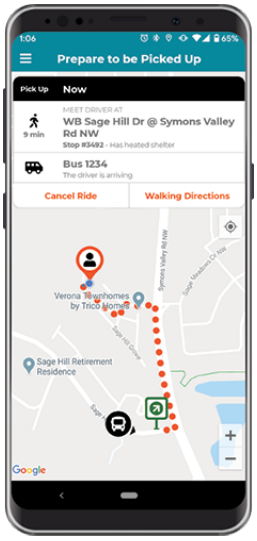
Microtransit Feasibility Study

September 2024



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September 2024

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The Whatcom Transportation Authority provides services and employment on a non-discriminatory basis, and complies with Section 504 of the Rehabilitation Act of 1973, Title VI of the Civil Rights Act, and the Americans with Disabilities Act of 1990. WTA also complies with the State of Washington Freedom from discrimination—Declaration of civil rights, RCW 49.60.030 To read these policies visit: http://www.ridewta.com/business/about-wta/non-discrimination and http://www.ridewta.com/getting-around/accessibility/ada

WTA provided cover and report images unless otherwise noted.

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KEY TAKEAWAYS

Microtransit is a flexible, appealing service option for riders but it comes at a significant cost to the agency.

1 Establish a Program
Implementing microtransit would require that WTA establish a new microtransit program to holistically address the staffing and programmatic needs of a new service type. Staffing this program would cost approximately $550,000 per year.

2 Significant Cost
For all potential microtransit zones analyzed, it would cost significantly more to provide microtransit service than it costs to provide fixed route services, even considering savings from removing fixed route service from the zones.

3 Operate In-House
Given WTA's experience operating the Lynden Hop and other efficiency and performance benefits of in-house operations, the study recommends that WTA operate future microtransit in-house.

SCORING

The nine identified microtransit zones were evaluated and scored using the following metrics:

- Existing Fixed-Route and ADA Service
- New Zone Cost
- Increased Boardings by Riders in Priority Populations
- Reduction of Vehicle Miles Travelled
- Connections to Existing Routes
- Cost per Boarding

Final Ranking:

1. Ferndale (83.3)
2. Blaine/Birch Bay (72.3)
3. Lynden (68.2)
4. Peaceful Valley/Kendall/Maple Falls (55.4)
5. Tweed Twenty/Silver Beach (48.7)
6. Yew St/Lake Padden (46.3)
7. Everson/Nooksack/Sumas (46.0)
8. Bellingham Waterfront Dist. (43.0)
9. Lummi Nation (38.2)

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Executive Summary

	Zone	Cost per Boarding	Peak Vehicles	Annual Cost*	Annual Ridership
1	Ferndale	$34.11	6	$2,287,500	67,063
2	Blaine/Birch Bay	$35.55	4	$1,434,000	40,347
3	Lynden	$35.49	6	$1,995,500	56,237
4	Peaceful Valley/ Kendall/Maple Falls	$35.15	2	$737,000	20,972
5	Tweed Twenty/ Silver Beach	$41.37	3	$1,182,000	28,462
6	Yew St/ Lake Padden	$54.88	2	$843,000	15,362
7	Everson/Nooksack/ Sumas	$38.99	1	$514,500	13,204
8	Bellingham Waterfront Dist.	$42.21	2	$916,000	21,715
9	Lummi Nation	$52.94	1	$514,500	9,705

* For comparison, the annual cost to operate Route 232, a GO-Line with 15-minute service, is $3.2 million with annual ridership of 376,000. The annual cost to operate Route 26 Lynden, is $1.5 million with annual ridership of 70,000. Also, the annual cost does not include the estimated $550,000 needed annually for support staff to operate a Microtransit Program.

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Project Background

After the completion of the Lynden Hop pilot microtransit service, WTA commissioned this Microtransit Feasibility Study to provide further information and analysis to inform potential, future microtransit service. This study evaluates potential microtransit service areas, but it does not evaluate microtransit services against other WTA needs and priorities – an effort that WTA may undertake before implementing new microtransit service. Further policy considerations are described in Chapter 4, under "Further Recommendations and Limitations." In addition to policy considerations, the efficiency and effectiveness of microtransit services may be evaluated in comparison to other service options.

This study was a collaborative project where the consultant team and WTA staff worked closely to determine where and when microtransit service could be effective within Whatcom County. The project team (Figure 2) comprised cross-department WTA staff who brought expertise in planning, operations, outreach, and technology. TMD and Transpo Group staff ("the consultant team"), who specialize in microtransit service development and implementation, provided further support to supplement WTA expertise. Where this document references the "Project Team" it refers to WTA staff, sometimes with support from the consultant team.

Figure 2: Project Team

WTA Staff	Consultant Staff
Tim Wilder, Planning Director	Gary Hewitt, Project Manager (TMD)
Mary Anderson, Senior Transit Planner	Heidi Ganum, Senior Project Manager (Transpo)
Becky Kelly, Transit Planner	Ankit Singh, Associate (TMD)
Malcom Duncan-Grave, Transit Planner	
Andrew Thompson, Dispatch Systems Coordinator	
Maureen McCarthy, Community & Government Relations Director	
Jamie Fairbanks, Operations Manager	
Shelly Davis, Paratransit Manager	
Josh Nylander, IT Director	
John Bender, Fleet Manager	
Audra Stiles, Grants and Revenue Manager	

WTA's Experience with Microtransit

In June 2021, WTA introduced the Lynden HOP on-demand van service in the City of Lynden. Riders could hail a ride anywhere in Lynden and could expect their van to arrive approximately 15 minutes after they made their request, taking them anywhere withing the zone. The service was operated by WTA staff using wheelchair accessible vehicles. The service was available to the general public from 7:15 a.m. to 7:30 p.m. on Mondays through Fridays, and 8 a.m. to 5:30 p.m. on Saturdays and Sundays. Eighty percent of the cost of the first year's operations came from a Federal Transit Administration "Integrated Mobility Innovations (IMI)" Grant.

The Lynden HOP pilot was discontinued in June 2024 because the service format was not financially sustainable and exceeded staff capacity to effectively manage the service. This was in part because HOP service was provided in addition to the existing fixed-route and ADA paratransit services within the City of Lynden. The HOP microtransit service was an additional 5,484 annual revenue hours of transit service and had a similar cost per hour as the ADA paratransit service. The HOP cost per boarding of $63.30 was also very high compared to the around $23 for fixed-route services, though less than $86.96 for ADA paratransit boardings. This study will include an analysis of the Lynden HOP zone and recommend options for service at a lower overall cost, including potential changes to the fixed-route and ADA paratransit services.

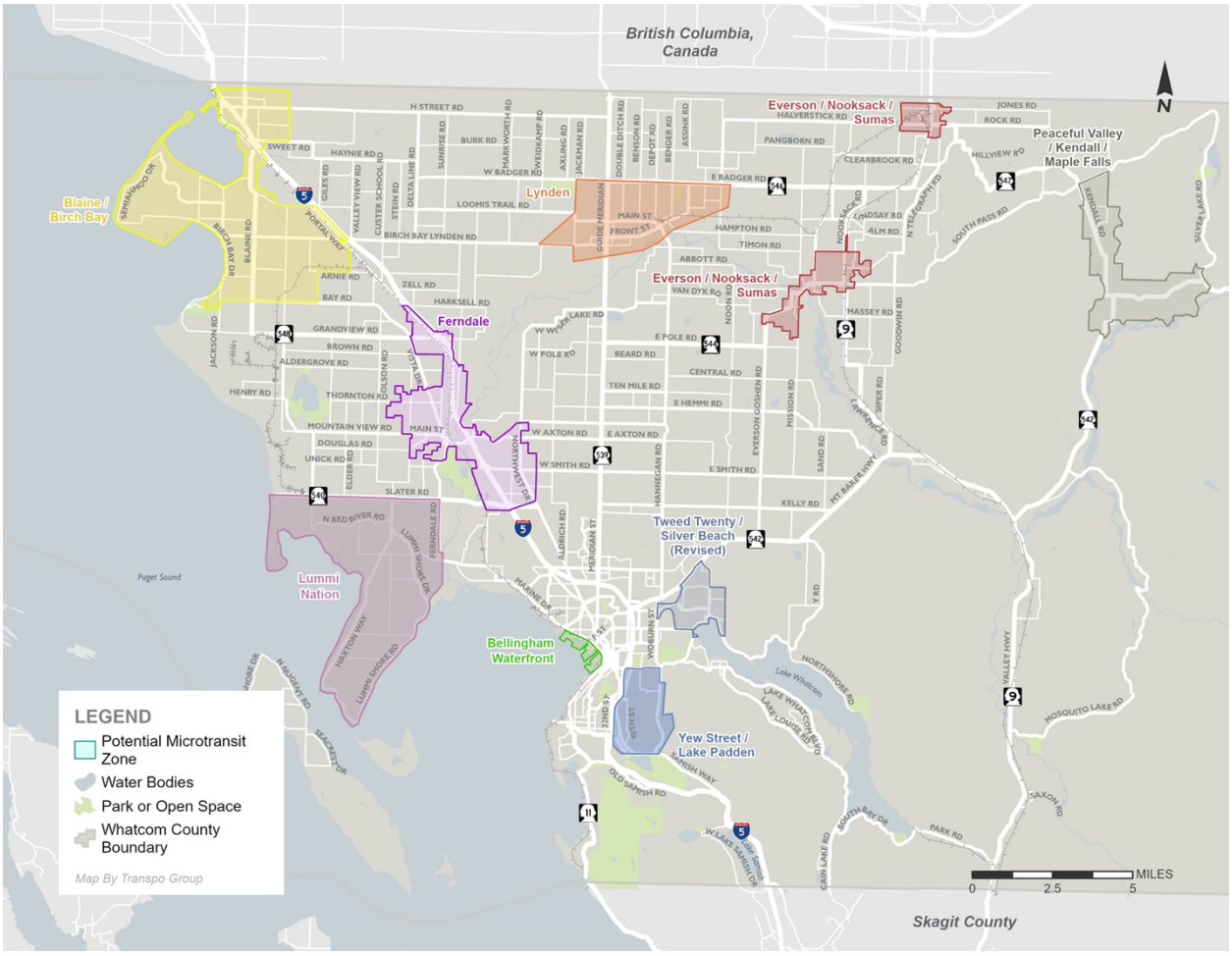
Identifying Future Microtransit Zones

The project team developed goals and objectives to help guide the identification of microtransit zones. These were developed to be consistent with broader WTA goals and the objectives of the since-ended Lynden pilot project and WTA 2040, WTA's long range transit plan. Ten zones were identified and were screened down to nine based on demographics and travel demand data. The final nine zones are described in Figure 3, and Figure 4 presents a map of the zones. The zones' operating parameters and potential changes to fixed-route service are discussed in the "Service Model and Technology" chapter.

Figure 3. Final Microtransit Zone Description

Zone	Description
Lynden	Zone boundaries would be the same as pilot project, minus the commercial area at Hannegan and Pole roads.
Ferndale	Includes the entire City of Ferndale, with additional pockets of residential and light industrial.
Blaine / Birch Bay	Includes most of the areas of Birch Bay and Blaine. Analyzed individual zones, but trip activity made one zone more logical.
Tweed Twenty / Silver Beach	Neighborhoods on east side of Bellingham with lower frequency fixed-route service.
Geneva / Sudden Valley	Neighborhoods east of Bellingham City limits with lower frequency fixed-route service.
Yew Street / Lake Padden	Neighborhood east of Lincoln St and south of Lakeway Dr. in Bellingham. Has existing fixed-route service which provides limited coverage.
Peaceful Valley / Kendall / Maple Falls	Rural communities in east Whatcom County currently served by limited fixed-route and Flex service.
Everson / Nooksack / Sumas	Includes most of the cities of Everson, Nooksack, and Sumas.
Bellingham Waterfront District	Zone analysis was based on future build out.
Lummi Nation	Zone would include the of Lummi Nation Reservation and extend to Slater Rd to the north and Ferndale Rd to the east. Analyzed on behalf of Lummi Transit.

Figure 4. Final Microtransit Zone Map



Service Model and Technology

Microtransit service models vary widely, with vendors able to provide a range of services from software to operations, depending on what the transit provider manages in house. The consultant team interviewed four peer agencies, each with different service models, to explore how their experiences could inform WTA's future microtransit operations. Based on peer interviews, research into service models, and resources and staff capacity available at WTA, the team recommends WTA manage and operate microtransit operations in house, using scheduling and dispatch software with a feature set that reflects the needs of WTA's different microtransit zones. The consultant team also interviewed two microtransit scheduling and dispatch software vendors, but this study does not recommend any specific vendor or product, only specific features.

Specific recommendations were made for the service parameters and metrics of the zones by typology. The zones were divided into "Local Urban" and "Small Cities / Rural" categories based on their development density and current WTA services. Parameters include recommended hours of operation, pick-up response times, and how

the service would pick up customers. The parameters and metrics are used for the modeling of ridership and costs in the "Service Evaluation" chapter.

It is also important to consider changes to existing fixed-route service when planning for new microtransit service. Microtransit should complement the rest of the transit system and not compete with it for riders since it is typically significantly more expensive to operate than fixed-route services. For each zone, the consultant team developed draft recommendations for WTA fixed-route changes that would support the addition of microtransit. These are included in each zone evaluation.

Microtransit Zone Evaluation

Nine microtransit zones were identified in this study. The project team developed metrics for evaluating the zones compared to one another and for ongoing service monitoring after implementation. Details on the metrics for each project goal / objective and an indexed score by zone and metric are provided. The metrics were weighted by the Project Team to calculate the total score for each zone shown in Figure 5.

Figure 5. Weighted Metric Scoring Summary

Zone	ADA and Fixed-Route Service per Capita after Implementation	New Transit Rides for Priority Populations	Connections to Existing Routes	Vehicle Miles Travelled Reduction	Cost per Boardings	New Zone Cost Ratio	Total Score
Weight	*10%*	*30%*	*10%*	*15%*	*25%*	*10%*	
Ferndale	2.7	30	5	14.5	25	6.1	83.3
Blaine / Birch Bay	8.4	18.9	2.5	15	24	3.5	72.3
Lynden	2.7	21.5	2.5	12.3	24	5.2	68.2
PV / Kendall / Maple Falls	3.2	18.3	2.5	4.6	24.3	2.5	55.4
Tweed Twenty / Silver Beach	2.3	9.5	7.5	4.6	20.6	4.2	48.7
Yew St / Lake Padden	1.4	6.8	10	2.6	15.5	10	46.3
Everson / Nooksack / Sumas	10.0	6.3	2.5	3.6	21.9	1.7	46.0
Bellingham Waterfront District	5.3	14.8	0	2	20.2	0.7	43.0
Lummi Nation	2.7	7.8	2.5	3.8	16.1	5.3	38.2

The Ferndale zone had the highest overall score of 83.3 points, followed by the Blaine / Birch Bay zone with 72.3 points. Lynden came third with 68.2 points, while the balance of the zones scores between 55.4

and 38.2 points. The Ferndale zone scored highest in the top two weighted criteria of new rides for priority populations and cost per boarding.

Recommendations

The consultant team recommends WTA prioritize further planning and analysis of Ferndale, Blaine/Birch Bay, and Lynden. The team further recommends that WTA operate microtransit service in house, with eventual transition to scheduling and dispatch software-as-a-service with more advanced microtransit features to support recommended service rules.

If WTA adds microtransit as a service option, it is recommended that a Microtransit Program be established. Additional staff will need to be brought on board to adequately manage the day-to-day operations and issues that may arise, including rider phone calls, software problems, vehicle maintenance, and dispatch calls.

Next Steps

Beginning in October 2024, WTA's Board of Directors will begin a six-month policy discussion. The goals are for the Board to understand the outcomes WTA can achieve through service, to identify Board priorities, and to direct staff by creating a service allocation policy. The Microtransit Feasibility Study will inform these discussions.

Chapter 1: Identifying Microtransit Zones

The purpose of this chapter is to summarize the process used to determine the microtransit zones to be evaluated in the WTA Microtransit Feasibility Study. The entire WTA service area was analyzed to determine potential microtransit zones. Ten locations were initially identified and screened down to nine based on an analysis of demographics and travel demand.

Goals and Objectives

The first step in the microtransit zone identification process was to develop overall goals and objectives for the potential service. The consultant team first reviewed the goals and objectives in WTA 2040, WTA's Long Range Transit Plan (Figure 6), which are used for developing transit service recommendations for the five-year Transit Development Plan.

Figure 6: WTA Long Range Transit Plan Goals

Goals
1: Be flexible, nimble, and innovative
2: Serve as a leader and a key partner in improving the equity and efficiency of local transportation
3: Improve accessibility and mobility for priority populations
4: Serve as stewards of the environment
5: Provide a range of services tailored to the communities we serve
6: Provide attractive, efficient, and financially sustainable services

WTA already has some microtransit experience based on the completed Lynden Hop pilot project, which started in June 2021 and ended in June 2024, as described in the "WTA's Experience with Microtransit" section of the Project Background. For this service, WTA developed the objectives shown in Figure 7, which were used during service design and for ongoing evaluation.

Figure 7: Lynden HOP Service Objectives

Objectives
• **Test whether an on-demand service could increase the effectiveness and usage of public transportation in a small city.**
• **Test the feasibility and scalability of operating an on-demand service entirely in house, with WTA drivers, customer service and dispatch, WTA-owned vehicles, and WTA-managed technology.**
• **For the per trip cost to be the same, or ideally less than, the cost to provide a Paratransit trip.**

The consultant team developed draft goals and objectives for this feasibility study, which were refined by the project team. Figure 8 outlines the goals and objectives that were used to identify potential zones and develop evaluation criteria.

Figure 8: Final Microtransit Service Goals and Objectives

Microtransit Service Goals and Objectives
1. Improve Accessibility • Enhance local mobility for areas not served well by traditional fixed-route transit • Improve transit access for priority populations
2. Integrate with Transit Network • Grow transit ridership by extending access to key transit corridors • Environmental stewardship
3. Efficient Service Delivery • Provide cost-effective service compared to existing fixed-route and paratransit services
4. Service Equality • Provide comparable service experience to existing fixed-route and paratransit service

Identification of Potential Zones

The next step in the process was to develop an exhaustive list of where WTA could consider providing microtransit service in Whatcom County. WTA provided the consultant team with an initial list of six locations, based on previous work by WTA planning staff. The consultant team then developed four additional zones based on the following factors:

- Areas where WTA can streamline fixed-route service, yielding resources that can be used for microtransit.
- Areas that are currently not adequately served by public transit service.

Zone boundaries which consider trip patterns and geographic boundaries. Examples include trips within a city and zones which allow for making trips to various destinations. Figure 9 represents the initial zones.

Figure 9: Initial Potential Microtransit Service Zones

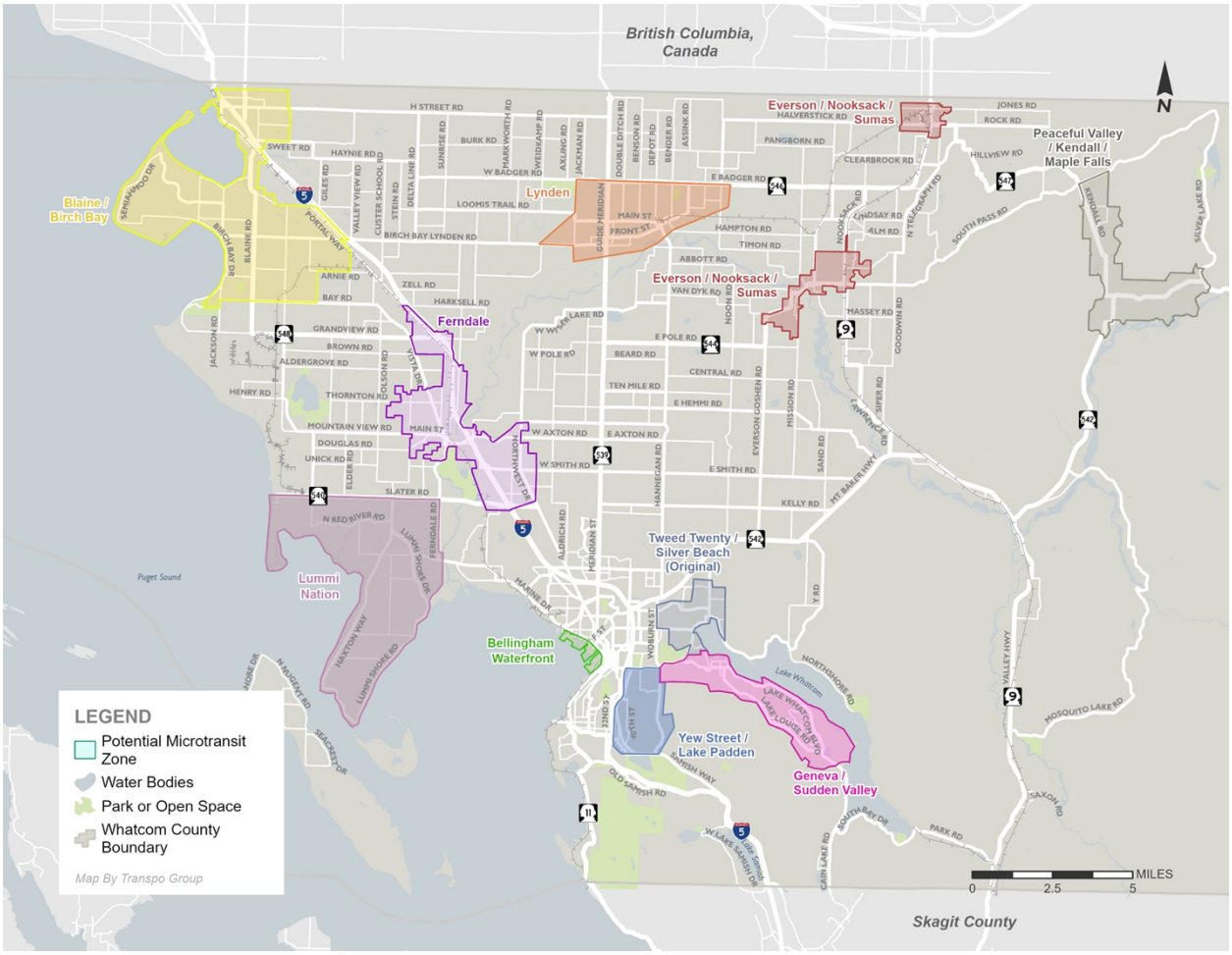


Figure 10: Potential Microtransit Zones

Zone	Description
Lynden	Zone boundaries would be the same as HOP pilot project, minus the commercial area at Hannegan and Pole roads. Potential to cut back Route 26 to Lynden Station.
Ferndale	Includes the entire City of Ferndale, with additional pockets of residential and light industrial. Potential to streamline Routes 27 and 75.
Blaine / Birch Bay	Includes most of the cities of Birch Bay and Blaine. Analyzed individual zones, but trip activity made one zone more logical. Potential to streamline Route 75.
Tweed Twenty / Silver Beach	Neighborhoods on east side of Bellingham with lower frequency fixed route service. Potential to cut back Route 525 and 540.
Geneva / Sudden Valley	Neighborhoods southeast of Tweed Twenty / Silver Beach with lower frequency fixed-route service. Potential to cut back Route 512.
Yew Street / Lake Padden	Neighborhood east of Lincoln St and south of Lakeway Dr. Has existing fixed-route service which provides limited coverage based on spacing and topology. Zone could replace Route 533.
Peaceful Valley / Kendall / Maple Falls	Rural communities in east Whatcom County currently served by limited fixed-route and Flex service. Potential to cut back Route 72X to library.
Everson / Nooksack / Sumas	Includes most of the cities of Everson, Nooksack, and Sumas. Potential to cut back or eliminate Route 71X. Could provide service connecting to Route 26 in Lynden or at Pole Rd.
Bellingham Waterfront District	Zone analysis was based on future build out. Could make sense as a way to provide transit service connecting the Waterfront District to the rest of the system.
Lummi Nation	Zone would include the Lummi Nation Indian Reservation and extend to Slater Rd to the north and Ferndale Rd to the east. Analyzed on behalf of Lummi Nation Transit.

Draft Zone Screening

After identifying the ten draft zones, the next step was to perform an initial screening of the draft zones based on demographic and high-level demand data. This data-driven process considered the following qualitative factors to ensure clear and comparable data were being used.

- Population: Total persons living in each zone based on 2020 Census data.
- Jobs: Total jobs in the zone based on Census Longitudinal Employer-Household Dynamics (LEHD) data.
- Weekly Internal Trips per Sq Mile: Estimated internal trips within the zone greater than .5 miles, normalized by square miles. This data is from Replica, a location-based service provider, and includes all trips, not just ones currently using transit.
- Average Trip Length: Average length of trips within the zone based on Replica data. Zones with either very short or long trips may not be a good fit for microtransit.
- Weekly Transit Service Supply: This is calculated based on how many times the existing WTA bus system provides service to each bus stop and how many ADA paratransit boardings are in each zone. This is used to determine the current transit investment in each zone compared to the population.
- Priority Population Percentages: The consultant team also looked at the percentages of minority, low-income, persons with disabilities, seniors, and zero-car households living in each zone based on Census data. WTA identified these populations as a priority for transit service, and they have a higher propensity to use public transit.

Figure 11 presents these demographic and demand statistics. The Lynden zone had the highest internal trip activity; however, this zone also had the highest amount of existing transit service. The Ferndale zone had the second highest internal trips. Blaine / Birch Bay had high internal trips, and the trip lengths were longer because of the zone size and lack of local destinations. The Geneva / Sudden Valley zone had high levels of transit service relative to population and lower internal trip demand. The Tweed Twenty / Silver Beach zone, Peaceful Valley / Kendall / Maple Falls zone, and Everson / Nooksack / Sumas zone had low internal trips. The Lummi Nation zone had a moderate level of internal trips and moderate transit service levels. The Bellingham Waterfront District zone had low existing trips and population, but as noted earlier, the consultant team evaluated this zone based on future build out of the approved development in this area.

Figure 11: Draft Zone Demographic and Demand Statistics

	Lynden	Ferndale	Blaine - Birch Bay	Tweed Twenty - Silver Beach	Geneva - Sudden Valley	Yew Street - Lake Padden	Peaceful Valley - Kendall - Maple Falls	Everson - Nooksack - Sumas	Bellingham Waterfront District	Lummi Nation
Population	16,230	17,640	16,209	8,757	10,693	9,998	4,075	5,856	119	5,744
Jobs	5,787	7,043	3,485	1,304	482	671	133	1,368	1,062	1,955
Weekly Internal Trips per Square Mile	19,391	15,107	6,387	13,408	7,388	7,213	2,633	6,690	950	1,498
Average Internal Trip Length (miles)	1.9	1.9	3.3	1.4	1.9	1.5	1.9	2.4	0.8	3.5
Weekly Fixed-Route Service Supply (trips by stop)	5,475	5,766	1,788	3,409	5,155	6,223	1,200	546	0	1,972
Weekly ADA and Zone Boardings	175	288	4	128	72	329	0	0	21	31
Low-Income Population (Poverty)	6%	8%	11%	6%	4%	13%	46%	9%	24%	15%
Minority Population	22%	30%	22%	19%	18%	22%	24%	31%	31%	62%
Disabled Population	12%	12%	17%	11%	9%	12%	18%	15%	15%	18%
Seniors	19%	16%	25%	17%	22%	17%	15%	15%	13%	17%

Final Zone Recommendations

The project team refined the zones down to nine based on practicality of microtransit service and initial screening. The project team removed the Geneva / Sudden Valley zone from consideration because of the low trip demand and because it was not feasible for riders to transfer between the microtransit and fixed-route service.

Figure 12 represents the final nine zones that the project team selected for evaluation. More detailed maps of each of the zone boundaries and existing transit services are shown on the following pages.

Figure 12: Final Microtransit Zones Evaluated

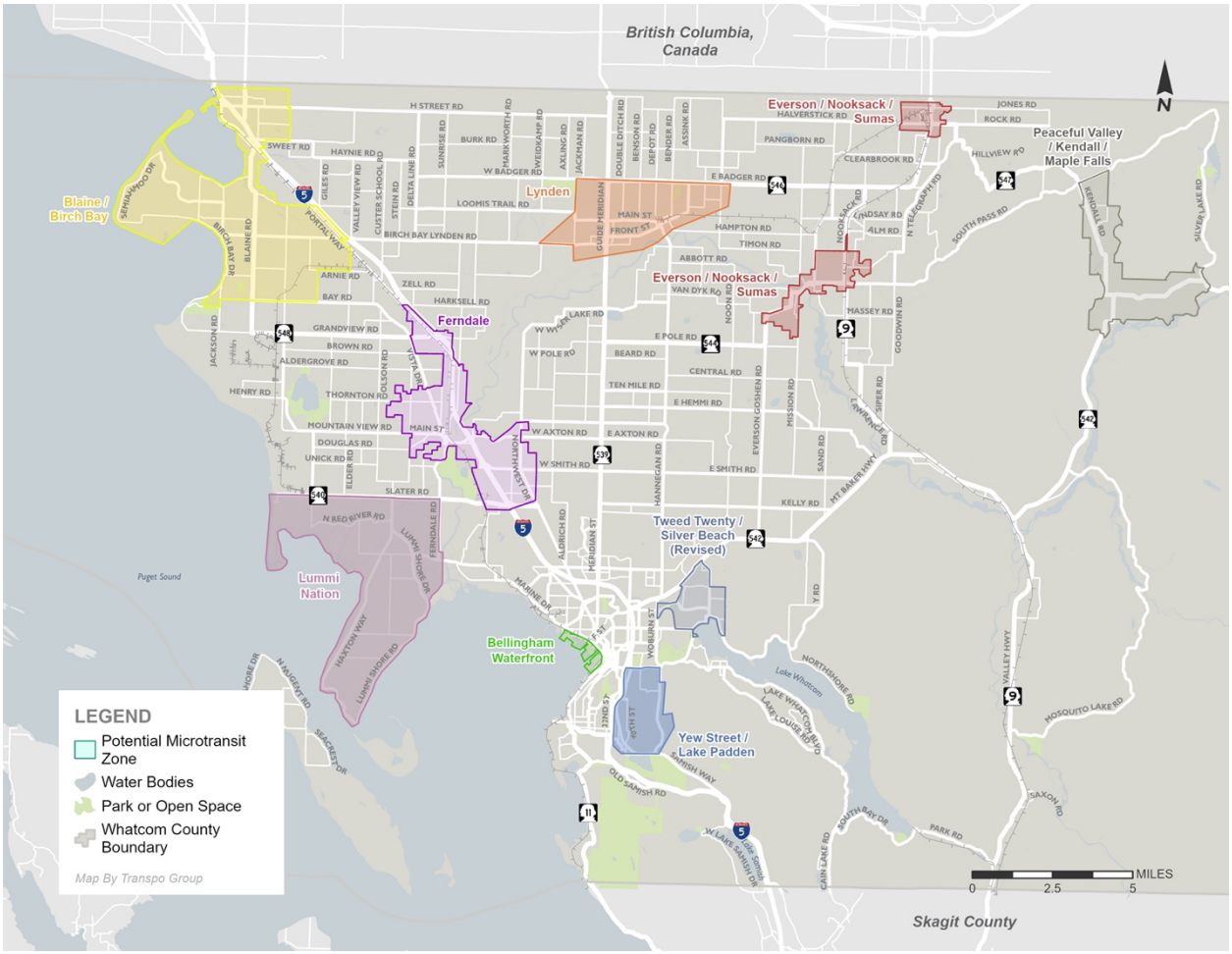


Figure 13: Lynden Zone

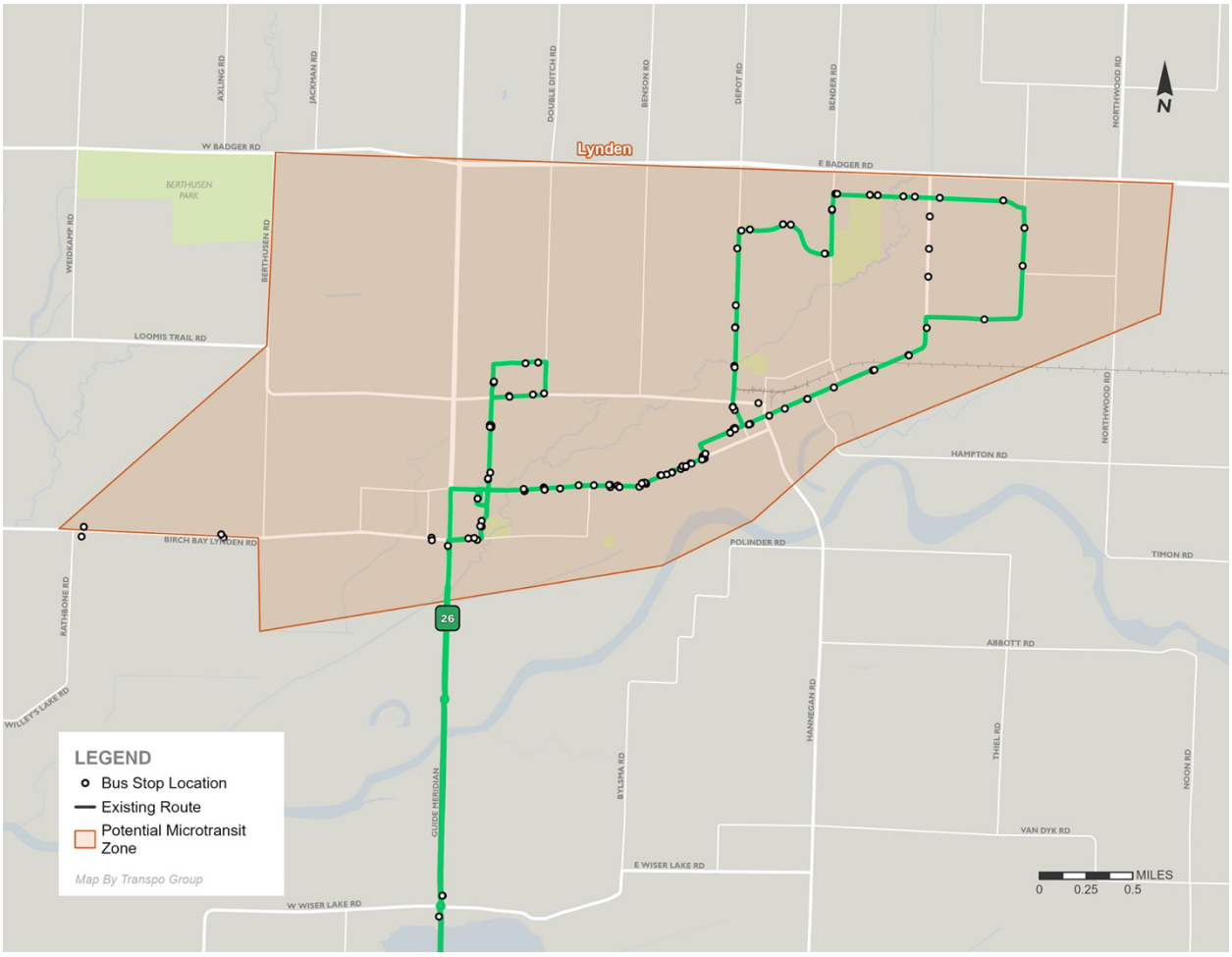


Figure 14: Ferndale Zone

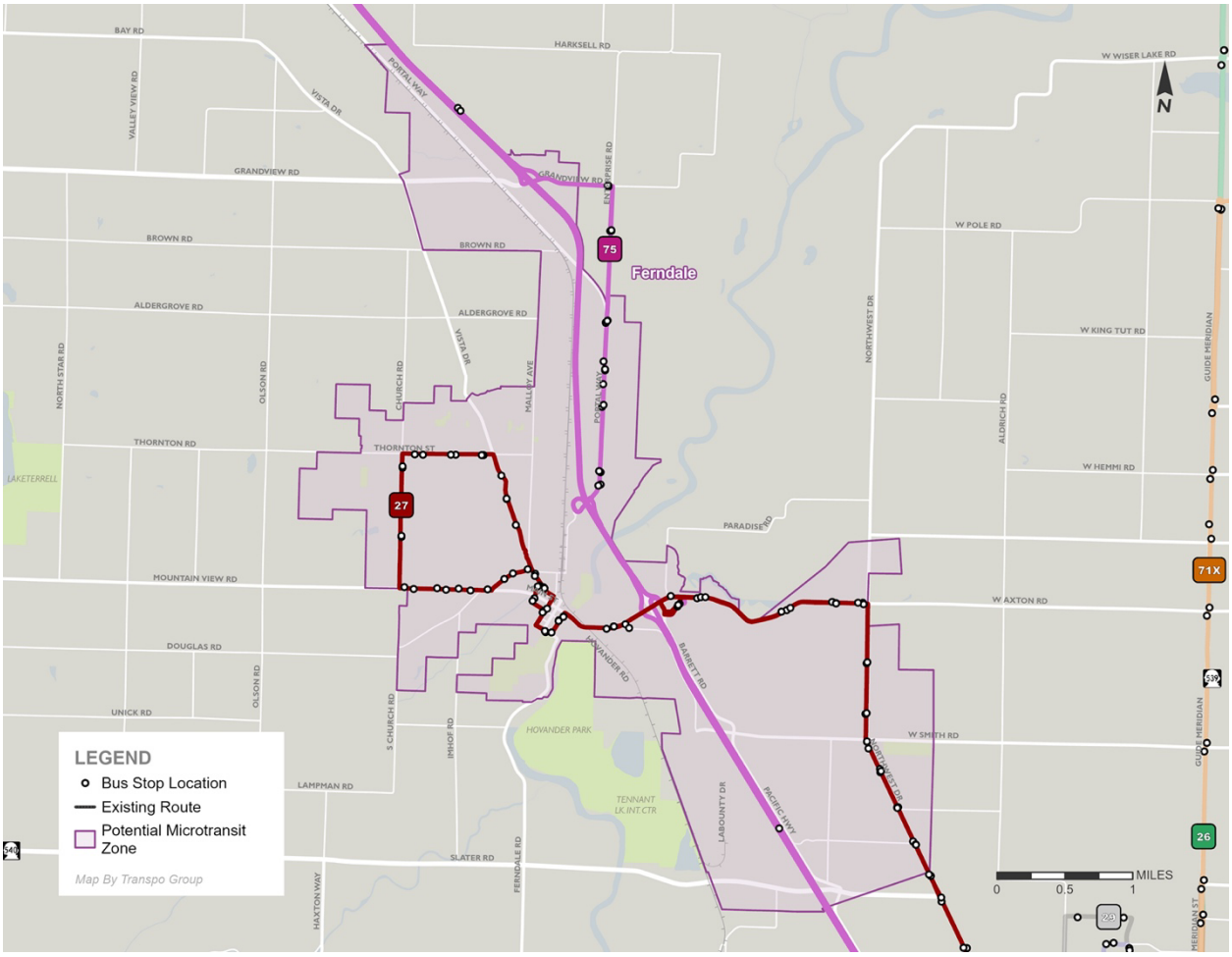


Figure 15: Blaine / Birch Bay Zone

Figure 16: Tweed Twenty / Silver Beach Zone

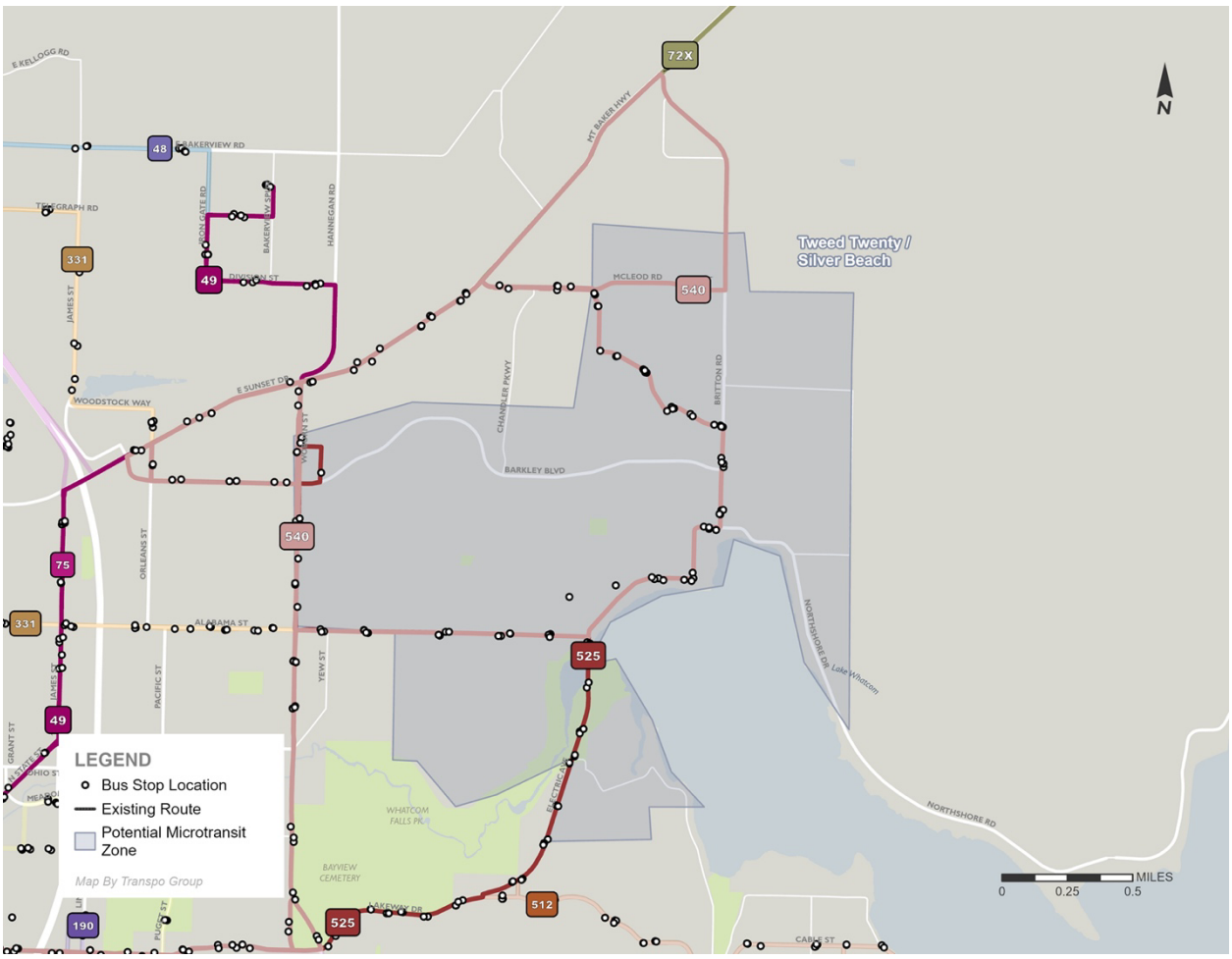


Figure 17: Yew St / Lake Padden Zone

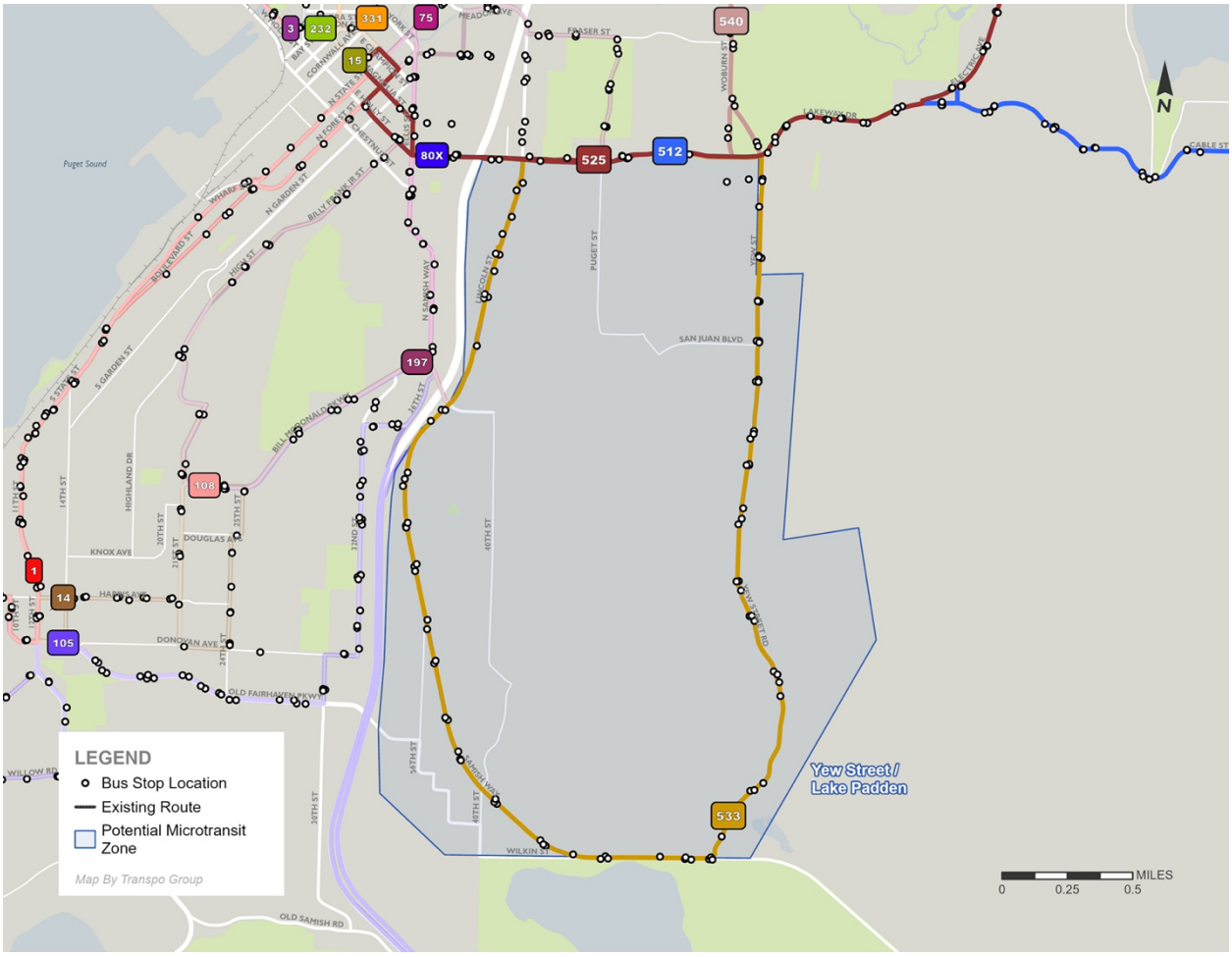


Figure 18: Peaceful Valley / Kendall / Maple Falls Zone

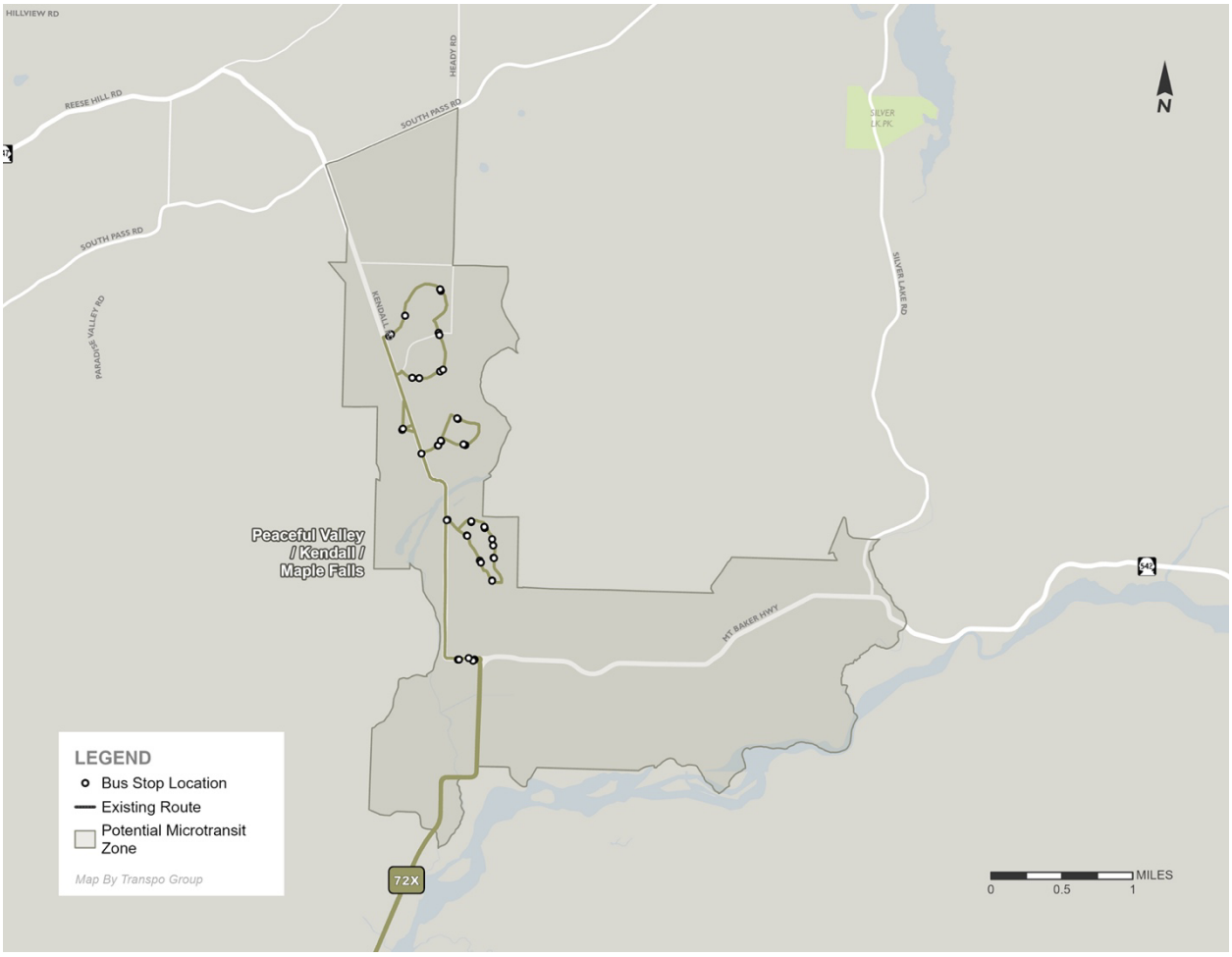


Figure 19: Everson / Nooksack / Sumas Zone

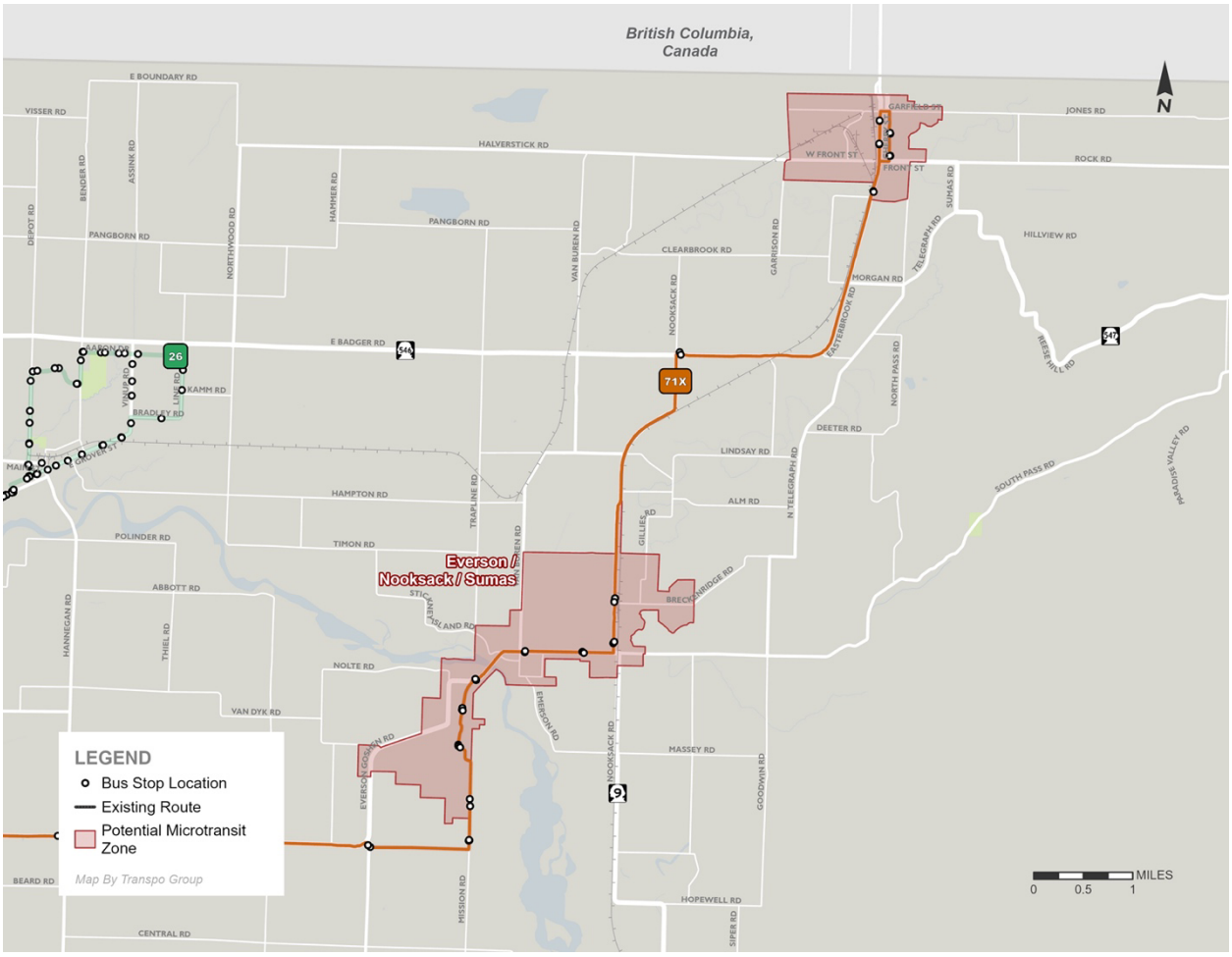
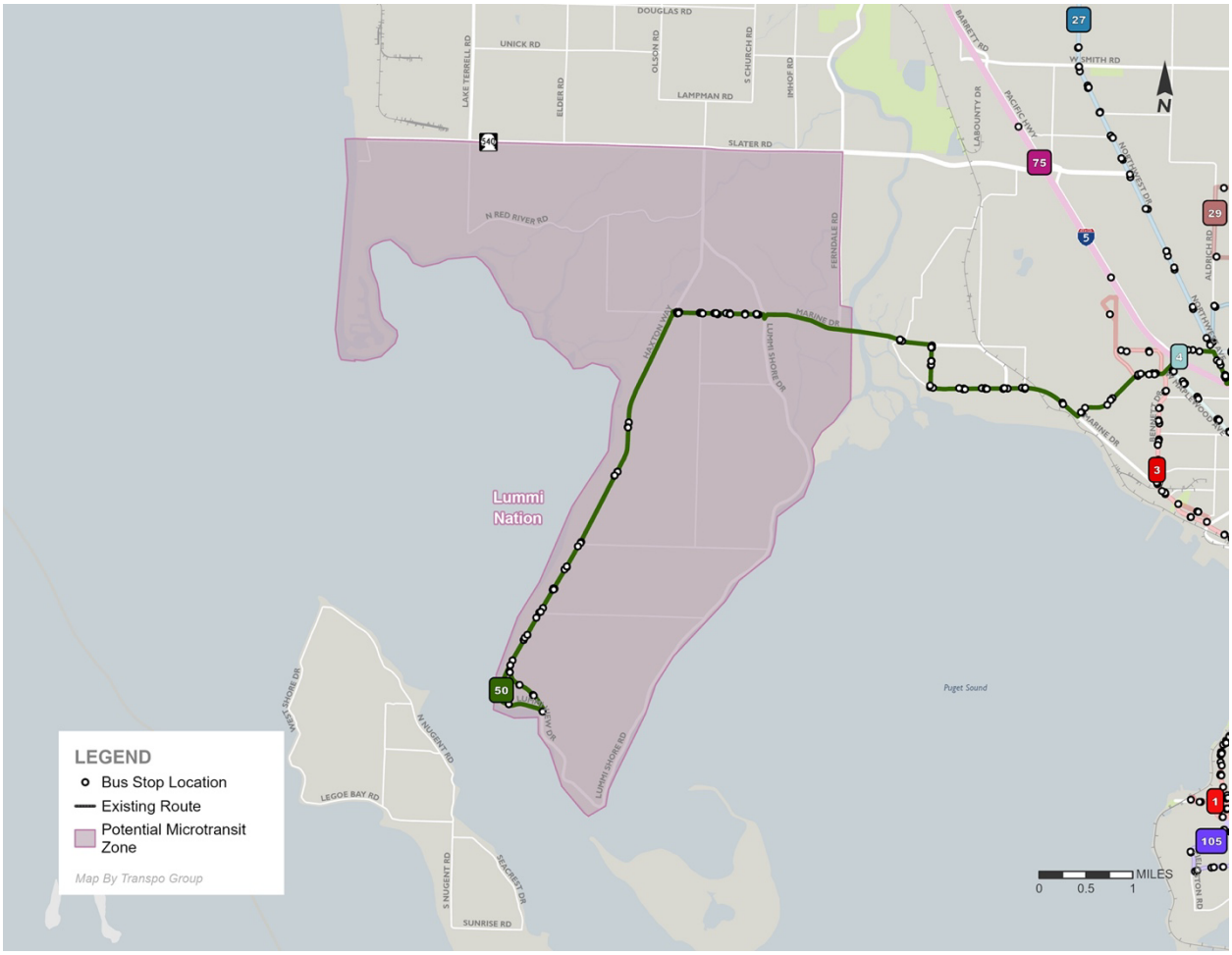


Figure 20: Bellingham Waterfront District Zone

Figure 21: Lummi Nation Zone



Chapter 2: Service Model and Technology

To better understand the options available, and the effectiveness of those options, the project team identified potential service models and peer agencies that represented a diversity of service models. The consultant team interviewed microtransit software-as-a-service (SaaS) vendors. In addition, the team examined existing research about system costs, particularly costs per passenger trip, where available, and identified factors shared by systems with lower costs. During this exploration, the team also investigated the ranges of fares charged by the systems and how they integrate microtransit services with fixed route services.

Specific recommendations were then made for the service parameters and metrics of the zones by typology. The zones were divided into "Local Urban" and "Small Cities / Rural" categories based on their development density and current WTA transit services. Parameters include recommended hours of operation, pick-up response times, and how the service would pick up customers.

It is also important to consider changes to existing fixed-route service when planning for new microtransit service. The project team developed draft recommendations for changes to the WTA routes in each zone that would support the addition of microtransit and were included in the zone evaluation.

Potential Service Models

There are dozens, if not more, of service models for how transit agencies provide transit services to riders, sometimes with multiple models in action at one agency. Though some features of microtransit service are distinct from more traditional transit services, the essential functions needed to deliver service are the same as those needed for other forms of demand-response transit:

- Reservations
- Scheduling
- Dispatching
- Service-Day Rider Calls
- Operations
- Vehicle Provision
- Facility Provision

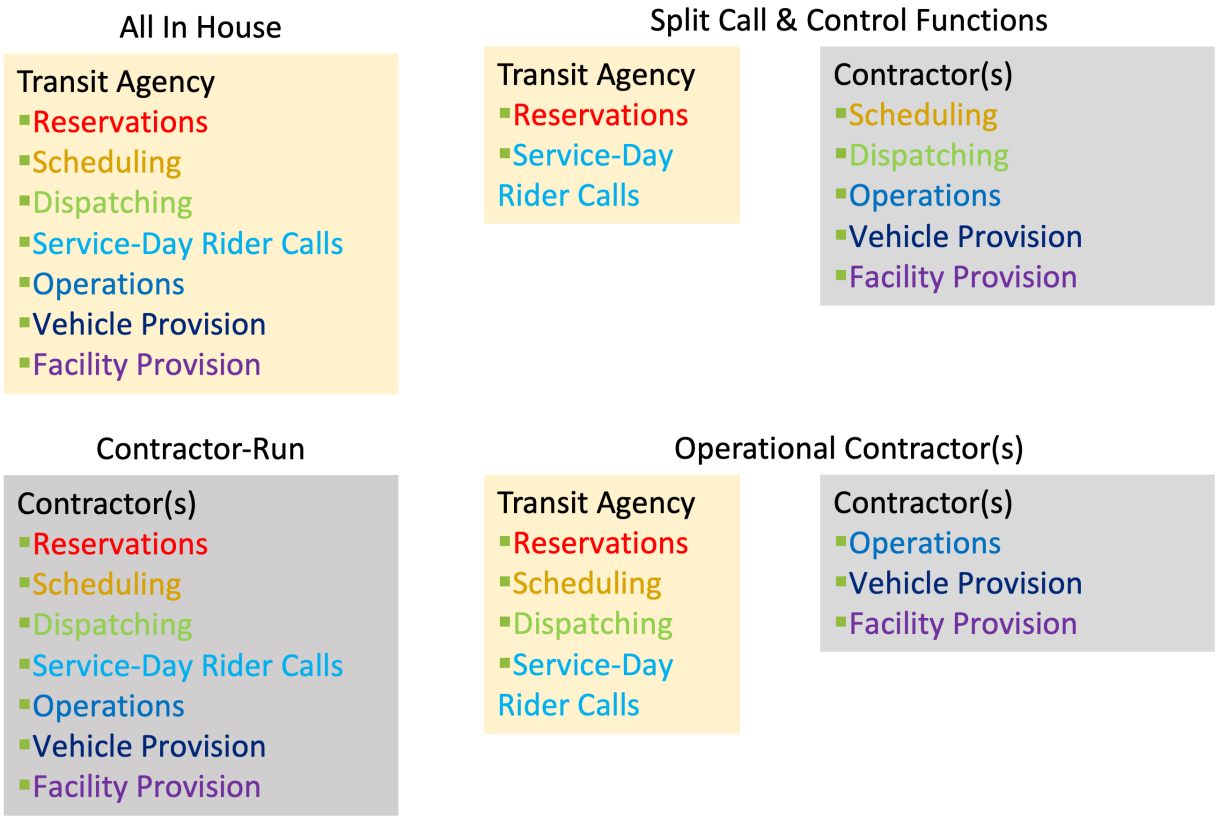
These functions are the most relevant to WTA but are not exhaustive of all potential microtransit services functions. Several additional functions are noted in the Peer Review section. Some key additional functions include program administration, rider eligibility determination, customer complaint, lost and found management, and vehicle maintenance.

Initially, as shown in Figure 22: Microtransit Operating Models Examined, models explored with WTA were:

- All in house (transit agency completes all the functions),
- Contractor run, may also be referred to as turnkey (contractor completes all the functions),

- Operational contractor (transit agency completes the reservations, scheduling, dispatching, and service-day rider calls; contractor completes the operations, vehicle provision, and facility provision), and
- Split call & control functions (transit agency completes the reservations and service-day rider calls; contractor completes the scheduling, dispatching, operations, vehicle provision, and facility provision).

Figure 22: Microtransit Operating Models Examined[1]



During steering committee and project team meetings, WTA requested that the language 'turnkey' not be used to describe models where a contractor handles all listed functions, because the word suggests a negligible level of transit agency involvement that, in examining peer experiences, may be inaccurate. For the rest of the Chapter, "contractor-run" is used in place of "turnkey."

Besides the four models described above, WTA was interested in learning more about user-side subsidy programs where the transit agency works with a third party or directly with the rider to subsidize transportation services provided by third parties.

[1] Adapted from National Academies of Sciences, Engineering, and Medicine. 2022. ADA Paratransit and Other Demand-Responsive Transportation Services in Small to Midsized Transit Agencies. Washington, DC: The National Academies Press. https://doi.org/10.17226/26509.

Operation Models

The following section describes and summarizes each microtransit operation model. Summaries include key challenges and benefits of the model, including those related specifically to WTA's operations. No matter the model, the agency's performance measures should inform how the agency establishes and provides microtransit services, and for models with contractor-managed functions, the contract should reflect these measures through incentives and penalties. Regardless of which operation model is implemented, WTA would need to establish a Microtransit Program, with, at a minimum, a dedicated manager to oversee the program.

All In House

In this model, common for small and mid-sized agencies, the transit agency handles all functions. This model has higher costs compared to the others, often because of the cost of staff wages and benefits. This model allows the agency to leverage the 80/20 federal match for capital, unlike in models where the contractor handles the fleet provision.

Keeping all the microtransit functions in-house gives the agency more control over the fleet (capacity, mix of vehicles, seating, retirement, etc.), allows the agency to move more quickly to respond to needed service changes and balance service with demand, and to cross-train drivers across services. This model reduces the need for extensive procurement and oversight resources.

Depending on the cost of services, these benefits may outweigh or balance out the potential higher cost of services. Some agencies may use the all-in-house model out of necessity if there are limited private/contracted options in the area. An in-house model would require hiring additional staff to adequately support the program. The likely staff needed would be a Microtransit Manager, a Customer Service Representative, a Dispatcher, a Dispatch Systems Coordinator (or IT Applications Administrator), and a Fleet Maintenance Technician. All-in-house is the model that peer agency C-TRAN (Vancouver, WA) uses for their microtransit service. While a contracted service provider runs Citibus (Lubbock, TX), the provider essentially acts as the transit agency, making this model the one that most closely represents the Citibus model.

Contractor-Run

This model has lower costs than the others, due in part to lower wages and benefits for personnel, particularly drivers. This model requires more significant agency investment in procurement, coordination, and oversight and provides the agency with less control over the quality of services (even with contractual performance incentives). Agencies often still manage some aspects of the microtransit services, such as rider eligibility (where relevant) and complaint management.

Benefits of this model, besides lower cost, depend on the contracted services. Agencies can reduce procurement efforts and increase stability by signing longer-term contracts, but shorter-term contracts allow for more flexibility to respond to changes in the market or poor performance by the contractor. Where there is sufficient demand for more than one contracted service provider, allowing multiple contractors may introduce more competition and better rates, but this will also require more oversight by the agency. The microtransit service may benefit from the contractor's singular focus, allowing them to ensure dedicated staff and resources to the service (without reducing service to account for other needs across the agency) and to understand and resolve microtransit service concerns more rapidly. However, that singular focus also reduces the contractor's ability to

diagnose and resolve issues of a more integrated nature, for example, the impact that microtransit service is having on other services.

This is the model that peer agency Ben Franklin Transit (BFT) uses for their microtransit service.

Operational Contractor

One of the two hybrid approaches examined, in the operational contractor model, the agency has control over reservations, scheduling, dispatch, and same-day rider calls, while the contractor has control over operations and vehicle and facility provision. In this model, agency control over the scheduling and dispatch software allows for a smoother transition to a new operational contractor, if needed. The agency also has more control over the relationship with the rider, and the cost is lower than the all-in-house model, due to the cost of driver wages and benefits. The agency may also benefit from a contractor's expertise in providing service in diverse environments.

Another version of this model includes the contractor leasing vehicles from the transit agency so that the agency could still leverage the federal match for capital purchases.

With functions split between at least two organizations, this model may introduce challenges associated with the drivers being employed by contractor but day-to-day answering to agency. The agency will need to build strong communication and conflict resolution processes. A similar challenge exists in the next model described, split call and control. Compared to the split call and control model, though, in this model, the agency has more control over the balance between service quality and cost efficiency. None of the peer agencies interviewed currently use this model.

Split Call & Control

The other hybrid approach examined, the split call and control model, limits the agency functions to reservations and same-day rider calls. This allows the agency to maintain some control over the rider relationship but less control over on-time performance now that the contractor is in control of scheduling, dispatch, and operations. This model is lower cost than the operational contractor model. None of the peer agencies interviewed currently use this model, though FAST's hybrid model comes closest.

Other Hybrid Models

Because of the many required functions for microtransit and the growing number of service providers offering microtransit services, there are many ways a transit agency can combine contractor-run and agency-run functions. Peer agency FAST represents a model not yet discussed, where the transit agency provides some customer service functions and provides the vehicles, vehicle maintenance, and facilities, while the contractor handles all the other functions.

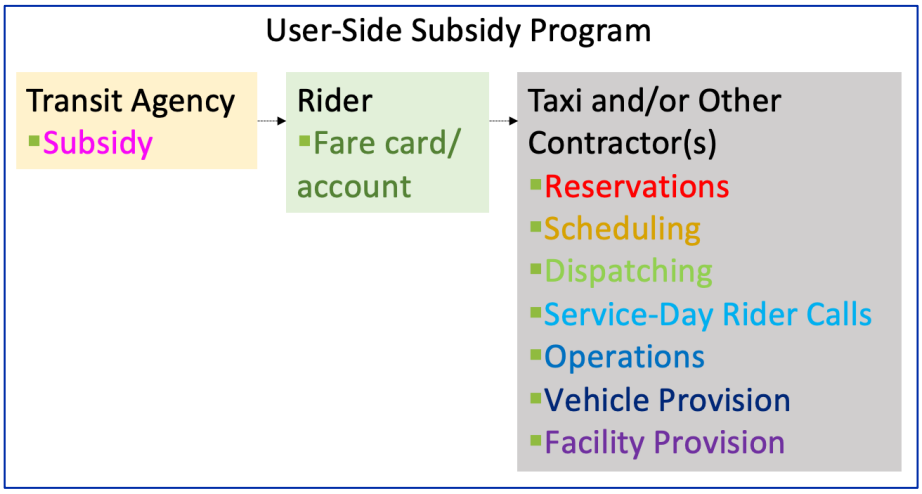
User-Side Subsidy

The transit agency can structure a user-side subsidy, shown in Figure 23, in different ways. The fundamental characteristic of this model is that the transit agency subsidizes the rider's use of other private services. Local taxi companies, transportation network companies (TNCs, such as Uber or Lyft), or other specialized transportation providers may provide these services. The transit agency may subsidize the rider directly or may contract with the transportation service provider. The transit agency benefits from reduced capital and staffing costs and can set subsidy caps or eligibility requirements to control program costs. For example, the agency may choose to:

- provide a fixed subsidy per ride, with the rider responsible for the remainder of the cost of the ride,
- cap the number of trips for which a rider is eligible for a subsidy,
- contribute a fixed amount of funding to a rider's account per month,
- limit eligibility of the subsidy to specific population groups (such as older adults or people with low incomes) or distribute voucher codes through specific community partners, or
- a combination of multiple funding and cost capping mechanisms.

In a recent study of ADA paratransit and other on-demand transit services, researchers found that "in most cases, the transit agencies use existing taxis already serving the community."[2] None of the peer agencies interviewed currently use this model.

Figure 23: User-Side Subsidy Functions



In this model, the agency will need to consider ADA service equivalency and driver screening and drug and alcohol testing requirements from the service providers. The study previously mentioned notes that one solution transit agencies have used is to lease one or more wheelchair accessible vehicles to the provider for a nominal fee. From the FTA, with respect to the drug and alcohol testing requirements for taxi providers:

> "**What is the taxicab exception, and when does it apply?**
>
> In general, when a public transit passenger randomly chooses from among a number of taxicab companies providing service, the testing regulations do not apply. The rationale for this is the practical difficulty of trying to administer a drug and alcohol testing program in connection with multiple companies. An example of this scenario is a guaranteed ride home program, in which

[2] National Academies of Sciences, Engineering, and Medicine. 2022. ADA Paratransit and Other Demand-Responsive Transportation Services in Small to Midsized Transit Agencies. Washington, DC: The National Academies Press. https://doi.org/10.17226/26509.

the transit agency contracts with multiple (two or more) taxicab companies in the area and a passenger may choose which taxicab company to contact to get a ride home."[3]

"**When does the taxicab exception not apply?**

The taxicab exception does not apply when a passenger does not choose the taxicab company providing the service. For example, many ADA paratransit agencies contract with taxicab companies and other entities to provide ADA paratransit service to ambulatory passengers. In those situations, when the ADA paratransit provider (not the passenger) contacts the taxicab company to schedule the ride, the drug and alcohol rules apply to the taxicab company providing the service. Similarly, if a public transit agency provides vouchers to passengers to use for one taxicab company, the passenger does not have a choice of which company to contact, so the drug and alcohol rules apply."[4]

Having multiple providers to choose from may be a limiting factor for WTA based on the lack of local taxi services; depending on the level of subsidy provided by WTA, induced rider demand may make taxi provision more financially attractive in the future. ADA requirements apply to general public demand-response service, including user-side subsidies of taxi or TNC services. For example, accessible vehicles must be available, and ADA-eligible passengers must be provided with the same level of service as the general public (e.g., ADA passengers should not have to wait longer for or be charged more for a trip).

In Galveston, TX (population 53,695 in 2020), Harris County Transit provides a user-side subsidy program that is described in detail in the previously mentioned study. The program provides an example of the flexibility and requirements of user-side subsidy programs, so the study's description of Harris County RIDES follows:

"Harris County RIDES is a 24/7 taxi subsidy program for Harris County residents who are seniors or have a disability and who are not in Houston METRO's service area. Service is available for nonemergency trips to anywhere within the county. Two types of service are offered:

- A shared-ride, advance-reservation service, which has a distance-based fare structure
- An on-demand service with the fare based on the regular taxi meter

The distance-based fare structure, with fares based on specific mileage ranges, generally offers about the same fare for a taxi and shared ride until 12 miles, after which the fares are lower.

Three carriers participate in the program, all of which operate WAVs in a nondedicated fashion: Yellow Cab, St. Anna Tender Care, and A New Haven (the latter two being small- business operators).

Riders request service from one of the three carriers and pay the metered fare using HCT's loadable EZTransport fare card that riders get upon registering for the program. The subsidy comes into play whenever a rider loads money onto the card; at that point, HCT matches the amount the rider loads. Therefore, if the rider loads $30.00, HCT loads an additional $30.00.

[3] https://www.transit.dot.gov/what-taxicab-exception-and-when-does-it-apply
[4] https://www.transit.dot.gov/when-does-taxicab-exception-not-apply

There is no limit to the amount a rider can load onto the card. Riders are in effect responsible for only half the fare.

Based on the October 2019 ridership, RIDES provided 63,000 trips in 2019 at a unit subsidy per trip of $11.00."

Other Considerations

There are several other considerations within the functions that may influence which model best suits an agency's needs.

Uniform service versus family of service

Providing fewer services with similar business rules can be simpler for riders to understand and for the agency to manage, but the agency may miss out on other efficiencies and opportunities to better meet rider needs. For example, if all services are available during the same operating hours, riders do not need to track different availability of the services, but the agency may miss out providing different services to meet different demands across the day.

Co-mingling with paratransit

Using the same vehicle and driver resources for ADA paratransit-eligible customers and the general public may create efficiencies but requires robust scheduling and dispatch processes and careful reporting. Because paratransit services are door-to-door, mixing paratransit customers and the general public may impact wait time and trip time for non-paratransit customers unless the scheduling and dispatch algorithm is advanced enough to account for those issues.

Dedicated versus non-dedicated service vehicles

Using non-dedicated service vehicles may reduce capital costs and create efficiencies, but the use of non-dedicated vehicles may cause confusion for riders and has the potential to cause inconsistencies in vehicle maintenance and upkeep.

Ambulatory versus non-ambulatory trip needs

Because it is cheaper to provide trips for ambulatory passengers, an agency may reduce overall program costs by including sedans or other vehicles that are not wheelchair accessible in the fleet. This approach will also introduce a need for robust scheduling and dispatching processes and careful reporting, like that required for co-mingling, to ensure that ADA-eligible riders are receiving equivalent service.

Overflow potential

Whether an agency chooses a contractor for microtransit operations, the agency may choose to contract overflow trips to a contractor. These trips may be those that the agency cannot otherwise fulfill or trips that the agency can more productively fulfill by contracting out. This type of mechanism can allow the agency to issue fewer trip denials and potentially increase productivity by reducing the number of transit vehicles making long distance trips that reduce key performance measures.

Service Model Summary

There are multiple microtransit service models available for WTA's consideration, including many other hybrid models not described in this study. Key factors that differentiate the models include cost of providing the service, control over service quality, agency experience with and capacity for procurement and oversight, and market factors influencing the attractiveness of a potential service contract.

Peer Review

The interviews provide insight into different options for microtransit and lessons learned by implementing those options.

The project and consultant team worked together to identify peer agencies to interview related to their microtransit operations. The factors that WTA considered in peer identification included:

- Is the agency a National Transit Database (NTD)-identified peer?
- Do the peers represent a mix of agencies based in and out of Washington?
- Do at least half of the peers co-mingle ADA and general public riders in their microtransit service?
- Do the peers use a mix of operating models?
- Among the peers, are several software vendors represented?

Based on these factors, WTA chose four agencies for the peer review (in addition to WTA). After several attempts to contact one of the selected peers, that agency was removed from the list. Descriptions of the remaining four peer agency microtransit programs follow. The consultant team asked each agency about their services, fare payment, operations, technology and software, cost, performance, and lessons learned.

Ben Franklin Transit

Ben Franklin Transit (BFT) provides transit service in Benton and Franklin Counties in southeastern Washington. BFT launched their microtransit service in April 2020, allowing the agency to disperse ridership across vehicles when BFT had to limit fixed route capacity.

Figure 24 shows the BFT microtransit service area. Before BFT introduced microtransit, a local taxi company provided Sunday night and taxi feeder service; this company went out of business unexpectedly. When BFT released an RFP to replace those services, BFT requested a service option that would also be more accessible and innovative, including trip-planning through an app. While local taxi companies submitted proposals, Via was the only proposer that could address the app-based trip planning request.

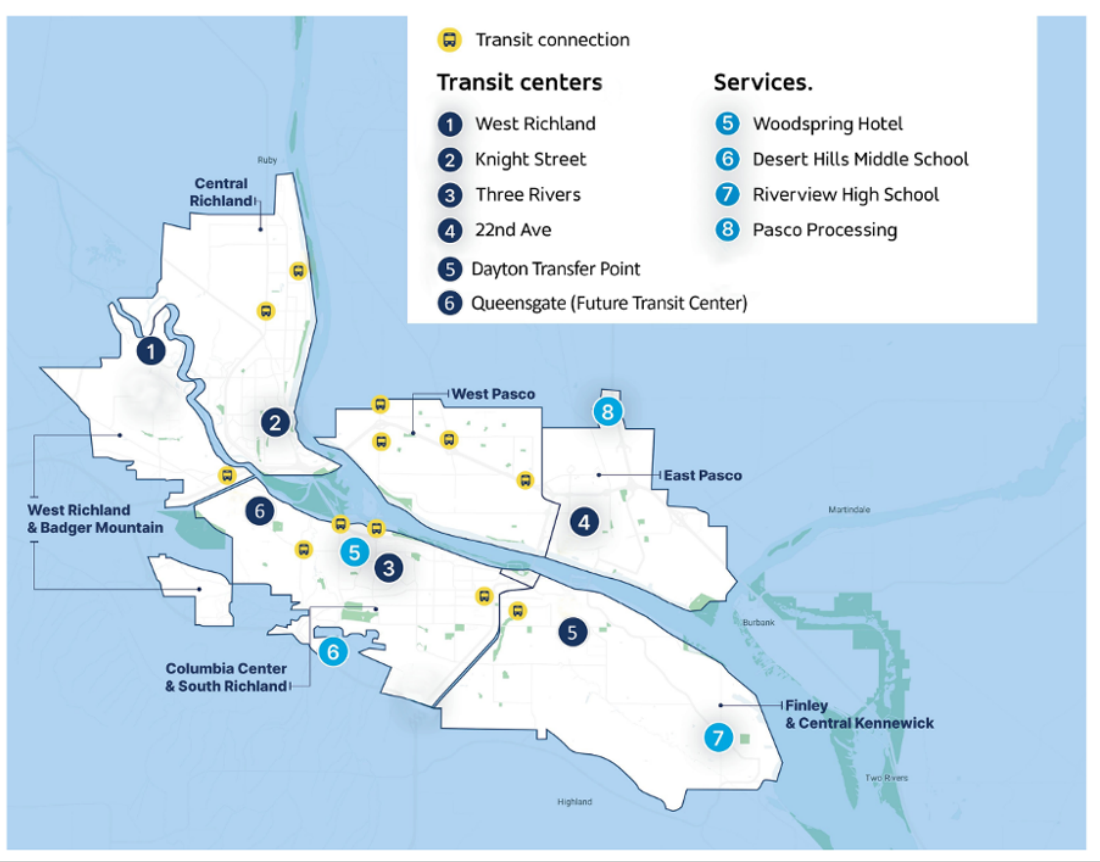
Over the initial 18 months of the service, BFT benefited from the flexibility of the service and could transform the service operating rules. Initially, the intent was to cover most of the BFT service area in the Tri-Cities, and riders could travel between zones. Service is now zone-based, and BFT added over 30 points of interest (POI) to provide structure within the zones. Prior usage of contracted taxi services and BFT's previously operated General Demand service informed the zone boundaries and the POI placements.

BFT does not co-mingle ADA and general public trips; BFT struggles to fulfill ADA trips, due in part to labor shortages, which limit BFT's ability to hire and train operators. As a result, sometimes operators working overtime

fulfill ADA trips. BFT operators are unionized, which is also a factor in determining how best to fulfill ADA trips while also providing microtransit services (which are contracted out).

The BFT microtransit team comprised the Chief Planning and Development Officer, the Director of Marketing, Operations Management, Customer Service staff, and some Planning support staff. The team has varied over time, but it maintains representation from all departments.

Figure 24: BFT's Microtransit Service Areas



Services

BFT's microtransit service - BFT CONNECT - is available in six zones. Passengers can request a ride to connect to BFT fixed routes, transit centers, and select destinations within a zone. Riders cannot schedule trip requests in advance.

BFT CONNECT services begin before and end after fixed route services, to help riders connect to and from the fixed route. Services are available:

- Monday-Friday: 5:45 a.m.-10:15 p.m.
- Saturday: 6:45 a.m.-10:15 p.m.
- Sunday: 7:45 a.m.-6:45 p.m.

Within the BFT service area, 70-80% of the population live within one of the six zones.

Fare Payment

The fare for BFT CONNECT is the same as for the fixed route bus, $1.50 per ride. With a monthly pass, riders can take unlimited BFT CONNECT rides. Riders can pay for a BFT CONNECT trip through the Via app, with exact cash fare on board the vehicle, or with a physical pass. The fare for BFT CONNECT includes a free transfer to the fixed route system, and a transfer slip from the fixed route system can be used to board CONNECT.

Operations

Via, as a transportation-as-a-service (TaaS) provider, fulfills all BFT CONNECT functions. For reservations, riders can use the Via app or reserve by phone through Via. Via operates a dedicated fleet for BFT CONNECT, with some vehicles owned by Via and some leased. BFT estimates that 15-20% of the BFT CONNECT vehicles are ADA accessible, creating challenges for ensuring commensurate ADA service.

Technology & Software

Via's rider-facing app allows riders to book through the app or by calling Via. The app also allows riders to check on the status of their trip and cancel their trip through the app. Riders receive a notification through the app when their vehicle is approaching. Riders can pay for their trip through the Via app, but the app does not allow for account-based payment.

Cost

Via charges BFT $50.16/hour to provide BFT CONNECT service. BFT also pays the additional TNC fees that are required by WA state law.

Performance

BFT's contract with Via does not include any performance measures outside of the star rating that drivers received through the Via app. In the future, BFT hopes to include more specific performance measures and service standards. BFT is monitoring utilization (boardings per vehicle hour), estimated time of arrivals/wait times, completed trips, cancellation rates, as well as how many trips are truly feeding people into the fixed route system. BFT noted, though, that the last metric is hard to truly quantify.

BFT has experienced challenges related to driver performance, including complaints about drivers' speeding, drivers not collecting fare, riders coercing drivers to take them to destinations not in the service parameters, and other customer service complaints. Concern over service quality is the major challenge BFT noted. While BFT expected a large company like Via to introduce some customer service-related issues, these have been more extensive than expected, and Via has not provided sufficient on-the-ground management to address those issues.

The most important issues that BFT has had to solve are addressing driver misconduct, reducing the number of situations where drivers are coerced into breaking the service parameter rules (e.g. dropping someone off right in front of their house), rider comprehension of how to use the service, and how to reduce rider bypass of the fixed route/ridership cannibalization.

Lessons Learned

Contracting out all the microtransit functions saves BFT staff time, allowing BFT to address other critical work while Via operates BFT CONNECT.

BFT could lean on Via for suggestions during the early implementation of the service; originally BFT planned for CONNECT to cover the entire service area–more of a supplement to fixed route as opposed to a feeder. Now the system is a good balance between the two; Via needed to adjust their algorithm to suggest fixed route when that's a viable option. Now, if the fixed route will take the same time, the Via app does not allow the CONNECT trip to be booked. Some passengers have learned how to get around those rules by timing their requests differently.

Initially, the objective behind the microtransit service was to provide increased accessibility and more options. Eventually, this shifted to a balance of managing microtransit demand and better incentivizing use of the fixed route services. This change also helped ease concerns from union drivers who perceived the microtransit services as reducing their work.

The "turnkey" solution was a lot of work to set up, and BFT continues to work with Via on a weekly basis on quality improvement, particularly customer service.

After completing a Title VI analysis of the removal of a low-performing fixed route service, BFT provided CONNECT service as a mitigation for affected populations.

Kevin Sliger from BFT is part of an American Public Transit Association (APTA) emerging leaders' group looking at this issue of the balance between fixed route and on-demand and at what point one makes more sense than the other.

C-TRAN

C-TRAN provides transit service within Clark County and throughout the southwest Washington/Portland region. C-TRAN launched their microtransit service, The Current, in January 2022.

Figure 25 shows C-TRAN's service area, including microtransit. The Current replaced C-TRAN's Connector service, which provided demand-response services in Camas, Ridgefield, and La Center. C-TRAN release a detailed, prescriptive RFP and received nine responses that met the minimum qualifications.

C-TRAN has an executive policy that prevents the agency from contracting out service operations, including overflow services.

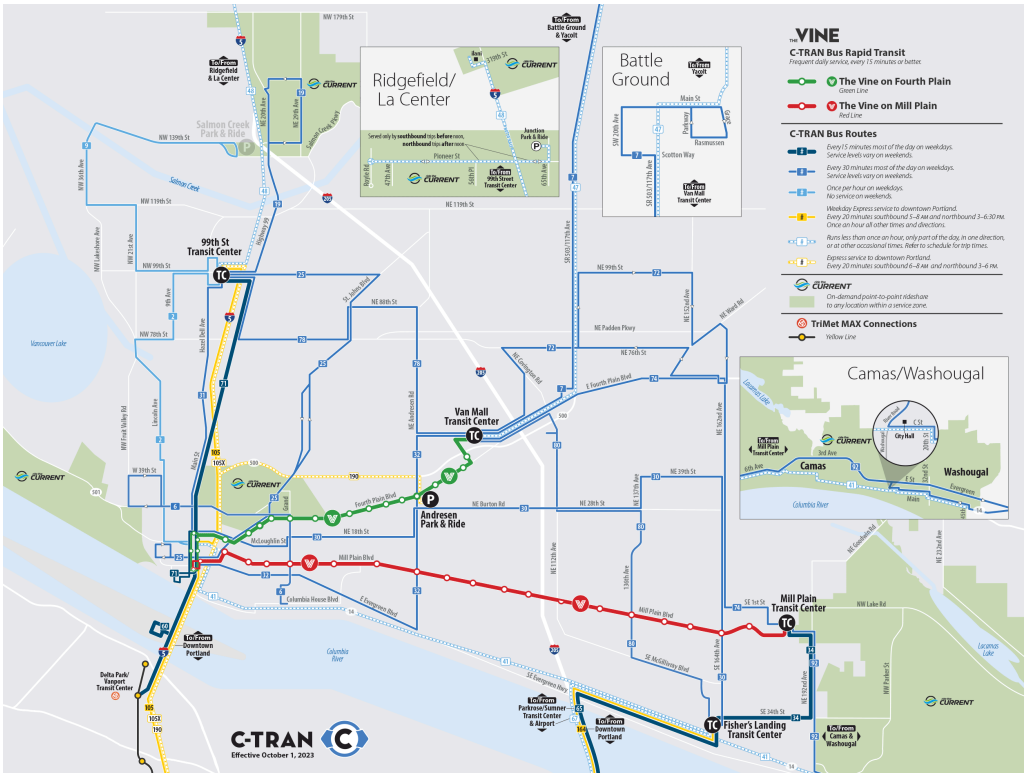
Services

The Current is available in five zones. Mostly, The Current zones do not overlap with paratransit services. Riders can travel within each zone and to select destinations outside of the zone but not between zones. For all zones except the Port of Vancouver, service hours are:

- Monday-Friday 5:30 a.m.-7:00 p.m.
- Saturday & Sunday 8:00 a.m.-6:00 p.m.

The Current is not available in the Port of Vancouver zone during the weekend. Riders can make reservations for immediate fulfillment or up to 48 hours in advance.

Figure 25: C-TRAN Services, Including Microtransit (The Current)



Fare Payment

The fare for The Current is the same as for the fixed route system, $1.25 (or $.60 for the Honored rate for seniors, people with disabilities, and Medicare recipients). Riders can only pay The Current fare on the vehicle, where riders can pay with exact cash, Hop pass, Apple Pay, and other tap-to-pay options. Riders paying with a Hop car can transfer from The Current to the fixed route system.

C-TRAN chose not to use their scheduling and dispatch platform (Spare) for fare payment to minimize finance and security complications. The vehicles have Hop pass readers, so the service integrates with other C-TRAN offerings. The most challenging aspect of fare payment has been handling cash payments, as the vehicles do not have fareboxes.

Operations

C-TRAN does not co-mingle ADA paratransit and general public riders. C-TRAN performs all microtransit functions directly. Microtransit operators have historically been the same personnel as the paratransit operators. C-TRAN has a bid system for driver assignments, and microtransit has proven to be popular with senior operators, as a microtransit shift provides more information about what a driver's day-to-day will be in terms of hours worked and what the shift itself will entail. Because the pool of microtransit and paratransit operators is the same, C-TRAN may reassign microtransit operators to fulfill paratransit overflow requests.

C-TRAN uses a homogenous, dedicated vehicle fleet for microtransit. All vehicles are lift-equipped, with bike racks and a full bus door.

Technology & Software

C-TRAN uses Spare for rider, vehicle, and central software. Spare provides a white-labeled rider app and web booking portal. In addition, riders can call to book through a C-TRAN customer service representative or can book on-board with a driver. Riders can manage their trips on the app and web portal, and riders receive app or text notifications when their vehicle is arriving.

C-TRAN uses Trapeze PASS for paratransit central software functions, and Spare does not integrate with Trapeze or other C-TRAN technology. Spare's open API allows C-TRAN to pull data needed for NTD and ridership reporting.

Cost

C-TRAN does not distinguish unique operating expenses from demand-response, since The Current operates with the same operator pool and maintenance pool. Reporting in this way helps staff move towards access-based conversations as opposed to 'overly expensive service provision.'

For the microtransit traveler, central, and vehicle software, C-TRAN pays Spare a base license fee per vehicle up to the highest number of active vehicles in service at one time, typically 7 per month. There are many packages of advanced features that C-TRAN has chosen not to use, but that would be an additional fee per vehicle. C-TRAN's contract with Spare is for three years with an option for 2 additional years.

Performance

C-TRAN currently does not have adopted standards for microtransit on any contractual incentives built in for Spare as the software provider. As of fall of 2023, C-TRAN was working on standards for the entire system, including microtransit, to be adopted in February 2024.

Currently, C-TRAN tracks trips that were accepted and canceled on C-TRAN's end. The agency is still grappling with having enough paratransit operators. When there are not enough paratransit operators, C-TRAN moves drivers and ends up canceling microtransit services. Currently, C-TRAN denies 2% of trips on average. C-TRAN cannot track trips where a rider looked for a trip and none was available.

The Current has a high rate of trip cancellations. The daily rate is about 35%, which does not account for the fact that riders have to cancel a trip and re-book if they want to modify the trip.

About 4% of The Current trips are no-shows, and of that 4%, about 90% happen from the same three or four habitual offenders. Overall, this has not created significant problems, and C-TRAN is looking at instituting temporary service suspensions for key offenders who no-show multiple times a day or 5-10 times a week. C-TRAN noted that there is a higher rate than they'd like of no-shows where the operator cannot find the rider, because the rider may be at a shopping center with multiple entrances. There is an option in Spare for the driver to call the rider to help make these connections, but C-TRAN does not pay for that additional feature.

The Current annually provides about 30,000 person-trips, and that number is trending up. About 60% of the reservations have another reservation on board at the same time.

Spare allows C-TRAN a fair amount of flexibility to set parameters and preferences between shorter rider trips or more pooled trips and efficient service. The pooled trips rate has fluctuated over the past 2 years as C-TRAN has balanced factors like operators feeling rushed or the service not having enough pooled trips. The only parameters

that C-TRAN noted that they cannot change in Spare, but would like to, is that Spare uses historically based travel speeds. C-TRAN would prefer to use real-time travel speeds.

Lessons Learned

Because C-TRAN operates everything in house, they control the system–operators, vehicles, customer service and can change any facet in a short time frame.

In-house operations also improve reliability; C-TRAN staff have heard stories from agencies using external vehicles, including of vehicles branded for other service and operators not acting professionally. With in-house operations, C-TRAN knows exactly what they are getting and can connect with any part of the team daily. This approach has limited out-of-pocket costs to the tablets, cell service, and vendor platform. However, microtransit is competing with C-TRAN's other services for resources; if there is a bad day in the maintenance shop, The Current may be down a vehicle. If there is a high demand day for paratransit, microtransit operators get pulled; it is rare, but sometimes a full day of microtransit service has had to be canceled.

C-TRAN's integration with Transit app provided significant benefits for The Current services in terms of marketing and data. Riders can plan a trip on The Current using Transit app, and C-TRAN can access data on trips that riders are searching for and when they're clicking through to book on The Current.

With the five zones, C-TRAN is stretched thin; zone design was a political choice, and as a result, there are too many service zones, and some are too large. This zone design has created challenges with trip availability. C-TRAN will mix operators between the service zones; it has been great to have that flexibility, but the practice also increases non-revenue service hours and miles. C-TRAN has found that service areas that are full-city limits are incredibly valuable for riders and easier to justify than partial service zones.

During procurement, C-TRAN requested features that were not available through Spare at the time but have since become available. To add them now, C-TRAN would have to pay for the new features separately. In future procurements, C-TRAN will consider how to better future-proof the contract to include feature advancements.

C-TRAN's homogenous, fully wheelchair-accessible fleet has been beneficial, particularly for addressing equity concerns.

FAST

FAST provides transit service to Fairfield, California and the surrounding area. Services are managed by the City of Fairfield and operated by MV Transportation. MV has operated FAST's transit services since 1998, with the most recent contract signed in 2020. Figure 26 illustrates the FAST microtransit service area. FAST conducted a comprehensive operations analysis (COA) in December 2020, realizing that transit would "never be exactly the same." The COA was critical to deciding where to implement the initial two pilot microtransit areas. This COA included a review of fixed route service and determining what fixed routes were underperforming. The COA evaluated current travel patterns of Fairfield residents, which highlighted the potential areas where different services may be beneficial, especially because of the pandemic increasing the number of workers working remotely.

At the time of the COA, FAST offered local fixed route and paratransit services. Over a two-year period, FAST implemented microtransit. FAST plans to eliminate fixed route services in the two microtransit zones.

The FAST microtransit team comprised City of Fairfield FAST staff, MV Transportation (FAST's contract operator), and Rahul Kumar from Innovate Mobility (who also completed FAST's COA and assisted with the RFP for technology services for paratransit/microtransit).

FAST transitioned from Routematch to The Routing Company (TRC) for its software platform. FAST was TRC's first client to co-mingle services, so FAST has worked closely with TRC to ensure the software could work for co-mingling. In July 2023, FAST started using TRC for scheduling and dispatch and then added microtransit, FAST Connect, in September 2023. Initially, FAST planned to provide on-demand services but now allows pre-scheduling. TRC's rider-facing app is called Ride Pingo.

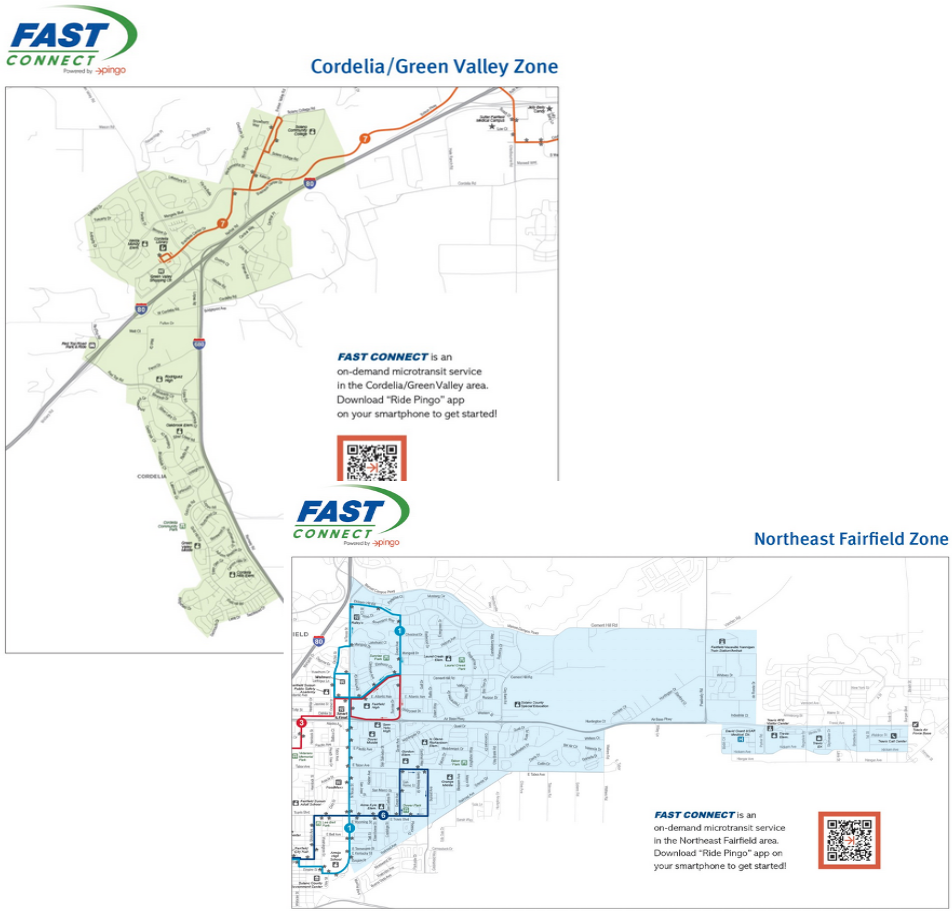
Services

FAST Connect is available in two zones for travel within each zone. Service is available:

- Monday-Friday 6:00 a.m.-8:00 p.m.
- Saturday 9:00 a.m.-5:00 p.m.

General public riders can request trips up to 24 hours in advance, and ADA-eligible riders can schedule trips up to 7 days in advance.

Figure 26: FAST's Microtransit Service Areas



Fare Payment

FAST Connect fares are the same as for the fixed route: $2.00 adult, $1.75 youth, and $1.00 senior/disabled/Medicare.

Riders can pay using the Token Transit app or the Clipper card. FAST was using Token Transit before the transition to TRC. Token Transit meets the city's cybersecurity requirements, while TRC's solution, Stripe, does not and therefore it is not used. When Clipper 2 rolls out in late 2024, FAST will transition completely to Clipper 2 and eliminate Token. For now, Clipper does not support paratransit payments, while Token does.

FAST also accepts cash payments, so each vehicle requires a GFI farebox and a Clipper validator, and drivers must visually validate Token Transit passes. Initially, FAST planned for the microtransit fare to be $3.00, but reduced it to $2.00 to make it easier to match the Clipper fare and drive the uptake of the card.

If a rider pays using the Clipper card, their fare includes a transfer to the fixed route system.

Operations

FAST Connect co-mingles the general public and paratransit riders, though FAST believes that there is unrealized potential for more co-mingling.

FAST and FAST's operational contractor, MV, share FAST Connect functions. FAST provides and maintains the vehicles and provides the operations facilities. MV provides the vehicle operators. FAST administrative staff and MV dispatch are co-located in a FAST-owned facility. This office is open to the public three days a week, so both FAST and MV staff interact with the public. MV primarily handles dispatch functions.

Both MV and FAST have access to the TRC central software. MV takes the list of trip requests and builds the manifests manually in the TRC central software.

Technology & Software

Riders can book FAST Connect trips through the Ride Pingo app or by calling. MV dispatch or FAST admin staff will book the trip through the central software. Riders get vehicle arrival notifications through the app.

Cost

Currently, FAST pays MV $46.97/revenue vehicle hour (RVH) along with a $120,000 monthly administration fee. They are in negotiations to increase the RVH fee.

Performance

FAST noted that the most important issue to solve was making sure they had the right number of vehicles/drivers out for service that were needed to meet demand. Also, it was important to ensure the program was marketed effectively through all means possible (newspaper, social media, videos, radio, water bill statements, etc.).

On average, FAST Connect has 3 passengers per hour. During peak periods, it can be up to 6 passengers. FAST does not have any performance-based incentives or penalties in the contract with MV or TRC, but FAST monitors passengers per revenue hour, cost per passenger, and cost per revenue hour. FAST noted they are still in the evaluation stage and will likely look at additional metrics as part of making decisions on where to expand in the future.

Lessons Learned

While FAST does not have incentives or penalties in the contract with MV, FAST identifies the MV manager in the contract. FAST noted that "over the years that we've had those clauses in the contract that are penalty or enhancement based. They just don't seem to work. We work hard at our relationship. So far it's worked. Is it perfect? No. But it's pretty good."

FAST noted that, with the transition to TRC, MV staff had to be totally re-trained. They noted TRC was great about training the drivers and even spent two weeks on site.

FAST also reviewed TRC's general service positively, noting that TRC has been honest and communicative about what their system can and can't do, and that TRC has promised nothing they haven't been able to deliver.

FAST is evaluating whether it makes sense financially to continue to co-mingle. Even though general public passengers are not moving between the zones, ADA paratransit clients are, and this can make it challenging to ensure that drivers are in the right location to meet demand. FAST noted MV seems to still be keeping the paratransit somewhat separate from the general public microtransit, so it is difficult to know how well the co-mingling works if it's not really full co-mingling.

Citibus

Citibus provides transit service to the City of Lubbock in TX. Citibus implemented Citibus On-Demand in response to fixed route service reductions during the pandemic. Citibus initially designed On-Demand to cover the full-service area and fill gaps of reduced fixed route. Before the pandemic, the Citibus service area did not encompass the entire city limits and primarily focused on the most populated section, accounting for approximately 60-65% of the area. In the prior years, a lot of development had happened outside of the service area. Since Citibus was behind in covering developing areas, the microtransit service allowed them to extend coverage. Citibus does not provide a map of the Citibus On-Demand service area; Figure 27 shows a screenshot from Citibus' GoPass traveler application.

The Citibus fixed route service has still not increased to full pre-pandemic levels. Citibus received a route restoration grant from FTA and is currently working on a network redesign. Now, microtransit and fixed route are competing. One goal of the redesign is to make microtransit complementary to fixed route. Citibus services are operated by RATPDev, who uses Spare for microtransit central software functions and GoPASS for the rider app.

The Citibus microtransit service team includes the General Manager, the Assistant General Manager/CFO, the Operations Manager, and Operations Supervisors.

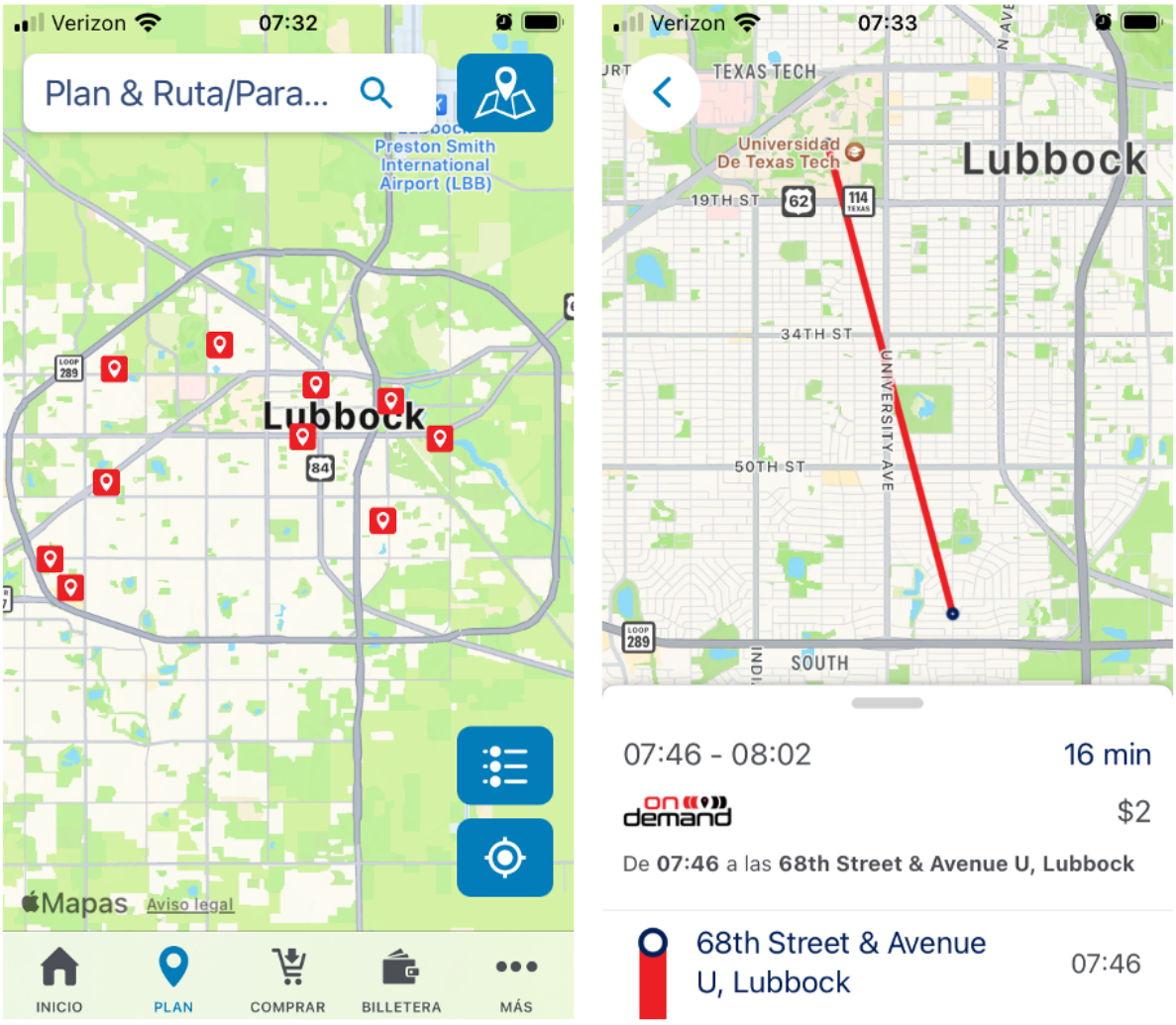
Services

Citibus On-Demand serves the entire city limits of Lubbock, TX. Riders can book up to two hours in advance, but Citibus encourages booking on-demand, as it improves the efficiency of the service. Citibus On-Demand is available:

- Monday-Friday 7:00 a.m.-11:00 p.m.
- Saturday 6:45 p.m.-11:00 p.m.

Any cancellation made less than one hour before pickup is a late cancellation under Citibus' policy.

Figure 27: Screenshots from Citibus' Microtransit Traveler App, GoPass



Fare Payment

The fare for Citibus On-Demand is $2.00 per ride, compared to $1.00 per ride or $2.00 all day for the fixed route services.

Riders can pay through using the GoPass rider app, which includes a stored value feature. Riders can add a credit card to their GoPass account. In addition, within GoPass, riders can see locations where they can use cash or credit to add value to their GoPass account. Riders can also store a credit card to their account by calling and talking with a customer service representative.

Although Spare is no longer used for the microtransit and is just available for ADA paratransit riders, payments stored through GoPass are also stored in Spare through API integration. ADA paratransit riders can use these payments on a per-trip basis for paratransit services.

Operations

The City of Lubbock owns Citibus vehicles and facilities. RATPDev operates the service, essentially acting as employees of the City. RATPDev handles vehicle maintenance and runs the call center out of the city-owned facility.

For central software functions, RATPDev uses Spare, which allows them to co-mingle ADA paratransit and general public microtransit riders. RATPDev also commingles Medicaid-paid NEMT riders along with the microtransit and paratransit riders. Spare allows RATPDev to set up as many services as needed, each with distinct parameters. RATPDev rarely brokers rides to other providers, though they have for special events, and Spare supports this functionality.

In adding microtransit to Citibus' family of services, RATPDev did not add any new vehicles to the fleet but just made empty seats (in vehicles serving paratransit and NEMT) available to the general public.

Technology & Software

Initially, RATPDev used Spare for the central, vehicle, and traveler-facing microtransit functions. Now RATPDev partners with DART to bring DART's GoPass app to Lubbock. GoPass provides full multimodal planning capabilities and connects with the Spare central software through an API. RATPDev noted they benefit from the work that DART had already done of working through integrations; as a result, the process has been relatively simple.

Spare does not allow booking parameters to be set by the hour, only by the day. As a result, when Spare provided the rider-facing application, riders would wait until midnight and then schedule multiple rides for the next day. Cancellations were 'through the roof,' so RATPDev values that GoPass allows them to limit advanced bookings to up to two hours before. Cancellations have decreased significantly. Spare has an integration with another software provider, Kari, that allows for automated no-show/late cancellation tracking and account management. After the network redesign, RATPDev may revisit the booking parameters.

Citibus riders only have access to the GoPass mobile application but will have access to the web version in the future.

Cost

RATPDev can separate operations data per service in Spare, but since they are using all the same vehicles, they cannot separate costs per service. Most of the microtransit trips are occurring in the same zone as the others, and there is no significant difference between trip lengths. With Medicaid, ADA paratransit, and microtransit all grouped together, the cost is just over $37/ride. RATPDev's operators are not unionized.

Performance

There are no performance incentives or penalties in the contract between RATPDev and the City. The RATPDev general manager reports directly to the Deputy City Manager. RATPDev's contract was just renewed for five years with two 5-year options. RATPDev reports that their productivity is "sometimes 3-3.5 passengers per vehicle hour, sometimes higher." Citibus also monitors on-time performance, riders per vehicle hour, total ridership, pooling percentage, and passenger/operator feedback.

The most important issue for Citibus to solve regarding microtransit service was to identify the gaps in fixed route service and to understand transportation needs in the areas not served by transit.

Lessons Learned

RATPDev noted that their service model of only allowing general public trips on demand when there is space on the vehicle limits financial risk and improves efficiency. It protects from oversubscription, and the productivity from co-mingling is high. There is a trade-off in on-time performance when productivity increases, so they monitor those measures regularly.

On the general public microtransit side, there are more trip requests coming through than Citibus can fulfill, which creates a negative rider experience. For now, because they are in the middle of the network redesign, RATPDev is accepting that trade-off.

Currently, the average trip length is 11-13 miles, which puts a burden on the system. RATPDev has considered contracting those trips across the service areas to taxis or TNCs, but there is a risk of the trip volume increasing beyond the budget that is available.

Key Themes from Peer Interviews

- Even when the central software functionality supports co-mingling, co-mingling is more likely to succeed when the operators are the same and have shared financial incentives to co-mingle. Separating out the costs of co-mingled services is challenging and may make it hard to identify opportunities for improved efficiencies.

- Agencies that operate microtransit in-house have maximum control and ability to make changes when needed across vehicles, operators, and business rules, but this often comes with competition between in-house services.

- In-house operation enables consistency in branding, customer service, vehicles and vehicle condition, and operator professionalism, leading to higher reliability. However, as noted above, reliance on internal resources can affect microtransit services if other service needs are not being met.

- Contractor-operated microtransit services reduce but do not eliminate day-to-day agency staff time spent on the program. Agencies highlighted the amount of communication and coordination needed to maintain the program; only RATPDev (who essentially acts as the transit agency) did not note it as a burden.

- None of the agencies interviewed include performance incentives or penalties for their contracted operator or software provider. Some noted this as an issue to address in future procurements, while others focused on the need for strong communication and trusting relationships as the better tool for performance management.

- Contracted operators bring expertise from multiple deployments and scales. Transit agencies can leverage this expertise to improve microtransit operations but may also face a lack of flexibility to allow for sufficient customization of services.

Cost, Fare, and Fixed-Route Integration Overview

To provide further context for key operational concerns, the consultant team completed a high-level desk scan of microtransit costs per trip, fare structures, and approaches to fixed-route integration.

Costs per Trip

Due in part to the many types of service models transit agencies use to deliver services and the competitive nature of SaaS and TaaS vendors, it is challenging to collect reliable, comparable cost data. Publicly, easily accessible data about cost per trip is limited for microtransit systems in operation. Much of the publicly shared cost data detailed enough to present cost per trip (or to allow for the calculation of cost per trip) are estimates prepared as part of a microtransit feasibility or planning study.

Increasingly, these studies are being performed by the SaaS and TaaS vendors themselves. At times, the productivity assumptions used in estimating cost per trip reflect higher productivity numbers than those that most microtransit systems in operation are reporting. For example, the East Durham Connect service was initially estimated to serve 35 riders per weekday and 20 on Saturday but was serving just over 6 riders a day when the GoDurham Microtransit Planning Study was conducted.[5] The study examined other peer agencies and identified cost per trip for three:

- Call-and-Ride, Denver CO - $21.84/trip with an average of 3.9 riders per hour
    - Call-and-Ride was replaced in 2019 by RTD's Flexride. For Call-and-Ride, RTD contracted out the operations of the service and provided the vehicles.[6]
- Capital Metro Pickup, Austin TX - $28.50/trip with an average of 3.1 riders per hour
    - Capital Metro operates the service with contracted drivers, CapMetro vehicles, and using Via's microtransit scheduling and dispatch SaaS.
    - They aim for the service to get to $20/trip with 5 riders per hour.[7]
- Go OnDemand Pilot (Raleigh/Durham NC) - $31.44/trip, no measure of riders per hour
    - The pilot transitioned to Go Durham Direct, with riders using Lyft and receiving a $5 subsidy for up to 60 trips month; the trip limit was reduced to 30 per month.

One of the major factors in cost per trip is productivity, which is also influenced by the percentage of rides that are shared. Parameters around allowable wait times and ride times can influence productivity by making more ride pooling trips possible. Transit Cooperative Research Program (TCRP) Synthesis 141 explored the state of public demand-response transit services, including performance measures and factors influencing service models and fare policies. The report includes two tables representing cost per trip – one for simulated trips (

Figure *28*) and one representing data provided by agencies (Figure 29).

[5] https://godurhamtransit.org/sites/default/files/godurhammicrotransitstudyfinal.pdf

[6] As noted in TCRP Synthesis 141: "The Colorado state legislature has required RTD to contract a substantial portion of its services for many years."

[7] Hansen, T., Walk, M., Tan, S., & Mahmoudzadeh, A. (2021). Performance Measurement and Evaluation Framework of Public Microtransit Service. *Transportation Research Record*, *2675*(12), 201-213. https://doi.org/10.1177/03611981211028622

*Figure 28: Performance Parameters from a Microtransit Simulation (TCRP Synthesis 141)**

# of trips	# of vehicles	Hours of service	Rides per hour per vehicle	Average wait time (minutes)	Average ride time (minutes)	Cost per trip ($)	Ride pooling (%)
50	2	11	2.3	2	17	28	25
100	2	11	4.5	10	24	14	41
100	4	11	2.3	2	15	28	20
100	6	11	1.5	0	15	43	15
300	6	11	4.5	8	23	14	40
300	10	11	2.7	2	16	24	25[8]

** "Ride pooling represents the percent reduction in number of vehicle stops due to pooling of rides. The cost per trip is based on $65 per vehicle hour. Source: TransLoc, Inc."*

Figure 29: Ridership per Vehicle Service Hour and Cost per Hour and per Trip (TCRP Synthesis 141)

Transit Agency	Contract or In house	Cost per Vehicle Service Hour	Passengers per Vehicle Service Hour	Cost per Passenger Trip
AC Transit	In house	$214 (fully allocated)	3	$71.00
Cherriots	In house	$65.00	3.5	$18.57
DART (Dallas)	Contracted. DART provides vehicles and facilities but not fuel.	$46.00	2.5 for original DRT service and 3.5 for new GoLink service	$18.40 $13.14
Greater Dayton RTA	In house and contracted	RTA pays Lyft and taxis; in-house paratransit	N/A	$13.00
Denver RTD	Contracted	$83.00	3.8	$21.84
HART	Contracted	HART pays contractor by trip and not by hour	3.5	$10.00
Houston Metro	In house	$75.00	2.4	$31.25
Kitsap Transit	In house	$130.72	3.66	$35.68
Lynx	Contracted	$41.17	3.3	$12.60
Monterey-Salinas Transit	Contracted	$54.18	4.03	$13.44
Napa Valley Transportation Authority	Contracted	$44.48	2.6	$17.00

[8] National Academies of Sciences, Engineering, and Medicine. 2019. *Microtransit or General Public Demand–Response Transit Services: State of the Practice*. Washington, DC: The National Academies Press. https://doi.org/10.17226/25414.

Transit Agency	Contract or In house	Cost per Vehicle Service Hour	Passengers per Vehicle Service Hour	Cost per Passenger Trip
North County Transit District	Contracted	$97.00	2.7	$36.00
Transit District of Utah	Contracted and in house	$34.69	4.7	$7.34

As seen between the costs represented in just these two studies, the cost per hour and cost per trip of providing general demand-response services varies. The lowest cost represented, for Transit District of Utah (TDU), provides deviated fixed route service. The $10.00 cost per passenger trip for HART's service was based on a contracted price. When the contractor requested $24.00/trip, HART did not renew the contract and reconfigured the service. As passengers are asked to wait longer for pickup, to walk further to access their pick-up location, and to travel further out of their way (to improve shared ride opportunities), the cost per passenger trip gets lower, and the demand-response experience for the customer becomes more like fixed route services.

A feasibility study of microtransit for the Greater Lynchburg Transit Company compared program costs for delivering the program in-house using microtransit SaaS or contractor-run through TaaS. The study authors estimated the annual operating cost of the SaaS model at $379,800-$771,600 and the TaaS model at $288,000-$740,400. These ranges emphasize the varied experiences across the industry and the fact that TaaS models have the *potential* to reduce costs. They noted, "these TaaS costs are based off examples with larger service areas where contractors may have greater efficiencies in operating several vehicles at a time. Actual unit costs charged to GLTC may be higher for a relatively small service pilot in Lynchburg."[9]

Microtransit Fares

As with costs per trip, the fares that agencies charge for microtransit trips vary. Some programs do not charge any fare at all, while others match the fare to fixed route services, some charge a premium fare, and everything in between. One further challenge with identifying microtransit fare structures is that agencies may change the structure. For example, for the microtransit services in Durham, NC, the pilot was initially free for riders and eventually changed to the agency providing a $5 subsidy and the rider paying for the remaining cost of the ride.

Factors influencing fare policy and collection include whether the vehicles have fare collection technology, the ease of adding and collecting a new fare type, the ease of aligning microtransit services with fixed route for transfers, if the service is a pilot, and the goals of the service itself. In feasibility and planning studies, riders tend to be willing to pay more for microtransit services, sometimes up to twice the fare for a fixed route trip.

Fixed-Route Integration

As with operating costs and microtransit service fares, there is wide variation in how agencies integrate microtransit and fixed-route services (for those agencies who continue to operate fixed-route services

[9] https://gltconline.com/wp-content/uploads/2022/07/GLTC_Microtransit_Feasibility_Study_FinalReport_2022-01-27-1.pdf

after the introduction of microtransit). Approaches include aligning fare policy, free transfers to the fixed-route services with the purchase of a microtransit fare, and creating operating rules designed to promote the use of fixed routes. Operating rules may include only providing microtransit services outside of fixed-route service hours, minimizing trips that do not connect to or from fixed-route services, encouraging the use of fixed-route services through trip-capping, not allowing the booking of microtransit trips that could be served by fixed routes, setting wait-time and travel time parameters to make the service operate less like a taxi or TNC and more like fixed-route service.

Technology Options

A key component of implementing microtransit is software. It is helpful to understand the components of the software as a basis for both the peer agency and software vendor interviews. Three key software components support microtransit services delivery. The software components are traveler, vehicle, and central. These components also interact with the different microtransit service functions, which include reservations, scheduling, dispatching, service-day rider calls, operations, and vehicle and facilities provision. These software components were discussed during interviews and are explained in more detail below.

Traveler

Traveler software, including mobile apps and websites, allows travelers to manage their microtransit trips, including discovering trip options, booking and pay for trips, modifying and canceling trips, checking on trip status, and providing feedback. Traveler technology also includes text and phone systems, which may integrate with the app/website or be separate.

Vehicle

Vehicle software refers to the in-vehicle application used by the drivers to deliver service. Vehicle software is installed on mobile data terminals (or tablets) that are mounted in the vehicle and that provide drivers with information needed to deliver services, including trip manifests, fare payment information, directions, communications with dispatch, and more.

Central

Customer service and admin staff use the central software to help deliver and report on services. Central software functions include customer reservations, scheduling trips to runs and building driver manifests, customer account management, reporting, and day-to-day overview of trip and vehicle status.

In coordination with the project team, the consultant team selected two software vendors to interview. These vendors both provide software to one or more of the peer agencies interviewed, and both software solutions allow for co-mingling of ADA paratransit and general public microtransit riders. The features, pricing, and other vendor information is summarized for each vendor below.

Spare

Spare Labs, founded in 2015, is based in Vancouver, BC. Spare's Washington-based clients include C-TRAN in Vancouver, Twin Transit, and Western Washington University. Spare is also the central and vehicle software behind DART's GoLink in the Dallas, TX area. GoLink is the largest microtransit service in North America, and Spare has been working with DART for eight years. Spare transitioned Capital Metro in Austin, Texas from Trapeze onto Spare paratransit. CapMetro had a team of full-time staff responsible for scheduling and batching trips and now those team members are in different, more proactive customer service roles, with a fully automated scheduling system.

Spare claims to be the organization that coined the term "co-mingling." During the interview, the two Spare team members spent at least half of the interview time asking questions to learn more about WTA and to tailor their presentation accordingly.

Features

The biggest factor that Spare emphasized was their focus on lowering the cost per trip through multiple strategies. These strategies include their optimization algorithm and their 'open fleets' feature, which allows for seamless integration of taxis and TNCs into the public transit fleet.

Spare noted that clients appreciate the ease of use of the product, the individual on-boarding attention they receive, and the ability to manage multiple demand-response services in one platform. Spare's comments mirror the key benefits mentioned by the two peer agencies that use Spare.

Service parameters in Spare can be easily changed by the agency, and multiple types of services with different parameters can be created and served by the same fleet. Spare allows trip requests to be locked to specific drivers or vehicles.

While Spare's traveler app can include fixed-route service information in the app, Spare typically recommends using Transit app and connecting to Spare through their open API. Spare does have its own traveler app, which can pull in GTFS information and can be white labeled.

Pricing structure

Spare's pricing structure is:

- Implementation fee — one time
- Base platform fee — annual
- Per vehicle fee (peak vehicle) — annual
- Partner success (tiered) — annual
- Additional features, per vehicle — annual

Spare's base platform, Launch, is included in the base platform fee. Other products can be added on for additional fees. Additional products include the traveler app, driver app, service planning simulations, advanced data analytics, eligibility management, enhanced optimization, and rider communications.

Further Vendor Information

Spare provided link below to agency clients who co-mingle riders.

- Milton Transit
- Gatra
- Cheyenne
- Lincoln

Spare provided this video about their client, CapMetro. https://www.youtube.com/watch?v=6rr1IK5VEkw

TRC/Ride Pingo

The Routing Company, founded in 2018, is based in Boston, MA. TRC's Washington-based clients include Clallam Transit, Kitsap Transit, and Hopelink. TRC supports Kitsap's microtransit, and Kitsap is transitioning from Trapeze to TRC for paratransit as well. TRC's software components are branded as Ride Pingo (traveler), Drive Pingo (vehicle), and Pingo OS (central). TRC offers other features branded as "Pingo," such as Pingo Access (paratransit) and Pingo Rural, which are integrated into the Pingo OS central software.

Features

The TRC team member interviewed emphasized TRC's focus on increasing ridership on fixed route service and improving utilization of on-demand services. TRC supports deviated fixed route service in rural areas and has found success in improving productivity.

TRC's Ride Pingo traveler app is not white labeled but allows for transit agency branding. TRC incorporates GTFS-realtime data into their traveler app and has a feature, "transit protect," that is designed to prevent microtransit services from cannibalizing ridership from fixed route services. Agencies can set parameters around how long travelers can be asked to wait to connect to a bus before the microtransit ride becomes available to book instead.

The feature that TRC team members and their materials have historically focused on most is TRC's routing algorithm, which makes "millions of computations in seconds to be able to drive more efficiency and provide the best routing."

Agencies can create venues and snap-points for specific entrances to guide travelers and operators to specific entrances or pick-up points. For general public riders, the vehicle app does not identify riders by name but by a ticket number for rider privacy. TRC's central software allows for guaranteed pre-booking and subscription trips.

Pricing structure

TRC's pricing structure is:

- Implementation fee one time
- Platform fee annual
- Per vehicle fee (peak vehicle) annual
- Partner success annual
- Additional features, per vehicle annual

All TRC's modules are included in the platform fee. Agencies can turn off modules that they do not want to use.

Combined Peer & Software Vendor Lessons

Based on insights from the peer agency and vendor interviews and the consultant team's industry understanding, the key considerations for microtransit implementation are described below.

- **Productivity.** Overall, productivity is very dependent on factors like zone size, eligibility rules, and booking requirements.

- **Establishing Goals.** Key goals around ridership, cost efficiency, integration, accessibility, etc. should guide decisions and support communication with community leaders and riders.

- **Assess Internal Resources.** Assess if the agency has operational capacity, technological experience, and call center resources to use before contracting services out.

- **Contract Services vs Agency Provided.**

    - Contracted services may allow faster deployment, but limit customization and oversight compared to in-house operations.

    - Across the industry, there are examples of agencies reducing costs and improving productivity by contracting out services and by bringing services back in house (Kansas City, Pinellas, LA Metro). There is no one right answer, and the "right" answer may change in the future.

- **System Decision-Making.** Clearly outline decision-making workflows, data sharing, vehicle specifications, etc. between internal teams and external vendors.

- **Continually Evolve System.** Even among agencies that have been providing microtransit services for several years, these services continue to evolve and change in response changing agency goals and community needs.

Zone-Specific Parameters and Metrics

Proposed Zone Typologies

The potential zones analyzed for this project have very different operating environments. They range from the Bellingham Waterfront District zone, which is very urban and has short trips, to the zone in Everson/Nooksack/Sumas zone with very rural development patterns and longer trip lengths. Based on the varied service areas, the consultant team recommends that WTA have two different service profiles which mirror the Fixed-Route Typologies developed for the Fixed-Route Evaluation Guidelines.

The zones should fall into two typologies, local urban and small cities/rural. Figure 30 shows the nine zones and the recommended typology, based on a review of the development density and current WTA fixed-route service.

Figure 30: Recommended Zone Typologies

Zone	Recommended Zone Typology
Lynden	Small Cities / Rural
Ferndale	Small Cities/ Rural
Blaine/Birch Bay	Small Cities / Rural
Tweed Twenty/Silver Beach	Local Urban
Yew St/Lake Padden	Local Urban
Peaceful Valley / Kendall / Maple Falls	Small Cities / Rural
Everson/Nooksack/Sumas	Small Cities / Rural
Bellingham Waterfront District	Local Urban
Lummi Nation	Small Cities / Rural

Recommended Typology Parameters and Metrics

The two microtransit zone typologies should have different operating parameters and metrics for efficiency and effectiveness. The local urban zones will be more of a “first-mile, last-mile” service, which is intended primarily to provide connections to the rest of the WTA transit system. The small cities/rural zones will primarily be point-to-point, which provides mobility in areas where fixed-route service is limited or non-existent. Figure 31 summarizes the recommended service parameters and performance metrics for the two typologies. Each of these is explained in more detail on the following pages.

Figure 31: Recommended Zone Parameters and Metrics

Parameter / Metrics	Local Urban	Small Cities / Rural
Weekday Operating Hours	7am – 10pm	6am – 9pm
Weekend Operating Hours	8am – 9pm	8am – 8pm
Weekday Response Time	15-30 min	15-60 min
Weekend Response Time	15-30 min	45-60 min
Pick-Up & Drop-Off Type	Virtual Stops	Curb-to-Curb
Advanced Reservations	No	Yes
Walk-On Service	No	Yes
Group Ride Discounts	Yes	Yes
Outside Zone Destinations	Yes	Yes
Productivity Metric	3.0	2.0
Shared-Ride Metric	20%	20%
Fixed-Route Connection Metric	30%	10%

Operating Hours

The recommended operating hours mirror the fixed-route guidelines for the same route typologies. The Small Cities / Rural zones start earlier on weekdays to allow for transfers to the fixed-route service for longer trips into Bellingham. The evening hours are an hour shorter on all days for both these zones based on reduced trip activity. If demand during the first or last hours of the days is unusually high or low, WTA may adjust the service span to accommodate the demand.

Response Time Metric

The time from requesting a pickup to the time the vehicle arrives, called "Response Time," should vary based on the zone typology. The response times are based on comparable fixed-route service wait times, calculated as half of the nearby route frequencies. Weekday and weekend response time ranges were developed based on the comparable fixed-route service frequency ranges. Overall, the response times for the Local Urban zones will be faster than the Small Cities / Rural zones, which have infrequent fixed-route service. The number of vehicles operating per hour should be adjusted annually to stay within the response time ranges.

Pick-Up & Drop-Off Type

The built environment differs between the two zone typologies. The Local Urban zones are more walkable and have smaller lot sizes. The Small Cities / Rural zones are predominantly built around car trips, where the traveler can park their vehicle close to the destination and limit the amount of walking required. For efficiency, the consultant team recommends using "Virtual Stop" locations in the Local Urban zones. "Virtual Stop" locations require travelers to walk to major intersections to access microtransit, similar to using fixed-route service. In the Small Cities / Rural zones, the service should be "Curb-to-Curb," where microtransit vehicles travel as close as possible to the destinations while remaining on public roads. The Virtual Stops are more efficient and will allow WTA to have a higher productivity goal, as discussed later.

Advanced Reservations

Advanced Reservations could make the service more efficient in some cases and can cause operational issues in others. The Small Cities / Rural zones make sense to have advanced reservations, since the number of trips will be lower and response times will be higher. WTA should permit these reservations any time during the day before travel until two hours prior to the requested pick-up time. Reservations will also be helpful where customers are trying to make connections to infrequent fixed-route service at a specific time. Reservations are not recommended in the Local Urban zones for more efficiency and availability.

Walk-On Service

In the Small Cities / Rural zones, WTA should permit customers to board the vehicle and request a trip at a key location in the zone instead of reserving in advance by calling or using an app. This should be permitted at the major connecting point to transit service for the zone, for example at a transit station or park and ride lot. Allowing customers to walk on to service can provide a valuable introduction for first-time users and can provide a lifeline to stranded transit users. For this to work efficiently, vehicles should stage at the key location when not in service. Walk-on service should not be allowed in the Local Urban zones except at major transit hubs, such as Bellingham Station, if the hub is part of a zone.

Group Ride Discounts

The fares for microtransit service should encourage group rides, as they are more efficient than single rides. An example of a group ride discount would be allowing additional passengers to ride for free or at a reduced rate with the customer who has requested the ride. Besides this working well for families and friends, this can be promoted to other potential users, such as employees at the same work site or students at the same school.

Outside Zone Destinations

Both zone types should allow for connections to special destinations nearby the zone boundaries. In Local Urban zones, this may be a transit station, large institution such as a hospital or school, or a large commercial development. In Small Cities / Rural zones, this will probably be a connection to another nearby transit station to allow for connectivity to the fixed-route system. The special destination areas should be set up to only allow trips to or from the destination, not to allow people to use the service to travel within the special destination area.

Productivity Metric

One of the key measures of productivity is the number of passengers boardings per revenue hour of service. Microtransit services typically struggle to exceed 3.5 boardings per revenue hour, even in the most ideal circumstances. For WTA, it is recommended that the Local Urban zones have a productivity goal of 3.0 boardings per revenue hour and Small Cities / Rural zones have a target of 2.0 boardings per revenue hour. WTA can use these assumptions when planning for new services and evaluating existing zones.

Shared-Ride Metric

The shared-ride metric measures the percentage of rides with more than one person in the vehicle for all or part of the ride. Mictrotransit is intended to be a shared-ride public transportation service compared to private services like Uber and Lyft. Sharing rides also reduces the vehicle miles travelled compared to providing direct service for each customer. A target of 20% shared rides is recommended for both zone typologies and is based on peer projects and results from the Lynden HOP pilot project.

Fixed-Route Connection Metric

Another performance metric is the percentage of customers connecting to/from microtransit to the WTA fixed-route bus service. The target in the Local Urban zones should be higher based on the purpose of these zones and the number of fixed-route connections. These zones extend the reach of transit where fixed-route service is not a good fit based on demand or the built environment. In the Small Cities / Rural zones, the service is in place of fixed-route bus service, and many trips will be internal to the zone. It is recommended that the Local Urban zones have a fixed-route connection goal of at least 30% and Small Cities / Rural zones have a target of at least 10%.

Fixed Route Integration

When implementing a new microtransit service, it is best practice to analyze the existing fixed-route transit service in and nearby the zone. Microtransit should complement the rest of the transit system and not compete with it for riders, since it typically has a higher cost per passenger boarding. Also, funds to operate microtransit service usually come from the same operating funds which are used to operate the local bus service. Given no new funds for service expansion, fixed route service would need to be reduced somewhere in the WTA system in order to substitute less efficient, but more flexible, microtransit service. WTA could realize some additional cost savings if the ADA paratransit service area is reduced where there is no fixed-route service.

The consultant team developed draft recommendations for changes to the WTA routes in each zone that would support the addition of microtransit. These recommendations were discussed with the project team and refined based on their feedback. The following section provides more details for the recommendations for each zone; these suggested changes were considered in the ridership modeling discussed in Chapter 3.

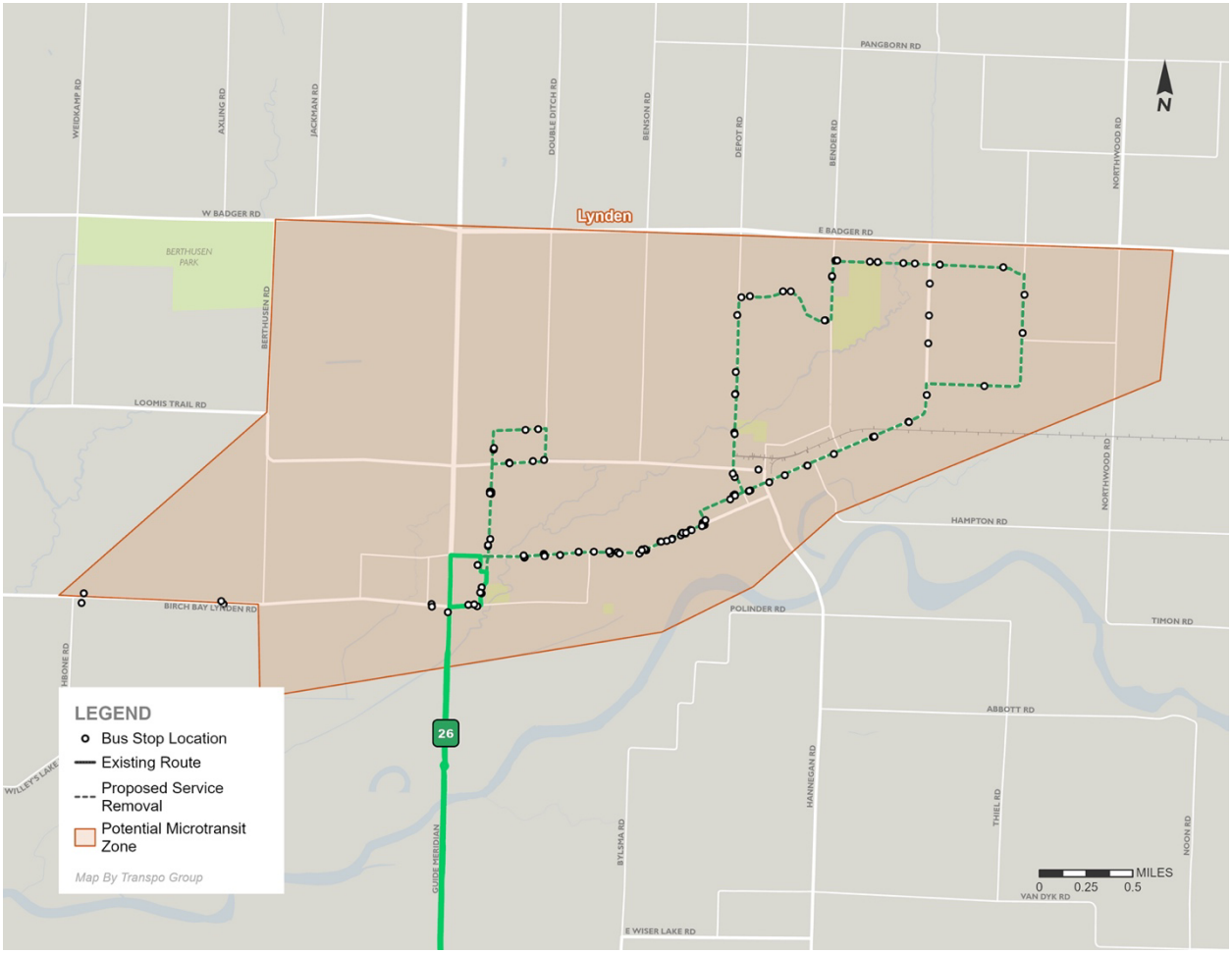
Paratransit Implications

WTA is required by law to provide complementary ADA service, called Paratransit, within ¾ of a mile on either side of a fixed route. If fixed-route service is removed in the microtransit zones, WTA would not be required to provide Paratransit within the zones. However, the microtransit fleet would be required to be wheelchair accessible. Given the large number of people who would be affected by this change, the WTA Board of Directors will need to have a policy level discussion on this topic. The number of Paratransit trips within each zone were taken into consideration in the ridership modeling.

Lynden Zone

For the Lynden Zone, the recommendation is to cut Route 26 back to Lynden Station coming from Bellingham, because the zone duplicates much of Route 26 inside the city (see Figure 32). This change would allow WTA to operate Route 26 at a 60-minute frequency all day with one bus. The modeled performance assumes that the riders at the impacted stops will use the new microtransit service, and the microtransit service evaluation accounts for the vehicles needed to serve those riders. Riders continuing further south will be able to transfer between the microtransit and Route 26 at Lynden Station. One weakness of this approach is the difficulty in accommodating larger numbers of riders that use the fixed route bus. Due to the limitations on capacity and trip travel times, multiple microtransit vehicles would have to be prioritized for this single purpose. The microtransit vehicle could also be staged at Lynden Station when not busy or to meet the hourly bus service.

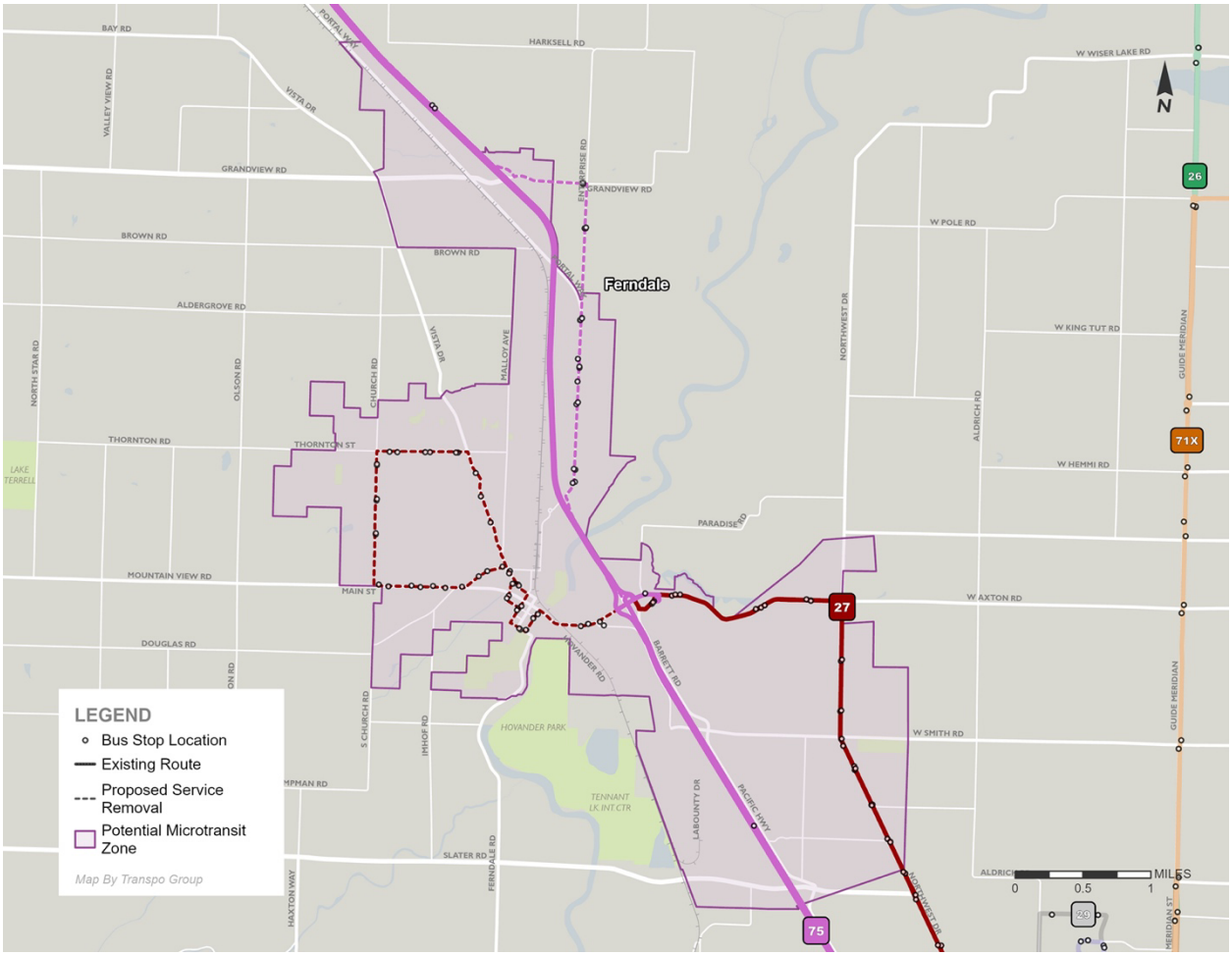
Figure 32: Lynden Zone Fixed-Route Recommendations Map



Ferndale Zone

For the Ferndale Zone, the recommendation is to straighten Route 75 within the zone and cut Route 27 back to Ferndale Station coming from Bellingham, as shown in Figure 33. If implemented with straightening in the Blaine/Birch Bay zone, WTA could improve the frequency of Route 75 to 60-minute all-day service and 120-minute weekend service with the same resources required for the current service. WTA could increase frequency of Route 27 to 60-minute service on all days. The modeled performance assumes that the riders at the impacted stops will use the new microtransit service, and the microtransit service evaluation accounts for the vehicles needed to serve those riders.

Figure 33: Ferndale Zone Fixed-Route Recommendations Map



Blaine / Birch Bay Zone

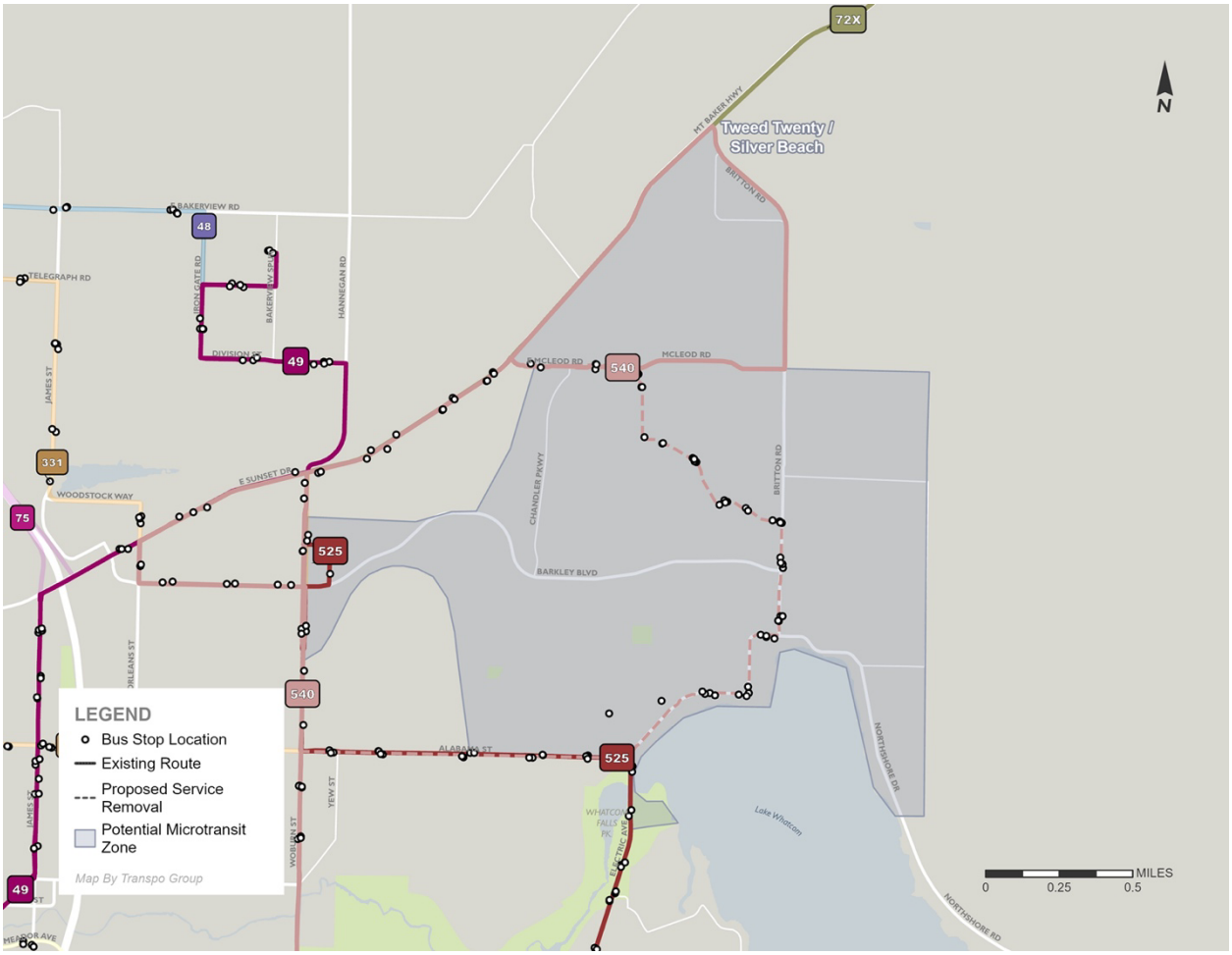
For the Blaine/Birch Bay Zone, the recommendation is to straighten Route 75 within the zone, as shown in Figure 34. As noted in the Ferndale zone recommendation, Route 75 could have an improved frequency across all days using the same amount of resources currently used for operations. The modeled performance assumes that the riders at the impacted stops will use the new microtransit service, and the microtransit service evaluation accounts for the vehicles needed to serve those riders.

Figure 34: Blaine / Birch Bay Zone Fixed-Route Recommendations Map

Tweed Twenty / Silver Beach Zone

While developing fixed-route recommendations for this zone, the consultant team made some changes to the zone boundaries to support the fixed-route service. The first change was to remove the section of the zone south of Alabama Street. The zone was also extended further north to include Squalicum High School and the area between Britton Road and Mount Baker Highway (see Figure 35). The consultant team recommends restructuring Route 540 by removing the east loop, which would be served by the new zone. WTA could improve the frequency of Route 540 to 40 minutes on weekdays if the route was shortened to Barkley Village. Either Route 72X or 520 could serve Squalicum High School, depending on the final routing. Route 72X is infrequent and would need to be scheduled so that trips pass by the high school at optimal times before and after school to allow for student use. The modeled performance assumes that the riders at the impacted Route 540 stops will use the new microtransit service, and the microtransit service evaluation accounts for the vehicles needed to serve those riders.

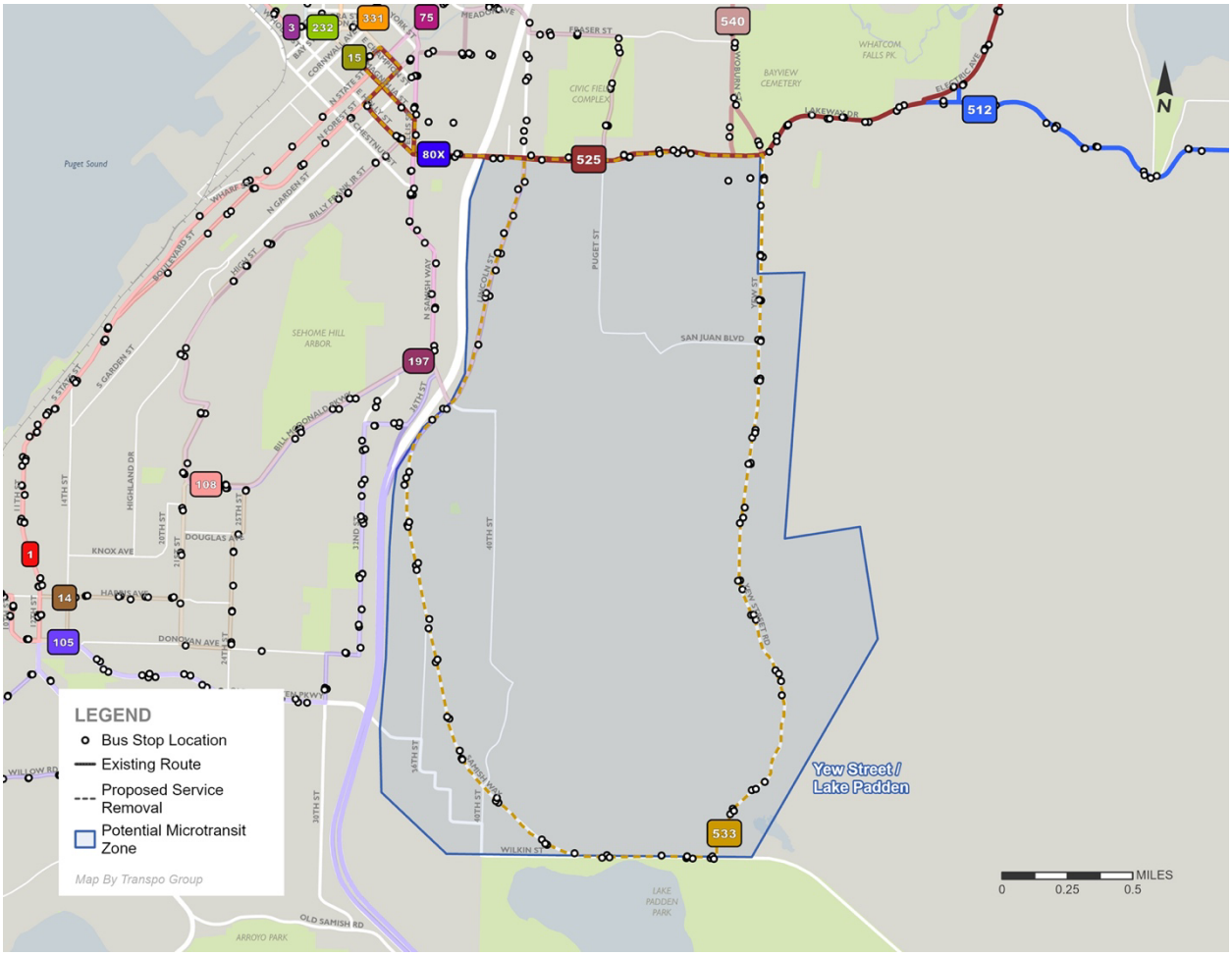
Figure 35: Tweed Twenty / Silver Beach Zone Fixed-Route Recommendations Map



Yew St / Lake Padden Zone

For the Yew St / Lake Padden Zone, the recommendation is to eliminate Route 533, since it would be entirely covered by the new zone (see Figure 36). The proposed zone includes a connection to the Lincoln Creek Park and Ride, which is within the zone boundaries. The modeled performance assumes that the riders at the impacted Route 533 stops will use the new microtransit service, and the microtransit service evaluation accounts for the vehicles needed to serve those riders. Since Route 533 is part of the 15-minute Plum Line service, WTA would need to increase the frequency on another route to keep the Plum Line at a 15-minute frequency.

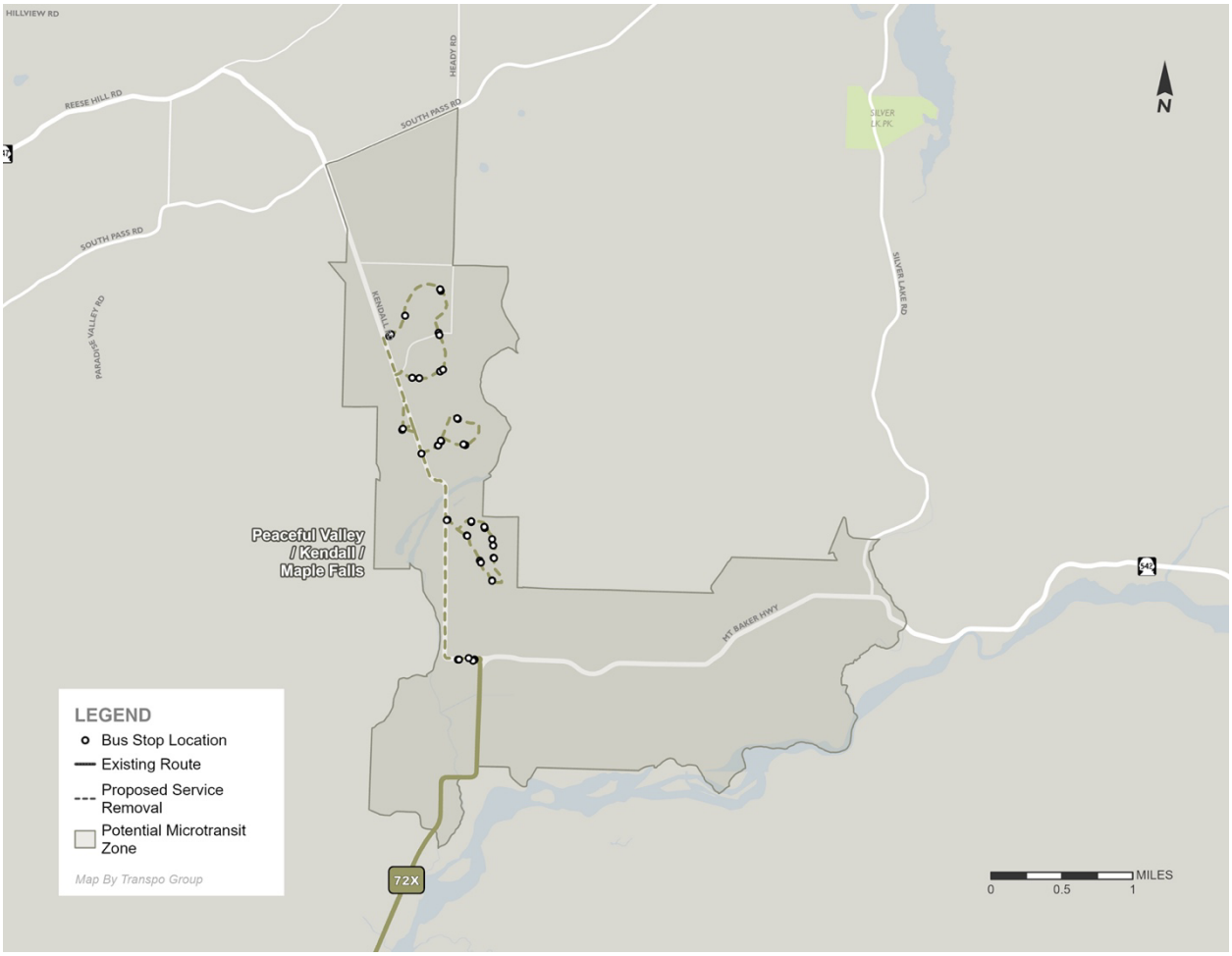
Figure 36: Yew St / Lake Padden Zone Fixed-Route Recommendations Map



Peaceful Valley / Kendall / Maple Falls Zone

For the Peaceful Valley / Kendall / Maple Falls Zone , the recommendation is to cut Route 72X back to Mount Baker Highway at Kendall Road coming from Bellingham (see Figure 37). This would allow WTA to provide 60-minute, bi-directional service on weekdays and 120-minute service on weekends with similar operating resources. The bus can layover at the library, which would also make a good location for the microtransit vehicles to stage when not in use. The modeled performance assumes that impacted Route 72X riders will use the new microtransit service, and the microtransit service evaluation accounts for the vehicles needed to serve those riders.

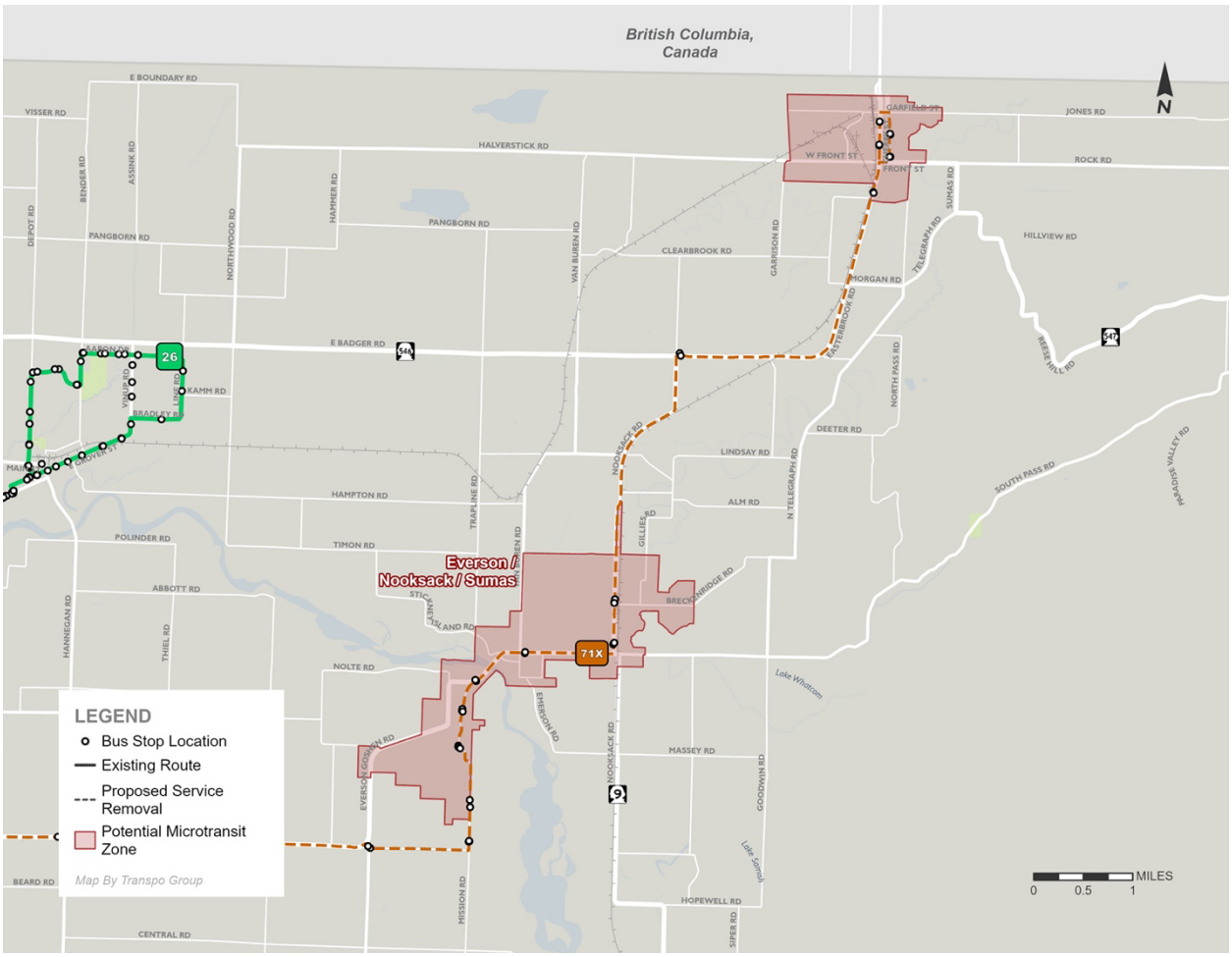
Figure 37: Peaceful Valley / Kendall / Maple Falls Zone Fixed-Route Recommendations Map



Everson / Nooksack / Sumas Zone

For the Everson / Nooksack / Sumas Zone, the recommendation is to eliminate Route 71X, which is the only route serving these cities. The southern portion of Route 71X, along Guide Meridian Road, is duplicative of Route 26. To allow for connections to/from these cities to the rest of the fixed-route network, the recommendation is to include Lynden Station as a destination outside of the contiguous zone boundaries. Customers could make trips to/from Lynden Station but nowhere else within the City of Lynden. The modeled performance assumes that impacted riders on the northern section of Route 71X will use the new microtransit service, and the microtransit service evaluation accounts for the vehicles needed to serve those riders.

Figure 38: Everson / Nooksack / Sumas Zone Fixed-Route Recommendations Map



Bellingham Waterfront District Zone

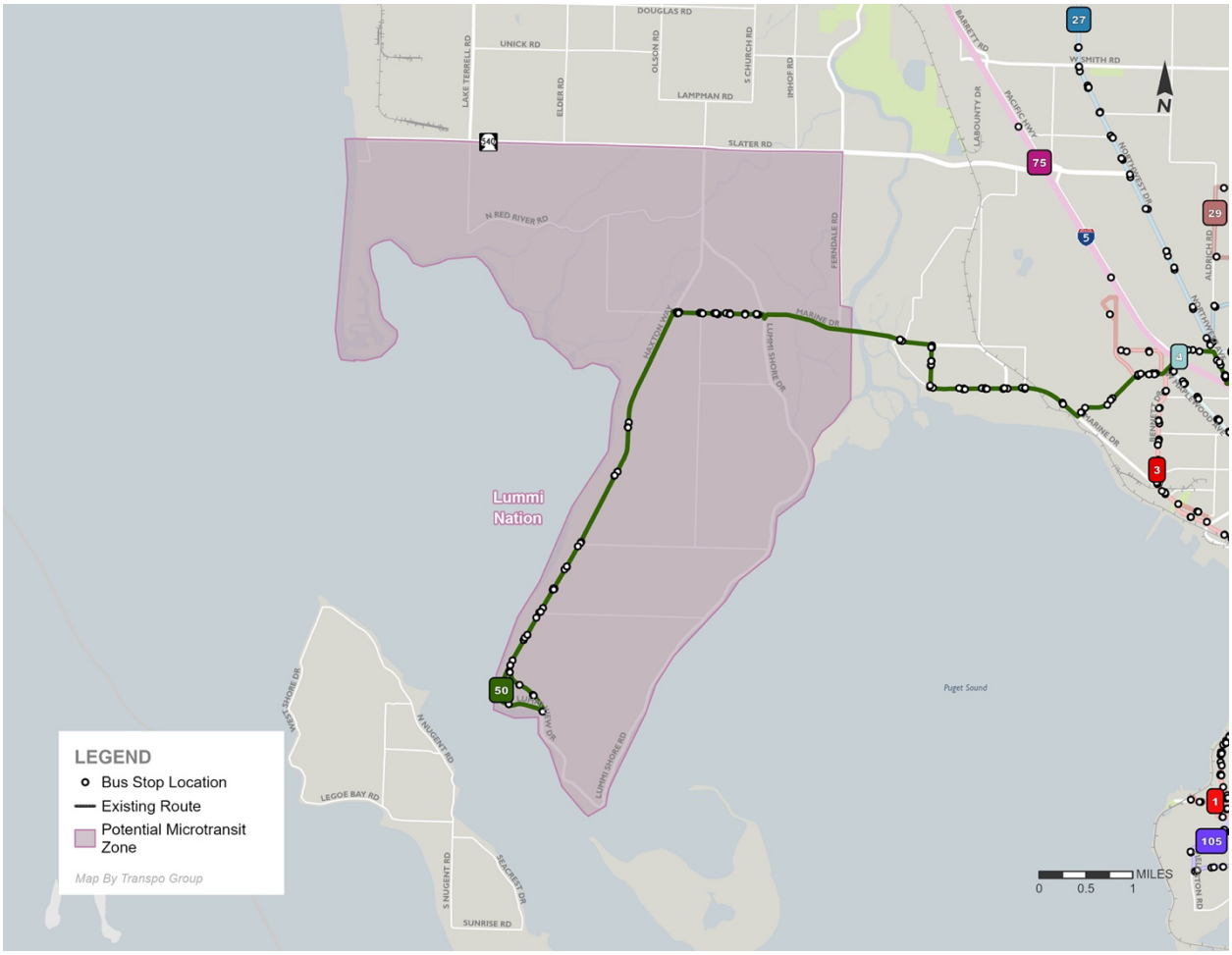
The Bellingham Waterfront District master plan envisions 6 million square-feet of mixed-use development within this area. The master plan also assumed that transit would serve this area with buildout of the development. There is currently no fixed-route service within the proposed zone, but Routes 1 and 3 provide service within walking distance of the zone boundary (see Figure 39). Another alternative to customers walking to these routes would be to allow customers in this zone to make trips to/from Bellingham Station, which would provide additional access to the rest of the WTA system. The modeled performance did not assume fixed-route ridership, since there are no existing fixed-route services, and the microtransit service evaluation accounts for the vehicles needed to serve those riders. WTA is planning on adding service to the Waterfront in fall 2024, and there may be the potential to restructure this service if microtransit is added in the future.

Figure 39: Bellingham Waterfront District Zone Fixed-Route Recommendations Map

Lummi Nation Zone

The Lummi Nation Zone is currently served by Route 50, in addition to an transit service provided by Lummi Nation (see Figure 40). For this study, the consultant team is not recommending changes to the fixed-route service, as the analysis of the Lummi Nation zone is provided for Lummi Nation Transit Planners to see the potential demand for microtransit service in their service area and not for WTA to replace fixed route transit with microtransit service in the area.

Figure 40: Lummi Nation Zone Fixed-Route Recommendations Map



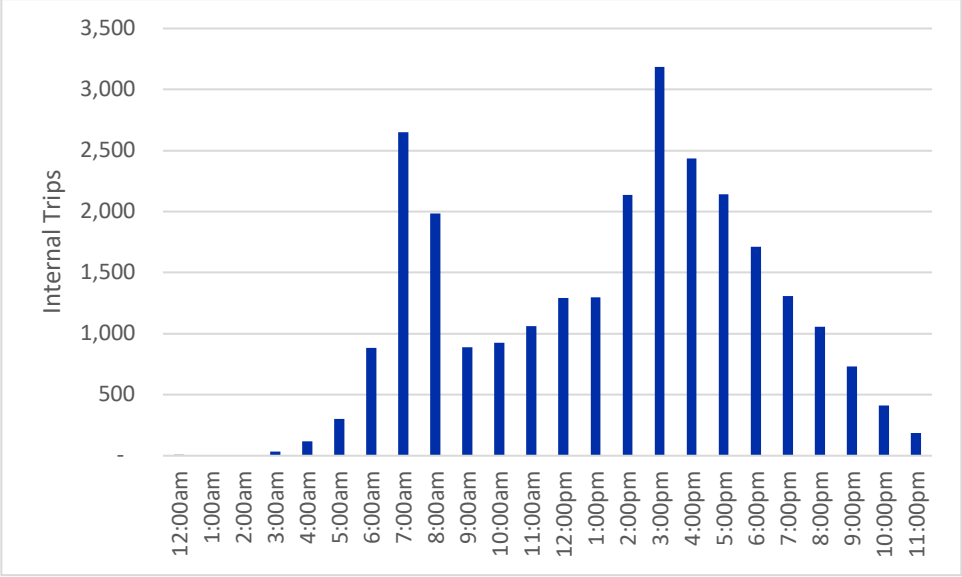
Chapter 3: Zone Evaluation

The purpose of this chapter is to summarize the evaluation of the nine microtransit zones identified in Chapter 1 and further defined in Chapter 2. Metrics were developed for both evaluating the zones compared to one another and for ongoing service monitoring after implementation. This chapter provides details on the metrics for each project goal / objective and the indexed score by zone. The last section provides a summary of the scoring by metric and a total score by zone which can be used to prioritize implementation.

Ridership Modeling

The consultant team projected microtransit demand for the potential zones using a trip-based model based on Replica data from Spring 2023, which is the most recent available data. Replica uses multiple types of location data collected from personal mobile devices and in-dashboard telematics to determine when and where people are making trips. The consultant team used the tool to determine the number of trips both starting and ending within each proposed zone boundary. The team filtered out trips shorter than ½ mile, as these are not likely to be potential microtransit trips. The data is provided hourly for a typical weekday and weekend day (see example in Figure 41).

Figure 41: Weekday Internal Trips by Hour in the Lynden Zone (Spring 2023)



The consultant team used the hourly internal trip pattern by hour to determine the general demand for microtransit. In some of the zones, extra trips are anticipated for customers who will be using microtransit to connect to fixed-route service leaving the zone. The model produces an "Optimal Vehicles" number based on the assumptions discussed in the next section. The team then modified the vehicle numbers based on the reasonableness. For example, if demand increases during only one hour, the consultant team would not add the three additional vehicles for only one hour, as this would be operationally inefficient. A screenshot of the weekday model for the Lynden Zone weekday service is shown in Figure 42.

Figure 42: Lynden Zone Weekday Service Model Screenshot

Trip Start Hour	Replica Trips	General Demand	Other Demand	Potential Trips	Average Trip in Minutes	Optimal Vehicles (RVH)	Planned Vehicles (RVH)	Planned Capacity	Planned Ridership	Unmet Demand	Excess Capacity	Avg Wait Time	Board / RVH	Cost	Cost per Boarding
12:00 AM	9	1	-	1	12	1		-	-	1	-		-	$ -	$ -
1:00 AM	5	1	-	1	14	1		-	-	1	-		-	$ -	$ -
2:00 AM	5	1	-	1	13	1		-	-	1	-		-	$ -	$ -
3:00 AM	33	1	-	1	11	1		-	-	1	-		-	$ -	$ -
4:00 AM	119	1	-	1	10	1		-	-	1	-		-	$ -	$ -
5:00 AM	300	2	-	2	10	1		-	-	2	-		-	$ -	$ -
6:00 AM	882	5	1	6	10	3	2	6	6	0	-	19.0	3.00	$ 200.00	$ 33.33
7:00 AM	2,651	14	5	19	10	7	5	15	15	4	-	7.7	3.00	$ 500.00	$ 33.33
8:00 AM	1,984	10	4	14	10	5	5	15	14	-	1	7.0	2.82	$ 500.00	$ 35.49
9:00 AM	890	5	2	7	9	3	3	9	7	-	2	8.6	2.28	$ 300.00	$ 43.90
10:00 AM	923	5	2	7	9	3	3	9	7	-	2	8.6	2.30	$ 300.00	$ 43.47
11:00 AM	1,060	6	2	8	9	3	3	9	8	-	1	10.6	2.73	$ 300.00	$ 36.66
12:00 PM	1,292	7	3	10	9	4	3	9	9	1	-	11.1	3.00	$ 300.00	$ 33.33
1:00 PM	1,300	7	3	10	9	4	3	9	9	1	-	11.6	3.00	$ 300.00	$ 33.33
2:00 PM	2,139	11	4	15	10	6	5	15	15	0	-	7.4	3.00	$ 500.00	$ 33.33
3:00 PM	3,185	16	7	23	10	8	6	18	18	5	-	6.3	3.00	$ 600.00	$ 33.33
4:00 PM	2,435	13	5	18	9	7	6	18	18	0	-	5.9	3.00	$ 600.00	$ 33.33
5:00 PM	2,140	11	4	15	9	6	5	15	15	0	-	6.7	3.00	$ 500.00	$ 33.33
6:00 PM	1,713	9	4	13	9	5	5	15	13	-	2	5.7	2.51	$ 500.00	$ 39.91
7:00 PM	1,310	7	3	10	9	4	4	12	10	-	2	7.1	2.42	$ 400.00	$ 41.24
8:00 PM	1,056	6	2	8	9	3	3	9	8	-	1	10.3	2.73	$ 300.00	$ 36.69
9:00 PM	729	4	2	6	10	2		-	-	6	-		-	$ -	$ -
10:00 PM	409	3	-	3	10	1		-	-	3	-		-	$ -	$ -
11:00 PM	186	1	-	1	11	1		-	-	1	-		-	$ -	$ -
Total	**26,755**	**147**	**52**	**199**	**10.1**	**81**	**61**	**183**	**171**	**28**	**12**	**8.9**	**2.81**	**$ 6,100.00**	**$ 35.59**

Modeling Assumptions

The consultant team adjusts the microtransit modeling assumptions for each project based on local conditions. This section describes the assumptions used for this project.

General Demand

Based on our experience with other microtransit services and the models developed by microtransit software providers, the general demand for microtransit is 0.5% of all internal trips. For most of the zones, the analysis used the Replica trip data described in the previous section to project trip demand. Since the Bellingham Waterfront District Zone is not built out, the existing trip patterns are not representative of the future demand. For this zone, the analysis used the projected 2045 full buildout internal trip volumes from the WCCOG travel demand model. The trips were allocated by hour based on the existing trip activity in the zone. The project team had concerns that the trip activity in the Peaceful Valley / Kendall / Maple Falls would be too low based on the lack of cellphone coverage, when cellphone data is the primary source of Replica trip activity. Trips in this zone were increased using the 2019 WCCOG travel demand model data.

Other Demand

As discussed earlier in this chapter, the analysis assumes some number of fixed-route riders will move to the microtransit, depending on changes to the routes. The team assumes that existing fixed-route trips that start and end in the zone are captured by the "General Demand." For routes leaving the proposed zone, the analysis assumed a portion of the riders would use a combination of fixed-route services and microtransit to make their trip. The analysis uses a ratio of internal zone and external zone trips to determine which percentage of the impacted fixed-route riders would be leaving the zone and need to make their trip on microtransit if their stop was impacted.

Service Hours and Response Time

Service hours and response time targets for each zone are based on the zone typology outlined in Chapter 2 and are summarized in Figure 43.

Figure 43: Operating Hours and Response Time by Day Type and Zone Typology

	Local Urban	Small Cities/Rural
Weekday Operating Hours	7a – 10p	6a – 9p
Weekend Operating Hours	8a – 9p	8a – 8p
Weekday Response Time	15-30 min	15-60 min
Weekend Response Time	15-30 min	45-60 min

Productivity

The analysis assumed that the microtransit service can accommodate an average of 3.0 boardings per vehicle per hour. This is based on experience with other microtransit services and analysis of WTA's Lynden HOP pilot project. The trip capacity sometime exceeds the demand during a given hour and the average boardings per revenue hour will be lower than 3.0 throughout the day.

Operating Cost

The analysis assumed a marginal operating cost of $100 per revenue hour of service. This is based on consultant team experience and discussions with WTA staff. This cost is intended to capture the direct operating costs and not support or administrative costs.

Modeling Results

Ridership, vehicle requirements, and operating cost were calculated for each zone on weekdays and weekends. The weekday estimates are summarized in Figure 44, and weekends are summarized in Figure 45. Annual estimates are summarized in

Figure 46. These costs do not account for any other service changes in support of the microtransit (for example, revisions to fixed-route service). Appendix A includes detailed model results. Because the Lynden Hop boundaries are similar to the proposed boundaries, modeling results for the Lynden zone can represent those similar to those that would have been expected for the Hop pilot.

Figure 44: Summary of Weekday Zone Model Results

Zone	Weekday Span	Weekday RVH*	Weekday Peak Vehicles	Weekday Boarding Estimate
Lynden	6:00a - 9:00p	61	6	171
Ferndale	6:00a - 9:00p	69	6	202
Blaine/Birch Bay	6:00a - 9:00p	42	4	118
Tweed Twenty/Silver Beach	7:00a - 10:00p	36	3	92
Yew St/Lake Padden	7:00a - 10:00p	24	2	44
Peaceful Valley / Kendall / Maple Falls	6:00a - 9:00p	22	2	63
Everson/Nooksack/Sumas	7:00a - 10:00p	15	1	38
Bellingham Waterfront District	7:00a - 10:00p	26	2	61
Lummi Nation	6:00a - 9:00p	15	1	29

*Revenue vehicle hours (RVH)

Figure 45: Summary of Weekend Zone Model Results

Zone	Weekend Span	Weekend RVH	Weekend Peak Vehicles	Weekend Boarding Estimate
Lynden	8:00a - 8:00p	40	4	114
Ferndale	8:00a - 8:00p	48	4	142
Blaine / Birch Bay	8:00a - 8:00p	33	4	94
Tweed Twenty / Silver Beach	8:00a - 9:00p	24	2	45
Yew St / Lake Padden	8:00a - 9:00p	21	2	39
Peaceful Valley / Kendall / Maple Falls	8:00a - 8:00p	16	2	46
Everson / Nooksack / Sumas	8:00a - 9:00p	12	1	32
Bellingham Waterfront District	8:00a - 9:00p	23	2	56
Lummi Nation	8:00a - 8:00p	12	1	21

Figure 46: Summary of Annual Statistics by Zone

Zone	Vehicles Required per Day	Annual RVH*	Annual Ridership Estimate	Annual Cost Estimate**
Lynden	6	19,955	56,237	$1,995,500
Ferndale	6	22,875	67,063	$2,287,500
Blaine / Birch Bay	4	14,340	40,347	$1,434,000
Tweed Twenty / Silver Beach	3	11,820	28,462	$1,182,000
Yew St / Lake Padden	2	8,430	15,362	$843,000
Peaceful Valley / Kendall / Maple Falls	2	7,370	20,972	$737,000
Everson / Nooksack / Sumas	1	5,145	13,204	$514,500
Bellingham Waterfront District	2	9,160	21,715	$916,000
Lummi Nation	1	5,145	9,705	$514,500

*For comparison, 2023 revenue hours for Route 26 was 7,175 and Route 232 was 15,048

**The annual cost to operate Route 232, a GO-Line with 15-minute service, is $3.2 million. Annual ridership on Route 232 is 376,000. The annual cost to operate Route 26 Lynden is $1.5 million, with annual ridership of 70,000.

Performance Metrics & Scoring

The project team developed the "Microtransit Service Goals and Objectives" shown in Figure 47. These goals were developed specifically for this project but are also consistent with the WTA Long Range Transit Plan and Lynden HOP service objectives. These goals are discussed in more detail in Chapter 1.

Figure 47: Microtransit Service Goals and Objectives

Microtransit Service Goals and Objectives
1. Improve Accessibility • Enhance local mobility for areas not served well by traditional fixed-route transit • Improve transit access for priority populations
2. Integrate with Transit Network • Grow transit ridership by extending access to key transit corridors • Environmental stewardship
3. Efficient Service Delivery • Provide cost-effective service compared to existing fixed-route and paratransit services
4. Service Equality • Provide comparable service experience to existing fixed-route and paratransit service

Next, the consultant team developed draft evaluation metrics which were refined by the project team. Some of the metrics were used for evaluating the zones, some will be used for monitoring, and some will be used for both purposes (see Figure 48).

Figure 48: Metric Summary

Goal	Metric	Zone Evaluation	Ongoing Monitoring
Improve Accessibility	ADA and Fixed- Route Service per Capita after Implementation	✓	
	New Transit Rides for Priority Populations	✓	✓
Integrate with Transit Network	Connections to Existing Routes	✓	
	Riders Connecting to Fixed-Route Service		✓
	Vehicle Miles Travelled Reduction	✓	✓
Efficient Service Delivery	Cost per Boardings	✓	✓
	New Zone Cost Ratio	✓	
	Passenger Miles per Hour, Passenger Miles per Boarding, Cost per Passenger Mile		✓
Service Equality	Operating Hours		✓
	Response Time		✓

For each evaluation metric, a summary of the calculation and indexed score is shown in the rest of this section. The zone scoring the highest on the metric receives an indexed score of 1.0, and the other zones are given an index score as a ratio of their performance compared to the highest performing zone. The combined scores and ratings by zone are discussed in the next section of the chapter.

Goal: Improve Accessibility

Objective: Enhance local mobility for areas not served well by traditional fixed-route transit

Metric: Existing ADA and Fixed- Route Service

This metric determines to what extent the proposed zone already has transit service, the higher the index, the greater the gap in service. It measures the amount of fixed route stop trips and ADA paratransit pickups divided by the total population within each zone. "Fixed-route stop trips" is a measurement of the total number of times that the bus services a stop in the zone. For example, if a route runs hourly from 6am to 6pm on weekdays, each stop would have 60 stop trips per week (12 trips per day for five days), and if the route had 40 stops, that would total to 2,400 weekly fixed-route stop trips. This metric will be used for both implementation and ranking. The lower the calculated metric, the higher the zone scores in the evaluation. The scoring is shown in Figure 49.

Figure 49: ADA and Fixed- Route Service per Capita after Implementation Evaluation Scoring

Zone	Weekly Fixed-Route Stop Trips	Weekly ADA Pickups	Zone Population	Service per Pop	Indexed Score
Lynden	5,475	175	16,230	0.35	0.27
Ferndale	5,766	288	17,640	0.34	0.27
Blaine/Birch Bay	1,788	4*	16,209	0.11	0.84
Tweed Twenty/Silver Beach	3,409	128	8,757	0.40	0.23
Yew St/Lake Padden	6,223	329	9,998	0.66	0.14
PV / Kendall / Maple Falls	1,200	-	4,075	0.29	0.32
Everson/Nooksack/Sumas	546	-	5,856	0.09	1.00
Bellingham Waterfront District	-	21	119	0.18	0.53
Lummi Nation	1,972	31	5,744	0.35	0.27

*Prior to deployment of paratransit service in this zone

Objective: Improve transit access for priority populations

Metric: New Transit Rides for Priority Populations

This metric measures new boardings by WTA Priority Populations (low-income, minority, car-free, disabled, and senior). The project team weighted the populations as shown in Figure 50. There is overlap in how individuals are counted, as an individual may be a member of more than one group.

Figure 50: Priority Population Weightings

Zone	Low-Income Population	Minority Population	Car Free Household	Disabled Population	Seniors	Weighted Priority Pop %
Weight	***40%***	***25%***	***10%***	***15%***	***10%***	
Lynden	6%	22%	7%	12%	19%	**13%**
Ferndale	8%	30%	5%	12%	16%	**15%**
Blaine/Birch Bay	11%	22%	3%	17%	25%	**15%**
Tweed Twenty/Silver Beach	6%	19%	5%	11%	17%	**11%**
Yew St/Lake Padden	13%	22%	3%	12%	17%	**14%**
PV / Kendall / Maple Falls	46%	24%	3%	18%	15%	**29%**
Everson/Nooksack/Sumas	9%	31%	6%	15%	15%	**16%**
Bellingham Waterfront District	24%	31%	14%	15%	13%	**22%**
Lummi Nation	15%	62%	2%	18%	17%	**26%**

The weighted average was calculated for each zone and divided by the total zone population to determine the weighted priority population percentage, which was multiplied by the weekly projected microtransit trips to get the priority population weekly boardings. This metric will be used for both implementation and ranking. After implementation, WTA can identify the actual number of priority population riders through surveys, which would be more accurate than using Census demographics. The higher the calculated metric, the higher the zone scores in the evaluation. Figure 51 shows scores for this metric.

Figure 51: New Transit Rides for Priority Populations Evaluation Scoring

Zone	Weighted Priority Pop %	Weekly Microtransit Trips	Priority Pop Weekly Boardings	Indexed Score
Lynden	13%	1,084.82	135.69	0.72
Ferndale	15%	1,292.72	189.14	1.00
Blaine / Birch Bay	15%	776.33	119.23	0.63
Tweed Twenty / Silver Beach	11%	551.10	60.19	0.32
Yew St / Lake Padden	14%	295.18	42.73	0.23
PV / Kendall / Maple Falls	29%	404.03	115.52	0.61
Everson / Nooksack / Sumas	16%	253.88	39.87	0.21
Bellingham Waterfront District	22%	417.00	93.12	0.49
Lummi Nation	26%	187.00	49.28	0.26

Goal: Integrate with Transit Network

Objective: Grow transit ridership by extending access to key transit corridors

Metric: Connections to Existing Routes

This metric measures how many WTA routes will provide connections from the zone to the rest of the WTA service area. It is based on the fixed-route network changes recommended in Chapter 2, which could

be implemented at the same time the microtransit service starts. Though the Everson / Nooksack / Sumas zone is proposed to not have any fixed-route service, the recommendation includes connecting to fixed-route service at Lynden Station. Bellingham Waterfront District scoring is based on no fixed-route service inside the zone post-implementation. The higher the calculated metric, the higher the zone scores in the evaluation. The scoring for this metric is shown in

Figure 52.

Figure 52: Connections to Existing Routes Evaluation Scoring

Zone	WTA Routes	Indexed Score
Lynden	1	0.25
Ferndale	2	0.50
Blaine / Birch Bay	1	0.25
Tweed Twenty / Silver Beach	3	0.75
Yew St / Lake Padden	4	1.00
PV / Kendall / Maple Falls	1	0.25
Everson / Nooksack / Sumas	1	0.25
Bellingham Waterfront District	0	-
Lummi Nation	1	0.25

Metric: Riders Connecting to Fixed-Route Service

This metric will be used to monitor how many microtransit customers use fixed-route service as part of their trip after implementation. One way to collect this data is through passenger surveys. Another is to geofence trip activity at key bus stops and stations and assume that these trips are connecting to fixed-route service.

Objective: Environmental stewardship

Metric: Vehicle Miles Travelled Reduction

This metric determines to what extent each zone reduces greenhouse gas emissions (GHG) by calculating the reduction in vehicle miles travelled (VMT). The metric calculates the total passenger miles of the microtransit passenger trips and reduces the total by the percentage of shared rides. The evaluation analysis assumed that 20% of trips would be shared based the target metric recommended in Chapter 2. The weekly boardings are multiplied by the average zone trip length (from the model) and reduced by 20% based on the shared riders. Zones with more VMT savings receive a higher score, as shown in Figure 53. This metric can also be used post-implementation based on data provided by the microtransit software.

Figure 53: Vehicle Miles Travelled Reduction Evaluation Scoring

Zone	Weekly Boardings	Average Trip Length	Weekly Passenger Miles	Shared Ride %	Weekly RVM	Weekly VMT Savings	Indexed Score
Lynden	1,084.82	1.92	2,088.16	20%	1,670.53	417.63	0.82
Ferndale	1,292.72	1.90	2,456.17	20%	1,964.94	491.23	0.97
Blaine / Birch Bay	776.33	3.27	2,541.69	20%	2,033.35	508.34	1.00
Tweed Twenty / Silver Beach	551.10	1.40	771.53	20%	617.23	154.31	0.30
Yew St / Lake Padden	295.18	1.50	442.77	20%	354.21	88.55	0.17
PV / Kendall / Maple Falls	404.03	1.95	787.20	20%	629.76	157.44	0.31
Everson / Nooksack / Sumas	253.88	2.38	603.18	20%	482.55	120.64	0.24
Bellingham Waterfront District	417.00	0.80	333.60	20%	266.88	66.72	0.13
Lummi Nation	187.00	3.48	649.85	20%	519.88	129.97	0.26

Goal: Efficient Service Delivery

Objective: Provide cost-effective service compared to WTA fixed route and paratransit services

Metric: Cost per Boarding

This metric measures the average cost per boarding of microtransit within each zone. The cost is based on a marginal operating cost of $100 per revenue hour. This amount is then divided by the estimated boardings. Zones with the lower cost will receive a higher rating in the evaluation. This metric can also be used post-implementation to monitor the cost effectiveness of the zone on an ongoing basis and help guide adjustments to the service levels. The scoring for this metric is shown in Figure 54.

Figure 54: Cost per Boarding Evaluation Scoring

Zone	Weekly Microtransit RVH	Marginal Cost per RVH	Weekly Zone Boardings	Cost per Boarding	Indexed Score
Lynden	385	$100.00	1,084.82	$35.49	0.96
Ferndale	441	$100.00	1,292.72	$34.11	1.00
Blaine / Birch Bay	276	$100.00	776.33	$35.55	0.96
Tweed Twenty / Silver Beach	228	$100.00	551.10	$41.37	0.82
Yew St / Lake Padden	162	$100.00	295.18	$54.88	0.62
PV / Kendall / Maple Falls	142	$100.00	404.03	$35.15	0.97
Everson / Nooksack / Sumas	99	$100.00	253.88	$38.99	0.87
Bellingham Waterfront District	176	$100.00	417.00	$42.21	0.81
Lummi Nation	99	$100.00	187.00	$52.94	0.64

Metric: New Zone Cost Ratio

This metric calculates the overall cost of transit service provided to a zone before and after implementation. For the baseline cost, the amount of current fixed-route and ADA paratransit service

area calculated as revenue hours. For fixed-route service the route length in the zone is used to proportionally assign revenue hours. For ADA paratransit service, the number of existing boardings is divided by 2.4, which is the average boardings per revenue hour for the ADA service. For the post-implementation service, the fixed-route hours are recalculated based on new route mileage in the zone and the analysis does not assume any additional hours will be assigned to the route. For ADA paratransit, boardings occurring outside ¾ miles of the new fixed-route network in the zone were removed; the team then recalculated the revenue hours using the same 2.4 boardings per revenue hour. The revenue hour estimates are then added into the total revenue hours for the zone post-implementation. The revenue hour estimates for the existing service and proposed service by mode are shown in Figure 55.

Figure 55: Existing and Proposed Annual Revenue Hour Estimates

Zone	Existing Fixed-Route RVH	Existing ADA RVH	Proposed Fixed-Route RVH	Proposed ADA RVH	Proposed Microtransit RVH
Lynden	3,702.4	3,707.6	453.0	759.2	20,020.0
Ferndale	5,821.5	6,219.2	2,347.9	4,269.2	22,932.0
Blaine / Birch Bay	3,439.8	-	292.9	-	14,352.0
Tweed Twenty / Silver Beach	1,397.8	2,750.8	343.4	2,620.8	11,856.0
Yew St / Lake Padden	2,334.8	7,108.4	-	5,740.8	8,424.0
PV / Kendall / Maple Falls	1,276.1	-	340.7	-	7,384.0
Everson / Nooksack / Sumas	589.7	-	-	-	5,148.0
Bellingham Waterfront District	-	457.6	-	457.6	9,152.0
Lummi Nation	2,280.3	520.0	2,280.3	520.0	5,148.0

*As a comparison, Route 232, a GO-Line with 15-minute service, operates with a total of 22,000 annual revenue hours

All services are assumed to cost the agency a marginal cost of $100 per revenue hour. The proposed cost is then divided by the existing cost to calculate a cost ratio, where a lower cost ratio means lower additional cost to the agency. The cost ratio is then indexed like the other metrics, where a lower cost ratio received a higher score. The scoring for this metric is shown Figure 56.

Figure 56: New Zone Annual Cost Ratio Evaluation Scoring

Zone	Existing Cost	Proposed Cost	Net Cost Increase	Cost Ratio	Indexed Score
Lynden	$741,000	$ 2,123,222	$1,382,222	2.87	0.52
Ferndale	$1,204,070	$2,954,910	$1,750,840	2.45	0.61
Blaine / Birch Bay	$343,980	$1,464,486	$1,120,506	4.26	0.35
Tweed Twenty / Silver Beach	$414,856	$1,482,021	$ 1,067,165	3.57	0.42
Yew St / Lake Padden	$944,320	$1,416,480	$ 472,160	1.50	1.00
PV / Kendall / Maple Falls	$127,613	$772,470	$ 644,857	6.05	0.25
Everson / Nooksack / Sumas	$58,968	$514,800	$ 455,832	8.73	0.17
Bellingham Waterfront District	$45,760	$960,960	$915,200	21.00	0.07
Lummi Nation	$280,025	$794,825	$514,800	2.84	0.53

Metric: Additional Monitoring Criteria

WTA tracks additional performance for their existing services. Any new microtransit service should also be monitored using these same metrics, even if there is not a specific goal tied to the metric. These metrics are currently passenger miles per hour, passenger miles per boarding, and cost per passenger mile. After a year or two of operations, WTA may want to develop specific microtransit targets for these metrics.

Goal: Service Equality

Objective: Enhance local mobility for areas not served well by traditional fixed-route transit

Metric: Operating Hours

Operating hour recommendations were developed as part of the service design and are described further after Figure 31. They mirror the fixed-route guidelines for the route typologies which serve the zone (see Figure 57). The zone modeling assumed these operating hours, so all the zones currently meet this metric. WTA should use this metric for ongoing service monitoring.

Figure 57: Operating Hours by Day Type and Zone Typology

Operating Hours	Local Urban	Small Cities/Rural
Weekday	7am – 10pm	6am – 9pm
Weekend	8am – 9pm	8am – 8pm

Metric: Response Time

The average response time was also developed as part of the service design and is consistent with the fixed-route services in the different zone types (see Figure 58). The number of vehicles were adjusted by hour during service design to stay within the response time targets. Response time will be an important metric to use post-implementation to inform decisions regarding vehicle allocation by time of day.

Figure 58: Operating Hours by Day Type and Zone Typology

Average Response Time	Local Urban	Small Cities/Rural
Weekday	15-30 min	15-60 min
Weekend	15-30 min	45-60 min

Zone Scoring Summary

There were seven overall scoring metrics used to evaluate the relative performance of the zones compared to the project goals and objectives. The project team developed weights for the goals based on their importance to the agency. “New Transit Rides for Priority Populations” and “Cost per Boarding” received the highest weight. The metric weights are shown in the first row of Figure 59. The weights were multiplied by the index score for each zone. For example, if the criteria had a 10% weight the zone scoring a full 1.0 index score would receive the full 10%. The “Total Score” is on a scale of 100 points where a zone scoring highest across all metrics would receive the full 100 points.

Figure 59: Weighted Metric Scoring Summary for Microtransit Service Zones

Zone	Existing Fixed-Route and ADA Service	New Transit Rides for Priority Populations	Connections to Existing Routes	Vehicle Miles Travelled Reduction	Cost per Boardings	New Zone Cost Ratio	Total Score
Weight	*10%*	*30%*	*10%*	*15%*	*25%*	*10%*	
Lynden	2.7	21.5	2.5	12.3	24	5.2	68.2
Ferndale	2.7	30	5	14.5	25	6.1	83.3
Blaine / Birch Bay	8.4	18.9	2.5	15	24	3.5	72.3
Tweed Twenty / Silver Beach	2.3	9.5	7.5	4.6	20.6	4.2	48.7
Yew St / Lake Padden	1.4	6.8	10	2.6	15.5	10	46.3
PV / Kendall / Maple Falls	3.2	18.3	2.5	4.6	24.3	2.5	55.4
Everson / Nooksack / Sumas	10.0	6.3	2.5	3.6	21.9	1.7	46.0
Bellingham Waterfront District	5.3	14.8	0	2	20.2	0.7	43.0
Lummi Nation	2.7	7.8	2.5	3.8	16.1	5.3	38.2

The Ferndale zone had the highest overall score of 83.3 points, followed by the Blaine / Birch Bay zone with 72.3 points. Lynden came third with 68.2 points, while the balance of the zones scores between 55.4 and 38.2 points. The Ferndale zone scored highest in the top two weighted criteria of new rides for priority populations and cost per boarding.

Chapter 4: Recommendations

Recommendation

The consultant team recommends that if WTA chooses to operate microtransit service, it prioritizes the further planning and analysis of microtransit in the three zones that scored the highest through the evaluation process: Ferndale, Blaine / Birch Bay, and Lynden. The team further recommends that if WTA chooses to operate the microtransit service, WTA eventually transition to scheduling & dispatch SaaS with more advanced microtransit features to support recommended service rules.

Reasoning

The reasoning behind focusing on the highest scoring zones is described throughout Chapter 3. The top three scored the highest across the criteria, taking into account the different weights given to each criterion. If the weights assigned to the criteria change, the three highest scoring zones would likely change, prompting a re-evaluation of the zones to prioritize.

Among the different operating models explored – from agency-run to contractor-run (TaaS) and hybrid models – the recommendation is to avoid splitting the functions in a hybrid model. While a hybrid model may incur some cost savings from delegating certain functions to a contractor that could be lower cost than WTA staff, hybrid models also require oversight, coordination, and management that may be even greater than in TaaS models. Depending on the split of functions, WTA staff may end up needing to use two separate back-end software providers (in-house Trapeze or other future software & contractor's software).

Having the microtransit services managed completely in-house or as TaaS allows for easier/clearer lines of accountability and enforcement of incentives and penalties. TaaS models are 'common for agencies or jurisdictions that do not already have their own vehicles or structure appropriate to provide microtransit.'[10] Among agencies considering implementing or expanding microtransit services, WTA is in the somewhat unusual position of having already set up in-house service operations. Because WTA has proven expertise and ability to operate microtransit, the benefits of changing to a TaaS model are not likely to be as substantive as an agency who has no experience in providing microtransit in-house.

For WTA, the benefit of choosing TaaS over in-house operations is likely to be limited to reduced costs (through lower wages for operators and reduced need for customer service representatives), though this is not a guaranteed benefit and will depend on multiple factors. Benefits to continuing in-house operations include:

- customer service quality and consistency
- ability to use same personnel/resources for microtransit when ADA demand is low or before/after ADA services end; flexibility to move staff between services as needed
- flexibility to change service parameters as needed, coordinate connections to fixed route

[10] https://learn.sharedusemobilitycenter.org/learning_module/microtransit/#section-operations

- ability to fully leverage federal capital match
- opportunities to explore true co-mingling in the future
- potential for better pricing for tablets, data, etc. with full fleet under the agency

Further Recommendations and Limitations

This study examines potential future microtransit zones and high-level recommendations for service rules and operations at WTA. As discussed earlier in the document, the study did not examine microtransit services compared to other WTA services. The study team recommends further actions for WTA during the next phases of microtransit consideration.

Software

If WTA chooses to operate microtransit in house, the consultant team recommends that WTA continue to use the same scheduling and dispatch software for both microtransit and ADA paratransit service but that WTA explore opportunities to procure scheduling and dispatch software with a richer set of microtransit features and easy-to-use traveler-facing online and mobile applications. A SaaS product that is well designed to support both public microtransit and ADA-paratransit will allow WTA to pilot co-mingling in the future where appropriate.

Specific features that will support the service parameter recommendations and WTA's goals include the ability to:

- Operate multiple zones with different service rules.
- Allow curb-to-curb requests by passenger and by zone.
- Set virtual bus stops.
- Snap request to nearby location, within parameters set by WTA.
- Allow advanced reservations, by zone.
- Set advance reservation rules at an hourly granularity (for example, 2 hours).
- Allow walk-on trips by zone.
- Provide discounts for rides booked by a group.
- Protect fixed route connections.

Further Peer Research

Among the peers interviewed for this study, C-TRAN is the agency that most closely mirrors the recommended operating model for WTA, with Citibus also being similar. In addition to these two agencies, other agencies that were identified as peers (but not selected for interviews) that operate microtransit in house include:

- Des Moines Area Regional Transit Authority
    - Also outsources rides to TNCs as needed
- Cache Valley Transit (Utah)

- Greater Richmond Transit Company (Virginia)

These agencies may provide further valuable insight for WTA in future phases of microtransit analysis.

Policy & Priorities Considerations

In general, the CBA may limit WTA's flexibility in implementing and revising microtransit service. In addition, in-house operations will limit the speed with which WTA can make fleet changes, which may be a benefit of some TaaS providers.

To address and balance these challenges and opportunities and others raised throughout the study, WTA will benefit from further examination of WTA policies and priorities. For example, some key topics to address include:

- Safety: How will WTA approach driver training and customer safety? If microtransit operators are not employed by WTA (including those both employed by and contracted by a microtransit contractor), how will WTA ensure that customer safety and driver training align with WTA's priorities?
- Mobility: Cost savings from reducing fixed route services and associated ADA paratransit service areas may help offset some of the costs of providing microtransit service, but this will also impact ADA-eligible riders' experience. For example, individuals accessing current paratransit services have access to their destinations without needing to transfer, but individuals who are provided microtransit services instead of paratransit services may need to transfer to access their final destination.
- Reliability: What factors are most important to WTA in ensuring reliability in microtransit service (on-time performance, canceled trips, rider time spent waiting for a ride)? How will WTA ensure that riders can rely on microtransit service to meet the goals of the program without the service reducing reliability of other services? If WTA operates the service in house, how will WTA determine trade-offs between services when there are resource constraints?
- Efficiency: What is an acceptable level of efficiency for WTA? What cost per trip is acceptable? Does that answer change depending on the trip or the passenger served? At what level of efficiency would WTA consider increasing or reducing/removing service?
- Labor: What flexibility does WTA's CBA provide for pursuing service changes that may reduce costs and improve efficiencies for microtransit service delivery? What are WTA's goals with respect to the development and retention of the range of roles needed to provide effective transit service?
- Cost: This study examined potential microtransit services using WTA's current costs as the foundation for analysis. There may be ways, in addition to those described here, to reduce costs. Each potential cost-reduction strategy (whether microtransit-specific or applying more broadly), will have trade-offs related to service performance, service quality, rider experience, and more. The study did not account for broader programmatic costs that would be incurred with service implementation. WTA would need to build program capacity with a project manager and staff from IT, Dispatch, CSR, and Fleet Maintenance.
- Flexibility/Scalability: How does WTA prioritize flexibility and scalability of services? A contracted provider may be able to introduce different and/or more vehicles into the fleet more rapidly, but there are other operational and customer service benefits to fleet vehicles being more standardized. To reduce per-trip costs, microtransit services should provide a high level of shared rides and ridership per vehicle revenue hour. Ridership increases also can create the need for either the introduction of another vehicle

or reduced service performance (longer wait times, for example). Fixed route services are better suited for scalability.

    - *Unlike fixed route service, scaling up microtransit to meet demand results in less efficient service and higher costs. Fixed route can typically accommodate greater demand and increases the cost-effectiveness of service.*

- Reporting & Performance Monitoring: What level of data availability does WTA require and does WTA want to access in order to comply with rules and regulations and continually monitor and audit performance? What level of data ownership does WTA want with respect to passenger and trip data?
- Integration With Fixed Route: How will WTA ensure that microtransit can effectively integrate with fixed-route service, given the limited capacity of microtransit service and the low fixed route frequencies, especially in rural areas? Will microtrotransit be able to provide a first-mile/last-mile option, versus a "one-seat ride" as fixed-route service is replaced by microtransit zones?

In addition to in-house operations, WTA may still want to consider developing a user-side subsidy program using local taxis or TNCs to provide trips that would otherwise have a significant negative impact on WTA's productivity. Any exploration of providing trips through a third-party with a user-side subsidy will have to account for the limitations on outsourcing included in the WTA collective bargaining agreement (CBA), ADA equivalency, and drug/alcohol compliance.

Appendix A: Detailed Modeling Results

Lynden: Weekday

Trip Start Hour	Replica Trips	General Demand	Other Demand	Potential Trips	Average Trip in Minutes	Optimal Vehicles (RVH)	Planned Vehicles (RVH)	Planned Capacity	Planned Ridership	Unmet Demand	Excess Capacity	Avg Wait Time	Board / RVH	Cost	Cost per Boarding
12:00 AM	9	1	-	1	12	1		-	-	1	-		-	$ -	$ -
1:00 AM	5	1	-	1	14	1		-	-	1	-		-	$ -	$ -
2:00 AM	5	1	-	1	13	1		-	-	1	-		-	$ -	$ -
3:00 AM	33	1	-	1	11	1		-	-	1	-		-	$ -	$ -
4:00 AM	119	1	-	1	10	1		-	-	1	-		-	$ -	$ -
5:00 AM	300	2	-	2	10	1		-	-	2	-		-	$ -	$ -
6:00 AM	882	5	1	6	10	3	2	6	6	0	-	19.0	3.00	$ 200.00	$ 33.33
7:00 AM	2,651	14	5	19	10	7	5	15	15	4	-	7.7	3.00	$ 500.00	$ 33.33
8:00 AM	1,984	10	4	14	10	5	5	15	14	-	1	7.0	2.82	$ 500.00	$ 35.49
9:00 AM	890	5	2	7	9	3	3	9	7	-	2	8.6	2.28	$ 300.00	$ 43.90
10:00 AM	923	5	2	7	9	3	3	9	7	-	2	8.6	2.30	$ 300.00	$ 43.47
11:00 AM	1,060	6	2	8	9	3	3	9	8	-	1	10.6	2.73	$ 300.00	$ 36.66
12:00 PM	1,292	7	3	10	9	4	3	9	9	1	-	11.1	3.00	$ 300.00	$ 33.33
1:00 PM	1,300	7	3	10	9	4	3	9	9	1	-	11.6	3.00	$ 300.00	$ 33.33
2:00 PM	2,139	11	4	15	10	6	5	15	15	0	-	7.4	3.00	$ 500.00	$ 33.33
3:00 PM	3,185	16	7	23	10	8	6	18	18	5	-	6.3	3.00	$ 600.00	$ 33.33
4:00 PM	2,435	13	5	18	9	7	6	18	18	0	-	5.9	3.00	$ 600.00	$ 33.33
5:00 PM	2,140	11	4	15	9	6	5	15	15	0	-	6.7	3.00	$ 500.00	$ 33.33
6:00 PM	1,713	9	4	13	9	5	5	15	13	-	2	5.7	2.51	$ 500.00	$ 39.91
7:00 PM	1,310	7	3	10	9	4	4	12	10	-	2	7.1	2.42	$ 400.00	$ 41.24
8:00 PM	1,056	6	2	8	9	3	3	9	8	-	1	10.3	2.73	$ 300.00	$ 36.69
9:00 PM	729	4	2	6	10	2		-	-	6	-		-	$ -	$ -
10:00 PM	409	3	-	3	10	1		-	-	3	-		-	$ -	$ -
11:00 PM	186	1	-	1	11	1		-	-	1	-		-	$ -	$ -
Total	**26,755**	**147**	**52**	**199**	**10.1**	**81**	**61**	**183**	**171**	**28**	**12**	**8.9**	**2.81**	**$ 6,100.00**	**$ 35.59**

Lynden: Weekend

Trip Start Hour	Replica Trips	General Demand	Other Demand	Potential Trips	Average Trip in Minutes	Optimal Vehicles (RVH)	Planned Vehicles (RVH)	Planned Capacity	Planned Ridership	Unmet Demand	Excess Capacity	Avg Wait Time	Board / RVH	Cost	Cost per Boarding
12:00 AM	8	1	-	1	11	1		-	-	1	-		-	$ -	$ -
1:00 AM	6	1	-	1	6	1		-	-	1	-		-	$ -	$ -
2:00 AM	3	1	-	1	25	1		-	-	1	-		-	$ -	$ -
3:00 AM	39	1	-	1	10	1		-	-	1	-		-	$ -	$ -
4:00 AM	69	1	-	1	11	1		-	-	1	-		-	$ -	$ -
5:00 AM	165	1	-	1	12	1		-	-	1	-		-	$ -	$ -
6:00 AM	377	2	-	2	11	1		-	-	2	-		-	$ -	$ -
7:00 AM	658	4	-	4	12	2		-	-	4	-		-	$ -	$ -
8:00 AM	778	4	1	5	10	2	2	6	5	-	1	16.9	2.64	$ 200.00	$ 37.93
9:00 AM	968	5	2	7	9	3	3	9	7	-	2	8.3	2.19	$ 300.00	$ 45.57
10:00 AM	1,186	6	2	8	9	3	3	9	8	-	1	10.3	2.65	$ 300.00	$ 37.79
11:00 AM	1,300	7	2	9	9	4	3	9	9	0	-	11.3	3.00	$ 300.00	$ 33.33
12:00 PM	1,460	8	2	10	9	4	3	9	9	1	-	11.4	3.00	$ 300.00	$ 33.33
1:00 PM	1,471	8	2	10	9	4	3	9	9	1	-	10.6	3.00	$ 300.00	$ 33.33
2:00 PM	1,508	8	2	10	9	4	3	9	9	1	-	10.7	3.00	$ 300.00	$ 33.33
3:00 PM	1,625	9	3	12	9	4	4	12	12	-	0	8.2	2.91	$ 400.00	$ 34.31
4:00 PM	2,098	11	3	14	9	5	4	12	12	2	-	8.7	3.00	$ 400.00	$ 33.33
5:00 PM	2,178	11	4	15	9	5	4	12	12	3	-	8.6	3.00	$ 400.00	$ 33.33
6:00 PM	1,779	9	3	12	9	4	4	12	12	-	0	8.5	2.98	$ 400.00	$ 33.59
7:00 PM	1,543	8	3	11	9	4	4	12	11	-	1	7.5	2.63	$ 400.00	$ 38.01
8:00 PM	1,300	7	-	7	9	3		-	-	7	-		-	$ -	$ -
9:00 PM	896	5	-	5	9	2		-	-	5	-		-	$ -	$ -
10:00 PM	553	3	-	3	10	1		-	-	3	-		-	$ -	$ -
11:00 PM	237	2	-	2	10	1		-	-	2	-		-	$ -	$ -
Total	**22,205**	**123**	**29**	**152**	**10.3**	**62**	**40**	**120**	**114**	**38**	**6**	**10**	**2.85**	**$ 4,000.00**	**$ 35.12**

Ferndale: Weekday

Trip Start Hour	Replica Trips	General Demand	Other Demand	Potential Trips	Average Trip in Minutes	Optimal Vehicles (RVH)	Planned Vehicles (RVH)	Planned Capacity	Planned Ridership	Unmet Demand	Excess Capacity	Avg Wait Time	Board / RVH	Cost	Cost per Boarding
12:00 AM	11	1	-	1	16	1		-	-	1	-		-	$ -	$ -
1:00 AM	5	1	-	1	9	1		-	-	1	-		-	$ -	$ -
2:00 AM	5	1	-	1	14	1		-	-	1	-		-	$ -	$ -
3:00 AM	35	1	-	1	15	1		-	-	1	-		-	$ -	$ -
4:00 AM	94	1	-	1	16	1		-	-	1	-		-	$ -	$ -
5:00 AM	284	2	-	2	13	1		-	-	2	-		-	$ -	$ -
6:00 AM	743	4	-	4	12	2		-	-	4	-		-	$ -	$ -
7:00 AM	2,175	11	12	23	12	8	6	18	18	5	-	7.3	3.00	$ 600.00	$ 33.33
8:00 AM	1,695	9	10	19	12	7	6	18	18	1	-	7.3	3.00	$ 600.00	$ 33.33
9:00 AM	796	4	5	9	11	3	3	9	9	-	0	13.1	2.84	$ 300.00	$ 35.15
10:00 AM	834	5	5	10	11	4	3	9	9	1	-	14.4	3.00	$ 300.00	$ 33.33
11:00 AM	874	5	5	10	10	4	3	9	9	1	-	12.9	3.00	$ 300.00	$ 33.33
12:00 PM	1,039	6	6	12	11	4	3	9	9	3	-	13.4	3.00	$ 300.00	$ 33.33
1:00 PM	1,102	6	6	12	11	5	3	9	9	3	-	13.3	3.00	$ 300.00	$ 33.33
2:00 PM	1,907	10	11	21	11	7	6	18	18	3	-	7.1	3.00	$ 600.00	$ 33.33
3:00 PM	2,836	15	16	31	11	11	6	18	18	13	-	7.1	3.00	$ 600.00	$ 33.33
4:00 PM	2,181	11	12	23	12	8	6	18	18	5	-	7.3	3.00	$ 600.00	$ 33.33
5:00 PM	1,791	9	10	19	12	7	6	18	18	1	-	7.4	3.00	$ 600.00	$ 33.33
6:00 PM	1,539	8	9	17	12	6	6	18	17	-	1	7.2	2.79	$ 600.00	$ 35.78
7:00 PM	1,235	7	7	14	12	5	5	15	14	-	1	8.7	2.81	$ 500.00	$ 35.62
8:00 PM	967	5	6	11	11	4	4	12	11	-	1	9.1	2.63	$ 400.00	$ 38.06
9:00 PM	701	4	4	8	11	3	3	9	8	-	1	12.3	2.66	$ 300.00	$ 37.53
10:00 PM	408	3	-	3	12	1		-	-	3	-		-	$ -	$ -
11:00 PM	165	1	-	1	11	1		-	-	1	-		-	$ -	$ -
Total	**23,422**	**130**	**123**	**253**	**12.1**	**96**	**69**	**207**	**202**	**52**	**5**	**9.9**	**2.93**	**$ 6,900.00**	**$ 34.19**

Ferndale: Weekend

Trip Start Hour	Replica Trips	General Demand	Other Demand	Potential Trips	Average Trip in Minutes	Optimal Vehicles (RVH)	Planned Vehicles (RVH)	Planned Capacity	Planned Ridership	Unmet Demand	Excess Capacity	Avg Wait Time	Board / RVH	Cost	Cost per Boarding
12:00 AM	13	1	-	1	13	1		-	-	1	-		-	$ -	$ -
1:00 AM	5	1	-	1	14	1		-	-	1	-		-	$ -	$ -
2:00 AM	7	1	-	1	10	1		-	-	1	-		-	$ -	$ -
3:00 AM	40	1	-	1	14	1		-	-	1	-		-	$ -	$ -
4:00 AM	77	1	-	1	14	1		-	-	1	-		-	$ -	$ -
5:00 AM	136	1	-	1	14	1		-	-	1	-		-	$ -	$ -
6:00 AM	313	2	-	2	13	1		-	-	2	-		-	$ -	$ -
7:00 AM	537	3	3	6	13	2		-	-	6	-		-	$ -	$ -
8:00 AM	699	4	3	7	12	3	3	9	7	-	2	12.1	2.48	$ 300.00	$ 40.28
9:00 AM	802	5	4	9	12	3	3	9	9	-	0	14.8	2.99	$ 300.00	$ 33.50
10:00 AM	861	5	4	9	12	4	3	9	9	0	-	14.6	3.00	$ 300.00	$ 33.33
11:00 AM	1,001	6	5	11	11	4	3	9	9	2	-	14.1	3.00	$ 300.00	$ 33.33
12:00 PM	1,179	6	6	12	11	4	4	12	12	-	0	10.2	2.95	$ 400.00	$ 33.86
1:00 PM	1,235	7	6	13	11	5	4	12	12	1	-	10.5	3.00	$ 400.00	$ 33.33
2:00 PM	1,211	7	6	13	11	5	4	12	12	1	-	10.3	3.00	$ 400.00	$ 33.33
3:00 PM	1,421	8	7	15	11	6	4	12	12	3	-	10.3	3.00	$ 400.00	$ 33.33
4:00 PM	1,842	10	9	19	12	7	4	12	12	7	-	11.2	3.00	$ 400.00	$ 33.33
5:00 PM	2,014	11	10	21	12	7	4	12	12	9	-	11.2	3.00	$ 400.00	$ 33.33
6:00 PM	1,660	9	8	17	12	6	4	12	12	5	-	11.0	3.00	$ 400.00	$ 33.33
7:00 PM	1,475	8	7	15	12	6	4	12	12	3	-	11.0	3.00	$ 400.00	$ 33.33
8:00 PM	1,125	6	6	12	12	4	4	12	12	-	0	10.5	2.89	$ 400.00	$ 34.64
9:00 PM	850	5	-	5	11	2		-	-	5	-		-	$ -	$ -
10:00 PM	535	3	-	3	11	1		-	-	3	-		-	$ -	$ -
11:00 PM	228	2	-	2	12	1		-	-	2	-		-	$ -	$ -
Total	**19,266**	**113**	**84**	**197**	**12.1**	**77**	**48**	**144**	**142**	**55**	**2**	**12**	**2.95**	**$ 4,800.00**	**$ 33.86**

Blaine_Birch: Weekday

Trip Start Hour	Replica Trips	General Demand	Other Demand	Potential Trips	Average Trip in Minutes	Optimal Vehicles (RVH)	Planned Vehicles (RVH)	Planned Capacity	Planned Ridership	Unmet Demand	Excess Capacity	Avg Wait Time	Board / RVH	Cost	Cost per Boarding
12:00 AM	19	1	-	1	16	1		-	-	1	-		-	$ -	$ -
1:00 AM	10	1	-	1	9	1		-	-	1	-		-	$ -	$ -
2:00 AM	5	1	-	1	9	1		-	-	1	-		-	$ -	$ -
3:00 AM	42	1	-	1	20	1		-	-	1	-		-	$ -	$ -
4:00 AM	104	1	-	1	17	1		-	-	1	-		-	$ -	$ -
5:00 AM	233	2	-	2	17	1		-	-	2	-		-	$ -	$ -
6:00 AM	682	4	1	5	18	2	2	6	5	-	1	25.7	2.31	$ 200.00	$ 43.21
7:00 AM	1,897	10	1	11	17	4	3	9	9	2	-	21.3	3.00	$ 300.00	$ 33.33
8:00 AM	1,354	7	2	9	17	3	3	9	9	-	0	20.8	2.92	$ 300.00	$ 34.29
9:00 AM	760	4	1	5	15	2	2	6	5	-	1	24.9	2.62	$ 200.00	$ 38.10
10:00 AM	812	5	1	6	14	2	2	6	6	-	0	24.5	2.85	$ 200.00	$ 35.08
11:00 AM	846	5	1	6	15	2	2	6	6	-	0	26.2	2.87	$ 200.00	$ 34.79
12:00 PM	941	5	1	6	15	2	2	6	6	-	0	26.2	2.89	$ 200.00	$ 34.60
1:00 PM	947	5	1	6	15	2	2	6	6	-	0	27.0	2.93	$ 200.00	$ 34.08
2:00 PM	1,640	9	1	10	15	4	3	9	9	1	-	18.9	3.00	$ 300.00	$ 33.33
3:00 PM	2,318	12	2	14	16	5	4	12	12	2	-	15.0	3.00	$ 400.00	$ 33.33
4:00 PM	1,952	10	2	12	15	5	4	12	12	0	-	13.9	3.00	$ 400.00	$ 33.33
5:00 PM	1,789	9	2	11	14	4	4	12	11	-	1	12.1	2.70	$ 400.00	$ 37.04
6:00 PM	1,487	8	2	10	15	4	4	12	10	-	2	11.6	2.41	$ 400.00	$ 41.45
7:00 PM	1,180	6	1	7	16	3	3	9	7	-	2	15.9	2.46	$ 300.00	$ 40.70
8:00 PM	989	5	1	6	16	3	2	6	6	0	-	29.6	3.00	$ 200.00	$ 33.33
9:00 PM	634	4	-	4	16	2		-	-	4	-		-	$ -	$ -
10:00 PM	419	3	-	3	17	1		-	-	3	-		-	$ -	$ -
11:00 PM	190	1	-	1	17	1		-	-	1	-		-	$ -	$ -
Total	**21,250**	**119**	**18**	**137**	**15.41**	**57**	**42**	**126**	**118**	**19**	**8**	**20.9**	**2.80**	**$ 4,200.00**	**$ 35.73**

Blaine_Birch: Weekend

Trip Start Hour	Replica Trips	General Demand	Other Demand	Potential Trips	Average Trip in Minutes	Optimal Vehicles (RVH)	Planned Vehicles (RVH)	Planned Capacity	Planned Ridership	Unmet Demand	Excess Capacity	Avg Wait Time	Board / RVH	Cost	Cost per Boarding
12:00 AM	21	1	-	1	20	1		-	-	1	-		-	$ -	$ -
1:00 AM	12	1	-	1	8	1		-	-	1	-		-	$ -	$ -
2:00 AM	3	1	-	1	31	1		-	-	1	-		-	$ -	$ -
3:00 AM	52	1	-	1	13	1		-	-	1	-		-	$ -	$ -
4:00 AM	71	1	-	1	14	1		-	-	1	-		-	$ -	$ -
5:00 AM	161	1	-	1	17	1		-	-	1	-		-	$ -	$ -
6:00 AM	364	2	-	2	20	1		-	-	2	-		-	$ -	$ -
7:00 AM	627	4	-	4	18	2		-	-	4	-		-	$ -	$ -
8:00 AM	672	4	1	5	16	2	2	6	5	-	1	27.4	2.71	$ 200.00	$ 36.95
9:00 AM	818	5	1	6	16	2	2	6	6	-	0	28.5	2.90	$ 200.00	$ 34.53
10:00 AM	936	5	1	6	15	2	2	6	6	-	0	27.6	2.92	$ 200.00	$ 34.21
11:00 AM	852	5	1	6	15	2	2	6	6	-	0	27.9	2.94	$ 200.00	$ 34.00
12:00 PM	1,058	6	1	7	15	3	2	6	6	1	-	28.6	3.00	$ 200.00	$ 33.33
1:00 PM	1,135	6	1	7	15	3	2	6	6	1	-	28.3	3.00	$ 200.00	$ 33.33
2:00 PM	1,147	6	2	8	15	3	3	9	8	-	1	16.5	2.57	$ 300.00	$ 38.91
3:00 PM	1,343	7	2	9	15	4	3	9	9	0	-	18.4	3.00	$ 300.00	$ 33.33
4:00 PM	1,805	10	2	12	15	5	4	12	12	0	-	13.8	3.00	$ 400.00	$ 33.33
5:00 PM	1,861	10	2	12	15	4	4	12	12	-	0	13.4	2.97	$ 400.00	$ 33.71
6:00 PM	1,647	9	2	11	15	4	4	12	11	-	1	12.7	2.64	$ 400.00	$ 37.91
7:00 PM	1,375	7	1	8	16	3	3	9	8	-	1	17.8	2.74	$ 300.00	$ 36.45
8:00 PM	1,082	6	-	6	16	2		-	-	6	-		-	$ -	$ -
9:00 PM	780	4	-	4	16	2		-	-	4	-		-	$ -	$ -
10:00 PM	591	3	-	3	17	1		-	-	3	-		-	$ -	$ -
11:00 PM	272	2	-	2	17	1		-	-	2	-		-	$ -	$ -
Total	**18,685**	**107**	**17**	**124**	**16.2**	**52**	**33**	**99**	**94**	**29**	**5**	**22**	**2.86**	**$ 3,300.00**	**$ 35.00**

Tweed_Silver: Weekday

Trip Start Hour	Replica Trips	General Demand	Other Demand	Potential Trips	Average Trip in Minutes	Optimal Vehicles (RVH)	Planned Vehicles (RVH)	Planned Capacity	Planned Ridership	Unmet Demand	Excess Capacity	Avg Wait Time	Board / RVH	Cost	Cost per Boarding
12:00 AM	2	1	-	1	13	1		-	-	1	-		-	$ -	$ -
1:00 AM	-	-	-	-		0		-	-	-	-		-	$ -	$ -
2:00 AM	-	-	-	-		0		-	-	-	-		-	$ -	$ -
3:00 AM	10	1	-	1	12	1		-	-	1	-		-	$ -	$ -
4:00 AM	22	1	-	1	13	1		-	-	1	-		-	$ -	$ -
5:00 AM	40	1	-	1	11	1		-	-	1	-		-	$ -	$ -
6:00 AM	150	1	-	1	12	1		-	-	1	-		-	$ -	$ -
7:00 AM	563	3	7	10	11	4	3	9	9	1	-	13.7	3.00	$ 300.00	$ 33.33
8:00 AM	448	3	5	8	11	3	3	9	8	-	1	13.2	2.75	$ 300.00	$ 36.31
9:00 AM	186	1	2	3	11	2	2	6	3	-	3	11.4	1.59	$ 200.00	$ 62.79
10:00 AM	213	2	3	5	10	2	2	6	5	-	1	13.9	2.25	$ 200.00	$ 44.42
11:00 AM	174	1	2	3	11	2	2	6	3	-	3	10.4	1.52	$ 200.00	$ 65.70
12:00 PM	236	2	3	5	10	2	2	6	5	-	1	14.6	2.39	$ 200.00	$ 41.91
1:00 PM	200	1	2	3	10	2	2	6	3	-	3	10.8	1.67	$ 200.00	$ 59.71
2:00 PM	423	3	5	8	10	3	3	9	8	-	1	11.6	2.66	$ 300.00	$ 37.64
3:00 PM	686	4	8	12	10	5	3	9	9	3	-	12.8	3.00	$ 300.00	$ 33.33
4:00 PM	534	3	6	9	11	4	3	9	9	0	-	13.9	3.00	$ 300.00	$ 33.33
5:00 PM	466	3	5	8	11	3	3	9	8	-	1	12.5	2.82	$ 300.00	$ 35.40
6:00 PM	443	3	5	8	11	3	3	9	8	-	1	12.3	2.73	$ 300.00	$ 36.57
7:00 PM	316	2	4	6	11	2	2	6	6	-	0	18.9	2.86	$ 200.00	$ 35.01
8:00 PM	259	2	3	5	10	2	2	6	5	-	1	15.6	2.52	$ 200.00	$ 39.66
9:00 PM	160	1	2	3	9	1	1	3	3	-	0	32.7	2.88	$ 100.00	$ 34.73
10:00 PM	90	1	-	1	10	1		-	-	1	-		-	$ -	$ -
11:00 PM	49	1	-	1	10	1		-	-	1	-		-	$ -	$ -
Total	**5,670**	**41**	**62**	**103**	**10.8**	**47**	**36**	**108**	**92**	**11**	**16**	**14.6**	**2.57**	**$ 3,600.00**	**$ 38.96**

Tweed_Silver: Weekend

Trip Start Hour	Replica Trips	General Demand	Other Demand	Potential Trips	Average Trip in Minutes	Optimal Vehicles (RVH)	Planned Vehicles (RVH)	Planned Capacity	Planned Ridership	Unmet Demand	Excess Capacity	Avg Wait Time	Board / RVH	Cost	Cost per Boarding
12:00 AM	2	1	-	1	9	1		-	-	1	-		-	$ -	$ -
1:00 AM	-	-	-	-		0		-	-	-	-		-	$ -	$ -
2:00 AM	2	1	-	1	11	1		-	-	1	-		-	$ -	$ -
3:00 AM	8	1	-	1	17	1		-	-	1	-		-	$ -	$ -
4:00 AM	9	1	-	1	11	1		-	-	1	-		-	$ -	$ -
5:00 AM	27	1	-	1	12	1		-	-	1	-		-	$ -	$ -
6:00 AM	70	1	-	1	12	1		-	-	1	-		-	$ -	$ -
7:00 AM	116	1	0	1	12	1		-	-	1	-		-	$ -	$ -
8:00 AM	178	1	1	2	11	1	1	3	2	-	1	24.4	1.73	$ 100.00	$ 57.94
9:00 AM	197	1	1	2	12	1	1	3	2	-	1	26.5	1.80	$ 100.00	$ 55.45
10:00 AM	255	2	1	3	11	2	2	6	3	-	3	10.8	1.52	$ 200.00	$ 65.79
11:00 AM	219	2	1	3	10	1	2	6	3	-	3	8.6	1.45	$ 200.00	$ 69.13
12:00 PM	267	2	1	3	9	2	2	6	3	-	3	8.8	1.54	$ 200.00	$ 64.75
1:00 PM	285	2	1	3	10	2	2	6	3	-	3	9.4	1.58	$ 200.00	$ 63.25
2:00 PM	343	2	1	3	9	2	2	6	3	-	3	9.7	1.70	$ 200.00	$ 58.85
3:00 PM	393	2	2	4	9	2	2	6	4	-	2	10.3	1.80	$ 200.00	$ 55.52
4:00 PM	530	3	2	5	10	2	2	6	5	-	1	16.4	2.58	$ 200.00	$ 38.75
5:00 PM	560	3	2	5	10	2	2	6	5	-	1	17.3	2.64	$ 200.00	$ 37.85
6:00 PM	449	3	2	5	10	2	2	6	5	-	1	15.8	2.42	$ 200.00	$ 41.40
7:00 PM	369	2	2	4	11	2	2	6	4	-	2	11.6	1.75	$ 200.00	$ 57.07
8:00 PM	258	2	1	3	10	2	2	6	3	-	3	9.2	1.53	$ 200.00	$ 65.53
9:00 PM	192	1	-	1	10	1		-	-	1	-		-	$ -	$ -
10:00 PM	105	1	-	1	9	1		-	-	1	-		-	$ -	$ -
11:00 PM	45	1	-	1	9	1		-	-	1	-		-	$ -	$ -
Total	**4,879**	**37**	**18**	**55**	**10.6**	**33**	**24**	**72**	**45**	**10**	**27**	**14**	**1.86**	**$ 2,400.00**	**$ 53.88**

Yew_Padden: Weekday

Trip Start Hour	Replica Trips	General Demand	Other Demand	Potential Trips	Average Trip in Minutes	Optimal Vehicles (RVH)	Planned Vehicles (RVH)	Planned Capacity	Planned Ridership	Unmet Demand	Excess Capacity	Avg Wait Time	Board / RVH	Cost	Cost per Boarding
12:00 AM	1	1	-	1	2	1		-	-	1	-		-	$ -	$ -
1:00 AM	2	1	-	1	14	1		-	-	1	-		-	$ -	$ -
2:00 AM	3	1	-	1	15	1		-	-	1	-		-	$ -	$ -
3:00 AM	14	1	-	1	8	1		-	-	1	-		-	$ -	$ -
4:00 AM	24	1	-	1	12	1		-	-	1	-		-	$ -	$ -
5:00 AM	35	1	-	1	12	1		-	-	1	-		-	$ -	$ -
6:00 AM	113	1	-	1	11	1		-	-	1	-		-	$ -	$ -
7:00 AM	284	2	1	3	11	2	2	6	3	-	3	12.0	1.68	$ 200.00	$ 59.55
8:00 AM	218	2	1	3	11	2	2	6	3	-	3	10.7	1.52	$ 200.00	$ 65.72
9:00 AM	139	1	1	2	11	1	1	3	2	-	1	22.9	1.67	$ 100.00	$ 60.06
10:00 AM	132	1	1	2	11	1	1	3	2	-	1	22.5	1.63	$ 100.00	$ 61.29
11:00 AM	160	1	1	2	11	1	1	3	2	-	1	25.3	1.77	$ 100.00	$ 56.64
12:00 PM	158	1	1	2	11	1	1	3	2	-	1	25.0	1.76	$ 100.00	$ 56.95
1:00 PM	220	2	1	3	11	2	2	6	3	-	3	10.5	1.53	$ 200.00	$ 65.52
2:00 PM	289	2	1	3	11	2	2	6	3	-	3	11.2	1.69	$ 200.00	$ 59.12
3:00 PM	403	3	2	5	10	2	2	6	5	-	1	15.1	2.46	$ 200.00	$ 40.58
4:00 PM	377	2	2	4	11	2	2	6	4	-	2	12.9	1.90	$ 200.00	$ 52.58
5:00 PM	360	2	2	4	10	2	2	6	4	-	2	12.2	1.86	$ 200.00	$ 53.73
6:00 PM	321	2	2	4	10	2	2	6	4	-	2	11.5	1.77	$ 200.00	$ 56.56
7:00 PM	269	2	1	3	11	2	2	6	3	-	3	10.9	1.64	$ 200.00	$ 60.85
8:00 PM	201	2	1	3	9	1	1	3	3	-	0	34.1	2.96	$ 100.00	$ 33.76
9:00 PM	155	1	1	2	11	1	1	3	2	-	1	24.2	1.74	$ 100.00	$ 57.42
10:00 PM	77	1	-	1	10	1		-	-	1	-		-	$ -	$ -
11:00 PM	37	1	-	1	14	1		-	-	1	-		-	$ -	$ -
Total	**3,992**	**35**	**18**	**53**	**10.8**	**33**	**24**	**72**	**44**	**9**	**28**	**17.4**	**1.82**	**$ 2,400.00**	**$ 55.00**

Yew_Padden: Weekend

Trip Start Hour	Replica Trips	General Demand	Other Demand	Potential Trips	Average Trip in Minutes	Optimal Vehicles (RVH)	Planned Vehicles (RVH)	Planned Capacity	Planned Ridership	Unmet Demand	Excess Capacity	Avg Wait Time	Board / RVH	Cost	Cost per Boarding
12:00 AM	1	1	-	1	29	1		-	-	1	-		-	$ -	$ -
1:00 AM	3	1	-	1	23	1		-	-	1	-		-	$ -	$ -
2:00 AM	2	1	-	1	8	1		-	-	1	-		-	$ -	$ -
3:00 AM	5	1	-	1	10	1		-	-	1	-		-	$ -	$ -
4:00 AM	5	1	-	1	13	1		-	-	1	-		-	$ -	$ -
5:00 AM	29	1	-	1	10	1		-	-	1	-		-	$ -	$ -
6:00 AM	71	1	-	1	12	1		-	-	1	-		-	$ -	$ -
7:00 AM	97	1	0	1	9	1		-	-	1	-		-	$ -	$ -
8:00 AM	141	1	1	2	11	1	1	3	2	-	1	20.6	1.51	$ 100.00	$ 66.31
9:00 AM	167	1	1	2	10	1	1	3	2	-	1	19.7	1.60	$ 100.00	$ 62.43
10:00 AM	204	2	1	3	10	1	2	6	3	-	3	8.7	1.37	$ 200.00	$ 73.12
11:00 AM	201	2	1	3	10	1	2	6	3	-	3	8.3	1.36	$ 200.00	$ 73.41
12:00 PM	255	2	1	3	10	1	2	6	3	-	3	9.6	1.46	$ 200.00	$ 68.52
1:00 PM	265	2	1	3	9	1	2	6	3	-	3	8.4	1.48	$ 200.00	$ 67.68
2:00 PM	276	2	1	3	11	1	2	6	3	-	3	9.9	1.50	$ 200.00	$ 66.79
3:00 PM	318	2	1	3	10	2	2	6	3	-	3	9.7	1.57	$ 200.00	$ 63.57
4:00 PM	405	3	1	4	11	2	2	6	4	-	2	14.9	2.23	$ 200.00	$ 44.85
5:00 PM	450	3	2	5	10	2	2	6	5	-	1	15.0	2.31	$ 200.00	$ 43.28
6:00 PM	370	2	1	3	10	2	1	3	3	0	-	38.4	3.00	$ 100.00	$ 33.33
7:00 PM	283	2	1	3	11	2	1	3	3	0	-	42.8	3.00	$ 100.00	$ 33.33
8:00 PM	232	2	1	3	10	1	1	3	3	-	0	34.2	2.84	$ 100.00	$ 35.26
9:00 PM	169	1	-	1	11	1		-	-	1	-		-	$ -	$ -
10:00 PM	97	1	-	1	10	1		-	-	1	-		-	$ -	$ -
11:00 PM	52	1	-	1	12	1		-	-	1	-		-	$ -	$ -
Total	**4,098**	**37**	**13**	**50**	**11.6**	**29**	**21**	**63**	**39**	**12**	**24**	**18**	**1.83**	**$ 2,100.00**	**$ 54.54**

PV_Ken_MF: Weekday

Trip Start Hour	Replica Trips	General Demand	Other Demand	Potential Trips	Average Trip in Minutes	Optimal Vehicles (RVH)	Planned Vehicles (RVH)	Planned Capacity	Planned Ridership	Unmet Demand	Excess Capacity	Avg Wait Time	Board / RVH	Cost	Cost per Boarding
12:00 AM	22	1	-	1	19	1		-	-	1	-		-	$ -	$ -
1:00 AM	13	1	-	1	15	1		-	-	1	-		-	$ -	$ -
2:00 AM	11	1	-	1	12	1		-	-	1	-		-	$ -	$ -
3:00 AM	18	1	-	1	9	1		-	-	1	-		-	$ -	$ -
4:00 AM	69	1	-	1	24	1		-	-	1	-		-	$ -	$ -
5:00 AM	69	1	-	1	16	1		-	-	1	-		-	$ -	$ -
6:00 AM	234	2	1	3	18	2	1	3	3	0	-	69.3	3.00	$ 100.00	$ 33.33
7:00 AM	546	3	3	6	17	2	2	6	6	-	0	29.5	2.83	$ 200.00	$ 35.34
8:00 AM	522	3	3	6	17	2	2	6	6	-	0	28.8	2.77	$ 200.00	$ 36.09
9:00 AM	201	2	1	3	17	1	1	3	3	-	0	63.4	2.98	$ 100.00	$ 33.56
10:00 AM	272	2	1	3	16	2	1	3	3	0	-	60.6	3.00	$ 100.00	$ 33.33
11:00 AM	236	2	1	3	14	2	1	3	3	0	-	53.8	3.00	$ 100.00	$ 33.33
12:00 PM	274	2	1	3	13	2	1	3	3	0	-	47.4	3.00	$ 100.00	$ 33.33
1:00 PM	294	2	1	3	14	2	1	3	3	0	-	50.9	3.00	$ 100.00	$ 33.33
2:00 PM	515	3	3	6	15	2	2	6	6	-	0	25.7	2.75	$ 200.00	$ 36.30
3:00 PM	754	4	4	8	15	3	2	6	6	2	-	28.4	3.00	$ 200.00	$ 33.33
4:00 PM	486	3	2	5	14	2	2	6	5	-	1	23.8	2.68	$ 200.00	$ 37.25
5:00 PM	471	3	2	5	15	2	2	6	5	-	1	24.6	2.65	$ 200.00	$ 37.78
6:00 PM	442	3	2	5	15	2	2	6	5	-	1	23.9	2.58	$ 200.00	$ 38.81
7:00 PM	358	2	2	4	14	2	1	3	3	1	-	53.7	3.00	$ 100.00	$ 33.33
8:00 PM	274	2	1	3	16	2	1	3	3	0	-	61.4	3.00	$ 100.00	$ 33.33
9:00 PM	214	2	-	2	13	1		-	-	2	-		-	$ -	$ -
10:00 PM	130	1	-	1	16	1		-	-	1	-		-	$ -	$ -
11:00 PM	53	1	-	1	18	1		-	-	1	-		-	$ -	$ -
Total	**6,477**	**48**	**29**	**77**	**15.45**	**39**	**22**	**66**	**63**	**14**	**3**	**43.0**	**2.84**	**$ 2,200.00**	**$ 35.20**

PV_Ken_MF: Weekend

Trip Start Hour	Replica Trips	General Demand	Other Demand	Potential Trips	Average Trip in Minutes	Optimal Vehicles (RVH)	Planned Vehicles (RVH)	Planned Capacity	Planned Ridership	Unmet Demand	Excess Capacity	Avg Wait Time	Board / RVH	Cost	Cost per Boarding
12:00 AM	18	1	-	1	14	1		-	-	1	-		-	$ -	$ -
1:00 AM	4	1	-	1	14	1		-	-	1	-		-	$ -	$ -
2:00 AM	2	1	-	1	14	1		-	-	1	-		-	$ -	$ -
3:00 AM	9	1	-	1	19	1		-	-	1	-		-	$ -	$ -
4:00 AM	18	1	-	1	14	1		-	-	1	-		-	$ -	$ -
5:00 AM	66	1	-	1	15	1		-	-	1	-		-	$ -	$ -
6:00 AM	126	1	-	1	17	1		-	-	1	-		-	$ -	$ -
7:00 AM	203	2	-	2	16	1		-	-	2	-		-	$ -	$ -
8:00 AM	210	2	1	3	16	2	1	3	3	0	-	61.0	3.00	$ 100.00	$ 33.33
9:00 AM	278	2	1	3	15	2	1	3	3	0	-	57.2	3.00	$ 100.00	$ 33.33
10:00 AM	316	2	2	4	16	2	1	3	3	1	-	59.8	3.00	$ 100.00	$ 33.33
11:00 AM	256	2	1	3	14	2	1	3	3	0	-	50.7	3.00	$ 100.00	$ 33.33
12:00 PM	294	2	1	3	14	2	1	3	3	0	-	52.0	3.00	$ 100.00	$ 33.33
1:00 PM	301	2	1	3	14	2	1	3	3	0	-	51.7	3.00	$ 100.00	$ 33.33
2:00 PM	329	2	2	4	14	2	1	3	3	1	-	53.0	3.00	$ 100.00	$ 33.33
3:00 PM	433	3	2	5	13	2	2	6	5	-	1	21.2	2.56	$ 200.00	$ 39.06
4:00 PM	515	3	3	6	14	2	2	6	6	-	0	24.6	2.76	$ 200.00	$ 36.23
5:00 PM	601	4	3	7	15	3	2	6	6	1	-	27.3	3.00	$ 200.00	$ 33.33
6:00 PM	431	3	2	5	14	2	2	6	5	-	1	22.6	2.55	$ 200.00	$ 39.15
7:00 PM	391	2	2	4	14	2	1	3	3	1	-	53.4	3.00	$ 100.00	$ 33.33
8:00 PM	362	2	-	2	14	1		-	-	2	-		-	$ -	$ -
9:00 PM	230	2	-	2	14	1		-	-	2	-		-	$ -	$ -
10:00 PM	164	1	-	1	14	1		-	-	1	-		-	$ -	$ -
11:00 PM	84	1	-	1	13	1		-	-	1	-		-	$ -	$ -
Total	**5,642**	**44**	**21**	**65**	**14.6**	**37**	**16**	**48**	**46**	**20**	**2**	**45**	**2.86**	**$ 1,600.00**	**$ 34.97**

EV_NS_SU: Weekday

Trip Start Hour	Replica Trips	General Demand	Other Demand	Potential Trips	Average Trip in Minutes	Optimal Vehicles (RVH)	Planned Vehicles (RVH)	Planned Capacity	Planned Ridership	Unmet Demand	Excess Capacity	Avg Wait Time	Board / RVH	Cost	Cost per Boarding
12:00 AM	-	-	-	-		0		-	-	-	-		-	$ -	$ -
1:00 AM	1	1	-	1	11	1		-	-	1	-		-	$ -	$ -
2:00 AM	6	1	-	1	8	1		-	-	1	-		-	$ -	$ -
3:00 AM	12	1	-	1	12	1		-	-	1	-		-	$ -	$ -
4:00 AM	16	1	-	1	10	1		-	-	1	-		-	$ -	$ -
5:00 AM	50	1	-	1	10	1		-	-	1	-		-	$ -	$ -
6:00 AM	135	1	1	2	12	1	1	3	2	-	1	31.0	2.00	$ 100.00	$ 50.00
7:00 AM	469	3	1	4	12	2	1	3	3	1	-	45.3	3.00	$ 100.00	$ 33.33
8:00 AM	346	2	1	3	10	1	1	3	3	-	-	38.5	3.00	$ 100.00	$ 33.33
9:00 AM	177	1	1	2	10	1	1	3	2	-	1	24.3	2.00	$ 100.00	$ 50.00
10:00 AM	154	1	1	2	11	1	1	3	2	-	1	27.0	2.00	$ 100.00	$ 50.00
11:00 AM	160	1	1	2	10	1	1	3	2	-	1	24.6	2.00	$ 100.00	$ 50.00
12:00 PM	149	1	1	2	10	1	1	3	2	-	1	24.2	2.00	$ 100.00	$ 50.00
1:00 PM	169	1	1	2	10	1	1	3	2	-	1	23.9	2.00	$ 100.00	$ 50.00
2:00 PM	322	2	1	3	10	1	1	3	3	-	-	37.6	3.00	$ 100.00	$ 33.33
3:00 PM	480	3	1	4	11	2	1	3	3	1	-	42.2	3.00	$ 100.00	$ 33.33
4:00 PM	397	2	1	3	11	1	1	3	3	-	-	39.5	3.00	$ 100.00	$ 33.33
5:00 PM	336	2	1	3	10	1	1	3	3	-	-	36.7	3.00	$ 100.00	$ 33.33
6:00 PM	286	2	1	3	9	1	1	3	3	-	-	33.1	3.00	$ 100.00	$ 33.33
7:00 PM	211	2	1	3	11	1	1	3	3	-	-	40.7	3.00	$ 100.00	$ 33.33
8:00 PM	147	1	1	2	12	1	1	3	2	-	1	29.4	2.00	$ 100.00	$ 50.00
9:00 PM	120	1	-	1	9	1		-	-	1	-		-	$ -	$ -
10:00 PM	86	1	-	1	11	1		-	-	1	-		-	$ -	$ -
11:00 PM	30	1	-	1	11	1		-	-	1	-		-	$ -	$ -
Total	**4,259**	**33**	**15**	**48**	**10.39**	**25**	**15**	**45**	**38**	**10**	**7**	**33.2**	**2.53**	**$ 1,500.00**	**$ 39.47**

EV_NS_SU: Weekend

Trip Start Hour	Replica Trips	General Demand	Other Demand	Potential Trips	Average Trip in Minutes	Optimal Vehicles (RVH)	Planned Vehicles (RVH)	Planned Capacity	Planned Ridership	Unmet Demand	Excess Capacity	Avg Wait Time	Board / RVH	Cost	Cost per Boarding
12:00 AM	-	-	-	-		0		-	-	-	-		-	$ -	$ -
1:00 AM	-	-	-	-		0		-	-	-	-		-	$ -	$ -
2:00 AM	-	-	-	-		0		-	-	-	-		-	$ -	$ -
3:00 AM	6	1	-	1	8	1		-	-	1	-		-	$ -	$ -
4:00 AM	12	1	-	1	12	1		-	-	1	-		-	$ -	$ -
5:00 AM	20	1	-	1	11	1		-	-	1	-		-	$ -	$ -
6:00 AM	40	1	-	1	11	1		-	-	1	-		-	$ -	$ -
7:00 AM	100	1	1	2	13	1		-	-	2	-		-	$ -	$ -
8:00 AM	104	1	1	2	11	1	1	3	2	-	1	24.9	1.80	$ 100.00	$ 55.60
9:00 AM	169	1	1	2	10	1	1	3	2	-	1	28.5	2.30	$ 100.00	$ 43.52
10:00 AM	194	1	1	2	10	1	1	3	2	-	1	30.8	2.49	$ 100.00	$ 40.16
11:00 AM	191	1	1	2	9	1	1	3	2	-	1	27.6	2.47	$ 100.00	$ 40.54
12:00 PM	190	1	1	2	8	1	1	3	2	-	1	23.7	2.46	$ 100.00	$ 40.66
1:00 PM	186	1	1	2	9	1	1	3	2	-	1	25.9	2.43	$ 100.00	$ 41.18
2:00 PM	230	2	2	4	8	2	1	3	3	1	-	30.0	3.00	$ 100.00	$ 33.33
3:00 PM	257	2	2	4	9	2	1	3	3	1	-	35.2	3.00	$ 100.00	$ 33.33
4:00 PM	344	2	3	5	10	2	1	3	3	2	-	37.4	3.00	$ 100.00	$ 33.33
5:00 PM	392	2	3	5	10	2	1	3	3	2	-	37.0	3.00	$ 100.00	$ 33.33
6:00 PM	302	2	2	4	9	2	1	3	3	1	-	35.6	3.00	$ 100.00	$ 33.33
7:00 PM	242	2	2	4	10	2	1	3	3	1	-	35.7	3.00	$ 100.00	$ 33.33
8:00 PM	175	1	-	1	10	1		-	-	1	-		-	$ -	$ -
9:00 PM	130	1	-	1	11	1		-	-	1	-		-	$ -	$ -
10:00 PM	79	1	-	1	10	1		-	-	1	-		-	$ -	$ -
11:00 PM	29	1	-	1	11	1		-	-	1	-		-	$ -	$ -
Total	**3,392**	**27**	**22**	**49**	**9.9**	**27**	**12**	**36**	**32**	**17**	**4**	**31**	**2.66**	**$ 1,200.00**	**$ 37.57**

Bell_WF: Weekday

Trip Start Hour	Replica Trips	General Demand	Other Demand	Potential Trips	Average Trip in Minutes	Optimal Vehicles (RVH)	Planned Vehicles (RVH)	Planned Capacity	Planned Ridership	Unmet Demand	Excess Capacity	Avg Wait Time	Board / RVH	Cost	Cost per Boarding
12:00 AM	-	-	-	-		0		-	-	-	-		-	$ -	$ -
1:00 AM	-	-	-	-		0		-	-	-	-		-	$ -	$ -
2:00 AM	-	-	-	-		0		-	-	-	-		-	$ -	$ -
3:00 AM	-	-	-	-		0		-	-	-	-		-	$ -	$ -
4:00 AM	-	-	-	-		0		-	-	-	-		-	$ -	$ -
5:00 AM	-	-	-	-		0		-	-	-	-		-	$ -	$ -
6:00 AM	273	2	-	2	9	1		-	-	2	-		-	$ -	$ -
7:00 AM	546	3	-	3	7	1	1	3	3	-	-	25.3	3.00	$ 100.00	$ 33.33
8:00 AM	136	1	-	1	3	1	1	3	1	-	2	3.8	1.00	$ 100.00	$ 100.00
9:00 AM	819	5	-	5	3	2	2	6	5	-	1	5.2	2.50	$ 200.00	$ 40.00
10:00 AM	1,092	6	-	6	5	2	2	6	6	-	-	8.4	3.00	$ 200.00	$ 33.33
11:00 AM	409	3	-	3	11	1	2	6	3	-	3	10.0	1.50	$ 200.00	$ 66.67
12:00 PM	409	3	-	3	18	1	2	6	3	-	3	16.9	1.50	$ 200.00	$ 66.67
1:00 PM	682	4	-	4	15	2	2	6	4	-	2	18.8	2.00	$ 200.00	$ 50.00
2:00 PM	1,092	6	-	6	11	2	2	6	6	-	-	20.9	3.00	$ 200.00	$ 33.33
3:00 PM	1,501	8	-	8	8	3	2	6	6	2	-	14.1	3.00	$ 200.00	$ 33.33
4:00 PM	1,365	7	-	7	9	3	2	6	6	1	-	15.9	3.00	$ 200.00	$ 33.33
5:00 PM	1,228	7	-	7	10	3	2	6	6	1	-	19.4	3.00	$ 200.00	$ 33.33
6:00 PM	409	3	-	3	11	1	2	6	3	-	3	10.0	1.50	$ 200.00	$ 66.67
7:00 PM	1,228	7	-	7	12	3	2	6	6	1	-	23.3	3.00	$ 200.00	$ 33.33
8:00 PM	136	1	-	1	1	1	1	3	1	-	2	1.3	1.00	$ 100.00	$ 100.00
9:00 PM	273	2	-	2	6	1	1	3	2	-	1	15.0	2.00	$ 100.00	$ 50.00
10:00 PM	273	2	-	2	17	1		-	-	2	-		-	$ -	$ -
11:00 PM	-	-	-	-		0		-	-	-	-		-	$ -	$ -
Total	**11,872**	**70**	**-**	**70**	**9.1**	**29**	**26**	**78**	**61**	**9**	**17**	**13.9**	**2.35**	**$ 2,600.00**	**$ 42.62**

Bell_WF: Weekend

Trip Start Hour	Replica Trips	General Demand	Other Demand	Potential Trips	Average Trip in Minutes	Optimal Vehicles (RVH)	Planned Vehicles (RVH)	Planned Capacity	Planned Ridership	Unmet Demand	Excess Capacity	Avg Wait Time	Board / RVH	Cost	Cost per Boarding
12:00 AM	-	-	-	-		0		-	-	-	-		-	$ -	$ -
1:00 AM	-	-	-	-		0		-	-	-	-		-	$ -	$ -
2:00 AM	-	-	-	-		0		-	-	-	-		-	$ -	$ -
3:00 AM	-	-	-	-		0		-	-	-	-		-	$ -	$ -
4:00 AM	-	-	-	-		0		-	-	-	-		-	$ -	$ -
5:00 AM	-	-	-	-		0		-	-	-	-		-	$ -	$ -
6:00 AM	273	2	-	2	10	1		-	-	2	-		-	$ -	$ -
7:00 AM	409	3	-	3	9	1		-	-	3	-		-	$ -	$ -
8:00 AM	273	2	-	2	12	1	1	3	2	-	1	30.0	2.00	$ 100.00	$ 50.00
9:00 AM	409	3	-	3	11	1	1	3	3	-	-	41.3	3.00	$ 100.00	$ 33.33
10:00 AM	1,092	6	-	6	9	2	2	6	6	-	-	15.9	3.00	$ 200.00	$ 33.33
11:00 AM	955	5	-	5	7	2	2	6	5	-	1	10.9	2.50	$ 200.00	$ 40.00
12:00 PM	819	5	-	5	10	2	2	6	5	-	1	15.6	2.50	$ 200.00	$ 40.00
1:00 PM	819	5	-	5	9	2	2	6	5	-	1	14.3	2.50	$ 200.00	$ 40.00
2:00 PM	273	2	-	2	6	1	2	6	2	-	4	3.8	1.00	$ 200.00	$ 100.00
3:00 PM	546	3	-	3	12	1	2	6	3	-	3	11.3	1.50	$ 200.00	$ 66.67
4:00 PM	1,365	7	-	7	9	3	2	6	6	1	-	17.1	3.00	$ 200.00	$ 33.33
5:00 PM	819	5	-	5	15	2	2	6	5	-	1	22.7	2.50	$ 200.00	$ 40.00
6:00 PM	819	5	-	5	9	2	2	6	5	-	1	14.3	2.50	$ 200.00	$ 40.00
7:00 PM	1,092	6	-	6	8	2	2	6	6	-	-	15.0	3.00	$ 200.00	$ 33.33
8:00 PM	409	3	-	3	12	1	1	3	3	-	-	43.8	3.00	$ 100.00	$ 33.33
9:00 PM	409	3	-	3	8	1		-	-	3	-		-	$ -	$ -
10:00 PM	-	-	-	-		0		-	-	-	-		-	$ -	$ -
11:00 PM	136	1	-	1	14	1		-	-	1	-		-	$ -	$ -
Total	**10,917**	**66**	**-**	**66**	**9.9**	**26**	**23**	**69**	**56**	**10**	**13**	**20**	**2.43**	**$ 2,300.00**	**$ 41.07**