

# Bangor Transit Study

## Task 8: Final Report

Prepared for Bangor Community Connector  
Prepared by Stantec





**Table of Contents**

<b>EXECUTIVE SUMMARY .....</b>	<b>6</b>
SUMMARY OF RECOMMENDATIONS .....	7
SERVICE IMPLICATIONS AND COST ESTIMATES .....	8
CAPITAL PLAN HIGHLIGHTS.....	9
NEXT STEPS.....	10
<b>1.0 INTRODUCTION.....</b>	<b>11</b>
<b>2.0 WHAT WE’VE SEEN AND HEARD .....</b>	<b>11</b>
<b>3.0 GAPS ANALYSIS .....</b>	<b>14</b>
3.1 SERVICE PLANNING AND OPERATIONS.....	14
3.2 TECHNOLOGY .....	15
3.3 FARES .....	16
3.4 PARTNERSHIPS .....	16
3.5 MARKETING.....	17
3.6 INFRASTRUCTURE .....	17
3.7 FLEET .....	18
<b>4.0 SERVICE PRINCIPLES AND OBJECTIVES .....</b>	<b>18</b>
<b>5.0 SHORT-TERM RECOMMENDATIONS (0-2 YEARS).....</b>	<b>21</b>
5.1 SERVICE PLANNING AND OPERATIONS.....	21
5.2 TECHNOLOGY .....	26
5.3 PARTNERSHIPS .....	27
5.4 MARKETING.....	27
5.5 INFRASTRUCTURE .....	28
5.6 FLEET .....	31
5.7 PERFORMANCE CRITERIA .....	31
<b>6.0 MID-TERM RECOMMENDATIONS (2-5 YEARS).....</b>	<b>32</b>
6.1 SERVICE PLANNING AND OPERATIONS.....	32
6.2 TECHNOLOGY .....	43
6.3 MARKETING.....	44
6.4 PERFORMANCE CRITERIA .....	45
<b>7.0 LONG-TERM RECOMMENDATIONS (5+ YEARS).....</b>	<b>45</b>
7.1 SERVICE PLANNING AND OPERATIONS.....	45
<b>8.0 SERVICE IMPLICATIONS AND COSTS.....</b>	<b>49</b>
<b>9.0 CAPITAL PLAN.....</b>	<b>50</b>
9.1 FLEET RENEWAL .....	50
9.2 TECHNOLOGY .....	51
9.3 INFRASTRUCTURE .....	55
9.4 MARKETING.....	59

9.5 POTENTIAL FUNDING OPPORTUNITIES .....60

**10.0 NEXT STEPS.....62**

## LIST OF FIGURES

Figure 1: Existing Community Connector Transit Service .....	13
Figure 2: Existing Community Connector Transit Service Frequency .....	20
Figure 3: GTrans (Gardena Transit) bus stop before (left) and after (right) rebranding.....	22
Figure 4: Proposed short-term Community Connector service .....	25
Figure 5: Example from Portland, ME, showing multiple route options with walk times and wait times .....	26
Figure 6: Waterloo Public Square and Bus Station .....	30
Figure 7: Proposed Community Connector Transit Service .....	34
Figure 8: Proposed Crosstown route concept .....	36
Figure 9: Proposed Capehart route concept .....	37
Figure 10: Proposed Center/Hammond route concept.....	38
Figure 11: Proposed Stillwater route concept .....	39
Figure 12: Proposed Mount Hope route concept.....	39
Figure 13: Proposed VOOT route concept.....	40
Figure 14: SFMTA interactive performance dashboard.....	45
Figure 15: Proposed Community Connector Transit Service Frequency .....	48
Figure 16: The recently completed Nashua Transit Center in Nashua, New Hampshire is an example of the desired facility .....	58

## LIST OF TABLES

Table 1: Existing route-level service details .....	12
Table 2: Stop spacing range and typical spacing.....	21
Table 3: Mid-term proposed route-level service details .....	42
Table 4: Long-term proposed route-level service details.....	47
Table 5: Estimated system costs.....	49
Table 6: Ten-year Fleet Renewal Schedule with 2018 and 2019 included for comparison purposes. ....	51
Table 7: Capital Plan Summary.....	61

## EXECUTIVE SUMMARY

The Community Connector is the public transportation provider of the Greater Bangor region. Public transit takes on a more important role in smaller regions, as young and old alike are dependent upon the service for their essential transportation needs. The Bangor Region is a close community where the word neighbor has real meaning. People depend upon the region's Community Connector bus service because it has become part of the community.

The Bangor Region has changed and continues to change. Employment has changed dramatically as the region has become a healthcare center from its roots in paper and manufacturing. Demographics have changed as well and while the average age is older than most similar regions in the nation; the Bangor Region has attracted newcomers because of the region's colleges and universities; its closeness to outdoor recreation and its relatively low cost of living.

The Community Connector needs to change to meet these changing employment, demographic and lifestyle needs of the community it serves. Ridership has stagnated over the past few years, as employment and lifestyles changed. Part of that change is adapting to how customers of the Community Connector live their lives. One important consideration is embracing technology, especially those technologies that would break down barriers to the use of public transit and help increase ridership. Another is adopting service design and delivery strategies that make Community Connector service more reliable in an age when every resident, regardless of their income, education or racial origin, values their time.

To reverse the trend of stagnating ridership, this strategic plan was developed through community collaboration, an analysis of existing service based on data available today, and by considering broader trends and best practices in mobility and public transit. An analysis of population density, jobs, key destinations, and existing route usage was used to determine where transit demand exists today and in the future. The route recommendations were developed to match transit service with demand as best possible and are expected to result in systemwide ridership increases. As data collection increases, Community Connector will continue to engage with the community to ensure future changes are driven by the region's voices.

This document summarizes the needs of the Community Connector and the Greater Bangor region, and then outlines phased recommendations, including a capital plan. The overall goal is to improve transportation options, entice new riders to try Community Connector, and improve the customer experience—fiscal prudence was a cornerstone of this planning process.

By the active participation of all segments of the community in the development of this Short-Range Transportation Plan (SRTP), the Greater Bangor Region has spoken with a strong voice that the community values the Community Connector and public transit. Residents of the region want service that operates to their schedules, meets their needs and they want it to be more dependable.

Stantec Consulting Services Inc. (Stantec) found during the development of the SRTP that there is active support for transit that can be harnessed to raise awareness of transit as a viable travel option; that will increase understanding of the essential role that transit can play to benefit the region's economy and contribute to its quality of life and to earn support for a sustainable level of funding from the entire region to deliver types and levels of high quality service that meet the essential travel needs of its residents.

## **SUMMARY OF RECOMMENDATIONS**

### **Short-term recommendations (within 2 years)**

- Implement fixed stops and eliminate flag-stop operation; deploy an appropriate level of amenities based on stop type
- Rename routes using a logical numbering or color scheme
- Pilot on-demand service on Route 10 (Hampden) that allows riders to book a trip in advance to destinations along the existing Hampden route to improve efficiency
- Introduce trip planning functionality to a refreshed website and through third party apps. Redevelop the Community Connector website for modern web browsing and improved functionality
- Implement scheduling software using software as a service
- Purchase an on-demand scheduling system to support the on-demand pilot on Route 10 (Hampden)
- Demonstrate advanced fare payment in the form of mobile payment
- Create partnerships with employers and employment centers in the Region to grow transit ridership by developing an employer transit benefit program
- Refresh the brand with a name replacement and new fleet livery design to coincide with the implementation of designated bus stops
- Redevelop Pickering Square Bus Terminal to serve as an important connection for the future proposed network, including offering community events such as pop-up markets, concerts, festivals, public art displays, and more
- Renew fleet according to a 12-year replacement schedule as per industry standard
- Develop performance criteria, data collection methods, and tracking tools
- Start collecting data needed for performance monitoring
- Begin exploring AVL/GPS technologies to prepare for implementation in the mid-term

**Mid-term recommendations (2 to 5 years)**

- Redesign transit network with consistent routes throughout the day
- Provide more direct service by reducing circuitous route segments that add to running time
- Transition pilot to a permanent on-demand service for Hampden following the short-term pilot
- Pilot late-night service
- Hire one additional FTE
- Introduce AVL/GPS to support real-time information and trip planning
- Introduce mobile fare payment
- Update to a more user-friendly website
- Acquire and disseminate real-time stop information
- Introduce asset management software
- Create a transit supportive tool kit for the development community
- Collect and disseminate transit system performance for increased transparency

**Long-term recommendations (beyond the next 5 years)**

- Extend service hours for key routes
- Increase frequency on productive routes

**SERVICE IMPLICATIONS AND COST ESTIMATES**

Based on the service concepts proposed in this plan, the following table highlights estimated operating and maintenance costs of a new network and service plan (for mid and long-term changes):



	Existing	Mid-term	Long-term
1. Crosstown	-	\$ 435,092.96	\$ 484,447.37
2. Capehart	\$ 537,292.06	\$ 428,462.57	\$ 471,755.91
3. Center St/Hammond	\$ 366,488.02	\$ 376,345.31	\$ 427,720.08
4. Stillwater	\$ 208,487.14	\$ 229,335.85	\$ 451,574.99
5. Mount Hope	\$ 208,487.14	\$ 208,487.14	\$ 208,487.14
6. Old Town (VOOT)	\$ 483,323.44	\$ 439,384.94	\$ 439,384.94
7. Black Bear	\$ 183,360.02	\$ 183,360.02	\$ 183,360.02
8. Brewer N	\$ 198,757.74	\$ 198,757.74	\$ 198,757.74
9. Brewer S	\$ 216,826.62	\$ 216,826.62	\$ 216,826.62
10. Hampden	\$ 190,490.69*	\$ 190,490.69*	\$ 190,490.69*
11. Mall Hopper	\$ 208,487.14	-	-
<b>Total</b>	<b>\$ 2,802,000.00</b>	<b>\$ 2,906,543.85</b>	<b>\$ 3,272,805.49</b>
<b>Difference from existing</b>	<b>-</b>	<b>\$ 104,543.85</b>	<b>\$ 470,805.49</b>

\*Cost may decrease depending on the results of the on-demand service. The existing service cost for Route 10 has been applied to be conservative.

### CAPITAL PLAN HIGHLIGHTS

The proposed 10-year Capital Plan provides Community Connector with a strategy that focuses on improving assets and infrastructure, and the investments required to support this plan. A summary of the investment plan is provided below. It calls for a total investment of \$12.6M over a 10-year span.

Project	Total Project Cost
<b>Fleet Renewal</b>	
New Revenue Vehicles	\$9,000,000
Major maintenance and overhaul	\$700,000
<b>Infrastructure Improvement</b>	
New Bus Stop Infrastructure	\$457,600
New Bus Stop Shelters	\$270,000
New Bus Stop Pads	\$112,500
New Bus Stop Benches	\$45,000
Pickering Square terminal redevelopment and customer service building	\$1,200,000
<b>Transit Technology</b>	
AVL System with Real Time Information	\$329,200
Scheduling Software as a Service	\$10,000
Mobile Fare Payment	\$125,000
Asset Management Software as a Service	\$30,000
On-demand Scheduling System	\$25,000

New website	\$45,000
<b>Comprehensive Branding Strategy</b>	
Rebranding Consulting Services	\$25,000
Bus wraps	\$120,000
Bus repaints	\$150,000
<b>Grand Total (over 10 years)</b>	<b>\$12,644,300</b>

## NEXT STEPS

This plan developed through collaboration with Community Connector staff, residents, customers, and stakeholders throughout the greater Bangor region has provided concrete steps forward for delivering more impactful and financially responsible public transportation.

It will be crucial for continued dialogue to propel the ideas and recommendations from this plan forward. **A champion is needed to promote the benefits of this plan, and partnerships with stakeholders will help this plan succeed.** The champion should be someone who is respected and well-known in the community, who also has time dedicated to advocating for improving quality of life. In other cities, champions have been business, civic, or religious leaders.

Early action items, such as numbering Community Connector's routes and the creation of fixed infrastructure for bus stops can develop momentum to implement more of this plan. With potential ridership growth, funding through competitive grants and other sources, service improvements, particularly evening service, can enhance mobility for the greater Bangor community.

## 1.0 INTRODUCTION

This final report has been devised as a cumulation of project tasks 5 to 8. Building off of the interim report, Stantec reviewed Community Connector’s existing services, operations, technology, fares, partnerships, marketing, and fleet, which informed the development of the system needs and opportunities. Based on the needs assessment, a summary of the key priorities for the City of Bangor, along with recommendations broken down into an implementation timeline of short-term (within the next 2 years), medium-term (2-5 years from now), and long-term (5 years or more into the future). To support the implementation plan, a capital plan has been devised to detail the critical investments related to the recommendations.

## 2.0 WHAT WE’VE SEEN AND HEARD

Stantec conducted a series of activities throughout the project to understand the strengths and weaknesses of the agency and its services. These activities included first-hand observations of the system, meetings with agency staff, an online survey for riders and non-riders, open houses with community members, analysis of ridership data, assessment of existing service, a peer agency comparison, and a review of planning and policy documents and data that is available today. Common themes arose from these activities, which are summarized below and described in greater detail in Task Reports 1 to 5.

First-hand observations and a comparison to peer agencies revealed that Community Connector lags behind other agencies in a few foundational components of transit service delivery. **Lack of fixed bus stops** is one area that Community Connector falls behind. Comparable peer agencies typically do not operate flag-stop service because it reduces efficiency, reliability, and legibility of the system. Community Connector could also improve its **use of technology** and **provide better information** to its riders by integrating trip planning with popular platforms such as Google Maps and mobile apps. To ensure agencies continue to deliver reliable services that meet the needs of residents and visitors, peers also **use data and service standards to track performance and make improvements**.

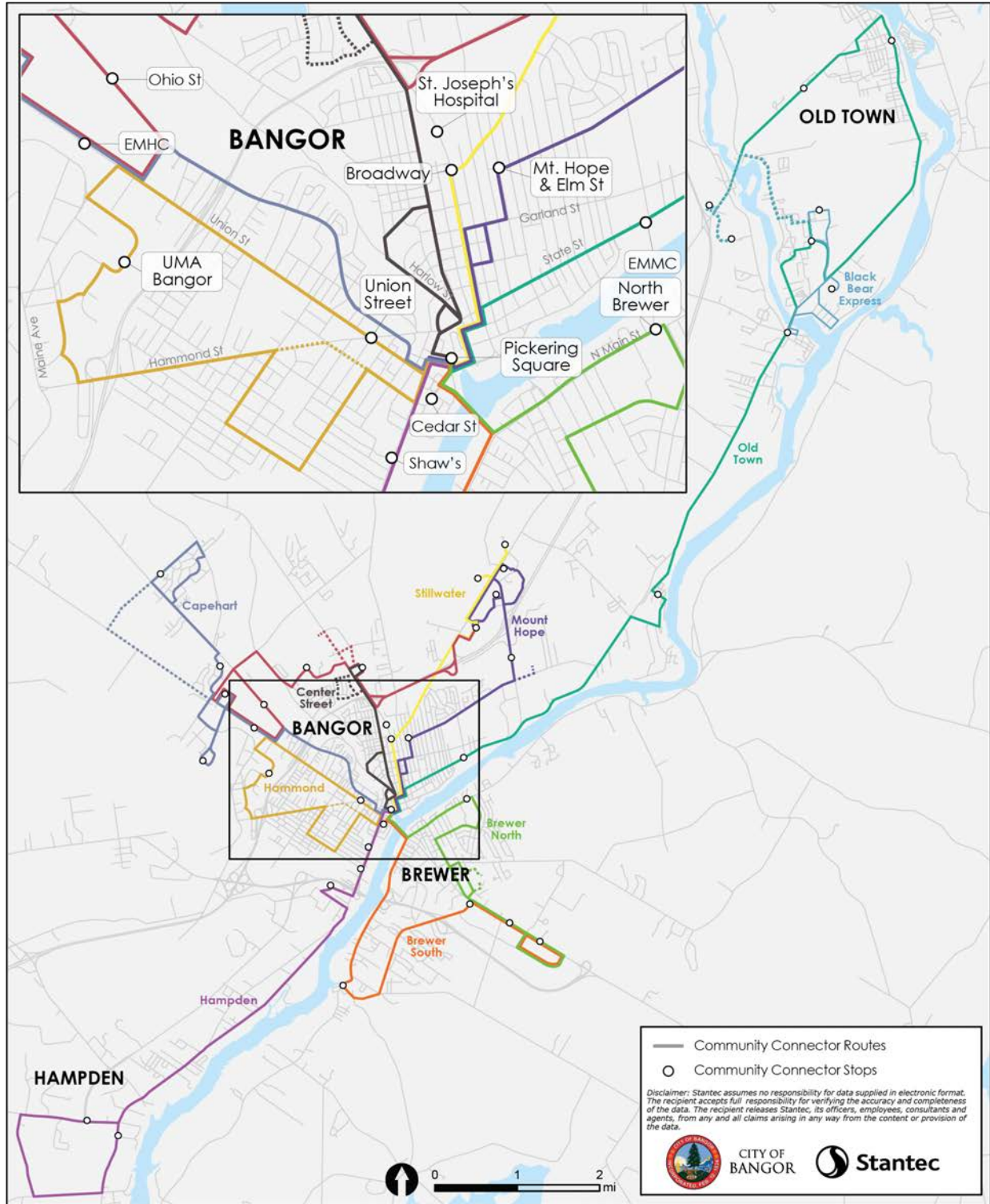
Through a series of engagement activities with the public, a common concern amongst riders and non-riders is the span of service. Non-riders from the University of Maine indicated that the main reasons for not taking transit are timing and availability of service, particularly during evenings and weekends. Local businesses also emphasized a **need for service later into the evening** to better serve employees and customers. Requests for later service have been expressed for years, including during public consultation activities held at Pickering Square in 2007 for the Short-Range Transit Route Redesign Study. Once again, this emerged as a consistent theme through the duration of the project, and 72% of survey participants even indicated that they would be willing to pay a higher fare if the service improved its frequency, reliability, and operating hours. The existing weekday and weekend service span and frequency is provided below in Table 1.

There are many positive attributes of Community Connector service, such as value for fare paid, safety on the bus, and provision of service between the City of Bangor and surrounding communities, but some **routes are complex** and **routes have multiple variations depending on the time of day that may be confusing to potential customers** (see existing transit service in Figure 1).

**Table 1: Existing route-level service details**

	Weekday Start Time	Weekday End Time	Service Headway (min)	Weekend Start time	Weekend End Times	Service Headway (min)
<b>Black Bear</b>	6:55 AM	9:55 PM	30	No service		
<b>Brewer N</b>	7:15 AM	6:00 PM	60	7:15 AM	6:00 PM	60
<b>Brewer S</b>	6:45 AM	6:30 PM	60	6:45 AM	6:30 PM	60
<b>Capehart</b>	6:06 AM	6:30 PM	30	7:06 AM	6:11 PM	30
<b>Center St.</b>	6:15 AM	6:08 PM	30	8:45 AM	6:08 PM	60
<b>Hammond</b>	5:53 AM	6:10 PM	30	9:15 AM	5:40 PM	60
<b>Hampden</b>	6:15 AM	6:10 PM	60	No service		
<b>Mall Hopper</b>	6:55 AM	6:45 PM	60	6:55 AM	6:45 PM	60
<b>Mount Hope</b>	6:15 AM	6:05 PM	60	6:15 AM	6:05 PM	60
<b>Old Town (VOOT)</b>	5:45 AM	7:00 PM	60	6:15 AM	7:05 PM	120-180
<b>Stillwater</b>	6:45 AM	6:35 PM	60	6:45 AM	6:35 PM	60

**City of Bangor - Community Connector**  
Existing Transit Service



**Figure 1: Existing Community Connector Transit Service**

### 3.0 GAPS ANALYSIS

Based on the analyses completed for the existing system, Stantec developed a list of gaps (or needs) of Community Connector regarding different components of the system. As detailed above, the interim report outlined findings from the stakeholder engagement and community outreach, as well as a thorough analysis of existing conditions, datasets, field visits, and discussions with Community Connector staff. The list below aims to capture the emergent themes or concepts that helped to inform recommendations of the Strategic Plan.

#### 3.1 SERVICE PLANNING AND OPERATIONS

Transit service standards are an industry-wide best practice—they tell the public and agency staff how goals and values are translated into service levels that the agency strives to maintain. Furthermore, standards provide systematic and objective ways of planning, monitoring, adjusting, and evaluating transit service provision. Service planning aims to ensure that transit service is attractive for the present, but also responsive to the future, and relies on community engagement, value-informed goals and objectives, and data-driven metrics.

Community Connector’s current service standards should be reviewed and monitored to ensure they continuously reflect current industry standards and community goals while also serving to identify triggers for changes in service. Without consistent application of guiding standards and commitments that are visible to the public, it is difficult to chart a clear direction in service design and provision.

Additionally, the use of alternative service delivery should be explored for low productivity routes. **Replacing conventional fixed-route service with an on-demand service in areas where demand is low offers a more cost-efficient option than operating 40-foot buses on a fixed schedule – these are costs that can be reallocated more effectively elsewhere in the system to maximize systemwide ridership.** With on-demand service it is easier to calibrate the service level to the demand, while also providing a higher level of service relative to low frequency routes.

Transit agencies are increasingly exploring on-demand or dynamic scheduling software solutions to unlock the opportunities of microtransit. Fixed-route services are costly and not advantageous in areas where land use is singular and/or residential densities are low - the ridership generated in those areas often do not warrant the fiscal investment. Gaining tremendous interest, on-demand solutions allow agencies to create “pop-up” routes in real-time based on demand for service.

The gaps related to service planning and operations have been identified below.

- Community Connector needs to provide a more fiscally sustainable alternative to low performing (passengers per revenue hour) routes.

- Community Connector needs to consider implementing alternative service delivery to communities like Hampden and the Veteran’s Home to deliver service more efficiently and adapt to ridership changes in the area.
- Community Connector needs to explore new strategies for attracting riders who live on the city’s outskirts or in neighbouring municipalities.
- Community Connector needs to develop internal safety practices and standard operating procedures to promote a culture of accountability internally and to the public.
- Community Connector needs to eliminate the flag-stop service and implement fixed stops to minimize barriers that are preventing riders from using and understanding the system, including individuals with disabilities and mobility challenges.
- Community Connector should develop a route numbering system or implement a color-based naming convention to improve wayfinding for existing and new riders.
- Community Connector needs to consider offering service later in the day to attract new riders and develop a strong customer base.
- Community Connector needs to redesign routes to eliminate duplication and reallocate resources to provide high frequency service along the most productive corridors.
- Community Connector needs to consider hiring more staff to maintain a good level of service, implement changes, and track performance.

### **3.2 TECHNOLOGY**

Technology is now playing a fundamental role in not only transit service planning and delivery, but in the provision of mobility services. Customers now expect seamless travel between modes using smartcards or open payments to pay for service, live arrival schedules, and up-to-date information at their fingertips. Staying relevant and attracting new ridership for transit agencies now hinges on exploiting technology for providing customer information, trip planning capabilities, as well as for internal operations. Moreover, technology can improve customer and operator safety. With more technology comes more data, and as such, the need for staff with the skills to translate data into information which inform decision-making.

Currently, Community Connector makes limited use of its technology. To improve functionality and user interface, Community Connector should explore applications that provide riders with access to real-time updates through a website or app. Additionally, applicable technologies can be used to collect information, particularly ridership at the route and trip level, on-time performance, loading profiles, travel times and so on that are necessary performance indicators to diagnose issues, develop corrective plans, and monitor progress.

Below are key needs that Stantec identified regarding technology.

- Community Connector requires more reliable, accurate and automated vehicle data to inform scheduling and improve operations.
- Community Connector needs to improve the dissemination of information to customers to improve trip planning and attract new riders including the potential provision of real-time information.
- Community Connector needs automated methods to capture passenger activity to make informed decisions regarding route alignments, service plans, and service allocation. In the absence of automated data collection technology, Community Connector should manually collect sample data.
- Community Connector needs to consider the pros and cons of implementing mobile fare payment options and eliminating cash payment.

### **3.3 FARES**

Farebox revenue should form a substantial portion of operating revenue for any transit agency. Currently, Community Connector recovers roughly 23%, which represents a 12% decrease in farebox revenue since 2013. While a fairly low number, it is generally inline with other agencies its size and with similar operating parameters across the country. Stantec observed that 72% of survey respondents would be willing to pay a higher fare if services were improved such as faster and more frequent service. If a fare increase is paired with an increase in service quality, it is expected that riders will be receptive to the changing fare. At the same time, we need to consider low-income populations and develop a low-income strategy to address their challenges paying higher fares.

Below, we identify areas for opportunity to expand the options to fit the right fare with the right rider.

- Community Connector needs to implement an employee pass and partner with employers across the city, including municipal and state governments, to provide an EcoPass as an alternative to free parking.
- Community Connector needs to consider increasing fares to assist in implementing a higher quality of service and increasing customer satisfaction.
- Community Connector needs to explore alternative fare structure strategies including the cost of monthly passes and a low-income fare strategy.

### **3.4 PARTNERSHIPS**

Transit service cannot exist in a vacuum; transit relies heavily on the community it serves and on collaboration with partners that remove snow from streets and sidewalks, partners that plan neighborhoods and that determine land uses and zoning, and partners that benefit from



customers delivered by transit vehicles. A great example of an existing partnership is with the University of Maine and other colleges, who work with the agency to develop and promote transit services that meet the needs of the community. Nevertheless, these partners are not always visible and many of the barriers, as well as opportunities to improve transit use depend on partnerships and collaboration to ensure that factors beyond the direct control of a transit agency work to favor transit use.

Below, we have identified potential partnership opportunities that can be explored.

- Community Connector needs to collaborate with other departments in the municipality to better utilize the public space and create a sense of place at Pickering Square. Partnerships with local community organizations can also help revitalize Pickering Square by helping to host events or pop-up displays.
- Community Connector needs to develop a working group of representatives with different departments to better integrate development, land use, transportation, and transit planning.
- Community Connector needs to explore partnerships with employers to promote transit to employees. Bangor has a significant amount of healthcare, education, government and utility employment. These are industries that are suited to the use of transit because they operate on fixed shifts or hours and they are organized to allow for the promotion of transit service at the work site.

### **3.5      MARKETING**

Stantec identified brand visibility and recognition as an opportunity area. Creating a strong brand helps generate buy-in from community members and public officials and can be a game-changer if done well. Many transit agencies go through rebranding exercises in effort to modernize their agency and develop a “transit is cool” culture.

- Community Connector’s route names may discourage use from neighboring service areas as the route names do not always reflect the areas it serves.
- Community Connector can be rebranded under a new name as the existing name can be misinterpreted as being exclusive to the surrounding service areas.
- Community Connector can promote their services by participating at arts and culture events in Bangor and the surrounding area.

### **3.6      INFRASTRUCTURE**

In relation to the identified need for a rebrand and implementing fixed stops to replace the flag-stop service, there is an opportunity to consider additional transit infrastructure including stop amenities.

- Community Connector needs to consider the implementation of physical bus infrastructure such as stop markers and bus shelters that can identify new designated stops and increase visibility of the service to non-riders. A bus stop guideline should be considered to direct the levels of infrastructure required throughout the bus stop network.

### **3.7 FLEET**

Devising a future transit strategy requires long-range fleet and lifecycle planning that considers the marketplace, governmental policy, future service development plans, legislation, and the attributes of the various types of propulsion products.

Community Connector's fleet was reviewed with consideration of propulsion sources, lifecycle, maintenance, vehicle size, and facility locations. Community Connector's conventional fleet consists of twenty-two 35' and 29' diesel buses with an average age of 11.14 years in 2018. The peak operating schedule requires 14 units, which means that Community Connector has a spare ratio of 36%. While the spare ratio is above the industry average of 20%, we have heard from staff that many of the buses are past their useful life threshold.

Community Connector's needs with respect to its fleet are outlined below.

- Community Connector needs to develop a fleet management plan.
- Community Connector needs to consider hiring a full-time technician for dedicated maintenance of the fleet. The cost implications of both can be weighed based on typical maintenance needs seen in recent years.
- Community Connector should consider the adoption of cleaner propulsion types. Transit agencies across the world are seeking ways to decarbonize their services through the proactive adoption of Zero Emission Buses (ZEB); to this extent, Community Connector should not be an exception. Battery Electric Buses (BEB) could lend themselves well to the Community Connector service area given the relatively short routes but further study is warranted.

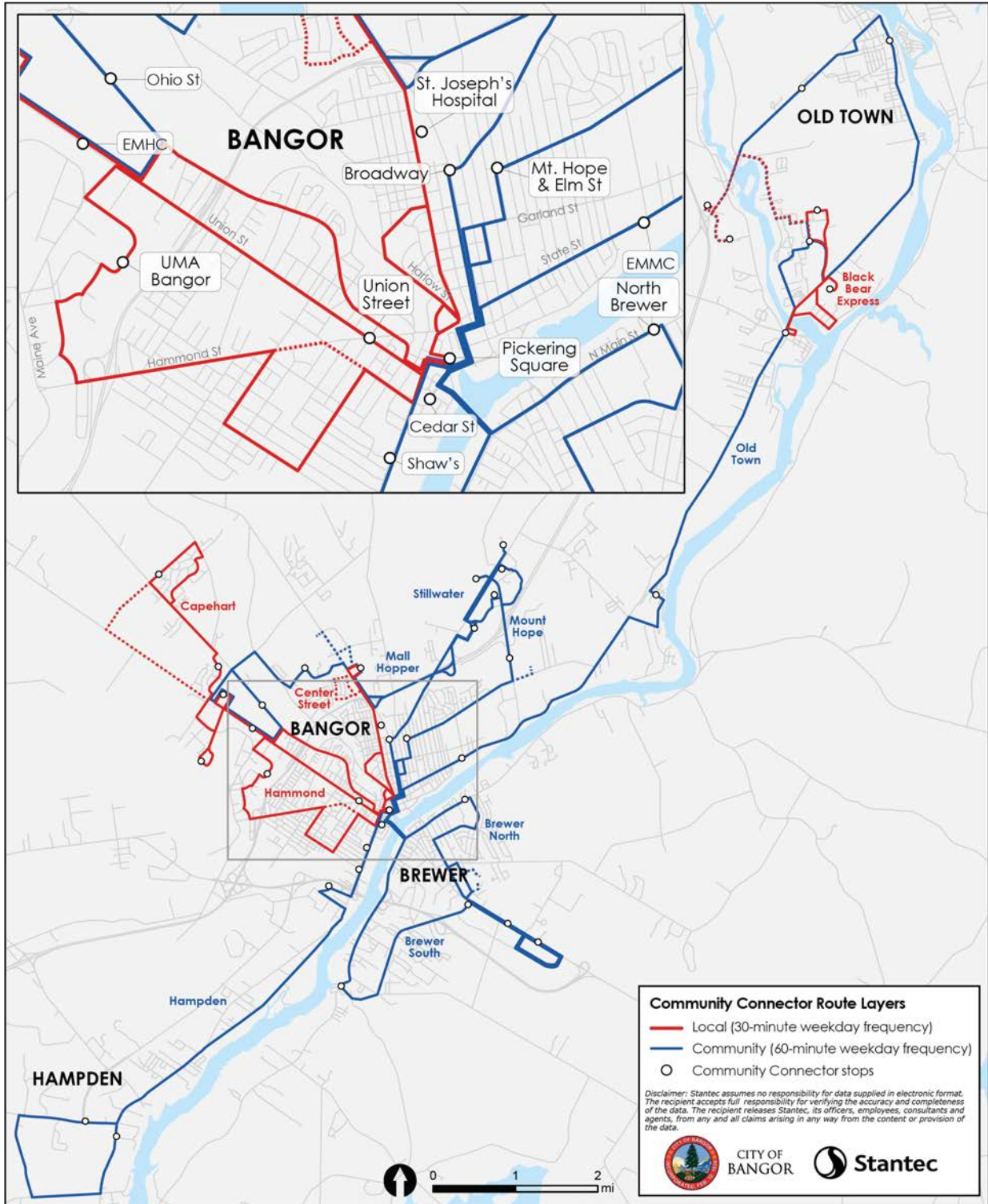
The gaps identified above along with previous analyses completed in the interim report have been used to develop service principles and objectives along with short, medium and long-term recommendations to achieve the goals of the system.

### **4.0 SERVICE PRINCIPLES AND OBJECTIVES**

This section describes some of the key decisions and influencing factors that enable the overarching goals of increasing ridership and improving financial sustainability. The principles described below are influenced by industry best practices, practices from neighboring transit operators, and from our findings through the analyses and stakeholder engagement activities.

- **Simplify routes and service delivery:** The system should be as simple as possible and easy to use for everyone. Community Connector should limit the number of route variants, one-way route segments and loops, as simple bi-directional routes are easier for riders to understand. Implementing fixed stops and renaming routes as numbers or colors can also increase the legibility of the network, while improving operations for Community Connector.
- **Right-size service levels to demand:** Community Connector should design transit service layers that meet diverse demands of the community. High-performing routes should be strengthened by increasing frequency to the extent demand supports it. For low-performing routes, such as Hampden, Community Connector could try something new that better matches demand on that route, such as an on-demand service. The existing service frequency across the network is shown in Figure 2. Routes with 30-minute service are Hammond, Capehart, and Center Street, while the rest of the system operates at 60-minute frequency. Increasing the frequency to 30 minutes on a 60-minute route with high ridership, such as Stillwater, would expand the 30-minute network and provide better connectivity between areas of high demand.
- **Maximize ridership:** Improve service to areas of high ridership and major trip generators. Strategies to maximize service can include providing service later into the evening on routes that are productive during the day to capture the evening market that is currently not served. Increasing frequency on the most productive routes can also maximize ridership by improving the convenience of transit in high-demand areas and attracting new riders with origins and destinations along these routes. Typically, when ridership increases on major routes or during new times of the day, ridership increases are observed on other routes and at other times of the day as well.
- **Increase accountability:** There are active communities in the Greater Bangor Area (GBA) who are interested in seeing the changes Community Connector is making to improve service. Increasing the transparency of decision-making to the public through collecting data and monitoring performance helps transit riders and taxpayers understand how the agency is using its resources. Developing a set of service standards and a method of collecting data will be the first steps to increasing accountability internally within the organization and externally to the public.

**City of Bangor - Community Connector**  
Existing Transit Service Layers



**Figure 2: Existing Community Connector Transit Service Frequency**

Based on these service principles and objectives, gaps identified and previous analyses a set of recommendations have been determined and outlined in the sections below.

## 5.0 SHORT-TERM RECOMMENDATIONS (0-2 YEARS)

To tie everything together, a list of recommendations is outlined below broken down into an implementation timeline of short-term (within the next 2 years), medium-term (2-5 years from now), and long-term (5 years or more into the future). The short-term recommendations include quick wins that will have major benefits for riders, along with pilot projects to test new service concepts. Mid and long-term recommendations build upon the quick wins by proposing more significant changes to route alignments, service hours, and operations.

The short-term recommendations are outlined below.

### 5.1 SERVICE PLANNING AND OPERATIONS

- Implement fixed stops and eliminate flag-stop operation:** The distance between stops has an impact on transit service operations – frequent stopping results in slower speeds and longer travel times, while infrequent stopping results in higher speeds and shorter travel times.

By operating a flag-stop system, Community Connector riders can request stops as close together or as far apart as is convenient for them. From a planning and operations perspective, flag stops are difficult to predict and can vary significantly by trip. While this scheme benefits the rider by reducing walking distances, the tradeoff is that buses likely make more stops than necessary and reduces the speed and efficiency of service, particularly during peak periods when passenger activity is high. It also makes it difficult for customers in mobility devices since there is no designated accessible infrastructure to deploy the bus ramp. As shown in Table 2, TCRP guidelines recommend stop spacing between 500 and 1,200 feet in urban areas and 600-2,500 feet in suburban areas.<sup>1</sup>

**Table 2: Stop spacing range and typical spacing<sup>2</sup>**

Environment	Spacing Range (ft)	Typical Spacing (ft)
Central Core Areas of CBDs	300-1,000	600
Urban Areas	500-1,200	750
Suburban Areas	600-2,500	1,000
Rural Areas	650-2,640	1,250

The stop spacing range should be used as a guide for determining stop location, but other factors to consider are the locations of major trip generators, traffic operations, intersection geometry, pedestrian access and safety, transfer opportunities between routes, parking restrictions and stop accessibility. Where possible, each stop should

<sup>1</sup> [https://nacto.org/docs/usdg/tcrp\\_report\\_19.pdf](https://nacto.org/docs/usdg/tcrp_report_19.pdf)

<sup>2</sup> Ibid.

have a pair that operates in the opposite direction for ease of communication and rider convenience. It is also recommended that Community Connector stops are placed at the far-side of intersections, when possible, to improve efficiency. Research has shown an average of 5 seconds of stop time saving at far-side stops compared to near-side stops, which can have major running time savings when deployed across many stops and routes in a network.

In the short term, Community Connector should mount temporary bus stop markers along existing routes to begin developing a fixed-stop transit network. Bus stop locations are likely to evolve as riders request new stops, routes change, and ridership data is collected. Permanent stops can be installed once stop demand is known and ridership has been established. Signage should be eye-catching and consistent to strengthen the agency's brand and promote the service on-street; essentially bus stops should act as advertising for the agency. Community Connector should limit the amount of information posted on stop markers to allow flexibility in the interim stage. Removable stickers indicating route number and direction can be applied and changed as needed and as the mid and long-term route changes take shape. Stantec recommended similar improvements in Gardena, California as seen below.



**Figure 3: GTrans (Gardena Transit) bus stop before (left) and after (right) rebranding**

*Source: Gardena Transit, 2018*

- **Rename routes using logical numbering scheme:** Location and alignment of routes should be used to assign route numbers, which will increase the convenience and ease of understanding for riders. Route numbering should consider future changes to ensure numbers make logical sense once major route changes have been implemented. An example of potential route numbers is shown below in Figure 4. With the elimination of the Mall Hopper in the mid-term, Route 11 can easily be removed without affecting the network's numbering scheme.

Any route variations should be clearly delineated by separate branch letters on schedules and destination signs, for example:

- 6A VOOT to University Mall
- 6B VOOT to Orono Research Park
- **Pilot on-demand service on Route 10 (Hampden).** This route does not experience ridership levels that warrant keeping the route in its current form. In effort to increase its productivity the fixed-route service on Route 10 should be replaced with on-demand service. By providing on-demand service, an agency can better serve communities by matching service levels to demand and offering service to new destinations that do not have enough demand to support traditional fixed-route transit. Agencies are able to keep costs lower by offering service only when and where people need it. For example, if someone needs to travel between Pickering Square and Shaw’s, and nobody is requesting a trip to or from Hampden, the transit vehicle only needs to operate between those two destinations, instead of making a longer and more expensive trip to Hampden. Leveraging app-based technology, real-time ride-matching and optimizing software, and innovative service delivery models, organizations are experimenting with providing demand responsive service to improve various performance metrics like trip time, on-time performance, cost, service area and service hours.

The intent of the pilot will be to understand the best ways to operationalize the service. This will include acquiring and testing an on-demand trip-planning software to ensure interoperability and ease of use with the existing vehicle fleet. Additionally, **the pilot will serve as an opportunity to introduce and familiarize riders with on-demand service. Using the insights gained from the pilot, the on-demand service can be tweaked and implemented permanently in the mid-term**, as detailed further below. Not only will this be useful for implementing a permanent solution for Hampden but the lessons learned can benefit the possible development of late night or on-demand service alternatives in other parts of the Bangor Region. Many software packages require only a tablet onboard the vehicle and a cellular connection.

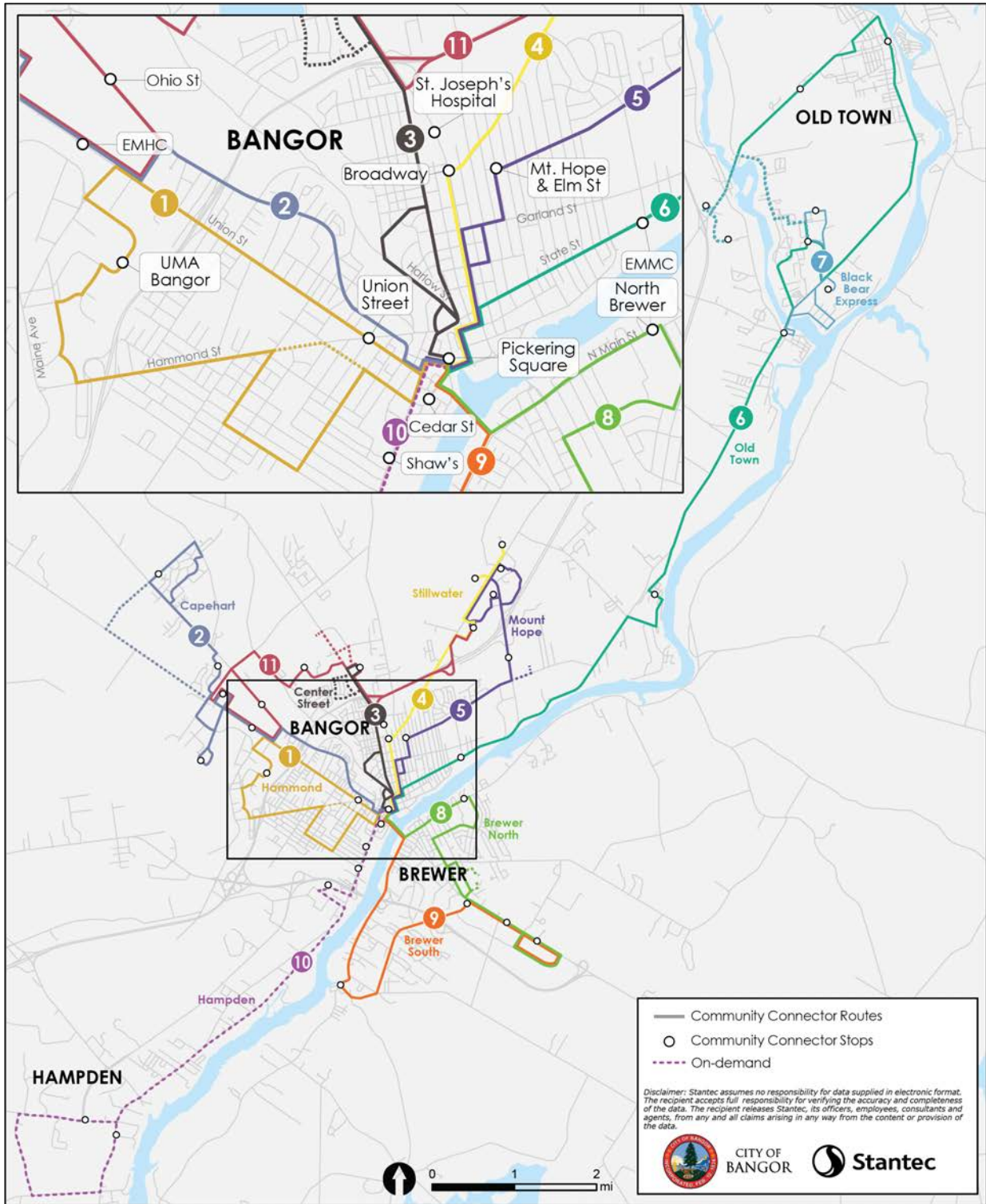
The proposed pilot can take several forms with the most forward-thinking approach involving collaboration with an app provider that offers a dynamic on-demand trip booking and scheduling system to be used in existing or new vehicles. This system would direct drivers to complete trips within a defined service area based on rider demand. Riders would book trips at least 60 minutes in advance, but preferably on a recurring basis such as weekly or daily trips. Advanced and recurring trip booking allows Community Connector to allocate the correct amount of resources for delivering the service and facilitate scheduling.

If the pilot is successful, larger partnerships can be explored to obtain an on-demand scheduling software. Additionally, a partnership with a transportation network company (TNC, like Uber or Lyft) can be considered to conduct trips within a designated service area that does not operate fixed-route service, such as along Odlin Road, and bring people to a destined point in the network to connect with other fixed routes.

Figure 4 illustrates the proposed short-term Community Connector network, including the proposed numbering.



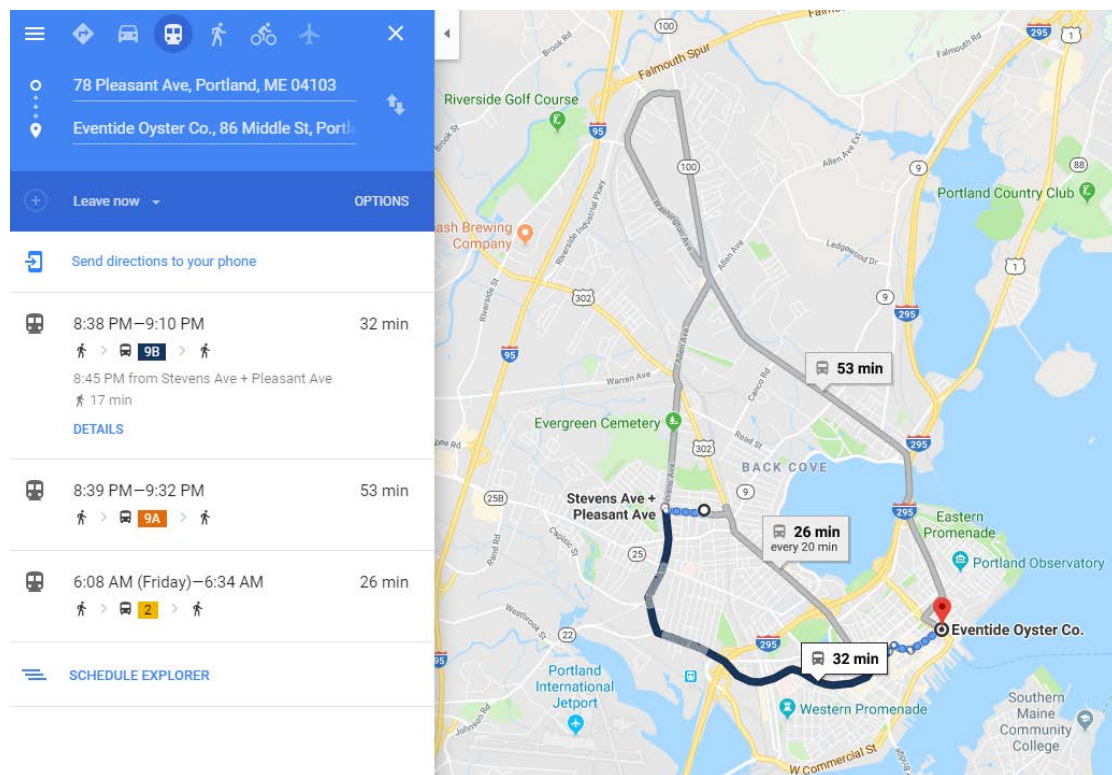
**City of Bangor - Community Connector**  
Proposed Short-Term Transit Service



**Figure 4: Proposed short-term Community Connector service**

## 5.2 TECHNOLOGY

- Introduce trip planning functionality to a refreshed website and through third party apps:** A major way customers and potential customers access trip planning information is via Google Maps, as well as apps like Transit, Moovit and, Citymapper. To facilitate bus travel and comprehensive trip planning, Community Connector should make GTFS data available to third parties so that this information will be integrated into Google Maps (see Figure 5 for example).



**Figure 5: Example from Portland, ME, showing multiple route options with walk times and wait times**

*Source: Google Maps*

- Introduce scheduling software:** This will enable the agency to prepare the schedules for all types of services that **optimize the number of vehicle trips to demand while minimizing non-revenue miles and hours of service**. Scheduling software variables include service requests, fleet size and availability and the requirements of labor (collective bargaining) agreements. The software that will be used to schedule the City of Bangor’s transit services will provide the City with runcutting and blocking tools to better utilize its part-time staff of bus operators.
- Purchase an on-demand scheduling system through software as a service** to support the on-demand service proposed on the Hampden route. Suitable software or app

providers should be explored during the pilot to determine needs and specifications required for permanent implementation in the mid-term.

### 5.3 PARTNERSHIPS

- To continue to grow transit ridership in the Greater Bangor Region strategic partnerships should be pursued. **Community Connector should work closely with the Bangor Region Chamber of Commerce to ensure that the route structure and service scheduling is supportive of employment activities.** As identified in the short-term marketing recommendations of this report, establishing a Transit Benefit Program would enable employers and employees to take advantage of the significant tax benefits available by purchasing bus passes at the place of employment. This would be an employment-related transit service program that guarantees that transit service is supportive of the local economy. Community Connector is currently working with the online retailer, Wayfair, to bring transportation to Wayfair's Bangor Customer Service Center. This program should serve as a model for how the public and private sectors can work together to achieve mutual beneficial goals. Wayfair, already a transit-supportive employer at its other locations, has approached the Community Connector to extend its services to meet the needs of Wayfair's Customer Service Center. Wayfair can help guarantee the Community Connector ridership by providing its employees with passes to utilize transit. Community Connector can reciprocate by meeting the shift times of the Wayfair Center.
- **Community Connector can work with employment programs to ensure service is provided to these centers and highlight the convenience and feasibility of transit in the Bangor Region.** Currently the Region has a low unemployment rate of 3.1% according to the Bureau of Labor Statistics (May 2019 Report) however that low rate does not stop the need for job training and job placement. Penobscot Job Corps has approached the Community Connector seeking to bring service closer to the Corps' Training Center on Union Street. The Community Connector has made route changes to serve the Training Center and to schedule service to meet the needs of those receiving training. While service changes to Job Corps are proposed in the mid-term recommendations, connectivity will be maintained to promote transit usage to the center. Similarly, the Community Connector should work with the State of Maine's Career Center, United Technologies Regional Learning Center and the Bangor Region Leadership Institute to guarantee that trainees come to understand the convenience of transit, so that when these trainees secure full time employment they continue to 'choose transit'.

### 5.4 MARKETING

- **Refresh the brand with a name replacement:** Stantec is recommending that the Community Connector name be replaced with a name that reflects the service area and the service. The brand should speak to service coverage as a collaboration between Bangor, Brewer, Hampden, Old Town, Orono and Veazie. The official name should be

used on these branding elements: Bus and Non-Revenue Vehicle Paint Schemes, Bus Stop Signs, Printed/Collateral Materials, Bus Driver Uniforms, Digital/Online Media and Advertising. To keep the cost of the brand refresh to a minimum, the recommendation is that the name be affixed to the existing fleet and new additions to the fleet using decals. Buses and non-revenue vehicles would be painted a solid commercial color using PPG Delfleet Paint or equivalent. We also recommend every bus is clear coated to retain the luster of the paint. The change of the brand should be accomplished pragmatically to minimize cost. New buses should be painted at the factory according to the paint specifications provided by the agency. Bus stop signs would be produced using the standard 9" x 12" aluminum or fiberglass reflective sign that would carry the route number, agency logo and the bus stop number that would connect riders to next bus information via the trip planning functionality on the Community Connector website.

- **Redevelop the Community Connector website for modern web browsing and improved functionality:** to supplement the introduction of a new transit brand, an overhaul to the existing website is recommended to provide clearer and visually appealing information. The landing pages should be more reflective of a separate transit operation in its appearance. A more memorable URL should be established by purchasing a separate domain name. That name should be established for transit alone and the site should be responsive meaning that the information should be adaptive to the device that the viewer is using whether it be a smartphone, iPad or desktop. This will optimize the experience for the viewer as the information will load without distortions.
- **Develop an Employer Transit Benefit Program:** This is a self-administered program that allows employees to pay their transit fares using pre-tax dollars. The Internal Revenue Service's Section 132 F of the Tax Code allows employees to use tax free dollars up to \$265 per month per employee to pay for transit passes and tickets. It is recommended that Bangor launch an Employer Transit Benefit Program in collaboration with the Greater Bangor Chamber of Commerce. Additionally, Bangor should seek out the services of the Service Core of Retired Executives or SCORE to help get the Employer Transit Benefit Program launched. To begin, a Home to Work survey should be conducted to understand commuting patterns in the workplace. The program can then be structured based on the types of fare payments and revenue collection systems chosen by Bangor including annual, monthly and seasonal passes. Additional resources may include employee transportation coordinators to disseminate information within workplaces, emergency ride home programs, new employee trip kits, and promotional materials.

## 5.5 INFRASTRUCTURE

- **Provide an appropriate level of amenities based on stop type, using the following guideline:**

- **A typical bus stop:** consist of a bus stop sign affixed to an existing telephone or utility pole. When necessary the City of Bangor should install a breakaway pole with sign. Poles should be placed two and one-half feet from the curb. Bus stop signs must be displayed at all bus stops with the designation of the routes that service that stop. The sign should display the route number(s), bus stop ID for real time information, the customer service line and the website.
- **Bus stops with 50 or more daily boardings:** should have a bench or shelter with a bench. This level of amenity would be concurrent with the establishment of a bus shelter and bus bench advertising agreement to defray the capital cost of the shelters and benches as well as the ongoing maintenance cost.

Consideration should be given to purchasing bus shelter and benches only if Bangor is unsuccessful in negotiating a bus shelter and bench program supported by advertising. Should the purchase of the shelters and benches be direct then an Adopt A Stop Program can be developed that recruits residents, developers and property owners to help maintain the shelters and benches.

- **Redevelop Pickering Square Bus Terminal to serve as an important connection for the future proposed network.** The gaps analysis revealed a need to better utilize public space and create a sense of place at Pickering Square. Pickering Square remains the most optimal spot for all routes to converge in the service area but is underutilized and underwhelming in its current form. While Pickering Square has benches and street trees in effort to make it a comfortable waiting area, a redesign of this space could make it a destination in its own right. Hosting events, such as the “Sounds of Summer” concert series, is a great idea for making an attractive space and should be expanded and promoted to encourage social gathering. In Waterloo, Canada, a bus station is located at Waterloo Public Square, which is a similar size to Pickering Square. Waterloo Public Square hosts hundreds of events including concerts, pop-up markets, festivals, public art displays, ice skating (during winter months), yoga classes, and more. The bus station allows for people to attend these events without worrying about finding parking or finding a ride from a family member or friend and creates a much more vibrant and attractive space. Similar strategies could be deployed at Pickering Square to promote local artists, cultural groups and community organizations and create a sense of place at Pickering Square.



**Figure 6: Waterloo Public Square and Bus Station<sup>3</sup>**

A redevelopment of the Pickering Square area will enhance the customer experience and support local and regional bus transfers. The terminal encourages transit usage and provides an opportunity to create a transit-oriented community in downtown Bangor. Transit systems leveraging a pulse-style schedule benefit from reliable, comfortable connections between routes at the common hub. For Community Connector, that hub is presently the Pickering Square area. Next to waiting time, transfers are one of the largest disincentives to using transit for potential passengers, so great care is taken to ensuring that these connections are as seamless and reliable as possible. The proposed hub in Pickering Square should provide enough platform capacity to handle all the proposed routes accessing the terminal simultaneously, in addition to regional bus services and supporting amenities. This should be started in the short-term to accommodate the medium and long-term service changes. Community Connector

<sup>3</sup> Image sources: Top left - Masri O Architects ([mastrioarchitects.ca](http://mastrioarchitects.ca)); top right - GPS Group ([gpsgroup.ca](http://gpsgroup.ca)); bottom left - Waterloo Public Square ([google photo](https://www.google.com/photos/107711111111111111111)), bottom right - Explore Waterloo Region ([explorewaterlooregion.com](http://explorewaterlooregion.com))

should work with other municipal departments to coordinate efforts to redesign the square.

## 5.6 FLEET

- **Renew fleet to moving towards a 12-year replacement schedule as per industry standard.** The Capital Plan in Section 9.0 details a 10-year fleet replacement schedule which will introduce a new fleet of forty-foot transit vehicles. This will require continual investment in the short, medium and long term, with the purchasing and maintenance of vehicles as outlined in the fleet plan.

## 5.7 PERFORMANCE CRITERIA

- **Develop performance criteria, data collection methods, and tracking tools:** Community Connector already captures a certain amount of data aggregated at the route level at different time periods. The ride checks, combined with existing data collection methods, should aim to record the following performance measures:
  - **Boardings per revenue hour and mile:** This measure is an industry best-practice indicator of performance and can reveal the effectiveness of the route to carry passengers. Not all routes, however, are expected to have high boardings per revenue hour. Some routes are designed to carry many passengers per revenue hour, and these routes tend to be frequency or ridership focused, while other routes may tolerate low passengers per revenue hour because these routes are coverage focused or service areas that may not lead to high ridership, but that house riders who are transit dependent.
  - **Boardings per trip:** Boardings at the trip level illustrate the transit demand by time of day, revealing most and least productive trips. This measure can be used to determine if new trips should be added or if certain trips can be cut. For example, if the last trip of the day has a high number of boardings (ridership is not decreasing), it may indicate a need for an additional evening trip. Similarly, if the first or last trip of the day sees almost no ridership, these trips may need to be removed and resources redeployed to routes with higher demand.
  - **Maximum and average load per trip:** This measure reflects fluctuation in patronage throughout the day and provides an indication of how full or empty vehicles are. Low average and maximum loads may indicate that there is not enough demand to support current service levels or that a smaller vehicle could be used to deliver the service.

- **On-time performance (OTP) by route/trip:** Measures the percentage of stops along a route that depart on-time (i.e. 0 to 3 minutes or 0 to 5 minutes of scheduled departure). Reliability is an important contributor to customer satisfaction and ridership loyalty. Particularly on lower frequency routes, if patrons consistently miss buses due to early departures, or are delayed because of late buses, customers will leave the system.
- **Average travel time by trip:** One factor tied to on-time performance is the actual travel time of a route. Typically, transit agencies create schedules and leave them as is, even though travel patterns may change. Actual travel time can be used to calculate travel time deviation per trip to determine the difference between scheduled and actual running time and provide recommendations to improve the accuracy of schedules. Comparing actual departure time to scheduled departure time at timepoints can identify which route segments have slower or faster travel times than scheduled.
- **Farebox recovery by route:** Measures the percentage of operating costs borne by revenue generated only through fares.
- **Cost per boarding by route:** A measure of how expensive a service is to operate relative to the number of riders using the system.
- **Start collecting data needed for performance monitoring:** In the absence of technology like AVL-APC, a simple yet labor-intensive way to collect stop and trip-level data is through ride checks, whereby surveyors will ride buses, capture boardings and alightings, stop times and schedule adherence, and note other operational issues. These ride checks should be of a sample of trips across all routes and dayparts. Ride checks are very useful for understanding busy areas and times of day, and potentially, where to site bus stops. Furthermore, they help provide some rational and defensible mechanisms for changing service beyond individual service requests or complaints.

## 6.0 MID-TERM RECOMMENDATIONS (2-5 YEARS)

### 6.1 SERVICE PLANNING AND OPERATIONS

- **Redesign transit network with consistent route alignments throughout the day:** Route variations or changes in pattern make it less convenient for riders to use the service and confuse potential riders who may want to try taking transit. Clear schedules and routes that operate along the same alignment throughout the day can improve the legibility of the network. The route recommendations given below are based on analysis of existing data but can be further refined as more data becomes available. These route changes



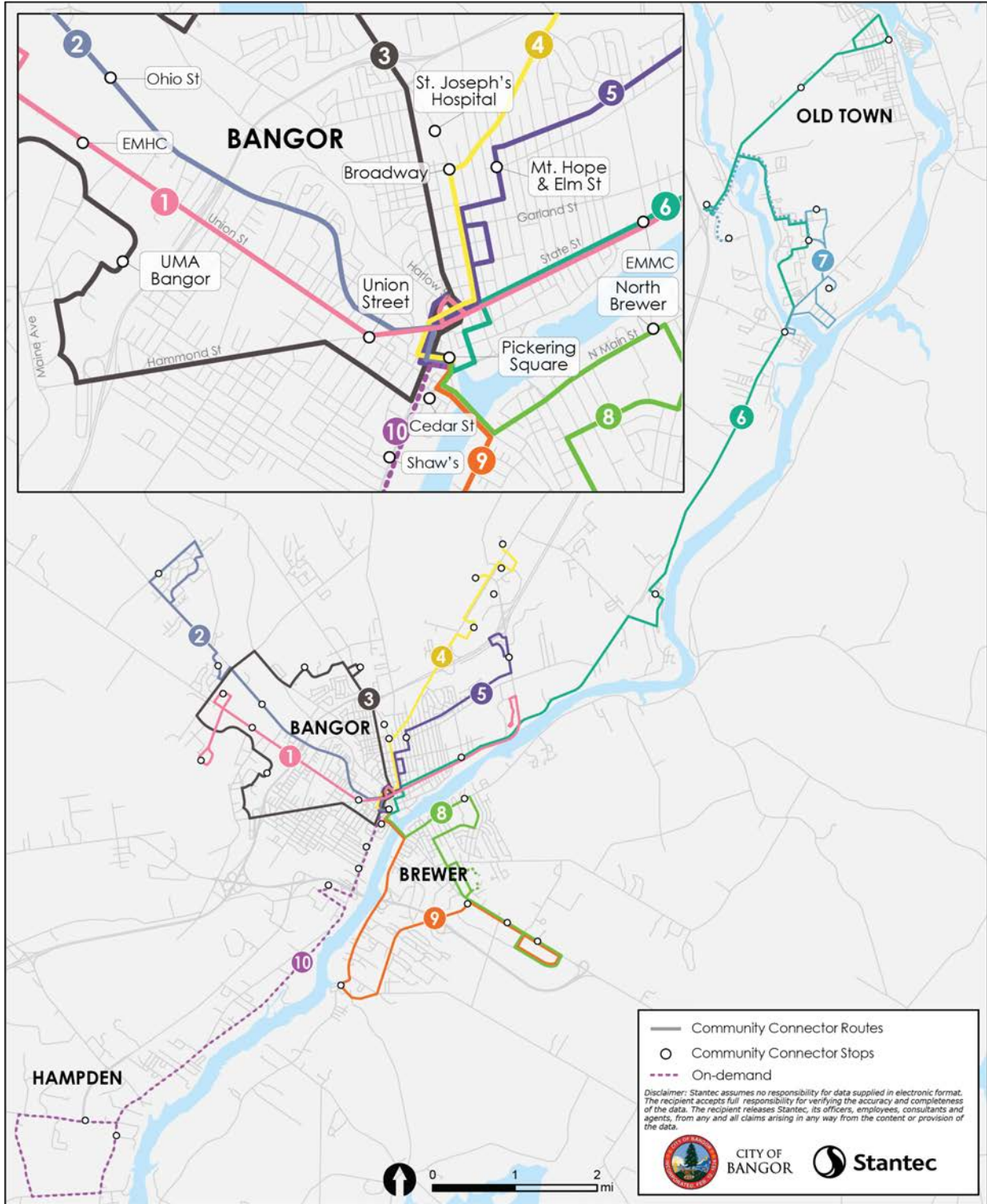
represent intermediate recommendations and may evolve as short-term recommendations are implemented.

Community Connector can use Remix software, which is already in use, to route plan and develop high-level cost estimates of transit operations. Furthermore, Remix enables rough scheduling and an understanding of resources need for service plan changes.

- **Provide more direct service by reducing circuitous route segments that add to running time:** Complex routing can not only act as a barrier to potential users because of confusing patterns and one-way loops, but also increasing running time and therefore reduces efficiency. Simple and direct routes require riders to walk longer distances to get to their destinations but allow the agency to provide better service by using those resources to increase frequency or serve new destinations.
- **Transition to a permanent on-demand service for Hampden (Route 10).** Following the results of the short-term on-demand pilot, the service can be tweaked and improved as necessary to create a permanent on-demand service. Further investigation can be done to determine other service areas that could be well served by on-demand service, potentially parts of the Veazie/Orono/Old Town (VOOT) route. The necessary software to support this service will be required which should be acquired through a software-as-a-service model. The on-demand pilot in the short term should provide insights on suitable technology and a program approach for Community Connector.

Figure 7 illustrates the proposed Community Connector network. Based on an analysis of data available today and existing travel patterns, this network is expected to bring increased ridership by providing frequent service to the places with the highest demand.

**City of Bangor - Community Connector**  
Proposed Transit Service

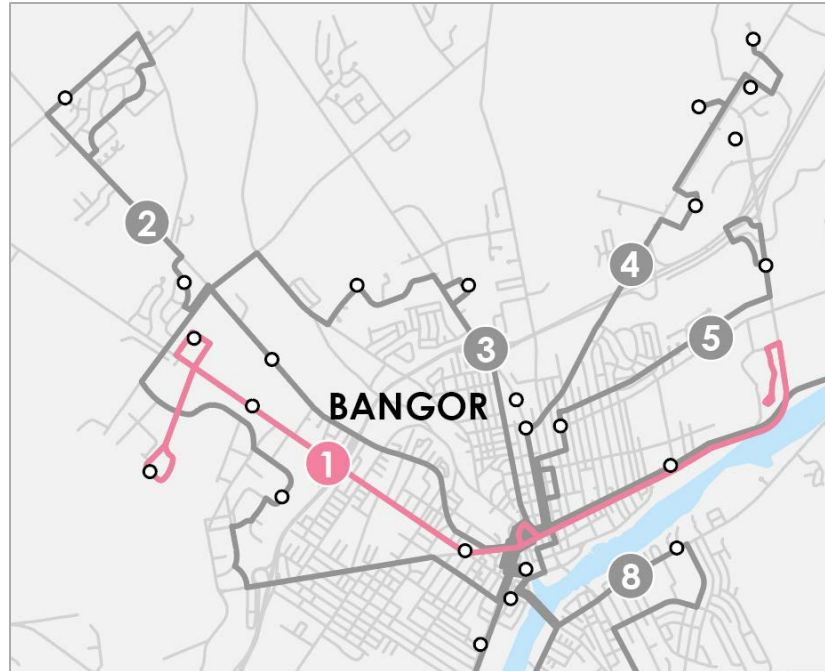


**Figure 7: Proposed Community Connector Transit Service**

- Below are the route-level recommendations for simplifying and improving the network. Route alignment changes build upon the actions that Community Connector has already carried out to eliminate confusing route configurations.

### Route 1: Crosstown

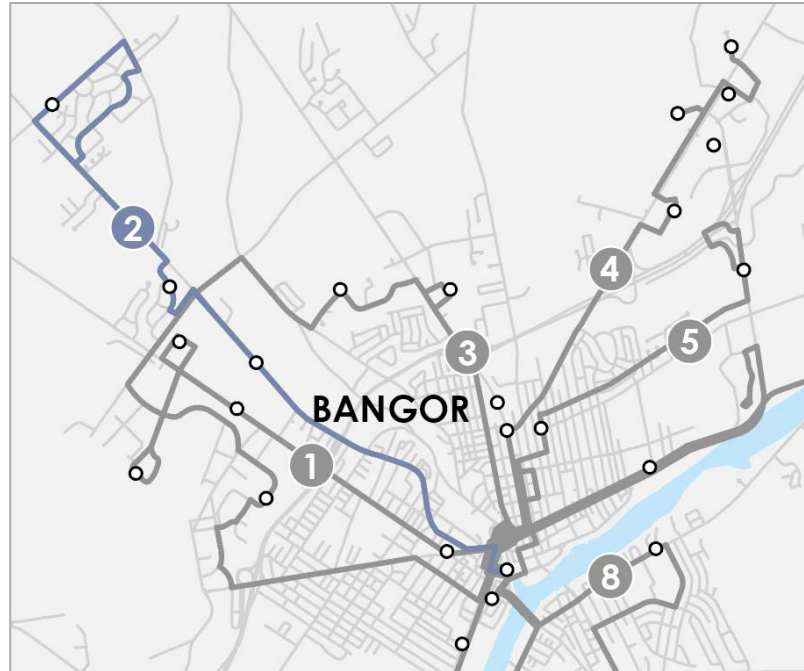
- We propose eliminating the poorly used Mall Hopper and designing a Crosstown route that **operates in an east-west orientation** as much as possible given the challenging geometry of the road network and Bangor's development. The malls served by the Mall Hopper route will be served by other routes – Bangor Mall will be served by Stillwater, Broadway Shopping Center will be served by Center/Hammond, and the Airport Mall will be served by Crosstown.
- This Crosstown route would operate between the Bangor Airport, service the Airport Mall, serve Union St, and operate along State St to the Veteran's Hospital, pending permission and operational checks. This route would not pass through Pickering Square, but is a short walk from the Square and has the possibility to connect to other routes. Transfers occurring along Hammond St and State St to routes like Stillwater, Mount Hope, Center/Hammond, and Capehart reduces the need for all transfers to occur at Pickering Square, which will reduce the amount of time needed for buses to wait in the Square.
- This route will serve as the backbone of the network, and as such, service would be provided every 30 minutes on weekdays and 60 minutes on Saturday. On weekdays, thirty-minute service on the Crosstown paired with 60-minute service on the VOOT route will result in 20-minute service along State Street, which is one of the most popular corridors in the system.
- Service will operate from 7am to 6:45pm to provide access to early appointments and employment opportunities at medical facilities on Union St (EMHC) and State St (EMMC). The intention is that service on this route be extended until 8 pm on weekdays once funding is available (long-term).
- Service to Job Corps is eliminated but can be reached by a ~10-minute walk. The placement of Job Corps does not lend itself to transit service because of the poor land use along Union St north of Griffin Rd.



**Figure 8: Proposed Crosstown route concept**

### Route 2: Capehart

- Capehart carries substantial ridership, but in terms of productivity or riders per revenue hour, it performs in the bottom third of routes. This may be attributed, in part, to the multiple variants and changes in routing throughout the day.
- We recommend developing a **consistent route alignment that operates every 30 minutes**. This route would provide service from Pickering Square along Ohio St, Griffin Rd, through Bolling Dr, and provide service in North Bangor/Capehart. Since this alignment removes the existing Capehart Route from Union St, this change should be implemented in tandem with the introduction of the Crosstown route (Route 1) on Union St to ensure access to important destinations like the EMHC is not affected. It should also be noted that these important destinations, like the Airport Mall, are located within a quarter mile of the Capehart route and therefore remains within an acceptable walking distance. If riders' origins are along the Capehart or Center/Hammond routes, they can access the Airport Mall within a quarter-mile walking distance.



**Figure 9: Proposed Capehart route concept**

*Route 3: Center/Hammond Loop*

- Given the difficult-to-serve layout and spread-out nature of destinations in Bangor, we propose a large loop circulator that combines elements of the Hammond loop, Center St route, and the eliminated Mall Hopper to provide bi-directional service between key destinations. The service will operate at least every 60 minutes in each direction on weekdays and Saturdays. Unlike existing one-way loops, this route would operate clockwise and counterclockwise and serve Pickering Square, Hammond St, UMA Bangor, Griffin Rd, Husson University, Broadway Shopping Center, Broadway, back to Pickering Square.
- Overall, this makes an increase in the level of service, by providing bi-directional service connecting numerous key origins and destinations. This route increases the number of travel options available to riders by providing access to both Pickering Square for transfers to other routes as well as serving the northern areas of Bangor. For example, students of UMA Bangor can easily travel to/from Pickering Square along the existing Hammond alignment, or travel to/from destinations in the north or east of Bangor such as Broadway Shopping Center, or can walk a short distance to Union St to take the new Crosstown route, where they have additional transfer opportunities and access to destinations along State St that would have previously required a transfer in Pickering Square.

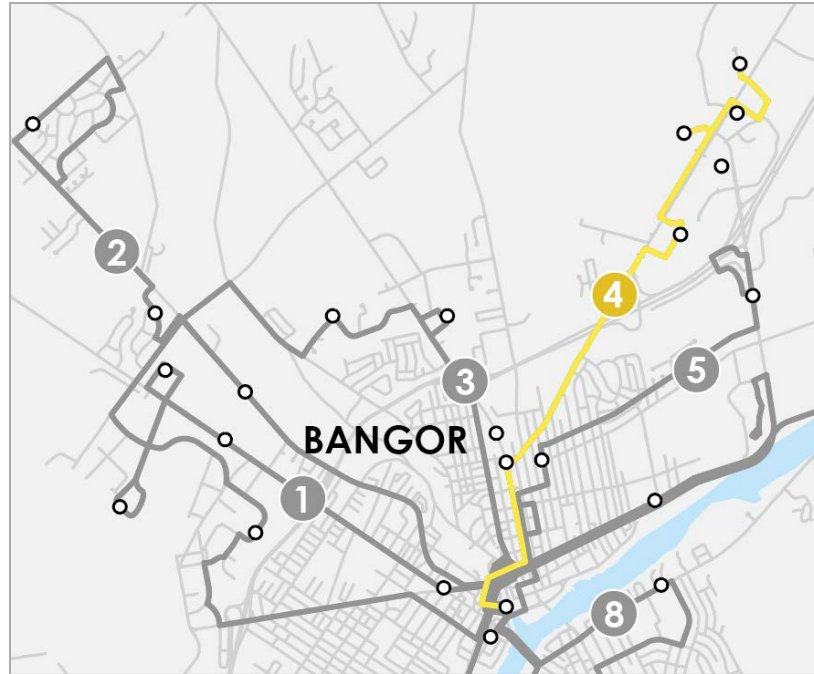
- Due to the large number of destinations served by this route, we propose longer Saturday operating hours than the Hammond currently operates, so that it operates from about 6 am until 7:00 pm on Saturdays.



**Figure 10: Proposed Center/Hammond route concept**

#### Route 4: Stillwater

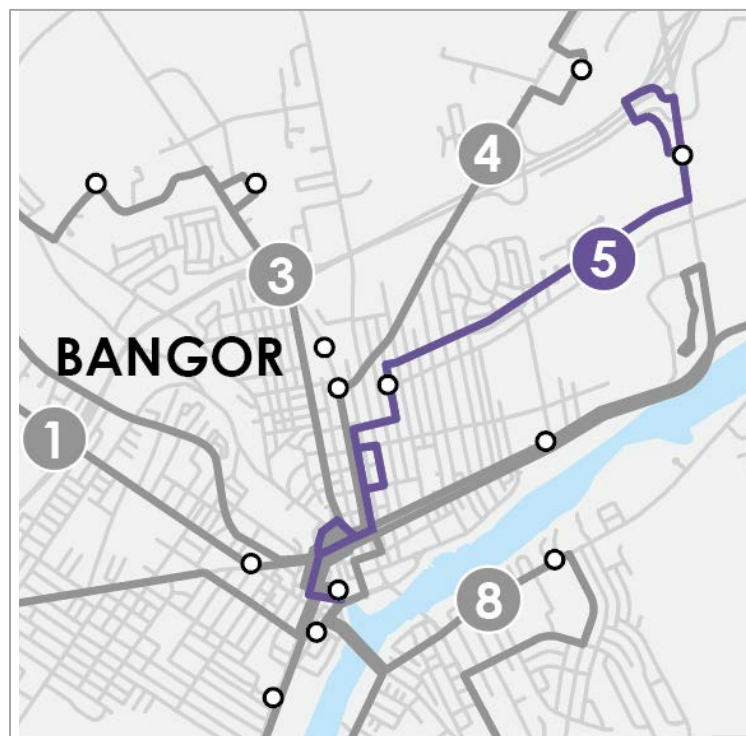
- This productive route serves important shopping destinations in Bangor and will be modified to serve the Target previously served by the Mt Hope route. Due to the later closing hours of these destinations, and to enable trips after traditional working hours, Stillwater is a candidate for later operating hours and potentially, more frequent service. Stillwater is the second most productive route of the existing system and may benefit from more frequent service to attract even more ridership on this popular route.



**Figure 11: Proposed Stillwater route concept**

*Route 5: Mount Hope*

- Redesign to serve Mt Hope Ave and terminate at the EMCC. The Target will be serviced by a slightly modified Stillwater route.



**Figure 12: Proposed Mount Hope route concept**

Route 6: Veazie/Orono/Old Town (VOOT)

- Redesign the route to streamline the alignment in Old Town/Orono. Some areas of Old Town, such as along Main St between Center St and the University of Maine, will no longer have fixed-route services due to low demand. Depending on the availability of technology and the success of the alternative service delivery in Hampden, these areas can be considered as candidates for on-demand service. Following the Hampden pilot, a pilot in Old Town can be conducted to help fill the service gaps where fixed-route transit will no longer operate.



**Figure 13: Proposed VOOT route concept**



### Route 7: Black Bear Orono Express

- No significant changes are recommended for the Black Bear Express, as the current alignment adequately serves the local trips within the University of Maine campus neighborhood. This route is an excellent example of how partnerships can be made with major destinations and employers to provide an essential service to its riders. The University of Maine and other colleges have shown that they are important leaders in creating partnerships with transit and we recommend continuing this trend with other employers to make transit the best option for commuting.

### Route 8 and 9: Brewer North and South

- No significant changes in alignment or frequency are recommended for the Brewer North and South routes. There are a limited number of alignment options due to the street geometry and the existing routes provide good connections along main streets to major commercial destinations.
- A service extension along North Main St is a possible future consideration but would result in a route that is longer and more difficult to serve. Community Connector can use lessons learned from the on-demand pilot in Hampden to determine if a similar on-demand service would be effective at extending the Brewer North service area.
- The Brewer routes, particularly Brewer North, begin service later in the morning than other routes. Once Community Connector has a better understanding of ridership and demand from improved data collection, it may be deemed beneficial to commence service earlier.

### Route 10: Hampden

- On-demand service will continue along Route 10. Based on insights, stakeholder feedback and lessons learned from the pilot in the short-term, modifications to the on-demand service can be made to best fit the Bangor context for permanent implementation.

### Route 11: Mall Hopper

- Recommended to replace existing Mall Hopper with route 3 – Center/Hammond Circulator route. Major shopping destinations on the existing Mall Hopper route,

such as Bangor Mall, Broadway Shopping Center, and Airport Mall, will still be served by the new proposed network.

- The service details are shown below in Table 3. The service space remains largely unchanged in the mid-term as Community Connector introduces new route alignments. The proposed service details illustrate the introduction of a bi-directional route, new 30-minute Crosstown route, and modified service on Capehart, Stillwater, and Mount Hope.

**Table 3: Mid-term proposed route-level service details**

	<b>Weekday Start Time</b>	<b>Weekday End Time</b>	<b>Service Headway (min)</b>	<b>Weekend Start time</b>	<b>Weekend End Times</b>	<b>Service Headway (min)</b>
<b>1. Crosstown</b>	6:55 AM	6:45 PM	30	6:55 AM	6:45 PM	60
<b>2. Capehart</b>	6:06 AM	6:30 PM	30	7:06 AM	6:11 PM	30
<b>3. Center St/Hammond</b>	6:15 AM	6:08 PM	60	6:15 AM	7:00 PM	60
<b>4. Stillwater</b>	6:45 AM	6:35 PM	60	6:45 AM	6:35 PM	60
<b>5. Mount Hope</b>	6:15 AM	6:05 PM	60	6:15 AM	6:05 PM	60
<b>6. Old Town (VOOT)</b>	5:45 AM	7:00 PM	60	6:15 AM	7:05 PM	120-180
<b>7. Black Bear</b>	6:55 AM	9:55 PM	30	No service		
<b>8. Brewer N</b>	7:15 AM	6:00 PM	60	7:15 AM	6:00 PM	60
<b>9. Brewer S</b>	6:45 AM	6:30 PM	60	6:45 AM	6:30 PM	60
<b>10. Hampden</b>	6:15 AM	6:10 PM	on-demand	No service		

- **Pilot late-night service:** In response to the frequent request for service to operate later in the evening, it is recommended that Community Connector extends the service span on its most productive weekday daytime route(s). Route 1: Crosstown would be a candidate for this pilot because it contains some of the most productive corridors and provides good coverage across the City of Bangor. Selecting only one route would minimize the financial investment for the pilot; however, extending the service span of one route may not be effective if it does not connect into a network of late-night service. It is suggested that additional route(s) be considered for a late-night pilot, including Stillwater, Capehart, and Center St/Hammond, if resources permit. These four routes have been selected for a late-night pilot because they offer good coverage of the service area, have relatively high ridership based on existing GPS data, and have destinations along these routes that are open past 6 PM. Pending a successful pilot, later service could be extended to additional routes such as Brewer North and South.

- **Hire one additional FTE** to serve as operations supervisor, scheduling analyst, and general aid for marketing and outreach. With the proposed service changes, ensuring support for scheduling and implementation, as well as customer outreach will be vital to successful changes.

## 6.2 TECHNOLOGY

- **Introduce AVL/GPS to support the following applications.** While implementation of AVL/GPS technology is recommended for the mid-term, Community Connector should begin exploring these technologies in the short-term to prepare for implementation.
  - **Allow for real-time tracking and locating of all vehicles.** Additionally, when combined with automated passenger counting this will allow the City to **monitor on-time performance** and provide Wi-Fi service to passengers, archive data for the analysis of service and vehicle performance, provide onboard automated stop announcements for next stops inside the bus and displaying stops on variable messaging devices.
  - **Better service the requirements of the Americans with Disabilities Act (ADA).** Advanced AVL/GPS systems offer further efficiencies when coupled with scheduling software that develop electronic manifests on tablets for ADA service. Such systems can evolve to provide online reservations, automatic notifications of passengers, van operators and service providers of trip request, trip changes and cancellations.
  - **Advanced AVL/GPS systems provide maintenance monitoring capabilities** that can be captured at the end of the run when entering the garage or while in service via wireless communication using Wi-Fi. Based upon the current maintenance procedures used for the city bus fleet in which bus maintenance is 'co-mingled' with the maintenance of the municipal fleet, it would be advantageous to add this capability to maintain vehicles in a state of good repair.
- **Introduce mobile fare payment:** This will provide additional convenience to riders while simultaneously lowering revenue collection costs including the handling of cash, selling of paper and plastic fare products and maintaining revenue collection equipment. Furthermore, this will help to reduce fare evasion. Mobile payments require a simple validator on board fixed route buses and paratransit vans. Stantec envisions a system that allows riders of fixed route service to use three simple fare payment products: day passes, weekly passes and monthly passes.
- **Update to a more user-friendly website:** With CAD/AVL technology, additional updates to the website can be made to include next bus predictions, trip planning and service alerts.
- **Introduce asset management software:** to comply with the reporting requirements of asset inventory, state of good repair and its capital investment plan for facilities, rolling

stock (buses, vans and non-revenue vehicles), equipment and infrastructure as per the FTA. Currently the City of Bangor collects the information required using a simple spreadsheet. In the future, that approach to asset management will be insufficient to meet the FTA's requirements since the requirements are considerable. Considering these requirements alongside the size of the Community Connector Administrative Staff, it was determined that purchasing a software package was the prudent way to maintain compliance with the FTA's Transit Asset Management requirements. Stantec recommends that this software be purchased on a 'software as a service' basis. The purchase will enable the City of Bangor to determine the level of maintenance needs for all of its transit capital assets while projecting future costs as demand for transit service increases across the Greater Bangor Region. At a minimum the software should provide these components:

- Asset inventory that includes all assets, asset procurements, implementations as well as disposals of assets
- Condition assessments of all capital assets
- Asset performance measures
- Life cycle costing to serve as the basis of comparing performance and for future procurements
- Financial planning to identify replacement cycles, funding requirements (federal and local) and capital planning
- Continuous improvement to assess the performance of the program and to increase overall system productivity
- Risk determination for the purpose of identifying when critical parts of the asset program may be reaching points of failure that would impact the delivery of service

### **6.3 MARKETING**

- **Create a transit supportive tool kit:** This will provide municipal governments, major employers, landowners and developers with information they need to encourage the use of transit. Specifically, the tool kit would provide municipalities with suggested strategies for integrating land use and transit planning. The tool kit would reside on the Bangor website so that developers, municipalities and major employers can access its content. Key topics in the tool kit would include transit prioritization, retention of existing tenants/businesses, development site layout, street and network connectivity, and pedestrian and active transportation circulation. Specific to the Bangor-context, the tool kit should provide the following information to developers and major employers:
  - **Definition of Transit-Oriented Development (TOD)** with neighborhood or development specific typologies-Urban Core such as Downtown Bangor, Urban Neighborhoods like Tree Streets or a Destination Hub such as the University of Maine or the Bangor Mall. This includes explaining the benefits of TOD including decreased vehicle miles traveled (VMT), greater public demand, reduced risk in

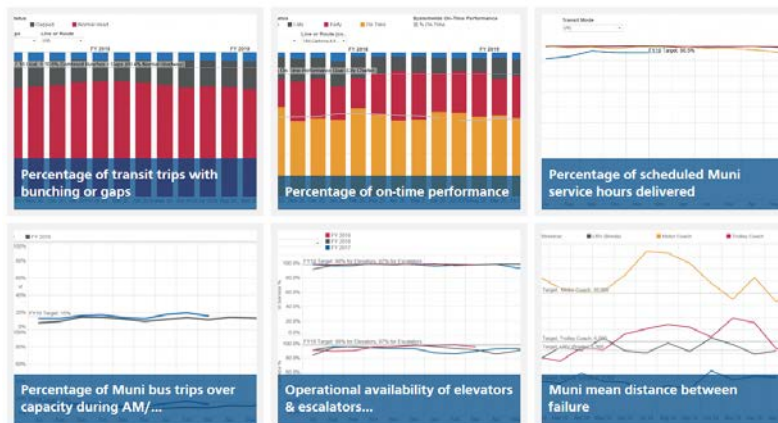
economic downturns, lower development costs, environmentally sustainability and increased property value.

- **Determination of Site Feasibility for TOD**
- **Funding Sources for TOD**
- **Case Studies of Successful TODs**

## 6.4 PERFORMANCE CRITERIA

- Once new technology is in place to collect data, and performance measures have been established (short-term recommendation), **Community Connector can disseminate the measured system performance to the community to increase transparency.** In San Francisco, the San Francisco Municipal Transportation Authority (SFMTA) provides interactive performance dashboards which track the agency’s progress towards achieving the goals outlined in the SFMTA’s Strategic Plan, as illustrated in Figure 14. The metrics presented identify the purpose, methodology and target value. This can be used to draw inspiration for the presentation of performance metrics for Community Connector.

Goal 2: Make transit and other sustainable modes of transportation the most attractive and preferred means of travel.



**Figure 14: SFMTA interactive performance dashboard**

Source: SFMTA

## 7.0 LONG-TERM RECOMMENDATIONS (5+ YEARS)

### 7.1 SERVICE PLANNING AND OPERATIONS

- **Extend service hours for key routes**, including Center/Hammond Loop, Crosstown, Capehart, and Stillwater until 8 pm every weeknight. The pilot will help determine the level of evening demand in the service area, and the pilot results should be used to adjust the number of trips required to satisfy the evening demand. Although extending service to 8 pm is recommended for the pilot, a different service span can be selected

based on evening uptake observed in the pilot. For example, if there is considerable uptake and positive feedback, it may be appropriate to identify funding for further extension of the service until 9 pm. We recommend maintaining daytime frequency until the end of service for ease of scheduling and customer convenience. For example, extending weekday service on the Capehart route by 1.5 hours would result in 3 new trips, or approximately 2.5 daily revenue hours.

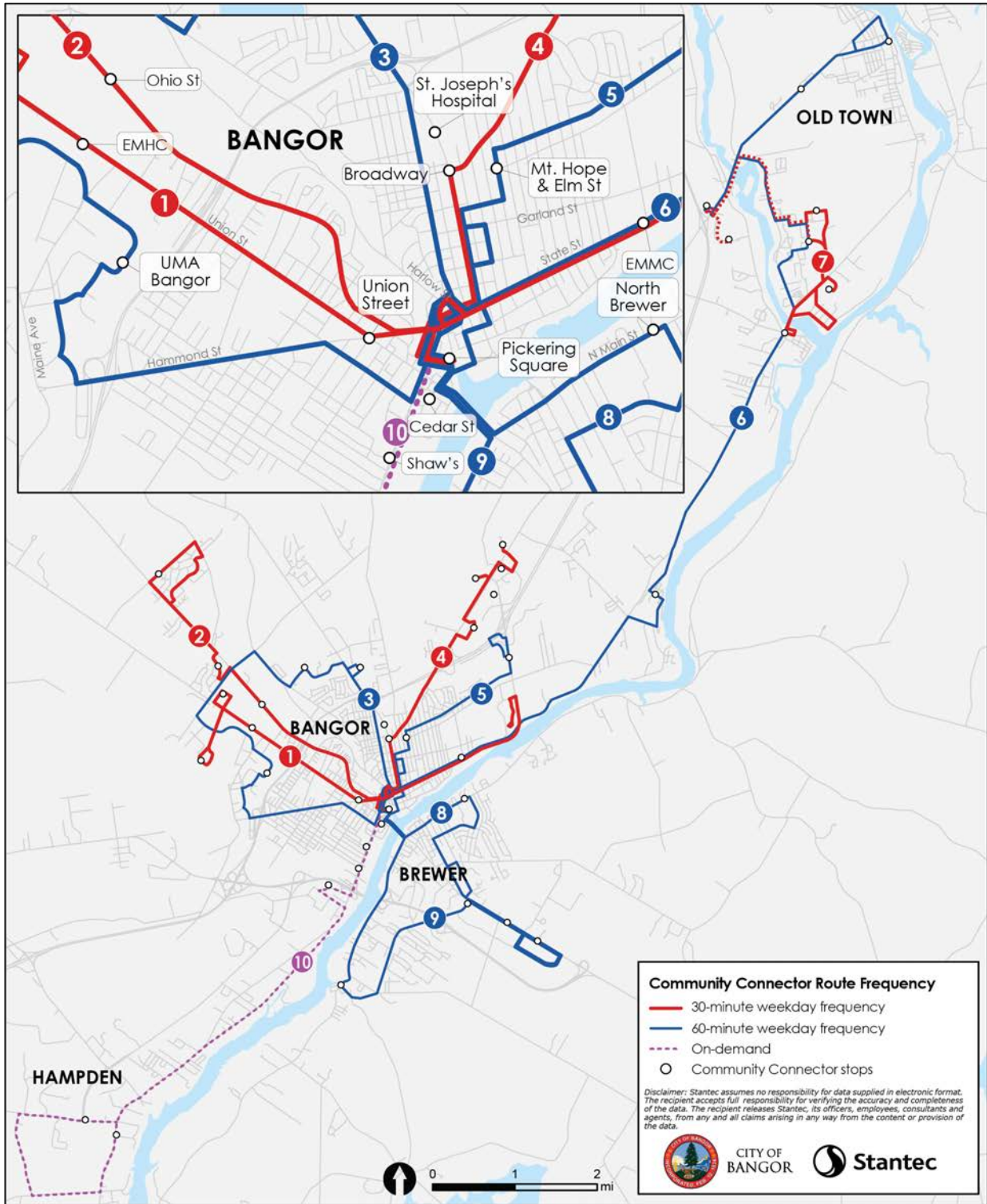
- **Increase frequency on productive routes:** It is expected that Route 4: Stillwater, an already productive route, will gain ridership after the new network is implemented, given the elimination of the Mall Hopper and modification of service to Target from Mount Hope to Stillwater. Increasing frequency to 30 minutes is expected to have positive impacts on this route's ridership, which will trickle down through the rest of the system as well.

The service details are shown below in Table 4, including increased span of service until 8 pm on multiple routes, Hampden operating as an on-demand service, and increase to 30-minute headways on Stillwater. The proposed route frequencies across the network are shown in Figure 15.

**Table 4: Long-term proposed route-level service details**

	<b>Weekday Start Time</b>	<b>Weekday End Time</b>	<b>Service Headway (min)</b>	<b>Weekend Start time</b>	<b>Weekend End Times</b>	<b>Service Headway (min)</b>
<b>1. Crosstown</b>	6:55 AM	8:00 PM	30	6:55 AM	6:45 PM	60
<b>2. Capehart</b>	6:06 AM	8:00 PM	30	7:06 AM	6:11 PM	30
<b>3. Center St/ Hammond</b>	6:15 AM	8:00 PM	60	6:15 AM	7:00 PM	60
<b>4. Stillwater</b>	6:45 AM	8:00 PM	30	6:45 AM	6:35 PM	60
<b>5. Mount Hope</b>	6:15 AM	6:05 PM	60	6:15 AM	6:05 PM	60
<b>6. Old Town (VOOT)</b>	5:45 AM	7:00 PM	60	6:15 AM	7:05 PM	120-180
<b>7. Black Bear</b>	6:55 AM	9:55 PM	30	No service		
<b>8. Brewer N</b>	7:15 AM	6:00 PM	60	7:15 AM	6:00 PM	60
<b>9. Brewer S</b>	6:45 AM	6:30 PM	60	6:45 AM	6:30 PM	60
<b>10. Hampden</b>	6:15 AM	6:10 PM	On- demand	No service		

**City of Bangor - Community Connector**  
Proposed Transit Service Frequency



**Figure 15: Proposed Community Connector Transit Service Frequency**



## 8.0 SERVICE IMPLICATIONS AND COSTS

We derived cost estimates for the mid and long-term plans based on the estimated service hours and an assumed cost per revenue hour of \$67.65. In the short-term, we do not recommend increasing the number of service hours provided, but instead Community Connector should focus efforts on improving existing service by introducing technology, collecting data, tracking performance, and implementing fixed stops. The estimated costs based on service hours per route are shown in Table 5.

**Table 5: Estimated system costs**

	Existing	Mid-term	Long-term
<b>1. Crosstown</b>	-	\$ 435,092.96	\$ 484,447.37
<b>2. Capehart</b>	\$ 537,292.06	\$ 428,462.57	\$ 471,755.91
<b>3. Center St/Hammond</b>	\$ 366,488.02	\$ 376,345.31	\$ 427,720.08
<b>4. Stillwater</b>	\$ 208,487.14	\$ 229,335.85	\$ 451,574.99
<b>5. Mount Hope</b>	\$ 208,487.14	\$ 208,487.14	\$ 208,487.14
<b>6. Old Town (VOOT)</b>	\$ 483,323.44	\$ 439,384.94	\$ 439,384.94
<b>7. Black Bear</b>	\$ 183,360.02	\$ 183,360.02	\$ 183,360.02
<b>8. Brewer N</b>	\$ 198,757.74	\$ 198,757.74	\$ 198,757.74
<b>9. Brewer S</b>	\$ 216,826.62	\$ 216,826.62	\$ 216,826.62
<b>10. Hampden</b>	\$ 190,490.69*	\$ 190,490.69*	\$ 190,490.69*
<b>11. Mall Hopper</b>	\$ 208,487.14	-	-
<b>Total</b>	\$ 2,802,000.00	\$ 2,906,543.85	\$ 3,272,805.49
<b>Difference from existing</b>	-	\$ 104,543.85	\$ 470,805.49

\*Cost may decrease depending on the results of the on-demand service. The existing service cost for Route 10 has been applied to be conservative.

### Short-term

- Depending on the success of the Hampden on-demand service pilot, additional cost savings may be realized through alternative service delivery and will also act to offset cost increases on other routes in the medium and long term. The savings will be able to be determined once the pilot is conducted and agreements are made with the applicable service and technology providers. To be conservative, the existing service costs have been applied in the short, medium and long term.

### Mid-term

- The proposed network changes are expected to add approximately \$105,000 of annual operating expenses in the mid-term. Some routes will see cost savings, such as reducing the length of Mount Hope and simplifying Capehart, but the introduction of the Crosstown route and increasing the Stillwater route to serve Target (previously served by Mount Hope) will result in increases in operating costs.

- While the mid-term changes will add costs, it is anticipated that the new network will improve service and increase revenue through more trips from new and existing riders. Union Street is currently only served in one direction as part of the Hammond loop, but is proposed to be served by 30-minute bi-directional service on Route 1: Crosstown. This change will create new opportunities for riders who could not previously travel east on Union Street, as well as connect riders to State St along the same route. Route 3: Center/Hammond will also be provided as a bi-directional service instead of a one-way loop, creating more travel options for riders. These changes, along with the short and mid-term recommendations described above, will help develop a stronger ridership base that can offset the increased costs of providing service.
- If deemed beneficial to start service on Brewer North and Brewer South earlier, the cost of providing service will increase. It is anticipated that it would cost an additional \$30,000 (approximately) to begin both routes at 6:15 AM.

### Long-term

- The long-term recommendations of providing later service and high frequency service on key corridors adds about \$470,000 in operating costs compared to current operations and approximately \$365,000 compared to the mid-term recommendations.
- These changes will increase operating costs, but farebox recovery revenues will likely not increase by the same magnitude. It would be prudent for Community Connector to raise fares and implement student and employee passes to build rider loyalty. Based on the survey results, Community Connector riders would be willing to pay greater fares for improved service, such as service later into the evening and more frequent service.

## **9.0 CAPITAL PLAN**

The proposed 10-year Capital Plan provides Community Connector with a strategy that focuses on improving assets and infrastructure, and the investments required to support this Strategic Plan. A summary of the Plan is provided in Table 7. It calls for a total investment of \$12.6M over a 10-year span.

The following sections provide an overview of the various components to the Capital Plan. This has been broken down into various categories including fleet renewal, transit technology, infrastructure improvements, and comprehensive branding strategy (marketing).

### **9.1 FLEET RENEWAL**

Community Connector will completely renew their fleet over the next ten years by moving toward a 12-year replacement schedule and a fleet of modern, brand-new forty-foot transit vehicles. The Capital Plan includes a fleet replacement schedule defined below in Table 6.

Presently, the Community Connector fleet has a very high average age, and vehicles are kept in service beyond the industry-standard 12-years from the date of manufacture. Community Connector has recently received grant funding to purchase brand new vehicles in 2019, allowing them to replace the oldest vehicles in the fleet.

Drive-train overhauls are commonly outsourced to heavy mechanics or OEM providers to revitalize major engine components and occasionally major system repairs. Industry best practice often schedules these at the half-life of the vehicle, or six years after original date of manufacture. For the purposes of this plan, overhauls are planned every six years at a cost of \$50,000 for all current and future vehicle purchases that are not scheduled for replacement. Major bodywork including frame, interior and exterior rehabilitation are not included in this budget estimate.

Since the proposed plan mainly involves a redistribution of service or revenue hours to different routes, as well as on-demand service pilots, the fleet renewal component of the Capital Plan assumes that the total fleet size will remain the same as present. However, the desire to replace existing 30-foot (cutaway) vehicles with conventional 40-foot vehicles over the course of this ten-year plan will effectively increase capacity of the fleet.

**Table 6: Ten-year Fleet Renewal Schedule with 2017 to 2019 included for comparison purposes.**

Note that Community Connector plans to replace its five oldest vehicles in 2019.

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
<b>Total</b>	22	24	26	23	22	22	22	22	22	22	22	22	22
<b>Purchased</b>	2	2	3	5	/	3	/	4	/	3	/	/	3
<b>Disposed</b>	/	/	6	6	/	3	/	4	/	3	/	/	3
<b>Overhauls</b>	/	/	/	/	/	/	2	1	3	5	/	3	/
<b>Avg. Age</b>	11	12	11	9	8	8	8	7	6	7	6	7	8

Note that the fleet plan considers that vehicles are disposed the following year after all replacements are received. Therefore, the fleet size starts at 26 in 2019 and decreases to the required 22 vehicles by 2021. By 2023 the existing fleet operating beyond their useful lives will have been largely replaced and a more normalized replacement schedule begins. It is further noted that this spare ratio is higher than normal since Community Connector does not have dedicated maintenance personnel and as such may have a higher number of vehicles requiring service than other properties of similar fleet size and makeup.

## 9.2 TECHNOLOGY

Technological advancements are recommended to improve Community Connector operations and customer experience. These technologies include:

- Transit Scheduling Software as a Service (2020);
- On-demand Transit Application and Dispatch System (2020);
- Computer-Aided Dispatch and Automatic Vehicle Location (CAD/AVL) system with real-time customer information API (2021);

- New Website with Customer Information (2021);
- Mobile Fare Payment (2022);
- Asset Management Software as a Service (2023);

### **9.2.1 Transit Scheduling SaaS**

The Capital Plan and technology recommendations propose procuring a vendor for Transit Scheduling Software as a Service. In addition to the differences in delivery models from traditional transit scheduling solutions, there are different costs associated with implementing these technologies.

Software as a Service (SaaS) delivery models are a form of cloud-based technology that minimize capital investment upfront, and provides greater flexibility to scale services, access support and provide features that may otherwise require additional resources for a traditional local solution. Current Transit Schedule SaaS providers offer the technology for a small initial setup fee and then ongoing costs on a unit basis such as per-vehicle or per-scheduled service-hour. By offering the solution in the cloud, features and modules can be added or removed easily, and the costs can scale as such.

Some of these modules include:

- Partially automated schedule creation based on user-defined headways;
- Automated or partially automated vehicle blocking based on user-defined parameters for layover, interlining, etc.;
- Automated or partially automated operator scheduling based on configured contract and operating rules;
- Automated or partially automated operator off-day scheduling and rostering.

Many of these technologies leverage the power of server-based cloud computing to provide robust automation and optimization algorithms that have proven savings and efficiencies over manual scheduling methods.

Costs for Transit Scheduling SaaS can range from \$100 to \$600/vehicle every month depending on the specific features and modules in use. Initial startup costs are generally equivalent to the total annual cost for an agency. For Community Connector, the expected annual cost is approximately \$7,000 to \$10,000 for a low-to-mid specification Transit Scheduling SaaS system. The initial capital costs are estimated at \$10,000 in the Capital Plan starting in 2020. It is expected that ongoing operating costs would be included in the annual operating budget for the Community Connector.

### **9.2.2 On-demand Transit Application and Dispatch System**

As described in previous sections, on-demand or alternative service delivery for Hampden initially, and potentially VOOT at a later stage, will require technology for the scheduling and dispatching of this type of service. This requires the procurement of new technology to support the on-demand booking, scheduling and routing of trips to serve customer requests.

These technologies are experiencing a great deal of growth and innovation in the industry. Many involve cloud-hosted Software as a Service applications to provide rapid rerouting and dispatching of vehicles to meet customer trip requests. They also include a customer application, which can be branded to suite the Community Connector's requests.

Many of these systems are capable of operating on off-the-shelf equipment, and there may be potential to integrate with onboard CAD/AVL equipment if conventional vehicles are to be leveraged. Others can provide specialized vehicles with separate equipment to manage the on-demand service.

The pricing indicated in the Capital Plan considers a service model involving a pay-per-trip ongoing cost and an initial investment of approximately \$25,000 including dedicated on-board equipment for routing, pickup and drop-off confirmation, and configuration of parameters for Community Connector.

### **9.2.3 Computer-Aided Dispatch/Automated Vehicle Location System**

Computer-aided Dispatch/Automated Vehicle Location (CAD/AVL) systems use Global Positioning System (GPS) to identify the locations of transit vehicles, and then compute the schedule and route adherence to aid with service monitoring. With the importance of these systems to day-to-day operations and the wealth of information that comes with them, CAD/AVL is often the cornerstone technology for many transit systems.

CAD/AVL systems rely on equipment on-board the vehicles as well as a certain amount of back-of-house technologies to operate. On-board technology includes a core system module which integrates with other on-board systems and a primary GPS receiver. For Community Connector, the CAD/AVL system will also include Wireless Local Area Network (WLAN) router and antenna, on-board voice annunciation for stop announcements, and an interior LED display for displaying next stop information and messages to customers on-board.

Back-office central systems require installing and maintaining central computers and servers in an appropriate facility, as well as redundant backups. Additionally, this technology will include dispatcher terminals to manage the services, a General Transit Feed Specification (GTFS) and GTFS- real-time customer information data feed and a WLAN system in the vehicle storage area/garage for managing data transfer. Back-office central systems are estimated to cost approximately \$85,000 including system installation, training and labor.

The Capital Plan estimates that on-board technology installation would cost approximately \$6,600 per vehicle and would involve installation onboard the most current vehicles that are not due for retirement the same year of the initial implementation. In subsequent years, additional on-board systems will be procured and installed on new vehicles as required. When older vehicles are retired, the systems will be removed and installed onboard new vehicles if still in good working condition. Ongoing replacement of parts and servicing of on-board components should be considered in the annual operating budget.

The total cost for the program is budgeted at \$329,200 over the implementation of the project. This does not include the costs of procuring the solution or consulting services to develop procurement materials and support implementation and testing, which some agencies choose to leverage.

#### **9.2.4 New customer information website**

The Capital Plan has proposed funding for a new website to support the Community Connector's efforts to rebrand and reach out to the public and provide information to riders. The website is planned for development alongside the implementation of the CAD/AVL system in 2021, and will include customer information tools that could include the following elements, among others:

- Next bus vehicle predictions;
- Customer trip planning;
- Service alerts and disruptions.

The new website should also integrate the Comprehensive Branding Strategy (described later) that is planned for 2020. The expected capital cost for the new website is \$45,000 including development of all required customer information tools that leverage the CAD/AVL data feed.

#### **9.2.5 Mobile Fare Payment as a Service**

Fare payment systems are rapidly transitioning away from smart card technology to usage of mobile devices. The organization and maintenance of a smart card system requires substantial investment of resources, particularly with fare sales. Mobile fare payment systems strive to replace the more conventional smart card with mobile devices like smart phones and wearables.

These systems often take the form of applications that display a barcode, a dynamic screen or connect to the devices Near Field Communication (NFC) transmitter and are validated either by the driver or an on-board validation device. The back-end system is often a cloud-based third-party hosted solution that provides a web-based interface for managing transactions, fare categories and other critical information.

A mobile fare payment solution for Community Connector will include an on-board validator that supports contactless payment and visual barcode validation. The cost to install on-board systems is estimated at \$125,000 not including additional costs for procuring the solution, or ongoing subscription costs to the service provider. It is planned to procure a Mobile Fare Payment as a Service provider in 2022, after the core CAD/AVL system has been implemented.

#### **9.2.6 Asset Management Software as a Service**

An Asset Management system is envisioned for Community Connector taking the form of a Software as a Service. This would support a variety of FTA reporting requirements while supporting efficiencies in the maintenance and asset management processes. Like other

Software as a Service models, the Asset Management system is expected to have a relatively low initial capital cost equivalent to approximately one year's worth of payments. It is estimated that the ongoing costs could range from \$10,000 to \$50,000 per year depending on the level of integration with other City of Bangor systems required.

For the Capital Plan, a budgeted capital cost of \$30,000 is allocated in 2023. This includes the start-up configuration of the software and any integration required with Community Connector systems, but not for advanced integrations with other third-parties or the City of Bangor. Additionally, it does not include costs associated with the procurement of this solution.

### **9.3 INFRASTRUCTURE**

The Capital Plan includes improving street-level infrastructure for the Community Connector with new permanent bus stops and shelters, and a new transit terminal in downtown Bangor at the current Pickering Square location.

#### **9.3.1 Bus Stop Infrastructure**

The plan eliminates the current practice of flagging down vehicles from the side of the road in favor of servicing at established bus stops. As a result, new bus posts, concrete pads and shelters are required. The Capital Plan includes budget for over five-hundred bus posts and signs, and additional concrete pads and shelters where existing roadside infrastructure does not include a suitably paved area for either the stop post or a shelter.

##### **9.3.1.1 Bus Stop Signage**

Bus stop signs are the core component of a transit service's street presence. The Transit Study proposes to install permanent bus stops throughout Bangor and the surrounding area. For each of these locations, the plan protects for a conventional bus stop sign. The sign would include bus stop information on a reflective metal sign affixed to a dedicated metal post secured in a concrete base. A comprehensive stop-by-stop review may identify areas where bus stop signs can be fixed upon existing utility poles with brackets to save space at the curbside and reduce added clutter at intersections.

It is estimated that five-hundred seventy-two (572) bus stop signs will be required for supporting the services proposed. These should be procured and installed prior to implementing service changes, and associated removal and replacement costs should be considered when conducting any future service changes and/or route redesign. The Capital Plan has this expense budgeted for 2020.

##### **9.3.1.2 Bus Stop Concrete Pads**

Bus stop concrete pads are both a prerequisite for shelters in most situations and provide a curbside connection to nearby sidewalks where one may not already exist. Ensuring that there is a stable flat surface for embark and disembark from a vehicle is critical for supporting

strollers, scooters, wheelchairs and other mobility devices where the vehicle is required to deploy the ramp.

The standard concrete pad measures eight feet by fourteen feet in dimension. However smaller or larger pads may be considered as space and demand require. The Capital Plan proposes installing fifteen permanent concrete pads of standard dimension ever year for the first three years of the plan as per the following requirements:

- A shelter is proposed for the site where there is insufficient space;
- The stop is sufficiently busy and lacks a direct paved connection to the nearest sidewalk; and/or
- The stop requires one to provide reasonable service to customers requiring a ramp to embark or disembark from the vehicle.

### **9.3.1.3 Bus Stop Shelters**

Bus stop shelters are designed to specifications determined by the agency and often include branding elements and static elements. More advanced bus stop shelter designs include amenities such as real-time information screens, automated fare media purchase and payment kiosks, heating elements, lighting and dynamic advertisements or “infotainment.”

The bus stop shelters proposed are in addition to existing shelters throughout Bangor. The design of these shelters is up for further consideration, but generally involve an approximately 4ft by 10ft glass enclosure with one side or one partial side facing the street open for entry and egress. The Capital Plan assumes that shelters will be placed at locations with a concrete pad installed or otherwise have sufficient space to allow for the shelter as well as safe boarding and disembarking of individuals using mobility devices who require access via the vehicle ramp.

Any additional amenities such as real-time information screens are not included, as they are commonly considered as part of larger Intelligent Transportation System (ITS) implementations such as a CAD/AVL systems.

The Capital Plan plans for thirty (30) shelters to be installed over the first three years at locations initially identified through the establishment of bus stops based on the guidelines in Section 5.1. Community Connector may wish to consider such locations as per the following requirements:

- The bus stop is heavily utilized, commonly seeing passenger boarding volumes above a specified threshold;
- The bus stop is in an open area such as alongside a parking lot or an open field without preferable shelter from wind, snow and rain; and/or
- Community Connector receives requests from passengers, city councilors and/or other stakeholders for a shelter at a particular stop or landmark; among other criteria or requirements.



### **9.3.2 Bus Stop Benches**

Bus stop benches are designed to withstand the elements as well as substantial wear and tear from ongoing daily use. Generally designed for two people side-by-side, double-bench varieties are also available. Benches are able to be placed within shelters, or outside in the open. However, for the purposes of this Capital Plan, we recommend that a bench is installed wherever a shelter is placed. This results in thirty (30) bench installations over the first three years of the plan. Benches should be accessible with applicable armrests allowing individuals with mobility-challenges or disabilities to be able to support themselves while sitting down or standing up.

### **9.3.3 Pickering Square Bus Terminal**

Pickering Square was determined to be the most optimal bus hub location because of its central location. The challenging road network does not allow for strong east-west corridors, and instead results in vehicles feeding into downtown Bangor. The resulting bus system is a radial network where a central spot is needed to facilitate timed transfers and provide access to the rest of the network. Pickering Square also has the potential to become a more attractive community destination where people are excited to spend time, through public space enhancements, infrastructure improvements, and new community uses.

The redevelopment of the Pickering Square area can enhance the customer experience and improve the quality of transfers between Community Connector bus routes and regional bus services. By establishing a permanent centerpiece for the transit services operating in Bangor, the Pickering Square Bus Terminal will serve to encourage transit usage and provide an opportunity to spur transit-focused community development in downtown Bangor.



**Figure 16: The recently completed Nashua Transit Center in Nashua, New Hampshire is an example of the desired facility**

The proposed hub in Pickering Square requires enough platform capacity to handle all the proposed routes accessing the terminal simultaneously, in addition to overflow and layover space, and locations for regional bus services to connect. Additionally, the Pickering Square hub will include covered, climate-controlled waiting space, customer service agents for inquiries and fare media sales and other amenities as defined during the design phase of the project. These changes will be paired with the introduction of events that will create new opportunities to engage in the community while waiting for the bus.

With a total budget of \$1,200,000, the Capital Plan assumes a three-year planning, design and construction timeline starting in 2020 with costs allocated at 15% in Year 1 for planning and design work, 35% in Year 2 for initial construction and the remaining 50% in Year 3 for final construction and project closeout. This budget does not include the necessary pre-approval design work, pre-procurement feasibility and engineering studies, or the costs for land acquisition.

## 9.4 MARKETING

A comprehensive rebrand of the Community Connector service is necessary to elevate the brand equity and promote the importance of the service provided. It is anticipated that this will occur in 2020, and a style guide will be created before other design elements are completed. This branding strategy would involve hiring a marketing and design consultant to engage with Community Connector, the City of Bangor and other relevant stakeholders.

The branding strategy would result in several elements that would have to be completed prior to or at least in coordination with other capital investments. These elements, and their coupled projects, could include the following, among others:

- Style guide including a new logo and core branding elements;
- Bus stop signage design (prior to implementing new bus stops);
- New bus schemes and temporary bus wrap design (prior to receipt of new vehicles);
- Communications campaign (prior to and in coordination with the Pickering Square Bus Terminal redevelopment);
- Website and social media designs (prior to new website development).

It is expected that the branding strategy will cost \$50,000.

### 9.4.1 New vehicle livery

As part of the Comprehensive Branding Strategy, it will be critical that vehicles are repainted until they are replaced by new vehicles with the new livery. Vehicles due for replacement within five years can receive a lower-cost bus wrap. Vehicles with lifespans beyond that will be repainted.

Bus wraps cost on average between \$8,000 and \$12,000 per vehicle, inclusive of installation and removal, for a complete coverage vinyl application and last up to six years but requires more maintenance over its useful life than a new paint job. A repaint costs between \$25,000 and \$35,000 per vehicle and would include protective coatings to reduce damage. Newer vehicles purchased before the updated livery and branding strategy are completed could be repainted to last longer and require less maintenance. Brand new vehicles would be painted by the OEM.

Based on the age of vehicles and the anticipated replacement schedule, the following are the estimates for the total number of bus wraps and repaints required following the launch of the new Community Connector brand in 2020:

- Twelve wraps (four for cutaway vehicles) at \$10,000 each; and
- Five repaints at \$30,000 each

All vehicles ordered in 2020 and beyond will be painted in the new livery. The total cost for the repaint and wrap program would be \$270,000. Savings could be realized if the new livery makes use of the current livery on Community Connector vehicles.

## **9.5 POTENTIAL FUNDING OPPORTUNITIES**

The Capital Plan highlights the substantial investment required to support the recommendations of this Study. However, there are opportunities for many large capital investments to qualify for alternative funding or be supported through third-party partnerships.

Community Connector has an existing practice of partnering with local businesses to install bus shelters around Bangor. This practice could continue to be leveraged and expanded to include the addition of new bus shelters, concrete pads, and (potentially) the location of some stops.

Large scale investments such as the Pickering Square Bus Terminal and the CAD/AVL project may also qualify for substantial grant funding at the Federal and State levels, provided that matching funds are committed by the City of Bangor. Community Connector and the City of Bangor could also consider partnerships with alternative service providers and regional transportation services to support an integrated regional hub at the Pickering Square Bus Terminal.

Local funding from the City of Bangor and federal funding from the FTA Urbanized Area Formula Grant 5307 can continue to be received. Additionally, a number of grant programs under the FAST Act can be further investigated for larger capital investments such as the BUILD Transportation Grant (formerly TIGER) or the Grant for Buses and Bus Facilities Program which support investment in bus transit and supporting infrastructure. The FAST Act funding is secured through fiscal year 2020, therefore Community Connector should investigate these funding opportunities as early as possible.

Table 7: Capital Plan Summary

Capital Investment Plan Summary																							
Project	Total Project Cost	Unit Cost	Qty	2020		2021		2022		2023		2024		2025		2026		2027		2028		2029	
				Budget	Qty	Budget	Qty	Budget	Qty	Budget	Qty	Budget	Qty	Budget	Qty	Budget	Qty	Budget	Qty	Budget	Qty	Budget	Qty
<b>1 Fleet Renewal</b>																							
1.1	New Revenue Vehicles	\$9,000,000	\$500,000	5	\$2,500,000	0	\$0	3	\$1,500,000	0	\$0	4	\$2,000,000	0	\$0	3	\$1,500,000	0	\$0	0	\$0	3	\$1,500,000
1.2	Major maintenance and overhaul	\$700,000	\$50,000	0	\$0	0	\$0	0	\$0	2	\$100,000	1	\$50,000	3	\$150,000	5	\$250,000	0	\$0	3	\$150,000	0	\$0
<b>2 Infrastructure Improvement</b>																							
2.1	New Bus Stop Infrastructure	\$457,600	\$800	572	\$457,600	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
2.1a	New Bus Stop Shelter	\$270,000	\$9,000	10	\$90,000	10	\$90,000	10	\$90,000	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
2.1b	New Bus Stop Pad	\$112,500	\$1,500	15	\$22,500	15	\$22,500	15	\$22,500	10	\$15,000	10	\$15,000	10	\$15,000	0	\$0	0	\$0	0	\$0	0	\$0
2.1c	New Bus Stop Benches	\$45,000	\$1,500	10	\$15,000	10	\$15,000	10	\$15,000	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
2.2	Pickering Square terminal and customer service building	\$1,200,000	\$0	0	\$180,000	0	\$420,000	0	\$600,000	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
<b>3 Transit Technology</b>																							
3.1	AVL System with Real Time Information	\$329,200	\$6,600	0	\$0	23	\$236,800	2	\$13,200	2	\$13,200	4	\$26,400	0	\$0	3	\$19,800	0	\$0	0	\$0	3	\$19,800
3.2	Scheduling Software as a Service	\$10,000	\$0	0	\$10,000	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
3.3	Mobile Fare Payment	\$125,000	\$0	0	\$0	0	\$0	0	\$125,000	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
3.4	Asset Management Software as a Service	\$30,000	\$0	0	\$0	0	\$0	0	\$0	0	\$30,000	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
3.5	On-demand Scheduling System	\$25,000	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$25,000	0	\$0	0	\$0	0	\$0	0	\$0
3.6	New website	\$45,000	\$0	0	\$0	0	\$45,000	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
<b>4 Comprehensive Branding Strategy</b>																							
4.1	Rebranding Consulting Services	\$25,000	\$0	0	\$25,000	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
4.2a	Bus wraps	\$120,000	\$10,000	12	\$120,000	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
4.2b	Bus repaints	\$150,000	\$30,000	5	\$150,000	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
<b>Total Capital Investment Required</b>					\$3,570,100		\$829,300		\$2,365,700		\$158,200		\$2,091,400		\$190,000		\$1,769,800		\$0		\$150,000		\$1,519,800

## 10.0 NEXT STEPS

This plan developed through collaboration with Community Connector staff, residents, customers, and stakeholders throughout the greater Bangor region has provided concrete steps forward for delivering more impactful and financially responsible public transportation.

It will be crucial for continued dialogue to propel the ideas and recommendations from this plan forward. **A champion is needed to promote the benefits of this plan, and partnerships with stakeholders will help this plan succeed.** In other cities, champions have been business, civic or religious leaders. For example, in Dallas the champion for transit service expansion was a member of the Hunt Family, which made its fortune in the oil business. In Charleston, South Carolina, the city's Mayor Joe Reilly had religious leaders come together to support a regional approach to transportation and the dedication of taxes to accomplish that goal. Typically, a champion should be someone who is respected and well known in the community, apolitical (meaning that the person is not strongly associated with politics but with community), and that the person has the time to dedicate to advocating for improving the quality of life.

Early action items, such as numbering Community Connector's routes and the creation of fixed infrastructure for bus stops can develop momentum to implement more of this plan. With potential ridership growth, funding through competitive grants and other sources, service improvements, particularly evening service, can enhance mobility for the greater Bangor community.

