, and capital needs.
- The infrastructure report Card should be updated annually to identify the gaps between actual and proposed levels of service and adequate strategies should be implemented to bridge those gaps.
- More detailed risk management framework should be designed to assess the risk models on regular basis and for actual understanding of the probability and consequences of asset failure.

4.4 Sanitary Sewer Network

The municipality is responsible for providing efficient and reliable wastewater collection service to the public through a network of sewer mains, pumping stations, lagoon, manholes, and treatment units.

4.4.1 What do we own?

The inventory components of the sanitary sewer network are outlined in the table below. The entire network consists of approximately 56.5km of sewer mains.

Asset Type	Asset Segment	Quantity
SANITARY SEWER NETWORK	Sewer mains	39,407m
	Force mains (<375mm)	17,157m
	House Sewer Connection	1957
	Collection*	4
	Electrical*	13
	Lagoon	3
	Manholes	451
	Monitoring*	1
	Pumping Station	14
	Scada	1
	Septic Field	2
	Treatment *	1
	Valve Chambers	4

*Collection in sewer system includes components like VFD and Flowmeter

*Electrical comprises of electrical units including electric panels, cabinets etc.

*Monitoring includes monitoring groundwater program for wet well

*Treatment includes mechanical components like air blowers, generator, backwash pumps etc.

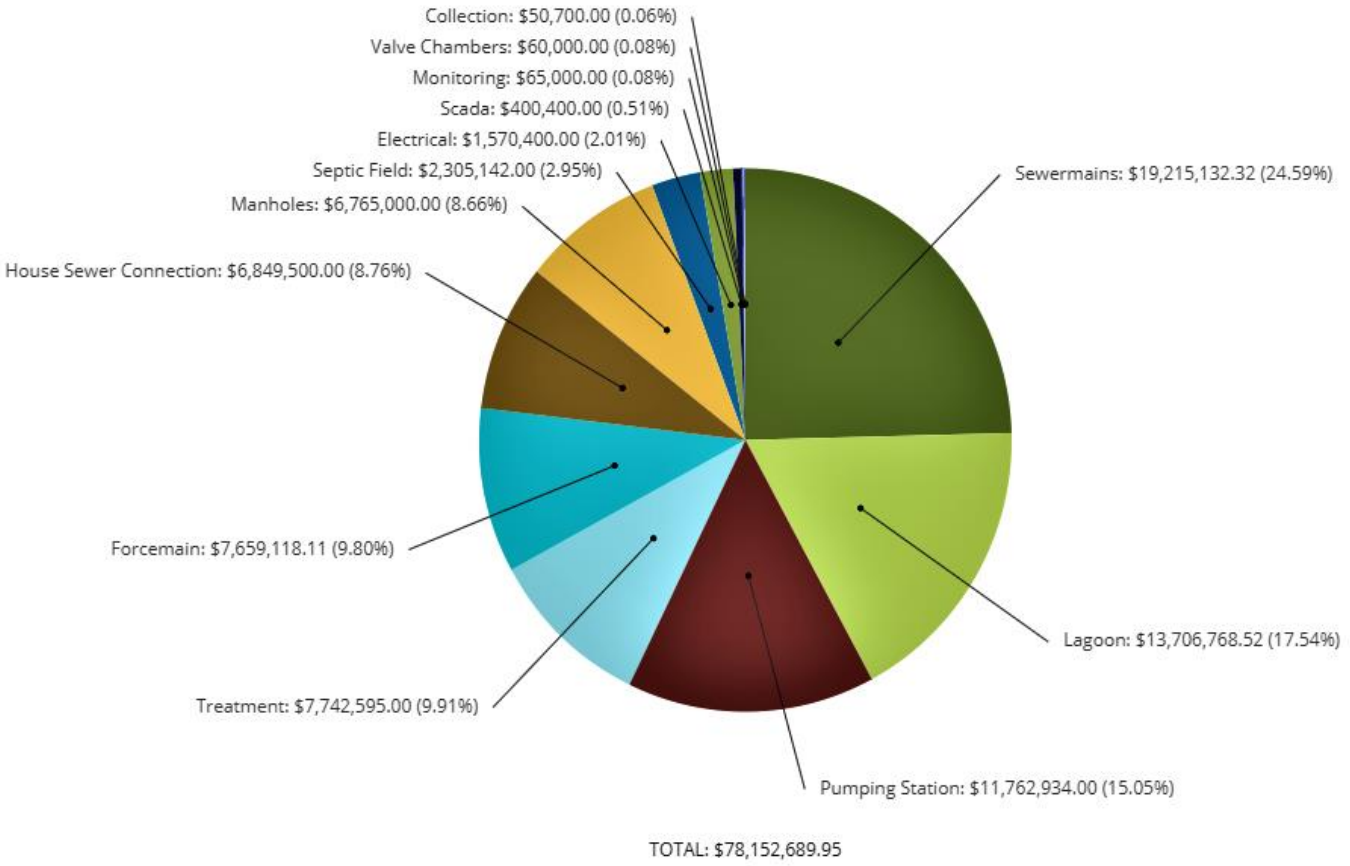
4.4.2 What is it worth?

The estimated replacement value of the sanitary sewer network, in 2020 dollars, is $78.15 million.

Asset Type	Asset Segment	Quantity	Replacement Cost Method	2020 Total Replacement Cost
SANITARY SEWER NETWORK	Sewer mains	39,407m	User-Defined Cost	$19,215,132
	Force mains(<375mm)	17,157m	User-Defined Cost	$7,659,118
	House Sewer Connection	1957	Cost/Unit	$6,849,500
	Collection	4	User-Defined Cost	$50,700
	Electrical	13	User-Defined Cost	$1,570,400
	Lagoon	3	CPI Tables	$13,706,769
	Manholes	451	User-Defined Cost	$6,765,000
	Monitoring	1	User-Defined Cost	$65,000
	Pumping Station	14	User-Defined Cost & CPI Tables	$11,762,934
	Scada (Computer System)	1	User-Defined Cost	$400,400
	Septic Field	2	User-Defined Cost & CPI Tables	$2,305,142
	Treatment	1	User-Defined Cost & CPI Tables	$7,742,595
	Valve Chambers	4	User-Defined Cost	$60,000
			TOTAL	**$78,152,690**

2020 SANITARY SEWER NETWORK REPLACEMENT VALUE

The pie chart below provides a breakdown of each of the sanitary sewer network components in the overall system.



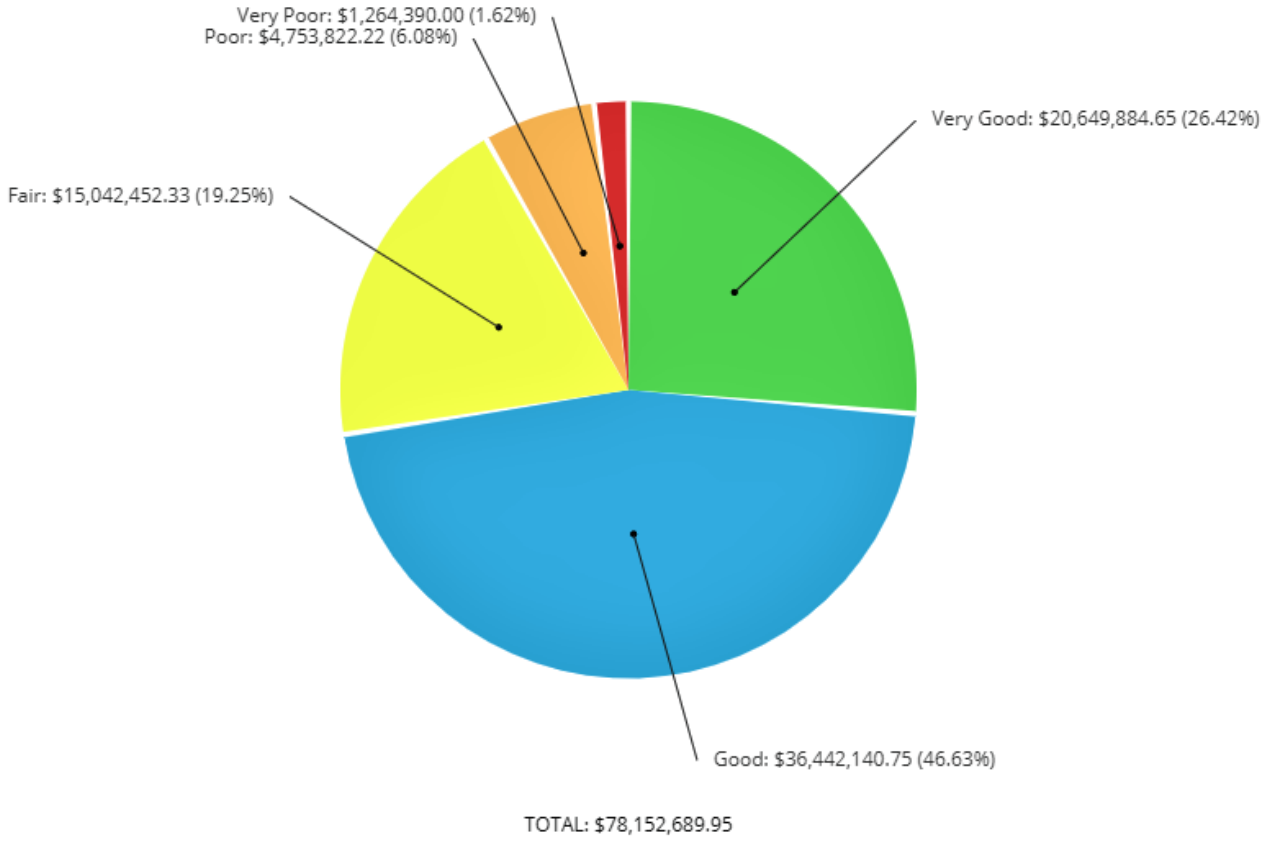
ASSET VALUATION: SANITARY SEWER SYSTEM

4.4.3 Asset Condition

For the Sewer System to provide safe and an acceptable level of service, The Nation Municipality monitors the condition of all assets at suitable intervals of time. The table below indicates the average condition and source of condition data for all the assets under the municipality's sanitary sewer system.

Asset Type	Asset Segment	Average Assessed Condition	Average Condition Rating	Condition Assessment Source
SANITARY SEWER NETWORK	Force mains (<375mm)	73.3%	Good	Age based
	House Sewer Connection	64.8%	Good	Age based
	Sewer mains	73.3%	Good	Age based
	Collection	74%	Good	Assessed Condition
	Electrical	66.7%	Good	Age based
	Lagoon	56.3%	Fair	Assessed Condition
	Manholes	69.5%	Good	Age based
	Monitoring	35.8%	Poor	Age based
	Pumping Station	70.4%	Good	Assessed Condition
	Scada (Computer System)	62.4%	Good	Age based
	Septic Field	49.5%	Fair	Age based
	Treatment	90.95%	Very Good	Assessed Condition
	Valve Chambers	81.4%	Good	Age based
	AVERAGE	**69.1%**	**Good**	

Based on the replacement cost of the water system, the pie chart below indicates that 1.62% of the total sanitary sewer assets, worth $1.26 million, are in very poor condition, 6.08%, worth $4.75 million, are in poor condition while nearly three quarters (73%) are in good to very good condition.



REPLACEMENT COST BASED ON CONDITION OF ASSETS

Approach to Condition Assessment

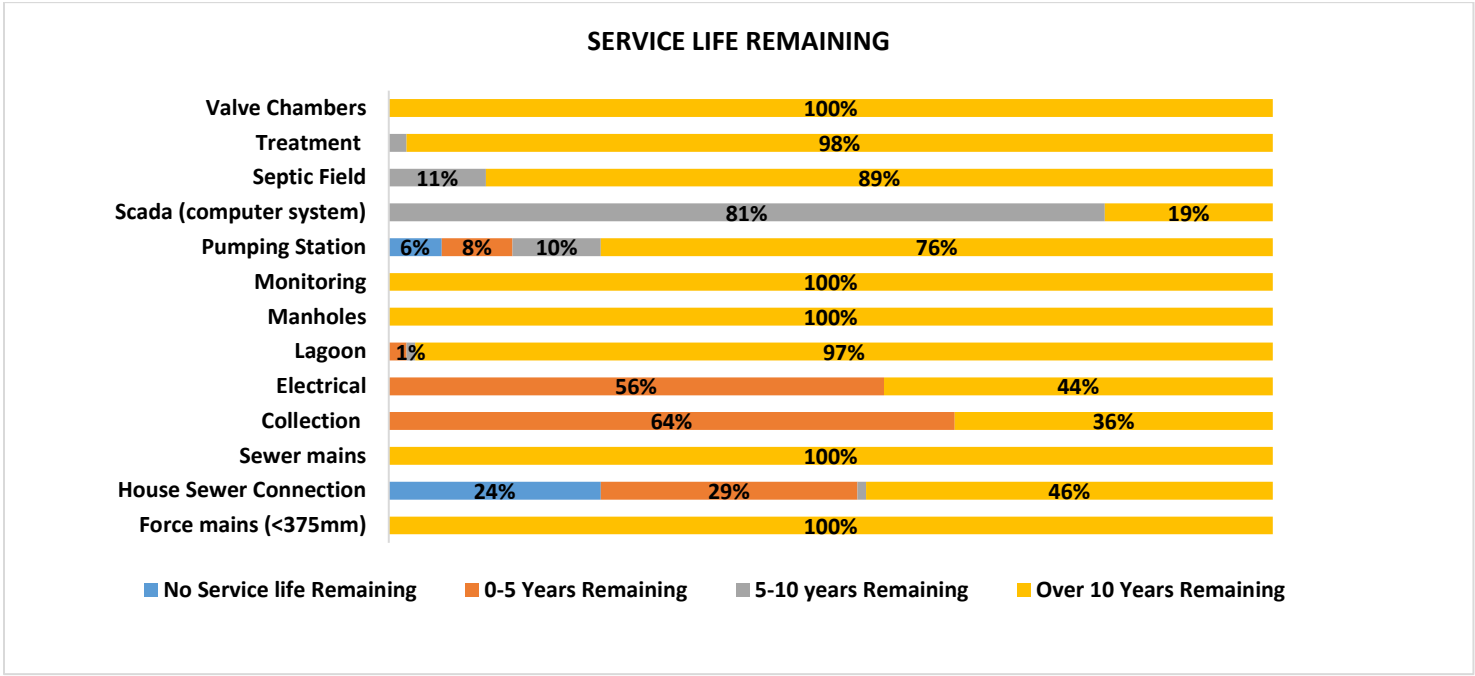
It is of utmost importance to have accurate and reliable data about the asset's condition for effectively managing the assets, improving the performance levels and determining the factors like remaining service age, risk factor etc. Nation's current approach for the condition assessment of wastewater network includes:

- Pumping stations are assessed by the trained staff, on regular basis, and a thorough inspection is done every year.
- Most of the condition assessment data is based on the age of assets and the municipality is continuously working on deploying new and latest techniques for more accurate and reliable data.
- For Sewer mains, annual flushing is done, and the municipality has also started CCTV inspections.

4.4.4 Age of Assets in Sanitary Sewer System

The following table shows the estimated useful age, the average age, and the service life remaining for different assets in the municipality's sewer system.

Asset Segment	Estimated Useful Life (Years)	Average Age (Years)	Average Service Life Remaining (Years)
Force mains (<375mm)	75	20	55
House Sewer Connection	60	20	40
Sewer mains	75	19.5	54.5
Collection	10-20	4	6-16
Electrical	25	8.5	16.5
Lagoon	75	25	50
Manholes	70	20	50
Monitoring	30	19	11
Pumping Station	35	8.5	23
Scada (computer system)	10	8	2
Septic Field	40-50	21	22
Treatment	32	3.75	28.25
Valve Chambers	75	18.5	56.5

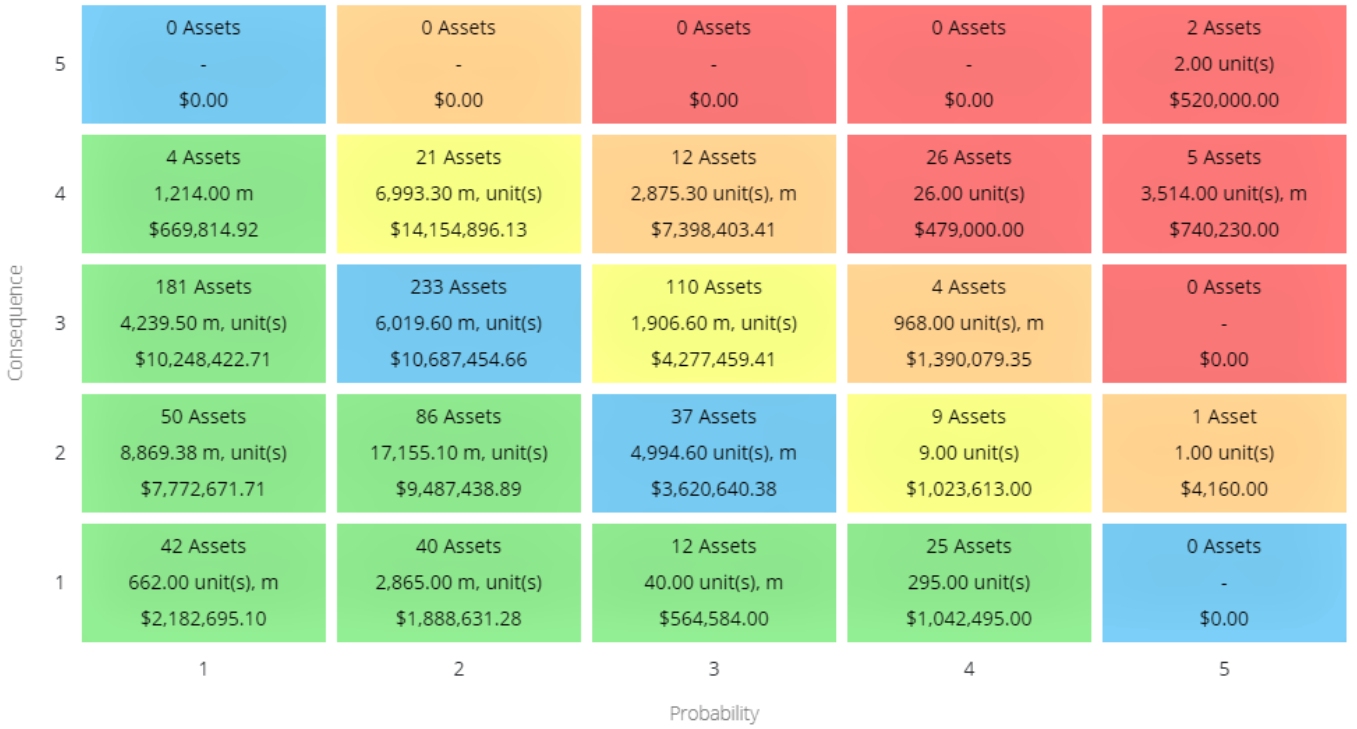


4.4.5 Risk Management

Risk within the infrastructure industry is often defined as the probability (likelihood) of failure multiplied by the consequence of that failure.

RISK = LIKELIHOOD OF FAILURE x CONSEQUENCE OF FAILURE

The following risk matrix represents the relationship between the probability of failure and the consequence of failure for the Nation's Sewer asset inventory 2020 within the CityWide Software.



RISK MATRIX

- Appendix B provides the criteria used to calculate the risk rating and based on that rating, the Nation plans suitable lifecycle strategies and treatment options.

4.4.6 Asset Management Lifecycle Strategy

With the passage of time, assets start deteriorating and it varies depending upon the climatic conditions, characteristics, location, and maintenance of each asset. In order to ensure the wastewater assets to perform at the required standards and provide suitable levels of service, there is an average annual capital requirement. It could be based on end-of-life replacement or could be based on lifecycle strategies at suitable intervals of time.

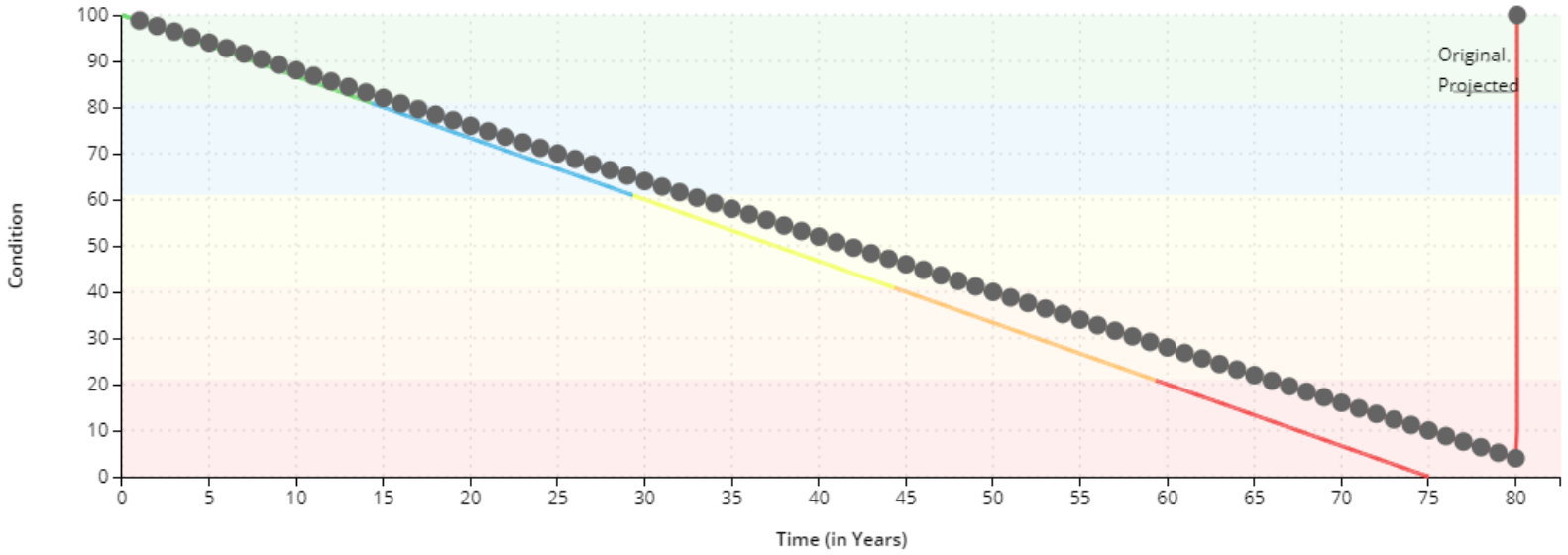
Lifecycle Strategy

After conducting appropriate studies and assessments, suitable life cycle activities are applied at the appropriate time in an asset's life, to provide the greatest additional life at the lowest cost. In the asset management industry, this is simply put as doing the right thing to the right asset at the right time.

Lifecycle Events for Sanitary Sewer System

Segment	Lifecycle Event Class	Event Trigger
Sewer mains	Maintenance	Annually
Lagoon	Preventative Maintenance	Every 3 years
Pumping Station	Preventative Maintenance	Annually
Treatment	Maintenance	Annually

The graph below illustrates the difference between EUL (expected useful life) before and after applying the lifecycle events, after applying some basic maintenance on Sewer mains.

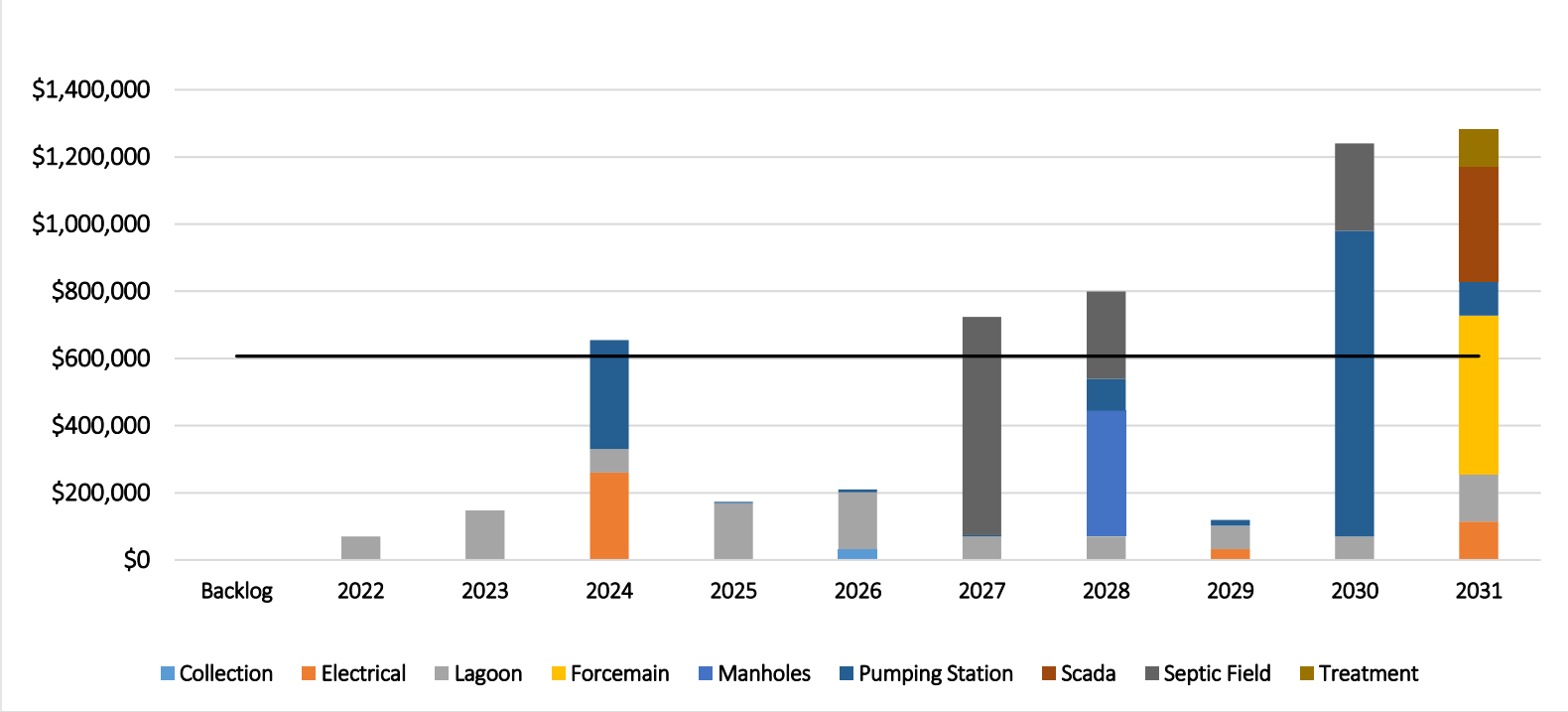


Forecasted Capital Needs

Following graph shows the 10 years capital requirements for the municipality's wastewater network assets, based on the end-of-life replacement.

End-of-Life Capital Requirements

Based on the end-of-life capital requirements, the municipality has the replacement needs of almost $0.6 million in 2024, $0.7 million in both 2027 & 2028, and over $1.1 million in 2030 and 2031 respectively. Nation's average annual capital requirement (replacement only) for its sewer system is $607,000 (black line), by analyzing the capital requirements until 2031.



Appendix C shows the projected capital requirements for next 10 years in order to maintain the current Levels of Service.

4.4.7 Levels of Service

The tables below indicate The Nation Municipality's current levels of service for Sewer System according to the guidelines given in O. Reg. 588/17. The tables include the Community (qualitative) and Technical Levels of Service along with the performance.

Community Levels of Service

The table shows the Community levels of service based on qualitative description of The Nation's Wastewater Collection Services.

Service Attribute	Qualitative Description	Current LOS (2020)
Scope	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal wastewater system	**Appendix D**
Reliability	Description of how combined sewers in the municipal wastewater system are designed with overflow structures in place which allow overflow during storm events to prevent backups into homes	There are no combined sewers in the municipality
	Description of the frequency and volume of overflows in combined sewers in the municipal wastewater system that occur in habitable areas or beaches	There are no combined sewers in the municipality
	Description of how storm water can get into sanitary sewers in the municipal wastewater system, causing sewage to overflow into streets or backup into homes	During heavy rainfalls, sanitary sewers could experience high volumes of inflow, exceeding their designed capacity. Storm water can also enter sanitary sewers via infiltration from broken pipes, cracks or bad joints in the sanitary sewers, holes in manhole covers etc. These factors, in extreme conditions, could result in overflow of sewage/water into streets or backup into homes. Installing a sump pump for storm water can help reduce this occurrence.
	Description of how sanitary sewers in the municipal wastewater system are designed to be resilient to infiltration of storm water	The municipality adheres to the provincial guidelines and design standards during construction or replacement of sanitary sewers. Also, it does not allow connecting sump pumps to wastewater system, there are no combined storm and sanitary sewers, and the manhole covers have only two holes each.
	Description of the effluent that is discharged from sewage treatment plants in the municipal wastewater system	N/A

Technical Levels of Service

The following table shows the technical levels of service based on the quantitative description of The Nation's Wastewater System.

Service Attribute	Technical Metric	Current LOS (2020)
Scope	Percentage of properties connected to the municipal wastewater system	**83%**
Reliability	The number of events per year where combined sewer flow in the municipal wastewater system exceeds system capacity compared to the total number of properties connected to the municipal wastewater system	**0**
	The number of connection-days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system	**0**
	The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system	**8**

4.4.8 Recommendations

- The municipality should establish more condition assessment strategies to identify high-risk water assets more accurately and thus, the actual field and financial requirements.
- The municipality should assess its short-, medium- and long-term operations and maintenance needs. An appropriate percentage of the replacement costs should then be allocated for the municipality's O&M requirements.
- More detailed risk management framework should be designed to assess the risk models on regular basis and for actual understanding of the probability and consequences of asset failure.
- Current levels of service should be measured in accordance with the metrics established by the municipality in this AMP. Additional metrics can be established in accordance with O. Reg. 588/17 as they are determined to provide meaningful and reliable inputs into asset management planning.

4.5 Storm Water Network

The municipality owns and efficiently maintains the storm water network comprising of storm sewer mains, catch basins, manholes, and other supporting infrastructure. The inventory was compiled using the Geographic Information System (GIS). The GIS serves as a repository of data from which the information about each asset can be displayed on maps.

4.5.1 What do we own?

The Nation Municipality currently owns the following inventory pertaining to the storm water network and has approximately 49 km of storm mains.

Asset Type	Asset Segment	Quantity
STORM SYSTEM	Storm Mains	**48,956.86m**
	Catch Basins	**1288**
	Manholes	**265**
	Storm water Pond Systems	**6**

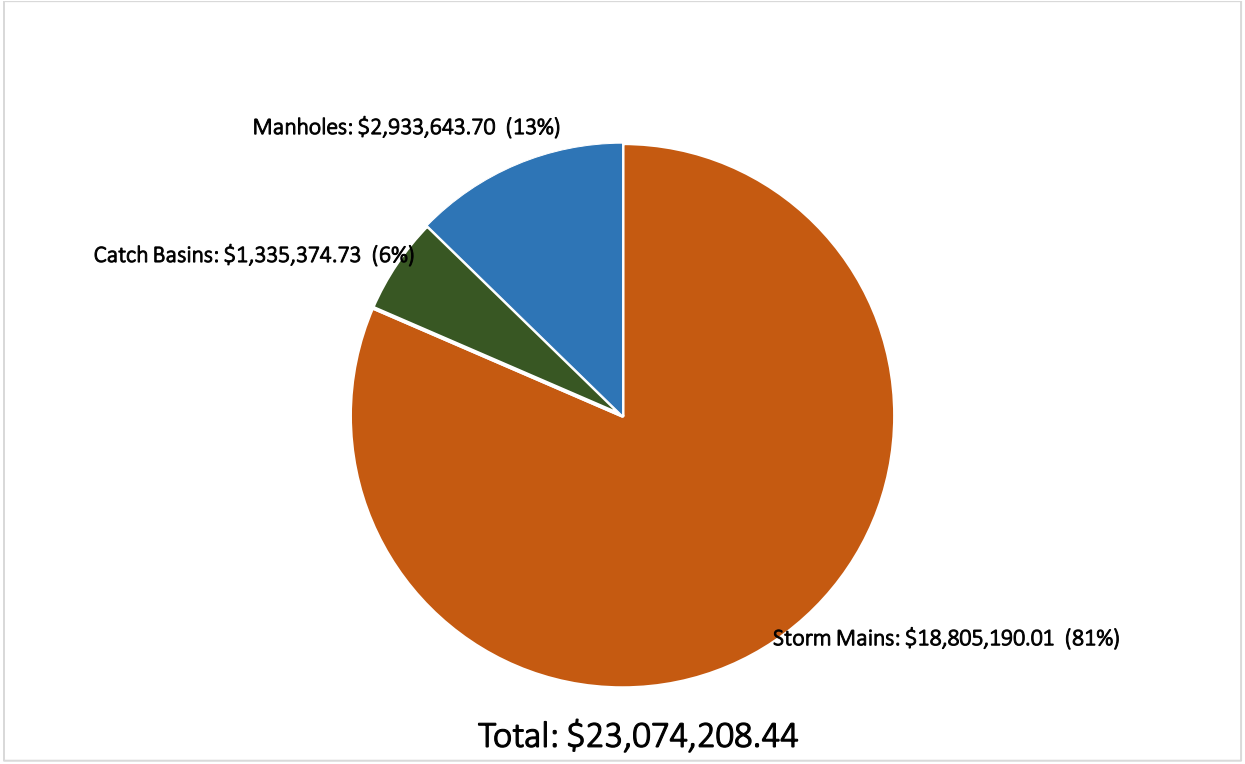
4.5.2 What is it worth?

The estimated replacement value of the storm sewer network, in 2021 dollars, is $23 million.

Asset Type	Asset Segment	Quantity	Replacement Cost Method	2021 Total Replacement Cost
STORM SYSTEM	Storm Mains	48,956.86m	User-Defined Cost	**$18,805,190**
	Catch Basins	1288	User-Defined Cost	**$1,335,374**
	Manholes	265	User-Defined Cost	**$2,933,644**
	Storm Water Management facilities	6	Not Planned for Replacement	
			TOTAL	**$23,074,208**

2021 STORM SEWER NETWORK REPLACEMENT VALUE

The pie chart below provides a breakdown of each of the storm sewer network components to the overall system value.



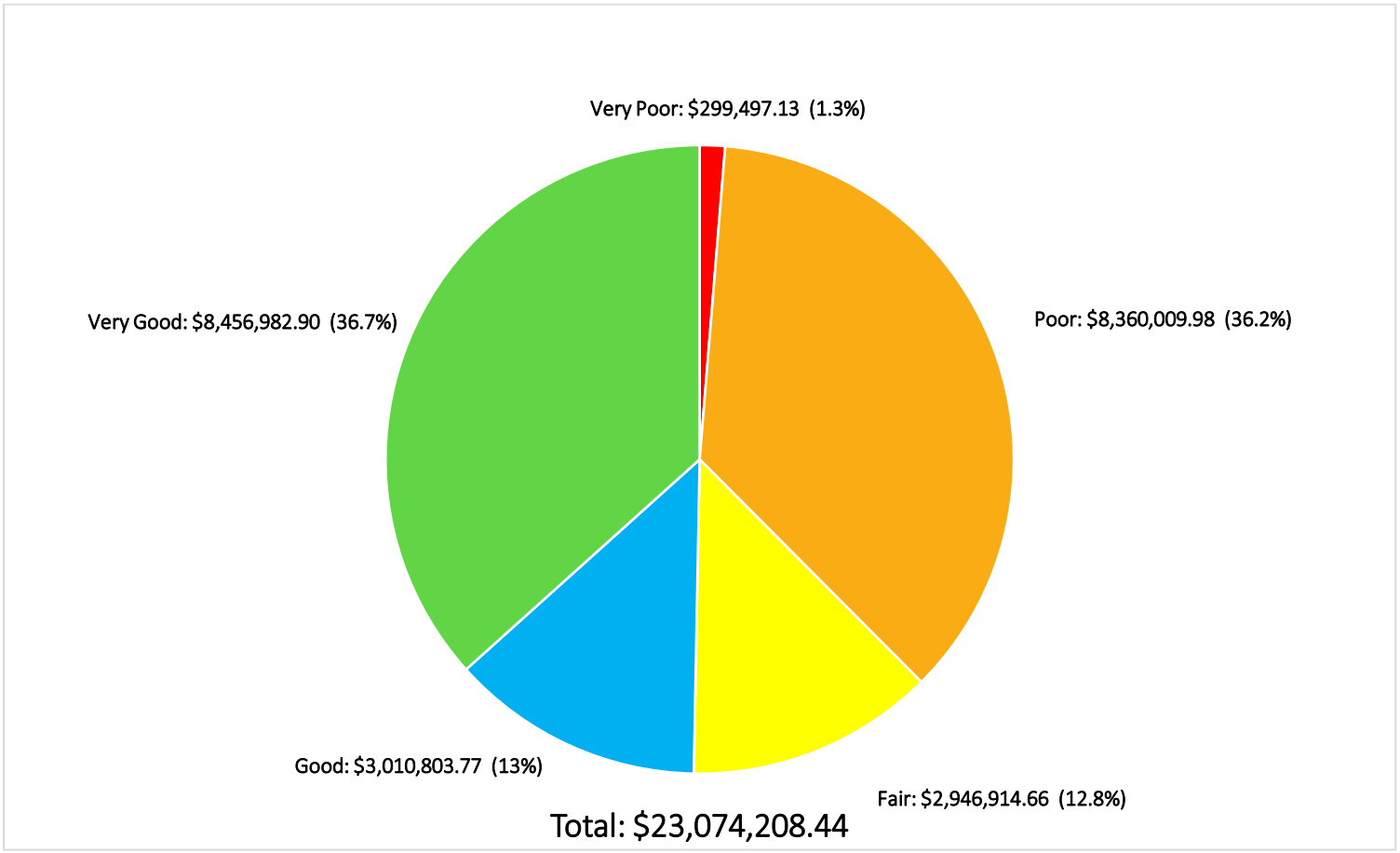
ASSET VALUATION: STORM SEWER NETWORK

4.5.3 Asset Condition

For the Storm water System to provide safe and an acceptable level of service, the table below indicates the average condition and source of condition data for all the assets under the municipality's Storm Sewer System.

Asset Type	Asset Segment	Average Condition	Average Condition Rating	Condition Assessment Source
STORM SYSTEM	Storm Mains	61.1%	Good	Age-Based
	Catch Basins	55.3%	Fair	Age-Based
	Manholes	66.5%	Good	Age-Based
	AVERAGE	61.4%	Good	

Based on the replacement cost, the pie chart below indicates that 1.3% of the total Storm sewer assets, worth $0.3 million, are in very poor condition, 36%, worth $8.36 million, are in poor condition while nearly half of the assets are in good to very good condition.



CONDITION OF ASSETS BASED ON REPLACEMENT COST

Approach to Condition Assessment

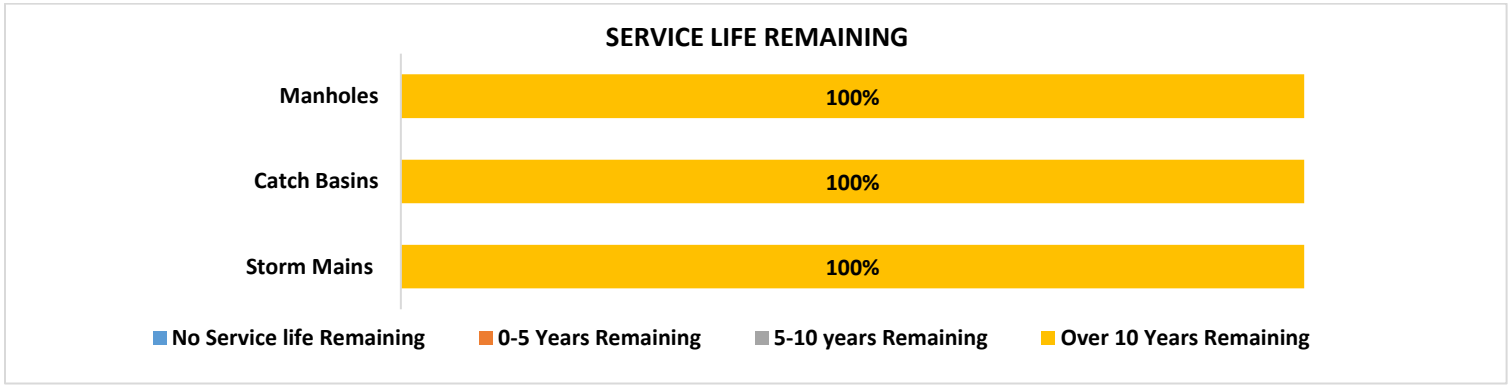
It is of utmost importance to have accurate and reliable data about the asset's condition for effectively managing the assets, improving the performance levels and determining the factors like remaining service age, risk factor etc. Nation's current approach for the condition assessment of Storm water Network includes:

- The Nation Municipality has contracted a third party for the inspection and assessment of stormwater management facilities (ponds) in May 2022, reviewing the design reports, plans, as-built drawings, and the condition of SWM facilities.
- Most of the condition assessment data is based on the age of assets and the municipality is continuously working on deploying new and latest techniques for more accurate and reliable data.

4.5.4 Age of Assets in Storm Sewer System

The following table shows the estimated useful age, the average age, and the service life remaining for different assets in the municipality's Storm Sewer system.

Asset Segment	Estimated Useful Life (Years)	Average Age (Years)	Average Service Life Remaining (Years)
Storm Mains	50-75	20-35	16-60
Catch Basins	50-75	15-35	16-60
Manholes	50-75	15-35	16-60



4.5.5 Risk Management

Risk within the infrastructure industry is often defined as the probability (likelihood) of failure multiplied by the consequence of that failure.

RISK = LIKELIHOOD OF FAILURE x CONSEQUENCE OF FAILURE

The following risk matrix represents the relationship between the probability of failure and the consequence of failure for the Nation's Storm Sewer asset inventory 2021 within the Citywide Software.

RISK MATRIX

- Appendix B provides the criteria used to calculate the risk rating and based on that rating, the Nation plans suitable lifecycle strategies and treatment options.

4.5.6 Asset Management Lifecycle Strategy

With the passage of time, assets start deteriorating and it varies depending upon the climatic conditions, characteristics, location, and maintenance of each asset. In order to ensure the storm water assets to perform at the required standards and provide suitable levels of service, there is an average annual capital requirement. It could be based on end-of-life replacement or could be based on lifecycle strategies at suitable intervals of time.

Lifecycle Strategy

After conducting appropriate studies and assessments, suitable life cycle activities are applied at the appropriate time in an asset's life, to provide the greatest additional life at the lowest cost. In the asset management industry, this is simply put as doing the right thing to the right asset at the right time.

Lifecycle Events for Storm Sewer System

Activity Type	Description
Maintenance	Municipality has started flushing Catch Basins to ensure unobstructed flow

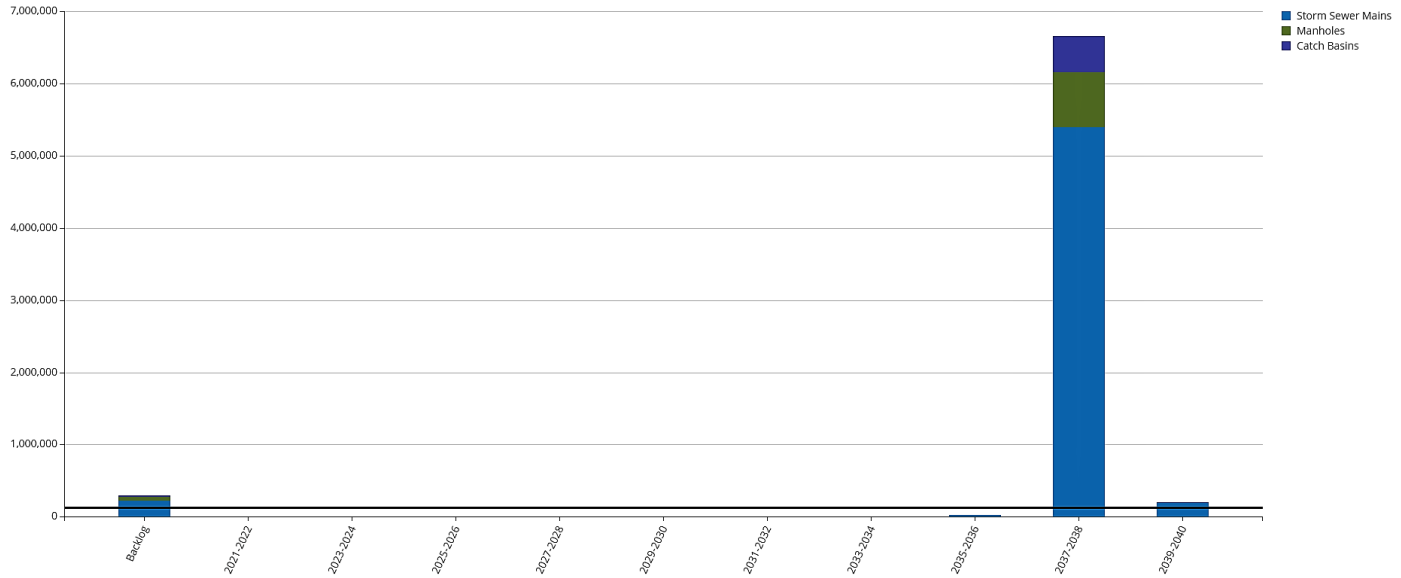
For the Storm Water Management Facilities, new strategies would be developed as recommended, on the basis of outcomes of the inspections, currently going on which include the field survey of structure condition, bank condition, vegetation type, and water levels.

Forecasted Capital Needs

The following graph shows the capital requirements for the municipality's storm water network assets, based on the end-of-life replacement.

End-of-Life Capital Requirements

Based on the end-of-life capital requirements, the municipality has major replacement needs of $6.65 million in 2037-2038 and Nation's average annual capital requirement (replacement only) for its storm sewer system is $144,000 (black line), by analyzing the capital requirements until 2040.



Appendix C shows the projected capital requirements for next 10 years in order to maintain the current Levels of Service.

4.5.7 Levels of Service

The tables below indicate The Nation Municipality's current levels of service for Storm Sewer System according to the guidelines given in O. Reg. 588/17. The tables include the Community (qualitative) and Technical Levels of Service along with the performance.

Community Levels of Service

The table shows the Community levels of service based on qualitative description of The Nation's Storm Sewer Services.

Service Attribute	Qualitative Description	Current LOS (2021)
Scope	Description, which may include maps, of the user groups or areas of the municipality that are protected from flooding, including the extent of the protection provided by the municipal storm water management system.	**Appendix D**

Technical Levels of Service

The following table shows the technical levels of service based on the quantitative description of The Nation's Storm water System.

Service Attribute	Technical Metric	Current LOS (2021)
Scope	Percentage of properties in municipality resilient to a 100-year storm	**TBD***
	Percentage of the municipal storm water management system resilient to a 5-year storm	**100%**

*The Nation Municipality does not currently have data available to confidently determine the resilience of 100-year storm water management system. Although all the new subdivisions are resilient to 100-year storm, but the older storms need to be accurately assessed for 100-year event.

4.5.8 Recommendations

- The municipality should establish condition assessment strategies to identify high-risk storm water assets more accurately and thus, the actual field and financial requirements.
- The municipality should assess its short, medium and long-term operations and maintenance needs. An appropriate percentage of the replacement costs should then be allocated for the municipality's O&M requirements.
- More detailed risk management framework should be designed to assess the risk models on regular basis and for actual understanding of the probability and consequences of asset failure.
- Current levels of service should be measured in accordance with the metrics established by the municipality in this AMP. Additional metrics can be established in accordance with O. Reg. 588/17 as they are determined to provide meaningful and reliable inputs into asset management planning.

5. Impacts of Growth

With the passage of time, the demand for municipal and services is changing continuously due to numerous factors. The factors could be internal or external or both. These changes in demand affect the assets' performance and levels of service as well. Understanding the key factors behind the growth and changes in demand will help the municipality to plan for the new infrastructure, and upgrade or replacement of existing infrastructure more effectively and efficiently.

5.1 Official Plan – United Counties of Prescott and Russell

The Nation Municipality is one of the eight local municipalities composing the United Counties of Prescott and Russell, which is the easternmost county in Ontario.

The Nation Municipality, as a constituent municipality of The United Counties of Prescott and Russell, adopted its first Official Plan on June 22, 1999, and it was approved by Ministry of Municipal Affairs and Housing (MMAH) on December 7, 1999. The Plan must be revised every 5 years. The goal of the Official Plan is to provide guidance and direction to growth and development, redevelopment and/or conservation activities in the United Counties.

The United Counties of Prescott and Russell have experienced significant growth over the last two decades. According to the 2021 Growth Management Strategy (GMS), Nation's population will increase from 13750 to 16060 in next two decades and the growth projects the need for over 1000 housing units by 2041. The municipality is expecting employment growth of around 680 jobs by the year 2041.

The table below describes the Nation's historical and forecasted growth figures for population, housing, and employment, based on the Official Plan 2021 by United Counties of Prescott and Russell.

Year	Population	Housing	Employment
2016	13210	4760	3050
2021	13750	5100	3140
2026	14430	5390	3290
2031	14870	5630	3440
2036	15500	5890	3630
2041	16060	6110	3820
2046	16680	6360	4020
2051	17220	6580	4210

5.2 Impact of Growth on Lifecycle Activities

Growth is the critical infrastructure demand driver for most infrastructure services. Since the municipality is anticipating growth in population, and housing, it has to plan for the infrastructure accordingly which may require expansion of existing infrastructure and services. While the addition of dwelling units will add to the existing assessment base and offset some of the costs associated with growth, the municipality will have to review and revise the lifecycle costs of the related infrastructure. These costs should be integrated to long-term funding strategies to maintain (at minimum) desired levels of service.

As the municipality constructs or acquires any growth-related assets, they would be integrated to the AMP. By July 1, 2025, the municipality should include a discussion about how the assumptions regarding future changes in population and economic activity informed the preparation of the lifecycle management and financial strategy.

6. Financial Strategy

- The Nation Municipality's current funding for capital projects is $3.2 million per year
- Annual Capital requirement being $4.6 million, there is a funding gap of $1.4 million annually
- For tax-funded assets, we are considering an average increase of tax revenues by approximately 1% every year for next 10 years to achieve sustainable funding
- For Water Services, we are considering an average annual increase of 4.3% and 3.9% in rates for next 10 years for Limoges and St. Isidore Water Network, respectively
- For Sanitary Sewer Services, we are considering an average annual increase of 6% in rate for next 10 years

6.1 Financial Strategy Overview

For an asset management plan to be effective and meaningful, it must be integrated with financial planning and long-term budgeting. The basic purpose of financial strategy is to ensure adequate and regular supply of funds fulfilling the present and future requirements for the municipal infrastructure. In Nation Municipality, financial strategies revolve around the annual budget processes and with a good financial plan, the Nation Municipality can identify the financial resources required for sustainable asset management based on existing asset inventories, desired levels of services, and projected growth requirements.

This report develops such a financial plan by presenting several scenarios for consideration and culminating with final recommendations. As outlined below, the scenarios presented model different combinations of the following components:
a) The financial requirements for:

- existing assets
- existing service levels
- requirements of contemplated changes in service levels (none identified for this plan)
- requirements of anticipated growth (none identified for this plan)

b) Use of traditional sources of municipal funds:

- tax levies
- user fees
- reserves
- debt

- development charges

c) Use of non-traditional sources of municipal funds:

- reallocated budgets
- partnerships
- procurement methods

d) Use of senior government funds:

- community building fund (gas tax)
- grants

If the financial plan component results in a funding shortfall, the province requires the inclusion of a specific plan as to how the impact of the shortfall will be managed. In determining the legitimacy of a funding shortfall, the province may evaluate a municipality's approach to the following:

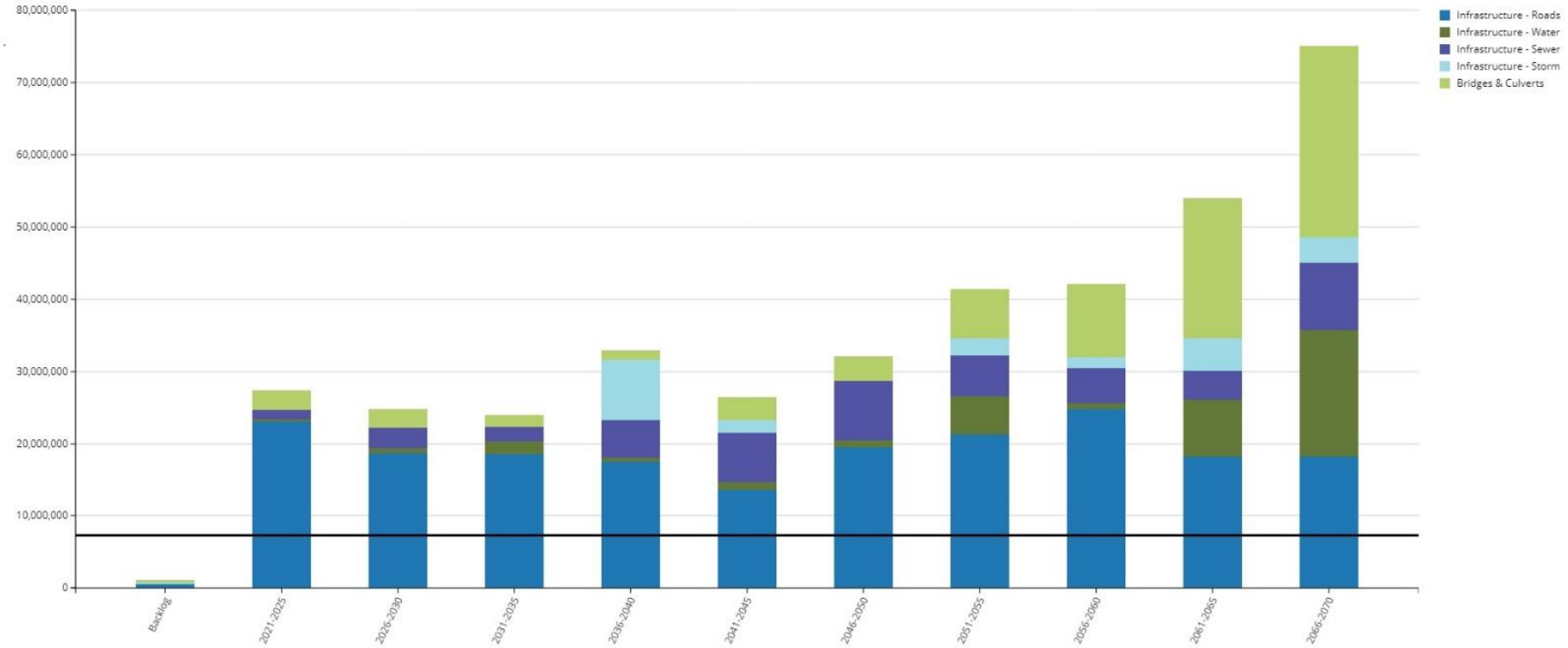
a) In order to reduce financial requirements, consideration has been given to revising service levels downward

b) All asset management and financial strategies have been considered. For example:

- If a zero-debt policy is in place, is it warranted? If not, the use of debt should be considered.
- Do user fees reflect the cost of the applicable service? If not, increased user fees should be considered.

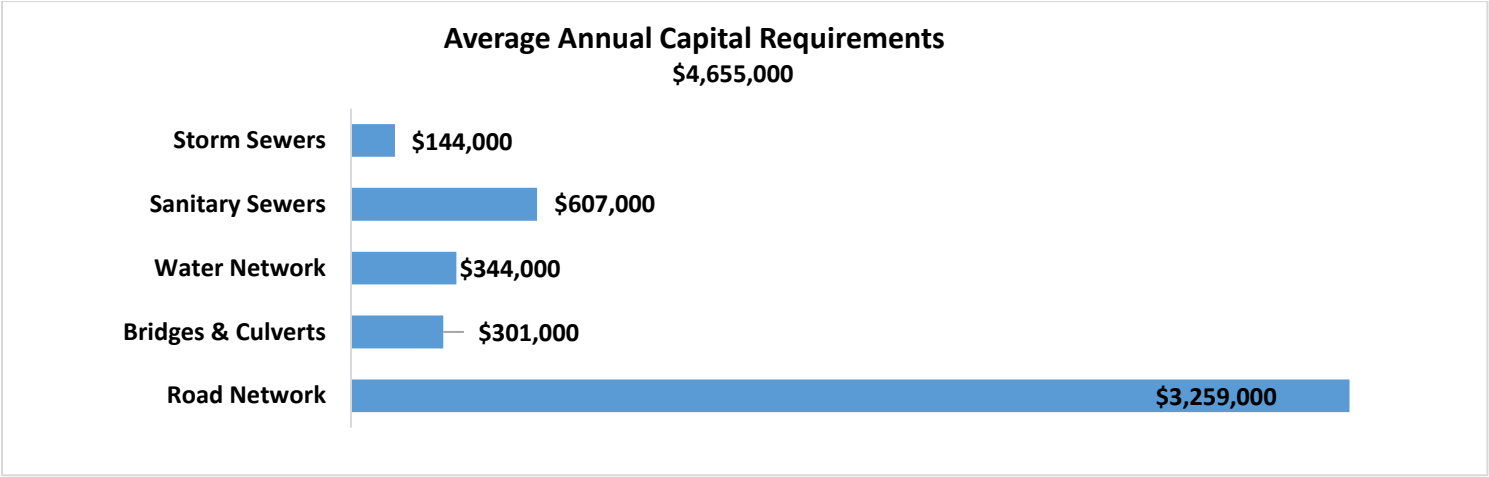
Annual Requirements & Funding Available

The following graph illustrates the capital requirements projected for 50 years (2021-2070) and based on these projections, the average annual capital requirement is $7.3 million to maintain and improve the levels of service for asset categories mentioned in this AMP.



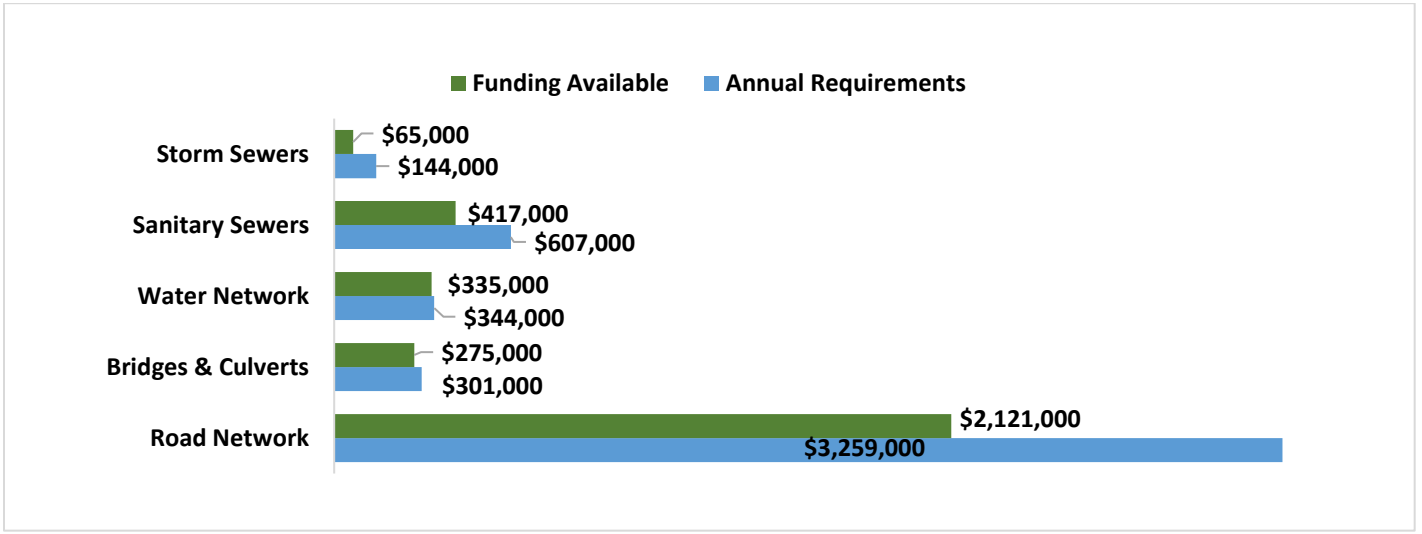
However, to plan for the financial strategy, the Nation Municipality is considering projections for 10 years and 20 years for rate based and tax-based asset categories, respectively. As such, it is difficult to quantify how funding overtime translated into addressing specific needs and making gains on a snapshot of past. However, with certainty we know that the need will only increase over time as data is refined, new assets are created/acquired, levels of service standards increase, and new services are introduced among a multitude of other reasons. Based on current projections, its average annual capital requirement is $4,655,000 to maintain current and uplift the required levels of service for all its core assets. The annual requirements are the amount the municipality should allocate every year to all assets to meet the required replacement needs, prevent infrastructure backlogs, and achieve sustainability in long run.

Annual requirement is based on “end-of-life” method for most of the asset categories.



Annual Funding Available

Based on current and historical analysis of capital funding sources, the Nation Municipality commits $3.2 million towards capital projects every year from its sustainable revenue sources. There is a funding gap of $1.4 million, the annual capital requirement being $4.6 million.



Based on current and historical analysis of capital funding sources, the Nation Municipality commits $3.2 million towards capital projects every year from its sustainable revenue sources. There is a funding gap of $1.4 million, the annual capital requirement being $4.6 million.

6.2 Funding Objective

We have developed scenarios to enable Nation to achieve full funding within 10 years or 20 years for the following assets:

a) Tax funded assets – Road network (paved roads); Bridges & Culverts; Storm Sewer Network

b) Rate funded assets – Water Network; Sanitary Sewer Network

For each scenario developed we have included strategies, where applicable, regarding the use of tax revenues, user fees and reserves.

6.3 Tax Funded Assets

6.3.1 Current Funding Position

The table shows, by category, Nation's average annual asset investment requirements, current funding positions and funding increases required to achieve full funding on assets funded by taxes, as per the projections for 2022 budget.

	Average Annual	Annual Funding Available					Annual
Asset Category	Capital Investment Required	Taxes	Community Building Fund	OCIF	Other Grants/Funds	Total Available for Capital Investment	Deficit for Capital Spending
Road Network	$3,259,000	$760,000	$406,200	$909,800	$45,000*	$2,121,000	($1,138,000)
Bridges & Culverts	$301,000	$275,000	-	-	-**	$275,000	($26,000)
Storm Sewers	$144,000	$65,000	-	-	-	$65,000	($79,000)
Total	$3,704,000	$1,100,000	$406,200	$909,800	$45,000	$2,461,000	($1,243,000)

***Development charges

** Investing in Canada Fund: $2,089,916 for Touchette Bridge – not included in the chart because this is one-time funding for this specific project.

Note: Major Capital projects for Bridges (especially construction of new or rehabilitation of closed ones) are carried out with grants from the government

6.3.2 Recommendations for Full Funding

The average annual investment requirement for paved roads, bridges & culverts, and storm sewers is **$3,704,000.** Annual revenue currently allocated to these assets is $2,461,000 leaving an annual deficit of $1,243,000. To put it another way, these infrastructure categories are currently funded at 66% of their long-term requirements. Nation has predicted total annual tax revenue of $12,929,925 in 2022. As illustrated in the next table, without using other sources of revenue, full funding would require an increase in tax revenue of 10.1% over time.

Asset Category	Tax Increase Required for Full Funding With No Other Sources of Funding
Road Network	9.1%
Bridges & Culverts	0.3%
Storm Sewers	0.7%
Total	**10.1%**

The following table explains the multiple scenarios to cope with the increase in tax rate (not considering inflation):

	Year 5	Year 10	Year 20
Infrastructure Deficit	$1,242,400	$1,242,400	$1,242,400
Change in Debt Costs	N/A	N/A	N/A
Net Infrastructure Deficit to be Addressed by Taxes	$1,242,400	$1,242,400	$1,242,400
Tax Increase required	10.1%	10.1%	10.1%
Annually	**2.0%**	**1.0%**	**0.5%**

We recommend the 10-year option in the above table. This involves full funding being achieved over 10 years by:

- Increasing the tax revenues by 1% each year for the next 10 years, for the projected capital expenditure for the tax-based asset categories in this report.
- Continuing the allocation of current Community Building Fund (earlier called Gas Tax) and OCIF revenue.
- Increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

- Reallocating the revenues from categories with surplus funding to those in deficit position.

Notes:

1. As in the past, periodic senior government infrastructure funding will most likely be available during the phase-in period. By Provincial AMP rules, this funding cannot be incorporated into an AMP unless there are firm commitments in place.
2. This AMP incorporates the government funding and grants as provided by finance department.
3. Investing in Canada Fund: $2,089,916 for Touchette Bridge – not included in the chart because this is one-time funding for this specific project
4. The recommended tax increase basically accounts for the capital needs and any increase required for additional operational costs or for building the reserve to account for unforeseen circumstances would be in addition to the above-mentioned values. We realize that raising tax revenues by the amounts recommended above for infrastructure purposes might be difficult to do. However, considering a longer phase-in window may have even greater consequences in terms of infrastructure failure.

Although this option achieves full funding on an annual basis in 10 years and provides financial sustainability over the period modeled (to 2040), the recommendations do require prioritizing capital projects to fit the resulting annual funding available. To illustrate, current projections show the investment shortfall of $1.1 million for Road Network, $26k for Bridges & Culverts and $78,800 for Storm water Network. Thus, prioritizing these and future projects will require the age-based data to be replaced by condition-based data. Although the recommendations include no further use of debt for existing assets, the results of the condition-based analysis may require otherwise.

6.4 Rate Funded Assets

6.4.1 Current Funding Position

The table shows, by category, Nation's average annual capital investment requirements for next 10 years, current funding positions and funding increases required to achieve full funding on assets funded by rates and service, based on 2022 projections.

	Average Annual Funding Status for 10 years				
Asset Category	**Average Annual Capital Requirement for Infrastructure**	**Average Annual Capital Requirements for Fleet through rate-funded assets**	**Total Average Annual Investment required**	**Total Available for Capital Investment as per 2022 projections[1]**	**Annual Surplus (Deficit) after Capital Spending**
Limoges Water Services	$233,000	$39,000	$272,000	$257,000	($15,000)
St. Isidore Water Services	$67,000	$5,000	$72,000	$78,000	$6,000
Sanitary Services	$563,000	$44,000	$607,000	$417,000	($190,000)
Total:	**$863,000**	**$88,000**	**$951,000**	**$752,000**	**($199,000)**

[1] Calculated using 2022 rates multiplied by equivalent units estimated for 2022.

6.4.2 Recommendations for Full Funding

The Nation Municipality's needs are expected to increase steadily over the coming 50-year time period even before factoring in inflation. Increasing capital reserve contributions at the rate of inflation will not be enough to meet the forecasted rates. It is since as the infrastructure ages, it will require greater and more frequent reinvestments.

As mentioned above, the Nation Municipality's financing plan for rate-funded infrastructure uses a 10-year horizon and based on that, the average annual investment requirement for sanitary and water services is $951,000. Annual investment currently available for capital purposes is $752,000 leaving an annual deficit of $199,000. To put it another way, these infrastructure categories are currently funded at 79.3% of their long-term requirements**.**

To meet the projected capital requirements mentioned in section 6.4.1, we have developed the following strategies according to the 2022 Capital Plan:

- For Limoges Water Network, the municipality proposed an average annual rate increase of 4.3% to cope with the capital requirements for next 10-years.
- For St. Isidore Water Network, we are dedicating a 3.9% increase in average annual rate to fund the capital needs.
- For Sanitary Sewers, based on 2022 Capital Plan, an average annual rate increase of 6% is recommended for next 10-years, to partially close the gap.

With respect to the above recommended rates, the following are the reasons that are considered in the financial strategy for the Water and Sanitary Sewer Network:

- 82% of the Limoges Water Service revenues and 74% of the St. Isidore Water Service revenues are allocated to operations. This leaves very little for capital. The rate increase will be used largely to fund capital requirements.
- In the case of rate-funded infrastructure such as water and sewer systems, having a reserve is essential to proper planning since large capital requirements are not constant and emergencies can occur at any time and must be dealt with immediately since resident safety is at stake. As such, the rate increase would allow the building of a reserve fund for future capital requirements. Furthermore, a rate increase is essential to not only meet the capital needs but also to meet unexpected and anticipated requirements (through reserve) for future years when a rate increase alone would not be able to cover the requirements.
- In addition to the average annual capital requirements of $272,000 and $72,000 for Limoges & St. Isidore Water Services respectively from 2022-2031, there is also an annual capital requirement of $470,000 and $192,000 from 2032-2070 for each respectively. Considering the increased capital expenditure for the later years, the Nation needs to build a financial strategy to cope with the future requirements. Part of this strategy is a rate increase to allow the building of a reserve fund.
- The future rates are subject to change in applicable inflation index on an annual basis and as capital requirements evolve with the growth of the infrastructure.

Notes:

- As in the past, periodic senior government infrastructure funding will most likely be available during the phase-in period. By Provincial AMP rules, this funding cannot be incorporated into an AMP unless there are firm commitments in place.

Although the recommended rates achieve full funding on an annual basis in 10 years and provides financial sustainability over the next period modelled (up to 2031), the recommendations do require prioritizing capital projects to fit the resulting annual funding available.

Prioritizing these and future projects will require the age-based data to be replaced by condition-based data. Although our recommendations include no further use of debt, the results of the condition-based analysis may require otherwise.

6.5 Use of Debt

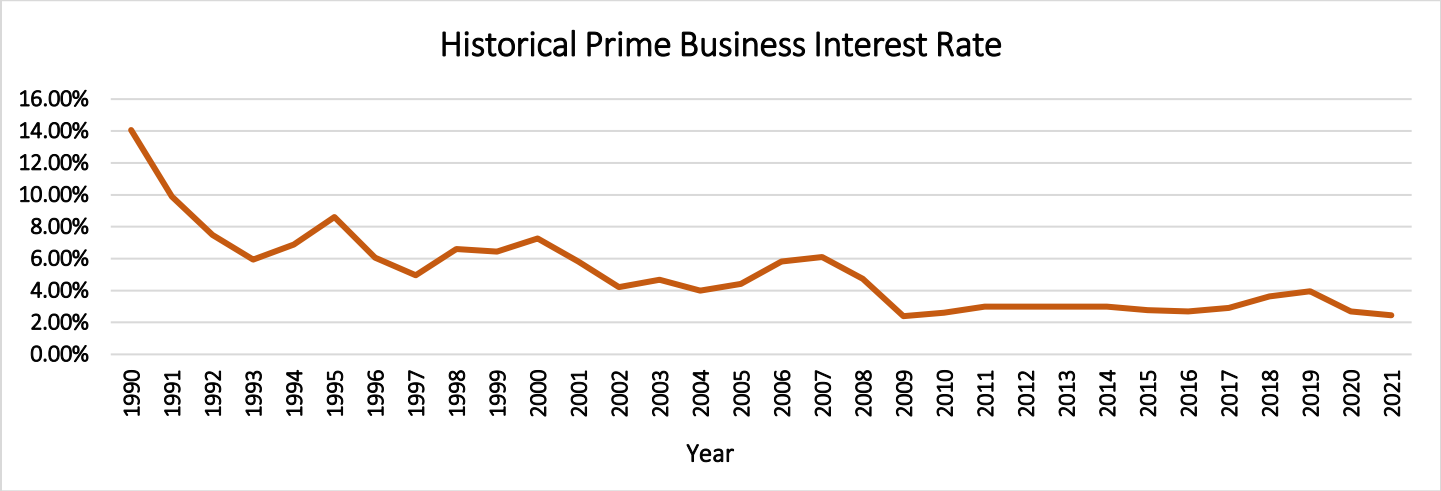
The following table reflects the premium paid on the projects when financed by debt (for reference purposes only). To illustrate, taking debt of $1 million for a project financed at 3.0% over 25 years would cost a premium of 44% or $440,000 of increased costs due to interest payments.

Interest Rate	Number of Years Financed					
	5	10	15	20	25	30
0.0%	0%	0%	0%	0%	0%	0%
0.5%	2%	3%	4%	5%	7%	8%
1.0%	3%	6%	8%	11%	14%	16%
1.5%	5%	8%	12%	16%	21%	25%
2.0%	6%	11%	17%	22%	28%	34%
2.5%	8%	14%	21%	28%	36%	43%
3.0%	9%	17%	26%	34%	44%	53%
3.5%	11%	20%	30%	41%	52%	63%
4.0%	12%	23%	35%	47%	60%	73%
4.5%	14%	26%	40%	54%	69%	84%
5.0%	15%	30%	45%	60%	77%	95%
5.5%	17%	33%	49%	67%	86%	106%
6.0%	19%	36%	54%	74%	96%	118%
6.5%	20%	39%	60%	82%	105%	130%
7.0%	22%	42%	65%	89%	115%	142%
7.5%	24%	46%	70%	96%	124%	154%
8.0%	25%	49%	75%	104%	134%	166%

Note:

- The table does not include the effect of inflation or the time value of money on delayed projects (calculated using APR calculator).
- Current municipal Infrastructure Ontario rates for **25-year** money is **3.68% (as of 28 March 2022).**
- In 2021 and recent prior years, rates were at an all-time low. Although still not as high as they have historically been, interest rates have seen a steady rise since January of 2022. It is expected that these will be higher by the end of 2022, adding an additional financial burden if a project is financed through debt.

- Risk of rising interest rates should be incorporated in sustainable funding models that include debt.



Referring to the graph above, a change in 20-year interest rates from 4% to 7% would change the premium from 47% to 89% and it would have a considerable impact on financial plan.

The Nation Municipality currently does not have any outstanding debt for the asset categories listed in this report. However, the municipality is considering a debt of $800,000 for a new Culvert, around $ 1 million for the new bridge (in addition to funds from government), $12.6 million for the new Water Main from Cheney, and 9.8 million for Sanitary Sewer Network (lagoon upgrade) in 2022.

Asset Category	Projected Principal Debt Amount ('000s)	Principal & Interest Payments in Next Ten Years ('000s)						
		2023	2024	2025	2026	2027	2028	2032
Road Network	-	-	-	-	-	-	-	-
Bridges & Culverts	$1,800	$111.3	$111.3	$111.3	$111.3	$111.3	$111.3	$111.3
Storm Sewer Network	-	-	-	-	-	-	-	-
Water Network	$12,650	$890	$890	$890	$890	$890	$890	$890
Sanitary Sewer Network	$9,825	$691.3	$691.3	$691.3	$691.3	$691.3	691.3	691.3
Total:	**$24,275**	**$1,692.6**	**$1,692.6**	**$1,692.6**	**$1,692.6**	**$1,692.6**	**$1,692.6**	**$1,692.6**

In future years, if the tax levy and the rate levy cannot be increased to a level sufficient to cover necessary infrastructure projects, additional debt may be obtained.

6.6 Use of Reserves

6.6.1 Available Reserves

Reserves play a critical role in long-term financial planning. The benefits of having reserves available for infrastructure planning include:

- the ability to stabilize tax rates when dealing with variable and sometimes uncontrollable factors
- financing one-time or short-term investments
- accumulating the funding for significant future infrastructure investments
- managing the use of debt
- normalizing infrastructure funding requirements

By infrastructure category, table below outlines the details of the reserves currently available to Nation.

Summary of Reserves Available	
Asset Category	**Balance on December 31,2021**
Road Network	0
Bridges & Culverts	0
Storm water Services	$125,000
Total Tax Funded Reserve:	**$125,000**
Limoges Water Services	$456,953
St. Isidore Water Services	$225,736
Sanitary Services	$2,132,384
Total Rate Funded Reserve:	**$2,815,073**

There is considerable debate in the municipal sector as to the appropriate level of reserves that a municipality should have on hand. There is no clear guideline that has gained wide acceptance. Factors that municipalities should consider when determining their capital reserve requirements include:

- breadth of services provided

- age and condition of infrastructure
- use and level of debt
- economic conditions and outlook
- internal reserve and debt policies

These reserves are available for use by applicable asset categories during the phase-in period to full funding. This, coupled with Nation's judicious use of debt in the past, allows the scenarios to assume that, if required, available reserves and debt capacity can be used for emergency situations. This will also allow Nation to address high priority infrastructure investments in the short to medium-term.

6.6.2 Recommendation

As per Ontario Regulation 588/17, the Nation Municipality must update its AMP and incorporate proposed levels of service for all asset categories in it by 2025. The future planning should reflect adjustments to service levels and their impacts on reserve balances.

7. Appendices

- **Appendix A shows overview of infrastructure report card with key data from each of core asset category**
- **Appendix B identifies the factors affecting the probability and consequences of failure, to calculate risk for each asset category**
- **Appendix C depicts the projections for 10-year capital requirements for each asset category**
- **Appendix D includes several maps and images to visualize the current levels of service**

Appendix A: Infrastructure Report Card

Asset Category	Replacement Cost (million)	Asset Condition	Financial Capacity	
Road Network	**$63.85**	**Good**	**Annual Requirement**	**$3,259,000**
			Funding Available	**$2,121,000**
			Annual Deficit/Surplus	**($1,138,000)**
Bridges & Culverts	**$69.44**	**Fair**	**Annual Requirement**	**$301,000**
			Funding Available	**$275,000**
			Annual Deficit/Surplus	**($26,000)**
Storm Sewer System	**$23.07**	**Good**	**Annual Requirement**	**$144,000**
			Funding Available	**$65,000**
			Annual Deficit/Surplus	**($79,000)**
Water Network	**$59.80**	**Good**	**Annual Requirement**	**$344,000**
			Funding Available	**$335,000**
			Annual Deficit/Surplus	**($11,000)**
Sanitary Sewers	**$78.15**	**Good**	**Annual Requirement**	**$607,000**
			Funding Available	**$417,000**
			Annual Deficit/Surplus	**($190,000)**
Overall	**$294.3**	**Good**	**Annual Requirement**	**$4,655,000**
			Funding Available	**$3,213,000**
			Annual Deficit/Surplus	**($1,442,000)**

Appendix B: Risk Assessment

Risk Assessment Metrics

Asset Class	Asset type	Risk Parameters: Probability of failure	Risk Parameters: Consequences of failure
Roads Network	• Road Surface: Gravel, Hot Mix, Surface Treatment • Curb • Guiderails • Sidewalks	• Road Classification • Condition • Average Annual Daily traffic (AADT) • Traffic restrictions • Service Life Remaining • Condition and width of ditches • Type and material used	• Replacement Cost • Number of Driveways per Km • Land Use • Ride Condition Rating (Health & Safety) • Speed (Km/h) • Commercial and Industrial Attraction
Bridges & Culverts	• Bridges • Culverts: Concrete, CSP, Plastic	• Condition • Material • Road Classification • Traffic Restrictions • AADT • Damages/Defects • Service Life Remaining	• Replacement Cost • Historical Cost • Speed (Km/h)
Water Network	• Water mains • All other component assets	• Condition • Pipe Material • Service Life Remaining	• Replacement Cost • Population Affected • Pipe Diameter • Location and Intended Use
Sanitary Sewers	• Sanitary sewer mains • All other assets	• Condition • Pipe Material • Service Life Remaining	• Replacement Cost • Population Affected • Pipe Diameter
Storm Sewer System	• Storm sewer mains • All other assets	• Condition • Pipe Material • Service Life Remaining	• Replacement Cost • Population Affected • Pipe Diameter

The following table shows the Likelihood and Consequence of Failure score for all assets:

Probability (Likelihood) of Failure: All Assets	
Probability of Failure	**Score**
Rare	1
Unlikely	2
Possible	3
Likely	4
Almost Certain	5

Consequence of Failure: All Assets	
Consequence of Failure	**Score**
Insignificant	1
Minor	2
Moderate	3
Major	4
Severe	5

Appendix C: 10 Year Capital Requirements

The tables below illustrate the projections for the Nation Municipality's upcoming 10 years capital requirements to meet the replacement needs for various assets and to maintain required levels of service.

Road Network											
Segment	**Backlog**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Guide Rails	$26,899	$26,382	$24,236	$61,936	$122,716	$0	$39,623	$240,596	$97,713	$30,154	$35,243
Road Surface - Hot Mix	$341,007	$6,182,508	$2,551,791	$3,499,332	$1,955,492	$1,824,178	$1,890,364	$3,669,514	$409,958	$810,741	$520,224
Road Surface Treatment	$98,615	$5,682,956	$1,558,328	$615,506	$215,314	$285,258	$3,720,226	$2,657,119	$942,997	$295,833	$34,262
Shoulders	$0	$26,526	$128,770	$168,396	$15,734	$7,728	$31,072	$104,076	$254,805	$63,056	$35,042
Sidewalks	$0	$0	$0	$35,658	$23,476	$19,665	$16,770	$73,059	$52,881	$26,137	$49,638
Signs	$17,200	$19,800	$0	$0	$0	$0	$0	$0	$0	$0	$129,585
Street Lights	$0	$0	$0	$0	$12,430	$2,486	$1,243	$4,972	$0	$0	$1,243
Total	**$491,140**	**$11,938,172**	**$4,263,125**	**$4,380,828**	**$2,345,162**	**$2,139,315**	**$5,699,298**	**$6,749,336**	**$1,758,354**	**$1,225,921**	**$805,237**

Bridges & Culverts												
Segments	**Backlog**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2030**	**2031**
Bridges	$0	$19,675	$19,675	$19,675	$19,675	$19,675	$19,675	$19,675	$19,675	$19,675	$19,675	$19,675
Culverts	$360,018	$965,824	$199,159	$69,672	$184,008	$290,078	$234,099	$364,511	$404,518	$175,702	$65,481	$105,581
Culverts (Over 3M)	$0	$224,973	$224,973	$204,615	$204,615	$204,615	$204,615	$191,874	$173,622	$173,622	$173,622	$101,562
Total	**$360,018**	**$1,210,472**	**$443,807**	**$293,962**	**$408,298**	**$514,368**	**$458,389**	**$576,060**	**$597,815**	**$368,999**	**$258,779**	**$226,818**

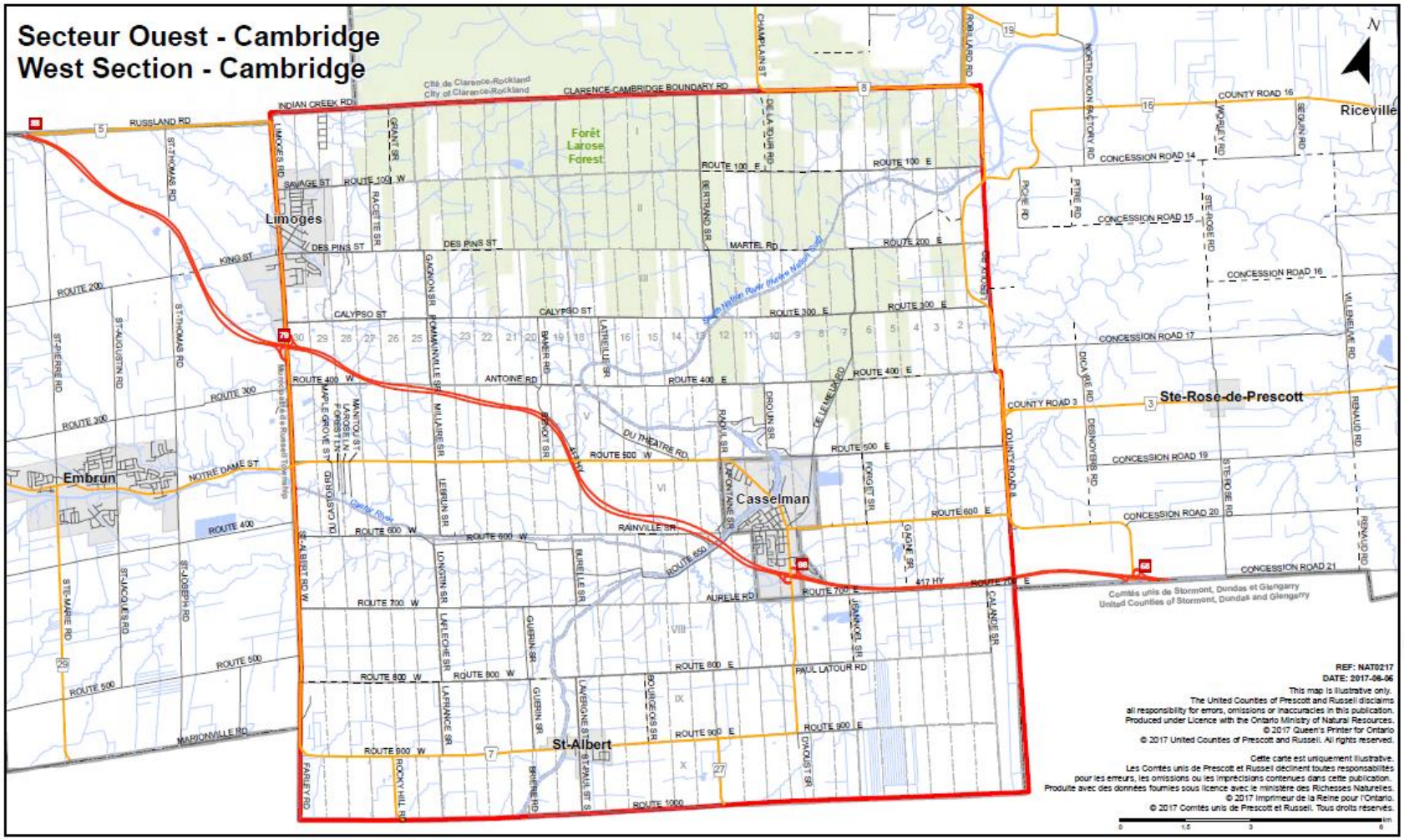
Water Network											
Segments	**Backlog**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Flowmeter	$0	$7,800	$0	$7,020	$19,500	$0	$5,850	$6,500	$0	$7,800	$0
Mechanical	$0	$0	$0	$0	$0	$3,900	$2,600	$0	$0	$0	$0
Meters	$10,900	$0	$37,468	$74,932	$0	$0	$74,932	$37,468	$74,932	$37,468	$294,800
Tower	$0	$0	$0	$0	$0	$250,000	$0	$0	$0	$0	$0
Treatment	$0	$91,000	$100,000	$0	$119,600	$130,000	$10,400	$26,000	$5,850	$18,200	$1,327,950
Total	**$10,900**	**$98,800**	**$137,468**	**$81,952**	**$139,100**	**$383,900**	**$93,782**	**$69,968**	**$80,782**	**$63,468**	**$1,622,750**

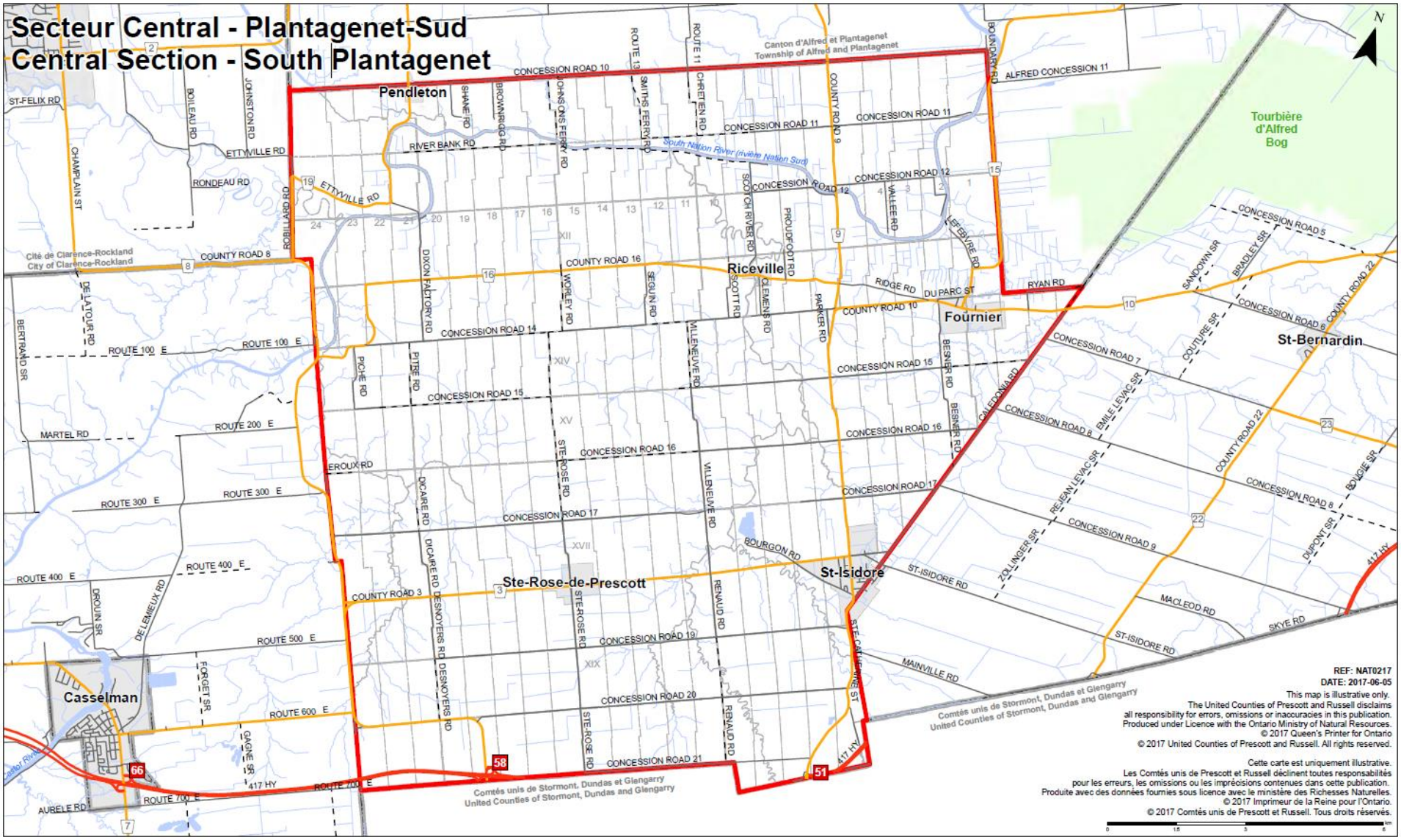
Sanitary Sewer Network											
Segments	**Backlog**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Collection	$0	$0	$0	$0	$0	$32,500	$0	$0	$0	$0	$0
Electrical	$0	$0	$0	$260,000	$0	$0	$0	$0	$32,500	$0	$114,400
Lagoon	$0	$70,000	$148,000	$70,000	$168,939	$169,174	$70,000	$70,000	$70,000	$70,000	$140,000
Forcemain	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$473,579
Manholes	$0	$0	$0	$0	$0	$0	$0	$375,000	$0	$0	$0
Pumping Station	$0	$0	$0	$325,000	$4,160	$8,320	$4,160	$94,250	$16,900	$910,000	$101,400
Scada	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$340,600
Septic Field	$0	$0	$0	$0	$0	$0	$650,000	$260,000	$0	$260,000	$0
Treatment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$111,800
Total	**$0**	**$70,000**	**$148,000**	**$655,000**	**$173,099**	**$209,994**	**$724,160**	**$799,250**	**$119,400**	**$1,240,000**	**$1,281,779**

Storm water Network											
Segments	**Backlog**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Catch Basins	$27,802	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Manholes	$53,611	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Storm Sewer Mains	$218,084	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	**$299,497**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Appendix D: Community Levels of Service Maps

Road Network: Connectivity Map




Secteur Central - Plantagenet-Sud
Central Section - South Plantagenet
Pendleton
Riceville
Fournier
St-Bernardin
St-Isidore
Ste-Rose-de-Prescott
Casselman
Tourbière d'Alfred Bog
Canton d'Alfred et Plantagenet
Township of Alfred and Plantagenet
Cité de Clarence-Rockland
City of Clarence-Rockland
Comtés unis de Stormont, Dundas et Glengarry
United Counties of Stormont, Dundas and Glengarry
South Nation River (rivière Nation Sud)
CONCESSION ROAD 10
CONCESSION ROAD 11
CONCESSION ROAD 12
CONCESSION ROAD 14
CONCESSION ROAD 15
CONCESSION ROAD 16
CONCESSION ROAD 17
CONCESSION ROAD 19
CONCESSION ROAD 20
CONCESSION ROAD 21
COUNTY ROAD 8
COUNTY ROAD 16
COUNTY ROAD 10
COUNTY ROAD 3
ROUTE 100 E
ROUTE 200 E
ROUTE 300 E
ROUTE 400 E
ROUTE 500 E
ROUTE 600 E
ROUTE 700 E
ETTYVILLE RD
RIVER BANK RD
RONDEAU RD
MARTEL RD
LEROUX RD
AUBELE RD
BOURGON RD
MAINVILLE RD
ST-ISIDORE RD
MACLEOD RD
SKYE RD
RIDGE RD
DU PARC ST
RYAN RD
ALFRED CONCESSION 11
CONCESSION ROAD 5
CONCESSION ROAD 6
CONCESSION ROAD 7
CONCESSION ROAD 8
CONCESSION ROAD 9
417 HY
REF: NAT0217
DATE: 2017-06-05
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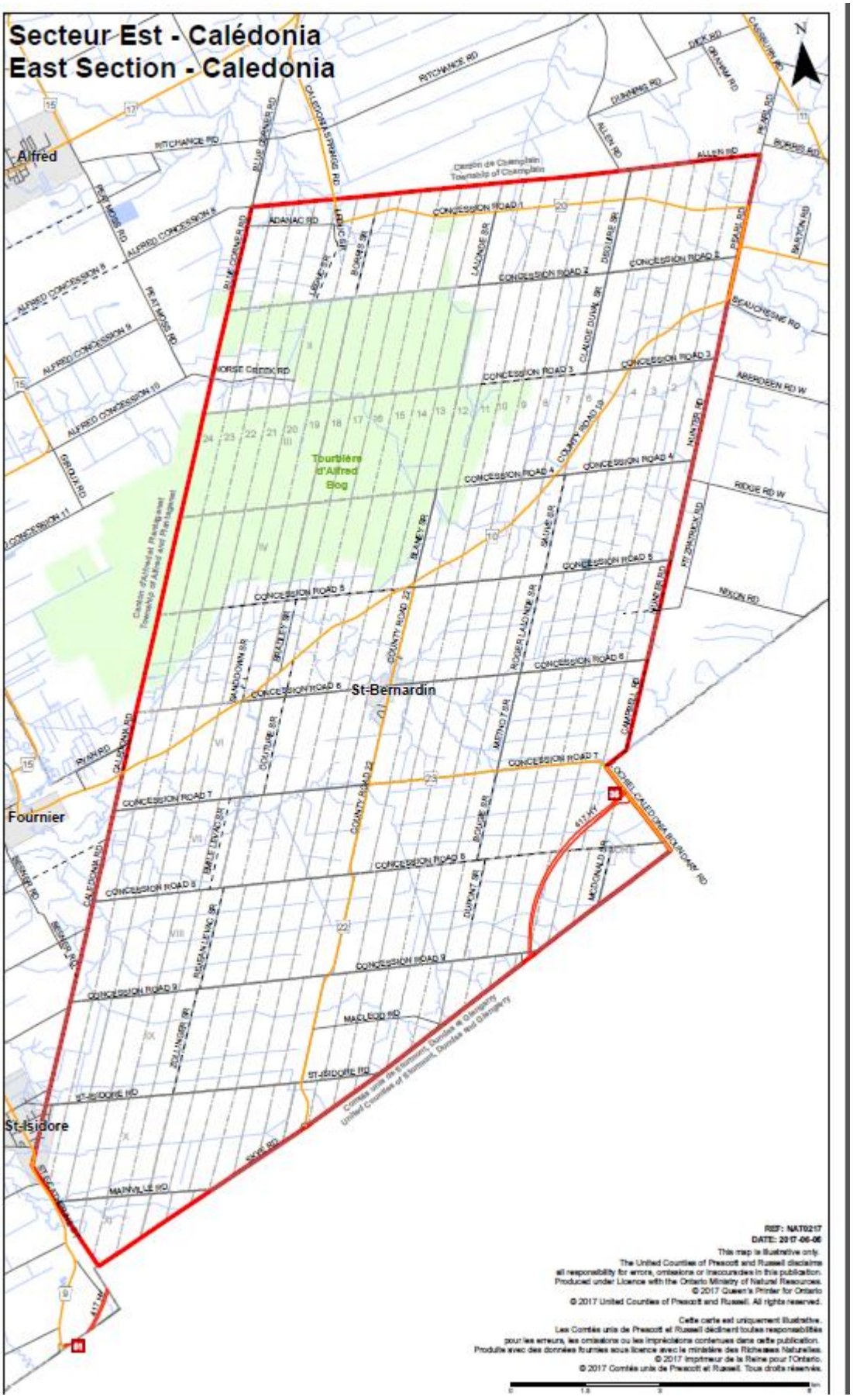
Secteur Est - Calédonia
East Section - Caledonia
Alfred
Fournier
St-Bernardin
St-Isidore
Tourbière d'Alfred Bog
PITCHANCE RD
CALEDONIA SPRINGS RD
ALLEN RD
ROBERTS RD
CONCESSION ROAD 1
CONCESSION ROAD 2
CONCESSION ROAD 3
CONCESSION ROAD 4
CONCESSION ROAD 5
CONCESSION ROAD 6
CONCESSION ROAD 7
CONCESSION ROAD 8
CONCESSION ROAD 9
BEAUCHESNE RD
ABERDEEN RD W
RIDGE RD W
NIXON RD
COUNTY ROAD 22
COUNTY ROAD 19
HUNTER RD
ST-ZEPHIRIN RD
CAMPBELL SR
DUPONT SR
MACLEOD RD
ST-ISIDORE RD
MAINVILLE RD
417-HY
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Road Surface Condition

St. Isidore Road -Very Good Road Condition

Ridge Road – Fair Road Condition

Concession 11 – Poor Road Condition

Concession 19 – Very Poor Road Condition

Bridge Condition

Concession 20 -West Scotch River Bridge (Sp-002)

Good Condition (BCI Rating: 73.2)

Louis Galipeau Bridge (Sp-009)

Poor Condition (BCI Rating: 59)

Concession 8 - Paxton Creek Bridge (Ca-009)

Very Poor Condition (BCI Rating: 42.7)

Culvert Condition

Caledonia-South Plantagenet Boundary Paxton Creek Culvert (Ca-012)

Very Good Condition (BCI Rating: 91.4)

Concession Road 17 Culvert (Sp-012)

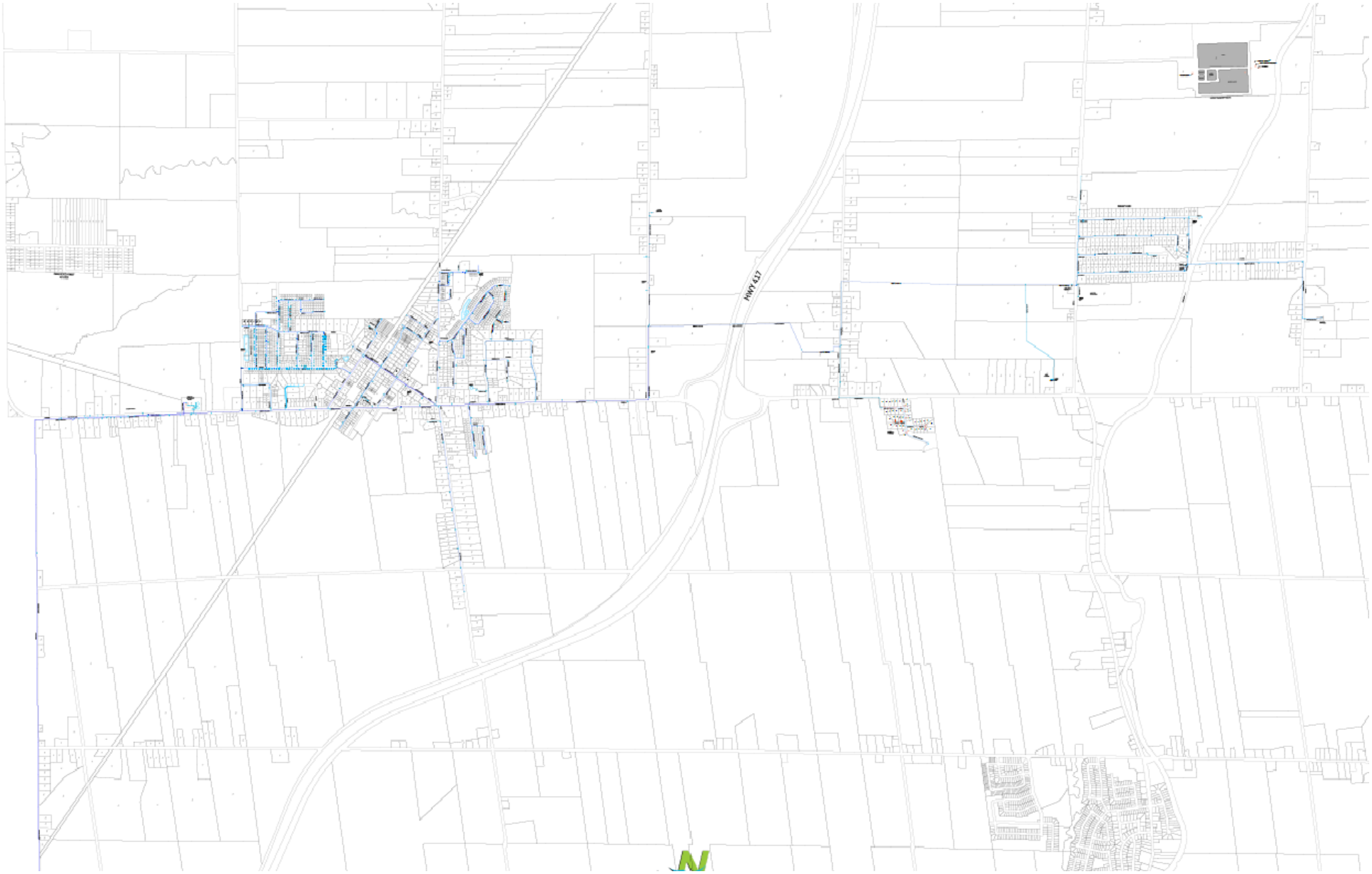
Good Condition (BCI Rating: 71.9)

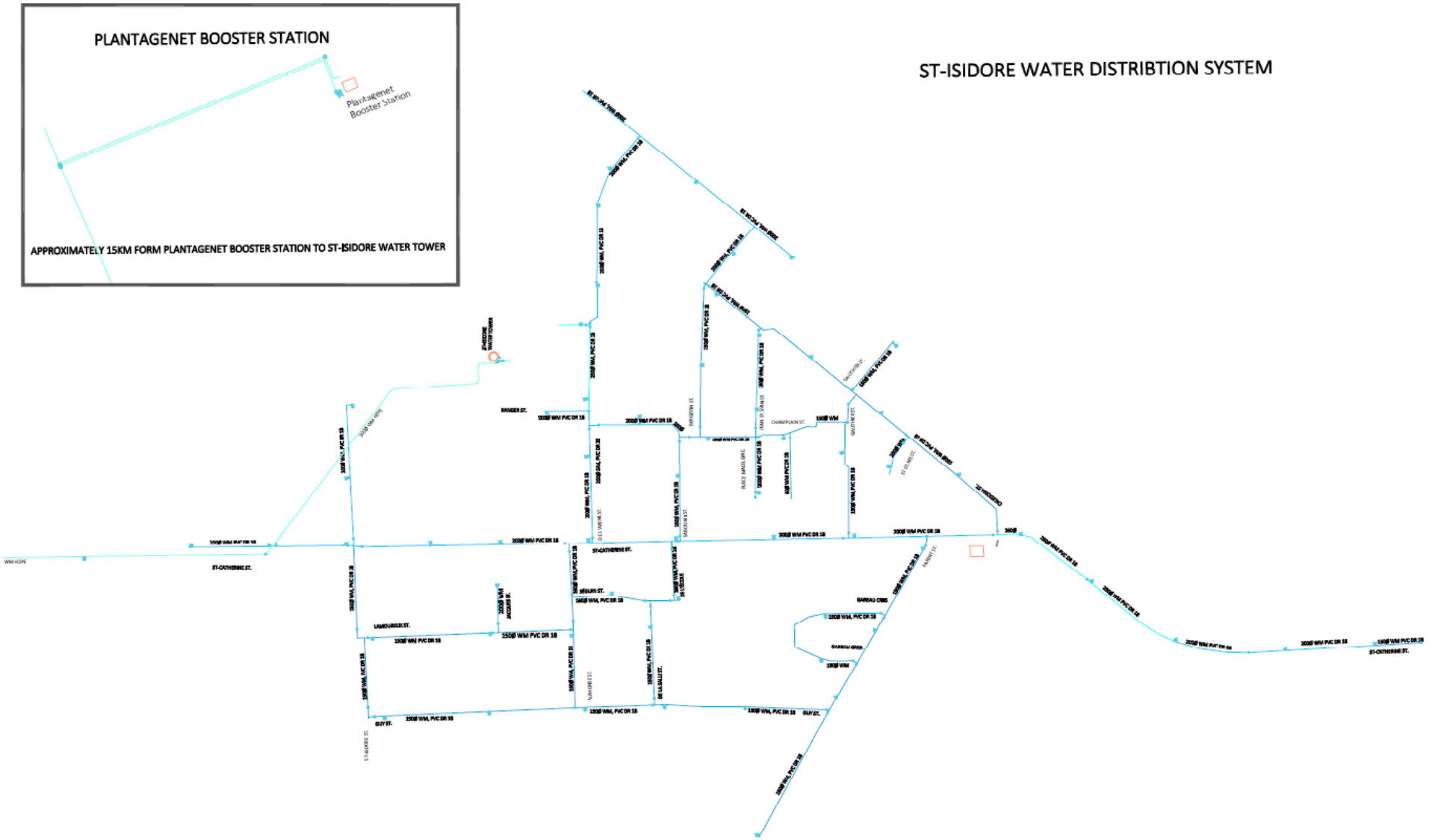
Concession 15 - Beaver Creek Culvert (Sp-021)

Fair Condition (BCI Rating: 66.4)

Water Services Map

Limoges Water Distribution Network



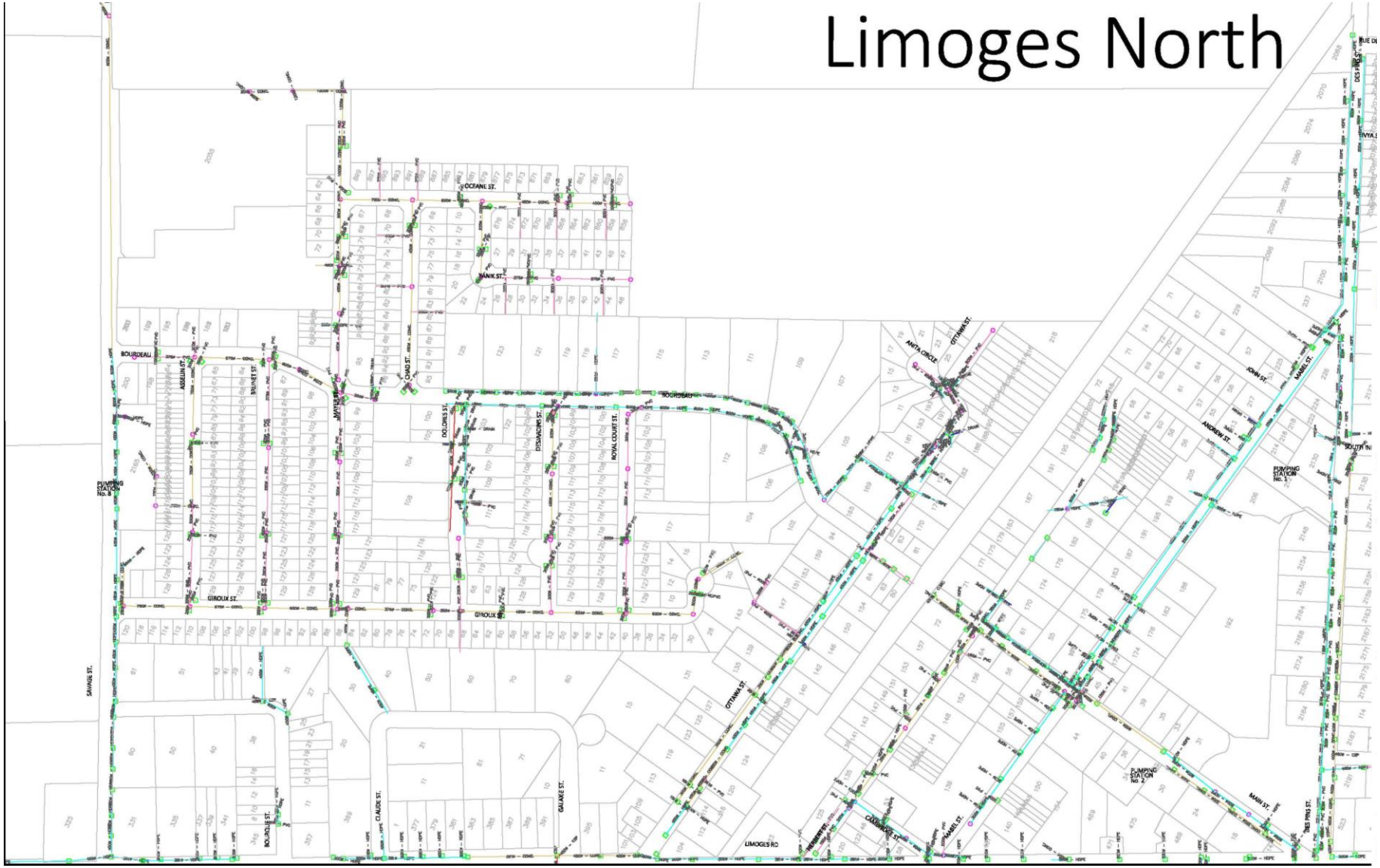

PLANTAGENET BOOSTER STATION
Plantagenet Booster Station
APPROXIMATELY 15KM FORM PLANTAGENET BOOSTER STATION TO ST-ISIDORE WATER TOWER
ST-ISIDORE WATER DISTRIBTION SYSTEM

Sanitary Sewer Services Map

Limoges Sewage Collection Network

St. Isidore Sewage Collection Network

Storm Sewer Service Map



Limoges South

Forest Park


MANITOU LANE
LA ROSE LANE
FOREST LANE
MAPLE GROVE
CAMBRIDGE PUBLIC SCHOOL
PUMPING STATION No. 9
ROUTE 560


Fournier
Rue du Parc St.
Union St.
County Rd 15
County Rd 10
County Rd 10
3079
3099
3110
3109
3129
3139
3122
5070
3138
3142
5062
5066
3148
3137
3151
3156
3161
3164
3165
3156
3159
3187
3197
3201
5207
5040
3176
3169
3213
5203
3177
3214
5145
5017
5069
3180
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5109
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4983
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5057
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4999
4964
4980
4986
4998
5018
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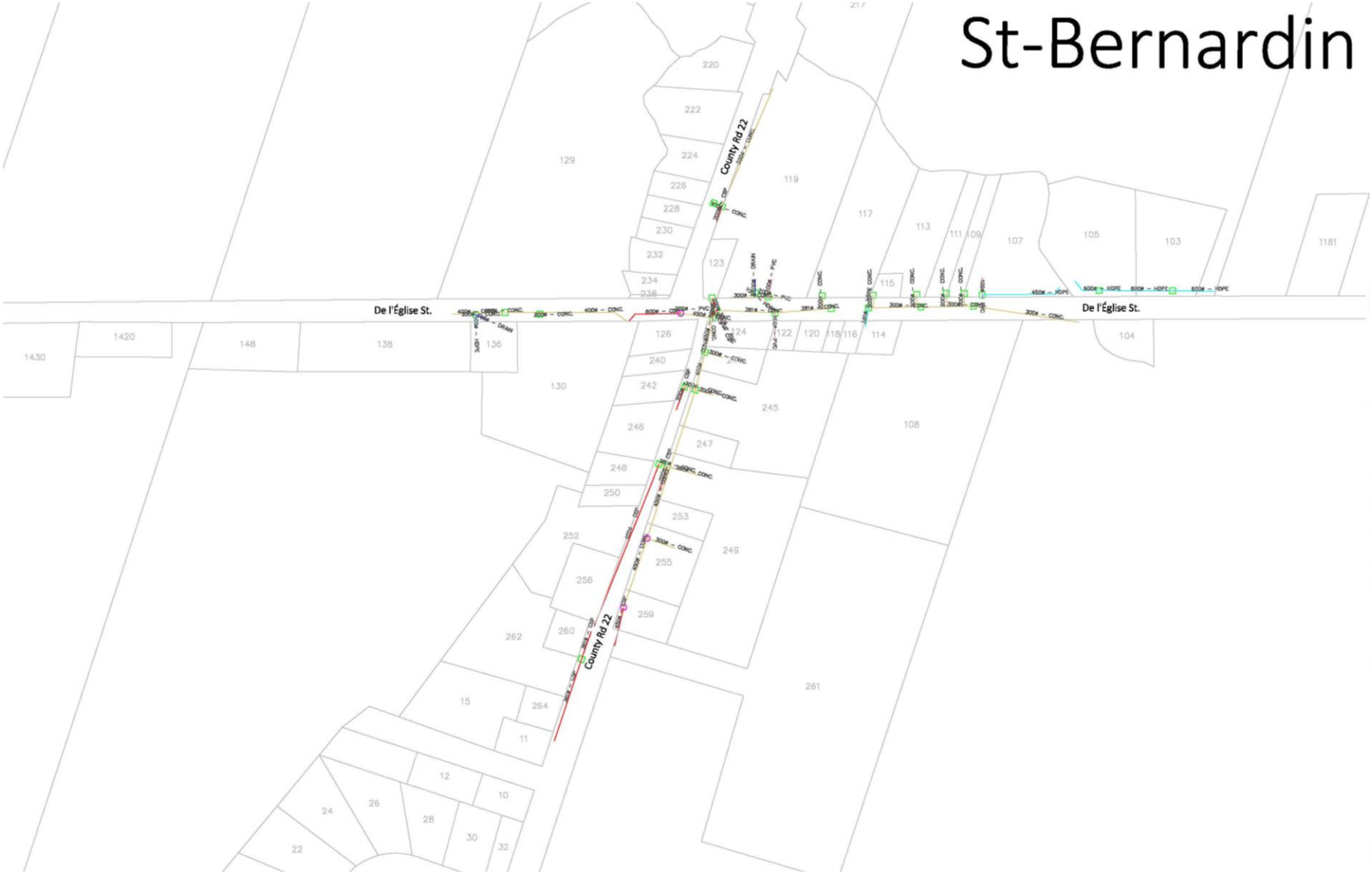
5048
5054
5060
5066
5072
5078
5082
5088
5098
5102
5108
5112
5114
5124
5148
5142
3237
5158


St-Albert
PRINCIPALE ST.
ADAM ST.
CAYER ST.

St-Isidore


ST-CATHERINE ST.
ST-ISIDORE ST.
CALEDONIA ST.
GUY ST.
RANGER ST.
SEGUIN ST.
GAREAU CRES.


St-Bernardin
De l'Église St.
De l'Église St.
County Rd 22
County Rd 22