HAMILTON STREET RAILWAY ASSET MANAGEMENT PLAN 2024

HAMILTON STREET RAILWAY (HSR) ASSET MANAGEMENT PLAN

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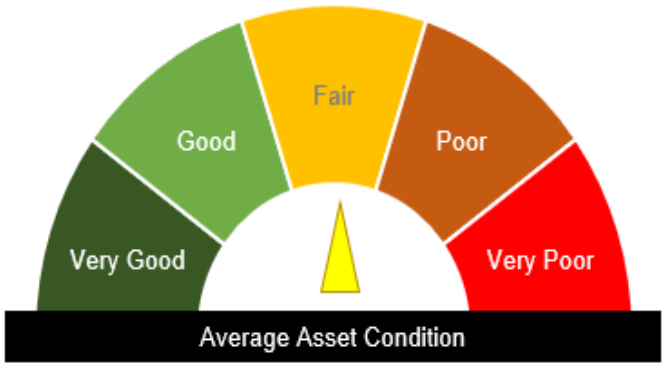
SUMMARY AND QUICK FACTS

SERVICE PROFILE

The purpose of Hamilton Street Railway (HSR) services is to provide, safe, accessible, reliable, and efficient public transit services across the City of Hamilton in accordance with Council and community expectations. Delivering seamless transportation is essential, as many customers rely on transit to support their quality of life.

ASSET SUMMARY

Replacement Value
$524.8M
FAIR CONDITION
Average Age of **14** years
or **50%** of the average
remaining service life



LEVEL OF SERVICE SUMMARY

- The majority of survey respondents felt that their transit was reliable and timely.
- Most survey respondents felt that bus operators were professional.
- Many survey respondents felt the inside of the bus was clean on their ride.
- Survey respondents were **SATISFIED** with how safe they felt during the trip (including bus stops, while riding the bus and while exiting the bus).

ASSET HIGHLIGHTS				
ASSETS	**QUANTITY**	**REPLACEMENT COST**	**AVERAGE CONDITION**	**STEWARDSHIP MEASURES**
Buses	308	$308.2M	Fair	Regular Inspections
HSR Facilities	4	$140.7M	Good	Building Condition Assessments

DATA CONFIDENCE

HAMILTON STREET RAILWAY (HSR) ASSET MANAGEMENT PLAN

DEMAND DRIVERS

Population change – Hamilton's population will continue to grow and HSR will likely see a significant ridership increase which will require additional buses and staff.

Climate Change - HSR has focused on ensuring that its fleet of vehicles is helping Hamilton meet its climate goals. HSR should complete its fleet transformation from diesel vehicles to Natural Gas vehicles within the next two years.

RISK

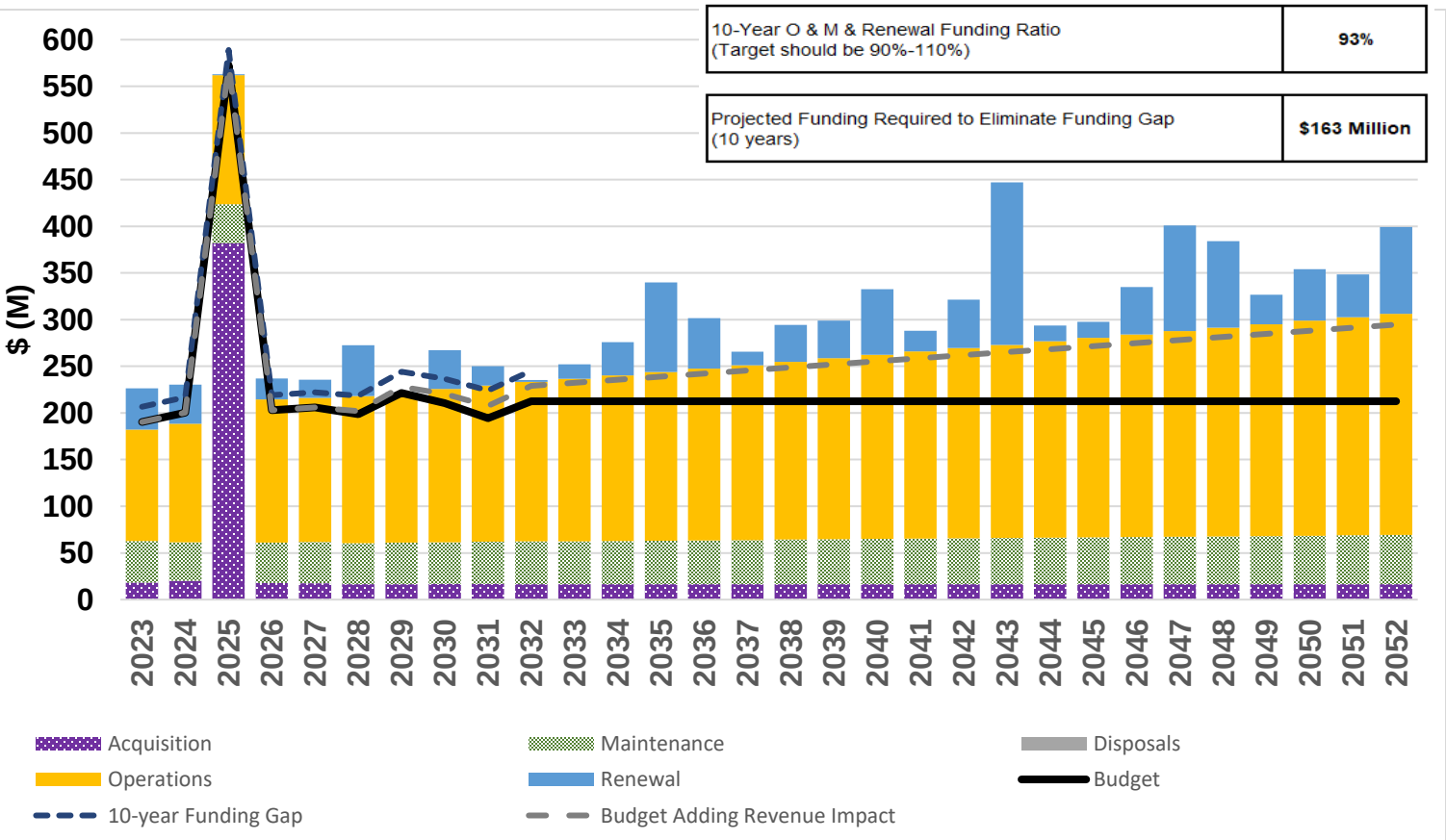
- Critical Assets are identified as the buses and HSR facilities.

CLIMATE CHANGE MITIGATION

- New Maintenance and Storage Facility specifications call for Net Zero design.
- Fleet transformation from diesel to natural gas vehicles and transitioning from compressed natural gas to renewable natural gas.

LIFECYCLE SUMMARY

Asset Renewal Funding Ratio (Target should be 90%-110%)	81%
10-Year O & M & Renewal Funding Ratio (Target should be 90%-110%)	93%
Projected Funding Required to Eliminate Funding Gap (10 years)	$163 Million



HAMILTON STREET RAILWAY (HSR) ASSET MANAGEMENT PLAN

1. INTRODUCTION

Hamilton Street Railway (HSR) exists to provide safe, accessible, reliable and efficient public transit services within the City. The purpose of this Asset Management (AM) Plan is to ensure that HSR has fulfilled the asset management planning requirements outlined in O. Reg 588/17 for current and proposed levels of service as well as ensure HSR has the required assets to deliver transit services in accordance with Council and community expectations.

This AM Plan is intended to communicate the requirements for the sustainable delivery of services through the management of assets, compliance with regulatory requirements, and required funding to provide the appropriate levels of service over the 2023 - 2052 planning period. The assets covered by this plan include the major components required to deliver effective HSR services to the City's residents.

It should be noted that at the time of report writing, the HSR (re)Designed network and corresponding Transit Growth Plan have not been finalized. Therefore, future updates of this document will reflect such changes. Additionally, the current asset management plan for HSR does not capture any associated costs with decarbonizing the transit fleet and migrating to hydrogen or electric vehicle propulsion technologies.

HSR has a variety of assets to support the delivery of public transportation within Hamilton. They range from:

- HSR facilities and maintenance equipment;
- Vehicles (revenue-generating and non-revenue-generating);
- On-street infrastructure, bus stops, and amenities; and,
- Technology such as hardware and software.

2. BACKGROUND

The information in this section is intended to give a snapshot in time of the current state of the HSR service area by providing background on the service, outlining legislative requirements, defining the asset hierarchy used throughout the report, and providing a detailed summary and analysis of existing inventory information as of 2023, including age profile, condition methodology, condition profile, and asset usage and performance for each of the asset classes. This section will provide the necessary background for the remainder of the plan.

2.1 SERVICE PROFILE

The service profile consists of four main aspects of the service:

- Service History;
- Service Function;
- Users of the Service; and,
- Unique Service Challenges

2.1.1 SERVICE HISTORY

On March 29th, 1873, a group of citizens petitioned the provincial legislature to enable the incorporation of public transportation in Hamilton. By May 1874, horse-drawn streetcars made their first trip on single tracks, with one route on James Street, from Stuart to King Street, and another on King Street from Locke to Wellington Street. As HSR continued to grow in 1880 the service erected its headquarters at Bay and Stuart Streets. The HSR headquarters housed 20 streetcars and provided care for its 50 horses. The horses worked four hours a day and typically travelled between 25 and 32 kilometres each day. The HSR horses were retired after five years of service.

HSR operated electric streetcars from 1884 to 1951 when the last transportation belt line was closed. The streetcars were soon replaced by electric trolley buses, with additional diesel buses supporting the transit route. By the end of 1992, all trolleybuses were replaced with diesel buses, with the Barton Street route being the last trolley bus route to be replaced. The HSR now operates 35 routes, covers 243 square kilometres, and provides approximately one million hours of service each year. The service utilizes 308 fully accessible buses, 20% of which operate using diesel petroleum, and 80% using compressed natural gas (CNG).

In the 1980s, the Region of Hamilton-Wentworth developed a Specialized Transit Program, jointly funded through the Region and the province, which was to be delivered through the non-profit contractor Disabled & Aged Regional Transportation System (DARTS). The Accessible Transportation Services (ATS) section within HSR, is the section responsible for oversight of specialized transit. ATS provides door-to-door shared ride service through the contractor and provides the Taxi Scrip Program. By the mid-1990s, the Region solely funded the service. Accessible Transit Services funding was assumed by the newly amalgamated City of Hamilton in 2001, and to date remains to be delivered by the same non-profit contractor. ATS continues

to service the boundaries of the amalgamated City limits, well beyond the HSR urban transit boundary.

HSR also offers a discounted taxi fare program, the Taxi Scrip Program, to specialized transit clients, to supplement ridership outside of the contracted services. The Taxi Scrip Program applies the same eligibility criteria used in determining eligibility for the contracted program. In 1996, the HSR acquired low-floor buses to assist in removing barriers for persons with mobility issues, and to increase ridership within its current service. As of 2009, all HSR buses became fully accessible.

HSR also provides transit services for large-scale community events, such as fairs and festivals. One such service of note is the shuttle service to and from Hamilton Tiger Cats games. The shuttle service provides express shuttles from three locations in the City to Tim Horton's Field. This service is provided by way of a reciprocal agreement between HSR and the Tiger Cats.

COVID-19 Pandemic 2020 – Today

During the global pandemic when most other City services were limited or temporarily halted, the HSR continued to deliver its critical services within the City and ensured that the City's most vulnerable customers remained able to access efficient and reliable transportation.

Because the HSR is self-sufficient insofar as it both operates and maintains its own fleet, it was able to respond quickly to the changing health and safety measures required to keep staff and customers safe. Further, because HSR maintains carefully monitored inventory levels, it was able to continue necessary repairs and maintenance activities.

The Accessible Transportation Services (ATS) section supported the City's public health efforts by providing isolation vehicles to COVID-19 testing and isolation centres for unhoused individuals and symptom-positive ATS customers requiring critical medical treatment, such as dialysis. During the pandemic, the HSR prioritized the implementation of the following safety measures on all HSR vehicles:

- Installation of custom Lexan Polycarbonate shields, which provided a barrier of protection for HSR operators;
- Distribution of Personal Protective Equipment (PPE) for all HSR operators: and,
- Applied social-distancing measures by adjusting the onboarding of customers by using the rear bus doors.

As the public health & and safety restrictions were lifted, HSR began the process of returning to its standard approach to transit services. HSR learned a great deal from the limitations in provisioning its services due to the COVID-19 pandemic. HSR has adapted the lessons learned to improve internal processes and how HSR can prepare for, and quickly respond to, future challenges in service delivery.

The COVID-19 pandemic had a significant and immediate impact on HSR ridership and highlighted the number of people for whom transit is an essential service. It also demonstrated how significantly marginalized persons bore the brunt of the economic impact of the pandemic, as historically, price sensitivity and affordability have always been identified as areas of concern among transit customers. The Public Health restrictions, namely the stay-at-home orders, significantly reduced ridership, slicing it by more than 50%. (21,659,000 trips in 2019 compared to 9,973,000 trips in 2021- a 56% decrease)

Eased health and safety restrictions in early 2022 allowed HSR to resume full-service transit operations, and by the end of 2022, HSR had recovered 82% of its pre-pandemic ridership. As of September 2023, ridership had reached 96% of pre-pandemic levels.

For Accessible Transportation Services, as of September 2023, ridership was at 63% of pre-pandemic levels.

These statistics show that ridership in Hamilton continues to recover. However, challenges remain as people continue to adapt to the post-pandemic climate. In addition, work-from-home or hybrid options may have a lasting impact on ridership.

2.1.2 SERVICE FUNCTION

The purpose of HSR's transit service is to provide safe, accessible, reliable, and efficient public transportation across the City of Hamilton. Delivering seamless transportation is essential, as many customers rely on transit to support their quality of life.

HSR services enable the public to get to school, work, sporting and social events, access medical care and facilitate access to necessities, like banking and grocery shopping. A high-quality public transit network is essential to the City of Hamilton; It ensures that the public is offered:

- Safe, clean, and environmentally conscious travel;
- Available and affordable travel;
- Accessible travel; and,
- Mode and mobility choices.

HSR's transit system supports all sectors of the City's economy, such as:

- Labour Force;
- Education;
- Culture;
- Tourism; and,
- Climate Mitigation.

While most economies have a dependency on public transit, HSR also contributes to the growth of our economic sectors by supplying accessible and affordable travel to all residents. Public transit allows for independent and equitable mobility city-wide, which can be attributed as a factor in the overall health and wellness of our community.

2.1.3 USERS OF THE SERVICE

The City of Hamilton's diverse population and many visitors account for HSR's diverse customer base. HSR user demographics range from students to seniors to professionals and tourists alike, who opt to use Hamilton's transit services to:

- Reliably travel across the City of Hamilton;
- Limit the environmental impact car travel has on the environment, such as greenhouse gases;
- Affordably travel or commute;
- Conveniently travel to appointments, shopping centres, sporting events; and,
- Assist in travel when physical mobility is a concern.

In ***Figure 1*** on the next page, you will see the detailed Conventional Transit services provided across Hamilton.

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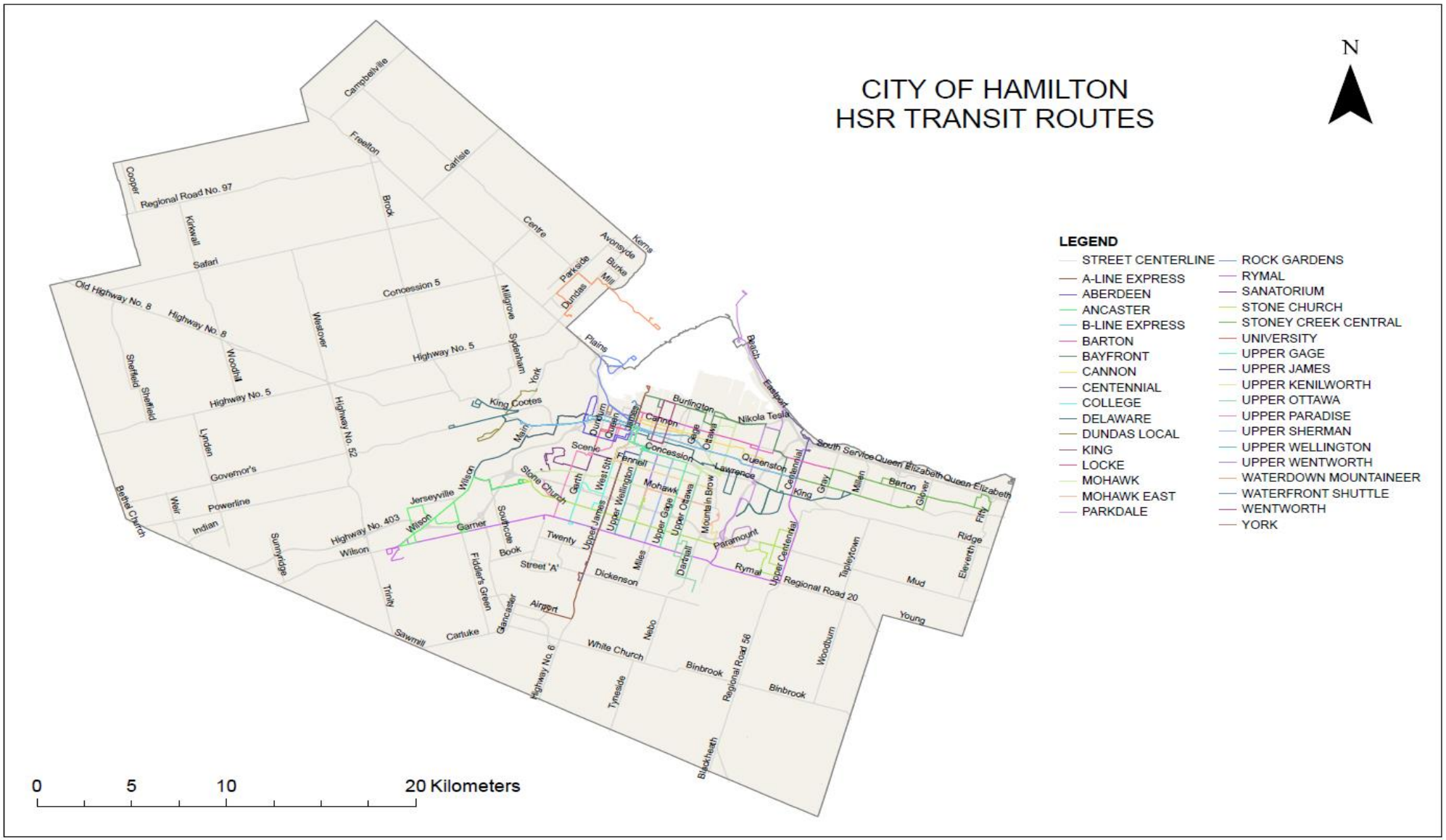
Figure 1: HSR Conventional Transit Services Overview Map



2.1.4 UNIQUE SERVICE CHALLENGES

Hamilton has a large geographic area to service, including both the urban area which is serviced by conventional transit as well as the urban and rural areas serviced by specialized transit. The larger the geographic area the more resources and assets are needed to deliver services at the desired levels of service. Given the recent growth in Hamilton, changing demographics, and changing priorities in how roads are used in our community, achieving, and maintaining the desired levels of service has become more difficult.

Investments in service have not been able to keep pace with this growth and these changes, so certain areas within Hamilton have not received service levels or access to service comparable to other areas. This is misaligned with community expectations, notably, that service levels should be equitable.

An additional unique service challenge for HSR relates to shelter vandalism which occurs on a regular basis. 2023 data from the contractor indicates that 73% of Hamilton's bus shelters experience vandalism of some form each year while 33% are subject to vandalism specific to smashed or etched glass. Of the five agencies in southwestern Ontario that this contractor serves, Hamilton has the highest number of damage calls per shelter when compared to the other agencies. This shelter vandalism includes graffiti, etching of glass, spray paint and smash sprees and can significantly impact budgets.

2.1.5 LEGISLATIVE REQUIREMENTS

The most significant legislative requirements that impact the delivery of the service are outlined in ***Table 1***. These requirements are considered throughout the report, and where relevant, are included in the levels of service measurements.

Table 1: Legislative Requirements

LEGISLATION OR REGULATION	REQUIREMENT
AODA Integrated Accessibility Standards Regulation (O.Reg. 191/11)	This regulation outlines Hamilton's responsibilities to deliver a specialized transit service and conditions of access to transit for specialized transit customers. O. Reg. 191/11 also includes accessibility requirements for conventional transit.

Hamilton is not required by legislation to offer transit services, however, by choosing to do so, there are legislative requirements the City must meet, notably, the regulation mandates that the City must also offer a specialized service. Specialized services are those that offer door-to-door travel, such as the external contracted program. Staff continuously monitor for changes to the regulation and measure their performance at delivering the specialized service.

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2.1.6 ASSET HIERARCHY

To deliver safe, accessible, reliable, and efficient public transportation services across the City of Hamilton, HSR requires assets. The Service Areas have been broken down into asset classes for the purpose of this AM Plan: Facilities, Vehicles, On-street Infrastructure, and Technology.

- **Facilities-** refers to any facilities required to deliver services, including the maintenance equipment;
- **Vehicles:** describes different types of vehicle assets (revenue-generating and other);
- **On-Street Infrastructure**: refers to assets related to bus stops; and,
- **Technology:** describes the different types of technology required to deliver the service including Information Technology (IT).

The asset class hierarchy outlining assets included in this section is shown below in ***Table 2***.

Table 2: Asset Class Hierarchy

SERVICE AREA	HAMILTON STREET RAILWAY			
ASSET CLASS	**FACILITIES**	**VEHICLES**	**ON-STREET INFRASTRUCTURE**	**TECHNOLOGY**
Asset	HSR Facilities	Revenue-generating	Bus stops and Amenities	Hardware
	Maintenance Equipment	Non-Revenue Generating		Software

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3. SUMMARY OF ASSETS

Table 3 displays the detailed summary of assets for the HSR service area. Sources of this data are a combination of different data included in the City's database systems. It is important to note that inventory information does change often and that this is a snapshot of information available as of year-end 2023.

The City owns approximately **$524.8 Million** in HSR assets, which are on average in **FAIR** condition. Assets are a weighted average of 14 years in age which is 50% of the average remaining service life.

For most assets, this means that the City should be completing preventative, preservation, and minor maintenance activities per the inspection reports as well as operating activities (e.g., inspection, cleaning) to prevent any premature failures.

The Corporate Asset Management (CAM) Office acknowledges that some works and projects are being completed on an ongoing basis and that some of the noted deficiencies may already be completed at the time of publication. It is also important to note that AM Plans only include asset information related to assets that the City owns. Finally, the assets included below are assets that are assumed and in service at the time of writing.

Data confidence associated with asset information is also presented in ***Table 3***. Data confidence descriptions are outlined on ***page 31***, in the AM Plan Overview. The replacement costs below are typically a medium data confidence level overall. For Facilities, these replacement costs are calculated using an internal tool which encompasses current market rates, building type and size. Technology assets are taken from the most recent purchase price for similar assets as well, but since some of these assets are not replaced as frequently, this was given a **medium** data confidence.

All assets have an itemized inventory with varying degrees of attribute information. A continuous improvement item identified in ***Table 29*** is to implement an asset registry for all HSR assets which includes key database fields and follows the newly developed City Data Standard.

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Table 3: Detailed Summary of Assets
****Weighted Average by Replacement Value***

ASSET CATEGORY	NUMBER OF ASSETS	REPLACEMENT VALUE	AVERAGE AGE (% RSL)	AVERAGE EQUIVALENT CONDITION
VEHICLES				
Revenue-generating Vehicles	308	$308.2M	6.6 Years (47%)	3 - Fair
Data Confidence	High	High	High	Low
Non–revenue–generating vehicles	20	$720K	6 Years (20%)	4 - Poor
Data Confidence	High	High	High	Low
SUBTOTAL		**$308.9M**		
Data Confidence		**High**	**High**	**Low**
FACILITIES / ON STREET INFRASTRUCTURE / TECHNOLOGY				
Facilities	4	$140.7M	31.5 Years (48%)	2 - Good
Data Confidence	High	Medium	Medium	Low
Maintenance Equipment	80	$5.7M	8.3 Years (56%)	3 - Fair
Data Confidence	High	Medium	Medium	Low
On-street Infrastructure	2,323	$61M	9.5 Years (56%)	3 - Fair
Data Confidence	Low	Low	Low	Low
Technology	236	$8.5M	14.6 Years (20%)	3 - Fair
Data Confidence	High	Medium	Medium	Low
SUBTOTAL		**$215.9M**		
Data Confidence		**Medium**	**Medium**	**Low**
TOTAL		**$524.8M**	***14 Years* (50%*)**	***3 - FAIR***
Data Confidence		**MEDIUM**	**MEDIUM**	**LOW**

Generally, the asset register data has most of the data elements regarding the quantity of assets. However, there are data elements, such as conditions, which were missing. In some circumstances, age was used as a proxy for condition, which lowers the data confidence for that asset class. HSR has identified the following continuous improvement items as noted in ***Table 29*** to increase data confidence and quality in future plans:

- Improved collection of condition data;
- Timely updating of replacement cost/market price information; and,
- Ensuring accurate remaining useful life estimates.

3.1 ASSET CONDITION GRADING

Condition refers to the physical state assets are in, a measure of the physical integrity of these assets or components and is the preferred measurement for planning lifecycle activities to ensure assets reach their expected useful life.

Since condition scores are reported using different scales and ranges depending on the asset, ***Table 4*** (on the next page) shows how each rating was converted to a standardized 5-point condition category so that the condition could be reported consistently across the AM Plan.

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Table 4: Equivalent Condition Conversion Table

EQUIVALENT CONDITION GRADING CATEGORY	CONDITION DESCRIPTION	% REMAINING SERVICE LIFE	FACILITIES CONDITION INDEX (FCI)
1-Very Good	The asset is new, recently rehabilitated or very well maintained. Preventative maintenance is required only.	>79.5%	N/A
2-Good	The asset is adequate, has slight defects and shows signs of some deterioration but has no significant impact on the asset's usage. Minor/preventative maintenance may be required.	69.5% – 79.4%	< 5%
3-Fair	The asset is in sound condition but has minor defects. Deterioration has some impact on the asset's usage. Minor to significant maintenance is required.	39.5% - 69.4%	>= 5% to < 10%
4-Poor	The asset has significant defects and deterioration. Deterioration has an impact on the asset's usage. Rehabilitation or major maintenance is required in the next year.	19.5% -39.4%	>= 10% to <30%
5-Very Poor	The asset has serious defects and deterioration. The asset is not fit for use. Urgent rehabilitation or decommissioning is required.	<19.4%	>= 30%

The following conversion assumptions were made:

- For assets where a condition assessment was not completed, but age information was known, the condition was based on the % of remaining service life; and,
- Facilities Condition Index was based on ranges provided by the consultant who completed the Building Condition Assessment (BCA).

The majority of the assets did not have an initial condition to reference, and a continuous improvement item has been identified to ensure that condition is available for future iterations of the plan.

3.2 ASSET CLASS PROFILE ANALYSIS

This section outlines the Age Profile, Condition Methodology, Condition Profile, and Performance Issues for each of the asset classes.

- The age of an asset is an important consideration in the asset management process as it can be used for planning purposes. Typically, assets have an estimated service life (ESL) which can be used to plan for replacement. Some lower-cost or lower criticality assets can be planned for renewal based on age as a proxy for condition or until other condition methodologies are established. It should be noted that if an asset's condition is based on age, it is typically considered to be of a low confidence level. Although typically, age is used when projecting replacements beyond the 10-year forecast to predict degradation.

- Condition refers to the physical state of assets and is a measure of the physical integrity of assets or components and is the preferred measurement for planning lifecycle activities to ensure assets reach their expected useful life. Assets are inspected/assessed at different frequencies and using different methodologies to determine their condition which are noted in this section.

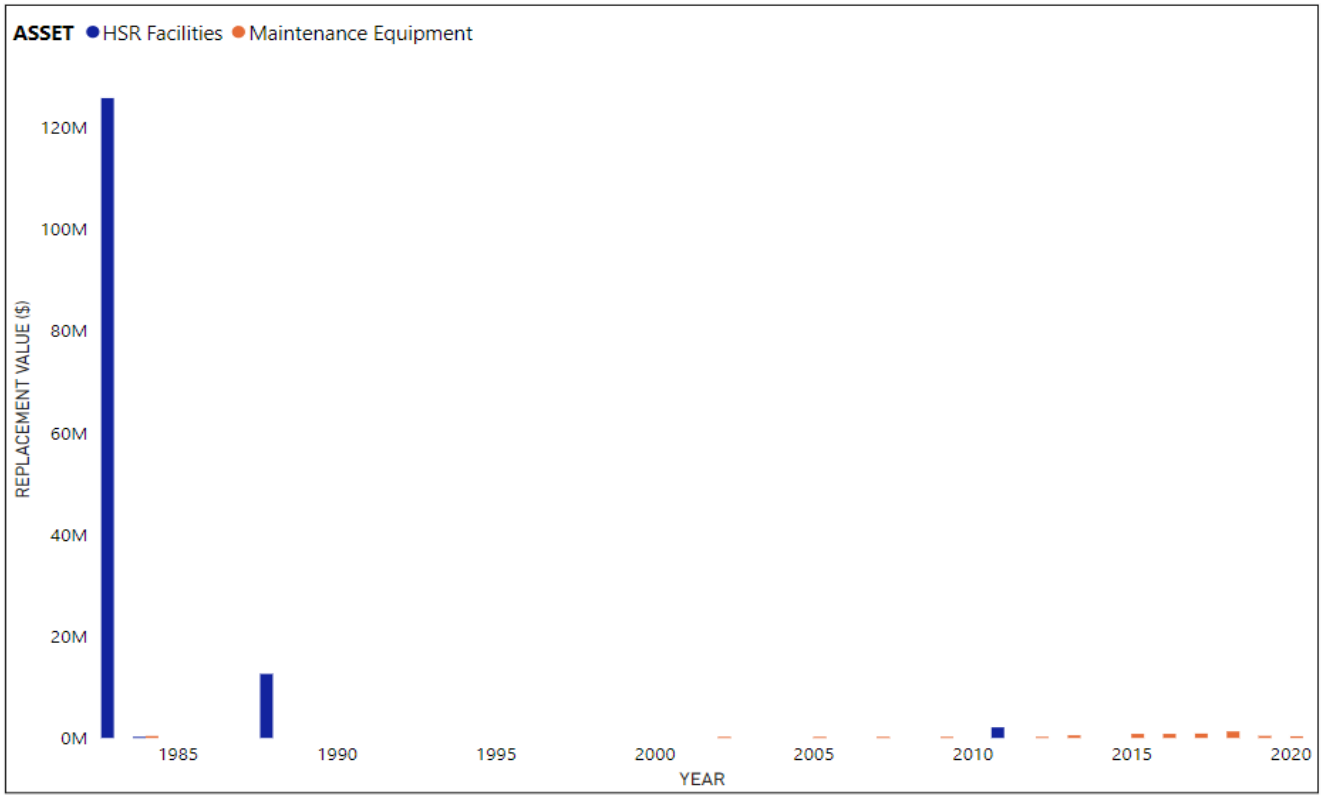
- Finally, there are often insufficient resources to address all known asset deficiencies, so performance issues may arise which are noted and prioritized in this AM Plan.

3.2.1 FACILITIES AND MAINTENANCE EQUIPMENT PROFILE

3.2.1.1 AGE PROFILE

Per ***Figure 2*** below, the age profile for HSR facilities shows the oldest asset is the Mountain Transit Centre built in 1983, with the other facilities assets being constructed between the years of 1984 and 2011. The oldest maintenance equipment asset was in 1983, with a reasonable distribution of age within the maintenance equipment inventory profile.

Figure 2: Facilities and Maintenance Equipment Age Profile



3.2.1.2 CONDITION METHODOLOGY & PROFILE

Condition for HSR facilities is determined based on the results of a Building Condition Assessment (BCA). BCAs are completed on HSR facilities every five years and output a score called a Facility Condition Index (FCI) which is considered to be a high confidence level source. The FCI is calculated based on a ratio of the cost of work required on the facility to the total replacement cost of the facility. The condition conversion from FCI to the standardized 5-point scale is used in the Asset Management Plan as shown in ***Table 4*****.**

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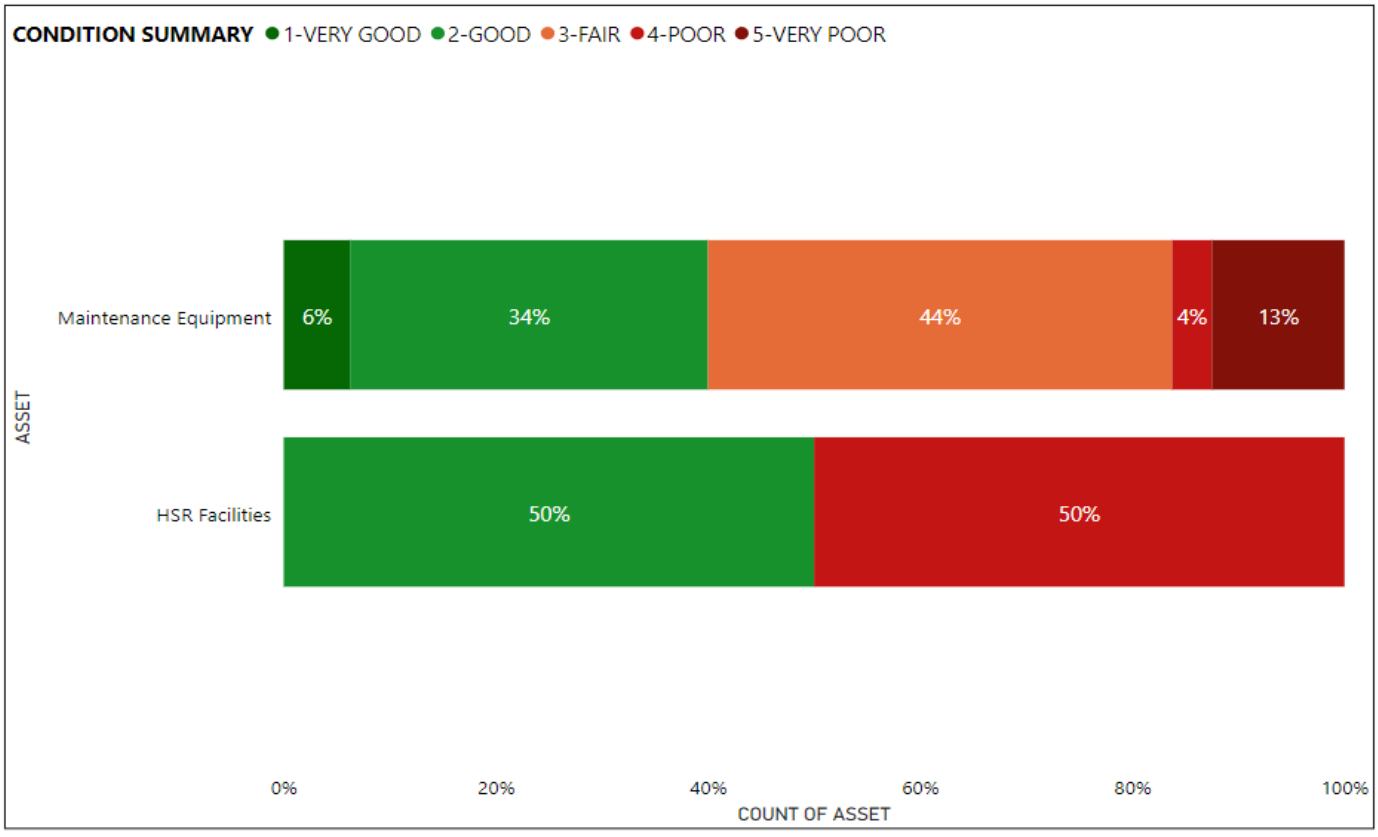
Table 5: Inspection and Condition Information

ASSET	INSPECTION FREQUENCY	LAST INSPECTION	CONDITION SCORE OUTPUT
HSR Facilities	Every 5 years	2019	Facility Condition Index (0% - 100%)
Maintenance Equipment	Various	Various	Certifications only

Per the BCA, half of HSR facilities are shown to be in **GOOD** condition with the other half showing in Poor condition. However, the BCA is a visual, surface level inspection which is typically a high confidence indicator of condition but does not involve detailed analysis such as cutting into walls or removing mechanical panels.

Currently, maintenance equipment assets do not have a formal method to determine condition and therefore age has been used to estimate the condition of these assets where age is known. This has been identified as a continuous improvement item in ***Table 29.***

Figure 3: HSR Facilities and Maintenance Equipment Asset Condition Distribution



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3.2.1.3 ASSET USAGE AND PERFORMANCE

As shown in ***Table 6***, the largest performance issue with HSR Facilities is a lack of space resulting in challenges with parking spaces for buses and staff, as well as impacting HSR's ability to have adequate space for maintaining buses. A direct result of the lack of space and large fleet complement is causing overuse of the hoists and equipment which impacts their expected useful life. Ultimately the new transit centre discussed in Acquisitions will help address this matter.

Table 6: Known Service Performance Deficiencies

ASSET	LOCATION	SERVICE DEFICIENCY	DESCRIPTION OF DEFICIENCY
FACILITY AND MAINTENANCE EQUIPMENT	**Mountain Transit Centre**	Lack of space	Lack of parking for buses and staff Lack of space for hoists to maintain buses
	Mountain Transit Centre	Exterior Windows	At the end of life resulting in greater heat loss
	Mountain Transit Centre	Deteriorating Floor finishes in Bus Bay and office areas	Concrete sealant is in poor condition in Bus Bay areas and tiles are chipped and cracked in office areas
	Maintenance Equipment	Overuse	Equipment is being used heavily and impacting the expected lifecycle

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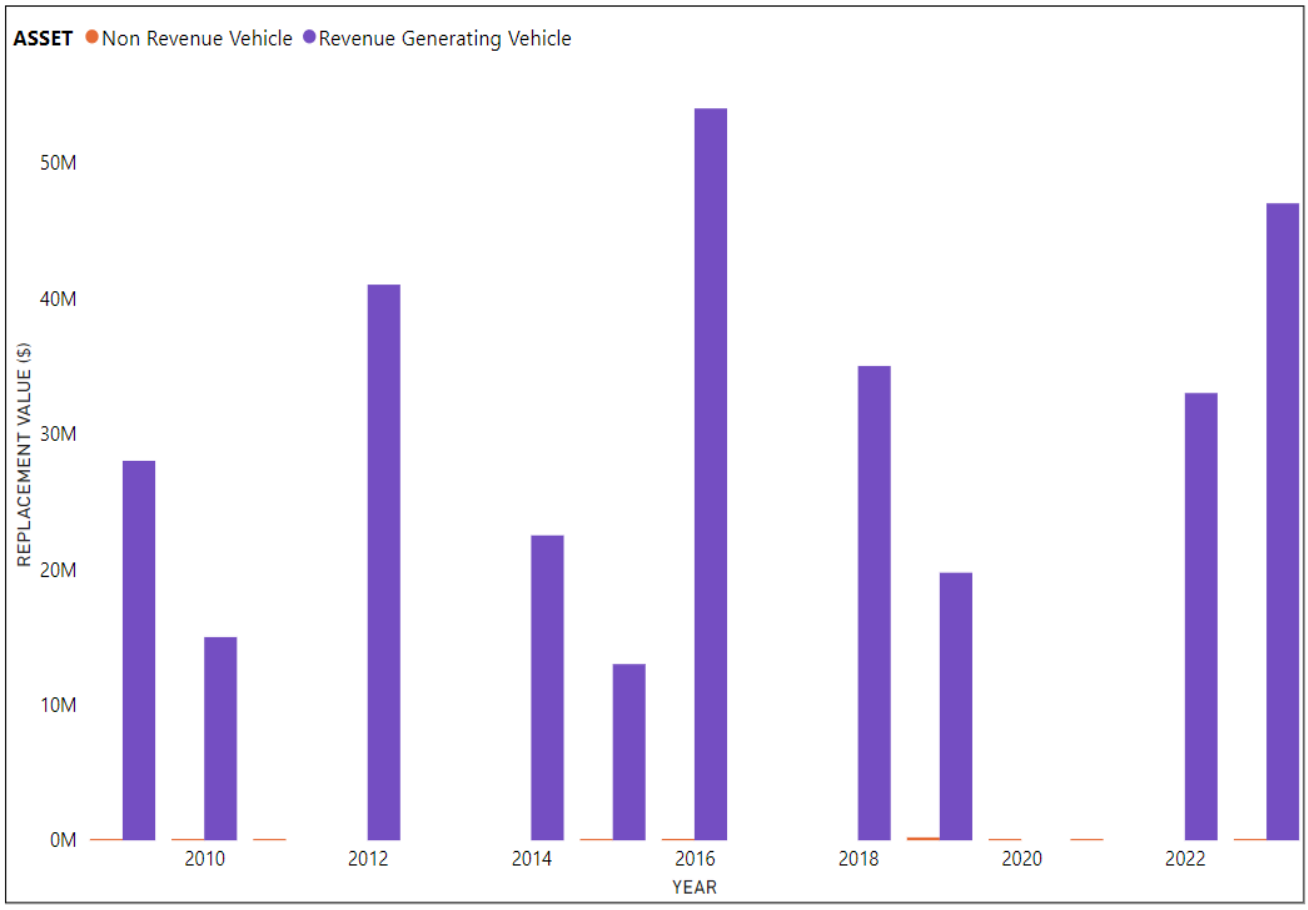
3.2.2 VEHICLES PROFILE

3.2.2.1 AGE PROFILE

Per ***Figure 4*** below, the age profile for HSR vehicles demonstrates the regular renewal of buses based on a 12-year estimated service life. Additionally, there is a reasonable distribution noted in the age profile indicating that HSR does an excellent job augmenting service levels and renewing assets.

Figure 4: Age Profile for HSR Vehicles



3.2.2.2 CONDITION METHODOLOGY & PROFILE

Since revenue-generating vehicles (buses) are a critical asset for HSR service, it is essential that these assets are kept in an acceptable state of repair to deliver reliable service. HSR inspects all buses as per the inspection frequency outlined in ***Table 7*** below. There is a reasonable distribution of asset age as they are currently replaced using an estimated service life of 12 years.

Table 7: Inspection and Condition Information

ASSET	INSPECTION TYPE	DESCRIPTION	FREQUENCY	CONDITION SCORE OUTPUT
REVENUE VEHICLES	**A**	Lube, oil, and filter change including a fluid level check. Check all major systems. Report any body damage. Road test vehicle.	7,500 km (6 weeks)	None
NON-REVENUE VEHICLES	**A**	Lube, oil, and filter change including a fluid level check. Check all major systems. Report any body damage. Road test vehicle.	5,000 km	None
REVENUE VEHICLES	**B**	Includes An inspection as well as rotating tires, recording brake measurements, and inspecting the overall vehicle against HSR standards.	Monthly	None
NON-REVENUE VEHICLES	**B**	Includes an inspection as well as rotating tires, recording brake measurement	15,000 - 20,000 km	None
REVENUE VEHICLES	**C**	Hinge Bolt Retorque & Check Main Bearing Hinge Inspection/Oil Change	140,000 km	None
NON-REVENUE VEHICLES	**C**	Includes An inspection as well as replacing fuel filter, and fluid change.	45,000 km	

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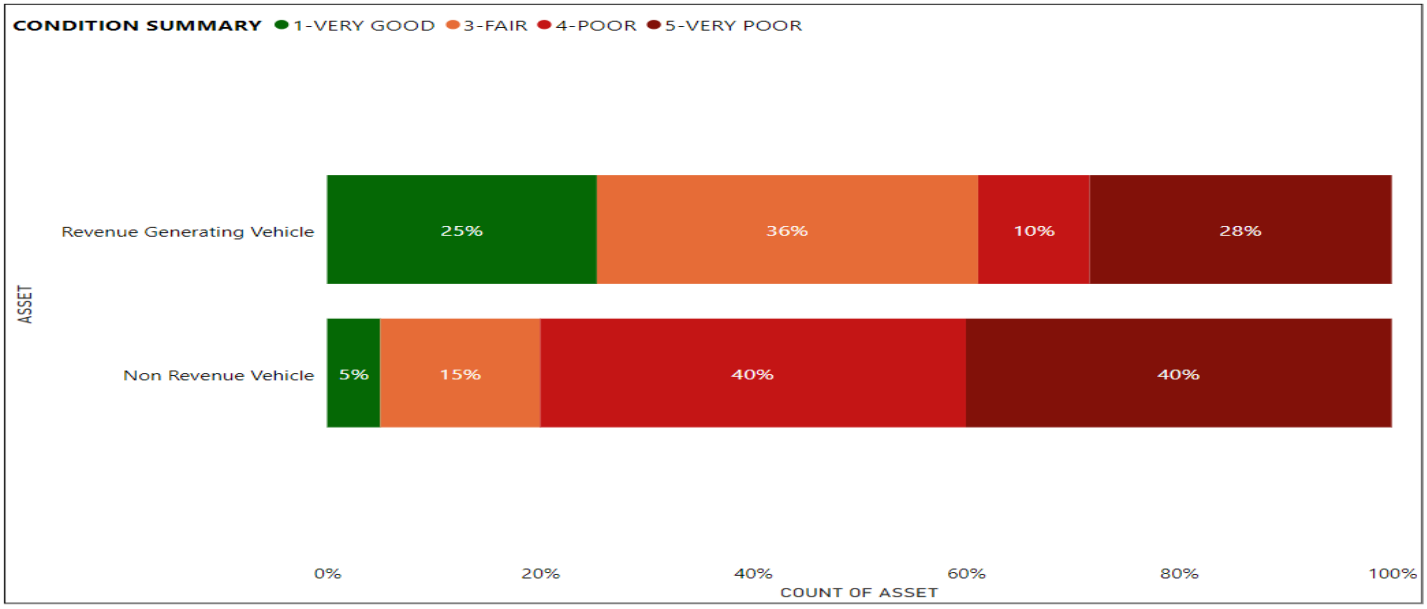
ASSET	INSPECTION TYPE	DESCRIPTION	FREQUENCY	CONDITION SCORE OUTPUT
REVENUE VEHICLES	**D**	Natural Gas P.R.D Inspection, Fire Suppression Inspection, Emission Test, MTO Inspection (147) 146 Done at six-month mark, Winter Prep/Inspection, Summer Prep/Inspection, Lube Major, C.N.G Fuel Tank Inspection, Farebox Rebuild Inspection I	every 12 months	None
NON-REVENUE VEHICLES	**D**	Includes An inspection as well as replacement of spark plugs and transaxle service or OEM recommendations.	75,000 km	
REVENUE VEHICLES	**E**	Diesel Tune-Up - Valve Sets	250,000 km	None
REVENUE VEHICLES	**F**	Natural Gas Tune Up - New Flyer and Nova	20,000 km	None
REVENUE VEHICLES	**G**	Natural Gas Tune Up - Vicinity - No Valve Adjustment	17,000 km	None
REVENUE VEHICLES	**H**	Natural Gas Tune Up - Vicinity - Valve Adjustment	51,000 km	None

Since there is no formal condition rating based on inspection, the condition was estimated based on the assumptions outlined in the condition conversion table in ***Table 4***. For revenue and non-revenue vehicles that were within the first 20% of their service life, they are considered to be in very good condition. If they are within their service life, they are considered to be in good condition. Any vehicles past their service life or mileage are considered to be in poor condition since they are considered deficient.

The condition profile for HSR non-revenue Vehicle assets is shown below in ***Figure 5***.

It is evident that the majority of HSR non-revenue vehicle assets are in Fair to Poor condition. Assets in Poor condition are generally lower criticality vehicles such as non-revenue generating vehicles but should be planned for replacement.

Figure 5: HSR Vehicles Condition Distribution



3.2.2.3 ASSET USAGE AND PERFORMANCE

As shown in ***Table 8***, the largest performance issues with HSR revenue-generating vehicles involve manufacturer adjustments to CNG vehicle engine estimated useful life resulting in impacts to engine life compared to a diesel vehicle. The impact on the lifecycle management of these vehicles is currently under further investigation.

Table 8: Known Service Performance Deficiencies

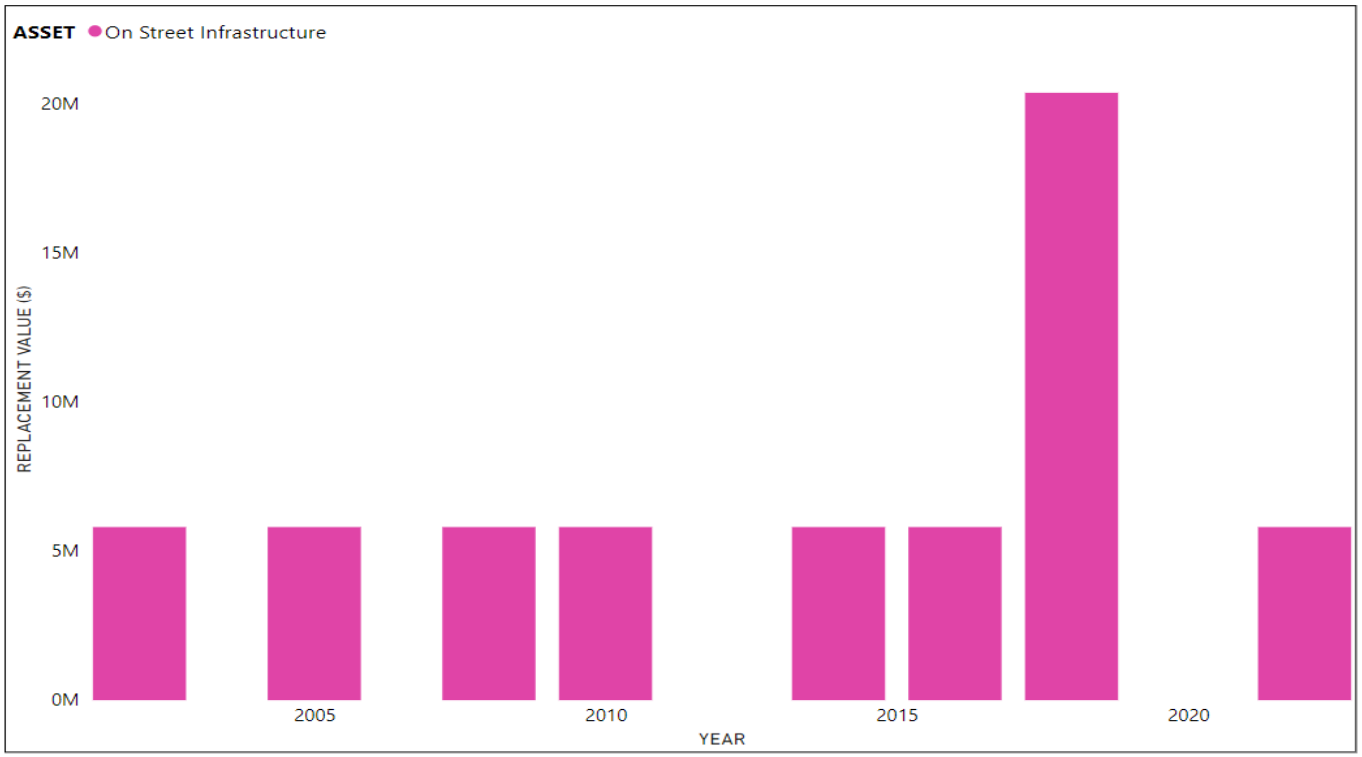
ASSET	LOCATION	SERVICE DEFICIENCY	DESCRIPTION OF DEFICIENCY
REVENUE GENERATING VEHICLES	**Various**	Projections for service life for CNG engines are less than anticipated	Engine manufacturers have recognized that service life projections were overstated impacting engine life in comparison to a diesel engine.

3.2.3 ON-STREET INFRASTRUCTURE PROFILE

3.2.3.1 AGE PROFILE

The age profile of the **On-Street Infrastructure** assets is shown in ***Figure 6***. An analysis of the age profile is provided below.

Figure 6: On-Street Infrastructure Age Profile



As shown in ***Figure 6***, the network of on-street infrastructure has been regularly expanded. A significant renewal happened in 2018 due to a shelter replacement project that replaced almost the entire inventory of regular and canopy shelters (2018 through 2020). With the exception of 66 shelters along the LRT corridor which HSR replaced in 2021/2022.

3.2.3.2 CONDITION METHODOLOGY & PROFILE

Bus Stop and bus stop amenity assets are inspected as per the inspection frequency shown in ***Table 9***.

Currently, on-street infrastructure assets do not have a formal method to determine condition and therefore age has been used to estimate the condition of these assets where age is known. This has been identified as a continuous improvement item in ***Table 29.***

Table 9: Inspection and Condition Information

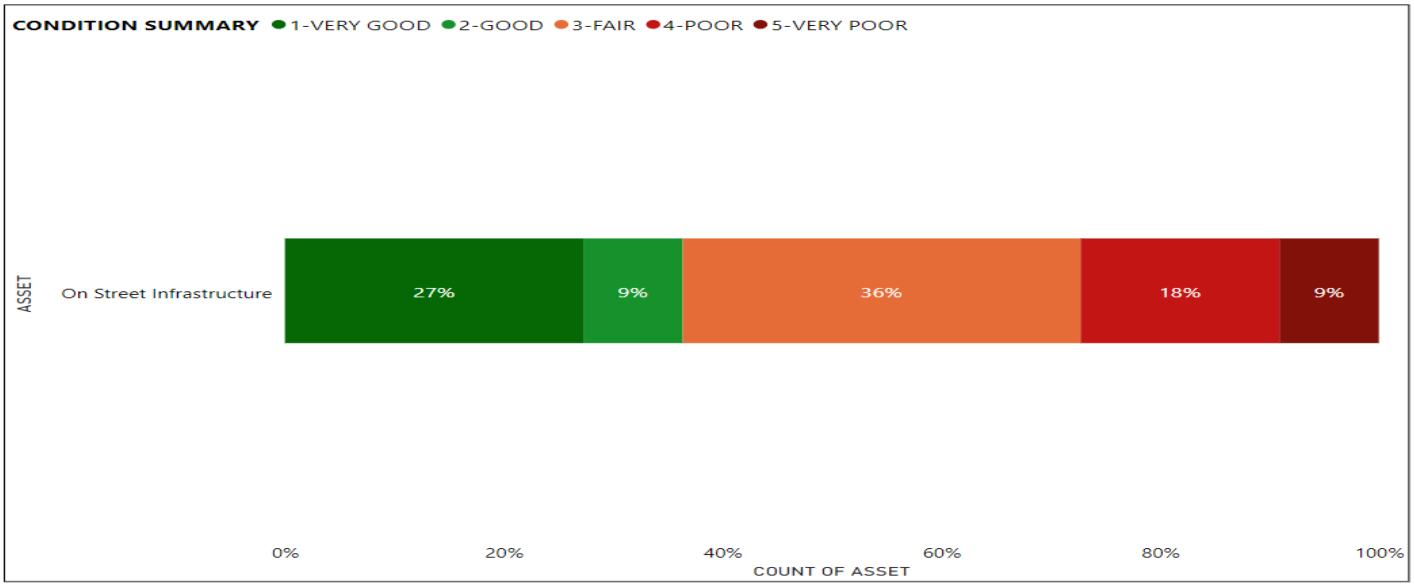
ASSET	INSPECTION TYPE	DESCRIPTION	FREQUENCY	CONDITION SCORE OUTPUT
Bus Stops and Amenities	**Inspection**	Visual assessment	Ad hoc	None

The condition profile for HSR On-street Infrastructure assets is shown below in ***Figure 7.***

It is evident that the majority of HSR On-street Infrastructure assets are in Very Good to Fair condition.

The original condition grades were converted to a standardized condition category for report consistency as per ***Table 4.***

Figure 7: On-Street Infrastructure Condition Distribution



3.2.3.3 ASSET USAGE AND PERFORMANCE

As shown in ***Table 10***, the largest performance issue with On-Street Infrastructure assets is vandalism including graffiti and damage to bus shelter enclosures.

Table 10: Known Service Performance Deficiencies

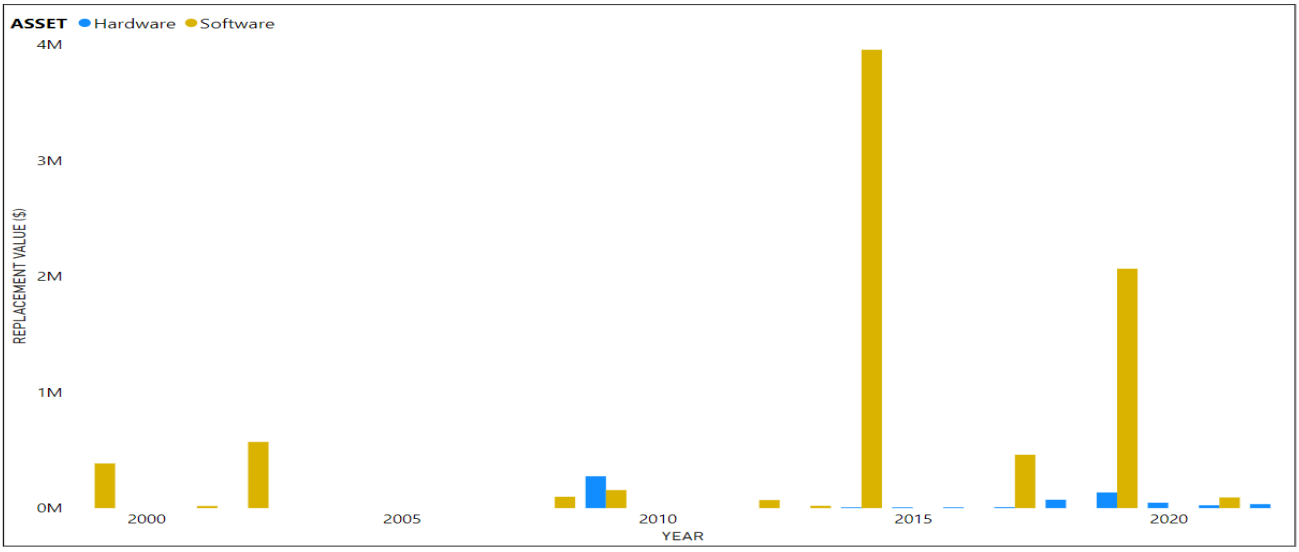
ASSET	LOCATION	SERVICE DEFICIENCY	DESCRIPTION OF DEFICIENCY
Bus Stops	**Various**	Vandalism	Graffiti and damage to bus shelter enclosures
Bus Stops	**Various**	Bus stop landing pads	Heaving due to trees, causing a potential tripping hazard
Bus Stop Amenities (shelter, bench, etc.)	**Various**	Vandalism	Graffiti and damage to bus stop amenities

3.2.4 TECHNOLOGY PROFILE

3.2.4.1 AGE PROFILE

The age profile of the **Technology** assets is shown in ***Figure 8***. The spike in 2014 is associated with the introduction of providing Real Time Information through our Computer Automated Design Automated Vehicle Locating (CAD AVL) system. This system allows for real-time tracking of bus locations to enhance operational performance. The second spike in 2019 relates to the acquisition of automated passenger count technology.

Figure 8: Technology Age Profile



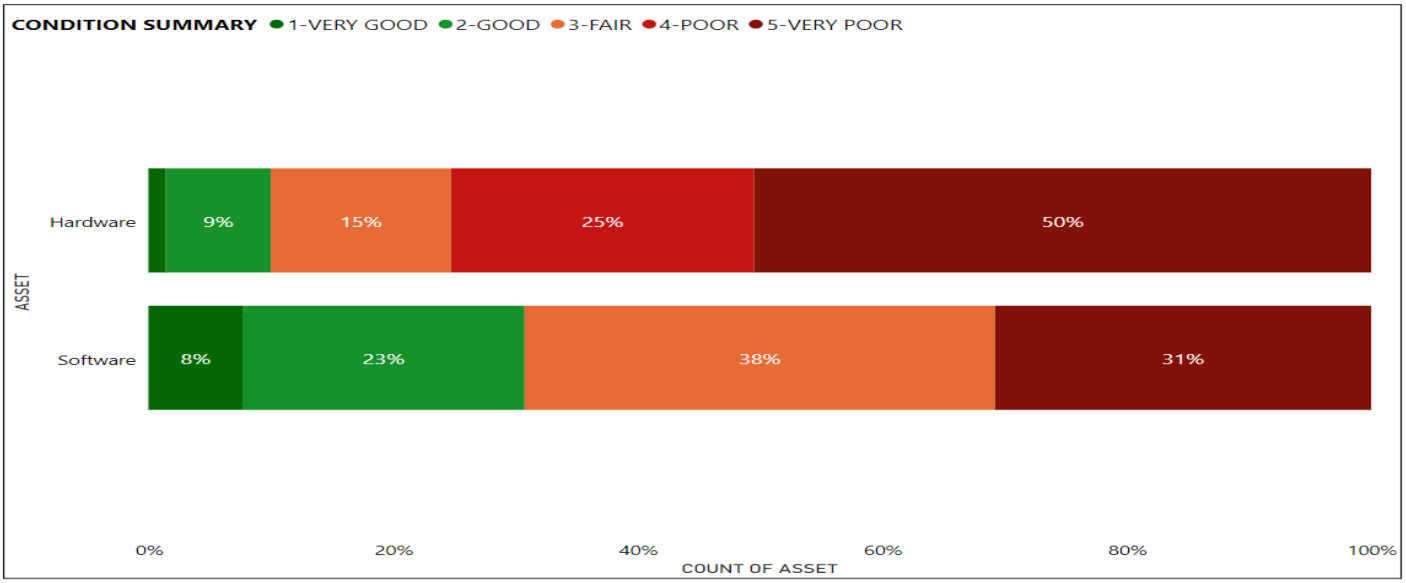
3.2.4.2 CONDITION METHODOLOGY & PROFILE

Currently, HSR does not determine the condition of Technology assets, therefore IT Equipment condition has been estimated based on age for this AM Plan. It is important to note that since the condition is based on age, there is low confidence in the condition for this asset group.

As shown below in ***Figure 9*** most of HSR Technology Equipment for Hardware is in Poor or Very Poor condition. This is because Hardware has short ESLs of four years, and the condition profile is based on age.

Most of HSR Technology Equipment for Software is in Fair or Very Poor condition. This is because Software has slightly longer ESLs and the condition profile is based on age.

Figure 9: Technology Condition Distribution



3.2.4.3 ASSET USAGE AND PERFORMANCE

As shown below in ***Table 11***, the largest performance issues with HSR Technology assets are capacity related to CAD AVL and its ability to support the volume of buses. HSR is planning to replace this technology in the next two years to ensure it can meet capacity demands in the future.

Table 11: Known Service Performance Deficiencies

ASSET	LOCATION	SERVICE DEFICIENCY	DESCRIPTION OF DEFICIENCY
Hardware and Software	**Various**	Capacity	CAD AVL does not have the capacity to support the current volume of buses

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4. MUNICIPALLY DEFINED CURRENT LEVELS OF SERVICE

Levels of service are measures of what the City provides to its customers, residents, and visitors, and are best described as the link between providing the service outcomes the community desires, and the way that the City provides those services.

O. Reg 588/17 does not define levels of service for HSR assets and therefore the City has developed municipally defined levels of service. Levels of service are defined in three ways, customer values, customer levels of service and technical levels of service which are outlined in this section. An explanation for how these were developed is provided in ***Section 6.5*** of the AM Plan Overview.

Current Council-approved service standards for conventional transit are shown in ***Table 12*** below. It is important to note that the ATS service standards coverage area is the entire City, both urban and rural, and service hours are the same as conventional.

Table 12: HSR Service Standards

HSR Service Standards			
Coverage	**Weekday**	**Saturday**	**Sunday**
System Wide Minimum	90% of residents / workplaces within Urban Transit Area to be within 400 metres of Weekday Peak service.		
Span (Start of trip)	**Weekday**	**Saturday**	**Sunday**
Route Maximum	5:00 AM – 2:00 AM	5:00 AM – 2:00 AM	6:00 AM – 12:00 AM
Frequency (Time between buses)	**Weekday** Peak / Non-Peak/ Evening	**Saturday** AM / Day / Evening	**Sunday** AM / Day / Evening
Route Minimum	30 / 30 / 60	30 / 30 / 60	30 / 30 / 60
Productivity (Boardings per Service Hour)	**Weekday** Peak / Non-Peak/ Evening	**Saturday** AM / Day / Evening	**Sunday** AM / Day / Evening
Route Minimum	25 / 15 / 15	15 / 15 / 15	15 / 15 / 15
Loading (Expressed as Percentage of Seated Capacity)	**Weekday** Peak / Non-Peak/ Evening	**Saturday** AM / Day / Evening	**Sunday** AM / Day / Evening
Route Maximum	125 / 100 / 100	100 / 100 / 100	100 / 100 / 100

4.1 SURVEY METHODOLOGY

To develop customer values and customer levels of service, Customer Satisfaction Survey results were analyzed from October 2021 to September 2022 from the HSRNow app. The survey received 313 submissions and contained ten questions related to HSR's service delivery. While these surveys were used to establish customer values and customer performance measures, it is important to note that the number of survey respondents only represents a small portion of the population. However, based on the 2022 ridership of 15.2 million, the sample size target was 385, and 313 responses were achieved. Therefore, the results are reflective at a 95% confidence level and 6% margin of error.

The future intent is to increase the response volume to this survey to be able to measure the trends in customer satisfaction and ensure that HSR is providing the agreed level of service. It is the intent of HSR to continuously improve the survey and marketing strategy to increase the response volume. This has been noted in ***Table 29*** in the continuous improvement section. As well, continuous improvement items have been identified to establish the voice of the customer for ATS clients to assist with Levels of Service and to conduct TransCab Customer Satisfaction Surveys to identify customer demands and levels of service.

4.2 CUSTOMER VALUES

Customer values, as shown in ***Table 13***, are what the customer can expect from HSR and from their tax dollars and fare payments in "customer speak" which outlines what is important to the customer, whether they see value in the service, and the expected trend based on the ten-year budget. These values are used to develop the level of service statements.

Customer Values indicate:

- What aspects of the service are important to the customer;
- Whether they see value in what is currently provided; and,
- The likely trend over time based on the current budget provision.

Table 13: Customer Values

SERVICE OBJECTIVE:			
CUSTOMER VALUES	**CUSTOMER SATISFACTION MEASURE**	**CURRENT FEEDBACK**	**EXPECTED TREND BASED ON PLANNED BUDGET (10-YEAR HORIZON)**
Trip routes and information are easy to access	HSR customer survey	Many survey respondents felt it was easy to access transit schedules; information	Maintain
Transit is reliable and timely	HSR customer survey	Some survey respondents felt that their transit was reliable and timely	Maintain
Excellent customer service	HSR customer survey	Most survey respondents felt that bus drivers were professional	Maintain
Comfortable transit ride	HSR Customer survey	Most survey respondents felt that the bus was not overcrowded	Maintain
The ride should be clean and appealing	HSR Customer Survey	Some survey respondents felt the inside of the bus was clean on their ride	Improve

4.2.1 CUSTOMER LEVELS OF SERVICE

Ultimately customer performance measures are the measures that HSR will use to assess whether it is delivering the level of service the customers desire. Customer level of service measurements relate to how the customer feels about the HSR service in terms of their quality, reliability, accessibility, responsiveness, sustainability and of course, their cost. HSR will continue to measure these customer levels of service to ensure a clear understanding of how the customers feel about the services and the value of their tax dollars.

HAMILTON STREET RAILWAY (HSR) ASSET MANAGEMENT PLAN

The Customer Levels of Service are considered in terms of:

Condition	How good is the service? What is the condition or quality of the service?
Function	Is it suitable for its intended purpose? Is it the right service?
Capacity/Use	Is the service over or underused? Do we need more or less of these assets?

In ***Table 14*** under each of the service measure types (Condition, Function, Capacity/Use) there is a summary of the performance measure being used, the current performance, and the expected performance based on the current budget allocation.

Table 14: Customer Levels of Service

TYPE OF MEASURE	LEVEL OF SERVICE STATEMENT	SOURCE	PERFORMANCE MEASURE	CURRENT PERFORMANCE	EXPECTED TREND BASED ON PLANNED BUDGET
Condition	Ensure that HSR assets are kept in safe and acceptable repair and that issues are resolved in a timely manner	HSR customer satisfaction survey	54% of survey respondents felt the bus was clean during their trip	Meets some Needs	Improve
			Confidence level	Low	
Function	Ensure that HSR assets can provide reliable, timely and safe transportation for customers	HSR customer satisfaction survey	64 % of survey respondents felt safe during the trip (including bus stop, while riding the bus and while exiting the bus	Meets Needs	Maintain
			61% of survey respondents felt their bus driver was professional during their trip	Meets Needs	Maintain

TYPE OF MEASURE	LEVEL OF SERVICE STATEMENT	SOURCE	PERFORMANCE MEASURE	CURRENT PERFORMANCE	EXPECTED TREND BASED ON PLANNED BUDGET
			52% of survey respondents felt their bus was on time/reliable	Meets some Needs	Improve
		Confidence level		Low	
Capacity	Ensure that there are sufficient assets to accommodate travel without overcrowding	HSR customer satisfaction survey	61% of survey respondents felt the bus was not overcrowded during their trip	Satisfied	Maintain
		Confidence level		Low	

Future iterations of the plan will utilize the Hamilton-specific methodology for gathering customer feedback on the Condition, Function and Capacity elements of HSR services. At the time of writing this plan, Hamilton had altered its approach to delivering its customer satisfaction survey and will be updated in future iterations with this plan as well as with the public engagement information currently being gathered for the HSR (Re)Envision project to avoid confusion of engaging twice with the public for the same service at the same time.

4.2.2 TECHNICAL LEVELS OF SERVICE

Technical levels of service are operational or technical measures of performance, which measure how HSR plans to achieve the desired customer outcomes and demonstrate effective performance, compliance, and management. The metrics should demonstrate how HSR delivers its services in alignment with its customer values; and should be viewed as possible levers to impact and influence the Customer Levels of Service. HSR will measure specific lifecycle activities to demonstrate how HSR is performing in delivering the desired level of service as well as to influence how customers perceive the services they receive from the assets.

Technical service measures are linked to the activities and annual budgets covering Acquisition, Operation, Maintenance, and Renewal. Asset owners and managers create, implement, and control technical service levels to influence service outcomes.[1]

Table 15 shows the activities expected to be provided under the current ten-year planned budget allocation and the forecast activity requirements being recommended in this AM Plan.

[1] IPWEA, 2015, IIMM, p 2|28.

HAMILTON STREET RAILWAY (HSR) ASSET MANAGEMENT PLAN

Table 15: Current Technical Levels of Service

LIFECYCLE ACTIVITY	LEVEL OF SERVICE	ACTIVITY MEASURE	CURRENT ACTUAL PERFORMANCE *	CURRENT TARGET PERFORMANCE **	PROPOSED 10-YEAR PERFORMANCE ***
Acquisition	Meet and strive to exceed accessibility standards	% of buses that are accessible as outlined in AODA standards	100%	100%	100%
	Improve the quality of shelters for comfort, cleanliness, safety, and accessibility	% of Bus stops that have a shelter installed	32%	Under Development	TBD
	Meet and strive to exceed accessibility standards	% of Bus stops that are accessible by AODA standards	64%	100%	TBD
	Improve the quality of bus stops for comfort, cleanliness, safety, and accessibility	% of bus stops that are lit at night	61%	Under development	TBD
	Improve the quality of bus stops for comfort, cleanliness, safety, and accessibility	% of bus stops that have a garbage receptacle	33%	Under Development	TBD
		Budget	**Maintain**	**To be developed**	**To be developed**

HAMILTON STREET RAILWAY (HSR) ASSET MANAGEMENT PLAN

LIFECYCLE ACTIVITY	LEVEL OF SERVICE	ACTIVITY MEASURE	CURRENT ACTUAL PERFORMANCE *	CURRENT TARGET PERFORMANCE **	PROPOSED 10-YEAR PERFORMANCE ***
Operation	Provide safe and reliable assets	% of bus stops inspected annually for the state of good repair	100%	100%	100%
		% of shelters cleaned bi-weekly	100%	100%	*100%*
		# of commendations per 1000 specialized trips	0.8	1	1
		# of specialized trip complaints per 1000 trips	8.3	1	<1
		% of total ATS trips delivered vs requested	65%	100%	100%
		% of buses receiving an A rating from the annual- MTO inspection	100%	100%	100%
		% of specialized trips delivered by the Contractor arriving within 15 minutes of service standard	97.2%	95%	> 95%
		% of bus interiors inspected daily for state of good repair	100%	100%	100%
		% of Contractor specialized transit trips requested that were denied	3.6%	5<5%	<1%

LIFECYCLE ACTIVITY	LEVEL OF SERVICE	ACTIVITY MEASURE	CURRENT ACTUAL PERFORMANCE *	CURRENT TARGET PERFORMANCE **	PROPOSED 10-YEAR PERFORMANCE ***
		% of transit service considered 'on time' (within 2 mins early or 5 mins late of scheduled times)	88%	95%	>95%
		% of buses' interiors deep cleaned twice monthly	100%	100%	100%
		Budget	**Maintain**	**To be developed**	**To be developed**
Maintenance *	Ensure the fleet is maintained in a state of good repair and meets MTO requirements	The target mean distance between mechanical failures is met or exceeded	7500 KM	6500 Km	TBD
		Budget	**Maintain**	**To be developed**	**To be developed**

Note: * Current activities related to Planned Budget.
**** Current internal target**
***** Expected performance related to forecast lifecycle costs.**

4.2.3 PROPOSED LEVELS OF SERVICE DISCUSSION

It is evident per ***Table 15*** that HSR is often meeting technical standards with some exceptions. It has been assumed for this first iteration of the HSR AM Plan that the current levels of service will be the proposed levels of service moving forward past 2025 in accordance with O. Reg 588/17. Proposed levels of service will be further refined through the (Re)envision initiative.

CONDITION

Based on ***Table 14*** above, survey respondents were somewhat satisfied with the condition of HSR assets. Customers value the cleanliness of the assets whether that be a bus stop or the inside of the bus as they take their trip. 54% of respondents felt that the buses were clean during their trip which indicates they are somewhat satisfied. As a continuous improvement item in ***Table 29***, HSR will set a goal to improve customer satisfaction with the cleanliness of buses and will determine the resources required to achieve the goal from both a staffing and financial perspective.

FUNCTION

Based on ***Table 14***, survey respondents were satisfied with how HSR assets functioned. 64% of respondents felt that they were safe during their trip and 61% felt that their driver was professional during their trip as well. While limited by the survey's number of respondents with such a small sample size it does indicate that the majority of customers are satisfied with how the transit service functions.

CAPACITY

Based on ***Table 14***, survey respondents were satisfied with HSR asset capacity. Based on the customer survey, 61% of respondents felt that the bus on their trip was not overcrowded. At the current ridership that bodes well for capacity however as Hamilton aims to increase its ridership, it is essential that HSR set a target for this capacity measurement. A continuous improvement item has been identified in ***Table 29*** to understand what the ideal target is for capacity on the bus as well as another item to expand HSR's measurement of capacity with other assets and services.

Another issue of capacity is noted with the technical levels of service as only 65 % of the specialized transit trips that were requested of the ATS contractor (which includes no-shows and requested but cancelled trips) were delivered, which indicates a capacity concern. This capacity concern relates more to the impact on vehicle productivity when there are late cancellations and/or no-shows which results in unused spots that could have been used by other service users. HSR would ideally target to fill all these requested trips and with 35% not being delivered it will require a continuous improvement item to explore options to improve this target with a fulsome understanding of the resources that will be required.

HSR should explore what additional questions may be beneficial to include in the customer engagement survey to determine satisfaction with additional HSR assets such as bus stops and transit facilities. Exploring customer expectations will allow HSR to develop its modelling and estimate future improvement costs.

A continuous improvement item has been created as shown in ***Table 29*** to add an additional level of service metrics for acquisition, renewal and disposals as well as ensuring that the current performance measurements are in line with customer values. As Hamilton's asset management maturity increases, and with the implementation of the Enterprise Asset Management (EAM) system, HSR will also have more capacity to measure additional metrics.

5. FUTURE DEMAND

Demand is defined as the desire customers have for assets or services, and what they are willing to pay for those assets or services. These desires are for either new assets/services or current assets.

The needs and desires of the residents change over time and HSR will continually monitor the demands for its services to ensure that it can respond proactively to these changes. As population increases there will be a greater need for the service, and as environmental concerns increase there will be an increased desire to mitigate greenhouse gases.

5.1 DEMAND DRIVERS

For HSR the key drivers are population change (***per page 45)*** in the AM Plan Overview, it is evident that Hamilton's population will continue to grow to 2051), council-driven targets (e.g., increase modal split to 12%) and climate change. With the City's future implementation of Light Rail Transit (LRT), further investigation of the impact on HSR will be required. [2]Additionally, with 27% of the Canadian population identifying as having a disability, plans for ATS to pilot the business cases for demand management outlined in response to AUD20009 will be key. A future continuous improvement item is to identify additional demand drivers and develop an effective and sustainable approach to meeting the demands.

5.2 DEMAND FORECASTS

The high-level present position and projections for demand drivers that may impact future service delivery and use of assets have been identified and documented in ***Table 16.*** At this time, specific projections have not been calculated and will be updated in the 2025 AM Plan per the timelines stated in the AMP Overview. In addition, growth projections have been shown in the AMP Overview.

5.3 DEMAND IMPACT AND MANAGEMENT PLAN

The impact of demand drivers that may affect future service delivery and use of assets is shown in ***Table 16.***

Demand for new services will be managed through a combination of managing existing assets, upgrading existing assets and providing new assets to meet demand and demand management. Demand management practices can include non-asset solutions, insuring against risks, and managing failures.

[2] Statistics Canada, *Canadian Survey on Disability, 2017 to 2022*(December 1, 2023), https://www150.statcan.gc.ca/n1/daily-quotidien/231201/dq231201b-eng.htm

Opportunities identified to date for demand management are shown in ***Table 16***. Climate change adaptation is included in ***Table 29***. Further opportunities will be developed in future revisions of this AM Plan, as identified in ***Table 29*** in the continuous improvement section.

Table 16: Demand Management Plan

DEMAND DRIVER	CURRENT POSITION	PROJECTION 10-YEAR HORIZON	IMPACT ON SERVICES	DEMAND MANAGEMENT PLAN
Population	543,667	660,000 (2051 Growth is projected to be 820,000)	Likely to see a significant ridership increase which **will require:** 42 additional buses, 126 FTE's 159,000 service hours $19.1 Million operating costs	Obtain approval for additional fleet 18 months in advance to staff appropriately. Explore options for financial commitments which can include council contributions or possible use of debt
Council Target Increase Modal Split to 12%	7-9% Modal Split	12%	**Will require**; 104 additional buses, 312 FTEs 530,000 service hours $63.6 Million operating costs Additional facility in 2031 with undetermined costs as of the writing of the report.	Explore options for financial commitments which can include council contributions or possible use of debt
Climate Change	% of Fleet that is CNG 60%	100% by 2026	Reduction of GHG emissions and reduction of fuel costs	All bus renewals or acquisitions will be alternative fuel sources

5.4 ASSET PROGRAMS TO MEET DEMAND

The new assets required to meet HSR's demand will either be acquired, donated or constructed.

At this time there will be several new assets required over the ten-year planning horizon. The current demand forecasts would require Hamilton to acquire approximately 146 additional buses as well as another HSR facility and an overflow facility by 2031. Acquiring new assets would commit HSR to significant ongoing operations, maintenance and renewal costs for the period that the service provided from the assets is required. These future costs are identified and considered in developing forecasts of future operations, maintenance and renewal costs for inclusion in the long-term financial plan.

6. RISK MANAGEMENT

The purpose of infrastructure risk management is to document the findings and recommendations resulting from the periodic identification, assessment, and treatment of risks associated with providing services from infrastructure, using the fundamentals of International Standard ISO 31000: 2018 Risk Management – Principles and Guidelines.

Risk Management is defined in ISO 31000:2018 as: 'coordinated activities to direct and control with regard to risk[3].

The City has released a formalized risk assessment process to identify risks associated with service delivery and to implement proactive strategies to mitigate risk to tolerable levels. The risk assessment process identifies credible risks associated with service delivery and will identify risks that will result in loss or reduction in service, personal injury, environmental impacts, a 'financial shock,' reputational impacts, or other consequences. The risk assessment process also identifies the likelihood of those risks occurring, and the consequences should the event occur which calculates a risk rating. Risk options are then evaluated, and a risk treatment plan is created which will be initiated with the release of this plan and has been identified as a continuous improvement item in ***Table 29***.

6.1 CRITICAL ASSETS

Critical assets are defined as those that have a high consequence of failure causing significant loss or reduction of service. Critical assets have been identified and along with their typical failure mode, and the impact on service delivery, are summarized in ***Table 17***. Failure modes may include physical failure, collapse, or essential service interruption.

Table 17: Critical Assets

CRITICAL ASSET(S)	FAILURE MODE	IMPACT
Revenue Generating Vehicles	Mechanical Failures/Accidents	While spares exist, when a breakdown or accident occurs there is an immediate impact on the service
HSR Facilities	Natural Disaster/Fire	Significant harm to the service if there is any major impact on the two major HSR facilities. Maintenance and operations would be impacted and widely felt.

[3] ISO 31000:2009, p 2

By identifying critical assets and failure modes an organization can ensure that investigative activities, condition inspection programs, maintenance and capital expenditure plans are targeted at critical assets.

6.2 RISK ASSESSMENT

The risk assessment process identifies credible risks, the likelihood of the risk event occurring, the consequences should the event occur, the development of a risk rating, the evaluation of the risk and the development of a risk treatment plan for non-acceptable risks.

An assessment of risks associated with service delivery will identify risks that will result in loss or reduction in service, personal injury, environmental impacts, a 'financial shock', reputational impacts, or other consequences.

Critical risks are those assessed with 'Very High' (requiring immediate corrective action) and 'High' (requiring corrective action) risk ratings identified in the Infrastructure Risk Management Plan. The residual risk and treatment costs of implementing the selected treatment plan are shown in Table 18. It is essential that these critical risks and costs are reported to management. Additional risks will be developed in future iterations of the plan and are identified in ***Table 29*** in the Continuous Improvement Section of the plan.

HSR has a variety of risks, and it would be impractical to list them all through the plan. As such, we are only reporting some of the high and medium risks in this plan. As costing becomes available through continuous improvement exercises this will improve the risk reporting for HSR Assets.

Table 18: Risks and Treatment Plans
Note * The Residual Risk Is the Risk Remaining After the Selected Risk Treatment Plan Is Implemented.

SERVICE OR ASSET AT RISK	WHAT CAN HAPPEN	RISK RATING	RISK TREATMENT PLAN	RESIDUAL RISK *	TREATMENT COSTS
Revenue-generating Vehicles	Accident or Mechanical Breakdown	High	Driver license vetting, driver training and supervision, vehicle preventative maintenance, regular inspections at least monthly, daily pre-trip checks, bus type geared to conditions (e.g., no articulated-on Mountain Accesses in slippery conditions)	Medium	Lost Revenue

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SERVICE OR ASSET AT RISK	WHAT CAN HAPPEN	RISK RATING	RISK TREATMENT PLAN	RESIDUAL RISK *	TREATMENT COSTS
Non-Revenue Vehicles	Accident	High	Driver training, daily maintenance check and cleaning, public reporting via complaints process during business hours, public reporting via CCC outside of business hours, on-board cameras, operator reporting	Medium	Operational Budget
End of the Line Washrooms	Damaged	Medium	regular patrol of washrooms, staff reporting, preventative maintenance and regular cleaning,	Low	Operational Budget
Presto Device	Damaged	Medium	Operator training and supervision, daily pre-trip checks, preventive maintenance, Operator reporting	Low	Operational Budget
ATS Contractor and Subcontractor Vehicles	Accident	High	Managed by the contractor: Driver license vetting, driver training and supervision, vehicle preventative maintenance, regular inspections at least monthly, daily pre-trip checks, cancel service if weather is too bad. Managed by ATS: contract oversight, all responses to Auditor General recommendations in AUD22007 including but not limited to random vehicle inspections and vehicle records inspections.	Medium	Operational Budget
Bus Shelter	Vandalism / Hate Speech	High	Maintenance of shelters, a regular patrol of stops, public reporting via complaints process during business hours, public reporting via CCC outside of business hours, operator reporting	Medium	Operational Cost

6.3 INFRASTRUCTURE RESILIENCE APPROACH

The resilience of our critical infrastructure is vital to the ongoing provision of services to customers. To adapt to changing conditions HSR needs to understand its capacity to 'withstand a given level of stress or demand', and to respond to possible disruptions to ensure continuity of service. We do not currently measure our resilience in service delivery and this will be included in the next iteration of the AM Plan.

Resilience covers the capacity of HSR to withstand any service disruptions, act appropriately and effectively in a crisis, absorb shocks and disturbances as well as adapt to ever-changing conditions. Resilience is built on aspects such as response and recovery planning, financial capacity, climate change risk, assessment and crisis leadership.

6.4 SERVICE AND RISK TRADE-OFFS

The decisions made in AM Plans are based on the objective of achieving the optimum benefits from the available resources. HSR service and risk tradeoffs will be determined in future plans as shown below in ***Table 19.***

Table 19: Service and Risk Trade-offs

WHAT WE CANNOT DO (WHAT CAN WE NOT AFFORD OVER THE NEXT 10 YEARS?)	SERVICE TRADE-OFF (HOW WILL NOT COMPLETING THIS AFFECT OUR SERVICE?)	RISK TRADE-OFF (WHAT RISK CONSEQUENCES ARE WE UNDERTAKING?)
To be determined in future plans		

7. CLIMATE CHANGE MITIGATION & ADAPTATION

Cities have a vital role to play in reducing the emission of greenhouse gases (mitigation), as well as preparing assets for the accelerating changes we have already begun to experience (adaptation). At a minimum, the City must consider how to manage our existing assets given the potential climate change impacts for our region.

Changes to Hamilton's climate will impact City assets in the following ways:

- Affect the asset lifecycle;
- Affect the levels of service that can be provided and the cost to maintain;
- Increase or change the demand on some of our systems; and,
- Increase or change the risks involved in delivering service.

To quantify the above asset/service impacts due to climate change in the Asset Management Plan, climate change is considered as both a future demand and a risk for both mitigation and adaptation efforts. These demands and risks should be quantified and incorporated into the lifecycle models as well as levels of service targets.

If climate change mitigation/adaptation projects have already been budgeted, these costs have been incorporated into the lifecycle models. However, many asset owners have not yet quantified the effects of the proposed demand management and risk adaptation plans described in this section, and so associated levels of service and costs will be addressed in future revisions of the plan. This has been identified as a Continuous Improvement item in ***Table 29.***

7.1 CLIMATE CHANGE MITIGATION

Climate Mitigation refers to human intervention to reduce GHG emissions or enhance GHG removals (e.g. building transportation infrastructure that can support cycling and public transit and reduce the need for car travel). The City of Hamilton's Community Energy + Emissions Plan (CEEP includes five Low-carbon Transformations necessary to achieve the City's target of net-zero GHG emissions by 2050:

- Innovating our industry;
- Transforming our buildings;
- Changing how we move;
- Revolutionizing renewables; and,
- Growing Green.

MITIGATION DEMAND ANALYSIS

These transformations were incorporated into the climate mitigation demand analysis for this service area by:

- Identifying the City's modelled targets for the low carbon transformations that applied to the service/asset;
- Discussing the impact, the targets would have on the service/asset; and,
- Proposing a preliminary demand management plan for how this modelled target will be achieved by 2050.

HAMILTON STREET RAILWAY (HSR) ASSET MANAGEMENT PLAN

As previously mentioned, due to the high level of uncertainty with the demand management plans, the cost of the demand impacts below have not been included in the lifecycle models or levels of service at this time. The demand management plans discussed in this section should be explored by asset owners in more detail following the AMP, and new projects should incorporate GHG emissions reduction methods, and changes which will be incorporated into future iterations of the AM Plan. This has been identified as a continuous improvement item in ***Table 29.***

Moving forward, the Climate Lens tool discussed in the AMP Overview will assess projects based on these targets and will assist with the prioritization of climate mitigation projects.

Table 20: Climate Change Mitigation Transformation

CLIMATE CHANGE MITIGATION TRANSFORMATION	MODELLED TARGET	IMPACT TO SERVICE/ASSET	DEMAND MANAGEMENT PLAN
Transforming our buildings	By 2050, all new municipal buildings achieve net-zero emissions.	Any new builds must be designed to Net Zero standards which is an increased cost to HSR to construct but provides lower operating costs including energy savings.	Gather estimates from other Net Zero facilities to quantify the cost.
Transforming our buildings	By 2050, all municipal buildings are retrofitted to achieve 50% energy efficiency relative to 2016.	Any renewals of HVAC material will be with energy-efficient equipment. Lighting renewals will be to LED lighting.	Use Building Condition Assessments to plan for renewals and budget accordingly. Investigate grants for energy-efficient conversions.
Changing how we move	Decarbonize the transit fleet by 2035. 100% of new municipal small and light-duty vehicles are electric by 2040. 100% of new municipal heavy-duty vehicles switch to clean hydrogen by 2040.	HSR has focused on ensuring that its fleet of vehicles is helping Hamilton meet its climate goals. It should complete its fleet transformation from diesel vehicles to Natural Gas vehicles within the next five years.	Continue to prepare for conversion to electric vehicles for light-duty vehicles by investigating grant funding and installing charging stations for non-revenue vehicles. Complete the planned conversion to NG Vehicles. Monitor feasibility and business planning to undertake the transition to clean hydrogen by 2040.

MITIGATION RISK ANALYSIS

Additionally, since the risk of not completing climate change mitigation projects is that the City continues to contribute to climate change in varying degrees which were modelled in the Climate Science Report for the City of Hamilton completed by ICLEI Canada, a risk analysis has not been completed in this AMP for not completing climate mitigation projects (ICLEI Canada, 2021).

CURRENT MITIGATION PROJECTS

Mitigation projects HSR is currently pursuing are outlined below in ***Table 21.*** These projects may already be included in the budget and may be quantified in the lifecycle models.

Table 21: Asset Climate Mitigation Projects

PROJECT	CLIMATE CHANGE MITIGATION TRANSFORMATION	PROJECT DESCRIPTION	CLIMATE CHANGE IMPACT
CNG Vehicles	Changing how we move	100% New revenue-generating vehicles	Reduce emissions associated with vehicles.
Maintenance and Storage Facility	Transforming our buildings	Proposed Maintenance and Storage Facility (MSF) specifications call for Net Zero design.	Reduce emissions associated with facility operation.
Social Marketing Campaigns	Changing how we move	Marketing campaigns designed to encourage new behaviours to build ridership and convert car trips into bus trips	Reduced emissions associated with vehicles.

CLIMATE MITIGATION DISCUSSION

At this time, HSR has already made progress toward some of the modelled target transformations as discussed below.

TRANSFORMING OUR BUILDINGS

HSR is beginning to move toward the *Transforming our Buildings* targets. The Maintenance and Storage Facility (MSF) that is scheduled for construction in 2025 was designed using Leadership in Energy and Environmental Design (LEED) guidelines. LEED provides a framework for the construction of green buildings by addressing carbon, energy, water, waste, transportation, materials, health and indoor environmental quality (USGBC, 2023).

CHANGE HOW WE MOVE

HSR conducts regular social marketing campaigns designed to encourage new behaviours by building ridership and converting single-rider car trips into bus trips resulting in a reduction in emissions associated with single occupancy vehicles.

7.2 CLIMATE CHANGE ADAPTATION

Climate Adaptation refers to the process of adjusting to actual or expected climate and its effects (e.g. building stormwater pipes under roads that will handle forecasted increased stormwater capacity and reduce regular road flooding).

The impacts of climate change may have a significant impact on the assets we manage and the services we provide. Climate change impacts on assets will vary depending on the location and the type of services provided, as will the way in which those impacts are responded to and managed.[4]

In 2021, the City of Hamilton completed a Vulnerability and Risk Assessment Report guided by ICLEI's Building Adaptive and Resilient Communities (BARC) Framework as part of the Climate Change Impact Adaptation Plan (CCIAP) (ICLEI, 2021). The BARC Framework identified thirteen high-impact areas.

ADAPTATION DEMAND ANALYSIS

The impacted areas were incorporated into the climate change adaptation analysis for this service area by:

- Identifying the asset-specific adaptation impact statements that affected the service areas;
- Discussing the potential impacts on the asset/service using the projected change in climate using the RCP4.5 Scenario; and,
- Proposing a preliminary demand management plan to adapt to these impacts.

It is important to note that due to the high level of uncertainty with the demand management plans, the cost of the demand impacts below has not been included in the lifecycle and financial models at this time. The demand management plans discussed in this section should be explored by asset owners in more detail following the AM Pan, and new projects should consider these adaptation impacts during the planning and design processes. Once the demand management plans are more finalized, the information will be incorporated into future iterations of the AMP. This has been identified as a continuous improvement item in ***Table 29.***

Moving forward, the Climate Lens tool discussed in the AMP Overview will assess projects based on these targets and will assist with the prioritization of climate adaptation projects.

Similarly, to the exercise above and using the risk process, asset owners:

- Reviewed the likelihood scores in the Vulnerability and Risk Assessment Report for the adaptation impact occurring;
- Identified the consequence to the asset/service if the event did happen to develop a risk rating; and,

[4] IPWEA Practice Note 12.1 Climate Change Impacts on the Useful Life of Infrastructure

- If the risk was identified as high, the asset owner produced a preliminary risk adaptation plan shown below in ***Table 22.***

It is important to note that due to the high level of uncertainty with the climate change risk adaptation plans, the cost of mitigating the risks below has not been included in the lifecycle and financial models at this time. The adaptation plans discussed in this section should be explored by asset owners in more detail following the AM Plan, and new projects should consider these risks during the planning and design processes. Future changes will be incorporated into future iterations of the AM Plan. Moving forward, the Climate Lens tool will assess projects based on these targets and will assist with the prioritization of climate adaptation projects.

The impact of climate change on assets is a new and complex discussion and further opportunities will be developed in future revisions of this AM Plan.

Table 22: Managing the Demand of Climate Change on Assets and Services

ADAPTATION IMPACT STATEMENT	BASELINE** (1976 - 2005)	AVERAGE PROJECTED** CHANGE IN 2021-2050 (ASSUMING RCP4.5* SCENARIO)	POTENTIAL IMPACT ON ASSETS AND SERVICES	DEMAND MANAGEMENT PLAN
Dryer, hotter and longer summers may affect the health and safety of local vulnerable populations.	71.6 days average length of the hot season	102 days average length of the hot season	Potential decrease in ridership due to more favourable weather for other active modes of transportation.	Monitor trends and continue to promote ridership
Changes in precipitation resulting in erosion of natural systems (i.e., water banks, escarpment erosion) leading to washouts of bridges and roadways.	25.8 heavy precipitation days (10 mm)	27.6 heavy precipitation days (10 mm)	Flooding on HSR routes could impact service delivery	Monitor trends and prepare alternate route maps in areas prone to flooding

ADAPTATION IMPACT STATEMENT	BASELINE** (1976 - 2005)	AVERAGE PROJECTED** CHANGE IN 2021-2050 (ASSUMING RCP4.5* SCENARIO)	POTENTIAL IMPACT ON ASSETS AND SERVICES	DEMAND MANAGEMENT PLAN
Prolonged power outages during winter months due to an increase in ice storms resulting in public safety concerns.	187mm average total winter precipitation	204mm average total winter precipitation	Potential of loss of essential services (i.e., communications) due to power outage.	Monitor trends and investigate alternate power sources for critical communications equipment

*RCP4.5 Scenario: Moderate projected GHG concentrations, resulting from substantial climate change mitigation measures. It represents an increase of 4.5 W/m2 in radiative forcing to the climate system. RCP 4.5 is associated with 580-720ppm of CO_2 and would more than likely lead to 3°C of warming by the end of the 21st century.
**Baseline and Projected numbers based on the 2021 Climate Science Report.

ADAPTATION RISK ANALYSIS

Additionally, the City should consider the risks for the asset or service as a result of climate change and consider ways to adapt to reduce the risk. Adaptation can have the following benefits:

- Assets will withstand the impacts of climate change;
- Services can be sustained; and,
- Assets that can endure may potentially lower the lifecycle cost and reduce their carbon footprint.

It is important to note that due to the high level of uncertainty with the climate change risk adaptation plans, the cost of mitigating the risks below has not been included in the lifecycle and financial models at this time. The adaptation plans discussed in this section as shown in ***Table 23***, should be explored by asset owners in more detail following the AM Plan, and new projects should consider these risks during the planning and design processes. Future changes will be incorporated into future iterations of the AM Plan. Moving forward, the Climate Lens tool will assess projects based on these targets and will assist with the prioritization of climate adaptation projects.

Table 23: Adapting to Climate Change

ADAPTATION IMPACT STATEMENT	SERVICE OR ASSET AT RISK DUE TO IMPACT	WHAT CAN HAPPEN	RISK RATING	RISK ADAPTATION PLAN
Prolonged power outages during winter months due to an increase in ice storms resulting in public safety concerns.	HSR Facilities	Potential loss of essential services (i.e., communications) due to power outage.	High	Investigate redundancy locations for critical communications equipment. Ensure proper maintenance of the backup power system.
Increased intensity and frequency of ice storms leading to increased hazardous roads, pathways, and sidewalk conditions.	Vehicles	Increase in motor vehicle collisions, inability for staff to get to work	High	Plan to ensure vehicles are maintained and in working condition and staff are available. Ensure that spare ratios are appropriately maintained and reviewed frequently Ensure snow-clearing contracts are in place to clear parking lots, pathways, and sidewalks. Plan for work-from-home options when applicable.

CURRENT ADAPTATION PROJECTS

Currently, HSR does not have any current or past climate change adaptation-specific projects identified. The impact of climate change on assets and how the City will adapt is a new and complex discussion and further opportunities will be developed in future revisions of this AM Plan.

CLIMATE ADAPTATION DISCUSSION

Currently, HSR has focused their climate change efforts on mitigation efforts and not yet on adaptation methods. This is because climate effects are more difficult to assess on HSR services and assets and need to be investigated further which has been identified as a continuous improvement item in ***Table 29***.

INCREASED TEMPERATURE

There are many projections related to increased temperature which include heat waves, rising temperatures, increase in average temperatures, and longer summers. One demand result of hot weather is an increase in cooling costs for low-income households. As stated in ***Table 23***, one of the Adaptation Impact Statements shows that hot weather affects health and safety for households without access to reliable air-conditioning and the homeless. During these events, this could lead to an increase in the need for public transit as a means of accessing air conditioning. HSR should investigate this correlation to ensure appropriate staff and assets are available as the climate continues to shift.

INCREASE IN ICE STORMS

An increase in ice storms can lead to increased motor vehicle collisions and power outages throughout the City which can lead to impacts on delivery of HSR services and increased ridership. Ice storms could also increase motor vehicle collisions for HSR vehicle assets and the availability of staff. HSR should investigate this correlation to ensure that appropriate staff and assets are available as climate change continues to affect the service.

8. LIFECYCLE MANAGEMENT PLAN

The lifecycle management plan details how the City plans to manage these assets at the agreed levels of service and at the accepted lifecycle costs while excluding inflationary values. The costs included in the lifecycle management plan include costs from both the capital and operating budgets. Asset management focuses on how taxpayer or ratepayer dollars are invested by lifecycle activities and not by budget allocation. Since both budgets contain various lifecycle activities, they have been consolidated together and separated by lifecycle activity in this section.

As a result of this new process, there may be some areas where the budget was not able to be broken down perfectly by lifecycle activity. Future AM Plans will focus on improving the understanding of whole-life costs and funding options. However, at this time the plan is limited to those aspects. A continuous improvement item included in ***Table 29*** is to complete the lifecycle analysis of vehicles and facilities to ensure data quality improves. In addition, a continuous improvement item has been added to ***Table 29*** to complete a whole-life cost analysis of ATS costing if door-to-door shared ride trips were to be delivered as an in-house service rather than by a Contractor. Expenditure on new assets and services will be accommodated in the long-term financial plan but only to the extent that there is available funding. A continuous improvement item included in ***Table 29*** is to modify the budget sheets to incorporate lifecycle stages so that the results can be more accurate in the next iteration of the plan.

At the time of writing, HSR creates a Capital forecast for ten years into the future, but the forecast only currently includes costs to 2026, with higher confidence values in the first four years. The remainder of the forecast was assumed based on predicted demands and averages. A continuous improvement item identified in **Table 29** is to continue to complete a ten-year Capital forecast. The Operating budget is created annually, but there is an additional estimated three-year projection which was used to estimate the operational budget increase for the first three years for HSR, after which, the budget was assumed to be flatlined.

8.1 ACQUISTION PLAN

Acquisition reflects new assets that did not previously exist or works which will upgrade or improve an existing asset beyond its current capacity. They may result from growth, demand, legal obligations or social or environmental needs. Assets can either be donated through development agreements to the City or through the construction of new assets which are mostly related to population growth. In HSR, assets are generally purchased or constructed.

CURRENT PROJECT DRIVERS – 10-YEAR PLANNING HORIZON

The City prioritizes capital projects based on various drivers to help determine ranking for project priorities and investment decisions as shown in ***Table 24***. As part of future AM Plans, the City will continue to develop its understanding of how projects are prioritized and ensure that multiple factors are being considered to drive investment decisions in the next iteration of the AM Plan. These drivers will include legal compliance, risk mitigation, O&M impacts, growth impacts, health and safety, reputation, and others. These drivers should be reviewed during each iteration of the AM Plan to ensure they are appropriate and effective in informing decision-making.

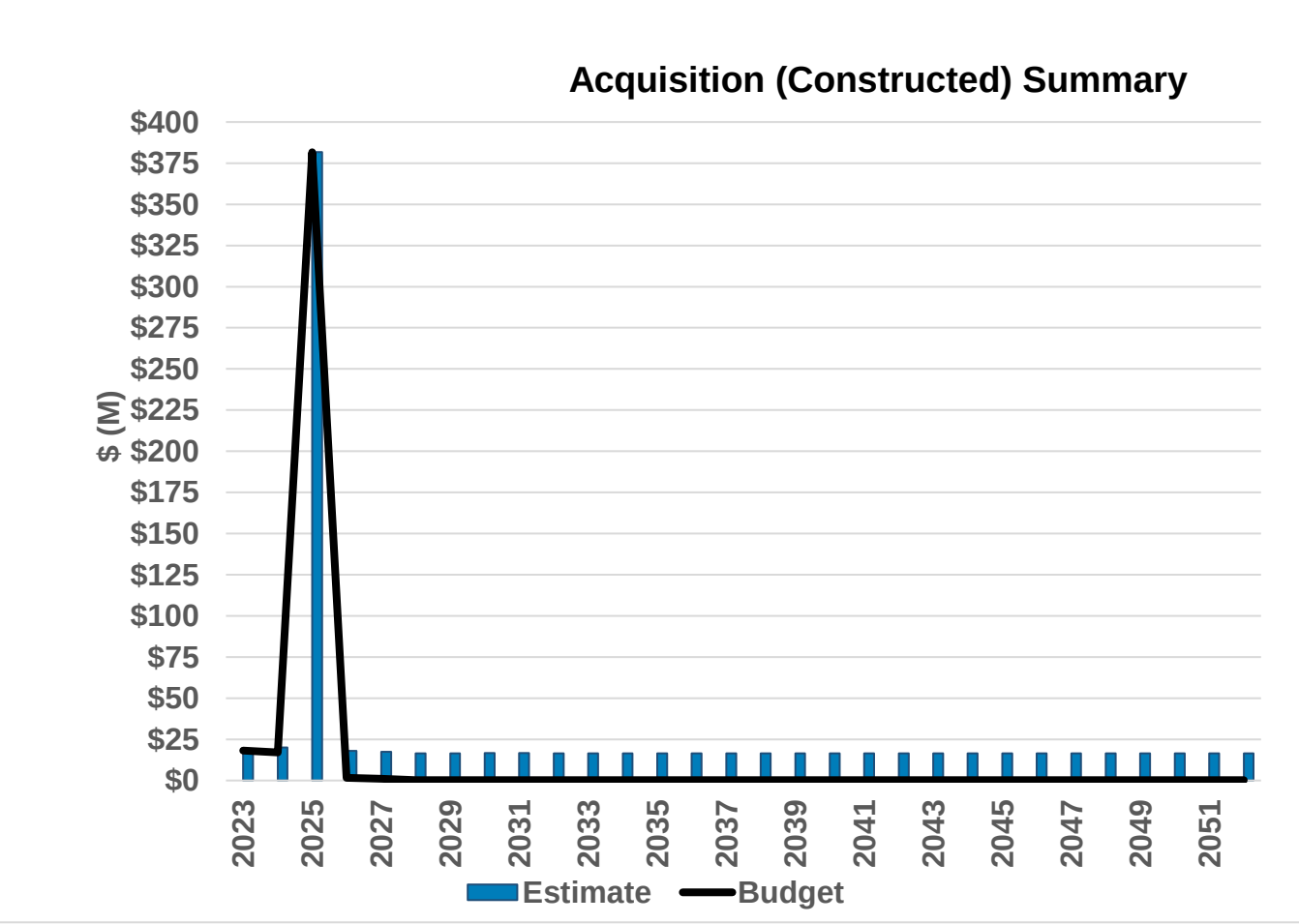
Table 24: Priority Ranking Criteria

CRITERIA	WEIGHTING
Age	***80%***
Condition	***20%***
Total	***100%***

CONSTRUCTED OR PURCHASED ACQUISITIONS

For HSR, assets are typically acquired through the purchase or construction of new assets which are mostly related to population growth, Council targets or Climate Change as discussed in the Demand section. ***Figure 10*** below shows the estimated acquisitions for HSR over the 30-year planning period.

Figure 10: Acquisition (Constructed) Summary
All Figure Values Are Shown In 2023 Dollars.



HAMILTON STREET RAILWAY (HSR) ASSET MANAGEMENT PLAN

Over the next 30-year planning period the City will acquire approximately **$868.5 Million** of constructed HSR assets which can either be new assets which did not exist before or expansion of assets when they are to be replaced. Major acquisition expenditures over the next ten years include:

- **$365.5 Million** for New Maintenance and Storage Facility;
- **$479.7 Million** for the HSR bus expansion program (estimating 15 additional buses per year from 2026 onward);
- **$4.5 Million** for A-line bus corridor;
- **$3.0 Million** for the new LimeRidge Terminal;
- **$1.2 Million** for Mountain Transit Centre parking expansion for buses;
- **$5.0 Million** for Integrated Transit Accessible vehicles; and,
- **$2.1 Million** for Bus Shelter Expansions.

The majority of the constructed assets costs peak between 2023 and 2027. This may change in the future once the HSR (re) Envision project, and its corresponding (re)Designed HSR network form the basis of the forthcoming Transit Growth Plan. When completed, future iterations of this plan will be updated. As AM knowledge, practices and abilities mature within the City, then in all likelihood there will be significant projects with equally significant costs that will appear within the later years of the 30-year planning horizon.

Hamilton does not have a sufficient budget for its planned acquisitions at this time. It will become critical to understand that through the construction or procurement of new assets, the City will be committing to funding the ongoing operations, maintenance and renewal costs which are very significant. Hamilton will need to address how to best fund these ongoing costs as well as the costs of constructing the assets while seeking the highest level of service possible.

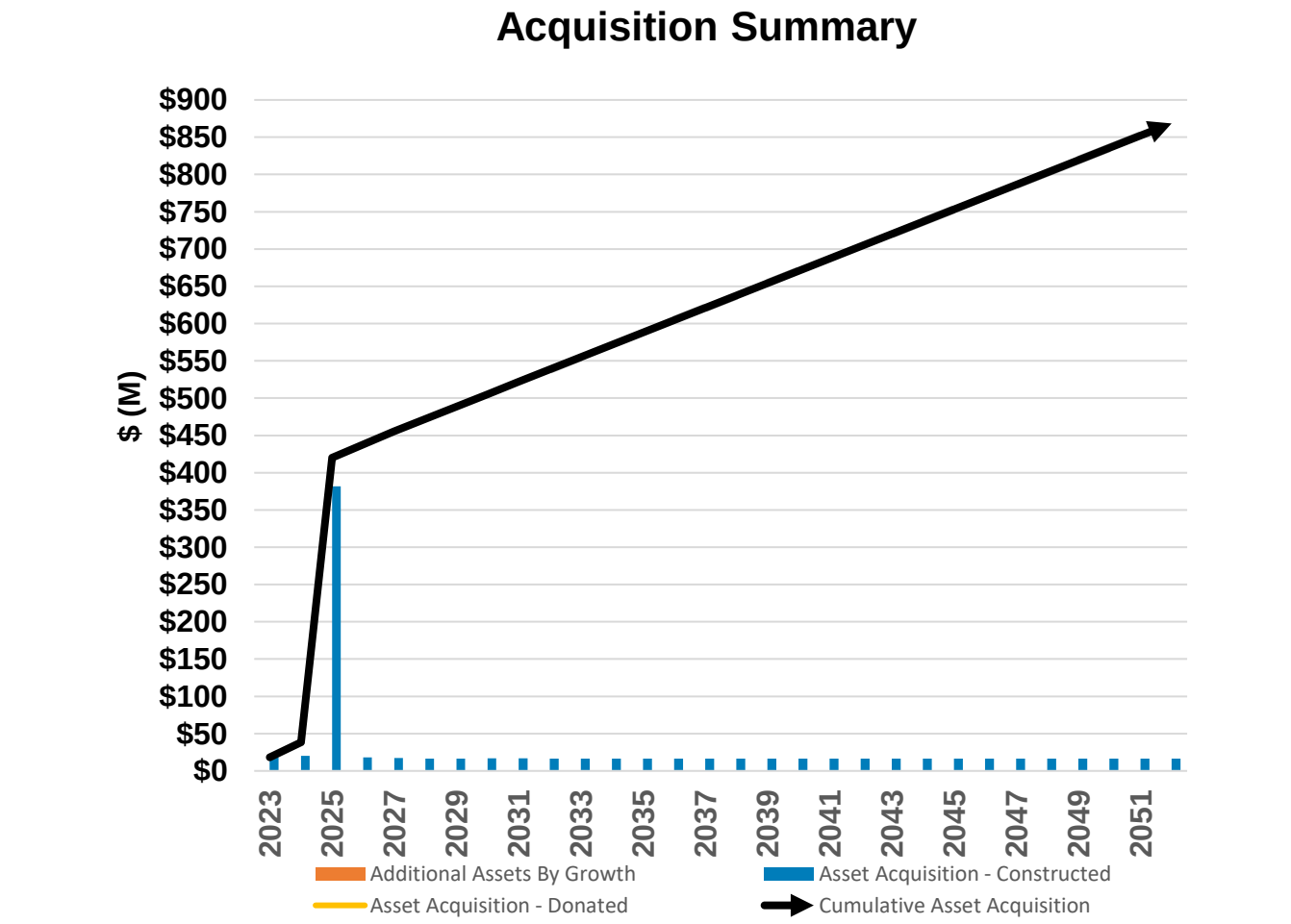
Hamilton will continue to monitor its constructed assets annually and update the AM Plan when new information becomes available.

HAMILTON STREET RAILWAY (HSR) ASSET MANAGEMENT PLAN

ACQUISITIONS SUMMARY

Forecast acquisition asset costs are summarized in ***Figure 11*** and show the cumulative effect of asset assumptions over the next 30-year planning period.

Figure 11: Acquisition Summary
All Figure Values Are Shown In 2023 Dollars.



When Hamilton commits to constructing new assets, the municipality must be prepared to fund future operations, maintenance, and renewal costs. Hamilton must also account for future depreciation when reviewing long-term sustainability. When reviewing the long-term impacts of asset acquisition, it is useful to consider the cumulative value of the acquired assets being taken on by Hamilton. The cumulative value of all acquisition work, including assets that are constructed and contributed shown in ***Figure 11*** above. It should be noted that the acquisition costs of the new Maintenance and Storage Facility (MSF) in 2025, are still under review and are subject to change pending Council approval.

Over the next 30-year planning period Hamilton will acquire approximately **$868.5 Million** of HSR assets. Most of these acquisitions are for the new Maintenance and Storage Facility and the expansion of bus services approved by the Council.

Future AM Plans will focus on improving the understanding of Whole Life Costs and funding options and integrating the HSR (re)Envision project. At this time the plan is limited to those aspects. Expenditure on new assets and services will be accommodated in the long-term financial plan but only to the extent that there is available funding.

8.2 OPERATIONS AND MAINTENANCE PLAN

Operations include all regular activities to provide services. Daily, weekly, seasonal, and annual activities are undertaken by staff to ensure the assets perform within acceptable parameters and to monitor the condition of the assets for safety and regulatory reasons. Examples of typical operational activities include operating assets, utility costs, inspections, and the necessary staffing resources to perform these activities. HSR examples include:

- Bus Cleaning;
- Fuel;
- Insurance;
- Inspections; and,
- Driver training.

A continuous improvement item identified as shown in ***Table 29*** is to review staffing needs to cover sick time cancellations to reduce cancellations or route delays which impact service.

Additionally, a continuous improvement item was identified to complete a whole life and risk analysis for the maintenance of bus shelters to understand the costs and implications of changes to the current ad/maintenance contract structure. Maintenance should be viewed as the ongoing management of deterioration. The purpose of planned maintenance is to ensure that the correct interventions are applied to assets in a proactive manner and to ensure it reaches their intended useful life. Maintenance does not significantly extend the useful life of the asset but allows assets to reach their intended useful life by returning the assets to a desired condition.

Examples of typical maintenance activities include facilities maintenance, equipment repairs, vehicle repairs as well as the appropriate staffing and material resources required to perform these activities.

Proactively planning maintenance significantly reduces the occurrence of reactive maintenance which is always linked to a higher risk to human safety and higher financial costs. The City needs to plan and properly fund its maintenance to ensure the transportation network is reliable and can achieve the desired level of service.

HSR will need to begin reviewing building condition assessments to ensure a proactive approach to maintenance as identified in the condition reports and to work collaboratively with Facilities to program and budget for maintenance needs to ensure the buildings are maintained in an appropriate condition. Most of HSR's maintenance expenses come from maintaining multiple assets such as vehicles and on-street infrastructure. As shown in ***Table 29***, a continuous improvement was identified to review bus maintenance employee hour allocations to improve service knowledge of planned maintenance and inspections. These investments for maintenance are intended to allow these assets to reach their estimated service life and

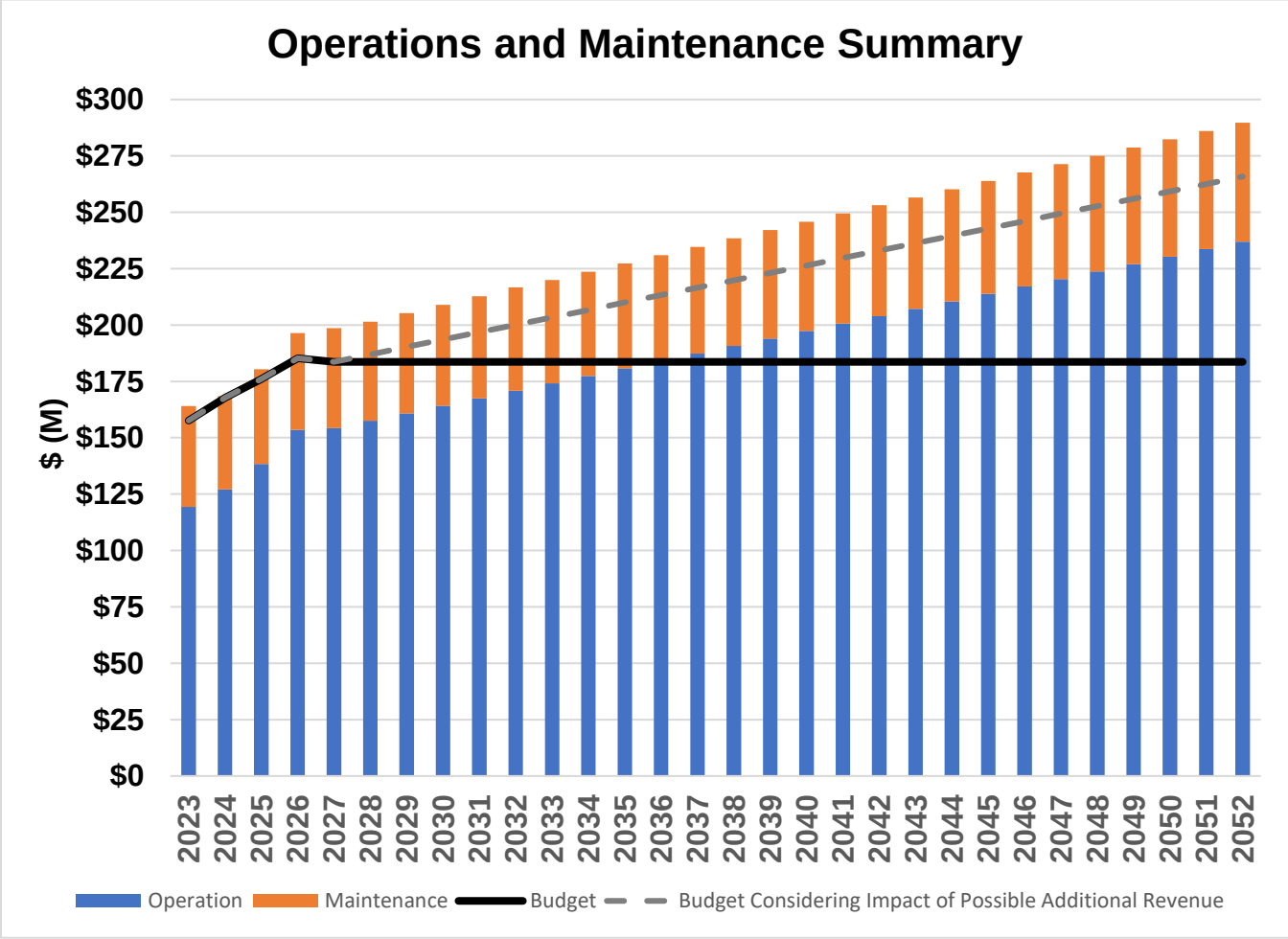
minimize reactive maintenance costs. It should be acknowledged that these forecast costs do not yet fully include the recommended works that need to be undertaken to ensure the entire inventory of assets will achieve their desired service lives and level of service. These forecast costs are likely underestimated at this time.

Deferred maintenance (i.e. works that are identified for maintenance activities but unable to be completed due to available resources) will be included in the infrastructure risk management plan in future iterations once those works have been identified and prioritized.

Assessment and priority of reactive maintenance is undertaken by staff using experience and judgement.

Forecast operations and maintenance costs vary in relation to the total value of the asset registry. When additional assets are acquired, future operations and maintenance costs are forecast to increase. When assets are disposed of, the forecast operation and maintenance costs are reduced. ***Figure 12*** shows the forecast operations and maintenance costs relative to the proposed operations and maintenance Planned Budget.

Figure 12: Operations and Maintenance Summary
All Figure Values Are Shown In 2023 Dollars.



Transit receives funding from a number of sources including Gas Tax and it is likely that increased routes and operating hours will contribute to an increase in revenues. Those revenues can be used to support an estimated increase in the operating budget. Based on a review of the 2023-2027 budgets and calculating the difference between Net and Gross operating budgets in the line called "*Financial Charges & General Revenue*" to determine the estimated annual amount being offset by these items. It is estimated that an increase of **$3.29 Million** can be added to the operating budget annually. This is modelled in ***Figure 12*** above as shown with the grey dashed line. The solid black line is the budget without any assumed increases. It can be seen that even with this estimated forecast increase the budget remains below the estimated forecast costs.

The increase in forecast O&M costs above budget is largely driven by:

- Staffing at new MSF Facility (estimated at 50% in 2025 and 100% in 2026 onwards);
- Vehicle Operators for the 15 new expansion buses acquired annually from 2026 onwards;
- Maintenance and Fuel costs for 15 new buses acquired annually from 2026 onwards; and,
- Maintenance and operating costs for Bus Stop Shelter Expansion;

The forecast costs include all costs from both the Capital and Operating budget. Asset management focuses on how taxpayer or ratepayer dollars are invested by lifecycle activities and not by budget allocation since both budgets contain various lifecycle activities, they must both be consolidated for the AM Plans.

The forecast of operations and maintenance costs are increasing steadily over time, and it is clear that the City has insufficient budget to achieve all of the work required to ensure that assets will be able to achieve their estimated service life at the desired level of service**.** It is anticipated that at the current budget levels, there will be insufficient budget to address all operating and maintenance needs over the 30-year planning horizon. The graph above illustrates that without increased funding or changes to lifecycle activities, there is a shortage of funding which will lead to:

- Higher cost reactive maintenance;
- Possible reduction to the availability of the assets;
- Impacts on private property; and,
- Increased financial and reputational risk.

This shortfall is primarily due to insufficient budget allocations to accommodate the rapid growth and expansion of services. The additional operating and maintenance is due to additional operating and maintenance costs associated with the new buses including fuel cost and staffing. Costs associated with FTE needs for the New Maintenance and Storage Facility have also been included. Adding additional assets over time significantly impacts the operational and maintenance resources required to sustain the expected or mandatory level of service. It should be noted that a significant amount of operational and maintenance expenditures is mandatory due to legislative requirements and cannot simply be avoided or deferred.

As the City continues to develop condition profiles and necessary works are identified based on their condition, it is anticipated this operation and maintenance forecasts will increase significantly. Where maintenance budget allocations will result in a lesser level of service, the service consequences and risks have been identified and are highlighted in the ***Risk Section 6***.

Deferred maintenance (i.e. works that are identified for maintenance activities but unable to be completed due to available resources) will be included in the infrastructure risk management plan for the next iteration.

As the City continues to develop condition profiles and necessary works are identified based on their condition, it is anticipated these operation and maintenance forecasts will change. Future iterations of this plan will provide a more thorough analysis of operations and maintenance costs including types of expenditures for training, mandatory certifications, insurance, staffing costs and requirements, equipment, and maintenance activities.

8.3 RENEWAL PLAN

Renewal is major work which does not increase the asset's design capacity but restores, rehabilitates, replaces, or renews an existing asset to its original service potential. Works over and above restoring an asset to its original service potential is considered to be an acquisition resulting in additional future operations and maintenance costs

Asset renewals are typically undertaken to either ensure the assets' reliability or quality will meet the service requirements set out by the City. Renewal projects are often triggered by service quality failure and can often be prioritized by those that have the highest consequence of failure, have high usage, have high operational and maintenance costs and other deciding factors.

The typical useful lives of assets used to develop projected asset renewal forecasts are shown in ***Table 25*** and are based on the estimated design life for this iteration of the AM Plan. Future iterations of the plan will focus on the Lifecycle approach to ESL which can vary greatly from design life. Asset useful lives were last reviewed in 2022 however they will be reviewed annually until their accuracy reflects the City's current practices.

Table 25: Useful Lives of Assets

ASSET (SUB)CATEGORY	EXPECTED USEFUL LIFE (YEARS)
Revenue Generating Vehicles (Buses)	12
Non-Revenue Generating Vehicles	5-7
Hardware	4-6
Maintenance Equipment	Various
Servers	15 – 20
Software	25

ASSET (SUB)CATEGORY	EXPECTED USEFUL LIFE (YEARS)
HSR Facilities	60
On-street infrastructure (Bus Shelters and amenities)	15

The estimates for renewals in this AM Plan were based on the register method which utilizes the data from the City's asset registry to analyze all available lifecycle information and then determine the optimal timing for renewals based on the ESL. The alternate method was also used to quantify renewals for future anticipated acquisitions.

RENEWAL RANKING CRITERIA

Asset renewal is typically undertaken to either:

- Ensure the reliability of the existing infrastructure to deliver the service it was constructed to facilitate (e.g., replacing a bridge that has a load limit); or,
- To ensure the infrastructure is of sufficient quality to meet the service requirements (e.g., condition of a culvert).[5]

[5] IPWEA, 2015, IIMM, Sec 3.4.4, p 3|91.

Future methodologies may be developed to optimize and prioritize renewals by identifying assets or asset groups that:

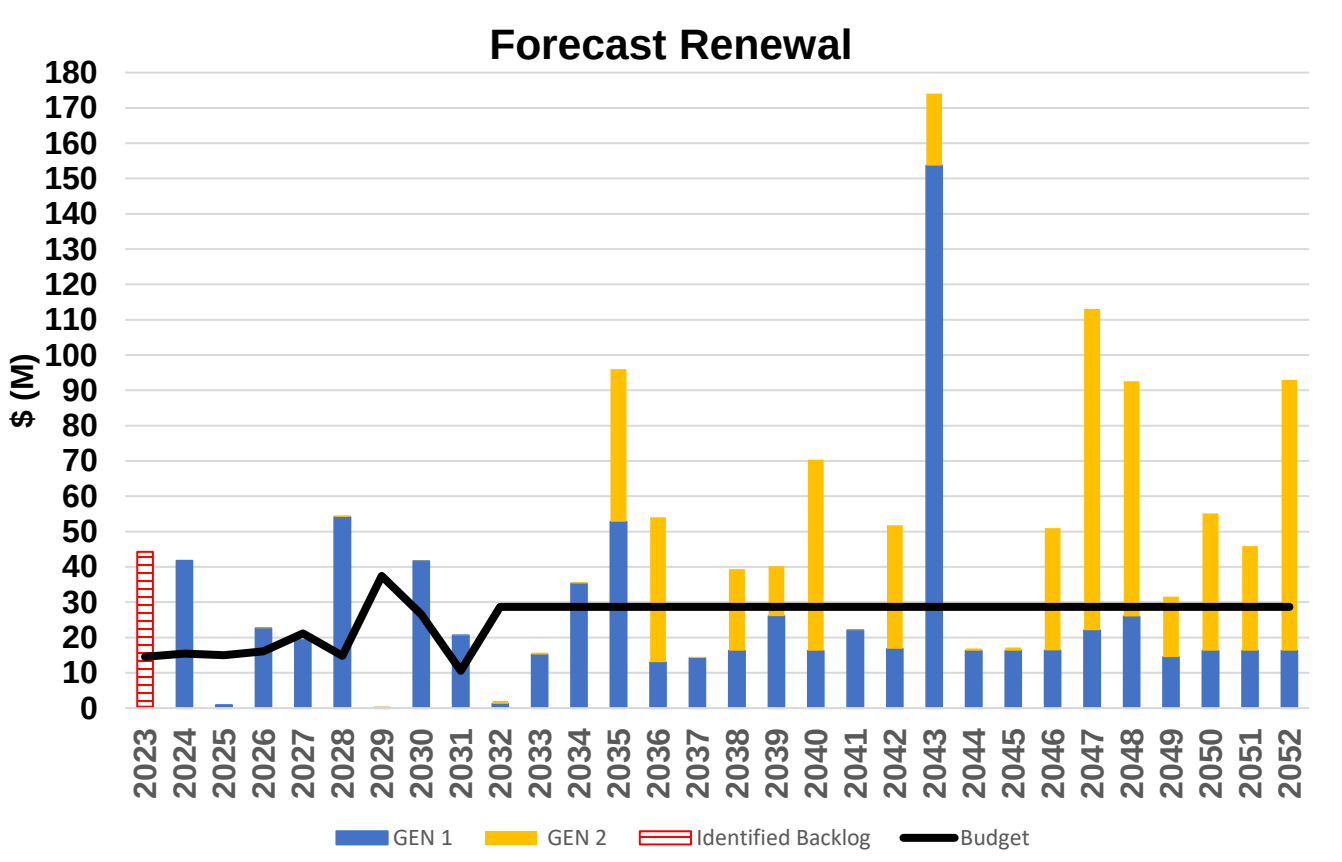
- Have a high consequence of failure;
- Have high use and the subsequent impact on users would be significant;
- Have higher than expected operational or maintenance costs, and,
- Have the potential to reduce life cycle costs by replacement with a modern equivalent asset that would provide the equivalent service.[6]

SUMMARY OF FUTURE RENEWAL COSTS

Forecast renewal costs are projected to increase over time if the asset stock increases. The forecast costs associated with renewals are shown relative to the proposed renewal budget in ***Figure 13.***

In the figure below, Generation 1 (Gen 1) costs refer to renewals that occur for the first time in the model based on the estimated service life and Generation 2+ (Gen 2+) costs refer to renewals that have occurred twice or more based on the estimated service life.

Figure 13: Forecast Renewal Costs
All Figure Values Are Shown In 2023 Dollars.



[6] Based on IPWEA, 2015, IIMM, Sec 3.4.5, p 3|97.

HAMILTON STREET RAILWAY (HSR) ASSET MANAGEMENT PLAN

The significant amount highlighted in 2023 represents the cumulative backlog of deferred work needed to be completed that has been either identified through its current estimated condition or age per ***Table 4*** when the condition was not available. This backlog represents nearly **$43.9 Million** of deferred works. A continuous improvement item was identified as shown in ***Table 29*** to review building condition assessments to identify necessary actions and determine their priority to be included in budgets.

Backlog items include:

- **$43 Million** in revenue-generating vehicles (2021 and 2022 End of Life estimates*);
- **$0.4 Million** in maintenance equipment; and,
- **$0.3 Million** in non-revenue generating vehicles.

*Some of the revenue-generating vehicles backlogs might have already been addressed due to the data cut-off dates and the date of the AM Plan preparation. The backlog is largely due to vehicles that have an identified end of-life of 2021 and 2022.

Deferred renewals (assets identified for renewal and not funded) are included and identified within the risk management plan. Prioritization of these projects will need to be funded and managed over time to ensure renewal occurs at the optimal time.

There is a sufficient budget to support the planned projects only. Without additional funding, the backlog will remain and continue to grow as future projects outside of the ten-year planning horizon continue to move forward into the ten-year scope. Continued deferrals of projects will lead to significantly higher operational and maintenance costs and will affect the availability of services in the future and impact levels of service.

The expected renewal works over the ten-year budget cycle include **$ 191.4 Million** for bus replacements with another $**1.3 Million** for non-revenue vehicle renewals. Additionally, **$1.6 Million** is allocated for bus shelter rehabilitation and **$1.1 Million** towards terminal and end-of-line rehabilitation. As the growth of HSR continues it will continue to need additional funding to ensure the renewals can be funded properly.

Deferring renewals creates risks of higher financial costs, decreased availability, and decreased satisfaction with asset performance. Ultimately, continuously deferring renewals works ensures Hamilton will not achieve intergenerational equality. If Hamilton continues to push out necessary renewals, there is a high risk that future generations will be unable to maintain the level of service the customers currently enjoy. It will burden future generations with significant costs that inevitably they will be unable to sustain.

Properly funded and timely renewals will ensure the assets perform as expected and it is recommended to continue to analyze asset renewals based on criticality and availability of funds for future AM Plans.

8.4 DISPOSAL PLAN

Disposal includes any activity associated with the disposal of a decommissioned asset including sale, possible closure of service, decommissioning, disposal of asset materials, or relocation. Disposals will occur when an asset reaches the end of its useful life. The end of its useful life can be determined by factors such as excessive operation and maintenance costs, regulatory changes, obsolescence, or demand for the structure has fallen.

Assets identified for possible decommissioning and disposal are shown in ***Table 26***. A summary of the disposal costs and estimated reductions in annual operations and maintenance of disposing of the assets are also outlined in ***Table 26***. Any costs or revenue gained from asset disposals is included in future iterations of the plan and the long-term financial plan.

As a continuous improvement, there will be a review of the estimate service life for assets and this section will be updated in the next iteration of this AM plan.

Table 26: Assets Identified for Disposal

ASSET	REASON FOR DISPOSAL	TIMING	DISPOSAL COSTS	OPERATIONS AND MAINTENANCE ANNUAL SAVINGS
Bus	End of Life	Annual	($5,000)	To be determined

8.5 SUMMARY OF CURRENT ASSET FORECAST COSTS

The financial projections from this asset plan are shown in ***Figure 14***. These projections include forecast costs for acquisition, operation, maintenance, renewal, and disposal. These forecast costs are shown relative to the proposed budget.

The bars in the graphs represent the forecast costs needed to minimize the life cycle costs associated with the service provision. The proposed budget line indicates the estimate of available funding. The gap between the forecast work and the proposed budget is the basis of the discussion on achieving a balance between costs, levels of service and risk to achieve the best value outcome.

HAMILTON STREET RAILWAY (HSR) ASSET MANAGEMENT PLAN

Figure 14: Lifecycle Summary
All Figure Values Are Shown In 2023 Dollars.

Asset Renewal Funding Ratio (Target should be 90%-110%)	81%
10-Year O & M & Renewal Funding Ratio (Target should be 90%-110%)	93%
Projected Funding Required to Eliminate Funding Gap (10 years)	$163 Million

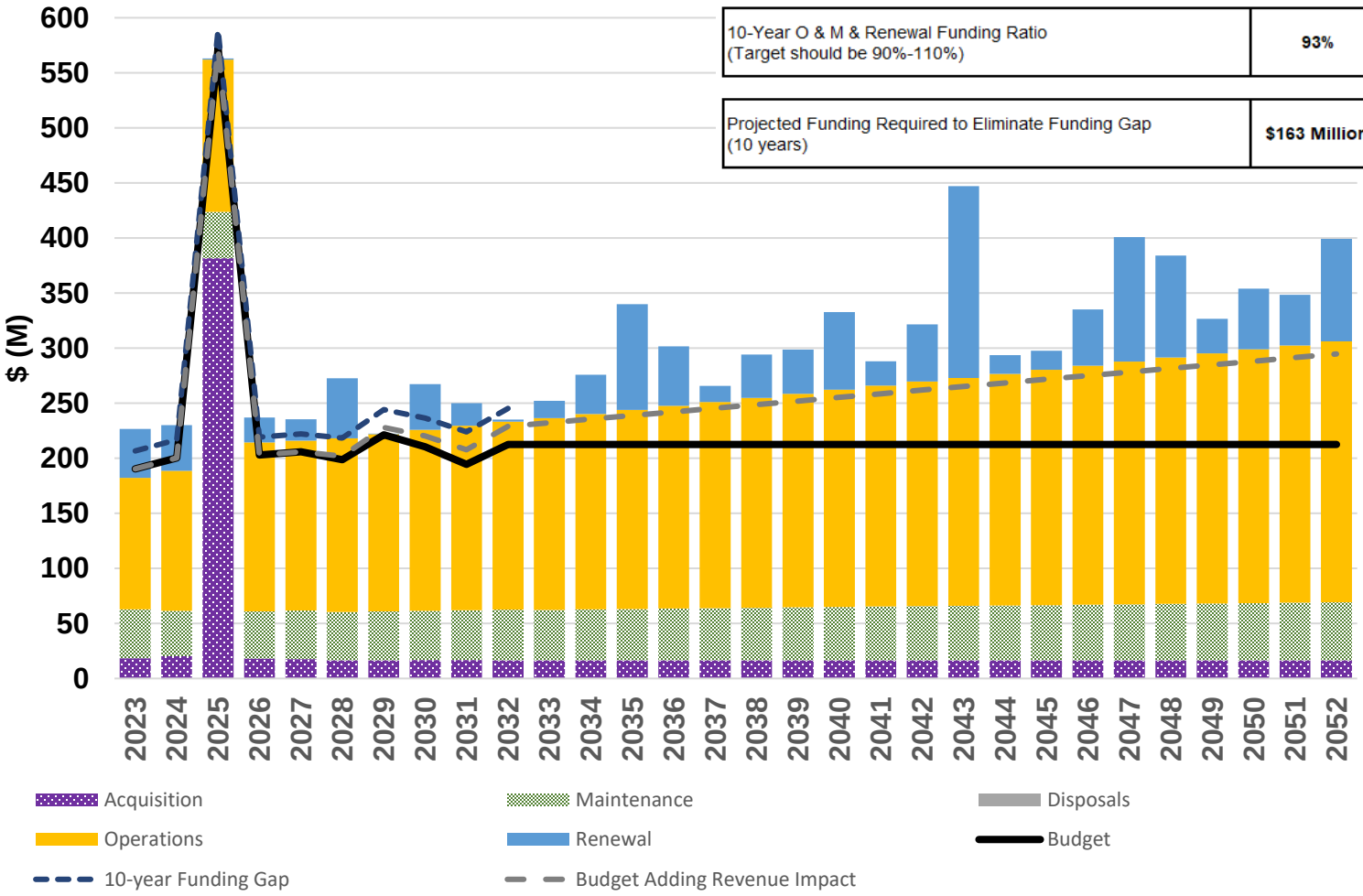


Figure 14 above shows a budget that is flatlined (the black line) and also a potential budget that includes an increase in the operating budget of **$3.28 Million annually** (the grey dashed line) as explained in the Lifecycle Operating and Maintenance section of the AM Plan. The ARFR is not impacted by this increase as the change impacts the O&M budgets. The 10-year O & M & Renewal funding and the projected funding gap shown in ***Figure 14*** are calculated using the increased revenue values. If the flat-lined budget (black line) is used, or if the revenue does not materialize then the 10 Year O & M & Renewal Ratio would be 90% and the Projected Funding Required to eliminate the Funding Gap (10 years) would be **$212 Million**.

There is typically a sufficient budget to address most of the planned operational and maintenance activities for the planning period for current assets. However, with the procurement of assets and their increased costs over time, there may be impacts on the service itself. Without some adjustment to available funds or other lifecycle management decisions, there will be insufficient budget to address all planned lifecycle activities.

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Hamilton currently has insufficient budget to address the large backlog of renewal work projected by the plan over the 30-year horizon. When deferring of renewals occurs, Hamilton runs the risk of higher cost reactive maintenance, service interruptions, decreased satisfaction, harm to its reputation along with other risk costs such as legal fees. Deferring renewals is not the optimal recommendation and Hamilton would benefit from seeking out long-term financing strategies to enable a more rapid renewal plan.

Without sufficient funding, the City has little option but to defer these necessary lifecycle activities. Deferring important lifecycle activities is never recommended. The City will benefit from allocating sufficient resources to developing its long-term financial plan to ensure that over time the City can fully fund the necessary lifecycle activities. Funding these activities helps to ensure the assets are compliant, safe, and effectively deliver the service the customers need and desire.

Renewing at a greater rate and increasing major maintenance projects would allow Hamilton to mitigate ever-decreasing transit conditions proactively. With **$524.8 Million** of assets to manage it is imperative that Hamilton optimize its renewal and major maintenance planning so that over time, high-cost reactive maintenance will be avoided or deferred to a later date.

The lack of funding allocated for the backlog of renewals and the necessary lifecycle activities creates an additional issue which is intergenerational equity. Each year the City defers necessary lifecycle activities, it pushes the ever-increasing financial burden on future generations. It is imperative the City begin addressing the lack of consistent and necessary funding to ensure that intergenerational equity will be achieved. Over time, allocating sufficient funding on a consistent basis ensures that future generations will be able to enjoy the same standards being enjoyed today.

Over time the City will continue to improve its lifecycle data, and this will allow for informed choices as to how best to mitigate those impacts and how to address the funding gap itself. This gap in funding future plans will be refined over the next three years and improve the confidence and accuracy of the forecasts in future revisions of this AM Plan.

9. FINANCIAL SUMMARY

This section contains the financial requirements resulting from the information presented in the previous sections of this AM Plan. Effective asset and financial management will enable the City to ensure its Transportation network provides the appropriate level of service for the City to achieve its goals and objectives. Reporting to stakeholders on service and financial performance ensures the City is transparently fulfilling its stewardship accountabilities.

Long-term financial planning (LTFP) is critical for the City to ensure the network lifecycle activities such as renewals, operations, maintenance, and acquisitions can happen at the optimal time. The City is under increasing pressure to meet the wants and needs of its customers while keeping costs at an affordable level and maintaining its financial sustainability.

Without funding asset activities properly for its Transportation network; the City will have difficult choices to make in the future which will include options such as higher costs reactive maintenance and operational costs, reduction of service and potential reputational damage.

Aligning the LTFP with the AM Plan is critical to ensure all of the network's needs will be met while the City is finalizing a clear financial strategy with measurable financial targets. The financial projections will be improved as the discussion on desired levels of service and asset performance matures.

9.1 SUSTAINABILITY OF SERVICE DELIVERY

There are two key indicators of sustainable service delivery that are considered within the AM Plan for this service area. The two indicators are the:

- Asset renewal funding ratio (proposed renewal budget for the next ten years/forecast renewal costs for next ten years); and,
- Medium-term forecast costs/proposed budget (over ten years of the planning period).

ASSET RENEWAL FUNDING RATIO

Asset Renewal Funding Ratio[7] **81%**

The Asset Renewal Funding Ratio is used to determine if the City is accommodating asset renewals in an **optimal** and **cost-effective** manner from a timing perspective and relative to financial constraints, the risk the City is prepared to accept and targeted service levels it wishes to maintain. The target renewal funding ratio should be ideally between **90% - 110%** over the entire planning period. A low indicator result generally indicates that service levels are achievable, however, the expenditures are below this level because the City is reluctant to fund the necessary work or prefers to maintain low levels of debt.

Over the next ten years, the City expects to have **81%** of the funds required for the optimal renewal of assets. This is a low number and should be addressed through this plan in the next

[7] AIFMM, 2015, Version 1.0, Financial Sustainability Indicator 3, Sec 2.6, p 9.

iteration. By only having sufficient funding to renew **81%** of the required assets in the appropriate timing it will inevitably require difficult trade-off choices that could include:

- A significant reduction in the level of service and availability of assets;
- Increased complaints and reduced customer satisfaction;
- Substantially increased reactive maintenance and renewal costs; and,
- Damage to the City's reputation and risk of fines or legal costs.

The lack of renewal resources will be addressed in future AM plans while aligning the plan to the LTFP. This will allow staff to develop options and long-term strategies to address the renewal rate. The City will review its renewal allocations once the entire inventory has been confirmed and amalgamated.

MEDIUM-TERM – 10 YEAR FINANCIAL PLANNING PERIOD

O&M and Renewal Ratio 93%

Although this AM Plan includes forecast projections to 30 years, the higher confidence numbers are typically within the first ten years of the lifecycle forecast. The ten-year Lifecycle Financial Ratio compares the Planned Budget with the Lifecycle Forecast for the optimal operation, maintenance, and renewal of assets to provide an agreed level of service over the next ten-year period. Similarly, to the AARF, the optimal ratio is also between **90-110%**. A low ratio would indicate that assets are not being funded at the rate that would meet the organization's risk and service level commitments.

The forecast operations, maintenance and renewal costs over the ten-year planning period is **$220.1 Million** on average per year. Over time as improved information becomes available, it is anticipated to see this number change. The proposed (budget) operations, maintenance and renewal funding is **$203.8 Million** on average per year (including the 50% of funding provided by the province) giving a 10-year funding shortfall of **$16.3 Million** per year or **$163 Million** over the ten year planning period. This indicates that **93%** of the forecast costs needed to provide the services documented in this AM Plan are accommodated in the proposed budget, which is not within the 90-110% range. Therefore, it can be concluded that HSR is not funding their assets at an acceptable rate. Note, that these calculations exclude acquired assets.

Funding an annual funding shortfall or funding 'gap' should not be addressed immediately. The overall gap in funding city-wide will require vetting, planning and resources to begin to incorporate gap management into the future budgets for all City services. This gap will need to be managed over time to reduce it in a sustainable manner and limit financial shock to customers. Options for managing the gap include:

- Financing strategies – increased funding, block funding for specific lifecycle activities, long-term debt utilization;
- Adjustments to lifecycle activities – increase/decrease maintenance or operations, increase/decrease frequency of renewals, limit acquisitions or dispose of underutilized assets;
- Influence level of service expectations or demand drivers; and,

- As a revenue-generating organization, HSR can look to adjust the balance between Fares and Rate levy to manage the gap.

These options and others will allow Hamilton to ensure the gap is managed appropriately and ensure the level of service outcomes the customers desire.

Providing sustainable services from infrastructure requires the management of service levels, risks, forecast outlays and financing to eventually achieve a financial indicator of **90-110%** for the first years of the AM Plan and ideally over the ten-year life of the Long-Term Financial Plan.

9.2 FORECAST COST (OUTLAYS) FOR THE LONG-TERM FINANCIAL PLAN

Table 27 shows the forecast costs (outlays) required for consideration in the 30-year long-term financial plan.

Providing services in a financially sustainable manner requires a balance between the forecast outlays required to deliver the agreed service levels with the planned budget allocations in the operational and capital budget. The City will begin developing its long-term financial plan (LTFP) to incorporate both the operational and capital budget information and help align the LTFP to the AM Plan which is critical for effective asset management planning.

A gap between the forecast outlays and the amounts allocated in the financial plan indicates further work is required on reviewing service levels in the AM Plan (including possibly revising the long-term financial plan).

The City will manage the 'gap' by continuing to develop this AM Plan to provide guidance on future service levels and resources required to provide these services in consultation with the community. Options to manage the gap include reduction and closure of low-use assets, increased funding allocations, reduce the expected level of service, utilization of debt-based funding over the long term, adjustments to lifecycle activities, improved renewals and multiple other options or combinations of options.

These options will be explored in the next AM Plan and the City will provide analysis and options for Council to consider going forward.

Table 27: Forecast Costs (Outlays) For the Long-term Financial Plan
Forecast Costs Are Shown In 2023 Dollar Values.

YEAR	ACQUISITION	OPERATION	MAINTENANCE	RENEWAL	DISPOSAL
2023	$18,248,000	$119,366,208	$44,638,752	$44,237,608	$0
2024	$20,130,500	$127,093,080	$41,257,536	$41,695,052	$0
2025	$381,639,008	$138,306,512	$42,132,200	$853,665	$0

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YEAR	ACQUISITION	OPERATION	MAINTENANCE	RENEWAL	DISPOSAL
2026	$17,995,000	$153,488,352	$42,924,272	$22,622,012	$0
2027	$17,445,000	$154,221,312	$44,334,852	$19,463,700	$0
2028	$16,530,000	$157,536,528	$43,970,068	$54,555,528	$0
2029	$16,530,000	$160,850,736	$44,416,692	$432,494	$0
2030	$16,710,000	$164,164,960	$44,816,476	$41,721,104	$0
2031	$16,710,000	$167,480,704	$45,234,692	$20,684,142	$0
2032	$16,530,000	$170,796,464	$45,900,156	$2,004,456	$0
2033	$16,530,000	$174,110,704	$45,801,392	$15,682,320	$0
2034	$16,530,000	$177,424,960	$46,178,704	$35,649,748	$0
2035	$16,530,000	$180,739,216	$46,556,028	$96,005,192	$0
2036	$16,530,000	$184,053,488	$46,933,368	$54,035,608	$0
2037	$16,530,000	$187,367,760	$47,310,720	$14,500,426	$0
2038	$16,530,000	$190,682,048	$47,688,088	$39,373,756	$0
2039	$16,530,000	$193,996,336	$48,065,472	$40,221,832	$0
2040	$16,530,000	$197,310,624	$48,442,864	$70,359,216	$0
2041	$16,530,000	$200,624,928	$48,820,276	$22,133,552	$0
2042	$16,530,000	$203,939,248	$49,197,704	$51,802,824	$0
2043	$16,470,000	$207,154,464	$49,396,888	$174,035,280	$0
2044	$16,470,000	$210,467,456	$49,771,888	$16,927,352	$0
2045	$16,470,000	$213,780,464	$50,146,888	$17,160,844	$0
2046	$16,470,000	$217,093,472	$50,521,888	$50,965,340	$0
2047	$16,470,000	$220,406,464	$50,896,888	$113,055,864	$0
2048	$16,470,000	$223,719,456	$51,271,888	$92,546,784	$0

YEAR	ACQUISITION	OPERATION	MAINTENANCE	RENEWAL	DISPOSAL
2049	$16,470,000	$227,032,464	$51,646,888	$31,566,776	$0
2050	$16,470,000	$230,345,472	$52,021,888	$55,144,392	$0
2051	$16,470,000	$233,658,464	$52,396,888	$45,914,320	$0
2052	$16,470,000	$236,971,456	$52,771,888	$92,890,808	$0

9.3 FUNDING STRATEGY

The proposed funding for assets is outlined in the City's operational budget and ten-year capital budget.

These operational and capital budgets determine how funding will be provided, whereas the AM Plan typically communicates how and when this will be spent, along with the service and risk consequences. Future iterations of the AM plan will provide service delivery options and alternatives to optimize limited financial resources.

9.4 VALUATION FORECASTS

Asset values are forecast to increase as additional assets are added into service. As projections improve and can be validated with market pricing, the net valuations will increase significantly despite some assets being programmed for disposal that will be removed from the register over the 30-year planning horizon.

Additional assets will add to the operations and maintenance needs in the longer term. Additional assets will also require additional costs due to future renewals. Any additional assets will also add to future depreciation forecasts. Any disposals of assets would decrease the operations and maintenance needs in the longer term and remove the high costs of renewal obligations. At this time, it is not possible to separate the disposal costs from the renewal or maintenance costs, however, this will be improved for the next iteration of the plan.

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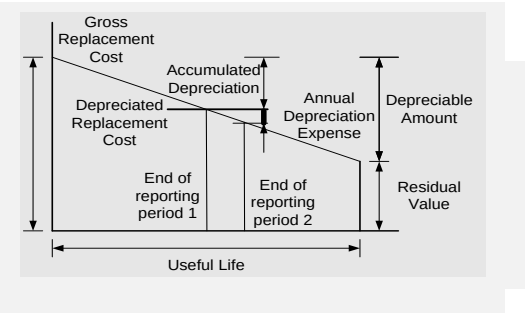
9.5 ASSET VALUATIONS

The best available estimate of the value of assets included in this AM Plan is shown below. The assets are valued at estimated replacement costs:

Replacement Cost (Current/Gross)	**$524,868,384**
Depreciable Amount	**$524,868,384**
Depreciated Replacement Cost[8]	**$239,154,432**
Depreciation	**$ 31,657,828**



The current replacement cost is the most common valuation approach for specialized infrastructure assets. The methodology includes establishing a comprehensive asset registry, assessing replacement costs (based on market pricing for the modern equivalent assets) and useful lives, determining the appropriate depreciation method, testing for impairments, and determining remaining useful life.

As the City matures its asset data, it is highly likely that these valuations will fluctuate significantly over the next three years, and they should increase over time based on improved market equivalent costs.

9.6 KEY ASSUMPTIONS MADE IN FINANCIAL FORECASTS

In compiling this AM Plan, it was necessary to make some assumptions. This section details the key assumptions made in the development of this AM plan and should provide readers with an understanding of the level of confidence in the data behind the financial forecasts.

Key assumptions made in this AM Plan are:

- Operational forecasts are based on current budget allocations and are the basis for the projections for the ten-year horizon and do not address other operational needs not yet identified; exceptions include the following:
  - Estimated Operations costs associated with the acquisition of 15 new buses per year have been incorporated into the plan (including employee costs and related direct costs, fuel);
  - Estimated Operating impacts associated with the new Maintenance Storage Facility have been included in this AM Plan (operating and employee-related costs);
- Maintenance forecasts are based on current budget allocations and do not identify asset needs at this time. It is solely based on planned activities;
  - Estimated maintenance costs associated with the acquisition of 15 new buses per year have been incorporated into the plan (including annual parts, direct maintenance, and labour costs);

[8] Also reported as Written Down Value, Carrying or Net Book Value.

- Lifecycle renewal of acquired revenue-generating vehicles has been incorporated in the plan;
- Replacement costs were based on a mixture of historical costing and recent purchase tenders depending on the asset class. Some assets were also made without determining what the asset would be replaced with in the future, with HSR fleet vehicles being the exception and the replacement was a known variable;
- Future electrification costs have not been incorporated into this AM Plan; and,
- This plan assumes that HSR utilizes 9.63% of the space at the Wentworth Facility.

9.7 FORECAST RELIABILITY AND CONFIDENCE

The forecast costs, proposed budgets, and valuation projections in this AM Plan are based on the best available data and data confidence for these is shown in ***Table 28***. For effective asset and financial management, it is critical that the information is current and accurate. Data confidence is defined in the AMP Overview.

Table 28: Data Confidence Assessment for Data Used in AM Plan

DATA	CONFIDENCE ASSESSMENT	COMMENT
Demand Drivers	Low – Medium	Further analysis of drivers is essential when the HSR (re) Envision Project is complete to ensure that the confidence can be increased.
Growth Projections	Low – Medium	Current growth projections are of low - medium confidence however with the (re) Envision Project for HSR growth projections will need to be updated to align with the new growth requirements.
Acquisition Forecast	Low – Medium	HSR vehicles are of low - medium confidence however with the (re) Envision project the AM Plan will need to be updated to align with new acquisitions. This could also be impacted by the LRT system being installed as ownership of the LRT has not been determined. Regardless of ownership of LRT, it will have an impact on HSR assets and operations.
Operation Forecast	Medium	Further lifecycle analysis and staffing analysis are required to improve future forecasts. A continuous improvement item has been identified and input into the plan.
Maintenance Forecast	Low	Effort and analysis are still required to ensure that maintenance forecasting is accurate. A lifecycle analysis is required to improve the plan's confidence. This has been identified as a continuous improvement within this plan
Renewal Forecast - Asset Values	Medium	The renewal forecast for vehicles is of a medium confidence however with the current (re)Envision project of HSR services, HSR will need to complete a full renewal analysis once a future plan has been finalized.
- Asset Useful Lives	Medium	Currently, the vehicle useful lives are accurate within one year however the other asset lives should be updated through the continuous improvement item identified within this plan
- Condition Modelling	Low	Age is often the default variable for replacement timing. Actual conditions should be assessed in future plans to ensure that it can be a primary driver for replacement costing and ESL accuracy.

DATA	CONFIDENCE ASSESSMENT	COMMENT
Disposal forecast	Medium	Most HSR vehicles are known within a year of accuracy for replacement timing. Facility assets should be reviewed for ESL

The estimated confidence level for the reliability of data used in this AM Plan is considered to be a **Low - Medium** confidence level. Several continuous improvement items are identified to help improve the overall confidence of the HSR AM Plan. If the continuous improvement plans are funded and completed it would raise the data confidence of the plan to a **Medium** or **Medium – High** confidence which is ideal for implementing an evidence-based approach for future HSR planning.

10. PLAN IMPROVEMENT AND MONITORING

10.1 STATUS OF ASSET MANAGEMENT PRACTICES[9]

ACCOUNTING AND FINANCIAL DATA SOURCES

This AM Plan utilizes accounting and financial data. The sources of the data are:

- 2023 Capital & Operating Budgets;
- Asset Management Data Collection Templates;
- Building Condition Assessment Reports;
- Audited Financial Statements and Government Reporting (FIR, TCA, etc.);
- Financial Exports from internal financial systems; and,
- Historical cost and estimates of budget allocation based on SME experience.

ASSET MANAGEMENT DATA SOURCES

This AM Plan also utilizes asset management data. The sources of the data are:

- Data extracts from various city applications and management software;
- Asset Management Data Collection Templates;
- 10-Year Local Transit Strategy;
- (Re) Envision;
- Ongoing customer satisfaction survey results;
- Tender documents, subdivision agreements and projected growth forecasts as well as internal reports;
- Condition assessments;
- Subject matter Expert Opinion and Anecdotal Information; and,
- Reports from the mandatory biennial inspection, operational and maintenance activities internal reports.

10.2 IMPROVEMENT PLAN

It is important that the City recognize areas of the AM Plan and planning processes that require future improvements to ensure both effective asset management and informed decision-making. The tasks listed below are essential to improving the AM Plan and the City's ability to make evidence-based and informed decisions. These improvements span from improved lifecycle activities, improved financial planning and plans to physically improve the assets.

The Improvement Plan shown in ***Table 29*** below, highlights proposed improvement items that will require further discussion and analysis to determine feasibility, resource requirements and

[9] ISO 55000 Refers to this as the Asset Management System

alignment to current work plans. Future iterations of this AM Plan will provide updates on these improvement plans.

Table 29: Improvement Plan
****p.a – per annum***

#	TASK	RESPONSIBILITY	RESOURCES REQUIRED	TIMELINE
1.	Conduct Transcab Customer Satisfaction Survey to identify customer demands and Levels of Service	**CXI,** AM	**$8,400 of Staff time** (Internal resources)	**Complete by the end of 2023**
2.	Establish Voice of the Customer for ATS/ clients to assist with Levels of Service	**CXI, ATS,** AM	**$3,500 of Staff time** (Internal resources)	**Complete by the end of 2023**
3.	Review Bus Maintenance FTE hour allocations to improve service knowledge of planned maintenance and inspections	**Fleet Maintenance,** Asset Management	**$5,500 of Staff Time** (internal resources)	**Complete by the end of 2024**
4.	Review Asset Registry to improve data quality and verify quantities, condition, Replacement Costs, Age and ESL	**HSR,** Finance Asset Management	**$6,500 of Staff Time** (internal resources)	**Complete by the end of 2024**
5.	Complete Lifecycle analysis of Vehicles and Facilities to ensure data quality improves	**AM**, HSR	**$7,000 of Staff time** (Internal Resources)	**Complete by the end of 2024**
6.	Complete a whole-life cost analysis of ATS costing if door-to-door shared ride trips were to be delivered as an in-house service rather than by the Contractor	**AM,** ATS, Finance, Operations	**$15,000 of Staff Time** (Internal Resources)	**Complete by the end of 2024**
7.	Review staffing needs to cover sick time cancellations Reduce cancellations or Route delays	**Operations,** AM, Union Representation	**$5,000 Staff time** (Internal resources)	**Complete by mid-2024**
8.	Complete a whole life and risk analysis for the maintenance of bus shelters to understand the costs and implications of changes to the current ad/maintenance contract structure.	**Operations, AM**	**$3,500 of Staff time** (Internal resources)	**Complete by the end of 2025**

HAMILTON STREET RAILWAY (HSR) ASSET MANAGEMENT PLAN

#	TASK	RESPONSIBILITY	RESOURCES REQUIRED	TIMELINE
9.	Review Building condition assessments to identify necessary actions and determine their priority to be included in budgets.	**Operations, AM**	**$1,500 of Staff time** (Internal resources)	**Complete by the end of 2024**
10.	Develop Technical LOS metrics and associated budget for Acquisitions, Renewals and Disposals ensuring that the performance measurements are in line with customer values	**Operations, AM**	**$3,500 of Staff time** (Internal resources)	**Complete by the end of 2024**
11.	Expand the promotion of the Customer Satisfaction Survey and add outreach to target non-digital customers and in-person intercepts to increase survey participation.	**CXI, AM**	**$2,000/year of Staff time** (Internal resources)	**Commence in 2023**
12.	Improve customer levels of service by identifying costs, budget and program improvements	**CXI**	**TBD**	**TBD**
13.	Modify any 3-point condition scales currently being utilized to a 5-point scale	**Operations**	**TBD**	**TBD**
14.	Establish a metric for satisfaction levels for bus cleanliness to determine the resources required to achieve this goal from a staffing and financial perspective	**CXI**	**TBD**	**Commence in 2023**
15.	Investigate what the ideal target is for capacity on the bus and expand HSR's measurement of capacity with other assets and services	**CXI**	**TBD**	**Complete by the end of 2023**
16.	Identify additional demand drivers and develop a sustainable approach to meeting the demands	**HSR**	**$3,000 Internal staff time**	**Annually**
17.	Initiate the Risk Treatment Plan created in this AM Plan	**HSR**	**TBD**	**TBD**
18.	Develop additional risks and report to Management	**HSR**	**TBD**	**TBD**

#	TASK	RESPONSIBILITY	RESOURCES REQUIRED	TIMELINE
19.	Quantify the effects of the proposed demand management and risk adaptation plans to ensure associated levels of service and cost will be addressed in future iterations of the AM Plan	**HSR**	**TBD**	**TBD**
20.	Incorporate climate mitigation projects into future demand management plans	**HSR**	**TBD**	**TBD**
21.	Incorporate climate adaptation projects into future demand management plans	**HSR**	**TBD**	**TBD**
22.	Investigate climate effects on HSR assets and services	**HSR**	**TBD**	**TBD**
23.	Modify budget sheets to incorporate lifecycle stages	**HSR, Finance**	**TBD**	**TBD**
24.	Complete a 10-year capital forecast	**HSR, Finance**	**TBD**	**Complete by the end of 2024**
25.	Complete a review of estimated service lives for Assets	**HSR**	**TBD**	**TBD**

10.3 MONITORING AND REVIEW PROCEDURES

This AM Plan will be reviewed during the annual budget planning process and revised to show any material changes in service levels, risks, forecast costs and proposed budgets as a result of budget decisions.

The AM Plan will be reviewed and updated on a regular basis to ensure it represents the current service level, asset values, forecast operations, maintenance, renewals, acquisition and asset disposal costs and planned budgets. These forecast costs and proposed budget will be incorporated into the Long-Term Financial Plan once completed.

10.4 PERFORMANCE MEASURES

The effectiveness of this AM Plan can be measured in the following ways:

- The degree to which the required forecast costs identified in this AM Plan are incorporated into the long-term financial plan;
- The degree to which the one-to-ten-year detailed works programs, budgets, business plans and corporate structures consider the 'global' works program trends provided by the AM Plan;
- The degree to which the existing and projected service levels and service consequences, risks and residual risks are incorporated into the Strategic Planning documents and associated plans; and
- The Asset Renewal Funding Ratio achieving the Organizational target (this target is often 90 – 100%