2021
Asset Management Plan

burlington.ca/assetmanagement

CITY OF
Burlington

Foreword and Acknowledgements

The City of Burlington owns and manages a wide range of infrastructure assets across multiple services. This infrastructure is directly linked to the economic, social and environmental advancement of the community. It is necessary to understand the overall health of the City's infrastructure assets and future requirements so that services can be delivered to our residents, businesses and visitors in a way that minimizes risk, is sustainable and makes financial sense.

The City's Asset Management Plan (AMP) guides the management of the City's many assets. It describes the portfolio of assets, how the City manages those assets, how well those actions are working and how much it will cost to maintain those assets to provide City services. By bringing all this information together, strengths and opportunities in the City's processes can be identified and strategies created to improve tomorrow's outcomes.

This AMP is the City's second, following the completion of its first edition in 2016. It details the state of infrastructure of the municipality's service areas and provides asset management and financial strategies designed to facilitate its pursuit of developing an advanced asset management program and mitigate long-term funding gaps.

The Asset Management team would like to thank City staff for their continued support, input and collaboration in the development of this AMP update.

In addition to the contributions made by staff, the team also thanks GM BluePlan Engineering Limited for their assistance in developing an AMP that meets and exceeds compliance with requirements set out by O.Reg. 588/17.

COVID-19 Pandemic Impacts

This AMP does not fully reflect the impacts of COVID 19. The City acknowledges that there will be economic impacts, that will have to be fully assessed at a later date.

NEIGHBOURHOOD,
BURLINGTON, ONTARIO

CITY OF Burlington

Asset Management Project Team

Andrew Maas – Manager, Asset Planning

Reena Bajwa – Coordinator of Financial Strategies & Business Consulting

Amy Daca – Coordinator, Asset Planning

Alyshia Tuomi – Coordinator, Linear Asset Management

Paul Swioklo – Senior Coordinator, Facility Asset Management

Luke Zygalko – Financial Analyst – Strategies & Business Consulting

Ellen Chen - Financial Analyst – Strategies & Business Consulting

Burlington Leadership Team (BLT) Project Sponsors

Allan Magi - Executive Director of Environment, Infrastructure and Community Services

Joan Ford – Chief Financial Officer

Scott Hamilton – Director of Engineering Services

ROYAL BOTANICAL
GARDENS, BURLINGTON,
ONTARIO

TABLE OF CONTENTS ——————————

Glossary of Terms

Acronym	Definition
AM	Asset Management
AMP	Asset Management Plan
ATMS	Advanced Traffic Management System
AODA	Accessibility for Ontarians with Disabilities Act
BLT	Burlington Leadership Team
BCI	Bridge Condition Index
CCA	Canadian Construction Association
CCTV	Closed-Circuit Television
CIC	Corporate Infrastructure Committee
CSCE	Canadian Society for Civil Engineering
CWWF	Clean Water and Wastewater Fund
DSS	Decision Support System
DWQMS	Drinking Water Quality Management Standard
EAB	Emerald Ash Borer
EAMS	Enterprise Asset Management Solution
ESL	Estimated Service Life
FCI	Facility Condition Index

Acronym	Definition
FCM	Federation of Canadian Municipalities
FMP	Fire Master Plan
GHG	Green House Gas
IMP	Integrated Mobility Plan
IT	Information Technology
LOS	Levels of Service
MMS	Maintenance Management System
MNAI	Municipal Natural Asset Initiative
MTO	Ministry of Transportation
NFPA	National Fire Protection Association
O&M	Operating & Maintenance
O.Reg 588/17	Ontario Regulation 588/17
OCIF	Ontario Community Infrastructure Fund
OGS	Oil and Grit Separators
OSIM	Ontario Structure Inspection Manual
PQI	Pavement Quality Index
RCC	Recreation, Community and Culture
RPF	Roads, Parks and Forestry
UFMP	Urban Forest Management Plan

1.0

Executive
Summary

BRANT STREET PIER, CITY OF BURLINGTON

1.0 Executive Summary

1.1 Introduction

The City of Burlington's (the City's) infrastructure systems support a range of municipal services that enable residents, businesses and other Burlington stakeholders to live, work and play in our City. The City is undergoing a significant shift with numerous demographic and economic changes. As this transition occurs, planned investments will be made into existing infrastructure in parallel with the City readily preparing for future infrastructure growth. This Asset Management Plan (AMP) has been updated from its 2016 predecessor and was developed in alignment with the City's strategic plan to encapsulate the City's Vision, Values and Key Strategic Objectives. It includes plans for the infrastructure that are fundamental to the wellbeing and livability of the community. The Plan is organized into dedicated chapters for each key service supported by the infrastructure: Transportation, Transit, Parking, Stormwater, Corporate Facilities, Recreation, Community and Culture, Parks, Fire, Urban Forestry, Corporate Fleet and Information Technology. Each chapter is further divided into the state of the infrastructure, levels of service, lifecycle management strategies, and current and future risks.

1.2 State of Infrastructure

The State of Infrastructure assesses and quantifies the asset portfolios in terms of overall condition, replacement value and estimated remaining service life. The City's current infrastructure has an estimated replacement value of $5.2 billion and is in an overall Good condition state, as shown in Figure E1.

Condition scores were obtained for each asset using a five-point rating scale that aligns with the National Infrastructure Report Card produced by the Federation of Canadian Municipalities (FCM), the Canadian Society for Civil Engineering (CSCE) and the Canadian Construction Association (CCA). The City has a number of initiatives in place aimed at improving condition assessment approaches to improve the quality of asset condition and replacement value data. The majority of the City's infrastructure growth has occurred over the last four decades, with the average asset age across all service areas between 6 and 37 years old as seen in Figure E2.

Although the majority of City assets are in good or very good condition, capital and operating investments are required for lifecycle strategies needed to address poor and very poor assets and to prevent other assets from reaching a poor condition state and maintain service levels.

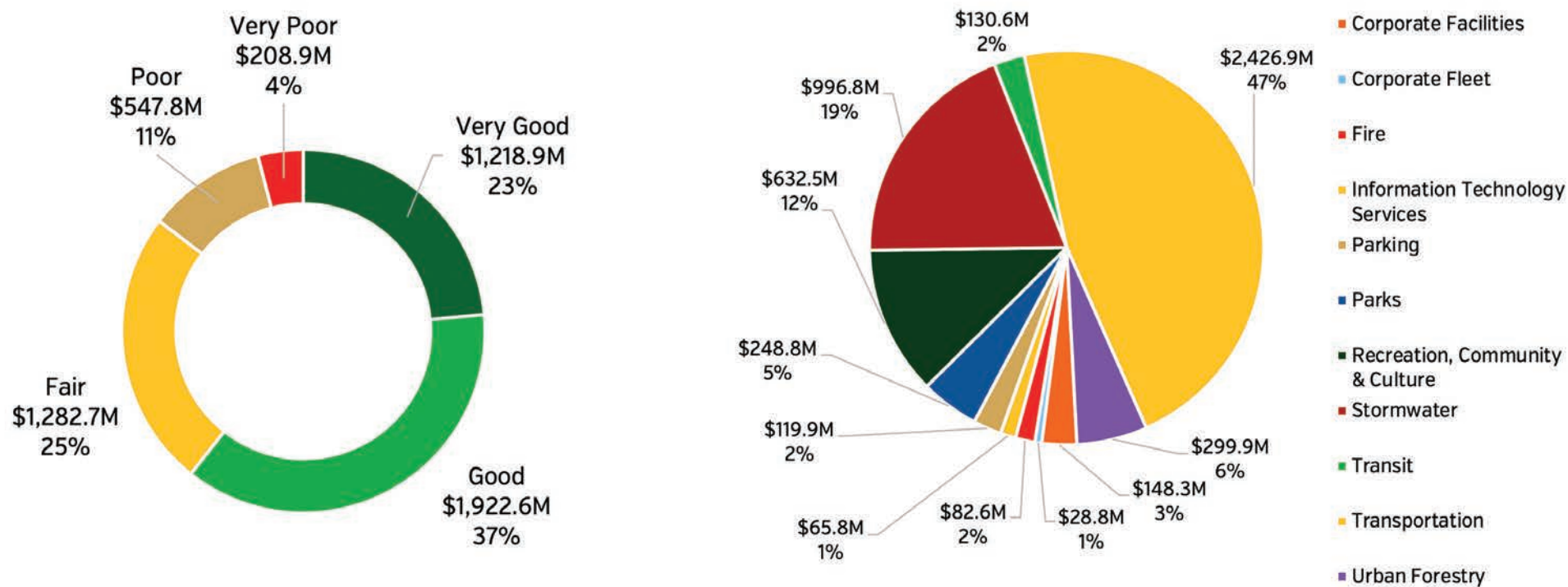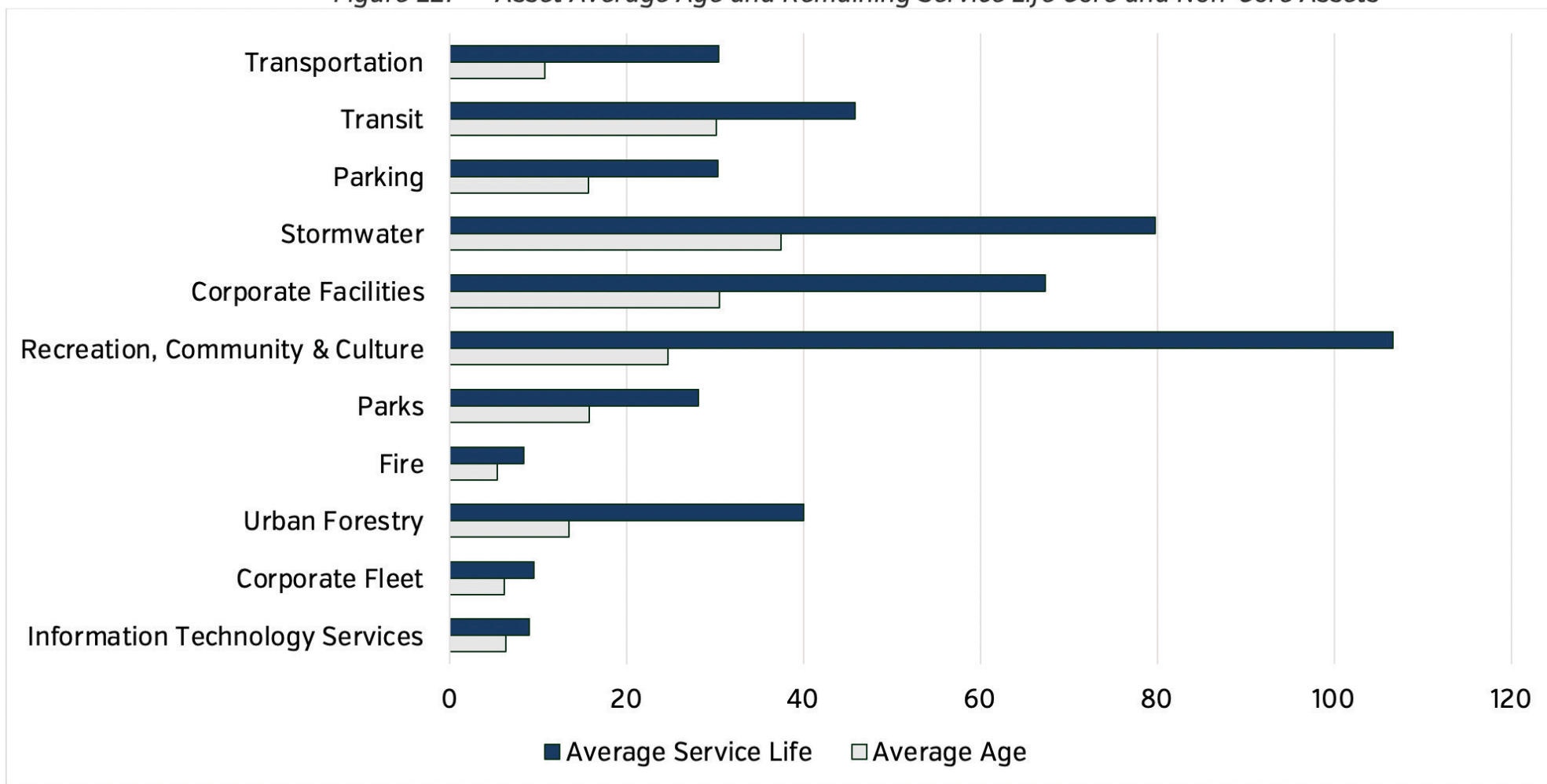Figure E1:   Asset Value and Condition Profile for Core and Non-Core Assets

Left chart (condition profile):
- Very Poor $208.9M 4%
- Poor $547.8M 11%
- Very Good $1,218.9M 23%
- Fair $1,282.7M 25%
- Good $1,922.6M 37%

Right chart (asset value):
- $130.6M 2%
- $2,426.9M 47%
- $996.8M 19%
- $632.5M 12%
- $248.8M 5%
- $119.9M 2%
- $299.9M 6%
- $65.8M 1%
- $82.6M 2%
- $148.3M 3%
- $28.8M 1%

Legend:
- Corporate Facilities
- Corporate Fleet
- Fire
- Information Technology Services
- Parking
- Parks
- Recreation, Community & Culture
- Stormwater
- Transit
- Transportation
- Urban Forestry

Figure E2: Asset Average Age and Remaining Service Life Core and Non-Core Assets

1.2.1   Levels of Service

Levels of Service (LOS) is a key component of asset management decision making that describe the planned outcome from the asset from a customer and/or technical performance perspective. Level of service statements describe the asset outputs that the City intends on delivering to the community and can be represented in terms of attributes such as availability, cost-effectiveness, reliability, responsiveness, safety, suitability and sustainability. LOS measures for each service area are established through discussions with City staff or are mandatory metrics as described in Ontario Regulation 588/17.

In addition to the measures required by O. Reg. 588/17, the City has developed other foundational asset service measures which will assist the City in understanding its performance levels and identifying areas of improvement. The Levels of Service inform the planned actions required to deliver the expected service levels and this link enables the City to gain an understanding of the costs associated with delivering its services to the community. The service levels and performance reporting in this AMP is compliant with O. Reg. 588/17. Through each update of the AMP, the City will continue to develop and refine service levels, performance measurements and targets. The City will also consider impacts of external factors affecting Levels of Service, such as changing regulations, population growth, customer expectations and trends, demographic changes, and climate change impacts.

1.2.2   Asset Lifecycle Management Strategy

The asset lifecycle management strategy is a set of planned lifecycle-based actions that the City of Burlington uses to manage its infrastructure to meet service levels. As assets near the end of their lifecycles, a plan is established to replace, decommission or upgrade the assets to meet future demand. Additionally, the City has developed a set of lifecycle models that track asset deterioration over time to help manage and forecast asset renewal, decommissioning and replacement. This model can be used to understand how different funding strategies can impact the LOS by demonstrating how lifecycle management activities may be delayed if funding is unavailable. Risk management is also incorporated into these models by applying risk scores to assets and prioritizing the completion of work for high-risk assets over low-risk assets.

For the purposes of this plan, lifecycle activity categories are as follows:

- **Non-Infrastructure:** Actions or policies that can lower costs or extend asset life
- **Maintenance:** Regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events
- **Rehabilitation:** Significant treatments designed to extend the life of the asset
- **Replacement:** Activities that are expected to occur once an asset has reached the end of its estimated service life and renewal/ rehabilitation is no longer an option
- **Disposal:** Activities associated with disposing of an asset once it has reached the end of its estimated service life, or is otherwise no longer needed
- **Expansion:** Planned activities required to extend services to previously un-serviced areas - or expand services to meet growth demands or customer expectations.

1.3 Financial Strategy

Asset investment forecasts are necessary to provide insight into prospective investment requirements and the impact of varying financing strategies on LOS. These forecasts take the current state of the infrastructure and apply the defined lifecycle management strategies to predict future LOS and the funding required to define the corporate asset needs.

By determining the cumulative spending requirements over the long-term it is possible to compare various financing strategies and confirm which strategy would allow the City to meet these forecasted needs. This provides direction to the current financial processes for operating and capital budgeting.

1.4 Continuous Improvement

The City has committed to continuous improvements to this AMP, including improvements to data collection, decision-making and strategic planning. This is achieved through regular reviews and comprehensive updates as well as other improvement initiatives through the Asset Management Business Service Plan. The aim is to strengthen AM processes to not only meet, but exceed, legislated requirements in support of providing City services.

2.0
Introduction

2.0
Introduction

2.0 Introduction

The City of Burlington's infrastructure systems support a range of municipal services that enable residents, businesses and other Burlington stakeholders to live, work and play in our City. In April 2016, a new Strategic Plan was approved by Burlington City Council, setting in place the vision that Burlington will be the place "where people, nature and businesses thrive" and introducing the following four strategic directions for the City over the next 25 years:

A City that Grows   A City that Moves   A Healthy and Greener City   An Engaging City

This Asset Management Plan (AMP) supports the development of the City's strategic direction of an Engaging City, through good governance of infrastructure and establishing common corporate objectives and priorities. As documented in the Strategic Plan, the City is undergoing a significant shift with numerous demographic and economic changes. As this transition occurs, planned investments will need to be made in existing infrastructure in addition to preparing for future infrastructure growth.

2.1 Asset Management Plan Purpose

Asset Management Plans are documents developed by the City that specify the activities, resources and timescales required for an individual asset, or grouping of assets, to achieve defined level of service objectives. In 2016, and prior to the enactment of O. Reg 588/17, the City prepared its first Asset Management Plan. The 2016 Plan considered six asset categories and summarized the state of the infrastructure, their values, and their asset management strategies. It also identified an improvement and monitoring plan for data and process improvements, compliance with the new regulations and incorporation of Levels of Service.

- An expanded and more comprehensive asset inventory
- Improved replacement valuation methodologies
- Improvements to data quality and processes
- Levels of Service
- Lifecycle management strategies
- Risk considerations
- Improved financial modelling and strategies

This has resulted in a significant increase in the valuation of the City's infrastructure, from nearly $3 billion dollars in 2016, to $5.8 billion as of 2020. It is anticipated with every iteration of an AMP, that not only will our knowledge and understanding of our asset management needs increase, but our asset valuations will as well. The Asset Management Plan helps the City make the best possible decisions regarding the construction, operation, maintenance, renewal, replacement, expansion and disposal of infrastructure assets while minimizing risk and cost to the community and maximizing service delivery. In addition, the AMP is designed to:

- Guide the consistent application of standards, best practices and tools
- Support effective service delivery through the sustainable management of the City's infrastructure
- Align investments with infrastructure priorities to deliver established levels of service in a financially responsible manner
- Provide input into long-term infrastructure plans and the City's budget
- Document existing and planned work practices and procedures
- Support business cases for key infrastructure investments and funding opportunities
- Develop sustainable financing plans
- Support discussion on the setting of levels of service targets
- Meet legislative requirements

This document has been developed in alignment with the City's Strategic Plan and includes plans for the infrastructure portfolios that are fundamental to the wellbeing and livability of the community, including: transportation; transit; parking; stormwater; corporate facilities; recreation, community and culture; parks; fire; urban forestry; corporate fleet and information technology.

It is worth noting that the while the majority of the infrastructure included in this AMP is considered 'grey', i.e., built or engineered structures and networks such as roads, sewers and facilities, some green infrastructure assets have been included. These include stormwater management ponds, creek infrastructure including erosion control features and the urban forest. These green assets help protect our natural environment by mimicking the natural hydrologic cycle and providing additional stormwater control, filtration and infiltration. Lessons and information gained from the Grindstone Creek Municipal Natural Asset Initiative (MNAI) pilot project in partnership with Conservation Halton will further enhance how the City continues to build green infrastructure into its Asset Management Program.

The plan is based on the guidelines set in place by the Ontario Ministry of Infrastructure's Building Together Guide for Municipal Asset Management Plans as well as Ontario Regulation 588/17 under the Infrastructure for Jobs and Prosperity Act. The plan provides an understanding of the infrastructure owned by the City, what it is worth, the condition it is in, the levels of service it is expected to provide, the activities to support that level of service and the funding required. As displayed in Figure 1, are the City's guiding principles for the development of the Asset Management Plan.

Figure 1.   Guiding Principles for Asset Management Plans

Provide line of sight and alignment with the City's organizational strategic goals

Incorporate all assets that support services to the community

Outline the expected levels of service, current performance and targets

Outline the future impacts of growth and demand on the asset portfolios

Leverage evidence-based approaches to support long-term funding decisions and the prolonging of asset lifecycles

Outline optimal lifecycle activities to operate, maintain, renew and dispose of assets and their cashflow forecasts

Incorporate a continuous improvement mindset, including key actions to improve asset management practices

2.2 Supporting the City's Vision, Values and Key Strategic Objectives

Burlington's Strategic Plan outlines the City's vision, values and strategic objectives for addressing Burlington's needs over a 25-year period (2015 – 2040). The City's assets support these objectives by providing the tangible infrastructure needed to provide services to the community.

To support the City's vision, the City developed the Asset Management (AM) Policy which was approved by Council in 2018 to align with the Strategic Plan by affirming the City's ongoing commitment to ensure consistent asset management processes. This policy is a high-level statement that outlines the principles that guide staff in the development and administration of the AM program. These principles are inherent to all AM practices for the City and include the following:

- Holistic
- Strategic and Forward Looking
- Health & Safety Focus
- Customer Service Focus
- Systematic
- Risk-based
- Value-based affordable
- Sustainable

- Environmentally conscious
- Integrated
- Innovation and Continuous Improvement

This policy also provides a clear governance structure by highlighting the roles and responsibilities of staff who make infrastructure-related decisions.

The AM policy is a new requirement of Ontario Regulation 588/17 - Asset Management Planning for Municipal Infrastructure (refer to Section 2.3 for an overview of this new regulation). This AMP was developed in alignment with several corporate documents, including the Strategic Plan, to ensure the City makes the best possible decisions regarding infrastructure needs while minimizing risk and cost to taxpayers and maximizing service delivery. It provides insights into the medium-term infrastructure needs which helps to guide the development of planning documents including the Official Plan and Financial Plans. Together, these documents provide a framework for asset management across the City, as shown in Figure 2.

Figure 2: Strategic Plan and Corporate Policies
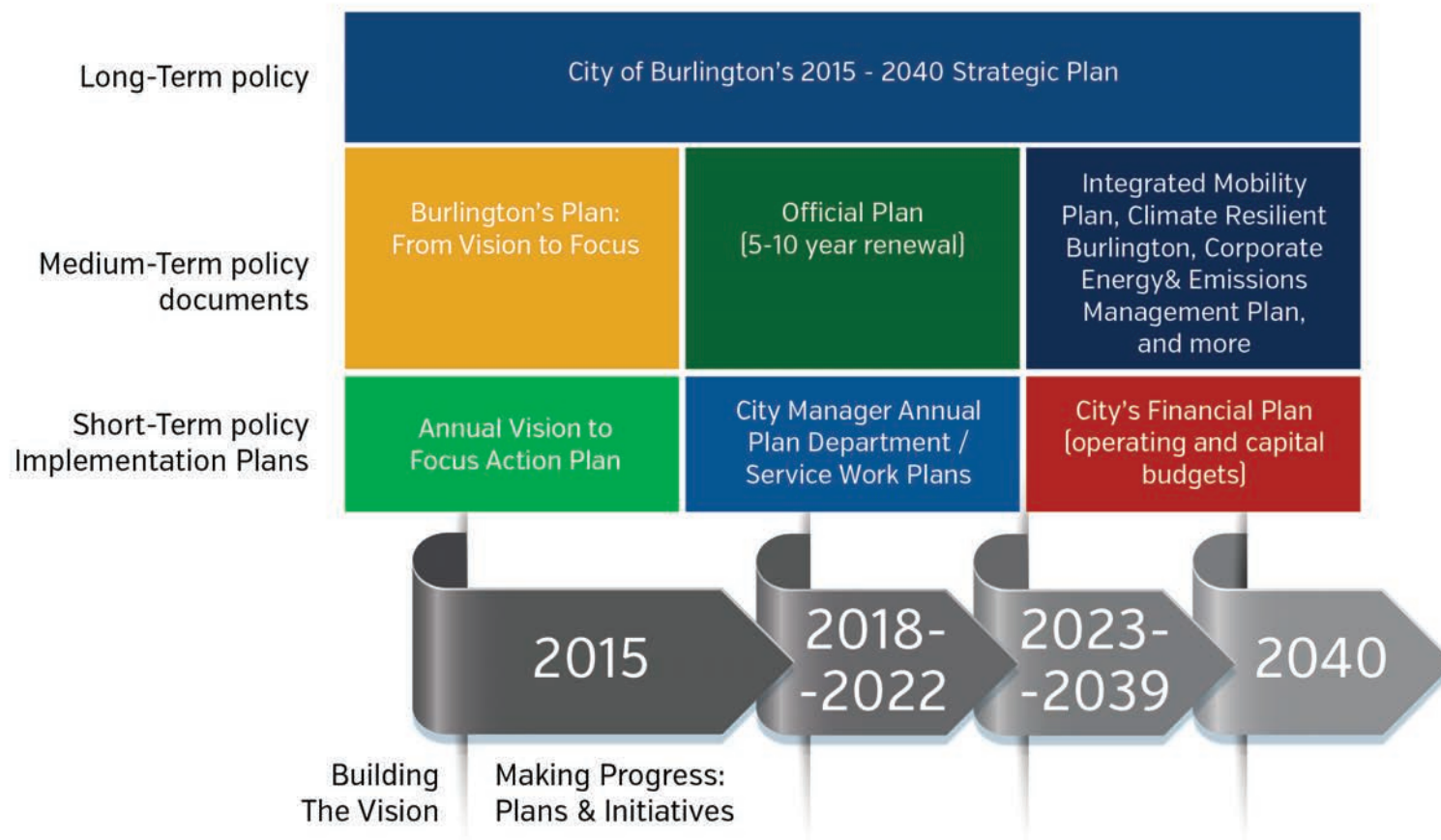
2.2.1 Risk and Climate Change Considerations

The condition, lifecycle activities and financial needs of an asset form the foundation of an asset management plan. They help us understand how the management of our assets will impact the delivery of our services. When used to guide and prioritize the financial needs of these assets, the Plan can be of greater benefit when it incorporates risk into the decision support process.

Risk is defined in asset management as the product of the likelihood of the failure of an asset and the consequence of its failure.

The likelihood of failure can be derived from the condition of the asset, but the consequence of failure can be complex and can vary by the type of asset, type of consequence, or spatially across a corporation. Consequence of failure was derived with each asset service and is described in more detail in the asset sections to follow.

Within the plan, these risk scores are incorporated into the financial forecasting to prioritize spending on assets considered high risk over those that are low risk.

As a part of the City's strategic objective of being a Healthy and Greener City, the City recognizes that climate change is a significant risk that needs to be addressed.

Figure 3: Strategic Initiatives and Progress Indicators for Climate Change

Strategic Initiatives
- Continually update and implement the Corporate Energy & Emissions Management Plan to achieve net-carbon neutraility in City Opertions
- The completion and implementation of a climate change adaptation plan
- Update and implement the Climate Action Plan, ensuring efficiency, resiliency and economic viability
- The City will complete and implement a climate change adaptation plan known as Climate Resilient Burlington: A Plan for Adapting to Our Warmer, Wetter and Wilder Weather

Progress Indicators
- Energy consumption for city operations on a city-wide scale
- Growth and expansion of the urban forest.
- Greenhouse gas emissions city-wide and for city operators
- Progress on energy targets in the Climate Actino Plan and Corporate Energy and Emissions Management Plan

In 2019 Burlington City Council declared a Climate Emergency, highlighting the need for climate change action and directed staff to consider climate change in future plans and actions. Later in 2019, a net-carbon neutral goal for 2040 for corporate emissions was approved in the Strategic Plan and then in 2020, a community-wide emission goal for 2050 was approved in the Climate Action Plan.

In 2021, a key step in preparing a climate adaptation plan called Climate Resilient Burlington, staff prepared a Climate Projections report for Council highlighting the "warmer, wetter & wilder" climate we anticipate in the future. By 2040, the City aims to achieve increased energy efficiency, protect the natural environment and mitigate climate change impacts. This will be achieved through numerous actions and measures of success, including, but not limited to the initiatives and indicators identified in Figure 3.

Within the AMP, climate change is acknowledged as a potential source of risk of impacts to City infrastructure and the services they provide. In particular, stormwater assets play a key role in adapting to the effects of extreme weather events. Understanding the long-term funding requirements for these assets and the impacts to the level of service they provide help

to support the City in managing the effects of climate change.

2.2.2 Growth Considerations

The City of Burlington and the community work together to develop its' Official Plan, which is a tool for the municipalities to manage growth and development. The Plan outlines long-term visions of the community and quality of life for Burlington residents through statements of objectives and policies. The Plan also provides policy direction on land use development and recourse management to guide the future planning and development of the City of Burlington.

From the City's Official Plan, Burlington's population was recorded to be at 171,000 in 2006 and was anticipated to reach 193,000 people by the year 2031. This results in a population increase of 22,000 people, or approximately 13% increase over the course of 25 years. This represents an employment increase of 18,000 over the course of 25 years from 88,000 to 106,000. For the purpose of this AMP, the BEDC's 2021 population estimate of 197,582 was used in calculating per capital metrics.

The demand on the City's infrastructure assets will change over time based on a number of contributing internal and

external factors, including growth. One effect that growth will have on the City's assets is increased demand resulting in higher deterioration of the existing asset portfolio. Planning for population growth may also require expanding of the infrastructure network (e.g., roadways, sewer systems, etc.) to ensure the appropriate level of connectivity is maintained throughout the City. Additionally, as the asset portfolio increases due to the assumption of new developments, maintenance and renewal of the new assets will require more resources including operation, maintenance workforce and capital budgets.

While this AMP does not incorporate growth projections or anticipated customer expectations on services into future funding needs, it is intended to provide insight to impacts to service delivery when growth and development are under consideration.

2.3 Provincial Asset Management Planning Requirements

The Province's 'Building Together: Guide for Municipal Asset Management Plans', published in 2012, was developed to encourage and support municipalities in Ontario to produce AMPs in a consistent manner. Building Together provides a general framework for AMP structure and recommends

content within the plan sections related to the State of Local Infrastructure, Levels of Service, Asset Lifecycle Management Strategies and Financing Strategies. The provincial and federal governments have made an AMP a prerequisite to accessing capital funding grants to encourage the development of AMPs. In 2015, Ontario adopted the Infrastructure for Jobs and Prosperity Act which confirmed the role that municipal infrastructure systems play in the strengthening of local economies. Following a year-long industry review process, the Province created Ontario Regulation 588/17 - Asset Management Planning for Municipal Infrastructure as the first regulation made under the Infrastructure for Jobs and Prosperity Act. O.Reg. 588/17 complements and elaborates on the Building Together guide by mandating specific requirements for municipal AM Policies and Plans, phased in over a five-year period. The requirement established by O.Reg.588/17 also serves as a prerequisite for certain programs including eligibility for provincial capital grants. Figure 4 summarizes the general timelines and requirements detailed in O.Reg. 588/17. This AMP has been designed to be compliant with the July 1, 2022 and July 1, 2024 requirements of the regulation.

Figure 4:   O.Reg. 588/17 Requirements

July 1, 2019
- An AM policy must be established. The Policy should provide detailed principles and commitments to be used for decision making; regarding when, why and how money will be spent on infrastructure systems

July 1, 2022
- An AMP that documents current levels of service and the associated costs to sustain them for what is considered 'core' asset systems, per O.Reg. 588/17 (water, wastewater, stormwater, road and bridges infrastructure systems)

July 1, 2024
- An AMP that documents the current levels of service being provided and the costs to sustain the current levels of serivce for all asset groups.

July 1, 2025
- An AMP must be produced that documents the current levels of service being provided, the costs to sustain the current levels of service, the desired levels of service, the costs to achieve the desired levels of service and the financial strategy to fund the necessary expenditures to achieve the desired levels of service for all infrastructure systems in the City

2.4 Asset Management Plan Development

This AMP builds upon the City's 2016 Asset Management Plan and is the culmination of efforts from staff across the City's organization involved with multiple aspects of the infrastructure asset lifecycle, including: finance staff involved with overseeing the capital and operating budget programs; technical staff who help plan and execute the construction of infrastructure assets; and front-line staff who operate and maintain infrastructure assets. Internal Asset Planning staff played a large role in the development of the AMP. The following key teams and resources supported the development of this plan:

- Asset Planning (Engineering Services)
- Financial Strategies and Business Consulting (Finance)
- Burlington Leadership Team (BLT)
- Service Area Teams:
  o Corporate Infrastructure Committee (CIC)
  o Asset Category Leads
  o Management Staff
  o Subject Matter Experts
  o Enterprise Asset Management Solution (EAMS) Project Team

2.4.1 Asset Management Plan Structure

The asset management structure generally follows the key sections outlined in the Building Together Guide for asset management plans (Ministry of Infrastructure, 2012). To provide a service-centric view, a dedicated chapter is included for each of the key services supported by the infrastructure and each section is divided into the state of the infrastructure, levels of service, lifecycle management strategy, current and future risks.

Overall, the plan structure is as follows:

- This introductory section outlining the purpose and structure of the AMP.
- A series of separate sections for each infrastructure service area, including:
  o State of the Infrastructure
  o Levels of Service
  o Lifecycle Management Strategy
  o Current and Future Risks
- A section outlining the financial strategy across all service areas.
- A section outlining the improvement plan across all services.

2.4.2 State of Infrastructure

The State of Infrastructure section for each service area incorporates the following:

- A summary of the inventory of assets which support the service area, including description and quantity of assets
- An approximation of the replacement value of the assets. Of note, not all assets are replaced; some are continually rehabilitated rather than replaced. As such, a replacement value estimate serves as a foundational benchmark to highlight the significance of the infrastructure that supports the service area.
- A description of the proportion of estimated service life that has been consumed for the assets that support the service area.
- Condition ratings of the assets that support each service area (i.e., % of assets in very good condition, weighted by the replacement value).
- A description of the data sources used to inform this Section, including any relevant condition assessment policies/practices.

The inventory of asset information is stored in various systems including Geographic Information Systems (GIS) and work management systems. The City is currently implementing an Enterprise Asset Management Solution (EAMS) in order to have a more centralized inventory with a high level of asset data standards in place.

Maintaining accurate and reliable asset information is important because it acts as a foundation for decision-making. This information can be used to estimate current and future needs which supports the planning process and allows the City to be more proactive over reactive.

Replacement values for each asset were derived based on a number of sources including:

- City construction contracts and tenders
- Industry sources (e.g., RSMeans database)
- Benchmark costing
- Historical inflated costs

For condition information, while the City aims to visually assess all assets, it is not always feasible to do so.
Because of this, a mix of approaches was used to determine the condition of assets including legislated inspections, visual inspections (on-site) and age-derived condition.
Condition ratings were applied to each asset based on the available information using a five-point rating scale shown

in Table 1. This scale aligns with the scale employed by the National Infrastructure Report Card produced by the Federation of Canadian Municipalities (FCM), the Canadian Society for Civil Engineering (CSCE) and the Canadian Construction Association (CCA). In addition to providing a comprehensive basis for assessment, this will allow for benchmarking of the results against the values presented in this document.

Table 1:   Condition Scale and Definitions

Summary	Definition
Very Good 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 Adequate for now	The infrastructure in the system or network is in good condition; some elements show general signs of deterioration that require attention. A few elements exhibit significant deficiencies.
Fair Requires attention	The infrastructure in the system or network is in fair condition; it shows general signs of deterioration and requires attention. Some elements exhibit significant deficiencies.
Poor 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 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 may be affecting service.
Not Assessed	This category is reserved for assets where data is either missing, not updated, or cannot be considered reliable. Flagging this data helps the departments identify where gaps in information exist and allows them to develop assessment plans to improve future data reliability and accuracy.

2.4.3   Levels of Service

Levels of Service (LOS) describe the quality, function and capacity of the City services being delivered. This section of the AMP describes measures for determining the LOS provided by each service area. LOS measures for each service area are established through discussions with City staff or are mandatory metrics as described in O.Reg. 588/17. The LOS Tables follow the same structure for each service area and contain the following major components:

- Key Service Attribute - Summarizes the type of service being provided to citizens, businesses and the wider community.
- Level of Service Statement - The key corporate performance expectations, based upon core values.
- Performance Measures:
    - o   Customer - Communicates service outcomes from the perspective of the customer.
    - o   Technical - Describes service inputs or outputs in technical terms.
- Current Performance - The current performance of the metric quantified through the best available information. Some metrics are identified but are to be calculated in future AMP updates

It should be noted that target performance metrics will be determined and integrated in future iterations of the AMP.

2.4.4   Asset Lifecycle Management Strategy

The asset lifecycle management strategy is a set of planned actions that will allow the assets to provide desired LOS in a sustainable way at the lowest lifecycle cost (i.e., through preventative action), while managing risk. This section describes the asset lifecycle activities applied to the asset category, the forecasted lifecycle activity costs and the optimal budget to maintain the current LOS. The approach to these items is described below.

Lifecycle activities describe planned actions that can be performed on an asset over its lifetime from construction to decommissioning. These activities are typically grouped into the following categories, as displayed in Table 2. Each service area section also explains the associated risks with each lifecycle activity.

Table 2:   *Typical Asset Lifecycle Activities*

Lifecycle Activity	Description	Examples
Non-Infrastructure	Actions or policies that can lower costs or extend asset life.	Better integrated infrastructure planning and land use planning, demand management, process optimization, managed failures
Maintenance	Regularly scheduled inspection and maintenance, or more significant repair activities associated with unexpected events.	Sewer spot repairs, fixing potholes
Rehabilitation	Significant treatments designed to extend the life of the asset.	Structural lining of sewers, road resurfacing, facility revitalization
Replacement	Activities that are expected to occur once an asset has reached the end of its estimated service life and renewal/rehabilitation is no longer an option.	Sewer replacement, road reconstruction
Disposal	Activities associated with disposing of an asset once it has reached the end of its estimated service life or is otherwise no longer needed.	Salvage of equipment
Expansion	Planned activities required to extend services to previously un-serviced areas - or expand services to meet growth demands.	New recreation centre to service new growth area

2.4.5   Assets Included in this Plan

The AMP aims to cover all infrastructure assets that support service to the community, as displayed in Table 3. The City's approach is to take a service-focused perspective to the AMP and as such, the various infrastructure systems are displayed in terms of service areas rather than asset categories.

Table 3: Assets Included in the Asset Management Plan

Service Area	Asset Category	Asset Type
Transportation	Roadways	Roads
		Active Transportation
	Structures	Bridges
		Minor Road Culverts
		Major Road Culverts
		Retaining Walls
		Noise Walls
	Traffic Control and Safety	Guiderails
		Signs
		Streetlights, Poles and Cabling
		Traffic Signals
Transit	Bus Stops	Concrete Pads
		Shelters
	Facilities	Bus Terminals
		Transit Operations
	Equipment	Equipment
	Vehicles	Conventional Buses
		Specialized Buses
		Support Vehicles
Parking	Parking Lots	Surface/Corporate Lots
		Downtown Lots
	Parking Facilities	Parking Garage/Offices
		Parking Services Building
	Equipment	Pay Stations
		Other Equipment

Service Area	Asset Category	Asset Type
Stormwater	Stormwater Management	Open Conveyance
		Stormwater Management Facilities
		Minor Treatment
	Stormwater Conveyance	Storm Sewer Pipes
		Storm Sewer Structures
Corporate Facilities	Administration Buildings	Animal Shelter
		Burlington Operations Centre Campus
		Cemetery Operation Buildings
		City Hall
Recreation, Community and Culture	Recreation	Golf Course
		Arenas
		Pools
	Community	Community Centres
		Event Venues
		Joint Ventures
	Culture	Arts Facilities
		Public Art Installations
		Libraries
		Museums
Parks	Parks Linear	Fencing
		Pathways
		Pedestrian Bridges & Piers
		Retaining Walls, Railings & Stairs
		Shoreline Protection and Seawalls

Service Area	Asset Category	Asset Type
Parks	Parks Linear	Multi-Use Recreational Trails
		Servicing/ Utilities
	Parks Amenities	Community Gardens
		Leash Free Areas
		Multi-Use Courts
		Playgrounds & Fitness Equipment
		Shade Structures
		Park Signs & Gateways
		Site Furniture
		Skateparks
		Splash Pads
		Tennis, Pickleball Courts
		Unique Assets
		Sports fields
	Parks Facilities	Maintenance Buildings
		Washroom Buildings
Fire	Stations & Facilities	Fire Stations (#2 - #8)
		Fire Department Headquarters
	Vehicles & Equipment	Vehicles & Equipment
Corporate Fleet	Vehicles	Light Vehicle
		Medium Vehicle
		Heavy Vehicle
	Equipment	Light Equipment
		Light Equipment (Off Road)

Service Area	Asset Category	Asset Type
Corporate Fleet	Equipment	Medium Equipment
		Medium Equipment (Off Road)
		Heavy Equipment
		Heavy Equipment (Off Road)
Urban Forestry	Trees	Street - Urban
		Street - Rural
		Park / Open Space
		Other
Information Technology	Software Applications	Major
		Minor
		Hosted Solution
	Hardware Systems and Devices	Servers
		Telephones
		Switches
		Workstations

2.5 Continuous Improvement

The AMP will be treated as a "living document" that will be revised annually to include updated asset inventory and condition information. As per O.Reg. 588/17 requirements, this annual update will include a review of the City's progress in implementing the AMP, any factors impeding implementation and a strategy to address these factors. A more comprehensive update to the AMP will be completed every five years, as dictated by the regulation.

Table 4:   Timeframe and Frequency of Update

Asset Management Element	Frequency
Asset Management Policy	Every 5 years
Corporate Asset Management Plan	Comprehensive update every 5 years
Asset Management Practices	Annual Review and Report to Council
Capital & Operating Budgets	Annual Amendment Processes

In addition, the City will maintain an improvement and monitoring program to enhance future revisions of this plan. The City applies the continuous improvement methodology indicated in Figure 5 to enhance the AM systems and more effectively deliver desired AM outcomes.

Figure 5: Plan-Do-Check-Act Cycle

2.6 Assumptions and Limitations

Assumptions and limitations are outlined within each section of the plan to highlight gaps and identify opportunities for improvement.

The City will actively encourage community and stakeholder collaboration to better understand current and future stakeholder needs, to ensure they are incorporated into asset management plans.

3.0
Transportation

The City of Burlington is committed to providing a safe and reliable transportation network that supports all modes of transportation.

CYCLIST, BURLINGTON, ONTARIO

Roadways

- Very Poor $118.7M 7%
- Very Good $422.9M 24%
- Poor $369.2M 21%
- Fair $310.9M 18%
- Good $520.5M 30%

Structures

- Very Poor $15.3M 3%
- Very Good $39.1M 7%
- Poor $55.8M 10%
- Fair $144.0M 25%
- Good $310.6M 55%

Traffic, Control and Safety

- Very Poor $12.6M 11%
- Very Good $13.4M 11%
- Poor $16.4M 14%
- Good $57.8M 48%
- Fair $19.7M 16%

3.0
Transportation
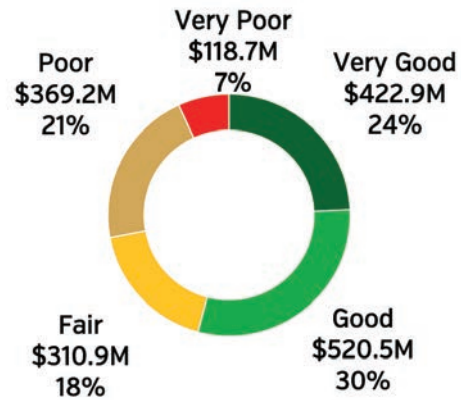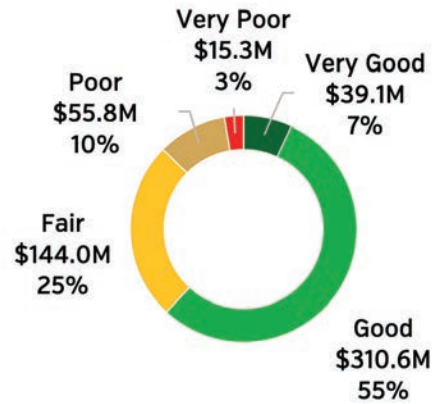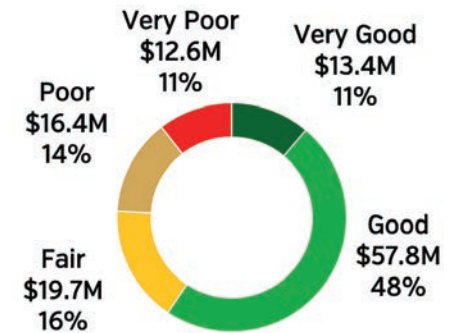
The City of Burlington is committed to providing a safe and reliable transportation network that supports all modes of transportation.

3.0 Transportation

Transportation infrastructure, including Roadways, Structures and Traffic Control and Safety assets, plays an integral role in the daily life of the City's citizens, promoting business, creating employment, providing social opportunities, creating markets and saving lives. As such, efficient transportation infrastructure is crucial to building a strong economy and improving the quality of life for citizens.

Transportation infrastructure makes up the largest group of assets in terms of quantity and replacement cost. Future Transportation infrastructure renewal and growth needs will be informed by the Integrated Mobility Plan (IMP). The IMP will have the following overarching goals:

- A wider range of transportation options, regardless of citizen age, means or ability.
- The efficient transportation of more people with compact modes of transportation (such as buses, bicycles and walking).
- A transportation system that is well-connected to other Regions.
- Fast, reliable and more frequent transit.
- The improvement of facilities for cyclists and pedestrians.
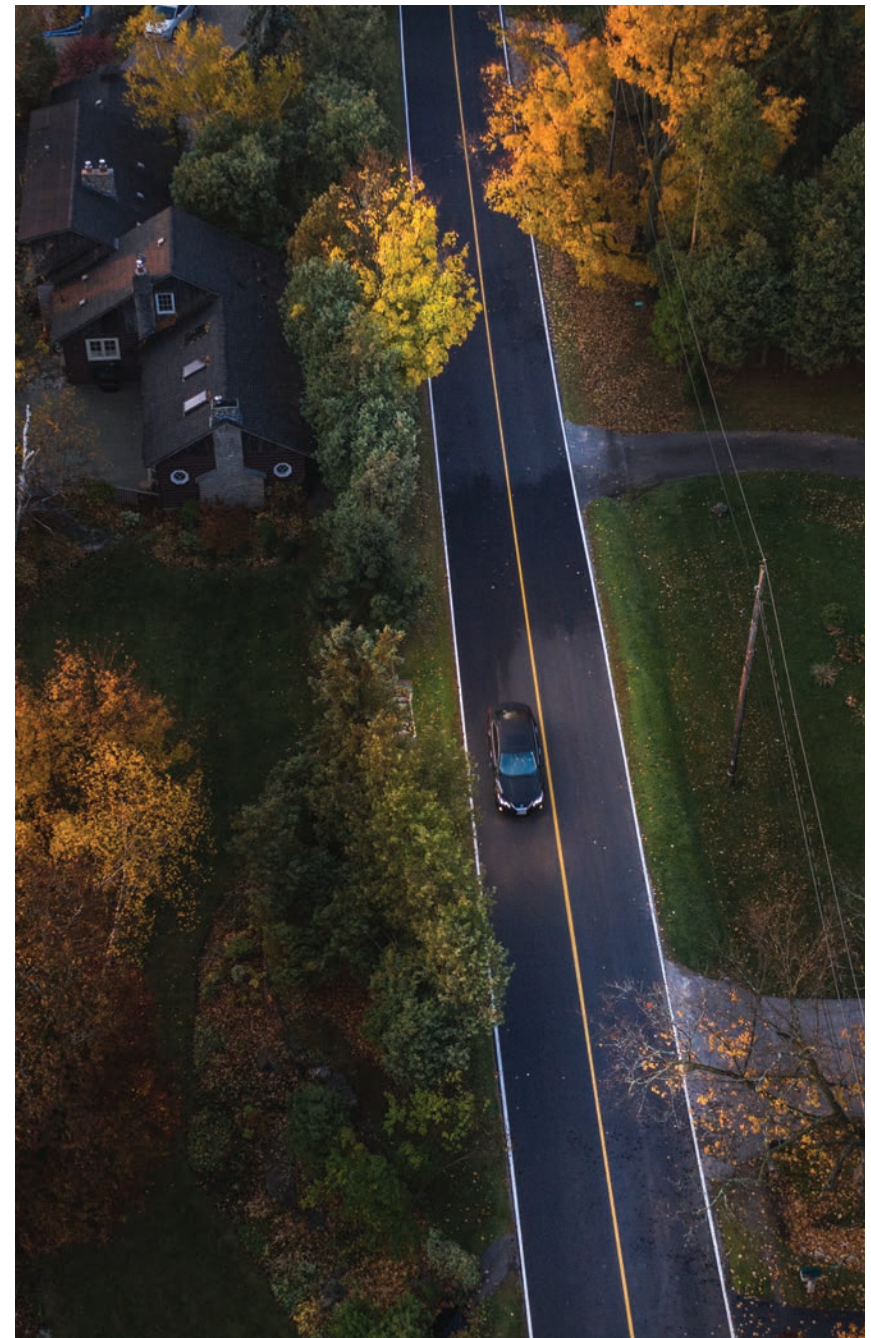
3.1   State of the Local Infrastructure

3.1.1   Asset Inventory and Valuation

An efficient, dependable, and safe transportation network is a fundamental expectation of the community. The City's transportation asset portfolio is comprised of Roadways, Structures and Traffic Control and Safety assets. This section summarizes the portfolio of infrastructure assets associated with the various public services managed by the City.

The City's portfolio of infrastructure assets for Transportation Services is valued at over $2.4 billion. This value is comprised of roadway assets, valued at $1.7 billion, structure assets valued at $565 million and traffic control and safety assets valued at $120 million.

These replacement values were developed using historic construction costs and a standardized costing index. Table 5 summarizes the replacement value and average condition score for Roadways, Structures and Traffic Assets. Assets within roadways include the pavement base, asphalt, curb and gutter, and islands for all local, collector and arterial road classes. It also includes active transportation network assets (e.g. sidewalks, multi-use paths or any separated cycling facilities).

Structures category include assets such as Bridges, Major and Minor Road Culverts, Noise Walls, and Retaining Walls.
To meet the City's transportation needs, the City also owns and operates Traffic, Control and Safety infrastructure, with assets including Streetlights, Streetlight Poles and Cabling, Traffic Signs and Traffic Signals.

Table 6 summarizes the asset inventory and valuation of these assets in greater detail.

Table 5:   Asset Valuations for the City's Transportation System

	Roadways	Structures	Traffic, Control and Safety
Total Replacement Value	$1,742.2M	$564.9M	$119.9M
Average Condition Score	**Good**	**Good**	**Fair**

Table 6:   Assets Inventory and Valuation for Roadways, Structures and Traffic Assets

Asset Type	Asset Sub-Type	Quantity	Replacement Value	Average Age	Average Condition
Roadways	Active Transportation	811 km	$153.4M	31	Fair
	Roads	1,612 km	$1,588.8M	34	Fair
Structures	Bridges	47	$231.8M	51	Fair
	Major Road Culverts	99	$232.8M	36	Fair
	Minor Road Culverts	2,729	$77.4M	36	Good
	Noise Walls	31	$10.0M	25	Fair
	Retaining Walls	199	$12.8M	27	Poor
Traffic Control & Safety	Streetlights, Poles and Fixtures	26,585	$82.6M	13	Fair
	Signs	35,384	$13.1M	5	Good
	Guiderails	332 km	$7.0M	13	Fair
	Traffic Signals	167	$17.2M	23	Good
TOTAL			**$2,426.9M**	**11**	

3.1.2   Asset Age Summary

Figure 6 displays average asset age as a proportion of the Estimated Service Life (ESL) by asset type for Roadways, Structures and Traffic Control and Safety Assets. The average ages for roads were calculated using the RoadMatrix estimated base construction date, while the pedestrian network age was based on installation years. The average ages for all structures were calculated using the estimated construction date available in the City's Asset Decision Support System (DSS).

Average asset ages have not surpassed the average ESL for any asset type and are relatively young. Of note, unlike other infrastructure, roadways require interim treatments at approximately 15–20-year intervals in order to reach the average ESL of the asset and they must be rehabilitated or replaced 2 or 3 times in order for the roadway to last 60 years.

Figure 6:   Average Asset Age as a Proportion of Average Asset ESL (Transportation assets)
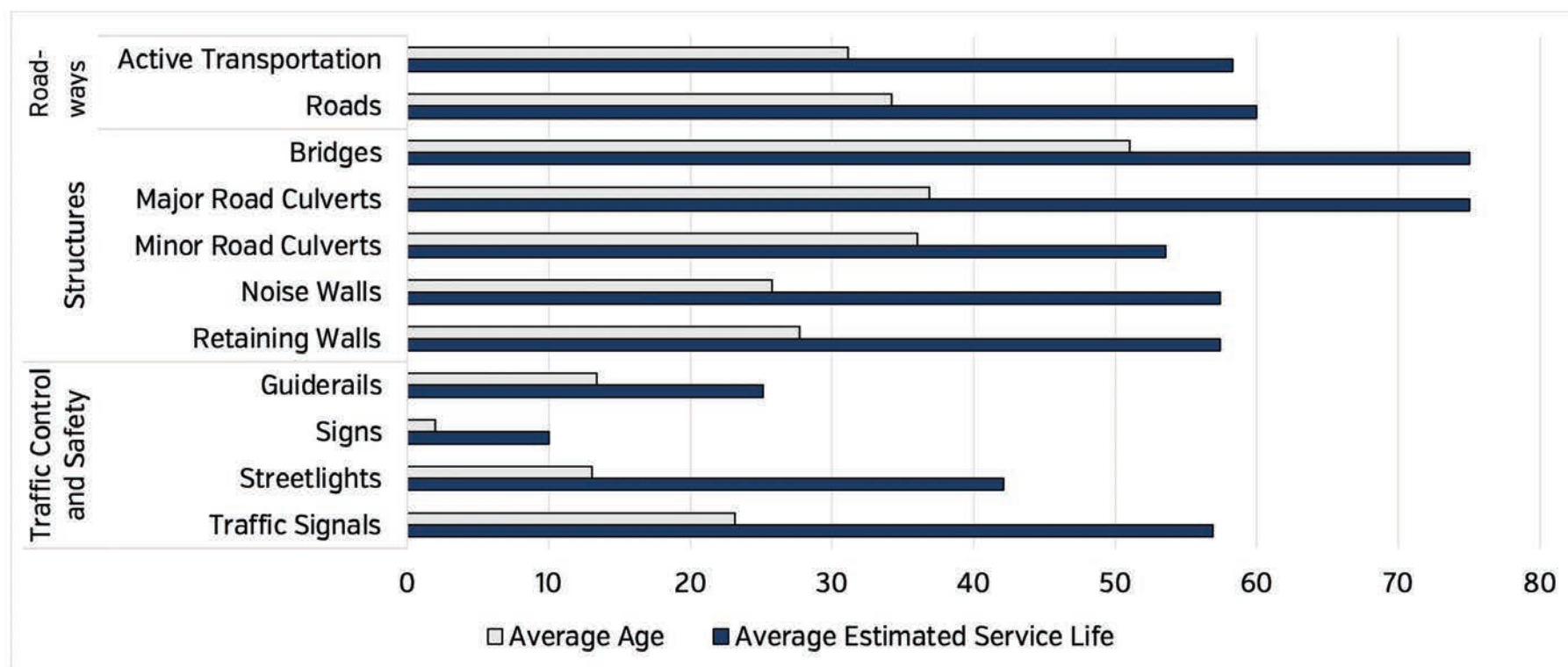
3.1.1   Asset Condition

This section outlines the breakdown of assets in each condition category based on the percentage of total replacement value. Asset condition was categorized based on the scale as shown in Table 7.

Table 7:   Transportation Condition Scale

Performance Category	Roads Pavement Quality Index (PQI)	Bridges/ Major Road Culverts Bridge Condition Index (BCI)	Remaining Assets Condition Rating and/or Service Life Remaining
Very Good	80 to 100	86 to 100	"Very Good" or >80% of life remaining
Good	67 to 79	71 to 85	"Good" or 60-80% of life remaining
Fair	55 to 66	61 to 70	"Fair" or 40-60% of life remaining
Poor	35 to 54	41 to 60	"Poor" or 20-40% of life remaining
Very Poor	0 to 34	0 to 40	"Very Poor" or <20% of life remaining

Nearly 60% of the City's Transportation services assets (Roadways, Structures, Traffic, Control and Safety) are in Good to Very Good condition, with the remainder approaching the end of their estimated service lives. Figure 7 illustrates the Condition distribution of the City's Transportation assets.

Figure 7:   Asset Condition Summary (all transportation assets)
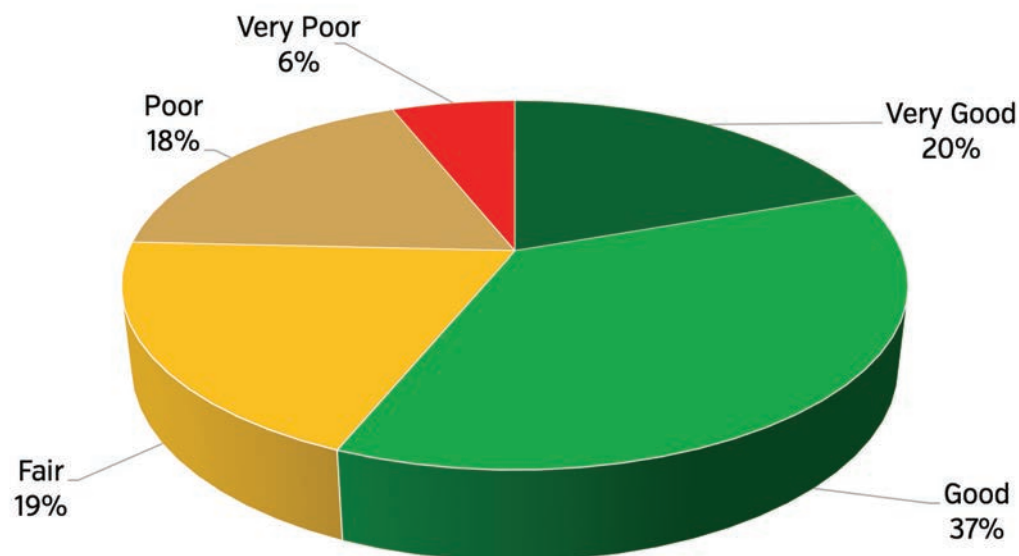
3.1.1.1 Roads

On a regular basis, the condition of the City's Roads and Active Transportation network are evaluated using multiple condition assessment techniques. Paved roads are assessed on a 5-year cycle, based on testing the width of the outer lane using a combination of visual rating with surface distress and longitudinal profile (wheel path roughness) data collection. A visual rating is used for curb type and condition. Results are analyzed to establish pavement quality for each road segment in the City, measured in terms of the Pavement Quality Index (PQI). The City manages pavement and curb assets in a pavement management application, RoadMatrix. Road sections that are determined to be at optimal time for rehabilitation are added to a list for rehabilitation and dependent on budget availability, highest priority roads are repaired while the remaining roads are planned to be addressed in future budgets.

Observations from staff and the public also result in as-needed spot repairs (i.e., potholes). Through the assessment results and based on the public and staff feedback, sidewalk repairs are made. In most cases, cycling routes are assessed during the regular road assessment and included in the PQI wherever possible.

Figure 8: Roadway Asset Condition by Asset Type and Percentage of Replacement Value
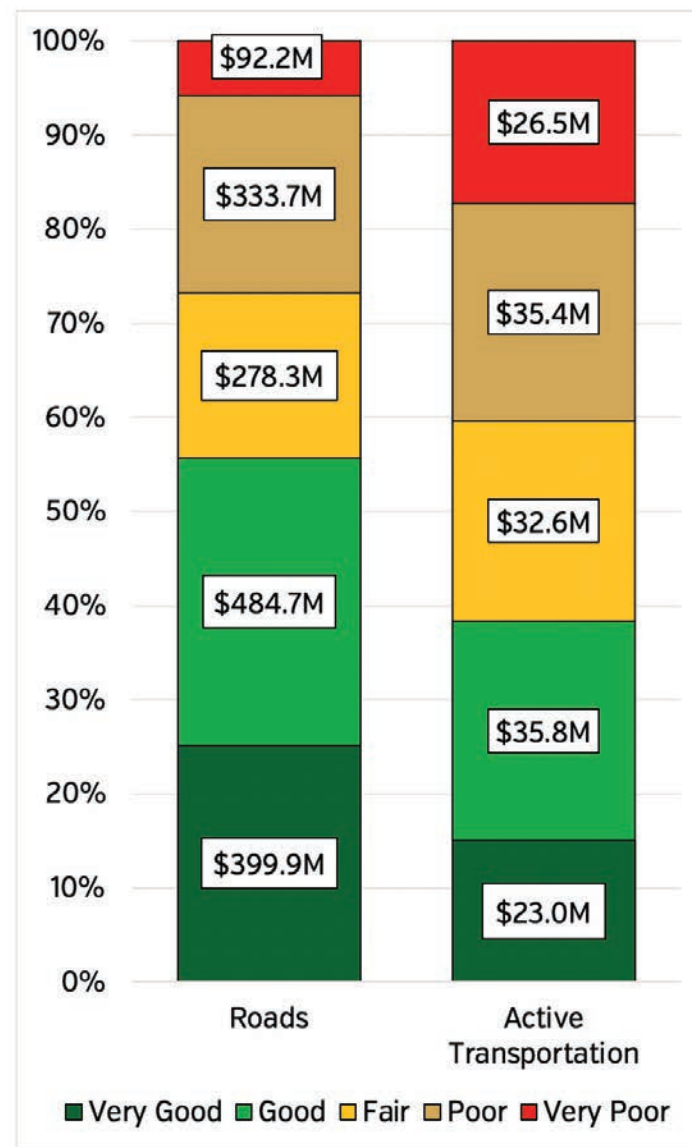
Over 55% of the City's Roads are in Very Good or Good condition, with the remainder primarily in Fair to Poor condition, indicating Roads are typically not approaching the end of their service life. Rather, this suggests a need for longer-term investments. Road assets are typically maintained on a lifecycle basis through the selection of the optimal treatment based on their current condition and expected deterioration. Treatments range from spot treatments such as patching and sealing, to resurfacing, to total reconstruction and are chosen to minimize the lifecycle cost of operating each asset within its target state.

Approximately 60% of the Active Transportation network is in the Very Good to Fair condition, with the remaining 40% nearing the end of their lifecycle. Active Transportation networks are managed proactively to address trip hazards and safety concerns and are walked annually to identify any required replacements. Figure 8 illustrates the condition of each Asset Type in the Roadways asset portfolio.

3.1.1.2   Structures

In terms of Structures, over 70% of bridges are in Good condition with the remaining in Fair or worse condition. The majority of the City's Major Road Culverts are in Good condition, with the remainder falling in either Fair, Poor or Very Poor condition. Minor Road Culverts range in condition from Very Good to Very Poor condition.

Over 50% of Noise walls are in Fair condition, with approximately 30% in Good or better condition and the remainder in either Poor or Very Poor condition.

Approximately 60% of the City's Retaining Walls are in Very Poor condition, with the remainder ranging in condition, indicating a need for attention over the short-term. Retaining walls are managed to meet safety and aesthetic standards.

Figure 9 illustrates the condition of each Asset Type in the Structures asset portfolio.

Figure 9:   Structures Asset Condition by Asset Type and Percentage of Replacement Value
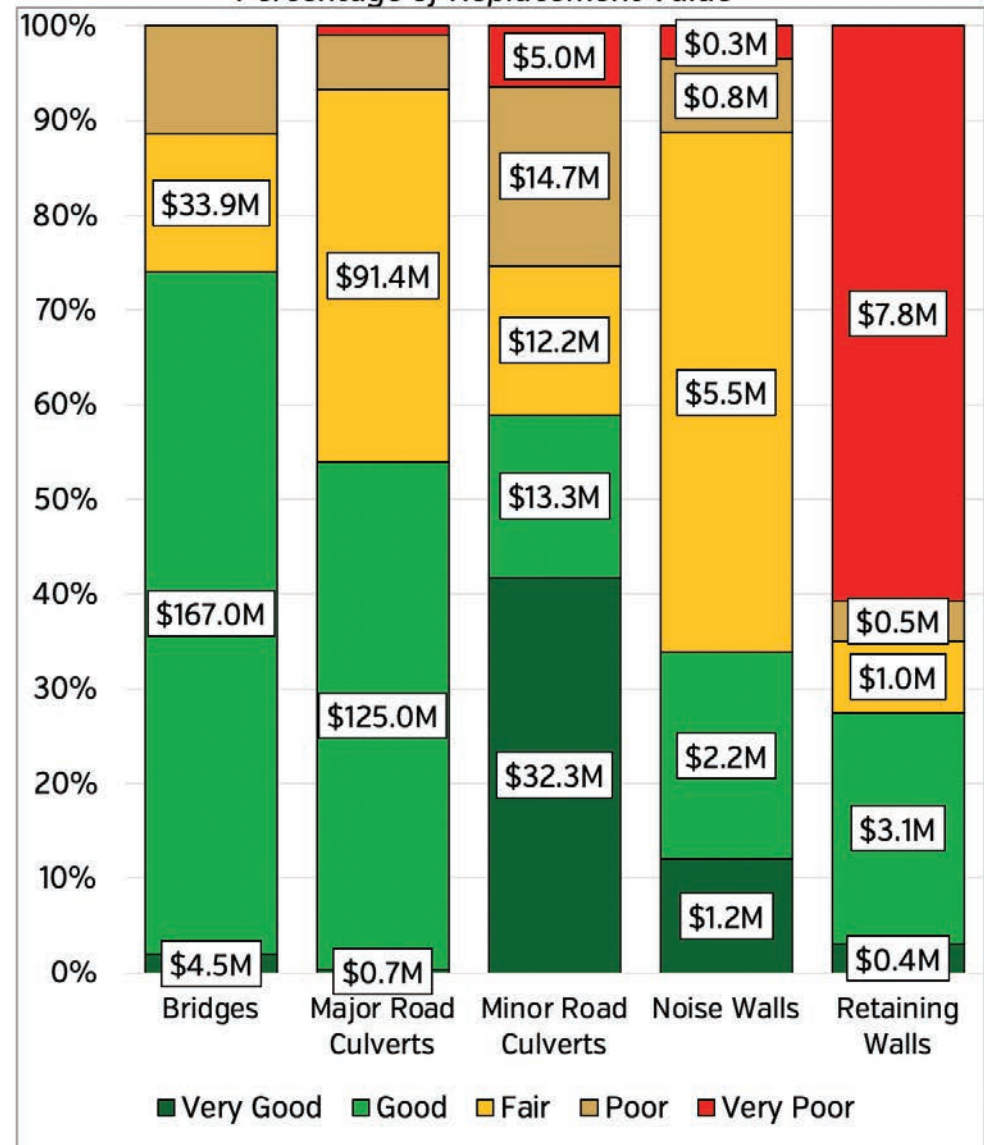
3.1.1.3   Traffic, Control and Safety

For Traffic, Control and Safety Assets, the majority of the City's Streetlights are in Good or Very Good condition, with the remaining third in Fair or worse condition. Streetlight assets include poles, fixtures and cabling. Infrastructure maintenance is contracted out with best practices and requirements listed in the contracts that determine the nature and frequency of re-lamping and pole maintenance, while signal timing and operation is the direct responsibility of the City.

Most of the Signage is in Good, while Traffic Signals vary from Very Good to Poor condition. Signage is maintained by City crews and are tested for various items depending on the type of signage. Major regulatory signs are tested for reflectivity while minor regulatory signs and guide/ information signs are managed adaptively based on public and staff observations.

Finally, approximately 60% of the Guiderails are in Fair condition. Figure 10 illustrates the condition of each asset type in the Traffic, Control and Safety assets portfolio.

Figure 10:   Traffic, Control and Safety Asset Condition by Asset Type and Replacement Value
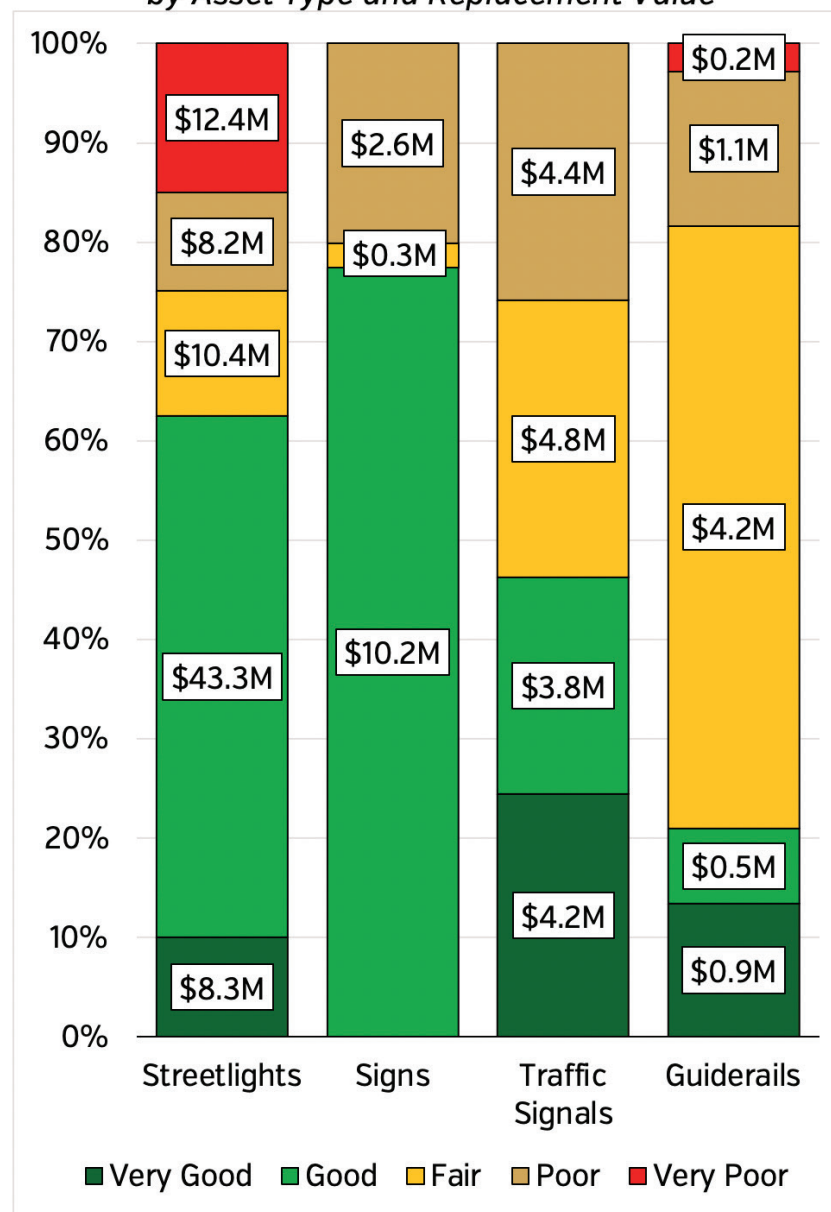
3.2 Levels of Service

A key pillar of asset management decision making is Levels of Service; a decisive business driver that describes the planned outcome from the asset, from a customer and/or technical performance perspective. Level of service statements describe the asset outputs that the City intends on delivering to the community and can be represented in terms of attributes such as cost-effectiveness, safety and sustainability.

3.2.1   Ontario's Requirements for Asset Management Planning

Ontario Regulation 588/17 requires legislated community levels of service for core assets, using qualitative descriptions to define the scope or quality of service delivered by an asset category. O. Reg. 588/17 also requires legislated technical levels of service for core assets which utilize metrics to measure the scope or quality of service being delivered by an asset category. O. Reg. 588/17 also requires legislated technical levels of service for core assets. Technical levels of service use metrics to measure the scope or quality of service being delivered by an asset category. Examples of technical levels of service include average surface condition for paved roads based on the Pavement Quality Index or the average bridge condition based on the Bridge Condition Index value.

Table 8 lists the performance measures that are included in the O. Reg 588/17 requirements for Roads, Structures and Traffic, Control and Safety assets.

Table 8:   Community and Technical Levels of Service (Transportation)

Community Levels of Service	Reference	Technical Levels of Service	Current Performance
Description or images that illustrate the different levels of road class pavement condition	*Table* 9	Average pavement condition (e.g., excellent, good, fair or poor) for paved roads	Fair
Description or images of the condition of bridges and how this would affect use of the bridges	Table 10	For bridges in the municipality, average bridge condition index value (BCI)	69.6
Description or images of the condition of culverts and how this would affect use of the culverts	Table 10	For structural culverts in the municipality, average bridge condition index value (BCI)	68.8
Description, which may include maps, of the road network in the municipality and its level of connectivity	*Figure 12*	Average surface condition (e.g. excellent, good, fair or poor) for paved roads	66.5
Description of the traffic that is supported by municipal bridges (e.g., heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, cyclists)		# of lane-kilometers of arterial roads as a proportion of square kilometers of land area of the municipality	43.1
		# of lane-kilometers of collector roads as a proportion of square kilometers of land area of the municipality	34.9
		# of lane-kilometers of rural roads as a proportion of square kilometers of land area of the municipality	18.6
		# of lane-kilometers of local roads as a proportion of square kilometers of land area of the municipality	89.4
		% of bridges in the municipality with loading or dimensional restrictions	0%

The "Reference" column in Table 8 is referring to the following Tables and maps that summarize the community levels of service. The percentage of lane-km of roads for each of the road classifications within each PQI category is provided in Table 9. Table 10 provides the percentage of bridge and culvert assets within each BCI category.

Table 9: Road Class Pavement Condition Percentage of Lane-km within each Category

Pavement Quality Index	Asset Description	Photo Example	Arterial Roads	Collector Roads	Local Roads	Rural Roads	Total
Very Good PQI: 80 – 100	Well maintained, good condition, new or recently rehabilitated		35.4%	27.9%	17.2%	16.7%	20.2%
Good PQI: 67-79	Acceptable, generally approaching mid stage of estimated service life		20.4%	2.3.%	40.5%	26.7%	35.8%
Fair PQI: 55 - 66	Signs of deterioration, some elements exhibit deficiencies		10.9%	19.7%	22.9%	15.0%	21.3%

Pavement Quality Index	Asset Description	Photo Example	Arterial Roads	Collector Roads	Local Roads	Rural Roads	Total
Poor PQI: 35-54	Approaching the end of service life, condition below standard, large portion of system exhibits significant deterioration		28.6%	21.3%	14.1%	35.0%	17.0%
Very Poor PQI: 0-34	Near or beyond estimated service life, widespread signs of advanced deterioration, some assets may be unusable		4.8%	7.9%	5.3%	6.7%	5.7%

Table 10: Descriptions of the Condition Ratings of Bridges and Culverts (BCI)

Bridge Condition Index	Asset Description	Photo Example	Bridges	Culverts	Total
Very Good BCI: 86-100	Well maintained, good condition, new or recently rehabilitated		6.3%	1%	2.7%
Good BCI: 71-85	Acceptable generally approaching mid stage of estimated service life		46.8%	52.5%	50.7%
Fair BCI: 61-70	Signs of deterioration, some elements exhibit deficiencies		31.9%	34.3%	33.6%
Poor BCI: 41-60	Approaching the end of service life, condition below standard, large portion of system exhibits significant deterioration		14.9%	9.1%	11.0%
Very Poor BCI: 0 – 40	Near or beyond estimated service life, widespread signs of advanced deterioration, some assets may be unusable		0.0%	3.0%	2.1%

Figure 11: Map of the Road Network in the City and the Level of Connectivity

3.2.2   Community and Technical Focused Performance Measures

The City has developed their own set of unique level of service performance metrics which are used to reflect citizen values and desires. These metrics are classified below through service attributes provided by the City that summarize the type of service being provided to citizens and their wider communities. Key service attributes for community focused performance measures for transportation assets include: Accessibility, Safety, Cost Effectiveness, Quality and Sustainability. Table 11 displays these performance measures.

Table 11:   Community Focused Performance Measures for Transportation Assets

Service Attribute	LOS Statement	Community Focused Performance Measures	
		Performance Measure	Current Performance
Accessibility	Providing an accessible transportation network.	% of sidewalks that comply with the AODA minimum clearance width of 1.5m	99.5%
		% of urban area cycling/active transportation routes completed, as identified in the cycling master plan	54.0%
		Length of warranted sidewalks currently missing from the pedestrian network	199.3 km
Cost Effectiveness	Providing an efficient transportation network for all modes.	Average asset renewal rate (# years)	116
		Total budget per capita	$147
		Operations and maintenance cost to provide transportation services (Roadway, Structures, Street Lighting, Signs and Traffic Signals ($ per capita)	$42

Service Attribute	LOS Statement	Community Focused Performance Measures	
		Performance Measure	Current Performance
Safety	Providing an operational road network that is safe for drivers, pedestrians and cyclists.	Average number of non-scheduled traffic signal service issues per month (unrelated to weather and accidents)	4
		Average number of streetlight maintenance issues reported per month	49
		Average number of sign issues reported per month	13
		Average number of sidewalk and curb repair requests received per month	19
		Average number of pavement repair requests received per month	10
		% of roadway lane km where the condition is good to very good	58%
Sustainability	Providing a transportation network that is environmentally conscious	% of streetlights with LED fixtures	87%

Table 12 below displays technical focused performance measures, developed for a deeper understanding of performance trends for subject matter experts. These measures are utilized to support decision-making and understand the impacts of decision on the transportation asset portfolio.

Table 12:   *Technical Focused Performance Measures for Transportation Assets*

Service Attribute	LOS Statement	Technical Focused Performance Measures	
		Performance Measure	Current Performance
Cost Effectiveness	Providing an efficient transportation network for all modes	Annual operations and maintenance budget	$8,212,636
		Average annual capital budget for roads and rights-of-way	$20,832,514
		10 Year average transportation asset renewal budget as a % of replacement value	0.86%
Quality	Providing a transportation network at the appropriate material quality	% of roads that meet the target condition level of Good or Very Good, as per the City's Strategic Plan, Strategic Direction 4 An Engaging City, Good Governance 4.1.e	55%
		% of signs that meet the target condition level of Good or Very Good, as per the City's Strategic Plan, Strategic Direction 4 An Engaging City, Good Governance 4.1.e	77%

Service Attribute	LOS Statement	Technical Focused Performance Measures	
		Performance Measure	Current Performance
Quality	Providing a transportation network at the appropriate material quality	% of sidewalks that meet the target condition level of Good or Very Good, as per the City's Strategic Plan, Strategic Direction 4 An Engaging City, Good Governance 4.1.e	38%
		% of streetlights that meet the target condition level of Good or Very Good, as per the City's Strategic Plan, Strategic Direction 4 An Engaging City, Good Governance 4.1.e	67%
		% of traffic signals that meet the target condition level of Good or Very Good, as per the City's Strategic Plan, Strategic Direction 4 An Engaging City, Good Governance 4.1.e	47%
		% of bridges and culverts that meet the target condition level of Good or Very Good, as per the City's Strategic Plan, Strategic Direction 4 An Engaging City, Good Governance 4.1.e	41%
Safety	Providing an operational road network that is safe for drivers, pedestrians and cyclists	% of bridges and structures in poor or very poor condition	13%
		% of sidewalks in poor or very poor condition	38.7%
		% of roads in poor or very poor condition	26.4%
		Sign Retroreflectivity Test - % Fail	11%
		% of road signs in poor condition	20.0%
		% of traffic signals in poor or very poor condition	26%

Service Attribute	LOS Statement	Technical Focused Performance Measures	
		Performance Measure	Current Performance
Safety	Providing an operational road network that is safe for drivers, pedestrians and cyclists	% of streetlights in poor or very poor condition	25%
		% of arterial and collector roads with year-round load restrictions	8%
		Roadway centerline km's that include amenities for all modes (car, bike, pedestrian, bus)	62.2
Sustainability	Providing a transportation network that is environmentally conscious	% of streetlights with LED fixtures	87%
		% reclaimed asphalt product (RAP) permitted in base and driveway asphalt	15%

3.3 Lifecycle Management Strategy

This section focuses on specific activities that work to maintain levels of service previously outlined. The City's knowledge and understanding is continually improving through the collection and utilization of data that informs decision making related to asset lifecycle system and LOS performance metrics.

The development of appropriate and cost-effective strategies is foundational for ensuring service sustainability. Further, the lifecycle management activities reduce the risks to service delivery and performance. Table 13, Table 14 and Table 15 in the following section describe the lifecycle management activities currently completed or planned to be implemented by the City for the Roadways, Structures and Traffic, Control and Safety asset types, respectively. The tables also display the risks associated with the alternative do-nothing approach.

Table 13: Transportation Roadways (Roadway and Pedestrian Network) Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	**Roadways:** • Road Inspections per the Minimum Maintenance Standards (MMS) • Sweeping, leaf collection and debris removal • Additional maintenance as per findings of MMS. • Snow and ice removal maintenance - sanding and icing • Sidewalk and road clearing • Island turf and flowerbed maintenance • Pothole, curb and gutter repair • Line markings reapplication **Pedestrian Network:** • Inspection as part of MMS	• Deficiencies are not identified through patrols • Increased lifecycle costs if maintenance is done improperly or not as scheduled • May contribute to premature asset failure, service disruptions or pose health and safety risks • Customer dissatisfaction with road congestion, road closures and other disruptions
Renewal/ Rehab Activities Significant repairs designed to extend the life of the asset	**Roadways:** • Surface Treatment (Rural Roads) • Localized Resurfacing - Minor mill and pave • Minor Reconstruction • Resurfacing • Crack seal **Pedestrian Network:** • Grinding • Spot repairs • Asphalt Patching • Partial segment replacement • Mud Jacking • Machine groom gravel pathways	• Renewal/rehab activities may not extend asset life as much as expected, leading to premature asset failure or the need for another renewal/rehab activity • Increased lifecycle costs if renewal/rehab activities are done improperly or not as scheduled • Changes to asset use as well as modernizing systems and adjusting to increasing levels of customer and employee service

Table 13: Transportation Roadways (Roadway and Pedestrian Network) Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Replacement Activities Activities that are expected to occur once an asset has reached the end of its estimated service life and renewal/ rehab is no longer an option	**Roadways:** • Major Reconstruction **Pedestrian Network:** • Full block replacements • Replacements for accessibility (tactile plates, ramps, etc.) • Replacement for utilities and developments • As part of construction projects	• Delay in construction projects may result in health and safety risks, higher costs, longer service disruption and customer dissatisfaction
Non-Infrastructure Activities Actions or policies that can lower costs or extend service lives	**Roadways:** • Integrated Mobility Plan (in development) • Traffic Studies/Counts • Monitoring active transportation volumes • Visual inspections by road patrol • Pavement Condition Assessment **Pedestrian Network:** • Annual MMS inspections • Integrated Mobility Plan • Connectivity review as part of capital projects • Visual inspections by road patrol • Official Plan	• Asset deterioration is over or underestimated • Inaccurate growth numbers and estimation of funding

Table 13: Transportation Roadways (Roadway and Pedestrian Network) Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Expansion / Service Enhancements Planned activities to improve an asset's capacity, quality and system reliability	**Roadways:** • Official plan targets • Master Plan/Integrated Mobility Plan • Development requirements/requests • Updated pavement and materials design processes • Improvements or new infrastructure as a result of Regional Ministry of Transportation/Rail requirements • Health and Safety requirements **Pedestrian Network:** • As required through development • As identified through the connectivity review and capital project development • Targets from the official plan • New City infrastructure as a result of Regional Bridges/MTO/Rail • Based on accessibility requirements during replacement or at intersections • Sidewalks that were not able to be built during development	• Growth activities are delayed or cancelled, resulting in the system being unable to accommodate for population and employment growth • Master Plans may overestimate, or underestimate required road expansions to accommodate for growth • Increased lifecycle costs • Health and safety • Improper renewal/rehabilitation can lead to decreased asset life, premature asset failure, unplanned failures and service outages • Road disruption and congestion
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its estimated service life, or is otherwise no longer needed by the municipality	**Roadways:** • Reclaimed asphalt pavement in base and driveway asphalt • Reuse of asphalt in granular materials during road reconstruction • Contaminated soils disposal **Pedestrian Network:** • Disposed during construction	• Improper disposal can lead to environmental impacts and expenses

Table 14:   Transportation Structure (Bridges and Culverts, Noise Walls and Retaining Walls) Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	**Bridges and Culverts:** • OSIM Inspections for structures over 3 m • Drains, expansion joint and sidewalk cleaning • Graffiti removal • Inspections for structures under 3 m including visual assessments **Retaining Walls & Noise Walls:** • Checked for damage as part of maintenance management system (MMS) • OSIM inspections on walls	• Deficiencies are not identified through inspections • Increased lifecycle costs if maintenance is done improperly or not as scheduled • May contribute to premature asset failure, service disruptions or pose health and safety risks • Customer dissatisfaction with bridge closures and other disruptions
Renewal/ Rehab Activities Significant repairs designed to extend the life of the asset	**Bridges and Culverts:** • Deck resurfacing and waterproofing • Minor Bridge/Culvert Rehabilitation • Major Bridge/Culvert Rehabilitation • Capital Bridge/Culvert Repairs **Retaining Walls & Noise Walls:** • When involved in a multi-vehicle accident as notified per police • Adjustments to meet current design standards • Noise wall panel repair and replacements • Repairs done when damaged or defects	• Renewal/rehab activities may not extend asset life as much as expected, leading to premature asset failure or the need for another renewal/rehab activity • Increased lifecycle costs if renewal/rehab activities are done improperly or not as scheduled • Changes to asset use as well as modernizing systems and adjusting to increasing levels of customer and employee service.

Table 14:   Transportation Structure (Bridges and Culverts, Noise Walls and Retaining Walls) Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Replacement Activities Activities that are expected to occur once an asset has reached the end of its estimated service life and renewal/ rehab is no longer an option	**Bridges and Culverts:** • Bridge/Culvert replacement based on condition surveys, structure age and assumed life of structure **Retaining Walls & Noise Walls:** • When involved in a motor vehicle accident as notified per police • Based on project coordination • Based on design standards • Replacements of retaining walls and noise walls based on condition assessments • Replaced if damaged extension is considerable or defects	• Risk of road collapse if deteriorated culvert is not replaced, increasing risk to public safety, transportation • Delay in construction projects may result in health and safety risks, higher costs, longer service disruption and customer dissatisfaction
Non-Infrastructure Activities Actions or policies that can lower costs or extend service lives	**Bridges and Culverts:** • Environmental Assessments • OSIM Inspections • Review of all components (code compliance) • Visual inspections by road patrol • Integrated Mobility Plans **Retaining Walls & Noise Walls:** • OSIM inspections on walls • Visual inspections by road patrol • Noise studies (for noise walls)	**All Assets:** • Asset deterioration is over or underestimated • Inaccurate growth numbers and estimation of funding

Table 14:   Transportation Structure (Bridges and Culverts, Noise Walls and Retaining Walls) Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Expansion / Service Enhancements Planned activities to improve an asset's capacity, quality and system reliability	**Bridges and Culverts:** • Council or community requests (typically grade separation and active transportation) • Adjustments due to capacity requirements • As identified in the Integrated Mobility Plan (in development) • Addition of lighting, beacons and signals • New City infrastructure as a result of Regional Bridges/MTO/Rail **Retaining Walls & Noise Walls:** • New roads/road reconstruction • Installation of noise walls • Infill development can trigger new noise walls • Based on individual studies/hazards	• Growth activities are delayed or cancelled, resulting in the system being unable to accommodate for population and employment growth • Master Plans may overestimate, or underestimate required road expansions to accommodate for growth
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its estimated service life, or is otherwise no longer needed by the municipality	**Bridges and Culverts:** • Through construction **Retaining Walls & Noise Walls:** • Dispose during construction or replacement as needed • Identified as not required based on third party assessment	• Improper disposal can lead to environmental impacts and expenses

Table 15: Transportation Traffic, Control and Safety Network (Streetlights, Traffic Signals, Signs and Guard Rails) Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	**Streetlights, Traffic Signals, Signs and Guard Rails:** • Issues reported as part of MMS • Defective signs/signals/lights • Reports/complaints • Accident reports • Annual retro reflectivity and sign condition review • Minor repairs and bulb changes • Graffiti removal	• Deficiencies are not identified through inspections • Increased lifecycle costs if maintenance is done improperly or not as scheduled • May contribute to premature asset failure, service disruptions or pose health and safety risks • Customer dissatisfaction with road congestion, road closures and other disruptions
Renewal/ Rehab Activities Significant repairs designed to extend the life of the asset	**Streetlights, Traffic Signals, Signs and Guard Rails:** • Rehabilitation of traffic signal components (conductors, signal housing and modules, cabinet controller and power supply) based on condition, age and assumed life • Replacement of streetlight fixtures • Rehabilitation of guiderail sections	• Renewal/rehab activities may not extend asset life as much as expected, leading to premature asset failure or the need for another renewal/rehab activity • Increased lifecycle costs if renewal/rehab activities are done improperly or not as scheduled • Health and safety risks due to missing or falling signage, or malfunctioning streetlights • Changes to asset use as well as modernizing systems and adjusting to increasing levels of customer and employee service.
Replacement Activities Activities that are expected to occur once an asset has reached the end of its estimated service life and renewal/ rehab is no longer an option	**Streetlights, Traffic Signals, Signs and Guard Rails:** • When Damaged or when retro reflectivity does not meet requirements • Utility relocation • Changes to legislation • Technology advances • Replacement as part of reconstruction	• Delay in construction projects may result in health and safety risks, higher costs, longer service disruption and customer dissatisfaction • Health and safety risks due to missing or falling signage, or malfunctioning streetlights • Delayed traffic signal replacements will lead to increased traffic congestion at intersections and further service disruption

*Table 15:	Transportation Traffic, Control and Safety Network (Streetlights, Traffic Signals, Signs and Guard Rails) Lifecycle Activities*

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Non-Infrastructure Activities Actions or policies that can lower costs or extend service lives	**Streetlights, Traffic Signals, Signs and Guard Rails:** • Retro reflectivity and sign condition review • Visual inspections by road patrol • Traffic signalization and optimization studies	• Asset deterioration is over or underestimated • Inaccurate growth numbers and estimation of funding • Energy consumption and costs are not reduced • Inefficient signal timing leading to traffic congestion at intersections • Incorrectly updated signal timings may pose health and safety risks
Expansion / Service Enhancements Planned activities to improve an asset's capacity, quality and system reliability	**Streetlights, Traffic Signals, Signs and Guard Rails:** • Added based on studies or new development	• Growth activities are delayed or cancelled, resulting in the system being unable to accommodate for population and employment growth • Master Plans may overestimate, or underestimate required road expansions to accommodate for growth • Health and safety risks due to lack of signage or proper lighting
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its estimated service life, or is otherwise no longer needed by the municipality	**Streetlights, Traffic Signals, Signs and Guard Rails:** • Dispose during construction or replacement as needed	• Improper disposal can lead to environmental impacts and expenses

3.4 Current and Future Risks

Through workshops with Transportation staff, assets or asset types were placed into a risk framework based on the range of severity of the consequence of failure according to three types of impacts: social, environmental and financial.

The scale of consequence can range from insignificant to severe/catastrophic and assets were assigned a weighted score based on the consequence of failure. Where appropriate, spatial attributes of an asset were incorporated into the framework (for example, road assets of greater proximity to emergency response centers were assigned a greater consequence of failure score than those further away.) In some asset types, only those deemed most critical were assigned the highest of scores in terms of the consequence of failure. These consequence of failure scores were then incorporated into the model to inform the prioritization of funding needs used in the financial analysis. It is important to recognize that these risk frameworks are not intended to reliably predict or prevent critical asset failure but can modify how financial needs are modeled in the long-term financial model.

For this iteration of the asset management plan, risk was considered in terms of the impacts of asset failure that we recognize currently or have observed previously. But it is important to consider impacts from other risks in the future such as those from climate change.

We anticipate that impacts from other future risk including climate change will impact our Transportation assets in a variety of ways including damage to our physical infrastructure such as roads, bridges and culverts through flooding or erosion from more frequent extreme rainfall or icing events; increased maintenance and/or decreased lifespan of pavement and active transportation assets due to more frequent freeze/thaw events in winter and heat extremes in summer; damage to our traffic signals, signs and streetlights due to extreme wind events; and shifts in demand for year-round active transportation due to periods of warmer winter weather. Increasing the City's transportation modal split towards more active forms (walking, cycling) is a key mitigation strategy. Another mitigation strategy already adopted by the City was the installation of high efficiency LED streetlight replacement program (2017-2018). Additional strategies to mitigate and adapt to climate change will continue to be explored by this asset service through coordination with the City's Climate Resilient Burlington Plan. Future iterations of this Plan can further build onto the decision support models by incorporating climate change impacts into the transportation risk framework.
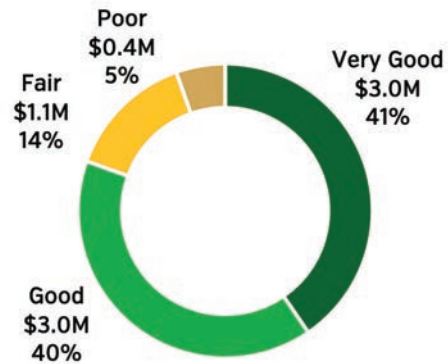
4.0
Transit

The City of Burlington is committed to efficiently providing a high quality, safe, efficient, accessible, convenient and reliable transit service that meets the expectations of the community.
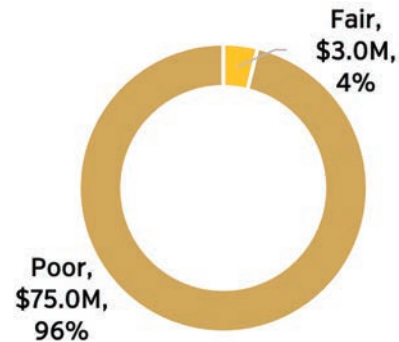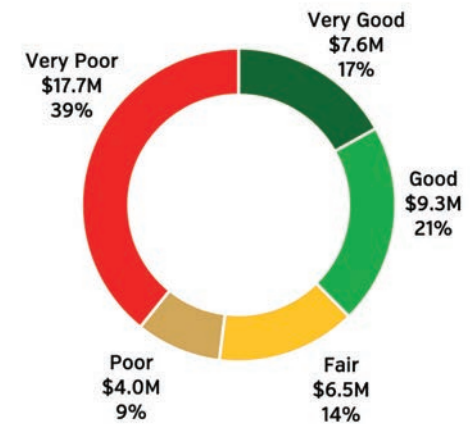
TRANSIT, BURLINGTON, ONTARIO

Bus Stops

- Poor $0.4M 5%
- Fair $1.1M 14%
- Good $3.0M 40%
- Very Good $3.0M 41%

Facilities

- Fair, $3.0M, 4%
- Poor, $75.0M, 96%

Vehicles & Equipment

- Very Poor $17.7M 39%
- Very Good $7.6M 17%
- Good $9.3M 21%
- Fair $6.5M 14%
- Poor $4.0M 9%

4.0
Transit

The City of Burlington is committed to efficiently providing a high quality, safe, efficient, accessible, convenient and reliable transit service that meets the expectations of the community.

4.0 Transit

The City of Burlington provides residents and visitors with a wide range of opportunities for getting around, including walking, cycling, public transit and automobiles. Transit services are an integral part of the City's services as it supports integrated city mobility, environmental sustainability and affordability. In fact, the City is currently in the process of producing an Integrated Mobility Plan, which will have the following overarching goals:

- A wider range of transportation options, regardless of citizen age, means or ability.
- The efficient transportation of more people with compact modes of transportation (such as buses, bicycles and walking).
- A transportation system that is well-connected to other Regions.
- Fast, reliable and more frequent transit.
- The improvement of facilities for cyclists and pedestrians.

Currently, Burlington Transit operates 9 full-service routes, 4 peak time routes and 3 late night service routes, with regular connections to GO Transit, Oakville Transit and Hamilton Street Railway.

The 2020 – 2024 Burlington Transit Business Plan guides the implementation of the City's transit service improvements, with a key focus on identifying the strategies and necessary resources required to meet transit ridership growth targets as identified in Halton Region's 2011 Transportation Master Plan. The City's Transit assets are broken down into bus stops, facilities, vehicles and equipment.

4.1   State of the Local Infrastructure

4.1.1 Asset Inventory and Valuation

Providing a high quality, safe, efficient, accessible, convenient, and reliable transit service that meets the expectations of the community is an important goal for the City of Burlington. This section summarizes the portfolio of infrastructure assets associated with the Transit services managed by the City.

The City of Burlington's portfolio of infrastructure assets for Transit services is valued at $130.6 million, which is comprised of a mixture of Bus Stops, valued at $7.5 million, Facilities valued at $78 million and Vehicles & Equipment valued at $45.1 million. These replacement values were developed based on a review of purchase costs, current market costs and regulated codes / requirements. Table 16 summarizes the Transit assets inventory, the associated replacement value and average condition scores. Table 17 summarizes the asset inventory and valuation of these assets in greater detail.

Table 16:   Asset Valuations for the City's Transit System

	Bus Stops	Facilities	Vehicles & Equipment
Total Replacement Value	$7.5M	$78.0M	$45.1M
Average Condition Score	Good	Poor	Poor

Table 17: Assets Inventory and Valuation for Bus Stops, Equipment, Facilities and Vehicles

Asset Type	Asset Sub-Type	Quantity	Replacement Value	Average Age	Average Condition
Bus Stops	Concrete Pads	792	$5.1M	40	Good
	Shelters	251	$2.4M	8	Very Good
Facilities	Bus Terminal	1	$3.0M	34	Fair
	Transit Operations	1	$75.0M	12	Poor
Equipment	Equipment	24	$4.5M	13	Fair
Vehicle	Conventional Buses	63	$37.4M	7	Poor
	Specialized Buses	15	$2.9M	3	Fair
	Support	6	$270.5K	5	Poor
TOTAL			$130.6M	29	Poor

4.1.2   Asset Age Summary

Figure 12 displays average asset age as a proportion of the Estimated Service Life (ESL) by asset type for the Transit assets inventory. As shown below, average ages have not surpassed the average ESL for any asset type and are relatively younger.

Figure 12:   Average Asset Age as a Proportion of Average Asset ESL (Transit Assets)
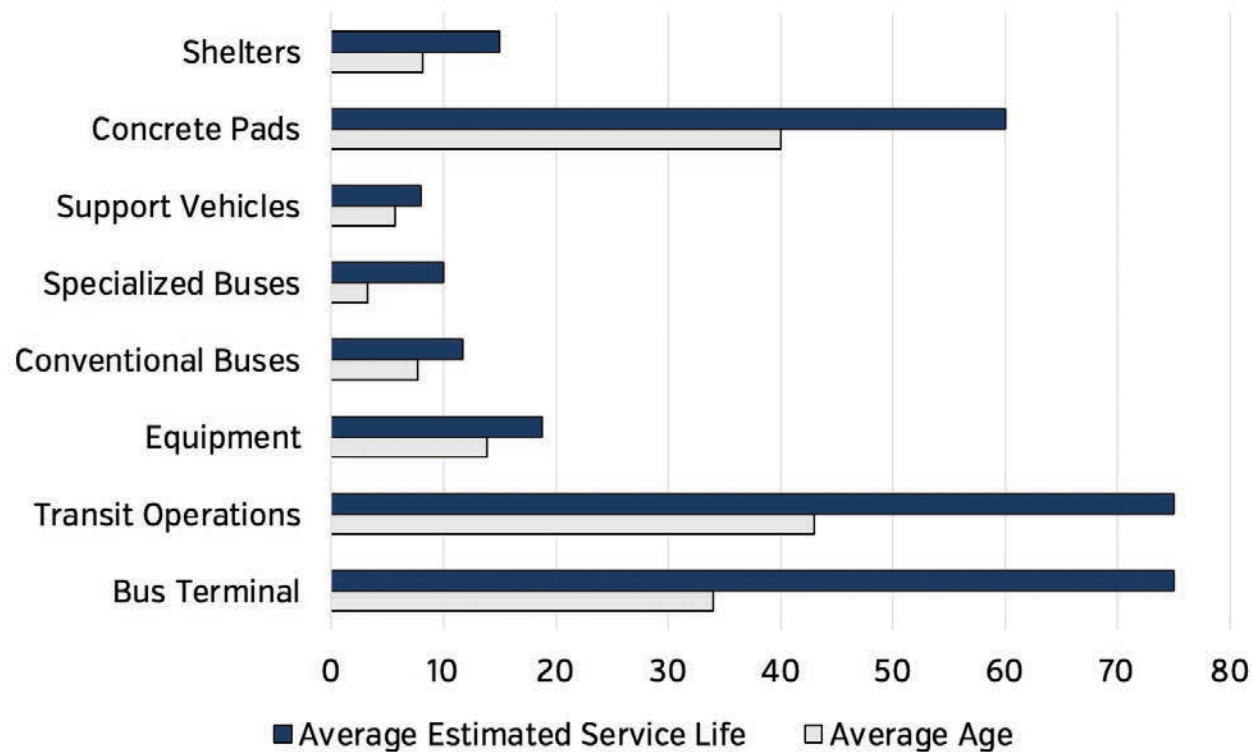
4.1.3   Asset Condition

This section outlines the breakdown of assets in each condition category based on the percentage of total replacement value. Asset condition was categorized based on the scale as shown in Table 18.

Table 18:   Transit Condition Scale

Performance Category	Facilities Facility Condition Index [FCI]	Remaining Assets Condition Rating and/or Service Life Remaining
Very Good	0.01 to 0.02	"Very Good" or >80% of life remaining
Good	0.03 to 0.05	"Good" or 60-80% of life remaining
Fair	0.06 to 0.1	"Fair" or 40-60% of life remaining
Poor	0.11 to 0.49	"Poor" or 20-40% of life remaining
Very Poor	0.5 to 1.0	"Very Poor" or <20% of life remaining

By replacement value, primarily driven by the Transit Operations facility, approximately 61% of the City's Transit assets are in Poor condition while 25% of the assets are in Very Good to Fair condition. Figure 13 illustrates the condition distribution of the City's Transit assets.

Figure 13:   Asset Condition Summary (Transit assets)
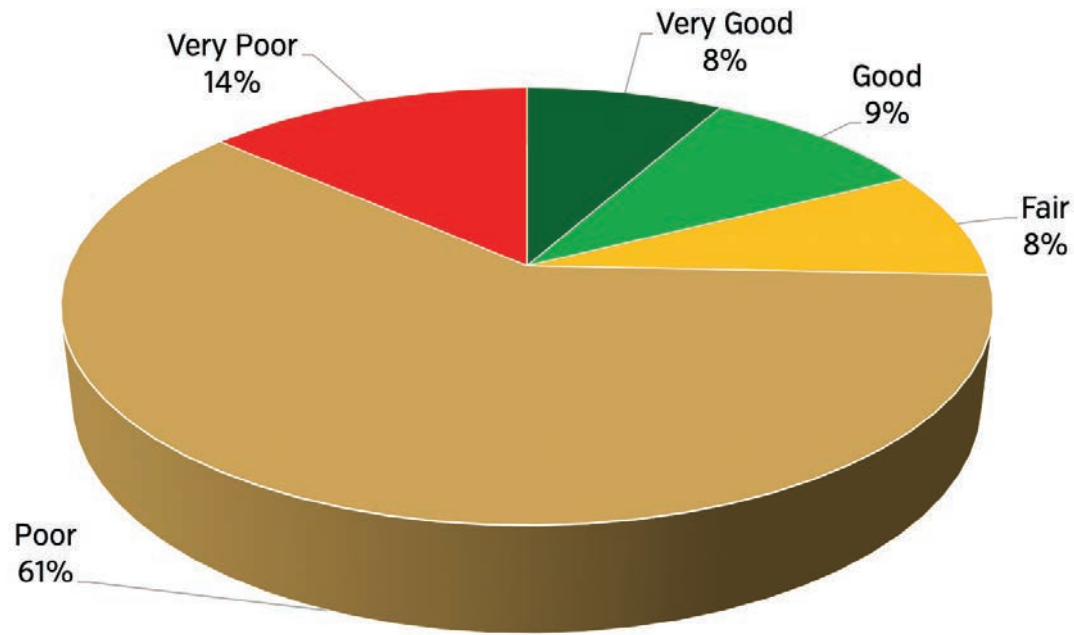
4.1.3.1   Bus Stops & Facilities

Figure 14 outlines the condition of Bus Stops and Transit Facilities as a proportion of replacement value. Based on 2020 inspections, approximately 80% of Bus Stops are in Very Good or Good condition, with the remaining 20% in Fair to Poor condition. The Bus Terminal is in Fair condition and the Transit Operations is in Poor condition.

City Facilities, including the Bus Terminal and Transit Operations Facilities are maintained through corporate contracts and condition assessments are carried out by qualified assessors. Comprehensive condition assessments are typically performed on a 5-year basis and additional interim assessments are completed as required. Condition can be assessed at the asset level, as well as at the Facility level using the industry standard Facility Condition Index (FCI).

4.1.3.2   Vehicles & Equipment

Figure 15 outlines the condition of Transit Vehicles and Equipment as a proportion of replacement value. Approximately 60% of Transit Equipment are in Good or Very Good condition with over 20% in Very Poor condition and the remaining in Fair or Poor. Of the vehicles, Specialized Buses are in the best condition with 60% in Very Good condition, compared to Conventional Buses and Support vehicles which have over 50% and 70% in Poor and Very Poor condition respectively. This suggests that there will be a required investment for these vehicles over the short term.
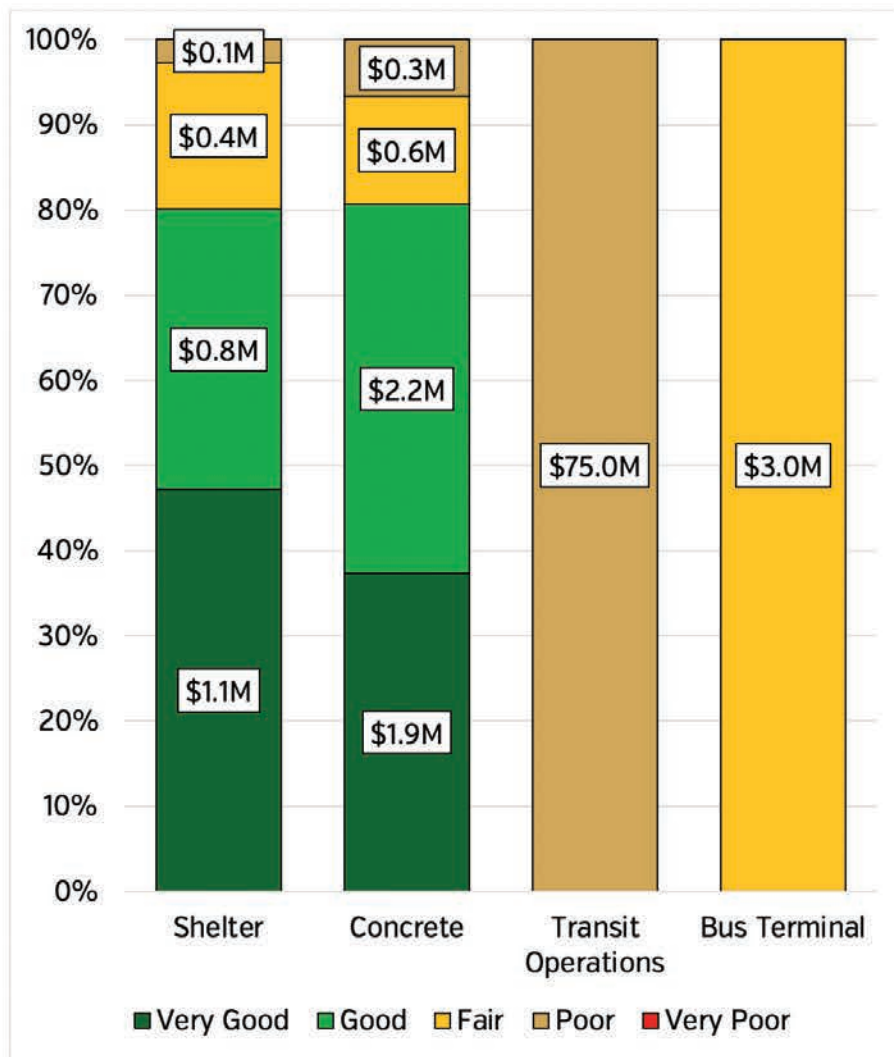
Figure 14: Bus Stops and Transit Facilities Asset Condition by Asset Type and Percentage of Replacement Value
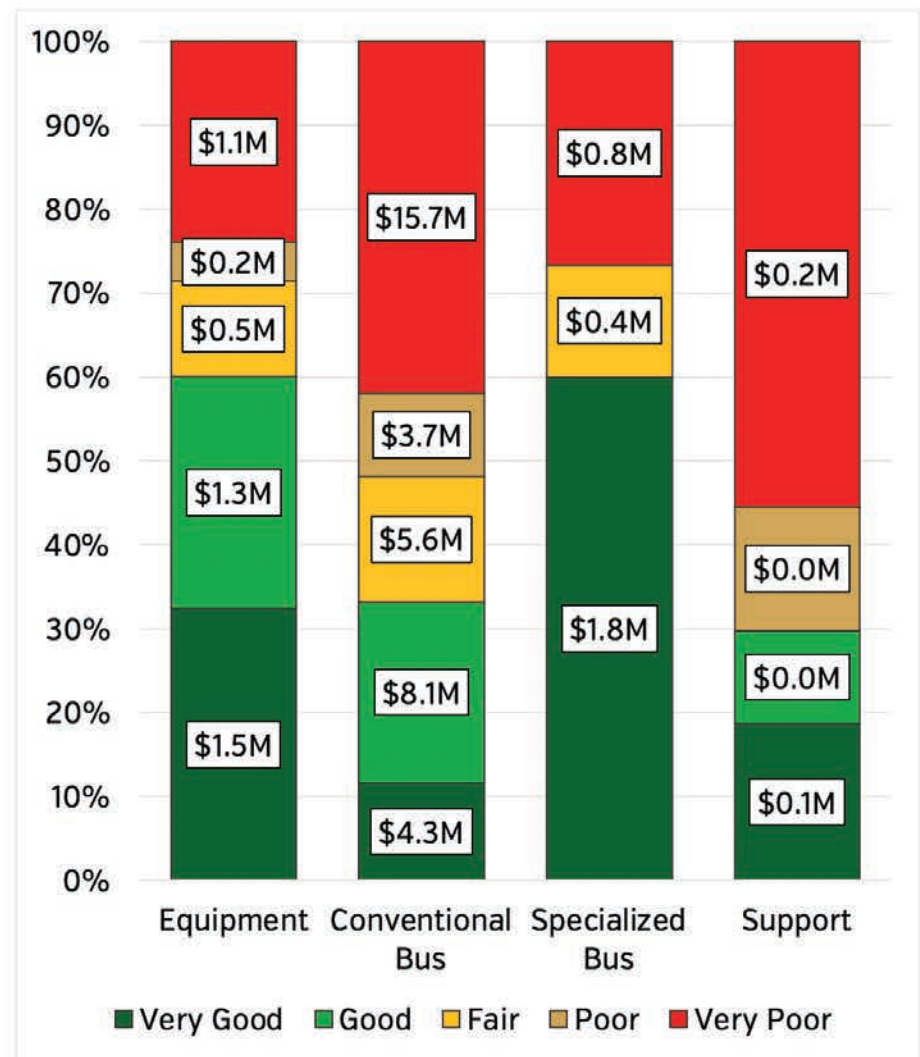
Figure 15: Transit Vehicle Asset Condition by Asset Type and Percentage of Replacement Value

4.2 Levels of Service

A key pillar of asset management decision making is Levels of Service; a decisive business driver that describes the planned outcome from the asset, from a customer and/or technical performance perspective. Level of service statements describe the asset outputs that the City intends on delivering to the community and can be represented in terms of attributes such as Cost-Effectiveness, Quality, Reliability and Safety.

4.2.1 Community and Technical Focused Performance Measures

The City has developed their own set of unique level of service performance metrics which are used to reflect citizen values and needs. These metrics are classified below through service attributes provided by the City that summarize the type of service being provided to citizens and their wider communities. These metrics are displayed in Table 19. Key service attributes for community focused performance measures for Transit assets include: Cost-Effectiveness, Quality and Safety.

Table 19: Community Focused Performance Measures for Transit Assets

| Service Attribute | LOS Statement | Community Focused Performance Measures | |
		Performance Measure	Current Performance
Quality	Providing a transit system at the appropriate quality	% of bus stops that meet a target design standard	67%
		% of bus stops that meet a target quality condition of fair or higher	93%
	Providing fleet services at the appropriate quality	% of fleet assets that meet the quality target	100%
		Annual # of complaints due to uncleanliness or appearance of vehicles	1
		Annual # of complaints due to physical condition of vehicles	0
Safety	Providing an operational road network that is safe for drivers, pedestrians and cyclists	Annual operations budgeted cost per capita	$36
	Providing safe vehicles and equipment	% of legislated MTO safety inspections met	100%

Table 20 below displays technical focused performance measures, developed for a deeper understanding of performance trends for subject matter experts. These measures are utilized to support decision-making and understand the impacts of decision on the Transit asset portfolio.

Table 20:   Technical Focused Performance Measures for Transit Assets

Service Attribute	LOS Statement	Technical Focused Performance Measures	
		Performance Measure	Current Performance
Availability	Providing a transit system that serves the needs of the community	% of urban-area residents within 400 m to a bus stop	$0
		Average bus stop spacing	379 m
Cost-Effectiveness	Providing a transit system in an efficient manner	Annual operating budget (2021)	$7,172,972
	Providing fleet services in an efficient manner	10 Year average fleet asset renewal budget for feet assets as a % of replacement value	8.5%
Quality	Providing fleet services at the appropriate quality	% of vehicles that meet or exceed the target design standard	100%
Reliability	Providing reliable vehicles and equipment	% of vehicles and equipment past their optimum service life	10%
		% of preventative maintenance activities completed on time	100%
		# of missed planned inspections	0
Safety	Providing safe vehicles and equipment	% of regulated MTO maintenance inspections completed	100%

4.3 Lifecycle Management Strategy

This section focuses on specific activities that work to maintain levels of service previously outlined. The City's knowledge and understanding is continually improving through the collection and utilization of data that informs decision making related to the asset lifecycles and LOS performance metrics.

The development of appropriate and cost-effective strategies is foundational for ensuring service sustainability. Further, the lifecycle management activities reduce the risks to service delivery and performance. Table 21 describes the lifecycle management activities currently completed or planned to be implemented by the City for Transit assets. The Table also displays the risks associated with the alternative do-nothing approach.

Table 21:   Transit Assets Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	**Transit Facilities:** • Inspections through corporate contracts • General facility maintenance • Critical equipment maintenance and scheduled overhauls • Comprehensive condition assessment of equipment within contracts • Contract initiation condition assessments • Interim assessment to assess quality of service **Transit Vehicles:** • Carrying out regular maintenance activities on all vehicles and equipment as per manufacturer's recommendations for optimum performance and lifecycle • Reactive maintenance for circumstances not easily mitigated (e.g. vehicle accidents, faster than anticipated breakdown) • Tracking maintenance activities in order to continue to improve. Target is to minimize unplanned non-standardized work • Empowering certified staff to make decisions on elective repairs (under $1,000) in order to ensure continuity of service and fewer breakdowns while in service	• Deficiencies could be not identified during inspections due to concealed components or difficult access • Increased lifecycle costs if maintenance is done improperly or not as scheduled • May contribute to premature asset failure, service disruptions or pose health and safety risks • Customer dissatisfaction with quality, safety or accessibility of facilities

Table 21:   Transit Assets Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Renewal / Rehabilitation Activities Significant repairs designed to extend the life of the asset	**Transit Facilities:** • Mid-life Renewal of facilities and major overhauls and modernization of equipment to support department service **Transit Vehicles:** • Regular preventative maintenance programs assist in determining renewals/rehabilitation required • Major overhauls or reconditioning are very costly and generally do not add enough extended life in order to add value • Review opportunities to repurpose add on equipment, attachments and outfitting past the lifecycle of the parent asset	• Renewal/rehab activities may not extend asset life as much as expected, leading to premature asset failure or the need for another renewal/rehab activity • Increased lifecycle costs if renewal/rehab activities are done improperly or not as scheduled • Changes to asset use as well as modernizing systems and adjusting to increasing levels of customer and employee service. These are unknown and could lead to large expenditures
Replacement Activities Activities that are expected to occur once an asset has reached the end of its estimated service life and renewal/ rehab is no longer an option	**Transit Facilities:** • Demolition and Replacement • Major renovation including large additions and property acquisition **Transit Vehicles:** • Optimal asset lifecycle assessed to determine timing of replacement that minimizes maintenance/repair and maximizes salvage value • Communication with the Supervisor of Fleet Services of end of life assets to help with service and repair decisions to mitigate non-value-added expenditures	• Lead to inefficiencies and substandard services for both staff and customers

Table 21:   Transit Assets Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Non-Infrastructure Activities Actions or policies that can lower costs or extend service lives	**Transit Facilities:** • Facility Master Plans and Department Plans • Community Outreach / Customer Engagement • Corporate Energy and Emissions Plans • Master Maintenance Plans • Capital Asset and Lifecycle Renewal Plans **Transit Vehicles:** • Lifecycle Management Review – Condition Assessment at end of life • Review and benchmarking of lifecycles • Test extending lifecycle to review impact • Cost review on assets past lifecycle	• Asset deterioration is over or underestimated • Inaccurate growth numbers and estimation of funding

Table 21:   Transit Assets Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities

Expansion / Service Enhancements
 	
Planned activities to improve an asset's capacity, quality and system reliability
	Transit Facilities:
	• Facility Upgrades and Service Enhancements
	• New Facilities and Buildings
	• Building and or Property Acquisition
	• Leasing Additional Buildings and Properties
	
	Transit Vehicles:
	• Post-delivery inspection to confirm vehicle arrived as specified
	• End-user training specific to the equipment to ensure proper operations and operator maintenance (cleaning, greasing, etc.)
	• Consider extended warranties when available and service agreements (e.g. rust proofing)
	• Procurement practices to emphasize quality assets
	• Growth and expansion are guided by, but not limited to:
	  o Burlington's Strategic Plan 2015-2040
	  o 2020-2024 Trans
	  o 2018-2022 Burlington's Plan: From Vision to Focus
	  o Burlington's Integrated Mobility Plan
	  o Development Charges Background Study
	  o Green Fleet Strategy
	  o Provincial Audit & Accountability Review
	• Capital growth projects are identified by City of Burlington Development Charges Background Study (subject to Development Charges Act, 1997 requirements)
		• Growth activities are delayed or cancelled, resulting in the system being unable to accommodate for population and employment growth

Table 21:   Transit Assets Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its estimated service life, or is otherwise no longer needed by the municipality	**Transit Facilities:** • Decommissioning • Sale • Change of Ownership • Consolidation of Buildings • Repurposing Buildings **Transit Vehicles:** • Optimal lifecycle analysis completed for each asset prior to replacement. Salvage amount can vary but an average of 15% of replacement value is consistently achieved • Planning with auction to ensure staggering of similar assets to maximize return and not flood market with availability • Planning with auction to target seasonal disposal of assets when demand is high	• Improper disposal can lead to environmental impacts and expenses

4.4 Current and Future Risks

Through workshops with Transit staff, asset types were placed into a framework based on the range of severity of the consequence of failure according to three types of impacts: social, environmental and financial.

The scale of consequence can range from insignificant to severe/catastrophic and assets were assigned a weighted score based on the consequence of failure. In some asset types, only those deemed most critical were assigned the highest of scores in terms of the consequence of failure, such as specialized fleet and equipment. Where appropriate, spatial attributes of an asset were incorporated into the framework [for example, bus stops located near major transportation hubs]. These consequence of failure scores were then incorporated into the model to inform the prioritization of funding needs used in the financial analysis. It is important to recognize that these risk frameworks are not intended to reliably predict or prevent critical asset failure but can modify how financial needs are modeled in the long-term financial model. For this iteration of the asset management plan, risk was considered in terms of the impacts of asset failure that we recognize currently or have observed previously. But it is important to consider impacts from other risks in the future such as those from climate change.

We anticipate that climate change will impact our Transit assets in a variety of ways including; increased salt corrosion and maintenance to the transit fleet due to an increase in frequency and severity of winter weather events; increased demands and maintenance on the heating and cooling systems of both transit fleet, the bus terminal and the bus operations centre; negative impacts to transit revenue if users find alternate forms of transportation due to inclement weather and/or more active transportation methods as a result of longer shoulder seasons; increased demands for shade/protection on non-sheltered bus stops; and increased sanding/salting maintenance at bus stops due to more frequent winter events.

The City has established the goal of reducing GHG emissions by 2040 to achieve net carbon neutrality for City operations. Any future electrification of Transit fleet or deep energy retrofit projects on Transit facilities will further increase the City's climate change mitigation initiatives.

Future iterations of this Plan can further build onto the decision support models by incorporating climate change impacts into the Transit risk framework.

5.0
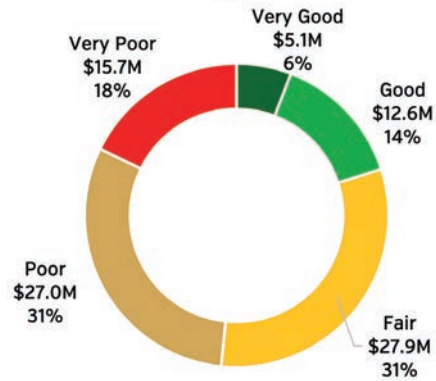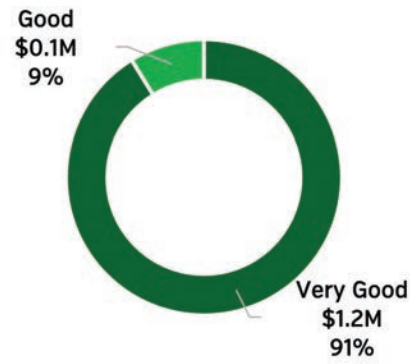## Parking

The City of Burlington is committed to efficiently providing safe and convenient parking services at an appropriate quality that is accessible to all residents.
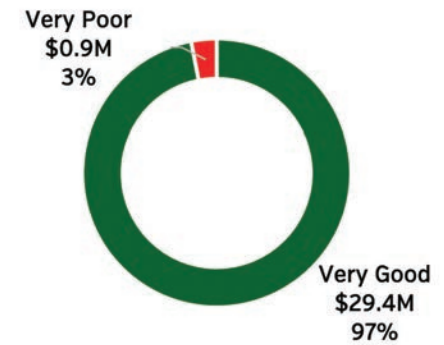
PARKING, BURLINGTON, ONTARIO

Parking Lots

Very Poor
$15.7M
18%

Very Good
$5.1M
6%

Good
$12.6M
14%

Poor
$27.0M
31%

Fair
$27.9M
31%

Equipment

Good
$0.1M
9%

Very Good
$1.2M
91%

Parking Facilities

Very Poor
$0.9M
3%

Very Good
$29.4M
97%

5.0
Parking

The City of Burlington is committed to efficiently providing safe and convenient parking services at an appropriate quality that is accessible to all residents.

5.0 Parking

Not unlike other municipalities, parking in the City is always increasing in complexity. With a growing and diversifying downtown core, there is significant competition in the downtown area for both parking lots and pay-by-plate parking stalls. The City of Burlington, as a non-profit corporation, provides controlled rate parking both short-term (on-street) and long-term (off-street). This supply supports Burlington's business, commercial and institutional services as well as entertainment venues. The City works to balance the general need to provide accessible and convenient parking, whilst ensuring traffic flows, emergency vehicle access and accessible parking for permitted users (as per the City's Strategic Plan, 2.1 – Increased Transportation Flows and Connectivity).

In the Spring of 2018, the City introduced occupancy sensors at all City-owned parking lots and on-street parking spaces. Burlington is one of the first cities in Canada to utilize this technology, which keeps track of occupied and available parking spaces and displays real-time information to citizens and visitors, simplifying the process of finding an available parking space. The City also currently provides over 30 public electric vehicle charging spaces in the downtown core.

5.1   State of the Local Infrastructure

5.1.1   Asset Inventory and Valuation

Having dependable and available parking facilities is an important component of the City's accessibility, for both citizens and visitors. This section summarizes the portfolio of infrastructure assets associated with the various parking services managed by the City. The City of Burlington's portfolio of infrastructure assets for Parking services is $119.9 million which is comprised of numerous parking lots, equipment, and parking facilities. Table 22 summarizes the Parking assets inventory, the associated replacement value and average condition scores. Table 23 summarizes the asset inventory and valuation of these assets in greater detail.

Table 22:   Asset Valuations for the City's Parking System

	Equipment	Parking Lots	Parking Facilities
Total Replacement Value	$1.3M	$88.3M	$30.3M
Average Condition Score	Very Good	Poor	Fair

Table 23:   Parking Assets Inventory and Valuation for Parking Lots, Facilities and Equipment Assets

Asset Type	Asset Sub-Type	Quantity	Replacement Value	Average Age	Average Condition
Equipment	Pay Stations	102	$713.0K	5	Very Good
	Other Equipment (sensors, signs, radios, etc.)	426	$571.5K	6	Very Good
Parking Lots	Surface Lots/Corporate Lots	128	$86.2M	16	Poor
	Downtown Lots	15	$2.0M	11	Poor
Parking Facilities	Parking Garage/ Offices	1	$29.4M	18	Good
	Parking Services Building	1	$928.4K	71	Very Poor
TOTAL			$119.9M	16	Fair

5.1.2   Asset Age Summary

Figure 16 displays average asset age as a proportion of the Estimated Service Life (ESL) by asset type for the Parking assets inventory. The average ages for the assets were calculated based on expert opinion. As shown below, average ages have not surpassed the average ESL for any asset type and are relatively younger.

Figure 16:   Average Asset Age as a Proportion of Average Asset ESL (Parking assets)
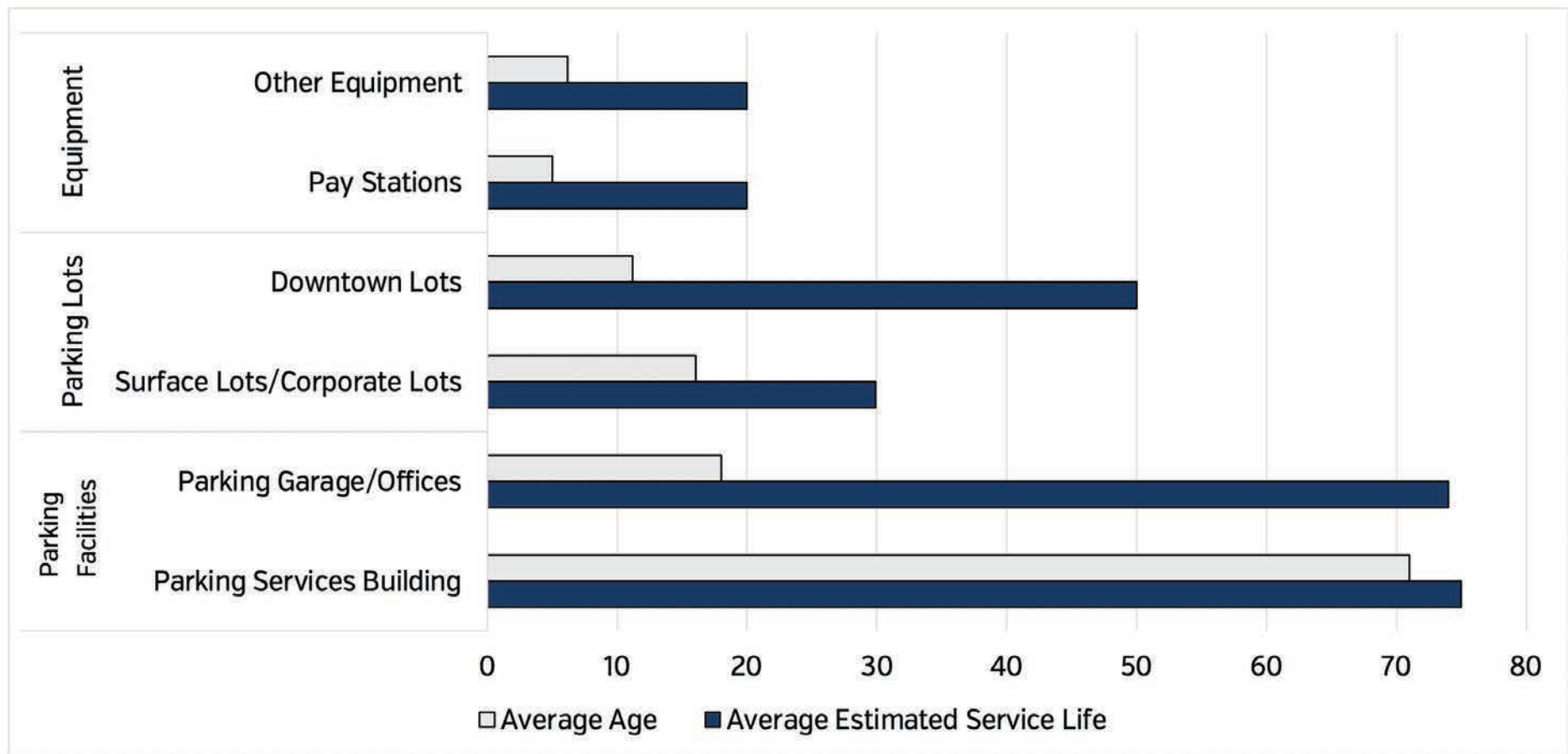
5.1.3   Asset Condition

This section outlines the breakdown of assets in each condition category based on the percentage of total replacement value. Asset condition was categorized based on the scale as shown in Table 24.

Table 24:   Parking Condition Scale

Performance Category	Facilities Facility Condition Index (FCI)	Remaining Assets Condition Rating and/or Service Life Remaining
Very Good	0.01 to 0.02	"Very Good" or >80% of life remaining
Good	0.03 to 0.05	"Good" or 60-80% of life remaining
Fair	0.06 to 0.1	"Fair" or 40-60% of life remaining
Poor	0.11 to 0.49	"Poor" or 20-40% of life remaining
Very Poor	0.5 to 1.0	"Very Poor" or <20% of life remaining

A little over 60% of the City's Parking assets are in Very Good, Good or Fair condition, with the remainder approaching the end of their estimated service lives, indicating a need for investment in the short to medium term. Figure 17 illustrates the condition distribution of the City's Parking assets.

Figure 17:   Asset Condition Summary (Parking assets)

Very Poor 14%
Very Good 5%
Good 35%
Poor 23%
Fair 23%
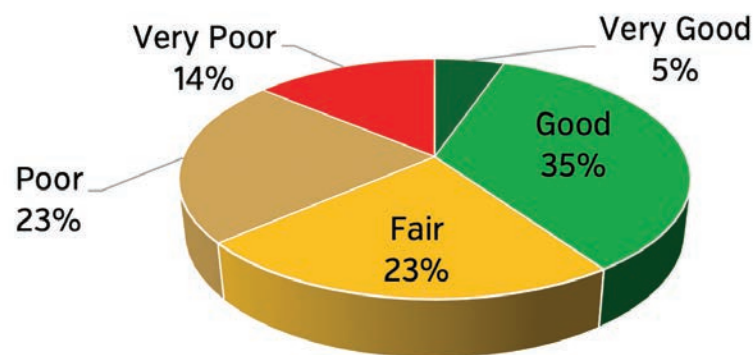
5.1.3.1 Parking Lots

Corporate/Surface Parking Lots are typically assessed on a 5-year basis, or as required, by external contractors. Downtown parking lots are managed by the City's Transportation Services department and have their own dedicated reserve fund. Figure 18 outlines the condition of Parking Lots as a proportion of replacement value. Nearly 50% of the Corporate/ Surface Lots are in Poor or Very Poor condition, while 64% of Downtown Lots are in Very Good or Good condition. Surface Lots/Corporate Lots outside of the downtown are mainly located in parks or on facility sites.

Figure 18: Parking Lot Asset Condition by Asset Type and Percentage of Replacement Value
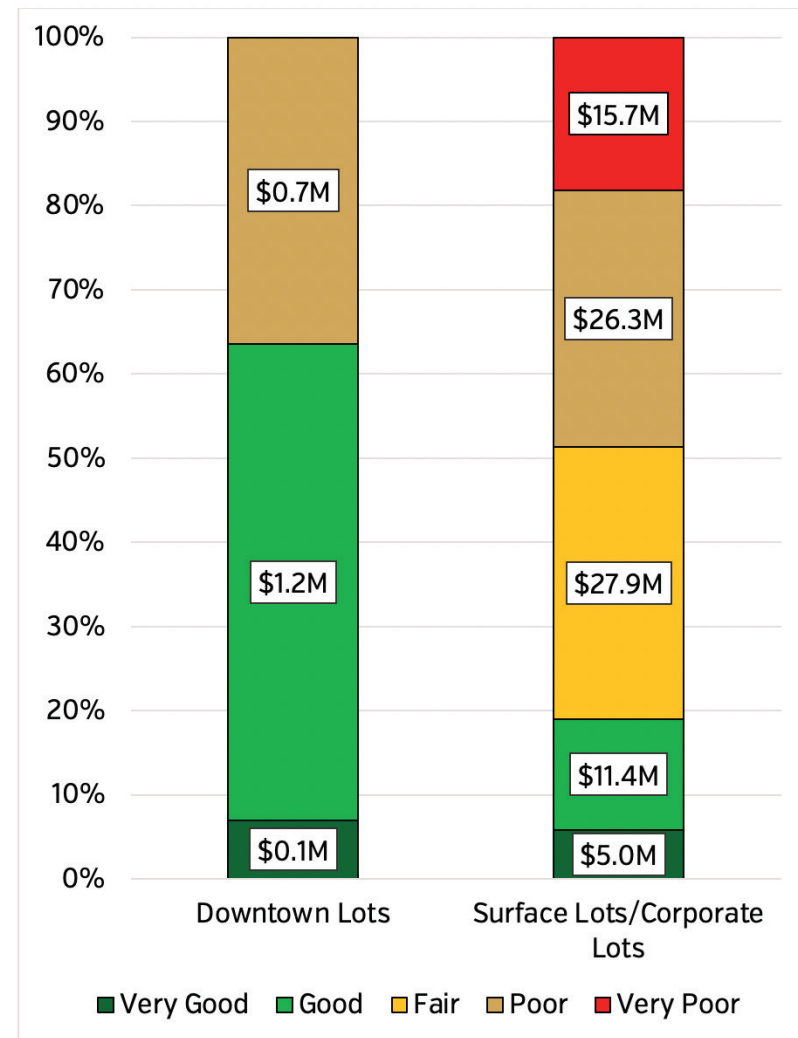
5.1.3.2   Equipment

Figure 19 outlines the condition of Parking Equipment as a proportion of replacement value. Since the majority of Parking equipment assets were purchased within the last 5-8 years, the majority of these assets are in Very Good condition.

Figure 19:   Parking Equipment Assets Condition by Asset Type and Percentage of Replacement Value
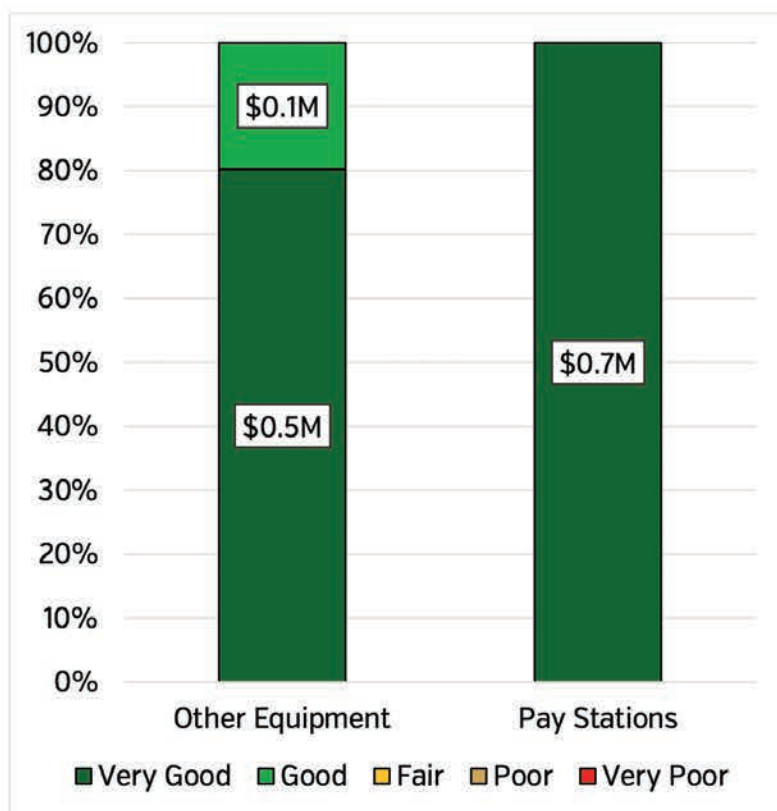
5.1.3.3   Parking Facilities

Figure 20 outlines the condition of the Parking Facilities as a proportion of replacement value. The Parking Garage / Offices is in Good condition while the Parking Service Building is in Very Poor Condition.

Figure 20:   Parking Facilities Assets Condition by Asset Type and Percentage of Replacement Value
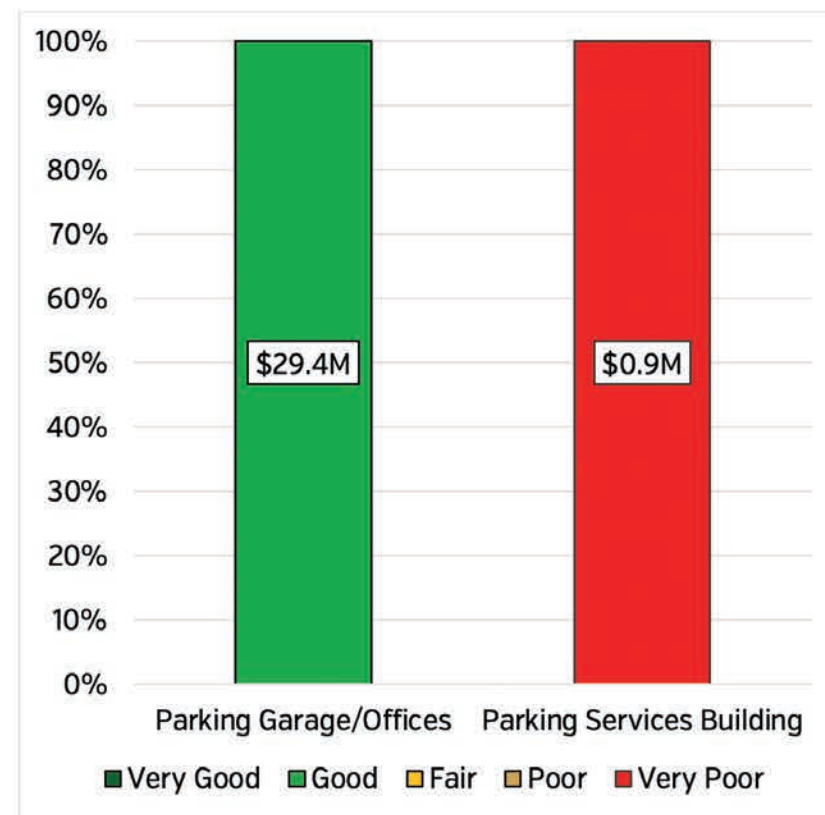
5.2 Levels of Service

5.2.1 Community and Technical Focused Performance Measures

The City has developed their own set of unique level of service performance metrics which are used to reflect citizen values and desires. These metrics are classified below through service attributes provided by the City that summarize the type of service being provided to citizens and their wider communities. These metrics are displayed in Table 25. Key service attributes for community focused performance measures for Parking assets include: Accessibility, Cost-Effectiveness and Reliability.

Table 25:   Community Focused Performance Measures for Parking Assets

Service Attribute	LOS Statement	Community Focused Performance Measures	
		Performance Measure	Current Performance
Accessibility	Providing the appropriate number of parking spaces	# of electric vehicle charging spaces	30
		# of accessible spaces (downtown)	38
		# of on-street parking spaces	335
Cost-Effectiveness	Providing parking services in an efficient manner	Cost per hour per space ($/space)	$1.75
		Revenue per parking space * ($/parking space)	$830.67 (2020) $1,534.55 (2019) $1,778.46 (2018)
Reliability	Providing a reliable parking service	% of time when payment terminals are operating	99.5%
		% of time when parking meters are operating	99.5%
		% of time when kiosks are operating	99.5%

*Three years of data are included for context due to abnormal asset revenues as a result of COVID-19

Table 26 below displays technical focused performance measures, developed for a deeper understanding of performance trends for subject matter experts. These measures are utilized to support decision-making and understand the impacts of decision on the Parking asset portfolio.

Table 26:   Technical Focused Performance Measures for Parking Assets

Service Attribute	LOS Statement	Technical Focused Performance Measures	
		Performance Measure	Current Performance
Cost-Effectiveness	Providing parking services in an efficient manner	Annual operating budget for parking	$64,200
		Average annual revenue for parking	$2,372,016
Quality	Providing parking at the appropriate quality level	% of parking lots in good condition (downtown)	71%
		% of City-wide parking lots in good condition	19%
		# of parking spaces (downtown)	1,649
		Parking Structure Facility Condition Index (FCI)	0.04
Sustainability	Providing low-emission energy supply	Total MWh provided at City owned electric vehicle charging stations	76 MWh (2019)

5.3 Lifecycle Management Strategy

This section focuses on specific activities that work to maintain the levels of service previously outlined. The City's knowledge and understanding is continually improving through the collection and utilization of data that informs decision making related to asset lifecycles and level of service performance metrics.

The development of appropriate and cost-effective strategies is foundational for ensuring service sustainability. Further, the lifecycle management activities reduce the risks to service delivery and performance.

Table 27 in the following section describe the lifecycle management activities currently completed or planned to be implemented by the City for Parking assets. The Table also displays the risks associated with the alternative do-nothing approach.

Table 27:   Parking Assets Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	• Scheduled inspections of parking lots • Complete Routine Maintenance	• Increased lifecycle costs if maintenance is done improperly or not as scheduled • May contribute to premature asset failure, service disruptions or pose health and safety risks • Customer dissatisfaction with condition and accessibility of Facilities
Renewal/ Rehab Activities Significant repairs designed to extend the life of the asset	**Parking Lots:** • Minor Reconstruction • Resurfacing **Parking Facilities:** • Mid-life Renewal	• Renewal/rehab activities may not extend asset life as much as expected, leading to premature asset failure or the need for another renewal/rehab activity • Increased lifecycle costs if renewal/rehab activities are done improperly or not as scheduled • Changes to asset use as well as modernizing systems and adjusting to increasing levels of customer and employee service
Replacement Activities Activities that are expected to occur once an asset has reached the end of its estimated service life and renewal/ rehab is no longer an option	**Parking Lots:** • Full Reconstruction	• Delay in construction projects may result in health and safety risks, higher costs, longer service disruption and customer dissatisfaction
Non-Infrastructure Activities Actions or policies that can lower costs or extend service lives	**Parking Lots:** • Corporate Parking Lot Assessments • Downtown Parking Lot Inspection / Assessments	• Asset deterioration is over or underestimated • Inaccurate growth numbers and estimation of funding
Expansion / Service Enhancements Planned activities to improve an asset's capacity, quality and system reliability.	• Property Acquisition and lot expansions • Parking lot modifications in line with future growth and expansion planning to accommodate other provided municipal services • Electrification of fleet vehicles as it relates to charging stations	• Growth activities are delayed or cancelled, resulting in the system being unable to accommodate for population and employment growth • Master Plans may overestimate, or underestimate required road expansions to accommodate for growth
Disposal Activities associated with disposing of an asset once it has reached the end of its estimated service life or is otherwise no longer needed by the municipality.	• Removal and or repurpose • Resale	• Improper disposal can lead to environmental impacts and expenses

5.4 Current and Future Risks

Through workshops with Parking staff, asset types were placed into a framework based on the range of severity of the consequence of failure according to three types of impacts: social, environmental and financial.

The scale of consequence can range from insignificant to severe/catastrophic and assets were assigned a weighted score based on the consequence of failure. In some asset types, only those deemed most critical were assigned the highest of scores in terms of the consequence of failure, such as parking facilities or EV charging stations. These consequence of failure scores were then incorporated into the model to inform the prioritization of funding needs used in the financial analysis. It is important to recognize that these risk frameworks are not intended to reliably predict or prevent critical asset failure but can modify how financial needs are modeled in the long-term financial model.

For this iteration of the asset management plan, risk was considered in terms of the impacts of asset failure that we recognize currently or have observed previously. But it is important to consider impacts from other risks in the future such as those from climate change.

We anticipate that climate change will impact our Parking assets in a variety of ways, including accelerated deterioration of asphalt from an increase in frequency and severity of extreme freeze-thaw action; increased maintenance of potholes or resurfacing; and increased needs for snow removal and/or salting/sanding due to an increase in extreme winter events.
The City is developing a Greening design manual for parking lots, both municipally owned and private, which will recommend sustainable, high efficiency and LID-based guidelines for future parking lot designs to both adapt to and mitigate the impacts of climate change.

Future iterations of this Plan can further build onto the decision support models by incorporating climate change impacts into the Parking risk framework.
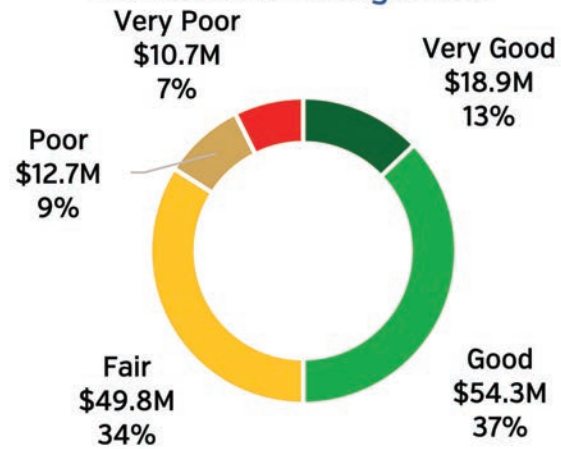
6.0
Stormwater

The City of Burlington is committed to managing surface water drainage with the goal of reducing the risk of flooding to better support sustainable infrastructure and a resilient environment.
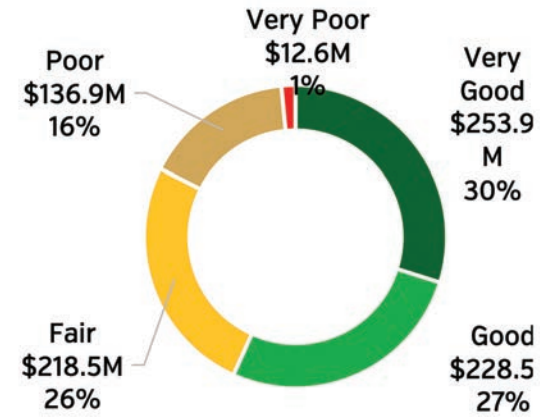
Stormwater Management

Very Poor
$10.7M
7%

Very Good
$18.9M
13%

Poor
$12.7M
9%

Fair
$49.8M
34%

Good
$54.3M
37%

Stormwater Conveyance

Very Poor
$12.6M
1%

Poor
$136.9M
16%

Very
Good
$253.9
M
30%

Fair
$218.5M
26%

Good
$228.5
27%

6.0
Stormwater

The City of Burlington is committed to managing surface water drainage with the goal of reducing the risk of flooding to better support sustainable infrastructure and a resilient environment.

6.0 Stormwater

The City of Burlington's Stormwater infrastructure manages and treats stormwater to protect the City's citizens and its natural and built environments. Stormwater, derived from rain and snowmelt, enters the storm system through catch basins, creeks, ditches and other stormwater channels. The Stormwater system drains stormwater away from buildings, roads and impervious surfaces.

Due to the increased intensity and frequency of storm events as a result of climate change, stormwater management is becoming increasingly crucial. Higher precipitation rates will reduce the capacity of the surrounding area to retain stormwater. Further, if stormwater infrastructure is not well maintained, appropriately sized, or in a state of good repair to accommodate these extra flows, this can increase the risk of overland flooding.

The City operates and maintains an extensive network of Stormwater infrastructure and equipment, broken into two asset types – Stormwater Management and Stormwater Conveyance. The Stormwater Management network is comprised of Open Conveyance, Stormwater Management Facilities and Minor Treatment equipment such as oil/grit separators. The Stormwater Conveyance network consists of storm sewers, and their associated structures, such as catchbasins and maintenance holes.

As the City continues to grow, more emphasis will be placed on Stormwater Management Infrastructure to manage changes in social, economic and environmental expectations.

6.1   State of the Local Infrastructure

6.1.1   Asset Inventory and Valuation

This section summarizes the portfolio of Stormwater infrastructure assets associated with the various public services managed by the City.

The City monitors ten watersheds and is responsible for over ten kilometers of creek erosion control infrastructure, such as weirs, drop-control structures, and bank protection walls. The City is also responsible for 30 stormwater management ponds as well as the associated in/outlet structures, storage pools and maintenance access connections.

These services are comprised of a mixture of Stormwater Management assets, valued at $146 million and Stormwater Conveyance assets, valued at $850 million. These values were developed based on historic construction costs and unit costs based on the size and material of pipes. Table 28 displays the Stormwater associated replacement value and average condition scores. Table 29 displays inventory and valuation information for Stormwater Management and Stormwater Conveyance.

Table 28:   Asset Valuations for the City's Stormwater System

	Stormwater Management	Stormwater Conveyance
Total Replacement Value	$146.3M	$850.5M
Average Condition Score	Fair	Good

Table 29:   Stormwater Assets Inventory and Valuation for Stormwater Management and Stormwater Conveyance Assets (Stormwater assets)

Asset Type	Asset Sub-Type	Quantity	Replacement Value	Average Age	Average Condition
Stormwater Management	Open Conveyance	50* 10.5 km**	$69.6M	28	Good
	Stormwater Management Facilities	30	$75.8M	13	Fair
	Minor Treatment	20	$1.0M	13	Good
Stormwater Conveyance	Storm Sewer Pipes	849 km	$680.9M	38	Good
	Storm Sewer Structures	27,817	$169.6M	36	Fair
TOTAL			$996.8M	37	Good

* Category includes Open Conveyance structures measured by count

** Category includes Open Conveyance erosion control measured by length

6.1.2   Asset Age Summary

Figure 21 displays average asset age as a proportion of the Estimated Service Life (ESL) by asset type for the Stormwater assets inventory. It should be noted that replacement value was calculated with the consideration that this service is replaced on a complete and standalone basis. In practice, the City's Core services (Transportation and Stormwater) coordinate to ensure cost efficiencies to maintain the current level of service at the lowest cost. As such, when considering the Core assets infrastructure lifecycle needs, the Core chapters should be read and considered holistically rather than as separate entities. As shown below, average ages have not surpassed the average ESL for any asset type and are relatively younger.

Figure 21:   Average Asset Age as a Proportion of Average Asset ESL (Stormwater assets)
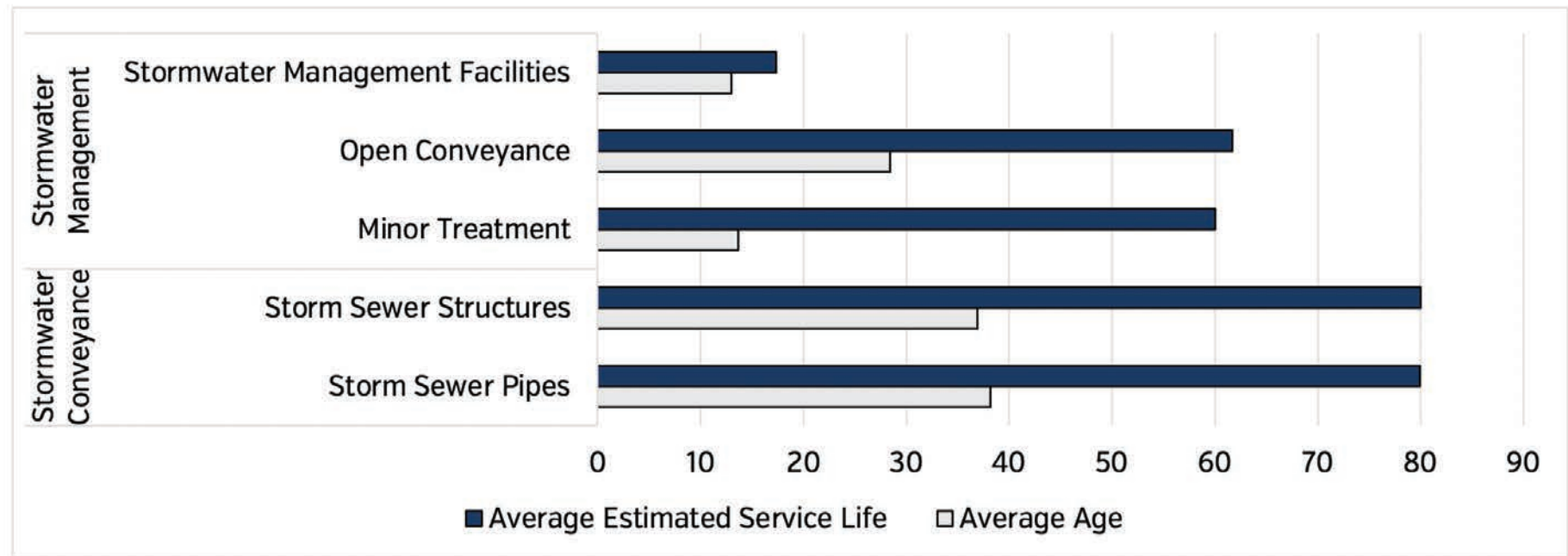

6.1.3   Asset Condition

This section outlines the breakdown of assets in each condition category based on the percentage of total replacement value. Asset condition was categorized based on the scale as shown in Table 30.

Table 30:   Stormwater Condition Scale

Performance Category	Condition Rating and/or Service Life Remaining
Very Good	"Very Good" or >80% of life remaining
Good	"Good" or 60-80% of life remaining
Fair	"Fair" or 40-60% of life remaining
Poor	"Poor" or 20-40% of life remaining
Very Poor	"Very Poor" or <20% of life remaining

Figure 22 displays the condition ratings for each Stormwater asset included in the AMP. Approximately 58% of the City's Stormwater assets are in are in Good to Very Good condition, with the remaining 42% in Fair or worse condition

Figure 22:   Asset Condition Summary (Stormwater assets)
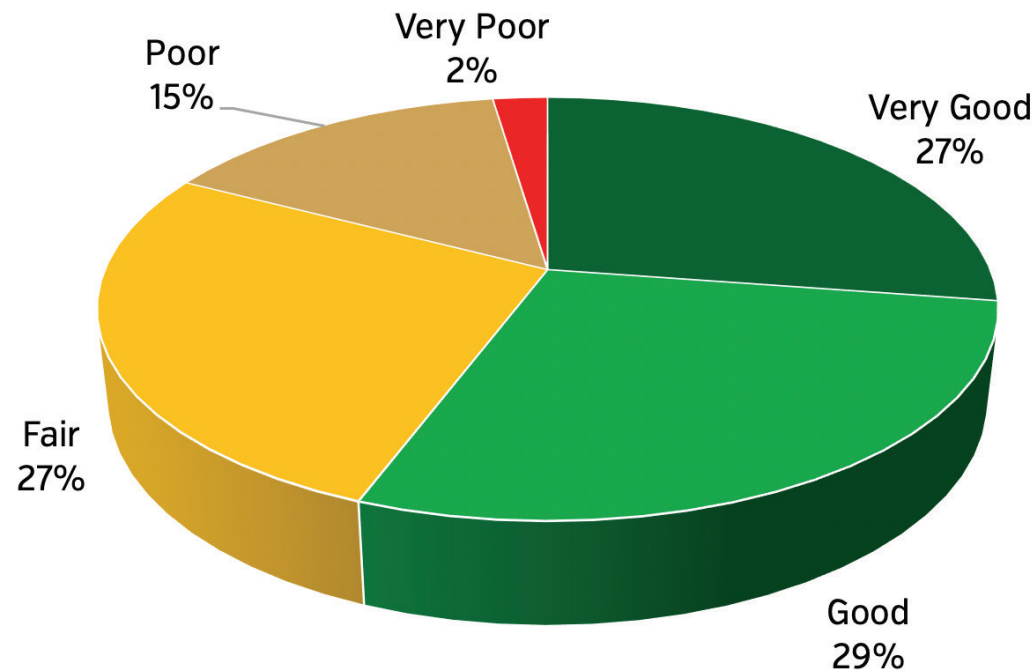
6.1.3.1   Stormwater Management

The City's Stormwater Management assets include Open Conveyance systems, Stormwater Management Facilities and Minor Treatment equipment. The condition of these assets was evaluated through a variety of techniques.

The condition of Minor Treatment equipment (oil and grit separators, OGS) is evaluated through an annual inspection program. Renewal activities are forecast based on annual inspection results and are unique to each OGS unit. Currently, the average condition of this asset is estimated to be Very Good.

Open Conveyance assets include creek infrastructure such as erosion control structures and are evaluated through visual inspections by the walking of the creek by a fluvial geomorphologist on a 5-year basis. Most assets are in Very Good to Good condition.

The conditions of Stormwater Management Facilities (stormwater management ponds) are based on the estimated frequency of pond cleanouts and results from sediment surveys. Sediment surveys are conducted when a pond approaches the anticipated date of cleanout. A sediment survey measures the accumulated sediment levels and confirms if a cleanout is required or can be deferred. Twenty percent of these assets are in Poor or Very Poor condition, suggesting a short-term need for pond cleanouts.

Figure 23:   Stormwater Management Asset Condition by Asset Type and Percentage of Replacement Value
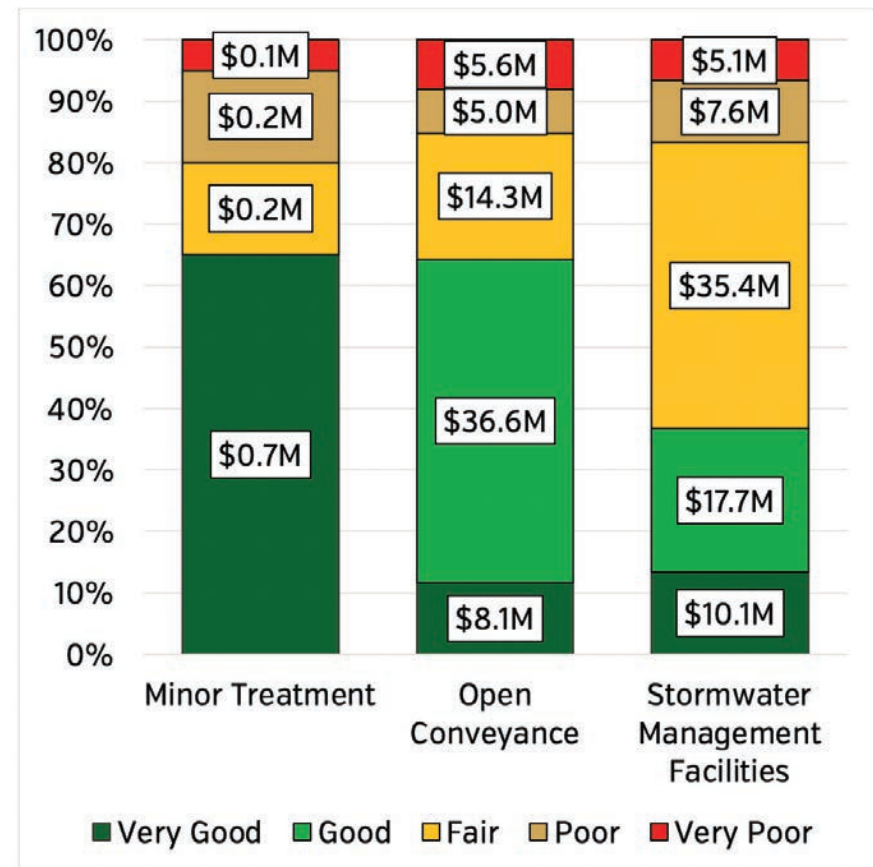
6.1.3.2   Stormwater Conveyance

The City's Stormwater Conveyance assets include linear storm sewer pipes, classified based on diameter, and storm sewer structures including catch basins, maintenance holes, pump stations, chambers and outlets.

These assets undergo regular inspection which helps identify future investment requirements. Inspections include annual CCTV inspection in select portions of the system on a rotating basis and evaluated using a standardized rating system which identifies the risk of failure and anticipated investment needs. Where possible, rehabilitation of pre-existing sewers is completed with trenchless technology, a less invasive rehabilitation method used to extend the sewer lifecycle at a fraction of the cost of replacement.

Figure 24 outlines the condition of Stormwater Conveyance Infrastructure as a proportion of replacement value. Over 50% of both the Storm Sewer Pipes are in Very Good or Good condition while nearly 40% of Storm Sewer Structures are in Very Good or Good condition.

Figure 24:   Stormwater Conveyance Infrastructure Condition by Asset Type and Percentage of Replacement Value
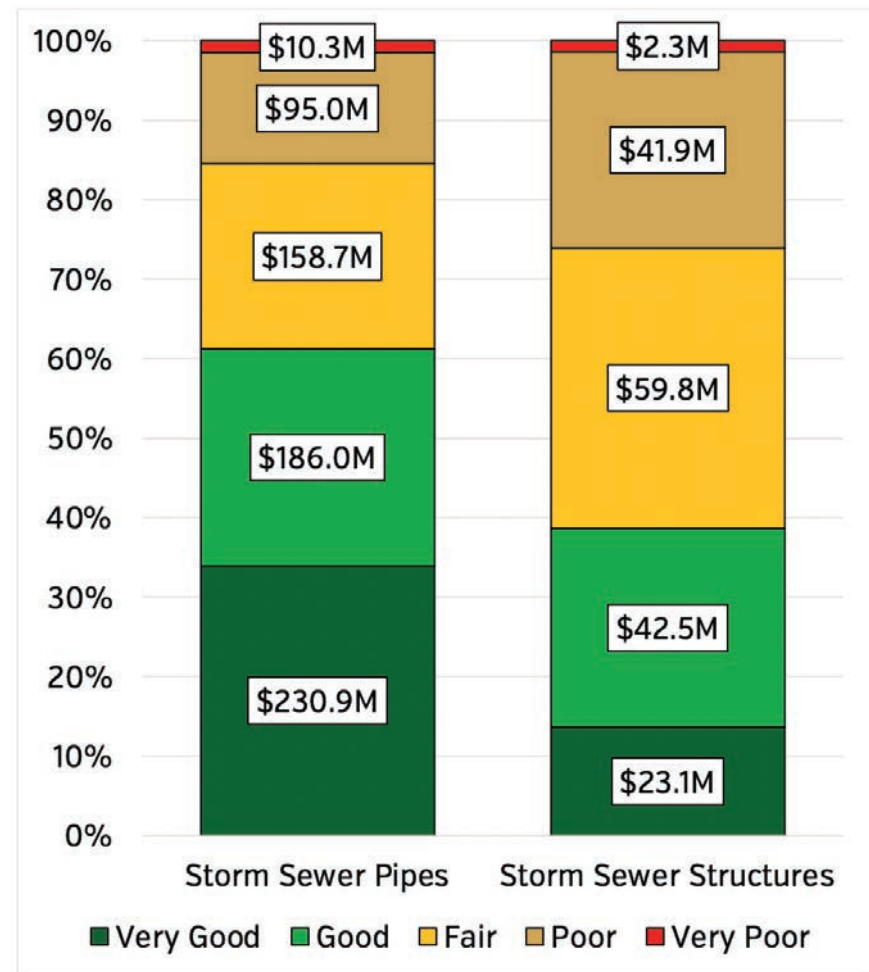
6.2 Levels of Service

6.2.1   Ontario's Requirements for Asset Management Planning

Ontario Regulation 588/17 requires legislated community levels of service for core assets, using qualitative descriptions to define the scope or quality of service delivered by an asset category. O. Reg. 588/17 also requires legislated technical levels of service for core assets which utilize metrics to measure the scope or quality of service being delivered by an asset category.

O. Reg. 588/17 also requires legislated technical levels of service for core assets. Technical levels of service use metrics to measure the scope or quality of service being delivered by an asset category. An example of a technical level of service includes percentage of the municipal stormwater management system resilient to a five-year storm. Table 31 lists the performance measures that are included in the O. Reg 588/17 requirements for Stormwater Management and Stormwater Conveyance assets.

Table 31: Community and Technical Levels of Service (Stormwater Management and Stormwater Conveyance)

Community Levels of Service	Reference	Technical Levels of Service	Current Performance
Description of the user groups or areas of the municipality that are protected from flooding, including the extent of the protection provided by the municipal stormwater management system.	The majority of the stormwater management system throughout the City provides protection from 5-year storm flows.[2]	Percentage of properties in municipality resilient to a 100-year storm.[1]	85.10%[1]
		Percentage of the municipal stormwater management system resilient to a 5-year storm. [2]	60%[2]

1. This value denotes the percentage of parcels that are considered to be located beyond the 100-year floodplain, as delineated by the Conservation Halton's Regulatory Limit.
2. This value denotes the percentage of the built stormwater conveyance system that was constructed after 1977, when the City completed and adopted its original Stormwater Management Design Manual which included sizing guidelines to ensure stormwater sewer conveyance met 5 year storm flows

6.2.2 Technical Focused Performance Measures

The City has developed their own set of unique level of service performance metrics which are used to reflect citizen values and desires. These metrics are classified below through service attributes provided by the City that summarize the type of service being provided to citizens and their wider communities. Key service attributes for community focused performance measures for stormwater assets include: Cost-Effectiveness and Quality.

Table 32 below displays technical focused performance measures, developed for a deeper understanding of performance trends for subject matter experts. These measures are utilized to support decision-making and understand the impacts of decision on the Stormwater asset portfolio.

Table 32:   Technical Focused Performance Measures for Stormwater Assets

Service Attribute	LOS Statement	Technical Focused Performance Measures	
		Performance Measure	Current Performance
Cost-Effectiveness	Providing stormwater services in an effective manner	Annual operating budget for stormwater	$1,220,054
		10 Year average stormwater capital budget	$3,103,299
Quality	Providing stormwater management at the appropriate quality	% of stormwater conveyance assets in poor or very poor condition	18%
		% of stormwater management assets in poor or very poor condition	16%
		Km of major roads (urban arterial, emergency routes, rural arterial and collector) where there is flooding during a Regulatory storm	60
		% of storm sewer network inspected annually	1.6%
		% of OGS inspected annually	100%
		% of catch basins cleaned out annually	25%
		Km of rural ditches regraded or annually	6 km

6.3 Lifecycle Management Strategy

This section focuses on specific activities that work to maintain levels of service previously outlined. The City's knowledge and understanding is continually improving through the collection and utilization of data that informs decision making related to asset lifecycle system and LOS performance metrics. The development of appropriate and cost-effective strategies is foundational for ensuring service sustainability. Further, the lifecycle management activities reduce the risks to service delivery and performance. Table 33 and Table 34 in the following section describe the lifecycle management activities currently completed or planned to be implemented by the City for Stormwater Management and Stormwater Conveyance assets, respectively. The tables also display the risks associated with the alternative do-nothing approach.

Table 33:   Stormwater Management Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	**Open Conveyance:** • Creek Inventory Inspections • Interim Creek Walkthroughs • Debris removal **Stormwater Management Facilities:** • Vegetation removal around maintenance infrastructure and access routes • Inspections • Sediment surveys **Minor Treatment (Oil and Grit Separators):** • Inspections and servicing	• Excessive erosion or flooding • Excessive overland flow during stormwater events • Contaminants and water quality issues
Renewal/ Rehab Activities Significant repairs designed to extend the life of the asset	**Open Conveyance:** • Erosion control repairs • Restoration • Staged rehab opportunities at various levels of condition • Armor stones/headwall repairs **Stormwater Management Facilities:** • Stormwater Pond Cleaning **Minor Treatment (Oil and Grit Separators):** • Cleanout	• Renewal/rehab activities may not extend asset life as much as expected, leading to premature asset failure or the need for another renewal/rehab activity • Increased lifecycle costs if renewal/rehab activities are done improperly or not as scheduled • Contaminants and water quality issues • Changes to asset use as well as modernizing systems and adjusting to increasing levels of customer and employee service • Risk of flooding due to reduced storage capacity if stormwater ponds are not cleaned of accumulated sediment

Table 33:   Stormwater Management Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Replacement Activities Activities that are expected to occur once an asset has reached the end of its estimated service life and renewal/ rehab is no longer an option	**Open Conveyance:** • Creek infrastructure replacement based on condition, age and the lifecycle management strategies **Stormwater Management Facilities:** • Replacement of components **Minor Treatment (Oil and Grit Separators):** • End of life replacement	• Risk to property, other assets (roads, sewers) if erosion is not mitigated • Delay in construction projects may result in higher costs, longer service disruption, road closures, customer dissatisfaction and health and safety risks
Non-Infrastructure Activities Actions or policies that can lower costs or extend service lives	**Open Conveyance:** • Watershed studies and modelling • Stormwater design guidelines • Watershed studies and modelling **Minor Treatment (Oil and Grit Separators):** • Stormwater design guidelines • Watershed studies and modelling	• Asset deterioration is over or underestimated • Increased demand and required capacity on the stormwater system • Potential risk of storm sewer backup and flooding on streets • Lack of coordination between local municipalities and other services may cause construction delays causing increased public disruption, construction costs and replacing assets before end of service life
Expansion / Service Enhancements Planned activities to improve an asset's capacity, quality and system reliability	**Open Conveyance:** • Capacity enhancements **Stormwater Management Facilities:** • Assumption of development-based stormwater management facilities as required **Minor Treatment (Oil and Grit Separators):** • Additions of new units and retrofits • As per identified opportunities	• Growth activities are delayed or cancelled, resulting in the system being unable to accommodate for increased flow due to population and employment growth • Incorrect sizing can cost more money to maintain and potentially lead to operational issues

Table 33:   Stormwater Management Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its estimated service life, or is otherwise no longer needed by the municipality	**Open Conveyance:** • NA **Stormwater Management Facilities:** • Disposal of materials as per regulatory requirements • Evaluating sediment reuse **Minor Treatment (Oil Grit Separators):** • Removals through standard construction practices	• Inadequate disposal of contaminants and materials • Failure to protect other infrastructure if erosion is not abated (bridges, roads, sanitary, water etc.)

Table 34: Stormwater Conveyance Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	**Storm Sewer Pipes:** • CCTV Inspection • Storm Sewer Flushing • Catch basin and sewer cleaning • Spot repairs, CB leads/replacements, minor capital • Laterals small scale repairs • Small culvert repairs **Storm Sewer Structures:** • MACP inspections on MHs • Catchbasin|repairs	• Excessive erosion or flooding • Excessive overland flow during stormwater events • Contaminants and water quality issues
Renewal/ Rehab Activities Significant repairs designed to extend the life of the asset	**Storm Sewer Pipes:** • Storm Sewer Spot Repair • Storm Sewer Spot Repair Extended • Structural lining **Storm Sewer Structures:** • Catchbasin cleaning • MH adjustments	• Renewal/rehab activities may not extend asset life as much as expected, leading to premature asset failure or the need for another renewal/rehab activity • Increased lifecycle costs if renewal/rehab activities are done improperly or not as scheduled • Changes to asset use as well as modernizing systems and adjusting to increasing levels of customer and employee service
Replacement Activities Activities that are expected to occur once an asset has reached the end of its estimated service life and renewal/ rehab is no longer an option	**Storm Sewer Pipes:** • Storm Sewer Replacement **Storm Sewer Structures:** • End of life replacement	• Delay in construction projects may result in higher costs, longer service disruption, road closures, customer dissatisfaction and health and safety risks

Table 34:   Stormwater Conveyance Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Non-Infrastructure Activities Actions or policies that can lower costs or extend service lives	**Storm Sewer Pipes:** • Stormwater design guidelines • Watershed studies and modelling **Storm Sewer Structures:** • Stormwater design guidelines • Watershed studies and modelling	• Asset deterioration is over or underestimated • Increased demand and required capacity on the stormwater system • Potential risk of storm sewer backup and flooding on streets • Lack of coordination between local municipalities and other services may cause construction delays causing increased public disruption, construction costs and replacing assets before end of service life
Expansion / Service Enhancements Planned activities to improve an asset's capacity, quality and system reliability	**Storm Sewer Pipes:** • Pipe upsizing **Storm Sewer Structures:** • MH upsizing aligned with upsizing of pipes • CB – adding additional	• Growth activities are delayed or cancelled, resulting in the system being unable to accommodate for increased flow due to population and employment growth • Incorrect sizing can cost more money to maintain and potentially lead to operational issues
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its estimated service life, or is otherwise no longer needed by the municipality	**Storm Sewer Pipes:** • Removals through standard construction practices **Storm Sewer Structures:** • Removals through standard construction practices	• Inadequate disposal of contaminants and materials

6.4 Current and Future Risks

Through workshops with Stormwater and Transportation staff, asset types were placed into a framework based on the range of severity of the consequence of failure according to three types of impacts: social, environmental and financial.

The scale of consequence can range from insignificant to severe/catastrophic and assets were assigned a weighted score based on the consequence of failure. Where appropriate, spatial attributes of an asset were incorporated into the framework (for example, storm sewer assets located below high-traffic roads). In some asset types, only those deemed most critical were assigned the highest of scores in terms of the consequence of failure. These consequence of failure scores were then incorporated into the model to inform the prioritization of funding needs used in the financial analysis. It is important to recognize that these risk frameworks are not intended to reliably predict or prevent critical asset failure but can modify how financial needs are modeled in the long-term financial model.

For this iteration of the asset management plan, risk was considered in terms of the impacts of asset failure that we recognize currently or have observed previously. But it is important to recognize future risks associated with impacts from climate change to our assets. Much of the City's stormwater infrastructure was designed and built during a time prior to our understanding the potential impacts of climate change and as a result, these assets may not prove to be as robust to the anticipated impacts of climate change. We anticipate that climate change will impact our stormwater assets in a variety of ways including: extreme rainfall events that overwhelm the capacity of the City's stormwater sewer systems, minor culverts, stormwater management ponds and creeks, resulting in flooding and possible damage to property and infrastructure; increased maintenance, repair and renewals to stormwater assets; increased erosion in creeks or along the shoreline due to extreme rainfall or storm, also resulting in increased suspended sediment input to its stormwater management ponds, creeks and Lake Ontario; and impacts to the health and water quality of the aquatic ecosystems downstream.

Future iterations of this Plan can further build onto the decision support models by incorporating climate change impacts into the stormwater risk framework.
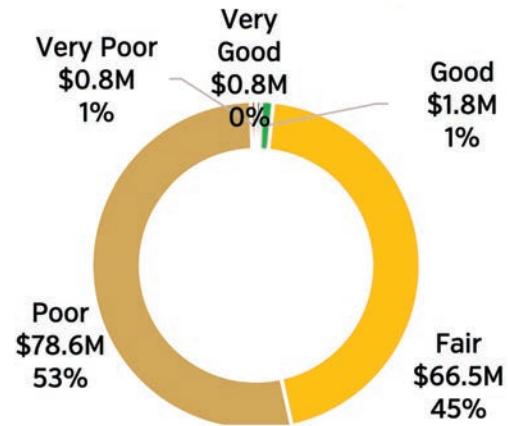
7.0
Corporate Facilities

The City of Burlington is committed to providing high-quality, efficient, safe and sustainable service and employment spaces for both residents and staff.

CITY HALL, BURLINGTON, ONTARIO

Administration Buildings

- Very Poor $0.8M 1%
- Very Good $0.8M 0%
- Good $1.8M 1%
- Poor $78.6M 53%
- Fair $66.5M 45%

7.0
Corporate Facilities

The City of Burlington is committed to providing high-quality, efficient, safe and sustainable service and employment spaces for both residents and staff.

7.0 Corporate Facilities

The City owns and operates Corporate Facilities that are used by staff, Council and members of the public. Ensuring that these facilities are well maintained helps to provide a safe working environment and enables a range of corporate internal and public services to run smoothly and efficiently. Corporate facilities include general service facilities such as administrative buildings and operations centres that are used by several different service areas.

7.1 State of the Local Infrastructure

7.1.1 Asset Inventory and Valuation

Having safe and reliable facilities is a fundamental expectation of City staff and members of the community. The City's corporate facility asset portfolio consists of facilities that primarily provide an administrative function. This includes: City Hall, the Operations Centre campus (comprised of multiple buildings on site), the Animal shelter and Cemetery Operations buildings. This section summarizes the portfolio of assets associated with the various corporate facilities managed by the City.

The City of Burlington's portfolio of infrastructure assets for Corporate Facilities is valued at $148.3 million. This replacement value is derived from individual system level assets / components within the facility management system. Table 35 and Table 36 summarizes the Corporate Facilities inventory, the associated replacement value and average condition scores.

Table 35:   Asset Valuations for the City's Corporate Facilities System

	Administration Buildings
Total Replacement Value	$148.3M
Average Condition Score	Poor

Table 36:   Corporate Facilities Inventory and Valuation for Administration Buildings and Other Corporate Facilities

Asset Type	Asset Sub-Type	Quantity	Replacement Value	Average Age	Average Condition
Administration Buildings	Animal Shelter	1	$5.1M	25	Fair
	Burlington Operations Centre Campus Buildings	9	$82.0M	11	Poor
	Cemetery Operation Buildings	2	$2.3M	53	Fair
	City Hall	1	$58.9M	56	Fair
TOTAL			$148.3M	15	Fair

7.1.2 Asset Age Summary

Figure 25 displays average asset age as a proportion of the Estimated Service Life (ESL) by asset for Corporate Facilities. The average ages for facilities were determined through the completion of a third-party building condition assessment in 2010. As shown below, average ages have not surpassed the average ESL for any asset type and are relatively younger.

Figure 25:   Average Asset Age as a Proportion of Average Asset ESL (Corporate Facilities assets)
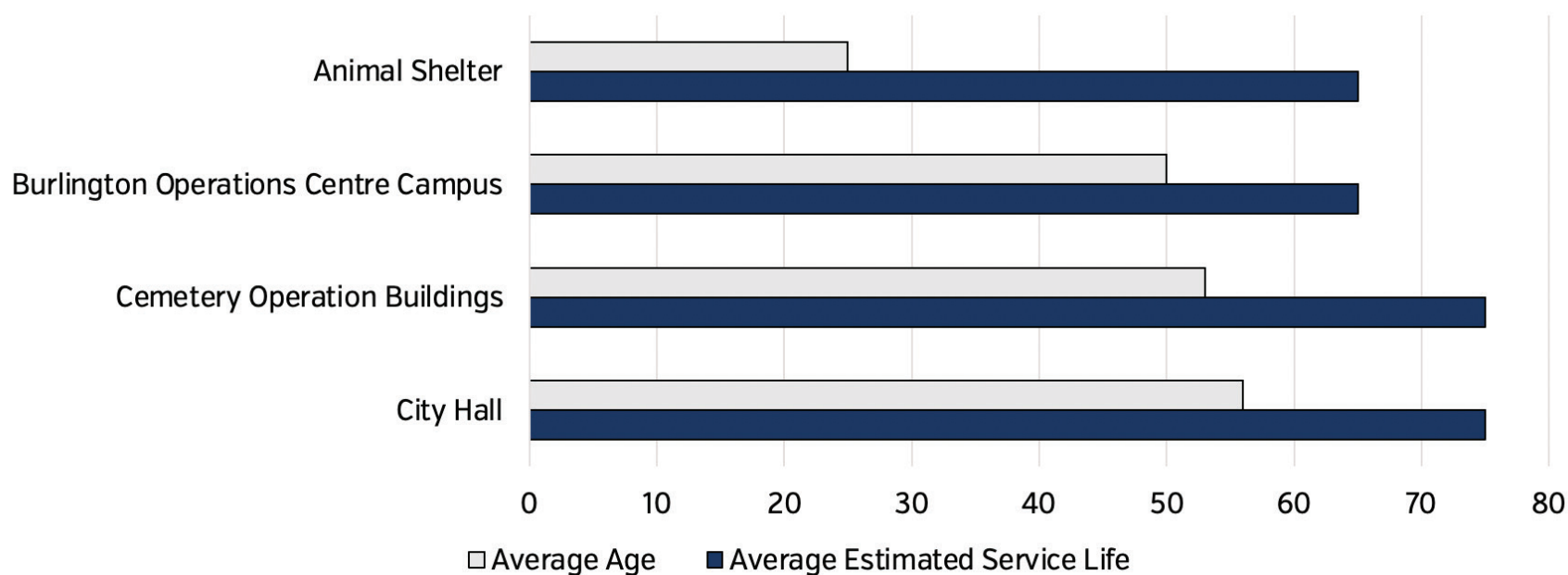
7.1.3 Asset Condition

This section outlines the breakdown of assets in each condition category based on the percentage of total replacement value. Asset condition was categorized based on the scale as shown in Table 37.

Table 37:   Corporate Facilities Condition Scale

Performance Category	Facility Condition Index (FCI)
Very Good	0.01 to 0.02
Good	0.03 to 0.05
Fair	0.06 to 0.1
Poor	0.11 to 0.49
Very Poor	0.5 to 1.0

City facilities are maintained through corporate contracts and condition assessments are carried out by qualified assessors. Comprehensive condition assessments are typically performed on a 5-year basis and additional interim assessments are completed as required. Condition can be assessed at the asset level, as well as at the Facility level using the industry standard Facility Condition Index (FCI). This value does not represent a visually assessed condition of the facility, but the ratio between renewal need costs and the replacement value of the facility.

Majority of the City's Corporate Facilities are in are in Poor condition, driven by one of the City's highest value assets in the portfolio (RPF Operations Centre) The remaining assets in the portfolio range from Poor to Fair condition. Figure 26 illustrates the condition distribution of the City's Corporate Facilities assets.

Figure 26:   Asset Conditions Summary (Corporate Facilities assets)
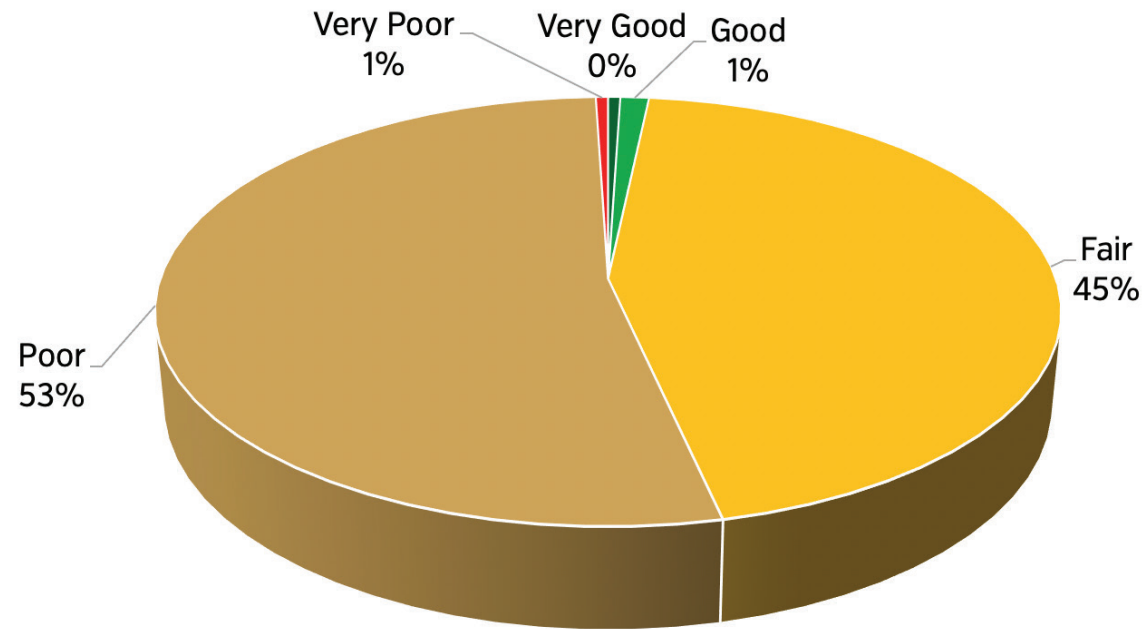
7.1.3.1 Administration Buildings

Figure 27 outlines the condition of Administrative Buildings as a proportion of replacement value based on FCI. All facilities are grouped in the Fair or Poor condition category, including Operations Centres, City Hall and Animal Shelters.

Figure 27: Administration Buildings Condition by Asset Type and Percentage of Replacement Value
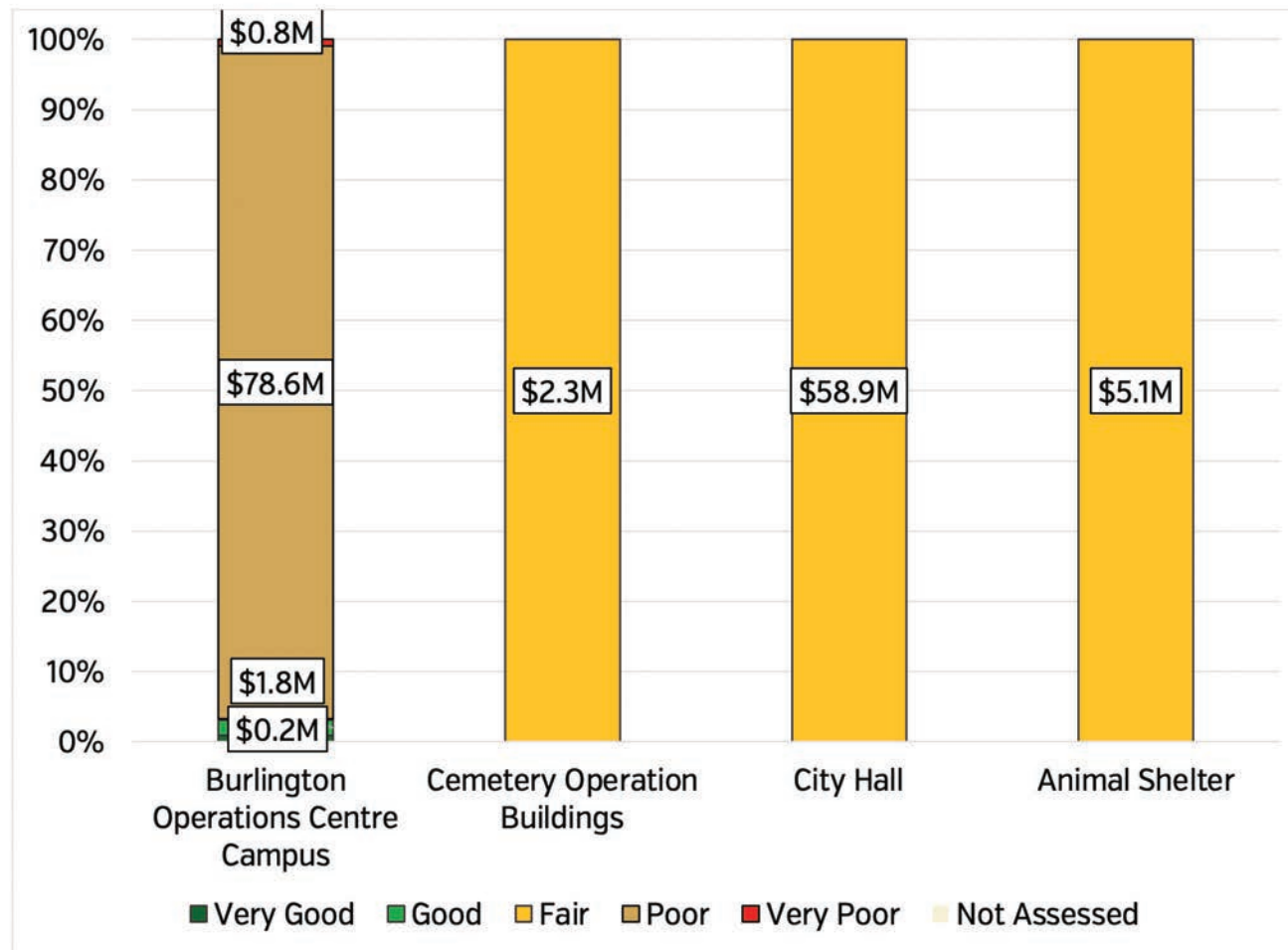
7.2 Levels of Service

7.2.1 Community and Technical Focused Performance Measures

The City has developed their own set of unique Level of Service performance metrics which are used to reflect citizen values and desires. These metrics are classified in Table 38 below through service attributes that summarize the type of service being provided to citizens and their wider communities. Key service attributes for community and technical focused performance measures for Corporate Facilities include: Accessibility, Cost Effectiveness, Sustainability, Safety and Quality.

Table 38:   Community Focused Performance Measures for Corporate Facilities

Service Attribute	LOS Statement	Community Focused Performance Measures	
		Performance Measure	Current Performance
Accessibility	Providing facilities management services to ensure that facilities are AODA compliant.	% of facilities that are AODA compliant where technically feasible	85%
Quality	Providing facilities in acceptable condition	% of facilities in poor or very poor condition	55.3%

Table 39 below displays technical focused performance measures, developed for a deeper understanding of performance trends for subject matter experts. These measures are utilized to support decision-making and understand the impacts of decision on the Corporate Facilities asset portfolio.

Table 39:   Technical Focused Performance Measures for Corporate Facilities Assets

Service Attribute	LOS Statement	Technical Focused Performance Measures	
		Performance Measure	Current Performance
Cost-Effectiveness	Providing facilities management services in an efficient manner	10 Year forecast average corporate facility asset renewal budget as a % of replacement value	3%
		Annual operating budget for corporate facilities management	$2,972,912
Sustainability	Providing facilities that are environmentally conscious	Annual electricity consumption per square metre (kWh/sq.m)	73.4
		Annual water consumption per square metre (m^3/sq.m)	0.48
		Annual natural gas consumption per square metre (m^3/sq.m)	18.2
		Total annual Greenhouse Gas emissions per square metre	36,541 g CO^2/sq.m
Quality	Providing facilities in acceptable condition	FCI of facilities	0.48
Safety	Providing facilities management services to ensure that facilities are safe	% of facilities that meet security requirements	100%

7.3 Lifecycle Management Strategy

This section focuses on specific activities that work to maintain levels of service previously outlined. The City's knowledge and understanding is continually improving through the collection and utilization of data that informs decision making related to asset lifecycle system and LOS performance metrics.

The development of appropriate and cost-effective strategies is foundational for ensuring service sustainability. Further, the lifecycle management activities reduce the risks to service delivery and performance.

Table 40 in the following section describe the lifecycle management activities currently completed or planned to be implemented by the City for Corporate Facilities assets, respectively. The table also displays the risks associated with the alternative do-nothing approach.

Table 40:   Corporate Facilities Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	• Inspections through corporate contracts • General facility maintenance • Critical equipment maintenance and scheduled overhauls • Comprehensive condition assessment of equipment within contracts • Contract initiation condition assessments • Interim assessment to assess quality of service	• Deficiencies are not identified through inspections due to concealed components or difficult access • Increased lifecycle costs if maintenance is done improperly or not as scheduled • Incorrectly planned maintenance activities can lead to premature asset failure
Renewal/Rehabilitation Activities Significant repairs designed to extend the life of the asset	• Mid-life renewal of facilities and major overhauls and modernization of equipment to support department service	• Renewal/rehab activities may not extend asset life as much as expected, leading to premature asset failure or the need for another renewal/rehab activity • Increased lifecycle costs if renewal/rehab activities are done improperly or not as scheduled • Changes to asset use as well as modernizing systems and adjusting to increasing levels of customer and employee service are unknown and could lead to large expenditures

Table 40: Corporate Facilities Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Replacement Activities Activities that are expected to occur once an asset has reached the end of its estimated service life and renewal/rehab is no longer an option	• Demolition and Replacement • Major renovation including large additions and property acquisition	• Large, complex design and construction projects may increase capital costs • Lead to inefficiencies and substandard services for both customers and staff
Non-Infrastructure Activities Actions or policies that can lower costs or extend service lives	• Facility Master Plans • Community Outreach / Customer Engagement • Corporate Energy and Emissions Plan	• Asset deterioration is over or underestimated • Inaccurate growth numbers and estimation of funding
Expansion Activities Planned activities to improve an asset's capacity, quality and system reliability	• Facility Upgrades and Service Enhancements • New Facilities and Buildings • Building and/or property acquisition • Leasing additional buildings and/or properties • Growth and expansions are guided by but not limited to the Burlington's Strategic Plan 2015-2020 and the 2018-2022 Burlington's Plan: From Vision to Focus	• Growth activities are delayed or cancelled, resulting in the system being unable to accommodate for population and employment growth • Master Plans may overestimate, or underestimate required road expansions to accommodate for growth

Table 40:   Corporate Facilities Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its estimated service life, or is otherwise no longer needed by the municipality	• Decommissioning • Sale • Change of Ownership • Consolidation of Buildings • Repurposing Buildings	• Improper disposal can lead to environmental impacts and expenses

7.4 Current and Future Risks

The scale of consequence can range from insignificant to severe/catastrophic and assets were assigned a weighted score based on the consequence of failure. In some asset types, only those deemed most critical were assigned the highest of scores in terms of the consequence of failure, such as corporate facilities that support critical operations support. These consequence of failure scores were then incorporated into the model to inform the prioritization of funding needs used in the financial analysis. It is important to recognize that these risk frameworks are not intended to reliably predict or prevent critical asset failure but can modify how financial needs are modeled in the long-term financial model.

For this iteration of the asset management plan, risk was considered in terms of the impacts of asset failure that we recognize currently or have observed previously. But it is important to consider impacts from other risks in the future such as those from climate change.

We anticipate that climate change will impact our Corporate Facility assets in a variety of ways including damage, flooding or facility closures due to extreme rainfall, heat and other extreme weather events, and increased demands on heating and cooling systems. The City has established the goal of reducing GHG emissions by 2040 to achieve net carbon neutrality for city operations. Climate Change mitigation efforts are identified through the process outlined in the Corporate Energy and Emissions Management Plan. Major action items include:

- Constructing and renovating to low carbon or net carbon neutral standards for major projects
- Installation of renewable energy (geo-exchange systems and solar photovoltaics)
- Commissioning of ongoing or monitored-based activities.
- Deep energy retrofit studies for upcoming capital replacements

Future iterations of this Plan can further build onto the decision support models by incorporating climate change impacts into the Facilities risk framework.
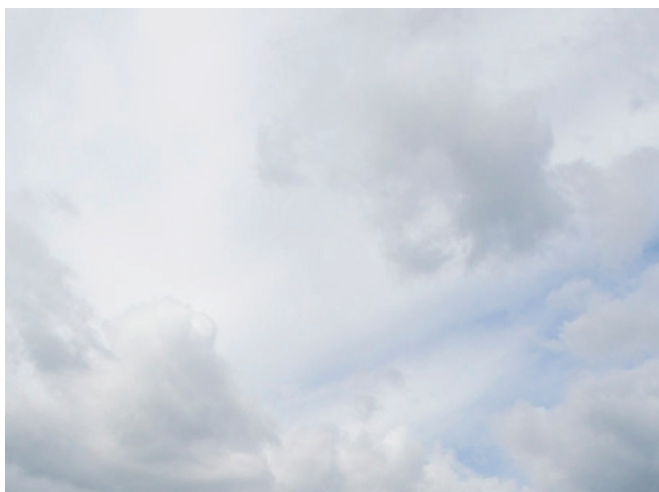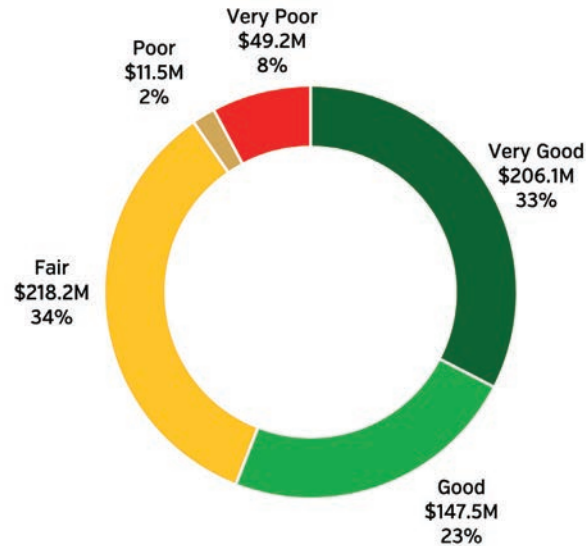
8.0
Recreation, Community & Culture

The City of Burlington is committed to efficiently providing high quality, safe and accessible recreation service for the public and to enhancing the quality of life of every one every day, through individual well-being and a sense of belonging.

ROTARY CENTENNIAL POND, BURLINGTON, ONTARIO

All Recreation, Community & Culture Assets

- Very Poor $49.2M 8%
- Poor $11.5M 2%
- Fair $218.2M 34%
- Good $147.5M 23%
- Very Good $206.1M 33%

8.0

Recreation, Community & Culture

The City of Burlington is committed to efficiently providing high quality, safe and accessible recreation service for the public and to enhancing the quality of life of every one every day, through individual well-being and a sense of belonging.

8.0 Recreation, Community and Culture

Recreation, Community and Culture (RCC) assets play an integral role in the community, promoting a safe, healthy and fun lifestyle. Recreation, community and culture contributes to community building through the facilitation of active and passive activities, opportunities for structured and spontaneous play, strengthening of neighbourhood connections, local tourism, learning, public enjoyment and more. Recreation assets include indoor activities such as the services offered in arenas and indoor pools, community centres and well as important outdoor facilities which include outdoor pools and golf courses. Community assets include facilities such as community centres and libraries and Culture assets include facilities such as museums, public art and monuments.

The City is in the process of developing a Parks and Recreation Facilities Master Plan for interior and outdoor recreational facilities. It will update the overall vision, direction and guidance for planning and making decisions. It is informed by public input and is aligned to local, provincial and national policies, strategies, best practices, trends, demographics and growth forecasts.
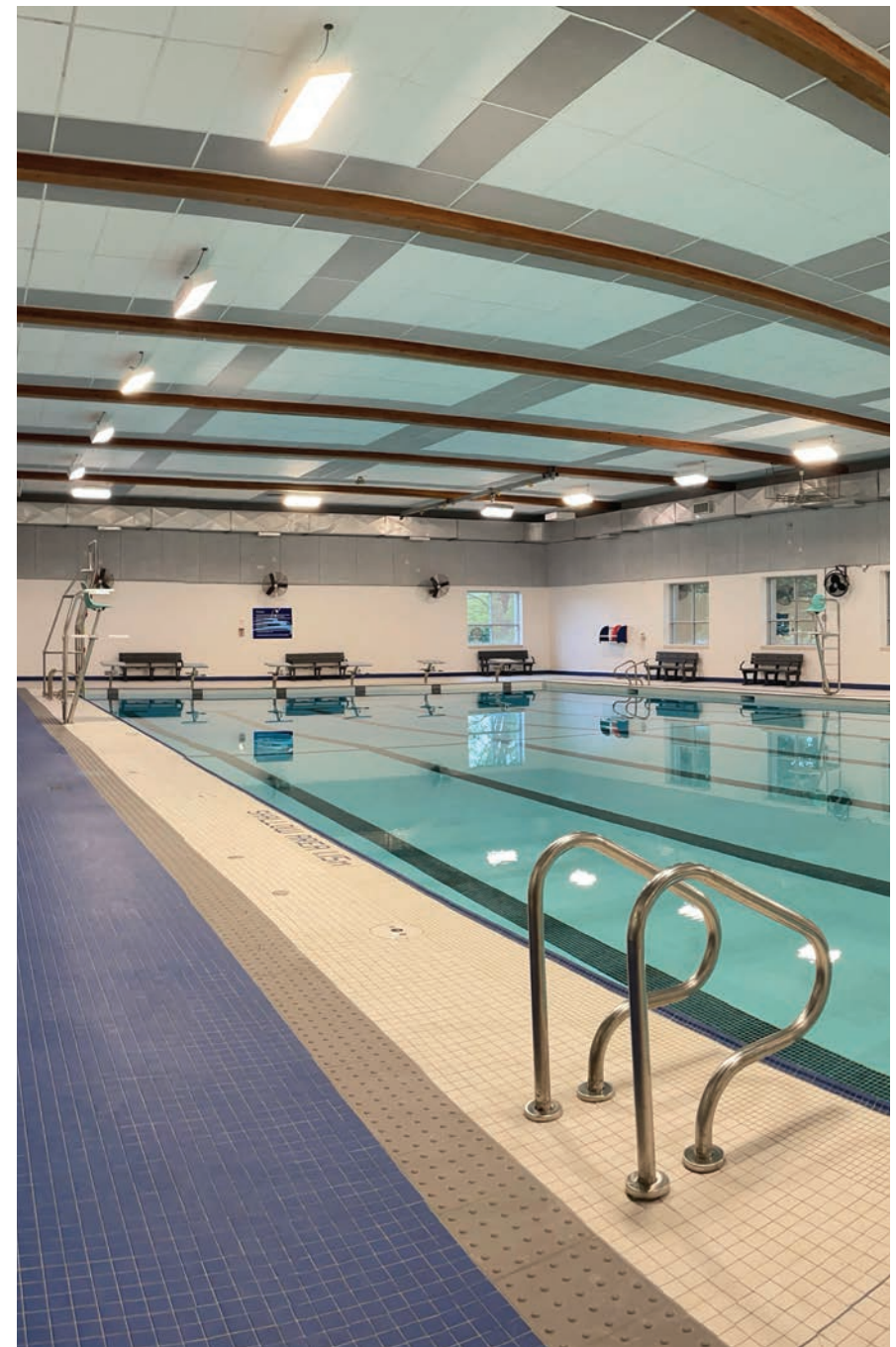
8.1   State of the Local Infrastructure

8.1.1   Asset Inventory and Valuation

Having safe and accessible recreation services is a fundamental expectation of many members of the community. The City's Recreation, Community and Culture asset portfolio is comprised of Culture Facilities, Recreation Facilities and Community Facilities. This section summarizes the portfolio of facilities associated with Recreation, Community and Culture managed by the City.

As shown in Table 41, the City of Burlington's portfolio of facilities for Recreation, Community and Culture is valued at $633 million which is comprised of a mixture of Recreation Facilities valued at $319 million, Community Facilities valued at $157 million, and Culture Facilities valued at $156 million. Joint Venture assets include building and recreation amenities that have collaborative agreements in place with community groups, boards, or not-for-profit user groups. This replacement value is derived from individual system level assets / components within the facility management system. Table 41 summarizes the Recreation, Community and Culture System inventory, the associated replacement value and average condition scores.

Table 41:   Asset Valuations for the City's Recreation, Community and Culture Assets

	Culture	Recreation	Community
Total Replacement Value	$156.4M	$319.2M	$157.0M
Average Condition Score	Good	Poor	Fair

Table 42 summarizes the asset inventory and valuation of these assets in greater detail.

Table 42:   Inventory and Valuation for Recreation, Community and Culture Assets

Asset Type	Asset Sub-Type	Quantity	Replacement Value	Average Age	Average Condition
Recreation Facilities	Arenas	7	$200.0M	16	Fair
	Golf Course Buildings, Amenities and Equipment	57	$10.8M	14	Fair
	Pools	7	$108.4M	50	Poor
Community Facilities	Community Centres	14	$98.8M	19	Fair
	Joint Venture	14	$23.9M	49	Poor
	Event Venues	4	$34.3M	58	Fair
Culture Facilities	Museums	2	$24.3M	119	Good
	Arts Facilities	2	$77.3M	26	Fair
	Libraries	4	$53.1M	25	Fair
	Public Art Installations	74	$1.6M	12	Very Good
TOTAL			$632.5M	19	Fair

8.1.2 Asset Age Summary

Figure 28 displays average asset age as a proportion of the Estimated Service Life (ESL) by asset for all Recreation, Community and Culture facilities. The average age of facility assets was determined through confirming with City records and building condition assessment data. As shown below, average ages have not surpassed the average ESL for any asset type and are relatively younger. It should be noted that the average ESL for Golf Facilities is lower as a result of vehicles being grouped within this category. Additionally, Public Art Installations are not included within the figure below because Public Art Installations do not have a defined ESL and replacement value varies for each installation.

Figure 28:   Average Asset Age as a Proportion of Average Asset ESL (Recreation, Community and Culture)
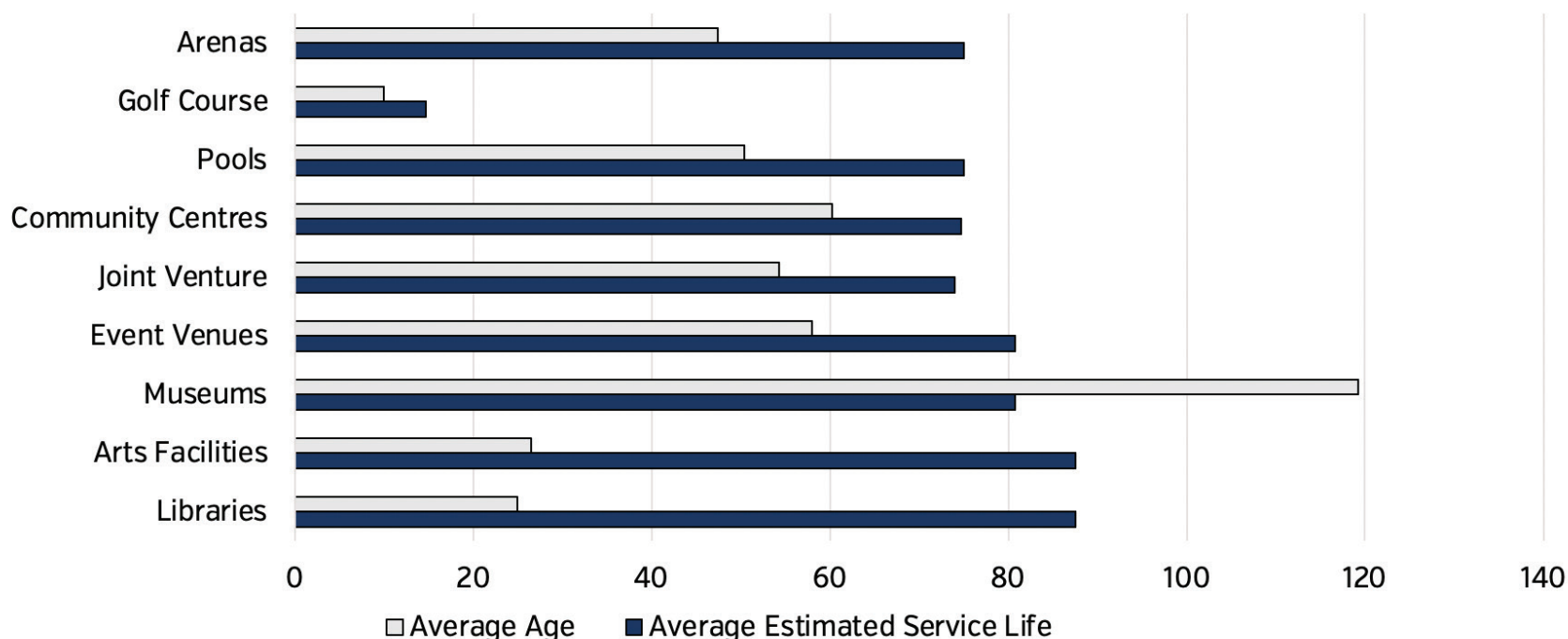
8.1.3 Asset Condition

This section outlines the breakdown of assets in each condition category based on the percentage of total replacement value. Asset condition was categorized based on the scale as shown in Table 43.

Table 43: Recreation, Community and Culture Condition Scale

Performance Category	Facility Condition Index (FCI)
Very Good	0.01 to 0.02
Good	0.03 to 0.05
Fair	0.06 to 0.1
Poor	0.11 to 0.49
Very Poor	0.5 to 1.0

City facilities are maintained through corporate contracts and condition assessments are carried out by qualified assessors. Comprehensive condition assessments are typically performed on a 5-year basis and additional interim assessments are completed as required. The City utilizes the VFA program as an asset decision support solution to help manage facility asset data. Condition can be assessed at the asset level, as well as at the Facility level using the industry standard Facility Condition Index (FCI). This value does not represent a visually assessed condition of the facility, but the ratio between renewal need costs and the replacement value of the facility.

As shown in Figure 29, 56% of the total replacement value for Recreation, Community and Culture facilities are in Very Good and Good Condition, while 34 % are in Fair condition and the remaining assets, approximately 10% are in Poor and Very Poor condition by replacement value.
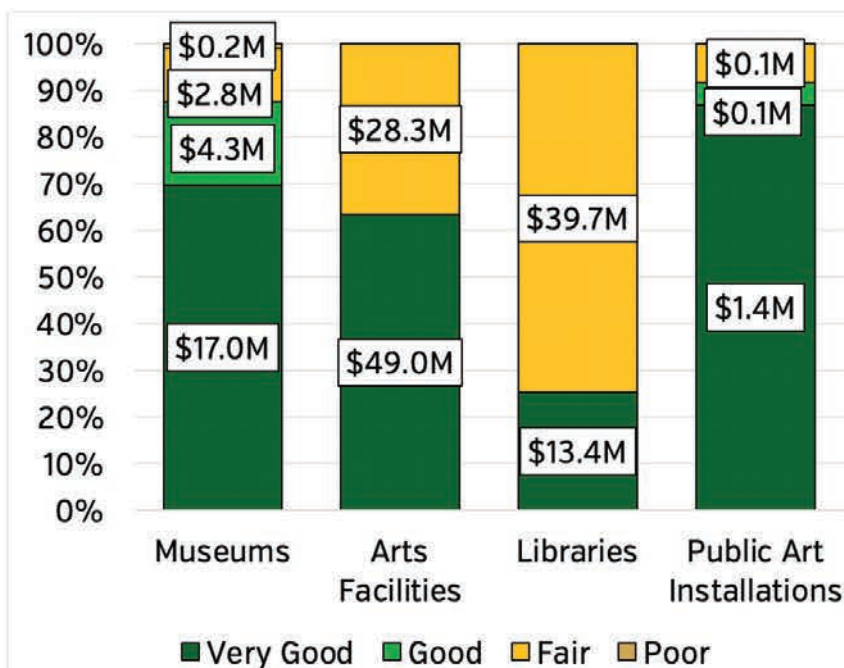

Figure 29: Asset Condition Summary (Recreation, Community and Culture assets)
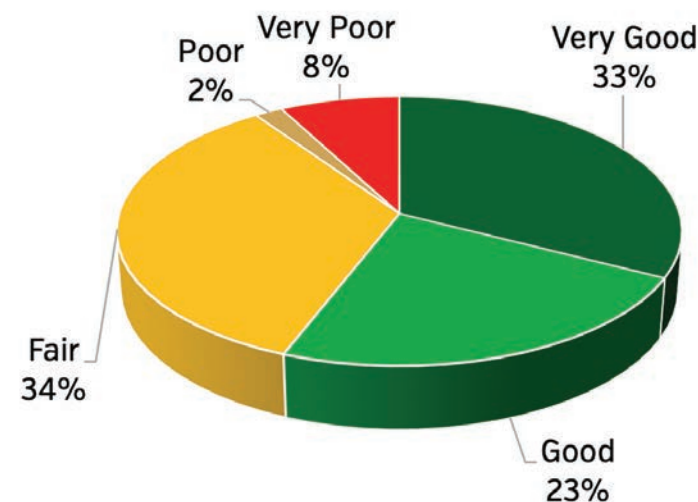
8.1.3.1   Culture Facilities

Culture Facilities include Museums, Art Facilities, Libraries and Public Art Installations. Figure 30 outlines the condition of these assets as a proportion of replacement value. The majority of Museums, Art Facilities and Public Art Installations are in Very Good to Good condition While approximately 75% of Libraries are in Very Good to Fair condition with the remaining 25% in Very Good condition.

8.1.3.2   Recreation Facilities

Recreation Facilities include Arenas, the Tyandaga Golf Course, and Pools. The majority of Arenas are in Very Good to Fair condition while the Golf Course assets and Pools are generally in Very Good to Good condition as shown in Figure 31.

Figure 30:   Culture Facilities by Asset Type and Percentage of Replacement Value

Figure 31:   Recreation Facilities by Asset Type and Percentage of Replacement Value
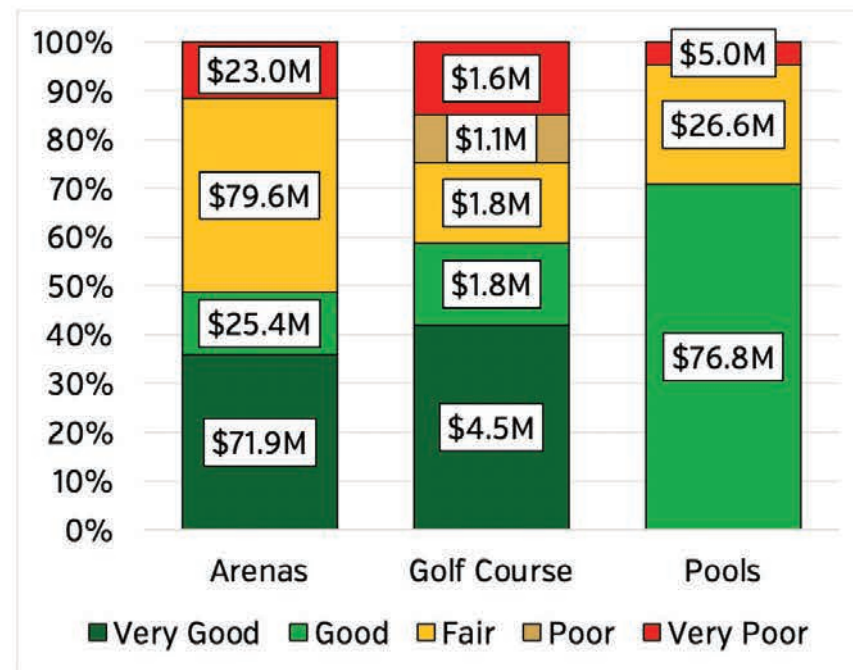
8.1.3.3   Community Facilities

Community Facilities include Community Centres, Joint Venture Facilities and Event Venues. Figure 33 outlines the condition of these assets as a proportion of replacement value based on FCI. Approximately 80% of Community Centres are in Very Good to Fair condition with the remaining 20% in Poor to Very Poor Condition. The majority of Joint Venture Facilities are in Fair to Poor condition while most Event Venues are in Very Good to Good condition with the remaining 32% in Fair condition.

The City will need to monitor the growing value of Community Centre and Joint Venture assets in a poor and very poor condition state to ensure service levels can be maintained.

Figure 32:   Community Facilities by Asset Type and Percentage of Replacement Value
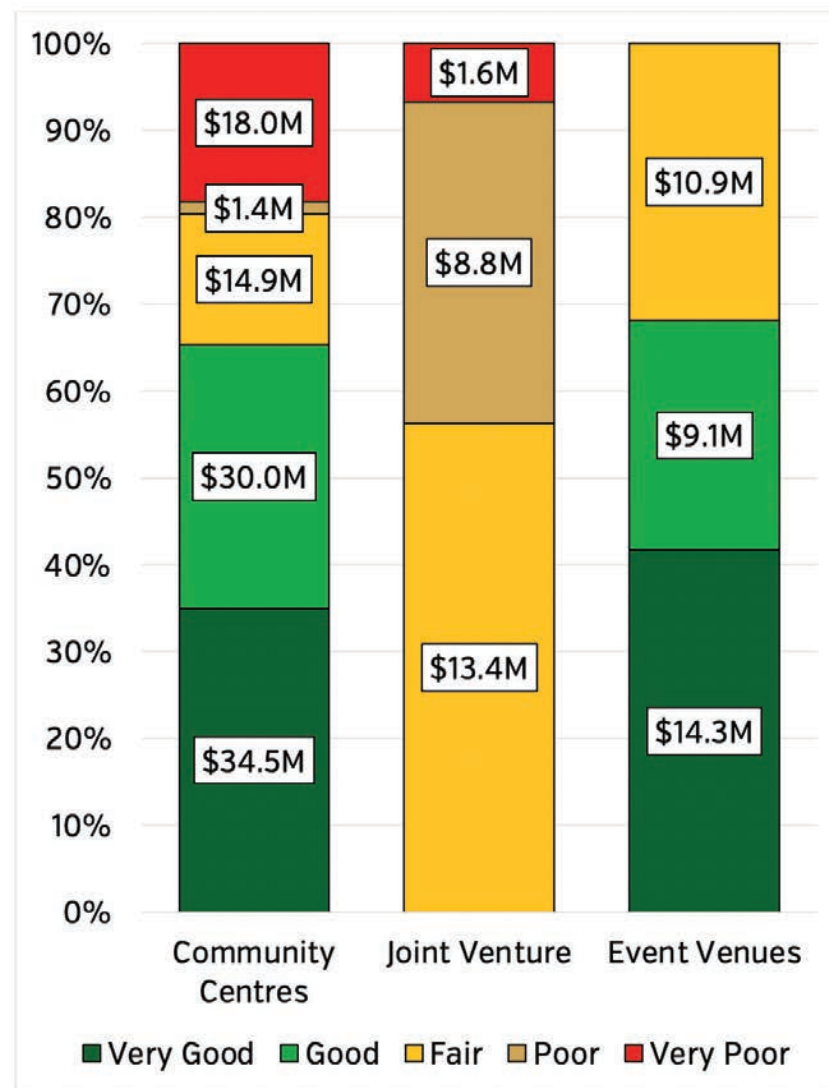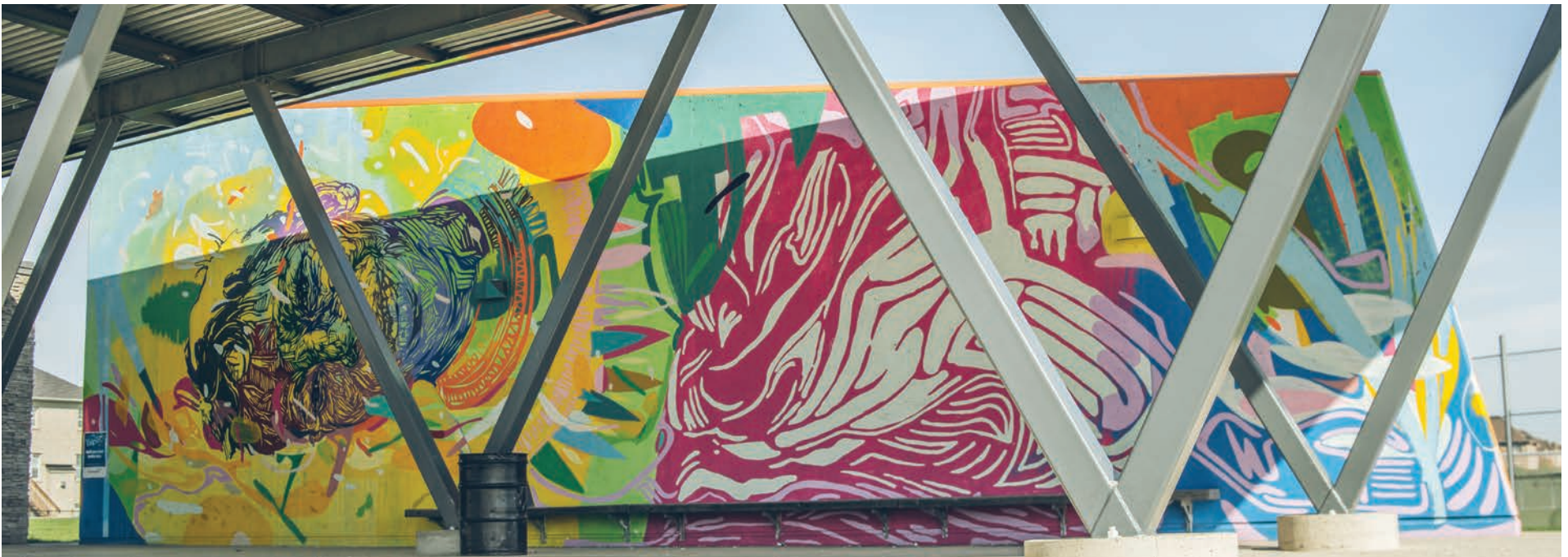
8.2 Levels of Service

8.2.1 Community and Technical Focused Performance Measures

The City has developed their own set of unique level of service performance metrics which are used to reflect citizen values and needs. These metrics are classified below through service attributes provided by the City that summarize the type of service being provided to citizens and the broader community. These metrics are displayed in Table 44. Key service attributes for community focused performance measures for Recreation, Community and Culture assets include: Accessibility, Cost-Effectiveness, Quality and Safety.

Table 44:   Community Focused Performance Measures for Recreation, Community and Culture Assets

Service Attribute	LOS Statement	Community Focused Performance Measures	
		Performance Measure	Current Performance
Accessibility	Providing recreation facilities and amenities that are AODA compliant	% of recreation facilities that are AODA compliant where technically feasible	85%
Cost-Effectiveness	Providing recreation services in an efficient manner	Average recreation asset renewal rate (# years)	91
Quality	Providing community recreation facilities in acceptable condition	% of community recreation, community & culture assets in poor or very poor condition	23%
	Providing recreation facilities at the expected standard	Average corporate rating of Community Centres facilities	3.2 out of 5
		Average corporate rating[1] of Arena facilities	2.6 out of 5
		Average corporate rating[1] of Aquatic facilities	3.9 out of 5

1.   Corporate ratings were completed by department staff and are based on a combination of a facility's condition and functionality.

Table 45 below displays technical focused performance measures, developed for a deeper understanding of performance trends for subject matter experts. These measures are utilized to support decision-making and understand the impacts of decision on the Recreation, Community and Culture asset portfolio.

Table 45: Technical Focused Performance Measures for Recreation, Community and Culture Assets

Service Attribute	LOS Statement	Technical Focused Performance Measures	
		Performance Measure	Current Performance
Accessibility	Providing an appropriate number of recreation facilities and amenities	# of recreation, community and cultural facilities per 10,000 residents	1.57
		# of ice surfaces per 10,000 residents	0.61
		# of aquatic facilities per 10,000 residents	0.35
		# of cultural facilities/Local Boards per 10,000 residents	0.72
Cost Effectiveness	Providing recreation services in an efficient manner	Annual operating budget for recreation facilities	$8,620,979
Sustainability	Providing community recreation facilities that are environmentally conscious	Total annual Greenhouse Gas emissions per square metre	8,978 g CO^2/sq.m
		Annual electricity consumption per square metre	169 kWh/sq.m (2020) 191 kWh/sq.m (2019) 188 kWh/sq.m (2018)
		Annual water consumption per square metre	1.70 m³/sq.m (2020) 1.98 m³/sq.m (2019) 2.05 m³/sq.m (2018)
		Annual natural gas consumption per square metre	16.7 m³/sq.m (2020) 24.4 m³/sq.m (2019) 24.2 m³/sq.m (2019)
		Total annual Greenhouse Gas emissions per square metre	50,932 CO^2/sq.m (2018) 51,455 CO^2/sq.m (2019) 35,417 CO^2/sq.m (2020)

Service Attribute	LOS Statement	Technical Focused Performance Measures	
		Performance Measure	Current Performance
Quality	Providing golf amenities at an acceptable standard	GolfPass™ Score	3.6 out of 5
	Providing facilities in acceptable condition	FCI of recreation facilities	0.60
Safety	Providing safe community recreation facilities	% completed safety improvements identified in 2013 Accessibility Audit	80%
		% of facilities that meet security standards	100%
		Monthly safety Inspections	50

1. Using 2017 – 2019 data

8.3 Lifecycle Management Strategy

This section focuses on specific activities that work to maintain levels of service previously outlined. The City's knowledge and understanding is continually improving through the collection and utilization of data that informs decision making related to asset lifecycle system and LOS performance metrics. The development of appropriate and cost-effective strategies is foundational for ensuring service sustainability. Further, the lifecycle management activities reduce the risks to service delivery and performance. Table 46 in the following section describes the lifecycle management activities currently completed or planned to be implemented by the City for Recreation, Community and Culture assets. The Tables also display the risks associated with the alternative do-nothing approach.

Table 46:   Recreation, Community and Culture Lifecycle Management Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	• Inspections through corporate contracts • General facility maintenance and scheduled overhauls • Critical equipment maintenance and overhauls • Comprehensive condition assessment of equipment within contracts • Contract initiation condition assessments • Interim assessment to assess quality of service	• Deficiencies are not identified through inspections due to concealed components or difficult access • Increased lifecycle costs if maintenance is done improperly or not as scheduled • Incorrectly planned maintenance activities can lead to premature asset failure

Table 46:   Recreation, Community and Culture Lifecycle Management Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Renewal/Rehabilitation Activities Significant repairs designed to extend the life of the asset	• Mid-life renewal of facilities and major overhauls and modernization of equipment to support department service	• Renewal/rehab activities may not extend asset life as much as expected, leading to premature asset failure or the need for another renewal/rehab activity • Increased lifecycle costs if renewal/rehab activities are done improperly or not as scheduled. • Changes to asset use as well as modernizing systems and adjusting to increasing levels of customer and employee service are unknown and could lead to large expenditures
Replacement Activities Activities that are expected to occur once an asset has reached the end of its estimated service life and renewal/rehab is no longer an option	• Demolition and replacement • Major renovation including large addition and property acquisition	• Large, complex design and construction projects may increase capital costs • Lead to inefficiencies and substandard services for both staff and customers
Non-Infrastructure Activities Actions or policies that can lower costs or extend service lives	• Facility condition assessments • Facility master plans • Detailed condition assessments • Community outreach / customer engagement • Corporate Energy and Emissions plan	• Asset deterioration is over or underestimated • Inaccurate growth numbers and estimation of funding

Table 46:   Recreation, Community and Culture Lifecycle Management Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Expansion Activities Planned activities to improve an asset's capacity, quality and system reliability	• Facility upgrades and service enhancements • New facilities and buildings • Building and/or property acquisition • Leasing additional building and or properties • Growth and expansions are guided by but not limited to Burlington's Strategic Plan 2015-2040, 2018-2022 Burlington's Plan: From Vision to Focus	• Growth activities are delayed or cancelled, resulting in the system being unable to accommodate for population and employment growth • Master Plans may overestimate, or underestimate required road expansions to accommodate for growth
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its estimated service life, or is otherwise no longer needed by the municipality	• Decommissioning • Sale • Change of ownership • Consolidation of buildings • Repurposing buildings	• Improper disposal can lead to environmental impacts and expenses

8.4 Current and Future Risks

Through workshops with Recreation, Community & Culture and Facilities staff, asset types were placed into a framework based on the range of severity of the consequence of failure according to three types of impacts: social, environmental and financial.

The scale of consequence can range from insignificant to severe/catastrophic and assets were assigned a weighted score based on the consequence of failure. In some asset types, only those deemed most critical were assigned the highest of scores in terms of the consequence of failure, such as facilities that provide recreational and programming services. These consequence of failure scores were then incorporated into the model to inform the prioritization of funding needs used in the financial analysis. It is important to recognize that these risk frameworks are not intended to reliably predict or prevent critical asset failure but can modify how financial needs are modeled in the long-term financial model.

For this iteration of the asset management plan, risk was considered in terms of the impacts of asset failure that we recognize currently or have observed previously. But it is important to consider impacts from other risks in the future such as those from climate change.

We anticipate that climate change will impact our recreational assets in a variety of ways, including increased demand or reliance on City community centres and recreational facilities as cooling centres due to an increase in summer temperatures and increased frequency and duration of extreme heat events; increased demand or reliance on facilities as emergency response centres in the event of severe weather such as extreme rainfall, wind or winter; increased wear and damage to facilities and their heating, cooling and exterior components due to damage from extreme heat or weather events, impacts on operations of outdoor winter amenities due to milder winter temperatures and weather extremes.

The City has established the goal of reducing Green House Gas (GHG) emissions by 2040 to achieve net carbon neutrality for City operations. Climate Change mitigation efforts are identified through the process outlined in the Corporate Energy and Emissions Management Plan. Major action items include:

- Constructing and renovating to low carbon or net carbon neutral standards for major projects.
- Installation of renewable energy (geo-exchange systems and solar photovoltaics).
- Commissioning of ongoing or monitored-based activities.
- Deep energy retrofit studies for upcoming capital replacements.
- Expand electrification of RCC equipment where possible (ice re-surfacers).

Future iterations of this Plan can further build onto the decision support models by incorporating climate change impacts into the Recreation, Community and Culture risk framework.
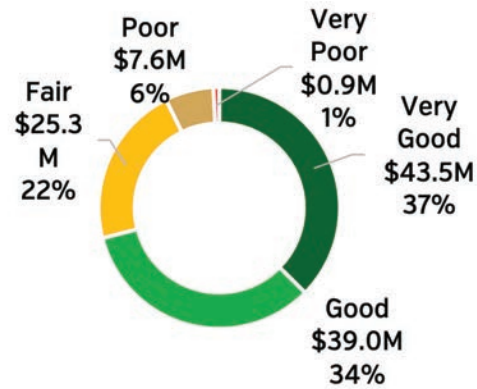
9.0
Parks

The City of Burlington is committed to efficiently providing high quality parks, open spaces and trails for people of all ages and abilities.
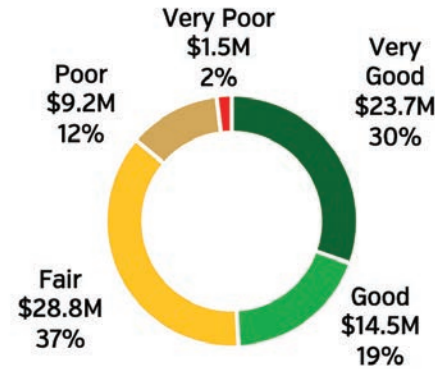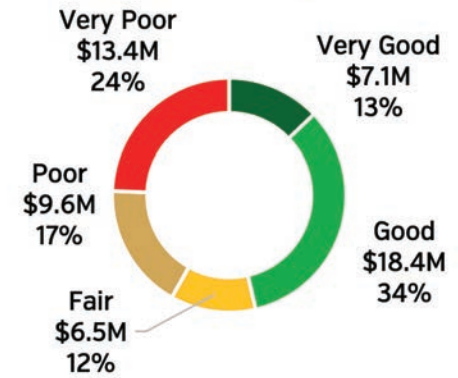
Parks Linear

- Very Poor $0.9M 1%
- Poor $7.6M 6%
- Fair $25.3M 22%
- Good $39.0M 34%
- Very Good $43.5M 37%

Parks Amenities

- Very Poor $1.5M 2%
- Poor $9.2M 12%
- Fair $28.8M 37%
- Good $14.5M 19%
- Very Good $23.7M 30%

Parks Facility

- Very Poor $13.4M 24%
- Poor $9.6M 17%
- Fair $6.5M 12%
- Good $18.4M 34%
- Very Good $7.1M 13%

9.0
Parks

The City of Burlington is committed to efficiently providing high quality parks, open spaces and trails for people of all ages and abilities.

9.0 Parks

Burlington's Parks infrastructure spans over 700 hectares and plays an important role in contributing to a "Healthy and Greener City," a key strategic direction established in the City's Strategic Plan. The City currently owns and maintains City, Community and Neighbourhood Parks, Parkettes, Special Resource Areas and Linkages which offer a wide variety of diversified leisure opportunities and amenities to Burlington's citizens and visitors. These amenities include, but are not limited to, a network of trails and pathways, gardens and natural areas, a variety of sports fields and playground equipment, entertainment venues, public concessions, and washrooms.

The City's investment in these assets helps to support families, build community capacity, improve health and physical activity levels and enhance the overall quality of life of Burlington's citizens.
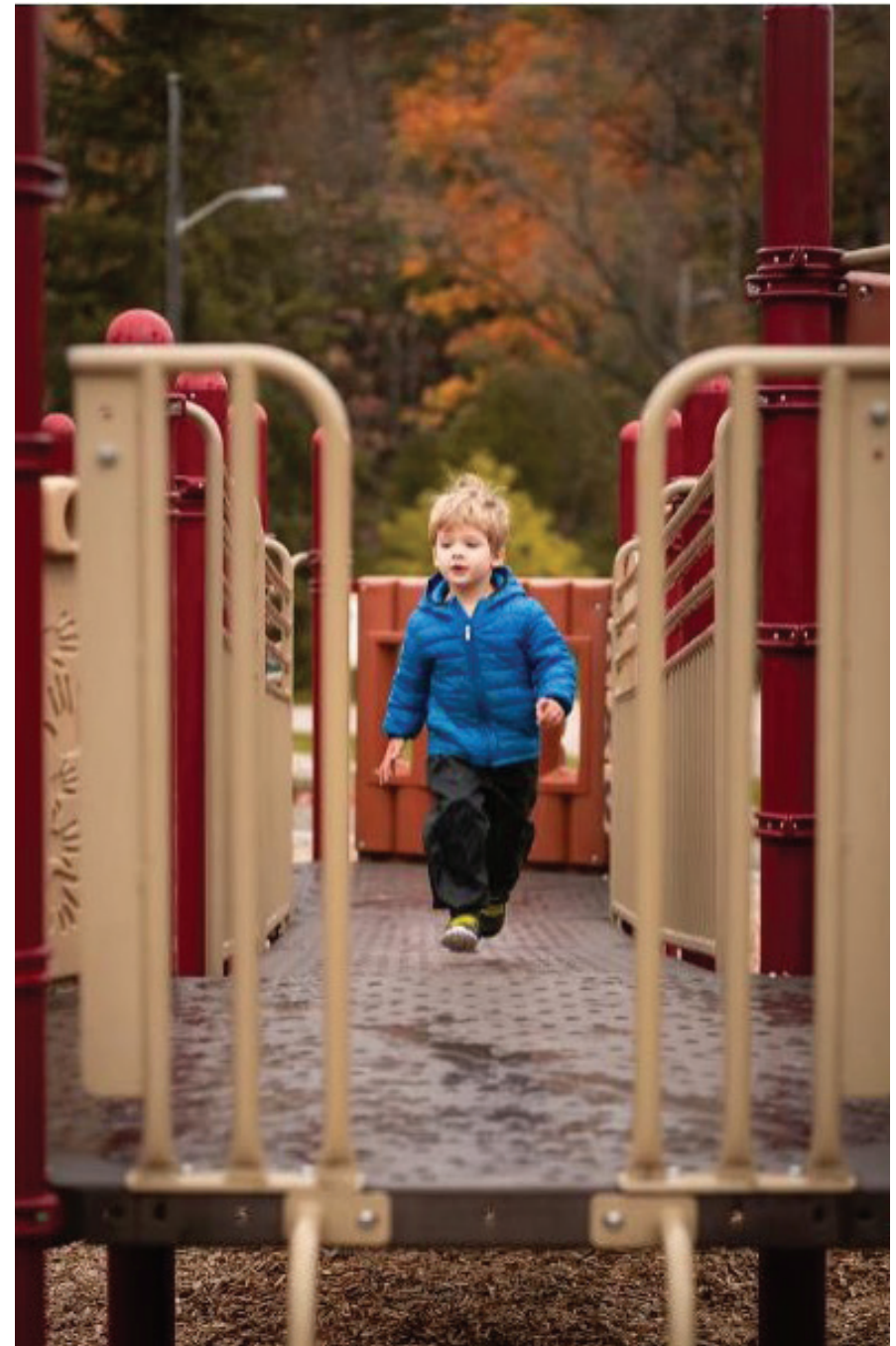
9.1 State of the Local Infrastructure

9.1.1   Asset Inventory and Valuation

The City's Parks service area is responsible for the maintenance and operation of a network of parks, facilities, and paths. This section summarizes the Parks assets managed by the City. The City's portfolio of infrastructure assets for Parks services is valued at $248.8 million. This value is comprised of Parks Facilities valued at $55 million and Parks Linear assets valued at $116 million, and Parks Amenities assets valued at $78 million. These replacement values were derived from historic construction costs, and for facilities, from individual system level asset / component costs within the facility management system. Table 47 summarizes the replacement value and average condition score for these three asset groups.

Assets included in the Park Facility category include Maintenance and Washroom Buildings. Assets included in the Parks Linear category include Fencing, Multi-Use Recreational Trails, Pathways, Pedestrian Bridges, Retaining Walls, Stairs and Shoreline Protection. Assets included in the Parks Amenities category include Community Gardens, Leash Free Areas, Multi-Use Courts, Parking Lots, Playgrounds and Fitness Equipment, Shade Structures, Signs and Gateways, Site Furniture, Skateparks and BMX Course, Splash Pads, Tennis and Pickleball Courts and several unique assets such as Burlington Itabashi Garden. Table 48 summarizes the asset inventory and valuation of these assets in greater detail.

Table 47:   Asset Valuations for the City's Park Assets

|	Parks Amenities	Parks Facilities	Parks Linear
Total Replacement Value	$77.7M	$54.8M	$116.3M
Average Condition Score	Good	Poor	Good

Table 48:   Asset Inventory and Valuation for Parks Amenities, Facilities and Parks Linear Assets

Asset Type	Asset Sub-Type	Quantity	Replacement Value	Average Age	Average Condition
Parks Facilities	Maintenance Buildings	16	$29.6M	36	Poor
Parks Linear	Fencing	386 km	$4.8M	20	Fair
	Pedestrian Bridges and Pier	62	$34.9M	18	Very Good
	Retaining Walls, Railings & Stairs	6 km	$5.2M	18	Good
	Shoreline Protection	12 km	$19.6M	6	Very Good
	Multi-Use Recreational Trails	91 km	$18.0M	10	Good
	Servicing	31 km	$11.4M	17	Good
	Pathways	76 km	$22.4M	13	Good
Parks Amenities	Community Gardens	5	$500.0K	9	Poor
	Multi-Use Courts	51	$1.3M	16	Poor
	Shade Structures	25	$2.7M	13	Good
	Site Furniture	2217	$10.5M	13	Fair
	Unique Assets	55	$2.2M	8	Very Good
	Sportsfields	120	$33.0M	18	Good
	Tennis, Pickleball	7	$1.8M	12	Good
	Splash Pads	9	$3.2M	10	Very Good
	Park Signs & Gateways	617	$3.1M	12	Good
	Playgrounds & Fitness Equipment	437	$16.7M	12	Good
	Leash Free Areas	4	$426.1K	15	Fair
	Skateparks	11	$2.3M	11	Fair
TOTAL			$248.8M	15	Good

9.1.2 Asset Age Summary

Figure 33 displays average asset age as a proportion of the Estimated Service Life (ESL) by asset type for Parks Amenities, Parks Facilities and Parks Linear. As shown below, average ages have not surpassed the average ESL for any asset type.

Figure 33:   Average Asset Age as a Proportion of Average Asset ESL (Parks)
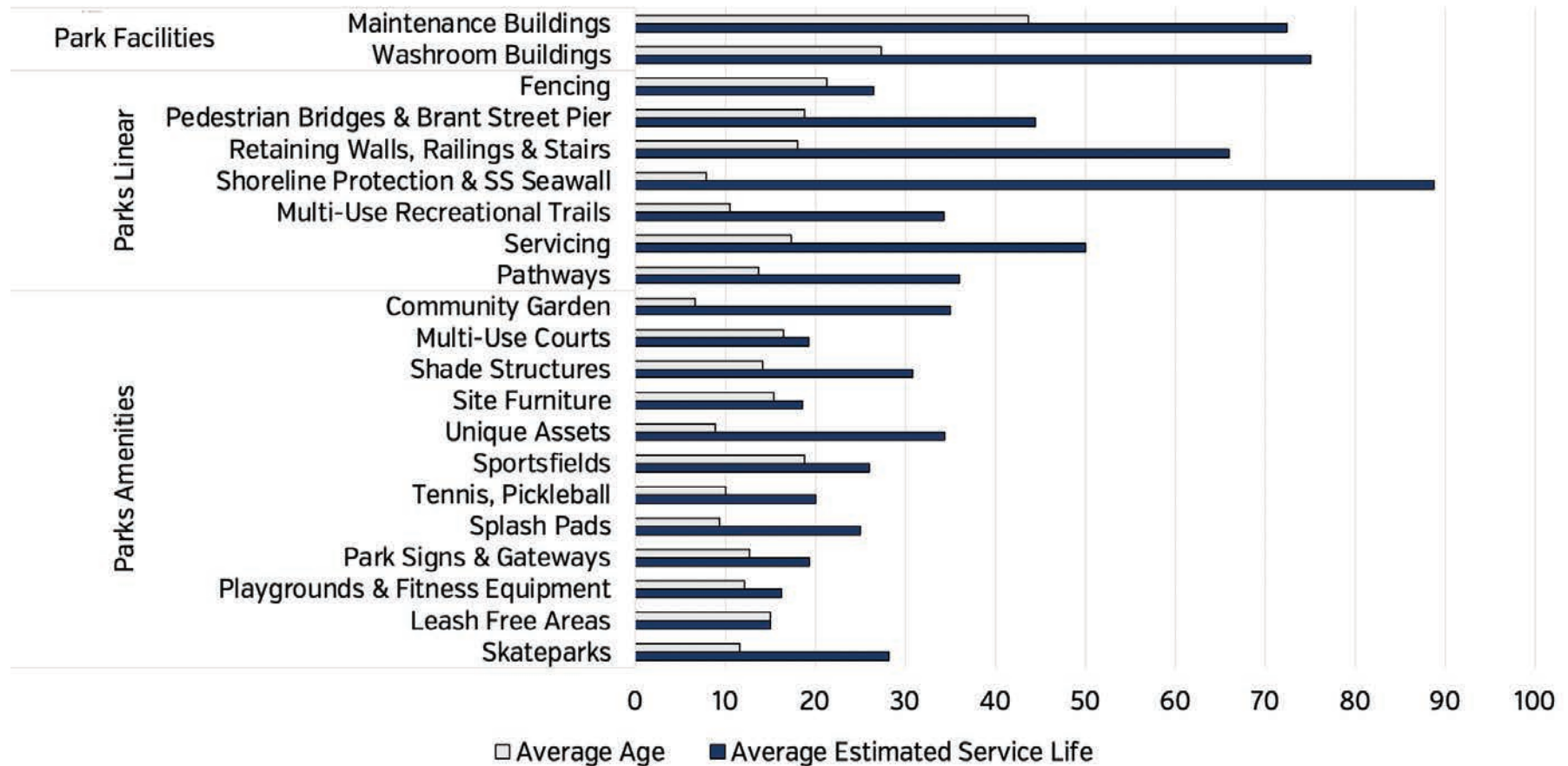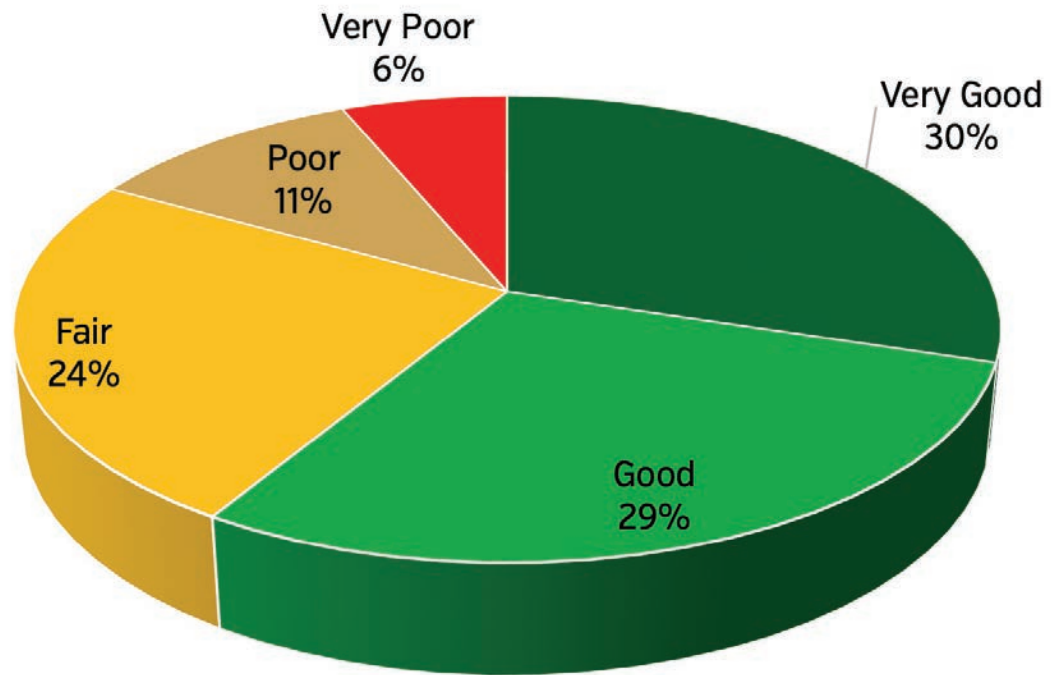
9.1.3 Asset Condition

This section outlines the breakdown of assets in each condition category based on the percentage of total replacement value. Asset condition was categorized based on the scale as shown in Table 49.

Table 49: Parks Condition Scale

Performance Category	Facilities Facility Condition Index (FCI)	Remaining Assets Condition Rating and/or Service Life Remaining
Very Good	0.01 to 0.02	"Very Good" or >80% of life remaining
Good	0.03 to 0.05	"Good" or 60-80% of life remaining
Fair	0.06 to 0.1	"Fair" or 40-60% of life remaining
Poor	0.11 to 0.49	"Poor" or 20-40% of life remaining
Very Poor	0.5 to 1.0	"Very Poor" or <20% of life remaining

The Parks service area has approximately 59% of assets in Good and Very Good condition and 41% in Fair to Very Poor condition as displayed in Figure 34 . The remainder are approaching the end of their estimated service lives, indicating a need for investment in the short to medium term. Asset conditions have been assessed and established using data from condition models, visual assessments completed by City staff, internal expert opinion and using age and estimated service life to determine asset condition. Maintenance issues, along with concerns identified by staff and the public are prioritized and addressed based on needs. Other assets are informally evaluated and needs are addressed reactively.

Figure 34: Asset Condition Summary (Parks assets)

9.1.3.1 Parks Asset Condition

Parks Amenities include a large variety of assets including from Sports Fields, Playgrounds, Splash Pads, Outdoor Courts, Parking lots and Skateparks.

While not formally evaluated Pathways are assessed for trip and safety hazards as a component of regular maintenance activities. Signs of deterioration or reduced service are noted and prioritized reactively through operations or capital projects.

The condition of Park Facilities can be assessed at the asset level, as well as at the Facility level using the industry standard Facility Condition Index (FCI). This value does not represent a visually assessed condition of the facility, but the ratio between renewal need costs and the replacement value of the facility.

Figure 35 outlines the condition of Parks assets as a proportion of replacement value. Most of the Parks assets are in Very Good to Fair condition.

Figure 35: Park Asset Condition by Asset Type and Percentage of Replacement Value
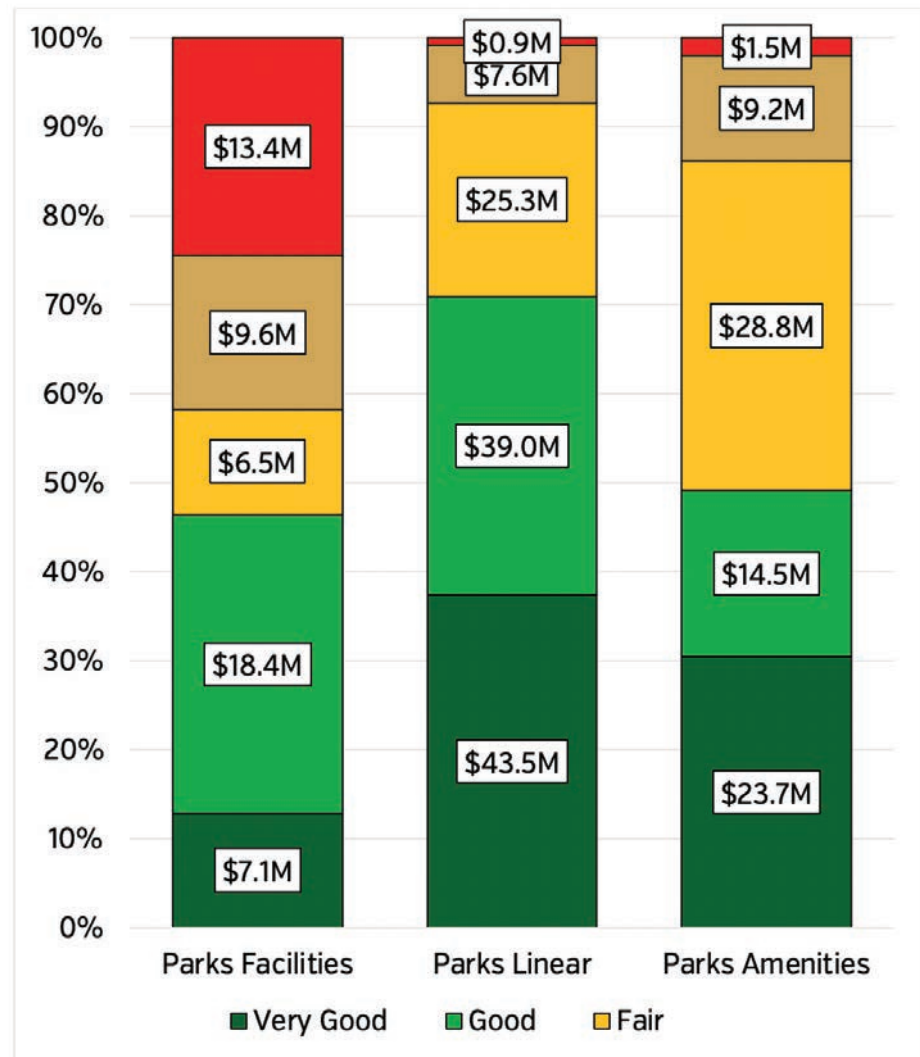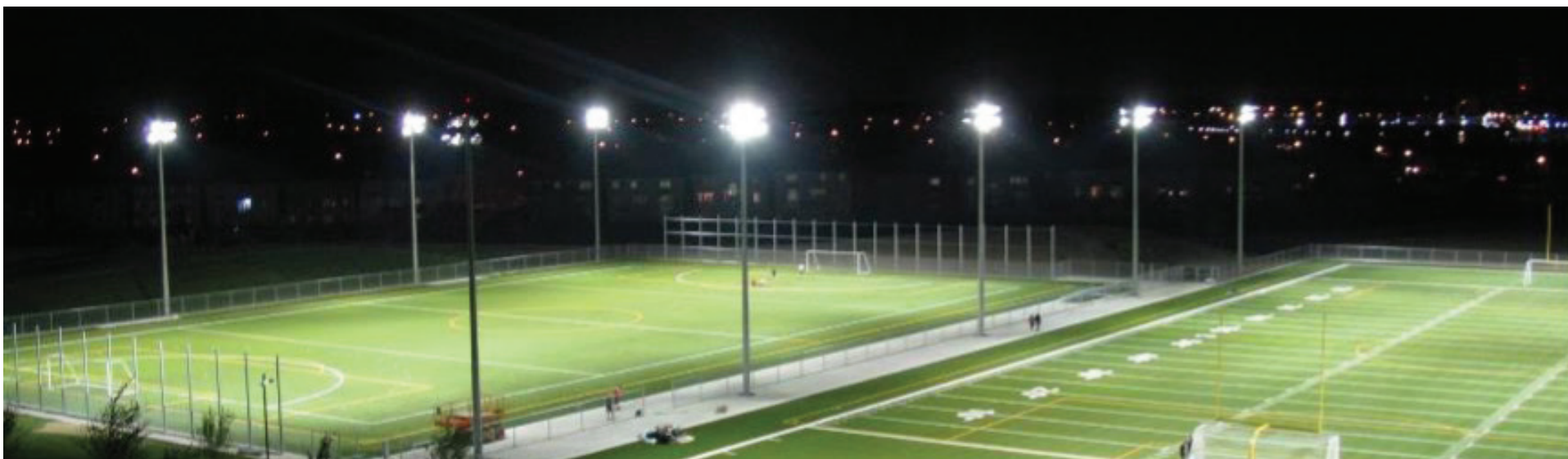
9.2 Levels of Service

9.2.1 Community and Technical Focused Performance Measures

The City's current strategic plan identified several objectives related to parks levels of service. These objectives are intensification, increased connectivity, healthy lifestyles, environmental and energy leadership and good governance. Park levels of service are influenced by many legislative and regulatory requirements such the Ontario Building Code and the Accessibility for Ontarians with Disabilities Act. Service levels are influenced by community expectations such as sport user groups and feedback collected during community engagement initiatives.

The City has developed its own set of unique level of service performance metrics that are used to reflect citizen values and needs. These metrics are classified below through service attributes provided by the City that summarize the type of service being provided to citizens and their wider communities. These metrics are displayed in Table 50. Key service attributes for community focused performance measures for park assets include: Accessibility, Cost-Effectiveness, Quality and Safety. The specific performance measures related to customer satisfaction are based on a September 2020 online "Love my Neighbourhood – Community Connectors" public survey and 2021 Yardstick data.

Table 50: Community Focused Performance Measures for Parks Assets

Service Attribute	LOS Statement	Community Focused Performance Measures	
		Performance Measure	Current Performance
Accessibility	Providing parks for all ages and abilities	% of residents that walk to the park	65%
	Providing parks within a reasonable proximity to every residential household	% of Burlington that is Parkland (current/target)	3.71%
		#ha of parkland per 1,000 persons	3.74
		Type and % of most visited parks	Neighbourhood parks, 50%
		% of properties within 400 m of a park	91%
	Providing different park types	Type and % of most visited parks	Neighbourhood parks, 50%
Quality	Providing parks and open spaces with infrastructure in acceptable condition	% very satisfied with cleanliness	45%
		% very satisfied with washroom amenities	20%
		% very satisfied with maintenance of parks	45%
		Top 3 things residents' value in parks	Cleanliness, shade, maintenance

Table 51 displays technical focused performance measures, developed for a deeper understanding of performance trends for subject matter experts. These measures are utilized to support decision-making and to understand the impacts of decision on the Parks asset portfolio.

Table 51:   Technical Focused Performance Measures for Parks Assets

Service Attribute	LOS Statement	Technical Focused Performance Measures	
		Performance Measure	Current Performance
Cost-Effectiveness	Providing parks, open spaces and trails in an efficient manner	Total budget per capita	$55
		Average annual capital budget for parks	$5,932,645
		Annual Operations and Maintenance Budget	$4,914,858
		% of park capital investment dedicated towards renewal vs new/enhanced or growth	79%
		10 Year forecast average Park asset renewal budget as a % of replacement value	2%
Quality	Providing parks and open spaces with infrastructure in acceptable condition	% of parks assets in fair or better condition	80%
		% leisure per capita	1.85
		% sport field per capita	0.39
		# public washrooms within park system	22
		Cost for park maintenance expressed as cost per 1,000 residents	$60,907.00
Sustainability	Providing parks, open spaces and trails with an ecoservices approach	% of a park area compared to city boundary	4%
		% of park that in natural state vs built	50 %
		#ha of wetlands or marshes in the park system	4.5 ha
		Annual electricity consumption per hectare (kWh/ha)	1,769 kWh/ha
		Annual water consumption per hectare (m^3/ha)	485 m^3/ha
		Annual natural gas consumption per hectare (m^3/ha)	6,024 m^3/ha
		Total annual Greenhouse Gas emissions per hectare	516,666 CO^2/sq.m

9.3 Lifecycle Management Strategy

This section focuses on specific activities that work to maintain the levels of service previously outlined. The City's knowledge and understanding is continually improving through the collection and utilization of data that informs decision making related to asset lifecycle system and LOS performance metrics.

The development of appropriate and cost-effective strategies is foundational for ensuring service sustainability. Further, the lifecycle management activities reduce the risks to service delivery and performance. The majority of park linear and park amenities assets have a run-to-failure life cycle while others have a more complex approach to lifecycle which includes rehabilitation before a full reconstruction in order to sustain the asset to the end of its anticipated estimated service life. Examples of these assets are pedestrian bridges, the Brant Street Pier, Spencer Smith Waterfront Promenade and artificial turf sports fields.

Table 52, Table 53, Table 54 in the following section describe the lifecycle management activities currently completed or planned to be implemented by the City for Parks Linear, Parks Amenities and Parks Facilities, respectively. The Tables also display the risks associated with the alternative do-nothing approach.

Table 52:   Parks Linear Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	• Pathways and Multi-Use Recreational Trails are monitored and repaired based on reporting of deficiencies. Pedestrian bridges are assessed every 3 years by external experts and monitored by staff.	• A backlog in maintenance can lead to failure of an asset in advance of planning capital replacement
Renewal/ Rehab Activities Significant repairs designed to extend the life of the asset	• The Waterfront Promenade and seawall are repaired annually. Decks and railings are replaced on pedestrian bridges halfway through their lifecycle • Resurfacing • Deck & Railing Replacement • Minor Rehabilitation (deck, caisson and railing removal, refacing, railing replacement, pavement, seawall and cap removal) • For poured in place skateparks – crack sealing, railing replacement and slab replacement. For modular skateparks, concrete pad will last 30 years but modular skateboarding elements to be replaced at year 15	• Without planned renewal or rehabilitation activities, the risks of failure are increased and consequences are significant • Changes to asset use as well as modernizing systems and adjusting to increasing levels of customer and employee service
Replacement Activities Activities that are expected to occur once an asset has reached the end of its estimated service life and renewal/ rehab is no longer an option	• Bundle as many assets that require replacement into one construction contract by park for cost efficiencies and to reduce disruption to the public	• Missing the window of opportunity to replace infrastructure at end-of-life results in assets being closed for public use
Non-Infrastructure Activities Actions or policies that can lower costs or extend service lives	• Infrastructure conformance with applicable law, technical standards, Ontario Building Code, government policies and Master Plans	• Asset deterioration is over or underestimated, inaccurate growth forecasts or estimation of funding
Expansion / Service Enhancements Planned activities to improve an asset's capacity, quality and system reliability	• New infrastructure is either identified as part of the City's Development Charge Study, through public outreach by the Recreation Community Culture Service or by Council approved master plans such as the Community Trails Strategy	• Trails and new parks are the only eligible assets that can be funded by Development Charges and require contribution by the Park Dedication Reserve Fund
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its estimated service life, or is otherwise no longer needed by the municipality	• Disposal activities range significantly given the diverse range of asset types in the Park Linear category. Where possible, materials are recycled or re-purposed, e.g. recycled granular is specified for the construction of Multi-Use Recreational Trails	• City has a responsibility to adhere to provincial regulations related to disposal activities

Table 53:   Parks Amenities Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	• Park Amenities assets monitored and repaired based on reporting of deficiencies. Playgrounds are inspected every month. Splash Pads are inspected every day during operation	• Regular planned maintenance in combination with unplanned reactive maintenance which is attributed to a number of reasons. A backlog in maintenance can lead to failure of an asset in advance of planning capital replacement
Renewal/ Rehab Activities Significant repairs designed to extend the life of the asset	• Tennis courts are resurfaced halfway through their lifecycle, artificial turf carpets are replaced 4 times throughout the field's lifecycle and skateparks are renewed on a 10-year cycle	• Without planned renewal or rehabilitation activities, the risks of failure are increased and park amenities will be closed until full replacement occurs • Changes to asset use as well as modernizing systems and adjusting to increasing levels of customer and employee service
Replacement Activities Activities that are expected to occur once an asset has reached the end of its estimated service life and renewal/ rehab is no longer an option	• The approach to replacement is to bundle as many assets as possible that require replacement into one construction contract by park for cost efficiencies and to reduce disruption to the public	• Missing the window of opportunity to replace infrastructure at end-of-life results in assets being closed for public use
Non-Infrastructure Activities Actions or policies that can lower costs or extend service lives	• Infrastructure conformance with applicable law, technical standards, Ontario Building Code, government policies and Master Plans	• Asset deterioration is over or underestimated, inaccurate growth forecasts or estimation of funding
Expansion / Service Enhancements Planned activities to improve an asset's capacity, quality and system reliability	• New infrastructure is either identified as part of the City's Development Charge Study, through public outreach by the Recreation Community Culture Service or by Council approved master plans such as the Community Trails Strategy	• New parks are the only eligible assets that can be funded by Development Charges and require contribution by the Park Dedication Reserve Fund
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its estimated service life, or is otherwise no longer needed by the municipality	• Disposal activities range significantly given the diverse range of asset types in the Park Amenities category. Where possible, materials are recycled or re-purposed	• City has a responsibility to adhere to provincial regulations related to disposal activities

Table 54: Parks Facilities Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	• Inspections through corporate contracts • General facility maintenance • Critical equipment maintenance and overhauls • Comprehensive condition assessment of equipment within contracts • Contract initiation condition assessments • Interim assessment to assess quality of service	• Deficiencies are not identified through patrols • Increased lifecycle costs if maintenance is done improperly or not as scheduled • May contribute to premature asset failure, service disruptions or pose health and safety risks • Customer dissatisfaction with quality, safety or accessibility of facilities
Renewal/ Rehab Activities Significant repairs designed to extend the life of the asset	• Mid-life renewal of facilities and major overhauls and modernization of equipment to support department service	• Renewal/rehab activities may not extend asset life as much as expected, leading to premature asset failure or the need for another renewal/rehab activity • Increased lifecycle costs if renewal/rehab activities are done improperly or not as scheduled • Changes to asset use as well as modernizing systems and adjusting to increasing levels of customer and employee service
Replacement Activities Activities that are expected to occur once an asset has reached the end of its estimated service life and renewal/ rehab is no longer an option	• Demolition and Replacement	• Delay in construction projects may result in health and safety risks, higher costs, longer service disruption and customer dissatisfaction
Non-Infrastructure Activities Actions or policies that can lower costs or extend service lives	• Facility Master Plans • Community Outreach / Customer Engagement • Corporate Energy and Emissions Plan	• Asset deterioration is over or underestimated • Inaccurate growth numbers and estimation of funding
Expansion / Service Enhancements Planned activities to improve an asset's capacity, quality and system reliability	• Facility Upgrades and Service Enhancements • New Facilities and Buildings • Change of Ownership	• Growth activities are delayed or cancelled, resulting in the system being unable to accommodate for population and employment growth
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its estimated service life, or is otherwise no longer needed by the municipality	• Decommissioning • Sale • Change of Ownership • Consolidation of Buildings • Repurposing Buildings	• Improper disposal can lead to environmental impacts and expenses

9.4 Current and Future Risks

Through workshops with Parks staff, asset types were placed into a framework based on the range of severity of the consequence of failure according to three types of impacts: social, environmental and financial.

The scale of consequence can range from insignificant to severe/catastrophic and assets were assigned a weighted score based on the consequence of failure, which focused primarily on the impacts to park users with respect to access for recreational and sports use. In some asset types, only those deemed most critical were assigned the highest of scores in terms of the consequence of failure. These consequence of failure scores were then incorporated into the model to inform the prioritization of funding needs used in the financial analysis. It is important to recognize that these risk frameworks are not intended to reliably predict or prevent critical asset failure but can modify how financial needs are modeled in the long-term financial model.

For this iteration of the asset management plan, risk was considered in terms of the impacts of asset failure that we recognize currently or have observed previously. But it is important to consider impacts from other risks in the future such as those from climate change.

We anticipate that climate change will impact our Parks assets in a variety of ways including; increased demands for park use as a result of an increase in summer temperatures and frequency or duration of extreme heat events that will place increased demand and reliance on City parks for shade and cooling; increased park closures or repairs as a result of an increase in extreme rainfall, wind or winter events; and accelerated erosion and possible slope failure along the City's shoreline protection as a result of extreme lake levels and extreme weather events that cause damaging wind and wave action.

When renewing or replacing parks assets, consideration will be given towards treatments and technologies that support climate change mitigation, such as low GHG-emitting assets and lifecycle strategies.

Future iterations of this Plan can further build onto the decision support models by incorporating climate change impacts into the Parks risk framework.

10.0
Fire

The City of Burlington is committed to ensuring public safety through the provision of reliable emergency response and fire prevention services including public education programs, inspections and enforcement.

BURLINGTON FIRE DEPARTMENT HEADQUARTERS, BURLINGTON, ONTARIO

Stations & Facilities

Fair
$15.5M
27%

Poor
$5.5M
9%

Very Good
$3.8M
7%

Very Poor
$5.5M
9%

Good
$27.9M
48%

Vehicles & Equipment

Very Poor
$9.2M
38%

Very Good
$8.9M
36%

Good
$2.1M
8%

Fair
$0.9M
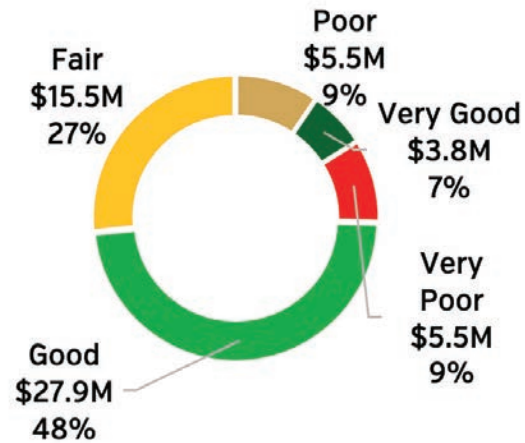4%

Poor
$3.4M
14%

10.0
Fire

The City of Burlington is committed to ensuring public safety through the provision of reliable emergency response and fire prevention services including public education programs, inspections and enforcement.
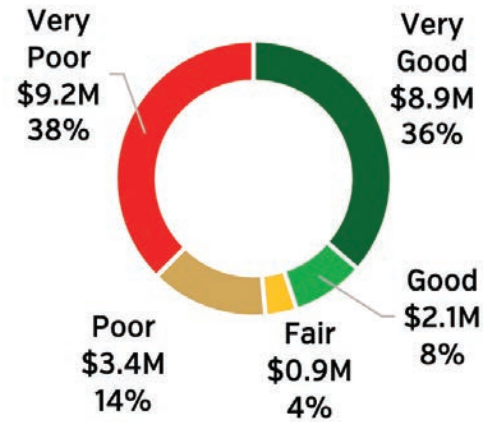
10.0 Fire

The City is committed to delivering effective and efficient fire protection services to prevent and mitigate fire loss, injury and death and to promote firefighter safety within the community. To support these services, the City maintains an array of facilities, vehicles and equipment. These assets range from specialized stations and training facilities, fire and rescue vehicles, to specialized equipment and emergency apparel.

The City is in the process of developing a Fire Master Plan (FMP). The FMP will guide the delivery of fire prevention, education and protection services through a strategic framework and recommended action plan. The Master Plan is anticipated to be finalized in late 2021.

10.1 State of the Local Infrastructure

10.1.1 Asset Inventory and Valuation

Ensuring public safety through emergency response and fire prevention is a fundamental expectation of many members of the community. This section summarizes the portfolio of assets associated with the various fire assets managed by the City.

As shown in Table 55, the City of Burlington's portfolio of infrastructure assets for Fire is valued at $82.6 million, which is comprised of a mixture of Stations & Facilities valued at $58 million and Vehicles & Equipment valued at $24 million. These replacement values were derived from historic costs, and for facilities, from individual system level asset / component costs within the facility management system. Table 56 summarizes the Fire assets inventory and the associated replacement value.

Table 55:   Asset Valuations for the City's Fire System

	Stations & Facilities	Vehicles & Equipment
Total Replacement Value	$58.2M	$24.4M
Average Condition Score	Fair	Fair

Table 56:   Asset Inventory and Valuation for Fire Assets

Asset Type	Asset Sub-Type	Quantity	Replacement Value	Average Age	Average Condition
Stations & Facilities	Fire Stations	7	$41.0M	18	Fair
	Headquarters	1	$17.2M	20	Good
Vehicles & Equipment	Vehicles & Equipment	680	$24.4M	4	Fair
TOTAL			$82.6M	7	Fair

10.1.2   Asset Age Summary

Figure 36 displays average asset age as a proportion of the Estimated Service Life (ESL) by asset for Stations & Facilities and Vehicles & Equipment assets. Front line emergency response vehicle life cycles are guided by National Fire Protection Association standards. As shown below, average ages have not surpassed the average ESL for any asset type and are relatively younger.

Figure 36: Average Asset Age as a Proportion of Average Asset ESL (Fire assets)
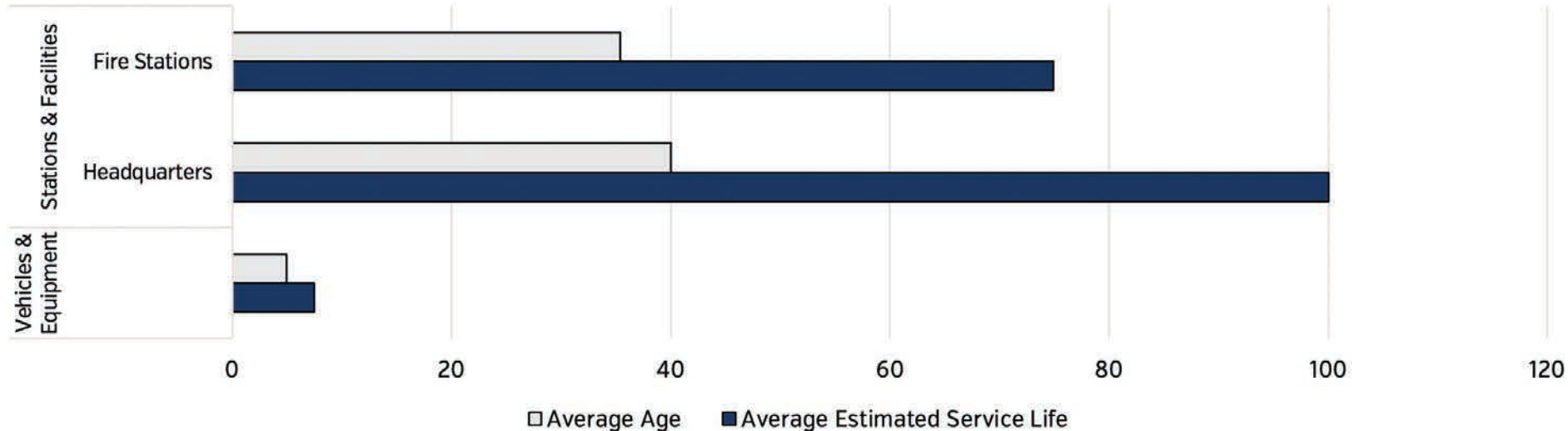
10.1.3 Asset Condition

This section outlines the breakdown of assets in each condition category based on the percentage of total replacement value. Asset condition was categorized based on the scale as shown in Table 57.

Table 57: Fire Condition Scale

Performance Category	Facilities Facility Condition Index (FCI)	Remaining Assets Condition Rating and/or Service Life Remaining
Very Good	0.01 to 0.02	"Very Good" or >80% of life remaining
Good	0.03 to 0.05	"Good" or 60-80% of life remaining
Fair	0.06 to 0.1	"Fair" or 40-60% of life remaining
Poor	0.11 to 0.49	"Poor" or 20-40% of life remaining
Very Poor	0.5 to 1.0	"Very Poor" or <20% of life remaining

The majority of Fire assets (58%) are in Good or Very Good condition, with 27% in Fair condition and the remaining 15% in Poor or Very Poor condition. The majority of assets within the 15% are vehicles and equipment nearing the end of service life. It should be noted that multiple Fire Stations are in a condition that will lead to replacement within a 10-year time horizon. Figure 37 illustrates the condition distribution of the City's Fire assets.

Figure 37:   Asset Condition Summary (Fire Assets)
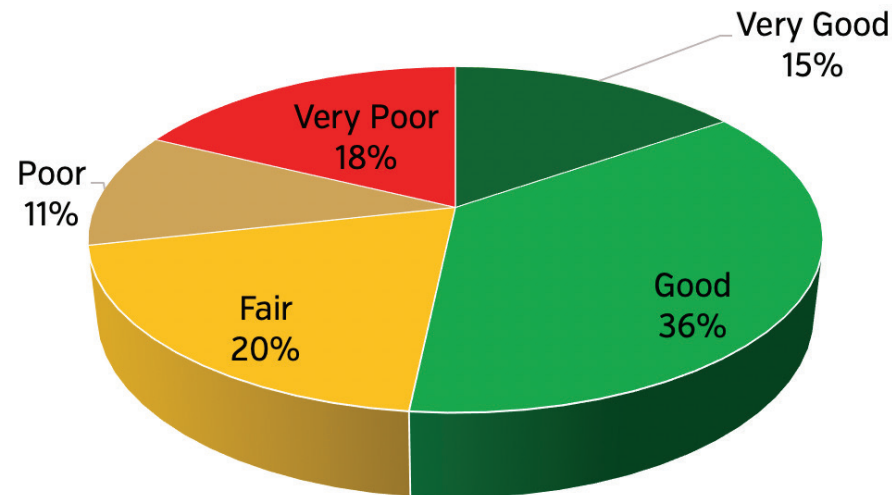
10.1.3.1   Stations & Facilities

City facilities are maintained through corporate contracts and condition assessments are carried out by qualified assessors. Comprehensive condition assessments are typically performed on a 5-year basis and additional interim assessments are completed as required. Condition can be assessed at the asset level, as well as at the Facility level using the industry standard Facility Condition Index (FCI). Figure 38 outlines the condition of Fire Stations & Facilities as a proportion of replacement value based on FCI.

Figure 38: Stations and Facilities Asset Condition by Asset Type and Percentage of Replacement Value
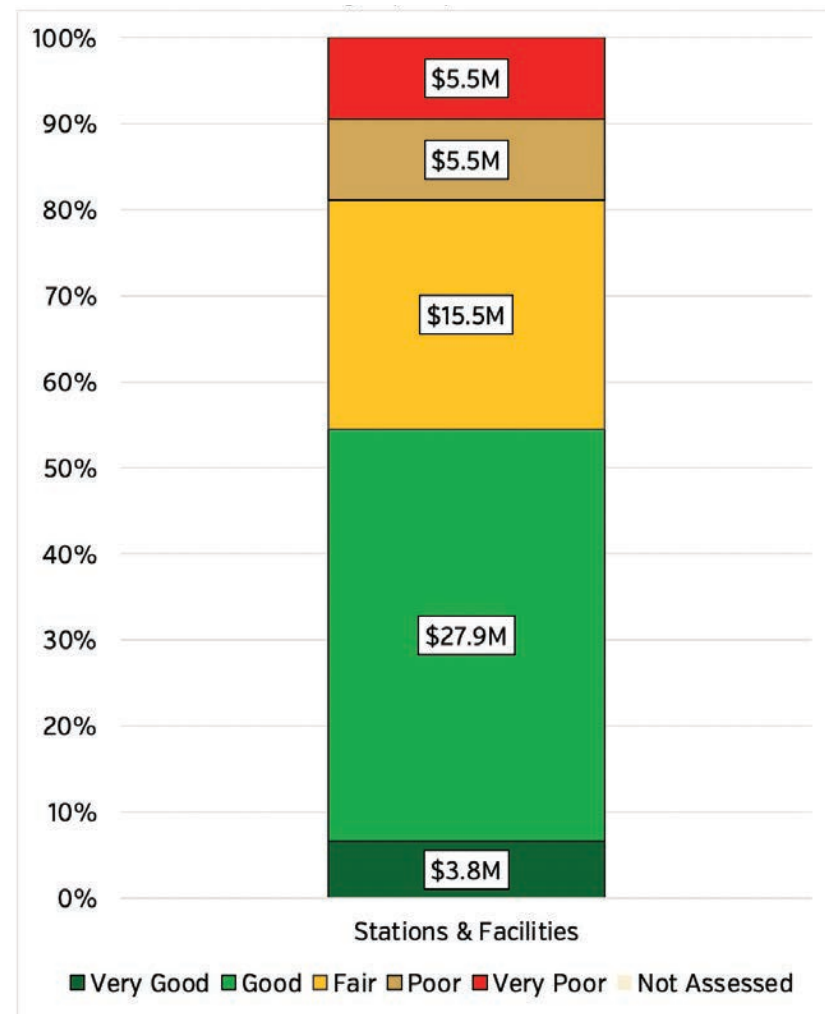
10.1.3.2   Vehicles & Equipment

Fire vehicles are maintained according to the National Fire Protection Association (NFPA) 1911 industry standards. In addition to daily and scheduled inspections, vehicles are included in the department's preventative maintenance program. While over 50% of Vehicles and Equipment fall into the Poor or Very Poor categories, this is based on age and is a result of their short-estimated service life. The remaining assets are in Fair or better condition.
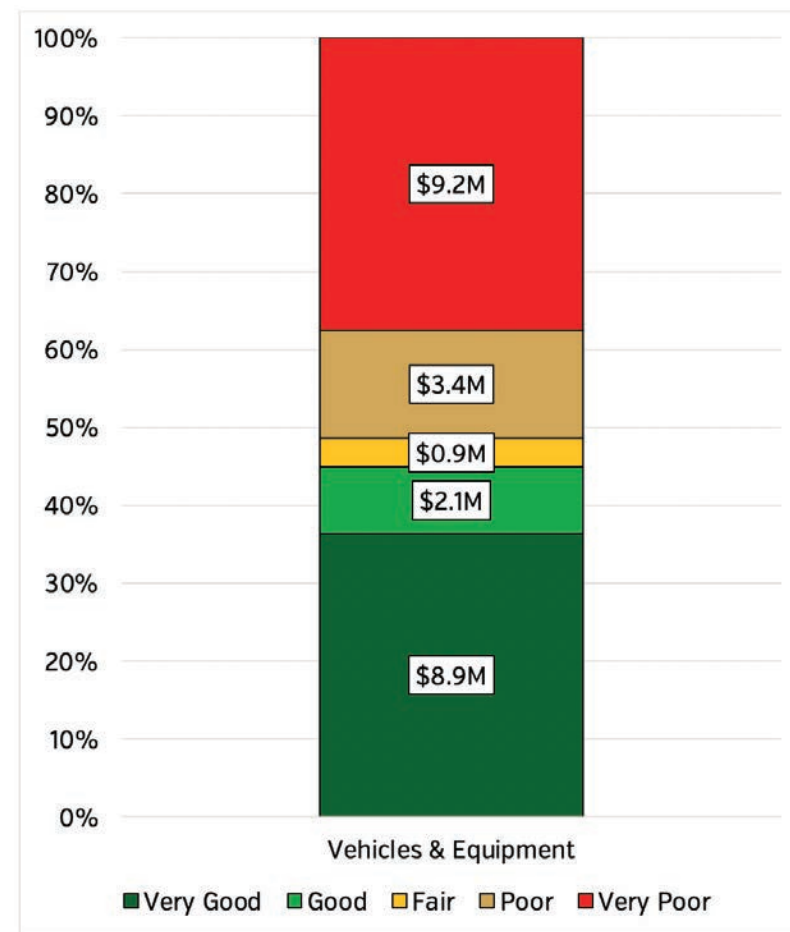
Figure 39:   Vehicles & Equipment Asset Condition by Asset Type and Percentage of Replacement Value.

10.2 Levels of Service

10.2.1   Community and Technical Focused Performance Measures

The City has developed their own set of unique level of service performance metrics which are used to reflect citizen values and desires. These metrics are classified below through service attributes provided by the City that summarize the type of service being provided to citizens and their wider communities. These metrics are displayed in Table 58. Key service attributes for community focused performance measures for Fire assets include: Accessibility, Cost Effectiveness, Quality, Reliability, Safety and Sustainability.

Table 58. Community Focused Performance Measures for Fire

Service Attribute	LOS Statement	Community Focused Performance Measures	
		Performance Measure	Current Performance
Quality	Providing fleet services at the appropriate quality	% of fleet assets that meet the quality targets	90%
	Providing fire rescue services at the appropriate quality	% of facility assets in poor or very poor condition	24%
Safety	Providing safe vehicles and equipment	% of legislated MTO safety inspections met	100%

Table 59 below displays technical focused performance measures, developed for a deeper understanding of performance trends for subject matter experts. These measures are utilized to support decision-making and understand the impacts of decision on the Fire asset portfolio.

Table 59: Technical Focused Performance Measures for Fire

Service Attribute	LOS Statement	Technical Focused Performance Measures	
		Performance Measure	Current Performance
Cost Effectiveness	Providing fleet services in an efficient manner	10 Year average fleet asset renewal budget as a % of replacement value	8%
Quality	Providing fire rescue services at the appropriate quality	Average Corporate Rating of Fire Facilities[1]	3.1 out of 5
		FCI of facilities	0.05
Reliability	Providing the appropriate amount of rescue services and ensuring firefighters are well prepared	% of fire facility assets in poor or very poor condition	22%

Service Attribute	LOS Statement	Technical Focused Performance Measures	
		Performance Measure	Current Performance
Reliability	Providing reliable vehicles and equipment	% of vehicles and equipment past their optimum service life	0%
		% of preventative maintenance activities completed on time	85%
		% of uptime	97%
		# of missed planned inspections	0
Safety	Providing safe vehicles and equipment	% of regulated MTO maintenance inspections completed	100%
Sustainability	Providing effective fire rescue services in an efficient manner	Annual operations and maintenance budget for fire assets	$1,321,089
	Providing fire facilities that are environmentally conscious	Annual facility electricity consumption per square metre	132 kWh/sq.m
		Annual facility natural gas consumption per square metre	15.1 m³/sq.m
		Annual facility water consumption per square metre	0.97 m³/sq.m
		Total annual Greenhouse Gas emissions per square metre	32,447 CO^2/sq.m

1. Corporate ratings were completed by department staff and are based on a combination of a facility's condition and functionality

10.3 Lifecycle Management Strategy

This section focuses on specific activities that work to maintain levels of service previously outlined. The City's knowledge and understanding is continually improving through the collection and utilization of data that informs decision making related to asset lifecycle system and LOS performance metrics.

The development of appropriate and cost-effective strategies is foundational for ensuring service sustainability. Further, the lifecycle management activities reduce the risks to service delivery and performance. Table 60 describes the lifecycle management activities currently completed or planned to be implemented by the City for Fire assets. The Tables also displays the risks associated with the alternative do-nothing approach.

Table 60.   Fire Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	**Fire Stations & Facilities:** • Inspections through corporate contracts • General facility maintenance and scheduled overhauls • Contract initiation condition assessments • Interim assessment to assess quality of service **Vehicles & Equipment:** • Fire industry National Fire Protection Association (NFPA) 1911 is the leading standard for inspection, maintenance, testing, refurbishing and retirement of in-service emergency vehicles. This Standard is referenced as part of the department's preventative maintenance and lifecycle replacement plan • Fire department emergency and non-emergency vehicles are included in the department's preventative maintenance (PM) program as a proactive measure to maintain and repair fleet to ensure a ready to respond capacity • Vehicle operator daily vehicle checks are completed and defects are reported to fire department specialized emergency vehicle technicians (EVT) who coordinate the required repairs in-house or outsourced based on the need • Dedicated reserve fleet are included in the PM program to allow extended down time for longer duration repairs and/or replacements • Third party testing is completed annually or following any major repair on all fire pumps, ground ladders and aerial devices. The majority of recommended repairs resulting from inspections are completed in house • All aerial devices undergo a non-destructive testing (NDT) every 5 years or following any major repairs	• Deficiencies are not identified through inspections due to concealed components or difficult access • Increased lifecycle costs if maintenance is done improperly or not as scheduled • Incorrectly planned maintenance activities can lead to premature asset failure or impacts to levels of service

Table 60.   Fire Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Renewal/ Rehab Activities Significant repairs designed to extend the life of the asset	**Fire Stations & Facilities:** • Mid-life renewal of facilities and major overhauls and modernization of equipment to support department service **Vehicles & Equipment:** • Fleet and equipment are replaced according to NFPA standards and certification through the Fire Underwriters Survey (FUS), with standards under the Automobile Fire Fighting Apparatus (ULCS-515) • Fire fleet are periodically rotated through eight (8) fire station locations to allow for more frequently used vehicles to be rotated with less frequently used vehicles extending asset life and maintaining service levels • Non-destructive testing is conducted for aerial (ladder) fleet on an annual basis and any required repairs completed to maintain and extend the life of the asset (NFPA 1911) • Significant repairs designed to extend the life of an asset	• Renewal/rehab activities may not extend asset life as much as expected, leading to premature asset failure or the need for another renewal/rehab activity • Increased lifecycle costs if renewal/rehab activities are done improperly or not as scheduled • Changes to asset use as well as modernizing systems and adjusting to increasing levels of customer and employee service are unknown and could lead to large expenditures

Table 60.   *Fire Lifecycle Activities*

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Replacement Activities Activities that are expected to occur once an asset has reached the end of its estimated service life and renewal/rehab is no longer an option	**Fire Stations & Facilities:** • Demolition and replacement • Major renovation including large additions and property acquisition **Vehicles & Equipment:** • Fleet and equipment are replaced according to NFPA standards and certification through the Fire Underwriters Survey (FUS), with standards under the Automobile Fire Fighting Apparatus (ULCS-515) • Fire industry National Fire Protection Association (NFPA) 1911 is the leading standard for the retirement and lifecycle planning of fire apparatus • NFPA 1901 is the leading standard outlining requirements and certification for new fire apparatus, including required certification required to meet Fire Underwriters Survey (FUS) requirements to ensure that these assets have positive effect on fire insurance grading public fire protection classification • Emergency response apparatus are designed and built to meet the requirements in NFPA 1901 and Standard for Automobile Fire Fighting Apparatus ULCS-515 current editions • Fire department fleet are included in the City's ten (10) year capital budget lifecycle replacement plan and are replaced based on NFPA leading standards, industry practices, manufactures recommended use and condition assessments • Fire department fleet are used until end of estimated service life, condition requires replacement, legislative requirements and/or leading practice change or service delivery enhancements are approved by council • Condition assessments are completed annually on all emergency response vehicles, replacement criteria include estimated service lifecycle, engine hours, kilometers travelled and anticipated future maintenance costs	• Lead to inefficiencies and substandard services for both customers and staff

Table 60.   Fire Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Non-Infrastructure Activities Actions or policies that can lower costs or extend service lives	**Fire Stations & Facilities:** • Facility condition assessments • Facility master plans • Detailed condition assessments • Community outreach / customer engagement • Fire Master Plan • Corporate Energy and Emissions plan **Vehicles & Equipment:** • Fire department fleet and equipment assets are maintained to industry leading practices, or higher, to ensure reliable delivery of fire emergency and non-emergency services • Fleet and equipment receive detailed and planned preventative maintenance inspections by fire operators and emergency vehicle technician • Included as part of the Fire department, the fleets' lifecycle replacement strategy is a green strategy which encourages fleet replacement with environmentally green solutions when and where applicable • Fire belongs to a fleet and equipment committee with representation from across the corporation to ensure the needs of the department and community are being met	• Asset deterioration is over or underestimated • Inaccurate growth numbers and estimation of funding • Fire safety knowledge and awareness among the public could be impacted negatively

Table 60.   Fire Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Expansion Activities Planned activities to improve an asset's capacity, quality and system reliability	**Fire Stations & Facilities:** • Facility upgrades, service enhancements and growth activities • New facilities and buildings • Building and/or property acquisition • Growth and expansions are guided by but not limited to Burlington's Strategic Plan 2015-2040 and 2018-2022 Burlington's Plan: Vison to Focus **Vehicles &Equipment:** • Fleet and equipment expansion/enhancements are implemented to ensure approved service levels are maintained and continue to meet the needs of a growing and changing city • Evaluation of urban density growth and expansion, including building occupancy and height are continually evaluated • Environmental assessment and adoption into fleet assets and replacement • Adopt technology to enhance or maintain service level	• Acquisition of new assets are delayed or cancelled, resulting in the system being unable to accommodate for population and employment growth • Master Plans may overestimate, or underestimate required expansions to accommodate for growth
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its estimated service life, or is otherwise no longer needed by the municipality	**Fire Stations & Facilities:** • Decommissioning • Sale • Change of ownership • Consolidation of buildings • Repurposing buildings **Vehicles & Equipment:** • At end of estimated service life, fire fleet and equipment are sold or disposed of following City policy, applicable regulations and environmental standards	• Improper disposal can lead to environmental impacts and expenses

10.4   Current and Future Risks

Through workshops with Fire staff, asset types were placed into a framework based on the range of severity of the consequence of failure according to three types of impacts: social, environmental and financial.

The scale of consequence can range from insignificant to severe/catastrophic and assets were assigned a weighted score based on the consequence of failure. In some asset types, only those deemed most critical were assigned the highest of scores in terms of the consequence of failure, such as critical emergency response vehicles, equipment and PPD. These consequence of failure scores were then incorporated into the model to inform the prioritization of funding needs used in the financial analysis. It is important to recognize that these risk frameworks are not intended to reliably predict or prevent critical asset failure, but can modify how financial needs are modeled in the long-term financial model.

For this iteration of the asset management plan, risk was considered in terms of the impacts of asset failure that we recognize currently or have observed previously. But it is important to consider impacts from other risks in the future such as those from climate change.

We anticipate that climate change will impact Fire vehicle and equipment in a variety of ways including: increased demands on emergency response to environmental hazards and events such as flooding, windstorms, ice storms or other extreme weather results that generate need for first response, even if not related to fire; accelerated asset depreciation and deterioration for assets tracked for mileage due to increased emergency response; and increased salt corrosion and rust as a result in increased maintenance needs for the fire fleet.

Future iterations of this Plan can further build onto the decision support models by incorporating climate change impacts into the Fire risk framework.

11.0
Urban Forestry

The City of Burlington is committed to protecting and maintaining a resilient and productive urban forest within the City that is safe, healthy, accessible and sustainable.

KILBRIDE STREET, BURLINGTON ONTARIO

Urban Forestry

- Very Poor $2.2M 4%
- Poor $1.7M 3%
- Fair $14.7M 27%
- Not Assessed $3.3M 6%
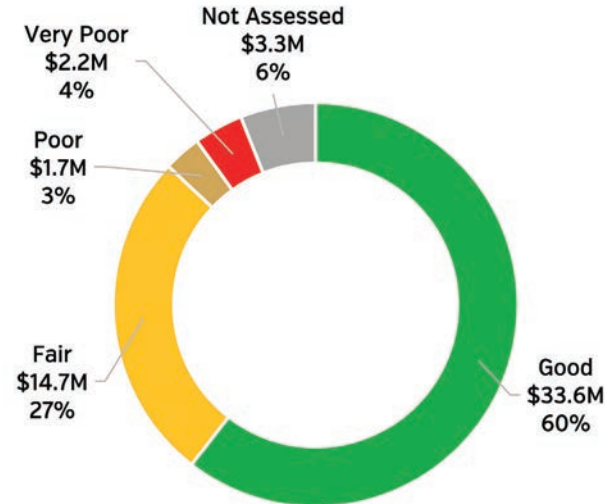- Good $33.6M 60%

11.0
Urban Forestry

The City of Burlington is committed to protecting and maintaining a resilient and productive urban forest within the City that is safe, healthy, accessible and sustainable.

11.0 Urban Forestry

The City of Burlington recognizes that a strong, healthy urban forest provides many benefits to its residents. The trees within Burlington's urban forest provide a wide range of environmental, economic, and social benefits, including improved air quality, reduced storm-water runoff, energy savings, noise reduction, natural bird and wildlife habitats, higher property values, and overall beautification of City streets and parks. This service contributes to the City's Strategic Plan, 3.2 Environmental and Energy Leadership.

The City's forestry section includes the forestry operations branch, whose team is responsible for routine tree maintenance and risk assessment; forest planning and health branch, tree planting and stumping, pest monitoring and management, public education and outreach and long-term management planning (e.g., Urban Forest Master Plan); and the administration of both public and private tree bylaws.
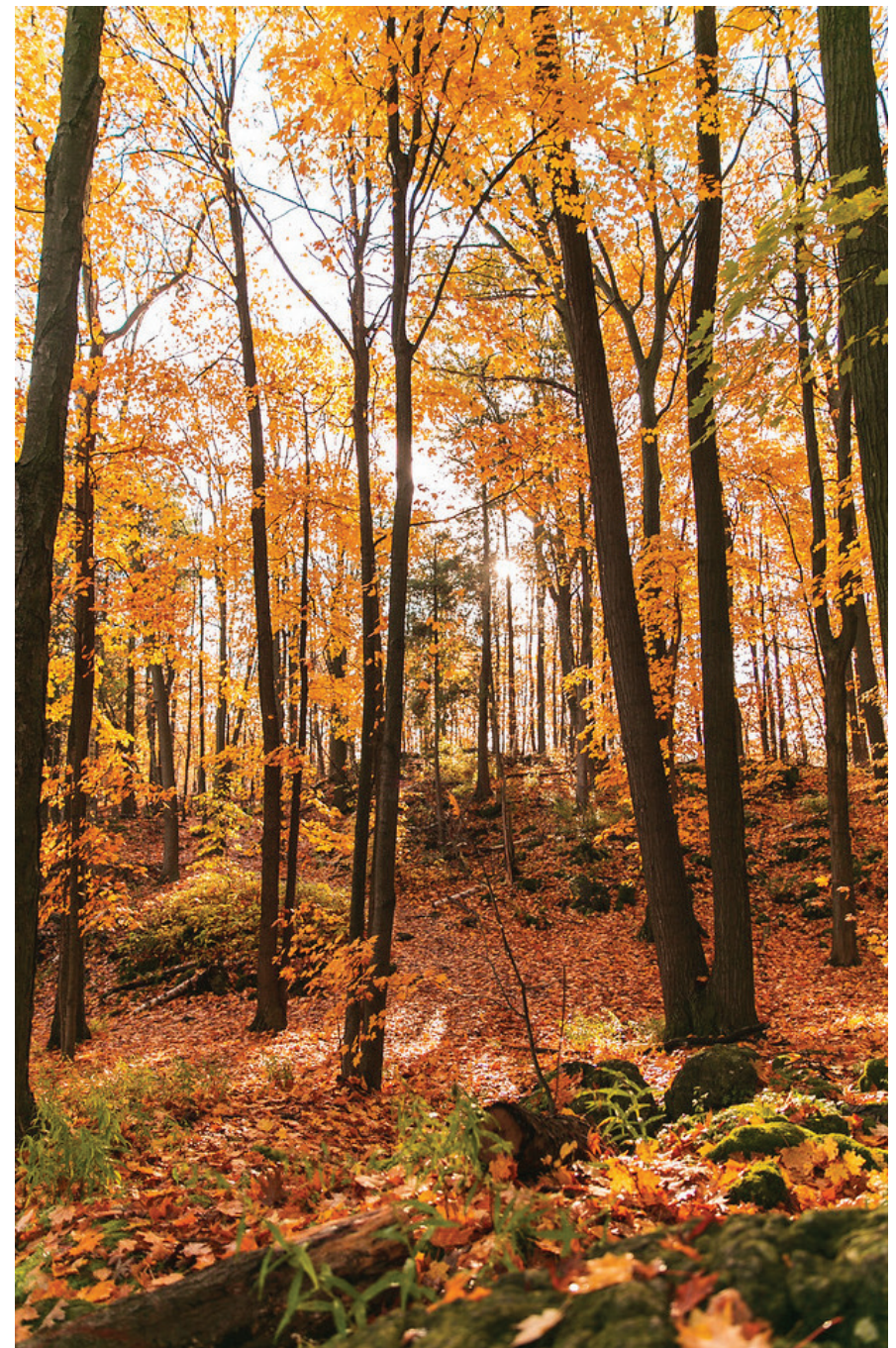
11.1 State of the Local Infrastructure

11.1.1 Asset Inventory and Evaluation

As a living asset, the City's urban forest presents unique challenges in the reporting of this critical asset. Traditional evaluation methodologies, lifecycle forecasting, and risk analyses used in asset management must be adapted to accurately capture the full scope of services and needs of this asset. The information that the City collects about its municipally owned forest is constantly growing.

Municipal asset management has often only considered the structural value, or replacement cost, of its urban forest. There is widely accepted acknowledgement of the values and benefits that an urban forest brings to its communities and this valuation goes far beyond just the financial cost to replace the asset. The emerging inclusion of living or natural assets in municipal asset management and other endeavors such as the Municipal Natural Asset Initiative, highlight the paradigm shift in urban forestry currently underway. Urban trees contribute tremendous, yet challenging to valuate, benefits to our community, including environmental, social, and economic net benefits. From oxygen generation, water recycling and erosion control, to shade, crime reduction, mental health benefits and increased property values, our urban trees provide complex, if not immeasurable benefits to our community. Recent studies have shown that a single tree may provide up to $162,000 in benefits over a 50-year timespan.

Placing a monetary value on a natural asset is a complex task and is an evolving field in the urban forestry sector. Organizations and standardized appraisal methodologies such as the Council for Tree & Landscape Appraisers (CTLA) and iTree demonstrate the ecological and economic value of urban forests. An update to the City's Urban Forest Management Plan (UFMP) is currently underway and intends to examine the merits and challenges associated with placing a monetary value on a living asset. The UFMP's findings and conclusions will be incorporated into future iterations of the AMP. Since this is the City's first inclusion of the Urban Forestry asset into its AMP update, we are taking a broader, generalized approach to quantifying and reporting on the City's urban forest.

For the intents and purposes of this AMP update, a preliminary monetary valuation of the City's Urban Forest is being provided strictly from a structural replacement cost i.e., the average cost to replace a tree, multiplied by the number of City-owned trees (street & park

only]. Not included in this valuation are woodlot trees since they are largely unaccounted for in the asset register. It is estimated that the woodlot inventory may be four to five times the number of known and documented City trees.

While the street tree inventory is considered complete, the park tree inventory is approximately only 15% complete. It is estimated that the Park tree inventory is 105,000 trees, however for the purposes of this AMP, only the percentage of Parks trees that have been inventoried and cataloged are included. Forestry operations will continue to collect additional park tree inventory data over time. Trees within creeks/ravines have also not been inventoried and are not included in this AMP. Due to the considerable cost and effort to inventory woodlot trees, this asset inventory will remain unaccounted in this version of the AMP, however Forestry operations may explore alternative methods of conducting woodlot inventories in the future.

As shown in Table 61, when considering only street and park trees, the replacement cost of City's Urban Forest is estimated to be $299.9 million. This is comprised of a mixture of Urban-Street trees, valued at $212.2 million, Rural-Street trees valued at $30 million and Parks and Open spaces trees valued at $55.6 million and Other trees valued at $2.2 million. Table 62 summarizes the Urban Forestry assets inventory and the associated replacement values.

Table 61:   Asset Valuations for the City's Urban Forestry Assets

	Urban-Street	Rural-Street	Park/Open Space	Other
Total Replacement Value	$212.2M	$30.0M	$55.6M	$2.2M
Average Condition Score	Good	Fair	Good	Good

Table 62: Assets Inventory and Valuation for Street Urban, Street Rural, Park / Open Space and Other Assets

| Asset Type	Asset Sub-Type	Quantity	Replacement Value	Average Age	Average Condition
Urban Forestry	Urban-Street	60,618	$212.2M	12	Good
	Rural-Street	8,585	$30.0M	17	Fair
	Park/Open Space	15,879	$55.6M	11	Good
	Other	617	$2.1M	8	Good
TOTAL			$299.9M	12	Good

11.1.2   Asset Age Summary

Age data on the City's tree inventory is widely incomplete, as the collection of tree installation/planting date did not begin routinely until 2018. Newly planted tree data now routinely includes the date of planting and this will further help build a database of the age of the urban forest for future iterations of the AMP.

11.1.3   Asset Condition

This section outlines the breakdown of assets in each condition category based on the percentage of total replacement value. Overall, 95% of the City's Urban Forest is in Very Good to Fair condition, as seen in Figure 40. The City's trees have been assigned a condition as documented during their last inspection. It is worth noting that tree condition data is not updated across the entire City every year, rather the City implements a grid-based program to inspect and complete maintenance over a rotating schedule approximately 7-10 years. There are approximately 5,500 trees (6% of the tree inventory) that do not have an assessed condition. Urban forestry also utilizes a slightly different condition rating scale of Good, Fair, Poor, and Dead. For the purposes of this AMP, 'Dead' trees were considered as Very Poor, and trees of unknown condition were omitted from the following condition graphs.

Figure 40:   Asset Condition Summary (all Urban Forestry assets)
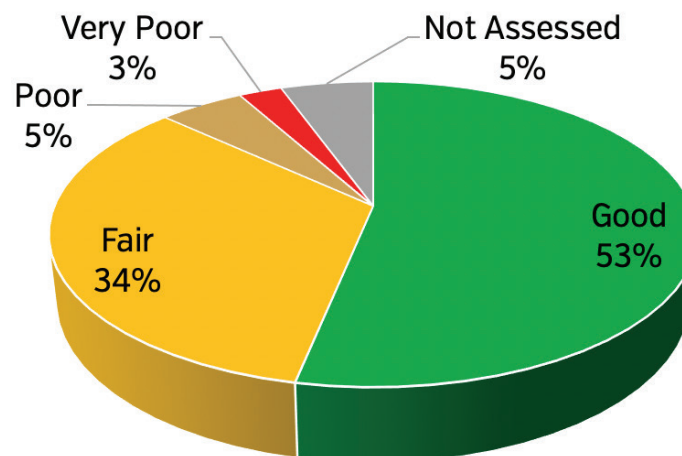
11.1.3.1   Urban Forestry

Figure 41 outlines the condition of Urban Forestry as a proportion of replacement value based on condition. The majority of these assets are in Good to Fair condition, with 8% in Poor or Very Poor condition. The remaining 5% of the assets have not been assessed. This is due in large part, to a comprehensive pest management strategy in response to combatting Emerald Ash Borer (EAB), an invasive insect that ravaged urban forests across the continent. Beginning in 2016, in order to manage the infestation, 8,500 ash trees were removed and replanted with new tree species. This pest management strategy is projected to continue until 2024. The removal of almost 15% of mature City trees and replanting with younger trees has resulted in a diverse, healthy and young cohort of urban trees comprising our urban forest inventory.

Figure 41: Urban Forestry Asset Condition by Asset Type and Percentage of Replacement Value

Legend: ■ Good ■ Fair ■ Poor ■ Very Poor ■ Not Assessed

Park/Open Space:
- Good: $33.6M
- Fair: $14.7M
- Poor: $1.7M
- Very Poor: $2.2M
- Not Assessed: $3.3M

Other:
- Good: $0.4M
- Fair: $0.4M
- Poor: $0.3M
- Very Poor: $0.2M
- Not Assessed: $0.8M

Urban - Street:
- Good: $121.7M
- Fair: $67.0M
- Poor: $8.3M
- Very Poor: $3.6M
- Not Assessed: $11.6M

Rural - Street:
- Good: $3.9M
- Fair: $18.7M
- Poor: $5.0M
- Very Poor: $1.7M
- Not Assessed: $0.9M

11.2 Levels of Service

11.2.1   Community and Technical Focused Performance Measures

The City has developed their own set of unique level of service performance metrics which are used to reflect citizen values and desires. These also align with the Service Business Plans outlined in our Strategic Plan and the Urban Forest Management Plan. These metrics are provided below and reflect the services provided by the City. Key service attributes for community focused performance measures for the City's Urban Forest include Cost-Effectiveness, Quality, Safety and Sustainability as provided below in Table 63.

Table 63: *Community and Technical Focused Performance Measures for Forestry*

Service Attribute	LOS Statement	Community Focused Performance Measures	
		Performance Measure	Current Performance
Cost-Effectiveness	Providing forestry services in an efficient manner	Total operations and maintenance budget per capita	$14
		# of street/right of way trees per capita	0.35
Quality	Providing quality urban forestry services and healthy urban trees	% of trees in poor or very poor condition	8%
		Average time to complete service (from call to closure of case)	2 days
Safety	Providing safe urban forestry services	#of CRM calls for tree inspections/obstructions/risks	334
Sustainability	Providing sustainable urban trees	# of species (or % of tree species) that make up >5% of tree population	3

11.3 Lifecycle Management Strategy

This section focuses on specific activities that work to maintain the levels of service previously outlined. The City's knowledge and understanding is continually improving through the collection and utilization of data that informs decision making related to asset lifecycle system and Levels of Service.

The development of appropriate and cost-effective strategies is foundational for ensuring service sustainability. Further, the lifecycle management activities reduce the risks to service delivery and performance. Table 64 describes the lifecycle management activities currently in place by Forestry Operations.

Table 64:   Urban Forestry Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	• Street and park inventories completed • Park tree inspections (Level 1 Risk Assessment) completed • Service calls for removals/clean up considered (Level 2 Risk Assessment) • Level 3 Risk Assessment: Tree Density Test (Resistograph) • Grid Tree (Pruning) Program	• Gaps in condition awareness and renewals not completed • Impacts to transportation or property damage • Risk of failure if poor condition not identified
Renewal / Rehabilitation Significant repairs designed to extend the life of the asset	• Emerald Ash Borer injection as short-term treatment • Gypsy Moth spraying	• Accelerated rate of Emerald Ash Borer disease • Defoliation of trees by Gypsy Moth caterpillars
Non-Infrastructure Actions or policies that can lower costs or extend service lives	• Public education and outreach • Specification for Tree Protection and Preservation, SS-12A, including the Aggregate Caliper Method for tree replacement guidelines • Integrated Pest Management guidelines • City Tree Bylaw • Public Tree Bylaw • UFMP	• Loss of urban forest canopy due to neglect, damage or unnecessary removals • Insufficient tree protection and replacement value to City in the event of removal. • Loss of urban forest due to pests or disease • Unauthorized removal of municipal assets. Long term impact to the urban forest • Unauthorized removal of private assets. Long term impact to the urban forest • No strategic framework in place to guide dept direction
Expansion Activities Planned activities to improve an asset's capacity, quality and system reliability	• New plantings in new developments	• No benefits of urban forest to community
Disposal Activities Activities associated with disposing of an asset once it has reached the end of its estimated service life, or is otherwise no longer needed by the municipality	• Tree Removal • Emerald Ash Borer Strategy	• Risk of collapse, damage or injury

11.4 Current and Future Risks

Risk management in Urban Forestry is directly linked to the health of our urban forest and is an ever-evolving topic of study. Traditional risk frameworks that that would normally apply to built or engineered assets don't properly capture the complex interrelationships between tree health and tree age, species, size and the surrounding environment or location. The City of Burlington's Forestry Health staff apply a Best Management Practices approach coupled with due diligence to risk management that includes pest management, tree planting and lifecycle treatment, species diversity and public education.

With the completion of the City's Urban Forest Management Plan (UFMP), various risk strategies, including those that may relate climate change, may be identified. Future iterations of the AMP will consider any risk frameworks or management strategies that relate to climate change.

We anticipate that the Urban Forest could be severely impacted by climate change through stress and damage due to extreme heat, drought, extreme storm events, and increased risks of canopy loss and tree decay due to invasive pest expansion. In coordination with the Climate Resilient Burlington Plan and the UFMP, Forestry staff will continue to assess and identify how the City's Urban Forest can best be managed and adapt to the impacts of climate change.

12.0
Corporate Fleet

The City of Burlington is committed to providing corporate vehicle and equipment operation, maintenance, replacement and operator training that is safe, reliable and environmentally sustainable.

SNOW REMOVAL, BURLINGTON, ONTARIO

Vehicles

Very Good $4.1M 25%

Good $4.0M 24%

Fair $2.1M 12%

Poor $2.6M 16%

Very Poor $3.9M 23%

Equipment

Very Good $1.2M 10%

Good $2.7M 23%

Fair $2.3M 19%
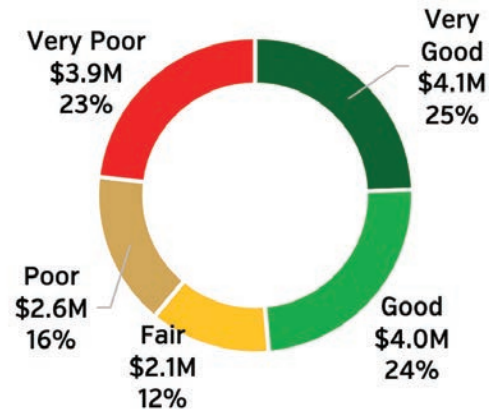
Poor $3.1M 25%

Very Poor $2.8M 23%

12.0
Corporate Fleet

The City of Burlington is committed to providing corporate vehicle and equipment operation, maintenance, replacement and operator training that is safe, reliable and environmentally sustainable.
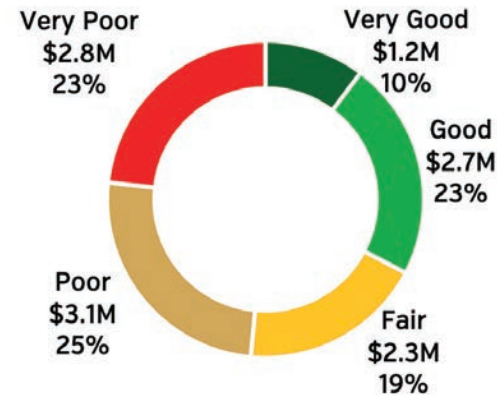
12.0 Corporate Fleet

City-owned fleet vehicles and equipment are operated across four different services areas within the corporation: Fire; Transit; Recreation; Community and Culture; and Corporate Fleet. This section of the AMP summarizes the vehicles and equipment within the Corporate Fleet service, which are managed by Roads, Parks and Forestry (RPF). Corporate Fleet owns and maintains 163 vehicles and 565 items of equipment. This service contributes to the City's Strategic Plan , 3.2 Environmental and Energy Leadership and 4.1 Good Governance.

The Corporate Fleet assets include light, medium and heavy vehicles that perform a variety of services from earth-moving to snow removal. Corporate Fleet equipment types include on- and off-road light, medium and heavy equipment, ranging from chainsaws to trailers to ice re-surfacers.

12.1 State of the Local Infrastructure

12.1.1   Asset Inventory and Evaluation

The Corporate Fleet asset data inventories are maintained in a work order management system for tracking vehicles and equipment, issuing/managing work orders, preventative maintenance and inspection programs, parts inventory, purchasing, fueling and other associated costs. Regular updates to the inventory are completed after regularly scheduled maintenance activities, renewal, and replacement of fleet assets.

The City develops current replacement values by using historical cost, inflation, and professional judgement. The relatively short life of fleet assets and the availability of off-the-shelf vehicles and prices make this practice feasible. For more complex equipment and vehicles (requiring a degree of customization or the addition of equipment to a base vehicle), additional time is required to assess replacement values at the anticipated time of purchase.

As shown in Table 65, the City of Burlington's portfolio of infrastructure assets for Corporate Fleet is valued at $28.8 million, which is comprised of a mixture of vehicles, valued at $16.7 million and equipment valued at $12.1 million. These replacement values were derived from historic costs adjusted for inflation. Table 66 summarizes the Corporate Fleet assets inventory and the associated replacement values.

Table 65:   Asset Valuations for the City's Corporate Fleet

|	Vehicles	Equipment
Total Replacement Value	$16.7M	$12.1M
Average Condition Score	**Fair**	**Fair**

Table 66:   Assets Inventory and Valuation for Corporate Fleet & Equipment Assets

Asset Type	Asset Sub-Type	Quantity	Replacement Value	Average Age	Average Condition
Vehicles	Light Vehicle	102	$3.9M	5	Fair
	Medium Vehicle	27	$2.0M	5	Fair
	Heavy Vehicle	33	$10.7M	5	Fair
Equipment	Light Equipment	22	$140.2K	9	Fair
	Light Equipment (Off Road)	455	$3.4M	6	Fair
	Medium Equipment	15	$819.2K	7	Good
	Medium Equipment (Off Road)	61	$5.4M	6	Fair
	Heavy Equipment	6	$624.2K	11	Poor
	Heavy Equipment (Off Road)	6	$1.8M	12	Poor
TOTAL			$28.8M	6	Fair

12.1.2   Asset Age Summary

Figure 42 displays average asset age as a proportion of the Estimated Service Life (ESL) by asset for Corporate Fleet assets. The average lifecycle of an asset is 6 years. Once an asset has reached its end of estimated service life, it is removed from service and auctioned off.

Figure 42: Average Asset Age as a Proportion of Average Asset ESL (Corporate Fleet assets)
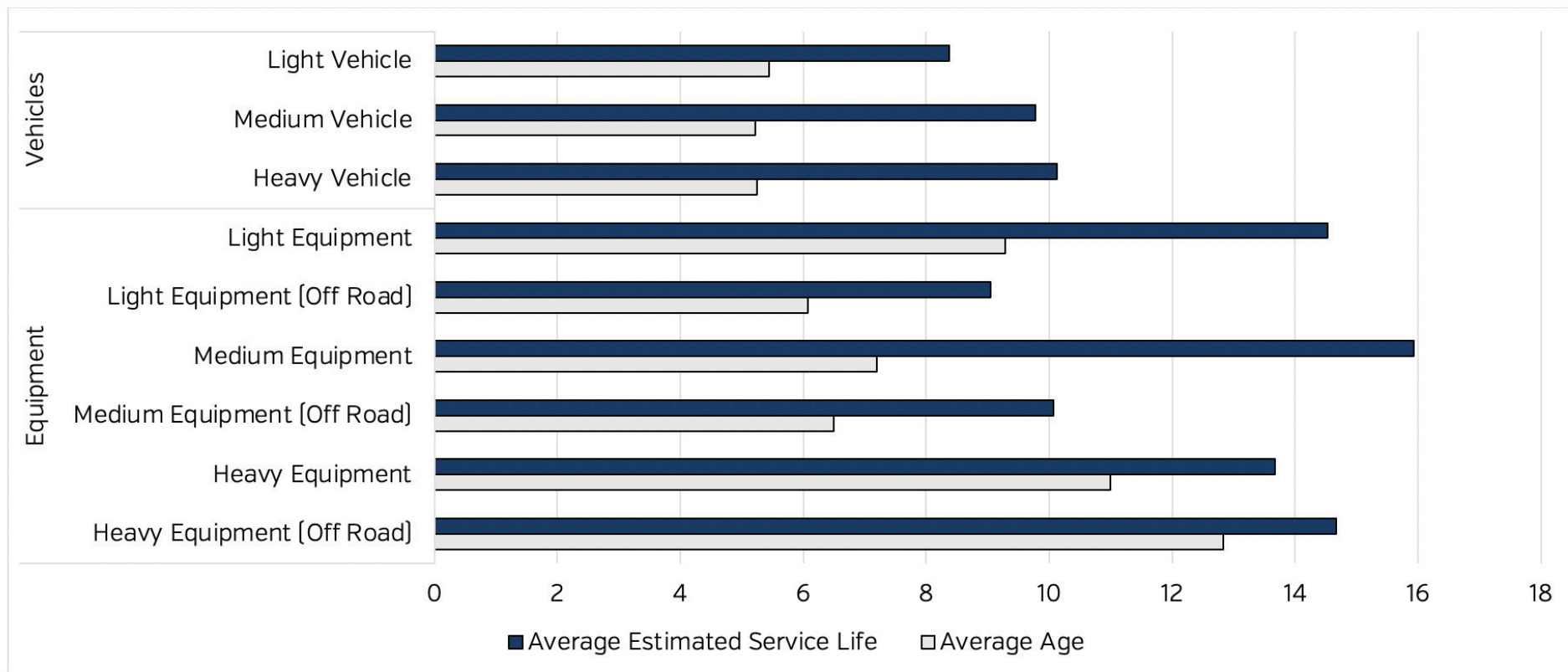
12.1.3   Asset Condition

This section outlines the breakdown of assets in each condition category based on the percentage of total replacement value. Asset condition was categorized based on the scale as shown in Table 67.

Table 67:   Corporate Fleet Condition Scale

Performance Category	Condition Rating and/or Service Life Remaining
Very Good	"Very Good" or >80% of life remaining
Good	"Good" or 60-80% of life remaining
Fair	"Fair" or 40-60% of life remaining
Poor	"Poor" or 20-40% of life remaining
Very Poor	"Very Poor" or <20% of life remaining

For Corporate Fleet assets, condition is verified by a variety of methods including visual inspections, legislative requirement (i.e. safety certifications), feedback from operators and supervisors, preventative maintenance performed on the unit and inspections performed by mechanics during regularly scheduled maintenance. Asset condition scores were determined based on; age (% of remaining life), maintenance and repair costs, and metering use (if applicable). Corporate Fleet asset conditions are distributed fairly evenly with 42% in Good or Very Good condition, 15% in Fair condition and the remaining 43% in Poor or worse condition. These assets in poorer condition represent vehicles and equipment near the end of their service life. Figure 43 illustrates the condition distribution of the City's Corporate Fleet assets.

*Figure 43:   Asset Condition Summary (Corporate Fleet assets)*
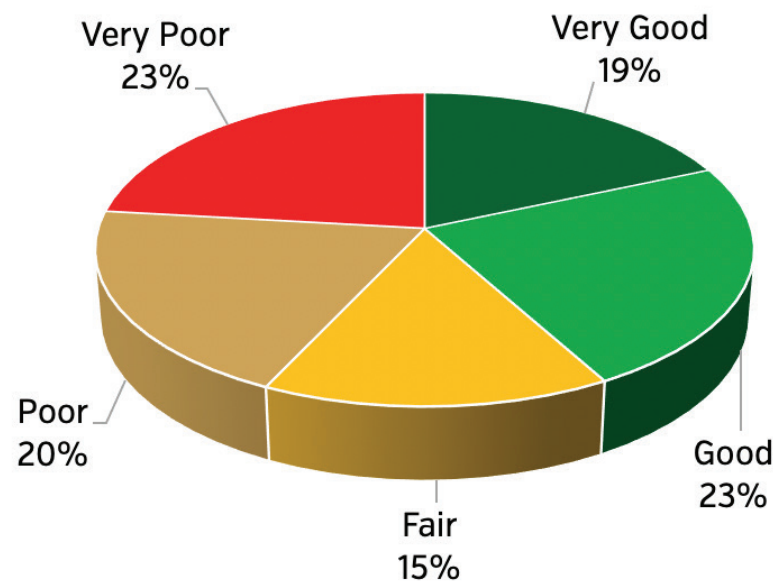
12.1.3.1 Vehicles & Equipment

Corporate fleet and equipment are inspected at regular intervals to meet regulatory requirements and evaluated for any major changes in condition or ability to meet estimated service life. Additional inspections on RPF vehicles and equipment are completed when an asset reaches the end of its estimated service life, at which point factors such as overall condition, hours used, service needs and industry trends all impact the decision to either extend or replace the unit. For this asset plan, the Corporate Fleet inventory was assigned a weighed score according to condition criteria where appropriate. In the case of smaller equipment that is not tracked for use or metering, the condition was derived based on age alone.

Figure 44 outlines the condition of Corporate Fleet assets as a proportion of replacement value based on condition. Nearly 50% of Equipment assets are in Very Poor or Poor condition, while the remaining assets are in Fair or above condition. For Vehicles, 48% of assets are in Very Good to Good condition with the remaining in Fair or worse condition.

Figure 44: Corporate Fleet Asset Condition by Asset Type and Percentage of Replacement Value
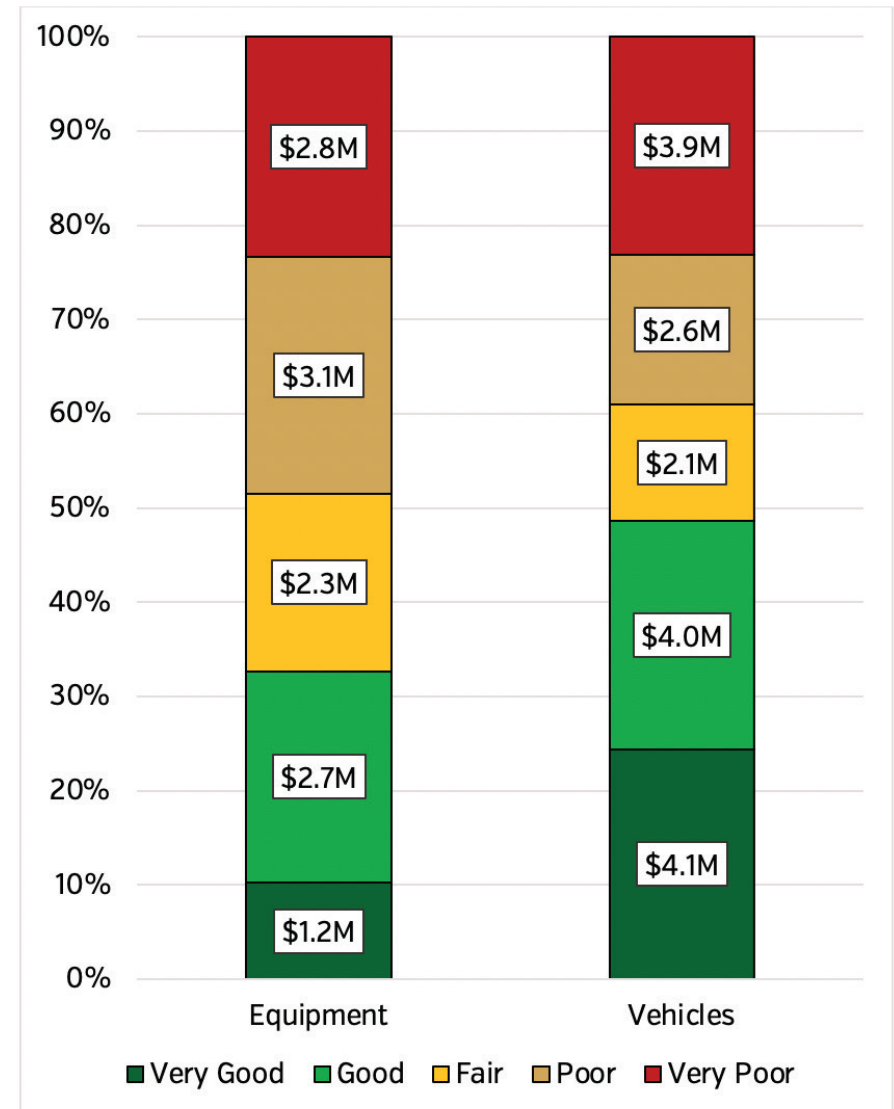
12.2 Levels of Service

12.2.1 Community and Technical Focused Performance Measures

The City has developed their own set of unique level of service performance metrics which are used to reflect citizen values and desires. These metrics are classified below through service attributes provided by the City that summarize the type of service being provided to citizens and their wider communities. These metrics are displayed in Table 68 and Table 69. Key service attributes for community & technical focused performance measures for Corporate Fleet assets include: Quality, Safety, Cost-Effectiveness, Reliability and Environmental Sustainability.

LEVELS OF SERVICE

Table 68:   Community Focused Performance Measures for Corporate Fleet

Service Attribute	LOS Statement	Community Focused Performance Measures	
		Performance Measure	Current Performance
Cost-Effectiveness	Providing corporate fleet vehicles and assets in an efficient manner	Cost to maintain fleet assets per capita	$24.87
Quality	Providing corporate fleet assets in an acceptable condition	% of fleet assets that meet the quality targets	98%
Reliability	Providing reliable corporate fleet vehicles and equipment	% of fleet assets that meet the expectations of the user group	95%
Safety	Providing safe corporate fleet vehicles and equipment	% of legislated MTO safety inspections met	100%
Sustainability	Providing corporate fleet vehicles and assets that are environmentally sustainable	Annual greenhouse gas emissions and fuel consumption[1]	1,210 Tonnes CO_2 (2018) 1,264 Tonnes CO_2 (2019) 1,049 Tonnes CO_2 (2020)

1. Three years of data are included for context due to abnormal asset operations as a result of COVID-19

Table 69:   Technical Focused Performance Measures for Corporate Fleet

Service Attribute	LOS Statement	Community Focused Performance Measures	
		Performance Measure	Current Performance
Cost-Effectiveness	Providing corporate fleet vehicles and assets in an efficient manner	Cost to maintain fleet assets per km ($/km)[1]	$2.18 (2018) $2.07 (2019) $2.45 (2020)
		Operations and Maintenance costs for fleet assets	$2,347,676
		10 Year average fleet asset renewal budget as a % of replacement value	10%
		% of Operations and Maintenance costs to total cost	49%
Quality	Providing corporate fleet assets in an acceptable condition	% of vehicles that meet or exceed the target design standard	100%
Reliable	Providing reliable corporate fleet vehicles and equipment	% of vehicles and equipment past their optimum service life	11%

1.   Three years of data are included for context due to abnormal asset operations as a result of COVID-19

12.3 Lifecycle Management Strategy

This section focuses on specific activities that work to maintain the levels of service previously outlined. The City's knowledge and understanding is continually improving through the collection and utilization of data that informs decision making related to asset lifecycle system and Levels of Service performance metrics.

The development of appropriate and cost-effective strategies is foundational for ensuring service sustainability. Further, the lifecycle management activities reduce the risks to service delivery and performance. Table 70 describes the lifecycle management activities currently in place or planned to be implemented by the City.

Table 70:   Corporate Fleet Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events	• Carrying out regular maintenance activities on all vehicles and equipment as per manufacturer's recommendations for optimum performance and lifecycle • Reactive maintenance for circumstances not easily mitigated (i.e. vehicle accidents, faster than anticipated breakdown) • Tracking maintenance activities in order to continue to improve. Target is to minimize unplanned non-standardized work • Empowering certified staff to make decisions on elective repairs (under $1,000) in order to ensure continuity of service and fewer breakdowns while in service	• Delayed maintenance activities may result in unscheduled downtime due to repair or failure
Renewal / Rehabilitation Significant repairs designed to extend the life of the asset	• Regular preventative maintenance programs assist in determining renewals/rehabilitation required • Major overhauls or reconditioning are very costly and generally do not add enough extended life in order to add value • Review opportunities to repurpose add on equipment, attachments and outfitting past the lifecycle of the parent asset	• Delayed renewals or rehabilitation may result in unscheduled downtime due to repairs or failure
Replacement Activities Activities that are expected to occur once an asset has reached the end of its estimated service life and renewal/ rehab is no longer an option	• Optimal asset lifecycle assessed to determine timing of replacement that minimizes maintenance/repair and maximizes salvage value • Communication with the Supervisor of Fleet Services of end of life assets to help with service and repair decisions to mitigate non-value-added expenditures	• Delayed replacement may result in unscheduled downtime due to failure • Reduction in services may result due to failure
Non-Infrastructure Actions or policies that can lower costs or extend service lives	• Lifecycle Management Review – Condition Assessment at end of life • Review and benchmarking of lifecycles • Test extending lifecycle to review impact • Cost review on assets past lifecycle	• Asset renewal needs are under- or overestimated

Table 70:   Corporate Fleet Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities

Expansion Activities
 	
Planned activities to improve an asset's capacity, quality and system reliability
	• Growth and expansion are guided by, but not limited to:
	   o Burlington's Strategic Plan 2015-2040
	   o 2018-2022 Burlington's Plan: From Vision to Focus
	   o Burlington's Integrated Mobility Plan
	   o Development Charges Background Study
	   o Green Fleet Strategy
	   o Provincial Audit & Accountability Review
	• Capital growth projects are identified by City of Burlington Development Charges Background Study (subject to Development Charges Act, 1997 requirements)
	• Electrification of fleet vehicles
		• Growth activities may be delayed and impact quality of asset services provided
		• Accelerated deterioration of other assets may result if growth needs are not assessed

Disposal Activities Activities associated with disposing of an asset once it has reached the end of its estimated service life, or is otherwise no longer needed by the municipality	• Optimal lifecycle analysis completed for each asset prior to replacement. Salvage amount can vary but an average of 15% of replacement value is consistently achieved • Planning with auction to ensure staggering of similar assets to maximize return and not flood market with availability • Planning with auction to target seasonal disposal of assets when demand is high	• Improper disposal can lead to environmental damages or lost recovery from salvage
Service Improvement Activities Activities to improve an asset's capacity, quality and system reliability	• Post-delivery inspection to confirm vehicle arrived as specified • End-user training specific to the equipment to ensure proper operations and operator maintenance (cleaning, greasing, etc.) • Consider extended warranties when available and service agreements (i.e. rust proofing) • Procurement practices to emphasize quality assets	

12.4 Current and Future Risks

Through workshops with Corporate Fleet staff, asset types were placed into a framework based on the range of severity of the consequence of failure according to three types of impacts: social, environmental and financial.

The scale of consequence can range from insignificant to severe/catastrophic and assets were assigned a weighted score based on the consequence of failure. In some asset types, only those deemed most critical were assigned the highest of scores in terms of the consequence of failure, such as specialized equipment and machinery used in Roads, Parks and Forestry operations for public safety or emergency response. These consequence of failure scores were then incorporated into the model to inform the prioritization of funding needs used in the financial analysis. It is important to recognize that these risk frameworks are not intended to reliably predict or prevent critical asset failure but can modify how financial needs are modeled in the long-term financial model.

The City's Corporate Fleet is positioned to both mitigate and adapt to climate change. In 2008, the City of Burlington adopted the Greening the Corporate Fleet: Transition Strategy. This will soon be replaced with an updated Green Fleet Strategy. A series of actions towards continuing the greening of the corporate fleet by improving efficiency and reducing emissions were previously identified, including transitioning to hybrid technology; adoption of alternative, cleaner fuels; electric vehicles; improved vehicle maintenance; and driver training. These objectives contribute towards mitigating climate change and support the City's Strategic Plan and Vision to Focus work plan.

It is anticipated that Burlington will experience more frequent and more severe weather as described in the City's Climate Projections for Burlington report. These extreme weather events will result in increased demand, maintenance and deterioration of the vehicles and equipment that provide operational and safety services to our City roads, parks and facilities.

Future iterations of this Plan can further build onto the decision support models by incorporating climate change impacts into the Corporate Fleet risk framework.

13.0
Information Technology

The City of Burlington is committed to providing reliable technology services and solutions to internal corporate services owners and its residents.

Information & Technology
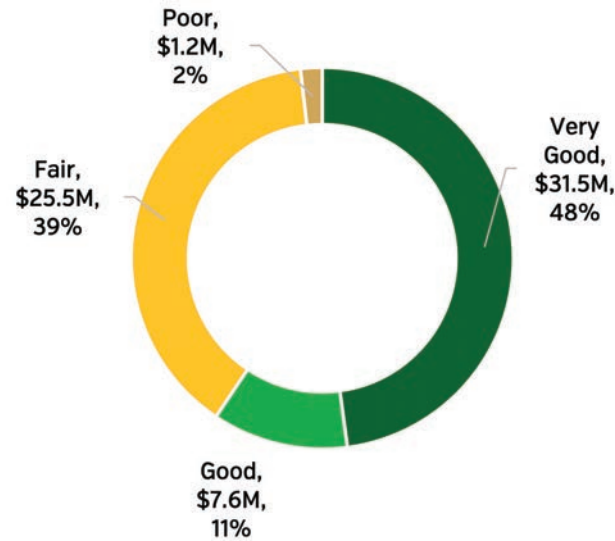
Poor, $1.2M, 2%

Very Good, $31.5M, 48%

Fair, $25.5M, 39%

Good, $7.6M, 11%

13.0
Information Technology

The City of Burlington is committed to providing reliable technology services and solutions to internal corporate services owners and its residents.

13.0 Information Technology

The City of Burlington's Information Technology (IT) Services department provides professional consulting services by proactively assisting the corporation's business areas with technology solutions that meet business objectives. This service contributes to the City's Strategic Plan, 4.1 Good Governance and 4.2 Community Building though Culture and Community Activities.

IT Services delivers desktop hardware and software support, business application management and support, online corporate services and bookings, data management and business intelligence, security, training and general consulting. IT Services is also responsible for managing the City's data centres, network, internet access, email and telephone system.
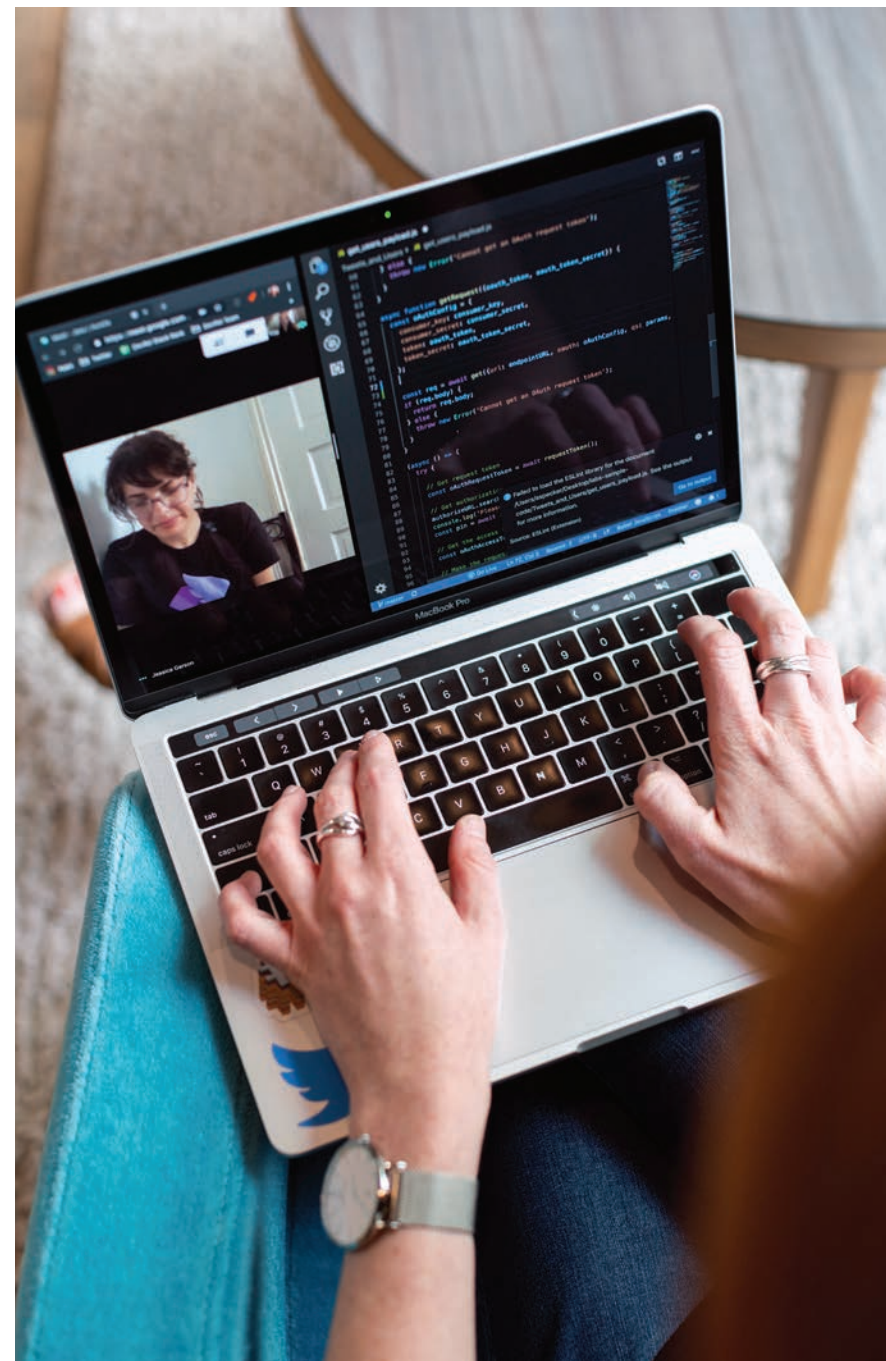
13.1 State of the Local Infrastructure

13.1.1 Asset Inventory and Evaluation

IT Services staff support more than 1,300 user IDs and about 3,900 (including PC's, telephones, laptops, and servers). IT Services manages all computer-related issues for the City through a centralized service desk and responds to approximately 15,000 service requests and incidents each year. Forecasted service requests are expected to grow by 4% to 5% per year.

The City's computer network extends to 43 corporate facilities throughout Burlington. A secure internet connection provides remote access to the City's network for those staff working from other locations. IT Services maintains an inventory of their hardware and software assets in a variety of applications and data systems. Given the short lifespan of IT assets, the replacement values maintained by the City are based on the most recent purchase price or license fee for an asset. However, given the dynamic schedule for both software and hardware IT assets, the City also updates asset values based on changing market prices from its vendors and suppliers. The City's value of IT assets included in this AMP is estimated at $66 million. Replacement costs include the expense and complexity of migrating data from legacy systems, and assume that each asset type will be replaced with a like-for-like system, though this may not always be the case. As systems, technology and business needs evolve, solutions are expected to gradually consolidate towards fully-integrable enterprise solutions.

Table 71 below summarizes the replacement value and average condition score for IT assets while Table 72 summarizes the asset inventory and valuation in greater detail.

Table 71:   Asset Valuations for the City's IT Assets

|	Hardware Systems and Devices	Software Applications
Total Replacement Value	$5.5M	$60.3M
Average Condition Score	Good	Good

Table 72: Assets Inventory and Valuation for IT Assets

Asset Type	Asset Sub-Type	Quantity	Replacement Value	Average Age	Average Condition
Hardware Systems and Devices	Servers (including software licenses)	27	$1.8M	3	Good
	Telephones	909	$1.2M	5	Good
	Switches	111	$710.0K	3	Good
	Workstations	1317	$1.8M	7	Good
Software Applications	Major	54	$42.1M	8	Good
	Minor	110	$8.3M	4	Poor
	Hosted Solutions	30	10.0M	5	Good
TOTAL			$65.8M	6	Good

13.1.2 Asset Age Summary

Figure 45 displays average asset age as a proportion of the Estimated Service Life (ESL) by asset type for IT assets. Using industry standards, as well as historical patterns for asset performance and replacement, the City has developed estimated service lives for each hardware asset type for forecasting purposes. However, given the pace of change, some hardware and software systems are replaced prior to the end of their estimated service life due to functional performance requirements or through loss of vendor support. Based on historical patterns for upgrades, the City has developed an expected schedule for major upgrades of software assets.

However, replacement or upgrading of software is driven by the actual upgrade cycles implemented by the software vendors. Replacement costs include the expense and complexity of migrating data from legacy systems and assume that each asset type will be replaced with a like-for-like system, though this may not always be the case. As systems, technology and business needs evolve, solutions are expected to gradually consolidate towards fully-integrable enterprise solutions.

Figure 45: Average Asset Age as a Proportion of Average Asset ESL (IT assets)
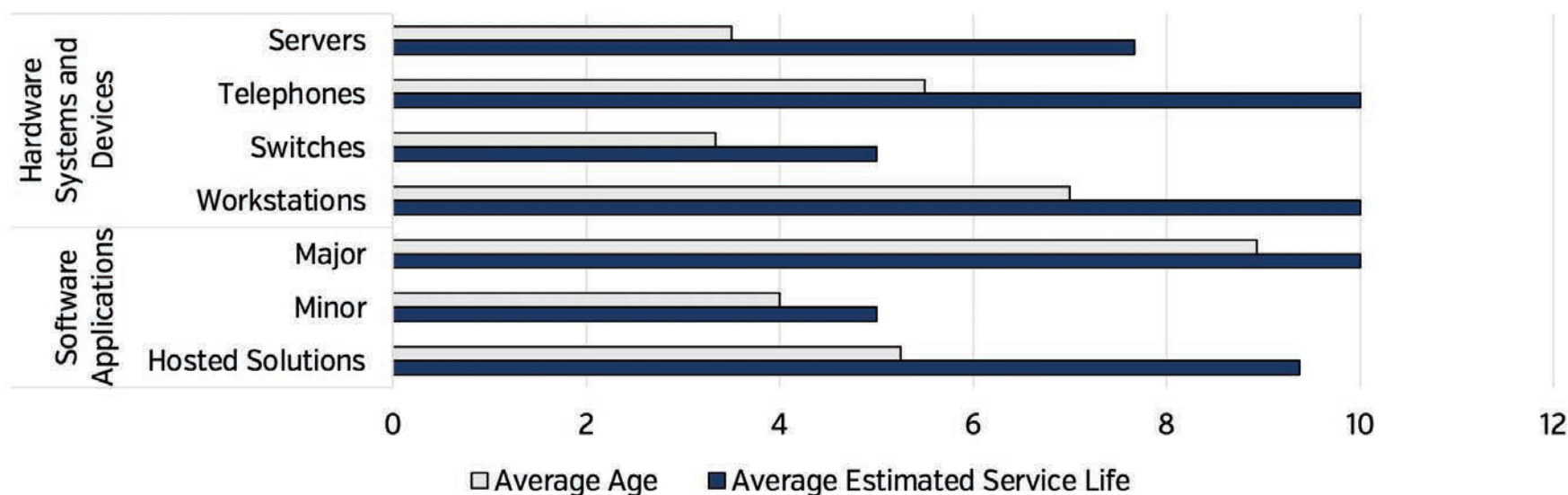
13.1.3 Asset Condition

This section outlines the breakdown of assets in each condition category based on the percentage of total replacement value. Asset condition was categorized based on the scale as shown in Table 73.

Table 73: Information and Technology Condition Scale

Performance Category	Condition Rating and/or Service Life Remaining
Very Good	"Very Good" or >80% of life remaining
Good	"Good" or 60-80% of life remaining
Fair	"Fair" or 40-60% of life remaining
Poor	"Poor" or 20-40% of life remaining
Very Poor	"Very Poor" or <20% of life remaining

IT Services currently does not maintain or assess condition on individual assets (i.e. laptops, telephones, servers etc.). Condition of each IT asset type were derived based on professional opinion, estimated service life, anticipated upgrades/renewals, performance and observed suitability. Unlike other City-owned assets, hardware and software are not only difficult to assess/inspect for condition, but they also decline for different reasons. Nearly 60% of the IT Services assets are in Good to Very Good condition, with the remaining 41% in Fair and Poor condition.

Figure 46:   Asset Condition Summary (IT assets)
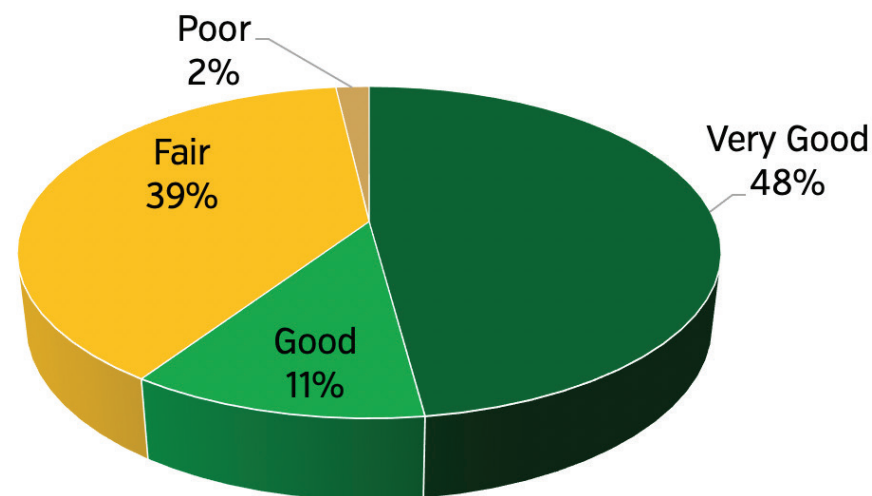
13.1.3.1   Hardware & Software

Figure 47 outlines the condition of IT assets as a proportion of replacement value based on condition. Hardware assets include items like servers, telephones, switches and workstations. Majority of Hardware assets are in Very Good to Good condition while the remaining assets are in Fair or Poor condition. Software assets include items like hosted solutions, major and minor software. It should be noted that hardware is typically replaced when it reaches the end of its estimated service life. Software conditions tend to be in Very Good to Fair condition as ongoing upgrades are applied to ensure the asset condition does not deteriorate or the level of service is not impacted. Software replacements are typically coordinated in advance of asset failure or reaching the end of its estimated service life in order to incorporate time for procurement and transition support from one software provider to another.
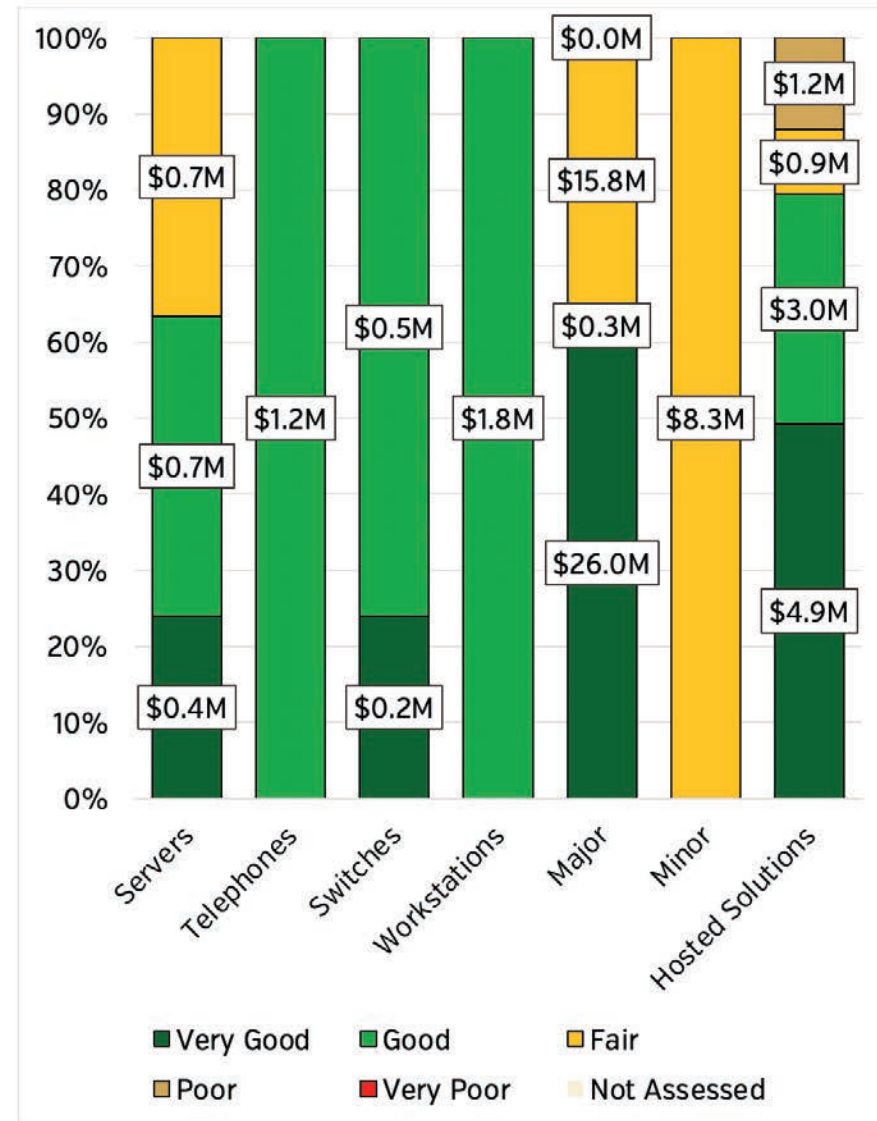

Figure 47:   IT Asset Condition by Asset Type and Percentage of Replacement Value

13.2 Levels of Service

13.2.1 Community and Technical Levels of Service

The City has developed their own set of unique level of service performance metrics which are used to reflect citizen values and desires. These metrics are classified below through service attributes provided by the City that summarize the type of service being provided to citizens and their wider communities. These metrics are displayed in Table 74. Key service attributes for community focused performance measures for IT assets include: Cost-Effectiveness, Quality and Safety.

Table 74: Community and Technical Focused Performance Measures for IT Assets

Service Attribute	LOS Statement	Community and Technical Focused Performance Measures	
		Performance Measure	Current Performance
Cost-Effectiveness	Cost to provide Information Technology that support corporate and business services	Annual operations and maintenance budget	$4,322,838

Service Attribute	LOS Statement	Community and Technical Focused Performance Measures	
		Performance Measure	Current Performance
Cost-Effectiveness	Solve and repair hardware and software issues in order to provide to constant and efficient corporate services	Number of Service Desk Tickets Received	14,800
Quality	Support corporate programs and devices with hardware and software	Number of devices supported	1,317
	Provide reliable hardware technology and solutions to the corporation	Staff satisfaction with reliability of communication systems and networks	78%
	Provide reliable software applications and solutions to the corporation	Staff satisfaction with reliability of applications and functionality	72%
	Provide responsive IT service support to staff	Satisfaction with responsiveness and effectiveness of service desk	85%
	Ensure critical systems are maintained or repaired quickly	Operational uptime of critical systems	99.9%
	Respond to and resolve incidents according to priority	% of Ticket Resolution Resolved on Time	86%
	Provide efficient corporate services to citizens	% Customers satisfied with IT Services	72%
Safety	Provide cyber security to ensure corporate and business services are protected	# of significant security measures implemented in previous 12 months	10

13.3 Lifecycle Management Strategy

This section describes the management activities that support the levels of service provided by IT Services. The City's knowledge and understanding is continually improving through the collection and utilization of data that informs decision making related to asset lifecycle system and LOS performance metrics. IT Services manages the life cycle of all IT assets ensuring ongoing system reliability. IT Services also coordinates major upgrades, applies fixes, responds to requests for improvements and provides general support to the user community. A core set of ten to twelve systems form the foundation of the City's critical business systems and serves the needs of multiple service areas. IT Services supports application integration to facilitate automated data transfer between business systems.

The development of appropriate and cost-effective strategies is foundational for ensuring service sustainability. Further, the lifecycle management activities reduce the risks to service delivery and performance. Table 75 in the following section describes the lifecycle management activities currently completed or planned to be implemented by the City for IT Service assets.

Table 75: IT Asset Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Maintenance Activities Including regularly scheduled inspection and maintenance, or more significant repair and activities associated with unexpected events.	• IT Staff, service leads and users of City hardware and software assets provide asset concerns on proactive basis through alerting applications, routine monitoring and preventative maintenance • Under special circumstances service leads manage assets under their control such as the Traffic Control system • Concerns are also addressed through routine maintenance programs reported by the user to the IT Service Desk • Major and Minor Software applications can continue to provide service beyond their expected lifecycle provided that maintenance for the system is effective and ongoing • Maintain communication with existing system vendors to ensure/forecast continuous support indefinitely	• Failure to complete planned maintenance can lead to premature asset failure and disruption of service • Urgent work requests may not be supported if sufficient resources are not allocated to ensure IT Service coverage • Unanticipated loss of vendor support will result in service disruptions
Renewal/ Rehab Activities Significant repairs designed to extend the life of the asset	• Proactive rehabilitation of City software programs • Infrastructure may undergo both software and hardware upgrades to keep current and fully supported • End user devices and applications are generally not rehabilitated • Assumption that all hosted solutions will utilize full contract extensions at least once before renewal or replacement is required	• Incorrect assumptions about renewal or rehabilitation activities may result in increased funding needs and premature replacement • Failure to complete renewal or rehabilitation can lead to premature asset failure and disruption of service
Replacement Activities Activities that are expected to occur once an asset has reached the end of its estimated service life and renewal/ rehab is no longer an option	• Scheduled replacement programs of IT infrastructure are in place. Assets are replaced when they are no longer meeting operational requirements or are reaching end of support • When IT applications are no longer supported by the vendor and ITS, generally they would be replaced with a new application • End user devices and applications are replaced when the asset reaches end of estimated service life or unexpected event occurs with the asset	• Failure to complete or initiate replacement activities in time can lead to disruption of service

Table 75:   IT Asset Lifecycle Activities

Activity Type	Lifecycle Management Activities	Risks Associated with Not Completing the Activities
Non-Infrastructure Activities Actions or policies that can lower costs or extend service lives	• Coordinate business needs with anticipated IT support to determine prioritization of IT asset replacements • Continuous focus to ensure application and software assets are considered "in support" to mitigate potential malware / cyber-attacks and ensure asset is operating efficiently for individuals using the asset	• Failure to understand corporate needs or security risks may result in loss of productivity or risk of cyber incidents
Expansion / Service Enhancements Planned activities to improve an asset's capacity, quality and system reliability.	• Expansion activities of applications and software include additional licensing due to staff growth, needs or implementation of new modules within the solution • Infrastructure services may be expanded to support new facilities or expanded services in existing facilities. End-user assets may be expanded to equip new users or address new user requirements. Infrastructure components may be expanded by adding capacity (e.g. memory, ports, hard drives)	• Lack of resources or delays in expansion activities may result in loss of productivity, decrease in levels of service, or disruption of service
Disposal Activities associated with disposing of an asset once it has reached the end of its estimated service life or is otherwise no longer needed by the municipality.	• IT Services works with authorized vendors to dispose of technology components per government mandated standards to ensure the assets are properly disposed • Some decommissioned equipment that has market value goes through a data sanitization (wipe process) and sold for resale purposes. Server drives are destroyed to ensure no data leakage	• Failure to properly dispose of hardware and software assets may result in risk of data security breaches, or loss of resale revenue

13.4 Current and Future Risks

Through workshops with IT Services staff, asset types were placed into a framework based on the range of severity of the consequence of failure according to three types of impacts: social, environmental and financial.

The scale of consequence can range from insignificant to severe/catastrophic and assets were assigned a weighted score based on the consequence of failure. In some asset types, only those deemed most critical were assigned the highest of scores in terms of the consequence of failure, such as network servers, switches and databases that support corporate communication and productivity. These consequence of failure scores were then incorporated into the model to inform the prioritization of funding needs used in the financial analysis. It is important to recognize that these risk frameworks are not intended to reliably predict or prevent critical asset failure but can modify how financial needs are modeled in the long-term financial model.

For this iteration of the asset management plan, risk was considered in terms of the impacts of asset failure as we recognize currently or have observed previously. But it is important to consider impacts from other risks in the future such as those from climate change. As IT Services provides critical support to much of the City's assets and services, it should continue to be incorporated into emergency management and risk scenarios under the City's Climate Resilient Burlington plan.

Future iterations of this Plan can further build onto the decision support models by incorporating additional climate change impacts into the IT Services risk framework.

14.0
Financing Strategy

14.0
Financing Strategy

14.0 Financing Strategy

This chapter aims to present the City's budget relative to the state of the infrastructure in order to understand long term funding needs that consider current asset valuations, asset condition, LOS, performance trends and lifecycle activities. Annually, the City undergoes a process to develop budgets that supports City operations and delivers the programs and services required to maintain citizen quality of life. The City's budgets are established to allocate funding to construct infrastructure assets and provide services (including salaries, equipment, and materials to provide services). The budgets consider both costs (expenditures) and available funding (revenues), which are broken into two components:

- Operating Budget: Used to support the day-to-day functions which provide services to Burlington's citizens, and to operate and maintain the City's existing infrastructure.
- Capital Budget: Used for the acquisition and renewal of infrastructure assets to support services to Burlington's citizens.

Through the budgeting process, choices are made to ensure the City services provided to residents align with the priorities in the 2018 – 2022 Strategic Work Plan: From Vision to Focus. This is the City's work plan that prioritizes key strategic directions from Burlington's 25-year Strategic Plan. The Vision to Focus Plan highlights key actions required to move these priorities forward. In order to develop sustainable financing strategies that consider levels of service and cost, forecasts of investment needs have been developed.

14.1   Operating Expenditures

The 4-year historical (2016 – 2019) and budget forecasted (2020 and 2021) operating expenditures for operation and maintenance for assets in each service area is displayed in Table 76.

Table 76:   Historical Operating Expenditures for Services ($'000)

Service Area	2016 Actual	2017 Actual	2018 Actual	2019 Actual	2020 Budget	2021 Budget
Transportation	$8,287	$7,779	$7,254	$7,265	$8,038	$8,213
Transit	$5,739	$6,217	$6,925	$6,722	$7,653	$7,173
Parking	$70	$61	$63	$48	$68	$64
Stormwater	$934	$701	$1,041	$1,236	$1,152	$1,220
Corporate Facilities	$1,802	$1,850	$2,768	$2,907	$2,818	$2,973
Recreation, Community & Culture	$7,889	$8,233	$8,464	$8,717	$8,637	$8,621
Parks	$3,806	$4,241	$4,426	$4,510	$4,776	$4,915
Fire	$1,194	$1,175	$1,212	$1,301	$1,333	$1,321
Urban Forestry	$1,951	$2,160	$3,209	$2,946	$2,618	$2,770
Corporate Fleet	$2,023	$2,168	$2,471	$2,472	$2,368	$2,348
Information Technology	$2,267	$2,532	$3,007	$3,101	$4,024	$4,323
Total	**$35,960**	**$37,118**	**$40,839**	**$41,225**	**$43,485**	**$43,940**

The 2020 budget information is shown here as the actual expenditures were impacted by COVID-19 and are not representative of typical operating needs. For modelling purposes, all future O&M expenditures are based on the 2021 budget.

14.2 Capital Expenditures

The capital budget funds the acquisition and construction of infrastructure assets which provide services to the City, as well as non-infrastructure solutions such as technical studies and master plans. Historical capital expenditures by asset category are displayed in Table 77, reflecting capital rehabilitation and replacement of existing infrastructure. Typically, the highest overall expenditures have occurred within the Roadways category.

Table 77: Historical Capital Expenditures by Asset Category ('000)

Asset Category	2016	2017	2018	2019	2020
Facilities and Buildings	$8,070	$10,371	$9,012	$6,982	$5,792
Fleet Vehicles, Accessories and Equipment	$2,397	$5,049	$6,321	$8,222	$5,820
Information Technology	$691	$740	$1,794	$1,389	$2,196
Parks and Open Space	$4,579	$5,539	$5,470	$4,452	$6,124
Roadways	$21,309	$31,920	$29,672	$31,675	$29,863
Stormwater Management	$1,338	$2,294	$2,243	$1,235	$694
Grand Total	$38,385	$55,913	$54,512	$53,954	$50,490

Table 78 reflects the forecast of funding available to the capital infrastructure renewal program up to 2030. Typically, Burlington's budget is broken out by asset category, so some assumptions were made in order to align funding sources with the appropriate service area.

Table 78: Forecasted Capital Funding Available ('000)

Service Area	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Transportation	$22,648	$20,931	$21,965	$20,851	$9,676	$20,199	$21,238	$26,550	$25,891	$8,283
Transit	$5,251	$4,881	$5,046	$3,530	$3,562	$4,138	$4,209	$4,055	$4,259	$4,259
Parking	$620	$620	$620	$620	$620	$620	$620	$620	$620	$620
Stormwater	$3,013	$3,351	$3,565	$3,781	$4,135	$4,364	$4,918	$5,174	$5,438	$5,710
Recreation, Community and Culture	$7,620	$7,520	$5,039	$4,035	$7,707	$7,065	$8,194	$8,797	$9,053	$9,428
Parks	$5,849	$5,312	$4,832	$5,695	$6,687	$7,032	$7,864	$8,148	$8,645	$8,703
Fire	$1,552	$1,656	$1,722	$1,791	$1,863	$1,937	$2,015	$2,095	$2,179	$2,179
Corporate Facilities	$5,104	$4,974	$5,064	$5,536	$5,215	$5,495	$5,580	$6,108	$3,170	$7,169
Urban Forestry*	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Corporate Fleet	$1,848	$2,533	$2,671	$2,777	$2,889	$3,004	$3,124	$3,249	$3,379	$3,379
Information Technology	$1,922	$3,015	$3,132	$3,151	$3,509	$3,742	$4,300	$4,559	$4,828	$5,100
Total	$55,427	$54,792	$53,656	$51,766	$45,864	$57,596	$62,062	$69,357	$67,462	$54,830

*Urban Forestry is funded through Transportation and Parks.

14.3 Funding Requirements for Existing Assets

In order to understand the long-term funding requirements for existing assets, a 60-year forecast of assets needs was run based on the existing asset portfolio and defined lifecycle strategies that manages the assets at the lowest life cycle cost. These strategies outline the estimated cost and timing of activities to be performed on assets throughout their lifecycle including capital works (i.e. asset replacements and renewals) and operations and maintenance activities (e.g. repairs, etc.). Assetic Software was used to model and forecast the asset deterioration and corresponding financial needs based on input data provided by service areas.

This forecast is unconstrained - it removes any budgetary limits to show the required funding to complete the lifecycle activities as planned and when eligible. For example, the forecast will spend money the year each road segment is forecasted to fall into 'poor' condition. This demonstrates the unconstrained funding requirements to execute this lifecycle strategy for each service area.

Figure 48 illustrates the annual funding requirements for all the City's service areas.   This figure demonstrates that, on average and based on carrying out the lifecycle activities when required by the triggers identified for all lifecycle requirements described in previous chapters, the City will need to invest approximately $106.9 million per year in capital spending over 60 years, including backlog.

Figure 48:   Funding Requirements Forecast - Unconstrained Budget Scenario [2021$]
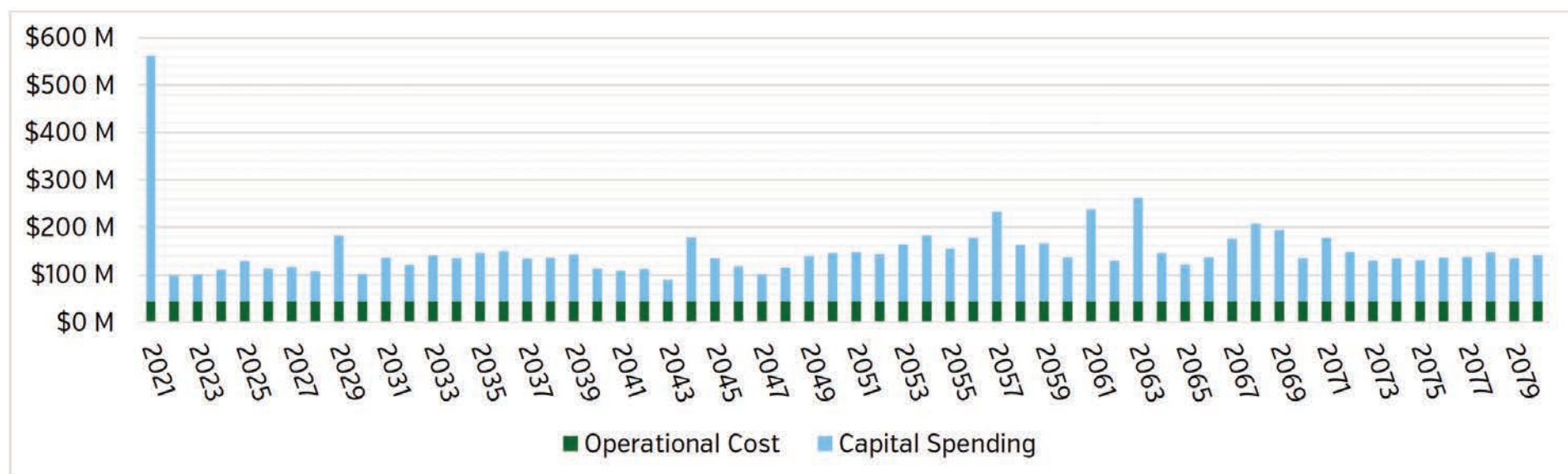
 The graph shows a spike in spending within the first year of the forecast which represents a backlog ($517.9M) of work. This represents the infrastructure that is eligible prior to 2022 for rehabilitation or replacement due to the best-known condition, but that required work has not been completed. Because this backlog is based on the defined levels of service within the modelling software and available data, it is expected to change as the City works to improve asset data and refine these strategies to better reflect actual activity costs, timing and LOS from Council and residents. While the backlog is useful to understand short term asset needs, it should be noted that many assets can continue to work beyond their preferred condition state and/or expected service life.

Figure 49 demonstrates how the distribution of assets in each condition category will vary over time based on this forecast. The average condition of the assets is Good in 2021 with 5% in Very Poor condition. The average condition decreases to Fair by 2080 with 15% of assets falling in Very Poor condition.

Figure 49: Condition Forecast - Unconstrained Budget Scenario
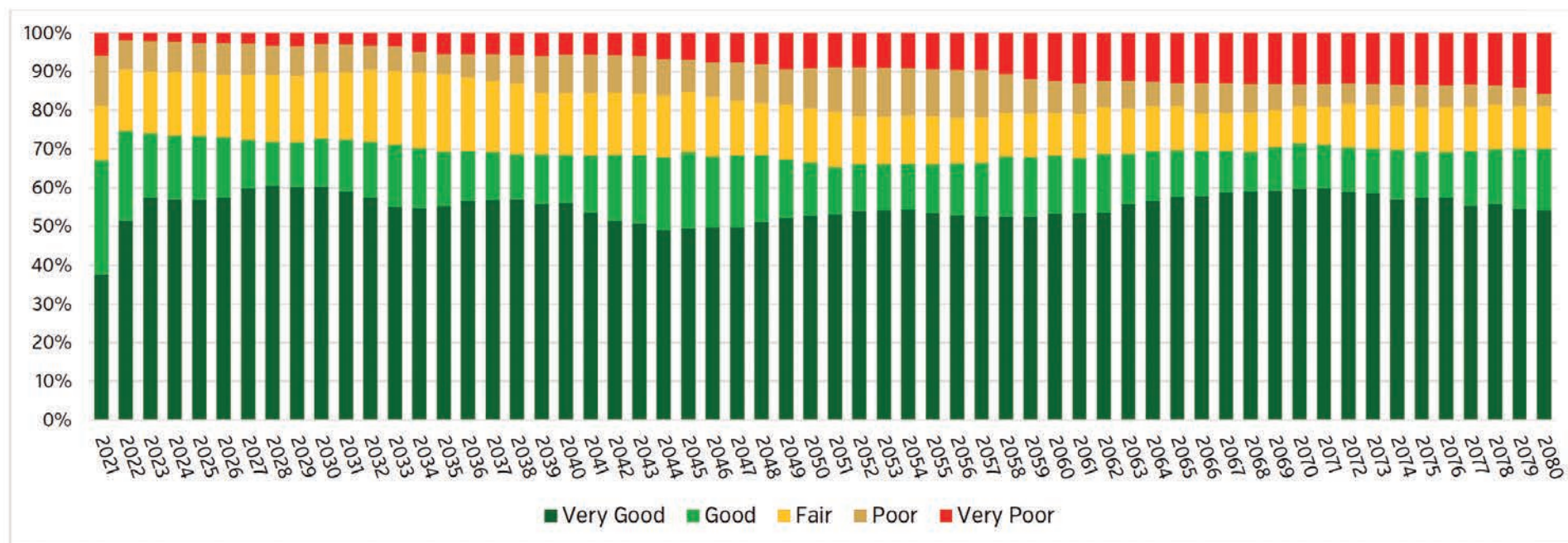
The figure shows that over time it is expected that there will be an increase in the percent of assets (by replacement value) that fall into "very poor" condition as the infrastructure ages. Although this scenario is unconstrained by budget, it does not complete work early and is only completed once the asset reaches the trigger condition so it is expected that assets will still fall into lower condition categories based on their lifecycle strategies. As the City continues to define proposed LOS and refine lifecycle strategies this profile will change to reflect these changes. Beyond this 60-year analysis, the condition of the assets will continue to fluctuate as the life cycle treatments are triggered.

14.4 The Expected Impacts of Current Budget Levels

The next scenario uses the 60-year forecasted capital budget from Table 78 to constrain the potential capital spending each year. Lifecycle activities still have the same condition targets as the unconstrained scenario; however, activities may be delayed if there is not enough available funding. The O&M budget spending remains the same as the unconstrained scenario.

Based on the asset lifecycle strategies and forecasted budget, Figure 50 illustrates the forecasted annual expenditures for all of the City's service areas. Spending may be higher than in the unconstrained scenario for some years due to the assets eligible prior to 2022 for renewal or replacement (backlog) being spread out over several years to fit within the annual budget. Higher costs may also occur where assets need to be replaced instead of rehabilitated due to activities being delay when funding is not available. Risk scores were developed and incorporated into the analysis to prioritize the treatment of assets with a high consequence of failure. If there are many treatments to be completed in a year, but not enough budget, the assets with higher risk scores will be prioritized and treated first. This could delay the treatment of lower risk assets.

Figure 50:   Expenditure Forecast - Budget Scenario (2021$)

The resulting effects on asset condition for all service areas is illustrated in in Figure 51 below. The average condition of the assets is Good in 2021 with 5% in Very Poor condition. The average condition decreases to Fair by 2080 with 28% of assets falling in Very Poor condition.

Figure 51:   Condition Forecast - Budget Scenario

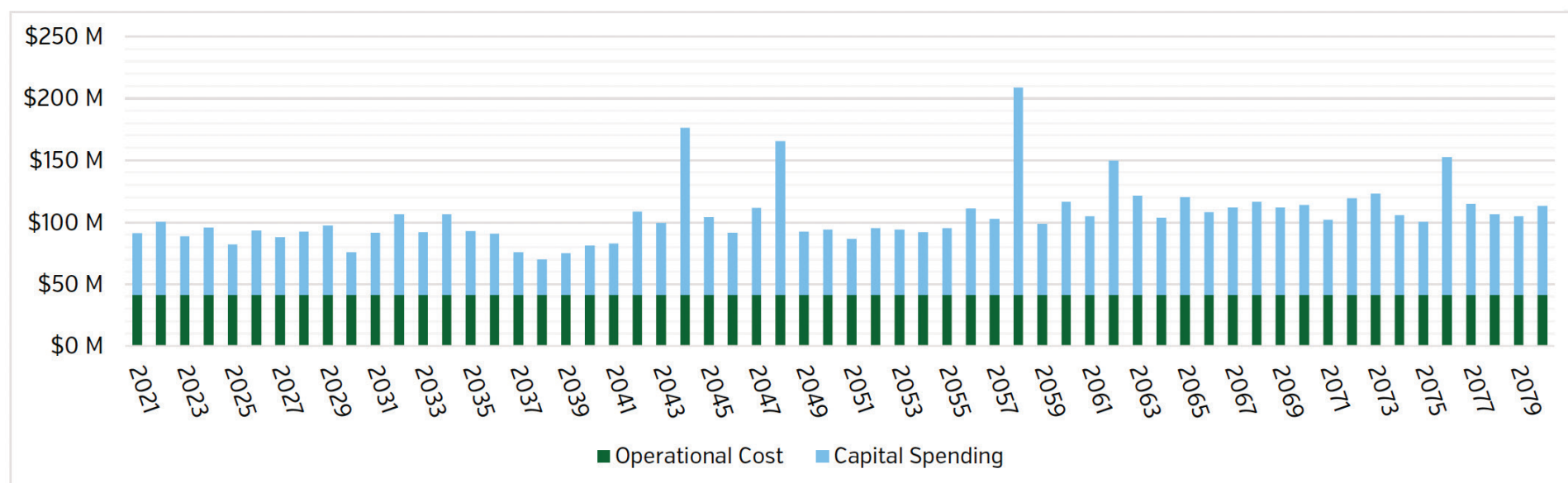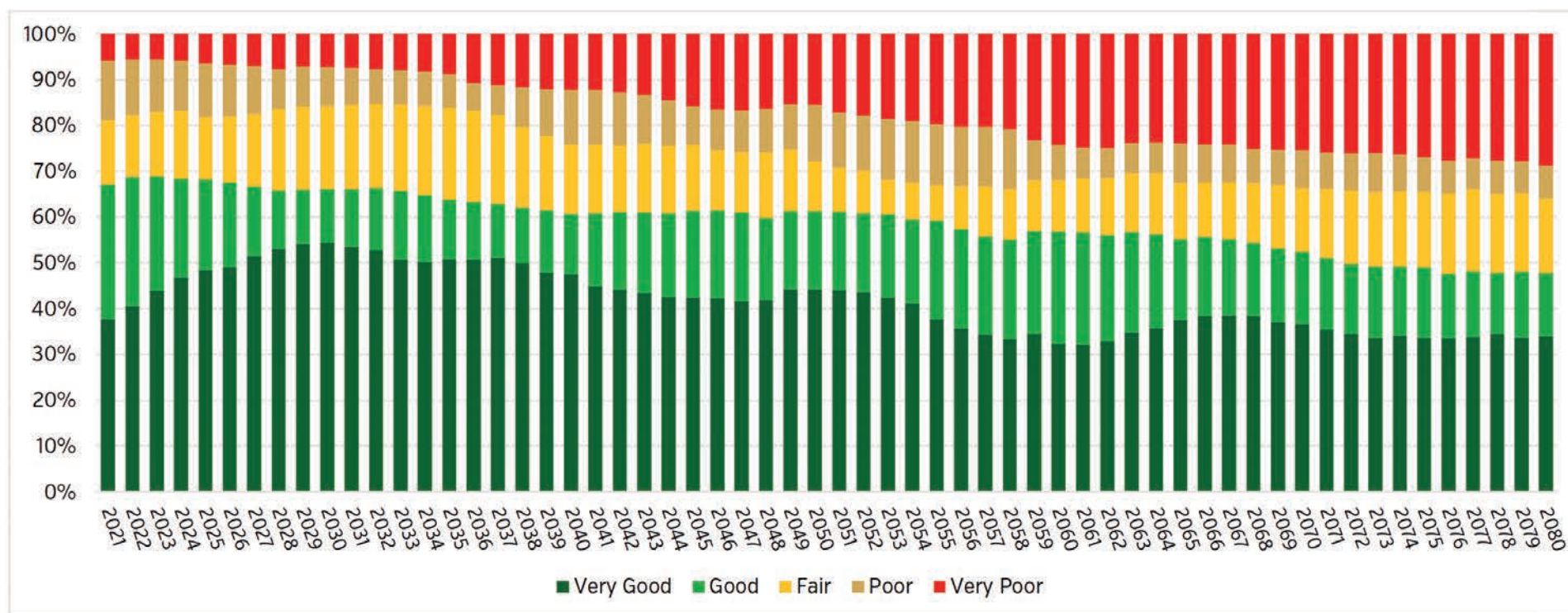This profile demonstrates that a greater majority of assets are anticipated to fall into lower condition categories over time in comparison to the unconstrained scenario.

14.5   Growth

Future growth and development have the potential to contribute to a more economically vibrant, healthy and sustainable city. However, there is an impact on both capital and operating expenditures as growth continues, since population growth changes demographics and expectations, demand, and wear and tear on infrastructure.

Planning for growth is primarily documented in the City's Development Charge Background Study, which is updated every 5 years as growth occurs and new needs emerge. The Development Charge Background Study and its corresponding City by-law includes projections for population and capital funding, and quantifies the anticipated impact of the additional capital on operating requirements. The current study covers the period from 2019-2028 for all assets, and to 2031 for core assets. The Official Plans for both the City of Burlington and the upper tier Region of Halton contain population and employment forecasts, which relate to the provincial plan, A Place to Grow: Growth Plan for the Greater Golden Horseshoe.

For the purposes of this AMP, the impacts of additional infrastructure due to growth have not been included.

14.6   Financing Strategy

The above scenarios demonstrate the forecasted funding requirements for the City's infrastructure and the effect of the existing budget on the condition of the asset portfolio.

Based on the lifecycle strategies currently defined, the budget will not be sufficient to meet infrastructure needs over the long-term. In order to address this unfunded renewal need, the City has several options including:

- Changing the level of service and risk,
- Increasing revenues, and exploring options to fund the deficit, through strategic use of reserves and/or debt, or
- A combination of these options.

There is linkage and tradeoffs between the effort/expenditures required by the assets, the levels of service provided, and the risks related to the selected strategies.

Figure 52:   Asset Management Fundamental Concept
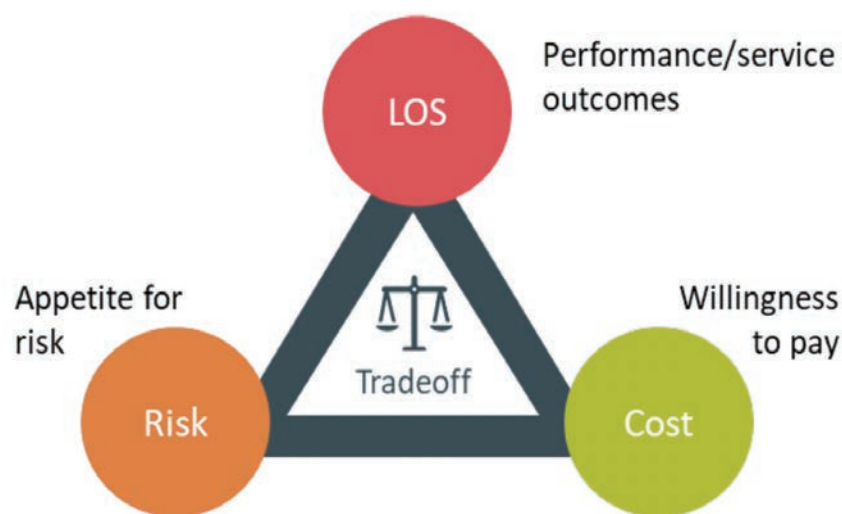
This three-legged stool is a fundamental concept in asset management, and equips the City with a framework to discuss options when continuing a plan forward for managing assets. This is especially important for upcoming legislative requirements to set proposed levels of service, as tradeoffs with cost and risk should be considered, discussed and documented.

14.6.1   Changing the Level of Service or Risk

The lifecycle strategies used within the forecasts outline when activities should be performed on the City's assets based on their condition score or age. Some assets may be allowed to run to failure before being replaced, while other assets may be replaced earlier in their lifecycle. This defines the level of service being provided based on condition and can be adjusted to balance risk tolerance and availability of funding.

These lifecycle strategies are also continuously being improved to better reflect how the City actually manages assets and improving data quality to better capture the actual state of the assets. The next steps in terms of asset management planning will be to define the proposed levels of service, which will include confirming the preferred condition or performance targets for the lifecycle strategies, or modifying the level of service metrics. While high risk assets should have a high level of service and not be allowed to run to failure, it may be possible that levels of service may be reduced for some assets that do not need to be renewed or replaced as frequently, reducing the forecasted spending requirements. However, any changes to LOS could impact the strategies that enable them to be managed at the lowest life cycle cost.

These considerations form the fundamental discussions that will need to occur while establishing proposed levels of service. Table 79 provides several examples of concepts for these discussions related to potential trade-offs.

Table 79:   Options for Future Discussions

Proposed Change	Example	Cost	Risk	Impact
Decrease level of service	Lower average condition index for roads	Short term cost savings may increase overall lifecycle cost	Public Safety	↓
			Service to the Customer	↓
			Organizational Reputation	↓
Change level of service metric	Use % Very Poor constant	May decrease	Organizational Reputation	↑
Adding enhancements / new levels of service	E.g. pedestrian pathways	Increase to construction costs, operating costs	Public Safety	↑
			Service to the Customer	↑
			Organizational Reputation	↑

There are a number of options that City can explore in order to fund a deficit in infrastructure needs including increasing revenues (e.g. levy) and strategically deploying reserves and/or debt.

Established by Council, reserve and reserve funds are an important element of the City's financial plan that assist with long-term financial stability and financial planning. Reserves are typically used to cushion the impact that major expenditures would otherwise have on tax rates in a given year. Reserve funds, similar to a savings account, are established for future purposes. The revenues for these funds come from a variety of sources including property taxes, user fees and grants. Grants are received by the City from senior levels of government and include the Provincial Gas Tax, Federal Gas Tax and Investing in Canada Infrastructure Program.

14.6.2   Importance of Full Life Cycle Costing

Life cycle costs should include all costs that are anticipated to occur during the ownership of an asset. This includes capital, operations, maintenance and disposal expenditures. Unless these full life cycle costs are defined, it is difficult to effectively plan for complete infrastructure costs going forward. The City continues to explore the identification and quantification of these costs to implement optimal management strategies by focusing on doing the most effective activities at the right time with consideration of the entire asset lifecycle costs.

It is important that the City continues to analyze projects and manage existing assets based on the full optimal life cycle costing. This will ensure that current infrastructure will have sufficient funds available when needed throughout its life. Plans for the ongoing improvement of information quality and the planning process will continue to be an integral part of the City's Asset Management system going forward.

14.6.3   Uncertainty and Assumptions in Forecasts

Several uncertainties exist that can impact the timing and value of renewal needs, the availability of funding and the corresponding financial forecasts. These challenges affect the delivery of City services while balancing level of service, cost and risk trade-offs. The City's Asset Managers are faced with increasing service commitments, budget constraints, and the respective risks associated with those decisions made.

Some of the changes are as follows:

- Unpredictability of weather due to climate change – As noted in the City's Asset Management Policy, climate change considerations continue to be a part of the City's planning and business decisions. However, the uncertainty in weather, in particular wet weather, continues to introduce capacity and performance pressures on storm, transportation and other assets that can impact forecasted expenditures. Increased climate variability introduces significant uncertainty into both existing infrastructure preparedness and planning for future infrastructure needs. Climate change will affect the way that the City manages its infrastructure, with impacts on rate of condition deterioration, planned service life and overall reliability of assets. This will be evidenced through an increase in reactive maintenance, as well as in the timing and costs associated with changes to maintenance schedules, renewal interventions, and the need for new capital investments. When possible, the City allocates funding to assist with climate change efforts. For example, the City sets aside funding towards stormwater management to address flood mitigation brought on by climate change events.

- Economic conditions in the City – As demonstrated through the devastating impacts from the ongoing pandemic, global and local economic conditions can affect the forecasting presented in this AMP. For example, as a result of the pandemic, the City is faced with operating budget pressures that has required prioritization of limited financial resources.

- Legislative requirements – Although legislative changes that may impact expenditure needs are usually well communicated in advance, this advance notice may not occur within the 10-year and 60-year horizons considered in this AMP.

- Aging Infrastructure – As the City's infrastructure continues to age and be consumed, it requires lifecycle activity investments to ensure that levels of service continue to be met. The relatively early adoption of asset management practices by the City has helped to reduce costs but continued advancement of these practices and supporting technologies is required to further reduce the total cost of ownership.

- Human Resources - Staff capacity to meet service expectations for the planning and delivery of infrastructure projects can be impacted by human resource constraints.

- New Initiatives - As service changes are introduced through Council initiatives, master plans or other drivers, City staff are challenged to continue to balance the associated costs and risks implications. The City has an opportunity to address this issue by striving to ensure that proposals for new initiatives that can impact available future funding include a fulsome discussion and analysis of the associated costs and risks in order to provide decision makers with a fuller picture of any asset implications.

- Levels of Service/New Services - Levels of service are currently based on condition, and while appropriate for this AMP and O. Reg. 588/17 compliance, the City may need to develop levels of service that consider other important indicator of successful service delivery such as safety, availability, connectivity, and citizen satisfaction, to name a few. In addition, inquiries from Councilors are considered to reflect the voice of the

residents – these initiatives can be considered direct responses to levels of service desired by citizens. Moving forward to meet the objectives of O.Reg. 588/17, the City will be establishing proposed levels of service that will be focused on both customer outcomes and service delivery while balancing customer expectations with risk and affordability. Our goal is to actively encourage community and stakeholder collaboration to understand future needs and incorporate them into subsequent iterations of this AMP.

15.0
Legislative Reportable Forecast

15.0 Legislative Reportable Forecast

Although this section does not pertain to the Financial Strategy, the Ontario Regulation 588/17 requires that municipal asset management plans include the costs to maintain the current levels of service for core assets, which are detailed in the section below.

The forecasts identified in Section 14 are based on carrying out lifecycle activities when assets become candidates for work to be done, such as a storm main that has reached its estimated service life. Since the City currently has a significant backlog of infrastructure that has triggered lifecycle work, but funding was not available for the work to be carried out, the City considers that today's actual level of service could be represented by the current condition distribution for these core assets. That is, the current level of service could be defined as today's percentage of assets in very poor condition, and the City reports the cost to hold that percentage steady, without getting worse. To satisfy regulatory requirements related to core assets and to provide that additional consideration, especially for conversations of proposed levels of service in coming years, these forecasts were prepared for core assets only.

Table 80:   Capital Costs to Maintain Current LOS, Core Assets, Annual Average 2022-2031

Core Asset Type	Current Level of Service Consideration	Cost to Maintain Current LOS
Roadways (Transportation)	1% very poor condition	$35M
Structures (Transportation)	1% very poor condition	$9M
Stormwater Management and Conveyance	1% very poor condition	$7.7M

For 2022-2031, Table 80 shows:
- On average it will cost $35M annually to ensure the no more than 1% of roadways will be in Very Poor condition.
- On average it will cost $9M annually to ensure the no more than 1% of transportation structures will be in Very Poor condition.
- On average it will cost $7.7M annually to ensure the no more than 1% of storm will be in Very Poor condition.

16.0
## Continuous Improvement

WATERFRONT, BURLINGTON, ONTARIO

16.0
Continuous Improvement

16.0 Continuous Improvement

Advancement of the Corporate Asset Management Program is dependent on the continuous improvement of processes, including improvements to asset information, decision-making and strategic planning. This section highlights next steps and opportunities for improvement that were identified through the development of this AMP. These initiatives may be used to enhance future versions of this plan and the associated financial projections and asset management policies. As a guide, the City is using the continuous improvement methodology approach displayed in Figure 48.

Figure 48: City Improvement Methodology
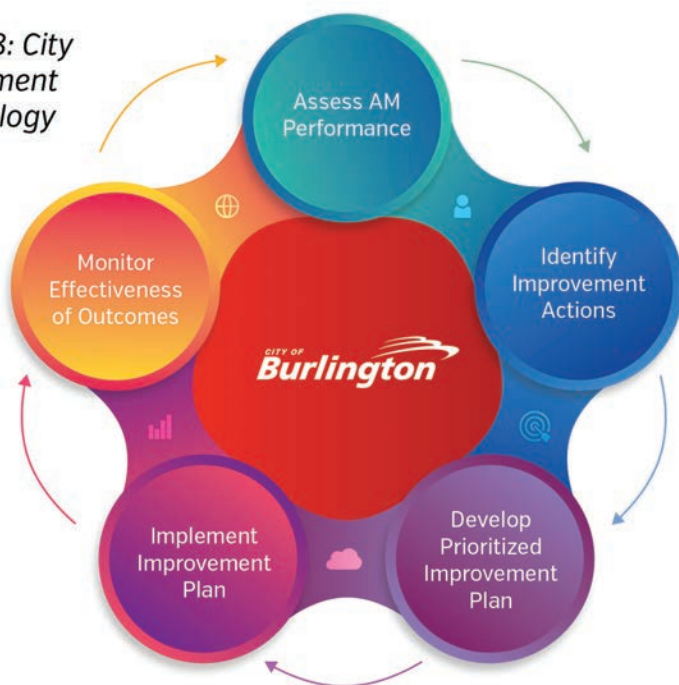
16.1 Improving Future Asset Management Plans

This plan is intended to be a "living document" that is relevant and integral to the City's daily asset management activities. For the plan to remain relevant and useful, it will continually be revised to include updates of asset data inventories, LOS metrics, life-cycle activities, as well as continuous improvement tasks, as specified within the timelines below:

- Regularly monitor the progress of the AMP by providing an annual update to Council, including implementation progress and description of any factors impeding implementation;
- A comprehensive update to the Asset Management Plan will occur every five (5) years, or as required by O.Reg 588/17; and
- A comprehensive update to the Asset Management Policy and Strategy every five (5) years

Improvements that will be made in future iterations include the following plan sections and will be updated as part of the asset management service area workplan on an annual basis:

- State of the Infrastructure: Asset inventories will be comprehensive and accurate, as data will be updated on an ongoing basis, including replacement value, estimated service life and performance/condition values. Data reliability will be improved through better internal processes, and as more condition assessments are performed, and estimates are refined.

- Levels of Service: In future plans, additional advanced LOS measures will be defined for all service areas and staff will continue to improve on how LOS performance data is collected and tracked. LOS measures will be used to represent proposed service levels, in addition to the current service levels in place.

- Lifecycle Activities: Forecasts of lifecycle activities will be refined over time to predict asset need timing and spending requirements more reliably. Asset class-specific strategies will be identified and documented.

- Risk and Climate Change: Future AMPs will include needs forecasts and risk management strategies for most assets. Risk assessments will be reviewed and refined over time to better capture future risks including climate change.

The City also aims to encourage community and stakeholder collaboration. Currently, community feedback is incorporated indirectly through existing public consultation processes related to service-specific engagement. Future iterations will aim to improve on community collaboration and availability of information.

## 16.2	Key Recommendations

In addition to enhancing future iterations of the AMP, several other key program recommendations have been identified. These are broad recommendations that include specific work plan activities that will be identified in the Asset Management service business plan. These activities will be prioritized and carried out within a 1- to 5-year timeframe, subject to funding. The key recommendations are as follows:

1.	Advance the corporate Asset Management Program through alignment with ISO 55000 series of standards. Staff will work to standardize asset management practices across the corporation and use ISO 55000 as a guide for establishing, implementing and maintaining AM systems, as well as for the planning, design and implementation of AM activities.

2.	Strengthen alignment with strategic plans and master plan initiatives. The AMP was established based on a planning approach that aligns with evolving organizational goals and objectives. It has been developed to conform with the City's 25-year Strategic Plan and align with the Vision to Focus plan, and future updates to the AM Policy and Plans will maintain this alignment. In addition, ongoing and future master plans that impact the City's assets will need to be coordinated in a way that the two types of documents work together. This includes utilizing AM tools and methodologies in master plans, such as evaluating infrastructure strategies with a consideration of total life-cycle cost. Examples of upcoming plans include the Integrated Mobility Plan (IMP), the Urban Forest Management Plan (UFMP), Parks & Recreation Facilities Master Plan and the Climate Resilient Burlington plan.

3.	Improve confidence in asset data, strategies and decision support. The City's asset data registries are the foundation of the AMP and are critical for understanding asset performance and conducting analyses necessary for developing technical strategies and forecasts. To improve overall infrastructure decision making, source data and information needs to be reliable. Areas of improvement will focus on closing inventory data gaps for all assets and updating data according to cycles defined in our AM plans. Data QA/QC procedures will be strengthened and will adhere to information and data governance and standards set in place. The Enterprise Asset Management Solution (EAMS) project currently underway will incorporate O&M activities and costs into decision criteria used for long-term capital asset prioritization and investment planning. The new asset decision support system will allow for life-cycle decision logic to be developed and will greatly enhance reporting functionality.

4.	Review financing strategies and process. – There will be a focus on improving financial reporting capabilities and improving integration between AM activities and the City's budget development process. Integration of financial systems (ERP) and EAMS will allow for more accurate and timely information. The processes in place to evaluate the gaps between forecasted infrastructure needs and current spending levels will be optimized, allowing for a better understanding of the trade-offs between investment and the level of service provided. Updates to the City's long-term financing plan will consider the risks associated with infrastructure investment gaps.

5.   Engage the community in asset management. Staff aim to involve the community in discussions about the City's infrastructure and communicate the benefits of asset management. A communication strategy will be developed and information about the state of the City's assets will be made available through updated online applications and dashboards. In addition, engagement with the public (e.g. satisfaction surveys) will be critical for future AMP iterations to ensure that desired levels of service reflect the values and priorities of the community, while also balancing affordability considerations.

16.3 Advancing Corporate Asset Management Capabilities

The City's current asset management practices were assessed using a variety of tools, standards and best practices, including the following:

- The ISO 55000 series of standards for asset management
- International Infrastructure Management Manual
- FCM Asset Management Readiness Scale
- Institute of Asset Management, an Anatomy
- Reliability Web Uptime Elements

These internationally developed standards each define key principles of asset management. These principles provide a framework that can be used to evaluate the current state of the City's asset management efforts and include the following:

- Strategic Asset Management Policy
- Customer Levels of Service and KPIs

- Technical Levels of Service and KPIs
- Growth Management
- Asset Management Plan
- Lifecycle Asset Management
- Risk Management
- Optimized Decision Making
- Work Planning and Execution
- Capital and Asset Maintenance Plans
- Financial Strategy, Planning and Reporting
- Asset Knowledge
- Resources
- Quality Management
- Technology and Tools
- Continuous Improvement

16.3.1   Capability Assessment

At the beginning of the AMP project, stakeholders were asked to provide input on the current and target practices associated with the asset management key principles previously described. An asset management capability assessment was completed to benchmark the level of application of each of the key principles of asset management within the City. The assessment was structured on a one to five scale, where a rating of 1 represents informal and undocumented capabilities and a rating of 5 represents sufficiently documented, structured and fully implemented capabilities, in-line with best practices.

The City's current and target state of each of the key asset management principles is displayed in Figure 49. Asset Register Data and Asset Condition are in good shape with minimal room for improvement, while the areas with high opportunity for improvement include AM Service Delivery Modes, Operations and Maintenance Planning and Continuous Improvement. Staff will continue to guide and support the ongoing improvement of AM within the organization and will complete the capability assessment on a regular basis in order to monitor progress against defined best practices.

Figure 49: Capability Assessment

burlington.ca/assetmanagement

CITY OF
Burlington