2013

Asset Management Plan

Public Works and Social Housing Infrastructure
City of Brantford, Ontario

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PREFACE

The 2013 Asset Management Plan provides an overview of the rapidly evolving and improving infrastructure asset management program at the City of Brantford. This plan aims to summarize some of the core policies, procedures and principles developed and adopted by the City for the management of its infrastructure, presented at a high level of detail in order to cater for the broad and strategic scope of the document, and to meet the format outlined in the Ministry of Infrastructure's *Building Together: Guide for Municipal Asset Management Plans* (2012).

It is the hope that this document provides a snapshot in time, of the practices today which can be benchmarked against and improved upon tomorrow. Writing this document has delivered value in highlighting some 'gaps' and opportunities for improvement, for which action plans can be developed with the goal of further enriching Brantford's holistic and progressive approach to asset management. As we grow and progress as a City, iterations of the asset management plan can be used as a tool to document and communicate our achievements and opportunities for improvement as we strive to be recognized as a leader in Asset Management, sustainably providing enhanced value to the public, minimizing risks and maximizing the return on infrastructure investments.

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ABBREVIATIONS

C~Scope	Combining Sea and Coastal Planning in Europe
CADD	Computer Aided Drafting and Design
CAO	Chief Administrative Officer
CAPS	Capital Asset Prioritization System
CCTV	Closed Circuit Television
CMMS	Computerized Maintenance Management System
CSA	Canadian Standards Association
ESL	Estimated Service Life
FCM	Federation of Canadian Municipalities
GIS	Geographic Information System
InfraGuide	National Guide to Sustainable Municipal Infrastructure
IT	Information Technology
LADR	Linear Asset Data Repository
LID	Low Impact Development
MMO	Marine Management Organization
MPMP	Municipal Performance Measurement Program
NWWBI	National Water and Wastewater Benchmarking Initiative
O&M	Operations and Maintenance
OSIM	Ontario Structural Inspection Manual
PACP	Pipeline Assessment and Certification Program
PAN	Priority Action Number
PCI	Pavement Condition Index
PM	Preventative Maintenance
PSAB	Public Sector Accounting Board
RSL	Remaining Service Life
SAWS	Sewer Assessment Web Service
SCADA	Supervisory Control and Data Acquisition
SQL	Structured Query Language
TCA	Tangible Capital Asset
TES	Traffic Engineering Software

EXECUTIVE SUMMARY

Brantford is a vibrant community with a population of approximately 97,000 people. The Corporation of the City of Brantford (the City), is responsible for the delivery of many of the services that are central to the prosperity and quality of life of people who live and work in the City. These core municipal service areas include: local government (governance and corporate management), fire services, police services, roadways, transit, wastewater, stormwater, drinking water, solid waste management, parks and recreation, library services, and land use planning. This asset management plan includes the following infrastructure areas that support the City's core services:

- Road Network (including streetlights, signs, intersections and traffic signals);
- Sidewalks;
- Bridges;
- Drinking Water Network;
- Wastewater Network;
- Stormwater Network;
- Solid Waste and Landfill;
- Public Works and Administrative Facilities;
- Corporate Fleet;
- Transit; and
- Social Housing.

This City's Asset Management Plan provides a historic perspective of Brantford's Asset Management implementation, ongoing activities, and areas of continuous improvement. While the scope of this document is for the full lifecycle of the City's infrastructure, it is a living document and is expected to be updated every five (5) years.

Arguably, asset management has been practiced in some shape or form in the City of Brantford since the first settlement in 1784. Over time, the buildings and infrastructure in the City have been constructed, operated, maintained and replaced, as the small village grew to the thriving city it is today. Following a period of minimal new construction during the Second World War in the 1940's, there was an infrastructure construction boom to meet the demands of a rapidly increasing population which saw its peak in the 1970's. As this infrastructure nears the end of its useful life, there will be a greater need to replace that infrastructure, subsequently driving up investment requirements. Now, more than ever, proactive asset management is needed to ensure that those investments are made in a fiscally responsible manner, while optimizing the lifecycle of the infrastructure.

In 2011, City Council approved an organizational restructuring which resulted in the creation of a dedicated Facilities and Asset Management Department. The existing Facilities Management and Geographic Information System (GIS) divisions were moved into the new department along with the creation of a new Capital Planning division. By moving the asset management planning function from various groups into a centralized division, it enables each group to focus on their respective area, while allowing a consistent approach to asset management across the Public Works Commission.

In 2012, the City of Brantford released its first report card on public works infrastructure which offered an objective assessment of the state of infrastructure management, asset replacement values, asset condition, financial contributions and funding requirements for the City's Public Works infrastructure. For

the 2013 Asset Management Plan, the City has updated the report card. The primary objective of the report card is to develop a repeatable and objective process for assessing the theoretical condition (based on age) and, where performance data exists, establish the current structural and performance condition of the City's infrastructure assets, utilizing data analytics procedures which provide a means to assess impacts on re-investment and funding levels over the short and long term.

Table E1 illustrates the results of the scorecard and the percentage of the system assets considered to have less than 25% remaining service life (RSL) or have exceeded their service life entirely.

Table E1. Summary of Remaining Service Life and Replacement Value

Program Area	2012 Replacement Value (Millions)	Rating Category (% Remaining Service Life)	Assets in Poor & Very Poor Rating Categories	
			%	2012 Replacement Value (Millions)
Road Network	$1,126.3	Good (69%)	3%	$37.2
Sidewalks	$147.9	Fair (34%)	48%	$71.6
Bridges, Retaining Walls and Culverts	$256.2	Fair (44%)	33%	$84.6
Water Distribution	$312.7	Fair (49%)	24%	$74.3
Water Facilities	$191.0	Very Good (78%)	4%	$6.8
Wastewater Collection	$234.1	Good (67%)	11%	$25.5
Wastewater Facilities	$196.7	Good (53%)	12%	$23.4
Stormwater Collection	$286.9	Good (56%)	13%	$37.2
Stormwater Facilities	$10.8	Good (65%)	7%	$0.8
Solid Waste and Landfill	$36.5	Good (53%)	23%	$8.5
Public Works and Admin. Facilities	$80.1	Fair (43%)	13%	$10.2
Corporate Fleet	$19.6	Poor (18%)	53%	$10.3
Transit	$29.3	Fair (51%)	29%	$8.6
Social Housing	$73.2	Good (51%)	4%	$3.1
Total	**$3,001.3**	**Good (59%)**	**13%**	**$402.1**

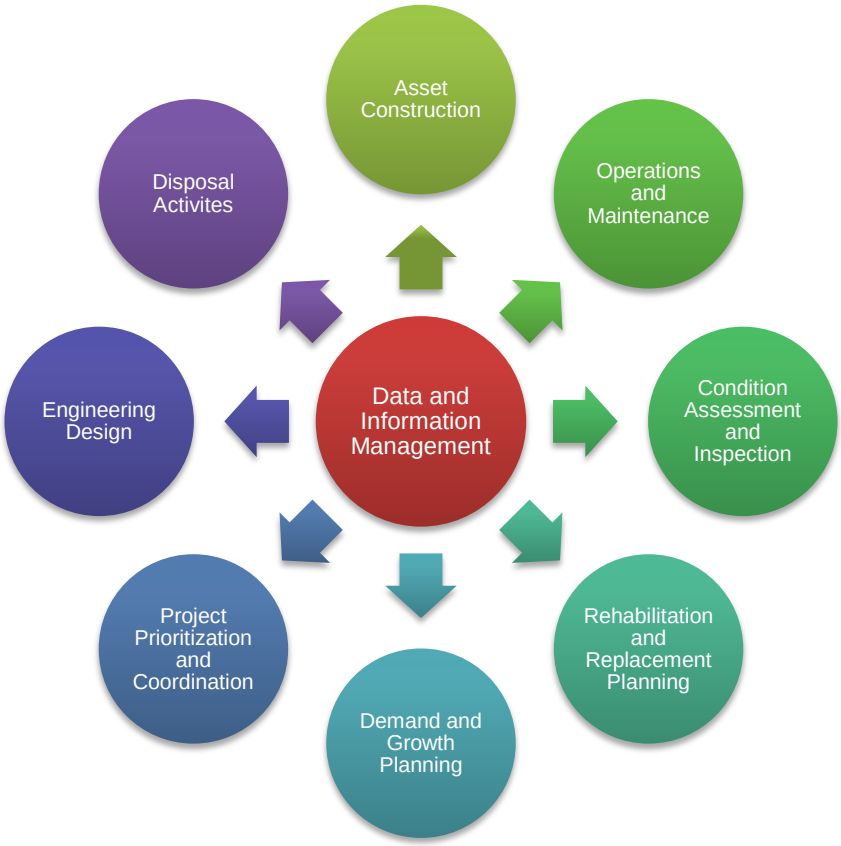
One of the objectives of asset management planning is to ensure that the performance and service provided by the infrastructure meets the needs and expectations of the users. A level of service, or service level, is a criteria set by the organization and community for the quality and performance of the services provided by the municipality. Levels of service typically relate to quality, quantity, reliability, responsiveness, environmental acceptability and cost.

The City of Brantford has embarked on a number of initiatives to monitor the levels of service provided by the City's infrastructure. These initiatives include meeting regulatory requirements, participating in national benchmarking initiatives, abiding to standard operating procedures, contributing to best practice reviews and monitoring performance through condition assessments.

The asset management strategy is a set of planned actions that will enable the assets to provide the desired levels of service in a sustainable way, while managing risk, at the lowest lifecycle cost. In order to facilitate the development of the asset management strategy, a number of activities or initiatives take place within the City. **Figure E1** shows the components of the asset management strategy and asset

lifecycle activities. At the core of the asset management strategy is the City's data and information which pushes and pulls key data from each of the activities.

Figure E1. Components of the Asset Management Strategy



Brantford is a growing city that has been designated as an urban growth center in the Provincial Growth Plan, and is destined for continued growth in all economic sectors. To this end, it is estimated that by 2041 the population of the City of Brantford will grow by 68% to 163,000 (Ministry of Infrastructure, 2013). Such growth has impacts on the required capacity and servicing provided by the City's core infrastructure networks. As a step towards better understanding future demand and how we can better plan to meet the future needs of the City, Brantford has implemented several core initiatives such as the Water, Wastewater and Stormwater Master Servicing Plan and the Transportation Master Plan.

In 2013, the City revisited its capital program development process to make the most of additional data that was at its disposal. In order to automate the process and allow for objective prioritization across program areas, the City developed automated and integrated business processes for the development of the linear infrastructure capital program.

An integral component of the annual budget cycle is the formation of multi-stakeholder working groups for key asset classes. These stakeholder groups combine tacit and technical knowledge of the infrastructure networks, their performance, problem areas and history that are integral inputs into developing a defensible and accurate capital investment program.

Brantford also uses short and long term analyses with the goal of developing sustainable infrastructure capital plans and financing strategies. Theses analyses include 100 year sustainability forecasts, a 10 year capital budget, and reserve fund forecasts.

Long term infrastructure investment forecasts provide insight into prospective investment requirements which may fall outside of the 10 year planning horizon typically utilized for capital budgeting processes. Large amounts of infrastructure construction during a short time span, as seen in the 1970's, will require equally as heavy investment once those assets reach the end of their service lives. If those investment requirements are not addressed appropriately, then levels of service could potentially decline and operations and maintenance costs could increase. The 100 year forecast aims to cover the entire lifecycle of the assets, therefore allowing identification of such trends.

Funding and re-investment requirements were developed for each program areas based on the analysis to establish an average annual cost for re-investment. The analysis shows that there are currently deferred capital investment needs of $169 million in the program areas covered in this asset management plan. The 'deferred capital investment needs' refers to an outstanding capital need, which arose in the past, but has not been addressed (i.e. assets that fall within the very poor rating category because their remaining service life is below zero). This could be related to infrastructure deterioration, capacity shortfalls or design service standard upgrades.

The Housing department has recently developed a 10 year housing stability plan will guide a housing and homelessness vision that incorporates solutions and initiatives to a range of housing options and supports, with a focus on dignity, pride in community and self-sufficiency over the next decade. The Plan includes 53 recommendations, 25 were identified by community stakeholders as a priority.

In 2013, the City is planning to transition to the implementation of a corporation-wide 10 year capital budget. A 10 year budget planning horizon provides perspective and awareness of future projects outside of the traditional short term plans. In addition to planning to transition to a 10 year budget, several improvements have been made to the format and presentation of the budget documents with the aim of increasing transparency and accountability.

Asset management at the City of Brantford is continually improving, striving towards efficiently managing assets to meet the service needs of the present without compromising the sustainability of its infrastructure for the demands of the future. This is being accomplished by implementing approaches to better understand the assets for which the City is responsible, the condition of these assets, how to maintain the assets to maximize useful life, and how to budget appropriately so assets can be replaced when needed. This all supports the movement towards being recognized as a well-managed city that provides efficient and effective government services while remaining fiscally responsible.

1. Introduction

Brantford is a vibrant community with a population of approximately 97,000 people. The Corporation of the City of Brantford (the City), is responsible for the delivery of many of the services that are central to the prosperity and quality of life of people who live and work in the City, and such services rely on well-planned, well-built and well-maintained infrastructure (Ministry of Infrastructure, 2012). These core municipal service areas include: local government (governance and corporate management), fire services, police services, roadways, transit, wastewater, stormwater, drinking water, solid waste management (garbage), parks and recreation, library services, and land use planning (Ministry of Municipal Affairs and Housing, 2007, pp. 8-13).

This asset management plan includes the following infrastructure that supports the City's core services:

- Road Network (including streetlights, signs, intersections and traffic signals);
- Sidewalks;
- Bridges;
- Drinking Water Network;
- Wastewater Network;
- Stormwater Network;
- Solid Waste and Landfill;
- Public Works and Administrative Facilities;
- Corporate Fleet;
- Transit; and
- Social Housing.

Asset Management

"The continuous improvement of systematic and coordinated activities and practices through which the City can optimally and sustainably manage its infrastructure systems, associated performance, risks and expenditures over their lifecycles for the purpose of achieving the organizational strategic plan."

This City's Asset Management Plan provides a historic perspective of Brantford's Asset Management implementation, ongoing activities, and areas of continuous improvement. While the scope of this document is for the full lifecycle of the City's infrastructure, it is a living document and is expected to be updated every five (5) years.

1.1. Brantford's Asset Management Philosophy

When we turn on a tap we rely on a steady flow of clean water, when we flush the toilet or take the garbage out, we expect the waste to be disposed of, and when we travel from "A to B" on our daily routines we expect safe, clean, non-congested roads and sidewalks. In fact, many of the activities that are critical to the quality of life and prosperity of our communities are dependent on municipal infrastructure. The term "municipal infrastructure" refers to civil assets under the control and responsibility of municipalities. These assets include, but are not limited to: buried utilities (drinking water and sewer systems), treatment plants, transportation networks (roads, bridges and transit systems), solid waste management facilities and services, City-owned Facilities, social housing, and parks and recreation.

It is the City's obligation to ensure that municipal infrastructure is managed in a responsible and endured way that serves the needs of the community. The process of managing municipal infrastructure is known as *Asset Management*.

Based on the internationally recognized PAS55 by the Institute of Asset Management (BSI, 2008a), asset management can be defined as *'the continuous improvement of systematic and coordinated activities and practices through which the City can optimally and sustainably manage its infrastructure systems, associated performance, risks and expenditures over their lifecycles for the purpose of achieving the organizational strategic plan'.*

Another definition of note is from the International Infrastructure Management Manual (INGENIUM, 2006) which defines asset management as *'the combination of management, financial, economic, engineering and other practices applied to physical assets with the objective of providing the required level of service in the most cost effective manner'.*

The City of Brantford's asset management plan is founded on a strategic asset management philosophy, which translates a vision into goals using a Mission, Core Values, and Guiding Principles. These goals and principles provide the objectives that unify, motivate and support the organization toward a common definition of success. **Figure 1** shows how the strategic vision, goals, values and principles relate to the detailed goals and objectives set out in the asset management plan.

Figure 1. Asset Management Philosophy Pyramid

1.1.1. Asset Management Mission

An asset management mission was developed in 2007 by the City. This mission describes how asset management programs will move towards the City's vision, defining the purpose and primary objectives related to the City's needs and values. The City's asset management mission statement is as follows:

> *Brantford will efficiently manage its assets to meet the service needs of the present without compromising the sustainability of its infrastructure for the demands of the future by knowing the assets for which the City is responsible, the condition of these assets, how to maintain the assets to maximize useful life and budgeting appropriately so assets can be replaced once they have expired or are not able to consistently provide planned levels of service.*

1.1.2. Asset Management Core Values

Core values are the operating philosophies that will guide the City's asset management strategy and the implementation of its asset management processes and programs. Core values support the vision and mission, and guide an organization's internal conduct as well as its relationship with the external world. The core values established previously for the City of Brantford are:

- Asset Management is an organizational commitment;
- Services and assets must be sustainable;
- Operate in a transparent and accountable manner;
- Continuous improvement of processes, data and technology; and
- Minimize risk to levels of service and public health and safety.

1.1.3. Asset Management Guiding Principles

Guiding principles serve as a series of parameters around which practices and decisions are formed. The City's asset management guiding principles include:

- Asset management will support the City's strategic planning documents such as the Strategic Plan, Transportation Master Plan, Master Servicing Plan, the Official Plan and the Housing Stability Plan;
- Asset needs will be prioritized across the organization in an open and consistent fashion to reflect the community's values and priorities;
- Assets will be operated and maintained to meet the declared levels of service;
- Assets will be optimized throughout the entire lifecycle to meet levels of service in the most cost-effective way;
- Risk will always be considered in asset management decision-making processes;

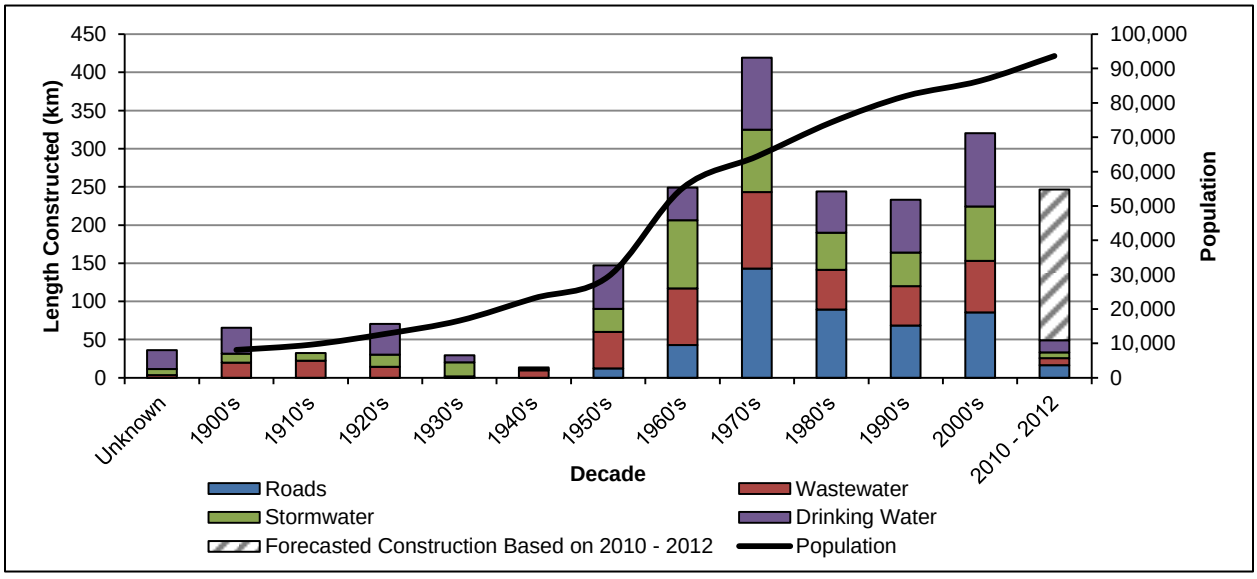
- A technology environment will be developed and maintained to ensure compatibility of systems and applications, and the efficient exchange and use (including analysis), of information; and
- Business processes and resources will be structured to provide the most efficient management of assets.

1.2. Shaping the Future: Evolution of Asset Management in Brantford

Arguably, Asset management has been practiced in some shape or form in the City of Brantford since the first settlement in 1784. Over time, the buildings and infrastructure of the City have been constructed, operated, maintained and replaced, as the small village grew to the thriving city it is today. The prosperity of the 19th and early 20th centuries, due to Brantford's large manufacturing industry, is reflected in the historical architecture found in older city districts where Victorian mansions line streets, and magnificent churches, theatres and commercial buildings echo of details of the past. Brantford's infrastructure networks have equal character and heritage.

Figure 2 shows the historical infrastructure constructed for roads, drinking water, wastewater, and stormwater since 1900. Following a period of minimal new construction during the Second World War in the 1940's, there was an infrastructure construction boom to meet the demands of a rapidly increasing population which saw its peak in the 1970's. This was then followed by two decades of lower levels of construction; followed by another peak in the 2000's. As the infrastructure constructed in the 1970's nears the end of its useful life, there will be a greater need to replace that infrastructure, subsequently driving up investment requirements. Now, more than ever, proactive asset management is needed to ensure that those investments are made in a fiscally responsible manner, while optimizing the lifecycle of the infrastructure.

Figure 2. City of Brantford Historical Infrastructure Construction and Population



Source: City of Brantford GIS (2013); (Statistics Canada, 2012)

In 2006, Brantford undertook a community-based consultation process which included input from residents, businesses, community organizations and staff, and resulted in the collection of visions, goals and actions valued by the community. From this, four strategic goals evolved, providing the framework for *'Shaping Our Future - Brantford's Community Strategic Plan'*[1]. The goals established were:

- **Economic Vitality and Innovation:** *Brantford will build a strong, diversified economic base that provides opportunities for both citizens and potential investors while supporting and enhancing innovation and education;*
- **High Quality of Life & Caring for All Citizens:** *Brantford will be recognized as a safe and healthy community for all citizens, while providing a high quality of recreation, sport, arts and culture;*
- **Managed Growth & Environmental Leadership:** *Brantford will be known for managing growth wisely, ensuring optimization of its infrastructure while protecting and enhancing our heritage and natural assets;* and
- **Excellence in Governance & Municipal Management:** *Brantford will engage its citizens through open and transparent communications, and be recognized as a well-managed city that provides efficient and effective government services while remaining fiscally responsible.*

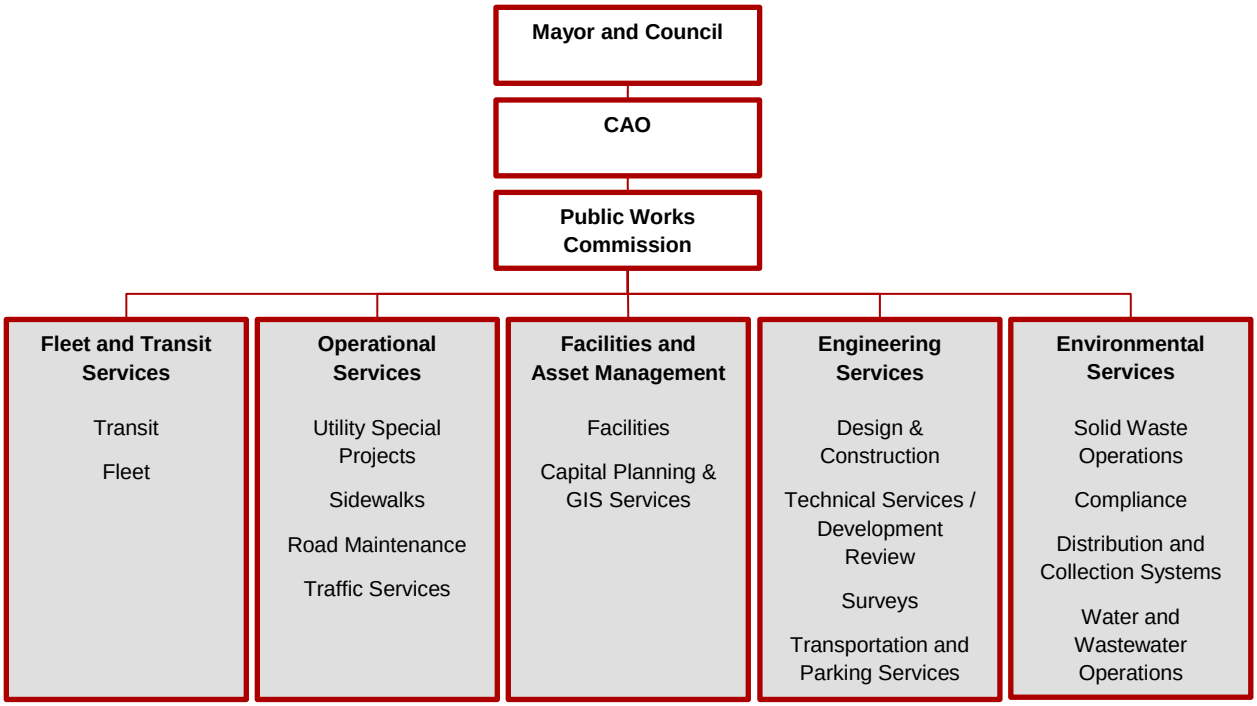
A component of the 2006 City's Corporate Strategic Plan was to develop initiatives to address the issues surrounding asset management and challenging issues concerning the City's residents. In 2006 one such initiative commenced with the development of a strategic infrastructure management plan for the road right of way system, as a step towards ensuring optimal infrastructure planning and maintenance (Urban & Environmental Consulting Inc and Watson & Associates, 2007).

City Council and staff reviewed the strategic goals for 2010-2014 to establish priorities and action plans that would continue to work towards the community's long term desired outcomes. Brantford's renewed strategic plan brings focus and unites the community as we work together to build a vibrant 21st century city. It creates a connection between our community, municipal government and corporate business processes and practices, and responds to the community while remaining flexible, so we can anticipate and adapt to local, regional and global changes and pressures. It provides the framework for future activities, actions, and decisions.

In 2011, Council approved an organizational restructuring which resulted in the creation of a dedicated Facilities and Asset Management Department. The existing Facilities Management and Geographic Information System (GIS) divisions were moved into the new department along with the creation of a new Capital Planning division as shown in **Figure 3**. By moving the asset management planning function from various groups into a centralized division, it enabled each department to focus on their respective area, while allowing a consistent approach to asset management across the Public Works Commission.

[1] For the City of Brantford's Community Strategic Plan see: https://mybrantford.ca/BrantfordsCommunityStrategicPlan.aspx [Last Accessed April 03, 2013]

Figure 3. City of Brantford Public Works Commission Organizational Structure, September 2013



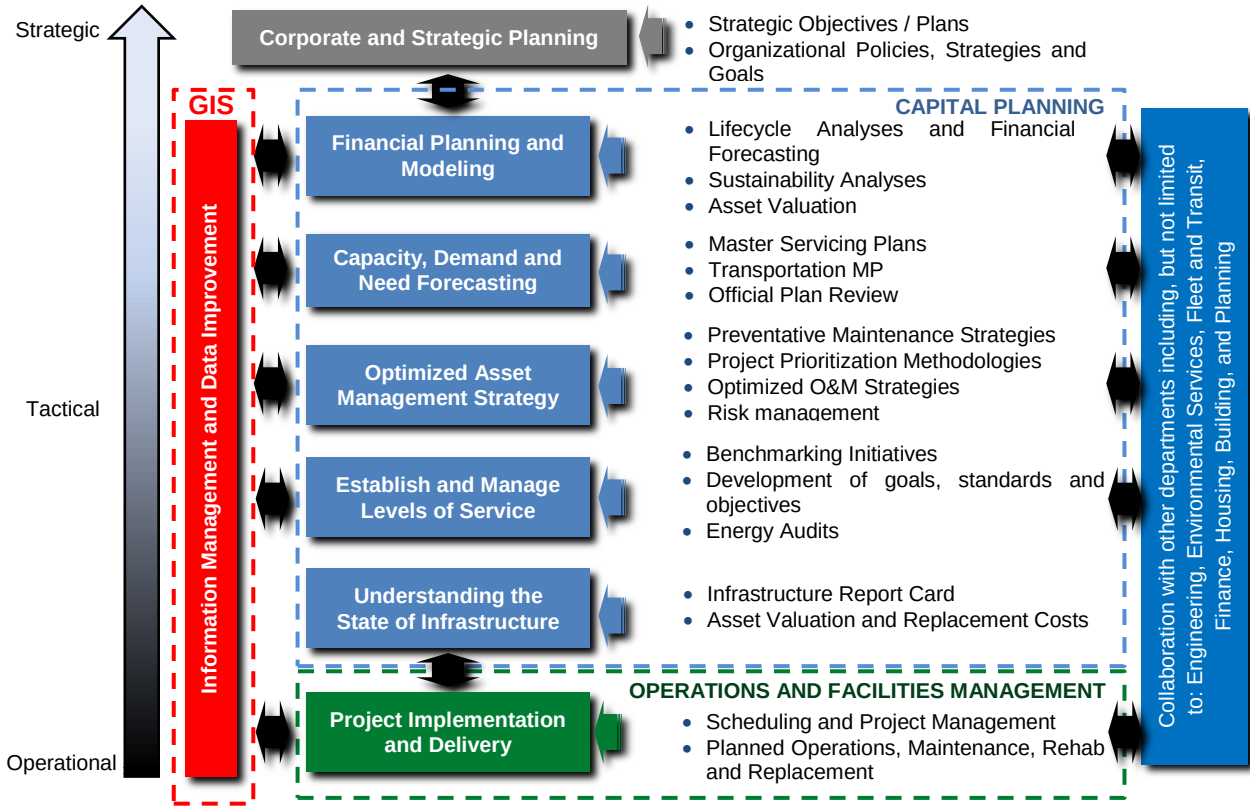
In the new Public Works Commission organizational structure, the Facilities and Asset Management department takes on the following roles and responsibilities:

- Preparation and submission of the Facilities and Asset Management Department's inputs to annual work plans and budgets (capital and operating) of the Public Works Commission;
- Planning for long-term financial investment to ensure consistent asset performance; providing corporate policies and standards related to space, furnishings and facilities; ensuring asset compliance with fire safety, building code, health & safety and environmental codes;
- Development and implementation of an asset management strategy related to facilities, water, wastewater, storm, roads, bridges, solid waste and vehicle assets to address full life-cycle costing and analysis to plan for long-term rehabilitation and replacement needs;
- Ensuring that the design and construction of City facilities is carried out in a timely manner in accordance with sound engineering practices, consistent with budgetary guidelines and standards;
- Ensuring that City infrastructure required to support new growth, or to service existing functions, is identified, budgeted for and programmed to be delivered in a timely and cost-effective manner, and in accordance with all appropriate legislative requirements;
- Completion of engineering studies to determine performance and condition of assets in order to establish cost-effective rehabilitation and replacement strategies to minimize lifecycle costs;

- Monitoring of operational performance against policies, procedures and standards with initiation of corrective action as required; preparation and submission of periodic performance reports;
- Monitoring of current levels of service, life cycle trends and deterioration models in order to plan and develop an integrated 10 year detailed budget and 20-100 year projected long range capital re-investment strategy in order to protect the city's infrastructure investments; and
- Management of the City's Capital Budget, prioritization of capital and operating programs, development of presentations, and rationalization of project needs based on a sound asset management approach.

The Facilities and Asset Management department, in collaboration with other departments within the City has established several initiatives to support the components of the asset management plan, as shown in **Figure 4**.

Figure 4. The Role of Facilities and Asset Management



Having a centralized facilities and asset management division facilitates the ability for capital planning priorities to be balanced across the organization and across asset classes. Through the annual capital budgeting process, the Capital Planning division works closely with the relevant stakeholder groups to ensure that the capital plan is feasible from multiple perspectives.

2. State of Local Infrastructure Report Card

In 2012, the City of Brantford released its first report card on public works infrastructure which offered an objective assessment of the state of infrastructure management, asset replacement values, asset condition, financial contributions and funding requirements for the City's Public Works infrastructure. For the 2013 Asset Management Plan, the City has updated the report card, now reporting on the following program areas:

1. Road Network;
2. Sidewalks *(new for 2013)*;
3. Bridges, Retaining Walls and Culverts;
4. Water Distribution;
5. Water Facilities;
6. Wastewater Collection;
7. Wastewater Facilities;
8. Stormwater Collection;
9. Stormwater Facilities;
10. Solid Waste & Landfill;
11. Public Works and Administrative Facilities;
12. Corporate Fleet;
13. Transit; and
14. Social Housing *(new for 2013)*.

Infrastructure Report Card

"The approach… is firmly grounded in the asset management principles contained within the National Guide to Sustainable Municipal Infrastructure (InfraGuide) and the recent Federation of Canadian Municipalities (FCM) Canadian Infrastructure Report Card (September 2012)."

The primary objective of the report card is to develop a repeatable and objective process for assessing the theoretical condition (based on age) and, where performance data exists, establish the current structural and performance condition of the City's infrastructure assets, utilizing data analytics procedures which provide a means to assess impacts on re-investment and funding levels over the short and long term. Information such as this is essential in understanding the current state of infrastructure, trends and major issues or opportunities for enhanced re-investment scenarios. While the City currently has significant data regarding the structural condition of a large majority of its asset classes, a number of data gaps still exist specifically around hydraulic and physical performance of our infrastructure. Additional information about these areas for improvement is included in **Section 2.5** of this document.

The report card:

- Translates the consolidated condition of the infrastructure within each of the program areas into a five (5) level rating system ranging from *Very Poor* to *Very Good*, which is then aggregated to present the overall state of the City's Public Works infrastructure
- Includes the Public Works and Social Housing program areas listed above, but allows for the inclusion of other City assets such as Parks and Recreation, and Long Term Care in the future.
- Uses available data for the analysis to produce a realistic account of the state of the infrastructure.

- Incorporates financial re-investment / budget information to project the future-state condition of assets based on historic and planned financial re-investment.
- Is developed in a format and using a methodology that is repeatable and consistent with best-practices to allow comparative analysis, trending and scenario development.

While the initial emphasis focuses on the age and physical structural condition of the assets, capacity analysis and master planning activities will be crucial in helping to define the functional capacity of the infrastructure moving forward. The report card is a living document that will incorporate additional and improved information as it becomes available.

The approach employed in the development of Brantford's Infrastructure Report Card is firmly grounded in the asset management principles contained within the National Guide to Sustainable Municipal Infrastructure (InfraGuide) and the recent Federation of Canadian Municipalities (FCM) Canadian Infrastructure Report Card (September 2012).

A key component in the development of this report card was the compilation and review of the City's asset inventory information. This information included data such as pipe materials, installation dates, estimated service life, condition data (such as main breaks and condition reports), and asset replacement values. Where available, condition, maintenance activities and inspection data was used to define the physical condition. Where no condition or inspection data existed, asset condition was estimated based on service life and engineering opinion, and was considered as a gap in the analysis to be filled for future Report Card development.

2.1. Asset Inventory Summary

An asset inventory for the City's Public Works Infrastructure was developed by utilizing the City's detailed asset data for each of the 14 program areas. Each program area was then divided into asset classes as shown in **Table 1**. Though not shown in the table, the asset classes were also further broken down to the individual asset level for the analysis (for example, a section of road on a particular street, or individual transit vehicles).

Table 1. Asset Inventory Classification

Program Area	Asset Class
Road Network	Local Major/Minor Arterial Major/Minor Collector Intersections Streetlights Traffic Signs Guard Rails Sound Barriers Lane Ways
Sidewalks	Sidewalks
Bridges, Retaining Walls and Culverts	Pedestrian and Vehicle Bridges, retaining walls, and Culverts
Water Distribution	Watermains Water Valves Hydrants Chambers

Program Area	Asset Class
Water Facilities	Water Treatment Plant (major component levels e.g. structural, mechanical, electrical, process piping) Raw Water Quality Monitoring Stations Pumping Stations Elevated Tank Reservoirs & Booster Stations
Wastewater Collection	Local Sewers Trunk Sewers Maintenance Holes
Wastewater Facilities	Sewage Treatment Plant (major process levels e.g. structural, mechanical, electrical, process piping, etc.) Pumping Stations
Stormwater Collection	Local Sewers Trunk Sewers Maintenance Holes
Stormwater Facilities	Detention Ponds Pumping Stations Control Gates
Solid Waste and Landfill	Individual Buildings and Landfill Cells
Public Works and Administrative Facilities	Public Works and Administrative Facilities including the Brantford Municipal Airport and Farmers Market.
Corporate Fleet	Golf Vehicle Units Operational Services Vehicle Units Parks Vehicle Units Water Vehicle Units
Transit	Buses Light vehicle/ trucks Other equipment Transit Service Centre / Garage Transit Terminal
Social Housing	Apartments, Townhouses, and Single Family Residential Buildings

Linear inventory data regarding the extent of the networks (water, wastewater, stormwater, roads, sidewalks and bridges) were extracted from the City's GIS. Facility data describing the quantities, value, condition and locations was extracted from various City databases and applications such as Building Web and JD Edwards. The City's suite of software and databases ensures that the most effective software tools are used to analyze and manage data.

Through intensive data collection efforts both in the office and the field, the City of Brantford's asset registry within the GIS is considered to be a reliable and comprehensive resource for asset information. Changes to assets and repairs conducted by crews as well as other activities, are providing continuous information for the GIS team to update and reconcile the asset registry.

For a breakdown of the asset types by quantity / extent, please see **Appendix 1**.

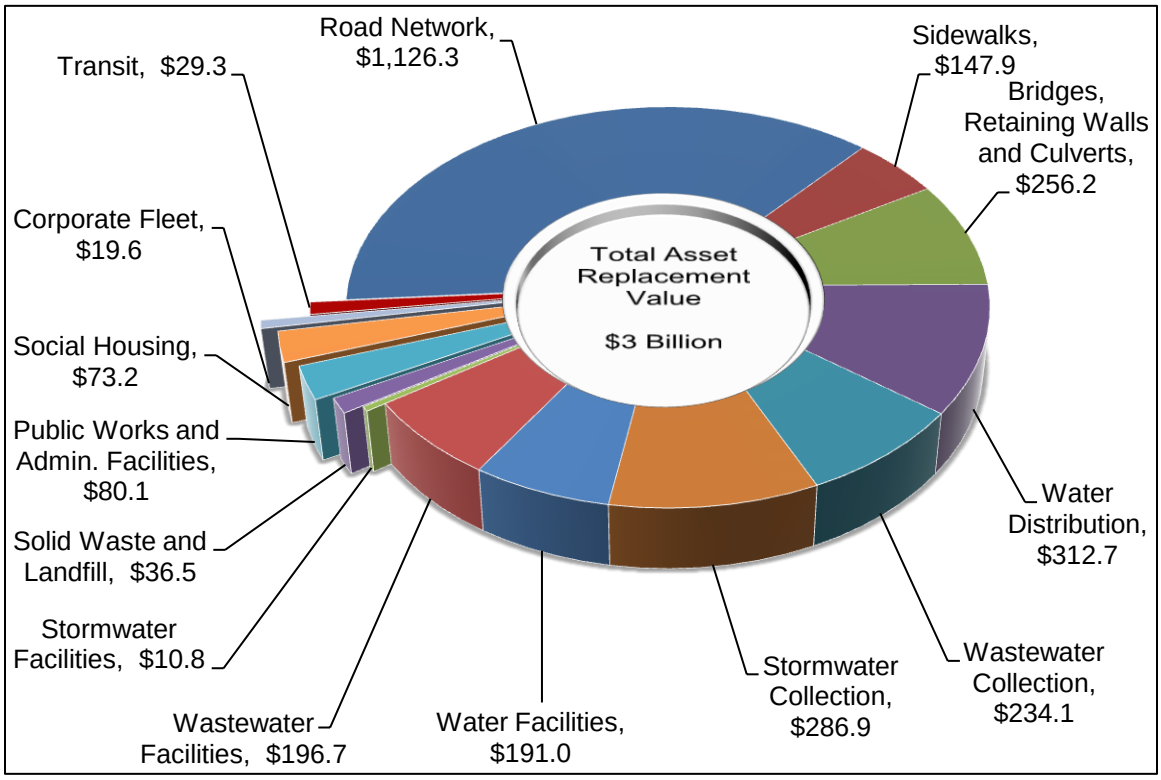
2.2. Asset Replacement Values

The unit replacement costs for linear assets were estimated using current standard budgeting values that are based on data such as historical tender pricing and current market replacement value. The City's

Tangible Capital Asset (TCA), Public Sector Accounting Board (PSAB) inventory as well as insurance assessed property values were used for vertical assets such as facilities and social housing, while a combination of the PSAB inventory and current market replacement value were used for corporate fleet and transit assets.

Figure 5 illustrates the replacement cost breakdown of the City's $3 billion asset inventory.

Figure 5. Public Works Commission and Social Housing Asset Replacement Value ($ Millions)



2.3. Asset Estimated Service Life

An asset's estimated service life (ESL) is the period of time that it is expected to be of use and fully functional to the City. Unless tangible condition and hydraulic performance data exists, once an asset reaches the end of its service life, it will be deemed to have deteriorated to a point that necessitates replacement. The ESL for each component was established by using a combination of the City's PSAB ESL figures as well as industry standards. Individual ESL's were used in conjunction with original construction dates to determine the theoretical remaining service life (RSL) of each asset. The percent (%) estimation of RSL was used further as a factor to assist in determining condition ratings.

2.4. Asset Condition Rating

The City undertakes numerous investigative techniques in order to determine and track the physical condition of its infrastructure. For instance, the interior of sanitary and storm pipes are routinely inspected using closed circuit television (CCTV) inspection. These inspections are guided by standard principals of

defect coding and condition rating that allow for a physical condition "score" for the infrastructure to be developed. For infrastructure without a standardized approach to condition assessment scoring, information such as visual inspections, building condition audits, bridge audits (OSIM Inspections[2]), annual pavement inspections, watermain break records and other maintenance related observations were used in establishing the condition of the asset.

Using the ESL and physical condition data (where available), a weighted score was calculated for each asset. Assets were then placed into one of five rating categories ranging from *Very Good* to *Very Poor* as shown in **Table 2** below. Individual infrastructure asset scores were then aggregated up to the program area, and then a weighted overall system rating was obtained.

Table 2. Rating Categories based on Service Life and Condition

Rating Category	% of Remaining Service Life (RSL)	Definition
Very Good	76 - 100%	*Fit for the Future* - The infrastructure in the system or network is generally in very good condition, typically new or recently rehabilitated. A few elements show general signs of deterioration that require attention
Good	51% -75%	*Adequate for Now* - Some infrastructure elements show general signs of deterioration that require attention. A few elements exhibit significant deficiencies
Fair	26% - 50%	*Requires Attention* – The infrastructure in the system or network shows general signs of deterioration and require attention with some elements exhibiting significant deficiencies
Poor	0% - 25%	*At Risk* - The infrastructure in the system or network is in poor condition and mostly below standard, with many elements approaching the end of their service life. A large portion of the system exhibits significant deterioration.
Very Poor	< 0%	*Unfit for Sustained Service* - The infrastructure in the system or network is in unacceptable condition with widespread signs of advanced deterioration. Many components in the system exhibit signs of imminent failure, which is affecting service or has effectively exceeded its theoretical service life.

As previously mentioned, a combination of the ESL and known asset condition was used to estimate the percentage of RSL for the assets. The percentage RSL for each asset was then weighted (based on replacement value), and used to provide the weighted average RSL for the program area. For example, the weighted average percentage RSL of the road network is 69%, meaning that on average, the road network assets are 31% into their estimated service life of 50 years, and have 69% of their service life remaining (i.e. the weighted average age of the road network is 35 years old). This would place the road network assets into the category of "Good" as defined in **Table 2**.

Understanding the percentage RSL for each of the assets helps to facilitate planning for replacement and major rehabilitation activities by providing insight into the quantity of assets that have exceeded typical ESLs, and therefore require attention due to increasing probability of failure and subsequently

[2] OSIM – the Ontario Structural Inspection Manual sets the standards for detailed bridge inspections and provides a uniform approach for professional engineers and other inspectors to follow. OSIM Inspections must be conducted in accordance with **Ontario Regulation 104/97**, ***Standards for Bridges***

deteriorating levels of service. It is important to note that some low-risk assets may also be feasible to run-to-failure, and though they may have exceeded their ESL, they may be fully functional, have good condition, and provide high levels of service for many years.

Table 3 illustrates the percentage of the system assets considered to have less than 25% RSL or have exceeded their RSL entirely. For example 53% of the corporate fleet falls within the *Poor* and *Very Poor* rating categories.

Table 3. Summary of Remaining Service Life and Replacement Value

Program Area	2012 Replacement Value (Millions)	Rating Category (% Remaining Service Life)	Assets in Poor & Very Poor Rating Categories	
			%	2012 Replacement Value (Millions)
Road Network	$1,126.3	Good (69%)	3%	$37.2
Sidewalks	$147.9	Fair (34%)	48%	$71.6
Bridges, Retaining Walls and Culverts	$256.2	Fair (44%)	33%	$84.6
Water Distribution	$312.7	Fair (49%)	24%	$74.3
Water Facilities	$191.0	Very Good (78%)	4%	$6.8
Wastewater Collection	$234.1	Good (67%)	11%	$25.5
Wastewater Facilities	$196.7	Good (53%)	12%	$23.4
Stormwater Collection	$286.9	Good (56%)	13%	$37.2
Stormwater Facilities	$10.8	Good (65%)	7%	$0.8
Solid Waste and Landfill	$36.5	Good (53%)	23%	$8.5
Public Works and Admin. Facilities	$80.1	Fair (43%)	13%	$10.2
Corporate Fleet	$19.6	Poor (18%)	53%	$10.3
Transit	$29.3	Fair (51%)	29%	$8.6
Social Housing	$73.2	Good (51%)	4%	$3.1
Total	**$3,001.3**	**Good (59%)**	**13%**	**$402.1**

As can be seen from **Table 3**, the weighted average for all Public Works and Social Housing infrastructure falls within the *Good* category with an average estimated RSL of 59%.

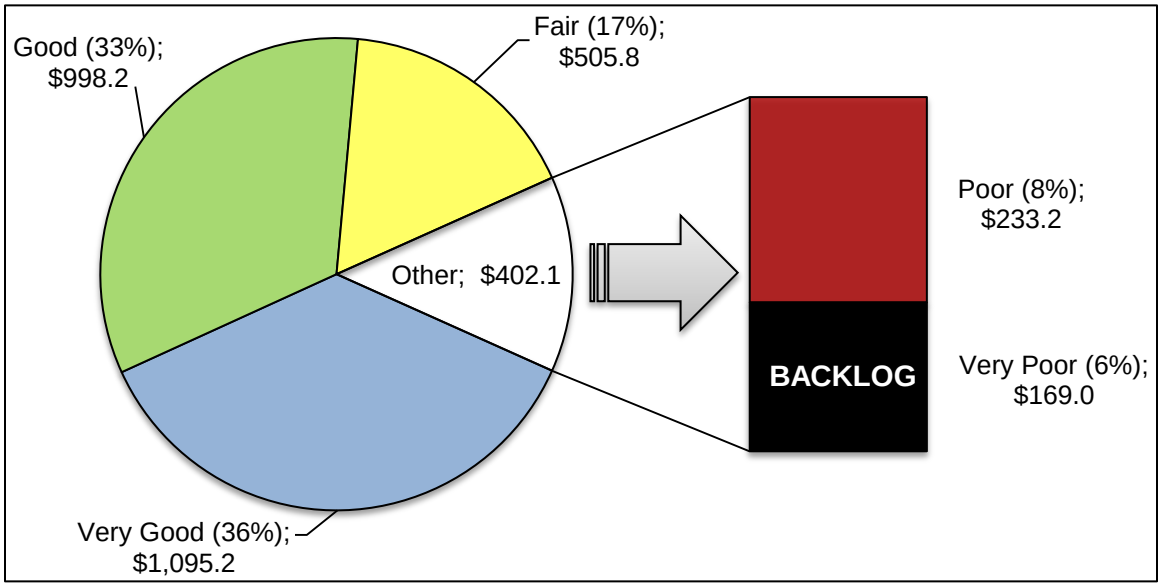
However, as has been noted, the City must continue to complete condition and performance assessments in order to properly assess the condition of the assets. For example, the Public Works and Administrative Facilities had building condition audits last completed in the mid 2000's. These reports are now obsolete and must be updated to determine the true condition of facility assets. Consequently, in 2013 the Public Works Commission and Housing Department have both embarked on building condition audit projects.

Also important to note is that approximately 13% of the City's Public Works and Social Housing asset portfolio has less than 25% of its service life remaining, or have exceeded their ESL entirely. This 13% equates to a total replacement value of $402.1 million. This is in-line with similar infrastructure categories across Canada, as described in the recently released FCM Canadian Infrastructure Report Card (September 2012). The FCM report identified that by replacement value, 9.5% of the municipal

infrastructure across Canada is considered to be in *Poor* to *Very Poor* condition. Through the development of the City's report card, it would appear that Brantford's results are relatively consistent with municipal infrastructure conditions across the Country.

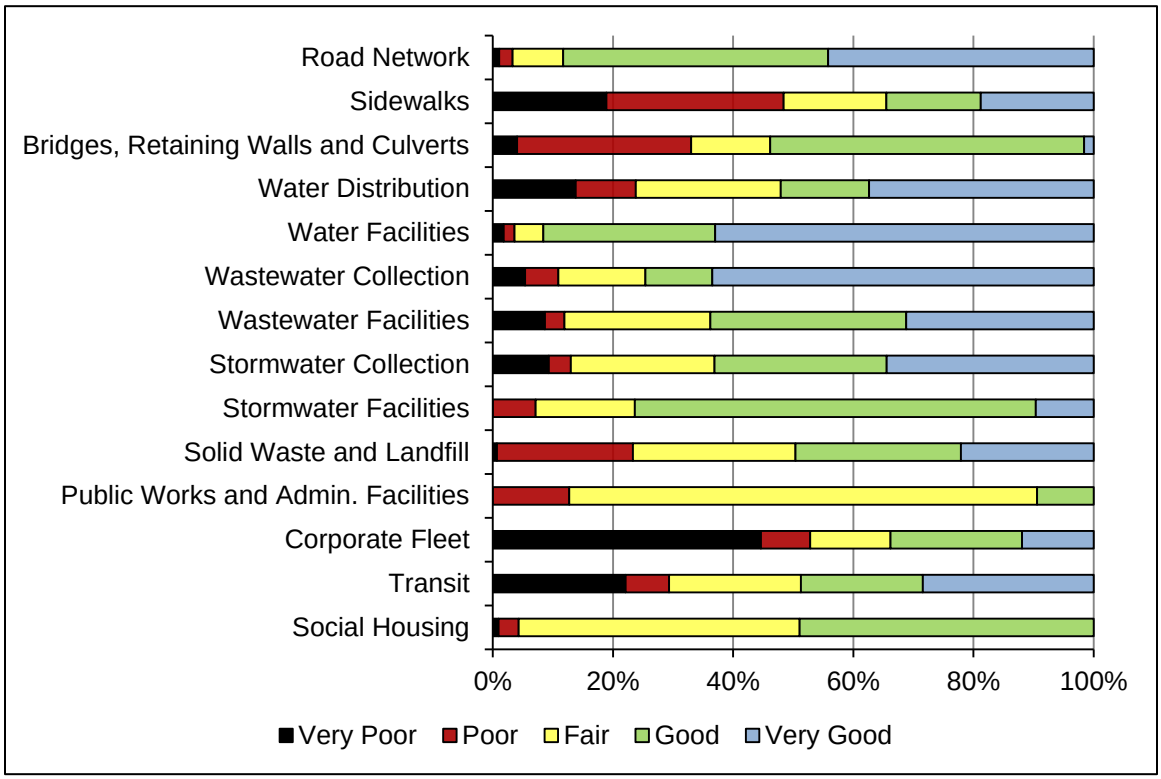
Figure 6 shows the replacement value of infrastructure within each of the rating categories. Overall, of the City's $3 billion in assets, 69% (or $2.03 billion) fall within the *Very Good* to *Good* categories; 17% ($0.51 billion) being in the *Fair* category, 8% ($0.23 billion) in the *Poor* category, and 6% ($0.17 billion) have exceeded their theoretical service lives and as such are in the *Very Poor* category.

Figure 6. Asset Rating Category Summary by Replacement Value ($ Millions)



The subsequent figure (**Figure 7**) shows the breakdown of assets by rating category across each of the program areas. From this it is apparent that Sidewalks, Corporate Fleet, and Transit have the greatest relative replacement value of assets that have exceeded their ESL, with 19%, 45%, and 22% respectively. In addition, Public Works and Administrative Facilities, Solid Waste and Landfill, and Social Housing have the largest value of assets that fall within the *Fair* and *Poor* rating categories, with 91%, 50% and 50%, respectively. This illustrates that in the near future there may be significant amounts of assets moving from *Fair* to *Poor* and from *Poor* to *Very Poor* as the infrastructure continues to age.

Figure 7. Breakdown of Asset Rating Category by Program Area



2.5. Data Confidence and Data Gaps

As with any data-intensive quantitative analysis, the results are only as good as the data that it is based on. The City recognizes that in the datasets used for the development of the infrastructure report card there are some gaps that may impact the validity of the results. To overcome the data gaps, an approach has been employed to measure and quantify the confidence in the data, and then to develop an action plan to improve the confidence in the data for future iterations. This approach also gives the reader a measure of how accurate the results of the analysis may be, and also aids the City in understanding deficiencies in the data and identifying areas for improvement.

Following a review of existing approaches to data confidence assessment, it was found that there is limited uptake in Canadian municipalities, therefore an assessment methodology was developed based on approaches used by C~Scope (Combining Sea and Coastal Planning in Europe) for reviewing geographical datasets, and an approach used by the Marine Management Organization (MMO) for reviewing evidence. The approach allows each piece of data to be assessed based on a number of factors in terms of high, moderate or low confidence based on the parameters shown in **Table 4**.

Table 4. Data Confidence Assessment Matrix

Factor	High Confidence (100%)	Moderate Confidence (50%)	Low Confidence (0%)
When was the data collected or last updated	Data is suitably up to date.	There may be minor changes to the data since it was collected.	There may be major changes to the data since it was collected.
Is the data complete for its intended use, suitably uniform?	The data is fully complete and present for the dataset.	The data is partially complete and present for the majority of the area e.g. data from surveys / sampling or collated from multiple but not comprehensive sources.	The data is known to be incomplete.
Is the data from an authoritative source?	Created from official and/or peer-reviewed sources.	Created from unofficial "published" sources – reports, internet etc.	Created by unofficial unpublished sources – fieldwork, personal accounts etc.
Any indication of errors?	No indication of errors.	Some errors evident – missing / incorrect / additional areas etc.	Significant number of errors – obviously missing or incorrect data.
Is the data verified by a relevant stakeholder (the staff member directly responsible for the assets)?	The data has been fully verified.	The data has been partially verified.	The data has not been verified.

Developed from: (C-SCOPE, 2012)

Each data set is evaluated based on the answer for each factor, providing a percentage confidence rating score between 0% (all factors have low confidence) and 100% (all factors have high confidence). The rating is calculated using **Equation [1]**.

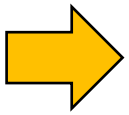
$$Confidence\ Rating = \sum Factor\ Confidence\ Rating \times \frac{1}{5} \quad [1]$$

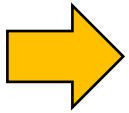
For example, a data set which has had minor changes since it was collected, is partially complete, created by unofficial unpublished sources, has no indication of errors, and has been partially verified would be scored as follows:

$$\left(50\% \times \frac{1}{5}\right) + \left(50\% \times \frac{1}{5}\right) + \left(50\% \times \frac{1}{5}\right) + \left(100\% \times \frac{1}{5}\right) + \left(50\% \times \frac{1}{5}\right) = 60\%\ (Moderate\ Confidence)$$

The data confidence ratings for the datasets used in this analysis compared to the data used in the 2012 analysis are shown in **Table 5**.

Table 5. Data Confidence Ratings for the Asset Report Card

Program Area	2012		2013		Data Confidence Trend	Comments
	Inventory and Condition	Valuation	Inventory and Condition	Valuation		
Road Network	50%	30%	70%	80%		• While inventory data is very comprehensive, the condition data is limited and was produced by subjective assessment. • In 2014, a Roadway Drivability Condition Assessment Study is recommended which will provide accurate condition data for the entire City. • In 2013, a detailed cost estimating template was created which significantly increased the accuracy of valuation.
Sidewalks	Not included in 2012 Report Card		30%	70%	N/A	• Sidewalk data is known to be incomplete. A Sidewalk Condition Assessment Study is planned for 2013. • Replacement costs are based on the 2013 detailed cost estimating template.
Bridges, Retaining Walls and Culverts	30%	30%	30%	30%		• Bridge data is currently incomplete, and is based on the 2011 OSIM Inspection. • Studies such as the 2013 Bridge Maintenance Strategy (In progress), and the 2013 OSIM Inspections (In Progress), will provide condition and replacement cost data for all bridges and culverts (>3m).
Water Distribution	50%	30%	60%	80%		• While inventory data is very comprehensive, there is no condition data. Age and Watermain breaks were used as a proxy. • In 2013, a detailed cost estimating template was created which significantly increased the accuracy of valuation.
Wastewater Collection	50%	30%	70%	80%		• While inventory data is very comprehensive, only 73% of condition data was available. • A Trunk Line Condition Assessment project is recommended in 2014 to improve the condition data coverage. • In 2013, a detailed cost estimating template was created which significantly increased the accuracy of valuation.

Program Area	2012		2013		Data Confidence Trend	Comments
	Inventory and Condition	Valuation	Inventory and Condition	Valuation		
Stormwater Collection	50%	30%	50%	80%		• While inventory data is very comprehensive, only 10% of condition data was available. • A Trunk Line Condition Assessment project is recommended in 2014 to improve the condition data coverage. • In 2013, a detailed cost estimating template was created which significantly increased the accuracy of valuation.
Water, Wastewater, Stormwater, and Solid Waste Facilities	20%	20%	60%	60%		• Facility inventory data is based on the City's published and verified Tangible Capital Asset Inventory. • There is currently no condition data for the facilities and age was used as a proxy. • The inventory has been verified since the 2012 iteration and there have been significant changes and improvements in the data.
Public Works and Admin. Facilities	30%	30%	30%	40%		• Public Works and Admin. Facility data is known to be incomplete and no condition data is available. Am annual Building Condition Assessment project is commencing in 2013 (in progress), which will significantly improve data. • Replacement costs for are based on insurance estimated property values for 14 of the 30 buildings, and inflated construction / acquisition costs were used for the remainder.
Corporate Fleet	90%	80%	90%	80%		• Fleet inventory data is complete and suitably up to date. No condition data is available; however age was used as a proxy. • Costs are based on historical acquisition and upgrade costs. • The inventory has been verified in 2013.

Program Area	2012		2013		Data Confidence Trend	Comments
	Inventory and Condition	Valuation	Inventory and Condition	Valuation		
Transit	60%	80%	80%	70%		• Transit inventory data is complete and suitably up to date. No condition data is available; age was used as a proxy. • Since 2012, the Transit data has been expanded to include property, such as the Transit Garage • Costs are based on historical acquisition and upgrade costs. • The inventory has been verified in 2013.
Social Housing	Not included in 2012 Report Card		80%	80%	N/A	• Inventory data is complete and condition data is from the 2013 Social Housing Building Condition Assessment Project. • Replacement costs are based on the Insurance Estimate of Property Values.

3. Desired Levels of Service

One of the objectives of asset management planning is to ensure that the performance and service provided by the infrastructure meets the needs and expectations of the users. A level of service, or service level, is a criteria set by the organization and community for the quality and performance of the services provided by the municipality. Levels of service typically relate to quality, quantity, reliability, responsiveness, environmental acceptability and cost.

Through the application of asset management principles, the City aims to understand the relationship between the levels of service and the cost of providing the service. This relationship can then be evaluated in consultation with the community to determine the optimum level of service they are willing to pay for (INGENIUM, 2006, p. 3.6).

The City of Brantford has embarked on a number of initiatives to monitor the levels of service provided by the City's infrastructure. Corporately, the City of Brantford participates in the Municipal Performance Measurement Program (MPMP); however initiatives pertaining specifically to asset management are summarized below.

3.1. Water, Wastewater and Stormwater

3.1.1. Benchmarking Overview

Since 2002, the City has been an active participant in the National Water and Wastewater Benchmarking Initiative (NWWBI).[3] This project was developed in response to a need for Canadian municipal water and wastewater utilities to measure, track and report on their utility performance (NWWBI, 2013). In the 2012 iteration, the NWWBI included approximately 48 Canadian municipalities, regional districts, and water utility companies. The benchmarking framework was founded for the purpose of answering four important questions that are commonly posed to managers of water, wastewater and stormwater (NWWBI, 2012):

1. How well are we doing?
2. How do we compare with similar organizations?
3. Are we getting value for money? and
4. How can we get better at what we do?

For over a decade the City of Brantford has been measuring the levels of service for water, wastewater and stormwater infrastructure through the NWWBI framework. The NWWBI's Utility Management Model defines a framework to achieve seven (7) high level performance goals developed through consultation with participants across Canada. The performance goals are as follows:

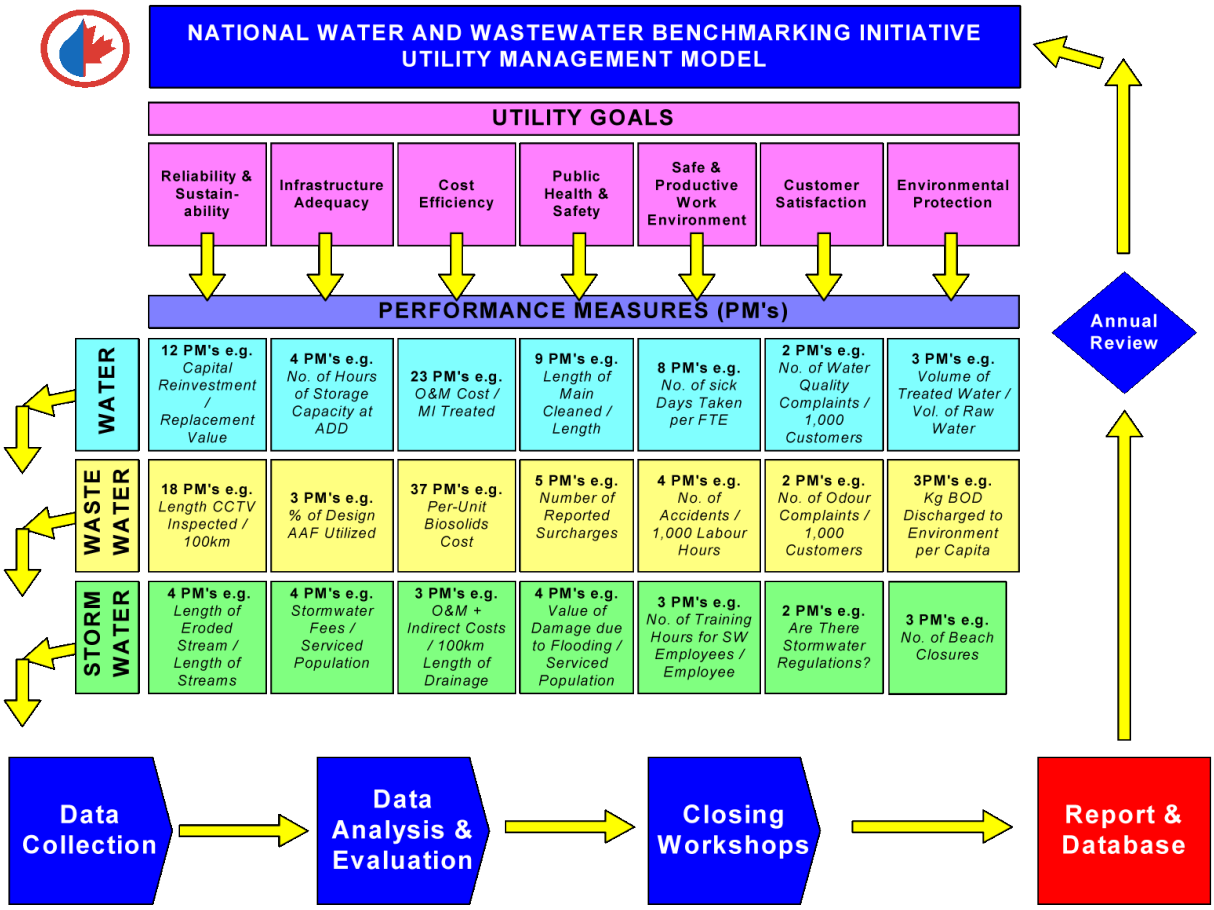
1. Provide reliable and sustainable infrastructure;
2. Ensure adequate capacity;
3. Meet service requirements with economic efficiency;
4. Protect public health and safety;

[3] For a full description of the NWWBI performance indicators visit http://www.nationalbenchmarking.ca/.

5. Provide a safe and productive workplace;
6. Have satisfied and informed customers; and
7. Protect the environment.

The standardized "Utility Management Model", as shown in **Figure 8**, was developed to provide a framework for the selection and definition of performance measures for these goals. It depicts the relationship between these goals and the many performance measures that are used to track a utility's success in achieving them and the annual process of collecting, analyzing and reporting on data that is critical to the measurement of performance.

Figure 8. National Water and Wastewater Benchmarking Initiative Utility Management Model



Source: AECOM, 2012

3.1.2. Attainment of Utility Goals

While there are hundreds of performance measures that the City tracks on an annual basis, the attainment of level of service targets can be summarized into *radar charts*. The radar charts provide an overall graphical summary of a utility's goal attainment to show to stakeholders such as the community, CAO, City Council and staff in other departments. Radar charts can be used to provide:

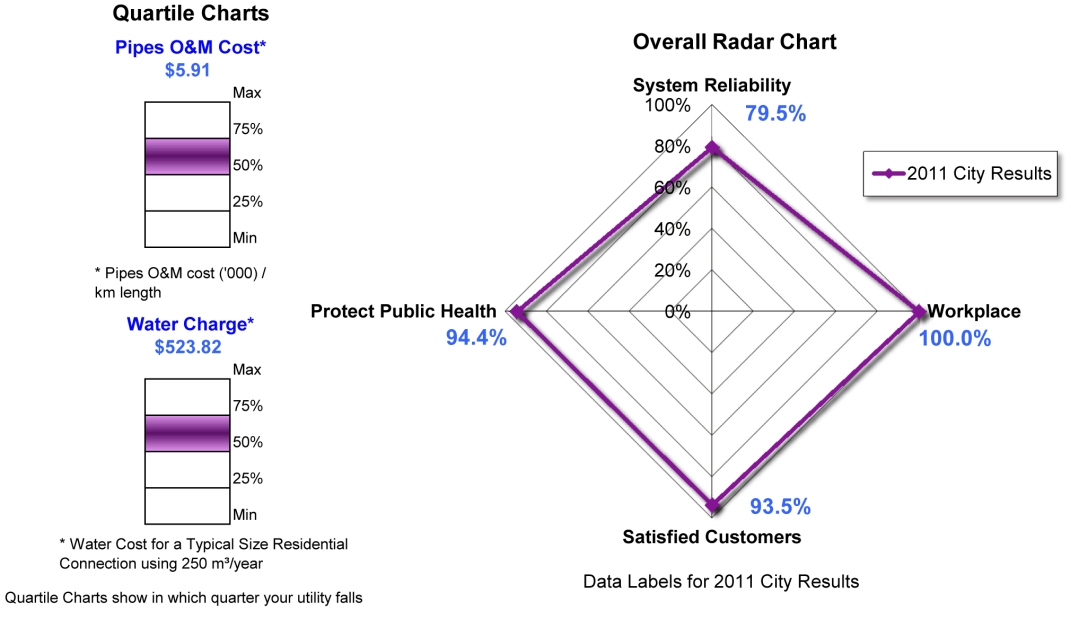
1. A high level summary of goal attainment for the utility;
2. Comparison of annual trends in goal attainment; and
3. Comparison of performance across the goals (for example is the utility performing well on the Minimum Sustainable Cost goal at the expense of other goals?)

The graphs are in the early stages of development and will continue to be developed and improved upon in order to meet the needs of the participating municipalities. The radar chart in **Figure 9** provides an example of the attainment of the City's water distribution level of service goals on a linear scale of 0% to 100%, where 100% represents attainment or exceedance of the target value and 0% represents the lowest performance in a select group of similar municipalities. It should be noted that at this stage, no specific goals have been formalized at the City of Brantford, however the NWWBI will be including a goal setting component for the 2013 / 2014 iteration.

Currently, the target value is 0 for many of the performance measures (for instance, main breaks, sick days etc.). The remaining performance measures can be generally categorized as negative or positive. Negative performance measures are those where performance (and the goal attainment score) increases as the performance measure value decreases, for example per unit cost. Positive performance measures are those where performance (and the goal attainment score) increases as the performance measure value increases, for example per field staff availability. Where obvious targets are not available, the group's minimum value is currently used. Similarly, where obvious 0% values are not available, the comparison group's maximum or minimum values are currently used.

The attainment of goals for the water distribution system related to system reliability, providing a safe and productive workplace, customer satisfaction and protection of public health is shown in **Figure 9**. The quartile chart shows that in the comparison group of municipalities, the pipes O&M cost and water charge are in the third quartile (i.e. higher than 50% - 75% of the comparison group).

Figure 9. NWWBI - Water Distribution Goal Attainment Radar and Quartile Charts

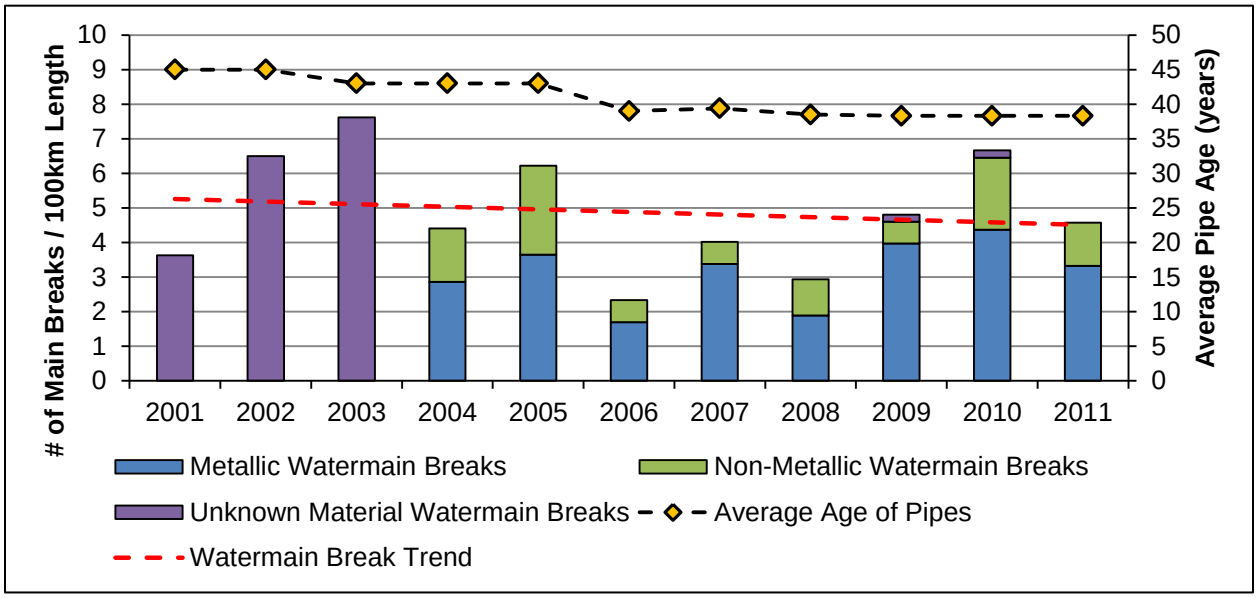


Source: NWWBI, 2013

3.1.3. Year to Year Performance Tracking

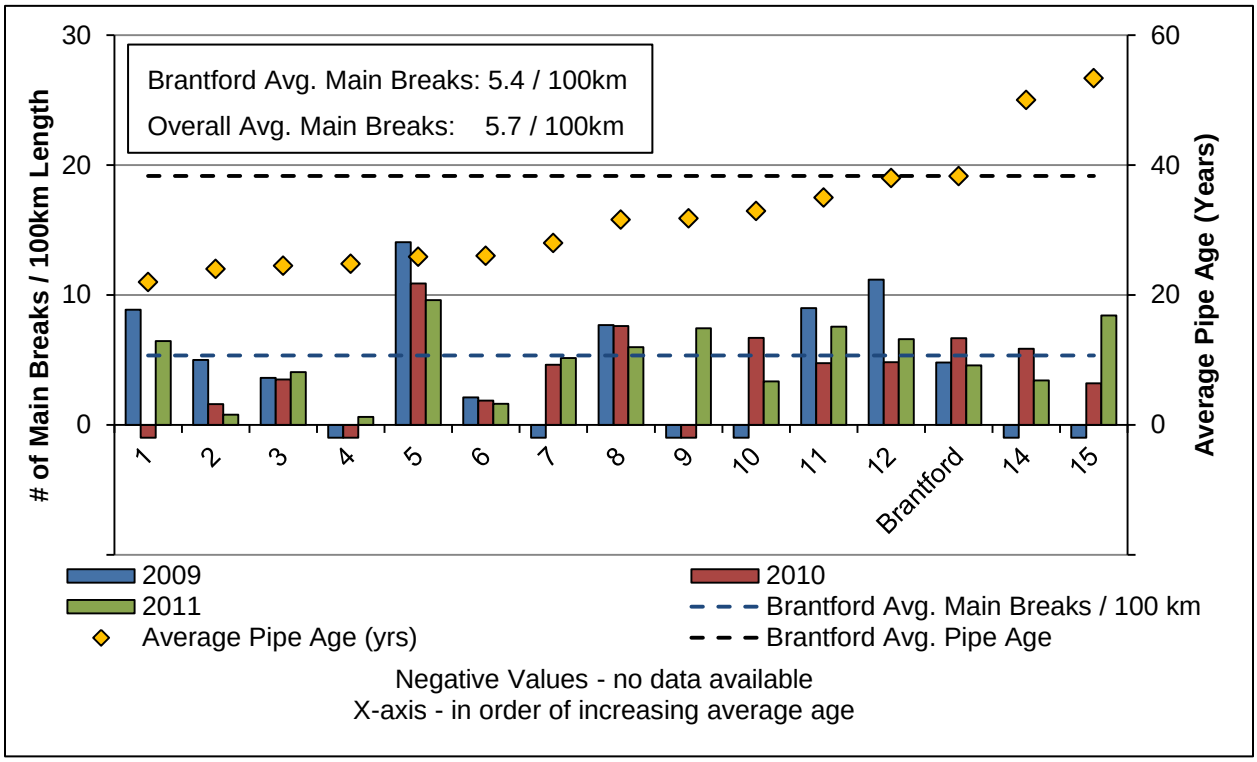
The tracking of performance measures from year to year allows staff to gain insight into trends, inter-relationships and the downstream impacts of initiatives. For example, a combination of factors can cause watermain breaks such as the construction quality, pipe age, pipe material, soil conditions, ground and water temperature, and pressure changes in the system. **Figure 10** shows an example of the number of water main breaks per 100km length broken down by material, compared to the average pipe age in the distribution system. The figure shows that since 2001 the average pipe age has been decreasing, and in a similar trend, the number of watermain breaks per 100km length has been on a decreasing trend. The data also shows that a large proportion of the watermain breaks from year to year are by pipes with metallic materials, indicating that metallic material watermains currently present a higher probability of failure than non-metallic watermains, which may be due to a prevalence of metallic watermains being installed 50 to 100 years ago. While there are other factors involved, benchmarking provides scope into the interrelationships between some of the parameters.

Figure 10. Water Distribution Number of Watermain Breaks / 100km Length and Average Age of Pipes



The City also uses the data to conduct comparisons to other similar organizations. **Figure 11** shows the number of watermain breaks in Brantford and other similar organizations (with networks below 550km) in comparison to the average pipe age. The graph shows that while Brantford has some of the oldest pipes in the comparison group, the number of watermain breaks is just under the overall average number of main breaks.

Figure 11. Water Distribution # of Main Breaks / 100 km Length and Average Pipe Age (Systems <550 km)



3.2. Visualizing Levels of Service

To aid in gaining an understanding of the levels of service being provided by an asset, the City undertakes inspections on a regular basis, which helps categorize the current condition and performance of the infrastructure. **Figure 12** to **Figure 16** show how a road segment's Pavement Condition Index (PCI) translates into the visual condition or levels of service provided by the road.

Figure 12. Very Good Condition (PCI between 80 and 100)

Figure 12 illustrates a road that has just been constructed and is in very condition. In the very good condition category (PCI 80-100), typically the roads show no signs of defects. **Figure 13** shows an example of a road that is in the good condition rating category (PCI 60-79). In this category, minor early signs of defects start appear such as cracks. In the example shown below, cracks have been filled for preventative maintenance purposes.

Figure 13. Good Condition (PCI between 60 and 79)

An example of a road in fair condition (PCI 40-59) is shown in **Figure 14**. In the fair condition rating category, the road shows moderate signs of deterioration such as alligator cracking, which in some cases may necessitate minor patch repairs.

Figure 14. Fair Condition (PCI between 40 and 59)

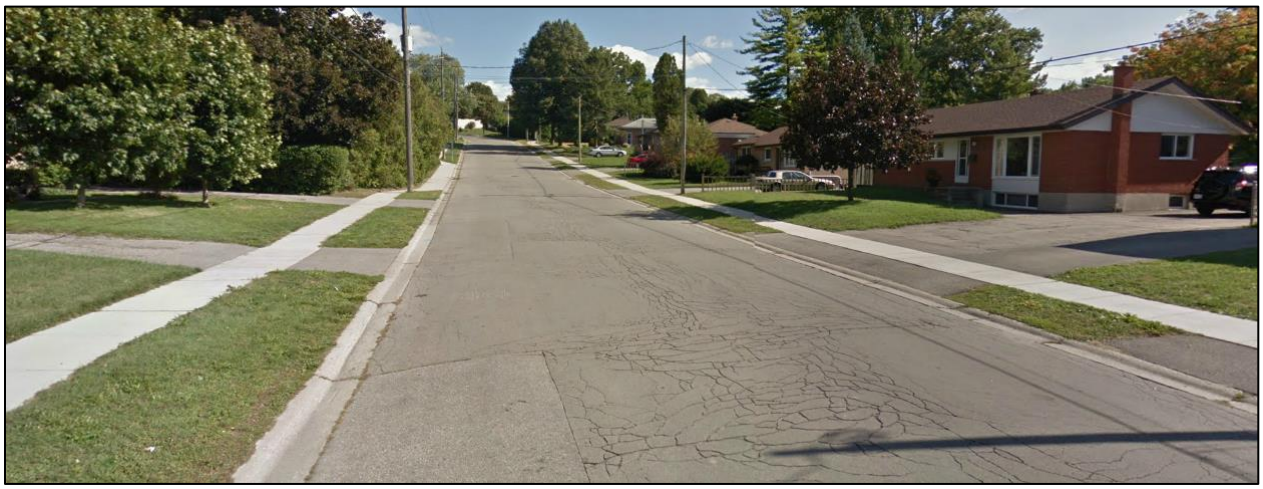


Figure 15 shows an example of a road that would fall into the poor condition rating category (PCI 20-39). At this stage, there has been substantial alligator cracking to the point that several pot holes have formed, resultantly increasing the operations and maintenance requirements of the road. In the 2013 capital planning process, all roads with a PCI below 40 were identified as resurfacing or reconstruction candidates in the 10 year capital forecast.

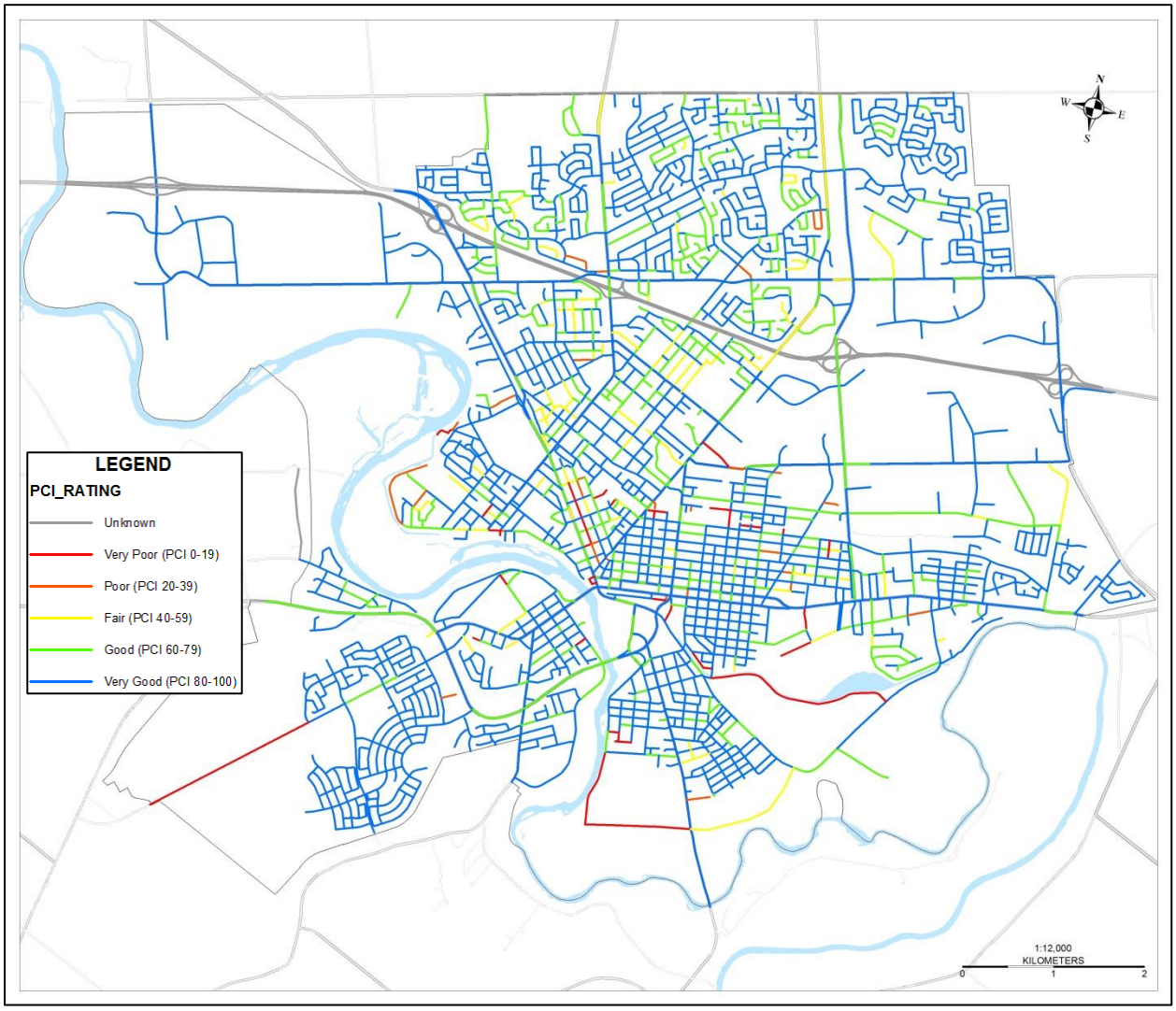
Figure 15. Poor Condition (PCI between 20 and 39)

The final condition rating category is very poor (PCI 0-19), which is demonstrated in **Figure 16**. Very poor roads show advanced signs of base and surface failure. The road shown in the figure has failed to the point that large amounts of the surface asphalt have crumbled away, exposing the granular base. In the 2013 capital planning process, all roads with a PCI below 40 were identified as resurfacing or reconstruction candidates in the 10 year capital forecast.

Figure 16. Very Poor Condition (PCI between 0 and 19)

To aid in the development of capital budgets, and to gain an understanding of investment requirements across the City, condition ratings are regularly mapped as shown in **Figure 17**, and used for planning purposes.

Figure 17. Example Map of Road Condition Ratings



Note:

- *This map is provided for example purposes only and may not represent the current road condition ratings.*

3.3. Level of Service Initiatives

In addition to tracking the performance measures as part of the NWWBI, the City maintains levels of service to meet or exceed a number of legislated standards. For instance, roadways are maintained to meet the criteria for inspections, pot holes and cracks set out in Ontario Regulation 239/02 – Minimum Maintenance Standards for Municipal Highways. On an ongoing basis, the City maintains documents and has implemented a number of initiatives that further establish the current and expected levels of service for quality and safety, quantity and capacity, and availability of services that include but are not limited to those shown in **Table 6**.

Table 6. Level of Service Initiatives

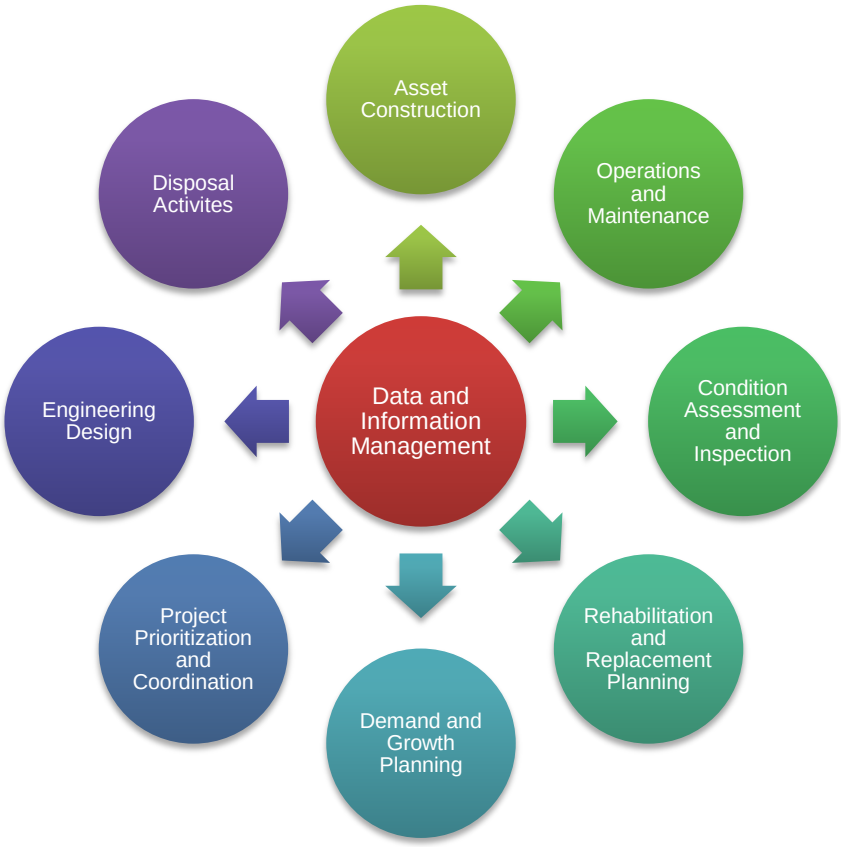
Service Criteria	Initiative
Quality and Safety	**Roads and Sidewalks** • Minimum Maintenance Standards • Ontario Good Roads Association Municipal Roads Survey • Annual Condition Assessment • Design Guidelines • Traffic Monitoring **Bridges, Culverts and Retaining Walls** • OSIM inspections • Bridge Maintenance Strategy **Water, Wastewater and Stormwater** • Drinking Water Quality Management Standard (DWQMS) • Standard Operating Procedures • National Water and Wastewater Benchmarking Initiative • Design Guidelines **Solid Waste and Landfill** • Waste Collection Standards • Blue Box Best Practice Annual Review **Public Works and Admin Facilities** • Building Condition Assessments (5-Year Return Cycle) • ASHRAE Guidelines • Energy Use and Efficiency Audits **Corporate Fleet and Transit** • Preventative maintenance strategy • Ministry of Transportation Motor Carrier Safety Standards Schedule 1 and 2 **Social Housing** • Building Condition Assessment (5 year cycle) • Annual building and unit inspections • Elevator inspections in accordance with TSSA • Reserve fund audits – capital planning • Annual Ministry of Municipal Affairs and Housing audits and reporting

Service Criteria	Initiative
Demand and Capacity	**Roads, Transit, Bridges and Sidewalks** • Transportation Master Plan • Traffic Controller Study **Water, Wastewater and Stormwater** • Water, Wastewater and Stormwater Master Servicing Plan • Treatment Plant Optimization Strategy **Solid Waste and Landfill** • Provincial Waste Collection Standards **Public Works and Admin Facilities** • Corporate Facility Accommodation Strategy • Operations Yard Master Plan **Fleet and transit** • Fleet and transit lifecycle costing analysis **Social Housing** • 10 Year Housing Stability Plan and 5 Year Implementation Plan
Availability and Accessibility	**Social Housing and Facilities** • Accessibility for Ontarians with Disabilities • Barrier Free Design • Facility Accessibility Design Standards **Corporate** • Customer Service Strategy • Communication Strategy • Online initiatives – myBrantford.ca • Infrastructure Report Card

4. Asset Management Strategy

The asset management strategy is the set of planned actions that will enable the assets to provide the desired levels of service in a sustainable way, while managing risk, at the lowest lifecycle cost. In order to facilitate the development of the asset management strategy, a number of activities or initiatives take place within the City. **Figure 18** shows the components of the asset management strategy and asset lifecycle activities. At the core of the asset management strategy is the City's data and information which pushes and pulls key data from each of the activities. The activities, starting from the original construction of the asset denote the required planning activities carried out by Brantford throughout the asset management planning lifecycle.

Figure 18. Components of the Asset Management Strategy



4.1. Data and Information Management

The Information Technology (IT) Services Department provides a suite of computer applications and systems to approximately 800 staff with dedicated user accounts at the City. The IT Services Department maintains the GIS server environment currently using ArcGIS for Internet Mapping along with ArcSDE and Oracle for spatial information storage and organization. The GIS data is managed, reviewed and

input by staff in the GIS department. IT Services also maintains the majority of the key data repositories and applications utilized for the purpose of asset management.

Key databases and applications that have current or future implications for the asset management strategies of the City include, but are not limited to:

- *Avantis Computerized Maintenance Management System (CMMS):* Currently utilized for maintenance management and work order purposes to varying extents within the Public Works Department. Avantis currently supports ESRI shapefile format only for GIS integration. An upgrade for Avantis has been identified and budgeted for by IT Services. There are ongoing requirements for bi-directional integration with the GIS desktop and web mapping environments. The CMMS also merits consideration with respect to mobile access for digital work orders and asset maintenance and updating in the field, along with requirements for remote access to GIS information by Avantis field users and operations staff.

- *Linear Asset Data Repository (LADR):* This is the current repository for most infrastructure assets. There is currently a linkage between LADR and the Avantis CMMS. However, this link needs to be bi-directional to capture changes to assets via the maintenance processes. Future considerations with respect to the planned Avantis upgrade, future ESRI integration, and planned changes to the GIS database model being utilized in the LADR system need to be scheduled and sequenced to align with priorities and associated timing.

- *GIS System (ESRI Canada):* The GIS system stores all geospatial information pertaining to the City's infrastructure networks. This database relates to LADR, and geographically displays the information. The City is currently in the process of examining its data needs, storage and formatting as it relates to both the LADR data repository and the GIS system. A full geospatial database needs analysis, data architecture and database design will be undertaken in the fall / winter of 2013. It is anticipated that the geospatial database will be built out and the required data will be migrated over in 2014. With a newly enhanced geospatial database, the City will be better positioned to take advantage of some of the state of the art remote-field data collection and web mapping applications offered in the ESRI GIS suite of tools.

- *GIS Web Mapping:* The City currently provides internal users with access to GIS through a web portal. Various map views have been established to allow the end user to select the type of mapping / query they would like. A similar web tool / portal has been established for select external users (utilities and locates). Along with the geospatial database design and build project the City is looking at ways to improve its web-mapping capabilities to enhance the way data is made available, displayed and shared.

- *Capital Planning Database:* The Capital Planning Database is used for the management of capital project data and multi-year budget forecasting. Future opportunities include integration and dynamic feed for display of analytics within a web-based GIS viewer. In the future, the application functionalities may be expanded to facilitate tool development within GIS for common functionality, reporting and data analysis.

- *Sewer Assessment Web Service (SAWS):* SAWS is used to manage sewer CCTV sewer inspection data within a Microsoft Access Database and Client Server application. CCTV data is collected in the field via the City's operations staff, which have all successfully completed the

PACP® / CSA PLUS 4012 Pipeline Assessment and Certification Program (PACP®) Canadian Edition. Resulting condition observations and codes are migrated into SAWS through a data load procedure. The City is currently developing a mapping interface to allow access to CCTV data via GIS; however, in the future this link needs to be bi-directional to capture changes to assets via the GIS upload procedure.

- *JD Edwards:* This application, based on an Oracle database, is the City's core financial system which stores all project-related financial information as well as the tangible capital asset register.

- *Traffic Engineering Software (TES):* Utilized in Transportation and Parking Services for the storage of traffic volumes, count data, accident statistics, and collision information. Currently, some of the GIS layers being utilized by TES are edited directly within the TES environment.

- *Supervisory Control and Data Acquisition (SCADA):* SCADA systems are used for Water & Wastewater operations and planning. The City is considering future integration of metrics from plant and linear assets for viewing within the GIS and superimposed with GIS layers.

- *Building and Facility Database:* The City historically maintained facility inventory information, building condition assessment results, and capital plans in the web-based software BuildingWEB. In 2013, the City has retained consulting services to develop a suitable non-proprietary Microsoft Access / Structured Query Language (SQL) based Uniformat II compliant database to house facility data and to replace BuildingWEB.

- *Water, Wastewater and Stormwater Hydraulic Models:* The City of Brantford has initiated a City wide Master Servicing Plan to identify a preferred water, sanitary and stormwater servicing strategy to support existing servicing needs and projected growth. The hydraulic models generated during this study will allow for simulation of growth and demand scenarios, and will provide the business case for the need, timing and cost of servicing and infrastructure.

- *Transportation System Model (TRANSCAD):* Along with the Master Servicing Plan, the Transportation Master Plan will provide balanced strategies for the servicing and operation of important transportation infrastructure within the city for the next 30 years. The GIS transportation model updated during this study allows for simulation of population/employment growth and transportation demand scenarios using travel patterns derived from the most recent Transportation Tomorrow Survey database. The study will look at potential impacts on City wide transportation networks including active transportation (walking/cycling), public transit, goods movement and auto travel, as well as support, inter-city transportation services.

- *YARDI Property Management Software (YARDI):* YARDI is the Housing Department's primary Property Management software. Through this software, Housing staff produce work orders, maintain a comprehensive tenant data base and produce financial records.

Brantford is in the process of reviewing and improving its data and information management capabilities, which is likely to necessitate significant changes that will result in increased efficiency in the coming years. Some examples of such initiatives include:

- SMART Cities Initiative;
- CustomerOne – Corporate Customer Service Strategy; and
- Geodatabase Design, Build and Data Migration.

4.2. Operations and Maintenance

Throughout the life of the assets corrective and preventative maintenance, as well as operational activities are recorded in the CMMS. Such data is utilized as inputs to capital planning when the assets reach a point where the benefits of rehabilitating and replacing the asset, exceed the costs. As well as undertaking regular maintenance studies to identify and implement best management practices for multiple asset classes, the City benchmarks operations and maintenance activities and costs on an ongoing basis.

4.3. Condition Assessment and Inspection

Asset condition and performance information supports lifecycle decision making and is critical to the management of risks and performance in achieving level of service standards. The City actively undertakes condition assessment activities, and utilizes the information in the development of capital plans. A list of the current condition assessment and inspection initiatives is shown in **Table 7**.

Table 7. Condition Assessment and Inspection Projects by Program Area

Program Area	Project	Interval	Target % of Network
Road Network	• Annual Road Survey	Ongoing	100%
	• Detailed Roadway Surface and Drivability Condition Assessment	Annual	100%
	• Minimum Maintenance Standards Road Survey	Ongoing	100%
Sidewalks	• Sidewalk Condition Assessment	3 Years	100%
	• Minimum Maintenance Standards Sidewalk Survey – Trip Hazards	Annual	100%
Bridges, Retaining Walls and Culverts	• Bridge and Culvert Structural Condition Assessment (OSIM)	Bi-Annual	100%
	• Bridge Detailed Condition Investigation	Ongoing	100%
Water Distribution	• Cast/Ductile Watermain Condition Assessment	Ongoing	100%
	• Watermain Condition Assessment	Annual	As required
Water Facilities	• Water Booster Station and Reservoir Condition Assessment Study	5 Years	100%
Wastewater Collection	• Wastewater Collection System Trunkline Condition Assessment	Annual	10%
	• In-House Wastewater Collection System CCTV Condition Assessment	Annual	10%
	• Manhole Condition Assessment Program	Bi-Annual	100%
Wastewater Facilities	• Sanitary Pumping Station Facility Condition Assessment	5-10 Years	100%
Stormwater Collection	• In-House Stormwater Collection System CCTV Condition Assessment	Annual	10%
	• Manhole Condition Assessment Program	Bi-Annual	100%
Stormwater Facilities	• Stormwater Retention Ponds and Stormceptor Inventory and Condition Assessment Study	One-off (2013-14)	100%
Solid Waste & Landfill	• Capacity Analysis and Forecasting	Ongoing	Ongoing
Public Works and Administrative Facilities	• Facility/Building Condition Assessment Program	Annual	20%
	• Facility/Building Roofing Condition Study	Annual	10%

Program Area	Project	Interval	Target % of Network
Corporate Fleet and Transit	• Ministry of Transportation Motor Carrier Safety Standards Schedule 1 and 2	Time/mile-age/fuel	100%
Social Housing	• Social Housing Building Condition Assessments	5 Years	100%
	• Facility/Building Roofing Condition Study	Annual	10%

Note:

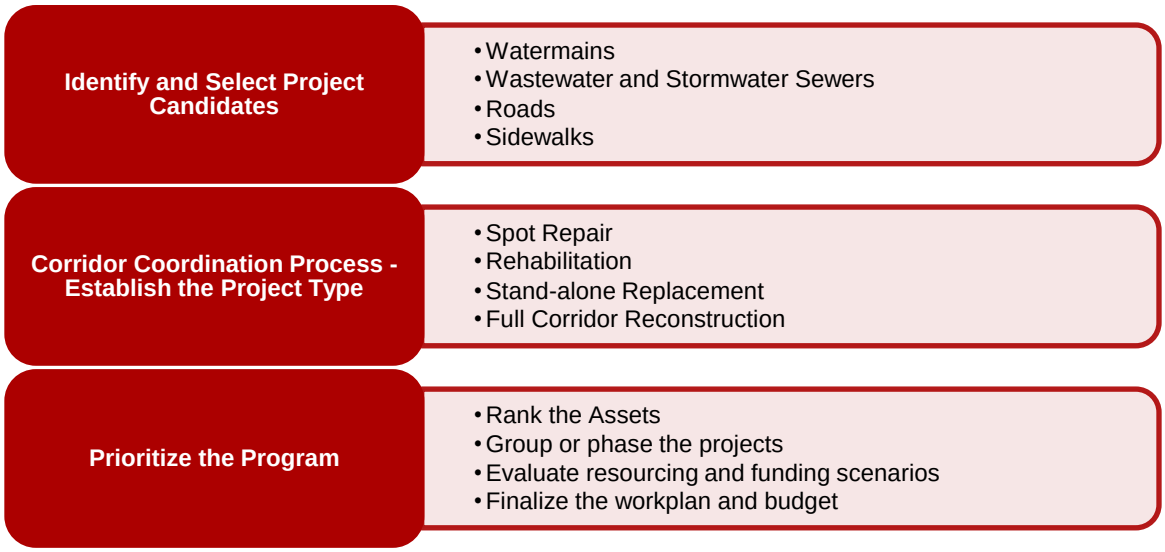
- *The "target % of Network" represents the percentage of the network assets that are covered in the specified interval.*

4.4. Rehabilitation and Replacement Planning

In 2013, the City revisited its capital program development process for linear infrastructure to make the most of additional data. Traditionally, an in-house database tool was used to generate an overall condition score for each water, wastewater and stormwater asset based on available data such as remaining service life, number of breaks, and the diameter of the pipe. Road project candidates were selected based on a visual windshield survey of Pavement Condition Index (PCI) as well as engineering judgement, condition assessments and cursory inspection. While this allowed lists of projects to be developed on a program level, a lack of relationships in the data between individual assets or groups of assets gave rise to challenges in analyzing an optimum treatment for a right of way corridor, which at the time required manual reconciliation of the project lists. In order to automate the process and allow for objective prioritization across program areas, the City developed automated and integrated business processes for the development of the linear infrastructure capital program.

The new capital planning business process is comprised of three core steps which are founded on data analytics and collaboration of the capital budget stakeholder working groups. The three steps are as shown in **Figure 19**.

Figure 19. Steps in the Linear Asset Capital Project Selection Process



4.4.1. Capital Budget Stakeholder Working Groups

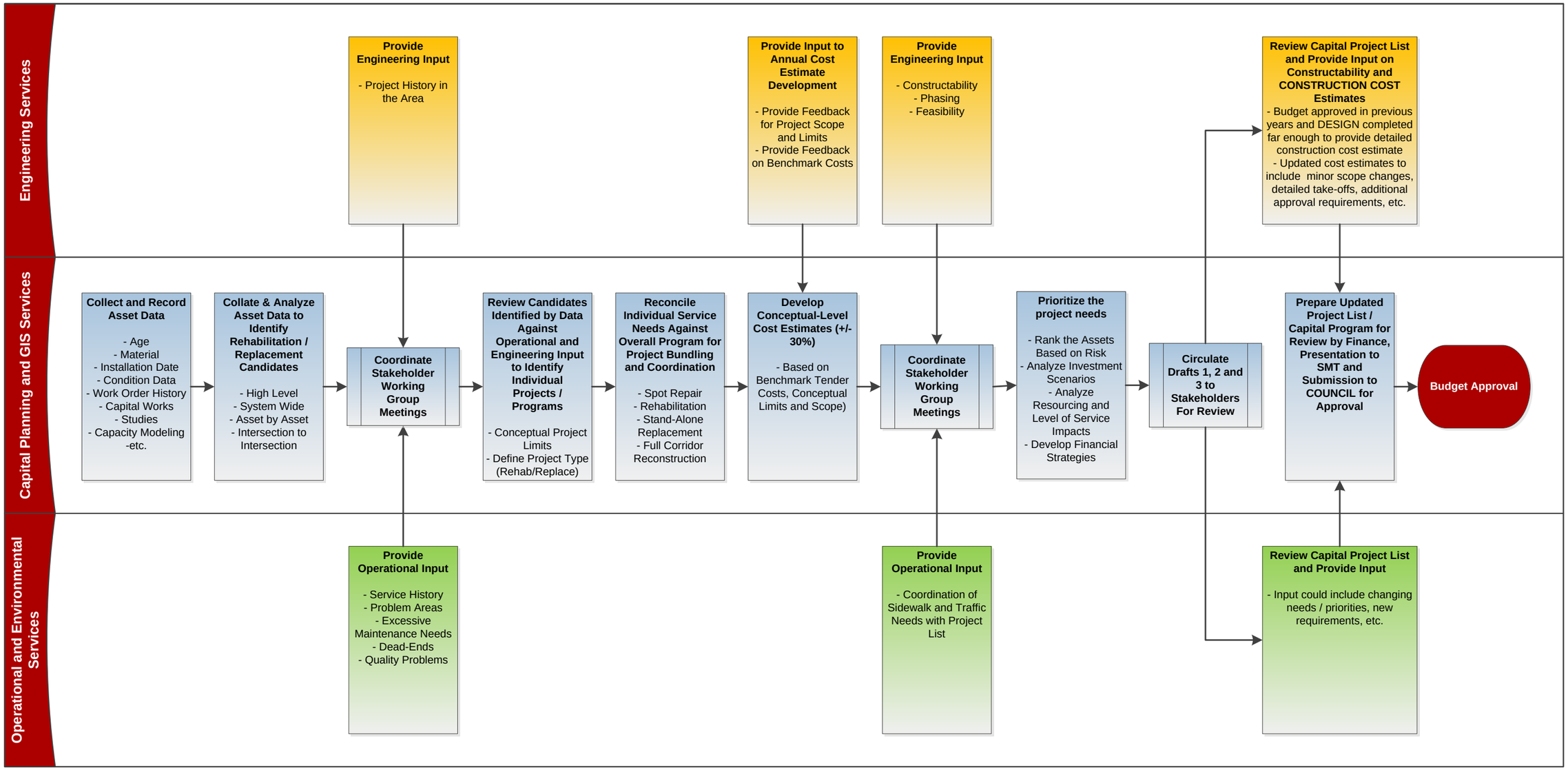
An integral component of the annual budget cycle is the formation of multi-stakeholder working groups for key asset classes. These stakeholder groups combine personal "tacit" and technical knowledge of the infrastructure networks, their performance, problem areas and history that are valuable inputs into developing a defensible and accurate capital investment program. While every effort is made to ensure that processes are automated, data is accurate and the outputs of analyses are credible, the human element of sharing ideas, providing multiple perspectives, and communicating experience is critical to success of the City of Brantford's capital budget development. The stakeholder working groups are comprised of representatives from various City departments that include, but are not limited to those shown in **Figure 20**.

Figure 20. Typical Members of Stakeholder Working Groups

Program Area	Typical Stakeholders
Road Network	Capital Planning, Road Maintenance, Design & Construction, Traffic Services, Transportation/Parking Services, Transit
Sidewalks	Capital Planning, Sidewalk Maintenance, Transportation/Parking, Transit
Bridges	Capital Planning, Bridge Maintenance, Design and Construction, Transportation/Parking
Water Distribution	Capital Planning, Distribution Operations, Technical Services / Development Review, Design and Construction, Compliance
Wastewater and Stormwater Collection	Capital Planning, Wastewater Operations, Technical Services / Development Review, Design and Construction
Water, Wastewater and Stormwater Facilities	Capital Planning, Water and Wastewater Operations (Treatment Plant)
Solid Waste and Landfill	Capital Planning, Solid Waste Operations
Public Works and Administrative Facilities	Capital Planning, Facilities Management, Facility/Property Managers
Corporate Fleet and Transit	Capital Planning, Fleet and Transit
Social Housing	Property Managers, Facility Management, Service Managers, Finance

Developing and coordinating the budget for the linear infrastructure is typically a complex process requiring input from many stakeholders across the organization as well as being very data intensive. To rationalize the process, the City has developed a workflow for the development of the budget which is shown in **Figure 21**. By formalizing the workflow and mapping out the steps, inputs and outputs as shown in the figure, the City is able to identify areas for improvement. This workflow was implemented for development of the 2014 budget cycle and is intended to evolve and continuously improve in years to come.

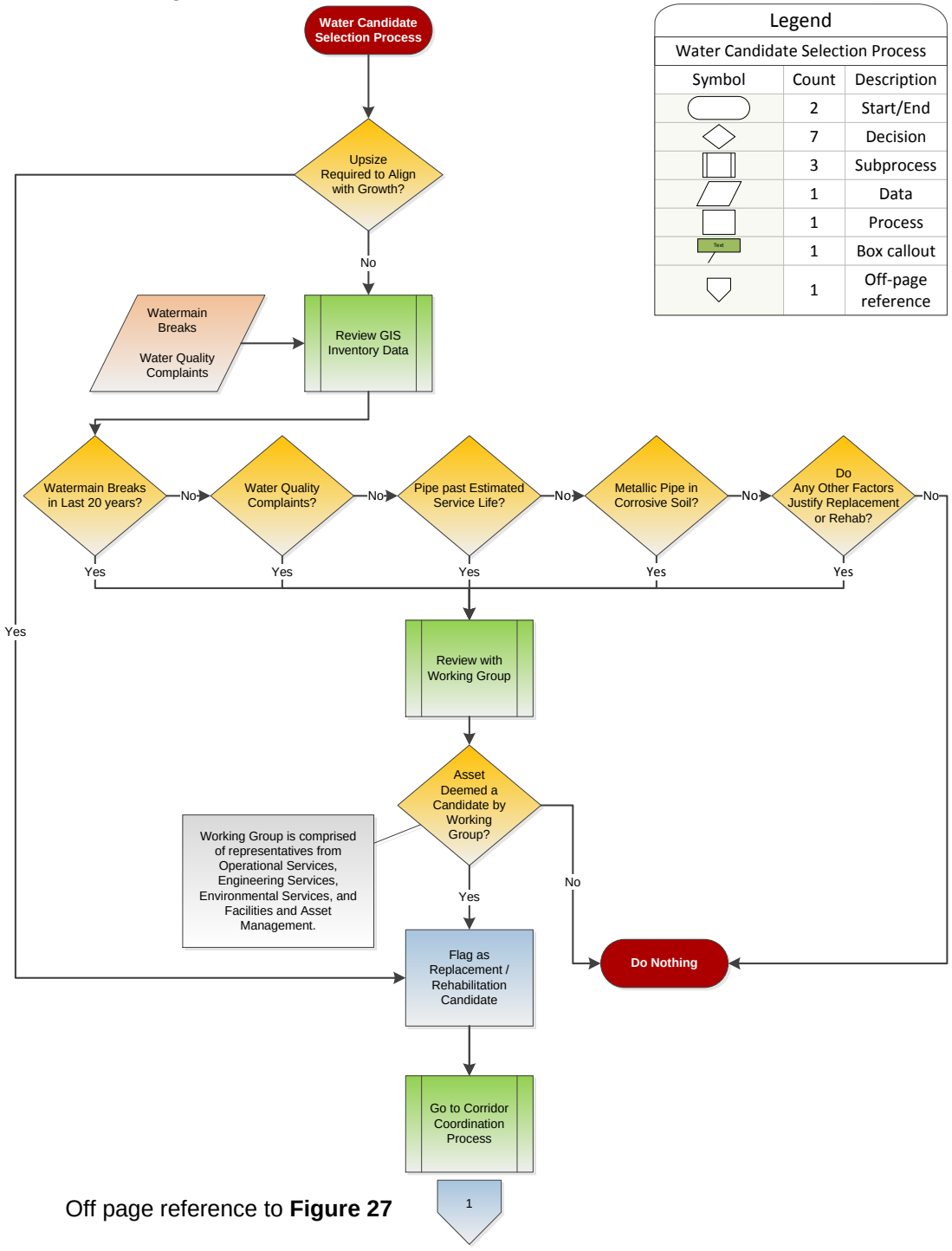
Figure 21. Linear Infrastructure Capital Budget Development Workflow



4.4.2. Identifying and Selecting Project Candidates

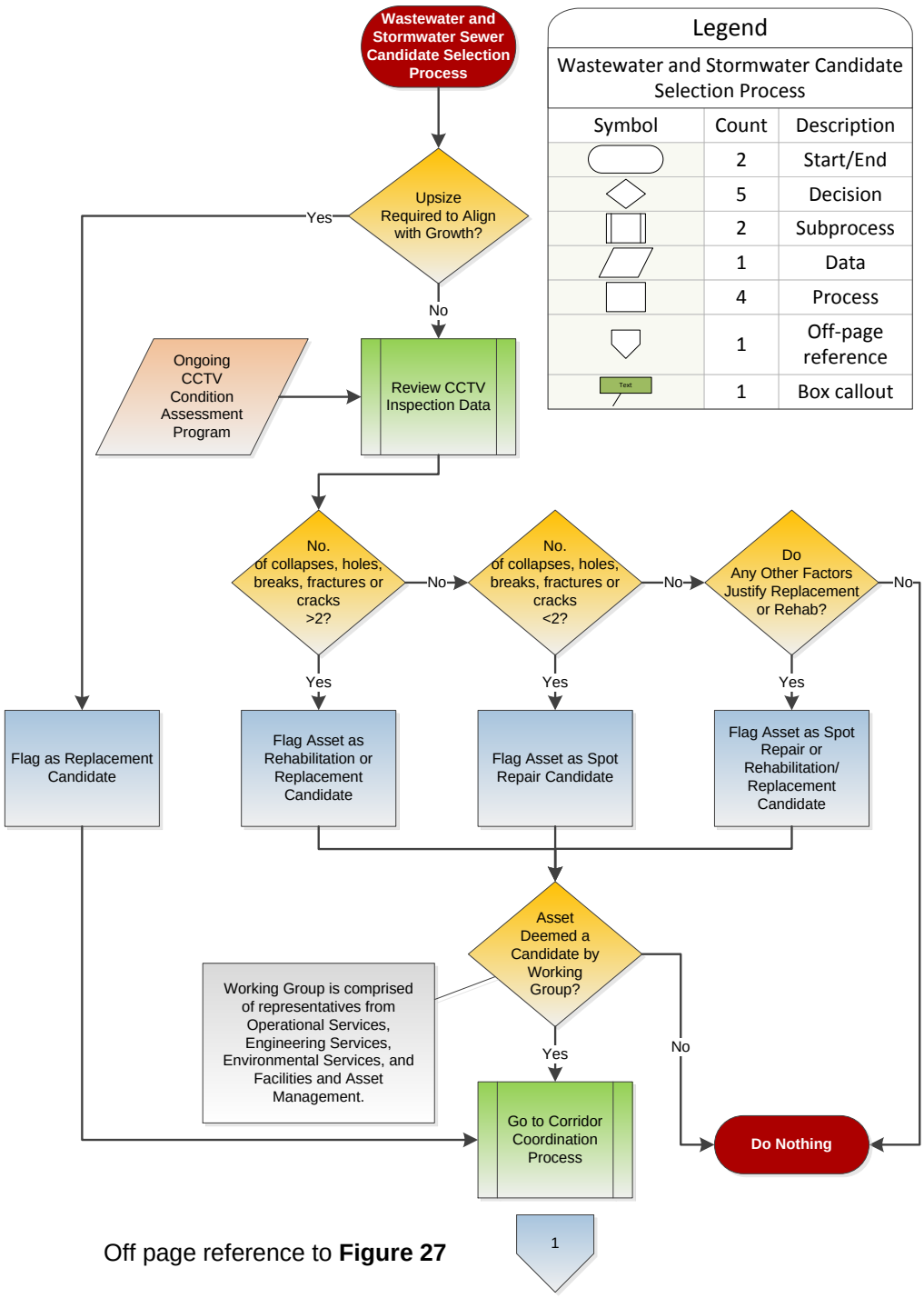
The workflows used in the selection of water, wastewater, stormwater and road replacement candidates are shown in **Figure 22** to **Figure 24**.

Figure 22. Water Candidate Selection Process Flow Chart



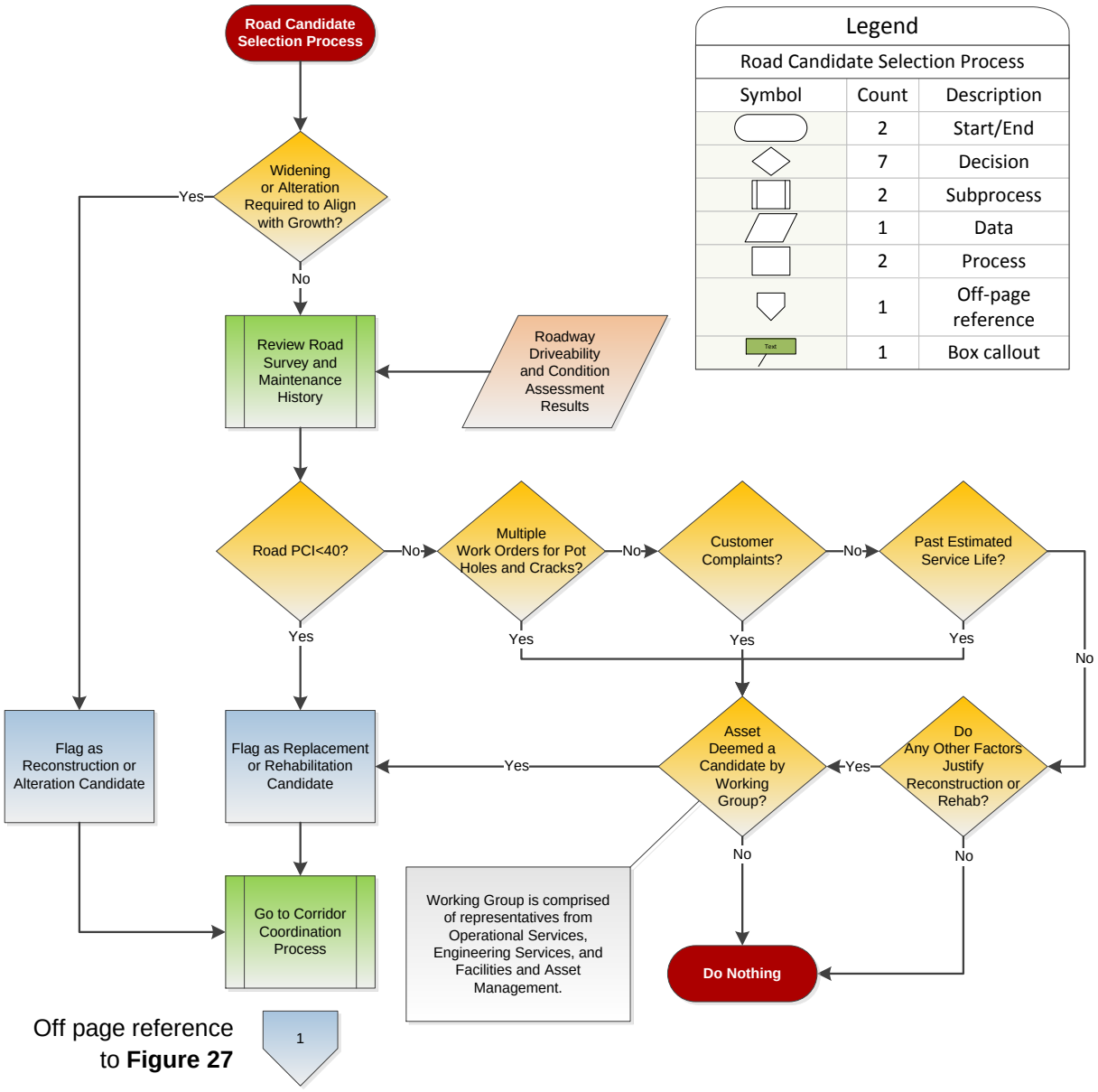
Off page reference to **Figure 27**

Figure 23. Wastewater and Stormwater Sewer Candidate Selection Process Flow Chart



Off page reference to **Figure 27**

Figure 24. Road Candidate Selection Process Flow Chart

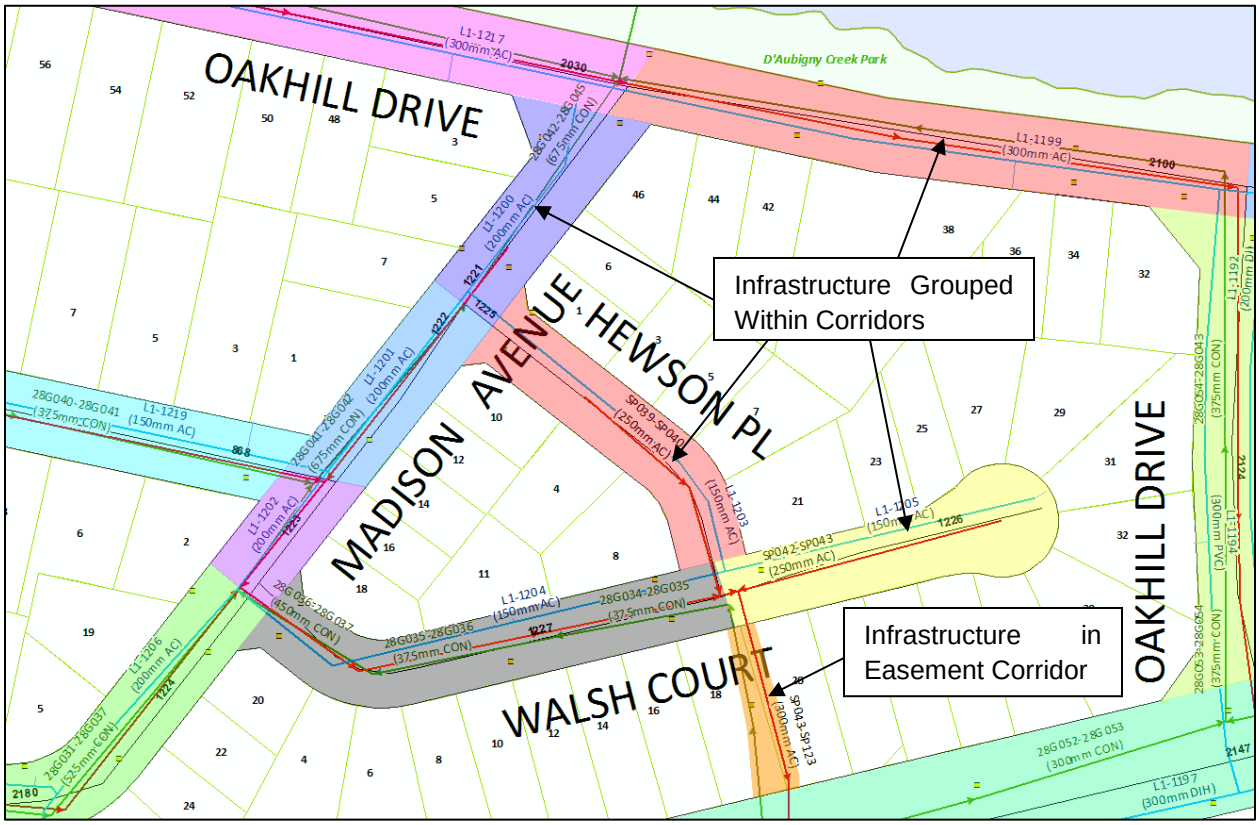


4.4.3. Corridor Coordination

The candidate selection process identifies which individual assets may be required to be replaced or rehabilitated. In any given right of way, there may be multiple assets of varying asset type that have been identified as replacement or rehabilitation candidates. Moreover, there may be assets within that same right of way that have recently been repaired, are in excellent condition, and may last for a number of years. The process of corridor coordination allows the City to identify and evaluate these scenarios, and develop the appropriate strategy that will extend the life of the corridor as long as possible, while maintaining the required levels of service and minimizing risk exposure.

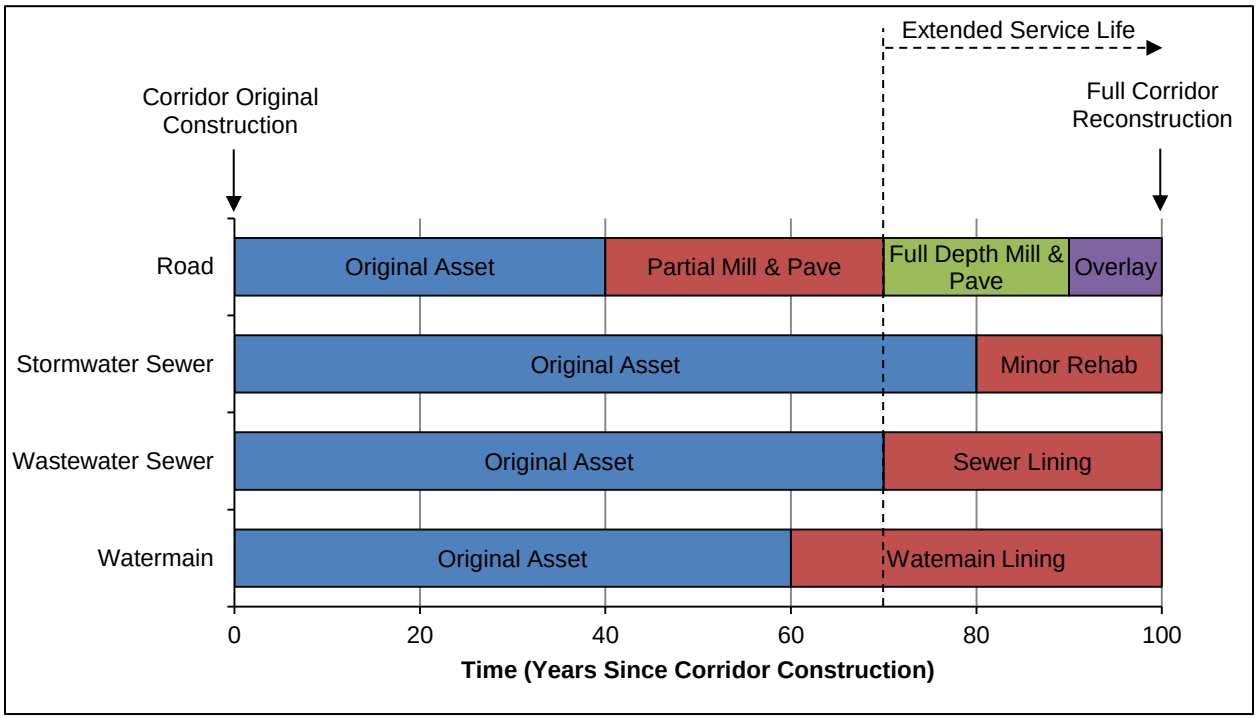
In order to form the locational relationship between the assets of different asset classes, the City divides all of the City right of ways into 'corridors'. With assets grouped into corridors, each asset can be assessed alongside each other to diagnose the optimum treatment method. **Figure 25** shows an example of how the right of way is divided into the corridors. Typically a corridor will range along a road from one intersection to the next, and also in easements from one end to the next.

Figure 25. Example of Corridor Breakdown



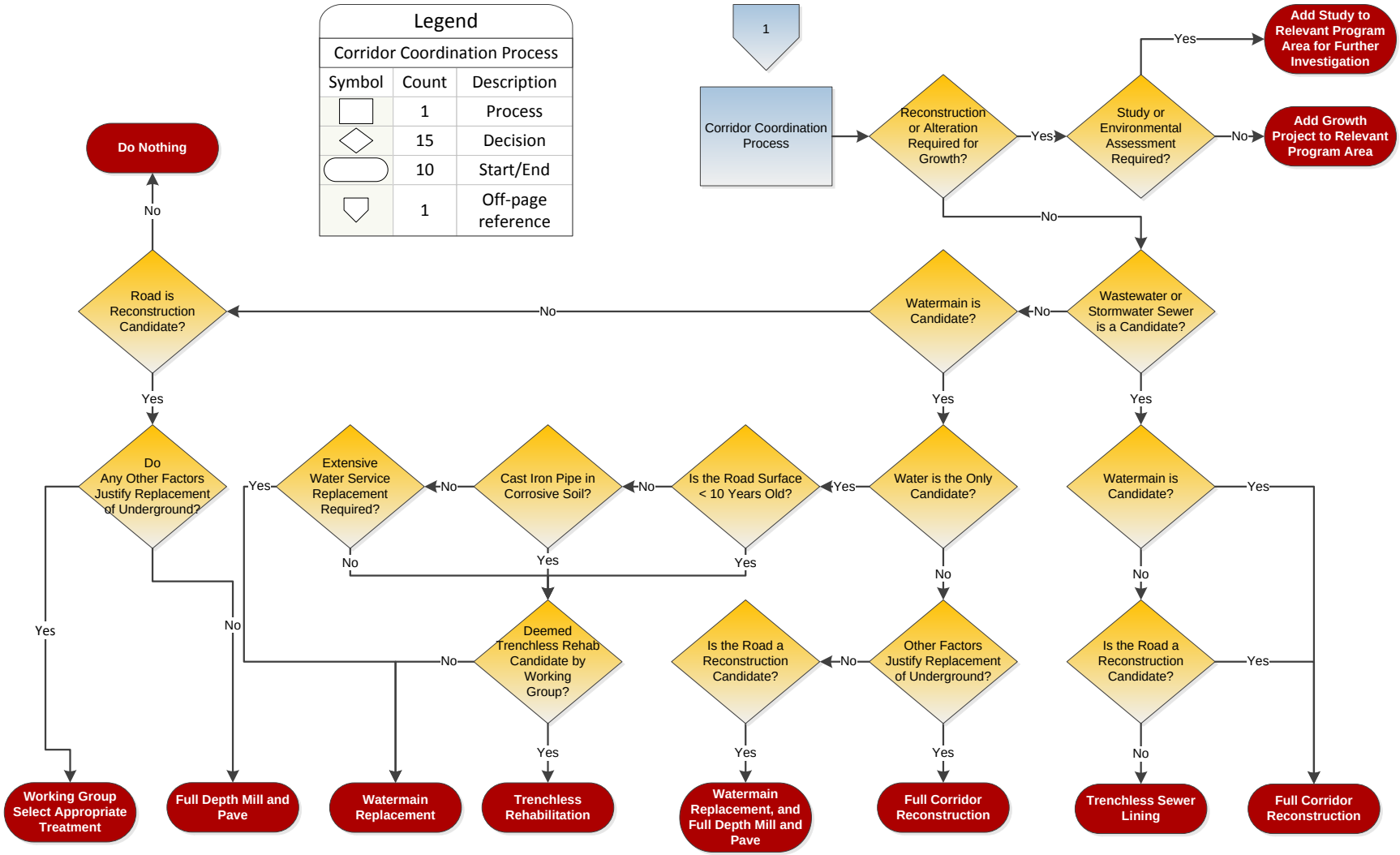
A hypothetical example of the lifecycle of an infrastructure corridor is shown in **Figure 26**. The figure shows an illustration of the varying lifespan of the asset classes in the corridor. For example, the road may require rehabilitation at approximately 40 years from the time it is constructed. At 60 years, the watermain may require replacement, requiring a trench to be cut in the road surface (which may still be in good condition); instead trenchless relining of the watermain could extend the service life of the pipe for an additional 40 years, and require minimal impact to the road surface. This approach to integrated capital planning allows the corridor reconstruction to be harmonized at the end of each asset's lifecycle, providing greater return on infrastructure investments over the long-term as well as minimizing disruption to the public due to construction activities.

Figure 26. Hypothetical Corridor Lifecycle



In order to ensure that decisions are being made consistently across the entire infrastructure network, the City has developed a formalized decision making process for selection of the project type. Mapping decision criteria in this way helps ensure a consistent, defensible and transparent approach to decision making. In addition, it allows the visualization of areas for improvement from stakeholder input and peer review. **Figure 27** depicts the decision criteria that are used for selecting the project type of a corridor. Following the corridor coordination process, corridors are grouped together and phased through consultation with each of the stakeholder working groups with the goal of achieving efficiencies in economies of scale.

Figure 27. Corridor Coordination (Project Type) Process Flow Chart



4.5. Demand and Growth Planning

Brantford is a growing city that has been designated as an urban growth center in the Provincial Growth Plan, and is destined for continued growth in all economic sectors. To this end, it is estimated that by 2041 the population of the City of Brantford will grow by 68% to 163,000 (Ministry of Infrastructure, 2013). Such growth has impacts on the required capacity and servicing provided by the City's core infrastructure networks. As a step towards better understanding future demand and how we can better plan to meet the future needs of the City, Brantford has implemented several core initiatives.

4.5.1. Water, Wastewater and Stormwater Master Servicing Plan 2013

The City of Brantford has initiated a City wide Master Servicing Plan to identify a preferred water, sanitary and stormwater servicing strategy to support existing servicing needs and projected growth. The Plan will provide the business case for the need, timing and cost of servicing and infrastructure. The study utilizes the Class Environmental Assessment process to develop a master plan that will form the servicing strategy for the design and operation of the City's water, sanitary and stormwater systems to the year 2041. The Master Servicing Plan will meet the growth projections for the City as defined in the Places to Grow Growth Plan for the Greater Golden Horseshoe, and align with other City planning documents including but not limited to the Downtown Master Plan, the Waterfront Master Plan, the Transportation Master Plan, the Streetscape Design Plan, the Southwest Secondary Plan, the Intensification Strategy and the Official Plan which are currently under review. The objectives of the Master Servicing Plan are as follows:

- Develop servicing policies and principles which future servicing must adhere to;
- Evaluate servicing options for alternative land use growth scenarios as part of the process of identifying the preferred land use option for growth to 2041;
- Identify the City's water, wastewater, and stormwater infrastructure needs to the year 2041 with consideration for a longer term servicing strategy;
- Develop a recommended implementation program for the preferred alternatives in the Master Servicing Plan for input in the Development Charges By-law process;
- Work with City staff undertaking the City's Official Plan Review and Transportation Master Plan Update to ensure that water, sanitary and stormwater servicing alternatives align responsibly with overall development and growth strategies for the City;
- Determine traditional treatment, pumping and storage requirements generated from existing use and projected growth;
- Leverage existing facilities to avoid new infrastructure where possible;
- Plan for new pipes in intensification areas with older infrastructure that require rehabilitation anyway;
- Optimize operations of the systems at the outer limits – optimize level of service and minimize energy usage where possible;
- Look for opportunity to reduce demands and flows in order to reduce need to expand the system or twin pipes;
- Plan for lot level stormwater controls and low impact development (LID) to minimize trunk stormwater infrastructure; and
- Consider innovative use of technologies and servicing concepts like grey water use to optimize system capacity.

4.5.2. Transportation Master Plan Update 2013

The purpose of the Transportation Master Plan is to develop an integrated transportation system to guide decision making. This plan will provide balanced strategies for the servicing and operation of important transportation infrastructure within the city for the next 30 years. The study will use information on travel patterns gathered during the most recent survey to look at active transportation (walking / cycling), public transit, goods movement and auto travel, as well as support, inter-city transportation services. The objectives of this study are as follows:

- Review non-automobile mobility in Brantford;
- Examine parking impacts of transportation system changes and proposed developments;
- Determine the need for transportation connections to the northwest and connections to projected growth areas;
- Review alternatives for the extension of Veterans Memorial Parkway;
- Examine existing and future transit transit ridership;
- Examine interregional travel demands (e.g., GO Transit, Highways 24);
- Review / modify truck routing plans and bylaws;
- Review / update current traffic calming policies for neighborhoods;
- Review local rail facilities;
- Expand the capabilities of the City's traffic control system; and
- Compare planning alternatives in accordance with the Ontario Municipal Class Environmental Assessment process.

4.5.3. Official Plan Consolidation and Update

The City of Brantford Official Plan is a policy document that sets out the City's general land use direction for long-term growth and development in a coordinated way to meet the community's needs and priorities. It also provides a way to evaluate and settle conflicting land uses while meeting local and provincial interests.

The Official Plan is made up of text and maps. The text includes policies describing the goals and objectives for the various land use designations within the City along with a general list of permitted uses in each of the designations. The maps divide lands in the city into different land use designations which are read with the policies to determine which uses are permitted in certain parts of the city.

An Official Plan is a legal document regulated by the Ontario Planning Act. The Planning Act requires municipalities to review their Official Plan at least every five years to ensure that the policies of the Plan meets the changing economic, social and environmental needs of the municipality and changes that are made at the Provincial level regarding planning and land use matters. Occasionally, it is necessary to change certain policies and mapping through an "Amendment." The Planning Act outlines how municipalities, review and process changes to the Official Plan. The City must give the public opportunities for input before adopting any changes to the Official Plan.

4.5.4. Brantford-Brant Housing Stability Plan 2014 - 2024

The Brantford – Brant Housing Stability Plan 2014 - 2024 will guide a housing and homelessness vision that incorporates solutions and initiatives to a range of housing options and supports, with a focus on dignity, pride in community and self-sufficiency over the next decade.

The Municipal government's role in planning for housing and homelessness services has been recognized in the Provincial Government's release of its Long Term Affordable Housing Strategy. The strategy states that Municipal Service Managers must establish local vision, engage the community to determine local needs and outcomes, and participate in local planning. As part of the *Housing Services Act 2012, Part II.*, Municipal Service Managers must develop a local 10 Year Housing and Homelessness Plan.

The Plan includes 53 recommendations, 25 were identified by community stakeholders as a priority. The following list of recommendations (not in priority sequence), are included in the Asset Management section:

- Compare planning alternatives in accordance with the Ontario Municipal Class Environmental Assessment process.
- Assess the impact of End of Operating Agreements and support strategic planning that will mitigate negative impact.
- Continue to respond or express interest in provincial funding announcements that allow for the opportunity to increase affordable housing, allocating 5% of units to those with physical disabilities and 5% to victims of violence.
- Explore the feasibility to develop new municipally funded capital programs to increase the supply of affordable housing (e.g. capital grants/loans, convert to rent programs, tax deferrals, development charges).
- Devise alternative business models in an effort to sustain and enhance the existing rent-geared-to-income model.
- Continue to work collaboratively with the Aboriginal Housing Providers to create additional housing units addressing the needs of the aboriginal community.
- Continue to work collaboratively with the Habitat for Humanity to create new affordable housing and ownership opportunities.
- Support increased contributions to the affordable housing reserve fund, thereby supporting the annual target of 180 new affordable units.
- Encourage the County of Brant to establish an affordable housing reserve fund to address the need for additional affordable housing units in the County.
- Support and monitor housing providers in the implementation of the *Accessibility for Ontarians with Disabilities Act* (AODA) on the Built Environment.
- Ensure the ongoing funding of capital reserves for social housing communities based on annually updated building condition assessments and encourage the practice of updating Building Condition Audits every five years incorporating AODA and Energy Reduction Strategies.
- The City of Brantford and County of Brant shall identify and evaluate sites, where deemed appropriate, for the inclusion of affordable housing units and also ensure that new affordable housing developments comply with appropriate urban design principles and guidelines, as required in each municipalities' respective Official Plan.

- Explore the feasibility and further promote opportunities for complete communities and density housing (i.e. developers gain more density and increased height in exchange for providing affordable housing), and use of Community Improvement Plans to offer other incentives for affordable housing.
- Ensure the ongoing sustainability and growth of social housing (rent-geared-to-income).
- Continue to monitor the affordable housing targets (180 new residential units/year), through the annual Residential Monitoring Report, and include reference to specific tenure targets (85% affordable rental and 15% affordable ownership).

New Affordable Units - In response to the Places to Grow Act and the Growth Plan, the City of Brantford had developed a range of new policies under Official Plan Amendment 125. Under section 13.2.1 of the affordable housing section it states, "The City shall set as its target for the development of affordable rental and homeownership housing, the creation of 180 new residential units each year through either the construction of new units or through the conversion of non-residential space. The target shall be interpreted as 85% affordable rental units and 15% affordable ownership units, of the 180 new residential unit target.

4.5.5. Other Initiatives that potentially impact Infrastructure Servicing

Along with the strategies described above, the City regularly develops strategies for specific purposes which feed into asset management decision making and demand forecasts. Some examples of these studies (completed and ongoing), are listed below:

- Affordable Housing Strategy
- Alexander Drive and Neighbourhood Area Sanitary Drainage Improvements
- Brantford Post-Secondary Impact Study
- Brantford Transit Comprehensive Study
- Brownfield Redevelopment Initiative
- Colborne and Dalhousie Street Two-Way Conversion Study
- Development Charges Study
- Downtown Revitalization
- Downtown Streetscape Design Project
- Economic Development Strategy
- Feasibility Study of Water Storage Facility
- Greenwich-Mohawk Brownfield Project
- Intensification Strategy
- Integrated Regional Transportation initiative (jointly with area municipalities and province of Ontario)
- North of Shellard Neighbourhood and Recreation Plan
- Official Plan Review
- Online Service Directory
- Parks & Recreation Master Plan
- Remediation Demonstration Project
- Shellard Lane Corridor Improvements Environmental Study Report
- Social Planning
- Sydenham-Pearl Brownfield Project

- Waterfront Master Plan
- Wayne Gretzky Sports Centre Expansion Project
- West of Conklin Study

4.6. Project Prioritization

Since most organizations, including the City of Brantford, rarely have sufficient financial resources to complete all required or recommended projects, capital works must be prioritized to ensure that critical projects are completed. In the absence of formal models for prioritizing projects, the City historically relied on ranking mechanisms based on informal methods that are often un-documented and inconsistent. Projects were often added to a project list until the City funding envelopes could no longer afford them, or projects were included on alternative discretionary lists such as an unfunded project list. Projects outside of the funding envelopes were either deferred or cancelled outright. In the absence of a formal, repeatable and documented prioritization process, varying factors played a role in project selection.

One of the key aspects of developing a consistent and defensible approach to capital planning and budgeting at the City of Brantford was the development of formalized decision making and prioritization criteria to be used when evaluating infrastructure assets. In 2006 the City implemented a Capital Asset Prioritization System (CAPS) for linear assets developed by an external consultant. CAPS used an algorithm to calculate a Priority Action Number (PAN) for all linear water, wastewater and stormwater assets based on available data.

In 2012, the City re-visited the process of capital program development which resulted in the introduction of several initiatives:

- Prioritization methodology for non-linear capital projects (e.g. facilities, parks and recreation, etc.);
- Prioritization methodology for linear capital projects (water distribution, wastewater collection, stormwater collection, roads and sidewalks);
- Development of business processes and criteria for capital project candidate selection (as described in **Section 4.4**); and
- Development of a capital planning workflow and multi-departmental working groups to develop and review capital budgets and levels of service (as described in **Section 4.4**).

Data Analytics

…the process of examining, transforming, modeling and visualizing data with the goal of discovering useful information, suggesting conclusions, making more accurate predictions, and supporting smarter decision making.

4.6.1. Non-Linear Project Prioritization

The system that was developed for non-linear capital projects relies on criteria that was established by staff and peer consultation, and was built on data analytics and a number of industry best practices.

At the highest level, an overall classification for each City project can be established:

- *High priority* projects are typically those that are required by regulation or law, are required by contract, improve public or employee health and safety, significantly reduce current operating,

maintenance or contractual expenses, or significantly increase the use of facilities and revenues, or contribute to job retention or benefit all or a majority of the City residents.

- *Medium priority* projects typically include those projects that would prevent additional deterioration of assets, improve delivery of services to the public, contribute to job creation, or might be non-essential, but have a high degree of public support.

- *Low priority* projects typically include those that support delivery of a service for which there might be declining demand, enable the provision of a new service or improve quality of life, but are considered non-essential.

In order to establish an individual project priority and ranking for comparative analysis, supporting information such as structural condition, performance condition, failure rates, project requirements and drivers for each potential project are reviewed.

The following eight (8) categories are used to score projects:

1. Legislated, Mandatory or Required By Law
2. Consequence of Failure
3. Service Levels
4. Operation and Maintenance Impact
5. Improved Efficiency
6. Expansion and Growth
7. Health and Safety
8. Coordinated Project

Project categories are divided into specific criteria that further establish the relative priority of the proposed project. The project ranking categories and sub-criteria are illustrated in **Table 8** below.

Table 8. Facility Project Ranking Criteria

Category (Sub-Criteria)	**Weighting** (Score)
1. Required to Meet Legislated Standards	**20%**
1.1. Does the project satisfy Federal, Provincial, County, or City mandates (e.g., by not performing this project Federal/Provincial money is withheld, laws violated if not followed, or addresses concurrency issues)? (Yes/No)	50
1.2. Is the project required for regulatory reasons, or does the project satisfy Federal, Provincial, County, or City recommendations or pending regulations? (Yes/No)	50
2. Consequence of Failure	**15%**
2.1. What is the consequence of failure of the asset? (High/Medium/Low)	100
3. Levels of Service	**10%**
3.1. Does the project maintain level of service standards? (Yes/No)	25
3.2. Does the project affect all customers within a recognized neighborhood or facility? (Yes/No)	25
3.3. Does the project affect all customers within the City by changing the way the City delivers services or does business (many external stakeholders)? (Yes/No)	50
4. Operation and Maintenance Impact	**10%**
4.1. After completion of the project, will maintenance be significantly more expensive and time consuming than at current level (requires additional resources)? (Yes/No)	-100
4.2. Will the project significantly decrease the demand on O&M budgets? (Yes/No)	100
4.3. Is the total capital cost of the project so high that it requires, on a temporary basis, the	

Category (Sub-Criteria)	Weighting (Score)
hiring of additional staff or significantly increases overhead costs beyond current levels? (Yes/No)	-50
5. Improved Efficiency	**10%**
5.1. Will the project significantly increase or improve the efficiency of existing processes? (Yes/No)	30
5.2. Does the project preserve or extend the life of an existing asset? (Yes/No)	50
5.3. Does the project use innovative solutions, approaches, or use technology in creative ways? (Yes/No)	20
6. Expansion and Growth	**10%**
6.1. Does the project increase infrastructure capacity to meet existing deficiencies to service the existing population? (Yes/No)	50
6.2. Does the project increase infrastructure capacity to meet future growth needs? (Yes/No)	25
6.3. Will the project attract new economies (i.e. tourism, facility use, businesses etc.)? (Yes/No)	25
7. Health and Safety	**15%**
7.1. Does the project eliminate a risk or hazard to public health and/or safety that endangers the City's population area? (Yes/No)	50
7.2. Does the project significantly reduce hazards or risks for users of the facility? (Yes/No)	50
8. Coordinated Project	**10%**
8.1. Will not commencing the project, or delaying the project, have major impacts on other projects or programs? (Yes/No)	50
8.2. Is the project required to be coordinated with other projects? (Yes/No)	5
Maximum Score	**100**

As illustrated in **Table 8**, the eight (8) categories are further broken down into sub-criteria, which form the ranking. All of the criteria require an answer of 'yes' or 'no' or 'low', 'medium', or 'high'. For each of the categories and the sub-criteria, a relative weighting has been assigned, providing the relative importance between the criteria. The categories with the highest weightings are those projects that are Legislated, Mandated or Required By Law (20%), or have the greatest Consequence of Failure and Health and Safety' risks (15%). All other criteria have a 10% weighting.

Each response is then scored as illustrated in **Table 9**, with a possible overall maximum score of 100%.

Table 9. Prioritization Criteria Scoring

Criteria Answer	Rating Calculation
Yes	100% x Sub-Criteria Score x Category Weighting
No	0
High	100% x Sub-Criteria Weighting x Category Weighting
Medium	67% x Sub-Criteria Weighting x Category Weighting
Low	33% x Sub-Criteria Weighting x Category Weighting

Once individual scores for each question are assigned and the weighting for each is applied, then each project receives an overall score out of 100. By applying the financial guidelines / envelopes against the list of projects, a line can be drawn to identify which projects can be funded within the current budget year and which projects require deferral further out in the capital project forecast.

It is also important to ensure that future projects requiring large financial expenditures be reviewed in the model using the same prioritization approach in order to start establishing capital reserve accounts for

these projects. To date, however, this concept has not been applied but is under consideration by the City's Finance department who are currently undertaking a review of capital financing strategies and policy for the City.

4.6.2. Linear Project Prioritization

As mentioned previously, historically the City used CAPS as well as stakeholder input as the basis for establishing the condition and priority of the linear projects. CAPS used an algorithm to generate a Priority Action Number (PAN) for each water, sanitary and stormwater asset. The PAN ranks the asset based on the specified criteria from three perspectives: condition, performance, and risk associated with failure. The weighted sum of all parameters represents the overall PAN of the asset and is used as an indication of its relative condition and priority.

Over time, needs and available data change, and therefore a new updated prioritization framework is currently in development by the City (expected completion 2014), which will be used as a tool to help determine the following:

- Priority of Wastewater and Stormwater Sewers for a targeted in-house CCTV condition assessment program;
- Priority of individual asset, corridor and project priority for capital budget ranking (water, wastewater, stormwater, roads and sidewalks); and
- Risk analysis of network areas in terms of probability and consequence of failure (water, wastewater, stormwater, roads and sidewalks).

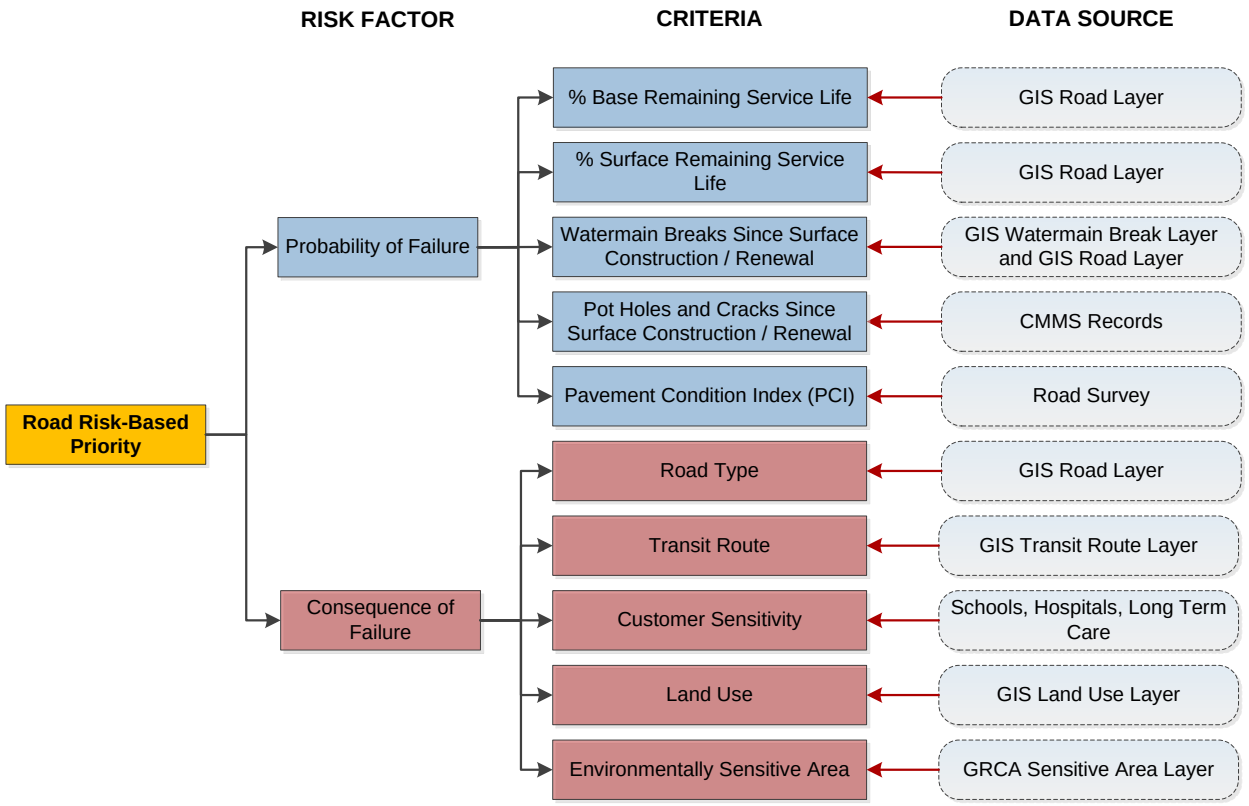
Currently, the City has developed an interim prioritization algorithm to rank projects, and identify both critical assets and assets that present the highest risks. Asset risk is calculated by applying **Equation** [**2]**.

$$Asset\ Risk = Probability\ of\ Failure\ Score \times Consequence\ of\ Failure\ Score \quad [2]$$

Failure can be defined as the condition at which an asset no longer meets its intended objective. Typically the most critical assets are those with the highest consequence of failure, and not necessarily a high probability of failure. For example, the failure of a watermain supplying a busy commercial location may cause substantial financial loss and a failure of a watermain servicing a hospital may have serious or life threatening consequences, however, a failure in a low density residential street during work hours may cause minimal disruptions. The most critical assets may be required to be monitored and inspected more frequently in order to pre-emptively identify potential hazards.

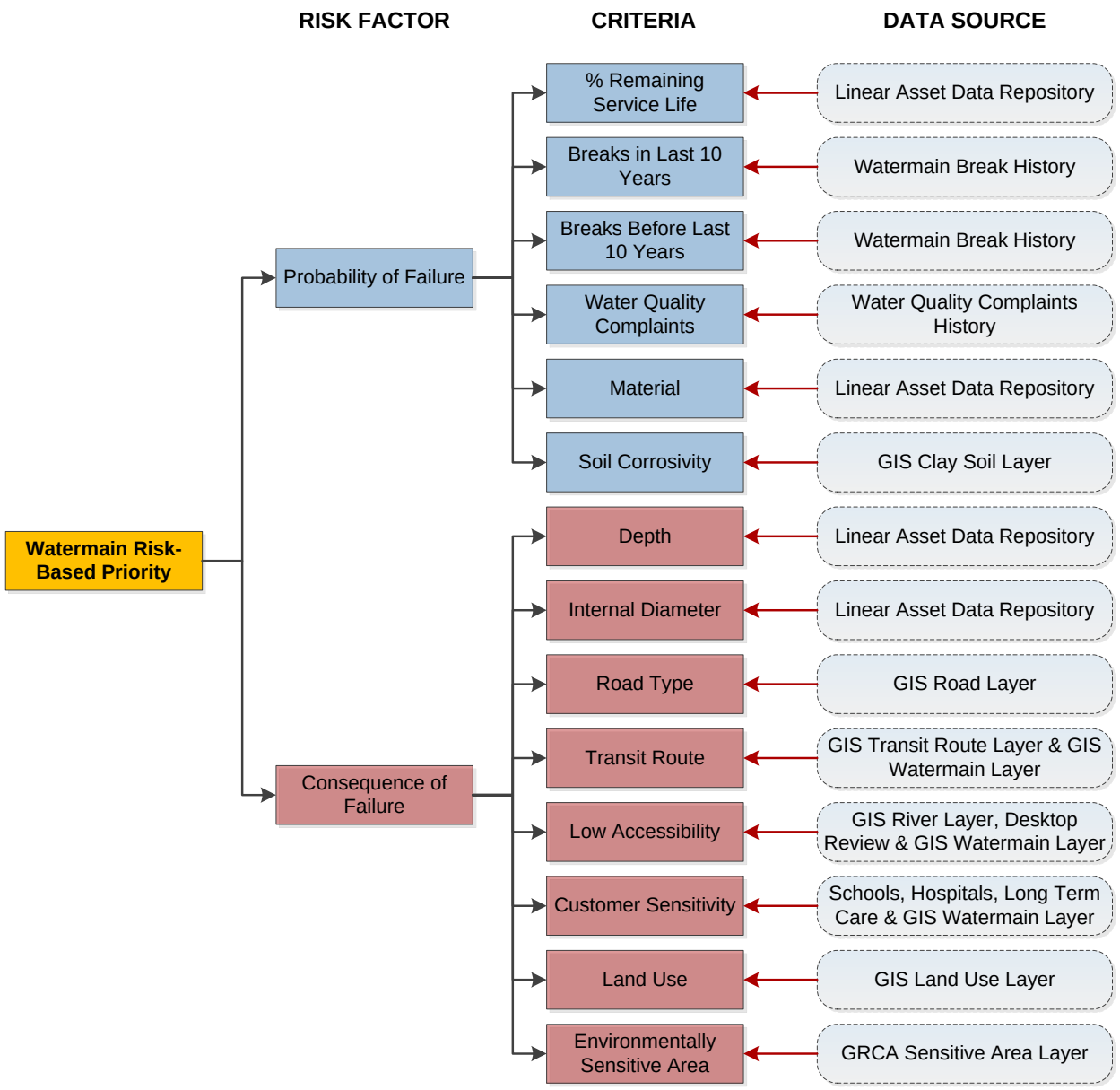
The probability and consequence of failure are quantified by breaking them down into several measurable criteria. **Figure 28** shows an example of the criteria and data sources used to quantify the probability and consequence of failure for roads. While the level of detail is beyond the scope of this document, rules are defined for each of the criteria to allocate a score where risks may be higher. For instance, a road with 0% Base Remaining Service Life is likely to have a higher chance of failure than a road that has just been constructed (i.e. with 100% Base Remaining Service Life), in this case the road with 0% Base Remaining Service Life would be allocated a higher probability of failure score.

Figure 28. Road Risk-Based Prioritization Criteria



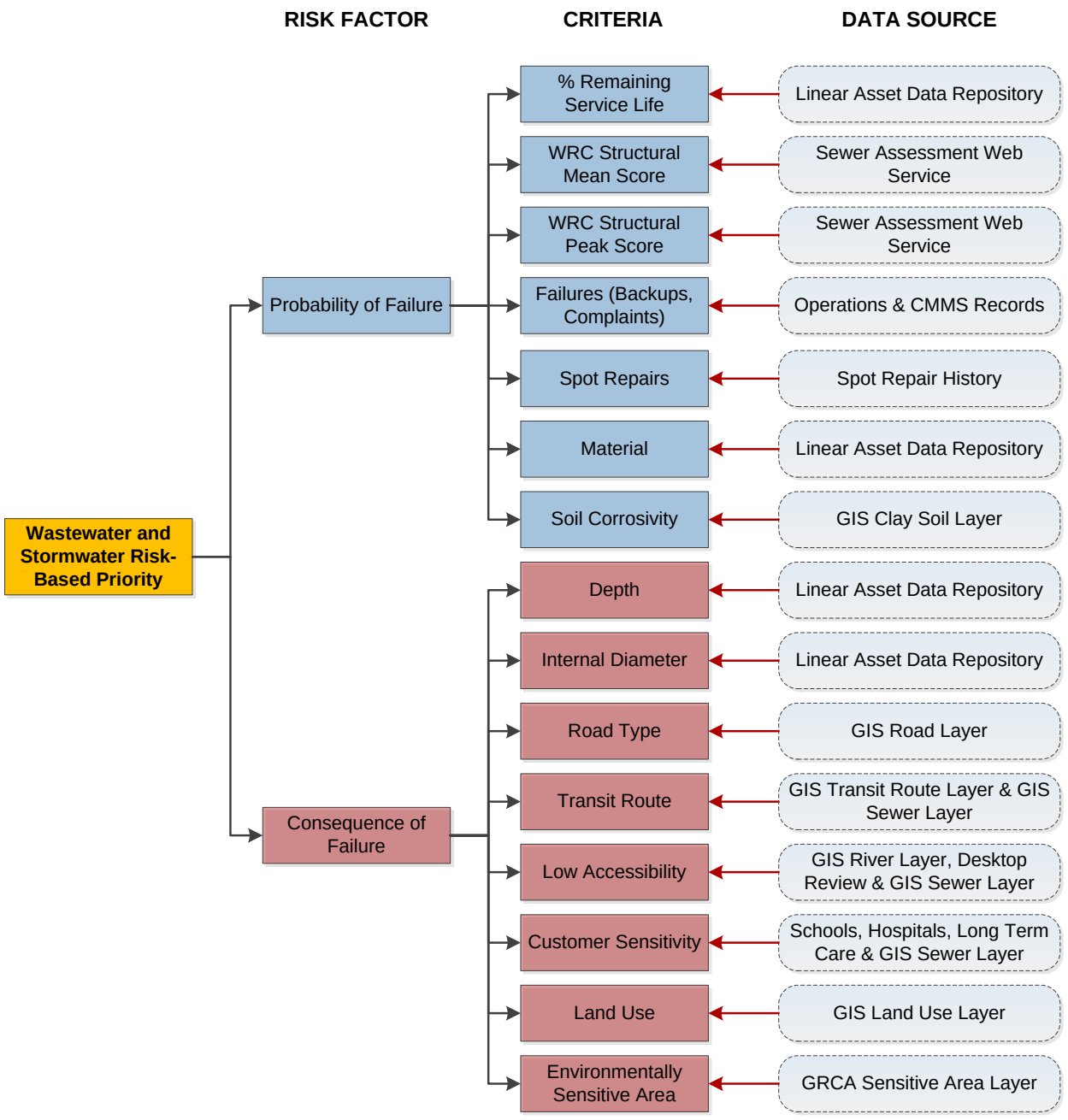
The criteria currently used in the evaluation of watermain risks and priorities are shown in **Figure 29**. The watermain risk priority takes into account maintenance records, as well as aspects that will impact the behaviour of the pipe such as the material, and the soil corrosivity. In the case where there is a metallic pipe in corrosive soil the asset is expected to have a higher risk of failure. While not currently included, there is opportunity to include performance data from the water hydraulic model such as hydraulic capacity and growth-related servicing requirements.

Figure 29. Watermain Risk-Based Prioritization Criteria and Data Sources



Factors that impact the probability and consequence of failure in wastewater and stormwater sewers are provided in **Figure 30**. Due to the similarities in behaviour, material, data, and condition assessment methods, wastewater and stormwater were deemed to be assessed based on the same criteria.

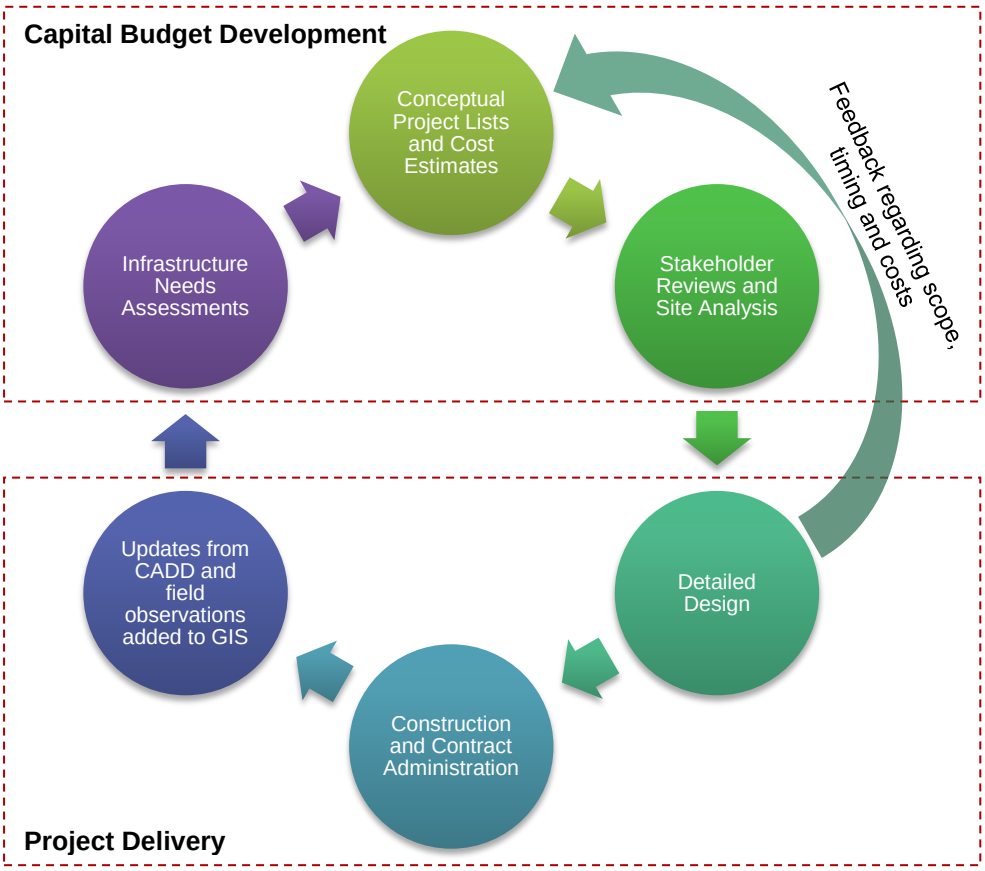
Figure 30. Wastewater and Stormwater Risk-Based Prioritization Criteria and Data Sources



4.7. Engineering Design, Construction and Disposal Activities

Throughout the development of asset lifecycle management strategies and capital investment plans, Engineering Services, Facilities and Asset Management, Operational Services and other site specific personnel collaborate to ensure feasibility and constructability of the program. The typical cycle from the conceptual project list development to project delivery and construction is shown in **Figure 31**.

Figure 31. Capital Budget and Project Delivery Cycle



An initial project list is developed through carrying out needs assessments and analyses using the processes as described in previous sections of this document. These project lists are conceptual in nature, typically forecasting needs over 10 years with the scope of projects based on expected worst case scenarios to account for future contingencies. These lists are then reviewed and validated by various stakeholders and representatives from the respective departments. During the detailed design phase, projects are individually analyzed and scoped to the needs of the project. The conceptual cost estimates and timing are then refined in the 10 year budget accordingly to reflect the identified project-specific scope and requirements. Once constructed the detailed CADD designs and field observations are compiled and entered into the City's GIS system to update and maintain asset records.

5. Financing Strategy

Several financing strategies are available for the funding of capital projects which are utilized on a project by project basis. The typical financing strategies utilized by the city are as follows:

- *Pay as you go:* Saving all funds in advance of building or acquiring an asset. This strategy is long range in nature and sometimes requires foregoing needs in the short term until enough capital has been saved to carry out the required project.
- *Reserve Accounts:* Contributing revenues to a reserve account, and drawing funds from the account. This strategy allows a reserve 'threshold' to be set to provide a buffer for unexpected expenditures. It also allows lifecycle contributions to be made on an annual basis which can be drawn upon when needed.
- *Debenture Financing:* A loan issued to the organization for building or acquiring an asset, which involves repayment annually with interest. The Province has limits on the total amount of debt which is based on an Annual Payment Limit or 25% of the municipality's source revenue.
- *Third-Party Contributions:* Contributions from parties external to the organization. This typically comes from contributions, subsidies and recoveries from development or grants from senior levels of government. This funding strategy impacts rates (except in the case of grants and subsidies).
- *User Fees:* Rates charged to the users of a service, which is typically based on a full cost recovery model.

In reality the City utilizes a combination of the above funding strategies depending on the specific project situation. Brantford, like many other cities across Canada has historically seen increases in taxes and rates lower than inflation and the true cost of delivering the service. Underground infrastructure, which can be fully functional for over 60 years and is often out of sight and out of mind, has historically received investments below the lifecycle requirements resulting in a steadily increasing backlog of deferred maintenance and capital expenditures.

Since the Walkerton incident in 2002, there has been an influx of new regulations for water and wastewater utilities, including the Safe Drinking Water Act, the Sustainable Water and Sewage Systems Act, and more recently the Water Opportunities and Water Conservation Act. The new requirements are proving to reshape the way municipalities finance and manage their infrastructure, requiring changes in business processes and operational procedures with the intention of achieving full cost recovery of water and wastewater services.

In further steps to achieve this goal, the City of Brantford undertakes a water and wastewater system financial sustainability plan every five (5) years. This plan is then used as a basis for the water and wastewater rate structure.

Brantford uses short and long term analyses with the goal of developing sustainable infrastructure capital plans and financing strategies. These analyses include a 100 year sustainability forecasts, a 10 year capital budget, and reserve fund forecasts.

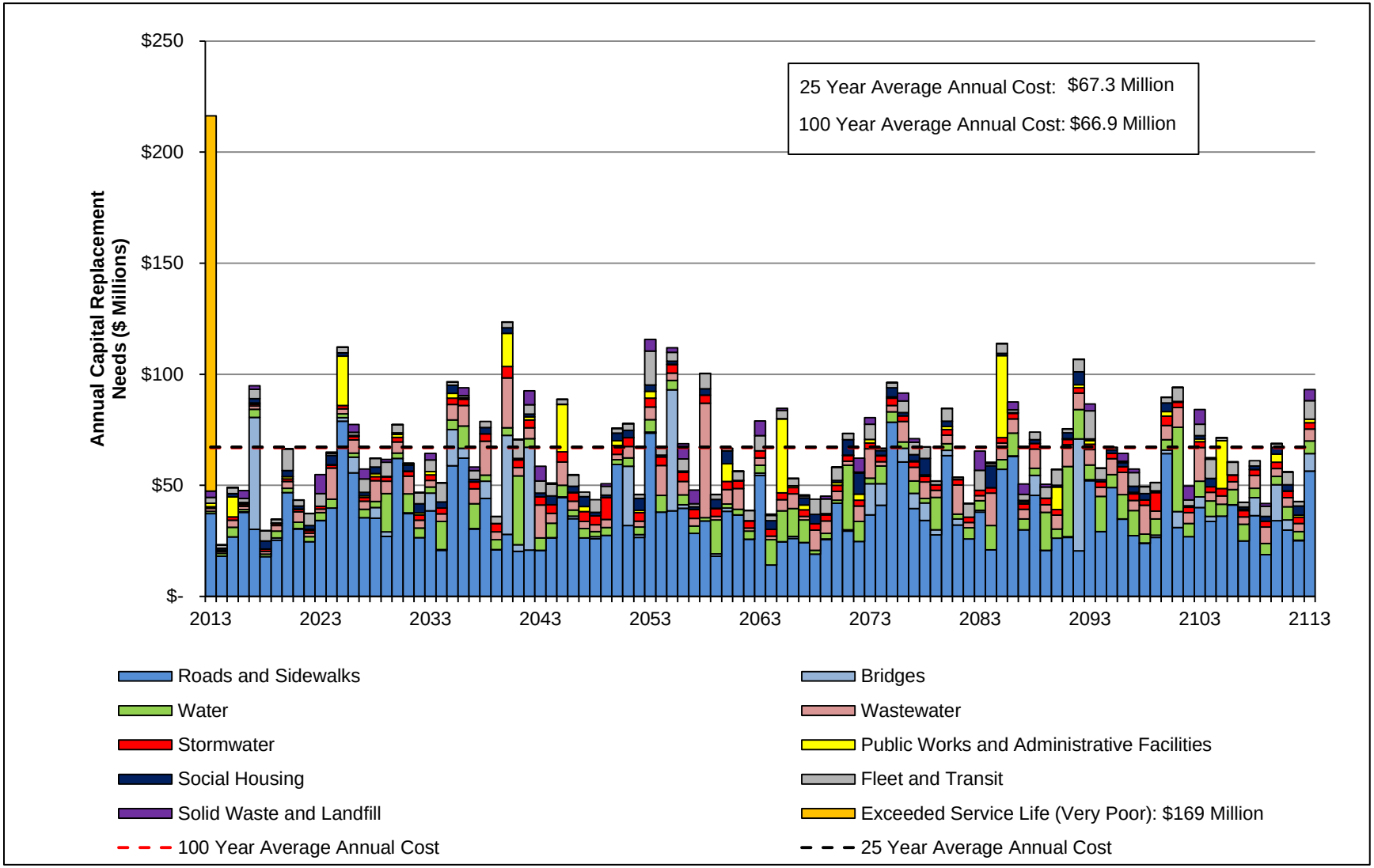
5.1. 100 Year Sustainability Forecasts

Long term infrastructure investment forecasts provide insight into prospective investment requirements which may fall outside of the 10 year planning horizon typically utilized for capital budgeting processes. Large amounts of infrastructure or building construction during a short time span, as seen in the 1970's, will require equally as heavy investment once those assets reach the end of their service lives. If those investment requirements are not addressed appropriately, levels of service could potentially decline and operations and maintenance costs could increase. The 100 year forecast aims to cover the entire lifecycle of the assets, therefore allowing identification of such trends.

Funding and re-investment requirements were developed for each program area based on the analysis to establish an average annual cost for re-investment. The reinvestment forecast takes into consideration statistical parameters that utilize the condition, estimated service lives, replacement costs and lifecycle probability distributions to provide trends of replacement costs on a given year. The replacement trends can then be used to develop short-term and long-term (25-year and 100-year) replacement requirements and average annual costs. The replacement costs are based on 2012 average tender prices, PSAB asset valuations, and insurance assessed values.

Figure 33 depicts the annual capital investment requirements across the asset groups covered in this analysis. The figure shows that there are currently deferred capital investment needs of $169 million. The 'deferred capital investment needs' refers to an outstanding capital need, which arose in the past, but has not been addressed (i.e. assets that fall within the very poor rating category because their remaining service life is below zero). This could be related to infrastructure deterioration, capacity shortfalls or design service standard upgrades. The figure also shows various spikes in the replacement forecasts, which is typically due to large assets with high replacement value, or groups of assets being required to be replaced in a given year. An example of this can been seen in areas of post-war growth where communities were built and developed en mass with significant investments in new infrastructure made over a relatively short time period.

Figure 32. All Program Areas 100 Year Investment Requirement Forecast (2012 Dollars)



The following figures show the breakdown of the long-term forecast by asset class, along with some discussion of funding sources and the types of projects that the replacements would be a component of.

5.1.1. Road Network

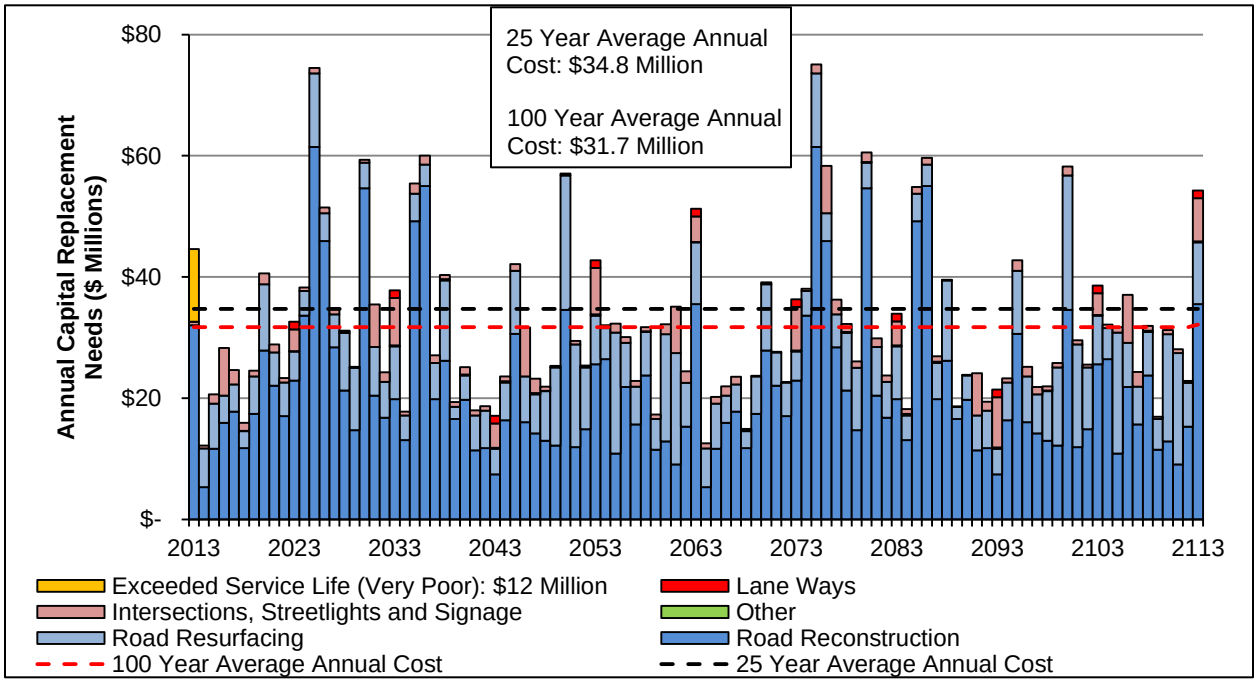
Figure 33 shows the forecasted annual investment requirements for the Road Network (including Roads, Intersections, Streetlights, Traffic Signs, Guard Rails, Sound Barriers and Laneways). The analysis shows deferred capital needs of $12 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives. For the purpose of the analysis, the deferred capital replacements are to be addressed in 2013, resulting in an investment spike at the end of the service life of the assets (in 2038 and 2088), while in reality the investments would be spread over a number of years depending on criticality. The forecasted 100 year average annual investment requirement is $31.7 million.

Road replacement projects are funded through a combination of Federal Fuel Tax, Tax-supported dedicated reserve accounts, and rate-supported reserve accounts where a road that otherwise would not be replaced is impacted as part of a rate project (such as watermain replacement when the road is in good condition). Growth related projects are funded in part or wholly through development charges.

Road reconstruction and rehabilitation is typically a component of the following project types:

- Full Corridor Reconstruction Projects;
- Watermain Replacement Projects (where the sidewalk is impacted by the construction); and
- Road Resurfacing Projects.

Figure 33. Road Network 100 Year Investment Requirement Forecast (2012 Dollars)



5.1.2. Sidewalks

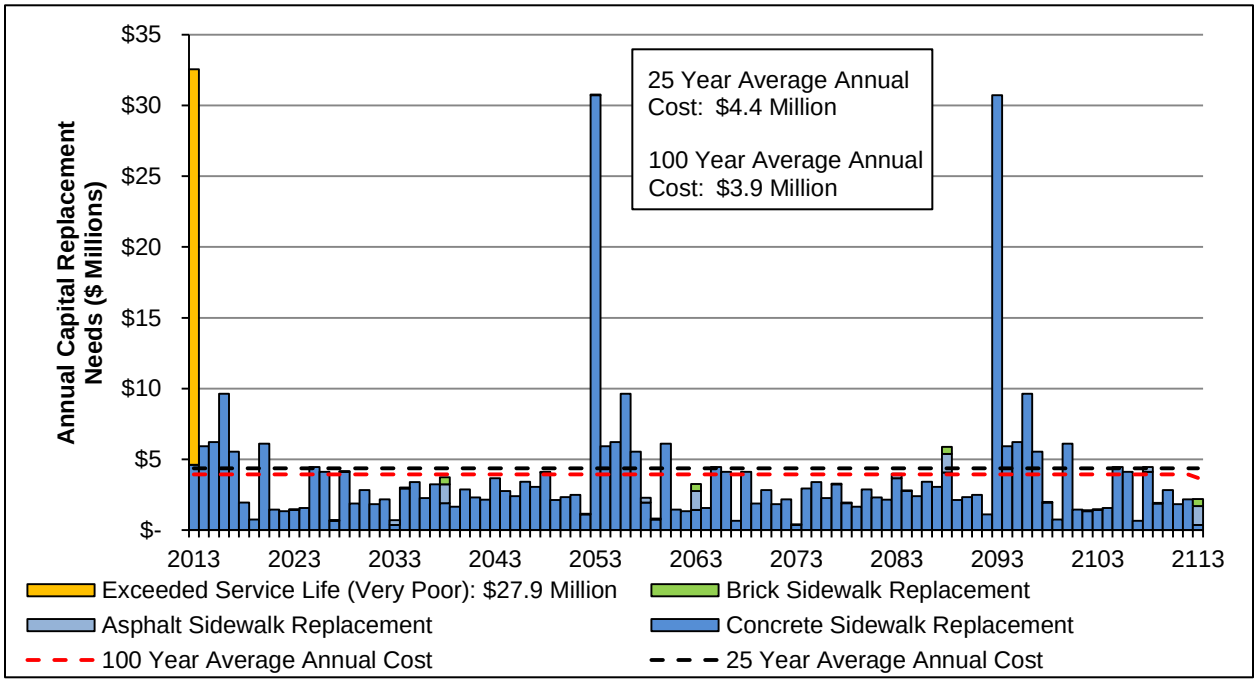
The forecasted annual investment requirements for the City's sidewalks are shown in **Figure 34**. The analysis shows deferred capital needs of $27.9 million, which represents sidewalks in the City that have exceeded their estimated service life. In reality, sidewalks can last many years beyond their estimated service life due to many factors such as location, maintenance, construction quality, weather and usage. For the purpose of the analysis, the deferred capital replacements are to be addressed in 2013, resulting in an investment spike at the end of the service life of the assets (in 2053 and 2093), while the investments would typically be spread over a number of years depending on criticality.

The forecast shows that the average annual investment requirements, based on estimated service life, are $3.9 million per year. In order to maintain the levels of service for sidewalks, the City prioritizes the sidewalk candidate list on an annual basis to ensure that the most critical and high risk sidewalks are addressed.

Sidewalk replacement projects are funded through a combination of Federal Fuel Tax, Tax-supported dedicated reserve accounts, and rate-supported reserve accounts where a sidewalk that otherwise would not be replaced is impacted as part of a rate project (such as watermain replacement when the sidewalk is in good condition). Sidewalk Replacement would typically occur as a component of the following project types:

- Full Corridor Reconstruction;
- Watermain Replacement Projects (where the sidewalk is impacted by the construction);
- Stand Alone Sidewalk Replacement Projects; and
- Road Resurfacing Projects (where there are deficiencies in the curbs and sidewalk).

Figure 34. Sidewalks 100 Year Investment Requirement Forecast



5.1.3. Bridges, Retaining Walls and Culverts

Figure 35 shows the forecasted annual investment requirements for bridges, retaining walls and culverts. The analysis shows deferred capital needs of $10.3 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives.

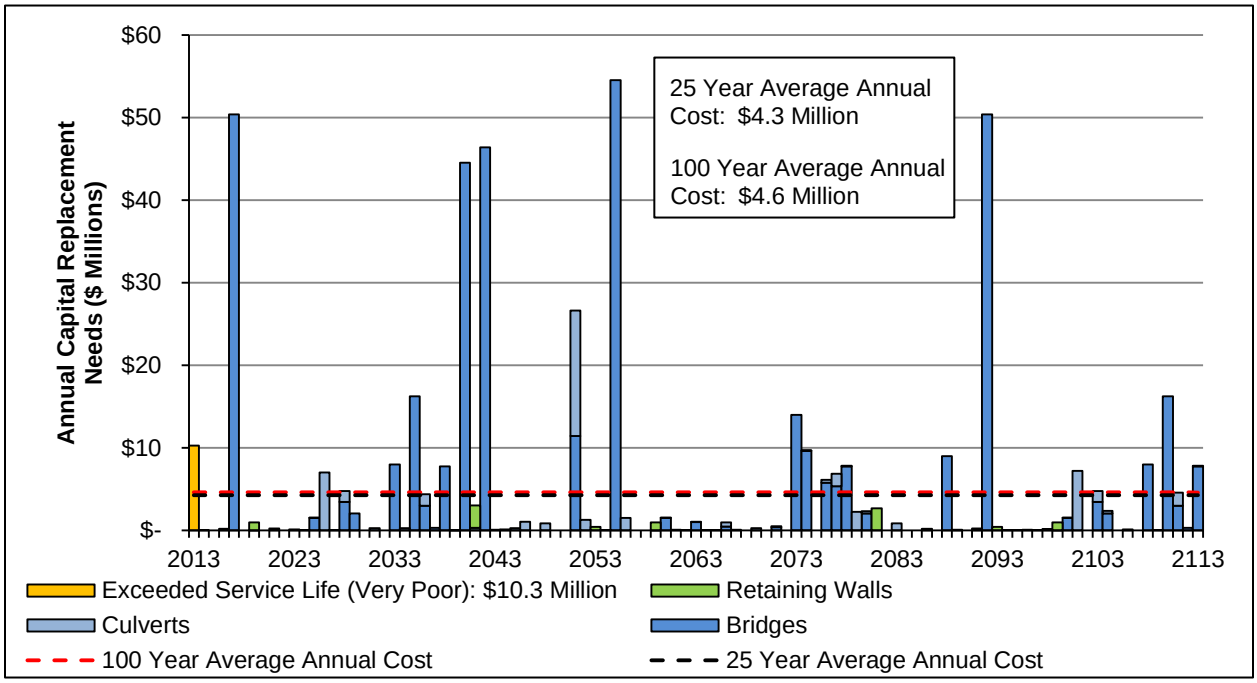
The figure illustrates several spikes in investment requirements, which is typically due to the bridges with high replacement value that were constructed in the 1970's reaching the end of their service lives, or groups of assets being required to be replaced on a given year. Large assets or asset groups are anticipated to reach the end of their service lives between 2030 and 2050, and then again in between 2070 and 2090. The forecasted 100 year average annual investment requirement is $4.6 million.

Bridge, retaining wall and culvert capital replacement projects are funded through a combination of Federal Fuel Tax and Tax-supported dedicated reserve accounts.

These replacements would typically occur as a component of the following project types:

- Bridge, Culvert or Retaining Wall Rehabilitation; and
- Bridge, Culvert or Retaining Wall Reconstruction.

Figure 35. Bridges, Retaining Walls and Culverts 100 Year Investment Requirement Forecast



5.1.4. Water Distribution

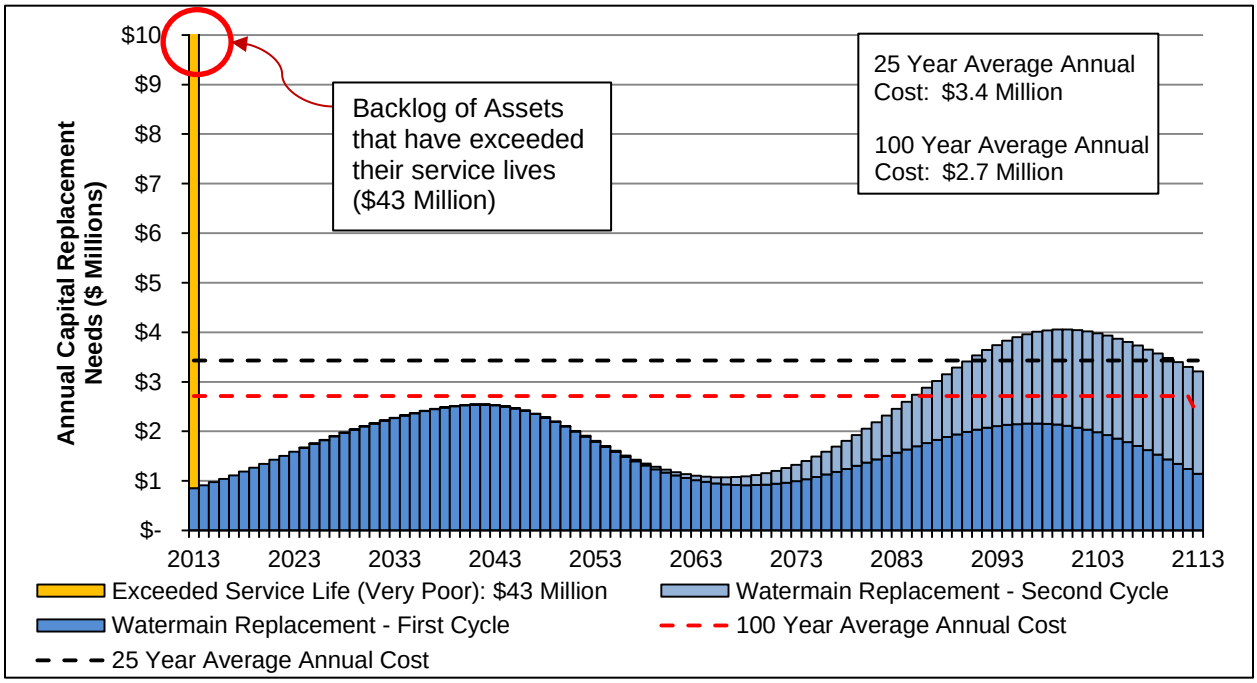
The water distribution forecasted annual investment requirements are shown in **Figure 36**. The analysis shows deferred capital needs of $43 million, which represents overdue capital watermain replacement expenditures or the replacement cost of watermains that have exceeded their theoretical service lives. The forecasted 100 year average annual investment requirement is $2.7 million.

The replacement forecast for the water distribution network does not include the cost of road restoration which typically amounts to 40% to 60% of the total project cost. Water replacement and renewal projects are funded through dedicated rate-supported reserve accounts. Growth related projects are funded in part or wholly through development charges.

Water distribution infrastructure rehabilitation and reconstruction would typically occur as a component of the following project types:

- Stand-alone Watermain Replacement;
- Watermain Replacement and Road Resurfacing; and
- Full Corridor Reconstruction.

Figure 36. Water Distribution Network 100 Year Investment Requirement Forecast



Note:

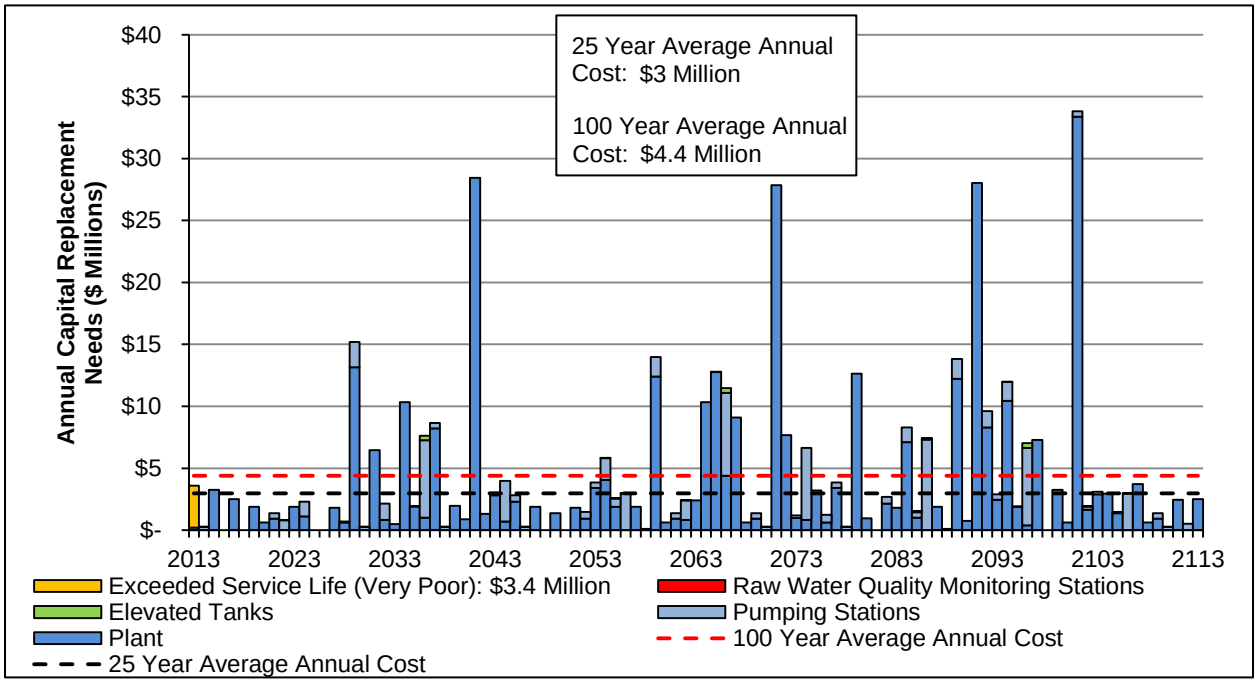
- *For this analysis watermain replacement costs only include replacement of the watermain, appurtenances and backfill. Costs do not include road restoration.*

5.1.5. Water Facilities

Figure 37 shows the forecasted annual investment requirements for water facilities (including the water treatment plant, pumping stations, elevated tanks and raw water quality monitoring stations). The analysis shows deferred capital needs of $3.4 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives. For the purpose of the analysis, the deferred capital replacements are to be addressed in 2013. There are several investment spikes in 2041, 2071, 2091, and 2101, which are due to large assets with high replacement value, or groups of assets at the water treatment plant being required to be replaced on a given year. The forecasted 100 year average annual investment requirement is $4.4 million.

Water facility replacement and renewal projects are funded through dedicated rate-supported reserve accounts. The facility reconstruction and rehabilitation is typically a component of a variety of project types depending on the project needs.

Figure 37. Water Facility 100 Year Investment Requirement Forecast



5.1.6. Wastewater Collection

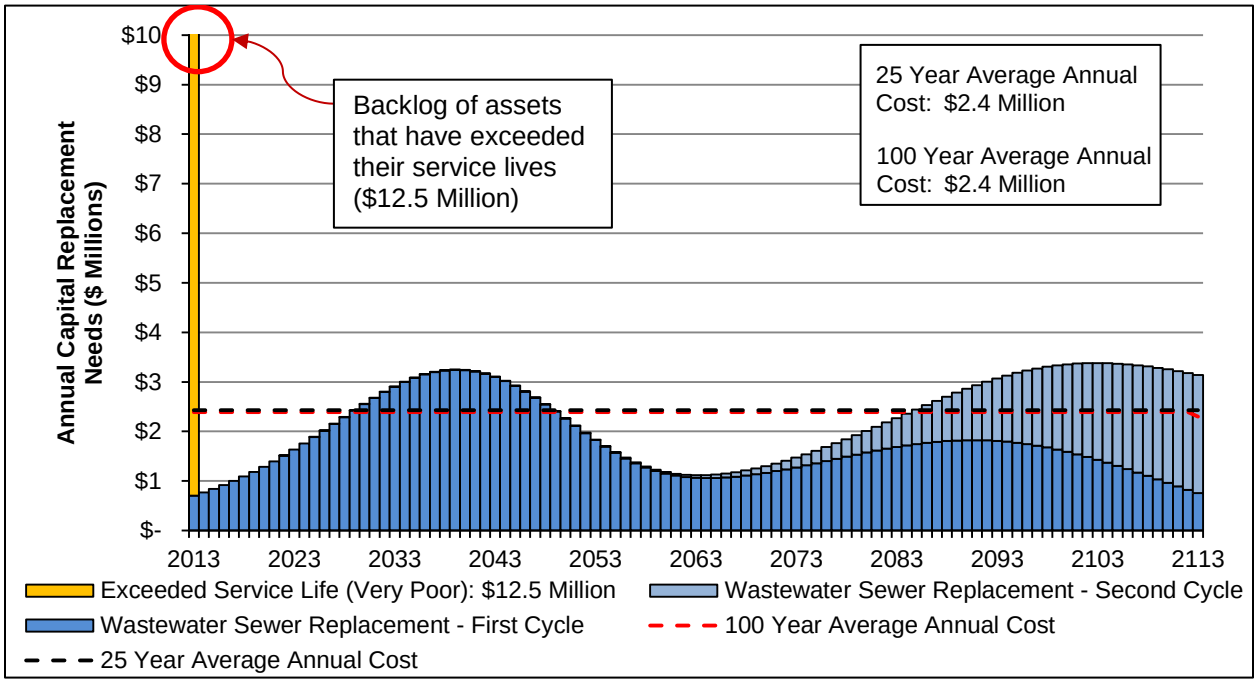
The wastewater collection forecasted annual investment requirements are shown in **Figure 38**. The analysis shows deferred capital needs of $12.5 million, which represents overdue capital wastewater replacement expenditures or the replacement cost of wastewater sewers that have exceeded their theoretical service lives. The forecasted 100 year average annual investment requirement is $2.4 million.

The replacement forecast for the wastewater collection network does not include the cost of road restoration which typically amounts to 40% to 60% of the total project cost. Wastewater replacement and renewal projects are funded through dedicated rate-supported reserve accounts. Growth related projects are funded in part or wholly through development charges.

Wastewater collection network infrastructure rehabilitation and reconstruction would typically occur as a component of the following project types:

- Stand-alone Wastewater Sewer Replacement (in easements);
- Full Corridor Reconstruction; and
- Wastewater Lining.

Figure 38. Wastewater Collection Network 100 Year Investment Requirement Forecast



Note:

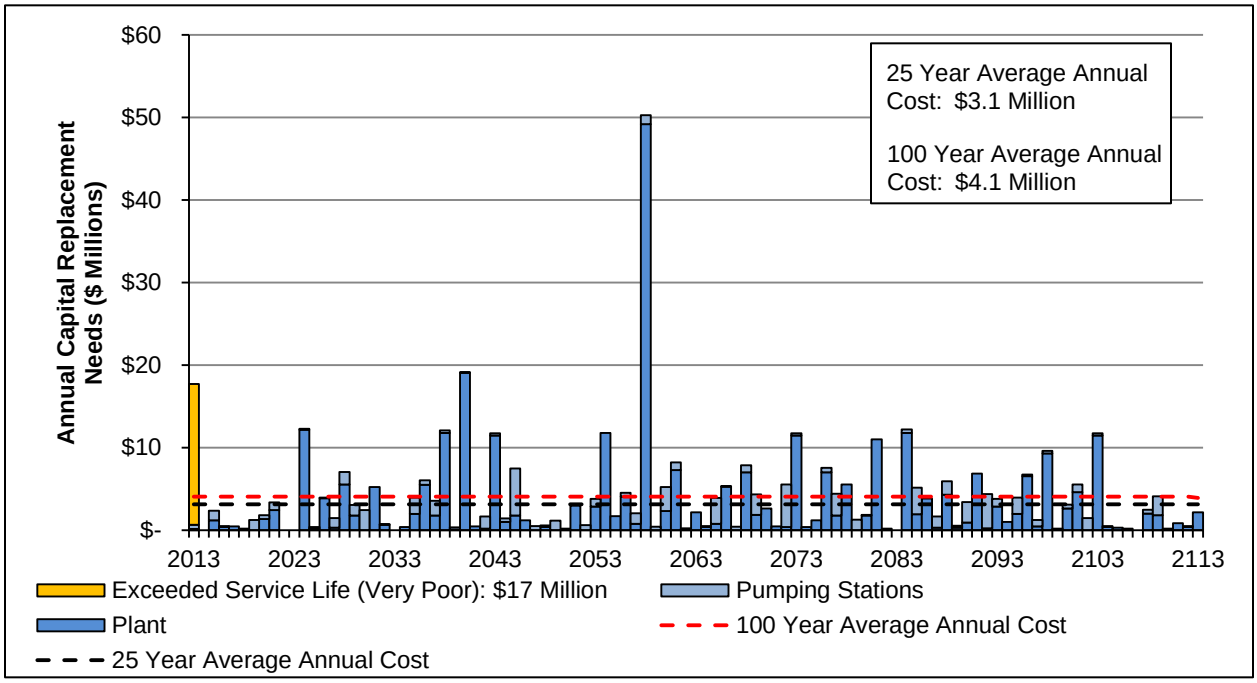
- *For this analysis wastewater sewer replacement costs only includes replacement of the wastewater sewer, appurtenances and backfill. Costs do not include road restoration.*

5.1.7. Wastewater Facilities

Figure 39 shows the forecasted annual investment requirements for wastewater facilities (including the wastewater treatment plant and pumping stations). The analysis shows deferred capital needs of $17 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives. For the purpose of the analysis, the deferred capital replacements are to be addressed in 2013. There is an investment spike in 2058, which is due to large assets with high replacement value, and groups of assets at the wastewater treatment plant being required to be replaced on that year. The forecasted 100 year average annual investment requirement is $4.1 million.

Wastewater facility replacement and renewal projects are funded through dedicated rate-supported reserve accounts. Wastewater facility reconstruction and rehabilitation is typically a component of a variety of project types depending on the project needs.

Figure 39. Wastewater Facility 100 Year Investment Requirement Forecast



5.1.8. Stormwater Collection

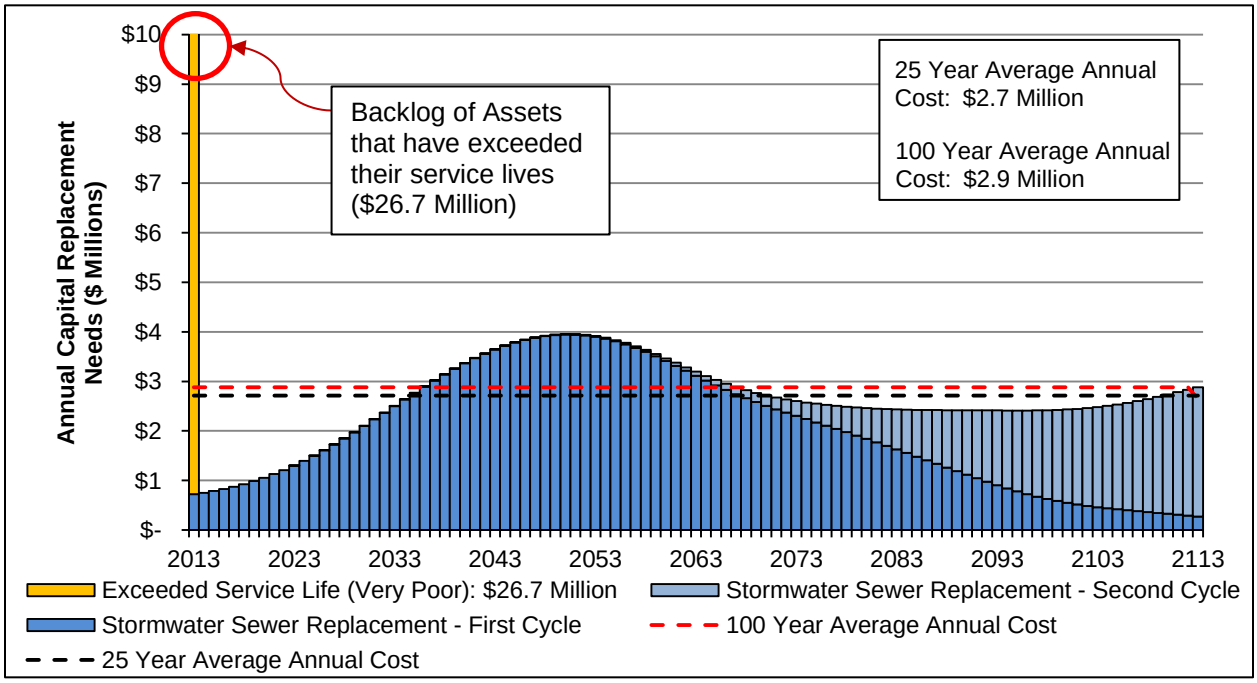
The stormwater collection forecasted annual investment requirements are shown in **Figure 40**. The analysis shows deferred capital needs of $26.7 million, which represents overdue capital stormwater replacement expenditures or the replacement cost of stormwater sewers that have exceeded their theoretical service lives. The forecasted 100 year average annual investment requirement is $2.9 million.

The replacement forecast for the stormwater collection network does not include the cost of road restoration which typically amounts to 40% to 60% of the total project cost. Stormwater projects are funded through tax and currently have no dedicated funding source.

Stormwater collection network infrastructure rehabilitation and reconstruction would typically occur as a component of the following project types:

- Stand-alone Stormwater Sewer Replacement (in easements);
- Full Corridor Reconstruction; and
- Stormwater Lining.

Figure 40. Stormwater Collection Network 100 Year Investment Requirement Forecast



Note:

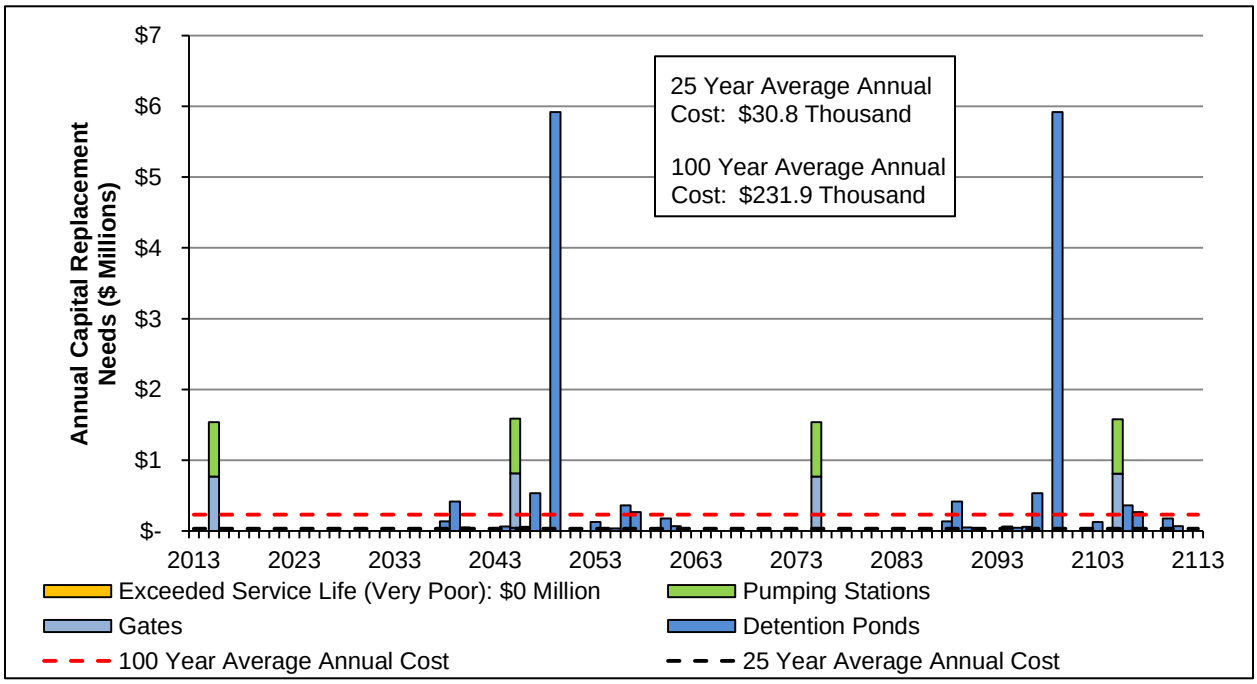
- *Stormwater Sewer replacement cost only includes replacement of the watermain, appurtenances and backfill. The cost does not include road restoration.*

5.1.9. Stormwater Facilities

Figure 41 shows the forecasted annual investment requirements for stormwater facilities (including stormwater detention ponds, gates and pumping stations). The analysis shows that there are currently no deferred capital needs. There are investment spikes in 2049, and 2099 which are due to a detention pond with a high replacement cost reaching the end of its service life necessitating replacement. The forecasted 100 year average annual investment requirement is $231.9 thousand.

Stormwater facility replacement and renewal projects are funded through tax and currently have no dedicated funding source. Stormwater facility reconstruction and rehabilitation is typically a component of a variety of project types depending on the project needs.

Figure 41. Stormwater Facility 100 Year Investment Requirement Forecast



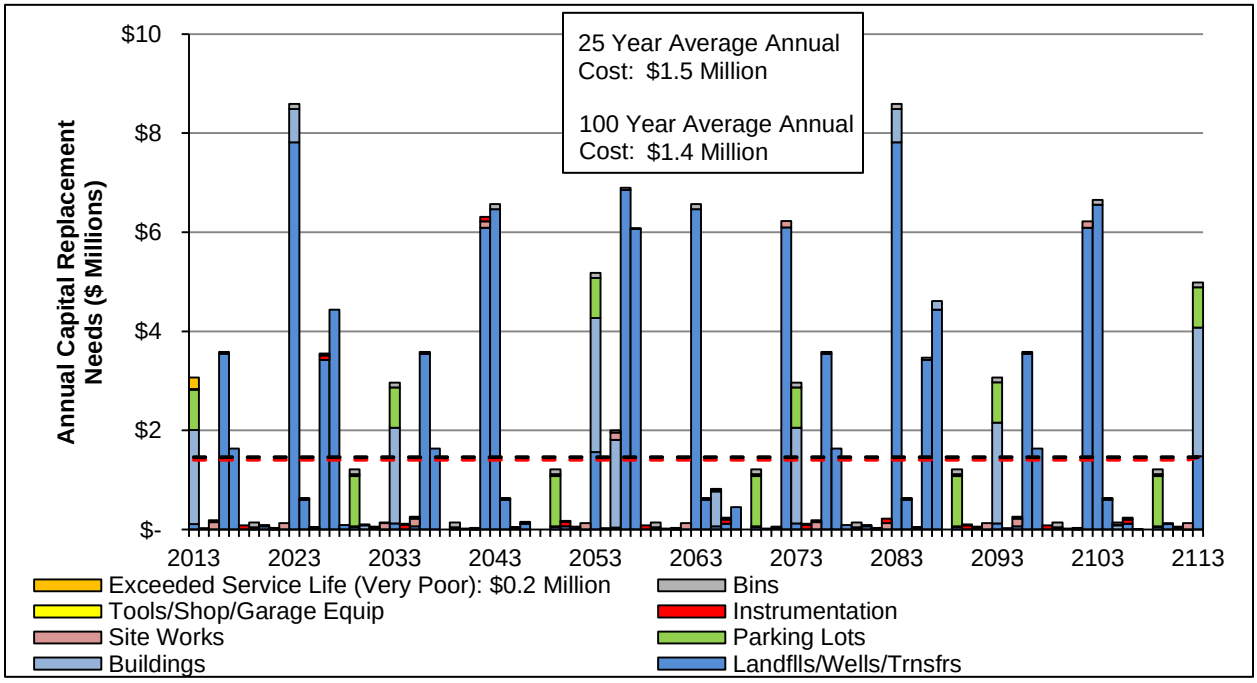
5.1.10. Solid Waste and Landfill

Figure 46 shows the forecasted annual investment requirements for solid waste and landfill. The analysis shows deferred capital needs of $0.2 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives.

The analysis shows that there are sporadic spikes throughout the 100 year forecast which are due to large assets in the Landfills/wells/transfers category with high replacement value reaching the end of their service lives, requiring replacement. The forecasted 100 year average annual investment requirement is $1.4 million.

Solid waste and landfill replacement and renewal projects are funded through user rate and tax-supported dedicated reserve accounts. The facility reconstruction and rehabilitation is typically a component of a variety of project types depending on the project needs.

Figure 42. Solid Waste and Landfill 100 Year Investment Requirement Forecast



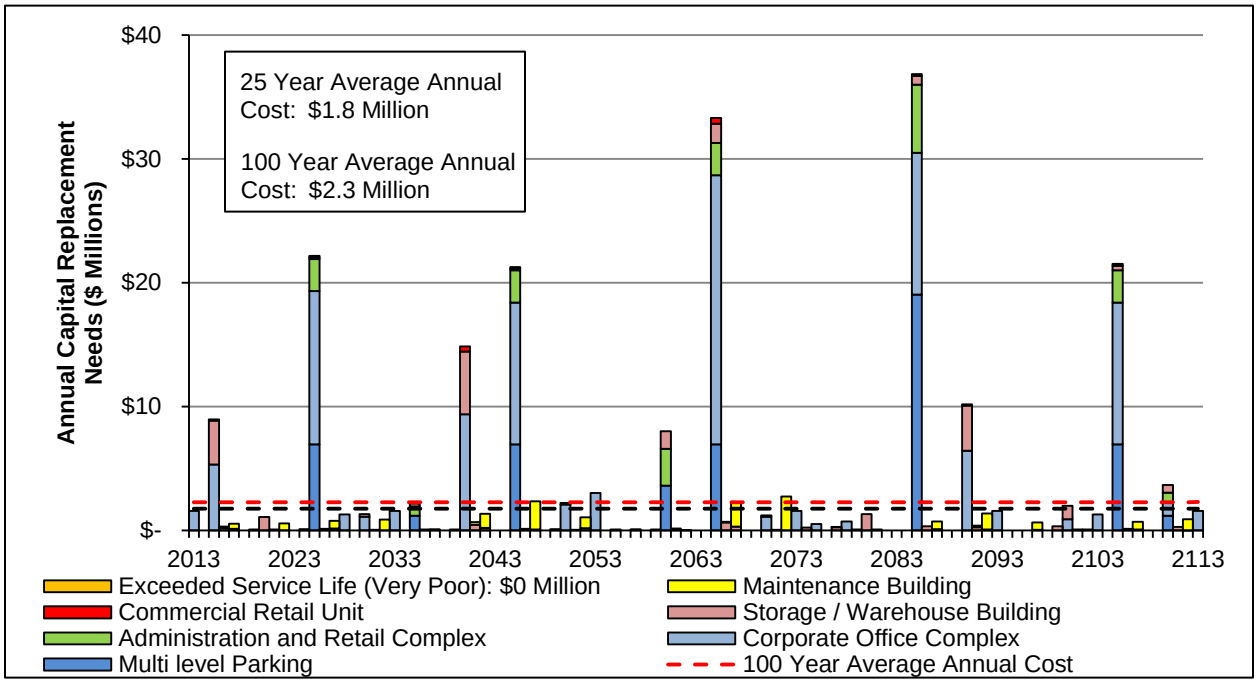
5.1.11. Public Works and Administrative Facilities

Figure 43 shows the forecasted annual investment requirements for public works and administrative facilities. There is limited available data pertaining to historical facility upgrades and renewals, therefore it was assumed that historically assets have been replaced at the end of their service lives when required and that in this case there are no deferred capital needs. An annual building condition assessment program for public works and administrative facilities was implemented in 2013; the results of which will aid in addressing this issue.

The figure shows investment spikes in 2025, 2045, 2065, 2085, and 2105 which are due to due to large assets with high replacement value, and groups of assets reaching the end of their service lives, requiring replacement. The forecasted 100 year average annual investment requirement is $2.3 million.

Public Works and Administrative facility replacement and renewal projects are funded through tax-supported dedicated reserve accounts or rate supported reserve accounts, shared with other services such as Parks and Recreation. The facility reconstruction and rehabilitation is typically a component of a variety of project types depending on the project needs.

Figure 43. Public Works and Administrative Facilities 100 Year Investment Requirement Forecast



Note:

- *Due to insufficient data pertaining to upgrades and renewals of the facilities, it is assumed that all components have historically been replaced at the end of their service lives for this analysis. Planned Building Condition Assessment projects will increase the integrity of the data.*

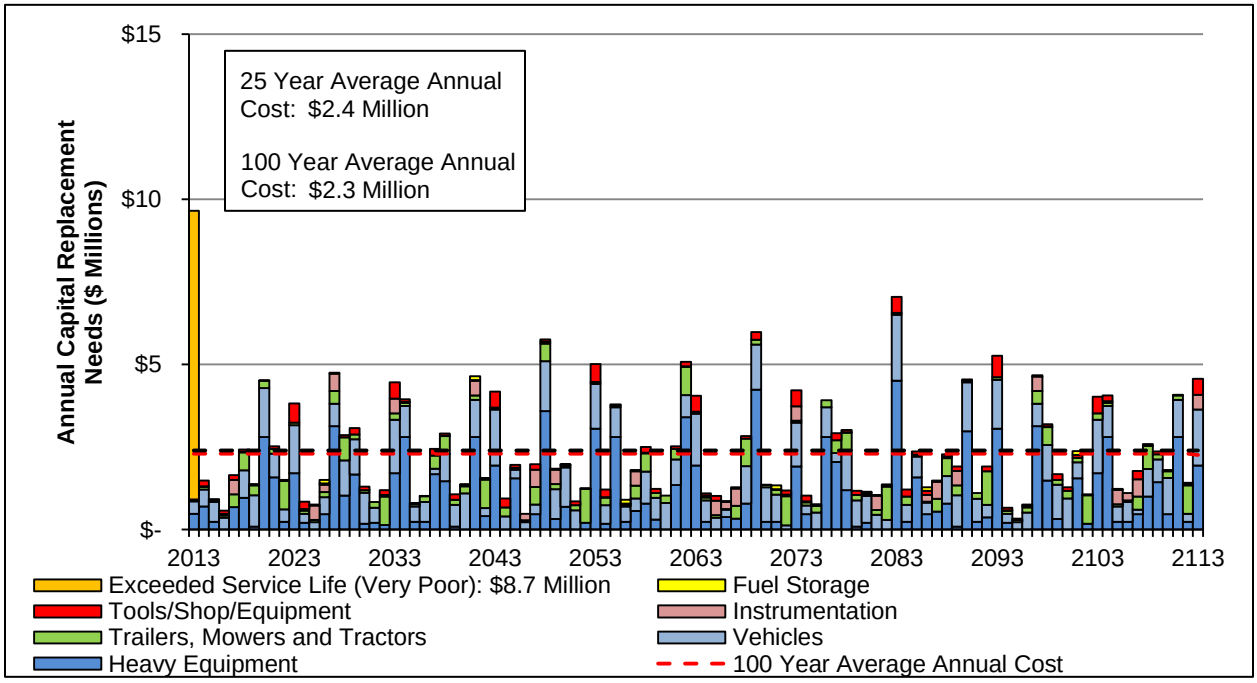
5.1.12. Corporate Fleet

Figure 44 shows the forecasted annual investment requirements for corporate fleet (including vehicles, heavy equipment, trailers, mowers and tractors, tools/shop/equipment, instrumentation and fuel storage). The analysis shows deferred capital needs of $8.7 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives.

The figure illustrates several spikes in investment requirements, which is typically due to assets in the fleet inventory with high replacement value reaching the end of their service lives, or groups of assets being required to be replaced on a given year. The forecasted 100 year average annual investment requirement is $2.3 million.

Fleet capital replacement projects are funded through a combination of user-rate chargebacks and Tax-supported dedicated reserve accounts.

Figure 44. Corporate Fleet 100 Year Investment Requirement Forecast



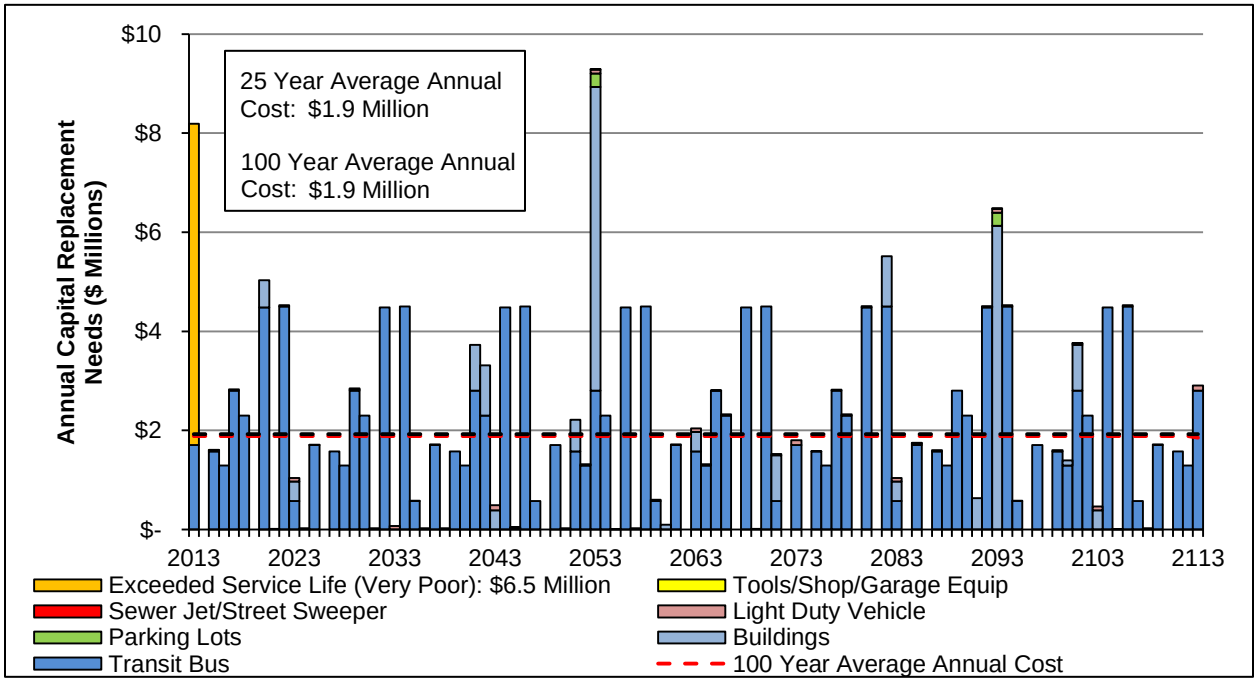
5.1.13. Transit

Figure 45 shows the forecasted annual investment requirements for transit (including transit buses, buildings, parking lots, light duty vehicles, sewer jets/street sweepers, and tools/shop/equipment). The analysis shows deferred capital needs of $6.5 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives.

The figure illustrates a spike in investment requirements in 2053, which is due to the transit service centre building reaching the end of its theoretical service life, necessitating replacement. The forecasted 100 year average annual investment requirement is $1.9 million.

Transit capital replacement projects are funded through a combination of Federal Fuel Tax, Provincial Fuel Tax, and a Tax-supported dedicated reserve account. Growth related projects are funded in part or wholly through development charges.

Figure 45. Transit 100 Year Investment Requirement Forecast



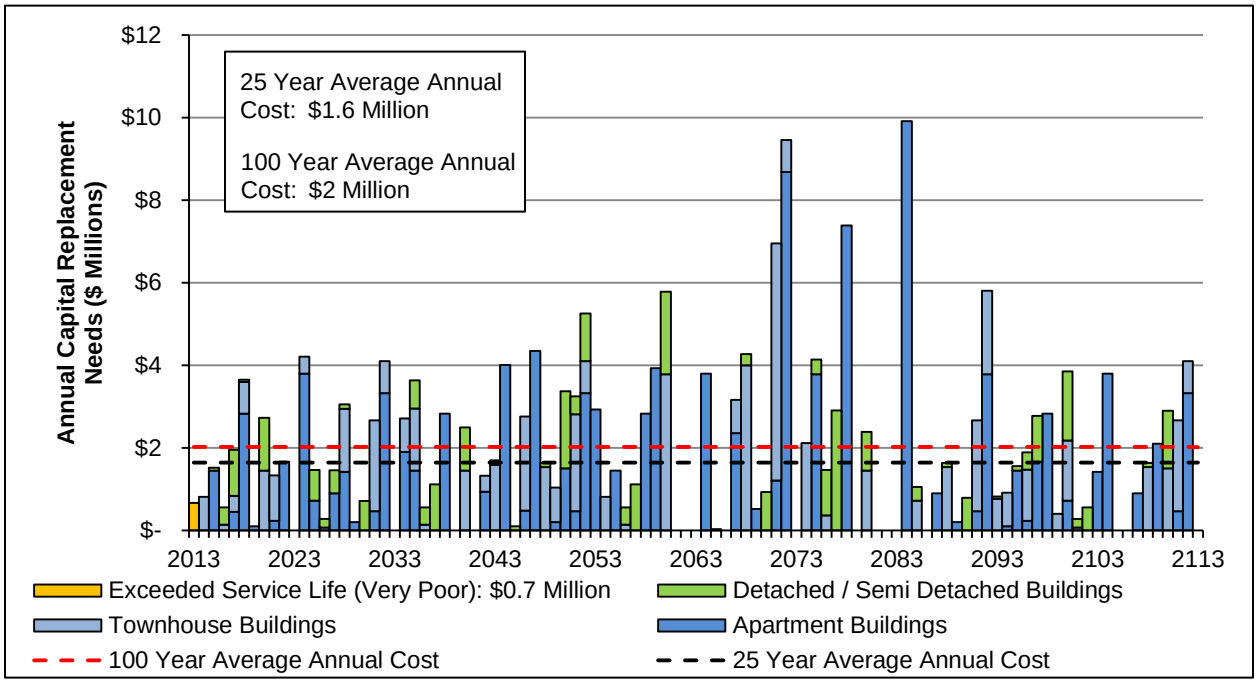
5.1.14. Social Housing Facilities

Figure 46 shows the forecasted annual investment requirements for the City's social housing building portfolio. The analysis shows deferred capital needs of $0.7 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives. There is limited available data pertaining to historical facility upgrades and renewals, therefore a building condition assessment program for all social housing buildings was implemented in 2013; the results of which will improve the understanding of the deferred capital needs.

The analysis shows that between 2070 and 2085 there are forecasted to be required investment spikes which are due to large assets in the townhouse and apartment buildings with high replacement value reaching the end of their service lives, requiring replacement. The forecasted 100 year average annual investment requirement is $2 million.

Social housing building replacement and renewal projects are funded through tax-supported dedicated reserve accounts, and provincial and federal grant programs. The facility reconstruction and rehabilitation is typically a component of a variety of project types depending on the project needs.

Figure 46. Social Housing Facility 100 Year Investment Requirement Forecast



Note:

- *Due to insufficient data pertaining to upgrades and renewals of the facilities, it is assumed that all components have historically been replaced at the end of their service lives for this analysis. Planned Building Condition Assessment projects will increase the integrity of the data.*

5.1.15. 100 Year Sustainability Forecast Summary

By comparing the 100 year forecasted average annual costs with the current approved funding, the funding gap, or surplus can be estimated. The 2013 approved funding, and the 100 year average annual costs for each program area are shown in **Table 10**. It should be noted that the 2013 Approved Funding column represents only the funding that was approved for specific projects in each program area, and does not include transfers to reserve accounts or surpluses.

To reduce the uncertainties created by the assumptions used to complete this analysis, further study activities are required such as establishing levels of service standards, continued assessment of the physical condition of the infrastructure, determination of capacity backlog and hydraulic / performance constraints, as well as determining the impact of growth and future capacity requirements through master servicing and planning studies.

It is clear that there are challenges to achieving the estimated reinvestment levels identified in the analysis. Staff will continue to use the results of the aforementioned studies in order to conduct analyses to ensure that scarce financial resources are directed to assets with the highest priority for rehabilitation or replacement, ensuring the most efficient use of available funding. This work will also position the City of Brantford to maximize funding opportunities that may become available in the future.

Table 10. Program Area Investment Levels and Anticipated Costs

Program Area	Estimated Remaining Service Life (Condition Category)	Exceeded Service Life – Very Poor ($ Millions)	2012 Replacement Value ($ Millions)	100 Year Average Annual Cost ($ Millions)	2013 Approved Funding ($ Millions)
Road Network	Good (69%)	12.00	1,126.26	31.7	8.13
Sidewalks	Fair (34%)	27.93	147.92	3.95	1.13
Bridges, Retaining Walls and Culverts	Fair (44%)	10.28	256.20	4.60	0.06
Water Distribution	Fair (49%)	43.03	312.69	2.71	4.46
Water Facilities	Very Good (78%)	3.38	190.95	4.40	0.45
Wastewater Collection	Good (67%)	12.51	234.15	2.39	1.64
Wastewater Facilities	Good (53%)	17.05	196.70	4.09	1.00
Stormwater Collection	Good (56%)	26.67	286.92	2.88	0.04
Stormwater Facilities	Good (65%)	-	10.82	0.23	-
Solid Waste and Landfill	Good (53%)	0.23	36.48	1.41	3.62
Public Works and Admin. Facilities	Fair (43%)	-	80.09	2.28	0.68
Corporate Fleet	Poor (18%)	8.74	19.58	2.30	0.69
Transit	Fair (51%)	6.49	29.34	1.89	1.03
Social Housing	Good (51%)	0.67	73.22	2.03	0.22
Overall	**Good (59%)**	**168.97**	**3,001.31**	**66.86**	**23.11**

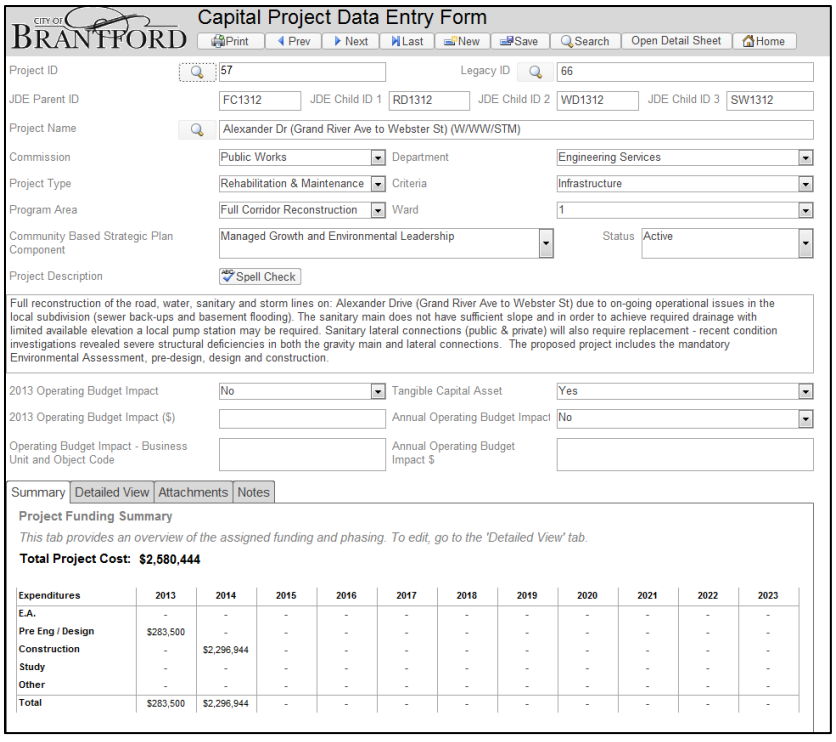
5.2. 10 Year Capital Budget

In 2013, the City is planning to transition to the implementation of a corporation-wide 10 year capital budget. Historically, the City compiled a five (5) year capital budget along with an unfunded list which was updated by staff on an annual basis. A 10 year budget provides a broader planning horizon, which provides perspective and awareness of future projects outside of traditional short-term plans. In addition to transitioning to a 10 year budget, several improvements have been made to format and presentation of the budget documents with the aim of increasing transparency and accountability. Some of the adjustments include but are not limited to:

- Grouping projects into 'program areas' to be coordinated with similar projects;
- Breaking down project lists into individual streets and boundaries (such as road resurfacing projects, and full corridor construction);
- Summarizing all program areas and projects into a 10 year forecast document as shown in **Table 11**;
- Linking all project funding with reserve funds to review impacts of project implementation scenarios;
- Adding key project data, drivers and attachments to the project detail sheets; and
- Removal of the 'unfunded' list to ensure all projects are reconsidered and re-prioritized on an annual basis.

To facilitate the collection and management of capital project data and ensure a consistent an automated process for developing the capital budget, City staff have developed a capital budgeting application and database. An example of the capital project data entry form is shown in **Figure 47**.

Figure 47. Capital Project Data Entry Form



An example of the 10 year capital forecast is shown in **Table 11**. The 10 year forecast is a living document and while the first year is what is recommended for approval during the budget cycle, years 2 through 10 are forecasted and may be subject to change as new information becomes available and needs change.

Table 11. Example of 10 Year Capital Forecast

Project Name	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Project Gross Cost
Road Reconstruction	**8,650,000**	**10,829,000**	**7,425,000**	**9,000,000**	**8,200,000**	**16,901,000**	**13,420,500**	**24,600,000**	**6,400,000**	**15,000,000**	**159,585,500**
Shellard Ln (West City limit to Colborne St W) (D, L, C)	8,500,000	6,000,000	-	-	-	-	-	-	-	-	16,660,000
Spurline Railway Track Removal Clarence St and Colborne St (Railway / Intersection Re-Alignment)	150,000	1,500,000	-	-	-	-	-	-	-	-	1,650,000
Colborne St / Dalhousie St / Brant Ave / Icomm Dr Intersection (D, C)	-	329,000	1,425,000	-	-	-	-	-	-	-	1,754,000
Veterans Memorial Pkwy from Market St to Colborne St (EA, D, L, C)	-	3,000,000	6,000,000	6,000,000	-	-	-	-	-	-	15,000,000
Charing Cross St Extension Including Grade Separation from West St to Henry St (EA, D, L, C)	-	-	-	2,000,000	6,000,000	9,000,000	9,000,000	-	-	-	26,000,000
Extension of Oak Park Rd to Colborne St W	-	-	-	1,000,000	-	1,500,000	-	-	-	-	39,500,000
Grade Seperation of Hardy Rd at CNR Rail Line	-	-	-	-	1,000,000	-	1,500,000	-	-	15,000,000	17,500,000
Oak Park Rd / Hwy 403 Interchange Improvements (EA, D, C)	-	-	-	-	1,200,000	5,800,000	-	-	-	-	7,000,000
Clarence St (Colborne St to West St) Phases 1 and 2 (EA, D, L, C)	-	-	-	-	-	300,000	675,000	9,500,000	4,500,000	-	14,975,000
Veterans Memorial Pkwy (Mount Pleasant to Erie Ave with Bridges), Phase 1 and 2 (EA, D,C)	-	-	-	-	-	301,000	2,145,500	14,300,000	-	-	16,746,500
Grey St from Wayne Gretzky Pkwy to Garden Ave (D, C)	-	-	-	-	-	-	100,000	800,000	-	-	900,000
Rowanwood Ave Extension from Grey St to Elgin St (EA, D, L,	-	-	-	-	-	-	-	-	1,900,000	-	1,900,000

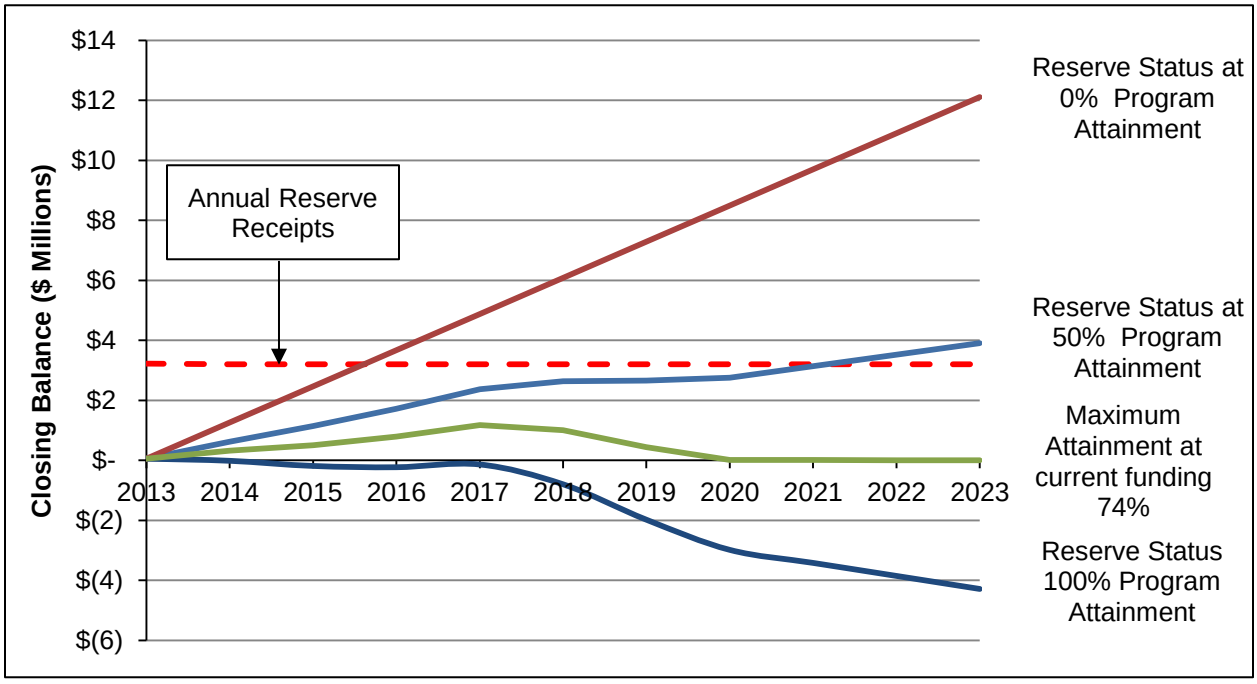
Budget year under consideration for approval by Council

5.3. Reserve Fund Forecasts

An analysis technique used typically after all investment needs have been identified by City staff is the reserve fund forecast. This process takes the required capital expenditures, along with the anticipated reserve fund receipts to forecast the balance of the reserve fund in future years. The capital budgeting database application as well as other stand-alone forecast models developed by staff, allow the City to analyze various funding scenarios to identify a financially sustainable budget. Often the capital needs outweigh the anticipated receipts, and therefore the reserve fund forecasts aid in the prioritization of the most critical projects and the evaluation of the risks and service level impacts of maintaining the current investment levels.

An example of a reserve fund forecast is shown in **Figure 48**. This type of analysis shows the impacts that changes in the levels of attainment will have on the reserve fund over the forecasted timespan. Attainment levels are the percentage of the proposed program that is delivered in the year, for example, if 5km of roads have been identified as requiring resurfacing in a year, 100% attainment of that program would be 5km of resurfacing, 50% attainment would be 2.5km of resurfacing, and 10% would be 0.5km of resurfacing. In the example below, the maximum attainment level of the program that can be achieved without resulting in a reserve deficit is 74% of the proposed program.

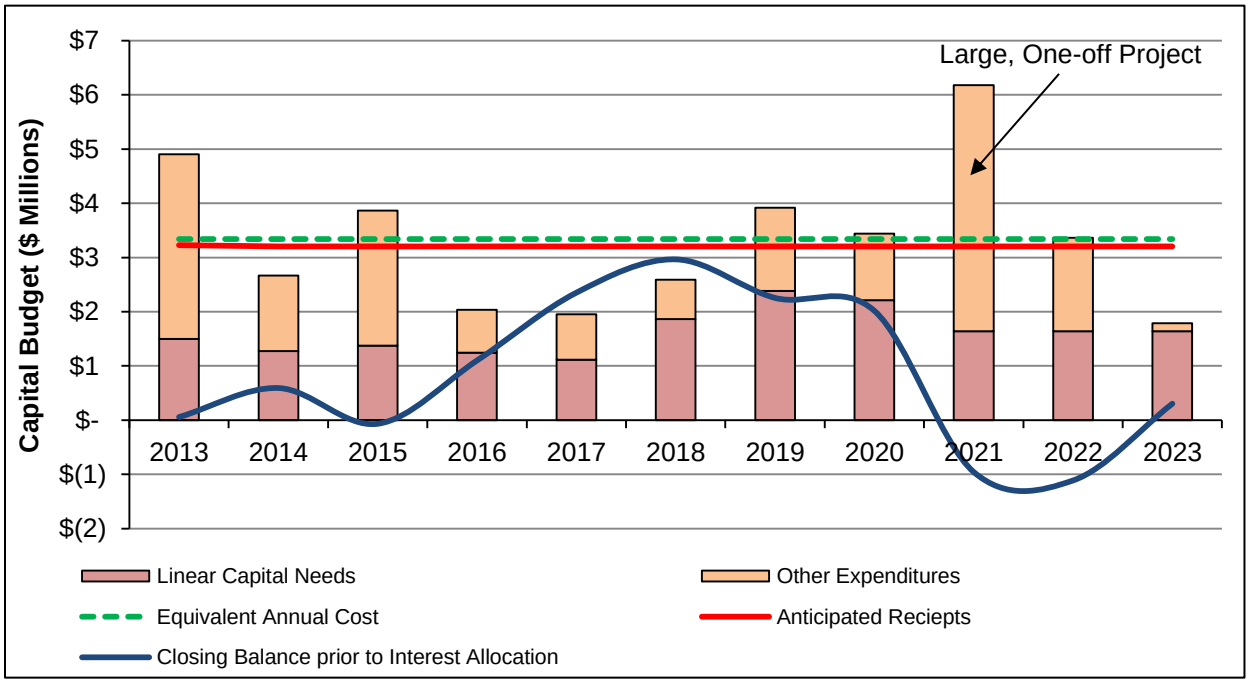
Figure 48. Sensitivity Analysis for the Impact of Program Scenarios on Reserve Balance



By translating the attainment levels into tangible targets and benchmarks, the City can evaluate, determine and communicate the relationship between the levels of service provided and the true cost of providing that service (i.e. the price/quality relationship). In times where the costs of projects are increasing at a faster rate than the funding levels and resources are increasingly being required to stretch further, this type of analysis can help quantify the impacts of maintaining funding levels, and identify opportunities for re-allocation or changes to levels of service.

Another type of reserve fund forecast is the comparison between annual expenditures and reserve fund closing balance as seen in **Figure 49**. This type of analysis allows the City to evaluate the impact of specific projects, or groups of projects on the future reserve account balance.

Figure 49. Impact Assessment of Funding Levels and Reserve Balance

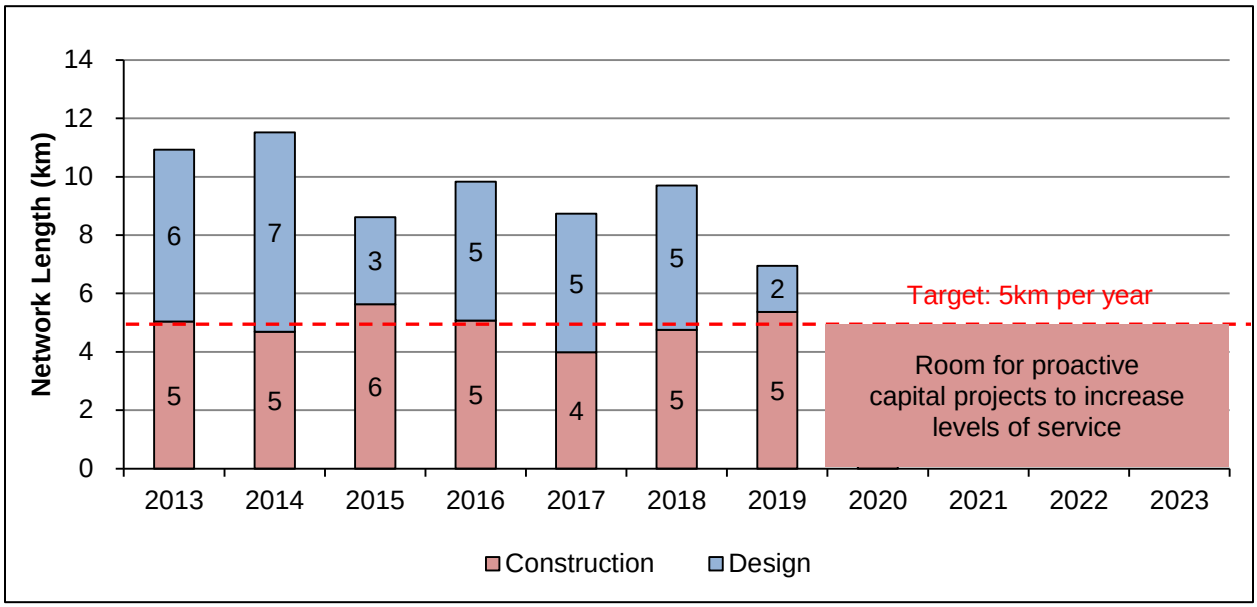


As part of the financial strategy, the City also analyzes capital programs in terms of resourcing and staffing, as well as network replacement targets. For instance, the network attainment targets can be compared with the identified immediate needs to identify how long it would take under the target attainment levels for the immediate needs to be fully addressed. An immediate need is typically a project candidate that has failed or has an observably deteriorated condition that necessitates replacement.

Once the immediate needs are fully addressed, then future proactive projects or increases in levels of service can be planned. Proactive projects are projects that are preventative in nature, and typically consist of replacement, rehabilitation or maintenance of an asset that presents a high risk of failure, but has not yet failed. An example of a proactive replacement project would be the replacement of a cast iron water main in corrosive soil that has 20% remaining service life, but currently has no recorded failures. Increases in levels of service could be asset interventions that raise the quality or performance of an existing asset.

Figure 50 shows an example of one such analysis which takes into account the planned length of the network designed and constructed each year. The identified needs under this scenario will be fully addressed in 2019, therefore allowing for proactive capital projects or increases in levels of service to be planned for the years of 2020 to 2023. While there will always be immediate needs, it is an objective of the City to minimize them where possible through proactive and preventative capital projects.

Figure 50. Evaluating identified needs and opportunities



6. Conclusions

This document presents a historic perspective of Brantford's Asset Management implementation, ongoing activities, and areas of continuous improvement. Through community-based consultation which included input from residents, businesses, community organizations and staff, the City has developed a collection of strategic visions, goals and action valued by the community. Out of these visions, goals, and actions many initiatives have been implemented, and in 2006 one such initiative commenced with the development of a strategic infrastructure management plan for the road right of way system, as a step towards ensuring optimal infrastructure planning and maintenance.

In 2011, Council approved an organizational restructuring which resulted in the creation of a dedicated Facilities and Asset Management Department. The existing Facilities Management and Geographic Information System (GIS) divisions were moved into the new department along with the creation of a new Capital Planning division. By moving the asset management planning function from various groups into a centralized division, it enabled other departments to focus on their respective area, while allowing a consistent approach to asset management across the Public Works Commission.

In 2012, the City of Brantford released its first report card on public works infrastructure which offered an objective assessment of the state of infrastructure management, asset replacement values, asset condition, financial contributions and funding requirements for the City's Public Works infrastructure. For the 2013 Asset Management Plan, the City has updated the report card. The report card found that overall the City's infrastructure is in good condition, with approximately 13% of assets in poor and very poor rating categories. To overcome data gaps, an approach has been employed to measure and quantify the confidence in the data, and then to develop an action plan to improve the confidence in the data for future iterations. This approach identified that in 10 out of 12 program areas in this asset management plan, the data has improved since 2012.

The City of Brantford has embarked on a number of initiatives to monitor the levels of service provided by the City's infrastructure. These initiatives include meeting regulatory requirements, national benchmarking initiatives, standard operating procedures, best practice reviews and condition assessments.

Short and long term analyses are used at the City with the goal of developing sustainable infrastructure capital plans and financing strategies. Theses analyses include a 100 year sustainability forecasts, a 10 year capital budget, and reserve fund forecasts. In 2013, the City is planning to transition to the implementation of a corporation-wide 10 year capital budget. A 10 year budget planning horizon provides perspective and awareness of future projects outside of the traditional short term plans. In addition to transitioning to a 10 year budget, several improvements have been made to format and presentation of the budget documents with the aim of increasing transparency and accountability.

Asset management at the City of Brantford is continually improving, striving towards efficiently managing assets to meet the service needs of the present without compromising the sustainability of its infrastructure for the demands of the future. This is being accomplished by implementing approaches to better understand the assets for which the City is responsible, the condition of these assets, how to maintain the assets to maximize useful life, and how to budget appropriately so assets can be replaced when needed. This all supports the movement towards being recognized as a well-managed city that provides efficient and effective government services while remaining fiscally responsible.

7. Next Steps

As well as providing a historical perspective of asset management practices, procedures and principles at the City, the Asset Management Plan has delivered value in highlighting some 'gaps' and opportunities for improvement, for which action plans can be developed with the goal of further enriching Brantford's holistic and progressive approach to asset management. **Table 12** to **Table 15** include preliminary action plans that support each of the sections of the asset management plan and Brantford's overall asset management program. It should be noted that the action plans are tentative, still require input from staff and council in places, and are subject to change depending on factors such as priority and timing.

Table 12. Preliminary Action Items Pertaining to the State of the Local Infrastructure

Activity / Action Item	Proposed Timing
• Consider inclusion of all City assets / program areas in subsequent iterations of the report card (e.g. Long Term Care, Parks & Recreation).	N/A
• Routinely report back to Senior Management and Council on the state of local infrastructure.	Bi-Annually
• Maintain annual facility condition investigation / audit program (via capital budget process).	Annually
• Develop tool / process (database-driven) for recording, tracking, storing and maintaining facility condition data.	2013
• Undertake Roadway drivability and condition assessment study to enhance condition data for the City's road network.	2014
• Undertake roadway surface furniture inventory (signs, intersections, street lighting) to augment asset inventory records.	2014
• Complete Traffic Sign reflectivity analysis for all City signs.	2014
• Coordinate findings of OSIM inspections with known maintenance backlog to develop a comprehensive capital re-investment program for the City's bridges.	2014
• Undertake specialized condition assessment activities for the City's sanitary and storm trunk system (large diameter collection trunks).	2014
• Initiate condition assessment and bathymetric surveys of the City's stormwater management ponds to ascertain current condition and identify capital re-investment requirements to ensure design integrity and functionality.	2013-2014
• Continue with in-house CCTV inspection program of the City's sanitary and stormwater linear network. Work to prioritize inspection needs, determine return frequencies, etc.	Ongoing
• Undertake an analysis of the City's fleet inventory as it relates to capital re-investment levels, optimal maintenance spending, etc.	2014-2015
• Plan for next cycle of building condition audits for Social Housing building inventory (initial study completed in 2013).	2018
• Develop inspection standards and related condition assessment program for the City's sidewalk network.	2014

Table 13. Preliminary Action Items Pertaining to the Desired Levels of Service

Activity / Action Item	Proposed Timing
• Conduct annual review of NWWBI data metrics for level of service standings, utility goal attainment and comparators; identify potential areas for improvement	Annual
• Monitor best practices and industry standards pertaining to levels of service - consider implementation at the City where appropriate	Ongoing
• Work with community partners in developing the delivery of the community hub approach in housing sites and/or identified neighbourhoods. (Sec. 2.2 of the 2013 Brantford-Brant Housing Stability Plan)	2013-2015
• Implement Smoke-Free Housing strategies including health promotion initiatives, resident education programs, increasing knowledge of smoking and second hand smoke health hazards and information regarding the availability of smoking cessation programs. (Sec. 3.2 of the 2013 Brantford-Brant Housing Stability Plan)	2013-2015
• Develop and implement Landlord & Tenant education programs for landlords and tenants, in areas including the Residential Tenancies Act, Human Rights, Diversity, Property Standards, and Accessibility for Ontarians with Disability Act, etc. (facilitate partnerships with the Legal Clinic, Private Landlord Associations, Social Media Programs) (Sec. 3.6 of the 2013 Brantford-Brant Housing Stability Plan	2014-2019

Table 14. Preliminary Action Items Pertaining to the Asset Management Strategy

Activity / Action Item	Proposed Timing
• Augment or optimize existing data systems for operability and harmonization across the organization.	Ongoing
• Undertake GIS needs analysis and develop a comprehensive geospatial model to capitalize on existing City IT investments such as the ESRI ELA Agreement, Avantis, JD Edwards, Web mapping, mobile/field data collection etc.	2013-2014
• Continue to develop and formalize asset prioritization and criticality frameworks.	
• Work to improve capital planning database and potentially build on framework for use across the City (in conjunction with IT department).	Ongoing
• Work towards integration of isolated systems, data sources, etc. to optimize capital planning analysis, data consistency, reliability, and sharing.	Ongoing
• Undertake SCADA (Supervisory Control and Data Acquisition) Master Plan and look for opportunities for data recording and sharing.	2014
• Complete the development of water, sanitary and stormwater hydraulic models – develop future methodologies/ business processes around model maintenance, use, and data sharing.	2013-2014
• Complete the development of the transportation model – develop future methodologies/ business processes around model maintenance, use, and data sharing.	2013/14
• Work to coordinate departmental data storage, consistency and accessibility for support of SMART Cities initiative.	N/A
• Continue with Condition Assessment and Inspection projects identified in Table 6 of Asset Management Strategy.	Ongoing
• Harmonize growth related needs with capital replacement/rehabilitation needs utilizing outputs from the Master Servicing & Transportation Master Plan and associated hydraulic models.	2014

Activity / Action Item	Proposed Timing
• Assess the impact of End of Operating Agreements and support strategic planning that will mitigate negative impact. (Sec. 4.1 of the 2013 Brantford-Brant Housing Stability Plan)	2013-2015
• Encourage mixed housing and mixed income development in all urban neighborhoods by increasing opportunities for rental, social and affordable housing in areas that currently offer limited opportunities. (Sec. 1.5 of the 2013 Brantford-Brant Housing Stability Plan)	2013-2015

Table 15. Preliminary Action Items Pertaining to the Financing Strategy

Activity / Action Item	Proposed Timing
• Work with internal stakeholder departments to review capital needs in the context of developing a sustainable infrastructure re-investment plan and associated financing strategies.	N/A
• Continue to explore and capitalize on harmonizing infrastructure needs were possible (e.g. corridor or right-of-way management) to optimize capital re-investment spending.	Ongoing
• Ensure the ongoing sustainability of social housing (rent- geared-to-income). (Sec. 1.2 of the 2013 Brantford-Brant Housing Stability Plan)	2015-2018
• Expand portable and in situ rent subsidy programs (i.e. rent supplements and/or housing allowances that go with the tenant and are not tied to a particular unit) (Sec. 1.7 of the 2013 Brantford-Brant Housing Stability Plan)	2015-2018
• Identify and engage partnership opportunities for the development, funding and provision of supportive housing options. (Sec. 2.4 of the 2013 Brantford-Brant Housing Stability Plan)	2015-2018
• Explore the feasibility to develop new municipally funded capital programs to increase the supply of affordable housing (e.g. capital grants/loans, convert to rent programs, tax deferrals, waive planning act fees). (Sec. 4.3 of the 2013 Brantford-Brant Housing Stability Plan)	2015-2018
• Devise alternative business models in an effort to sustain and enhance the existing rent-geared-to-income model. (Sec. 4.4 of the 2013 Brantford-Brant Housing Stability Plan)	2015-2018

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Appendix 1. Asset Inventory

Appendix 1.1. Road Network

Asset Class	Quantity	Unit	Replacement Cost ($)
Roads	**1,042,218**	Lane m	**1,090,848,000**
Arterial Roads	230,786	Lane m	241,555,000
Collector Roads	205,499	Lane m	215,091,000
Local Roads	605,933	Lane m	634,202,000
Roadside Structures	**98**	**each**	**1,446,600**
Guard Rails	89	each	747,600
Sound Barriers	9	each	699,000
Street Lighting	**11,349**	**each**	**15,200,000**
Fixtures and Wiring	9,349	each	10,576,000
Poles	2,000	each	4,624,000
Traffic and Roadside	**521**	**each**	**17,491,500**
Signalized Intersections	421	each	16,618,000
Controllers	129	each	2,969,000
Intersection - Above Ground	129	each	7,621,000
Intersection - Below Ground	129	each	5,994,000
Warning Lights	34	each	34,000
Signs	**33**	**each**	**777,000**
Mountings	23	each	377,000
Signs	10	each	400,000
Street Furniture	**67**	**each**	**96,500**
Information Signs	4	each	65,000
Waste Receptacles	63	each	31,500

Appendix 1.2. Sidewalks

Asset Class	Quantity	Unit	Replacement Cost ($)
Sidewalks	**555,545**	**m**	**147,916,000**
Asphalt	7,657	**m**	2,037,000
Brick	2,483	**m**	663,000
Concrete	545,228	**m**	145,169,000
Unknown	176	**m**	47,000

Appendix 1.3. Bridges, Retaining Walls and Culverts

Asset Class	Quantity 1	Unit 1	Quantity 2	Unit 2	Replacement Cost ($)
Bridges	**26**	**each**	**2,517**	**m**	**217,118,000**
Pedestrian/Vehicle Bridges	15	each	1,473	m	183,333,000
Railway Bridges	11	each	1,044	m	33,785,000
Culverts	**164**	**each**	**4,227**	**m**	**35,006,500**
Culvert < 3m Span	152	each	3,927	m	2,970,500
Culvert > 3m Span	12	each	300	m	32,036,000
Retaining Walls	**383**	**each**	**8,920**	**m**	**4,072,000**

Appendix 1.4. Drinking Water

Appendix 1.4.1. Water Distribution

Asset Class	Quantity	Unit	Replacement Cost ($)
Water Mains	478,484	m	312,689,000
Water Distribution Main (0-150mm)	209,691	m	120,551,000
Water Distribution Main (150mm-450mm)	245,077	m	167,500,000
Water Transmission Main (475mm or greater)	23,716	m	24,638,000
Water Appurtenances	**10,671**	**each**	**Included in water main replacement cost**
Valves	7811	each	Included in water main replacement cost
Hydrants	2647	each	Included in water main replacement cost
Chambers	213	each	Included in water main replacement cost

Appendix 1.4.2. Water Facilities

Asset Class	Quantity	Unit	Replacement Cost ($)
Water Facilities	**7**	**each**	**190,950,000**
Elevated Tanks	1	each	579,000
Plant	1	each	156,559,000
Pumping Stations	4	each	33,672,000
Raw Water Quality Monitoring Stations	1	each	140,000

Appendix 1.5. Wastewater

Appendix 1.5.1. Wastewater Collection

Asset Class	Quantity	Unit	Replacement Cost ($)
Wastewater Sewer Lines	**420,118**	**m**	**234,149,000**
Local Sewers (150mm-400mm)	361,898	m	180,923,000
Trunk Sewers (450mm-900mm)	40,118	m	33,663,000
Trunk Sewers(975mm or greater)	18,103	m	19,563,000
Wastewater Appurtenances	**5,847**	**each**	
Active Manholes	5,847	each	Included in sewer line replacement cost

Appendix 1.5.2. Wastewater Facilities

Asset Class	Quantity	Unit	Replacement Cost ($)
Wastewater Facilities	**10**	**each**	**196,697,000**
Plant	1	each	165,209,000
Lagoons	1	each	415,000
Pumping Stations	8	each	31,073,000

Appendix 1.6. Stormwater

Appendix 1.6.1. Stormwater Collection

Asset Class	Quantity	Unit	Replacement Cost ($)
Stormwater Sewer Lines	**371,682**	m	**286,915,000**
Local Sewers (150mm-400mm)	186,062	m	102,203,000
Trunk Sewers (450mm-900mm)	143,483	m	113,986,000
Trunk Sewers(975mm or greater)	42,137	m	70,726,000

Asset Class	Quantity	Unit	Replacement Cost ($)
Stormwater Appurtenances	**5,973**	**each**	
Active Manholes	5,973	each	Included in sewer line replacement cost

Appendix 1.6.2. Stormwater Facilities

Asset Class	Quantity	Unit	Replacement Cost ($)
Stormwater Facilities	**22**	**each**	**10,824,000**
Control Gates	2	each	1,788,000
Pumping Stations	1	each	770,000
Detention Ponds	19	each	8,266,000

Appendix 1.7. Solid Waste and Landfill

Asset Class	Quantity	Unit	Replacement Cost ($)
Solid Waste & Landfill Assets	**54**	**each**	**36,482,000**
Bins	9	each	347,000
Building Improvements/Upgrades	2	each	1,932,000
Computer Software	1	each	85,000
Control Systems	2	each	25,000
Fencing/Retaining Walls	2	each	264,000
Garage/Maintenance Building	2	each	699,000
Land	2	each	2,470,000
Landfills/Wells/Transfers	25	each	28,417,000
Office Building/Brick Building	1	each	99,000
Parking Lots	2	each	1,823,000
Structures/Signs	1	each	14,000
Shed/Steel Frame Building	4	each	268,000
Tools/Shop/Garage Equipment	1	each	39,000

Appendix 1.8. Corporate Facilities

Asset Class	Quantity	Unit	Replacement Cost ($)
Corporate Facilities	**30**	**each**	**80,090,000**
Administration and Retail Complex	1	each	7,713,000
Multi-level Parking	1	each	21,490,000
Commercial Retail Unit	1	each	787,000
Maintenance Building	5	each	6,824,000
Storage / Warehouse Building	19	each	11,429,000
Corporate Office Complex	3	each	31,847,000

Appendix 1.9. Corporate Fleet

Asset Class	Quantity	Unit	Replacement Cost ($)
Fleet Vehicles and Equipment	**255**	**each**	**18,226,000**
Heavy Construction Equipment	4	each	858,000
Heavy Duty Vehicle	32	each	3,755,000
Ice Re-Surfacer	4	each	351,000
Light Duty Vehicle	84	each	2,787,000
Mowers/Tractors	52	each	2,340,000
Park Equipment	1	each	54,000
Sander/Dump Truck/Backhoe	28	each	4,931,000
Sewer Jet/Street Sweeper	6	each	1,657,000
Tools/Shop/Garage Equip	33	each	1,250,000
Trailers/Golf Carts	9	each	227,000
Turf Equipment	2	each	16,000
Miscellaneous Fleet Assets	**10**	**each**	**1,353,000**
Communication Systems	3	each	452,000
Computer Software	1	each	26,000
Control Systems	3	each	760,000
Underground Fuel Storage	3	each	115,000

Appendix 1.10. Transit

Asset Class	Quantity	Unit	Replacement Cost ($)
Transit Facilities	**46**	**each**	**29,342,000**
Building Improvements and Upgrades	6	each	3,058,000
Buildings (Transit Service Centre / Garage)	1	Each	6,127,000
Land	1	Each	445,000
Parking Lots	1	Each	269,000
Transit Vehicles and Equipment	**36**	**each**	**19,395,000**
Light Duty Vehicle	3	each	124,000
Sewer Jet/Street Sweeper	1	each	14,000
Tools/Shop/Garage Equip	1	each	5,000
Transit Bus	31	each	19,252,000
Miscellaneous Transit Assets	**1**	**each**	**48,000**
Computer Hardware	1	each	48,000

Appendix 1.11. Social Housing

Asset Class	Quantity	Unit	Replacement Cost ($)
Social Housing	**96**	**each**	**73,221,000**
Apartment Buildings	8	each	40,978,000
Townhouse Buildings	6	each	21,837,000
Detached / Semi-Detached Buildings	82	each	10,406,000