THE ASSET MANAGEMENT PLAN FOR THE MUNICIPALITY OF KINCARDINE

2013

THE MUNICIPALITY OF KINCARDINE
1475 CONCESSION 5, R.R. #5
KINCARDINE, ONTARIO, N2Z 2X6

SUBMITTED DECEMBER 2013
BY PUBLIC SECTOR DIGEST
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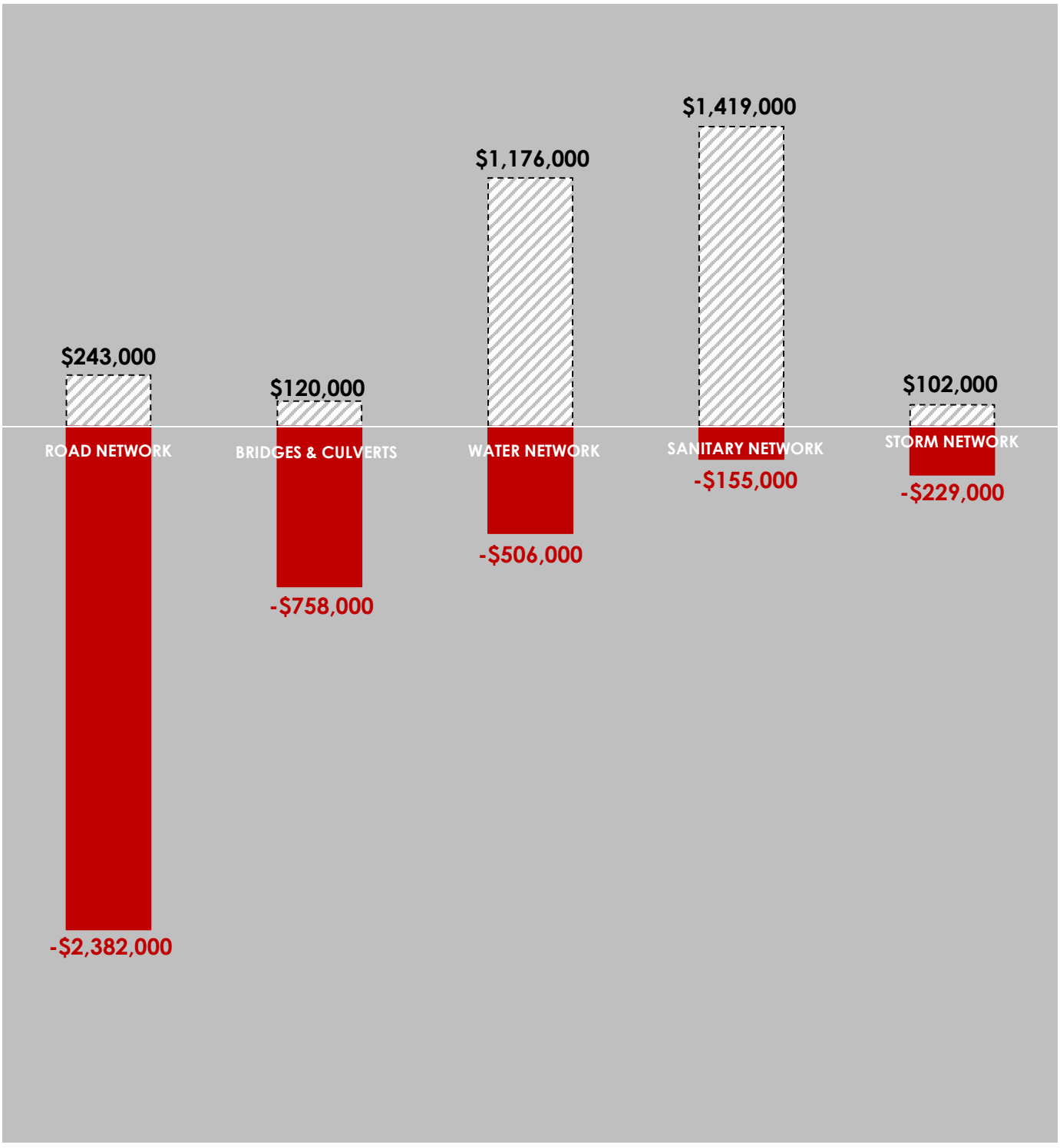
LONDON, ONTARIO, N6A 5P3

AVERAGE ANNUAL FUNDING REQUIRED **vs.** AVERAGE ANNUAL FUNDING AVAILABLE



Total Annual Deficit: $4,030,000

Annual Funding Available

Annual Funding Deficit

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December 2013

The Municipality of Kincardine
1475 Concession 5, R.R. #5
Kincardine, Ontario, N2Z 2X6

We are pleased to submit the 2013 Asset Management Plan (AMP) for The Municipality of Kincardine. This AMP complies with the requirements as outlined within the provincial *Building Together Guide for Municipal Asset Management Plans.* 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 broad and profound impact of asset management on the community, and the financial & administrative complexity involved in this ongoing process, we recommend that senior decision-makers from across the organization are actively involved in its implementation.

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. As such, we are appreciative of your decision to entrust us with the strategic direction of its infrastructure and asset management planning, and are confident that this AMP will serve as a valuable tool.

Sincerely,
The Public Sector Digest Inc.

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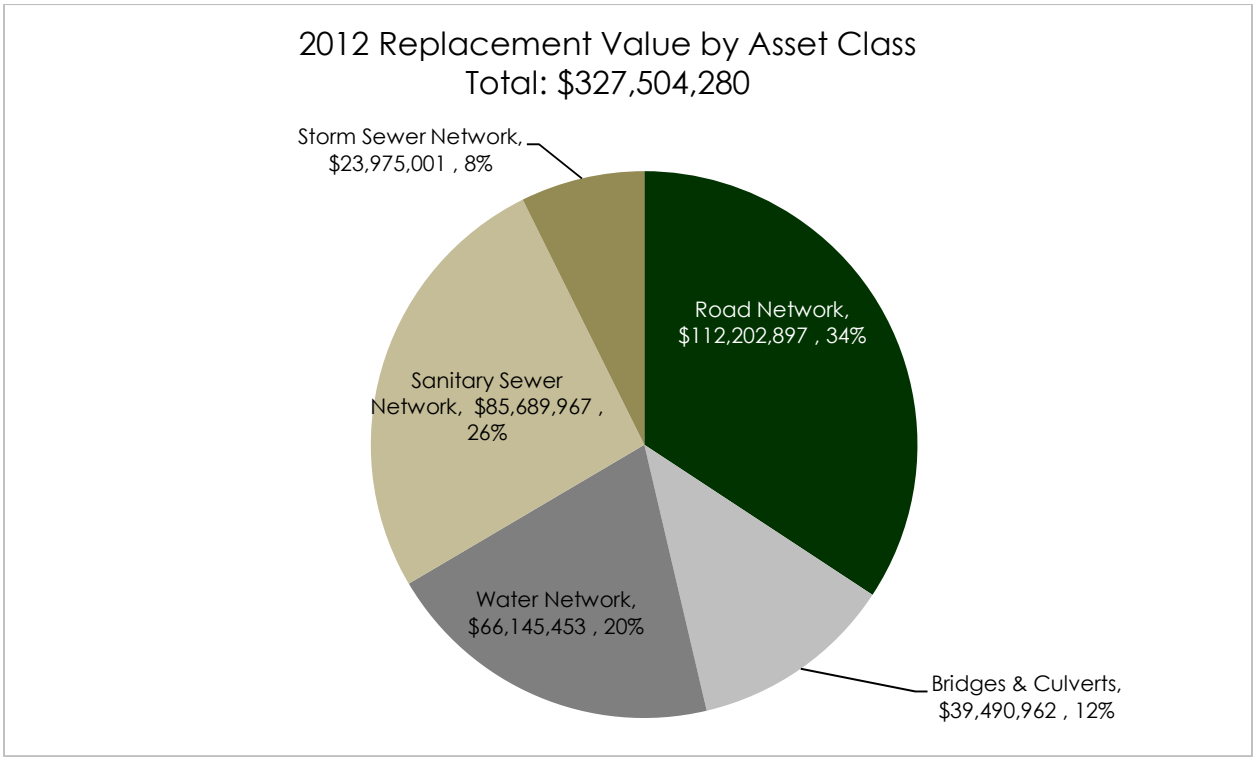
1.0 Executive Summary

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 Municipality of Kincardine meets all requirements as outlined within the provincial *Building Together Guide for Municipal Asset Management Plans.* 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.

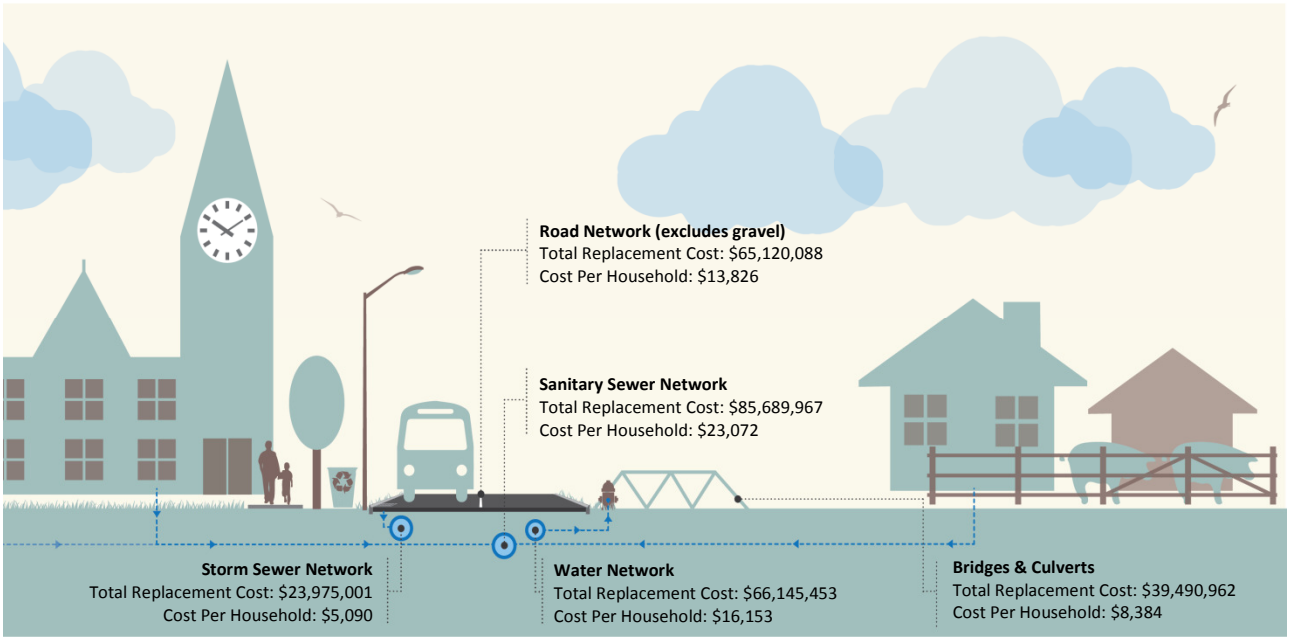
Measured in 2012 dollars, the replacement value of the asset classes analyzed totaled **$327 million** for Kincardine.



While the municipality is responsible for the strategic direction, it is the taxpayer in Kincardine who ultimately bears the financial burden. As such, a 'cost per household' (CPH) analysis was conducted for each of the asset classes 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. The diagram below illustrates the total CPH, as well as the CPH for individual asset classes.

Infrastructure Replacement Cost Per Household

Total: $66,526 per household



In assessing the municipality's state of the infrastructure, we examined, and graded, both the current condition (Condition vs. Performance) of the asset classes as well as the municipality's financial capacity to fund the asset's average annual requirement for sustainability (Funding vs. Need). We then generated the municipality's infrastructure report card. The municipality received a **cumulative GPA of** '**D+**', with an **annual infrastructure deficit of $4,030,000**. Kincardine received an 'F' on the Funding vs. Need dimension on 3 of the five asset classes analyzed in this document. For its road network, the municipality earned an 'F', funding only 10% of its annual infrastructure requirements for the network.

Kincardine's grades on the Condition vs. Performance dimension were equally consistent across the five asset classes. The municipality received a 'C' or 'C+' for four of the five asset classes. For its road network, Kincardine received a 'B+'. A grade of 'C' suggests increasing, and likely, significant signs of deterioration in asset condition and potential compromise in functionality. It also suggests substantial financial demands on the municipality in the short term.

For example, based on field condition data, the road network is generally in good condition; however, due to the short life cycles of certain assets (e.g. road surfaces) there are significant replacement requirements over the next 5 years totaling approximately $14 million. Similarly, based on field condition assessment data, of the majority of bridges and large structures are in fair or good condition. However, there are some replacement requirements to be addressed totaling approximately $4.8 million in the next 5 years and $17 million in the 5 – 10 year window.

In order for an AMP to be effectively put into action, it must be integrated with financial planning and long-term budgeting. We have developed scenarios that would enable Kincardine to achieve full funding within 5 years or 10 years for the following: tax funded assets, including road network (paved roads), bridges & culverts, storm sewer network, and; rate funded assets, including water network, and sanitary sewer network.

The average annual investment requirement for paved roads, bridges & culverts, and storm sewers is $3,834,000. Annual revenue currently allocated to these assets for capital purposes is $465,000 leaving an annual deficit of $3,369,000. To put it another way, these infrastructure categories are currently funded at 12% of their long-term requirements. In 2013, Kincardine has annual tax revenues of $11,273,000. Without consideration of any other sources of revenue, full funding would require a combined tax increase of 29.9% over time. We recommend a 10 year option which involves full funding being achieved over 10 years by:

a) when realized, reallocating the debt cost reductions of $5,000 to the infrastructure deficit as outlined above.
b) increasing tax revenues by 3.0% each year for the next 10 years solely for the purpose of phasing in full funding to the tax based asset categories covered in this AMP.
c) allocating the $343,000 of gas tax revenue to the paved roads category.
d) increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

The average annual investment requirement for sanitary services and water services is $3,256,000. Annual revenue currently allocated to these assets for capital purposes is $2,595,000 leaving an annual deficit of $661,000. To put it another way, these infrastructure categories are currently funded at 80% of their long-term requirements. In 2013, Kincardine has annual sanitary revenues of $2,115,000 and annual water revenues of $2,485,000. Full funding would require the following changes over time: a 7.3% increase to sanitary rates and a 20.3% increase to water rates. We recommend a 10 year option which involves full funding being achieved over 10 years by:

a) when realized, reallocating the debt cost reductions for sanitary and water services to the infrastructure deficit.
b) increasing rate revenues by 1.7% for water services and 0.7% for sanitary services each year for the next 10 years solely for the purpose of phasing in full funding to the asset categories covered in this section of the AMP.
c) increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

The revenue options outlined in this plan allow Kincardine to fully fund its long-term infrastructure requirements without further use of debt. However, as explained in sections 7.3.2 and 7.4.2, the recommended condition rating analysis may require otherwise. Kincardine's reserves, totaling $11.5 million for the tax and rate funded classes, are available for use by applicable asset categories during the phase-in period to full funding. This, coupled with Kincardine'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 high priority and emergency infrastructure investments in the short to medium-term.

2.0 Introduction

This Asset Management Plan meets all provincial requirements as outlined within the Ontario Building Together Guide for Municipal Asset Management Plans. As such, the following key sections and content are included:

1. Executive Summary and Introduction
2. State of the Current Infrastructure
3. Desired Levels of Service
4. Asset Management Strategy
5. Financial Strategy

The following asset classes are addressed:

1. **Road Network:** Paved and gravel
2. **Bridges & Culverts**: Bridges and large culverts with a span greater than 3m
3. **Water Network:** Water mains, meters, valves and hydrants
4. **Sanitary Sewer Network:** Sanitary sewer mains, manholes and lagoon
5. **Storm Sewer Network:** Storm sewer mains, manholes and catch basins

Municipalities are encouraged to cover all asset classes in future iterations of the AMP.

This asset management plan 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.

At a strategic level, within the State of the Current Infrastructure section, it will identify current and future challenges that should be addressed in order to maintain sustainable infrastructure services on a long-term, life cycle basis.

It will outline a Desired Level of Service (LOS) Framework for each asset category to assist the development and tracking of LOS through performance measures across strategic, financial, tactical, operational, and maintenance activities within the organization.

At a tactical level, within the Asset Management Strategy section, it will develop an implementation process to be applied to the needs-identification and prioritization of renewal, rehabilitation, and maintenance activities, resulting in a 10 year plan that will include growth projections.

At a financial level, within the Financial Strategy section, a strategy will be developed that fully integrates with other sections of this asset management plan, to ensure delivery and optimization of the 10 year infrastructure budget.

Through the development of this plan, all data, analysis, life cycle projections, and budget models will be provided through the Public Sector Digest's CityWide suite of software products. The software and plan will be synchronized, will evolve together, and therefore, will allow for ease of updates, and annual reporting of performance measures and overall results.

This will allow for continuous improvement of the plan and its projections. It is therefore recommended that the plan be revisited and updated on an annual basis, particularly as more detailed information becomes available.

2.1 Importance of Infrastructure

Municipalities throughout Ontario, large and small, own a diverse portfolio of infrastructure assets that in turn provide a varied number of services to their citizens. The infrastructure, in essence, is a conduit for the various public services the municipality provides, e.g., the roads supply a transportation network service; the water infrastructure supplies a clean drinking water service. A community's prosperity, economic

development, competitiveness, image, and overall quality of life are inherently and explicitly tied to the performance of its infrastructure.

2.2 Asset Management Plan (AMP) - Relationship to 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.

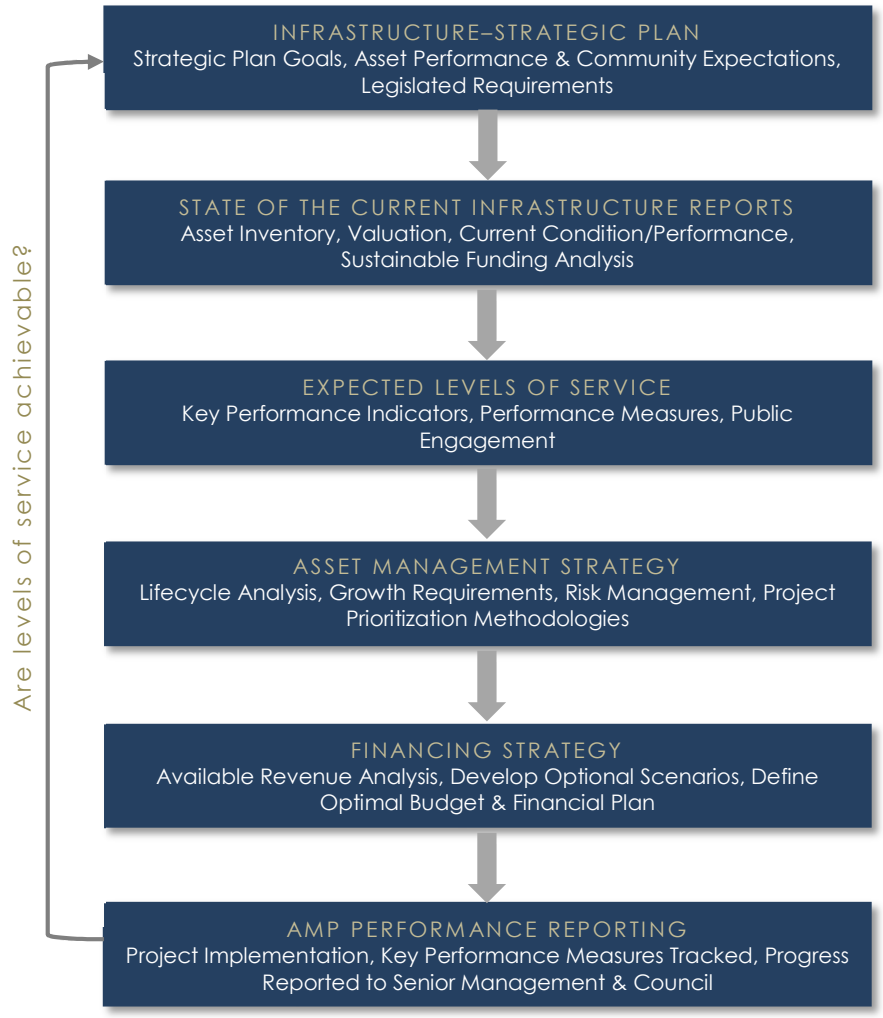
2.3 AMP - Relationship to other Plans

An asset management plan is a key component of the municipality's planning process linking with multiple other corporate plans and documents. For example:

- **The Official Plan** – The AMP should utilize and influence the land use policy directions for long-term growth and development as provided through the Official Plan.
- **Long Term Financial Plan** – The AMP should both utilize and conversely influence the financial forecasts within the long-term financial plan.
- **Capital Budget** – The decision framework and infrastructure needs identified in the AMP form the basis on which future capital budgets are prepared.
- **Infrastructure Master Plans** – The AMP will utilize goals and projections from infrastructure master plans and in turn will influence future master plan recommendations.
- **By-Laws, standards, and policies** – The AMP will influence and utilize policies and by-laws related to infrastructure management practices and standards.
- **Regulations** – The AMP must recognize and abide by industry and senior government regulations.
- **Business Plans** – The service levels, policies, processes, and budgets defined in the AMP are incorporated into business plans as activity budgets, management strategies, and performance measures.

2.4 Purpose and Methodology

The following diagram depicts the approach and methodology, including the key components and links between those components that embody this asset management plan:



It can be seen from the above that a municipality's infrastructure planning starts at the corporate level with ties to the strategic plan, alignment to the community's expectations, and compliance with industry and government regulations.

Then, through the State of the Infrastructure analysis, overall asset inventory, valuation, condition and performance are reported. Also, a life cycle analysis of needs for each infrastructure class is conducted. This analysis yields the sustainable funding level, compared against actual current funding levels, and determines whether there is a funding surplus or deficit for each infrastructure program. The overall measure of condition and available funding is finally scored for each asset class and presented as a star rating (similar to the hotel star rating) and a letter grade (A-F) within the Infrastructure Report card.

From the lifecycle analysis above, the municipality gains an understanding of the level of service provided today for each infrastructure class and the projected level of service for the future. The next section of the AMP provides a framework for a municipality to develop a Desired Level of Service (or target service level) and develop performance measures to track the year-to-year progress towards this established target level of service.

The Asset Management Strategy then provides a detailed analysis for each infrastructure class. Included in this analysis are best practices and methodologies from within the industry which can guide the overall management of the infrastructure in order to achieve the desired level of service. This section also provides an overview of condition assessment techniques for each asset class; life cycle interventions required, including those interventions that yield the best return on investment; and prioritization techniques, including risk quantification, to determine which priority projects should move forward into the budget first.

The Financing Strategy then fully integrates with the asset management strategy and asset management plan, and provides a financial analysis that optimizes the 10 year infrastructure budget. All revenue sources available are reviewed, such as the tax levy, debt allocations, rates, reserves, grants, gas tax, development charges, etc., and necessary budget allocations are analysed to inform and deliver the infrastructure programs.

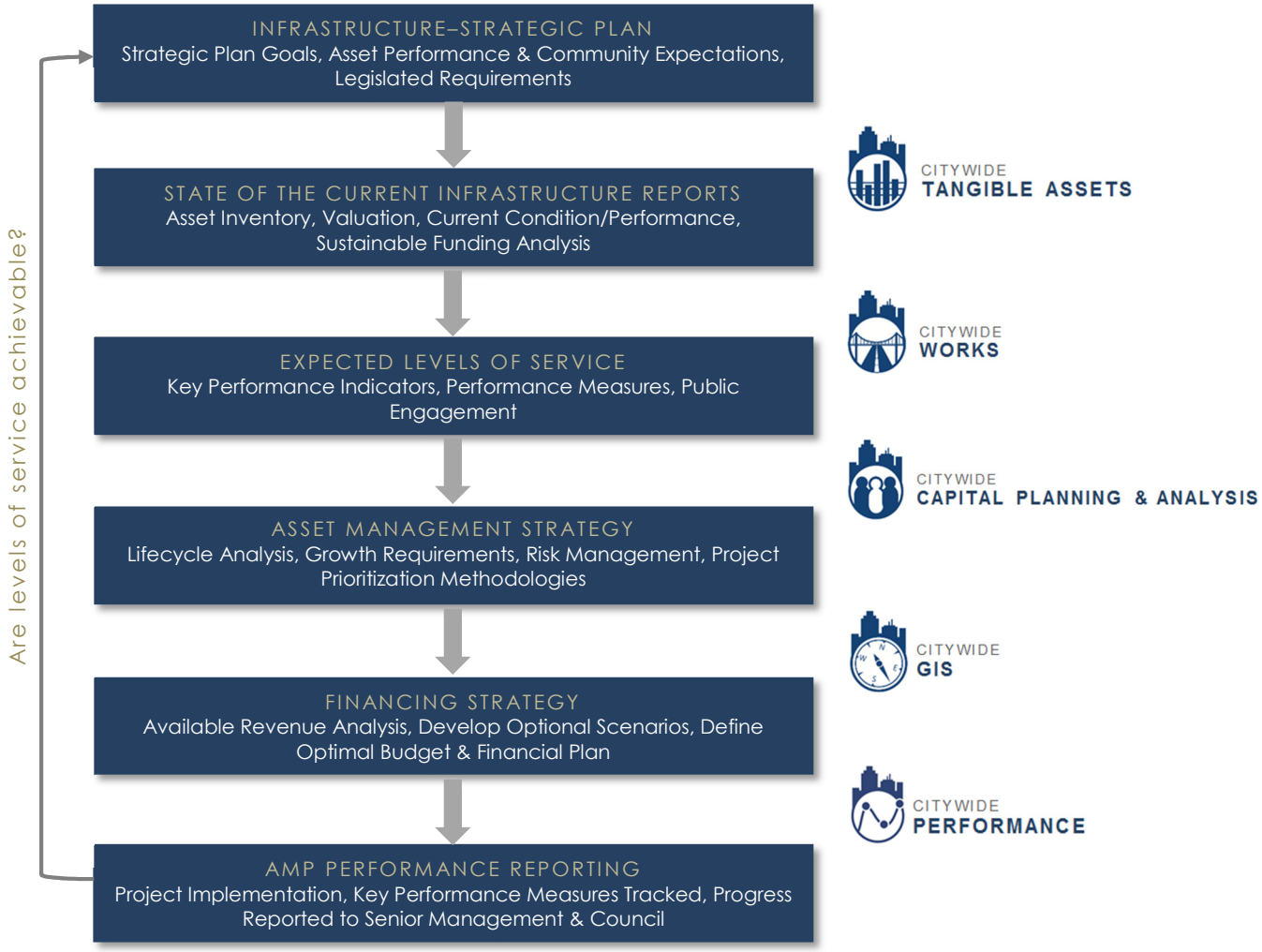
Finally, in subsequent updates to this AMP, actual project implementation will be reviewed and measured through the established performance metrics to quantify whether the desired level of service is achieved or achievable for each infrastructure class. If shortfalls in performance are observed, these will be discussed and alternate financial models or service level target adjustments will be presented.

2.5 CityWide Software alignment with AMP

The plan will be built and developed hand in hand with a database of municipal infrastructure information in the CityWide software suite of products. The software will ultimately contain the municipality's asset base, valuation information, life cycle activity predictions, costs for activities, sustainability analysis, project prioritization parameters, key performance indicators and targets, 10 year asset management strategy, and the financial plan to deliver the required infrastructure budget.

The software and plan will be synchronized, and will evolve together year-to-year as more detailed information becomes available. This synchronization will allow for ease of updates, modeling and scenario building, and annual reporting of performance measures and results. This will allow for continuous improvement of the plan and its projections. It is therefore recommended that it is revisited and updated on an annual basis.

The following diagram outlines the various CityWide software products and how they align to the various components of the AMP.



3.0 State of the Infrastructure (SOTI)

3.1 Objective and Scope

Objective: To identify the state of the municipality's infrastructure today and the projected state in the future if current funding levels and management practices remain status quo.

The analysis and subsequent communication tools will outline future asset requirements, will start the development of tactical implementation plans, and ultimately assist the organization to provide cost effective sustainable services to the current and future community.

The approach was based on the following key industry state of the infrastructure documents:

- Canadian Infrastructure Report Card
- City of Hamilton's State of the Infrastructure reports
- Other Ontario Municipal State of the Infrastructure reports

The above reports are themselves based on established principles found within key, industry best practices documents such as:

- The National Guide for Sustainable Municipal Infrastructure (Canada)
- The International Infrastructure Management Manual (Australia / New Zealand)
- American Society of Civil Engineering Manuals (U.S.A.)

Scope: Within this State of the Infrastructure report, a high level review will be undertaken for the following asset classes:

1. **Road Network:** Paved and gravel
2. **Bridges & Culverts**: Bridges and large culverts with a span greater than 3m
3. **Water Network:** Water mains, meters, valves and hydrants
4. **Sanitary Sewer Network:** Sanitary sewer mains, manholes and lagoon
5. **Storm Sewer Network:** Storm sewer mains, manholes and catch basins

3.2 Approach

The asset classes above were reviewed at a very high level due to the nature of data and information available. Subsequent detailed reviews of this analysis are recommended on an annual basis, as more detailed conditions assessment information becomes available for each infrastructure program.

3.2.1 Base Data

In order to understand the full inventory of infrastructure assets within Kincardine, all tangible capital asset data, as collected to meet the PSAB 3150 accounting standard, was loaded into the CityWide Tangible Asset™ software module. This data base now provides a detailed and summarized inventory of assets as used throughout the analysis within this report and the entire Asset Management Plan.

3.2.2 Asset Deterioration Review

The municipality has supplied condition data for the entire road network and all of the large bridge and culvert structures. The condition data recalculates a new performance age for each individual asset and, as such, a far more accurate prediction of future replacement can be established and applied to the future investment requirements within this AMP report. For those assets without condition data, the sanitary, water and storm assets, the deterioration review will rely on the 'straight line' amortization schedule approach provided from the accounting data. Although this approach is based on age data and useful life projections, and is not as accurate as the use of detailed condition data, it does provide a relatively reliable benchmark of future requirements.

3.2.3 Identify Sustainable Investment Requirements

A gap analysis was performed to identify sustainable investment requirements for each asset category. Information on current spending levels and budgets was acquired from the organization, future investment requirements were calculated, and the gap between the two was identified.

The above analysis is performed by using investment and financial planning models, and life cycle costing analysis, embedded within the CityWide software suite of applications.

3.2.4 Asset Rating Criteria

Each asset category will be rated on two key dimensions:

- **Condition vs. Performance**: Based on the condition of the asset today and how well performs its function.
- **Funding vs. Need**: Based on the actual investment requirements to ensure replacement of the asset at the right time, versus current spending levels for each asset group.

3.2.5 Infrastructure Report Card

The dimensions above will be based on a simple 1–5 star rating system, which will be converted into a letter grading system ranging from A-F. An average of the two ratings will be used to calculate the combined rating for each asset class. The outputs for all municipal assets will be consolidated within the CityWide software to produce one overall Infrastructure Report Card showing the current state of the assets.

Grading Scale: Condition vs. Performance

What is the condition of the asset today and how well does it perform its function?

Star Rating	Letter Grade	Color Indicator	Description
★★★★★	A		**Excellent**: No noticeable defects
★★★★	B		**Good**: Minor deterioration
★★★	C		**Fair**: Deterioration evident, function is affected
★★	D		**Poor**: Serious deterioration. Function is inadequate
★	F		**Critical**: No longer functional. General or complete failure

Grading Scale: Funding vs. Need

Based on the actual investment requirements to ensure replacement of the asset at the right time, versus current spending levels for each asset group.

Star Rating	Letter Grade	Description
★★★★★	A	**Excellent**: 91 to 100% of need
★★★★	B	**Good**: 76 to 90% of need
★★★	C	**Fair**: 61 to 75% of need
★★	D	**Poor**: 46 – 60% of need
★	F	**Critical**: under 45% of need

3.2.6 General Methodology and Reporting Approach

The report will be based on the seven key questions of asset management as outlined within the National Guide for Sustainable Municipal Infrastructure:

- What do you own and where is it? (inventory)
- What is it worth? (valuation / replacement cost)
- What is its condition / remaining service life? (function & performance)
- What needs to be done? (maintain, rehabilitate, replace)
- When do you need to do it? (useful life analysis)
- How much will it cost? (investment requirements)
- How do you ensure sustainability? (long-term financial plan)

The above questions will be answered for each individual asset category in the following report sections.

3.3 Road Network

D

INFRASTRUCTURE REPORT CARD GRADE

3.3 Road Network

Note: The financial analysis in this section includes paved roads. Gravel roads are excluded from the capital replacement analysis, as by nature, they require perpetual maintenance activities and funding. However, the gravel roads have been included in the Road Network inventory and replacement value tables. There is also further information regarding gravel roads in section 3.4 "Gravel Roads – Maintenance Requirements" of this AMP.

3.3.1 What do we own?

As shown in the summary table below, the entire network comprises approximately 483 centreline km of road.

Road Network Inventory

Asset Type	Asset Component	Quantity/Units
Road Network	Road Bases - Paved	330km
	Road – Surfaces	330km
	Roads – Gravel	153.49km
	Sidewalks	32,262m
	Curb and Gutter	259.29km
	Signalized and Pedestrian Intersections	9
	Street Light Poles	448
	Street Light Fixtures	863
	Guide Rails	22,516m
	Signs	2,120

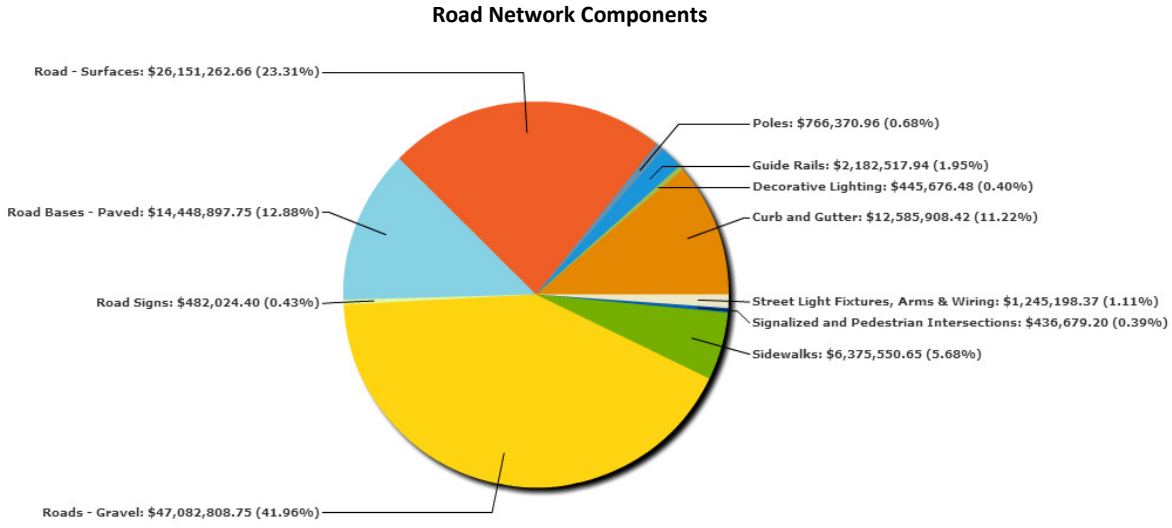
The road network data was extracted from the Tangible Capital Asset and G.I.S. modules of the CityWide software suite.

3.3.2 What is it worth?

The estimated replacement value of the road network, in 2012 dollars, is approximately $112 million. The cost per household for the road network is $13,826 based on 4,710 households.

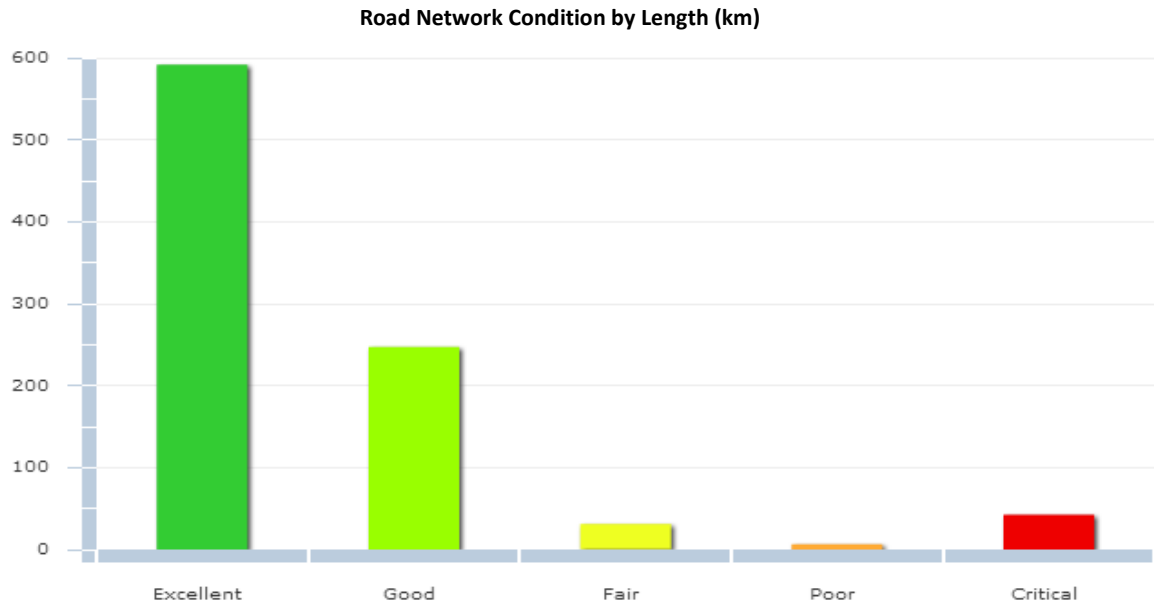
Road Network Replacement Value				
Asset Type	Asset Component	Quantity/Units	2012 Unit Replacement Cost	2012 Overall Replacement Cost
Road Network	Road Bases - Paved	330km	$43,669/km	$14,448,898
	Roads - Gravel	153.49km	$310,798/km	$47,082,809
	Road - Surfaces	330km	$79,700/km	$26,151,263
	Sidewalks	32,261.67m	$198/m	$6,375,551
	Curb and Gutter	259.29km	$48,540/km	$12,585,908
	Signalized Intersections	5	$47,466/each	$237,331
	Pedestrian Intersections	4	$49,837/each	$199,348
	Street Light Poles - Concrete	227	$1,438/each	$326,426
	Street Light Poles - Steel	153	$2,406/each	$368,074
	Street Light Poles - Wood	68	$1,056/each	$71,872
	Street Light Fixtures - Concrete	259	$1,438/each	$372,512
	Street Light Fixtures - Steel	174	$2,406/each	$418,594
	Street Light Fixtures - Wood	430	$1,056/each	$454,093
	Guide Rails - 3 Guide Wires	15,685.60	$51/m	$804,985
	Guide Rails - Steel Beam	6,829.95	$202/m	$1,377,533
	Decorative Lighting	211	NRBCPI	$445,676
	Signs	2,120	$227/each	$482,024
				$112,202,896

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



3.3.3 What condition is it in?

The vast majority, 94%, of the municipality's road network is in fair to excellent condition. As such, the municipality received a Condition vs. Performance rating of 'B+'.



3.3.4 What do we need to do to it?

There are generally four distinct phases in an asset's life cycle that require specific types of attention and lifecycle activity. These are presented at a high level for the road network below. Further detail is provided in the "Asset Management Strategy" section of this AMP.

Addressing Asset Needs

Phase	Lifecycle Activity	Asset Life Stage
Minor maintenance	Activities such as inspections, monitoring, sweeping, winter control, etc.	1st Qtr
Major maintenance	Activities such as repairing pot holes, grinding out roadway rutting, and patching sections of road.	2nd Qtr
Rehabilitation	Rehabilitation activities such as asphalt overlays, mill and paves, etc.	3rd Qtr
Replacement	Full road reconstruction	4th Qtr

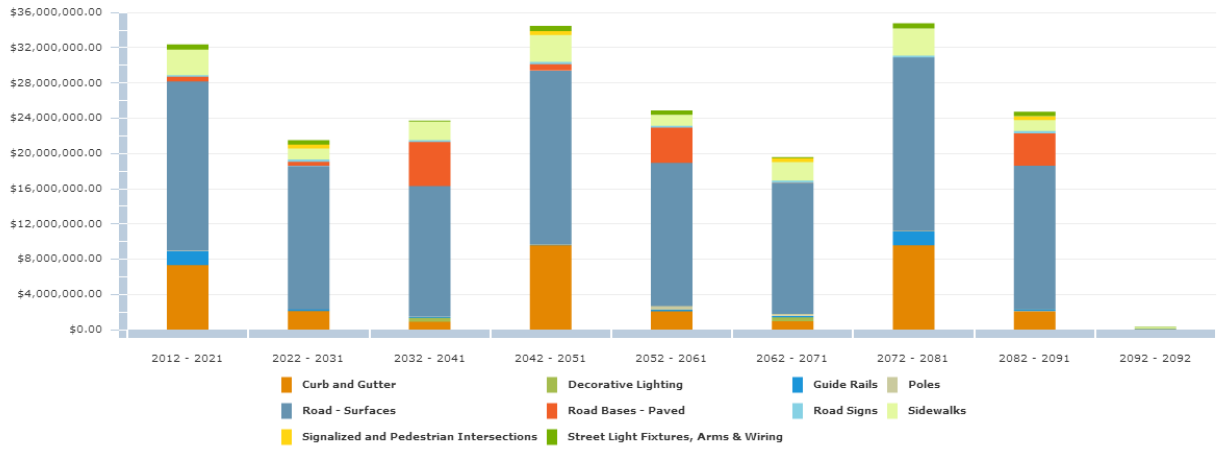
3.3.5 When do we need to do it?

For the purpose of this report, 'useful life' data for each asset class was obtained from the accounting data within the CityWide software database. This proposed useful life is used to determine replacement needs of individual assets. These needs are calculated and quantified in the system as part of the overall financial requirements.

Asset Useful Life in Years

Asset Type	Asset Component	Useful Life
Road Network	Road Bases - Paved	75
	Roads - Gravel	75
	Road - Surfaces	15
	Sidewalks	30
	Curb and Gutter	30
	Signalized Intersections	20
	Pedestrian Intersections	20
	Street Light Poles - Concrete	80
	Street Light Poles - Steel	70
	Street Light Poles - Wood	30
	Street Light Fixtures - Concrete	30
	Street Light Fixtures - Steel	30
	Street Light Fixtures - Wood	30
	Guide Rails - 3 Guide Wires	60
	Guide Rails - Steel Beam	60
	Decorative Lighting	30
	Signs	20

Road Network Replacement Profile (excludes gravel roads)



3.3.6 How much money do we need?

The analysis completed to determine capital revenue requirements was based on the following constraints and assumptions:

1. Replacement costs are based upon the unit costs identified within the "What is it worth" section.
2. The timing for individual road replacement was defined by the replacement year as described in the "When do you need to do it?" section.
3. All values are presented in 2012 dollars.
4. The analysis was run for an 80 year period to ensure all assets went through at least one iteration of replacement, therefore providing a sustainable projection.

3.3.7 How do we reach sustainability?

Based upon the above parameters, the average annual revenue required to sustain Kincardine's paved road network is approximately **$2,625,000**. Based on Kincardine's current annual funding of **$243,000**, there is an annual **deficit of $2,382,000**. As such, the municipality received a Funding vs. Need rating of 'F'. The following graph illustrates the expenditure requirements in five year increments against the sustainable funding threshold line.

Sustainable Funding Requirements (excludes gravel roads)

In conclusion, based on field condition data, the road network is generally in good condition; however, due to the short life cycles of certain assets (e.g. road surfaces) there are significant replacement requirements over the next 5 years totaling approximately $14 million. The condition assessment data, along with risk management strategies, should be reviewed together to aid in prioritizing overall needs for rehabilitation and replacement and assist with optimizing the long and short term budgets. Further detail is outlined within the "asset management strategy" section of this AMP.

3.3.8 Recommendations

The municipality received an overall rating of 'D' for its road network, calculated from the Condition vs. Performance and the Funding vs. Need ratings. Accordingly, we recommend the following:

1. The condition assessment data, along with risk management strategies, should be reviewed together to aid in prioritizing overall needs for rehabilitation and replacement.
2. A tailored life cycle activity framework should be also be developed by the municipality as outlined further within the "Asset Management Strategy" section of this AMP.
3. As approximately 30% of the municipality's road network is gravel roads, a detailed study should be undertaken to assess the overall maintenance costs of gravel roads and whether there is benefit to converting some gravel roads to paved , or surface treated roads, thereby reducing future costs. This is further outlined within the "Asset Management Strategy" section of this AMP.
4. Once the above studies are complete or underway, the data should be loaded into the CityWide software and an updated "current state of the infrastructure" analysis should be generated.
5. An appropriate % of asset replacement value should be used for operations and maintenance activities on an annual basis. This should be determined through a detailed analysis of O & M activities and be added to future AMP reporting.
6. The Infrastructure Report Card should be updated on an annual basis.

3.4 Gravel Roads – Maintenance Requirements

3.4.1 Introduction

Paved roads are usually designed and constructed with careful consideration given to the correct shape of the cross section. Once paving is complete the roadway will keep its general shape for the duration of its useful life. Gravel roads are quite different. Many have poor base construction, will be prone to wheel track rutting in wet weather, and traffic will continually displace gravel from the surface to the shoulder area, even the ditch, during wet and dry weather. Maintaining the shape of the road surface and shoulder is essential to ensure proper performance and to provide a sufficient level of service for the public.

Therefore, the management of gravel roads is not through major rehabilitation and replacement, but rather through good perpetual maintenance and some minor rehabilitation which depend on a few basic principles: proper techniques and cycles for grading; the use and upkeep of good surface gravel; and, dust abatement and stabilization.

3.4.2 Maintaining a Good Cross Section

In order to maintain a gravel road properly, a good cross section is required consisting of a crowned driving surface, a shoulder with correct slope, and a ditch. The crown of the road is essential for good drainage. A road with no crown, or insufficient crown, will cause water to collect on the surface during a rainfall, will soften the crust, and ultimately lead to rutting which will become severe if the subgrade also softens. Even if the subgrade remains firm, traffic will cause depressions in the road where water collects and the road will develop potholes. It is a generally accepted industry standard that 1.25cm per 12cm (one foot), approximately 4%, on the cross slope is ideal for road crown.

The road shoulder serves some key functions. It supports the edge of the travelled portion of the roadway, provides a safe area for drivers to regain control of vehicles if they are forced to leave the road, and finally, carries water further away from the road surface. The shoulder should ideally meet the edge of the roadway at the same elevation and then slope away gradually towards the ditch.

The ditch is the most important and common drainage structure for gravel roads. Every effort should be made to maintain a minimal ditch. The ditch should be kept free of obstructions such as eroded soil, vegetation or debris.

3.4.3 Grading Operations

Routine grading is the activity that ensures gravel roadways maintain a good cross section or proper profile. The three key components to good grading are: operating speed, blade angle, and blade pitch.

Excessive operating speed can cause many problems such as inconsistent profile, and blade movement or bouncing that can cut depressions and leave ridges in the road surface. It is generally accepted that grader speed should not exceed 8km per hour. The angle of the blade is also critical for good maintenance and industry standards suggest the optimal angle is between 30 and 45 degrees. Finally, the correct pitch or tilt of the blade is very important. If the blade is pitched back too far, the material will tend to build up in front of the blade and will not fall forward, which mixes the materials, and will move along and discharge at the end of the blade.

3.4.4 Good Surface Gravel

Once the correct shape is established on a roadway and drainage matters are taken care of, attention must be given to the placement of good gravel. Good surface gravel requires a percentage of stone which gives strength to support loads, particularly in wet weather. It also requires a percentage of sand size particles to fill the voids between the stones which provide stability. And finally, a percentage of plastic fines are needed to bind the material together which allows a gravel road to form a crust and shed water. Typical municipal maintenance routines will include activities to ensure a good gravel surface through both spot repairs (often annually) and also re-graveling of roadways (approximately every five years).

3.4.5 Dust Abatement and stabilization

A typical maintenance activity for gravel roads also includes dust abatement and stabilization. All gravel roads will give off dust at some point, although the amount of dust can vary greatly from region to region. The most common treatment to reduce dust is the application of Calcium Chloride, in flake or liquid form, or Magnesium Chloride, generally just in liquid form. Of course, there are other products on the market as well. Calcium and Magnesium Chloride can be very effective if used properly. They are hygroscopic products which draw moisture from the air and keep the road surface constantly damp. In addition to alleviating dust issues, the continual dampness also serves to maintain the loss of fine materials within the gravel surface, which in turn helps maintain road binding and stabilization. A good dust abatement program can actually help waterproof and bind the road, in doing so can reduce gravel loss, and therefore, reduce the frequency of grading.

3.4.6 The Cost of Maintaining Gravel Roads

We conducted an industry review to determine the standard cost for maintaining gravel roads. However, it became apparent that no industry standard exists for either the cost of maintenance or for the frequency at which the maintenance activities should be completed. Presented below, as a guideline only, are two studies on the maintenance costs for gravel roads:

3.4.7 Minnesota Study (2005)

The first study is from the Minnesota Department of Transportation (MnDOT) Local Road Research Board (LRRB), where the researchers looked at historical and estimated cost data from multiple counties in Minnesota.

The study team found that the typical maintenance schedule consisted of routine grading and re-graveling with two inches of new gravel every five years. They found that a typical road needed to be graded 21 times a year or three times a month from April – October, and the upper bound for re-graveling was five years for any road over 100 ADT; lower volume roads could possibly go longer. The calculated costs including materials, labour, and hauling totaled $1,400 per year or $67 per visit for the grading activity and $13,800 for the re-gravel activity every five years. The re-gravel included an estimate gravel cost of $7 per cubic yard and a 2.5" thick lift of gravel (to be compacted down to 2"). Therefore, they developed an average estimated annual maintenance cost for gravel roads at $4,160 per mile. This converts to $2,600 per km of roadway and if adjusted for inflation into 2012 dollars, using the Non-Residential Building Construction Price Index (NRBCPI), it would be $3,500.

Reference: Jahren, Charles T. et. al. "Economics of Upgrading an Aggregate Road," Minnesota Department of Transportation, St. Paul, Mn, January 2005.

3.4.8 South Dakota study (2004)

This second study was conducted by South Dakota's Department of Transportation (SDDOT). The default maintenance program for gravel roads from SDDOT's report includes grading 50 times per year, re-graveling once every six years, and spot graveling once per year. The unit cost for grading was very similar to Minnesota at $65 per mile, re-gravel at $7,036 per mile and spot graveling or pothole repair at $2,420 per mile, totaling to an average annual maintenance cost of $6,843 per mile. Due to the frequency of the grading activity and the addition of the spot gravel maintenance, the SDDOT number is higher than Minnesota reported even though the re-gravel activity is reported at about half of the price in Minnesota.

This converts to $4,277 per km of roadway and if adjusted for inflation into 2012 dollars, using the NRBCPI, it would be $5,758.

Reference: Zimmerman, K.A. and A.S. Wolters. "Local Road Surfacing Criteria," South Dakota Department of Transportation, Pierre, SD, June 2004.

3.4.9 Ontario Municipal Benchmarking Initiative (OMBI)

One of the many metrics tracked through the Ontario Municipal Benchmarking Initiative is the "Operating costs for Unpaved (Loose top) Roads per lane Km." As referenced from the OMBI data dictionary, this includes maintenance activities such as dust suppression, loose top grading, loose top gravelling, spot base repair and wash out repair.

Of the six Ontario municipalities that included 2012 costs for this category, there is a wide variation in the reporting. The highest cost per lane km was $14,900 while the lowest cost was $397. The average cost was $6,300 per lane km. Assuming two lanes per gravel road to match the studies above, the Ontario OMBI average becomes $12,600 per km of roadway.

Summary of Costs

Source	2012 Maintenance Cost per km (adjusted for inflation using NRBCPI)
Minnesota Study	$3,500
South Dakota Study	$5,758
OMBI Average (six municipalities)	$12,600

3.4.10 Conclusion

As discussed above, there are currently no industry standards in regards to the cost of gravel road maintenance and the frequency at which the maintenance activities should be completed. Also, there is no established benchmark cost for the maintenance of a km of gravel road and the numbers presented above will vary significantly due to the level of service or maintenance that's provided (i.e., frequency of grading cycles and re-gravel cycles).

Kinczrdine currently spends $352,472 (based on 2012 numbers) annually on gravel road maintenance. With a gravel road network of approximately 153 km, the maintenance cost per km of roadway is $2,304. This appears to be significantly less than the typical budget limits as shown above. Of course there are many variables in this analysis, therefore it is recommended that a detailed study be undertaken to establish different cost options associated with different levels of service and that this be included with future updates to this AMP.

3.5 Bridges & Culverts

F

INFRASTRUCTURE REPORT CARD GRADE

3.5 Bridges & Culverts

3.5.1 What do we own?

As shown in the summary table below, the municipality owns 27 bridges and 52 culverts.

Bridges & Culverts Inventory		
Asset Type	Asset Component	Quantity/Units
Bridges & Culverts	Bridges – Structure	5,407m.sq
	Bridges – Deck	5,407m.sq
	Culverts	5,845 m.sq

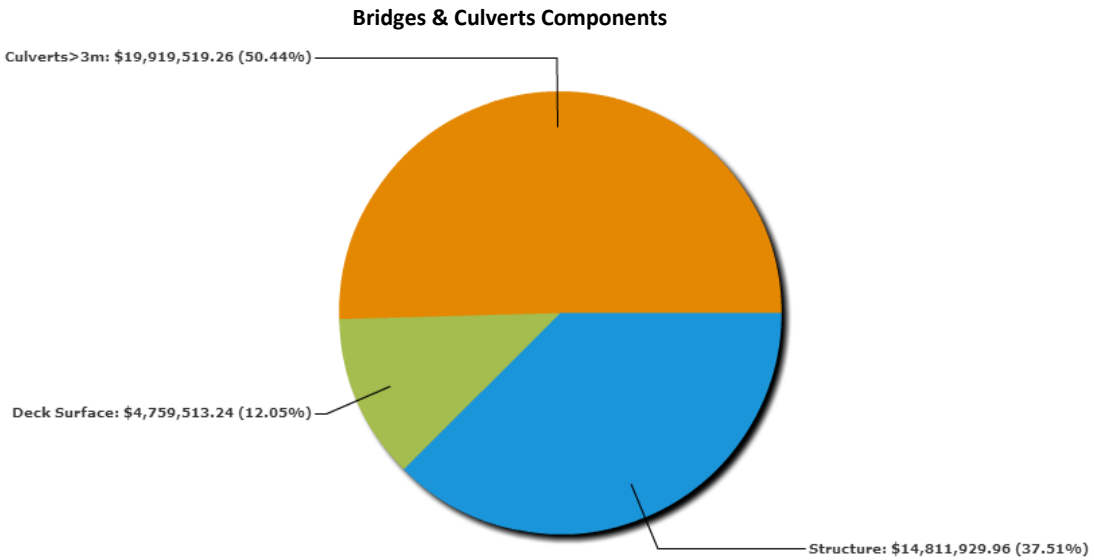
The bridges & culverts data was extracted from the Tangible Capital Asset and G.I.S. modules of the CityWide software suite.

3.5.2 What is it worth?

The estimated replacement value of the municipality's bridges & culverts, in 2012 dollars, is approximately $39 million. The cost per household for bridges & culverts $8,384 based on 4,710 households.

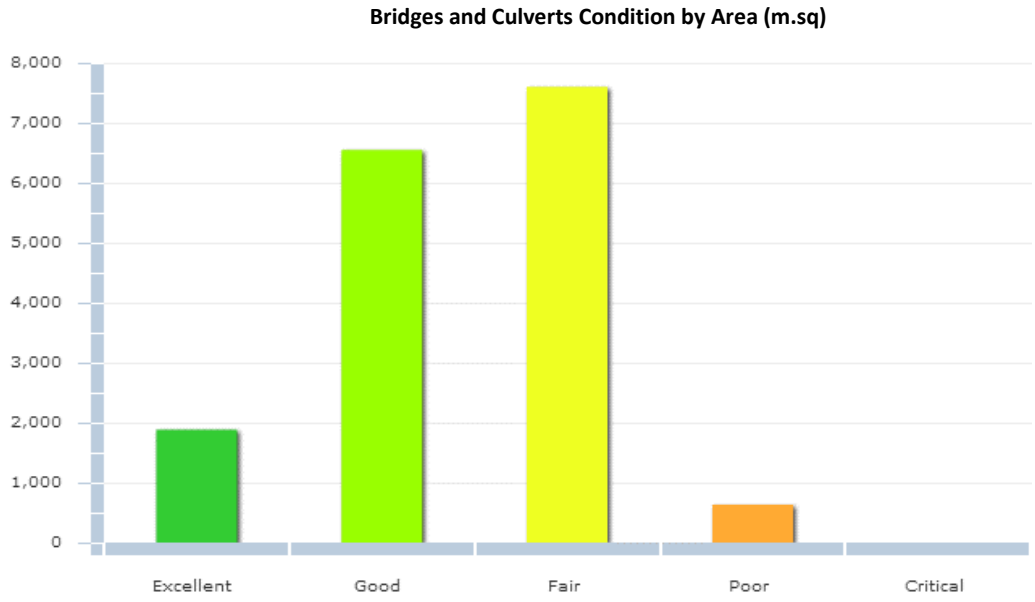
Bridges & Culverts Replacement Value				
Asset Type	Asset Component	Quantity/Units	2012 Unit Replacement Cost	2012 Replacement Cost
Bridges & Culverts	Bridges – Structure	5,407m.sq	NRBCPI	$14,811,930
	Bridges – Deck	5,407m.sq	NRBCPI	$4,759,513
	Culverts	5,845m.sq	NRBCPI	$19,919,519
				$39,490,962

The pie chart below provides a breakdown of each of the bridges & culverts components to the overall structures value.



3.5.3 What condition is it in?

Virtually all, 96%, of the municipality's bridges & culverts are in fair to excellent condition. As such, the municipality received a Condition vs. Performance rating of 'C+'.



3.5.4 What do we need to do to it?

There are generally four distinct phases in an asset's life cycle. These are presented at a high level for the bridge and culvert structures below. Further detail is provided in the "Asset Management Strategy" section of this AMP.

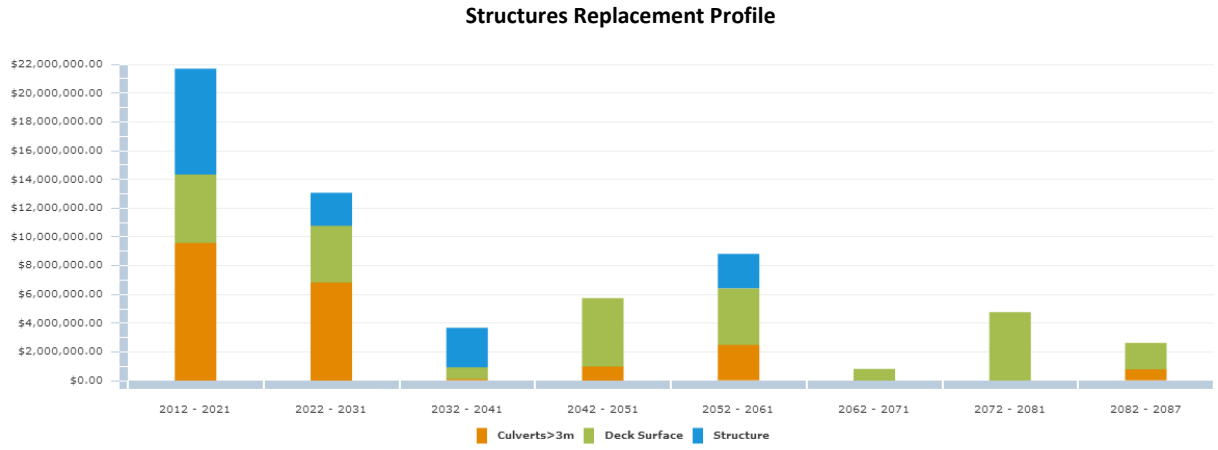
Addressing Asset Needs		
Phase	Lifecycle Activity	Asset Life Stage
Minor Maintenance	Activities such as inspections, monitoring, sweeping, winter control, etc.	1st Qtr
Major Maintenance	Activities such as repairs to cracked or spalled concrete, damaged expansion joints, bent or damaged railings, etc.	2nd Qtr
Rehabilitation	Rehabilitation events such as structural reinforcement of structural elements, deck replacements, etc.	3rd Qtr
Replacement	Full structure reconstruction	4th Qtr

3.5.5 When do we need to do it?

For the purpose of this report, 'useful life' data for each asset class was obtained from the accounting data within the CityWide software database. This proposed useful life is used to determine replacement needs of individual assets, which are calculated in the system as part of the overall financial requirements.

Asset Useful Life in Years		
Asset Type	Asset Component	Useful Life in Years
Bridges & Culverts	Bridges – Structure	75
	Bridges – Deck	15
	Culverts	75

The following graph shows the current projection of structure replacements based on the age of the asset only.



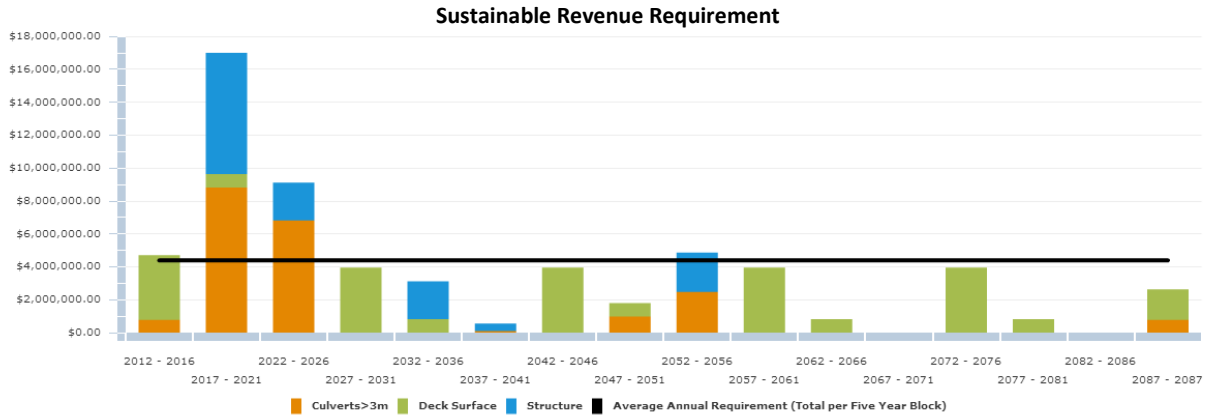
3.5.6 How much money do we need?

The analysis completed to determine capital revenue requirements was based on the following constraints and assumptions:

1. Replacement costs are based upon the "What is it worth" section above.
2. The timing for individual structure replacement was defined by the replacement year as described in the "When do you need to do it?" section above.
3. All values are presented in 2012 dollars.
4. The analysis was run for a 75 year period to ensure all assets cycled through at least one iteration of replacement, therefore providing a sustainable projection.

3.5.7 How do we reach sustainability?

Based upon the above assumptions, the average annual revenue required to sustain Kincardine's bridges & culverts is **$878,000**. Based on Kincardine's current annual funding of **$120,000**, there is an annual **deficit of $758,000**. As such, the municipality received a Funding vs. Need rating of 'F'. The following graph presents five year blocks of expenditure requirements against the sustainable funding threshold line.



In conclusion, based on field condition assessment data, of the majority of bridges and large structures are in fair or good condition. However, there are some replacement requirements to be addressed totaling approximately $4.8 million in the next 5 years and $17 million in the 5 – 10 year window. The condition assessment data, along with risk management strategies, should be reviewed together to aid in prioritizing overall needs for rehabilitation and replacement and assist with optimizing the long and short term budgets. Further detail is outlined within the "asset management strategy" section of this AMP.

3.5.8 Recommendations

The municipality received an overall rating of 'F' for its bridges & culverts, calculated from the Condition vs. Performance and the Funding vs. Need ratings. Accordingly, we recommend the following:

1. The condition assessment data, along with risk management strategies, should be reviewed together to aid in prioritizing overall needs for rehabilitation and replacement.

2. An appropriate % of asset replacement value should be used for operations and maintenance activities on an annual basis. This should be determined through a detailed analysis of O & M activities and added to future AMP reporting.

3. The Infrastructure Report Card should be updated on an annual basis.

3.6 Water Network

C

INFRASTRUCTURE REPORT CARD GRADE

3.6 Water Network

3.6.1 What do we own?

Kincardine is responsible for the following water network inventory which includes approximately 100km of water mains:

Water Network Inventory		
Asset Type	Asset Component	Quantity
Water Network	Mains - Local (less than 450mm)	99,717m
	Mains - Local (greater than 450mm)	777m
	Mains - Local (other)	26.79m
	Water Meters	4,056
	Wells	9
	Water Towers	2
	Chlorine Station	1
	Pumphouse	1
	Treatment Plant	1
	Water Meter Pits	8
	Water Services	42,919m
	Water Valves	1,220
	Water Valve Chambers	26
	Water Blow Off	52
	Water Curbstop	4,323
	Hydrants	434

The water network data was extracted from the Tangible Capital Asset and G.I.S. modules of the CityWide software suite.

3.6.2 What is it worth?

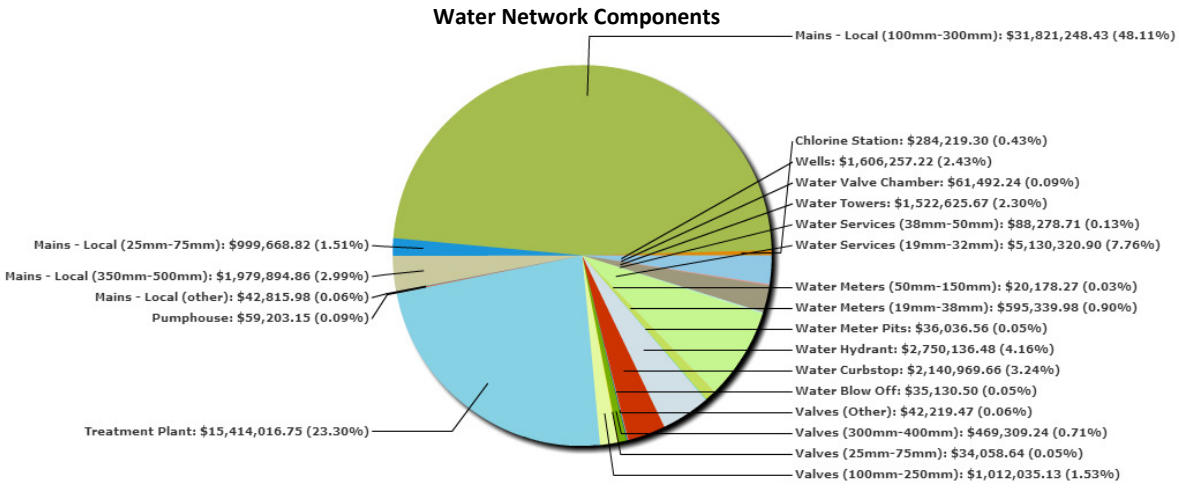
The estimated replacement value of the water network, in 2012 dollars, is approximately $66 million. The cost per household for the water network is $16,153 based on 4,095 households.

Water Network Replacement Value

Asset Type	Asset Component	Quantity/Units	2012 Unit Replacement Cost	2012 Overall Replacement Cost
Water Network	Mains - Local (25mm) - Polyethylene	277.76m	$191.26/m	$53,124
	Mains - Local (25mm) - Copper	220.76m	$201.87/m	$44,565
	Mains - Local (25mm) - PVC	184.37m	$211.95/m	$39,076
	Mains - Local (38mm)	35.50m	$228.09/m	$8,097
	Mains - Local (50mm)	4,481.34m	$189.76/m	$850,379
	Mains - Local (75mm)	18.47m	NRBCPI	$4,428
	Mains - Local (100mm)	2,969.47m	$307.71/m	$913,735
	Mains - Local (150mm)	46,479.59m	$287.13/m	$13,344,492
	Mains - Local (200mm)	11,096.58m	$305.41/m	$3,391,518
	Mains - Local (250mm)	1,706.57m	$433.58/m	$739,934
	Mains - Local (300mm)	29,552.72m	$455.30/m	$13,431,569
	Mains - Local (350mm)	728.84m	$531.09/m	$387,078
	Mains - Local (400mm)	1,965.35m	$535.92/m	$1,053,272
	Mains - Local (500mm)	777.24m	$694.18/m	$539,544
	Mains - Local (Other)	26.79m	NRBCPI	$42,816
	Meters (19mm)	3,970	$144.86/each	$575,094
	Meters (25mm)	31	$278.38/each	$8,630
	Meters (38mm)	22	$528/each	$11,616
	Meters (50mm)	20	$665.87/each	$13,317
	Meters (75mm)	5	$1128.50/each	$4,514
	Meters (100mm)	6	$346.75/each	$1,734
	Meters (150mm)	2	NRBCPI	$613
	Wells	9	NRBCPI	$1,606,257
	Water Towers	2	NRBCPI	$1,522,626
	Chlorine Station	1	NRBCPI	$284,219
	Pumphouse	1	NRBCPI	$59,203
	Treatment Plant	1	NRBCPI	$15,414,017
	Water Meter Pits	8	$4504.57/each	$36,037
	Water Services (19mm)	41,460	$120.54/m	$4,995,678
	Water Services (25mm)	775	$129.21/m	$100,178
	Water Services (32mm)	222	NRBCPI	$34,465
	Water Services (38mm) - Polyethylene	74	$251.70/m	$18,572
	Water Services (38mm) - Copper	22	$265.36/m	$5,829
	Water Services (50mm) - Copper	139	$212.72/m	$29,550
	Water Services (50mm) - Polyethylene	225.93	$150.08/m	$33,908
	Water Services (50mm) - Other	1	NRBCPI	$420

	Valves (25mm)	4	$915.89/each	$3,664
	Valves (38mm)	1	NRBCPI	$1,013
	Valves (50mm)	25	$1013.14/each	$25,329
	Valves (75mm)	4	$1013.35/each	$4,053
	Valves (100mm)	27	$903.82/each	$24,403
	Valves (150mm)	820	$1047.71/each	$858,074
	Valves (200mm)	73	$1095.10/each	$79,942
	Valves (250mm)	20	$2480.76/each	$49,615
	Valves (300mm)	175	$2584.51/each	$449,705
	Valves (350mm)	4	$2613.55/each	$10,454
	Valves (400mm)	1	NRBCPI	$9,150
	Valves (Other)	66	NRBCPI	$42,219
	Water Valve Chambers - Air Release	12	$2041.87/each	$24,502
	Water Valve Chambers - Single Line Drain	8	$4,192	$33,537
	Water Valve Chambers - Air Relief/Butterfly	6	NRBCPI	$3,453
	Water Blow Off (19/20mm)	5	$357.05/each	$1,785
	Water Blow Off (25mm)	3	$679.61/each	$2,039
	Water Blow Off (50mm)	35	$731.24/each	$25,593
	Water Blow Off (other)	9	NRBCPI	$5713
	Water Curb Stop (19mm)	4,214	$501.46/each	$2,083,065
	Water Curb Stop (25mm)	74	$502.21/each	$36,661
	Water Curb Stop (50mm)	3	$546.86/each	$1,641
	Water Curb Stop (Other)	32	NRBCPI	$19,603
	Hydrants	434	$6336.72/each	$2,750,136
				$66,145,456

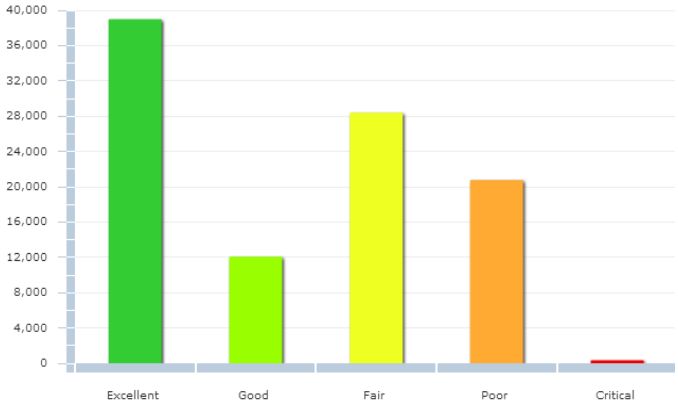
The pie chart below provides a breakdown of each of the network components to the overall system value.



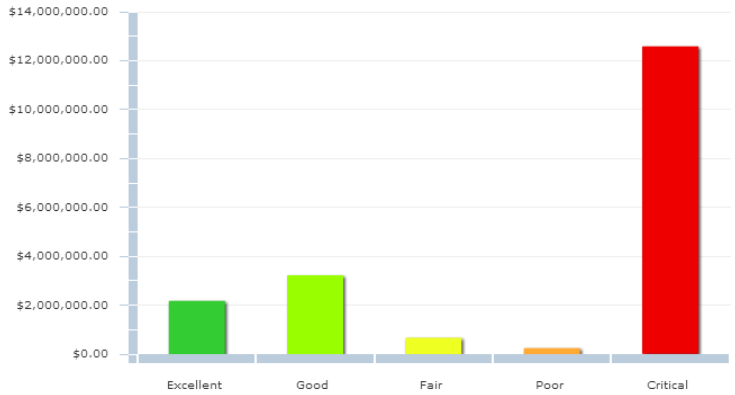
3.6.3 What condition is it in?

While 98% of the municipality's sanitary mains are in fair to excellent condition, 2/3 of its facilities, based on replacement cost, are in critical condition. As such, the municipality received a Condition vs. Performance rating of 'C'.

Water Mains Condition by Length (metres)



Water Facility Condition by Cost



3.6.4 What do we need to do to it?

There are generally four distinct phases in an asset's life cycle. These are presented at a high level for the water network below. Further detail is provided in the "Asset Management Strategy" section of this AMP.

Addressing Asset Needs		
Phase	Lifecycle Activity	Asset Age
Minor Maintenance	Activities such as inspections, monitoring, cleaning and flushing, hydrant flushing, pressure tests, visual inspections, etc.	1st Qtr
Major Maintenance	Such events as repairing water main breaks, repairing valves, replacing individual small sections of pipe etc.	2nd Qtr
Rehabilitation	Rehabilitation events such as structural lining of pipes and a cathodic protection program to slow the rate of pipe deterioration.	3rd Qtr
Replacement	Pipe replacements	4th Qtr

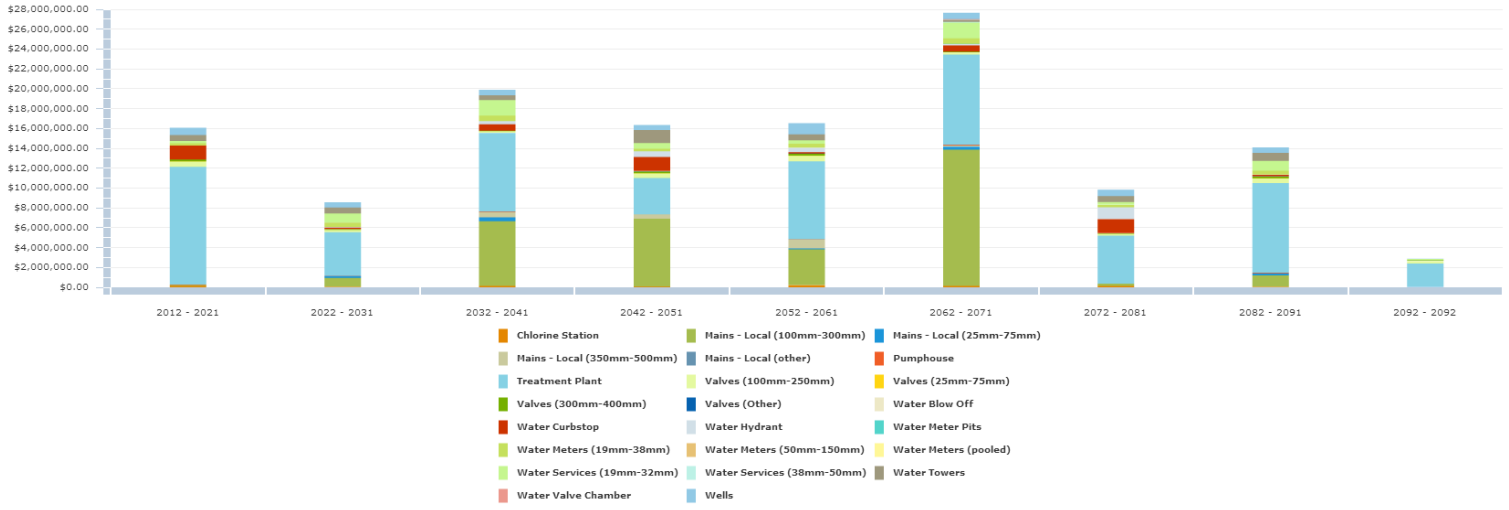
3.6.5 When do we need to do it?

For the purpose of this report "useful life" data for each asset class was obtained from the accounting data within the CityWide software database. This proposed useful life is used to determine replacement needs of individual assets, which are calculated in the system as part of the overall financial requirements.

Asset Useful Life in Years		
Asset Type	Asset Component	Useful Life in Years
Water Network	Mains - Local (less than 450mm)	60-80
	Mains - Local (greater than 450mm)	60-80
	Mains - Local (other)	60-80
	Meters	15
	Wells	12-50
	Water Towers	12-50
	Chlorine Station	12-50
	Pumphouse	15-25
	Treatment Plant	10-50
	Water Meter Pits	60
	Water Services	60
	Valves	40
	Water Valve Chambers	16-51
	Water Blow Off	40
	Water Curb Stop (19mm)	30
	Hydrants	70

As field condition information becomes available in time, the data should be loaded into the CityWide system in order to increasingly have a more accurate picture of current asset age and condition, therefore, future replacement requirements. The following graph shows the current projection of water main replacements based on the age of the assets only.

Water Main Replacement Profile



3.6.6 How much money do we need?

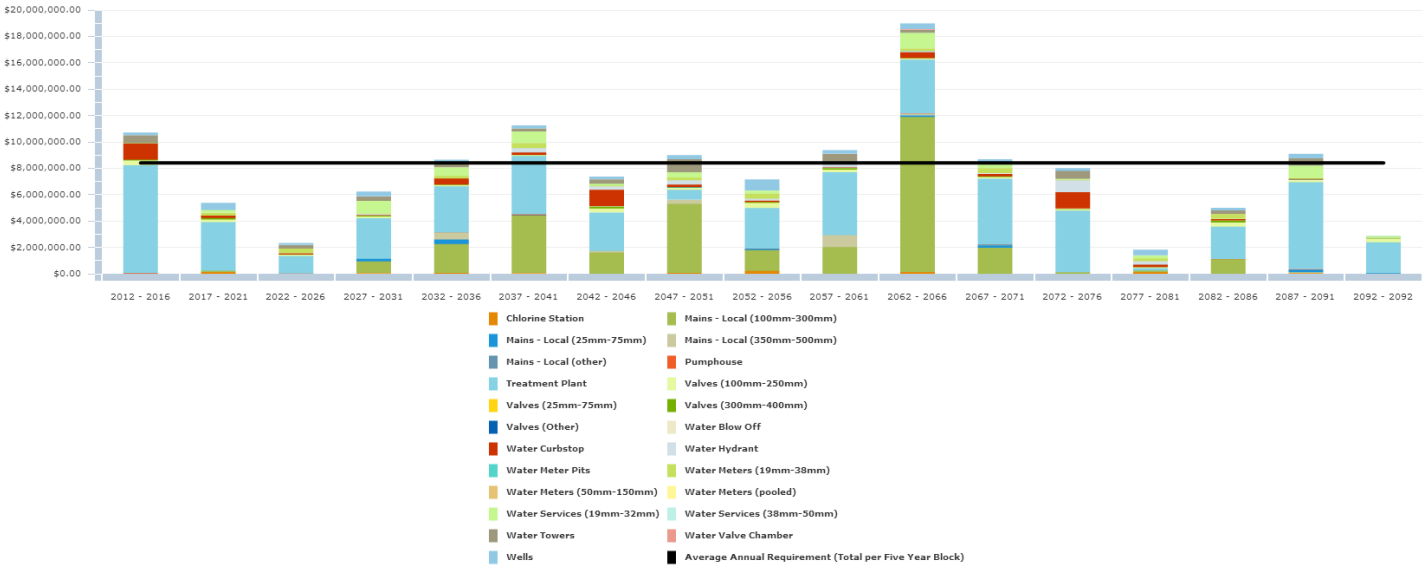
The analysis completed to determine capital revenue requirements was based on the following assumptions:

1. Replacement costs are based upon the unit costs identified within the "What is it worth" section above.
2. The timing for individual water main replacement was defined by the replacement year as described in the "When do you need to do it?" section above.
3. All values are presented in 2012 dollars.
4. The analysis was run for an 80 year period to ensure all assets went through at least one iteration of replacement, therefore providing a sustainable projection.

3.6.7 How do we reach sustainability?

Based upon the above assumptions, the average annual revenue required to sustain Kincardine's water network is approximately **$1,682,000**. Based on Kincardine's current annual funding of **$1,176,000**, there is a **deficit of $506,000**. As such, the municipality received a Funding vs. Need rating of 'C'. The following graph presents five year blocks of expenditure requirements against the sustainable funding threshold line.

Sustainable Revenue Requirements



In conclusion, Kincardine's water distribution network is in fair condition based on age data only. There are needs totaling approximately $11 million to be addressed within the next 5 years. However, to gain a better understanding of actual field performance, a condition assessment program should be established to aid in prioritizing overall needs for rehabilitation and replacement and to assist with optimizing the long and short term budgets. Further detail is outlined within the "asset management strategy" section of this AMP.

3.6.8 Recommendations

The municipality received an overall rating of 'C' for its water network, calculated from the Condition vs. Performance and the Funding vs. Need ratings. Accordingly, we recommend the following:

1. A more detailed study to define the current condition of the water network should be undertaken as described further within the "Asset Management Strategy" section of this AMP.

2. Once the above study is complete, a new performance age should be applied to each water main and an updated "current state of the infrastructure" analysis should be generated.

3. An appropriate % of asset replacement value should be used for operations and maintenance activities on an annual basis. This should be determined through a detailed analysis of O & M activities and be added to future AMP reporting.

4. The Infrastructure Report Card should be updated on an annual basis.

3.7 Sanitary Sewer Network

C

INFRASTRUCTURE REPORT CARD GRADE

3.7 Sanitary Sewer Network

3.7.1 What do we own?

The inventory components of the sanitary sewer network are outlined in the table below. The entire Network consists of approximately 80km of sewer main.

Sanitary Sewer Inventory

Asset Type	Asset Component	Quantity
Sanitary Sewer Network	Sanitary Cleanouts	17
	Curbstops	3,141m
	Forcemain Pipes	16,727m
	Wastewater Laterals	35,064m
	Mains - Local (Less than 450mm)	62,170m
	Mains - Local (Greater than 450mm)	1,056m
	Mains - Local (No Pipe Size)	72.50m
	Lift Stations	6
	Chlorine Station	1
	Pumping Stations	6
	Wastewater Plant	1
	Facilities - Other	2
	Grinder Lines	1,132m
	Manholes	875
	Valves	11
	Lagoon	2

The Sanitary Sewer Network data was extracted from the Tangible Capital Asset and G.I.S. modules of the CityWide software application.

3.7.2 What is it worth?

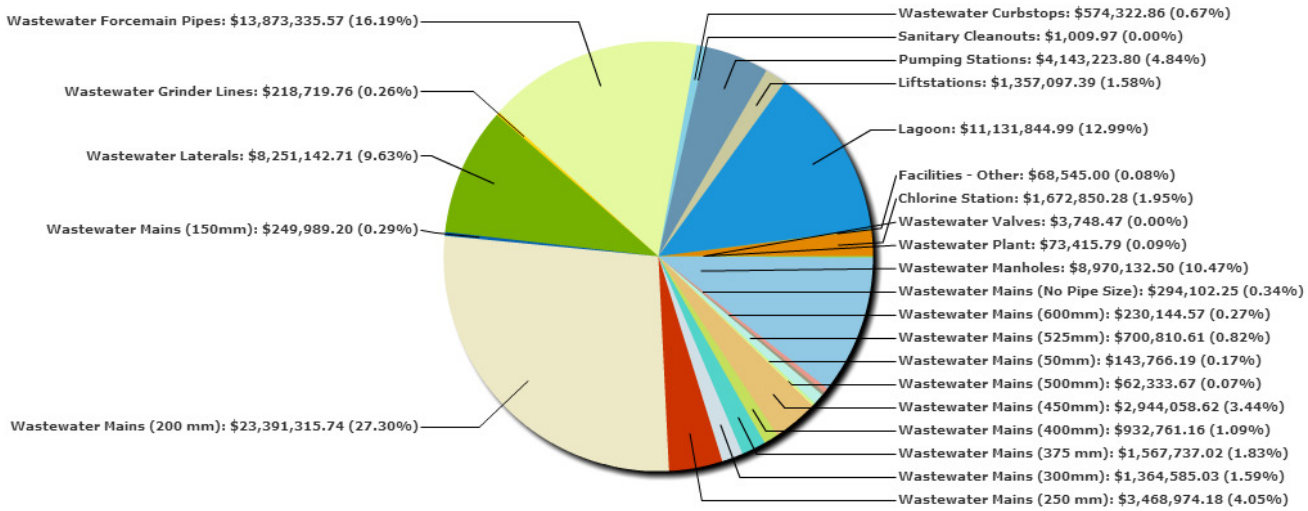
The estimated replacement value of the sanitary sewer network, in 2012 dollars, is approximately $85.6 million. The cost per household for the sanitary network is $23,072 based on 3,714 households.

Sanitary Sewer Replacement Value

Asset Type	Asset Component	Quantity	2012 Unit Replacement Cost	2012 Overall Replacement Cost
Sanitary Sewer Network	Sanitary Cleanouts	17	$59/m	$1,010
	Curbstops - 38mm	598.35	$181/m	$108,145
	Curbstops - 50mm	2,542.97	$183/m	$466,178
	Forcemain Pipes - PVC/PE	11,388.27	NRBCPI	$8,432,750
	Forcemain Pipes - Ductile Iron	1,365.15	NRBCPI	$1,268,487
	Forcemain Pipes - Asbestos Cement	3,973.93	NRBCPI	$4,172,098
	Wastewater Laterals - 100mm	14,845.50	$293.08/m	$4,350,918
	Wastewater Laterals - 125mm	18,070.46	$188.61/m	$3,408,017
	Wastewater Laterals - 150mm	1,277.89	$178.59/m	$228,219
	Wastewater Laterals - 200mm	5.25	$198.63.m	$1,042
	Wastewater Laterals - Other	864.55	NRBCPI	$262,946
	Mains - Local (50mm)	149.59	$961.09/m	$143,766
	Mains - Local (150mm) - PVC	491.47	$264.57/m	$130,029
	Mains - Local (150mm) - HDPE	442.44	$271.13/m	$119,960
	Mains - Local (200mm)	42,577.66	$549.38/m	$23,391,316
	Mains - Local (250mm)	6,928.31	$506.49/m	$3,468,974
	Mains - Local (300mm)	2,638.36	$517.21/m	$1,364,585
	Mains - Local (375mm)	3,899.26	$402.26/m	$1,567,737
	Mains - Local (400mm)	1,284.44	$726.20/m	$932,761
	Mains - Local (450mm)	3,758.82	$783.24/m	$2,944,059
	Mains - Local (500mm)	68.08	$915.57/m	$62,334
	Mains - Local (525mm)	753.25	$930.38/m	$700,811
	Mains - Local (600mm)	235.07	$979.05/m	$230,145
	Mains - Local (No Pipe Size)	72.50	NRBCPI	$294,102
	Lift Stations	6	NRBCPI	$1,357,097
	Chlorine Station	1	NRBCPI	$1,672,850
	Pumping Stations	6	NRBCPI	$4,143,224
	Wastewater Plant	1	NRBCPI	$73,416
	Facilities - Other	2	NRBCPI	$68,545
	Grinder Lines - 32mm	89.12	$191.67/m	$17,081
	Grinder Lines - 38mm	101.30	$198.54/m	$20,113
	Grinder Lines - 50mm	742.08	$228.80/m	$169,789
	Grinder Lines - No Pipe Size	199.11	NRBCPI	$11,737
	Manholes	875	$10,251.58/each	$8,970,133
	Valves	11	$340.77/each	$3,748
	Lagoon	2	NRBCPI	$11,131,845
				$85,689,967

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

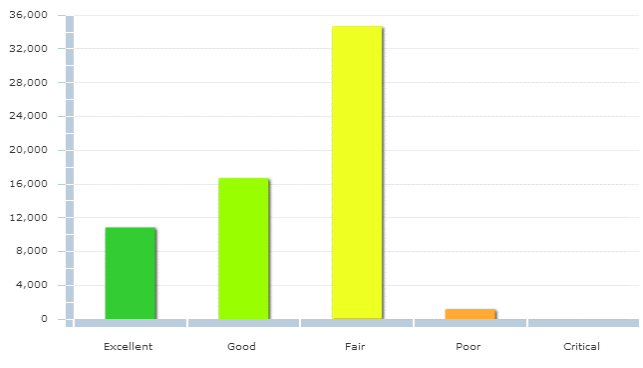
Sanitary Sewer Network Components



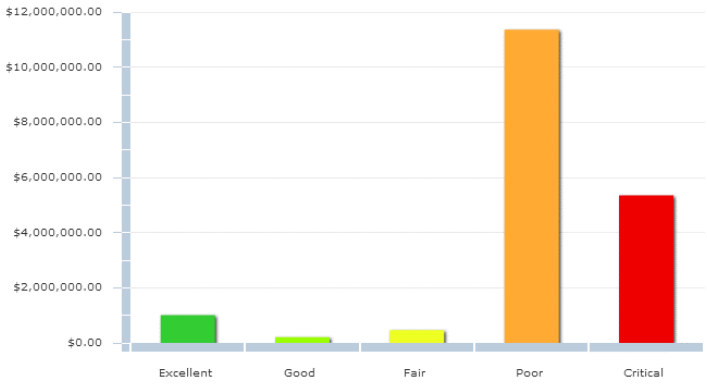
3.7.3 What condition is it in?

While 98% of the sanitary mains are in fair to excellent condition, nearly 91% of the municipality's appurtenances and facilities assets are in poor or critical condition. As such, the municipality received a Condition vs. Performance rating of 'C'.

Sanitary Sewer Mains Condition by Length (m)



Sanitary Facility Condition by Cost



3.7.4 What do we need to do to it?

There are generally four distinct phases in an assets life cycle. These are presented at a high level for the sanitary sewer network below. Further detail is provided in the "Asset Management Strategy" section of this AMP.

Addressing Asset Needs		
Phase	Lifecycle Activity	Asset Life Stage
Minor Maintenance	Activities such as inspections, monitoring, cleaning and flushing, zoom camera and CCTV inspections, etc.	1st Qtr
Major Maintenance	Activities such as repairing manholes and replacing individual small sections of pipe.	2nd Qtr
Rehabilitation	Rehabilitation events such as structural lining of pipes are extremely cost effective and provide an additional 75 plus years of life.	3rd Qtr
Replacement	Pipe replacements	4th Qtr

3.7.5 When do we need to do it?

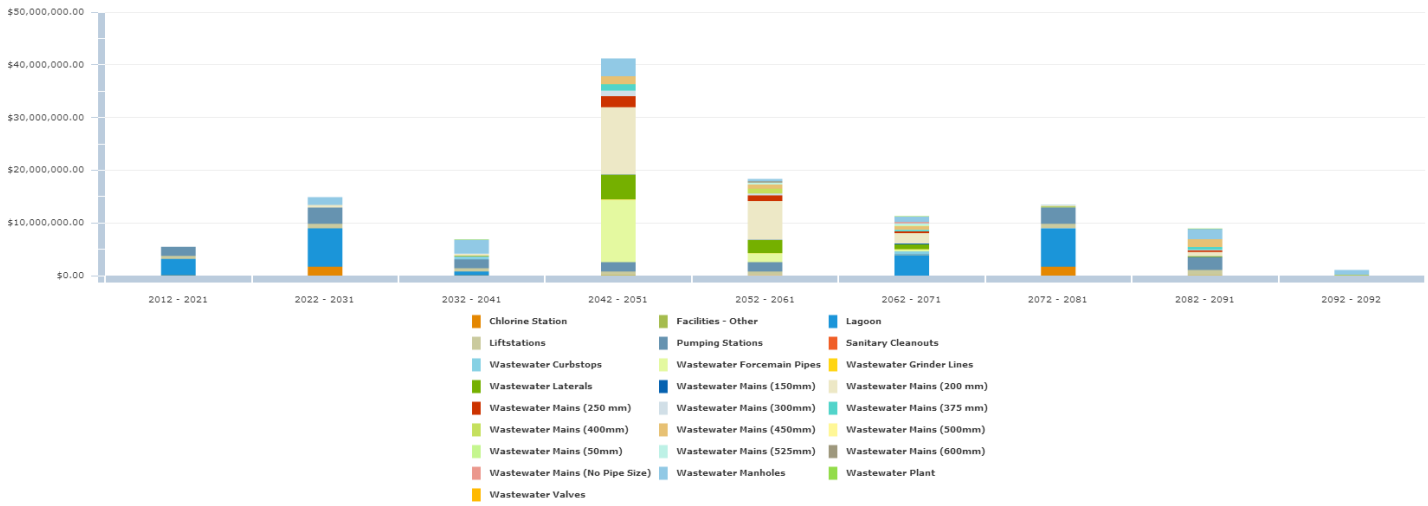
For the purpose of this report "useful life" data for each asset class was obtained from the accounting data within the CityWide software database. This proposed useful life is used to determine replacement needs of individual assets, which are calculated in the system as part of the overall financial requirements.

Asset Useful Life in Years		
Asset Type	Asset Component	Useful Life in Years
Sanitary Sewer Network	Sanitary Cleanouts	30
	Curbstops - 38mm	30
	Curbstops - 50mm	30
	Forcemain Pipes - PVC/PE	60
	Forcemain Pipes - Ductile Iron	70
	Forcemain Pipes - Asbestos Cement	80
	Wastewater Laterals - 100mm	40-80
	Wastewater Laterals - 125mm	30-80
	Wastewater Laterals - 150mm	40-80
	Wastewater Laterals - 200mm	80
	Wastewater Laterals - Other	40-80
	Mains - Local (50mm)	60
	Mains - Local (150mm) - PVC	60
	Mains - Local (150mm) - HDPE	60-80
	Mains - Local (200mm)	30-80
	Mains - Local (250mm)	30-80
	Mains - Local (300mm)	40-80
	Mains - Local (375mm)	30-60
	Mains - Local (400mm)	60-80
	Mains - Local (450mm)	30-80
	Mains - Local (500mm)	60
	Mains - Local (525mm)	60
	Mains - Local (600mm)	60

	Mains - Local (No Pipe Size)	45-80
	Lift Stations	12-50
	Chlorine Station	12-50
	Pumping Stations	12-50
	Wastewater Plant	25
	Facilities - Other	35
	Grinder Lines - 32mm	60
	Grinder Lines - 38mm	60
	Grinder Lines - 50mm	60
	Grinder Lines - No Pipe Size	60
	Manholes	15-60
	Valves	40
	Lagoon	50

As field condition information becomes available in time, the data should be loaded into the CityWide system in order to increasingly have a more accurate picture of current asset performance age and, therefore, future replacement requirements. The following graph shows the current projection of sanitary sewer main replacements based on the age of the asset only.

Sanitary Sewer Main Replacement Profile



3.7.6 How much money do we need?

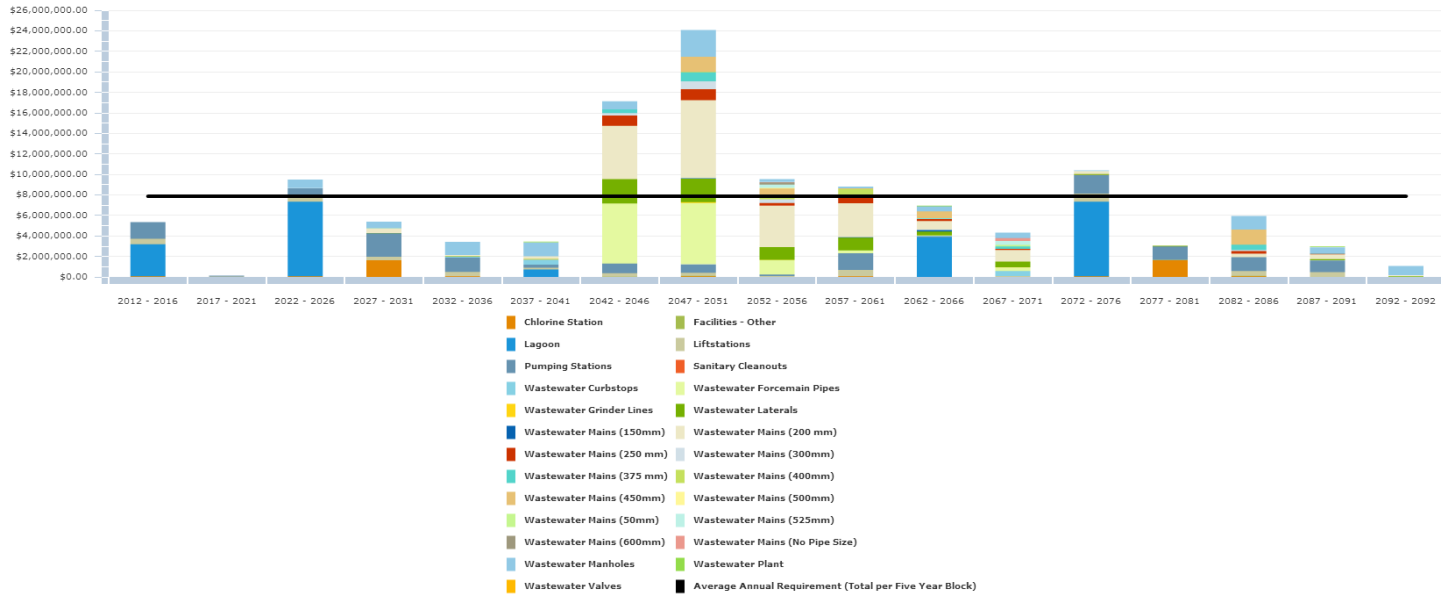
The analysis completed to determine capital revenue requirements was based on the following assumptions:

1. Replacement costs are based upon the unit costs identified within the "What is it worth" section above.
2. The timing for individual sewer main replacement was defined by the replacement year as described in the "When do you need to do it?" section above.
3. All values are presented in 2012 dollars.
4. The analysis was run for an 80 year period to ensure all assets went through at least one iteration of replacement, therefore providing a sustainable projection.

3.7.7 How do we reach sustainability?

Based upon the above assumptions, the average annual revenue required to sustain Kincardine's sanitary sewer network is approximately **$1,574,000**. Based on Kincardine's current annual funding of **$1,419,000**, there is an annual **deficit of $155,000**. As such, the municipality received a Funding vs. Need rating of 'B'. The following graph presents five year blocks of expenditure requirements against the sustainable funding threshold line.

Sustainable Revenue Requirements



In conclusion, the sanitary sewer network, from an age based analysis only, is generally in fair condition. There are replacement needs to be addressed totaling approximately $5 million over the next 5 years. It should be noted, however, that a condition assessment program would outline any pipes that have accelerated deterioration and could be good candidates for a rehabilitation program. This is discussed further in the Asset Management Strategy portion of the Asset Management Plan.

3.7.8 Recommendations

The municipality received an overall rating of 'C' for its sanitary sewer network, calculated from the Condition vs. Performance and the Funding vs. Need ratings. Accordingly, we recommend the following:

1. A condition assessment program should be established for the sanitary sewer network to gain a better understanding of current condition and performance as outlined further within the "Asset Management Strategy" section of this AMP.

2. Once the above study is complete or underway, the condition data should be loaded into the CityWide software and an updated "current state of the infrastructure" analysis should be generated.

3. An appropriate % of asset replacement value should be used for operations and maintenance activities on an annual basis. This should be determined through a detailed analysis of O & M activities and be added to future AMP reporting.

4. The Infrastructure Report Card should be updated on an annual basis.

3.8 Storm Sewer Network

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INFRASTRUCTURE REPORT CARD GRADE

3.8 Storm Sewer Network

3.8.1 What do we own?

The inventory components of the Storm Sewer Collection system are outlined in the table below. The entire network consists of approximately 56km of sewer mains.

Storm Sewer Network Inventory

Asset Type	Asset Component	Quantity/Units
Storm Sewer Network	Mains (100mm-250mm)	16,877m
	Mains (300mm-575mm)	32,802m
	Mains (600mm-875mm)	5610m
	Mains (890mm-1500mm)	1774m
	Mains (No Pipe Size)	406m
	Storm Sewer Laterals	3945m
	Storm Sewer Culverts	28
	Storm Sewer Catch Basins	1349
	Manholes	528

The storm sewer network data was extracted from the Tangible Capital Asset and G.I.S. modules of the CityWide software suite.

3.8.2 What is it worth?

The estimated replacement value of the storm sewer network, in 2012 dollars, is approximately $24 million.

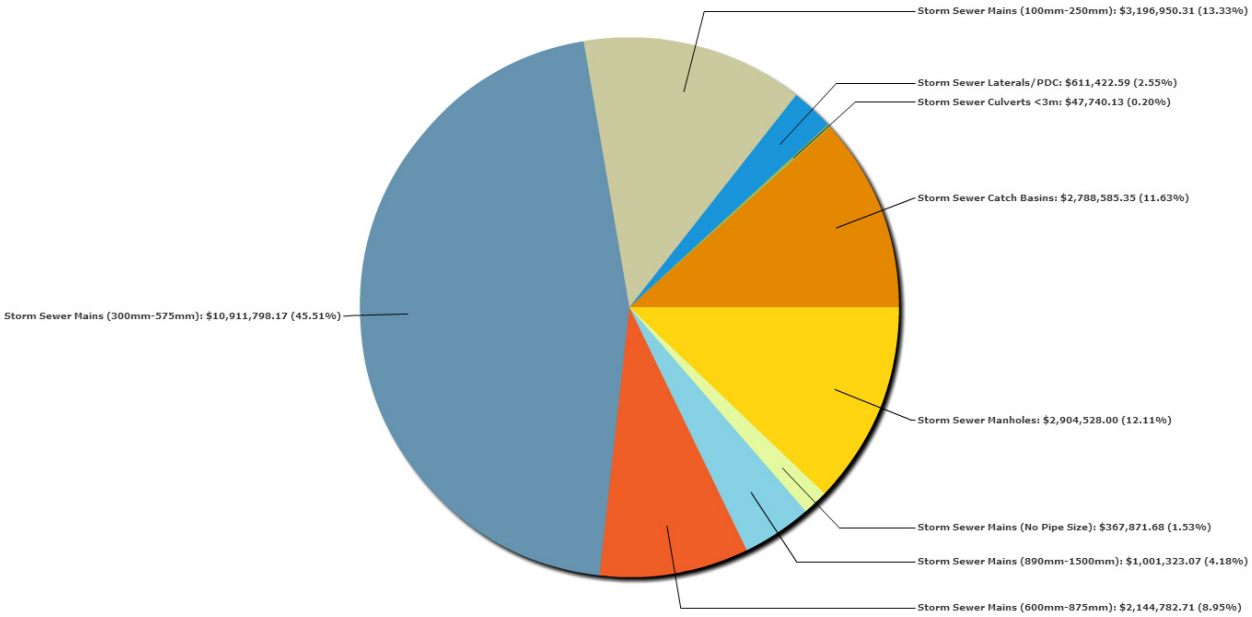
Storm Replacement Value

Asset Type	Asset Component	Quantity/Units	2012 Unit Replacement Cost	2012 Overall Replacement Cost
	Mains - Local (100mm)	327.18	$248.54/m	$81,317
	Mains - Local (125mm)	261.35	$230.68/m	$60,288
	Mains - Local (150mm)	621.84	$124.37/m	$77,338
	Mains - Local (150mm) - HDPE	5722.44	$119.62/m	$684,518
	Mains - Local (200mm)	1954.17	$219.64/m	$429,214
	Mains - Local (250mm)	7989.86	$233.33/m	$1,864,275
	Mains - Local (300mm)	269.98	$183.55/m	$49,554
	Mains - Local (300mm) - HDPE	1932.59	$315.65/m	$610,022
	Mains - Local (300mm) - Concrete	18376.28	$331.51/m	$6,091,933
	Mains - Local (350mm)	203.67	$271.90/m	$55,378
	Mains - Local (375mm)	3906.32	$328.17/m	$1,281,938
	Mains - Local (375mm) - HDPE	560.6	$340.42/m	$190,841

	Mains - Local (400mm)	198.36	$324.27/m	$64,323
	Mains - Local (450mm)	3518	$345.50/m	$1,215,602
	Mains - Local (450mm) - HDPE	678.44	$351.11/m	$238,207
	Mains - Local (480mm)	12	NRBCPI	$3,979
	Mains - Local (500mm) - HDPE	275.83	$346.78/m	$95,651
	Mains - Local (500mm) - Concrete	2415.43	$349.75/m	$844,795
	Mains - Local (525mm)	396.97	$375.23/m	$148,956
	Mains - Local (575mm)	57.38	$359.34/m	$20,619
	Mains - Local (600mm)	1919.23	$333.58/m	$640,217
	Mains - Local (600mm) - HDPE	360.51	$338.75/m	$122,123
	Mains - Local (650mm)	1552.76	$428.82/m	$665,854
	Mains - Local (675mm)	319.13	$356.22/m	$113,681
	Mains - Local (750mm)	1187.23	$433.86/m	$515,090
	Mains - Local (825mm)	151.5	NRBCPI	$27,975
	Mains - Local (875mm)	119.88	$499.21/m	$59,843
	Mains - Local (890mm)	50.65	NRBCPI	$25,337
	Mains - Local (900mm)	1148.5	$461.28/m	$529,781
	Mains -Local (1200mm)	405.78	$757.33/m	$307,307
	Mains - Local (1375mm)	155.05	$820.39/m	$127,198
	Mains - Local (1500mm)	14.26	$820.41/m	$11,700
	Mains (No Pipe Size)	405.55	NRBCPI	$367,872
	Storm Sewer Laterals (100mm) - PVC DR	866.02	$198.40/m	$171,818
	Storm Sewer Laterals (100mm) - PVC	636.59	$170.71/m	$108,673
	Storm Sewer Laterals (125mm)	490.7	$93.58/m	$45,920
	Storm Sewer Laterals (150mm)	1726.64	$98.90/m	$170,764
	Storm Sewer Laterals (Other)	225.22	NRBCPI	$114,247
	Storm Sewer Culverts (450mm x 6m)	5	$1465.31/each	$7,326
	Storm Sewer Culverts (400mm x 6m)	20	$1605/each	$32,100
	Storm Sewer Culverts (Other)	3	NRBCPI	$8,314
	Storm Sewer Catch Basins	1349	$2067.15/m	$2,788,585
	Manholes	528	$5501/each	$2,904,528
				$23,975,001

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

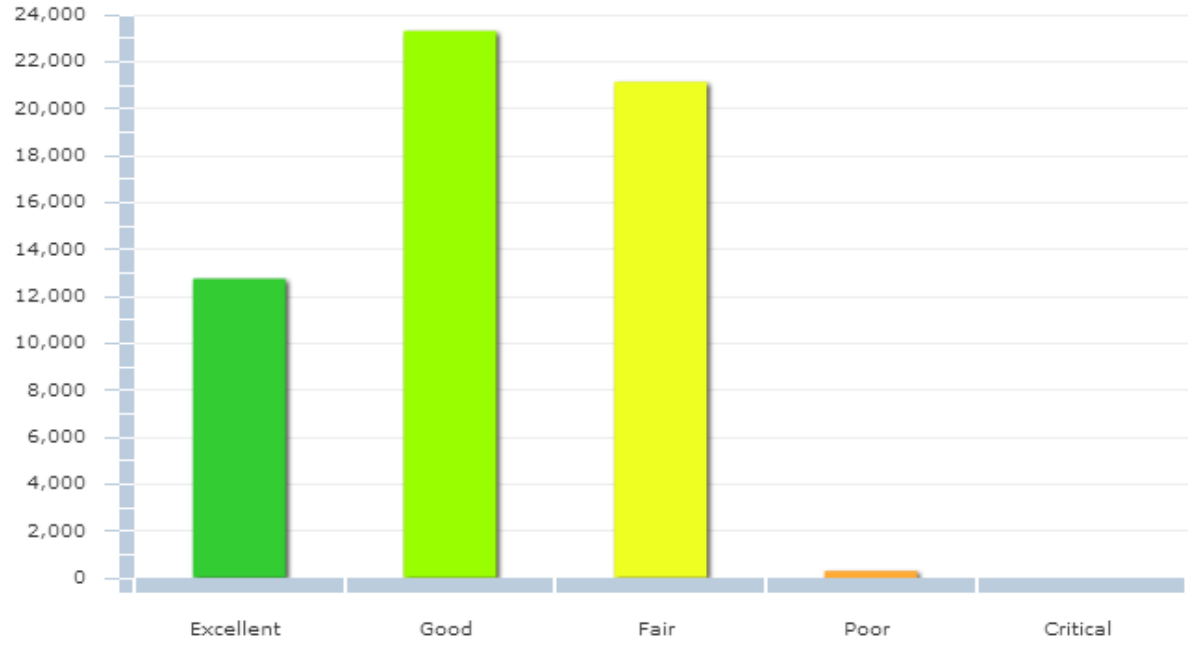
Storm Sewer Network Components



3.8.3 What condition is it in?

The municipality's storm sewer mains are all in fair to excellent condition. However, 32% of its catch basins, culverts, and man holes are in poor condition. As such, the municipality received a Condition vs. Performance rating of 'C+'.

Storm Sewer Network Condition by Length (metres)



3.8.4 What do we need to do to it?

There are generally four distinct phases in an assets life cycle. These are presented at a high level for the storm sewer network below. Further detail is provided in the "Asset Management Strategy" section of this AMP.

Addressing Asset Needs

Phase	Lifecycle Activity	Asset Age
Minor Maintenance	Activities such as inspections, monitoring, cleaning and flushing, zoom camera and CCTV inspections, etc.	1st Qtr
Major Maintenance	Activities such as repairing manholes and replacing individual small sections of pipe.	2nd Qtr
Rehabilitation	Rehabilitation events such as structural lining of pipes are extremely cost effective and provide an additional 75 plus years of life.	3rd Qtr
Replacement	Pipe replacements	4th Qtr

3.8.5 When do we need to do it?

For the purpose of this report "useful life" data for each asset class was obtained from the accounting data within the CityWide software database. This proposed useful life is used to determine replacement needs of individual assets, which are calculated in the system as part of the overall financial requirements.

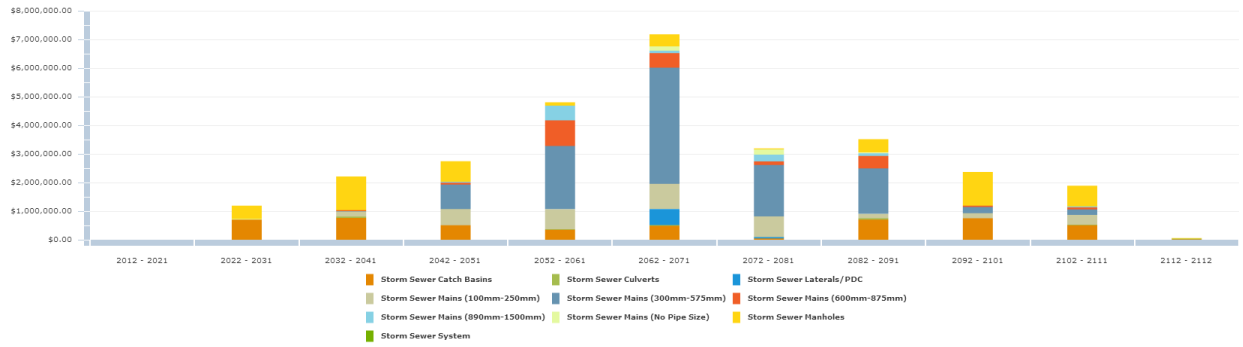
Asset Useful Life in Years

Asset Type	Asset Component	Useful Life in Years
Storm Sewer Network	Mains - Local (100mm)	60-80
	Mains - Local (125mm)	80
	Mains - Local (150mm)	60-100
	Mains - Local (150mm) - HDPE	60
	Mains - Local (200mm)	50-100
	Mains - Local (250mm)	60-100
	Mains - Local (300mm)	60-80
	Mains - Local (300mm) - HDPE	60
	Mains - Local (300mm) - Concrete	50-100
	Mains - Local (350mm)	80-100
	Mains - Local (375mm)	50-100
	Mains - Local (375mm) - HDPE	60
	Mains - Local (400mm)	80
	Mains - Local (450mm)	50-100
	Mains - Local (450mm) - HDPE	60
	Mains - Local (480mm)	60
	Mains - Local (500mm) - HDPE	60
	Mains - Local (500mm) - Concrete	80-100
	Mains - Local (525mm)	60
	Mains - Local (575mm)	80

	Mains - Local (600mm)	80-100
	Mains - Local (600mm) - HDPE	60-80
	Mains - Local (650mm)	80-100
	Mains - Local (675mm)	60-100
	Mains - Local (750mm)	60-80
	Mains - Local (825mm)	100
	Mains - Local (875mm)	80
	Mains - Local (890mm)	80
	Mains - Local (900mm)	80-100
	Mains -Local (1200mm)	80
	Mains - Local (1375mm)	80
	Mains - Local (1500mm)	80
	Mains (No Pipe Size)	60-100
	Storm Sewer Laterals (100mm) - PVC DR	60
	Storm Sewer Laterals (100mm) - PVC	60
	Storm Sewer Laterals (125mm)	60
	Storm Sewer Laterals (150mm)	60
	Storm Sewer Laterals (Other)	60
	Storm Sewer Culverts (450mm x 6m)	25
	Storm Sewer Culverts (400mm x 6m)	25
	Storm Sewer Culverts (Other)	25
	Storm Sewer Catch Basins	60
	Manholes	60

As field condition information becomes available in time, the data should be loaded into the CityWide system in order to increasingly have a more accurate picture of current asset performance age and, therefore, future replacement requirements. The following graph shows the current projection of storm sewer main replacements based on the age of the asset only.

Storm Sewer Main Replacement Profile



3.8.6 How much money do we need?

The analysis completed to determine capital revenue requirements was based on the following assumptions:

1. Replacement costs are based upon the unit costs identified within the "What is it worth" section above.
2. The timing for individual storm sewer main replacement was defined by the replacement year as described in the "When do you need to do it?" section above.
3. All values are presented in 2012 dollars.
4. The analysis was run for a 100 year period to ensure all assets went through one iteration of replacement, therefore providing a sustainable projection.

3.8.7 How do we reach sustainability?

Based upon the above assumptions, the average annual revenue required to sustain Kincardine's storm sewer network is approximately **$331,000**. Based on Kincardine's current annual funding of **$102,000**, there is an annual **deficit of $229,000**. As such, the municipality received a Funding vs. Need rating of 'F'.

Storm Sewer Main Replacement Profile

In conclusion, Kincardine's storm sewer collection network, based on age data only, is generally in good condition with no immediate replacement needs. However, a field condition assessment program will aid in understanding and prioritizing overall needs for rehabilitation and replacement and will assist with optimizing the long term budget. Further detail is outlined within the "asset management strategy" section of this AMP.

3.8.8 Recommendations

The municipality received an overall rating of 'D' for its storm sewer network, calculated from the Condition vs. Performance and the Funding vs. Need ratings. Accordingly, we recommend the following:

1. A condition assessment program should be established for the storm sewer network to gain a better understanding of current condition and performance as outlined further within the "Asset Management Strategy" section of this AMP.

2. Once the above study is complete or underway, the condition data should be loaded into the CityWide software and an updated "current state of the infrastructure" analysis should be generated.

3. An appropriate % of asset replacement value should be used for operations and maintenance activities on an annual basis. This should be determined through a detailed analysis of O & M activities and be added to future AMP reporting.

4. The Infrastructure Report Card should be updated on an annual basis.

4.0 Infrastructure Report Card

CUMULATIVE GPA

D+

Infrastructure Report Card

The Municipality of Kincardine

1. Each asset category was rated on two key, equally weighted (50/50) dimensions: **Condition vs. Performance**, and **Funding vs. Need**.
2. See the "***What condition is it in***?" section details on the grade of each asset category on the Condition vs. Performance dimension.
3. See the "***How do we reach sustainability***?" section for details on the grade of each asset category on the Funding vs. Need dimension.
4. The 'Overall Rating' below is the average of the two ratings.

Asset Category	Condition vs. Performance	Funding vs. Need	Overall Grade	Comments
Road Network	B+	F	D	The vast majority, 94%, of the municipality's road network is in fair to excellent condition. The average annual revenue required to sustain Kincardine's paved road network is approximately **$2,625,000**. Based on Kincardine's current annual funding of **$243,000**, there is an annual **deficit of $2,382,000**.
Bridges & Culverts	C+	F	F	Virtually all, 96%, of the municipality's bridges & culverts are in fair to excellent condition. The average annual revenue required to sustain Kincardine's bridges & culverts is **$878,000**. Based on Kincardine's current annual funding of **$120,000**, there is an annual **deficit of 758,000**.
Water Network	C	C	C	While 98% of the municipality's sanitary mains are in fair to excellent condition, 2/3 of its facilities, based on replacement cost, are in critical condition. The average annual revenue required to sustain Kincardine's water network is approximately **$1,682,000**. Based on Kincardine's current annual funding of **$1,176,000**, there is an annual **deficit of $506,000**.
Sanitary Sewer Network	C	B	C	While 98% of the sanitary mains are in fair to excellent condition, nearly 91% of the municipality's appurtenances and facilities assets are in poor or critical condition. The average annual revenue required to sustain Kincardine's sanitary sewer network is approximately **$1,574,000**. Based on Kincardine's current annual funding of **$1,419,000**, there is an annual **deficit of $155,000.**
Storm Sewer Network	C+	F	D	The municipality's storm sewer mains are all in fair to excellent condition. However, 32% of its catch basins, culverts, and man holes are in poor condition. The average annual revenue required to sustain Kincardine's storm sewer network is approximately **$331,000**. Based on Kincardine's current annual funding of **$102,000**, there is an annual **deficit of 229,000**.

5.0 Desired Levels of Service

Desired levels of service are high level indicators, comprising many factors, as listed below, that establish defined quality thresholds at which municipal services should be supplied to the community. They support the organization's strategic goals and are based on customer expectations, statutory requirements, standards, and the financial capacity of a municipality to deliver those levels of service.

Levels of Service are used:

- to inform customers of the proposed type and level of service to be offered;
- to identify the costs and benefits of the services offered;
- to assess suitability, affordability and equity of the services offered;
- as a measure of the effectiveness of the asset management plan
- as a focus for the AM strategies developed to deliver the required level of service

In order for a municipality to establish a desired level of service, it will be important to review the key factors involved in the delivery of that service, and the interactions between those factors. In addition, it will be important to establish some key performance metrics and track them over an annual cycle to gain a better understanding of the current level of service supplied.

Within this first Asset Management Plan, key factors affecting level of service will be outlined below and some key performance indicators for each asset type will be outlined for further review. This will provide a framework and starting point from which the municipality can determine future desired levels of service for each infrastructure class.

5.1 Key factors that influence a level of service:

- Strategic and Corporate Goals
- Legislative Requirements
- Expected Asset Performance
- Community Expectations
- Availability of Finances

5.1.1 Strategic and Corporate Goals

Infrastructure levels of service can be influenced by strategic and corporate goals. Strategic plans spell 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 level of importance that a community's vision is dependent upon infrastructure, will ultimately affect the levels of service provided or those levels that it ultimately aspires to deliver.

5.1.2 Legislative Requirements

Infrastructure levels of service are directly influenced by many legislative and regulatory requirements. For instance, the Safe Drinking Water Act, the Minimum Maintenance Standards for municipal highways, building codes, and the Accessibility for Ontarians with Disabilities Act are all legislative requirements that prevent levels of service from declining below a certain standard.

5.1.3 Expected Asset Performance

A level of service will be affected by current asset condition, and performance and limitations in regards to safety, capacity, and the ability to meet regulatory and environmental requirements. In addition, the design life of the asset, the maintenance items required, the rehabilitation or replacement schedule of the asset, and the total costs, are all critical factors that will affect the level of service that can be provided.

5.1.4 Community Expectations

Levels of services are directly related to the expectations that the general public has from the infrastructure. For example, the public will have a qualitative opinion on what an acceptable road looks like, and a quantitative one on how long it should take to travel between two locations. Infrastructure costs

are projected to increase dramatically in the future, therefore it is essential that the public is not only consulted, but also be educated, and ultimately make choices with respect to the service levels that they wish to pay for.

5.1.5 Availability of Finances

Availability of finances will ultimately control all aspects of a desired level of service. Ideally, these funds must be sufficient to achieve corporate goals, meet legislative requirements, address an asset's life cycle needs, and meet community expectations. Levels of service will be dictated by availability of funds or elected officials' ability to increase funds, or the community's willingness to pay.

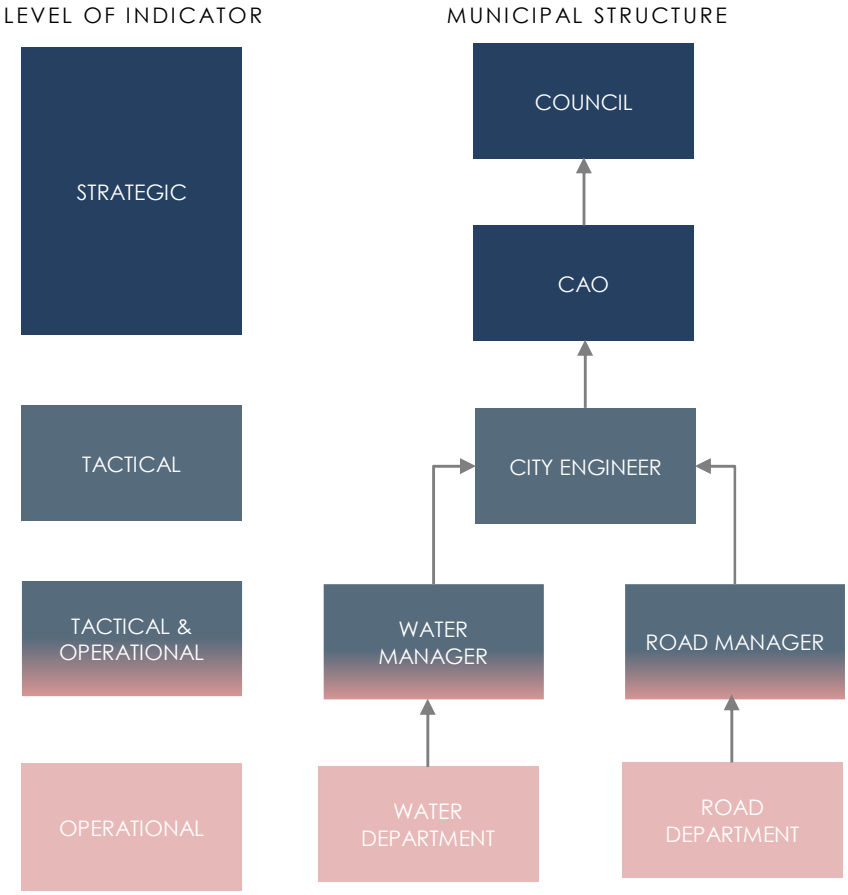
5.2 Key Performance Indicators

Performance measures or key performance indicators (KPIs) that track levels of service should be specific, measurable, achievable, relevant, and timebound (SMART). Many good performance measures can be established and tracked through the CityWide suite of software products. In this way, through automation, results can be reviewed on an annual basis and adjustments can be made to the overall asset management plan, including the desired level of service targets.

In establishing measures, a good rule of thumb to remember is that maintenance activities ensure the performance of an asset and prevent premature aging, whereas rehab activities extend the life of an asset. Replacement activities, by definition, renew the life of an asset. In addition, these activities are constrained by resource availability (in particular, finances) and strategic plan objectives. Therefore, performance measures should not just be established for operating and maintenance activities, but also for the strategic, financial, and tactical levels of the asset management program. This will assist all levels of program delivery to review their performance as part of the overall level of service provided.

This is a very similar approach to the "balanced score card" methodology, in which financial and non-financial measures are established and reviewed to determine whether current performance meets expectations. The "balanced score card", by design, links day to day operations activities to tactical and strategic priorities in order to achieve an overall goal, or in this case, a desired level of service.

The structure of accountability and level of indicator with this type of process is represented in the following table, modified from the InfraGuide's best practice document, "Developing Indicators and Benchmarks" published in April 2003.



As a note, a caution should be raised over developing too many performance indicators that may result in data overload and lack of clarity. It is better to develop a select few that focus in on the targets of the asset management plan.

Outlined below for each infrastructure class is a suggested service description, suggested service scope, and suggested performance indicators. These should be reviewed and updated in each iteration of the AMP.

5.3 Transportation Services

5.3.1 Service Description

The municipality's transportation network comprises approximately 483 centreline km of road, of which approximately 153km are gravel and 330km are paved roads. The transport network also includes 27 bridges, 52 culverts, 32km of sidewalk, and the associated curbs, street lights, signs and guiderails.

Together, the above infrastructure enables the municipality to deliver transportation and pedestrian facility services and give people a range of options for moving about in a safe and efficient manner.

5.3.2 Scope of Services

- **Movement** – providing for the movement of people and goods.
- **Access** – providing access to residential, commercial, and industrial properties and other community amenities.
- **Recreation** –providing for recreational use, such as walking, cycling, or special events such as parades.

5.3.3 Performance Indicators (reported annually)

Performance Indicators (reported annually)	
Strategic Indicators	■ percentage of total reinvestment compared to asset replacement value ■ completion of strategic plan objectives (related to transportation)
Financial Indicators	■ annual revenues compared to annual expenditures ■ annual replacement value depreciation compared to annual expenditures ■ total cost of borrowing compared to total cost of service ■ revenue required to maintain annual network growth
Tactical Indicators	■ percentage of road network rehabilitated / reconstructed ■ value of bridge / large culvert structures rehabilitated or reconstructed ■ overall road condition index as a percentage of desired condition index ■ overall bridge condition index as a percentage of desired condition index ■ annual adjustment in condition indexes ■ annual percentage of network growth ■ percent of paved road lane km where the condition is rated poor or critical ■ number of bridge / large culvert structures where the condition is rated poor or critical ■ percentage of road network replacement value spent on operations and maintenance ■ percentage of bridge / large culvert structures replacement value spent on operations and maintenance
Operational Indicators	■ percentage of road network inspected within last 5 years ■ percentage of bridge / large culvert structures inspected within last two years ■ operating costs for paved roads per lane km ■ operating costs for gravel roads per lane km ■ operating costs for bridge / large culvert structures per square metre ■ number of customer requests received annually ■ percentage of customer requests responded to within 24 hours

5.4 Water / Sanitary / Storm Networks

5.4.1 Service Description

The municipality's water distribution network comprises 100km of water main, meters, valves and hydrants. The waste water network comprises 80 km of sanitary sewer main, manholes and a logoon. The storm water network comprises 56km of storm main, manholes, and catchbasins.

Together, the above infrastructure enables the municipality to deliver a potable water distribution service, and a waste water and storm water collection service to the residents of the municipality.

5.4.2 Scope of services

- The provision of clean safe drinking water through a distribution network of water mains and pumps.
- The removal of waste water through a collection network of sanitary sewer mains.
- The removal of storm water through a collection network of storm sewer mains, and catch basins

5.4.3 Performance Indicators (reported annually)

Performance Indicators (reported annually)	
Strategic Indicators	■ Percentage of total reinvestment compared to asset replacement value ■ Completion of strategic plan objectives (related water / sanitary / storm)
Financial Indicators	■ Annual revenues compared to annual expenditures ■ Annual replacement value depreciation compared to annual expenditures ■ Total cost of borrowing compared to total cost of service ■ Revenue required to maintain annual network growth ■ Lost revenue from system outages
Tactical Indicators	■ Percentage of water / sanitary / storm network rehabilitated / reconstructed ■ Overall water / sanitary / storm network condition index as a percentage of desired condition index ■ Annual adjustment in condition indexes ■ Annual percentage of growth in water / sanitary / storm network ■ Percentage of mains where the condition is rated poor or critical for each network ■ Percentage of water / sanitary / storm network replacement value spent on operations and maintenance
Operational Indicators	■ Percentage of water / sanitary / storm network inspected ■ Operating costs for the collection of wastewater per kilometre of main. ■ Number of wastewater main backups per 100 kilometres of main ■ Operating costs for storm water management (collection, treatment, and disposal) per kilometre of drainage system. ■ Operating costs for the distribution/ transmission of drinking water per kilometre of water distribution pipe. ■ Number of days when a boil water advisory issued by the medical officer of health, applicable to a municipal water supply, was in effect. ■ Number of water main breaks per 100 kilometres of water distribution pipe in a year. ■ Number of customer requests received annually per water / sanitary / storm networks ■ Percentage of customer requests responded to within 24 hours per water / sanitary / storm network

6.0 Asset Management Strategy

6.1 Objective

To outline and establish a set of planned actions, based on best practice, that will enable the assets to provide a desired and sustainable level of service, while managing risk, at the lowest life cycle cost.

The Asset Management Strategy will develop an implementation process that can be applied to the needs identification and prioritization of renewal, rehabilitation, and maintenance activities. This will assist in the production of a 10 year plan, including growth projections, to ensure the best overall health and performance of the municipality's infrastructure.

This section includes an overview of condition assessment techniques for each asset class; the life cycle interventions required, including interventions with the best ROI; and prioritization techniques, including risk, to determine which priority projects should move forward into the budget first.

6.2 Non-Infrastructure Solutions and Requirements

The municipality should explore, as requested through the provincial requirements, which non-infrastructure solutions should be incorporated into the budgets for the road, water, sewer (sanitary and storm), and bridges & culverts programs. Non- Infrastructure solutions are such items as studies, policies, condition assessments, consultation exercises, etc., that could potentially extend the life of assets or lower total asset program costs in the future.

Typical solutions for a municipality include linking the asset management plan to the strategic plan, growth and demand management studies, infrastructure master plans, better integrated infrastructure and land use planning, public consultation on levels of service, and condition assessment programs. As part of future asset management plans, a review of these requirements should take place, and a portion of the capital budget should be dedicated for these items in each programs budget.

It is recommended, under this category of solutions, that the municipality implement holistic condition assessment programs for their road, water, sanitary, and storm sewer networks. This will lead to higher understanding of infrastructure needs, enhanced budget prioritization methodologies, and a clearer path of what is required to achieve sustainable infrastructure programs.

6.3 Condition Assessment Programs

The foundation of good asset management practice is based on having comprehensive and reliable information on the current condition of the infrastructure. Municipalities need to have a clear understanding regarding performance and condition of their assets, as all management decisions regarding future expenditures and field activities should be based on this knowledge. An incomplete understanding about an asset may lead to its premature failure or premature replacement.

Some benefits of holistic condition assessment programs within the overall asset management process are listed below:

- Understanding of overall network condition leads to better management practices
- Allows for the establishment of rehabilitation programs
- Prevents future failures and provides liability protection
- Potential reduction in operation / maintenance costs
- Accurate current asset valuation
- Allows for the establishment of risk assessment programs
- Establishes proactive repair schedules and preventive maintenance programs
- Avoids unnecessary expenditures

- Extends asset service life therefore improving level of service
- Improves financial transparency and accountability
- Enables accurate asset reporting which, in turn, enables better decision making

Condition assessment can involve different forms of analysis such as subjective opinion, mathematical models, or variations thereof, and can be completed through a very detailed or very cursory approach.

When establishing the condition assessment of an entire asset class, the cursory approach (metrics such as good, fair, poor, critical) is used. This will be a less expensive approach when applied to thousands of assets, yet will still provide up to date information, and will allow for detailed assessment or follow up inspections on those assets captured as poor or critical condition later.

The following section outlines condition assessment programs available for road, bridge, sewer, and water networks that would be useful for the municipality.

6.3.1 Pavement Network Inspections

Typical industry pavement inspections are performed by consulting firms using specialised assessment vehicles equipped with various electronic sensors and data capture equipment. The vehicles will drive the entire road network and typically collect two different types of inspection data – surface distress data and roughness data.

Surface distress data involves the collection of multiple industry standard surface distresses, which are captured either electronically, using sensing detection equipment mounted on the van, or visually, by the van's inspection crew. Examples of surface distresses are:

- **For asphalt surfaces**
  alligator cracking; distortion; excessive crown; flushing; longitudinal cracking; map cracking; patching; edge cracking; potholes; ravelling; rippling; transverse cracking; wheel track rutting

- **For concrete surfaces**
  coarse aggregate loss; corner 'C' and 'D' cracking; distortion; joint faulting; joint sealant loss; joint spalling; linear cracking; patching; polishing; potholes; ravelling; scaling; transverse cracking

Roughness data capture involves the measurement of the roughness of the road, measured by lasers that are mounted on the inspection van's bumper, calibrated to an international roughness index.

Most firms will deliver this data to the client in a database format complete with engineering algorithms and weighting factors to produce an overall condition index for each segment of roadway. This type of scoring database is ideal for upload into the CityWide software database, in order to tag each road with a present condition and then further life cycle analysis to determine what activity should be completed on which road, in what timeframe, and to calculate the cost for the work will be completed within the CityWide system.

The above process is an excellent way to capture road condition as the inspection trucks will provide detailed surface and roughness data for each road segment, and often include video or street imagery. A very rough industry estimate of cost would be about $100 per centreline km of road, which means it would cost the municipality approximately $33,000 for the 330 centreline km of paved road network.

Another option for a cursory level of condition assessment is for municipal road crews to perform simple windshield surveys as part of their regular patrol. Many municipalities have created data collection inspection forms to assist this process and to standardize what presence of defects would constitute a good, fair, poor, or critical score. Lacking any other data for the complete road network, this can still be seen as a good method and will assist greatly with the overall management of the road network. The CityWide Works software has a road patrol component built in that could capture this type of inspection data during road patrols in the field, enabling later analysis of rehabilitation and replacement needs for budget development.

It is recommended that the municipality establish a pavement condition assessment program and that a portion of capital funding is dedicated to this.

6.3.2 Bridges & Culverts (greater than 3m) Inspections

Ontario municipalities are mandated by the Ministry of Transportation to inspect all structures that have a span of 3 metres or more, according to the OSIM (Ontario Structure Inspection Manual). At present, in the municipality, there are 79 structures that meet this criterion.

Structure inspections must be performed by, or under the guidance of, a structural engineer, must be performed on a biennial basis (once every two years), and include such information as structure type, number of spans, span lengths, other key attribute data, detailed photo images, and structure element by element inspection, rating and recommendations for repair, rehabilitation, and replacement.

The best approach to develop a 10 year needs list for the municipality's structure portfolio would be to have the structural engineer who performs the inspections to develop a maintenance requirements report, and rehabilitation and replacement requirements report as part of the overall assignment. In addition to refining the overall needs requirements, the structural engineer should identify those structures that will require more detailed investigations and non-destructive testing techniques. Examples of these investigations are:

- Detailed deck condition survey
- Non-destructive delamination survey of asphalt covered decks
- Substructure condition survey
- Detailed coating condition survey
- Underwater investigation
- Fatigue investigation
- Structure evaluation

Through the OSIM recommendations and additional detailed investigations, a 10 year needs list will be developed for the municipality's bridges.

The 10 year needs list developed could then be further prioritized using risk management techniques to better allocate resources. Also, the results of the OSIM inspection for each structure, whether BCI (bridge condition index) or general condition (good, fair, poor, critical) should be entered into the CityWide software to update results and analysis for the development of the budget.

6.3.3 Sewer Network Inspections (Sanitary & Storm)

The most popular and practical type of sanitary and storm sewer assessment is the use of Closed Circuit Television Video (CCTV). The process involves a small robotic crawler vehicle with a CCTV camera attached that is lowered down a maintenance hole into the sewer main to be inspected. The vehicle and camera then travels the length of the pipe providing a live video feed to a truck on the road above where a technician / inspector records defects and information regarding the pipe. A wide range of construction or deterioration problems can be captured including open/displaced joints, presence of roots, infiltration & inflow, cracking, fracturing, exfiltration, collapse, deformation of pipe and more. Therefore, sewer CCTV inspection is a very good tool for locating and evaluating structural defects and general condition of underground pipes.

Even though CCTV is an excellent option for inspection of sewers it is a fairly costly process and does take significant time to inspect a large volume of pipes.

Another option in the industry today is the use of Zoom Camera equipment. This is very similar to traditional CCTV, however, a crawler vehicle is not used but in it's a place a camera is lowered down a maintenance hole attached to a pole like piece of equipment. The camera is then rotated towards each connecting pipe and the operator above progressively zooms in to record all defects and information about each pipe. The downside to this technique is the further down the pipe the image is zoomed, the less clarity is available to accurately record defects and measurement. The upside is the process is far quicker and significantly less expensive and an assessment of the manhole can be provided as well. Also, it is important to note that 80% of pipe deficiencies generally occur within 20 metres of each manhole. The following is a list of advantages of utilizing Zoom Camera technology:

- A time and cost efficient way of examining sewer systems;
- Problem areas can be quickly targeted;
- Can be complemented by a conventional camera (CCTV), if required afterwards;
- In a normal environment, 20 to 30 manholes can be inspected in a single day, covering more than 1,500 meters of pipe;
- Contrary to the conventional camera approach, cleaning and upstream flow control is not required prior to inspection;
- Normally detects 80% of pipe deficiencies, as most deficiencies generally occur within 20 meters of manholes.

The following table is based on general industry costs for traditional CCTV inspection and Zoom Camera inspection; however, costs should be verified through local contractors. It is for illustrative purposes only but supplies a general idea of the cost to inspect Kincardine's entire sanitary and storm networks.

Sanitary and Sewer Inspection Cost Estimates

Sewer Network	Assessment Activity	Cost	Metres of Main / # of Manholes	**Total**
Sanitary	Full CCTV	$10 (per m)	80,000m	**$800,000**
	Zoom	$300 (per mh)	875 manholes	**$262,500**
Storm	Full CCTV	$10 (per m)	56,000m	**$560,000**
	Zoom	$300 (Per mh)	528 manholes	**$158,400**

It can be seen from the above table that there is a significant cost savings achieved through the use of Zoom Camera technology. A good industry trend and best practice is to inspect the entire network using Zoom Camera technology and follow up on the poor and critical rated pipes with more detail using a full CCTV inspection. In this way, inspection expenditures are kept to a minimum, however, an accurate assessment on whether to rehabilitate or replace pipes will be provided for those with the greatest need.

It is recommended that the municipality establish a sewer condition assessment program and that a portion of capital funding is dedicated to this.

In addition to receiving a video and defect report of each pipe's CCTV or Zoom camera inspection, many companies can now provide a database of the inspection results, complete with scoring matrixes that provide an overall general condition score for each pipe segment that has been assessed. Typically pipes are scored from 1 – 5, with 1 being a relatively new pipe and 5 being a pipe at the end of its design life. This type of scoring database is ideal for upload into the CityWide software database, in order to tag each pipe with a present condition and then further life cycle analysis to determine what activity should be done to which pipe, in what timeframe, and to calculate the cost for the work will be completed by the CityWide system.

6.3.4 Water network inspections

Unlike sewer mains, it is very difficult to inspect water mains from the inside due to the high pressure flow of water constantly underway within the water network. Physical inspections require a disruption of service to residents, can be an expensive exercise, and are time consuming to set up. It is recommended practice that physical inspection of water mains typically only occurs for high risk, large transmission mains within the system, and only when there is a requirement. There are a number of high tech inspection techniques in the industry for large diameter pipes but these should be researched first for applicability as they are quite expensive. Examples are:

- Remote eddy field current (RFEC)
- Ultrasonic and acoustic techniques
- Impact echo (IE)
- Georadar

For the majority of pipes within the distribution network gathering key information in regards to the main and its environment can supply the best method to determine a general condition. Key data that could be used, along with weighting factors, to determine an overall condition score are listed below.

- Age
- Material Type
- Breaks
- Hydrant Flow Inspections
- Soil Condition

Understanding the age of the pipe will determine useful life remaining, however, water mains fail for many other reasons than just age. The pipe material is important to know as different pipe types have different design lives and different deterioration profiles. Keeping a water main break history is one of the best analysis tools to predict future pipe failures and to assist with programming rehabilitation and replacement schedules. Also, most municipalities perform hydrant flow tests for fire flow prevention purposes. The readings from these tests can also help determine condition of the associated water main. If a hydrant has a relatively poor flow condition it could be indicative of a high degree of encrustation within the attached water main, which could then be flagged as a candidate for cleaning or possibly lining. Finally, soil condition is important to understand as certain soil types can be very aggressive at causing deterioration on certain pipe types.

It is recommended that the municipality develop a rating system for the mains within the distribution network based on the availability of key data, and that funds are budgeted for this development.

Also, it is recommended that the municipality utilize the CityWide Works application to track water main break work orders and hydrant flow inspection readings as a starting point to develop a future scoring database for each water main.

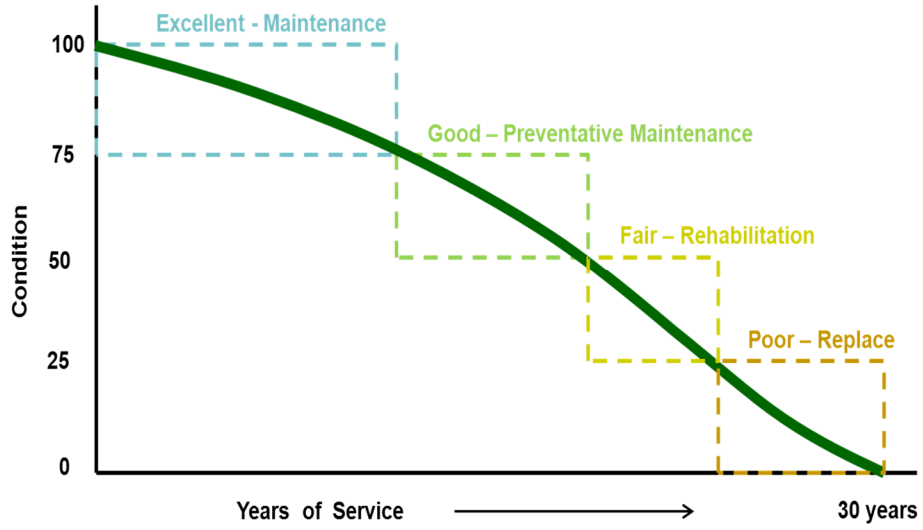
6.4 AM Strategy – Life Cycle Analysis Framework

An industry review was conducted to determine which life cycle activities can be 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. If these techniques are applied across entire asset networks or portfolios (e.g., the entire road network), the municipality could gain the best overall asset condition while expending the lowest total cost for those programs.

6.4.1 Paved Roads

The following analysis has been conducted at a fairly high level, using industry standard activities and costs for paved roads. With future updates of this Asset Management Strategy, the municipality may wish to run the same analysis with a detailed review of municipality activities used for roads and the associated local costs for those work activities. All of this information can be input into the CityWide software suite in order to perform updated financial analysis as more detailed information becomes available.

The following diagram depicts a general deterioration profile of a road with a 30 year life.



As shown above, during the road's life cycle there are various windows available for work activity that will maintain or extend the life of the asset. These windows are: maintenance; preventative maintenance; rehabilitation; and replacement or reconstruction.

The windows or thresholds for when certain work activities should be applied to also coincide approximately with the condition state of the asset as shown below:

Asset Condition and Related Work Activity: Paved Roads

Condition	Condition Range	Work Activity
Excellent condition (Maintenance only phase)	100-76	■ maintenance only
Good Condition (Preventative maintenance phase)	75 - 51	■ crack sealing ■ emulsions
Fair Condition (Rehabilitation phase)	50 -26	■ resurface - mill & pave ■ resurface - asphalt overlay ■ single & double surface treatment (for rural roads)
Poor Condition (Reconstruction phase)	25 - 1	■ reconstruct - pulverize and pave ■ reconstruct - full surface and base reconstruction
Critical Condition (Reconstruction phase)	0	■ critical includes assets beyond their useful lives which make up the backlog. They require the same interventions as the "poor" category above.

With future updates of this Asset Management Strategy the municipality may wish to review the above condition ranges and thresholds for when certain types of work activity occur, and adjust to better suit the municipality's work program. Also note: when adjusting these thresholds, it actually adjusts the level of service provided and ultimately changes the amount of money required. These threshold and condition ranges can be easily updated with the CityWide software suite and an updated financial analysis can be calculated. These adjustments will be an important component of future Asset Management Plans, as the Province requires each municipality to present various management options within the financing plan.

The table below outlines the costs for various road activities, the added life obtained for each, the condition range at which they should be applied, and the cost of 1 year added life for each (cost of activity / added life) in order to present an apples to apples comparison.

Road Lifecycle Activity Options

Treatment	Average Unit Cost (per sq. m)	Added Life (Years)	Condition Range	Cost Of Activity/Added Life
Urban Reconstruction	$205	30	25 - 0	$6.83
Urban Resurfacing	$84	15	50 - 26	$5.60
Rural Reconstruction	$135	30	25 - 0	$4.50
Rural Resurfacing	$40	15	50 - 26	$2.67
Double Surface Treatment	$25	10	50 - 26	$2.50
Routing & Crack Sealing (P.M)	$2	3	75 - 51	$0.67

As can be seen in the table above, preventative maintenance activities such as routing and crack sealing have the lowest associated cost (per sq. m) in order to obtain one year of added life. Of course, preventative maintenance activities can only be applied to a road at a relatively early point in the life cycle. It is recommended that the municipality engage in an active preventative maintenance program for all paved roads and that a portion of the maintenance budget is allocated to this.

Also, rehabilitation activities, such as urban and rural resurfacing or double surface treatments (tar and chip) for rural roads have a lower cost to obtain each year of added life than full reconstruction activities. It is recommended, if not in place already, that the municipality engages in an active rehabilitation program for urban and rural paved roads and that a portion of the capital budget is dedicated to this.

Of course, in order to implement the above programs it will be important to also establish a general condition score for each road segment, established through standard condition assessment protocols as previously described.

It is important to note that a "worst first" budget approach, whereby no life cycle activities other than reconstruction at the end of a roads life are applied, will result in the most costly method of managing a road network overall.

6.4.2 Gravel Roads

The life cycle activities required for these roads are quite different from paved roads. Gravel roads require a cycle of perpetual maintenance, including general re-grading, reshaping of the crown and cross section, gravel spot and section replacement, dust abatement and ditch clearing and cleaning.

Gravel roads can require frequent maintenance, especially after wet periods and when accommodating increased traffic. Wheel motion shoves material to the outside (as well as in-between travelled lanes), leading to rutting, reduced water-runoff, and eventual road destruction if unchecked. This deterioration process is prevented if interrupted early enough, simple re-grading is sufficient, with material being pushed back into the proper profile.

As a high proportion of gravel roads can have a significant impact on the maintenance budget, it is recommended that with further updates of this asset management plan the municipality study the traffic volumes and maintenance requirements in more detail for its gravel road network.

Similar studies elsewhere have found converting certain roadways to paved roads can be very cost beneficial especially if frequent maintenance is required due to higher traffic volumes. Roads within the gravel network should be ranked and rated using the following criteria:

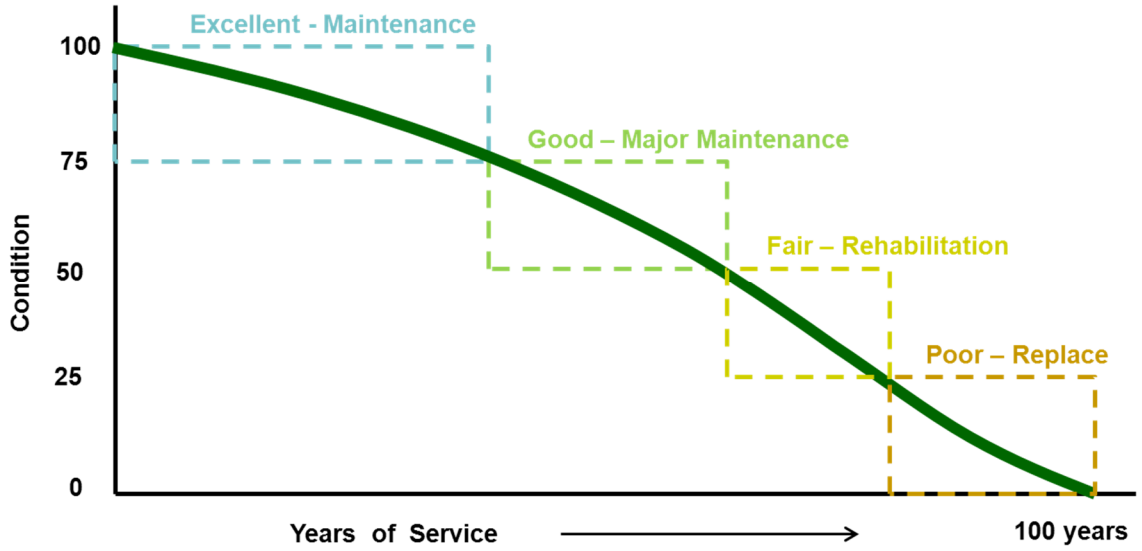
- Usage - traffic volumes and type of traffic
- Functional importance of the roadway
- Known safety issues
- Frequency of maintenance and overall expenditures required

Through the above type of analysis, a program could be introduced to convert certain gravel roadways into paved roads, reducing overall costs, and be brought forward into the long range budget.

6.4.3 Sanitary and Storm Sewers

The following analysis has been conducted at a fairly high level, using industry standard activities and costs for sanitary and storm sewer rehabilitation and replacement. With future updates of this asset management strategy, the municipality may wish to run the same analysis with a detailed review of municipality activities used for sewer mains and the associated local costs for those work activities. All of this information can be input into the CityWide software suite in order to perform updated financial analysis as more detailed information becomes available.

The following diagram depicts a general deterioration profile of a sewer main with a 100 year life.



As shown above, during the sewer main's life cycle there are various windows available for work activity that will maintain or extend the life of the asset. These windows are: maintenance; major maintenance; rehabilitation; and replacement or reconstruction.

The windows or thresholds for when certain work activities should be applied also coincide approximately with the condition state of the asset as shown below:

Asset Condition and Related Work Activity: Sewer Main

Condition	Condition Range	Work Activity
Excellent condition (Maintenance only phase)	100-76	■ maintenance only (cleaning & flushing etc.)
Good Condition (Preventative maintenance phase)	75 - 51	■ mahhole repairs ■ small pipe section repairs
Fair Condition (Rehabilitation phase)	50 -26	■ structural relining
Poor Condition (Reconstruction phase)	25 - 1	■ pipe replacement
Critical Condition (Reconstruction phase)	0	■ critical includes assets beyond their useful lives which make up the backlog. They require the same interventions as the "poor" category above.

With future updates of this Asset Management Strategy the municipality may wish to review the above condition ranges and thresholds for when certain types of work activity occur, and adjust to better suit the municipality's work program. Also note: when adjusting these thresholds, it actually adjusts the level of service provided and ultimately changes the amount of money required. These threshold and condition ranges can be easily updated with the CityWide software suite and an updated financial analysis can be calculated. These adjustments will be an important component of future Asset Management Plans, as the province requires each municipality to present various management options within the financing plan.

The table below outlines the costs, by pipe diameter, for various sewer main rehabilitation (lining) and replacement activities. The columns display the added life obtained for each activity, the condition range at which they should be applied, and the cost of 1 year added life for each (cost of activity / added life) in order to present an apples to apples comparison.

Sewer Main Lifecycle Activity Options

Category	Cost (per m)	Added Life	Condition Range	1 year Added Life Cost (Cost / Added Life)
Structural Rehab (m)				
0 - 325mm	$174.69	75	50 - 75	$2.33
325 - 625mm	$283.92	75	50 - 75	$3.79
625 - 925mm	$1,857.11	75	50 - 75	$24.76
> 925mm	$1,771.34	75	50 - 75	$23.62
Replacement (m)				
0 - 325mm	$475	100	76 - 100	$4.75
325 - 625mm	$725	100	76 - 100	$7.25
625 - 925mm	$900	100	76 - 100	$9
> 925mm	$1,475	100	76 - 100	$14.75

As can be seen in the above table, structural rehabilitation or lining of sewer mains is an extremely cost effective industry activity and solution for pipes with a diameter less than 625mm. The unit cost of lining is approximately one third of replacement and the cost to obtain one year of added life is half the cost. For Kincardine, this diameter range would account for over 100% of sanitary sewer mains and approximately 85% of storm mains. Structural lining has been proven through industry testing to have a design life (useful life) of 75 years, however, it is believed that liners will probably obtain 100 years of life (the same as a new pipe).

For sewer mains with diameters greater than 625mm specialized liners are required and therefore the costs are no longer effective. It should be noted, however, that the industry is continually expanding its technology in this area and therefore future costs should be further reviewed for change and possible price reductions.

It is recommended, if not in place already, that the municipality engage in an active structural lining program for sanitary and storm sewer mains and that a portion of the capital budget be dedicated to this.

In order to implement the above, it will be important to also establish a condition assessment program to establish a condition score for each sewer main within the sanitary and storm collection networks, and therefore identify which pipes are good candidates for structural lining.

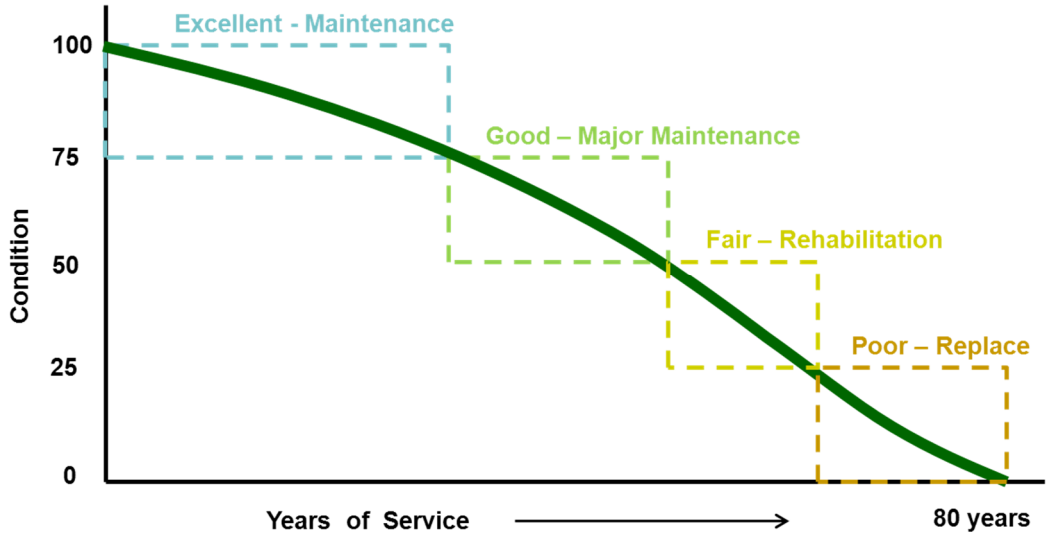
6.4.4 Bridges & Culverts (greater than 3m span)

The best approach to develop a 10 year needs list for the municipality's bridge structure portfolio would be to have the structural engineer who performs the inspections to develop a maintenance requirements report, a rehabilitation and replacement requirements report and identify additional detailed inspections as required. This approach is described in more detail within the "Bridges & Culverts (greater than 3m) Inspections" section above.

6.4.5 Water Network

As with roads and sewers above, the following analysis has been conducted at a fairly high level, using industry standard activities and costs for water main rehabilitation and replacement.

The following diagram depicts a general deterioration profile of a water main with an 80 year life.



As shown above, during the water main's life cycle there are various windows available for work activity that will maintain or extend the life of the asset. These windows are: maintenance; major maintenance; rehabilitation; and replacement or reconstruction.

The windows or thresholds for when certain work activities should be applied also coincide approximately with the condition state of the asset as shown below:

Asset Condition and Related Work Activity: Water Main

Condition	Condition Range	Work Activity
Excellent condition (Maintenance only phase)	100-76	■ maintenance only (cleaning & flushing etc.)
Good Condition (Preventative maintenance phase)	75 - 51	■ water main break repairs ■ small pipe section repairs
Fair Condition (Rehabilitation phase)	50 -26	■ structural water main relining
Poor Condition (Reconstruction phase)	25 - 1	■ pipe replacement
Critical Condition (Reconstruction phase)	0	■ critical includes assets beyond their useful lives which make up the backlog. They require the same interventions as the "poor" category above.

Water main Lifecycle Activity Option				
Category	Cost	Added Life	Condition Range	Cost of Activity / Added Life
Structural Rehab (m)				
00 - 0.150m	$209.70	50	50 - 75	$4.19
0.150 - 0.300m	$315	50	50 - 75	$6.30
0.300 - 0.400m	$630	50	50 - 75	$12.60
0.400 - 0.700m	$1,500	50	50 - 75	$30
0.700 m - & +	$2,000	50	50 - 75	$40
Replacement (m)				
00 - 0.150m	$233	80	76 - 100	$2.91
0.150 - 0.300m	$350	80	76 - 100	$4.38
0.300 - 0.400m	$700	80	76 - 100	$8.75
0.400 - 0.700m	$1,500	80	76 - 100	$18.75
0.700 m - & +	$2,000	80	76 - 100	$25

Water rehab technologies still require some digging (known as low dig technologies, due to lack of access) and are actually more expensive on a life cycle basis. However, if the road above the water main is in good condition lining avoids the cost of road reconstruction still resulting in a cost effective solution.

It should be noted, that the industry is continually expanding its technology in this area and therefore future costs should be further reviewed for change and possible price reductions.

At this time, it is recommended that the municipality only utilize water main structural lining when the road above requires rehab or no work.

6.5 Growth and Demand

Typically a municipality will have specific plans associated with population growth. It is essential that the asset management strategy should address not only the existing infrastructure, as above, but must include the impact of projected growth on defined project schedules and funding requirements. Projects would include the funding of the construction of new infrastructure, and/or the expansion of existing infrastructure to meet new demands. The municipality should enter these projects into the CityWide software in order to be included within the short and long term budgets as required.

6.6 Project Prioritization

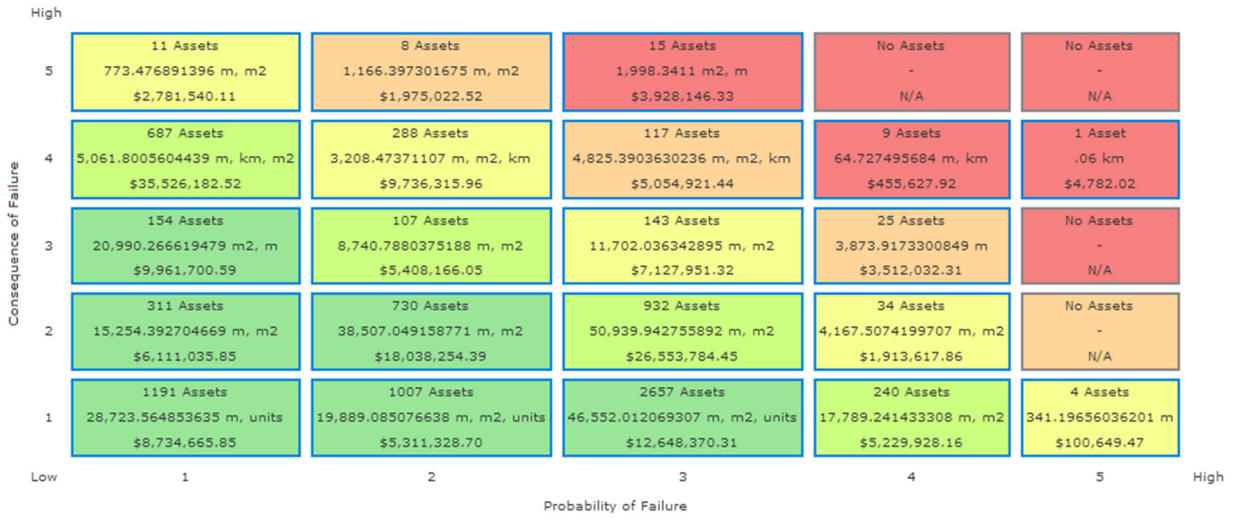
The above techniques and processes when established for the road, water, sewer networks and bridges will supply a significant listing of potential projects. Typically the infrastructure needs will exceed available resources and therefore project prioritization parameters must be developed to ensure the right projects come forward into the short and long range budgets. An important method of project prioritization is to rank each project, or each piece of infrastructure, on the basis of how much risk it represents to the organization.

6.6.1 Risk Matrix and Scoring Methodology

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 sub division 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 table represents the scoring matrix for risk:



All of the municipality's assets analyzed within this asset management plan have been given both a likelihood of failure score and a consequence of failure score within the CityWide software.

The following risk scores have been developed at a high level for each asset class within the CityWide software system. It is recommended that the municipality undertake a detailed study to develop a more

tailored suite of risk scores, particularly in regards to the consequence of failure, and that this be updated within the CityWide software with future updates to this Asset Management Plan.

The current scores that will determine budget prioritization currently within the system are as follows:

All assets:
The Likelihood of Failure score is based on the condition of the assets:

Likelihood of Failure: **All Assets**	
Asset condition	Likelihood of failure
Excellent condition	Score of 1
Good condition	Score of 2
Fair condition	Score of 3
Poor condition	Score of 4
Critical condition	Score of 5

Bridges (based on valuation):
The consequence of failure score for this initial AMP is based upon the replacement value of the structure. The higher the value, probably the larger the structure and therefore probably the higher the consequential risk of failure:

Consequence of Failure: **Bridges**	
Replacement Value	Consequence of failure
Up to $100k	Score of 1
$101 to $250k	Score of 2
$251 to $500k	Score of 3
$501 to $850k	Score of 4
$851k and over	Score of 5

Roads (based on classification):
The consequence of failure score for this initial AMP is based upon the road classification as this will reflect traffic volumes and number of people affected.

Consequence of Failure: **Roads**	
Road Classification	Consequence of failure
Gravel	Score of 1
Paved	Score of 4

Sanitary Sewer (based on diameter):
The consequence of failure score for this initial AMP is based upon pipe diameter as this will reflect potential upstream service area affected.

Consequence of Failure: **Sanitary Sewer**	
Pipe Diameter	Consequence of failure
Less than 150mm	Score of 1
151-250mm	Score of 2
251-350mm	Score of 3
351-500mm	Score of 4
501mm and over	Score of 5

Water (based on diameter):
The consequence of failure score for this initial AMP is based upon pipe diameter as this will reflect potential service area affected.

Consequence of Failure: **Water**	
Pipe Diameter	Consequence of Failure
Less than 100mm	Score of 1
101 – 200mm	Score of 2
201 – 300mm	Score of 3
301 – 400mm	Score of 4
401 and over	Score of 5

Storm Sewer (based on diameter):
The consequence of failure score for this initial AMP is based upon pipe diameter as this will reflect potential upstream service area affected.

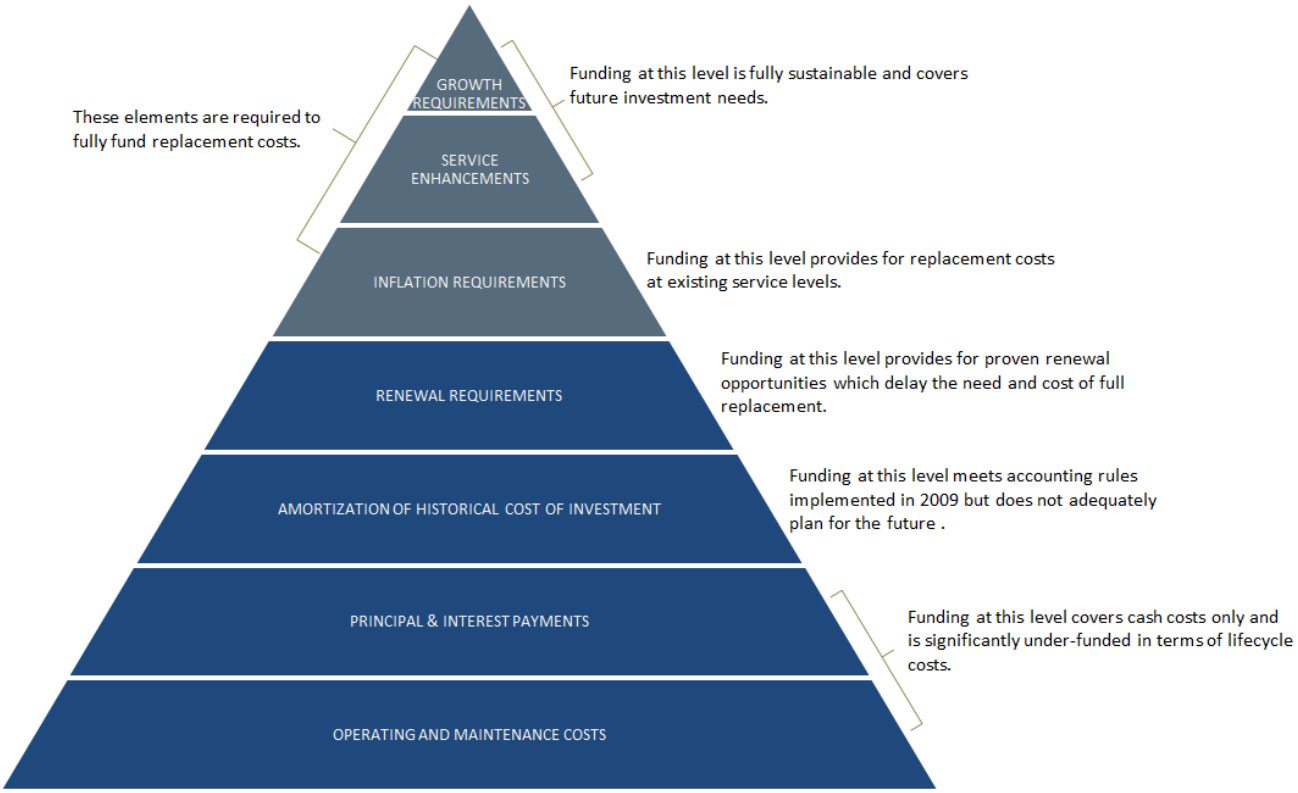
Consequence of Failure: **Storm Sewer**	
Replacement Value	Consequence of failure
Less than 200mm	Score of 1
201 – 500mm	Score of 2
501 – 800mm	Score of 3
801 – 1200mm	Score of 4
1,201mm and over	Score of 5

7.0 Financial Strategy

7.1 General overview of financial plan requirements

In order for an AMP to be effectively put into action, it must be integrated with financial planning and long-term budgeting. The development of a comprehensive financial plan will allow Kincardine to identify the financial resources required for sustainable asset management based on existing asset inventories, desired levels of service and projected growth requirements.

The following pyramid depicts the various cost elements and resulting funding levels that should be incorporated into AMP's that are based on best practices.



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 (as documented in the SOTI section of this report) 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 (no additional debt required for this AMP)
- development charges (not applicable)

c) use of non-traditional sources of municipal funds:
- reallocated budgets (not required for this AMP)
- partnerships (not applicable)
- procurement methods (no changes recommended)

d) use of senior government funds:
- gas tax
- grants (not included in this plan due to Provincial requirements for firm commitments)

If the financial plan component of an AMP 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.

This AMP includes recommendations that avoid long-term funding deficits.

7.2 Financial information relating to Kincardine's AMP

7.2.1 Funding objective

We have developed scenarios that would enable Kincardine to achieve full funding within 5 to 10 years for the following assets:

a) **Tax funded assets**: Road Network; Bridges & Culverts; Storm Sewer Network
b) **Rate funded assets:** Sanitary Sewer Network; Water Network

Note: For the purposes of this AMP, we have excluded the category of gravel roads since gravel roads are a perpetual maintenance asset and end of life replacement calculations do not normally apply. If gravel roads are maintained properly, they, in essence, could last forever.

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

7.3 Tax funded assets

7.3.1 Current funding position

Tables 1 and 2 outline, by asset category, Kincardine's average annual asset investment requirements, current funding positions, and funding increases required to achieve full funding on assets funded by taxes.

Table 1. Summary of Infrastructure Requirements & Current Funding Available

Asset Category	Average Annual Investment Required	2013 Current Funding				Annual Deficit/Surplus
		Taxes	Gas Tax	Taxes to Reserves (see note below)	Total Funding Available	
Road Network	2,625,000	0	0	243,000	243,000	2,382,000
Bridges & Culverts	878,000	0	0	120,000	120,000	758,000
Storm Sewer Network	331,000	0	0	102,000	102,000	229,000
Total	**3,834,000**	**0**	**0**	**465,000**	**465,000**	**3,369,000**

Note: The taxes to reserves amount is comprised of $65,000 allocated to paved roads and 50%, or $400,000, of the taxes allocated to the Lifecycle Reserve Fund for a total of $465,000.

7.3.2 Recommendations for full funding

The average annual investment requirement for paved roads, bridges & culverts, and storm sewers is $3,834,000. Annual revenue currently allocated to these assets for capital purposes is $465,000 leaving an annual deficit of $3,369,000. To put it another way, these infrastructure categories are currently funded at 12% of their long-term requirements.

In 2013, Kincardine has annual tax revenues of $11,273,000. As illustrated in table 2, without consideration of any other sources of revenue, full funding would require the following tax increase over time:

Table 2. Tax Increases Required for Full Funding

Asset Category	Tax Increase Required for Full Funding
Road Network	21.2%
Bridges & Culverts	6.7%
Storm Sewer Network	2.0%
Total	**29.9%**

As illustrated in table 8, Kincardine's debt payments for these asset categories will be decreasing by $5,000 from 2013 to 2017 (5 years). Although not illustrated, debt payments will decrease by $5,000 from 2013 to 2022 (10 years). Our recommendations include capturing those decreases in cost and allocating them to the infrastructure deficit outlined above.

Table 3 outlines this concept and presents a number of options:

Table 3. Effect of Reallocating Decreases in Debt Costs

	Without Reallocation of Decreasing Debt Costs		With Reallocation of Decreasing Debt Costs	
	5 Years	10 Years	5 Years	10 Years
Infrastructure Deficit as Outlined in Table 1	3,369,000	3,369,000	3,369,000	3,369,000
Change in Debt Costs	N/A	N/A	-5,000	-5,000
Resulting Infrastructure Deficit	**3,369,000**	**3,369,000**	**3,364,000**	**3,364,000**
Resulting Tax Increase Required:				
Total Over Time	**29.9%**	**29.9%**	**29.8%**	**29.8%**
Annually	6.0%	3.0%	6.0%	3.0%

Considering all of the above information, we recommend the 10 year option in table 3 that includes the reallocations. This involves full funding being achieved over 10 years by:

a) when realized, reallocating the debt cost reductions of $5,000 to the infrastructure deficit as outlined above.
b) increasing tax revenues by 3.0% each year for the next 10 years solely for the purpose of phasing in full funding to the asset categories covered in this section of the AMP.
c) allocating the $343,000 of gas tax revenue to the paved roads category.
d) increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

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 the AMP unless there are firm commitments in place.
2. We realize that raising tax revenues by the amounts recommended above for infrastructure purposes will be very 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 2050), the recommendations do require prioritizing capital projects to fit the resulting annual funding available. As of 2013, age based data shows a pent up investment demand of $4,530,000 for paved roads, $4,125,000 for bridges & culverts, and $0 for storm sewers. Prioritizing 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.

7.4 Rate funded assets

7.4.1 Current funding position

Tables 4 and 5 outline, by asset category, Kincardine's average annual asset investment requirements, current funding positions and funding increases required to achieve full funding on assets funded by rates.

Table 4. Summary of Infrastructure Requirements & Current Funding Available

Asset Category	Average Annual Investment Required	2013 Annual Funding Available				Annual Deficit
		Rates	Less: Allocated to Operations	Other	Total Funding Available	
Sanitary Sewer Network	1,574,000	2,115,000	-696,000	0	1,419,000	155,000
Water Network	1,682,000	2,485,000	-1,309,000	0	1,176,000	506,000
Total	**3,256,000**	**4,600,000**	**-2,005,000**	**0**	**2,595,000**	**661,000**

7.4.2 Recommendations for full funding

The average annual investment requirement for sanitary services and water services is $3,256,000. Annual revenue currently allocated to these assets for capital purposes is $2,595,000 leaving an annual deficit of $661,000. To put it another way, these infrastructure categories are currently funded at 80% of their long-term requirements.

In 2013, Kincardine has annual sanitary revenues of $2,115,000 and annual water revenues of $2,485,000. As illustrated in table 5, full funding would require the following changes over time:

Table 5. Rate Increases Required for Full Funding

Asset Category	Rate Increase Required for Full Funding
Sanitary Sewer Network	7.3%
Water Network	20.3%

As illustrated in table 8, Kincardine's debt payments for sanitary services will be decreasing by $5,000 from 2013 to 2017 (5 years). Although not illustrated, debt payments for sanitary services will be decreasing by $5,000 from 2013 to 2022 (10 years). For water services, the amounts are $66,000 and $208,000 respectively.

Tables 6a and 6b outline the above concept and present a number of options:

Table 6a. Without Change in Debt Costs

	Sanitary Sewer Network		Water Network	
	5 YEARS	10 YEARS	5 YEARS	10 YEARS
Infrastructure Deficit as Outlined in Table 4	155,000	155,000	506,000	506,000
CHANGE IN DEBT COSTS	N/A	N/A	N/A	N/A
Resulting Infrastructure Deficit	**155,000**	**155,000**	**506,000**	**506,000**
Resulting Rate Increase Required:				
TOTAL OVER TIME	**7.3%**	**7.3%**	**20.3%**	**20.3%**
Annually	1.5%	0.7%	4.1%	2.0%

Table 6b. With Change in Debt Costs

	Sanitary Sewer Network		Water Network	
	5 YEARS	10 YEARS	5 YEARS	10 YEARS
Infrastructure Deficit as Outlined in Table 4	155,000	155,000	506,000	506,000
CHANGE IN DEBT COSTS	-5,000	-5,000	-66,000	-208,000
Resulting Infrastructure Deficit	**150,000**	**150,000**	**440,000**	**298,000**
Resulting Rate Increase Required:				
TOTAL OVER TIME	**7.1%**	**7.1%**	**17.7%**	**17.7%**
Annually	1.4%	0.7%	3.5%	1.7%

Considering all of the above information, we recommend the 10 year option in table 6 that includes the reallocations. This involves full funding being achieved over 10 years by:

a) when realized, reallocating the debt cost reductions for sanitary and water services to the infrastructure deficit.
b) increasing rate revenues by 1.7% for water services and 0.7% for sanitary services each year for the next 10 years solely for the purpose of phasing in full funding to the asset categories covered in this section of the AMP.
c) increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

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. Any increase in rates required for operations would be in addition to the above recommendations.

Although this option achieves full funding on an annual basis in 10 years and provides financial sustainability over the period modeled (to 2050), the recommendations do require prioritizing capital projects to fit the resulting annual funding available. As of 2013, age based data shows a pent up investment demand of $5,317,000 for sanitary services and $10,534,000 for water services. Prioritizing 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.

7.5 Use of debt

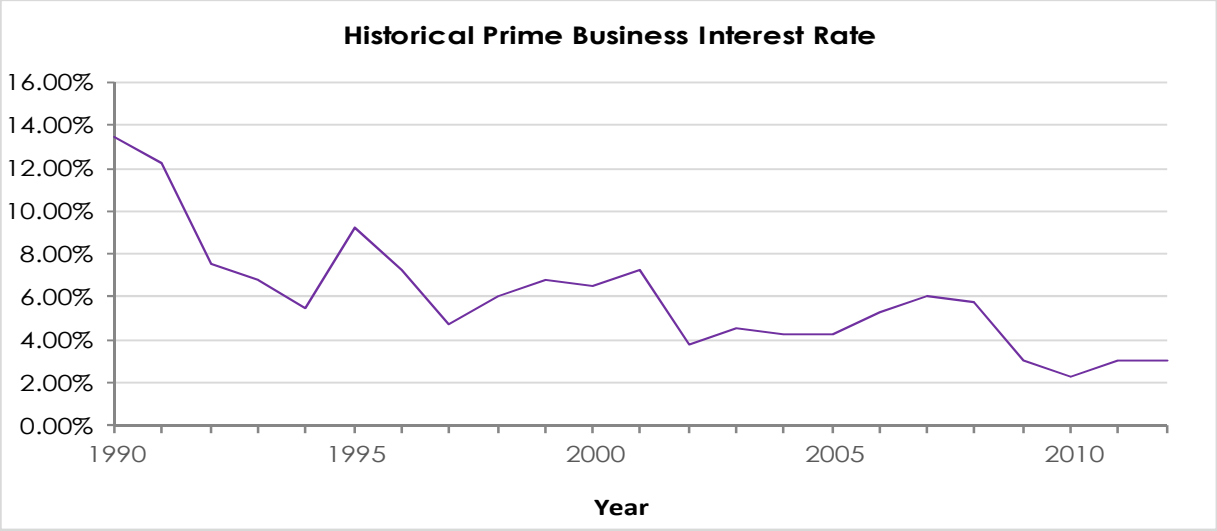
For reference purposes, table 6 outlines the premium paid on a project if financed by debt. For example, a $1M project financed at 3.0%[1] over 15 years would result in a 26% premium or $260,000 of increased costs due to interest payments. For simplicity, the table does not take into account the time value of money or the effect of inflation on delayed projects.

Table 6. Total Interest Paid as a % of Project Costs

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

It should be noted that current interest rates are near all-time lows. Sustainable funding models that include debt need to incorporate the risk of rising interest rates. The following graph shows where historical lending rates have been:

[1] Current municipal Infrastructure Ontario rates for 15 year money is 3.2%.



As illustrated in table 6, a change in 15 year rates from 3% to 6% would change the premium from 26% to 54%. Such a change would have a significant impact on a financial plan.

Tables 7 and 8 outline how Kincardine has historically used debt for investing in the asset categories as listed. There is currently $1,472,000 of debt outstanding for the assets covered by this AMP. In terms of overall debt capacity, Kincardine currently has $4,129,000 of total outstanding debt and $674,000 of total annual principal and interest payment commitments. These principal and interest payments are well within its provincially prescribed annual maximum of $9,364,000.

Table 7. Overview of Use of Debt

Asset Category	Current Debt Outstanding	Use Of Debt in the Last Five Years				
		2009	2010	2011	2012	2013
Road Network	16,000	0	0	26,000	0	0
Bridges & Culverts	0	0	0	0	0	0
Storm Sewers	0	0	0	0	0	0
Total Tax Funded	16,000	0	0	26,000	0	0
Sanitary Sewer Network	16,000	0	0	26,000	0	0
Water Network	1,456,000	0	0	26,000	0	0
Total rate Funded	1,472,000	0	0	52,000	0	0
Total AMP Debt	1,488,000	0	0	78,000	0	0
Non AMP Debt	2,641,000	100,000	3,350,000	163,000	0	0
Overall Total	**4,129,000**	**100,000**	**3,350,000**	**241,000**	**0**	**0**

Table 8. Overview of Debt Costs

Asset Category	Principal & Interest Payments in the Next Five Years				
	2013	2014	2015	2016	2017
Road Network	5,000	5,000	5,000	0	0
Bridges & Culverts	0	0	0	0	0
Storm Sewer Network	0	0	0	0	0
Total Tax Funded	5,000	5,000	5,000	0	0
Sanitary Sewer Network	5,000	5,000	5,000	0	0
Water Network	208,000	208,000	475,000	142,000	142,000
Total Rate Funded	213,000	213,000	480,000	142,000	142,000
Total Amp Debt	218,000	218,000	485,000	142,000	142,000
Non Amp Debt	456,000	456,000	455,000	418,000	418,000
Overall Total	**674,000**	**674,000**	**940,000**	**560,000**	**560,000**

The revenue options outlined in this plan allow Kincardine to fully fund its long-term infrastructure requirements without further use of debt. However, as explained in sections 7.3.2 and 7.4.2, the recommended condition rating analysis may require otherwise.

7.6 Use of reserves

7.6.1 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 9 outlines the details of the reserves currently available to Kincardine.

Table 9. Summary of Reserves Available

Asset Category	Balance at December 31, 2012
Road Network	304,000
Bridges	0
Storm Sewers	0
Total Tax Funded	**304,000**
Water Network	4,992,000
Sanitary Sewer Network	5,270,000
Total Rate Funded	**10,262,000**

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 take into account 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.

The reserves in table 9 are available for use by applicable asset categories during the phase-in period to full funding. This, coupled with Kincardine'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 high priority and emergency infrastructure investments in the short to medium-term.

7.6.2 Recommendation

As Kincardine updates its AMP and expands it to include other asset categories, we recommend that future planning should include determining what its long-term reserve balance requirements are and a plan to achieve such balances.

8.0 Appendix A: Report Card Calculations

Key Calculations

1. "Weighted, unadjusted star rating":

(% of assets in given condition) x (potential star rating)

2. "Adjusted star rating"

(weighted, unadjsted star rating) x (% of total replacement value)

3. "Overall Rating"

$$\frac{\textit{(Condition vs. Performance star rating)} + \textit{(Funding vs. Need star rating)}}{2}$$

Grade Cuttoffs

1. Conditions vs Performance

Letter Grade	Star Rating
F	0
D	2
D+	2.5
C	2.9
C+	3.5
B	3.9
B+	4.5
A	4.9
A	5

2. Funding vs Need

Funding %	Star rating	Grade
0.0%	0	F
25.0%	1	F
46.0%	1.9	D
61.0%	2.9	C
76.0%	3.9	B
91.0%	4.9	A
100.0%	5	A

Roads Kincardine

1. Condition vs. Performance

Total category replacement value	$53,186,069	Segment replacement value	$53,186,069	Segment value as a % of total category replacement value	100.0%

Segment	Condition	Letter grade	Star rating	Quantity (km) in given condition	% of Assets in given condition	Weighted, unadjusted star rating	Segment adjusted star rating
Roads (excludes gravel)	Excellent	A	5	592	64%	3.22	4.5
	Good	B	4	247	27%	1.08	
	Fair	C	3	31	3%	0.10	
	Poor	D	2	6	1%	0.01	
	Critical	F	1	43	5%	0.05	
			Totals	**919**	**100%**	**4.46**	

Category star rating	Category letter grade
4.5	B+

2. Funding vs. Need

Average annual investment required	2013 funding available	Funding percentage	Deficit		
$2,625,000	$243,000	9.3%	$2,382,000		

Category star rating	Category letter grade
0.0	F

3. Overall Rating

Condition vs Performance star rating	Funding vs. Need star rating	Average star rating	Overall letter grade
4.5	0.0	2.2	D

Bridges & Culverts Kincardine

1. Condition vs. Performance

Total category replacement value	$39,490,962	Segment replacement value	$39,490,962	Segment value as a % of total category replacement value	100.0%

Segment	Condition	Letter grade	Star rating	Quantity (m.sq) in given condition	% of Assets in given condition	Weighted, unadjusted star rating	Segment adjusted star rating
Bridges & Culverts	Excellent	A	5	1,879	11%	0.56	3.6
	Good	B	4	6,547	39%	1.57	
	Fair	C	3	7,599	46%	1.37	
	Poor	D	2	633	4%	0.08	
	Critical	F	1	0	0%	0.00	
			Totals	**16,658**	**100%**	**3.58**	

Category star rating	Category letter grade
3.6	C+

2. Funding vs. Need

Average annual investment required	2013 funding available	Funding percentage	Deficit		
$878,000	$120,000	13.7%	$758,000		

Category star rating	Category letter grade
0.0	F

3. Overall Rating

Condition vs Performance star rating	Funding vs. Need star rating	Average star rating	Overall letter grade
3.6	0.0	1.8	F

Water Kincardine

1. Condition vs. Performance

Total category replacement value	$53,729,949	Segment replacement value	$34,843,627	Segment value as a % of total category replacement value	64.8%

Segment	Condition	Letter grade	Star rating	Quantity (m) in given condition	% of Assets in given condition	Weighted, unadjusted star rating	Segment adjusted star rating
Mains	Excellent	A	5	38,975	39%	1.94	2.4
	Good	B	4	12,076	12%	0.48	
	Fair	C	3	28,381	28%	0.85	
	Poor	D	2	20,748	21%	0.41	
	Critical	F	1	341	0%	0.00	
			Totals	**100,521**	**100%**	**3.68**	

Total category replacement value	$53,729,949	Segment replacement value	$18,886,322	Segment value as a % of total category replacement value	35.2%

Segment	Condition	Letter grade	Star rating	Quantity ($) in given condition	% of Assets in given condition	Weighted, unadjusted star rating	Segment adjusted star rating
Facilities	Excellent	A	5	2,178,855	12%	0.58	0.7
	Good	B	4	3,225,283	17%	0.68	
	Fair	C	3	667,872	4%	0.11	
	Poor	D	2	237,133	1%	0.03	
	Critical	F	1	12,577,178	67%	0.67	
			Totals	**18,886,321**	**100%**	**2.06**	

Category star rating	Category letter grade
3.1	**C**

2. Funding vs. Need

Average annual investment required	2013 funding available	Funding percentage	Deficit			Category star rating	Category letter grade
$1,682,000	$1,176,000	69.9%	$506,000			**2.9**	**C**

3. Overall Rating

Condition vs Performance star rating	Funding vs. Need star rating	Average star rating	Overall letter grade
3.1	2.9	**3.0**	**C**

Sanitary Kincardine

1. Condition vs. Performance

Total category replacement value	$63,346,770	Segment replacement value	$35,350,579	Segment value as a % of total category replacement value	55.8%

Segment	Condition	Letter grade	Star rating	Quantity (m) in given condition	% of Assets in given condition	Weighted, unadjusted star rating	Segment adjusted star rating
Mains	Excellent	A	5	10,837	22%	1.12	1.9
	Good	B	4	1,670	3%	0.14	
	Fair	C	3	34,651	72%	2.15	
	Poor	D	2	1,142	2%	0.05	
	Critical	F	1	0	0%	0.00	
			Totals	**48,300**	**100%**	**3.46**	

Total category replacement value	$63,346,770	Segment replacement value	$9,549,214	Segment value as a % of total category replacement value	15.1%

Segment	Condition	Letter grade	Star rating	Units in given condition	% of Assets in given condition	Weighted, unadjusted star rating	Segment adjusted star rating
Appurtenances	Excellent	A	5	170	19%	0.94	0.5
	Good	B	4	247	27%	1.09	
	Fair	C	3	211	23%	0.70	
	Poor	D	2	269	30%	0.60	
	Critical	F	1	6	1%	0.01	
			Totals	**903**	**100%**	**3.34**	

Total category replacement value	$63,346,770	Segment replacement value	$18,446,977	Segment value as a % of total category replacement value	29.1%

Segment	Condition	Letter grade	Star rating	Quantities ($) given condition	% of Assets in given condition	Weighted, unadjusted star rating	Segment adjusted star rating
Facilities	Excellent	A	5	$1,007,006	5%	0.27	0.6
	Good	B	4	$204,549	1%	0.04	
	Fair	C	3	$461,228	3%	0.08	
	Poor	D	2	$11,361,566	62%	1.24	
	Critical	F	1	$5,344,082	29%	0.29	
			Totals	**$18,378,431**	**100%**	**1.92**	

Category star rating	Category letter grade
3.0	C

2. Funding vs. Need

Average annual investment required	2013 funding available	Funding percentage	Deficit			Category star rating	Category letter grade
$1,574,000	$1,419,000	90.2%	$155,000			3.9	B

3. Overall Rating

Condition vs Performance star rating	Funding vs. Need star rating	Average star rating	Overall letter grade
3.0	3.9	3.4	C

Storm Kincardine

1. Condition vs. Performance

Total category replacement value	$23,363,579	Segment replacement value	$17,622,726	Segment value as a % of total category replacement value	75.4%

Segment	Condition	Letter grade	Star rating	Quantity (m) in given condition	% of Assets in given condition	Weighted, unadjusted star rating	Segment adjusted star rating
Mains	Excellent	A	5	12,740	22%	1.11	2.9
	Good	B	4	23,298	41%	1.62	
	Fair	C	3	21,128	37%	1.10	
	Poor	D	2	303	1%	0.01	
	Critical	F	1	0	0%	0.00	
			Totals	**57,469**	**100%**	**3.84**	

Total category replacement value	$23,363,579	Segment replacement value	$5,740,853	Segment value as a % of total category replacement value	24.6%

Segment	Condition	Letter grade	Star rating	Units in given condition	% of Assets in given condition	Weighted, unadjusted star rating	Segment adjusted star rating
Catch basins, culverts, and manholes	Excellent	A	5	358	19%	0.94	0.8
	Good	B	4	335	18%	0.70	
	Fair	C	3	598	31%	0.94	
	Poor	D	2	613	32%	0.64	
	Critical	F	1	0	0%	0.00	
			Totals	**1,904**	**100%**	**3.23**	

Category star rating	Category letter grade
3.7	**C+**

2. Funding vs. Need

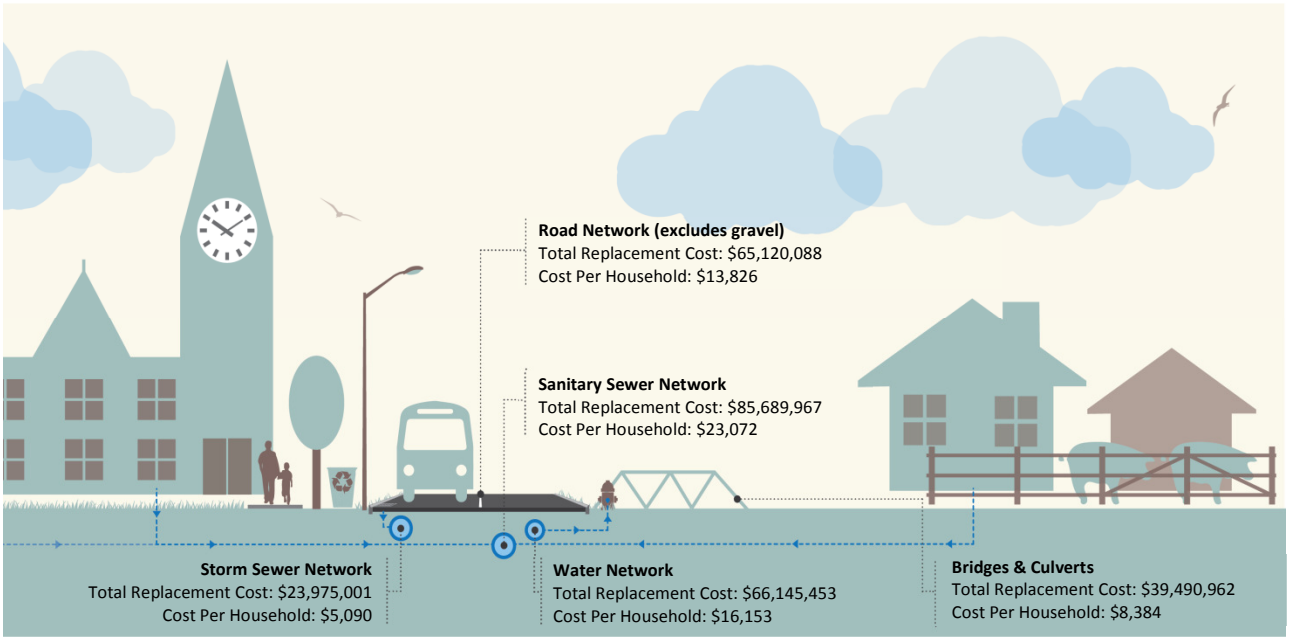
Average annual investment required	2013 funding available	Funding percentage	Deficit			Category star rating	Category letter grade
$331,000	$102,000	30.8%	$229,000			**1.0**	**F**

3. Overall Rating

Condition vs Performance star rating	Funding vs. Need star rating	Average star rating	Overall letter grade
3.7	1.0	**2.3**	**D**

Infrastructure Replacement Cost Per Household

Total: $66,526 per household



Daily Investment Required Per Household for Infrastructure Sustainability